



















## Industrial Safety Systems. Made by SICK.

  
**safety** PLUS

Sensor Systems and Services  
for Safety Technology

- Contents
- List of product families
- Product selection based on risk assessment
- Products and systems

**SICK**  
Sensor Intelligence.

	<p>safetyPLUS → A-0                  Services → A-2                  Regulations and standards → A-16</p>		<b>A</b>	
	<p>Applications</p>		<p>Products and complete solutions for effective protection of people and protection against accidents</p>	<b>B</b>
<p>Opto-electronic protective devices</p>	<p>Safety laser scanners</p>		<p>Electro-sensitive protection of hazardous points, hazardous areas and access for stationary and mobile applications</p>	<b>C</b>
	<p>Safety camera system</p>		<p>The innovative solution for the protection of hazardous points on press brakes</p>	<b>D</b>
	<p>Safety light curtains</p>		<p>Electro-sensitive protection of hazardous points, hazardous areas and access</p>	<b>E</b>
	<p>Multiple light beam safety devices</p>		<p>Electro-sensitive protection of hazardous areas and access</p>	<b>F</b>
	<p>Single-beam photoelectric safety switches</p>		<p>Electro-sensitive protection of hazardous areas and access</p>	<b>G</b>
<p>Electro-mechanical and non-contact safety switches</p>	<p>Safety switches with separate actuator</p>		<p>Access protection at guards. With separate, coded actuator</p>	<b>H</b>
	<p>Safety locking devices</p>		<p>Access protection at guards. With electrical or mechanical locking</p>	<b>I</b>
	<p>Safety position switches</p>		<p>Safe position monitoring</p>	<b>J</b>
	<p>Safety hinge switches</p>		<p>Access protection at hinged guards. Adjustable switching points</p>	<b>K</b>
	<p>Non-contact safety switches</p>		<p>Electro-sensitive safety sensors with evaluation unit. In transponder, reed and inductive technology</p>	<b>L</b>
	<p>Safety operating devices</p>		<p>Rope-operated switches as per emergency stop legislation. Enabling switches for work in hazardous areas</p>	<b>M</b>
<p>Safe control solutions</p>	<p>Safety relays</p>		<p>Enable electro-mechanical and opto-electronic safety components to be simply integrated into a machine or system: From emergency stop to laser scanner</p>	<b>N</b>
	<p>Safety controllers</p>		<p>For the individual solution of independent or mutually interdependent complex safety applications</p>	<b>O</b>
	<p>Safety network solutions</p>		<p>Designed for machines and systems with high network complexity and programmable controllers</p>	<b>P</b>
<p>Safety software</p>	<p>Safexpert</p>		<p>Software for safety engineering. This software provides step-by-step guidance towards CE certification, support during risk analysis, and simplifies the process of documentation.</p>	<b>Q</b>
	<p>Glossary</p>		<b>R</b>	

# List of product families

## Opto-electronic protective devices

Safety laser scanners		Safety light curtains		Multiple light beam safety devices	
S3000 Professional	C-3	C4000 Advanced	E-2	M4000 Advanced / UE403	F-2
S3000 Advanced	C-10	M4000 Advanced Curtain	E-23	M4000 Advanced A/P / UE403	F-2
S3000 Standard	C-17	C4000 Standard	E-39	M4000 Standard	F-17
S3000 Remote	C-24	C4000 Micro	E-68	M4000 Standard A/P	F-17
S3000 Professional CMS	C-31	C4000 Micro in IP67 Housing	E-77	M4000 Area	F-29
S300 Professional	C-38	C4000 Basic Plus	E-82	M2000 Standard	F-38
S300 Advanced	C-48	C4000 Basic	E-91	M2000 Standard in IP67 Housing	F-46
S300 Standard	C-57	C4000 Eco	E-101	M2000 RES/EDM	F-51
S200	C-65	C4000 Entry/Exit	E-110	M2000 Cascadable	F-59
<b>Safety camera system</b>		C4000 Palletizer	E-117	M2000-A/P Standard	F-67
V4000 Press Brake	D-2	C2000 Standard	E-124	M2000-A/P RES/EDM	F-75
		C2000 Standard in IP67 Housing	E-137	Mirror and device columns	F-82
		C2000 RES/EDM	E-142	<b>Single-beam photoelectric safety switches</b>	
		C2000 Cascadable	E-155	L4000 system	G-2
		LGT	E-165	WSU/WEU26/2	G-11
				WS/WE18-3	G-17
				WS/WE27-2	G-22
				VS/VE18-2	G-27

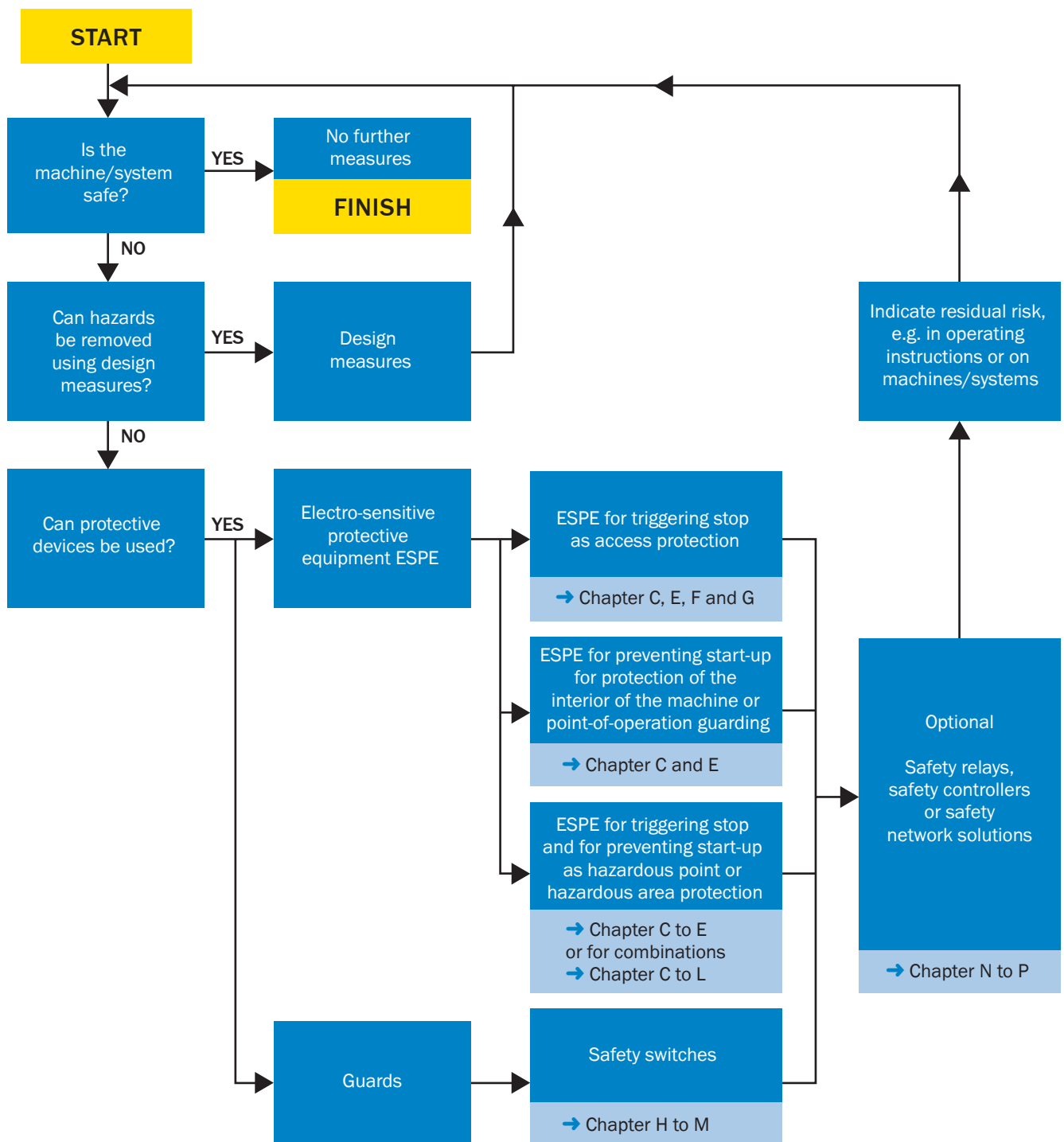
## Electro-mechanical and non-contact safety switches

Safety switches with separate actuator		Safety locking devices		Safety hinge switches	
i10	H-2	i10 Lock	I-2	i10H	K-2
i11S	H-7	i14 Lock	I-9	i110H	K-5
i12S	H-12	i200 Lock	I-13	<b>Non-contact safety switches</b>	
i16S	H-17	i1001 Lock	I-17	RE300	L-2
i17S	H-21	i1002 Lock	I-23	RE4000	L-7
i100S	H-25	<b>Safety position switches</b>		T4000	L-12
i110S	H-31	i10P	J-2	T4000 Multi	L-17
i1001	H-35	i10R	J-4	T4000 Compact	L-23
i1002	H-41	i100P	J-7	IN4000	L-28
		i100R	J-10	<b>Safety operating devices</b>	
		i110P	J-13	E100	M-2
		i110R	J-16	i110RP	M-5

## Safe control solutions

Safety relays		Safety controllers		Safety controllers	
UE10-30S	N-3	UE410 Flexi	O-2	UE4232	P-17
UE23-2MF	N-9	UE440	O-18	UE4233	P-17
UE42-2HD	N-13	UE470	O-18	UE4234	P-17
UE43-2MF	N-18	UE4427	O-26	UE4421	P-20
UE43-3MF	N-23	UE4457	O-26	UE4420	P-28
UE43-6MF	N-28	UE4470	O-34	UE4450	P-28
UE44-3SL	N-32	<b>Safety network solutions</b>		UE4455	P-28
UE45-3S1	N-37	UE4120	P-2	UE4427	P-36
UE48-20S	N-42	UE4150	P-2	UE4457	P-36
UE48-30S	N-48	UE4155	P-2	UE4470	P-44
UE49	N-53	UE4140	P-50	UE1840	P-50
LE20	N-57	UE1140	P-50	UE1940	P-50
LE20 Muting	N-64	UE3212	P-9		
UE10-4XT	N-71	UE4215	P-13		
UE11-4DX	N-74	UE4231	P-17		

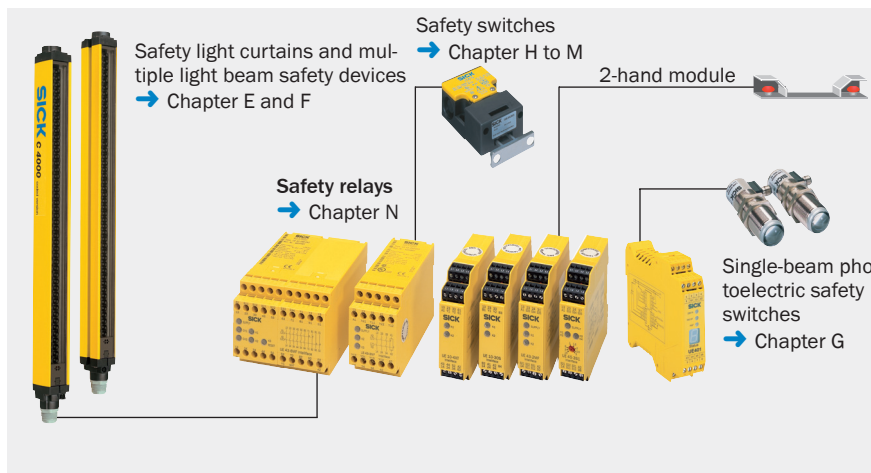
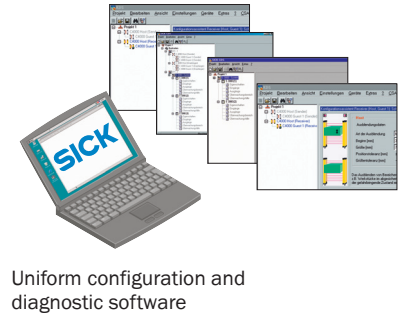
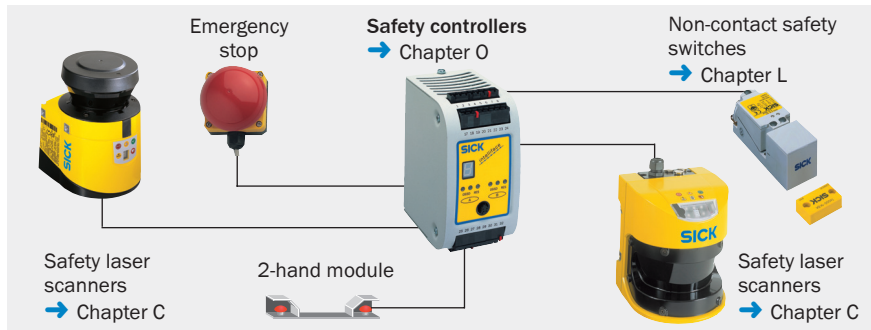
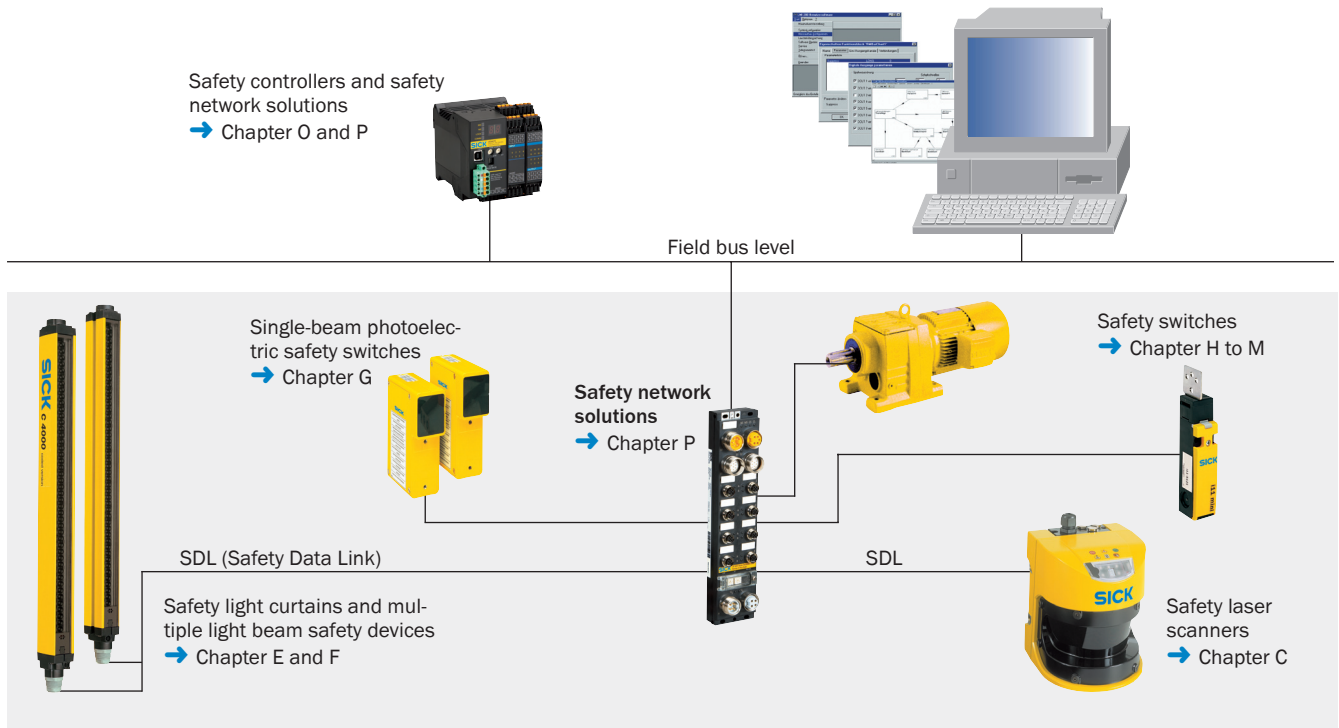
→ Combinations see appendix "Sensor systems and safe control solutions from SICK"



**Note:**  
 The simplified risk analysis process shown here is only intended to provide a quick introduction to product selection. You will find information on the process, in accordance with ISO 12100, in → Chapter A under Regulations and standards as well as → Chapter Q, Safexpert.

**Industrial Safety Systems from SICK.**  
**Safe to say: more performance!**





## Safexpert

Safety engineering on machines and systems: Safe design, risk assessment and documentation  
→ Chapter Q

**SICK – leading position worldwide  
in factory and process automation.**



**SICK – one of the world's  
leading manufacturers of  
sensors and sensor solutions  
for industrial applications.**

SICK is a technology and market leader in factory and process automation. The company, founded in 1946 and with its headquarters in Waldkirch in Breisgau, today employs more than 4,000 employees and is active worldwide with subsidiaries, representatives and associated companies.



## Years of continuous growth – with continuous expansion of its range of products and services



### Factory automation

The products and solutions from SICK are as varied as the tasks for controlling production and logistical processes.

SICK sensors detect, count and classify objects and also detect their shape, position, colour, and surface differences.

SICK safety technology protects against hazards caused by machines and systems in production and transport processes – and is comprehensively effective in accident prevention and the protection of people.

SICK bar-code readers and bar-code reading systems take over sorting and routing in flows of industrial materials, in baggage and package distribution systems and in mail-order companies. 2-D code readers provide unambiguous identification of laboratory samples, electronic components and bulk printed matter. RFID technology expands now the range of applications for the Auto Ident Division as a complete supplier.

SICK laser measurement systems provide important information on vehicle heights and shapes of loads, and monitor routes for automated guided transport systems.



### Process automation

Components and systems for gas analysis, flow rate and level measurement systems, as well as for effluent systems, are the main analysis and process measurement products from SICK MAIHAK.



## Success based on technological and user expertise.

The exchange of specialist knowledge is a key success factor in research and development.

Only in this way product ideas can be efficiently implemented in fully developed applications.



### Industrial Sensors



Encoders, ultrasonic sensors, inductive, capacitive and magnetic proximity sensors as well as magnetic cylinder sensors, photoelectric switches, contrast scanners and luminescence scanners, color sensors, fork sensors, light grids, distance sensors, data transmission systems, vision sensors, position finders and light section sensors.

### Industrial Safety Systems



Photoelectric safety switches, safety light curtains, safety laser scanners, safety switches and safety software, safety camera system and safe control solutions.

The range of services provided includes commissioning, safety inspections, repair and exchange service, stoptime measurements, technical advice, education and training.



At SICK more than 300 employees work in research and development.



**SICK is present worldwide with more than 40 national and international subsidiaries, numerous representatives as well as associated companies.**

### Auto Ident



Stationary 2-D code readers and bar-code scanners, hand-held scanners for mobile and stationary use, omnidirectional bar-code reading systems, indoor and outdoor laser measurement systems, evaluation electronics, bus interfacing technology, software tools, engineering.

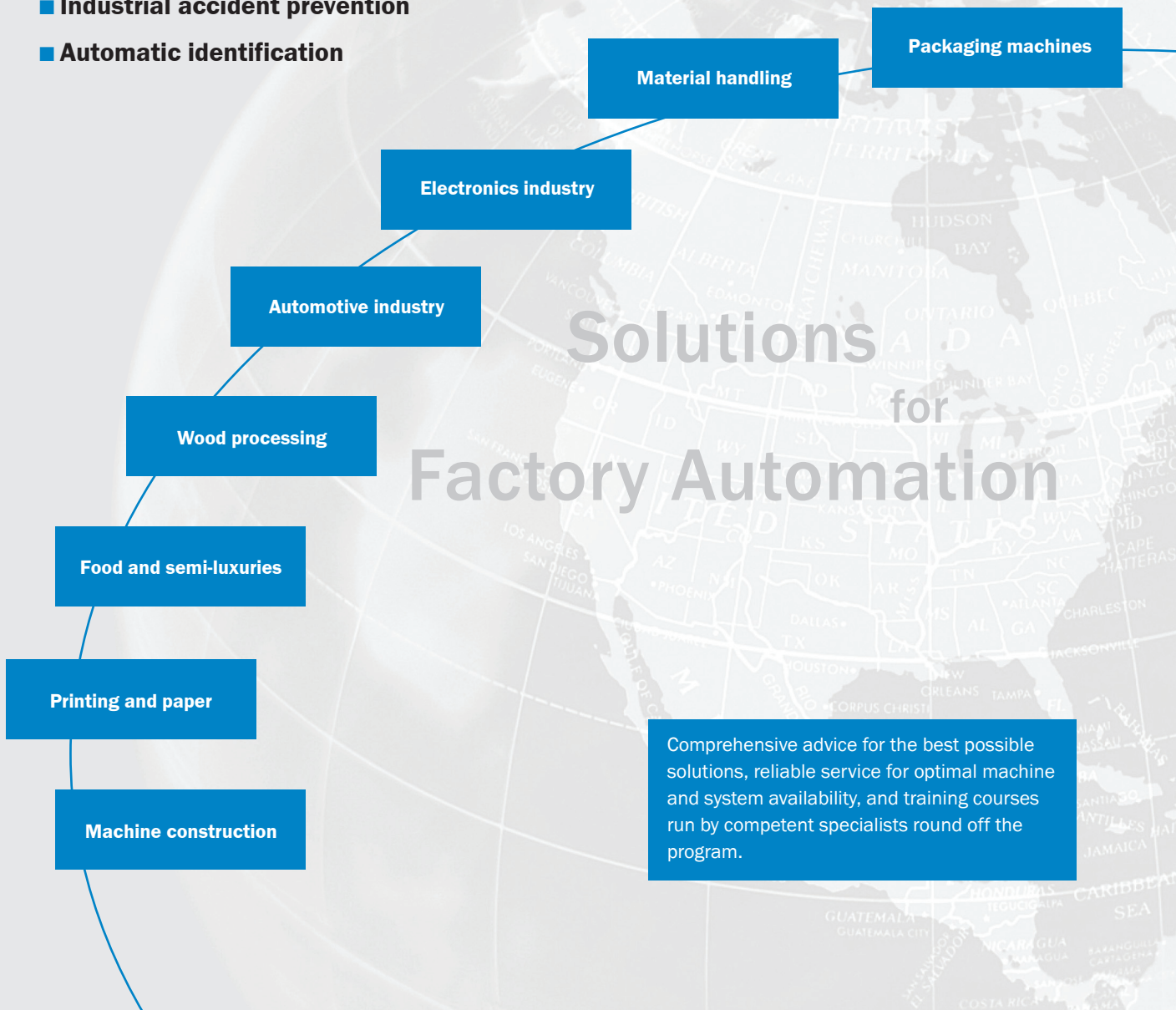


## Solutions for factory automation.



Factory automation places very high requirements on machines and systems so that rationalisation potential can be effectively exploited for cost-effective manufacturing. For machine construction and systems engineering, SICK provides a wide range of components in the areas:

- **Sensors**
- **Industrial accident prevention**
- **Automatic identification**



## At home in many sectors.

SICK is present with innovative, powerful products and product systems wherever industrial processes require optimisation. With its comprehensive services SICK, as a development partner for industry, offers efficient solutions for all aspects of factory and process automation.

### Automotive industry

Competence, know-how and extensive experience characterise SICK's worldwide involvement in the automotive industry. With a complete range of industrial sensors, as well as systems and services, SICK contributes towards increasing the availability of machines and systems, improving productivity, and ensuring that manufacturing processes are safe and cost-effective.



### Material handling/logistics



Sensor solutions from SICK are involved wherever flexible and efficient design of material flow and logistical processes are vital – e.g. in high-bay warehouses or logistics centres.



## Packaging/food

Electro-sensitive sensors detect, position, classify and count a very wide range of objects – in the beverage, food and semi-luxury industries too. As a result, for example, biscuits are placed in the right packing, bottles are filled with precision, labels are correctly positioned. SICK sensors ensure that production processes run efficiently.



## Electronics



Regardless of whether wafer detection, chip positioning or circuit-board inspections are involved – SICK sensors detect and perform final inspections in high-end applications – cost-effectively and with maximum precision.

## Machine construction

Where effective prevention of accidents and protection of people have the highest priority, safety laser scanners, safety light curtains, photoelectric safety switches and safety switches from SICK provide protection of hazardous areas, hazardous points and access on machines and production systems. SICK has extensive experience based on many thousands of applications.



## safetyPLUS from SICK.

# Safe to say: more innovative performance – and a clear plus in efficiency for your operation!

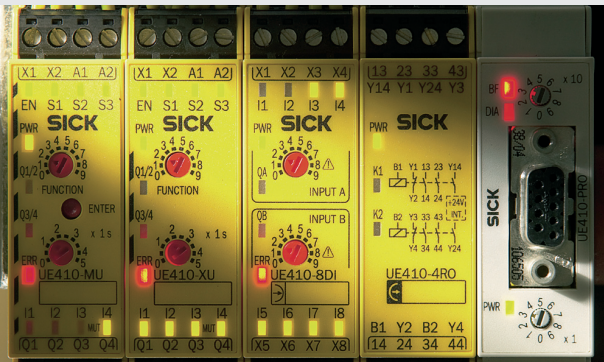
SICK points the way to the future: with the world's most comprehensive safety portfolio – and with the decisive plus for each of your challenges! safetyPLUS represents our entire range in the Industrial Safety Systems Division, and reflects our aim to do everything technically possible and economically desirable.

safetyPLUS:  
More **inspiration** for trailblazing solutions!

SICK has been developing safety innovations at the highest level for 60 years. During this time we have gained an excellent reputation as a complete supplier of trailblazing safety solutions: many of our innovations now also set international standards in performance and functionality! Thus our company is one of the most important trendsetters in the entire sector – a position that we intend to build upon for our customers.

safetyPLUS:  
More **competence** for each of your individual projects!

Whether individual solutions or integrated safety concepts: SICK is your partner from the risk analysis and hazard assessment to creating the safety concept – and we are there for you at any time from the project planning in the design phase, to implementation, and support during running operation. Our competence for the safe interaction between humans and machines is unique worldwide. Moreover, thanks to our fundamental knowledge of all relevant standards we ensure maximum legal security for producers and users.



**safetyPLUS:**  
More **system openness** for your machines and plants!

SICK develops innovations and solutions that can be integrated in almost all system architectures. The central core of this philosophy of "system openness" is particularly evident in the case of our powerful control solutions: thus with us you do not have to stick to any particular system platform, as our solutions can be seamlessly integrated into almost all system environments! So your decision in favour of SICK is also a decision in favour of your gain in corporate freedom.

**safetyPLUS:**  
More **intelligence** for your smooth operations!

The use of intelligent control technology in combination with dialogue-enabled sensors forms the threshold to considerably greater economic efficiency – because optimum productivity demands optimum interplay between humans and machines, just as much as between safety sensors and controllers. Intelligent solutions provide more information on the state of your machines – and, thanks to comprehensive diagnostic information, the security of knowing that you always have everything under control!

**safetyPLUS:**  
More **quality** in products and services!

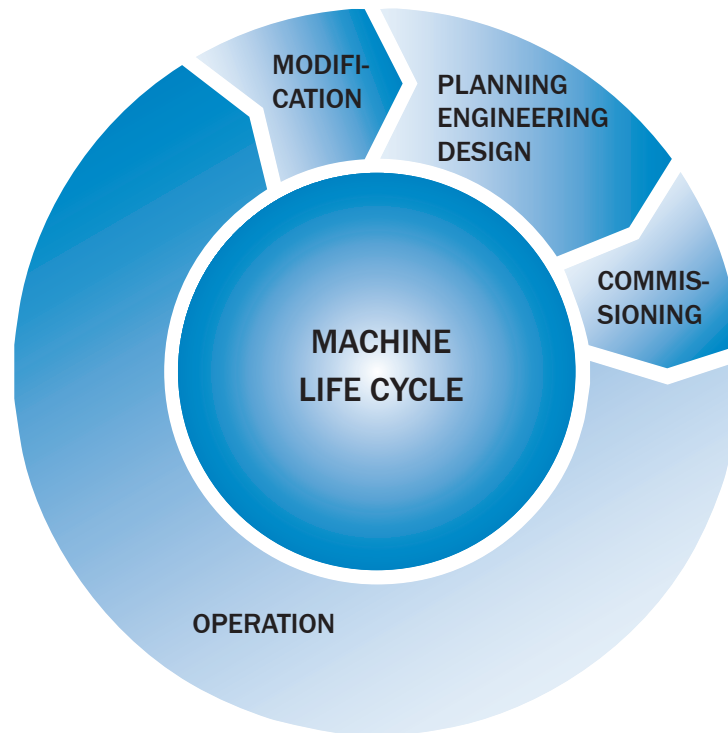
Our first-class product quality reflects our excellent relationship with our customers – with whom many years of collaboration connect us. Safety consultancy, services in the areas of engineering and project planning, commissioning with safety acceptance, training, product support, accredited inspections, and much more besides, are part of our fixed range of services for all our customers. Over 4,000 employees in more than 40 countries are pleased to be of service at any time!




**safetyPLUS**



# A International Service Solutions



## Safety during all phases of the machine life cycle

In our highly competitive marketplace we need to fine-tune options to stay ahead of the game. By co-ordinating our performance with your requirements SICK offers you a complete support package, which is available to you for the entire service life

of your machine and which encompasses planning and commissioning through to maintenance, repair and updating of your system. Service – configured to suit your own requirements.

## Services from SICK tailored to customer requirements

- Increase in machine availability
- Conforming to international technical safety standards
- Documented and traceable results
- Fast, competent and on-time support
- Reduced costs through optimised solutions
- Support of your safety organisation

## High-quality accredited inspection services in compliance with DIN EN ISO/IEC 17020



DAT-I-003/01

**SICK Safety Inspection**

This standard regulates the general criteria for the work carried out by a variety of types of inspection organisations.









The quality of our services largely depends on the training and skill of our employees and the structure of our processes and methodology.

It is important to constantly monitor and improve the processes and their quality, and adapt to meet our customers' requirements. Annual verification by independent external auditors ensures the maintenance of service quality.

Services performed by our subsidiaries are based upon standards valid throughout Europe. Country-specific standards are taken into account. The accredited inspection body at SICK AG in Germany guarantees Europe-wide procedures and quality of the inspections.



# Services at a glance

		Page
	<p><b>Application support</b></p> <p>Our specialists will assist you in planning the safe operation of your system and provide help in implementing your safety requirements. We can thus eliminate any sources of danger from the outset, saving you time and money.</p>	www.sick.com
	<p><b>Product support</b></p> <p>If against one's expectations a malfunction occurs we offer competent support. Our device exchange service is rapid and cost-effective to ensure re-commissioning of your production line. And in cases of emergency we will undertake to repair your equipment quickly in our factory or, if appropriate, on site.</p>	www.sick.com
	<p><b>Safety inspection</b></p> <p>Inspections minimise risks, reduce machine downtimes, and allow the maintenance of safety and quality standards. Our service contracts ensure that your safety equipment operates optimally at all operator-machine interfaces.</p>	Initial inspection
		Periodic inspection
		Stoptime measurement
	<p><b>Commissioning check</b></p> <p>With the commissioning check the correct technical function of the SICK protective devices is confirmed. Thus the availability is ensured right from the start.</p>	A-11
	<p><b>Upgrade services</b></p> <p>We offer you tailor-made upgrade kits to ensure the availability of your plant also in future. Thus you achieve safety and optimal productivity with modern protective devices.</p>	www.sick.com/upgrade
	<p><b>Training &amp; Education</b></p> <p>Our comprehensive training programme gets your staff "technically fit" to deal with any safety-related technical situations that may arise. We provide support to users and operators on product introduction, and can also offer support regarding efficient and technically correct use of SICK safety products.</p>	A-13

➔ Please contact your national subsidiary or agent to find out more about the services offered in your country, or select your contact at [www.sick.com](http://www.sick.com).

A



- Comply with current safety standards
- Reduce responsibility
- Maintain safety levels, availability and ongoing production

## Initial inspection



### Our competence – your safety!

The verification of safety functions is usually expensive and time-consuming: complex machine functions, increased documentation and tighter deadlines complicate acceptance. Final adjustments, e.g. of electro-sensitive protective equipment, often lead to hasty alterations and can thus increase the risk of accidents. Collaborate with our experts and exploit their application experience in your process with

our “initial inspection” service, offering you important advantages:

- Quality of test methods and competent execution by a service engineer trained to DIN EN ISO/IEC 17020
- Traceable and documented results for quality management
- Early detection of safety risks and thus increased availability of your machine or system
- Recognised safety, certified by our test seal

### Scope of services

The initial inspection determines the operational safety of the SICK safety device for protecting against mechanical hazards of

the production system. The SICK inspection is carried out on the basis of current regulations.

### Main test areas

- Does the SICK safety device function in line with the current use of the machine?
- Does the type of SICK safety device correspond with the hazards actually encountered?
- Does the SICK safety device correspond with the type required according to IEC 61496?
- Does integration of the SICK safety device, up to output signal transfer to the control system, correspond with the category complying with EN 954?
- Is it impossible to bypass the SICK safety device?

### Test documentation

- The SICK test seal will be attached if the test is successful.
- A test report supplements your machine documentation regarding compliance with machine safety requirements.

Further information	Page
→ Periodic inspection	A-6
→ Stoptime measurement	A-9
→ Commissioning check	A-11
→ Training & Education	A-13



Test seal for presses



Test seal for power-driven machinery

## Preconditions

- The devices are assembled, ready for operation and accessible.
- The machine documentation must be available as it is part of the inspection.
- The machine operator must be available for the duration of the inspection, to set up system-specific operations and to start the system.
- The machine stoptime is required in order to determine the safety distance for the protective device. This can be made available in written form. Alternatively, we can offer “stoptime measurement” as a separate service  
→ stoptime measurement page A-9.

## Extended scope of service included in the initial inspection

- Some parameterisation and adjustments are carried out. Major alterations, e.g. programming or conversions, are charged according to expenditure.
- At the client's request, employees are instructed in operating the safety device, insofar that this is necessary and can be carried out quickly during the inspection.

## Ordering information

Inspection for device type	Part number
WSU/WEU26	1690006
LGT	1681266
AGS	1690015
LGS	1690017
VS/VE18	1681984
MSL, MSLZ	1681043
M2000	1681321
M4000	1682310
M4000 with UE403	1682311
FGS	1681017
C2000 (host)	1681319
C2000 (guest)	1681980
PLS	1681019
S3000 Standard	1681880
S3000 Advanced	on request
S3000 Professional	on request
S3000 Remote	on request
S300 Standard	on request
S300 Advanced	on request
S300 Professional	on request
C4000 (host)	1681613
C4000 (guest)	1681614
V4000	on request
LVU1406	1690004
LVS1400	1690013
LVU206-1106	1690002
LVS300-1050	1690011
LSI-1PLS	on request
LSI-2PLS	on request
LSI-3PLS	on request
LSI-4PLS	on request
Equipment from other suppliers (AOPD, AOPDDR)	1681944 <sup>1)</sup>

<sup>1)</sup> Device types as per prior agreement

The above-mentioned details for placing orders relate to invoice costing based on lump sum charges. Information on prices and price breakdowns are given in the current price list.

Inspections are carried out on the basis of accredited inspection methods in Germany. Country-specific standards are taken into account. Please contact your national subsidiary or agent to find out more about the services offered in your country, or select your contact at [www.sick.com](http://www.sick.com).

A



- Comply with current safety standards
- Reduce responsibility
- Maintain safety levels, availability and ongoing production

## Periodic inspection



### Our competence – your safety!

Preventive protective measures not only increase employee safety, but also optimise the availability of your system and, therefore, improve your business success. The EU directive on the use of equipment stipulates the periodic inspection of safety devices.

Our “periodic inspection” service offers you important advantages:

- Experts and their application experience contribute to meeting your operational safety targets – permanently

- Quality of test methods and competent execution by a service engineer trained to DIN EN ISO/IEC 17020
- Traceable and documented results for quality management
- Early detection of safety risks, and thus increased availability of your machine or system
- Correct functionality of your safety devices, certified by our test seal

### Scope of services

Periodic testing is based on the initial inspection. Following the first SICK inspection, you receive confirmation of the operational safety of the SICK safety device installed to protect against the mechanical hazards posed by the production systems,

according to the SICK safety standard. Apart from verifying the operational safety of the machine or system, the periodic inspection also includes the preventive maintenance of your safety device.

### Main test areas

- Does the SICK safety device function in line with the current use of the machine?
- Does the type of SICK safety device correspond with the hazards actually encountered?
- Does the SICK safety device correspond with the type required according to IEC 61496?
- Does integration of the SICK safety device, up to output signal transfer to the control system, correspond with the category complying with EN 954?
- Is it impossible to bypass the SICK safety device?

### Test documentation

- The SICK test seal will be attached if the test is successful.
- A test report supplements your machine documentation regarding compliance with machine safety requirements.

Further information	Page
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→ Stoptime measurement	A-9
→ Commissioning check	A-11
→ Training & Education	A-13



Test seal for presses



Test seal for power-driven machinery

## Preconditions

- The devices are assembled, ready for operation and accessible.
- The machine documentation must be available as it is part of the inspection.
- The machine operator must be available for the duration of the measurement, to set up system-specific operations and to start the system.
- The machine stoptime is required in order to determine the safety distance for the protective device. This can be made available in written form. Alternatively, we can offer “stoptime measurement” as a separate service  
→ stoptime measurement page A-9.

## Extended scope of service included in the periodic inspection

- Preventive maintenance of the safety device
- Readjustment of the safety device, if required
- Removal of contamination which may affect its functionality
- Necessary maintenance work is carried out for devices with components subject to wear such as scanners or old type light grids (LVU, LVS, etc.), e.g. cleaning of mirrors and optical heads.
- Removal of minor faults, where this is possible without requiring a significant length of time
- At the client's request, employees are instructed in operating the safety device, insofar that this is necessary and can be carried out quickly during the inspection.
- Some parameterisation and adjustments are carried out. Major alterations, e.g. programming or conversions, are charged according to expenditure.

## Periodic inspection with a service contract



Unforeseen events can be reduced to a minimum by regular safety inspections following prior arrangement with you. For an entire production site, if desired.

Take advantage of the following additional benefits:

- Less organisational effort through agreed appointments and monitoring of the inspections
- Benefit of scheduled machine downtimes for the measurements and inspections
- Priority aid in case of faults

Discuss with us the options available for your production site.

## A

## Ordering information

Inspection for device type	Part number
WSU/WEU26	1690036
LGT	1681268
VS/VE18	1681985
AGS	1690046
LGS	1690048
MSL, MSLZ	1681041
M2000	1681313
M4000	1682313
M4000 with UE403	1682314
FGS	1681021
C2000 (host)	1681311
C2000 (guest)	1682101
PLS	1681023
S3000 Standard	1681882
S3000 Advanced	on request
S3000 Professional	on request
S3000 Remote	on request
S300 Standard	on request
S300 Advanced	on request
S300 Professional	on request
C4000 (host)	1681624
C4000 (guest)	1681625
V4000	on request
LVU 1406	1690034
LVS 1400	1690044
LVU206-1106	1690032
LVS300-1050	1690042
LSI-1PLS	1681620
LSI-2PLS	1681621
LSI-3PLS	1681622
LSI-4PLS	1681623
Equipment from other suppliers (AOPD, AOPDDR)	1681945 <sup>1)</sup>

<sup>1)</sup> Device types as per prior agreement

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## Stoptime measurement



A



- Comply with current safety standards
- Reduce responsibility
- Maintain safety levels, availability and ongoing production

### Confidence in our quality!

If the requirements of the EU Machinery Directive are to be followed and non-contact safety devices are installed, there must be sufficient distance between the safety device and the hazardous area. For its calculation and safety assessment, the stoptime for presses and power-driven machinery must be determined. This stoptime must be included in the documentation and must, for presses, also be clearly visible on the machine.

Our “stoptime measurement” service offers you important advantages:

- Experts and their application experience contribute to meeting your operational safety targets – permanently
- Quality of test methods and competent execution by a service engineer trained to DIN EN ISO/IEC 17020
- Traceable and documented results for quality management
- Quality of measurement assured by calibrated measurement equipment and execution by SICK experts

### Scope of services

Stoptime measurement calculates the safety distance according to specific machinery standards (Type C standard) or to EN 999; it is mandatory for a safety inspection.

The safety distance for the safety device is calculated by measuring the stoptime and using standardised calculation rules and application-dependent constants.

### Measurement

- Measurement of the stoptime on 10 representative samples and determination of the current stoptime.
- Computing the minimum safety distance according to the calculation principles of a specific machinery standard (Type C standard) or EN 999.

Note:  
For multiple-axis applications, a measurement must be performed for each dangerous movement.

### Documentation

- A measurement report will be provided for your machine documentation.
- A label with the measurement data is attached directly to the machine.

SICK

Measurement on

No.  Pos.

Stoptime  ms

Safety distance  mm

Further information	Page
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→ Initial inspection	A-4
→ Periodic inspection	A-6
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## A

## Preconditions

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- The power-driven machinery or press must be equipped with the workpiece/tool for the intended use.
- The machine operator must be available for the duration of the measurement, to set up system-specific operations and to start the system.
- The system or machine must be freely accessible for the measurement.

## Ordering information

---

Service	Remarks	Part number
Stoptime measurement	For each dangerous movement of the machine	1681946

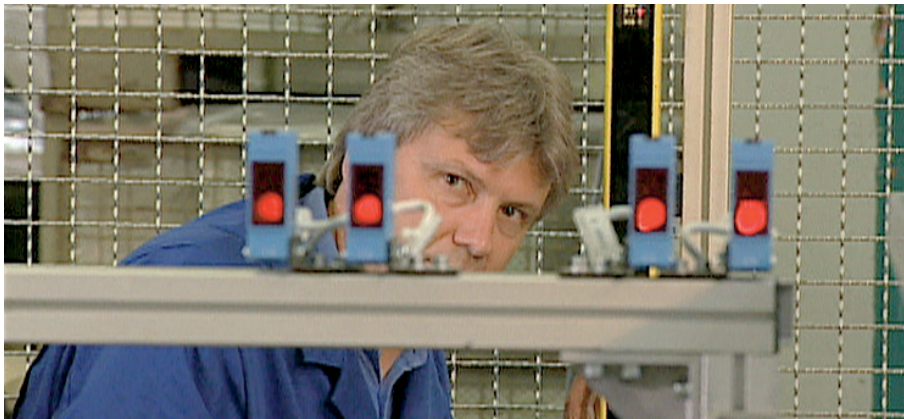
Inspections are carried out on the basis of accredited inspection methods in Germany. Country-specific standards are taken into account. Please contact your national subsidiary or agent to find out more about the services offered in your country, or select your contact at [www.sick.com](http://www.sick.com).



## Commissioning check



A



### Our product knowledge – your confidence

With the commissioning check the correct installation and technical function of the previously commissioned SICK protective devices in a new plant will be ensured. Our "Commissioning Check" service offers you important advantages:

- Ensuring availability early on
- Part of the safety check
- Verification of the set device parameters

### Scope of services

Determination of the correct installation and function of device components.

### Main test areas

- Mechanical mounting with respect to adjustment and alignment
- Electrical connection of protective conductors
- Selection of the correct voltage supply (tolerance, voltage level, stability)
- Function of the output signal switching devices
- Function of the interface communication
- Correct configuration of protective and warning fields as well as adaptations
- Determination of the correct operating mode (blinking, restart lock, automatic operation)

### Documentation

- A report with the set device parameters is drawn up.

Note:  
This report is not a substitute for safety checks in accordance with 89/655 EEC and their national equivalents.

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## A

## Preconditions

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- The devices are installed, configured, functional and accessible.

## Extended scope of service included in the commissioning check

---

- Correction of wrongly set device parameters and device alignments.
- At the client's request, employees are instructed in operating the safety device, insofar that is necessary and can be carried out quickly during the commissioning check.

## Ordering information

---

Check for device type	Part number
All SICK devices	1682047

## Training & Education



### Our knowledge – your advantage!

As a rule, the more experience you have, the more confidently you can handle an application. Transferring experience, and thus optimising applications, is an important component of SICK seminars and training courses. They are therefore all particularly practice-oriented.

The second emphasis of the training is to impart confidence. You will practice concrete product applications under the leadership of qualified trainers. You will thus

become increasingly confident during the course of the training, during which trainers will meet individual needs flexibly, and each participant can gain maximum benefit.

The “learning experience” is followed by the “success experience”. As a well-trained employee you know the everyday professional demands on you and can react to them flexibly. A success that pays.

### User knowledge gained from practical experience for practical applications

- Being “fit”: being in control of equipment in an emergency, and thus reducing machine downtime
- Surety in decision-making through clarity of relevant rules, regulations and application specifications
- Increased levels of quality through ongoing staff training
- Keeping technology in focus so that the right investment decisions are also made in the future



A

- Train employees
- Strengthen investment decisions
- Secure competitive advantage

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→ Safety light curtains	E-0
→ Safety controllers	O-0
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A

Seminars



**Enhancing knowledge**

Over the course of time, statutory and legislative requirements and/or standards change. Even technological change, moving away from traditional wiring technology using relays and multi-

pole cabling towards programmable safety modules and even entire networks using bus technology, brings about the need to make adjustments to meet these new innovations.

In series of seminars on the principles of technical safety current know-how on the following crucial topics is imparted:

- Essential information on relevant regulations regarding machine safety
- Standard-orientated selection of suitable safety devices
- Integration of safety equipment in the general control system
- Correct assessment of safety procedures based upon currently applicable directives, standards and legislation/regulations.

**Target groups**

- Design engineers
- Electrical engineers
- Technical managers
- Those responsible for machine safety

User training



**More confidence to select the right application**

SICK Training & Education programmes offer you an entire array of qualification measures. The customer training programmes are directed towards the products, in order to integrate these effectively into the planned application in an efficient and durable manner. You will receive the necessary tools to facilitate the setting up of any device and also carry out analyses and diagnostic investigations.

The general structure of a customer training programme embraces the various phases which arise during the selection and integration of a product:

- Selection
  - Safety aspects
  - Product properties and application possibilities
- Integration
  - Installation into the application and wiring
  - Programming
  - Commissioning
- Operating the system safely
  - Error/fault diagnostics and rectification

**Target groups**

- Employees in:
  - Maintenance
  - Servicing
  - Design
  - Planning

Customer-specific training programmes



**Match individual qualification requirements**

On request, SICK Training & Education will prepare a tailor-made qualification concept for your application. A programme which will contribute towards optimising operational quality and accelerate the transfer of knowledge on technical safety.

## Ordering information

A

### Seminars <sup>1)</sup>

Title	Part number
▪ Technical principles on safety	
Principles of machine related safety	1681692
Function, selection and application of safety devices	1681694
Safety technology for power-driven machinery	1681696
Safety technology for presses	1681698
Safety technology for power-driven machinery and presses	1681700
▪ Specialist seminars	
CE marking	1682111
Hazard analysis and risk assessment	1681913
Safexpert <sup>®</sup> training	1681365

### User training <sup>1)</sup>

Title	Part number
Advanced safety training	7026005
▪ Safety light curtains and light beams	
C4000 light curtain – basic training	1681681
Advanced functions of the C4000 with UE402 interface – advanced training	1681683
FGS light curtain with LCU safety interface	1681353
M4000 multiple light beam safety device – basic training	1682325
M4000 multiple light beam safety device – advanced training	1682327
MSL multi-beam photoelectric switch with MSM muting module	1681357
▪ Safety scanners	
S3000 laser scanner – basic training	1681916
S3000 laser scanner – mobile applications	1681917
S300 laser scanner – basic training	1681918
V4000 camera system – integration training	1682329
PLS proximity laser scanner	1681359
LSI laser scanner interface	1681361
Product instruction on PLS proximity laser scanner (on-site)	1681680
Product instruction on S3000 laser scanner (on-site)	1681919
▪ Safety interfaces	
Automation and field bus basics for DeviceNet and DeviceNet Safety	1682332
SICK safety network solutions with UE44XX	1682333
UE4100 – bus node for PROFIsafe	1681691
UE440/470 – multifunctional safety controllers	1681923

<sup>1)</sup> If required, we can conduct our seminars and customer training programmes on your premises

→ Up-to-date detailed information can be obtained on the Internet at [www.sick.com/training](http://www.sick.com/training)



Please contact your national subsidiary or agent for details on the services offered in your country, or select your contact at [www.sick.com](http://www.sick.com).




## A Regulations and standards

This chapter is intended for designers and users of machines who specify and employ protective devices. On the pages that follow, we show you various ways you can protect machines with

SICK protective devices while observing the applicable European and US regulations, directives and standards. The examples provided are the result of our many years' practical experience and are typical applications.

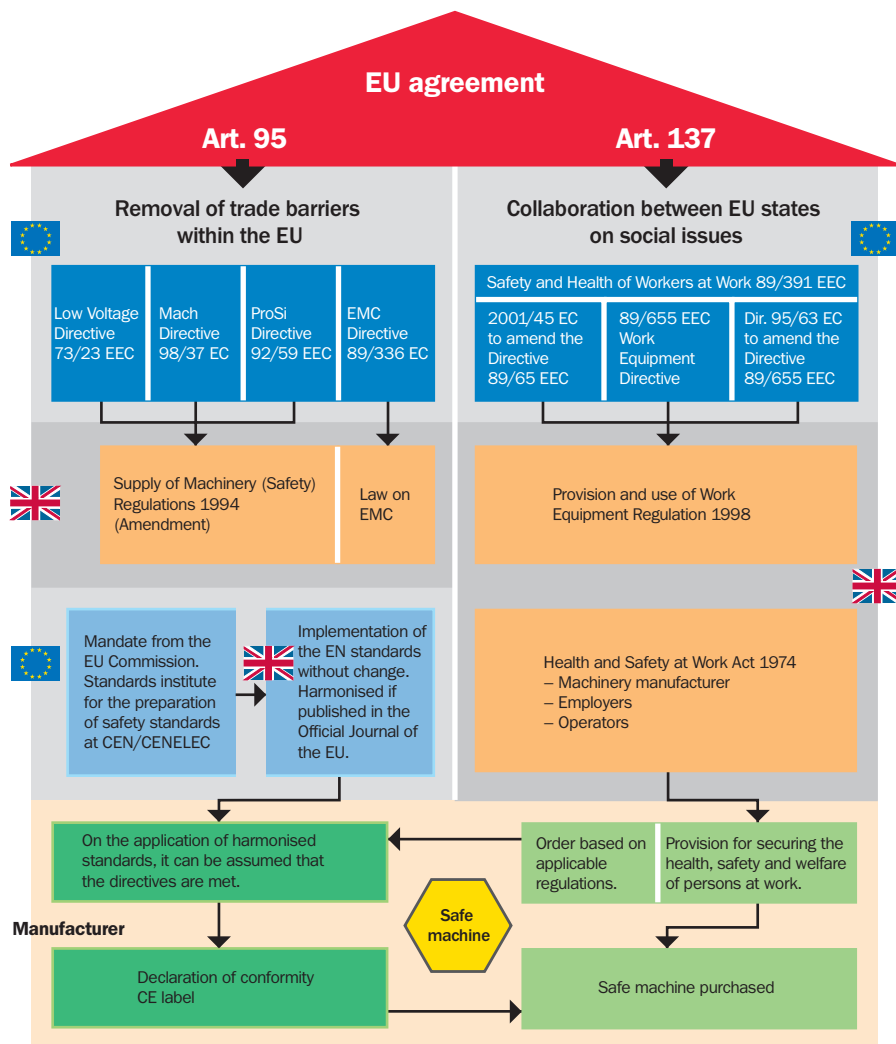
No legal claims can be made on the basis of the information provided. Each machine requires a specific solution as a result of national and international regulations and standards.

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A

## European directives, objectives and procedures



The directives agreed by the EU Commission/Council must be implemented in national law by the member states in order to allow implementation of the concept of free trade.

Moreover, EU standards institutes have been authorised to prepare EU standards that define the legal requirements in more detail.

In the area of machine safety, harmonisation has progressed very rapidly to protect the operators on machines and systems. Directives have been agreed and standards published.

**In this chapter we will briefly explain:**

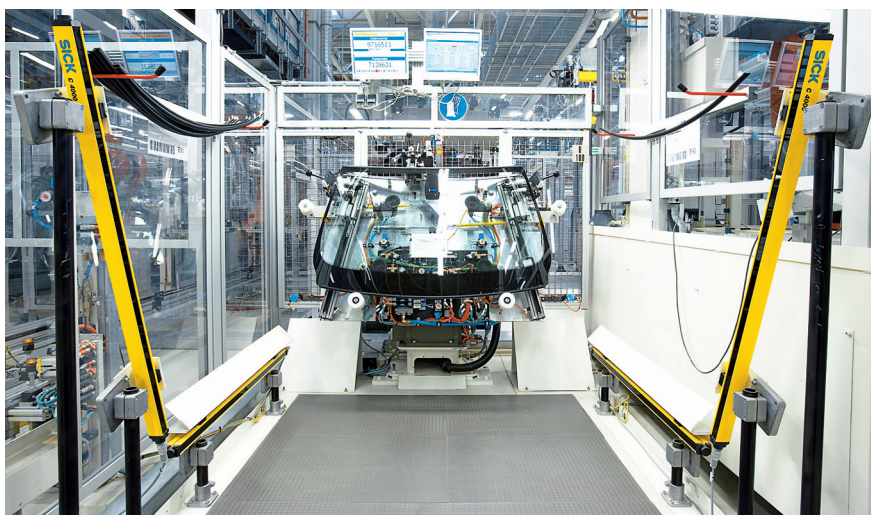
- The Machinery Directive 98/37 EC – applicable to the production of machines as well as to safety components placed on the market individually, and also applicable to second-hand machinery and devices from other countries that are to be placed on the market in the EU for the first time (e.g. from the USA or Japan)
- The Work Equipment Directive 89/655 EEC – applicable to the use of machines and devices
- The most important standards and their current wording



## The Machinery Directive 98/37/EC



Access protection with differentiation between man and material, realised using C4000 safety light curtain



The Machinery Directive 98/37 EC is intended for manufacturers of machines and devices, and organisations placing machines and devices on the market. It defines tasks for meeting the health and safety requirements for new machines, with the intention of removing trade barriers within Europe and guaranteeing operators a high level of protection.

The harmonised European standards define the possible ways and means of implementing these objectives. The Machinery Directive is integrated in national law and therefore binding. The standards harmonised at European level are prepared by private institutions and must remain voluntary stipulations. On the other hand, it is assumed that a machine built in accordance with the harmonised standards published in the Official Journal of the EU will meet the essential requirements in the directive.

As required by European law, the directive and its amendments must be implemented in every member country. The directive came into force on 1 January 1995 for machines and on 1 January 1997 for safety components.

You will find the original text of the Machinery Directive on the Internet, in the portal on European Union law, among other sites. → [http://europa.eu.int/index\\_en.htm](http://europa.eu.int/index_en.htm)

### What must machine manufacturers do?

The manufacturers must take into account the integration of safety during the design process. In practice this means that the designer must perform a hazard analysis and risk assessment during the development phase such that resulting measures can flow directly into the design.

To certify the conformity of the machine, the manufacturer must apply the CE label to every machine, and provide an EC Declaration of Conformity.

The Machinery Directive explains the complete process for conformity assessment. There are two categories of machines:

- Machines that are particularly hazardous are subject to special procedures. Annex IV of the Machinery Directive contains a list of the relevant machines. There is a similar list for electro-sensitive devices for protecting people, such as photo-electric switches and scanners.
- All other machines that are not listed in Annex IV are subject to the standard process.

### The procedure for obtaining the EC Declaration of Conformity for machines and devices not listed in Annex IV

If the machine/safety component is not listed in Annex IV, the manufacturer is responsible for applying the CE label without the involvement of a notified Body. The manufacturer must first document the measurements and test results and be able to provide them to the national authorities on request.

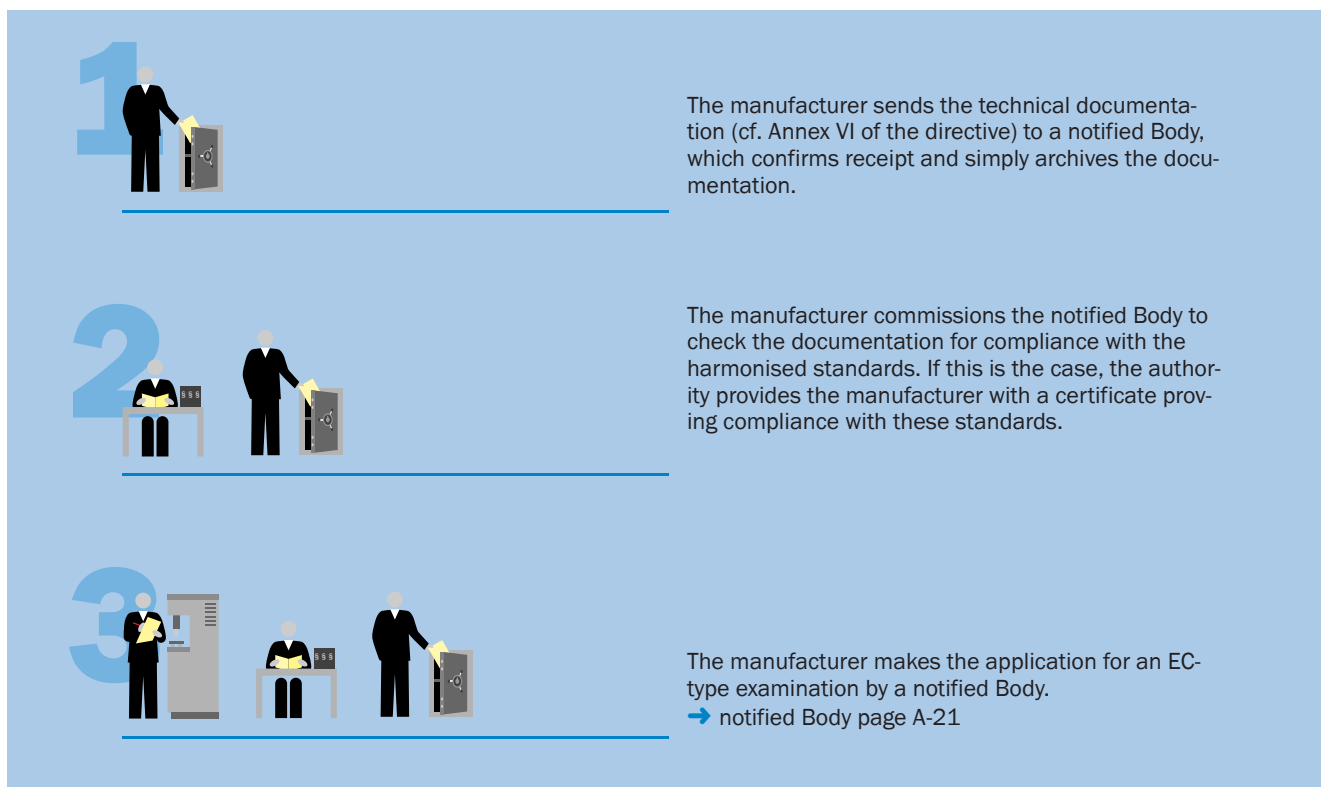
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**The procedure for obtaining the EC Declaration of Conformity for machines and devices that are listed in Annex IV**

- If harmonised standards exist for the machine or safety components, and these standards cover the entire range of requirements, the EC Declaration of Conformity can be obtained in one of three ways (see points 1-3).
- If there are no harmonised standards for the machine, or if the machine or parts of the machine was/were not built according to C-type standards, the EC Declaration of Conformity can only be obtained with an EC-type examination (see point 3). The manufacturer must provide the machine and the

corresponding technical documentation to the notified Body (→ page A-21) so that such a test can be performed. This Body tests for compliance with the directives and prepares an EC-type examination certificate that contains the results of the tests.

In all cases the manufacturer is responsible for preparing the Declaration of Conformity for the product in question and thus accepts responsibility for the machines and protective devices being designed and built in accordance with the standards and directives.



**The Work Equipment Directive 89/655 EEC (supplemented with the Directive 95/63 EC)**

The directive is intended to ensure that minimum regulations are observed during the use of work equipment to improve health and safety.

The employer’s obligations are defined in articles 3 to 8 of the directive:

Art. 3	General obligations
Art. 4	Rules concerning work equipment
Art. 4a	Inspection of work equipment
Art. 5	Work equipment involving specific risks
Art. 5a	Ergonomics and occupational health
Art. 6	Informing workers
Art. 7	Training of workers
Art. 8	Consultation of workers and workers’ participation

You will find the complete text of the 89/655 EEC Work Equipment Directive on the Internet, in the portal on European Union law, among other sites.

→ <http://europa.eu.int/eur-lex>

Each member state is allowed to add its own national requirements: service/maintenance period, use of gloves, etc.

→ see also graphic (right half) on page A-18

## Bodies

### Bodies providing safety advice

Companies that want to know whether their machines are compliant with the applicable European directives and standards can obtain advice on safety aspects from e.g. the HSE and DTI.

### Accredited Bodies

Accreditation is undertaken and monitored by the appropriate national institution.

The types of machine that the Body is entitled to test are defined as part of the accreditation.

### Notified Bodies

Each EC member state has the obligation to nominate notified Bodies as per the minimum requirements defined in the Machinery Directive, and to notify Brussels of these Bodies for listing.

Only these Bodies are authorised to issue EC-type examination certificates for the machines and safety components listed in Annex IV. It is explicitly stated that these Bodies are dedicated to specific areas of activity.

A list of the certification Bodies so far notified by EC member states may be obtained from the DTI London.

## European standards on the safety of machinery

### Harmonised European standards

The European Union's Commission authorises the CEN (European Committee for Standardisation) or CENELEC (European Committee for Electrotechnical Standardisation) to prepare a standard.

The technical specifications for compliance with the essential safety requirements in the directive are then defined in the related forums. As soon as the standard has been ratified, it is published in the Official Journal of the European Union. It is then considered a harmonised standard.

This type of standard is used as a reference and replaces all national standards on the same subject. The conformity of a safety component or a machine with a harmonised standard

forms a basis for assuming conformity with the underlying health and safety requirements defined in the Machinery Directive 98/37 EC.

### The status of the standard is indicated by various abbreviations

- A standard with the prefix EN... is recognised in all EU states and can be applied
- A standard with the prefix prEN... is currently in preparation
- A document that also has TS in the prefix is a Technical Specification. These documents define technical requirements that are to be met by a product, a process or a service. A technical specification is an initial draft standard.



Car industry:  
Area protection of an insertion station using a SICK laser scanner. The protective field is marked on the floor.



A

Different types of standards

There are three different types of standard:

**A-type standards**

(Basic safety standards) contain basic terminology, principles of design and general aspects that can be applied to all machinery.

**B-type standards**

(Group safety standards) address a safety aspect or safety equipment that can be used for a wide range of machinery.

- B1-type standards on special safety aspects (e.g. safety distances, surface temperature, noise), e.g. the electrical safety of machinery (EN 60204), the calculation of safety distances (EN 999).
- B2-type standards on safety equipment (e.g. two-hand controls, interlocking equipment, pressure-sensitive protective equipment, guards, electro-sensitive protective equipment IEC 61496 parts 1 and 2 / EN 61496 part 1, EN/TS 61496-2 part 2 and EN/TS 61496 part 3).

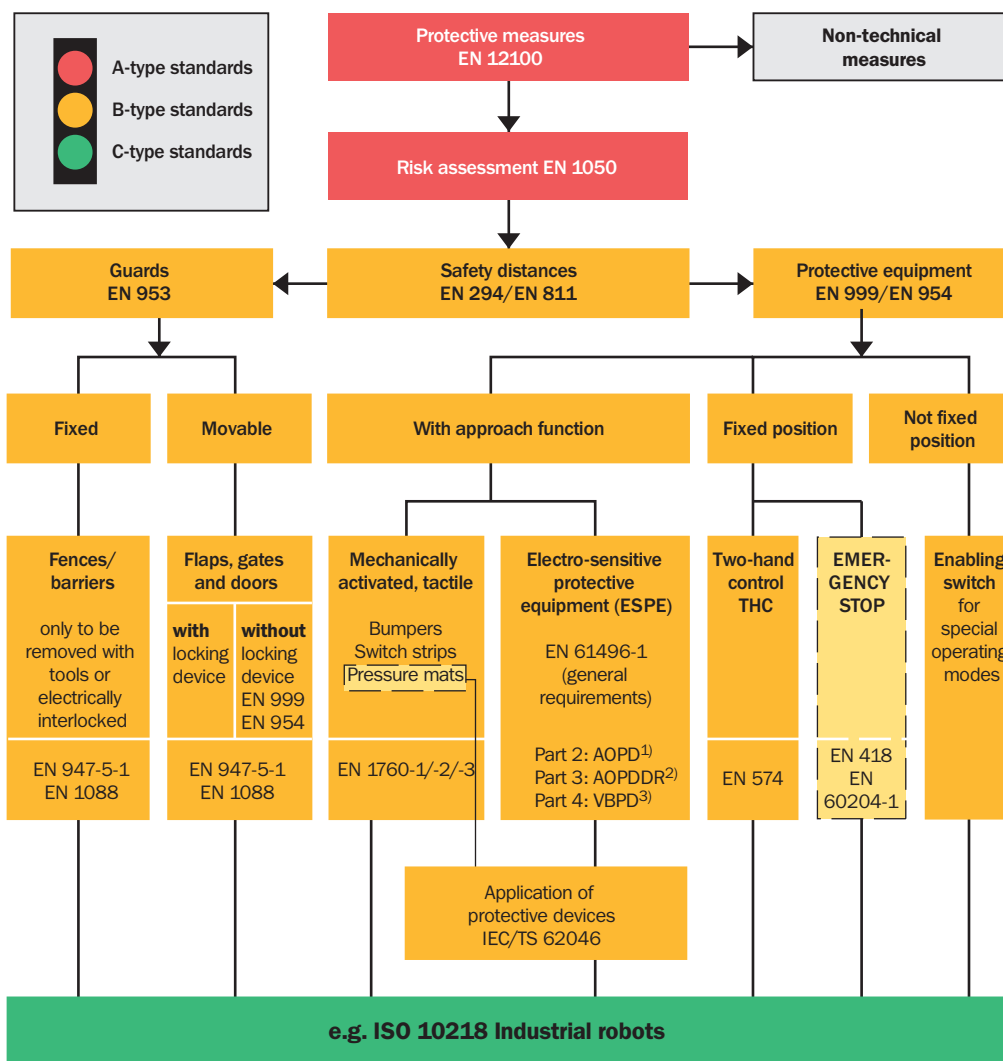
**C-type standards**

(Machinery safety standards) contain all safety requirements for a specific machine or a type of machine. If this standard exists, it has priority over the A-type or B-type standard.

Nevertheless, a C-type standard can refer to a B-type standard or an A-type standard.

If there is no C-type standard for a machine, conformity can be achieved based on the A-type or B-type standard. In all circumstances the requirements of the Machinery Directive must be met.

**Possible selections for protective devices on an industrial robot and related standards**



1) AOPD Active Opto-electronic Protective Device  
 2) AOPDDR Active Opto-electronic Protective Device responsive to Diffuse Reflection  
 3) VBPD Vision Based Protective Device

## Some examples of standards

A

Type of standard	European standards EN	International standards ISO / IEC	Title	
A	EN 12100-1* EN 12100-2* * previously EN 292	ISO 12100-1 ISO 12100-2	Safety of machinery – basic concepts, general principles for design	
	EN 1050	ISO 14121	Risk assessment	
B	EN 61496-1 EN/TS 61496-2	IEC 61496-1 IEC 61496-2	Safety of machines – electro-sensitive protective equipment (ESPE) ▪Part 1: General requirements and tests ▪Part 2: Particular requirements for equipment using active opto-electronic protective devices	
	EN/TS 61496-3	IEC 61496-3	▪Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Reflection (AOPDDR)	
	EN 999	ISO 13855	The positioning of protective equipment in respect of approach speeds of parts of the human body	
	EN 294	ISO 13852	Safety distances to prevent danger zones being reached by the upper limbs	
	EN 349	ISO 13854	Safety of machinery – minimum gaps to avoid crushing of parts of the human body	
	EN 811	ISO 13853	Safety of machinery – safety distances to prevent danger zones being reached by the lower limbs	
	EN 954-1 EN 13849-2	ISO 13849-1 ISO 13849-2	Safety-related parts of control systems ▪Part 1: General principles for design ▪Part 2: Validation	
	EN 62061	IEC 62061	Functional safety of safety-related electrical, electronic and programmable electronic control systems	
	EN 61508	IEC 61508	Functional safety of electrical, electronic and programmable electronic safety-related systems	
	EN 60204-1	IEC 60204-1	Electrical equipment of machines ▪Part 1: General requirements	
	EN 1088	ISO 14119	Safety of machinery. Interlocking devices associated with guards. Principles for design and selection	
	EN 574	ISO 13851	Safety of machinery. Two-hand control devices – functional aspects; Principles for design	
	EN 418	ISO 13850	Emergency stop equipment – functional aspects; Principles for design	
	EN 1037	ISO 14118	Safety of machinery. Prevention of unexpected start-up	
	EN/TS 62046	IEC/TS 62046	Safety of machinery – Use of protective equipment to detect the presence of persons	
	C	EN 692		Mechanical presses
		EN 693		Hydraulic presses
EN 13736			Pneumatic presses	
EN 12622			Safety of machine tools. Hydraulic press brakes	
EN 775		ISO 10218	Industrial robots	
EN 1010		ISO 1010	Printing and paper processing machines	
EN 11111		ISO 11111	Textile machines	
EN 81-1			Safety rules for the construction and installation of lifts ▪Part 1: Electric lifts	
EN 280			Mobile elevating work platforms – Design calculations – Stability criteria – Construction – Safety – Examinations and tests	
EN 1570			Safety requirements for lifting tables	
EN 1493			Vehicle lifts	
EN 1808		Safety requirements on suspended access equipment – Design, calculations, stability criteria, construction. Tests		

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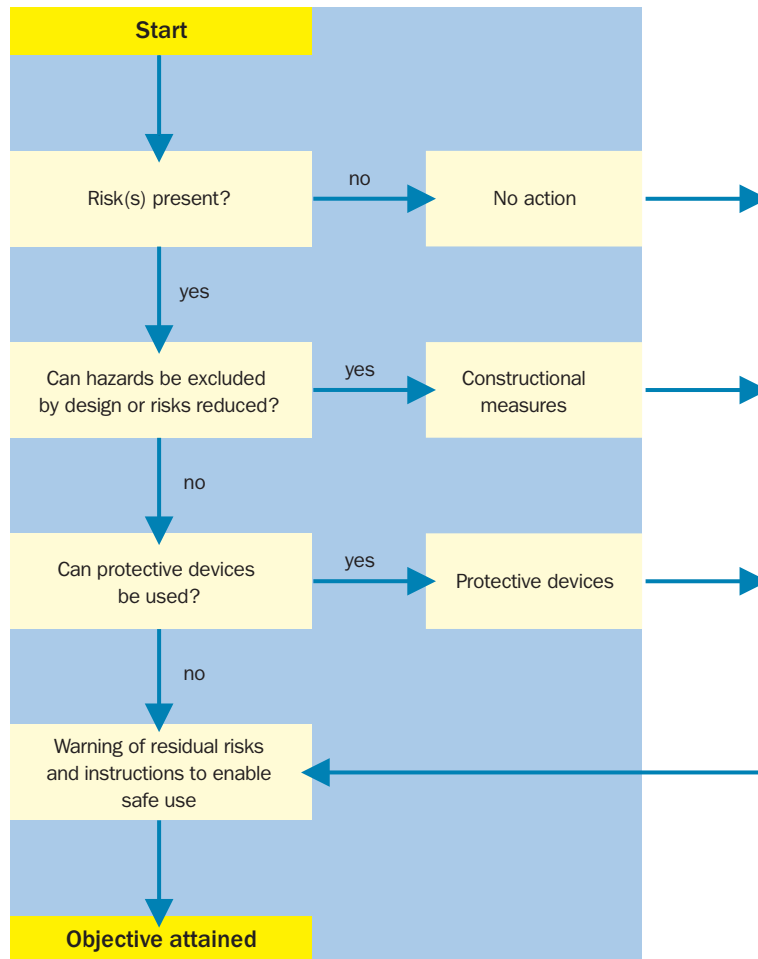
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Type of standard	European standards EN	International standards ISO / IEC	Title
C	EN 691		Woodworking machines – safety and health – common requirements
	EN 1870-1		Safety of woodworking machines – circular sawing machines ▪Part 1: Circular saw benches (with and without sliding table) and dimension saws
	EN 1870-4		Safety of woodworking machines – circular sawing machines ▪Part 4: Multiblade rip-sawing machines with manual loading and/or unloading
	EN 848-1		Safety of woodworking machines – one side moulding machines with rotating tool ▪Part 1: Single spindle vertical moulding machines
	EN 940		Safety of woodworking machines – combined woodworking machines
	EN 1218-1		Safety of woodworking machines – tenoning machines ▪Part 1: Single end tenoning machines with sliding table
	EN 289		Rubber and plastics machinery. Compression and transfer moulding presses. Safety requirements for the design
	EN 422		Rubber and plastics machinery. Safety – blow moulding machines intended for the production of hollow articles – requirements for design and construction
	EN 1114-1		Rubber and plastics machines – extruders and extrusion lines ▪Part 1: Safety requirements for extruders
	EN 1612-1		Rubber and plastics machines – reaction moulding machines ▪Part 1: Safety requirements for metering and mixing units
	EN 528		Storing and retrieval equipment – safety
	EN 281		Self-propelled industrial trucks with driver’s seat; Rules for the design and layout of pedals
	EN 1459		Safety of industrial trucks – self-propelled variable-reach trucks
	EN 1525		Safety of industrial trucks. Driverless trucks and their systems
	EN 1526		Safety of industrial trucks – additional requirements for automated functions on trucks
	prEN 1672-1		Food processing machinery – safety and hygiene requirements – basic concepts
	EN 972		Tannery machines – reciprocating roller machines – safety requirements
	EN 869		Safety requirements for high-pressure metal die-casting units
	EN 710		Safety requirements for foundry moulding and core-making machinery and plant and associated equipment
	EN 415-4		Palletisers and depalletisers

→ Further information on this topic can be found on the VDMA’s site, [www.vdma.org](http://www.vdma.org), or the “Safety of Machinery in Europe”, available from Beuth Verlag GmbH

## Risk analysis

A



During the design of a machine, the possible risks must be analysed and, where necessary, additional protective devices fitted to protect the operator from existing residual risks (crushing, cutting, pulling, impacts, stabbing, penetration, vibration, grazing, etc.), cf. EN 12100-1 and EN 1050.

This risk assessment process is provided in Safexpert<sup>®</sup>, software for safety engineering, (→ page Q-0). The list of hazards, trees for making selections for the risk assessment and the scheme for evaluating the safety category (for measures related to the control) simplify the assessment. The user directly follows the requirements of the EN 1050 and EN 12100-1 standards.

The hazards are assessed separately by hazardous points and in the appropriate life phases. The assessment of individual hazards allows the risk assessment to be simplified, and can contribute to the optimum selection of measures to reduce the risk.

The process diagram above shows whether it is advisable to use a protective device.

The remainder of this section is based on the assumption that some risks cannot be eliminated, and that it may be necessary to use an additional protective device.

A

## Why electro-sensitive protective equipment (ESPE)?

If the operator must regularly intervene in a machine and is therefore exposed to a hazard, it is normally best to use an opto-electronic protective device instead of mechanical guards (fixed guard, two-hand control, fences, etc.).

- Access time is reduced (the operator does not need to wait for the guard to open)
- Productivity is increased (time saved during machine loading)
- Workplace ergonomics are improved
- In addition, operators and other people are equally protected

**Warning:**

An ESPE can only be used if the operator is not exposed to any risk of injury from splashing material (e.g. molten material) or flying pieces of material. Also, the access time must be greater than the time required to stop the hazard.

## Selection of an ESPE

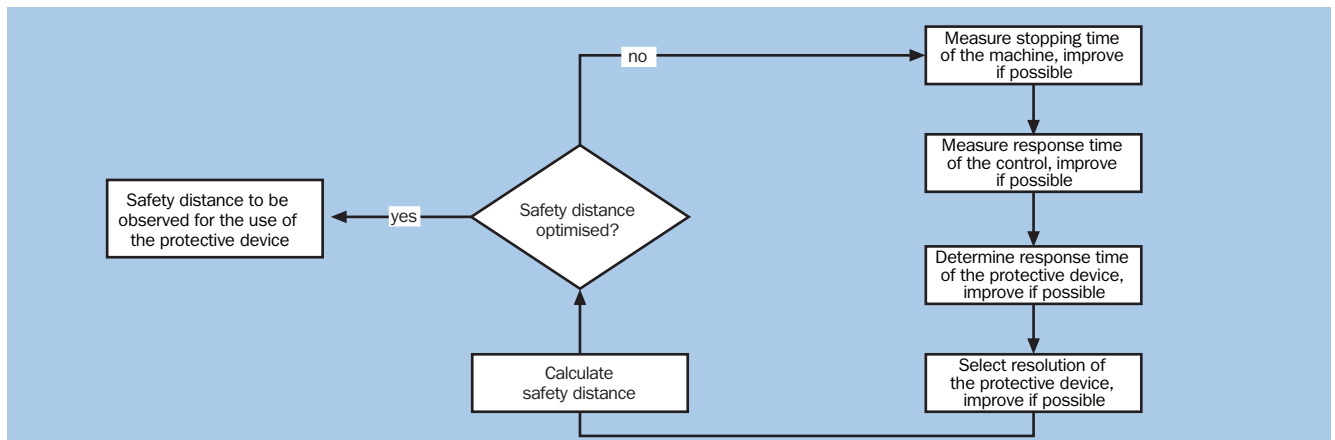
The basic criteria for the selection of an opto-electronic protective device depend on a variety of requirements, such as:

- The standards to be observed (e.g. EN 692/mechanical presses)
- The space available in front of the hazardous area
- Commercial criteria
- Ergonomic factors (e.g. periodic insertion of parts, or no need for periodic access)

After definition of the protective area, the safety distance (ESPE to the hazardous point) is defined using the following parameters:

- Stopping time of the machine
- Response time of the controller
- Response time of the ESPE
- Supplements to the safety distance calculated

### Iterative process for the optimisation of the safety distance





## Definition of the function to be performed



### Hazardous point protection: Finger or hand detection

This type of protective device is advantageous because a shorter safety distance is possible and the operator can work more ergonomically (e.g. during insertion work on a press).



### Access protection: Detection of a person on access to the hazardous area

This type of protective device is used to protect the access to a hazardous area. A stop signal is triggered if the hazardous area is entered. A person who is standing behind the protective device will not be detected by the ESPE!



### Hazardous area protection: Detection of the presence of an operator in the hazardous area

This type of protective device is suitable for machines on which, e.g. a hazardous area is enclosed by a guard and the entire area cannot be seen from the reset button.

It is also suitable for protecting the approaches to a hazardous area where it combines perimeter and presence sensing safeguarding (permanent detection of personnel or objects throughout the defined zone).

This type of protective device is also suitable for AGS (automated guided systems) and stackers, to protect the operator and/or third persons during movement of the vehicles or while docking these vehicles to a fixed station.



Protection of a mobile stone setting machine with SICK laser scanners

## Definition of the protective field

Depending on the installation and configuration, it is necessary to take the following points into consideration:

- The size of the protective field
- The various access points
- The accessible hazardous areas
- The risk of bypassing the protective device and of the undetected presence of people in the hazardous area

A

Compliance with category of the safety-related parts of the machine control system

While the essential requirements of the directive are aimed at a high level of safety, the resources must nevertheless be proportional to the risk involved.

The protection of an operator who manually inserts and removes parts at a metal press requires different consideration compared to the protection of an operator who works on a machine on which the maximum risk is the trapping of a finger. Furthermore, one and the same machine can have different access points with varying levels of risk. For this reason, different measures can be adopted for different parts of the safety-related control for a machine.

Against this background, the EN 954-1 standard aids designers in the definition of the categories for the various parts of the safety-related control, based on the following parameters:

- The possible severity of injury (S)
- The frequency and/or duration of exposure to the hazard (F)
- The possibility of preventing the hazard (P)

The behaviour of the safety-related control in case of a fault is defined for each category (B, 1, 2, 3, 4, cf. table page A-29). If identical technology is assumed (pneumatic, electronic, mechanical, hydraulic, etc.), these categories represent a sequential scale. For example, category 4 is higher than category 3. On the other hand, the categories are not intended to be used to compare different technologies.

The categories are also not intended to be used in any given order or hierarchical arrangement in relation to safety requirements.

Nevertheless, the AOPDs (Active Opto-electronic Protective Devices) and their interfaces must comply with the requirement of the category for the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop).

**Selection of safety-related parts of control systems (EN 954-1)**

**Category**

	B	1	2	3	4
<b>S</b> Degree of injury					
S1 Light injury	●	●	○	○	○
S2 Serious injury, including death	●	●	●	○	○
<b>F</b> Frequency and/or duration of exposure to hazard					
F1 Rare to more often and/or short duration of exposure	●	●	●	○	○
F2 Often to continuous and/or long duration of exposure	●	●	●	●	○
<b>P</b> Possibility of hazard avoidance					
P1 Possible under certain circumstances	●	●	●	○	○
P2 Hardly possible	●	●	●	●	○

Compan	Type	B/1	2	3	4	Application field
SICK	Light Grid C 2000	X	X			Point-of-operation guarding, Access guarding, H
SICK	Photoelectric Switch M 2000	X	X			Access guarding
SICK	Light Grid LGT	X	X			Point-of-operation guarding, Hazardous area gu:
SICK	Photoelectric Switch MSL	X	X	X	X	Access guarding, Hazardous area guarding
SICK	Photoelectric Switch WSWUWEU	X	X	X	X	Access guarding
SICK	Interface Module LE 20	X	X			Interface module for WSWWE 27-2, VSWVE 18-2, (C
SICK	Through-Beam Photoelectric Sw	X	X			Access guarding
SICK	Light Curtain C4000	X	X	X	X	Point-of-operation guarding

Category selection of the safety-related parts of the control in Safexpert®

→ See “Choosing a SICK protective device” page A-36

**Categories for the safety-related parts of controls (EN 954-1, ISO 13849). Cf. figures page A-34**

Categories	Concise list of requirements	System behaviour	Principles for achieving safety
<b>B</b>	The safety-related parts of controls and/or their protective devices, as well as their components, must be designed, built, assembled and combined in compliance with the applicable standards such that they can withstand the effects expected.	The occurrence of a fault can result in the loss of the safety function.	Predominantly characterised by the selection of components
<b>1</b>	The requirements of B must be met. Proven components and proven safety principles must be used.	The occurrence of a fault can result in the loss of the safety function, but the probability of occurrence is less than in B.	
<b>2</b>	The requirements of B must be met and proven safety principles used. The machine control must check the safety function at suitable intervals.	The occurrence of a fault can result in the loss of the safety function between checks/tests. The loss of the safety function is detected by the check.	Predominantly characterised by the structure
<b>3</b>	The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that: <ul style="list-style-type: none"> <li>▪ a single fault in each of these parts does not result in the loss of the safety function, and</li> <li>▪ whenever feasible within reasonable limits, the single fault is detected</li> </ul>	The safety function is retained when the single fault occurs. Some, but not all faults are detected. Accumulation of undetected faults may lead to loss of the safety function.	
<b>4</b>	The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that: <ul style="list-style-type: none"> <li>▪ a single fault in each of these parts does not result in the loss of the safety function, and</li> <li>▪ the single fault is detected before or when the safety function is required or, if such detection is not possible, an accumulation of faults must not lead to loss of the safety function.</li> </ul>	The safety function is always retained when faults occur. The faults are detected in good time to prevent loss of the safety function.	

A

Calculation of the safety distance

General formula for calculation from EN 999	
<b>S = (K × T) + C</b>	
<b>S</b>	Minimum distance in millimetres, measured from the hazardous area to the detection point, to the detection line, to the detection plane or to the protective field
<b>K</b>	A parameter in millimetres per second, derived from data on approach speeds of the body or parts of the body
<b>T</b>	Stopping/run-down time of the entire system in seconds
<b>C</b>	Additional distance in millimetres that defines the intrusion into the hazardous area before the protective device is triggered

The calculation of the safety distance for an ESPE is described in the EN 999 standard. If the machine is subject to a specific standard (e.g. metal presses) or a special technical specification, then reference must be made to this document. Every ESPE must be installed such that access to the hazardous area is reliably detected by the protective device. For finger and hand protection, or the protection of a hazardous area, it must not be possible for a person to be present in the hazardous area without being detected. If the minimum distance calculated satisfies the industrial and ergonomic requirements, it must also be checked whether the installation and the configuration of the protective device is so designed that undetected presence of people in the hazardous area is impossible.

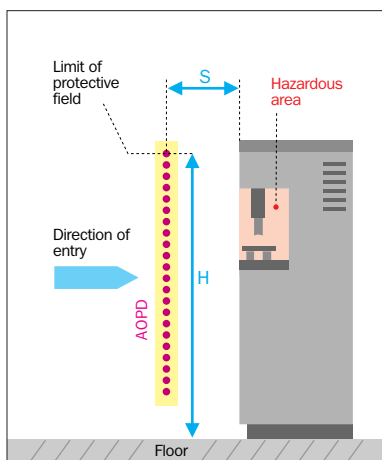
If, however, people can be present in the hazardous area without detection, the installation must be equipped with additional protective measures/protective devices. If the minimum distance is too large and is unacceptable on ergonomic grounds, it must be defined whether it is possible to reduce the overall stopping time of the machine. Otherwise, an ESPE with a better resolution is to be selected.

The measurement of the stopping/run-down time, a service provided by SICK, is important here and requires specific expertise. → See “SICK services” page A-2.

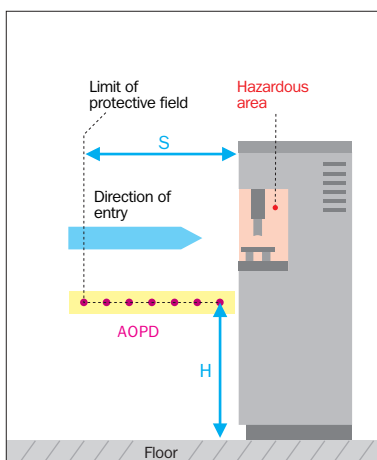
Example: On perpendicular approach and with a total stopping time of 100 ms, a safety distance of 368 mm is to be maintained for an AOPD with a resolution of 35 mm. With a resolution of 14 mm, on the other hand, the safety distance is only 200 mm. The following table is to be applied for presses in accordance with the EN 692 and EN 693 standards. Taking into account the resolution of the AOPD, when calculating the minimum distance S, supplement C at least must be added (cf. EN 692).

Resolution of the ESPE d (mm)	Supplement C (mm)	Stroke triggering by AOPD/PSDI mode
d ≤ 14	0	
14 < d ≤ 20	80	permitted
20 < d ≤ 30	130	
30 < d ≤ 40	240	
d > 40	850	not permitted

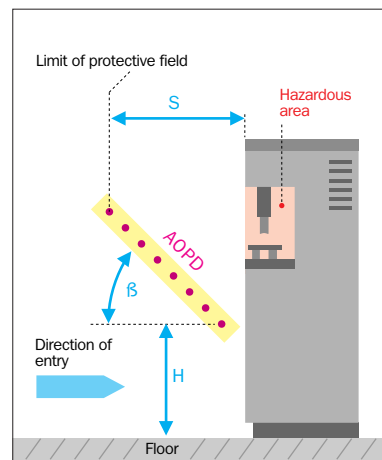
In general, one differentiates between three different approach types



Perpendicular approach/perpendicular entry into the protective field level



Parallel approach/parallel entry into the protective field level



Angular approach

**The following table contains the formulae for calculating the safety distance S**

Special examples can be found beginning on page A-32

Approach	Detection capability (resolution)	Minimum safety distance (mm)	Comments/notes
Perpendicular $\beta = 90^\circ (\pm 5^\circ)$	$d \leq 40$ mm	$S = 2000T + 8(d - 14)$ S must not be $< 100$ mm	NB: To prevent bypassing the AOPD, use EN 294. In practice this standard cannot always be applied because it considers the hand can be manipulated. In this case it is necessary to seek advice from the relevant authorities.  Height of the bottom beam $\leq 300$ mm Height of the highest beam $\geq 900$ mm  Number of beams    Recommended heights 4                      300, 600, 900, 1200 mm 3                      300, 700, 1100 mm 2                      400, 900 mm 1                      750 mm
	$40 < d \leq 70$ mm	$S = 1600T + 850$	
	$d > 70$ mm	multi-beam $S = 1600T + 850$  single-beam $S = 1600T + 1200$	
Parallel $\beta = 0^\circ (\pm 5^\circ)$	—	$S = 1600T + (1200 - 0.4 \times H)$ where $1200 - 0.4 \times H > 850$ mm	$15 \times (d - 50) \leq H \leq 1000$ mm if $H \geq 300$ mm, there is a risk of undetected access under the beam to be taken into account, where $d \leq H/15 + 50$
Angular $5^\circ < \beta < 85^\circ$	—	where $\beta > 30^\circ$ , cf. vertical approach where $\beta < 30^\circ$ , cf. parallel approach S then applies to the furthest beam whose height $\leq 1000$ mm.	$d \leq H/15 + 50$ is in respect to the lowest beam

**S** = Minimum distance**H** = Height**d** = Resolution **$\beta$**  = Angle between detection plane and the direction of entry**T** = Time**In general, the following errors must be excluded when mounting protective devices:**

Reaching over



Reaching under

Reaching under from  
a crouched position

Standing behind

# A Examples for machine protection

## Area protection

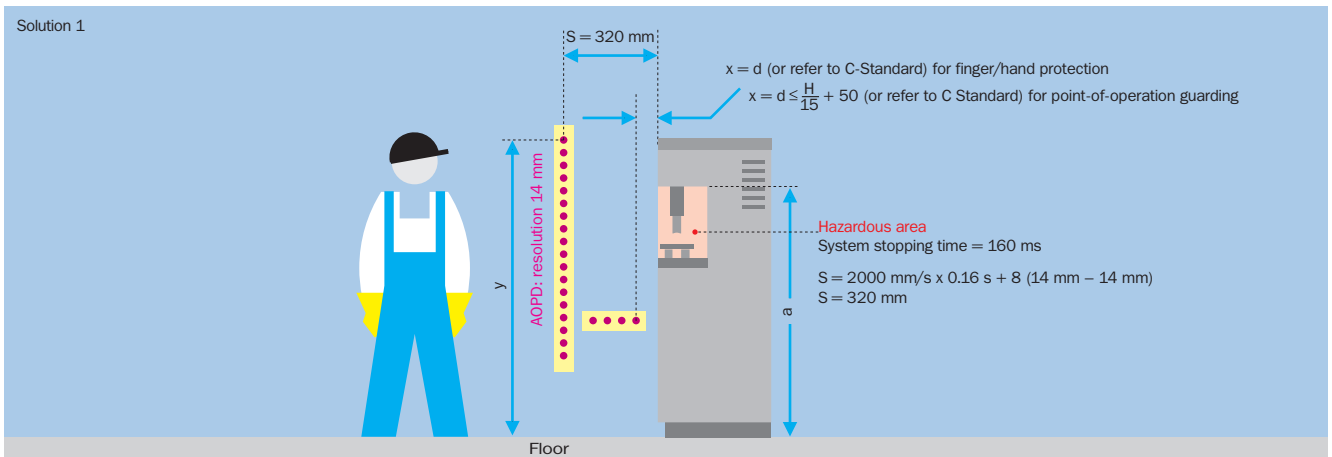
It is a condition that

- the machine can only be reached via this access,
- there is a risk of serious injury,
- the operator needs to enter the hazardous area frequently.

### Solution 1: Perpendicular approach Hazardous point protection with point-of-operation guarding

The calculation, as shown in the diagram, yields a safety distance of  $S = 320$  mm. By using an AOPD with a better resolution, this is already a small safety distance. However the dis-

tance must not be less than 100 mm. To ensure that the person is detected anywhere in the hazardous area, two AOPDs are used: a vertical AOPD, positioned at the calculated safety distance (perpendicular approach), and a horizontal AOPD, to eliminate the hazard of standing behind the vertical AOPD.



- a = Height of the hazardous area
- d = Detection capability (resolution) of the AOPD
- S = Safety distance

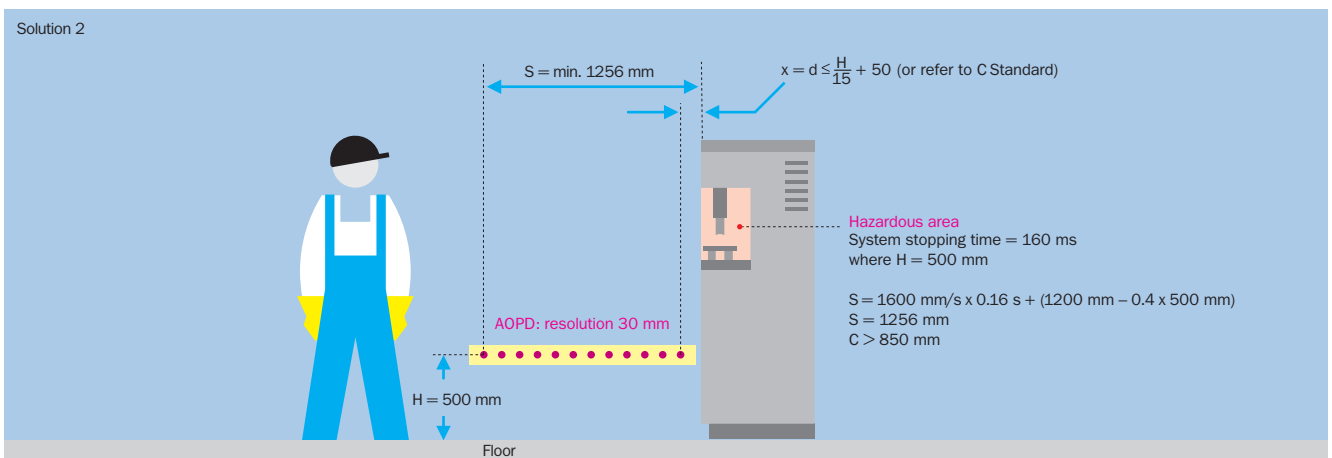
- x = From end of the protective field to the mechanical point-of-operation guarding
- y = 1800 mm, if the height of the hazardous area a = 1000 mm (as per EN 294, table 1)

### Solution 2: Parallel approach Hazardous area protection

A horizontal AOPD is used.

The diagram below shows the calculation of the safety distance  $S$  and the positioning of the AOPD. If the installation height of

the AOPD is increased to 500 mm, the safety distance is reduced. However, it must still not be possible to access the hazardous area beneath the AOPD. In such cases it is necessary to install an additional protective device based on the risk assessment.



- C = Additional distance in millimetres that defines the intrusion into the hazardous area before the protective device is triggered
- d = Detection capability (resolution) of the AOPD
- H = Installation height

- S = Safety distance
- x = From end of the protective field to the mechanical point-of-operation guarding

**Result**

The table below shows the results of these two solutions.  
Operative requirements determine which of the two solutions is chosen.

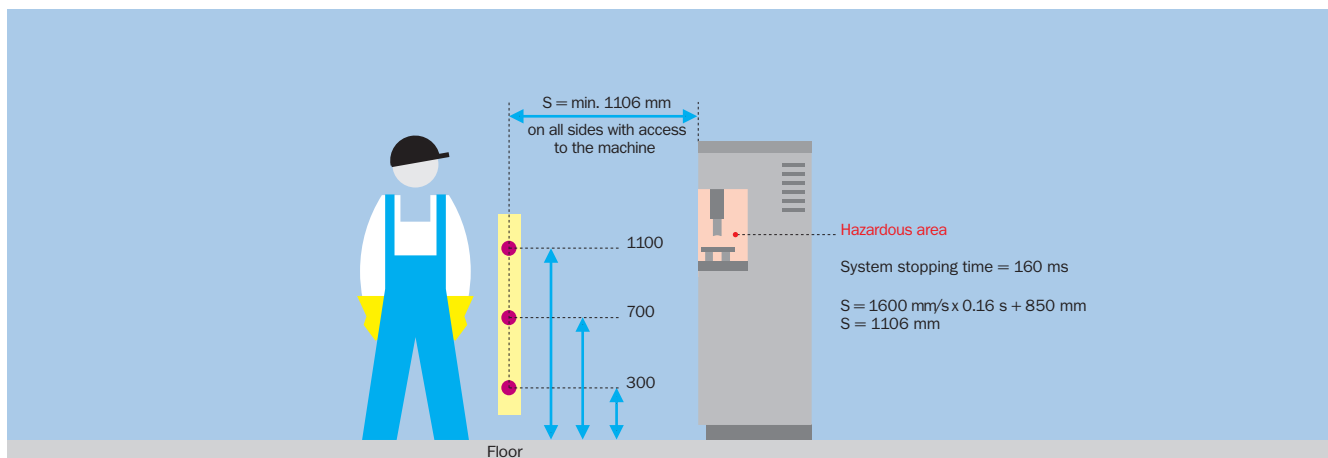
	Advantages	Disadvantages
<b>Solution 1</b> S = 320 mm	<ul style="list-style-type: none"> <li>Greater productivity, as the operator is closer</li> <li>The short distance between the vertical photoelectric switch and the hazardous area makes it possible to store material near the machine (short distances)</li> </ul>	<ul style="list-style-type: none"> <li>Higher price for the protective device</li> </ul>
<b>Solution 2</b> S = 1256 mm	<ul style="list-style-type: none"> <li>Lower price for the protective device</li> <li>Enables access to be protected independently of the height of the hazardous area</li> </ul>	<ul style="list-style-type: none"> <li>The operator is much further away (long distances)</li> <li>It is difficult to store products on the floor, as the AOPD takes up a large amount of the space</li> <li>Lower productivity</li> </ul>

**Access protection**

Access protection with 3 beams (at heights of 300 mm, 700 mm and 1100 mm) allows perpendicular approach, as described in the chapter "Calculation of the safety distance" (→ page A-30). This solution permits the operator to stand between the hazardous area and the AOPD without detection. For this reason, additional safety measures must be taken to

reduce this risk. The control mechanism (e.g. reset button) must be positioned such that the entire hazardous area can be seen. It must not be possible to reach the button from the hazardous area.

Note: The control switch can have several functions.



H = Installation height

S = Safety distance

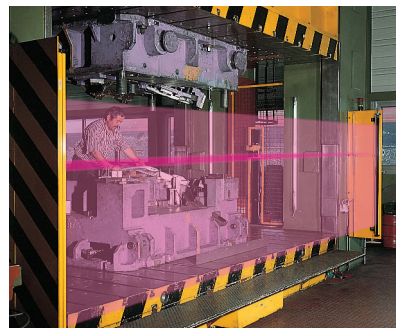
**Press internal protection**

This type of protection is recommended for large presses that are accessible from the floor. In this special case, it is necessary to prevent the press starting while the operator is in the interior. This is a secondary protective device that under no circumstances can take over the function of the primary protection, for which an appropriate device is used (AOPD or two-hand control).

In this special case: The safety distance for the primary protective device with the task of stopping the press must be calculated while the secondary protective device detects the presence of a person in the press, and thus prevents the press starting up.

**Spotting press**

Hazardous point protection with safety light curtain (AOPD) and interior monitoring with safety laser scanner (AOPDR). Both sensors are activated on start-up. Then the SICK laser scanner is muted during the downward stroke.



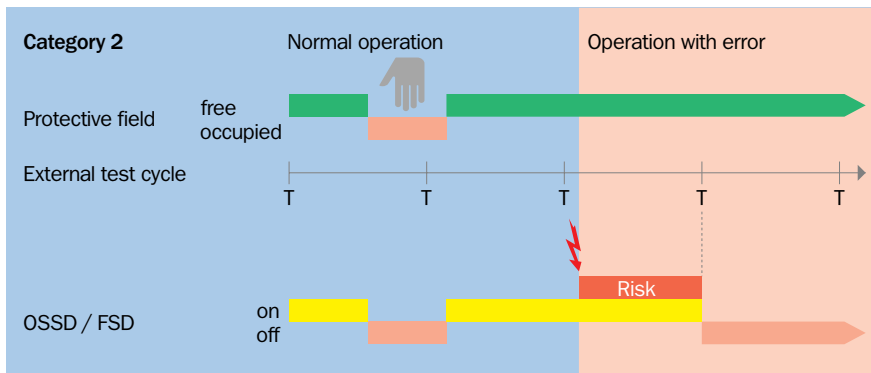
# A Connection to the controller

## Machine interface

It is imperative that each protective device is correctly integrated in the machine control. This means that the part of the machine control responsible for safety (protective device, machine control and main stop elements) must meet the category that was found during the risk assessment as per EN 1050 and EN 954-1. The following figures explain the categories

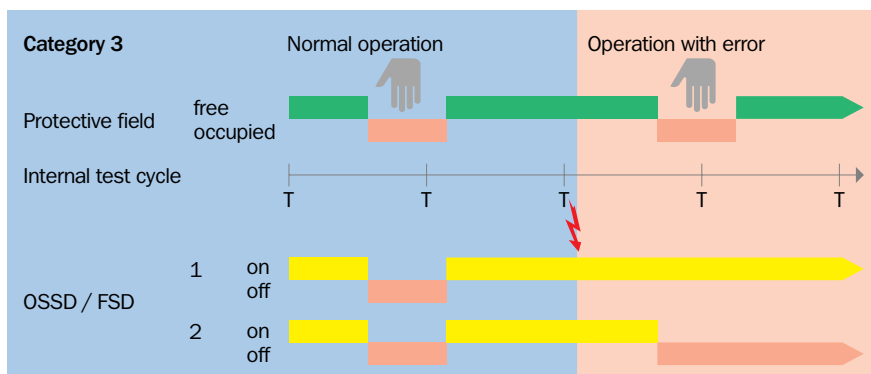
according to EN 954-1 that are suitable for an AOPD and the control. This risk assessment applies to the entire system including stop elements.

If a protective device is activated under normal operating conditions, e.g., on interruption of the protective field, the machine is always stopped (independent of the category). The various categories differ in the detection of faults.



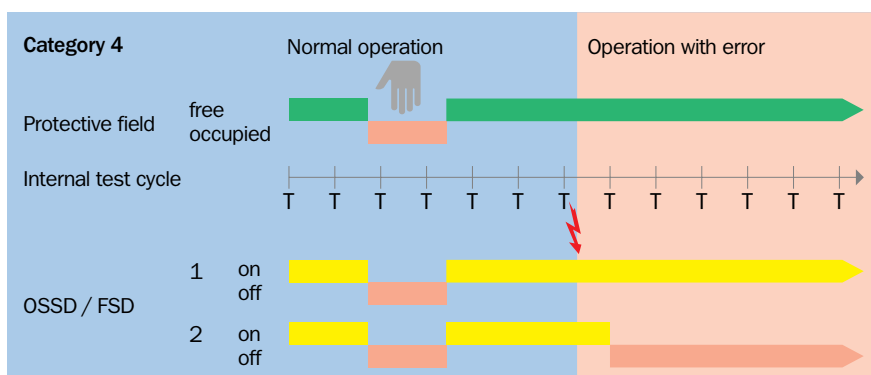
### Category 2

Faults are detected during a check by the external test. In the period between the occurrence of the fault and the next test there is a risk.



### Category 3

The fault is detected either when the hand enters the protective field or by internal checking.



### Category 4

The protective function is retained despite the fault. Unlike category 3, second and third faults must not result in the loss of the protective function if the first fault is not detected. Internal tests must be within the response time of the protective device.

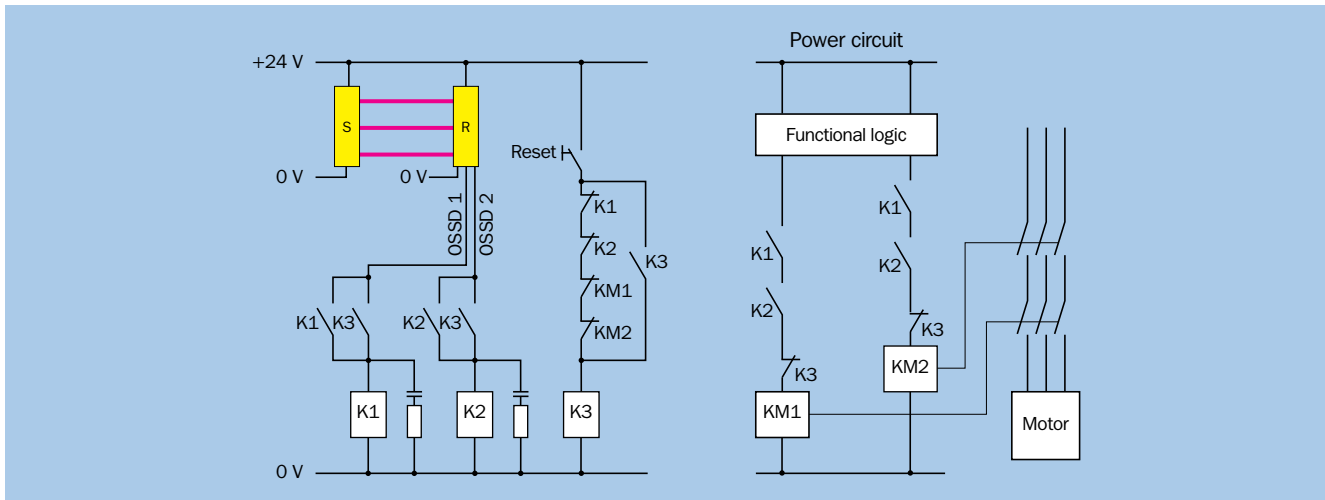


## Connection example for a protective device ESPE type 4 according to IEC 61496

A

**With external reset**

The figure shows a simple machine on which the AOPD reset function can also start the machine.



K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

K1, K2 and K3 are the auxiliary contactors. KM1 and KM2 are main contactors. All contactors are positively guided.

In this case the entire protective system has a redundant (dual-channel) design

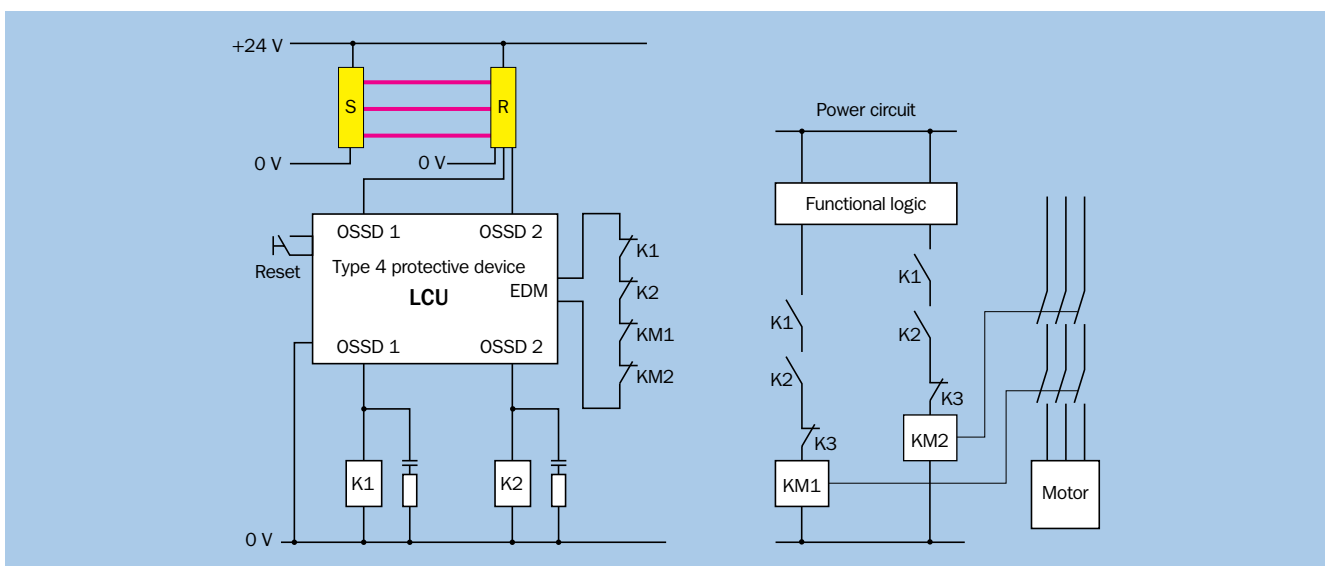
- The protective device (OSSDs)
- The auxiliary circuit (FSDs)
- The power circuit (MPCEs)

The contactors K1/K2 are monitored via K3. If one of the normally open contacts K1 or K2 “sticks”, its partner, the normally closed contact cannot close. As a consequence, the coil of K3 cannot be energised and therefore the contactors K1 and K2 can no longer be operated. The control circuit therefore remains open.

**With internal reset**

Another connection example of a protective device type 4 ESPE according to IEC 61496 with restart interlock and external device monitoring. Reset and external device monitoring are

dynamically monitored by the SICK protective device. Feature of this connection: reduced installation effort.



K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

→ You will find further examples in the SICK connection diagram finder at [www.sick.com](http://www.sick.com)

# A Single break/double break PSDI mode

This operating mode is advantageous if parts must be manually inserted or removed periodically. In this mode the machine cycle is automatically re-initiated after the protective field becomes clear again after one or two interruptions.

The control switch is to be operated under the following conditions:

- On machine start
- On restart if the protective field of the AOPD is interrupted during a dangerous movement
- If the cycle time is exceeded by more than 30 s (cf. EN 12100)

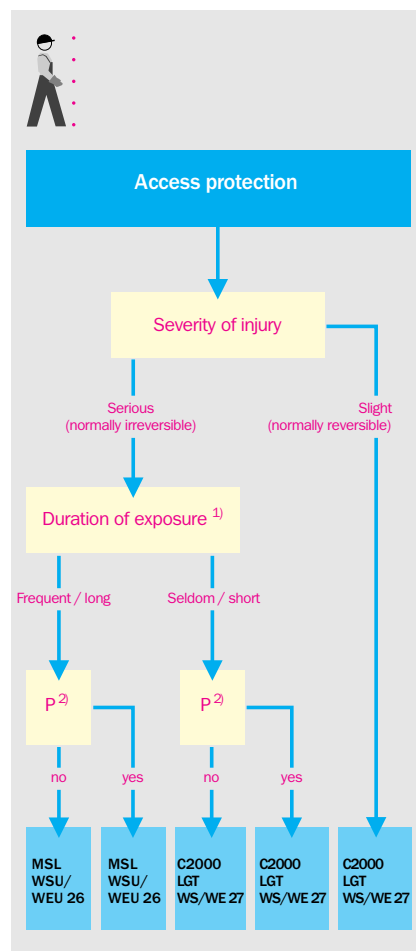
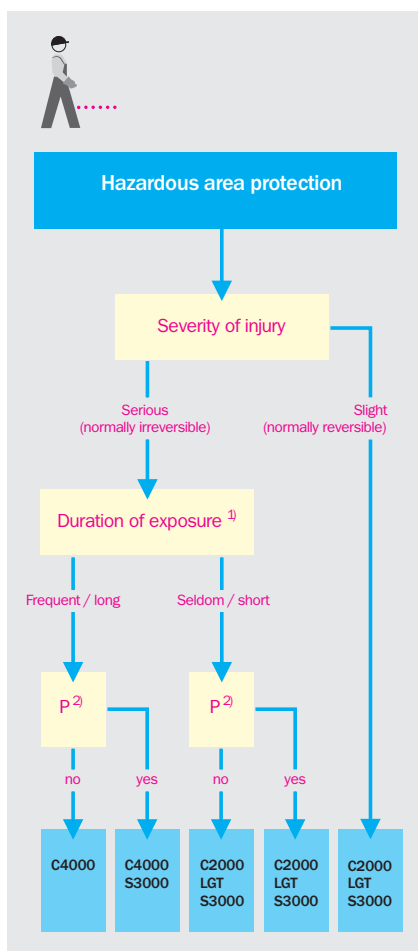
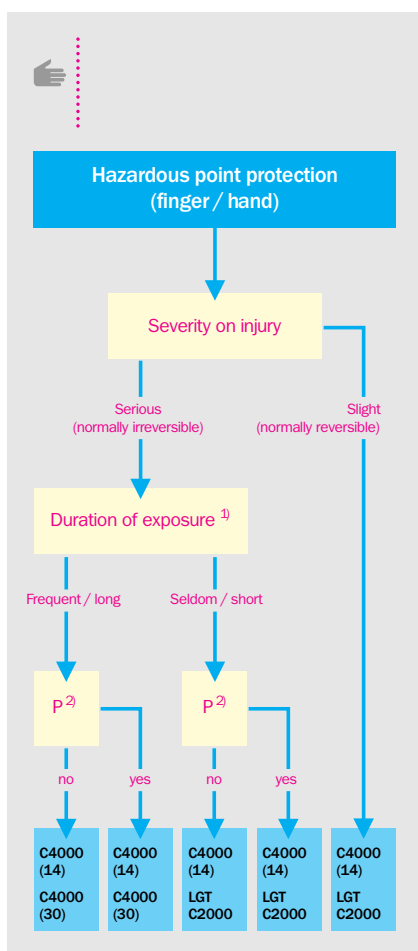
Further information can be found e.g. in EN 692.

Nevertheless, it is necessary to check that the operator cannot be placed at risk during the working process. This situation limits its use to small machines on which the hazardous area cannot be entered and there is point-of-operation guarding. All other sides of the machine must also be protected using suitable measures.

If this operating mode is used, the resolution of the AOPD must be less than or equal to 30 mm (see EN 999, EN 692, EN 693).

## Choosing a SICK protective device

→ Selection as per the risk analysis and chapter “Selecting of an ESPE” from page A-26



1) The duration of the exposure to the hazard (frequency/duration)  
The expected duration of direct exposure must include the access frequency.

2) Possibility of avoiding the hazard  
Yes: means that the operator can avoid the hazard.

Note:

If there is a risk of irreversible injuries, we recommend using an AOPD of at least ESPE type 3 in accordance with IEC 61496.

## Guards

A

### Requirements are placed on guards are per the following standards:

- EN 12100 “Safety of machinery – Basic concepts, general principles for design”
- EN 953 “Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards”

## General requirements

- Guards must be designed to be adequately robust and durable to ensure that they withstand the environmental conditions to be expected during operation. These properties must be retained during the entire period of use of the machines
- They must not cause any additional hazards
- It must not be possible to easily bypass the guards or render them ineffective
- The guards must be an adequate distance from the hazardous area if they have openings (see EN 294). This requirement also applies to openings in guards as well as between guard and machine frame, clamping plates, etc.
- Guards must not restrict observation of the working process more than necessary, insofar that observation is necessary
- Guards must be firmly held in place
- They must be retained either by systems that can only be opened with tools, or they must be interlocked with the dangerous movement
- As far as possible, they should not remain in the protective position if the fastening is undone

### Ergonomic criteria

Ergonomic aspects are also significant during the design of guards. Guards will only be accepted by employees if they do not hinder setup, maintenance and other similar activities any more than necessary.

The following aspects affect the use of a guard:

- Easy opening and closing, lifting or moving
- Single-handed opening, closing, lifting and moving of the guard
- Handle to suit function
- Opened guards must allow convenient access
- Opened guards must be secured against slamming shut if slamming shut could cause injuries. Measures against slamming shut could, for example, be:
  - Guards with counterweight
  - Gas struts or helical springs
  - Locking devices that automatically keep the guards open

## Fixed guards and interlocked guards

Guards that are not removed or opened very often or are only removed or opened for maintenance work – provided they are not interlocked with the dangerous movement – must be fastened to the machine such that they can only be undone with tools. Their removal must involve a dismantling process for which tools are required (see also supplementary measures in the related C-type standards).

Guards that are opened frequently, or for setup, must be interlocked with the dangerous movement such that after opening or removing the guard, dangerous movements come to a standstill in good time.

Guards are opened “frequently” if, for example, employees must open them at least once per shift.

Locks are necessary if hazards are to be expected on opening guards (e.g. very long run-down).

Guards in accordance with EN 12100 and EN 953		
Fixed	Movable	
Fences/barriers	Flaps, gates and doors	
Only to be removed with tools or electrically interlocked	With locking device	Without locking device EN 999 EN 954
EN 947-5-1 EN 1088	EN 947-5-1 EN 1088	

A

## Position switches with personnel protective function

For the interlocking of a guard, the position switches with a personnel protective function (safety limit switches) must meet special requirements (EN 60204-1, EN 1088 and EN 60947-5-1 “Control circuit devices and switching elements; electromechanical control circuit devices”).

- Their placement and design must protect them against inadvertent operation, changes in position and damage: The switch and the control cam must be secured by shape (not force), e.g. using round holes, pins, stops
- They must be protected by their actuation method, or their integration in the control must be such that they cannot be

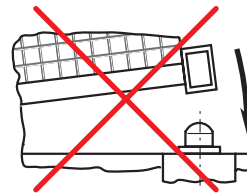
- easily bypassed (manipulated). For this reason, the position switches must have normally closed contacts
- It must be possible to check the switches for correct operation and, if possible, they must be easily accessible for inspection
  - The switches must not be used as a mechanical stop
  - The position switches must be fitted such that they are protected against damage due to external effects
  - The actuation stroke must be set to suit the positive opening travel in accordance with the manufacturer’s instructions. The minimum plunger travel defined by the manufacturer must be observed in order to provide the necessary switching distance for the positive opening

## Design of guards

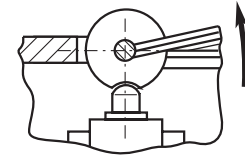
### Interlocks with and without locking

Interlocks establish a direct dependency between the function of the movable guards and the dangerous machine movements. Guards that are frequently removed or opened, or are removed or opened for setup, must be interlocked with the dangerous movement.

It must not be possible to manipulate the interlock using simple means. Simple means are, for instance: screws, needles, sheets of metal, coins, bent wire.



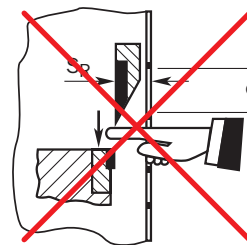
easy to manipulate



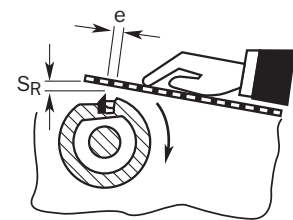
cannot be manipulated

### Protection against reaching through

The dimensions of the guards are to take into account the physical size of the hazardous point and the size of the human body. The permissible mesh spacing on wire grilles depends on the distance of the protective grille from the hazardous point. The greater the gap, the farther the guard must be from the hazardous point (EN 294).



EN 294 not observed



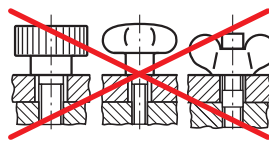
EN 294 observed

## Correct fastening

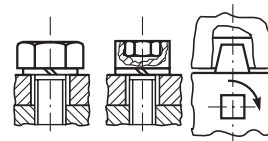
Guards that are only opened for maintenance work must be fastened such that they can only be undone with tools (e.g. spanner, screwdriver, key). Fastening elements must be designed such that they cannot be lost.

Quick-release joints, screw knobs, knurled screw and wing bolts are not permitted!

The guard should not remain in the protective position after the fastenings have been undone.



not permitted

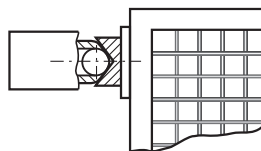


permitted

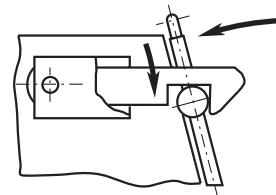
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## Stopping at the end position

As far as feasible, movable guards must be joined to the machine such that they can be securely held in the open position by hinges, guides, etc. Shaped mountings are to be preferred. Friction mountings (e.g. ball joints) are not recommended due to their diminishing effectiveness (wear).



permitted



better

## A

The key regulations and standards for the export of machines and systems to the USA are listed here. This brief summary cannot replace detailed consideration of the national regulations/directives and standards.

To provide a consistent illustration of the process for the selection of a protective device, we have included repetitions from the EU part.

## Legislation, regulations, objectives and procedures

Health and safety in the workplace has been a serious topic in the United States for more than 30 years. In 1970, the United States Congress recognized that “personal injuries and illnesses arising out of work situations imposed a substantial burden upon, and were a hindrance to, interstate commerce in terms of lost production, wage loss, medical expenses and disability compensation payments.” (Occupational Safety and Health Act (OSHA) of 1970, section 2 (a)).

Based on these issues and others, Congress passed the Occupational Safety and

Health Act of 1970. This act encourages “employers and employees efforts to reduce the number of occupational safety and health hazards at their places of employment, and to stimulate employers and employees to institute new and to perfect existing programs for providing safe and healthy working conditions.” (OSHA Act of 1970, Section 2 (b) (1)).

As part of the OSHA Act of 1970, Congress established the Occupational Safety and Health Administration (OSHA) to enforce worker safety regulations associated with the Act.

### OSHA Regulations and U.S. Consensus Standards

Worker safety regulations in the United States are enforced through the Occupational Safety and Health Administration (OSHA). The United States Congress, through the Occupational Safety and Health Act, established OSHA on December 29, 1970.

The goal of this act was to assure safe and healthy working conditions for working men and women by:

- Authorizing enforcement of the requirements developed under the Act
- By assisting and encouraging the States in their efforts to assure safe and healthy working conditions
- By providing for research, information, education and training in the field of occupational safety and health.

Occupational and Health Standards in the United States are defined in Title 29 of the Code of Federal Regulations Part 1910, which is broken down into a number of subparts. Subpart O deals specifically with Machinery and Machine Guarding and defines general requirements for all machines as well as requirements for certain specific types of machinery. A breakdown is presented in the following table. Selected passages of these subpart sections appear in the appendix at the end of this Safety Engineering section.

#### Title 29 of the U.S. Code of Federal Regulations, Part 1910, Subpart O

- 1910.211 – Definitions
- 1910.212 – General requirements for all machines
- 1910.213 – Woodworking machinery requirements
- 1910.214 – Cooperage machinery
- 1910.215 – Abrasive wheel machinery
- 1910.216 – Mills and calenders in the rubber and plastics industries
- 1910.217 – Mechanical presses
- 1910.218 – Forging machines
- 1910.219 – Mechanical power transmission apparatus

## National standards

In addition, Section 18 of the OSHA Act of 1970, OSHA also encourages the States to develop and operate their own job safety and health programs. The following states and territories of the United States have recognized programs:

▪ Alaska	▪ New Mexico
▪ Arizona	▪ New York <sup>1)</sup>
▪ California	▪ North Carolina
▪ Connecticut <sup>1)</sup>	▪ Oregon
▪ Hawaii	▪ Puerto Rico
▪ Indiana	▪ South Carolina
▪ Iowa	▪ Tennessee
▪ Kentucky	▪ Utah
▪ Maryland	▪ Vermont
▪ Michigan	▪ Virgin Islands
▪ Minnesota	▪ Virginia
▪ Nevada	▪ Washington
▪ New Jersey <sup>1)</sup>	▪ Wyoming

<sup>1)</sup> The Connecticut, New Jersey and New York State Plans cover public sector (State and Local Government) employment only.

OSHA provides contact information and an OSHA profile for each of these State Plans which may include additional regulations. This information may be obtained at OSHA's internet web-site at:

→ [www.osha-slc.gov/fso/osp](http://www.osha-slc.gov/fso/osp)

or

→ [www.osha.gov/index.html](http://www.osha.gov/index.html)

In addition to the referenced OSHA Standards above, OSHA also may enforce National Consensus Standards as though they are OSHA Standards. The term “national consensus standard” means any occupational safety and health standard or modification thereof, which

1. has been adopted and promulgated by a nationally recognized, standards-producing organization under procedures whereby it can be determined by the Secretary of Labor that persons interested and affected by the scope or provisions of the standard have reached substantial agreement on its adoption
2. was formulated in a manner which afforded an opportunity for diverse views to be considered
3. has been designated as such a standard by the Secretary of Labor, after consultation with other appropriate Federal agencies
4. by an international standard that covers a subject which is not covered by a standard in the United States

## Selection of important ANSI standards

It is important to note that OSHA utilizes these national consensus standards to further define machine safeguarding requirements in addition to Subpart O.

For instance, in 1910.212(a)(3)(ii), the following statement is made:

“The point of operation of machines whose operation exposes an operator to injury, shall be guarded. The protective device shall be in conformity with any appropriate standards, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.”

“Any appropriate standards” refers to national consensus standards that are generally accepted in industry. Where possible, OSHA promulgates these national consensus standards and

established federal standards as safety standards. The American National Standards Institute (ANSI), The National Fire Protection Agency (NFPA) and in some instances Underwriters Laboratories (UL) are national consensus standards bodies that are frequently referenced by OSHA.

Agencies recognized by OSHA as national consensus standards bodies include the National Fire Protection Agency (NFPA) and the American National Standards Institute (ANSI).

A summary of important ANSI and other safety standards is presented in the tables that follow.

Consult local, state and federal regulations for any additional requirements that may apply to your specific application.

A selection of important standards related to machinery and machine safety are presented in the table below:

## Summary of important National Consensus Standards for safety at work in the United States

ANSI B11.1	Mechanical Power Presses – Safety Requirements for Construction, Care and Use
ANSI B11.2	Hydraulic Power Presses – Safety Requirements for Construction, Care and Use
ANSI B11.3	Power Press Brakes – Safety Requirements for Construction, Care and Use
ANSI B11.4	Machine Tools – Shears – Safety Requirements for Construction, Care and Use
ANSI B11.5	Machine Tools – Iron Workers – Safety Requirements for Construction, Care and Use
ANSI B11.6	Lathes – Safety Requirements for Construction, Care and Use

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ANSI B11.7	Cold Headers and Cold Formers – Safety Requirements for Construction, Care and Use
ANSI B11.8	Drilling, Milling and Boring Machines – Safety Requirements for Construction, Care and Use
ANSI B11.9	Grinding Machines – Safety Requirements for Construction, Care and Use
ANSI B11.10	Metal Sawing Machines – Safety Requirements for Construction, Care and Use
ANSI B11.11	Gear-Cutting Machines – Safety Requirements for Construction, Care and Use
ANSI B11.12	Machine Tools – Roll-Forming and Roll-Bending Machines – Safety Requirements for Construction, Care and Use
ANSI B11.13	Machine Tools – Single- and Multiple-Spindle Automatic Bar and Chucking Machines – Safety Requirements for Construction, Care and Use
ANSI B11.14	Machine Tools – Coil-Slitting Machines – Safety Requirements for Construction, Care and Use
ANSI B11.15	Pipe, Tube and Shape-Bending Machines – Safety Requirements for Construction, Care and Use
ANSI B11.16	Metal Powder Compacting Presses – Safety Requirements for Construction, Care and Use
ANSI B11.17	Machine Tools – Horizontal Hydraulic Extrusion Presses – Safety Requirements for the Construction, Care and Use
ANSI B11.18	Machine Tools – Machines and Machinery Systems for Processing Strip, Sheet or Plate from Coiled Configuration – Requirements for Construction, Care and Use
ANSI B11.19	Performance Criteria for the Design, Construction, Care and Operation of Safeguarding When Referenced by Other B11 Machine Tool Safety Standards.
ANSI B11.20	Machine Tools – Manufacturing Systems / Cells – Safety Requirements for Construction, Care and Use
ANSI B11.21	Machine Tools using Lasers for Processing Materials – Safety Requirements for Construction, Care and Use
ANSI B11 TR.1	Ergonomic Guidelines for the Design, Installation and Use of Machine Tools
ANSI B11 TR.2	Mist Control on Machines Using Metal Working Fluids
ANSI B151.27	Safety Requirements for Robots Used with Horizontal Injection Molding Machines
ANSI B56.5	Safety Standard for Guided Industrial Vehicles and Automated Functions of Manned Industrial Vehicles
ANSI R15.06	Safety Requirements for Robots and Robot Systems
ANSI B65.1	Safety Standards for Printing Press Systems
<b>The National Fire Protection Agency (NFPA)</b>	
NFPA 70E	Electrical Safety Requirements for Employee Workplaces
<b>Other National Consensus Standards</b>	
ASME B15.1	Safety Standards for Mechanical Power Transmission Apparatus
<b>Underwriters Labs (UL)</b>	
UL508	Industrial Control Equipment

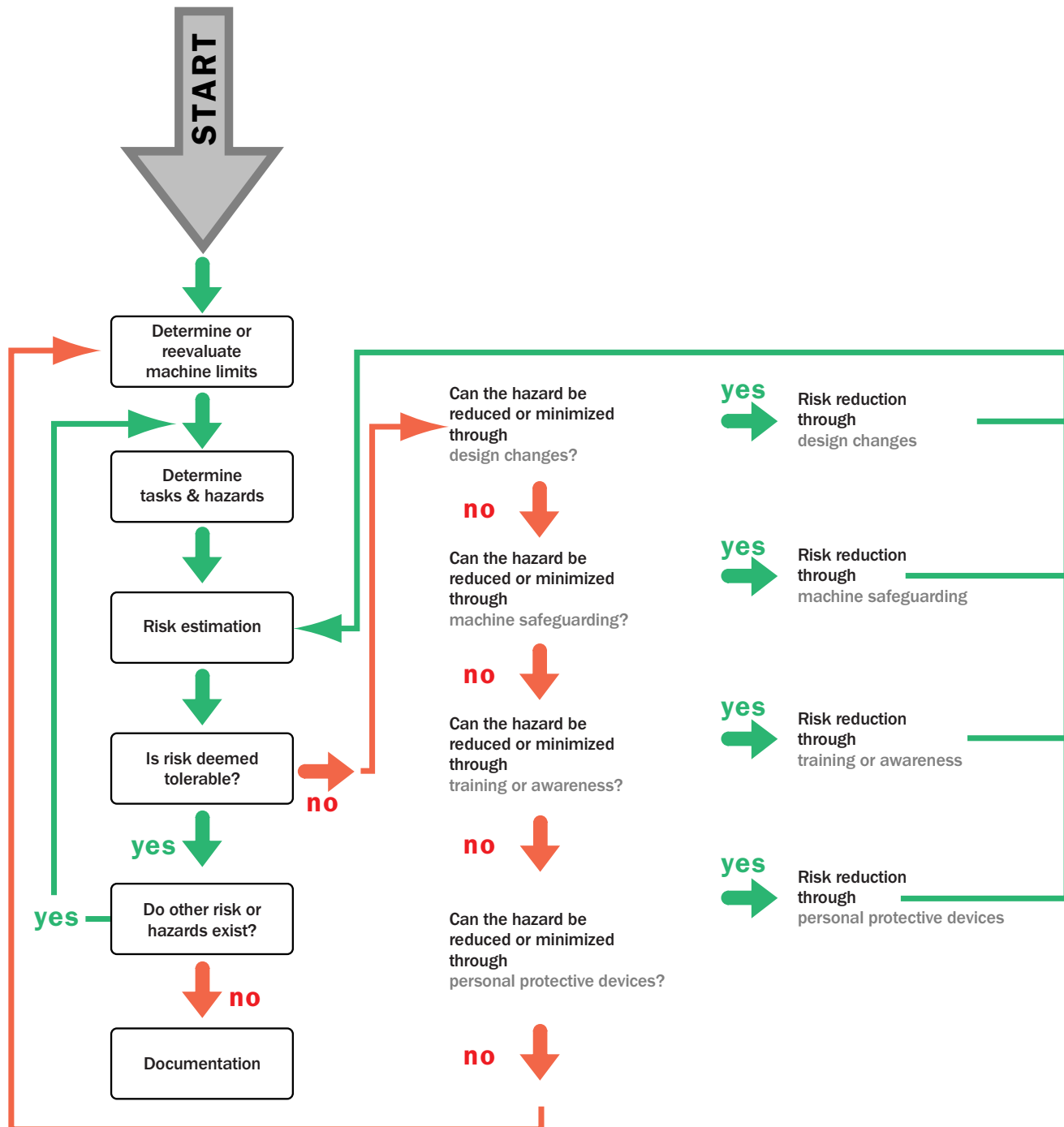
NOTE: This list of standards is not comprehensive, but rather a sampling of the more common machine safeguarding standards. Consult ANSI or other national consensus standards bodies for a complete listing



## Choosing protective devices

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### Risk analysis process



During the design of a machine, the possible risks must be analyzed and, where necessary, additional safeguarding devices fitted to protect the operator from existing residual risks (crushing, cutting, pulling, impacts, stabbing, penetration, vibration, grazing, etc.), cf. Title 29 U.S. Code of Federal Regulations, Part 1910 Subpart O, international standards ISO 12100, ISO 14121.

The flow diagram given above shows a method for deciding whether it is advisable to use a safeguarding device.

The remainder of this section is based on the assumption that some risks cannot be eliminated, and that it may be necessary to use an additional safeguarding device.

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## Why electro-sensitive protective equipment (ESPE)?

This section is based on the fact that some risks cannot be eliminated through design, and that it is necessary to use a protective device.

If an operator must often make interact with a machine and during this process is exposed to a hazard, it is advisable to fit a protective device to prevent exposing the operator to the dangerous machine movement.

When installed correctly, a protective device prevents or detects reaching into or entry into a hazardous area. When an entry is detected the protective device, in conjunction with the machine control system, prevents the initiation of hazardous movement or initiates an immediate stop of the machine, thus eliminating the existence of the hazard.

Opto-electronic protective devices are often preferred to other mechanical safeguarding devices such as fixed or movable guards and two-hand controls due to the following advantages:

- Reduction of access time  
The operator no longer has to wait for a guard to open.
- Increased productivity  
The operator saves time in loading the machine.
- Improved ergonomics  
Repetitive motion is minimized and perhaps eliminated.
- Protects other individuals  
Some protective devices protect the operator, but provide little or no protection for other individuals who may be in or near the hazardous area.

## Selection of an ESPE

Once the decision is made to utilize an opto-electronic protective device, the next step in the process is the selection of a specific device. The principle criteria for choosing an opto-electronic protective device are defined in the following four steps. Each step is interdependent and calls for an iterative approach.

Each step is interdependent and calls for an iterative approach.

**Warning:**

An ESPE can only be used if the operator is not exposed to any risk of injury from splashing material (e.g. molten material) or flying pieces of material. Also, the access time must be greater than the time required to stop the hazard.

### Step 1: Definition of the function to be performed

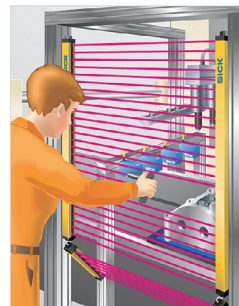
In the first step it is to be defined which function is to be provided by the protective device.

**Protective function Nr. 1: Hazardous point protection**

Hazardous point protection is safeguarding which occurs in close proximity to a machine tool where material is positioned and a process is performed. This safeguarding function is meant to detect a finger or hand entering a defined area, during a hazardous motion of the machine.

The primary functions of protective devices generally include, but are not limited to, the following:

- Triggers a stop before the hazardous point is reached
- Prevents unintentional machine starts as long as the protective field is interrupted or there is a person or objects in the protective field

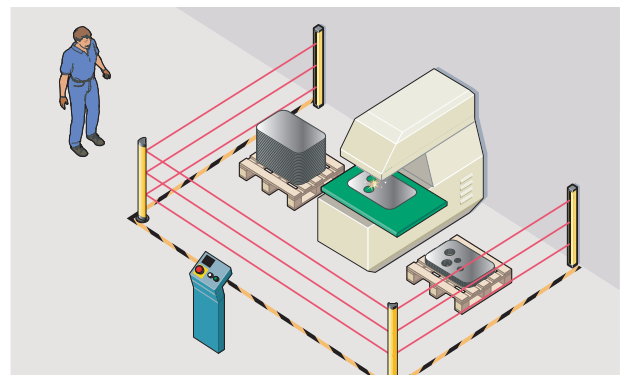


**Protective function Nr. 2: Access protection/Entry-exit protection**

The access protection or entry-exit protection is used to detect the intrusion of a person in an area.

As soon as entry is detected, a signal is triggered to stop the machine's dangerous movement.

An additional requirement of this safeguarding function is that the operator is required to have a full view of the hazardous area at the control station. The control station, including the ability to restart the machine, must be located well outside of the hazardous area. (The start of the machine shall not be possible from inside of the hazardous area.) The operator must also ensure that there are no people in the hazardous area before actuating a control switch for acknowledging the protective device and restarting the machine.

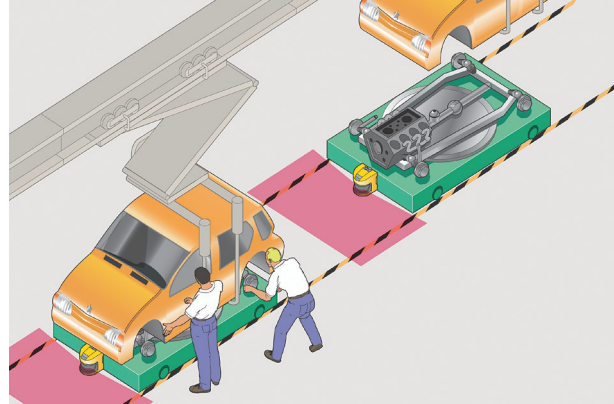


### Protective function Nr. 3: Area protection

The function of area protection is similar to access protection with the added function of sensing the presence of personnel inside the hazardous area. This type of safeguarding is suitable for machines where hazardous areas enclosed by fixed guards are not visible from the control point.

It is also suitable for protecting the approaches to a hazardous area where it combines perimeter and presence sensing safeguarding (permanent detection of personnel throughout the zone).

This type of safeguarding is also suitable for automated guided systems (AGS) to protect operators and/or third persons during vehicle movement.



### Step 2: Definition of the protective field

The second step in choosing which opto-electronic protective device is to define and assess the risks associated with the machine.

Depending on the installation and configuration, it is necessary to take the following points into consideration:

- The size of the protective field
- Stop triggering/start preventing
- The various access points
- The accessible hazardous areas
- The risk of bypassing the protective device and of the undetected presence of people in the hazardous area

### Step 3: Selection of the type of ESPE and the category for the safety-related parts of the machine controller

Several standards address the methods of assessing and estimating risks associated with the tasks and hazards of a machine, e.g. ANSI/RIA R15.06, ISO 14121, ISO 13849, IEC 62061 and others. For the purpose of this discussion, a review of the standard ISO 13849 is given here (see table on the following page).

While the essential requirements of the directive are aimed at a high level of safety, the resources must nevertheless be proportional to the risk involved.

The protection of an operator who manually inserts and removes parts at a metal press requires different consideration compared to the protection of an operator who works on a machine on which the maximum risk is the trapping of a finger. Furthermore, one and the same machine can have different access points with varying levels of risk. For this reason, different measures can be adopted for different parts of the safety-related control for a machine.

Against this background, the ISO 13849-1 standard aids the designer in the definition of the categories for the various parts of the safety-related control, based on the following parameters:

- The possible severity of injury
- The frequency and/or the duration of the exposure to the hazard
- The possibility of preventing the hazard

The behaviour of the safety-related control in case of a fault is defined for each category (B, 1, 2, 3, 4, cf. table page A-46). If identical technology is assumed (pneumatic, electronic, mechanical, hydraulic, etc.), these categories represent a sequential scale. For example, category 4 is higher than category 3. On the other hand, the categories are not intended to be used to compare different technologies.

The categories are also not intended to be used in any given order or hierarchical arrangement in relation to safety requirements.

Nevertheless, the type of AOPD (Active Opto-electronic Protective Device) and the interface of the AOPD must comply with the requirement of the category for the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop).

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Categories of the safety-related parts of the control system (ISO 13849)

Categories	Concise list of requirements	System behaviour	Principles for achieving safety
B	The safety-related parts of controls and/or their protective devices, as well as their components, must be designed, built, assembled and combined in compliance with the applicable standards such that they can withstand the effects expected.	The occurrence of a fault can result in the loss of the safety function.	Predominantly characterised by the selection of components
1	The requirements of B must be met. Proven components and proven safety principles must be used.	The occurrence of a fault can result in the loss of the safety function, but the probability of occurrence is less than in B.	
2	The requirements of B must be met and proven safety principles used. The machine control must check the safety function at suitable intervals.	The occurrence of a fault can result in the loss of the safety function between checks. The loss of the safety function is detected by the check.	Predominantly characterised by the structure
3 <sup>1)</sup>	The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that: <ul style="list-style-type: none"> <li>▪ a single fault in each of these parts does not result in the loss of the safety function, and</li> <li>▪ whenever feasible within reasonable limits, the single fault is detected</li> </ul>	The safety function is always retained when the single fault occurs. Some, but not all faults are detected. Accumulation of undetected faults may lead to loss of the safety function.	
4 <sup>1)</sup>	The requirements of B must be met and proven safety principles used. Safety-related parts must be designed such that: <ul style="list-style-type: none"> <li>▪ a single fault in each of these parts does not result in the loss of the safety function, and</li> <li>▪ the single failure is detected before the safety function is required or when the safety function is required, or if this detection is not possible, an accumulation of failures must not lead to the loss of the safety function.</li> </ul>	The safety function is always retained when faults occur. The faults are detected in good time to prevent loss of the safety function.	

<sup>1)</sup> corresponds to control reliability

Category selection of the safety-related part of the control system

**Risk estimation**

Starting point for risk estimation for the safety-related part of the control system

**Category selection**

	B	1	2	3	4
S1	●	●	○	○	○
F1	●	●	●	○	○
S2	○	●	●	●	○
F2	○	●	●	●	○
P1	○	○	○	○	○
P2	○	○	○	○	○

**S SEVERITY (of injury)**

S1 Slight injury: normally reversible or requires only first-aid as defined in OSHA § 1904.12<sup>1)</sup>

S2 Serious injury: normally irreversible, or fatal or requires more than first-aid as defined in OSHA § 1904.12<sup>1)</sup>

**F FREQUENCY (or duration of exposure to hazard)**

F1 Infrequent: Typical exposure to hazard less than once per hour<sup>1)</sup>

F2 Frequent: Typical exposure to hazard more than once per hour<sup>1)</sup>

**P POSSIBILITY (of avoiding the hazard)**

P1 Likely: Can move out of the way or sufficient warning/response time or the robot speed is less than 250 mm/s<sup>1)</sup>

P2 Not likely: Cannot move out of the way or inadequate response time or the robot speed is higher than 250 mm/s<sup>1)</sup>

<sup>1)</sup> Note: Additional definitions and criteria information are based on ANSI R15.06-1999, table 1.

- Preferred category
- Possible categories which can require additional measures
- Measures which can be overdimensioned for the relevant risk

## Step 4: Calculation of the safety distance

The calculation of the minimum safety distance for a protective device is described in the U.S. Code of Federal Regulations, Volume 29 (29CFR), Part 1910, Subpart O entitled “Machine Safeguarding” and in ANSI B11.19-2003, Annex D.

### Minimum safety distance required

$$D_s = H_s \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$$

### Minimum safety distance required

**$D_s$**  The minimum distance in mm or inches from the hazardous area to the detection point, plan or zone

### Hand Speed Constant (approach speed)

**$H_s$**  A parameter in mm/s or in/s, derived from data on approach speeds of the body or parts of the body. Often 1600 mm/s (63 in/s) is used for  $H_s$

### Components of the overall stopping time of the machine

**$T_s$**  Stopping/run-down time of the machine tool measured at the final control element

**$T_c$**  Response time of the control system

**$T_r$**  Response time of the protective device and its interface

**$T_{bm}$**  Additional response time for the brake monitor

Note: Any additional time delays must be accounted for in this calculation

### Penetration factor

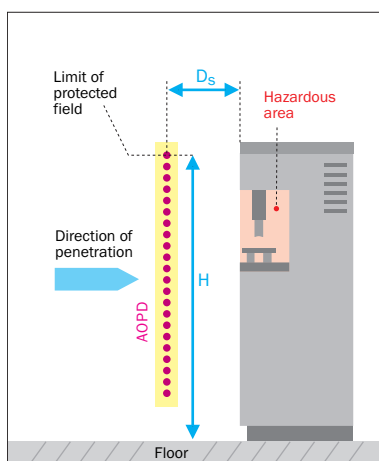
**$D_{pf}$**  An additional distance added to the overall safety distance required. This value is based on intrusion toward the hazardous area prior to actuation of the electro-sensitive protective equipment (AOPD). Values range from 6 mm to 1220 mm (0.25 in to 48 in) or more, depending on the application. For example on vertical protection with an AOPD with an effective resolution of less than 64 mm (2.5 in),  $D_{pf}$  can be determined approximately using the following formula:  
 $D_{pf} \text{ (in)} = 3.4 \times (\text{effective resolution} - 0.276)$ , but not less than 0

Users are also directed to refer to specific machine regulations and standards that may apply to their application. Several of these regulations and standards are presented in the appendix of the Safety Engineering section. Any protective device shall be installed in such a way that access to the hazardous area without the person being detected by the device is impossible.

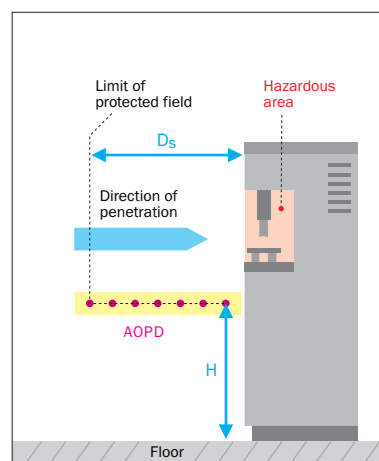
If the minimum safety distance calculated is acceptable from an operational, industrial and ergonomic point of view, it must nevertheless be determined whether the installation and the configuration of the protective device is such that people cannot enter the hazardous area and cannot be present in the hazardous area without being detected by the protective device.

If the minimum safety distance is too large and is unacceptable from an ergonomic point of view, it must be checked whether it is possible to reduce the overall response time of the machine or to increase the object detection capability (resolution) of the protective device.

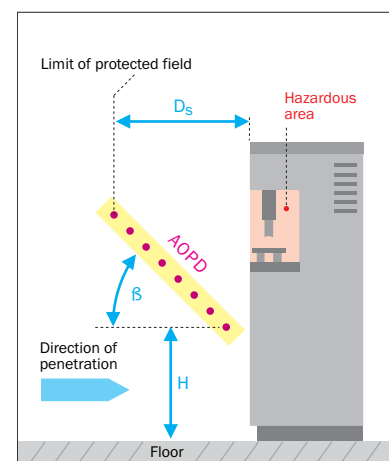
## In general, one differentiates between three different approach types



Perpendicular approach / perpendicular entering of the protective field orientation



Parallel approach/parallel entry into the protective field orientation



Angular approach

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The following table contains the formulae for the calculation of the safety distance  $D_s$

You will find examples on the next page.

Approach	Detection capability (resolution)	Safety distance	Beam height (distance from floor)
<b>Perpendicular</b> $\beta = 90^\circ (\pm 5^\circ)$	$d < 64 \text{ mm (2.5 in)}$	$D_s = H_s \times \sum T_{total} + D_{pf}$ where $D_{pf}$ is determined by:  $D_{pf} = 3.4 \times (\text{resolution} - 6.875 \text{ mm})$ $D_{pf} = 3.4 \times (\text{resolution} - 0.275 \text{ in})$	Height of the bottom beam $\leq 300 \text{ mm (12 in)}$ Height of highest beam $\geq 1200 \text{ mm (48 in)}$ <sup>1)</sup>
	$64 \text{ (2.5 in)} \leq d \leq 600 \text{ mm (24 in)}$	$D_{pf} = 900 \text{ mm (36 in)}$	Height of the bottom beam $\leq 300 \text{ mm (12 in)}$ Height of highest beam $\geq 1200 \text{ mm (48 in)}$ <sup>1)</sup>
	$64 \text{ (2.5 in)} \leq d \leq 600 \text{ mm (24 in)}$	$D_{pf} = 1200 \text{ mm (48 in)}$	Height of the bottom beam $\leq 300 \text{ mm (12 in)}$ Height of highest beam $\geq 900 \text{ mm (36 in)}$ <sup>1)</sup>
<b>Parallel</b> $\beta = 0^\circ (\pm 5^\circ)$	—	$D_s = H_s \times \sum T_{total} + D_{pf}$ where $D_{pf}$ is determined by:  $D_{pf} = 1200 \text{ mm (48 in)}$	Height of protective field $\leq 300 \text{ mm (12 in)}$
<b>Angular</b> $5^\circ < \beta < 85^\circ$	—	If $\beta \geq 30^\circ$ , use the perpendicular approach defined above. If $\beta < 30^\circ$ , use the horizontal or parallel approach defined above. The safety distance $D_s$ is based on the beam closest to the hazardous point.	

Per ANSI R15.06-1999

$D_s$  = Safety distance

$H$  = Height

$d$  = Detection capability (resolution)

$\beta$  = Angle between detection plane and the direction of entry

$T$  = Time

**1) Important note:**

Under no circumstance shall it be possible to reach the closest hazardous point. For calculation of the height of detection zone ref. ISO 13852, table 1.

## Examples for machine protection

### Area protection

This example shows two possible ways of addressing safeguarding needs for a machine with a hazardous point. These methods will take both a vertical approach and a horizontal approach to machine safeguarding into account.

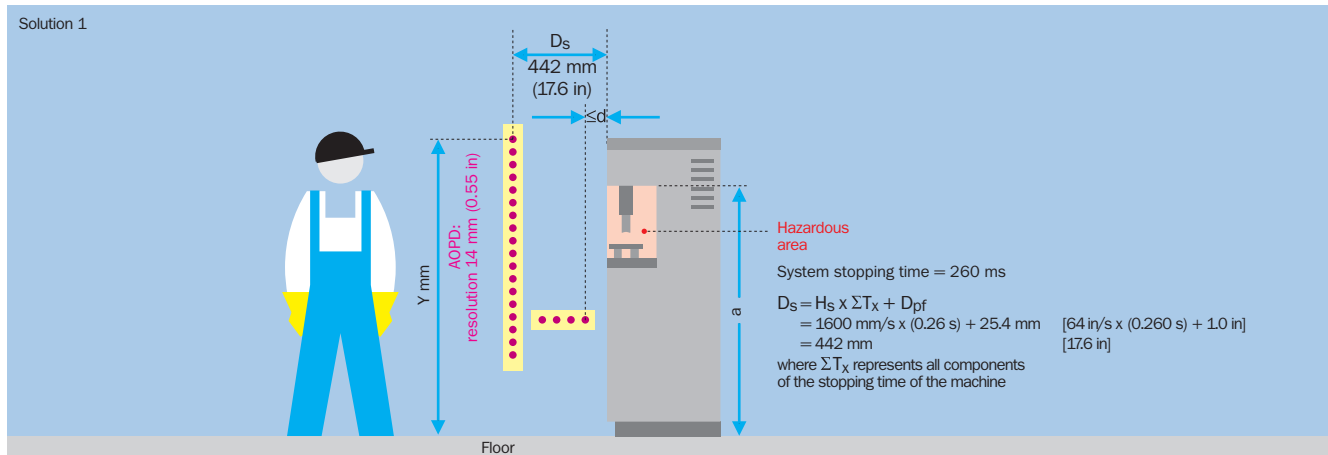
It is a condition that

- the machine can only be reached via this access,
- there is a risk of serious injury,
- the operator needs to enter the hazardous area frequently.

#### Solution 1: Perpendicular approach, hazardous point protection with area guarding

In the diagram below, an AOPD with 14 mm (0.55 in) resolution is mounted vertically to provide hazardous point protection. A second AOPD is mounted horizontally to prevent personnel from being present behind the vertical protection.

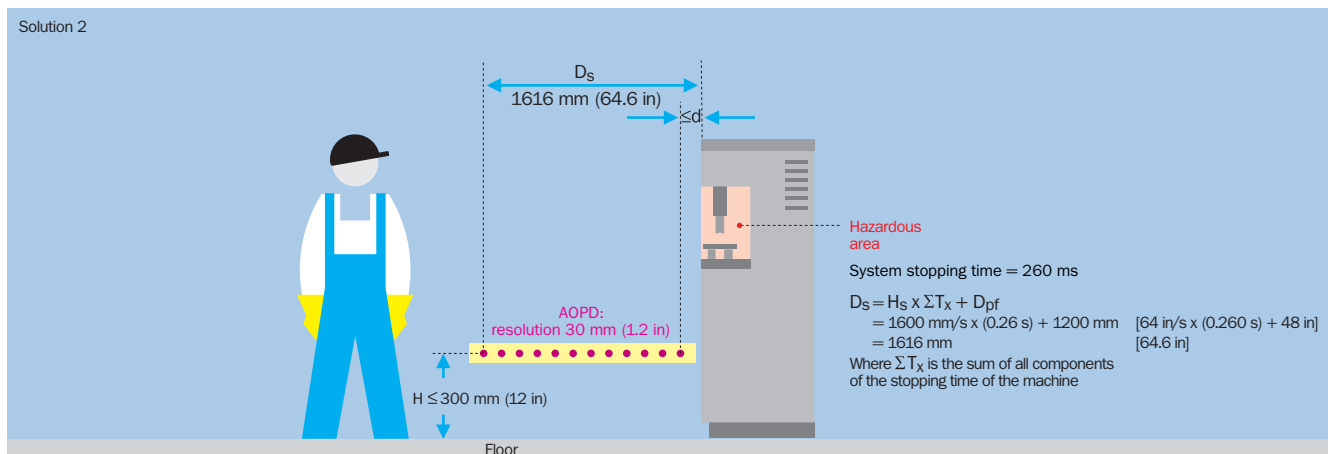
It is imperative that the vertical AOPD is mounted in such a way as to prevent personnel from reaching over, under or around the AOPD, thus reaching the hazardous point.



#### Solution 2: Parallel approach, area protection

In this approach a horizontal AOPD is used. The diagram below shows the calculation of the safety distance  $D_s$  and the positioning of the AOPD.

The maximum installation height of the AOPD of 300 mm (12 in) must not be exceeded. If these mounting considerations cannot be met, mechanical means have to prevent a person from entering the hazardous area undetected by passing under the AOPD.



Note:

The resolution of the AOPD depends on the height of the detection zone to assure the presence sensing in the hazardous area:  $15 (d - 50 \text{ mm}) \leq H_s \leq 1000 \text{ mm}$

Continued on next page

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**Result**

The table below shows the results of these two solutions. Operative requirements determine which of the two solutions is chosen.

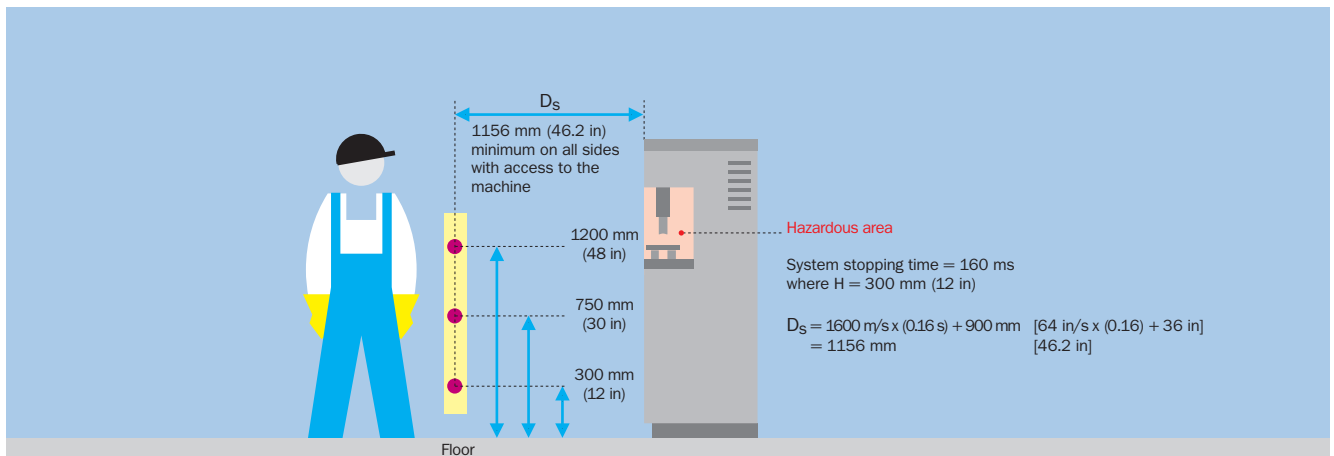
	Advantages	Disadvantages
<b>Solution 1</b> $D_s = 442 \text{ mm (17.6 in)}$	<ul style="list-style-type: none"> <li>Greater productivity, as the operator is closer</li> <li>The short distance between the vertical photoelectric switch and the hazardous area makes it possible to store material near the machine (short distances)</li> </ul>	<ul style="list-style-type: none"> <li>Higher price for the protective device</li> </ul>
<b>Solution 2</b> $D_s = 1616 \text{ mm (64.6 in)}$	<ul style="list-style-type: none"> <li>Lower price for the protective device</li> <li>Enables access to be protected independently of the height of the hazardous area</li> </ul>	<ul style="list-style-type: none"> <li>The operator is much further away (long distances)</li> <li>It is difficult to store products on the floor, as the AOPD takes up a large amount of the space</li> <li>Lower productivity</li> </ul>

**Access protection**

Access protection with 3 beams (at heights of 300 mm, 750 mm and 1200 mm) enable perpendicular approach, as described in the chapter “Calculation of the safety distance” (→ page A-47). This solution permits the operator to stand between the hazardous area and the AOPD without detection. For this reason, additional safety measures must be taken to

reduce this risk. The control mechanism (e.g. reset button) must be positioned such that the entire hazardous area can be seen. It must not be possible to reach the button from the hazardous area.

Note: The control switch can have several functions.



H = Installation height

$D_s$  = Safety distance

**Guarding the interior of a press**

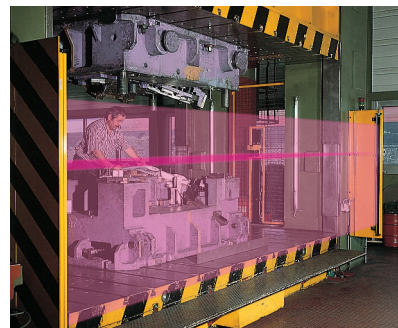
This type of protection is recommended for large presses that are accessible from the floor. In this special case, it is necessary to prevent the press starting while the operator is in the interior. This is a secondary protective device that under no circumstances can take over the function of the primary protection, for which an appropriate device is used (AOPD or two-hand control).

In this special case: The safety distance for the primary protective device (AOPD) with the task of stopping the press must be calculated, while the secondary protective device detects the presence of a person in the press and so prevents the press starting up.



**Spotting press**

Hazardous point protection with safety light curtain (AOPD) and interior monitoring with safety laser scanner (AOPDR). Both sensors are activated on start-up. Then the SICK laser scanner PLS is muted during the downward stroke.





## Connection to the controller

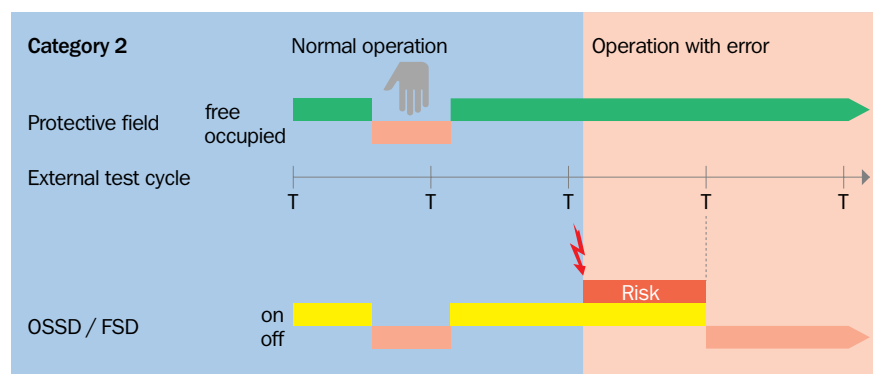
A

### Machine interface

It is imperative that each protective device is correctly integrated in the machine control. This means that the part of the machine control responsible for safety (protective device, machine control and main stop elements) must meet the category (see A-46 and A-53) that was found during the risk assessment as per ANSI / R15.06-99, ISO 14121 and ISO 13849. The following figures explain the categories according to ISO 13849 that are suitable for an AOPD and the control. This risk assessment applies to the entire system including stop elements. It is important to note that the safety “system” is comprised of more than just the protective device. The control or interface

units, as well as any controlling elements, such as a control valve, must also be taken into account.

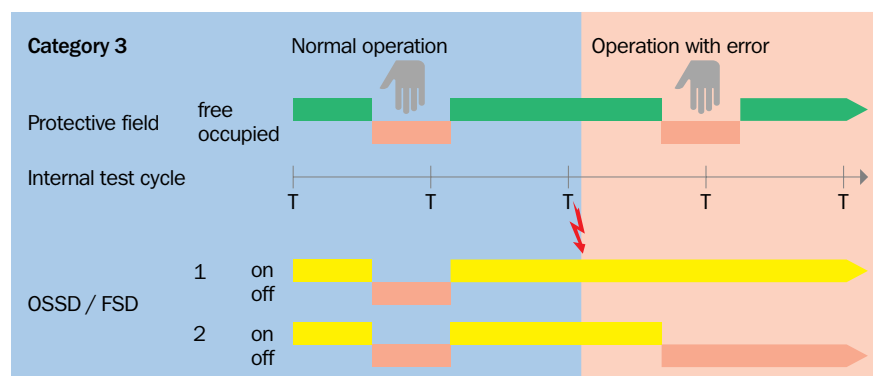
If a protective device is activated under normal operating conditions, e.g., on interruption of the protective field, the machine is stopped (independent of the category). The various categories differ in the detection of faults. However, if a failure does occur in the protective device, it is dealt with differently, depending on the category of the protective device as defined further in the diagrams below.



#### Category 2

Loss of protective function between checking intervals possible.

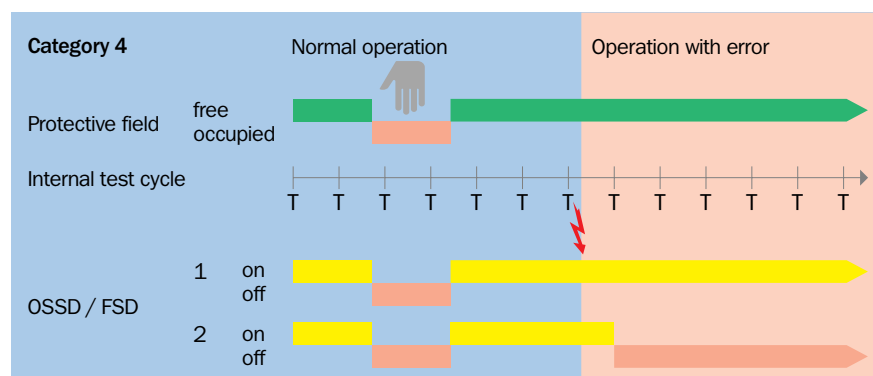
Faults are detected during a check by the external test. In the period between the occurrence of the fault and the next test there is a risk.



#### Category 3

A single failure assures the protective function as an output signal for stopping can still be generated (e.g., if a hand enters the protective field). The failure is detected either when the hand enters the protective field or by internal checking. Accumulation of failures may lead to loss of the protective function.

The system shall be designed so that a single failure in any of its parts does not lead to the loss of protective functions.



#### Category 4

A single failure still assures the protective function. In addition to category 3, the protective function must be assured in case of an accumulation of failures. Therefore, internal tests must be within the response time of the protective device.

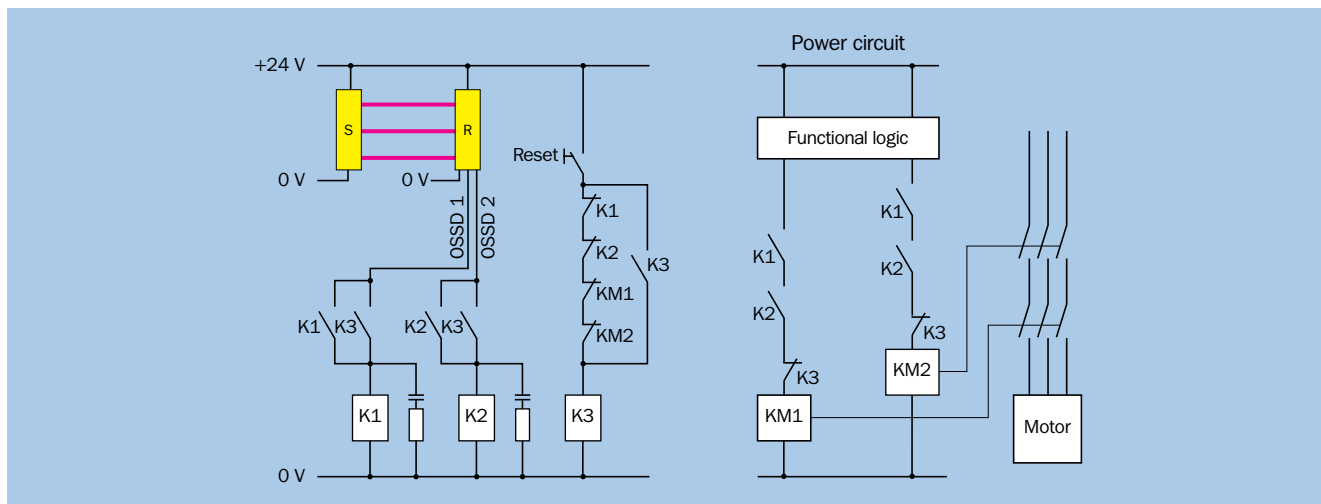
The single failure is detected at or before the next demand on the protective function. If the detection is not possible then an accumulation of failures shall not lead to a loss of the protective function.

A

Connection example for a protective device ESPE type 4 according to IEC 61496

**With external reset**

The figure shows a simple machine on which the AOPD reset function can also start the machine.



K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

K1, K2 and K3 are the auxiliary contactors. KM1 and KM2 are main contactors. All contactors are positively guided. In this case the entire protective system has a redundant (dual-channel) design

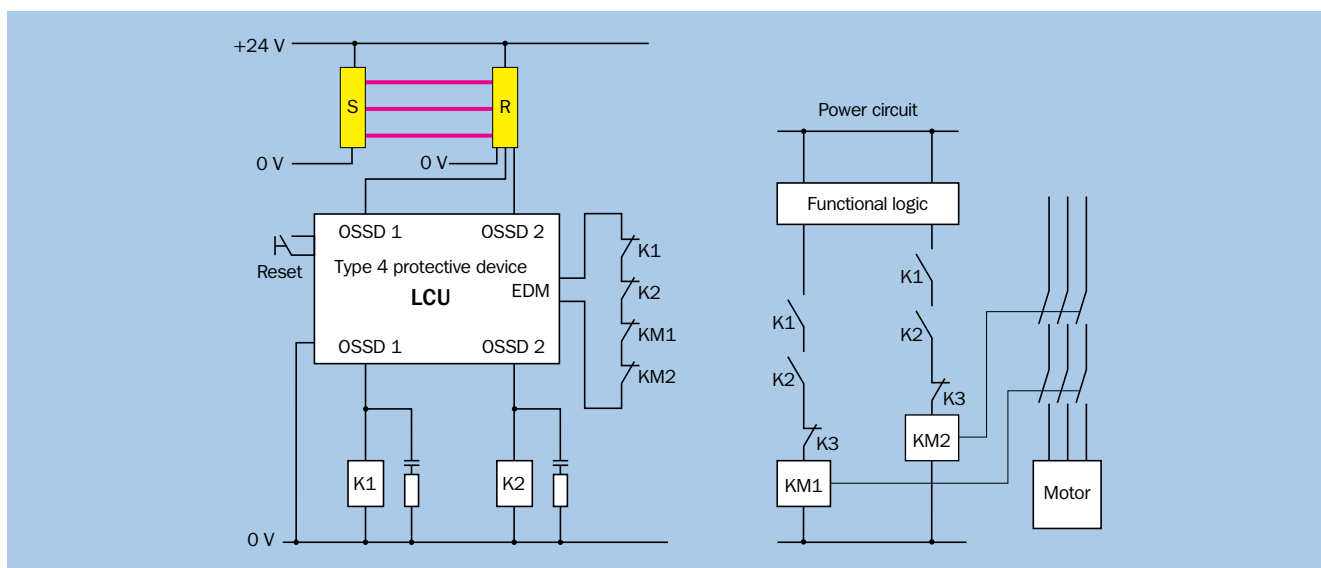
- The protective device (OSSDs)
- The auxiliary circuit (FSDs)
- The main control circuit (MPCEs)

The contactors K1/K2 are monitored via K3. If one of the normally open contacts K1 or K2 “sticks”, its partner, the normally closed contact cannot close. As a consequence, the coil of K3 cannot be energised and therefore the contactors K1 and K2 can no longer be operated. The control circuit therefore remains open.

**With internal reset**

Another connection example of a protective device type 4 ESPE according to IEC 61496 with restart interlock and external device monitoring. Reset and external device monitoring are

dynamically monitored by the SICK protective device. Feature of this connection: reduced installation effort.



K1/K2 = FSD1/FSD2, KM1/KM2 = MPCE1/MPCE2

## Control reliability

“Control reliability” has been defined and implemented based on a variety of definitions. In the definitions presented below, the word “shall” denotes a mandatory requirement for compliance with a regulation or standard. The words “should” and “may” are intended to reflect recommendations and good work practices.

**For example, OSHA 1910.211 defines “control reliability” as:**

A control system designed and constructed so that a failure within the system does not prevent normal stopping action from being applied when required, but does prevent initiation of a successive cycle until the failure is corrected. The failure shall be detectable by means of a simple test or indicated by the control system.

**The American National Standards Institute (ANSI) defines “control reliability” in Standard B11.19-2003 (3.14) as:**

The capability of the machine control system, the protective device, other control components and related interfacing to achieve a safe state in the event of a failure within their safety-related functions.

**ANSI B11.19-2003 (E.6.1) further states:**

“Control Reliability”

- cannot prevent a repeat cycle in the event of a major mechanical failure or in the presence of multiple simultaneous component failures
- is not provided by simple redundancy. There must be monitoring to assure that redundancy is maintained.

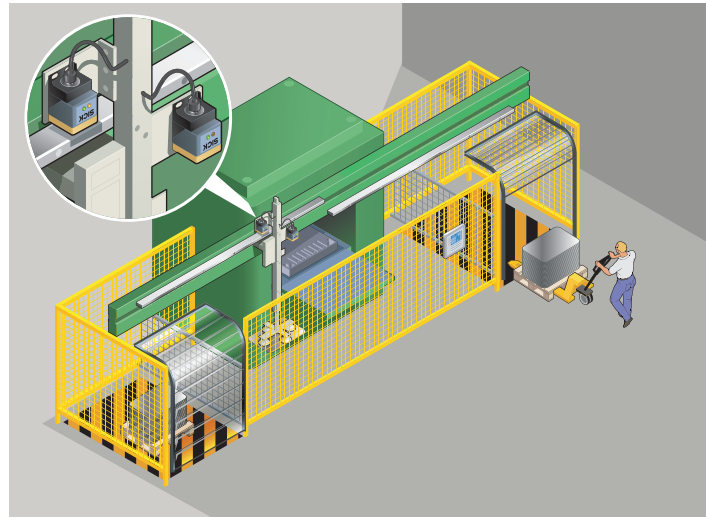
**ANSI B11.20 (E6.13) further clarifies the requirements of control reliability by stating the following:**

Control component failure protection of electrical, electronic, pneumatic or hydraulic systems frequently consists of multiple, independent parallel or series circuitry or components arranged to meet the requirements of 6.13 (a clause defining “control reliability”). Protection against the consequences of failure of control components should not depend solely upon simple redundancy. Component redundancy is the use of two or more control components in parallel or series circuits and is used to ensure reliable operation. However, failure of one of the redundant components can go undetected, allowing the appearance of safe operation. When the additional element of the redundant circuit subsequently fails, an unsafe condition can occur. Monitoring and response to such single failures is essential.

Based on these definitions, it is important to take control reliability into account in the development of safety-related electrical, electronic and pneumatic systems. Control reliable circuits should be hardware based and include monitoring at the system level. ANSI/RIA R15.061999 (4.5.4) provides a practical guide to implementing “control reliability” by requiring the following components:

- a) The monitoring shall generate a stop signal if a failure is detected. A warning shall be provided if a hazard remains after cessation of motion
- b) Following detection of a failure, a safe state shall be maintained until the fault is cleared
- c) Failures with a common cause (e.g. overvoltage) must be taken into account if the probability is high that such a failure may occur
- d) The single failure should be detected at time of failure. If not practical, the failure should be detected at the next demand upon the safety function.

## Products and complete solutions for effective operator protection and accident protection



### Solutions from SICK: always with an eye on the big picture!

Today there is no alternative to the use of industrial safety technology. However it is only when this technology sustainably optimises the production processes that the technically

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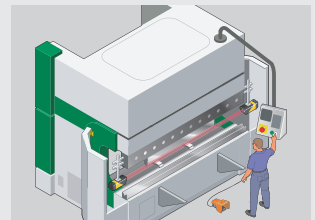
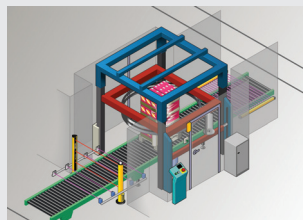
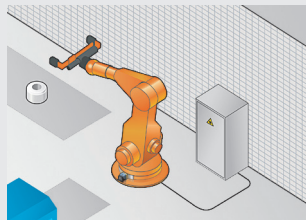
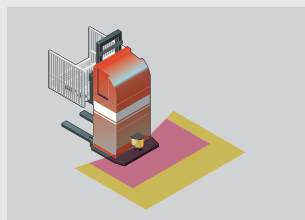
### Think about tomorrow, today!

The name SICK stands for know-how direct from practice: our knowledge of many machines and systems forms the basis for customised and individual solutions that will also satisfy your future requirements!

The applications shown on the following pages schematically illustrate the solution of the tasks. The selection of devices,

their arrangement and mounting must be adapted to the task, the specific situation and the requirements of the site where the devices are used, especially in the safety technology sector.

Talk to us. We will be pleased to provide advice and be of service.



## Applications at a glance

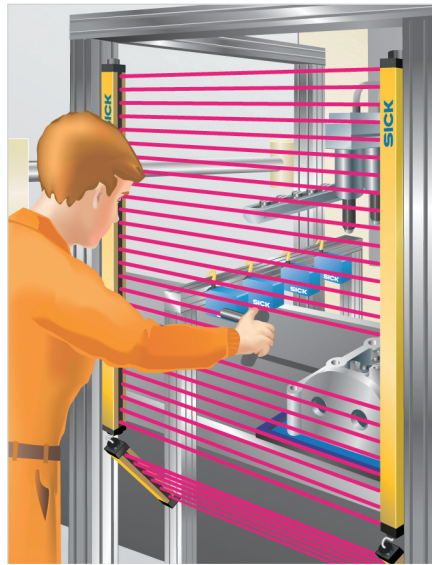
Task	Description	Industrial sector	Product	Page
Hazard protection	Hazard protection on a cylinder head handling station	Automotive and other vehicles	C4000	B-2
	Protection of a handling machine in cheese manufacture	Food & beverage	C2000, IP67 Housing	B-3
	Protection of a press brake	Machine tools and production systems	V4000, M2000, C2000	B-4
Hazardous point protection with area protection	Hazardous point and area protection on an industrial robot	Assembly, handling, robotics, automation	C4000	B-5
	Hazardous point and area protection on a rotary table	Automotive and other vehicles	C4000, S3000, UE4100, UE4400	B-6
Hazardous area protection	Protection of a skid in automobile production	Automotive and other vehicles	S3000	B-8
	Area protection on a pipe-bending machine	Metal and steel production, processing	S3000	B-9
	Protection of crossing paths for automated transport systems	Automotive and other vehicles	S3000, VS/VE18-2, LE20	B-10
	Hazardous area protection on a wrap-around tray packaging machine	Food & beverage	C2000, L4000, RE300, UE410 Flexi	B-11
	Protection of the route for an automated guided vehicle	Storage and conveyor technology	S3000, S300	B-12
Access protection	Access protection and positioning in a gas bottle store	Storage and conveyor technology, pharmaceutical/medical	IN4000, M2000, UE4200	B-13
	Safety interlocks on robot cells in a harsh operating environment	Automotive and other vehicles	i1001 Lock	B-14
	Three-sided protection of a punching machine	Machine tools and production systems	M4000	B-15
	Protection of a stone transport crane	Construction, stone, glass, ceramics, etc.	M2000	B-16
	Hazardous point and access protection on a press brake	Machine tools and production systems	C4000, C2000, M2000, UE470	B-17
Access protection with area protection	Access and area protection on a palletiser robot	Food & beverage, packaging	S300, i14 Lock, E100, UE410 Flexi	B-18
	Hazardous area and access protection on a robot cell	Assembly, handling, robotics, automation	S3000, UE440	B-19
Safe position monitoring	Safe monitoring of a gantry robot's working area	Automotive and other vehicles	IN4000	B-20
	Safe monitoring of a robot's working area	Assembly, handling, robotics, automation	IN4000	B-21
Access protection with differentiation between man and material (muting)	Access protection for AGV gates on a robot cell	Automotive and other vehicles	M4000, T4000 Compact	B-22
	Hazardous area and access protection on a coil store	Storage and conveyor technology	M4000 with UE403, T4000 Compact, UE4200	B-23
	Access protection on a pallet stretch wrapper	Food & beverage, packaging	M4000, i16, C4000 Palletizer, UE410 Flexi	B-24
Access protection with differentiation between man and material (muting alternative)	Access protection with differentiation between man and material on a palletising system	Storage and conveyor technology, Packaging	C4000 Palletizer	B-25
	Access protection to a robot cell with differentiation between man and material	Automotive and other vehicles	C4000 Entry/Exit	B-26
	Access protection on an assembly cell	Automotive and other vehicles	S3000, UE440	B-27
Overview for access protection with differentiation between man and material				B-28



## B

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## Application overview

### Hazardous point protection on a cylinder head handling station

Task	Hazardous point protection
Industrial sector	Automotive and other vehicles
Application location	Handling robots
Product family	C4000

## Application in detail

### Task

Along with manual assembly stations, a cylinder head assembly line also includes fully automatic assembly stations with handling robots. Their working area is to be protected against access by the workers to prevent injuries to fingers and hands. The protective device is to be designed in such a way that when the robot is at a standstill, work processes, e.g. the insertion of parts, rectification of malfunctions and setup, are not hindered.

### Implementation

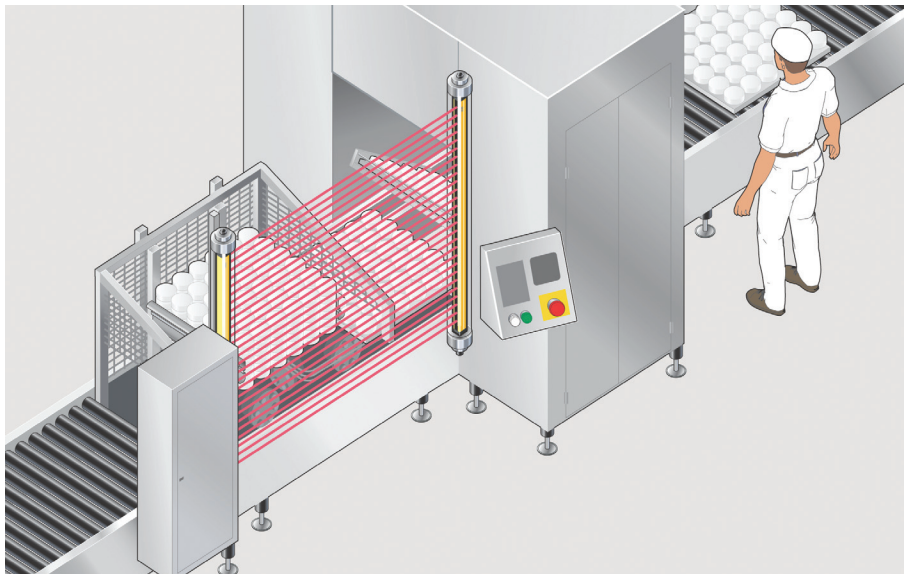
Using the C4000 safety light curtain it was possible to implement hazardous point protection and point-of-operation guarding. To protect the assembly or handling stations, the cells are equipped with light curtains on the sides open to the workers. If a worker reaches into the cell while the robot is working, the light curtain is interrupted and

the assembly or handling process stopped. As it would be possible to step behind the vertically arranged light curtain (as shown in the figure), a further light curtain is fitted at an angle beneath the vertical safety light curtain. The safety light curtains are connected together serially. The vertical light curtain acts as a guest and the light curtain fitted beneath it is the host. As a result, the two light curtains can be connected to the robot control system via a single input.

### Customer benefits

The proven safety technology makes it possible to reliably implement hazardous point protection and point-of-operation guarding. The serial configuration (cascading), simplifies wiring and reduces the number of inputs required thus cutting the amount of space required in the control cabinet. Low cost installation is therefore possible.

Further information	Page
→ C4000	E-2
→ Services	A-2



## Application overview

### Protection of a handling machine in cheese manufacture

Task	Hazardous point protection
Industrial sector	Food & beverage
Application location	Stacker
Product family	C2000, IP67 Housing

## Application in detail

### Task

In the factory of a French Camembert manufacturer, a reliable solution was sought for protection against the crushing of the hands and fingers on a stack collector. The solution must also not interfere with the production process. The environment for the safety system has an atmospheric humidity of up to 85 % - at an ambient temperature of 25 °C. Also the equipment must be washed off once or twice a day using alkaline or acidic cleaning agents. Finally, cold water (5 to 10 °C) at a pressure of 40 bar is used for rinsing and cleaning.

### Implementation

Since its installation the C2000 in IP67 Housing has been found to be the ideal solution.

The protective housing is a PMMA acrylic tube with V4A stainless steel end caps. It is of compact design without trap points for dirt or contamination. A pressure equalisation membrane integrated into one of the end caps prevents the penetration of moisture and ensures that the window does not mist up. The cable entry is provided using proven PG cable glands.

The resistance of the materials used for the IP67 Housing series as well as the

cable was positively assessed in material compatibility tests performed by Ecolab (Henkel) for the cleaning products P3 (P3-topax 56, P3-topax 66, P3-topax 91, P3-topactive 200, P3-topactive DES). The low pressure foam method (COP cleaning and disinfection) for the food processing industry is recommended.

The C2000 is an electro-sensitive protective equipment of type 2 in accordance with IEC 61496. The parallel light beams generate a flat protective field in front of the dangerous area. Unauthorised or inadvertent reaching into the running machine results in the interruption of one or more light beams. The evaluation electronics for the C2000 detect this situation within a few milliseconds and immediately generate a shutdown signal for the stack collector.

### Customer benefits

Using the C2000 in an IP67 Housing ensures reliable protection despite harsh ambient conditions. The machine protection meets not only the requirements in relation to hygiene, resistance to cleaning, availability and safety, but also the requirements in relation to ergonomics and productivity, as the stack collector is always accessible when shutdown.



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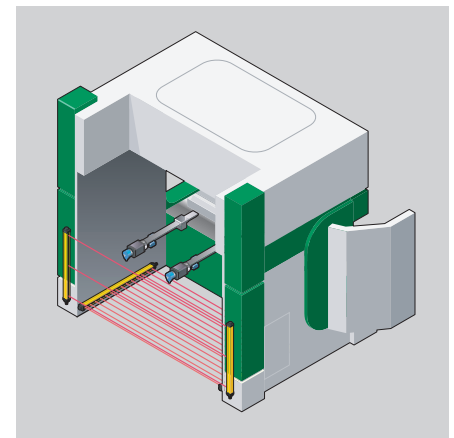
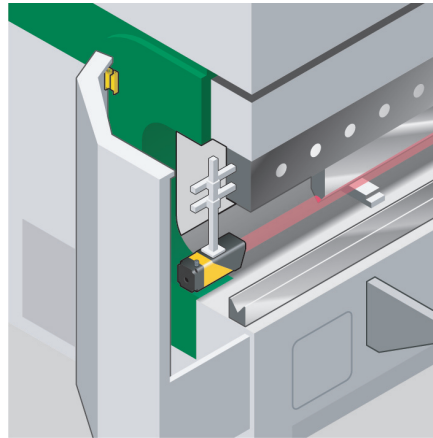
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→ IP67 Housing	E-137
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## Application overview

### Protection of a press brake

Task	Hazardous point protection
Industrial sector	Machine tools and production systems
Application location	Machine tools
Product family	V4000, M2000, C2000

## Application in detail

### Task

Both the front and rear of a hydraulic press brake are to be protected: The dangerous tool closing movement (punch/die) is to be safely stopped on reaching in and it is to be possible to safely access the rear of the machine without the hindrance of moving guards (e.g. doors).

### Implementation

The hazardous point between punch and die is protected using the V4000 safety camera system. The system's sender and receiver are fastened to the punch. During the downward movement of the punch a two-dimensional safety field matched to the related bending process is active. The height of the field reduces continuously as the punch approaches the die. As soon as an object that is not allowed (e.g. hand or finger) enters the safety field, a stop signal is given.

The access protection on the rear of the press brake is provided using a host/guest

system comprising a vertically mounted M2000 multi-beam photoelectric safety switch and a horizontally arranged C2000 safety light curtain for point-of-operation guarding. Entrance into the hazardous area stops the dangerous movement of the press.

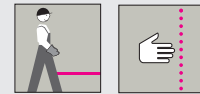
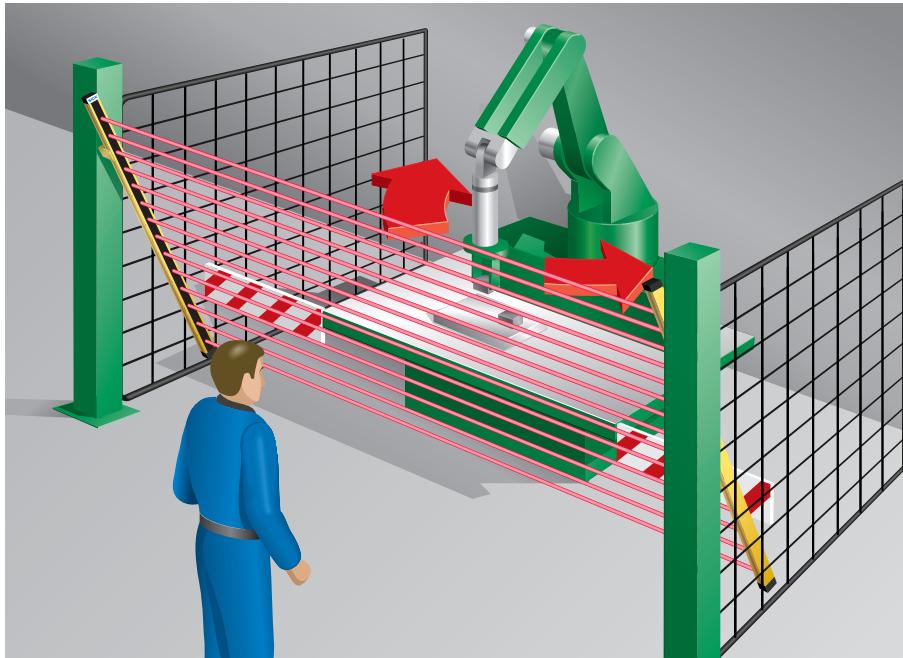
### Customer benefits

Along with ensuring maximum safety, the image information for the safety camera system is also used for optimising the bending process and therefore the cycle time. The reduction in the cycle time increases the capacity of the machine and as a result cost-effectiveness.

The combination of M2000 and C2000 on the rear of the machine provides a high level of safety and, with the machine switched off, quick, clear access which in turn increases productivity.

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→ V4000	D-2
→ C2000	E-124
→ M2000	F-38
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## Application overview

### Hazardous point and area protection on an industrial robot

Task	Hazardous point protection with area protection
Industrial sector	Assembly, handling, robotics, automation
Application location	Robot station
Product family	C4000

## Application in detail

### Task

The insertion station of an industrial robot is to be protected by electro-sensitive protective equipment. The user often needs to enter the hazardous area. A door or a grid would make it more difficult to insert and remove parts.

### Implementation

There are two possible ways of providing protection here using C4000 safety light curtains (type 4):

First possibility:

Hazardous point and area protection with two light curtains in a host-guest configuration. A light curtain arranged vertically in front of the cell stops the robot if the worker reaches into the protective field or the robot leaves its defined path due to an error and enters the worker's workplace. A second light curtain arranged horizontally above the floor is used for protection

against standing behind the vertical light curtain.

The host-guest connection is electrical, so the two devices act like a "single" stand-alone light curtain. This configuration saves I/O interfaces on safe controls or relay evaluation modules. This also saves additional wiring for the guest.

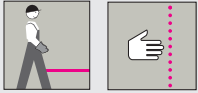
Second possibility:

The light curtain is positioned at an angle (see figure). So it is not possible to stand behind the light curtain. The front edge of the protective field is defined by the safety distance. As this is the more cost-effective solution for the problem, it was implemented.

### Customer benefits

Quicker and less awkward insertion and removal of parts than with hazardous area protection using a door or grid. As a consequence the productivity is increased. The work process is also easier to observe.

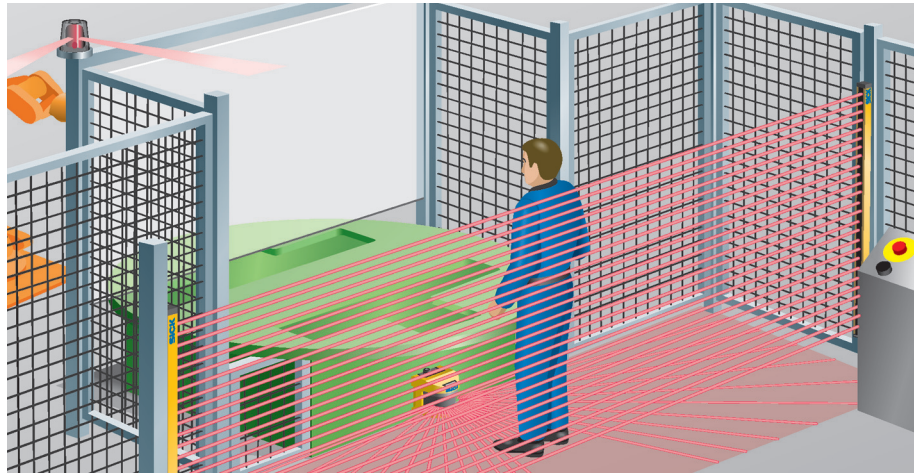
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## Application overview

### Hazardous point and area protection on a rotary table

Task	Hazardous point protection with area protection
Industrial sector	Automotive and other vehicles
Application location	Revolving machine
Product family	C4000, S3000, UE4100/UE4400

Further information	Page
→ S3000	C-17
→ C4000	E-2
→ UE4100	P-2
→ UE4400	P-28
→ Services	A-2

## Application in detail

### Task

Small parts, such as bolts and straps, are welded to sheet metal body parts on a rotary table by a robot. The sheet metal parts are inserted in the rotary table by the robot, clamped and the table rotated by 180°. A worker then fits the small parts to the body part. The rotary table is then rotated by 180° again into the robot cell where the parts are welded automatically. To protect against the hazardous rotation of the table and welding process, the robot cell must be equipped with appropriate safety systems. All safety devices are to be analysed from a control room via PROFIBUS and relevant information displayed.

### Implementation

Protection was achieved using the C4000 safety light curtain and the S3000 safety laser scanner. If the worker enters the hazardous area, the light curtain is interrupted and the rotary motion of the table or the welding process stopped. To protect the area between the rotary table and the light curtain, a safety laser scanner is also fitted. This device ensures that it is not possible to stand behind the C4000. As it is possible to program the scanner's monitored area as required, the non-rectangular area between the rotary table and the light curtain can be monitored in its entirety. The two safety sensors, as well as emer-

gency stop switches and other sensors, are installed on the UE4100 bus node.

The complete safety application is solved using one bus node. The bus loading due to several users is reduced to a minimum.

### Customer benefits

Due to the combination of light curtain and laser scanner, full protection of the robot rotary table is achieved. The programmable laser scanner enables the protection to be flexibly adapted to the space monitored.

The C4000 and S3000 safety devices have an expanded communication interface via which they can be connected to the UE4100/UE4400 bus node. As a result, the devices can be completely analysed from a control room using the SICK Configuration & Diagnostic Software (CDS) without the need for any initial in-situ diagnostics.

With this expanded communication interface, electro-sensitive protective devices remain independent of the evaluation unit selected. I.e. safety laser scanners and safety light curtains are suitable both for a conventional solution with safety relays and for a solution with a safe network solution. Investments in new hardware due to changes in the boundary conditions are therefore not necessary.

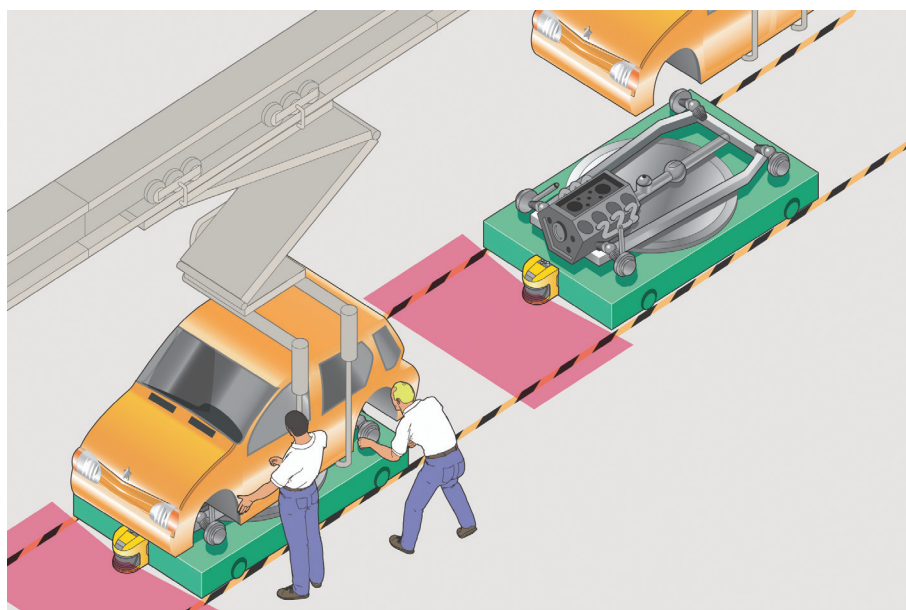
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## Application overview

### Protection of a skid in automobile production

Task	Hazardous area protection
Industrial sector	Automotive and other vehicles
Application location	Assembly line
Product family	S3000

## Application in detail

### Task

During final assembly in a car factory, engine and body are transported to the "marriage" on automatically guided vehicles (AGVs). As personnel or other vehicles could cross the vehicle's path, the AGV must be protected, i.e. even at high velocities the AGV must stop reliably before a collision can occur. This aspect is particularly important during assembly, after fitting of the body, when workers must perform manual work. In the past this protection was provided by tactile bumpers. However these bumpers only provide protection at low velocities.

### Implementation

A S3000 Professional laser scanner was fitted to the front of the AGV to scan the surroundings within its programmed protective and warning fields. With its velocity-dependent protective field/warning field switching using incremental encoder signals, the device slows down the vehicle or stops it completely as soon as a person or object is detected. The incremental encoders are used for the velocity-dependent control of the protective field (high velocity results in a long braking distance that, in

turn, must be monitored by a long protective field). As soon as the scanner detects an object, the device reduces vehicle velocity or stops the AGV. Due to the use of digital switching inputs, it is also possible to change the protective field appropriately on left- or right-hand bends. Up to 8 protective fields and 8 monitoring fields can be programmed.

### Customer benefits

Velocity-dependent protective field switching allows routes to be driven considerably faster, as the velocity is reduced and the protective field shortened before sharp bends (this feature allows tighter bends to be used). The vehicle can be accelerated on straight sections and the protective field adjusted to suit.

Fixed protective fields must always be set in such a way that there is no spurious switching due to the surroundings, so high velocities are generally not possible in such cases.

Use of the S3000 Professional laser scanner has significantly improved both cost-effectiveness and the protection of people and property.

#### Further information

→ S3000

→ Services

#### Page

C-3

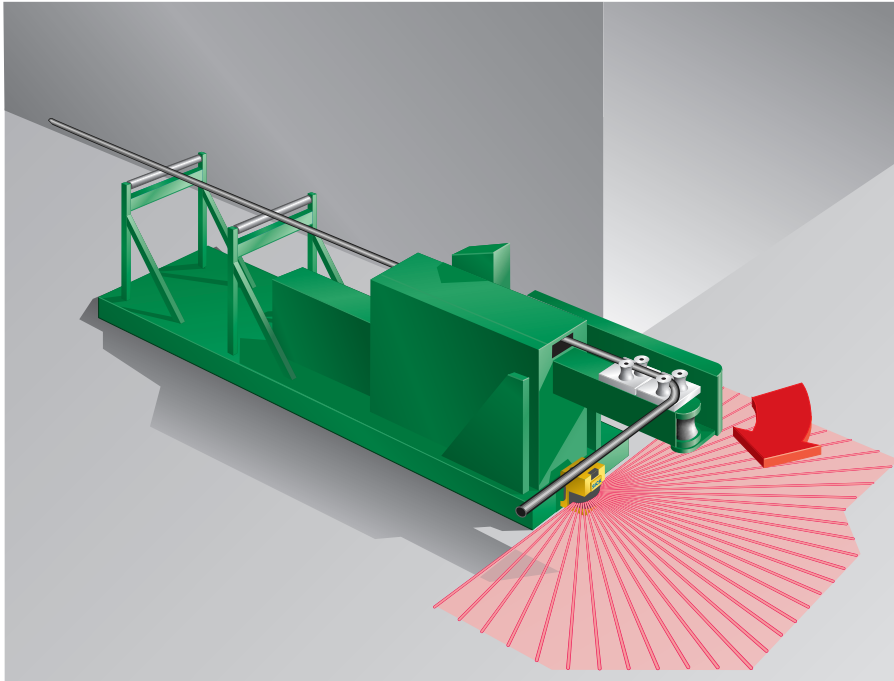
A-2



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## Application overview

### Area protection on a pipe-bending machine

Task	Hazardous area protection
Industrial sector	Metal and steel production, processing
Application location	Pipe bending machine
Product family	S3000

## Application in detail

### Task

Steel pipes of varying length, shape and diameter are processed on a pipe bending machine for the manufacture of furniture. There are hazards for the machine operator from the bending movement of the working head (risk of crushing) as well as the pivoting movement of the free end of the piece of pipe. A risk assessment in accordance with EN 1050 resulted in a categorisation of category 3 for the safety related parts of the machine controller.

The protection measures of the past, mats, light curtains and physical barriers cause a significant hindrance for the machine operators when loading and removing material. These items are also subject to heavy mechanical wear.

### Implementation

By using a S3000 safety laser scanner, the system can be conveniently protected with-

out hindering operation. The scanner sits underneath the bending head and covers a scanning range of 190°. The freely programmable protective field responsible for safe shutdown of the dangerous movement covers the entire hazardous area horizontally such that reaching over can also be prevented. A warning field of variable dimensions is used as a preliminary zone. If the operator enters this zone while the dangerous movement is taking place, a warning signal is output before the work step needs to be interrupted.

### Customer benefits

The freely programmable protective field allows optimal adaptation to hazardous areas. Wear-free scanner technology guarantees straightforward integration, high availability, improved ergonomics and an increase in machine utilisation.

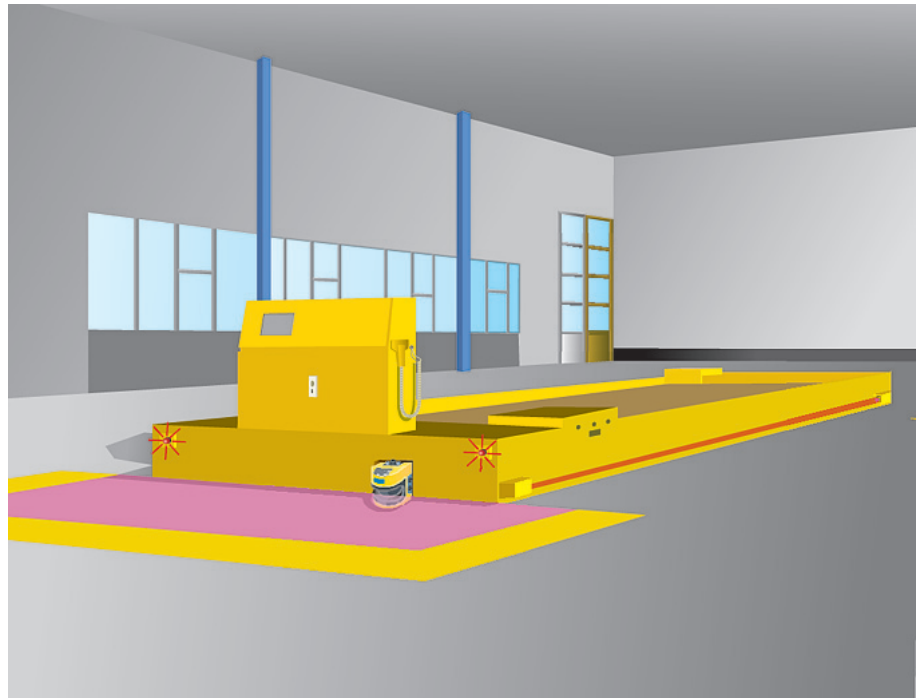
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## Application overview

### Protection of crossing paths for automated transport systems

Task	Hazardous area protection
Industrial sector	Automotive and other vehicles
Application location	Automated guided systems
Product family	S3000, VS/VE18-2, LE20

## Application in detail

### Task

An enormous automated guided system (AGS) 13 m long transports the rear sections of aircraft. In its primary direction of movement and when it is reversing the AGS is monitored by S3000 safety laser scanners that send signals to the vehicle control system if there are people or obstacles in the way. The velocity of the vehicle is then reduced or the vehicle stopped. For fine positioning the AGS moves sideways at a velocity of 0.16 m/s. The long sides of the vehicle are to be equipped with electro-sensitive protective equipments instead of unreliable mechanical switch strips.

### Implementation

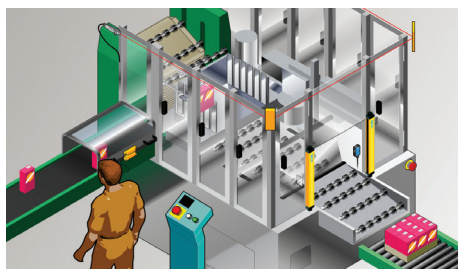
When the vehicle drives sideways people are protected by two VS/VE18 cylindrical

single-beam photoelectric safety switches – one system per side. Both these systems are connected to one LE20 evaluation unit, which tests the systems at 3 s intervals. If the light beam between sender and receiver is interrupted, the LE20 stops the vehicle.

### Customer benefits

The electro-sensitive solution is considerably more economical and less sensitive to malfunctions than the solution using mechanical switch strips. Less material is used and mounting is significantly easier. Compared to tactile alternatives, the monitoring of the sides using VS/VE18 is also the more cost-effective solution even on much shorter AGVs.

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## Application overview

### Hazardous area protection on a wrap-around tray packaging machine

Task	Hazardous area protection
Industrial sector	Food & beverage
Application location	Packing machines
Product family	C2000, L4000, RE300/RE4000, UE410 Flexi

## Application in detail

### Task

A wrap-around tray packaging machine picks up 6 or 12 drink cartons and places them on a tray insert. The machine aligns the tray insert and bonds it to a carrier (tray) that now securely restrains the items during transport.

The packaged items move through a tunnel into the machine. As long as the tunnel is closed it prevents direct access to the hazardous zone. If the packaged items become jammed, the tunnel must be opened. It can then no longer provide its safety function.

The exit on the packaging machine also represents a further possible means of access to the dangerous movements. This access is to be prevented by an electro-sensitive protective equipment.

Nine doors can be opened for making adjustments, for maintenance work or for troubleshooting. These doors are to be protected against access in a cost-saving manner. The use of safety switches is too expensive here and requires considerable installation and wiring effort. For this reason a lower cost, time saving solution is required.

Emergency stop buttons are used to stop the entire machine in case of danger.

### Implementation

The tunnel is protected with an RE300 non-contact safety switch. When the tunnel cover is opened this switch shuts down the conveyor belt and the machine. The dangerous movements are stopped.

A C2000 safety light curtain is fitted to the exit on the packer. This light curtain is muted by a signal from the PLC (programmable logic controller) and a WL27 photo-

electric reflex switch with no release delay when the packaged items leave the packer on their carrier. If a person reaches in here, the C2000 shuts down the conveyor.

The nine doors on the machine are secured all-round using one L4000 photoelectric safety switch and two deflector mirrors. Nine separate safety switches are replaced. If any of these doors are opened, the light beam is interrupted: the L4000 issues a stop signal that is evaluated in the UE410 Flexi safety controller. This controller generates a shutdown signal that is sent to the controller for the packaging machine. When the doors are all shut again the packaging machine is re-started using a reset button. The reset button must be positioned such that all the doors can be seen when the button is actuated. The actuation of an emergency stop button interrupts the supply of power to the machine.

All safety sensors, the muting photoelectric switch, emergency stop buttons and reset button are connected to a UE410 Flexi modular safety controller. The UE410 Flexi therefore covers all the safe control aspects. The necessary logic can be selected in the controller using rotary switches. No software is required.

### Customer benefits

A series of safety relays and a muting module are replaced by the UE410 Flexi modular safety controller comprising one main module and two expansion modules. The L4000 photoelectric safety switch replaces nine safety switches with one light beam. Both measures significantly reduce the wiring effort and the hardware costs.



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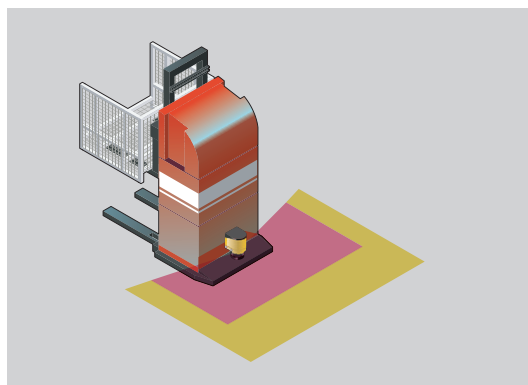
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## Application overview

### Protection of the route for an automated guided vehicle

Task	Hazardous area protection
Industrial sector	Storage and conveyor technology
Application location	Automated guided systems
Product family	S3000, S300

## Application in detail

### Task

Automated guided vehicles (AGV) are used to transport heavy mesh crates or pallets between machining stations and storage locations. Once the AGV has picked up a pallet or mesh crate, it moves automatically to the next destination programmed. Persons must be protected along this route (Type 3). Collisions with other vehicles and material on the floor are also to be prevented. Bumpers used in the past and that only permit low vehicle speeds are to be replaced.

### Implementation

The automated guided vehicle (AGV) is protected in both directions of travel: for moving forward with an S3000 Professional

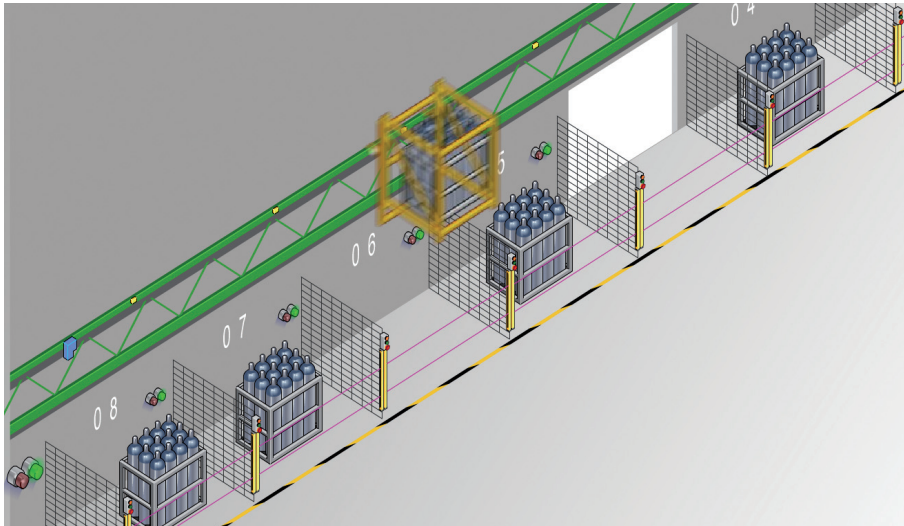
safety laser scanner and for reversing with an S300. Using DKS40 incremental encoders, the S3000 Professional acquires the velocity of the vehicle via its dynamic control inputs. Protective and warning fields for different velocities are configured in the S3000 and S300 safety laser scanners. These fields are switched dynamically depending on the speed and direction of movement.

### Customer benefits

By using the S3000 and S300 safety laser scanners, a higher vehicle velocity is possible than with bumpers, as a result the utilisation of the vehicles is greater and costs are saved.

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## Application overview

### Access protection and positioning in a gas bottle store

Task	Access protection
Industrial sector	Storage and conveyor technology, pharmaceutical/medical
Application location	Material store
Product family	IN4000, M2000, UE4200

## Application in detail

### Task

Filled gas bottles are set down in racks in defined storage locations by a conveyor system and subsequently picked up again from these locations. The position information is provided to the conveyor system by a central computer. The individual storage locations must be approached safely and with precision. To protect people while the gas bottle racks are set down or picked up, the individual storage locations are to be protected against access.

### Implementation

IN4000 non-contact safety switches are used for the exact positioning of the conveyor system. They send the signal for safe set down or pick up of the bottle rack to the conveyor system.

To protect against hazards, each storage location is protected separately using M2000 multi-beam photoelectric safety

switches. As a result a bottle rack can be set down or picked up while bottle racks are placed in a neighbouring cell, e.g. using a pallet truck, at the same time. During this process the light beams on the M2000 are interrupted and a signal sent to the system controller to ensure the conveyor system cannot move to this cell.

UE4200 series AS-Interface Safety at Work modules are used for the integration of the position switches and multiple light beam safety devices. Safe evaluation is performed using the AS-Interface safety monitor.

### Customer benefits

Exact positioning of the conveyor system and simultaneous protection of the operators. AS-Interface simplifies the wiring of the safety functions distributed in the system; the parameters for these functions can be straightforwardly and flexibly set in the AS-Interface safety monitor.



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## Application overview

### Safety interlocks on robot cells in a harsh operating environment

Task	Access protection
Industrial sector	Automotive and other vehicles
Application location	Manufacturing cell
Product family	i1001 Lock

## Application in detail

### Task

To protect a handling robot in engine assembly the hazardous area is fenced. Access to the robot cell is only allowed via a door when the dangerous robot movements have come to a stop.

### Implementation

Access protection on the robot cell is achieved using the i1001 Lock safety locking device. The safety locking device is fitted to the door frame, the actuator to the door. After the door is closed, the handle actuator is inserted in the locking device and the two items joined together using a rotary movement. The i1001 Lock is mechanically locked. Only now can the robot start its assembly task.

Access to the robot cell is prevented using the locking mechanism on the safety locking device until the robot has completed its handling action and has returned to

its parking position. Only then is the lock released using a signal to the locking solenoid on the i1001 Lock. Then it is possible to re-open the door by turning the handle actuator.

### Customer benefits

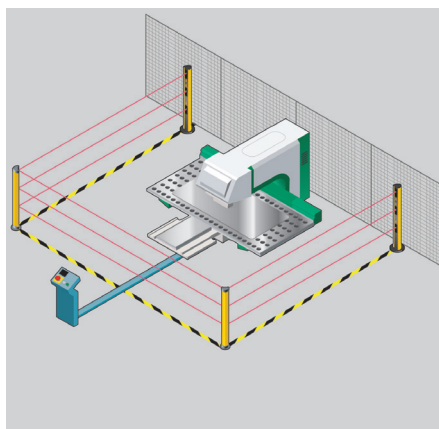
If it is necessary to complete a handling action before access is provided to a hazardous area, a safety locking device can be used.

The i1001 Lock, specially designed for harsh operating conditions, provides reliable access protection with long service life.

Two LEDs indicate the current status of the door: whether it is open/closed and locked/unlocked.

The design of the i1001 Lock enables it to be used without problems even on heavy doors or in case of imprecise door mounting.

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## Application overview

### Three-sided protection of a punching machine

Task	Access protection
Industrial sector	Machine tools and production systems
Application location	Punching machine
Product family	M4000

## Application in detail

### Task

A punching machine must be protected from three sides. Pieces of sheet metal of various sizes are processed on the machine; the batch sizes also vary significantly. To operate the machine unhindered, access is required for loading and for tool and program changes. A mechanical fence would severely hinder productivity and was therefore not considered.

### Implementation

A M4000 multiple light beam safety device with two deflector mirror columns was chosen for the access protection. The devices are permanently installed at the necessary safety distance from the hazardous point

(tool) as per EN 999. On interruption of at least one light beam, the system sends a stop signal to the machine control. As people in the hazardous area cannot be detected, it is necessary to incorporate a restart interlock on the punching machine. It must not be possible to reach the related reset button from the hazardous area.

### Customer benefits

Use of a cost-effective system comprising safety photoelectric switches and deflector mirror columns: only two sides need to be actively wired; easy-to-adjust deflector mirrors in robust columns. When the machine is shut down it is freely accessible, thus increasing productivity.



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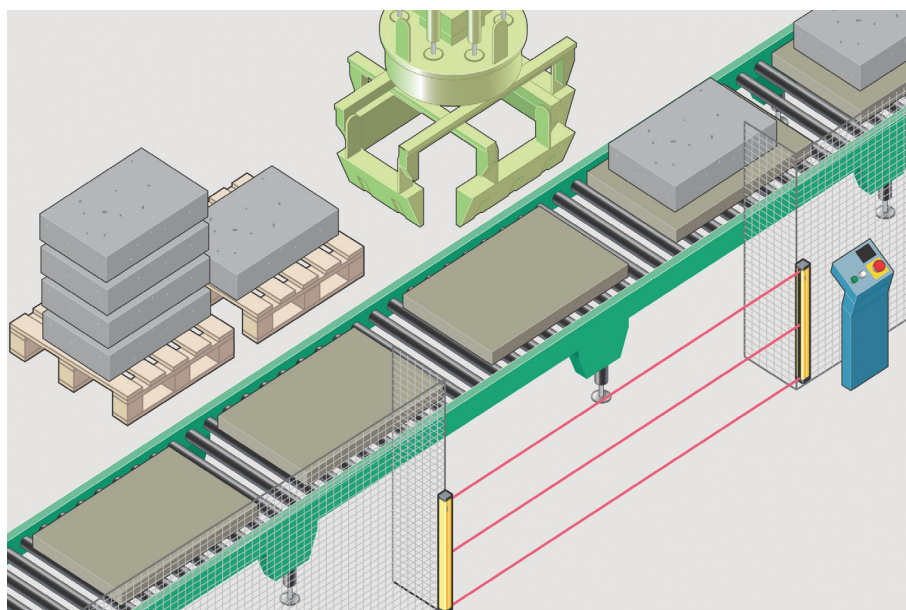
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## Application overview

### Protection of a stone transport crane

Task	Access protection
Industrial sector	Construction, stone, glass, ceramics, etc.
Application location	Paving machine
Product family	M2000

## Application in detail

### Task

In the past, a block positioning crane has been protected with fences and numerous safety switches. When it was necessary to perform servicing, change moulds or troubleshoot problems on the machine, the fences had to be opened and even partially or completely dismantled. When the fences had been closed and re-assembled again, it was often necessary to re-fit and adjust more than a dozen safety switches.

A further problem was the vibration in the area around the crane caused by shaking the blocks in the mould; these vibrations caused "false alarms" at the limit switches and brought the crane to a standstill.

### Implementation

The requirements were therefore less effort and fewer error messages, as well as improved access to the system. The machine tool and structural steelwork manufacturer found the solution in the M2000 multi-beam photoelectric safety switch. In conjunction with the safe PLC,

this testable access protection system represents an easy-to-use, time-saving solution.

Classified in accordance with type 2 IEC 61496, the M2000 provides scanning ranges of up to 70 m along with integrated external device monitoring and restart interlock functions.

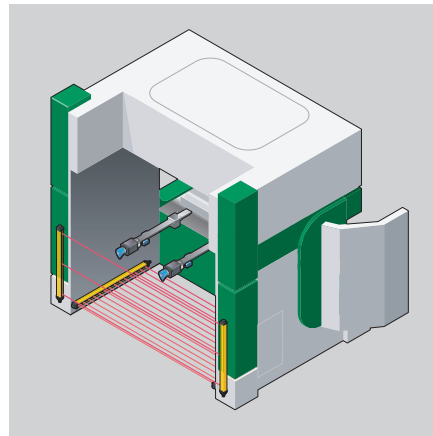
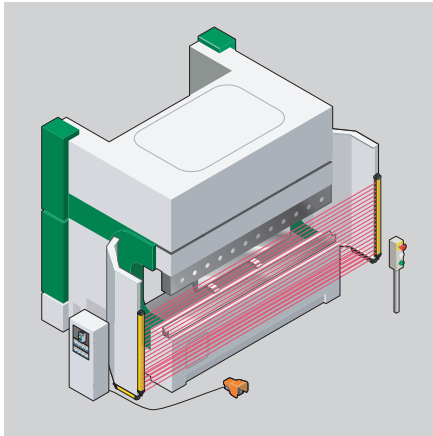
As in this case it is possible to stand behind the photoelectric safety switch, a restart interlock function must be incorporated in the system. Prior to moving the crane and after every interruption of the M2000 during a dangerous crane movement, a reset button (restart interlock function) must be activated.

### Customer benefits

The time-consuming assembly and dismantling of fences/safety doors and safety switches, as well as the false alarms from the limit switches, no longer occur.

With the use of the electro-sensitive multi-beam photoelectric safety switch, a robust, cost-effective solution has been found. Costs for hardware, control cabinet and cable laying have been saved.

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## Application overview

### Hazardous point and access protection on a press brake

Task	Access protection
Industrial sector	Machine tools and production systems
Application location	Machine tools
Product family	C4000, C2000, M2000, UE470

## Application in detail

### Task

Both the front and rear of a hydraulic press brake are to be protected: The dangerous tool closing movement (punch/die) is to be safely stopped on reaching in and it is to be possible to safely access the rear of the machine without the hindrance of moving guards (e.g. doors).

### Implementation

The hazardous point on the press is protected using the UE470 safety controller with a C4000 safety light curtain. As soon as an object that is not allowed (e.g. hand or finger) enters the light curtain's protective field, a stop signal is given.

The access protection on the rear of the press brake is provided using a host/guest system comprising a vertically mounted M2000 multi-beam photoelectric safety switch and a horizontally arranged C2000 safety light curtain for point-of-operation guarding. Entrance into the hazardous area stops the dangerous movement of the press.

All press-related signals such as top dead centre (TDC), bottom dead centre (BDC)

and stop control contact (SCC) are evaluated. The press is shut down depending on the connected safety sensors.

For this safety application, the indication of "PSDI" as well as the functions "Reset required", "Reset", "EDM" and "Emergency stop" are configured in the safety controller UE470.

### Customer benefits

The proven safety technology makes it possible to reliably implement hazardous point protection and access protection. The combination of M2000 and C2000 on the rear of the machine replaces moving guards. It provides a high level of safety and, with the machine switched off, quick clear access, which increases productivity.

The use of the UE470 safety controller replaces the complex relay wiring. Up to 5 operating modes can be selected. All press-related signals including run-on monitoring (SCC) are evaluated. Uniform controller and safety sensor configuration and diagnostics are possible using just one tool for setting parameters (CDS). On-line monitoring increases the ease of servicing.



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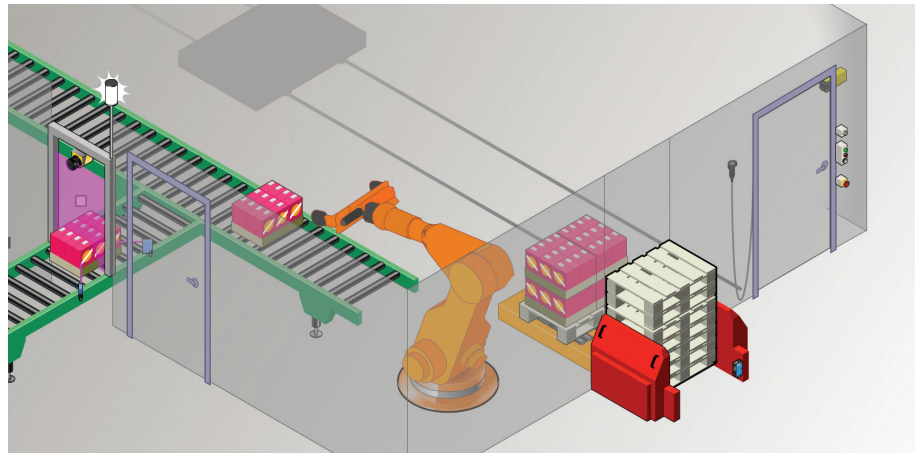
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## Application overview

### Access and area protection on a palletiser robot

Task	Access protection with area protection
Industrial sector	Food & beverage, packaging
Application location	Robot station
Product family	S300, i14 Lock, E100, UE410 Flexi

## Application in detail

### Task

In an automatic palletiser system a robot picks up the packaged items and places them on pallets. The dangerous movements of the robot are to be stopped if an unauthorised person enters the cell through the entrance for the packaged items or a door. It is to be possible to setup the machine using an enabling button that mutes the function of the safety device on the door for the duration of the setup work.

### Implementation

For vertical access control on the packaged item entrance, a system comprising an S300 safety laser scanner and two WL12 photoelectric reflex switches is used. The system differentiates between man and material: Packaged items are allowed through unhindered but if a person attempts to enter the machine here, the machine is stopped immediately. The sensors are connected via a UE410 Flexi modular safety controller to realise the muting logic.

The service door is protected using an i14 Lock safety switch. To open the door it is necessary to press a button on the control panel: this action triggers a stop command for the machine. The locking is maintained until all dangerous movements have stopped safely. Only then is it possible to open the door.

To setup the machine or perform maintenance, the robot must be moved to a safe

position using the safety operating device. To setup the robot a key switch on the control panel is changed from automatic to setup mode and then a Start button pressed. As the actual protective function of the locking on the door is disabled for the duration of the setup work, the E100 enabling switch is used as a safety device. If the switch is held in the middle position, the machine operates at reduced velocity (setup mode). If the E100 is pressed all the way down, or released, all dangerous movements on the machine are stopped. The muting of the safety function on the i14 Lock safety locking device is realised using a second UE410 Flexi.

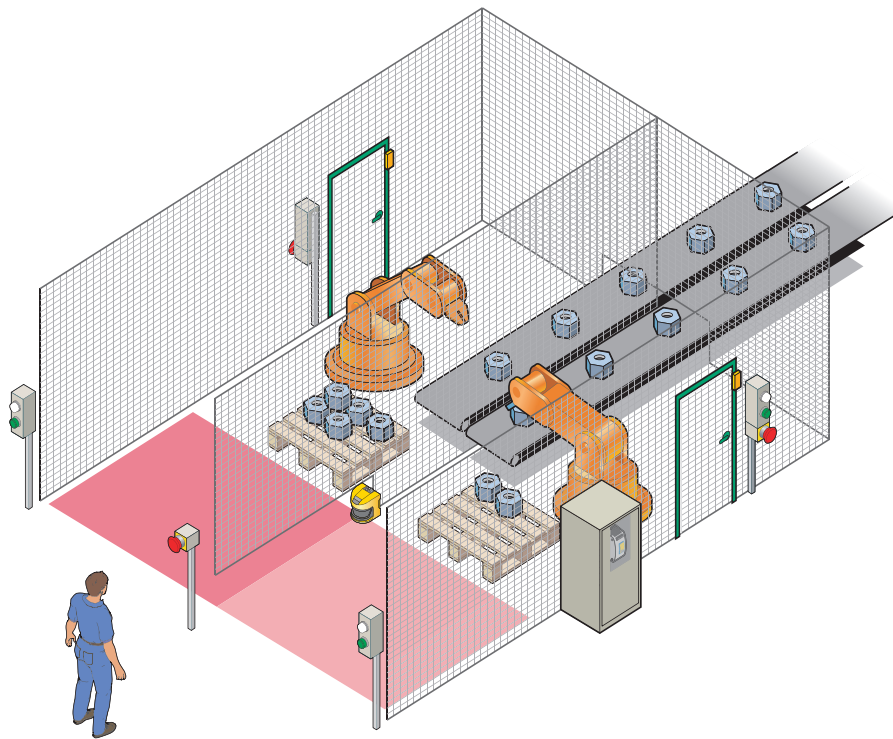
### Customer benefits

The entire muting application is realised using one UE410 Flexi module only 22.5 mm wide. The necessary functions can be adjusted straightforwardly using rotary switches.

The E100 safety operating device enables the machine to be setup safely. In this case one UE410 Flexi module is sufficient to mute the i14 Lock safety locking device instead of two relays.

Additional safety sensors, e.g. emergency stop buttons or additional safety switches can be straightforwardly connected using expansion modules. The UE410 Flexi system can be expanded from 8 to 104 inputs/outputs.

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## Application overview

### Hazardous area and access protection on a robot cell

Task	Access protection with area protection
Industrial sector	Assembly, handling, robotics, automation
Application location	Robot station
Product family	S3000, UE440

## Application in detail

### Task

Two robot cells are continuously loaded with pallets of workpieces to be machined. Mechanical protection would significantly hinder loading and cause delays. For this reason the working areas on both robots and the access to the cells are to be protected separately using an electro-sensitive protective device.

### Implementation

The hazardous areas of both robot cells are secured using the UE440 compact safety controller in conjunction with an S3000 safety laser scanner.

The S3000 safety laser scanner monitors the two hazardous areas using two simultaneous protective fields such that the safety controller safely shuts down the related robot if a protective field is entered.

The side access doors to the robot cells are monitored by safety switches. The emer-

gency stop and the reset function are also realised using the safety controller.

### Customer benefits

Just one S3000 safety laser scanner replaces moving guards (heavy doors) on two workstations and permits safe, unhindered access to the two robots. The size of the protective field can be adjusted to the velocity of the dangerous robot movements using simple operating mode switching.

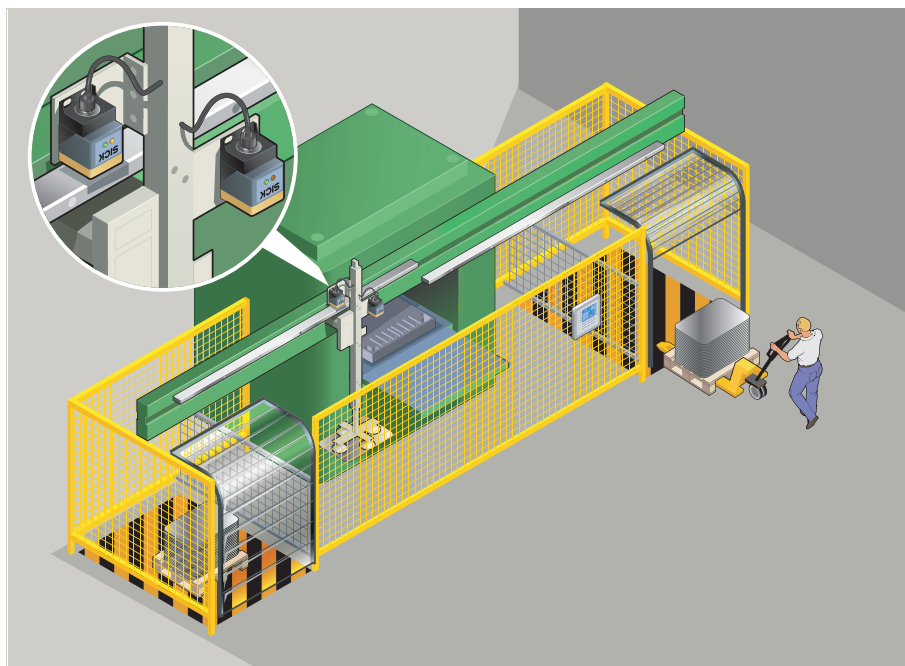
The UE440 compact safety controller evaluates the simultaneous protective fields on the scanner and switches the related OSSD. Uniform controller and safety sensor configuration and diagnostics are possible using just one tool for setting parameters (CDS). On-line monitoring increases the ease of servicing.

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## Application overview

### Safe monitoring of a gantry robot's working area

Task	Safe position monitoring
Industrial sector	Automotive and other vehicles
Application location	Gantry robot
Product family	IN4000

## Application in detail

### Task

A gantry robot picks up sheets of metal from the right or left supply station and places them in the feeder for the press in the middle of the system. When the material in one station is used up, new pallets with sheets of metal are placed in the station manually. For this purpose the roller door on the empty station (right or left) must be opened. When the door is opened the robot is only allowed to pick up material from the station with the closed roller door.

### Implementation

Two IN4000 non-contact safety switches are fastened to the robot's horizontal carriage. These inductive sensors detect the presence of metal. The two monitoring areas are defined by the length of two metal rails. If the robot moves from one of these defined areas, a stop signal is sent to the safety controller PLC that stops the

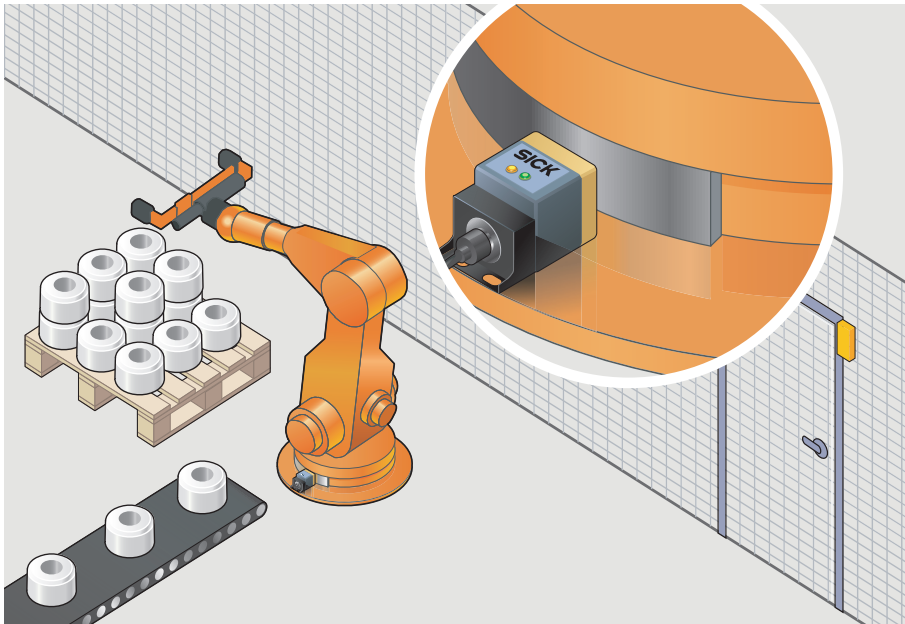
drive. The state (open/closed) of the roller doors is signaled to the PLC by additional sensors. In this way people present in one of the open supply stations are securely protected against the dangerous movements of the robot.

### Customer benefits

The mechanical barriers (doors) are very expensive and they also do not satisfy the related safety requirements. The IN4000 is the ideal product for this application. Tactile roller switches are not suitable for the high forces produced by the velocity of the continuous horizontal movements of the elements. Thanks to the non-contact technology in the IN4000 there is no wear on this product. Further advantages are straightforward installation and adjustment, as well as resistance to shock and vibration.

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## Application overview

### Safe monitoring of a robot's working area

Task	Safe position monitoring
Industrial sector	Assembly, handling, robotics, automation
Application location	Robot station
Product family	IN4000

## Application in detail

### Task

In a robot station the gripper robot removes workpieces and places them on a conveyor belt. The operating area of the robot must be safely limited so that, should the normal controller fail, the robot cannot collide with parts of the system such as the fence. In the past this activity was performed by mechanical safety switches. However due to the high rate of operation of approx. 28,000 cycles per second these switches have not proved reliable enough as their rollers wore excessively and production was stopped.

### Implementation

The requirements are met here by the IN4000 non-contact inductive safety sys-

tem. The sensor is fitted to the mounting plate and operated using its evaluation unit or a safe controller. Due to the non-contact polling, mechanically related malfunctions are a thing of the past. The IN4000 reliably stops the robot if its control system is faulty. The device also features increased immunity to the shocks and vibration to which it is subjected daily in the harsh industrial environment.

### Customer benefits

The working area of the robot is reliably monitored, as a result production downtime is saved. The costs for expensive hardened metal tracks, roller switches and the increased cabling effort are also saved.

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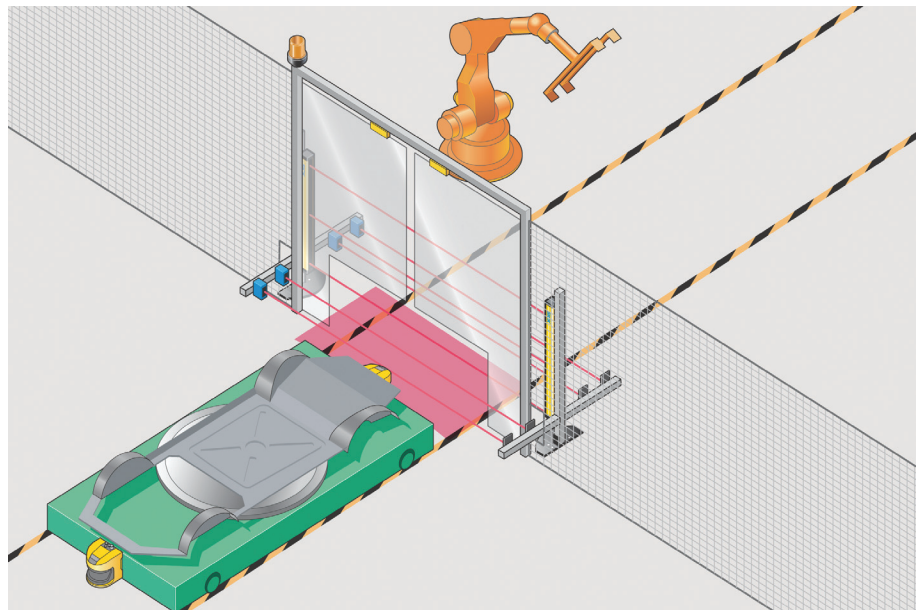
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## Application overview

### Access protection for AGV gates on a robot cell

Task	Access protection with differentiation between man and material (muting)
Industrial sector	Automotive and other vehicles
Application location	Robot station
Product family	M4000, T4000 Compact

## Application in detail

### Task

Robot cells for the assembly of vehicle floor groups are linked using automated guided systems (AGSs). The guards for the assembly cells are equipped with gates for the entry and exit of the AGSs. These gates must be protected against the access of persons also when the AGSs are passing through the gate.

### Implementation

It was possible to achieve access protection using sensor equipment consisting of the T4000 C safety lock, the M4000 multiple light beam safety device and WL24 photoelectric reflex switches. Access across the path of the AGS is protected by the M4000 multiple light beam safety device. To ensure that the AGS does not trigger a safety stop on driving through the photoelectric safety switch, two photoelectric reflex switches are arranged in front of and behind the photoelectric safety switch. When the AGS drives up to the gate, the two WL24 photoelectric switches mounted

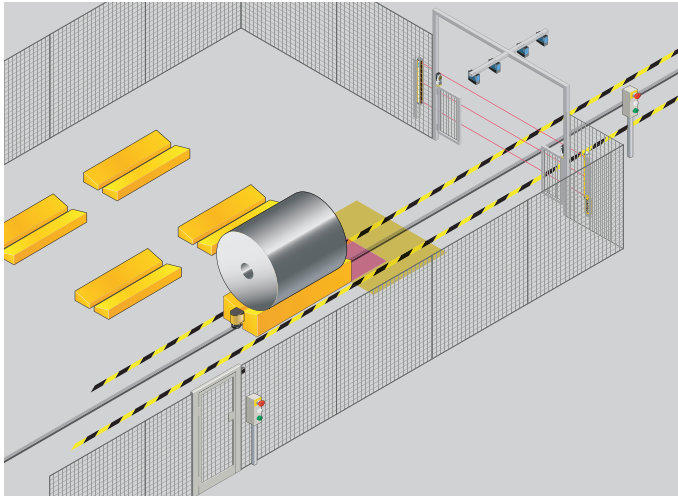
in front of the photoelectric safety switch are interrupted and provide the signal for deactivating the photoelectric safety switch. To check the access protection for tampering or faults, the plausibility of the signals at the photoelectric reflex switches is checked with time sampling.

To ensure that there is no risk of crushing between the AGS and fencing there is 500 mm clearance beside the loaded AGS in accordance with the regulations. To prevent people being able to pass through this space at the same time as the AGS, and so enter the robot cell undetected, the gate is equipped with hinged doors that are monitored using T4000 C safety sensors. To enter the robot cell beside the AGS, a person would have to open the hinged door, an action that would result in a safety stop.

### Customer benefits

The sensors used enable complete access protection to be provided. The individual components feature wear-free operation and straightforward installation.

Further information	Page
→ S3000	C-3
→ M4000	F-2
→ T4000 Compact	L-23
→ Services	A-2



## Application overview

### Hazardous area and access protection on a coil store

Task	Access protection with differentiation between man and material (muting)
Industrial sector	Storage and conveyor technology
Application location	Coil store
Product family	M4000 Advanced with UE403, T4000 Compact, S300, UE4200

## Application in detail

### Task

The working area in an automated coil store is protected against unauthorised access by fences. Carriages used to bring the coils into this area or to remove them are to be able to pass in and out through a gate unhindered. However, if people pass through the gate, dangerous movements must be stopped. The doors in the fence are also to be protected.

### Implementation

A muting system monitors the gate to the coil store. This system comprises an M4000 Advanced multiple light beam safety device with integrated muting module and a UE403 with four DS40 distance sensors with background suppression. The carriage with the coil is reliably detected and the M4000 muted by the special arrangement of the DS40 distance sensors. The carriage can move into or out of the cell without the electro-sensitive protective equipment (ESPE) stopping the system. However, if a person wants to enter the system, his/her presence is detected by the ESPE and the system stopped. The two hinged doors are secured using T4000 Compact safety switches. These sensors are used to ensure a person cannot enter the system in parallel with the carriage

while the ESPE is muted. The slowly moving carriage is protected in both directions of travel by S300 safety laser scanners. Safety switches with a locking device are used for access protection on the doors. Due to the distributed arrangement of the individual safety functions in and around the working area, a safety solution with AS-Interface Safety at Work is appropriate. The safety switches and muting solution are integrated using the related UE4200 safety modules. The safe signals are processed and the safe shutdown triggered using the AS-Interface Safety at Work monitor.

The slowly moving carriage is protected in both directions of travel by S300 safety laser scanners.

### Customer benefits

Reliable access protection with differentiation between people and material as well as hazardous area protection on the vehicle. By using the non-contact safety switches, a robust, cost-effective solution has been found. AS-Interface simplifies the wiring of the safety functions distributed in the system; the parameters for these functions can be straightforwardly and flexibly set in the AS-Interface Safety at Work monitor.



B

### Application Finder

- SICK is continuously publishing examples of application solutions on the Internet (→ [www.sick.com](http://www.sick.com)).
- The "Application Finder" will guide you to further solutions involving products from SICK's Industrial Sensor, Industrial Safety Systems and Auto Ident Divisions.

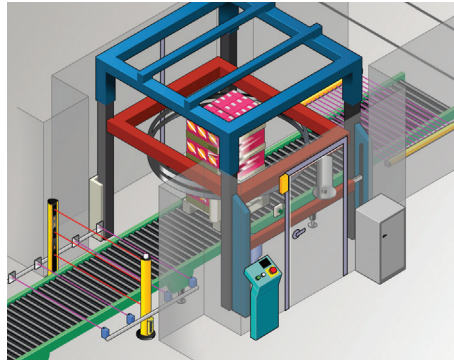
Further information	Page
→ S300	C-38
→ M4000	F-2
→ T4000 Compact	L-23
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## B

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## Application overview

### Access protection on a pallet stretch wrapper

Task	Access protection with differentiation between man and material (muting)
Industrial sector	Food & beverage, packaging
Application location	Packing machines
Product family	M4000, i16S, C4000 Palletizer, UE410 Flexi

## Application in detail

### Task

A pallet stretch wrapper accepts partially or fully laden pallets from one side, as a rule from a palletiser. It wraps the related items (identified by a barcode reader) in stretch film and then passes them to a conveyor system.

The wrapping is performed using two motors: one moves the rotating arm around the pallet and the other moves the arm up and down. As some stretch wrapper machines wrap up to 150 pallets per hour, these movements are fairly dangerous. Normally the film is re-loaded from one side by an operator every couple of hours. All possible accesses to the machine must be protected.

### Implementation

The entrance to the machine is secured by a muting system comprising an M4000 multiple light beam safety device and four WL18 photoelectric reflex switches as muting sensors. This system differentiates between man and material. Due to the arrangement of the muting sensors, pallets with packed items are detected as such and the M4000 muted: the machine continues to operate. If a person tries to enter the machine, the M4000 is not muted: the machine's dangerous movements are stopped.

The machine's exit is protected against access by a C4000 Palletizer safety light curtain. This device learns the shape of the pallet bases and is therefore able to differentiate between operators and pallets. No additional muting sensors are required.

The access to the machine is protected by an i16 safety switch. Opening the door stops only the film loading mechanism such that maintenance can be performed efficiently without shutting down the entire machine.

A Reset button must be pressed to re-start the machine after a stop caused by the safety sensors. On the actuation of an emergency stop button or unauthorised access through a service door, the C4000 Palletizer safety light curtain or the M4000 multiple light beam safety device interrupts the supply of power to the machine.

All safety sensors, emergency stop buttons and the Reset button are connected to a UE410 Flexi modular safety controller. The necessary logic can be selected in the controller using rotary switches. No software is required.

### Customer benefits

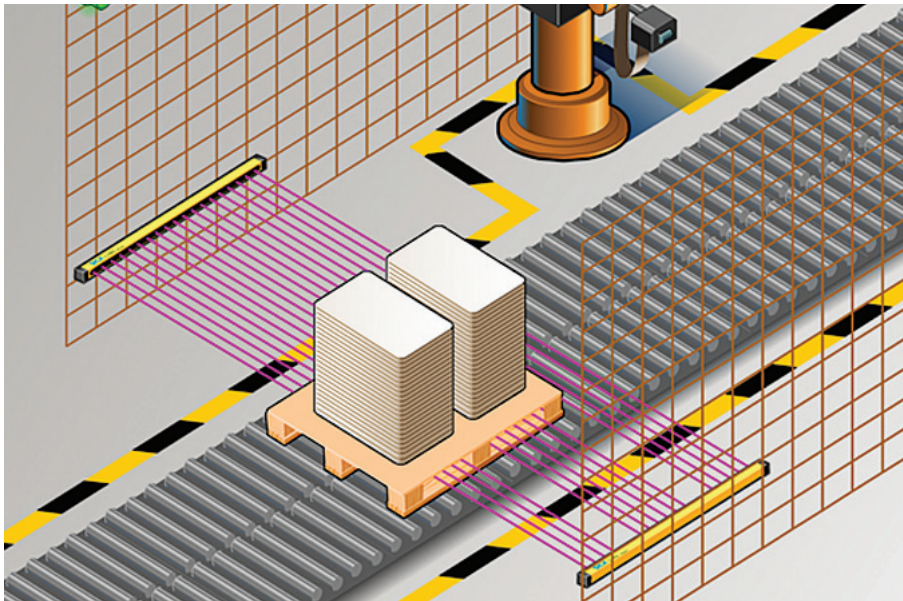
The UE410 Flexi modular safety controller can be expanded as required. It comprises a main unit and expansion units (input and output expansion modules, relay output expansions, a diagnostics module for the field bus interface to PROFIBUS-DP, Device-Net or CANopen) that can be simply plugged together at the sides. The modules communicate with each other using a "backplane bus". The individual functions can be selected on the front using a screwdriver. UE410 Flexi saves space in the control cabinet. The wiring effort is considerably reduced compared to conventional safety switches. In this example two UE410 Flexi replace six conventional safety relays and the related wiring.

Further information	Page
→ C4000 Palletizer	E-117
→ M4000	F-2
→ i16S	H-17
→ UE410 Flexi	O-2
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## Application overview

### Access protection with differentiation between man and material on a palletiser system

Task	Access protection with differentiation between man and material (muting alternative)
Industrial sector	Storage and conveyor technology, packaging
Application location	Palletiser
Product family	C4000 Palletizer

## Application in detail

### Task

A palletiser system is divided into various sections, e.g., pallet entry and exit, horizontal binder for securing the load, label stamp, etc. Pallet entry and exit are used for supplying material and pallets. At the same time workers must be protected against dangerous movement in case of accidental access: material is to be able to enter and leave unhindered, if a person enters the hazardous area a stop signal must be sent to the system controller.

### Implementation

For the access protection a C4000 Palletizer safety light curtain is installed horizontally at pallet height in front of the entry and exit to the palletiser system. Only one pair of sensors is required with this solution; muting sensors are not required simplifying integration in the system controller.

The continuously active sensor is no longer muted, but instead automatically learns unlimited "shadow patterns" for pallets that

it then allows to pass as long as the patterns do not change. The C4000 Palletizer Standard variant is manually "taught" the object to be accepted. As a result both versions are difficult to tamper with and provide safety up to cat. 4.

Selectable direction detection or an additional input for, e.g., a barcode scanner provide further possible ways of optimally designing the safety distance.

### Customer benefits

An innovative economical solution as numerous individual components and their integration, e. g. muting sensors, indicators or fence elements, can be saved. The pair of C4000 Palletizer sensors durably increases availability due to the reduced sources of faults (additional sensors). Maintenance work can be undertaken more quickly due to the increased freedom. Apart from fence elements and wiring in the control cabinet, valuable space is also saved as the pallets can be parked in the protective field.

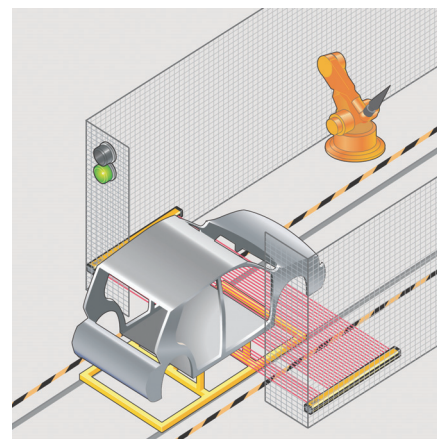
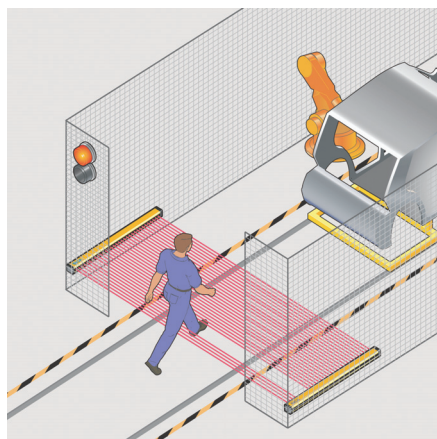
Further information	Page
→ C4000 Palletizer	E-117
→ Services	A-2



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Application  Finder

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## Application overview

### Access protection to a robot cell with differentiation between man and material

Task	Access protection with differentiation between man and material (muting alternative)
Industrial sector	Automotive and other vehicles
Application location	Robot station
Product family	C4000 Entry/Exit

## Application in detail

### Task

During shell manufacture at a car factory, shells are automatically transported into the hazardous area of a robot cell. If a person enters this area, the robot must be stopped immediately.

In the past the area was protected with a light curtain and several muting sensors; however these sensors can be tampered with and are difficult to mount.

### Implementation

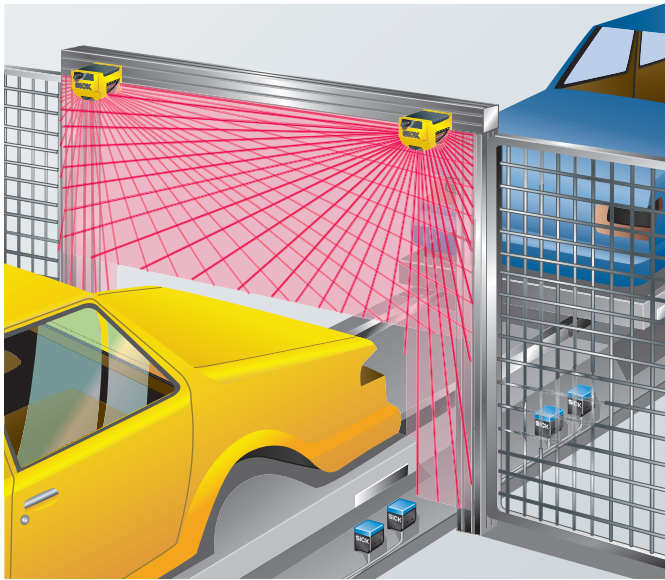
The C 4000 Entry/Exit safety light curtain with its dynamic, self-teaching blanking was used. The continuously active sensor is difficult to tamper with and therefore provides maximum safety up to category 4. It reliably detects objects, learns their dis-

tances and monitors them. Invalid objects or asynchronous movements result in immediate shut down. The robot is stopped immediately as soon as a person enters the hazardous area. The protective field length of 900 mm ensures that it is not possible to inadvertently step over the protective device. The light curtain is also insensitive to flying welding sparks due to its internal analysis electronics.

### Customer benefits

A cost-effective solution, as no additional sensors or further protection measures, e.g. muting sensors, muting lamps or hinged doors, are needed. The compact sensor pair is easy to mount and saves time, e.g. particularly during maintenance.

Further information	Page
→ C4000 Entry/Exit	E-110
→ Services	A-2



## Application overview

### Access protection on an assembly cell

Task	Access protection with differentiation between man and material (muting)
Industrial sector	Automotive and other vehicles
Application location	Assembly line
Product family	S3000, UE440

## Application in detail

### Problem

The entrance to an assembly cell in final assembly in a car plant is to be protected. In this case the solution is not only to comply with category 3, but also to permit the transport of the bodyshells to the robots. Here a contour check is to be made so that people are reliably detected.

### Implementation

Two S3000 safety laser scanners are fitted vertically over the conveyor such that their protective fields monitor the entire entrance area: there are no monitoring gaps beside the bodyshell and the conveyor. The protective fields are adjusted to the profile of the bodyshell in steps using IQ40 inductive proximity switches arranged on the

conveyor. The skid with the bodyshell can pass without triggering a signal. If a person interrupts the protective fields, conveyor and robot movement are stopped. The correct function of the IQ40 proximity switches for the activation of protective field switching as well as the necessary concurrency are monitored by the UE440 compact safety controller with protection against tampering.

### Customer benefits

The sensors used provide complete access protection without gaps. As the protective fields of the two S3000 safety laser scanners are always active, hinged doors beside the conveyor are not necessary.



**B**



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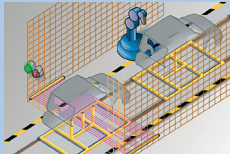

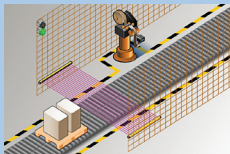
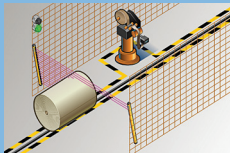
# Overview for access protection with differentiation between man and material

## Selecting the most suitable solution

In the following you will find the most important products for realising access protection with differentiation between man and

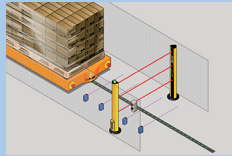
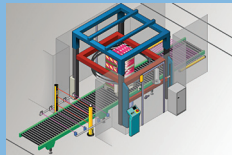
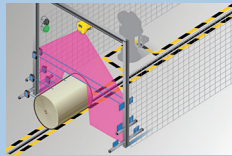
material. Talk to us about the various advantages of the individual solutions for your application.

B

Principle	Type acc. to IEC 61496	Typical application/sensor	Function and criteria	Advantages, safety and notes	Page
Pattern recognition	Type 4	Transporting items on transport aids, e.g. skids  C4000 Entry/Exit	<ul style="list-style-type: none"> <li><b>Function</b> Object patterns that are produced, e.g., by the struts on a skid on passing through the protective field of the horizontally mounted safety light curtain are automatically photographed and handed over during the passage.</li> <li><b>Criteria</b> <ul style="list-style-type: none"> <li>Max. 1 to 5 objects in protective field at same time (system dependent)</li> <li>Max. width of each object 150 mm</li> <li>Size and distance between the objects constant on passing through the protective field</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>High potential savings, as no additional hinged flaps required, wiring effort and downtimes are minimised</li> <li>High availability, as no interruption in production due to faulty muting lamps, incorrectly adjusted muting sensors or override cycles</li> <li>Fewer components, straightforward mounting, no additional muting sensors, only one sensor pair (ESPE)</li> <li>The protective field can be used as a parking position for skids</li> </ul> <p>No muting, always active, as a result a high level of safety</p> <p>ATEX II 3G 3D certified (explosion protected for foodstuff industry such as flour, fodder, etc.)</p>	E-110
Pattern recognition	Type 4	Transporting items on transport aids, e.g. a pallet load secured with shrink film  C4000 Palletizer Standard	<ul style="list-style-type: none"> <li><b>Function</b> Objects with a closed optical contour pass through the protective field of the horizontally mounted safety light curtain. The sensor monitors whether the geometry is closed.</li> <li><b>Criteria</b> <ul style="list-style-type: none"> <li>One object with closed optical contour</li> <li>Minimum width 500 mm</li> <li>Changing batches are taught in manually</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>High availability as no interruption of production due to faulty muting lamps, incorrectly adjusted muting sensors or override cycles</li> <li>Fewer components, straightforward mounting, no additional muting sensors, only one sensor pair (ESPE)</li> <li>The protective field can be used as a parking position for skids</li> </ul> <p>No muting, always active, as a result a high level of safety</p> <p>ATEX II 3G 3D certified (explosion protected for foodstuff industry such as flour, fodder, etc.)</p>	E-117
Pattern recognition	Type 4	Transporting items on/in transport aids, e.g. pallets or mesh crates  C4000 Palletizer Advanced	<ul style="list-style-type: none"> <li><b>Function</b> Object patterns e.g. the feet of a pallet are automatically photographed and handed over during the passage.</li> <li><b>Criteria</b> <ul style="list-style-type: none"> <li>Max. 2 to 5 objects in protective field at same time (system dependent)</li> <li>Max. width of each object 240 mm</li> <li>Size and distance between the objects constant on passing through the protective field</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>High availability as no interruption of production due to faulty muting lamps, incorrectly adjusted muting sensors or override cycles</li> <li>Fewer components, straightforward mounting, no additional muting sensors, only one sensor pair (ESPE)</li> <li>The protective field can be used as a parking position for skids</li> </ul> <p>No muting, always active, as a result a high level of safety</p> <p>ATEX II 3G 3D certified (explosion protected for foodstuff industry such as flour, fodder, etc.)</p>	E-117
Pattern recognition	Type 4	Transporting items, e.g., paper or coils of steel  C4000 Advanced, diagonally arranged	<ul style="list-style-type: none"> <li><b>Function</b> Objects with closed optical contours are transported through the protective field of the safety light curtain. During this process the sensor monitors whether the optical geometry is closed and whether there is only one item.</li> <li><b>Criteria</b> <ul style="list-style-type: none"> <li>One object with closed optical contour</li> <li>Max. height 1500 mm</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Space saving due to almost vertical mounting</li> <li>Straightforward mounting, no additional muting sensors, only one sensor pair (ESPE)</li> </ul> <p>No muting, always active, as a result a high level of safety</p> <p>No gaps allowed in the object</p> <p>Lateral shadow areas must also be protected</p>	E-2

■ Cost-effectiveness ■ Safety ■ Notes

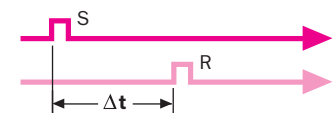
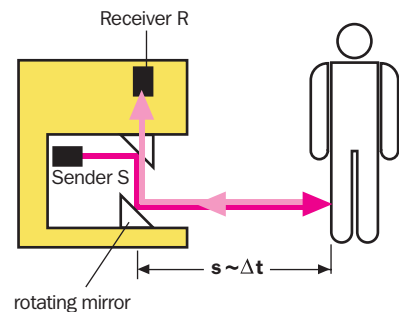


Principle	Type acc. to IEC 61496	Typical application/sensor	Function and criteria	Advantages, safety and notes	Page
Decentral muting IP 65	Type 4	<p>Transporting items on transport aids or directly on conveyor equipment such as conveyor belts, chain or roller conveyors</p>  <p>M4000 Advanced M4000 Advanced A/P M4000 Advanced Curtain with UE403</p>	<ul style="list-style-type: none"> <li>■ <b>Function</b> The item transported is detected using additional muting sensors for as long as it is transported through the protective field of the photoelectric safety switch. A differentiation is made between man and material due to the arrangement and detection principle of the muting and sensor.</li> <li>■ <b>Criteria</b> <ul style="list-style-type: none"> <li>■ Continuous detection of the item transported as long as it is transported through the protective field of the photoelectric safety switch</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Highly flexible solution in relation to the shape of the item transported and the settings for the muting configurations</li> <li>■ Minimisation of wiring effort due to decentral IP 65 muting solution. Muting signals connected locally</li> <li>■ High resolution of the M4000 Advanced Curtain variants reduces safety distance</li> <li>■ Increased safety, e.g., due to defined beams that remain permanently active (partial blanking instead of muting)</li> <li>■ Precise adjustment and correct selection of the detection principle for the muting sensors required</li> <li>■ Additional mechanical protection such as hinged doors may be necessary</li> </ul>	F-2 E-23
Central muting IP 20	Type 2 Type 3 Type 4	<p>Transporting items on transport aids or directly on conveyor equipment such as conveyor belts, chain or roller conveyors</p>  <p>AOPD with UE410 Flexi</p>	<ul style="list-style-type: none"> <li>■ <b>Function</b> The item transported is detected using additional muting sensors for as long as it is transported through the protective field of the safety sensor. A differentiation is made between man and material due to the arrangement and detection principle of the muting sensors.</li> <li>■ <b>Criteria</b> <ul style="list-style-type: none"> <li>■ Continuous detection of the item transported for as long as it is transported through the protective field of the safety sensor</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Complete safety control logic, e.g. for end of line packaging applications, in an IP 20 control cabinet module (UE410 Flexi)</li> <li>■ Space-saving 22 mm width of the UE410 Flexi</li> <li>■ Use of any AOPD (type 2 and 4) and AOPDDR (type 3)</li> <li>■ All cables must be laid to a central control cabinet</li> </ul>	O-2
Protective fields with gateway		<p>Transporting items on transport aids or directly on conveyor equipment such as conveyor belts, chain or roller conveyors</p>  <p>S3000</p>	<ul style="list-style-type: none"> <li>■ <b>Function</b> An appropriate "gateway" in the protective field of the safety laser scanner is activated by the item transported using a safe controller or standard sensors before the vertical protective field is reached. Defined areas or parts of the machine around the protective field are continuously monitored as a reference. In this way tampering or incorrect adjustment is detected.</li> <li>■ <b>Criteria</b> <ul style="list-style-type: none"> <li>■ Switching of the "gateways" by safe controller or using standard sensors</li> <li>■ Maximum 7 different "gateways"</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Very flexible solution in relation to the shape of the item transported/protective field</li> <li>■ No additional sensors necessary with safe controller</li> <li>■ Straightforward mounting, as hinged doors are not necessary, less mechanics and wiring effort</li> <li>■ No muting, always active, as a result a high level of safety. If there is no transported item, the protective field is completely closed</li> <li>■ Automatic checking for correct controller signals</li> <li>■ Response time greater than for photoelectric safety switches or multiple light beam safety devices</li> </ul>	C-3

■ Cost-effectiveness ■ Safety ■ Notes

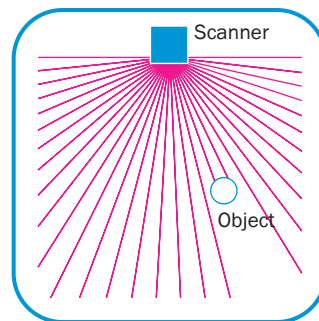
## Principle of operation of laser scanners

Laser scanners are compact systems that scan their surroundings with a beam (“optical radar”). If the emitted light pulses hit an object, the light is reflected and detected in the laser scanner’s receiver. The time between the emission of a light pulse and the reception of the reflection represents the distance between the laser scanner and object (light time-of-flight measurement). An internal rotating mirror “moves” the light pulses in



Laser scanner principle of operation

a circle to produce 2-dimensional scanning. So-called monitored areas can be defined within the field of view (scanning angle) and the device-specific scanning range of a laser scanner. If an object is detected in a monitored area, this situation is indicated by the laser scanner using 2 switching outputs (safe “stop” signal to the machine).



Fan-shaped scanning of the surroundings

## Use of laser scanners

Laser scanners are used for area monitoring (hazardous area protection), hazardous point protection and access protection.

A differentiation is made between:

- Stationary applications
  - Horizontal applications: e.g. pipe bending machines, machining centres, robot cells, press return area, etc.
  - Vertical applications: Entry/Exit, hand protection
- Mobile applications
  - Monitoring the movement of AGVs (automated guided vehicles), narrow aisle stackers, etc.

## Advantages of the SICK safety laser scanners

### Additional functions for plant and machine control

- Switchable monitored areas in accordance with the current process phase
- Monitoring external switching elements/contactors (EDM) saves costs and effort in the machine control
- High-current outputs for directly operated switching elements (contactors), making conversion of the switching signals using relay interfaces, etc. unnecessary
- Measured data on the surroundings as well as reflector detection to support vehicle steering (AGV). Only one sensor for safety and control
- Integrated restart interlock (RES) minimises the effort in the machine control

### Product range

- A very wide range of application requirements can be addressed with a compatible product family, thus minimising stock-keeping and investment costs.

### Experience

- Proven in use
- The highest quality standards guarantee stable serial production
- Consultation and service expertise

## Services for productive safety

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.


Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A

# Safety laser scanners



C

Safety application	Scanning range (m)	Scanning angle (°)	Switchable field sets <sup>1)</sup>	Incremental encoder connections	Static control inputs	Functions					Product	Page
						External device monitoring (EDM)	Host/guest operation	Safe interface to bus systems	Reflector mark detection and expanded measured data input	Measured data output via RS-422 interface		
	4 / 5,5 / 7	190	8	2	4	✓	✓	✓	–	✓	S3000 Professional <sup>2)</sup>	C-3
			4	–	2	✓	✓	✓	–	✓	S3000 Advanced <sup>2)</sup>	C-10
			1	–	–	✓	✓	✓	–	✓	S3000 Standard <sup>2)</sup>	C-17
			8	–	–	✓	✓	✓	–	✓	S3000 Remote <sup>2) 3)</sup>	C-24
			8	2	4	✓	✓	✓	✓	✓	S3000 Professional CMS <sup>2)</sup>	C-31
	2	270	4	2	2	✓	✓	✓	–	✓	S300 Professional	C-38
			2	–	1	✓	✓	✓	–	–	S300 Advanced	C-48
			1	–	–	✓	✓	✓	–	–	S300 Standard	C-57
	1,5	270	1	–	–	✓	–	–	–	–	S200	C-65

<sup>1)</sup> Field set comprising of protective field and warning field

<sup>2)</sup> Special features of the S3000 product family on page C-2

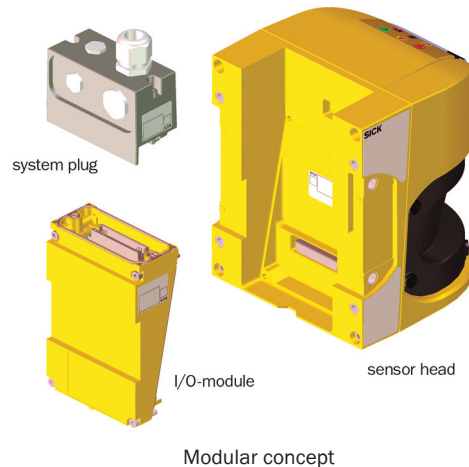
<sup>3)</sup> S3000 Remote can only be used in conjunction with another S3000 or a UE100 series safety controller

## Special features of the safety laser scanners

### S3000 - the modular system

C

- Modular concept
  - S3000 solutions grow with your needs
  - Security of investment due to configurable variants
  - Easy to service
- Largest achievable scanning range is 7 m for safety applications
- Configuration memory in the system plug
- Selectable resolution makes it possible to adapt the devices to a very wide range of application requirements
- Certified for vertical use for access control or entry/exit applications, as well as hand protection
- 7-segment display
- Integrated external device monitoring (EDM)
- Safe integration in bus systems
- Up to 8 switchable protective/warning fields (field sets)
- Formation of host/guest systems with S3000/S300
- Direct connection of incremental encoders
- Certified according to IEC/EN 61496-3 (type 3) and IEC/EN 61508 (SIL2)
- Measured data output via RS-422 interface
- Reflector mark detection



### S300/S200 – Compact. Flexible. Intelligent.

- Extremely compact
  - S300 is the smallest laser scanner in the world
  - S200 – the first laser scanner for cat. 2 applications
  - Easy to service
- 8 m warning field and 2 m protective field
- Superior 270° scan angle
- Configuration memory in the system plug
- Selectable resolution makes it possible to adapt the devices to a very wide range of application requirements
- Certified for vertical use for access control or entry/exit applications, as well as hand protection
- 7-segment display
- Integrated external device monitoring (EDM)
- Safe integration in bus systems
- Up to 4 switchable protective/warning fields (field sets)
- Formation of host/guest systems with S300/S3000
- Direct connection of incremental encoders
- Adjustable object resolution
- Stand-by input
- RS-422 data interface



## Overview of technical specifications

Protective field range (depending on type)	4 m / 5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	8
Scan angle	190°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Response time	60 ms, 120 ms
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)

## Product description

The S3000 Professional can be used for a wide range of applications for the protection of machines and systems. The field sets can be conveniently defined using a PC or laptop.

- For complex applications with up to 8 protective fields/warning fields

- Static and dynamic protective field switching
- Incremental encoder connections
- Possibility of connecting two S3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

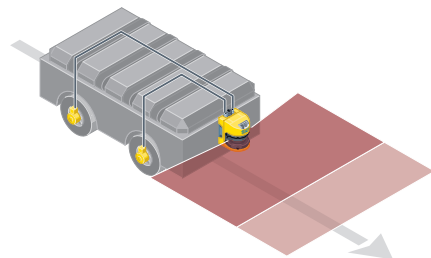
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

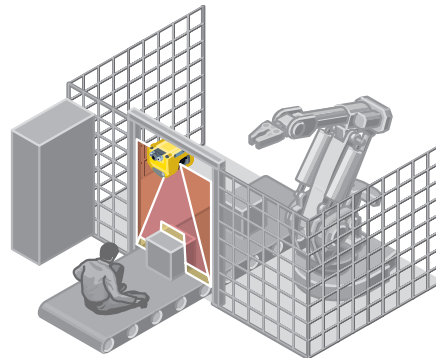
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow corridor vehicles



Velocity-dependent vehicle monitoring



Vertical access protection (entry/exit) with "contour as reference"



- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



Further information	Page
→ Ordering information	C-4
→ Technical specifications	C-4
→ Dimensional drawings	C-6
→ Connection diagrams	C-7
→ Accessories	C-8
→ Services	A-2

## Ordering information

Delivery S3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-8

System part	Protective field range	Type	Part number
Sensor head with I/O module	4 m	S30A-4011DA	1028936
	5.5 m	S30A-6011DA	1019600
	7 m	S30A-7011DA	1023892
Sensor head	4 m	Sensor head short range	2034999
	5.5 m	Sensor head medium range	2022972
	7 m	Sensor head long range	2026747
I/O module	—	I/O module Professional	2022872

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Front screen material	Polycarbonate
Front screen surface finish	Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Weight	3.3 kg

## Functional data

Scan angle	190°
Protective field range (depending on type)	4 m / 5.5 m / 7 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	60 ms, 120 ms <sup>1)</sup>
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Angular resolution	0.5°/0.25° (depending on range and resolution)
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

<sup>1)</sup> Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

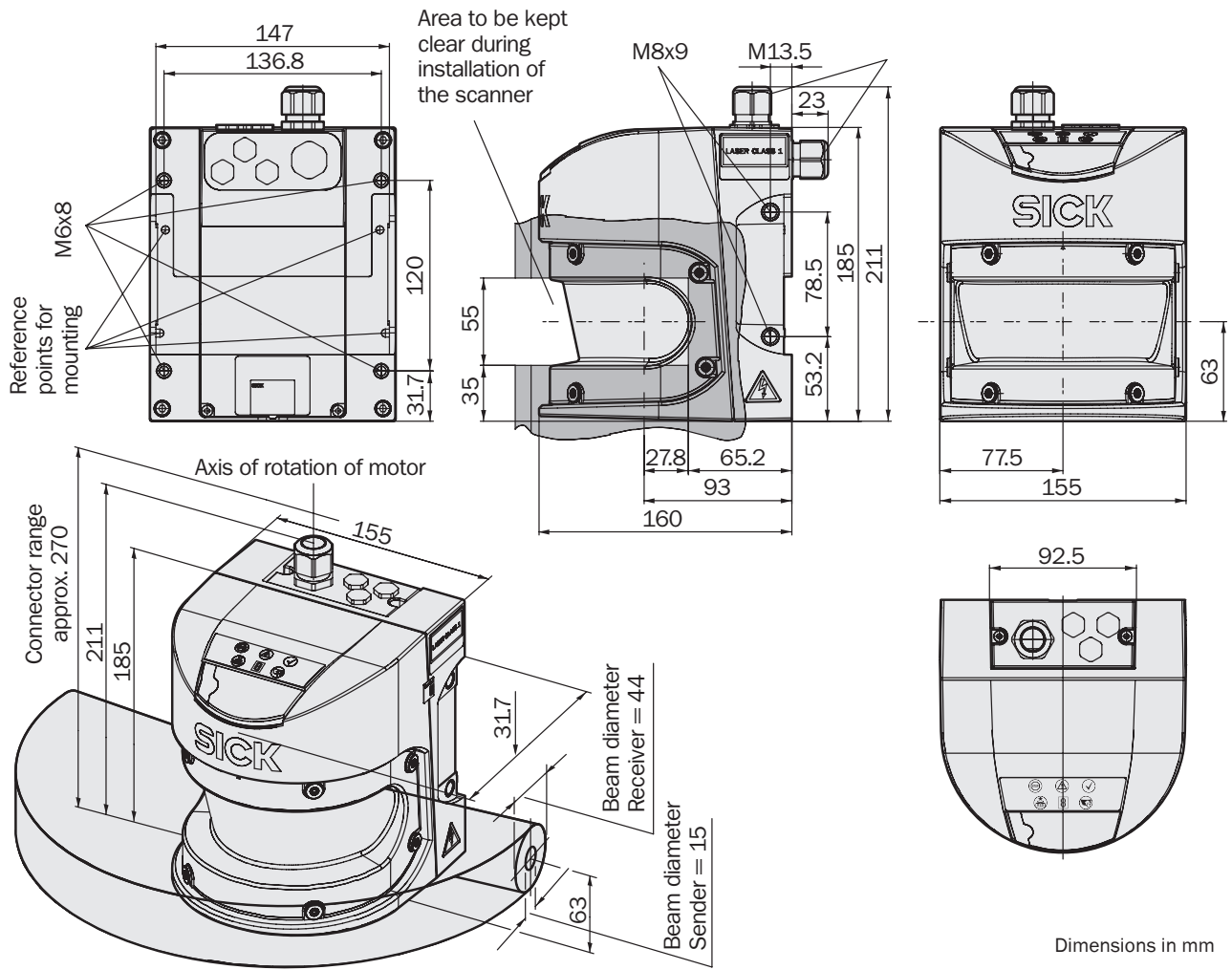
## Electrical data

Connection type	Plug-in connection housing with screw
Connector technology	Screw-type terminals
Supply voltage $V_s$	24 V DC (16.8 V DC ... 28.8 V DC)
Power consumption	0.8 A (24 V DC)
Power consumption	2.3 A <sup>1)</sup>
Number of inputs	
EDM	1
Restart/Reset	1
Static switching signals	2, 4
Dynamic encoder signals (incremental encoder)	2
Number of safety capable outputs	
Safety outputs (OSSD)	2 x 500 mA
Output for warning field	1 x 100 mA
Diagnostic output	1 x 100 mA
Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232
Transmission rate	9.6 kBaud, 19.2 kBaud, 38.4 kBaud
Data interface	RS-422 (≤500 kBaud)
EFI – safe SICK device communication	
Transmission rate	≤500 kBaud
Cable length	50 m
Connection conductor cross-section	0.34 mm <sup>2</sup>

<sup>1)</sup> Including maximum output load

# Dimensional drawings

C

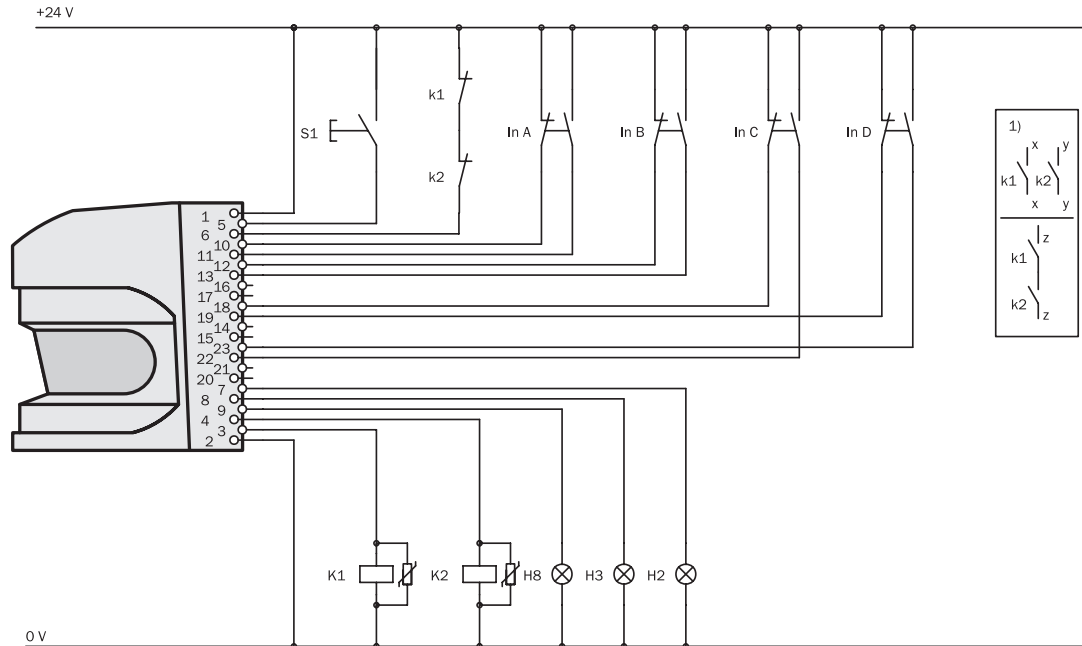




## Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

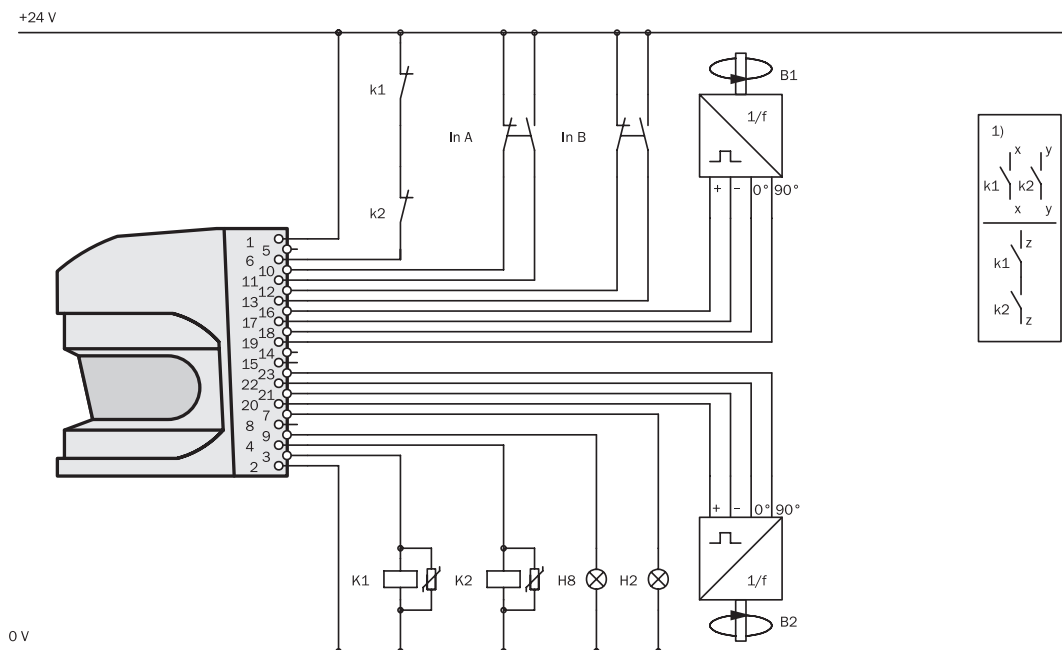
### Protective field switching with four static inputs



- S3000 Professional in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)

- Static protective field switching by means of the control inputs A, B, C and D

### Protective field switching with static and dynamic inputs






- S3000 Professional in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)

- Dynamic protective field switching using B1 and B2 as well as static protective field switching using the control inputs A and B

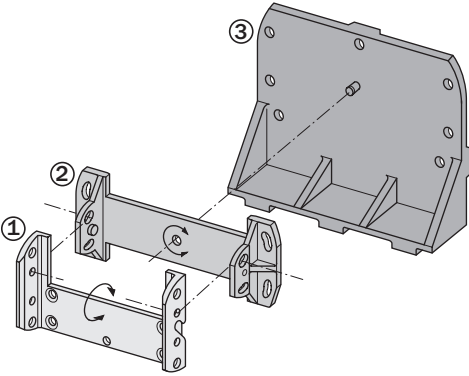
## Safe control solutions

C

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

## Accessories

### Mounting systems

Description		Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility		Mounting kit 1	2015623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 2	2015624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 3	2015625
Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible		Mounting bracket	7087514

### System plugs

Direction of cable outlet	Usage	Connection type	Number of cores	Cable length	Type	Part number
Upward	Not for use with incremental encoders	Without cable	—	—	SX0A-A0000B	2023797
		Pre-assembled	17	5 m	SX0A-B1705B	2027174
				10 m	SX0A-B1710B	2027175
				20 m	SX0A-B1720B	2027816
	For use with incremental encoders	Without cable	—	—	SX0A-A0000D	2023310
		Pre-assembled	13	5 m	SX0A-B1305D	2027176
10 m	SX0A-B1310D			2027177		

**Connection cables**

Type	Number of cores	Cable length	Part number
Connection cable	13	100 m	6025729
	17	100 m	6025730
EFI connection cable	—	50 m	6026675

**Cable gland**

Usage	Size of the cable gland	Part number
For EFI connections	M12	5308757

**Configuration connection cables**

Note	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**SDL connection cables**

Note	Direction of cable outlet	Connection type	Number of cores	Cable length	Part number
For the connection of safety bus modules to S3000	Straight	Interconnectron plug M23 x 12	12	2.5 m	2029337
				5 m	2029338
				10 m	2029339
				15 m	2029340

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
		4 A	6010362

**Miscellaneous**

Type	Description	Part number
Front screen	Spare parts set for front screen with replacement seal and screws	2027180
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353



C



- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



## Overview of technical specifications

Protective field range (depending on type)	4 m / 5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	4
Scan angle	190°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Response time	60 ms, 120 ms
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)

## Product description

S3000 Advanced safety laser scanners are used for the horizontal and vertical protection of hazardous areas, hazardous points and accesses.

- For complex applications with up to 4 protective fields/warning fields
- Static protective field switching
- Possibility of connecting two S3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

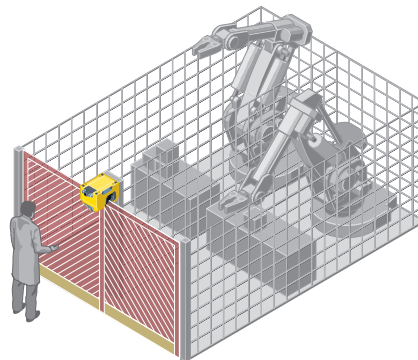
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

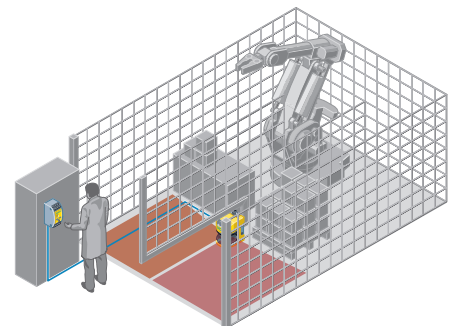
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow corridor vehicles



Access protection on a robot cell with several working areas with "contour as reference"



Protection of two separate working areas with one S3000 and a SICK safety controller

Further information	Page
→ Dimensional drawings	C-13
→ Connection diagrams	C-14
→ Accessories	C-15
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## Ordering information

Delivery S3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-15

System part	Protective field range	Type	Part number
Sensor head with I/O module	4 m	S30A-4011CA	1028935
	5.5 m	S30A-6011CA	1023547
	7 m	S30A-7011CA	1023891
Sensor head	4 m	Sensor head short range	2034999
	5.5 m	Sensor head medium range	2022972
	7 m	Sensor head long range	2026747
I/O module	—	I/O module Advanced	2026802

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Front screen material	Polycarbonate
Front screen surface finish	Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Weight	3.3 kg

Continued on next page

## Functional data

Scan angle	190°
Protective field range (depending on type)	4 m / 5.5 m / 7 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	60 ms, 120 ms <sup>1)</sup>
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Angular resolution	0.5°/0.25° (depending on range and resolution)
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

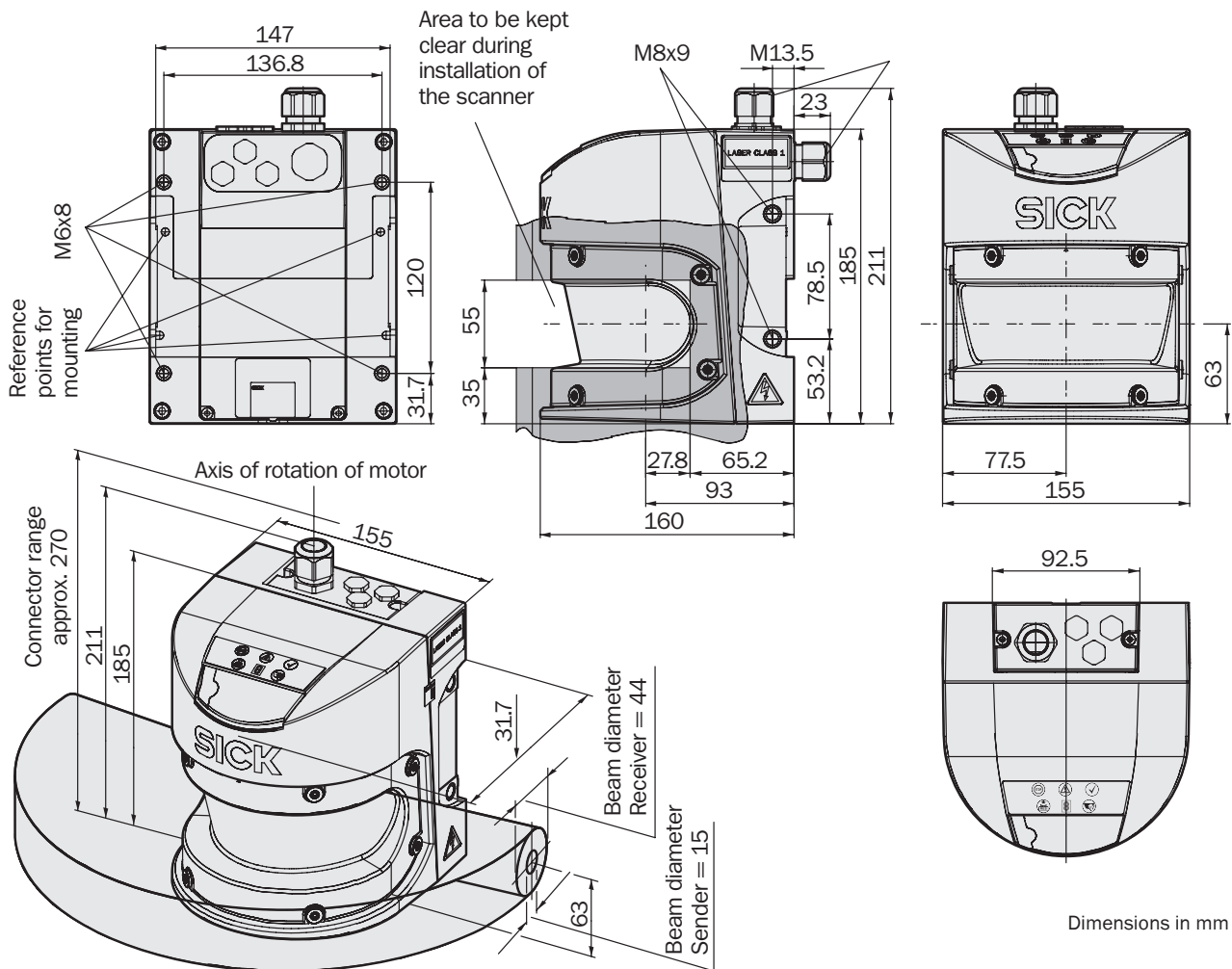
<sup>1)</sup> Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

## Electrical data

Connection type	Plug-in connection housing with screw
Connector technology	Screw-type terminals
Supply voltage $V_s$	24 V DC (16.8 V DC ... 28.8 V DC)
Power consumption	0.8 A (24 V DC)
Power consumption	2.3 A <sup>1)</sup>
Number of inputs	
EDM	1
Restart/Reset	1
Static switching signals	2
Number of safety capable outputs	
Safety outputs (OSSD)	2 x 500 mA
Output for warning field	1 x 100 mA
Diagnostic output	1 x 100 mA
Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232
Transmission rate	9.6 kBaud, 19.2 kBaud, 38.4 kBaud
Data interface	RS-422 (≤500 kBaud)
EFI – safe SICK device communication	
Transmission rate	≤500 kBaud
Cable length	50 m
Connection conductor cross-section	0.34 mm <sup>2</sup>

<sup>1)</sup> Including maximum output load

# Dimensional drawings



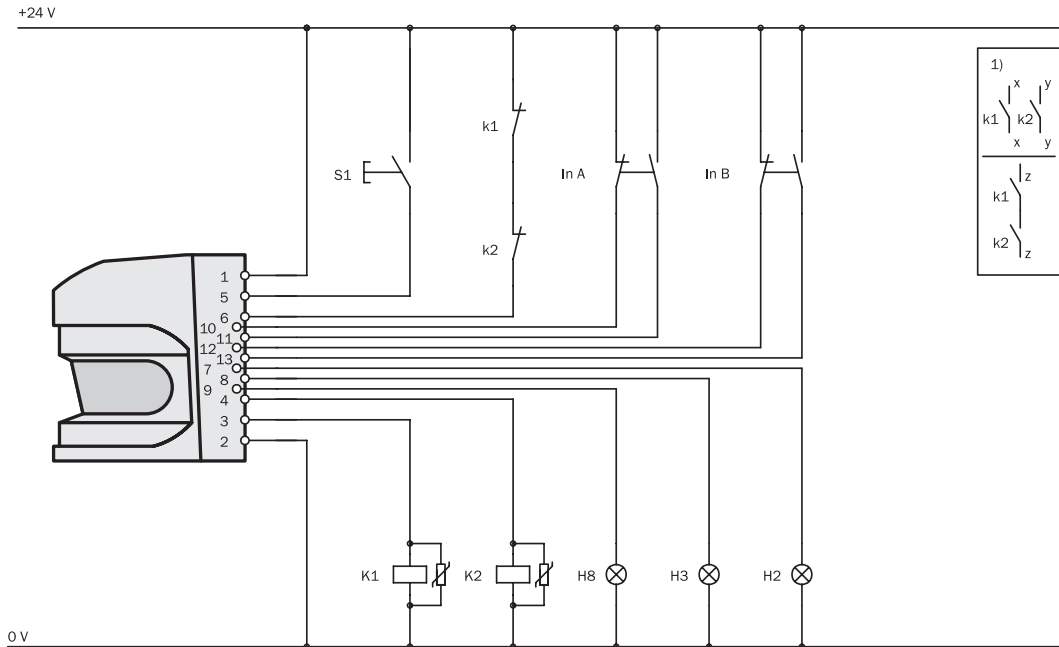
C

# Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

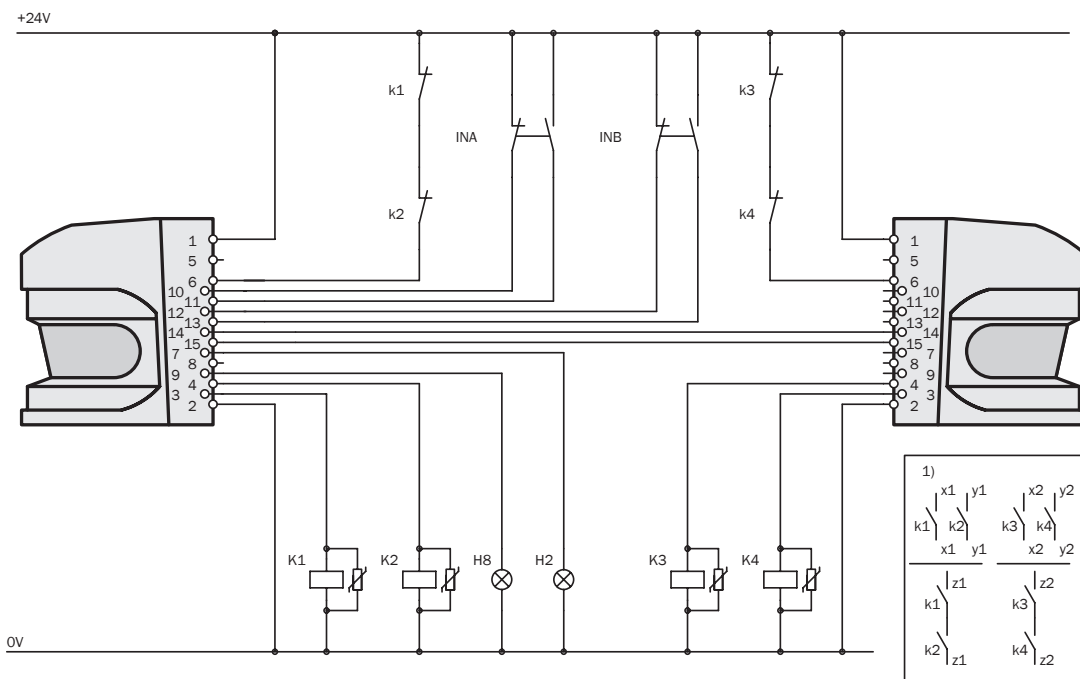
## Protective field switching with two static inputs

C



- S3000 Advanced in conjunction with relays/contactors
- Protective field switching by means of control inputs A and B
- Operating mode: with restart interlock and external device monitoring (EDM)




## Protective field switching between two S3000 with static inputs



- S3000 Advanced with S3000 Advanced in conjunction with relays/contactors
- Protective field switching by means of control input A and control input B on separate OSSD pairs (simultaneous monitoring)
- Operating mode: without restart interlock with external device monitoring (EDM)



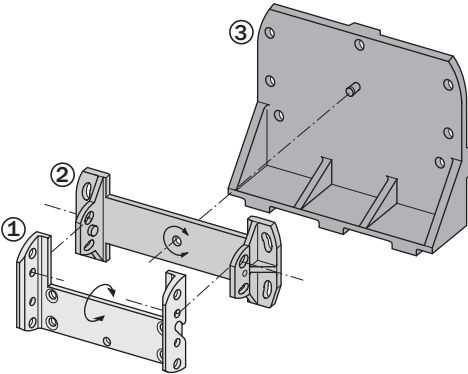
## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

C

## Accessories

### Mounting systems

Description		Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility		Mounting kit 1	2015623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 2	2015624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 3	2015625
Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible		Mounting bracket	7087514

### System plugs

Direction of cable outlet	Usage	Connection type	Number of cores	Cable length	Type	Part number
Upward	Not for use with incremental encoders	Without cable	—	—	SX0A-A0000B	2023797
		Pre-assembled	13	5 m	SX0A-B1305B	2027172
				10 m	SX0A-B1310B	2027173
				20 m	SX0A-B1320B	2027815

**Connection cables**

Type	Number of cores	Cable length	Part number
Connection cable	13	100 m	6025729
EFI connection cable	–	50 m	6026675

**Cable gland**

Usage	Size of the cable gland	Part number
For EFI connections	M12	5308757

**Configuration connection cables**

Note	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**SDL connection cables**

Note	Direction of cable outlet	Connection type	Number of cores	Cable length	Part number
For the connection of safety bus modules to S3000	Straight	Interconnectron plug M23 x 12	12	2.5 m	2029337
				5 m	2029338
				10 m	2029339
				15 m	2029340

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
		4 A	6010362

**Miscellaneous**

Type	Description	Part number
Front screen	Spare parts set for front screen with replacement seal and screws	2027180
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353

## Overview of technical specifications

Protective field range (depending on type)	4 m / 5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	1
Scan angle	190°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Response time	60 ms, 120 ms
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)

## Product description

S3000 Standard safety laser scanners are used for the horizontal and vertical protection of hazardous areas, hazardous points and accesses as well as to protect automated guided vehicles.

- 1 protective and warning field
- Possibility of connecting two S3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

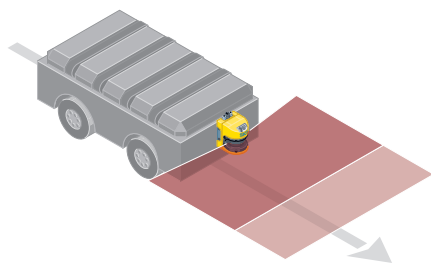
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

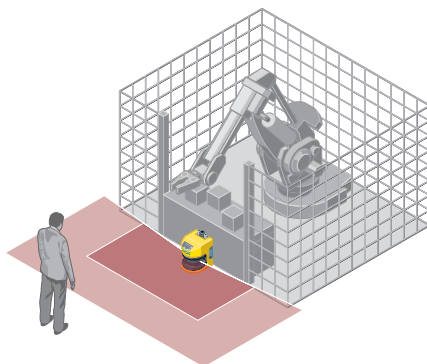
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow corridor vehicles



Hazardous area protection on an AGV with one direction of travel



Hazardous area protection on a robot cell



- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



Further information	Page
→ Ordering information	C-18
→ Technical specifications	C-18
→ Dimensional drawings	C-20
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→ Services	A-2

## Ordering information

Delivery S3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-22

System part	Protective field range	Type	Part number
Sensor head with I/O module	4 m	S30A-4011BA	1028934
	5.5 m	S30A-6011BA	1023546
	7 m	S30A-7011BA	1023890
Sensor head	4 m	Sensor head short range	2034999
	5.5 m	Sensor head medium range	2022972
	7 m	Sensor head long range	2026747
I/O module	—	I/O module Standard	2026801

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Front screen material	Polycarbonate
Front screen surface finish	Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Weight	3.3 kg

## Functional data

Scan angle	190°
Protective field range (depending on type)	4 m / 5.5 m / 7 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	60 ms, 120 ms <sup>1)</sup>
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Angular resolution	0.5°/0.25° (depending on range and resolution)
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

<sup>1)</sup> Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

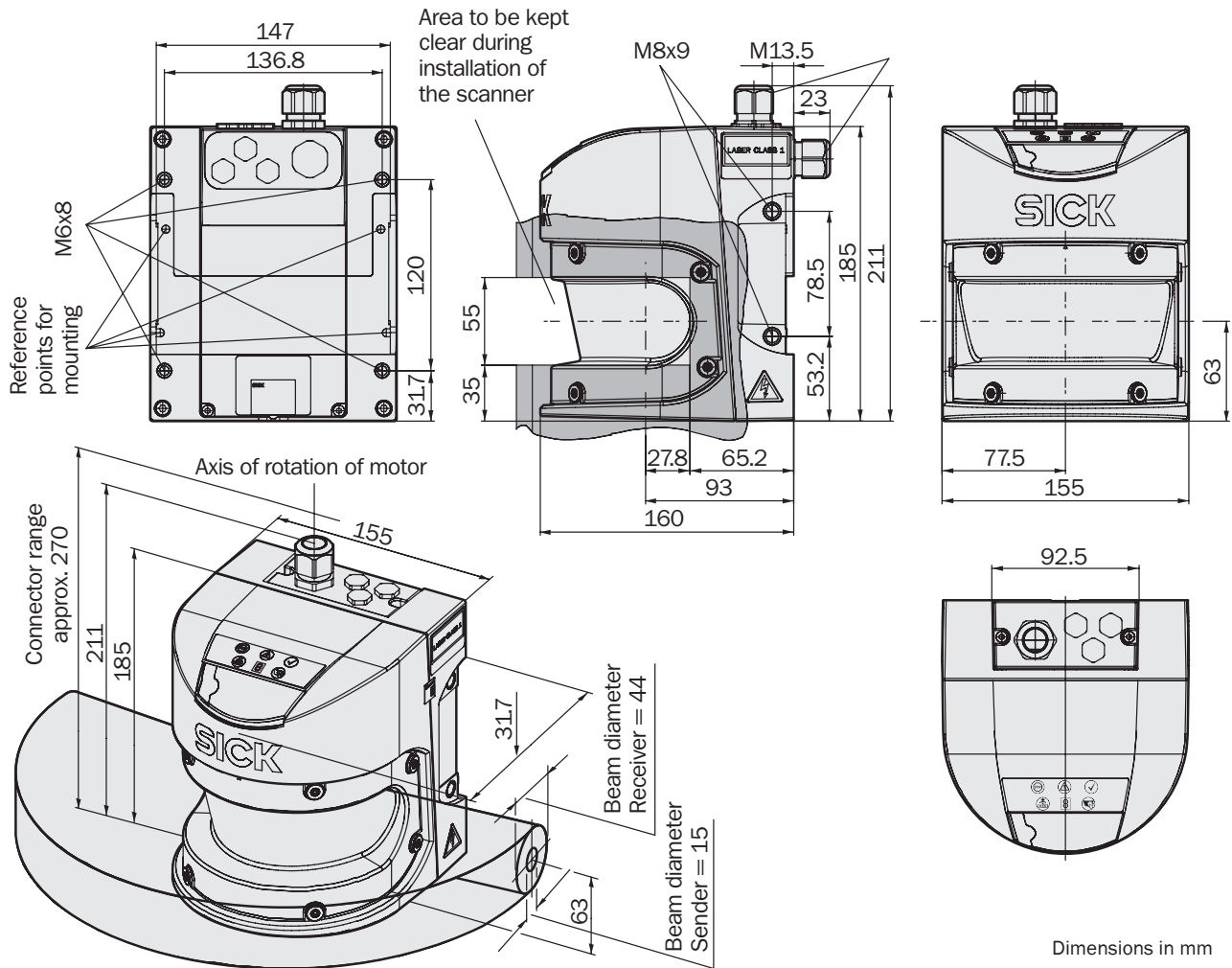
## Electrical data

Connection type	Plug-in connection housing with screw
Connector technology	Screw-type terminals
Supply voltage $V_s$	24 V DC (16.8 V DC ... 28.8 V DC)
Power consumption	0.8 A (24 V DC)
Power consumption	2.3 A <sup>1)</sup>
Number of inputs	
EDM	1
Restart/Reset	1
Number of safety capable outputs	
Safety outputs (OSSD)	2 x 500 mA
Output for warning field	1 x 100 mA
Diagnostic output	1 x 100 mA
Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232
Transmission rate	9.6 kBaud, 19.2 kBaud, 38.4 kBaud
Data interface	RS-422 (≤500 kBaud)
EFI – safe SICK device communication	
Transmission rate	≤500 kBaud
Cable length	50 m
Connection conductor cross-section	0.34 mm <sup>2</sup>

<sup>1)</sup> Including maximum output load

# Dimensional drawings

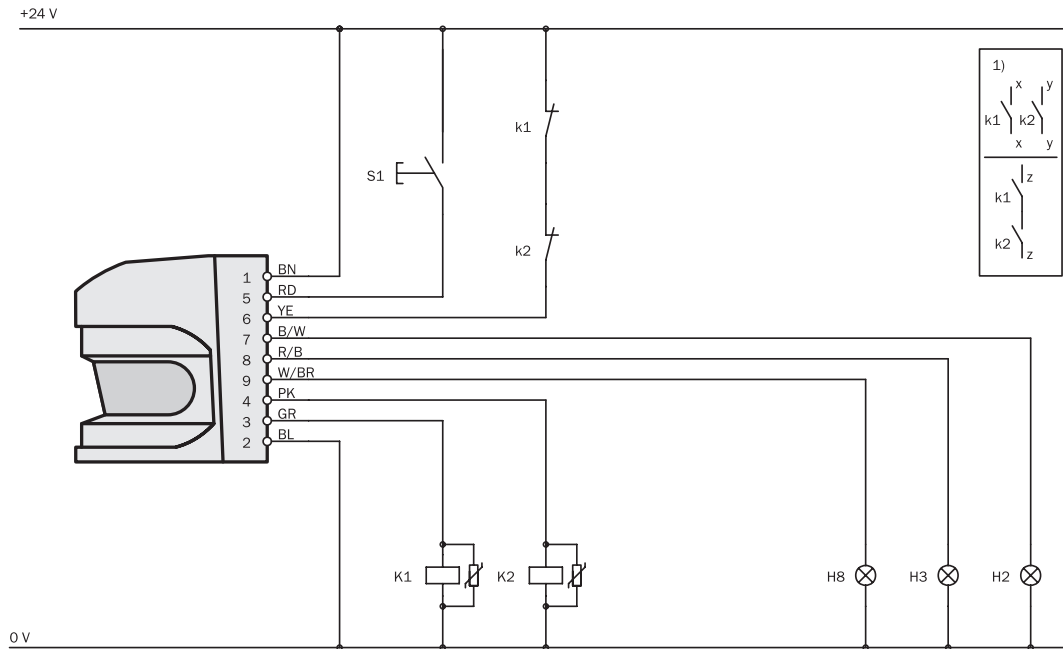
C



# Connection diagrams

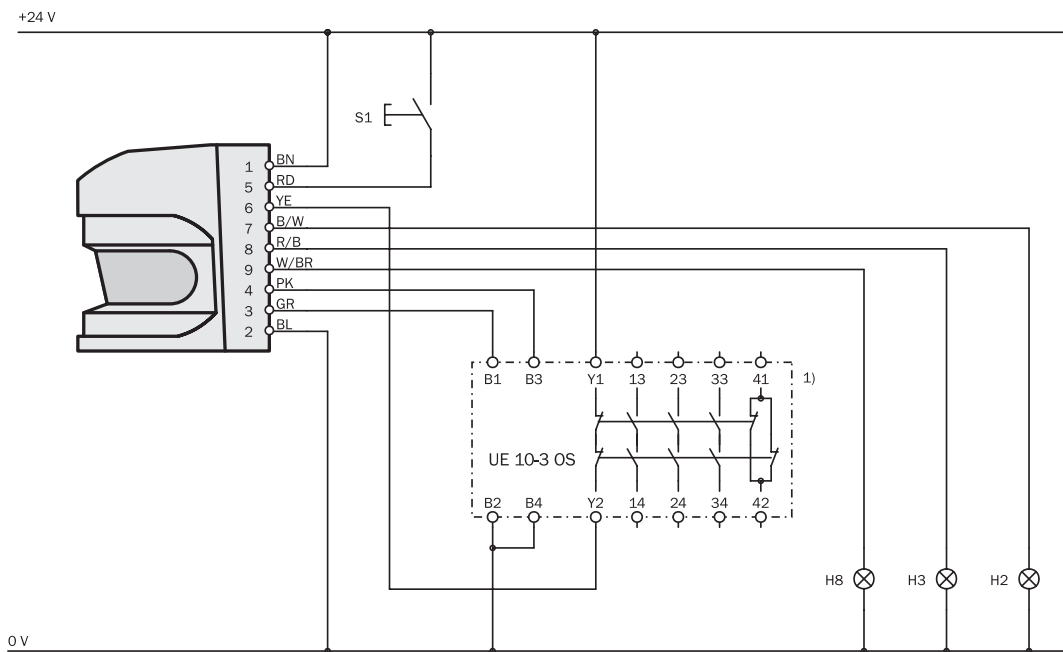
→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

## With restart interlock and external device monitoring



- S3000 Standard in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)




## Restart interlock and external device monitoring (EDM) with safety relay UE10-30S



- S3000 Standard in conjunction with UE10-30S
- Operating mode: with restart interlock and external device monitoring (EDM)

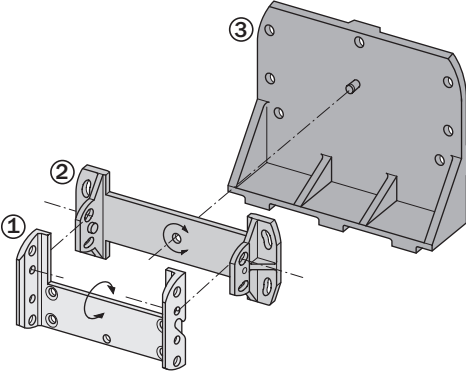
## Safe control solutions

C

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

## Accessories

### Mounting systems

Description		Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility		Mounting kit 1	2015623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 2	2015624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 3	2015625
Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible		Mounting bracket	7087514

### System plugs

Direction of cable outlet	Usage	Connection type	Number of cores	Cable length	Type	Part number
Upward	Not for use with incremental encoders	Without cable	—	—	SX0A-A0000B	2023797
		Pre-assembled	9	5 m	SX0A-B0905B	2027170
				10 m	SX0A-B0910B	2027171
				20 m	SX0A-B0920B	2027814



**Connection cables**

Type	Number of cores	Cable length	Part number
Connection cable	9	100 m	6022651
EFI connection cable	–	50 m	6026675

**Cable gland**

Usage	Size of the cable gland	Part number
For EFI connections	M12	5308757

**Configuration connection cables**

Note	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**SDL connection cables**

Note	Direction of cable outlet	Connection type	Number of cores	Cable length	Part number
For the connection of safety bus modules to S3000	Straight	Interconnectron plug M23 x 12	12	2.5 m	2029337
				5 m	2029338
				10 m	2029339
				15 m	2029340

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
		4 A	6010362

**Miscellaneous**

Type	Description	Part number
Front screen	Spare parts set for front screen with replacement seal and screws	2027180
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353



C



- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



## Overview of technical specifications

**Note:** S3000 Remote can only be used in conjunction with another S3000 or a UE100 series safety controller

Protective field range (depending on type)	4 m / 5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	8, the number of field sets is dependent on the S3000 variant to which the S3000 Remote is connected
Scan angle	190°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Response time	60 ms, 120 ms
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)

## Product description

- Autonomous vehicle systems can be protected cost-effectively to suit the specific case using S3000 Remote.
- Up to 8 protective/warning fields
- For complex applications with host/guest combinations
- For 2 directions of travel
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

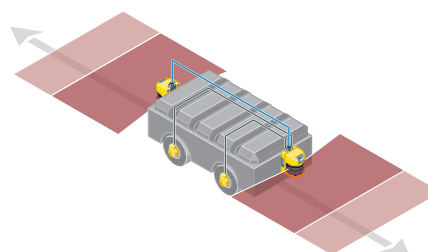
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations (gates)
- Robot cells
- Narrow corridor vehicles



S3000 Professional and S3000 Remote: complex application with bidirectional travel (velocity-dependent protective field/warning field switching using incremental encoders)

Further information	Page
→ Dimensional drawings	C-27
→ Connection diagrams	C-28
→ Accessories	C-29
→ Services	A-2

## Ordering information

Delivery S3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-29

System part	Protective field range	Type	Part number
Sensor head with I/O module	4 m	S30A-4011EA	1028938
	5.5 m	S30A-6011EA	1023548
	7 m	S30A-7011EA	1023893
Sensor head	4 m	Sensor head short range	2034999
	5.5 m	Sensor head medium range	2022972
	7 m	Sensor head long range	2026747
I/O module	—	I/O module Remote	2026803

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Front screen material	Polycarbonate
Front screen surface finish	Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Weight	3.3 kg

Continued on next page

## Functional data

Scan angle	190°
Protective field range (depending on type)	4 m / 5.5 m / 7 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	60 ms, 120 ms <sup>1)</sup>
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Angular resolution	0.5°/0.25° (depending on range and resolution)
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

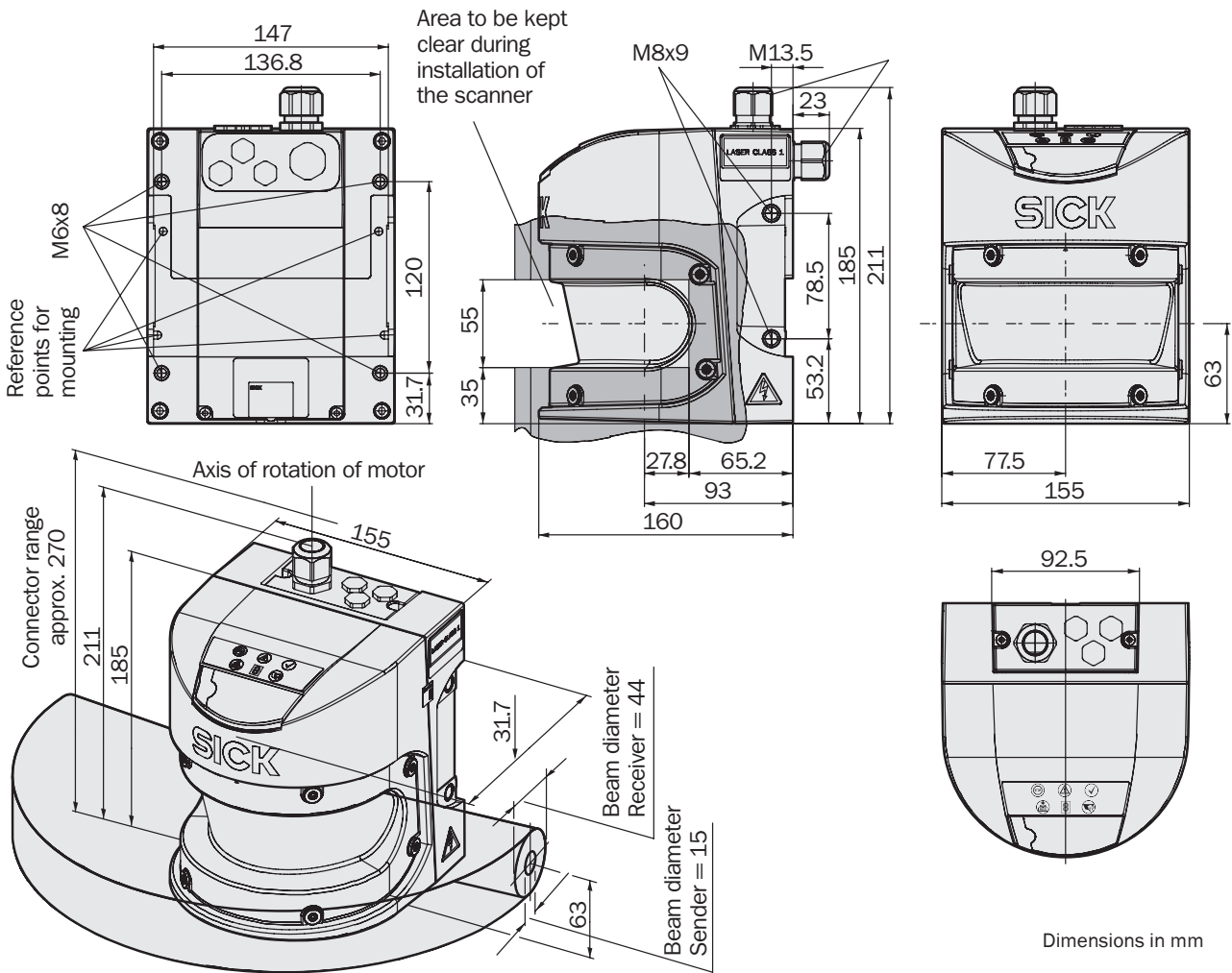
<sup>1)</sup> Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

## Electrical data

Connection type	Plug-in connection housing with screw
Connector technology	Screw-type terminals
Supply voltage $V_s$	24 V DC (16.8 V DC ... 28.8 V DC)
Power consumption	0.8 A (24 V DC)
Power consumption	2.3 A <sup>1)</sup>
Number of inputs	
EDM	1
Restart/Reset	1
Number of safety capable outputs	
Safety outputs (OSSD)	2 x 500 mA
Output for warning field	1 x 100 mA
Diagnostic output	1 x 100 mA
Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232
Transmission rate	9.6 kBaud, 19.2 kBaud, 38.4 kBaud
Data interface	RS-422 (≤500 kBaud)
EFI – safe SICK device communication	
Transmission rate	≤500 kBaud
Cable length	50 m
Connection conductor cross-section	0.34 mm <sup>2</sup>

<sup>1)</sup> Including maximum output load

# Dimensional drawings



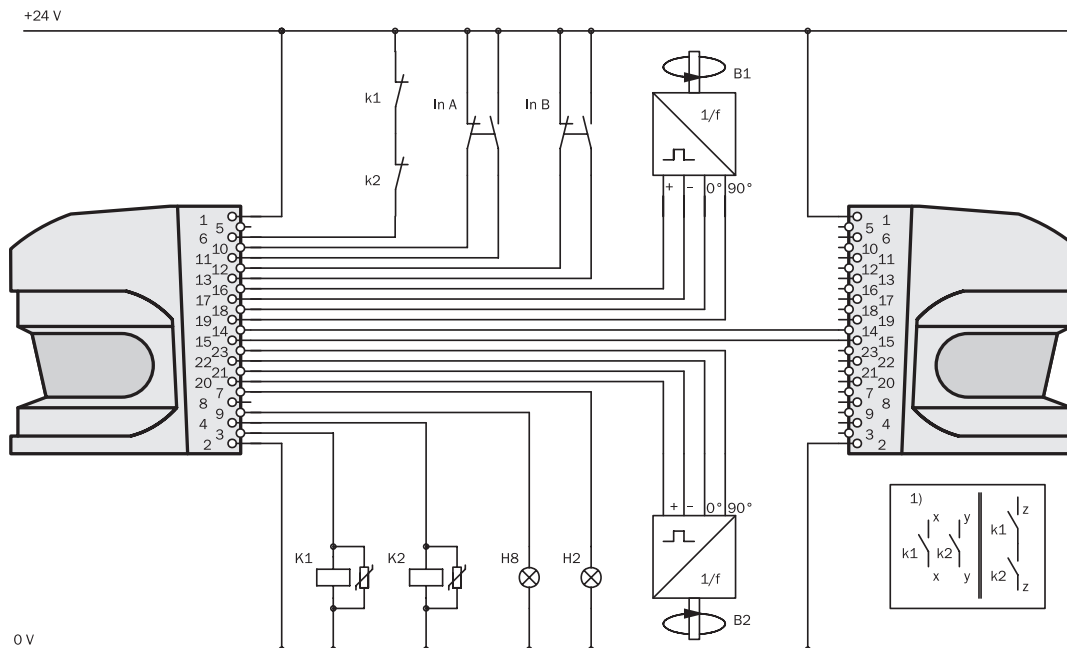
C

## Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

### Protective field switching between two S3000 with static and dynamic inputs

C



- S3000 Professional (left) and Remote (right) in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)
- Direction of travel-dependent dynamic protective field switching by means of B1 and B2 as well as static protective field switching by means of the control inputs A and B with sensor communication via EFI

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

## Accessories

### Mounting systems

Description		Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility		Mounting kit 1	2015623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 2	2015624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 3	2015625
Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible		Mounting bracket	7087514

### System plugs

Direction of cable outlet	Usage	Connection type	Number of cores	Cable length	Type	Part number
Upward	Not for use with incremental encoders	Without cable	—	—	SX0A-A0000B	2023797
		Pre-assembled	9	5 m	SX0A-B0905B	2027170
				10 m	SX0A-B0910B	2027171
				20 m	SX0A-B0920B	2027814

### Connection cable

Type	Cable length	Part number
EFI connection cable	50 m	6026675

### Cable gland

Usage	Size of the cable gland	Part number
For EFI connections	M12	5308757

### Configuration connection cables

Note	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**SDL connection cables**

Note	Direction of cable outlet	Connection type	Number of cores	Cable length	Part number
For the connection of safety bus modules to S3000	Straight	Interconnectron plug M23 x 12	12	2.5 m	2029337
				5 m	2029338
				10 m	2029339
				15 m	2029340

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
		4 A	6010362

**Miscellaneous**

Type	Description	Part number
Front screen	Spare parts set for front screen with replacement seal and screws	2027180
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353



## Overview of technical specifications

Protective field range (depending on type)	4 m / 5.5 m / 7 m
Warning field range	49 m (20 m at 20 % reflectivity)
Number of field sets	8
Scan angle	190°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Response time	60 ms, 120 ms
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)

## Product description

With S3000 Professional CMS (Contour Measurement and Safety) it is possible for the first time to combine the protection of people and the acquisition of surrounding contours. This system opens up new ways of productively achieving your objectives in the logistics and materials handling sector.

- Personnel protection and acquisition of the surrounding contour in one scanner
- Measured data output via RS-422 interface in real-time

- Reflector mark detection up to 30 m
- Velocity transfer for odometry
- 8 switchable protective/warning fields
- Static and dynamic protective field switching
- Incremental encoder connections
- Possibility of connecting two S3000 units to form a single system
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

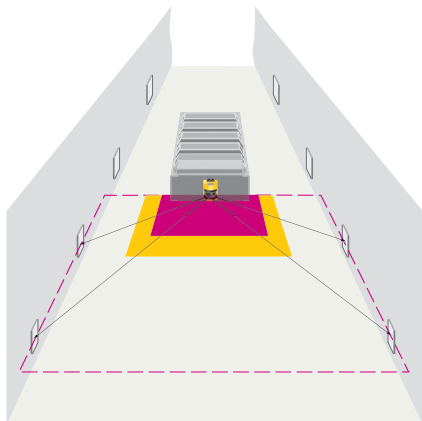
- Combination with SICK safe control solutions
- Safe integration to bus systems

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Freely moving transport vehicles



Personnel protection and acquisition of the surrounding contour with integrated reflector detection



- Modular concept
- Scanning range 4 m, 5.5 m or 7 m
- Configuration memory
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)



Further information	Page
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→ Technical specifications	C-32
→ Dimensional drawings	C-34
→ Connection diagrams	C-35
→ Accessories	C-36
→ Services	A-2

## Ordering information

Delivery S3000 systems:

- Sensor head with I/O module mounted
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "Important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-36

System part	Protective field range	Type	Part number
Sensor head with I/O module	4 m	S30A-4011DB	1028939
	5.5 m	S30A-6011DB	1026401
	7 m	S30A-7011DB	1026402
Sensor head	4 m	Sensor head short range	2034999
	5.5 m	Sensor head medium range	2022972
	7 m	Sensor head long range	2026747
I/O module	—	I/O module Professional CMS	2030915

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 and 1040.11, DIN EN 60825:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Front screen material	Polycarbonate
Front screen surface finish	Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	155 mm x 185 mm x 160 mm
Weight	3.3 kg

## Functional data

Scan angle	190°
Protective field range (depending on type)	4 m / 5.5 m / 7 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	60 ms, 120 ms <sup>1)</sup>
Resolution	30 mm, 40 mm, 50 mm, 70 mm, 150 mm, selectable
Angular resolution	0.5°/0.25° (depending on range and resolution)
Protective field supplement	100 mm
Warning field range	49 m (20 m at 20 % reflectivity)
Distance measuring range	49 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

<sup>1)</sup> Depending on basic response time, resolution, maximum protective field range, multiple sampling and type of outputs

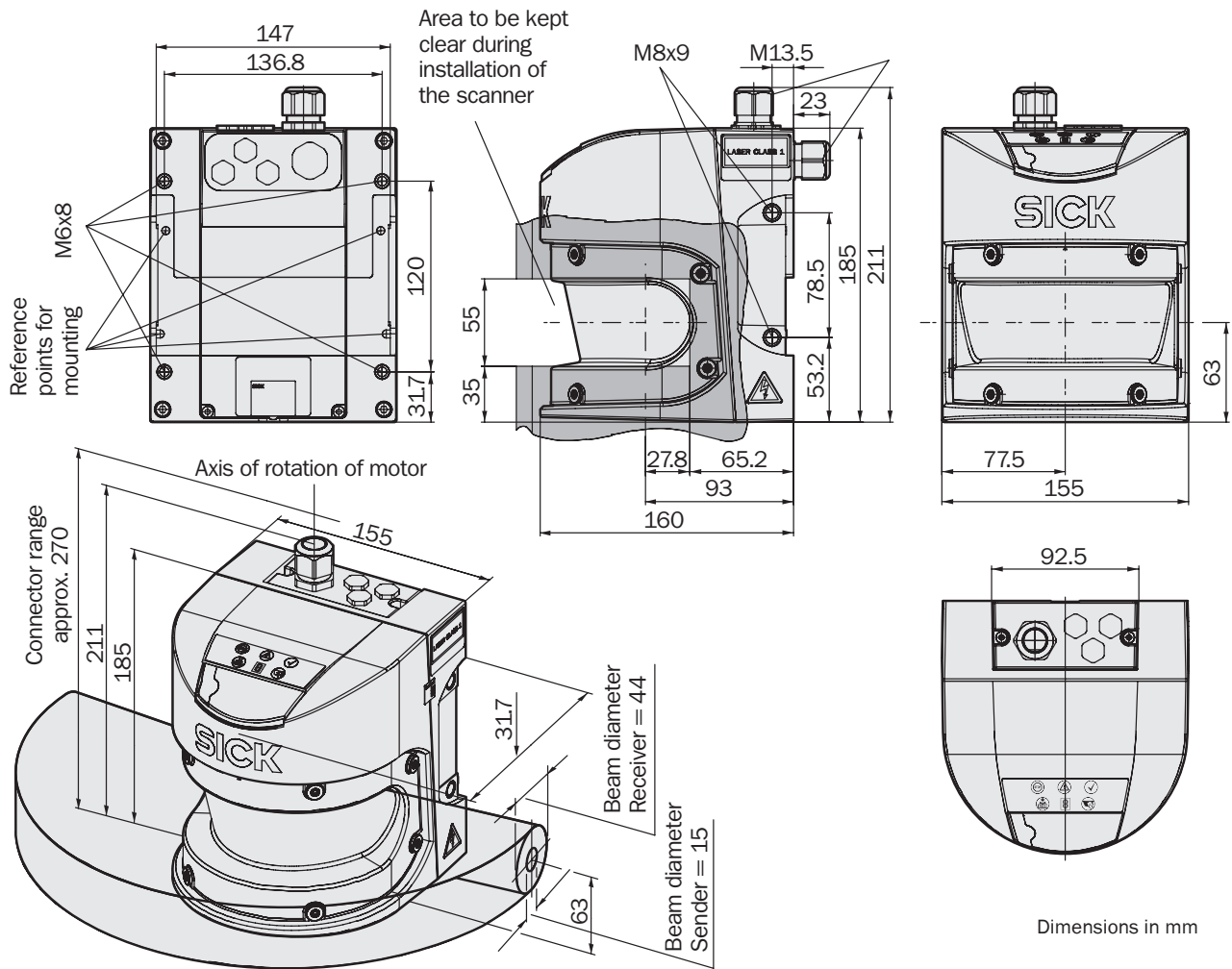
## Electrical data

Connection type	Plug-in connection housing with screw
Connector technology	Screw-type terminals
Supply voltage $V_s$	24 V DC (16.8 V DC ... 28.8 V DC)
Power consumption	0.8 A (24 V DC)
Power consumption	2.3 A <sup>1)</sup>
Number of inputs	
EDM	1
Restart/Reset	1
Static switching signals	2, 4
Dynamic encoder signals (incremental encoder)	2
Number of safety capable outputs	
Safety outputs (OSSD)	2 x 500 mA
Output for warning field	1 x 100 mA
Diagnostic output	1 x 100 mA
Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232
Transmission rate	9.6 kBaud, 19.2 kBaud, 38.4 kBaud
Data interface	RS-422 (≤500 kBaud)
EFI – safe SICK device communication	
Transmission rate	≤500 kBaud
Cable length	50 m
Connection conductor cross-section	0.34 mm <sup>2</sup>

<sup>1)</sup> Including maximum output load

# Dimensional drawings

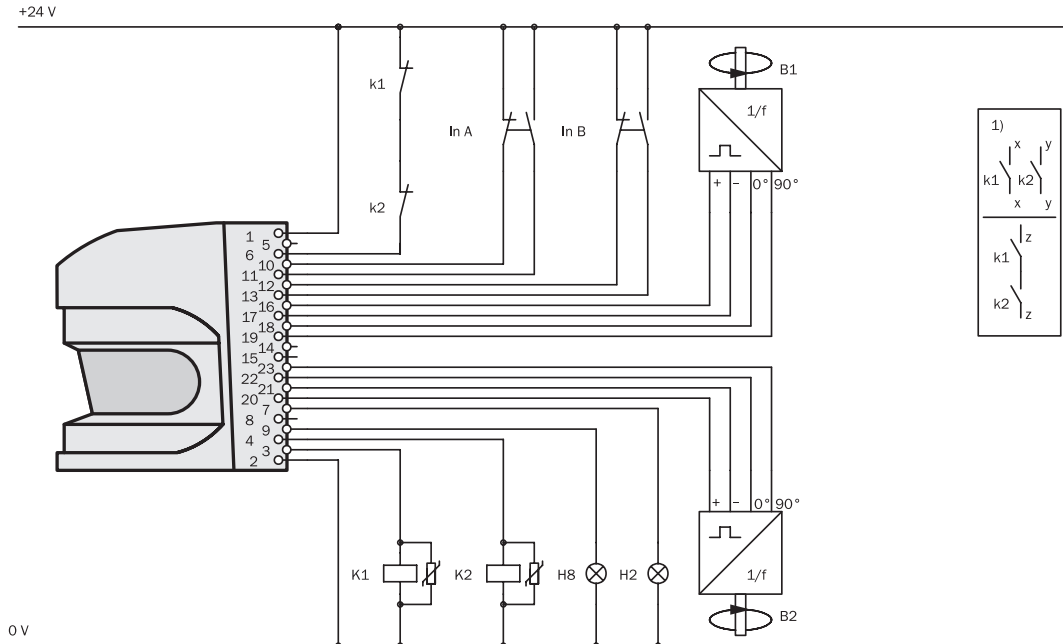
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## Connection diagrams




→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

### Protective field switching with static and dynamic inputs



- S3000 Professional CMS in conjunction with relays/contactors
- Operating mode: without restart interlock with external device monitoring (EDM)
- Dynamic protective field switching using B1 and B2 as well as static protective field switching using the control inputs A and B

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

## Accessories

### Mounting systems

Description		Type	Part number
Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility		Mounting kit 1	2015623
Bracket only in conjunction with mounting kit 1. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 2	2015624
Bracket only in conjunction with mounting kit 1 and 2. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment possible		Mounting kit 3	2015625
Mounting bracket, rugged design, with protective cover. Floor mounting. Height adjustment possible		Mounting bracket	7087514

### System plugs

Direction of cable outlet	Usage	Connection type	Number of cores	Cable length	Type	Part number
Upward	Not for use with incremental encoders	Without cable	—	—	SX0A-A0000B	2023797
		Pre-assembled	17	5 m	SX0A-B1705B	2027174
				10 m	SX0A-B1710B	2027175
				20 m	SX0A-B1720B	2027816
	For use with incremental encoders	Without cable	—	—	SX0A-A0000D	2023310
		Pre-assembled	13	5 m	SX0A-B1305D	2027176
10 m	SX0A-B1310D			2027177		

### Connection cables

Type	Number of cores	Cable length	Part number
Connection cable	13	100 m	6025729
	17	100 m	6025730
EFI connection cable	—	50 m	6026675

### Cable gland

Usage	Size of the cable gland	Part number
For EFI connections	M12	5308757

### Configuration connection cables

Note	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**SDL connection cables**

Note	Direction of cable outlet	Connection type	Number of cores	Cable length	Part number
For the connection of safety bus modules to S3000	Straight	Interconnectron plug M23 x 12	12	2.5 m	2029337
				5 m	2029338
				10 m	2029339
				15 m	2029340

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
		4 A	6010362

**Miscellaneous**

Type	Description	Part number
Front screen	Spare parts set for front screen with replacement seal and screws	2027180
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353



C



- Extremely compact design
- Scanning angle 270°
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)
- Stand-by input



## Overview of technical specifications

Protective field range	2 m
Warning field range	8 m (at 30 % reflectivity)
Number of field sets	4
Scan angle	270°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, selectable
Response time	80 ms
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)

## Product description

Small but refined, the safety laser scanner for mobile use.

Optimal protection, e.g., for small, free moving transport systems and service robots on which the protective fields must be flexibly adjusted to different velocities.

- 4 switchable protective/warning fields
- Adjustable object resolution

- Facility for connecting incremental encoder
- Measured data output over RS-422 data interface
- EFI – safe SICK device communication
- New multi-system "Configuration & Diagnostic Software" CDS

## In-system added value

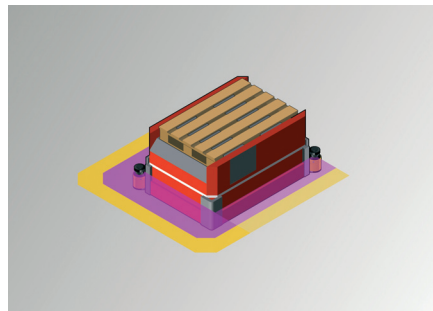
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

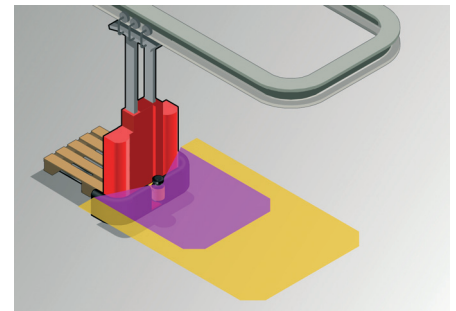
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations
- Robot cells
- Overhead monorail transport systems



All-round protection on an AGV



Hazardous area protection on an electrical overhead conveyor

Further information	Page
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→ Services	A-2



## Ordering information

Delivery S300

- Safety laser scanner
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-45

Type	Part number
S30B-2011DA	1026822

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 und 1040.11, IEC 60825-1:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Optics cover material	Polycarbonate
Optics cover surface finish	Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	102 mm x 152 mm x 105 mm
Weight	1.2 kg

### Functional data

Scan angle	270°
Protective field range	2 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	80 ms
Resolution	30 mm, 40 mm, 50 mm, 70 mm, selectable
Angular resolution	0.5°
Protective field supplement	100 mm
Warning field range	8 m (at 30 % reflectivity)
Distance measuring range	30 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

Continued on next page

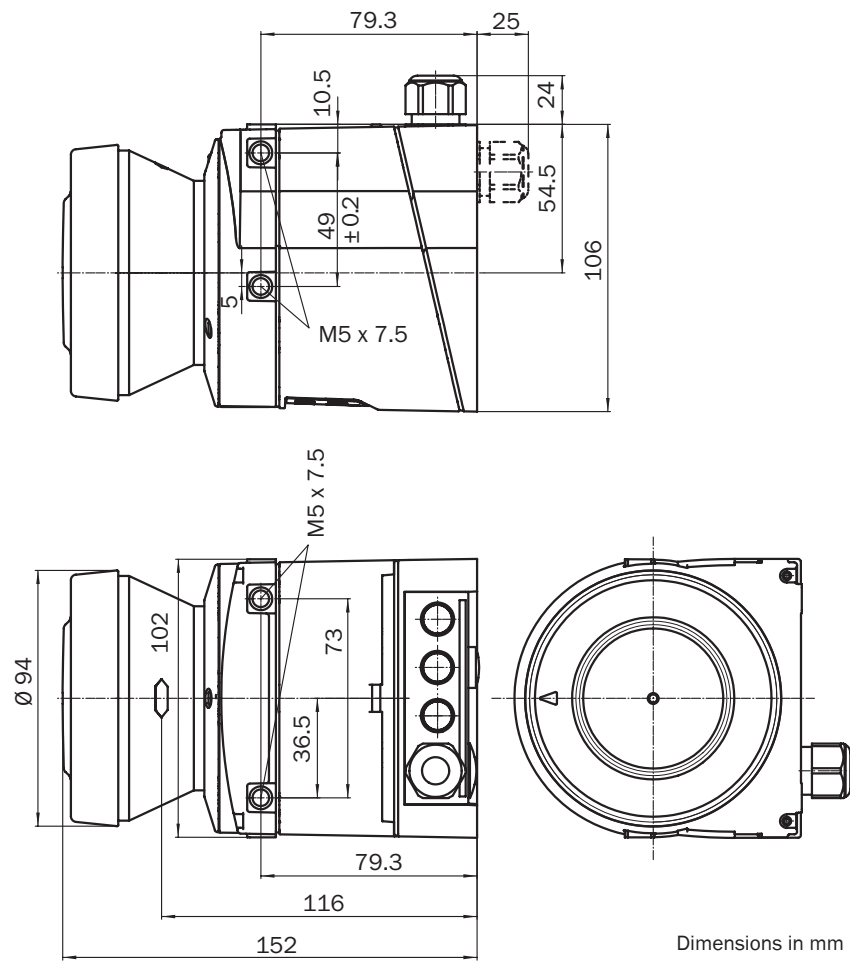
## Electrical data

Connection type	Plug-in connection housing with screw
Connector technology	Screw-type terminals
Supply voltage $V_s$	24 V DC (16.8 V DC ... 30 V DC)
Power consumption	0.33 A (24 V DC)
Power consumption	1.65 A <sup>1)</sup>
Number of inputs	
EDM	1
Restart/Reset	1
Static switching signals or dynamic encoder signals	2, dual-channel
Standby	1
Number of safety capable outputs	
Safety outputs (OSSD)	2 x 250 mA
Output for warning field	1 x 100 mA
Diagnostic output	1 x 100 mA
Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232
Transmission rate	38.4 kBaud
Data interface	RS-422 (500 kBaud)
EFI – safe SICK device communication	
Transmission rate	500 kBaud
Cable length	50 m
Connection conductor cross-section	0.22 mm <sup>2</sup>

<sup>1)</sup> Including maximum output load

# Dimensional drawings

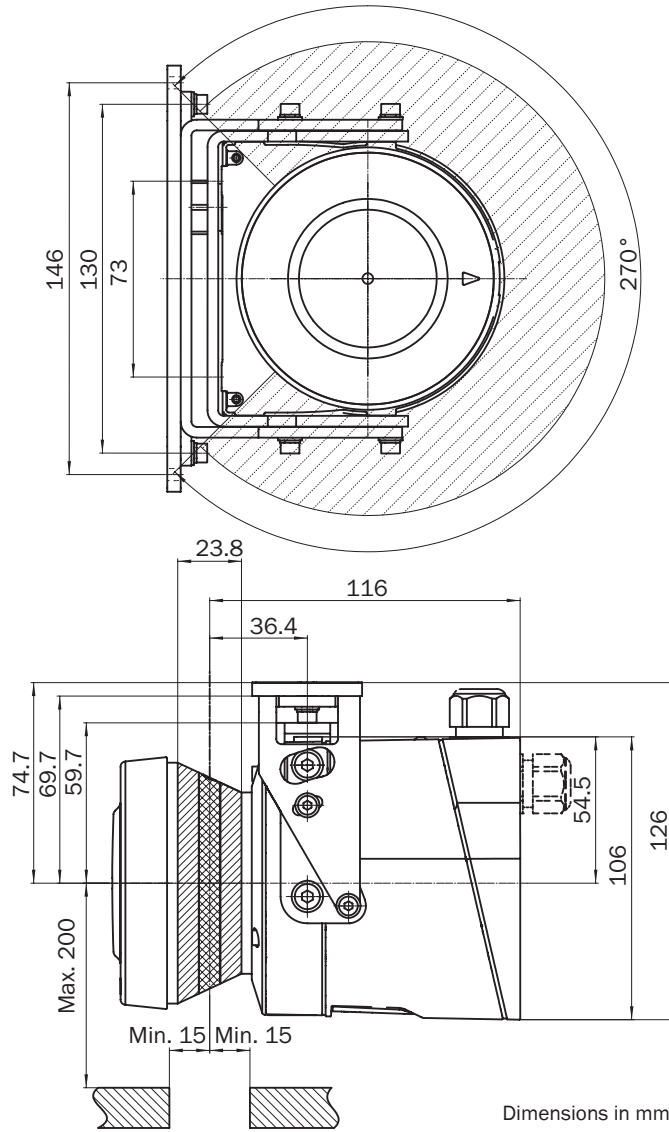
S300



C

Scan plane origin

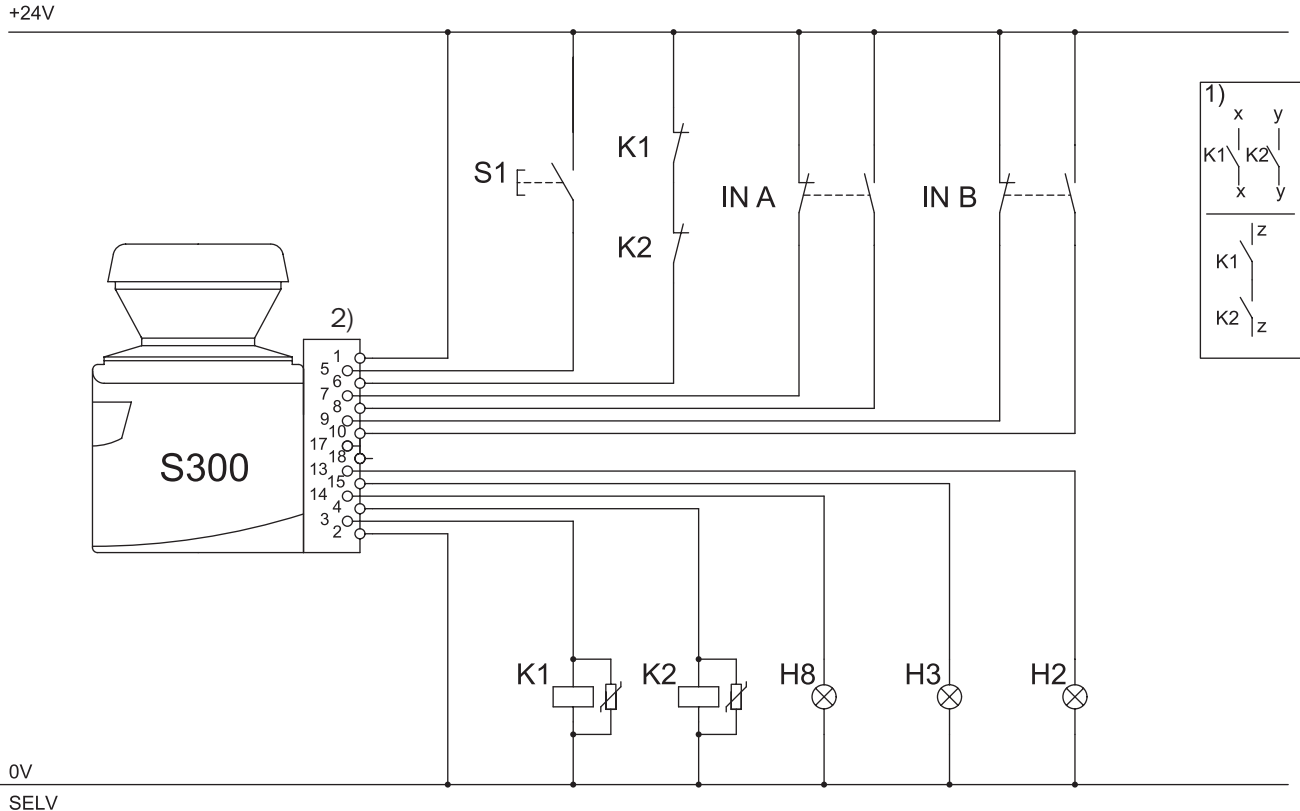
C



# Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

## Protective field switching with two static inputs



- S300 Professional in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)
- Protective field switching using control input IN A and IN B

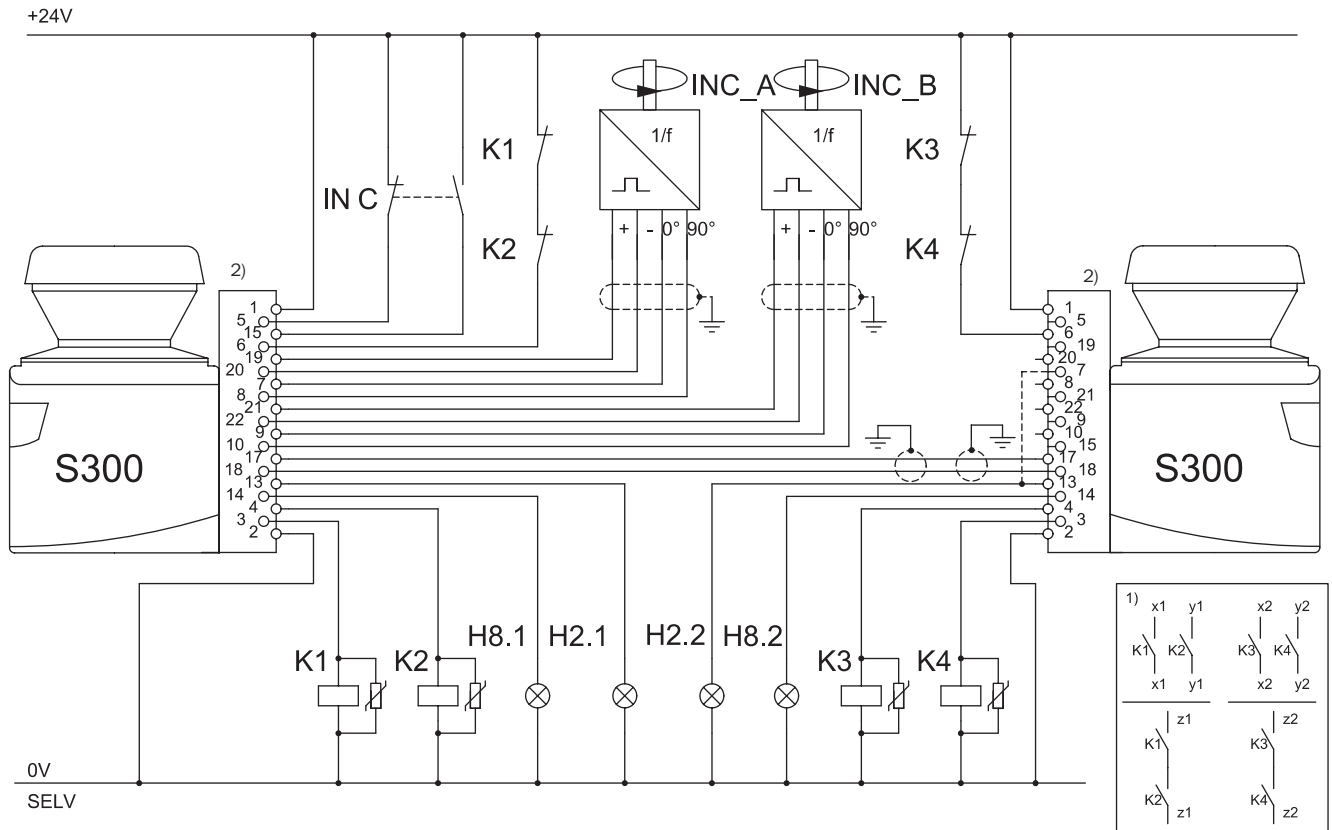
**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration

must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.  
 2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).

Protective field switching between two S300 with static and dynamic inputs

C






- S300 Professional with S300 Professional in master/slave connection with relays/contactors
- Operating mode: with restart interlock and external device monitoring
- Dynamic protective field switching by the incremental encoders A and B on the master
- Static protective field switching using the control input IN C on the master
- The protective fields affect the related OSSDs on master or slave

Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

C

## Accessories

### Mounting systems

→ Dimensional drawings mounting accessories Page C-46

Type	Mounting	Adjustment	Note	Part number
Mounting kit 1a	Mounting bracket for mounting at the rear on wall or machine	—	—	2034324
Mounting kit 1b	Mounting bracket for rear mounting on wall or machine with protection of optics cover	—	—	2034325
Mounting kit 2	Mounting bracket	Cross-wise adjustment possible	Only in conjunction with mounting kit 1a or 1b	2039302
Mounting kit 3		Longitudinal adjustment possible	Only in conjunction with mounting kit 2	2039303

### System plugs

Usage	Connection type	Number of cores	Cable length	Type	Part number
Not for use with incremental encoders	Without cable	—	—	SX0B-A0000G	2032807
	Pre-assembled	15	5 m	SX0B-B1505G	2034264
			10 m	SX0B-B1510G	2034265
For use with incremental encoders	Without cable	—	—	SX0B-A0000J	2032856
	Pre-assembled	11	5 m	SX0B-B1105J	2032857
			10 m	SX0B-B1110J	2032858

### Connection cables

Type	Number of cores	Cable length	Part number
Connection cable	15	100 m	6030795
EFI connection cable	—	By the meter	6029448

**Cable gland**

Usage	Size of the cable gland	Part number
For EFL connections	M12	5308757

**Configuration connection cables**

Description	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Power supply units**

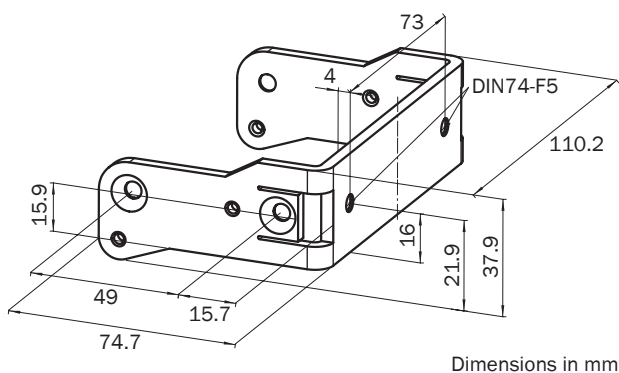
Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
		4 A	6010362

**Miscellaneous**

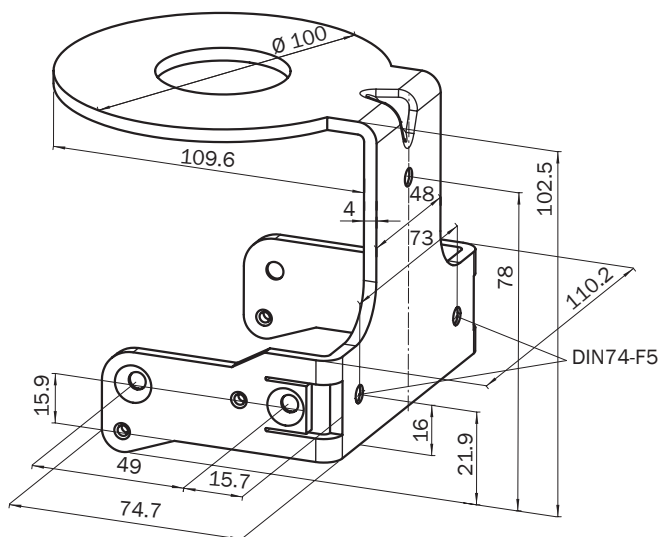
Type	Description	Part number
Optic cover	Spare parts set for optic cover with replacement seal and screws	2039248
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353

**Dimensional drawings mounting accessories**

**Mounting kit 1a**

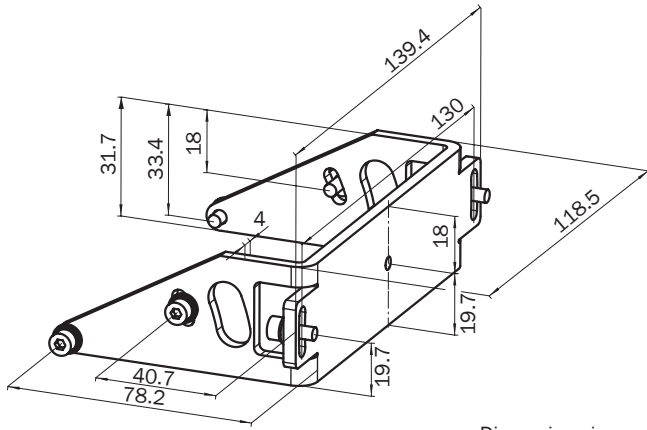


**Mounting kit 1b**



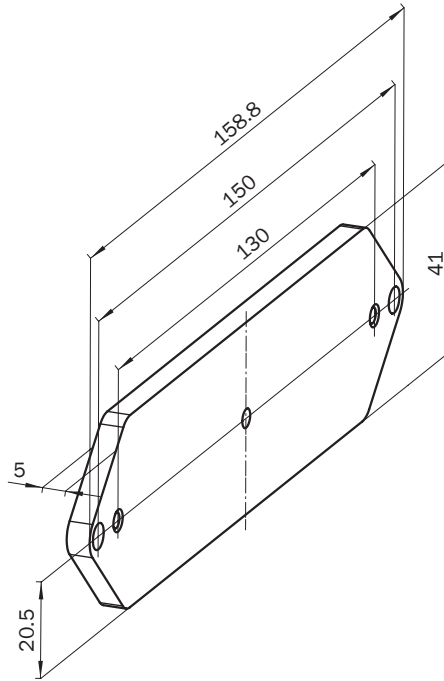


**Mounting kit 2**



Dimensions in mm

**Mounting kit 3**



C



C



- Extremely compact design
- Scanning angle 270°
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)
- Stand-by input



## Overview of technical specifications

Protective field range	2 m
Warning field range	8 m (at 30 % reflectivity)
Number of field sets	2
Scan angle	270°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, selectable
Response time	80 ms
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)

## Product description

Compact safety laser scanner for complete safety.

The S300 Advanced is the system of choice particularly for applications with changing operating positions, e.g. insertion stations, robots, moving workbenches and more.

- 2 protective/warning fields
- Possibility of connecting two S300 units to form a single system
- Static protective field switching
- New multi-system "Configuration & Diagnostic Software" CDS

## In-system added value

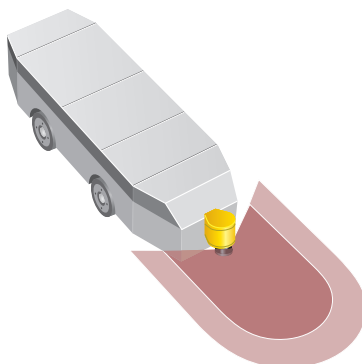
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

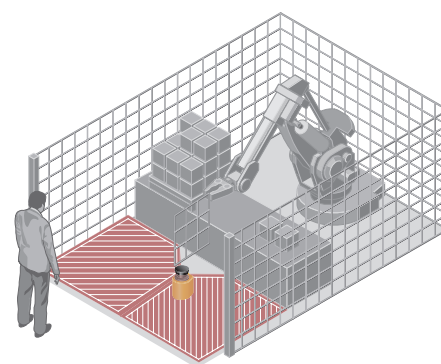
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations
- Robot cells
- Overhead monorail transport systems



Hazardous area protection on an AGV with one direction of travel



Hazardous area protection on a robot cell with two operating areas

Further information	Page
→ Dimensional drawings	C-51
→ Connection diagrams	C-53
→ Accessories	C-54
→ Services	A-2

## Ordering information

Delivery S300

- Safety laser scanner
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-54

Type	Part number
S30B-2011CA	1026821

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 und 1040.11, IEC 60825-1:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Optics cover material	Polycarbonate
Optics cover surface finish	Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	102 mm x 152 mm x 105 mm
Weight	1.2 kg

### Functional data

Scan angle	270°
Protective field range	2 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	80 ms
Resolution	30 mm, 40 mm, 50 mm, 70 mm, selectable
Angular resolution	0.5°
Protective field supplement	100 mm
Warning field range	8 m (at 30 % reflectivity)
Distance measuring range	30 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

Continued on next page

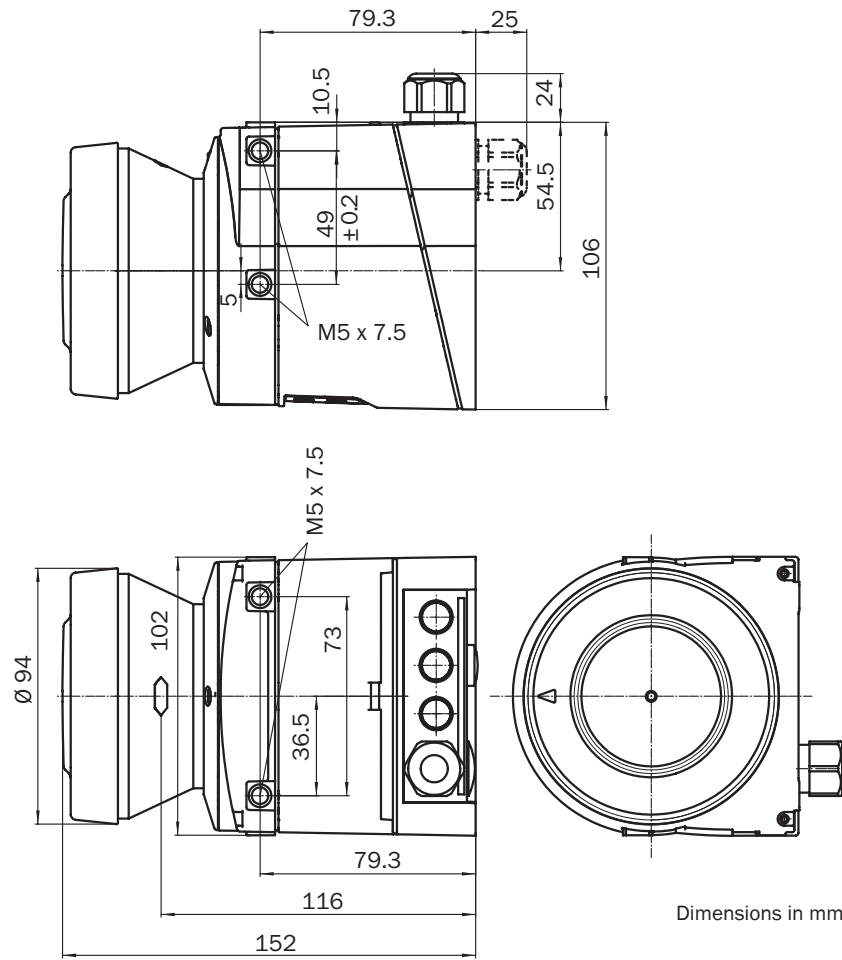
## Electrical data

Connection type	Plug-in connection housing with screw
Connector technology	Screw-type terminals
Supply voltage $V_s$	24 V DC (16.8 V DC ... 30 V DC)
Power consumption	0.33 A (24 V DC)
Power consumption	1.65 A <sup>1)</sup>
Number of inputs	
EDM	1
Restart/Reset	1
Static switching signals	1, dual-channel
Standby	1
Number of safety capable outputs	
Safety outputs (OSSD)	2 x 250 mA
Output for warning field	1 x 100 mA
Diagnostic output	1 x 100 mA
Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232
Transmission rate	38.4 kBaud
EFI – safe SICK device communication	
Transmission rate	500 kBaud
Cable length	50 m
Connection conductor cross-section	0.22 mm <sup>2</sup>

<sup>1)</sup> Including maximum output load

# Dimensional drawings

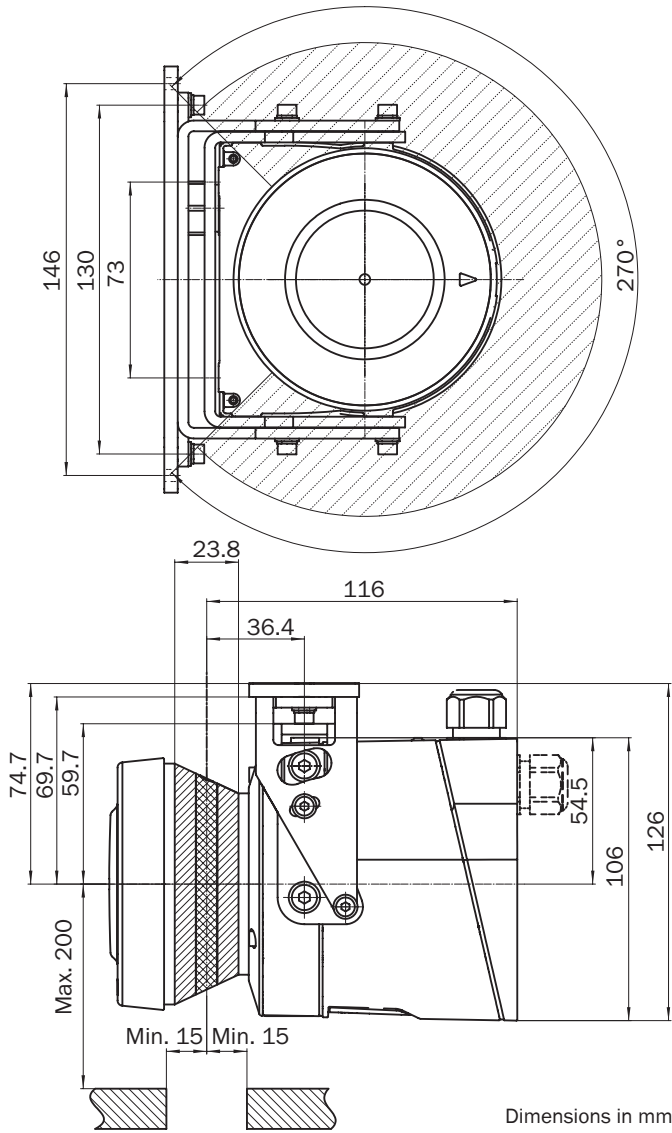
S300



C

Scan plane origin

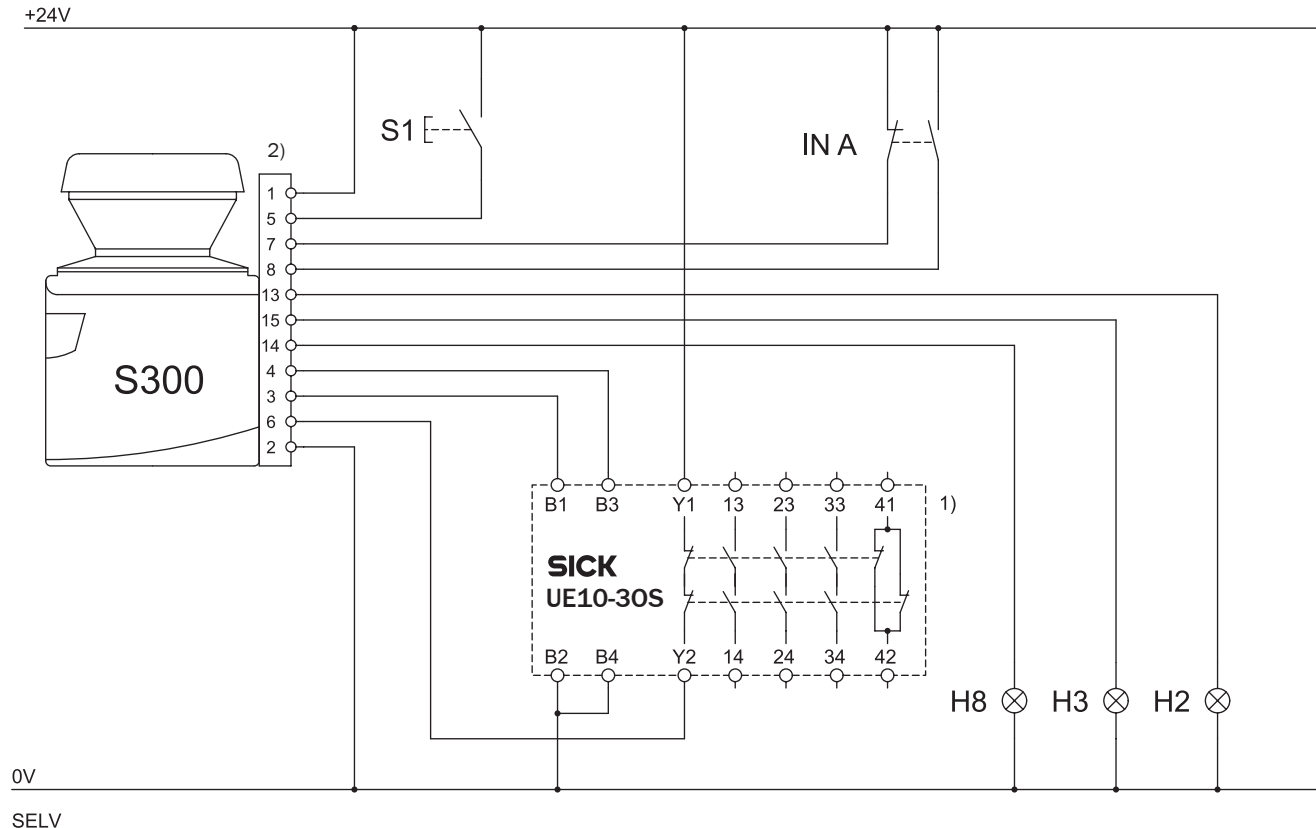
C



# Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

## Protective field switching with one pair of static inputs



- S300 Advanced in conjunction with UE10-30S
- Operating mode: with restart interlock and external device monitoring (EDM)
- Protective field switching by means of control input IN A




**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration

must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

## Accessories

### Mounting systems

→ Dimensional drawings mounting accessories Page C-55

Type	Mounting	Adjustment	Note	Part number
Mounting kit 1a	Mounting bracket for mounting at the rear on wall or machine	—	—	2034324
Mounting kit 1b	Mounting bracket for rear mounting on wall or machine with protection of optics cover	—	—	2034325
Mounting kit 2	Mounting bracket	Cross-wise adjustment possible	Only in conjunction with mounting kit 1a or 1b	2039302
Mounting kit 3		Longitudinal adjustment possible	Only in conjunction with mounting kit 2	2039303

### System plugs

Connection type	Number of cores	Cable length	Type	Part number
Without cable	—	—	SX0B-A0000G	2032807
Pre-assembled	15	5 m	SX0B-B1505G	2034264
		10 m	SX0B-B1510G	2034265

### Connection cables

Type	Number of cores	Cable length	Part number
Connection cable	15	100 m	6030795
EFI connection cable	—	By the meter	6029448



**Cable gland**

Usage	Size of the cable gland	Part number
For EFI connections	M12	5308757

**Configuration connection cables**

Description	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Power supply units**

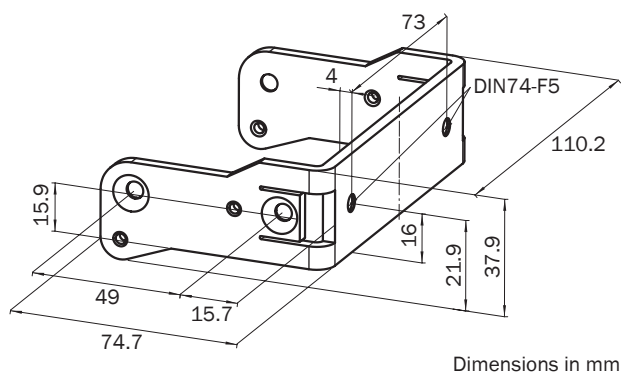
Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
		4 A	6010362

**Miscellaneous**

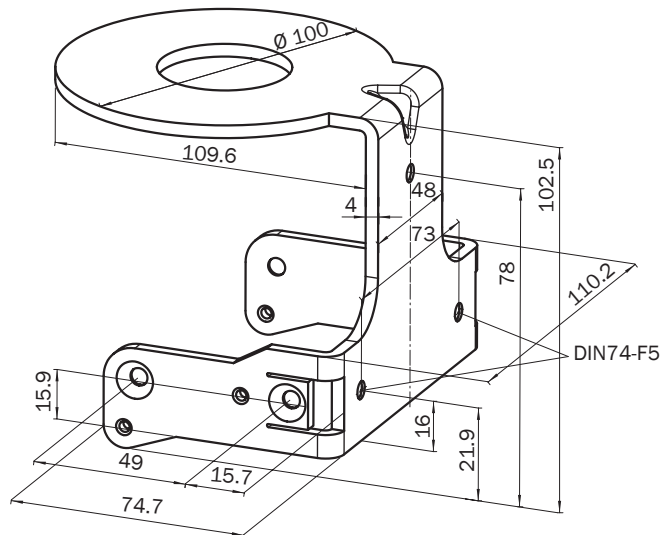
Type	Description	Part number
Optic cover	Spare parts set for optic cover with replacement seal and screws	2039248
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353

**Dimensional drawings mounting accessories**

**Mounting kit 1a**

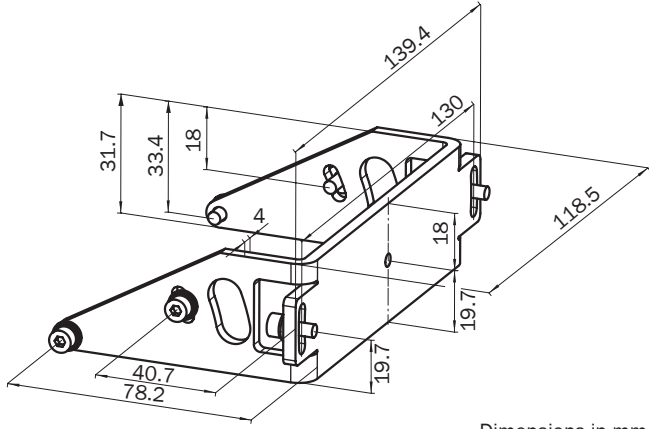


**Mounting kit 1b**



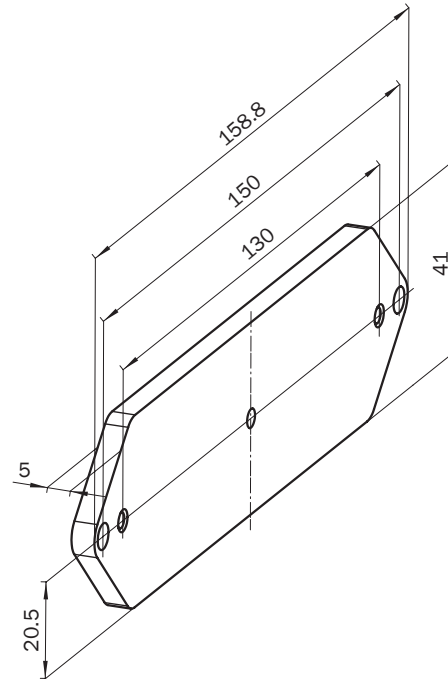
C

Mounting kit 2



Dimensions in mm

Mounting kit 3



## Overview of technical specifications

Protective field range	2 m
Warning field range	8 m (at 30 % reflectivity)
Number of field sets	1
Scan angle	270°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, selectable
Response time	80 ms
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)

## Product description

High-end safety at entry level price  
 The low-cost solution for simple requirements with one protective field and warning field.  
 Ideal for the horizontal and vertical protection of hazardous areas and areas of access.

With adjustable object resolution as well as configurable "contour as reference".

- 1 protective and warning field
- New multi-system "Configuration & Diagnostic Software" CDS

## In-system added value

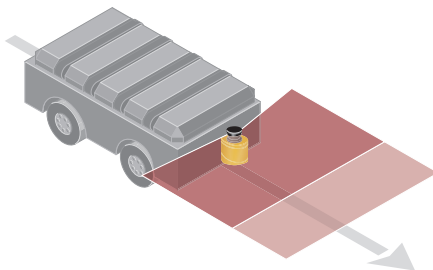
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

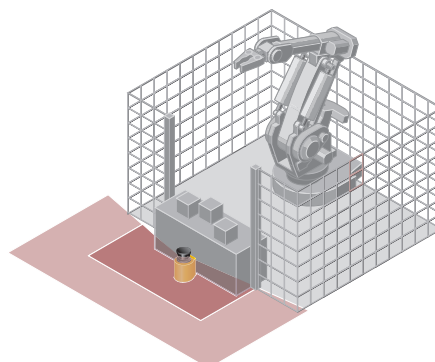
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Freely moving transport vehicles
- Production lines
- Machining centres
- Entry/Exit stations
- Robot cells
- Overhead monorail transport systems



Hazardous area protection on an AGV with one direction of travel



Hazardous area protection on a robot cell



- Extremely compact design
- Scanning angle 270°
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)
- Stand-by input



Further information	Page
→ Ordering information	C-58
→ Technical specifications	C-58
→ Dimensional drawings	C-59
→ Connection diagrams	C-61
→ Accessories	C-62
→ Services	A-2

## Ordering information

Delivery S300

- Safety laser scanner
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-62

Type	Part number
S30B-2011BA	1026820

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 und 1040.11, IEC 60825-1:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 3 (IEC/EN 61496-3)
Safety integrity level	SIL2 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Optics cover material	Polycarbonate
Optics cover surface finish	Outside with scratch-resistant coating
System plug	With ESD protected configuration memory
Dimensions (W x H x D)	102 mm x 152 mm x 105 mm
Weight	1.2 kg

### Functional data

Scan angle	270°
Protective field range	2 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	80 ms
Resolution	30 mm, 40 mm, 50 mm, 70 mm, selectable
Angular resolution	0.5°
Protective field supplement	100 mm
Warning field range	8 m (at 30 % reflectivity)
Distance measuring range	30 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

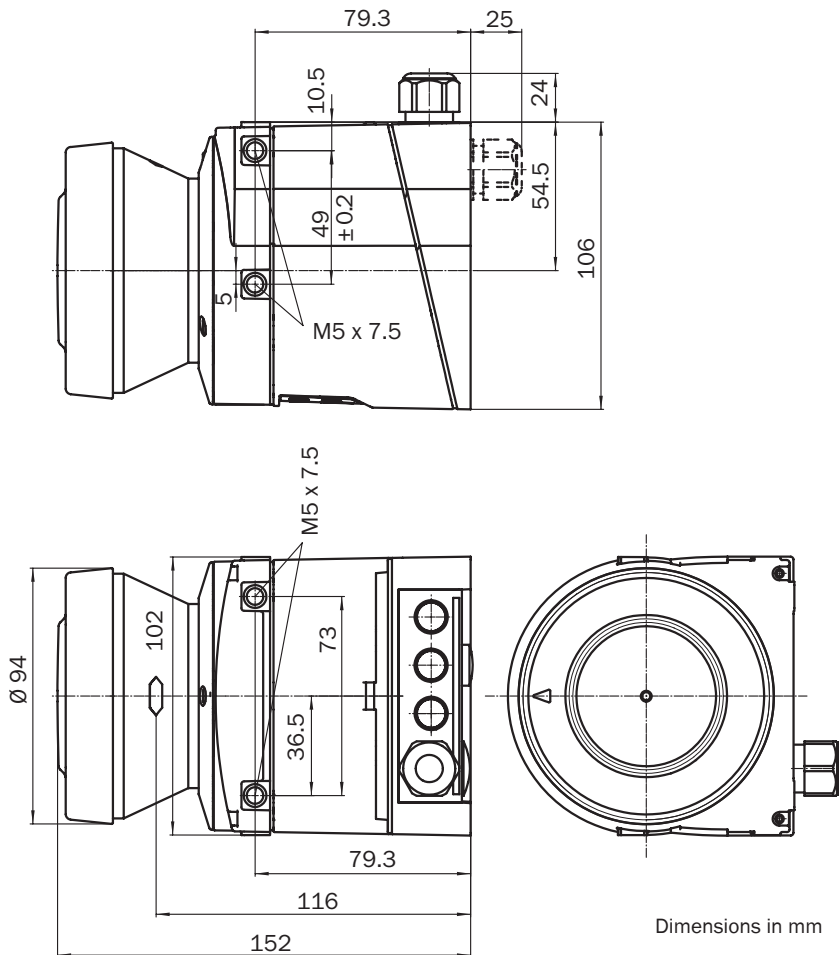
**Electrical data**

Connection type	Plug-in connection housing with screw	
Connector technology	Screw-type terminals	
Supply voltage $V_s$	24 V DC (16.8 V DC ... 30 V DC)	
Power consumption	0.33 A (24 V DC)	
Power consumption	1.65 A <sup>1)</sup>	
Number of inputs	EDM	1
	Restart/Reset	1
	Standby	1
Number of safety capable outputs	Safety outputs (OSSD)	2 x 250 mA
	Output for warning field	1 x 100 mA
	Diagnostic output	1 x 100 mA
	Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232	
	Transmission rate	38.4 kBaud

<sup>1)</sup> Including maximum output load

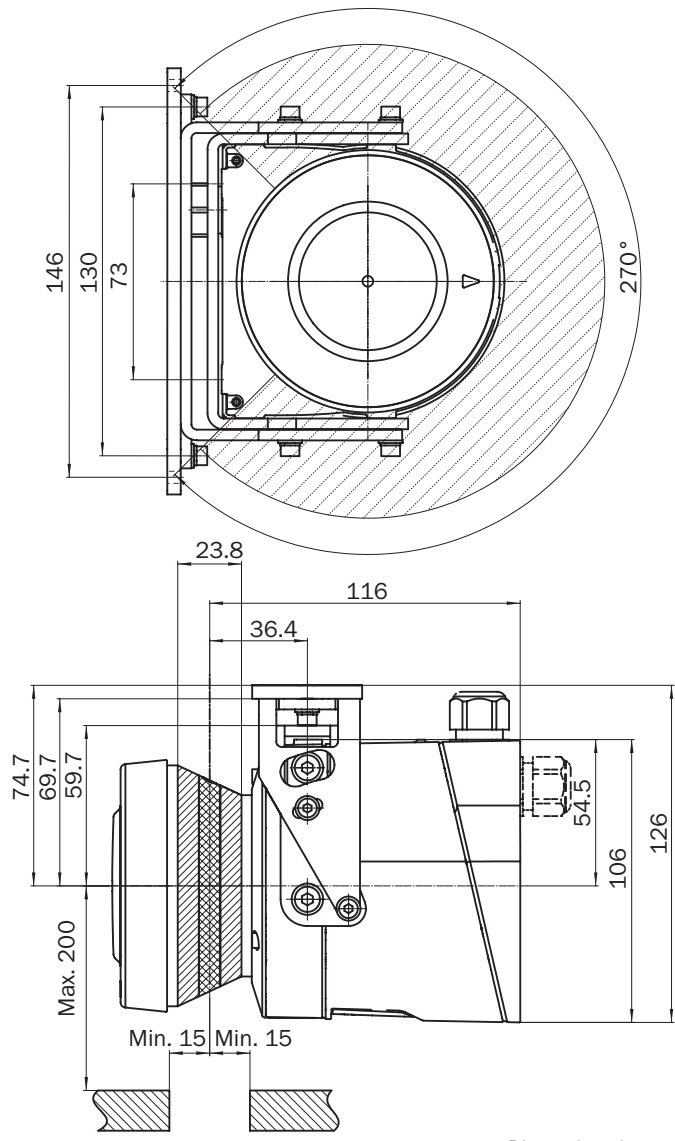
**Dimensional drawings**

**S300**



Scan plane origin

C

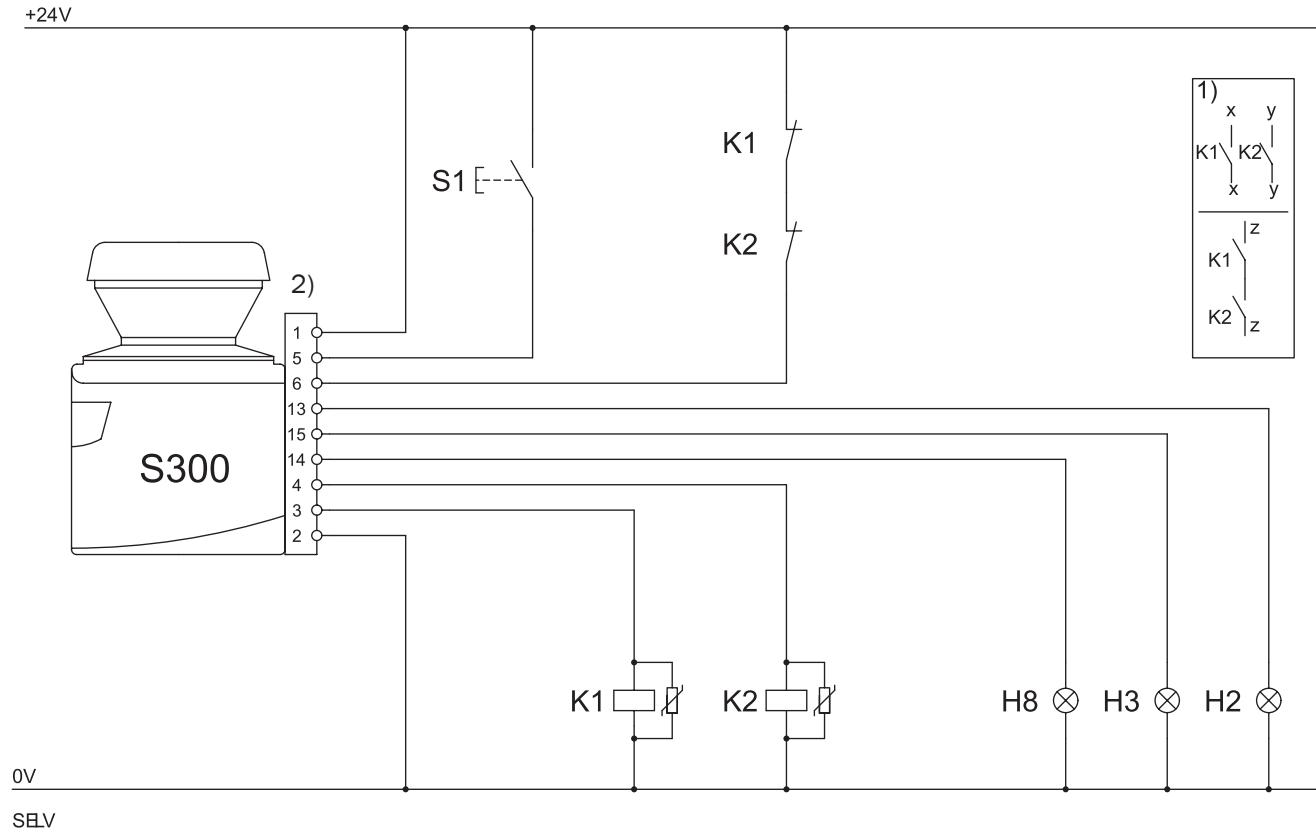


Dimensions in mm

# Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

## With restart interlock and external device monitoring



- S300 Standard in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)

**Comments**

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration




must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).

C

## Safe control solutions

C

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

## Accessories

### Mounting systems

→ Dimensional drawings mounting accessories Page C-63

Type	Mounting	Adjustment	Note	Part number
Mounting kit 1a	Mounting bracket for mounting at the rear on wall or machine	—	—	2034324
Mounting kit 1b	Mounting bracket for rear mounting on wall or machine with protection of optics cover	—	—	2034325
Mounting kit 2	Mounting bracket	Cross-wise adjustment possible	Only in conjunction with mounting kit 1a or 1b	2039302
Mounting kit 3		Longitudinal adjustment possible	Only in conjunction with mounting kit 2	2039303

### System plugs

Connection type	Number of cores	Cable length	Type	Part number
Without cable	—	—	SX0B-A0000G	2032807
Pre-assembled	11	5 m	SX0B-B1105G	2032859
		10 m	SX0B-B1110G	2032860
		20 m	SX0B-B1120G	2032861

### Connection cable

Type	Number of cores	Cable length	Part number
Connection cable	15	100 m	6030795



**Configuration connection cables**

Description	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314



**Power supply units**

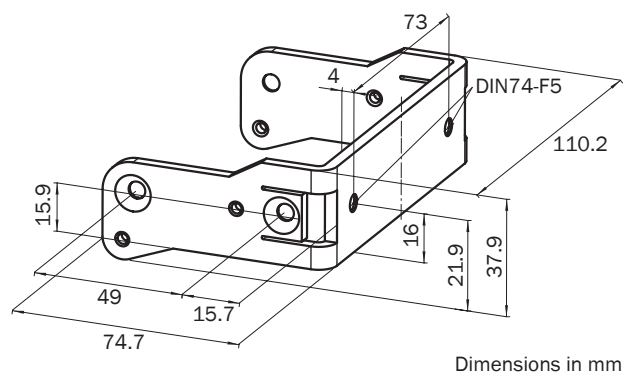
Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
4 A		6010362	

**Miscellaneous**

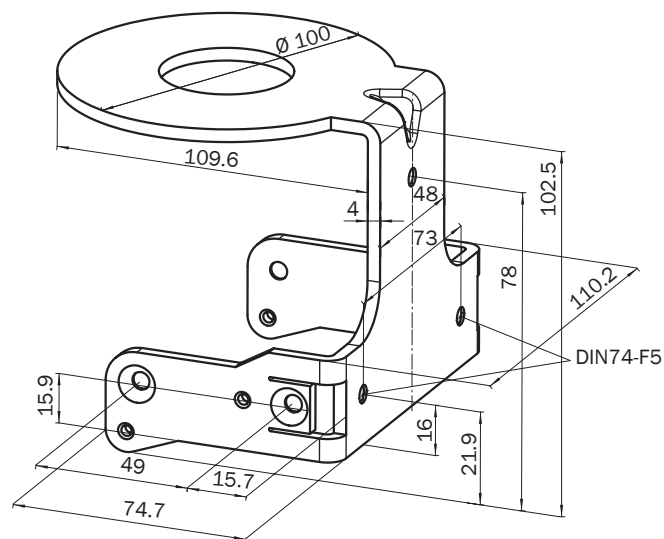
Type	Description	Part number
Optic cover	Spare parts set for optic cover with replacement seal and screws	2039248
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353

**Dimensional drawings mounting accessories**

**Mounting kit 1a**

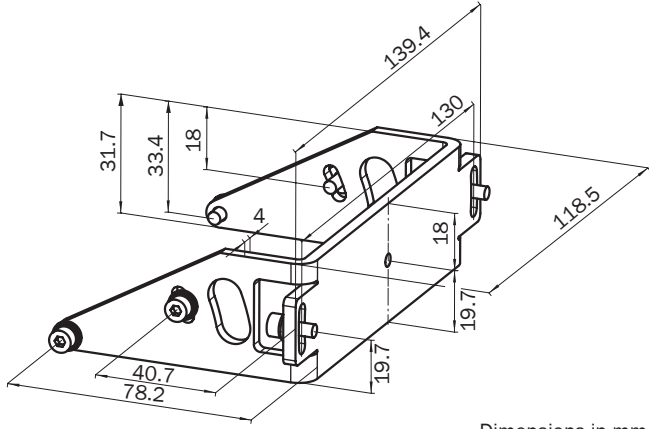


**Mounting kit 1b**



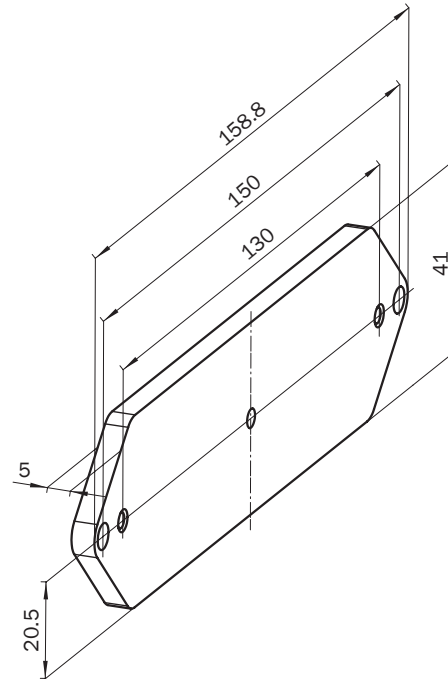
C

Mounting kit 2



Dimensions in mm

Mounting kit 3



## Overview of technical specifications

Protective field range	1.5 m
Warning field range	8 m (at 30 % reflectivity)
Number of field sets	1
Scan angle	270°
Resolution	30 mm, 40 mm, 50 mm, 70 mm, selectable
Response time	80 ms
Type	Type 2 (IEC/EN 61496-1)
Safety integrity level	SIL1 (IEC/EN 61508)

## Product description

State-of-the-art type 2 solution.

Finally a system that meets the requirements of type 2 in accordance with IEC/EN 61496 at the highest technical level and at astoundingly low cost.

The S200 is flexible and easy to integrate, can be used horizontally and vertically, and

impresses with its adjustable object resolution as well as the contour as reference function.

- 1 protective/warning field (field set)
- New uniform "Configuration & Diagnostic Software" CDS

## In-system added value

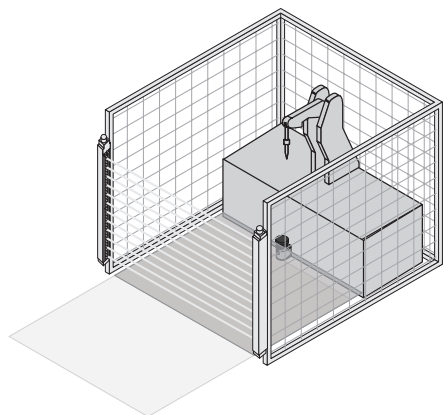
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

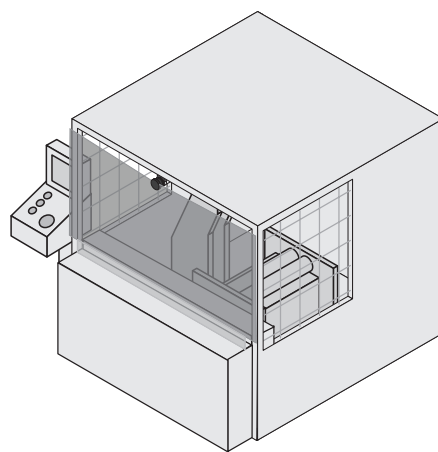
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Machining centres
- Entry/Exit stations
- Robot cells
- Overhead monorail transport systems



Point-of-operation guarding on a robot cell using S200 in conjunction with safety light curtain



Hazardous point protection on a small automatic placement machine



- Extremely compact design
- Scanning angle 270°
- Selectable resolution
- Certified for vertical use
- 7-segment display
- Integrated external device monitoring (EDM)
- Stand-by input



Further information	Page
→ Ordering information	C-66
→ Technical specifications	C-66
→ Dimensional drawings	C-68
→ Connection diagrams	C-70
→ Accessories	C-71
→ Services	A-2

## Ordering information

Delivery S200

- Safety laser scanner
- Operating instructions and CDS (Configuration & Diagnostic Software) on CD-ROM
- Adhesive label "important information"

The system plug has to be ordered separately!

→ Ordering information system plug and accessories Page C-71

Type	Part number
S20B-1011BA	1026823

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

Laser protection class	1 (21 CFR 1040.10 und 1040.11, IEC 60825-1:2001)
Enclosure rating	IP 65 (EN 60529)
Protection class	2 (DIN VDE 0160, DIN EN 50178)
Type	Type 2 (IEC/EN 61496-1)
Safety integrity level	SIL1 (IEC/EN 61508)
Ambient operating temperature from ... to	-10 °C ... +50 °C
Type of light	Pulsed laser diode
Wave length	905 nm
Housing colour	RAL 1021 (rape yellow)
Housing material	Aluminium die-cast
Optics cover material	Polycarbonate
Optics cover surface finish	Outside with scratch-resistant coating
Dimensions (W x H x D)	102 mm x 152 mm x 105 mm
Weight	1.2 kg

### Functional data

Scan angle	270°
Protective field range	1.5 m
Reflectivity	Reflectors 1.8 % ... >1000 %
Response time	80 ms
Resolution	30 mm, 40 mm, 50 mm, 70 mm, selectable
Angular resolution	0.5°
Protective field supplement	100 mm
Warning field range	8 m (at 30 % reflectivity)
Distance measuring range	30 m
Number of multiple samplings	2 ... 16, configurable via CDS
Reset time	2 s ... 60 s, configurable

## Electrical data

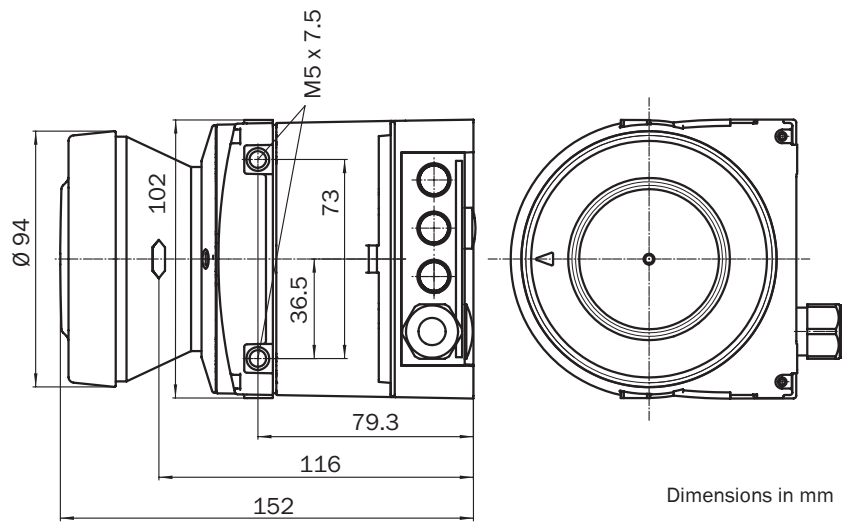
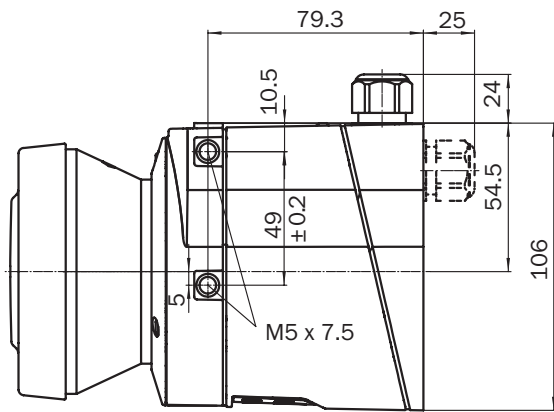
Connection type	Plug-in connection housing with screw
Connector technology	Screw-type terminals
Supply voltage $V_s$	24 V DC (16.8 V DC ... 30 V DC)
Power consumption	0.33 A (24 V DC)
Power consumption	1.65 A <sup>1)</sup>
Number of inputs	
EDM	1
Restart/Reset	1
Standby	1
Number of safety capable outputs	
Safety outputs (OSSD)	2 x 250 mA
Output for warning field	1 x 100 mA
Diagnostic output	1 x 100 mA
Restart/reset required	1 x 100 mA
Configuration and diagnostics interface	RS-232
Transmission rate	38.4 kBaud

<sup>1)</sup> Including maximum output load

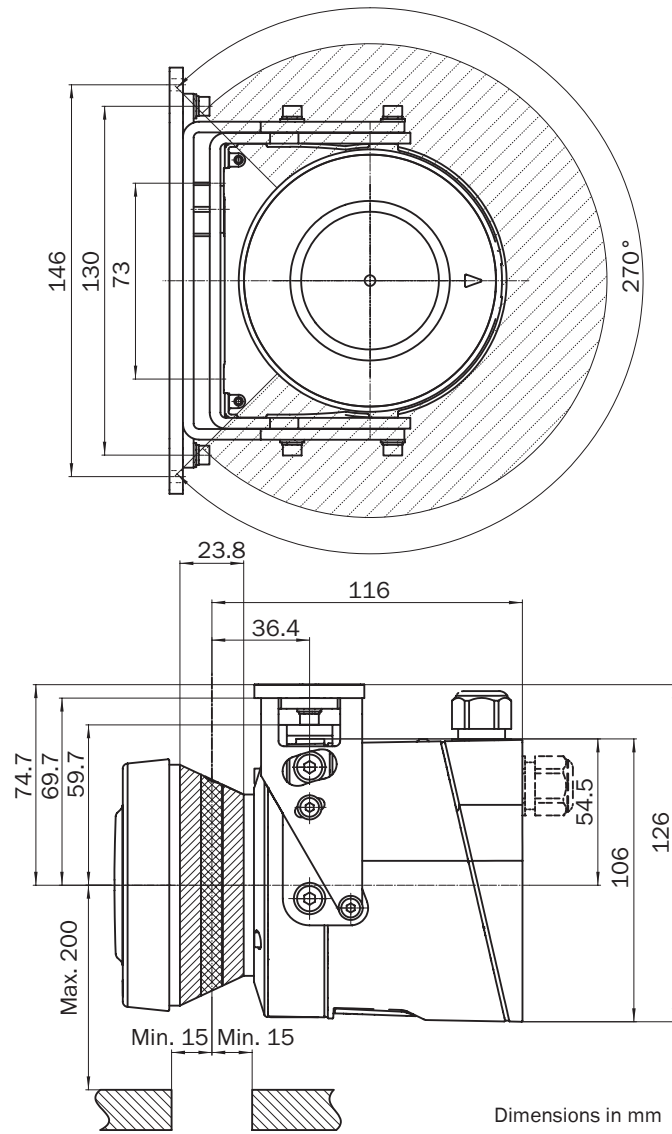
C

## Dimensional drawings

S200



Scan plane origin

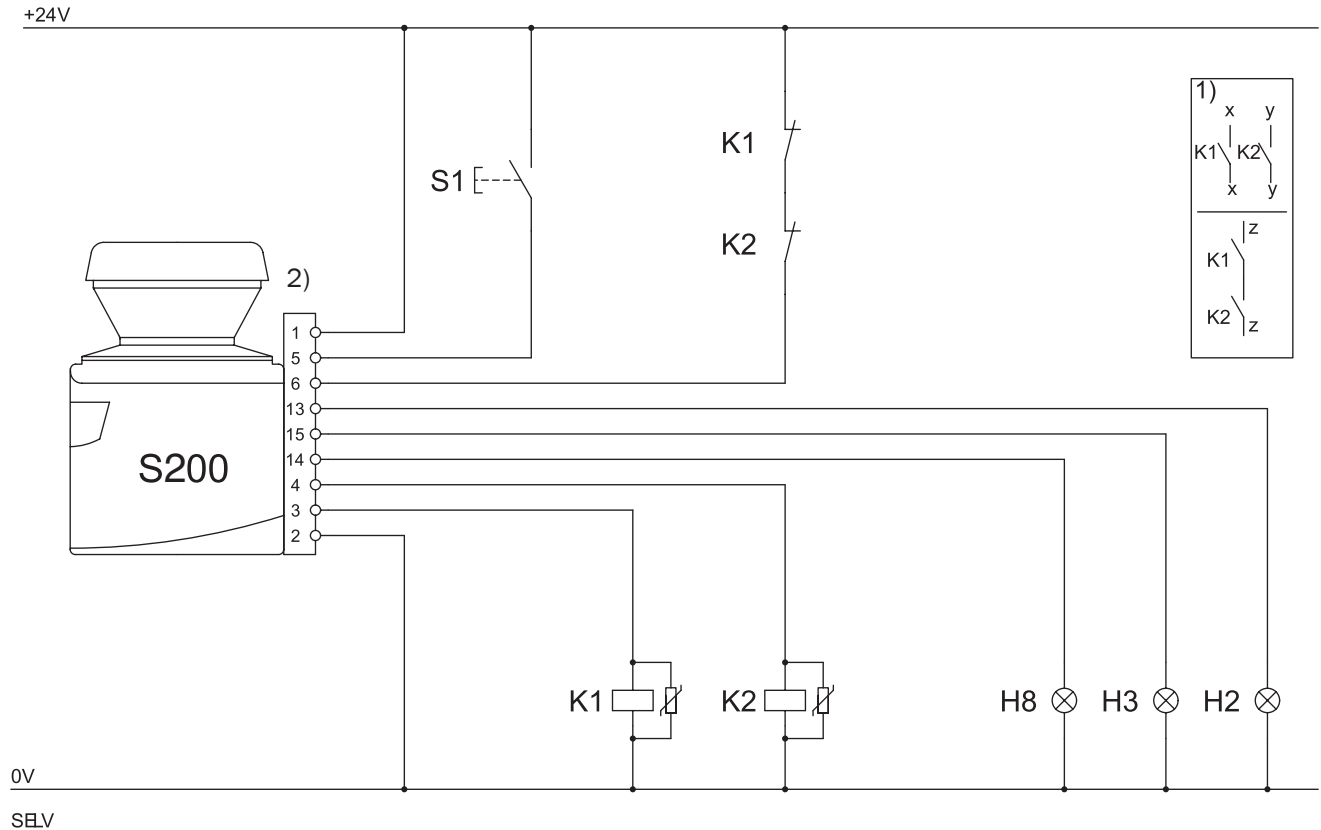


C

## Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

### With restart interlock and external device monitoring



- S200 in conjunction with relays/contactors
- Operating mode: with restart interlock and external device monitoring (EDM)

#### Comments




1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration

must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) Functional earth (FE): To achieve the specified EMC safety, the functional earth (FE) must be connected (e.g. to the central earth star point on the vehicle or the system).



## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

C

## Accessories

### Mounting systems

→ Dimensional drawings mounting accessories Page C-72

Type	Mounting	Adjustment	Note	Part number
Mounting kit 1a	Mounting bracket for mounting at the rear on wall or machine	—	—	2034324
Mounting kit 1b	Mounting bracket for rear mounting on wall or machine with protection of optics cover	—	—	2034325
Mounting kit 2	Mounting bracket	Cross-wise adjustment possible	Only in conjunction with mounting kit 1a or 1b	2039302
Mounting kit 3		Longitudinal adjustment possible	Only in conjunction with mounting kit 2	2039303

### System plugs

Connection type	Number of cores	Cable length	Type	Part number
Without cable	—	—	SX0B-A0000G	2032807
Pre-assembled	11	5 m	SX0B-B1105G	2032859
		10 m	SX0B-B1110G	2032860
		20 m	SX0B-B1120G	2032861

### Connection cable

Type	Number of cores	Cable length	Part number
Connection cable	15	100 m	6030795

**Configuration connection cables**

Description	Connection type	Cable length	Part number
For connecting the configuration connection to the PC	M8 x 4, SUB-D 9-pol	2 m	6021195
		8 m	2027649

**Configuration software**

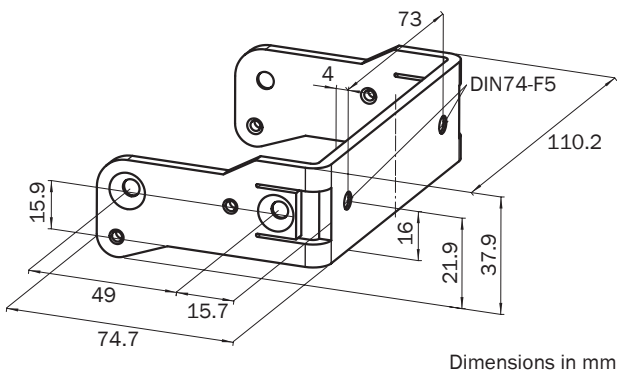
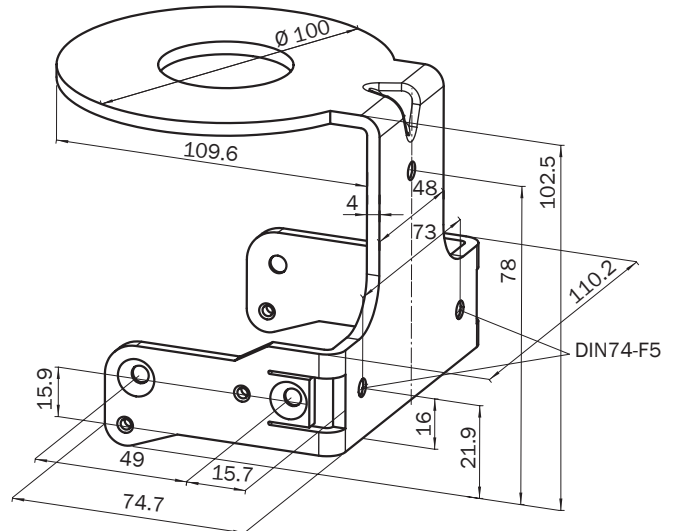
Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Power supply units**

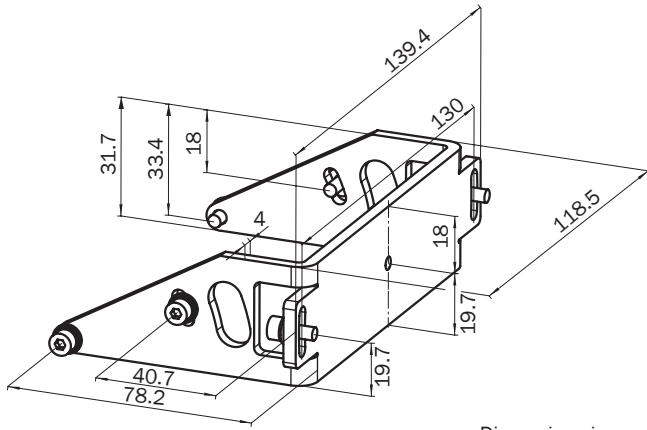
Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790
120 V AC, 230 V AC		2.5 A	6010361
		4 A	6010362

**Miscellaneous**

Type	Description	Part number
Optic cover	Spare parts set for optic cover with replacement seal and screws	2039248
Plastic cleaner	Plastic cleaner and care product, anti-static	5600006
Lens cloth	Cloth for cleaning the front screen	4003353

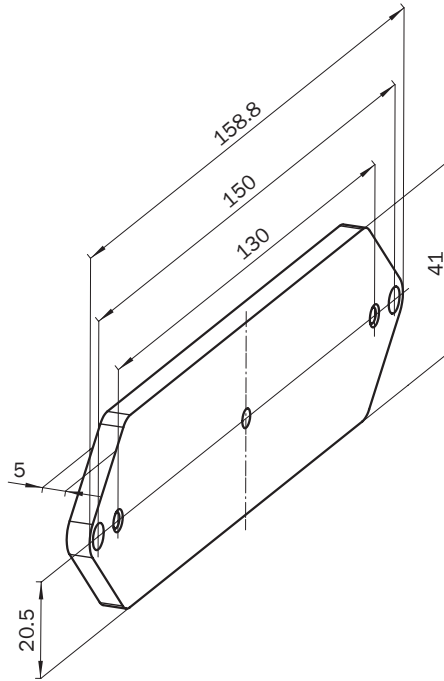
**Dimensional drawings mounting accessories****Mounting kit 1a****Mounting kit 1b**

**Mounting kit 2**



Dimensions in mm

**Mounting kit 3**

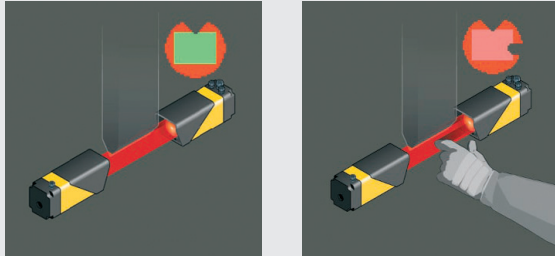


C

## Principle of operation of V4000 Press Brake

The V4000 PB is a camera-based system for complete protecting of hazardous points on press brakes. It is a compact system, consisting of a sender and a receiver, mounted on the upper beam of the press to protect against the hazardous fast

closing movement. It provides a safety volume below the punch line and its Output Signal Switching Devices (OSSD) deliver a stop signal to the press controller in order to stop the movement, in case a finger or hand has been detected.



### V4000 Press Brake applications

Monitoring of the protection volume:

The V4000 PB monitors the protection volume directly below the upper tool.

Each infringement of the protection volume generates a dual-channel signal resulting in a safe stop of the press brake. The resolution of the V4000 PB is better than 14 mm.

## Advantages of V4000 Press Brake

### Operator

- Because of foot switch monitoring, both hands free to handle the metal sheet
- Maximum safety for finger and hand protection
- Resolution better than 14 mm
- Simple and fast tool changes due to large tolerance bands
- Self-learning modes simplifies material change
- Interruption-free bending cycles
- Intuitive use
- LED and 7-segment display for fast diagnostics

### Production

- Maximum safety at maximum speed (up to 300 mm/s)
- Simple and fast retrofitting
- Can be used on older machines
- Reduction of downtimes through powerful diagnostic functions
- Vibration immunity even at emergency stops. The result is higher reliability
- Supports even complex bending tasks
- Maximum productivity through optimised machine cycles
- Worldwide service support for commissioning, maintenance, and repair



### Machine manufacturer

- Cat. IV, SIL3
- Approved technology
- Camera-based technology for complete protecting the hazardous area through generous protection volumes
- Compact safety solution
- Easy to integrate into all safety controllers
- Supports even complex bending sequences
- Complete integration into HMI possible
- Enables data exchange with machine controller
- Visualisation and diagnosis software

# Safety camera system V4000 Press Brake



D

Safety application	Protective field range (m)	Size of safety volume (mm)	Resolution (mm)	Safety		Product	Page
				Type 4 (IEC/EN 61496)	Safety integrity level SIL3 (IEC/EN 61508)		
 	0 ... 7.5	40 x 26	14	✓	✓	V4000 Press Brake	D-2



D

- Press brake protection
- Camera-based
- 7-segment display
- Integrated external device monitoring (EDM)
- Easy configuration via CDS



## Technical data overview

Protective field range	0 m ... 7.5 m
Size of safety volume	40 mm x 26 mm
Resolution	14 mm
Type	Type 4 (IEC/EN 61496)
Safety integrity level	SIL3 (IEC/EN 61508)

## Product description

The V4000 PB is a camera-based system for complete protecting of press brakes. It is a compact system, consisting of a sender and a receiver, mounted on the upper beam of the press to protect against the hazardous fast closing movement. It provides a safety volume below the punch line and its Output Signal Switching Devices (OSSD) deliver a stop signal to the press controller in order to stop the movement, in case a finger or hand has been detected.

- Camera-based system able to constantly monitor and adjust safety volume
- Maximises machine availability with self-optimising algorithms
- Comprehensive self-diagnostics
- Fast and simple configuration and installation
- High immunity against vibrations and contamination
- Optimised guard-only modes for most common bending tasks
- No unnecessary machine stops, reducing machine hydraulic stress

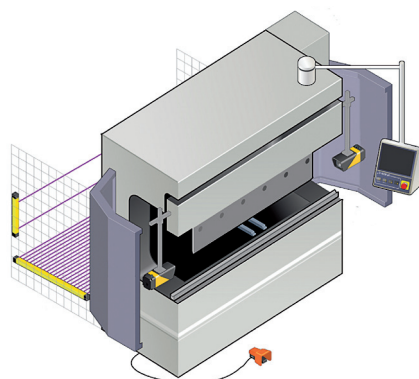
## In-system added value

- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

- Press brakes



V4000 mounted on a press brake

Further information	Page
→ Technical specifications	D-4
→ Dimensional drawings	D-5
→ Connection example	D-8
→ Accessories	D-9
→ Services	A-2

## Ordering information

---

Delivery V4000 Press Brake:

- V4000 Press Brake sender  
and  
V4000 Press Brake receiver
- Test piece
- Set of masks
- Operating instructions and CDS on CD-ROM
- Sticker: *Information for daily inspection*
- Magnetic plate for edge covering on the female die

→ Accessories see page D-9

Sender		Receiver	
Type	Part number	Type	Part number
V40PBS-0700000	1025765	V40PBE-0700000	1025766

**D**

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General system data

Laser protection class	Laser class 1M (21 CFR 1040.10 and 1040.11, IEC 60825-1:2001)
Protective field range	0 m ... 7.5 m
Size of safety volume	40 x 26 mm
Resolution	10 ... 14 mm
Protection class according to DIN VDE 0106, DIN EN 50178	III
Enclosure rating (IEC 60529)	IP 54
Supply voltage $V_S$ at device <sup>1)</sup>	24 V (19.2 V ... 28.8 V)
Synchronisation	Electrical
Type	Type 4 (IEC 61496 )
Safety integrity level	SIL3 (IEC 61508 )

### Sender

Power consumption	Max. 0.2 A
-------------------	------------

### Receiver

Output signal switching devices (OSSDs)	2 PNP semiconductors (short-circuit protected <sup>2)</sup> /cross-circuit monitored)
Response time T1	10 ms
Switching voltage HIGH (active, $V_{eff}$ )	24 V ( $V_S - 2.7 V \dots V_S$ )
Switching voltage LOW (inactive)	0 V (0 V ... 3.5 V)
Switching current	0 mA ... 500 mA
Power consumption	Max. 0.5 A (without OSSD)
Application diagnostic output for teach-in request, set speed request $V_{slow}$	PNP semiconductor, short-circuit protected <sup>2)</sup>
Switching voltage HIGH (active)	24 V ( $V_S - 3.3 V \dots V_S$ )
Switching voltage LOW (inactive)	High resistance
Switching current	0 mA ... 200 mA

### Betriebsdaten

Connection	Plug-in connection housing with screw terminal connections
Length of cable <sup>3)</sup>	Max. 30 m
Wire cross-section	Min. 0.14 mm <sup>2</sup>
Ambient operating temperature	0 °C ... +50 °C
Air humidity	15 % ... 95 %, non-dewing
Storage temperature	-25 °C ... +70 °C (max. 24 h)
Vibration resistance	5 g, 10 Hz ... 100 Hz (IEC 61496-1, sections 5.1.2 and 5.4.2)
Shock resistance	
Single shock	15 g, 11 ms (EN 60068-2-27)
Continuous shock	10 g, 16 ms (IEC/EN 61496-1, sections 5.1.2 and 5.4.4.2)

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

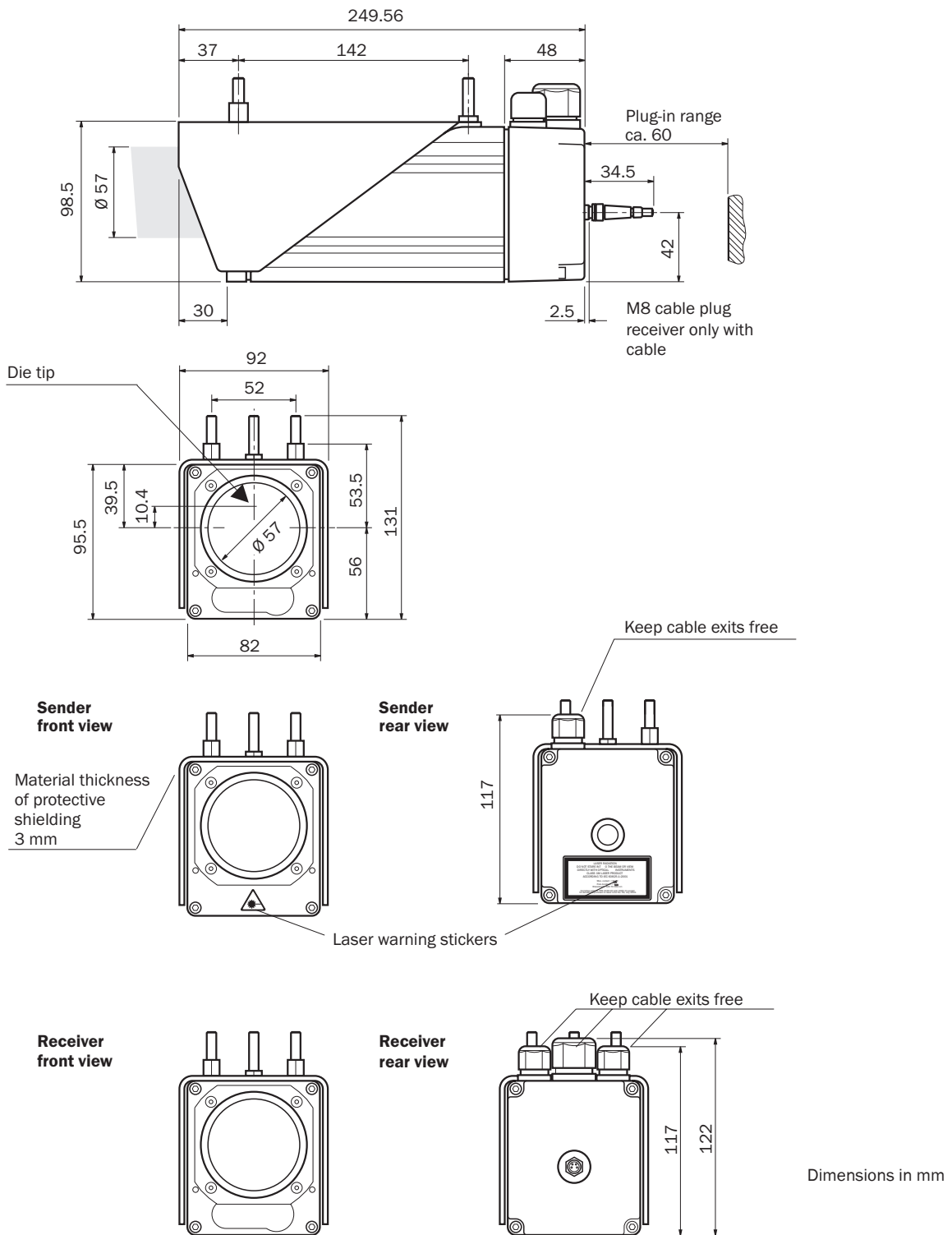
<sup>2)</sup> Applies to the voltage range between -30 V and +30 V

<sup>3)</sup> Depending on load, power supply and wire cross-section. The technical specifications must be observed.



# Dimensional drawings

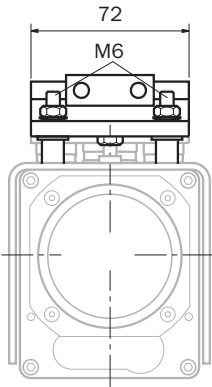
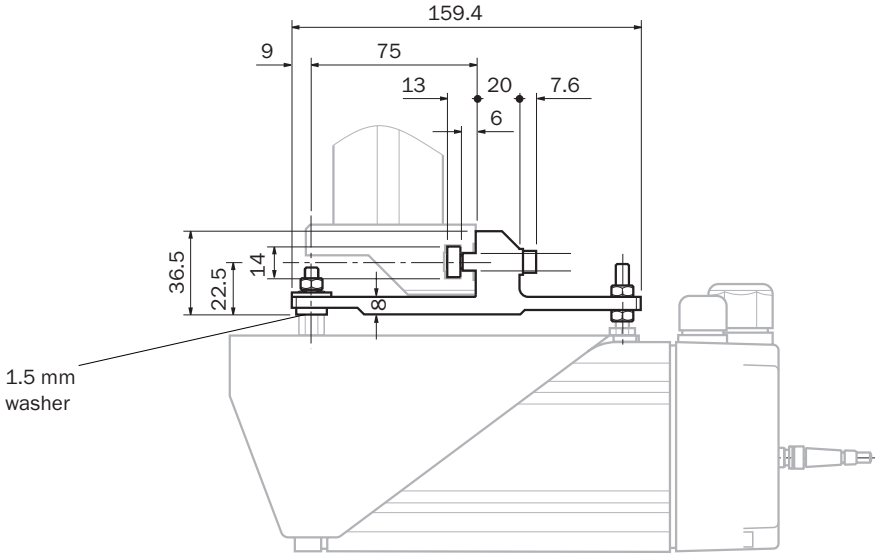
## Sender and receiver



Dimensions in mm

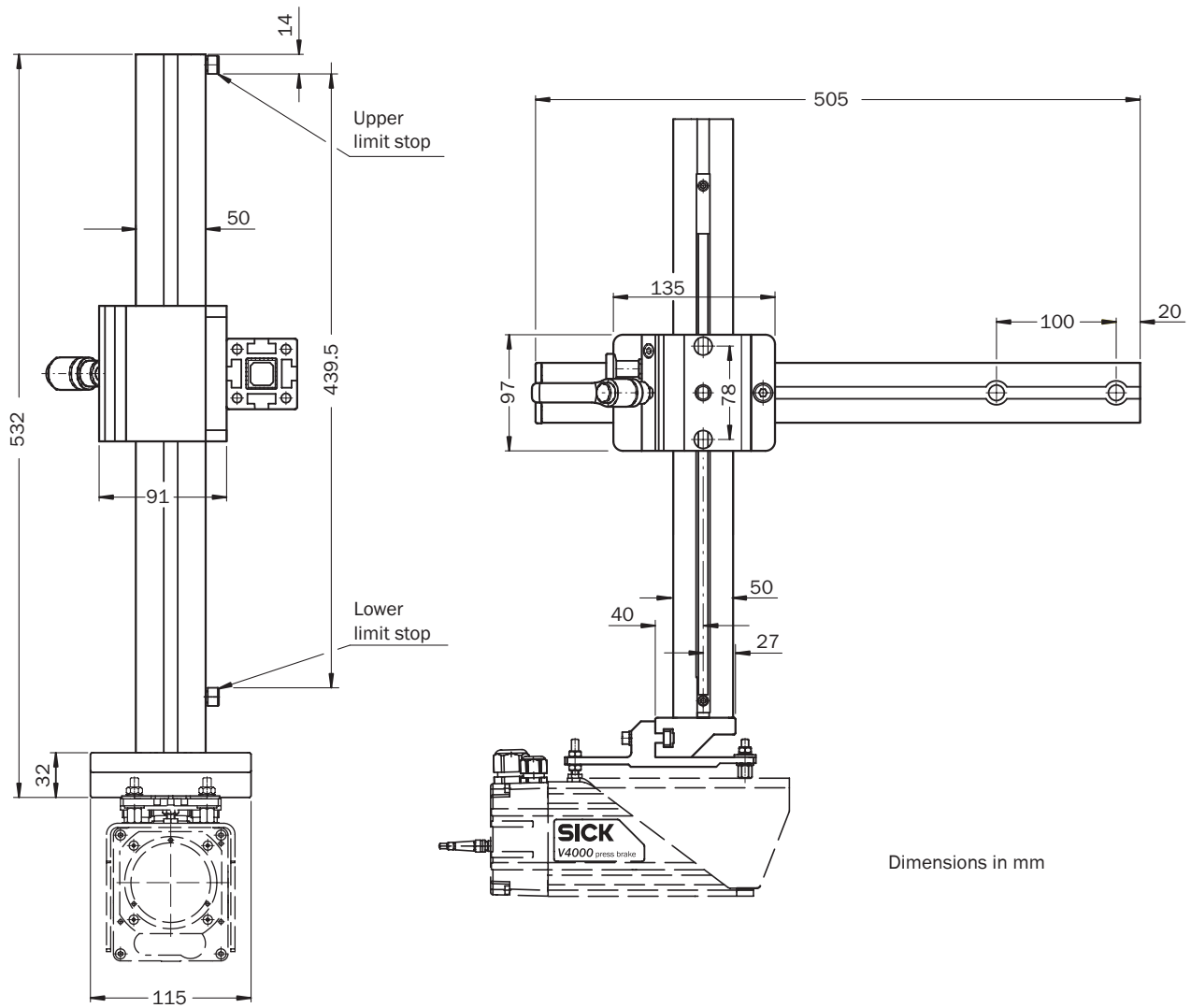
Mounting kit 1

D



Dimensions in mm

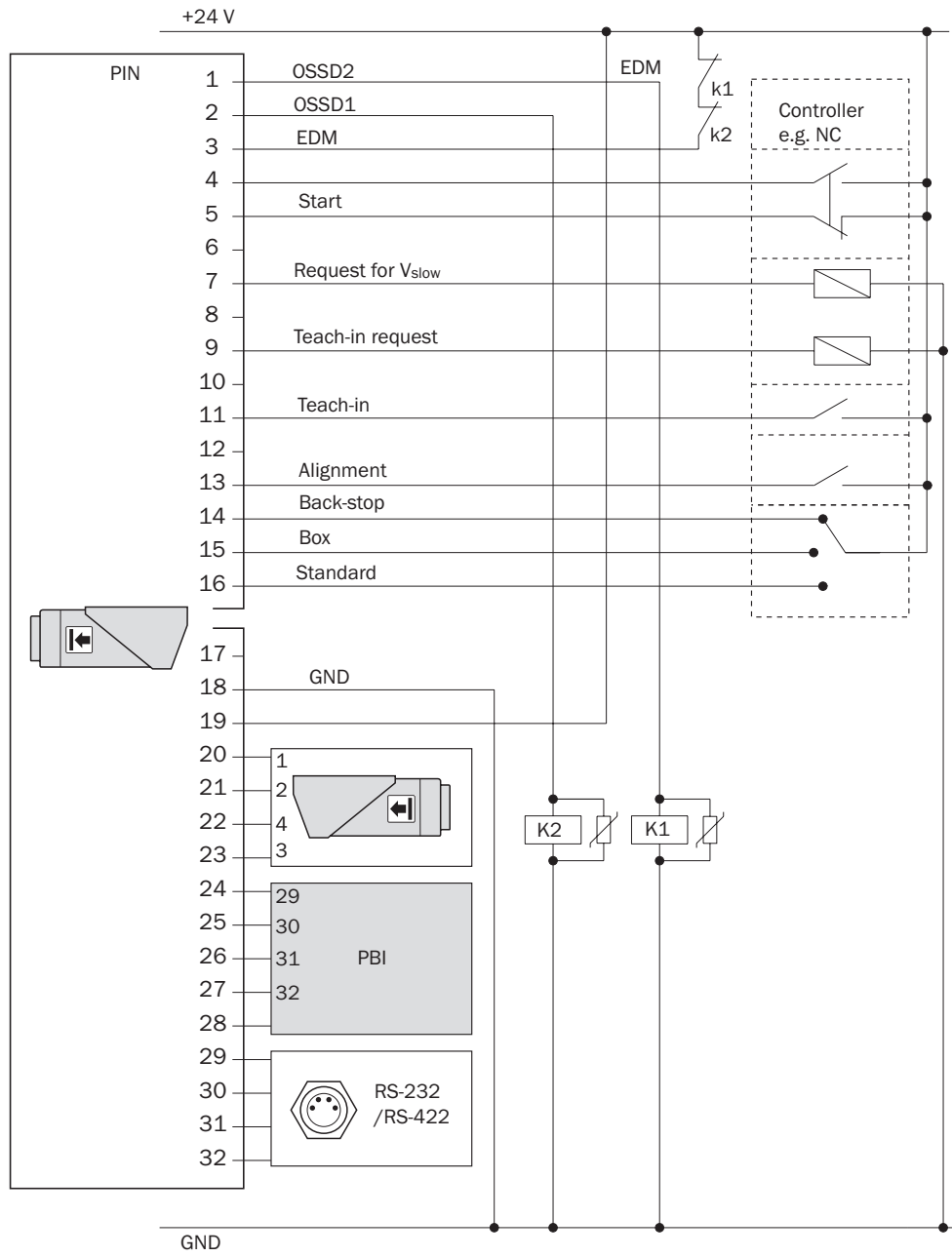
Mounting kit 2



D

# Connection example V4000 Press Brake

D



## Accessories

Part	Description	Part number
PBI (Press Brake Interface)		1026798
Spare part set PBI plug	<ul style="list-style-type: none"> <li>■ With extractor for PBI, 16-pin</li> <li>■ 2 pieces</li> </ul>	2032051
Spare part set V4000 PB plug	<ul style="list-style-type: none"> <li>■ Receiver 16-pin</li> <li>■ 2 pieces</li> </ul>	2032052
Set of masks	<ul style="list-style-type: none"> <li>■ Receiver mask, sender mask, press crosshead mask</li> </ul>	2030829
Test object	<ul style="list-style-type: none"> <li>■ For protection volume monitoring</li> </ul>	4040724
Magnetic plate	<ul style="list-style-type: none"> <li>■ For covering the female die opening below the workpiece</li> </ul>	4040736

### Mounting systems

Part	Description	Part number
Mounting kit 1	<ul style="list-style-type: none"> <li>■ Alignment plate</li> <li>■ 2 pieces</li> </ul>	2031126
Mounting kit 2	<ul style="list-style-type: none"> <li>■ Mounting arm</li> <li>■ 2 pieces</li> </ul>	2031745

### Connector technology

Part	Description	Part number
Connecting cables (shielded) for self-configuration, yard ware, wire cross-section 0.34 mm <sup>2</sup>	<ul style="list-style-type: none"> <li>■ Sender - receiver, 4-pin, approved for trailing cables</li> </ul>	6029221
	<ul style="list-style-type: none"> <li>■ Receiver - PBI, 4-pin</li> </ul>	6029222
	<ul style="list-style-type: none"> <li>■ Receiver - control cabinet, 18-pin, approved for trailing cables</li> </ul>	6029223
Power supply	<ul style="list-style-type: none"> <li>■ 24 V DC, 2.5 A</li> </ul>	6010361
Service cable 2 m	<ul style="list-style-type: none"> <li>■ Connecting cable between configuration connection and serial PC interface</li> </ul>	6021195
Service cable 8 m	<ul style="list-style-type: none"> <li>■ M8 4-pin/SUB-D 9-pin (DIN 41642)</li> </ul>	2027649

D

## Principle of operation of safety light curtains

Safety light curtains are used for finger protection, hand protection and access protection. They comprise a sender unit and a receiver unit and are electro-sensitive. Depending on the type, various machine functions are integrated or can be selected

using safe control solutions: Restart interlock, external device monitoring, fixed/floating blanking, PSDI function, bypass function, operating mode selection, etc.

## Applications for safety light curtains

Presses, automatic placement machines, robot insertion stations, transfer lines, palletiser systems, textile and wood processing machines, etc.

### Tell us your application!

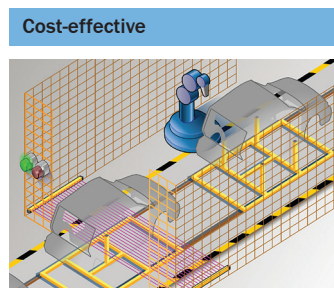
We will show you the most cost-effective solution.

## Advantages of the SICK safety light curtains

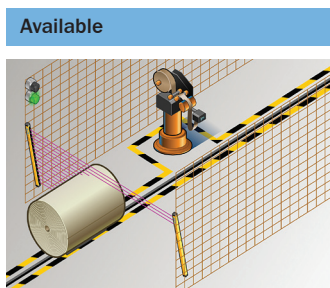
### Only invest in what you actually need!

Effective protection for man and machine – irrespective of the safety task you want to address, SICK can provide a comprehensive solution with a wide range of safety light curtains.

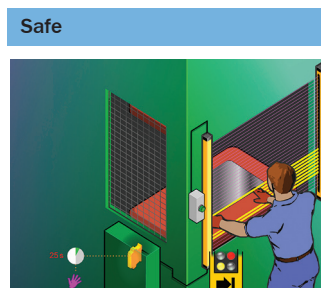
- Cost-saving complete systems with integrated functions for a wide range of requirements
- Rapid commissioning
- Individual adaptation using CDS user software or customer-specific pre-settings from the factory
- Can be used with large temperature fluctuations as well as in wet areas due to IP67 Housing
- Reduced engineering and stock-holding costs due to universal interface for various automation environments
- Integrated PSDI mode with defined PSDI window provides up to 30% higher productivity



**Cost-effective**  
Access protection:  
A safety light curtain without additional sensors and mechanics

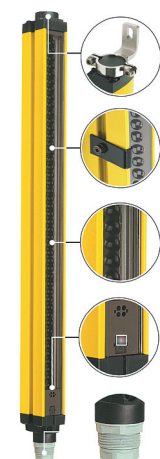



**Available**  
Access protection with differentiation between man and material using "blanking"



**Safe**  
Classic finger/hand protection:  
Defined PSDI window hinders unintentional cycle start caused by reaching over or reaching under

## Mounting and operation made easy



- Comprehensive range of mounting solutions and accessories provides a wide range of installation options
- Heavy-duty additional front screen for use with welding sparks
- Additional package enables ATEX applications in explosion-protected zones 2 and 22 (II cat. 3G/3D) 
- 7-segment display for device status with display that can be rotated by 180°
- All peripheral technologies can be incorporated using a universal interface: from the relay through safe control to the bus.

## Services for productive safety

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.

Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A

# Safety light curtains



E

Safety application	Type according to IEC 61496	Resolution (mm)	Functions										Product	Page
			External device	Restart interlock	Beam coding	Operating mode <sup>1)</sup>	PSDI mode <sup>1)</sup>	Blanking	Safe interface to bus systems	Muting	ATEX II 3G/3D <sup>7)</sup>			
 	Type 4	14/20/30/40	✓	✓	✓	✓	✓ <sup>1)</sup>	✓	✓ <sup>6)</sup>	✓ <sup>3)</sup>	✓	C4000 Advanced	E-2	
		14/30	✓	✓	✓	–	✓ <sup>4)</sup>	–	✓ <sup>6)</sup>	✓ <sup>2)</sup>	–	M4000 Advanced Curtain	E-23	
		14/20/30/40	✓	✓	✓	✓	✓ <sup>1)</sup>	–	✓ <sup>6)</sup>	✓ <sup>3)</sup>	✓	C4000 Standard	E-39	
			✓	✓	–	–	✓ <sup>4)</sup>	–	✓	✓ <sup>3)</sup>	–	C4000 Micro	E-68	
			✓	✓	–	–	✓ <sup>4)</sup>	–	✓	✓ <sup>3)</sup>	–	C4000 Micro in IP67 Housing	E-68	
		14/30	✓	✓	–	–	✓ <sup>4)</sup>	–	✓	✓ <sup>3)</sup>	–	C4000 Basic Plus	E-82	
			✓	–	–	–	✓ <sup>4)</sup>	–	✓	✓ <sup>3)</sup>	–	C4000 Basic	E-91	
		–	–	–	–	✓ <sup>4)</sup>	–	✓	✓ <sup>3)</sup>	–	C4000 Eco	E-101		
	Type 4	20	✓	✓	–	✓	–	–	✓ <sup>6)</sup>	–	✓	C4000 Entry/Exit	E-110	
			✓	✓	✓	✓	–	–	✓ <sup>6)</sup>	–	✓	C4000 Palletizer	E-117	
 	Type 2	20/30/40	✓	–	✓	–	–	–	✓	✓ <sup>5)</sup>	–	C2000 Standard	E-124	
		30	✓	–	✓	–	–	–	✓	✓ <sup>5)</sup>	–	C2000 Standard in IP67 Housing	E-137	
		20/30/40	✓	✓	✓	–	–	–	✓	✓ <sup>5)</sup>	–	C2000 RES/EDM	E-142	
			✓	–	✓	–	–	–	✓	✓ <sup>5)</sup>	–	C2000 Cascadable	E-155	
	Type 2 <sup>8)</sup>	30	✓	✓	–	–	–	✓	✓	–	–	LGT	E-165	

<sup>1)</sup> With UE402

<sup>2)</sup> With UE403

<sup>3)</sup> With UE410 Flexi

<sup>4)</sup> With UE470

<sup>5)</sup> With LE20 Muting

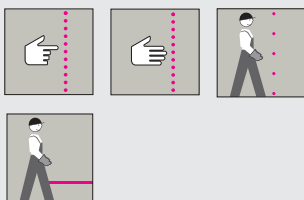
<sup>6)</sup> Safety network solutions with SDL interface expand the functionality of the devices and allow diagnostics and configuration

<sup>7)</sup> With ATEX package

<sup>8)</sup> Checked according to prEN 50100

→ Suitable device columns can be found beginning on page F-82

E



- External device monitoring (EDM)
- Restart interlock (RES)
- Beam coding
- Teach-in blanking
- Floating blanking
- Fixed blanking
- Reduced resolution
- Up to 3 systems can be cascaded
- Alignment and diagnostics via 7-segment display
- ATEX II 3 G/3D
- Configuration and diagnostics via PC



Further information	Page
→ Technical specifications	E-10
→ Dimensional drawings	E-12
→ Connection diagrams	E-16
→ Accessories	E-17
→ Services	A-2

## Overview of technical specifications

Protective field height (depending on type)	150 mm ... 1800 mm
Scanning range (depending on type)	0 m ... 8 m / 0 m ... 19 m
Resolution (depending on type)	14 mm / 20 mm / 30 mm / 40 mm
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

The C4000 Advanced safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection:

- Blanking functions allow defined objects to be present in the protective field, e.g. cables, benches.
- Quick teach-in on-site reduces set-up times
- Adjustable tolerances increase availability
- Emergency stop, bypass or reset directly at the extension connection
- Application diagnostic output for status information
- Configure quickly and straightforwardly using Clone Plug

## In-system added value

- Combination with SICK safe control solutions

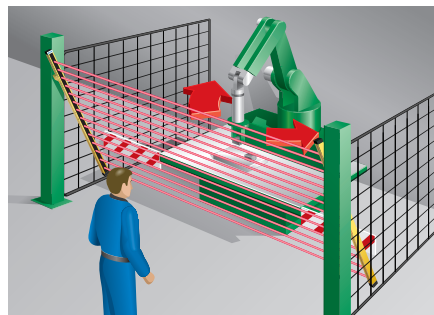
Combination with	Restart interlock	External device monitoring	Bypass	PSDI/ PSDI window	Teach-in	Operating mode selection	Further information
UE402	-	-	✓	✓	✓	✓	E-18
UE48-20S	✓	✓	-	-	-	-	N-42
UE48-30S	✓	✓	-	-	-	-	N-48
UE10-30S	Relay module						N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Plastic and rubber industry
- Shaping machine tools
- Electronics industry
- Car and vehicle manufacture
- Robots
- Printing and paper industry
- Wood processing
- Palletiser



Hazardous point protection on an industrial robot



## Ordering information

### C4000 Advanced without extension connection

→ Ordering information C4000 Advanced with extension connection page E-5

<b>Housing cross-section</b>	48 mm × 40 mm
<b>Functions</b>	Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI mode (with UE402), bypass (with UE402), operating mode switching (with UE402)
<b>Consisting of</b>	Sender and receiver unit
<b>Usage</b>	Last system in a cascade or stand-alone system
<b>Connections</b>	System connection: Hirschmann plug M26 × 11 + FE Configuration connection: M8 × 4

E

#### Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1018591	C40E-0301CB010	1018781
450	C40S-0401CA010	1018347	C40E-0401CB010	1018782
600	C40S-0601CA010	1018593	C40E-0601CB010	1018783
750	C40S-0701CA010	1018595	C40E-0701CB010	1018784
900	C40S-0901CA010	1018597	C40E-0901CB010	1018785
1050	C40S-1001CA010	1018599	C40E-1001CB010	1018786
1200	C40S-1201CA010	1018601	C40E-1201CB010	1018787
1350	C40S-1301CA010	1018603	C40E-1301CB010	1018788
1500	C40S-1501CA010	1018605	C40E-1501CB010	1018789
1650	C40S-1601CA010	1018607	C40E-1601CB010	1018790
1800	C40S-1801CA010	1018609	C40E-1801CB010	1018791

#### Resolution 20 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1018613	C40E-0302CB010	1018792
450	C40S-0402CA010	1018615	C40E-0402CB010	1018793
600	C40S-0602CA010	1018617	C40E-0602CB010	1018794
750	C40S-0702CA010	1018619	C40E-0702CB010	1018795
900	C40S-0902CA010	1018621	C40E-0902CB010	1018796
1050	C40S-1002CA010	1018623	C40E-1002CB010	1018797
1200	C40S-1202CA010	1018625	C40E-1202CB010	1018798
1350	C40S-1302CA010	1018627	C40E-1302CB010	1018799
1500	C40S-1502CA010	1018629	C40E-1502CB010	1018800
1650	C40S-1602CA010	1018631	C40E-1602CB010	1018801
1800	C40S-1802CA010	1018633	C40E-1802CB010	1018802

Continued on next page

**Resolution 30 mm, scanning range 0 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1018635	C40E-0303CB010	1018803
450	C40S-0403CA010	1018637	C40E-0403CB010	1018804
600	C40S-0603CA010	1018639	C40E-0603CB010	1018805
750	C40S-0703CA010	1018641	C40E-0703CB010	1018806
900	C40S-0903CA010	1018643	C40E-0903CB010	1018807
1050	C40S-1003CA010	1018645	C40E-1003CB010	1018809
1200	C40S-1203CA010	1018647	C40E-1203CB010	1018810
1350	C40S-1303CA010	1018649	C40E-1303CB010	1018811
1500	C40S-1503CA010	1018651	C40E-1503CB010	1018812
1650	C40S-1603CA010	1018653	C40E-1603CB010	1018813
1800	C40S-1803CA010	1018655	C40E-1803CB010	1018814

**Resolution 40 mm, scanning range 0 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1018657	C40E-0304CB010	1018815
450	C40S-0404CA010	1018659	C40E-0404CB010	1018816
600	C40S-0604CA010	1018661	C40E-0604CB010	1018817
750	C40S-0704CA010	1018663	C40E-0704CB010	1018818
900	C40S-0904CA010	1018665	C40E-0904CB010	1018819
1050	C40S-1004CA010	1018667	C40E-1004CB010	1018820
1200	C40S-1204CA010	1018669	C40E-1204CB010	1018821
1350	C40S-1304CA010	1018671	C40E-1304CB010	1018822
1500	C40S-1504CA010	1018673	C40E-1504CB010	1018823
1650	C40S-1604CA010	1018675	C40E-1604CB010	1018824
1800	C40S-1804CA010	1018677	C40E-1804CB010	1018825

## C4000 Advanced with extension connection M26×11 + FE

→ Ordering information C4000 Advanced without extension connection page E-3

<b>Housing cross-section</b>	48 mm × 40 mm
<b>Functions</b>	Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI mode (with UE402), bypass or emergency stop, operating mode switching (with UE402)
<b>Consisting of</b>	Sender and receiver unit
<b>Usage</b>	First system in cascade, middle system in cascade
<b>Connections</b>	System connection: Hirschmann plug M26×11 + FE Extension connection: Hirschmann socket M26×11 + FE Configuration connection: M8×4

E

## Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301DA010	1018690	C40E-0301DB010	1018827
450	C40S-0401DA010	1018349	C40E-0401DB010	1018828
600	C40S-0601DA010	1018692	C40E-0601DB010	1018829
750	C40S-0701DA010	1018694	C40E-0701DB010	1018830
900	C40S-0901DA010	1018696	C40E-0901DB010	1018831
1050	C40S-1001DA010	1018698	C40E-1001DB010	1018832
1200	C40S-1201DA010	1018700	C40E-1201DB010	1018833
1350	C40S-1301DA010	1018702	C40E-1301DB010	1018834
1500	C40S-1501DA010	1018704	C40E-1501DB010	1018835
1650	C40S-1601DA010	1018706	C40E-1601DB010	1018836
1800	C40S-1801DA010	1018708	C40E-1801DB010	1018837

## Resolution 20 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302DA010	1018710	C40E-0302DB010	1018838
450	C40S-0402DA010	1018712	C40E-0402DB010	1018839
600	C40S-0602DA010	1018714	C40E-0602DB010	1018840
750	C40S-0702DA010	1018716	C40E-0702DB010	1018841
900	C40S-0902DA010	1018718	C40E-0902DB010	1018842
1050	C40S-1002DA010	1018720	C40E-1002DB010	1018843
1200	C40S-1202DA010	1018722	C40E-1202DB010	1018844
1350	C40S-1302DA010	1018724	C40E-1302DB010	1018845
1500	C40S-1502DA010	1018726	C40E-1502DB010	1018846
1650	C40S-1602DA010	1018728	C40E-1602DB010	1018847
1800	C40S-1802DA010	1018730	C40E-1802DB010	1018848

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**Resolution 30 mm, scanning range 0 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303DA010	1018733	C40E-0303DB010	1018849
450	C40S-0403DA010	1018735	C40E-0403DB010	1018850
600	C40S-0603DA010	1018737	C40E-0603DB010	1018851
750	C40S-0703DA010	1018739	C40E-0703DB010	1018852
900	C40S-0903DA010	1018741	C40E-0903DB010	1018853
1050	C40S-1003DA010	1018743	C40E-1003DB010	1018854
1200	C40S-1203DA010	1018745	C40E-1203DB010	1018855
1350	C40S-1303DA010	1018747	C40E-1303DB010	1018856
1500	C40S-1503DA010	1018749	C40E-1503DB010	1018857
1650	C40S-1603DA010	1018751	C40E-1603DB010	1018858
1800	C40S-1803DA010	1018753	C40E-1803DB010	1018859

**Resolution 40 mm, scanning range 0 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304DA010	1018755	C40E-0304DB010	1018860
450	C40S-0404DA010	1018757	C40E-0404DB010	1018861
600	C40S-0604DA010	1018759	C40E-0604DB010	1018862
750	C40S-0704DA010	1018762	C40E-0704DB010	1018863
900	C40S-0904DA010	1018765	C40E-0904DB010	1018864
1050	C40S-1004DA010	1018767	C40E-1004DB010	1018865
1200	C40S-1204DA010	1018769	C40E-1204DB010	1018866
1350	C40S-1304DA010	1018771	C40E-1304DB010	1018867
1500	C40S-1504DA010	1018773	C40E-1504DB010	1018868
1650	C40S-1604DA010	1018775	C40E-1604DB010	1018869
1800	C40S-1804DA010	1018777	C40E-1804DB010	1018870

## C4000 Advanced with extension connection M12×7 + FE

→ Ordering information C4000 Advanced without extension connection page E-3

Housing cross-section	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI mode (with UE402), bypass or emergency stop, operating mode switching (with UE402)
Consisting of	Sender and receiver unit
Usage	First system in cascade, middle system in cascade
Connections	System connection: Hirschmann plug M26×11 + FE Extension connection: Hirschmann socket M12×7 + FE Configuration connection: M8×4

E

## Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301DA040	1028969	C40E-0301DB040	1028989
450	C40S-0401DA040	1028967	C40E-0401DB040	1028990
600	C40S-0601DA040	1028971	C40E-0601DB040	1028991
750	C40S-0701DA040	1028973	C40E-0701DB040	1028992
900	C40S-0901DA040	1028975	C40E-0901DB040	1028993
1050	C40S-1001DA040	1028977	C40E-1001DB040	1028994
1200	C40S-1201DA040	1028979	C40E-1201DB040	1028995
1350	C40S-1301DA040	1028981	C40E-1301DB040	1028996
1500	C40S-1501DA040	1028983	C40E-1501DB040	1028997
1650	C40S-1601DA040	1028985	C40E-1601DB040	1028998
1800	C40S-1801DA040	1028987	C40E-1801DB040	1028999

## Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303DA040	1029001	C40E-0303DB040	1029023
450	C40S-0403DA040	1029003	C40E-0403DB040	1029024
600	C40S-0603DA040	1029005	C40E-0603DB040	1029025
750	C40S-0703DA040	1029007	C40E-0703DB040	1029026
900	C40S-0903DA040	1029009	C40E-0903DB040	1029027
1050	C40S-1003DA040	1029011	C40E-1003DB040	1029028
1200	C40S-1203DA040	1029013	C40E-1203DB040	1029029
1350	C40S-1303DA040	1029015	C40E-1303DB040	1029030
1500	C40S-1503DA040	1029017	C40E-1503DB040	1029031
1650	C40S-1603DA040	1029019	C40E-1603DB040	1029032
1800	C40S-1803DA040	1029021	C40E-1803DB040	1029033

## C4000 Advanced Guest with straight system connection

→ Ordering information C4000 Advanced without extension connection page E-3

Housing cross-section	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI mode (with UE402), bypass, operating mode switching (with UE402)
Consisting of	Sender and receiver unit
Usage	Last system in cascade, configurable via host
Connections	System connection: Flying lead 320 mm with plug M12 × 7 + FE, straight

## E

## Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C46S-0101CT400	1028796	C46E-0101CU400	1028820
300	C46S-0301CT400	1028802	C46E-0301CU400	1028821
450	C46S-0401CT400	1028804	C46E-0401CU400	1028822
600	C46S-0601CT400	1028806	C46E-0601CU400	1028823
750	C46S-0701CT400	1028808	C46E-0701CU400	1028824
900	C46S-0901CT400	1040173	C46E-0901CU400	1040186
1050	C46S-1001CT400	1040175	C46E-1001CU400	1040187
1200	C46S-1201CT400	1040177	C46E-1201CU400	1040188
1350	C46S-1301CT400	1040179	C46E-1301CU400	1040189
1500	C46S-1501CT400	1040181	C46E-1501CU400	1040190
1650	C46S-1601CT400	1040182	C46E-1601CU400	1040191
1800	C46S-1801CT400	1040184	C46E-1801CU400	1040192

## Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C46S-0103CT400	1028879	C46E-0103CU400	1028889
300	C46S-0303CT400	1028881	C46E-0303CU400	1028890
450	C46S-0403CT400	1028883	C46E-0403CU400	1028891
600	C46S-0603CT400	1028885	C46E-0603CU400	1028892
750	C46S-0703CT400	1028887	C46E-0703CU400	1028893
900	C46S-0903CT400	1040193	C46E-0903CU400	1040207
1050	C46S-1003CT400	1040195	C46E-1003CU400	1040208
1200	C46S-1203CT400	1040197	C46E-1203CU400	1040209
1350	C46S-1303CT400	1040199	C46E-1303CU400	1040210
1500	C46S-1503CT400	1040201	C46E-1503CU400	1040211
1650	C46S-1603CT400	1040203	C46E-1603CU400	1040212
1800	C46S-1803CT400	1040205	C46E-1803CU400	1040213

## C4000 Advanced Guest with angled system connection

→ Ordering information C4000 Advanced without extension connection page E-3

Housing cross-section	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, fixed blanking, floating blanking, reduced resolution, PSDI mode (with UE402), bypass, operating mode switching (with UE402)
Consisting of	Sender and receiver unit
Usage	Last system in cascade, configurable via host
Connections	System connection: Flying lead 320 mm with plug M12×7 + FE, angled

### Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C46S-0101CT500	1028810	C46E-0101CU500	1028825

### Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C46S-0103CT500	1028901	C46E-0103CU500	1028894

E

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### C4000 Advanced

#### General system data

Scanning range (depending on type)	0 m ... 8 m / 0 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm ... 40 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

#### Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	9 ms ... 56 ms (stand-alone system, without beam coding, without blanking)
Switching voltage	$V_S - 2.25 \text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	≤3 A

#### Sender unit

Power consumption	≤2 A
-------------------	------

#### General operating data

Connection type system connection	Hirschmann plug M26 × 11 + FE
Connection type extension connection (depending on type)	Hirschmann socket M26 × 11 + FE Hirschmann socket M12 × 7 + FE
Connection type configuration connection	M8 × 4
Connecting cable length	Max. 50 m
Connecting cable wire cross-section	M26 × 11 + FE M12 × 7 + FE 0.75 mm <sup>2</sup> 0.25 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm × 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Weight (depending on type)	0.82 kg ... 3.71 kg



## C4000 Advanced Guest

## General system data

Scanning range (depending on type)	0 m ... 8 m / 0 m ... 19 m
Protective field height (depending on type)	150 mm ... 1800 mm
Resolution (depending on type)	14 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

E

## Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	9 ms ... 56 ms (stand-alone system, without beam coding, without blanking)
Switching voltage	$V_S - 2.25\text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	≤3 A

## Sender unit

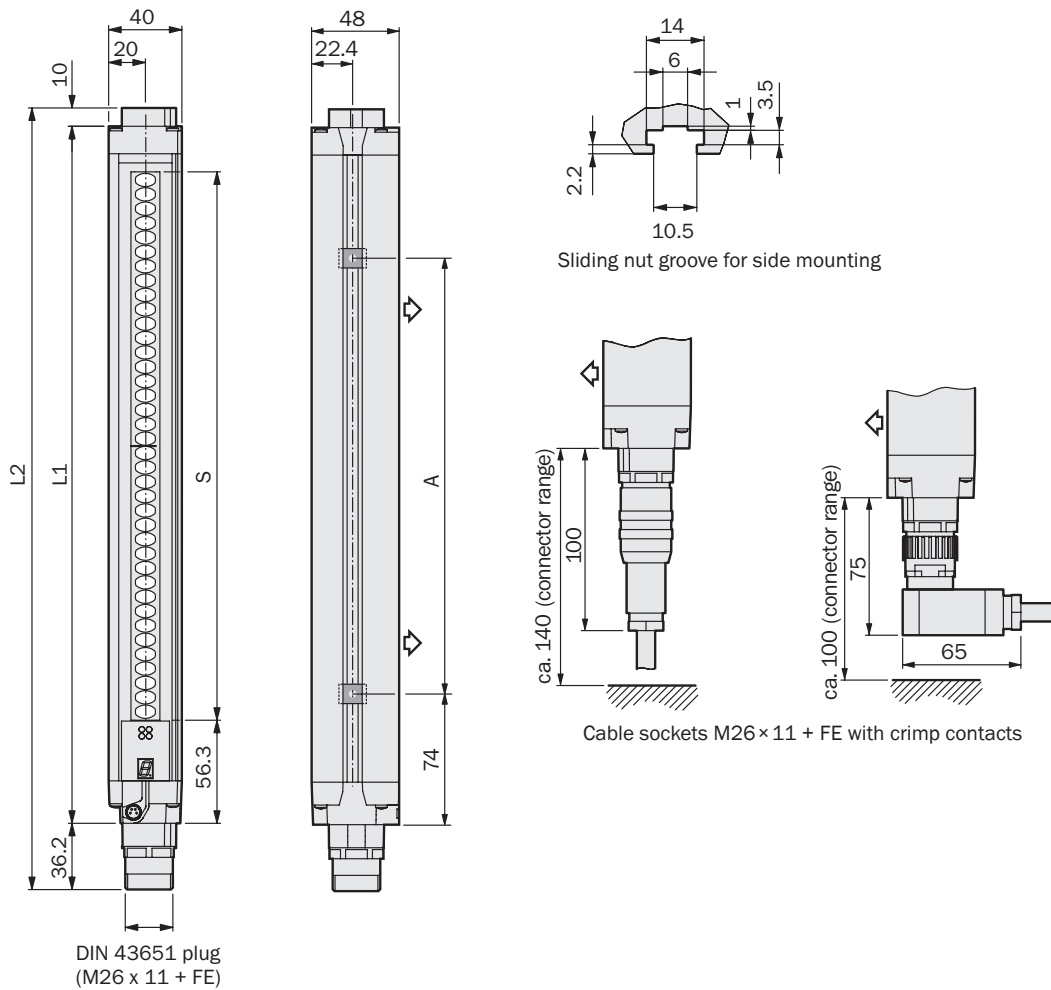
Power consumption	≤2 A
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## General operating data

Connection type system connection (depending on type)	Flying lead 320 mm with plug M12×7 + FE, straight Flying lead 320 mm with plug M12×7 + FE, angled
Connecting cable length	Max. 3 m between host and guest
Connecting cable wire cross-section	0.25 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm × 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Weight (depending on type)	0.82 kg ... 3.71 kg

# Dimensional drawings

## C4000 Advanced without extension connection

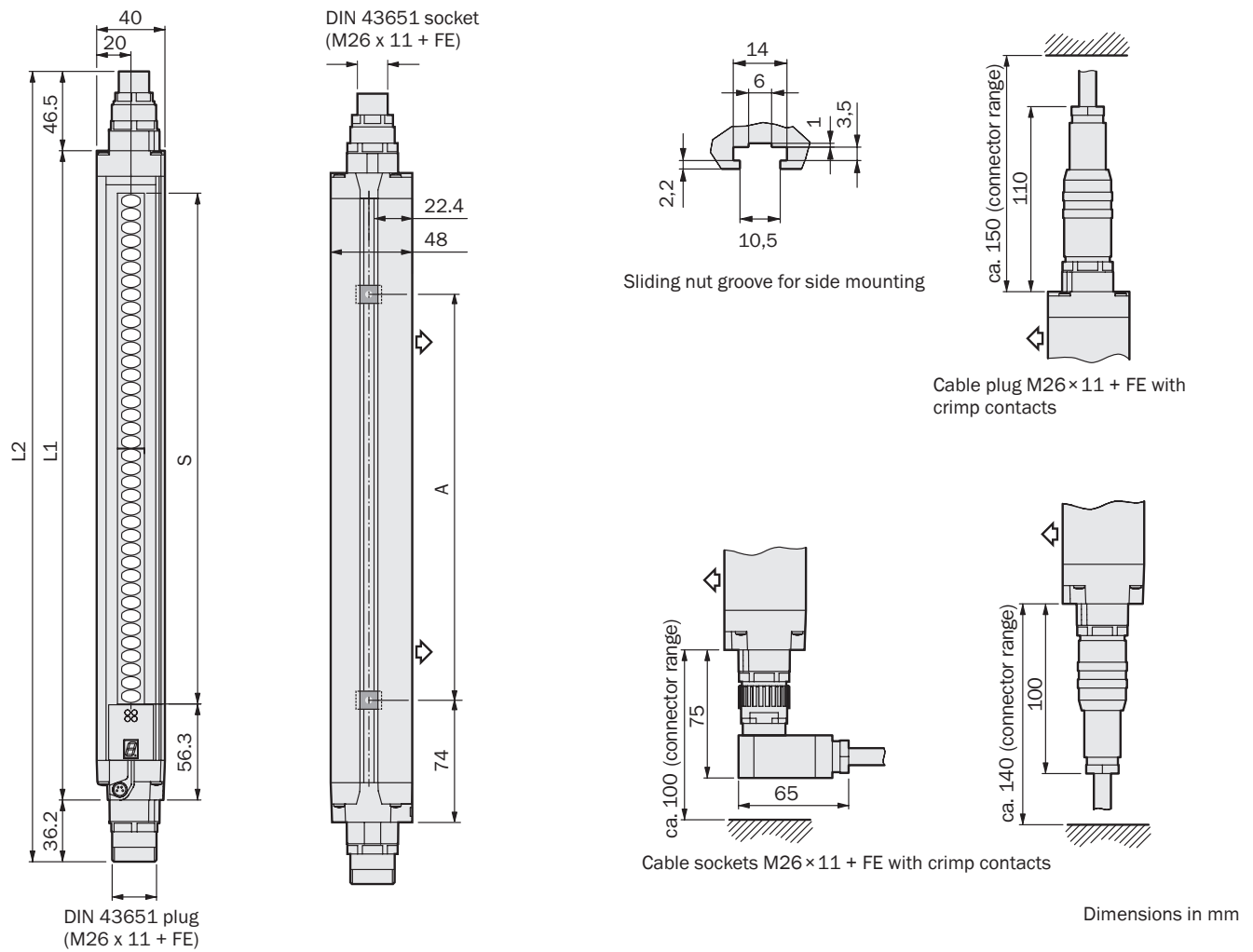


Dimensions in mm

Protective field height S	L1	L2	A
300	381	427	224
450	532	578	374
600	682	728	524
750	833	879	674
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424
1650	1736	1782	1574
1800	1887	1933	1724

Dimensions in mm

C4000 Advanced with extension connection M26×11 + FE

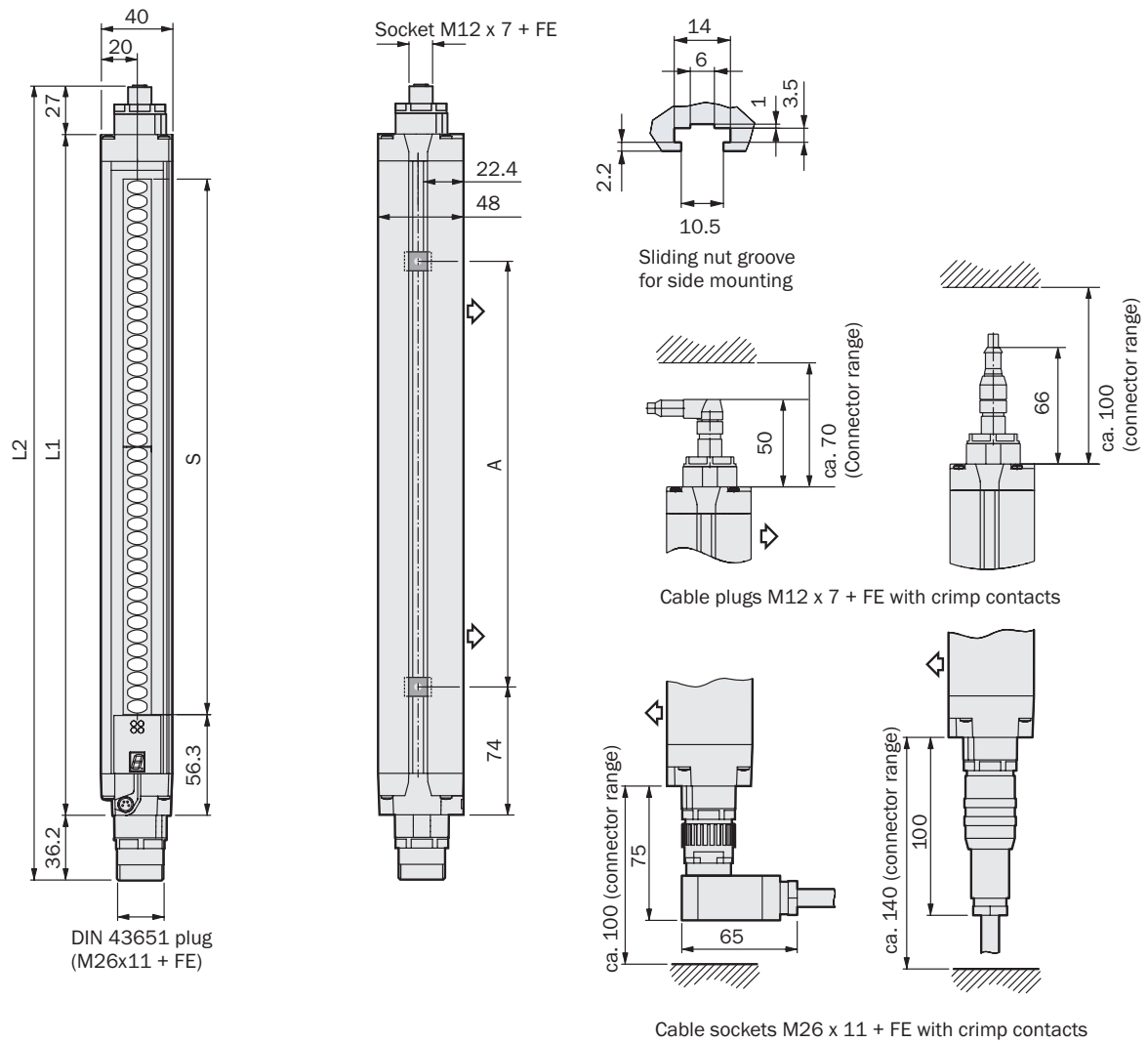


Protective field height S	L1	L2	A
300	381	464	224
450	532	614	374
600	682	765	524
750	833	915	674
900	984	1066	824
1050	1134	1216	974
1200	1283	1366	1124
1350	1435	1517	1274
1500	1586	1669	1424
1650	1736	1818	1574
1800	1887	1969	1724

Dimensions in mm

C4000 Advanced with extension connection M12 x 7 + FE

E

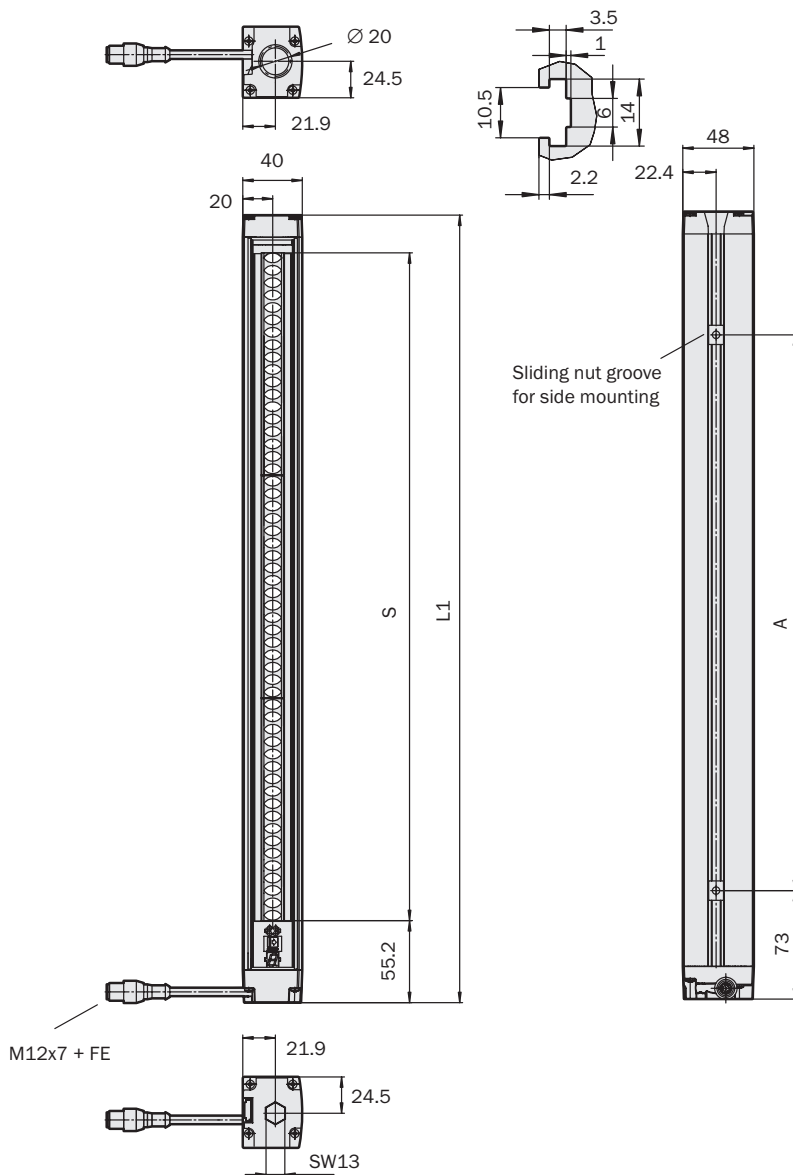


Dimensions in mm

Protective field height S	L1	L2	A
300	381	444	224
450	532	594	374
600	682	744	524
750	833	895	674
900	984	1046	824
1050	1134	1196	974
1200	1283	1346	1124
1350	1435	1497	1274
1500	1586	1649	1424
1650	1736	1798	1574
1800	1887	1949	1724

Dimensions in mm

C4000 Advanced Guest



Dimensions in mm

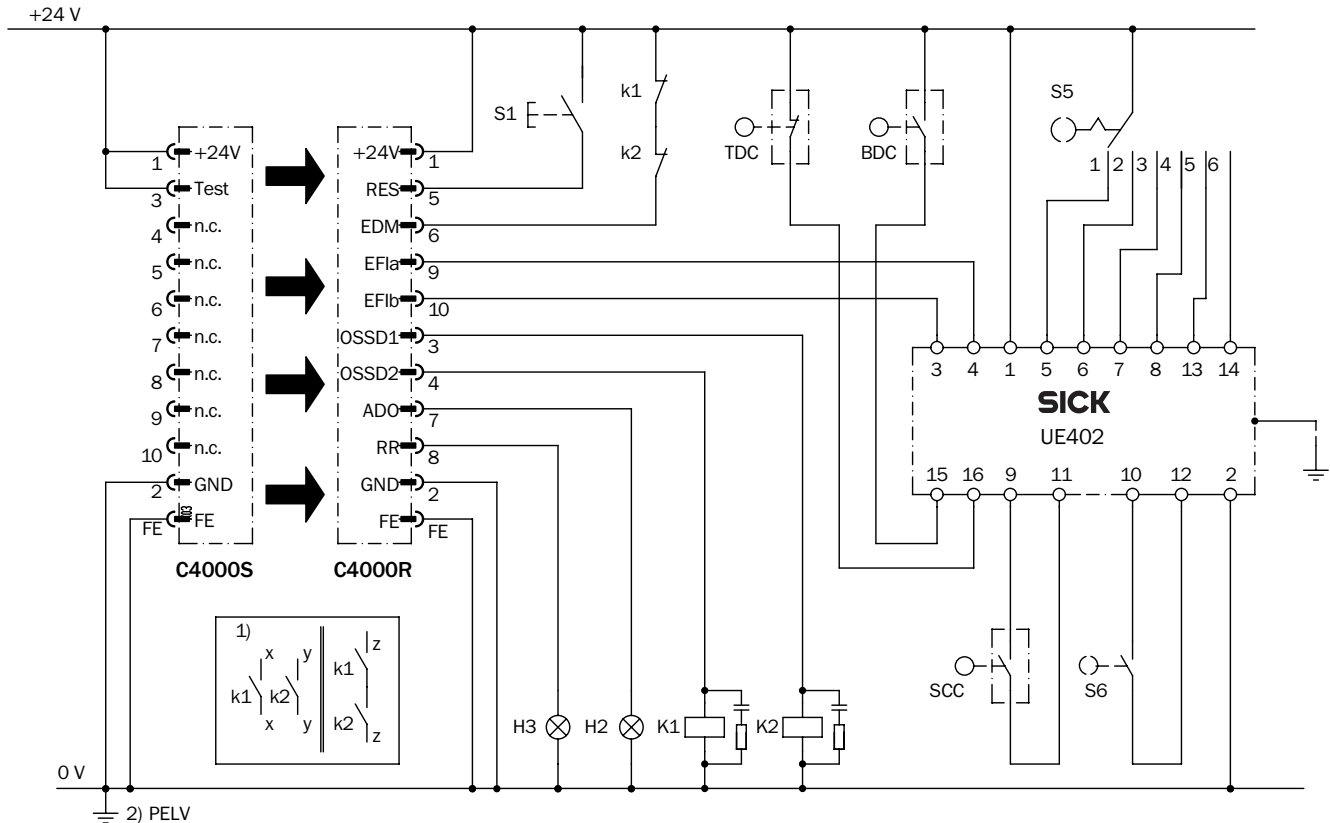
Protective field height S	L1	A
150	220	76
300	380	224
450	530	374
600	680	524
750	830	674
900	981	825
1050	1131	975
1200	1281	1125
1350	1432	1275
1500	1583	1427
1650	1733	1504
1800	1884	1728

Dimensions in mm

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### C4000 Advanced on UE402 safety switching amplifier



#### Task

Integration of a C4000 Advanced safety light curtain with UE402 in a controller. Six configurable operating modes with restart interlock and external device monitoring. PSDI mode with TDC, BDC, SCC. Teachable blanking areas.

#### Function

If no object is detected in the active protective field and the contactors K1 and K2 are in the de-energised position, the lamp H3 flashes as a prompt to operate control switch S1. The OSSDs are switched on when S1 is operated (button is pressed and released). These outputs activate contactors K1 and K2. On the detection of an object in an active protective field, the OSSDs deactivate contactors K1 and K2.

#### Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. Cross-circuits

and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). Jamming of the S1 button prevents output circuit to enable.




#### Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV as required in EN 60204-1 / 6.4.

Please see the operating instructions for the related devices to obtain information on the effects of the functions with configurable parameters. This information is to be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

E

## Accessories

→ Dimensional drawings mounting systems see page E-20

### Mounting systems

Designation	Type of fastening	Packing unit	Comment	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2019659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2019506
Mounting kit 11	Replacement bracket	4	Suitable as replacement of FGS	2021646
Stainless steel bracket	Pivoting	4	For all protective field heights	2023708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2026850

### Sliding nuts

Designation	Packing unit	Comment	Part number
Sliding nuts	4	Included in the delivery	2017550

### Cable sockets

Connection type	Connector technology	Direction of the cable outlet	Part number
Hirschmann cable socket M26 × 11 + FE	Crimp contacts	Straight	6020757
		Angled	6020758

### Cable plugs

Connection type	Connector technology	Direction of the cable outlet on the plug	Part number
Hirschmann cable plug M26 × 11 + FE	Crimp contacts	Straight	6021191
		Angled	6021192

Continued on next page

**Connecting cables**

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26×11 + FE	Straight	2.5 m	2022544
		5 m	2022545
		7.5 m	2022546
		10 m	2022547
		15 m	2022548
		20 m	2022549
		30 m	2022550

**Connection cables cascade**

Connection type	Direction of the cable outlet	Cable length	Part number
Plug connection, M26×11 + FE	Plug straight/socket straight	0.25 m	2022278
		0.5 m	2021838
		1 m	2022279
		1.5 m	2022280
		2 m	2022281
		2.5 m	2022282
		3 m	2022283
	Plug straight, socket angled	0.25 m	2022284
		0.5 m	2022285
		1 m	2022286
		1.5 m	2022287
		2 m	2022288
		2.5 m	2022289
		3 m	2022290
Plug connection, M12×7 + FE	Plug straight, socket angled	1 m	6021002
	Plug angled, socket straight	1 m	6030974

**Connection cables emergency stop, reset button, door switch**

Connector technology	Direction of the cable outlet	Cable length	Part number
Stripped	Plug straight	2.5 m	2026869
		10 m	2026870

**Cables without plug/socket**

Comment	Part number
Self assembly cable (suitable for EFI communication)	6021437

**Connection cables configuration**

Comment	Cable length	Part number
For connecting the configuration interface to the serial interface on the PC	2 m	6021195
	8 m	2027649

**Interfaces**

Designation	Enclosure rating	Description	Type	Part number
Safety relay	IP 20	Expands C4000 Standard/Advanced with the functions PSDI mode, bypass, operating mode selection	UE402	1023577



**Power supplies**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for protective field height	Part number
300 mm	2022412
450 mm	2022413
600 mm	2022414
750 mm	2022415
900 mm	2022416
1050 mm	2022417
1200 mm	2022418
1350 mm	2022419
1500 mm	2022420
1650 mm	2022421
1800 mm	2022422

**Deflector mirrors**

Designation	Suitable for protective field height	Part number
PNS75-034	300 mm	1019414
PNS75-049	450 mm	1019415
PNS75-064	600 mm	1019416
PNS75-079	750 mm	1019417
PNS75-094	900 mm	1019418
PNS75-109	1050 mm	1019419
PNS75-124	1200 mm	1019420
PNS75-139	1350 mm	1019421
PNS75-154	1500 mm	1019422
PNS75-169	1650 mm	1019423
PNS75-184	1800 mm	1019424
PNS125-034	300 mm	1019425
PNS125-049	450 mm	1019426
PNS125-064	600 mm	1019427
PNS125-079	750 mm	1019428
PNS125-094	900 mm	1019429
PNS125-109	1050 mm	1019430
PNS125-124	1200 mm	1019431
PNS125-139	1350 mm	1019432
PNS125-154	1500 mm	1019433
PNS125-169	1650 mm	1019434
PNS125-184	1800 mm	1019435

Continued on next page

**Sliding nuts for deflector mirrors**

Suitable for	Packing unit	Part number
PNS75 and PNS125	6	2030600

**Explosion protection**

Designation	Comment	Part number
ATEX package	Can be used in zone 2/22, 3G 3D	2029961

**Laser alignment aid**

Designation	Maximum scanning range	Type of light	Part number
Laser alignment aid AR60	60 m	Red light	1015741
AR60 adapter for C4000	—	—	4032461

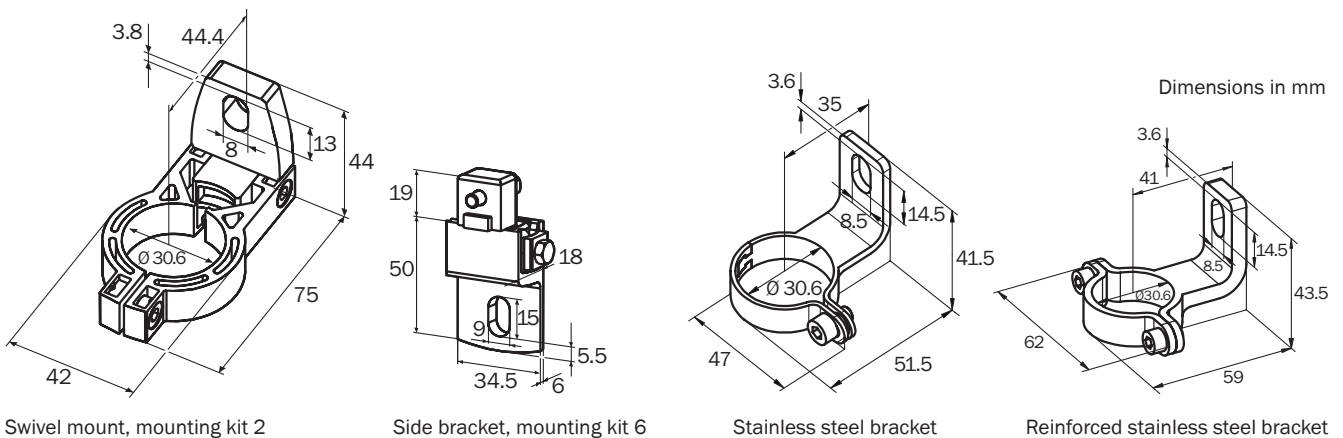
**Configuration software**

Designation	Comment	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages	2032314

**Configuration tools**

Designation	Comment	Part number
Clone Plug for C4000 and M4000	For C4000 Standard / Advanced / Palletizer / Entry/Exit and M4000 Advanced	1029665
Host-Guest Plug for C4000	For C4000 Standard / Advanced	1029717
Wall mount	Packing unit: 1	5318443
Protective cap	For Clone Plug / Host-Guest Plug	5318293

**Dimensional drawings mounting systems**



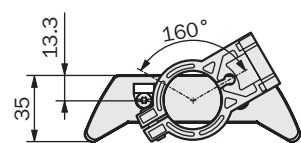
Swivel mount, mounting kit 2

Side bracket, mounting kit 6

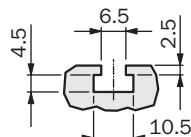
Stainless steel bracket

Reinforced stainless steel bracket

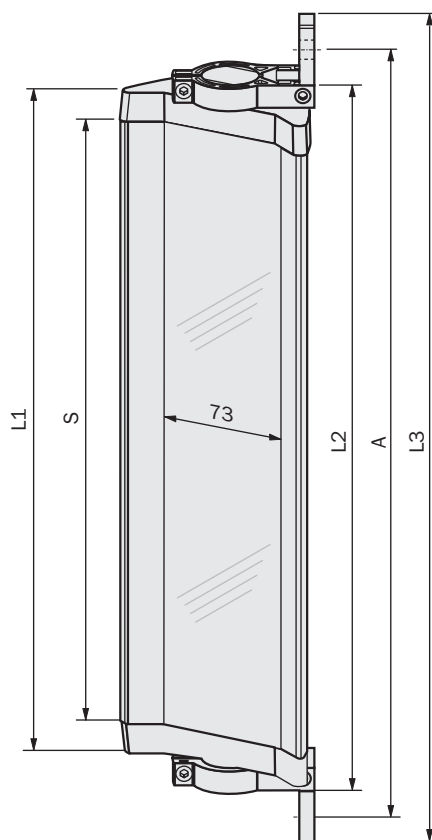
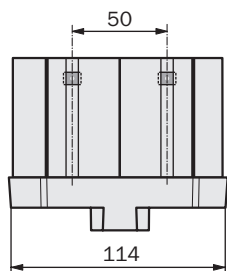
Dimensional drawings deflector mirror PNS75



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



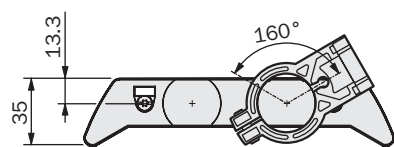
Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

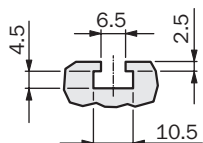
Dimensions in mm

E

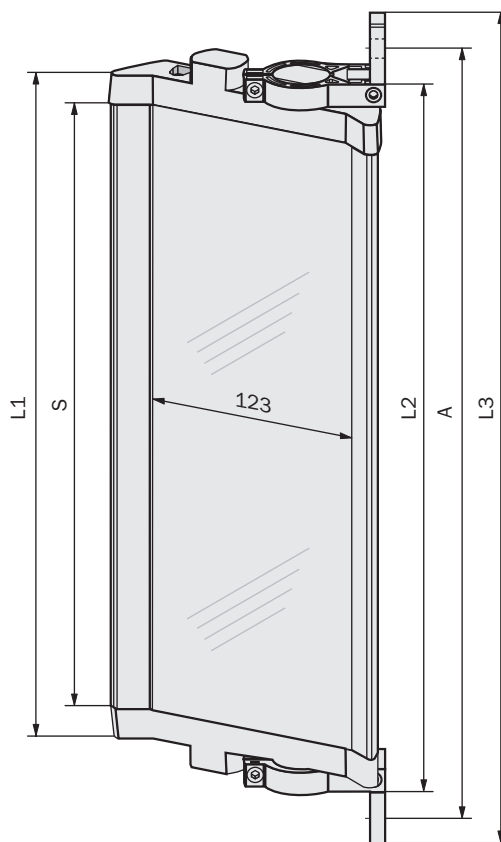
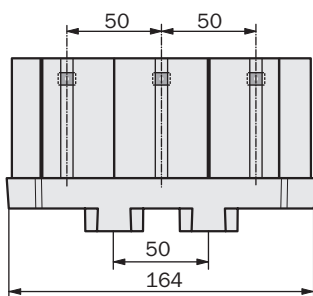
Dimensional drawings deflector mirror PNS125



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

E

## Overview of technical specifications

Scanning range (depending on type)	0 m ... 8 m / 0 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

The M4000 Advanced Curtain multiple light beam safety device together with the UE403 switching amplifier form the efficient solution for decentralised conventional muting applications involving automatic material transport which require safety light curtains with high resolution (14/30 mm) due to a short safety distance. Access protection with muting can be achieved with maximum availability thanks to their integrated functions, easily configured by PC via the RS-232 interface, and the

simple in-situ connection of muting signals and control switches to the UE403.

The integrated functions, and status and diagnostic information, permit rapid commissioning and prevent unnecessary machine downtimes.

The modular concept provides a high level of machine safety that takes economic efficiency into account as device properties can be adapted to meet specific requirements.

## In-system added value

- Combination with safe control solutions by SICK
- M4000 Advanced with UE403 for the connection of:
  - 2 to 4 muting sensors
  - External muting lamp
  - Reset- and override control switch
  - Conveyor belt stop signal
- Further functions:
  - Concurrence monitoring
  - Total muting time monitoring
  - Sensor gap monitoring
  - Sensor test
  - Partial blanking
  - Muting end via ESPE
  - Integrated override

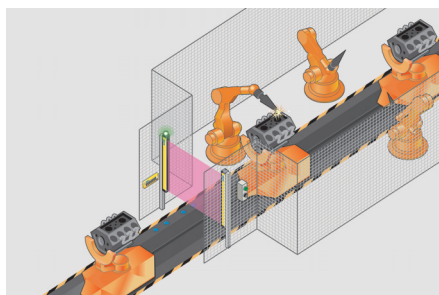
→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

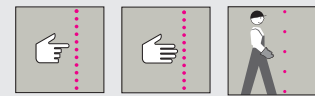
→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

Provides access protection with or without muting on robot systems, machine centres in mechanical engineering applications,

automated conveying storage and transport systems.



Access protection with muting on a motor machining station



- 14/30 mm resolution
- 300 to 1800 mm protective field height
- Restart interlock (RES)
- External device monitoring (EDM)
- Beam coding
- LED/7-segment display
- Application diagnostic output (ADO)
- Configuration and diagnosis via PC
- SDL interface
- Muting configurable in conjunction with UE403
- End cap with integrated LED (optional)



Further information	Page
→ Ordering information	E-24
→ Technical specifications	E-26
→ Dimensional drawings	E-29
→ Connection diagrams	E-31
→ Accessories	E-32
→ Services	A-2

## Ordering information

### M4000 Advanced Curtain, resolution 14 mm

Protective field height (mm)	End cap with integrated LED	Sender		Receiver	
		Type	Part number	Type	Part number
300	—	M40S-60A503AA0	— <sup>1)</sup>	M40E-60A503RB0	— <sup>1)</sup>
	✓	M40S-60A503AA0	— <sup>1)</sup>	M40E-60A523RB0	— <sup>1)</sup>
450	—	M40S-61A503AA0	— <sup>1)</sup>	M40E-61A503RB0	— <sup>1)</sup>
	✓	M40S-61A503AA0	— <sup>1)</sup>	M40E-61A523RB0	— <sup>1)</sup>
600	—	M40S-62A503AA0	— <sup>1)</sup>	M40E-62A503RB0	— <sup>1)</sup>
	✓	M40S-62A503AA0	— <sup>1)</sup>	M40E-62A523RB0	— <sup>1)</sup>
750	—	M40S-63A503AA0	— <sup>1)</sup>	M40E-63A503RB0	— <sup>1)</sup>
	✓	M40S-63A503AA0	— <sup>1)</sup>	M40E-63A523RB0	— <sup>1)</sup>
900	—	M40S-64A503AA0	— <sup>1)</sup>	M40E-64A503RB0	— <sup>1)</sup>
	✓	M40S-64A503AA0	— <sup>1)</sup>	M40E-64A523RB0	— <sup>1)</sup>
1050	—	M40S-65A503AA0	— <sup>1)</sup>	M40E-65A503RB0	— <sup>1)</sup>
	✓	M40S-65A503AA0	— <sup>1)</sup>	M40E-65A523RB0	— <sup>1)</sup>
1200	—	M40S-66A503AA0	— <sup>1)</sup>	M40E-66A503RB0	— <sup>1)</sup>
	✓	M40S-66A503AA0	— <sup>1)</sup>	M40E-66A523RB0	— <sup>1)</sup>
1350	—	M40S-67A503AA0	— <sup>1)</sup>	M40E-67A503RB0	— <sup>1)</sup>
	✓	M40S-67A503AA0	— <sup>1)</sup>	M40E-67A523RB0	— <sup>1)</sup>
1500	—	M40S-68A503AA0	— <sup>1)</sup>	M40E-68A503RB0	— <sup>1)</sup>
	✓	M40S-68A503AA0	— <sup>1)</sup>	M40E-68A523RB0	— <sup>1)</sup>
1650	—	M40S-69A503AA0	— <sup>1)</sup>	M40E-69A503RB0	— <sup>1)</sup>
	✓	M40S-69A503AA0	— <sup>1)</sup>	M40E-69A523RB0	— <sup>1)</sup>
1800	—	M40S-70A503AA0	— <sup>1)</sup>	M40E-70A503RB0	— <sup>1)</sup>
	✓	M40S-70A503AA0	— <sup>1)</sup>	M40E-70A523RB0	— <sup>1)</sup>

<sup>1)</sup> When ordering first time, please use the expression in column "Type" instead of "Part number". These products are available by first quarter 2007.

## M4000 Advanced Curtain, resolution 30 mm

Protective field height (mm)	End cap with integrated LED	Sender		Receiver	
		Type	Part number	Type	Part number
300	–	M40S-60A303AA0	1201570	M40E-60A303RBO	1201572
	✓	M40S-60A303AA0	1201570	M40E-60A323RBO	– <sup>1)</sup>
450	–	M40S-61A303AA0	1201127	M40E-61A303RBO	1201214
	✓	M40S-61A303AA0	1201127	M40E-61A323RBO	– <sup>1)</sup>
600	–	M40S-62A303AA0	1201463	M40E-62A303RBO	1201464
	✓	M40S-62A303AA0	1201463	M40E-62A323RBO	– <sup>1)</sup>
750	–	M40S-63A303AA0	1201571	M40E-63A303RBO	1201573
	✓	M40S-63A303AA0	1201571	M40E-63A323RBO	– <sup>1)</sup>
900	–	M40S-64A303AA0	1201441	M40E-64A303RBO	1201442
	✓	M40S-64A303AA0	1201441	M40E-64A323RBO	– <sup>1)</sup>
1050	–	M40S-65A303AA0	1201482	M40E-65A303RBO	1201483
	✓	M40S-65A303AA0	1201482	M40E-65A323RBO	– <sup>1)</sup>
1200	–	M40S-66A303AA0	1201036	M40E-66A303RBO	1201035
	✓	M40S-66A303AA0	1201036	M40E-66A323RBO	– <sup>1)</sup>
1350	–	M40S-67A303AA0	– <sup>1)</sup>	M40E-67A303RBO	– <sup>1)</sup>
	✓	M40S-67A303AA0	– <sup>1)</sup>	M40E-67A323RBO	– <sup>1)</sup>
1500	–	M40S-68A303AA0	– <sup>1)</sup>	M40E-68A303RBO	– <sup>1)</sup>
	✓	M40S-68A303AA0	– <sup>1)</sup>	M40E-68A323RBO	– <sup>1)</sup>
1650	–	M40S-69A303AA0	– <sup>1)</sup>	M40E-69A303RBO	– <sup>1)</sup>
	✓	M40S-69A303AA0	– <sup>1)</sup>	M40E-69A323RBO	– <sup>1)</sup>
1800	–	M40S-70A303AA0	– <sup>1)</sup>	M40E-70A303RBO	– <sup>1)</sup>
	✓	M40S-70A303AA0	– <sup>1)</sup>	M40E-70A323RBO	– <sup>1)</sup>

<sup>1)</sup> When ordering first time, please use the expression in column "Type" instead of "Part number". These products are available by first quarter 2007.

## Muting module UE403

Type	Part number
UE403-A0930	1026287

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### M4000 Advanced Curtain

#### General data

	Sender	Receiver
Resolution (depending on type)	14 mm / 30 mm	
Protective field height (depending on type)	300 mm ... 1800 mm	
Scanning range		
for resolution 14 mm	—	0 m ... 2.5 m / 2 m ... 8 m
for resolution 30 mm	—	0 m ... 6 m / 5 m ... 19 m
configurable	—	✓
Response time (depending on type)	Max. 56 ms	
Protection class	III (EN 50178:1998)	
Enclosure rating	IP 65 (EN 60529)	
Synchronisation	Optical, without separate synchronisation	
Type	Type 4 (IEC 61496), SIL3 (EN 61508))	
Ambient operating temperature from ... to	0 °C ... +55 °C	
Storage temperature from ... to	-25 °C ... +70 °C	
Air humidity from ... to	15 % ... 95 %, non-dewing	
Housing cross section	52 mm x 55.5 mm	
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)	
Shock resistance	10 g, 16 ms (IEC 60068-2-29)	
Housing material	Aluminium alloy ALMGSI 0.5	
Front screen material	Polycarbonate, scratch-resistant coating	

#### Electrical data

	Sender	Receiver
Connection type		
System connection	M26 x 11 + FE Hirschmann plug	M26 x 11 + FE Hirschmann plug
Extension connection	—	M12 x 5 Plug
Cable length	50 m <sup>1)</sup>	50 m <sup>1)</sup>
Conductor cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Supply voltage	24 V (19.2 V ... 28.8 V) <sup>2)</sup>	
Ripple	±10 %	
Power consumption	Max. 0.3 A	Max. 0.8 A
Display elements	LED/7-segment	
Safety outputs (OSSD)		
Type of output	—	2 PNP semiconductors, short-circuit protected, cross-circuit monitored <sup>3)</sup>
Switching voltage HIGH	—	24 V DC ( $V_S - 2.25 V \dots V_S$ )
Switching voltage LOW	—	0 V DC (0 V DC ... 3.5 V DC)
Switching current	—	0 mA ... 500 mA
Application diagnostic output		
Switching voltage HIGH	—	PNP semiconductor, short-circuit protected
Switching voltage LOW	—	24 V DC ( $V_S - 4.2 V \dots V_S$ )
Switching current	—	High resistance
		0 mA ... 100 mA

<sup>1)</sup> Depending on load, power supply and wire cross-section. The technical specifications must be observed.

<sup>2)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

<sup>3)</sup> Applies to a voltage range between -30 V and +30 V.



## Functional data

	Sender	Receiver
Safe integration to bus system		✓
Restart interlock	—	✓
Restart interlock (delivery status)	—	Internal
External device monitoring	—	✓
External device monitoring (delivery status)	—	Activated
Beam coding		✓
Beam coding (delivery status)		Non-coded
Configurable application diagnostic output	—	✓
Application diagnostic output (delivery status)	—	Contamination (OWS)
Sender test	✓	—
Sender test (delivery status)	Deactivated	—
Configurable scanning range	—	✓
Scanning range (delivery status)	—	2.5 m / 6 m
End cap with integrated LED (optional)	—	✓
SDL interface		✓
CDS configuration via RS-232 interface		✓
Concurrence monitoring (with UE403)	—	✓
Monitoring total muting time (with UE403)	—	✓
Sensor gap monitoring (with UE403)	—	✓
Sensor test (with UE403)	—	✓
Partial blanking (with UE403)	—	✓
End of muting by ESPE (with UE403)	—	✓
Belt stop (with UE403)	—	✓
Muting with override (with UE403)	—	✓

E

## Muting module UE403

## General data

Type of muting sensors	Optical sensors, inductive sensors, mechanical switches, controller signals
Protection class	III (EN 50178:1998)
Enclosure rating	IP 65 (IEC 60529)
Type	Type 4 (IEC 61496)
Ambient operating temperature from ... to	0 °C ... +55 °C
Air humidity from ... to	15 % ... 95 %, non-dewing
Storage temperature from ... to	-25 °C ... +70 °C
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Housing material	Aluminium die-cast, powder coated
Material, Connector strip	Polyamide
Mounting	Flexible mounting to the M4000 Advanced or directly in the system

## Electrical data

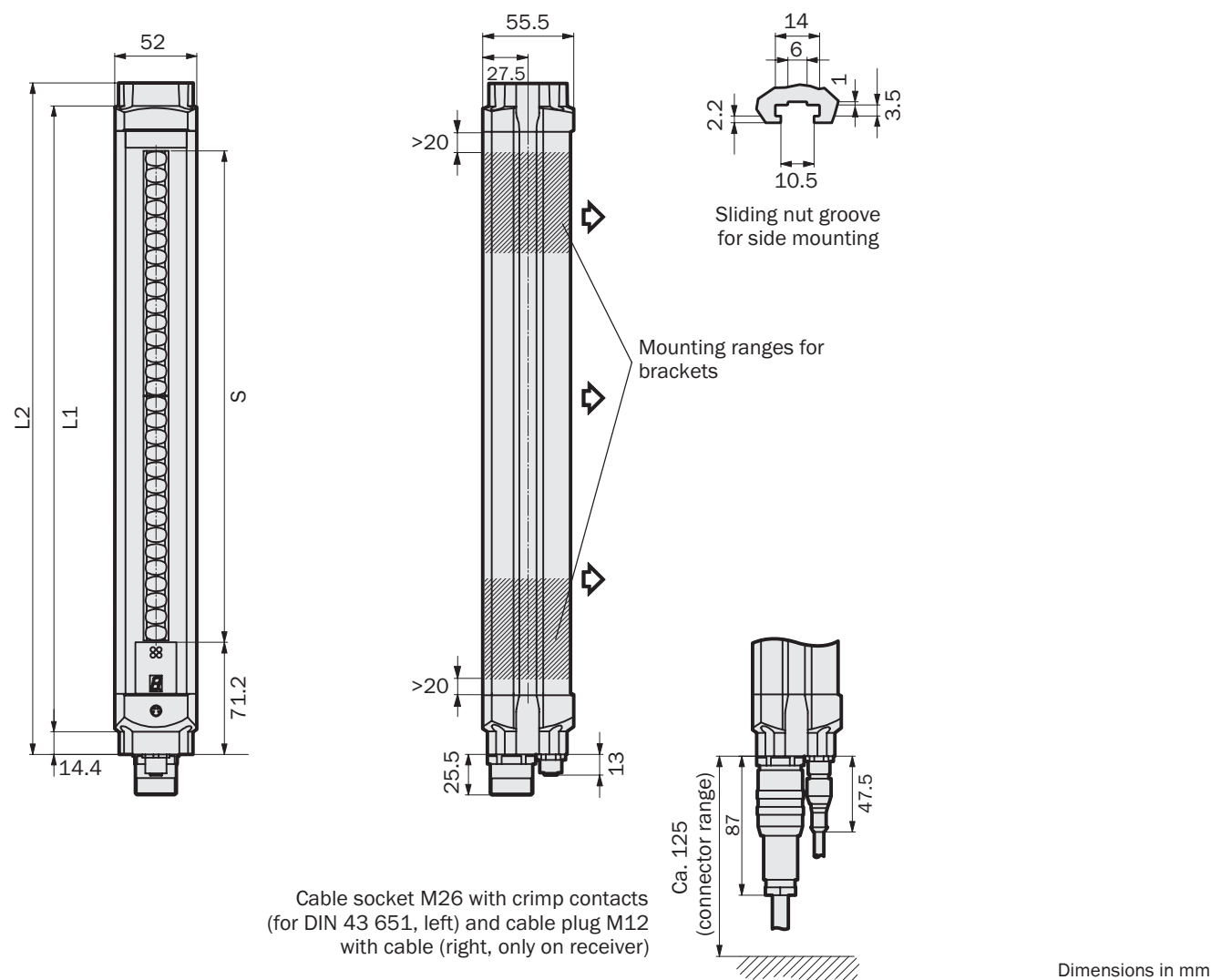
Supply voltage $V_s$	24 V DC (19.2 V DC ... 28.8 V DC), via connected ESPE								
Inputs override, reset, c1, belt stop, muting sensors	<table border="0"> <tr> <td style="padding-right: 20px;">Switching voltage HIGH</td> <td>24 V DC (11 V DC ... 30 V DC)</td> </tr> <tr> <td style="padding-right: 20px;">Input current HIGH</td> <td>10 mA (6 mA ... 15 mA)</td> </tr> <tr> <td style="padding-right: 20px;">Switching voltage LOW</td> <td>0 V DC (-30 V DC ... 5 V DC)</td> </tr> <tr> <td style="padding-right: 20px;">Input current LOW</td> <td>0 mA (-0.5 mA ... 1.5 mA)</td> </tr> </table>	Switching voltage HIGH	24 V DC (11 V DC ... 30 V DC)	Input current HIGH	10 mA (6 mA ... 15 mA)	Switching voltage LOW	0 V DC (-30 V DC ... 5 V DC)	Input current LOW	0 mA (-0.5 mA ... 1.5 mA)
Switching voltage HIGH	24 V DC (11 V DC ... 30 V DC)								
Input current HIGH	10 mA (6 mA ... 15 mA)								
Switching voltage LOW	0 V DC (-30 V DC ... 5 V DC)								
Input current LOW	0 mA (-0.5 mA ... 1.5 mA)								
Outputs 24 V DC voltage supply for reset, override, C1, muting sensors	<table border="0"> <tr> <td style="padding-right: 20px;">Supply voltage</td> <td>24 V DC (15 V DC ... 28.8 V DC)</td> </tr> <tr> <td style="padding-right: 20px;">Output current for muting sensors</td> <td>500 mA <sup>1)</sup></td> </tr> <tr> <td style="padding-right: 20px;">Output current for reset, override, C1</td> <td>400 mA <sup>1)</sup></td> </tr> </table>	Supply voltage	24 V DC (15 V DC ... 28.8 V DC)	Output current for muting sensors	500 mA <sup>1)</sup>	Output current for reset, override, C1	400 mA <sup>1)</sup>		
Supply voltage	24 V DC (15 V DC ... 28.8 V DC)								
Output current for muting sensors	500 mA <sup>1)</sup>								
Output current for reset, override, C1	400 mA <sup>1)</sup>								
Muting lamp	<table border="0"> <tr> <td style="padding-right: 20px;">Output current monitored</td> <td>20 mA ... 400 mA</td> </tr> <tr> <td style="padding-right: 20px;">Output current not monitored</td> <td>0 mA ... 400 mA</td> </tr> </table>	Output current monitored	20 mA ... 400 mA	Output current not monitored	0 mA ... 400 mA				
Output current monitored	20 mA ... 400 mA								
Output current not monitored	0 mA ... 400 mA								
Connection type	Socket M12 x 5								
Cable length	10 m <sup>2)</sup>								
Wire cross-section	0.34 mm <sup>2</sup>								
Cable resistance	<0.5 Ohm (per cable)								

<sup>1)</sup> Total of all supply currents from the connections RES/OVR, A1, A2, B1 and B2 (pin 1 in each case): max. 1000 mA

<sup>2)</sup> Between UE403 and M4000 Advanced as well as between the muting sensors/control switches/muting lamp and UE403

# Dimensional drawings

## M4000 Advanced Curtain

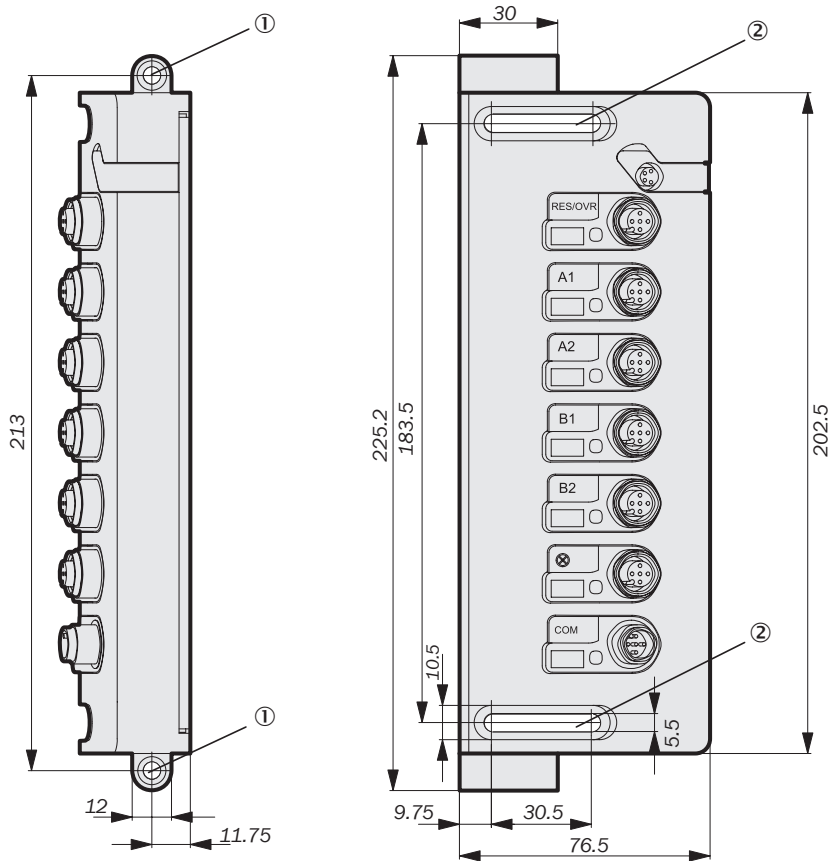


Protective field height S	Dimension L1	Dimension L2
300	387	416
450	537	566
600	687	716
750	837	866
900	987	1016
1050	1137	1166
1200	1287	1316
1350	1437	1466
1500	1587	1616
1650	1737	1766
1800	1887	1916

Dimensions in mm

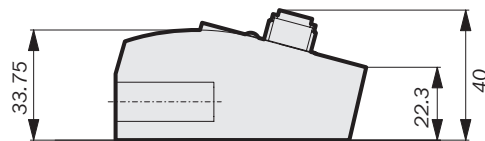
Muting module UE403

E



**Note:**

The fixing holes ① and slots ② are suitable for cheese head screws M5 x 30 as per DIN EN ISO 4762.

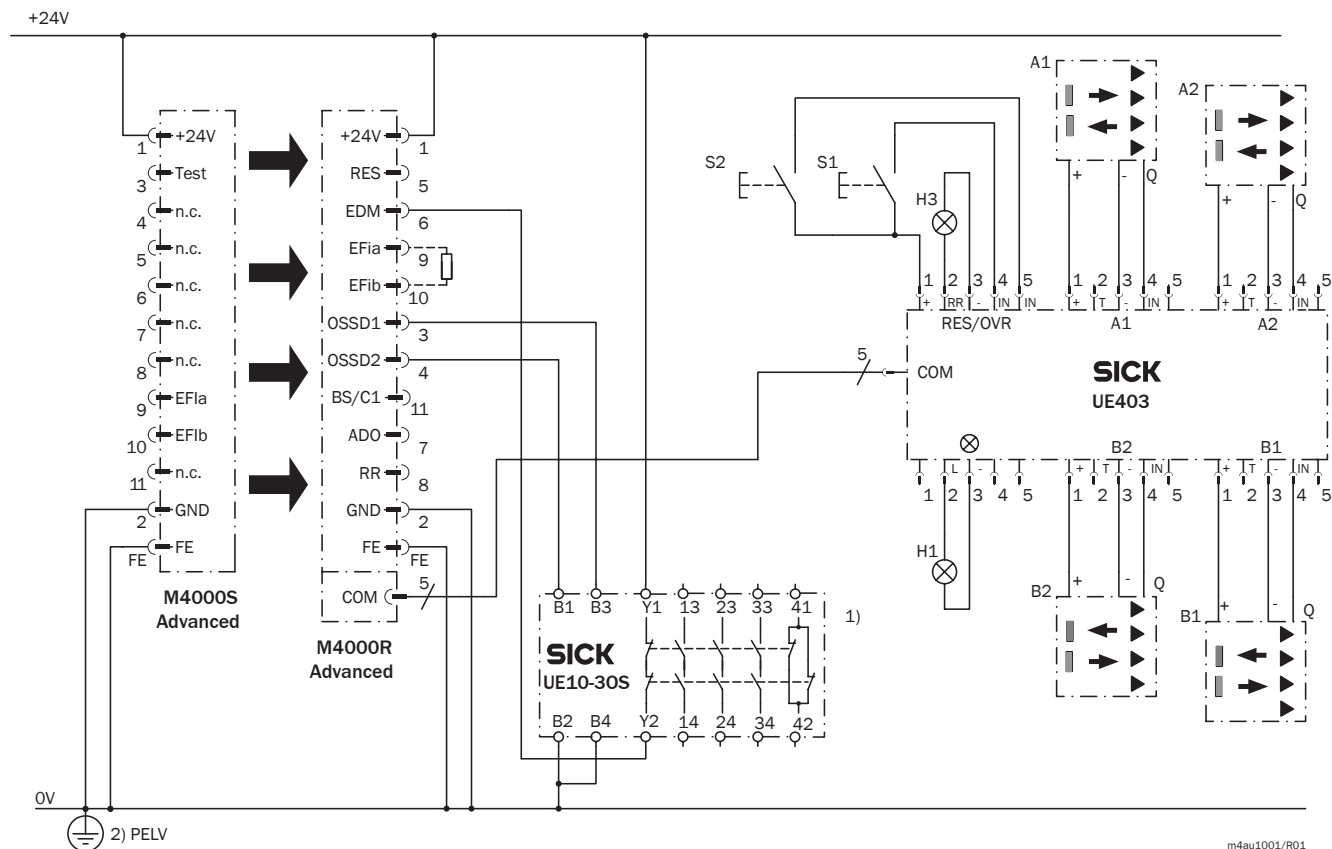


Dimensions in mm

# Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

## M4000 Advanced Curtain with UE403 muting module connected to UE10-30S safety relay



### Task

Connection of an M4000 Advanced Curtain safety light curtain with muting module UE403 to an UE10-30S safety relay. Muting with 4 photoelectric reflex switches (dark switching, PNP). Operating mode: with restart interlock and external device monitoring.

### Operating characteristics

When the light path is clear and the UE10-30S is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready for switch on and waits for an input signal/switch-on signal. The system is enabled by pressing and releasing the button S1. The outputs OSSD1 and OSSD2 are live, the UE10-30S is switched on. On interruption of one or several of the light beams, the UE10-30S is de-energised by the OSSD1 and OSSD2 outputs.

### Muting and override

When the light path is clear and the muting input conditions are valid muting starts. The muting lamp H1 illuminates. Different time and monitoring functions can be configured.

When the light path is interrupted and muting sensors are active, e. g. because of muting errors or a new power-on, override is enabled by pressing and releasing the button S2.

### Fault analysis

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The erroneous behaviour of the UE10-30S will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the system does not enable the output current circuits.




The failure of one muting sensor will be detected by the muting sequence, and prohibit a new muting cycle. On manipulation (e.g. jamming) of the button S2, the system does not enable override. A permanent use of the override function will be inhibited through the device.

### Comments

- 1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be dual-channel (x-/y paths). Single-channel insertion in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices. This applies particularly on the use of configurable functions.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe.	Page P-0

E

## Accessories

### M4000 Advanced Curtain

#### Mounting systems

→ Dimensional drawings mounting systems see page E-36

Type	Property	Packing unit	Part number
Mounting kit 1	Rigid	4	7021352
Mounting kit 2	Adjustable	4	2017751
Mounting kit 6	Swivel function, side bracket	4	2019506
Mounting kit 12	Swivel mount	4	2030510

#### Sliding nuts/sliding blocks

Type	Packing unit	Remark	Part number
Sliding block (sliding nuts)	4	Included with delivery	2017550

#### Connection cables

Connection type	Cable alignment	Cable length	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	2.5 m	2022544
		5 m	2022545
		7.5 m	2022546
		10 m	2022547
		15 m	2022548
		20 m	2022549
		30 m	2022550

**Cable receptacles**

Connection type	Cable alignment	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	6020757
	Angled	6020758

**Extension connection cables**

Connection type	Cable alignment	Remark	Cable length	Part number
Plug M12 x 5, socket M12 x 5	Plug straight/socket straight	Connection cable for M4000 Advanced with M12, 5 pin connector and UE403	0.6 m	6025930
			1 m	6029280
			1.5 m	6029281
			2 m	6025931
			5 m	6029282

**Configuration connection cable**

Connection type	Cable length	Remark	Part number
M8 x 4, SUB-D 9-pol	2 m	For connecting the configuration connection to the PC	6021195

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for	Packing unit	Remark	Part number
M40x-60xxxxxx	2	Including sliding blocks and mounting screws	2033235
M40x-61xxxxxx			2033236
M40x-62xxxxxx			2033237
M40x-63xxxxxx			2033238
M40x-64xxxxxx			2033239
M40x-65xxxxxx			2033240
M40x-66xxxxxx			2033241
M40x-67xxxxxx			2033242
M40x-68xxxxxx			2033243
M40x-69xxxxxx			2033244
M40x-70xxxxxx			2033245

Continued on next page

**Deflector mirrors**

Type	Suitable for protective field height	Remark	Part number
PNS125-034	300 mm	—	1019425
PNS75-034			1019414
PNS125-049	450 mm		1019426
PNS75-049			1019415
PNS125-064	600 mm		1019427
PNS75-064			1019416
PNS125-079	750 mm		1019428
PNS75-079			1019417
PNS125-094	900 mm		1019429
PNS75-094			1019418
PNS125-109	1050 mm		1019430
PNS75-109			1019419
PNS125-124	1200 mm		1019431
PNS75-124			1019420
PNS125-139	1350 mm		1019432
PNS75-139			1019421
PNS125-154	1500 mm		1019433
PNS75-154			1019422
PNS125-169	1650 mm		1019434
PNS75-169			1019423
PNS125-184	1800 mm	1019435	
PNS75-184		1019424	
PNS75-008	—	Including mounting adapter (two pieces swivel mount)	1026647

**Laser alignment aid**

Type	Type of light	Scanning range	Part number
Laser alignment aid AR60	Red light	Max. 60 m	1015741
AR60 adapter for M4000	—	—	4040006

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Configuration Tools**

Type	Remark	Part number
Clone Plug for C4000 and M4000	For C4000 Standard / Advanced / Palletizer / Entry/ Exit and M4000 Advanced	1029665
Wall mount	Packing unit: 1	5318443
Protective cap	For Clone Plug / Host Guest Plug	5318293



## Muting module UE403

## Mounting systems

Property	Packing unit	Remark	Part number
Fixing screws with sliding nuts	2	Included in the delivery	2033250

## Muting sensor connecting cables

Connection type	Cable alignment	Cable length	Remark	Part number
Plug M12 x 4	Plug straight/ socket angled	1 m	Suitable for muting sensor WL24 and WT24	6025974
		2 m	Suitable for muting sensor WL24 and WT24	6025975
		5 m	Suitable for muting sensor WL24 and WT24	6025087
		1 m	Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected	6025944
		2 m	Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected	6025945
		5 m	Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected	6025116
Plug M12 x 3	Plug straight/ socket angled	1 m	Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected	6026106
		2 m	Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected	6026107
		5 m	Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected	6025118

## Extension connection cables

Connection type	Cable alignment	Remark	Cable length	Part number
Plug M12 x 5, socket M12 x 5	Plug straight/socket straight	Connection cable for M4000 Advanced with M12, 5 pin connector and UE403	0.6 m	6025930
			1 m	6029280
			1.5 m	6029281
			2 m	6025931
			5 m	6029282

## Configuration connection cable

Connection type	Cable length	Remark	Part number
M8 x 4, SUB-D 9-pol	2 m	For connecting the configuration connection to the PC	6021195

## Connection cables for control switches

Connection type	Cable alignment	Cable length	Part number
Plug M12 x 5	Straight	2 m	6026133
		5 m	6026134
		10 m	6026135

**Connectors**

Connection type	Cable alignment	Type	Part number
Socket M12 x 4	Angled	DOS-1204-W	6007303
Plug M12 x 4	Straight	STE-1204-G	6009932

**Muting indicator lamp**

Type of muting indicator	Connection type	Cable length	Remark	Part number
Incandescent lamp	Connector	2 m	Incl. mounting bracket and mounting kit	2033116
		10 m	Incl. mounting bracket	2033117
LED		2 m	Incl. mounting bracket and mounting kit	2033118
		10 m	Incl. mounting bracket	2033119

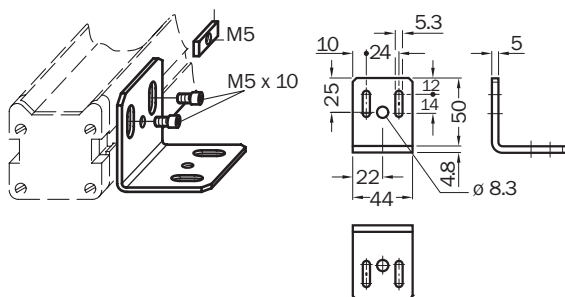
E

**Muting accessories, other**

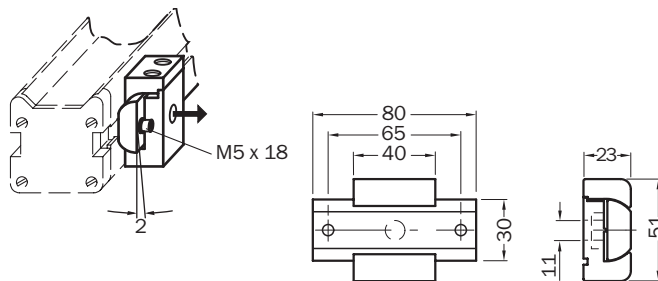
Type	Part number
Protective cap for quick-disconnect socket on UE403	6011170

**Dimensional drawings mounting systems**

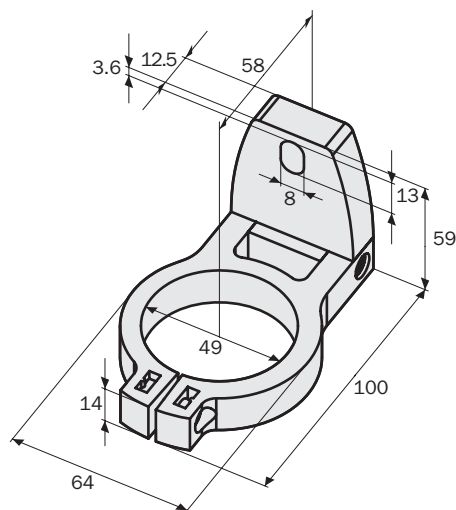
**Mounting kit 1**



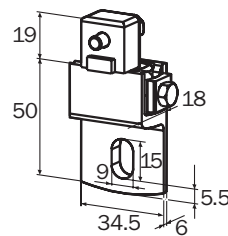
**Mounting kit 2**



**Mounting kit 12**

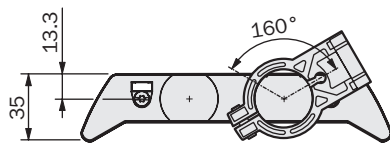


**Mounting kit 6**

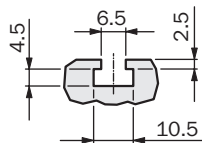


Dimensions in mm

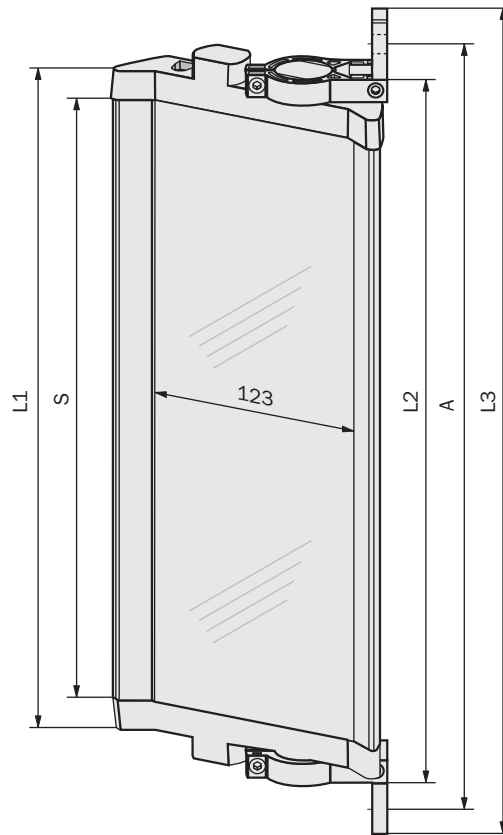
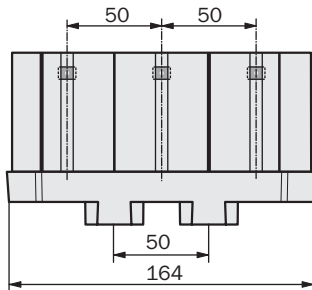
Dimensional drawings deflector mirror PNS125



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



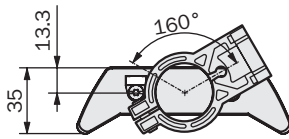
Dimensions in mm

Mirror height S	Dimension L1	Dimension L2	Dimension L3	Dimension A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

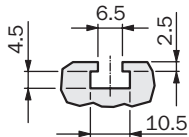
Dimensions in mm

E

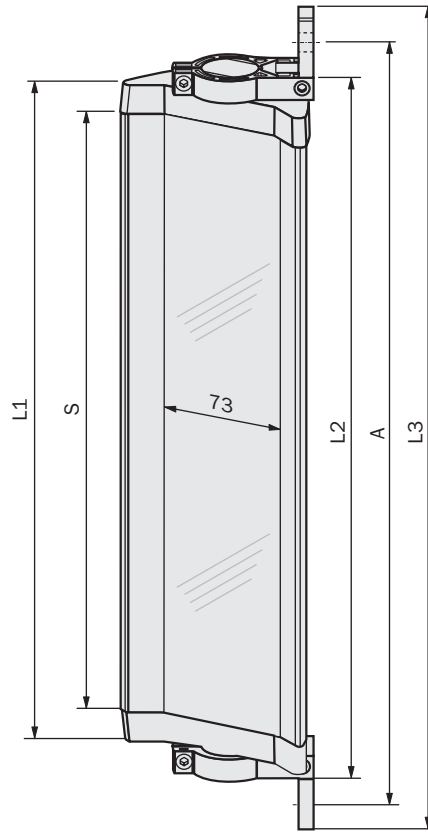
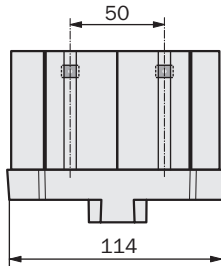
Dimensional drawings deflector mirror PNS75



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



Dimensions in mm

Mirror height S	Dimension L1	Dimension L2	Dimension L3	Dimension A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

## Overview of technical specifications

Protective field height (depending on type)	150 mm ... 1800 mm
Scanning range (depending on type)	0 m ... 8 m / 0 m ... 19 m
Resolution (depending on type)	14 mm / 20 mm / 30 mm / 40 mm
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

The C4000 Standard safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection:

- Alignment and diagnostics via 7-segment display
- Application diagnostic output for status information

- Configuration and diagnostics via RS-232 interface
- Emergency stop button or reset button directly at the extension connection
- Rapid commissioning due to preconfigured devices
- Configure quickly and straightforwardly using Clone Plug

## In-system added value

- Combination with SICK safe control solutions

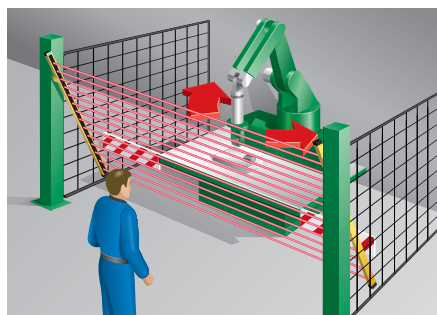
Combination with	Restart interlock	External device monitoring	Bypass	PSDI/ PSDI window	Teach-in	Operating mode selection	Further information
UE402	-	-	✓	✓	✓	✓	E-63
UE48-20S	✓	✓	-	-	-	-	N-42
UE48-30S	✓	✓	-	-	-	-	N-48
UE10-30S	Relay module						N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

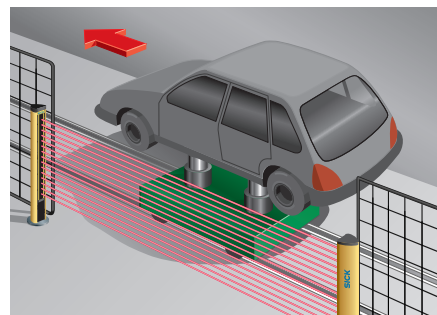
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

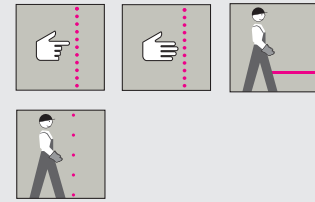
- Car and vehicle manufacture
- Shaping machine tools
- Plastic and rubber industry
- Electronics industry
- Robots
- Printing and paper industry
- Wood processing
- Palletiser



Hazardous point protection on an industrial robot



Hazardous point protection on an assembly line



- External device monitoring (EDM)
- Restart interlock (RES)
- Beam coding
- Up to 3 systems can be cascaded
- Alignment and diagnostics via 7-segment display
- ATEX II 3 G/3D
- Configuration and diagnostics via PC



Further information	Page
→ Ordering information	E-40
→ Technical specifications	E-55
→ Dimensional drawings	E-57
→ Connection diagrams	E-61
→ Accessories	E-62
→ Services	A-2

## Ordering information

### C4000 Standard without extension connection

→ Ordering information C4000 Standard with extension connection page E-42

Housing dimensions	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass (with UE402), operating mode selection (with UE402)
Consisting of	Sender and receiver unit
Usage	Last system in cascade or stand-alone system
Connections	System connection: Hirschmann plug M26 × 11 + FE Configuration and diagnostics interface: M8 × 4

E

#### Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1018591	C40E-0301CA010	1018592
450	C40S-0401CA010	1018347	C40E-0401CA010	1018348
600	C40S-0601CA010	1018593	C40E-0601CA010	1018594
750	C40S-0701CA010	1018595	C40E-0701CA010	1018596
900	C40S-0901CA010	1018597	C40E-0901CA010	1018598
1050	C40S-1001CA010	1018599	C40E-1001CA010	1018600
1200	C40S-1201CA010	1018601	C40E-1201CA010	1018602
1350	C40S-1301CA010	1018603	C40E-1301CA010	1018604
1500	C40S-1501CA010	1018605	C40E-1501CA010	1018606
1650	C40S-1601CA010	1018607	C40E-1601CA010	1018608
1800	C40S-1801CA010	1018609	C40E-1801CA010	1018610

#### Resolution 20 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1018613	C40E-0302CA010	1018614
450	C40S-0402CA010	1018615	C40E-0402CA010	1018616
600	C40S-0602CA010	1018617	C40E-0602CA010	1018618
750	C40S-0702CA010	1018619	C40E-0702CA010	1018620
900	C40S-0902CA010	1018621	C40E-0902CA010	1018622
1050	C40S-1002CA010	1018623	C40E-1002CA010	1018624
1200	C40S-1202CA010	1018625	C40E-1202CA010	1018626
1350	C40S-1302CA010	1018627	C40E-1302CA010	1018628
1500	C40S-1502CA010	1018629	C40E-1502CA010	1018630
1650	C40S-1602CA010	1018631	C40E-1602CA010	1018632
1800	C40S-1802CA010	1018633	C40E-1802CA010	1018634

**Resolution 30 mm, scanning range 0 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1018635	C40E-0303CA010	1018636
450	C40S-0403CA010	1018637	C40E-0403CA010	1018638
600	C40S-0603CA010	1018639	C40E-0603CA010	1018640
750	C40S-0703CA010	1018641	C40E-0703CA010	1018642
900	C40S-0903CA010	1018643	C40E-0903CA010	1018644
1050	C40S-1003CA010	1018645	C40E-1003CA010	1018646
1200	C40S-1203CA010	1018647	C40E-1203CA010	1018648
1350	C40S-1303CA010	1018649	C40E-1303CA010	1018650
1500	C40S-1503CA010	1018651	C40E-1503CA010	1018652
1650	C40S-1603CA010	1018653	C40E-1603CA010	1018654
1800	C40S-1803CA010	1018655	C40E-1803CA010	1018656

E

**Resolution 40 mm, scanning range 0 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1018657	C40E-0304CA010	1018658
450	C40S-0404CA010	1018659	C40E-0404CA010	1018660
600	C40S-0604CA010	1018661	C40E-0604CA010	1018662
750	C40S-0704CA010	1018663	C40E-0704CA010	1018664
900	C40S-0904CA010	1018665	C40E-0904CA010	1018666
1050	C40S-1004CA010	1018667	C40E-1004CA010	1018668
1200	C40S-1204CA010	1018669	C40E-1204CA010	1018670
1350	C40S-1304CA010	1018671	C40E-1304CA010	1018672
1500	C40S-1504CA010	1018673	C40E-1504CA010	1018674
1650	C40S-1604CA010	1018675	C40E-1604CA010	1018676
1800	C40S-1804CA010	1018677	C40E-1804CA010	1018678

**C4000 Standard with angled system connection, without extension connection**

<b>Housing dimensions</b>	48 mm × 40 mm
<b>Functions</b>	Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass (with UE402), operating mode selection (with UE402)
<b>Consisting of</b>	Sender and receiver unit
<b>Usage</b>	Last system in cascade or stand-alone system
<b>Connections</b>	System connection: Hirschmann plug M26 × 11 + FE Configuration and diagnostics interface: M8 × 4

Resolution (mm)	Scanning range (m)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
14	0 ... 8	300	C40S-0301CA020	1022267	C40E-0301CA020	1022268
		450	C40S-0401CA020	1026737	C40E-0401CA020	1026738
30	0 ... 19	300	C40S-0303CA020	1026733	C40E-0303CA020	1026734
		450	C40S-0403CA020	1026735	C40E-0403CA020	1026736

## C4000 Standard with extension connection M26×11 + FE

→ Ordering information C4000 Standard without extension connection page E-40

Housing dimensions	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass or emergency stop, operating mode selection (with UE402)
Consisting of	Sender and receiver unit
Usage	First system in cascade, middle system in cascade
Connections	System connection: Hirschmann plug M26×11 + FE Extension connection: Hirschmann socket M26×11 + FE Configuration and diagnostics interface: M8×4

## E

## Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301DA010	1018690	C40E-0301DA010	1018691
450	C40S-0401DA010	1018349	C40E-0401DA010	1018350
600	C40S-0601DA010	1018692	C40E-0601DA010	1018693
750	C40S-0701DA010	1018694	C40E-0701DA010	1018695
900	C40S-0901DA010	1018696	C40E-0901DA010	1018697
1050	C40S-1001DA010	1018698	C40E-1001DA010	1018699
1200	C40S-1201DA010	1018700	C40E-1201DA010	1018701
1350	C40S-1301DA010	1018702	C40E-1301DA010	1018703
1500	C40S-1501DA010	1018704	C40E-1501DA010	1018705
1650	C40S-1601DA010	1018706	C40E-1601DA010	1018707
1800	C40S-1801DA010	1018708	C40E-1801DA010	1018709

## Resolution 20 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302DA010	1018710	C40E-0302DA010	1018711
450	C40S-0402DA010	1018712	C40E-0402DA010	1018713
600	C40S-0602DA010	1018714	C40E-0602DA010	1018715
750	C40S-0702DA010	1018716	C40E-0702DA010	1018717
900	C40S-0902DA010	1018718	C40E-0902DA010	1018719
1050	C40S-1002DA010	1018720	C40E-1002DA010	1018721
1200	C40S-1202DA010	1018722	C40E-1202DA010	1018723
1350	C40S-1302DA010	1018724	C40E-1302DA010	1018725
1500	C40S-1502DA010	1018726	C40E-1502DA010	1018727
1650	C40S-1602DA010	1018728	C40E-1602DA010	1018729
1800	C40S-1802DA010	1018730	C40E-1802DA010	1018731



**Resolution 30 mm, scanning range 0 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303DA010	1018733	C40E-0303DA010	1018734
450	C40S-0403DA010	1018735	C40E-0403DA010	1018736
600	C40S-0603DA010	1018737	C40E-0603DA010	1018738
750	C40S-0703DA010	1018739	C40E-0703DA010	1018740
900	C40S-0903DA010	1018741	C40E-0903DA010	1018742
1050	C40S-1003DA010	1018743	C40E-1003DA010	1018744
1200	C40S-1203DA010	1018745	C40E-1203DA010	1018746
1350	C40S-1303DA010	1018747	C40E-1303DA010	1018748
1500	C40S-1503DA010	1018749	C40E-1503DA010	1018750
1650	C40S-1603DA010	1018751	C40E-1603DA010	1018752
1800	C40S-1803DA010	1018753	C40E-1803DA010	1018754

E

**Resolution 40 mm, scanning range 0 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304DA010	1018755	C40E-0304DA010	1018756
450	C40S-0404DA010	1018757	C40E-0404DA010	1018758
600	C40S-0604DA010	1018759	C40E-0604DA010	1018760
750	C40S-0704DA010	1018762	C40E-0704DA010	1018763
900	C40S-0904DA010	1018765	C40E-0904DA010	1018766
1050	C40S-1004DA010	1018767	C40E-1004DA010	1018768
1200	C40S-1204DA010	1018769	C40E-1204DA010	1018770
1350	C40S-1304DA010	1018771	C40E-1304DA010	1018772
1500	C40S-1504DA010	1018773	C40E-1504DA010	1018774
1650	C40S-1604DA010	1018775	C40E-1604DA010	1018776
1800	C40S-1804DA010	1018777	C40E-1804DA010	1018778

## C4000 Standard with extension connection M12×7 + FE

→ Ordering information C4000 Standard without extension connection page E-40

Housing dimensions	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass or emergency stop, operating mode selection (with UE402)
Consisting of	Sender and receiver unit
Usage	First system in cascade, middle system in cascade
Connections	System connection: Hirschmann plug M26×11 + FE Extension connection: Hirschmann socket M12×7 + FE Configuration and diagnostics interface: M8×4

## E

## Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301DA040	1028969	C40E-0301DA040	1028970
450	C40S-0401DA040	1028967	C40E-0401DA040	1028968
600	C40S-0601DA040	1028971	C40E-0601DA040	1028972
750	C40S-0701DA040	1028973	C40E-0701DA040	1028974
900	C40S-0901DA040	1028975	C40E-0901DA040	1028976
1050	C40S-1001DA040	1028977	C40E-1001DA040	1028978
1200	C40S-1201DA040	1028979	C40E-1201DA040	1028980
1350	C40S-1301DA040	1028981	C40E-1301DA040	1028982
1500	C40S-1501DA040	1028983	C40E-1501DA040	1028984
1650	C40S-1601DA040	1028985	C40E-1601DA040	1028986
1800	C40S-1801DA040	1028987	C40E-1801DA040	1028988

## Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303DA040	1029001	C40E-0303DA040	1029002
450	C40S-0403DA040	1029003	C40E-0403DA040	1029004
600	C40S-0603DA040	1029005	C40E-0603DA040	1029006
750	C40S-0703DA040	1029007	C40E-0703DA040	1029008
900	C40S-0903DA040	1029009	C40E-0903DA040	1029010
1050	C40S-1003DA040	1029011	C40E-1003DA040	1029012
1200	C40S-1203DA040	1029013	C40E-1203DA040	1029014
1350	C40S-1303DA040	1029015	C40E-1303DA040	1029016
1500	C40S-1503DA040	1029017	C40E-1503DA040	1029018
1650	C40S-1603DA040	1029019	C40E-1603DA040	1029020
1800	C40S-1803DA040	1029021	C40E-1803DA040	1029022

## C4000 Standard Guest with straight system connection

→ Ordering information C4000 Standard without extension connection page E-40

<b>Housing dimensions</b>	48 mm × 40 mm
<b>Functions</b>	Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass, operating mode selection (with UE402)
<b>Consisting of</b>	Sender and receiver unit
<b>Usage</b>	Last system in cascade, configurable via host
<b>Connections</b>	System connection: Flying lead 320 mm with plug M12 × 7 + FE, straight

### Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C46S-0101CT400	1028796	C46E-0101CT400	1028797
300	C46S-0301CT400	1028802	C46E-0301CT400	1028803
450	C46S-0401CT400	1028804	C46E-0401CT400	1028805
600	C46S-0601CT400	1028806	C46E-0601CT400	1028807
750	C46S-0701CT400	1028808	C46E-0701CT400	1028809
900	C46S-0901CT400	1040173	C46E-0901CT400	1040174
1050	C46S-1001CT400	1040175	C46E-1001CT400	1040176
1200	C46S-1201CT400	1040177	C46E-1201CT400	1040178
1350	C46S-1301CT400	1040179	C46E-1301CT400	1040180
1500	C46S-1501CT400	1040181	C46E-1501CT400	1040214
1650	C46S-1601CT400	1040182	C46E-1601CT400	1040183
1800	C46S-1801CT400	1040184	C46E-1801CT400	1040185

### Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C46S-0103CT400	1028879	C46E-0103CT400	1028880
300	C46S-0303CT400	1028881	C46E-0303CT400	1028882
450	C46S-0403CT400	1028883	C46E-0403CT400	1028884
600	C46S-0603CT400	1028885	C46E-0603CT400	1028886
750	C46S-0703CT400	1028887	C46E-0703CT400	1028888
900	C46S-0903CT400	1040193	C46E-0903CT400	1040194
1050	C46S-1003CT400	1040195	C46E-1003CT400	1040196
1200	C46S-1203CT400	1040197	C46E-1203CT400	1040198
1350	C46S-1303CT400	1040199	C46E-1303CT400	1040200
1500	C46S-1503CT400	1040201	C46E-1503CT400	1040202
1650	C46S-1603CT400	1040203	C46E-1603CT400	1040204
1800	C46S-1803CT400	1040205	C46E-1803CT400	1040206

## C4000 Standard Guest with angled system connection

→ Ordering information C4000 Standard without extension connection page E-40

Housing dimensions	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, PSDI mode (with UE402), bypass, operating mode selection (with UE402)
Consisting of	Sender and receiver unit
Usage	Last system in cascade, configurable via host
Connections	System connection: Flying lead 320 mm with plug M12 × 7 + FE, angled

### E

#### Resolution 14 mm, scanning range 0 m ... 8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C46S-0101CT500	1028810	C46E-0101CT500	1028811

#### Resolution 30 mm, scanning range 0 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C46S-0101CT500	1028810	C46E-0101CT500	1028811

## C4000 Standard without extension connection, with pre-configuration C

Based on C4000 Standard	With the following pre-configuration			
	C	D	E	F
Restart interlock	External	External	Internal	Internal
External device monitoring	Selected	Selected	Selected	Selected
Beam coding	Non-coded	Non-coded	Non-coded	Non-coded
Scanning range	Short	Long	Short	Long

## Resolution 14 mm, scanning range 0 m ... 2.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1018591	C40E-0301CC010	1022358
450	C40S-0401CA010	1018347	C40E-0401CC010	1022359
600	C40S-0601CA010	1018593	C40E-0601CC010	1022360
750	C40S-0701CA010	1018595	C40E-0701CC010	1022361
900	C40S-0901CA010	1018597	C40E-0901CC010	1022362
1050	C40S-1001CA010	1018599	C40E-1001CC010	1022363
1200	C40S-1201CA010	1018601	C40E-1201CC010	1022364
1350	C40S-1301CA010	1018603	C40E-1301CC010	1022365
1500	C40S-1501CA010	1018605	C40E-1501CC010	1022366
1650	C40S-1601CA010	1018607	C40E-1601CC010	1022367
1800	C40S-1801CA010	1018609	C40E-1801CC010	1022368

## Resolution 20 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1018613	C40E-0302CC010	1022369
450	C40S-0402CA010	1018615	C40E-0402CC010	1022370
600	C40S-0602CA010	1018617	C40E-0602CC010	1022371
750	C40S-0702CA010	1018619	C40E-0702CC010	1022372
900	C40S-0902CA010	1018621	C40E-0902CC010	1022373
1050	C40S-1002CA010	1018623	C40E-1002CC010	1022374
1200	C40S-1202CA010	1018625	C40E-1202CC010	1022375
1350	C40S-1302CA010	1018627	C40E-1302CC010	1022376
1500	C40S-1502CA010	1018629	C40E-1502CC010	1022377
1650	C40S-1602CA010	1018631	C40E-1602CC010	1022378
1800	C40S-1802CA010	1018633	C40E-1802CC010	1022379

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**Resolution 30 mm, scanning range 0 m ... 6 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1018635	C40E-0303CC010	1022380
450	C40S-0403CA010	1018637	C40E-0403CC010	1022381
600	C40S-0603CA010	1018639	C40E-0603CC010	1022382
750	C40S-0703CA010	1018641	C40E-0703CC010	1022383
900	C40S-0903CA010	1018643	C40E-0903CC010	1022384
1050	C40S-1003CA010	1018645	C40E-1003CC010	1022385
1200	C40S-1203CA010	1018647	C40E-1203CC010	1022386
1350	C40S-1303CA010	1018649	C40E-1303CC010	1022387
1500	C40S-1503CA010	1018651	C40E-1503CC010	1022388
1650	C40S-1603CA010	1018653	C40E-1603CC010	1022389
1800	C40S-1803CA010	1018655	C40E-1803CC010	1022390

**Resolution 40 mm, scanning range 0 m ... 6 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1018657	C40E-0304CC010	1022391
450	C40S-0404CA010	1018659	C40E-0404CC010	1022392
600	C40S-0604CA010	1018661	C40E-0604CC010	1022393
750	C40S-0704CA010	1018663	C40E-0704CC010	1022394
900	C40S-0904CA010	1018665	C40E-0904CC010	1022395
1050	C40S-1004CA010	1018667	C40E-1004CC010	1022396
1200	C40S-1204CA010	1018669	C40E-1204CC010	1022397
1350	C40S-1304CA010	1018671	C40E-1304CC010	1022398
1500	C40S-1504CA010	1018673	C40E-1504CC010	1022399
1650	C40S-1604CA010	1018675	C40E-1604CC010	1022400
1800	C40S-1804CA010	1018677	C40E-1804CC010	1022401

## C4000 Standard without extension connection, with pre-configuration D

Based on C4000 Standard	With the following pre-configuration			
	C	D	E	F
Restart interlock	External	External	Internal	Internal
External device monitoring	Selected	Selected	Selected	Selected
Beam coding	Non-coded	Non-coded	Non-coded	Non-coded
Scanning range	Short	Long	Short	Long

## Resolution 14 mm, scanning range 2 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1018591	C40E-0301CD010	1022402
450	C40S-0401CA010	1018347	C40E-0401CD010	1022403
600	C40S-0601CA010	1018593	C40E-0601CD010	1022404
750	C40S-0701CA010	1018595	C40E-0701CD010	1022405
900	C40S-0901CA010	1018597	C40E-0901CD010	1022406
1050	C40S-1001CA010	1018599	C40E-1001CD010	1022407
1200	C40S-1201CA010	1018601	C40E-1201CD010	1022408
1350	C40S-1301CA010	1018603	C40E-1301CD010	1022409
1500	C40S-1501CA010	1018605	C40E-1501CD010	1022410
1650	C40S-1601CA010	1018607	C40E-1601CD010	1022411
1800	C40S-1801CA010	1018609	C40E-1801CD010	1022412

## Resolution 20 mm, scanning range 5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1018613	C40E-0302CD010	1022413
450	C40S-0402CA010	1018615	C40E-0402CD010	1022414
600	C40S-0602CA010	1018617	C40E-0602CD010	1022415
750	C40S-0702CA010	1018619	C40E-0702CD010	1022416
900	C40S-0902CA010	1018621	C40E-0902CD010	1022417
1050	C40S-1002CA010	1018623	C40E-1002CD010	1022418
1200	C40S-1202CA010	1018625	C40E-1202CD010	1022419
1350	C40S-1302CA010	1018627	C40E-1302CD010	1022420
1500	C40S-1502CA010	1018629	C40E-1502CD010	1022421
1650	C40S-1602CA010	1018631	C40E-1602CD010	1022422
1800	C40S-1802CA010	1018633	C40E-1802CD010	1022423

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**Resolution 30 mm, scanning range 5 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1018635	C40E-0303CD010	1022424
450	C40S-0403CA010	1018637	C40E-0403CD010	1022425
600	C40S-0603CA010	1018639	C40E-0603CD010	1022426
750	C40S-0703CA010	1018641	C40E-0703CD010	1022427
900	C40S-0903CA010	1018643	C40E-0903CD010	1022428
1050	C40S-1003CA010	1018645	C40E-1003CD010	1022429
1200	C40S-1203CA010	1018647	C40E-1203CD010	1022430
1350	C40S-1303CA010	1018649	C40E-1303CD010	1022431
1500	C40S-1503CA010	1018651	C40E-1503CD010	1022432
1650	C40S-1603CA010	1018653	C40E-1603CD010	1022433
1800	C40S-1803CA010	1018655	C40E-1803CD010	1022434

**Resolution 40 mm, scanning range 5 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1018657	C40E-0304CD010	1022435
450	C40S-0404CA010	1018659	C40E-0404CD010	1022436
600	C40S-0604CA010	1018661	C40E-0604CD010	1022437
750	C40S-0704CA010	1018663	C40E-0704CD010	1022438
900	C40S-0904CA010	1018665	C40E-0904CD010	1022439
1050	C40S-1004CA010	1018667	C40E-1004CD010	1022440
1200	C40S-1204CA010	1018669	C40E-1204CD010	1022441
1350	C40S-1304CA010	1018671	C40E-1304CD010	1022442
1500	C40S-1504CA010	1018673	C40E-1504CD010	1022443
1650	C40S-1604CA010	1018675	C40E-1604CD010	1022444
1800	C40S-1804CA010	1018677	C40E-1804CD010	1022445



## C4000 Standard without extension connection, with pre-configuration E

Based on C4000 Standard	With the following pre-configuration			
	C	D	E	F
Restart interlock	External	External	Internal	Internal
External device monitoring	Selected	Selected	Selected	Selected
Beam coding	Non-coded	Non-coded	Non-coded	Non-coded
Scanning range	Short	Long	Short	Long

## Resolution 14 mm, scanning range 0 m ... 2.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1018591	C40E-0301CE010	1022446
450	C40S-0401CA010	1018347	C40E-0401CE010	1022447
600	C40S-0601CA010	1018593	C40E-0601CE010	1022448
750	C40S-0701CA010	1018595	C40E-0701CE010	1022449
900	C40S-0901CA010	1018597	C40E-0901CE010	1022450
1050	C40S-1001CA010	1018599	C40E-1001CE010	1022451
1200	C40S-1201CA010	1018601	C40E-1201CE010	1022452
1350	C40S-1301CA010	1018603	C40E-1301CE010	1022453
1500	C40S-1501CA010	1018605	C40E-1501CE010	1022454
1650	C40S-1601CA010	1018607	C40E-1601CE010	1022455
1800	C40S-1801CA010	1018609	C40E-1801CE010	1022456

## Resolution 20 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1018613	C40E-0302CE010	1022457
450	C40S-0402CA010	1018615	C40E-0402CE010	1022458
600	C40S-0602CA010	1018617	C40E-0602CE010	1022459
750	C40S-0702CA010	1018619	C40E-0702CE010	1022460
900	C40S-0902CA010	1018621	C40E-0902CE010	1022461
1050	C40S-1002CA010	1018623	C40E-1002CE010	1022462
1200	C40S-1202CA010	1018625	C40E-1202CE010	1022463
1350	C40S-1302CA010	1018627	C40E-1302CE010	1022464
1500	C40S-1502CA010	1018629	C40E-1502CE010	1022465
1650	C40S-1602CA010	1018631	C40E-1602CE010	1022466
1800	C40S-1802CA010	1018633	C40E-1802CE010	1022467

Continued on next page

**Resolution 30 mm, scanning range 0 m ... 6 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1018635	C40E-0303CE010	1022468
450	C40S-0403CA010	1018637	C40E-0403CE010	1022469
600	C40S-0603CA010	1018639	C40E-0603CE010	1022470
750	C40S-0703CA010	1018641	C40E-0703CE010	1022471
900	C40S-0903CA010	1018643	C40E-0903CE010	1022472
1050	C40S-1003CA010	1018645	C40E-1003CE010	1022473
1200	C40S-1203CA010	1018647	C40E-1203CE010	1022474
1350	C40S-1303CA010	1018649	C40E-1303CE010	1022475
1500	C40S-1503CA010	1018651	C40E-1503CE010	1022476
1650	C40S-1603CA010	1018653	C40E-1603CE010	1022477
1800	C40S-1803CA010	1018655	C40E-1803CE010	1022478

**Resolution 40 mm, scanning range 0 m ... 6 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1018657	C40E-0304CE010	1022479
450	C40S-0404CA010	1018659	C40E-0404CE010	1022480
600	C40S-0604CA010	1018661	C40E-0604CE010	1022481
750	C40S-0704CA010	1018663	C40E-0704CE010	1022482
900	C40S-0904CA010	1018665	C40E-0904CE010	1022483
1050	C40S-1004CA010	1018667	C40E-1004CE010	1022484
1200	C40S-1204CA010	1018669	C40E-1204CE010	1022485
1350	C40S-1304CA010	1018671	C40E-1304CE010	1022486
1500	C40S-1504CA010	1018673	C40E-1504CE010	1022487
1650	C40S-1604CA010	1018675	C40E-1604CE010	1022488
1800	C40S-1804CA010	1018677	C40E-1804CE010	1022489

## C4000 Standard without extension connection, with pre-configuration F

Based on C4000 Standard	With the following pre-configuration			
	C	D	E	F
Restart interlock	External	External	Internal	Internal
External device monitoring	Selected	Selected	Selected	Selected
Beam coding	Non-coded	Non-coded	Non-coded	Non-coded
Scanning range	Short	Long	Short	Long

## Resolution 14 mm, scanning range 2 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301CA010	1018591	C40E-0301CF010	1022490
450	C40S-0401CA010	1018347	C40E-0401CF010	1022491
600	C40S-0601CA010	1018593	C40E-0601CF010	1022492
750	C40S-0701CA010	1018595	C40E-0701CF010	1022493
900	C40S-0901CA010	1018597	C40E-0901CF010	1022494
1050	C40S-1001CA010	1018599	C40E-1001CF010	1022495
1200	C40S-1201CA010	1018601	C40E-1201CF010	1022496
1350	C40S-1301CA010	1018603	C40E-1301CF010	1022497
1500	C40S-1501CA010	1018605	C40E-1501CF010	1022498
1650	C40S-1601CA010	1018607	C40E-1601CF010	1022499
1800	C40S-1801CA010	1018609	C40E-1801CF010	1022500

## Resolution 20 mm, scanning range 5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0302CA010	1018613	C40E-0302CF010	1022501
450	C40S-0402CA010	1018615	C40E-0402CF010	1022502
600	C40S-0602CA010	1018617	C40E-0602CF010	1022503
750	C40S-0702CA010	1018619	C40E-0702CF010	1022504
900	C40S-0902CA010	1018621	C40E-0902CF010	1022505
1050	C40S-1002CA010	1018623	C40E-1002CF010	1022506
1200	C40S-1202CA010	1018625	C40E-1202CF010	1022507
1350	C40S-1302CA010	1018627	C40E-1302CF010	1022508
1500	C40S-1502CA010	1018629	C40E-1502CF010	1022509
1650	C40S-1602CA010	1018631	C40E-1602CF010	1022510
1800	C40S-1802CA010	1018633	C40E-1802CF010	1022511

Continued on next page

**Resolution 30 mm, scanning range 5 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303CA010	1018635	C40E-0303CF010	1022512
450	C40S-0403CA010	1018637	C40E-0403CF010	1022513
600	C40S-0603CA010	1018639	C40E-0603CF010	1022514
750	C40S-0703CA010	1018641	C40E-0703CF010	1022515
900	C40S-0903CA010	1018643	C40E-0903CF010	1022516
1050	C40S-1003CA010	1018645	C40E-1003CF010	1022517
1200	C40S-1203CA010	1018647	C40E-1203CF010	1022518
1350	C40S-1303CA010	1018649	C40E-1303CF010	1022519
1500	C40S-1503CA010	1018651	C40E-1503CF010	1022520
1650	C40S-1603CA010	1018653	C40E-1603CF010	1022521
1800	C40S-1803CA010	1018655	C40E-1803CF010	1022522

**Resolution 40 mm, scanning range 5 m ... 19 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0304CA010	1018657	C40E-0304CF010	1022523
450	C40S-0404CA010	1018659	C40E-0404CF010	1022524
600	C40S-0604CA010	1018661	C40E-0604CF010	1022525
750	C40S-0704CA010	1018663	C40E-0704CF010	1022526
900	C40S-0904CA010	1018665	C40E-0904CF010	1022527
1050	C40S-1004CA010	1018667	C40E-1004CF010	1022528
1200	C40S-1204CA010	1018669	C40E-1204CF010	1022529
1350	C40S-1304CA010	1018671	C40E-1304CF010	1022530
1500	C40S-1504CA010	1018673	C40E-1504CF010	1022531
1650	C40S-1604CA010	1018675	C40E-1604CF010	1022532
1800	C40S-1804CA010	1018677	C40E-1804CF010	1022533

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### C4000 Standard

#### General system data

Scanning range (depending on type)	0 m ... 6 m / 0 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm ... 40 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

#### Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	9 ms ... 56 ms (stand-alone system, without beam coding, without blanking)
Switching voltage	$V_S - 2.25\text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	≤3 A

#### Sender unit

Power consumption	≤2 A
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#### General operating data

Connection type system connection	Hirschmann plug M26 × 11 + FE
Connection type extension connection	Hirschmann socket M26 × 11 + FE
Connection type configuration connection	M8 × 4
Connecting cable length	Max. 50 m
Connecting cable wire cross-section	0.75 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm × 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Weight (depending on type)	0.82 kg ... 3.71 kg

## C4000 Standard Guest

## General system data

Scanning range (depending on type)	0 m ... 6 m / 0 m ... 19 m
Protective field height (depending on type)	150 mm ... 1800 mm
Resolution (depending on type)	14 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

E

## Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	9 ms ... 56 ms (stand-alone system, without beam coding, without blanking)
Switching voltage	$V_S - 2.25 V$ 3.5 V
Switching current max.	500 mA
Power consumption	$\leq 3 A$

## Sender unit

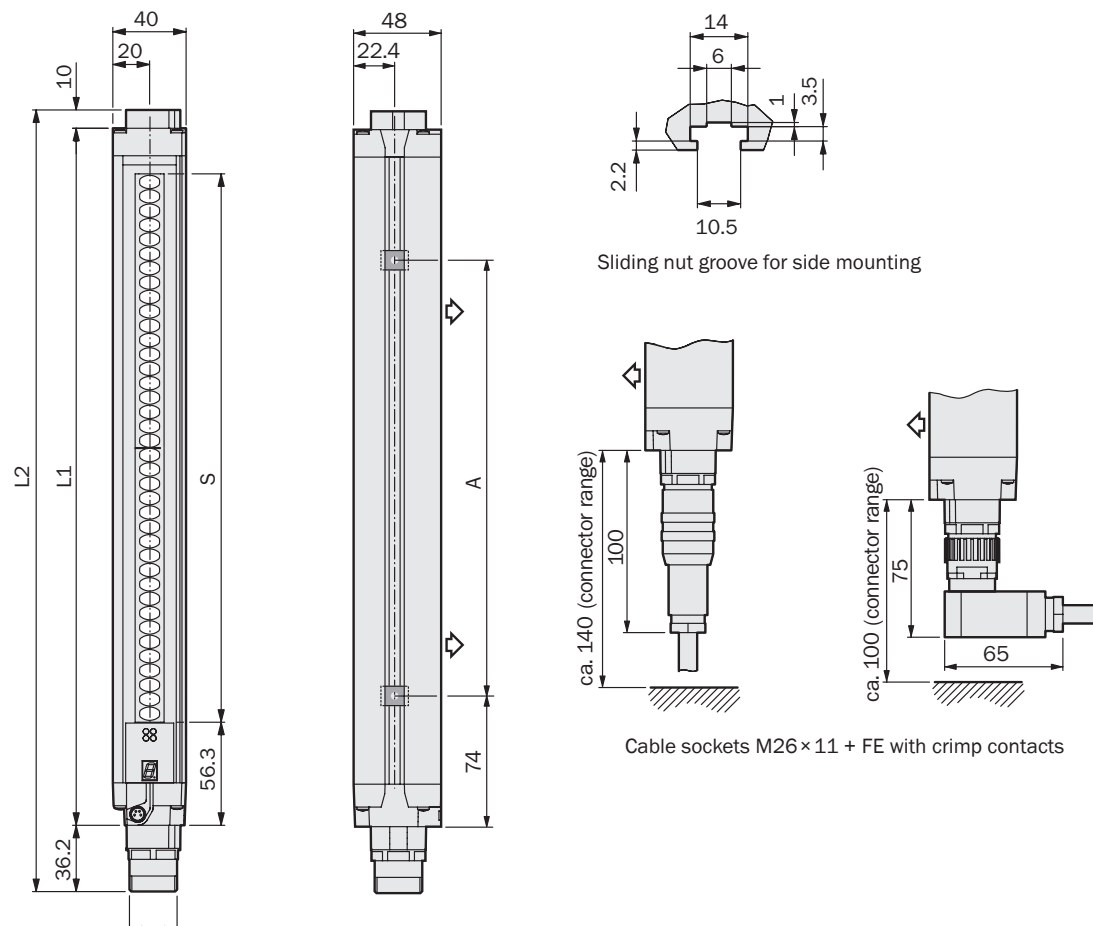
Power consumption	$\leq 2 A$
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## General operating data

Connection type system connection (depending on type)	Flying lead 320 mm with plug M12×7 + FE, straight Flying lead 320 mm with plug M12×7 + FE, angled
Connecting cable length	Max. 3 m between host and guest
Connecting cable wire cross-section	0.25 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm × 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Weight (depending on type)	0.82 kg ... 3.71 kg

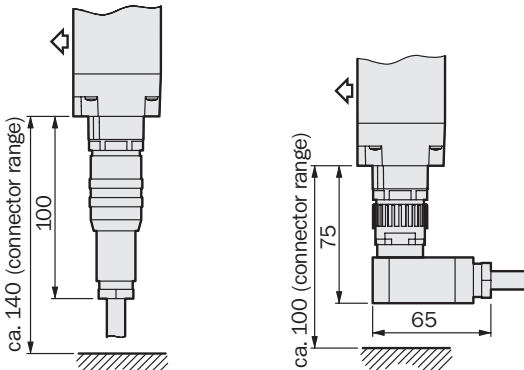
# Dimensional drawings

## C4000 Standard without extension connection



DIN 43651 plug (M26 x 11 + FE)

Sliding nut groove for side mounting



Cable sockets M26 x 11 + FE with crimp contacts

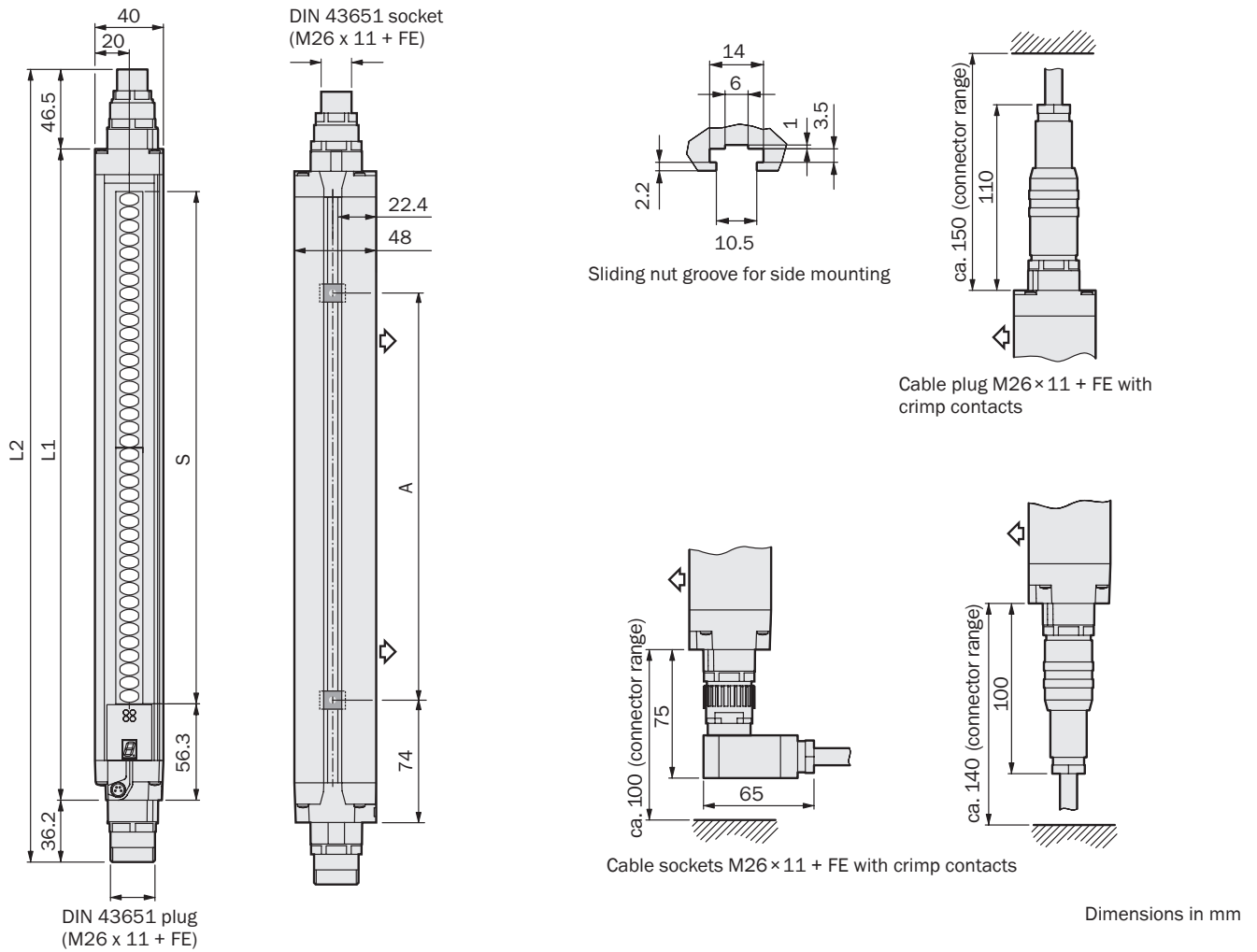
Dimensions in mm

Protective field height S	L1	L2	A
300	381	427	224
450	532	578	374
600	682	728	524
750	833	879	674
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424
1650	1736	1782	1574
1800	1887	1933	1724

Dimensions in mm

C4000 Standard with extension connection M26×11 + FE

E

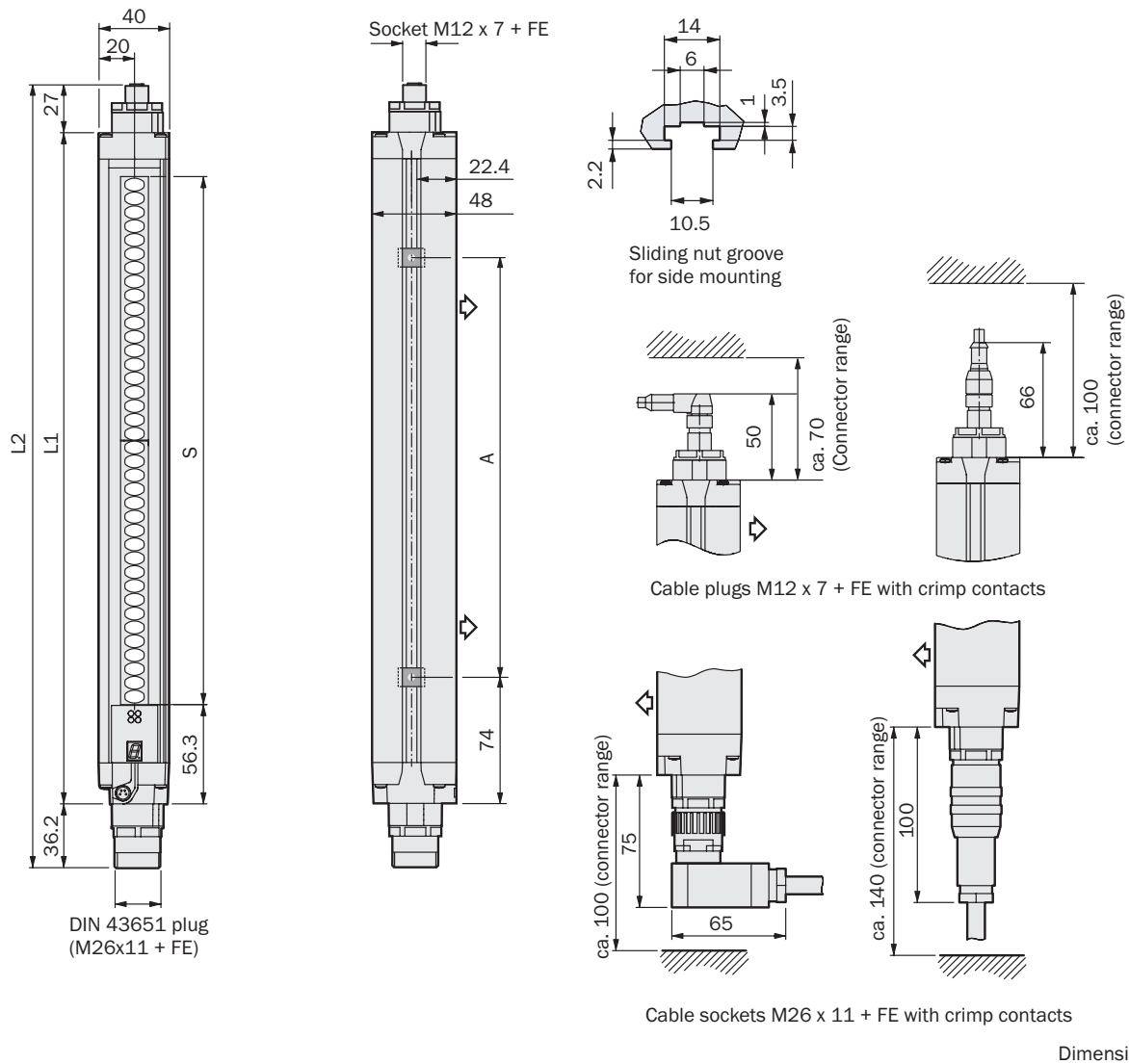


Protective field height S	L1	L2	A
300	381	464	224
450	532	614	374
600	682	765	524
750	833	915	674
900	984	1066	824
1050	1134	1216	974
1200	1283	1366	1124
1350	1435	1517	1274
1500	1586	1669	1424
1650	1736	1818	1574
1800	1887	1969	1724

Dimensions in mm



C4000 Standard with extension connection M12 x 7 + FE



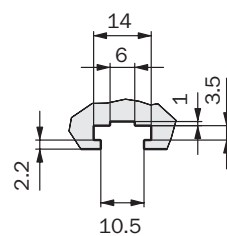
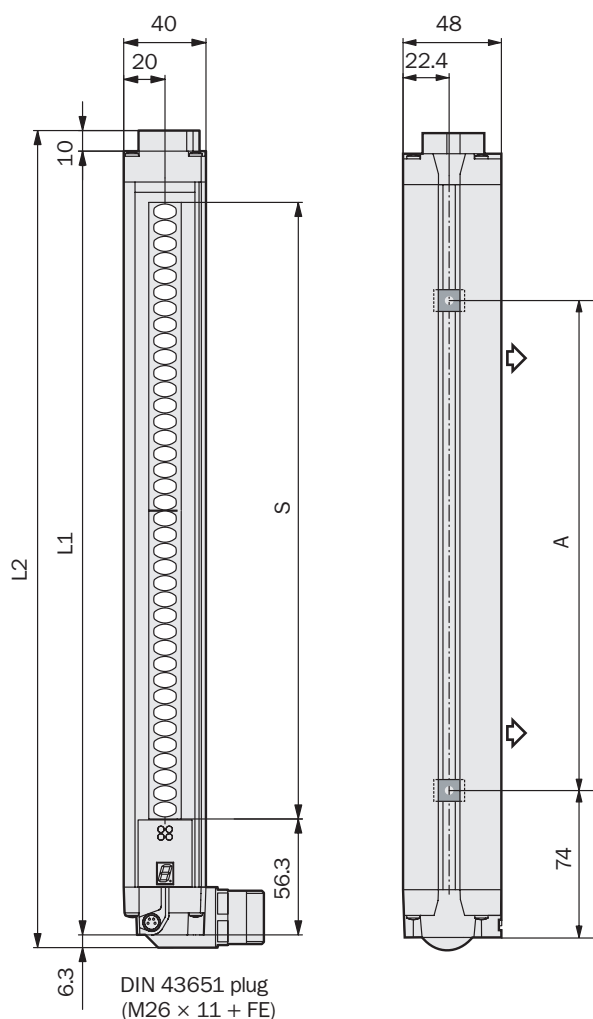
Dimensions in mm

Protective field height S	L1	L2	A
300	381	444	224
450	532	594	374
600	682	744	524
750	833	895	674
900	984	1046	824
1050	1134	1196	974
1200	1283	1346	1124
1350	1435	1497	1274
1500	1586	1649	1424
1650	1736	1798	1574
1800	1887	1949	1724

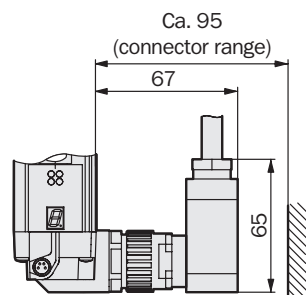
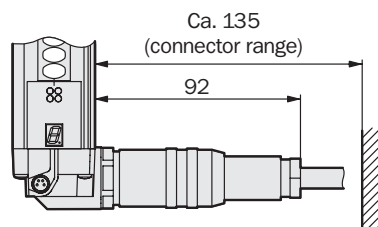
Dimensions in mm

C4000 Standard with angled system connection, without extension connection

E



Sliding nut groove for side mounting



Cable sockets M26 x 11 + FE with crimp contacts

Dimensions in mm

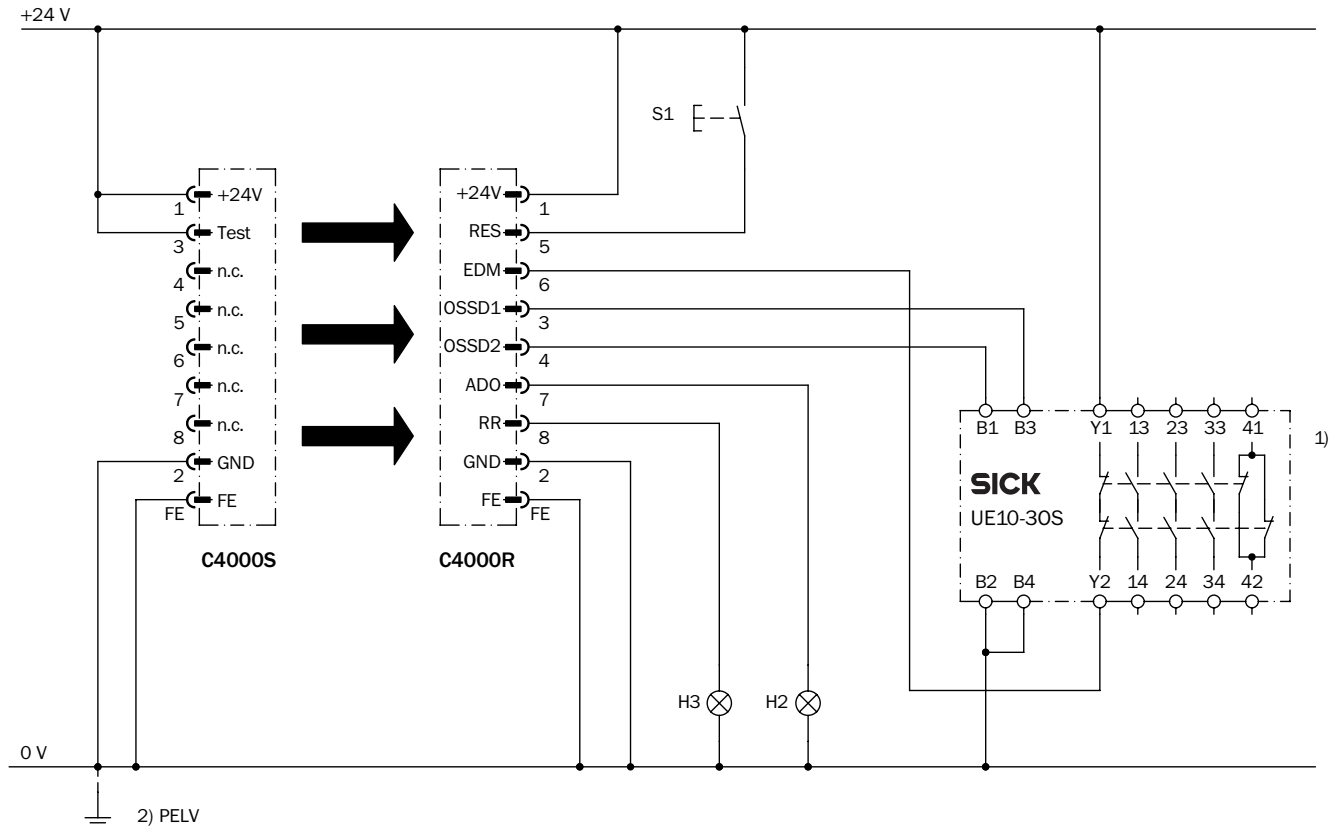
Protective field height S	L1	L2	A
300	381	397	224
450	532	548	374

Dimensions in mm

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### C4000 Standard on UE10-30S safety relay



#### Task

Connection of a C4000 Standard safety light curtain to UE10-30S. Operating mode with restart interlock and external device monitoring.

#### Function

When the light path is clear and the UE10-30S is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 are flashing. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-30S is switched on. On the interruption of one of the light beams, the UE10-30S is deactivated by the OSSD1 and OSSD2 outputs.

#### Possible faults




Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-30S will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable. Lamp H2 is illuminated if there is contamination (adjustable parameter).

#### Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4.

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe.	Page P-0

## Accessories

→ Dimensional drawings mounting systems see page E-65

### Mounting systems

Designation	Type of fastening	Packing unit	Comment	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2019659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2019506
Mounting kit 11	Replacement bracket	4	Suitable as replacement of FGS	2021646
Stainless steel bracket	Pivoting	4	For all protective field heights	2023708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2026850

### Sliding nuts

Designation	Packing unit	Comment	Part number
Sliding nuts	4	Included in the delivery	2017550

### Cable sockets

Connection type	Connector technology	Direction of the cable outlet	Part number
Hirschmann cable socket M26 × 11 + FE	Crimp contacts	Straight	6020757
		Angled	6020758

### Cable plugs

Connection type	Connector technology	Direction of the cable outlet on the plug	Part number
Hirschmann cable plug M26 × 11 + FE	Crimp contacts	Straight	6021191
		Angled	6021192

**Connecting cables**

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26 × 11 + FE	Straight	2.5 m	2022544
		5 m	2022545
		7.5 m	2022546
		10 m	2022547
		15 m	2022548
		20 m	2022549
		30 m	2022550

**Connection cables cascade**

Connection type	Direction of the cable outlet	Cable length	Part number
Plug connection, M26 × 11 + FE	Plug straight/socket straight	0.25 m	2022278
		0.5 m	2021838
		1 m	2022279
		1.5 m	2022280
		2 m	2022281
		2.5 m	2022282
		3 m	2022283
	Plug straight, socket angled	0.25 m	2022284
		0.5 m	2022285
		1 m	2022286
		1.5 m	2022287
		2 m	2022288
		2.5 m	2022289
		3 m	2022290
Plug connection, M12 × 7 + FE	Plug straight, socket angled	1 m	6021002
	Plug angled, socket straight	1 m	6030974

**Connection cables emergency stop, reset button, door switch**

Connector technology	Direction of the cable outlet	Cable length	Part number
Stripped	Plug straight	2.5 m	2026869
		10 m	2026870

**Cables without plug/socket**

Comment	Part number
Self assembly cable (suitable for EFI communication)	6021437

**Connection cables configuration**

Comment	Cable length	Part number
For connecting the configuration interface to the serial interface on the PC	2 m	6021195
	8 m	2027649

**Interfaces**

Designation	Enclosure rating	Description	Type	Part number
Safety relay	IP 20	Expands C4000 Standard/Advanced with the functions PSDI mode, bypass, operating mode selection	UE402	1023577

Continued on next page

**Power supplies**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for protective field height (mm)	Part number
300	2022412
450	2022413
600	2022414
750	2022415
900	2022416
1050	2022417
1200	2022418
1350	2022419
1500	2022420
1650	2022421
1800	2022422

**Deflector mirrors**

Designation	Suitable for protective field height (mm)	Part number
PNS75-034	300	1019414
PNS75-049	450	1019415
PNS75-064	600	1019416
PNS75-079	750	1019417
PNS75-094	900	1019418
PNS75-109	1050	1019419
PNS75-124	1200	1019420
PNS75-139	1350	1019421
PNS75-154	1500	1019422
PNS75-169	1650	1019423
PNS75-184	1800	1019424
PNS125-034	300	1019425
PNS125-049	450	1019426
PNS125-064	600	1019427
PNS125-079	750	1019428
PNS125-094	900	1019429
PNS125-109	1050	1019430
PNS125-124	1200	1019431
PNS125-139	1350	1019432
PNS125-154	1500	1019433
PNS125-169	1650	1019434
PNS125-184	1800	1019435

**Sliding nuts for deflector mirrors**

Suitable for	Packing unit	Part number
PNS75 and PNS125	6	2030600

**Explosion protection**

Designation	Comment	Part number
ATEX package	Can be used in zone 2/22, 3G 3D	2029961

**Laser alignment aid**

Designation	Maximum scanning range	Type of light	Part number
Laser alignment aid AR60	60 m	Red light	1015741
AR60 adapter for C4000	—	—	4032461

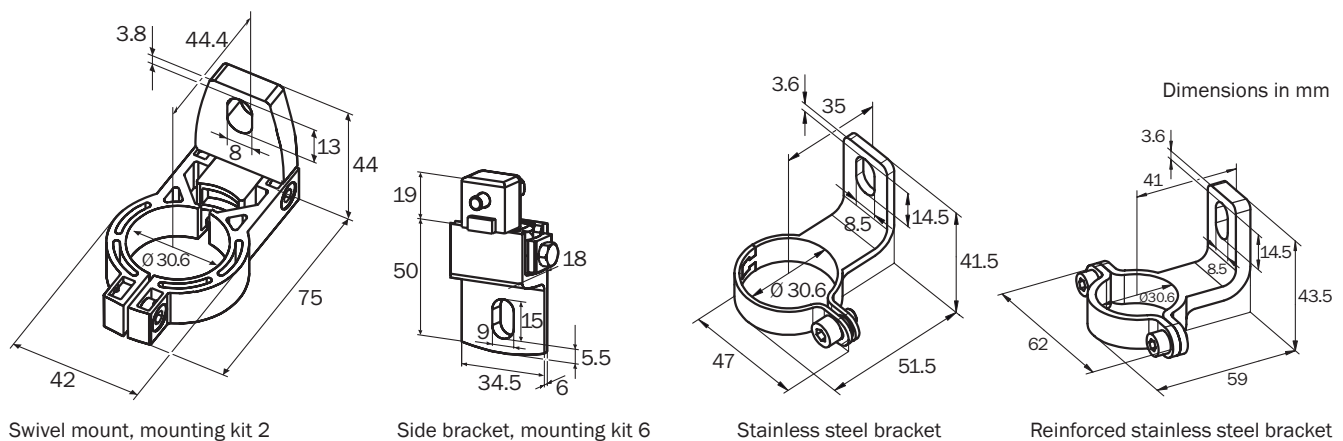
**Configuration software**

Designation	Comment	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages	2032314

**Configuration tools**

Designation	Comment	Part number
Clone Plug for C4000 and M4000	For C4000 Standard / Advanced / Palletizer / Entry/Exit and M4000 Advanced	1029665
Host-Guest Plug for C4000	For C4000 Standard / Advanced	1029717
Wall mount	Packing unit: 1	5318443
Protective cap	For Clone Plug / Host-Guest Plug	5318293

**Dimensional drawings mounting systems**



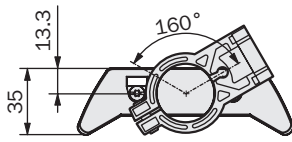
Swivel mount, mounting kit 2

Side bracket, mounting kit 6

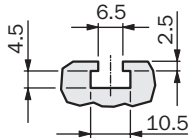
Stainless steel bracket

Reinforced stainless steel bracket

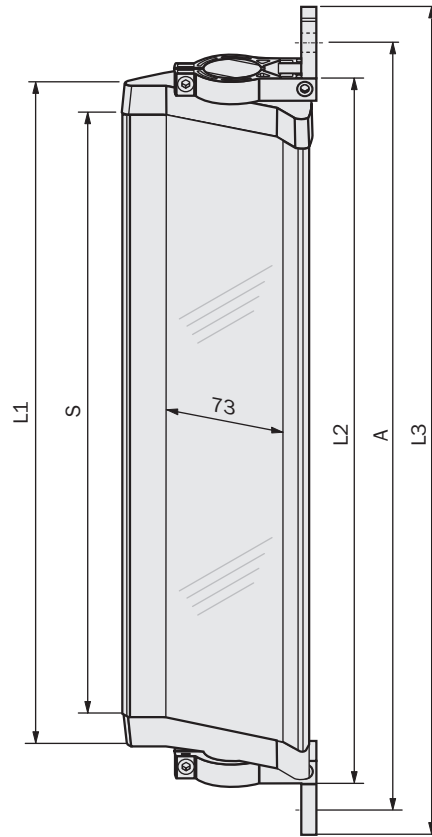
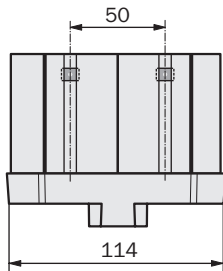
Dimensional drawings deflector mirror PNS75



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



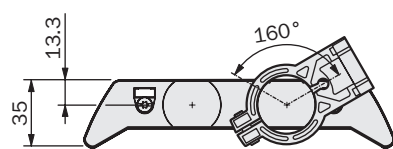
Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

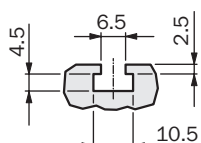
Dimensions in mm



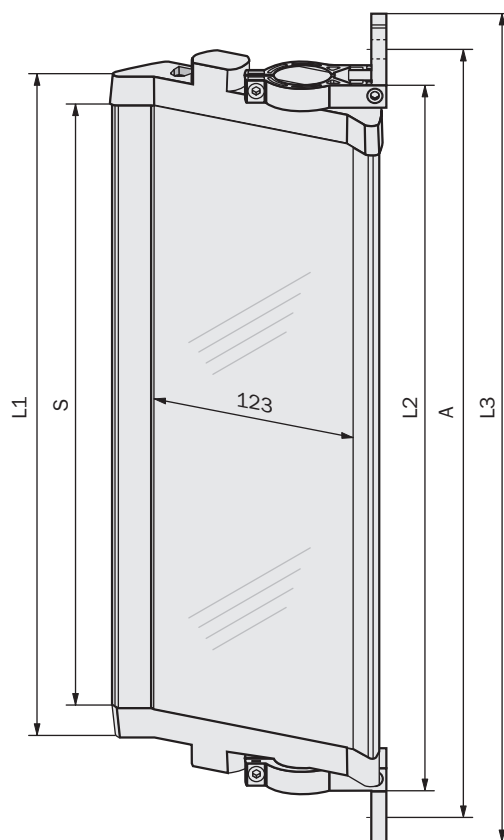
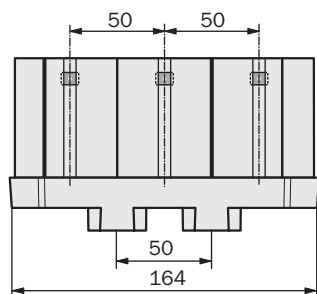
Dimensional drawings deflector mirror PNS125



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting

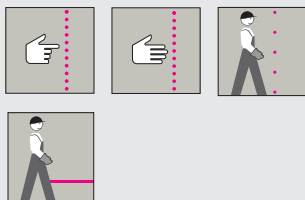


Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

E



E

- Small, compact design
- External device monitoring (EDM)
- Restart interlock (RES)



Further information	Page
→ Technical specifications	E-70
→ Dimensional drawings	E-71
→ Connection diagrams	E-72
→ Accessories	E-73
→ Services	A-2

## Overview of technical specifications

Protective field height (depending on type)	150 mm ... 1200 mm
Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

The C4000 Micro safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection.

- Simplified machine integration in small spaces due to small, compact design
- Space-saving cable entry due to M12 connections

## In-system added value

- Combination with SICK safe control solutions

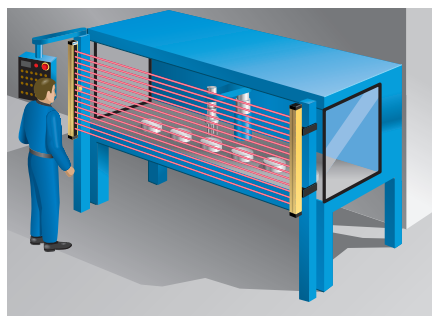
Combination with	Restart interlock	External device monitoring	Further information
UE48-20S	✓	✓	N-42
UE48-30S	✓	✓	N-48
UE10-30S	Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Electronics industry
- Packaging machines
- Food, tobacco and beverage industry
- Handling machines
- Special machine-tool manufacture



Hazardous point protection on a handling machine

## Ordering information

### C4000 Micro

Housing cross-section	33.5 mm × 28.5 mm
Functions	Restart interlock, external device monitoring
Consisting of	Sender and receiver unit, operating instructions on CD-ROM
Usage	Stand-alone system
Connections	System connection: M12 × 7 + FE

#### Resolution 14 mm, scanning range 0 m ... 2.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C41S-0101AA300	1024054	C41E-0101AG300	1024055
300	C41S-0301AA300	1023458	C41E-0301AG300	1023459
450	C41S-0401AA300	1023460	C41E-0401AG300	1023461
600	C41S-0601AA300	1023462	C41E-0601AG300	1023463
750	C41S-0701AA300	1023464	C41E-0701AG300	1023465
900	C41S-0901AA300	1023466	C41E-0901AG300	1023467
1050	C41S-1001AA300	1023468	C41E-1001AG300	1023469
1200	C41S-1201AA300	1023470	C41E-1201AG300	1023471

#### Resolution 14 mm, scanning range 1 m ... 5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C41S-0101AA300	1024054	C41E-0101BG300	1024037
300	C41S-0301AA300	1023458	C41E-0301BG300	1023486
450	C41S-0401AA300	1023460	C41E-0401BG300	1023487
600	C41S-0601AA300	1023462	C41E-0601BG300	1023488
750	C41S-0701AA300	1023464	C41E-0701BG300	1023489
900	C41S-0901AA300	1023466	C41E-0901BG300	1023490
1050	C41S-1001AA300	1023468	C41E-1001BG300	1023491
1200	C41S-1201AA300	1023470	C41E-1201BG300	1023492

#### Resolution 30 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C41S-0103AA300	1023563	C41E-0103AG300	1023860
300	C41S-0303AA300	1023472	C41E-0303AG300	1023473
450	C41S-0403AA300	1023474	C41E-0403AG300	1023475
600	C41S-0603AA300	1023476	C41E-0603AG300	1023477
750	C41S-0703AA300	1023478	C41E-0703AG300	1023479
900	C41S-0903AA300	1023480	C41E-0903AG300	1023481
1050	C41S-1003AA300	1023482	C41E-1003AG300	1023483
1200	C41S-1203AA300	1023484	C41E-1203AG300	1023485

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General system data

Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Protective field height (depending on type)	150 mm ... 1200 mm
Resolution (depending on type)	14 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 (IEC 61496)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

### Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Switching voltage	$V_S - 2.25$ V 3.5 V
Switching current max.	500 mA
Power consumption	≤1.45 A

### Sender unit

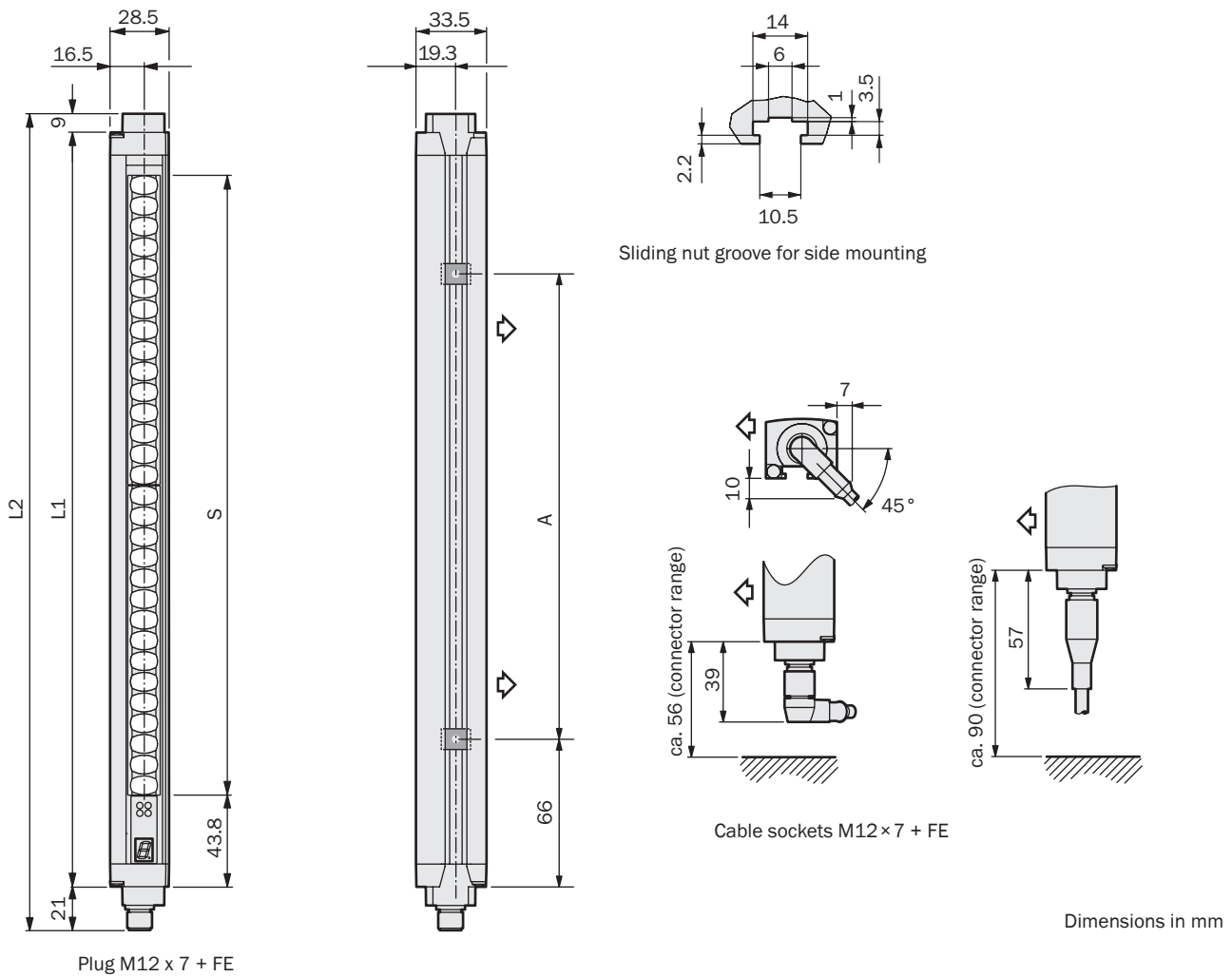
Power consumption	≤0.35 A
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### General operating data

Connection type system connection	M12 × 7 + FE
Connecting cable length	Max. 15 m
Connecting cable wire cross-section	0.25 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	33.5 mm × 28.5 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Weight (depending on type)	0.37 kg ... 1.25 kg

# Dimensional drawings

## C4000 Micro



E

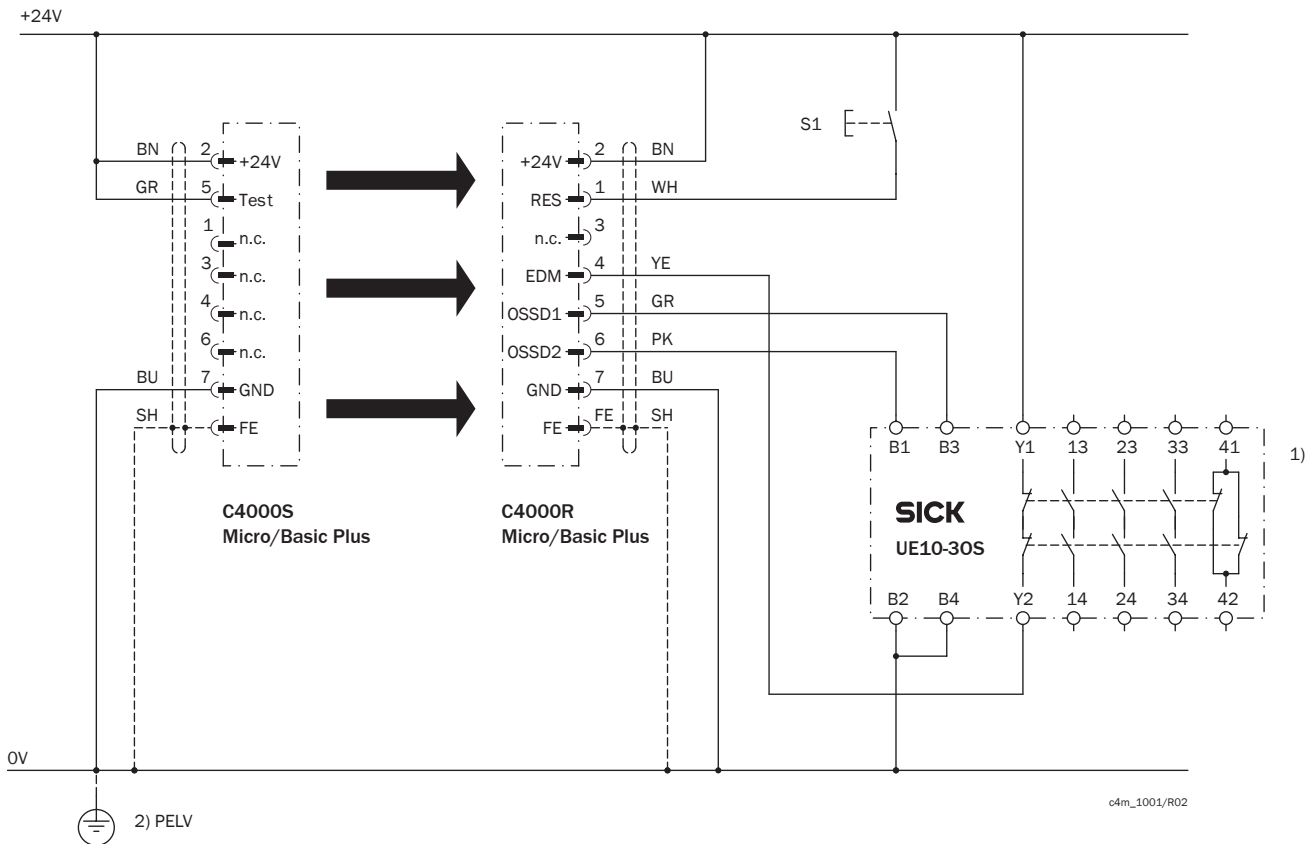
Protective field height S	L1	L2	A
150	276	246	-
300	364	394	224
450	515	545	374
600	666	696	524
750	816	846	674
900	967	997	824
1050	1117	1147	974
1200	1266	1296	1124

Dimensions in mm

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### C4000 Micro on UE10-30S safety relay



#### Task

Integration of a C4000 Micro/Basic Plus safety light curtain on UE10-30S.

Operating mode with restart interlock and external device monitoring.

#### Function

When the light path is clear and the UE10-30S is de-energised and functioning correctly, the yellow LED on the receiver flashes. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-30S is switched on. On the interruption of one of the light beams, the UE10-30S is deactivated by the OSSD1 and OSSD2 outputs.

#### Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-30S will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.




#### Comments

- 1) Output current circuits. These contacts are to be connected to the controller such that, with the output current circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV in accordance with the requirements in EN 60204-1/6.4

Take note of the operating instructions of the integrated devices.

E

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

E

## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page E-81

Designation	Type of fastening	Packing unit	Comment	Part number
Mounting kit 1	Pivoting, swivel mount	4	For all protective field heights	2019649
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2019506
Mounting kit 10	Replacement bracket	4	Suitable as replacement of FGS	2021645
Stainless steel bracket	Pivoting	4	Small housing profile	2030288

### Sliding nuts

Designation	Packing unit	Comment	Part number
Sliding nuts	4	Included in the delivery	2017550

### Connecting cables

Connection type	Connector technology	Maximum connection wire cross-section	Direction of the cable outlet	Cable length	Part number
Cable socket M12×7 + FE	Stripped	0.25 mm <sup>2</sup>	Straight	2.5 m	6020537
				5 m	6020354
				7.5 m	6020353
				10 m	6020352
			Angled	15 m	6020872
				5 m	6021342
			15 m	6021343	

### Cable sockets

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Part number
M12×7 + FE	Screw contacts	Straight	Max. 0.75 mm <sup>2</sup>	6028422

Continued on next page

**Power supplies**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for protective field height (mm)	Part number
300	2022405
450	2022406
600	2022407
750	2022408
900	2022409
1050	2022410
1200	2022411

**Deflector mirrors**

Designation	Suitable for protective field height (mm)	Part number
PNS75-034	300	1019414
PNS75-049	450	1019415
PNS75-064	600	1019416
PNS75-079	750	1019417
PNS75-094	900	1019418
PNS75-109	1050	1019419
PNS75-124	1200	1019420
PNS125-034	300	1019425
PNS125-049	450	1019426
PNS125-064	600	1019427
PNS125-079	750	1019428
PNS125-094	900	1019429
PNS125-109	1050	1019430
PNS125-124	1200	1019431

**Sliding nuts for deflector mirrors**

Suitable for	Packing unit	Part number
PNS75 and PNS125	6	2030600

**Laser alignment aid**

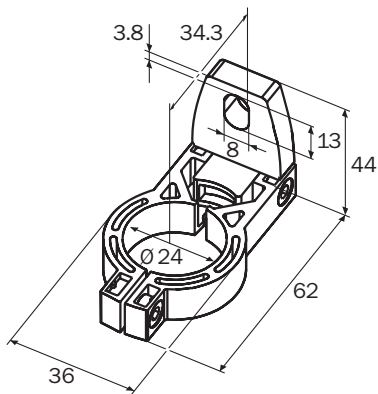
Designation	Maximum scanning range	Type of light	Part number
Laser alignment aid AR60	60 m	Red light	1015741
AR60 adapter for C4000 Micro	—	—	4032462

**Documentation**

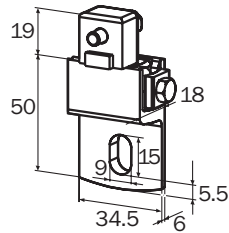
Designation	Comment	Part number
Operating instructions C4000 Micro / Basic Plus/ Basic / Eco on CD-ROM	Included in the delivery	2026783



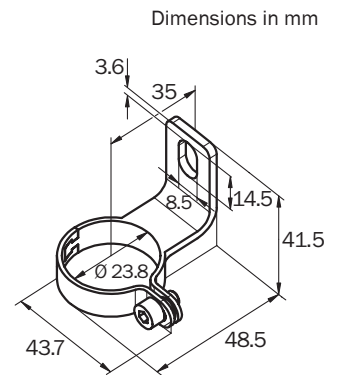
Dimensional drawings mounting systems



Swivel mount, mounting kit 1



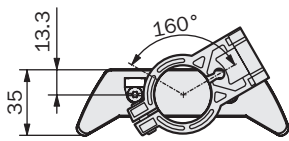
Side bracket, mounting kit 6



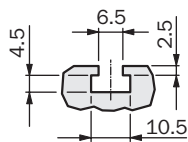
Stainless steel bracket



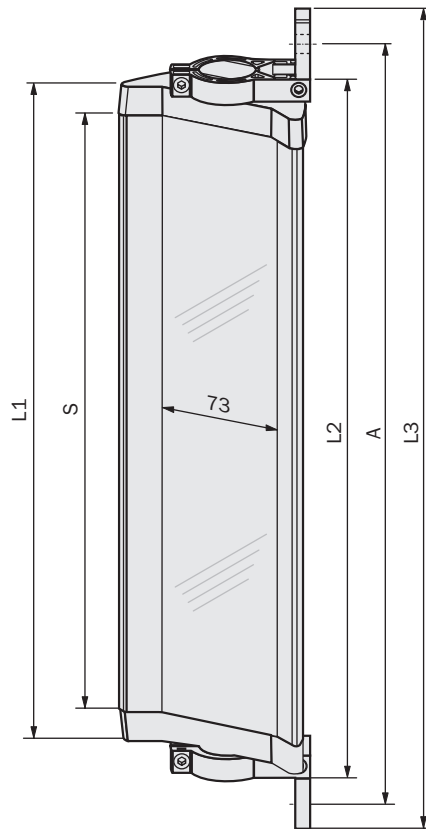
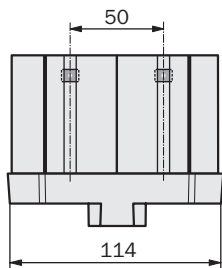
Dimensional drawings deflector mirror PNS75



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting

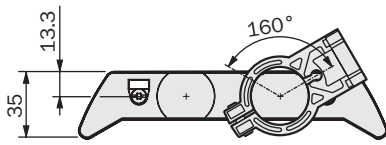


Dimensions in mm

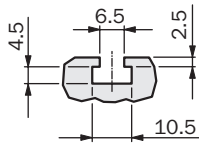
Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340

Dimensions in mm

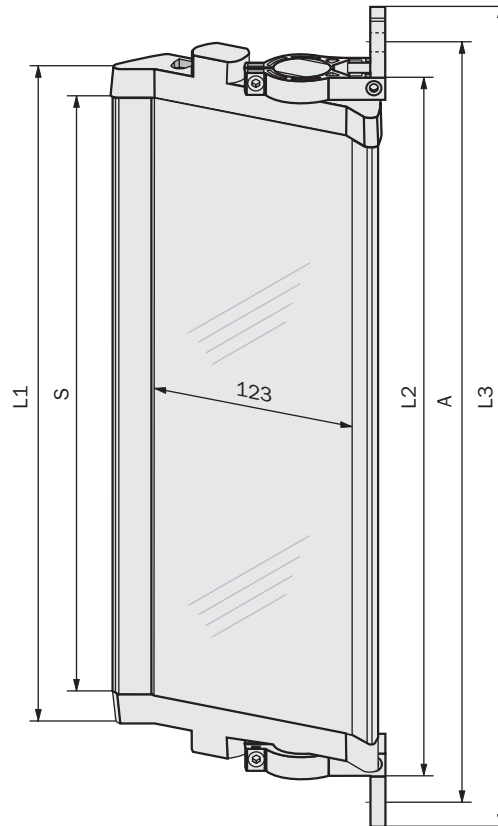
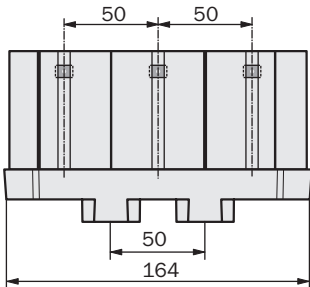
Dimensional drawings deflector mirror PNS125



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340

Dimensions in mm

## Overview of technical specifications

Resistant materials	V4A, PMMA, PA, PVC
Enclosure rating	IP 66, IP 67
Protective field height (depending on type)	150 mm ... 1200 mm
Scanning range (depending on type)	0 m ... 1.8 m / 1 m ... 4 m / 0 m ... 4.5 m
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 (IEC 61496-1), Type 2 (IEC 61496-2)

## Product description

The IP67 Housing in conjunction with the C4000 Micro safety light curtain achieves the enclosure rating IP 67. A high level of resistance against the usual cleaning agents is achieved by using suitable materials (V4A, PMMA, PA, PVC).

A compensating element (membrane) prevents the plastic tubes misting up and the entry of liquids. The cable is fed into the device through the proven PG connector.

## In-system added value

- Combination with SICK safe control solutions

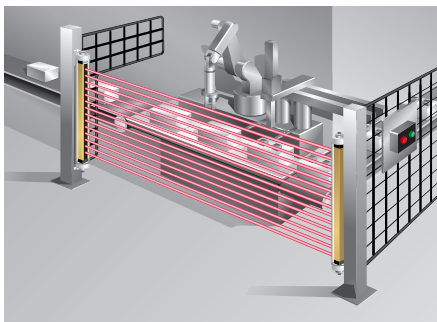
Combination with	Restart interlock	External device monitoring	Further information
UE48-20S	✓	✓	N-42
UE48-30S	✓	✓	N-48
UE10-30S	–	–	N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

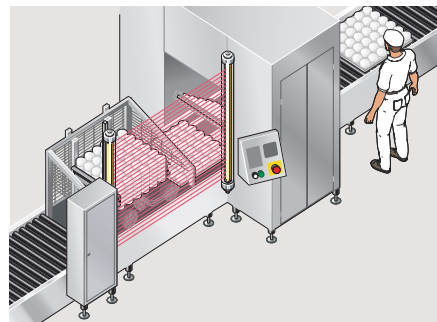
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

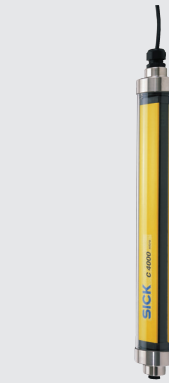
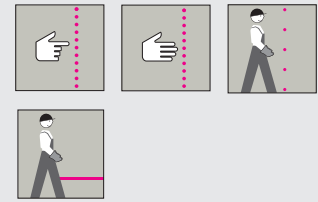
- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Hazardous point protection on a processing centre in the hygiene area



Hazardous point protection on a cheese-making machine



- High durability
- Compact design
- On site diagnostics
- External device monitoring (EDM)
- Restart interlock (RES)



Further information	Page
→ Ordering information	E-78
→ Technical specifications	E-79
→ Dimensional drawing	E-80
→ Accessories	E-81
→ Services	A-2

## Ordering information

IP67 Housing with integrated sender or receiver unit C4000 Micro, including 15 m PVC cable

### Resolution 14 mm, scanning range 0 m ... 1.8 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C45S-0101AA220	1025720	C45E-0101AG220	1025721
300	C45S-0301AA220	1025722	C45E-0301AG220	1025723
450	C45S-0401AA220	1025727	C45E-0401AG220	1025728
600	C45S-0601AA220	1025732	C45E-0601AG220	1025733
750	C45S-0701AA220	1025737	C45E-0701AG220	1025738
900	C45S-0901AA220	1025742	C45E-0901AG220	1025743
1050	C45S-1001AA220	1025747	C45E-1001AG220	1025748
1200	C45S-1201AA220	1025753	C45E-1201AG220	1025754

### Resolution 14 mm, scanning range 1 m ... 4 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C45S-0101AA220	1025720	C45E-0101BG220	1025719
300	C45S-0301AA220	1025722	C45E-0301BG220	1025726
450	C45S-0401AA220	1025727	C45E-0401BG220	1025731
600	C45S-0601AA220	1025732	C45E-0601BG220	1025736
750	C45S-0701AA220	1025737	C45E-0701BG220	1025741
900	C45S-0901AA220	1025742	C45E-0901BG220	1025746
1050	C45S-1001AA220	1025747	C45E-1001BG220	1025752
1200	C45S-1201AA220	1025753	C45E-1201BG220	1025757

### Resolution 30 mm, scanning range 0 m ... 4.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	C45S-0103AA220	1025717	C45E-0103AG220	1025718
300	C45S-0303AA220	1025724	C45E-0303AG220	1025725
450	C45S-0403AA220	1025729	C45E-0403AG220	1025730
600	C45S-0603AA220	1025734	C45E-0603AG220	1025735
750	C45S-0703AA220	1025739	C45E-0703AG220	1025740
900	C45S-0903AA220	1025744	C45E-0903AG220	1025745
1050	C45S-1003AA220	1025749	C45E-1003AG220	1025750
1200	C45S-1203AA220	1025755	C45E-1203AG220	1025756

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### C4000 Micro in IP67 Housing

→ C4000 specific data see C4000 Micro page E-70

Scanning range (depending on type)	0 m ... 1.8 m / 1 m ... 4 m / 0 m ... 4.5 m								
Protective field height (depending on type)	150 mm ... 1200 mm								
Resolution (depending on type)	14 mm / 30 mm								
Type	Type 4 (IEC 61496-1), Type 2 (IEC 61496-2)								
Enclosure rating	IP 66, IP 67								
Materials	<table border="0"> <tr> <td>End caps</td> <td>Stainless steel (V4A)</td> </tr> <tr> <td>Plastic tube</td> <td>PMMA</td> </tr> <tr> <td>Compensating element (membrane)</td> <td>PA 6</td> </tr> <tr> <td>PG connector</td> <td>PA 6</td> </tr> </table>	End caps	Stainless steel (V4A)	Plastic tube	PMMA	Compensating element (membrane)	PA 6	PG connector	PA 6
End caps	Stainless steel (V4A)								
Plastic tube	PMMA								
Compensating element (membrane)	PA 6								
PG connector	PA 6								
Ambient operating temperature	0 °C ... +55 °C								
Storage temperature	-25 °C ... +70 °C								

E

# Dimensional drawing

E

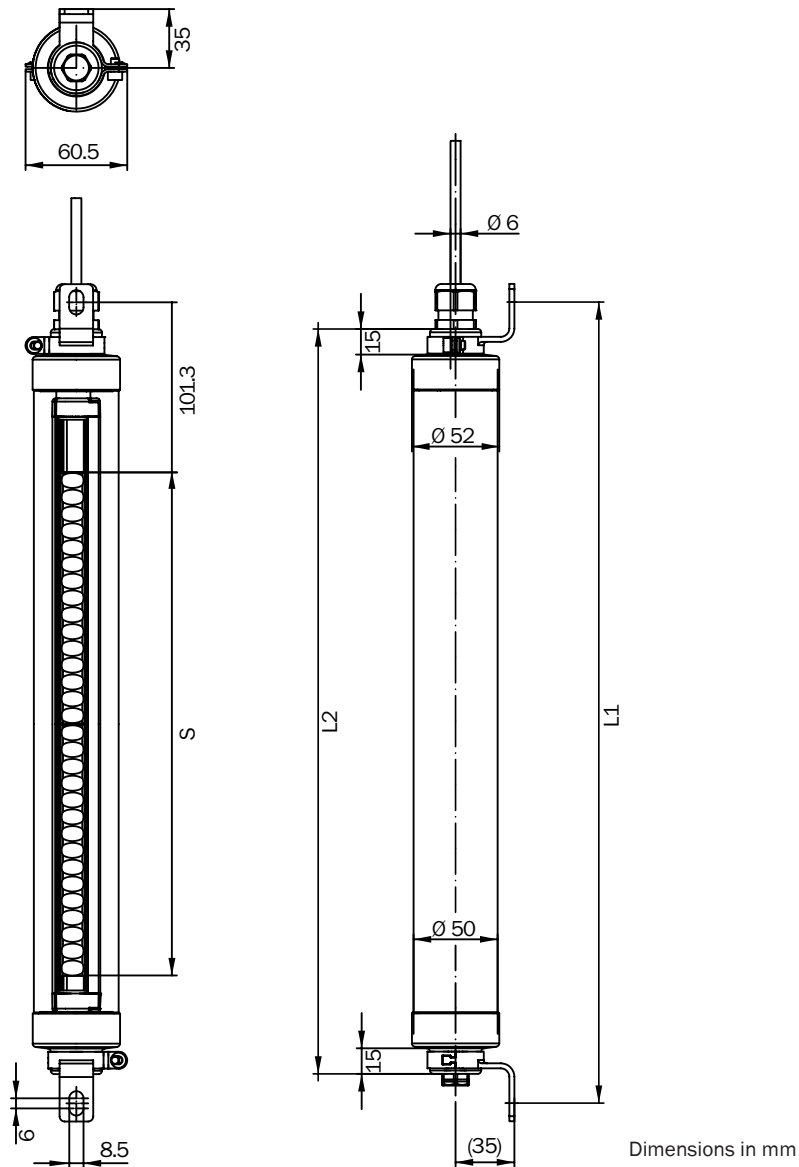





Illustration with stainless steel bracket (not included in the delivery)

Protective field height S	L 1	L 2
150	357	324
300	476	443
450	626	593
600	777	744
750	927	894
900	1078	1045
1050	1228	1195
1200	1382	1349

Dimensions in mm

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe.	Page P-0

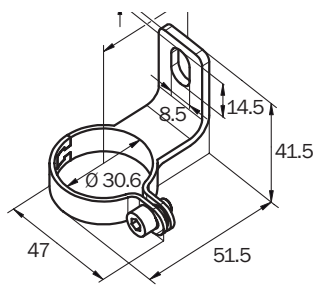
E

## Accessories

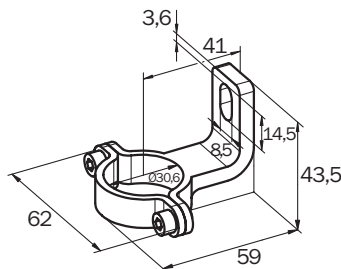
### Mounting systems

Designation	Comment	Packing unit	Part number
Stainless steel bracket	Pivoting	4	2023708
Reinforced stainless steel bracket	Pivoting	4	2026850
Stainless steel support bracket	Pivoting	2	2026849
Mounting key	For M12 cable socket on device replacement	1	4034690
Venting membrane	—	1	5309082

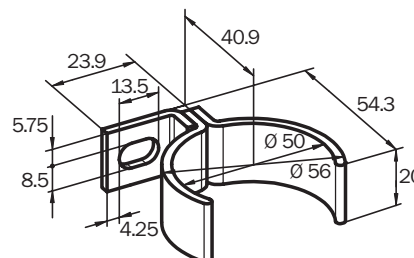
### Dimensional drawings mounting systems



Stainless steel bracket



Reinforced stainless steel bracket

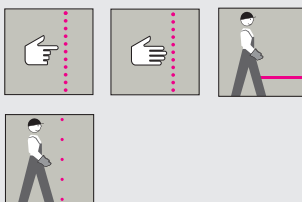


Stainless steel support bracket

Dimensions in mm



Mounting key



E

- 7-segment display + LED
- Restart interlock (RES)
- External device monitoring (EDM)
- Pre-assembled M12 cables



Further information	Page
→ Technical specifications	E-85
→ Dimensional drawings	E-86
→ Connection diagrams	E-87
→ Accessories	E-87
→ Services	A-2

## Overview of technical specifications

Protective field height (depending on type)	150 mm ... 1200 mm / 300 mm ... 1800 mm
Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 according to IEC 61496, SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

Cost-effective and reliable protection of hazardous points and hazardous areas using the C4000 Basic Plus safety light curtain.

Pre-assembled "off-the-peg" M12×8 cables save money and machine integration is made easy by integrated functions such as restart interlock and external device monitoring. Alignment and diagnostics using the proven 7-segment display save more time.

- Cost and time saving in case of replacement: Sender and receiver can be replaced separately

- Security of investment due to high impact resistance and resistance of the front screen to scratches
- High system availability due to tested interaction between sensor and evaluation unit
- Space-saving and compact systems due to fast response times for low safety distances
- High availability even in harsh industrial conditions due to EMC immunity

## In-system added value

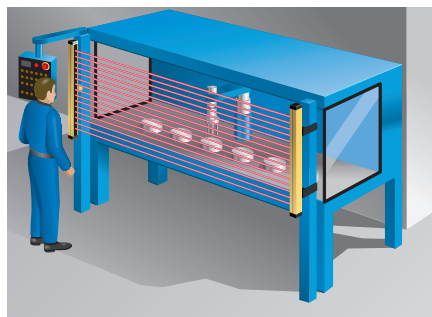
Combination with	Restart interlock	External device monitoring	Further information
UE48-20S	✓	✓	N-42
UE48-30S	✓	✓	N-48
UE10-30S	Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

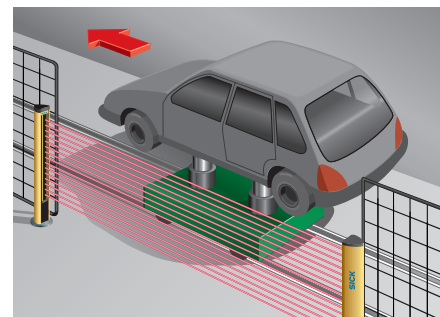
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Car and vehicle manufacture
- Machine tools
- Electronics industry
- Packaging machines
- Food, tobacco and beverage industry
- Handling machines
- Special machine-tool manufacture
- Environmental engineering



Hazardous point protection on a handling machine



Access protection on an assembly line



## Ordering information

### C4000 Basic Plus

Housing cross-section	40 mm × 48 mm
Functions	Restart interlock, external device monitoring
Usage	As a stand-alone system
Connections	System connection: M12 × 7 + FE (sender and receiver unit)

#### Resolution 14 mm, scanning range 0 m ... 2.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301AA300	1027922	C40E-0301AG300	1027944
450	C40S-0401AA300	1027923	C40E-0401AG300	1027945
600	C40S-0601AA300	1027924	C40E-0601AG300	1027946
750	C40S-0701AA300	1027925	C40E-0701AG300	1027947
900	C40S-0901AA300	1027926	C40E-0901AG300	1027948
1050	C40S-1001AA300	1027927	C40E-1001AG300	1027949
1200	C40S-1201AA300	1027928	C40E-1201AG300	1027950
1350	C40S-1301AA300	1027929	C40E-1301AG300	1027951
1500	C40S-1501AA300	1027930	C40E-1501AG300	1027952
1650	C40S-1601AA300	1027931	C40E-1601AG300	1027953
1800	C40S-1801AA300	1027932	C40E-1801AG300	1027954

#### Resolution 14 mm, scanning range 1 m ... 5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301AA300	1027922	C40E-0301BG300	1027966
450	C40S-0401AA300	1027923	C40E-0401BG300	1027967
600	C40S-0601AA300	1027924	C40E-0601BG300	1027968
750	C40S-0701AA300	1027925	C40E-0701BG300	1027969
900	C40S-0901AA300	1027926	C40E-0901BG300	1027970
1050	C40S-1001AA300	1027927	C40E-1001BG300	1027971
1200	C40S-1201AA300	1027928	C40E-1201BG300	1027972
1350	C40S-1301AA300	1027929	C40E-1301BG300	1027973
1500	C40S-1501AA300	1027930	C40E-1501BG300	1027974
1650	C40S-1601AA300	1027931	C40E-1601BG300	1027975
1800	C40S-1801AA300	1027932	C40E-1801BG300	1027976

Continued on next page

## Resolution 30 mm, scanning range 0 m ... 6 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303AA300	1027933	C40E-0303AG300	1027955
450	C40S-0403AA300	1027934	C40E-0403AG300	1027956
600	C40S-0603AA300	1027935	C40E-0603AG300	1027957
750	C40S-0703AA300	1027936	C40E-0703AG300	1027958
900	C40S-0903AA300	1027937	C40E-0903AG300	1027959
1050	C40S-1003AA300	1027938	C40E-1003AG300	1027960
1200	C40S-1203AA300	1027939	C40E-1203AG300	1027961
1350	C40S-1303AA300	1027940	C40E-1303AG300	1027962
1500	C40S-1503AA300	1027941	C40E-1503AG300	1027963
1650	C40S-1603AA300	1027942	C40E-1603AG300	1027964
1800	C40S-1803AA300	1027943	C40E-1803AG300	1027965

E

## Detailed technical specifications

### General system data

Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 according to IEC 61496, SIL3 (EN 61508)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

E

### Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Switching voltage	24 V (15 V ... 28.8 V) DC
	$HIGH_{min}$ $LOW_{max}$ 3.5 V
Switching current max.	500 mA
Power consumption	≤0.45 A (without OSSD)

### Sender unit

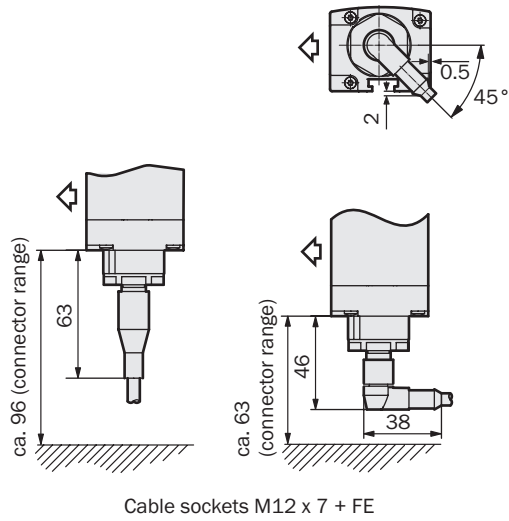
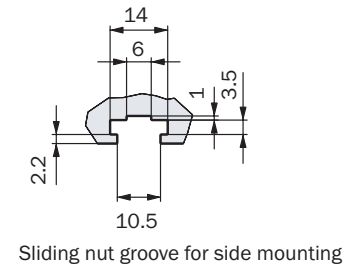
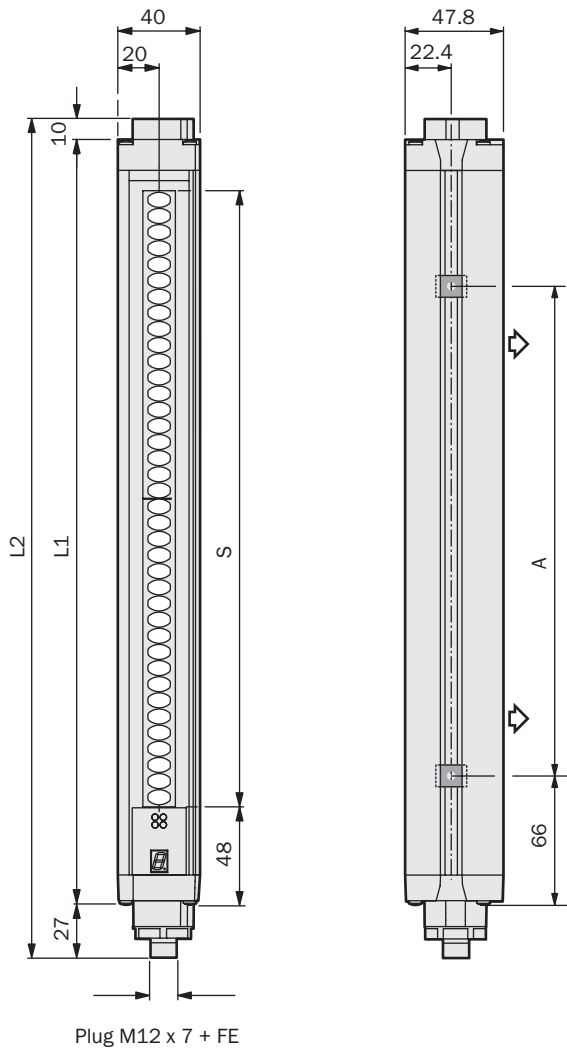
Power consumption	≤0.35 A
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### Operating data

Connection type	M12×7 + FE
Cable length	Max. 15 m
Wire cross-section	0.25 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	40 mm × 48 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)

# Dimensional drawings

E



Dimensions in mm




Protective field height S	L1	L2	A
300	372	417	224
450	523	568	374
600	674	718	524
750	824	869	674
900	975	1020	824
1050	1125	1170	974
1200	1274	1319	1124
1350	1426	1471	1274
1500	1577	1622	1424
1650	1727	1772	1574
1800	1878	1923	1724

Dimensions in mm

## Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFSafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page E-90

Designation	Type of fastening	Packing unit	Comment	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2019659
Mounting kit 3	Pivoting, with anti-vibration mount	4	For all protective field heights	2017752
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2019506
Mounting kit 11	Replacement bracket	4	Suitable as replacement of FGS	2021646
Stainless steel bracket	Pivoting	4	For all protective field heights	2023708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2026850

### Sliding nuts

Designation	Packing unit	Comment	Part number
Sliding nuts	4	Included in the delivery	2017550

Continued on next page

**Connecting cables**

Connection type	Direction of the cable outlet	Connector technology	Cable length	Part number
Cable socket M12 × 7 + FE	Straight	Stripped	2.5 m	6020537
			5 m	6020354
			10 m	6020352
			15 m	6020872
			7.5 m	6020353
	Angled		5 m	6021342
			15 m	6021343

**Power supplies**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Reset tool**

Designation	Comment	Part number
Reset tool	For deactivation of the integrated restart interlock	6022103
Adapter cable	—	2026866

**Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for protective field height (mm)	Part number
300	2022412
450	2022413
600	2022414
750	2022415
900	2022416
1050	2022417
1200	2022418
1350	2022419
1500	2022420
1650	2022421
1800	2022422

**Additional front screens Heavy Duty**

Suitable for protective field height (mm)	Part number
300	2026853
450	2026854
600	2026855
750	2026856
900	2026857
1050	2026858
1200	2026859
1350	2026860
1500	2026861
1650	2026862
1800	2026863

**E****Deflector mirrors**

Designation	Suitable for protective field height (mm)	Part number
PNS75-034	300	1019414
PNS75-049	450	1019415
PNS75-064	600	1019416
PNS75-079	750	1019417
PNS75-094	900	1019418
PNS75-109	1050	1019419
PNS75-124	1200	1019420
PNS75-139	1350	1019421
PNS75-154	1500	1019422
PNS75-169	1650	1019423
PNS75-184	1800	1019424
PNS125-034	300	1019425
PNS125-049	450	1019426
PNS125-064	600	1019427
PNS125-079	750	1019428
PNS125-094	900	1019429
PNS125-109	1050	1019430
PNS125-124	1200	1019431
PNS125-139	1350	1019432
PNS125-154	1500	1019433
PNS125-169	1650	1019434
PNS125-184	1800	1019435

**Sliding nuts for deflector mirrors**

Suitable for	Packing unit	Part number
PNS75 and PNS125	6	2030600

Continued on next page

**Laser alignment aid**

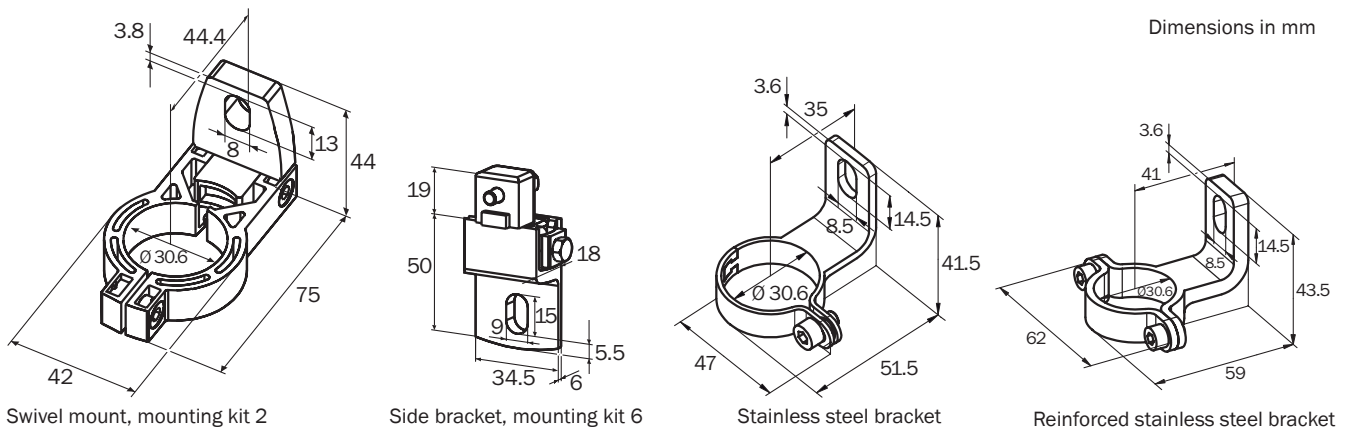
Designation	Maximum scanning range	Type of light	Part number
Laser alignment aid AR60	60 m	Red light	1015741
AR60 adapter for C4000 Basic Plus	—	—	4032461

**Documentation**

Designation	Comment	Part number
Operating instructions C4000 Basic Plus, C4000 Basic, C4000 Eco, C4000 Micro on CD-ROM	Included in the delivery	2026783

**Dimensional drawings mounting systems**

E





## Overview of technical specifications

Protective field height (depending on type)	300 mm ... 1800 mm
Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

The C4000 Basic safety light curtain is used wherever hazardous points and hazardous areas require reliable and cost-effective protection. It is a robust device

designed for use in simple applications. Alignment and diagnostics via 7-segment display.

## In-system added value

- Combination with SICK safe control solutions

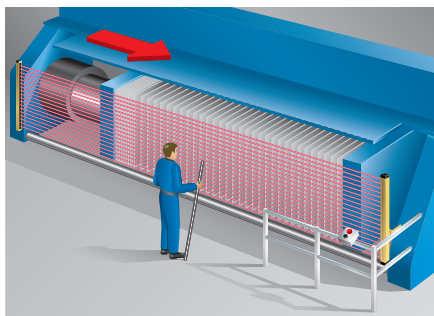
Combination with	Restart interlock	External device monitoring	Further information
UE48-20S	✓	✓	N-42
UE48-30S	✓	✓	N-48

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

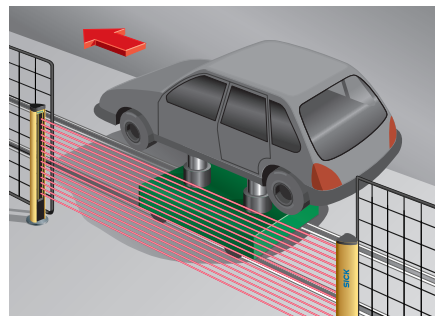
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

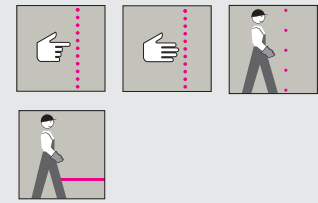
- Car and vehicle manufacture
- Machine tools
- Environmental engineering



Hazardous point protection on a diaphragm press



Access protection on an assembly line



- External device monitoring (EDM)



Further information	Page
→ Ordering information	E-92
→ Technical specifications	E-94
→ Dimensional drawings	E-95
→ Connection diagrams	E-96
→ Accessories	E-96
→ Services	A-2

## Ordering information

### C4000 Basic

Housing cross-section	48 mm × 40 mm
Functions	External device monitoring
Consisting of	Sender and receiver unit
Usage	Stand-alone system
Connections	System connection: Hirschmann M26 × 6 + FE

#### Resolution 14 mm, scanning range 0 m ... 2.5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301AA030	1022195	C40E-0301AH030	1022196
450	C40S-0401AA030	1022198	C40E-0401AH030	1022199
600	C40S-0601AA030	1022200	C40E-0601AH030	1022201
750	C40S-0701AA030	1022202	C40E-0701AH030	1022203
900	C40S-0901AA030	1022204	C40E-0901AH030	1022205
1050	C40S-1001AA030	1022206	C40E-1001AH030	1022207
1200	C40S-1201AA030	1022208	C40E-1201AH030	1022209
1350	C40S-1301AA030	1022210	C40E-1301AH030	1022211
1500	C40S-1501AA030	1022212	C40E-1501AH030	1022213
1650	C40S-1601AA030	1022214	C40E-1601AH030	1022215
1800	C40S-1801AA030	1022216	C40E-1801AH030	1022217

#### Resolution 14 mm, scanning range 1 m ... 5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301AA030	1022195	C40E-0301BH030	1022240
450	C40S-0401AA030	1022198	C40E-0401BH030	1022241
600	C40S-0601AA030	1022200	C40E-0601BH030	1022242
750	C40S-0701AA030	1022202	C40E-0701BH030	1022243
900	C40S-0901AA030	1022204	C40E-0901BH030	1022244
1050	C40S-1001AA030	1022206	C40E-1001BH030	1022245
1200	C40S-1201AA030	1022208	C40E-1201BH030	1022246
1350	C40S-1301AA030	1022210	C40E-1301BH030	1022247
1500	C40S-1501AA030	1022212	C40E-1501BH030	1022248
1650	C40S-1601AA030	1022214	C40E-1601BH030	1022249
1800	C40S-1801AA030	1022216	C40E-1801BH030	1022250

**Resolution 30 mm, scanning range 0 m ... 6 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303AA030	1022218	C40E-0303AH030	1022219
450	C40S-0403AA030	1022220	C40E-0403AH030	1022221
600	C40S-0603AA030	1022222	C40E-0603AH030	1022223
750	C40S-0703AA030	1022224	C40E-0703AH030	1022225
900	C40S-0903AA030	1022226	C40E-0903AH030	1022227
1050	C40S-1003AA030	1022228	C40E-1003AH030	1022229
1200	C40S-1203AA030	1022230	C40E-1203AH030	1022231
1350	C40S-1303AA030	1022232	C40E-1303AH030	1022233
1500	C40S-1503AA030	1022234	C40E-1503AH030	1022235
1650	C40S-1603AA030	1022236	C40E-1603AH030	1022237
1800	C40S-1803AA030	1022238	C40E-1803AH030	1022239

E

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General system data

Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_s$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 (IEC 61496)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

### Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	9 ms ... 26 ms
Switching voltage	$V_s - 2.25\text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	≤1.45 A

### Sender unit

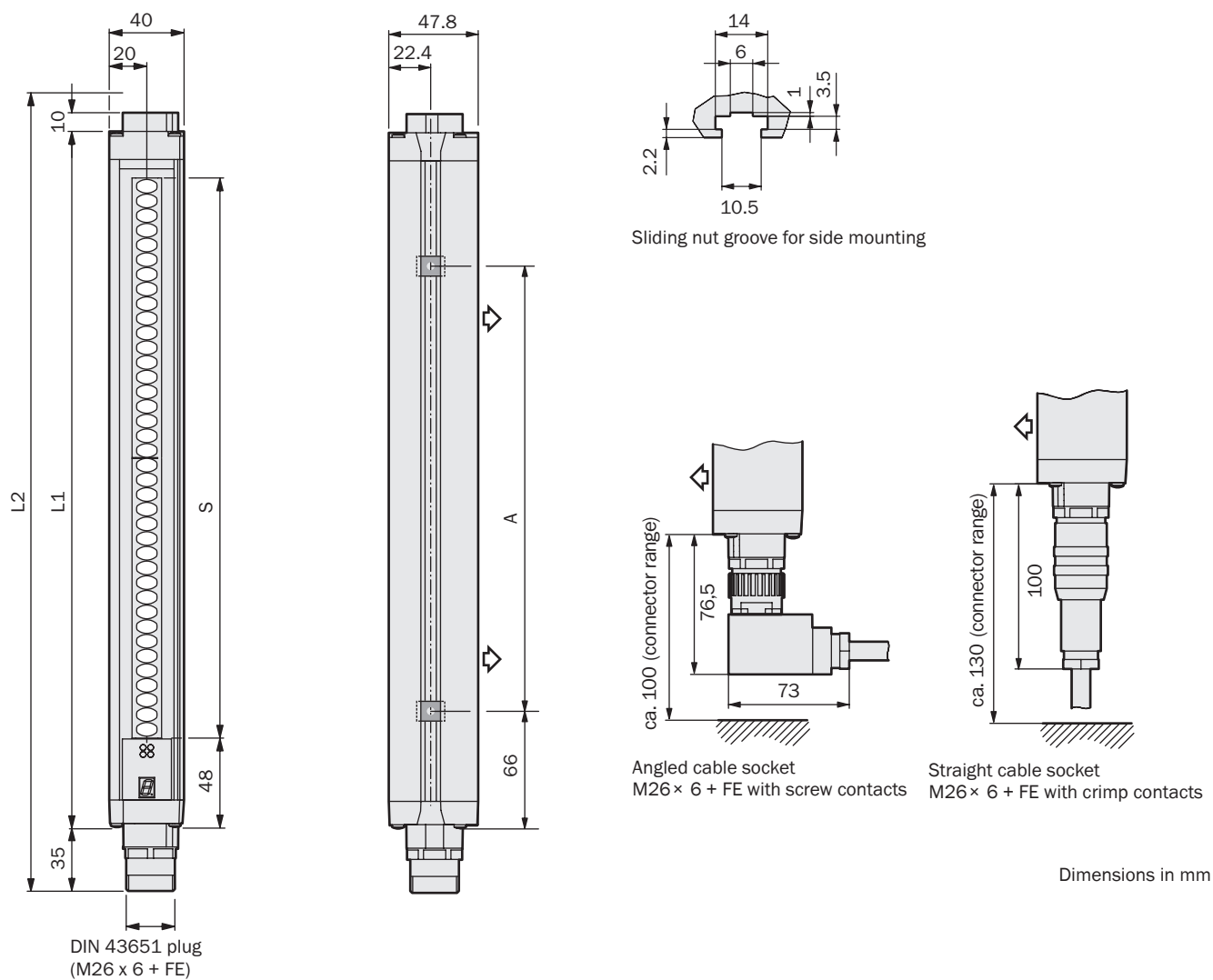
Power consumption	≤0.35 A
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### General operating data

Connection type system connection	Hirschmann plug M26 × 6 + FE
Connecting cable length	Max. 50 m
Connecting cable wire cross-section	0.75 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm × 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Weight (depending on type)	0.82 kg ... 3.71 kg

# Dimensional drawings

## C4000 Basic



E

Protective field height S	L1	L2	A
300	372	417	224
450	523	568	374
600	674	718	524
750	824	869	674
900	975	1020	824
1050	1125	1170	974
1200	1274	1319	1124
1350	1426	1471	1274
1500	1577	1622	1424
1650	1727	1772	1574
1800	1878	1923	1724




Dimensions in mm

## Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

## Safe control solutions

E

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page E-98

Designation	Type of fastening	Packing unit	Comment	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2019659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2019506
Mounting kit 11	Replacement bracket	4	Suitable as replacement of FGS	2021646
Stainless steel bracket	Pivoting	4	For all protective field heights	2023708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2026850

### Sliding nuts

Designation	Packing unit	Comment	Part number
Sliding nuts	4	Included in the delivery	2017550

### Cable sockets

Connection type	Connector technology	Direction of the cable outlet on socket	Part number
Hirschmann cable socket M26 × 6 + FE	Crimped	Straight	6006612
	Screwed	Angled	6007363

**Connecting cables**

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26 × 6 + FE	Straight	2.5 m	2023993
		5 m	2023994
		7.5 m	2023995
		10 m	2023996
		15 m	2023997
		20 m	2023998
		30 m	2023999

**Power supplies**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**E****Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for protective field height (mm)	Part number
300	2022412
450	2022413
600	2022414
750	2022415
900	2022416
1050	2022417
1200	2022418
1350	2022419
1500	2022420
1650	2022421
1800	2022422

**Deflector mirrors**

Designation	Suitable for protective field height (mm)	Part number
PNS75-034	300	1019414
PNS75-049	450	1019415
PNS75-064	600	1019416
PNS75-079	750	1019417
PNS75-094	900	1019418
PNS75-109	1050	1019419
PNS75-124	1200	1019420
PNS75-139	1350	1019421
PNS75-154	1500	1019422
PNS75-169	1650	1019423
PNS75-184	1800	1019424

Continued on next page

**Deflector mirrors**

Designation	Suitable for protective field height (mm)	Part number
PNS125-034	300	1019425
PNS125-049	450	1019426
PNS125-064	600	1019427
PNS125-079	750	1019428
PNS125-094	900	1019429
PNS125-109	1050	1019430
PNS125-124	1200	1019431
PNS125-139	1350	1019432
PNS125-154	1500	1019433
PNS125-169	1650	1019434
PNS125-184	1800	1019435

**Sliding nuts for deflector mirrors**

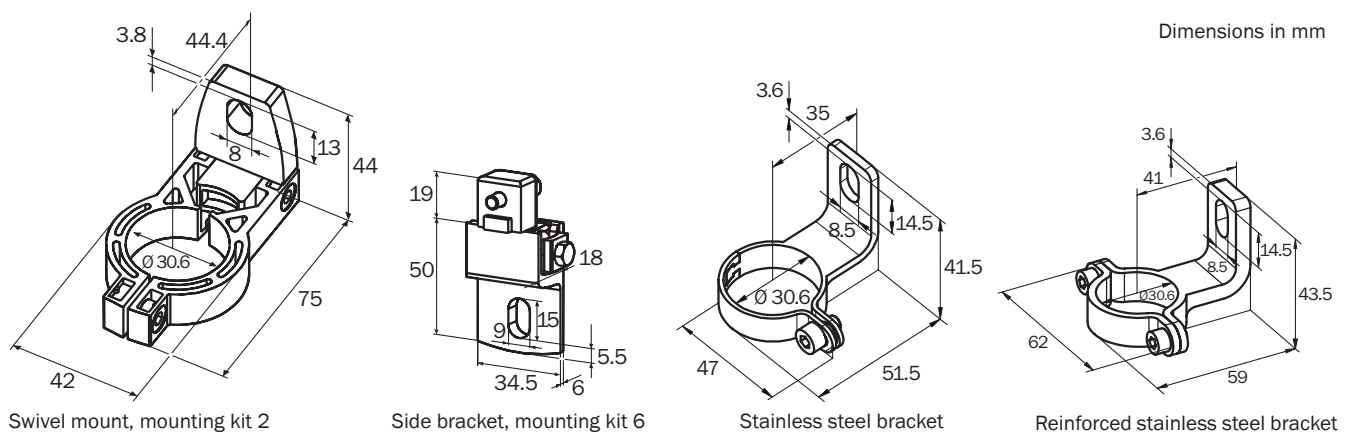
Suitable for	Packing unit	Part number
PNS75 and PNS125	6	2030600

**Laser alignment aid**

Designation	Maximum scanning range	Type of light	Part number
Laser alignment aid AR60	60 m	Red light	1015741
AR60 adapter for C4000	—	—	4032461

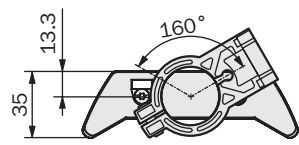
**Documentation**

Designation	Comment	Part number
Operating instructions C4000 Micro/Basic on CD-ROM	Included in the delivery	2026783

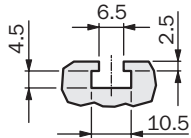
**Dimensional drawings mounting systems**



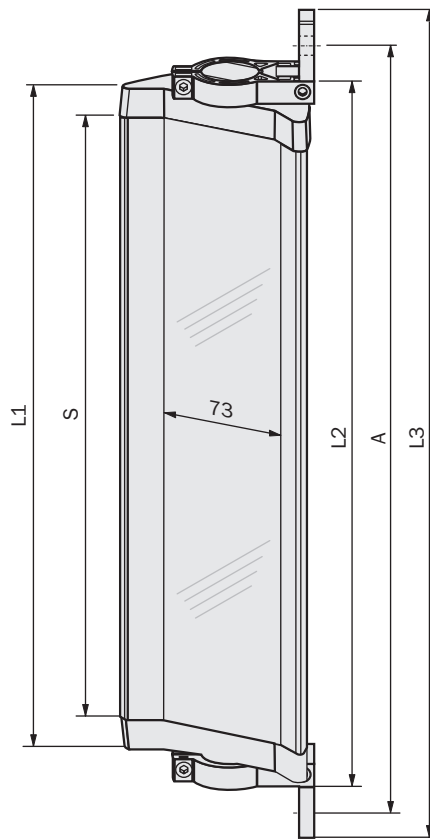
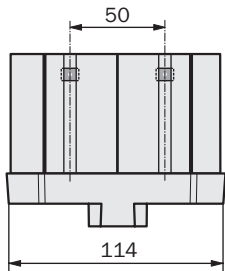
Dimensional drawings deflector mirror PNS75



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting

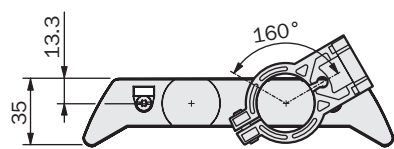


Dimensions in mm

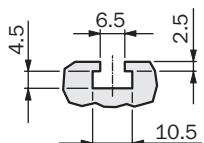
Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

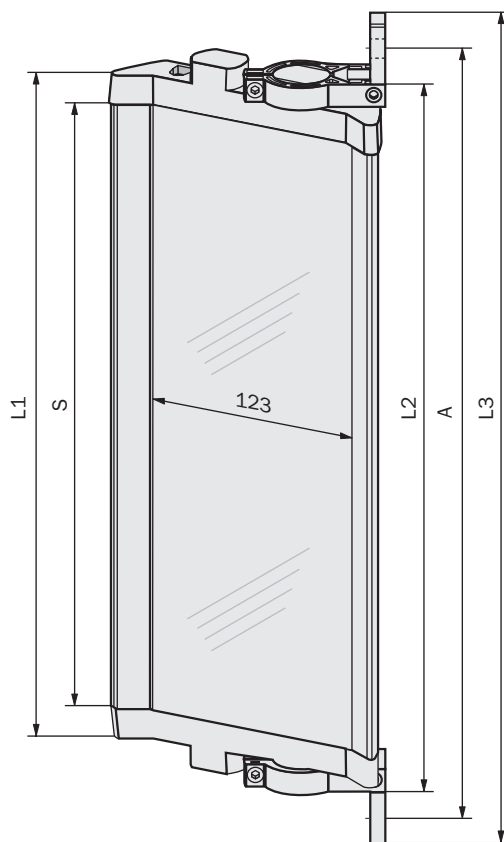
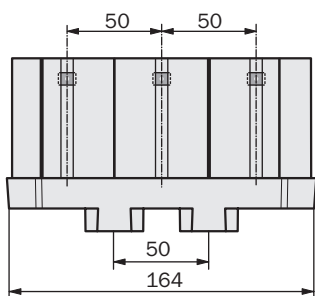
Dimensional drawings deflector mirror PNS125



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

E

## Overview of technical specifications

Protective field height (depending on type)	150 mm ... 1200 mm / 300 mm ... 1800 mm
Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Resolution (depending on type)	14 mm / 30 mm
Type	Type 4 according to IEC 61496, SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

The C4000 Eco safety light curtain reliably protects hazardous points and hazardous areas. Pre-assembled cable M12 × 5 and clever accessories such as the T-piece for only one cable back to the control cabinet save money.

Time-saving alignment and diagnostics using proven 7-segment display.

■ Cost and time saving in case of replacement: Sender and receiver can be replaced separately

- Security of investment due to high impact resistance and resistance of the front screen to scratches
- High system availability due to tested interaction between sensor and evaluation unit
- Space-saving and compact systems due to fast response times for low safety distances
- High availability even in harsh industrial conditions due to EMC immunity

## In-system added value

- Combination with SICK safe control solutions

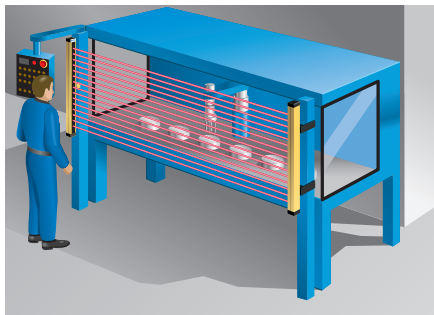
Combination with	Restart interlock	External device monitoring	Further information
UE48-20S	✓	✓	N-42
UE48-30S	✓	✓	N-48
UE10-30S	Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

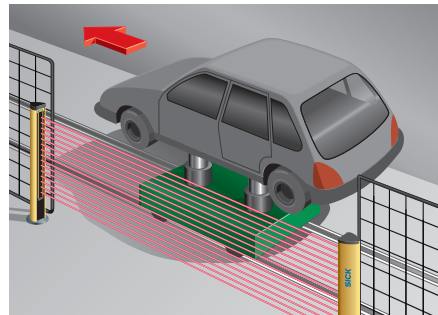
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

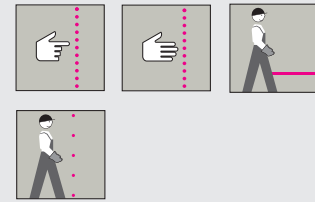
- Car and vehicle construction
- Machine tools
- Electronics industry
- Packaging machines
- Food, tobacco and beverage industry
- Handling machines
- Special machine-tool manufacture
- Environmental engineering



Hazardous point protection on a handling machine



Access protection on an assembly line



- 7-segment display + LED
- Restart interlock (RES)
- External device monitoring (EDM)
- Pre-assembled M12 cables



Further information	Page
→ Ordering information	E-102
→ Technical specifications	E-104
→ Dimensional drawings	E-105
→ Connection diagrams	E-106
→ Accessories	E-107
→ Services	A-2

## Ordering information

### C4000 Eco

Housing cross-section	40 mm × 48 mm
Functions	Protective operation
Usage	As a stand-alone system
Connections	System connection: M12 × 4 + FE (sender and receiver unit)

#### Resolution 14 mm, scanning range 0 m ... 2.5 m

E

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301AA310	1027440	C40E-0301AN310	1027441
450	C40S-0401AA310	1027442	C40E-0401AN310	1027443
600	C40S-0601AA310	1027444	C40E-0601AN310	1027445
750	C40S-0701AA310	1027446	C40E-0701AN310	1027447
900	C40S-0901AA310	1027448	C40E-0901AN310	1027449
1050	C40S-1001AA310	1027450	C40E-1001AN310	1027451
1200	C40S-1201AA310	1027452	C40E-1201AN310	1027453
1350	C40S-1301AA310	1027454	C40E-1301AN310	1027455
1500	C40S-1501AA310	1027456	C40E-1501AN310	1027457
1650	C40S-1601AA310	1027458	C40E-1601AN310	1027459
1800	C40S-1801AA310	1027460	C40E-1801AN310	1027463

#### Resolution 14 mm, scanning range 1 m ... 5 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0301AA310	1027440	C40E-0301BN310	1027486
450	C40S-0401AA310	1027442	C40E-0401BN310	1027487
600	C40S-0601AA310	1027444	C40E-0601BN310	1027488
750	C40S-0701AA310	1027446	C40E-0701BN310	1027489
900	C40S-0901AA310	1027448	C40E-0901BN310	1027490
1050	C40S-1001AA310	1027450	C40E-1001BN310	1027491
1200	C40S-1201AA310	1027452	C40E-1201BN310	1027492
1350	C40S-1301AA310	1027454	C40E-1301BN310	1027493
1500	C40S-1501AA310	1027456	C40E-1501BN310	1027494
1650	C40S-1601AA310	1027458	C40E-1601BN310	1027495
1800	C40S-1801AA310	1027460	C40E-1801BN310	1027496

**Resolution 30 mm, scanning range 0 m ... 6 m**

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
300	C40S-0303AA310	1027464	C40E-0303AN310	1027465
450	C40S-0403AA310	1027466	C40E-0403AN310	1027467
600	C40S-0603AA310	1027468	C40E-0603AN310	1027469
750	C40S-0703AA310	1027470	C40E-0703AN310	1027471
900	C40S-0903AA310	1027472	C40E-0903AN310	1027473
1050	C40S-1003AA310	1027474	C40E-1003AN310	1027475
1200	C40S-1203AA310	1027476	C40E-1203AN310	1027477
1350	C40S-1303AA310	1027478	C40E-1303AN310	1027479
1500	C40S-1503AA310	1027480	C40E-1503AN310	1027481
1650	C40S-1603AA310	1027482	C40E-1603AN310	1027483
1800	C40S-1803AA310	1027484	C40E-1803AN310	1027485

**E**

## Detailed technical specifications

### General system data

Scanning range (depending on type)	0 m ... 2.5 m / 1 m ... 5 m / 0 m ... 6 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	14 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_s$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 according to IEC 61496, SIL3 (EN 61508)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

### Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Switching voltage	24 V (15 V ... 28.8 V) DC
	$HIGH_{min}$ $LOW_{max}$ 3.5 V
Switching current max.	500 mA
Power consumption	≤0.45 A (without OSSD)

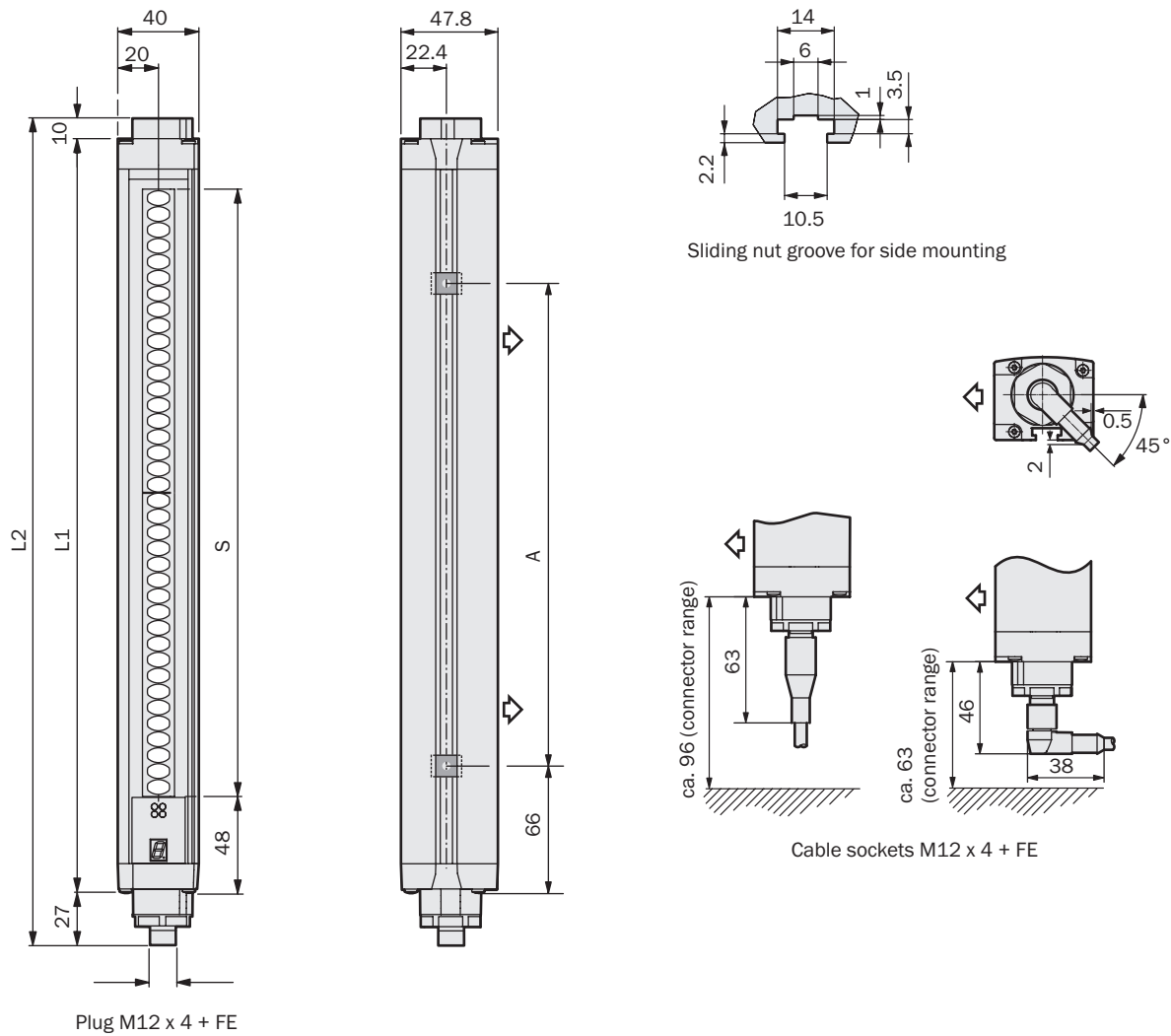
### Sender unit

Power consumption	≤0.35 A
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### Operating data

Connection type	M12 × 4 + FE
Cable length	15 m
Wire cross-section	0.25 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	40 mm × 48 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)

# Dimensional drawings



Dimensions in mm

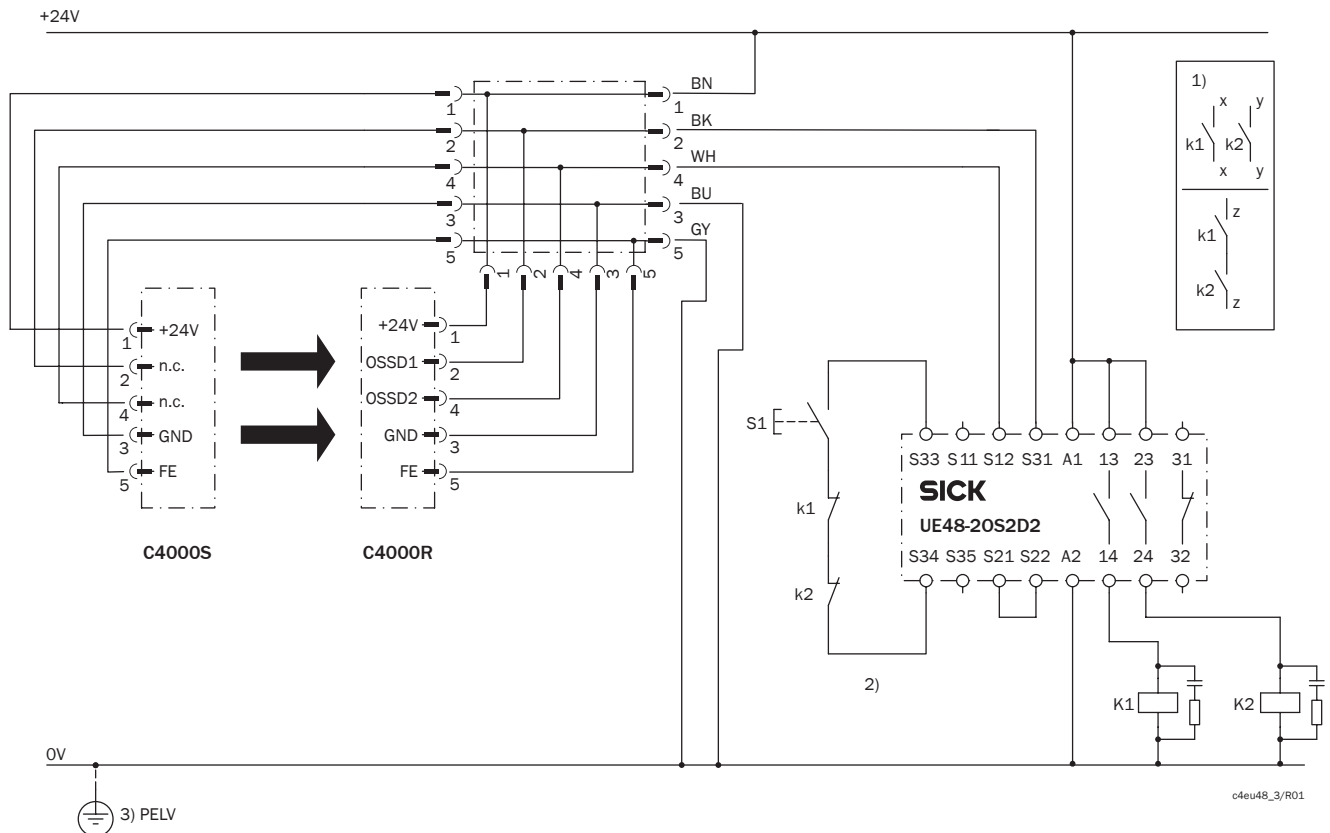
Protective field height S	L1	L2	A
300	372	417	224
450	523	568	374
600	674	718	524
750	824	869	674
900	975	1020	824
1050	1125	1170	974
1200	1274	1319	1124
1350	1426	1471	1274
1500	1577	1622	1424
1650	1727	1772	1574
1800	1878	1923	1724

Dimensions in mm

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### C4000 Eco with T-piece on UE48-20S safety relay



#### Task

Connection of a C4000 Eco safety light curtain with a T-piece to a UE48-20S safety relay.

Operating mode: with restart interlock and external device monitoring.

#### Function

If the light path is clear, the OSSD1 and OSSD2 outputs are live. If K1 and K2 are de-energised and functioning correctly, the system is ready for switch on and waits for an input signal/switch-on signal. The UE48-20S is switched on by pressing and releasing the button S1. The outputs (contacts 13-14 and 23-24) energise the contactors K1 and K2. On interruption of one or several of the light beams, the UE48-20S is de-energised by the OSSD1 and OSSD2 outputs. The contactors K1 and K2 are de-energised.

#### Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of one of the contactors K1 or K2 will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the UE48-20S will not re-enable the output current circuits.

#### Comments




- 1) Output current circuits. These contacts are to be connected to the controller such that, with the output current circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) The external device monitoring is only static.
- 3) PELV as required in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices.

This circuit can also be used for the UE48-30S.



## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

E

## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page E-109

Designation	Type of fastening	Packing unit	Comment	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2019659
Mounting kit 3	Pivoting, with anti-vibration mount	4	For all protective field heights	2017752
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2019506
Mounting kit 11	Replacement bracket	4	Suitable as replacement of FGS	2021646
Stainless steel bracket	Pivoting	4	For all protective field heights	2023708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2026850

### Sliding nuts

Designation	Packing unit	Comment	Part number
Sliding nuts	4	Included in the delivery	2017550

### Connecting cables

Connection type	Direction of the cable outlet	Connector technology	Cable length	Part number
Cable socket M12 × 4 + FE	Straight	Stripped	2 m	6008899
			5 m	6009868
			10 m	6010544
			15 m	6029215

Continued on next page

**Connection cables for T-pieces**

Connection type	Direction of the cable outlet	Connector technology	Cable length	Comment	Part number
Cable socket M12 × 4 + FE	Straight	Stripped	0.6 m	For connection to T-piece	6025930
			2 m		6025931

**T-piece**

Designation	Comment	Part number
T-piece	For connection to connection cable M12 × 4 + FE	6030664

**Power supplies**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for protective field height (mm)	Part number
300	2022412
450	2022413
600	2022414
750	2022415
900	2022416
1050	2022417
1200	2022418
1350	2022419
1500	2022420
1650	2022421
1800	2022422

**Additional front screens Heavy Duty**

Suitable for protective field height (mm)	Part number
300	2026853
450	2026854
600	2026855
750	2026856
900	2026857
1050	2026858
1200	2026859
1350	2026860
1500	2026861
1650	2026862
1800	2026863

## Deflector mirrors

Designation	Suitable for protective field height (mm)	Part number
PNS75-034	300	1019414
PNS75-049	450	1019415
PNS75-064	600	1019416
PNS75-079	750	1019417
PNS75-094	900	1019418
PNS75-109	1050	1019419
PNS75-124	1200	1019420
PNS75-139	1350	1019421
PNS75-154	1500	1019422
PNS75-169	1650	1019423
PNS75-184	1800	1019424
PNS125-034	300	1019425
PNS125-049	450	1019426
PNS125-064	600	1019427
PNS125-079	750	1019428
PNS125-094	900	1019429
PNS125-109	1050	1019430
PNS125-124	1200	1019431
PNS125-139	1350	1019432
PNS125-154	1500	1019433
PNS125-169	1650	1019434
PNS125-184	1800	1019435

E

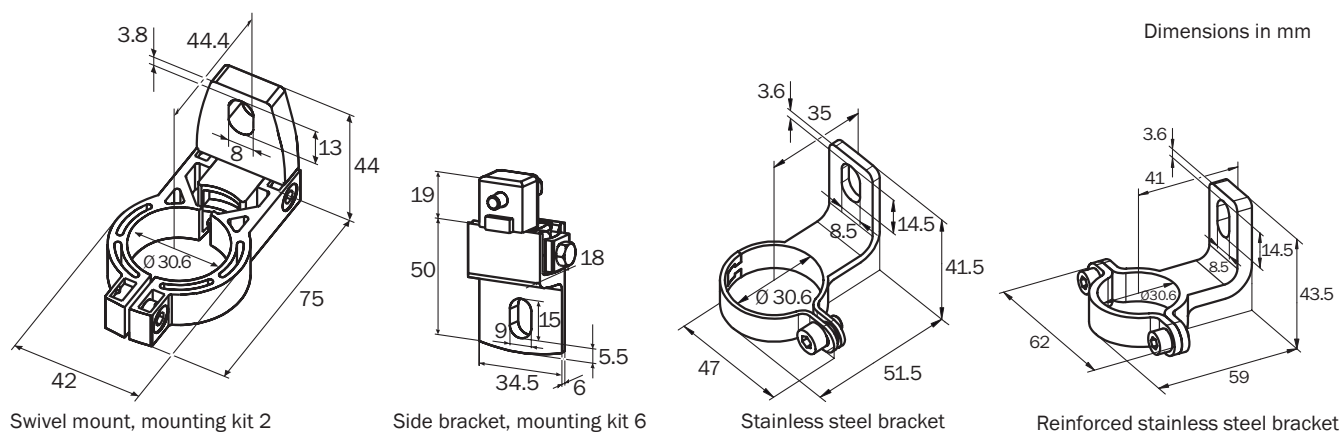
## Laser alignment aid

Designation	Maximum scanning range	Type of light	Part number
Laser alignment aid AR60	60 m	Red light	1015741
AR60 adapter for C4000 Basic Plus	—	—	4032461

## Documentation

Designation	Comment	Part number
Operating instructions C4000 Basic Plus, C4000 Basic, C4000 Eco, C4000 Micro on CD-ROM	Included in the delivery	2026783

## Dimensional drawings mounting systems





- Self-teach dynamic blanking
- External device monitoring (EDM)
- Restart interlock (RES)
- Configuration and diagnostics via PC
- Beam coding
- Multiple sampling to increase availability



## Overview of technical specifications

Protective field length (depending on type)	900 mm ... 1500 mm
Scanning range	0.5 m ... 19 m
Resolution	20 mm
Type	Type 4 (IEC 61496), SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

The C4000 Entry/Exit safety light curtain is used wherever material is to be automatically transported into the dangerous area in a machine and, at the same time, access by people must be reliably excluded:

- Maximum safety due to continuously active light curtain – tampering is very difficult

- Cost-effective due to savings on additional sensor systems or other protection measures, e.g. muting sensors, muting lamp, hinged doors etc.
- Very high availability due to self-teach distance monitoring
- Reduced mounting effort due to compact pair of sensors
- Functions can be activated without additional control device

## In-system added value

- Combination with SICK safe control solutions

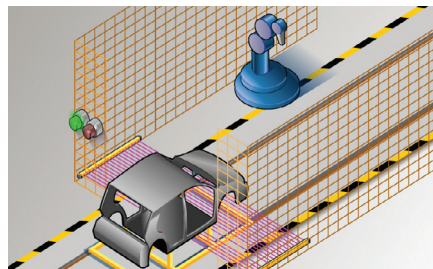
Combination with	Restart interlock	External device monitoring	Bypass	Operating mode selection	Further information
UE402	–	–	✓	✓	E-115
UE48-20S	✓	✓	–	–	N-42
UE48-30S	✓	✓	–	–	N-48
UE10-30S	Relay module				N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

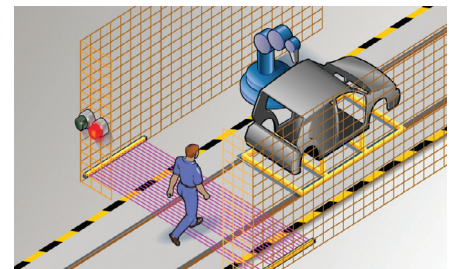
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Car and vehicle construction
- Storage and conveyor technology



Horizontal safety light curtain. No additional muting sensors required



Invalid objects or asynchronous movements result in shut down

Further information	Page
→ Technical specifications	E-112
→ Dimensional drawings	E-113
→ Accessories	E-114
→ Services	A-2

## Ordering information

Housing cross-section	48 mm × 40 mm
Function	Restart interlock, external device monitoring, beam coding, self-teach dynamic blanking, operating mode switching (with UE402)
Consisting of	Sender and receiver unit
Usage	Stand-alone system
Connections	System connection: Hirschmann plug M26 × 11 + FE

### Resolution 20 mm, scanning range 0.5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
900	C40S-0902CI010	1023968	C40E-0902CI010	1023969
1050	C40S-1002CI010	1024044	C40E-1002CI010	1024045
1200	C40S-1202CI010	1024046	C40E-1202CI010	1024047
1350	C40S-1302CI010	1024048	C40E-1302CI010	1024049
1500	C40S-1502CI010	1024050	C40E-1502CI010	1024051

E

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General system data

Scanning range	0.5 m ... 19 m
Protective field length (depending on type)	900 mm ... 1500 mm
Resolution	20 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 (IEC 61496), SIL (EN 61508)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

### Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Response time (depending on type)	15 ms ... 38 ms (without beam coding, multiple sampling 2 times)
Switching voltage	$V_S - 2.25 \text{ V}$ 3.5 V
Switching current max.	500 mA
Power consumption	≤1.8 A

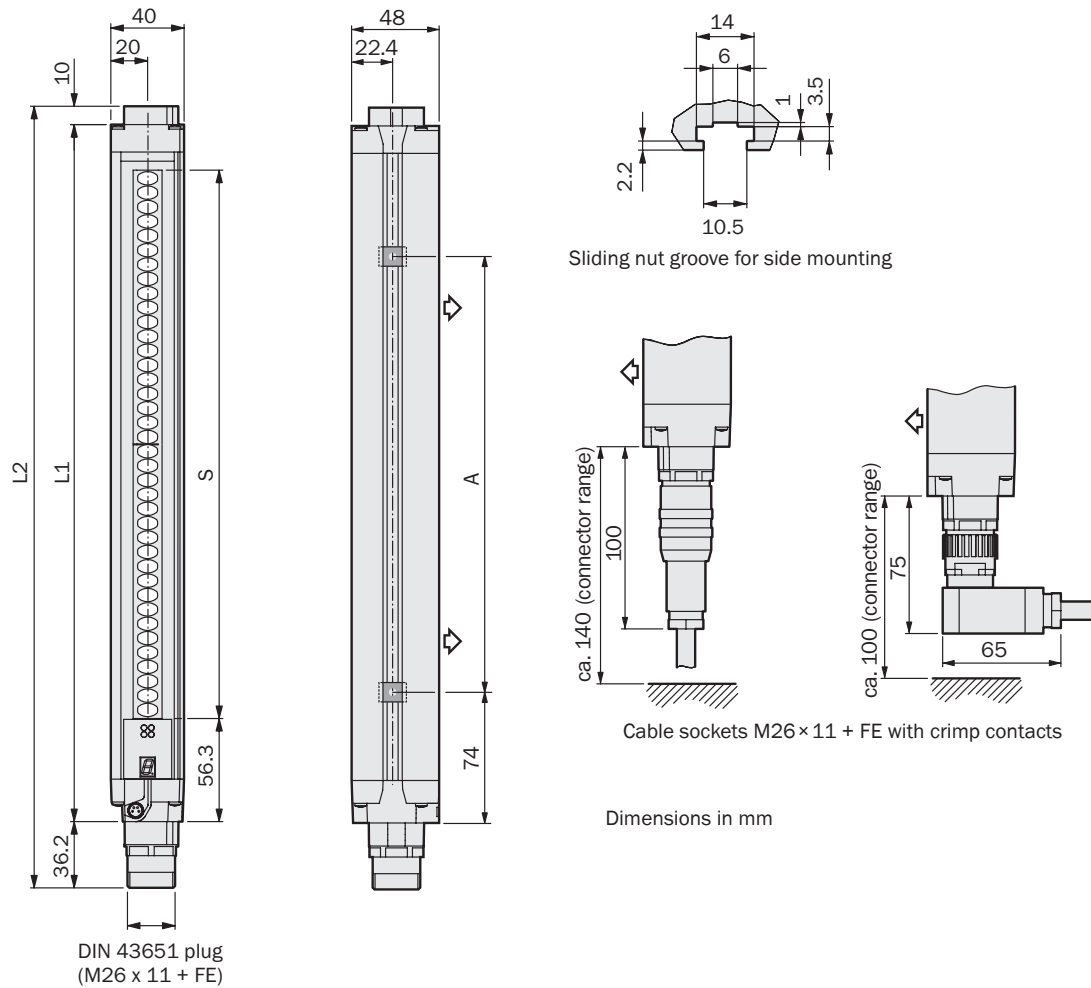
### Sender unit

Power consumption	≤1 A
-------------------	------

### General operating data

Connection type system connection	Hirschmann plug M26 × 11 + FE
Connection type configuration connection	M8 × 4
Connecting cable length	Max. 50 m
Connecting cable wire cross-section	0.75 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm × 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Weight (depending on type)	1.96 kg ... 3.14 kg

## Dimensional drawings






E

S	L1	L2	A
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424

Dimensions in mm

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe.	Page P-0

E

## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page E-116

Designation	Type of fastening	Packing unit	Comment	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2019659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2019506
Mounting kit 11	Replacement bracket	4	Suitable as replacement of FGS	2021646
Stainless steel bracket	Pivoting	4	For all protective field heights	2023708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2026850

### Sliding nuts

Designation	Packing unit	Comment	Part number
Sliding nuts	4	Included in the delivery	2017550

### Connecting cables

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26 × 11 + FE	Straight	2.5 m	2022544
		5 m	2022545
		7.5 m	2022546
		10 m	2022547
		15 m	2022548
		20 m	2022549
		30 m	2022550



**Plug connection**

Connection type	Connector technology	Direction of the cable outlet	Part number
Hirschmann cable socket M26 × 11 + FE	Crimp contacts	Straight	6020757
		Angled	6020758
Hirschmann-cable plug M26 × 11 + FE		Straight	6021191
		Angled	6021192

**Power supplies**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Interfaces**

Designation	Enclosure rating	Description	Type	Part number
Safety relay	IP 20	Expands C4000 Entry/Exit with the functions bypass, operating mode selection	UE402	1023577

**Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for protective field length (mm)	Part number
900	2022416
1050	2022417
1200	2022418
1350	2022419
1500	2022420

**Explosion protection**

Designation	Comment	Part number
ATEX package	Can be used in zone 2/22, 3G 3D	2029961

**Laser alignment aid**

Designation	Maximum scanning range	Type of light	Part number
Laser alignment aid AR60	60 m	Red light	1015741
AR60 adapter for C4000	—	—	4032461

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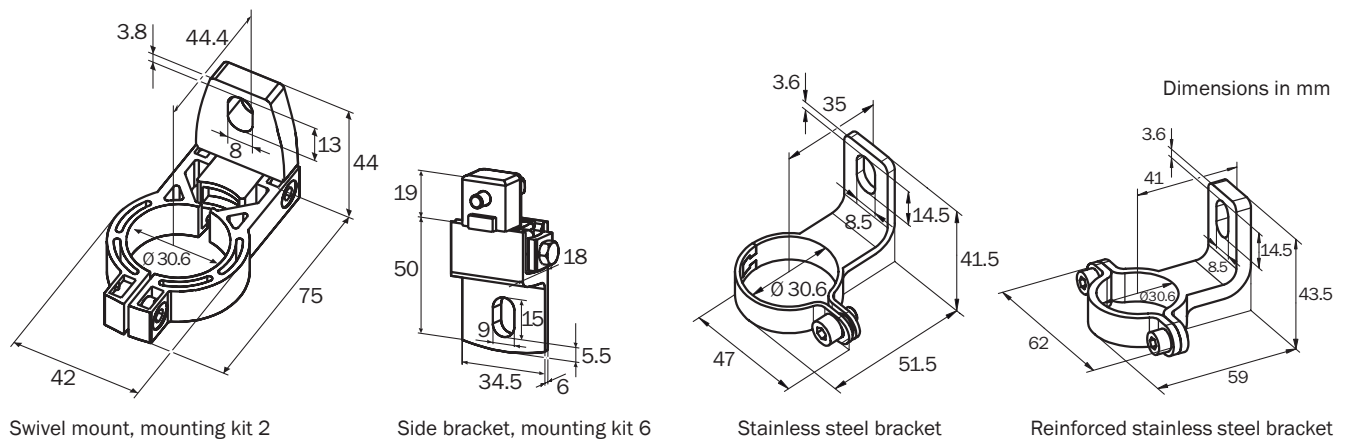
**Configuration software**

Designation	Comment	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages	2032314

**Configuration tools**

Designation	Comment	Part number
Clone Plug for C4000 and M4000	For C4000 Standard / Advanced / Palletizer / Entry/Exit and M4000 Advanced	1029665
Wall mount	Packing unit: 1	5318443
Protective cap	For Clone Plug / Host-Guest Plug	5318293

**E** Dimensional drawings mounting systems



Swivel mount, mounting kit 2

Side bracket, mounting kit 6

Stainless steel bracket

Reinforced stainless steel bracket

## Overview of technical specifications

Protective field length (depending on type)	750 mm ... 1800 mm
Scanning range	0.5 m ... 19 m
Resolution (depending on type)	40 mm / 30 mm
Type	Type 4 according to IEC 61496, SIL3 (EN 61508)
Enclosure rating	IP 65

## Product description

The C4000 Palletizer safety light curtain is the innovative muting alternative for access protection during automatic material transport.

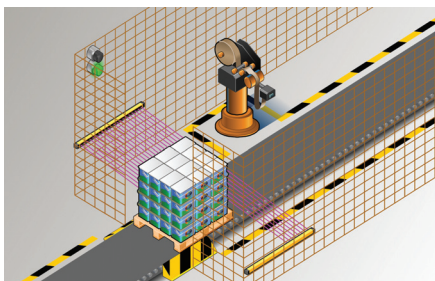
- Economical to procure: only one sensor pair means costs savings during planning, design, mounting, wiring and service
- Quickly placed in operation, euro pallets, mesh crates, etc. are recognised without programming
- Very high availability due to self-teach recognition of patterns on loading with different pallets
- Safer: provides protection in areas in which there is no object, unlike conventional muting solutions. The entire access area is protected if the belt is stopped
- Recognition of different package sizes: Packages with varying dimensions are sorted out
- Small installation area: direction detection enables very short light curtains to be used on outlet areas
- Quality control integrated: C4000 detects the pallet contours

	C4000 Palletizer Standard	C4000 Palletizer Advanced
<b>Detected objects</b>	Packages on the pallet (min. size 500 mm)	Pallets, mesh crates or packages (max. size 240 mm)
<b>Pattern recognition</b>	Using size and enclosed shape of a package	Using size and number of objects (min. 2) and monitoring the distance between them
<b>Teach-in</b>	Via reset button	Automatic, within the parameters that can be configured
<b>Object tolerance</b>	Configurable	Fixed
<b>Resolution</b>	40 mm	30 mm

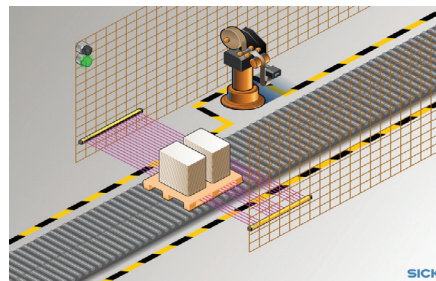
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

### ■ Storage and conveyor technology



Sensor differentiates between product and worker



Sensor differentiates between pallet and worker



- Self-teach dynamic blanking
- Direction detection
- Belt signal
- External device monitoring (EDM)
- Restart interlock (RES)
- Beam coding



E

Further information	Page
→ Ordering information	E-118
→ Technical specifications	E-119
→ Dimensional drawings	E-120
→ Connection diagrams	E-120
→ Accessories	E-121
→ Services	A-2

## Ordering information

### C4000 Palletizer Standard

Housing cross-section	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, self-teach dynamic blanking, bypass, operating mode switching (with UE402), belt signal, direction detection
Usage	Stand-alone system
Connections	System connection: Hirschmann plug M26 × 11 + FE Configuration connection: M8 × 4

## E

#### Resolution 40 mm, scanning range 0.5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
750	C40S-0704CP010	1027124	C40E-0704CP010	1027125
900	C40S-0904CP010	1027126	C40E-0904CP010	1027127
1050	C40S-1004CP010	1027128	C40E-1004CP010	1027129
1200	C40S-1204CP010	1027130	C40E-1204CP010	1027131
1350	C40S-1304CP010	1027132	C40E-1304CP010	1027133
1500	C40S-1504CP010	1027134	C40E-1504CP010	1027135
1650	C40S-1604CP010	1027136	C40E-1604CP010	1027137
1800	C40S-1804CP010	1027138	C40E-1804CP010	1027139

### C4000 Palletizer Advanced

Housing cross-section	48 mm × 40 mm
Functions	Restart interlock, external device monitoring, beam coding, self-teach dynamic blanking, bypass, operating mode switching (with UE402), belt signal, direction detection
Usage	Stand-alone system
Connections	System connection: Hirschmann plug M26 × 11 + FE Configuration connection: M8 × 4

#### Resolution 30 mm, scanning range 0.5 m ... 19 m

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
750	C40S-0703CP010	1027100	C40E-0703CK010	1027101
900	C40S-0903CP010	1027102	C40E-0903CK010	1027103
1050	C40S-1003CP010	1027104	C40E-1003CK010	1027105
1200	C40S-1203CP010	1027106	C40E-1203CK010	1027107
1350	C40S-1303CP010	1027108	C40E-1303CK010	1027109
1500	C40S-1503CP010	1027110	C40E-1503CK010	1027111
1650	C40S-1603CP010	1027112	C40E-1603CK010	1027113
1800	C40S-1803CP010	1027114	C40E-1803CK010	1027115

## Detailed technical specifications

### General system data

Scanning range	0.5 m ... 19 m
Protective field length (depending on type)	750 mm ... 1800 mm
Resolution (depending on type)	40 mm / 30 mm
Protection class	III
Enclosure rating	IP 65
Supply voltage $V_s$	24 V (19.2 V ... 28.8 V) DC <sup>1)</sup>
Type	Type 4 according to IEC 61496, SIL3 (EN 61508)
Synchronisation	Optical, without separate synchronisation

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1. Suitable power supplies are available as accessories from SICK.

### Receiver unit

Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Switching voltage LOW	3.5 V
Switching current max.	500 mA
Power consumption	≤1.8 A

### Sender unit

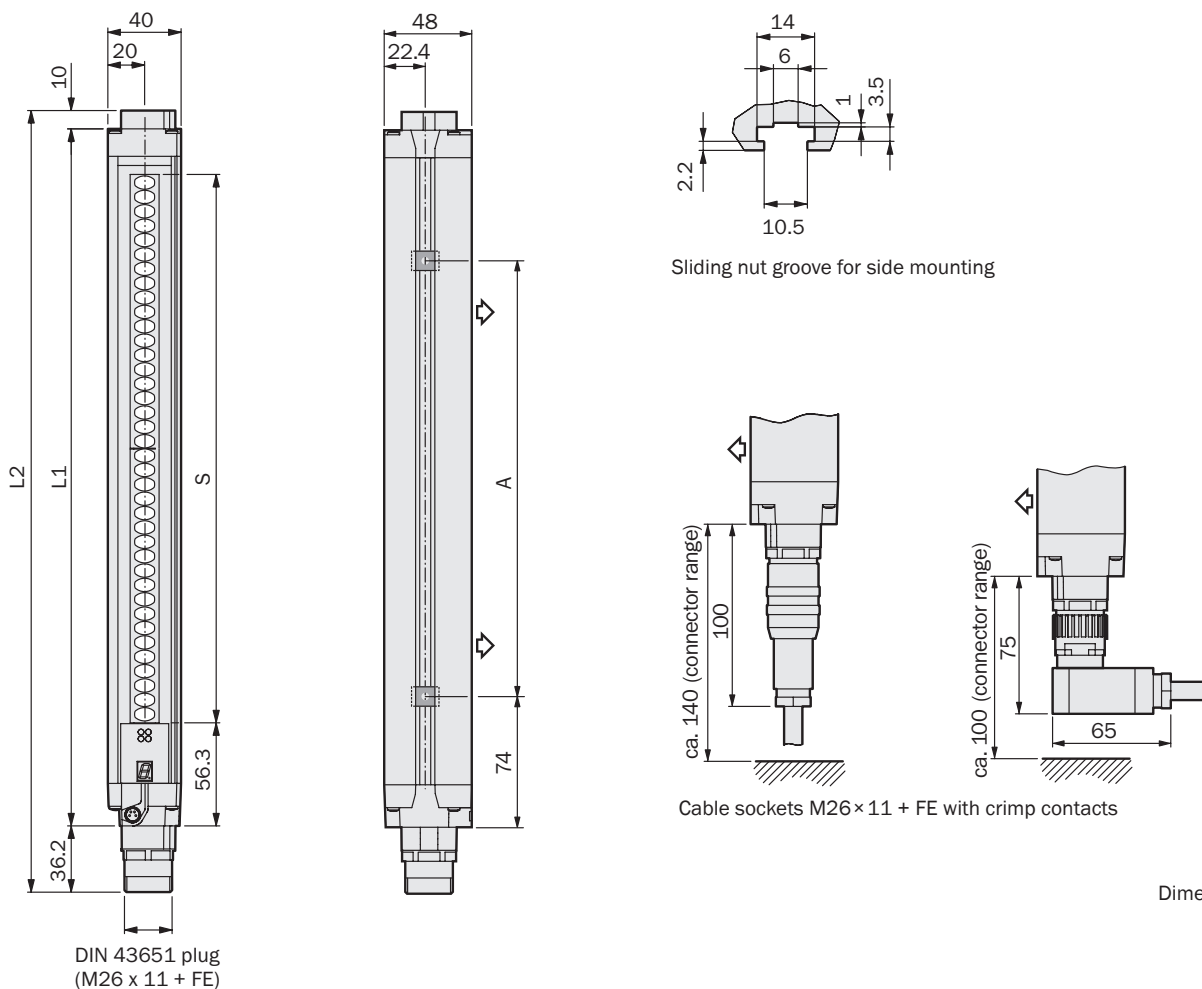
Power consumption	≤1 A
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### Operating data

Connection type	Hirschmann plug M26×11 + FE
Connection type configuration connection	M8×4
Cable length	Max. 50 m
Wire cross-section	0.75 mm <sup>2</sup>
Ambient operating temperature from ... to	0 °C ... +55 °C
Storage temperature from ... to	-25 °C ... +70 °C
Air humidity from ... to	15 % ... 95 %
Housing cross-section	48 mm × 40 mm
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)

E

## Dimensional drawings






Protective field length S	L1	L2	A
750	833	879	674
900	984	1030	824
1050	1134	1180	974
1200	1283	1329	1124
1350	1435	1481	1274
1500	1586	1632	1424
1650	1736	1782	1574
1800	1887	1933	1724

Dimensions in mm

## Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page E-123

Designation	Type of fastening	Packing unit	Comment	Part number
Mounting kit 2	Pivoting, swivel mount	4	For all protective field heights	2019659
Mounting kit 6	Pivoting, side bracket	4	For all protective field heights	2019506
Mounting kit 11	Replacement bracket	4	Suitable as replacement of FGS	2021646
Stainless steel bracket	Pivoting	4	For all protective field heights	2023708
Reinforced stainless steel bracket	Pivoting	4	For all protective field heights	2026850

### Sliding nuts

Designation	Packing unit	Comment	Part number
Sliding nuts	4	Included in the delivery	2017550

### Connecting cables

Connection type	Direction of the cable outlet	Cable length	Part number
Hirschmann cable socket M26 × 11 + FE	Straight	2.5 m	2022544
		5 m	2022545
		7.5 m	2022546
		10 m	2022547
		15 m	2022548
		20 m	2022549
		30 m	2022550
		50 m	2033548

Continued on next page

**Plug connection**

Connection type	Connector technology	Direction of the cable outlet	Part number
Hirschmann cable socket M26 × 11 + FE	Crimp contacts	Straight	6020757
		Angled	6020758
Hirschmann-cable plug M26 × 11 + FE		Straight	6021191
		Angled	6021192

**Connection cables configuration**

Comment	Cable length	Part number
For connecting the configuration interface to the serial interface on the PC	2 m	6021195
	8 m	2027649

**E****Interfaces**

Designation	Enclosure rating	Description	Type	Part number
Safety relay	IP 20	Expands C4000 Palletizer with the functions emergency stop, operating mode selection	UE402	1023577

**Power supplies**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Additional front screens**

Designation	Suitable for protective field length (mm)	Part number
Additional front screen (weld spark guard)	750	2022415
	900	2022416
	1050	2022417
	1200	2022418
	1350	2022419
	1500	2022420
	1650	2022421
	1800	2022422
Additional front screen Heavy Duty (weld spark guard) with bracket	750	2026856
	900	2026857
	1050	2026858
	1200	2026859
	1350	2026860
	1500	2026861
	1650	2026862
	1800	2026863

**Explosion protection**

Designation	Comment	Part number
ATEX package	Can be used in zone 2/22, 3G 3D	2029961



**Laser alignment aid**

Designation	Maximum scanning range	Type of light	Part number
Laser alignment aid AR60	60 m	Red light	1015741
AR60 adapter for C4000	—	—	4032461

**Configuration software**

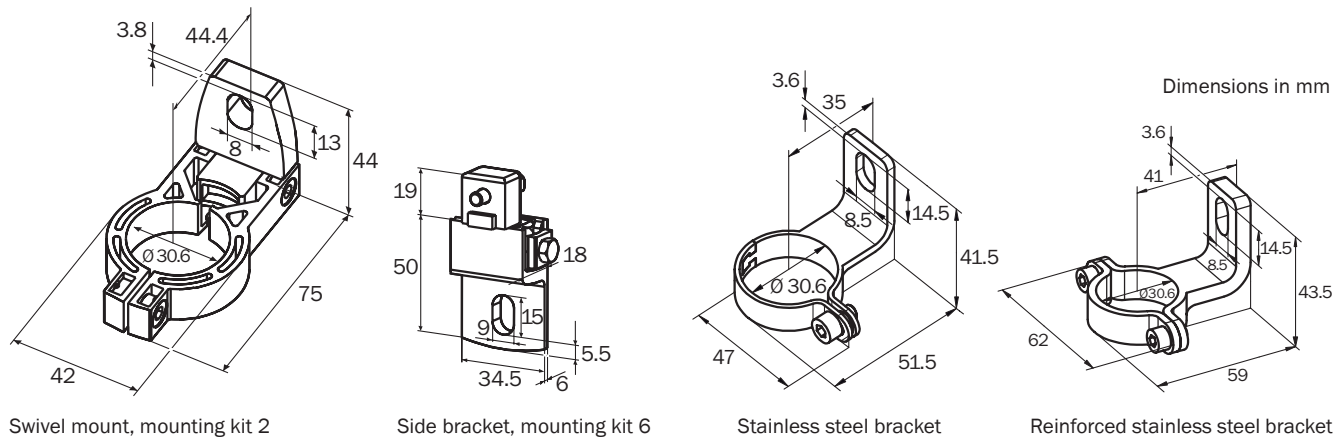
Designation	Comment	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in multiple languages	2032314

**Configuration tools**

Designation	Comment	Part number
Clone Plug for C4000 and M4000	For C4000 Standard / Advanced / Palletizer / Entry/Exit and M4000 Advanced	1029665
Wall mount	Packing unit: 1	5318443
Protective cap	For Clone Plug / Host-Guest Plug	5318293



**Dimensional drawings mounting systems**



Swivel mount, mounting kit 2

Side bracket, mounting kit 6

Stainless steel bracket

Reinforced stainless steel bracket



E

- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Technical specifications	E-127
→ Dimensional drawings	E-128
→ Connection diagrams	E-130
→ Accessories	E-131
→ Dimensional drawings accessories	E-134
→ Services	A-2

## Overview of technical specifications

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	150 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

## Product description

With its high signal reserve, the C2000 Standard safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum

machine security while taking into account economic considerations by precisely coordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

## In-system added value

- Combination with safe control solutions from SICK

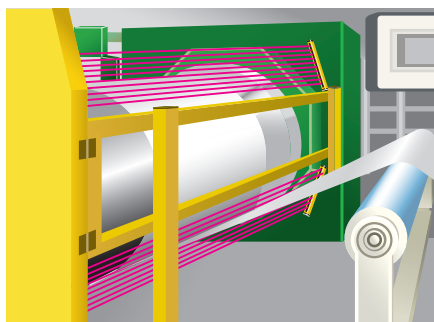
Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20	✓	✓	–	N-57
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	–	N-42
UE48-30S	✓	✓	–	N-48
UE10-30S	Relay module			N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

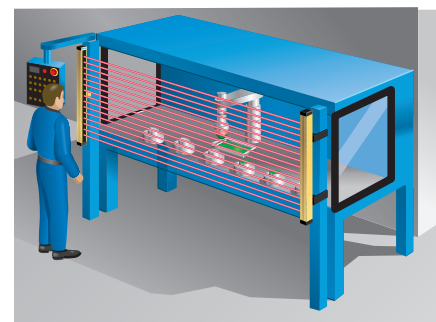
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Textile industry: C2000 Standard on a warping machine



Printing industry: C2000 Standard on a pad printing machine

## Ordering information

### C2000 Standard

- With external device monitoring (EDM)
- For usage as a stand-alone system
- Consisting of sender and receiver unit

→ Accessories see page E-131

### Scanning range 0 ... 6 m

Resolution (mm)	Housing cross-section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	150	C20S-015102A11	1016563	C20E-015302A11	1016564
		300	C20S-030102A11	1016448	C20E-030302A11	1016449
		450	C20S-045102A11	1016573	C20E-045302A11	1016459
		600	C20S-060102A11	1016574	C20E-060302A11	1016575
		750	C20S-075102A11	1016579	C20E-075302A11	1016580
		900	C20S-090102A11	1016584	C20E-090302A11	1016585
		1050	C20S-105102A11	1016589	C20E-105302A11	1016590
30	34 x 29	1200	C20S-120102A11	1016464	C20E-120302A11	1016465
		150	C20S-015103A11	1016475	C20E-015303A11	1016476
		300	C20S-030103A11	1016568	C20E-030303A11	1016569
		450	C20S-045103A11	1016454	C20E-045303A11	1016455
		600	C20S-060103A11	1016477	C20E-060303A11	1016478
		750	C20S-075103A11	1016479	C20E-075303A11	1016480
		900	C20S-090103A11	1016481	C20E-090303A11	1016482
	48 x 40	1050	C20S-105103A11	1016483	C20E-105303A11	1016484
		1200	C20S-120103A11	1016594	C20E-120303A11	1016595
		1350	C20S-135103A12	1016600	C20E-135303A12	1016601
		1500	C20S-150103A12	1016605	C20E-150303A12	1016606
		1650	C20S-165103A12	1016610	C20E-165303A12	1016611
		1800	C20S-180103A12	1016615	C20E-180303A12	1016616
40	34 x 29	150	C20S-015104A11	1016565	C20E-015304A11	1016566
		300	C20S-030104A11	1016570	C20E-030304A11	1016571
		450	C20S-045104A11	1016456	C20E-045304A11	1016457
		600	C20S-060104A11	1016576	C20E-060304A11	1016577
		750	C20S-075104A11	1016581	C20E-075304A11	1016582
		900	C20S-090104A11	1016586	C20E-090304A11	1016587
		1050	C20S-105104A11	1016591	C20E-105304A11	1016592
	48 x 40	1200	C20S-120104A11	1016596	C20E-120304A11	1016597
		1350	C20S-135104A12	1016603	C20E-135304A12	1016604
		1500	C20S-150104A12	1016608	C20E-150304A12	1016609
		1650	C20S-165104A12	1016613	C20E-165304A12	1016614
		1800	C20S-180104A12	1016618	C20E-180304A12	1016619

Continued on next page

## Scanning range 2.5 ... 19 m

Resolution (mm)	Housing cross-section (mm)	Protective field height (mm)	Sender unit		Receiver unit		
			Type	Part number	Type	Part number	
20	34 x 29	150	C20S-015202A11	1016631	C20E-015302A11	1016564	
		300	C20S-030202A11	1016632	C20E-030302A11	1016449	
		450	C20S-045202A11	1016458	C20E-045302A11	1016459	
		600	C20S-060202A11	1016633	C20E-060302A11	1016575	
		750	C20S-075202A11	1016634	C20E-075302A11	1016580	
		900	C20S-090202A11	1016635	C20E-090302A11	1016585	
		1050	C20S-105202A11	1016636	C20E-105302A11	1016590	
		1200	C20S-120202A11	1016466	C20E-120302A11	1016465	
30	34 x 29	150	C20S-015203A11	1016567	C20E-015303A11	1016476	
		300	C20S-030203A11	1016572	C20E-030303A11	1016569	
		450	C20S-045203A11	1016460	C20E-045303A11	1016455	
		600	C20S-060203A11	1016578	C20E-060303A11	1016478	
		750	C20S-075203A11	1016583	C20E-075303A11	1016480	
		900	C20S-090203A11	1016588	C20E-090303A11	1016482	
		1050	C20S-105203A11	1016593	C20E-105303A11	1016484	
			1200	C20S-120203A11	1016599	C20E-120303A11	1016595
		48 x 40	1350	C20S-135203A12	1016602	C20E-135303A12	1016601
			1500	C20S-150203A12	1016607	C20E-150303A12	1016606
			1650	C20S-165203A12	1016612	C20E-165303A12	1016611
			1800	C20S-180203A12	1016617	C20E-180303A12	1016616
	40	34 x 29	150	C20S-015204A11	1016637	C20E-015304A11	1016566
			300	C20S-030204A11	1016638	C20E-030304A11	1016571
450			C20S-045204A11	1016462	C20E-045304A11	1016457	
600			C20S-060204A11	1016639	C20E-060304A11	1016577	
750			C20S-075204A11	1016640	C20E-075304A11	1016582	
900			C20S-090204A11	1016641	C20E-090304A11	1016587	
1050			C20S-105204A11	1016642	C20E-105304A11	1016592	
			1200	C20S-120204A11	1016643	C20E-120304A11	1016597
		48 x 40	1350	C20S-135204A12	1016644	C20E-135304A12	1016604
			1500	C20S-150204A12	1016646	C20E-150304A12	1016609
			1650	C20S-165204A12	1016647	C20E-165304A12	1016614
			1800	C20S-180204A12	1016648	C20E-180304A12	1016619

E

## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	150 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC

### Sender unit

Power consumption	Max. 6.2 W
-------------------	------------

### Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms ... 34 ms
Switching voltage	$V_S - 2.25\text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 8 W

### Operating data

Connection type	M12 plug, 8-pin
Connection cable wire cross-section	Max. 0.25 mm <sup>2</sup>
Connection cable length	Max. 15 m
Ambient operating temperature $T_A$	0 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section (depending on type) for protective field heights of 150 mm to 1200 mm for protective field heights of 1350 mm to 1800 mm	34 mm x 29 mm 48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	0.27 kg ... 3.88 kg

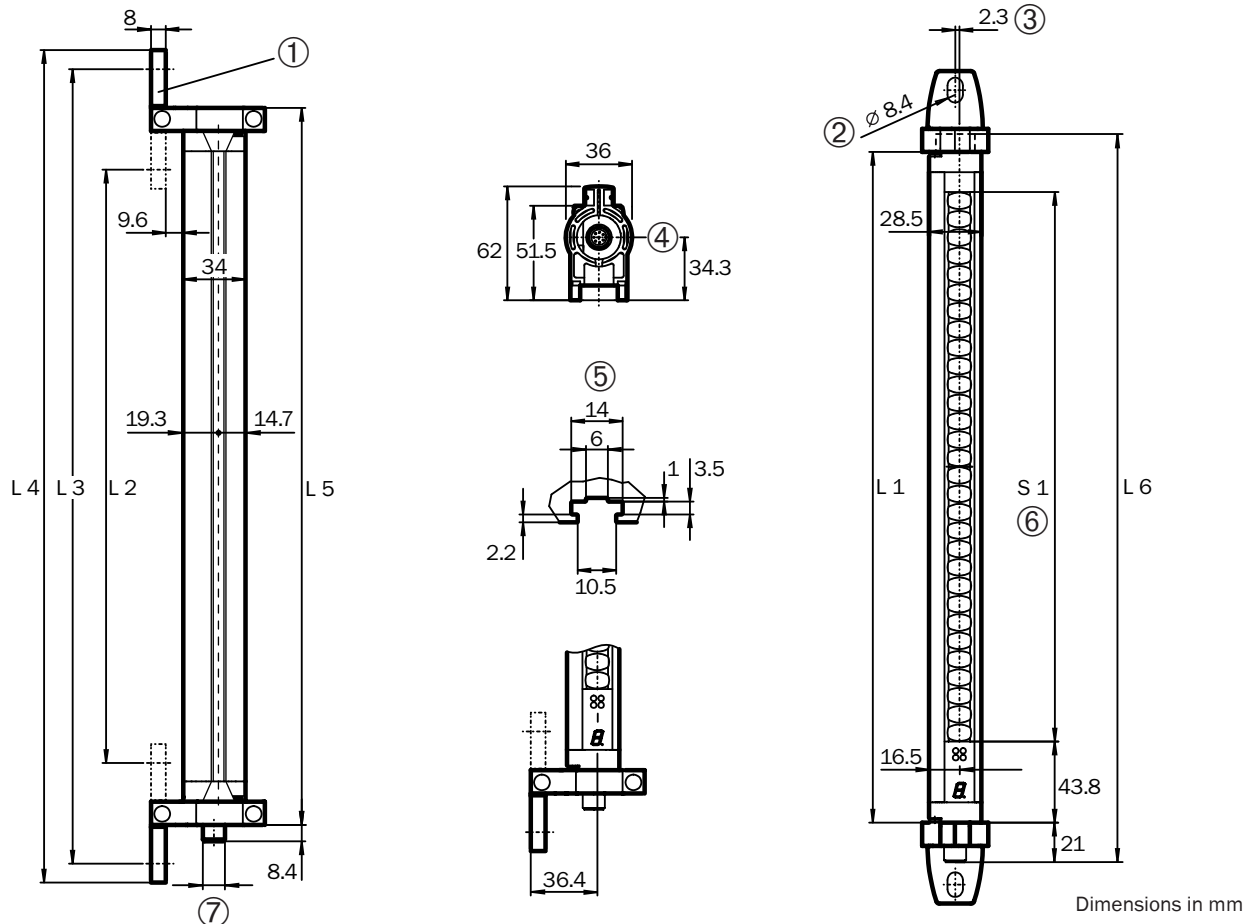
E

# Dimensional drawings

→ You can find more dimensional drawings in the technical description/operating instructions. Download at [www.sick.com](http://www.sick.com)

## Protective field heights 150 mm ... 1200 mm

E



Sender unit with swivel mount, small housing profile (receiver unit mirror image)

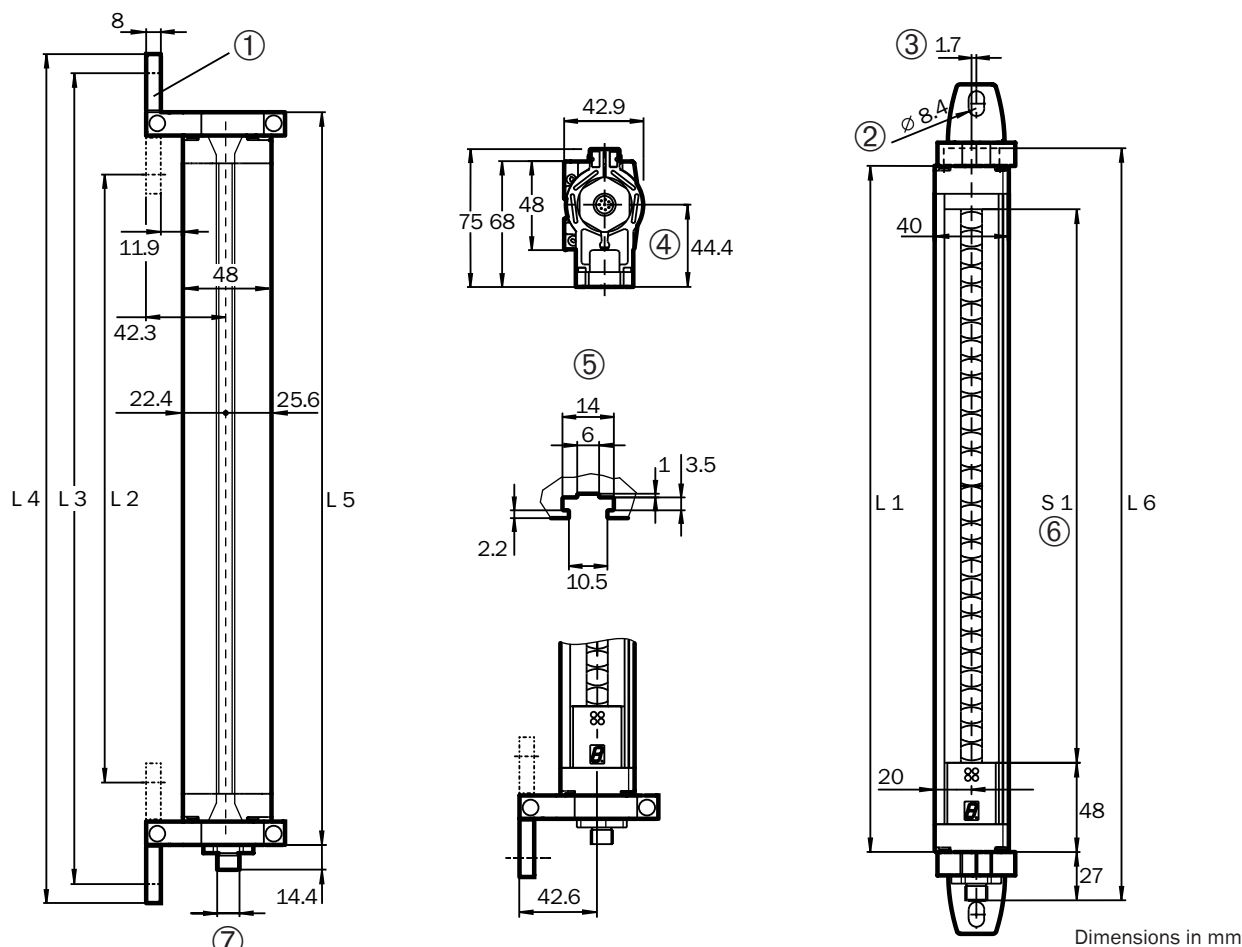
- ① Mounting clamp
- ② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ③ Centre of light beam offset
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Protective field height
- ⑦ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5	L 6
150	246	204	313	334	271	276
300	364	322	432	452	390	394
450	515	473	582	603	540	545
600	666	623	733	754	691	696
750	816	774	884	904	841	846
900	967	924	1034	1055	992	997
1050	1117	1075	1185	1205	1142	1147
1200	1266	1224	1334	1354	1292	1298

S1 = protective field height

Dimensions in mm

Protective field heights 1350 mm ... 1800 mm



Sender unit with swivel mount, large housing profile (receiver unit mirror image)

- ① Mounting clamp
- ② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ③ Centre of light beam offset
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Protective field height
- ⑦ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5	L 6
1350	1426	1384	1494	1514	1452	1463
1500	1577	1535	1644	1665	1602	1614
1650	1727	1685	1795	1815	1752	1764
1800	1878	1836	1945	1966	1903	1915

S1 = protective field height

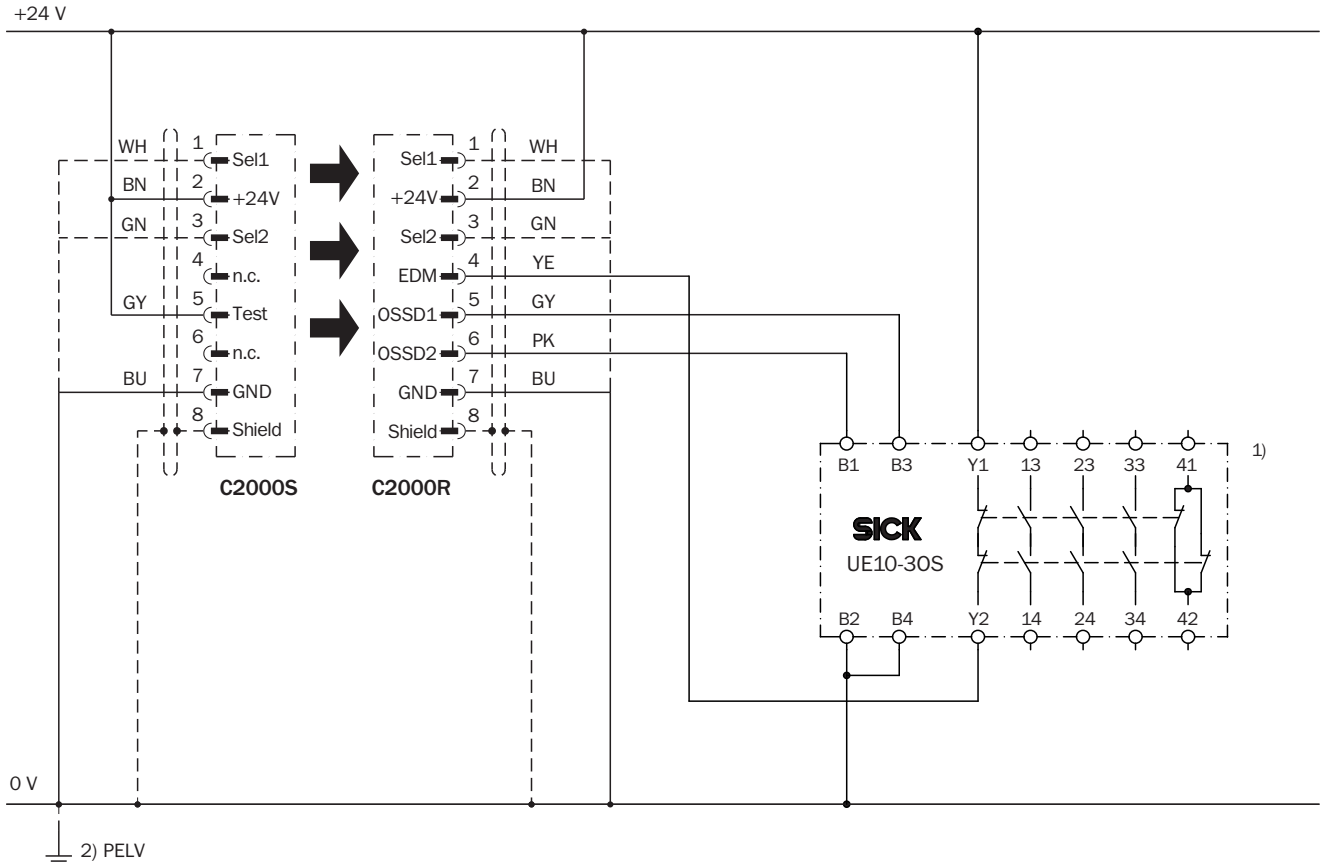
Dimensions in mm

E

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### C2000 Standard on UE10-30S safety relay



#### Task

Interfacing a C2000 Standard safety light curtain to UE10-30S. Operating mode without restart interlock with external device monitoring.

#### Function

The system is enabled when the light path is clear and the UE10-30S is de-energised and functioning correctly. The OSSD1 and OSSD2 outputs are live, the UE10-30S is switched on. On the interruption of one of the light beams, the UE10-30S is deactivated by the OSSD1 and OSSD2 outputs.

#### Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-30S will be detected and will not result in the loss of the shutdown function.




#### Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.



## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFSafe.	Page P-0

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## Accessories

### Mounting accessories

→ Dimensional drawings mounting accessories see page E-134

Designation	Description	Part number
Mounting kit 1	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> <li>▪ For protective field height 150 mm ... 1200 mm</li> </ul>	2019649
Mounting kit 2	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2019659
Mounting kit 6	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Side bracket</li> </ul>	2019506
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ For protective field height 150 mm ... 1200 mm</li> </ul>	2030288
	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2026850

Continued on next page

**Connector technology**

System connection	Designation	Description	Connection cable	Part number
M12 plug	M12 cable socket	<ul style="list-style-type: none"> <li>8-pin</li> <li>Straight</li> </ul>	2.5 m	6020537
			5.0 m	6020354
			7.5 m	6020353
			10.0 m	6020352
			15.0 m	6020872
		<ul style="list-style-type: none"> <li>8-pin</li> <li>Angled</li> </ul>	5.0 m	6021342
			15.0 m	6021343

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Device columns <sup>1)</sup>**

→ Dimensional drawings device columns see page F-86

Designation	Description	Part number
Device column with front screen	<ul style="list-style-type: none"> <li>For C2000 Standard (protective field height 150 mm ... 1050 mm)</li> <li>For C2000 Cascadable and RES/EDM (protective field height 150 mm ... 900 mm)</li> <li>1200 mm high</li> <li>Including mounting kit 1 (2 pieces)</li> </ul>	2021333
	<ul style="list-style-type: none"> <li>For C2000 (protective field height 150 mm ... 1200 mm)</li> <li>1500 mm high</li> <li>Including mounting kit 1 (2 pieces)</li> </ul>	2021242
	<ul style="list-style-type: none"> <li>For C2000 (protective field height 150 mm ... 1200 mm)</li> <li>1700 mm high</li> <li>Including mounting kit 1 (2 pieces)</li> </ul>	2021337
	<ul style="list-style-type: none"> <li>For C2000 (protective field height 1350 mm ... 1500 mm)</li> <li>1700 mm high</li> <li>Including mounting kit 2 (2 pieces)</li> </ul>	2021332

<sup>1)</sup> Warning, reduction of the scanning range!

**Additional front screens <sup>1)</sup>**

Designation	For protective field height (mm)	Part number
Additional front screen (weld spark guard)	300	2022405
	450	2022406
	600	2022407
	750	2022408
	900	2022409
	1050	2022410
	1200	2022411

<sup>1)</sup> Warning, reduction of the scanning range!

**Additional front screens Heavy Duty <sup>1)</sup>**

Designation	For protective field height (mm)	Part number
Additional front screen Heavy Duty (weld spark guard) with bracket	1350	2026860
	1500	2026861
	1650	2026862
	1800	2026863

<sup>1)</sup> Warning, reduction of the scanning range!

**Deflector mirrors <sup>1)</sup> (incl. mounting kit 2)**

→ Dimensional drawings deflector mirrors see page E-135

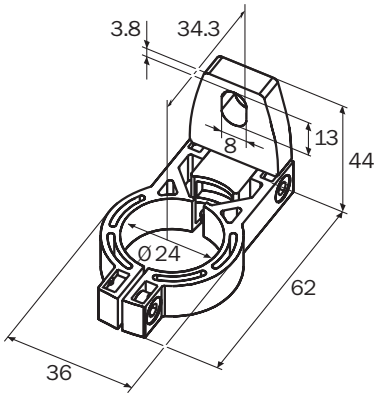
Designation	For protective field height (mm)	Type	Part number
For overall protective field width 0 m ... 4 m	300	PNS75-034	1019414
	450	PNS75-049	1019415
	600	PNS75-064	1019416
	750	PNS75-079	1019417
	900	PNS75-094	1019418
	1050	PNS75-109	1019419
	1200	PNS75-124	1019420
	1350	PNS75-139	1019421
	1500	PNS75-154	1019422
	1650	PNS75-169	1019423
	1800	PNS75-184	1019424
For overall protective field width 4 m ... 15 m	300	PNS125-034	1019425
	450	PNS125-049	1019426
	600	PNS125-064	1019427
	750	PNS125-079	1019428
	900	PNS125-094	1019429
	1050	PNS125-109	1019430
	1200	PNS125-124	1019431
	1350	PNS125-139	1019432
	1500	PNS125-154	1019433
	1650	PNS125-169	1019434
	1800	PNS125-184	1019435

<sup>1)</sup> Warning, reduction of the scanning range!

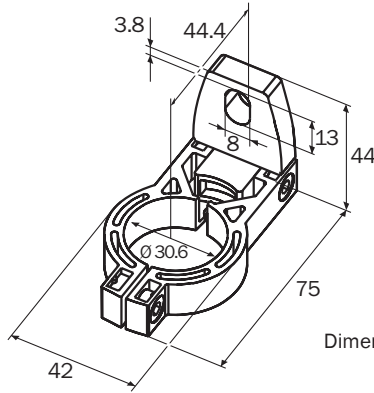
**Laser alignment aid**

Designation	Description	Type	Part number
Laser alignment aid	<ul style="list-style-type: none"> <li>Does not require connection to power supply</li> </ul>	AR60	1015741
Adapter for AR60	<ul style="list-style-type: none"> <li>For large housing profile</li> </ul>	—	4032461
	<ul style="list-style-type: none"> <li>For small housing profile</li> </ul>	—	4032462

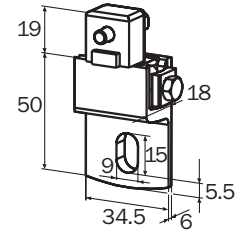
Dimensional drawings mounting accessories



Swivel mount  
Mounting kit 1  
for protective field height 150 mm ... 1200 mm

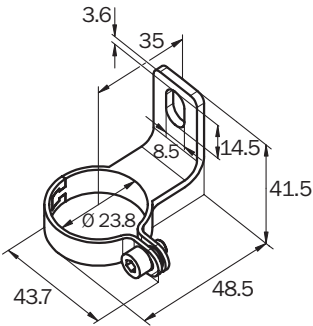


Swivel mount  
Mounting kit 2  
for protective field height 1350 mm ... 1800 mm

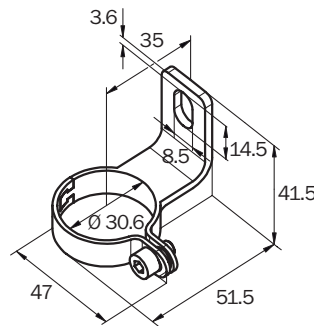


Side bracket  
Mounting kit 6

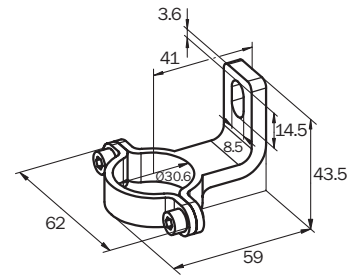
Dimensions in mm



Stainless steel bracket  
for protective field height 150 mm ... 1200 mm



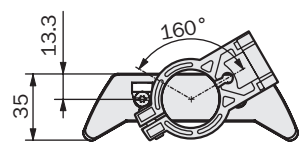
Stainless steel bracket  
for protective field height 1350 mm ... 1800 mm



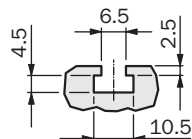
Reinforced stainless steel bracket for  
protective field height 1350 mm ... 1800 mm

E

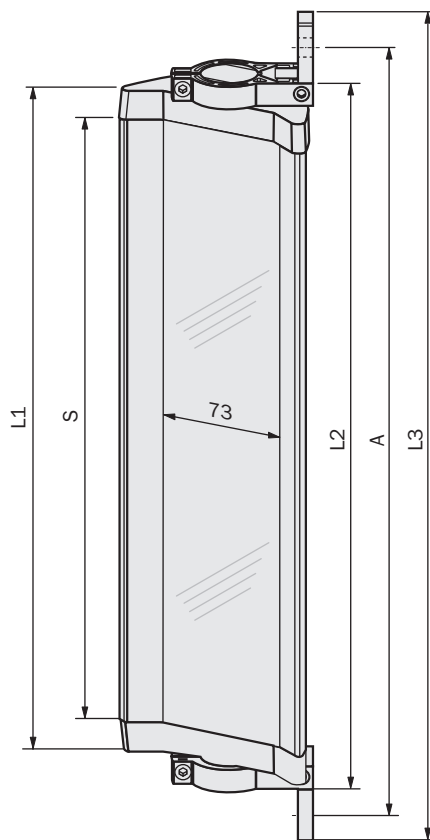
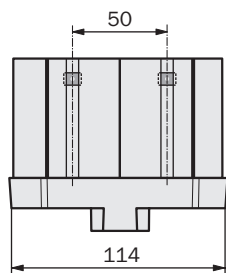
## Dimensional drawings deflector mirror PNS75



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting

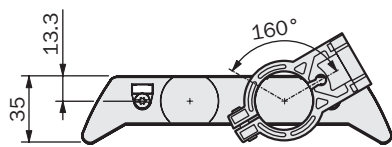


Dimensions in mm

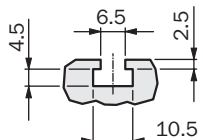
Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

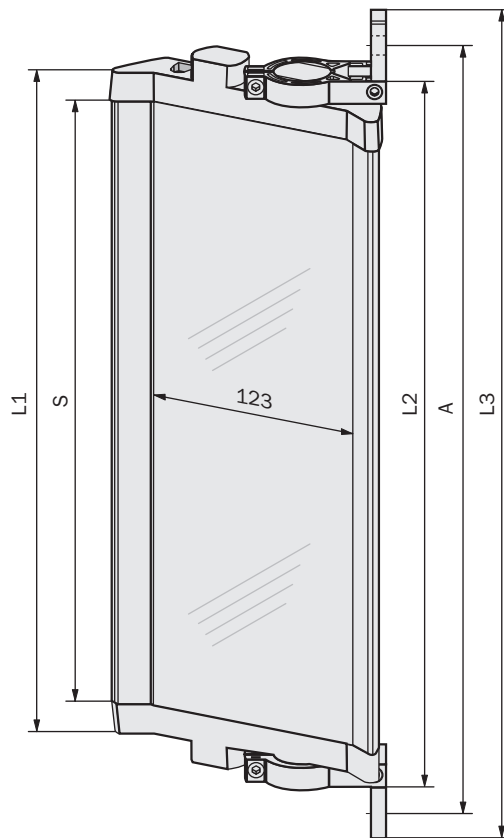
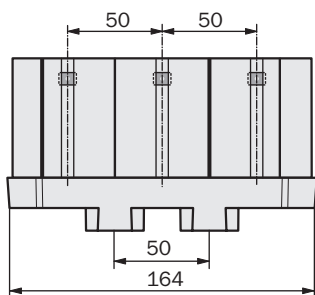
# Dimensional drawings deflector mirror PNS125



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



Dimensions in mm

E

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm

## Overview of technical specifications

Resistant materials	Stainless steel (V4A), PMMA, PA, PVC
Enclosure rating	IP 67
Protective field width (depending on type)	0 m ... 4.5 m / 2.5 m ... 14.5 m
Protective field height (depending on type)	150 mm ... 1200 mm
Resolution (depending on type)	30 mm
Type	Type 2 according to EN 61496

## Product description

The IP67 Housing in conjunction with the safety light curtain C2000 achieves the enclosure rating IP 67. A high level of resistance against the usual cleaning agents is achieved by using suitable materials (V4A, PMMA, PA, PVC).

A compensating element (membrane) prevents the plastic tubes misting up and the entry of liquids. The cable is fed into the device through the proven PG connector.

## In-system added value

■ Combination with safe control solutions from SICK

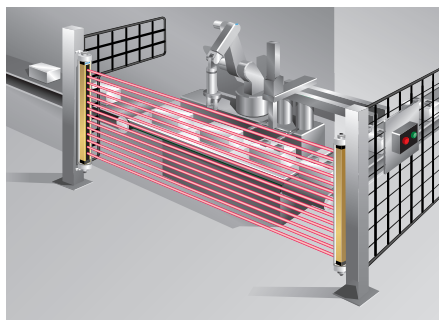
Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20	✓	✓	—	N-57
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S		Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

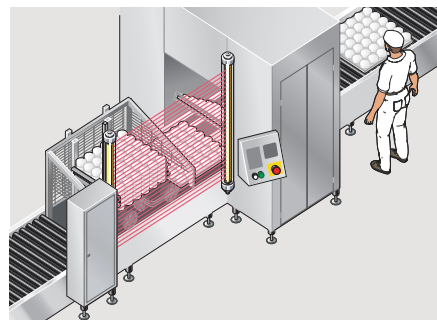
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Hazardous point protection on a processing centre in the hygiene area



Hazardous point protection on a cheese-making machine



- High durability
- Compact design
- External device monitoring (EDM)
- Self-testing
- On-site diagnostics
- Beam coding



Further information	Page
→ Ordering information	E-138
→ Technical specifications	E-138
→ Dimensional drawings	E-139
→ Connection diagrams	E-140
→ Accessories	E-140
→ Dimensional drawings accessories	E-141
→ Services	A-2

## Ordering information

IP67 Housing with integrated sender or receiver unit C2000 Standard, including 15 m PVC cable

→ Accessories see page E-140

### Scanning range 0 ... 4.5 m

Resolution (mm)	Protective field height (mm)	Sender unit		Receiver unit	
		Type	Part number	Type	Part number
30	150	C25S-015103C11	1024184	C25E-015303C11	1024185
	300	C25S-030103C11	1024187	C25E-030303C11	1024188
	450	C25S-045103C11	1024190	C25E-045303C11	1024191
	600	C25S-060103C11	1024193	C25E-060303C11	1024194
	750	C25S-075103C11	1024196	C25E-075303C11	1024197
	900	C25S-090103C11	1024199	C25E-090303C11	1024200
	1050	C25S-105103C11	1024202	C25E-105303C11	1024203
	1200	C25S-120103C11	1024205	C25E-120303C11	1024206

### Scanning range 2.5 ... 14.5 m

Resolution (mm)	Protective field height (mm)	Sender unit		Receiver unit	
		Type	Part number	Type	Part number
30	150	C25S-015203C11	1024186	C25E-015303C11	1024185
	300	C25S-030203C11	1024189	C25E-030303C11	1024188
	450	C25S-045203C11	1024192	C25E-045303C11	1024191
	600	C25S-060203C11	1024195	C25E-060303C11	1024194
	750	C25S-075203C11	1024198	C25E-075303C11	1024197
	900	C25S-090203C11	1024201	C25E-090303C11	1024200
	1050	C25S-105203C11	1024204	C25E-105303C11	1024203
	1200	C25S-120203C11	1024207	C25E-120303C11	1024206

## Detailed technical specifications

→ You can find further data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### C2000 Standard in IP67 Housing

→ C2000 specific data see C2000 Standard page E-127

Protective field width (depending on type)	0 m ... 4.5 m / 2.5 m ... 14.5 m								
Protective field height (depending on type)	150 mm ... 1200 mm								
Resolution	30 mm								
Enclosure rating	IP 66, IP 67								
Type	Type 2 according to EN 61496								
Materials	<table border="0"> <tr> <td>End caps</td> <td>Stainless steel (V4A)</td> </tr> <tr> <td>Plastic tube</td> <td>PMMA</td> </tr> <tr> <td>Compensating element (membrane)</td> <td>PA 6</td> </tr> <tr> <td>PG connector</td> <td>PA 6</td> </tr> </table>	End caps	Stainless steel (V4A)	Plastic tube	PMMA	Compensating element (membrane)	PA 6	PG connector	PA 6
End caps	Stainless steel (V4A)								
Plastic tube	PMMA								
Compensating element (membrane)	PA 6								
PG connector	PA 6								
Ambient operating temperature $T_A$	0 °C ... +55 °C								
Storage temperature $T_S$	-25 °C ... +70 °C								



## Dimensional drawings

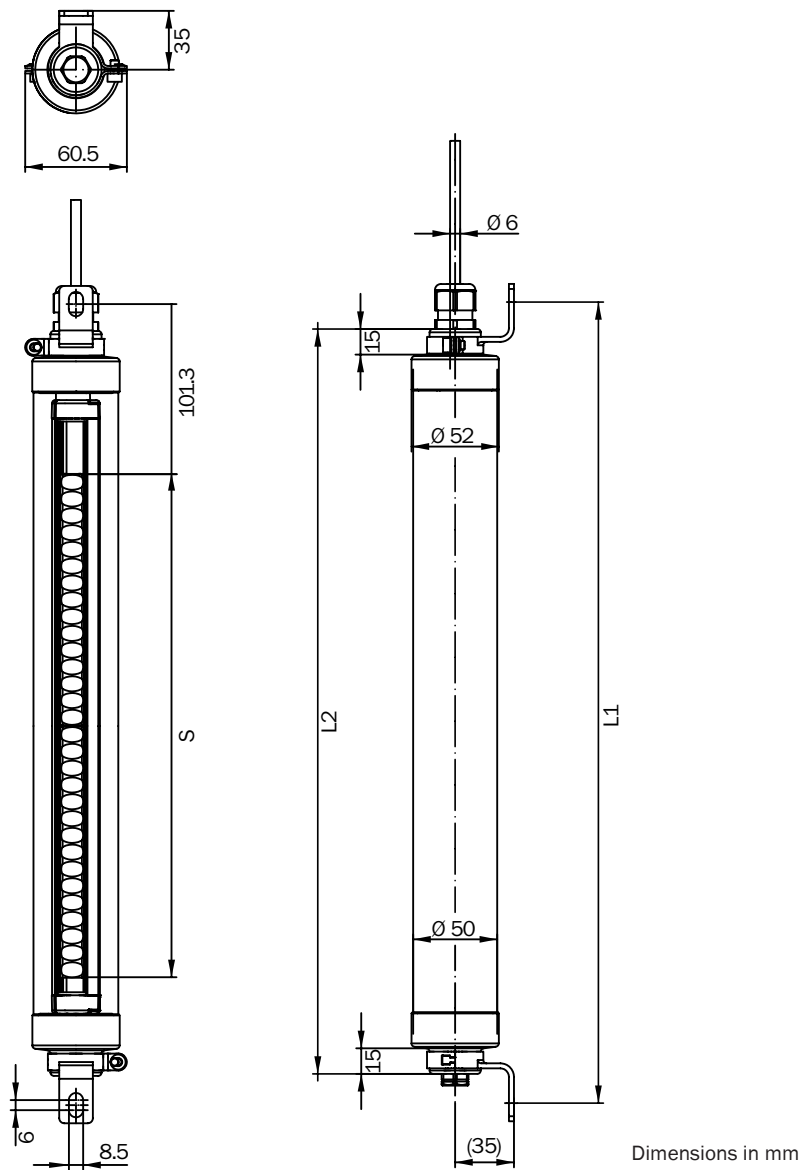


Illustration with stainless steel bracket (not supplied with delivery)




Protective field height S	L 1	L 2
150	357	324
300	476	443
450	626	593
600	777	744
750	927	894
900	1078	1045
1050	1228	1195
1200	1382	1349

Dimensions in mm

## Connection diagrams

- Connection diagram C2000 Standard on UE10-30S safety relay see page E-130
- You can find more connection diagrams at [www.sick.com](http://www.sick.com)

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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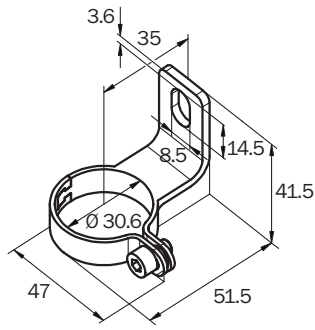
## Accessories

- Dimensional drawings mounting systems see page E-141

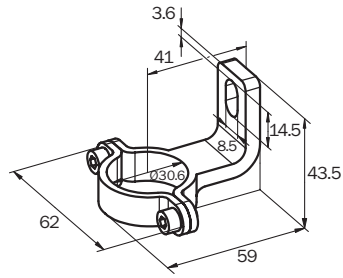
### Mounting accessories

Designation	Description	Part number
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16ms</li> </ul>	2026850
Stainless steel support bracket	<ul style="list-style-type: none"> <li>▪ 2 pieces</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> </ul>	2026849
Mounting key	<ul style="list-style-type: none"> <li>▪ For M12 cable socket on device replacement</li> </ul>	4034690
Venting membrane	—	5309082

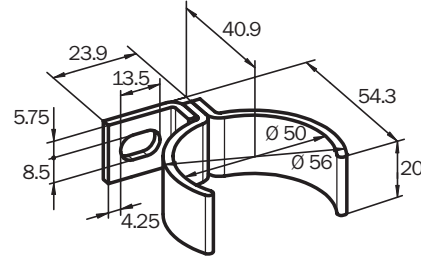
Dimensional drawings mounting accessories



Stainless steel bracket



Reinforced stainless steel bracket



Stainless steel support bracket

Dimensions in mm



Mounting key





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- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Technical specifications	E-145
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→ Connection diagrams	E-148
→ Accessories	E-149
→ Dimensional drawings accessories	E-152
→ Services	A-2

## Overview of technical specifications

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

## Product description

With its high signal reserve, the C2000 RES/EDM safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considerations by precisely co-

ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector. Compared to traditional solutions the integrated restart interlock in the C2000 RES/EDM offers the advantages of shorter cable runs and quicker commissioning.

## In-system added value

- Combination with safe control solutions from SICK

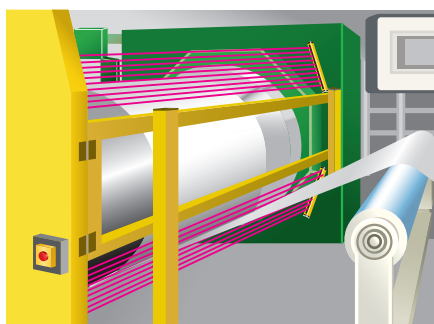
Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S		Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

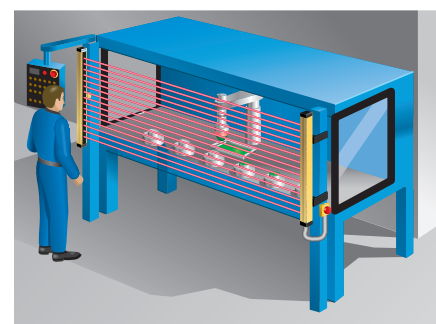
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



C2000 RES/EDM on a warping machine



C2000 RES/EDM on a pad printing machine

## Ordering information

### C2000 RES/EDM

- With restart interlock (RES) and external device monitoring (EDM)
- For usage as a stand-alone system
- Consisting of sender and receiver unit

→ Accessories see page E-149

### Scanning range 0 ... 6 m

Resolution (mm)	Housing cross-section (mm)	Protective field height (mm)	Sender unit		Receiver unit			
			Type	Part number	Type	Part number		
20	34 x 29	300	C20S-030102A11	1016448	C20E-030302A21	1018073		
		450	C20S-045102A11	1016573	C20E-045302A21	1018079		
		600	C20S-060102A11	1016574	C20E-060302A21	1018056		
		750	C20S-075102A11	1016579	C20E-075302A21	1018096		
		900	C20S-090102A11	1016584	C20E-090302A21	1018105		
		1050	C20S-105102A11	1016589	C20E-105302A21	1018114		
		1200	C20S-120102A11	1016464	C20E-120302A21	1016970		
30	34 x 29	300	C20S-030103A11	1016568	C20E-030303A21	1016974		
		450	C20S-045103A11	1016454	C20E-045303A21	1018081		
		600	C20S-060103A11	1016477	C20E-060303A21	1018089		
		750	C20S-075103A11	1016479	C20E-075303A21	1018098		
		900	C20S-090103A11	1016481	C20E-090303A21	1018107		
		1050	C20S-105103A11	1016483	C20E-105303A21	1018116		
		1200	C20S-120103A11	1016594	C20E-120303A21	1018124		
	48 x 40	1350	C20S-135103A12	1016600	C20E-135303A22	1018058		
		1500	C20S-150103A12	1016605	C20E-150303A22	1018134		
		1650	C20S-165103A12	1016610	C20E-165303A22	1018140		
		1800	C20S-180103A12	1016615	C20E-180303A22	1018147		
		40	34 x 29	300	C20S-030104A11	1016570	C20E-030304A21	1016973
				450	C20S-045104A11	1016456	C20E-045304A21	1018083
				600	C20S-060104A11	1016576	C20E-060304A21	1018091
750	C20S-075104A11			1016581	C20E-075304A21	1018100		
900	C20S-090104A11			1016586	C20E-090304A21	1018109		
1050	C20S-105104A11			1016591	C20E-105304A21	1018118		
1200	C20S-120104A11			1016596	C20E-120304A21	1018126		
48 x 40	1350	C20S-135104A12	1016603	C20E-135304A22	1018130			
	1500	C20S-150104A12	1016608	C20E-150304A22	1018136			
	1650	C20S-165104A12	1016613	C20E-165304A22	1018142			
	1800	C20S-180104A12	1016618	C20E-180304A22	1018149			

Continued on next page

## Scanning range 2.5 ... 19 m

Resolution (mm)	Housing cross-section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	300	C20S-030202A11	1016632	C20E-030302A21	1018073
		450	C20S-045202A11	1016458	C20E-045302A21	1018079
		600	C20S-060202A11	1016633	C20E-060302A21	1018056
		750	C20S-075202A11	1016634	C20E-075302A21	1018096
		900	C20S-090202A11	1016635	C20E-090302A21	1018105
		1050	C20S-105202A11	1016636	C20E-105302A21	1018114
		1200	C20S-120202A11	1016466	C20E-120302A21	1016970
30	34 x 29	300	C20S-030203A11	1016572	C20E-030303A21	1016974
		450	C20S-045203A11	1016460	C20E-045303A21	1018081
		600	C20S-060203A11	1016578	C20E-060303A21	1018089
		750	C20S-075203A11	1016583	C20E-075303A21	1018098
		900	C20S-090203A11	1016588	C20E-090303A21	1018107
		1050	C20S-105203A11	1016593	C20E-105303A21	1018116
		1200	C20S-120203A11	1016599	C20E-120303A21	1018124
	48 x 40	1350	C20S-135203A12	1016602	C20E-135303A22	1018058
		1500	C20S-150203A12	1016607	C20E-150303A22	1018134
		1650	C20S-165203A12	1016612	C20E-165303A22	1018140
		1800	C20S-180203A12	1016617	C20E-180303A22	1018147
		300	C20S-030204A11	1016638	C20E-030304A21	1016973
		450	C20S-045204A11	1016462	C20E-045304A21	1018083
		600	C20S-060204A11	1016639	C20E-060304A21	1018091
40	34 x 29	750	C20S-075204A11	1016640	C20E-075304A21	1018100
		900	C20S-090204A11	1016641	C20E-090304A21	1018109
		1050	C20S-105204A11	1016642	C20E-105304A21	1018118
		1200	C20S-120204A11	1016643	C20E-120304A21	1018126
		1350	C20S-135204A12	1016644	C20E-135304A22	1018130
		1500	C20S-150204A12	1016646	C20E-150304A22	1018136
	48 x 40	1650	C20S-165204A12	1016647	C20E-165304A22	1018142
		1800	C20S-180204A12	1016648	C20E-180304A22	1018149

E

## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC

### Sender unit

Power consumption	Max. 6.2 W
-------------------	------------

### Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms ... 34 ms
Switching voltage	$V_S - 2.25\text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 8 W

### Operating data

Connection type	M12 plug, 8-pin
Connection cable wire cross-section	Max. 0.25 mm <sup>2</sup>
Connection cable length	Max. 15 m
Ambient operating temperature $T_A$	0 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section (depending on type) for protective field heights of 300 mm to 1200 mm for protective field heights of 1350 mm to 1800 mm	34 mm x 29 mm 48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 m according to IEC 60068-2-29
Weight (depending on type)	0.27 kg ... 3.88 kg

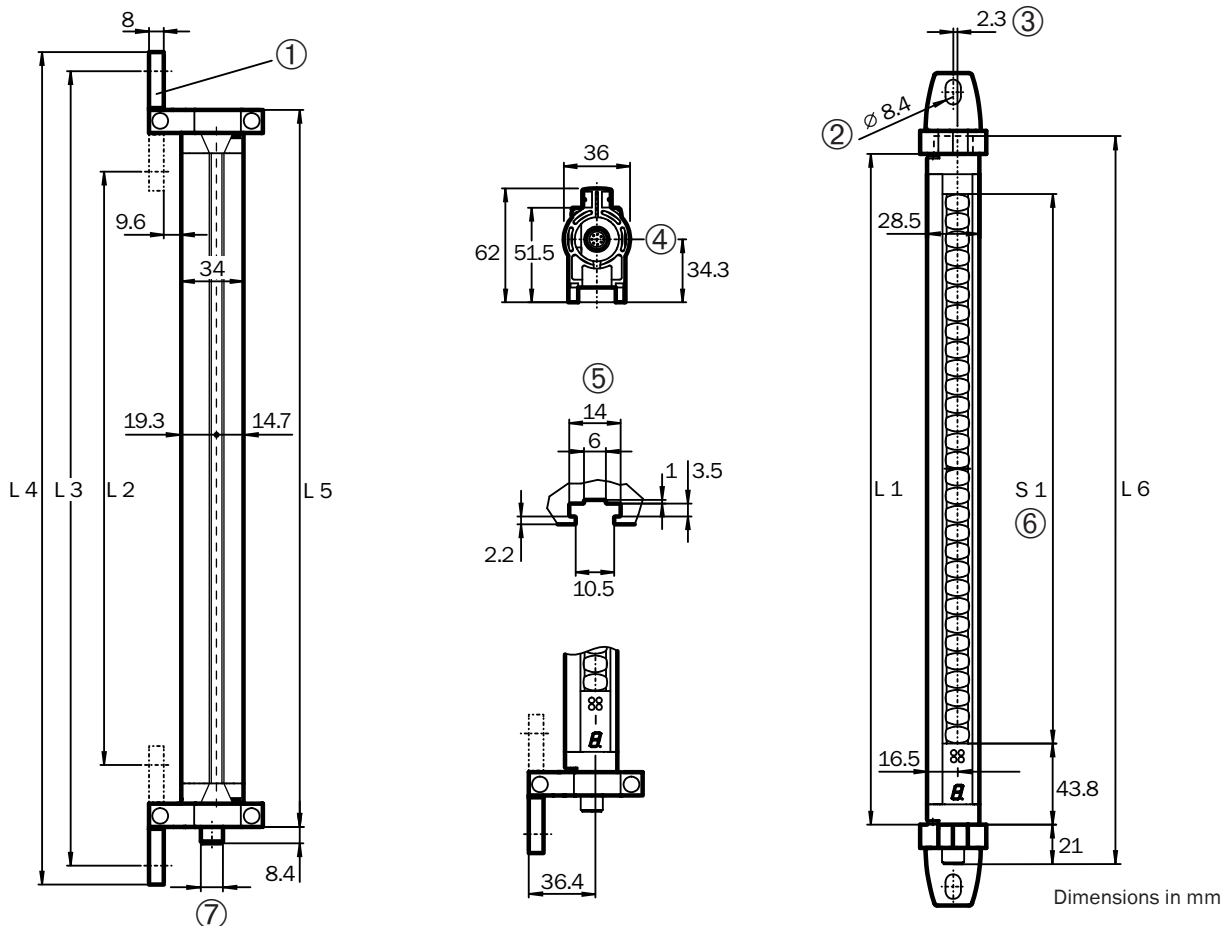
E

# Dimensional drawings

→ You can find more dimensional drawings in the technical description/operating instructions. Download at [www.sick.com](http://www.sick.com)

## Protective field heights 300 mm ... 1200 mm

E



Sender unit with swivel mount, small housing profile (receiver unit not mirror image. Dimensions as C2000 Cascadable, see page E-159)

- ① Mounting clamp
- ② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ③ Centre of light beam offset
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Protective field height
- ⑦ Plug M12 x 1

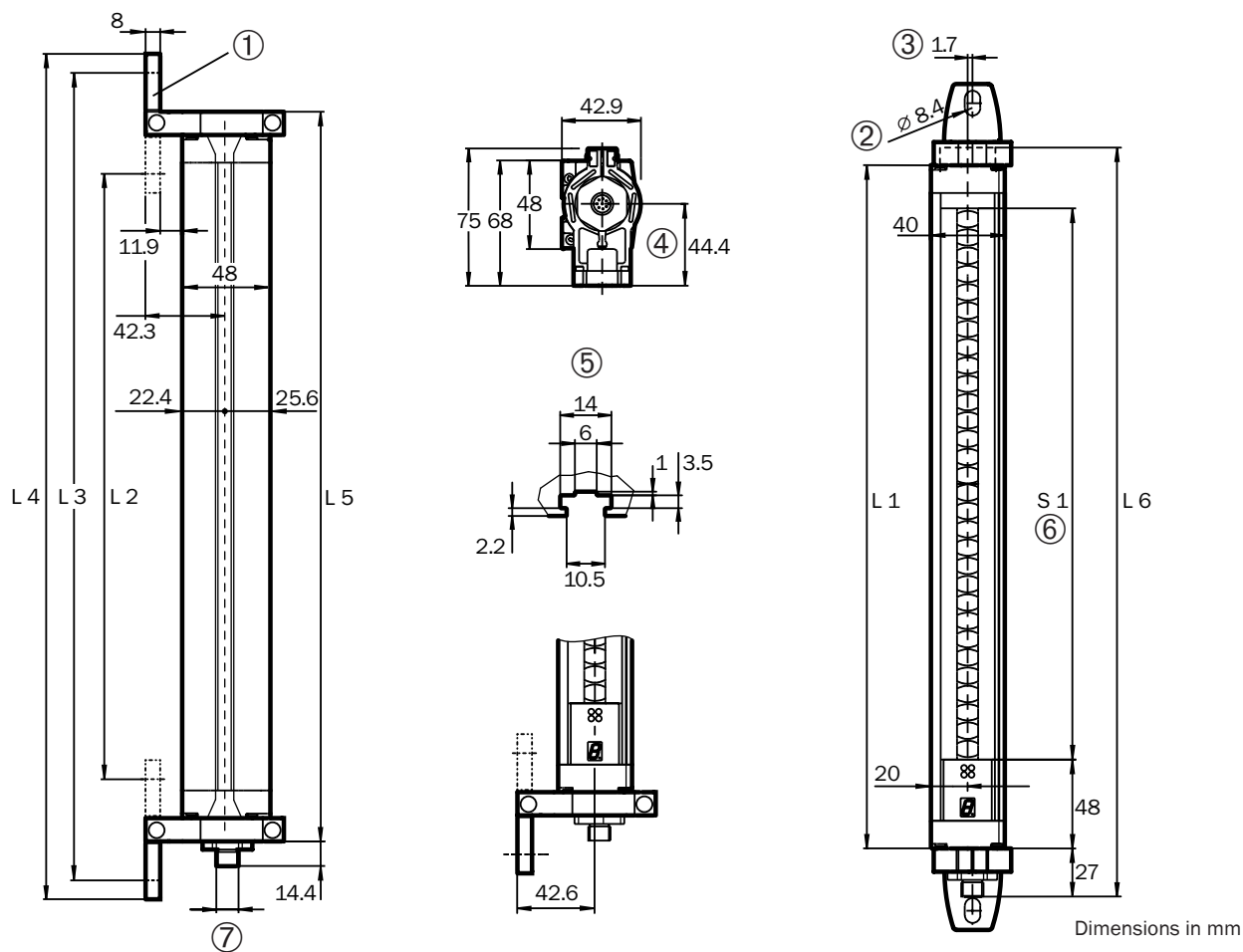
S 1	L 1	L 2	L 3	L 4	L 5	L 6
300	364	322	432	452	390	394
450	515	473	582	603	540	545
600	666	623	733	754	691	696
750	816	774	884	904	841	846
900	967	924	1034	1055	992	997
1050	1117	1075	1185	1205	1142	1147
1200	1266	1224	1334	1354	1292	1298

S1 = protective field height

Dimensions in mm



Protective field heights 1350 mm ... 1800 mm



Sender unit with swivel mount, large housing profile (receiver unit not mirror image, see C2000 Cascadable, page E-160)

- ① Mounting clamp
- ② Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ③ Centre of light beam offset
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Protective field height
- ⑦ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5	L 6
1350	1426	1384	1494	1514	1452	1463
1500	1577	1535	1644	1665	1602	1614
1650	1727	1685	1795	1815	1752	1764
1800	1878	1836	1945	1966	1903	1915

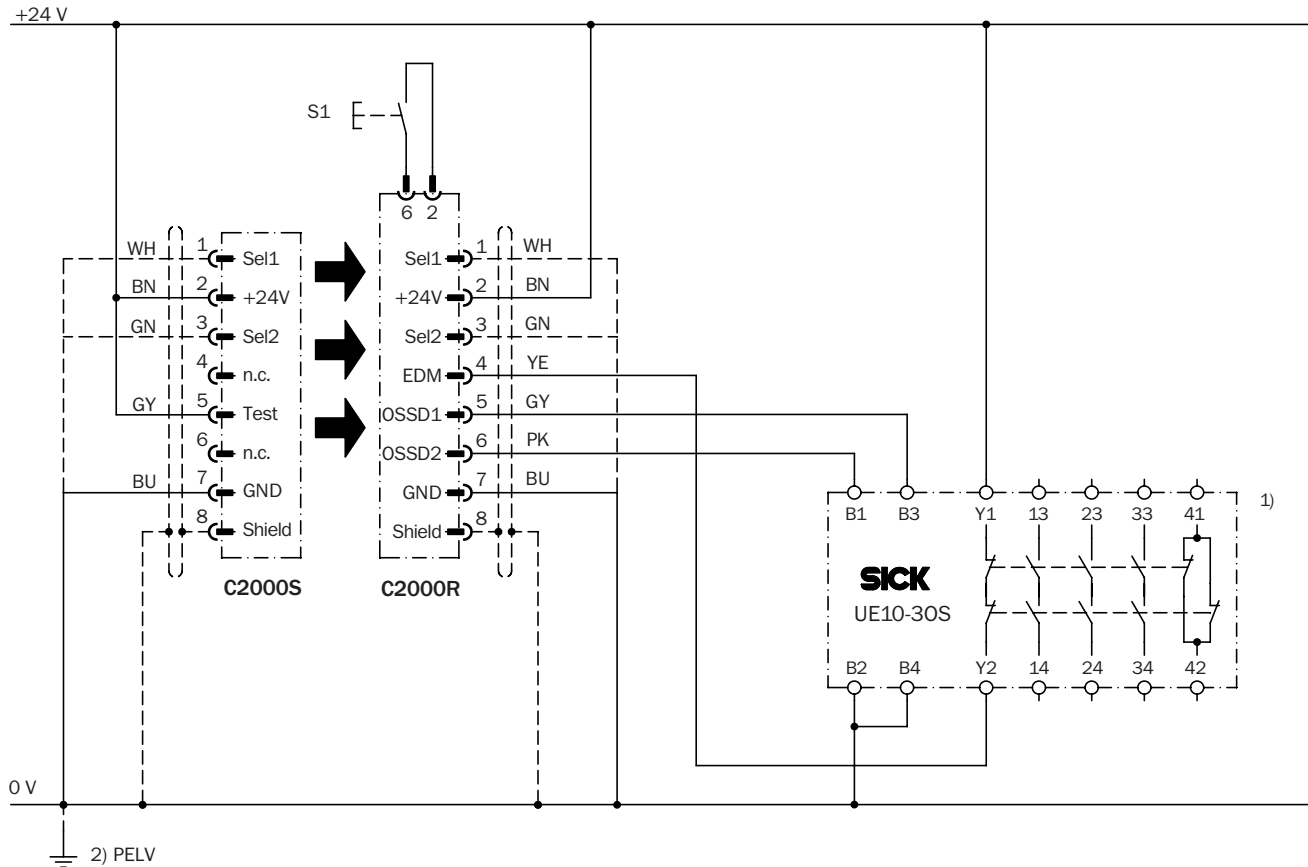
S1 = protective field height

Dimensions in mm

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### C2000 RES/EDM on UE10-30S safety relay



#### Task

Interfacing a C2000 RES/EDM safety light curtain to UE10-30S. Operating mode with restart interlock and external device monitoring.

#### Function

The yellow LED on the receiver flashes when the light path is clear and the UE10-30S is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-30S is switched on. On the interruption of one of the light beams, the UE10-30S is deactivated by the OSSD1 and OSSD2 outputs.

#### Possible faults




Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-30S will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

#### Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFSafe.	Page P-0

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## Accessories

### Mounting accessories

→ Dimensional drawings mounting accessories see page E-152

Designation	Description	Part number
Mounting kit 1	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> <li>▪ For protective field height 300 mm ... 1200 mm</li> </ul>	2019649
Mounting kit 2	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2019659
Mounting kit 6	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Side bracket</li> </ul>	2019506
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ For protective field height 300 mm ... 1200 mm</li> </ul>	2030288
	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2026850

Continued on next page

## Connector technology

System connection	Designation	Description	Connection cable	Part number
M12 plug	M12 cable socket	<ul style="list-style-type: none"> <li>8-pin</li> <li>Straight</li> </ul>	2.5 m	6020537
			5.0 m	6020354
			7.5 m	6020353
			10.0 m	6020352
			15.0 m	6020872
		<ul style="list-style-type: none"> <li>8-pin</li> <li>Angled</li> </ul>	5.0 m	6021342
			15.0 m	6021343
Extension connection	M12 cable plug	<ul style="list-style-type: none"> <li>Straight</li> <li>For the connection of a control switch</li> </ul>	5.0 m	6021204
			15.0 m	6021205
		<ul style="list-style-type: none"> <li>Angled</li> <li>For the connection of a control switch</li> </ul>	5.0 m	6021830
			15.0 m	6021831
	Plug	<ul style="list-style-type: none"> <li>Pre-assembled</li> <li>For deactivation of the integrated restart interlock</li> <li>M12</li> </ul>	—	6021238

## Power supply units

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

Device columns <sup>1)</sup>

→ Dimensional drawings device columns see page F-86

Designation	Description	Part number
Device column with front screen	<ul style="list-style-type: none"> <li>For C2000 Standard (protective field height 150 mm ... 1050 mm)</li> <li>For C2000 Cascadable and RES/EDM (protective field height 150 mm ... 900 mm)</li> <li>1200 mm high</li> <li>Including mounting kit 1 (2 pieces)</li> </ul>	2021333
	<ul style="list-style-type: none"> <li>For C2000 (protective field height 150 mm ... 1200 mm)</li> <li>1500 mm high</li> <li>Including mounting kit 1 (2 pieces)</li> </ul>	2021242
	<ul style="list-style-type: none"> <li>For C2000 (protective field height 150 mm ... 1200 mm)</li> <li>1700 mm high</li> <li>Including mounting kit 1 (2 pieces)</li> </ul>	2021337
	<ul style="list-style-type: none"> <li>For C2000 (protective field height 1350 mm ... 1500 mm)</li> <li>1700 mm high</li> <li>Including mounting kit 2 (2 pieces)</li> </ul>	2021332

<sup>1)</sup> Warning, reduction of the scanning range!

**Additional front screens <sup>1)</sup>**

Designation	For protective field height (mm)	Part number
Additional front screen (weld spark guard)	300	2022405
	450	2022406
	600	2022407
	750	2022408
	900	2022409
	1050	2022410
	1200	2022411

<sup>1)</sup> Warning, reduction of the scanning range!

**Additional front screens Heavy Duty <sup>1)</sup>**

Designation	For protective field height (mm)	Part number
Additional front screen Heavy Duty (weld spark guard) with bracket	1350	2026860
	1500	2026861
	1650	2026862
	1800	2026863

<sup>1)</sup> Warning, reduction of the scanning range!

**Deflector mirrors <sup>1)</sup> (incl. mounting kit 2)**

→ Dimensional drawings deflector mirrors see page E-153

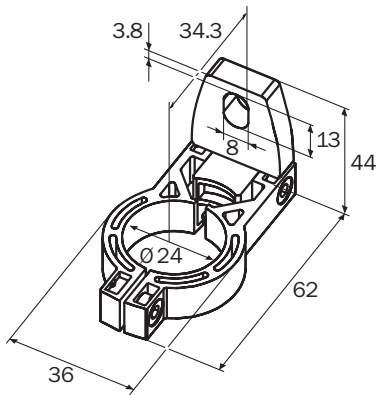
Designation	For protective field height (mm)	Type	Part number
For overall protective field width 0 m ... 4 m	300	PNS75-034	1019414
	450	PNS75-049	1019415
	600	PNS75-064	1019416
	750	PNS75-079	1019417
	900	PNS75-094	1019418
	1050	PNS75-109	1019419
	1200	PNS75-124	1019420
	1350	PNS75-139	1019421
	1500	PNS75-154	1019422
	1650	PNS75-169	1019423
	1800	PNS75-184	1019424
For overall protective field width 4 m ... 15 m	300	PNS125-034	1019425
	450	PNS125-049	1019426
	600	PNS125-064	1019427
	750	PNS125-079	1019428
	900	PNS125-094	1019429
	1050	PNS125-109	1019430
	1200	PNS125-124	1019431
	1350	PNS125-139	1019432
	1500	PNS125-154	1019433
	1650	PNS125-169	1019434
	1800	PNS125-184	1019435

<sup>1)</sup> Warning, reduction of the scanning range!

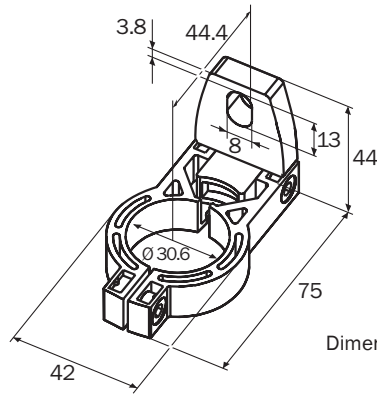
**Laser alignment aid**

Designation	Description	Type	Part number
Laser alignment aid	▪ Does not require connection to power supply	AR60	1015741
Adapter for AR60	▪ For large housing profile	—	4032461
	▪ For small housing profile	—	4032462

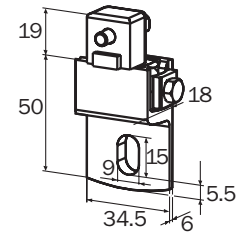
Dimensional drawings mounting accessories



Swivel mount  
Mounting kit 1  
for protective field height 150 mm ... 1200 mm

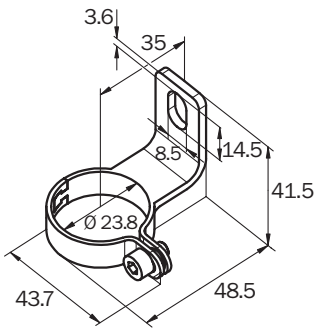


Swivel mount  
Mounting kit 2  
for protective field height 1350 mm ... 1800 mm

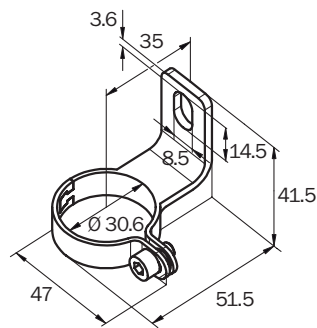


Side bracket  
Mounting kit 6

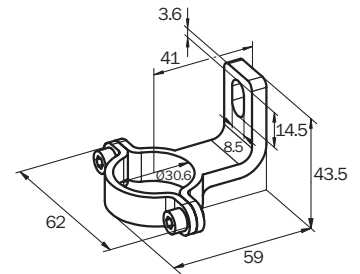
Dimensions in mm



Stainless steel bracket  
for protective field height 150 mm ... 1200 mm



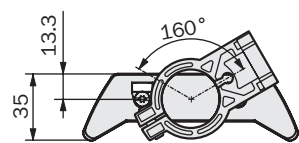
Stainless steel bracket  
for protective field height 1350 mm ... 1800 mm



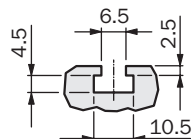
Reinforced stainless steel bracket for  
protective field height 1350 mm ... 1800 mm

E

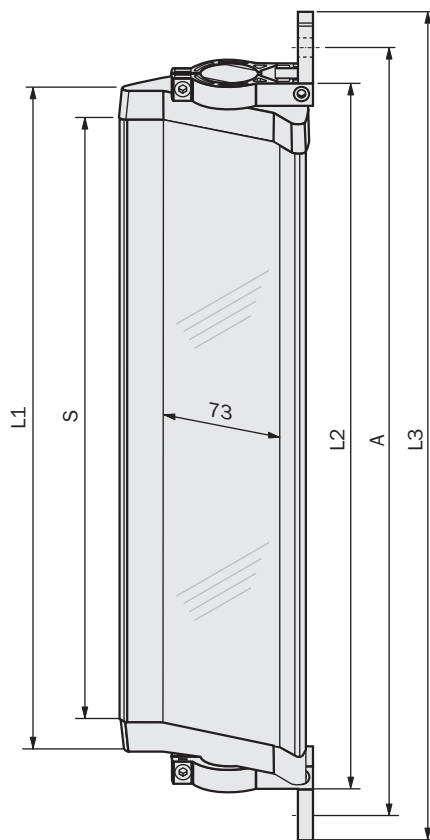
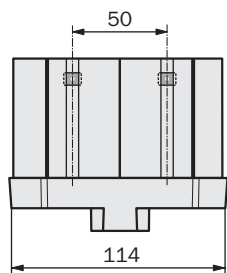
## Dimensional drawings deflector mirror PNS75



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



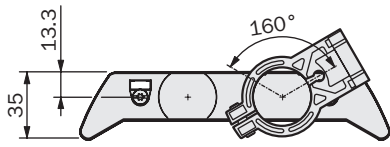
Dimensions in mm

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

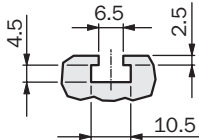
Dimensions in mm

E

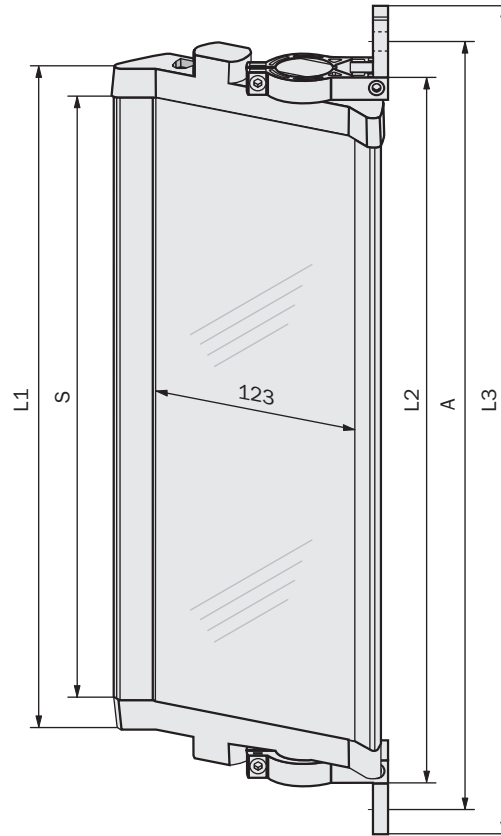
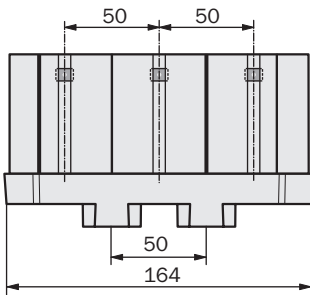
# Dimensional drawings deflector mirror PNS125



Mounting with swivel mount bracket (Part No. 2019659)



Sliding nut groove for side mounting



Dimensions in mm

E

Mirror height S	L1	L2	L3	A
340	372	396	460	440
490	522	546	610	590
640	672	696	760	740
790	822	846	910	890
940	972	996	1060	1040
1090	1122	1146	1210	1190
1240	1272	1296	1360	1340
1390	1422	1446	1510	1490
1540	1572	1596	1660	1640
1690	1722	1746	1810	1790
1840	1872	1896	1960	1940

Dimensions in mm



## Overview of technical specifications

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Number of beams in complete system	Max. 180 beams
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

## Product description

With its high signal reserve, the C2000 Cascadable safety light curtain is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considerations by

precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

With the cascadable variants, safety light curtains can be flexibly adapted to the existing installation situation.

## In-system added value

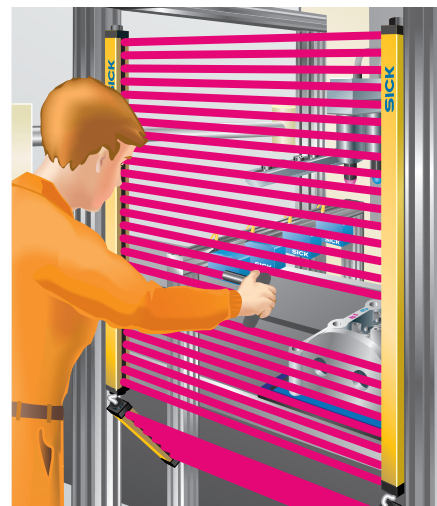
- Combination with safe control solutions from SICK

Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20	✓	✓	—	N-57
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S		Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)



C2000 Cascadable on a pad printing machine

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



- Cascade
  - Max. 3 devices
  - Max. 3 m cable length
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Ordering information	E-156
→ Technical specifications	E-158
→ Dimensional drawings	E-159
→ Connection diagrams	E-161
→ Accessories	E-162
→ Dimensional drawings accessories	E-164
→ Services	A-2

## Ordering information

C2000 Cascadable

- With external device monitoring (EDM)
- For usage as cascaded device
- Consisting of sender and receiver unit

→ Accessories page E-162

### Scanning range 0 ... 6 m

Resolution (mm)	Housing cross-section (mm)	Protective field height (mm)	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
20	34 x 29	300	C20S-030102A21	1018072	C20E-030302A21	1018073
		450	C20S-045102A21	1018078	C20E-045302A21	1018079
		600	C20S-060102A21	1018055	C20E-060302A21	1018056
		750	C20S-075102A21	1018095	C20E-075302A21	1018096
		900	C20S-090102A21	1018104	C20E-090302A21	1018105
		1050	C20S-105102A21	1018113	C20E-105302A21	1018114
		1200	C20S-120102A21	1018122	C20E-120302A21	1016970
30	34 x 29	300	C20S-030103A21	1018074	C20E-030303A21	1016974
		450	C20S-045103A21	1018080	C20E-045303A21	1018081
		600	C20S-060103A21	1018087	C20E-060303A21	1018089
		750	C20S-075103A21	1018097	C20E-075303A21	1018098
		900	C20S-090103A21	1018106	C20E-090303A21	1018107
		1050	C20S-105103A21	1018115	C20E-105303A21	1018116
		1200	C20S-120103A21	1018123	C20E-120303A21	1018124
	48 x 40	1350	C20S-135103A22	1018057	C20E-135303A22	1018058
		1500	C20S-150103A22	1018133	C20E-150303A22	1018134
		1650	C20S-165103A22	1018139	C20E-165303A22	1018140
		1800	C20S-180103A22	1018145	C20E-180303A22	1018147
40	34 x 29	300	C20S-030104A21	1016967	C20E-030304A21	1016973
		450	C20S-045104A21	1018082	C20E-045304A21	1018083
		600	C20S-060104A21	1018090	C20E-060304A21	1018091
		750	C20S-075104A21	1018099	C20E-075304A21	1018100
		900	C20S-090104A21	1018108	C20E-090304A21	1018109
		1050	C20S-105104A21	1018117	C20E-105304A21	1018118
		1200	C20S-120104A21	1018125	C20E-120304A21	1018126
	48 x 40	1350	C20S-135104A22	1018129	C20E-135304A22	1018130
		1500	C20S-150104A22	1018135	C20E-150304A22	1018136
		1650	C20S-165104A22	1018141	C20E-165304A22	1018142
		1800	C20S-180104A22	1018148	C20E-180304A22	1018149

E

## Scanning range 2.5 ... 19 m

Resolution (mm)	Housing cross-section (mm)	Protective field height (mm)	Sender unit		Receiver unit			
			Type	Part number	Type	Part number		
20	34 x 29	300	C20S-030202A21	1018075	C20E-030302A21	1018073		
		450	C20S-045202A21	1018084	C20E-045302A21	1018079		
		600	C20S-060202A21	1018092	C20E-060302A21	1018056		
		750	C20S-075202A21	1018101	C20E-075302A21	1018096		
		900	C20S-090202A21	1018110	C20E-090302A21	1018105		
		1050	C20S-105202A21	1018119	C20E-105302A21	1018114		
		1200	C20S-120202A21	1016964	C20E-120302A21	1016970		
30	34 x 29	300	C20S-030203A21	1016968	C20E-030303A21	1016974		
		450	C20S-045203A21	1018085	C20E-045303A21	1018081		
		600	C20S-060203A21	1018093	C20E-060303A21	1018089		
		750	C20S-075203A21	1018102	C20E-075303A21	1018098		
		900	C20S-090203A21	1018111	C20E-090303A21	1018107		
		1050	C20S-105203A21	1018120	C20E-105303A21	1018116		
		1200	C20S-120203A21	1018127	C20E-120303A21	1018124		
	48 x 40	1350	C20S-135203A22	1018131	C20E-135303A22	1018058		
		1500	C20S-150203A22	1018137	C20E-150303A22	1018134		
		1650	C20S-165203A22	1018143	C20E-165303A22	1018140		
		1800	C20S-180203A22	1018150	C20E-180303A22	1018147		
		40	34 x 29	300	C20S-030204A21	1018077	C20E-030304A21	1016973
				450	C20S-045204A21	1018086	C20E-045304A21	1018083
				600	C20S-060204A21	1018094	C20E-060304A21	1018091
750	C20S-075204A21			1018103	C20E-075304A21	1018100		
900	C20S-090204A21			1018112	C20E-090304A21	1018109		
1050	C20S-105204A21			1018121	C20E-105304A21	1018118		
1200	C20S-120204A21			1018128	C20E-120304A21	1018126		
48 x 40	1350	C20S-135204A22	1018132	C20E-135304A22	1018130			
	1500	C20S-150204A22	1018138	C20E-150304A22	1018136			
	1650	C20S-165204A22	1018144	C20E-165304A22	1018142			
	1800	C20S-180204A22	1018151	C20E-180304A22	1018149			

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## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Protective field width (depending on type)	0 m ... 6 m / 2.5 m ... 19 m
Protective field height (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	20 mm / 30 mm / 40 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC

### Sender unit

Power consumption	Max. 6.2 W
-------------------	------------

### Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms ... 34 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 8 W

### Operating data

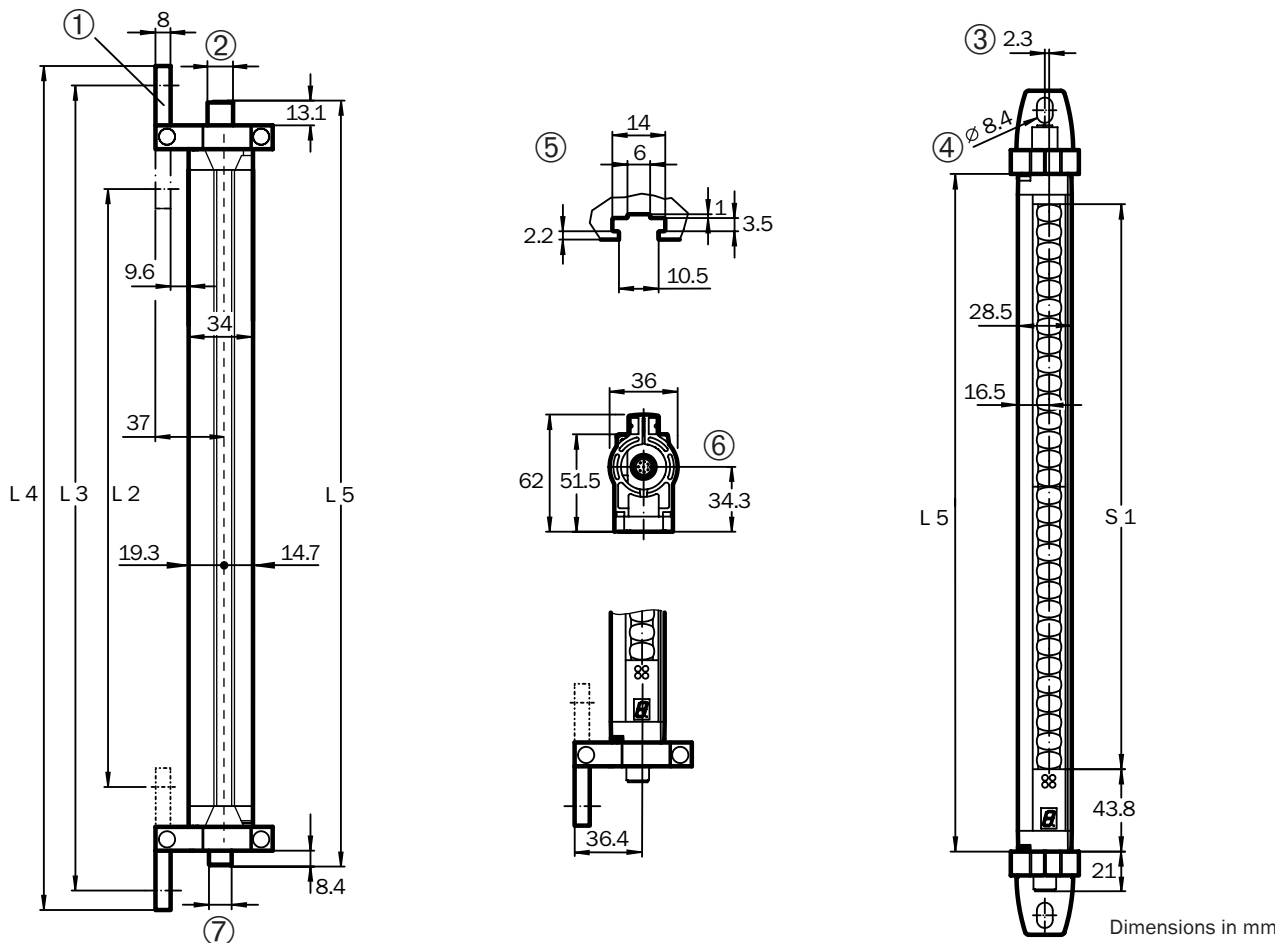
Connection type	M12 plug, 8-pin
Connection cable wire cross-section	Max. 0.25 mm <sup>2</sup>
Connection cable length	Max. 15 m
Ambient operating temperature $T_A$	0 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section (depending on type) for protective field heights of 300 mm to 1200 mm for protective field heights of 1350 mm to 1800 mm	34 mm x 29 mm 48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	0.27 kg ... 3.88 kg

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## Dimensional drawings

→ You can find more dimensional drawings in the technical description/operating instructions. Download at [www.sick.com](http://www.sick.com)

### Protective field heights 300 mm ... 1200 mm



Sender unit with swivel mount, small housing profile (receiver unit mirror image)

- ① Mounting clamp
- ② Plug M12 x 1
- ③ Centre of light beam offset
- ④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ⑤ Sliding nut groove for side mounting
- ⑥ Adjustment
- ⑦ Plug M12 x 1

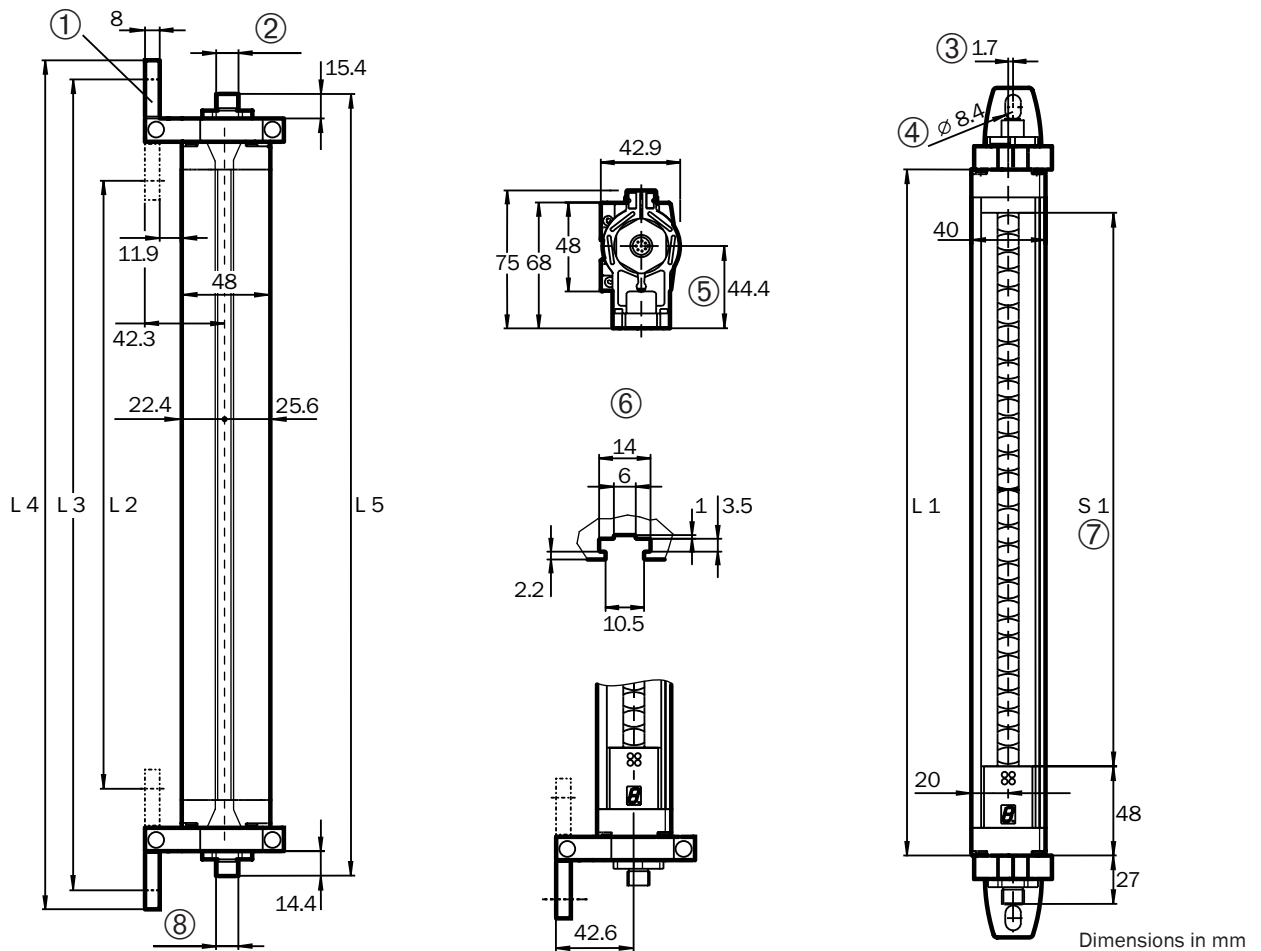
S 1	L 1	L 2	L 3	L 4	L 5
300	364	322	432	452	411
450	515	473	582	603	562
600	666	623	733	754	712
750	816	774	884	904	863
900	967	924	1034	1055	1013
1050	1117	1075	1185	1205	1164
1200	1266	1224	1334	1354	1313

S1 = protective field height

Dimensions in mm

Protective field heights 1350 mm ... 1800 mm

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Sender unit with swivel mount, large housing profile (receiver unit mirror image)

- ① Mounting clamp
- ② M12 x 1 socket
- ③ Centre of light beam offset
- ④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ⑤ Adjustment
- ⑥ Sliding nut groove for side mounting
- ⑦ Protective field height
- ⑧ Plug M12 x 1

S 1	L 1	L 2	L 3	L 4	L 5
1350	1426	1384	1494	1514	1481
1500	1577	1535	1644	1665	1632
1650	1727	1685	1795	1815	1782
1800	1878	1836	1945	1966	1933

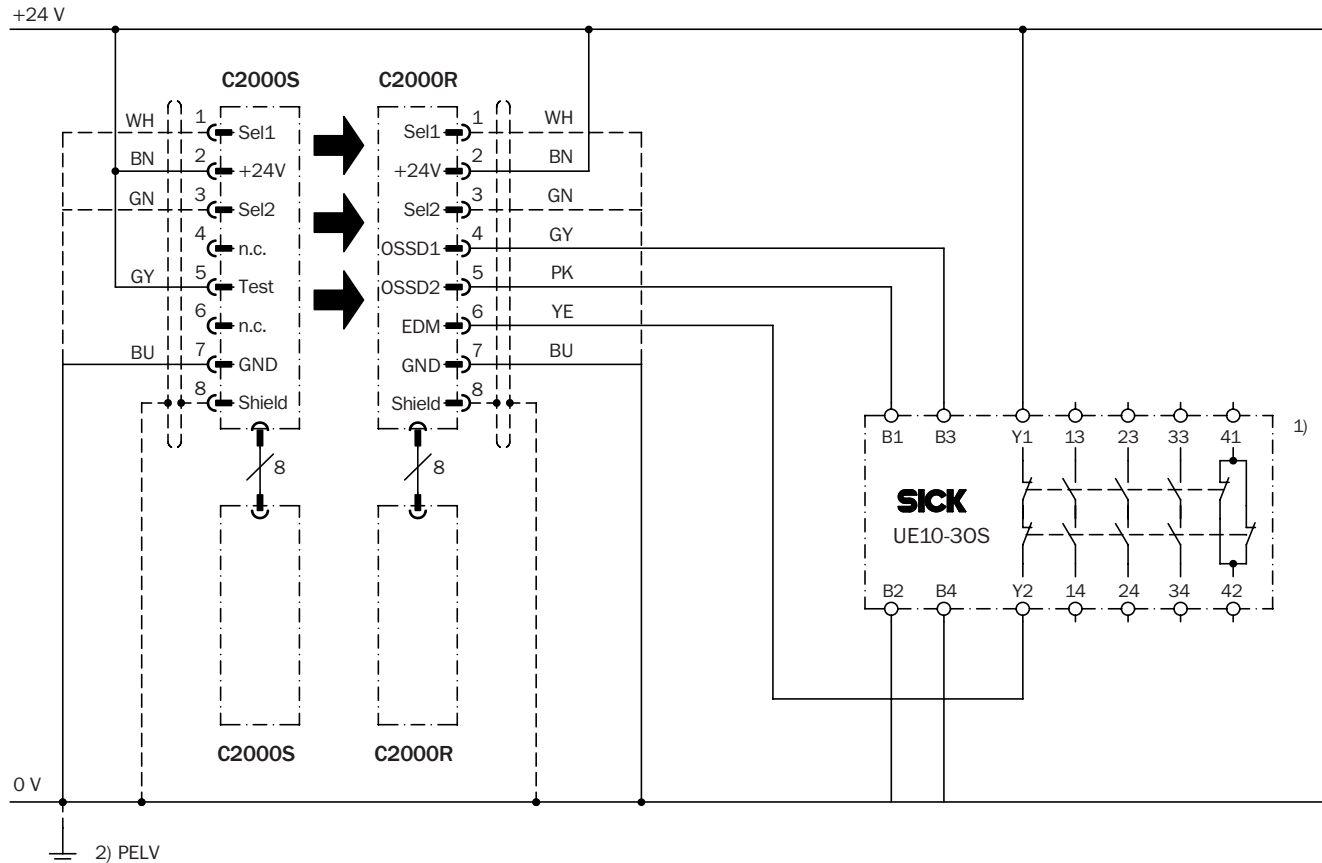
S1 = protective field height

Dimensions in mm

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### C2000 Cascadable on UE10-30S safety relay



#### Task

Interfacing two cascaded C2000 safety light curtains to UE10-30S. Operating mode without restart interlock with external device monitoring. Restart interlock is realised via the machine control.

#### Function

The system is enabled when the light path is clear and the UE10-30S is de-energised and functioning correctly. The OSSD1 and OSSD2 outputs are live, the UE10-30S is switched on. On the interruption of one of the light beams, the UE10-30S is deactivated by the OSSD1 and OSSD2 outputs.

#### Possible faults




Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-30S will be detected and will not result in the loss of the shutdown function.

#### Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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## Accessories

### Mounting accessories

→ Dimensional drawings mounting accessories see page E-164

Designation	Description	Part number
Mounting kit 1	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> <li>▪ For protective field height 300 mm ... 1200 mm</li> </ul>	2019649
Mounting kit 2	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2019659
Mounting kit 6	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Side bracket</li> </ul>	2019506
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ For protective field height 300 mm ... 1200 mm</li> </ul>	2030288
	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> <li>▪ For protective field height 1350 mm ... 1800 mm</li> </ul>	2026850



**Connector technology**

System connection	Designation	Description	Connection cable	Part number
M12 plug	M12 cable socket	<ul style="list-style-type: none"> <li>▪ 8-pin</li> <li>▪ Straight</li> </ul>	2.5 m	6020537
			5.0 m	6020354
			7.5 m	6020353
			10.0 m	6020352
			15.0 m	6020872
		<ul style="list-style-type: none"> <li>▪ 8-pin</li> <li>▪ Angled</li> </ul>	5.0 m	6021342
			15.0 m	6021343
Extension connection	Cable sockets/plugs	<ul style="list-style-type: none"> <li>▪ Pre-assembled</li> <li>▪ M12</li> <li>▪ 8-pin</li> <li>▪ Straight</li> </ul>	0.25 m	6021000
			0.5 m	6021001
			1 m	6021002
			1.5 m	6021003
			2 m	6021004
			2.5 m	6021005
			3 m	6021006

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Device columns <sup>1)</sup>**

→ Dimensional drawings device columns see page F-86

Designation	Description	Part number
Device column with front screen	<ul style="list-style-type: none"> <li>▪ For C2000 Standard (protective field height 300 mm ... 1050 mm)</li> <li>▪ For C2000 Cascadable and RES/EDM (protective field height 150 mm ... 900 mm)</li> <li>▪ 1200 mm high</li> <li>▪ Including mounting kit 1 (2 pieces)</li> </ul>	2021333
	<ul style="list-style-type: none"> <li>▪ For C2000 (protective field height 150 mm ... 1200 mm)</li> <li>▪ 1500 mm high</li> <li>▪ Including mounting kit 1 (2 pieces)</li> </ul>	2021242
	<ul style="list-style-type: none"> <li>▪ For C2000 (protective field height 150 mm ... 1200 mm)</li> <li>▪ 1700 mm high</li> <li>▪ Including mounting kit 1 (2 pieces)</li> </ul>	2021337
	<ul style="list-style-type: none"> <li>▪ For C2000 (protective field height 1350 mm ... 1500 mm)</li> <li>▪ 1700 mm high</li> <li>▪ Including mounting kit 2 (2 pieces)</li> </ul>	2021332

<sup>1)</sup> Warning, reduction of the scanning range!

**Laser alignment aid**

Designation	Description	Type	Part number
Laser alignment aid	<ul style="list-style-type: none"> <li>▪ Does not require connection to power supply</li> </ul>	AR60	1015741
Adapter for AR60	<ul style="list-style-type: none"> <li>▪ For large housing profile</li> </ul>	—	4032461
	<ul style="list-style-type: none"> <li>▪ For small housing profile</li> </ul>	—	4032462

Continued on next page

**Additional front screens <sup>1)</sup>**

Designation	For protective field height (mm)	Part number
Additional front screen (weld spark guard)	300	2022405
	450	2022406
	600	2022407
	750	2022408
	900	2022409
	1050	2022410
	1200	2022411

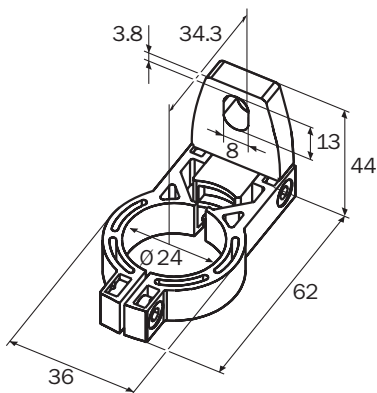
<sup>1)</sup> Warning, reduction of the scanning range!

**Additional front screens Heavy Duty <sup>1)</sup>**

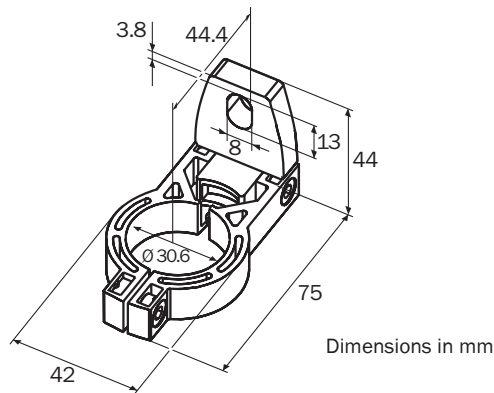
Designation	For protective field height (mm)	Part number
Additional front screen Heavy Duty (weld spark guard) with bracket	1350	2026860
	1500	2026861
	1650	2026862
	1800	2026863

<sup>1)</sup> Warning, reduction of the scanning range!

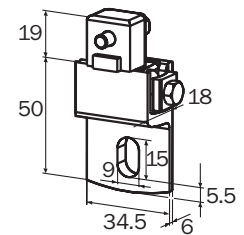
**Dimensional drawings mounting accessories**



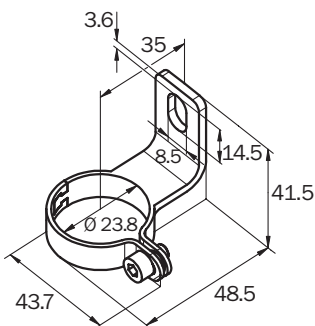
Swivel mount  
Mounting kit 1  
for protective field height 150 mm ... 1200 mm



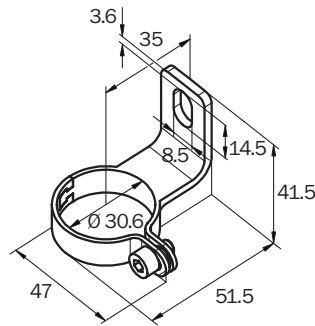
Swivel mount  
Mounting kit 2  
for protective field height 1350 mm ... 1800 mm



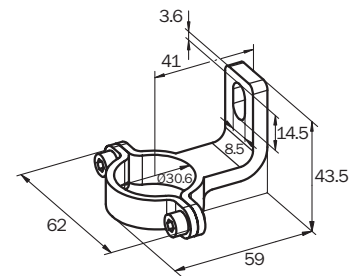
Side bracket  
Mounting kit 6



Stainless steel bracket  
for protective field height 150 mm ... 1200 mm



Stainless steel bracket  
for protective field height 1350 mm ... 1800 mm



Reinforced stainless steel bracket for  
protective field height 1350 mm ... 1800 mm

## Overview of technical specifications

Protective field width	0.1 m ... 6 m	
Protective field height (depending on type)	150 mm ... 900 mm	
Resolution	30 mm	
Type	Type 2 according to EN 50100	
Enclosure rating	Sender/receiver unit	IP 65
	Control unit	IP 54

## Product description

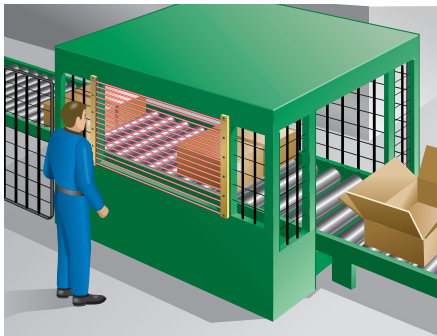
Due to its compact design, the LGT safety light curtain is suitable for applications on small machines, where space is limited. Functions and status information integrated in the control unit allow rapid commis-

sioning and prevent unnecessary machine downtimes. Sector-oriented service concepts round off the product range and can be combined to form a customer-specific package of solutions.

## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Packaging industry: LGT on a packaging machine



E

- Restart interlock (RES)
- External device monitoring (EDM)
- 7-segment display
- Diagnostics
- Blanking
- Small design



Further information	Page
→ Ordering information	E-166
→ Technical specifications	E-167
→ Dimensional drawings	E-168
→ Services	A-2

## Ordering information

### LGT

LGT consisting of:

- Sender unit (LGTS) and receiver unit (LGTE)
- Control unit (LGTN)

#### Sender and receiver units

Protective field height (mm)	Sender unit		Receiver unit	
	Type	Part number	Type	Part number
150	LGTS015-051	1013413	LGTE015-051	1013414
300	LGTS030-111	1013415	LGTE030-111	1013416
450	LGTS045-171	1013417	LGTE045-171	1013418
600	LGTS060-231	1013419	LGTE060-231	1013420
750	LGTS075-291	1013421	LGTE075-291	1013422
900	LGTS090-351	1013423	LGTE090-351	1013424

#### Control units

Designation	Description	Type	Part number
Control unit	■ 24 V DC	LGTN101-511	6010683
	■ 115 / 230 V AC + 24 V DC	LGTN101-311	6010521
	■ 24 V DC ■ For installation in control cabinets	LGTN101-521	6008527
	■ 115 / 230 V AC + 24 V DC ■ For installation in control cabinets	LGTN101-321	6008526

#### Accessories

Designation	Connection cable	Part number
Connection cable with socket	2.5 m	6009923
	5 m	6009924
	10 m	6009926
	15 m	6008410
	20 m	6008411
Snap-on clip	—	4028654

## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Protective field width		0.1 m ... 6 m
Protective field height (depending on type)		150 mm ... 900 mm
Resolution		30 mm
Enclosure rating	Sender/receiver unit Control unit LGTN	IP 65 IP 54
Type		Type 2 according to EN 50100
Synchronisation		Electrical synchronisation
Supply voltage $V_s$ <sup>1)</sup>	Direct current Residual ripple	24 V (19.2 V ... 28.8 V) DC 5 V <sub>PP</sub>
	Alternating current Frequency	115 V (92 V ... 126,5 V) AC / 230 V (184 V ... 253 V) AC 50 Hz (48 Hz ... 62 Hz)
Power consumption		Max. 13 W / 16 VA
Response time (depending on type)		Max. 50 ms
Master relay	Resistive switching capacity Inductive switching capacity	Max. 4 A, 45 V DC Max. 4 A, 25 V DC
Auxiliary relay	Resistive switching capacity Inductive switching capacity	Max. 8 A, 55 V DC Max. 8 A, 15 V DC

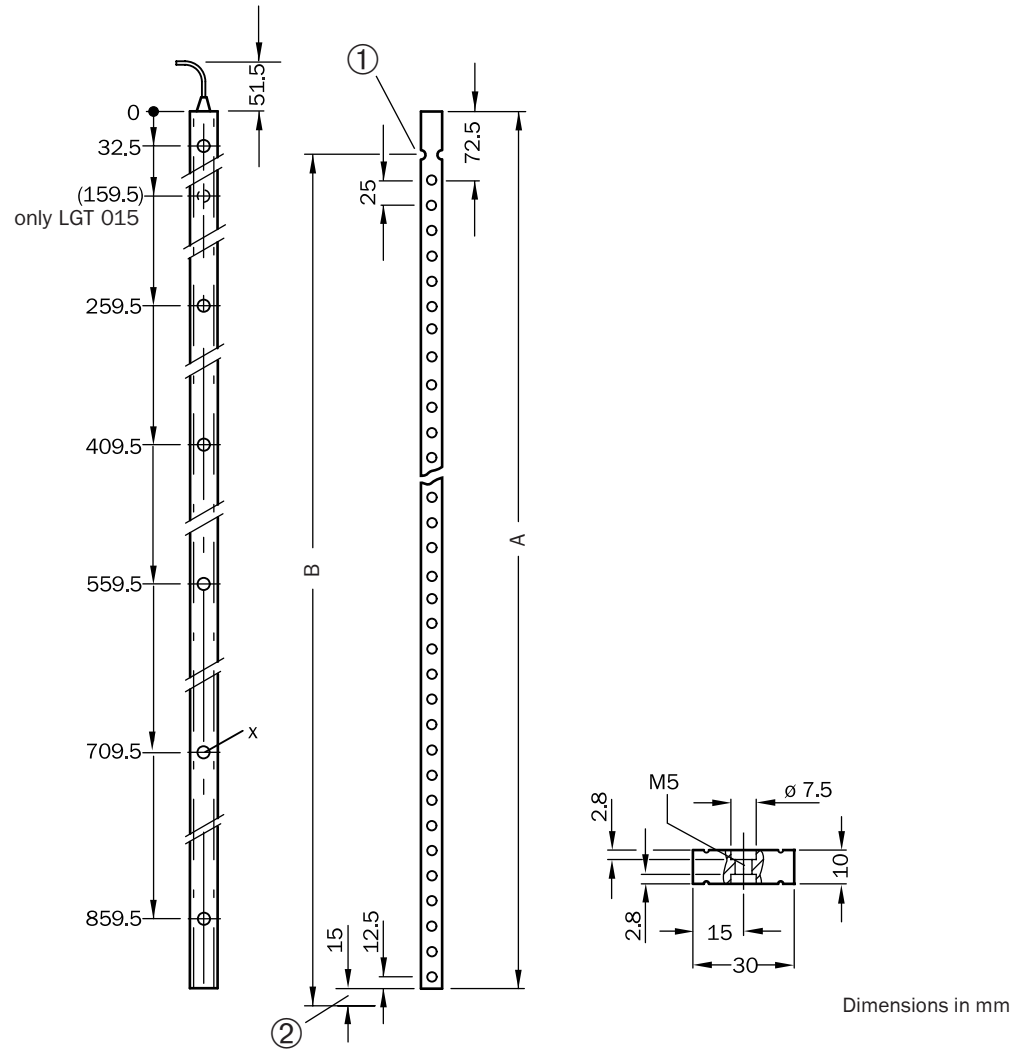
### Operating data

Connection type	PG11
Connection cable length	Max. 10 m
Ambient operating temperature $T_A$	-10 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	10 mm x 30 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29

<sup>1)</sup> A power supply unit with safe isolation (SELV, PELV circuit) is to be used

## Dimensional drawings

### Sender unit LGTS and receiver unit LGTE

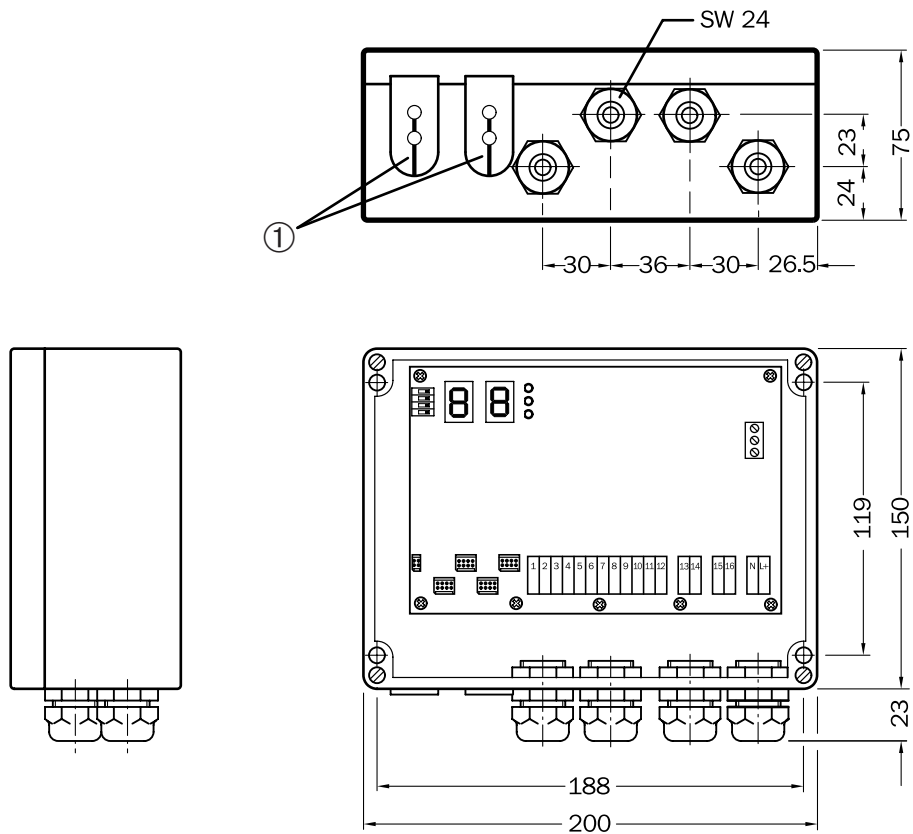


Dimensions in mm

- ① The upper limit of the protective field is indicated by a cut-out in the housing  
 ② The lower limit of the protective field is 15 mm from the end of the housing

LGT type	Number of beams	Housing length A (mm)	Protective field height B (mm)
015	5	185	155
030	11	335	305
045	17	485	455
060	23	635	605
075	29	785	755
090	35	935	905

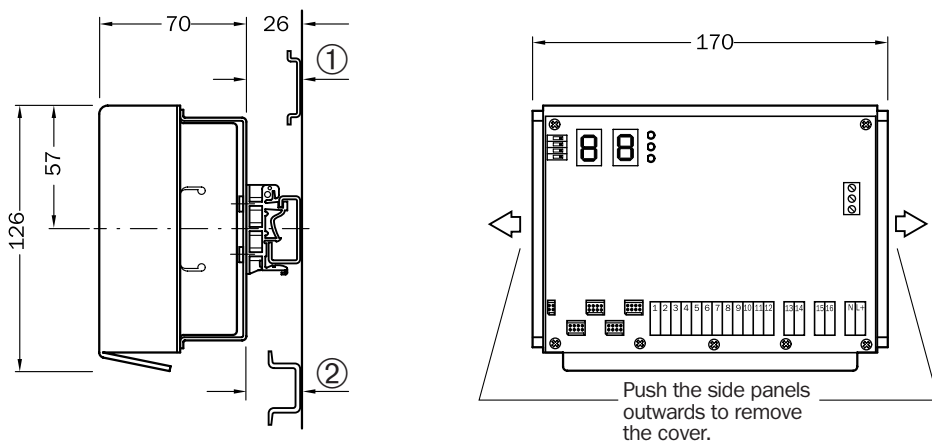
Control unit LGTN with housing



Dimensions in mm

① To insert cable: remove bush and push apart

Control unit LGTN for installation in control cabinets



Dimensions in mm

- ① For mounting on low 20 mm mounting rail
- ② For mounting on high 28 mm mounting rail

## Principle of operation of multiple light beam safety devices

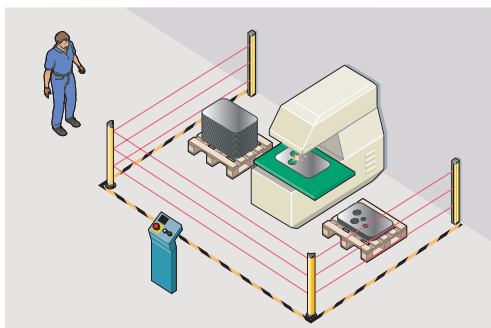
Multiple light beam safety devices are electro-sensitive protective devices comprising a sender unit and a receiver unit or a sender/receiver unit on the active side and one or more deflector mirrors on the passive side. If one or more light beams are

interrupted, the multiple light beam safety device provides a shutdown signal that is suitable for interrupting the dangerous state on a machine or system.

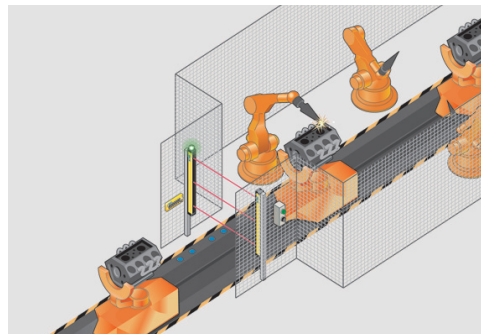
## Applications for multiple light beam safety devices

Multiple light beam safety devices are used wherever access to a hazardous area must be protected or the hazardous area itself must be monitored.

In some applications, the protective device must be able to unambiguously differentiate between man and material.



Machine tool industry: M4000 Standard with mirror column for multi-sided access protection on a punching machine



Automotive industry: M4000 Advanced with UE403 for access protection with muting on a motor machining station

## Advantages of the SICK multiple light beam safety device

SICK's range of multiple light beam safety devices provides a reliable, cost-effective solution for almost every hazardous area protection and access protection application. Customised solutions are produced using standard components that are flexible in use: From simple access protection to the complex muting application with direction monitoring, belt stop and override function.

The M4000 Standard and/or Advanced can be used for access protection and M4000 Area for hazardous area protection (horizontal use) if a type 4 multiple light beam safety device is required. M4000 Advanced in combination with the switching amplifier UE403 offers a comfortable, decentralised muting

solution where automatic material transport in and out of the hazardous area is required. In sectors such as warehouse systems and conveyor systems, the M4000 Advanced with UE403 not only complies with safety requirements, but also provides highly efficient automatic material transport.

The M2000 is the right choice for applications where a type 2 multiple light beam safety device is desired. Product variants with differing functionalities are available for countless applications. The use of SICK interfaces also offers numerous advantages. The M2000 variants in IP 67 housings were designed for environments in which very high demands are made of the enclosure rating (IP 67) and the material strength.

## Mounting and operation made easy

SICK provides a comprehensive range of accessories for multiple light beam safety devices. These accessories make it possible to integrate the devices in the machine control and also to

mount the devices rapidly, reliably and safely. Device and mirror columns offer an efficient solution to realise multi-sided access protection at minimum assembly expenditure.

## Services for productive safety

With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.

Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A



# Multiple light beam safety devices



F

Safety application	Type according to IEC 61496	Number of beams resp. resolution	Scanning range (m)	Functions						Product	Page
				Sender/receiver system	Active/passive system	Muting	Beam coding	Restart interlock	External device monitoring		
	Type 4	2 ... 8	0.5 ... 70	✓	—	✓ <sup>1)</sup>	✓	✓	✓	M4000 Advanced / UE403	F-2
		2 / 4 <sup>2)</sup>	0.5 ... 7.5 / 4.5	—	✓	✓ <sup>1)</sup>	✓	✓	✓	M4000 Advanced A/P / UE403	
		2 ... 8	0.5 ... 70	✓	—	—	✓	✓	✓	M4000 Standard	F-17
		2 / 4 <sup>2)</sup>	0.5 ... 7.5 / 4.5	—	✓	—	✓	✓	✓	M4000 Standard A/P	
	Type 4	60 mm 80 mm	0.5 ... 19 0.5 ... 70	✓	—	—	✓	✓	M4000 Area	F-29	
	Type 2	2 ... 9 2 ... 4	0 ... 25 0 ... 70	✓	—	✓ <sup>3)</sup>	✓	—	✓	M2000 Standard	F-38
				✓	—	✓ <sup>3)</sup>	✓	—	✓	M2000 Standard in IP67 Housing	F-46
				✓	—	✓ <sup>3)</sup>	✓	✓	✓	M2000 RES/EDM	F-51
		2 ... 9	0 ... 25	✓	—	✓ <sup>3)</sup>	✓	—	✓	M2000 Cascadable	F-59
		1 <sup>2)</sup>	0 ... 6	—	✓	✓ <sup>3)</sup>	—	—	✓	M2000-A/P Standard	F-67
				—	✓	✓ <sup>3)</sup>	—	✓	✓	M2000-A/P RES/EDM	F-75

<sup>1)</sup> Muting with switching amplifier UE403

<sup>2)</sup> Passive side using deflector mirror/deflector unit

<sup>3)</sup> Muting with safety evaluation unit LE20 Muting / safety controller UE410 Flexi

→ Suitable mirror columns and device columns can be found beginning on page F-82



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- Restart interlock (RES)
- External device monitoring (EDM)
- Beam coding
- LED/7-segment display
- Application diagnostic output (ADO)
- Configuration and diagnosis via PC
- SDL interface
- Muting configurable in conjunction with external switching amplifier UE403
- A/P (active/passive) variant
- Integrated laser alignment aid (optional)
- End cap with integrated LED (optional)



Further information	Page
→ Technical specifications	F-5
→ Dimensional drawings	F-9
→ Connection diagrams	F-11
→ Accessories	F-12
→ Services	A-2

## Overview of technical specifications

Scanning range (depending on type)	0.5 m ... 70 m / 4.5 m / 7.5 m
Number of beams (depending on type)	2 ... 8
Beam separation (depending on type)	220 mm ... 600 mm
Type	Type 4 (IEC 61496), SIL3 (IEC 61508)
Enclosure rating	IP 65

## Product description

The M4000 Advanced multiple light beam safety device together with the UE403 switching amplifier form the efficient solution for decentralised conventional muting applications involving automatic material transport.

Access protection with muting can be achieved with maximum availability thanks to their integrated functions, easily configured by PC via the RS-232 interface, and the simple in-situ connection of muting signals and control switches to the UE403.

The integrated functions, and status and diagnostic information, permit rapid commissioning and prevent unnecessary machine downtimes.

The modular concept provides a high level of machine safety that takes economic efficiency into account as device properties can be adapted to meet specific requirements. This is especially the case for the M4000 Advanced A/P (active/passive) variants, with which only one side requires electrical connection - considerably simplifying installation and cutting costs.

## In-system added value

- Combination with safe control solutions by SICK
- M4000 Advanced with UE403 for the connection of:
  - 2 to 4 muting sensors
  - External muting lamp
  - Reset- and override control switch
  - Conveyor belt stop signal
- Further functions:
  - Concurrence monitoring
  - Total muting time monitoring
  - Sensor gap monitoring
  - Sensor test
  - Partial blanking
  - Muting end via ESPE
  - Integrated override

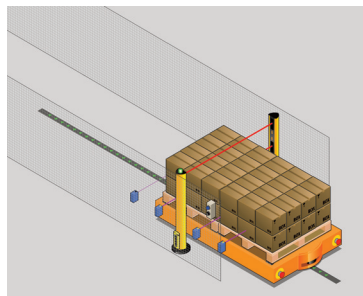
→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

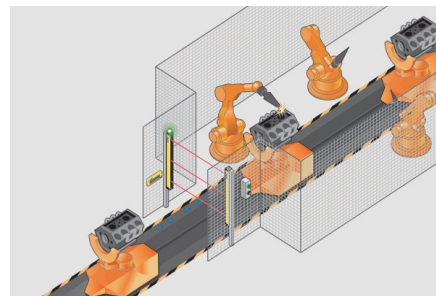
→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

Provides access protection of hazardous areas on machining centres in mechanical engineering applications, robot systems

(such as welding lines in the automotive industry) and automated conveying, storage and transport systems.



Access protection with partial blanking on a system with floor transporter



Access protection with muting on a motor machining station

## Ordering information

### M4000 Advanced

Number of beams	Beam separation	Sender		Receiver	
		Type	Part number	Type	Part number
2	500 mm	M40S-025003AA0	1200060	M40E-025003RB0	1200065
	600 mm	M40S-026003AA0	1200070	M40E-026003RB0	1200096
3	220 mm	M40S-032203AA0	1200063	M40E-032203RB0	1200097
	400 mm	M40S-034003AA0	1200061	M40E-034003RB0	1200064
	450 mm	M40S-034503AA0	1200071	M40E-034503RB0	1200098
4	220 mm	M40S-042203AA0	1200072	M40E-042203RB0	1200099
	300 mm	M40S-043003AA0	1200073	M40E-043003RB0	1200100
5	220 mm	M40S-052203AA0	1200074	M40E-052203RB0	1200101
6	220 mm	M40S-062203AA0	1200075	M40E-062203RB0	1200102
7	220 mm	M40S-072203AA0	1200076	M40E-072203RB0	1200103
8	220 mm	M40S-082203AA0	1200077	M40E-082203RB0	1200104

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### M4000 Advanced with integrated alignment aid

Number of beams	Beam separation	Sender		Receiver	
		Type	Part number	Type	Part number
2	500 mm	M40S-025013AA0	1200057	M40E-025013RB0	1200058
	600 mm	M40S-026013AA0	1200078	M40E-026013RB0	1200105
3	400 mm	M40S-034013AA0	1200069	M40E-034013RB0	1200106
	450 mm	M40S-034513AA0	1200082	M40E-034513RB0	1200107
4	300 mm	M40S-043013AA0	1200080	M40E-043013RB0	1200108

### M4000 Advanced with end cap with integrated LED

Number of beams	Beam separation	Sender		Receiver	
		Type	Part number	Type	Part number
2	500 mm	M40S-025003AA0	1200060	M40E-025023RB0	1200062
	600 mm	M40S-026003AA0	1200070	M40E-026023RB0	1200079
3	220 mm	M40S-032203AA0	1200063	M40E-032223RB0	1200066
	400 mm	M40S-034003AA0	1200061	M40E-034023RB0	1200067
	450 mm	M40S-034503AA0	1200071	M40E-034523RB0	1200081
4	220 mm	M40S-042203AA0	1200072	M40E-042223RB0	_ 1)
	300 mm	M40S-043003AA0	1200073	M40E-043023RB0	1200109
5	220 mm	M40S-052203AA0	1200074	M40E-052223RB0	_ 1)
6	220 mm	M40S-062203AA0	1200075	M40E-062223RB0	_ 1)
7	220 mm	M40S-072203AA0	1200076	M40E-072223RB0	1201247
8	220 mm	M40S-082203AA0	1200077	M40E-082223RB0	_ 1)

<sup>1)</sup> When ordering first time, please use the expression in column "Type" instead of "Part number"

Continued on next page

## M4000 Advanced with integrated alignment aid and end cap with integrated LED

Number of beams	Beam separation	Sender		Receiver	
		Type	Part number	Type	Part number
2	500 mm	M40S-025013AA0	1200057	M40E-025033RB0	1200110
	600 mm	M40S-026013AA0	1200078	M40E-026033RB0	1200111
3	400 mm	M40S-034013AA0	1200069	M40E-034033RB0	1200068
	450 mm	M40S-034513AA0	1200082	M40E-034533RB0	1200112
4	300 mm	M40S-043013AA0	1200080	M40E-043033RB0	1200113

## M4000 Advanced A/P

Number of beams	Beam separation	Scanning range	System connection	Sender/receiver in one housing		Deflector unit	
				Type	Part number	Type	Part number
2	500 mm	7.5 m	M26 x 11 + FE Hirschmann plug	M40Z-025003RB0	1200115	PSD01-1501 <sup>1)</sup>	1027906
		4.5 m		M40Z-025003TB0	1200128	PSD01-2501 <sup>2)</sup>	1027907
4	300 mm	4.5 m		M40Z-043003TB0	1200127	PSD02-2301 <sup>2)</sup>	1027908

<sup>1)</sup> With mirror deflection (max. usable scanning range 7.5 m)

<sup>2)</sup> With fibre-optic deflection (max. usable scanning range 4.5 m)

## M4000 Advanced A/P with end cap with integrated LED

Number of beams	Beam separation	Scanning range	System connection	Sender/receiver in one housing		Deflector unit	
				Type	Part number	Type	Part number
2	500 mm	7.5 m	M26 x 11 + FE Hirschmann plug	M40Z-025023RB0	1200126	PSD01-1501 <sup>1)</sup>	1027906
		4.5 m		M40Z-025023TB0	1200125	PSD01-2501 <sup>2)</sup>	1027907
4	300 mm	4.5 m		M40Z-043023TB0	1200131	PSD02-2301 <sup>2)</sup>	1027908

<sup>1)</sup> With mirror deflection (max. usable scanning range 7.5 m)

<sup>2)</sup> With fibre-optic deflection (max. usable scanning range 4.5 m)

## Muting module UE403

Type	Part number
UE403-A0930	1026287

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### M4000 Advanced

#### General data

	Sender	Receiver
Number of beams (depending on type)	2 ... 8	
Beam separation (depending on type)	220 mm ... 600 mm	
Scanning range	—	0.5 m ... 20 m
	—	15 m ... 70 m
	Configurable	✓
Response time (depending on type)	—	Max. 11 ms
Protection class	III (EN 50178:1998)	
Enclosure rating	IP 65 (EN 60529)	
Synchronisation	Optical, without separate synchronisation	
Type	Type 4 (IEC 61496), SIL3 (IEC 61508)	
Ambient operating temperature from ... to	0 °C ... +55 °C	
Storage temperature from ... to	-25 °C ... +70 °C	
Air humidity from ... to	15 % ... 95 %, non-dewing	
Housing cross section	52 mm x 55.5 mm	
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC60068-2-6)	
Shock resistance	10 g, 16 ms (IEC 60068-2-29)	
Housing material	Aluminium alloy ALMGSI 0.5	
Front screen material	Polycarbonate, scratch-resistant coating	

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#### Functional data

	Sender	Receiver
Safe integration to bus system		✓
Restart interlock	—	✓
Restart interlock (delivery status)	—	Internal
External device monitoring	—	✓
External device monitoring (delivery status)	—	Activated
Beam coding		✓
Beam coding (delivery status)		Non-coded
Configurable application diagnostic output	—	✓
Application diagnostic output (delivery status)	—	Contamination (OWS)
Sender test	✓	—
Sender test (delivery status)	Deactivated	—
Configurable scanning range	—	✓
Scanning range (delivery status)	—	20 m
Integrated laser alignment aid (optional)		✓
End cap with integrated LED (optional)	—	✓
SDL interface		✓
CDS configuration via RS-232 interface		✓
Concurrence monitoring (with UE403)	—	✓
Monitoring total muting time (with UE403)	—	✓
Sensor gap monitoring (with UE403)	—	✓
Sensor test (with UE403)	—	✓
Partial blanking (with UE403)	—	✓
End of muting by ESPE (with UE403)	—	✓
Belt stop (with UE403)	—	✓
Muting with override (with UE403)	—	✓

Continued on next page

## Electrical data

		Sender	Receiver
Connection type	System connection	M26 x 11 + FE Hirschmann plug	M26 x 11 + FE Hirschmann plug
	Extension connection	—	M12 x 5 Plug
	Cable length	50 m <sup>1)</sup>	50 m <sup>1)</sup>
	Wire cross-section	0.75 mm <sup>2</sup>	0.75 mm <sup>2</sup>
Supply voltage V <sub>S</sub>	24 V (19.2 V ... 28.8 V) <sup>2)</sup>		
Ripple	±10 %		
Power consumption	Max. 0.2 A	Max. 0.6 A	
Display elements	LED/7-segment		
Safety outputs (OSSD)	Type of output	—	2 PNP semiconductors, short-circuit protected, cross-circuit monitored <sup>3)</sup>
	Switching voltage HIGH	—	24 V DC (V <sub>S</sub> - 2.25 V ... V <sub>S</sub> )
	Switching voltage LOW	—	0 V DC (0 V DC ... 3.5 V DC)
	Switching current	—	0 mA ... 500 mA
Application diagnostic output	Switching voltage HIGH	—	PNP semiconductor, short-circuit protected
	Switching voltage LOW	—	24 V DC (V <sub>S</sub> - 4.2 V ... V <sub>S</sub> )
	Switching current	—	High resistance
			0 mA ... 100 mA
Integrated laser alignment aid	Wave length	—	≤1 mW
	Laser class	—	630 nm ... 680 nm
			2 (IEC 60825-1:2001)

<sup>1)</sup> Depending on load, power supply and wire cross-section. The technical specifications must be observed.

<sup>2)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

<sup>3)</sup> Applies to a voltage range between -30 V and +30 V.

## M4000 Advanced A/P

## General data

		Sender/receiver in one housing	Deflector unit
Number of beams (depending on type)		2 / 4	
Beam separation (depending on type)		500 mm / 300 mm	
Scanning range	(depending on type)	0.5 m ... 7.5 m / 0.5 m ... 4.5 m	7.5 m / 4.5 m
	Configurable	✓	—
Response time		Max. 10 ms	—
Protection class		III (EN 50178:1998)	—
Enclosure rating		IP 65 (EN 60529)	—
Synchronisation		Optical, without separate synchronisation	—
Type		Type 4 (IEC 61496)	—
Ambient operating temperature from ... to		0 °C ... +55 °C	—
Storage temperature from ... to		-25 °C ... +70 °C	—
Air humidity from ... to		15 % ... 95 %, non-dewing	—
Housing cross section		52 mm x 55.5 mm	
Vibration resistance		5 g, 10 Hz ... 55 Hz (IEC60068-2-6)	—
Shock resistance		10 g, 16 ms (IEC 60068-2-29)	—
Housing material		Aluminium alloy ALMGS1 0.5	—
Front screen material		Polycarbonate, scratch-resistant coating	—

## Functional data

	Sender/receiver in one housing	Deflector unit
Safe integration to bus system	✓	—
Restart interlock	✓	—
Restart interlock (delivery status)	Internal	—
External device monitoring	✓	—
External device monitoring (delivery status)	Activated	—
Beam coding	✓	—
Beam coding (delivery status)	Non-coded	—
Configurable application diagnostic output	✓	—
Application diagnostic output (delivery status)	Contamination (OWS)	—
Configurable scanning range	✓	—
Scanning range (delivery status) (depending on type)	7.5 m / 4.5 m	—
End cap with integrated LED (optional)	✓	—
SDL interface	✓	—
CDS configuration via RS-232 interface	✓	—
Concurrence monitoring (with UE403)	✓	—
Monitoring total muting time (with UE403)	✓	—
Sensor gap monitoring (with UE403)	✓	—
Sensor test (with UE403)	✓	—
Partial blanking (with UE403)	✓	—
End of muting by ESPE (with UE403)	✓	—
Belt stop (with UE403)	✓	—
Muting with override (with UE403)	✓	—

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## Electrical data

	Sender/receiver in one housing	Deflector unit
Connection type	System connection	M26 x 11 + FE Hirschmann plug
	Extension connection	M12 x 5 Plug
	Cable length	50 m <sup>1)</sup>
	Wire cross-section	0.75 mm <sup>2</sup>
Supply voltage V <sub>S</sub>	24 V DC (19.2 V DC ... 28.8 V DC) <sup>2)</sup>	—
Ripple	±10 %	—
Power consumption	Max. 0.6 A	—
Display elements	LED/7-segment	—
Safety outputs (OSSD)	Type of output	2 PNP semiconductors, short-circuit protected, cross-circuit monitored <sup>3)</sup>
	Switching voltage HIGH	24 V DC (V <sub>S</sub> - 2.25 V ... V <sub>S</sub> )
	Switching voltage LOW	0 V DC (0 V DC ... 3.5 V DC)
	Switching current	0 mA ... 500 mA
Application diagnostic output		PNP semiconductor, short-circuit protected
	Switching voltage HIGH	24 V DC (V <sub>S</sub> - 4.2 V ... V <sub>S</sub> )
	Switching voltage LOW	High resistance
	Switching current	0 mA ... 100 mA

<sup>1)</sup> Depending on load, power supply and wire cross-section. The technical specifications must be observed.

Continued on next page

<sup>2)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

<sup>3)</sup> Applies to a voltage range between -30 V and +30 V.

## Muting module UE403

## General data

Type of muting sensors	Optical sensors, inductive sensors, mechanical switches, controller signals
Protection class	III (EN 50178:1998)
Enclosure rating	IP 65 (IEC 60529)
Type	Type 4 (IEC 61496), SIL3 (IEC 61508)
Ambient operating temperature from ... to	0 °C ... +55 °C
Air humidity from ... to	15 % ... 95 %, non-dewing
Storage temperature from ... to	-25 °C ... +70 °C
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Housing material	Aluminium die-cast, powder coated
Material, Connector strip	Polyamide
Mounting	Flexible mounting to the M4000 Advanced or directly in the system

## F

## Electrical data

Supply voltage $V_s$	24 V DC (19.2 V DC ... 28.8 V DC), via connected ESPE
Inputs override, reset, C1, belt stop, muting sensors	
Switching voltage HIGH	24 V DC (11 V DC ... 30 V DC)
Input current HIGH	10 mA (6 mA ... 15 mA)
Switching voltage LOW	0 V DC (-30 V DC ... 5 V DC)
Input current LOW	0 mA (-0.5 mA ... 1.5 mA)
Outputs 24 V DC voltage supply for reset, override, C1, muting sensors	
Supply voltage	24 V DC (15 V DC ... 28.8 V DC)
Output current for muting sensors	500 mA <sup>1)</sup>
Output current for reset, override, C1	400 mA <sup>1)</sup>
Muting lamp	
Output current monitored	20 mA ... 400 mA
Output current not monitored	0 mA ... 400 mA
Connection type	Socket M12 x 5
Cable length	10 m <sup>2)</sup>
Wire cross-section	0.34 mm <sup>2</sup>
Cable resistance	<0.5 Ohm (per cable)

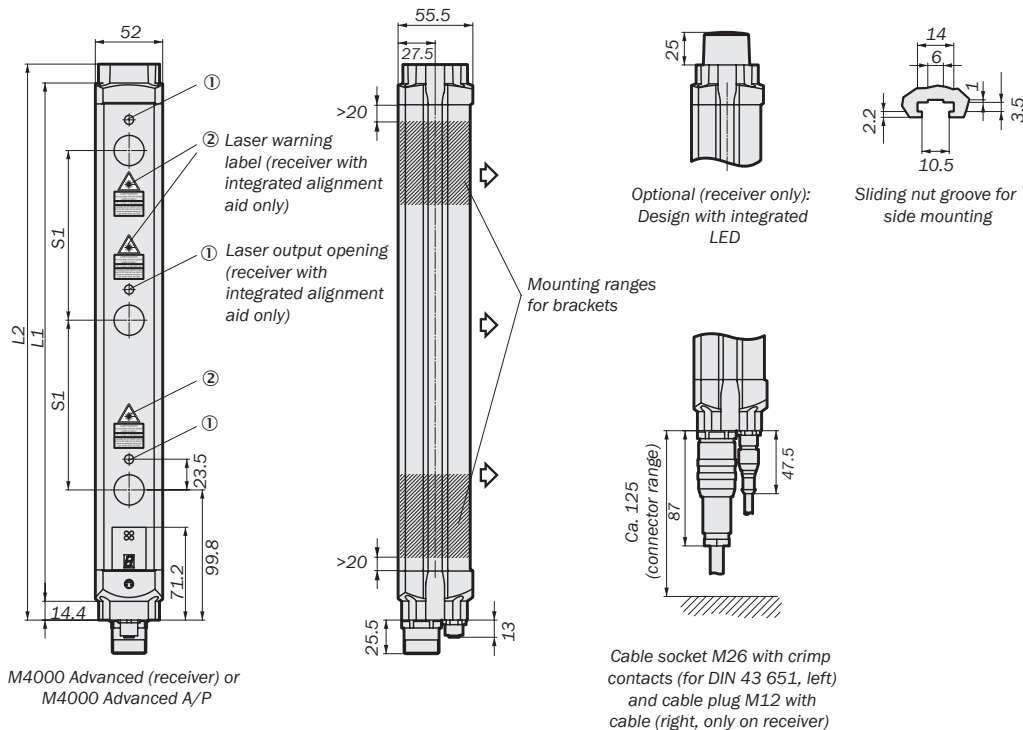
<sup>1)</sup> Total of all supply currents from the connections RES/OVR, A1, A2, B1 and B2 (pin 1 in each case): max. 1000 mA

<sup>2)</sup> Between UE403 and M4000 Advanced as well as between the muting sensors/control switches/muting lamp and UE403



# Dimensional drawings

## M4000 Advanced, M4000 Advanced A/P



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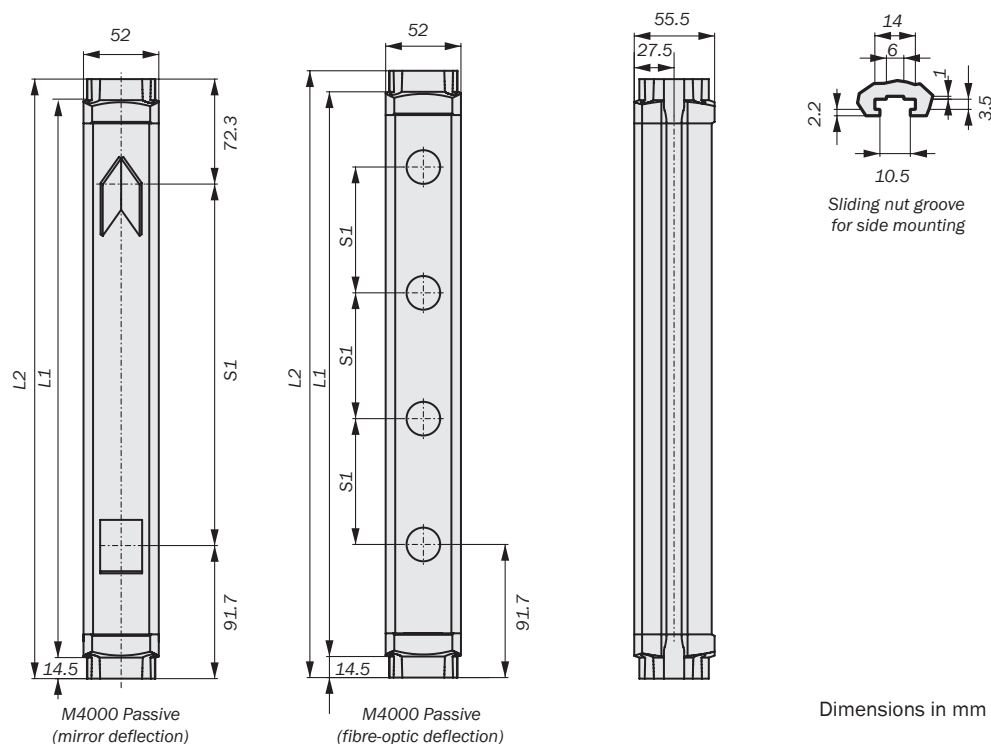
M4000 Advanced (receiver) or  
M4000 Advanced A/P

Cable socket M26 with crimp  
contacts (for DIN 43 651, left)  
and cable plug M12 with  
cable (right, only on receiver)

Dimensions in mm

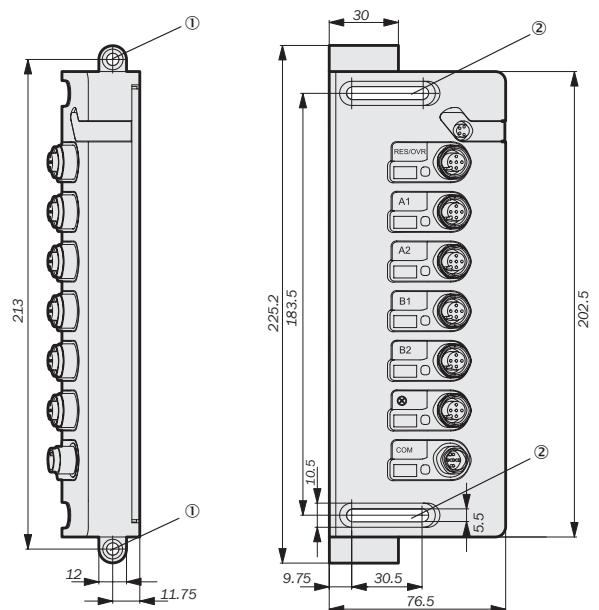
Number of beams	Beam separation S1	Dimension L1	Dimension L2
2	500	643	672
2	600	743	772
3	220	583	612
3	400	943	972
3	450	1043	1072
4	220	803	832
4	300	1043	1072
5	220	1023	1052
6	220	1243	1272
7	220	1462	1491
8	220	1682	1711

M4000 deflector units



Number of beams	Beam separation S1	Dimension L1	Dimension L2
2	500	643	672
4	300	1043	1072

Muting module UE403



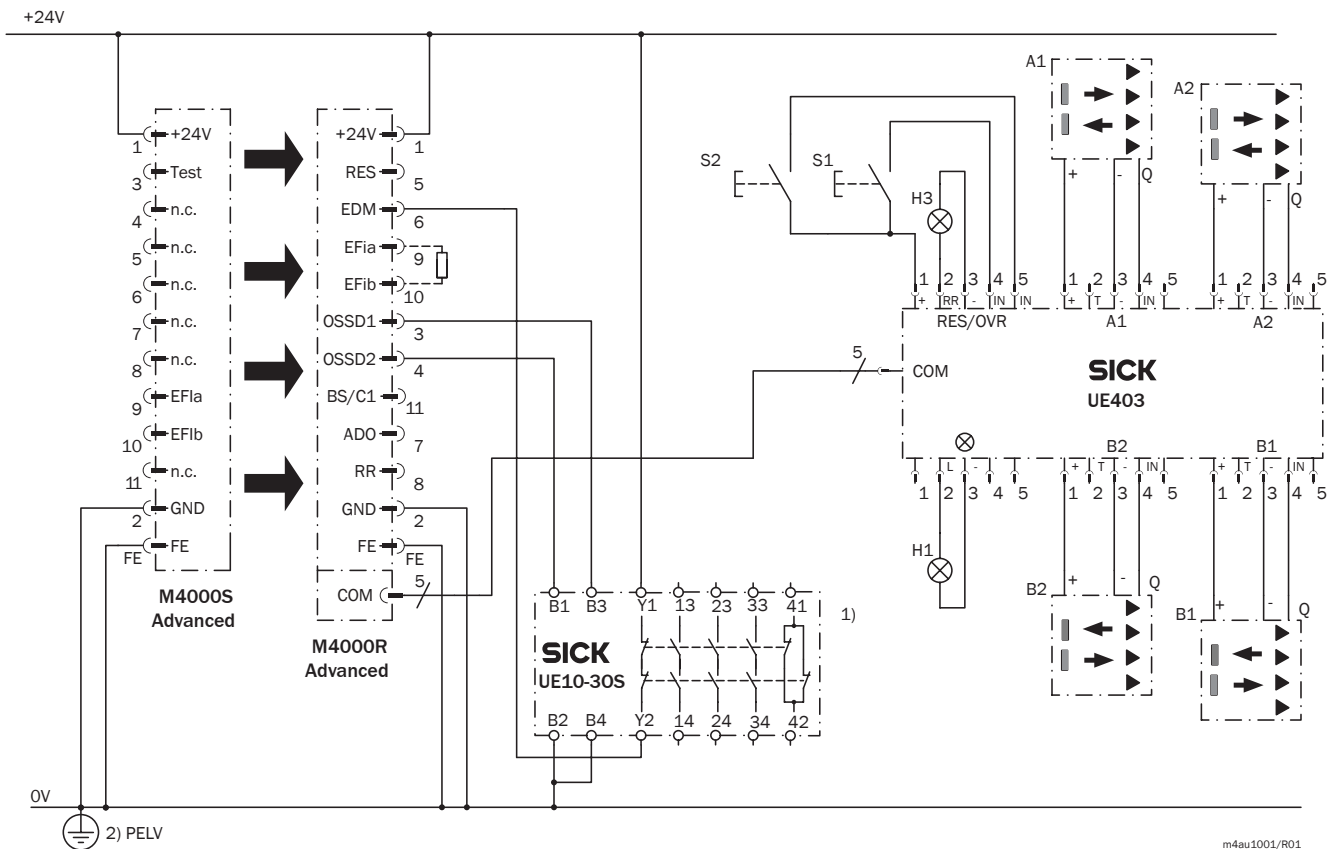
Dimensions in mm

**Note:**  
The fixing holes ① and slots ② are suitable for cheese head screws M5 x 30 as per DIN EN ISO 4762.

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### M4000 Advanced with UE403 muting module connected to UE10-30S safety relay



#### Task

Connection of an M4000 Advanced multiple light beam safety device with UE403 muting module to an UE10-30S safety relay. Muting with 4 photoelectric reflex switches (dark switching, PNP). Operating mode: with restart interlock and external device monitoring.

#### Operating characteristics

When the light path is clear and the UE10-30S is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready for switch on and waits for an input signal/switch-on signal. The system is enabled by pressing and releasing the button S1. The outputs OSSD1 and OSSD2 are live, the UE10-30S is switched on. On interruption of one or several of the light beams, the UE10-30S is de-energised by the OSSD1 and OSSD2 outputs.

#### Muting and override

When the light path is clear and the muting input conditions are valid muting starts. The muting lamp H1 illuminates. Different time and monitoring functions can be configured.

When the light path is interrupted and muting sensors are active, e. g. because of muting errors or a new power-on, override is enabled by pressing and releasing the button S2.

#### Fault analysis

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The erroneous behaviour of the UE10-30S will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the system does not enable the output current circuits.

The failure of one muting sensor will be detected by the muting sequence, and prohibit a new muting cycle. On manipulation (e.g. jamming) of the button S2, the system does not enable override. A permanent use of the override function will be inhibited through the device.




#### Comments

1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be dual-channel (x/y paths). Single-channel insertion in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices. This applies particularly on the use of configurable functions.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page F-16

Type	Property	Packing unit	Part number
Mounting kit 1	Rigid	4	7021352
Mounting kit 2	Adjustable	4	2017751
Mounting kit 6	Swivel function, side bracket	4	2019506
Mounting kit 12	Swivel Mount	4	2030510

### Sliding nuts/sliding blocks

Type	Remark	Packing unit	Part number
Sliding block (sliding nuts)	Included with delivery	4	2017550

### Connection cables

Connection type	Cable alignment	Cable length	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	2.5 m	2022544
		5 m	2022545
		7.5 m	2022546
		10 m	2022547
		15 m	2022548
		20 m	2022549
		30 m	2022550

**Cable receptacles**

Connection type	Cable alignment	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	6020757
	Angled	6020758

**Extension connection cable**

Connection type	Cable alignment	Remark	Cable length	Part number
Plug M12 x 5, socket M12 x 5	Plug straight/socket straight	Connection cable for M4000 Advanced with M12, 5 pin connector and UE403	0.6 m	6025930
			1 m	6029280
			1.5 m	6029281
			2 m	6025931
			5 m	6029282

**Configuration connection cable**

Connection type	Cable length	Remark	Part number
M8 x 4, SUB-D 9-pol	2 m	For connecting the configuration connection to the PC	6021195

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**Mirror columns and device columns**

→ Suitable mirror columns and device columns can be found beginning on page F-82

**Additional front screens**

Suitable for	Packing unit	Remark	Part number
M40x-0250xxxxx	2	Including sliding blocks and mounting screws	2033225
M40x-0260xxxxx			2033226
M40x-0322xxxxx			2033227
M40x-0340xxxxx			2033228
M40x-0345xxxxx			2033229
M40x-0422xxxxx			2033230
M40x-0522xxxxx			2033231
M40x-0622xxxxx			2033232
M40x-0722xxxxx			2033233
M40x-0822xxxxx			2033234

**Deflector mirrors**

Type	Remark	Part number
PNS75-008	Including mounting adapter (two pieces swivel mount)	1026647

**Laser alignment aid**

Type	Type of light	Scanning range	Part number
Laser alignment aid AR60	Red light	Max. 60 m	1015741
AR60 adapter for M4000	—	—	4040006

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

Continued on next page

**Configuration Tools**

Type	Remark	Part number
Clone Plug for C4000 and M4000	For C4000 Standard / Advanced / Palletizer / Entry/ Exit and M4000 Advanced	1029665
Wall mount	Packing unit: 1	5318443
Protective cap	For Clone Plug / Host Guest Plug	5318293

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

**Muting module UE403****Mounting systems**

Property	Packing unit	Remark	Part number
Fixing screws with sliding nuts	2	Included in the delivery	2033250

**Muting sensor connecting cables**

Connection type	Cable alignment	Cable length	Remark	Part number
Plug M12 x 4	Plug straight/ socket angled	1 m	Suitable for muting sensor WL24 and WT24	6025974
		2 m	Suitable for muting sensor WL24 and WT24	6025975
		5 m	Suitable for muting sensor WL24 and WT24	6025087
		1 m	Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected	6025944
		2 m	Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected	6025945
		5 m	Suitable for muting sensor WL12, WL14, WL18, WL23, WL27, pin 4 (plug) rotated to pin 2 (socket), pin 2 (plug) not connected	6025116
Plug M12 x 3	Plug straight/ socket angled	1 m	Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected	6026106
		2 m	Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected	6026107
		5 m	Suitable for muting sensor WT27, WL260, WT260, pin 2 (plug) not connected	6025118

**Extension connection cables**

Connection type	Cable alignment	Remark	Cable length	Part number
Plug M12 x 5, socket M12 x 5	Plug straight/socket straight	Connection cable for M4000 Advanced with M12, 5 pin connector and UE403	0.6 m	6025930
			1 m	6029280
			1.5 m	6029281
			2 m	6025931
			5 m	6029282

**Configuration connection cables**

Connection type	Cable length	Remark	Part number
M8 x 4, SUB-D 9-pol	2 m	For connecting the configuration connection to the PC	6021195

**Connection cables for control switches**

Connection type	Cable alignment	Cable length	Part number
Plug M12 x 5	Straight	2 m	6026133
		5 m	6026134
		10 m	6026135

**Connectors**

Connection type	Cable alignment	Type	Part number
Socket M12 x 4	Angled	DOS-1204-W	6007303
Plug M12 x 4	Straight	STE-1204-G	6009932

**Muting indicator lamps**

Type of muting indicator	Connection type	Cable length	Remark	Part number
Incandescent lamp	Connector	2 m	Incl. mounting bracket and mounting kit	2033116
		10 m	Incl. mounting bracket	2033117
LED		2 m	Incl. mounting bracket and mounting kit	2033118
		10 m	Incl. mounting bracket	2033119

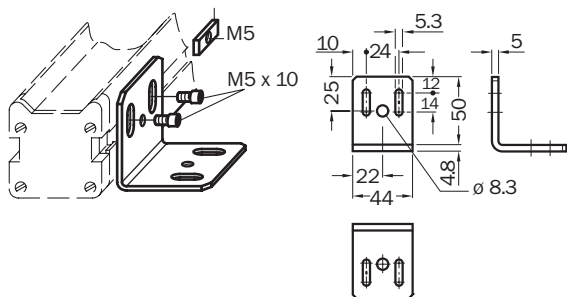
F

**Muting accessories, other**

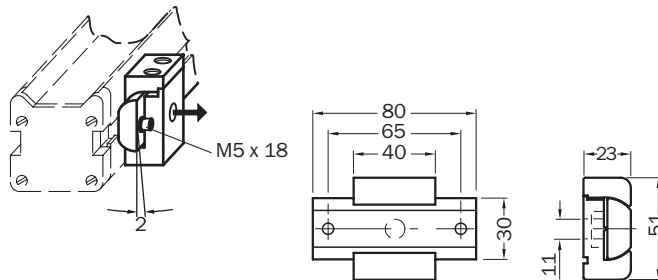
Type	Part number
Protective cap for quick-disconnect socket on UE403	6011170

Dimensional drawings mounting systems

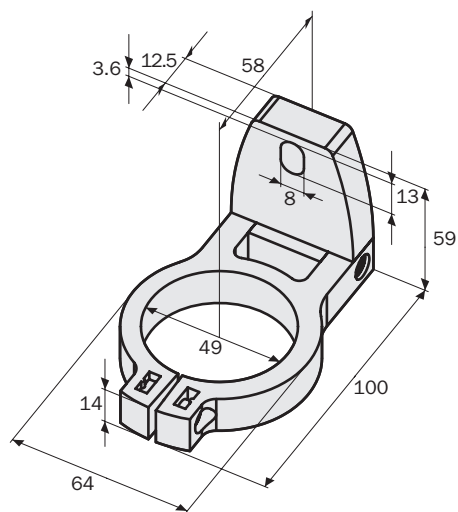
Mounting kit 1



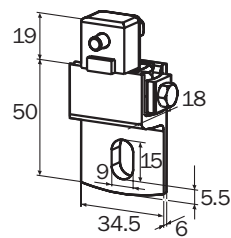
Mounting kit 2



Mounting kit 12



Mounting kit 6



Dimensions in mm

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## Overview of technical specifications

Scanning range (depending on type)	0.5 m ... 70 m / 4.5 m / 7.5 m
Number of beams (depending on type)	2 ... 8
Beam separation (depending on type)	220 mm ... 600 mm
Type	Type 4 (IEC 61496), SIL3 (IEC 61508)
Enclosure rating	IP 65

## Product description

The M4000 Standard multiple light beam safety device is the solution for one-sided or multi-sided access protection. Efficient perimeter guarding solutions with maximum availability are realised due to the high optical range and comprehensive functions, which are easily configured via configuration buttons.

The integrated functions and status information ensure rapid commissioning and help to minimise machine down time. The modular concept achieves maximum machine security with economic considerations by harmonising the characteristics of the device precisely to the requirements. Interfaces and service concepts complete the product range to give an ideal industrial solution.

## In-system added value

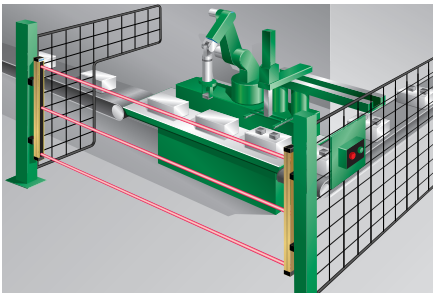
- Combination with safe control solutions by SICK
- Direct integration in AS-Interface Safety at Work bus systems

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

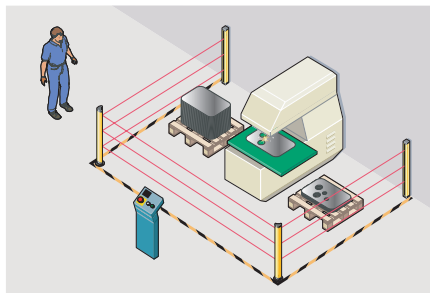
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Machine tool industry
- Material handling
- Packaging industry
- Stone production
- Automotive industry



M4000 Standard on a packing machine



M4000 Standard with mirror columns on a punching machine



- Housing with 3 nut grooves
- Configuration buttons
- Restart interlock (RES)
- External device monitoring (EDM)
- Beam coding
- LED/7-segment display
- Application diagnostic output (ADO)
- Integrated laser alignment aid (optional)
- End cap with integrated LED (optional)
- Separate reset connection for receiver (optional)



Further information	Page
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→ Accessories	F-26
→ Services	A-2

## Ordering information

### M4000 Standard

Number of beams	Beam separation	Sender		Receiver	
		Type	Part number	Type	Part number
2	500 mm	M40S-025000AR0	1200000	M40E-025000RR0	1200017
	600 mm	M40S-026000AR0	1200001	M40E-026000RR0	1200018
3	220 mm	M40S-032200AR0	1200002	M40E-032200RR0	1200019
	400 mm	M40S-034000AR0	1200003	M40E-034000RR0	1200020
	450 mm	M40S-034500AR0	1200004	M40E-034500RR0	1200021
4	220 mm	M40S-042200AR0	1200005	M40E-042200RR0	1200022
	300 mm	M40S-043000AR0	1200006	M40E-043000RR0	1200023
5	220 mm	M40S-052200AR0	1200007	M40E-052200RR0	1200024
6	220 mm	M40S-062200AR0	1200008	M40E-062200RR0	1200025
7	220 mm	M40S-072200AR0	1200009	M40E-072200RR0	1200026
8	220 mm	M40S-082200AR0	1200010	M40E-082200RR0	1200027

### M4000 Standard with integrated alignment aid

Number of beams	Beam separation	Sender		Receiver	
		Type	Part number	Type	Part number
2	500 mm	M40S-025010AR0	1200011	M40E-025010RR0	1200028
	600 mm	M40S-026010AR0	1200012	M40E-026010RR0	1200029
3	400 mm	M40S-034010AR0	1200013	M40E-034010RR0	1200030
	450 mm	M40S-034510AR0	1200014	M40E-034510RR0	1200031
4	300 mm	M40S-043010AR0	1200015	M40E-043010RR0	1200032

### M4000 Standard with end cap with integrated LED

Number of beams	Beam separation	Sender		Receiver	
		Type	Part number	Type	Part number
2	500 mm	M40S-025000AR0	1200000	M40E-025020RR0	1200033
	600 mm	M40S-026000AR0	1200001	M40E-026020RR0	1200034
3	220 mm	M40S-032200AR0	1200002	M40E-032220RR0	— <sup>1)</sup>
	400 mm	M40S-034000AR0	1200003	M40E-034020RR0	1200035
	450 mm	M40S-034500AR0	1200004	M40E-034520RR0	1200036
4	220 mm	M40S-042200AR0	1200005	M40E-042220RR0	— <sup>1)</sup>
	300 mm	M40S-043000AR0	1200006	M40E-043020RR0	1200037
5	220 mm	M40S-052200AR0	1200007	M40E-052220RR0	— <sup>1)</sup>
6	220 mm	M40S-062200AR0	1200008	M40E-062220RR0	1200121
7	220 mm	M40S-072200AR0	1200009	M40E-072220RR0	— <sup>1)</sup>
8	220 mm	M40S-082200AR0	1200010	M40E-082200RR0	— <sup>1)</sup>

<sup>1)</sup> When ordering first time, please use the expression in column "Type" instead of "Part number"

## M4000 Standard with integrated alignment aid and end cap with integrated LED

Number of beams	Beam separation	Sender		Receiver	
		Type	Part number	Type	Part number
2	500 mm	M40S-025010ARO	1200011	M40E-025030RRO	1200038
	600 mm	M40S-026010ARO	1200012	M40E-026030RRO	1200039
3	400 mm	M40S-034010ARO	1200013	M40E-034030RRO	1200040
	450 mm	M40S-034510ARO	1200014	M40E-034530RRO	1200041
4	300 mm	M40S-043010ARO	1200015	M40E-043030RRO	1200042

## M4000 Standard A/P

Number of beams	Beam separation	Scanning range	System connection	Sender/receiver in one housing		Deflector unit	
				Type	Part number	Type	Part number
2	500 mm	7.5 m	M12 x 8 Plug	M40Z-025000RRO	1200120	PSD01-1501 <sup>1)</sup>	1027906
		4.5 m		M40Z-025000TRO	1200122	PSD01-2501 <sup>2)</sup>	1027907
4	300 mm	4.5 m		M40Z-043000TRO	1200123	PSD02-2301 <sup>2)</sup>	1027908

<sup>1)</sup> With mirror deflection (max. usable scanning range 7.5 m)

<sup>2)</sup> With fibre-optic deflection (max. usable scanning range 4.5 m)

## M4000 Standard A/P with end cap with integrated LED

Number of beams	Beam separation	Scanning range	System connection	Sender/receiver in one housing		Deflector unit	
				Type	Part number	Type	Part number
2	500 mm	7.5 m	M12 x 8 Plug	M40Z-025020RRO	1200124	PSD01-1501 <sup>1)</sup>	1027906
		4.5 m		M40Z-025020TRO	1200129	PSD01-2501 <sup>2)</sup>	1027907
4	300 mm	4.5 m		M40Z-043020TRO	1200130	PSD02-2301 <sup>2)</sup>	1027908

<sup>1)</sup> With mirror deflection (max. usable scanning range 7.5 m)

<sup>2)</sup> With fibre-optic deflection (max. usable scanning range 4.5 m)

## Options

Description
Integrated Interface AS-interface Safety at Work <sup>1)</sup>
Separate Connection Reset M12 x 5 <sup>1)</sup>

<sup>1)</sup> Options not combinable. Type and part number on request or via product finder at [www.sick.com](http://www.sick.com)

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### M4000 Standard

#### General data

	Sender	Receiver
Number of beams (depending on type)	2 ... 8	
Beam separation (depending on type)	220 mm ... 600 mm	
Scanning range	—	0.5 m ... 20 m
	—	15 m ... 70 m
<b>Configurable</b>	—	✓
Response time (depending on type)	—	Max. 11 ms
Protection class	III (EN 50178:1998)	
Enclosure rating	IP 65 (EN 60529)	
Synchronisation	Optical, without separate synchronisation	
Type	Type 4 (IEC 61496), SIL3 (IEC 61508)	
Ambient operating temperature from ... to	0 °C ... +55 °C	
Storage temperature from ... to	-25 °C ... +70 °C	
Air humidity from ... to	15 % ... 95 %, non-dewing	
Housing cross section	52 mm x 55.5 mm	
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC60068-2-6)	
Shock resistance	10 g, 16 ms (IEC 60068-2-29)	
Housing material	Aluminium alloy ALMGSI 0.5	
Front screen material	Polycarbonate, scratch-resistant coating	

#### Functional data

	Sender	Receiver
Restart interlock	—	✓
Restart interlock (delivery status)	—	Activated
External device monitoring	—	✓
External device monitoring (delivery status)	—	Activated
Beam coding	✓	
Beam coding (delivery status)	Non-coded	
Configuration buttons	✓	
Configurable application diagnostic output	—	✓
Application diagnostic output (delivery status)	—	Contamination (OWS)
Sender test	✓	—
Sender test (delivery status)	Deactivated	—
Configurable scanning range	—	✓
Scanning range (delivery status)	—	20 m
Integrated laser alignment aid (optional)	✓	
End cap with integrated LED (optional)	—	✓

## Electrical data

		Sender	Receiver
Connection type	System connection	M12 x 8 Plug	
	Cable length	15 m <sup>1)</sup>	
	Wire cross-section	0.25 mm <sup>2</sup>	
Supply voltage $V_S$		24 V DC (19.2 V DC ... 28.8 V DC) <sup>2)</sup>	
Ripple		±10 %	
Power consumption		Max. 0.2 A	Max. 0.6 A
Display elements		LED/7-segment	
Safety outputs (OSSD)	Type of output (depending on type)	—	2 PNP semiconductors, short-circuit protected, cross-circuit monitored <sup>3)</sup>
	Switching voltage HIGH	—	24 V DC ( $V_S - 2.25 V \dots V_S$ )
	Switching voltage LOW	—	0 V DC (0 V DC ... 3.5 V DC)
	Switching current	—	0 mA ... 500 mA
Application diagnostic output	Switching voltage HIGH	—	PNP semiconductor, short-circuit protected
	Switching voltage LOW	—	24 V DC ( $V_S - 4.2 V \dots V_S$ )
	Switching current	—	High resistance
		—	0 mA ... 100 mA
Integrated laser alignment aid	Wave length	—	≤ 1 mW
	Laser class	—	630 nm ... 680 nm
		—	2 (IEC 60825-1:2001)

<sup>1)</sup> Depending on load, power supply and wire cross-section. The technical specifications must be observed.

<sup>2)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

<sup>3)</sup> Applies to a voltage range between -30 V and +30 V.

## M4000 Standard A/P

## General data

		Sender/receiver in one housing	Deflector unit
Number of beams (depending on type)		2 / 4	
Beam separation (depending on type)		500 mm / 300 mm	
Scanning range	(depending on type)	0.5 m ... 7.5 m / 0.5 m ... 4.5 m	7.5 m / 4.5 m
	Configurable	✓	—
Response time		Max. 10 ms	—
Protection class		III (EN 50178:1998)	—
Enclosure rating		IP 65 (EN 60529)	—
Synchronisation		Optical, without separate synchronisation	—
Type		Type 4 (IEC 61496)	—
Ambient operating temperature from ... to		0 °C ... +55 °C	—
Storage temperature from ... to		-25 °C ... +70 °C	—
Air humidity from ... to		15 % ... 95 %, non-dewing	—
Housing cross section		52 mm x 55.5 mm	
Vibration resistance		5 g, 10 Hz ... 55 Hz (IEC60068-2-6)	—
Shock resistance		10 g, 16 ms (IEC 60068-2-29)	—
Housing material		Aluminium alloy ALMGSI 0.5	—
Front screen material		Polycarbonate, scratch-resistant coating	—

Continued on next page

## Functional data

	Sender/receiver in one housing	Deflector unit
Restart interlock	✓	—
Restart interlock (delivery status)	Internal	—
External device monitoring	✓	—
External device monitoring (delivery status)	Activated	—
Beam coding	✓	—
Beam coding (delivery status)	Non-coded	—
Configuration buttons	✓	—
Configurable application diagnostic output	✓	—
Application diagnostic output (delivery status)	Contamination (OWS)	—
Configurable scanning range	✓	—
Scanning range (delivery status) (depending on type)	7.5 m / 4.5 m	—
End cap with integrated LED (optional)	✓	—

## F

## Electrical data

	Sender/receiver in one housing	Deflector unit
Connection type	System connection	M12 x 8 Plug
	Cable length	15 m <sup>1)</sup>
	Wire cross-section	0.25 mm <sup>2</sup>
Supply voltage $V_S$	24 V DC (19.2 V DC ... 28.8 V DC) <sup>2)</sup>	—
Ripple	±10 %	—
Power consumption	Max. 0.6 A	—
Display elements	LED/7-segment	—
Safety outputs (OSSD)	Type of output	2 PNP semiconductors, short-circuit protected, cross-circuit monitored <sup>3)</sup>
	Switching voltage HIGH	24 V DC ( $V_S - 2.25 \text{ V} \dots V_S$ )
	Switching voltage LOW	0 V DC (0 V DC ... 3.5 V DC)
	Switching current	0 mA ... 500 mA
Application diagnostic output		PNP semiconductor, short-circuit protected
	Switching voltage HIGH	24 V DC ( $V_S - 4.2 \text{ V} \dots V_S$ )
	Switching voltage LOW	High resistance
	Switching current	0 mA ... 100 mA

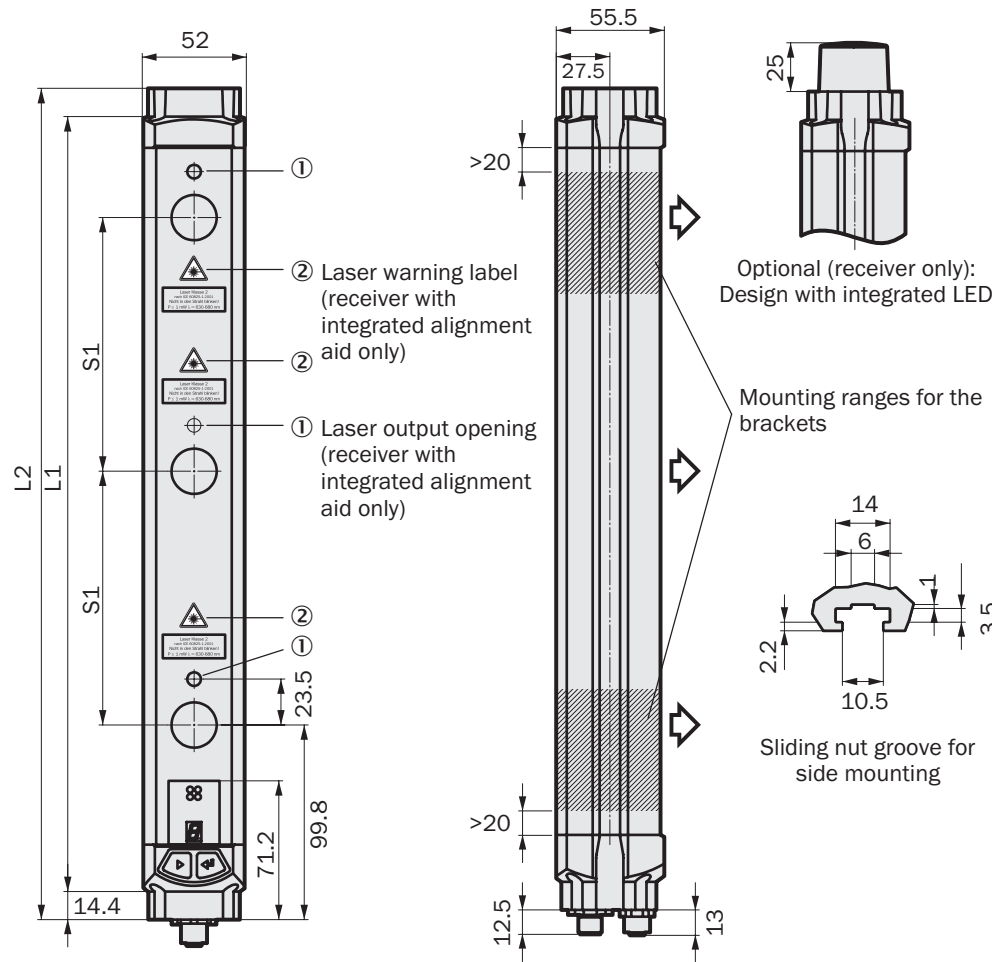
<sup>1)</sup> Depending on load, power supply and wire cross-section. The technical specifications must be observed.

<sup>2)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

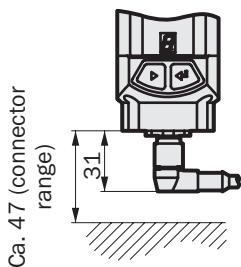
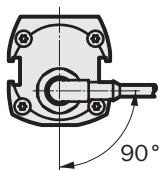
<sup>3)</sup> Applies to a voltage range between -30 V and +30 V.

# Dimensional drawings

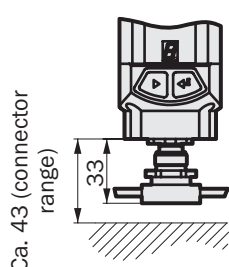
## M4000 Standard



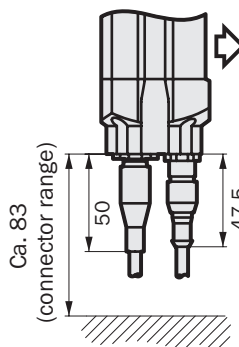
Dimensions in mm



Cable socket M12 angled (only with AS-Interface aligned)



AS-Interface clip M12 (aligned)



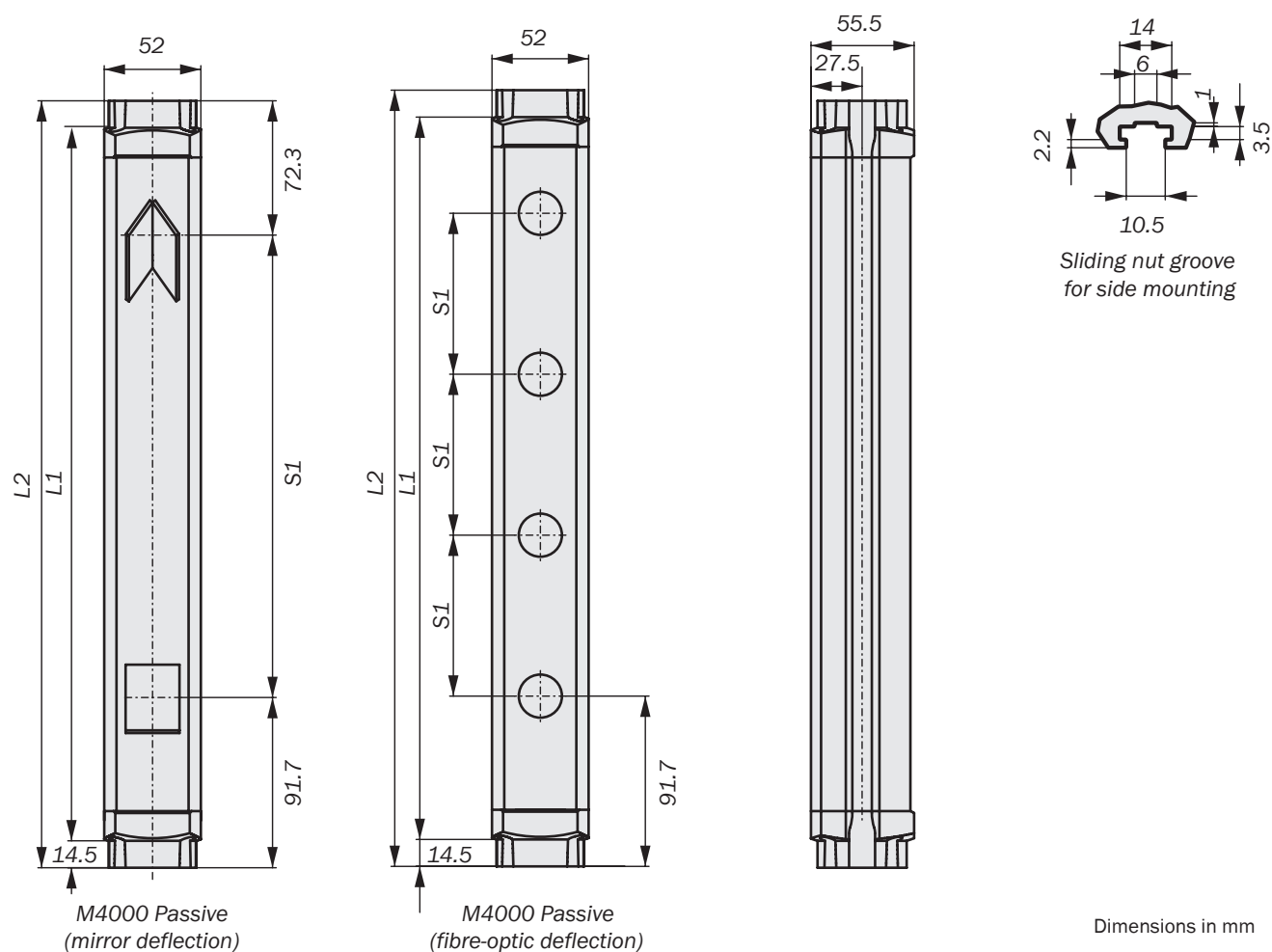
Cable socket M12 with cable (left) and cable plug M12 with cable (right, optional, only on receiver)

Table with dimensions see next page

Number of beams	Beam separation S1	Dimension L1	Dimension L2
2	500	643	672
2	600	743	772
3	220	583	612
3	400	943	972
3	450	1043	1072
4	220	803	832
4	300	1043	1072
5	220	1023	1052
6	220	1243	1272
7	220	1462	1491
2	500	643	672

M4000 deflector units

F



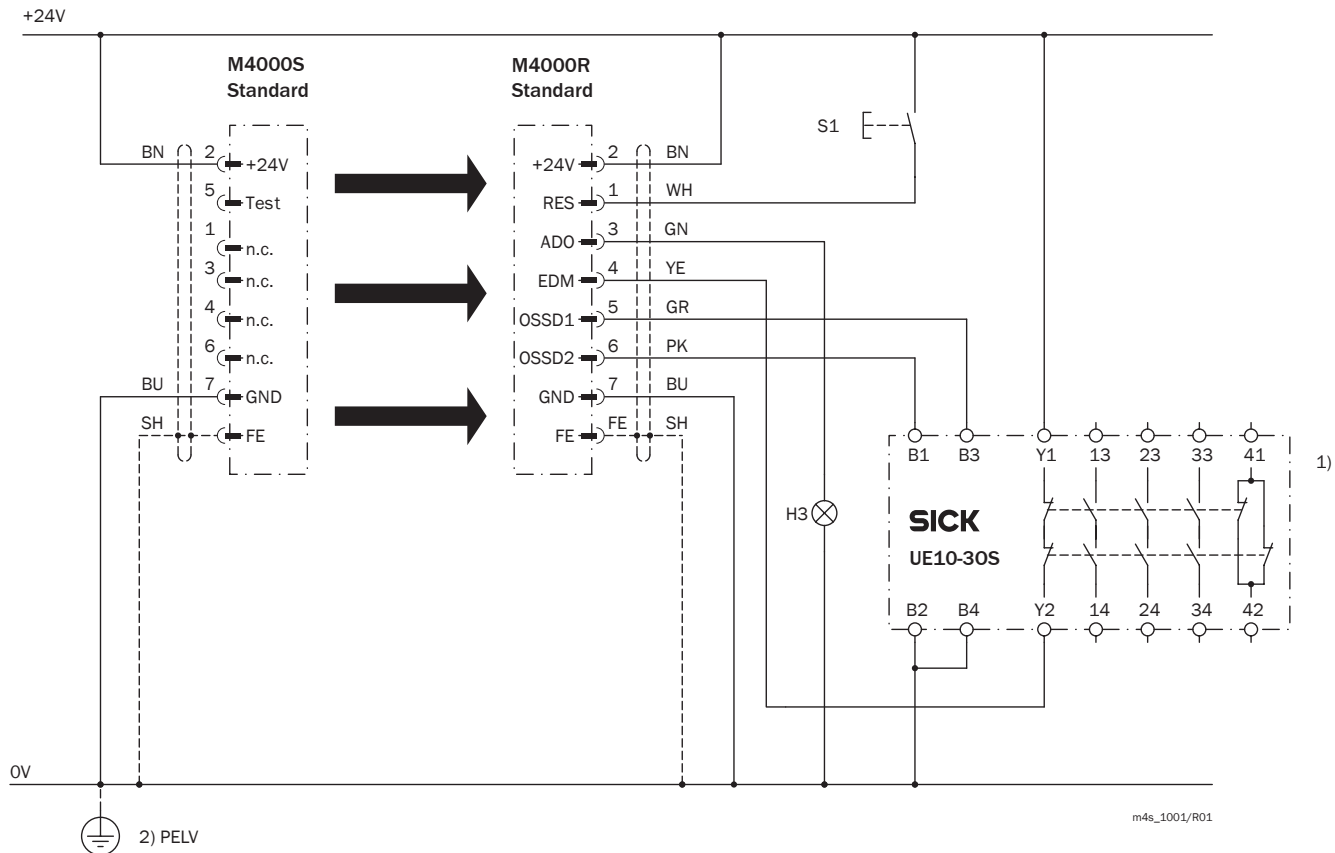
Number of beams	Beam separation S1	Dimension L1	Dimension L2
2	500	643	672
4	300	1043	1072



## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### M4000 Standard connected to UE10-30S safety relay



#### Task

Connection of an M4000 Standard multiple light beam safety device to a UE10-30S safety relay.

Operating mode: with restart interlock and external device monitoring.

#### Operating characteristics

When the light path is clear and the UE10-30S is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready for switch on and waits for an input signal/switch-on signal. The system is enabled by pressing and releasing the button S1. The outputs OSSD1 and OSSD2 are live, the UE10-30S is switched on. On interruption of one or several of the light beams, the UE10-30S is de-energised by the OSSD1 and OSSD2 outputs.

#### Fault analysis

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The erroneous behaviour of the UE10-30S will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the system does not enable the output current circuits.




#### Comments

1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be dual-channel (x-/y paths). Single-channel insertion in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page F-28

Type	Property	Packing unit	Part number
Mounting kit 1	Rigid	4	7021352
Mounting kit 2	Adjustable	4	2017751
Mounting kit 6	Swivel function, side bracket	4	2019506
Mounting kit 12	Swivel Mount	4	2030510

### Sliding nuts/sliding blocks

Type	Remark	Packing unit	Part number
Sliding block (sliding nuts)	Included with delivery	4	2017550

### Connection cable

Connection type	Remark	Cable alignment	Cable length	Part number
Socket M12 x 7 + FE	Suitable for M4000 Standard	Straight	2.5 m	6020537
			5 m	6020354
			7.5 m	6020353
			10 m	6020352
			15 m	6020872
Plug M12 x 5	Suitable for M4000 Standard with additional reset connection	Straight	2 m	6026133
			5 m	6026134
			10 m	6026135

**Connectors**

Connection type	Cable alignment	Type	Part number
Socket M12 x 8	Straight	DOS-1208-G	6028422
Plug M12 x 5	Straight	STE-1205-G	6022083

**Mirror columns and device columns**

→ Suitable mirror columns and device columns can be found beginning on page F-82

**Additional front screens**

Suitable for	Packing unit	Remark	Part number
M40x-0250xxxxx	2	Including sliding blocks and mounting screws	2033225
M40x-0260xxxxx			2033226
M40x-0322xxxxx			2033227
M40x-0340xxxxx			2033228
M40x-0345xxxxx			2033229
M40x-0422xxxxx			2033230
M40x-0522xxxxx			2033231
M40x-0622xxxxx			2033232
M40x-0722xxxxx			2033233
M40x-0822xxxxx			2033234

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**Deflector mirrors**

Type	Remark	Part number
PNS75-008	Including mounting adapter (two pieces swivel mount)	1026647
PSK45	For 90° deflection, incl. mounting set, not suitable for column mounting	5306053

**AS-Interface module lower part**

Type	Part number
ASI-M12	6022472

**Laser alignment aid**

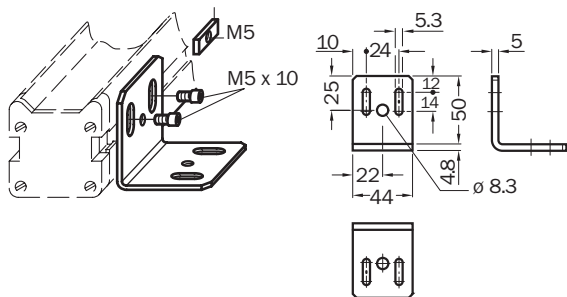
Type	Scanning range	Type of light	Part number
Laser alignment aid AR60	Max. 60 m	Red light	1015741
AR60 adapter for M4000	—	—	4040006

**Power supply units**

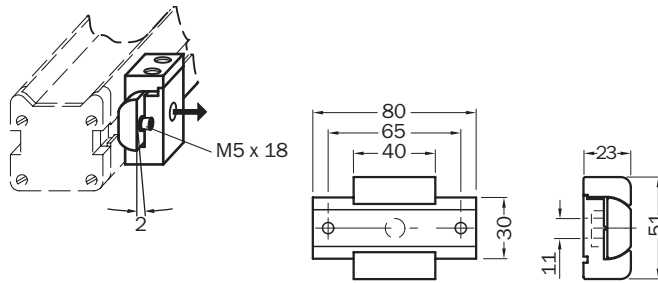
Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

Dimensional drawings mounting systems

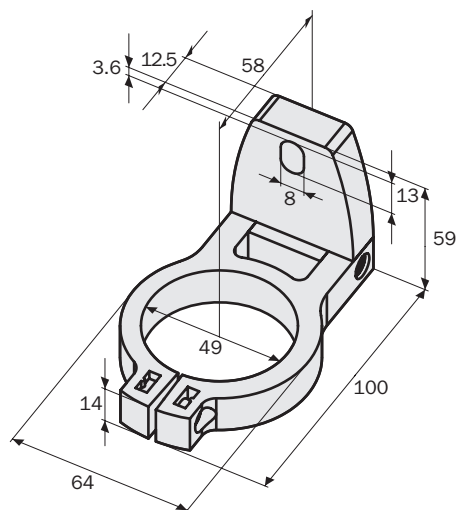
Mounting kit 1



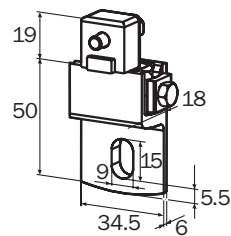
Mounting kit 2



Mounting kit 12



Mounting kit 6



Dimensions in mm

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## Overview of technical specifications

Scanning range (depending on type)	0.5 m ... 19 m / 0.5 m ... 70 m
Length of the monitored area (depending on type)	300 mm ... 1800 mm
Resolution (depending on type)	60 mm / 80 mm
Type	Type 4 (IEC 61496), SIL3 (IEC 61508)
Enclosure rating	IP 65

## Product description

The M4000 Area multiple light beam safety device is the efficient solution for area protection or for preventing employees standing behind point-of-operation protection. Area protection can be achieved with maximum availability thanks to its long range

and integrated functions, easily configured by PC via the RS-232 interface.

The integrated functions, and status and diagnostic information, permit rapid commissioning and prevent unnecessary machine downtimes.

## In-system added value

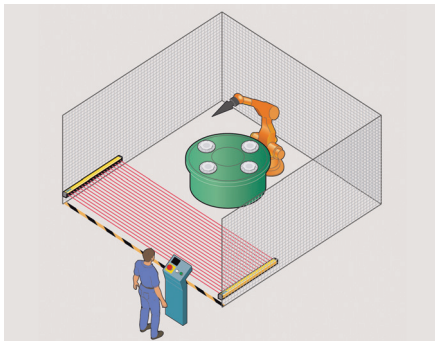
■ Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

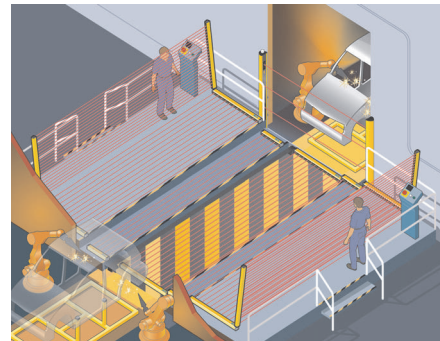
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

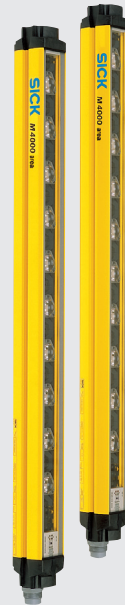
Provides area protection or point-of-operation guarding of a hazardous point protection e.g. on robots, machining centres in



Hazardous area protection with M4000 Area on a robot



Point-of-operation guarding with M4000 Area at an output conveyor in the automobile industry



- 60 or 80 mm resolution
- Restart interlock (RES)
- External device monitoring (EDM)
- Beam coding
- LED/7-segment display
- Application diagnostic output (ADO)
- Configuration and diagnosis via PC
- SDL interface



Further information	Page
→ Ordering information	F-30
→ Technical specifications	F-31
→ Dimensional drawings	F-9
→ Connection diagrams	F-34
→ Accessories	F-35
→ Services	A-2

## Ordering information

### M4000 Area

Resolution	Length of the monitored area	Sender		Receiver	
		Type	Part number	Type	Part number
60 mm	300 mm	M40S-60A005AA0	1200915	M40E-60A005RA0	1200916
	450 mm	M40S-61A005AA0	1200138	M40E-61A005RA0	1200137
	600 mm	M40S-60A005AA0	1201067	M40E-62A005RA0	1201068
	750 mm	M40S-63A005AA0	1200674	M40E-63A005RA0	1200914
	900 mm	M40S-64A005AA0	1200506	M40E-64A005RA0	1200508
	1050 mm	M40S-65A005AA0	1200507	M40E-65A005RA0	1200509
	1200 mm	M40S-66A005AA0	1200805	M40E-66A005RA0	1200806
	1350 mm	M40S-67A005AA0	1200837	M40E-67A005RA0	1200838
	1500 mm	M40S-68A005AA0	1200850	M40E-68A005RA0	1200849
	1650 mm	M40S-60A005AA0	1200912	M40E-69A005RA0	1200913
	1800 mm	M40S-70A005AA0	1200147	M40E-70A005RA0	1200146
80 mm	600 mm	M40S-62A105AA0	1200139	M40E-62A105RA0	1200140
	750 mm	M40S-63A105AA0	1200134	M40E-63A105RA0	1200685
	900 mm	M40S-64A105AA0	1201655	M40E-64A105RA0	1201656
	1050 mm	M40S-65A105AA0	1200586	M40E-65A105RA0	1200587
	1200 mm	M40S-66A105AA0	1201046	M40E-66A105RA0	1201045
	1350 mm	M40S-67A105AA0	1200604	M40E-67A105RA0	1200605
	1500 mm	M40S-68A105AA0	1200588	M40E-68A105RA0	1200589
	1650 mm	M40S-69A105AA0	1200686	M40E-69A105RA0	1200687
	1800 mm	M40S-70A105AA0	1200149	M40E-70A105RA0	1200148

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## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

	Sender	Receiver
Resolution (depending on type)	60 mm / 80 mm	
Length of the monitored area (depending on type)	300 mm ... 1800 mm	
Scanning range		0.5 m ... 6 m / 5 m ... 19 m
for resolution 60 mm	—	0.5 m ... 20 m / 15 m ... 70 m
for resolution 80 mm	—	✓
Configurable	—	
Response time	—	Max. 17 ms
Protection class	III (EN 50178:1998)	
Enclosure rating	IP 65 (EN 60529)	
Synchronisation	Optical, without separate synchronisation	
Type	Type 4 (IEC 61496), SIL3 (IEC 61508)	
Ambient operating temperature from ... to	0 °C ... +55 °C	
Storage temperature from ... to	-25 °C ... +70 °C	
Air humidity from ... to	15 % ... 95 %, non-dewing	
Housing cross section	52 mm x 55.5 mm	
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC60068-2-6)	
Shock resistance	10 g, 16 ms (IEC 60068-2-29)	
Housing material	Aluminium alloy ALMGSI 0.5	
Front screen material	Polycarbonate, scratch-resistant coating	

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### Functional data

	Sender	Receiver
Safe integration to bus system		✓
Restart interlock	—	✓
Restart interlock (delivery status)	—	Internal
External device monitoring	—	✓
External device monitoring (delivery status)	—	Activated
Beam coding		✓
Beam coding (delivery status)		Non-coded
Configurable application diagnostic output	—	✓
Application diagnostic output (delivery status)	—	Contamination (OWS)
Sender test	✓	—
Sender test (delivery status)	Deactivated	—
Configurable scanning range	—	✓
Scanning range (delivery status) (depending on type)	—	6 m / 20 m
SDL interface		✓
CDS configuration via RS-232 interface		✓

Continued on next page

## Electrical data

		Sender	Receiver
Connection type	System connection	M26 x 11 + FE Hirschmann plug	
	Cable length	50 m <sup>1)</sup>	
	Wire cross-section	0.75 mm <sup>2</sup>	
Supply voltage $V_S$		24 V (19.2 V ... 28.8 V) <sup>2)</sup>	
Ripple		±10 %	
Power consumption		Max. 0.2 A	Max. 0.6 A
Display elements		LED/7-segment	
Safety outputs (OSSD)	Type of output	—	2 PNP semiconductors, short-circuit protected, cross-circuit monitored <sup>3)</sup>
	Switching voltage HIGH	—	24 V DC ( $V_S - 2.25 \text{ V} \dots V_S$ )
	Switching voltage LOW	—	0 V DC (0 V DC ... 3.5 V DC)
	Switching current	—	0 mA ... 500 mA
Application diagnostic output	Switching voltage HIGH	—	PNP semiconductor, short-circuit protected
	Switching voltage LOW	—	24 V DC ( $V_S - 4.2 \text{ V} \dots V_S$ )
	Switching current	—	High resistance
		—	0 mA ... 100 mA

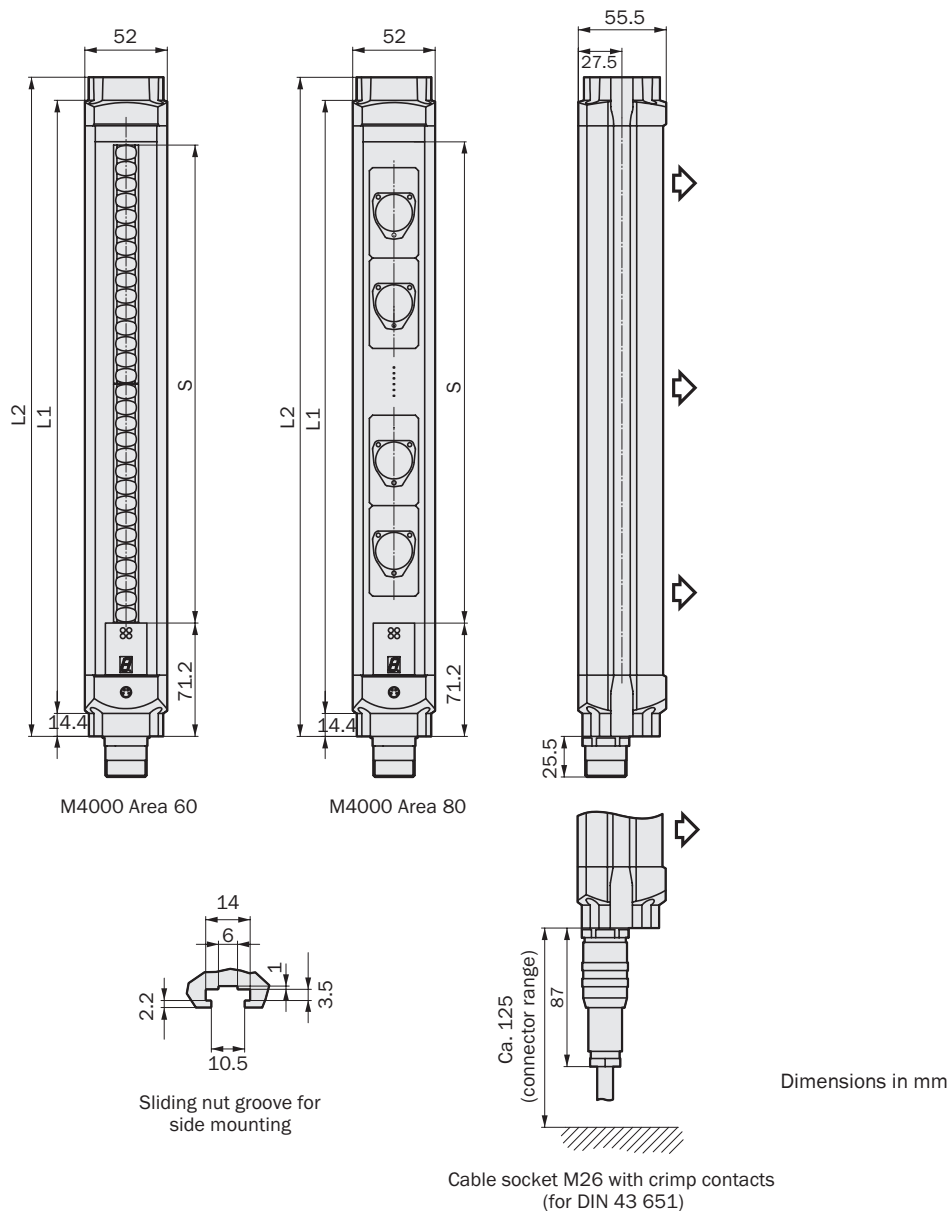
<sup>1)</sup> Depending on load, power supply and wire cross-section. The technical specifications must be observed.

<sup>2)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204.

<sup>3)</sup> Applies to a voltage range between -30 V and +30 V.



# Dimensional drawings



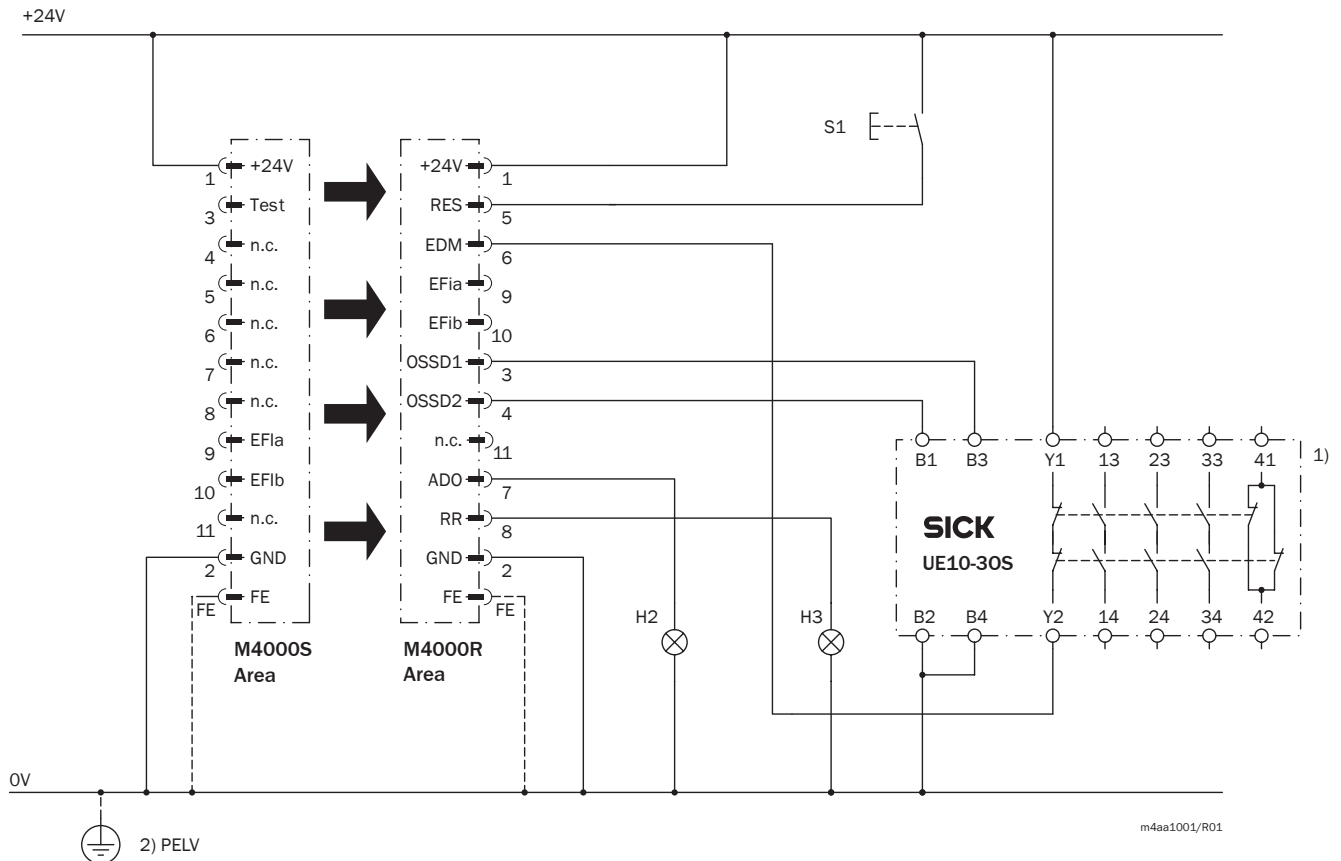
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Length of the monitored area S	Dimension L1	Dimension L2
300	387	416
450	537	566
600	687	716
750	837	866
900	987	1016
1050	1137	1166
1200	1287	1316
1350	1437	1466
1500	1587	1616
1650	1737	1766
1800	1887	1916

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### M4000 Area connected to UE10-30S safety relay



#### Task

Connection of an M4000 Area multiple light beam safety device to a UE10-30S safety relay.

Operating mode: with restart interlock and external device monitoring.

#### Operating characteristics

When the light path is clear and the UE10-30S is de-energised and functioning correctly, the yellow LED on the receiver and the lamp H3 flash. The system is ready for switch on and waits for an input signal/switch-on signal. The system is enabled by pressing and releasing the button S1. The outputs OSSD1 and OSSD2 are live, the UE10-30S is switched on. On interruption of one or several of the light beams, the UE10-30S is de-energised by the OSSD1 and OSSD2 outputs.

If the optics are dirty, indicator H2 illuminates.

#### Fault analysis

Cross-circuits and short-circuits of the OSSDs are detected and lead to the inhibited state (lock-out). The erroneous behaviour of the UE10-30S will be detected. The shutdown function is retained. On manipulation (e.g. jamming) of the button S1, the system does not enable the output current circuits.




#### Comments

1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, this integration must be dual-channel (x-/y paths). Single-channel insertion in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) PELV in accordance with the requirements in EN 60204-1 / 6.4

Take note of the operating instructions of the integrated devices. This applies particularly on the use of configurable functions.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page F-37

Type	Property	Packing unit	Part number
Mounting kit 1	Rigid	4	7021352
Mounting kit 2	Adjustable	4	2017751
Mounting kit 6	Swivel function, side bracket	4	2019506
Mounting kit 12	Swivel Mount	4	2030510

### Sliding nuts/sliding blocks

Type	Remark	Packing unit	Part number
Sliding block (sliding nuts)	Included with delivery	4	2017550

### Cable receptacles

Connection type	Cable alignment	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	6020757
	Angled	6020758

### Connection cables

Connection type	Cable alignment	Cable length	Part number
Hirschmann cable socket M26 x 11 + FE	Straight	2.5 m	2022544
		5 m	2022545
		7.5 m	2022546
		10 m	2022547
		15 m	2022548
		20 m	2022549
		30 m	2022550

Continued on next page

**Device columns**

→ Suitable device columns can be found beginning on page F-82

**Additional front screens**

Suitable for	Packing unit	Remark	Part number
M40x-0250xxxx	2	Including sliding blocks and mounting screws	2033225
M40x-0260xxxx			2033226
M40x-0322xxxx			2033227
M40x-0340xxxx			2033228
M40x-0345xxxx			2033229
M40x-0422xxxx			2033230
M40x-0522xxxx			2033231
M40x-0622xxxx			2033232
M40x-0722xxxx			2033233
M40x-0822xxxx			2033234

**Laser alignment aid**

Type	Type of light	Scanning range	Part number
Laser alignment aid AR60	Red light	Max. 60 m	1015741
AR60 adapter for M4000	—	—	4040006

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Configuration Tools**

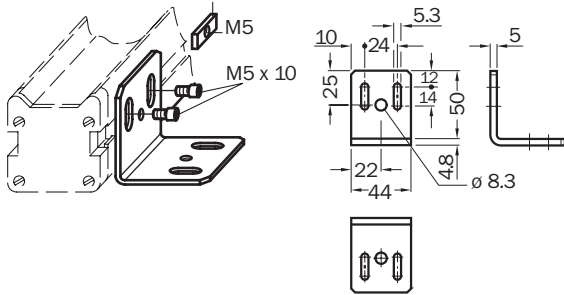
Type	Remark	Part number
Clone Plug for C4000 and M4000	For C4000 Standard / Advanced / Palletizer / Entry/ Exit and M4000 Advanced	1029665
Wall mount	Packing unit: 1	5318443
Protective cap	For Clone Plug / Host Guest Plug	5318293

**Power supply units**

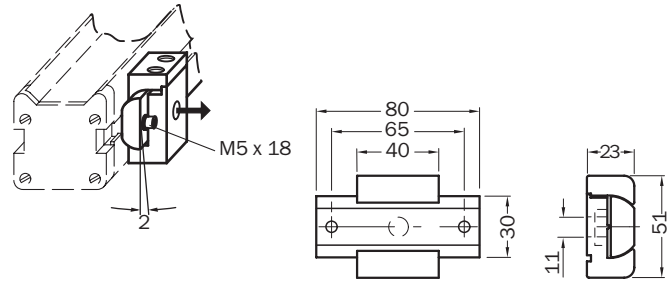
Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

Dimensional drawings mounting systems

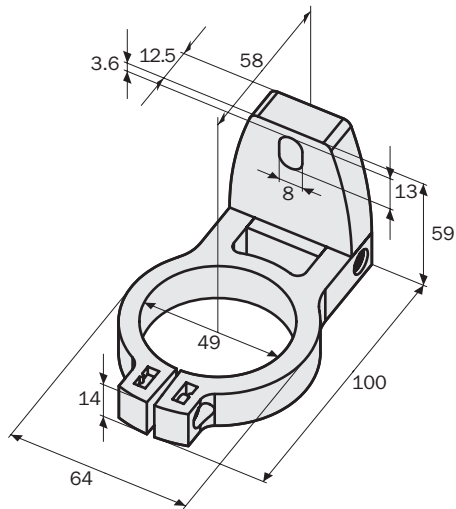
Mounting kit 1



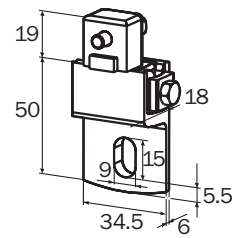
Mounting kit 2



Mounting kit 12



Mounting kit 6



Dimensions in mm

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- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
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→ Dimensional drawings	F-41
→ Connection diagram	F-42
→ Accessories	F-43
→ Dimensional drawings accessories	F-45
→ Services	A-2

## Overview of technical specifications

Scanning range (depending on type)	0 m ... 25 m / 0 m ... 70 m
Number of beams (depending on type)	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

## Product description

With its high signal reserve, the M2000 Standard multi-beam photoelectric safety switch is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept

achieves maximum machine security while taking into account economic considerations by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

## In-system added value

- Combination with safe control solutions from SICK

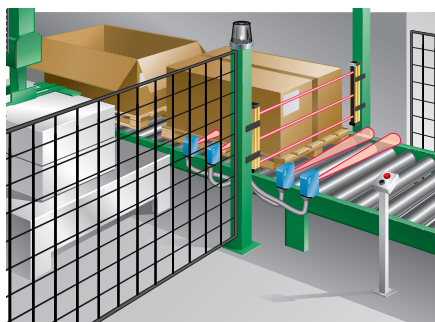
Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20	✓	✓	—	N-57
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S		Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

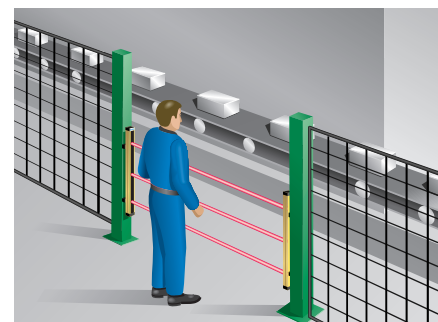
## Applications

→ For more applications please refer to the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Packaging industry: M2000 Standard with LE20 on a packaging machine



Storage and conveyor technology: M2000 on a conveyor belt system

## Ordering information

M2000 Standard

- With external device monitoring <sup>1)</sup> (EDM)
- Consisting of sender and receiver unit

→ Accessories see page F-43

### Scanning range 0 ... 25 m

Number of beams	Beam separation / Resolution (mm)	Connection plug	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE	M20S-02150A120	1016405	M20E-02150A120	1016421
		M12, 8-pin	M20S-02150A122	1018186	M20E-02150A122	1018187
3	400	Hirschmann 6-pin + PE	M20S-03140A120	1016428	M20E-03140A120	1016429
		M12, 8-pin	M20S-03140A122	1018188	M20E-03140A122	1018189
4	300	Hirschmann 6-pin + PE	M20S-04130A120	1016509	M20E-04130A120	1016510
		M12, 8-pin	M20S-04130A122	1018190	M20E-04130A122	1018191
6	170	Hirschmann 6-pin + PE	M20S-061A3A120	1016446	M20E-061A3A120	1016447
		M12, 8-pin	M20S-061A3A122	1018192	M20E-061A3A122	1018193
7	170	Hirschmann 6-pin + PE	M20S-071A3A120	1016434	M20E-071A3A120	1016435
		M12, 8-pin	M20S-071A3A122	1018194	M20E-071A3A122	1018195
8	116	Hirschmann 6-pin + PE	M20S-081A2A120	1016438	M20E-081A2A120	1016439
		M12, 8-pin	M20S-081A2A122	1018196	M20E-081A2A122	1018197
	170	Hirschmann 6-pin + PE	M20S-081A3A120	1016440	M20E-081A3A120	1016441
		M12, 8-pin	M20S-081A3A122	1018198	M20E-081A3A122	1018199
9	170	Hirschmann 6-pin + PE	M20S-091A3A120	1016442	M20E-091A3A120	1016443
		M12, 8-pin	M20S-091A3A122	1018200	M20E-091A3A122	1018201

### Scanning range 0 ... 70 m

Number of beams	Beam separation (mm)	Connection plug	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE	M20S-02250A120	1018172	M20E-02250A120	1018173
		M12, 8-pin	M20S-02250A122	1018174	M20E-02250A122	1018175
3	400	Hirschmann 6-pin + PE	M20S-03240A120	1018176	M20E-03240A120	1018177
		M12, 8-pin	M20S-03240A122	1018178	M20E-03240A122	1018179
4	300	Hirschmann 6-pin + PE	M20S-04230A120	1018180	M20E-04230A120	1018181
		M12, 8-pin	M20S-04230A122	1018182	M20E-04230A122	1018183

<sup>1)</sup> External device monitoring only available with devices with M12 plug!

## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Scanning range (depending on type)	0 m ... 25 m / 0 m ... 70 m
Number of beams (depending on type)	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC

### Sender unit

Power consumption	Max. 3.7 W
-------------------	------------

### Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 8 ms
Switching voltage	$V_S - 2.25\text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 5 W

### Operating data

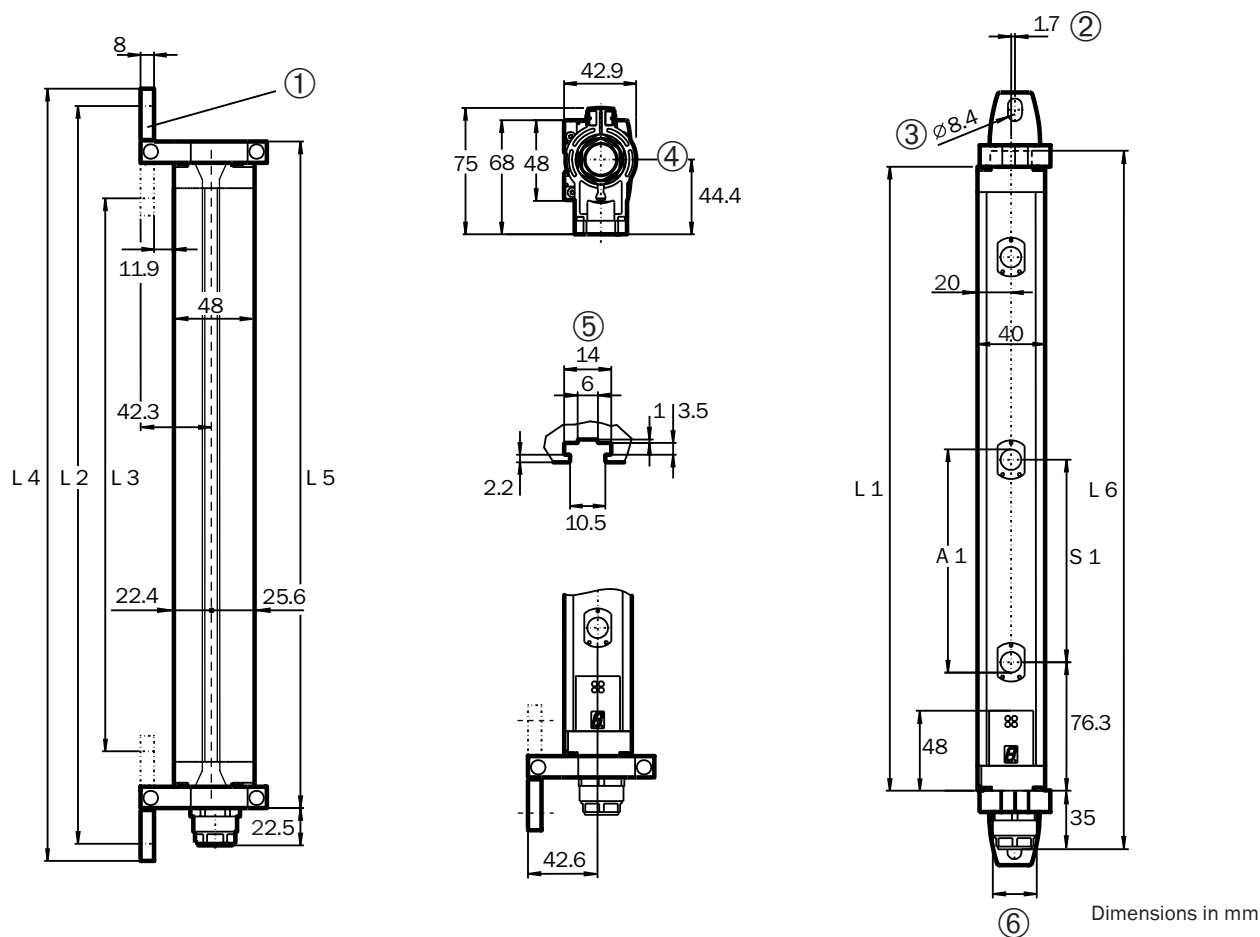
Connection type (depending on type)	Hirschmann plug 6-pin + PE M12 plug, 8-pin
Connection cable wire cross-section	Hirschmann plug M12 plug Max. 1 mm <sup>2</sup> Max. 0.25 mm <sup>2</sup>
Connection cable length	for wire cross-section 1 mm <sup>2</sup> for wire cross-section 0.25 mm <sup>2</sup> Max. 60 m Max. 15 m
Ambient operating temperature $T_A$	0 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	1.25 kg ... 2.86 kg

F



# Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at [www.sick.com](http://www.sick.com)



Sender unit with swivel mount (receiver unit mirror image)

- ① Mounting clamp
- ② Centre of light beam offset
- ③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Plug PG13.5 according to DIN 43651

N	S 1	A 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	—	630	697	588	718	655	675
3	400	—	931	998	888	1019	956	976
4	300	—	1031	1098	989	1119	1056	1076
8	—	116	851	919	809	939	877	896
6	—	170	916	983	874	1004	941	960
7	—	170	1073	1140	1031	1161	1098	1118
8	—	170	1231	1298	1189	1319	1256	1275
9	—	170	1388	1455	1346	1476	1413	1433

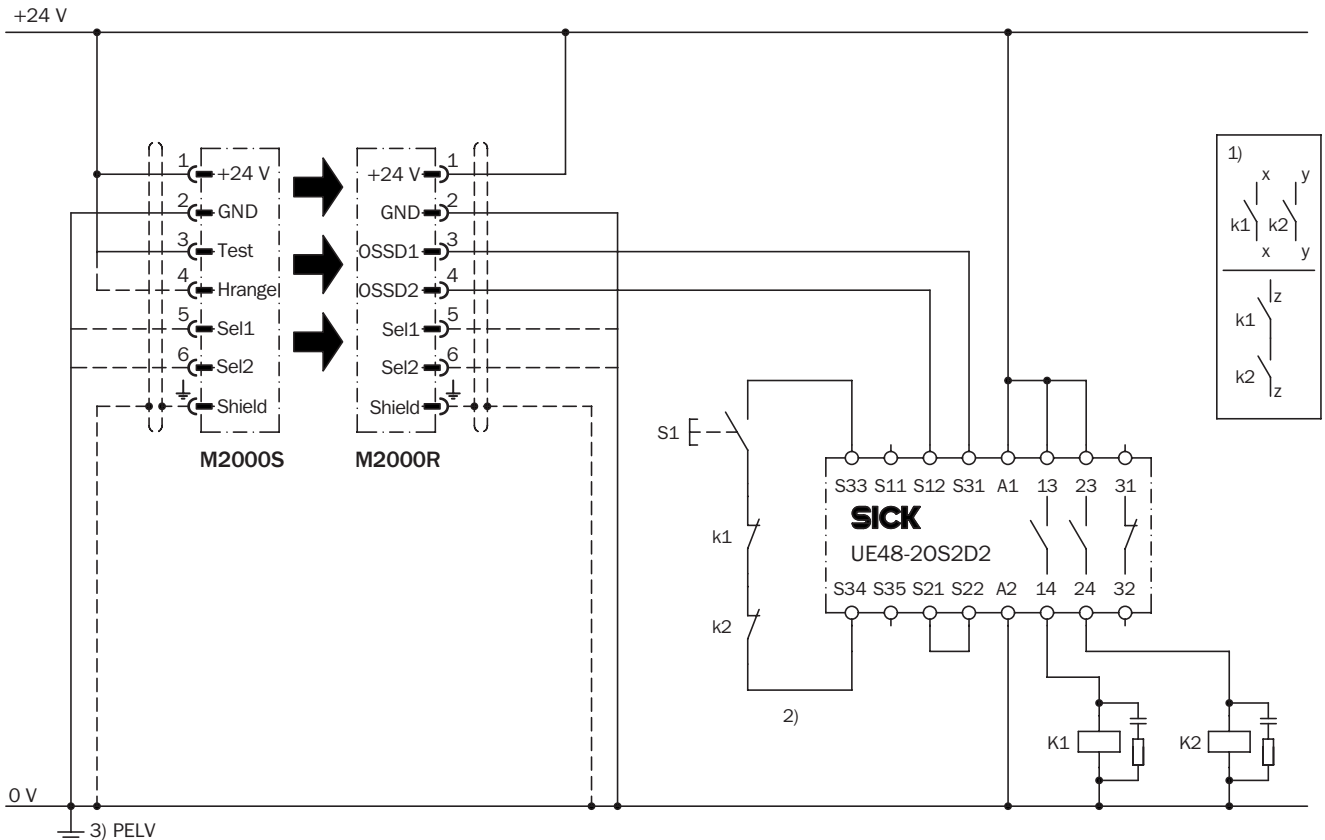
**N** Number of beams  
**S 1** Beam separation  
**A 1** Resolution

Dimensions in mm

## Connection diagram

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### M2000 Standard on UE48-20S safety relay



#### Task

Interfacing an M2000 Standard multi-beam photoelectric safety switch to UE48-20S. Operating mode with restart interlock and external device monitoring.

#### Function

If the light path is clear, the OSSD1 and OSSD2 outputs are live. The system is ready to switch on if K1 and K2 are de-energised. By pressing S1 (button is pressed and released) the UE48 relay is energised and its contacts 13-14 and 23-24 activate K1 and K2. On interruption of one of the light beams, the UE48-20S is de-energised by the OSSD1 and OSSD2 outputs and K1 and K2 are deactivated.

#### Possible faults




Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of one of the K1 or K2 contactors will be detected and does not result in the loss of the shutdown function. Jamming of the S1 button will prevent the UE48-20S from enabling.

#### Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) The external device monitoring is only static.
- 3) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFSafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page F-45

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> </ul>	2019659
Mounting kit 6	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Side bracket</li> </ul>	2019506
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Large housing profile</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> </ul>	2026850

Continued on next page

**Connector technology**

System connection	Designation	Description	Connection cable	Part number
Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> <li>6-pin + PE</li> <li>Straight</li> </ul>	—	6006612
		<ul style="list-style-type: none"> <li>6-pin + PE</li> <li>Angled with screw connections</li> </ul>	—	6007363
M12 plug	M12 cable socket	<ul style="list-style-type: none"> <li>8-pin</li> <li>Straight</li> </ul>	2.5 m	6020537
			5.0 m	6020354
			7.5 m	6020353
		<ul style="list-style-type: none"> <li>8-pin</li> <li>Angled</li> </ul>	10.0 m	6020352
			15.0 m	6020872
			5.0 m	6021342
		15.0 m	6021343	

**Device columns**

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> <li>2-beam, 500 mm beam separation</li> <li>Including mounting kit</li> </ul>	2021328
	<ul style="list-style-type: none"> <li>3-beam, 400 mm beam separation</li> <li>Including mounting kit</li> </ul>	2021329
Device column with front screen <sup>1)</sup>	<ul style="list-style-type: none"> <li>Length 1200 mm</li> <li>Including mounting kit</li> </ul>	2021330
	<ul style="list-style-type: none"> <li>Length 1500 mm</li> <li>Including mounting kit</li> </ul>	2021331
	<ul style="list-style-type: none"> <li>Length 1700 mm</li> <li>Including mounting kit</li> </ul>	2021332

<sup>1)</sup> Warning, reduction of the scanning range!

**Device columns for outdoor use**

Designation	Description	Part number
Device column with heating 220 V	<ul style="list-style-type: none"> <li>Suitable for M20-02x50Axxx</li> <li>With brackets and cable socket</li> <li>Without photoelectric safety switch</li> </ul>	2023707
	<ul style="list-style-type: none"> <li>Suitable for M20-03x40Axxx</li> <li>With brackets and cable socket</li> <li>Without photoelectric safety switch</li> </ul>	2025441

**Mirror columns <sup>1)</sup>**

Designation	Description	Part number
Mirror column, fully assembled with mirrors	<ul style="list-style-type: none"> <li>Suitable for M20x-02xxxxx, 2-beam, 500 mm beam separation</li> </ul>	1015041
	<ul style="list-style-type: none"> <li>Suitable for M20x-03xxxxx, 3-beam, 400 mm beam separation</li> </ul>	1015040
	<ul style="list-style-type: none"> <li>Suitable for M20x-04xxxxx, 4-beam, 300 mm beam separation</li> </ul>	1019115

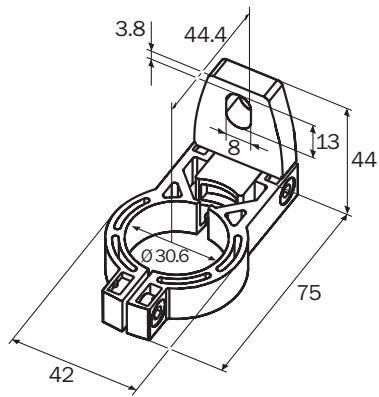
<sup>1)</sup> Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns and mirror columns please refer to page F-82

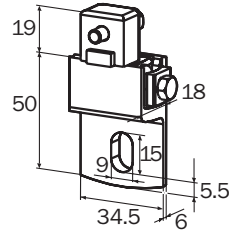
**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

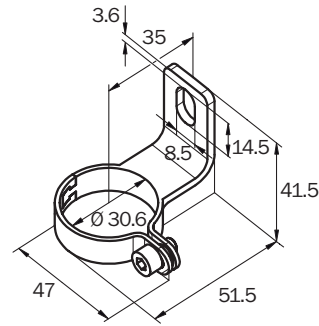
Dimensional drawings mounting systems



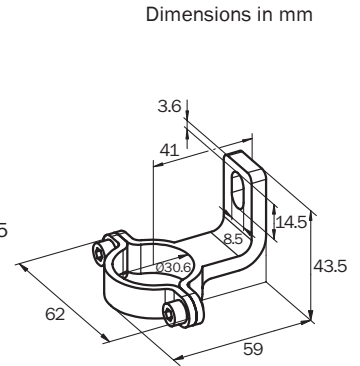
Swivel mount  
Mounting kit 2



Side bracket  
Mounting kit 6



Stainless steel bracket



Reinforced stainless steel bracket

Dimensions in mm





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- High durability
- Compact design
- External device monitoring (EDM)
- Self-testing
- On-site diagnostics
- Beam coding



Further information	Page
→ Dimensional drawings	F-48
→ Connection diagram	F-42
→ Accessories	F-49
→ Dimensional drawings accessories	F-50
→ Services	A-2

## Overview of technical specifications

Resistant materials	Stainless steel (V4A), PMMA, PA, PVC
Enclosure rating	IP 67
Scanning range	0 m ... 19 m
Number of beams (depending on type)	2 / 3 / 4
Beam separation (depending on type)	300 mm / 400 mm / 500 mm
Type	Type 2 according to EN 61496

## Product description

The IP67 Housing in conjunction with the multi-beam photoelectric safety switch M2000 achieves the enclosure rating IP 67. The materials used (V4A, PMMA, PA, PVC) have a high level of resistance against common cleaning agents.

A compensating element (membrane) prevents the plastic tubes misting up and the entry of liquids. The cable is fed into the device through the proven PG connector.

## In-system added value

- Combination with safe control solutions from SICK

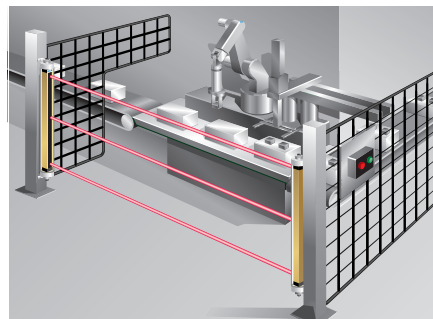
Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20	✓	✓	—	N-57
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S	Relay module			N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ For more applications please refer to the application finder at [www.sick.com](http://www.sick.com)

- Packaging industry
- Food industry
- Chemical industry
- Pharmaceutical industry
- Clean-room systems



Access protection on a processing centre in the hygiene area

## Ordering information

IP67 Housing with integrated sender or receiver unit M2000, including 15 m PVC cable

→ Accessories see page F-49

Scanning range 0 ... 19 m

Number of beams	Beam separation (mm)	Sender unit		Receiver unit	
		Type	Part number	Type	Part number
2	500	M25S-02150C112	1024208	M25E-02150C112	1024209
3	400	M25S-03140C112	1024210	M25E-03140C112	1024211
4	300	M25S-04130C112	1024212	M25E-04130C112	1024213

## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### M2000 Standard in IP67 Housing

→ M2000 specific data see M2000 Standard, page F-40

Scanning range	0 m ... 19 m								
Number of beams (depending on type)	2 / 3 / 4								
Beam separation (depending on type)	300 mm / 400 mm / 500 mm								
Enclosure rating	IP 66, IP 67								
Type	Type 2 according to EN 61496								
Materials	<table border="0"> <tr> <td>End caps</td> <td>Stainless steel</td> </tr> <tr> <td>Plastic tube</td> <td>PMMA</td> </tr> <tr> <td>Compensating element (membrane)</td> <td>PA 6</td> </tr> <tr> <td>PG connector</td> <td>PA 6</td> </tr> </table>	End caps	Stainless steel	Plastic tube	PMMA	Compensating element (membrane)	PA 6	PG connector	PA 6
End caps	Stainless steel								
Plastic tube	PMMA								
Compensating element (membrane)	PA 6								
PG connector	PA 6								
Ambient operating temperature $T_A$	0 °C ... +55 °C								
Storage temperature $T_S$	-25 °C ... +70 °C								

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Dimensional drawings

F

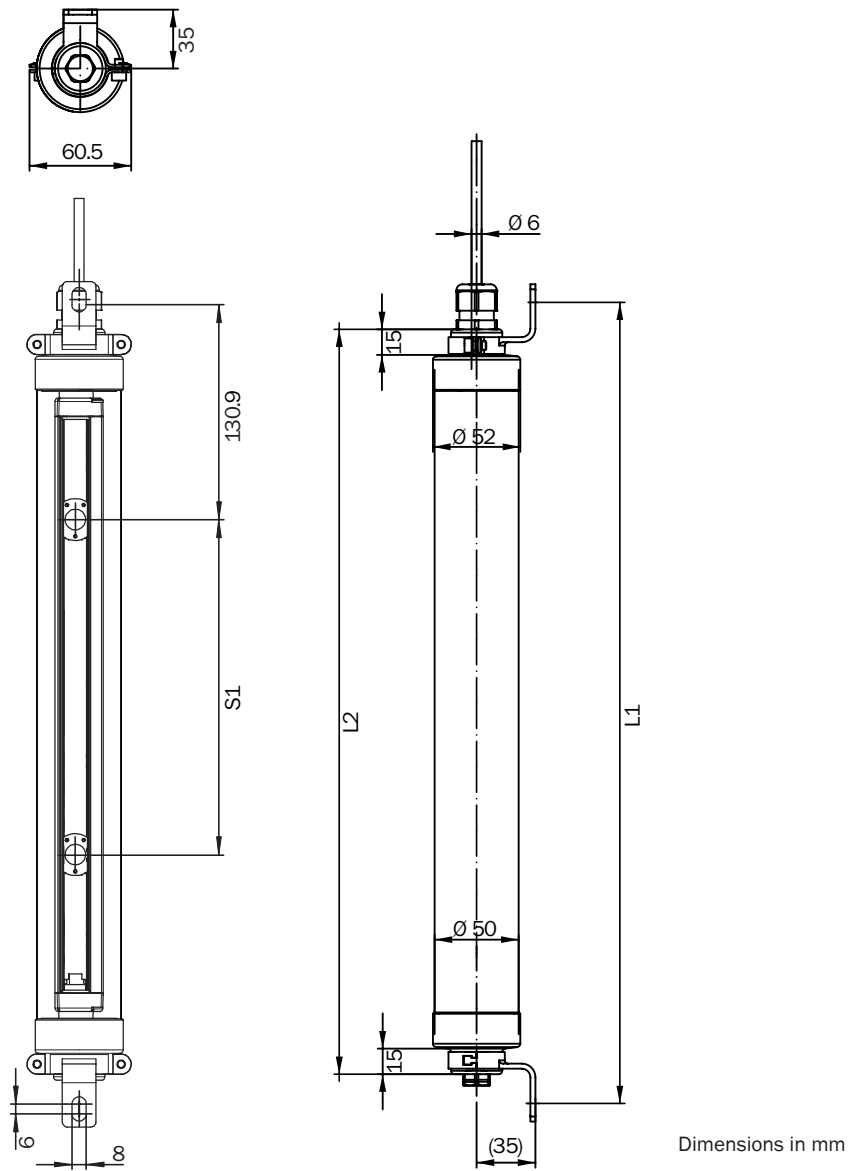


Illustration with stainless steel bracket (not supplied with delivery)

Number of beams	Beam separation S 1	L 1	L 2
2	500	777	744
3	400	1078	1045
4	300	1228	1195




Dimensions in mm



## Connection diagram

- Connection diagram M2000 Standard on safety relay UE48 see page F-42
- You can find more connection diagrams at [www.sick.com](http://www.sick.com)

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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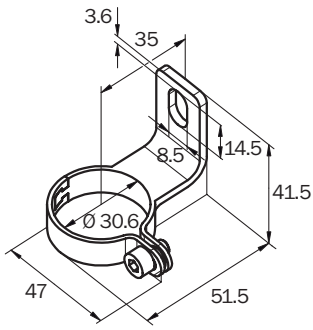
## Accessories

### Mounting systems

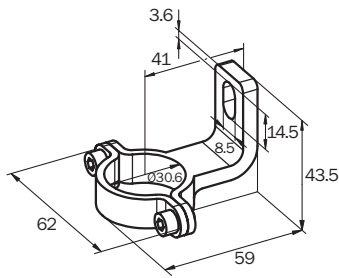
- Dimensional drawings mounting systems see page F-50

Designation	Description	Part number
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> </ul>	2026850
Stainless steel support bracket	<ul style="list-style-type: none"> <li>▪ 2 pieces</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> </ul>	2026849
Mounting key	<ul style="list-style-type: none"> <li>▪ For M12 cable socket on device replacement</li> </ul>	4034690
Venting membrane	—	5309082

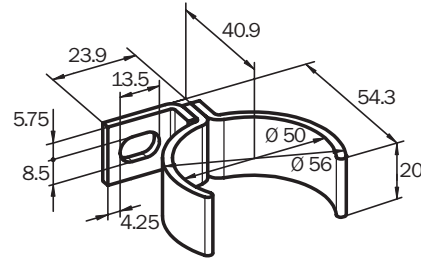
Dimensional drawings mounting systems



Stainless steel bracket



Reinforced stainless steel bracket



Stainless steel support bracket

Dimensions in mm



Mounting key

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## Overview of technical specifications

Scanning range (depending on type)	0 m ... 25 m / 0 m ... 70 m
Number of beams (depending on type)	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

## Product description

With its high signal reserve, the M2000 RES/EDM multi-beam photoelectric safety switch is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtimes. The modular concept achieves maximum machine security while taking into account economic considera-

tions by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

The integrated restart interlock in the M2000 RES/EDM offers the advantages of shorter cable runs and quicker commissioning compared to traditional solutions.

## In-system added value

### ■ Combination with safe control solutions from SICK

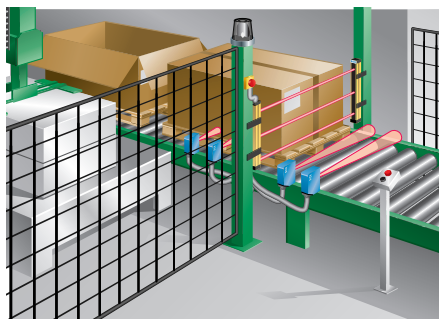
Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S		Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

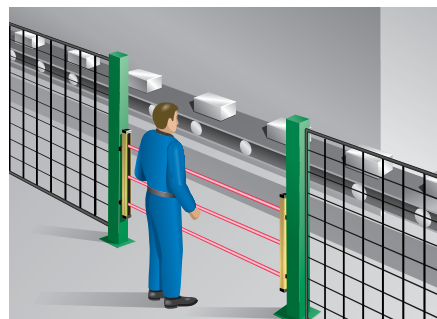
## Applications

→ For more applications please refer to the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



Packaging industry: M2000 RES/EDM with LE20 on a packaging machine



Storage and conveyor technology: M2000 on a conveyor belt system



- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



Further information	Page
→ Ordering information	F-52
→ Technical specifications	F-53
→ Dimensional drawings	F-54
→ Connection diagram	F-55
→ Accessories	F-56
→ Dimensional drawings accessories	F-58
→ Services	A-2

## Ordering information

M2000 RES/EDM

- With restart interlock (RES) and external device monitoring (EDM)
- For usage as a stand-alone system
- Consisting of sender and receiver unit

→ Accessories see page F-56

### Scanning range 0 ... 25 m

Number of beams	Beam separation / Resolution (mm)	Connection plug Sender unit / Receiver unit	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE / 11-pin + PE	M20S-02150A120	1016405	M20E-02150A221	1018032
		M12, 8-pin	M20S-02150A122	1018186	M20E-02150A222	1018213
3	400	Hirschmann 6-pin + PE / 11-pin + PE	M20S-03140A120	1016428	M20E-03140A221	1018034
		M12, 8-pin	M20S-03140A122	1018188	M20E-03140A222	1018215
4	300	Hirschmann 6-pin + PE / 11-pin + PE	M20S-04130A120	1016509	M20E-04130A221	1018217
		M12, 8-pin	M20S-04130A122	1018190	M20E-04130A222	1018219
6	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-061A3A120	1016446	M20E-061A3A221	1018221
		M12, 8-pin	M20S-061A3A122	1018192	M20E-061A3A222	1018223
7	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-071A3A120	1016434	M20E-071A3A221	1018225
		M12, 8-pin	M20S-071A3A122	1018194	M20E-071A3A222	1018227
8	116	Hirschmann 6-pin + PE / 11-pin + PE	M20S-081A2A120	1016438	M20E-081A2A221	1018229
		M12, 8-pin	M20S-081A2A122	1018196	M20E-081A2A222	1018231
	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-081A3A120	1016440	M20E-081A3A221	1018233
		M12, 8-pin	M20S-081A3A122	1018198	M20E-081A3A222	1018235
9	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-091A3A120	1016442	M20E-091A3A221	1018036
		M12, 8-pin	M20S-091A3A122	1018200	M20E-091A3A222	1018237

### Scanning range 0 ... 70 m

Number of beams	Beam separation (mm)	Connection plug Sender unit / Receiver unit	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE / 11-pin + PE	M20S-02250A120	1018172	M20E-02250A221	1018206
		M12, 8-pin	M20S-02250A122	1018174	M20E-02250A222	1018207
3	400	Hirschmann 6-pin + PE / 11-pin + PE	M20S-03240A120	1018176	M20E-03240A221	1018208
		M12, 8-pin	M20S-03240A122	1018178	M20E-03240A222	1018209
4	300	Hirschmann 6-pin + PE / 11-pin + PE	M20S-04230A120	1018180	M20E-04230A221	1018210
		M12, 8-pin	M20S-04230A122	1018182	M20E-04230A222	1018211

## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Scanning range (depending on type)	0 m ... 25 m / 0 m ... 70 m
Number of beams (depending on type)	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC

### Sender unit

Power consumption	Max. 3.7 W
-------------------	------------

### Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 8 ms
Switching voltage	$V_S - 2.25 V$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 5 W

### Operating data

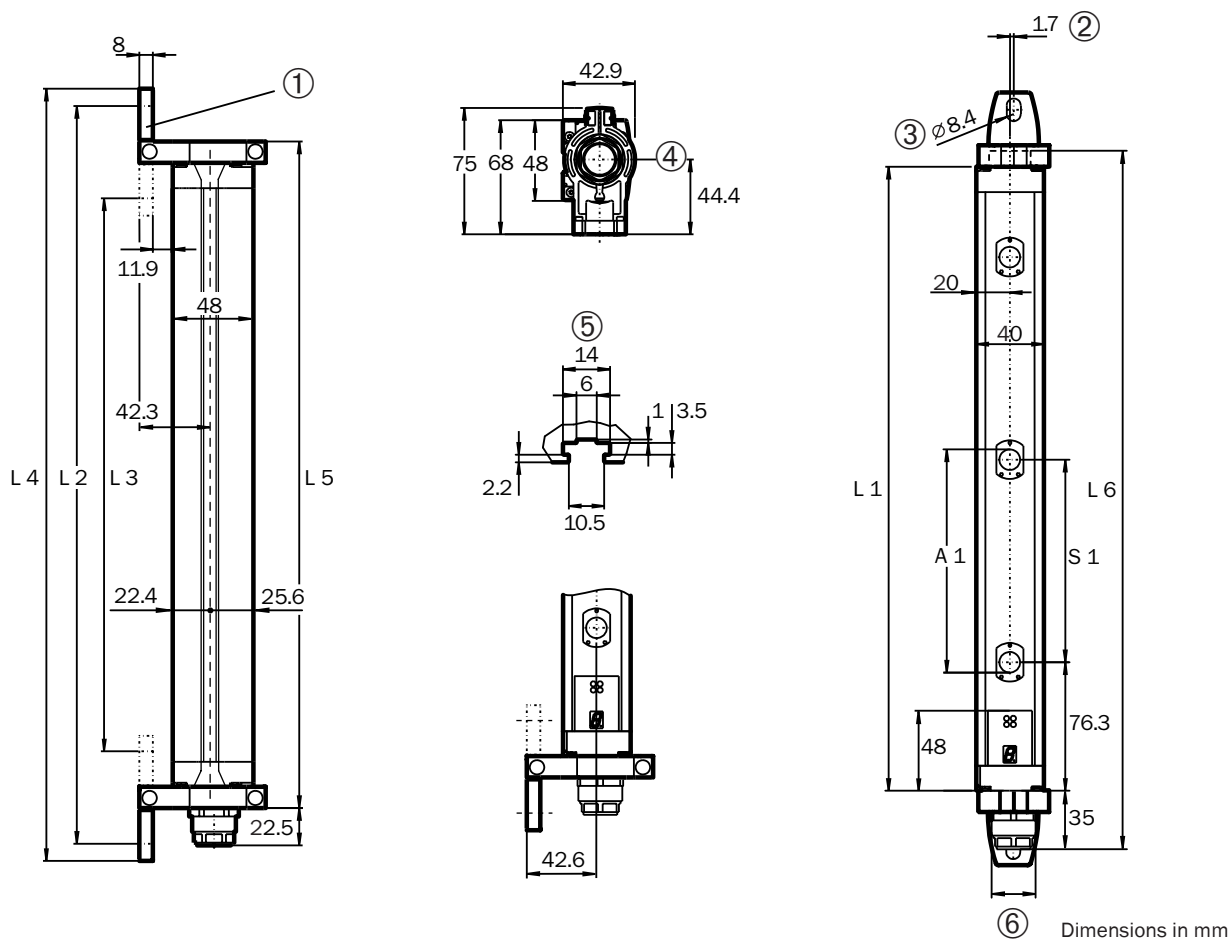
Connection type (depending on type)	Hirschmann plug (sender unit: 6-pin + PE, receiver unit: 11-pin + PE) M12 plug, 8-pin
Connection cable wire cross-section	Hirschmann plug M12 plug Max. 1 mm <sup>2</sup> Max. 0.25 mm <sup>2</sup>
Connection cable length	for wire cross-section 1 mm <sup>2</sup> for wire cross-section 0.25 mm <sup>2</sup> Max. 60 m Max. 15 m
Ambient operating temperature $T_A$	0 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	1.25 kg ... 2.86 kg

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# Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at [www.sick.com](http://www.sick.com)

F



Sender unit with swivel mount (receiver unit not mirror image. Dimensions as M2000 Cascadable, see page F-62)

- ① Mounting clamp
- ② Centre of light beam offset
- ③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ④ Adjustment
- ⑤ Sliding nut groove for side mounting
- ⑥ Plug PG13.5 according to DIN 43651

N	S 1	A 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	—	630	697	588	718	655	675
3	400	—	931	998	888	1019	956	976
4	300	—	1031	1098	989	1119	1056	1076
8	—	116	851	919	809	939	877	896
6	—	170	916	983	874	1004	941	960
7	—	170	1073	1140	1031	1161	1098	1118
8	—	170	1231	1298	1189	1319	1256	1275
9	—	170	1388	1455	1346	1476	1413	1433

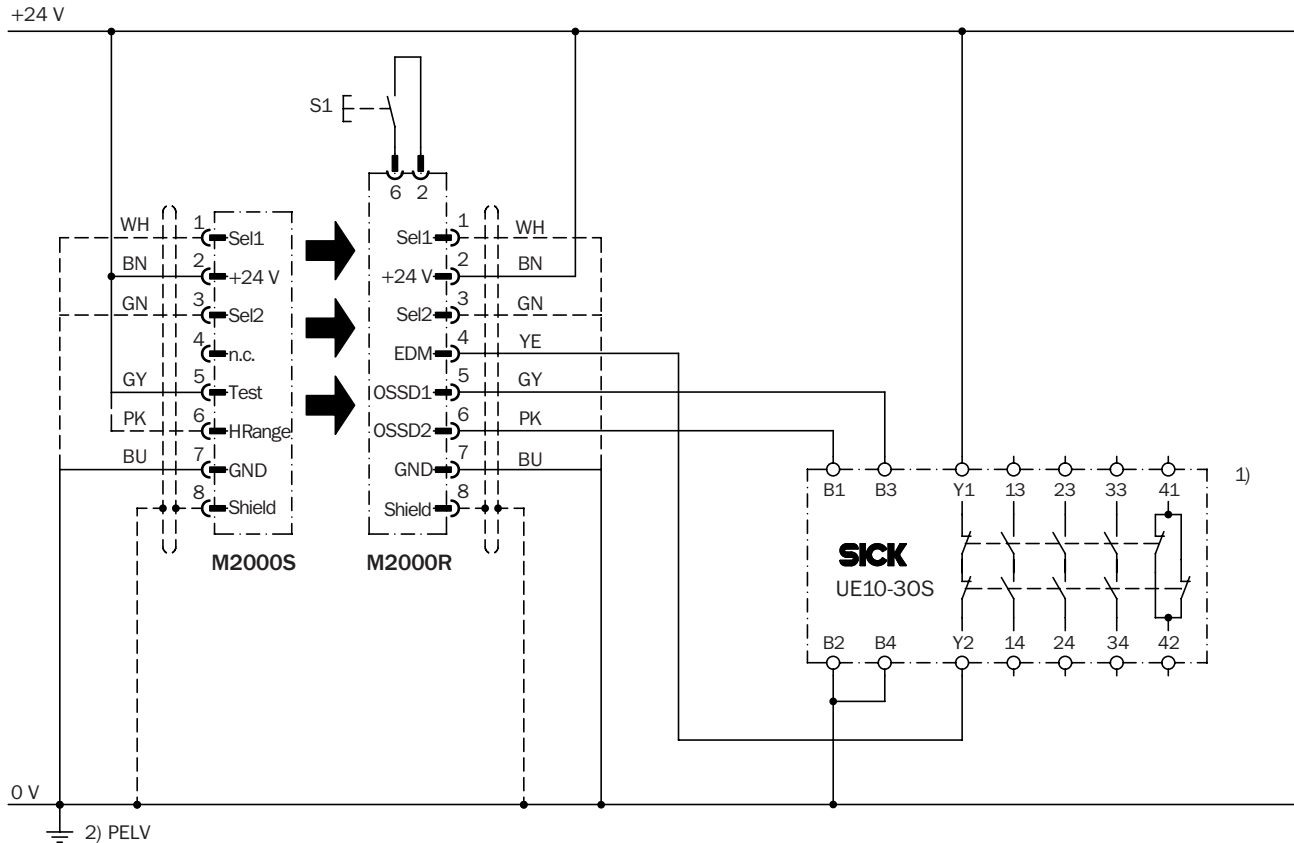
Dimensions in mm

- N Number of beams
- S 1 Beam separation
- A 1 Resolution

## Connection diagram

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### M2000 RES/EDM on UE10-30S safety relay



#### Task

Interfacing an M2000 RES/EDM multi-beam photoelectric safety switch to UE10-30S. Operating mode with restart interlock and external device monitoring.

#### Function

The yellow LED on the receiver flashes when the light path is clear and the UE10-30S is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-30S is switched on. On the interruption of one of the light beams, the UE10-30S is deactivated by the OSSD1 and OSSD2 outputs.

#### Possible faults

Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10 will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.




#### Comments

<sup>1)</sup> Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

<sup>2)</sup> PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page F-58

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> </ul>	2019659
Mounting kit 6	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Side bracket</li> </ul>	2019506
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Large housing profile</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> </ul>	2026850



**Connector technology**

Connection	Designation	Description	Connection cable	Part number
System connection Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> <li>6-pin + PE</li> <li>Straight</li> </ul>	—	6006612
		<ul style="list-style-type: none"> <li>6-pin + PE</li> <li>Angled with screw connections</li> </ul>	—	6007363
		<ul style="list-style-type: none"> <li>11-pin + PE</li> <li>Straight</li> </ul>	—	6020757
		<ul style="list-style-type: none"> <li>11-pin + PE</li> <li>Angled</li> </ul>	—	6020758
System connection M12 plug	M12 cable socket	<ul style="list-style-type: none"> <li>8-pin</li> <li>Straight</li> </ul>	2.5 m	6020537
			5.0 m	6020354
			7.5 m	6020353
			10.0 m	6020352
			15.0 m	6020872
		<ul style="list-style-type: none"> <li>8-pin</li> <li>Angled</li> </ul>	5.0 m	6021342
		15.0 m	6021343	
Extension connection	M12 cable plug	<ul style="list-style-type: none"> <li>For the connection of a control switch</li> <li>8-pin</li> <li>Straight</li> </ul>	5 m	6021204
			15 m	6021205
		<ul style="list-style-type: none"> <li>For the connection of a control switch</li> <li>8-pin</li> <li>Angled</li> </ul>	5 m	6021830
			15 m	6021831
		M12 plug	<ul style="list-style-type: none"> <li>For deactivation of the integrated restart interlock</li> <li>Pre-assembled</li> </ul>	—

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**Device columns**

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> <li>2-beam, 500 mm beam separation</li> <li>Including mounting kit</li> </ul>	2021328
	<ul style="list-style-type: none"> <li>3-beam, 400 mm beam separation</li> <li>Including mounting kit</li> </ul>	2021329
Device column with front screen <sup>1)</sup>	<ul style="list-style-type: none"> <li>Length 1200 mm</li> <li>Including mounting kit</li> </ul>	2021330
	<ul style="list-style-type: none"> <li>Length 1500 mm</li> <li>Including mounting kit</li> </ul>	2021331
	<ul style="list-style-type: none"> <li>Length 1700 mm</li> <li>Including mounting kit</li> </ul>	2021332

<sup>1)</sup> Warning, reduction of the scanning range!

**Device columns for outdoor use**

Designation	Description	Part number
Device column with heating 220 V	<ul style="list-style-type: none"> <li>Suitable for M20-02x50Axxx</li> <li>With brackets and cable socket</li> <li>Without photoelectric safety switch</li> </ul>	2023707
	<ul style="list-style-type: none"> <li>Suitable for M20-03x40Axxx</li> <li>With brackets and cable socket</li> <li>Without photoelectric safety switch</li> </ul>	2025441

Continued on next page

**Mirror columns <sup>1)</sup>**

Designation	Description	Part number
Mirror column, fully assembled with mirrors	▪ Suitable for M20x-02xxxx, 2-beam, 500 mm beam separation	1015041
	▪ Suitable for M20x-03xxxx, 3-beam, 400 mm beam separation	1015040
	▪ Suitable for M20x-04xxxx, 4-beam, 300 mm beam separation	1019115

<sup>1)</sup> Warning, reduction of the scanning range!

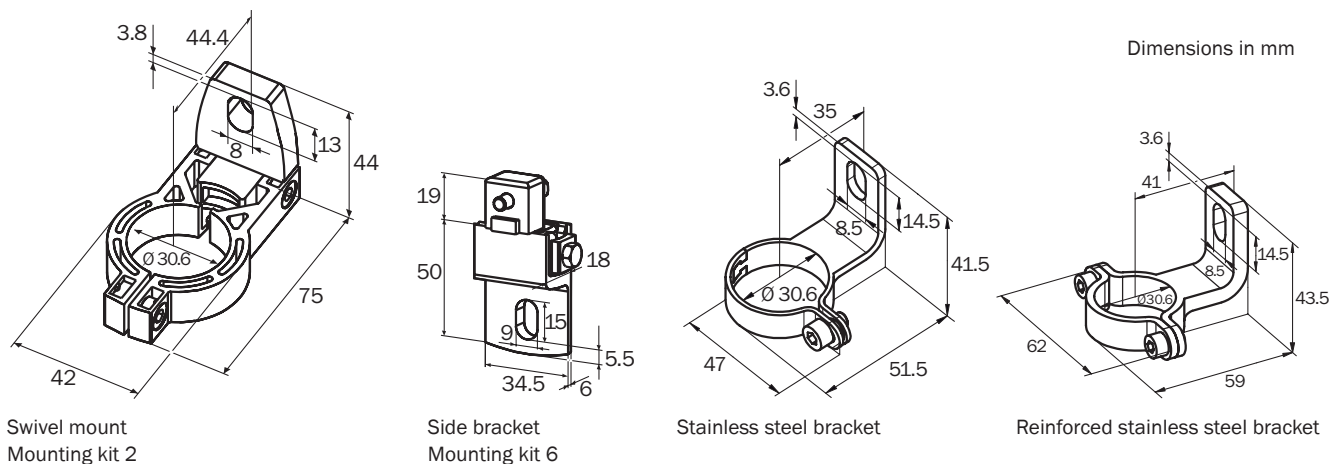
→ For dimensional drawings of the device columns and mirror columns please refer to page F-82

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

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**Dimensional drawings mounting systems**



## Overview of technical specifications

Scanning range	0 m ... 25 m
Number of beams	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

## Product description

With its high signal reserve, the M2000 Cascadable multi-beam photoelectric safety switch is also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtime. The modular concept achieves maximum machine security while taking into account economic consid-

erations by precisely co-ordinating the characteristics of the device to the requirements. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

With the cascadable variants, photoelectric safety switches can be flexibly adapted to the existing installation.

## In-system added value

- Combination with safe control solutions from SICK

Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20	✓	✓	—	N-57
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S		Relay module		N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ For more applications please refer to the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



- Cascade
  - Max. 3 devices
  - Max. 3 m cable length
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid
- Beam coding



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→ Dimensional drawings	F-62
→ Connection diagram	F-63
→ Accessories	F-64
→ Dimensional drawings accessories	F-66
→ Services	A-2

## Ordering information

M2000 Cascadable

- With integrated external device monitoring function (EDM)
- For usage as cascaded device
- Consisting of sender and receiver unit

→ Accessories see page F-64

### Scanning range 0 ... 25 m

Number of beams	Beam separation / Resolution (mm)	Connection plug Sender unit / Receiver unit	Sender unit		Receiver unit	
			Type	Part number	Type	Part number
2	500	Hirschmann 6-pin + PE / 11-pin + PE	M20S-02150A220	1018031	M20E-02150A221	1018032
		M12, 8-pin	M20S-02150A222	1018212	M20E-02150A222	1018213
3	400	Hirschmann 6-pin + PE / 11-pin + PE	M20S-03140A220	1018033	M20E-03140A221	1018034
		M12, 8-pin	M20S-03140A222	1018214	M20E-03140A222	1018215
4	300	Hirschmann 6-pin + PE / 11-pin + PE	M20S-04130A220	1018216	M20E-04130A221	1018217
		M12, 8-pin	M20S-04130A222	1018218	M20E-04130A222	1018219
6	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-061A3A220	1018220	M20E-061A3A221	1018221
		M12, 8-pin	M20S-061A3A222	1018222	M20E-061A3A222	1018223
7	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-071A3A220	1018224	M20E-071A3A221	1018225
		M12, 8-pin	M20S-071A3A222	1018226	M20E-071A3A222	1018227
8	116	Hirschmann 6-pin + PE / 11-pin + PE	M20S-081A2A220	1018228	M20E-081A2A221	1018229
		M12, 8-pin	M20S-081A2A222	1018230	M20E-081A2A222	1018231
	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-081A3A220	1018232	M20E-081A3A221	1018233
		M12, 8-pin	M20S-081A3A222	1018234	M20E-081A3A222	1018235
9	170	Hirschmann 6-pin + PE / 11-pin + PE	M20S-091A3A220	1018035	M20E-091A3A221	1018036
		M12, 8-pin	M20S-091A3A222	1018236	M20E-091A3A222	1018237

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## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Scanning range	0 m ... 25 m
Number of beams	2 ... 9
Beam separation or resolution (depending on type)	116 mm / 170 mm / 300 mm / 400 mm / 500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC

### Sender unit

Power consumption	Max. 3.7 W
-------------------	------------

### Receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 8 ms
Switching voltage	$V_S - 2.25 V$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 5 W

### Operating data

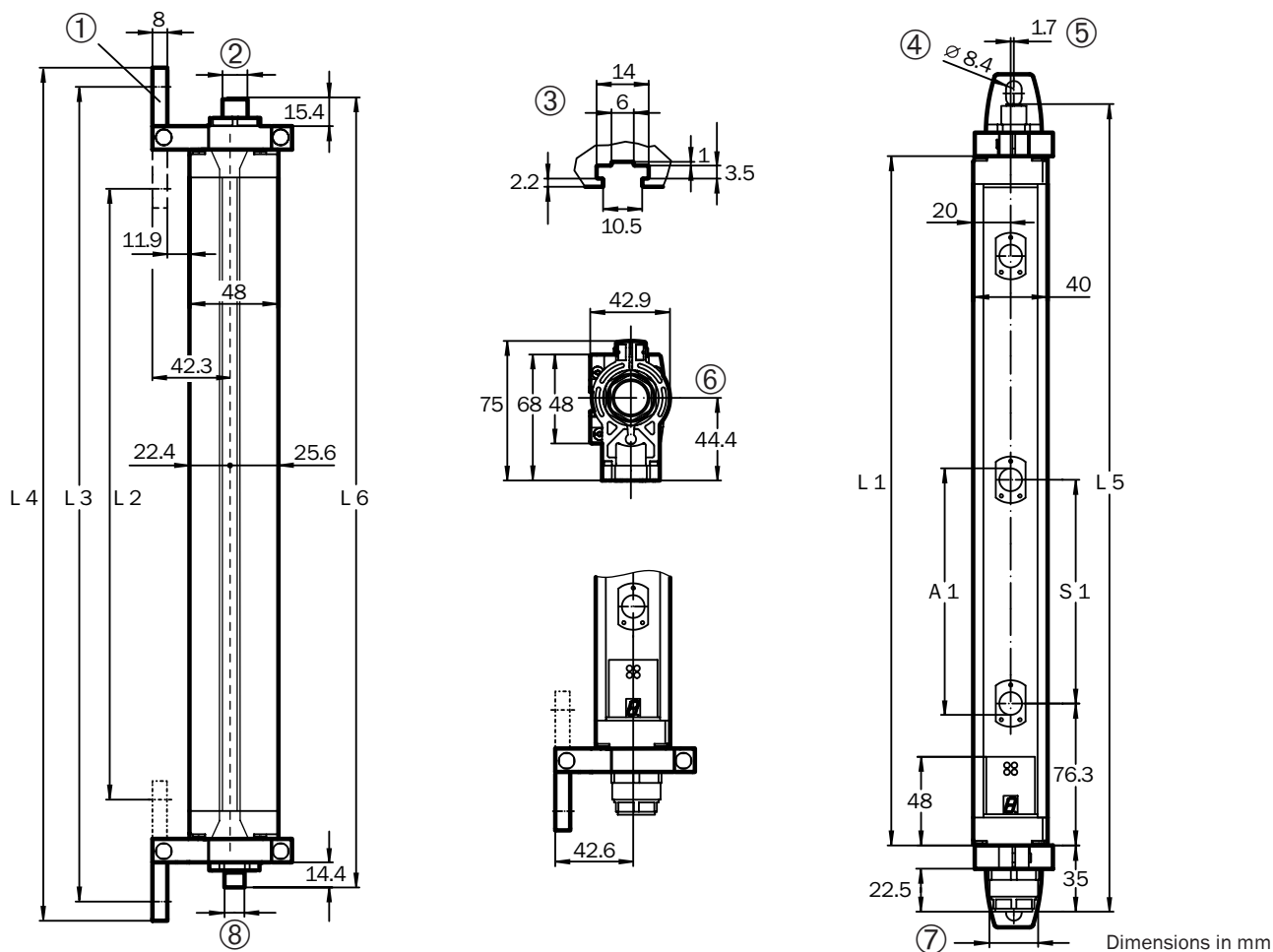
Connection type (depending on type)	Hirschmann plug (sender unit: 6-pin + PE, receiver unit: 11-pin + PE) M12 plug, 8-pin
Connection cable wire cross-section	Hirschmann plug M12 plug Max. 1 mm <sup>2</sup> Max. 0.25 mm <sup>2</sup>
Connection cable length	for wire cross-section 1 mm <sup>2</sup> for wire cross-section 0.25 mm <sup>2</sup> Max. 60 m Max. 15 m
Ambient operating temperature $T_A$	0 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	1.25 kg ... 2.86 kg

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# Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at [www.sick.com](http://www.sick.com)

F



Sender unit with swivel mount (receiver unit mirror image)

- ① Mounting clamp
- ② M12 x 1 socket (standard)
- ③ Sliding nut groove for side mounting
- ④ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ⑤ Centre of light beam offset
- ⑥ Adjustment
- ⑦ Plug PG13.5 according to DIN 43651
- ⑧ Plug M12 x 1

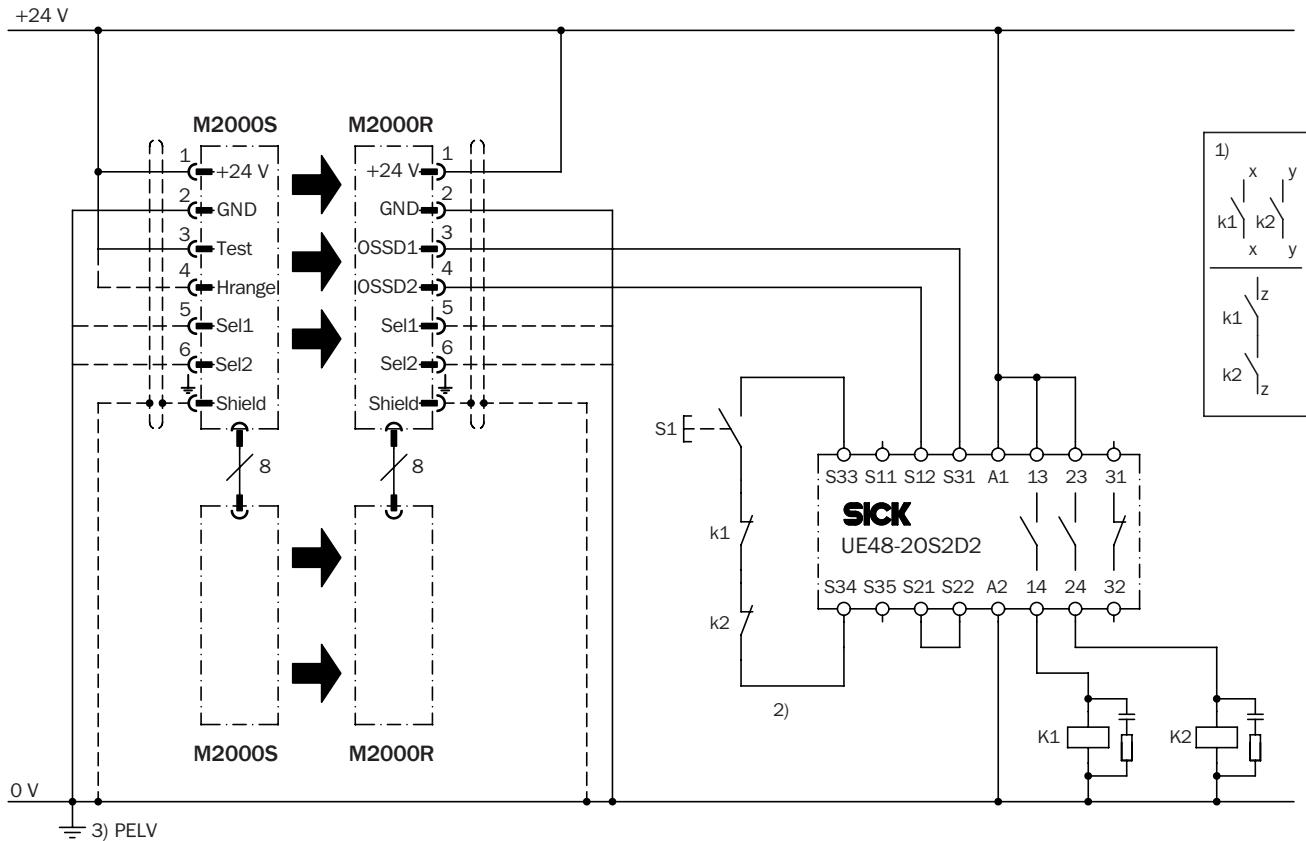
N	S 1	A 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	—	630	588	697	718	694	686
3	400	—	931	888	998	1019	995	987
4	300	—	1031	989	1098	1119	1095	1087
8	—	116	851	809	919	939	915	907
6	—	170	916	874	983	1004	979	971
7	—	170	1073	1031	1140	1161	1137	1129
8	—	170	1231	1189	1298	1319	1294	1286
9	—	170	1388	1346	1455	1476	1452	1444

N Number of beams    A 1 Resolution    S 1 Beam separation    Dimensions in mm

## Connection diagram

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### M2000 Cascadable on UE48-20S safety relay



#### Task

Interfacing two M2000 Cascadable multi-beam photoelectric safety switches to UE48-20S. Operating mode with restart interlock and external device monitoring.

#### Function

If the light path is clear, the OSSD1 and OSSD2 outputs are live. The system is ready to switch on if K1 and K2 are de-energised. By pressing S1 (button is pressed and released) the UE48-20S relay is energised and its contacts 13-14 and 23-24 activate K1 and K2.

On interruption of one of the light beams, the UE48-20S is de-energised by the OSSD1 and OSSD2 outputs and K1 and K2 are deactivated.

#### Possible faults




Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of one of the K1 or K2 contactors will be detected and does not result in the loss of the shutdown function. Jamming of the S1 button will prevent the UE48-20S from enabling.

#### Comments

- 1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) The external device monitoring is only static.
- 3) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page F-66

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> </ul>	2019659
Mounting kit 6	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Side bracket</li> </ul>	2019506
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Large housing profile</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> </ul>	2026850



**Connector technology**

Connection	Designation	Description	Connection cable	Part number
System connection Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> <li>6-pin + PE</li> <li>Straight</li> </ul>	—	6006612
		<ul style="list-style-type: none"> <li>6-pin + PE</li> <li>Angled with screw connections</li> </ul>	—	6007363
System connection M12 plug	M12 cable socket	<ul style="list-style-type: none"> <li>8-pin</li> <li>Straight</li> </ul>	2.5 m	6020537
			5.0 m	6020354
			7.5 m	6020353
			10.0 m	6020352
			15.0 m	6020872
		<ul style="list-style-type: none"> <li>8-pin</li> <li>Angled</li> </ul>	5.0 m	6021342
15.0 m	6021343			
Extension connection	M12 cable sockets and plugs	<ul style="list-style-type: none"> <li>Pre-assembled</li> <li>8-pin</li> <li>Straight</li> </ul>	0.25 m	6021000
			0.5 m	6021001
			1 m	6021002
			1.5 m	6021003
			2 m	6021004
			2.5 m	6021005
			3 m	6021006

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**Device columns**

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> <li>2-beam, 500 mm beam separation</li> <li>Including mounting kit</li> </ul>	2021328
	<ul style="list-style-type: none"> <li>3-beam, 400 mm beam separation</li> <li>Including mounting kit</li> </ul>	2021329
Device column with front screen <sup>1)</sup>	<ul style="list-style-type: none"> <li>Length 1200 mm</li> <li>Including mounting kit</li> </ul>	2021330
	<ul style="list-style-type: none"> <li>Length 1500 mm</li> <li>Including mounting kit</li> </ul>	2021331
	<ul style="list-style-type: none"> <li>Length 1700 mm</li> <li>Including mounting kit</li> </ul>	2021332

<sup>1)</sup> Warning, reduction of the scanning range!

**Device columns for outdoor use**

Designation	Description	Part number
Device column with heating 220 V	<ul style="list-style-type: none"> <li>Suitable for M20-02x50Axxx</li> <li>With brackets and cable socket</li> <li>Without photoelectric safety switch</li> </ul>	2023707
	<ul style="list-style-type: none"> <li>Suitable for M20-03x40Axxx</li> <li>With brackets and cable socket</li> <li>Without photoelectric safety switch</li> </ul>	2025441

Continued on next page

**Mirror columns <sup>1)</sup>**

Designation	Description	Part number
Mirror column, fully assembled with mirrors	▪ Suitable for M20x-02xxxx, 2-beam, 500 mm beam separation	1015041
	▪ Suitable for M20x-03xxxx, 3-beam, 400 mm beam separation	1015040
	▪ Suitable for M20x-04xxxx, 4-beam, 300 mm beam separation	1019115

<sup>1)</sup> Warning, reduction of the scanning range!

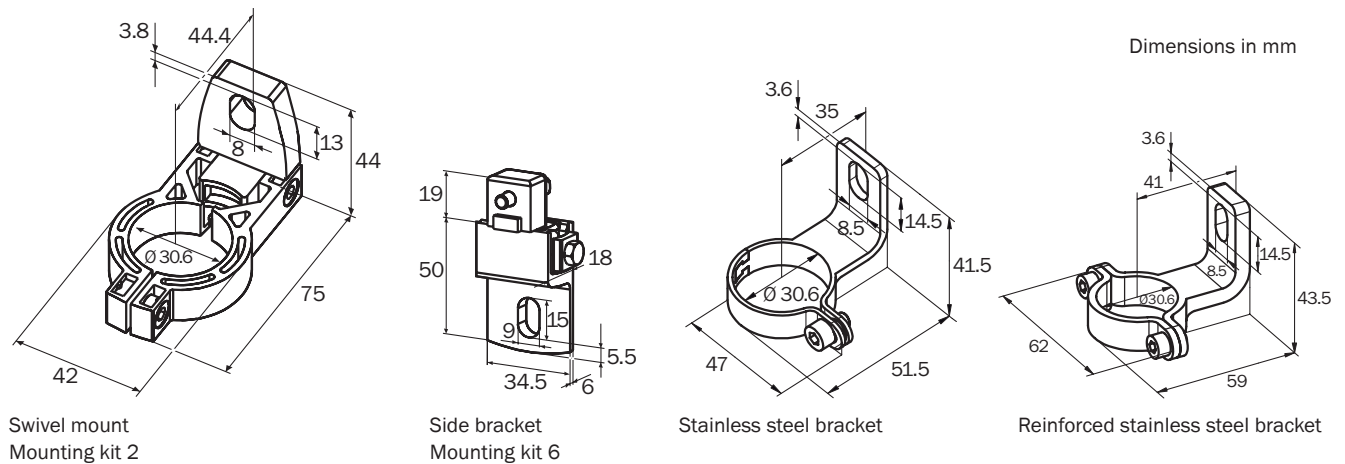
→ For dimensional drawings of the device columns and mirror columns please refer to page F-82

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

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**Dimensional drawings mounting systems**



## Overview of technical specifications

Scanning range	0 m ... 6 m
Number of beams	1
Beam separation	500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

## Product description

The M2000-A/P Standard multi-beam photoelectric safety switch comprises a sender/receiver unit on the active side (A) and one or more deflector mirrors on the passive side (P).

With their high signal reserve, they are also reliable under harsh industrial conditions.

Functions and status information integrated in the device allow rapid commissioning and prevent unnecessary machine downtime.

Interfaces and service concepts complete the product range to provide an ideal solution.

## In-system added value

### ■ Combination with safe control solutions from SICK

Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20	✓	✓	—	N-57
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S	Relay module			N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ For more applications please refer to the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid



Further information	Page
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## Ordering information

M2000-A/P Standard

- With external device monitoring <sup>1)</sup> (EDM)
- Comprising a sender/receiver unit as the active side and a deflector mirror as the passive side

→ Accessories see page F-72

### Scanning range 0 ... 6 m

Number of beams	Beam separation (mm)	Connection plug	Sender and receiver unit		Deflector mirror	
			Type	Part number	Type	Part number
1	500	Hirschmann 11-pin + PE	M20Z-02550A121	1016513	PSR01-1501	1016677
		M12, 8-pin	M20Z-02550A122	1018361		

<sup>1)</sup> External device monitoring only available with devices with M12 plug!

## F

## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Scanning range	0 m ... 6 m
Number of beams	1
Beam separation	500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC

### Sender/receiver unit

Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms
Switching voltage	$V_S - 2.25 \text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 7.5 W

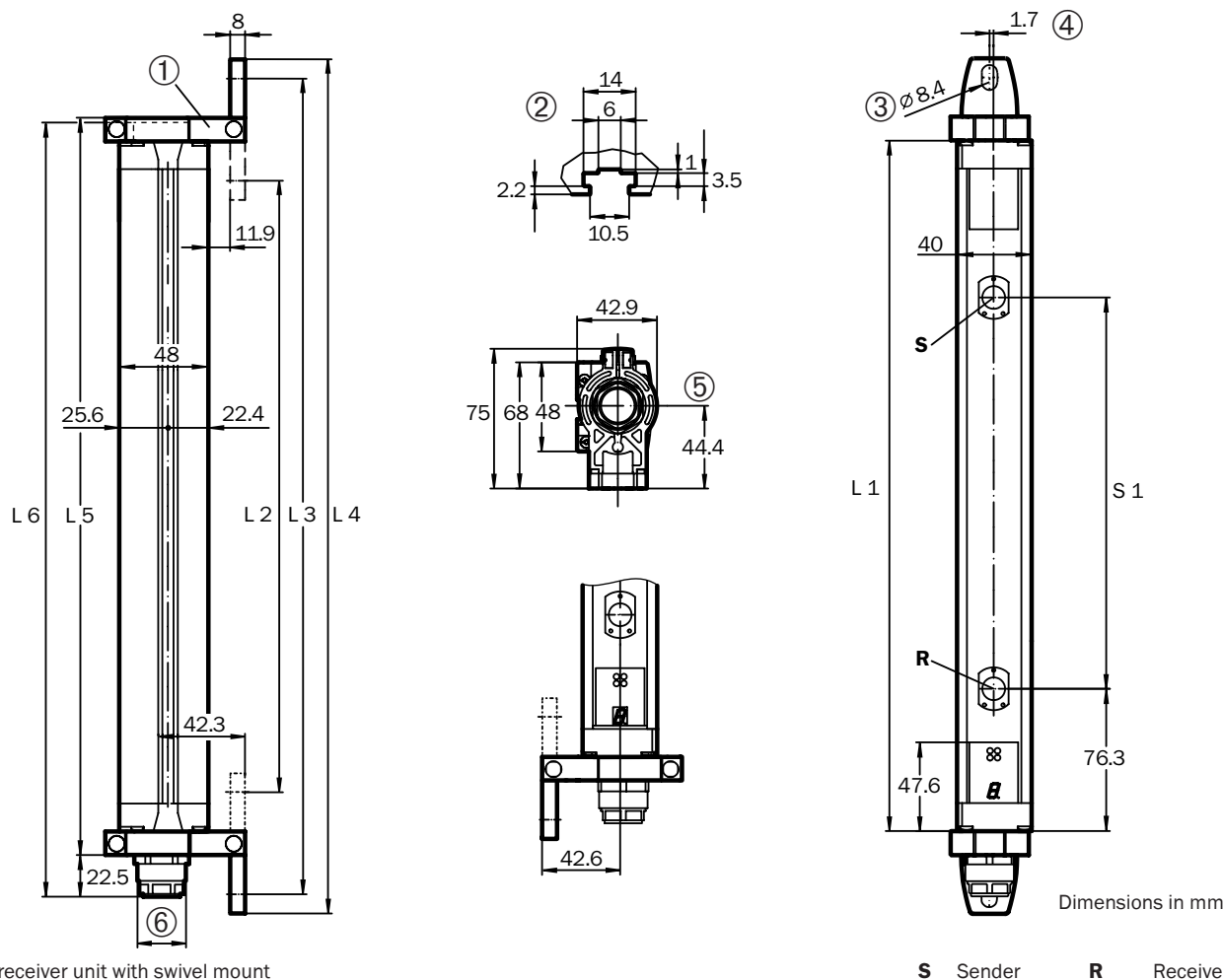
### Operating data

Connection type (depending on type)	Hirschmann plug 11-pin + PE M12 plug, 8-pin
Connection cable wire cross-section	<b>Hirschmann plug</b> Max. 1 mm <sup>2</sup> <b>M12 plug</b> Max. 0.25 mm <sup>2</sup>
Connection cable length	for wire cross-section 1 mm <sup>2</sup> Max. 60 m for wire cross-section 0.25 mm <sup>2</sup> Max. 15 m

Ambient operating temperature $T_A$	0 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight	1.41 kg

## Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at [www.sick.com](http://www.sick.com)



Sender/receiver unit with swivel mount

- ① Mounting clamp
- ② Sliding nut groove for side mounting
- ③ Hexagon screw M8 DIN 933 with washer DIN 9021 (not supplied with delivery)
- ④ Adjustment
- ⑤ Centre of light beam offset
- ⑥ Hirschmann plug DIN 43651

**S** Sender      **R** Receiver

N	S 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	653	611	720	741	678	700

**N** Number of beams      **S 1** Beam separation

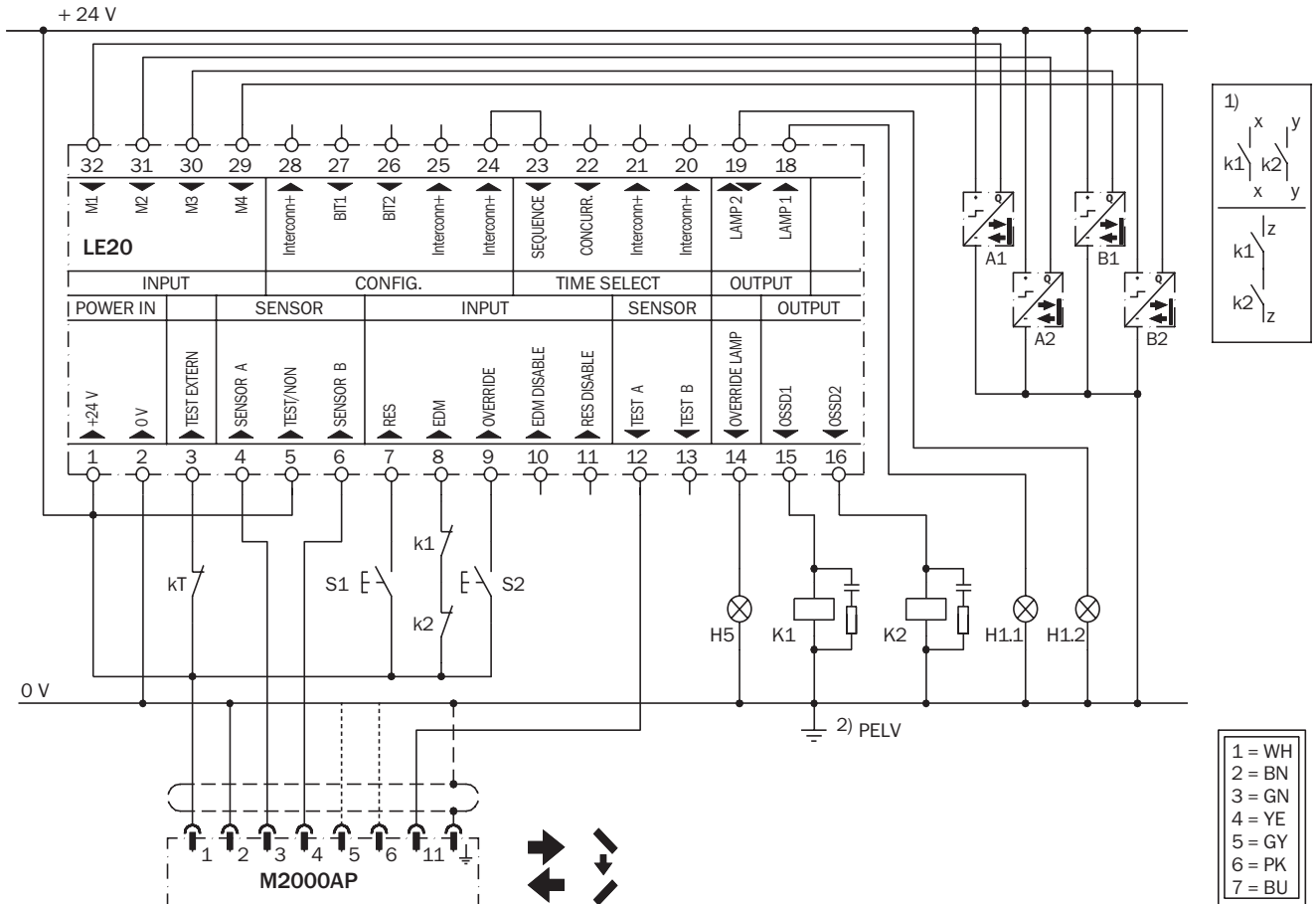
Dimensions in mm

# Connection diagram

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

## M2000-A/P Standard on LE20 Muting safety evaluation unit

F



See next page for a description of the connection diagram

**Task**

Integration of an M2000-A/P Standard multi-beam photoelectric safety switch in a control system via an LE20. Muting using 4 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors, operating mode with restart interlock and external device monitoring.

**Function**

If the light beams are clear and the K1 and K2 contactors are de-energised, the OSSDs on the LE20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE20 (terminals 15 and 16) activate the contactors K1 and K2. If a light beam is interrupted, the LE20 deactivates the contactors K1 and K2.

**Muting**

The protective field must be clear, and the OSSDs on the LE20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A or B is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting, also on switching from A1 & A2 to B1 & B2.

**Override**

If, after a power failure or a muting error, the object to be muted is present in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if a valid combination of muting signals is present at the LE20. This situation is indicated by illumination of the override lamp H5.

**Possible faults**

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing, and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.




**Comments**

- <sup>1)</sup> Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- <sup>2)</sup> PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

**F**

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page F-74

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> </ul>	2019659
Mounting kit 6	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Side bracket</li> </ul>	2019506
Mounting kit 9	<ul style="list-style-type: none"> <li>▪ 2 pieces swivel mount, pivoting for sender/receiver unit M2000-A/P/active</li> <li>▪ 2 pieces side brackets, pivoting for deflector mirror PSR01-1501</li> </ul>	2021569
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Large housing profile</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> </ul>	2026850



**Connector technology**

Connection	Designation	Description	Connection cable	Part number
System connection Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> <li>11-pin + PE</li> <li>Straight</li> </ul>	—	6020757
		<ul style="list-style-type: none"> <li>11-pin + PE</li> <li>Angled</li> </ul>	—	6020758
System connection M12 plug	M12 cable socket	<ul style="list-style-type: none"> <li>8-pin</li> <li>Straight</li> </ul>	2.5 m	6020537
			5.0 m	6020354
			7.5 m	6020353
			10.0 m	6020352
			15.0 m	6020872
		<ul style="list-style-type: none"> <li>8-pin</li> <li>Angled</li> </ul>	5.0 m	6021342
	15.0 m	6021343		

**Device columns**

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> <li>2-beam, 500 mm beam separation</li> <li>Including mounting kit</li> </ul>	2021328
Device column with front screen <sup>1)</sup>	<ul style="list-style-type: none"> <li>Length 1200 mm</li> <li>Including mounting kit</li> </ul>	2021330
	<ul style="list-style-type: none"> <li>Length 1500 mm</li> <li>Including mounting kit</li> </ul>	2021331
	<ul style="list-style-type: none"> <li>Length 1700 mm</li> <li>Including mounting kit</li> </ul>	2021332

<sup>1)</sup> Warning, reduction of the scanning range!

**Mirror column <sup>1)</sup>**

Designation	Description	Part number
Mirror column, fully assembled with mirrors 45°	<ul style="list-style-type: none"> <li>Suitable for M20Z-02xxxxxx, 2-beam, 500 mm beam separation</li> </ul>	1015042

<sup>1)</sup> Warning, reduction of the scanning range!

**Deflector mirror <sup>1)</sup>**

Designation	Description	Part number
Deflector mirror PSR01-S04	<ul style="list-style-type: none"> <li>Suitable for M20Z-02550xxx with end caps for swivel mount bracket (large housing) and front screen</li> </ul>	1025227

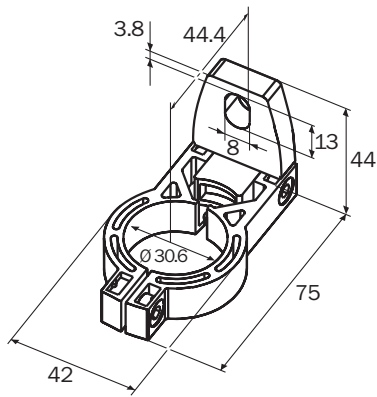
<sup>1)</sup> Warning, reduction of the scanning range!

→ For dimensional drawings of the device columns, mirror columns and deflector mirrors please refer to the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

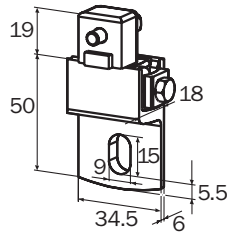
**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

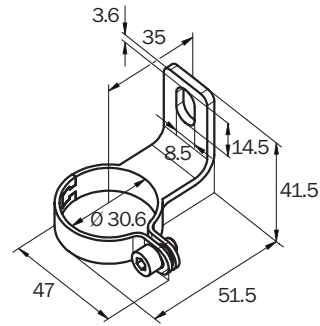
Dimensional drawings mounting systems



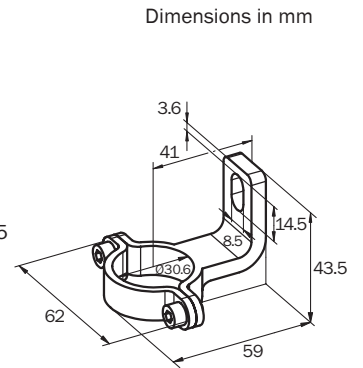
Swivel mount  
Mounting kit 2  
Mounting kit 9



Side bracket  
Mounting kit 6  
Mounting kit 9



Stainless steel bracket



Reinforced stainless steel bracket

Dimensions in mm

F

## Overview of technical specifications

Scanning range	0 m ... 6 m
Number of beams	1
Beam separation	500 mm
Type	Type 2 according to EN 61496
Enclosure rating	IP 65

## Product description

The M2000-A/P RES/EDM multi-beam photoelectric safety switch comprises a sender/receiver unit on the active side (A) and one or more deflector mirrors on the passive side (P).

With their high signal reserve, they are also reliable under harsh industrial conditions. Functions and status information integrated in the device allow rapid commis-

sioning and prevent unnecessary machine downtime. Interfaces and service concepts complete the product range to provide an ideal solution for the sector.

The integrated restart interlock in the M2000-A/P RES/EDM offers the advantages of shorter cable runs and quicker commissioning compared to traditional solutions.

## In-system added value

- Combination with safe control solutions from SICK

Combination with	Restart interlock	External device monitoring	Muting	Further information
LE20 Muting	✓	✓	✓	N-64
UE48-20S	✓	✓	—	N-42
UE48-30S	✓	✓	—	N-48
UE10-30S	Relay module			N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

## Applications

→ For more applications please refer to the application finder at [www.sick.com](http://www.sick.com)

- Storage and conveyor technology
- Wood industry
- Textile industry
- Stone production
- Electronics industry
- Packaging industry



- Restart interlock (RES)
- External device monitoring (EDM)
- Self-testing
- 7-segment display
- Diagnostics
- Alignment aid



Further information	Page
→ Ordering information	F-76
→ Technical specifications	F-76
→ Dimensional drawings	F-77
→ Connection diagram	F-78
→ Accessories	F-79
→ Dimensional drawings accessories	F-81
→ Services	A-2

## Ordering information

M2000-A/P RES/EDM

■ Comprising a sender/receiver unit as the active side and a deflector mirror as the passive side

→ Accessories see page F-79

### Scanning range 0 ... 6 m

Number of beams	Beam separation (mm)	Connection plug	Sender and receiver unit		Deflector mirror	
			Type	Part number	Type	Part number
1	500	Hirschmann 11-pin + PE	M20Z-02550A221	1018239	PSR01-1501	1016677
		M12, 8-pin	M20Z-02550A222	1018362		

## Detailed technical specifications

→ You can find more detailed data in the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

### General system data

Scanning range	0 m ... 6 m
Number of beams	1
Beam separation	500 mm
Enclosure rating	IP 65
Type	Type 2 according to EN 61496
Synchronisation	Optical, without separate synchronisation
Supply voltage $V_S$	24 V (19.2 V ... 28.8 V) DC

### Sender/receiver unit

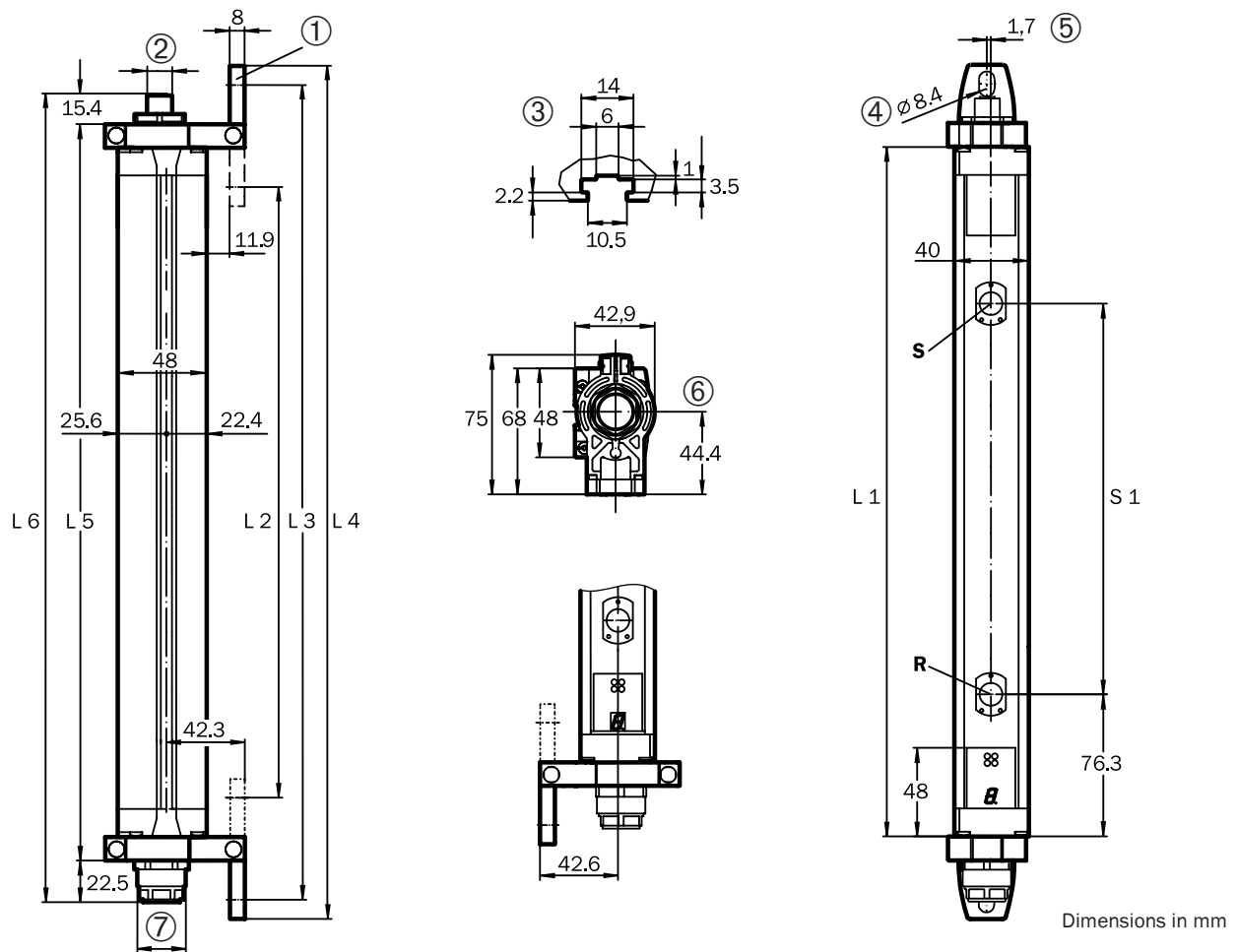
Switching outputs (OSSDs)	2 PNP semiconductors (short-circuit protected, cross-circuit monitored)
Response time (depending on type)	Max. 7 ms
Switching voltage	$V_S - 2.25\text{ V}$ 1 V
Switching current	Max. 500 mA
Power consumption	Max. 7.5 W

### Operating data

Connection type (depending on type)	Hirschmann plug 11-pin + PE M12 plug, 8-pin
Connection cable wire cross-section	Hirschmann plug M12 plug Max. 1 mm <sup>2</sup> Max. 0.25 mm <sup>2</sup>
Connection cable length	for wire cross-section 1 mm <sup>2</sup> for wire cross-section 0.25 mm <sup>2</sup> Max. 60 m Max. 15 m
Ambient operating temperature $T_A$	0 °C ... +55 °C
Storage temperature $T_S$	-25 °C ... +70 °C
Air humidity	15 % ... 95 %
Housing cross-section	48 mm x 40 mm
Vibration resistance	5 g, 10 ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29
Weight (depending on type)	1.25 kg ... 2.86 kg

## Dimensional drawings

→ You will find more dimensional drawings in the technical description/operating instructions. Download at [www.sick.com](http://www.sick.com)



Sender/receiver unit with swivel mount

- ① Mounting clamp
- ② M12 x 1 socket (standard)
- ③ Sliding nut groove for side mounting
- ④ Hex screw M8, DIN 933 with washer. DIN 9021 (not supplied with delivery)
- ⑤ Centre of light beam offset
- ⑥ Adjustment
- ⑦ Plug PG13.5 according to DIN 43651

**S** Sender

**R** Receiver

N	S 1	L 1	L 2	L 3	L 4	L 5	L 6
2	500	653	611	720	741	678	716

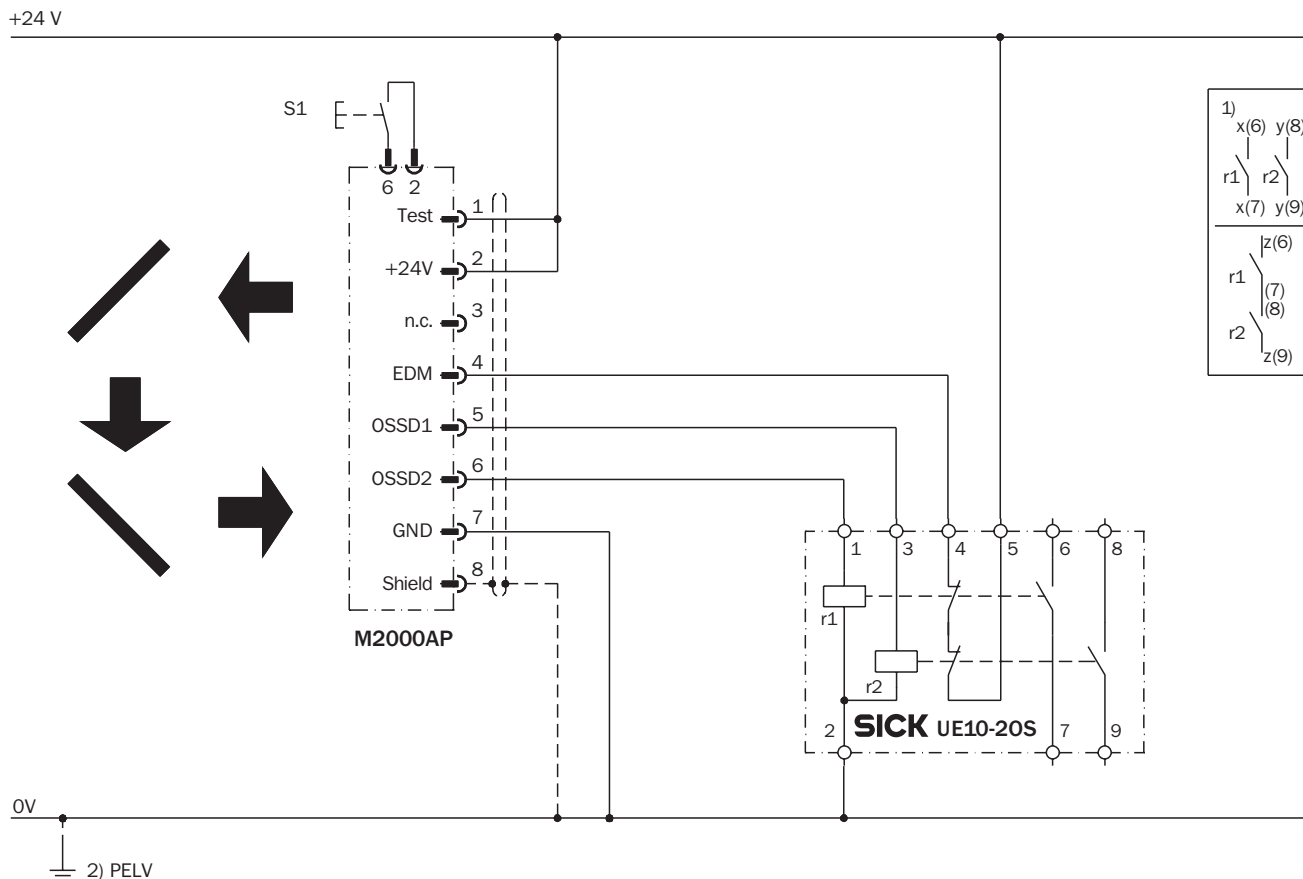
**N** Number of beams    **S 1** Beam separation

Dimensions in mm

## Connection diagram

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### M2000-A/P RES/EDM on UE10-20S safety relay



#### Task

Interfacing an M2000-A/P RES/EDM multi-beam photoelectric safety switch to UE10-20S. Operating mode with restart interlock and external device monitoring.

#### Function

The yellow LED on the M2000-A/P RES/EDM flashes when the light path is clear and the UE10-20S is de-energised and functioning correctly. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10-20S is switched on. On interruption of one of the light beams, the UE10-20S is de-energised by the OSSD1 and OSSD2 outputs.

#### Possible faults




Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10-20S will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

#### Comments

- 1) Output circuits. These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking the risk analysis into account.
- 2) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFSafe.	Page P-0

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## Accessories

### Mounting systems

→ Dimensional drawings mounting systems see page F-81

Designation	Description	Part number
Mounting kit 2	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Swivel mount</li> </ul>	2019659
Mounting kit 6	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Side bracket</li> </ul>	2019506
Mounting kit 9	<ul style="list-style-type: none"> <li>▪ 2 pieces swivel mount, pivoting for sender/receiver unit M2000-A/P/active</li> <li>▪ 2 pieces side brackets, pivoting for deflector mirror PSR01-1501</li> </ul>	2021569
Stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Large housing profile</li> </ul>	2023708
Reinforced stainless steel bracket	<ul style="list-style-type: none"> <li>▪ 4 pieces</li> <li>▪ Pivoting</li> <li>▪ Vibration resistance 5 g, 10 Hz ... 55 Hz</li> <li>▪ Shock resistance 10 g, 16 ms</li> </ul>	2026850

Continued on next page

**Connector technology**

Connection	Designation	Description	Connection cable	Part number
System connection Hirschmann plug	Hirschmann cable socket	<ul style="list-style-type: none"> <li>11-pin + PE</li> <li>Straight</li> </ul>	—	6020757
		<ul style="list-style-type: none"> <li>11-pin + PE</li> <li>Angled</li> </ul>	—	6020758
System connection M12 plug	M12 cable socket	<ul style="list-style-type: none"> <li>8-pin</li> <li>Straight</li> </ul>	2.5 m	6020537
			5.0 m	6020354
			7.5 m	6020353
			10.0 m	6020352
			15.0 m	6020872
		<ul style="list-style-type: none"> <li>8-pin</li> <li>Angled</li> </ul>	5.0 m	6021342
15.0 m	6021343			

**Device columns**

Designation	Description	Part number
Device column without front screen	<ul style="list-style-type: none"> <li>2-beam, 500 mm beam separation</li> <li>Including mounting kit</li> </ul>	2021328
Device column with front screen <sup>1)</sup>	<ul style="list-style-type: none"> <li>Length 1200 mm</li> <li>Including mounting kit</li> </ul>	2021330
	<ul style="list-style-type: none"> <li>Length 1500 mm</li> <li>Including mounting kit</li> </ul>	2021331
	<ul style="list-style-type: none"> <li>Length 1700 mm</li> <li>Including mounting kit</li> </ul>	2021332

<sup>1)</sup> Warning, reduction of the scanning range!

**Device columns for outdoor use**

Designation	Description	Part number
Device column with heating 220 V	<ul style="list-style-type: none"> <li>Suitable for M20-02x50Axxx and M20Z-02x50Axxx</li> <li>With brackets and cable socket</li> <li>Without photoelectric safety switch</li> </ul>	2023707

**Mirror column <sup>1)</sup>**

Designation	Description	Part number
Mirror column, fully assembled with mirrors 45°	<ul style="list-style-type: none"> <li>Suitable for M20Z-02xxxxxx, 2-beam, 500 mm beam separation</li> </ul>	1015042

<sup>1)</sup> Warning, reduction of the scanning range!

**Deflector mirror <sup>1)</sup>**

Designation	Description	Part number
Deflector mirror PSR01-S04	<ul style="list-style-type: none"> <li>Suitable for M20Z-02550xxxx with end caps for swivel mount bracket (large housing) and front screen</li> </ul>	1025227

<sup>1)</sup> Warning, reduction of the scanning range!

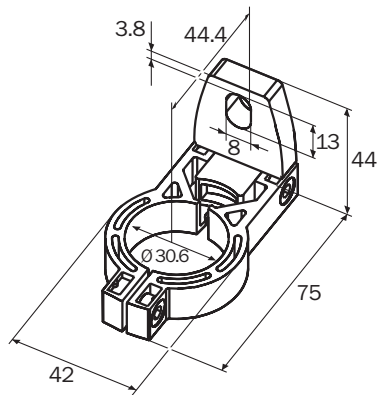
→ For dimensional drawings of the device columns, mirror columns and deflector mirrors please refer to the operating instructions/technical description. Download at [www.sick.com](http://www.sick.com)

**Power supply units**

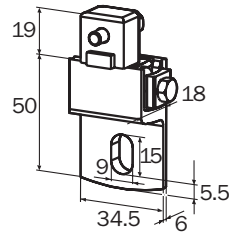
Input voltage	Output voltage	Maximum output current	Part number
100 V AC, 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790



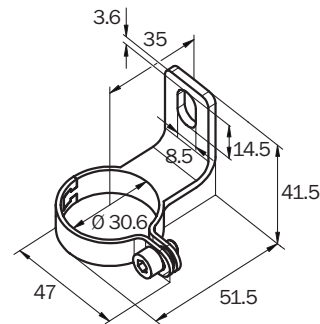
## Dimensional drawings mounting systems



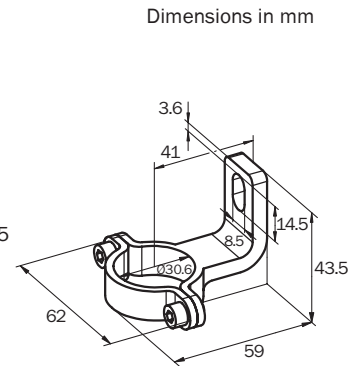
Swivel mount  
Mounting kit 2  
Mounting kit 9



Side bracket  
Mounting kit 6  
Mounting kit 9



Stainless steel bracket



Reinforced stainless steel bracket

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- Easy to mount
- Optimal adjustment
- Protection of the light beam safety devices
- Very stable
- Of universal application for:
  - Multiple light beam safety devices
  - Safety light curtains

## Overview of technical specifications

Suitable for	M4000 M2000 C4000 C2000
Number of beams (depending on type)	2, 3, 4
Protective field heights (depending on type)	150 mm ... 1350 mm
Column heights (depending on type)	1200 mm, 1500 mm, 1700 mm
Design versions (depending on type)	<ul style="list-style-type: none"> <li>■ With front plate</li> <li>■ With front screen</li> <li>■ With front screen heating for outdoor use (up to -15 °C)</li> </ul>

## Product description

Mirror columns and device columns are used where protection on several sides is necessary or there are problems mounting opto-electronic protective devices. On machining centres the opto-electronic protective devices must be positioned free-standing in the room. The combination of light beam safety devices with deflector mirrors is the right solution here: as there are only two active sides, the wiring effort is considerably reduced.

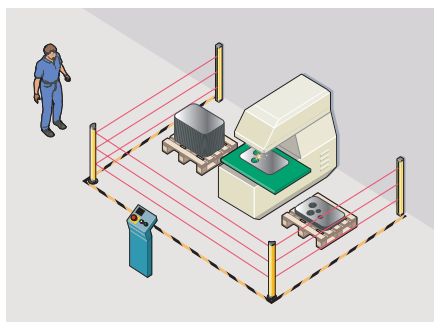
The adjustment of the deflector mirrors mounted in sturdy columns is very straightforward. Here the unhindered access for loading as well as for changing tools and programs is a further advantage over mechanical fencing.

The use of mirror columns and device columns results in increased productivity.

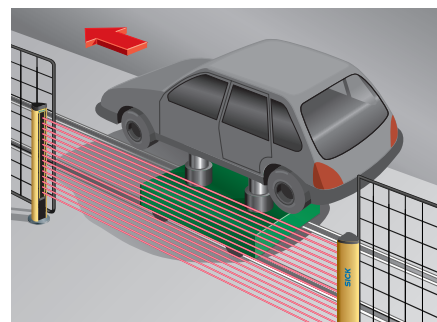
## Applications

→ For more applications please refer to the application finder at [www.sick.com](http://www.sick.com)

- Machine tool industry
- Storage and conveyor technology
- Packaging industry
- Stone production
- Automotive industry



Machine tool industry: Access protection with deflector mirror columns on a punching machine



Automotive industry: Hazardous point protection on an assembly line

Further information	Page
→ Accessories	F-85
→ Dimensional drawings	F-86

## Ordering information

### Mirror columns for multiple light beam safety devices <sup>1)</sup>

Description	Suitable for	Number of beams	Beam separation (mm)	Type	Part number
▪ Horizontal deflection	▪ M40#-0250##### ▪ M20S-02#50##### ▪ M20E-02#50#####	2	500	PM3S96-00240020	1040619
	▪ M40#-03400##### ▪ M40#-03401##### ▪ M20#-03#40#1##	3	400	PM3S11-00330030	1040625
	▪ M40#-0430##### ▪ M20#-04#30#####	4	300	PM3S13-00430040	1040626
	▪ M40#-0260#####	2	600	PM3S96-00230060	1040620
	▪ M40#-0345#####	3	450	PM3S13-00330050	1040624
	▪ Vertical deflection	▪ M40Z-0250##### ▪ M20Z-02#####	2	500	PM2Z96-30240020
▪ Horizontal deflection ▪ With mirror for viewing the rear of the machine		▪ M40#-0250##### ▪ M20S-02#50##### ▪ M20E-02#50#####	2	500	PM3S96-S17

<sup>1)</sup> Warning, reduction of the scanning range!

The scanning range is reduced per mirror deflection (n) in accordance with the following formula:

$$\text{Scanning range (with mirror deflection)} = \text{Scanning range (of the light beam safety device without mirror deflection)} \times \sqrt{0,8^n}$$

Example: M2000 with a scanning range of 25 m is deflected three times. The scanning range is now  $25 \text{ m} \times \sqrt{0,8^3} = 17.8 \text{ m}$

### Device columns with front plate for multiple light beam safety devices

Description	Suitable for	Number of beams	Beam separation (mm)	Type	Part number	
▪ Without cut-out for indicator lamps ▪ Including mounting kit	▪ M40#-02500##### ▪ M40#-02501#####	2	500	PU2M96-10240020	2031438	
	▪ M40#-03400##### ▪ M40#-03401#####	3	400	PU2M11-10330030	2032465	
	▪ M40#-04300##### ▪ M40#-04301#####	4	300	PU2M13-10430040	2032466	
	▪ M40#-02600##### ▪ M40#-02601#####	2	600	PU2M96-10230060	2032969	
	▪ M40#-03450##### ▪ M40#-03451#####	3	450	PU2M13-10330050	2032971	
	▪ M20S-02#50#1## ▪ M20E-02#50#1##	2	500	PU2G96-10240020	2032039	
	▪ M20#-02#50#2##	2	500	PUG12-1024002	2021328	
	▪ M20#-03#40#1##	3	400	PU2G11-10330030	2032040	
	▪ M20#-03#40#2##	3	400	PUG12-1033003	2021329	
	▪ With cut-out for indicator lamps ▪ Including mounting kit	▪ M40#-02502##### ▪ M40#-02503#####	2	500	PU2M96-50240020	2032467
		▪ M40#-03402##### ▪ M40#-03403#####	3	400	PU2M11-50330030	2032468
		▪ M40#-04302##### ▪ M40#-04303#####	4	300	PU2M13-50430040	2032469
		▪ M40#-02602##### ▪ M40#-02603#####	2	600	PU2M96-50230060	2032970
▪ M40#-03452##### ▪ M40#-03453#####		3	450	PU2M13-50330050	2032972	

Device columns with front screen for multiple light beam safety devices and safety light curtains <sup>1)</sup>

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Suitable for	Protective field height (mm)	Max. installation length (mm)	Description	Type	Part number
▪ M4000	—	1200	▪ Including mounting kit	PUM12-4	2018608
		1700		PUM17-4	2018767
▪ M2000	—	1200	▪ Including mounting kit 2 (2 pieces)	PUG12-4	2021330
		1500		PUG15-4	2021331
		1700		PUG17-4	2021332
▪ C4000 Basic ▪ C4000 Standard/ Advanced without extension connection ▪ C2000 (large housing)	300 ... 900	1200	▪ Including mounting kit 2 (2 pieces)	PUG12-4	2021330
	300 ... 1200	1500		PUG15-4	2021331
	300 ... 1350	1700		PUG17-4	2021332
	1350	1700		PUG17-4	2021332
▪ C4000 Micro ▪ C2000 Standard	150 ... 1050	1200	▪ Including mounting kit 1 (2 pieces)	PUK12-4	2021333
		1500		PUK15-4	2021242
	150 ... 1200	1700		PUK17-4	2021337
▪ C4000 Standard/ Advanced with extension connection	300 ... 600	1200	▪ Including mounting kit 2 (2 pieces)	PUG12-4	2021330
	300 ... 900	1500		PUG15-4	2021331
	300 ... 1200	1700		PUG17-4	2021332
▪ C2000 RES/EDM ▪ C2000 Cascadable	150 ... 900	1200	▪ Including mounting kit 1 (2 pieces)	PUK12-4	2021333
		1500		PUK15-4	2021242
	150 ... 1200	1700		PUK17-4	2021337

<sup>1)</sup> Warning, reduction of the scanning range! Each front screen reduces the scanning range by 7.5 %.  
Example: C2000 sender and receiver mounted in device columns, two front screens reduce the scanning range: 19 m × 0.85 = 16.1 m

→ Note on ordering: Device columns for safety light curtains with installation lengths greater than 1700 mm on request

Device columns for outdoor use (to -15 °C) for multiple light beam safety devices <sup>1)</sup>

Description	Suitable for	Number of beams	Beam separation (mm)	Type	Part number
<ul style="list-style-type: none"> <li>▪ With front screen heating, 220 V</li> <li>▪ Including brackets and cable socket (without light beam safety device)</li> </ul>	<ul style="list-style-type: none"> <li>▪ M4000 Standard M40#-0250#0##0</li> <li>▪ M4000 Standard A/P M40Z-025000#R0</li> <li>▪ M4000 Advanced M40#-0250#3##0</li> <li>▪ M4000 Advanced A/P M40Z-025003##0</li> </ul>	2	500	PUM12-S02	2019654
	<ul style="list-style-type: none"> <li>▪ M4000 Standard M40#-0340#0##0</li> <li>▪ M4000 Advanced M40#-0340#3##0</li> </ul>	3	400	PUM12-S01	2020800
	<ul style="list-style-type: none"> <li>▪ M20#-02#50A###</li> <li>▪ M20Z-02#50A###</li> </ul>	2	500	PUG12-S02	2023707
	<ul style="list-style-type: none"> <li>▪ M20#-03#40A###</li> </ul>	3	400	PUG12-S01	2025441

<sup>1)</sup> Warning, reduction of the scanning range! Each front screen reduces the scanning range by 7.5 %.

Example: M2000 sender and receiver mounted in device columns, two front screens reduce the scanning range:  $25 \text{ m} \times 0.85 = 21.25 \text{ m}$

## Accessories

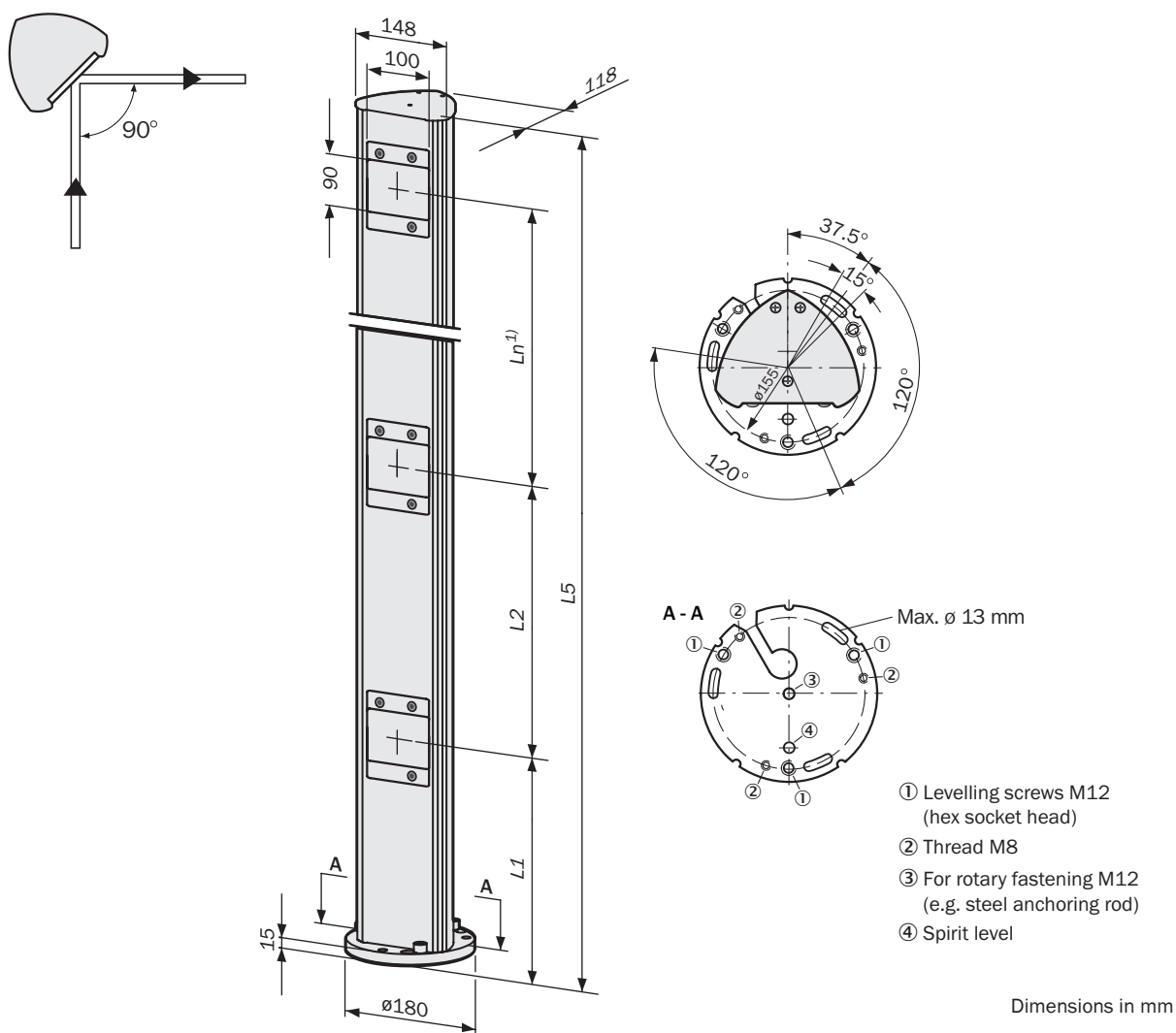
### Mounting accessories

Type	Description	Part number
Adjusting plate	<ul style="list-style-type: none"> <li>▪ For floor fastening</li> </ul>	4031053
Steel plug		5308961
Mounting bracket UE403	<ul style="list-style-type: none"> <li>▪ For fastening to base plate</li> <li>▪ Incl. screws</li> </ul>	2032035

## Dimensional drawings

### Mirror column with horizontal deflection for multiple light beam safety devices

F



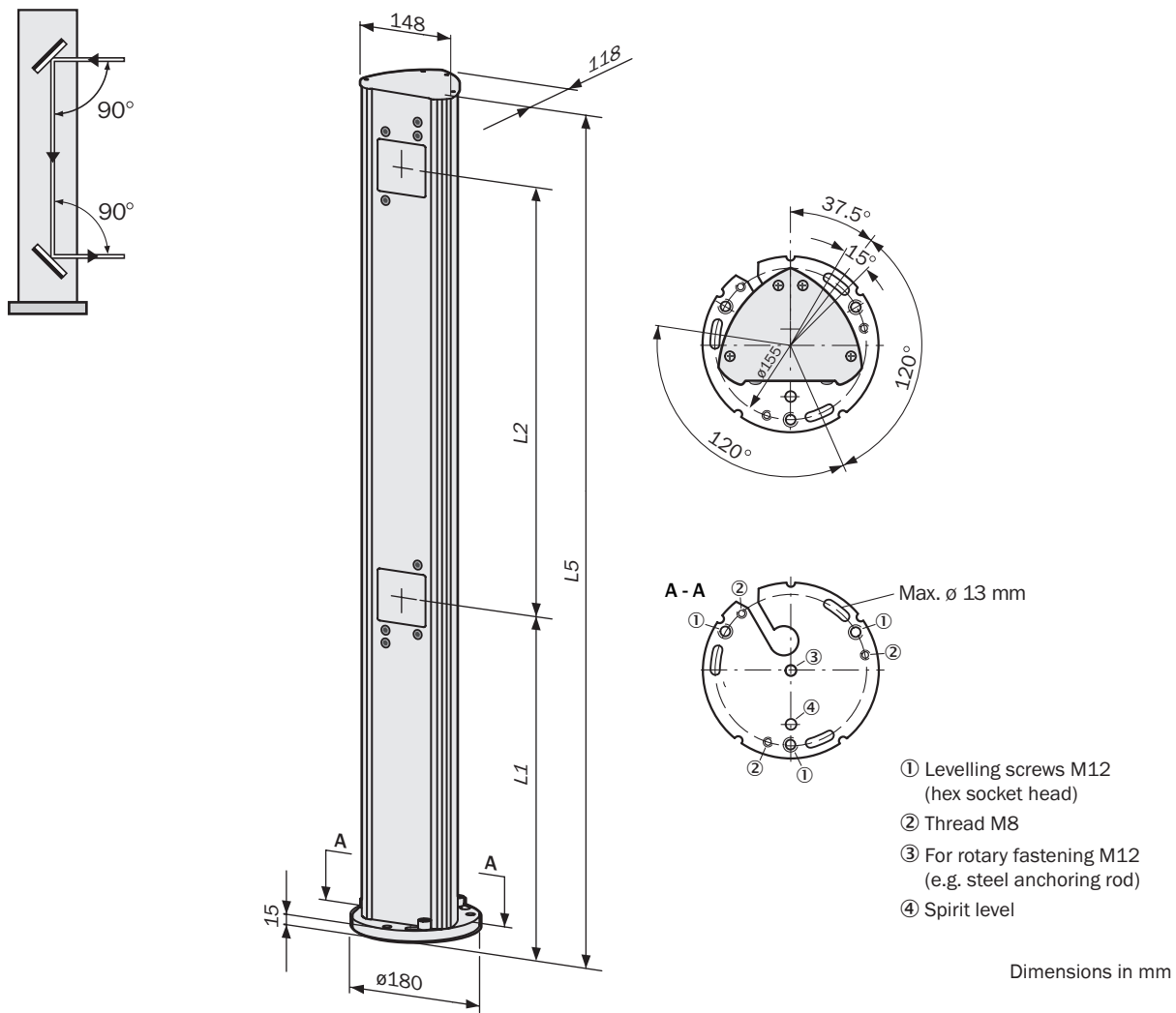
1) Ln in the illustration corresponds to the values L3 and L4 in the table depending on the mirror column

Number of beams	L1	L2	L3	L4	L5	Part number
2	400	500	—	—	985	1040619
2	400	500	—	—	985	1040622
3	300	400	400	—	1185	1040625
4	300	300	300	300	1285	1040626
2	300	600	—	—	985	1040620
3	300	450	450	—	1285	1040624

Dimensions in mm

→ Note on mounting: The mirrors can be quickly and straightforwardly adjusted using adjusting screws

Mirror column with vertical deflection for multiple light beam safety devices



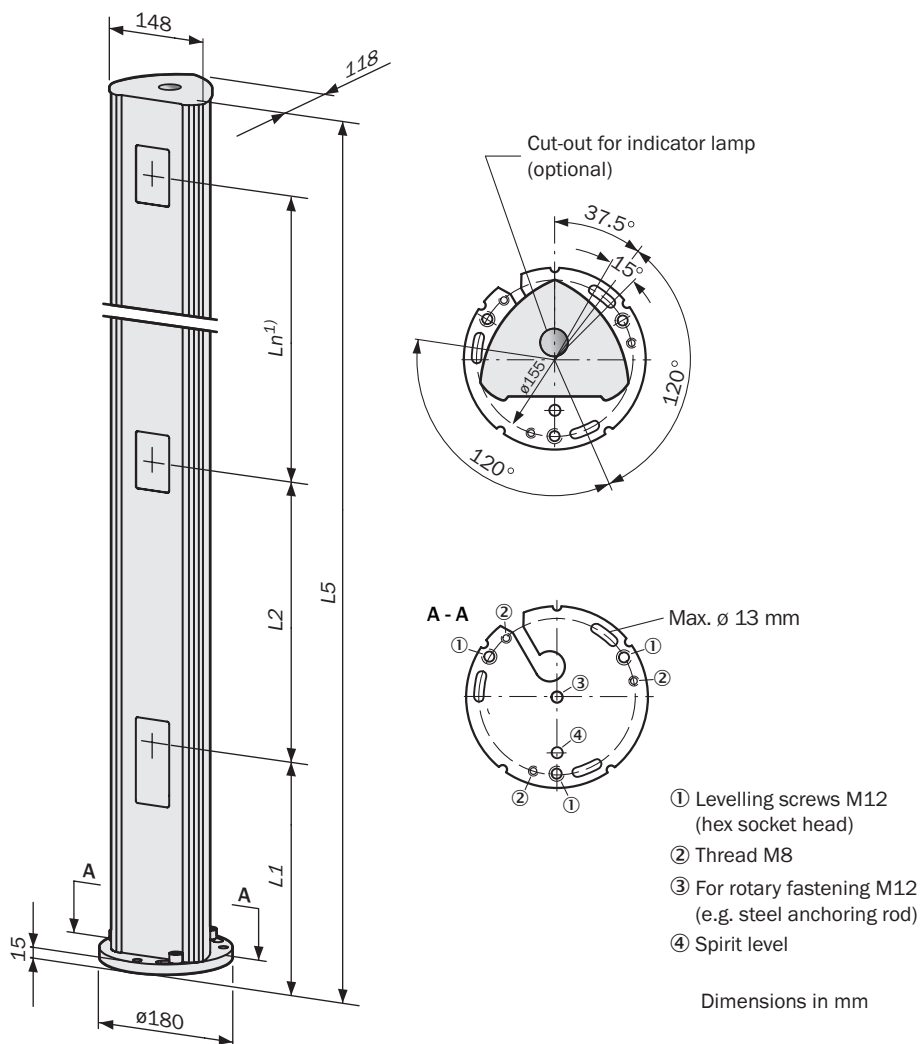
Number of beams	L1	L2	L5	Part number
2	400	500	985	1027265

Dimensions in mm

→ Note on mounting: The mirrors can be quickly and straightforwardly adjusted using adjusting screws in the front plate

Device column with front plate for multiple light beam safety devices

F



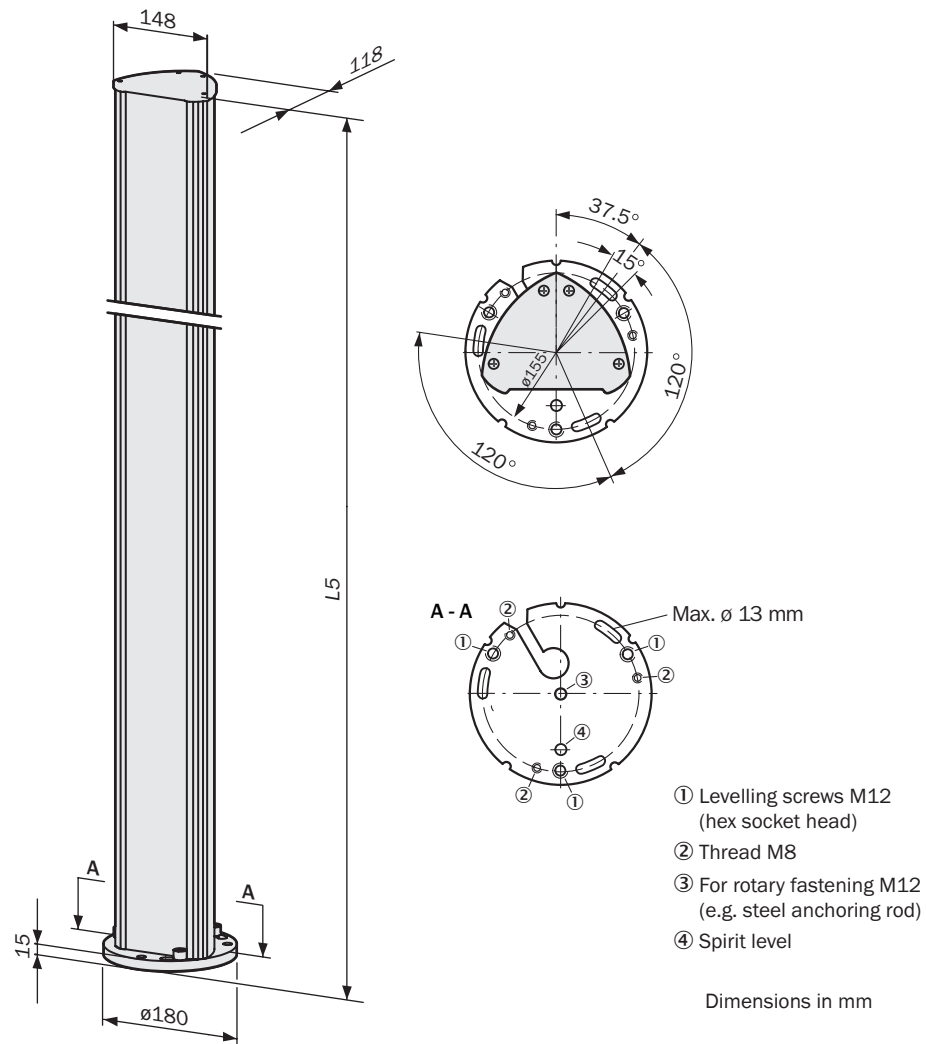
1)  $L_n$  in the illustration corresponds to the values  $L_3$  and  $L_4$  in the table depending on the device column

Number of beams	L1	L2	L3	L4	L5	Part number
2	400	500	—	—	985	2031438
3	300	400	400	—	1185	2032465
4	300	300	300	300	1285	2032466
2	300	600	—	—	985	2032969
3	300	450	450	—	1285	2032971
2	400	500	—	—	985	2032467
3	300	400	400	—	1185	2032468
4	300	300	300	300	1285	2032469
2	300	600	—	—	985	2032970
3	300	450	450	—	1285	2032972
2	400	500	—	—	985	2032039
2	400	500	—	—	1220	2021328
3	300	400	400	—	1185	2032040
3	300	400	400	—	1220	2021329

Dimensions in mm



Device column with front screen for multiple light beam safety devices and safety light curtains

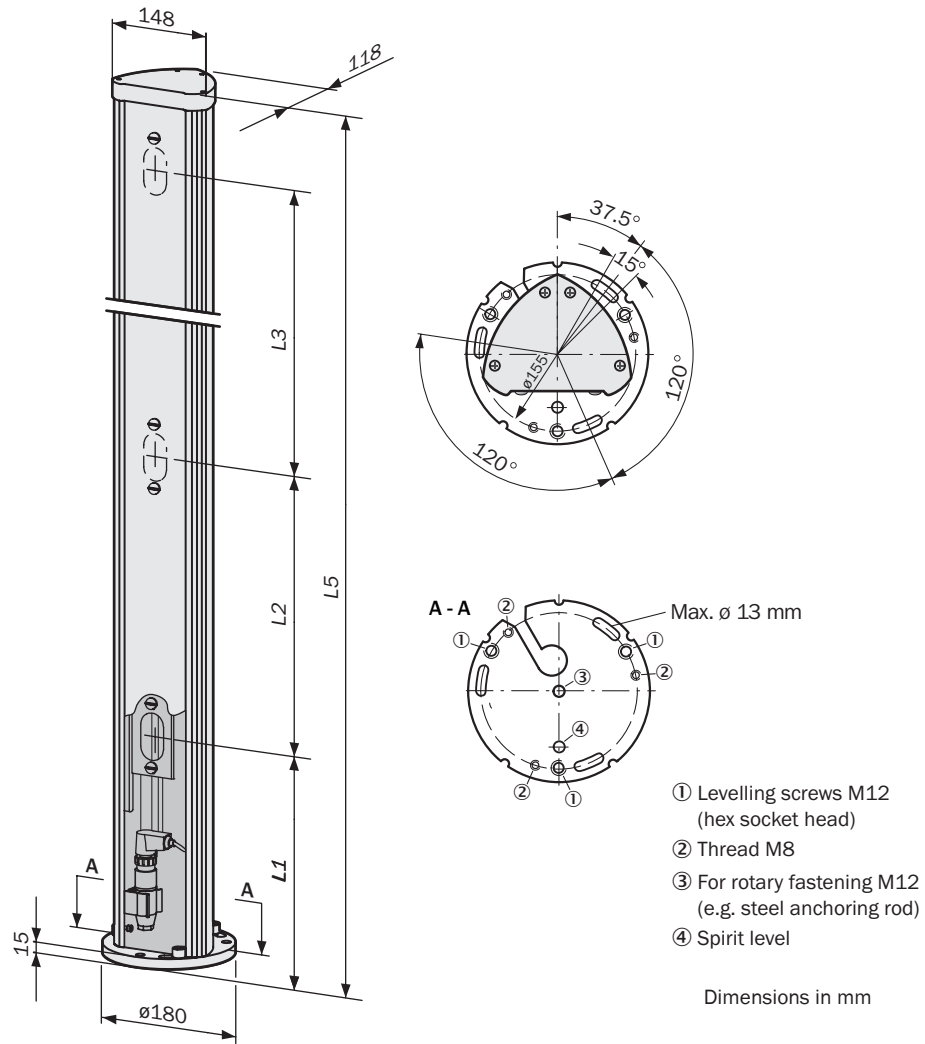


L5	Part number
1220	2018608
1720	2018767
1220	2021333
1520	2021242
1720	2021337
1220	2021330
1520	2021331
1720	2021332

Dimensions in mm

Device column for outdoor use for multiple light beam safety devices, with heating

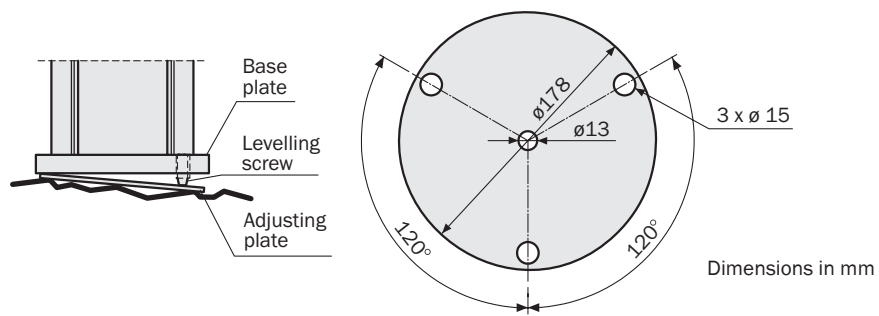
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Number of beams	L1	L2	L3	L5	Part number
2	400	500	—	1223	2019654
2	400	500	—	1223	2023707
3	300	400	400	1223	2020800
3	300	400	400	1223	2025441

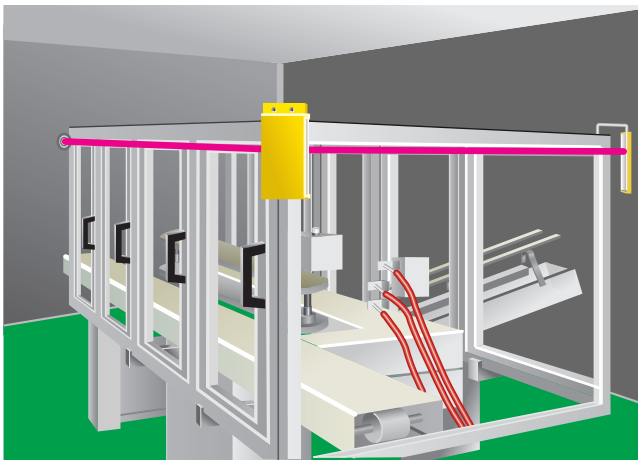
Dimensions in mm

## Adjusting plate

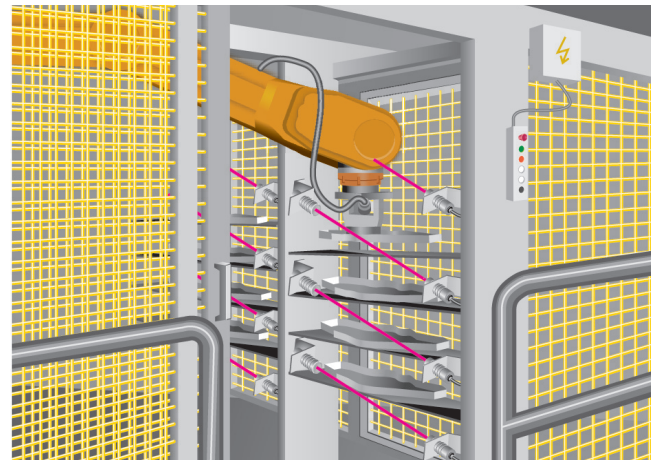


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## Electro-sensitive access protection of hazardous areas with type 2 and type 4 single-beam photoelectric safety switches



Door monitoring on a packaging machine



Monitoring robot presence at a loading station

SICK's single-beam photoelectric safety switches consist either of testable senders and receivers, or of testable senders and receivers combined with an evaluation unit. These devices impress both with their large scanning range and the variety of shapes and sizes available. They also offer maximum safety performance as they comply with type 2 or type 4 in accordance with EN 61496.

The possible applications are very wide-ranging: Whether on robots, processing machines, machining centres, palletising systems, high-bay warehouses or transfer lines – with products from SICK you will profit from a customer-friendly solution of the highest quality.

### Double benefit for low stock-keeping costs

You profit twice with SICK devices, as you can also use the photoelectric safety switches for your automation applications. You only need to keep one type of through-beam photoelectric switch in stock and can thus reduce your costs.

### Also safe in extreme situations

All single-beam photoelectric safety switches from SICK have an IP 67 enclosure rating and are therefore very well equipped to withstand extreme conditions such as heat (up to +60 °C), cold (to -40 °C) or humidity. SICK also provides solutions for changing ambient conditions and the outdoor area.

### Flexible technology that adapts as required

SICK photoelectric safety switches offer you more flexibility than ever before. You will profit from the very wide range of shapes, sizes and types and will have a very large choice of housing materials. Whether rectangular or cylindrical photoelectric switches, at SICK you will always find the right solution for your application.

### Impressive performance, optimum price

You will also profit from an optimum price-performance ratio. SICK products are optimally matched to one another.

## Services for productive safety


With services tailored specifically to your needs, SICK offers all-embracing support for the safety of your machine or system.

Address productivity and cost-effectiveness from the start: From selection and planning, through commissioning and inspection, to maintenance and modernisation.

→ For information about the services please refer to chapter A

# Single-beam photoelectric safety switches



Safety application	Type according to IEC/EN 61496	Number of sensors	Scanning range (m)	Ambient operating temperature (°C)	Type	Construction size (mm), (H x W x D or Ø x L)	Functions			Product	Page	
							Muting	Restart interlock	External device monitoring			
	Type 4	8 <sup>1)</sup>	0 ... 5	-20 ... +55	Cylindrical	M18 x 108	-	✓ <sup>1)</sup>	✓ <sup>1)</sup>	L4000/L400	G-2	
			0 ... 10			M18 x 98		✓ <sup>1)</sup>	✓ <sup>1)</sup>			
			0 ... 60			M30 x100		✓ <sup>1)</sup>	✓ <sup>1)</sup>			
	Type 2	6 <sup>2)</sup>	1	0.5 ... 18	-25 ... +55	Rectangular	156 x 50 x 116	-	✓ <sup>4)</sup>	✓ <sup>4)</sup>	WSU/WEU26/2	G-11
				15 ... 70					✓ <sup>4)</sup>	✓ <sup>4)</sup>		
Type 2	6 <sup>2)</sup>	1	0 ... 12/18 <sup>3)</sup>	-25 ... +60	Rectangular	75.5 x 17.6 x 33.5	✓ <sup>2)</sup>	✓ <sup>2)</sup>	✓ <sup>2)</sup>	WS/WE18-3	G-17	
			0 ... 25/35 <sup>3)</sup>					✓ <sup>2)</sup>	✓ <sup>2)</sup>			
Type 2	6 <sup>2)</sup>	1	0 ... 16/22 <sup>3)</sup>	-40 ... +60	Cylindrical	M18 x 80	✓ <sup>2)</sup>	✓ <sup>2)</sup>	✓ <sup>2)</sup>	VS/VE18-2	G-27	
			0 ... 25/35 <sup>3)</sup>					✓ <sup>2)</sup>	✓ <sup>2)</sup>			

<sup>1)</sup> With UE401

<sup>2)</sup> With LE20 / LE20 Muting / UE410 Flexi

<sup>3)</sup> Typical / maximum

<sup>4)</sup> With LCU-X



- Restart interlock (RES)
- External device monitoring (EDM)
- Maximum 8 sensor pairs
- Simple alignment
- Simple diagnostics and service



## Overview of technical specifications

Scanning range (depending on type)	0 m ... 10 m / 0 m ... 5 m / 0 m ... 60 m
Construction size (depending on type)	M18 x 107.7 mm / M18 x 97.7 mm / M30 x 100 mm
Enclosure rating	IP 67
Ambient operating temperature from ... to	-20 °C ... +55 °C
Type	Type 4 (IEC 61496), only in conjunction with UE401

## Product description

The L4000 photoelectric safety switch system comprises the UE401 safety evaluation unit, to which up to 4 L4000/L400 sensors (sender/receiver combinations) can be connected as single pairs or up to 8 sensors can be connected in cascade. The UE401 safety evaluation device is the connecting link between sensors and machine controller.

Colour LEDs provide in-situ information on operational status. The indication of status

and error messages on the 7-segment display of the UE401 safety evaluation unit allows rapid diagnostics. The possibility of connecting 4 individual sensor pairs or 8 sensors, the range of versions providing the right scanning range for the specific application, the suitability for outdoor applications, and the use of deflector mirrors also allow for the solution of complex protection tasks.

## In-system added value

- Combination with SICK safe control solutions

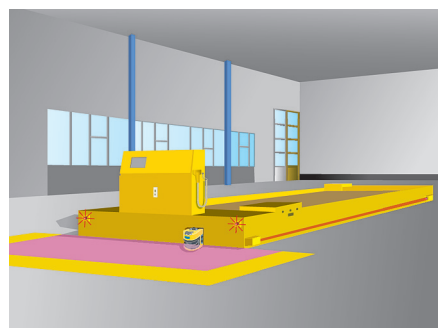
Combination with	Number of enable current paths	Number of signalling current paths	Further information
UE10-30S	3	1	N-3

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

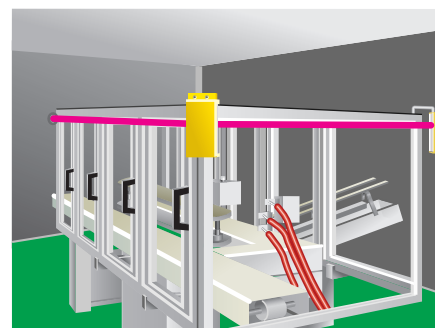
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Robots
- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Lateral protection on an automated guided vehicle



Door monitoring on a packaging machine

Further information	Page
→ Technical specifications	G-4
→ Dimensional drawings	G-7
→ Connection diagrams	G-8
→ Accessories	G-9
→ Services	A-2

## Ordering information

### Evaluation unit UE401

Type	Part number
UE401-A0010	6027343

### Single-beam photoelectric safety switch L4000

- Construction size M30 x 100 mm
- Plug M12 x 4, angled

Scanning range	Optical axis	Housing material	System part	Type	Part number
0 m ... 60 m	Axial	Metal	Sender	L40S-33MA2A	6027335
			Receiver	L40E-33MA2A	6027336

### Single-beam photoelectric safety switch L400

- Plug M12 x 4, straight

Scanning range	Optical axis	Construction size	Housing material	System part	Type	Part number
0 m ... 5 m	Radial	M18 x 107.7 mm	Metal	Sender	L40S-11MA1A	6027341
				Receiver	L40E-11MA1A	6027342
0 m ... 10 m	Axial	M18 x 97.7 mm	Plastic	Sender	L40S-21KA1A	6027337
				Receiver	L40E-21KA1A	6027338
			Metal	Sender	L40S-21MA1A	6027339
				Receiver	L40E-21MA1A	6027340

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## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### Evaluation unit UE401

#### General data

Number of single-beam photoelectric safety switches from ... to	Sensor pairs 1 ... 8
Maximum response time	30 ms
Protection class	III
Enclosure rating	IP 20
Type	Type 4 (IEC 61496)
Ambient operating temperature from ... to	-20 °C ... +55 °C
Air humidity from ... to	15 % ... 95 %, non-dewing
Storage temperature from ... to	-25 °C ... +75 °C
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)
Shock resistance	10 g, 16 ms (IEC 60068-2-29)
Weight	160 g
Mounting	Snap-on mounting on mounting rail acc. to EN 50022

#### Electrical data

Connector technology	Interchangeable, coded screw-type terminals
Cable length	100 m
Conductor cross-section	0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Supply voltage $V_S$	24 V DC (19.2 V DC ... 28.8 V DC)
Safety outputs	2 PNP semiconductors, short-circuit protected, cross-circuit monitored
Power consumption	< 3.6 W
Switching voltage HIGH	24 V DC (17.5 V DC ... 28.8 V DC)
Maximum switching voltage LOW	1.3 V DC
Switching current	0.5 A



## Single-beam photoelectric safety switch L4000

## General data

	L40S-33MA2A	L40E-33MA2A
System part	Sender	Receiver
Scanning range	0 m ... 60 m	
Number of beams	1	
Optical axis	Axial	
Light beam diameter	26 mm	
Aperture angle/receive angle	$\pm 2.5^\circ / \pm 2.5^\circ$	
Light sender/type of light	LED (visible red light)	—
Wave length	660 nm	—
Protection class	III	
Enclosure rating	IP 67	
Type	Type 4 (IEC 61496), only in conjunction with UE401	
Ambient operating temperature from ... to	-20 °C ... +55 °C	
Storage temperature from ... to	-25 °C ... +75 °C	
Air humidity from ... to	15 % ... 95 %, non-dewing	
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)	
Shock resistance	10 g, 16 ms (IEC 60068-2-29)	
Design	Cylindrical	
Dimensions (diameter x length)	M30 x 100 mm	
Housing material	Brass nickel-plated	
Lens material	Glass	
Weight	212 g	

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## Electrical data

	L40S-33MA2A	L40E-33MA2A
System part	Sender	Receiver
Connection type	Plug M12 x 4, angled	
Supply voltage $V_S$	24 V DC (19.2 V DC ... 28.8 V DC)	
Maximum power consumption	60 mA	30 mA

## Single-beam photoelectric safety switch L400

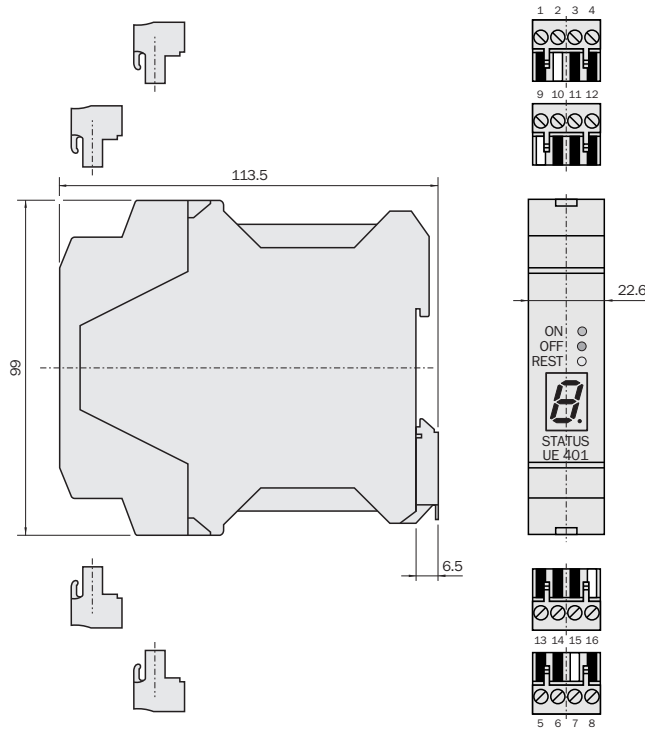
	L40S-11MA1A	L40E-11MA1A	L40S-21KA1A	L40E-21KA1A	L40S-21MA1A	L40E-21MA1A
System part	Sender	Receiver	Sender	Receiver	Sender	Receiver
Scanning range	0 m ... 5 m		0 m ... 10 m			
Number of beams	1					
Optical axis	Radial		Axial			
Light beam diameter	12 mm					
Aperture angle/receive angle	$\pm 2.5^\circ / \pm 2.5^\circ$					
Light sender/type of light	LED (visible red light)	—	LED (visible red light)	—	LED (visible red light)	—
Wave length	660 nm	—	660 nm	—	660 nm	—
Protection class	III					
Enclosure rating	IP 67					
Type	Type 4 (IEC 61496), only in conjunction with UE401					
Ambient operating temperature from ... to	-20 °C ... +55 °C					
Storage temperature from ... to	-25 °C ... +75 °C					
Air humidity from ... to	15 % ... 95 %, non-dewing					
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)					
Shock resistance	10 g, 16 ms (IEC 60068-2-29)					
Design	Cylindrical					
Dimensions (diameter x length)	M18 x 107.7 mm		M18 x 97.7 mm			
Housing material	Brass nickel-plated		Plastic		Brass nickel-plated	
Lens material	Glass					
Weight	67 g		30 g		67 g	

## Electrical data

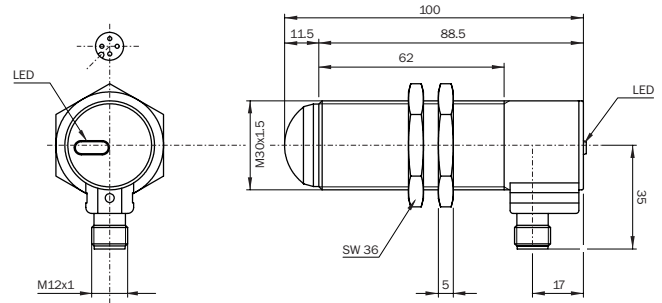
	L40S-11MA1A	L40E-11MA1A	L40S-21KA1A	L40E-21KA1A	L40S-21MA1A	L40E-21MA1A
System part	Sender	Receiver	Sender	Receiver	Sender	Receiver
Connection type	Plug M12 x 4, straight					
Supply voltage $V_S$	24 V DC (19.2 V DC ... 28.8 V DC)					
Maximum power consumption	60 mA	30 mA	60 mA	30 mA	60 mA	30 mA

# Dimensional drawings

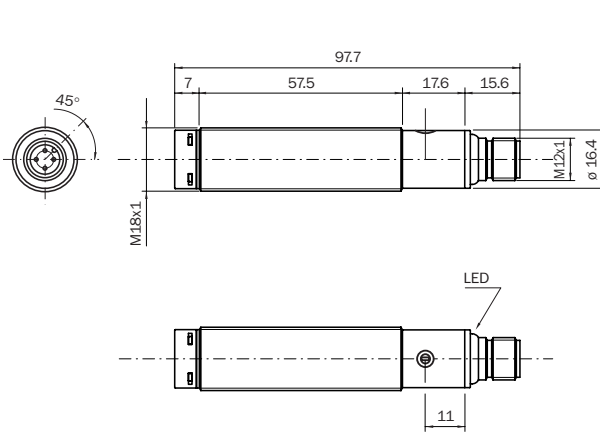
## Evaluation unit UE401



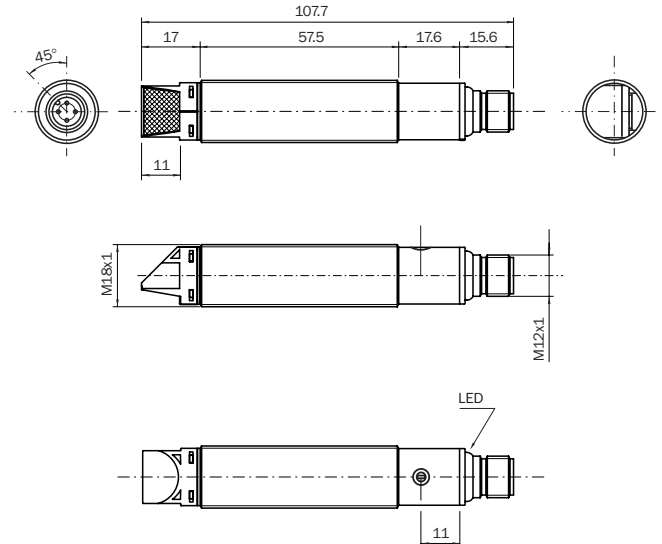
## L4000



## L400, axial



## L400, radial

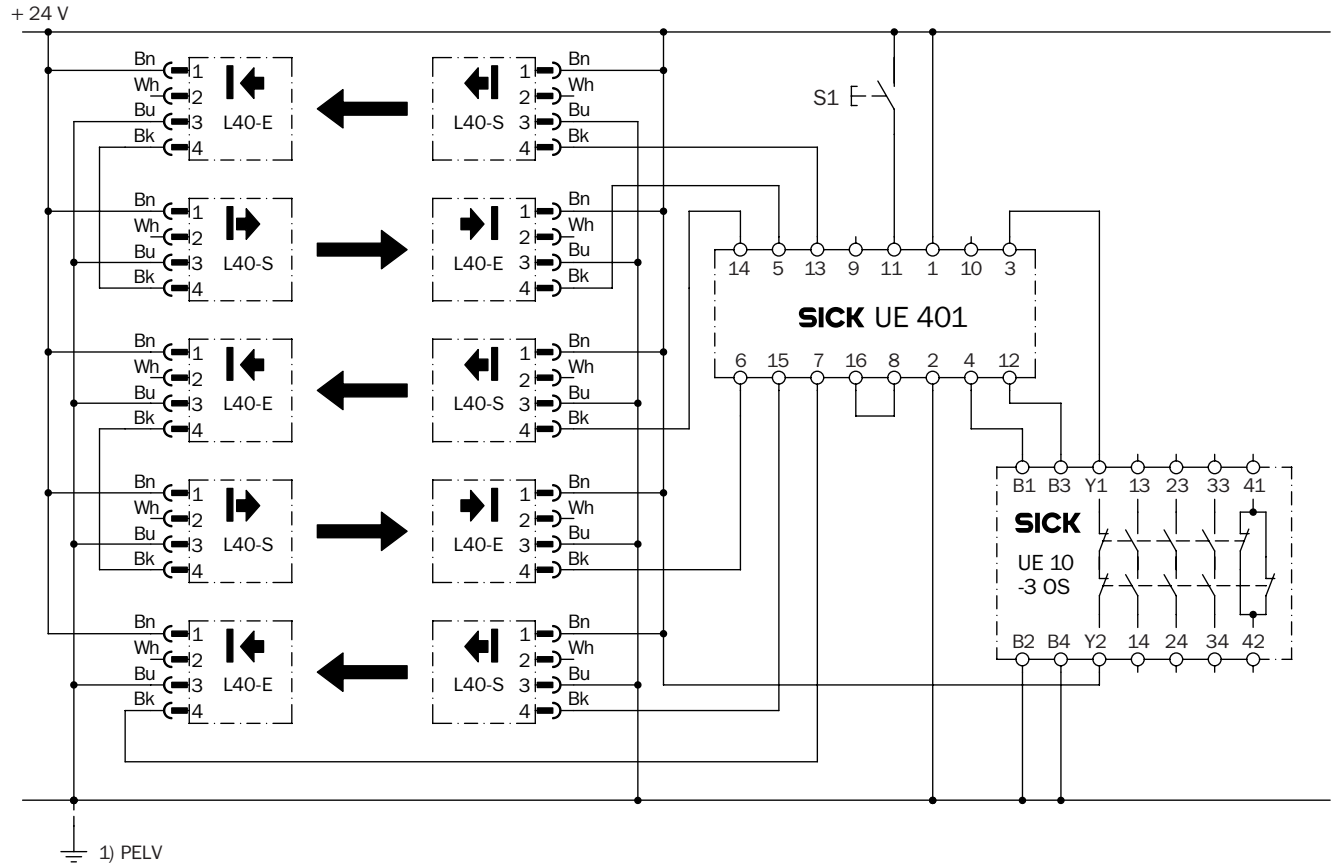


Dimensions in mm

# Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

## 5 x L4000 (two pairs cascaded) on UE401 with UE10-3OS



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**Task**

Integration of five single-beam photoelectric safety switches L400/L4000 (2 pairs cascaded) with safety evaluation device UE401 and safety relay UE10-3OS. Operating mode with restart interlock and external device monitoring.

**Function**

When the light path is clear and the UE10 is de-energised and functioning correctly, the yellow LED on the UE401 flashes. The system is ready to be switched on. The system is enabled by pressing S1 (button is pressed and released). The OSSD1 and OSSD2 outputs are live, the UE10 is switched on. On the interruption of one of the light beams, the UE10 is deactivated by the OSSD1 and OSSD2 outputs.

**Possible faults**




Cross-circuits and short-circuits of the OSSDs are being detected and lead to the inhibited state (lock-out). The incorrect functioning of the UE10 will be detected and will not result in the loss of the shutdown function. Jamming of the S1 button prevents output circuit to enable.

**Comments**

1) PELV as required in EN 60204-1 / 6.4

The related operating instructions for the integrated devices must be observed!

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0



## Accessories

### Mounting systems

Description	Construction size	Mounting	Property	Type	Part number
Mounting bracket	M18	With fixing holes 4 mm	Adjustable	BEF-HA-M18-R	5313513
	M30	With tapering thread M6		BEF-HA-M30-A	5311527
		With fixing holes for M4		BEF-HA-M30-R	5311528
	M18	—	—	BEF-WN-M18	5308446
	M30	—	—	BEF-WN-M30	5308445

### Connectors

Description	Connection type	Cable alignment	Cable length	Cable material	Type	Part number
Cable socket	M12 x 4	Straight	2 m	PVC	DOL-1204-G02M	6009382
			5 m	PVC	DOL-1204-G05M	6009866
				PUR halogen free	DOL-1204-G05MC	6025901
		10 m	PVC	DOL-1204-G10M	6010543	
		Angled	2 m	PVC	DOL-1204-W02M	6009383
			5 m	PVC	DOL-1204-W05M	6009867
				PUR halogen free	DOL-1204-W05MC	6025904
		10 m	PVC	DOL-1204-W10M	6010541	
		Straight	Can be preformed	—	DOS-1204-G	6007302
		Angled		—	DOS-1204-W	6007303
Cable plug	M12 x 4	Straight	—	STE-1204-G	6009932	

**Deflector mirrors**

Description	Usage	Mirror surface	Delivery	Type	Part number
Deflector mirrors <sup>1)</sup>	—	105 mm x 160 mm	—	PNS105-1	1004076
	—	75 mm x 80 mm	Including mounting adapter (two pieces swivel mount)	PNS75-008	1026647
	—	96 mm x 124 mm	—	PSK1	1005229
	For 90° deflection	—	Incl. mounting set, not suitable for column mounting	PSK45	5306053
Mounting bracket	For PSK 1	—	—	BEF-GH	2009292
Spring fastening				—	2012473

<sup>1)</sup> Reduction of the scanning range

**Laser alignment aid**

Type	Part number
Laser alignment aid AR60	1015741
AR60 adapter for L4000	5311529
AR60 adapter for L400	5313533

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## Overview of technical specifications

Scanning range (depending on type)	0.5 m ... 18 m / 15 m ... 70 m
Construction size	156 mm x 50 mm x 116 mm
Supply voltage (depending on type)	24 V DC / 115 V AC / 230 V AC
Enclosure rating (depending on type)	IP 65 / IP 67
Ambient operating temperature from ... to	-25 °C ... +55 °C
Type	Type 4 (EN 61496 part 1 and EN 50100 part 2)

## Product description

The photoelectric safety switch WSU/WEU26/2 is used for access protection of hazardous areas on machines or plants.

The devices are permanently mounted in the access area with the necessary safety distance from the nearest hazardous point and send a shutdown signal to the machine or system when the light beam is interrupted.

## In-system added value

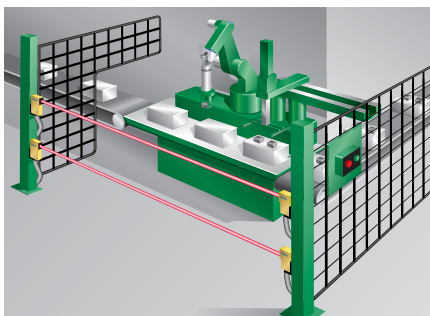
- Combination with SICK safe control solutions

→ Combinations see appendix "Sensor systems and safe control solutions from SICK"

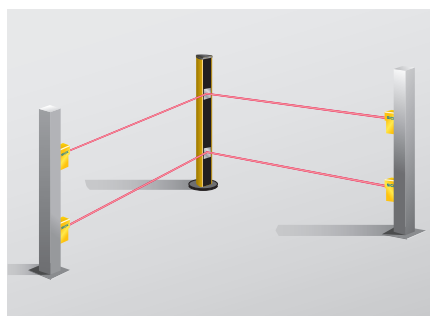
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Robots
- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection on a machining centre



Access protection with mirror deflection



- Universal in application
- Relay outputs
- Universal power supply
- Robust design
- Large scanning range
- Front screen heating

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CE

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→ Ordering information	G-12
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→ Accessories	G-15
→ Services	A-2

## Ordering information

Scanning range	Supply voltage	Connection type	Enclosure rating	Sender		Receiver	
				Type	Part number	Type	Part number
0.5 m ... 18 m	230 V AC	PG gland	IP 67	WSU26/2-110	1015615	WEU26/2-110	1015616
		Plug 6 + PE	IP 65	WSU26/2-111	1015712	WEU26/2-111	1015713
		Plug 6 + PE <sup>1)</sup>		WSU26/2-113	1015716	WEU26/2-112	1015714
		Plug 6 + PE <sup>1)</sup>		WSU26/2-113	1015716	WEU26/2-113	1015715
		Plug 15 + PE	IP 65	WSU26/2-114	1015834	WEU26/2-114	1015835
15 m ... 70 m	230 V AC	PG gland	IP 67	WSU26/2-210	1015731	WEU26/2-210	1015743
		Plug 6 + PE	IP 65	WSU26/2-211	1015733	WEU26/2-211	1015744
		Plug 6 + PE <sup>1)</sup>		WSU26/2-213	1015736	WEU26/2-212	1015746
		Plug 6 + PE <sup>1)</sup>		WSU26/2-213	1015736	WEU26/2-213	1015748
		Plug 15 + PE	IP 65	WSU26/2-214	1015840	WEU26/2-214	1015841
0.5 m ... 18 m	115 V AC	PG gland	IP 67	WSU26/2-120	1015717	WEU26/2-120	1015718
		Plug 6 + PE	IP 65	WSU26/2-121	1015719	WEU26/2-121	1015720
		Plug 6 + PE <sup>1)</sup>		WSU26/2-123	1015723	WEU26/2-122	1015721
		Plug 6 + PE <sup>1)</sup>		WSU26/2-123	1015723	WEU26/2-123	1015722
		Plug 15 + PE	IP 65	WSU26/2-124	1015836	WEU26/2-124	1015837
15 m ... 70 m	115 V AC	PG gland	IP 67	WSU26/2-220	1015738	WEU26/2-220	1015749
		Plug 6 + PE	IP 65	WSU26/2-221	1015740	WEU26/2-221	1015750
		Plug 6 + PE <sup>1)</sup>		WSU26/2-223	1015737	WEU26/2-222	1015751
		Plug 6 + PE <sup>1)</sup>		WSU26/2-223	1015737	WEU26/2-223	1015505
		Plug 15 + PE	IP 65	WSU26/2-224	1015842	WEU26/2-224	1015843
0.5 m ... 18 m	24 V DC	PG gland	IP 67	WSU26/2-130	1015724	WEU26/2-130	1015725
		Plug 6 + PE	IP 65	WSU26/2-131	1015726	WEU26/2-131	1015727
		Plug 6 + PE <sup>1)</sup>		WSU26/2-133	1015730	WEU26/2-132	1015728
		Plug 6 + PE <sup>1)</sup>		WSU26/2-133	1015730	WEU26/2-133	1015729
		Plug 15 + PE	IP 65	WSU26/2-134	1015838	WEU26/2-134	1015839
15 m ... 70 m	24 V DC	PG gland	IP 67	WSU26/2-230	1015745	WEU26/2-230	1015504
		Plug 6 + PE	IP 65	WSU26/2-231	1015747	WEU26/2-231	1015753
		Plug 6 + PE <sup>1)</sup>		WSU26/2-233	1015739	WEU26/2-232	1015754
		Plug 6 + PE <sup>1)</sup>		WSU26/2-233	1015739	WEU26/2-233	1015755
		Plug 15 + PE	IP 65	WSU26/2-234	1015844	WEU26/2-234	1015845

<sup>1)</sup> Alternative internal wiring of the normally closed and normally open contacts (see technical description)



## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

	Sender	Receiver
Scanning range (depending on type)	0.5 m ... 18 m / 15 m ... 70 m	
Number of beams	1	
Synchronisation	Optical, without separate synchronisation cable	
Light beam diameter	23 mm	
Aperture angle/receive angle	4° / 4°	
Wave length	950 nm	—
Protection class	I	
Enclosure rating (depending on type)	IP 67 / IP 65	
Type	Type 4 (EN 61496 part 1 and EN 50100 part 2)	
Dimensions (W x H x D)	156 mm x 50 mm x 116 mm	
Housing material	Zinc die-cast	
Ambient operating temperature from ... to	-25 °C ... +55 °C	
Storage temperature from ... to	-25 °C ... +70 °C	
Air humidity from ... to	15 % ... 95 %, non-dewing	
Vibration resistance	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)	
Shock resistance	10 g, 16 ms (IEC 68-2-29)	
Weight (depending on type)	1.00 kg ... 1.35 kg	1.47 kg ... 1.87

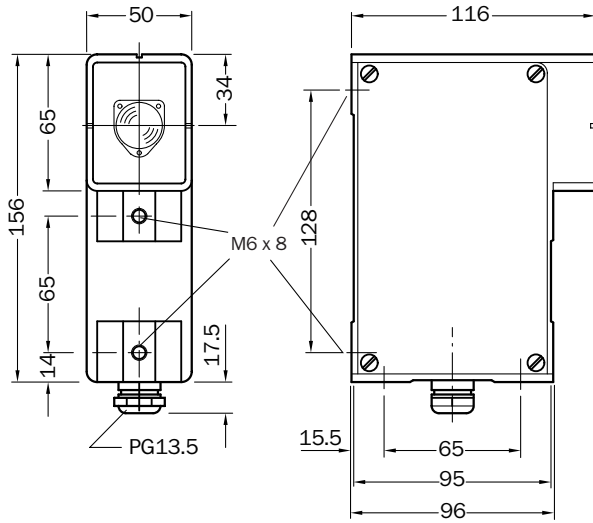
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### Electrical data

	Sender	Receiver
Connection type (depending on type)	PG13.5 PG gland / Plug 6 + PE / Plug 15 + PE	
Supply voltage $V_S$ (depending on type)	230 V AC (195.5 V AC ... 253 V AC) / 115 V AC (97.8 V AC ... 126 V AC) / 24 V DC (19.2 V DC ... 28.8 V DC)	
Supply frequency	48 Hz	
Power consumption (depending on type)	7 VA / 4 W	10 VA / 6 W
Switching outputs	—	Relay
Maximum response time	—	22 ms
Switching current	—	0.02 A ... 2 A
Switching voltage min ... max	—	24 V DC ... 250 V AC
Maximum switching power AC/DC	—	1380 VA / 144 W
Mechanical life (relay contacts)	—	1 x 10 <sup>7</sup> switching cycles
Electrical life (relay contacts) (depending on type)		
DC version	—	5 x 10 <sup>4</sup> switching cycles, with 2 A switching current /
AC version	—	8 x 10 <sup>4</sup> switching cycles, with 2 A switching current
Test input	Volt-free switch	—

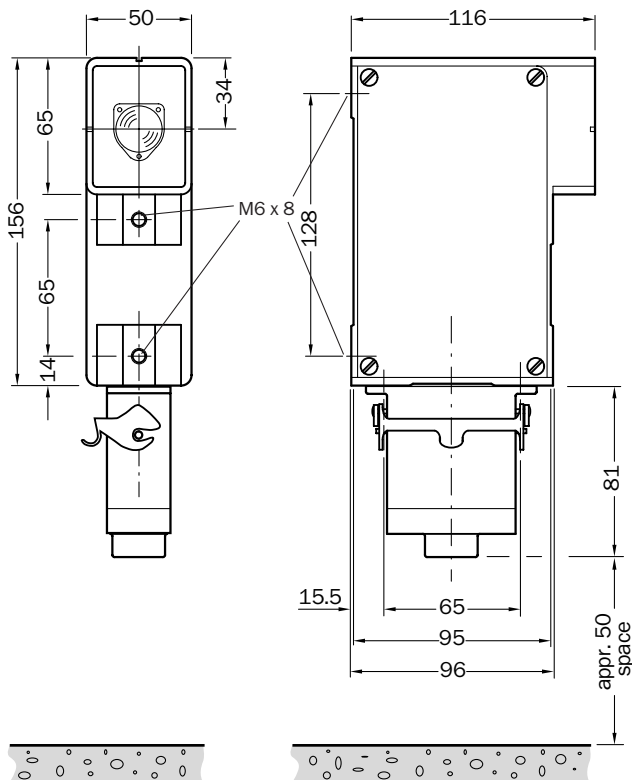
# Dimensional drawings

**PG gland**

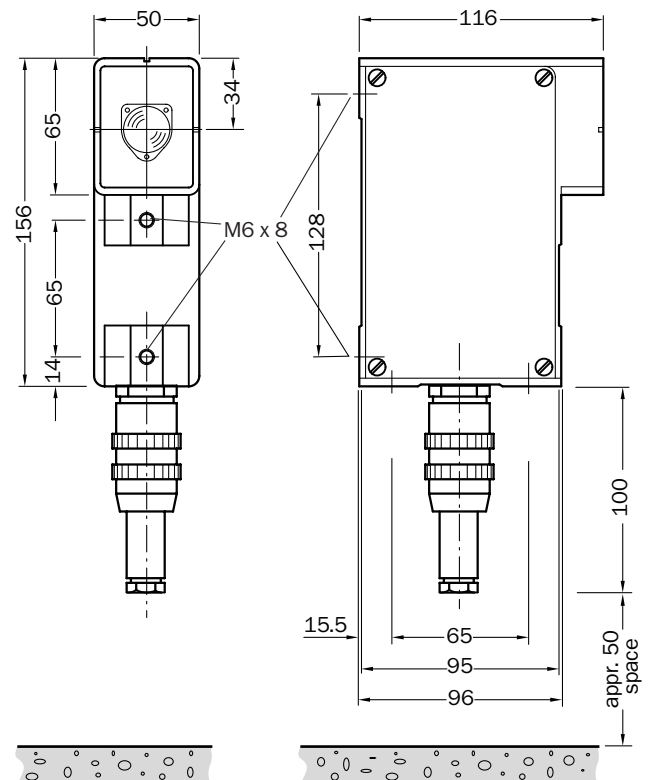


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**Plug 15 + PE**



**Plug 6 + PE**






Dimensions in mm

## Connection diagrams

→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe.	Page P-0

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## Accessories

### Mounting systems

Property	Description	Part number
Mounting bracket	For WSU/WEU26/2	2007900

### Deflector mirrors

Description	Usage	Mirror surface	Remark	Type	Part number
Deflector mirrors <sup>1)</sup>	—	105 mm x 160 mm	—	PNS105-1	1004076
	—	75 mm x 80 mm	Including mounting adapter (two pieces swivel mount)	PNS75-008	1026647
	—	96 mm x 124 mm	—	PSK1	1005229
	For 90° deflection	—	Incl. mounting set, not suitable for column mounting	PSK45	5306053
Mounting bracket	For PSK 1	—	—	BEF-GH	2009292
Spring fastening				—	2012473

<sup>1)</sup> Reduction of the scanning range

**Cable receptacles**

Description	Construction size	Cable alignment	Part number
Hirschmann cable receptacle	6-pin + PE	Straight	6006612
		Angled	6006613
Cable receptacles	PG13.5	Straight	2019075
	PG16	Lateral	2019076

**PG expansion**

Description	Construction size	Type	Part number
PG expansion	PG13/21	—	5307052
	PG21	Two-way splitter	5305978

**Device protection**

Description	Part number
Snow protection tube	1003619
Dust protection tube	1003556

**Arc-suppressor**

Description	Type	Part number
0.22 µF/220 Ohm for 110 V AC ... 220 V AC	RC-A	6001224
2.2 µF/100 Ohm for 24 V AC/DC ... 48 V AC/DC	RC-AD	6001225

**Laser alignment aid**

Description	Part number
Laser alignment aid AR60	1015741
Adapter AR60 WSU/WEU26/2	4031156

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## Overview of technical specifications

Scanning range (typical/maximum)	0 m... 12 m / 0 ... 18 m
Light sender/type of light	LED/visible red light
Construction size	75.5 mm x 17.6 mm x 33.5 mm
Enclosure rating	IP 67
Ambient operating temperature from ... to	-40 °C ... +60 °C
Type	Type 2 (EN 61496), only in conjunction with suitable testing device

## Product description

The SICK single-beam photoelectric safety switch WS/WE18-3 consists of a testable sender and receiver combined with an evaluation unit.

## In-system added value

- Combination with SICK safe control solutions

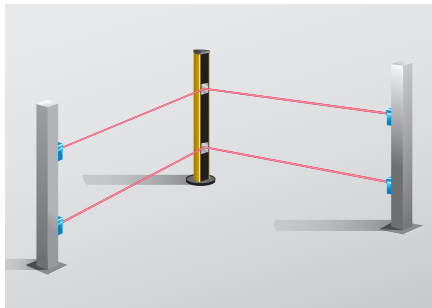
Combination with	Type of output	Number of sensors	Restart interlock	External device monitoring	Muting	Further information
LE20	PNP, monitored and short-circuit protected	6	✓	✓	—	N-57
LE20 Muting		6	✓	✓	✓	N-64
UE10-30S	Relay contacts	—	—	—	—	N-3
UE410 Flexi	PNP semiconductors, short-circuit protected, cross-circuit monitored	4	✓	✓	✓	O-2

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

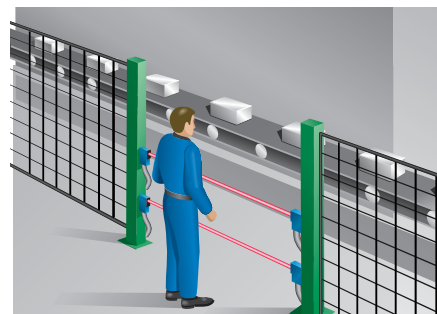
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection with mirror deflection



Access protection on a conveyor system



- Compact design
- Red light
- Plastic housing, ABS



Further information	Page
→ Ordering information	G-18
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## Ordering information

Scanning range	Connection type	Type of output	System part	Type	Part number
12 m	Plug M12 x 4	PNP, Q and $\bar{Q}$	Sender/receiver	WS/WE18-3P460	1026751
			Sender	WS18-3D460	2031731
			Receiver	WE18-3P460	2031732

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

	WS18-3D460	WE18-3P460
System part	Sender	Receiver
Scanning range (typical/maximum)	0 m ... 12 m / 0 m ... 18 m	
Number of beams	1	
Light spot diameter (distance)	300 mm/10 m	
Aperture angle/receive angle	$\pm 1.5^\circ / \pm 5^\circ$	
Light sender/type of light	LED/visible red light	
Wave length	660 nm	
Average service life ( $T_A$ )	100000 h (+25 °C)	
Protection class	II	
Enclosure rating	IP 67	
Type	Type 2 (EN 61496), only in conjunction with suitable testing device	
Design	Rectangular	
Dimensions (W x H x D)	75.5 mm x 17.6 mm x 33.5 mm	
Housing material	ABS	
Ambient operating temperature from ... to	-40 °C ... +60 °C	
Storage temperature from ... to	-40 °C ... +75 °C	
Weight	40 g	

### Electrical data

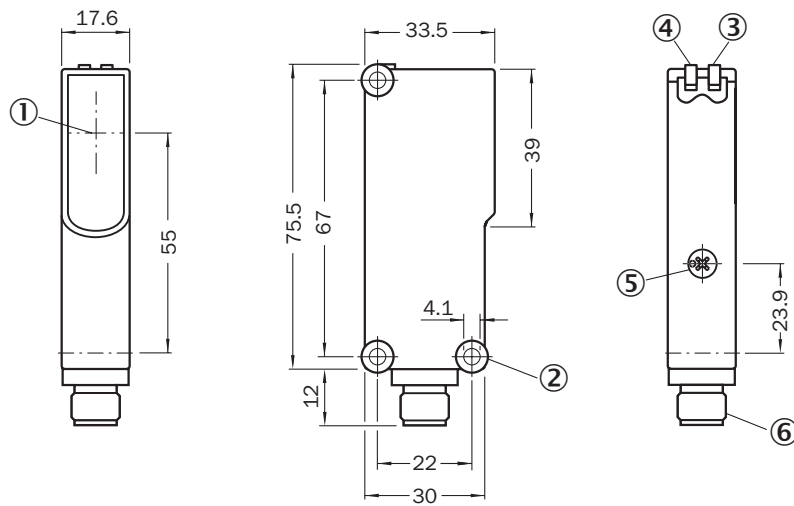
	WS18-3D460	WE18-3P460
System part	Sender	Receiver
Connection type	Plug M12 x 4	
Supply voltage $V_S$	24 V DC (16.8 V DC ... 28.8 V DC) <sup>1)</sup>	
Maximum power consumption	35 mA	20 mA
Test input voltage	$V_S$ or not connected (sender on) 0 V DC (sender off)	—
Test duration	2 ms <sup>2)</sup>	—
Switching outputs	—	PNP, Q and $\bar{Q}$ <sup>3)</sup>
Maximum response time	—	500 $\mu$ S
Maximum switching sequence	—	1000 Hz
Maximum switching current	—	100 mA
Diagnosis display	LED	

<sup>1)</sup> Reverse polarity protected

<sup>2)</sup> Signal propagation time for Ohmic load, for test signal application (sender) and output signal reaction (receiver)

<sup>3)</sup> Short-circuit protected interference suppression

## Dimensional drawings



- ① Centre of optical axis
- ② Fastening hole
- ③ LED, yellow; light reception status
- ④ LED, green; operating voltage active
- ⑤ Sensitivity adjuster on WE
- ⑥ Device plug M12, 4-pin

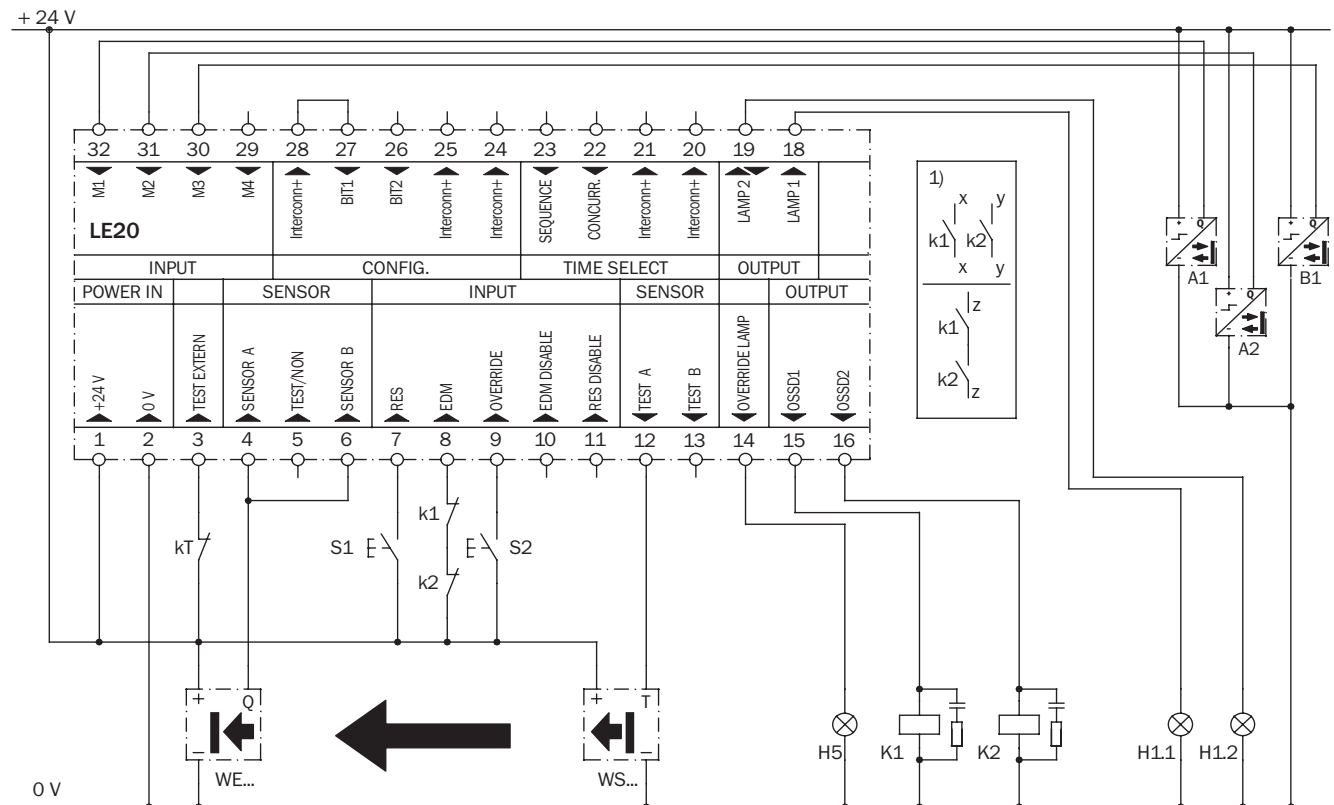
Dimensions in mm

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# Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

## WS/WE18-3 on LE20 Muting safety evaluation unit



### Task

Integration of the single-beam photoelectric safety switch in a control via an LE20. Muting using 2 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors, operating mode with restart interlock and external device monitoring.

### Function

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE20 deactivates the contactors K1 and K2.

### Muting

The protective field must be clear, and the OSSDs on the LE20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting.

### Override

If, after a power failure or a muting error, the object to be muted is present in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if both muting signals (A1 and A2) are present at the LE20. This situation is indicated by illumination of the override lamp H5.

### Possible faults

The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.




### Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.



## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.	Page P-0

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## Accessories

### Mounting systems

Description	Usage	Type	Part number
Mounting bracket	For WS/WE12-2	BEF-WN-W18	2009317

### Connectors

Description	Connection type	Cable alignment	Cable length	Cable material	Type	Part number
Cable socket	M12 x 4	Straight	2 m	PVC	DOL-1204-G02M	6009382
			Can be preformed	—	DOS-1204-G	6007302

### Deflector mirrors

Description	Usage	Mirror surface	Remark	Type	Part number
Deflector mirrors <sup>1)</sup>	—	105 mm x 160 mm	—	PNS105-1	1004076
	—	75 mm x 80 mm	Including mounting adapter (two pieces swivel mount)	PNS75-008	1026647
	—	96 mm x 124 mm	—	PSK1	1005229
	For 90° deflection	—	Incl. mounting set, not suitable for column mounting	PSK45	5306053
Mounting bracket	For PSK 1	—	—	BEF-GH	2009292
Spring fastening				—	2012473

<sup>1)</sup> Reduction of the scanning range



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- Integrated heating
- High scanning range
- Plastic housing, ABS
- Compact design
- Red light



## Overview of technical specifications

Scanning range (typical/maximum)	0 m ... 25 m / 0 m ... 35 m
Light sender/type of light	LED/visible red light
Construction size	80 mm x 24 mm x 53.5 mm
Enclosure rating	IP 67
Ambient operating temperature from ... to	-40 °C ... +60 °C
Type	Type 2, EN 61496, only in conjunction with suitable testing device

## Product description

The SICK single-beam photoelectric safety switch WS/WE27-2 consists of a testable sender and receiver combined with an evaluation unit.

## In-system added value

- Combination with SICK safe control solutions

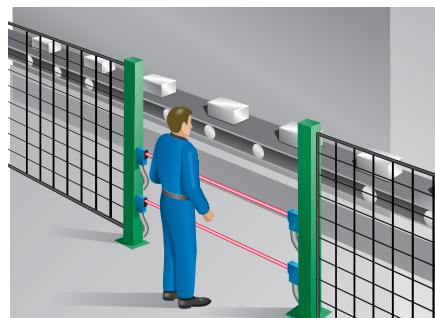
Combination with	Type of output	Number of sensors	Restart interlock	External device monitoring	Muting	Further information
LE20	PNP, monitored and short-circuit protected	6	✓	✓	—	N-57
LE20 Muting		6	✓	✓	✓	N-64
UE10-30S	Relay contacts	—	—	—	—	N-3
UE410 Flexi	PNP semiconductors, short-circuit protected, cross-circuit monitored	4	✓	✓	✓	O-2

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

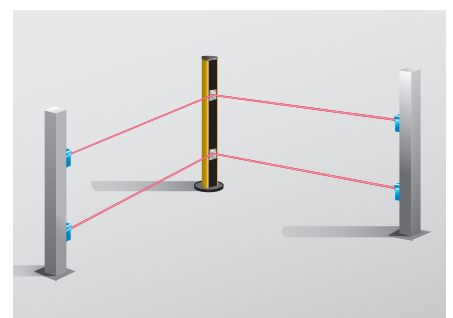
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Access protection on a conveyor system



Access protection with mirror deflection

Further information	Page
→ Dimensional drawings	G-24
→ Connection diagrams	G-25
→ Accessories	G-26
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## Ordering information

Scanning range	Connection type	System part	Front screen heating	Type	Part number
0 m ... 25 m	Plug M12 x 4	Sender/receiver	✓	WS/WE27-2F450S05	1016025
			–	WS/WE27-2F460	1019561
	Plug 7-pin		–	WS/WE27-2F730	1015124
			✓	WS/WE27-2F750	1015752
	Plug M12 x 4	Sender	✓	WS27-2D450S05	2018932
		Receiver	✓	WE27-2F450S05	2018933
		Sender	–	WS27-2D460	2021365
		Receiver	–	WE27-2F460	2021708
	Plug, 7-pin	Sender	–	WS27-2D730	2017894
		Receiver	–	WE27-2F730	2017895
		Sender	✓	WS27-2D750	2018618
		Receiver	✓	WE27-2F750	2018619

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

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### General data

	Sender	Receiver
Scanning range (typical/maximum)	0 m ... 25 m / 0 m ... 35 m	
Light spot diameter (distance)	1200 mm (25 m)	
Aperture angle/receive angle	±4°/±5°	
Light sender/type of light	LED/visible red light	
Wave length	660 nm	
Average service life (T <sub>A</sub> )	100000 h (+25 °C)	
Protection class	II	
Enclosure rating	IP 67	
Type	Type 2 (EN 61496), only in conjunction with suitable testing device	
Design	Rectangular	
Dimensions (W x H x D)	80 mm x 24 mm x 53.5 mm	
Housing material	ABS	
Ambient operating temperature from ... to	–40 °C ... +60 °C	
Storage temperature from ... to	–40 °C ... +75 °C	
Weight	100 g	

Electrical data

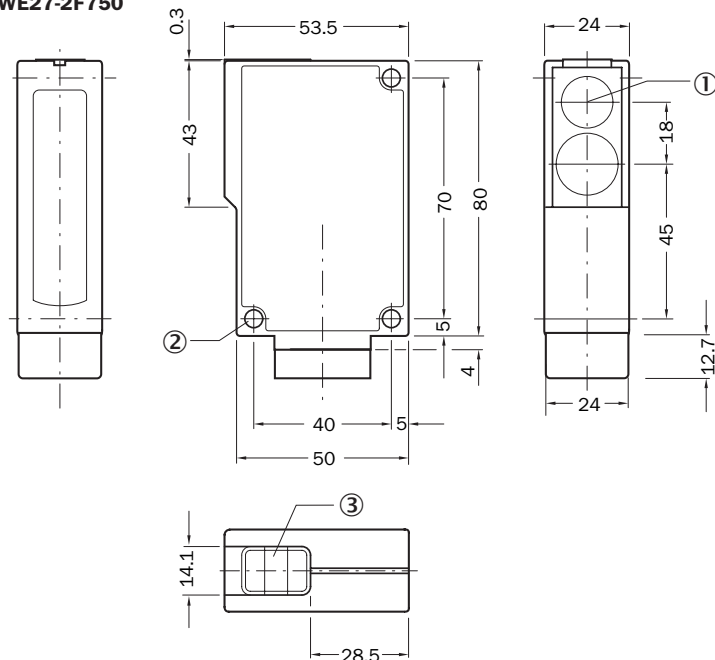
Connection type (depending on type)	Plug M12 x 4 / Plug, 7-pin	
Supply voltage $V_S$	24 V DC (16.8 V DC ... 28.8 V DC) <sup>1)</sup>	
Maximum power consumption (depending on type)	50 mA / 35 mA	45 mA / 35 mA
Test input voltage	$V_S$ (sender on), 0 V DC (sender off)	—
Switching outputs	—	PNP, Q and $\bar{Q}$ <sup>2)</sup>
Maximum response time	—	500 $\mu$ S
Maximum switching sequence	—	1000 Hz
Diagnosis display	LED	

<sup>1)</sup> Reverse polarity protected

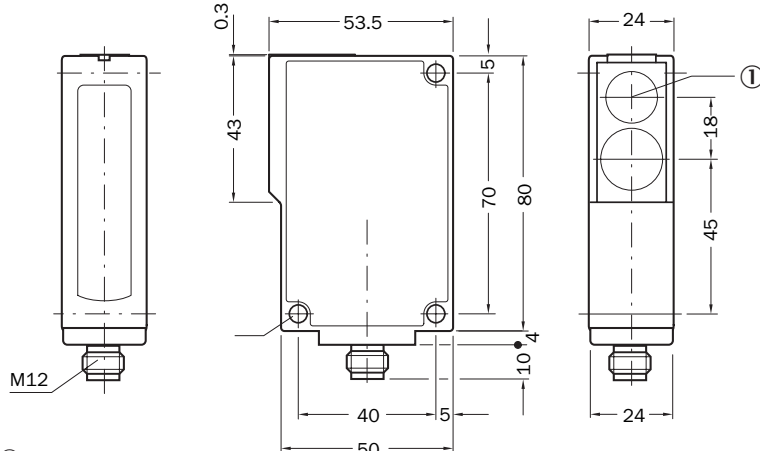
<sup>2)</sup> Short-circuit protected interference suppression

Dimensional drawings

WS/WE27-2F730  
WS/WE27-2F750



WS/WE27-2F460  
WS/WE27-2F450S05



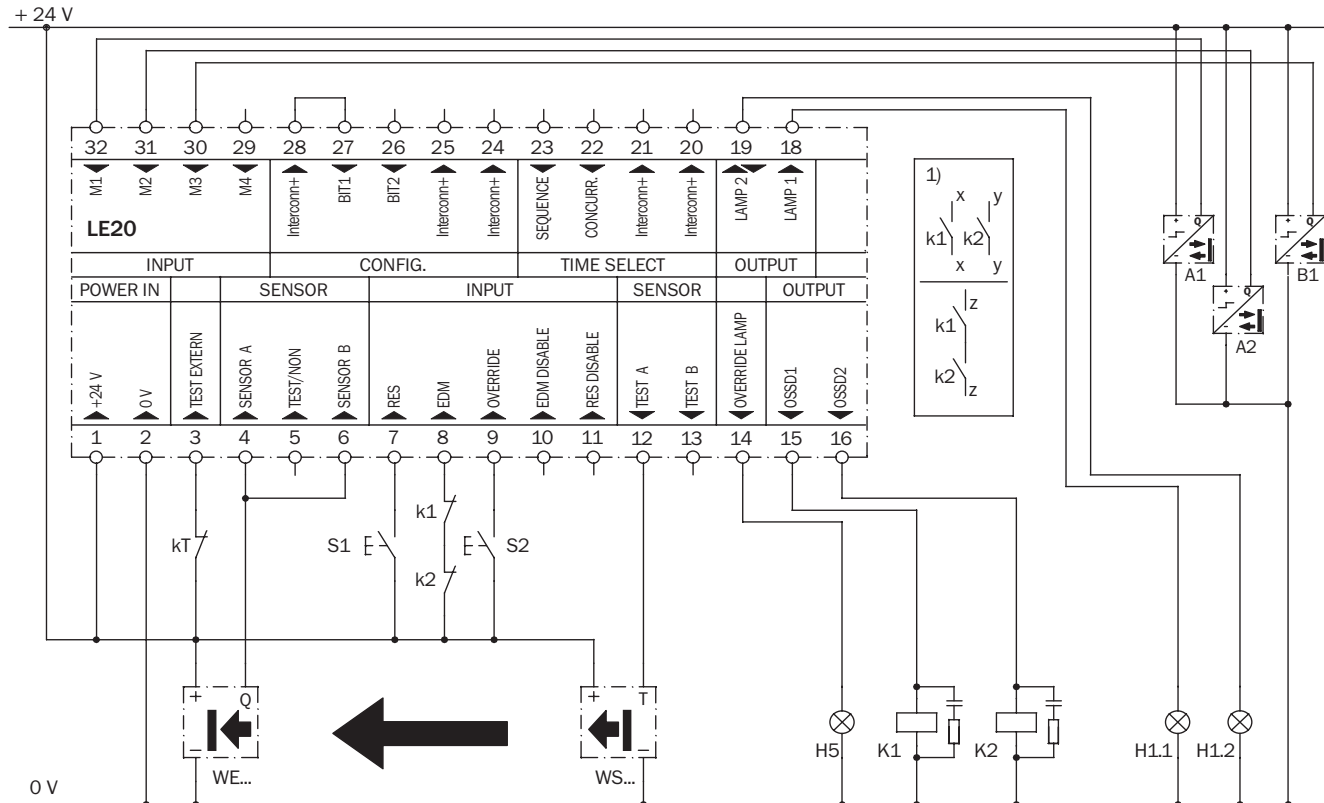
- ① Centre of optical axis
- ② Fastening hole  $\varnothing$  5.2 mm
- ③ LED

Dimensions in mm

## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### WS/WE27-2 on LE20 Muting safety evaluation unit



#### Task

Integration of the single-beam photoelectric safety switch in a control via an LE20. Muting using 3 photoelectric proximity switches (light switching PNP) and override circuit. Concurrence monitoring of the muting sensors A1-A2, operating mode with restart interlock and external device monitoring.

#### Function

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE20 deactivates the contactors K1 and K2.

#### Muting

The protective field must be clear, and the OSSDs on the LE20 switched on, to allow initiation of the muting function. If photoelectric proximity switch pair A is not activated within 3 seconds, the muting is prevented. The muting inputs must remain activated without interruption for the duration of the muting, also on switching from B1 to A1 & A2.

#### Override

If, after a power failure or a muting error, the object to be muted is in the light beam, the object can be moved out of the protective field by operating the S2 button. This is only possible if a valid combination of muting signals is present at the LE20. This situation is indicated by illumination of the override lamp H5.

#### Possible faults




The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

#### Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe.	Page P-0

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## Accessories

### Mounting systems

Description	Usage	Type	Part number
Mounting bracket	For WS/WE27-2	BEF-WN-W27	2009122

### Connectors

Description	Connection type	Cable alignment	Cable length	Cable material	Remark	Type	Part number
Cable socket	M12 x 4	Straight	2 m	PVC	—	DOL-1204-G02M	6009382
			—	—	—	DOS-1204-G	6007302
	Q7, 7-pin, DC	Angled	—	—	With coding for DC	DOS-2107-W	6006823

### Deflector mirrors

Description	Usage	Mirror surface	Delivery	Type	Part number
Deflector mirrors <sup>1)</sup>	—	105 mm x 160 mm	—	PNS105-1	1004076
	—	75 mm x 80 mm	Including mounting adapter (two pieces swivel mount)	PNS75-008	1026647
	—	96 mm x 124 mm	—	PSK1	1005229
	For 90° deflection	—	Incl. mounting set, not suitable for column mounting	PSK45	5306053
Mounting bracket	For PSK 1	—	—	BEF-GH	2009292
Spring fastening				—	2012473

<sup>1)</sup> Reduction of the scanning range

### Laser alignment aid

Type	Part number
Laser alignment aid AR60	1015741
AR60 adapter for WS/WE27-2	4032828

## Overview of technical specifications

Scanning range (typical/maximum)	0 m ... 16 m / 0 m ... 22 m
Light sender/type of light	LED/visible red light
Construction size (depending on type)	M18 x 85.3 mm / M18 x 97.7 mm
Enclosure rating	IP 67
Ambient operating temperature from ... to	-25 °C ... +70 °C
Type	Type 2 (EN 61496), only in conjunction with LE20

## Product description

The SICK single-beam photoelectric safety switch VS/VE18-2 consists of a testable sender and receiver combined with an evaluation unit.

## In-system added value

- Combination with SICK safe control solutions

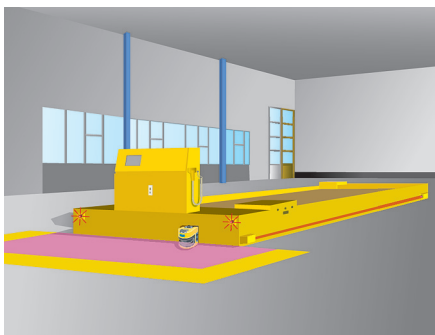
Combination with	Type of output	Number of sensors	Restart interlock	External device monitoring	Muting	Further information
LE20	PNP, monitored and short-circuit protected	6	✓	✓	—	N-57
LE20 Muting		6	✓	✓	✓	N-64
UE10-30S	Relay contacts	—	—	—	—	N-3
UE410 Flexi	PNP semiconductors, short-circuit protected, cross-circuit monitored	4	✓	✓	✓	O-2

→ More combinations see appendix "Sensor systems and safe control solutions from SICK"

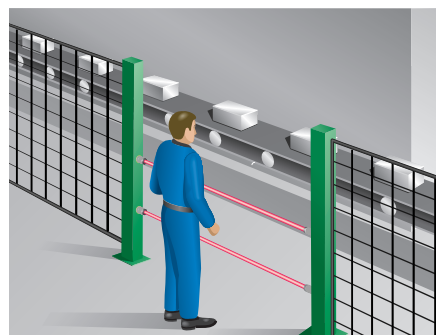
## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Processing machines
- Machining centres
- Palletiser systems
- High-bay warehouses
- Transfer lines



Hazardous area protection using the VS/VE18 and the LE20 on an automated guided vehicle (AGV)



Access protection on a conveyor system



- Metal housing
- High scanning range
- Cylindrical design
- Red light



Further information	Page
→ Ordering information	G-28
→ Technical specifications	G-28
→ Dimensional drawings	G-29
→ Connection diagrams	G-30
→ Accessories	G-31
→ Services	A-2

## Ordering information

Scanning range	System part	Connection type	Type	Part number
0 m ... 16 m	Sender/receiver	Plug M12 x 4, angled	VS/VE18-204550	6011845
		Plug M12 x 4, straight	VS/VE18-204450	6011846
	Sender	Plug M12 x 4, angled	VS18-2D5550	6011847
		Plug M12 x 4, straight	VS18-2D5450	6011849
	Receiver	Plug M12 x 4, angled	VE18-204550	6011850
		Plug M12 x 4, straight	VE18-204450	6011848

## Detailed technical specifications

→ You can find further data in the operating instructions. Download at [www.sick.com](http://www.sick.com)

### General data

	VS18-2D5450	VE18-204450	VS18-2D5550	VE18-204550
System part	Sender	Receiver	Sender	Receiver
Scanning range (typical/maximum)	0 m ... 16 m / 0 m ... 22 m			
Number of beams	1			
Light spot diameter (distance)	1200 mm (25 m)			
Aperture angle/receive angle	±4°/±5°			
Light sender/type of light	LED/visible red light			
Wave length	660 nm			
Average service life (T <sub>A</sub> )	100000 h (+25 °C)			
Protection class	III			
Enclosure rating	IP 67			
Type	Type 2 (EN 61496), only in conjunction with LE20			
Design	Cylindrical			
Dimensions (diameter x length)	M18 x 97.7 mm		M18 x 85.3 mm	
Housing material	Brass nickel-plated			
Ambient operating temperature from ... to	-25 °C ... +70 °C			
Weight	250 g			

### Electrical data

	VS18-2D5450	VE18-204450	VS18-2D5550	VE18-204550
System part	Sender	Receiver	Sender	Receiver
Connection type	Plug M12 x 4, straight		Plug M12 x 4, angled	
Supply voltage V <sub>S</sub>	24 V DC (16.8 V DC ... 28.8 V DC) <sup>1)</sup>			
Maximum power consumption	35 mA	25 mA	35 mA	25 mA
Switching outputs	—	PNP, Q and $\bar{Q}$ <sup>2)</sup>	—	PNP, Q and $\bar{Q}$ <sup>2)</sup>
Maximum response time	—	2 ms	—	2 ms
Maximum switching sequence	—	250 Hz	—	250 Hz
Maximum switching current	—	100 mA	—	100 mA
Diagnosis display	LED			

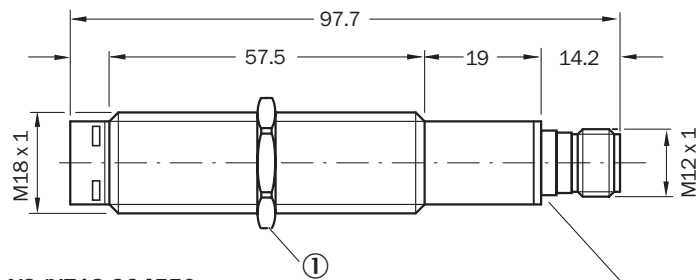
<sup>1)</sup> Reverse polarity protected

<sup>2)</sup> Short-circuit protected, interference suppression

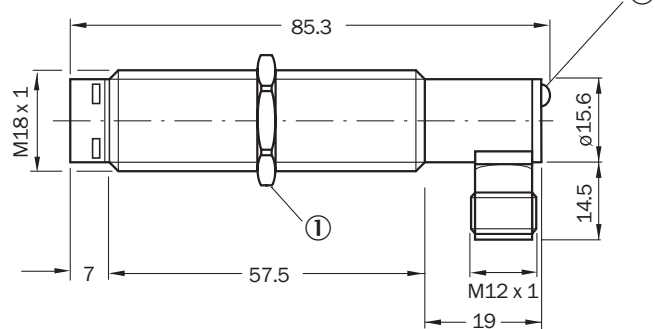


## Dimensional drawings

### VS/VE18-204450



### VS/VE18-204550



Dimensions in mm

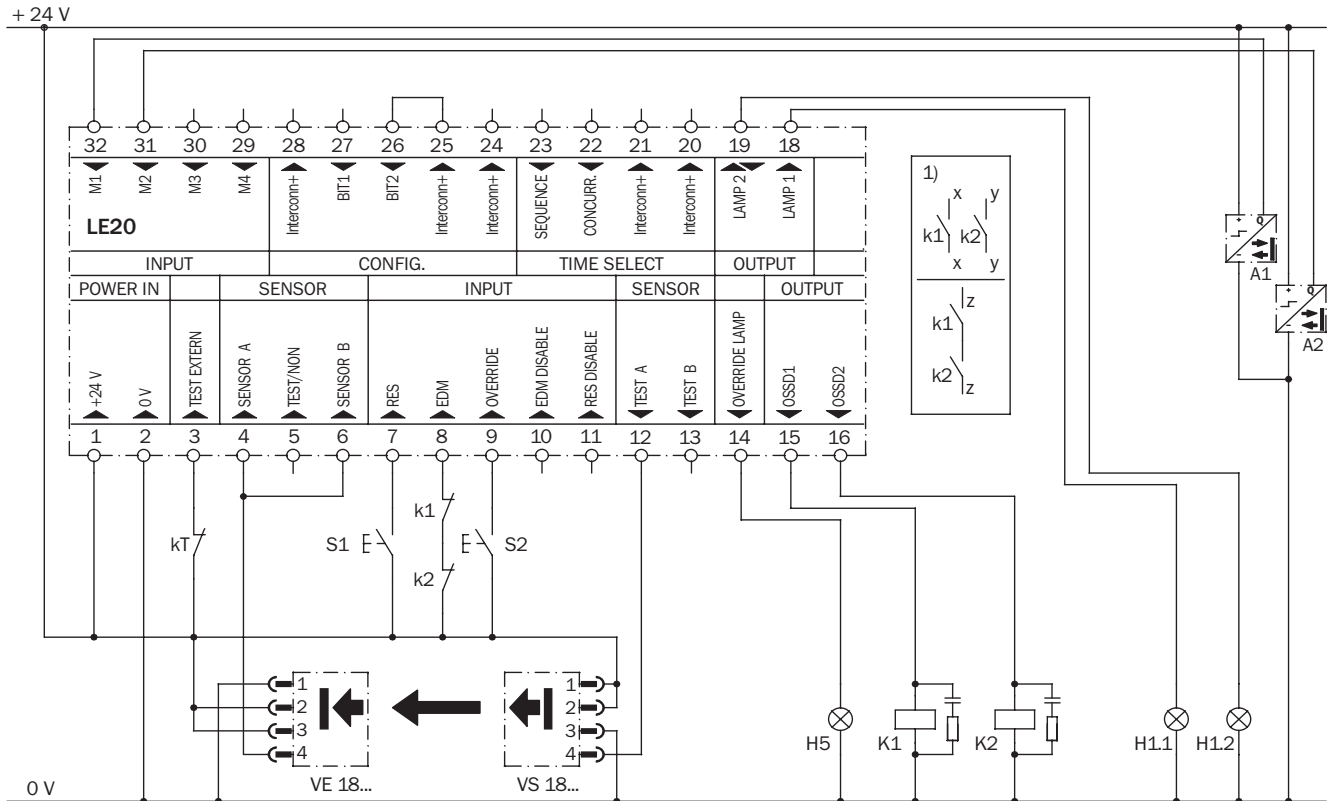
- ① Mounting nut M18
- ② LED

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## Connection diagrams

→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### VS/VE18-2 on LE20 Muting safety evaluation unit



#### Task

Integration of the VS/VE18-204450 or VS/VE18-204550 single-beam photoelectric safety switch in a control via an LE20. Muting using 2 photoelectric proximity switches (light switching PNP) and override circuit. Concurrency monitoring of the muting sensors. Operating mode with restart interlock and external device monitoring.

#### Function

If the light beam is clear and the contactors K1 and K2 are de-energised, the OSSDs in the LE20 are switched on by pressing S1 (button is pressed and released). The OSSDs of the LE20 (terminals 15 and 16) activate the contactors K1 and K2. If the light beam is interrupted, the LE20 deactivates the contactors K1 and K2.

#### Muting

The protective field must be clear, and the OSSDs on the LE20 switched on, to allow initiation of the muting function. Muting is prevented if photoelectric proximity switch pair A is not activated within 3 seconds. The muting inputs must remain activated without interruption for the duration of the muting.

#### Override

If, after a power failure or a muting error, the object to be muted is in the light beam, the object can be moved out of the protective field by operating the button S2. This is only possible if both

muting signals (A1 and A2) are present at the LE20. This situation is indicated by illumination of the override lamp H5.

#### Possible faults




The incorrect functioning of one of the K1 or K2 contactors does not result in the loss of the shutdown function. The outputs of the LE20 are monitored PNP semiconductor outputs. Jamming of the S1 button prevents output circuit to enable. Failure of a muting sensor is detected so that renewed muting is prevented. Muting cannot be initiated if the muting lamp H1.1 is not connected or is faulty, or if there is a short-circuit in this circuit. If a replacement indicator (H1.2) is connected, it will indicate the failure of the muting lamp H1.1 by flashing and muting can be initiated. Jamming of the S2 button will be detected after no more than 30 minutes and will bring the override to an end.

#### Comments

1) Output circuits: These contacts are to be connected to the controller such that, with the output circuit open, the dangerous state is disabled. For categories 4 and 3, the integration must be dual-channel (x/y paths). Single-channel integration in the control (z path) is only possible with a single-channel control and taking into account the risk analysis.

The related operating instructions for the integrated devices must be observed.

## Safe control solutions

	Product group	Applications	Further information
	Safety relays	Safety relays allow simple integration of safety components into machinery or plant.	Page N-0
	Safety controllers	Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.	Page O-0
	Safety network solutions	Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times. SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe.	Page P-0

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## Accessories

### Mounting systems

Description	Construction size	Mounting	Property	Type	Part number
Mounting bracket	M18	With fixing holes 4 mm	Adjustable	BEF-HA-M18-R	5313513
		—	—	BEF-WN-M18	5308446

### Connectors

Description	Connection type	Cable alignment	Cable length	Cable material	Type	Part number
Cable socket	M12 x 4	Straight	2 m	PVC	DOL-1204-G02M	6009382
			Can be preformed	—	DOS-1204-G	6007302

### Deflector mirrors

Description	Usage	Mirror surface	Delivery	Type	Part number
Deflector mirrors <sup>1)</sup>	—	105 mm x 160 mm	—	PNS105-1	1004076
	—	75 mm x 80 mm	Including mounting adapter (two pieces swivel mount)	PNS75-008	1026647
	—	96 mm x 124 mm	—	PSK1	1005229
	For 90° deflection	—	Incl. mounting set, not suitable for column mounting	PSK45	5306053
Mounting bracket	For PSK 1	—	—	BEF-GH	2009292
Spring fastening				—	2012473

<sup>1)</sup> Reduction of the scanning range

### Laser alignment aid

Type	Part number
Laser alignment aid AR60	1015741
AR60 adapter for VS/VE18-2 (M18)	5313533

## Explanations of features

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### **Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

### **Housing material**

The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

### **Number of actuation directions**

Safety switches can be actuated in different axes. The setting of the actuating direction is facilitated by the head, which can be rotated through 90 or 180 degrees. Up to 5 actuation directions can be implemented, depending on the type.

### **Type of actuator**

The majority of safety switches have appropriately coded tongue-operated actuators that prevent simple manipulation of the switch.

The i1000 series has an additional handle-operated actuator with coded spindle. It is not actuated by applying a force but by applying a torque.

## Safety switches with separate actuator



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Safety application	Number of positive action normally closed contacts/normally open contacts <sup>1)</sup>	Housing material <sup>1)</sup>	Number x size of cable gland	Locking force	Type of actuator <sup>1)</sup>	Product	Page
	1 / 1 2 / 0	Plastic	1 x M20	10 N	Tongue operated	i10	H-2
	1 / 0 2 / 1		1 x M16 or 3 x M16	10 N		i11S	H-7
	1 / 1 2 / 0 2 / 1		1 x M16	—		i12S	H-12
	1 / 1 2 / 0		3 x M20	30 N		i16S	H-17
	2 / 1		3 x M20	—		i17S	H-21
	3 / 1		1 x M20	10 N		Tongue operated	i100S
	3 / 1 2 / 2	1 x M20	5 N	Tongue operated	i110S	H-31	
	2 / 1	1 x PG13.5	—	Handle operated	i1001	H-35	
	2 / 1	1 x PG13.5	—	Tongue operated	i1002	H-41	

<sup>1)</sup> Explanation see page H-0



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- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M20
- Enclosure rating IP 67



## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts (depending on type)	0 / 1
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries	1
Size of the cable gland	M20
Locking force	10 N

## Product description

- Safety switches with remote multi-coded actuator
- Various actuator versions available
- 2-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.

→ see P-0

## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
1	1	i10-A113	6022530
2	0	i10-A203	6022529

Please order actuator separately

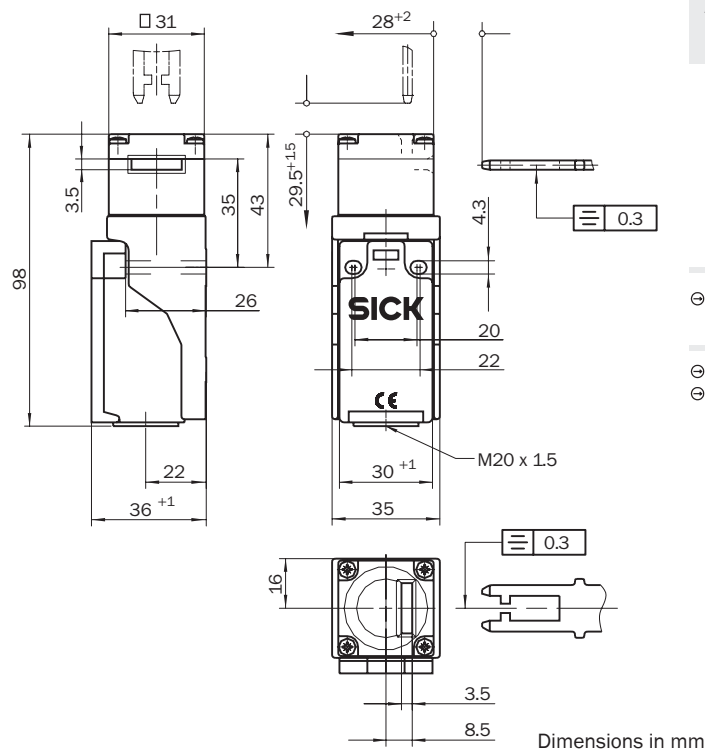
Further information	Page
→ Actuators	H-4
→ Lockout bar	H-6
→ Other accessories	H-6
→ Services	A-2

## Detailed technical specifications

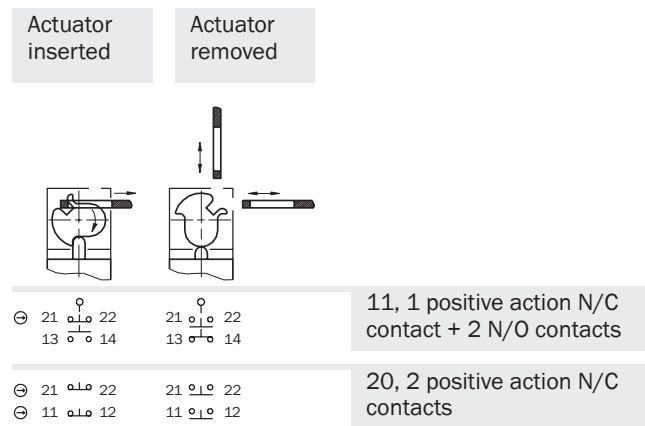
Type	i10-A113	i10-A203
Housing material	Glass-fibre reinforced thermoplastic	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Maximum approach speed	333 mm/s	
Locking force	10 N	
Actuation frequency	Max. 1.94 Hz	
Switching principle	Slow-action switch	
Number of positive action normally closed contacts	1	2
Number of normally open contacts	1	0
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	4 A (230 V AC), 4 A (24 V DC)	
Rated insulation voltage U <sub>i</sub>	250 V	
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC	
Minimum switching voltage	24 V DC	
Minimum switching current (switching voltage)	30 mA (24 V DC)	
Contact material	Silver alloy, gold flashed	
Connection type	Cable gland	
Maximum connection cable cross-section	1.5 mm <sup>2</sup>	
Short-circuit protection	4A gG	
Weight	0.15 kg	0.14 kg



## Dimensional drawings



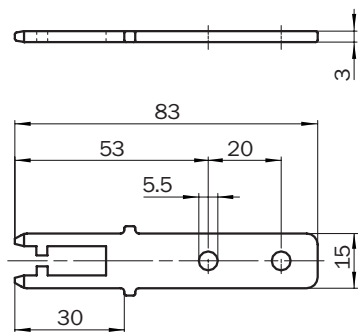
## Switching elements



## Actuators

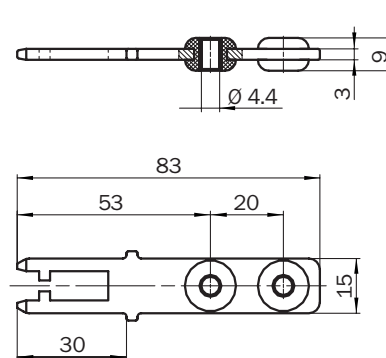
Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 1000 mm	iE10-S1	5306527
	Rubber-mounted	Min. 1000 mm	iE10-S2	5306530
Angled	Rigid	Min. 1000 mm	iE10-A1	5306535
Radius	Semi flexible	Min. 90 mm	iE10-R1	5306528
		Min. 100 mm	iE10-R2	5306529

### iE10-S1



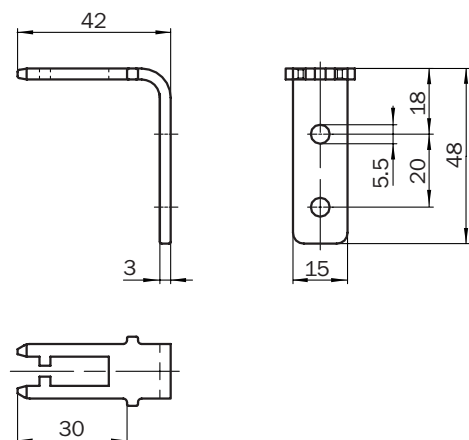
2 safety screws included.  
Min. door radius 1000 mm.

### iE10-S2



2 safety screws included.  
Min. door radius 1000 mm.

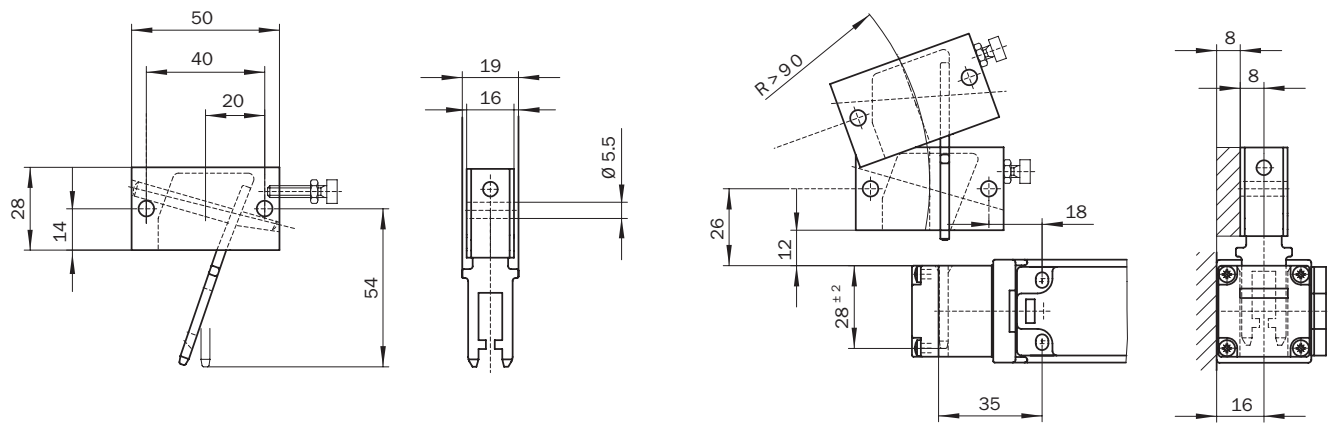
### iE10-A1



2 safety screws included.  
Min. door radius 1000 mm.

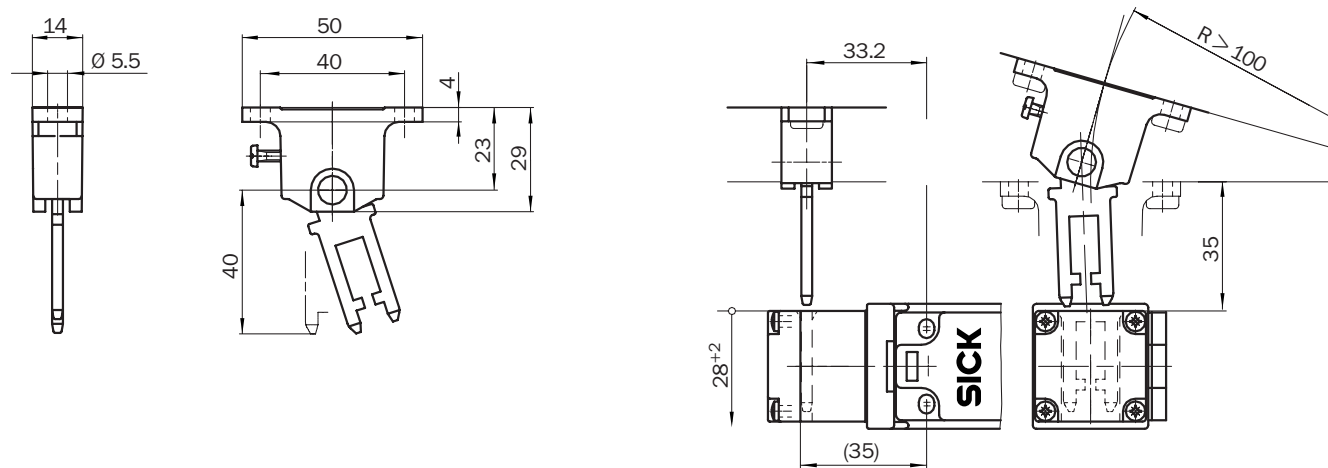


iE10-R1



2 safety screws included.  
Min. door radius 90 mm.

iE10-R2

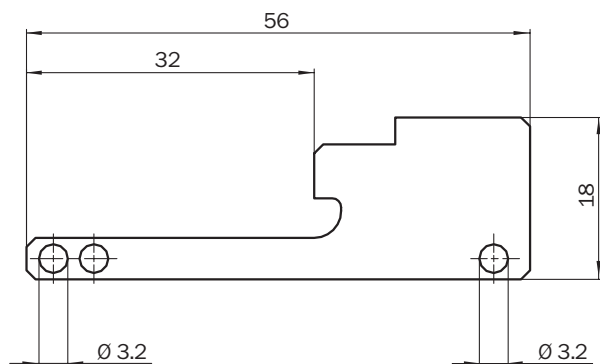


2 safety screws included.  
Min. door radius 100 mm.

## Lockout bar

Type	Part number
iE10-S3	5306536

### iE10-S3



The locking bar can be inserted into the safety switch in place of the actuator when the safety guard is in the open condition and can be secured to prevent its removal by standard commercially available padlocks (max. 2 pcs.). This guarantees reliable protection for persons who have to enter potentially hazardous areas.

## Other accessories

### Cable gland

Type	Part number
Cable gland M20	5309164

## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts (depending on type)	0 / 1
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries (depending on type)	1 / 3
Size of the cable gland	M16
Locking force	10 N

## Product description

- Safety switches with remote multi-coded actuator
- Miniature design – ideal for direct mounting on framework
- 1- or 3-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

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SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.

→ see P-0

## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
1	0	i11-S103	6022584
2	1	i11-S213	6022583

Please order actuator separately



- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M16
- Enclosure rating IP 67



H

Further information	Page
→ Technical specifications	H-8
→ Dimensional drawings	H-9
→ Switching elements	H-9
→ Actuators	H-10
→ Other accessories	H-11
→ Services	A-2

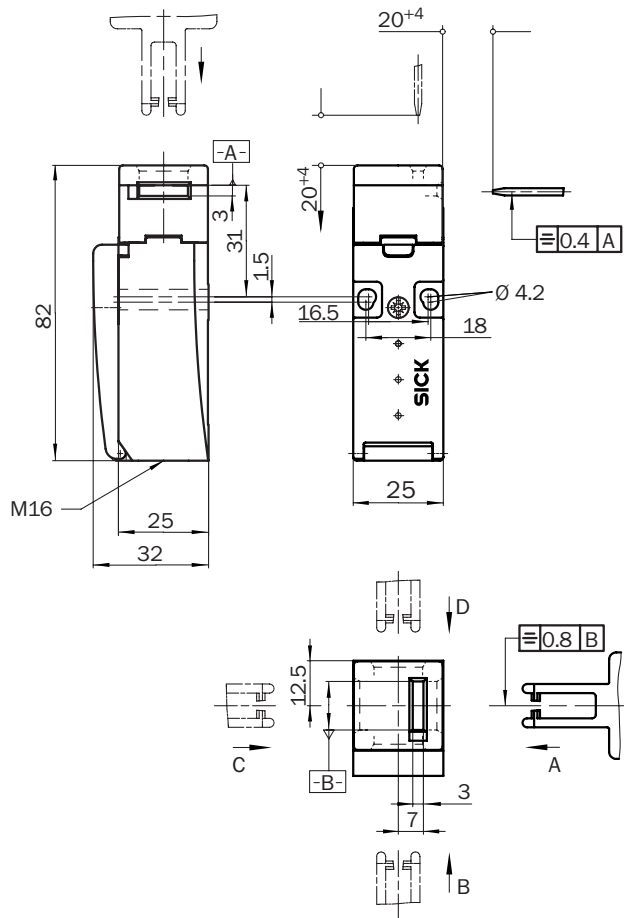
## Detailed technical specifications

Type	i11-S103	i11-S213
Housing material	Glass-fibre reinforced thermoplastic	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Maximum approach speed	333 mm/s	
Actuation force	Min. 6 N	
Locking force	10 N	
Actuation frequency	Max. 1.94 Hz	
Switching principle	Slow-action switch	
Number of positive action normally closed contacts	1	2
Number of normally open contacts	0	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	4 A (230 V AC), 4 A (24 V DC)	
Rated insulation voltage U <sub>i</sub>	250 V	
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC	
Minimum switching voltage	12 V DC	
Minimum switching current (switching voltage)	1 mA (24 V DC)	
Contact material	Silver alloy, gold flashed	
Connection type	Cable gland	
Maximum connection cable cross-section	1.5 mm <sup>2</sup>	
Short-circuit protection	4A gG	
Weight	0.1 kg	

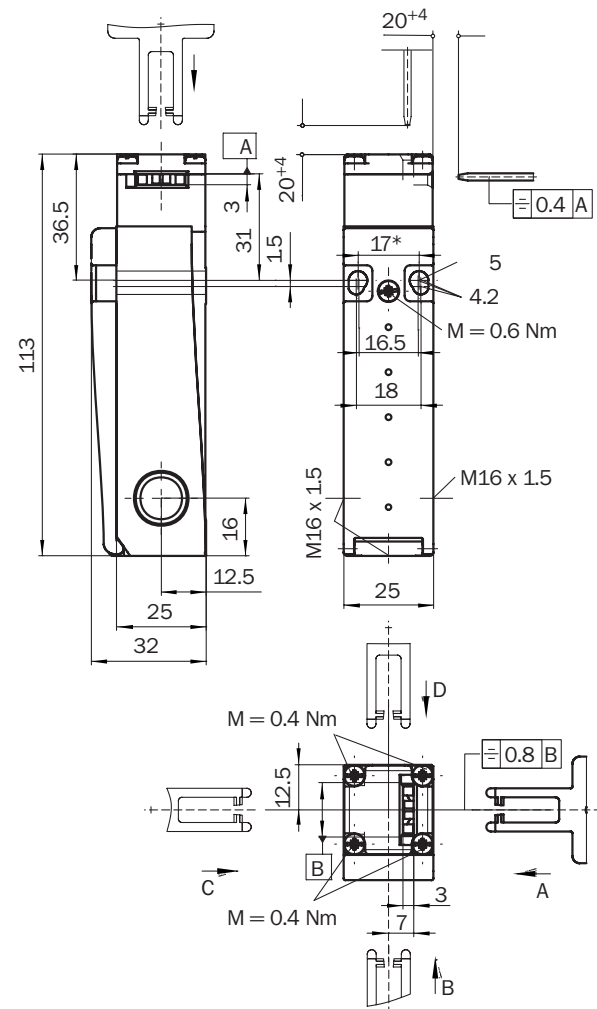
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# Dimensional drawings

**i11-S103**

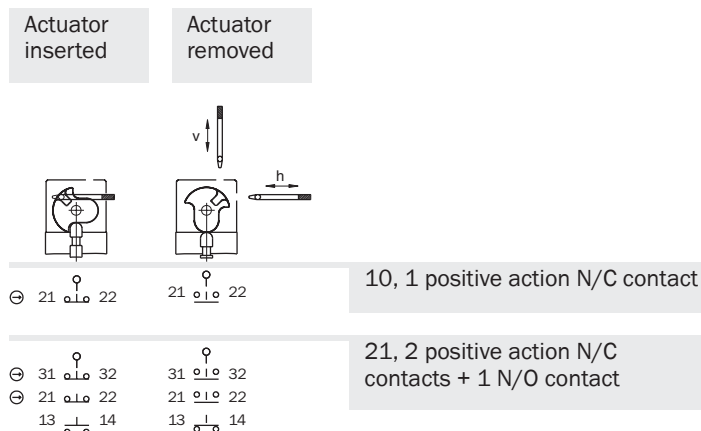


**i11-S213**



Dimensions in mm

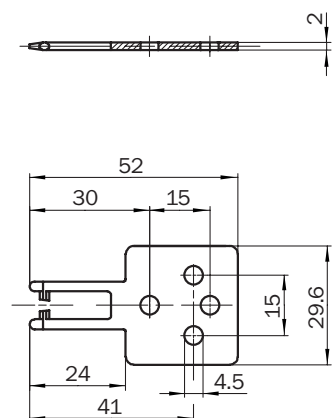
# Switching elements



# Actuators

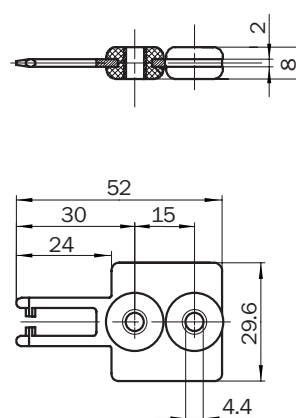
Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 150 mm	iE11-S1	5306537
	Rubber-mounted, in line	Min. 150 mm	iE11-S2	5306539
	Rubber-mounted, transversal	Min. 150 mm	iE11-S3	5306540
	Narrow	Min. 150 mm	iE11-S4	5318428
Angled	Rigid	Min. 150 mm	iE11-A1	5306538
	Rubber-mounted, transversal	Min. 150 mm	iE11-A2	5306541

## iE11-S1



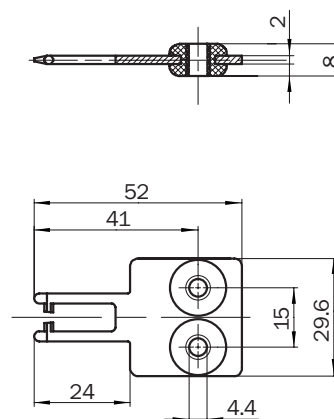
2 safety screws M4 x 14 included

## iE11-S2



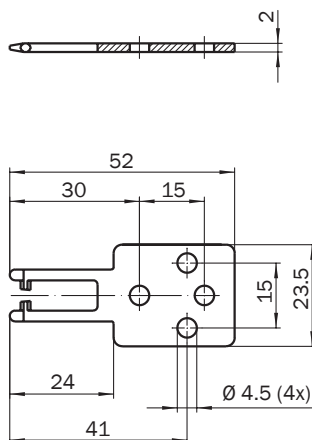
2 safety screws M4 x 14 included

## iE11-S3



2 safety screws M4 x 14 included

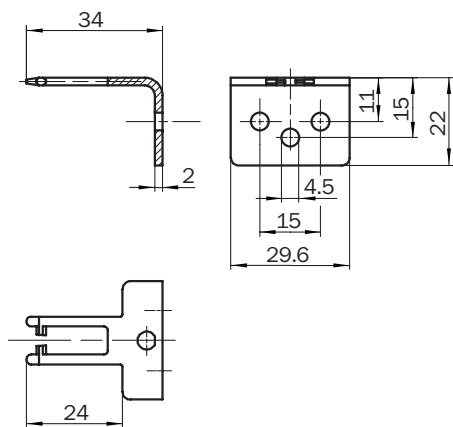
## iE11-S4



2 safety screws M4 x 14 included

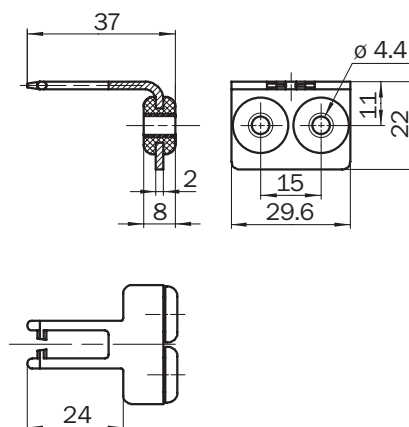
H

## iE11-A1



2 safety screws M4 x 14 included

## iE11-A2



2 safety screws M4 x 14 included

## Other accessories

## Cable gland

Type	Part number
Cable gland M16	5309163





- Housing material glass-fibre reinforced thermoplastic
- Five actuating directions
- Cable gland M16
- Two designs: Miniature housing and design according to EN 50047
- Enclosure rating IP 67



Further information	Page
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→ Switching elements	H-15
→ Actuator travel diagram	H-15
→ Actuators	H-16
→ Other accessories	H-16
→ Services	A-2

## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts (depending on type)	0 / 1
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries	1
Size of the cable gland	M16

## Product description

- Safety switches with remote multi-coded actuator
- 2- or 3-pole contact element
- One version as miniature design – ideal for direct mounting on framework
- Suitable for very small door radius (60 mm), with appropriate actuator.

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant. → see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy. → see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFSafe. → see P-0

## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
1	1	i12-SA113	6025057
2	0	i12-SA203	6025100
	1	i12-SB213	6025059

Please order actuator separately



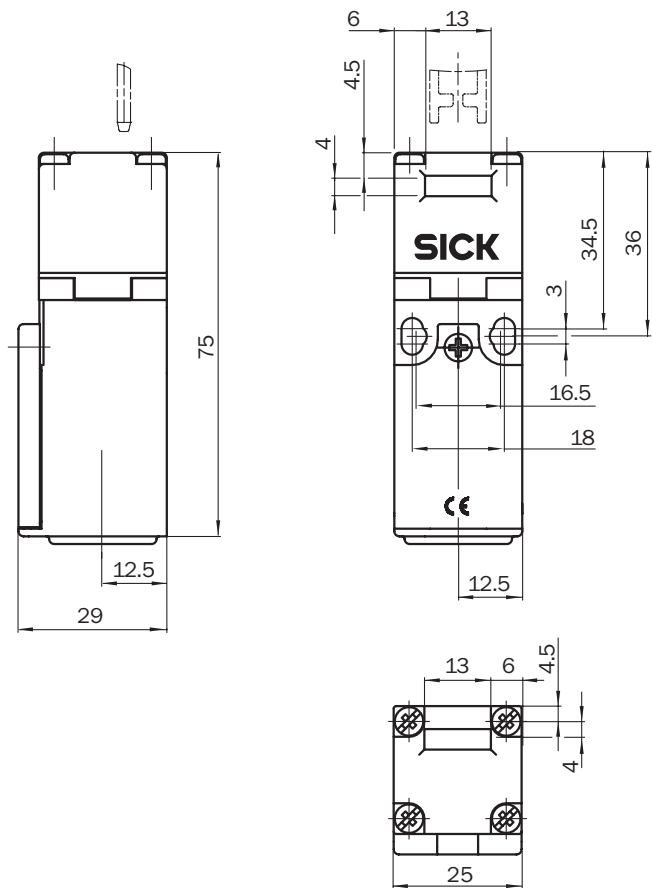
## Detailed technical specifications

Type	i12-SA113	i12-SA203	i12-SB213
Housing material	Glass-fibre reinforced thermoplastic		
Enclosure rating	IP 67		
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles		
Ambient operating temperature from ... to	-20 °C ... +80 °C		
Maximum approach speed	160 mm/s		
Actuation force	Min. 6 N		Min. 15 N
Actuation frequency	Max. 2 Hz		
Switching principle	Slow-action switch		
Number of positive action normally closed contacts	1	2	
Number of normally open contacts	1	0	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13		
Rated operating current (voltage)	3 A (240 V AC), 3 A (24 V DC)		
Rated insulation voltage U <sub>i</sub>	240 V		
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC		
Minimum switching voltage	5 V DC		
Minimum switching current (switching voltage)	5 mA (5 V DC)		
Connection type	Cable gland		
Maximum connection cable cross-section	1.5 mm <sup>2</sup>		
Short-circuit protection	3A gG		
Weight	0.08 kg		0.11 kg

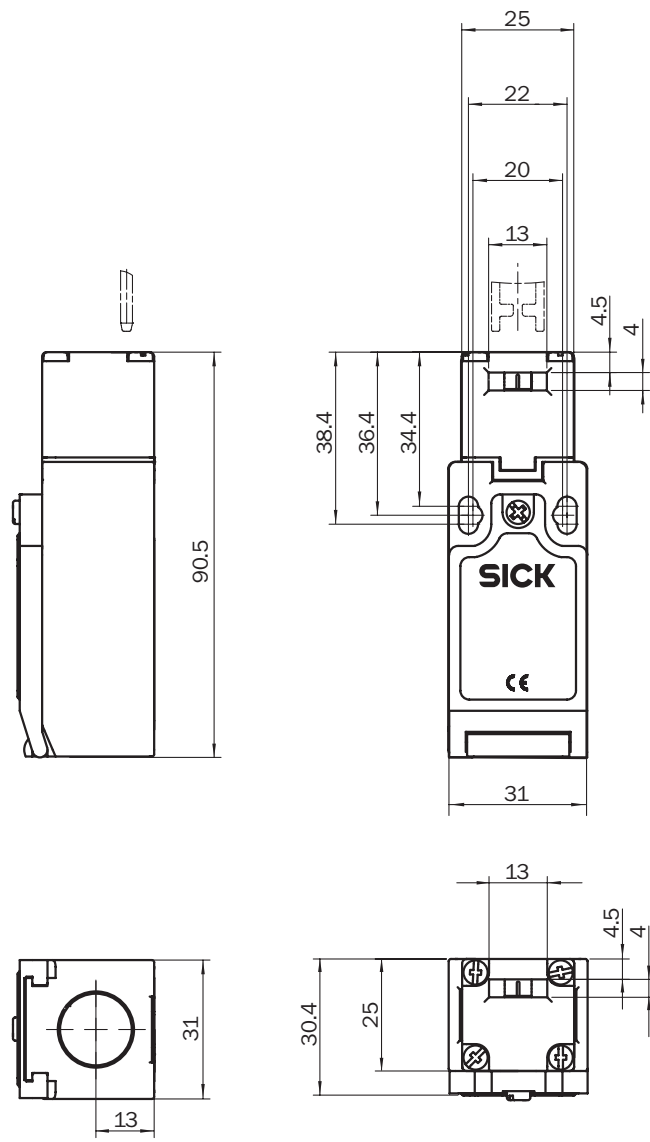


# Dimensional drawings

**i12-SA113, i12-SA203**



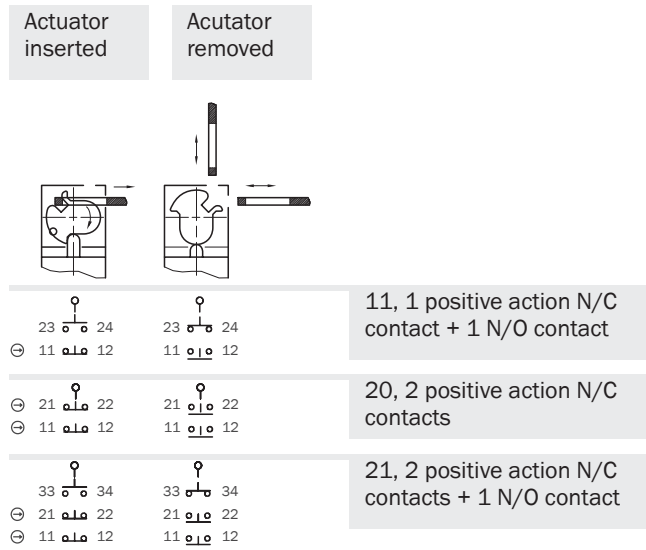
**i12-SB213**



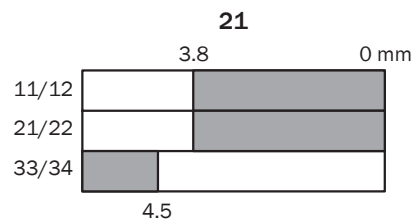
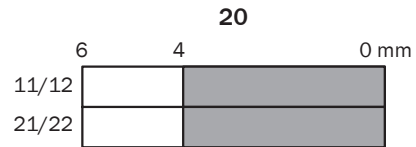
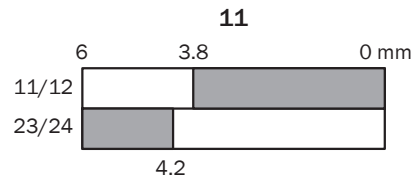
Dimensions in mm

H

## Switching elements



## Actuator travel diagram



- Contacts open
- Contacts closed

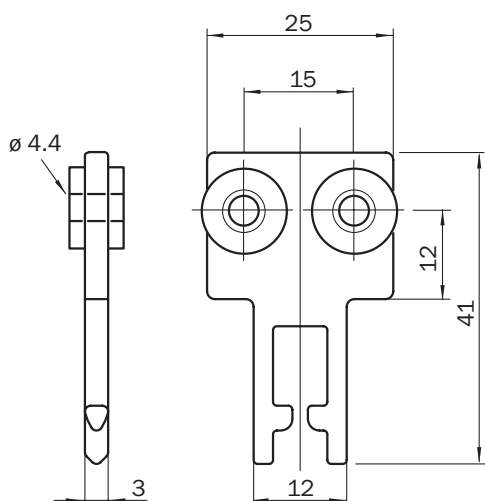
Contact action over the entire actuator withdrawal distance (full insertion = 0 mm)



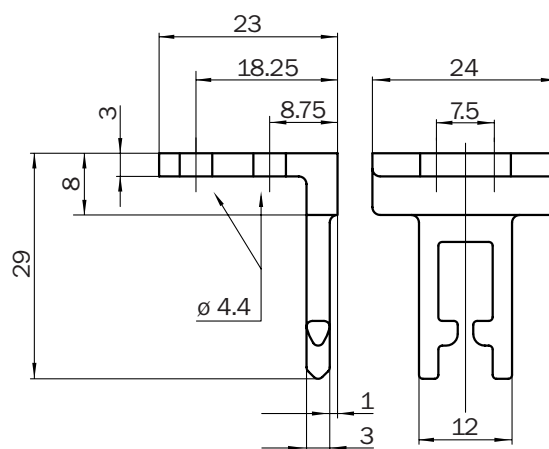
## Actuators

Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 150 mm	iE12-S1	5311131
Angled	Rigid	Min. 150 mm	iE12-A1	5311132
Radius	Semi flexible	Min. 60 mm	iE12-F1	5308842

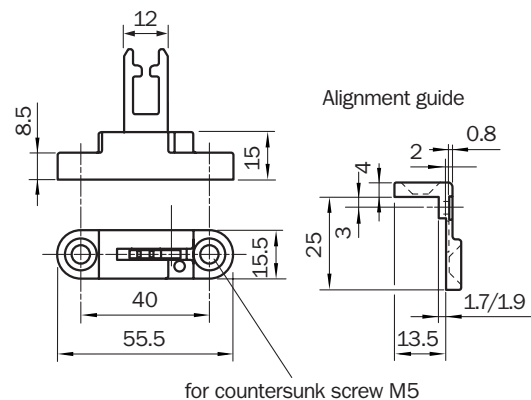
### iE12-S1



### iE12-A1



### iE12-F1



## Other accessories

### Cable gland

Type	Part number
Cable gland M16	5309163

## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts (depending on type)	0 / 1
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries	3
Size of the cable gland	M20
Locking force	30 N

## Product description

- Safety switches with remote multi-coded actuator
- Easy conversion of actuating direction through rotatable head
- 2-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

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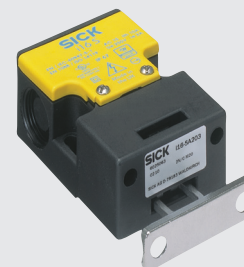
SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.

→ see P-0

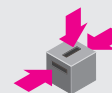
## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
1	1	i16-SA113	6025065
2	0	i16-SA203	6025063

Please order actuator separately



- Housing material glass-fibre reinforced thermoplastic
- Three actuating directions
- 30 N locking force
- Cable gland 3 x M20
- Enclosure rating IP 67



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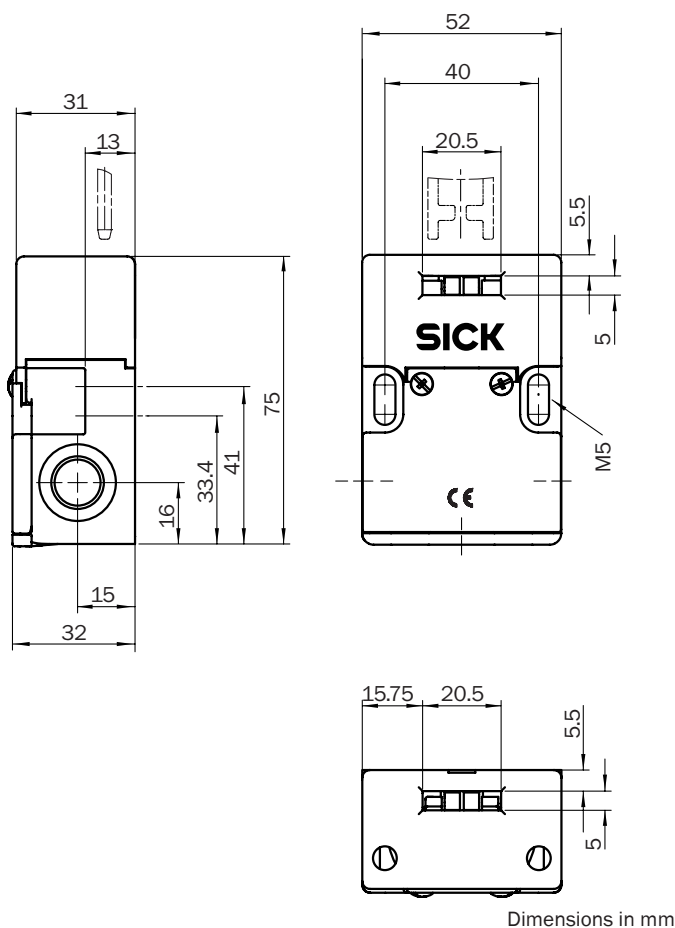
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→ Catch and retainer kit	H-20
→ Other accessories	H-20
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## Detailed technical specifications

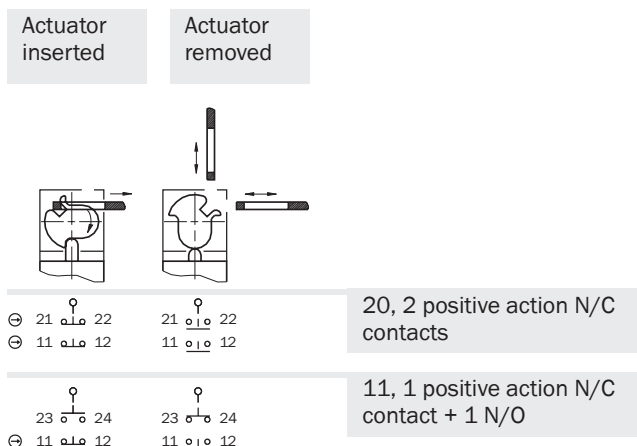
Type	i16-SA113	i16-SA203
Housing material	Glassfibre reinforced polybutylene terephthalate (PBT)	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Maximum approach speed	160 mm/s	
Actuation force	Min. 30 N	
Locking force	30 N	
Actuation frequency	Max. 2 Hz	
Switching principle	Slow-action switch	
Number of positive action normally closed contacts	1	2
Number of normally open contacts	1	0
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	2 A (250 V AC), 2 A (24 V DC)	
Rated insulation voltage U <sub>i</sub>	250 V	
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC	
Minimum switching voltage	5 V DC	
Minimum switching current (switching voltage)	5 mA (5 V DC)	
Contact material	Silver, nickel	
Connection type	Cable gland	
Maximum connection cable cross-section	1.5 mm <sup>2</sup>	
Short-circuit protection	2A gG	
Weight	0.14 kg	

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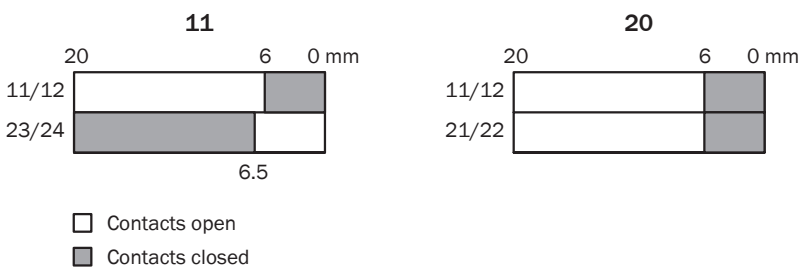
## Dimensional drawings



## Switching elements



## Actuator travel diagram

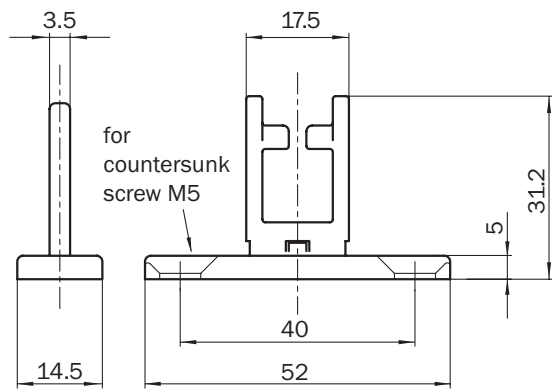


Contact action over the entire actuator withdrawal distance (full insertion = 0 mm)

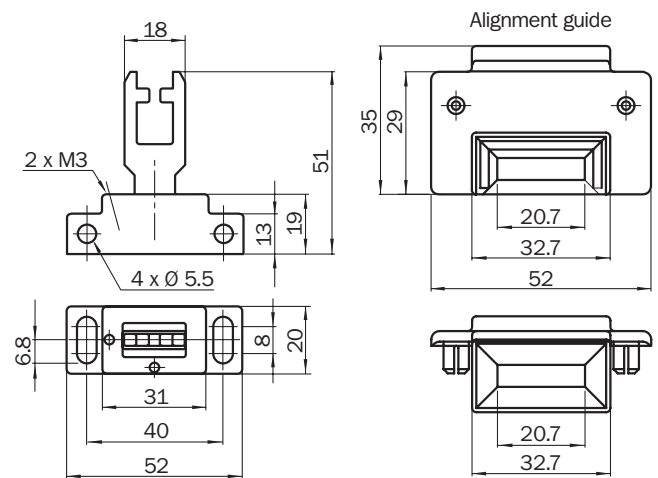
## Actuators

Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 175 mm	iE16-S1	5311128
	Fully flexible	Min. 60 mm	iE16-F1	5311129
Radius	Semi flexible	Min. 60 mm	iE16-F2	5311278

iE16-S1

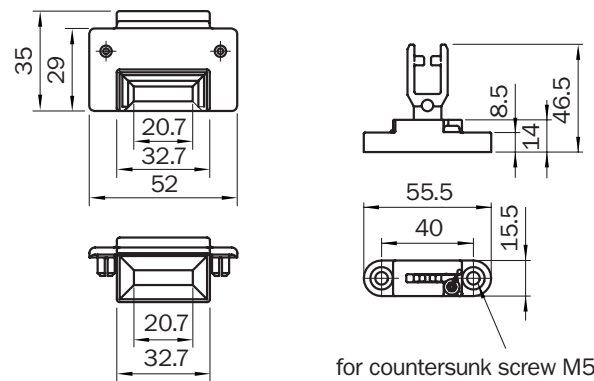


iE16-F1



The actuator facilitates movement in both horizontal and vertical planes.

iE16-F2

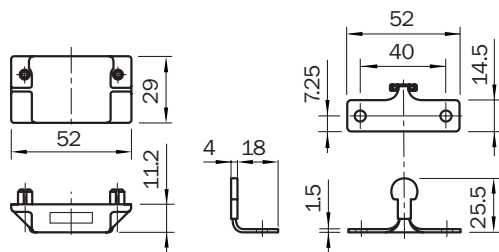


The actuator facilitates movement in the horizontal plane only.

Catch and retainer kit

Type	Part number
iE16-SCR	5310780

iE16-SCR



- An increase in the locking force by 50 N.
- Only in connection with rigid actuators.

Other accessories

Cable gland

Type	Part number
Cable gland M20	5309164



## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Type of actuator	Tongue operated
Housing material	Plastic
Number of cable entries	3
Size of the cable gland	M20

## Product description

- Safety switch with remote multi-coded actuator
- 3-pole contact element
- Easy conversion of actuating direction through rotatable head

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

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SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.

→ see P-0

## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
2	1	i17-SA213	6025067

Please order actuator separately



- Housing material glass-fibre reinforced thermoplastic
- Three actuating directions
- Cable gland 3 x M20
- Enclosure rating IP 67



H

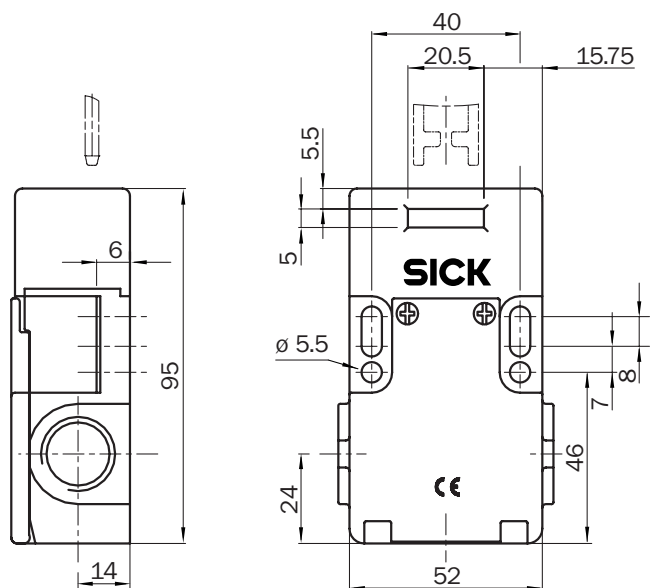
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→ Catch and retainer kit	H-24
→ Other accessories	H-24
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## Detailed technical specifications

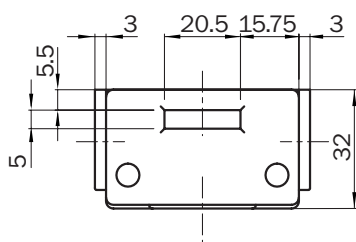
Housing material	Glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-20 °C ... +80 °C
Maximum approach speed	1000 mm/s
Actuation force	Min. 12 N
Actuation frequency	Max. 2 Hz
Switching principle	Slow-action switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	2 A (250 V AC), 2 A (24 V DC)
Rated insulation voltage U <sub>i</sub>	250 V
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Minimum switching voltage	5 V DC
Minimum switching current (switching voltage)	5 mA (5 V DC)
Contact material	Silver, nickel
Connection type	Cable gland
Maximum connection cable cross-section	1.5 mm <sup>2</sup>
Short-circuit protection	2A gG
Weight	0.16 kg

H

## Dimensional drawings

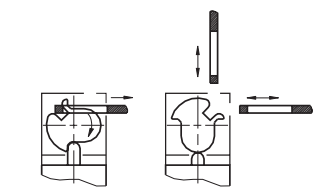


Dimensions in mm



## Switching elements

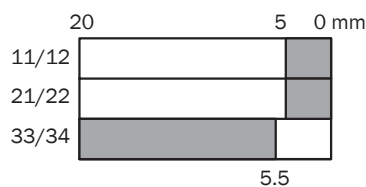
Actuator inserted      Actuator removed



♀ 33 ♂ 34      ♀ 33 ♂ 34  
 ⊕ 21 ♂ 22      ⊕ 21 ♂ 22  
 ⊖ 11 ♂ 12      ⊖ 11 ♂ 12

21, 2 positive action N/C contact + 1 N/O

## Actuator travel diagram



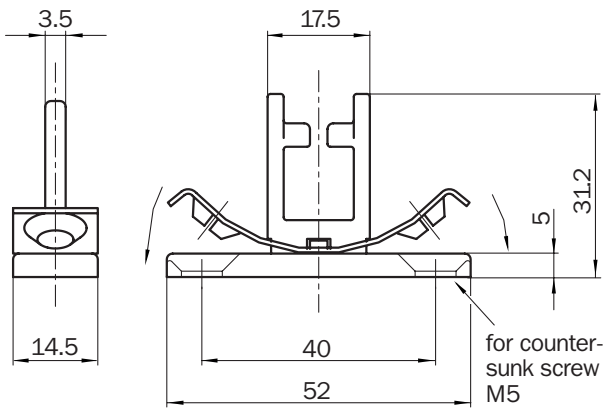
- Contacts open
- Contacts closed

Contact action over the entire actuator withdrawal distance (full insertion = 0 mm)

## Actuators

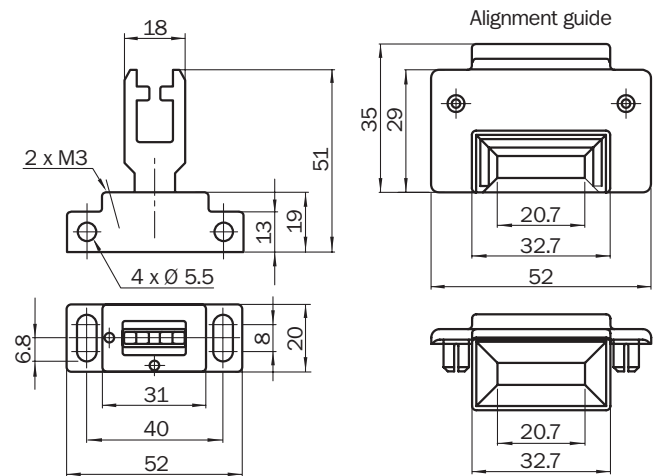
Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 175 mm	iE17-S1	5311130
	Fully flexible	Min. 60 mm	iE16-F1	5311129
Radius	Semi flexible	Min. 60 mm	iE16-F2	5311278

iE17-S1



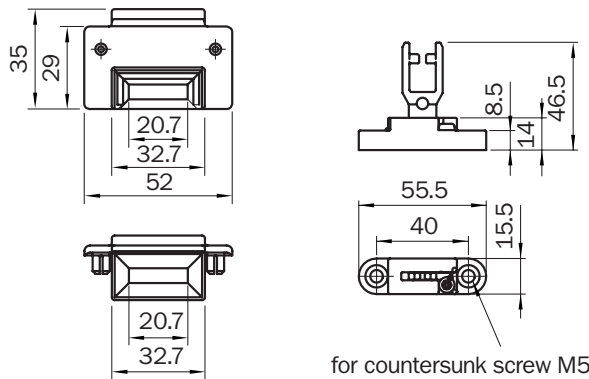
The actuator facilitates movement in the horizontal plane only.

iE16-F1



The actuator facilitates movement in both horizontal and vertical planes.

iE16-F2

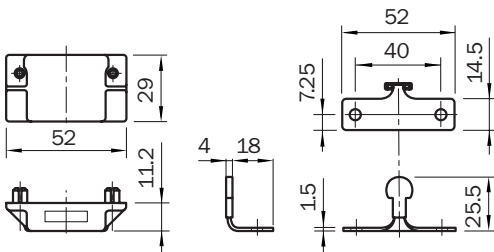


The actuator facilitates movement in the horizontal plane only.

Catch and retainer kit

Type	Part number
iE16-SCR	5310780

iE16-SCR



- An increase in the locking force by 50 N.
- Only in connection with rigid actuators.

Other accessories

Cable gland

Type	Part number
Cable gland M20	5309164

## Overview of technical specifications

Number of positive action normally closed contacts	3
Number of normally open contacts	1
Type of actuator	Tongue operated
Housing material	Metal
Number of cable entries	1
Size of the cable gland	M20
Locking force	10 N

## Product description

- Safety switches with remote multi-coded actuator
- Self-cleaning head element – elimination of contamination through actuator movement
- 4-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

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→ see P-0

## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
3	1	i100-S313	6022590

Please order actuator separately



- Housing material die-cast light alloy
- Four actuating directions
- Cable gland M20
- Enclosure rating IP 67
- Three-dimensional coded actuator
- Design according to EN 50041



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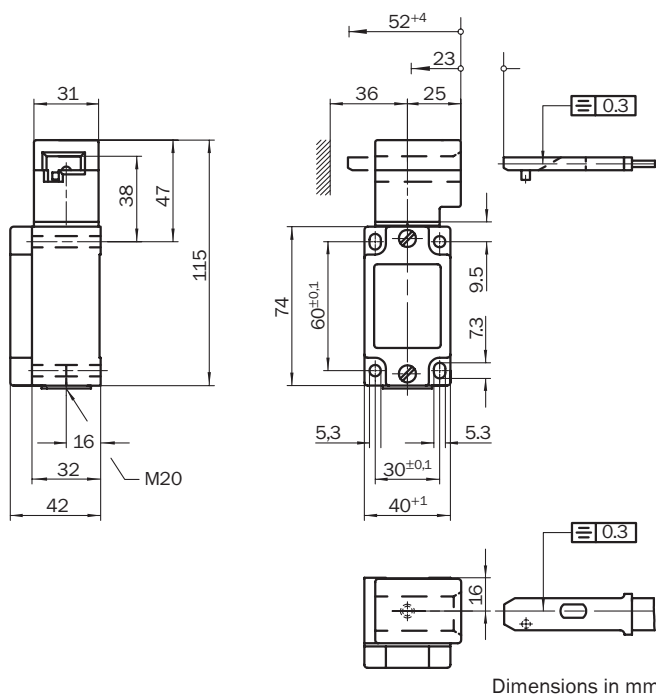
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→ Switching elements	H-26
→ Actuators	H-27
→ Lockout bar	H-30
→ Other accessories	H-30
→ Services	A-2

## Detailed technical specifications

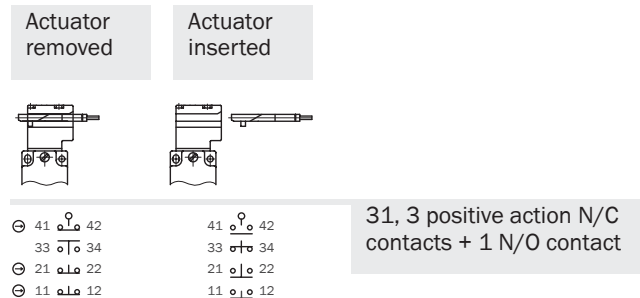
Housing material	Die-cast light alloy
Surface treatment	Anodized
Enclosure rating	IP 67
Mechanical life (relay contacts)	2 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-25 °C ... +80 °C
Maximum approach speed	333 mm/s
Actuation force	Min. 35 N
Locking force	10 N
Actuation frequency	Max. 1.94 Hz
Switching principle	Slow-action switch
Number of positive action normally closed contacts	3
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	4 A (230 V AC), 4 A (24 V DC)
Rated insulation voltage U <sub>i</sub>	250 V
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Minimum switching voltage	12 V DC
Minimum switching current (switching voltage)	1 mA (24 V DC)
Contact material	Silver alloy, gold flashed
Connection type	Cable gland
Maximum connection cable cross-section	1.5 mm <sup>2</sup>
Short-circuit protection	4A gG
Weight	0.37 kg

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## Dimensional drawings



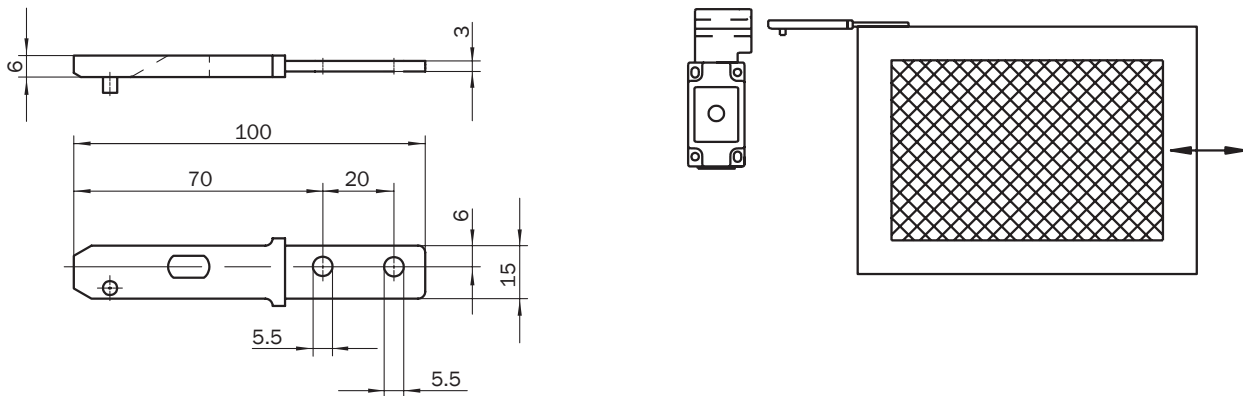
## Switching elements



## Actuators

Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 1000 mm	iE100-S1	5306497
Radius, door hinged on left	Semi flexible	Min. 400 mm	iE100-R1	5306498
Radius, door hinged on right	Semi flexible	Min. 400 mm	iE100-R2	5306499
Radius, safety flap hinged at bottom	Semi flexible	Min. 165 mm	iE100-R3	5306500
Radius, safety flap hinged at top	Semi flexible	Min. 165 mm	iE100-R4	5306526

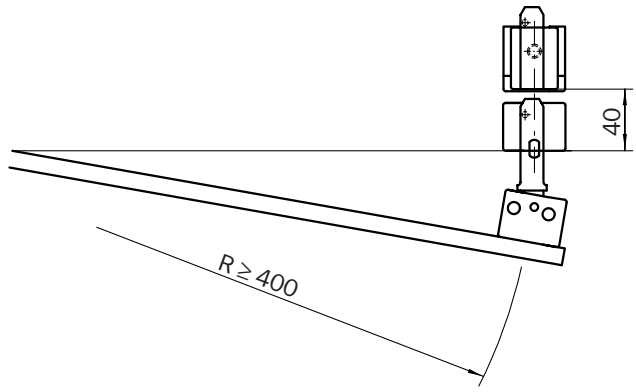
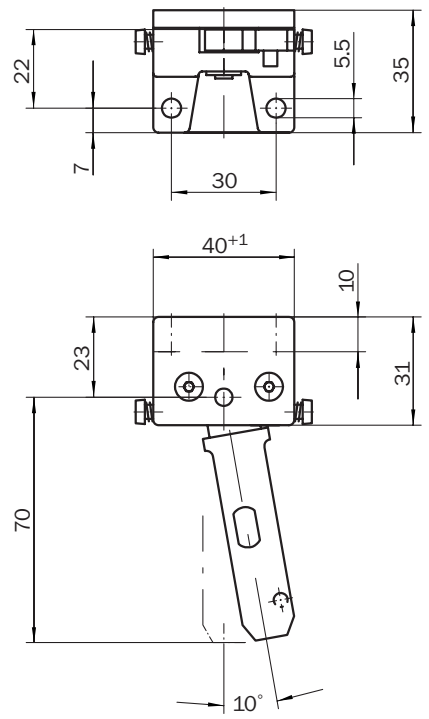
### iE100-S1 straight



Min. door radius 1000 mm.  
With two safety screws for each actuator.

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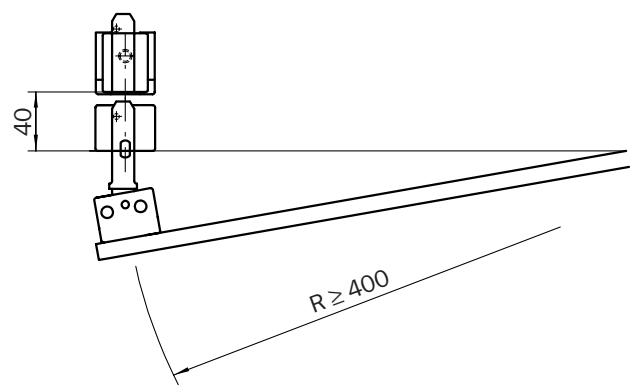
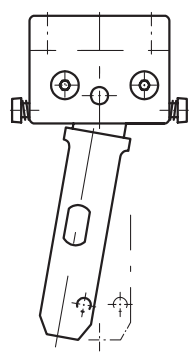
iE100-R1 radius, door hinged on left



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2 safety screws included.  
Min. door radius 400 mm.

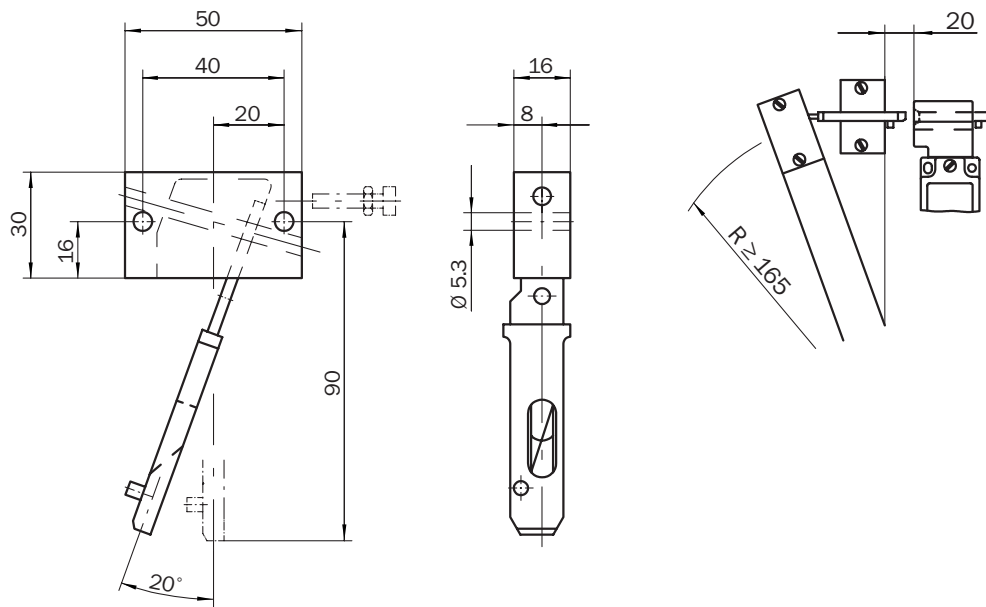
iE100-R2 radius, door hinged on right



2 safety screws included.  
Min. door radius 400 mm.

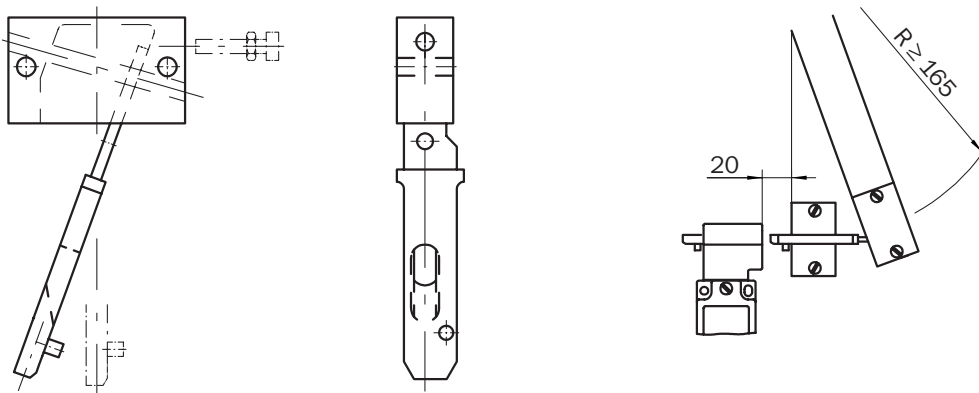


## iE100-R3 radius, safety flap hinged at bottom



2 safety screws included.  
Min. door radius 165 mm.

## iE100-R4 radius, safety flap hinged at top



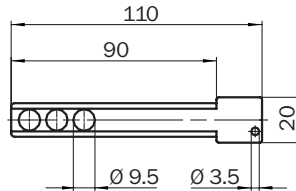
2 safety screws included.  
Min. door radius 165 mm.

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## Lockout bar

Type	Part number
iE100-S2	5306534

### iE100-S2



The lockout bar can be inserted in the safety switch instead of the actuator when the safety guard is in open condition and can then be secured to prevent removal by standard commercially available padlocks (max. 3 pcs.). This guarantees reliable protection for persons who have to enter potentially hazardous areas.

## Other accessories

### Cable gland

Type	Part number
Cable gland M20	5309164

## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	2 / 3
Number of normally open contacts (depending on type)	1 / 2
Type of actuator	Tongue operated
Housing material	Metal
Number of cable entries	1
Size of the cable gland	M20
Locking force	5 N

## Product description

- Safety switches with remote multi-coded actuator
- Small door radius (175 mm) possible even with standard actuator
- 4-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

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→ see P-0

## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
2	2	i110-SA223	6025074
3	1	i110-SA313	6025073

Please order actuator separately



H

- Housing material die-cast zinc
- Five actuating directions
- Cable gland M20
- Enclosure rating IP 67
- Design according to EN 50041



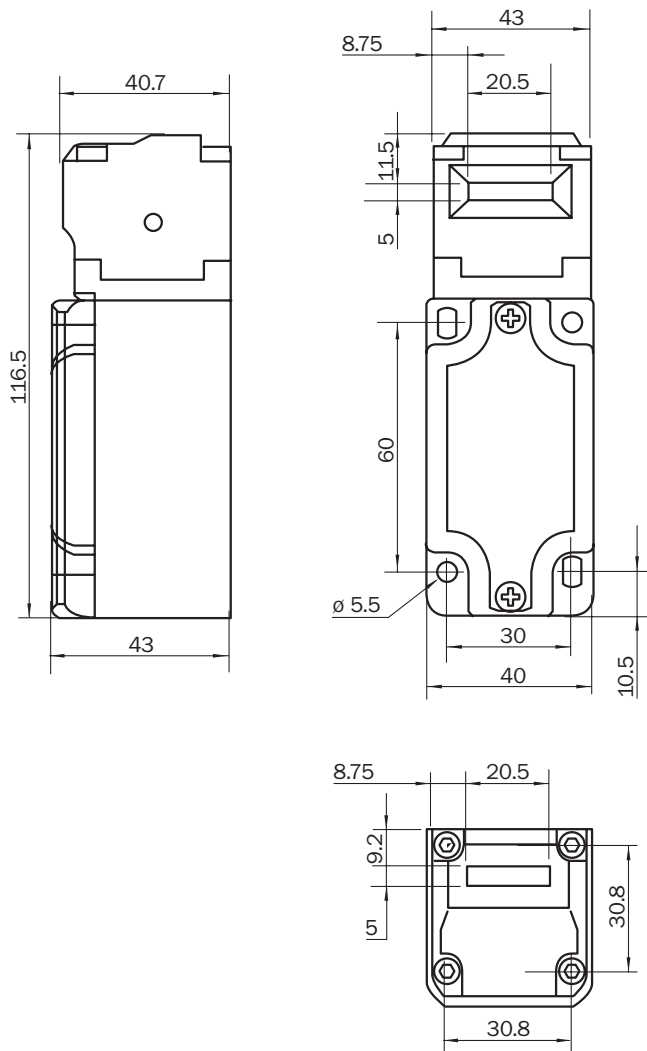
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→ Dimensional drawings	H-33
→ Switching elements	H-33
→ Actuator travel diagram	H-34
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→ Services	A-2

## Detailed technical specifications

Type	i110-SA223	i110-SA313
Housing material	Zinc die-cast	
Surface treatment	Varnished	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Maximum approach speed	100 mm/s	
Actuation force	Min. 12 N	
Locking force	5 N	
Actuation frequency	Max. 2 Hz	
Switching principle	Slow-action switch	
Number of positive action normally closed contacts	2	3
Number of normally open contacts	2	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	3 A (240 V AC), 3 A (24 V DC)	
Rated insulation voltage U <sub>i</sub>	250 V	
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC	
Minimum switching voltage	5 V DC	
Minimum switching current (switching voltage)	5 mA (5 V DC)	
Contact material	Silver, nickel	
Connection type	Cable gland	
Maximum connection cable cross-section	1.5 mm <sup>2</sup>	
Short-circuit protection	3A gG	
Weight	0.34 kg	

H

## Dimensional drawings



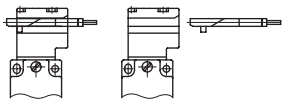
Dimensions in mm

H

## Switching elements

Actuator inserted

Actuator removed

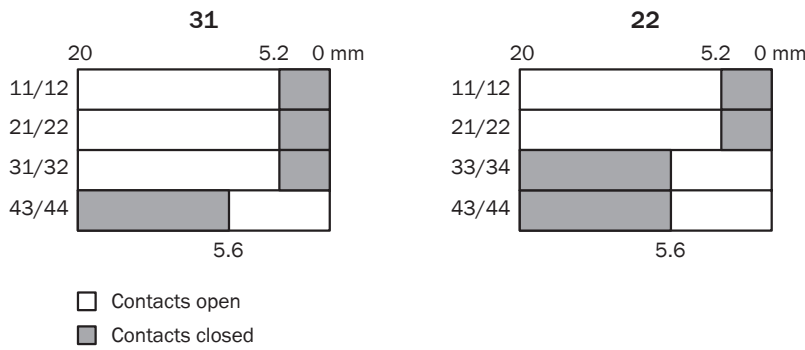


31, 3 positive action N/C contacts + 1 N/O



22, 2 positive action N/C contacts + 2 N/O

## Actuator travel diagram



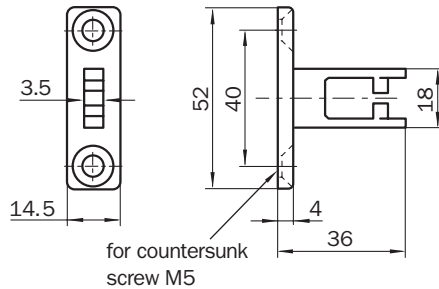
Contact action over the entire actuator withdrawal distance  
 (full insertion = 0 mm)

## Actuators

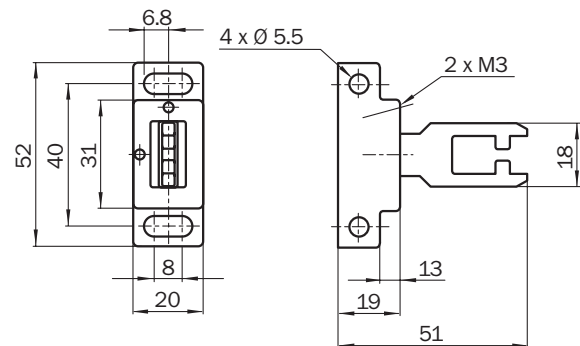
Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 175 mm	iE110-S1	5311134
	Fully flexible	Min. 60 mm	iE110-F1	5311135

H

### iE110-S1



### iE110-F1



## Other accessories

### Cable gland

Type	Part number
Cable gland M20	5309164

## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Type of actuator	Handle operated
Housing material	Metal
Number of cable entries	1
Size of the cable gland	PG13.5

## Product description

- Safety switch with separate handle-operated actuator
- 3-pole contact element
- The system can compensate for any mis-alignment, such as caused by door drop

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

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→ see P-0

## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Supply voltage	Type	Part number
2	1	24 V DC	i1001-24	6021016

Actuator supplied with delivery



- Housing material powder-coated die-cast zinc
- Cable gland PG13.5
- Four actuating directions
- Enclosure rating IP 67
- LED function indicator
- Handle-operated actuator

H



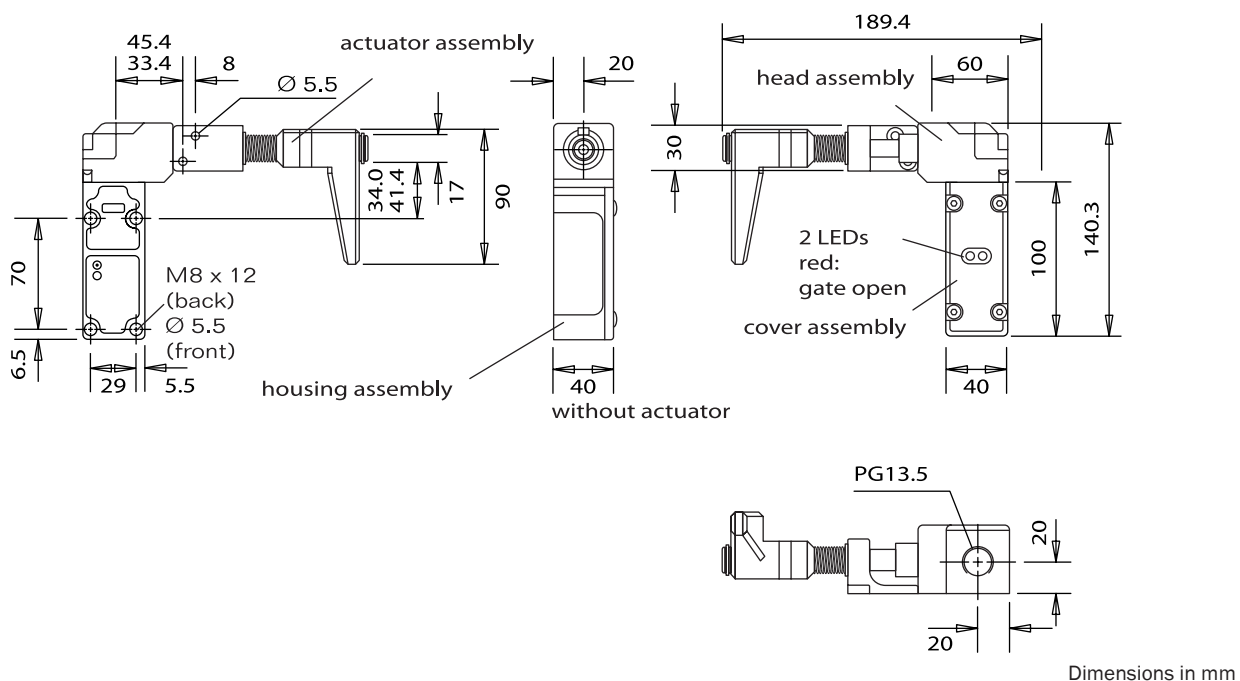
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→ Dimensional drawings	H-36
→ Internal circuitry	H-37
→ Trapped key systems	H-37
→ Actuator	H-39
→ Lockout bar	H-40
→ Other accessories	H-40
→ Services	A-2

## Detailed technical specifications

Housing material	Zinc alloy and stainless steel
Surface treatment	Varnished
Enclosure rating	IP 67
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-5 °C ... +40 °C
Maximum approach speed	333 mm/s
Actuation frequency	Max. 2 Hz
Switching principle	Slow-action switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	10 A (24 V DC)
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Contact material	90 % silver and 10 % nickel
Connection type	Cable gland
Maximum connection cable cross-section	2.5 mm <sup>2</sup>
Weight	1.37 kg

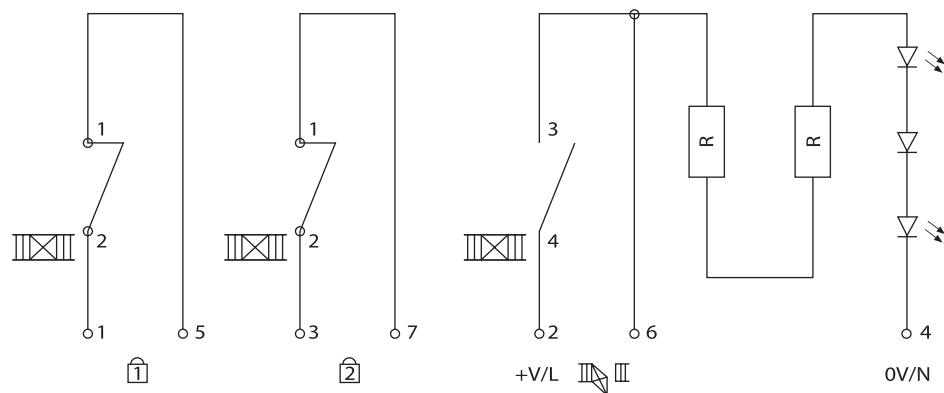
## H

## Dimensional drawings





## Internal circuitry



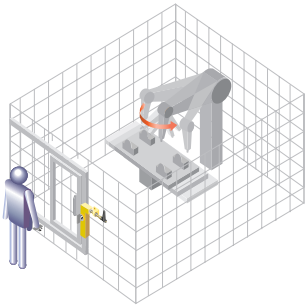
## Trapped key systems

Accessory type	Coding	Delivery	Type	Part number
Access key adapter	1	Key supplied with delivery	iE1000-AK1	5308302
	2	Key supplied with delivery	iE1000-AK2	5308303
Safety key adapter	1	Key supplied with delivery	iE1000-SK1	5308297
	2	Key supplied with delivery	iE1000-SK2	5308298
Enabling unit	1	Key supplied with delivery	iE1000-ES1	6021019
	2	Key supplied with delivery	iE1000-ES2	6021020

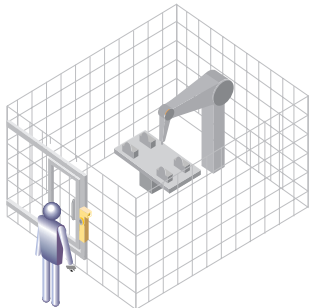
Additional types on request

H

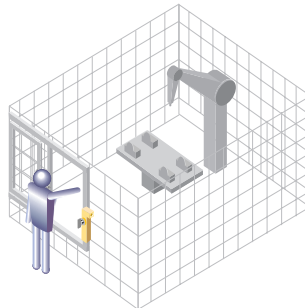
Access key adapter



Plant in action, no key inserted



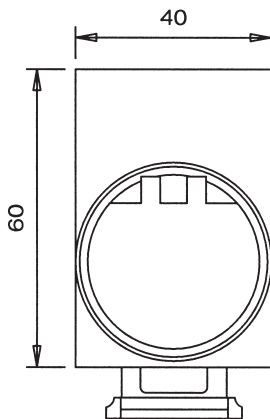
Key is inserted, plant comes to a standstill



Door can now be opened

**Access function**

■ Application example  
Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.

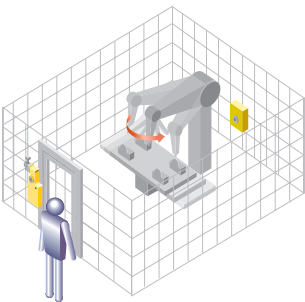


The access key adapter is installed between the head and the housing of the safety switch.

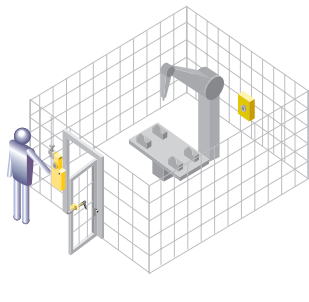
If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

H

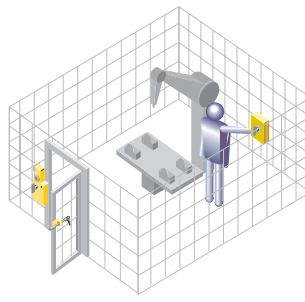
Safety key adapter



Plant in action, door closed, key inserted



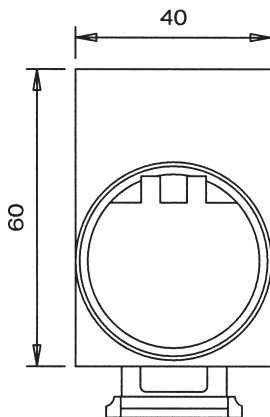
Key is removed, plant comes to standstill, door can be opened



Person enters, key inserted inside, plant runs in enable mode

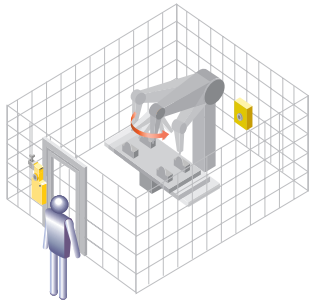
**Enable function**

■ Application example  
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

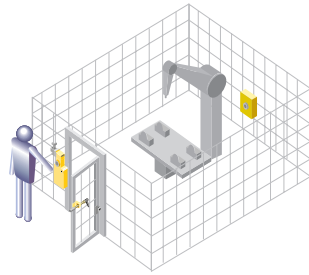


The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

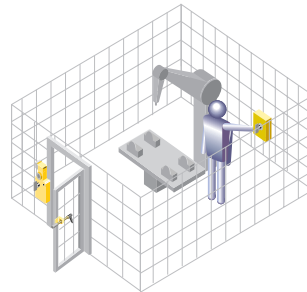
## Enabling unit



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened

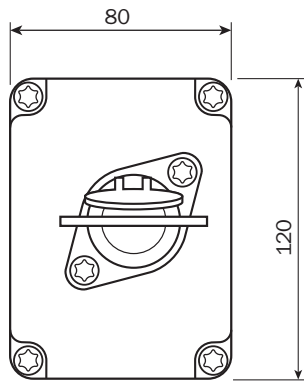


Person enters, key inserted inside, plant runs in enable mode

### Enable function

■ Application example  
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

Contact set 2 x N/O + 2 x N/C for connections into the machine's stop circuit.



## Actuator

Actuation option	Way of actuation	Type	Part number
Turning lever	Fully flexible	iE1001-R1	5308316

## iE1001-R1



## Lockout bar

Type	Part number
iE1002-R1	5308313

### iE1002-R1



## H

## Other accessories

### Key

Prevention of unintentional machine start	Access function	Enable function	Coding	Type	Part number
-	✓	-	1	Key AK1	5308686
-	✓	-	2	Key AK2	5308687
✓	-	✓	1	Key SK1	5308307
✓	-	✓	2	Key SK2	5308308

### Cable gland

Type	Part number
Cable gland PG13.5	5305811

### Safety screws

Type	Part number
Safety allen screws	5308317

### Safety switch accessories, miscellaneous

Usage	Type	Part number
For safety allen screws	BIT	5308319

## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Type of actuator	Tongue operated
Housing material	Metal
Number of cable entries	1
Size of the cable gland	PG13.5

## Product description

- Safety switch with remote multi-coded actuator
- 3-pole contact element
- The system can compensate for any misalignment, such as caused by door drop

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

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→ see O-0

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→ see P-0

## Order information

Number of positive action normally closed contacts	Number of normally open contacts	Supply voltage	Type	Part number
2	1	24 V DC	i1002-24	6021010

Actuator supplied with delivery



- Housing material powder-coated die-cast zinc
- Four actuating directions
- Cable gland PG13.5
- Enclosure rating IP 67
- LED function indicator
- Separate actuator



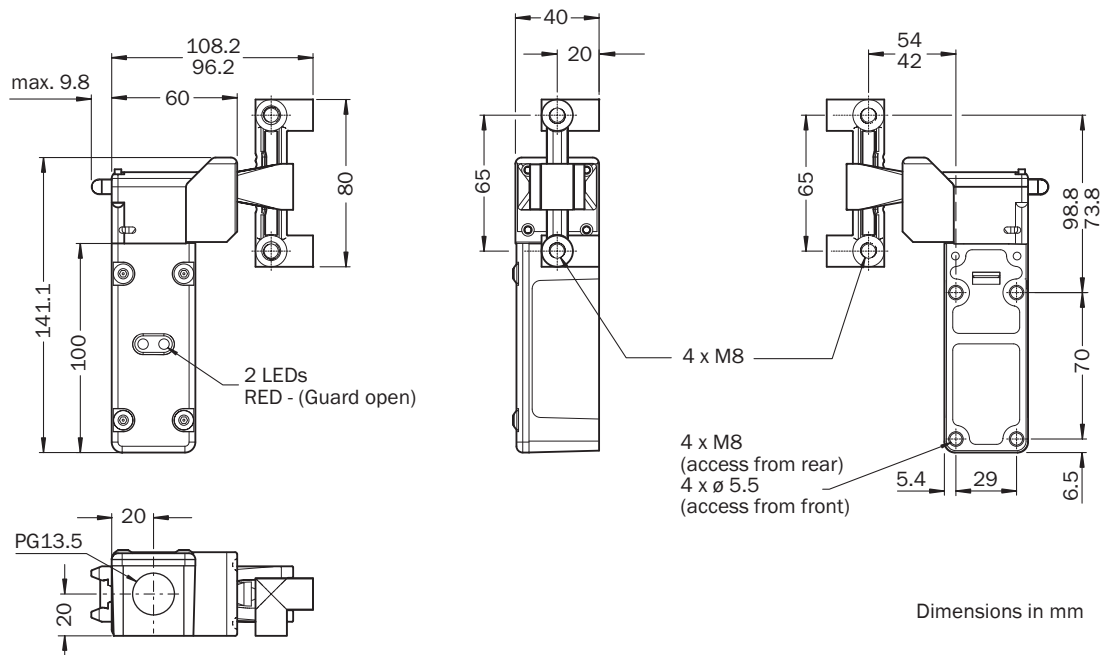
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→ Dimensional drawings	H-42
→ Internal circuitry	H-43
→ Trapped key systems	H-43
→ Actuator	H-46
→ Lockout bar	H-46
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## Detailed technical specifications

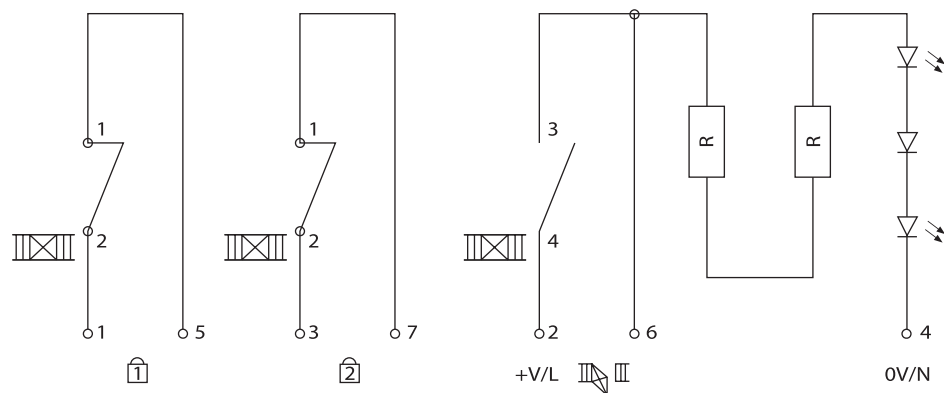
Housing material	Zinc alloy and stainless steel
Surface treatment	Varnished
Enclosure rating	IP 67
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-5 °C ... +40 °C
Maximum approach speed	333 mm/s
Actuation force	Min. 5 N
Actuation frequency	Max. 2 Hz
Switching principle	Slow-action switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	10 A (24 V DC)
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Contact material	90 % silver and 10 % nickel
Connection type	Cable gland
Maximum connection cable cross-section	2.5 mm <sup>2</sup>
Weight	1.11 kg

## H

## Dimensional drawings



## Internal circuitry



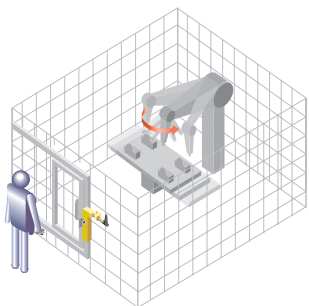
## Trapped key systems

Accessory type	Coding	Delivery	Type	Part number
Access key adapter	1	Key supplied with delivery	iE1000-AK1	5308302
	2	Key supplied with delivery	iE1000-AK2	5308303
Safety key adapter	1	Key supplied with delivery	iE1000-SK1	5308297
	2	Key supplied with delivery	iE1000-SK2	5308298
Enabling unit	1	Key supplied with delivery	iE1000-ES1	6021019
	2	Key supplied with delivery	iE1000-ES2	6021020

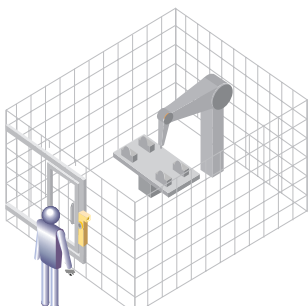
Additional types on request

H

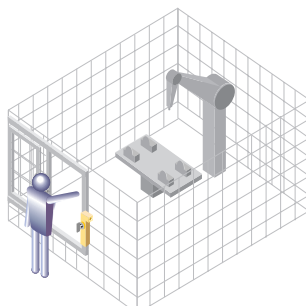
### Access key adapter



Plant in action, no key inserted



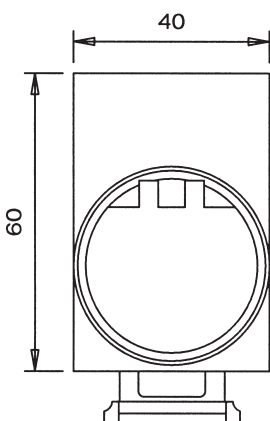
Key is inserted, plant comes to a standstill



Door can now be opened

#### Access function

■ Application example  
Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.

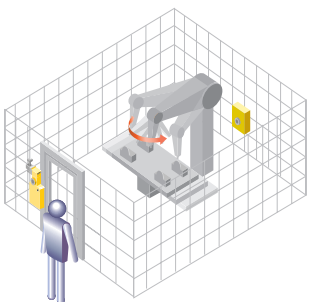


The access key adapter is installed between the head and the housing of the safety switch.

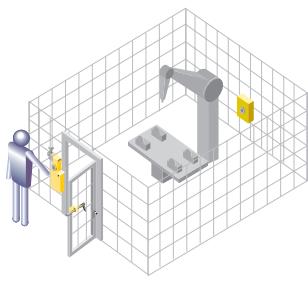
If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

H

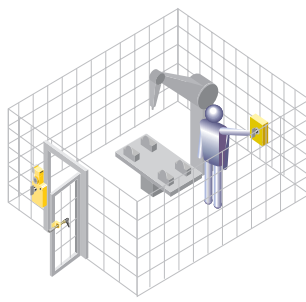
### Safety key adapter



Plant in action, door closed, key inserted



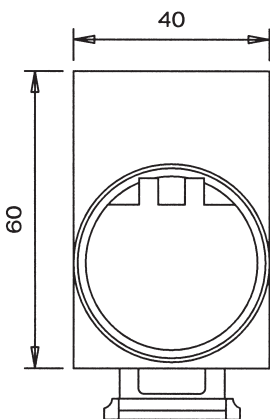
Key is removed, plant comes to standstill, door can be opened



Person enters, key inserted inside, plant runs in enable mode

#### Enable function

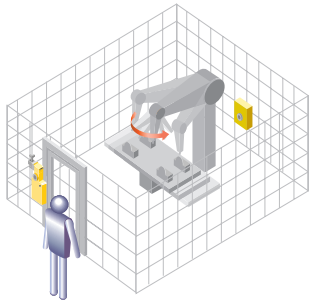
■ Application example  
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



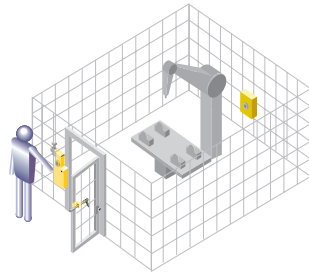
The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.



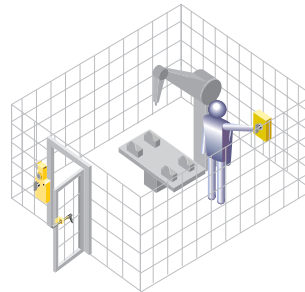
## Enabling unit



Plant in action, door closed, key inserted



Key is removed, plant comes to standstill, door can be opened

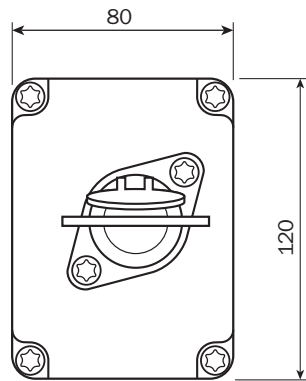


Person enters, key inserted inside, plant runs in enable mode

### Enable function

■ Application example  
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

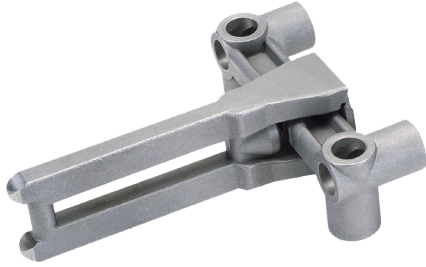
Contact set 2 x N/O + 2 x N/C for connections into the machine's stop circuit.



## Actuator

Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Semi flexible	Min. 300 mm	iE1002-S2	5308315

### iE1002-S2



## H

## Lockout bar

Type	Part number
iE1002-S3	5308312

### iE1002-S3



## Other accessories

### Key

Prevention of unintentional machine start	Access function	Enable function	Coding	Type	Part number
-	✓	-	1	Key AK1	5308686
-	✓	-	2	Key AK2	5308687
✓	-	✓	1	Key SK1	5308307
✓	-	✓	2	Key SK2	5308308

### Cable gland

Type	Part number
Cable gland PG13.5	5305811

### Safety screws

Type	Part number
Safety allen screws	5308317

### Safety switch accessories, miscellaneous

Usage	Type	Part number
For safety allen screws	BIT	5308319



## Explanations of features

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### **Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the "positive action" type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

### **Door signalling contact**

The three possible states of a safety locking device are "Door locked and closed", "Door unlocked and closed" and "Door unlocked and open". Depending on the version, there is a contact element for the third state, which is activated when the door is opened. Both positive action normally closed contact/normally open contact combinations and normally closed contacts without positive action, are used as door signalling contacts.

### **Housing material**

The housing materials used can be separated into two large groups - "metals" and "plastics". The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

### **Locking force**

The locking force gives the maximum force which can act on the locking mechanism. Depending on the type, the maximum locking force is only achieved by using additional fixing screws that are included in the supply (e.g. i200-Lock).

### **Locking type**

Safety locking devices are equipped either with a mechanical or electric locking device.

For the mechanical locking device, the locking is activated after inserting the actuator. It can be released by applying the voltage to the locking magnet.

For the electric locking device, the voltage must be applied to the locking magnet after inserting the actuating element in order to activate the locking.

### **Type of actuator**

The majority of safety switches have appropriately coded tongue-operated actuators that prevent simple manipulation of the switch.


The i1000 series has an additional handle-operated actuator with coded spindle. It is not actuated by applying a force but by applying a torque.

### **Mechanical unlocking mechanism**

The locking device can be unlocked, e.g. on a power failure, using the mechanical unlocking mechanism.

# Safety locking devices



Safety application	Number of positive action normally closed contacts/normally open contacts <sup>1)</sup>	Housing material <sup>1)</sup>	Type of actuator <sup>1)</sup>	Door signalling contacts <sup>1)</sup>	Number x size of cable gland	Locking force <sup>1)</sup>	Locking type <sup>1)</sup> mechanical (m)/electrical (e)	Product	Page
	2 / 1 3 / 1 4 / 0	Plastic	Tongue operated	✓	3 x M20	1200 N	m / e	i10 Lock	I-2
	2 / 1 3 / 0	Plastic	Tongue operated	—	1 x M20	1200 N	m	i14 Lock	I-9
	4 / 1 3 / 2	Plastic	Tongue operated	✓	3 x M20	2000 N	m / e	i200 Lock	I-13
	4 / 2	Metal	Handle operated	✓	1 x PG13.5	2500 N	m	i1001 Lock	I-17
	4 / 2	Metal	Tongue operated	✓	1 x PG13.5	2500 N	m	i1002 Lock	I-23

<sup>1)</sup> Explanation see page I-0



- Housing material glass-fibre reinforced thermoplastic
- Locking force 1200 N
- Five actuating directions
- Cable gland 3 x M20
- Enclosure rating IP 67
- Mechanical unlocking mechanism



Further information	Page
→ Dimensional drawings	I-4
→ Switching elements	I-5
→ Actuators	I-5
→ Lockout bar	I-7
→ Lock	I-7
→ Alignment aid	I-8
→ Other accessories	I-8
→ Services	A-2

## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts (depending on type)	0 / 1
Number of positive action normally closed door monitoring contacts (depending on type)	0 / 1 / 2
Number of normally open door monitoring contacts (depending on type)	0 / 1
Number of normally closed door monitoring contacts (depending on type)	0 / 1
Housing material	Plastic
Locking force	1200 N
Locking type (depending on type)	Electrical / mechanical

## Product description

- Safety switches with remote multi-coded actuator and tumbler mechanism
- Small design – ideal for direct mounting on framework
- 4-pole contact element
- Various actuator versions available

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.

→ see P-0

## Ordering information

Positive action normally closed	Door monitoring				Solenoid operating voltage	Locking type	Type	Part number
	Normally open	Positive action normally closed	Normally open	Normally closed				
2	1	0	0	1	24 V DC	Electrical	i10-E0233 Lock	6022585
	0	0	1	1	24 V DC	Electrical	i10-E0253 Lock	6020536
		1	1	0	24 V DC	Electrical	i10-E0313S02 Lock	6011368
		2	0	0	24 V DC	Electrical	i10-E0453 Lock	6020598
	1	0	0	1	24 V DC	Mechanical	i10-M0233 Lock	6022580
	0	0	1	1	24 V DC	Mechanical	i10-M0253 Lock	6027397

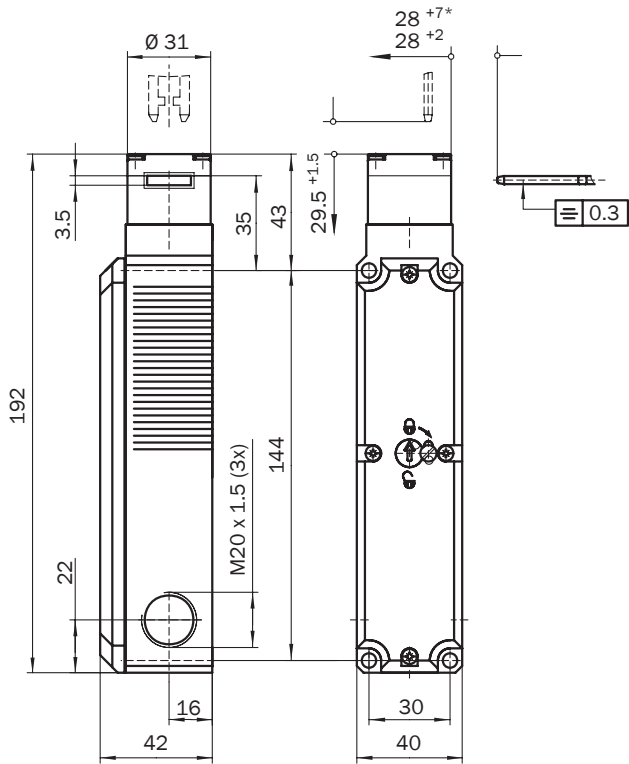
Please order actuator separately

## Detailed technical specifications

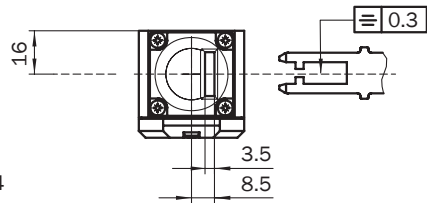
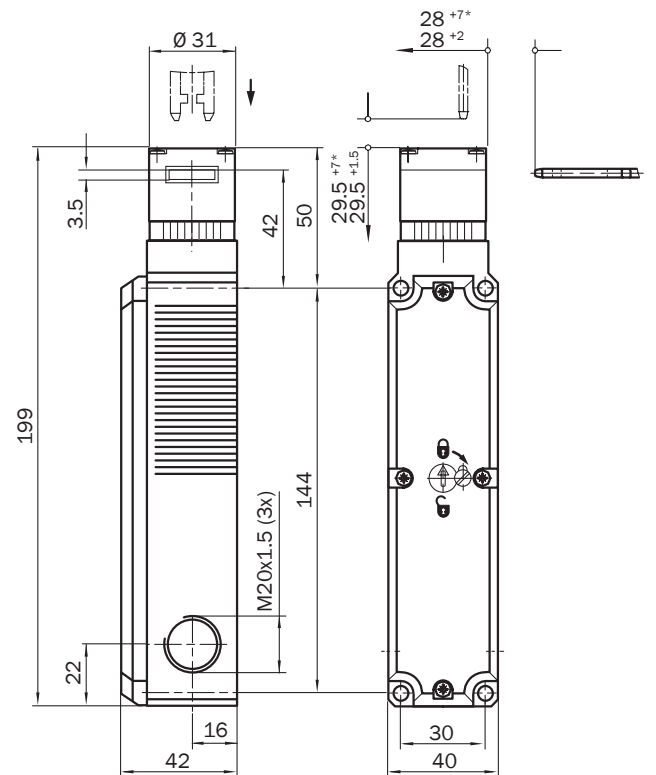
Type	i10-E0233 Lock	i10-E0253 Lock	i10- E0313S02 Lock	i10-E0453 Lock	i10-M0233 Lock	i10-M0253 Lock
Housing material	Glass-fibre reinforced thermoplastic					
Enclosure rating	IP 67					
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles, in case of radius actuator 1 x 10 <sup>5</sup> switching cycles					
Ambient operating temperature from ... to	-20 °C ... +55 °C					
Maximum approach speed	333 mm/s					
Actuation force	Min. 20 N					
Locking force	1200 N					
Actuation frequency	Max. 1.94 Hz					
Switching principle	Slow-action switch					
Number of positive action normally closed contacts	2					
Number of normally open contacts	1		0		1	0
Number of positive action normally closed door monitoring contacts		0	1	2		0
Number of normally open door monitoring contacts	0		1		0	1
Number of normally closed door monitoring contacts		1		0		1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13					
Rated operating current (voltage)	4 A (230 V AC), 4 A (24 V DC)					
Rated insulation voltage U <sub>i</sub>	250 V					
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC					
Minimum switching voltage	12 V DC					
Minimum switching current (switching voltage)	1 mA (24 V DC)					
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC					
Power consumption	Max. 8 W					
Duty cycle	100 %					
Contact material	Silver alloy, gold flashed					
Connection type	Cable gland					
Maximum connection wire cross-section	1.5 mm <sup>2</sup>					
Short-circuit protection	4A gG					
Weight	0.46 kg					

# Dimensional drawings

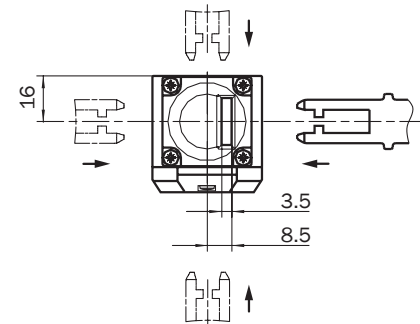
**i10-E0233 Lock, i10-E0253 Lock, i10-E0453 Lock, i10-M0233 Lock, i10-M0253 Lock**



**i10-E0313S02 Lock**



\* in case of actuator with overtravel: iE10-S4 und iE10-A4

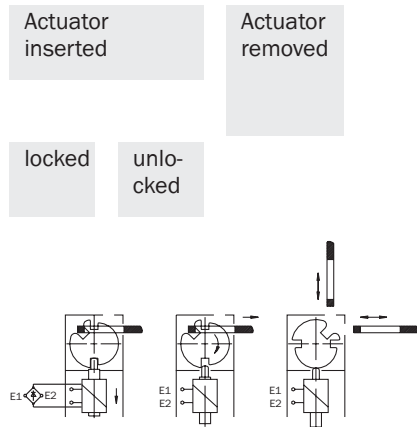


\* in case of actuator with overtravel: iE10-S4 und iE10-A4

Dimensions in mm



## Switching elements

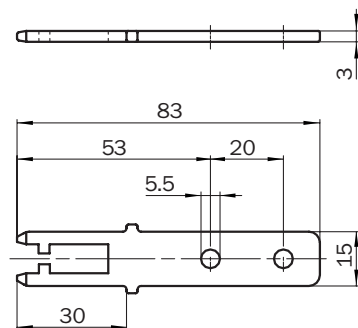


<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 35 34</li> <li>⊕ 21 22</li> <li>⊖ 11 12</li> </ul>	<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 35 34</li> <li>⊕ 21 22</li> <li>⊖ 11 12</li> </ul>	<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 35 34</li> <li>⊕ 21 22</li> <li>⊖ 11 0 12</li> </ul>	23, 2 positive action N/C contacts + 1 N/O contact + 1 N/C as door contact
<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 13 14</li> </ul>	<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 13 14</li> </ul>	<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 13 0 14</li> </ul>	25, 2 positive action N/C contacts + 1 N/O contact as door contact + 1 N/C as door contact
<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 13 14</li> </ul>	<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 13 14</li> </ul>	<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 13 0 14</li> </ul>	31, 2 positive action N/C contacts + 1 N/O contact as door contact + 1 positive action N/C as door contact
<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 11 12</li> </ul>	<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 11 12</li> </ul>	<ul style="list-style-type: none"> <li>⊕ 41 0 42</li> <li>⊖ 31 32</li> <li>⊕ 21 22</li> <li>⊖ 11 0 12</li> </ul>	45, 2 positive action N/C contacts + 2 positive action N/C as door contacts

## Actuators

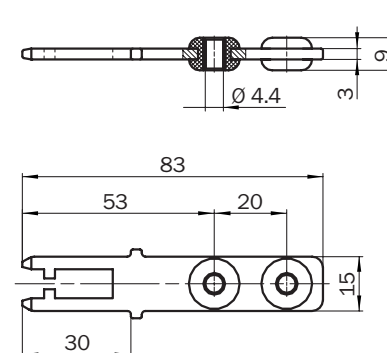
Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 1000 mm	iE10-S1	5306527
	Rubber-mounted	Min. 1000 mm	iE10-S2	5306530
	Rigid	Min. 1000 mm	iE10-S4	5308383
Angled	Rigid	Min. 1000 mm	iE10-A1	5306535
			iE10-A4	5308497
Radius	Semi flexible	Min. 90 mm	iE10-R1	5306528
		Min. 100 mm	iE10-R2	5306529

### iE10-S1



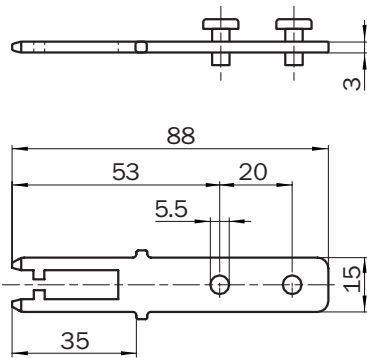
2 safety screws included.  
Min. door radius 1000 mm.

### iE10-S2



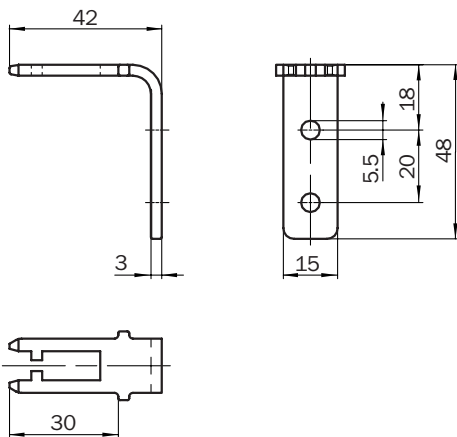
2 safety screws included.  
Min. door radius 1000 mm.

iE10-S4



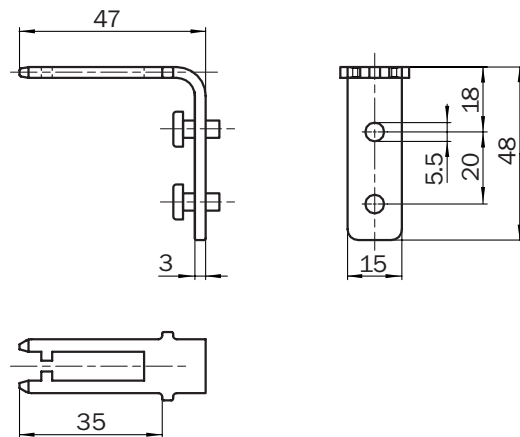
2 safety screws included  
Min. door radius 1000 mm

iE10-A1



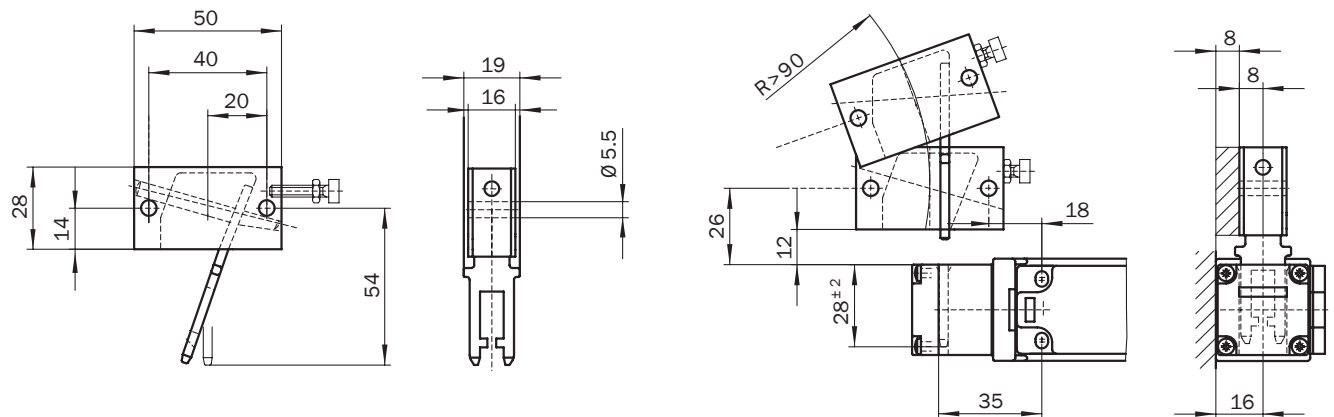
2 safety screws included.  
Min. door radius 1000 mm.

iE10-A4



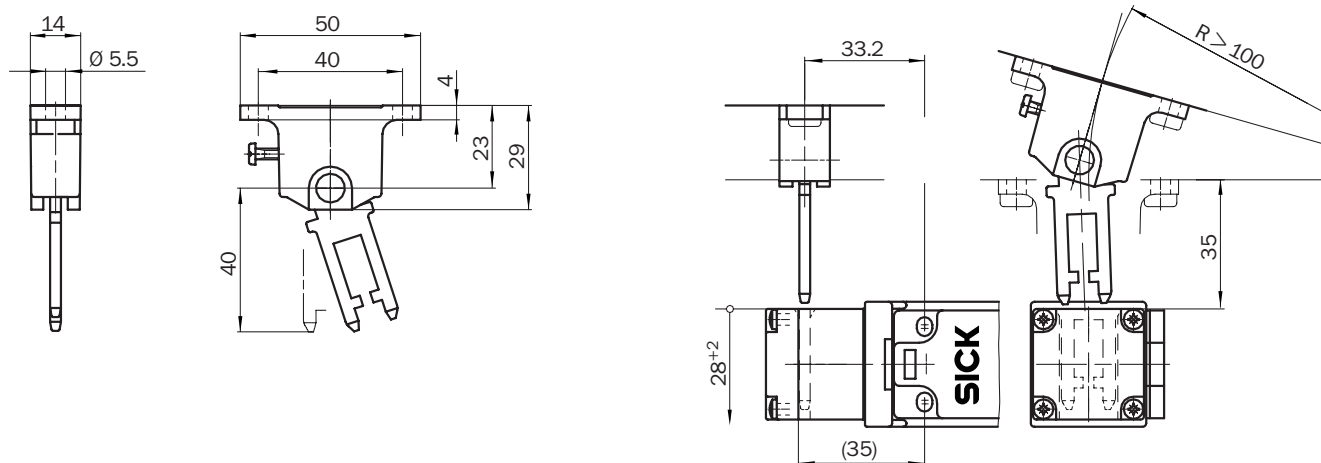
2 safety screws included  
Min. door radius 1000 mm

iE10-R1



2 safety screws included.  
Min. door radius 90 mm.

### iE10-R2

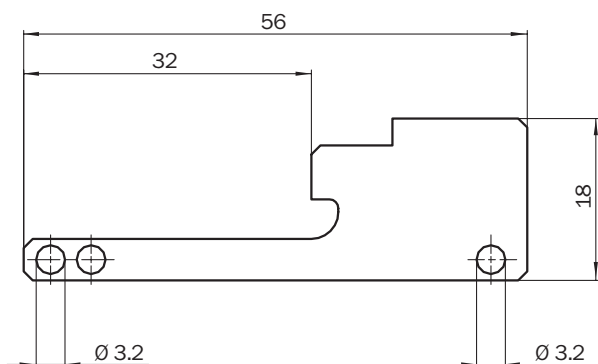


2 safety screws included.  
Min. door radius 100 mm.

### Lockout bar

Type	Part number
iE10-S3	5306536

### iE10-S3

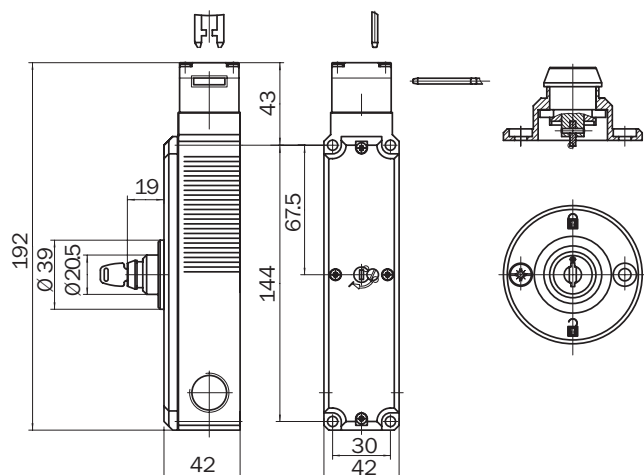


The locking bar can be inserted into the safety switch in place of the actuator when the protective device is in the open condition and can be secured to prevent its removal by standard commercially available padlocks (max. 2 pcs.). This guarantees reliable protection for persons who have to enter potentially hazardous areas.

### Lock

Property	Delivery	Type	Part number
Parallel closing	Including key	iE10-K2	5308270

iE10-K2



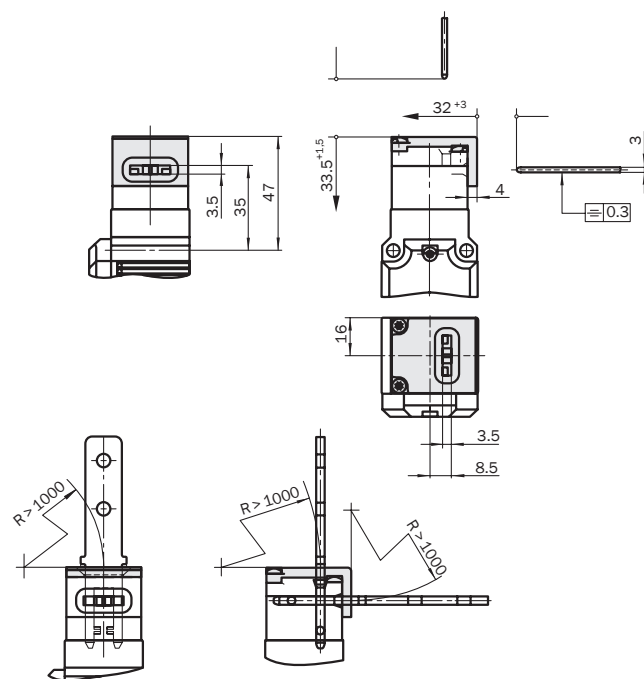
The mechanical unlocking mechanism of the i10 Lock can easily be carried out via a key. The selected lock on the front of the i10 Lock is fixed with two screws.

- Parallel closing locking mechanism
- Delivery with fixing screws and two keys

Alignment aid

Type	Part number
iE10-G1	5318460

iE10-G1



The metal alignment aid provides the actuator with a wider entry area into the safety locking device i10 Lock. With the alignment aid the safety switch is better protected against damage.

- It may be secured to the locking device with the two M3 x 34 self-tapping screws (screws supplied with delivery).
- It can only be used in combination with actuators with over-travel (iE10-A4, iE10-S4).
- It can not be used with special locking devices (i10-E0313S02) which have already a longer top entry overtravel.

Other accessories

Cable gland

Type	Part number
Cable gland M20	5309164

## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	2 / 3
Number of normally open contacts (depending on type)	0 / 1
Number of positive action normally closed door monitoring contacts	0
Number of normally open door monitoring contacts	0
Number of normally closed door monitoring contacts	0
Housing material	Plastic
Locking force	1200 N
Locking type	Mechanical

## Product description

- Safety switches with remote multi-coded actuator and tumbler mechanism
- Easy conversion of actuating direction through rotatable head
- 3-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

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→ see O-0

### Safety network solutions

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→ see P-0

## Ordering information

Positive action normally closed	Normally open	Door monitoring			Solenoid operating voltage	Locking type	Type	Part number
		Positive action normally closed	Normally open	Normally closed				
2	1	0	0	0	24 V DC	Mechanical	i14-M0213 Lock	6025060
3	0	0	0	0	24 V DC	Mechanical	i14-M0303 Lock	6025062

Please order actuator separately



- Housing material glass-fibre reinforced thermoplastic
- Locking force 1200 N
- Three actuating directions
- Cable gland 3 x M20
- LED solenoid monitoring
- Mechanical unlocking mechanisms on three sides

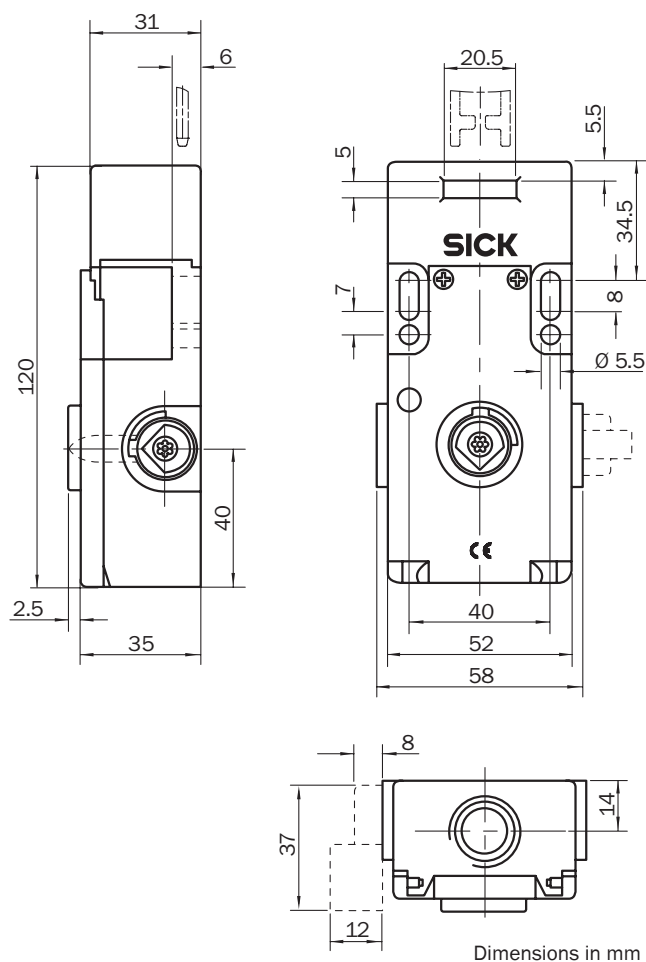


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→ Switching elements	I-11
→ Actuator travel diagram	I-11
→ Actuator	I-11
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→ Services	A-2

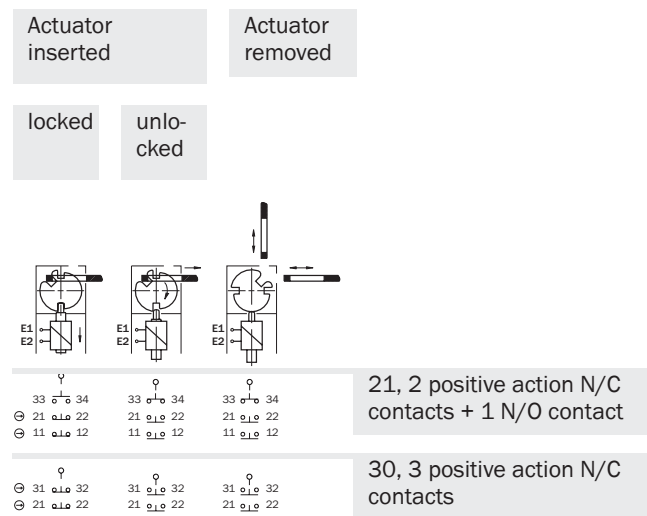
## Detailed technical specifications

Type	i14-M0213 Lock	i14-M0303 Lock
Housing material	Glass-fibre reinforced thermoplastic	
Enclosure rating	IP 65	
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to	-10 °C ... +60 °C	
Maximum approach speed	160 mm/s	
Actuation force	Min. 12 N	
Locking force	1200 N	
Switching principle	Slow-action switch	
Number of positive action normally closed contacts	2	3
Number of normally open contacts	1	0
Number of positive action normally closed door monitoring contacts	0	
Number of normally open door monitoring contacts	0	
Number of normally closed door monitoring contacts	0	
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	2 A (250 V AC), 2 A (24 V DC)	
Rated insulation voltage U <sub>i</sub>	250 V	
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC	
Minimum switching voltage	5 V DC	
Minimum switching current (switching voltage)	5 mA (5 V DC)	
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC	
Power consumption	Max. 7 W	
Duty cycle	100 %	
Connection type	Cable gland	
Maximum connection wire cross-section	1.5 mm <sup>2</sup>	
Short-circuit protection	2A gG	
Weight	0.37 kg	

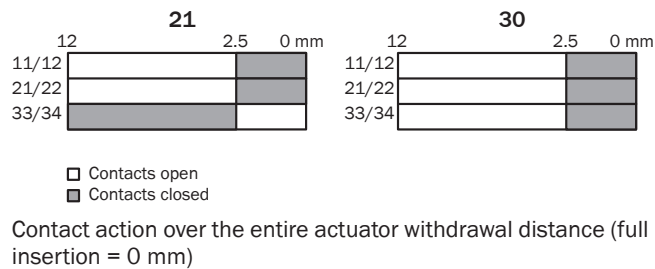
## Dimensional drawings



## Switching elements



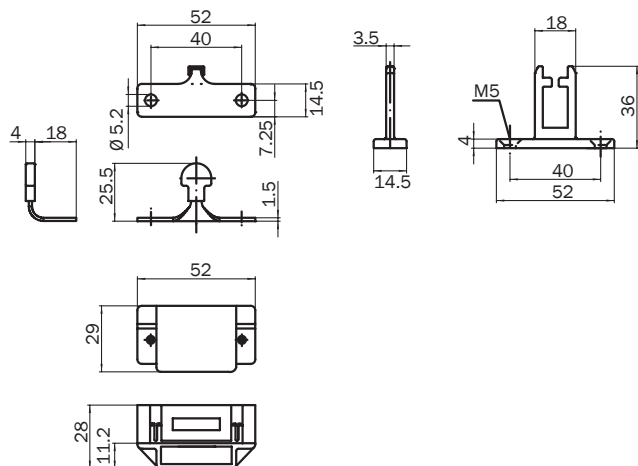
## Actuator travel diagram



## Actuator

Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 160 mm	iE14-S1	5311133

## iE14-S1







## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts (depending on type)	0 / 1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Housing material	Plastic
Locking force	2000 N
Locking type (depending on type)	Electrical / mechanical

## Product description

- Safety switches with remote multi-coded actuator and tumbler mechanism
- Twin contact element for remote locking and door monitoring functions
- Straight, flexible or bolt actuator available

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

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→ see O-0

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→ see P-0

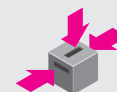
## Ordering information

Positive action normally closed	Normally open	Door monitoring			Solenoid operating voltage	Locking type	Type	Part number
		Positive action normally closed	Normally open	Normally closed				
1	1	2	1	0	24 V DC	Mechanical	I200-M0323 Lock	6025113
2	0	2	1	0	24 V DC	Mechanical	I200-M0413 Lock	6025115
1	1	2	1	0	24 V DC	Electrical	I200-E0323 Lock	6026140

Please order actuator separately



- Housing material glass-fibre reinforced thermoplastic
- Entry for actuator made of stainless steel
- Locking force 2000 N
- Three actuating directions
- Cable gland 3 x M20
- Mechanical unlocking mechanisms on three sides
- LED solenoid monitoring



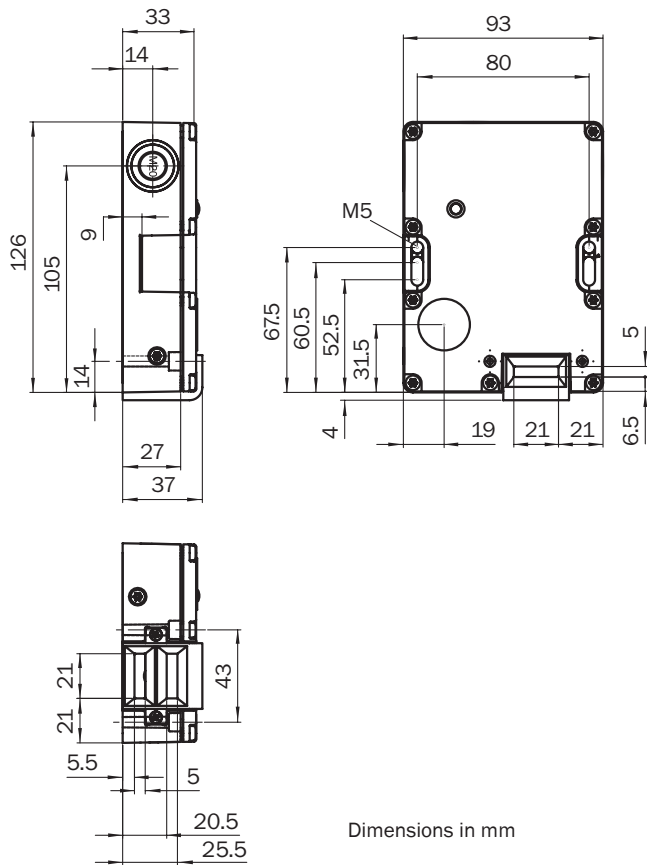
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→ Dimensional drawings	I-15
→ Switching elements	I-15
→ Actuator travel diagram	I-15
→ Actuators	I-16
→ Bolt	I-16
→ Other accessories	I-16
→ Services	A-2

## Detailed technical specifications

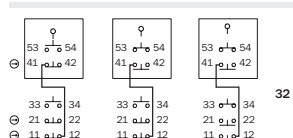
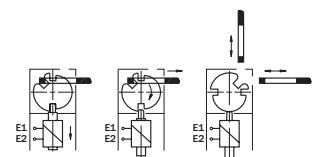
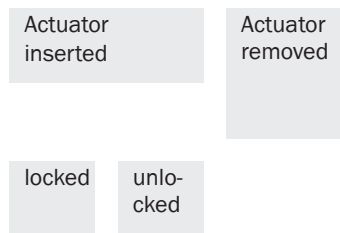
Type	I200-M0323 Lock	I200-M0413 Lock	I200-E0323 Lock
Housing material	Glass-fibre reinforced polyester		
Enclosure rating	IP 65		
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles		
Ambient operating temperature from ... to	-20 °C ... +60 °C		
Maximum approach speed	160 mm/s		
Locking force	2000 N <sup>1)</sup>		
Switching principle	Slow-action switch		
Number of positive action normally closed contacts	1	2	1
Number of normally open contacts	1	0	1
Number of positive action normally closed door monitoring contacts	2		
Number of normally open door monitoring contacts	1		
Number of normally closed door monitoring contacts	0		
Usage category in compliance with IEC 947-5-1	AC-15/DC-13		
Rated operating current (voltage)	2 A (250 V AC), 2 A (24 V DC)		
Rated insulation voltage U <sub>i</sub>	250 V		
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC		
Minimum switching voltage	5 V DC		
Minimum switching current (switching voltage)	5 mA (5 V DC)		
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC		
Power consumption	Max. 7 W		
Duty cycle	100 %		
Connection type	Cable gland		
Short-circuit protection	2A gG		
Weight	0.55 kg		

<sup>1)</sup> Only in combination with the delivered fixing screws, otherwise 1500 N

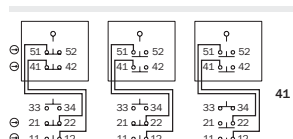
## Dimensional drawings



## Switching elements

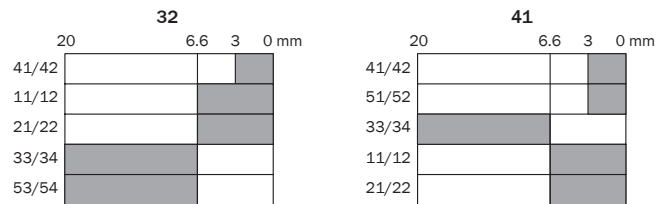


32, 1 positive action N/C contact + 1 N/O contact + 2 positive action N/C as door contacts + 1 N/O as door contact



41, 2 positive action N/C contacts + 2 positive action N/C as door contacts + 1 N/O as door contact

## Actuator travel diagram



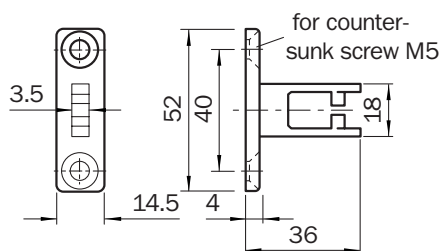
□ Contacts open  
■ Contacts closed

Contact action over the entire actuator withdrawal distance (full insertion = 0 mm)

## Actuators

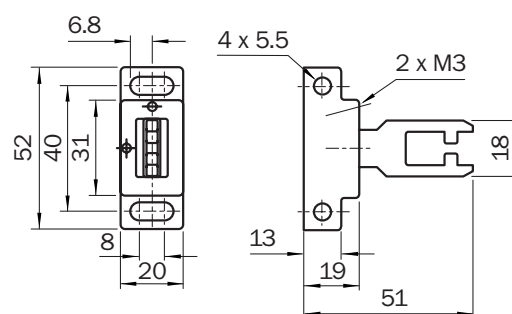
Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Rigid	Min. 175 mm	iE200-S1	5308758
	Fully flexible	Min. 80 mm	iE200-F1	5308759

### iE200-S1



Min. door radius 175 mm

### iE200-F1

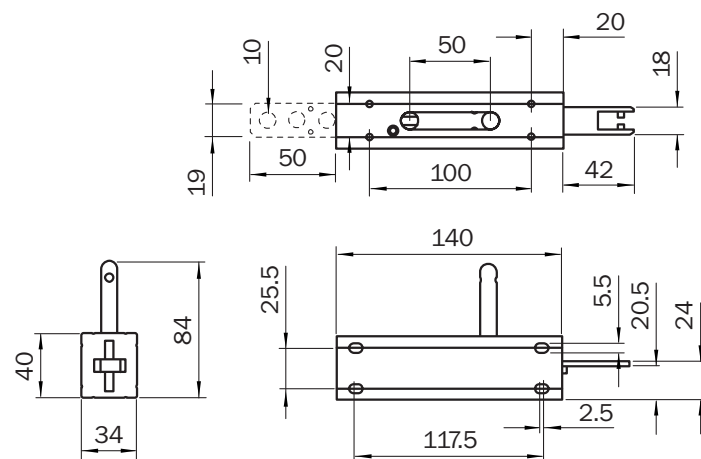


Min. door radius 80 mm

## Bolt

Type	Part number
iE200-B1	5308760

### iE200-B1



## Other accessories

### Cable gland

Type	Part number
Cable gland M20	5309164

## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Housing material	Metal
Locking force	2500 N
Locking type	Mechanical

## Product description

- Safety locking device with handle-operated actuator
- Two contact elements for separate door and solenoid monitoring
- The system can compensate for any misalignment, such as caused by door drop

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

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→ see O-0

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→ see P-0

## Ordering information

Positive action normally closed	Normally open	Door monitoring			Solenoid operating voltage	Locking type	Type	Part number
		Positive action normally closed	Normally open	Normally closed				
2	1	2	1	0	24 V DC	Mechanical	i1001-24 Lock	6021013

Actuator supplied with delivery



- Housing material powder-coated die-cast zinc
- Locking force 2500 N
- Four actuating directions
- Cable gland PG13.5
- LED status indicator
- Handle actuator

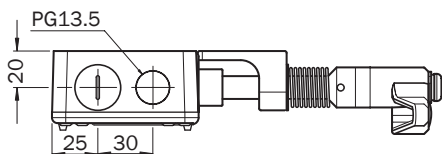
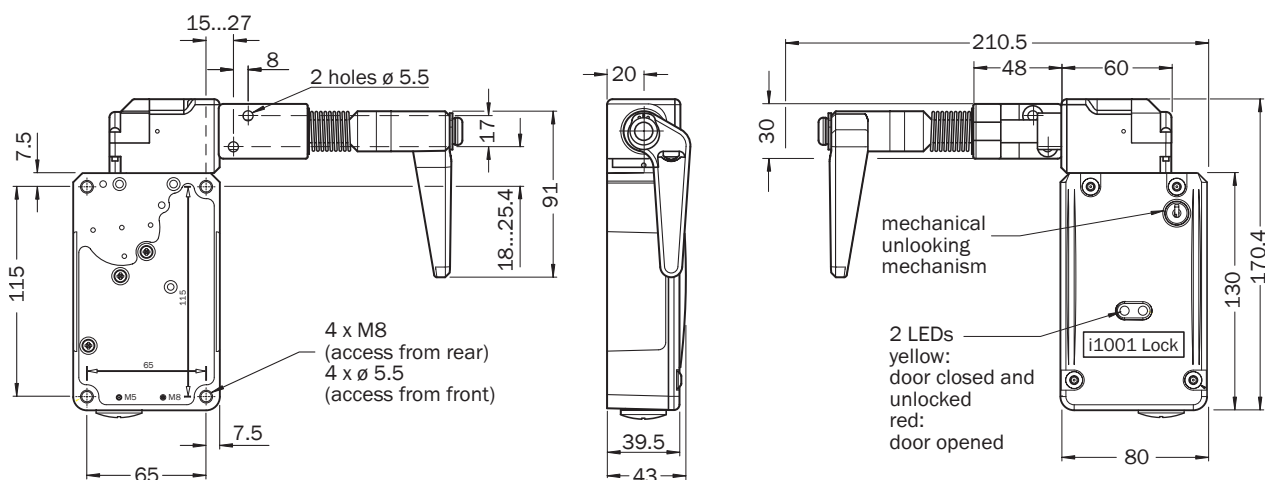


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→ Actuator	I-21
→ Lockout bar	I-21
→ Other accessories	I-22
→ Services	A-2

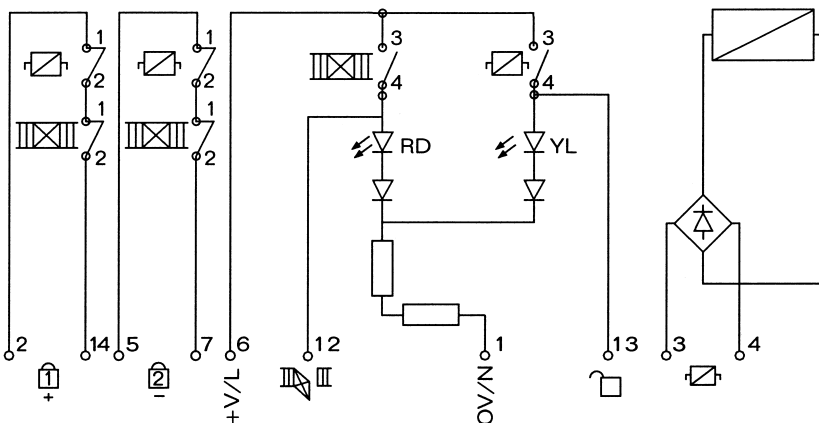
## Detailed technical specifications

Housing material	Zinc alloy and stainless steel
Surface treatment	Varnished
Enclosure rating	IP 67
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-5 °C ... +40 °C
Maximum approach speed	333.3 mm/s
Locking force	2500 N
Switching principle	Slow-action switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	10 A (24 V DC)
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC
Power consumption	Max. 12 W
Duty cycle	100 %
Contact material	90 % silver and 10 % nickel
Connection type	Cable gland
Maximum connection wire cross-section	2.5 mm <sup>2</sup>
Weight	2.25 kg

## Dimensional drawings



## Internal circuitry

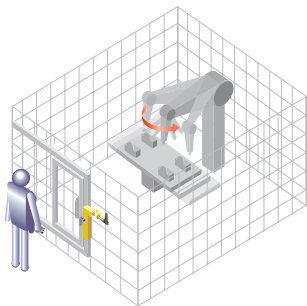


## Trapped key systems

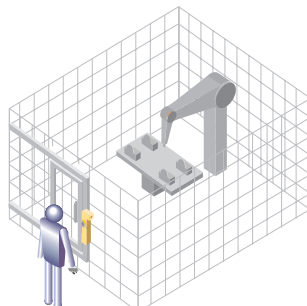
Accessory type	Coding	Delivery	Type	Part number
Access key adapter	1	Key supplied with delivery	iE1000-AK1	5308302
	2	Key supplied with delivery	iE1000-AK2	5308303
Safety key adapter	1	Key supplied with delivery	iE1000-SK1	5308297
	2	Key supplied with delivery	iE1000-SK2	5308298
Enabling unit	1	Key supplied with delivery	iE1000-ES1	6021019
	2	Key supplied with delivery	iE1000-ES2	6021020

Additional types on request

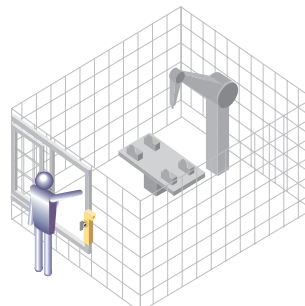
## Access key adapter



Plant in action, no key inserted



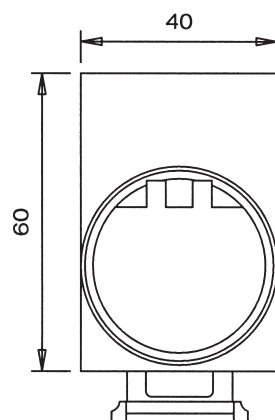
Key is inserted, plant comes to a standstill



Door can now be opened

### Access function

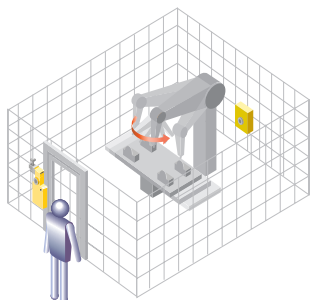
■ Application example  
Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.



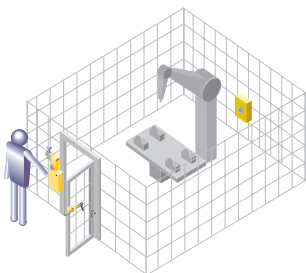
The access key adapter is installed between the head and the housing of the safety switch.

If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

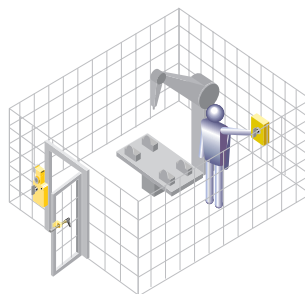
### Safety key adapter



Plant in action, door closed, key inserted



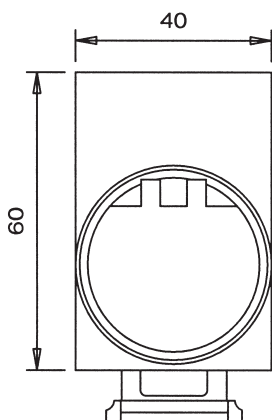
Key is removed, plant comes to standstill, door can be opened



Person enters, key inserted inside, plant runs in enable mode

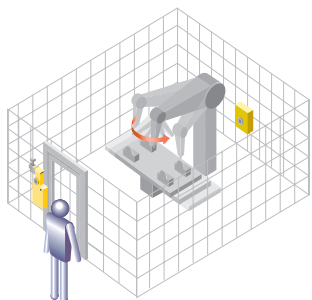
#### Enable function

■ Application example  
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

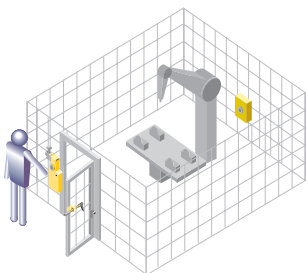


The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

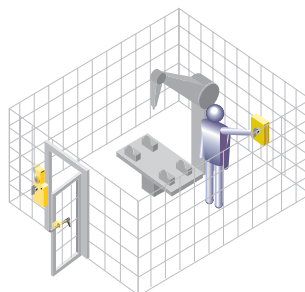
### Enabling unit



Plant in action, door closed, key inserted



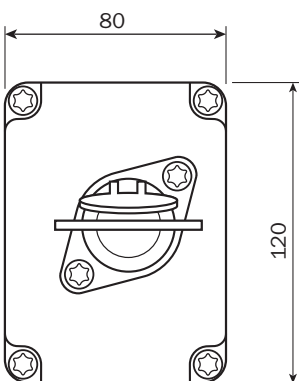
Key is removed, plant comes to standstill, door can be opened



Person enters, key inserted inside, plant runs in enable mode

#### Enable function

■ Application example  
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.



Contact set 2 x N/O + 2 x N/C for connections into the machine's stop circuit.



## Actuator

Actuation option	Way of actuation	Type	Part number
Turning lever	Fully flexible	iE1001-R1	5308316

### iE1001-R1



## Lockout bar

Type	Part number
iE1002-R1	5308313

### iE1002-R1



## Other accessories

### Key

Prevention of unintentional machine start	Access function	Enabling function	Mechanical unlocking mechanism	Coding	Type	Part number
–	✓	–	–	1	Key AK1	5308686
–	✓	–	–	2	Key AK2	5308687
✓	–	✓	–	1	Key SK1	5308307
✓	–	✓	–	2	Key SK2	5308308
–	–	–	✓	–	Key for emergency release	5308320

### Cable gland

Type	Part number
Cable gland PG13.5	5305811

### Safety screws

Type	Part number
Safety allen screws	5308317

### Safety switch accessories, miscellaneous

Usage	Type	Part number
For safety allen screws	BIT	5308319

## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Housing material	Metal
Locking force	2500 N
Locking type	Mechanical

## Product description

- Safety switch with separate coded actuator and guard locking
- Two contact elements for separate door and solenoid monitoring
- The system can compensate for any misalignment, such as caused by door drop

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.

→ see P-0

## Ordering information

Positive action normally closed	Normally open	Door monitoring			Solenoid operating voltage	Locking type	Type	Part number
		Positive action normally closed	Normally open	Normally closed				
2	1	2	1	0	24 V DC	Mechanical	i1002-24 Lock	6021007

Actuator supplied with delivery



- Housing material powder-coated die-cast zinc
- Locking force 2500 N
- Four actuating directions
- Cable gland PG13.5
- LED status indicator
- Separate actuator

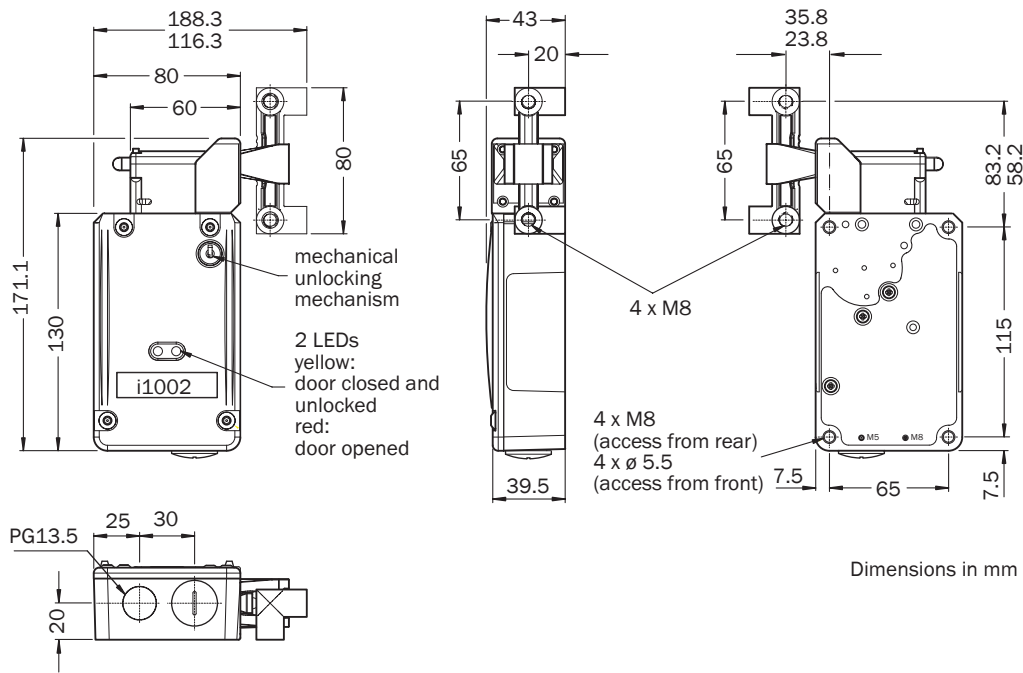


Further information	Page
→ Technical specifications	I-24
→ Dimensional drawings	I-25
→ Internal circuitry	I-25
→ Trapped key systems	I-26
→ Actuator	I-28
→ Lockout bar	I-28
→ Other accessories	I-29
→ Services	A-2

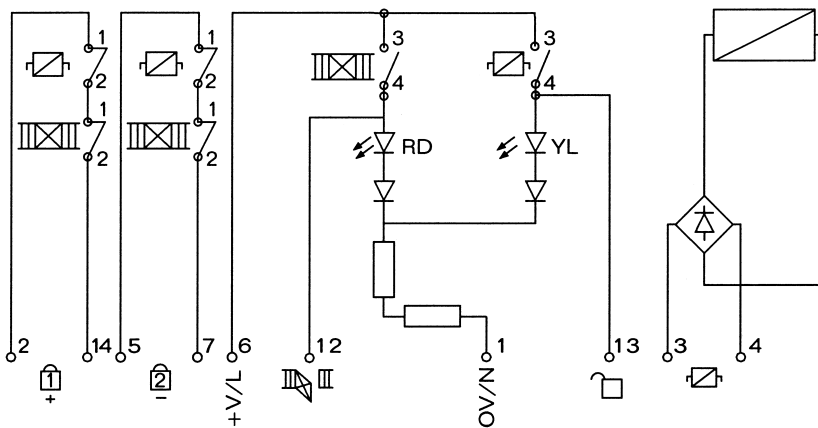
## Detailed technical specifications

Housing material	Zinc alloy and stainless steel
Surface treatment	Varnished
Enclosure rating	IP 67
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-5 °C ... +40 °C
Maximum approach speed	333.3 mm/s
Actuation force	Min. 5 N
Locking force	2500 N
Switching principle	Slow-action switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Number of positive action normally closed door monitoring contacts	2
Number of normally open door monitoring contacts	1
Number of normally closed door monitoring contacts	0
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	10 A (24 V DC)
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Solenoid operating voltage	24 V (20.4 V ... 26.4 V) DC
Power consumption	Max. 12 W
Duty cycle	100 %
Contact material	90 % silver and 10 % nickel
Connection type	Cable gland
Maximum connection wire cross-section	2.5 mm <sup>2</sup>
Weight	1.98 kg

## Dimensional drawings



## Internal circuitry

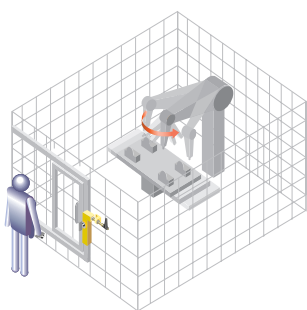


## Trapped key systems

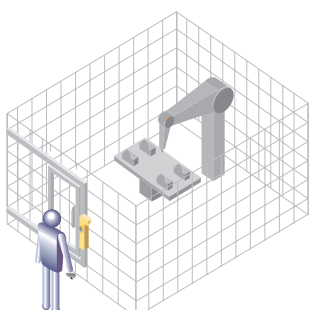
Accessory type	Coding	Delivery	Type	Part number
Access key adapter	1	Key supplied with delivery	iE1000-AK1	5308302
	2	Key supplied with delivery	iE1000-AK2	5308303
Safety key adapter	1	Key supplied with delivery	iE1000-SK1	5308297
	2	Key supplied with delivery	iE1000-SK2	5308298
Enabling unit	1	Key supplied with delivery	iE1000-ES1	6021019
	2	Key supplied with delivery	iE1000-ES2	6021020

Additional types on request

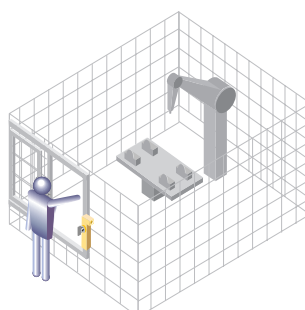
### Access key adapter



Plant in action, no key inserted



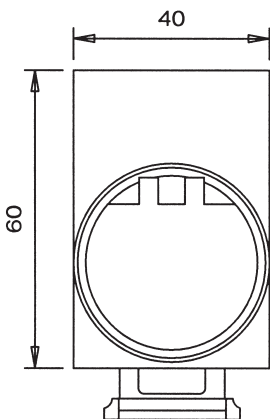
Key is inserted, plant comes to a standstill



Door can now be opened

#### Access function

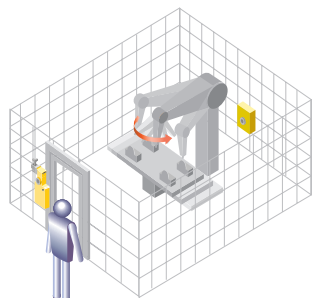
■ Application example  
Basic unit + head unit + access key adapter. Only those with an access key can gain access to the machine.



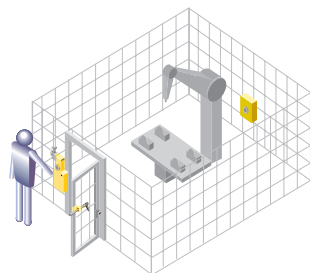
The access key adapter is installed between the head and the housing of the safety switch.

If no key present in the adapter, the door is in the closed position. The door can only be opened if the safety key is inserted and turned (enabling access).

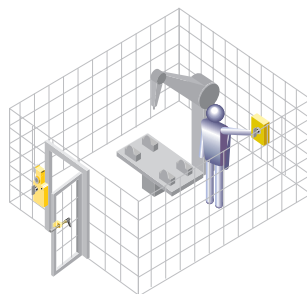
### Safety key adapter



Plant in action, door closed, key inserted



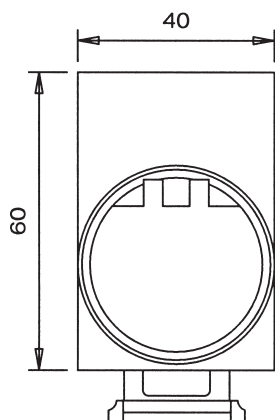
Key is removed, plant comes to standstill, door can be opened



Person enters, key inserted inside, plant runs in enable mode

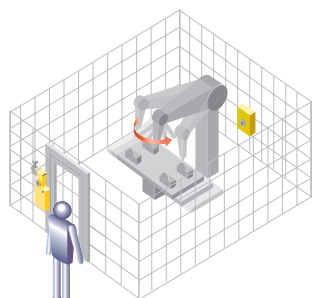
#### Enable function

■ Application example  
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

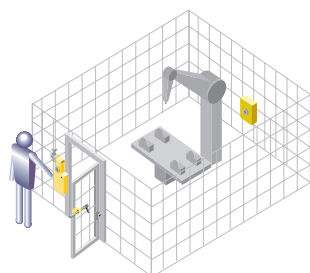


The safety key adapter is installed between the head and the housing of the safety switch. The key is securely held in the unit and the door is kept in the closed position. Only when the safety key is turned and withdrawn access is possible.

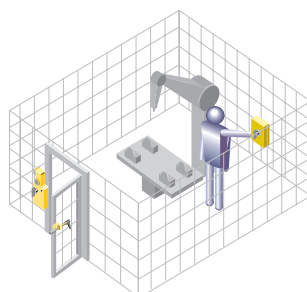
### Enabling unit



Plant in action, door closed, key inserted



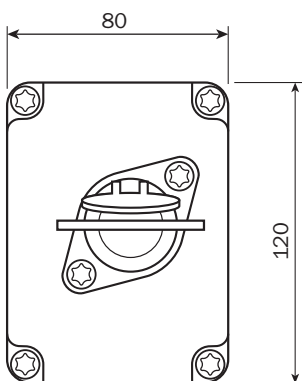
Key is removed, plant comes to standstill, door can be opened



Person enters, key inserted inside, plant runs in enable mode

#### Enable function

■ Application example  
Basic unit + head unit + safety key adapter. In enable mode no person can set the machine in motion from outside. The machine is started from inside with the safety key.

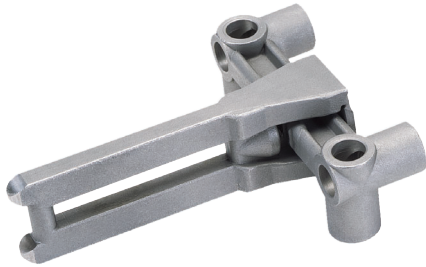


Contact set 2 x N/O + 2 x N/C for connections into the machine's stop circuit.

## Actuator

Actuation option	Way of actuation	Door radius	Type	Part number
Straight	Semi flexible	Min. 300 mm	iE1002-S2	5308315

### iE1002-S2



## Lockout bar

Type	Part number
iE1002-S3	5308312

### iE1002-S3





## Other accessories

### Key

Prevention of unintentional machine start	Access function	Enabling function	Mechanical unlocking mechanism	Coding	Type	Part number
–	✓	–	–	1	Key AK1	5308686
–	✓	–	–	2	Key AK2	5308687
✓	–	✓	–	1	Key SK1	5308307
✓	–	✓	–	2	Key SK2	5308308
–	–	–	✓	–	Key for emergency release	5308320

### Cable gland

Type	Part number
Cable gland PG13.5	5305811

### Safety screws

Type	Part number
Safety allen screws	5308317

### Safety switch accessories, miscellaneous

Usage	Type	Part number
For safety allen screws	BIT	5308319

## Explanations of features

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### **Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

### **Housing material**

The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

### **Switching principle**

#### ■ Slow-action switch


The speed with which the slow-acting switching element is actuated directly affects the speed of normally closed contacts or normally open contacts. The switching points for actuating and resetting the position switch are in the same position.

#### ■ Snap-action switch

Snap-action switching elements react independently of the actuation speed and open or close at a defined point. The contacts of the snap-action switching elements have a different switching point depending on the directional movement, i.e. the switching points for actuating and resetting the position switch are in different positions.

# Safety position switches



Safety application	Number of positive action normally closed contacts/normally open contacts <sup>1)</sup>	Housing material <sup>1)</sup>	Switching principle <sup>1)</sup>	Type of actuator	Enclosure rating	Product	Page
	2 / 1	Plastic	Slow-action switch	Roller plunger	IP 66	i10P	J-2
				Turning lever		i10R	J-4
	3 / 1	Metal	Slow-action switch	Roller plunger	IP 67	i100P	J-7
				Turning lever		i100R	J-10
	1 / 1		Slow-action switch/ snap-action switch	Roller plunger	IP 66	i110P	J-13
				Turning lever		i110R	J-16

<sup>1)</sup> Explanation see page J-0





- Housing material glass-fibre reinforced thermoplastic
- Cable gland M20
- Design according to EN 50047
- Enclosure rating IP 66



## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Switching principle	Slow-action switch
Type of actuator	Roller plunger
Housing material	Plastic
Enclosure rating	IP 66

## Product description

- Roller plunger design
- 3-pole contact element
- Plunger made of plastic

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant. → see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy. → see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe. → see P-0

## Ordering information

Number of positive action normally closed contacts	Number of normally open contacts	Switching principle	Type	Part number
2	1	Slow-action switch	i10-PA213	6025088

Further information

→ Services

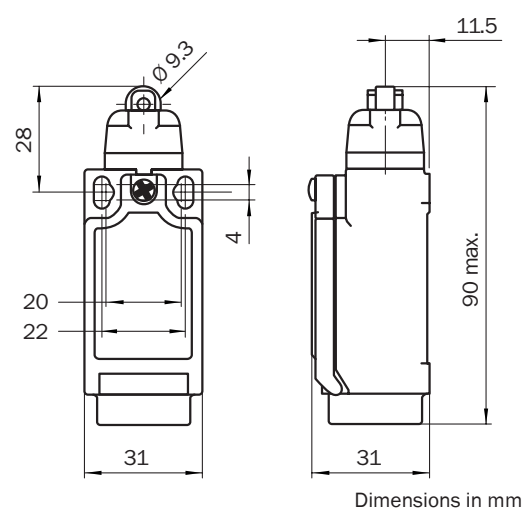
Page

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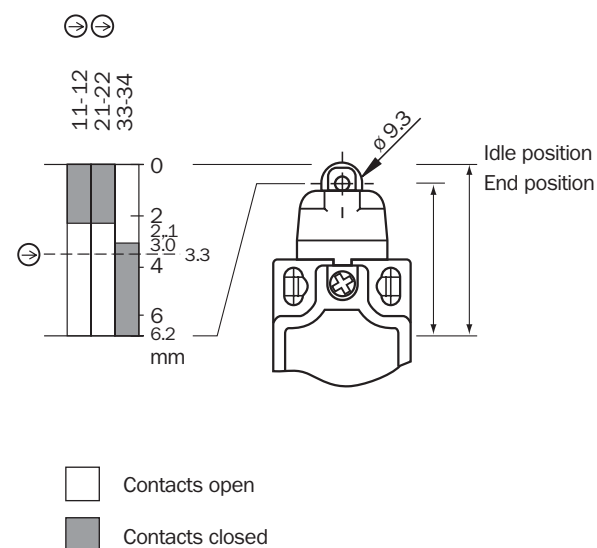
## Detailed technical specifications

Housing material	Glass-fibre reinforced thermoplastic
Enclosure rating	IP 66
Mechanical life (relay contacts)	10 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-25 °C ... +80 °C
Approach speed from ... to	0.1 m/min ... 15 m/min
Actuation force	Min. 6 N
Actuation frequency	Max. 1.67 Hz
Switching principle	Slow-action switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	3 A (230 V AC), 0.27 A (230 V DC)
Rated insulation voltage U <sub>i</sub>	250 V
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Minimum switching voltage	5 V DC
Minimum switching current (switching voltage)	5 mA (5 V DC)
Connection type	Cable gland
Maximum connection wire cross-section	2.5 mm <sup>2</sup>
Short-circuit protection	F15
Positive break travel	3.5 mm
Weight	0.11 kg

## Dimensional drawings



## Actuator travel diagram



## Accessories

### Cable gland

Type	Part number
Cable gland M20	5309164



- Housing material glass-fibre reinforced thermoplastic
- Cable gland M20
- Design according to EN 50047
- Enclosure rating IP 66



## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Switching principle	Slow-action switch
Type of actuator	Turning lever
Housing material	Plastic
Enclosure rating	IP 66

## Product description

- Turning lever design
- Roller made of plastic
- 3-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

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→ see P-0

## Ordering information

Number of positive action normally closed contacts	Number of normally open contacts	Switching principle	Type	Part number
2	1	Slow-action switch	i10-RA213	6025085

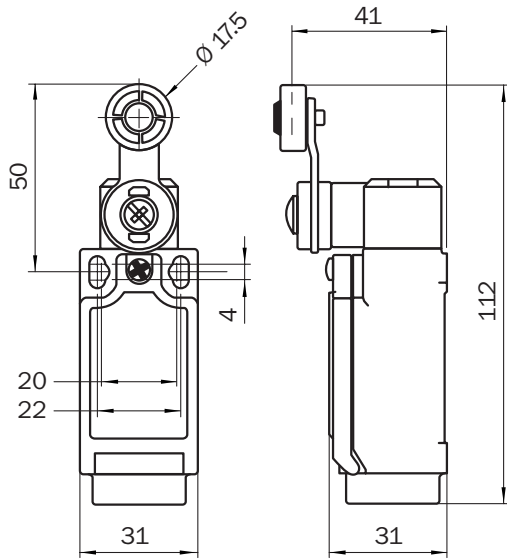
Further information	Page
→ Dimensional drawings	J-6
→ Actuator travel diagram	J-6
→ Accessories	J-6
→ Services	A-2

## Detailed technical specifications

Housing material	Glass-fibre reinforced thermoplastic
Enclosure rating	IP 66
Mechanical life (relay contacts)	10 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-25 °C ... +80 °C
Minimum actuation torque	0.14 Nm
Approach speed from ... to	0.1 m/min ... 15 m/min
Actuation frequency	Max. 1.67 Hz
Switching principle	Slow-action switch
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	3 A (230 V AC), 0.27 A (230 V DC)
Rated insulation voltage U <sub>i</sub>	250 V
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Minimum switching voltage	5 V DC
Minimum switching current (switching voltage)	5 mA (5 V DC)
Connection type	Cable gland
Maximum connection wire cross-section	2.5 mm <sup>2</sup>
Short-circuit protection	F15
Positive break angle	47°
Weight	0.11 kg

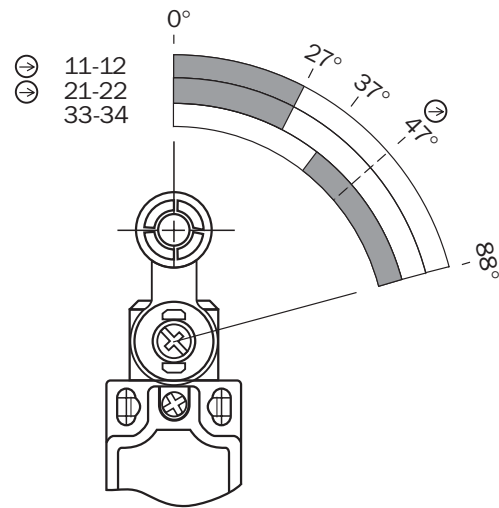
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### Dimensional drawings



Dimensions in mm

### Actuator travel diagram



- Contacts open
- Contacts closed

### Accessories

#### Cable gland

Type	Part number
Cable gland M20	5309164



## Overview of technical specifications

Number of positive action normally closed contacts	3
Number of normally open contacts	1
Switching principle	Slow-action switch
Type of actuator	Roller plunger
Housing material	Metal
Enclosure rating	IP 67

## Product description

- Roller plunger design
- 4-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

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SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.

→ see P-0

## Ordering information

Number of positive action normally closed contacts	Number of normally open contacts	Switching principle	Type	Part number
3	1	Slow-action switch	i100-P313	6022589



- Housing material die-cast light alloy
- Roller plunger with stainless steel roller
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 67

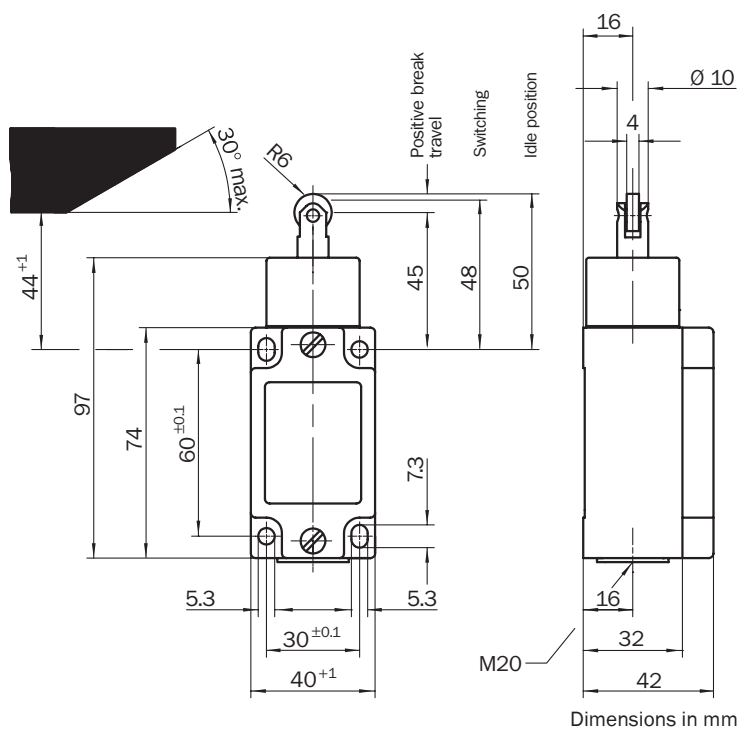


Further information	Page
→ Technical specifications	J-8
→ Dimensional drawings	J-8
→ Actuator travel diagram	J-9
→ Accessories	J-9
→ Services	A-2

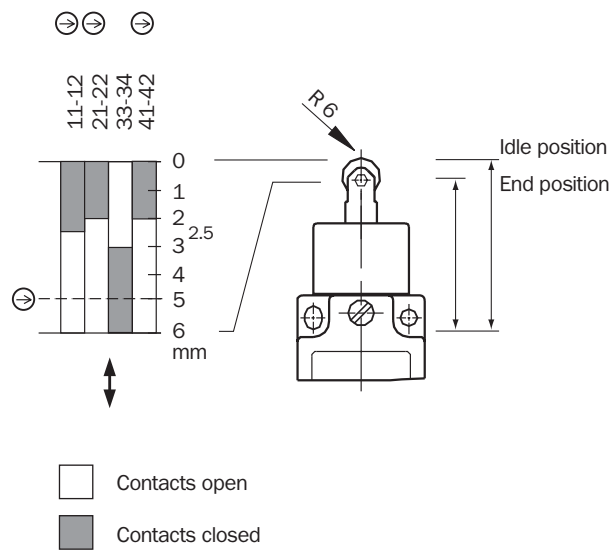
## Detailed technical specifications

Housing material	Die-cast light alloy
Surface treatment	Anodized
Enclosure rating	IP 67
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-25 °C ... +80 °C
Approach speed from ... to	0.1 m/min ... 20 m/min
Actuation force	Min. 30 N
Actuation frequency	Max. 1.94 Hz
Switching principle	Slow-action switch
Number of positive action normally closed contacts	3
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	4 A (230 V AC), 4 A (24 V DC)
Rated insulation voltage U <sub>i</sub>	250 V
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Minimum switching voltage	12 V DC
Minimum switching current (switching voltage)	1 mA (24 V DC)
Contact material	Silver alloy, gold flashed
Connection type	Cable gland
Maximum connection wire cross-section	1.5 mm <sup>2</sup>
Short-circuit protection	4A gG
Positive break travel	5 mm
Weight	0.33 kg

## Dimensional drawings



## Actuator travel diagram



## Accessories

### Cable gland

Type	Part number
Cable gland M20	5309164



- Housing material die-cast light alloy
- Adjustable switching direction (left, right, both sides)
- Turning lever with stainless steel roller
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 67



## Overview of technical specifications

Number of positive action normally closed contacts	3
Number of normally open contacts	1
Switching principle	Slow-action switch
Type of actuator	Turning lever
Housing material	Metal
Enclosure rating	IP 67

## Product description

- Turning lever design
- High flexibility through adjustable switching direction
- 4-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant. → see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy. → see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shot thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. → see P-0

## Ordering information

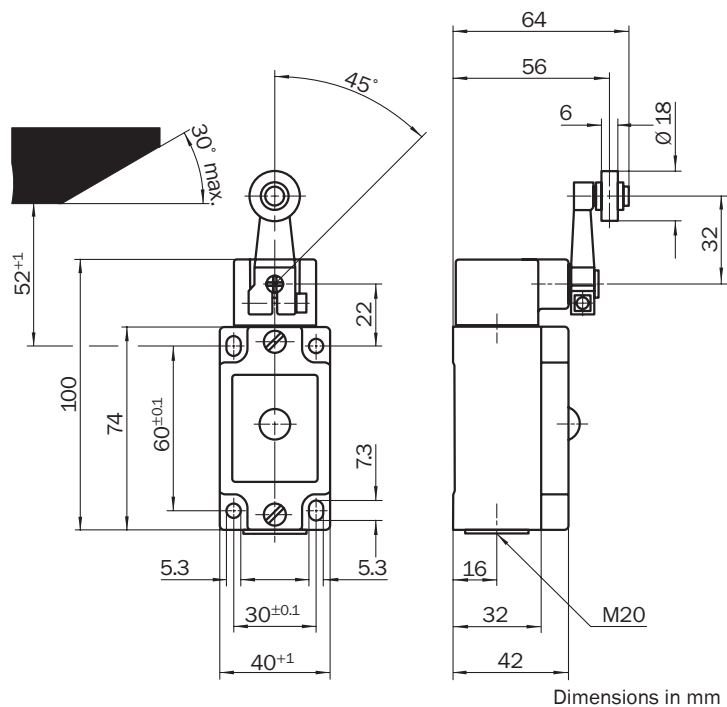
Number of positive action normally closed contacts	Number of normally open contacts	Switching principle	Type	Part number
3	1	Slow-action switch	i100-R313	6022588

Further information	Page
→ Actuator travel diagram	J-12
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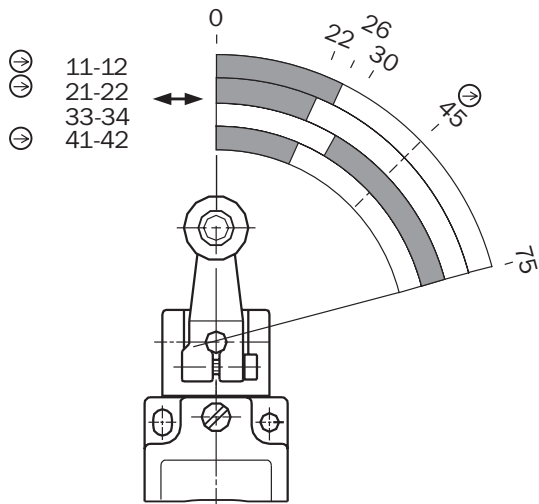
## Detailed technical specifications

Housing material	Die-cast light alloy
Surface treatment	Anodised
Enclosure rating	IP 67
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-25 °C ... +80 °C
Approach speed from ... to	0.1 m/min ... 60 m/min
Actuation force	Min. 15 N
Actuation frequency	Max. 2.78 Hz
Switching principle	Slow-action switch
Number of positive action normally closed contacts	3
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	4 A (230 V AC), 4 A (24 V DC)
Rated insulation voltage U <sub>i</sub>	250 V
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Minimum switching voltage	12 V DC
Minimum switching current (switching voltage)	1 mA (24 V DC)
Contact material	Silver alloy, gold flashed
Connection type	Cable gland
Maximum connection wire cross-section	1.5 mm <sup>2</sup>
Short-circuit protection	4A gG
Positive break angle	45°
Weight	0.37 kg

## Dimensional drawings



## Actuator travel diagram



## Accessories

### Cable gland

Type	Part number
Cable gland M20	5309164

## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2 / 3
Number of normally open contacts (depending on type)	1 / 2
Switching principle (depending on type)	Slow-action switch / snap-action switch
Type of actuator	Roller plunger
Housing material	Metal
Enclosure rating	IP 66

## Product description

- Roller plunger design
- 4-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

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→ see P-0

## Ordering information

Number of positive action normally closed contacts	Number of normally open contacts	Switching principle	Type	Part number
1	1	Snap-action switch	i110-PA123	6025106
2	2	Slow-action switch	i110-PA223	6025105
3	1	Slow-action switch	i110-PA313	6025104



- Housing material die-cast zinc
- Roller plunger with stainless steel roller
- Slow- or snap-action switch
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 66



J



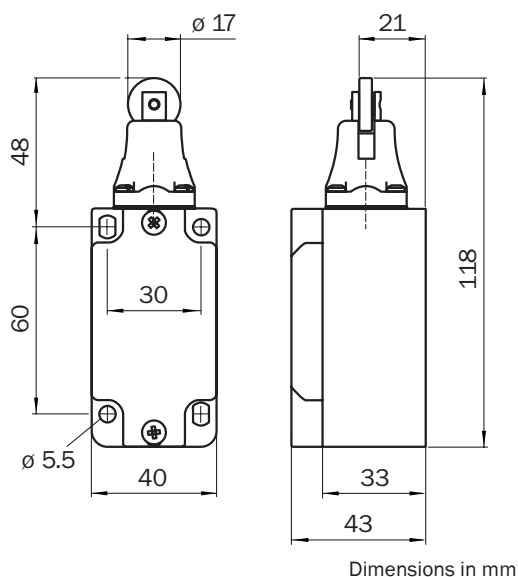
Further information	Page
→ Technical specifications	J-14
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## Detailed technical specifications

Type	i110-PA123	i110-PA223	i110-PA313
Housing material		Zinc die-cast	
Surface treatment		Varnished	
Enclosure rating		IP 66	
Mechanical life (relay contacts)		10 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to		-25 °C ... +80 °C	
Approach speed from ... to		0.1 m/min ... 15 m/min	
Actuation force	Min. 13 N	Min. 11 N	
Actuation frequency		Max. 1.67 Hz	
Switching principle	Snap-action switch	Slow-action switch	
Number of positive action normally closed contacts	1	2	3
Number of normally open contacts	1	2	1
Usage category in compliance with IEC 947-5-1		AC-15/DC-13	
Rated operating current (voltage)		3 A (230 V AC), 0.27 A (230 V DC)	
Rated insulation voltage U <sub>i</sub>		250 V	
Rated impulse withstand voltage U <sub>imp</sub>		2500 V AC	
Minimum switching voltage		5 V DC	
Minimum switching current (switching voltage)		5 mA (5 V DC)	
Connection type		Cable gland	
Maximum connection wire cross-section		2.5 mm <sup>2</sup>	
Short-circuit protection		F15	
Positive break travel	4.5 mm	4 mm	
Weight		0.43 kg	

## J

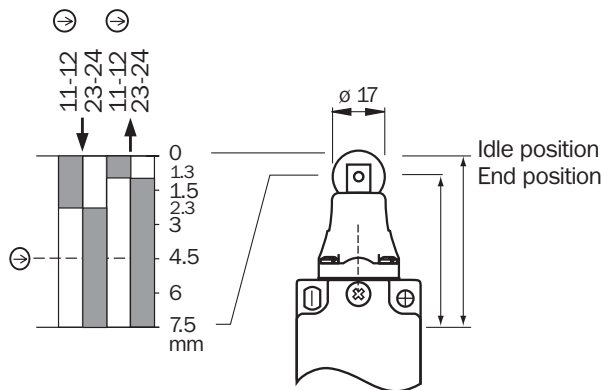
## Dimensional drawings





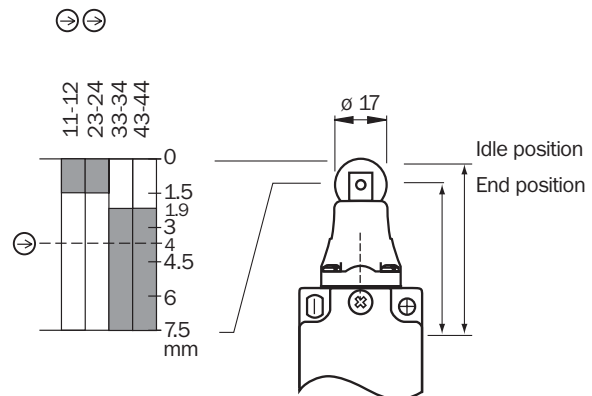
## Actuator travel diagrams

### i110-PA123



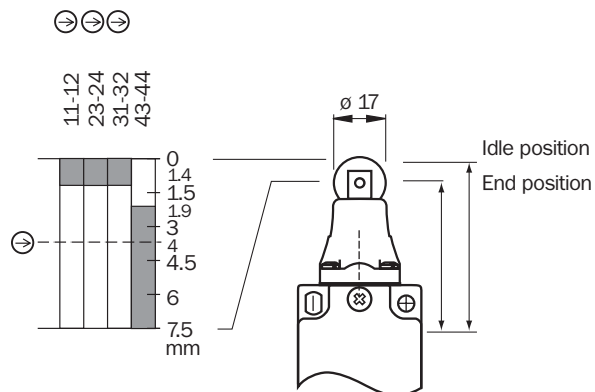
- Contacts open
- Contacts closed

### i110-PA223



- Contacts open
- Contacts closed

### i110-PA313



- Contacts open
- Contacts closed

## Accessories

### Cable gland

Type	Part number
Cable gland M20	5309164



- Housing material die-cast zinc
- Turning lever with plastic roller
- Slow- or snap-action switch
- Cable gland M20
- Design according to EN 50041
- Enclosure rating IP 66



## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2 / 3
Number of normally open contacts (depending on type)	1 / 2
Switching principle (depending on type)	Slow-action switch / snap-action switch
Type of actuator	Turning lever
Housing material	Metal
Enclosure rating	IP 66

## Product description

- Turning lever design
- 4-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant. → see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy. → see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFI-safe. → see P-0

## Ordering information

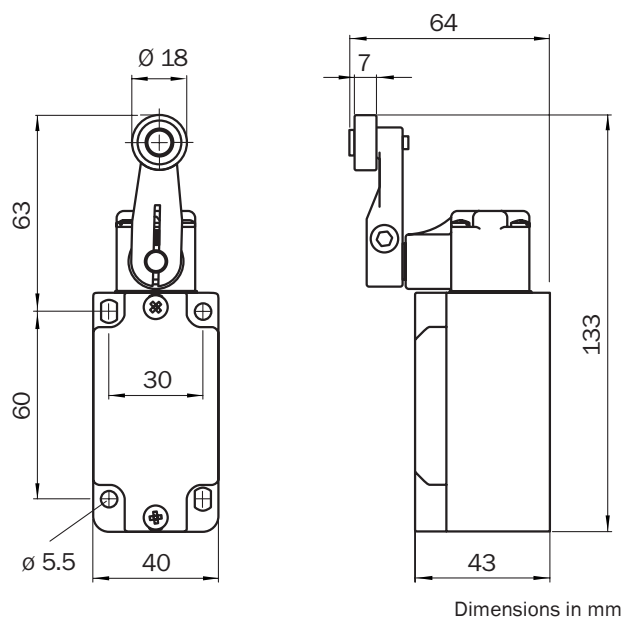
Number of positive action normally closed contacts	Number of normally open contacts	Switching principle	Type	Part number
1	1	Snap-action switch	i110-RA123	6025109
2	2	Slow-action switch	i110-RA223	6025108
3	1	Slow-action switch	i110-RA313	6025107

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## Detailed technical specifications

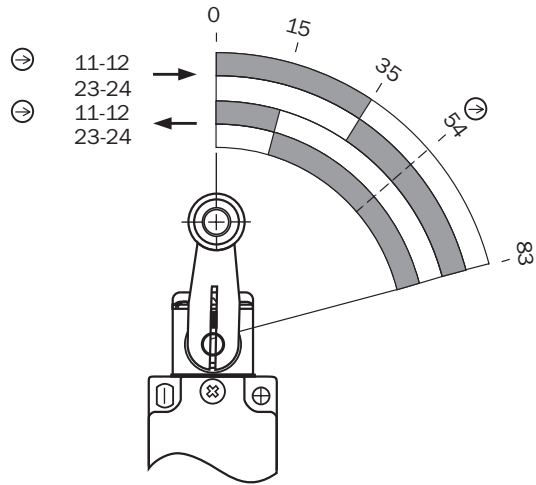
Type	i110-RA123	i110-RA223	i110-RA313
Housing material		Zinc die-cast	
Surface treatment		Varnished	
Enclosure rating		IP 66	
Mechanical life (relay contacts)		10 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to		-25 °C ... +80 °C	
Minimum actuation torque		0.34 Nm	
Approach speed from ... to		0.1 m/min ... 15 m/min	
Actuation frequency		Max. 1.67 Hz	
Switching principle	Snap-action switch	Slow-action switch	
Number of positive action normally closed contacts	1	2	3
Number of normally open contacts	1	2	1
Usage category in compliance with IEC 947-5-1		AC-15/DC-13	
Rated operating current (voltage)		3 A (230 V AC), 0.27 A (230 V DC)	
Rated insulation voltage U <sub>i</sub>		250 V	
Rated impulse withstand voltage U <sub>imp</sub>		2500 V AC	
Minimum switching voltage		5 V DC	
Minimum switching current (switching voltage)		5 mA (5 V DC)	
Connection type		Cable gland	
Maximum connection wire cross-section		2.5 mm <sup>2</sup>	
Short-circuit protection		F15	
Positive break angle	54°	44°	
Weight		0.52 kg	

## Dimensional drawings



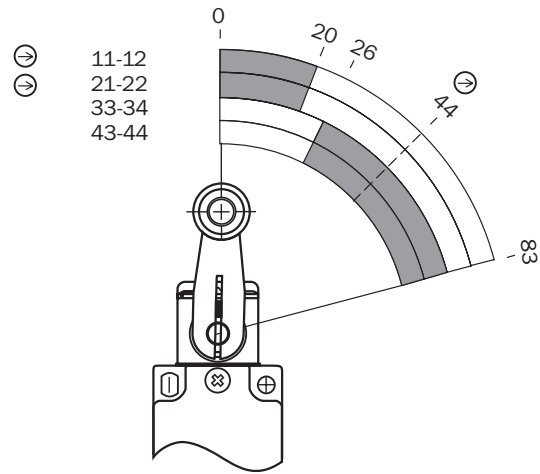
# Actuator travel diagrams

**i110-RA123**



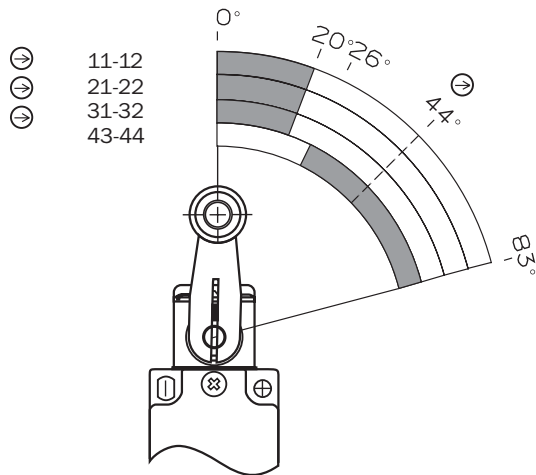
□ Contacts open  
 ■ Contacts closed

**i110-RA223**



□ Contacts open  
 ■ Contacts closed

**i110-RA313**



□ Contacts open  
 ■ Contacts closed

J

## Accessories

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### Cable gland

Type	Part number
Cable gland M20	5309164

J

## Explanations of features

---

### **Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.

### **Housing material**


The housing materials used can be separated into two large groups - “metals” and “plastics”. The metal housing materials are available as both anodised die-cast light metal and painted die-cast zinc versions. Glass-fibre reinforced thermoplastics are exclusively used for the plastic housings.

### **Shaft version**

The safety hinge switches are designed to be directly fitted to pivotal protective devices. For this, either the solid shaft is used to replace the existing hinge pin, or the solid shaft or hollow shaft is connected directly to the existing hinge pin.

## Safety hinge switches



Safety application	Number of positive action normally closed contacts/ normally open contacts <sup>1)</sup>	Housing material <sup>1)</sup>	Type of shaft <sup>1)</sup>	Length of the shaft	Enclosure rating	Product	Page
	1 / 1	Plastic	Solid	55 mm	IP 67	i10H	K-2
	2 / 1			85 mm			
	2 / 1	Metal	Hollow shaft	36.5 mm	IP 66	i110H	K-5

<sup>1)</sup> Explanation see page K-0

K



- Housing material glass-fibre reinforced thermoplastic
- Solid stainless steel shaft
- Cable gland M16
- Adjustable switching point
- Miniature housing and design according to EN 50047
- Enclosure rating IP 67



K



## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	1 / 2
Number of normally open contacts	1
Type of shaft	Solid
Length of the shaft (depending on type)	55 mm / 85 mm
Housing material	Plastic
Enclosure rating	IP 67

## Product description

- Safety hinge switches for direct installation to pivotal protective devices
- Solid shaft design
- 2- or 3-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant. → see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy. → see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. → see P-0

## Ordering information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
1	1	i10-HA113	6025050
2	1	i10-HB213	6025053

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→ Switching elements	K-4
→ Actuator travel diagrams	K-4
→ Mounting	K-4
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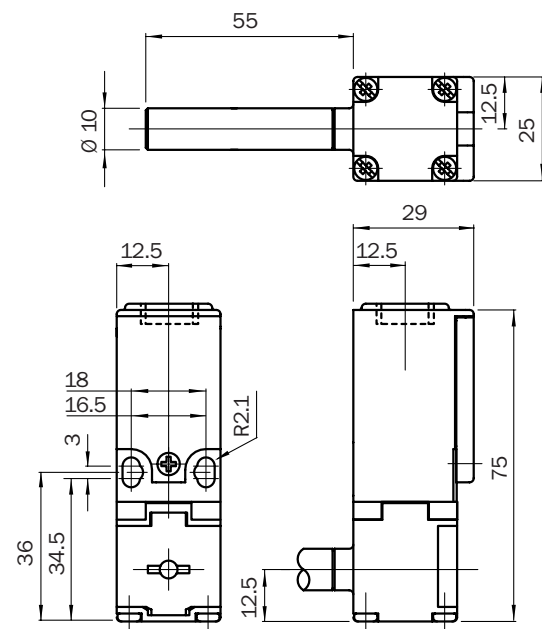


## Detailed technical specifications

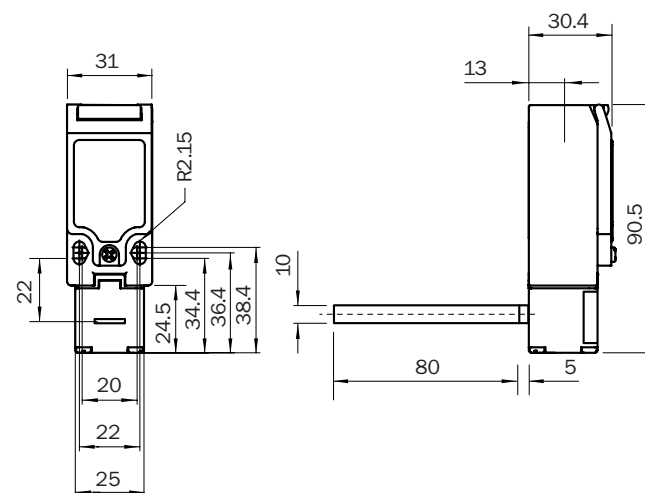
Type	i10-HA113	i10-HB213
Housing material	Glass-fibre reinforced polyester	
Enclosure rating	IP 67	
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to	-20 °C ... +80 °C	
Minimum actuation torque	0.08 Nm	
Actuation frequency	Max. 1 Hz	
Switching principle	Slow-action switch	
Switching angle	Adjustable 3° ... 11°	Adjustable 5° ... 14°
Number of positive action normally closed contacts	1	2
Number of normally open contacts	1	
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	2 A (250 V AC), 2 A (24 V DC)	
Rated insulation voltage U <sub>i</sub>	250 V	
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC	
Minimum switching voltage	5 V DC	
Minimum switching current (switching voltage)	5 mA (5 V DC)	
Connection type	Cable gland	
Weight	0.12 kg	0.17 kg

## Dimensional drawings

i10-HA113



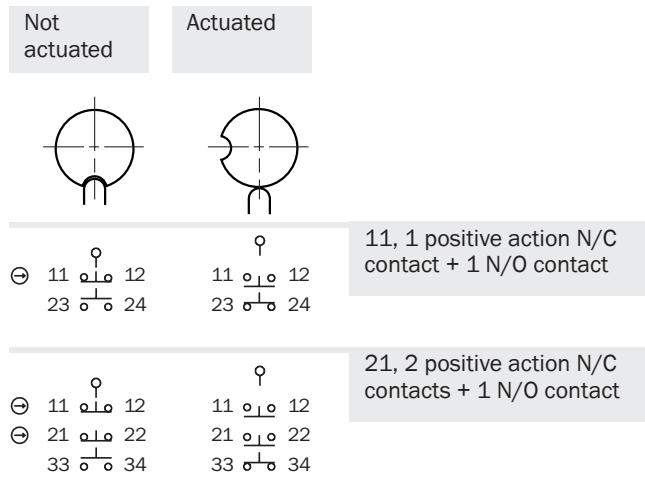
i10-HB213



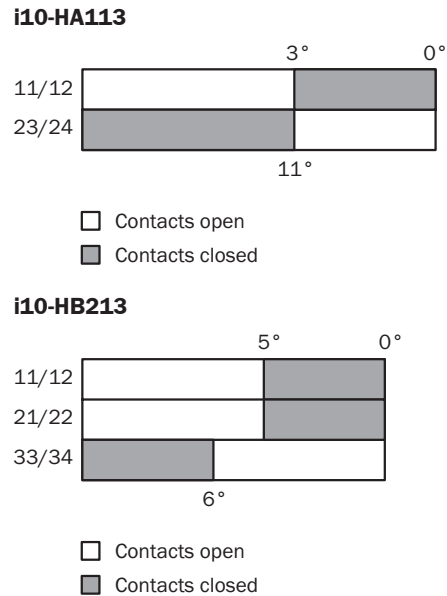
Dimensions in mm

K

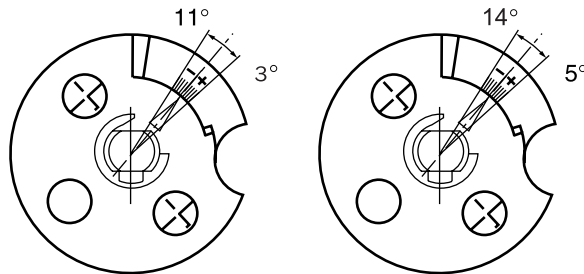
## Switching elements



## Actuator travel diagrams



## Mounting



**K**

### Adjusting the switching angle

The switching angle can be set in the range of 3° ... 11° (i10HA) or 5° ... 14° (i10HB).

After functional testing safety hinge switches and switch cams must be pinned together to ensure integral intermeshed connection.

## Accessories

### Cable gland

Type	Part number
Cable gland M16	5309163

## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	1
Type of shaft	Hollow shaft
Length of the shaft	36.5 mm
Housing material	Metal
Enclosure rating	IP 66

## Product description

- Safety hinge switch for direct installation to pivotal protective devices
- Hollow shaft design
- 3-pole contact element

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

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→ see P-0

## Ordering information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
2	1	i110-HA213	6025072



- Housing material die-cast zinc
- Hollow shaft stainless steel
- Cable gland M20
- Adjustable switching point
- Enclosure rating IP 66



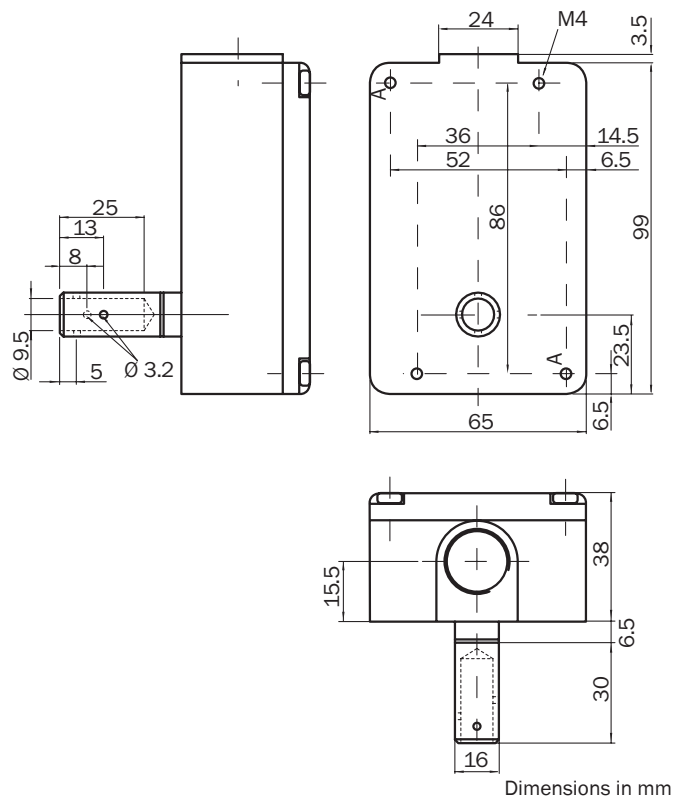
K

Further information	Page
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→ Dimensional drawings	K-6
→ Switching elements	K-7
→ Actuator travel diagram	K-7
→ Mounting	K-7
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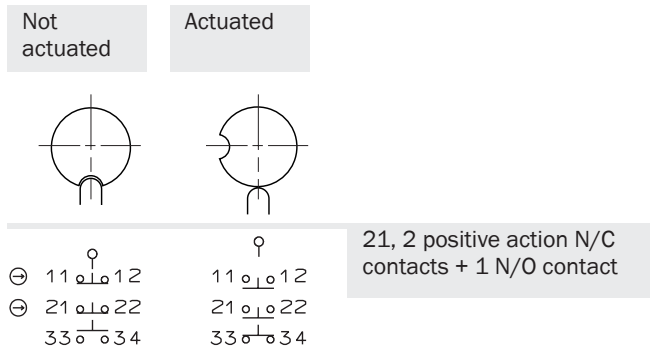
## Detailed technical specifications

Housing material	Zinc die-cast
Surface treatment	Varnished
Enclosure rating	IP 66
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-25 °C ... +80 °C
Minimum actuation torque	0.12 Nm
Actuation frequency	Max. 1 Hz
Switching principle	Slow-action switch
Switching angle	Adjustable 5° ... 11°
Number of positive action normally closed contacts	2
Number of normally open contacts	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	2 A (250 V AC), 5 A (100 V AC), 2 A (24 V DC)
Rated insulation voltage U <sub>i</sub>	250 V
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC
Minimum switching voltage	5 V DC
Minimum switching current (switching voltage)	5 mA (5 V DC)
Connection type	Cable gland
Maximum connection cable cross-section	1.5 mm <sup>2</sup>
Short-circuit protection	2A gG
Weight	0.45 kg

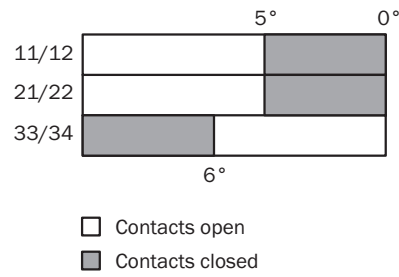
## Dimensional drawings



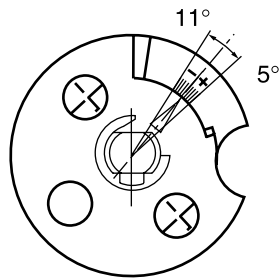
## Switching elements



## Actuator travel diagram



## Mounting



### Adjusting the switching angle

The switching angle can be set within the range of 5° ... 11°. After functional testing safety hinge switches and switch cams must be pinned together to ensure integral intermeshed connection.

## Accessories

### Cable gland

Type	Part number
Cable gland M20	5309164



## Explanations of features

### Sensor principle

Non-contact safety switches can be sub-divided into the following groups according to the principle upon which they operate:

#### ■ Reed

These sensors have reed-type contacts in the sensor, which are opened or closed in the actuator by means of solenoids/magnets.

#### ■ Transponder

In the case of transponder-type sensors, a wireless communication link is effected between the sensor and the actuator. Each actuator is distinctly coded and is consequently a "unique copy".

Data is transferred between the sensor and the actuator within the response zone of the sensor. The code of the actuator is scanned and compared with the code stored in the memory of the evaluation unit.

#### ■ Inductive

Inductive sensors do not require any physical actuators. The sensors are actuated by metal (typically ST37 steel) in the response zone.

### Category according to EN 954-1

In accordance with the Directive on Machinery, machine manufacturers and system manufacturers must carry out a risk assessment analysis.

The EN 954-1 Standard will assist in determining the category of the safety-related parts of the manufacturer's control system.

The illustrated non-contact safety switches comply in each case with the requirements of the category in accordance with EN 954-1.

### Type of output

Non-contact safety switches generally comprise 2 or 3 components:

- the sensor
- any possible actuator and
- an evaluation unit

The evaluation units are sub-divided into 2 categories, based upon the technologies utilised:

- with relay outputs and
- with semi-conductor outputs

### Number of safe outputs

Apart from the category and the type of output adopted, the number of safe outputs plays an important role when connecting non-contact safety switches to the control system.

The number required is dependent upon the number of safe outputs of the evaluation unit.

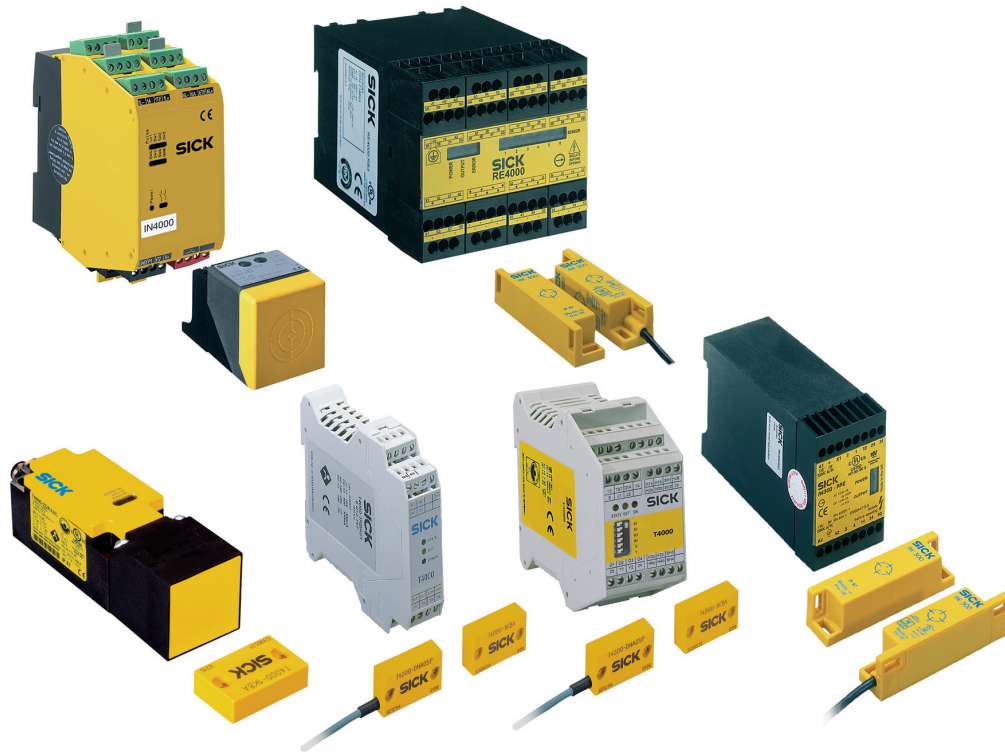
### External device monitoring (EDM)


See glossary page R-3

### Restart interlock

See glossary page R-9

# Non-contact safety switches



Safety application	Sensor principle <sup>1)</sup>	Type of output <sup>1)</sup>	Category according to EN 954-1	Maximum number of sensors	Number of safe outputs	Restart interlock (RES) <sup>1)</sup>	External device monitoring (EDM) <sup>1)</sup>	Product	Page
	Reed	Relay	3	1	2	✓	✓	RE300	L-2
			4	6	3	✓	✓	RE4000	L-7
	Transponder	Relay	3	1	2	—	—	T4000	L-12
			4	2 / 4	2	✓	✓	T4000 Multi	L-17
		Semiconductor	3	1	2	—	—	T4000 Compact	L-23
Inductive	Relay	4	10	3	—	✓	IN4000	L-28	

<sup>1)</sup> Explanation see page L-0



- Actuator with coding
- Sensor and actuator with IP 67 enclosure rating
- Direct connection of the sensors to safe control possible
- Evaluation unit for all common operating voltages



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→ Dimensional drawings	L-4
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→ Response range	L-6
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## Overview of technical specifications

Sensor principle	Reed
Category according to EN 954-1	3
Number of non-contact safety switches	1
Type of output	Relay
Number of safe outputs (N/O)	2
Number of application diagnostic outputs	1 x Relay

## Product description

The RE300 is a magnetically coded non-contact safety switch, whose contacts are operated with the corresponding RE300 element. The sensor is equipped with two complementary switching contacts in N/O / N/C combination.

The switching signals are evaluated either with the special SICK RE300/RE4000 evaluation units or by suitable safety evaluation electronics such as a safety programmable logic controller.

## Ordering information

System part	Cable length	Type	Part number
Evaluation unit	-	RE300-RA2	6025082
Sensor & Actuator	3 m	RE300-DA03P	6025080
	10 m	RE300-DA10P	6025079



## Detailed technical specifications

### Evaluation unit

Category according to EN 954-1	3
Classification in compliance with IEC/EN 60947-5-3	PDF-S
Housing material	PC, polycarbonate
Enclosure rating	IP 20
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-10 °C ... +55 °C
Shock resistance	30 g, 11 ms (IEC 60068-2-27)
Vibration resistance	10 Hz ... 55 Hz, 0.35 mm (IEC 60068-2-6)
Operating voltage	230 V AC (207 V AC ... 253 V AC) <sup>1)</sup>
Operating voltage	110 V AC (99 V AC ... 121 V AC) <sup>1)</sup>
Operating voltage	24 V AC/DC (21.6 V AC/DC ... 26.4 V AC/DC) <sup>2)</sup>
Number of non-contact safety switches	1
Rated impulse withstand voltage U <sub>imp</sub>	4000 V AC
Type of output	Relay
Number of safe outputs (N/O)	2
Number of application diagnostic outputs	1 x Relay
Short-circuit protection	F5 (AC), F3 (DC)
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	4 A (250 V AC), 2 A (30 V DC)
Minimum switching current (switching voltage)	10 mA (10 V DC)
Minimum switching current (switching voltage)	10 mA (10 V AC)
Maximum switching current (switching voltage)	2 A (30 V DC)
Maximum switching current (switching voltage)	4 A (250 V AC)
Maximum switching power	1000 VA (cos phi = 1)
Weight	0.503 kg
Out indication	✓
Power indication	✓
Maximum switch on time	70 ms
Switching delay from state change	25 ms
Maximum cable resistance at sensor input	75 Ohm
External device monitoring	✓

<sup>1)</sup> When using the 110 V AC or 230 V AC operating voltage, protective earth conductor PE must be connected to the -/PE terminal.

<sup>2)</sup> PELV earthed safety extra-low voltage. When using terminals +/-, terminal -/PE must be connected to the protective earth conductor PE.

Continued on next page

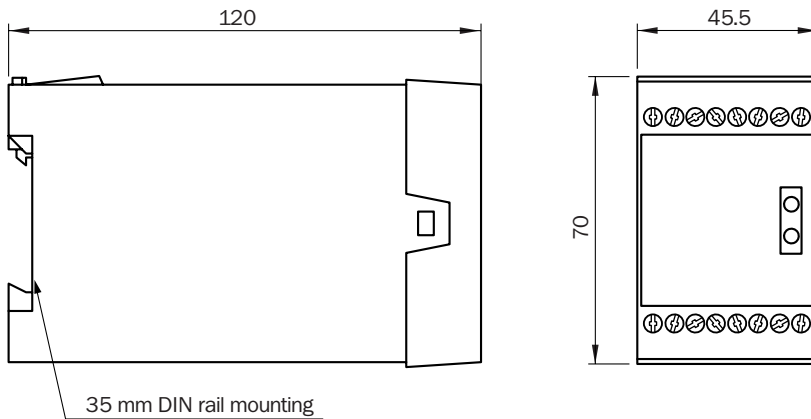
Sensor & actuator

Type	RE300-DA03P	RE300-DA10P
Sensor principle	Reed	
Category according to EN 954-1	3 <sup>1)</sup>	
Housing material	ABS shape	
Enclosure rating	IP 67	
Ambient operating temperature from ... to	-10 °C ... +55 °C	
Shock resistance	30 g, 11 ms (IEC 60068-2-29)	
Vibration resistance	10 Hz ... 55 Hz, 0.35 mm (IEC 60068-2-6)	
Maximum switching voltage	30 V DC	
Maximum switching current	30 mA	
Weight	0.168 kg	0.322 kg
Switch-on distance	5 mm	
Switch-off distance	15 mm	
Safe switch-off distance	15 mm	
Minimum approach speed	17 mm/s	
Cable length	3 m	10 m
Cable material	PVC	
Maximum cable resistance at sensor input	75 Ohm	

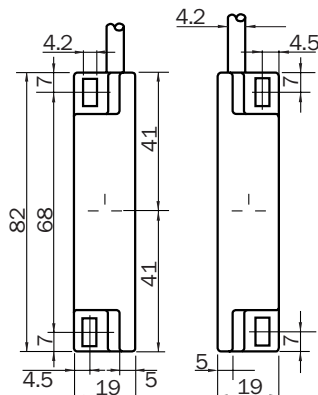
<sup>1)</sup> Depends on the evaluation unit. Systems up to category 3 according to EN 954-1 can be implemented using the evaluation unit RE300 or a safe control; using the evaluation unit RE400 systems up to category 4 can be implemented.

Dimensional drawings

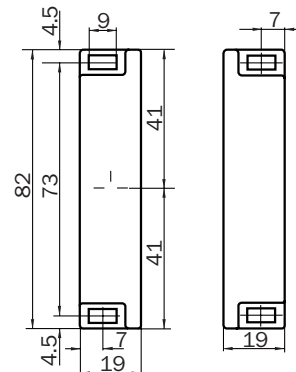
Evaluation unit



Sensor



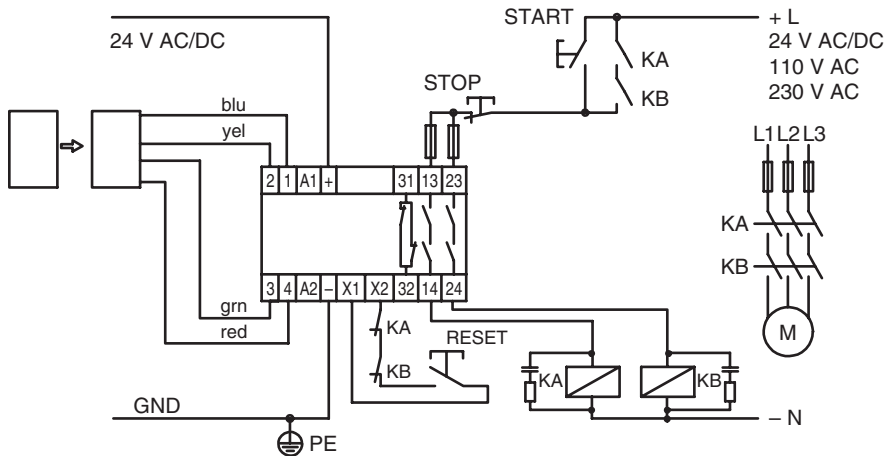
Actuator



Dimensions in mm

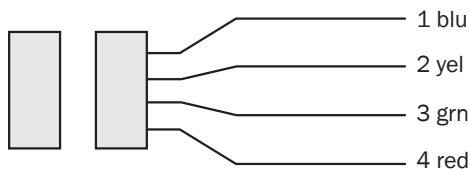
# Internal circuitry

## Evaluation unit

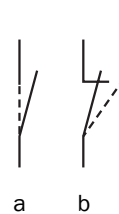


Example of wiring 24 V AC/DC with contactor control and static reset

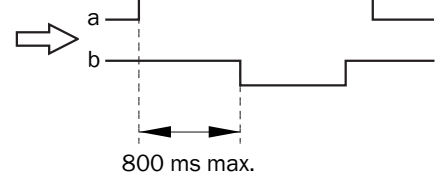
## Sensor



## Sensor (stand-alone)



### Input behaviour



### Output behaviour

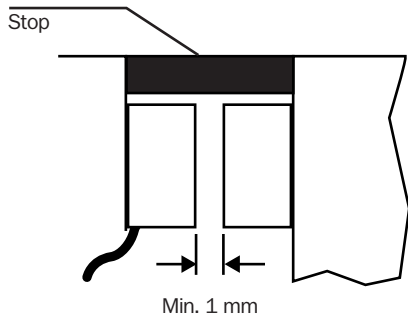


## Direct connection of the sensor to safe control

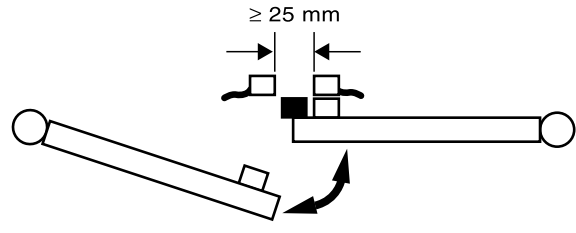
When evaluating the sensor signals of RE300 with a safe control both contact signals 1/4 and 2/3 MUST be monitored. Both contacts must switch complementarily with a maximum discrepancy time of 800 ms; this time must be monitored by the evaluation electronics (safe control).

When connecting the sensor to a fail-safe control, the input module must be configured, such that the set discrepancy time has no effect on the response time of the evaluation (typical parameterisation "provide 0 value"). If this is not possible, this must be taken into account when calculating the reaction time.

# Mounting

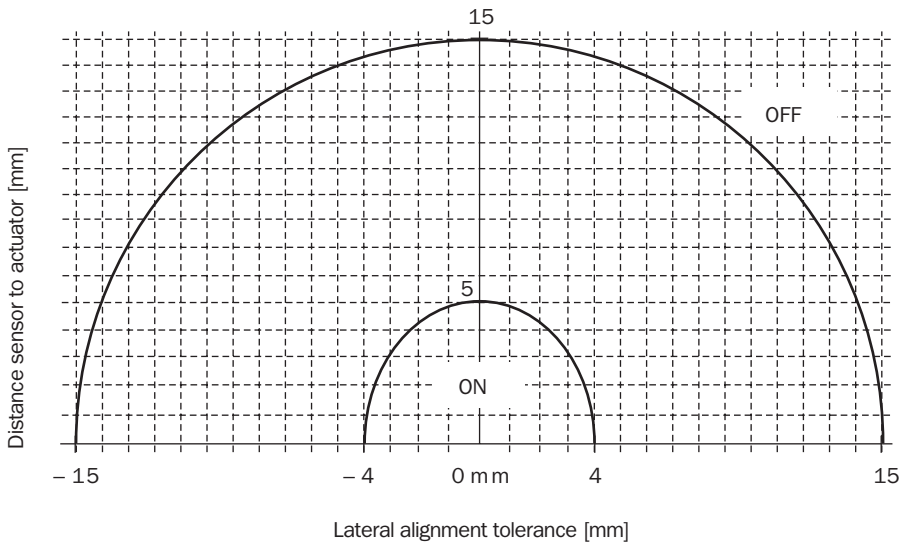
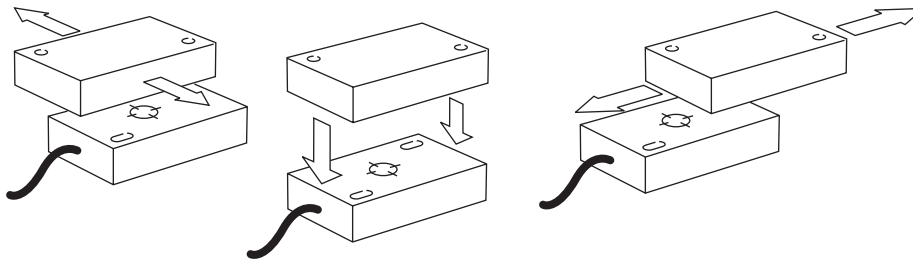


Minimum distance between sensor and actuator



Minimum distance to neighbouring sensors

# Response range



## Overview of technical specifications

Sensor principle	Reed
Category according to EN 954-1 (depending on type)	Up to cat. 4
Number of non-contact safety switches from ... to	2 ... 6
Type of output	Relay
Number of safe outputs (N/O)	3
Number of application diagnostic outputs	1 x Relay
Number of delayed safe outputs (N/O)	1

## Product description

The RE4000 non-contact safety switch system comprises of the following components:

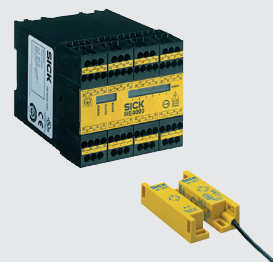
- 2 to 6 sensors
- 2 to 6 magnetically coded actuators and
- 1 evaluation unit

The evaluation unit is further equipped with:

- 1 application diagnostic output (normally closed contact)
- 1 delayed output (normally open contact) with adjustable time delay from 0.6 s to 30 s
- 2 LED status displays and
- 6 LEDs for status display of each individual sensor

## Ordering information

System part	Cable length	Type	Part number
Evaluation unit	–	RE4000-RB3	6025083
Sensor & Actuator	3 m	RE300-DA03P	6025080
	10 m	RE300-DA10P	6025079



- Actuator with coding
- Sensor and actuator with IP 67 enclosure rating
- Evaluation unit for all common operating voltages
- Evaluation unit for monitoring 2 to 6 independently actuated protective devices
- Adjustable release delay from 0.6 to 30 s for additional safety output



Further information	Page
→ Technical specifications	L-8
→ Dimensional drawings	L-9
→ Internal circuitry	L-10
→ Mounting	L-10
→ Response range	L-11
→ Services	A-2

## Detailed technical specifications

### Evaluation unit

Category according to EN 954-1	Up to cat. 4 <sup>1)</sup>
Classification in compliance with IEC/EN 60947-5-3	PDF-S
Housing material	PC, polycarbonate
Enclosure rating	IP 20
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	-10 °C ... +55 °C
Shock resistance	30 g, 11 ms (IEC 60068-2-27)
Vibration resistance	10 Hz ... 55 Hz, 0.35 mm (IEC 60068-2-6)
Operating voltage	230 V AC (196 V AC ... 253 V AC) <sup>2)</sup>
Operating voltage	110 V AC (94 V AC ... 121 V AC) <sup>2)</sup>
Operating voltage	24 V AC/DC (20.4 V AC/DC ... 27.6 V AC/DC) <sup>3)</sup>
Number of non-contact safety switches from ... to	2 ... 6
Rated impulse withstand voltage U <sub>imp</sub>	4000 V AC
Type of output	Relay
Number of safe outputs (N/O)	3
Number of application diagnostic outputs	1 x Relay
Number of delayed safe outputs (N/O)	1
Off delay min ... max	0.6 s ... 30 s
Short-circuit protection	F5 (AC), F3 (DC)
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	2 A (240 V AC), 1 A (24 V DC)
Minimum switching current (switching voltage)	10 mA (10 V DC)
Minimum switching current (switching voltage)	10 mA (10 V AC)
Maximum switching current (switching voltage)	2 A (30 V DC)
Maximum switching current (switching voltage)	4 A (250 V AC)
Maximum switching power	1000 VA (cos phi = 1)
Weight	0.675 kg
Out indication	✓
Power indication	✓
Error indication	✓
Sensor display	✓
Maximum switch on time	50 ms
Switching delay from state change	25 ms
Maximum cable resistance at sensor input	50 Ohm
External device monitoring	✓

<sup>1)</sup> When using the delayed release output 57/58 up to cat. 3

<sup>2)</sup> On the usage of 110 V AC or 230V AC operating voltage, the -V/PE terminal must be connected to the PE earth conductor.

<sup>3)</sup> PELV earthed safety extra-low voltage. On usage of +V/-V terminals, the -V/PE terminal must be connected to the PE earth conductor.

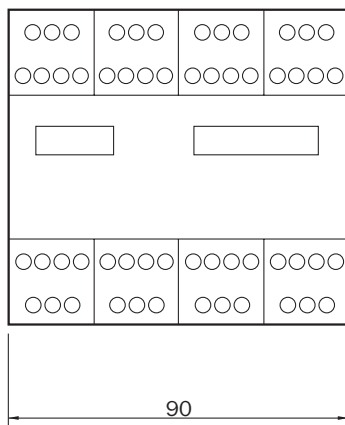
Sensor & actuator

Type	RE300-DA03P	RE300-DA10P
Sensor principle	Reed	
Category according to EN 954-1	3 <sup>1)</sup>	
Housing material	ABS shape	
Enclosure rating	IP 67	
Ambient operating temperature from ... to	-10 °C ... +55 °C	
Shock resistance	30 g, 11 ms (IEC 60068-2-29)	
Vibration resistance	10 Hz ... 55 Hz, 0.35 mm (IEC 60068-2-6)	
Maximum output voltage	30 V DC	
Maximum output current	30 mA	
Weight	0.168 kg	0.322 kg
Switch-on distance	5 mm	
Switch-off distance	15 mm	
Safe switch-off distance	15 mm	
Minimum approach speed	17 mm/s	
Cable length	3 m	10 m
Cable material	PVC	
Maximum cable resistance at sensor input	75 Ohm	

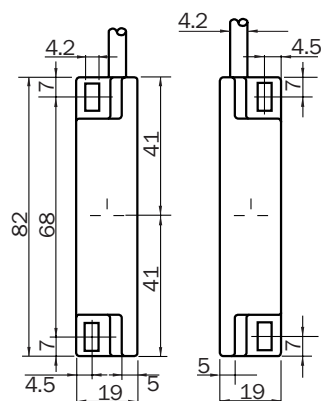
<sup>1)</sup> Depends on the evaluation unit. Systems up to category 3 according to EN 954-1 can be implemented using the evaluation unit RE300 or a safe control; using the evaluation unit RE4000 systems up to category 4 can be implemented.

Dimensional drawings

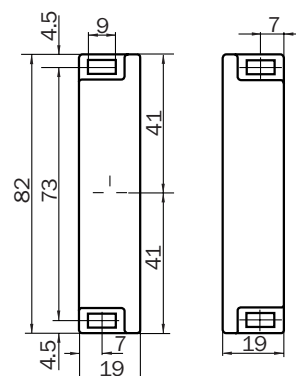
Evaluation unit



Sensor

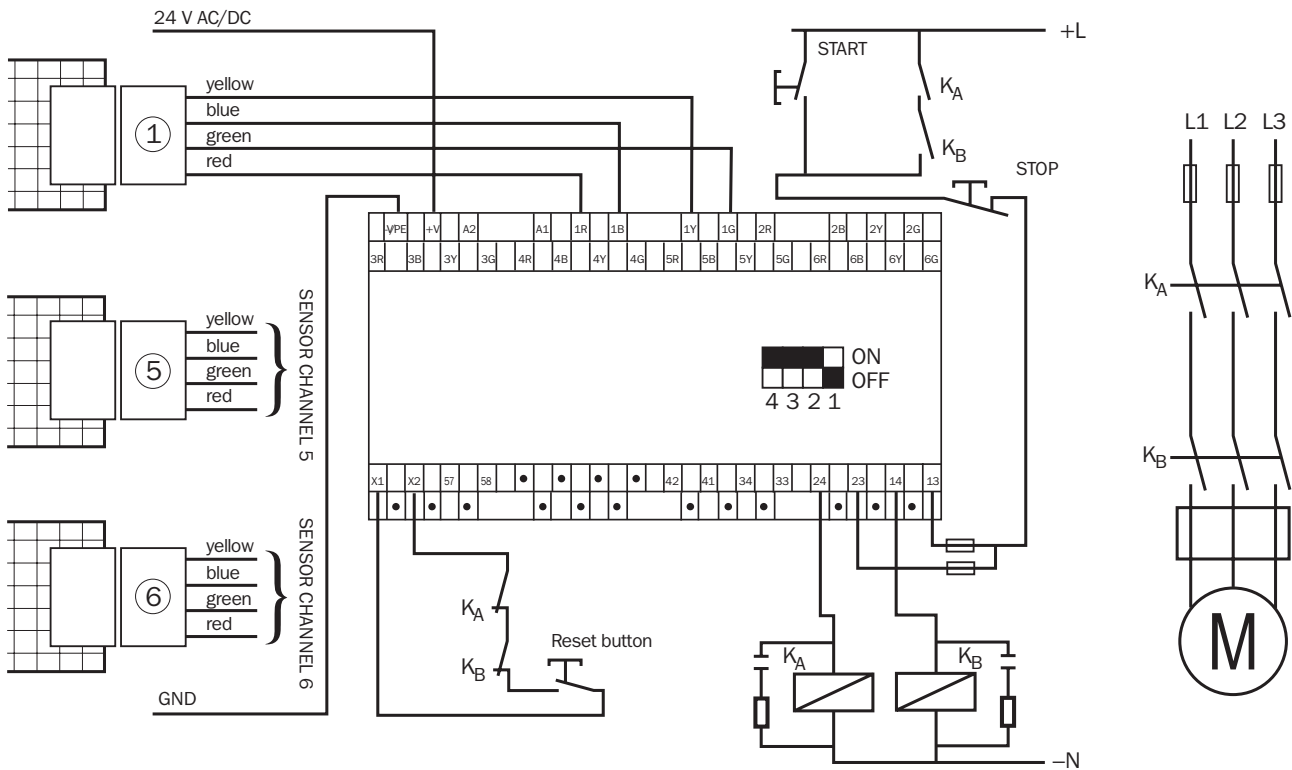


Actuator



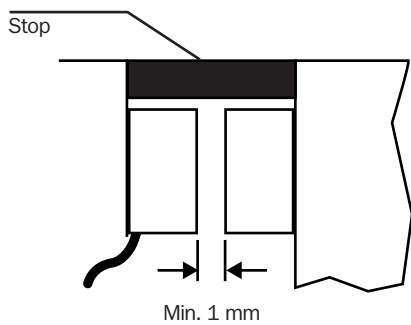
Dimensions in mm

## Internal circuitry

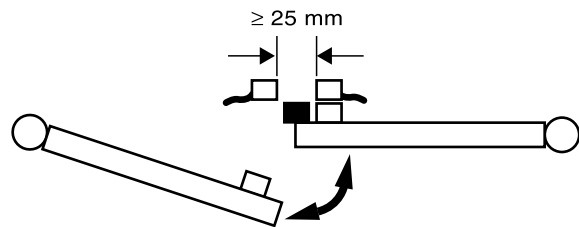


Example wiring for 24 V AC/DC with 3 sensors, with external device monitoring and static reset

## Mounting



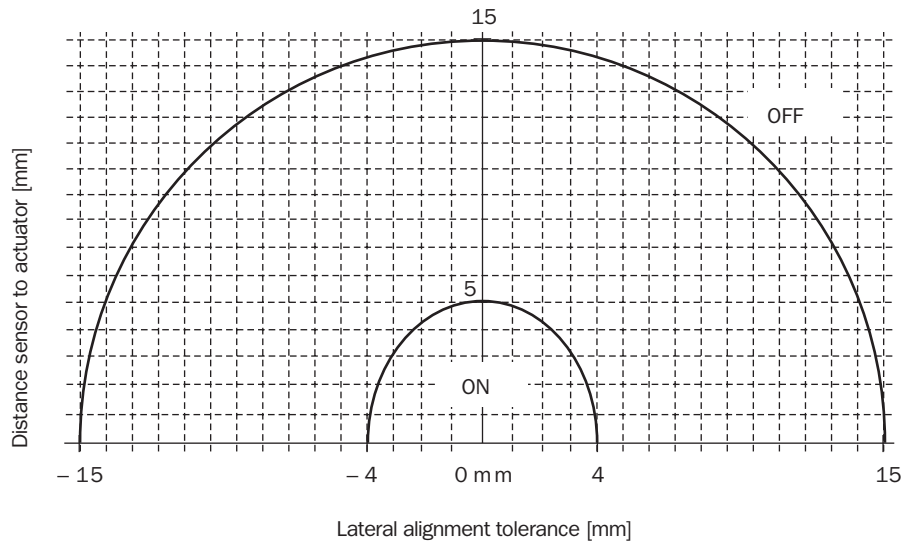
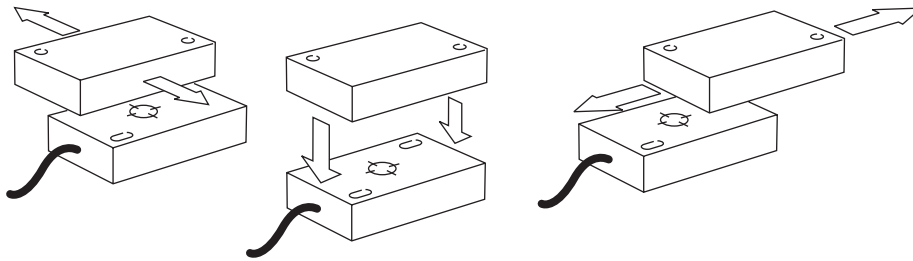
Minimum distance between sensor and actuator



Minimum distance to neighbouring sensors



## Response range





- High protection against manipulation through individually coded actuator
- Small compact design of sensor and actuator
- Sensor and actuator with IP 67 protection



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## Overview of technical specifications

Sensor principle	Transponder
Category according to EN 954-1	3
Number of non-contact safety switches	1
Type of output	Relay
Number of safe outputs (N/O)	2
Number of application diagnostic outputs	1 x Semiconductor, p-switching

## Product description

The T4000 non-contact safety switch system comprises of the following components:

- 1 sensor
- 1 coded actuator (unique copy)
- 1 evaluation unit

The evaluation unit is further equipped with:

- 1 solid-state application diagnostic output
- 2 LED status displays

## Ordering information

System part	Connection type	Cable length	Type	Part number
Evaluation unit	Plug-in terminals	-	T4000-1 RBA 01	6012147
Sensor	Connector	-	T4000 DNAC	6021912
	Cable	5 m	T4000 DNA05P	6012144
		10 m	T4000 DNA10P	6012145
		15 m	T4000 DNA15P	6012146
Actuator	-	-	T4000-1 KBA	5306531

Connecting cable not supplied with delivery

## Detailed technical specifications

### Evaluation unit

Category according to EN 954-1	3
Classification in compliance with IEC/EN 60947-5-3	PDF-M
Classification according to cULus Note operating voltage External fuse Maximum switching voltage	Class 2 Operation with UL-class 2 power supply only At supply voltage 0.25 A ... 8 A 60 V DC/30 V AC
Housing material	Plastic PA6.6
Enclosure rating	IP 20
Mechanical life (relay contacts)	10 x 10 <sup>6</sup> switching cycles
Ambient operating temperature from ... to	0 °C ... +55 °C
Protection class	3
Shock resistance	30 g, 11 ms (IEC 60068-2-27)
Vibration resistance	10 Hz ... 55 Hz, 0.5 mm (IEC 60068-2-6)
Operating voltage	24 V DC (21 V DC ... 27 V DC)
Number of non-contact safety switches	1
Connection type	Plug-in terminals
Rated insulation voltage $U_i$	63 V
Rated impulse withstand voltage $U_{imp}$	1500 V AC
Type of output	Relay
Number of safe outputs (N/O)	2
Number of application diagnostic outputs	1 x Semiconductor, p-switching
Short-circuit protection	6A gG
Usage category in compliance with IEC 947-5-1	AC-12/DC-12, AC-140/DC-13
Rated operating current (voltage)	0.3 A (60 V AC) 50 Hz, 2 A (30 V AC) 50 Hz, 0.3 A (60 V DC), 4 A (30 V DC)
Minimum switching current (switching voltage)	1 mA (0.1 V DC)
Maximum switching power	60 VA
Weight	0.327 kg
Out indication	✓
Error indication	✓
Status display	✓
Maximum switch on time	3000 ms
Switching delay from state change	180 ms

Continued on next page

Sensor

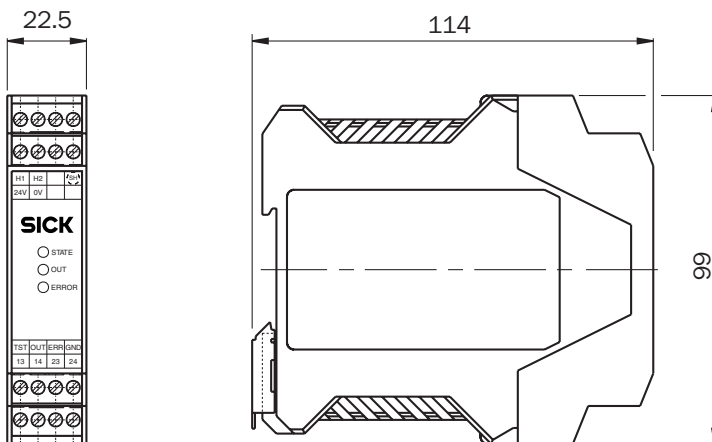
Type	T4000 DNAC	T4000 DNA05P	T4000 DNA10P	T4000 DNA15P
Sensor principle	Transponder			
Housing material	Fortron, glass-fibre reinforced thermoplastic			
Enclosure rating	IP 67			
Ambient operating temperature from ... to	-25 °C ... +70 °C			
Connection type	Connector	Cable		
Size of the cable gland	M8			
Weight	0.12 kg	0.25 kg	0.39 kg	0.53 kg
Monitoring time minimum dwell time	0.5 s			
Cable length	-	5 m	10 m	15 m
Maximum cable length	50 m			
Cable material	-	PVC		

Actuator

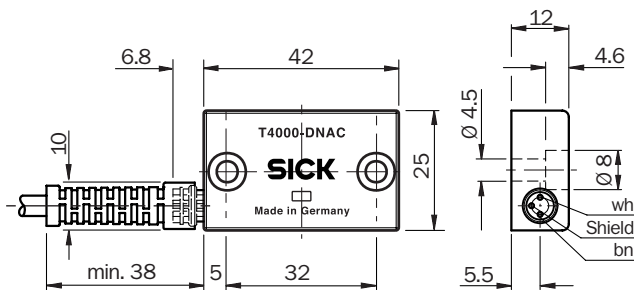
Housing material	Fortron, glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Ambient operating temperature from ... to	-25 °C ... +70 °C
Weight	0.03 kg
Monitoring time minimum dwell time	0.5 s

Dimensional drawings

Evaluation unit

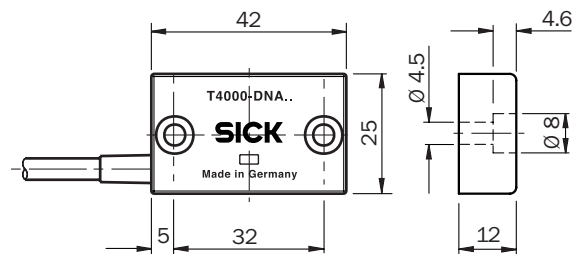


Sensor, connector

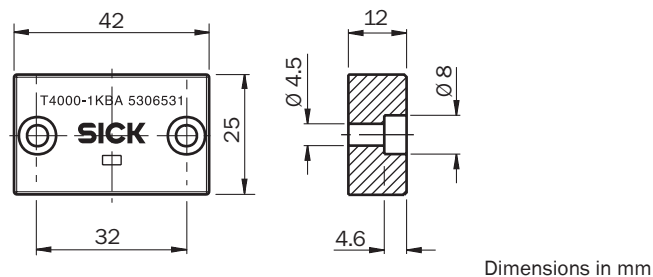


Dimensions in mm

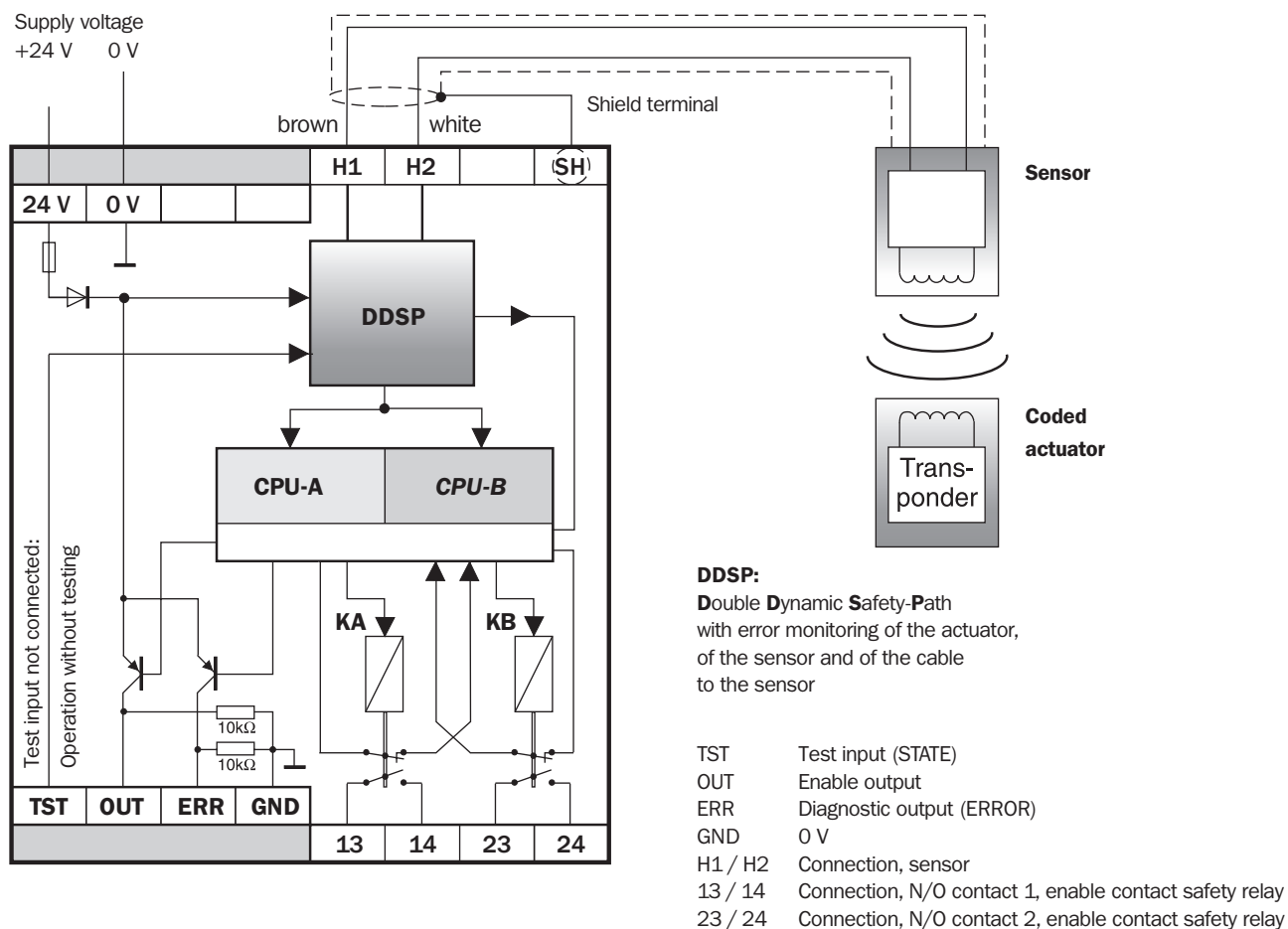
Sensor, cable



Actuator

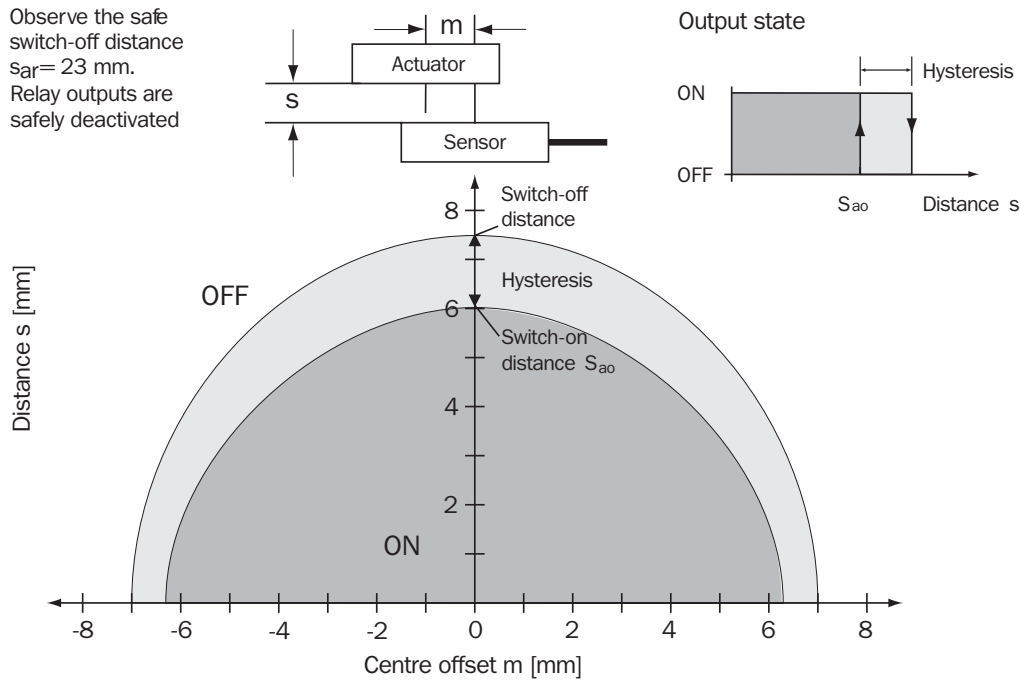


Internal circuitry



## Response range

Observe the safe switch-off distance  $s_{ar} = 23 \text{ mm}$ . Relay outputs are safely deactivated



## Accessories

### Connection cable

Cable length	Type	Part number
20 m	T4000-DNA20C	6021913
25 m	T4000-DNA25C	6021914
50 m	T4000-DNA50C	6021915

### Safety screws

Packing unit	Type	Part number
20	Safety screws T4000	5309170

## Overview of technical specifications

Sensor principle	Transponder
Category according to EN 954-1	4
Number of non-contact safety switches from ... to (depending on type)	1 ... 2 / 1 ... 4
Type of output	Relay
Number of safe outputs (N/O)	2
Number of application diagnostic outputs (depending on type)	2 x Semiconductor, p-switching / 4 x Semiconductor, p-switching

## Product description

The T4000 Multi non-contact safety switch system comprises of the following components:

- 1 to 4 sensors
- 1 to 4 coded actuators (unique copy)
- 1 evaluation unit

The evaluation unit is further equipped with:

- 2 LED status displays
- External device monitoring (EDM)
- Restart interlock

## Ordering information

System part	Connection type	Number of read heads from ... to	Cable length	Type	Part number
Evaluation unit	-	1 ... 2	-	T4000-1RCA02	6029946
		1 ... 4	-	T4000-1RCA04	6029947
Sensor	Connector	-	-	T4000 DNAC	6021912
	Cable	-	5 m	T4000 DNA05P	6012144
			10 m	T4000 DNA10P	6012145
			15 m	T4000 DNA15P	6012146
Actuator	-	-	-	T4000-1 KBA	5306531

Connecting cable not supplied with delivery



- Connection of multiple sensors to one evaluation unit
- High protection against manipulation through individually coded actuator
- Small compact design of sensor and actuator
- Sensor and actuator with IP 67 enclosure rating



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## Detailed technical specifications

### Evaluation unit

Type	T4000-1RCA02	T4000-1RCA04
Category according to EN 954-1	4	
Classification in compliance with IEC/EN 60947-5-3	PDF-M	
Classification according to cULus	Class 2	
Note operating voltage	Operation with UL-class 2 power supply only	
External fuse	At operating voltage 0.25 A ... 8 A	
Maximum switching voltage	60 V DC/30 V AC	
Housing material	Plastic PA6.6	
Enclosure rating	IP 20	
Mechanical life (relay contacts)	10 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to	0 °C ... +55 °C	
Protection class	3	
Operating voltage	24 V DC (21 V DC ... 27 V DC)	
Number of non-contact safety switches from ... to	1 ... 2	1 ... 4
Rated insulation voltage U <sub>i</sub>	250 V	
Rated impulse withstand voltage U <sub>imp</sub>	4000 V AC	
Type of output	Relay	
Number of safe outputs (N/O)	2	
Number of application diagnostic outputs	2 x Semiconductor, p-switching	4 x Semiconductor, p-switching
Short-circuit protection	6A gG	
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	1.5 A (230 V AC), 1.2 A (24 V DC)	
Minimum switching current (switching voltage)	1 mA (1 V DC)	
Maximum switching current (switching voltage)	6 A (240 V AC)	
Weight	250 g	
Out indication	✓	
Power indication	✓	
Error indication	✓	
Status display	✓	
Maximum switch on time	12 s	
Switching delay from state change	290 ms	450 ms
External device monitoring	✓	
Restart interlock	✓	



**Sensor**

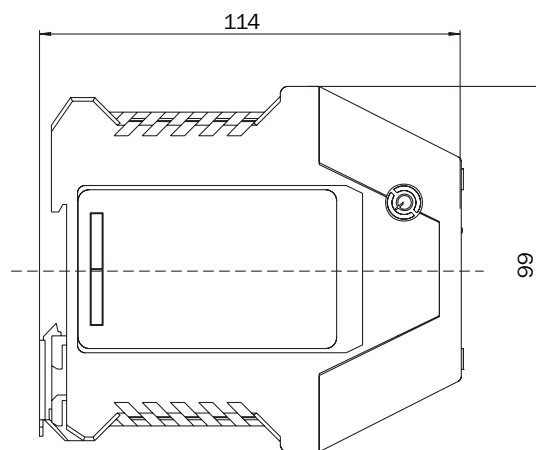
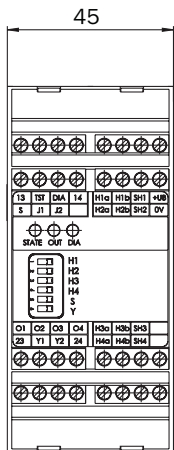
Type	T4000 DNAC	T4000 DNA05P	T4000 DNA10P	T4000 DNA15P
Sensor principle	Transponder			
Housing material	Fortron, glass-fibre reinforced thermoplastic			
Enclosure rating	IP 67			
Ambient operating temperature from ... to	-25 °C ... +70 °C			
Connection type	Connector	Cable		
Size of the cable gland	M8			
Weight	0.12 kg	0.25 kg	0.39 kg	0.53 kg
Monitoring time minimum dwell time	0.5 s			
Cable length	-	5 m	10 m	15 m
Maximum cable length	50 m			
Cable material	-	PVC		

**Actuator**

Housing material	Fortron, glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Ambient operating temperature from ... to	-25 °C ... +70 °C
Weight	0.03 kg
Monitoring time minimum dwell time	0.5 s

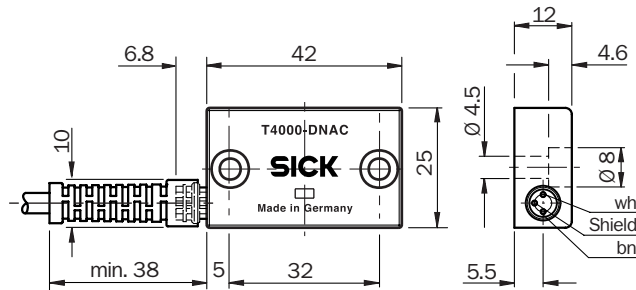
**Dimensional drawings**

**Evaluation unit**

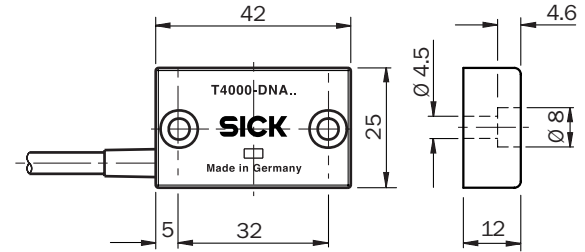


Dimensions in mm

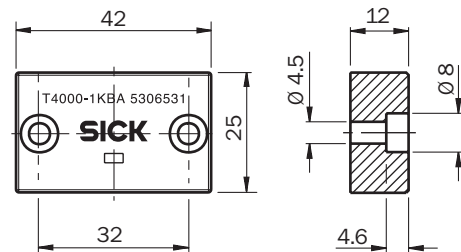
Sensor, connector



Sensor, cable



Actuator

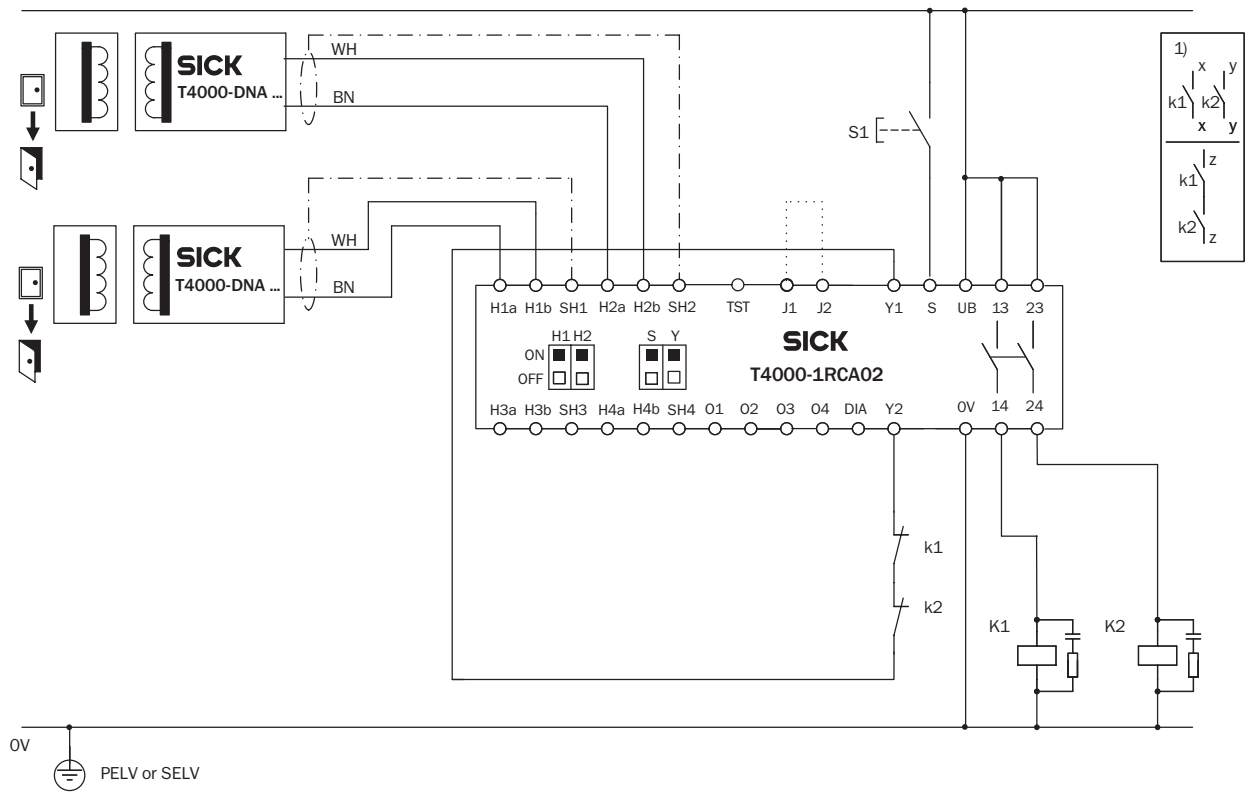


Dimensions in mm

Internal circuitry

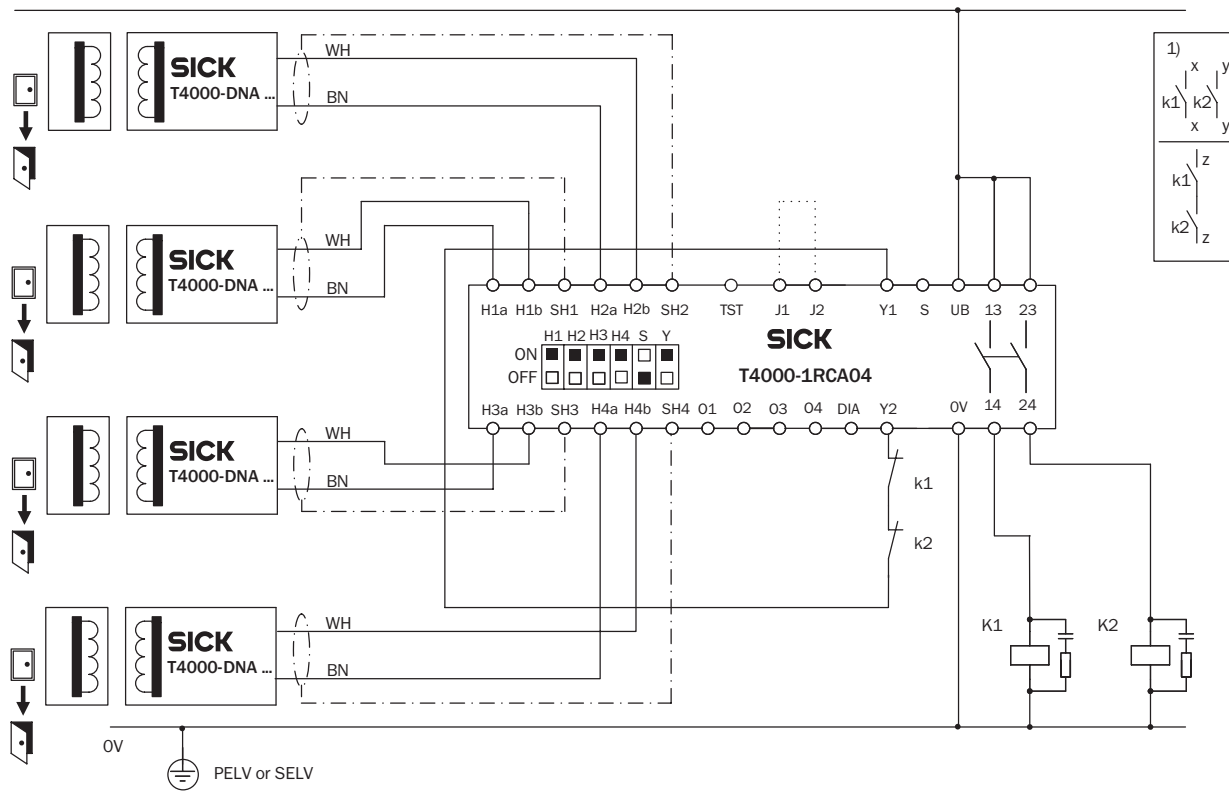
T4000-1RCA02

+24V

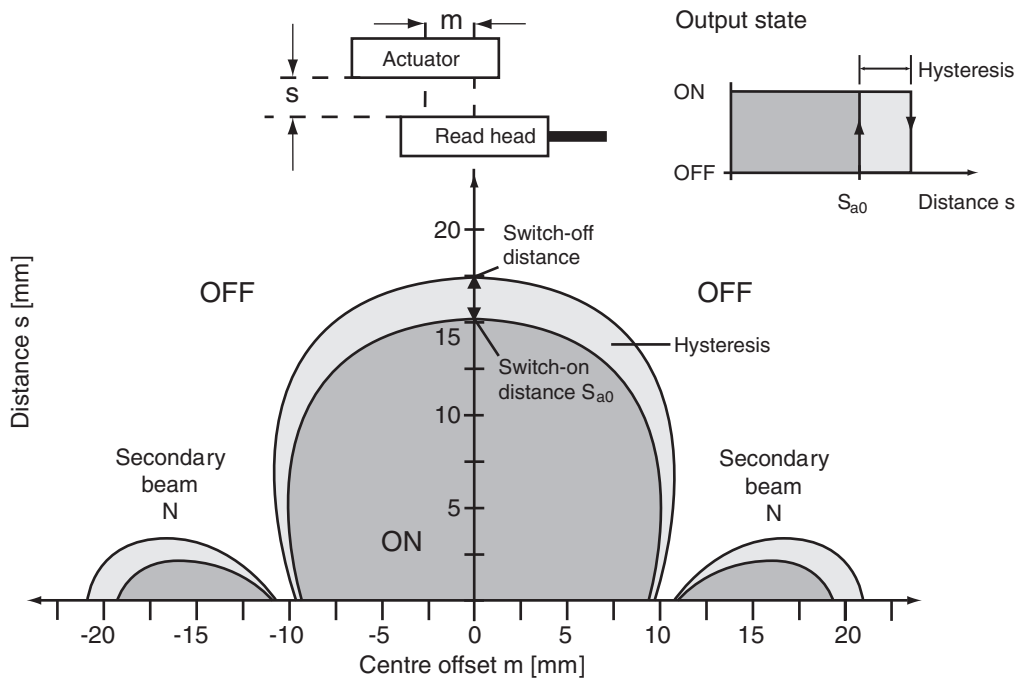


**T4000-1RCA04**

+24V



## Response range



## Accessories

### Connection cable

Cable length	Type	Part number
20 m	T4000-DNA20C	6021913
25 m	T4000-DNA25C	6021914
50 m	T4000-DNA50C	6021915

### Safety screws

Packing unit	Type	Part number
20	Safety screws T4000	5309170

## Overview of technical specifications

Sensor principle	Transponder
Category according to EN 954-1	3
Number of non-contact safety switches	1
Type of output	Semiconductor, p-switching
Number of safe outputs	2

## Product description

The T4000 Compact non-contact safety switch system comprises of the following components:

- 1 sensor with integrated evaluation unit and
- 1 coded actuator

The sensor with integrated evaluation unit is further equipped with:

- 1 solid-state application diagnostic output
- 2 LED status displays

## In-system added value

Possible connections to

- SICK UE10 safety relays series (see table) → see N-0
- SICK UE440 and UE470 safety controllers → see O-0
- SICK UE4100 PROFIsafe safety remote I/Os → see P-0

## Ordering information

System part	Type	Part number
Evaluation Unit & Sensor	T4000-2 DRNAC	6022052
Actuator	T4000-1 KBA	5306531

Connecting cable not supplied with delivery



- High protection against manipulation through individually coded actuator
- Sensor response range up to 20 mm
- Compact design of the actuator
- Sensor with integrated evaluation unit
- Sensor with LED status display – directly on the protective device
- Sensor with integrated evaluation unit and actuator with IP 67 enclosure rating



Further information	Page
→ Technical specifications	L-24
→ Dimensional drawings	L-25
→ Internal circuitry	L-26
→ Response range	L-27
→ Accessories	L-27
→ Services	A-2

## Detailed technical specifications

### Evaluation Unit & Sensor

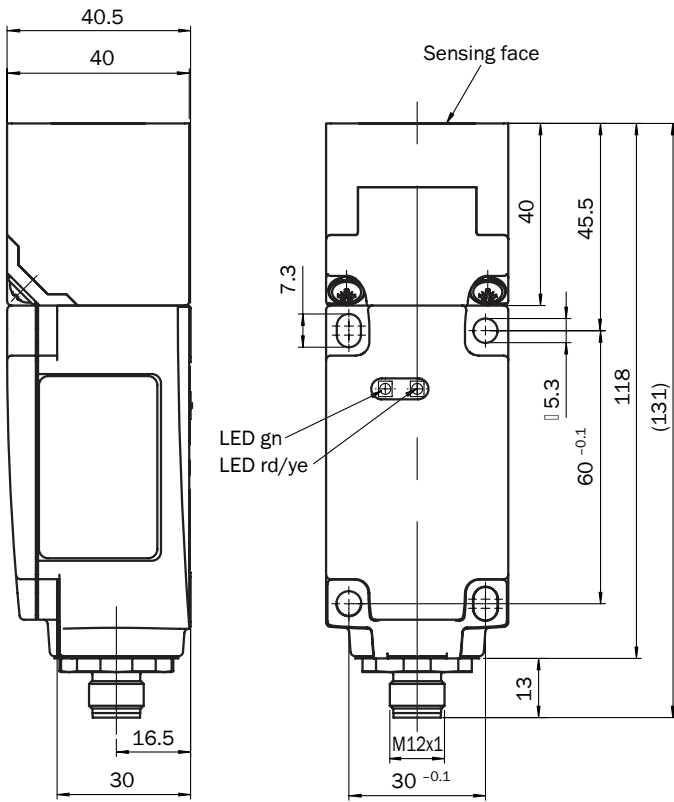
Sensor principle	Transponder
Category according to EN 954-1	3
Classification in compliance with IEC/EN 60947-5-3	PDF-M
Classification according to cULus Note operating voltage External fuse Maximum switching voltage	Class 2 Operation with UL-class 2 power supply only At supply voltage 0.25 A ... 8 A 24 V DC
Housing material	Plastic PTB VO GF30
Enclosure rating	IP 67
Ambient operating temperature from ... to	-20 °C ... +55 °C
Protection class	3
Shock resistance	30 g, 11 ms (IEC 60068-2-27)
Vibration resistance	10 Hz ... 55 Hz, 0.5 mm (IEC 60068-2-6)
Operating voltage	18 V DC ... 27 V DC
Number of non-contact safety switches	1
Size of the cable gland	M12
Rated insulation voltage $U_i$	30 V
Rated impulse withstand voltage $U_{imp}$	1500 V AC
Type of output	Semiconductor, p-switching
Number of safe outputs	2
Short-circuit protection	F0.4
Usage category in compliance with IEC 947-5-1	DC-13
Rated operating current (voltage)	0.4 A (24 V DC)
Maximum switching power	2 VA
Weight	0.4 kg
Out indication	✓
Error indication	✓
Status display	✓
Switch-on distance	20 mm
Switch-off distance	23 mm
Safe switch-off distance	40 mm
Monitoring time minimum dwell time	0.5 s
Maximum switch on time	3 s
Switching delay from state change	180 ms
Discrepancy time of the safety outputs	Max. 120 ms
Cable length	300 m

### Actuator

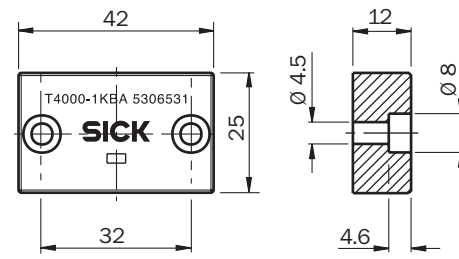
Housing material	Fortron, glass-fibre reinforced thermoplastic
Enclosure rating	IP 67
Ambient operating temperature from ... to	-25 °C ... +70 °C
Weight	0.03 kg
Monitoring time minimum dwell time	0.5 s

# Dimensional drawings

## Evaluation Unit & Sensor

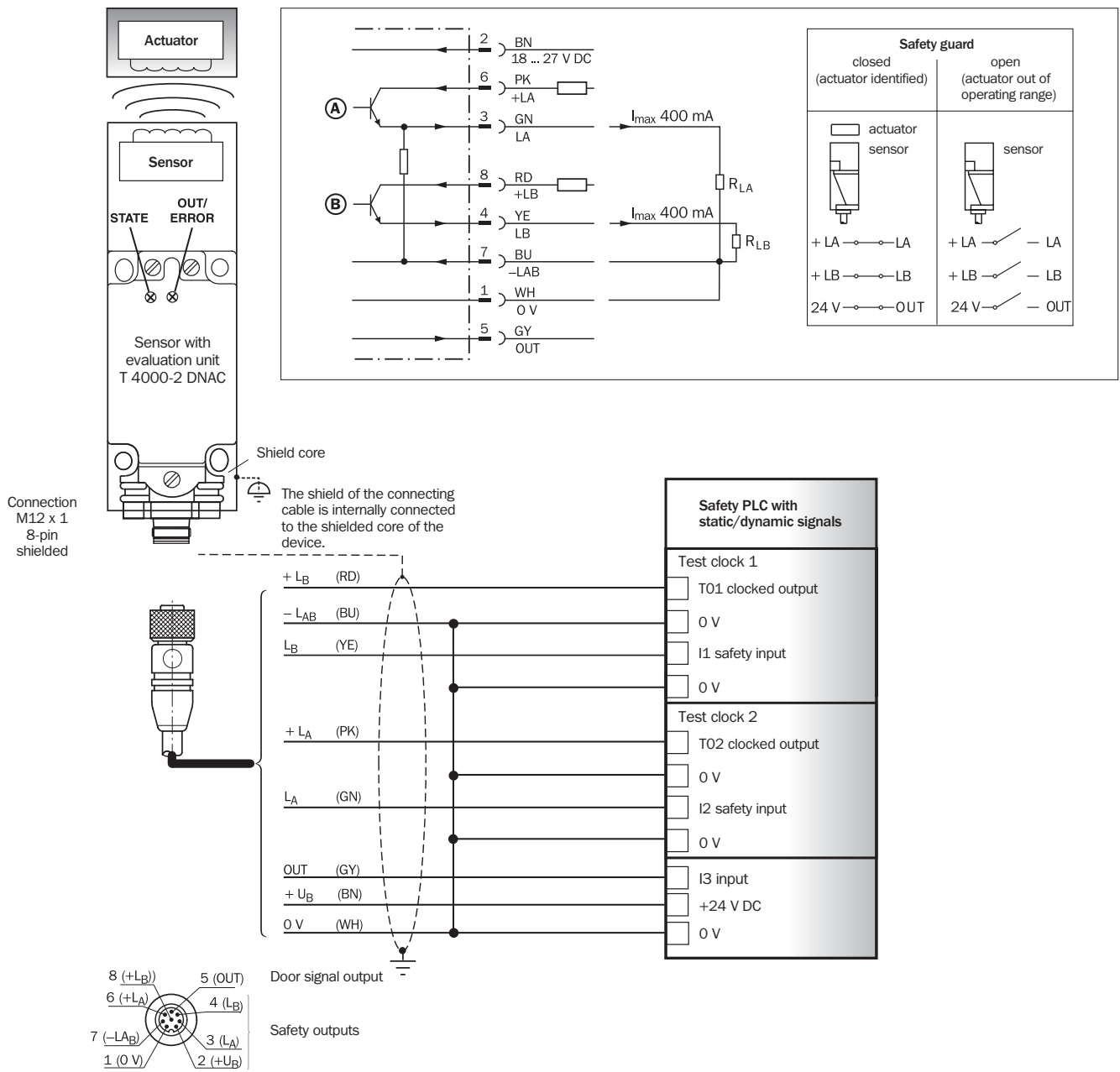


## Actuator



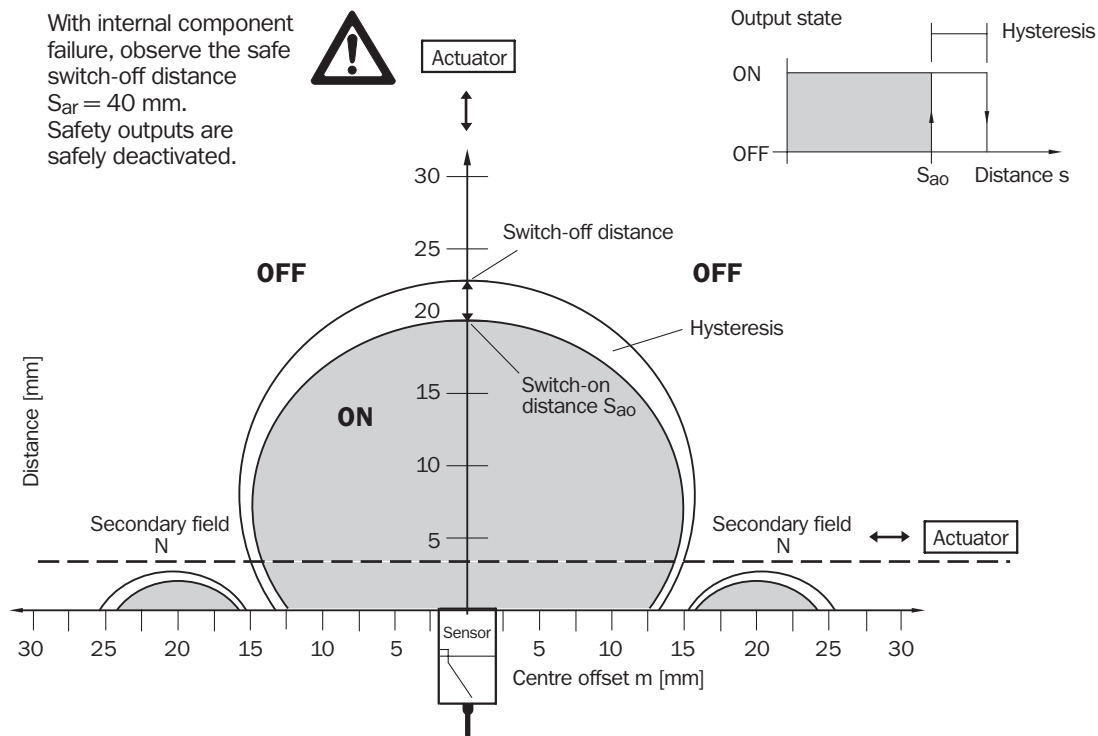
Dimensions in mm

# Internal circuitry





## Response range



A minimum distance of  $s = 3$  mm must be maintained in the case of lateral approach in order to prevent entry into the operating range of the secondary fields.

## Accessories

### Connection cable

Cable length	Type	Part number
5 m	DOL-1208-G05MA	6020993
10 m	DOL-1208-G10MA	6022152
15 m	DOL-1208-G15MA	6022153
30 m	DOL-1208-G30MA	6022242

### Safety screws

Packing unit	Type	Part number
20	Safety screws T4000	5309170



- Category 4 according to EN 954-1
- No actuator necessary
- Sensor with LED status display
- Safe cascading of the sensors possible
- Direct connection of the sensors to safe PLC
- Connection of up to 10 sensors to one evaluation unit



## Overview of technical specifications

Sensor principle	Inductive
Category according to EN 954-1	4
Number of non-contact safety switches from ... to	1 ... 10
Type of output	Relay
Number of safe outputs (N/O)	3
Number of application diagnostic outputs	2 x Relay

## Product description

The non-contact safety switch IN4000 is an inductive sensor that is activated by metal (e.g. steel ST37). It does not, therefore, require a separate coded actuator. Due to the non-contact form of operation, this sensor has advantages in that it is

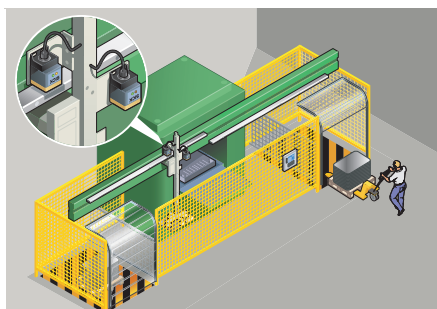
straightforward to adjust and install. It also has increased resistance to shock and vibration.

The response range of the sensor is monitored spatially and over time. In this way, increased protection against tampering is provided.

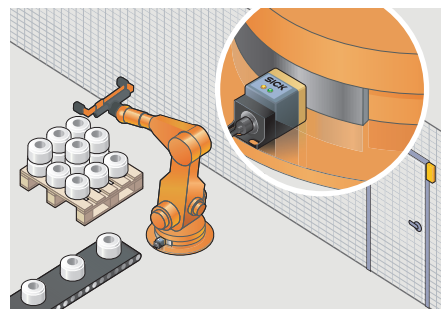
## In-system added value

- Possible connections to SICK safety remote I/Os PROFIsafe and modular safety controller UE410 Flexi

## Applications



Safe position monitoring on a gantry robot



Safe axis monitoring of a robot

## Ordering information

System part	Design	Housing diameter	Connection type	Type	Part number
Evaluation unit	-	-	-	IN40-R1212B	6027390
Sensor	Cuboid	-	Connector	IN40-D0101K	6027389
		M30		IN40-D0202K	6027392
	M18	IN40-D0303K		6027391	

Further information	Page
→ Dimensional drawings	L-30
→ Internal circuitry	L-31
→ Response range	L-32
→ T-junction	L-32
→ Accessories	L-33
→ Services	A-2

## Detailed technical specifications

### Evaluation unit

Category according to EN 954-1	4
Housing material	PA
Enclosure rating	IP 20
Ambient operating temperature from ... to	0 °C ... +70 °C
Operating voltage	24 V DC (19.2 V DC ... 30 V DC)
Number of non-contact safety switches from ... to	1 ... 10
Type of output	Relay
Number of safe outputs (N/O)	3
Number of application diagnostic outputs	2 x Relay
Usage category in compliance with IEC 947-5-1	AC-15/DC-13
Rated operating current (voltage)	3 A (250 V AC), 3 A (24 V DC)
Weight	350 g
Out indication	✓
Power indication	✓
Error indication	✓
Status display	✓
Sensor display	✓
Maximum switch on time	1000 ms
Switching delay from state change	210 ms
External device monitoring	✓

### Sensor

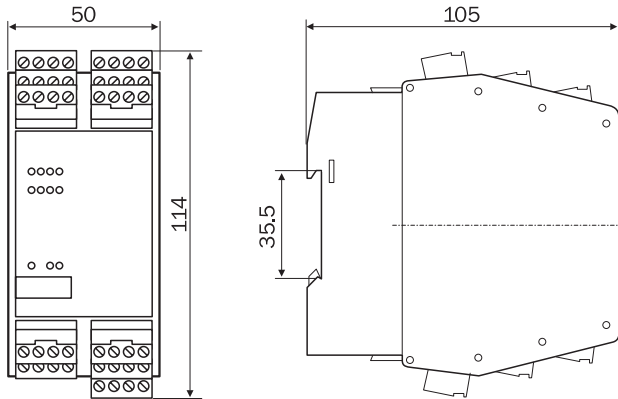
Type	IN40-D0101K	IN40-D0202K	IN40-D0303K
Sensor principle	Inductive		
Category according to EN 954-1	4		
Classification in compliance with IEC/EN 60947-5-3	PDF-M		
Housing material	PPE/zink-die cast	PEEK/V4A	PBT/V4A
Enclosure rating	IP 67	IP 69K	
Ambient operating temperature from ... to	-25 °C ... +70 °C	0 °C ... +70 °C	-25 °C ... +70 °C
Protection class	3		
Shock resistance	according to EN 60947-5-3		
Vibration resistance	according to EN 60947-5-3		
Operating voltage	24 V DC (19.2 V DC ... 30 V DC)		
Connection type	Connector		
Size of the cable gland	M12		
Weight	0.22 kg	0.13 kg	0.06 kg
Power indication	✓		
Status display	✓		
Switch-on distance from ... to	10 mm ... 15 mm <sup>1)</sup>	6 mm ... 12 mm <sup>1)</sup>	3 mm ... 6 mm <sup>1)</sup>
Safe switch-off distance	30 mm <sup>1)</sup>		15 mm <sup>1)</sup>
Monitoring time minimum dwell time	0.2 s		
Switching delay from state change	T2 + 20 ms <sup>2)</sup>		

<sup>1)</sup> Dependent on material. The indicated values refer to steel ST37.

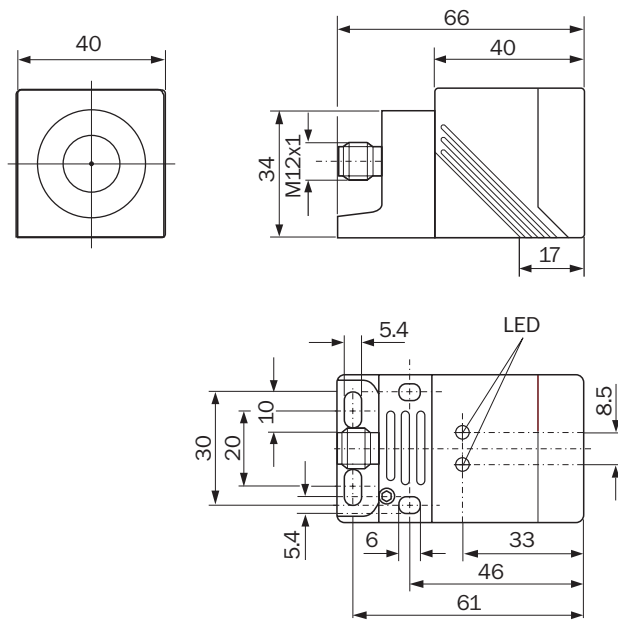
<sup>2)</sup> During this time the output is switched off (Logical "0"), see response range.

# Dimensional drawings

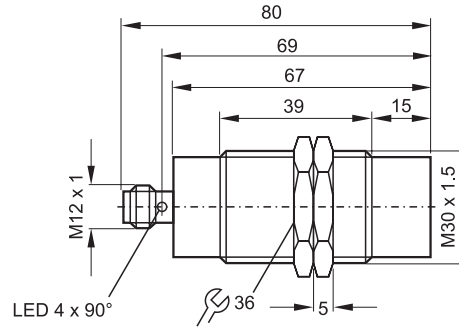
**Evaluation unit, IN40-R1212B**



**Sensor, IN40-D0101K**

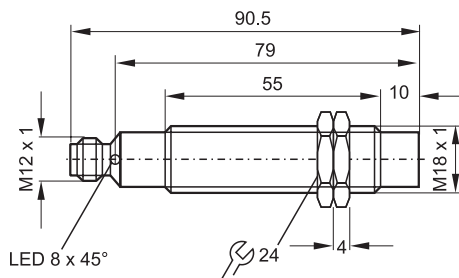


**Sensor, IN40-D0202K**



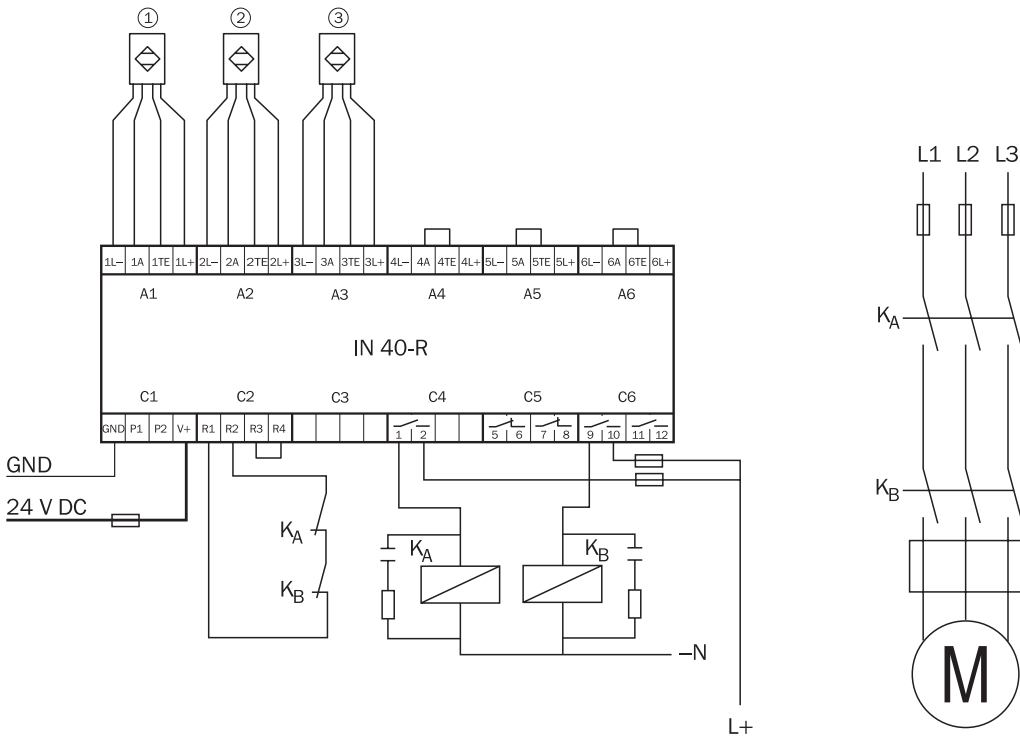
Dimensions in mm

**Sensor, IN40-D0303K**

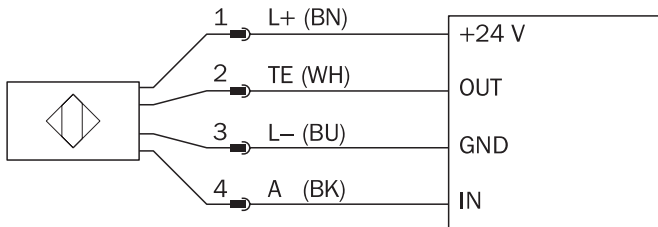
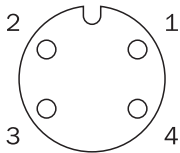


# Internal circuitry

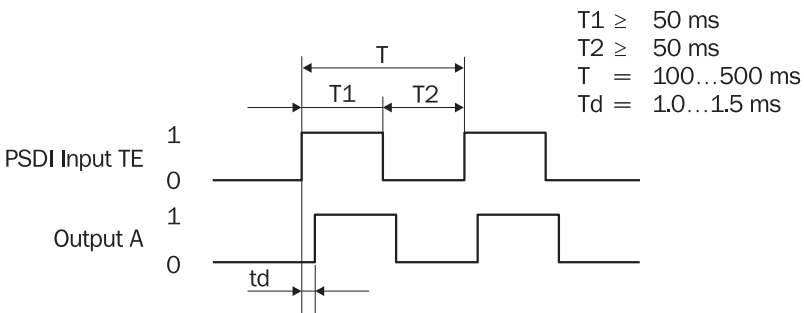
## Evaluation unit



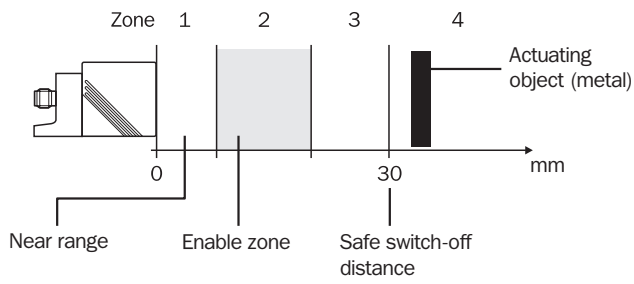
## Sensor connections



## Sensor timing



## Response range



## T-junction

Type	Description	Part number
IN40-A2121N	T-junction for serial connection of IN4000 sensors	5315025



## Accessories

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### Connector

Cable length	Type	Part number
5 m	DOL-1204-G05M	6009866
10 m	DOL-1204-G10M	6010543
15 m	DOL-1204-G15M	6010753



## Explanations of features

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### **Positive action normally closed contacts/normally open contacts**

Safety switches have contact elements in normally closed contact/normally open contact combinations. The normally closed contacts of a safety switch are of the “positive action” type, i.e. the forced movement of the normally closed contact ensures that the contacts are separated every time. Normally open contacts primarily serve as signalling contacts and must not be used for the safety circuit.



### **Housing material**

The housing materials used can be separated into two large groups – “metals” and “plastics”. The metal versions of the rope switch are made of painted die-cast zinc. Neoprene is used for the plastic cap of the enabling switch.



## Safety operating devices



Safety application	Model	Number of positive action normally closed contacts/normally open contacts <sup>1)</sup>	Housing material <sup>1)</sup>	Connection type	Cable length/number x size of cable gland	Enclosure rating	Product	Page
	Enabling switch	2 / 2	Plastic	Cable	5 m 10 m 25 m	IP 65 IP 67	E100	M-2
	Rope-operated emergency stop switch	3 / 1 2 / 2	Metal	Cable gland	1 x M20	IP 66	i110RP	M-5

<sup>1)</sup> Explanation see page M-0



- Enabling switch to EN 775
- Ergonomic design
- Light weight
- 3 position operation
- Options with additional plus/minus buttons



## Overview of technical specifications

Number of positive action normally closed contacts	2
Number of normally open contacts	2
Housing material	Plastic
Connection type	Cable
Cable length (depending on type)	5 m / 10 m / 25 m
Type of connection cable (depending on type)	Coil / straight

## Product description

- Enabling switch for safe maintenance work within a hazardous area
- 4-pole contact element
- Plus/minus buttons for additional control of direction of movement

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant. → see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy. → see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe. → see P-0

## Ordering information

Number of positive action normally closed contacts	Number of normally open contacts	Type of connection cable	Cable length	Plus/minus buttons	Type	Part number
2	2	Straight	5 m	-	E100-A2A22S05A	6012141
			10 m	-	E100-A2A22S10A	6021916
		Coil	5 m	-	E100-A2A22C05A	6021917
			5 m	✓	E100-B2A22S05A	6022879
		Straight	10 m	✓	E100-B2A22S10A	6022880
			25 m	✓	E100-B2A22S25A	6033234

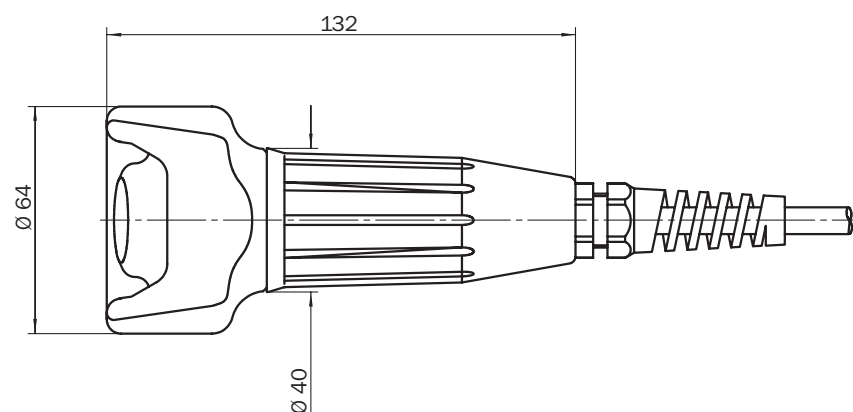
Further information	Page
→ Actuator travel diagram	M-4
→ Accessories	M-4
→ Services	A-2

## Detailed technical specifications

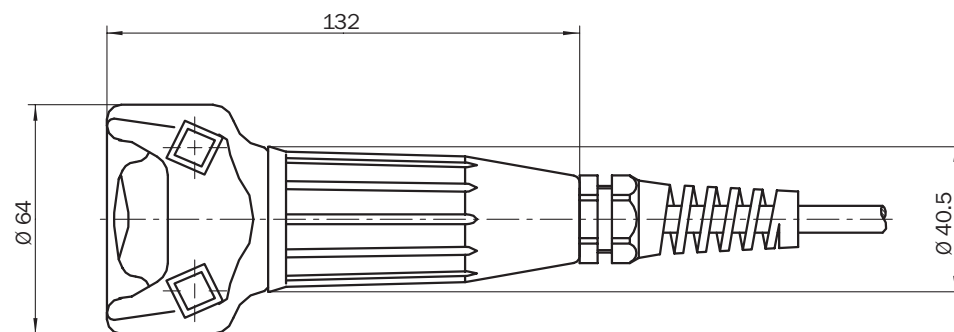
Type	E100- A2A22S05A	E100- A2A22S10A	E100- A2A22C05A	E100- B2A22S05A	E100- B2A22S10A	E100- B2A22S25A
Housing material	Plastic					
Enclosure rating	IP 67			IP 65		
Mechanical life (relay contacts)	1 x 10 <sup>5</sup> switching cycles					
Ambient operating temperature from ... to	-5 °C ... +50 °C					
Switching principle	Slow-action switch					
Number of positive action normally closed contacts	2					
Number of normally open contacts	2					
Usage category in compliance with IEC 947-5-1	AC-15/DC-13			DC-13		
Rated operating current (voltage)	2 A (230 V AC), 2 A (24 V DC)			2 A (24 V DC)		
Rated insulation voltage U <sub>i</sub>	250 V			32 V		
Rated impulse withstand voltage U <sub>i</sub> Mp	2500 V AC			800 V AC		
Minimum switching voltage	12 V DC					
Minimum switching current (switching voltage)	1 mA (24 V DC)					
Connection type	Cable					
Connection conductor cross-section	0.34 mm <sup>2</sup>			0.5 mm <sup>2</sup>		
Short-circuit protection	2A gG			2A gG / 0.1A gG		
Weight	0.86 kg	1.27 kg				1.32 kg

## Dimensional drawings

### E100A



### E100B



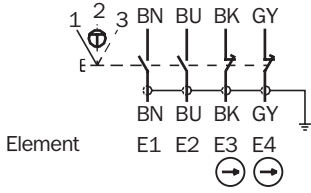
Dimensions in mm

M

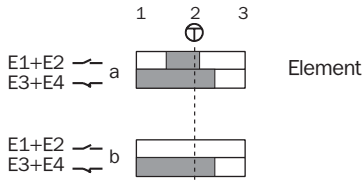
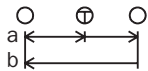
# Actuator travel diagram

## E100A

2 NO  
2 positive action NC



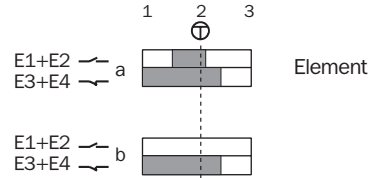
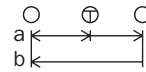
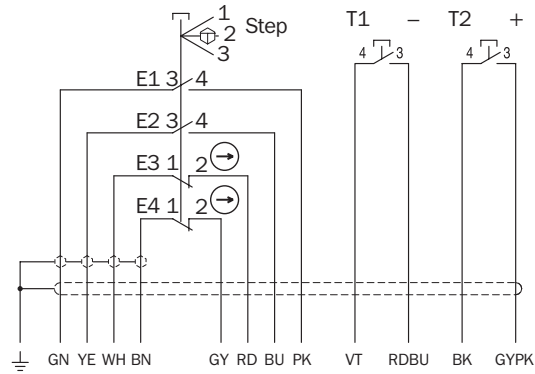
Element



□ Contacts open  
■ Contacts closed

⊖ Positive action NC  
⊕ Trigger point

## E100B



□ Contacts open  
■ Contacts closed

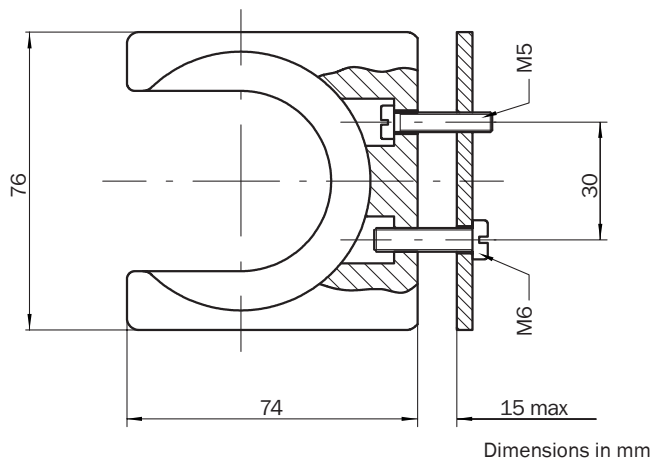
⊕ Trigger point

# Accessories

## Safety switch accessories, miscellaneous

Type	Part number
Fixing bracket	5308209

## Fixing bracket



## Overview of technical specifications

Number of positive action normally closed contacts (depending on type)	2 / 3
Number of normally open contacts (depending on type)	1 / 2
Housing material	Metal
Connection type	Cable gland

## Product description

- Rope-operated switch
- 4-pole contact element
- Complete wire sets available for simple installation

## In-system added value

### Safety relays

Safety relays allow simple integration of safety components into machinery or plant.

→ see N-0

### Safety controllers

Safety controllers are utilised when the safety function (e.g. switching off a dangerous movement) is to be accomplished in a flexible way by logical combination of safety relevant signals. Operation of machinery becomes more flexible as well as generation of machine variants becomes more easy.

→ see O-0

### Safety network solutions

Safety network solutions are utilised in plants and machinery of larger scale. This is saving cabling and enables modular design of the safety automation. Potential errors or faults can be easily localised and quickly trouble shooted thanks to comprehensive diagnostics functions. That significantly reduces machine down times.

SICK offers solutions for the open automation standards: AS-i Safety at Work, DeviceNet Safety and PROFIsafe.

→ see P-0

## Ordering information

Number of positive action normally closed contacts	Number of normally open contacts	Type	Part number
2	2	i110-RP223	6025077
3	1	i110-RP313	6025076



- Rope-operated emergency stop switch according to EN 418 and EN 60947-5-5
- Housing material die-cast zinc
- Cable gland M20
- Design of the basic housing according to EN 50041
- Enclosure rating IP 66
- Wide range of accessories for quick installation



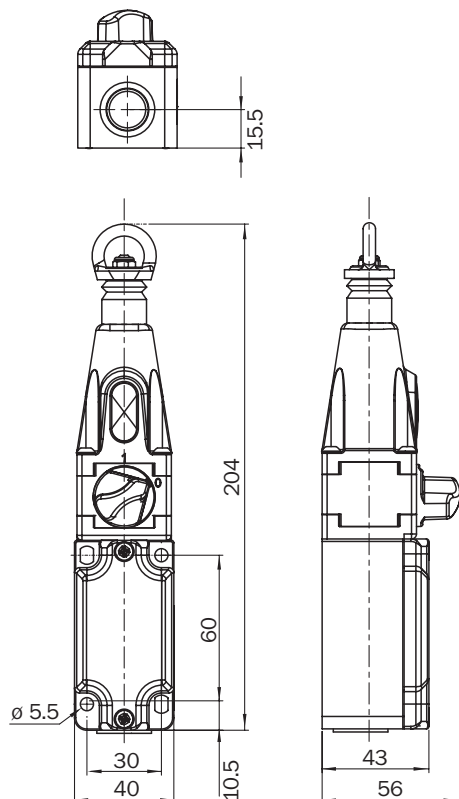
M

Further information	Page
→ Technical specifications	M-6
→ Dimensional drawings	M-6
→ Switching elements	M-6
→ Rope accessories	M-7
→ Other accessories	M-7
→ Services	A-2

## Detailed technical specifications

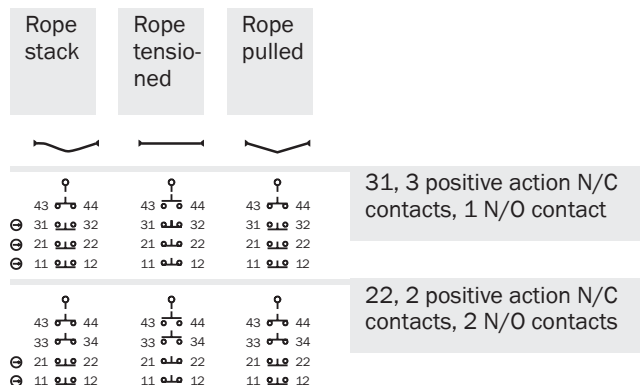
Type	i110-RP223	i110-RP313
Housing material	Metal	
Surface treatment	Varnished	
Enclosure rating	IP 66	
Mechanical life (relay contacts)	1 x 10 <sup>6</sup> switching cycles	
Ambient operating temperature from ... to	-25 °C ... +80 °C	
Actuation force (deflection)	Max. 125 N (300 mm)	
Actuation frequency	Max. 1 Hz	
Switching principle	Slow-action switch	
Number of positive action normally closed contacts	2	3
Number of normally open contacts	2	1
Usage category in compliance with IEC 947-5-1	AC-15/DC-13	
Rated operating current (voltage)	2 A (250 V AC), 5 A (100 V AC), 2 A (24 V DC)	
Rated insulation voltage U <sub>i</sub>	250 V	
Rated impulse withstand voltage U <sub>imp</sub>	2500 V AC	
Minimum switching voltage	5 V DC	
Minimum switching current (switching voltage)	5 mA (5 V DC)	
Connection type	Cable gland	
Connection conductor cross-section	1.5 mm <sup>2</sup>	
Short-circuit protection	2A gG	
Maximum cord length	30 m	
Weight	0.84 kg	

## Dimensional drawings



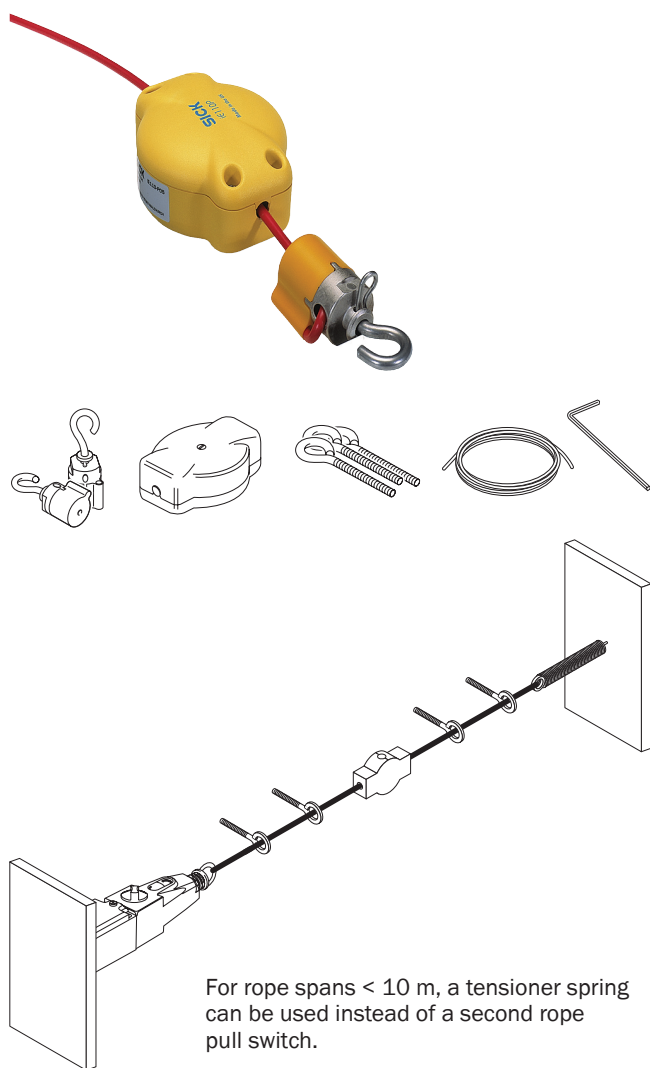
Dimensions in mm

## Switching elements



## Rope accessories

Accessory type	Cord length	Type	Part number
Rope accessory set	5 m	iE110-P05	5311136
	10 m	iE110-P10	5311137
	20 m	iE110-P20	5311138
	30 m	iE110-P30	5311139
Rope	30 m	iE110-PL30	5310813
	100 m	iE110-PL100	5310814
Eye bolt	-	iE110-PEB	5309035
Tensioner set	-	iE110-PTR	5309034
Spring	-	iE110-PTS	5311290
Rope gripper	-	iE110-PRG	5314230



### Rope accessory set iE110-P05

2 rope grippers, 1 tensioner, 3 eye bolts, 5 m rope, 1 allen key

### Rope accessory set iE110-P10

2 rope grippers, 1 tensioner, 6 eye bolts, 10 m rope, 1 allen key

### Rope accessory set iE110-P20

2 rope grippers, 1 tensioner, 10 eye bolts, 20 m rope, 1 allen key

### Rope accessory set iE110-P30

2 rope grippers, 1 tensioner, 14 eye bolts, 30 m rope, 1 allen key

### Tensioner set iE110-PTR

2 rope grippers, 1 tensioner, 1 allen key

### Rope gripper iE110-PRG


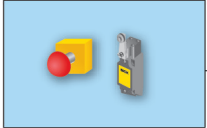

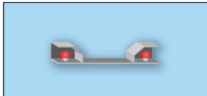

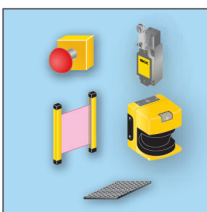

2 rope grippers

## Other accessories

### Cable gland

Type	Part number
Cable gland M20	5309164

## Selection table

Main Application	Mode	Features		UE-Unit	Page
	Single-channel Input	Stop Cat. 0	$\frac{2}{1}$	<b>UE23-2MF</b>	N-9
			$\frac{2}{1}$	<b>UE43-2MF</b>	N-18
	$\frac{3}{1}$		<b>UE43-3MF</b>	N-23	
	$\frac{6}{4}$		<b>UE43-6MF</b>	N-28	
	Dual-channel Input		$\frac{3}{0}$	<b>UE45-3S1 2 3</b> 1 Output up to 3 s Off-Delay	N-37
			$\frac{3}{0}$	<b>UE45-3S1 2 30</b> 1 Output up to 30 s Off-Delay	N-37
 1)	Dual-channel Input	Stop Cat. 0	$\frac{3}{0}$	<b>UE44-3SL 2 3</b> 1 Output up to 3 s On-Delay	N-32
			$\frac{3}{0}$	<b>UE44-3SL 2 30</b> 1 Output up to 30 s On-Delay	N-32
	Dual-channel Input	Stop Cat. 0	$\frac{2}{1}$	<b>UE42-2HD</b>	N-13
	Dual-channel Input	Stop Cat. 0	$\frac{3}{1}$	<b>UE10-30S</b>	N-3
	Dual-channel Input	Stop Cat. 0	$\frac{2}{1}$	<b>UE48-20S</b>	N-42
			$\frac{3}{0}$	<b>UE48-30S</b>	N-48
	Muting sensor technology	Stopp-Kat. 0	$\frac{2}{1}$	<b>UE49-2MM</b>	N-53
			$\frac{3}{0}$	<b>UE49-3MM</b>	N-53

1) Safety switch with mechanical locking



# Safety relays



Applications									Technical specifications				Type of unit		Product	Page
Emergency stop	Safety switch	Two-hand controls Typ III C	Pressure sensitive mats (in 4-wire technology)	Opto-electronic protective device	Monitoring of simultaneous activation (s)	Muting	Manual reset (monitored)	Automatic reset	Category according to EN 954-1	Number of enable current paths/signalling current paths	Input circuit (number of channels)	Housing width (mm)	Main unit	Expansion unit		
-	-	-	-	✓	-	-	-	-	- <sup>1)</sup>	3 / 1	1 or 2	22.5	✓	-	UE10-30S	N-3
✓	✓	-	-	-	-	-	✓	✓	4 <sup>2)</sup>	2 / 1	1	22.5	✓	-	UE23-2MF	N-9
-	✓	✓	-	-	0.5	-	-	✓	4	2 / 1	2	22.5	✓	-	UE42-2HD	N-13
✓	✓	-	-	-	-	-	✓	✓	4	2 / 1	1 or 2	22.5	✓	-	UE43-2MF	N-18
✓	✓	-	-	-	-	-	✓	✓	4	3 / 1	1 or 2	45.0	✓	-	UE43-3MF	N-23
✓	✓	-	-	-	-	-	✓	✓	4	6 / 4	1 or 2	90.0	✓	-	UE43-6MF	N-28
✓	✓	-	-	-	-	-	✓	✓	4	3 <sup>3)</sup> / 0	1 or 2	22.5	✓	-	UE44-3SL	N-32
✓	✓	-	-	-	-	-	✓	✓	4	3 <sup>4)</sup> / 0	1 or 2	22.5	✓	-	UE45-3S1	N-37
✓	✓	-	✓	✓	-	-	✓	✓	4	2 / 1	1 or 2	22.5	✓	-	UE48-20S	N-42
✓	✓	-	✓	✓	-	-	✓	✓	4	3 / 0	1 or 2	22.5	✓	-	UE48-30S	N-48
✓	✓	-	-	✓	0.22	✓	✓	✓	4	2 / 1 oder 3 / 0	6	45.0	✓	-	UE49	N-53
-	-	-	-	✓ <sup>5)</sup>	-	-	✓	✓	2	2	2	100.2	✓	-	LE20	N-57
-	-	-	-	✓ <sup>5)</sup>	3	✓	✓	✓	2	2	2	100.2	✓	-	LE20 Muting	N-64
-	-	-	-	-	-	-	-	-	- <sup>6)</sup>	4 / 2	-	22.5	-	✓	UE10-4XT	N-71
-	-	-	-	-	-	-	-	-	- <sup>6)</sup>	4 / 2 <sup>7)</sup>	-	22.5	-	✓	UE11-4DX	N-74

1) Same as protective device

2) The wires for the input and output signals shall be routed outside the control cabinet according to the category to be used

3) One normally open contact on-delayed














4) One normally open contact off-delayed

5) Testable

6) Same as main unit

7) 4 normally open contacts / 2 normally closed contacts with off-delay function

## Symbols

Function		Off-delay
		On-delay
		External device monitoring
		Expansion unit
Reset		Automatic reset
		Manual reset (monitored)
Applications		Safety switch
		Emergency stop
		Safety laser scanner
		Safety light curtain
		Pressure sensitive mat
		Two-hand controls
		Safety locking device, mechanically locked

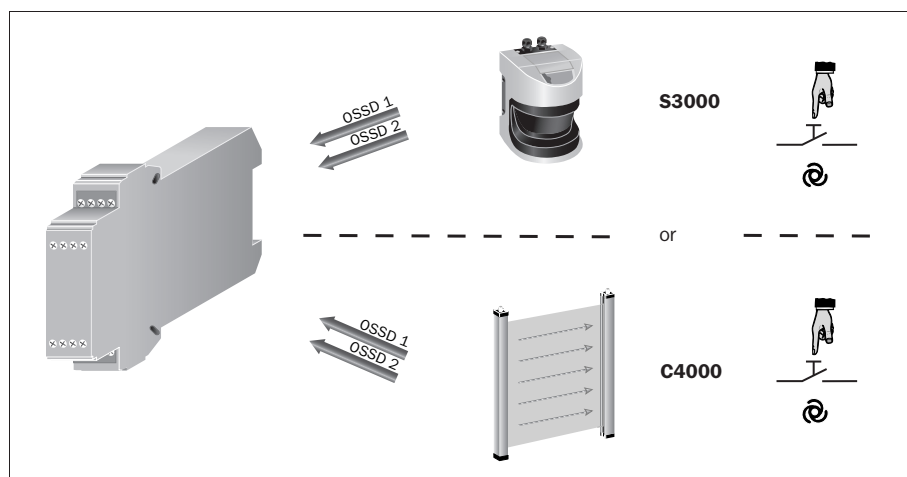
## Overview of technical specifications

Category according to EN 954-1	4
Number of enable current paths/signalling current paths	3 / 1
Input circuit	Single- or dual-channel
Housing width	22.5 mm

## Product description

- N/C contact for external device monitoring (EDM)
- 2 LEDs for:
  - Relay K1
  - Relay K2
- Increase in the number of outputs by way of the expansion units
  - UE10-4XT
  - UE11-4DX
- Available with plug-in terminals (key coded)

## Applications



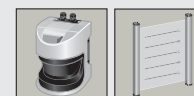
## In-system added value

The safety relay UE10-30S is a relay module for:

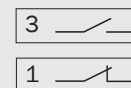
- Opto-electronic protective devices with monitored semiconductor outputs, integral external device monitoring (EDM) and restart interlock, such as
  - C4000
  - C/M2000
  - M4000
  - S3000
- Safety systems with monitored semiconductor outputs, integral external device monitoring and restart interlock, such as
  - LSI
  - LE20

## Ordering information

Connection type	Type	Part number
Screw-type terminals	UE10-30S2D0	6024917
Plug-in terminals	UE10-30S3D0	6024918



- For safety laser scanners
- For safety light curtains



Further information	Page
→ Symbols	N-2
→ Technical specifications	N-4
→ Internal circuitry	N-5
→ Dimensional drawings	N-6
→ Connection diagrams	N-7
→ Expansion modules	N-71 N-74
→ Services	A-2

## Detailed technical specifications

### General system data

Voltage supply to B1 - B2, B3 - B4	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
------------------------------------	--	----------------------

### Inputs B1 ... B4

Activation time	40 ms
Switch-on voltage	24 V (15 V ... 30 V)
Switch-on current	500 mA

### Output circuits (13 - 14, 23 - 24, 33 - 34, 41 - 42, Y1 - Y2)

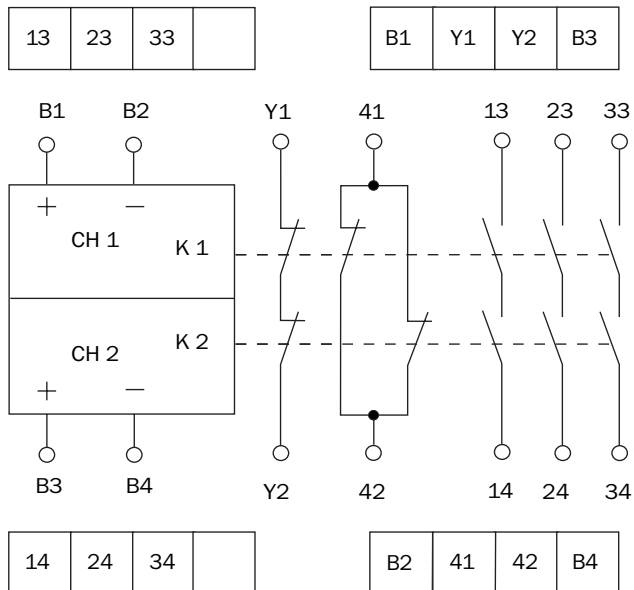
Response time (K1 / K2)	20 ms
Relay contacts	3 N/O, enable current paths, safety relevant 1 N/C, signalling current path, not safety relevant 1 N/C, contactor monitoring
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	
Switching voltage enable current paths/signalling current paths	10 V AC ... 230 V AC / 10 V DC ... 30 V DC
Switching voltage contactor monitoring	10 V DC ... 24 V DC
Switching current enable current paths	10 mA ... 6 A
Switching current signalling current paths	10 mA ... 2 A
Switching current contactor monitoring	10 mA ... 0.1 A
Total current across all contacts	12 A
Application category according to EN 60947-5-1	AC-15 U <sub>e</sub> 230 V AC, I <sub>e</sub> 4 A (360 c/h) AC-15 U <sub>e</sub> 230 V AC, I <sub>e</sub> 3 A (3600 c/h) DC-13 U <sub>e</sub> 24 V DC, I <sub>e</sub> 4 A (360 c/h) DC-13 U <sub>e</sub> 24 V DC, I <sub>e</sub> 2.5 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10 <sup>7</sup> switching cycles
Service life, electrical (dependent on the load)	2 x 10 <sup>6</sup> switching cycles

### Operating data

Surge voltage rating (U <sub>Imp.</sub> )	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	
External	3
Internal	2
Voltage rating	300 V AC
Test voltage U <sub>eff</sub> (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	
Housing	IP 40
Terminals	IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	-25 °C ... +55 °C
Storage temperature	-25 °C ... +75 °C
Wire cross-sections	
Single strand wire (2 x, identical cross section)	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup>
Single strand wire (1 x)	0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>
Fine stranded wire with terminal crimps (1 x)	0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Weight	0.2 kg

N

## Internal circuitry



### Function

If the semiconductor outputs of the installed safety device (e.g. C4000, S3000) are energised, then the safety output contacts will close.

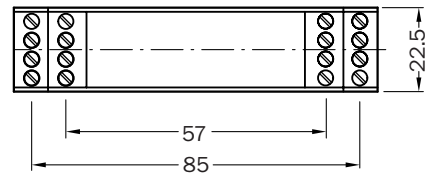
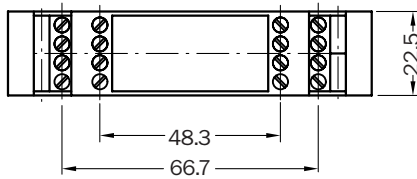
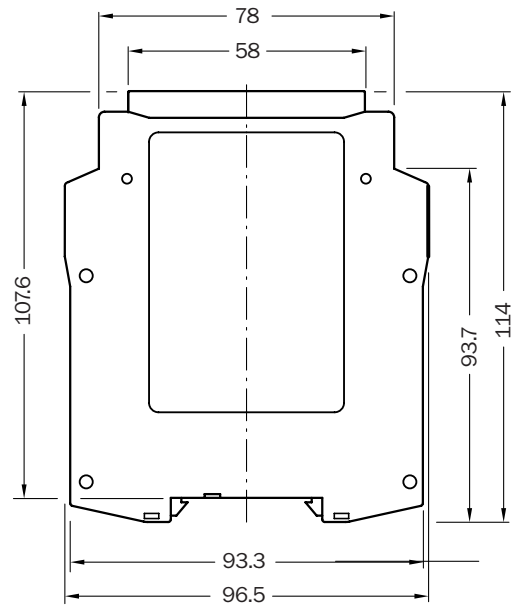
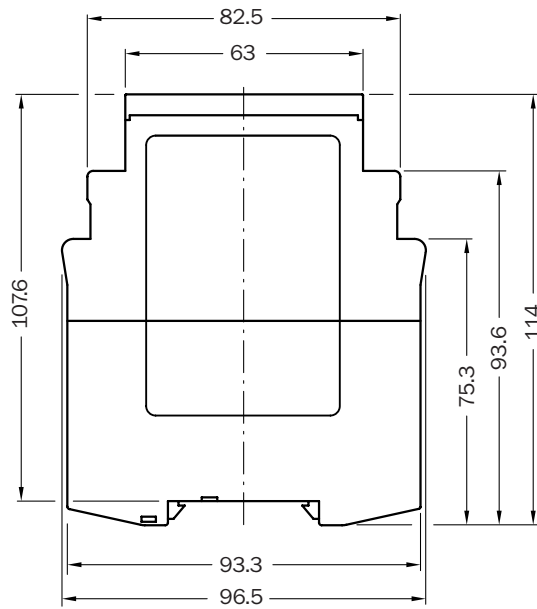
When at least one of the semiconductor outputs of the safety device becomes de-energised, then the output contacts revert back to open circuit status.

If restart interlock is needed, then this is achieved in the safety device, for example C4000 or S3000.

### External device monitoring (EDM)

Category 3 or 4 according to EN 954-1 requires monitoring of contactors. This is provided in the connected protective device, for example in the C4000 or S3000. The normally closed contact (Y1 -Y2) in the UE10-30S unit is, however, a part of this contactor monitoring system.

# Dimensional drawings



Housing with screw-type terminals

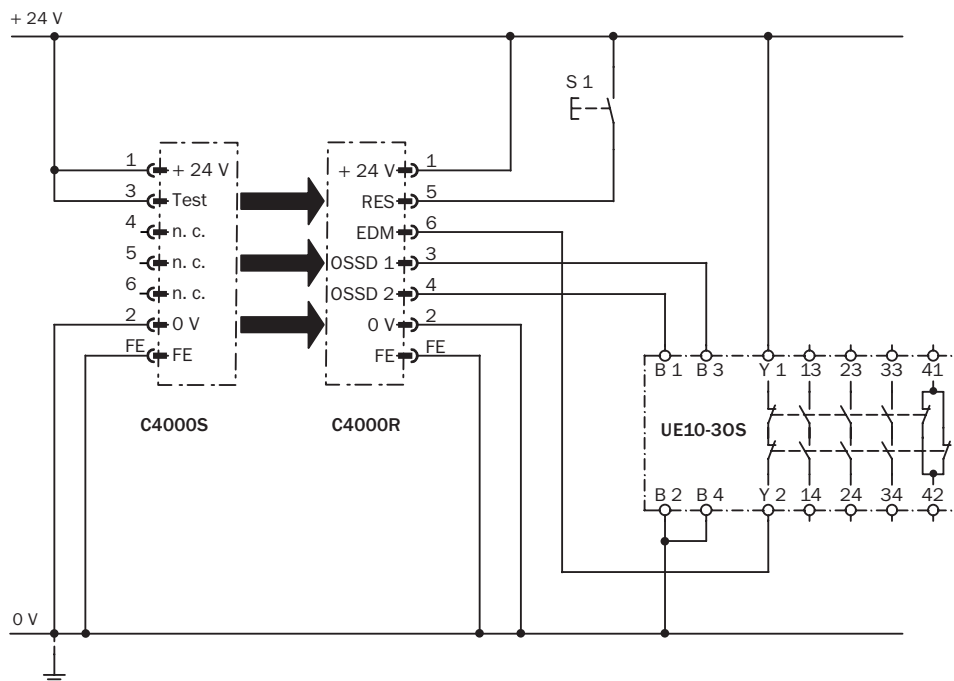
Housing with plug-in terminals

Dimensions in mm

N

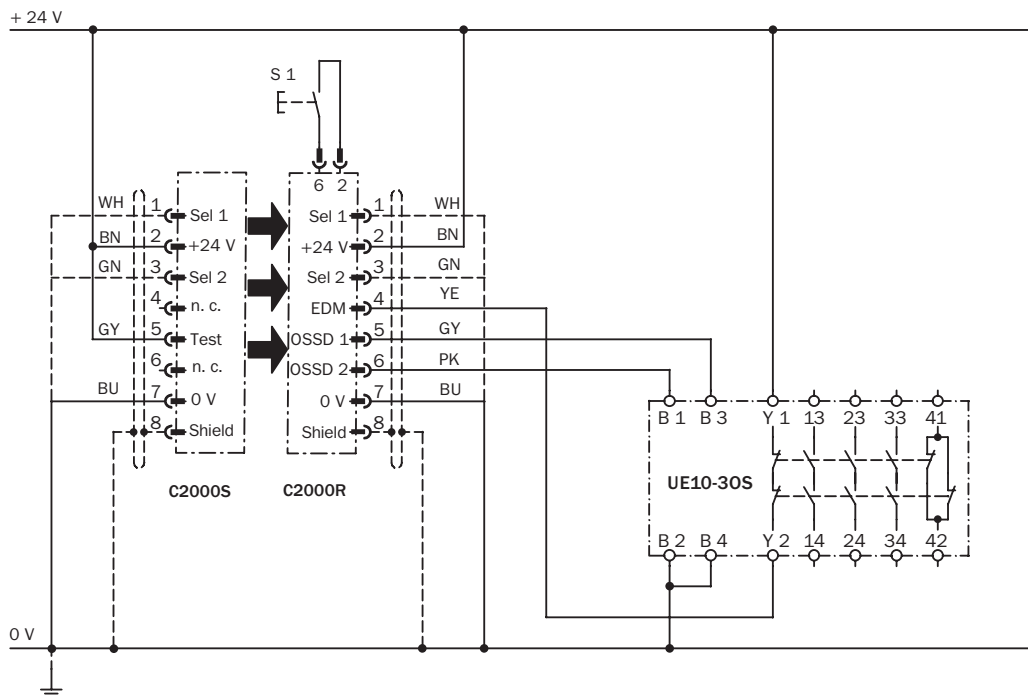
## Connection diagrams

### Safety light curtain C4000 Standard/Advanced connected to UE10-30S safety relay



Operating mode: with manual reset and external device monitoring (active)

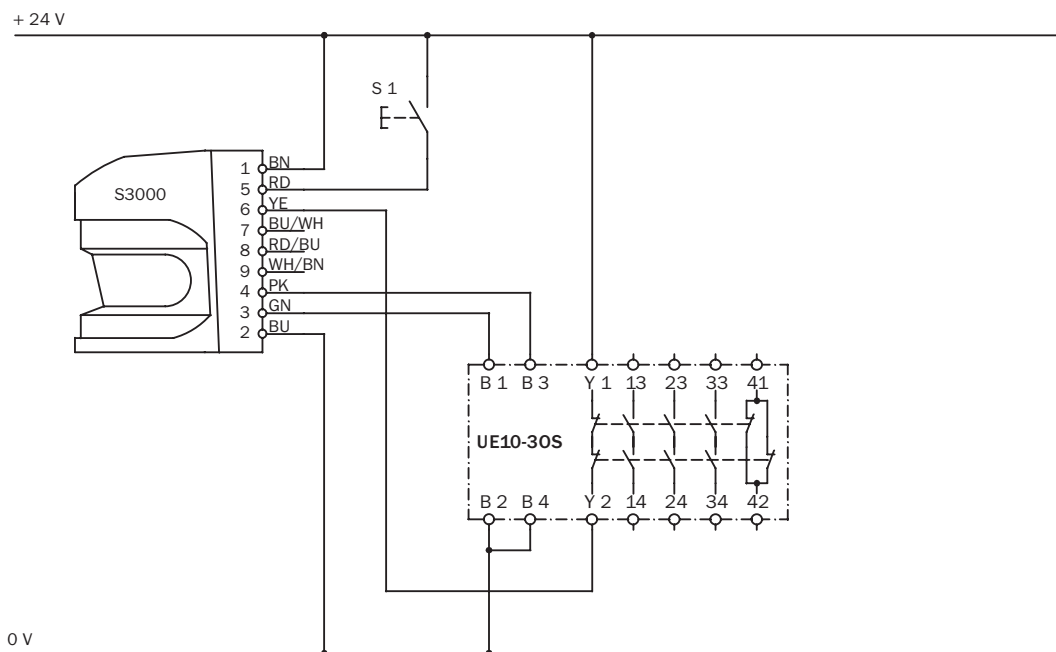
### Safety light curtain C2000 (EDM/RES) connected to UE10-30S safety relay



Operating mode: with manual reset and external device monitoring

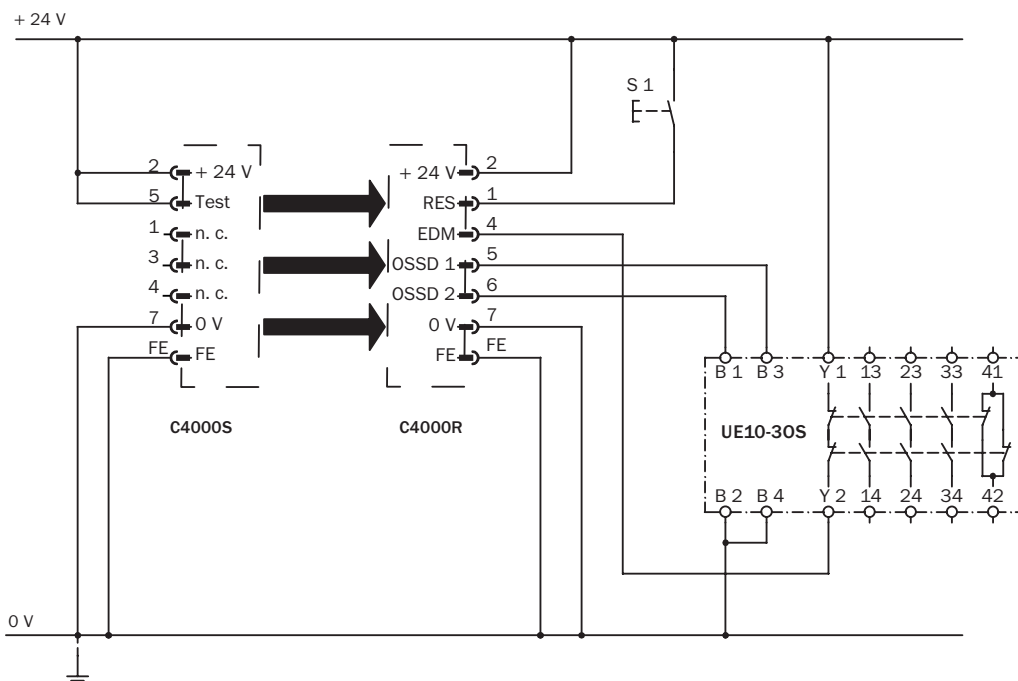
Continued on next page

Safety laser scanner S3000 Standard connected to UE10-30S safety relay



Operating mode: with manual reset and external device monitoring

Safety light curtain C4000 Micro connected to UE10-30S safety relay



Operating mode: with manual reset and external device monitoring

N



## Overview of technical specifications

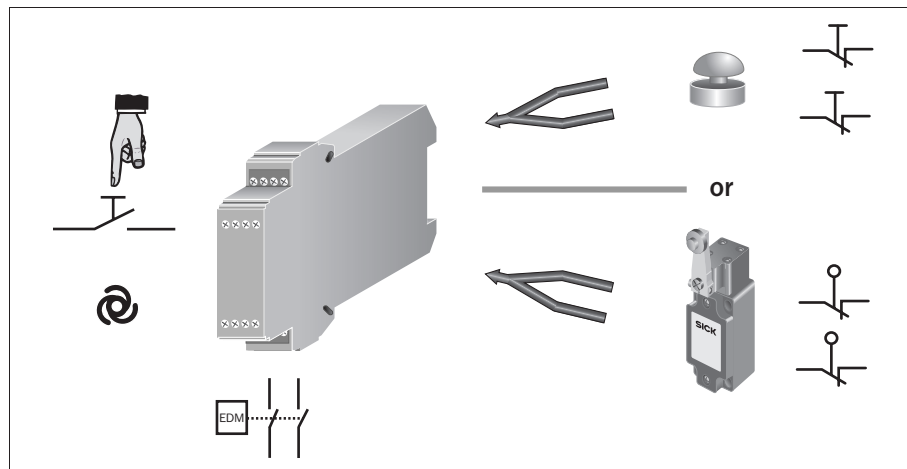
Category according to EN 954-1	4 <sup>1)</sup>
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Single-channel
Housing width	22.5 mm

<sup>1)</sup> The wires for the input and output signals shall be routed outside the control cabinet according to the category to be used.

## Product description

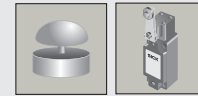
- 2 LEDs:
  - Supply voltage
  - Relay K1, K2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Screw-type terminals

## Applications

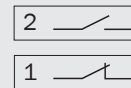


## Ordering information

Supply voltage	Type	Part number
24 V DC	UE23-2MF2D3	6026146
115 ... 120 V AC	UE23-2MF2A4	6026147
230 V AC	UE23-2MF2A3	6026148



- For emergency stops
- For safety switches



Further information	Page
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→ Technical specifications	N-10
→ Internal circuitry	N-11
→ Dimensional drawings	N-12
→ Expansion modules	N-71 N-74
→ Services	A-2

## Detailed technical specifications

### General system data

Protection class according to EN 50178		II, double insulated
Category according to EN 954-1		4 <sup>1)</sup>
Stop category according to EN 60204		0
Supply voltage/Input circuit V <sub>S</sub> (A1 - A2)	UE23-2MF2D2 UE23-2MF2A4 UE23-2MF2A3	24 V DC (20.4 V DC ... 26.4 V DC) 115/120 V AC (98 V AC ... 132 V AC) 230 V AC (196 V AC ... 253 V AC)
Power consumption	AC DC	2.7 VA 1.6 W
Residual ripple in DC mode (within the limits of V <sub>S</sub> )		2.4 V <sub>SS</sub>
Nominal frequency in AC mode		50 Hz ... 60 Hz

### Control voltage (Y1 - Y2 - Y3)

Control voltage		40 V DC
Control current		200 mA
Fuse		PTC resistor
Reset time	Manual (Y3) Automatic (Y2)	70 ms 600 ms
Galvanic separation (only on AC units)		Yes

### Output circuits (13 - 14, 23 - 24, 31 - 32)

Response time (K1 / K2)		30 ms ... 80 ms
Relay contacts		2 N/O, enable current paths, safety relevant 1 N/C, signalling current path, not safety relevant
Contact type		Positively guided
Contact material		Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 12 A
Application category according to EN 60947-5-1		AC-15 U <sub>e</sub> 230 V AC, I <sub>e</sub> 4 A (360 c/h) AC-15 U <sub>e</sub> 230 V AC, I <sub>e</sub> 3 A (3600 c/h) DC-13 U <sub>e</sub> 24 V DC, I <sub>e</sub> 4 A (360 c/h) DC-13 U <sub>e</sub> 24 V DC, I <sub>e</sub> 2.5 A (3600 c/h)
Permitted switching frequency		3600 c/h
Service life, mechanical (relay contacts)		1 x 10 <sup>7</sup> switching cycles
Service life, electrical (dependent on the load)		2 x 10 <sup>6</sup> switching cycles

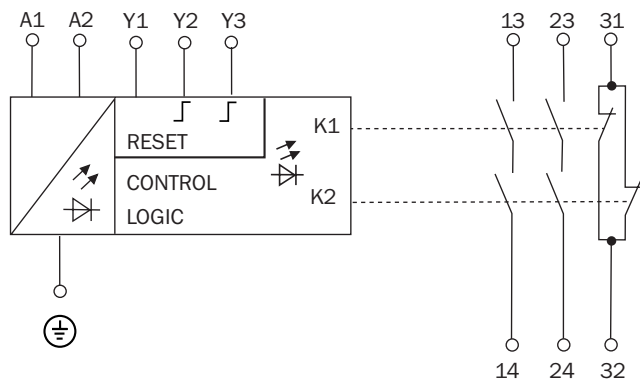
### Operating data

Surge voltage rating (U <sub>Imp.</sub> )		4 kV
Excess voltage category		III
Contamination rating of the unit (EN 50178)	External Internal	3 2
Voltage rating		300 V AC
Test voltage U <sub>eff</sub> (50 Hz) EN 60439-1		2.0 kV

<sup>1)</sup> The wires for the input and output signals shall be routed outside the control cabinet according to the category to be used

Enclosure rating	Housing Terminals	IP 40 IP 20
Radio interference		DIN EN 61000-6-4
Screening against interference		DIN EN 61000-6-2
Ambient operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +75 °C
Wire cross-sections	Single strand wire (2 x, identical cross section) Single strand wire (1 x) Fine stranded wire with terminal crimps (2 x, identical cross section) Fine stranded wire with terminal crimps (1 x)	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup> 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Weight		0.27 kg

## Internal circuitry



### Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain in the open state. If the connected sensor is not activated (i.e. the input circuits are closed), then the normally open contacts close immediately in automatic Reset (LED "K1, K2" illuminates). In the case of manual reset, this only occurs after pressing the reset button.

### External device monitoring (EDM)

The unit can take over the function of external device monitoring. The contactor monitoring system monitors the external relays through their normally closed contacts.

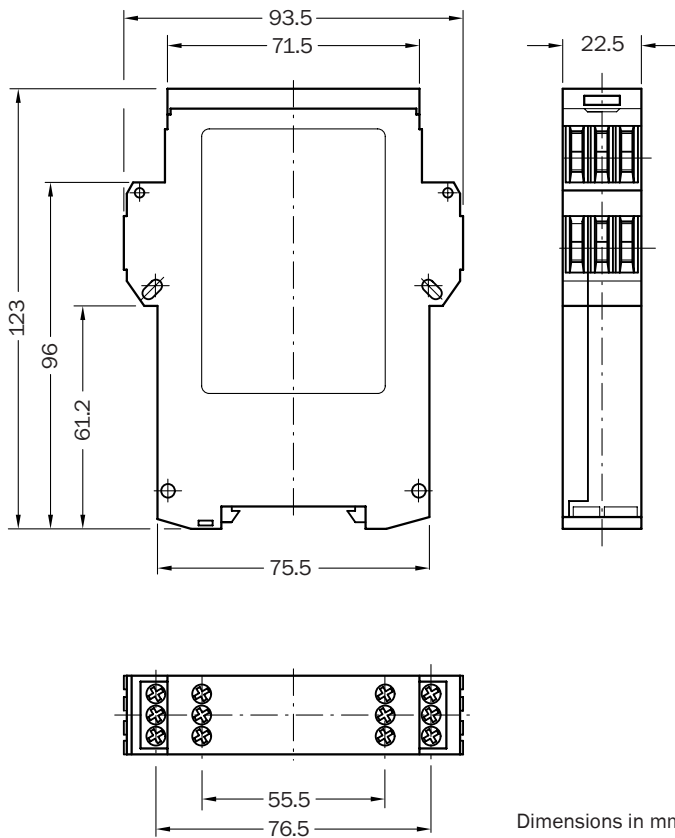
### Manual reset

For manual resetting a pushbutton must be connected to terminals Y1 and Y3. This reset is monitored.

### Automatic reset

For automatic resetting, Y1 - Y2 must be linked.

# Dimensional drawings



Dimensions in mm

Housing with screw-type terminals

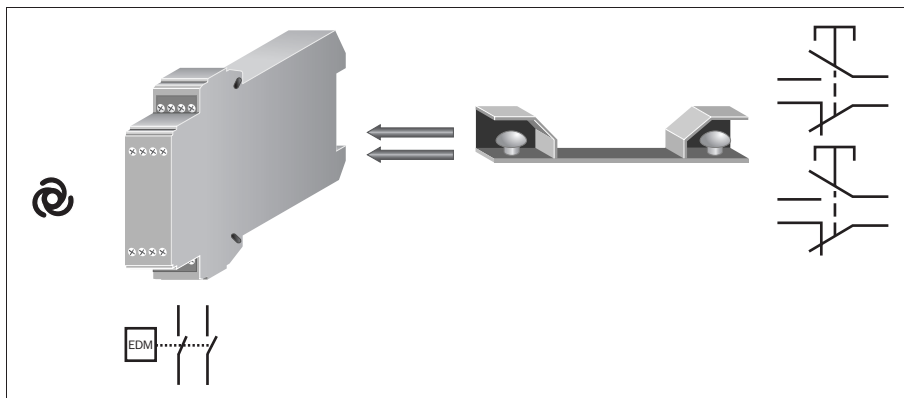
## Overview of technical specifications

Category according to EN 954-1	4
Requirements in accordance with EN 574	Type III C
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Dual-channel
Housing width	22.5 mm

## Product description

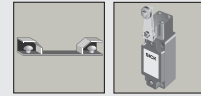
- 3 LEDs for:
  - Supply voltage
  - Relay K1
  - Relay K2
- Automatic start
- Increase in the number of outputs by way of the expansion unit UE10-4XT
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications

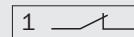
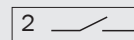


## Ordering information

Connection type	Type	Part number
Screw-type terminals	UE42-2HD2D2	6024878
Plug-in terminals	UE42-2HD3D2	6024881



- For two-hand controls Typ III C in accordance with EN 574
- For safety switches



Further information	Page
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## Detailed technical specifications

### General system data

Voltage supply to A1 / A2	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Category according to EN 954-1		4
Supply voltage $V_S$ (A1 / A2)		24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	AC DC	2.7 VA 1.5 W
Residual ripple in DC mode (within the limits of $V_S$ )		2.4 $V_{SS}$
Nominal frequency in AC mode		50 Hz ... 60 Hz

### Control voltage (Y11 - Y21)

Control voltage		24 V DC
Control current		60 mA
Short-circuit current between Y11 and A2		1000 mA
Fuse		PTC resistor
Galvanic separation between A1 / A2 and Y11 / Y21		No

### Input circuits (Y12 - Y14 and Y22 - Y23)

Input current		60 mA
Reset time		40 ms
Activation time tolerance between the two start buttons		500 ms
Minimum switch-off time		250 ms
Line resistance at the input circuit		< 70 $\Omega$
Switch-on time (upon applying the supply voltage)		250 ms

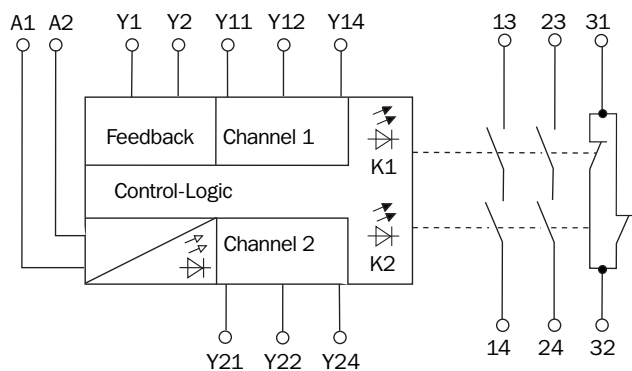
### Output circuits (13 - 14, 23 - 24, 31 - 32)

Response time (K1 / K2)		50 ms
Relay contacts		2 N/O, enable current paths, safety relevant 1 N/C, signalling current path, not safety relevant
Contact type		Positively guided
Contact material		Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 12 A
Application category according to EN 60947-5-1		AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h) AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h)
Permitted switching frequency		3600 c/h
Service life, mechanical (relay contacts)		$1 \times 10^7$ switching cycles
Service life, electrical (dependent on the load)		$2 \times 10^6$ switching cycles

## Operating data

Surge voltage rating ( $U_{imp.}$ )		4 kV
Excess voltage category		III
Contamination rating of the unit (EN 50178)	External	3
	Internal	2
Voltage rating		300 V AC
Test voltage $U_{eff}$ (50 Hz) EN 60439-1		2.0 kV
Enclosure rating	Housing	IP 40
	Terminals	IP 20
Radio interference		EN 60947-1 02/99
Screening against interference		EN 60947-1 02/99
Ambient operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +75 °C
Wire cross-sections	Single strand wire (2 x, identical cross section)	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup>
	Single strand wire (1 x)	0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (1 x)	0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Weight		0.2 kg

## Internal circuitry



### Function

The UE42-2HD unit corresponds to EN 574 Type III C. A prerequisite for the release of the outputs is that the two inputs (e.g. two-hand pushbuttons) are actuated within 0.5 sec. After applying the supply voltage to the terminals A1 - A2 the LED SUPPLY illuminates to indicate that electrical power is present. Pressing the two-hand pushbuttons S1 and S2 at the same time (see page N-17 - connection diagrams) closes the two normally open contacts. Releasing even one of the buttons will cause the circuits to adopt the open circuit status.

A renewed attempt to initiate starting is only possible if both start buttons are set to their nominal start position (for two-hand pushbuttons units: if both have been released) and the normally closed contact is closed.

### External device monitoring (EDM)

The UE42-2HD can take over the function of external device monitoring. The normally closed contacts of the external relays are switched in series, connected to the terminals Y1 - Y2.

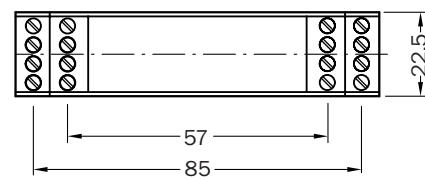
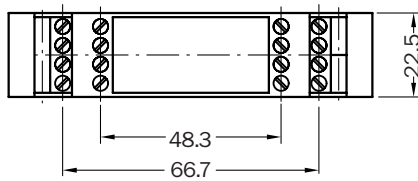
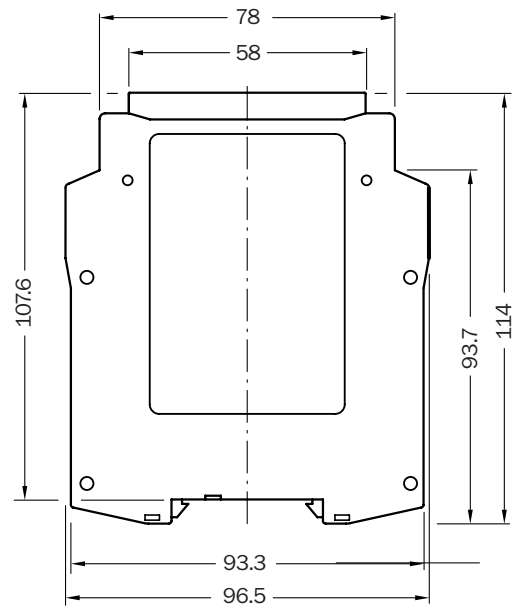
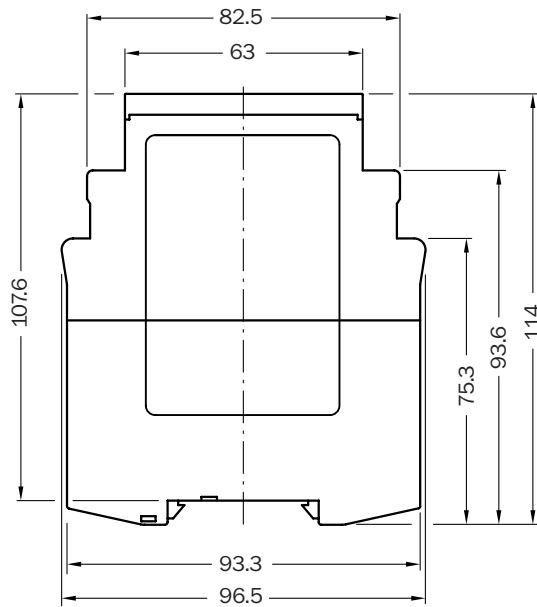
### Automatic start

The UE42-2HD has an automatic start facility.

### Monitoring of simultaneous activation

The pressing of the start buttons at the same time is monitored. Only when both start buttons are activated within 0.5 sec do normally open contacts close and the normally closed contact opens.

# Dimensional drawings



Housing with screw-type terminals

Housing with plug-in terminals

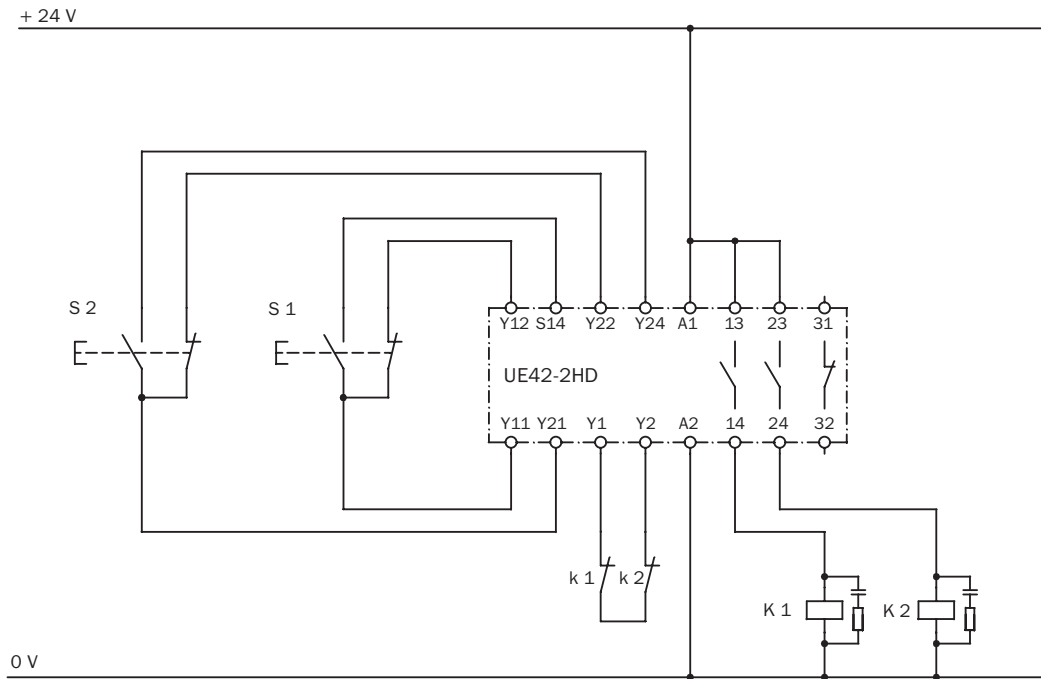
Dimensions in mm

N



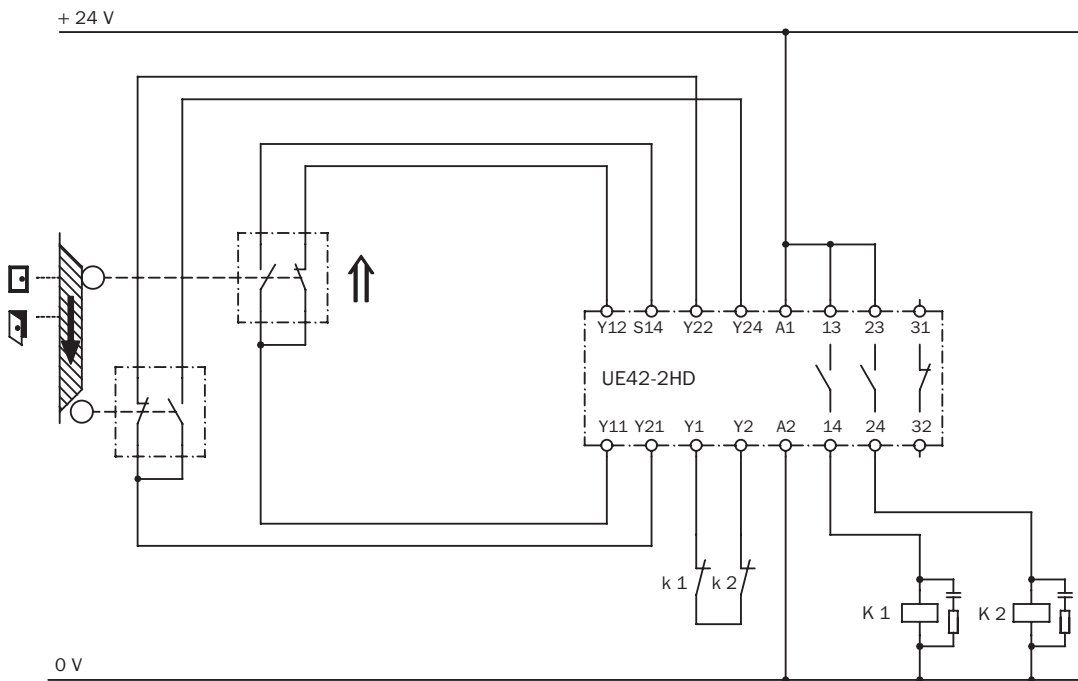
## Connection diagrams

### Two-hand control with UE42-2HD safety relay, dual-channel system



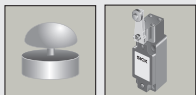
Operating mode: with automatic start and external device monitoring (EDM)

### Two safety switches connected to UE42-2HD safety relay, dual-channel system

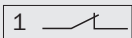
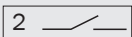


Operating mode: with automatic reset and external device monitoring (EDM)

N



- For emergency stops
- For safety switches



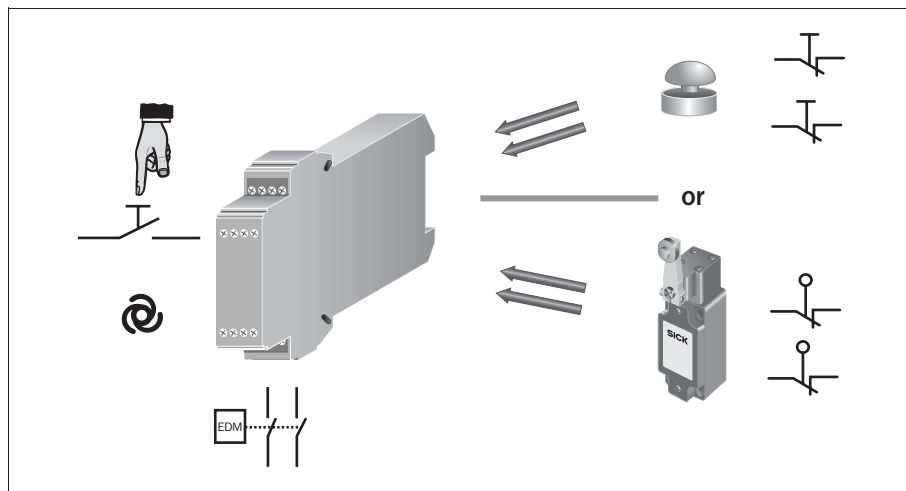
## Overview of technical specifications

Category according to EN 954-1	4
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Dual-channel
Housing width	22.5 mm

## Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K1
  - Relay K2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications



## Ordering information

Connection type	Type	Part number
Screw-type terminals	UE43-2MF2D2	6024893
Plug-in terminals	UE43-2MF3D2	6024894

Further information	Page
→ Symbols	N-2
→ Internal circuitry	N-20
→ Dimensional drawings	N-21
→ Connection diagram	N-22
→ Expansion modules	N-71 N-74
→ Services	A-2

N

## Detailed technical specifications

### General system data

Voltage supply to A1 / A2 Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Category according to EN 954	4
Stop category according to EN 60204	0
Supply voltage $V_S$ (A1 / A2)	24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	AC 4.6 VA DC 2.1 W
Residual ripple in DC mode (within the limits of $V_S$ )	2.4 $V_{SS}$
Nominal frequency in AC mode	50 Hz ... 60 Hz

### Control voltage S33 / S11 and S21

Control voltage	17.4 V DC ... 22 V DC
Control current	40 mA ... 100 mA
Short-circuit current between S33 / S11 and S21	2000 mA
Fuse	PTC resistor
Reaction time by cross connection	3 s
Activation time upon detection of cross connection	3 s
Galvanic separation between A1 / A2 and S21, S11, S33	No

### Input circuits (S12, S31, S22, S34, S35)

Input current S12 and S31 / S22	40 mA ... 100 mA
Input current S34 / S35	5 mA ... 50 mA
Reset time	Manual (S34) 40 ms Automatic (S35) 200 ms ... 500 ms
Activation time of reset button	50 ms
Line resistance at the input circuit	< 35 $\Omega$
Synchronisation time	500 ms

### Output circuits (13 - 14, 23 - 24, 31 - 32)

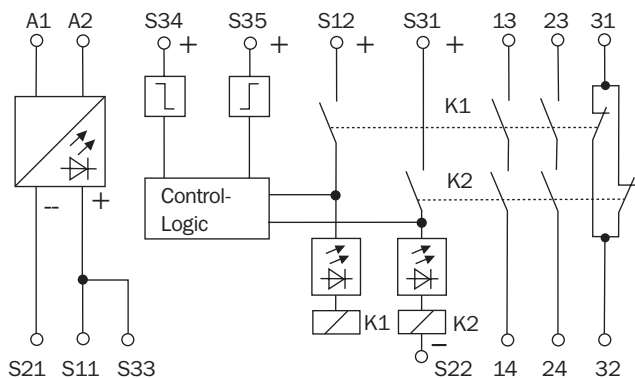
Response time (K1 / K2)	25 ms
Minimum time outputs will stay off	40 ms
Relay contacts	2 N/O, enable current paths, safety relevant 1 N/C, signalling current path, not safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	Switching voltage 10 V AC ... 230 V AC / 10 V DC ... 30 V DC Switching current 10 mA ... 6 A Total current across all contacts 12 A
Application category according to EN 60947-5-1	AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h) AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h)
Service life, mechanical (relay contacts)	1 x 10 <sup>7</sup> switching cycles
Service life, electrical (dependent on the load)	1 x 10 <sup>5</sup> switching cycles

Continued on next page

**Operating data**

Surge voltage rating (U <sub>Imp.</sub> )		4 kV
Excess voltage category		III
Contamination rating of the unit (EN 50178)	External	3
	Internal	2
Voltage rating		300 V AC
Test voltage U <sub>eff</sub> (50 Hz) EN 60439-1		2.0 kV
Enclosure rating	Housing	IP 40
	Terminals	IP 20
Radio interference		DIN EN 61000-6-4
Screening against interference		DIN EN 61000-6-2
Ambient operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +75 °C
Wire cross-sections	Single strand wire (2 x, identical cross section)	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup>
	Single strand wire (1 x)	0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (1 x)	0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Weight		0.2 kg

**Internal circuitry**



**Function**

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain in the opened state. If the connected sensor is not activated (i.e. the input circuits are closed), then the normally open contacts close immediately in automatic reset (LED K1 and K2 illuminate). In the case of manual reset, this only occurs after pressing and releasing the reset button. Activation of the sensor (opening of one or both input circuits) effects the opening of the normally open outputs.

**External device monitoring (EDM)**

The UE43-2MF unit can take over the function of external device monitoring. The contactor monitoring system monitors the external relays by means of their normally closed contacts.

**Manual reset**

For manual resetting a pushbutton must be connected to terminals S33 - S34. Reset is monitored.

**Automatic reset**

For automatic resetting, S12 - S35 must be linked.

**Cross circuit detection**

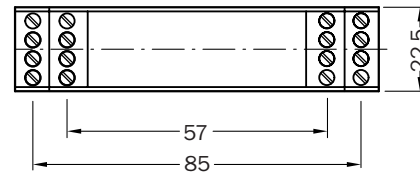
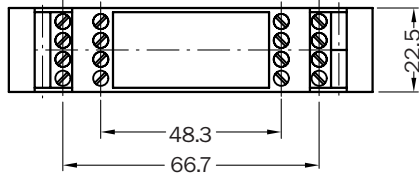
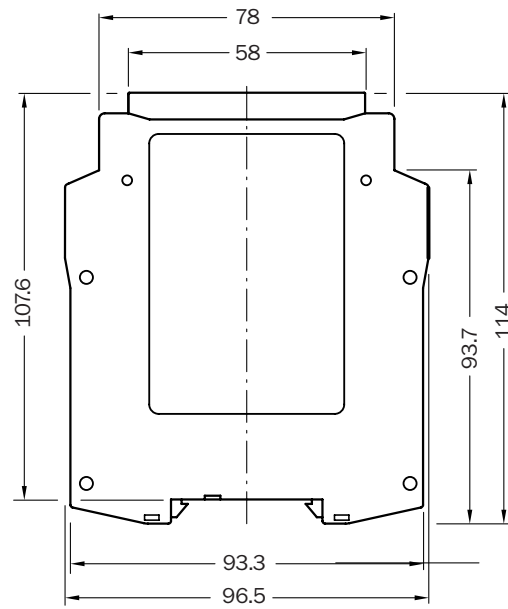
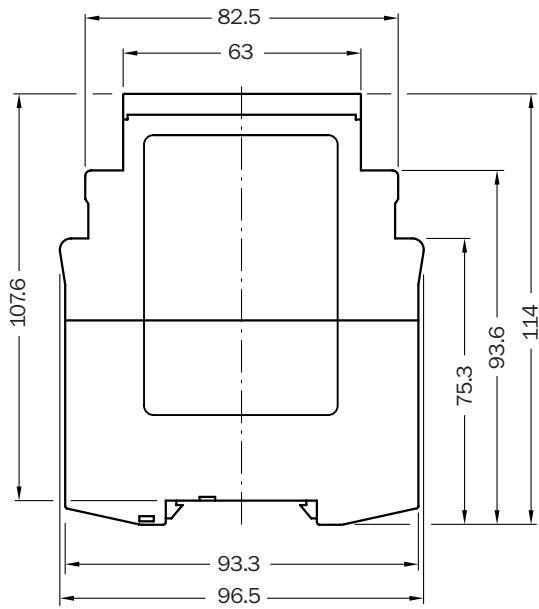
Cross circuit is detected on dual-channel wired systems if these are wired with opposing polarity.

**Monitoring of synchronisation**

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

N

## Dimensional drawings



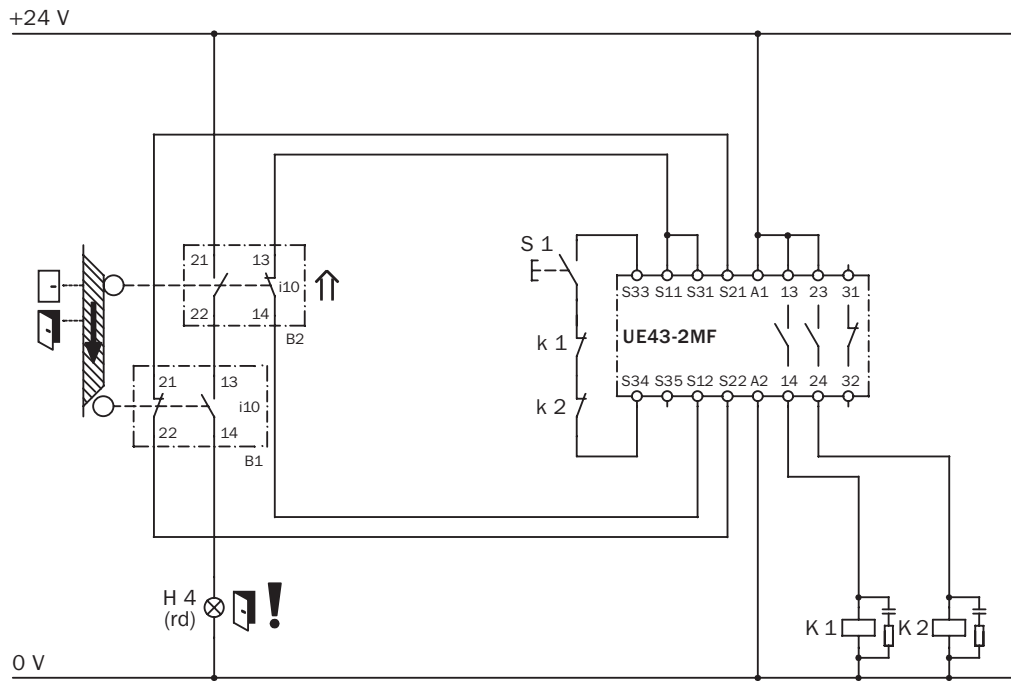
Housing with screw-type terminals

Housing with plug-in terminals

Dimensions in mm

# Connection diagram

## Two safety switches i10 to UE43-2MF safety relay, dual-channel system



Operating mode: with manual reset and external device monitoring (EDM)

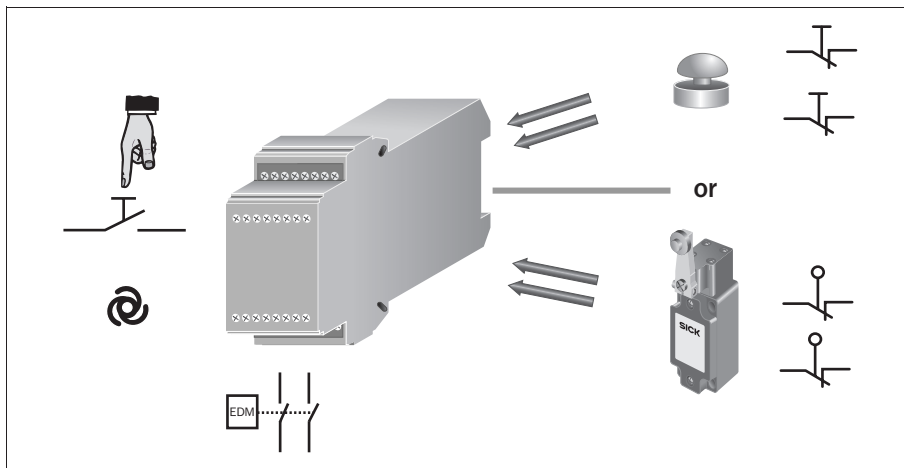
## Overview of technical specifications

Category according to EN 954-1	4
Number of enable current paths/signalling current paths	3 / 1
Input circuit	Single- or dual-channel
Housing width	45 mm

## Product description

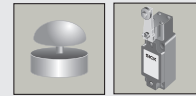
- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K2
  - Relay K3
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion units
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)

## Applications

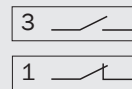


## Ordering information

Supply voltage	Type	Part number
24 V DC	UE43-3MF2D3	6024897
24 V AC	UE43-3MF2A0	6024898
115 V AC	UE43-3MF2A1	6024899
120 V AC	UE43-3MF2A2	6024900
230 V AC	UE43-3MF2A3	6024901



- For emergency stops
- For safety switches



Further information	Page
→ Symbols	N-2
→ Technical specifications	N-24
→ Internal circuitry	N-26
→ Dimensional drawings	N-27
→ Connection diagram	N-27
→ Expansion modules	N-71 N-74
→ Services	A-2

## Detailed technical specifications

### General system data

Voltage supply to A1 / A2 for DC units	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Voltage supply to A1 / A2 for AC units		Use of earth conductor terminal
Category according to EN 954-1		4
Stop category according to EN 60204		0
Supply voltage $V_S$	UE43-3MF2D3 UE43-3MF2A0 UE43-3MF2A1 UE43-3MF2A2 UE43-3MF2A3	24 V DC (20.4 V DC ... 26.4 V DC) 24 V AC (20.4 V AC ... 26.4 V AC) 115 V AC (97.75 V AC ... 126.5 V AC) 120 V AC (102.0 V AC ... 132.0 V AC) 230 V AC (195.5 V AC ... 253.0 V AC)
Power consumption	AC DC	2.5 W / 3.2 VA 1.0 W
Residual ripple in DC mode (within the limits of $V_S$ )		2.4 $V_{SS}$
Nominal frequency in AC mode		50 Hz ... 60 Hz

### Control voltage Y11 and Y21

Control voltage		24 V DC
Control current		40 mA
Short-circuit current between Y11 and A2		1000 mA
Fuse	AC units DC units	Short circuit resistant transformer PTC resistor
Reaction time by cross connection		3 s
Galvanic separation between A1 / A2 and Y11 - Y21 - PE (only on AC units)		Yes

### Input circuits (Y12 and Y31 - Y22)

Input current Y12 and Y31		15 mA
Input current Y13 and Y14 (reset circuit)		40 mA
Reset time	Manual (Y13) Automatic (Y14)	150 ms ... 250 ms 0.8 s ... 1.2 s
Synchronisation time		500 ms
Line resistance at the input circuit		< 70 $\Omega$
Input time upon applying supply voltage		100 ms

### Output circuits (13 - 14, 23 - 24, 33 - 34, 41 - 42)

Response time (K2 / K3)		50 ms
Relay contacts		3 N/O, enable current paths, safety relevant 1 N/C, signalling current path, not safety relevant
Contact type		Positively guided
Contact material		Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 18 A
Application category according to EN 60947-5-1		AC-15 $U_e$ 230 V AC, $I_e$ 6 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 6 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h)



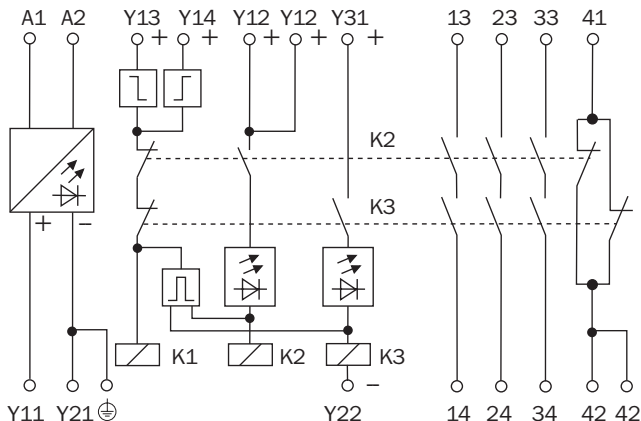
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	$1 \times 10^7$ switching cycles
Service life, electrical (dependent on the load)	$2 \times 10^6$ switching cycles

### Operating data

Surge voltage rating ( $U_{imp.}$ )	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	External Internal
	3 2
Voltage rating	300 V AC
Test voltage $U_{eff}$ (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	Housing Terminals
	IP 40 IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	-25 °C ... +55 °C
Storage temperature	-25 °C ... +75 °C
Wire cross-sections	
Single strand wire (2 x, identical cross section)	0.75 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Single strand wire (1 x)	0.75 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Fine stranded wire with terminal crimps (2 x, identical cross section)	0.5 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
Fine stranded wire with terminal crimps (1 x)	0.5 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>

Weight	AC units	0.36 kg
	DC units	0.30 kg

## Internal circuitry



### Function

After applying the supply voltage (LED SUPPLY illuminates) the normally open contacts remain open. If the connected sensor is not activated (i.e. the input circuits are closed), the normally open contacts close immediately in automatic reset (LED K2 and K3 illuminate). In the case of manual resetting, this is only effected upon pressing and releasing the reset button.

Activation of the sensor (opening of one or both input circuits) effects the opening of the normally open contacts (LED K2 and K3 off).

### External device monitoring (EDM)

The UE43-3MF unit can take over the external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

### Manual reset

For manual resetting a pushbutton must be connected to terminals Y12 and Y13. Reset is monitored.

### Automatic reset

For automatic resetting Y12 - Y14 must be linked.

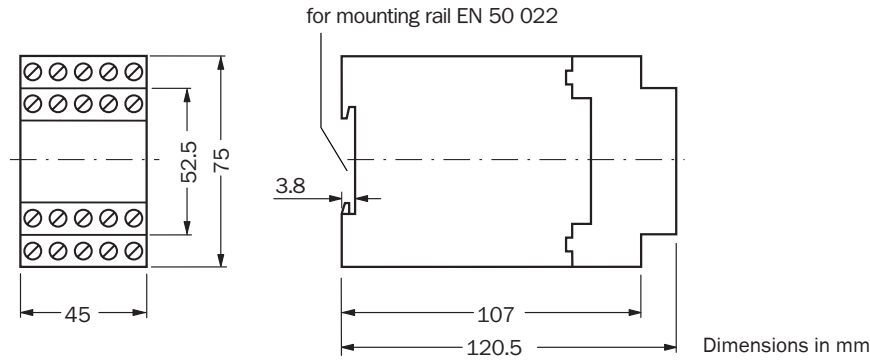
### Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

### Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

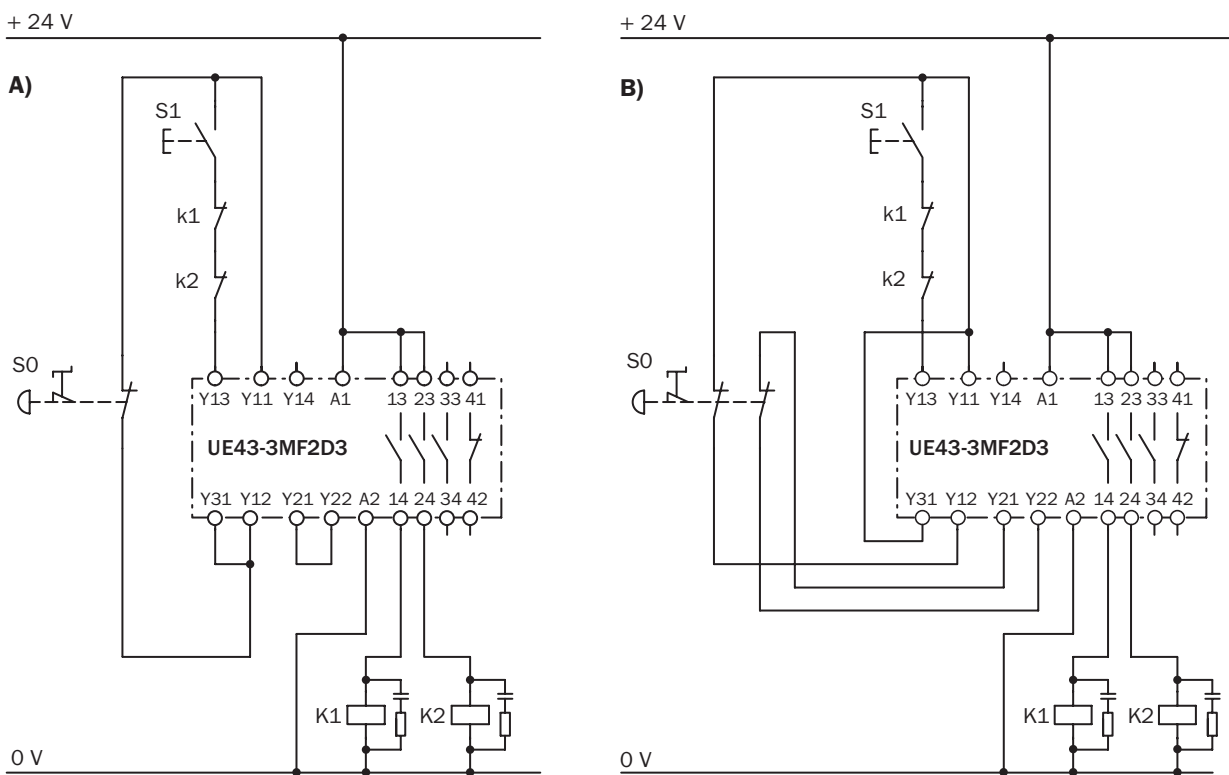
## Dimensional drawings



Housing with screw-type terminals

## Connection diagram

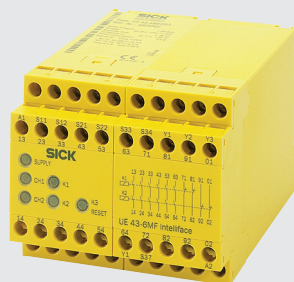
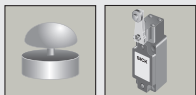
Emergency stop switch connected to UE43-3MF2D3 safety relay



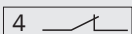
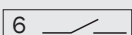
Operating mode: with manual reset and external device monitoring

- A) single-channel system
- B) dual-channel system

N



- For emergency stops
- For safety switches



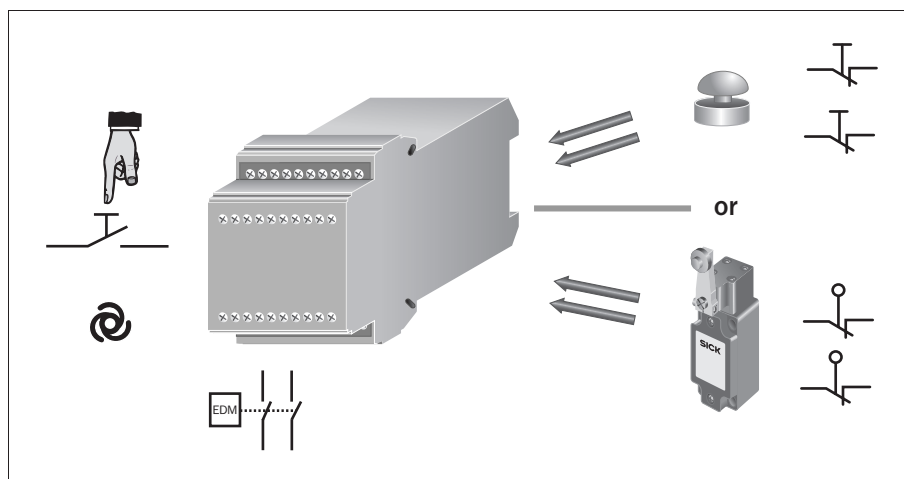
## Overview of technical specifications

Category according to EN 954-1	4
Number of enable current paths/signalling current paths	6 / 4
Input circuit	Single- or dual-channel
Housing width	90 mm

## Product description

- Cross circuit detection on dual-channel wired systems
- 6 LEDs:
  - Supply voltage
  - Input circuit CH1
  - Input circuit CH2
  - Relay K1
  - Relay K2
  - Relay K3 RESET
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)

## Applications



## Ordering information

Supply voltage	Type	Part number
24 V DC	UE43-6MF2D3	6024902
120 V AC	UE43-6MF2A2	6024905
230 V AC	UE43-6MF2A3	6024906

N

Further information	Page
→ Symbols	N-2
→ Internal circuitry	N-31
→ Dimensional drawings	N-31
→ Expansion modules	N-71 N-74
→ Services	A-2

## Detailed technical specifications

### General system data

Voltage supply to A1 / A2 for DC units	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Voltage supply to A1 / A2 for AC units		Use of earth conductor terminal
Category according to EN 954-1		4
Stop category according to EN 60204		0
Supply voltage $V_S$ (A1 / A2)	UE43-6MF2D3 UE43-6MF2A2 UE43-6MF2A3	24 V DC (20.4 V DC ... 26.4 V DC) 120 V AC (102.0 V AC ... 132.0 V AC) 230 V AC (195.5 V AC ... 253.0 V AC)
Power consumption	AC DC	4.2 W / 4.5 VA 2.4 W
Residual ripple in DC mode (within the limits of $V_S$ )		2.4 $V_{SS}$
Nominal frequency in AC mode		50 Hz ... 60 Hz

### Control voltage S11 and S21

Control voltage		24 V DC
Control current		40 mA
Short circuit current (between Y11 and A2)		1000 mA
Fuse	AC units DC units	Short-circuit resistant transformer PTC resistor
Reaction time by cross connection (DC unit)		3 s
Galvanic separation between A1 - 2 and Y11 - Y21 - PE (only on AC units)		Yes

### Input circuits (S12 - S22 and Y3 - S22)

Input current		40 mA
Reset time	Manual Automatic	350 ms 500 ms
Synchronisation time		500 ms
Line resistance at the input circuit		< 85 $\Omega$
Switch-on time upon applying the supply voltage (AC units)		100 ms

### Output circuits (13 - 14, 23 - 24, 33 - 34, 43 - 44, 53 - 54, 63 - 64, 71 - 72, 81 - 82, 91 - 92, 01 - 02)

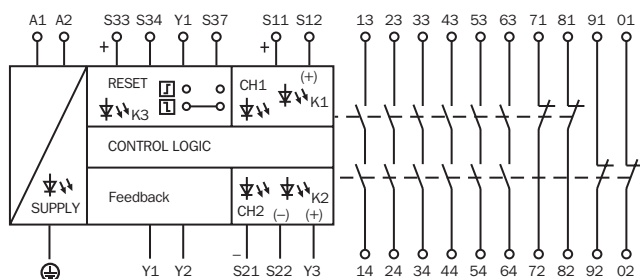
Response time (K1 / K2)		60 ms
Relay contacts		6 N/O, enable current paths, safety relevant 4 N/C, signalling current paths, not safety relevant
Contact type		Positively guided
Contact material		Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 24 A
Application category according to EN 60947-5-1		AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 6 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 2 A (3600 c/h)
Permitted switching frequency		3600 c/h
Service life, mechanical (relay contacts)		1 x 10 <sup>7</sup> switching cycles
Service life, electrical (dependent on the load)		2 x 10 <sup>6</sup> switching cycles

Continued on next page

**Operating data**

Surge voltage rating (U <sub>Imp.</sub> )		4 kV
Excess voltage category		III
Contamination rating of the unit (EN 50178)	External	3
	Internal	2
Voltage rating		300 V AC
Test voltage U <sub>eff</sub> (50 Hz) EN 60439-1		2.0 kV
Enclosure rating	Housing	IP 40
	Terminals	IP 20
Radio interference		DIN EN 61000-6-4
Screening against interference		DIN EN 61000-6-2
Ambient operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +75 °C
Wire cross-sections	Single strand wire (2 x, identical cross section)	0.75 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
	Single strand wire (1 x)	0.75 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (2 x, identical cross section)	0.5 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (1 x)	0.5 mm <sup>2</sup> ... 1.5 mm <sup>2</sup>
Weight		0.8 kg

## Internal circuitry



### Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated, the LEDs CH1 and CH2 illuminate. In the case of automatic resetting, the normally open contacts close immediately (LEDs K1 and K2 illuminate). With manual resetting the normally open contacts only close upon pressing and releasing the reset button.

The activation of the sensor (opening of one or both input circuits) effects the opening of the normally open contacts (LEDs K1 and K2 off).

### External device monitoring (EDM)

The UE43-6MF unit can take over the external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

### Manual reset

For manual reset a pushbutton is to be connected between contacts S12 and S34 and Y1 - S37 must be jumpered. This reset is monitored.

### Automatic reset

S12 - S34 must be jumpered. Y1 - Y37 is not jumpered.

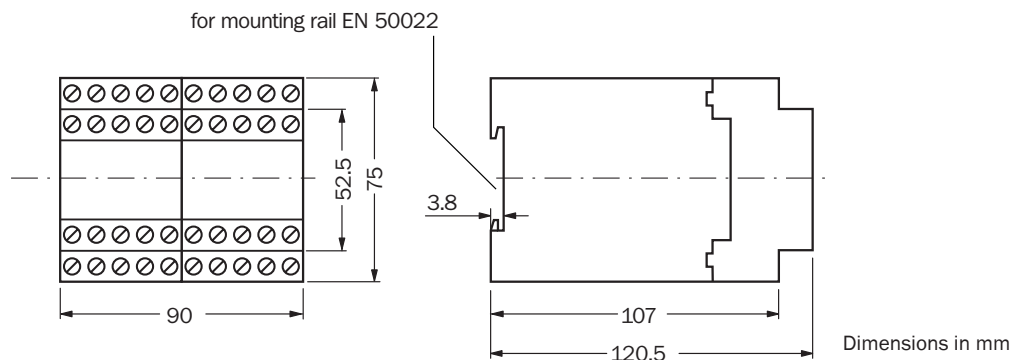
### Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

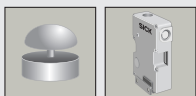
### Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

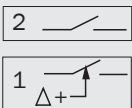
## Dimensional drawings



Housing with screw-type terminals



- For emergency stops
- For safety switches
- For safety switches with mechanical locking



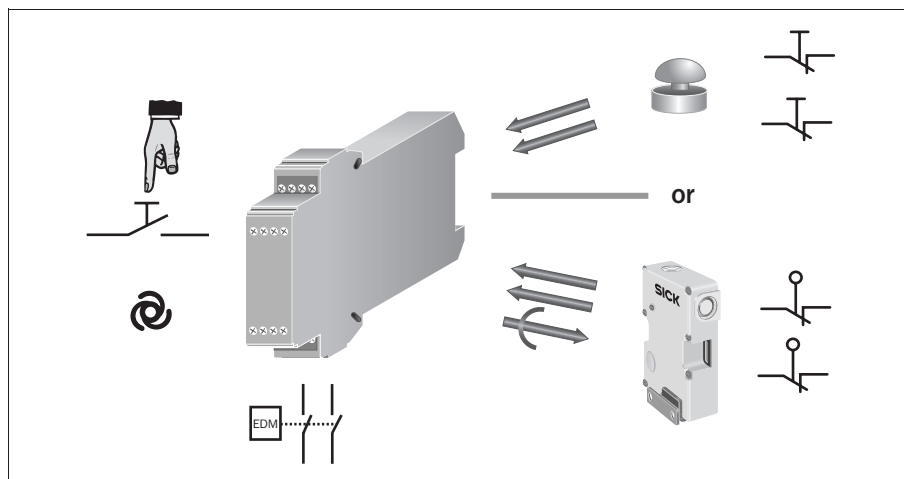
## Overview of technical specifications

Category according to EN 954-1	4
Number of enable current paths/signalling current paths	2 / 0
Number of on-delayed response time enable current paths	1
Input circuit	Single- or dual-channel
Housing width	22.5 mm

## Product description

- Cross circuit detection on dual-channel wired systems
- Outputs:
  - 2 normally open contacts
  - 1 on-delayed response time enable current path, adjustable from 0.15 ... 3 s or 1.5 ... 30 s
- 3 LEDs:
  - Supply voltage
  - Relay K1 / K2 (without delay)
  - Relay K3 / K4 (delayed)
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications



## Ordering information

On-delay time	Connection type	Type	Part number
0.15 s ... 3 s	Screw-type terminals	UE44-3SL2D33	6024907
	Plug-in terminals	UE44-3SL3D33	6024908
1.5 s ... 30 s	Screw-type terminals	UE44-3SL2D330	6024909
	Plug-in terminals	UE44-3SL3D330	6024910

Further information	Page
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→ Expansion modules	N-71 N-74
→ Services	A-2



## Detailed technical specifications

### General system data

Voltage supply to A1 / A2 for DC units	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Category according to EN 954-1		4
Stop category according to EN 60204		0
Supply voltage $V_S$		24 V DC (20.4 V DC ... 26.4 V DC)
Power consumption		1.8 W
Residual ripple in DC mode (within the limits of $V_S$ )		2.4 $V_{SS}$

### Control voltage S 11 - S33 and S21

Control voltage		22 V DC
Control current		60 mA
Short-circuit current between S 11 and A2		2200 mA
Fuse		PTC resistor
Reaction time by cross connection		2 s
Galvanic separation between A1 / A2 and S 11 - S21		No

### Input circuits (S 12 and S31)

Input current S 12 and S31		25 mA ... 100 mA
Input current S34 / S35 (reset circuit)		40 mA ... 50 mA
Reset time	Manual (S34) Automatic (S35)	30 ms 750 ms
Synchronisation time		500 ms
Activation time of reset button		250 ms
Line resistance at the input circuit		< 85 $\Omega$

### Output circuits (13 - 14, 23 - 24, 37 - 38)

Response time (K1 / K2)		25 ms
On-delay time (K3 / K4)	UE44-3SL xD3 3 UE44-3SL xD3 30	0.15 s ... 3 s 1.5 s ... 30 s
Relay contacts		2 N/O, enable current paths, Category 4 1 N/O, enable current path, on-delayed, Category 3
Contact type		Positively guided
Contact material		Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 12 A
Application category according to EN 60947-5-1		AC-15 $U_e$ 230 V AC, $I_e$ 4 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 5 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h)
Permitted switching frequency		3600 c/h
Service life, mechanical (relay contacts)		5 x 10 <sup>6</sup> switching cycles
Service life, electrical (dependent on the load)		2 x 10 <sup>6</sup> switching cycles

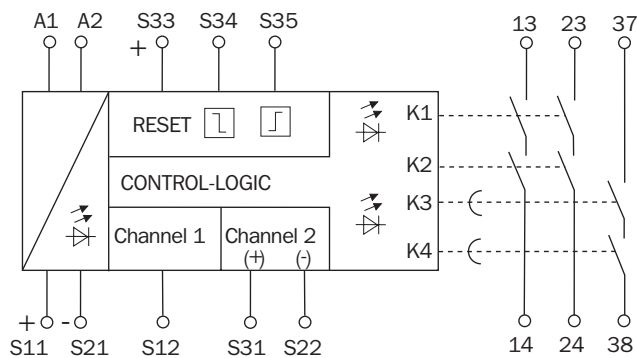
### Operating data

Surge voltage rating ( $U_{imp}$ )		4 kV
Excess voltage category		III

Continued on next page

Contamination rating of the unit (EN 50178)	External	3
	Internal	2
Voltage rating		300 V AC
Test voltage $U_{eff}$ (50 Hz) EN 60439-1		2.0 kV
Enclosure rating	Housing	IP 40
	Terminals	IP 20
Radio interference		EN 60947-1 02/99
Screening against interference		EN 60947-1 02/99
Ambient operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +75 °C
Wire cross-sections	Single strand wire (2 x, identical cross section)	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup>
	Single strand wire (1 x)	0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (1 x)	0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Weight		0.2 kg

## Internal circuitry



### Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts (13 - 14 / 23 - 24) remain open. After completion of the on-delay set on the relay, the delay circuit (37 - 38) closes, and the LED K3 / K4 illuminates. If the connected sensor is not activated (i.e. the input circuits are closed), the normally open contacts (13 - 14 / 23 - 24) close immediately during automatic reset, the LED K1 / K2 illuminates, and the delay circuit (37 - 38) opens (LED K3 / K4 off). In the case of manual reset, this only occurs after pressing and releasing the reset button.

The activation of the sensor (opening of one or both input circuits) effects the opening of both normally open contacts (13 - 14 / 23 - 24), with LED K1 / K2 being off, and a time delayed closing of the third circuit (37 - 38), with LED K3 / K4 illuminating.

### External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

### Manual reset

For manual resetting, a pushbutton is to be connected between 24 V DC supply and terminal S34. This reset is monitored. For applications with mechanical locking safety switches, only channel 2 must be closed during manual reset.

### Automatic reset

For automatic resetting S 12 - S35 must be linked. For applications with mechanical locking safety switches, only channel 1 must be closed during automatic reset.

### Cross circuit detection

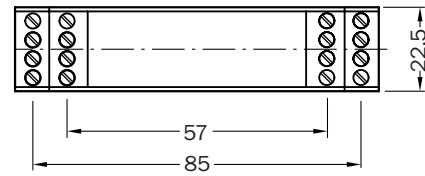
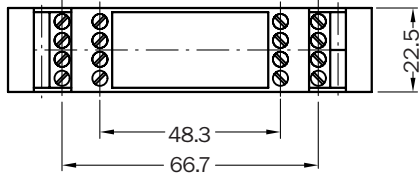
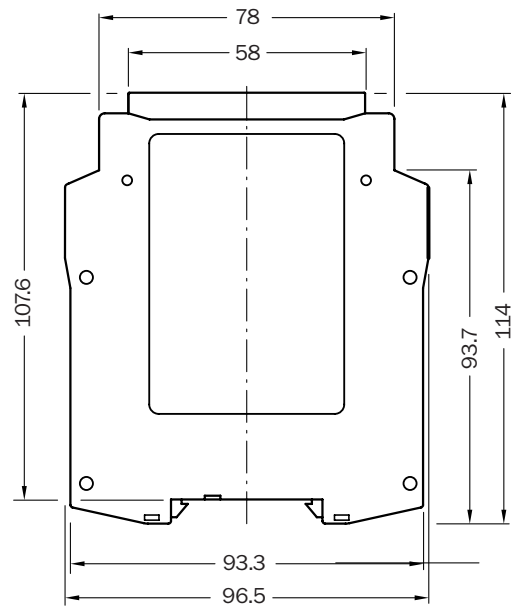
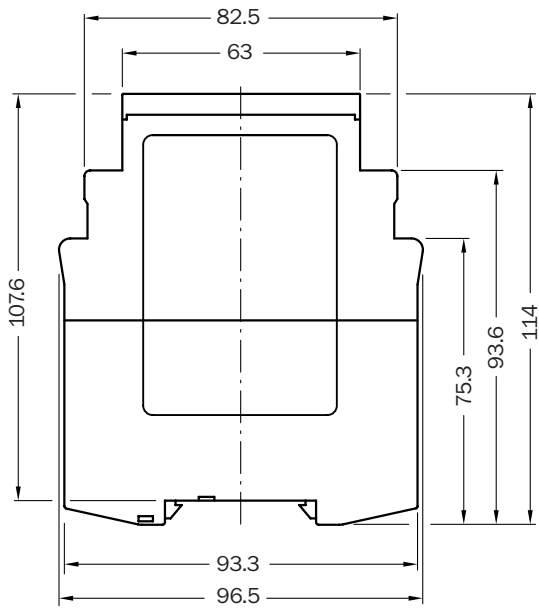
Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

### Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

N

## Dimensional drawings



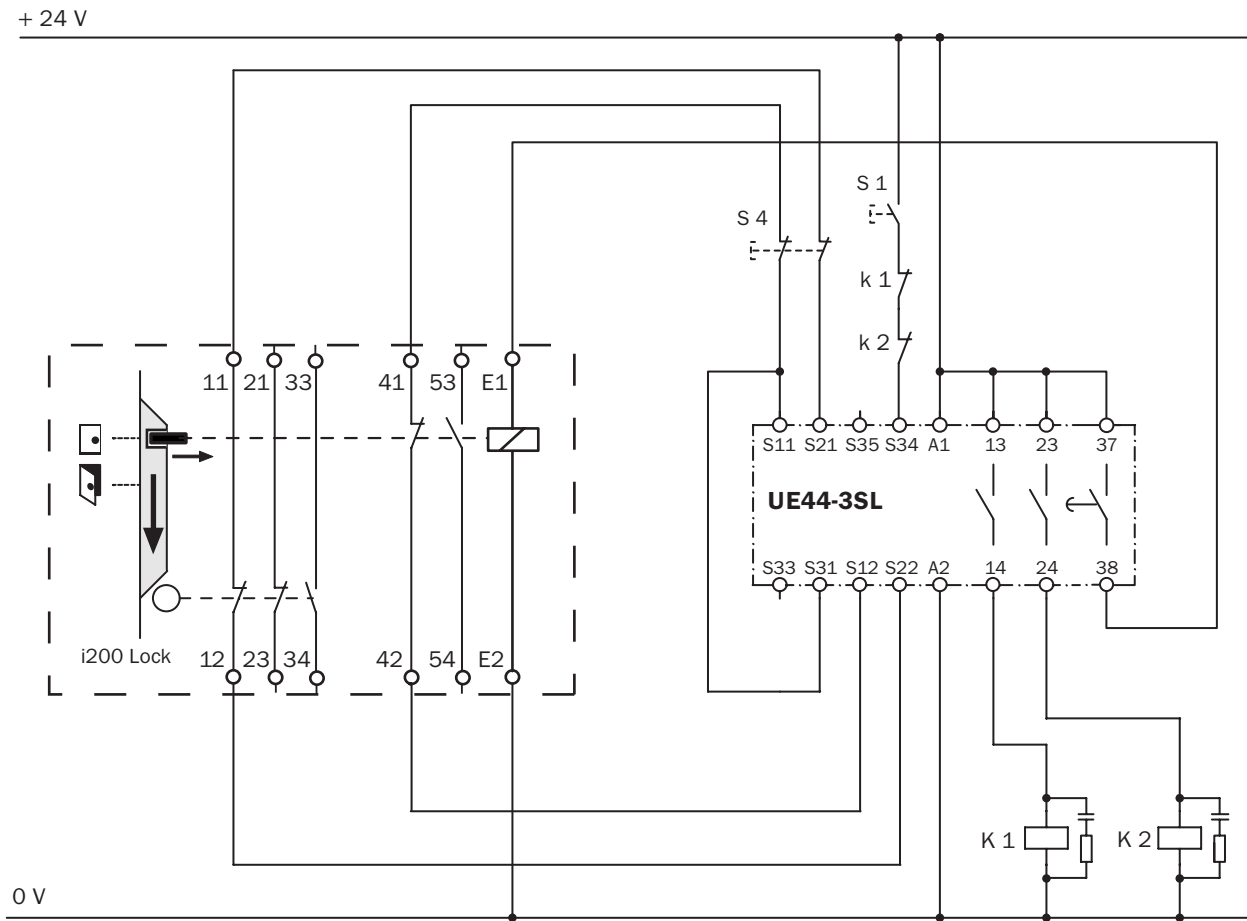
Housing with screw-type terminals

Housing with plug-in terminals

Dimensions in mm

# Connection diagram

i200 Lock safety switch (with mechanical locking) connected to UE44-3SL safety relay



Operating mode: with manual reset and external device monitoring (EDM)

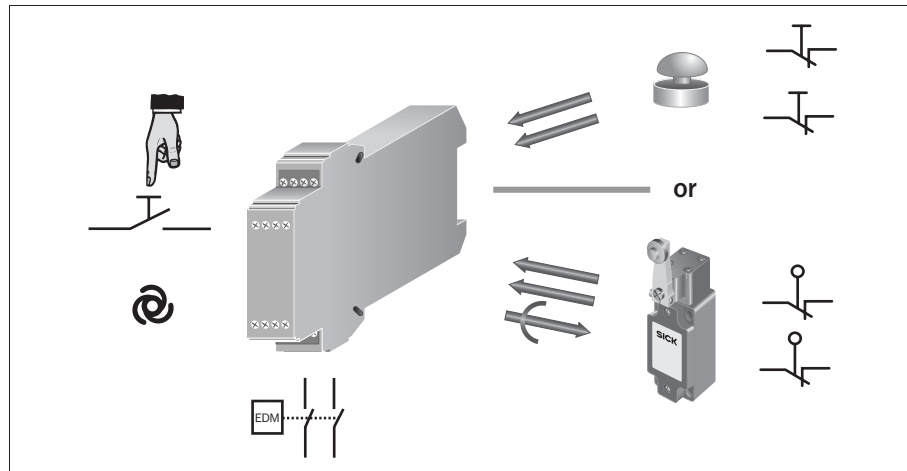
## Overview of technical specifications

Category according to EN 954-1	4
Number of enable current paths/signalling current paths	2 / 0
Number of off-delayed normally open contacts	1
Input circuit	Single- or dual-channel
Housing width	22.5 mm

## Product description

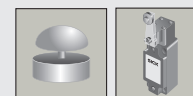
- Cross circuit detection on dual-channel wired systems
- Outputs:
  - 2 normally open contacts
  - 1 normally open contact with off-delay, adjustable from 0.15 ... 3 s or 1.5 ... 30 s
- 3 LEDs:
  - Supply voltage
  - Relay K1 / K2 (without delay)
  - Relay K3 / K4 (delayed)
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications

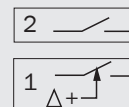


## Ordering information

Off-delay time	Connection type	Type	Part number
0.15 s ... 3 s	Screw-type terminals	UE45-3S12D33	6024911
	Plug-in terminals	UE45-3S13D33	6024912
1.5 s ... 30 s	Screw-type terminals	UE45-3S12D330	6024913
	Plug-in terminals	UE45-3S13D330	6024914



- For emergency stops
- For safety switches



Further information	Page
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→ Dimensional drawings	N-40
→ Connection diagram	N-41
→ Expansion modules	N-71 N-74
→ Services	A-2

## Detailed technical specifications

### General system data

Voltage supply to A1 / A2	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Category according to EN 954-1		4
Stop category according to EN 60204		0/1
Supply voltage $V_S$		24 V DC (20.4 V DC ... 26.4 V DC)
Power consumption		2.6 W
Residual ripple in DC mode (within the limits of $V_S$ )		2.4 $V_{SS}$

### Control voltage S11 / S33 and S21

Control voltage		24 V DC
Control current		60 mA
Short-circuit current between S11 and A2		2200 mA
Fuse		PTC resistor
Reaction time by cross connection		2 s
Galvanic separation between A1 / A2 and S11 / S21		No

### Input circuits (S12 and S31)

Input current S12 and S31		25 mA ... 100 mA
Input current S34 / S35 (reset circuit)		40 mA ... 50 mA
Reset time	Manual (S34) Automatic (S35)	30 ms 600 ms
Synchronisation time		500 ms
Activation time of reset button		200 ms
Line resistance at the input circuit		< 85 $\Omega$

### Output circuits (13 - 14, 23 - 24, 37 - 38)

Response time (K1 / K2)		25 ms
Off-delay time (K3 / K4)	UE45-3S1 xD3 3 UE45-3S1 xD3 30	0.15 s ... 3 s 1.5 s ... 30 s
Relay contacts		2 N/O, enable current paths, Category 4 1 N/O, enable current path, off-delayed, Category 3
Contact type		Positively guided
Contact material		Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 12 A
Application category according to EN 60947-5-1		AC-15 $U_e$ 230 V AC, $I_e$ 4 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 5 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h)
Permitted switching frequency		3600 c/h
Service life, mechanical (relay contacts)		5 x 10 <sup>6</sup> switching cycles
Service life, electrical (dependent on the load)		2 x 10 <sup>6</sup> switching cycles

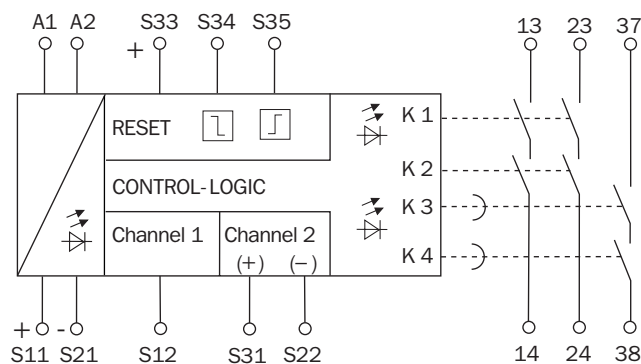
N

## Operating data

Surge voltage rating ( $U_{imp.}$ )		4 kV
Excess voltage category		III
Contamination rating of the unit (EN 50178)	External	3
	Internal	2
Voltage rating		300 V AC
Test voltage $U_{eff}$ (50 Hz) EN 60439-1		2.0 kV
Enclosure rating	Housing	IP 40
	Terminals	IP 20
Radio interference		EN 60947-1 02/99
Screening against interference		EN 60947-1 02/99
Ambient operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +75 °C
Wire cross-sections	Single strand wire (2 x, identical cross section)	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup>
	Single strand wire (1 x)	0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (1 x)	0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>

Weight	0.2 kg
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## Internal circuitry



### Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated (i.e. the input circuits are closed), the normally open contacts close immediately during automatic resetting, LED K1 / K2 and K3 / K4 illuminate. In the case of manual resetting, this only occurs after pressing and releasing the reset button.

The activation of the sensor (opening of one or both input circuits) effects the opening of both normally open contacts (13 - 14 / 23 - 24) immediately, and a time delayed closing of the third circuit (37 - 38), with LED K1 / K2 immediately going off and K3 / K4 going off later.

### External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

### Manual reset

For manual resetting, a pushbutton must be connected to terminals S33 - S34. This reset is monitored.

### Automatic reset

For automatic resetting S33 - S35 must be linked.

### Cross circuit detection

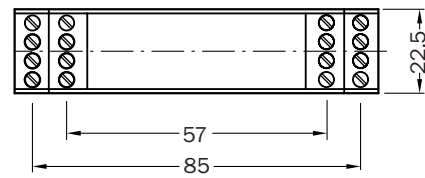
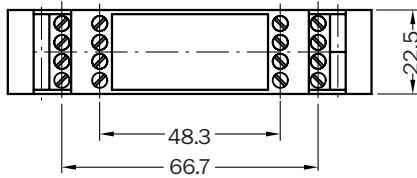
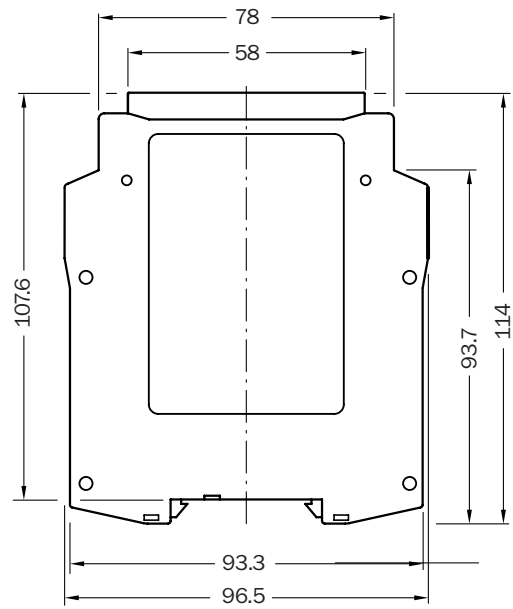
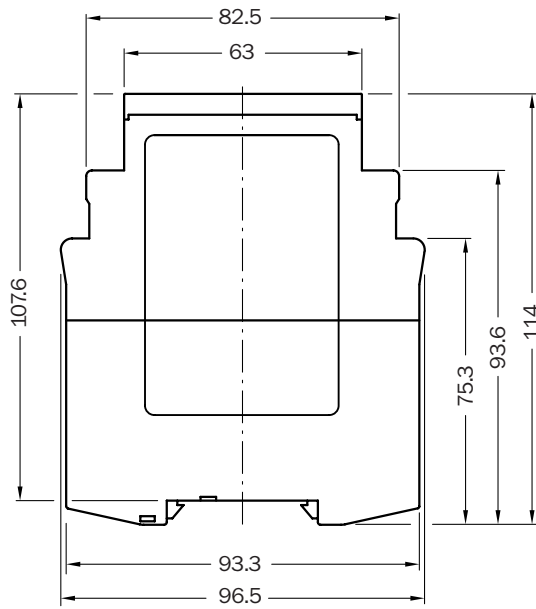
Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

### Monitoring of synchronisation

Only if input 2 closes by no later than 0.5 sec after input 1 do the output circuits close. If input 2 closes before input 1, the monitoring of synchronisation will not be effected, and the output circuits will close. This monitoring only takes place in automatic reset.

N

# Dimensional drawings



Housing with screw-type terminals

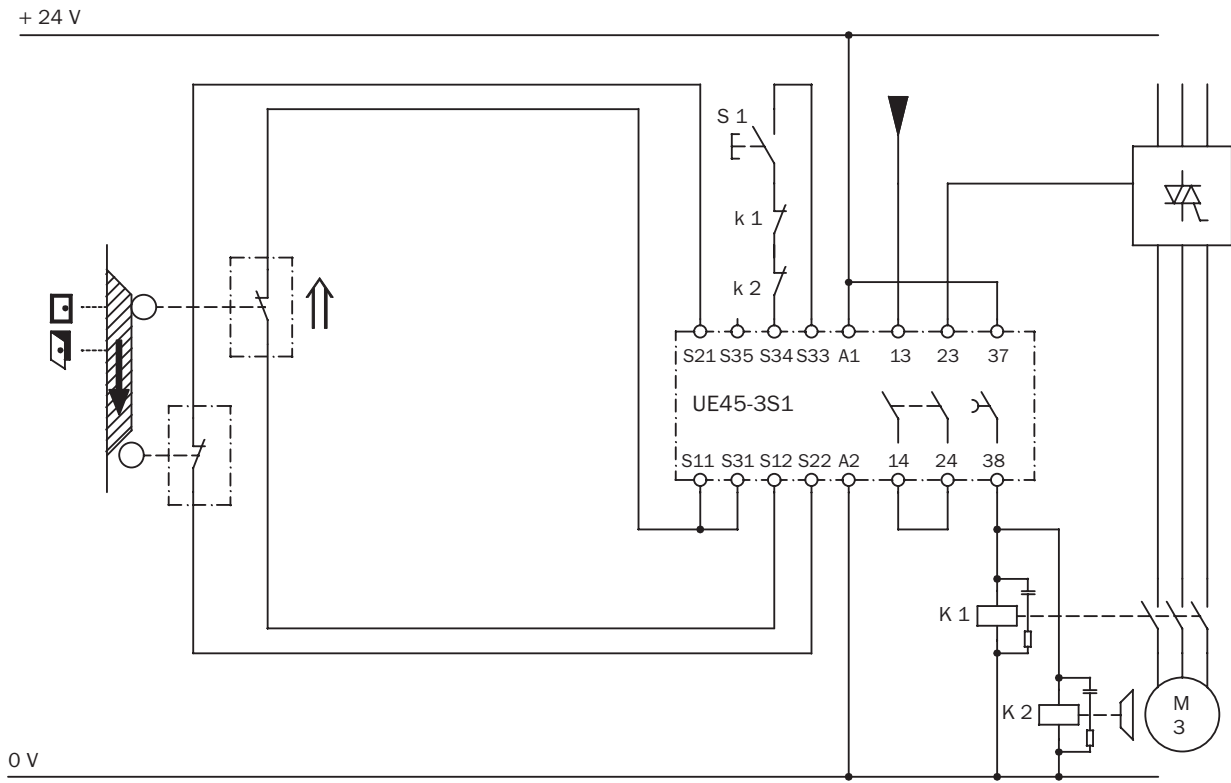
Housing with plug-in terminals

Dimensions in mm

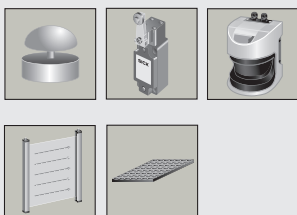


# Connection diagram

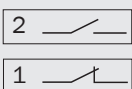
## Two safety switches connected to UE45-3S1 safety relay



Operating mode: with manual reset and external device monitoring (EDM)



- For emergency stops
- For safety switches
- For safety laser scanners
- For safety light curtains
- For non-contact safety switches
- For pressure sensitive mats in accordance with EN 1760 using 4-wire technology



Further information	Page
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→ Dimensional drawings	N-45
→ Connection diagrams	N-46
→ Expansion modules	N-71 N-74
→ Services	A-2

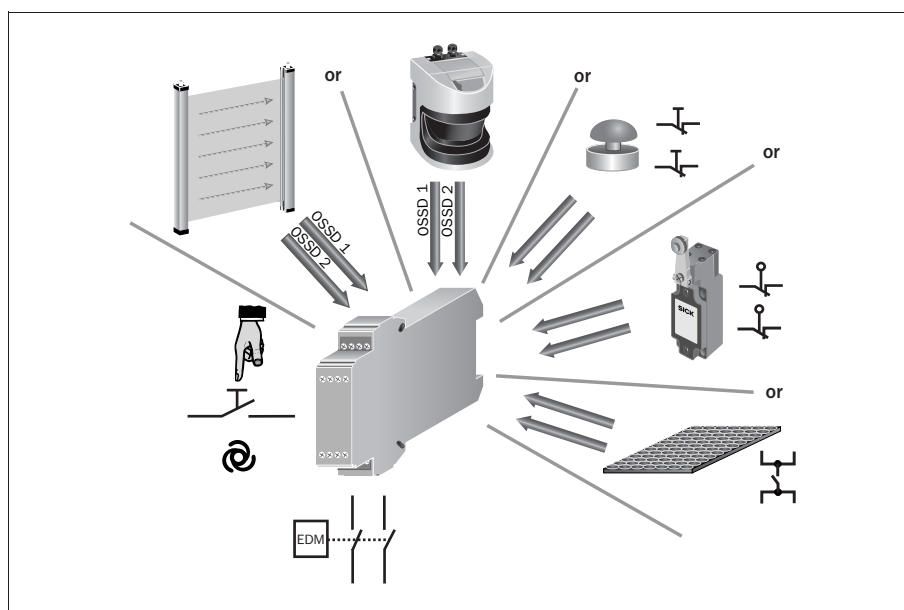
## Overview of technical specifications

Category according to EN 954-1	4
Number of enable current paths/signalling current paths	2 / 1
Input circuit	Single- or dual-channel
Housing width	22.5 mm

## Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K1
  - Relay K2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications



## In-system added value

Units employing monitored semiconductor outputs (OSSD), such as

- FGS
- PLS
- C2000
- M2000
- C4000
- S3000
- LSI
- M4000
- T4000 Compact

## Ordering information

Connection type	Type	Part number
Screw-type terminals	UE48-20S2D2	6024915
Plug-in terminals	UE48-20S3D2	6024916

## Detailed technical specifications

### General system data

Voltage supply to A1 / A2	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Category according to EN 954		4
Stop category according to EN 60204		0
Supply voltage $V_S$ (A1 / A2)		24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	AC mode DC mode	4.6 VA 2.1 W
Residual ripple in DC mode (within the limits of $V_S$ )		2.4 $V_{SS}$
Nominal frequency in AC mode		50 Hz ... 60 Hz

### Control voltage S33 / S11 and S21

Control voltage		17.4 V DC ... 22 V DC
Control current		40 mA ... 100 mA
Short-circuit current between S33 / S11 and S21		300 mA
Fuse		Electronic fuse
Reaction time by cross connection		50 ms
Activation time upon detection of cross connection		50 ms
Galvanic separation between A1 / A2 and S21, S11, S33		No

### Input circuits (S12, S31, S22, S34, S35)

Input voltage (S12 and S31)	HIGH LOW	17.4 V DC ... 26.4 V DC -3 V DC ... +5 V DC
Input current S12 and S31 / S22		40 mA ... 100 mA
Input current S34 / S35		5 mA ... 50 mA
Reset time	Manual (S34) Automatic (S35)	40 ms 80 ms
Activation time of reset button		50 ms
Minimum switch-off time/minimum switch-on time		7 ms
Permitted test pulse time/test frequency		1000 $\mu$ s / 10 $s^{-1}$
Line resistance at the input circuit		< 35 $\Omega$

### Output circuits (13 - 14, 23 - 24, 31 - 32 / 33 - 34)

Response time (K1 / K2)		25 ms
Minimum time outputs will stay off		70 ms ... 130 ms
Relay contacts		2 N/O, enable current paths, safety relevant 1 N/C, signalling current path, not safety relevant
Contact type		Positively guided
Contact material		Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 12 A
Application category according to EN 60947-5-1		AC-15 $U_e$ 230 V AC, $I_e$ 4 A (360 c/h) AC-15 $U_e$ 230 V AC, $I_e$ 3 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 4 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 2.5 A (3600 c/h)

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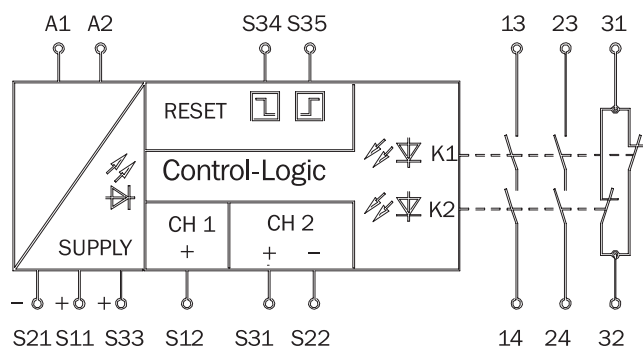
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10 <sup>7</sup> switching cycles
Service life, electrical (dependent on the load)	2 x 10 <sup>6</sup> switching cycles

**Operating data**

Surge voltage rating (U <sub>Imp.</sub> )	4 kV	
Excess voltage category	III	
Contamination rating of the unit (EN 50178)	External	3
	Internal	2
Voltage rating	300 V AC	
Test voltage U <sub>eff</sub> (50 Hz) EN 60439-1	2.0 kV	
Enclosure rating	Housing	IP 40
	Terminals	IP 20
Radio interference	DIN EN 61000-6-4	
Screening against interference	DIN EN 61000-6-2	
Ambient operating temperature	-25 °C ... +55 °C	
Storage temperature	-25 °C ... +75 °C	
Wire cross-sections	Single strand wire (2 x, identical cross section)	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup>
	Single strand wire (1 x)	0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (2 x, identical cross section)	0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>
	Fine stranded wire with terminal crimps (1 x)	0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>

Weight	0.2 kg
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## Internal circuitry



**Function**

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated or the protective field of the connected opto-electronic protective device is not broken (i.e. the input circuits are closed), then the normally open contacts close immediately in automatic reset, LED K1 and K2 illuminate. In the case of manual resetting, this only occurs after pressing and releasing the reset button. The activation of the sensor or incursion into the protective field of the non-contact safety device (open state of one of the two input circuits) effects the opening of the normally open contacts (LED K1 and K2 off).

**External device monitoring (EDM)**

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

**Manual reset**

For manual resetting, a pushbutton must be connected to terminals S33 - S34. This reset is monitored.

**Automatic reset**

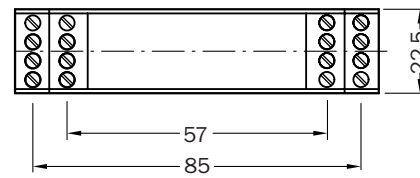
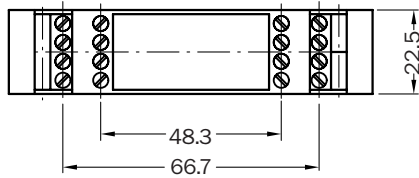
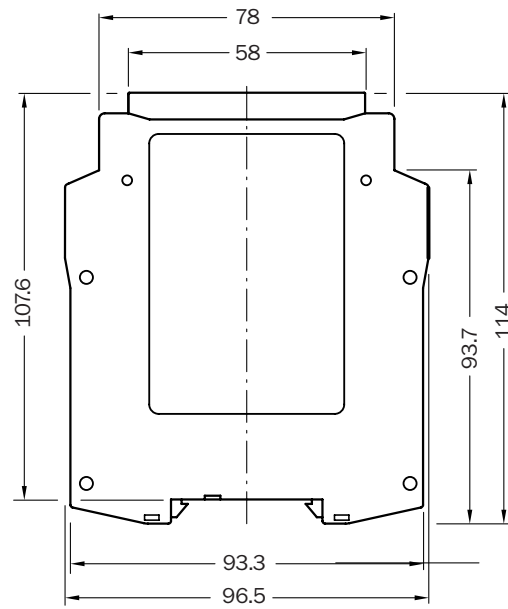
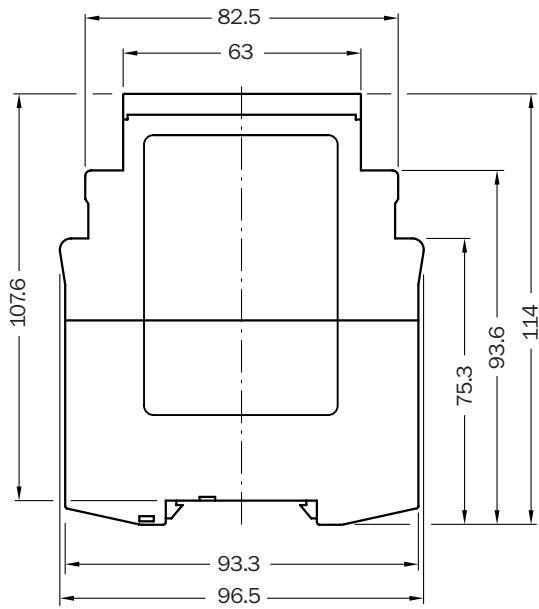
- For ESPEs: S33 - S35 must be linked
- For applications with potential free contacts on the input circuit S12 - S35 must be linked.

**Cross circuit detection**

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

N

## Dimensional drawings



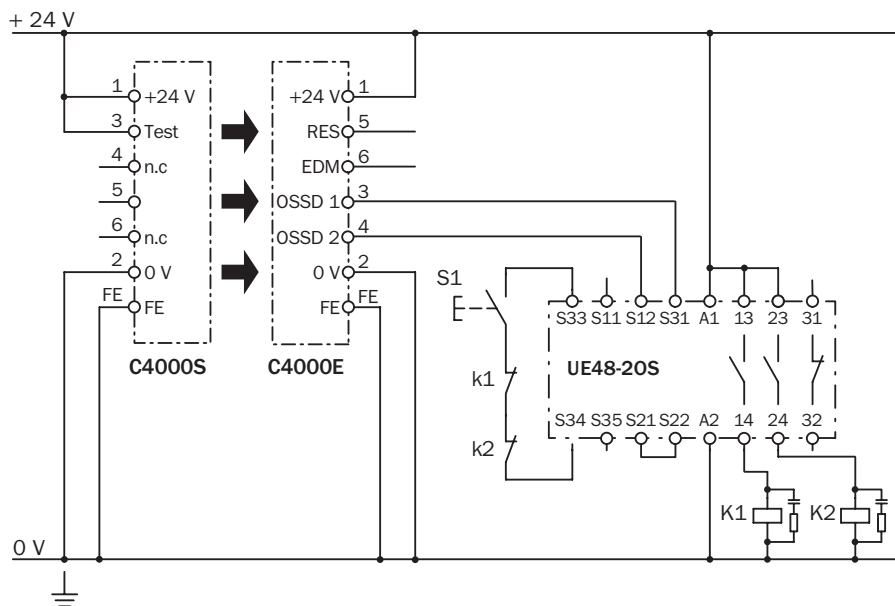
Housing with screw-type terminals

Housing with plug-in terminals

Dimensions in mm

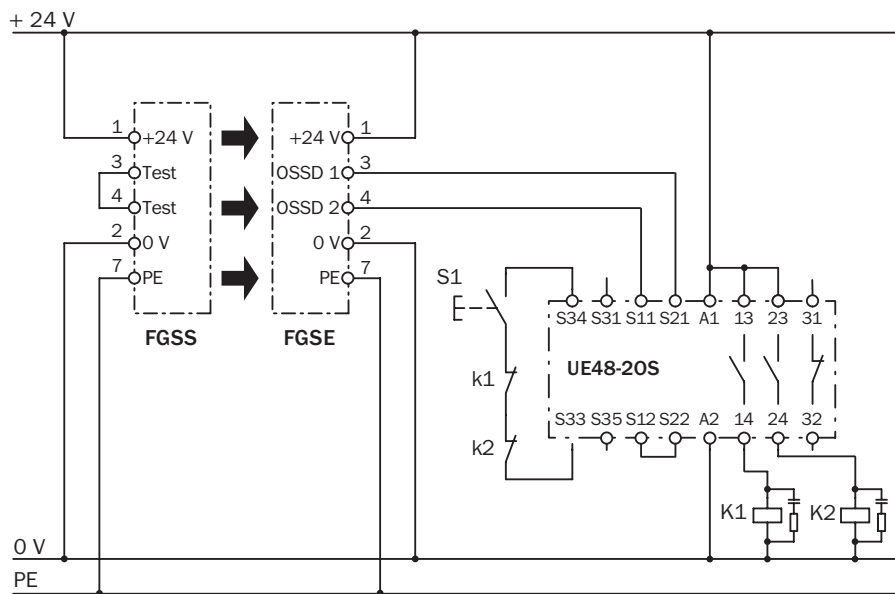
## Connection diagrams

### Safety light curtain C4000 Basic to UE48-20S safety relay



Operating mode: with manual reset and external device monitoring (EDM)

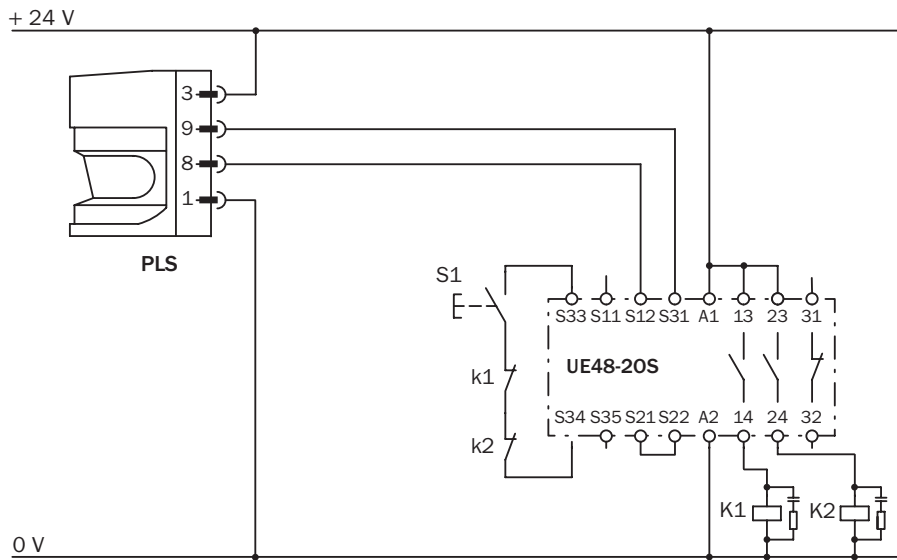
### Safety light curtain FGS connected to UE48-20S safety relay



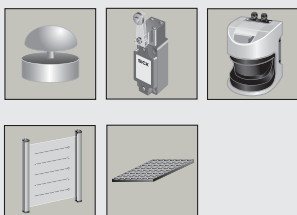
Operating mode: with manual reset and external device monitoring (EDM)

N

Safety laser scanner PLS connected to UE48-20S safety relay



Operating mode: with manual reset and external device monitoring (EDM)



- For emergency stops
- For safety switches
- For safety laser scanners
- For safety light curtains
- For non-contact safety switches
- For pressure sensitive mats in accordance with EN 1760 using 4-wire technology



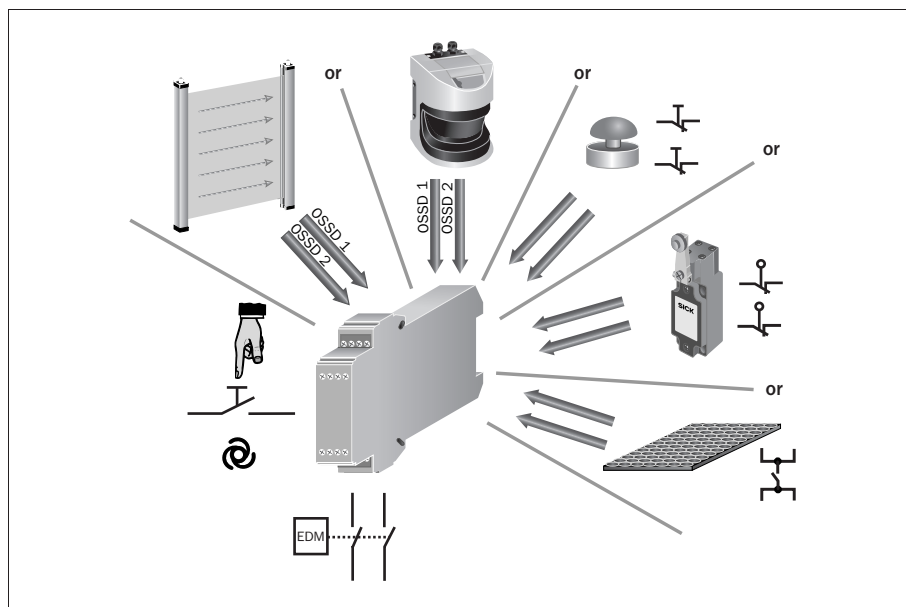
## Overview of technical specifications

Category according to EN 954-1	4
Number of enable current paths/signalling current paths	3 / 0
Input circuit	Single- or dual-channel
Housing width	22.5 mm

## Product description

- Cross circuit detection on dual-channel wired systems
- 3 LEDs:
  - Supply voltage
  - Relay K1
  - Relay K2
- Manual reset
- Automatic reset
- Increase in the number of outputs by way of the expansion modules
  - UE10-4XT
  - UE11-4DX
- External device monitoring (EDM)
- Available with plug-in terminals (key coded)

## Applications



## In-system added value

- Units employing monitored semiconductor outputs (OSSD), such as
- FGS
  - PLS
  - C2000
  - M2000
  - C4000
  - S3000
  - LSI
  - M4000
  - T4000 Compact

Further information	Page
→ Symbols	N-2
→ Internal circuitry	N-51
→ Dimensional drawings	N-52
→ Connection diagrams	N-46
→ Expansion modules	N-71 N-74
→ Services	A-2



## Ordering information

Connection type	Type	Part number
Screw-type terminals	UE48-30S2D2	6025089
Plug-in terminals	UE48-30S3D2	6025097

## Detailed technical specifications

### General system data

Voltage supply to A1 / A2	Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Category according to EN 954		4
Stop category according to EN 60204		0
Supply voltage $V_S$ (A1 / A2)		24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	AC mode DC mode	4.6 VA 2.1 W
Residual ripple in DC mode (within the limits of $V_S$ )		2.4 $V_{SS}$
Nominal frequency in AC mode		50 Hz ... 60 Hz

### Control voltage S33 / S11 and S21

Control voltage	17.4 V DC ... 22 V DC
Control current	40 mA ... 100 mA
Short-circuit current between S33 / S11 and S21	300 mA
Fuse	Electronic fuse
Reaction time by cross connection	50 ms
Activation time upon detection of cross connection	50 ms
Galvanic separation between A1 / A2 and S21, S11, S33	No

### Input circuits (S12, S31, S22, S34, S35)

Input voltage (S12 and S31)	HIGH LOW	17.4 V DC ... 26.4 V DC -3 V DC ... +5 V DC
Input current S12 and S31 / S22		40 mA ... 100 mA
Input current S34 / S35		5 mA ... 50 mA
Reset time	Manual (S34) Automatic (S35)	40 ms 80 ms
Activation time of reset button		50 ms
Minimum switch-off time/minimum switch-on time		7 ms
Permitted test pulse time/test frequency		1000 $\mu$ s / 10 s <sup>-1</sup>
Line resistance at the input circuit		< 35 $\Omega$

Continued on next page

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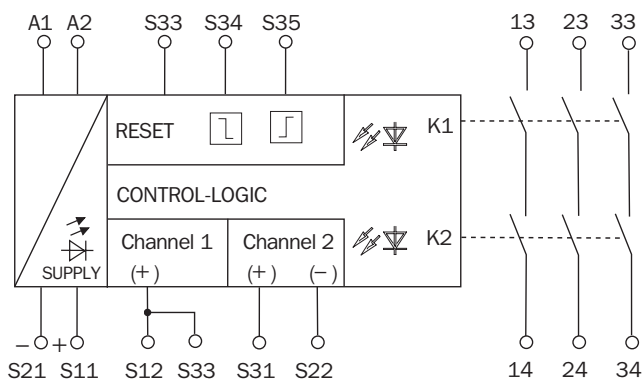
## Output circuits (13 - 14, 23 - 24, 31 - 32 / 33 - 34)

Response time (K1 / K2)	25 ms
Minimum time outputs will stay off	70 ms ... 130 ms
Relay contacts	3 N/O, enable current paths, safety relevant
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	Switching voltage Switching current Total current across all contacts
	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 mA ... 6 A 12 A
Application category according to EN 60947-5-1	AC-15 U <sub>e</sub> 230 V AC, I <sub>e</sub> 4 A (360 c/h) AC-15 U <sub>e</sub> 230 V AC, I <sub>e</sub> 3 A (3600 c/h) DC-13 U <sub>e</sub> 24 V DC, I <sub>e</sub> 4 A (360 c/h) DC-13 U <sub>e</sub> 24 V DC, I <sub>e</sub> 2.5 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10 <sup>7</sup> switching cycles
Service life, electrical (dependent on the load)	2 x 10 <sup>6</sup> switching cycles

## Operating data

Surge voltage rating (U <sub>Imp.</sub> )	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	External Internal
	3 2
Voltage rating	300 V AC
Test voltage U <sub>eff</sub> (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	Housing Terminals
	IP 40 IP 20
Radio interference	DIN EN 61000-6-4
Screening against interference	DIN EN 61000-6-2
Ambient operating temperature	-25 °C ... +55 °C
Storage temperature	-25 °C ... +75 °C
Wire cross-sections	Single strand wire (2 x, identical cross section) Single strand wire (1 x) Fine stranded wire with terminal crimps (2 x, identical cross section) Fine stranded wire with terminal crimps (1 x)
	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup> 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Weight	0.2 kg

## Internal circuitry



### Function

After applying the supply voltage (LED SUPPLY illuminates), the normally open contacts remain open. If the connected sensor is not activated or the protective field of the connected opto-electronic protective device is not broken (i.e. the input circuits are closed), then the normally open contacts close immediately in automatic reset, LED K1 and K2 illuminate. In the case of manual resetting, this only occurs after pressing and releasing the reset button. The activation of the sensor or incursion into the protective field of the non-contact safety device (open state of one of the two input circuits) effects the opening of the normally open contacts (LED K1 and K2 off).

### External device monitoring (EDM)

The unit can take over external device monitoring. The contactor monitoring system monitors the external relays by way of their normally closed contacts.

### Manual reset

For manual resetting, a pushbutton must be connected to terminals S33 - S34. This reset is monitored.

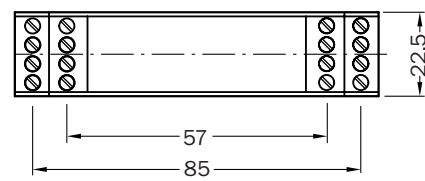
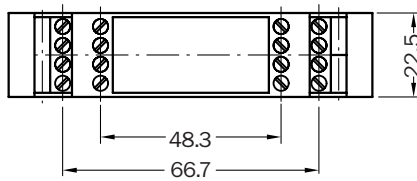
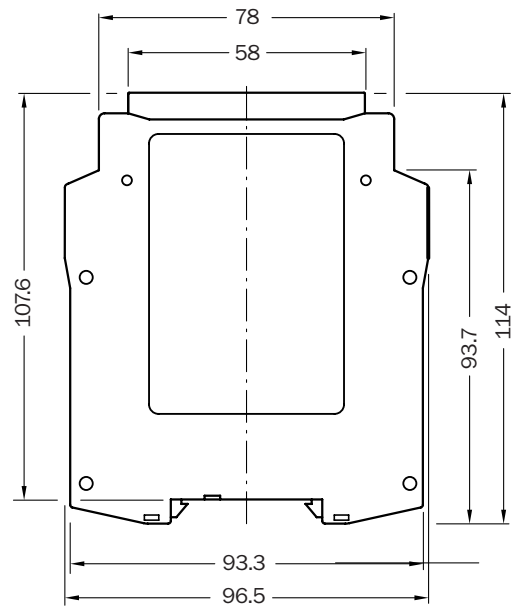
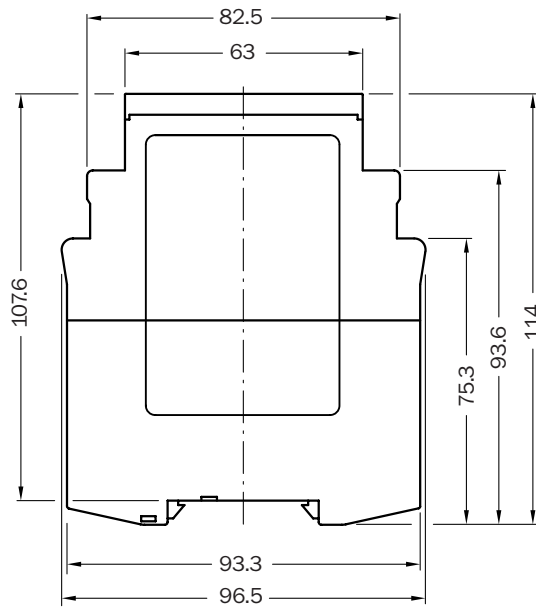
### Automatic reset

- For ESPEs: S33 - S35 must be linked.
- For applications with potential free contacts on the input circuit S12 - S35 must be linked.

### Cross circuit detection

Cross circuit is detected on dual-channel wired systems, if these are wired with opposing polarity.

## Dimensional drawings



Housing with screw-type terminals

Housing with plug-in terminals

Dimensions in mm

## Connection diagrams

→ Connection diagrams see safety relay UE48-20S starting on page N-46

## Overview of technical specifications

Category	4 (EN 954-1)
Number of enable current paths (depending on type)	2 / 3
Number of signalling current paths	1 / 0
Muting	✓
Number of muting sensors	2, 4
Supply voltage	24 V DC
Enclosure rating	IP 20

## Product description

UE49 muting modules are intended for use on: Electro-sensitive protective equipments (ESPE) with monitored active switching outputs (OSSD), two-channel, complying with EN 61496-1.

They enable protective operation with or without the muting function.

In protective operation with muting, the muting module differentiates between conveyed goods and persons. The ESPE

permits certain objects to penetrate into the hazardous area without the dangerous movement being switched off, whereas persons are excluded.

The operating modes are selected using a rotary switch. In all operating modes, there is detection of wire breakage at the ESPE connections, and detection, with visual signal, of over and low voltage is also available. In addition, there is a connection for a monitored reset button.

## In-system added value

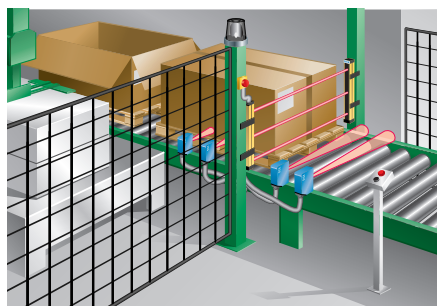
Devices employing monitored semiconductor outputs (OSSD), such as

- M2000
- MSL
- C4000
- C2000
- FGS
- S3000

## Applications

→ You can find more applications using the application finder at [www.sick.com](http://www.sick.com)

- Automotive industry
- Robotic
- Machining centres
- Palletisers
- Packaging machinery
- Stone setting machinery
- Stackers
- Timber industry
- Textile industry



Access protection with differentiation between man and material (muting)



- Muting module for electro-sensitive protective equipment (ESPE)
- Meets requirements up to categorie 4 according to EN 954-1
- Connection of 2 resp. 4 muting sensors
- Integrated override function
- Automatic reset
- Manual reset
- Muting functions by operating mode selector switch



N

Further information	Page
→ Ordering information	N-54
→ Technical specifications	N-54
→ Internal circuitry	N-55
→ Dimensional drawings	N-56

## Ordering information

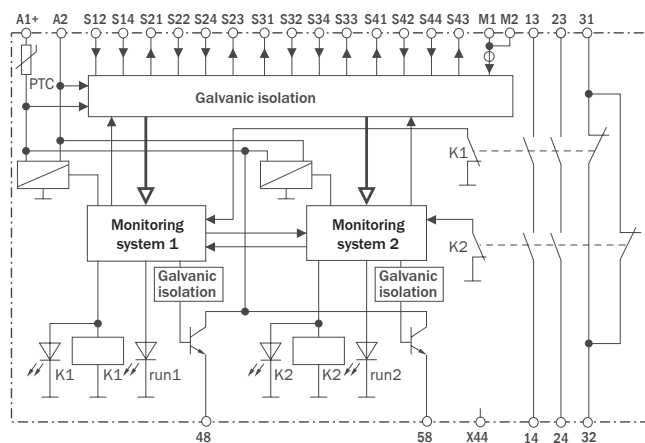
Number of enable current paths	Number of signalling current paths	Model Name	Part number
2	1	UE49-2MM3D3	6025098
3	-	UE49-3MM3D3	6025099

## Detailed technical specifications

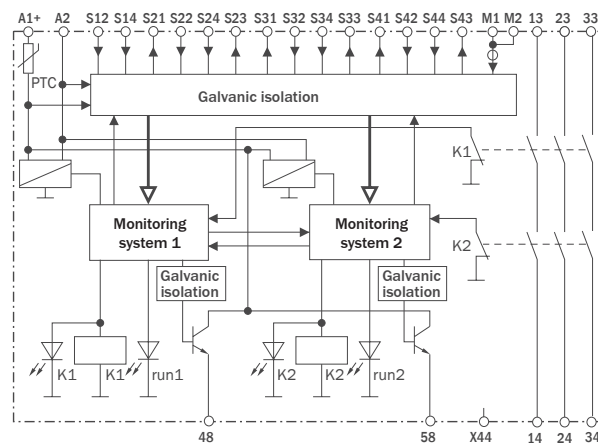
	UE49-2MM3D3	UE49-3MM3D3
Category	4 (EN 954-1)	
Voltage supply to A1 / A2 Output circuit > 25 V AC / 60 V DC Output circuit < 25 V AC / 60 V DC	PELV PELV or SELV	
Supply voltage $V_S$	24 V DC (20.4 V DC ... 27.6 V DC)	
Ripple	$\pm 10\%$ (within limits of $V_S$ )	
Maximum power consumption	4 W (signal outputs not loaded)	
Reset time (manual reset)	Max. 55 ms	
Reset time (automatic reset)	Max. 65 ms	
Concurrence monitoring time	Max. 220 ms	
Maximum cable length	100 m	
Maximum cable resistance	25 $\Omega$	
Number of enable current paths	2	3
Number of signalling current paths	1	-
Maximum response time	70 ms	
Maximum switching current	5 A	
Maximum total current	15 A	
Usage category	AC-15/DC-13	
Rated operating current (voltage)	N/C contacts N/O contacts	- 3 A (230 V AC), 8 A (24 V DC) 0.1 Hz
		2 A (230 V AC), 8 A (24 V DC) 0.1 Hz 3 A (230 V AC), 8 A (24 V DC) 0.1 Hz
Maximum switching sequence	1200 switching cycles/h	
Short-circuit protection	6A GL (EN 60947-5-1), C 8 A	
Mechanical life (relay contacts)	1 x 10 <sup>7</sup> switching cycles	
Electrical life (relay contacts)	1 x 10 <sup>5</sup> switching cycles (to AC 15 at 2 A, 230 V AC)	
Overvoltage category	III	
Enclosure rating	terminals housing	IP 20 IP 40
Interference emission	EN 61000-6-2	
Interference resistance	EN 55011, Class B	
Ambient operating temperature from ... to	0 °C ... +50 °C	
Storage temperature from ... to	-20 °C ... +70 °C	
Connection type	Screw-terminal connector	
Dimensions (W x H x D)	45 mm x 74 mm x 121 mm	

## Internal circuitry

### UE49-2MM3D3



### UE49-3MM3D3



### Function

UE49-2MM and UE49-3MM muting modules meet safety-specific requirements up to category 4 (EN 954). Connected command units and safety sensors, subsequent controls, their wiring and installation must also comply with this category as defined in EN 954.

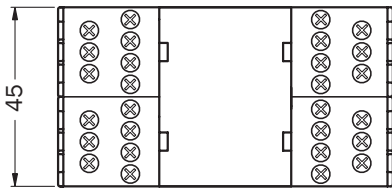
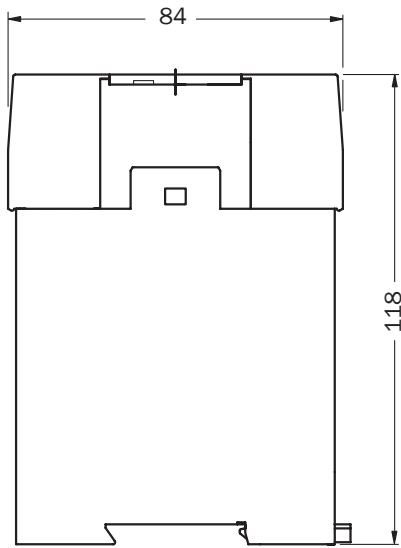
The muting function is employed when certain objects, e.g. material pallets, are permitted to pass into the hazardous area. For the duration of this transport through the safety light beams, it suppresses monitoring by the ESPE.

For the period during which the material is being transported, muting sensors detect its presence. By careful choice of the type of sensors and their arrangement, it is possible to distinguish between objects and persons. To this end, two or four muting sensors can be connected to the muting module. As it interacts with the muting sensors and ESPE, the conveyed object produces a precisely-defined signal sequence as it

passes the hazardous area. So as to ensure that the entry of a person to the ESPE will always result in the dangerous movement being switched off, it must not be possible for a person to generate the same signal sequence as a conveyed object.

During the muting condition, the muting lamp, which is monitored by the device, is illuminated. The maximum permitted duration of the muting condition can be set in steps between 10 seconds and 8 hours, or be completely deactivated. During the muting cycle, an error in the sequence of muting signals or exceeding the permissible muting duration results in a FAULT. A release by pressing the reset button is only permitted when the muting sensors are quiescent, the muting lamp is not defective, and the ESPE that is to be bypassed is free.

## Dimensional drawings



Dimensions in mm



## Overview of technical specifications

Category according to EN 954-1	2
Type of connectable opto-electronic protective devices	C2000, M2000, single-beam photoelectric safety switches
Number of connectable C2000, M2000 systems	3 (cascaded)
Number of connectable single-beam photoelectric safety switches	1 ... 6
Number of safe outputs (OSSDs)	2
Maximum switching current	500 mA
Response time	14 ms

## Product description

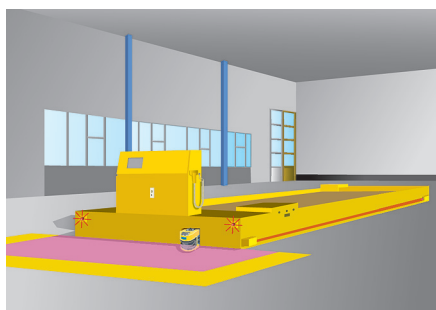
- 2 OSSDs, PNP, monitored and short-circuit protected
- External test pulse not required
- Functions individually selectable

## In-system added value

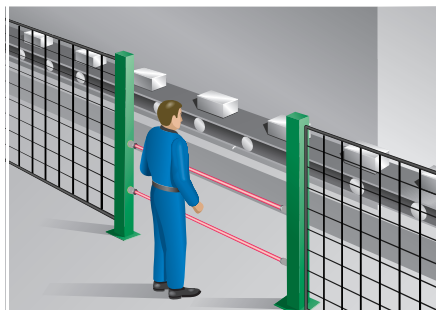
Evaluation unit for:

- C2000
- M2000
- Up to 6 testable single-beam photoelectric safety switch pairs

## Applications



Hazardous area protection using the VS/VE18 and the LE20 on an automated guided vehicle (AGV)



Access protection with VS/VE18 and LE20

## Ordering information

Connection type	Enclosure rating	Type	Part number
Screw terminal connector	IP 20	LE20-2612	1016503
	IP 65	LE20-1612	1016500
Spring clamp terminal connector	IP 20	LE20-2614	1016505
	IP 65	LE20-1614	1016499



- Restart interlock
- External device monitoring (EDM)
- Self testing
- 7-segment diagnostic display



Further information	Page
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→ Internal circuitry	N-59
→ Dimensional drawings	N-60
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→ Accessories	N-63
→ Services	A-2

## Detailed technical specifications

### Electrical data

Supply voltage $V_S$	24 V DC -30 %/+20 %, 5 % ripple <sup>1)</sup>
Power-up delay (after power On)	2 s approx.
Current consumption $I_{max}$	100 mA
Power consumption	4 W
Response time	5 ms
Response time of entire system (dependent on system configuration)	To be calculated from the following values: <ul style="list-style-type: none"> <li>▪ C2000/M2000: approx. 7 ms to 25 ms, dependent on protective field height and resolution</li> <li>▪ Single-beam photoelectric safety switches: max. 9 ms</li> <li>▪ LE20: 5 ms</li> <li>▪ Relay module: 5 ms</li> </ul>
Response time for test input	Max. 30 ms
Reset time	Max. 50 ms
Connecting cables	0.5 mm <sup>2</sup> , length max. 30 m 2.5 mm <sup>2</sup> , length max. 150 m
Inputs: signal level on/off	HIGH: 15 V ... $V_S$ LOW: 0 V ... 10 V
Test extern	HIGH: external test inactive LOW: external test active Pulse duration > 30 ms
Self-test cycle time	2 s

### Outputs

Outputs OSSD 1, OSSD 2 (the levels refer to connection to the system connector)	PNP, monitored and short-circuit-proof
Switching current $I_{max}$	500 mA
Switching voltage $V_{max}$	$V_S - 2.0$ V at 500 mA
Switching capacity $P_{max}$	13.2 W
Inductive switching capacity $P_{max ind}$	1 VA
Protective field free V	$V_{max}$
Protective field interrupted V	0 V
Residual current at signal level "0" I	0.1 mA
Max. capacitive load	200 nF at I: 50 mA 2.5 $\mu$ F at I: 500 mA
Test period test rate	2 s
Test pulse width	150 $\mu$ s approx.
Test A, Test B (inactive/active)	$V_S - 2.65$ V/0 V Total current Test A + Test B < 10 mA Max. capacitive load 10 $\mu$ F

## Operating data

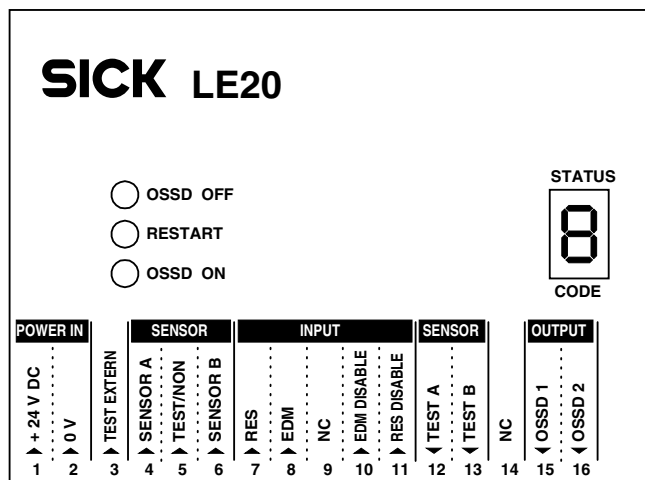
Protection class	III <sup>2)</sup>
Enclosure rating	IP 20, IP 65 optional
Type according to EN 61496	Type 2
Ambient operating temperature	-20 °C ... +60 °C
Storage temperature	-25 °C ... +75 °C
Air humidity (non condensing)	15 % ... 95 %
Vibration resistance	5g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29

<sup>1)</sup> The upper and lower supply voltage limits must not be infringed.

The external voltage supply to the devices must be capable of withstanding a short-term power failure of 20 ms in accordance with EN 60204. Suitable power supply units are available from SICK as accessories

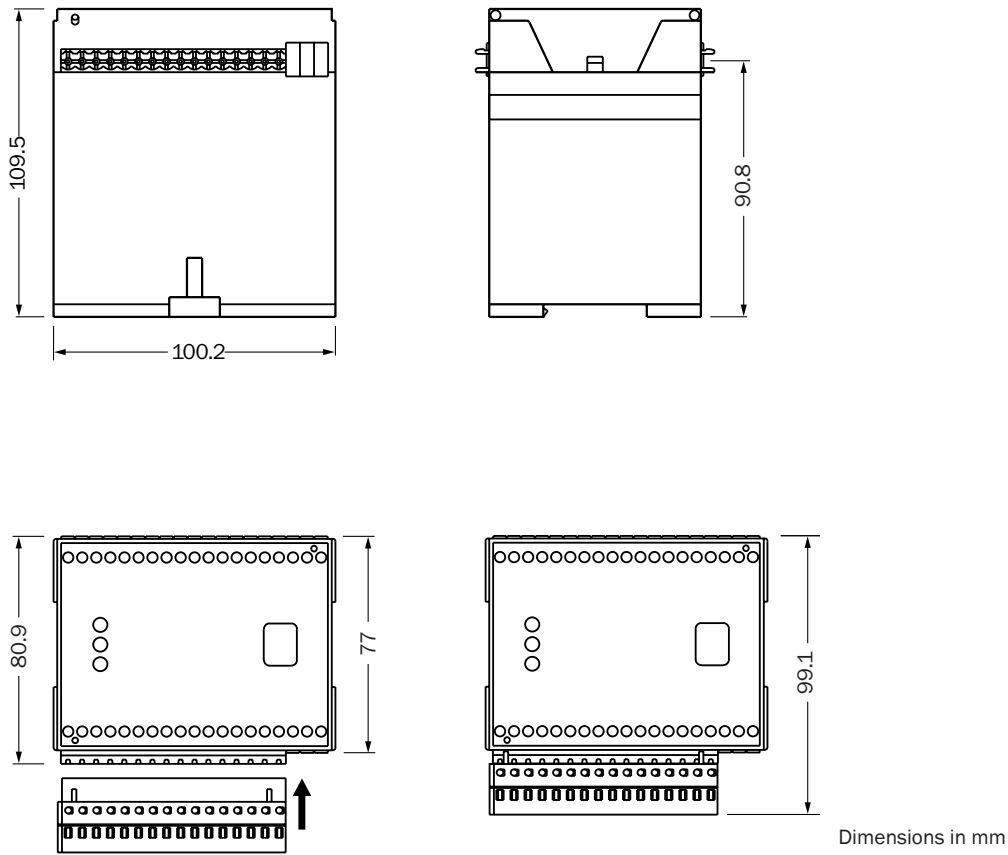
<sup>2)</sup> The circuits connected to the inputs and outputs must conform to the creepage and clearance distances specified in the relevant standards with regard to safe isolation in accordance with PELV (EN 60204, 6.4)

## Internal circuitry

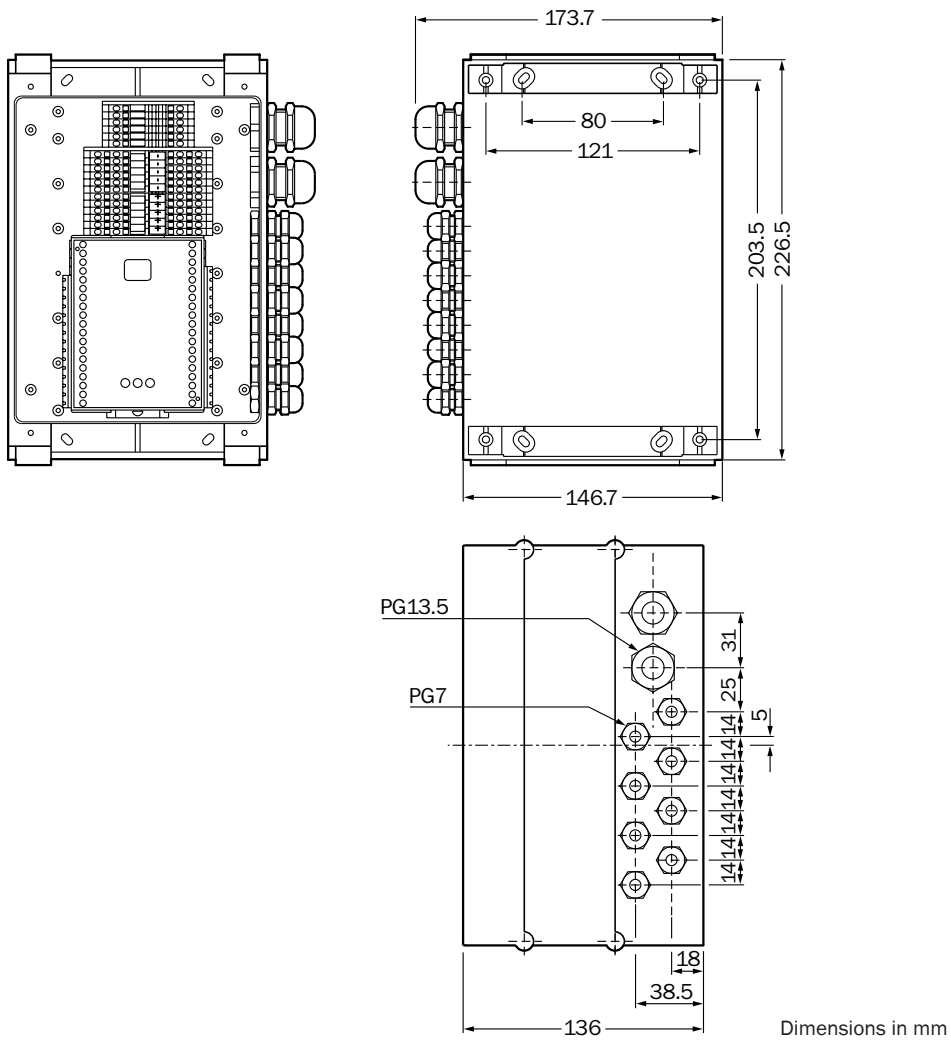


The LE20 safety evaluation unit is able to carry out a periodic safety test of the connected photoelectric switches, and provides the photoelectric switch system with the additional reset interlock and external device monitoring safety functions.

## Dimensional drawings



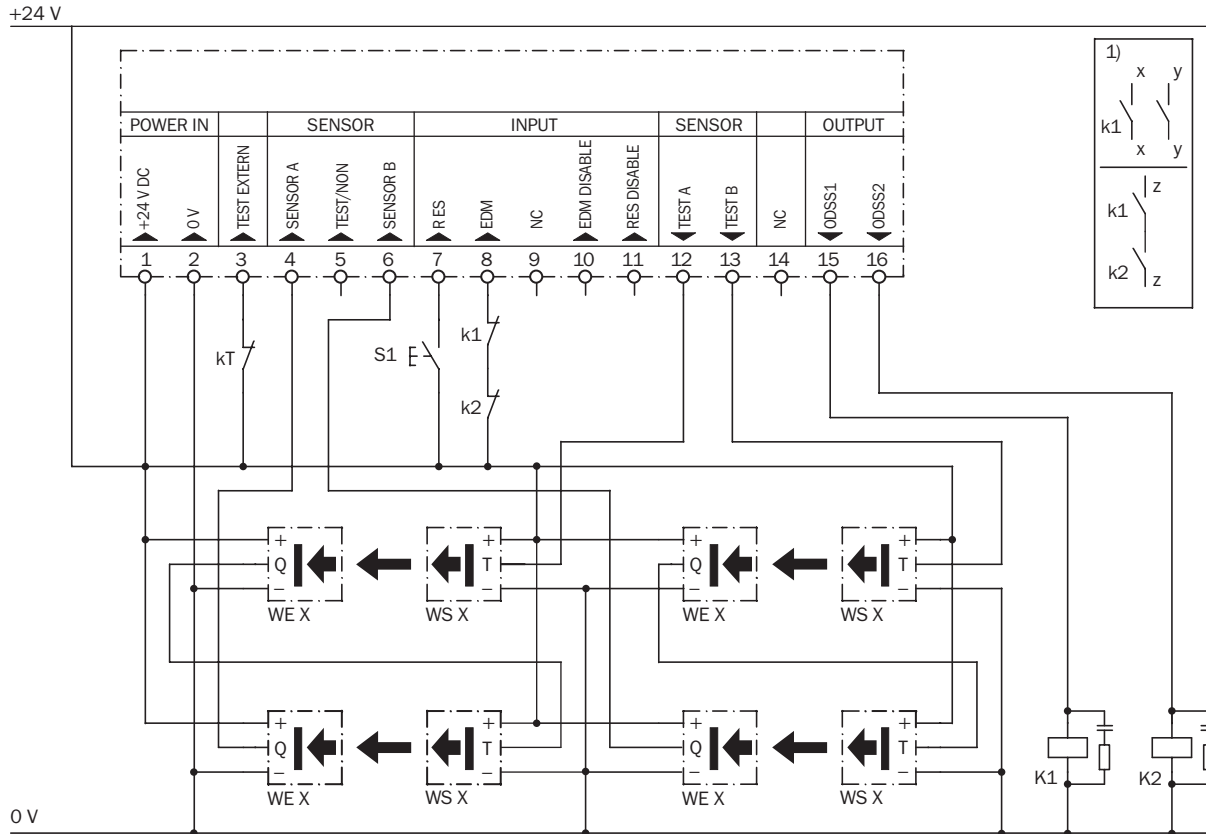
Mechanical dimensions, LE20 with screw clamps, IP 20



Mechanical dimensions, IP 65 housing for LE20

# Connection diagrams

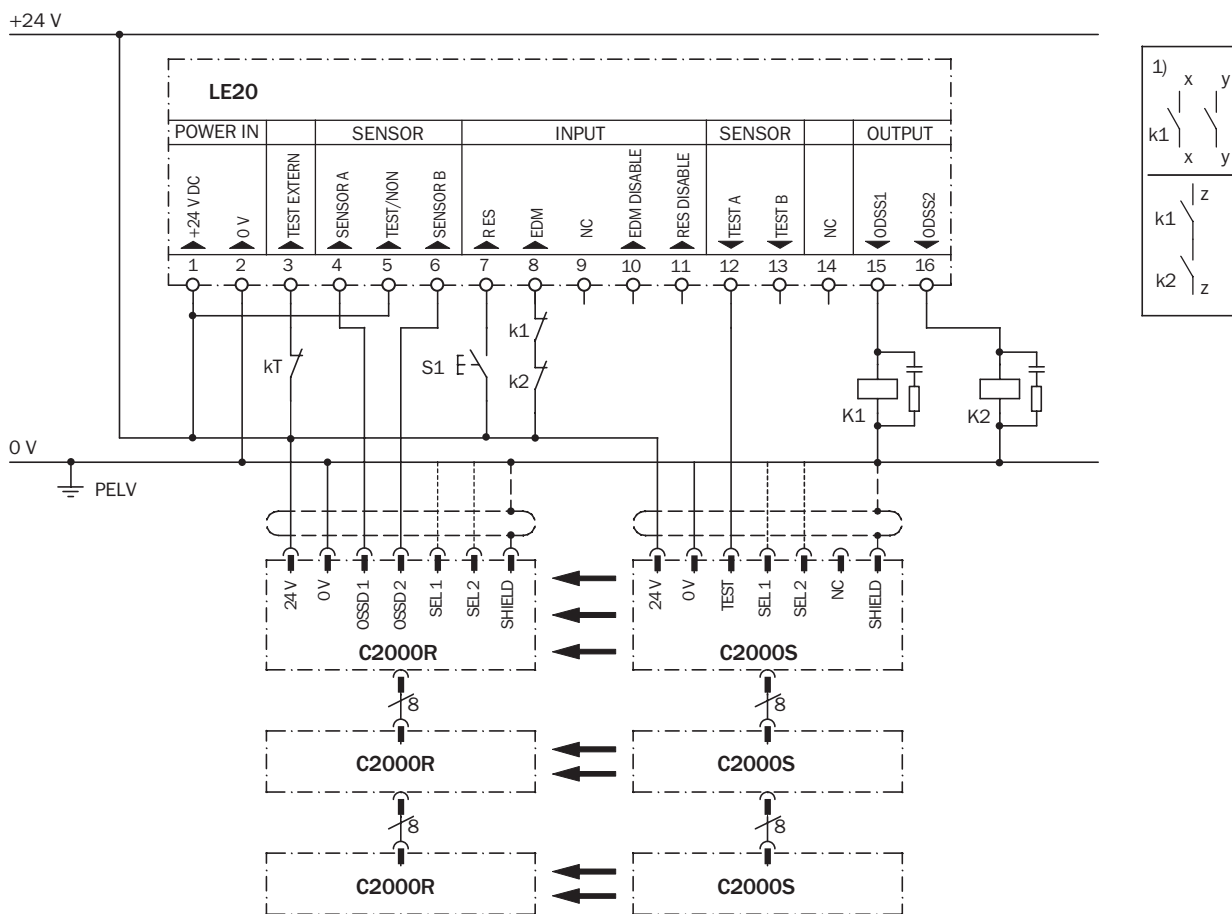
Safety relay LE20 with 4 single-beam photoelectric safety switches WS/WE27-2, WS/WE18-2 or WS/WE12-2



These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

Safety relay LE20 with a cascade: C2000 - C2000 - C2000



These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

Ordering information accessories

Interfaces

Description	Connection type	Type	Part number
Safety relay UE10-20S	With screw terminal connector	UE10-20S2DO	2019772
	With spring clamp terminal connector	UE10-20S4DO	2019771





- Muting
- Restart interlock
- External device monitoring (EDM)
- Self testing
- 7-segment diagnostic display



## Overview of technical specifications

Category according to EN 954-1	2
Type of connectable opto-electronic protective devices	C2000, M2000, single-beam photoelectric safety switches
Number of connectable C2000, M2000 systems	3 (cascaded)
Number of connectable single-beam photoelectric safety switches	1 ... 6
Number of safe outputs (OSSDs)	2
Maximum switching current	500 mA
Response time	14 ms

## Product description

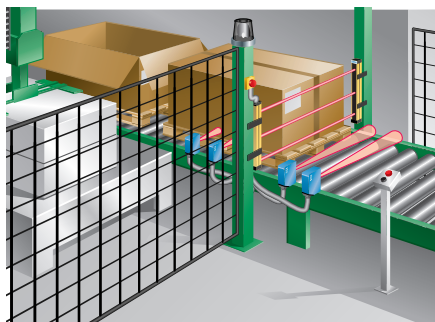
- 2 OSSDs, PNP, monitored and short-circuit protected
- External test pulse not required
- Functions individually selectable
- Up to 4 muting inputs, sensor or PLC signals possible
- Muting monitoring functions: sequence and concurrence operation possible
- Integrated override function

## In-system added value

Evaluation unit for:

- C2000
- M2000
- Up to 6 testable single-beam photoelectric safety switch pairs

## Applications



Access protection with differentiation between man and material (muting)

## Ordering information

Connection type	Enclosure rating	Type	Part number
Screw terminal connector	IP 20	LE20-2622	1016502
	IP 65	LE20-1622	1016498
Spring clamp terminal connector	IP 20	LE20-2624	1016501
	IP 65	LE20-1624	1016497

Further information	Page
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→ Services	A-2



## Detailed technical specifications

### Electrical data

Supply voltage $V_S$	24 V DC -30 %/+20 %, 5 % ripple <sup>1)</sup>
Power-up delay (after power On)	2 s approx.
Current consumption $I_{max}$	150 mA
Power consumption	4 W (without muting and override lamps)
Response time	5 ms
Response time of entire system (dependent on system configuration)	To be calculated from the following constants: <ul style="list-style-type: none"> <li>▪ C2000/M2000: approx. 7 ms to 25 ms, dependent on protective field height and resolution</li> <li>▪ Single-beam photoelectric safety switches: max. 9 ms</li> <li>▪ LE20: 5 ms</li> <li>▪ Relay module: 5 ms</li> </ul>
Response time for test input	Max. 30 ms
Reset time	Max. 50 ms
Connecting cables	0.5 mm <sup>2</sup> , length max. 30 m 2.5 mm <sup>2</sup> , length max. 150 m
Inputs: signal level on/off	HIGH: 15 V ... $V_S$ LOW: 0 V ... 10 V
Test extern	HIGH: external test inactive LOW: external test active Pulse duration > 30 ms
Concurrence monitoring	Time window selectable: 3 s or $\infty$
Self-test cycle time	2 s

### Outputs

Outputs OSSD 1, OSSD 2 (the levels refer to connection to the system connector)	PNP, monitored and short-circuit-proof
Switching current $I_{max}$ Switching voltage $V_{max}$ Switching capacity $P_{max}$ Inductive switching capacity $P_{max ind}$ Protective field free V Protective field interrupted V Residual current at signal level "0" I Max. capacitive load	500 mA $V_S - 2.0$ V at 500 mA 13.2 W 1 VA $U_{max}$ 0 V 0.1 mA 200 nF bei I = 50 mA 2.5 $\mu$ F bei I = 500 mA
Test period test rate Test pulse width	2 s 150 $\mu$ s approx.
Test A, Test B (inactive/active)	$V_S - 2.65$ V/0 V Total current Test A + Test B < 10 mA Max. capacitive load 10 $\mu$ F
Override lamp	24 V DC, 1 ... 10 W
Lamp 1, 2	24 V DC, 1 ... 10 W

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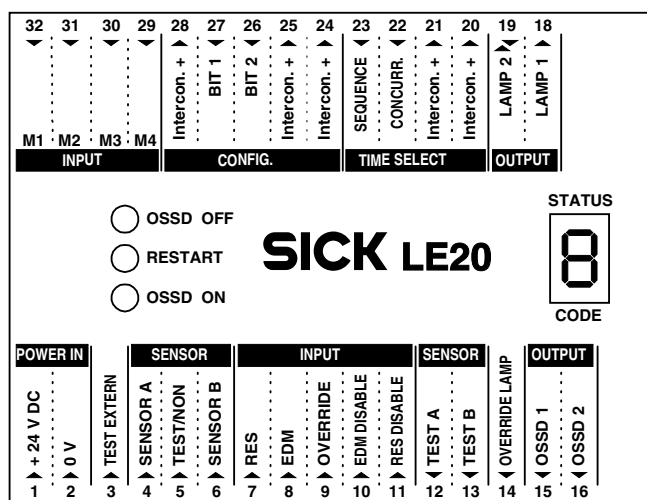


Operating data

Protection class	III <sup>2)</sup>
Enclosure rating	IP 20, IP 65 optional
Type according to EN 61496	Type 2
Ambient operating temperature	-20 °C ... +60 °C
Storage temperature	-25 °C ... +75 °C
Air humidity (non condensing)	15 % ... 95 %
Vibration resistance	5g, 10 Hz ... 55 Hz according to IEC 60068-2-6
Shock resistance	10 g, 16 ms according to IEC 60068-2-29

- 1) The upper and lower supply voltage limits must not be infringed.  
The external voltage supply to the devices must be capable of withstanding a short-term power failure of 20 ms in accordance with EN 60204. Suitable power supply units are available from SICK as accessories
- 2) The circuits connected to the inputs and outputs must conform to the creepage and clearance distances specified in the relevant standards with regard to safe isolation in accordance with PELV (EN 60204, 6.4)

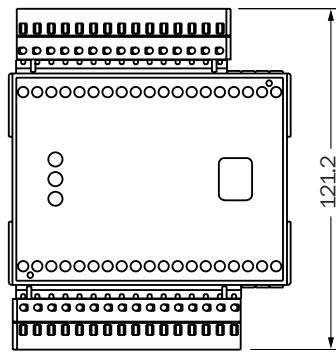
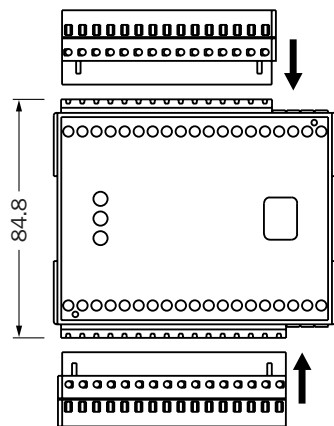
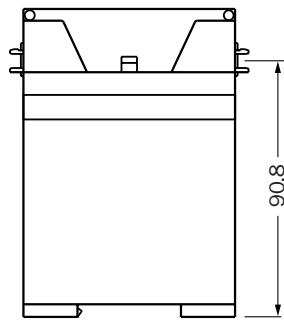
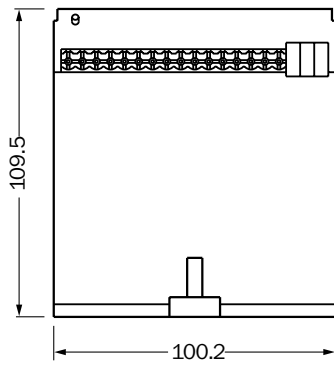
Internal circuitry



The LE20 safety evaluation unit is able to carry out a periodic safety test of the connected photoelectric switches, and provides the photoelectric switch system with the additional reset interlock and external device monitoring safety functions.

The expanded LE20 Muting version uses additional muting sensors to distinguish objects entering the hazardous area past the photoelectric switches from human beings, and allows the objects to pass without stopping the machine.

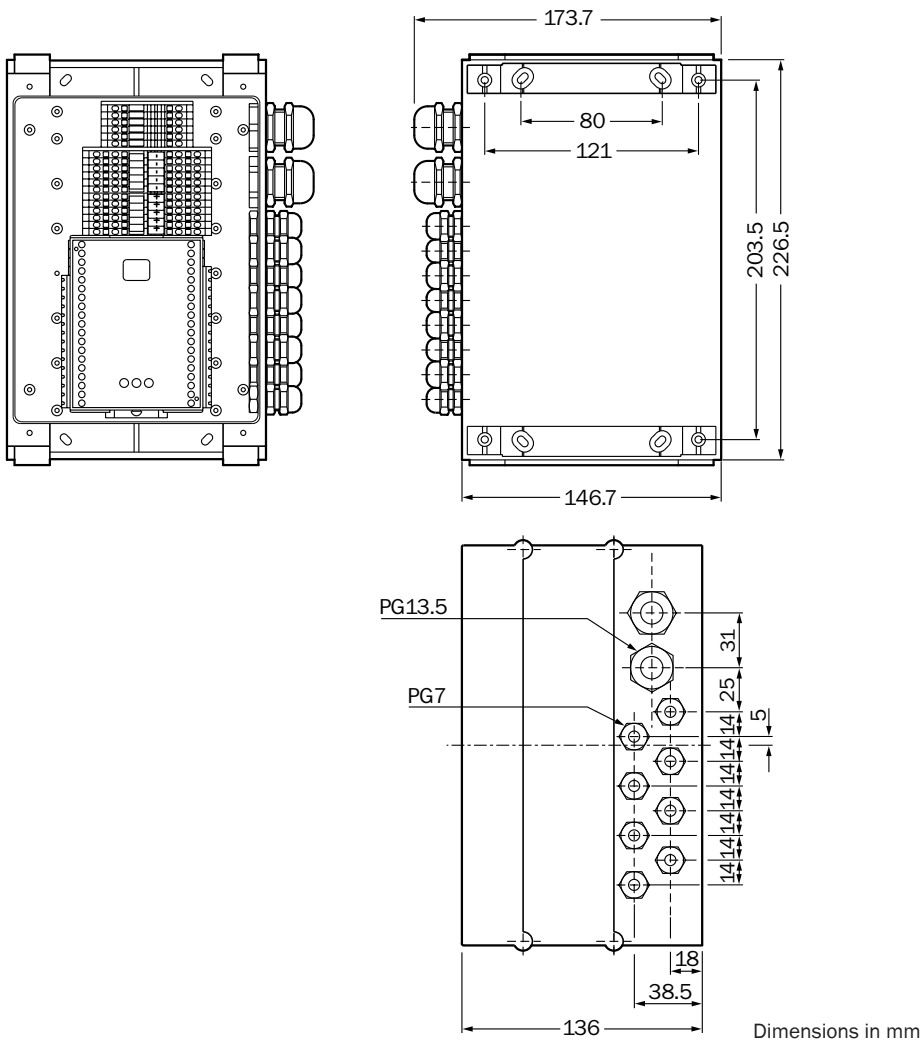
## Dimensional drawings



Dimensions in mm

Mechanical dimensions, LE20 Muting with screw clamps, IP 20

Continued on next page

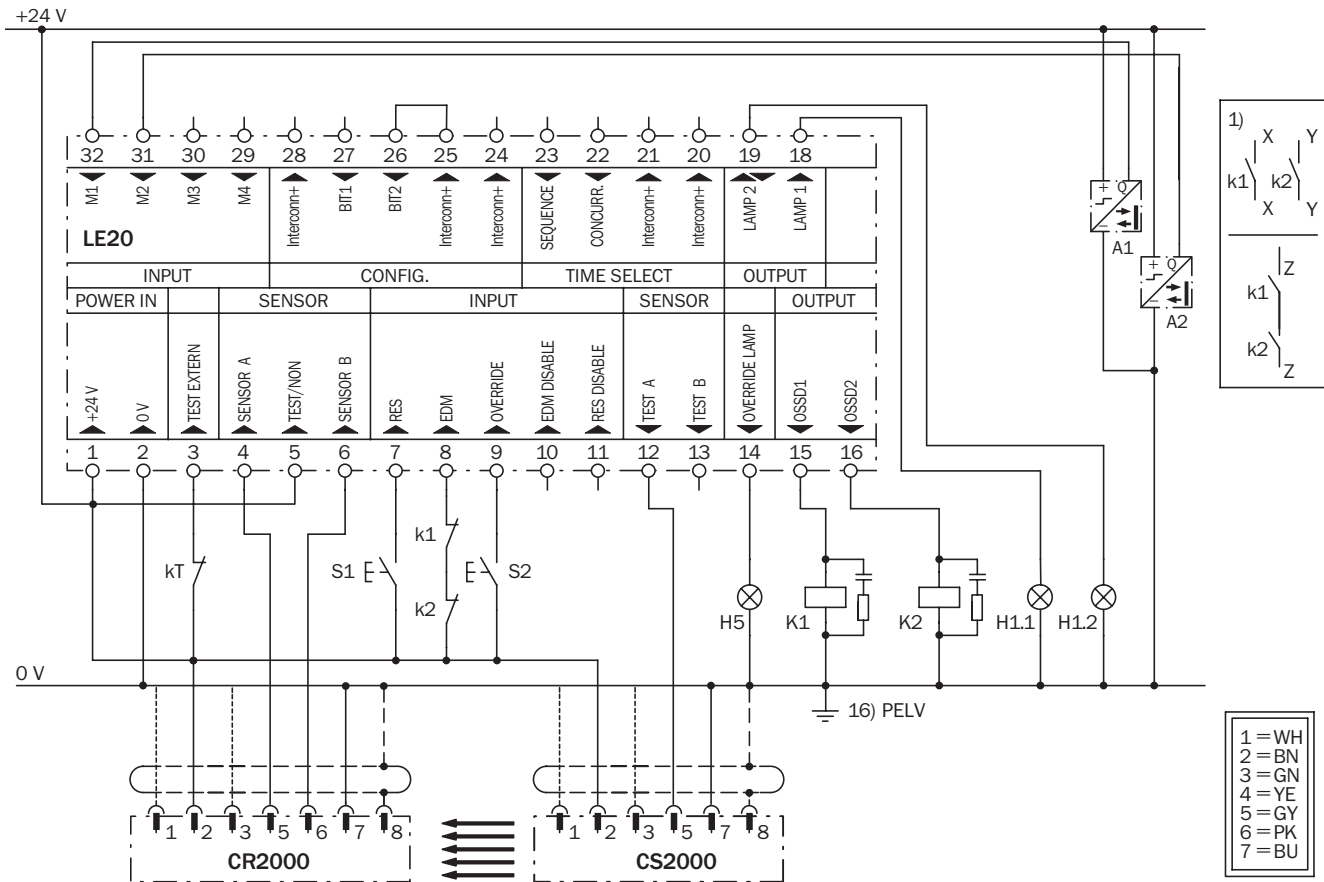


Mechanical dimensions, IP 65 housing for LE20 Muting

N

# Connection diagrams

## Safety relay LE20 Muting with C2000, 2 muting sensors and 2 muting indicator lamps



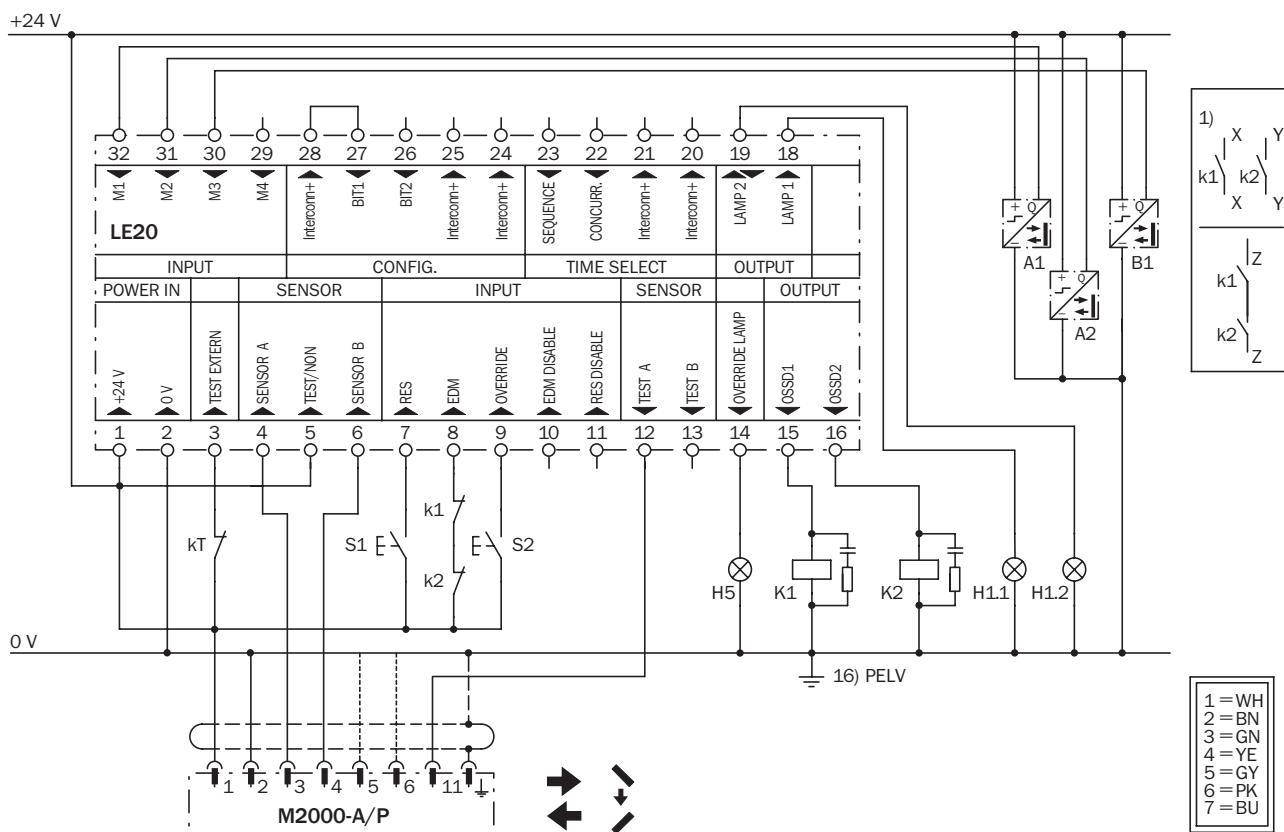
These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

Continued on next page



Safety relay LE20 Muting with M2000-A/P and 3 muting sensors



These contacts must be integrated into the control system such that when the output circuit is open the hazardous state is eliminated.

In safety categories 4 and 3 they must be integrated in two-channel configuration (x, y paths). Single-channel insertion into the control system (z path) is only possible with single-channel control and taking account of the risk analysis.

Ordering information accessories

Interfaces

Description	Connection type	Type	Part number
Safety relay UE10-20S	▪ With screw terminal connector	UE10-20S2D0	2019772
	▪ With spring clamp terminal connector	UE10-20S4D0	2019771

Muting indicator lamps

Description	Delivery/cable length	Part number
Muting indicator lamp, bulb	▪ Including mounting kit	2020743
Muting indicator lamp, LED lamp	▪ Cable length 2 m	2019909
	▪ Cable length 10 m	2019910



## Overview of technical specifications

Category according to EN 954-1	Same as main unit
Number of enable current paths	4
Number of signalling current paths	2
Housing width	22.5 mm

## Product description

- The UE10-4XT expansion module serve to:
  - Increase the number of output contacts of a main unit
  - N/C contact for external device monitoring (EDM)
- 2 LEDs:
  - Relay K1
  - Relay K2
- Available with plug-in terminals (key coded)

## In-system added value

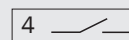
- Applicable with UE10–UE48 units

## Ordering information

Connection type	Type	Part number
Screw-type terminals	UE10-4XT2D2	6024919
Plug-in terminals	UE10-4XT3D2	6024920



- Expansion module
- External device monitoring (EDM)



N

Further information	Page
→ Symbols	N-2
→ Technical specifications	N-72
→ Internal circuitry	N-73
→ Dimensional drawings	N-73
→ Services	A-2

## Detailed technical specifications

### General system data

Voltage supply to A1 - A2 Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Supply voltage $V_S$ (A1 - A2)	24 V AC/DC (20.4 V AC/DC ... 26.4 V AC/DC)
Power consumption	AC mode 2.7 VA DC mode 1.5 W
Residual ripple in DC mode (within the limits of $V_S$ )	2.4 $V_{SS}$
Nominal frequency in AC mode	50 Hz ... 60 Hz
Switch-on time (upon applying the supply voltage)	25 ms

### Output circuits (13 - 14, 23 - 24, 33 - 34, 43 - 44, 51 - 52, 61 - 62, Y1 - Y2)

Response time (K1 / K2)	40 ms
Relay contacts	4 N/O, enable current paths, safety relevant 2 N/C, signalling current paths, not safety relevant 1 N/C, contactor monitoring
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
Load capacity of contacts	Switching voltage enable current paths 10 V AC ... 230 V AC / 10 V DC ... 30 V DC Switching voltage contactor monitoring 10 V DC ... 24 V DC Switching current enable current paths 10 mA ... 6 A Switching current signalling current paths 10 mA ... 2 A Switching current contactor monitoring 10 mA ... 0.1 A Total current across all contacts 12 A
Application category according to EN 60947-5-1	AC-15 $U_e$ 230 V AC, $I_e$ 6 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 6 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	1 x 10 <sup>7</sup> switching cycles
Service life, electrical (dependent on the load)	2 x 10 <sup>6</sup> switching cycles

### Operating data

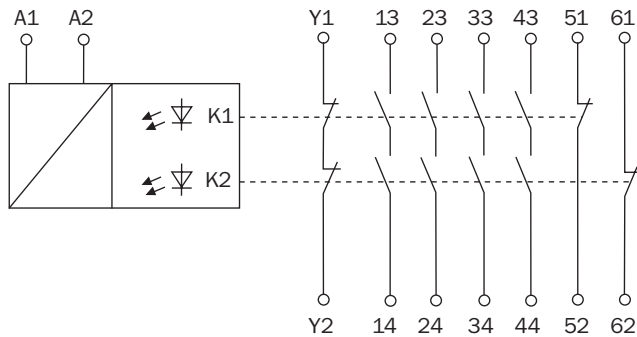
Surge voltage rating ( $U_{Imp.}$ )	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	External 3 Internal 2
Voltage rating	300 V AC
Test voltage $U_{eff}$ (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	Housing IP 40 Terminals IP 20
Radio interference	EN 60947-1 02/99
Screening against interference	EN 60947-1 02/99
Ambient operating temperature	-25 °C ... +55 °C
Storage temperature	-25 °C ... +75 °C
Wire cross-sections	Single strand wire (2 x, identical cross section) 0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> Single strand wire (1 x) 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> Fine stranded wire with terminal crimps (2 x, identical cross section) 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup> Fine stranded wire with terminal crimps (1 x) 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>

Weight	0.2 kg
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## Internal circuitry



### Function

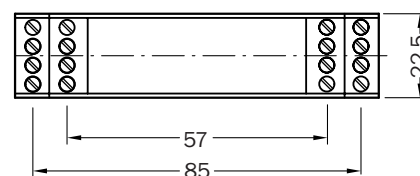
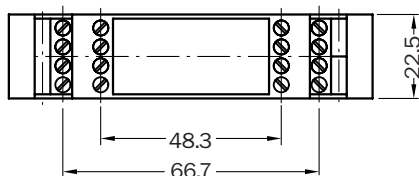
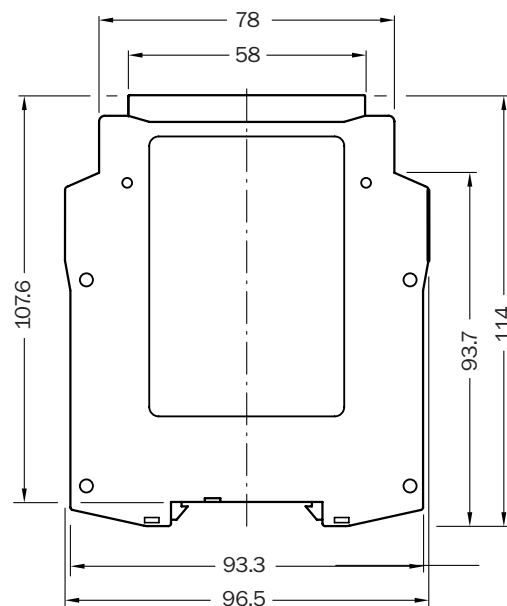
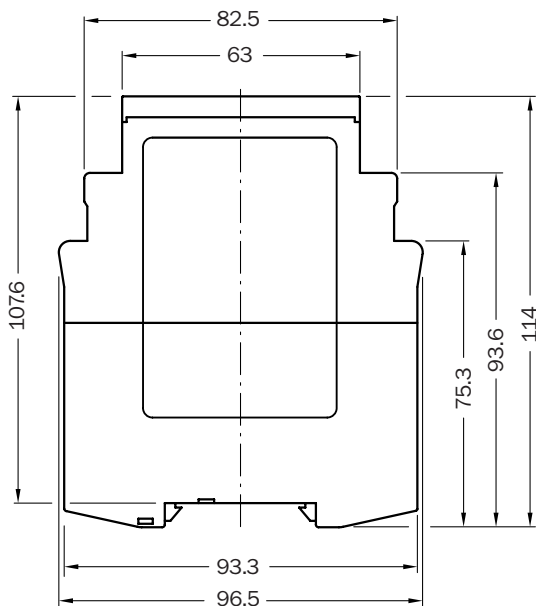
The supply voltage of the expansion module is linked to an output contact of a main unit. Upon applying the supply voltage to terminals A1 and A2, relays K1 and K2 are energised (the LEDs for both relays illuminate): The 4 output contacts close, the two normally closed contacts and the EDM (feedback) circuit switch to open circuit status.

When the output contacts of the standard unit opens (e.g. by activation of the emergency stop), the relays K1 and K2 de-energise: The normally open contacts open, and the two normally closed contacts close.

### External device monitoring (EDM)

If external device monitoring is implemented in the connected main unit, then the normally closed contacts (Y1 - Y2) prevent the resetting of the main unit, when K1 and/or K2 do not de-energise.

## Dimensional drawings



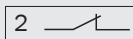
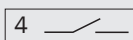
Housing with screw-type terminals

Housing with plug-in terminals

Dimensions in mm



- Expansion module
- External device monitoring (EDM)



## Overview of technical specifications

Category according to EN 954-1	Same as main unit
Number of enable current paths	4
Number of off-delayed normally open contacts	2
Housing width	22.5 mm

## Product description

- The UE11-4DX expansion module serve to:
  - Increase the number of output contacts of a main unit
  - UE11-4DX has off-delayed outputs (0.5 s, 1 s, 2 s or 3 s, depending on model)
  - N/C contact for external device monitoring (EDM)
- 2 LEDs:
  - Relay K1
  - Relay K2
- Available with plug-in terminals

## In-system added value

- Applicable with UE10–UE48 units

## Ordering information

Delay	Connection type	Type	Part number
0.5 s	Screw-type terminals	UE11-4DX2D30.5	6024921
	Plug-in terminals	UE11-4DX3D30.5	6024925
1 s	Screw-type terminals	UE11-4DX2D31	6024922
	Plug-in terminals	UE11-4DX3D31	6024926
2 s	Screw-type terminals	UE11-4DX2D32	6024923
	Plug-in terminals	UE11-4DX3D32	6024927
3 s	Screw-type terminals	UE11-4DX2D33	6024924
	Plug-in terminals	UE11-4DX3D33	6024928

N

Further information	Page
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→ Dimensional drawings	N-77
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## Detailed technical specifications

### General system data

<b>Voltage supply to A1 - A2</b> Electrical output circuit > 25 V AC / 60 V DC Electrical output circuit < 25 V AC / 60 V DC	PELV PELV or SELV
Supply voltage $V_S$ (A1 - A2)	24 V DC (20.4 V DC ... 26.4 V DC)
Power consumption	2.0 W
Residual ripple in DC mode (within the limits of $V_S$ )	2.4 $V_{SS}$
Switch-on time (upon applying the supply voltage)	75 ms

### Output circuits (17 - 18, 27 - 28, 37 - 38, 47 - 48, 55 - 56, 65 - 66, Y1 - Y2) off-delayed

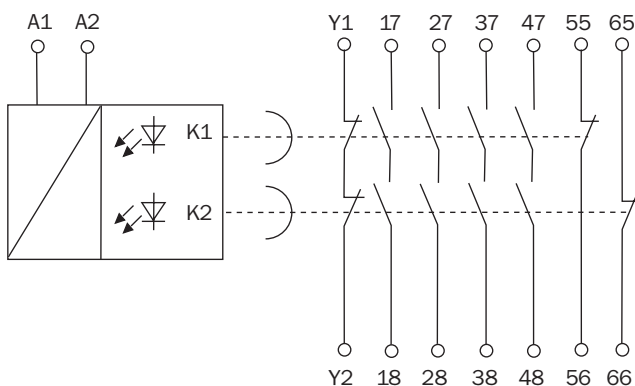
<b>Switch-off delay time (depending on type)</b> Influence of the supply voltage Influence of ambient temperature Mean value of error (% + ± 10 ms) Dispersion (% + ± 10 ms)	0.5 s, 1 s, 2 s or 3 s 0.5 (%/% $\Delta U_N$ ) 0.4 (%/K) ± 20 ± 2
Relay contacts	4 N/O, enable current paths, safety relevant 2 N/C, signalling current paths, not safety relevant 1 N/C, contactor monitoring
Contact type	Positively guided
Contact material	Silver alloy; gold-plated
<b>Load capacity of contacts</b> Switching voltage enable current paths Switching voltage contactor monitoring Switching current enable current paths Switching current signalling current paths Switching current contactor monitoring Total current across all contacts	10 V AC ... 230 V AC / 10 V DC ... 30 V DC 10 V DC ... 24 V DC 10 mA ... 6 A 10 mA ... 2 A 10 mA ... 0.1 A 12 A
Application category according to EN 60947-5-1	AC-15 $U_e$ 230 V AC, $I_e$ 6 A (3600 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 6 A (360 c/h) DC-13 $U_e$ 24 V DC, $I_e$ 3 A (3600 c/h)
Permitted switching frequency	3600 c/h
Service life, mechanical (relay contacts)	$1 \times 10^7$ switching cycles
Service life, electrical (dependent on the load)	$2 \times 10^6$ switching cycles

### Operating data

Surge voltage rating ( $U_{Imp.}$ )	4 kV
Excess voltage category	III
Contamination rating of the unit (EN 50178)	External 3 Internal 2
Voltage rating	300 V AC
Test voltage $U_{eff}$ (50 Hz) EN 60439-1	2.0 kV
Enclosure rating	Housing IP 40 Terminals IP 20
Radio interference	EN 60947-1 02/99
Screening against interference	EN 60947-1 02/99
Ambient operating temperature	-25 °C ... +55 °C
Storage temperature	-25 °C ... +75 °C
<b>Wire cross-sections</b> Single strand wire (2 x, identical cross section) Single strand wire (1 x) Fine stranded wire with terminal crimps (2 x, identical cross section) Fine stranded wire with terminal crimps (1 x)	0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup> 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>

Weight	0.2 kg
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## Internal circuitry



### Function

The supply voltage of the expansion module is switched by way of a output contact of a standard unit.

Upon applying the supply voltage to terminals A1 and A2, relays K1 and K2 are energised (the LEDs for both relays illuminate): The 4 output contacts close, the two normally closed contacts and the EDM (feedback) circuit switch to open circuit status.

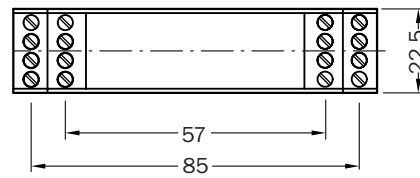
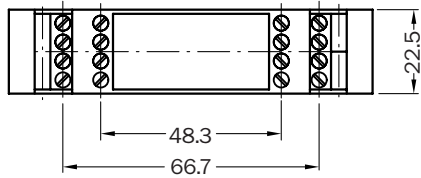
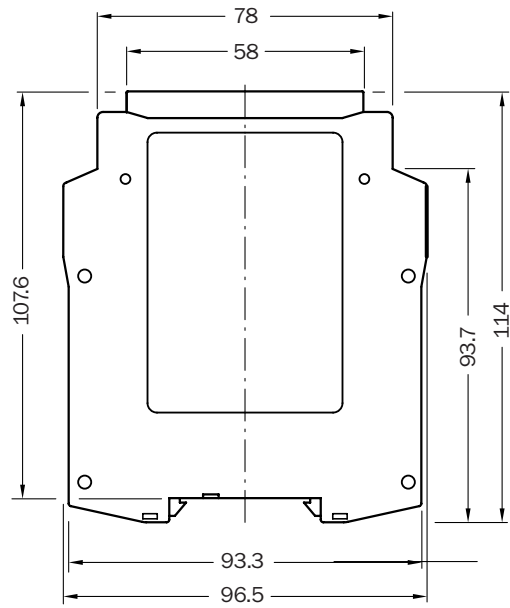
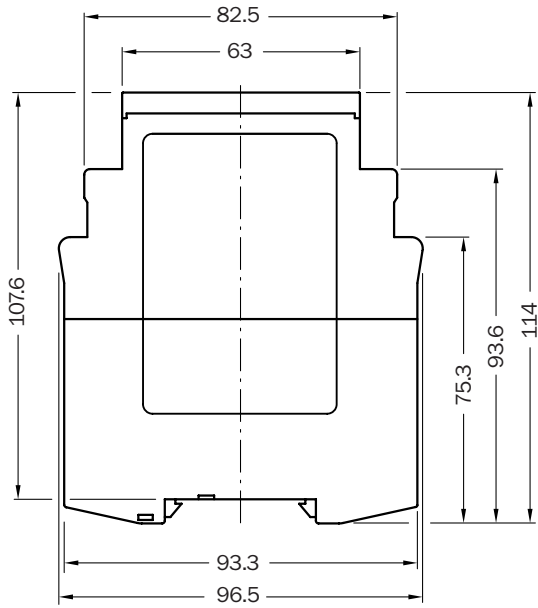
When the output contacts of the standard unit opens (e.g. by activation of the emergency stop switch), the relays K1 and K2 de-energise after a unit specific delay. These fixed switch-off delay times of 0.5 s, 1 s, 2 s and 3 s are according to the type.

This is achieved by means of capacitors, so that even in the event of power supply failure the off-delay runs its full duration in each instance. Only after the delay period has expired do the relays K1 and K2 return to their neutral rest position. With the combination of UE11-4DX (with off-delayed) and a standard unit, stop category 1 (EN 418) can be realised.

### External device monitoring (EDM)

If external device monitoring is implemented in the upstream installed standard unit, then the normally closed contacts (Y1 - Y2) prevent the resetting of the standard unit, when K1 and/or K2 do not de-energise.

# Dimensional drawings



Housing with screw-type terminals

Housing with plug-in terminals

Dimensions in mm



## Technical overview and applications



### Modular

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Configurable
- Can be expanded locally
- Application orientated function modules available



### Compact

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Configurable with application blocks
- Online diagnostics
- Software tool
- Communication interface for intelligent SICK safety sensors



### Flexible

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Programmable with function blocks
- Can be expanded decentrally
- Online diagnostics
- Software tool
- Network enabled



### Decentral

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Decentral controller in robust IP 67 enclosure rating
- For stand-alone use or in a network
- A standard PLC can directly operate the safe outputs on the remote controller using "Safety Enable"
- Quick and consistent shut-down time (<8 ms) even in a network, thanks to "Fast Shut Off" function

#### Applications:

- Packaging machines
- Machine tools
- Placement and handling machines

#### Applications:

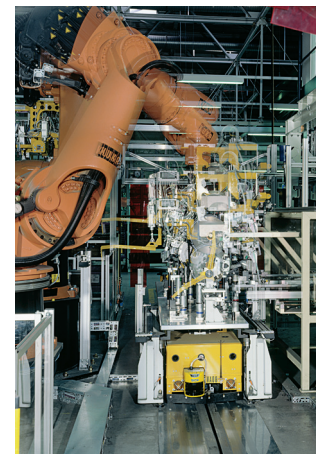
- Presses
- Machine tools
- Placement and handling machines

#### Applications:

- Machine tool manufacture and systems engineering

#### Applications:

- Machine tool manufacture and systems engineering
- Machine tools
- Robot-assisted production



# Safety controllers



Description	Number of inputs single-/dual-channel	Number of inputs expandable to single-/dual-channel	Number of outputs single-/dual-channel	Number of outputs expandable to single-/dual-channel	Expandable via	Change to the logic	Functions					Product	Page
							Signals related to pressing actions <sup>4)</sup>	Operating mode selection	Simultaneous protective field evaluation	Diagnostics (control and sensor)	EFI – safe SICK device communication <sup>6)</sup>		
Modular safety controller	4/2	100/50 <sup>1)</sup>	4/2	52/26 <sup>1)</sup>	Safety bus (device back panel)	Adjustable <sup>3)</sup>	–	–	–	✓ <sup>5)</sup>	–	UE410 Flexi	0-2
Compact safety controller	15/7	–	–/2	–	–	Configurable	–	✓	✓	✓	✓	UE440	0-18
							✓	✓	✓	✓	✓	UE470	0-18
Safety remote controller	12/6	1024/512 <sup>2)</sup>	–/2	–	–	Programmable	–	✓	–	✓	–	UE4427	0-26
	14/8	1024/512 <sup>2)</sup>	–/2	–	Network	Programmable	–	✓	✓	✓	✓	UE4457	0-26
Flexible safety controller	16/8	1024/512 <sup>2)</sup>	8/4	512/256 <sup>2)</sup>	Network	Programmable	–	✓	✓	✓	–	UE4470	0-34

<sup>1)</sup> Depending on module combination

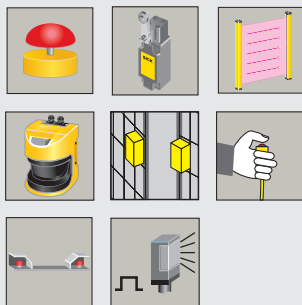
<sup>2)</sup> Depending on network expansion

<sup>3)</sup> Via program switch

<sup>4)</sup> Bottom dead centre, top dead centre and stop control contact

<sup>5)</sup> Via diagnosis module on fieldbus

<sup>6)</sup> Enhanced function interface, safe SICK device communication



- Optimal integration of SICK safety devices
- Significant reduction in the control cabinet width
- Easy program selection using rotary switches (no software required)
- Significant reduction in the wiring effort
- Relay module
- PROFIBUS and DeviceNet integration



Further information	Page
→ Technical specifications	0-4
→ Internal circuitry	0-10
→ Dimensional drawings	0-12
→ Connection diagrams	0-13
→ Accessories	0-17
→ Services	A-2

## Overview of technical specifications

Number of inputs	4 ... 100 depending on module combination
Number of safety capable outputs	4 ... 52 depending on module combination
Field bus (depending on type)	DeviceNet/PROFIBUS-DP
Program selection	Adjustable by means of rotary switch
Logical functions	OR, AND, BYPASS, Muting
Muting	✓

## Product description

Behind the UE410 Flexi series is a safety control concept that enables different units and modules to be connected together as required in the specific case.

The units are of plug-in style with communication between the individual units over an internal bus.

The sensors that can be connected and the function are defined using rotary switches on the related units; except for the relay modules and the fieldbus modules that are used for integration in a higher level

controller without a safety function. These modules are output units and have no effect on the logic set or the function of the upstream units.

The UE410 series comprises the units:

- UE410-MU (main unit)
- UE410-XU (extension unit)
- UE410-8DI (input expansion unit)
- UE410-2RO/-4RO (relay module)
- UE410-PRO/UE410-DEV (diagnosis module PROFIBUS-DP/DeviceNet. CANopen in preparation)

## In-system added value

A UE410 system always comprises a main unit (UE410-MU) and, as required,

additional extension units and an appropriate diagnosis module.

	Module	Number of inputs	Number of outputs	Delay time (adjustable) <sup>(3)</sup>	Connector technology	Field bus	Number of application diagnostic outputs
UE410-MU	Main unit	4	4	0 ... 5 s 0 ... 50 s 0 ... 300 s	Plug-in terminals/ dual level spring clamp terminals	—	—
UE410-XU	Extension unit	4	4	0 ... 5 s 0 ... 50 s 0 ... 300 s		—	—
UE410-8DI	Input expansion unit	4 <sup>(1)</sup>	—	—		—	—
UE410-2RO/ UE410-4RO	Relay module	—	2/4 <sup>(2)</sup>	—		—	1/2
UE410-PRO/ UE410-DEV	Diagnosis module	—	—	—		PROFIBUS-DP/ DeviceNet	—

<sup>1)</sup> Dual-channel

<sup>2)</sup> Relay outputs

<sup>3)</sup> Only outputs Q3/Q4

→ Configuring UE410 Flexi modules: [www.ue410flexi.com](http://www.ue410flexi.com)



## Ordering information

### Main unit

Number of inputs	Number of safety capable outputs	Connector technology	Delay time (adjustable) <sup>1)</sup>	Type	Part number
2 dual-channel resp. 4 single-channel	2 dual-channel resp. 4 single-channel	Plug-in terminals	0 s ... 5 s	UE410-MU3T5	6026136
			0 s ... 50 s	UE410-MU3T50	6026137
			0 s ... 300 s	UE410-MU3T300	6026138
		Dual level spring clamp terminals	0 s ... 5 s	UE410-MU4T5	6032669
			0 s ... 50 s	UE410-MU4T50	6032670
			0 s ... 300 s	UE410-MU4T300	6032671

<sup>1)</sup> Only outputs Q3/Q4

### Extension unit

Number of inputs	Number of safety capable outputs	Connector technology	Delay time (adjustable) <sup>1)</sup>	Type	Part number
2 dual-channel resp. 4 single-channel	2 dual-channel resp. 4 single-channel	Plug-in terminals	0 s ... 5 s	UE410-XU3T5	6032470
			0 s ... 50 s	UE410-XU3T50	6032471
			0 s ... 300 s	UE410-XU3T300	6032472
		Dual level spring clamp terminals	0 s ... 5 s	UE410-XU4T5	6032672
			0 s ... 50 s	UE410-XU4T50	6032673
			0 s ... 300 s	UE410-XU4T300	6032674

<sup>1)</sup> Only outputs Q3/Q4

### Input expansion unit

Number of inputs	Connector technology	Type	Part number
4 dual-channel resp. 8 single-channel	Plug-in terminals	UE410-8DI3	6026139
	Dual level spring clamp terminals	UE410-8DI4	6032675

### Relay module

Number of normally open contacts	Number of application diagnostic outputs	Connector technology	Type	Part number
2	1	Plug-in terminals	UE410-2R03	6026144
		Dual level spring clamp terminals	UE410-2R04	6032677
4	2	Plug-in terminals	UE410-4R03	6026143
		Dual level spring clamp terminals	UE410-4R04	6032676

### Diagnosis module

Field bus	Connector technology	Type	Part number
PROFIBUS-DP	Plug-in terminals	UE410-PRO3	6028407
	Dual level spring clamp terminals	UE410-PRO4	6032678
DeviceNet	Plug-in terminals	UE410-DEV3	6032469
	Dual level spring clamp terminals	UE410-DEV4	6032679

## Detailed technical specifications

### Main unit

#### General data

	UE410- MU3T5	UE410- MU3T50	UE410- MU3T300	UE410- MU4T5	UE410- MU4T50	UE410- MU4T300
Category	4 (EN 954-1)					
Safety integrity level	SIL3 (IEC 61508)					
PFD	1.7 x 10 <sup>-5</sup>					
PFH	7.9 x 10 <sup>-9</sup> /h					
SFF	96 %					
DC	93 %					
Ambient operating temperature	-25 °C ... +55 °C					
Storage temperature	-25 °C ... +70 °C					
Air humidity from ... to	15 % ... 95 %, non-dewing					
Climate conditions according to	EN 61131-2					
Vibration resistance	5 Hz ... 500 Hz					
Vibration resistance (checked to)	EN 60068-2-64, EN 61131-2					
Enclosure rating	EN/IEC 60529					
Clamps	IP 40					
Housing	IP 20					
Electromagnetic compatibility (EMC)	Class A (EN 61131-2, EN 61000-6-2, EN 55011)					
Protection class	III					
Connection conductor cross-section	Single-wire or fine-wire conductor: 1 x 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>					
Connector technology	Plug-in terminals			Dual level spring clamp terminals		
Dimensions (W x H x D)	29 mm x 96.5 mm x 120.8 mm					
Weight	180 g					

## Electrical data

	UE410- MU3T5	UE410- MU3T50	UE410- MU3T300	UE410- MU4T5	UE410- MU4T50	UE410- MU4T300
Supply voltage	24 V DC (19.2 V DC ... 30 V DC)					
Type of supply voltage	PELV (electrical output circuit on UE410-4RO/UE410-2RO > 25 V AC/60 V DC), PELV or SELV (electrical output circuit on UE410-4RO/UE410-2RO < 25 V AC/60 V DC)					
Power consumption	3 W					
Switch-on time	10 s					
Short-circuit protection	4A, fuse characteristic gG					
Input circuit (I1 - I4, EN, S1 - S3)	Input voltage HIGH Input voltage LOW Input current HIGH Input current LOW Switch-on time Synchronous time monitoring Muting time to operate Tolerated muting sensor signal interrupt Switch-on time ENTER button					
	15 V ... 30 V -5 V DC ... 5 V DC 3 mA (2.3 mA ... 3.6 mA) -2.5 mA ... 0.15 mA Min. 70 ms 800 ms (at program 2) 500 ms (at program 4 and 5) 61 ms, at program 3 <sup>1)</sup> 100 ms, at program 3 <sup>2)</sup> 3 s <sup>3)</sup>					
Number of inputs	2 dual-channel resp. 4 single-channel					
Control outputs (X1, X2)	Number of outputs Type of output Output voltage Output current Test pulse width Test pulse rate Load capacity					
	2 PNP semiconductors, short-circuit protected, cross-circuit monitored 18 V DC ... 30 V DC Max. 150 mA 12 ms (at program 1, 2, 4, 5, 6 on X1 and X2, at program 3.2 on X1) 52 ms (at program 3.2 on X2) 5 Hz Max. 1000 nF					
Safety outputs (Q1, Q2, Q3, Q4)	Number of safety capable outputs Type of output Output voltage Output current Response time Test pulse width Test pulse rate Load capacity Cable length Response time					
	4 PNP semiconductors, short-circuit protected, cross-circuit monitored 30 V DC 2 A 13 ms 300 µs 5 Hz 500 nF 100 m, 1.5 mm <sup>2</sup> 13 ms (I1/I2) program 3.1, 7, 8 29 ms (I1/I2) program 1, 2, 4, 5, 6 130 ms (I1/I2) program 1 safety mat 79 ms (I1/X1) program 3.2 29 ms (I2/X2) program 3.2 13 ms (I3/I4) program 1, 2, 7, 8 29 ms (I3/I4) program 4 and 5 13 ms (EN) at cascading					
Delay time <sup>4)</sup>	Adjustable 0 s ... 5 s	Adjustable 0 s ... 50 s	Adjustable 0 s ... 300 s	Adjustable 0 s ... 5 s	Adjustable 0 s ... 50 s	Adjustable 0 s ... 300 s
Data interface	Via field bus					

<sup>1)</sup> Time between muting condition valid (I3/I4 HIGH) and muting active

<sup>2)</sup> One muting input (I3 or I4) may be LOW for this time

<sup>3)</sup> Upon applying the supply voltage

<sup>4)</sup> Only outputs Q3/Q4

## Extension unit

## General data

	UE410- XU3T5	UE410- XU3T50	UE410- XU3T300	UE410- XU4T5	UE410- XU4T50	UE410- XU4T300
Category	4 (EN 954-1)					
Safety integrity level	SIL3 (IEC 61508)					
PFD	$1.7 \times 10^{-5}$					
PFH	$7.9 \times 10^{-9}/h$					
SFF	96 %					
DC	93 %					
Ambient operating temperature	-25 °C ... +55 °C					
Storage temperature	-25 °C ... +70 °C					
Air humidity from ... to	15 % ... 95 %, non-dewing					
Climate conditions according to	EN 61131-2					
Vibration resistance	5 Hz ... 500 Hz					
Vibration resistance (checked to)	EN 60068-2-64, EN 61131-2					
Enclosure rating	EN/IEC 60529					
Clamps	IP 40					
Housing	IP 20					
Electromagnetic compatibility (EMC)	Class A (EN 61131-2, EN 61000-6-2, EN 55011)					
Protection class	III					
Connection conductor cross-section	Single-wire or fine-wire conductor: 1 x 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>					
Connector technology	Plug-in terminals			Dual level spring clamp terminals		
Dimensions (W x H x D)	22.5 mm x 96.5 mm x 120.8 mm					
Weight	180 g					

## Electrical data

	UE410- XU3T5	UE410- XU3T50	UE410- XU3T300	UE410- XU4T5	UE410- XU4T50	UE410- XU4T300
Supply voltage	24 V DC (19.2 V DC ... 30 V DC)					
Type of supply voltage	PELV (electrical output circuit on UE410-4RO/UE410-2RO > 25 V AC/60 V DC), PELV or SELV (electrical output circuit on UE410-4RO/UE410-2RO < 25 V AC/60 V DC)					
Power consumption	3 W					
Switch-on time	10 s					
Short-circuit protection	4A fuse characteristic gG					
Input circuit (I1 - I4, EN, S1 - S3)	Input voltage HIGH Input voltage LOW Input current HIGH Input current LOW Switch-on time Synchronous time monitoring Muting time to operate Tolerated muting sensor signal interrupt					
	15 V ... 30 V -5 V DC ... 5 V DC 3 mA (2.3 mA ... 3.6 mA) -2.5 mA ... 0.15 mA Min. 70 ms 800 ms (at program 2) 500 ms (at program 4 and 5) 61 ms, at program 3 <sup>1)</sup> 100 ms, at program 3 <sup>2)</sup>					
Number of inputs	2 dual-channel resp. 4 single-channel					
Control outputs (X1, X2)	Number of outputs Type of output Output voltage Output current Test pulse width Test pulse rate Load capacity					
	2 PNP semiconductors, short-circuit protected, cross-circuit monitored 18 V DC ... 30 V DC Max. 150 mA 12 ms (at program 1, 2, 4, 5, 6 on X1 and X2, at program 3.2 on X1) 52 ms (at program 3.2 on X2) 5 Hz Max. 1000 nF					

	UE410- XU3T5	UE410- XU3T50	UE410- XU3T300	UE410- XU4T5	UE410- XU4T50	UE410- XU4T300
<b>Safety outputs (Q1, Q2, Q3, Q4)</b>						
Number of safety capable outputs	4					
Type of output	PNP semiconductors, short-circuit protected, cross-circuit monitored					
Output voltage	30 V DC					
Output current	2 A					
Response time	13 ms					
Test pulse width	300 µs					
Test pulse rate	5 Hz					
Load capacity	500 nF					
Cable length	100 m, 1.5 mm <sup>2</sup>					
Response time	13 ms (I1/I2) program 3.1, 7, 8 29 ms (I1/I2) program 1, 2, 4, 5, 6 130 ms (I1/I2) program 1 safety mat 79 ms (I1/X1) program 3.2 29 ms (I2/X2) program 3.2 13 ms (I3/I4) program 1, 2, 7, 8 29 ms (I3/I4) program 4 and 5 13 ms (EN) at cascading					
<b>Delay time <sup>3)</sup></b>	Adjustable 0 s ... 5 s	Adjustable 0 s ... 50 s	Adjustable 0 s ... 300 s	Adjustable 0 s ... 5 s	Adjustable 0 s ... 50 s	Adjustable 0 s ... 300 s
<b>Data interface</b>	Via field bus					

<sup>1)</sup> Time between muting condition valid (I3/I4 HIGH) and muting active

<sup>2)</sup> One muting input (I3 or I4) may be LOW for this time

<sup>3)</sup> Only outputs Q3/Q4

## Input expansion unit

### General data

	UE410-8DI3	UE410-8DI4
<b>Category</b>	4 (EN 954-1)	
<b>Safety integrity level</b>	SIL3 (IEC 61508)	
PFD	9.2 x 10 <sup>-6</sup>	
PFH	6.1 x 10 <sup>-9</sup> /h	
SFF	96 %	
DC	93 %	
<b>Ambient operating temperature</b>	-25 °C ... +55 °C	
<b>Storage temperature</b>	-25 °C ... +70 °C	
<b>Air humidity from ... to</b>	15 % ... 95 %, non-dewing	
<b>Climate conditions according to</b>	EN 61131-2	
<b>Vibration resistance</b>	5 Hz ... 500 Hz	
<b>Vibration resistance (checked to)</b>	EN 60068-2-64, EN 61131-2	
<b>Enclosure rating</b>	EN/IEC 60529	
Clamps	IP 40	
Housing	IP 20	
<b>Electromagnetic compatibility (EMC)</b>	Class A (EN 61131-2, EN 61000-6-2, EN 55011)	
<b>Protection class</b>	III	
<b>Connection conductor cross-section</b>	Single-wire or fine-wire conductor: 1 x 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>	
<b>Connector technology</b>	Plug-in terminals	Dual level spring clamp terminals
<b>Dimensions (W x H x D)</b>	22.5 mm x 96.5 mm x 120.8 mm	
<b>Weight</b>	150 g	

## Electrical data

		UE410-8DI3	UE410-8DI4
Power consumption		2 W	
Input circuit (I1 - I4, EN, S1 - S3)	Input voltage HIGH Input voltage LOW Input current HIGH Input current LOW Switch-on time Synchronous time monitoring	15 V ... 30 V -5 V ... 5 V DC 3 mA (2.3 mA ... 3.6 mA) -2.5 mA ... 0.15 mA Min. 70 ms 800 ms (at program 3 and 5)	
Number of inputs		4 dual-channel resp. 8 single-channel	
Control outputs (X1 - X8)	Number of outputs Type of output Output voltage Output current Test pulse width Test pulse rate Load capacity	8 PNP semiconductors, short-circuit protected, conditionally cross-circuit monitored 18 V DC ... 30 V DC Max. 150 mA 12 ms (at program 1, 2, 4, 5 on X1 and X2) 5 Hz Max. 1000 nF	
Safety outputs (Q1, Q2, Q3, Q4)	Response time	17 ms (for main unit and input expansion unit) mode switch selection 6, 7 on UE410-8DI 34 ms (for main unit and input expansion unit) mode switch selection 1, 2, 3, 4, 5 on UE410-8DI 134 ms (for main unit and input expansion unit) mode switch selection 2 safety mat on UE410-8DI	
Data interface		Via field bus	

## Relay module

## General data

		UE410-2R03	UE410-2R04	UE410-4R03	UE410-4R04
Galvanised decoupling	yes no	Supply circuit – output circuit and input circuit – output circuit Supply circuit – input circuit			
Ambient operating temperature		-25 °C ... +55 °C			
Storage temperature		-25 °C ... +70 °C			
Air humidity from ... to		15 % ... 95 %, non-dewing			
Climate conditions according to		EN 61131-2			
Vibration resistance		5 Hz ... 500 Hz			
Vibration resistance (checked to)		EN 60068-2-64, EN 61131-2			
Enclosure rating	Clamps Housing	EN/IEC 60529 IP 40 IP 20			
Electromagnetic compatibility (EMC)		Class A (EN 61131-2, EN 61000-6-2, EN 55011)			
Protection class		III			
Connection conductor cross-section		Single-wire or fine-wire conductor: 1 x 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>			
Connector technology		Plug-in terminals	Dual level spring clamp terminals	Plug-in terminals	Dual level spring clamp terminals
Dimensions (W x H x D)		22 mm x 96.5 mm x 120.8 mm			
Weight		160 g		190 g	

## Electrical data

	UE410-2R03	UE410-2R04	UE410-4R03	UE410-4R04
Supply voltage	24 V DC (19.2 V DC ... 30 V DC)			
Type of supply voltage	PELV (electrical output circuit on UE410-4R0/UE410-2R0 > 25 V AC/60 V DC), PELV or SELV (electrical output circuit on UE410-4R0/UE410-2R0 < 25 V AC/60 V DC)			
Power consumption	1 W		2 W	
Short-circuit protection	6A, fuse characteristic gG (per circuit)			
Safety outputs (Q1, Q2, Q3, Q4)	2		4	
Number of normally open contacts	2		4	
Number of application diagnostic outputs	1		2	
Type of output	Potential free, positively-driven			
Switching voltage	230 V DC (5 V DC ... 275 V DC) 250 V AC (5 V AC ... 275 V AC)			
Output current	6 A			
Total current	12 A			
Response time	<30 ms			
Contact material	AgSnO2			
Surface treatment	Au (1µM)			
Usage category	AC-15/DC-13			
Rated operating current (voltage)	3 A (250 V AC), 3 A (24 V DC)			
Response time	<30 ms			
Data interface	Via field bus			

## Diagnosis module

## General data

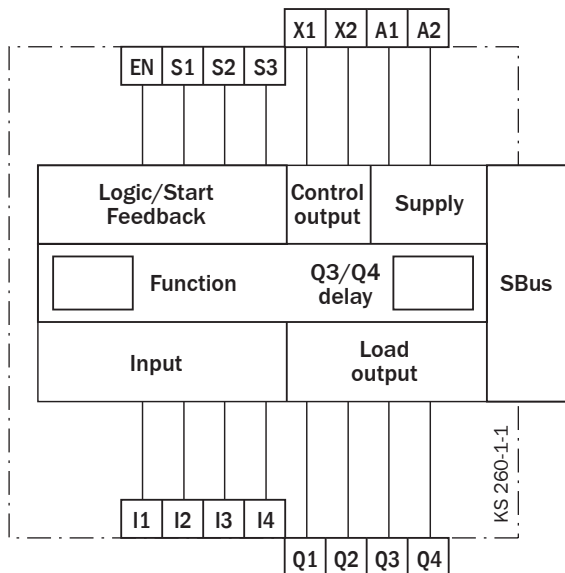
	UE410-PR03	UE410-PR04	UE410-DEV3	UE410-DEV4
Ambient operating temperature	-25 °C ... +55 °C			
Storage temperature	-25 °C ... +70 °C			
Air humidity from ... to	15 % ... 95 %, non-dewing			
Climate conditions according to	EN 61131-2			
Vibration resistance	5 Hz ... 500 Hz			
Vibration resistance (checked to)	EN 60068-2-64, EN 61131-2			
Enclosure rating	EN/IEC 60529			
Clamps	IP 40			
Housing	IP 20			
Electromagnetic compatibility (EMC)	Class A (EN 61131-2, EN 61000-6-2, EN 55011)			
Protection class	III			
Connection conductor cross-section	Single-wire or fine-wire conductor: 1 x 0.14 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.14 mm <sup>2</sup> ... 0.75 mm <sup>2</sup> / fine-wire with terminal crimp according to EN 46288: 1 x 0.25 mm <sup>2</sup> ... 2.5 mm <sup>2</sup> or 2 x 0.25 mm <sup>2</sup> ... 0.5 mm <sup>2</sup>			
Connector technology	Plug-in terminals	Dual level spring clamp terminals	Plug-in terminals	Dual level spring clamp terminals
Dimensions (W x H x D)	22.5 mm x 96.5 mm x 120.8 mm			
Weight	160 g			

Electrical data

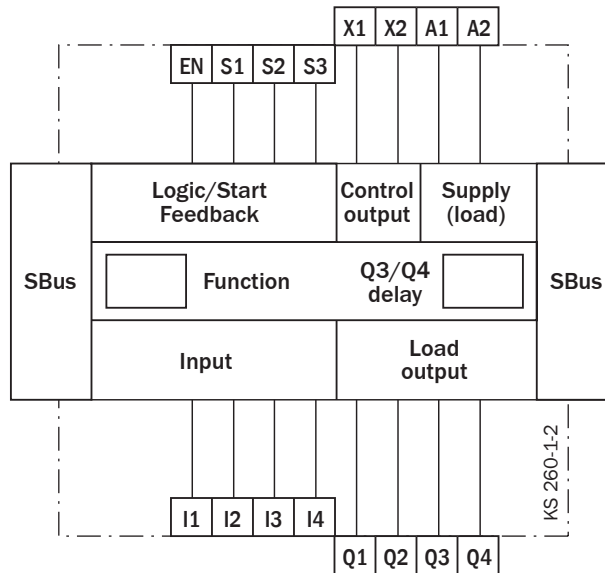
	UE410-PRO3	UE410-PRO4	UE410-DEV3	UE410-DEV4
Supply voltage	24 V DC (19.2 V DC ... 30 V DC)			
Power consumption	1.6 W			
Control outputs (X1 - X4)	Number of outputs: 4 Type of output: PNP semiconductors, short-circuit protected Output voltage: 18 V DC ... 30 V DC Output current: Max. 100 mA Load capacity: Max. 100 nF			
Data interface	Field bus: RS-485, PROFIBUS-DP, VO Communication behavior: SUB-D 9 pole, female Connector technology: SUB-D 9 pole, female Slave address: 0 ... 99 Transmission rate: 12 Mbaud Cable length (transmission rate): 1200 m (9,6 Kbit/s, 19,2 Kbit/s, 93,75 Kbit/s), 1000 m (187,5 Kbit/s), 400 m (500 Kbit/s), 200 m (1500 Kbit/s), 100 m (12000 Kbit/s)		Field bus: ISO-DIS 11898 Communication behavior: DeviceNet, Group 2 Only Server Connector technology: Plug-in terminal 5 pole Slave address: 0 ... 63 Transmission rate: 125 Kbit/s, 250 Kbit/s, 500 Kbit/s Cable length (transmission rate): —	

Internal circuitry

Main unit UE410-MU

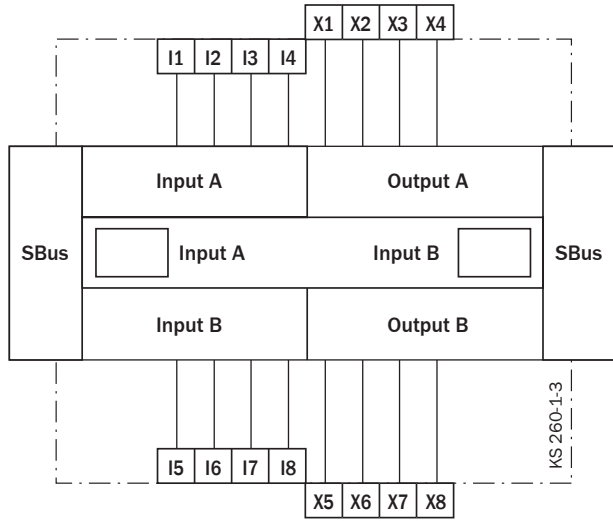


Extension unit UE410-XU

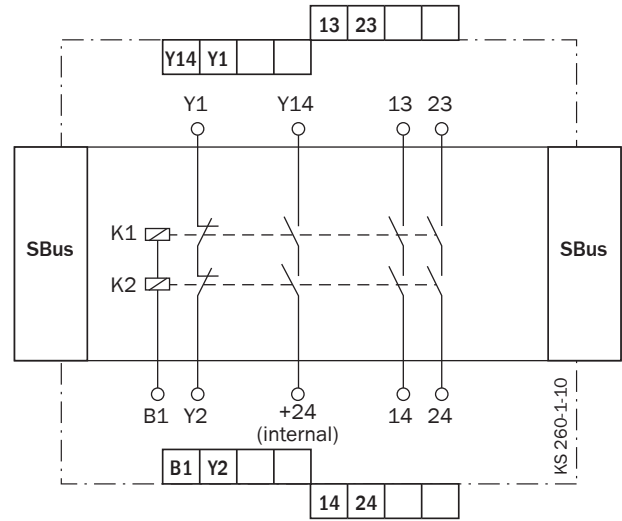




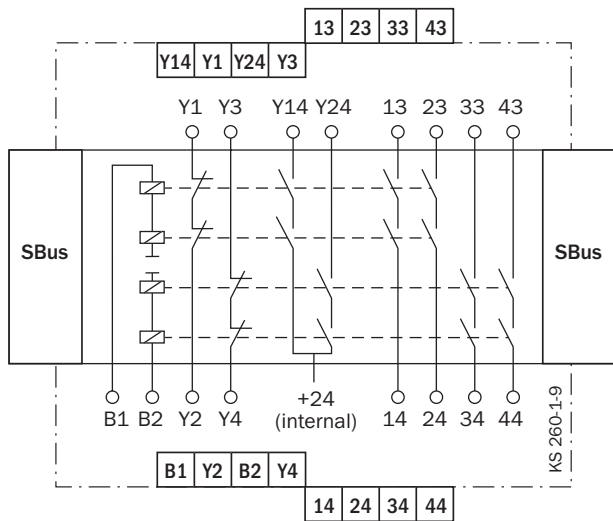
**Input expansion unit UE410-8DI**



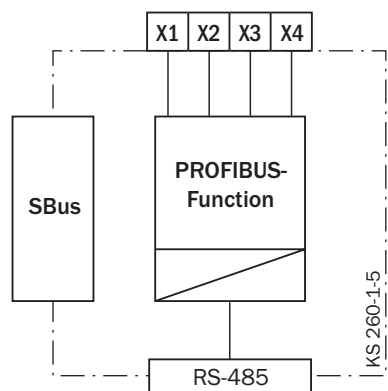
**Relay module UE410-2R0**



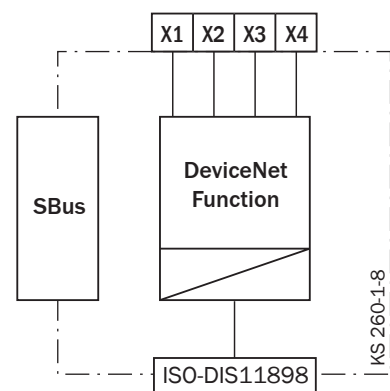
**Relay module UE410-4R0**



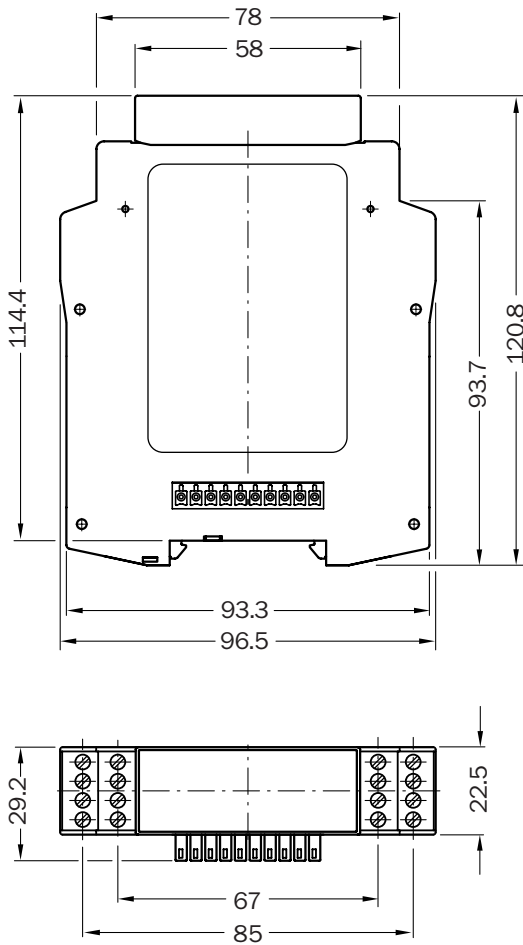
**Diagnosis module UE410-PRO for PROFIBUS-DP**



**Diagnosis module UE410-DEV for DeviceNet**



## Dimensional drawings

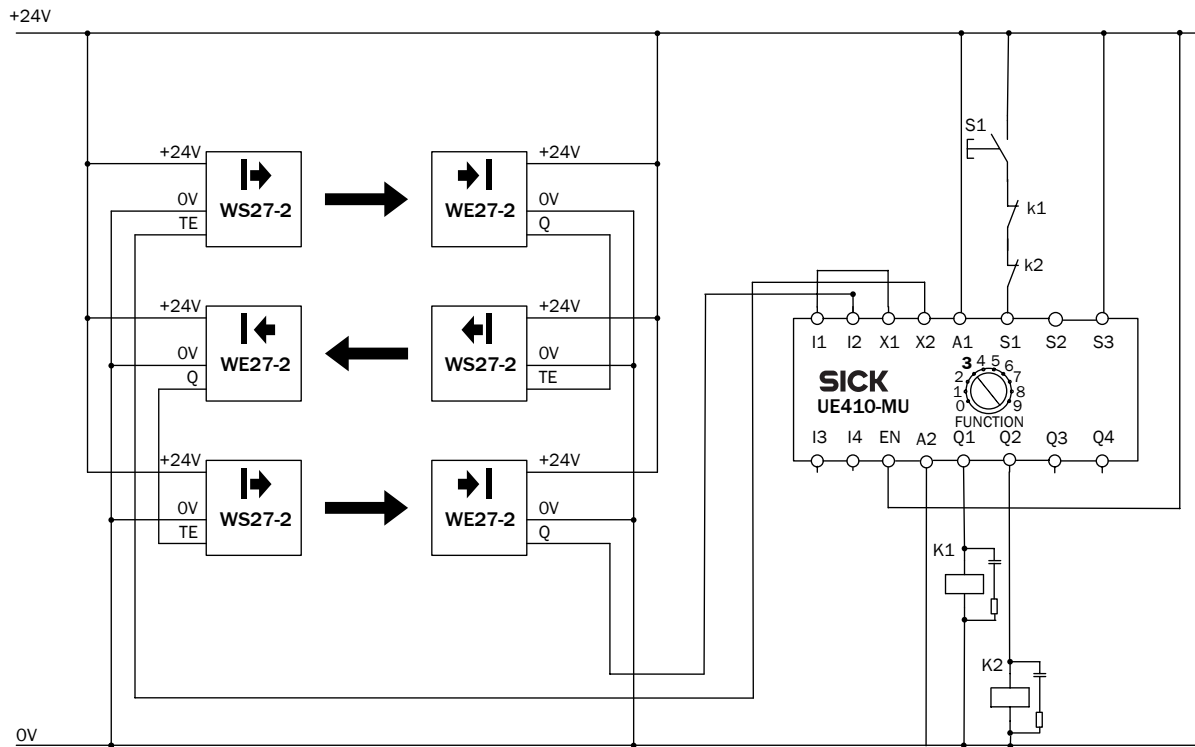


Dimensions in mm

## Connection diagrams

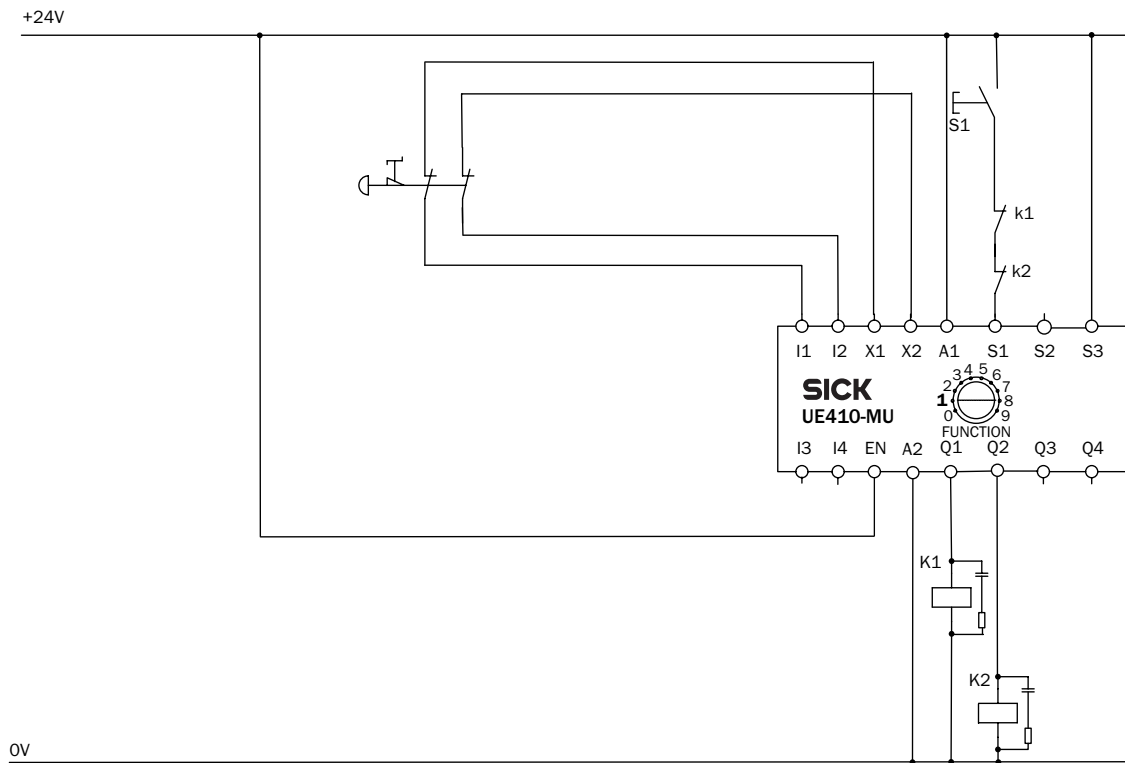
→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

### 3 single-beam photoelectric safety switches WS/WE27-2 on UE410-MU



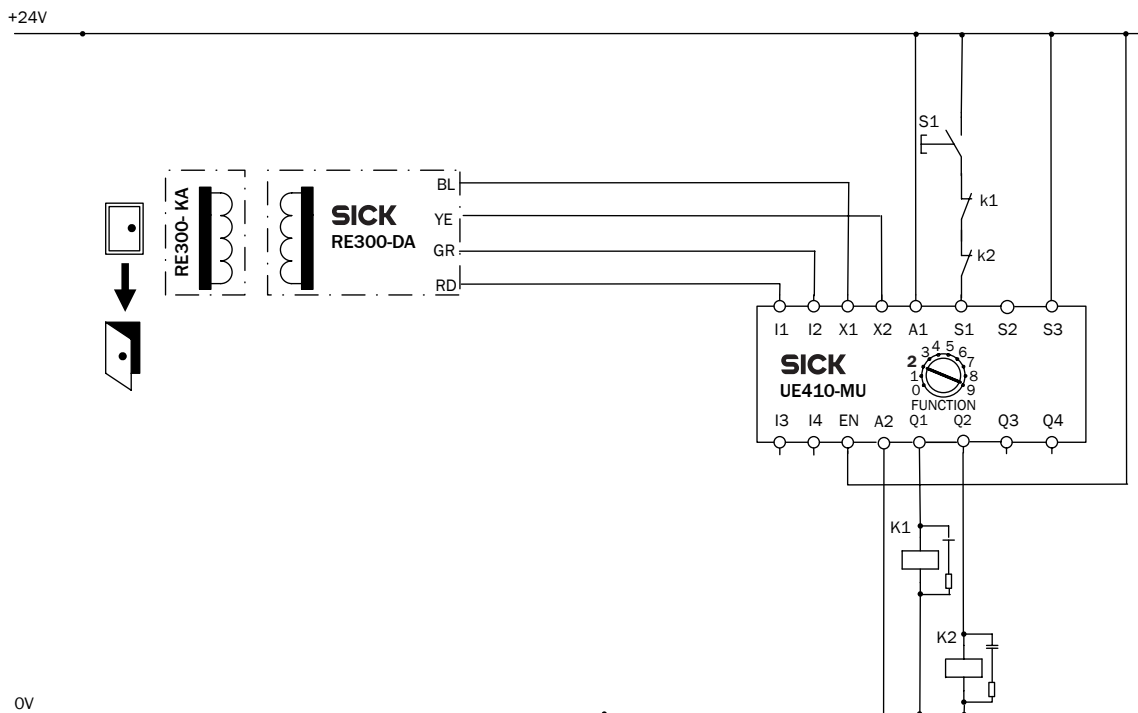
Program 3.2 with restart interlock and external device monitoring (EDM)

Emergency stop on UE410-MU



Program 1 with restart interlock and external device monitoring (EDM)

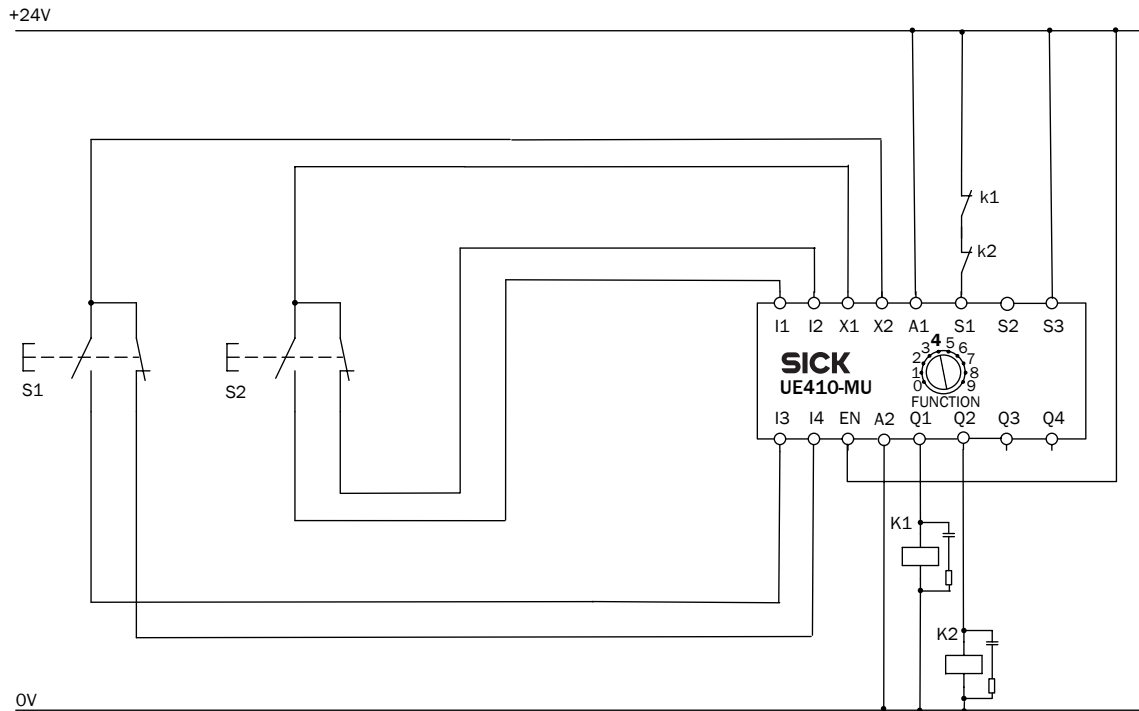
Non-contact safety switch RE300 on UE410-MU



Program 2 with restart interlock and external device monitoring (EDM)

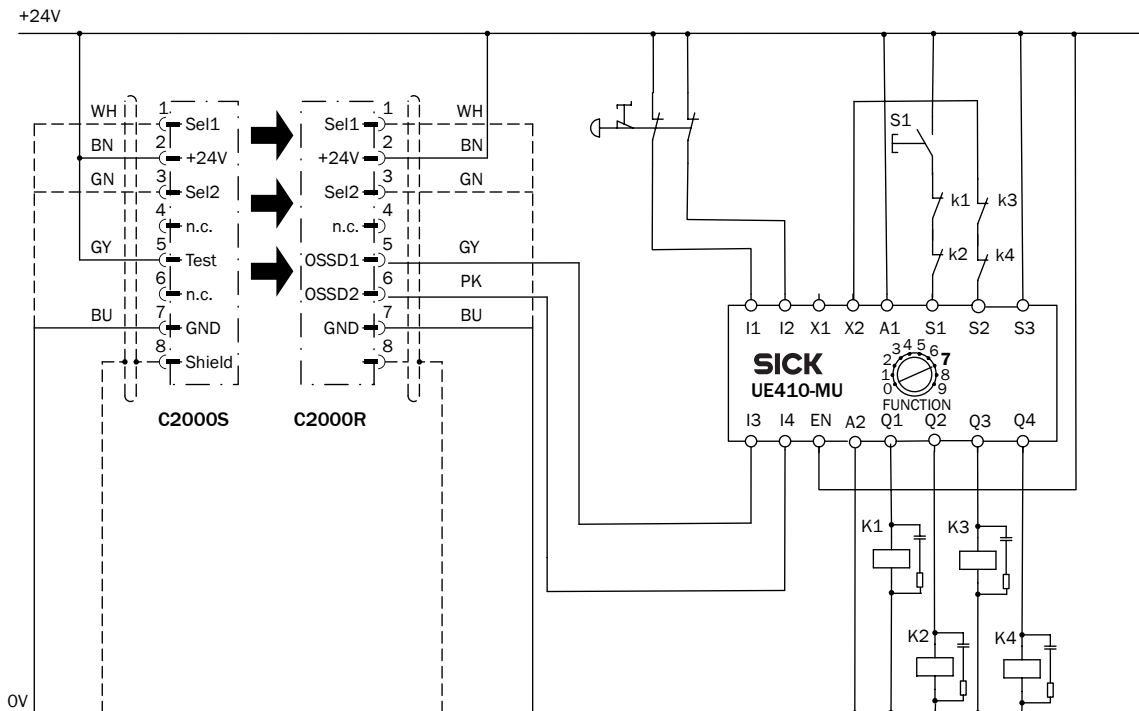
0

Two-hand control type III C on UE410-MU



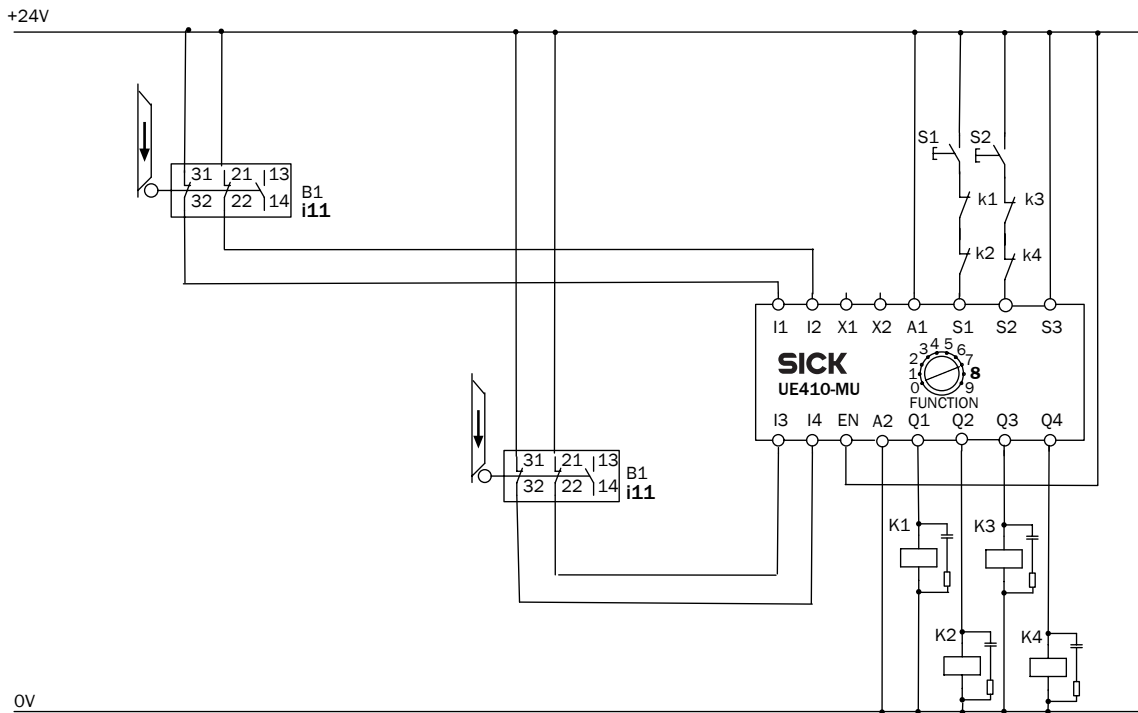
Program 4 without restart interlock and with external device monitoring (EDM)

Safety light curtain C2000 and emergency stop on UE410-MU



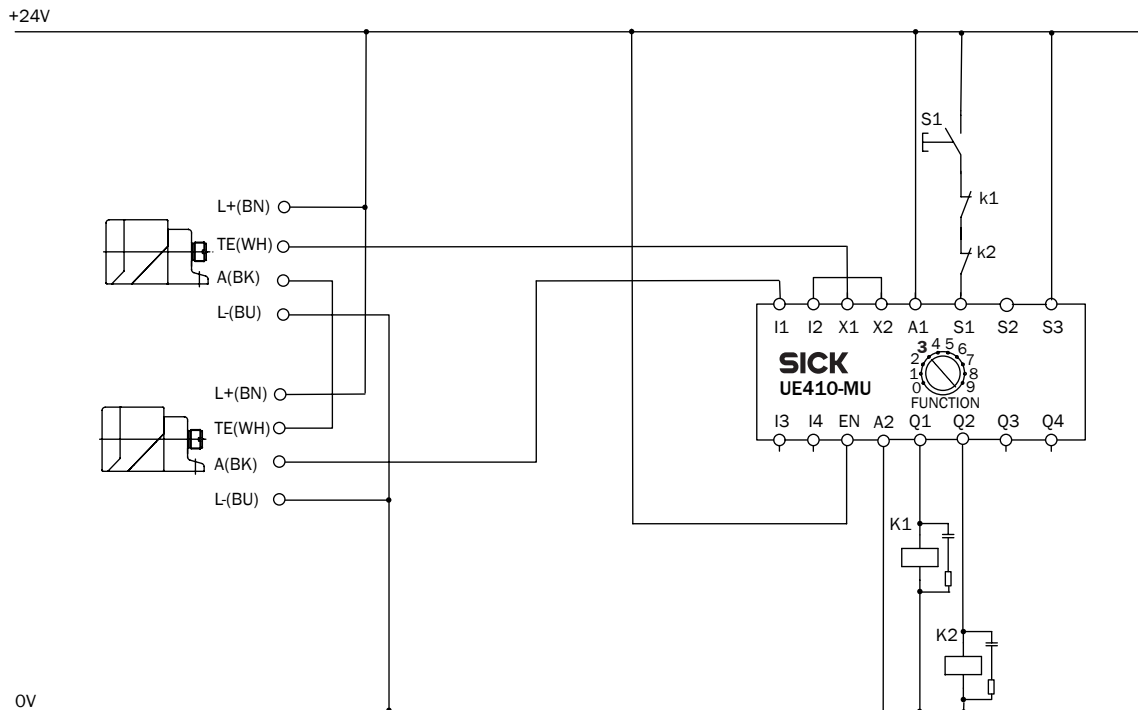
Program 7 with restart interlock and external device monitoring (EDM)

2 safety switches with separate actuator i11, 2 separate hazardous areas on UE410-MU



Program 8 with restart interlock and external device monitoring (EDM)

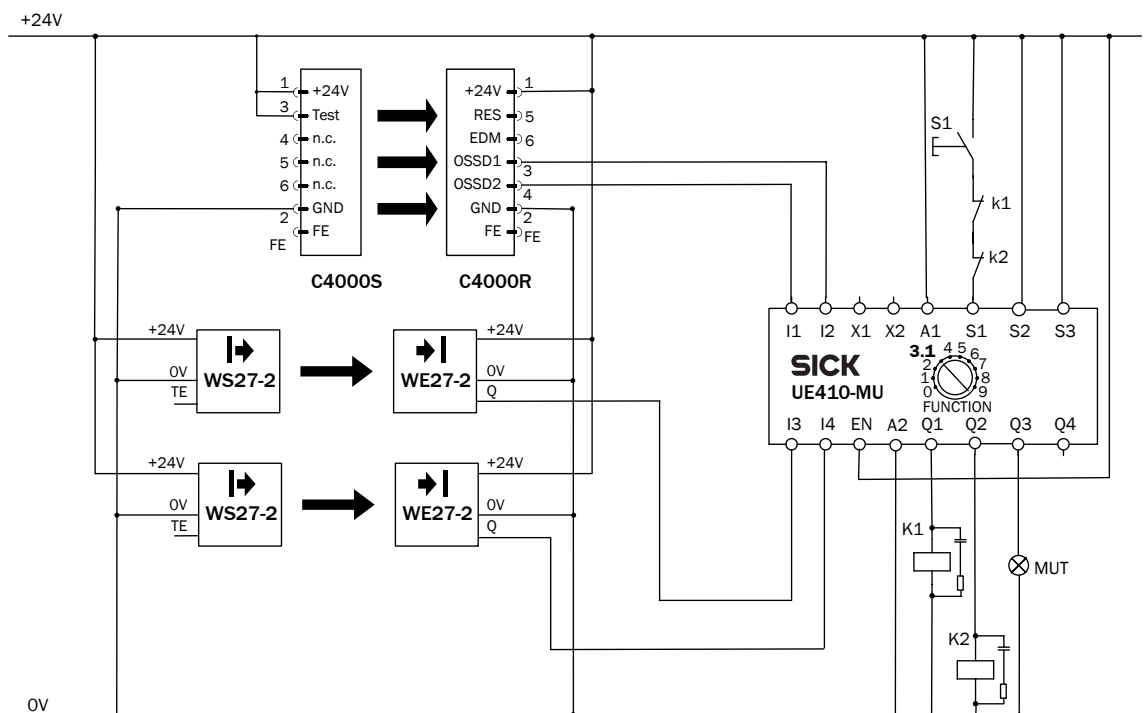
2 non-contact safety switches IN4000 on UE410-MU



Program 3.2 with restart interlock and external device monitoring (EDM)

0

Safety light curtain C4000 with 2 muting sensors on UE410-MU



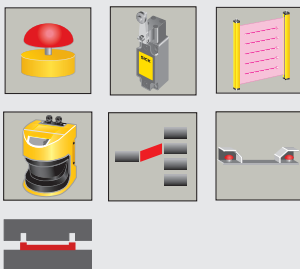
Program 3.1 with restart interlock and external device monitoring (EDM)

## Accessories

### Muting indicator lamp

Type of muting indicator	Cable length	Description	Remark connection cable	Part number
LED lamp	2 m	Incl. mounting kit	Incl. connection cable	2019909
	10 m			2019910
Indicator lamp (bulb)	—		Connecting cable not included	2020743

➔ Configuring UE410 Flexi modules: [www.ue410flexi.com](http://www.ue410flexi.com)



- Online monitoring
- CDS interface
- Simple drag and drop programming
- Space saving



## Overview of technical specifications

Category	4 (EN 954-1)
Safety integrity level	SIL3 (IEC 61508)
Number of inputs	15 single-channel / 7 dual-channel
Number of EFI interfaces	2
Number safety applications	2
Number of operating modes	5
Number of safety outputs	2
Number of application diagnostic outputs	4
Enclosure rating	IP 20
Stop category to EN 60204	0, 1
Supply voltage	24 V DC
Response time	<10 ms

## Product description

- Two independent or dependent safety applications
- Intelligent communication interface for electro-sensitive protective equipment
- 2 pairs of safe semiconductor outputs (category 4) with separate EDM and reset
- 4 wear-free semiconductor outputs
- Stopping category 0 and 1
- Reduced wiring effort due to logical linking of the safety sensors (AND, OR, NAND ...)
- Secure against tampering due to different password levels

## In-system added value

- 5 operating modes
- Simple configuration via drag and drop with uniform user software CDS for SICK safety devices
- Simple replication of the application by uploading and downloading data sets
- 2 ESPE interfaces category 4 for C4000/S3000
- Function expansion for intelligent SICK sensors (simultaneous protective field monitoring S3000)

## Applications

- Safety light curtains
- Photoelectric safety switches
- Safety laser scanners
- Safety switches
- Emergency stop



Further information	Page
→ Device overview and connections	0-20
→ Dimensional drawings	0-21
→ Connection diagrams	0-21
→ Accessories	0-25
→ Services	A-2



## Ordering information

Type	Signals related to pressing actions	Part number
UE440-A0410	—	1023859
UE470-A0410	✓	1023862

## Detailed technical specifications

### General data

	UE440-A0410	UE470-A0410
Enclosure rating	IP 20 (EN/IEC 60529)	
Category	4 (EN 954-1)	
Safety integrity level	SIL3 (IEC 61508)	
Protection class	III (EN 50178)	
Connector technology	Screw-terminal connector	
Dimensions (W x H x D)	65 mm x 120 mm x 100 mm	

### Electrical data

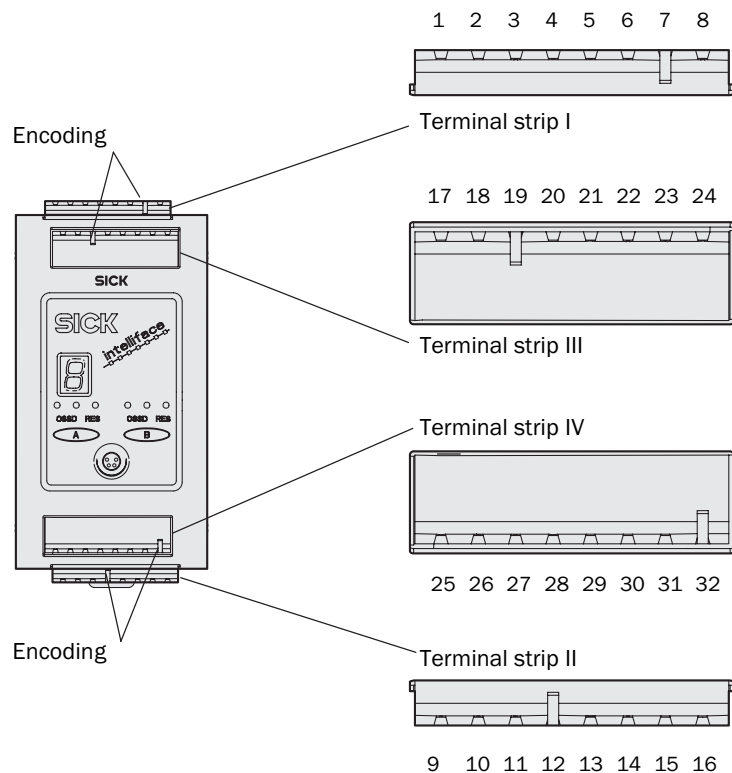
	UE440-A0410	UE470-A0410
Supply voltage	24 V DC (19.2 V DC ... 28.8 V DC) <sup>1)</sup>	
Ripple	≤10 %, within the limits of U <sub>V</sub>	
Power consumption	Max. 4.5 A	
Number of inputs	15 single-channel / 7 dual-channel	
Number of EFI interfaces	2	
Number of operating modes	5	
Number of safety outputs	2	
Number of application diagnostic outputs	4	
Stop category to EN 60204	0, 1	
Maximum response time	<10 ms	
Input delay	0 ms ... 1000 ms, configurable	
Discrepancy time	10 ms ... 30 s, configurable	

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains failures of 20 ms as specified in EN 60204-1

### Functions

	UE440-A0410	UE470-A0410
Restart interlock		✓
Automatic Reset		✓
External device monitoring		✓
Signals related to pressing actions		
Bottom dead centre	—	✓
Top dead centre	—	✓
Stop control contact	—	✓
Expanded functions through the use of the safe SICK device communication EFI		✓

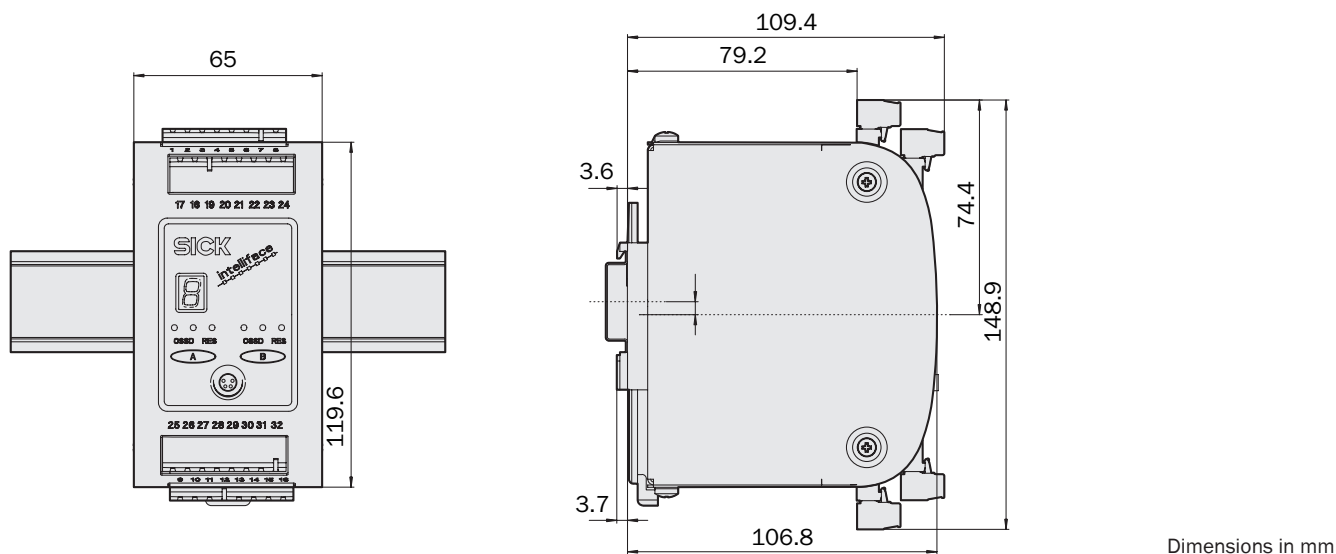
## Device overview and connections



Terminal number(s)	Name convention	Functionality
1	24 V DC	V DC input (voltage supply)
2	0 V DC	V DC input (voltage supply)
3	FE	Functional earthing
4-8	I1.1 to I1.4	Inputs
14, 16, 17-20	I2.1, I2.3, I3.0 to I3.3	Inputs
26-27	I1.5 to I1.6	Inputs
30, 32	I2.0, I2.2	Inputs
21, 25	O1.0 to O1.1	Single output (single-channel) or can be used for test signals
12, 28	O1.3, O1.2	Single output (single-channel)
13, 15, 29, 31	O2.0, O2.2, O2.1, O2.3	Single output (single-channel) or can be used as switching output (dual-channel switch-off of a machine or system)
10-11, 22-23	EFI1 <sub>B</sub> , EFI1 <sub>A</sub> , EFI2 <sub>A</sub> , EFI2 <sub>B</sub>	Device communication for ESPE with EFI
9	FE	Functional earthing, for applying shielding of EFI1 (if shielding is necessary for EMC reasons)
24	FE	Functional earthing, for applying shielding of EFI2 (if shielding is necessary for EMC reasons)

0

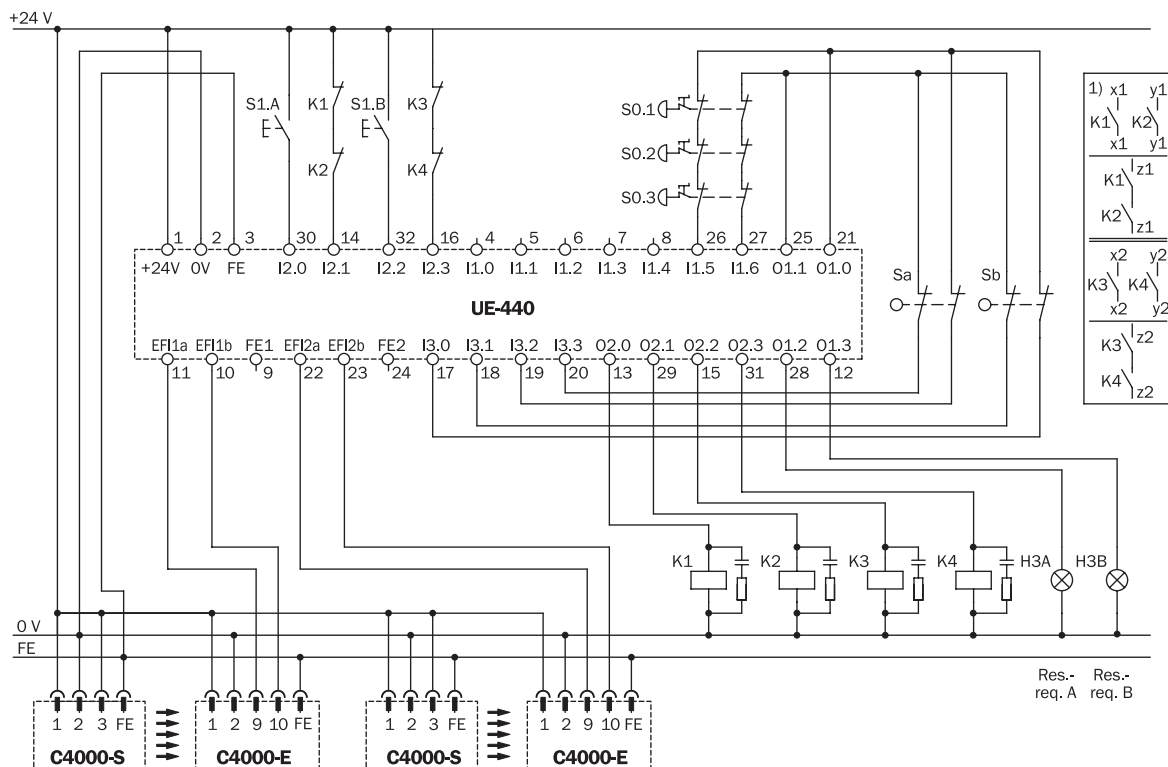
## Dimensional drawings



## Connection diagrams

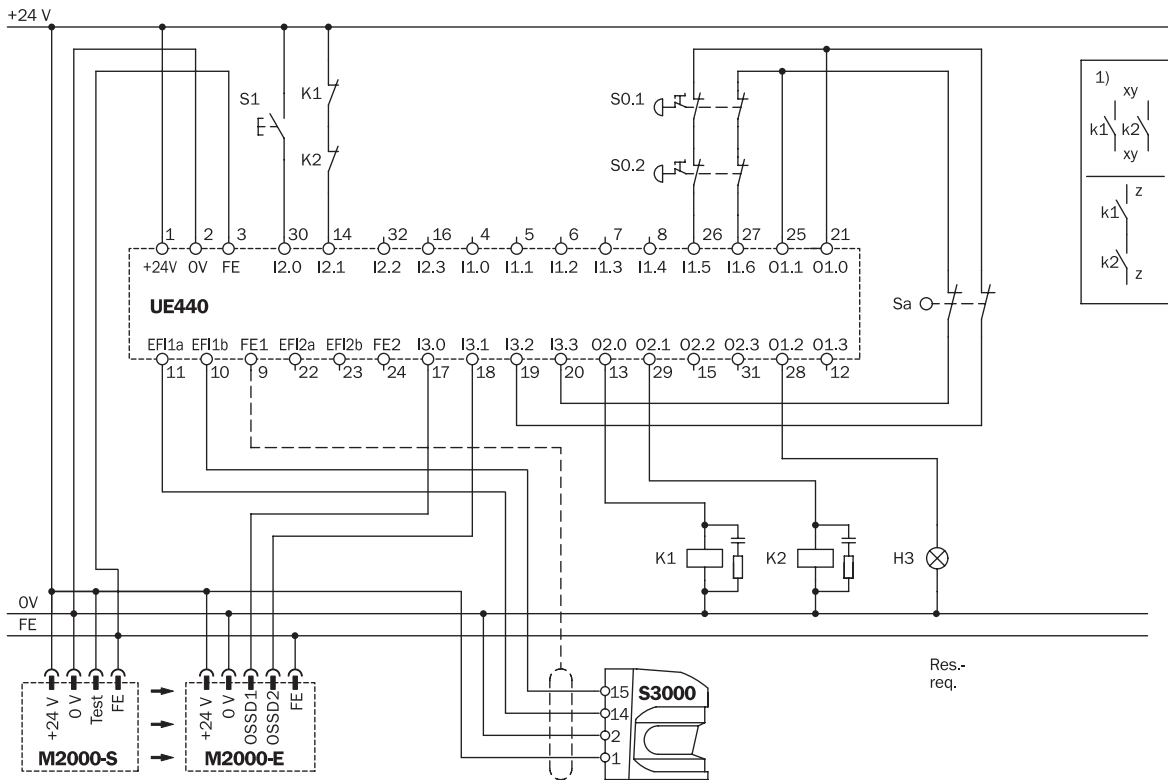
→ You can find more connection diagrams at [www.sick.com](http://www.sick.com)

### Protection of two separate accesses with UE440 and C4000 Standard/Advanced



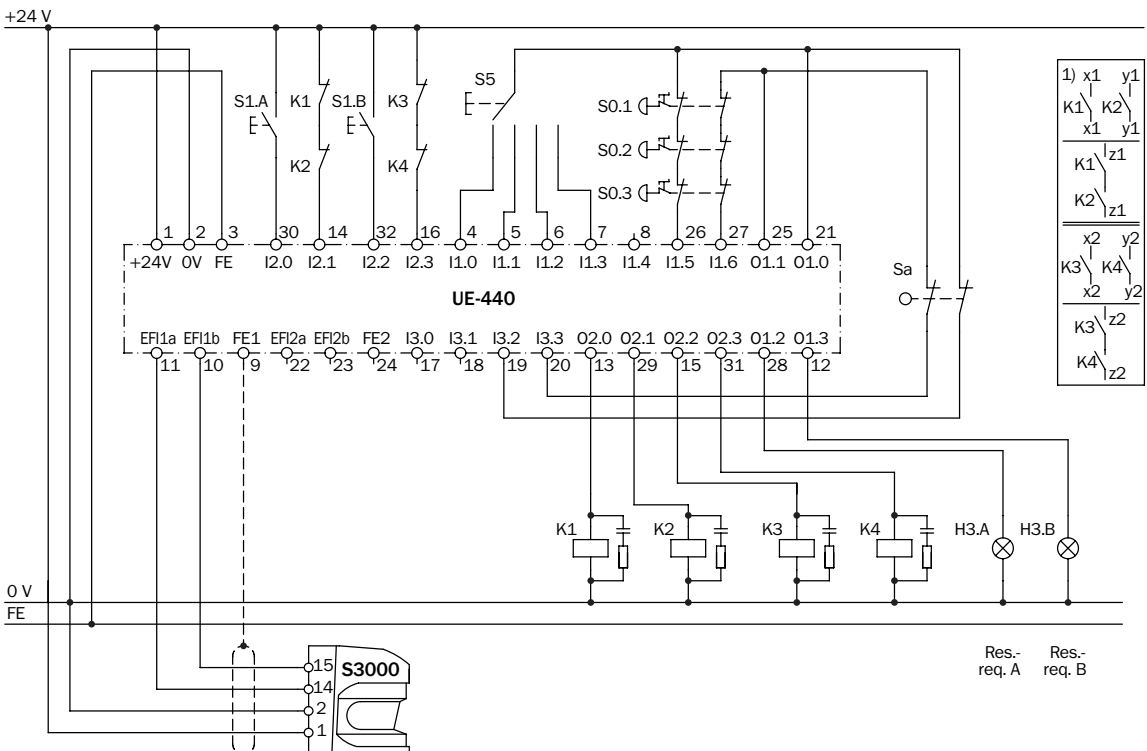
With restart interlock, external device monitoring (EDM), emergency stop, safety doors

Access protection with UE440 and M2000, point-of-operation guarding with S3000



With restart interlock, external device monitoring (EDM), emergency stop, safety door

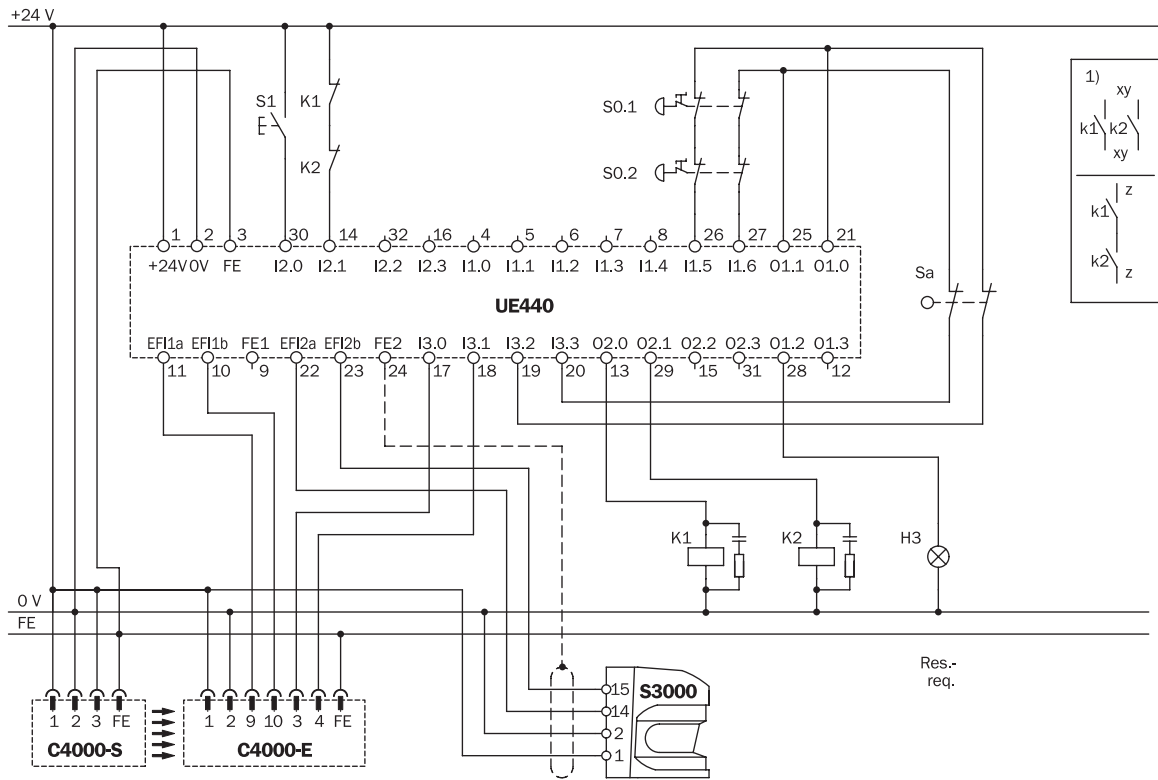
Simultaneous hazardous point protection with UE440 and S3000



With operating mode selector switch, restart interlock, external device monitoring (EDM), emergency stop, safety doors

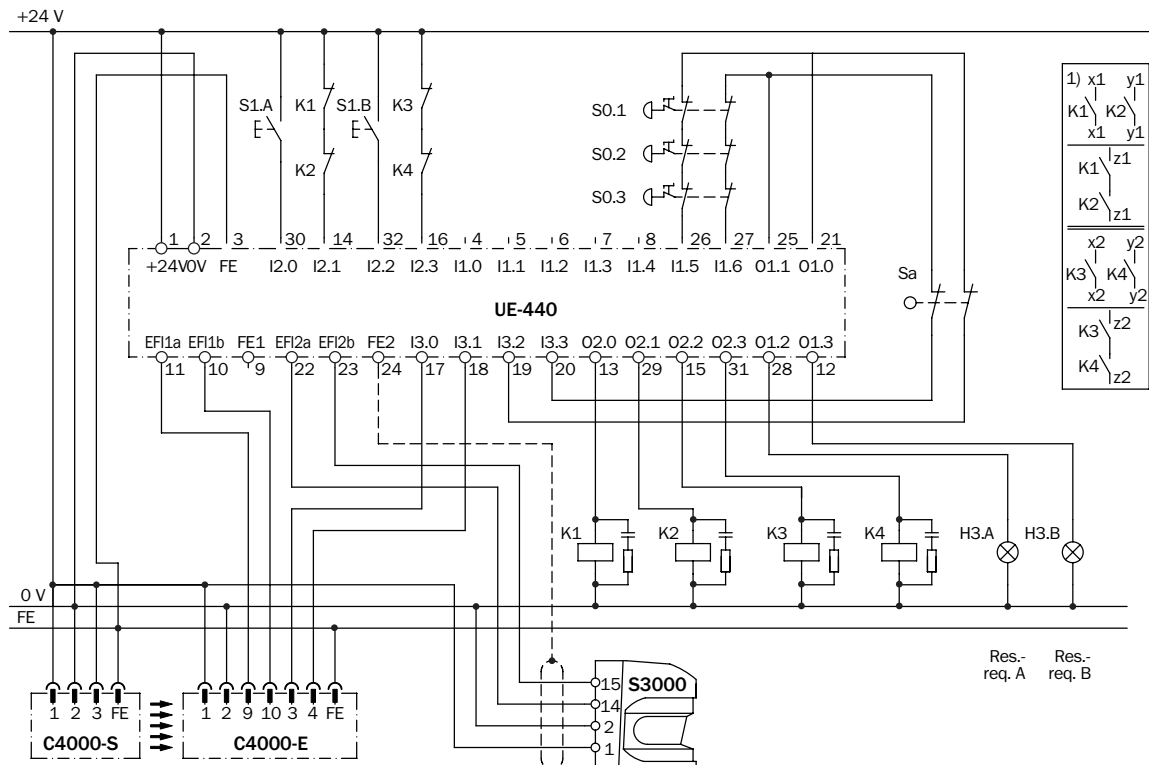
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Hazardous point protection with UE440 and C4000, interior area protection with S3000



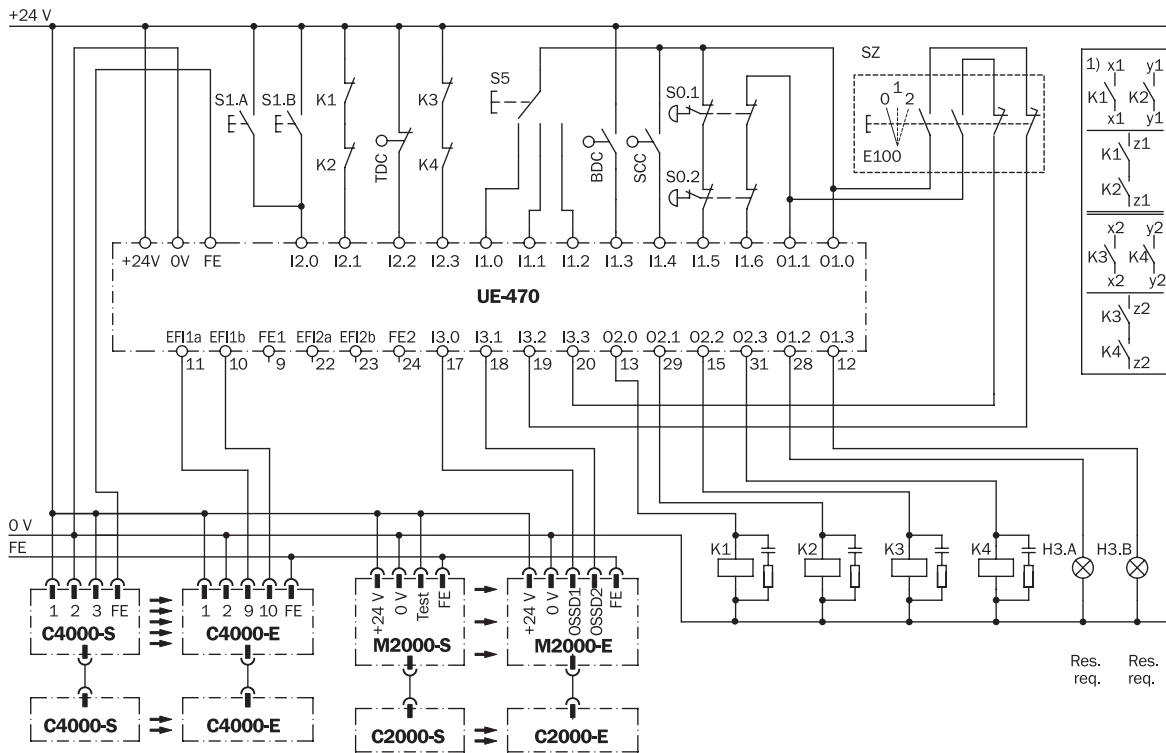
With restart interlock, external device monitoring (EDM), emergency stop, safety door

Protection of two separate hazardous points with C4000, S3000 and UE440



With restart interlock, external device monitoring (EDM), emergency stop, safety door

Hazardous point protection with UE470, C4000, C2000 and M2000 on a press with PSDI mode



With operating mode selector switch, restart interlock, external device monitoring (EDM), machine cycle contacts BDC, TDC and SCC as well as emergency stop and enabling switch

## Accessories

### Connection cable

Type	Connector technology	Cable length	Part number
EFI connection cable	Stripped	50 m	6026675

### Configuration software

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2026875
Release code of CDS software	Enables configuration and online diagnostics of the UE440/470 and the connected EFI devices	2031323

### Connection set

Type	Usage	Part number
System plug	Four pre-encoded screw-connection terminal, strips, including blank fields in bag	2029991

### Configuration connection cable

Connector technology	Cable length	Part number
M8 x 4, SUB-D 9-pol	2 m	6021195
	8 m	2027649



- Solving applications up to SIL3 (IEC 61508)
- Rugged IP 67 enclosure for field mounting
- Operation as controller or as remote I/O possible
- Fixed and fast reaction time using Fast Shut-Off
- Standard PLC may control UE44x7 safety outputs
- Easy upgrade of sensors and actuators on DeviceNet Safety



Further information	Page
→ Dimensional drawings	0-28
→ Device overview and connections	0-29
→ Connection diagrams	0-30
→ Accessories	0-31
→ Services	A-2

## Overview of technical specifications

Fieldbus	DeviceNet Safety
Number of safety inputs	6 dual-channel resp. 12 single-channel
Number of SDL connections	2
Number of safety capable outputs	2 dual-channel
Safety integrity level	SIL3 (IEC 61508)

## Product description

SICK's UE4427 and UE4457 series IP 67 safety remote controllers integrate and evaluate all combination of safety sensors and actuators. This can either be achieved in stand alone mode or in networked applications.

Function block logic can be implemented directly at the unit, solving the application. The Safety Enable functionality allows standard masters (e.g. PLC) to control the safety outputs of the UE44x7 devices directly, without the need for an additional safety PLC.

The Fast Shut-Off functionality enables fast and constant reaction time of 8 ms through direct routing of local safety inputs to the safety outputs of UE44x7.

- Compact safety controller in IP 67 technology
- Comfortable library of certified function blocks
- Optimised system reaction times in stand alone or networked operation
- Standard PLC may control safety outputs of the device
- 6 dual-channel or 12 single-channel safety inputs on board
- Comfortable integration and diagnostics of intelligent SICK safety sensors via SICK Safety Data Link (SDL) at UE4457
- 2 dual-channel bipolar safety outputs (2A) on board

## Applications

- Electro-sensitive protective equipments
- Emergency stop buttons
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact





## Ordering information

Functionality	Number of safety inputs	Number of SDL connections	Usage of the expanded functions on the SDL	Number of safety capable outputs	Type	Part number
Safety remote controller	6 dual-channel resp. 12 single-channel	—	—	2 dual-channel	UE4427-03DC9F0	1028304
		2	✓	2 dual-channel	UE4457-03DC9F0	1023807

## Detailed technical specifications

### General system data

	UE4427-03DC9F0	UE4457-03DC9F0
Fieldbus	DeviceNet Safety	
Category	4 (EN 954-1)	
Safety integrity level	SIL3 (IEC 61508)	
Supply voltage	19.2 V DC ... 28.8 V DC	
Connection type supply voltage	Mini 7/8" × 4	
Ambient operating temperature from ... to	-10 °C ... +55 °C	
Enclosure rating	IP 67	
Protection class	III (IEC 61131-2)	
Vibration resistance according to IEC 60068-2-6	0.35 mm, 10 Hz ... 57 Hz, 50 m/sec <sup>2</sup> , 57 Hz ... 150 Hz	
Shock resistance	150 g, 11 ms (IEC 60068-2-27)	
Mounting	Location in the vicinity of the equipment	
Weight	570 g	650 g

### Field-signal connections

Connection type	5-pole M12 connector	
Number of safety inputs	6 dual-channel resp. 12 single-channel	
Type of output on the field-signal input	PNP or contact	
Input voltage HIGH	11 V DC ... 30 V DC	
Input voltage LOW	-30 V DC ... 5 V DC	
Input current HIGH	5 mA	
Input delay	0 ms ... 635 ms, configurable	
Number of SDL connections	—	2
Safety outputs		
Number of safety capable outputs	2 dual-channel	
Type of output	Bipolar type	
Maximum response time	15 ms	
Switching current	2 A	
Leakage current	0.5 mA	
Test/signal outputs		
Output current per channel	700 mA	
Leakage current	Max. 0.5 mA	

### DeviceNet Safety network connections

Number of safety target connections	Max. 6
Expected packet interval (EPI) setting	10 ms ... 5 ms
Single cast I/O support	16 Bytes/16 Bytes
Multi cast I/O support	16 Bytes/16 Bytes

DeviceNet network connections

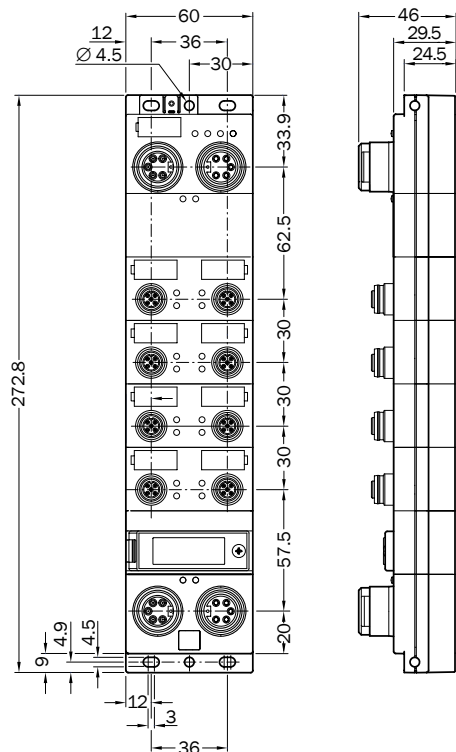
	UE4427-03DC9F0	UE4457-03DC9F0
Poll connection maximum I/O transmission rate	16 Bytes/16 Bytes	
Number of standard slave connections	Max. 3	
Number of UCMM server	Max. 4	
Connection type	Mini 7/8" × 5	
DeviceNet communication rate	125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection	
DeviceNet communication rate setting method	Software	
DeviceNet addressing	Via the safety network configuration tool (e.g. SICK DeviceNet Safety Configurator)	

Functions

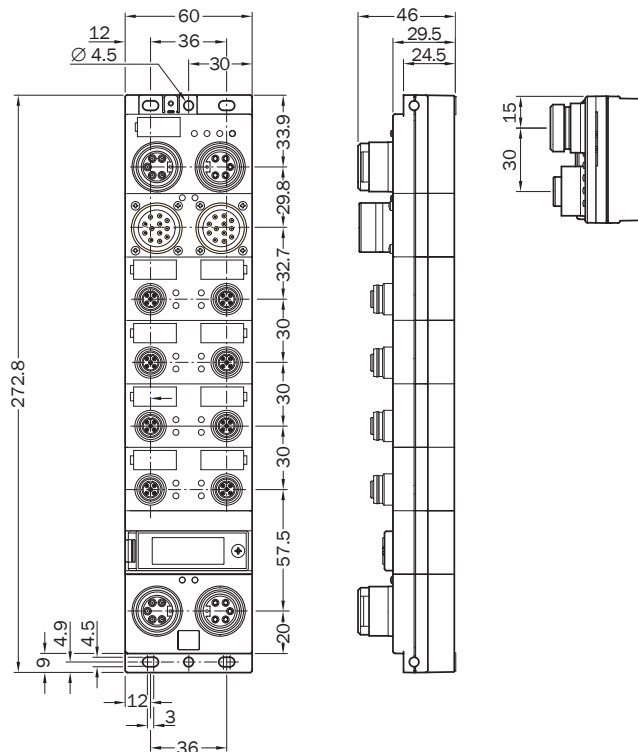
Functionality	Safety remote controller
Usage of the expanded functions on the SDL	✓
External device monitoring	✓
Restart interlock	✓
Automatic Reset	✓
Logical functions	AND, OR, XOR, XNOR, NOT
On-delay	✓
Off-delay	✓
Door monitoring	✓
Signal routing	✓
Bidirectional communication	✓
Two-hand control systems	✓

Dimensional drawings

UE4427



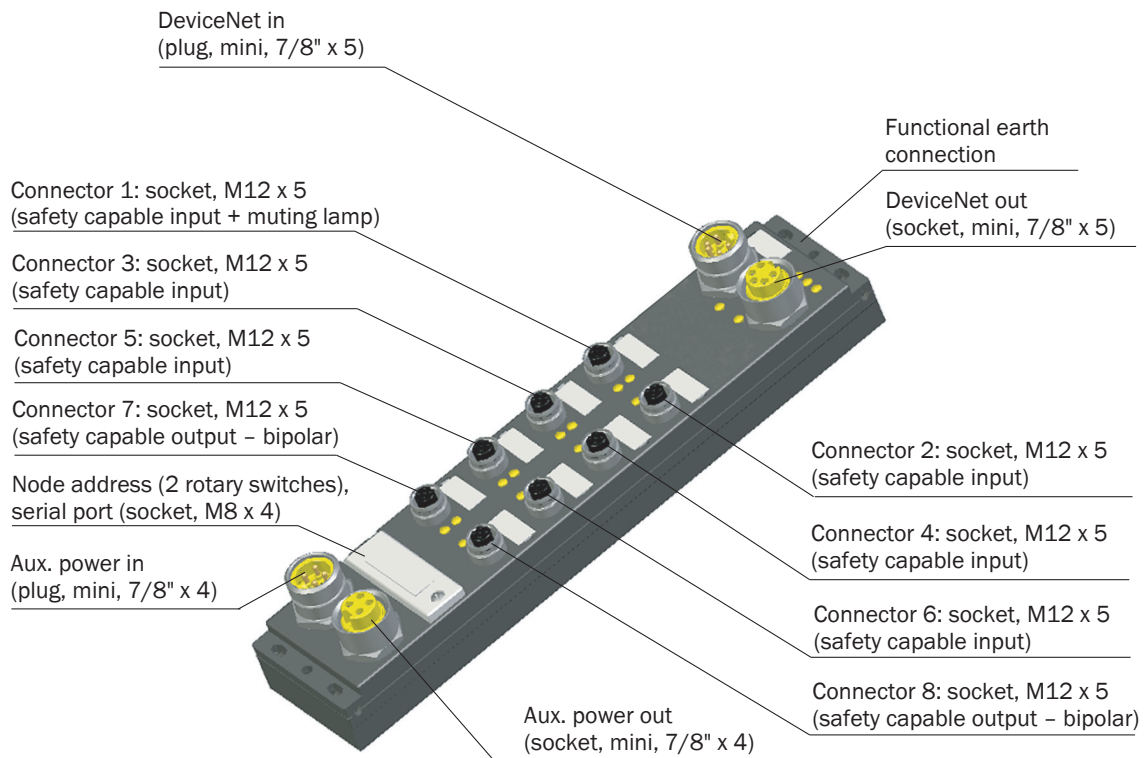
UE4457



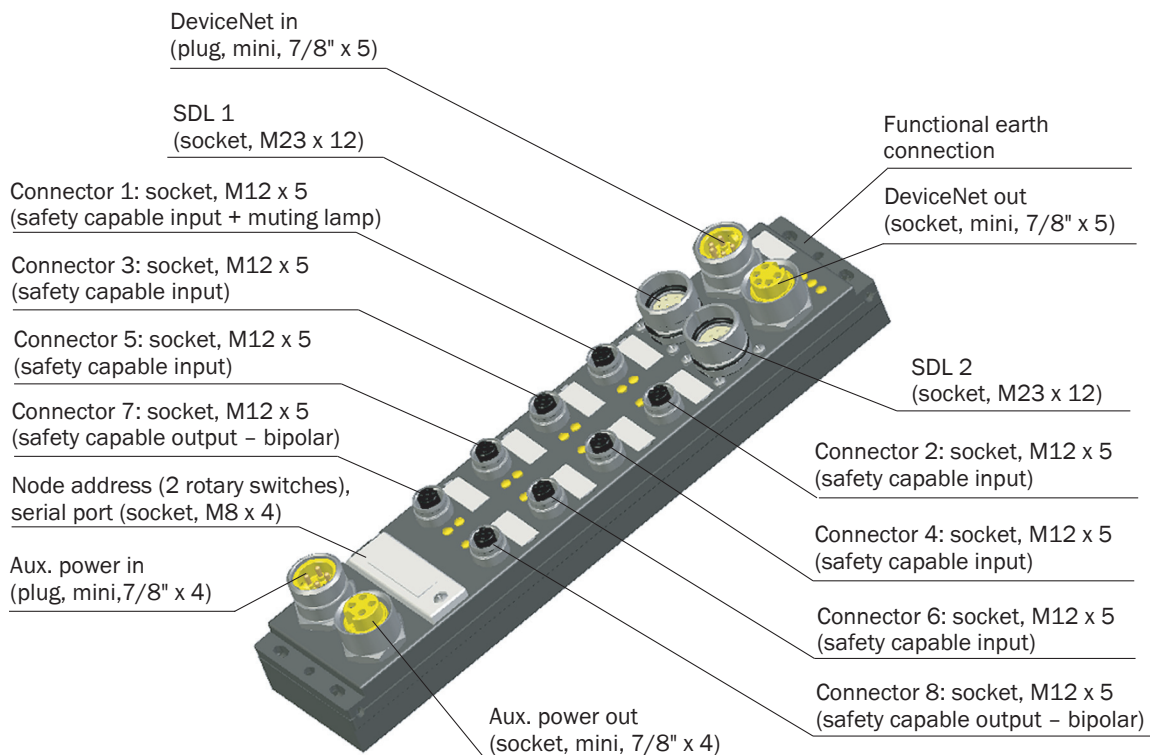
Dimensions in mm

## Device overview and connections

### UE4427



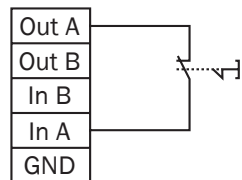
### UE4457



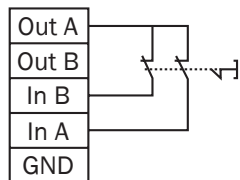
## Connection diagrams

### Emergency stop, emergency shutdown, safety door on the field-signal connection

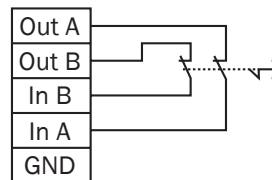
Single-channel



Dual-channel with common testing



Dual-channel with isolated testing

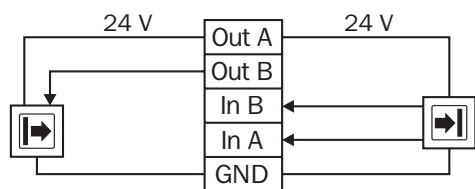


Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.

The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category

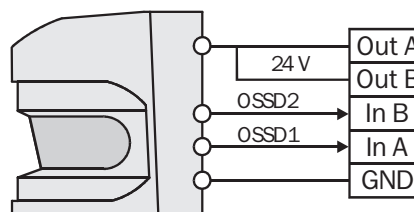
depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

### Electro-sensitive protective equipment (ESPE) on the field-signal connection



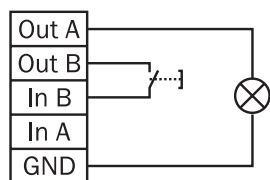
In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.

You can use output Out B to test the sender.



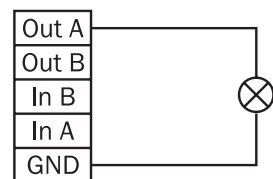
The switching outputs of the receiver are present on inputs In A and In B.

### Control switch with indicator display on the field-signal connection



The indicator display (Out A) is being controlled via an FPLC.

### Muting lamp on the field-signal connection



It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.

0

## Accessories

### Field-signal connection, connection cables

Connection type	Connector technology	Direction of the cable outlet	Cable material	Shielded	Cable length	Part number
Plug M12 x 5	Stripped	Straight	PUR halogen free	—	2 m	6026133
					5 m	6026134
					10 m	6026135
			—	✓	2 m	6024860
					5 m	6024861
					10 m	6024862

### Field-signal connection, T-junctions

Connection type	Usage	Part number
Plug M12 x 5	For the simultaneous connection of, e.g., two emergency stop buttons (single-channel) on one field-signal connection	6024744
	For the connection of sender/receiver to the the field-signal connection	6026517

### Field-signal connection, connectors

Connection type	Connector technology	Connection wire cross-section	Direction of the cable outlet	Cable diameter	Shielded	Part number
Plug M12 x 5	Screwed	0.75 mm <sup>2</sup>	Straight	—	✓	6024741
				Ø 4 mm	—	6022083
			Angled	Ø 4 mm	—	6022082

### Field-signal connection, protective cap

Type	Packing unit	Part number
Protective cap	10	2019706

### SDL connection, SDL connection cables

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Description	Shielded	Cable length	Part number
Interconnectron plug M23 x 12	Stripped	Straight	0.75 mm <sup>2</sup>	For the connection of the S3000 safety laser scanner	✓	2.5 m	2029337
						5 m	2029338
						10 m	2029339
						15 m	2029340
Interconnectron cable socket M23 x 11 + FE and Interconnectron plug M23 x 11 + FE	—	Plug straight/ socket straight	—	For the connection of the C4000 safety light curtain	—	0.5 m	7029160
						3 m	7029161
						7.5 m	7029162
						15 m	7029163
Hirschmann cable socket M26 x 11 + FE, Interconnectron plug M23 x 11 + FE	—	Plug straight/ socket straight	—		—	20 m	7029164
						2.5 m	2029131
						5 m	2025634
						10 m	2025635
						15 m	2025636

**SDL connection, connectors**

Connection type	Connector technology	Connection wire cross-section	Part number
Interconnectron plug M23 x 12	Crimped	0.82 mm <sup>2</sup>	6024742

**SDL connection, protective cap**

Type	Part number
Protective cap	5310774

**DeviceNet Safety connection, connection cables**

Connection type	Cable material	Cable diameter	Cable length	Part number
Mini 7/8" x 5, male and female	PVC	Ø 6.9 mm	1 m	6030743
		Ø 6.9 mm	2 m	6030744
		Ø 6.9 mm	3 m	6030745
		Ø 6.9 mm	4 m	6030746
		Ø 6.9 mm	5 m	6030747
		Ø 6.9 mm	6 m	6030748
		Ø 12.2 mm	2 m	6030749
		Ø 12.2 mm	5 m	6030750
		Ø 12.2 mm	10 m	6030751
DeviceNet cable, thin	PVC	Ø 6.9 mm	By the meter	6030921
DeviceNet cable, thick		Ø 12.2 mm		6030756

**DeviceNet Safety connection, DeviceNet connectors**

Connection type	Connector technology	Direction of the cable outlet	Usage	Type	Part number
Mini 7/8" x 5, female	—	—	Panel mount	DeviceNet connection	6030807
Mini 7/8" x 5, male	—	—	Panel mount	DeviceNet connection	6030808
			—	DeviceNet terminator	6028995
Mini 7/8" x 5, female	Can be preformed	Straight	—	DOS-7805-GK	6028331
	—	Straight	—	DOS-7805-GKEND	6028329
Mini 7/8" x 5, male	Can be preformed	Straight	—	STE-7805-GK	6028332
Mini 7/8" x 5, one male and two female	—	—	—	T-connector	6030752

**DeviceNet Safety connection, protective caps**

Connection type	Part number
Mini 7/8" x 4 or 7/8" x 5, male	5315188
Mini 7/8" x 4 or 7/8" x 5, female	5315187

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790



**Auxiliary power supply, connection cables**

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Description	Cable length	Part number
Mini 7/8" x 4, female	Flying leads	Straight	1.5 mm <sup>2</sup>	With screw lock	0.3 m	6030805
Mini 7/8" x 4, male						6030806
Mini 7/8" x 4, female	Stripped	—	—	—	2 m	6030753
			—	—	5 m	6030754
			—	—	10 m	6030755
—	—	—	—	—	By the meter	6030757

**Auxiliary power supply, cable receptacles**

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Part number
Mini 7/8" x 4, female	Screwed	Straight	1.5 mm <sup>2</sup>	6030803

**Auxiliary power supply, connectors**

Connection type	Direction of the cable outlet	Connection wire cross-section	Part number
Mini 7/8" x 4, male	Straight	1.5 mm <sup>2</sup>	6030804

**Configuration connection, configuration connection cables**

Connection type	Description	Cable length	Part number
M8 x 4, SUB-D 9-pol	For connecting the configuration connection to the PC	2 m	6021195
		8 m	2027649

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314
CDS plug-in for DeviceNet Safety SNCT	Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2032920)	2027422

**Cable cover**

Connection type	Description	Type	Part number
M12	For minimising cable tampering. Sheath provides visible indication when it has been removed. Used to detect when cables have potentially been changed	Cable sheath/cover	5315186

**Designation plates**

Description	Packing unit	Part number
In the 9 x 20 mm frame	40	5310775



- Solving applications up to SIL3 (IEC 61508)
- Local/remote connection of safety sensors and actuators
- Decentralised evaluation of safety sensors and actuators
- Easy upgrade of installed base of sensors and actuators
- Logical combinations between sensors and actuators
- Large library of approved safety function blocks
- Remote configuration of other DeviceNet Safety™ devices via network



## Overview of technical specifications

Fieldbus	DeviceNet Safety
Number of safety inputs	8 dual-channel resp. 16 single-channel
Number of safety capable outputs	4 dual-channel resp. 8 single-channel
Safety integrity level	SIL3 (IEC 61508)

## Product description

SICK's UE4400 safety network controllers integrate and evaluate any combination of safety input and actuator devices into DeviceNet Safety™ networks, using local or remote safety inputs and outputs. Safety devices can now be logically combined for optimised machine safety control strategies. Applications include packaging machinery, robot cells, machine tools and transfer lines.

Status, diagnostic and error information can be easily accessed locally or through

the network. Integrated basic and application-specific function blocks are provided for simple and complex control capability. Logical operations include: AND, OR, Exclusive OR, Exclusive NOR, NOT, ON-delay timer, OFF-delay timer, restart interlock, external device monitoring (EDM), emergency stop, safety gate monitoring, ESPE/AOPD (e.g. safety light curtain), enabling switch, two-hand control, automatic reset, and operating mode selector switch.

## Applications

- Electro-sensitive protective equipments
- Emergency stop buttons
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact



Further information	Page
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→ Device overview and connections	0-37
→ Internal circuitry	0-38
→ Accessories	0-39
→ Services	A-2



## Ordering information

Functionality	Number of safety inputs	Number of test/signal outputs (with current monitoring)	Type	Part number
Flexible safety controller	8 dual-channel resp. 16 single-channel	4 (0)	UE4470-22EE690	1028312

## Detailed technical specifications

### General system data

Fieldbus	DeviceNet Safety
Category	4 (EN 954-1)
Safety integrity level	SIL3 (IEC 61508)
Supply voltage	20.4 V DC ... 26.4 V DC
Connection type supply voltage	Spring terminal plug
Ambient operating temperature from ... to	-10 °C ... +55 °C
Enclosure rating	IP 20
Protection class	III (IEC 61131-2)
Vibration resistance according to IEC 60068-2-6	0.35 mm, 10 Hz ... 57 Hz, 50 m/sec <sup>2</sup> , 57 Hz ... 150 Hz
Shock resistance	150 m/sec <sup>2</sup> , 11 ms (IEC 60068-2-27)
Mounting	35 mm mounting rail (DIN 46277)
Weight	460 g

### Field-signal connections

Connection type	Spring terminal plug
Number of safety inputs Type of output on the field-signal input Input voltage HIGH Input voltage LOW Input current HIGH Input delay	8 dual-channel resp. 16 single-channel PNP or contact 11 V DC ... 30 V DC 0 V DC ... 5 V DC 5 mA 0 ms ... 126 ms, configurable
Safety outputs Number of safety capable outputs Type of output Maximum response time Switching current Leakage current	4 dual-channel resp. 8 single-channel Source output (PNP) 15 ms 500 mA 0.1 mA
Test/signal outputs Number of test/signal outputs (with current monitoring) Output current per channel Leakage current	4 (0) 700 mA Max. 0.1 mA

### DeviceNet Safety network connections

Number of originator connections	Max. 16
Number of safety target connections Expected packet interval (EPI) setting Single cast I/O support Multi cast I/O support	Max. 4 Minimum device cycle time 16 Bytes/16 Bytes 16 Bytes/16 Bytes

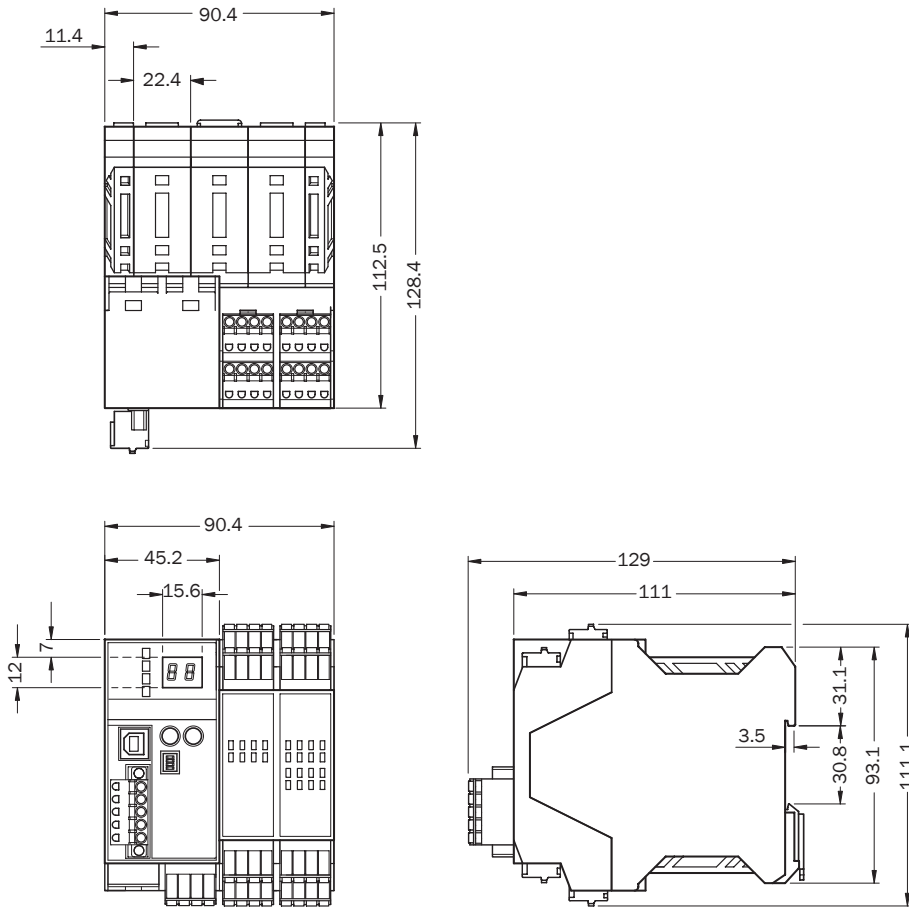
**DeviceNet network connections**

Poll connection maximum I/O transmission rate	16 Bytes/16 Bytes
Number of standard slave connections	Max. 2
Number of UCMM clients	8, open connections
Number of UCMM server	Max. 5
Connection type	Spring terminal block
DeviceNet communication rate	125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection
DeviceNet communication rate setting method	DIP switch
DeviceNet addressing	Via the safety network configuration tool (e.g. SICK DeviceNet Safety Configurator)

**Functions**

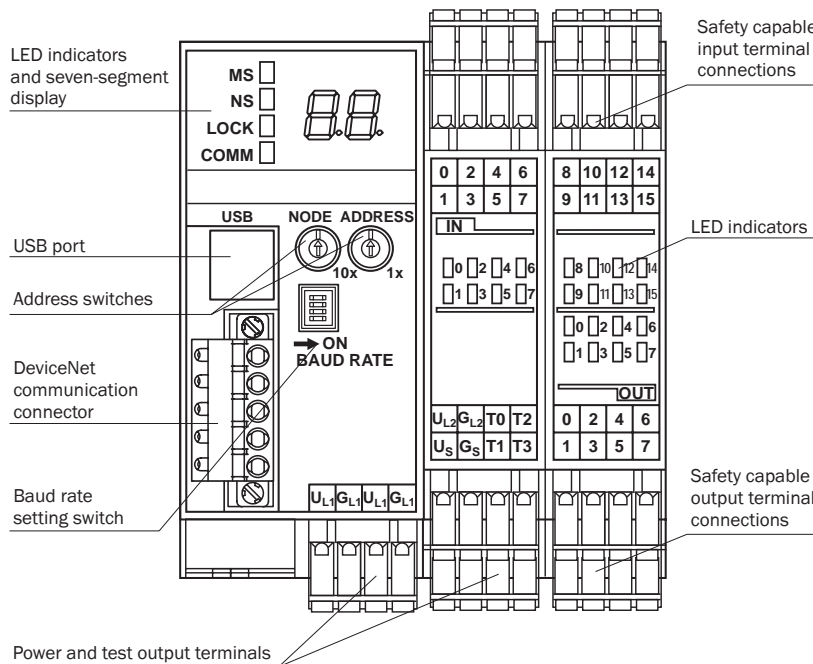
Functionality	Flexible safety controller
External device monitoring	✓
Restart interlock	✓
Automatic Reset	✓
Logical functions	AND, OR, XOR, XNOR, NOT
On-delay	✓
Off-delay	✓
Door monitoring	✓
Signal routing	✓
Emergency stop switch	✓
Safety switches	✓
Opto-electronic protective devices	✓
Two-hand control systems	✓

## Dimensional drawings

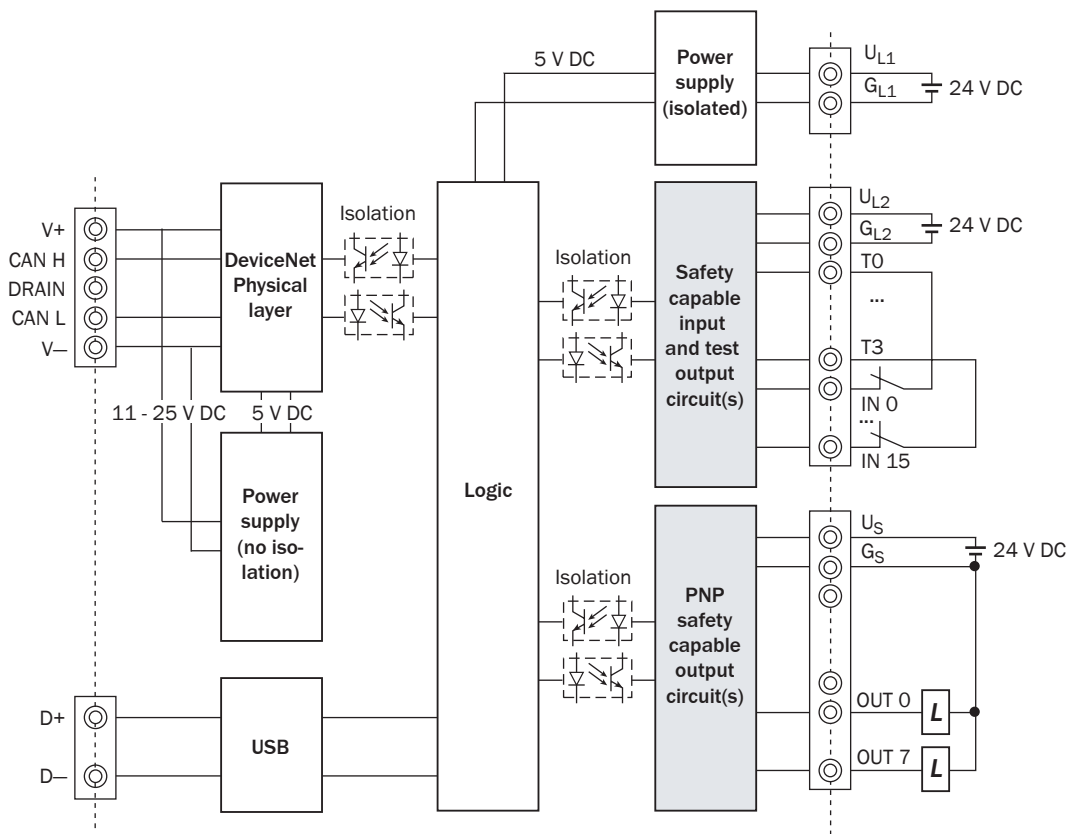


Dimensions in mm

## Device overview and connections



## Internal circuitry



Terminal name	Description
U <sub>L1</sub>	24 V DC power supply terminal for internal device power (e.g. internal logic). Both U <sub>L1</sub> terminals are internally connected
G <sub>L1</sub>	0 V DC power supply terminal for internal device power (e.g. internal logic). Both G <sub>L1</sub> terminals are internally connected
U <sub>L2</sub>	24 V DC power supply terminal for external input device and test output
G <sub>L2</sub>	0 V DC power supply terminal for external input device and test output
U <sub>S</sub>	24 V DC power supply terminal for external output device
G <sub>S</sub>	0 V DC power supply terminal for external output device
IN0 to IN15	Safety capable input terminals
T0 to T3	Test/signal output terminals
OUT0 to OUT7	Safety capable output terminals

## Accessories

### Configuration software

Type	Description	Part number
SICK DeviceNet Safety Configurator	Enables the configuration and diagnosis of the DeviceNet and DeviceNet Safety network. Includes SICK CDS plug-in module for SICK UE4421 and configuration software plug-in for SICK UE4470 Safety Network Controller	2032920
CDS plug-in for DeviceNet Safety SNCT	Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2032920)	2027422

### DeviceNet Safety connection, terminal connectors

Connection type	Direction of the cable outlet	Delivery	Part number
Terminal plug with M12 x 5 connector	—	—	6030818
Spring terminal plug, 5-pole	Single entry	With screw flange	6030817
	Double entry		6030816

### DeviceNet Safety connection, configuration connection cables

Connection type	Cable length	Part number
USB A to USB B	1.8 m	6030820
	4.6 m	6030819

### Connection terminals

Connection type	Packing unit	Delivery	Part number
Spring terminal plug, 4-pole	9	Key inserts and instructions	6030815

### Power supply units

Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

## Technical overview and applications



### PROFIsafe

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Combines safe data and data that is not safe in mixed operation
- Decentralised input modules in IP 20 and IP 67
- Programming of the safety PLC dependent on the manufacture
- Central configuration and diagnostics down to the sensor level
- Communication interface for intelligent SICK safety sensors

#### Applications:

- Bodyshell manufacture and final assembly in the car industry
- Robot cells



### AS-Interface Safety at Work

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Combines safe data and data that is not safe in mixed operation
- Safety monitor
- Decentralised input modules up to IP 67
- Configurable
- Central network configuration and diagnostics as well as local sensor configuration and diagnostics

#### Applications:

- Storage and conveyor technology
- Packaging machines
- Machine tools



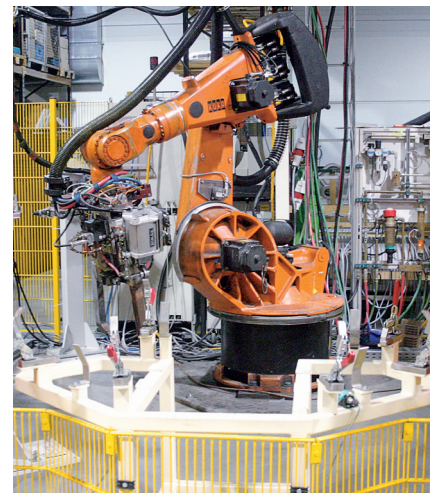
### DeviceNet Safety™

For safety tasks up to category 4 (EN 954-1) or SIL3 (IEC 61508)

- Combines safe controllers and controllers that are not safe in mixed operation
- Fully programmable safety controller solution
- Decentral controllers, input modules and output modules in IP 20 and IP 67
- Central configuration and diagnostics down to sensor level using one tool
- Quick and consistent shut-down times (<8 ms) also in a network thanks to "Fast Shut-Off"
- Standard PLC can directly operate safety outputs on the remote controllers


#### Applications:

- Machine tool manufacture and systems engineering
- Storage and conveyor technology
- Robot cells



# Safety network solutions



Description		Number of safe inputs single-channel/ dual-channel	Number of safe outputs single-channel/ dual-channel	En- closure rating	Number of SDL/EFI connections	Function range	Product	Page	
	Safety remote I/O	16/8	—	IP 67	— 2 <sup>1)</sup>	— Bi-directional communication <sup>2)</sup>	UE4120 UE4150 UE4155	P-2 P-2 P-2	
	EFI-Gateway	—	—	IP 20	2	Bi-directional communication <sup>2)</sup>	UE4140	P-50	
	EFI-Gateway	—	—	IP 20	2	Bi-directional communication <sup>2)</sup>	UE1140	P-50	
	Safety Slave	2/1	—	IP 65 IP 67	— —	— —	UE3212 UE4215	P-9 P-13	
	Safety Monitor	—	—/1	IP 20	—	Basic	UE4231	P-17	
			—/2	IP 20	—	Basic	UE4232	P-17	
			—/1	IP 20	—	Enhanced	UE4233	P-17	
			—/2	IP 20	—	Enhanced	UE4234	P-17	
	Safety remote I/O	4/2, 8/4, 12/6	8/4	IP 20	— —	— —	UE4421 UE4420	P-20 P-28	
		12/6	—/2	IP 67	2 <sup>1)</sup>	— Bi-directional communication <sup>2)</sup>	UE4450 UE4455	P-28 P-28	
	Safety remote controller	12/6	—/2	IP 67	—	—	—	UE4427	P-36
					2 <sup>1)</sup>	Bi-directional communication <sup>2)</sup>	UE4457	P-36	
					—	—	UE4470	P-44	
<b>Ethernet (TCP/IP)</b>	EFI-Gateway	—	—	IP 20	2	Bi-directional communication <sup>2)</sup>	UE1840	P-50	
	<b>CANopen</b>	EFI-Gateway	—	—	IP 20	2	Bi-directional communication <sup>2)</sup>	UE1940	P-50

<sup>1)</sup> ESPE without EFI communication can also be connected to the SDL connection

<sup>2)</sup> Usage of the expanded functions in the connected safety sensors on the SDL/EFI connection



- Control cabinet free manufacture
- Central diagnosis
- Less wiring expenditure
- Safety Data Link (SDL) to SICK safety components



## Overview of technical specifications

Fieldbus	PROFIsafe
Number of safety inputs	8 dual-channel resp. 16 single-channel
Number of SDL connections	2
Enclosure rating	IP 67
Category	4 (EN 954-1)
Safety integrity level	SIL3 (IEC 61508)

## Product description

- Easy configuration and diagnosis with the aid of Windows-based CDS software (Configuration & Diagnostic Software)
- Offline configuration of the system without FPLC is possible
- Support for PROFIsafe V1.20 10/2002
- Support for PROFIBUS-DP V1:
  - Cyclic communication with DP-Master Class 1 (central control)
  - Acyclic communication with DP-Master Class 2 (configuration and diagnosis tool)
- 2 SDL connections to connect active SICK safety components (UE4150/UE4155)
- Configuration and diagnosis of all the components connected to the SDL connection via the configuration connection of the UE4150/UE4155
- Usage of the expanded functions of the safety components with SICK device communication (UE4155)

## Applications

- Electro-sensitive protective equipments
- Emergency stop buttons
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact



Further information	Page
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→ Device overview and connections	P-4
→ Connection diagrams	P-6
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P



## Ordering information

Description	Number of SDL connections	Usage of the expanded functions on the SDL	Delivery	Type	Part number
Safety remote I/O	—	—	Including configuration & diagnostic software and operating instructions on CD-ROM	UE4120-01BC600	1024176
	2	—		UE4150-01BC700	1019557
		✓		UE4155-01BC700	1024057

## Detailed technical specifications

Type	UE4120-01BC600	UE4150-01BC700	UE4155-01BC700
Fieldbus	PROFIsafe		
Enclosure rating	IP 67		
Category	4 (EN 954-1)		
Safety integrity level	SIL3 (IEC 61508)		
Supply voltage	24 V DC (19.2 V DC ... 28.8 V DC) <sup>1)</sup>		
Power consumption	Max. 9 A		

<sup>1)</sup> The external voltage supply must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1.

### Field-signal inputs

Input voltage HIGH	24 V (11 V ... 28.8 V)
Input delay	0 ms ... 90 ms, configurable

### Field-signal outputs

Output voltage HIGH	$U_V$ , without load, switched-on
Switching current	0 mA ... 700 mA
Minimum current for fault monitoring	7 mA, 20 mA, 40 mA, on field-signal connections 7 and 8 <sup>1)</sup>

<sup>1)</sup> Only when the connection is configured as an output for a muting lamp.

### SDL connections

Input current	—	Max. 1.4 A
Internal resistance	—	Max. 0.3 Ohm

### OSSD inputs

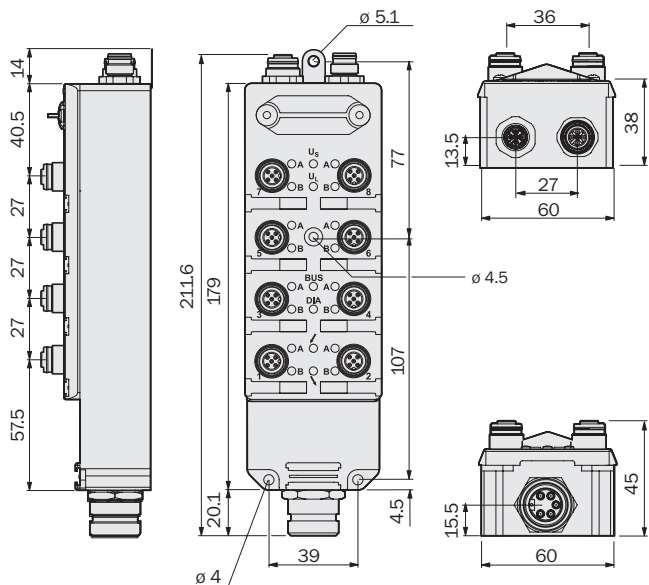
Input voltage HIGH	—	24 V (13 V ... 28.8 V)
Test pulse width	—	Max. 700 ms
Test pulse rate	—	Max. 500 Hz

### PROFIBUS connection

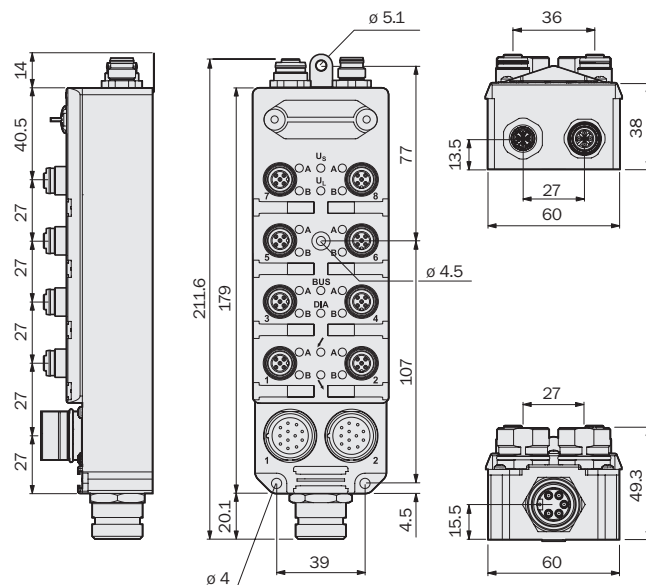
Baud rate	9.6 KBit/s ... 12 MBit/s	
Address mode	3 ... 125	
Recovery detection	070F hex	071A hex

## Dimensional drawings

### UE4120



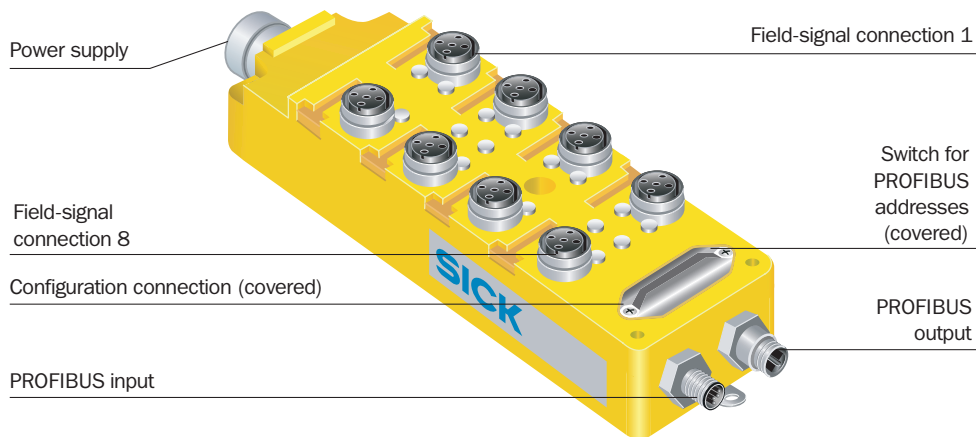
### UE4150, UE 4155



Dimensions in mm

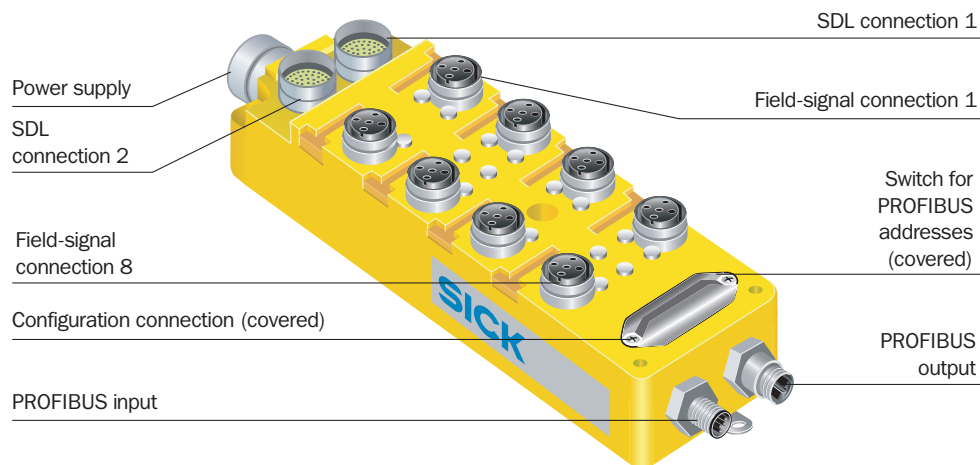
## Device overview and connections

### UE4120



Connection	Function
Power supply	Common voltage supply for UE4120 and the safety components connected to the field-signal connections
Field-signal connections	To connect OSSDs and passive components, e.g. switches fitted with volt-free contacts 1 field-signal connection = 2 channels (2 safety inputs and 2 outputs) Connections can be shared by a two-way splitter
Configuration connection	To directly connect a PC to the SICK CDS in order to configure the system
PROFIBUS connection	Input and output according to PROFIBUS specification

UE4150, UE 4155

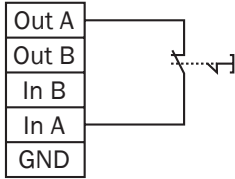


Connection	Function
<b>Power supply</b>	Common supply voltage for the bus node and the safety components connected to the SDL and field-signal connections
<b>SDL connections</b>	To connect safety components with SICK device communication and/or OSSDs
<b>Field-signal connections</b>	To connect OSSDs and passive components, e.g. switches fitted with volt-free contacts 1 field-signal connection = 2 channels (2 safety inputs and 2 outputs) Connections can be shared by a two-way splitter
<b>Configuration connection</b>	To directly connect a PC to the SICK CDS in order to configure the system
<b>PROFIBUS connection</b>	Input and output according to PROFIBUS specification

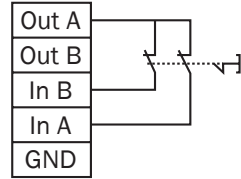
## Connection diagrams

### Emergency stop, emergency shutdown, safety door on the field-signal connection

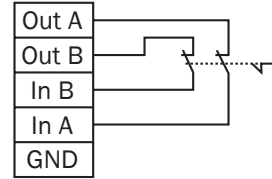
Single-channel



Dual-channel with common testing



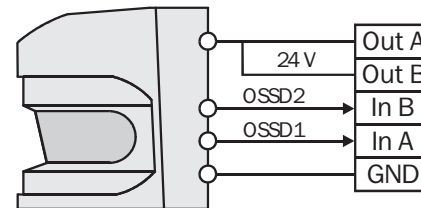
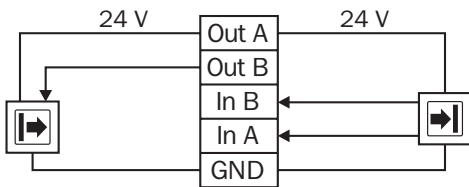
Dual-channel with isolated testing



Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing. The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category

depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

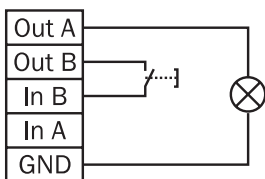
### Electro-sensitive protective equipment (ESPE) on the field-signal connection



In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output. You can use output Out B to test the sender.

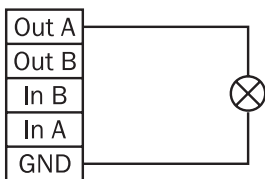
The switching outputs of the receiver are present on inputs In A and In B.

### Control switch with indicator display on the field-signal connection



The indicator display (Out A) is being controlled via an FPLC.

### Muting lamp on the field-signal connection



It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.



## Accessories

### Field-signal connection, connection cables

Connection type	Connector technology	Direction of the cable outlet	Shielded	Cable length	Part number
Plug M12 x 5	Stripped	Straight	—	2 m	6026133
				5 m	6026134
				10 m	6026135
			✓	2 m	6024860
				5 m	6024861
				10 m	6024862

### Field-signal connection

Description	Packing unit	Type	Part number
Protective cap M12	10	DOS-12SK	5309189

### Field-signal connection, T-junctions

Connection type	Usage	Part number
Plug M12 x 5	For the simultaneous connection of, e.g., two emergency stop buttons (single-channel) on one field-signal connection	6024744
	For the connection of sender/receiver to the the field-signal connection	6026517

### Field-signal connection, connectors

Connection type	Connector technology	Maximum connection cable cross-section	Direction of the cable outlet	Shielded	Part number
Plug M12 x 5	Screwed	0.75 mm <sup>2</sup>	Straight	✓	6024741
				—	6022083
			Angled	—	6022082

### SDL connection, SDL connection cables

Connection type	Connector technology	Direction of the cable outlet	Description	Shielded	Cable length	Part number
Interconnectron plug M23 x 12	Stripped	Straight	For the connection of the S3000 safety laser scanner	✓	2.5 m	2029337
					5 m	2029338
					10 m	2029339
					15 m	2029340
Hirschmann cable socket M26 x 11 + FE, Interconnectron plug M23 x 11 + FE	—	Plug straight/ socket straight	For the connection of the C4000 safety light curtain	—	2.5 m	2029131
					5 m	2025634
					10 m	2025635
					15 m	2025636

**SDL connection, connector**

Connection type	Connector technology	Maximum connection cable cross-section	Part number
Interconnectron plug M23 x 12	Crimped	0.82 mm <sup>2</sup>	6024742

**SDL connection, protective cap**

Type	Part number
Protective cap	5310774

**PROFIBUS connection, connectors**

Connection type	Connector technology	Direction of the cable outlet	Maximum connection cable cross-section	Coding	Shielded	Type	Part number
Socket M12 x 5	Screwed	Straight	0.75 mm <sup>2</sup>	B-coding	✓	PR-DOS-1205-G	6021353
Plug M12 x 5					✓	PR-STE-1205-G	6021354
Plug M12 x 4 with terminating resistor	—	—	—		—	PR-STE-END	6021156

**Power supply, cable receptacles**

Connector technology	Direction of the cable outlet	Part number
Screwed	Straight	6024745

**Configuration connection, configuration connection cable**

Connection type	Description	Cable length	Part number
M8 x 4, SUB-D 9-pol	For connecting the configuration connection to the PC	2 m	6021195
		8 m	2027649

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314

**Designation plates**

Description	Packing unit	Part number
In the 9 x 20 mm frame	40	5310775

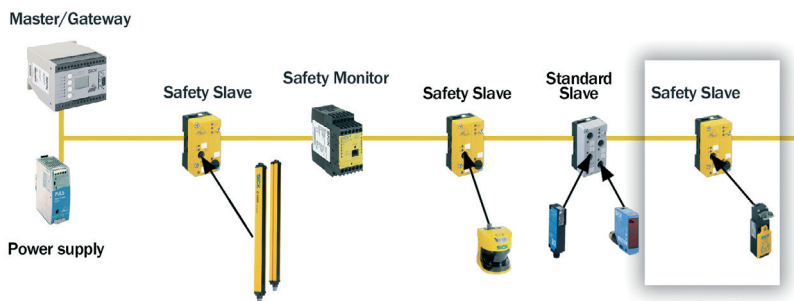
## Overview of technical specifications

Fieldbus	AS-Interface Safety at Work
Component	Safety slave
Type of output of connectable safety sensors	Positively driven safety contacts
Enclosure rating	IP 65
Category	3 (EN 954-1)

## Product description

- Connection for different switches fitted with volt-free contacts
- AS-Interface (yellow AS-Interface cable)
- AS-Interface version 2.1

## Applications



## Ordering information

Type	Part number
UE3212-10CA200	1025814



- Safety automation without control cabinet
- Less wiring expenditure



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## Detailed technical specifications

Fieldbus	AS-Interface Safety at Work
Enclosure rating	IP 65 (EN 60529)
Category	3 (EN 954-1)
Power consumption	Max. 70 mA
Response time	4 ms

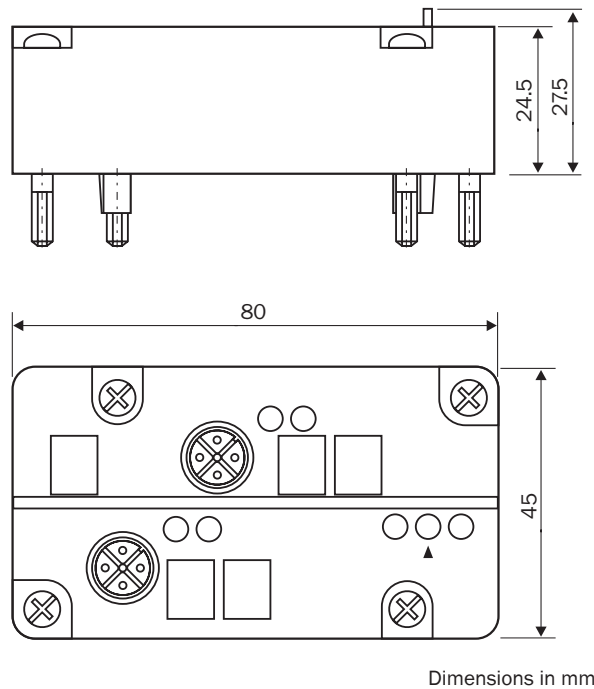
### AS-Interface Safety at Work

AS-Interface profile	S-7.B.0.
Supply voltage	26.5 V DC ... 31.6 V DC
AS-Interface master version	2.1
Data bits IN input channel I1	AS-Interface Safety at Work code sequence on D0, D1
Data bits IN input channel I2	AS-Interface Safety at Work code sequence on D2, D3
Data bits OUT	D0 (LED alarm)
Data bits OUT not used	D1, D2, D3 (don't care)

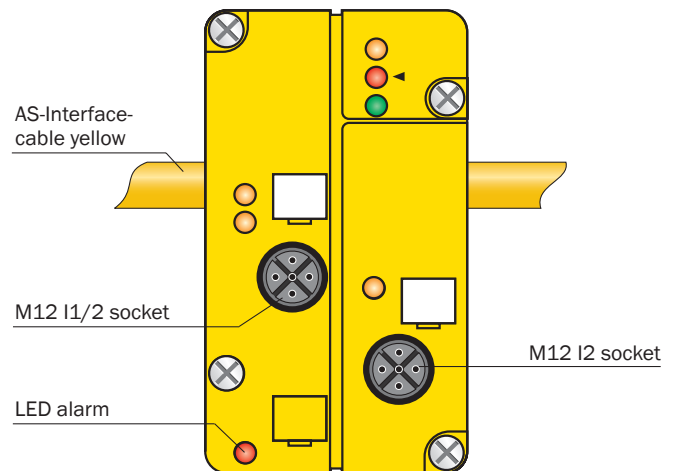
### Socket I1/2

Opening time	Min. 43 ms
Cable length	5 m

## Dimensional drawings



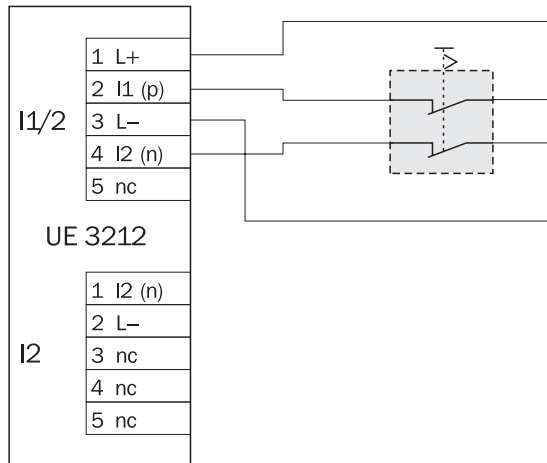
## Device overview and connections





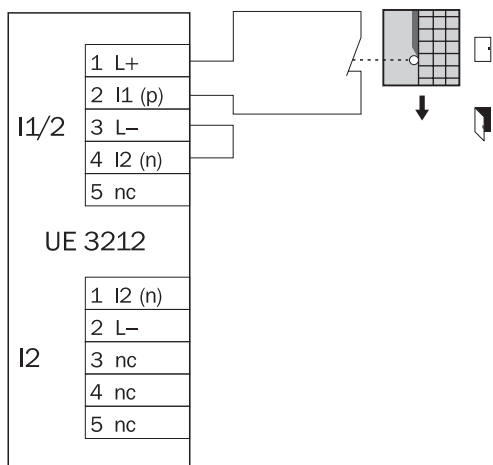
## Connection diagrams

### Connection of a dual-channel emergency stop button



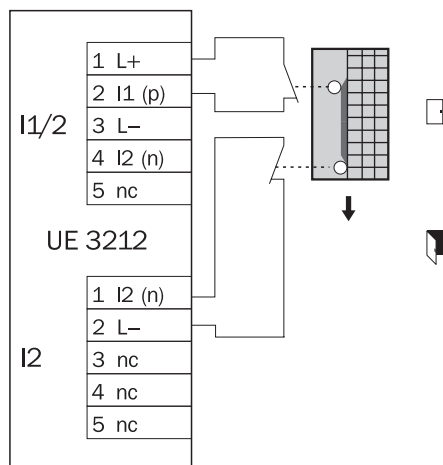
Monitoring block to be selected in the safety monitor "dual-channel positively driven"

### Connection of a single-channel safety door



Monitoring block to be selected in the safety monitor "dual-channel independent"

### Connection of a dual-channel safety door



Monitoring block to be selected in the safety monitor "dual-channel dependent"

## Accessories

### Connection cables

Connection type	Direction of the cable outlet	Cable length	Part number
Plug M12 x 5	Straight	2 m	6026133
		5 m	6026134

### Connectors

Connection type	Maximum connection cable cross-section	Direction of the cable outlet	Type	Part number
Plug M12 x 4	0.75 mm <sup>2</sup>	Straight	STE-1204-G	6009932
		Angled	STE-1204-W	6022084
Plug M12 x 5	0.75 mm <sup>2</sup>	Straight	STE-1205-G	6022083
		Angled	STE-1205-W	6022082

### AS-Interface accessories

Addressing	Type	Part number
Without addressing socket	ASI-FK	6022394
With addressing socket	ASI-FK-A	6022396

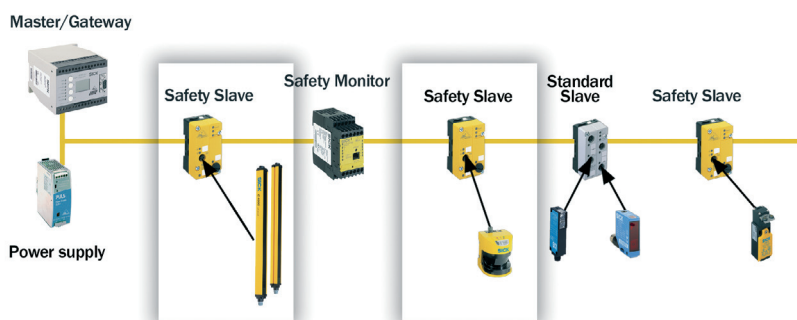
## Overview of technical specifications

Fieldbus	AS-Interface Safety at Work
Component	Safety slave
Type of output of connectable safety sensors	OSSD
Enclosure rating	IP 67
Category	4 (EN 954-1)

## Product description

- Connection for electro-sensitive protective equipment (ESPE) with self-monitoring semiconductor outputs (OSSDs)
- Connection for the sender unit and the receiver unit of an ESPE system
- AS-Interface (yellow AS-Interface cable)
- External power supply for ESPE over 24 V ribbon cable (black AS-Interface cable)
- AS-Interface version 2.1

## Applications



## Ordering information

Type	Part number
UE4215-14CA200	1025687



- Control cabinet free manufacture
- Less wiring expenditure



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## Detailed technical specifications

Fieldbus	AS-Interface Safety at Work
Enclosure rating	IP 67 (EN 60529)
Category	4 (EN 954-1)
Power consumption	Max. 60 mA
Response time	22 ms

### AS-Interface Safety at Work

AS-Interface profile	S-O.B.E
Supply voltage	26.5 V DC ... 31.6 V DC
AS-Interface master version	2.1
Data bits IN input channel I1	AS-Interface Safety at Work code sequence on D0, D1
Data bits IN input channel I2	AS-Interface Safety at Work code sequence on D2, D3
Data bits OUT	Not used

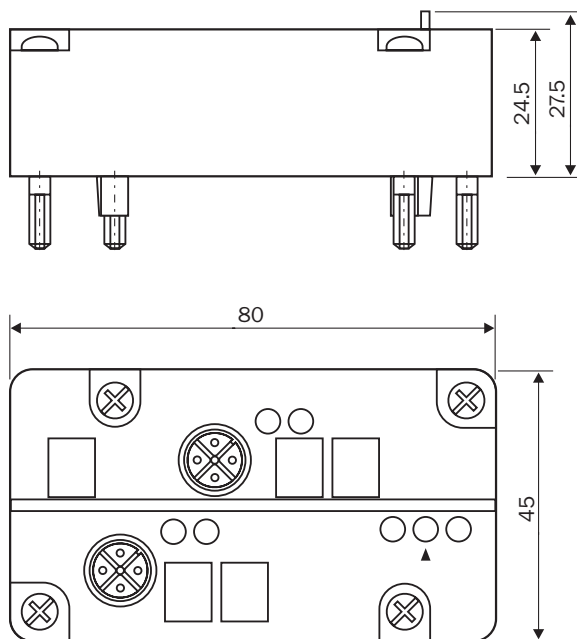
### Socket I1/2

Output current Pin 1 (AUX L+)	Max. 1.4 A
OSSD inputs	
Input voltage HIGH	24 V (13.5 V ... 28.8 V)
Test pulse rate	0 Hz ... 25 Hz
Test pulse width	0 μS ... 550 μS
Opening time	Min. 51 ms
Cable capacitance	Max. 100 pF

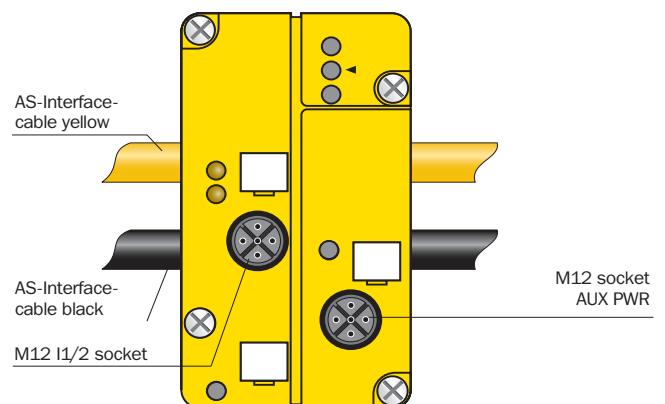
### AUX PWR

Supply voltage	24 V (16.8 V ... 28.8 V)
ESPE sender total output current (AUX L+)	Max. 1.4 A

## Dimensional drawings



## Device overview and connections

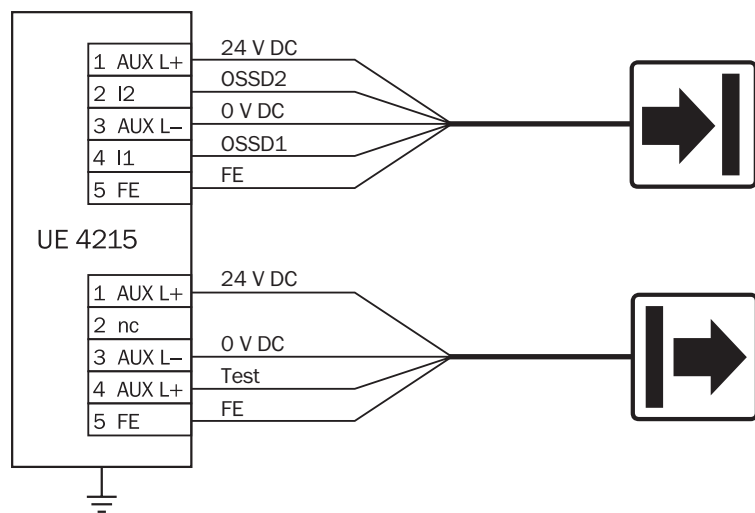


Dimensions in mm

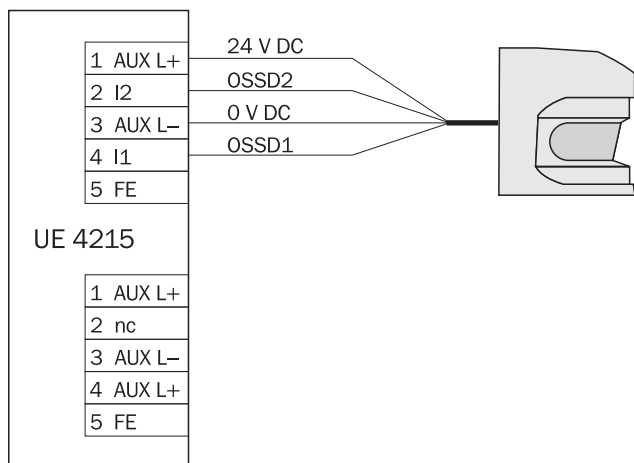
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## Connection diagrams

### Connection of safety light curtains with self-monitored semiconductor outputs (OSSDs)



### Connection of a safety laser scanner



## Accessories

### Connection cables

Connection type	Direction of the cable outlet	Description	Cable length	Part number
Plug M12 x 5	Straight	—	2 m	6026133
			5 m	6026134
			10 m	6026135
Plug M12 x 5, Hirschmann cable socket M26 x 11 + FE	Plug straight/socket straight	Connecting cable for safety light curtain (e.g. C4000) or multiple light beam safety device (e.g. M4000)	2 m	2030357
			5 m	2030365
			10 m	2030366
M12 x 7 + FE	Straight	Connecting cable with cable socket for safety light curtain (e.g. C2000) or multiple light beam safety device (e.g. M2000)	2.5 m	6020537
			5 m	6020354
			7.5 m	6020353
			10 m	6020352

### Connectors

Connection type	Maximum connection cable cross-section	Direction of the cable outlet	Type	Part number
Plug M12 x 5	0.75 mm <sup>2</sup>	Straight	STE-1205-G	6022083
		Angled	STE-1205-W	6022082

### AS-Interface module lower parts

Addressing	Type	Part number
Without addressing socket	ASI-FKE	6022395
With addressing socket	ASI-FKE-A	6022397
With addressing socket and earthing	ASI-FKE-A-E	6025058

### Sliding nuts/sliding blocks

Type	Description	Part number
Claw sliding nut	For direct earthing of MSL, C2000, M2000, C4000 required when using the AS-Interface module lower parts FKE or FKE-A	4031411

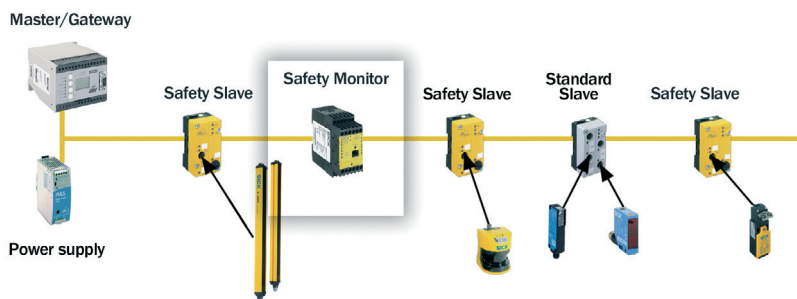
## Overview of technical specifications

Fieldbus	AS-Interface Safety at Work
Component	Safety monitor
Enclosure rating	IP 20
Category	4 (EN 954-1)

## Product description

- Evaluation of the safety-relevant signals in the AS-Interface network
- It is possible to use several safety monitors in an AS-Interface network

## Applications



## Ordering information

Application (graphic)	Type	Part number
Solution for simple safety applications	UE4231-22CE010	1025815
	UE4232-22CE020	1025816
Solution for complex safety applications	UE4233-22CE010	6032490
	UE4234-22CE020	6032491



- 2 dual-channel enable path for safety-related shutdown
- Parameterisable functions by software
- Instruction set for the solution of complex safety applications
- Connection of up to 31 dual-channel safety sensors via AS-Interface
- Several safety monitors on one AS-Interface system are possible
- Diagnostics can be performed using the AS-Interface and configuration software



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→ Services	A-2

## Detailed technical specifications

Type	UE4231-22CE010	UE4232-22CE020	UE4233-22CE010	UE4234-22CE020
Fieldbus	AS-Interface Safety at Work			
Application (graphic)	Solution for simple safety applications		Solution for complex safety applications	
Enclosure rating	IP 20 (EN 60529)			
Category	4 (EN 954-1)			
Safety integrity level	SIL3 (IEC 61508)			
Supply voltage	24 V DC (20.4 V DC ... 27.6 V DC)			
Power consumption	Max. 150 mA	Max. 200 mA	Max. 150 mA	Max. 200 mA
Response time	40 ms			

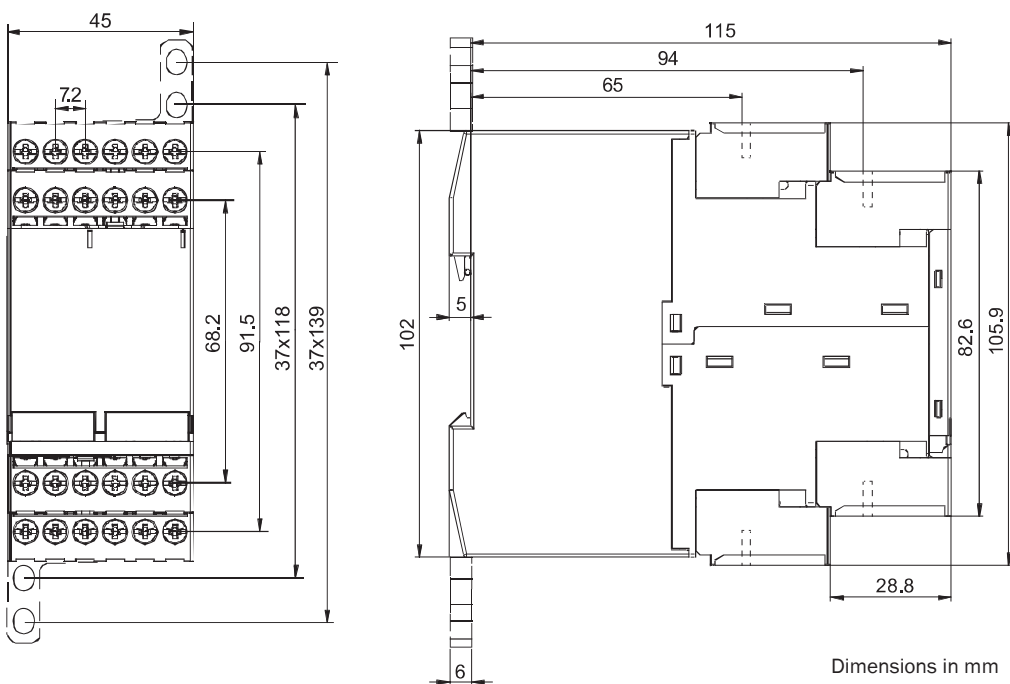
### AS-Interface Safety at Work

AS-Interface profile	Monitor 7.F
Supply voltage	18.5 V ... 31.6 V
Power consumption	Max. 45 mA

### Safety outputs

Type of output	1 dual-channel	2 dual-channel	1 dual-channel	2 dual-channel
Usage category	AC-15/DC-13			
Rated operating current (voltage)	3 A (230 V AC), 1 A (24 V DC)			
Total current	6 A	8 A	6 A	8 A
Thermal continuous current per output circuit	3 A			

## Dimensional drawings

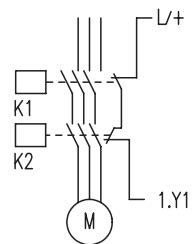
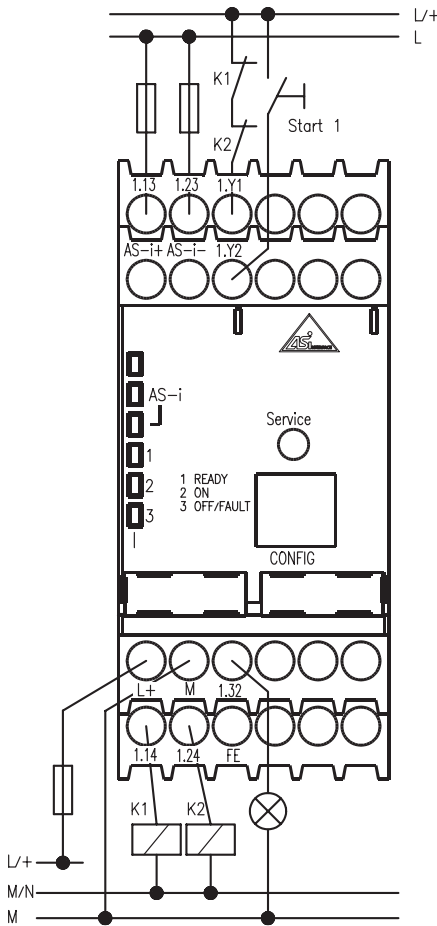


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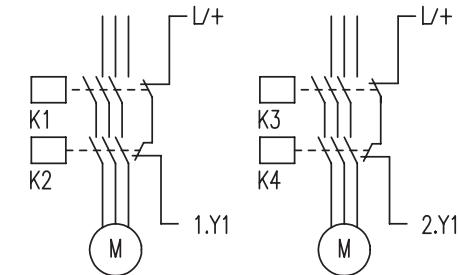
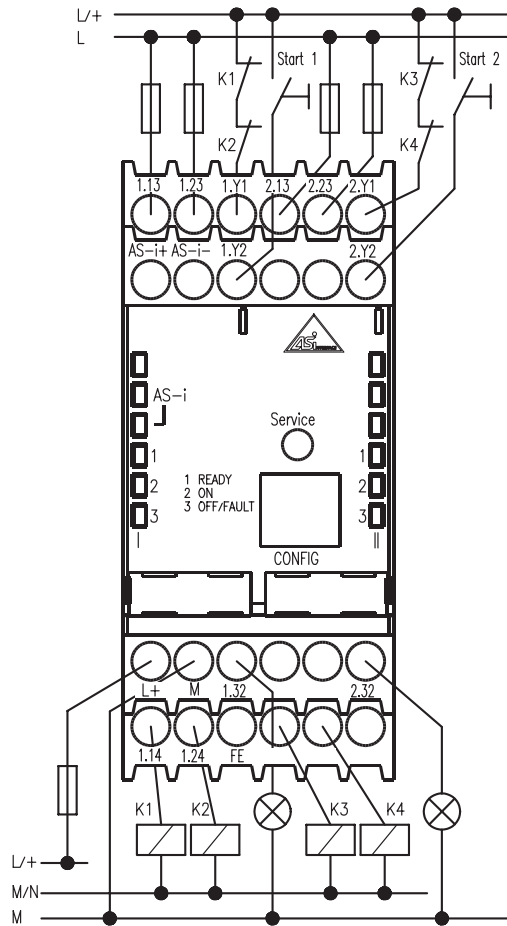


## Internal circuitry

UE4231, UE4233



UE4232, UE4234



## Accessories

### Configuration connection cables

Connection type	Cable length	Type	Part number
RJ45/RJ45 crossover	0.08 m	Monitor interface cable	6028938
RJ45/SUB-D 9-pol	2 m	Monitor configuration cable	6028937

### Configuration software

Type	Part number
ASIMON configuration software	2030532



- Solving applications up to SIL3 (IEC 61508)
- Easy upgrade of sensors and actuators on DeviceNet Safety™
- Multiple safety sensors and actuators are supported
- Decentralised evaluation of safety sensors and actuators
- Easy installation using pluggable terminal strip
- IP 20 enclosure rating for DIN rail, panel mounting
- Uses only one safety fieldbus address for up to 16 sensors and actuators



## Overview of technical specifications

Fieldbus	DeviceNet Safety
Number of safety inputs (depending on type)	6 dual-channel resp. 12 single-channel / 4 dual-channel resp. 8 single-channel / 2 dual-channel resp. 4 single-channel
Number of safety capable outputs (depending on type)	4 dual-channel resp. 8 single-channel / 2 dual-channel resp. 4 single-channel
Safety integrity level	SIL3 (IEC 61508)

## Product description

SICK's UE4421 IP 20 remote I/O bus modules integrate safety sensors and actuators using DeviceNet Safety™. UE4421 series IP 20 remote I/O bus modules are configured using an EDS file via the DeviceNet Safety™ network.

Versions include semiconductor safety inputs only, a combination of semiconductor safety inputs and safety outputs and semiconductor inputs with relay-based safety outputs.

## Applications

- Electro-sensitive protective equipments
- Emergency stop buttons
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact



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P

## Ordering information

Functionality	Number of safety inputs	Number of safety capable outputs	Number of test/signal outputs (with current monitoring)	Type	Part number
Remote input device	6 dual-channel resp. 12 single-channel	—	4 (1)	UE4421-22EE900	1028309
Remote I/O device	2 dual-channel resp. 4 single-channel	2 dual-channel resp. 4 single-channel	4 (1)	UE4421-22EE330	1028310
	4 dual-channel resp. 8 single-channel	4 dual-channel resp. 8 single-channel	4 (1)	UE4421-22EE490	1028311

## Detailed technical specifications

### General system data

	UE4421-22EE900	UE4421-22EE330	UE4421-22EE490
Fieldbus	DeviceNet Safety		
Category	4 (EN 954-1)		
Safety integrity level	SIL3 (IEC 61508)		
Supply voltage	20.4 V DC ... 26.4 V DC		
Connection type supply voltage	Spring terminal plug		
Ambient operating temperature from ... to	-10 °C ... +55 °C		
Enclosure rating	IP 20		
Protection class	III (IEC 61131-2)	II (IEC 61131-2)	III (IEC 61131-2)
Vibration resistance according to IEC 60068-2-6	0.35 mm, 10 Hz ... 57 Hz, 50 m/sec <sup>2</sup> , 57 Hz ... 150 Hz		
Shock resistance	150 m/sec <sup>2</sup> , 11 ms (IEC 60068-2-27)	100 m/sec <sup>2</sup> , 11 ms (IEC 60068-2-27)	150 m/sec <sup>2</sup> , 11 ms (IEC 60068-2-27)
Mounting	35 mm mounting rail (DIN 46277)		
Weight	420 g	460 g	420 g

Field-signal connections

	UE4421-22EE900	UE4421-22EE330	UE4421-22EE490
Connection type	Spring terminal plug		
Number of safety inputs	6 dual-channel resp. 12 single-channel	2 dual-channel resp. 4 single-channel	4 dual-channel resp. 8 single-channel
Type of output on the field-signal input	PNP or contact		
Input voltage HIGH	11 V DC ... 26.4 V DC	11 V DC ... 26.4 V DC	11 V DC ... 26.4 V DC
Input voltage LOW	0 V DC ... 5 V DC	0 V DC ... 5 V DC	0 V DC ... 5 V DC
Input current HIGH	6 mA	6 mA	6 mA
Input delay	0 ms ... 126 ms, configurable	0 ms ... 126 ms, configurable	0 ms ... 126 ms, configurable
Safety outputs			
Number of safety capable outputs	—	2 dual-channel resp. 4 single-channel	4 dual-channel resp. 8 single-channel
Type of output	—	Relay type	Current sourcing (PNP)
Maximum response time	15 ms	15 ms	15 ms
Switching current	—	2 A	500 mA
Leakage current	—	—	0.1 mA
Mechanical life (relay contacts)	—	5 x 10 <sup>6</sup> switching cycles	—
Electrical life (relay contacts)	—	1 x 10 <sup>5</sup> switching cycles	—
Test/signal outputs			
Number of test/signal outputs (with current monitoring)		4 (1)	
Output current per channel		700 mA	
Leakage current		Max. 0.1 mA	

DeviceNet Safety network connections

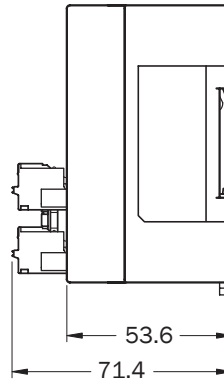
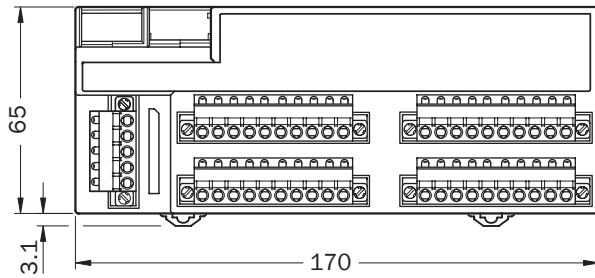
Number of safety target connections	Max. 4
Expected packet interval (EPI) setting	6 ms ... 1 ms
Single cast I/O support	5 Bytes/5 Bytes
Multi cast I/O support	5 Bytes/5 Bytes

DeviceNet network connections

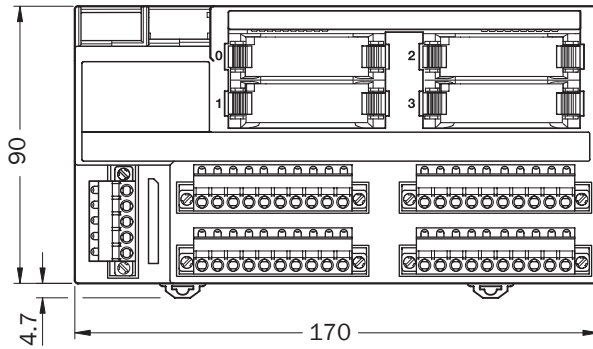
Poll connection maximum I/O transmission rate	5 Bytes/5 Bytes
Number of standard slave connections	Max. 2
Number of UCMM server	Max. 2
Connection type	Spring terminal block
DeviceNet communication rate	125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection
DeviceNet communication rate setting method	Automatic (Autobaud Only)
DeviceNet addressing	Via the safety network configuration tool (e.g. SICK DeviceNet Safety Configurator)

## Dimensional drawings

**UE4421-22EE900, UE4421-22EE490**



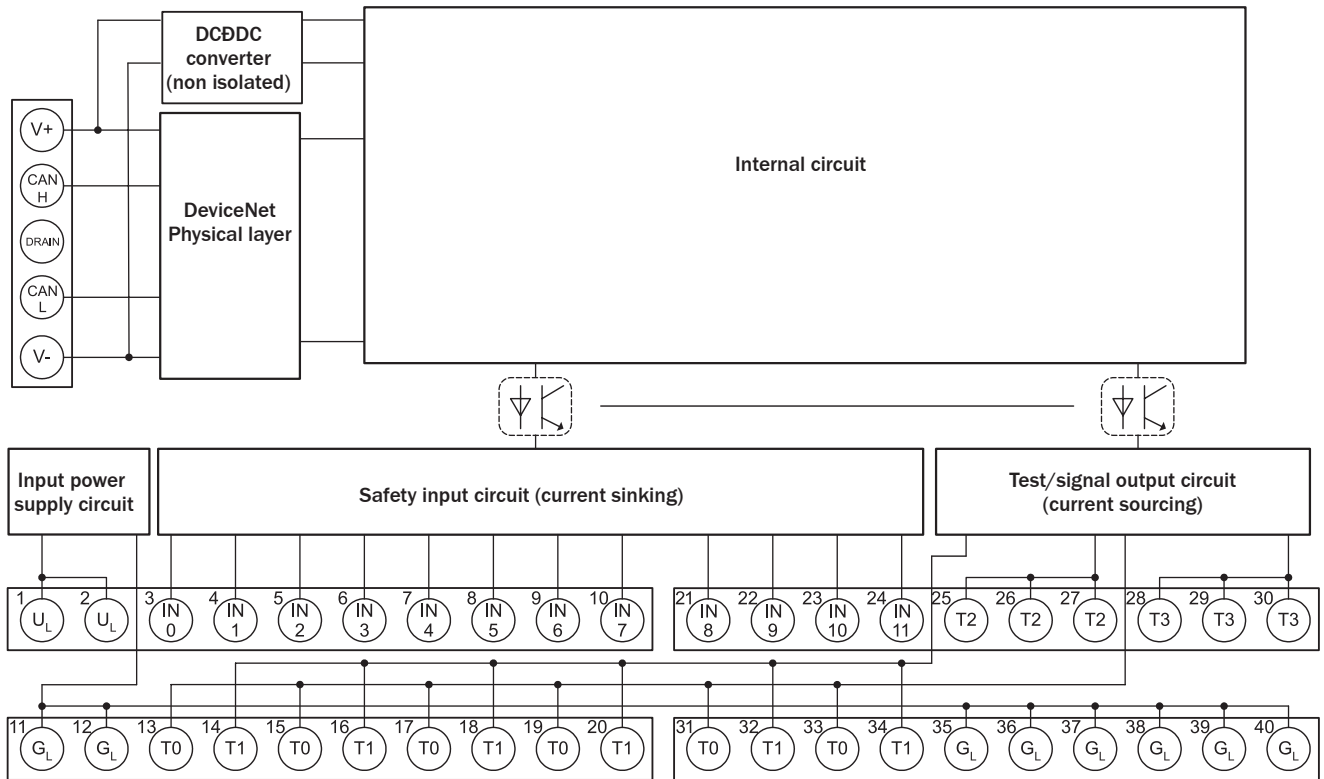
**UE4421-22EE330**



Dimensions in mm

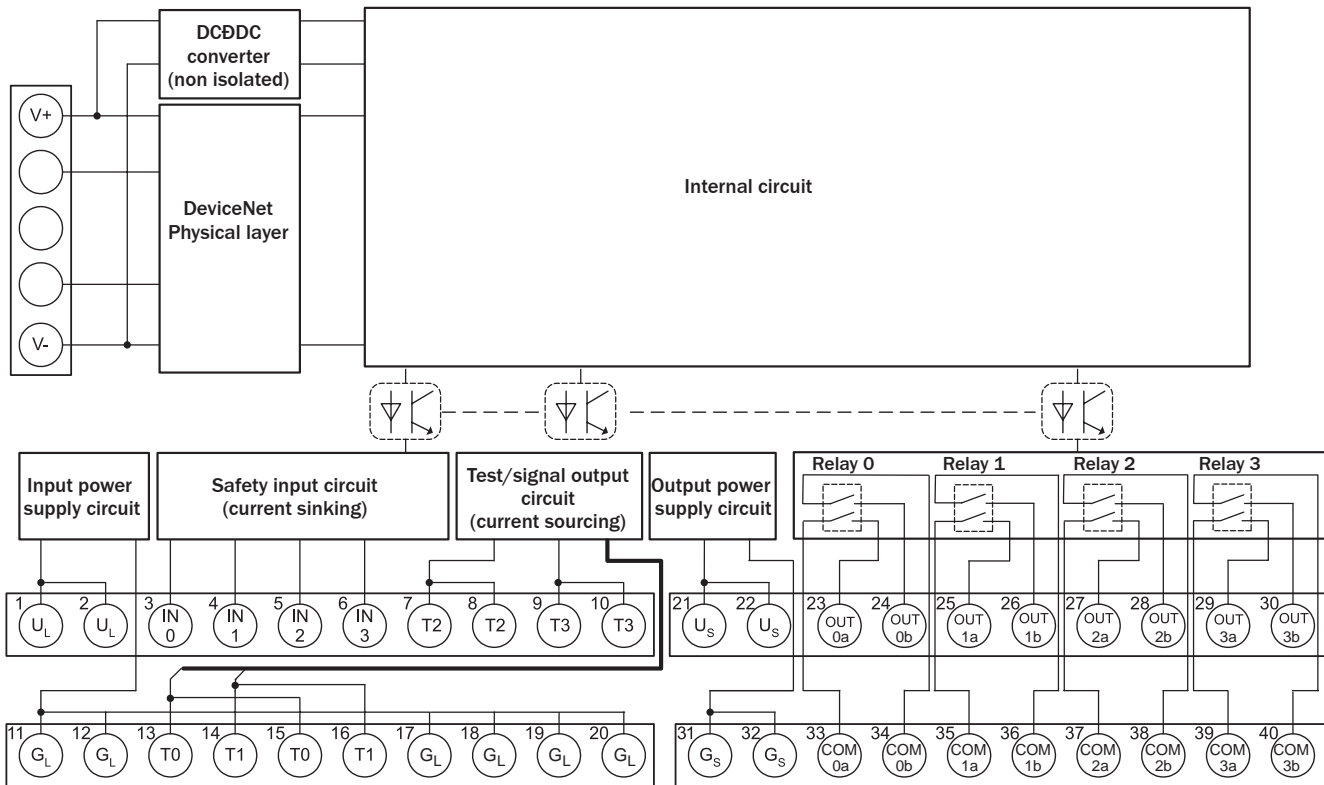
# Internal circuitry

UE4421-22EE900



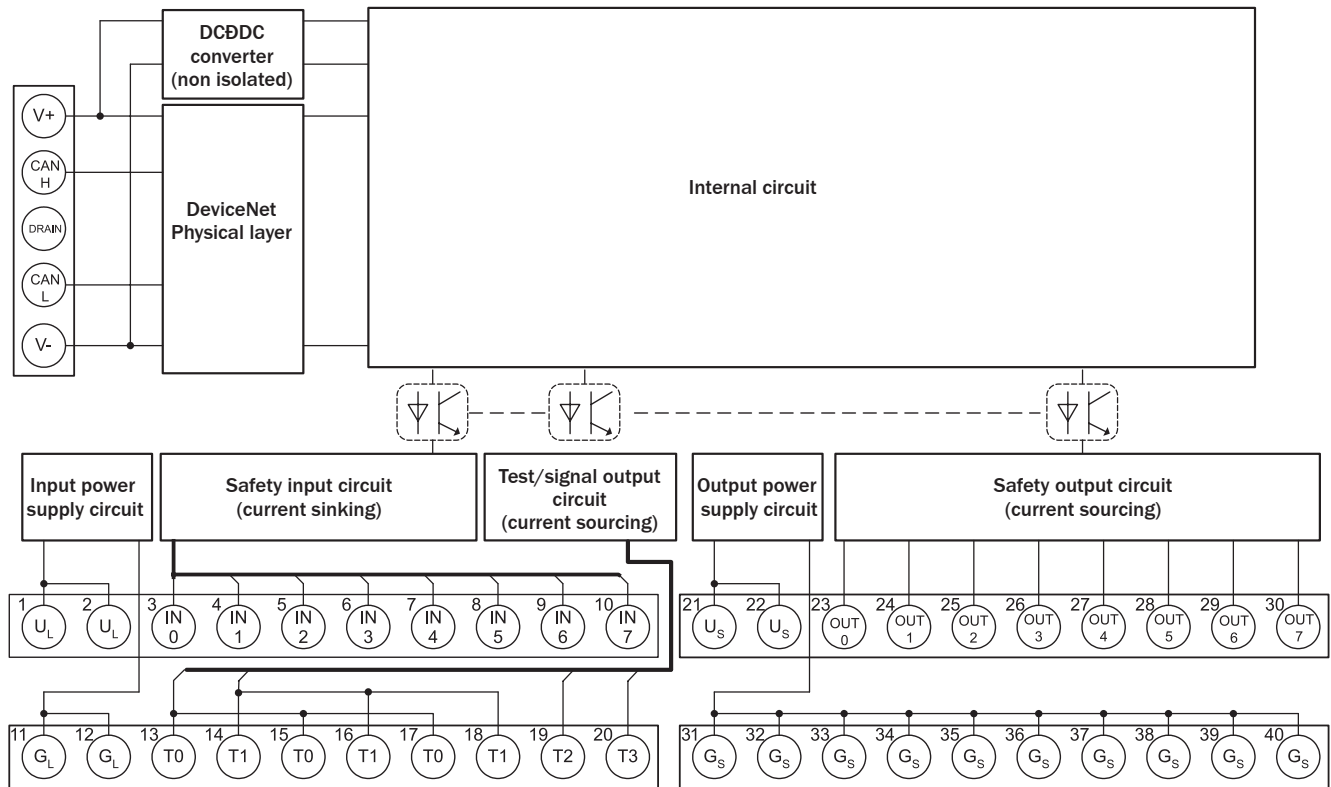
Terminal number(s)	Naming convention	Functionality
1, 2	U <sub>L</sub>	Power terminals for safety capable input devices and test/signal outputs. The terminals must be wired to 24 V DC
11, 12, 35 - 40	G <sub>L</sub>	Power terminals for safety capable inputs and test/signal outputs. The terminals must be wired to common (0 V DC). All G <sub>L</sub> terminals are internally connected
3 - 10, 21 - 24	IN0 to IN11	Terminals for safety capable input devices
13 - 20, 25 - 30, 31 - 34	T0 to T3	Terminals for test/signal outputs

UE4421-22EE330



Terminal number(s)	Naming convention	Functionality
1, 2	U <sub>L</sub>	Power terminals for input devices The terminals must be wired to 24 V DC
11, 12, 17 - 20	G <sub>L</sub>	Power terminals for safety capable inputs and test/signal outputs These terminals should be connected to 0 V DC common for U <sub>L</sub> All G <sub>L</sub> terminals are internally connected
3 - 6	IN0 to IN7	Terminals for safety capable input devices
7 - 10, 13 - 16	T0 to T3	Terminals for test/signal
21, 22	U <sub>S</sub>	Power terminals for output devices The terminals must be wired to 24 V DC
31, 32	G <sub>S</sub>	Power terminals for output devices These terminals must be wired to 0 V DC common All G <sub>S</sub> terminals are internally connected
23 - 30	OUT 0a/0b to OUT 3a/3b	Terminals for safety capable output devices OUT xa/xb are the same output
33 - 40	COM 0a/0b to COM 3a/3b	Terminals for safety capable output devices COM xa/xb are the same output

UE4421-22EE490



Terminal number(s)	Naming convention	Functionality
1, 2	U <sub>L</sub>	Power terminals for safety capable input devices and test/signal outputs The terminals must be wired to 24 V DC
11, 12	G <sub>L</sub>	Power terminals for safety capable inputs and test/signal outputs The terminals must be wired to common (0 V DC) All G <sub>L</sub> terminals are internally connected.
3 - 10	IN0 to IN7	Terminals for safety capable input devices
13 - 20	T0 to T3	Terminals for test/signal
21, 22	U <sub>S</sub>	Power terminals for output devices The terminals must be wired to 24 V DC
31 - 40	G <sub>S</sub>	Power terminals for safety capable outputs These terminals should be connected to 0 V DC common for U <sub>S</sub> All G <sub>S</sub> terminals are internally connected
23 - 30	OUT0 to OUT7	Terminals for safety capable output devices





## Accessories

### DeviceNet Safety connection, terminal connectors

Connection type	Direction of the cable outlet	Delivery	Part number
Terminal plug with M12 x 5 connector	—	—	6030818
Spring terminal plug, 5-pole	Single entry	With screw flange	6030817
	Double entry	With screw flange	6030816

### DeviceNet Safety connection, DeviceNet color code stickers

Usage	Part number
For 5-pole terminal blocks	5315184

### Power supply units

Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790

### Auxiliary power supply, connection cables

Cable type	Type	Part number
By the meter	Connection cable	6030757

### Spare parts

Description	Packing unit	Delivery	Part number
10-pole terminal blocks, spring clamp	2	number stickers, key inserts and instructions	6030814
10-pole terminal blocks, screw clamp	4		6030813
Replacement relay for UE4421-22EE330	—	—	6030821



- Solving applications up to SIL3 (IEC 61508)
- Easy upgrade of sensors and actuators on DeviceNet Safety
- Multiple safety sensors and actuators are supported
- Decentralised evaluation of safety sensors and actuators
- Easy installation utilising standardized connectors
- Rugged IP 67 enclosure for field mounting
- Only one safety fieldbus address for up to 14 sensors and actuators



Further information	Page
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## Overview of technical specifications

Fieldbus	DeviceNet Safety
Number of safety inputs	6 dual-channel resp. 12 single-channel
Number of SDL connections	2
Number of safety capable outputs	2 dual-channel
Safety integrity level	SIL3 (IEC 61508)

## Product description

SICK's UE4400 series IP 67 remote I/O bus modules integrate safety sensors and actuators into a flexible control system using DeviceNet Safety™.

Units are designed with 6 dual-channel safety inputs and 2 dual-channel bipolar safety outputs.

UE4400 IP 67 remote I/O bus modules allow users to implement safety applications up to category 4 (EN 954-1) and SIL3 (IEC 61508).

Individual test outputs provide easy management of safety input signals. Connection to both DeviceNet Safety™ and standard DeviceNet allows users to bring

diagnostic information seamlessly to an operator interface.

Configuration can be done locally via RS-232 interface or remotely through the network.

SICK safety sensors such as C4000 safety light curtains and S3000 safety laser scanners can be intelligently integrated into the DeviceNet Safety fieldbus network using SICK Safety Data Link (SDL) technology on the UE4450/UE4455 product types.

## Applications

- Electro-sensitive protective equipments
- Emergency stop buttons
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact



## Ordering information

Functionality	Number of safety inputs	Usage of the expanded functions on the SDL	Number of safety capable outputs	Number of test/signal outputs (with current monitoring)	Type	Part number
Remote I/O device	6 dual-channel resp. 12 single-channel	—	2 dual-channel	12	UE4420-03DC9F0	1028302
					UE4450-03DC9F0	1028305
	✓	2 dual-channel	12	UE4455-03DC9F0	1028306	

## Detailed technical specifications

### General system data

	UE4420-03DC9F0	UE4450-03DC9F0	UE4455-03DC9F0
Fieldbus	DeviceNet Safety		
Category	4 (EN 954-1)		
Safety integrity level	SIL3 (IEC 61508)		
Supply voltage	19.2 V DC ... 28.8 V DC		
Connection type supply voltage	Mini 7/8" × 4		
Ambient operating temperature from ... to	-10 °C ... +55 °C		
Enclosure rating	IP 67		
Protection class	III (IEC 61131-2)		
Vibration resistance according to IEC 60068-2-6	0.35 mm, 10 Hz ... 57 Hz, 50 m/sec <sup>2</sup> , 57 Hz ... 150 Hz		
Shock resistance	150 g, 11 ms (IEC 60068-2-27)		
Mounting	Location in the vicinity of the equipment		
Weight	522 g	582 g	

### Field-signal connections

Connection type	5-pole M12 connector		
Number of safety inputs	6 dual-channel resp. 12 single-channel		
Type of output on the field-signal input	PNP or contact		
Input voltage HIGH	11 V DC ... 30 V DC		
Input voltage LOW	-30 V DC ... 5 V DC		
Input current HIGH	5 mA		
Input delay	0 ms ... 635 ms, configurable		
Number of SDL connections	—	2	
Safety outputs	2 dual-channel		
Number of safety capable outputs	Bipolar type		
Type of output	15 ms		
Maximum response time	2 A		
Switching current	0.5 mA		
Leakage current			
Test/signal outputs	12		
Number of test/signal outputs (with current monitoring)	700 mA		
Output current per channel	Max. 0.5 mA		
Leakage current			

DeviceNet Safety network connections

	UE4420-03DC9F0	UE4450-03DC9F0	UE4455-03DC9F0
Number of safety target connections		Max. 6	
Expected packet interval (EPI) setting		10 ms ... 5 ms	
Single cast I/O support		16 Bytes/16 Bytes	
Multi cast I/O support		16 Bytes/16 Bytes	

DeviceNet network connections

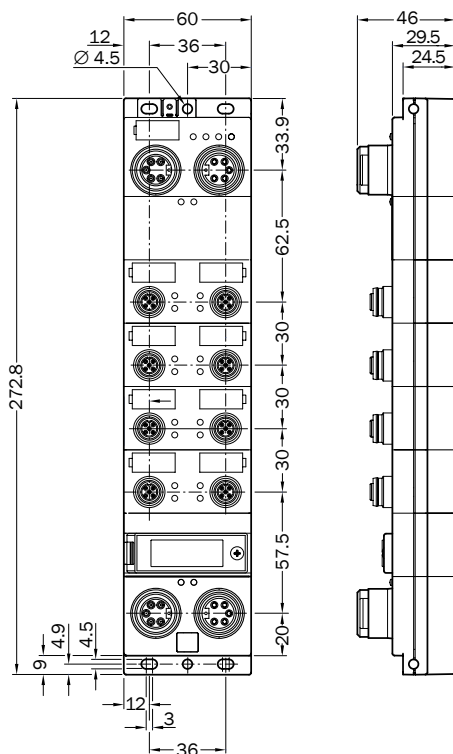
Poll connection maximum I/O transmission rate	16 Bytes/16 Bytes
Number of standard slave connections	Max. 3
Number of UCMM server	Max. 4
Connection type	Mini 7/8" x 5
DeviceNet communication rate	125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection
DeviceNet communication rate setting method	Software
DeviceNet addressing	Via the safety network configuration tool (e.g. SICK DeviceNet Safety Configurator)

Functions

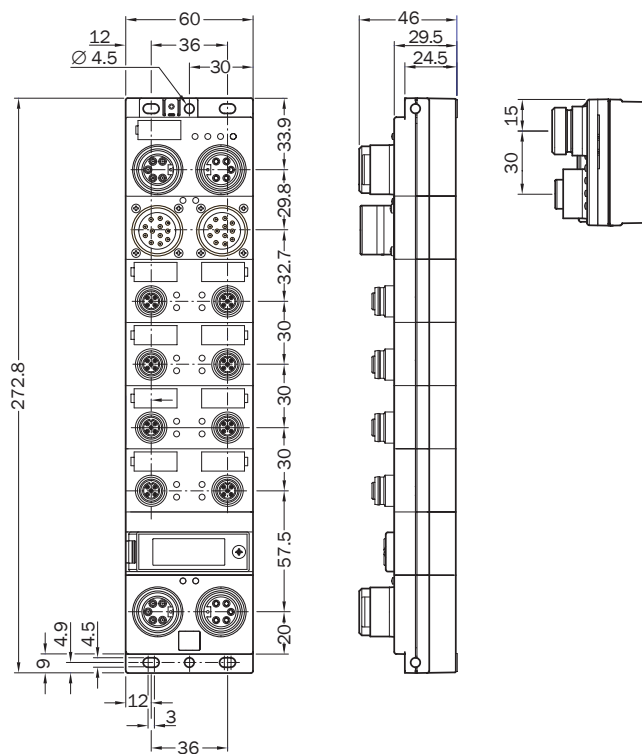
Functionality	Remote I/O device	
Signal routing	—	✓
Bidirectional communication	—	✓

Dimensional drawings

UE4420



UE4450, UE4455

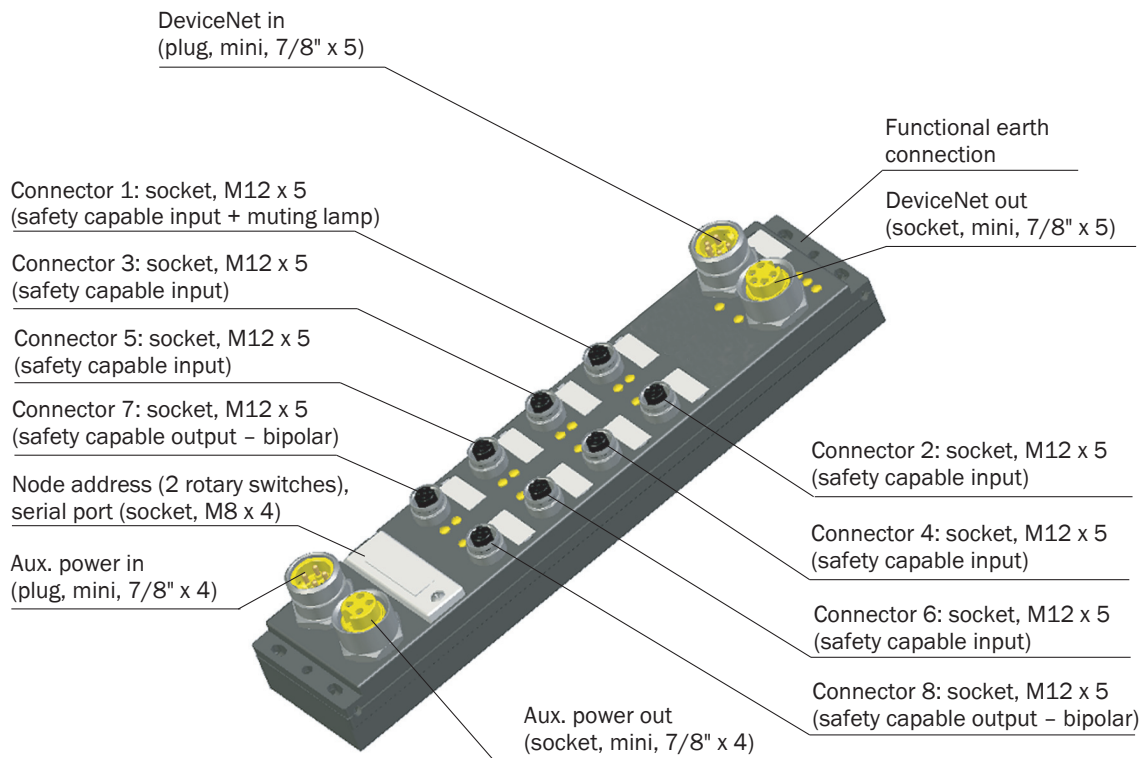


Dimensions in mm

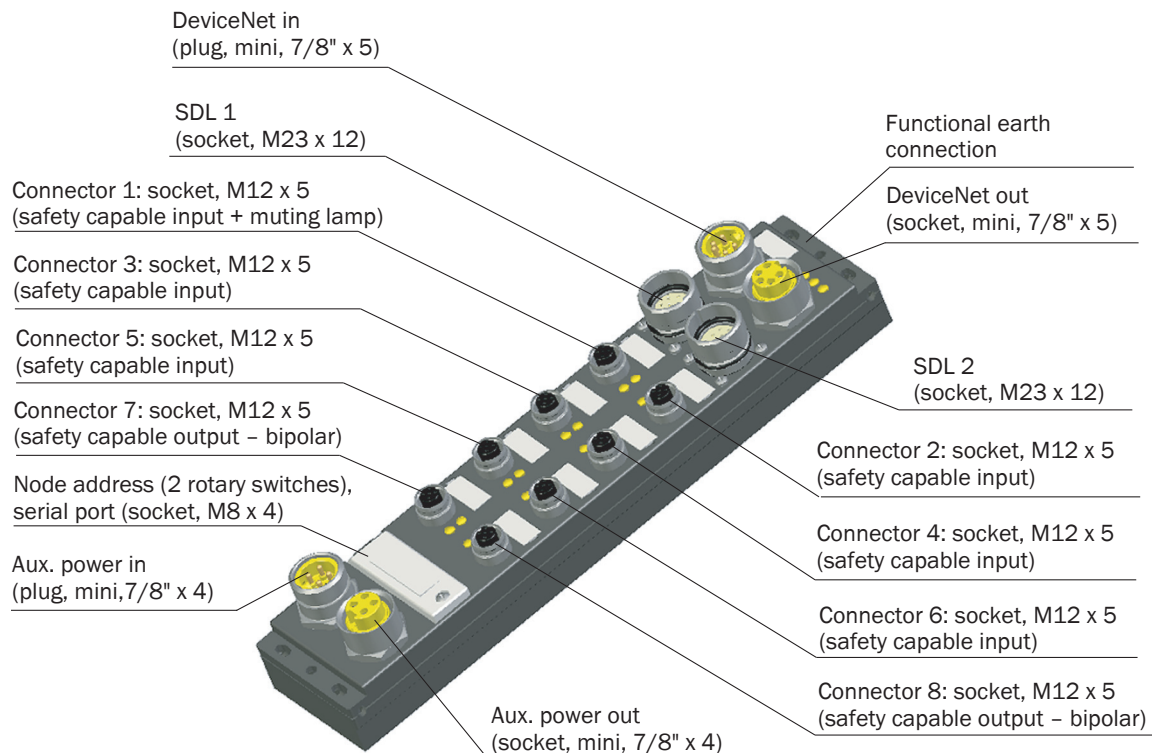


## Device overview and connections

### UE4420



### UE4450, UE4455

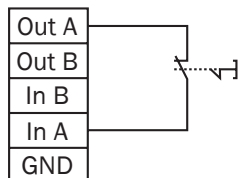


## Connection diagrams

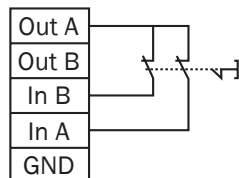
→ You can find connection diagrams at [www.sick.com](http://www.sick.com)

### Emergency stop, emergency shutdown, safety door on the field-signal connection

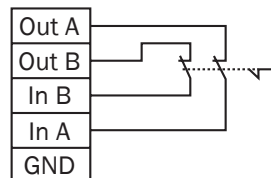
Single-channel



Dual-channel with common testing



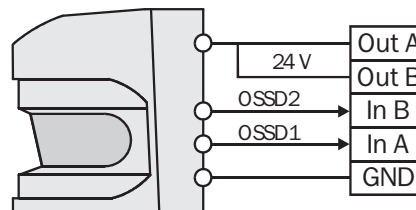
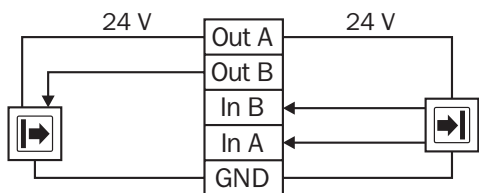
Dual-channel with isolated testing



Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing. The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category

depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

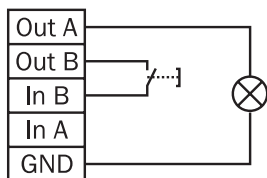
### Electro-sensitive protective equipment (ESPE) on the field-signal connection



In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output. You can use output Out B to test the sender.

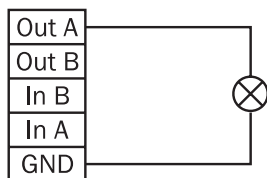
The switching outputs of the receiver are present on inputs In A and In B.

### Control switch with indicator display on the field-signal connection



The indicator display (Out A) is being controlled via an FPLC.

### Muting lamp on the field-signal connection



It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.

P

## Accessories

### Field-signal connection, connection cables

Connection type	Connector technology	Direction of the cable outlet	Cable material	Shielded	Cable length	Part number
Plug M12 x 5	Stripped	Straight	PUR halogen free	—	2 m	6026133
					5 m	6026134
					10 m	6026135
			—	✓	2 m	6024860
					5 m	6024861
					10 m	6024862

### Field-signal connection, T-junctions

Connection type	Usage	Part number
Plug M12 x 5	For the simultaneous connection of, e.g., two emergency stop buttons (single-channel) on one field-signal connection	6024744
	For the connection of sender/receiver to the the field-signal connection	6026517

### Field-signal connection, connectors

Connection type	Connector technology	Connection wire cross-section	Direction of the cable outlet	Cable diameter	Shielded	Type	Part number
Plug M12 x 5	Screwed	0.75 mm <sup>2</sup>	Straight	—	✓	Plug	6024741
				Ø 4 mm	—	STE-1205-G	6022083
			Angled	Ø 4 mm	—	STE-1205-W	6022082

### Field-signal connection, protective cap

Type	Packing unit	Part number
Protective cap	10	2019706

### SDL connection, SDL connection cables

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Description	Shielded	Cable length	Part number
Interconnectron plug M23 x 12	Stripped	Straight	0.75 mm <sup>2</sup>	For the connection of the S3000 safety laser scanner	✓	2.5 m	2029337
						5 m	2029338
						10 m	2029339
						15 m	2029340
Interconnectron cable socket M23 x 11 + FE and Interconnectron plug M23 x 11 + FE	—	Plug straight/ socket straight	—	For the connection of the C4000 safety light curtain	—	0.5 m	7029160
						3 m	7029161
						7.5 m	7029162
						15 m	7029163
Hirschmann cable socket M26 x 11 + FE, Interconnectron plug M23 x 11 + FE	—	Plug straight/ socket straight	—			20 m	7029164
						2.5 m	2029131
						5 m	2025634
						10 m	2025635
						15 m	2025636

**SDL connection, connector**

Connection type	Connector technology	Connection wire cross-section	Part number
Interconnectron plug M23 x 12	Crimped	0.82 mm <sup>2</sup>	6024742

**SDL connection, protective cap**

Type	Part number
Protective cap	5310774

**DeviceNet Safety connection, connection cables**

Connection type	Cable material	Cable diameter	Cable length	Part number
Mini 7/8" x 5, male and female	PVC	Ø 6.9 mm	1 m	6030743
		Ø 6.9 mm	2 m	6030744
		Ø 6.9 mm	3 m	6030745
		Ø 6.9 mm	4 m	6030746
		Ø 6.9 mm	5 m	6030747
		Ø 6.9 mm	6 m	6030748
		Ø 12.2 mm	2 m	6030749
		Ø 12.2 mm	5 m	6030750
		Ø 12.2 mm	10 m	6030751
DeviceNet cable, thin	PVC	Ø 6.9 mm	By the meter	6030921
DeviceNet cable, thick	PVC	Ø 12.2 mm		6030756

**DeviceNet Safety connection, DeviceNet connectors**

Connection type	Connector technology	Direction of the cable outlet	Usage	Type	Part number
Mini 7/8" x 5, female	—	—	Panel mount	DeviceNet connection	6030807
Mini 7/8" x 5, male	—	—	Panel mount	DeviceNet connection	6030808
			—	DeviceNet terminator	6028995
Mini 7/8" x 5, female	Can be preformed	Straight	—	DOS-7805-GK	6028331
	—	Straight	—	DOS-7805-GKEND	6028329
Mini 7/8" x 5, male	Can be preformed	Straight	—	STE-7805-GK	6028332
Mini 7/8" x 5, one male and two female	—	—	—	T-connector	6030752

**DeviceNet Safety connection, protective caps**

Connection type	Part number
Mini 7/8" x 4 or 7/8" x 5, male	5315188
Mini 7/8" x 4 or 7/8" x 5, female	5315187

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790





**Auxiliary power supply, connection cables**

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Description	Cable length	Part number
Mini 7/8" x 4, female	Flying leads	Straight	1.5 mm <sup>2</sup>	With screw lock	0.3 m	6030805
Mini 7/8" x 4, male						6030806
Mini 7/8" x 4, female	Stripped	—	—	—	2 m	6030753
			—	—	5 m	6030754
			—	—	10 m	6030755
—	—	—	—	—	By the meter	6030757

**Auxiliary power supply, cable receptacles**

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Part number
Mini 7/8" x 4, female	Screwed	Straight	1.5 mm <sup>2</sup>	6030803

**Auxiliary power supply, connector**

Connection type	Direction of the cable outlet	Connection wire cross-section	Type	Part number
Mini 7/8" x 4, male	Straight	1.5 mm <sup>2</sup>	Plug	6030804

**Configuration connection, configuration connection cables**

Connection type	Description	Cable length	Part number
M8 x 4, SUB-D 9-pol	For connecting the configuration connection to the PC	2 m	6021195
		8 m	2027649

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314
CDS plug-in for DeviceNet Safety SNCT	Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2032920)	2027422

**Cable cover**

Connection type	Description	Type	Part number
M12	For minimising cable tampering. Sheath provides visible indication when it has been removed. Used to detect when cables have potentially been changed	Cable sheath/cover	5315186

**Designation plates**

Description	Packing unit	Part number
In the 9 x 20 mm frame	40	5310775



- Solving applications up to SIL3 (IEC 61508)
- Rugged IP 67 enclosure for field mounting
- Operation as controller or as remote I/O possible
- Fixed and fast reaction time using Fast Shut-Off
- Standard PLC may control UE44x7 safety outputs
- Easy upgrade of sensors and actuators on DeviceNet Safety



**TÜV** CE



SAFETY **DeviceNet**  
COMMUNICATING

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→ Device overview and connections	P-39
→ Connection diagrams	P-40
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## Overview of technical specifications

Fieldbus	DeviceNet Safety
Number of safety inputs	6 dual-channel resp. 12 single-channel
Number of SDL connections	2
Number of safety capable outputs	2 dual-channel
Safety integrity level	SIL3 (IEC 61508)

## Product description

SICK's UE4427 and UE4457 series IP 67 safety remote controllers integrate and evaluate all combination of safety sensors and actuators. This can either be achieved in stand alone mode or in networked applications.

Function block logic can be implemented directly at the unit, solving the application. The Safety Enable functionality allows standard masters (e.g. PLC) to control the safety outputs of the UE44x7 devices directly, without the need for an additional safety PLC.

The Fast Shut-Off functionality enables fast and constant reaction time of 8 ms through direct routing of local safety inputs to the safety outputs of UE44x7.

- Compact safety controller in IP 67 technology
- Comfortable library of certified function blocks
- Optimised system reaction times in stand alone or networked operation
- Standard PLC may control safety outputs of the device
- 6 dual-channel or 12 single-channel safety inputs on board
- Comfortable integration and diagnostics of intelligent SICK safety sensors via SICK Safety Data Link (SDL) at UE4457
- 2 dual-channel bipolar safety outputs (2A) on board

## Applications

- Electro-sensitive protective equipments
- Emergency stop buttons
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact



## Ordering information

Functionality	Number of safety inputs	Number of SDL connections	Usage of the expanded functions on the SDL	Number of safety capable outputs	Type	Part number
Safety remote controller	6 dual-channel resp. 12 single-channel	—	—	2 dual-channel	UE4427-03DC9F0	1028304
		2	✓	2 dual-channel	UE4457-03DC9F0	1023807

## Detailed technical specifications

### General system data

	UE4427-03DC9F0	UE4457-03DC9F0
Fieldbus	DeviceNet Safety	
Category	4 (EN 954-1)	
Safety integrity level	SIL3 (IEC 61508)	
Supply voltage	19.2 V DC ... 28.8 V DC	
Connection type supply voltage	Mini 7/8" × 4	
Ambient operating temperature from ... to	-10 °C ... +55 °C	
Enclosure rating	IP 67	
Protection class	III (IEC 61131-2)	
Vibration resistance according to IEC 60068-2-6	0.35 mm, 10 Hz ... 57 Hz, 50 m/sec <sup>2</sup> , 57 Hz ... 150 Hz	
Shock resistance	150 g, 11 ms (IEC 60068-2-27)	
Mounting	Location in the vicinity of the equipment	
Weight	570 g	650 g

### Field-signal connections

Connection type	5-pole M12 connector	
Number of safety inputs	6 dual-channel resp. 12 single-channel	
Type of output on the field-signal input	PNP or contact	
Input voltage HIGH	11 V DC ... 30 V DC	
Input voltage LOW	-30 V DC ... 5 V DC	
Input current HIGH	5 mA	
Input delay	0 ms ... 635 ms, configurable	
Number of SDL connections	—	2
Safety outputs	2 dual-channel	
Number of safety capable outputs	Bipolar type	
Type of output	15 ms	
Maximum response time	2 A	
Switching current	0.5 mA	
Leakage current		
Test/signal outputs	700 mA	
Output current per channel	Max. 0.5 mA	
Leakage current		

### DeviceNet Safety network connections

Number of safety target connections	Max. 6
Expected packet interval (EPI) setting	10 ms ... 5 ms
Single cast I/O support	16 Bytes/16 Bytes
Multi cast I/O support	16 Bytes/16 Bytes

DeviceNet network connections

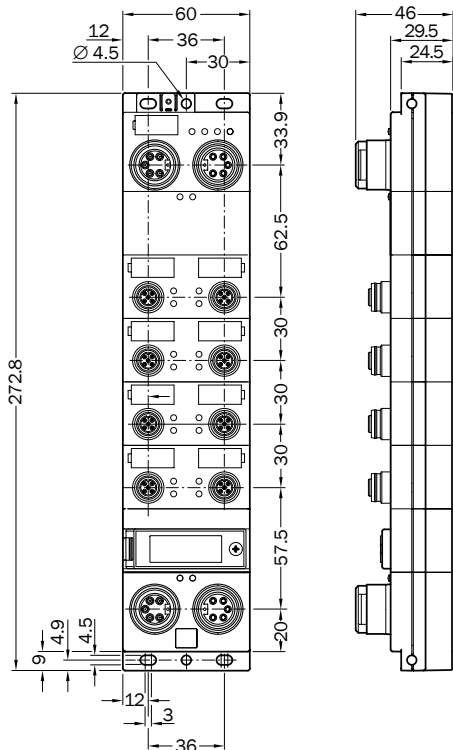
	UE4427-03DC9F0	UE4457-03DC9F0
Poll connection maximum I/O transmission rate	16 Bytes/16 Bytes	
Number of standard slave connections	Max. 3	
Number of UCMM server	Max. 4	
Connection type	Mini 7/8" x 5	
DeviceNet communication rate	125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection	
DeviceNet communication rate setting method	Software	
DeviceNet addressing	Via the safety network configuration tool (e.g. SICK DeviceNet Safety Configurator)	

Functions

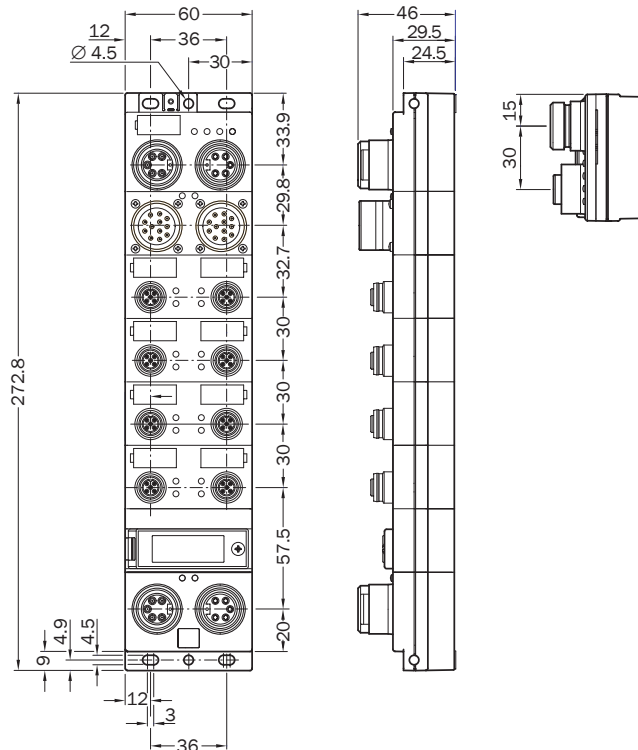
Functionality	Safety remote controller
Usage of the expanded functions on the SDL	✓
External device monitoring	✓
Restart interlock	✓
Automatic Reset	✓
Logical functions	AND, OR, XOR, XNOR, NOT
On-delay	✓
Off-delay	✓
Door monitoring	✓
Signal routing	✓
Bidirectional communication	✓
Two-hand control systems	✓

Dimensional drawings

UE4427



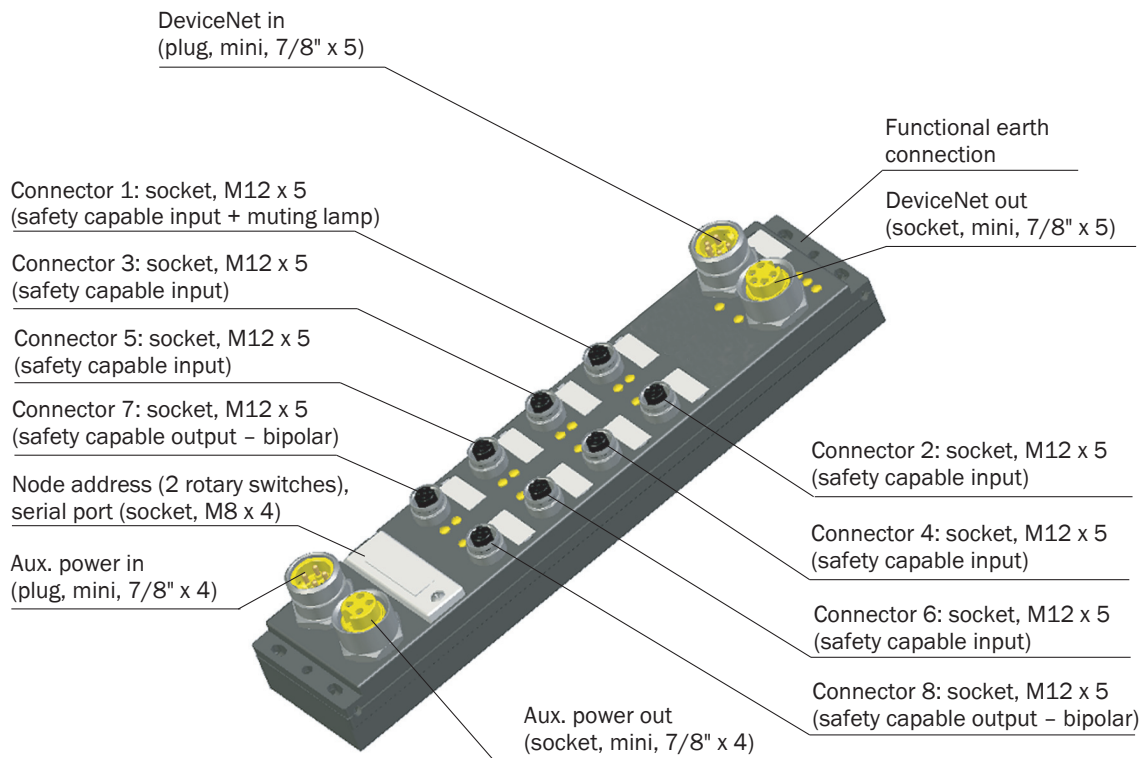
UE4457



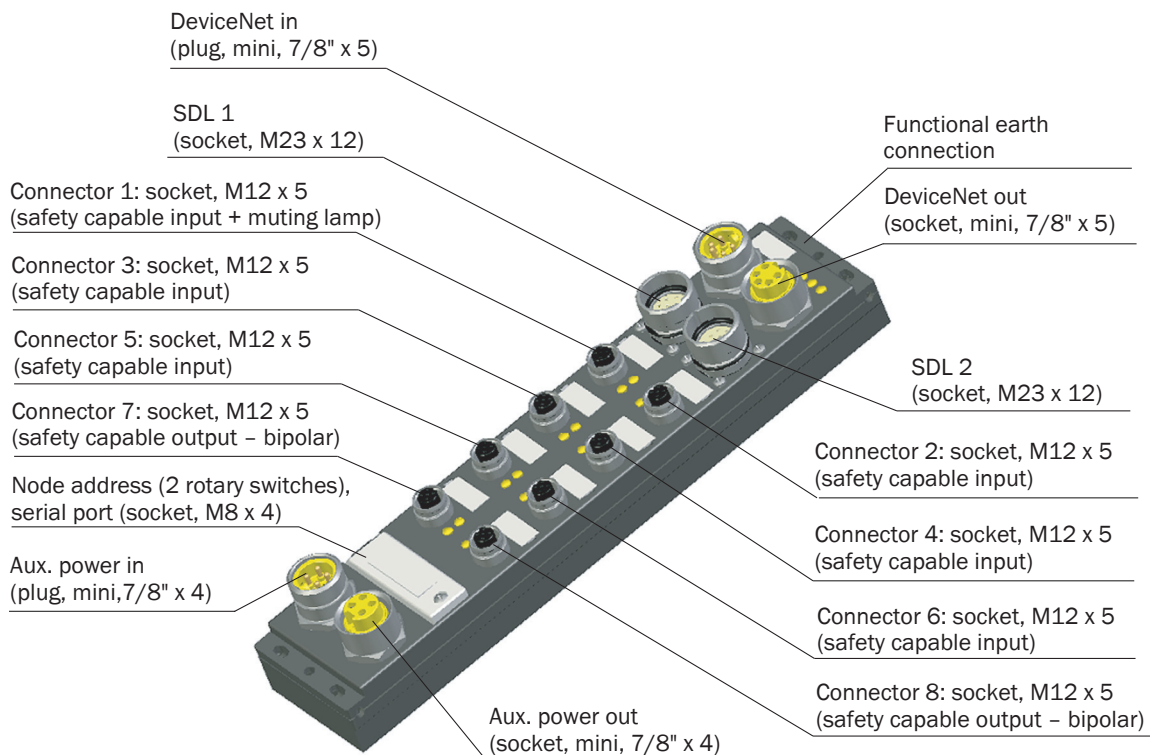
Dimensions in mm

## Device overview and connections

### UE4427



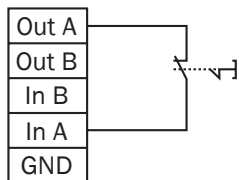
### UE4457



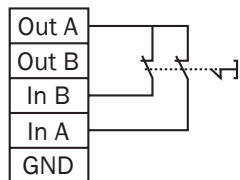
## Connection diagrams

### Emergency stop, emergency shutdown, safety door on the field-signal connection

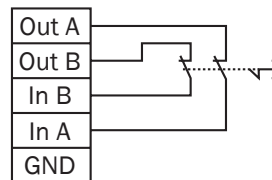
Single-channel



Dual-channel with common testing



Dual-channel with isolated testing

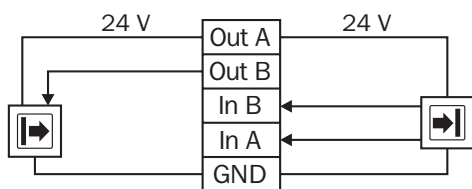


Depending on the control category required, you can realise the emergency stop using a single-channel, dual-channel with common testing or dual-channel with isolated testing.

The classification of components fitted with contacts (e.g. safety door switches and emergency stops) into a control category

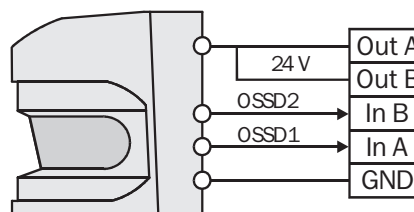
depends both on the connection type (single-channel/dual-channel) and on the execution (single/redundant, testing type). You must therefore always select the appropriate switching element for the required control category and switching type.

### Electro-sensitive protective equipment (ESPE) on the field-signal connection



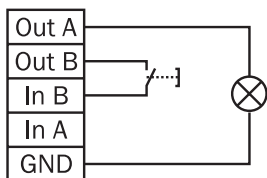
In the connection of electro-sensitive protective equipment (ESPE), sender and receiver can be considered as a system's input and output.

You can use output Out B to test the sender.



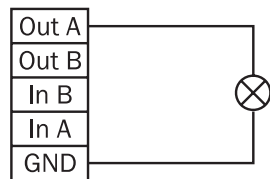
The switching outputs of the receiver are present on inputs In A and In B.

### Control switch with indicator display on the field-signal connection



The indicator display (Out A) is being controlled via an FPLC.

### Muting lamp on the field-signal connection



It is only permitted to connect a muting lamp to channel A of field-signal outputs 7 and 8, as only these outputs have fault monitoring.

P

## Accessories

### Field-signal connection, connection cables

Connection type	Connector technology	Direction of the cable outlet	Cable material	Shielded	Cable length	Part number
Plug M12 x 5	Stripped	Straight	PUR halogen free	—	2 m	6026133
					5 m	6026134
					10 m	6026135
			—	✓	2 m	6024860
					5 m	6024861
					10 m	6024862

### Field-signal connection, T-junctions

Connection type	Usage	Part number
Plug M12 x 5	For the simultaneous connection of, e.g., two emergency stop buttons (single-channel) on one field-signal connection	6024744
	For the connection of sender/receiver to the the field-signal connection	6026517

### Field-signal connection, connectors

Connection type	Connector technology	Connection wire cross-section	Direction of the cable outlet	Cable diameter	Shielded	Part number
Plug M12 x 5	Screwed	0.75 mm <sup>2</sup>	Straight	—	✓	6024741
				Ø 4 mm	—	6022083
			Angled	Ø 4 mm	—	6022082

### Field-signal connection, protective cap

Type	Packing unit	Part number
Protective cap	10	2019706

### SDL connection, SDL connection cables

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Description	Shielded	Cable length	Part number
Interconnectron plug M23 x 12	Stripped	Straight	0.75 mm <sup>2</sup>	For the connection of the S3000 safety laser scanner	✓	2.5 m	2029337
						5 m	2029338
						10 m	2029339
						15 m	2029340
Interconnectron cable socket M23 x 11 + FE and Interconnectron plug M23 x 11 + FE	—	Plug straight/ socket straight	—	For the connection of the C4000 safety light curtain	—	0.5 m	7029160
						3 m	7029161
						7.5 m	7029162
						15 m	7029163
Hirschmann cable socket M26 x 11 + FE, Interconnectron plug M23 x 11 + FE	—	Plug straight/ socket straight	—		—	20 m	7029164
						2.5 m	2029131
						5 m	2025634
						10 m	2025635
						15 m	2025636

**SDL connection, connectors**

Connection type	Connector technology	Connection wire cross-section	Part number
Interconnectron plug M23 x 12	Crimped	0.82 mm <sup>2</sup>	6024742

**SDL connection, protective cap**

Type	Part number
Protective cap	5310774

**DeviceNet Safety connection, connection cables**

Connection type	Cable material	Cable diameter	Cable length	Part number
Mini 7/8" x 5, male and female	PVC	Ø 6.9 mm	1 m	6030743
		Ø 6.9 mm	2 m	6030744
		Ø 6.9 mm	3 m	6030745
		Ø 6.9 mm	4 m	6030746
		Ø 6.9 mm	5 m	6030747
		Ø 6.9 mm	6 m	6030748
		Ø 12.2 mm	2 m	6030749
		Ø 12.2 mm	5 m	6030750
		Ø 12.2 mm	10 m	6030751
DeviceNet cable, thin	PVC	Ø 6.9 mm	By the meter	6030921
DeviceNet cable, thick		Ø 12.2 mm		6030756

**DeviceNet Safety connection, DeviceNet connectors**

Connection type	Connector technology	Direction of the cable outlet	Usage	Type	Part number
Mini 7/8" x 5, female	—	—	Panel mount	DeviceNet connection	6030807
Mini 7/8" x 5, male	—	—	Panel mount	DeviceNet connection	6030808
			—	DeviceNet terminator	6028995
Mini 7/8" x 5, female	Can be preformed	Straight	—	DOS-7805-GK	6028331
	—	Straight	—	DOS-7805-GKEND	6028329
Mini 7/8" x 5, male	Can be preformed	Straight	—	STE-7805-GK	6028332
Mini 7/8" x 5, one male and two female	—	—	—	T-connector	6030752

**DeviceNet Safety connection, protective caps**

Connection type	Part number
Mini 7/8" x 4 or 7/8" x 5, male	5315188
Mini 7/8" x 4 or 7/8" x 5, female	5315187

**Power supply units**

Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790





**Auxiliary power supply, connection cables**

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Description	Cable length	Part number
Mini 7/8" x 4, female	Flying leads	Straight	1.5 mm <sup>2</sup>	With screw lock	0.3 m	6030805
Mini 7/8" x 4, male						6030806
Mini 7/8" x 4, female	Stripped	—	—	—	2 m	6030753
			—	—	5 m	6030754
			—	—	10 m	6030755
—	—	—	—	—	By the meter	6030757

**Auxiliary power supply, cable receptacles**

Connection type	Connector technology	Direction of the cable outlet	Connection wire cross-section	Part number
Mini 7/8" x 4, female	Screwed	Straight	1.5 mm <sup>2</sup>	6030803

**Auxiliary power supply, connectors**

Connection type	Direction of the cable outlet	Connection wire cross-section	Part number
Mini 7/8" x 4, male	Straight	1.5 mm <sup>2</sup>	6030804

**Configuration connection, configuration connection cables**

Connection type	Description	Cable length	Part number
M8 x 4, SUB-D 9-pol	For connecting the configuration connection to the PC	2 m	6021195
		8 m	2027649

**Configuration software**

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314
CDS plug-in for DeviceNet Safety SNCT	Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2032920)	2027422

**Cable cover**

Connection type	Description	Type	Part number
M12	For minimising cable tampering. Sheath provides visible indication when it has been removed. Used to detect when cables have potentially been changed	Cable sheath/cover	5315186

**Designation plates**

Description	Packing unit	Part number
In the 9 x 20 mm frame	40	5310775



- Solving applications up to SIL3 (IEC 61508)
- Local/remote connection of safety sensors and actuators
- Decentralised evaluation of safety sensors and actuators
- Easy upgrade of installed base of sensors and actuators
- Logical combinations between sensors and actuators
- Large library of approved safety function blocks
- Remote configuration of other DeviceNet Safety™ devices via network



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## Overview of technical specifications

Fieldbus	DeviceNet Safety
Number of safety inputs	8 dual-channel resp. 16 single-channel
Number of safety capable outputs	4 dual-channel resp. 8 single-channel
Safety integrity level	SIL3 (IEC 61508)

## Product description

SICK's UE4400 safety network controllers integrate and evaluate any combination of safety input and actuator devices into DeviceNet Safety™ networks, using local or remote safety inputs and outputs. Safety devices can now be logically combined for optimised machine safety control strategies. Applications include packaging machinery, robot cells, machine tools and transfer lines.

Status, diagnostic and error information can be easily accessed locally or through

the network. Integrated basic and application-specific function blocks are provided for simple and complex control capability. Logical operations include: AND, OR, Exclusive OR, Exclusive NOR, NOT, ON-delay timer, OFF-delay timer, restart interlock, external device monitoring (EDM), emergency stop, safety gate monitoring, ESPE/AOPD (e.g. safety light curtain), enabling switch, two-hand control, automatic reset, and operating mode selector switch.

## Applications

- Electro-sensitive protective equipments
- Emergency stop buttons
- Electro-mechanical safety switches
- Safety operating devices
- Control switches with lamps
- Operating mode selector switches
- Muting sensors
- Muting lamp
- Non-contact safety switch T4000 Compact



## Ordering information

Functionality	Number of safety inputs	Number of test/signal outputs (with current monitoring)	Type	Part number
Flexible safety controller	8 dual-channel resp. 16 single-channel	4 (0)	UE4470-22EE690	1028312

## Detailed technical specifications

### General system data

Fieldbus	DeviceNet Safety
Category	4 (EN 954-1)
Safety integrity level	SIL3 (IEC 61508)
Supply voltage	20.4 V DC ... 26.4 V DC
Connection type supply voltage	Spring terminal plug
Ambient operating temperature from ... to	-10 °C ... +55 °C
Enclosure rating	IP 20
Protection class	III (IEC 61131-2)
Vibration resistance according to IEC 60068-2-6	0.35 mm, 10 Hz ... 57 Hz, 50 m/sec <sup>2</sup> , 57 Hz ... 150 Hz
Shock resistance	150 m/sec <sup>2</sup> , 11 ms (IEC 60068-2-27)
Mounting	35 mm mounting rail (DIN 46277)
Weight	460 g

### Field-signal connections

Connection type	Spring terminal plug
Number of safety inputs Type of output on the field-signal input Input voltage HIGH Input voltage LOW Input current HIGH Input delay	8 dual-channel resp. 16 single-channel PNP or contact 11 V DC ... 30 V DC 0 V DC ... 5 V DC 5 mA 0 ms ... 126 ms, configurable
Safety outputs Number of safety capable outputs Type of output Maximum response time Switching current Leakage current	4 dual-channel resp. 8 single-channel Source output (PNP) 15 ms 500 mA 0.1 mA
Test/signal outputs Number of test/signal outputs (with current monitoring) Output current per channel Leakage current	4 (0) 700 mA Max. 0.1 mA

### DeviceNet Safety network connections

Number of originator connections	Max. 16
Number of safety target connections Expected packet interval (EPI) setting Single cast I/O support Multi cast I/O support	Max. 4 Minimum device cycle time 16 Bytes/16 Bytes 16 Bytes/16 Bytes

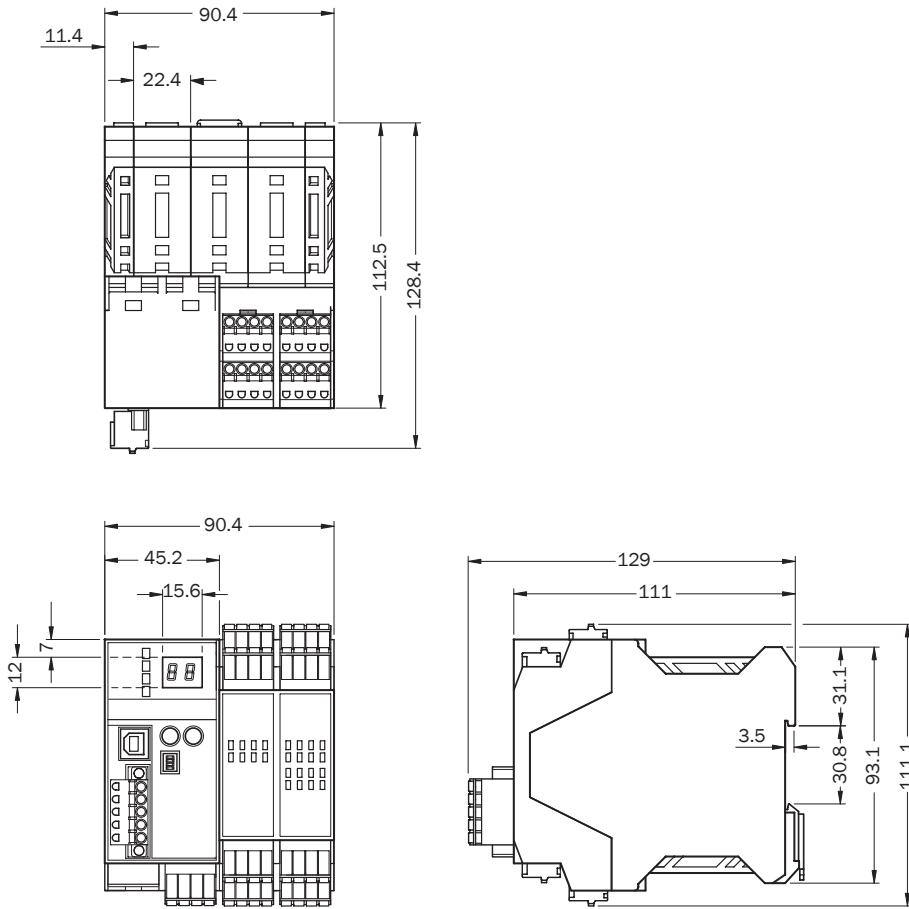
**DeviceNet network connections**

Poll connection maximum I/O transmission rate	16 Bytes/16 Bytes
Number of standard slave connections	Max. 2
Number of UCMM clients	8, open connections
Number of UCMM server	Max. 5
Connection type	Spring terminal block
DeviceNet communication rate	125 KBit/s, 250 KBit/s, 500 KBit/s, Autobaud Detection
DeviceNet communication rate setting method	DIP switch
DeviceNet addressing	Via the safety network configuration tool (e.g. SICK DeviceNet Safety Configurator)

**Functions**

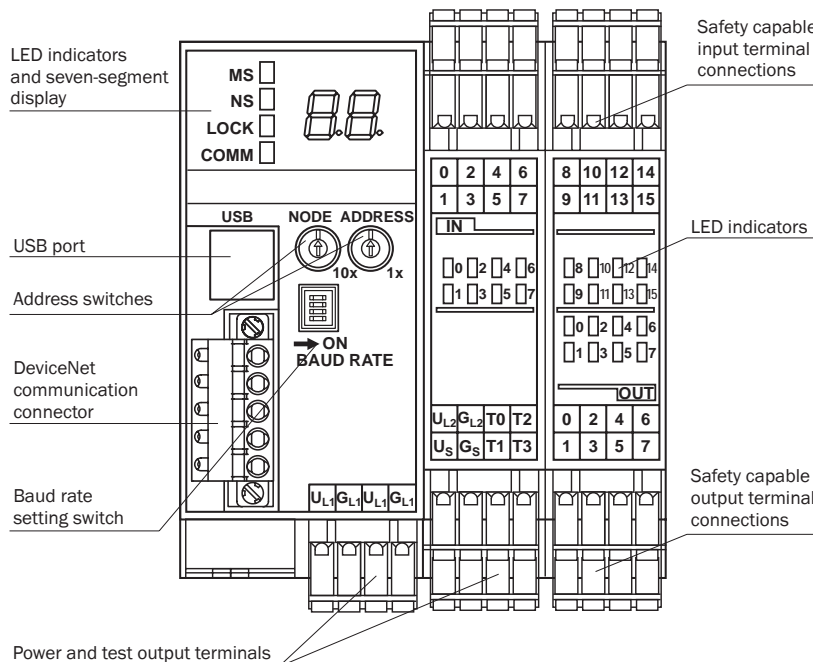
Functionality	Flexible safety controller
External device monitoring	✓
Restart interlock	✓
Automatic Reset	✓
Logical functions	AND, OR, XOR, XNOR, NOT
On-delay	✓
Off-delay	✓
Door monitoring	✓
Signal routing	✓
Emergency stop switch	✓
Safety switches	✓
Opto-electronic protective devices	✓
Two-hand control systems	✓

## Dimensional drawings

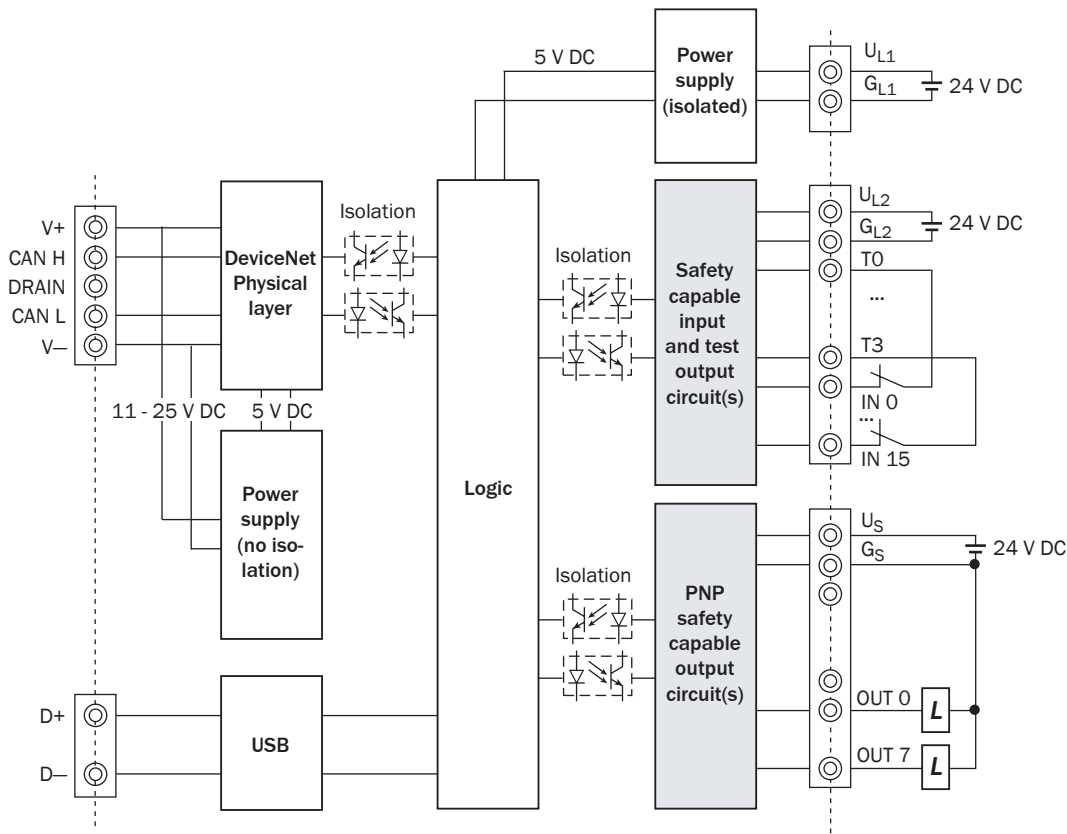


Dimensions in mm

## Device overview and connections



## Internal circuitry



Terminal name	Description
U <sub>L1</sub>	24 V DC power supply terminal for internal device power (e.g. internal logic). Both U <sub>L1</sub> terminals are internally connected
G <sub>L1</sub>	0 V DC power supply terminal for internal device power (e.g. internal logic). Both G <sub>L1</sub> terminals are internally connected
U <sub>L2</sub>	24 V DC power supply terminal for external input device and test output
G <sub>L2</sub>	0 V DC power supply terminal for external input device and test output
U <sub>S</sub>	24 V DC power supply terminal for external output device
G <sub>S</sub>	0 V DC power supply terminal for external output device
IN0 to IN15	Safety capable input terminals
T0 to T3	Test/signal output terminals
OUT0 to OUT7	Safety capable output terminals

## Accessories

### Configuration software

Type	Description	Part number
SICK DeviceNet Safety Configurator	Enables the configuration and diagnosis of the DeviceNet and DeviceNet Safety network. Includes SICK CDS plug-in module for SICK UE4421 and configuration software plug-in for SICK UE4470 Safety Network Controller	2032920
CDS plug-in for DeviceNet Safety SNCT	Provides plug-in configuration software and .EDS files for SICK DeviceNet Safety devices used with compatible third-party Safety Network Configuration Tool (SNCT). This software is already included with SICK DeviceNet Safety Configurator (2032920)	2027422

### DeviceNet Safety connection, terminal connectors

Connection type	Direction of the cable outlet	Delivery	Part number
Terminal plug with M12 x 5 connector	—	—	6030818
Spring terminal plug, 5-pole	Single entry	With screw flange	6030817
	Double entry		6030816

### DeviceNet Safety connection, configuration connection cables

Connection type	Cable length	Part number
USB A to USB B	1.8 m	6030820
	4.6 m	6030819

### Connection terminals

Connection type	Packing unit	Delivery	Part number
Spring terminal plug, 4-pole	9	Key inserts and instructions	6030815

### Power supply units

Input voltage	Output voltage	Maximum output current	Part number
100 V AC ... 240 V AC	24 V DC	2.1 A	7028789
		3.9 A	7028790



- 2 inputs (EFI interface) for the connection of intelligent SICK safety solutions
- Easy configuration and diagnosis with the aid of CDS (Configuration & Diagnostic Software)



## Overview of technical specifications

Fieldbus/communication interface (depending on type)	PROFIBUS / Ethernet (TCP/IP) / CANopen / PROFI-safe
Number of EFI interfaces	2
Enclosure rating	IP 20
Category	4 (EN 954-1)
Safety integrity level	SIL3 (IEC 61508)

## Product description

The family of EFI gateways is used for connecting intelligent SICK safety devices to fieldbus and Ethernet interfaces.

Properties EFI gateways:

- All SICK components connected to the EFI connection can be easily configured and diagnostics also performed straightforwardly using CDS.

Properties UE1840:

- Activation of an e-mail function by linking the information on EFI devices connected (e.g. contamination on the S3000).

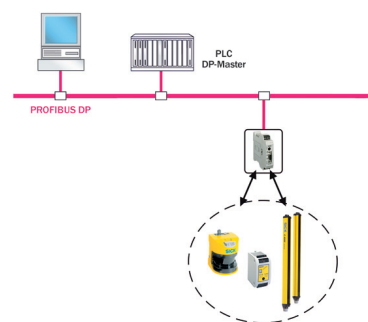
Properties UE1140, UE1940 and UE4140:

- Configurable process image with information from the EFI sensors connected to the PLC and from the PLC to the sensors (input and output).
- Support of PROFIBUS-DP V1 (UE1140, UE4140)
- Support of PROFI-safe V2.00 (UE4140)
- Support of CANopen (UE1940)

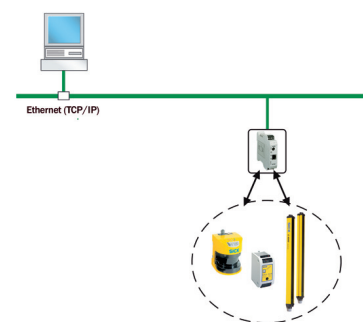
## Applications

- S3000/S300 safety laser scanners
- M4000 multiple light beam safety devices
- C4000 safety light curtains
- UE440/UE470 safety controllers

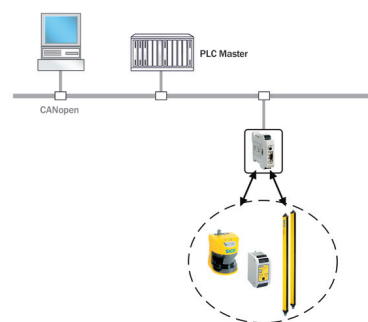
### PROFIBUS Gateway UE1140



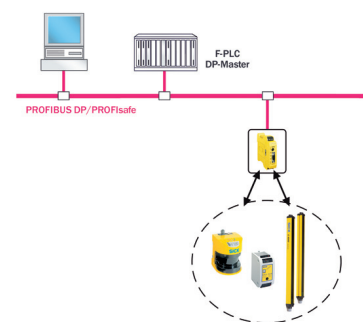
### Ethernet Gateway UE1840



### CANopen Gateway UE1940



### PROFI-safe Gateway UE4140



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## Ordering information

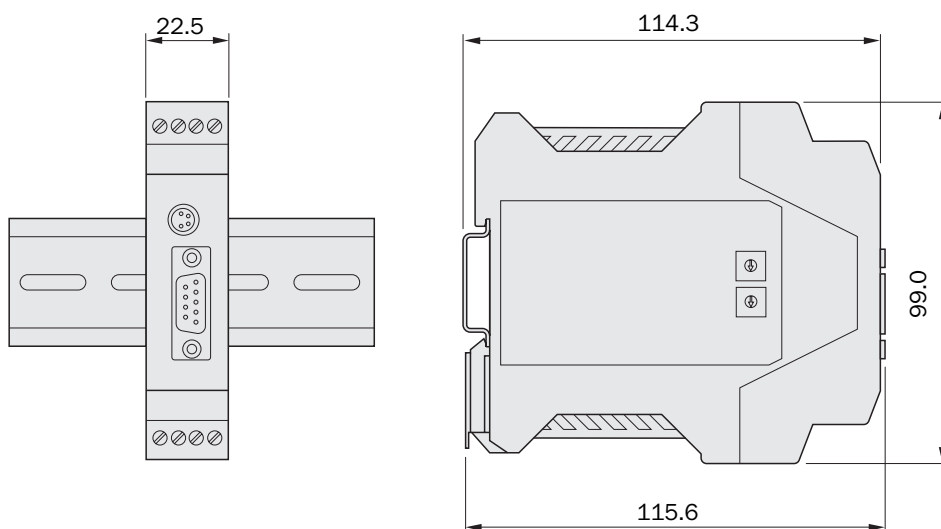
Fieldbus/communication interface	Number of EFI interfaces	Use of expanded functions through EFI	Type	Part number
PROFIBUS	2	✓	UE1140-22I0000	1029099
Ethernet (TCP/IP)	2	✓	UE1840-22H0000	1029100
CANopen	2	✓	UE1940-I220000	1040397
PROFIsafe	2	✓	UE4140-22I0000	1029098

## Detailed technical specifications

Type	UE1140-22I0000	UE1840-22H0000	UE1940-I220000	UE4140-22I0000
Fieldbus/communication interface	PROFIBUS	Ethernet (TCP/IP)	CANopen	PROFIsafe
Enclosure rating	IP 20 (IEC 60529)			
Category	4 (EN 954-1)			
Safety integrity level	SIL3 (IEC 61508)			
Supply voltage	24 V DC (19.2 V DC ... 28.8 V DC)			
Maximum power consumption	4 W			
Connection type	Plug-in terminals, screwed			
Baud rate	0.0096 MBit/s ... 12 MBit/s	10 MBit/s ... 100 MBit/s	0.01 MBit/s ... 1 MBit/s	0.0096 MBit/s ... 12 MBit/s
Address range	3 ... 126	—	0 ... 99	3 ... 126
Recovery detection	0995 hex	—	—	0994 hex
CANopen profile	—	—	401	—

## Dimensional drawings

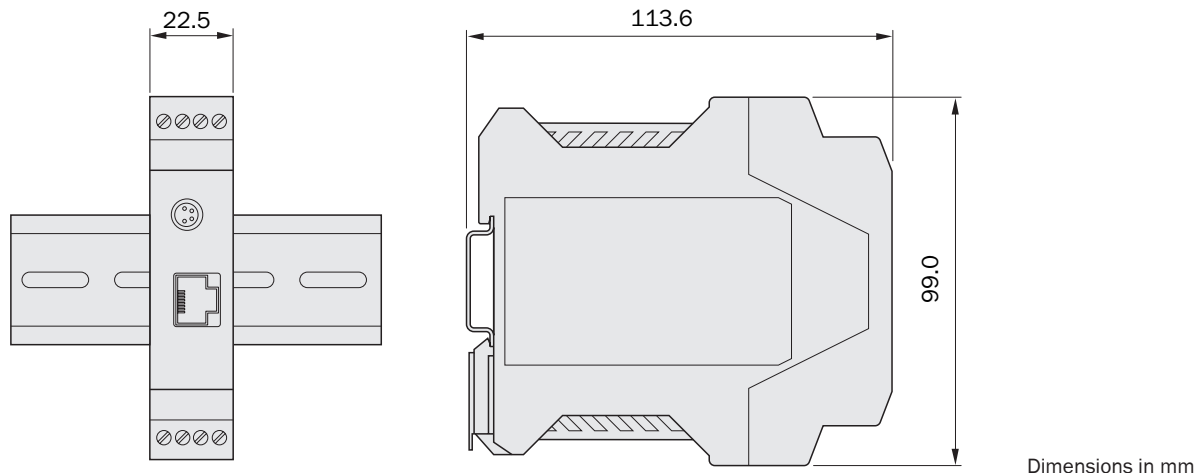
### PROFIBUS Gateway UE1140, CANopen Gateway UE1940, PROFIsafe Gateway UE4140



Dimensions in mm

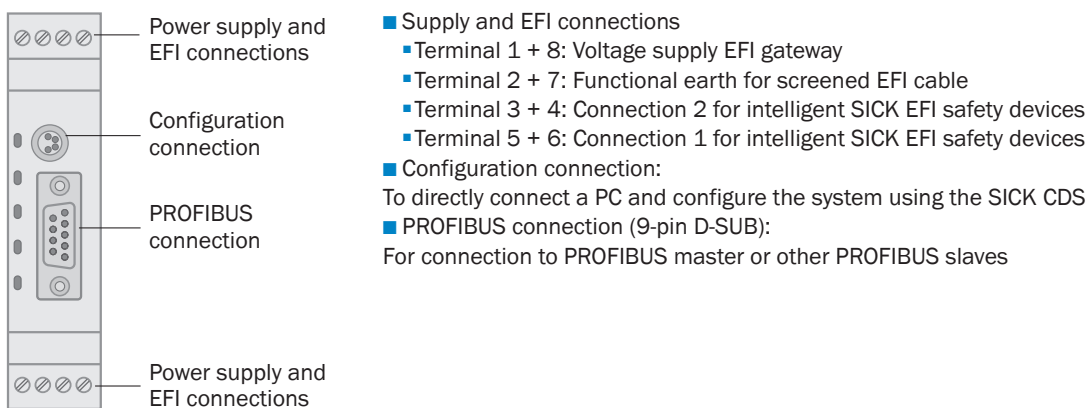


**Ethernet Gateway UE1840**

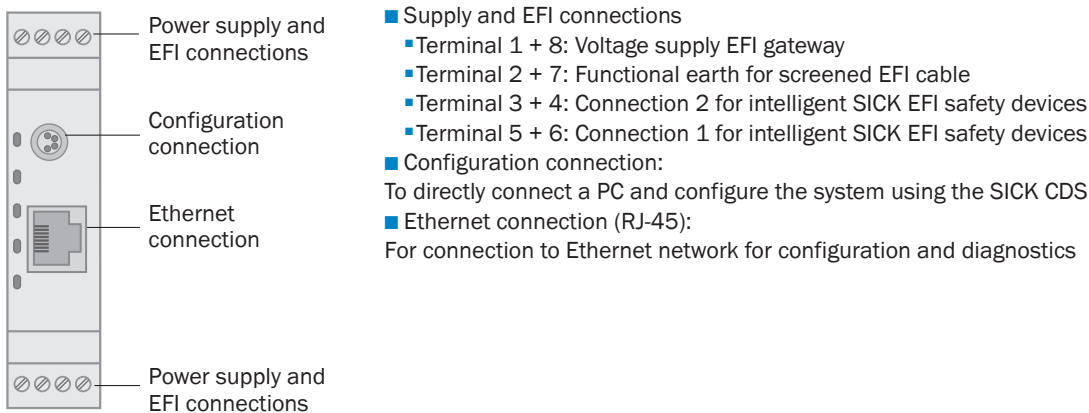


**Device overview and connections**

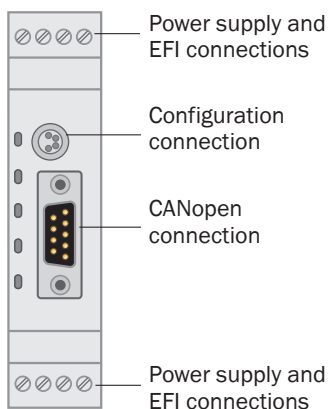
**PROFIBUS Gateway UE1140**



**Ethernet Gateway UE1840**

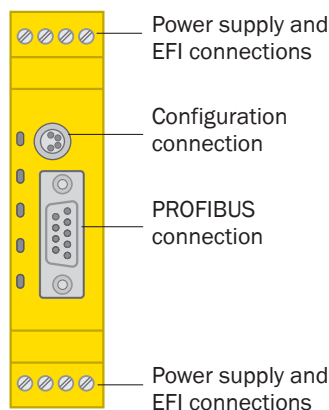


### CANopen Gateway UE1940



- Supply and EFI connections
  - Terminal 1 + 8: Voltage supply EFI gateway
  - Terminal 2 + 7: Functional earth for screened EFI cable
  - Terminal 3 + 4: Connection 2 for intelligent SICK EFI safety devices
  - Terminal 5 + 6: Connection 1 for intelligent SICK EFI safety devices
- Configuration connection:
  - To directly connect a PC and configure the system using the SICK CDS
- CANopen connection (9-pin D-SUB):
  - For connection to CANopen networks

### PROFIsafe Gateway UE4140



- Supply and EFI connections
  - Terminal 1 + 8: Voltage supply EFI gateway
  - Terminal 2 + 7: Functional earth for screened EFI cable
  - Terminal 3 + 4: Connection 2 for intelligent SICK EFI safety devices
  - Terminal 5 + 6: Connection 1 for intelligent SICK EFI safety devices
- Configuration connection:
  - To directly connect a PC and configure the system using the SICK CDS
- PROFIBUS connection (9-pin D-SUB):
  - For connection to PROFIBUS master or other PROFIBUS slaves

## Accessories

### Connection cables

Cable type (acc. to standard)	Cable type	Type	Part number
1 x 2 x 0.22 mm <sup>2</sup>	By the meter	EFI connection cable	6029448

### Configuration connection cables

Connection type	Description	Cable length	Part number
M8 x 4, SUB-D 9-pol	For connecting the configuration connection to the PC	2 m	6021195
		8 m	2027649

### Configuration software

Type	Description	Part number
CDS	CDS (Configuration & Diagnostic Software) on CD-ROM including online documentation and operating instructions in all available languages	2032314



- Simplified documentation including operating instructions
- Structure for implementing the directives and standards
- Hazard analysis and risk assessment
- Full text of directives and standards
- Network enabled



## Product description

Safexpert is a software package for safety engineering. This package guides you, step by step, towards CE certification, provides support during risk analysis and simplifies the documentation process.

Safexpert assists in achieving high levels of safety.

### Add-on modules:

- Operating instructions assistant
- Check and Acceptance assistant
- Packages of full-text standards

## Benefit

### Simplified documentation

- CE labelling and documentation in a single step
- Parallel preparation of the operating instructions
- Simplified adaptation of the documentation and the hazard analysis on changes or modifications to the machine

### Save time and costs

- Re-using solutions saves up to 70 % of time required
- Retain an overview, even with a large number of parallel projects

### More safety

- Structure for implementing the Machinery Directive
- The status check ensures that no unresolved points are forgotten
- Consistent hazard analysis
- Greater security on liability issues

“By using Safexpert we save up to 70 % on the CE effort and can therefore process a large number of projects in parallel. This situation shortens the total time taken to complete the projects and the machines are available quicker.”

Siemens VDO Automotive

## CE guidelines

CE-main theme							
Conformity overview							
	1.	2.	3.	4.	5.	6.	7.
■ The following items must be taken care of before the CE-mark can be put onto the machine.							
	Done	Name	Date				
<b>1. Product classification</b>	<input checked="" type="checkbox"/>	Haarmann Heike	2000.12.11				
<b>2. Evaluate use of further directives</b>	<input checked="" type="checkbox"/>	Haarmann Heike	2000.11.27				
<b>3. Evaluate relevant standards</b>	<input checked="" type="checkbox"/>	Görmemann Otto	1999.04.02				
<b>4. Carry out hazard analysis</b>	<input type="checkbox"/>		..				
<b>5. Compile technical construction file</b>	<input checked="" type="checkbox"/>	Haarmann Heike	2000.11.27				
<b>6. Include notified body</b>	<input checked="" type="checkbox"/>	Görmemann Otto	1999.05.14				
<b>7. Print conformity or manufacturer's declaration</b>	<input type="checkbox"/>		..				
Note:	Responsible for the complete risk assessment is Mr. Smith, director technical department						

At the end of these 7 steps you can print out the hazard analysis and the declaration of conformity directly.

Further information	Page
→ Selection aid	Q-2
→ Ordering information	Q-2
→ Services	A-2

## Hazard analysis (HA)

The screenshot shows the 'Hazard assessment following EN 1050' software interface. The window title is 'Hazard assessment following EN 1050'. The interface is divided into several sections:

- Valuation:** Includes 'Cross-references' and 'Display: Yes (hazard occurs)'. A tree view on the left shows a hierarchy of hazards: 'use limits' (expanded), 'Crushing hazard', 'Entanglement hazard', 'Drawing-in, trapping hazard', 'Operator station', 'Normal operation' (selected), 'Cleaning', 'Troubleshooting', 'Maintenance', 'Stabbing or puncture hazard', 'Harmful substances: contact or inhalation', 'Unexpected start-up', 'time limits', 'Harmful substances: contact or inhalation', 'space, time, use limits', and 'Harmful substances: contact or inhalation'.
- Form Fields:**
  - 1. Limit of the machine: use limits
  - 2. Hazard occurs: Yes (selected), No, Possibly
  - 3. Hazard location: Operator station
  - 4. Phase of the machinery life: Normal operation
  - 5. Hazard description: Trapp hands between tool and material during operation / pressing
- Measures Table:**

No.	Measure	Type	Risk
1	Light curtain to protect the insert area, sides protected by fences	CSE	IN : 6 OUT : 3
2	Warning sign at machine	PIC	IN : 3 OUT : 2
3	Only trained personal, made aware of hazards	OI	IN : 2 OUT : 2
- Bottom Section:** '7. Safety achieved' checkbox is unchecked. A 'Close' button is at the bottom right.

The program mirrors the procedure in the Machinery Directive and in the EN ISO 12100-1/-2 and EN 1050 (ISO 14121) standards. It is also possible to determine the category for safety devices in accordance with EN 954-1.

The decision trees are saved and only need to be clicked on. All information entered is automatically added to the relevant reports.

## System requirements

- Windows 95, 98, 2000, NT, XP  
(Windows is a registered trademark of Microsoft Corporation)
- 32 MB RAM
- Monitor ≥ 800 x 600 pixel

## Selection aid

Functions	Licences		
	Basic	Compact	Professional
Safety project management	✓	✓	✓
CE guidelines - 7 steps to the CE guidelines	✓	✓	✓
Hazard analysis incl. hazard list in accordance with EN 1050	✓	✓	✓
Standards and directives information system	–	✓	✓
Collection of graphics characters	–	✓	✓
Example of EU-compliant operating instructions template	–	✓	✓
The “Standard” package of standards with the original texts of 9 standards	–	–	✓

## Add-on modules

The modules can be combined with all licences:

### ■ Operating instructions assistant

The add-on module for the operating instructions with operating instructions template

### ■ Check and Acceptance assistant

The Check and Acceptance assistant provides support in the execution of tests, and the acceptance of machines and plants, with maximum uniformity and concise documentation

### ■ The “Standard” and “Standard Plus” packages of standards

Full text of approx. 50 standards

## Ordering information

### Licences

Designation	Description	Part number
Safexpert 5.0 Basic	<ul style="list-style-type: none"> <li>English</li> <li>Single-place licence</li> </ul>	2033331
	<ul style="list-style-type: none"> <li>English</li> <li>Multi-place licence</li> </ul>	2033333
Safexpert 5.0 Compact	<ul style="list-style-type: none"> <li>English</li> <li>Single-place licence</li> </ul>	2033335
	<ul style="list-style-type: none"> <li>English</li> <li>Multi-place licence</li> </ul>	2033337
Safexpert 5.0 Professional	<ul style="list-style-type: none"> <li>English</li> <li>Single-place licence</li> </ul>	2033339
	<ul style="list-style-type: none"> <li>English</li> <li>Multi-place licence</li> </ul>	2033341
Upgrade to newer versions	<ul style="list-style-type: none"> <li>From Safexpert 4.0 to Safexpert 4.2</li> <li>Single-place licence</li> </ul>	2031557
	<ul style="list-style-type: none"> <li>From Safexpert 4.2 to Safexpert 5.0</li> <li>Multi-place licence</li> </ul>	2033342

Note: The Basic version cannot be combined with Compact or Professional

### Upgrade

Safexpert Master Module for the expansion from Basic to Compact	<ul style="list-style-type: none"> <li>English</li> <li>Single-place licence</li> </ul>	2031552
	<ul style="list-style-type: none"> <li>English</li> <li>Multi-place licence</li> </ul>	2031554

Note: Expanding for Compact to Professional see next page “Standards”

## Modules and add-ons

Designation	Description	Part number
Operating instructions assistant	<ul style="list-style-type: none"> <li>▪ English</li> <li>▪ Single-place licence</li> </ul>	2031544
	<ul style="list-style-type: none"> <li>▪ English</li> <li>▪ Multi-place licence</li> </ul>	2031546
Check and Acceptance assistant	<ul style="list-style-type: none"> <li>▪ English</li> <li>▪ Single-place licence</li> </ul>	2031548
	<ul style="list-style-type: none"> <li>▪ English</li> <li>▪ Multi-place licence</li> </ul>	2031550

## Standards

### Standards for expanding Compact to Professional

Designation	Description	Part number
Safexpert Standard	<ul style="list-style-type: none"> <li>▪ English</li> <li>▪ Nine standards: EN 294, EN 349, EN 418, EN 954-1, EN 999, EN 1050, EN ISO 12100-1, -2, EN 60204-1</li> </ul>	6021373

### Further A-type and B-type standards from the “Safe Machinery” area (ICS 13.110) <sup>1)</sup>

Designation	Description	Part number
Standard Plus and Standard	<ul style="list-style-type: none"> <li>▪ Without Safexpert</li> <li>▪ English</li> </ul>	6022507
Standard Plus as supplement to Safexpert Professional	<ul style="list-style-type: none"> <li>▪ English</li> </ul>	6022511
Standard Plus Update	<ul style="list-style-type: none"> <li>▪ Update 01-2006</li> <li>▪ English</li> </ul>	2040048

<sup>1)</sup> Without preliminary or electrotechnical standards

### Safety of machinery - Basic concepts, general principles for design

Designation	Description	Part number
EN ISO 12100-1	<ul style="list-style-type: none"> <li>▪ English</li> </ul>	2031415
EN ISO 12100-2		2031417

### C-type standards, single standards and explanations

Designation	Description	Part number
EN 692	<ul style="list-style-type: none"> <li>▪ Mechanical presses – Safety</li> <li>▪ English</li> </ul>	6024687
EN 693	<ul style="list-style-type: none"> <li>▪ Hydraulic presses – Safety</li> <li>▪ English</li> </ul>	6024689
EN 775	<ul style="list-style-type: none"> <li>▪ Industrial robots – Safety</li> <li>▪ English</li> </ul>	6024691

### Update service for the database of titles of standards and directives

Designation	Description	Part number
Yearly update service	<ul style="list-style-type: none"> <li>▪ Document register system, Europe</li> <li>▪ English</li> </ul>	6021380





Term	Explanation
<b>A</b>	
Actuation duration (reset button)	Time that a reset button must be operated to reset the safety relay.
Actuator, actor	Actuator: component, e.g. servomotor, clutch, solenoid valve or similar, for intervening in the process.
ADO	Application Diagnostic Output Configurable signal output that indicates a specific status of the protective device.
Ambient temperature, max.	The highest permissible temperature of the ambient air, or another medium, at which the full functionality of an item of equipment is still guaranteed.
Ambient temperature, min.	The lowest permissible temperature of the ambient air, or another medium, at which the full functionality of an item of equipment is still guaranteed.
ANSI	American National Standards Institute Promotes and manages American industrial standards. → <a href="http://www.ansi.org">www.ansi.org</a>
AOPD	Active Opto-electronic Protective Device Text from IEC 61496-2: A device with a sensor function produced by opto-electronic sender and receiver units. A stop signal is generated when an opaque object within the defined protective field interrupts the light emitted by the device. In EN 692 Mechanical presses, EN 693 Hydraulic presses and EN 12622 Hydraulic press brakes the abbreviation AOS is used as a synonym for AOPD.
AOPDDR	Active Opto-electronic Protective Device responsive to Diffuse Reflection Term from IEC 61496-3: Device with a sensor function produced by opto-electronic sender and receiver elements, that detects the diffuse reflection of light, generated by the device, by an object in a defined two-dimensional protective field.
AS-i	Actuator-Sensor Interface Open bus system for the lowest automation level. Enables sensors, actuators and integrated systems to be easily connected to the first control level. Master-slave principle, up to 248 binary outputs per network, analogue I/Os possible, electronic address setting over the bus connection, unshielded 2-core ribbon cable, information and power supply on one cable, reverse-polarity protected connection technology. → <a href="http://www.as-interface.com">www.as-interface.com</a>
AS-Interface Safety at Work	Extension of the AS-interface system with safety-related components by using a combination of AS-interface safety monitor and safe AS-interface bus nodes.
AS-Interface Safety at Work Safety Monitor	One or more safety monitors integrated in the AS-interface system monitor safe AS-interface bus nodes and shut down the protected part of the machine such that the dangerous state of the machine is brought to an end.
A-type standards	(Basic safety standards) contain basic terminology, principles of design, and general aspects that apply to all machinery, devices and systems.
<b>B</b>	
Beam coding	Beam coding ensures that the receiver only detects and evaluates light from the sender allocated to the receiver.
Beam separation	Distance between the centres of the beams on a multi-beam photoelectric safety switch.
Blanking	An optional function on an AOPD unit that permits the presence in the protective field of an object, larger than the detection capability or physical resolution of the AOPD, without the OSSDs switching to the off state. The object is therefore blanked. With fixed position blanking, the position of the blanked object does not change during operation. With floating blanking the blanked objects can move in the protective field during operation. In both cases the ability of the AOPD unit to detect objects in the remaining protective field is unchanged.

Continued on next page

Term	Explanation
Blanking (continued)	Blanking of a specific section of the protective field for a safety light curtain. This section is then inactive. There are two types of blanking: <ul style="list-style-type: none"> <li>▪ Fixed blanking permits a specific, fixed part of the protective field to be blanked. This function is selected, e.g. if a fixed part of a unit protrudes into the protective field.</li> <li>▪ Floating blanking permits a specific number of light beams from the safety light curtain to be interrupted without the output of a stop signal. This function is selected if the permitted interruption of the protective field does not relate to a fixed position in the protective field, e.g. if a cable or hose is moved through the protective field.</li> </ul>
Blind zone	Zone in front of a sensor in which an object or a reflector is not detected. The blind zone always starts at 0 mm.
BSI	British Standards Institution Standards institute in the UK → <a href="http://www.bsi.org.uk">www.bsi.org.uk</a>
B-type standards	(Group safety standards) address a safety aspect or a type of safety-related equipment that can be used for a wide range of machinery, devices and systems. <ul style="list-style-type: none"> <li>▪ B1-type standards address special safety aspects, e.g. the electrical safety of machinery (IEC 60204), the calculation of safety distances (ISO 13855).</li> <li>▪ B2-type standards address safety equipment, e.g. two-hand controls, interlocking equipment, pressure-sensitive protective equipment, guards, electro-sensitive protective equipment (IEC 61496 parts 1, 2 and 3)</li> </ul>
Bus system, bus	Common cable for the transmission of data and control information between different components and systems using a defined protocol. A differentiation is to be made between parallel and serial buses. <ul style="list-style-type: none"> <li>▪ Parallel bus systems have a large number of wires on which data, address or control information can be transmitted as parallel bits. They are used as plug-in bus systems for the connection of plug-in modules and as peripheral buses for connecting computers to their local I/O devices.</li> <li>▪ Serial bus systems transmit data between components distributed over a wide area in a system as serial bits using a common medium (two-core or multi-core cable, coaxial cable or fibre-optic cable) and as a result drastically reduce the wiring effort compared to conventional wiring. Familiar examples are: DeviceNet, PROFIBUS, Interbus, CAN, AS-i et al.</li> </ul>
<b>C</b>	
Cascadable	Describes the feature, particularly on light curtains, that allows a basic device (host) to be connected by a cable to a following device (guest).
CDS	Configuration & Diagnostic Software Configuration and diagnostics software for SICK safety systems.
CE label	This label on products comprises the letters CE and indicates conformity with all EU directives that apply to the labelled product. The label states that the person or legal entity that applied the label, or had it applied, has ensured that the product complies with all the Union's directives for complete harmonization and has been subjected to all the stipulated conformity assessment procedures.
CEN	Comité Européen de Normalisation European Committee for Standardisation. Promotes technical harmonization in Europe in collaboration with European partners, e.g. CENELEC and globally active bodies. Is specifically responsible for the area of non-electrical standards. → <a href="http://www.cenorm.be">www.cenorm.be</a>
CENELEC	Comité Européen de Normalisation Electrotechnique European Committee for Electrotechnical Standardisation. Responsible for the harmonization of electrotechnical standards within the European Union and the entire European Economic Region, EER. → <a href="http://www.cenelec.be">www.cenelec.be</a>
Concurrence monitoring	Simultaneous operation of the start buttons is monitored and is stipulated for two-hand controls. The output contacts are only switched if the state of both start buttons changes within 0.5 s.

Term	Explanation
Contamination control	Prior to the failure of the sensor, indicates an unsatisfactory signal reserve due to maladjustment or contamination (for optical sensors).
Cross-circuit/short-circuit detection	Detection of cross-circuit/short-circuit, or a reduction in the insulation resistance between contact and contact, or short-circuit between core and core, or more than one single conductor cable.
CSA	Canadian Standards Association The Canadian Standards Association prepares standards for improving public safety and health, protecting the environment and easing trade. CSA tests and certifies the electrical properties and the safety of products. It is designated by → OSHA as a national, recognised test laboratory for testing all products that fall under the responsibility of OSHA. → <a href="http://www.csa.ca">www.csa.ca</a>
C-type standards	(Machinery safety standards) contain all safety requirements for a specific machine or a type of machine. If this standard exists, it has priority over the A-type or B-type standard. Nevertheless, a C-type standard can refer to a A-type standard or an B-type standard. If there is no C-type standard for a machine, conformity can be achieved based on the A-type or B-type standard. In all circumstances the requirements of the Machinery Directive must be met.
<b>D</b>	
Dangerous state	State that can result in injuries to people. Safety sensors prevent this hazard if the protective device is used correctly.
DeviceNet™	Simple CAN-based communication system for networking industrial automation equipment with higher-ranking control equipment. The transmission medium is two twisted, screened pairs of wires inside one cable. One pair is used for communication and the other for the supply of power to the equipment connected. → <a href="http://www.odva.org">www.odva.org</a>
<b>E</b>	
EDM	External device monitoring Term from IEC 61496-3: A means with which the item of electro-sensitive protective equipment (ESPE) monitors the status of the parts of the control outside the ESPE. → Monitoring function for downstream devices
EFI	Enhanced Function Interface Safe SICK device interface for the transmission of safety relevant signals. A bus interface to a safe fieldbus is possible using the SICK UE1000 device family.
EMC	Electromagnetic Compatibility Ability of an item of equipment to work satisfactorily in its electromagnetic environment and at the same time not to excessively interfere with this environment, in which there are other items of equipment.
Enclosure ratings	Enclosure ratings describe a machine's or sensor's level of protection against physical contact and penetration of foreign bodies and water. The enclosure rating code starts with the letters IP (ingress protection); the first digit indicates the level of protection against accidental contact and foreign bodies. The second digit describes the protection against the penetration of water. The higher the digit, the greater the protection provided. In industry, enclosure ratings from IP 65 have become established as the standard. SICK sensors predominantly have an enclosure rating of IP 67.
Entry/Exit	Innovative muting alternative for access protection: Muting sensors and muting lamps are no longer required. Additional protection measures (e.g. hinged doors) are not required as a rule.

Term	Explanation
ESD	<p>Electrostatic Discharge</p> <p>Electrostatic discharge: Equalisation of charge between differently electrostatically charged fixed, gaseous or liquid media. The currents generated during discharge can damage or destroy electronic components, or impair the function of electronic devices. These effects on devices are covered by legislation on electromagnetic compatibility. When handling electronic components, assemblies and devices, discharges from the body during e.g. transport, mounting, testing, repair and service, are of significance.</p> <p>→ <a href="http://www.darc.de/geetze/pdf/emvg.pdf">www.darc.de/geetze/pdf/emvg.pdf</a></p>
ESPE	<p>Electro-Sensitive Protective Equipment</p> <p>Text from IEC 61496-1: Electro-sensitive protective equipment (ESPE). These items of equipment can be based on the following physical principles: opto-electronics, ultrasonics, inductive sensor systems, infrared movement sensors, etc.</p> <p>ESPE comprise the following elements: a sensor function, a control/monitoring function, switching outputs (OSSD).</p> <p>They are used to protect people at machines and systems on which there is a risk of injury. They cause the machine or system to adopt a safe state before a person can be exposed to a hazardous situation.</p>
External device monitoring	→ EDM
<b>F</b>	
Fieldbus	<p>Bus system in close proximity to the process for the direct connection of intelligent sensors and actuators. On a fieldbus, smaller quantities of data are transmitted digitally between sensors and actuators and control equipment. The data must be transmitted as quickly as possible, i.e. the data should be transmitted close to real time. In addition, a fixed minimum and maximum response time must be guaranteed.</p>
FPLC	Fail-safe Programmable Logic Controller
FSD	<p>Final Switching Device</p> <p>The component in the safety-related control system on the machine that interrupts the circuit to the Machine Primary Control Element (MPCE) if the switching output (OSSD) changes to the off state.</p>
<b>G</b>	
Guards	<p>A fundamental differentiation is made between “fixed” and “movable” guards.</p> <ul style="list-style-type: none"> <li>▪ Fixed guards are used for hazardous points where it is unnecessary, or only seldom necessary, to make changes. As a rule, they are fixed in place and can only be removed with tools.</li> <li>▪ Movable guards are used if it is necessary to make changes at the hazardous point to operate the machine, to rectify malfunctions or during setup. These guards are monitored using → safety switches.</li> </ul>
<b>H</b>	
Hazardous area	Text from ISO 12100-1: A hazardous area is any area in a machine and/or around a machine in which a person can be subjected to a hazard.
<b>I</b>	
Interbus	<p>Bus system with technical characteristics specifically designed for use in industrial sensor/actuator systems and homogeneous networking from the control level to the last position switch.</p> <p>→ <a href="http://www.interbusclub.com">www.interbusclub.com</a></p>
Interface	<p>Connection point between two devices or systems. The devices/systems on each side of an interface are connected together using an interface cable via which data, addresses, and control signals are exchanged. In this context, the term interface covers the entirety of the functional, electrical and design conditions (coding, signal level, pin assignments) that characterise the connection point between the devices or systems.</p> <p>Depending on the type of data transmission, a differentiation must be made between parallel (e.g. Centronics, IEEE 488) and serial interfaces (e.g. V.24, RS-422, RS-423, RS-485), which are designed for different transmission speeds and transmission distances.</p>

Term	Explanation
IP enclosure rating	IEC 60529 describes standardised degrees of protection with which the housing of a product complies if the product is correctly installed. → enclosure rating
ISO	International Organization for Standardization Worldwide federation of national standards institutes in 148 countries. The term ISO is not an acronym for the name of the organisation, but comes from the first three letters of the Greek word "isos", which roughly means "equal" in the sense of equivalence. → <a href="http://www.iso.ch">www.iso.ch</a>
<b>L</b>	
Laser	Light Amplification by Stimulated Emission of Radiation Amplifier for electromagnetic waves in the visible light spectrum
Laser protection class	Categorisation of laser equipment into classes. In the classes 1 to 4, limits are set for photochemical hazards for the accessible radiation.
LED	Light Emitting Diode (luminescence diode).
Light curtain	An AOPD with a resolution $\leq 116$ mm. (A resolution $\leq 40$ mm is suitable for finger and hand protection).
Light spot	Light spot dimension, determining the sensor's resolution.
Locking device monitoring	Identifies whether the locking device is monitored and can therefore be incorporated in the safety circuit.
Locking force	Maximum force with which a guard can be safely locked.
<b>M</b>	
Machinery Directive	The Machinery Directive 98/37 EC is addressed at the designers of new machines. It defines the tasks for complying with the health and safety requirements for new machines so that they can be sold and freely marketed in the European Union's member states, and so that operators are guaranteed a high degree of protection.  The harmonized European standards define the possible ways and means of implementing these objectives. The Machinery Directive is integrated in national law and therefore binding. The standards are, however, not binding. On the other hand, it is assumed that a machine built in accordance with the harmonized standards will meet the essential requirements in the directive.  As required by European law, the directive and its amendments must be implemented in every member country. The directive came into force on 1 January 1995 for machines and on 1 January 1997 for safety components.
Manipulation	Manipulation is the conscious deactivation or bypassing of protective devices and their components. Safety switches and equipment must be designed so that functions used to provide protection cannot be changed or bypassed manually or using simple means. Simple means are, e.g. screwdriver, ball-point pen, nail, piece of wire, adhesive tape, etc. Means that are not simple are those that require more than one work step with tools. The removal of parts, turning away of safety switches from their protective position, the use of a second actuator or bridging the contacts is not bypassing with simple means. The intentional and conscious deactivation of protective devices is considered gross negligence in case of accidents, and will thus result in serious consequences. During design, consideration should be given to the feasibility of straightforward, correct operation of machines and system despite the protective devices. If this aspect is not considered, the safety measures may be bypassed.
Master	Central bus user that controls bus access. All other bus users work as slaves.
Master/slave principle	The master element defines the instructions, slave elements follow the instructions from the master. For example, with decentralised bus control an automation device, as the master element, assigns the access rights for the other components (slave elements).

Term	Explanation
<b>Mechanical installation conditions for proximity sensors</b>	<p>A proximity sensor can be installed flush if any attenuating material can be placed around the active face without affecting the key device features.</p> <p>A proximity sensor cannot be installed flush if a specific clear zone is required around its active face.</p> <p>Quasi-flush applies to sensors that have the appearance of a flush sensor (i.e. not the typical plastic cap on the sensor with clear zone), but still have clear zone switching distances. These sensors can mostly not be installed 100 % flush or even recessed, but need a small clear zone (protrusion).</p>
<b>Mechanical unlocking mechanism</b>	Is used to unlock a safety switch from the outside.
<b>Minimum shutdown time</b>	Minimum time necessary to detect an infringement of the protective field on the input circuit on the relay. At values below this minimum figure, an incorrect situation will not be detected, or the relay will switch to the error state.
<b>Minimum switch-off time</b>	The time for an internal check on the relay contacts.
<b>Minimum switch-on time</b>	Minimum time that a signal must be present on the input circuit before a reset can be performed (change from LOW to HIGH).
<b>Monitoring function for downstream devices</b>	<p>The external monitoring device (→ EDM) must provide the necessary means for the connection to the signals from the external devices (e.g. MPCE(s), FSD(s), muting devices) so that the EDM can unambiguously monitor the status of such devices.</p> <p>The safety device must change to the interlocked state if an incorrect state is detected in one of the devices to be monitored by the EDM.</p>
<b>Mounting of safety switches</b>	<p>The mounting and mounting method for safety switches are crucial for the safe monitoring of guards, their function and operational safety. Guards and their components, e.g. safety switches, must be seen in direct relation to the feasibility of manipulation. Therefore precautions should be taken in the design to exclude this possibility as far as possible.</p> <p>Along with due consideration of general regulations, such as mounting all components related to safety in guards, a further reduction in the risk can be achieved by preventive design measures:</p> <ul style="list-style-type: none"> <li>▪ Mounting safety switches behind the guards or inside the system.</li> <li>▪ Locking the actuator insertion openings on the safety switches (for type 2) when the guard is opened (lockout bar).</li> <li>▪ Moving the actuator in a so-called C-rail. This prevents the use of a "second" actuator.</li> </ul>
<b>MPCE</b>	<p>Machine Primary Control Element</p> <p>Text from IEC 61496-1: Element in the main circuit: The element that interrupts the main circuit to stop the machine.</p>
<b>Muting</b>	Text from IEC 61496-1: Muting function: Time limited bridging of the protective function with additional sensors to differentiate between people and objects.
<b>Muting of an AOPD</b>	<p>Bridging a protective device for a time can be relevant for safety. For example, the standard EN 415-4 (1993) for packaging machines addresses the problem of palletisers and de-palletisers (machines in which all work on the pallet load is performed automatically and only by the machine). At the entry and exit to the chamber (where under normal operating conditions there is a hazard), it is necessary to bridge the AOPD when the pallet moves past. On the other hand it is also necessary to detect the entry of people. The muting system must be able to differentiate between the pallet and the operator.</p> <p>The muting conditions that are defined in the standard EN 415-4 state that:</p> <ul style="list-style-type: none"> <li>▪ Muting is only allowed to be activated during the period of time in the working cycle when the loaded pallet blocks access to the hazardous area.</li> <li>▪ Muting must be automatic.</li> <li>▪ Muting must not be dependent on a single electrical signal.</li> <li>▪ Muting must not be entirely dependent on software signals.</li> <li>▪ Muting signals occurring during an invalid combination must not permit any muting state, and it must be ensured that the protective function is retained.</li> <li>▪ The muting state is lifted immediately after the pallet has passed through and the protective device is reactivated.</li> </ul>

Term	Explanation
Muting-dependent manual bridging	An optional function on an ESPE, also called override. This function permits activation of the muting function, and thus the bridging of the ESPE, by the manual operation of a control switch for the purpose of, e.g. clearing blockages in the muting area on a roller conveyor. The override function must only be able to be activated when at least one muting sensor is active. The manually initiated override is deactivated automatically after either a correct muting sequence or a pre-set time. Source: IEC 61496-1: 2001 FDIS; A.7.1.5
<b>N</b>	
NC	Normally Closed N/C contact
NO	Normally Open N/O contact
No load current	Current that is drawn by a sensor with 3 or 4 connections without a load connected.
Number of beams	Number of beams of a multi-beam photoelectric safety switch.
Number of protective fields	Number of the switchable protective fields of an AOPDDR
<b>O</b>	
Operating range	The scanning range is the maximum possible distance (specified detection distance) between sender and receiver (through-beam photoelectric switch) or between sensor and reflector (photoelectric reflex switch) at which stable function can be guaranteed.
Operating voltage, max.	The maximum operating voltage is the upper limit for the voltage used to supply the equipment with power for operation. The specified maximum operating voltage must not be exceeded, especially not by the maximum peaks on any residual ripple.
Operating voltage, min.	The minimum operating voltage is the lower limit for the voltage used to supply the equipment with power for operation so that the equipment continues to function. The voltage must not drop below the specified minimum operating voltage, especially not by the minimum peaks on any residual ripple.
OSHA	Occupational Safety & Health Administration Authority for health and work safety. Responsible for work safety regulations in the USA. OSHA has the task, by means of the preparation and implementation of directives, to safeguard the health and safety of the American worker, to provide means for training and further training, and to promote the continuous improvement of health and work safety. → <a href="http://www.osha.gov">www.osha.gov</a>
OSSD	Output Signal Switching Device The part of the item of electro-sensitive protective equipment (ESPE) that is connected to the machine control, and that changes to the off state when the sensor section is triggered during correct operation.
Output current, max.	Maximum permissible load current on the output.
Output current, min.	Minimum load current necessary on the output.
Output signal switching device	→ OSSD
Output switching element OSSD	→ OSSD
Outputs, safe	→ OSSD
Override	→ Muting-dependent manual bridging
<b>P</b>	
PDF	Proximity Device with defined behaviour under Fault conditions
PDF category	Describes the behaviour of a proximity device under fault conditions.

Term	Explanation
PELV	<p>Protective Extra Low Voltage</p> <p>Protective extra low voltage with safe isolation (see DIN VDE 0100-410/01.97, section 410). The protective measure PELV differs from → SELV (Safety Extra Low Voltage) only in the type of connection to earth. A PELV circuit is present if, for example, the secondary side is earthed for operational reasons. The highest permissible nominal voltage for the protective measures SELV and PELV is max. 50 V AC and 120 V DC.</p>
Positively driven opening on safety switches	<p>Positively driven opening on safety switches signifies that there must be positive, shape-based transmission of force between actuator and switching element. The actuating mechanism must be so designed that even on mechanical failure, e.g. on the fracture of a spring or contact welding, the contacts open reliably and remain open in the actuated state.</p> <p>→ Further stipulations are defined in the standards IEC 947-5-1, EN 60947, VDE 0660 part 200.</p>
Power-up delay	<p>Time that the safety module requires to become ready for operation after application of the supply voltage.</p>
PROFIBUS PROFIBUS-DP	<p>In complex manufacturing processes, the total costs for sensors and actuators depend not only on the purchase price, but crucially also on the installation costs. Using decentral automation systems with bus technology, these costs can be significantly reduced. Universal fieldbus terminals and couplers enable SICK sensors to be rapidly adapted to all common system environments.</p> <p>It is possible to integrate, among others, photoelectric proximity switches, photoelectric reflex switches and through-beam photoelectric switches, color sensors, contrast and luminescence scanners, distance measuring systems, as well as bar-code reading systems.</p> <p>For safety engineering, SafetyBUS p® provides a bus solution for the bidirectional communication between safety systems – such as the C4000 light curtain or the S3000 laser scanner – and the controls on machines. While bus systems like PROFIBUS-DP, Interbus, DeviceNet and CANopen cover the higher field level in automation structures, AS-i, the Actuator-Sensor interface, is suitable for use at the lowest field level in decentral control concepts. Instead of complex parallel wiring, numerous different sensors and actuators can be simply, rapidly and cost-effectively connected together. It is possible to integrate the AS-i bus in a higher level control, e.g. a PLC or a computer, without problems. Up to 31 slaves can be connected to a two-core cable, and up to four binary users can be connected to each slave. It is therefore possible to supply up to 124 sensors with one bus. All sensors with AS-i support, for example SICK's photoelectric switches and photoelectric proximity switches, contain an application-specific integrated circuit, the AS-i chip. This component is also fitted in an external AS-i module with a dedicated address and support for four conventional sensors and actuators so that standard components can also be incorporated.</p>
PROFIsafe	<p>Profile for safety-related data transmission via the PROFIBUS network</p>
Protective field	<p>The area in which the test object specified by the manufacturer is detected by the item of electro-sensitive protective equipment (ESPE).</p> <ul style="list-style-type: none"> <li>▪ Safety light grid/light curtain: The protective field lies between the sender unit and receiver unit. The field is defined by the protective field height and the protective field width.</li> <li>▪ Safety laser scanner: the protective field secures the hazardous area on a machine or vehicle. The field is defined by the scanning range, scanning angle, response time and resolution of the device used (see technical specifications). The size and shape of the protective field can be configured with the aid of the → CDS.</li> </ul>
Protective field height for safety light curtains	<p>Height of the active protective field along the longitudinal axis of the light curtain.</p>
Protective field range	<p>On devices with separate sender unit and receiver unit, this is the distance between the sender and receiver; on reflex devices, the distance between the sensor and reflector.</p>
Protective field width for safety light curtains	<p>Is given by the length of the light path between sender and receiver. To guarantee the safe protective function, the maximum permissible protective field width must not be exceeded.</p>



Term	Explanation
PSDI control	<p>An optional function on an item of ESPE with which the ESPE triggers the dangerous machine movement as well as its protective function. The following types of actuation are common:</p> <ul style="list-style-type: none"> <li>▪ In the single break PSDI mode the machine movement is started by interrupting and clearing the protective device's protective field.</li> <li>▪ In the double break PSDI mode the machine movement is started by interrupting and clearing the protective device's protective field twice in succession.</li> </ul>
PSDI mode	<p>This term refers to manual intervention at hazardous points during the machine working cycle. Hereby the protective measures must achieve a high level of safety for monitoring the protective device and for signal processing. If these conditions are met, the start command can be given in this operating mode if the protective device returns correctly to the protective setting.</p>
<b>R</b>	
Radiation source	Source for beam generation using semiconductor LEDs or conventional gas discharge lamps.
Reactivation delay	Delay until a sensor's protective function is effective (response time of all relays).
Reduced resolution	An optional function on ESPE (particularly light curtains) with which several objects up to a certain size, that occasionally cause interruptions, can be tolerated in the protective field without OSSDs switching to the off state, provided a certain number of neighbouring light beams remain clear.
Reflector distance, min.	Minimal permissible distance between photoelectric reflex switch and reflector
RES	Reset inhibit → Restart interlock
Reset time	<p>Time between operating the reset (in the "safe" state) and the "enabled" state. The time starts:</p> <ul style="list-style-type: none"> <li>▪ with manual reset on release of the reset button (except UE23-2 MF safety relay).</li> <li>▪ with automatic reset on closing of the input circuits (e.g. closing the protected door).</li> </ul>
Response delay time	Time by which the response of the safety contacts is delayed. The times can be adjusted on switching devices with response delay.
Response time	The maximum time between the occurrence of the event that caused the triggering of the sensor and the achievement of the off state at the output switching elements (OSSDs).
Response time ESPE	The maximum time between the occurrence of the event that results in the triggering of the sensor and the achievement of the off state at the switching outputs (OSSDs)
Restart interlock	<p>Text from IEC 61496-1: A device for preventing an automatic machine restart after triggering of the sensor function during a dangerous part of the machine cycle, or after a change in the operating mode or the actuation method for the machine, or after a change to the start control equipment on the machine.</p> <ul style="list-style-type: none"> <li>▪ Operating modes include: inching, single stroke, automatic.</li> <li>▪ Start control equipment includes: Foot switch, two-hand control, single break PSDI triggering or double break PSDI triggering by the ESPE's sensor function.</li> <li>▪ Restart interlock (RES): The machine stops and the restart interlock (RES) is engaged on interruption of at least one light beam. This interlock ensures that the machine can only be restarted if the light path is clear and the reset button has been pressed and released again.</li> </ul>

Term	Explanation
Risk assessment	<p>Compliance with category of the safety-related parts of the machine control system. While the essential requirements of the directive are aimed at a high level of safety, the resources must nevertheless be proportional to the risk involved.</p> <p>The protection of an operator who manually inserts and removes parts in a metal press must not be considered in the same way as the protection of an operator who works on a machine where the worst-case risk is the trapping of a finger.</p> <p>Furthermore, one and the same machine can have different access points with varying levels of risk. For this reason, different measures can be adopted for different parts of the safety-related control for a machine.</p> <p>Against this background, the standard ISO 13849-1 aids designers in the definition of the categories for the various parts of the safety-related control based on the following parameters:</p> <ul style="list-style-type: none"> <li>▪ The possible severity of injury</li> <li>▪ The frequency and/or duration of exposure to the hazard</li> <li>▪ The possibility of preventing the hazard</li> </ul> <p>The behaviour of the safety-related control in case of a fault is defined for each category. If identical technology is assumed (pneumatic, electronic, mechanical, hydraulic, etc.), these categories represent a sequential scale. For example, category 4 is higher than category 3. On the other hand, the categories are not intended to be used to compare different technologies.</p> <p>The categories are also not intended to be used in any given order or hierarchical arrangement in relation to safety requirements.</p> <p>Nevertheless, the AOPDs and their interface must comply with the requirement of the category of the safety-related parts of the control under consideration, so that the safety function is ensured (e.g. machine stop and safe stop).</p>
Risk estimation	<p>It is necessary to estimate the risk to determine the measures required to achieve the protection objectives and the resulting solutions.</p> <p>The necessary safety solutions are defined taking into account the risk parameters and the severity of the hazard.</p>
<b>S</b>	
Safe outputs	→ OSSD
Safety operating devices	<p>These switches are manually operated control switches designed for work in the hazardous areas of machines and systems. In the “manual operating mode” the protective action of movable guards is lifted under certain conditions.</p> <p>Authorised personnel enter hazardous areas with the safety operating device to carry out programming, setup, observation, repair, test or service work.</p>
Safety switches	<p>Safety switches are items of safety equipment for monitoring movable guards. On opening, they must safely open the circuit and keep it open until the guard is closed again.</p> <p>Safety switches with solenoid locks are locking devices that, in conjunction with the control, forcibly keep movable guards in the protective position until the dangerous states are brought to an end.</p>
Safety switches category 1	Safety switches on which switching element and actuating element form a single unit.
Safety switches category 2	Safety switches on which switching element and actuating element do not form a single design unit, though on operation they are moved together or separated by the function.
SafetyBUS p®	<p>Fieldbus system manufactured by Pilz for the serial transmission of safety-related information. Safety systems and safety products such as photoelectric switches, light curtains, safety switches or emergency stop circuits can be connected decentrally and safely with this bus. Interfacing is performed using decentral I/Os. Devices with an integrated bus node can be connected directly to the bus. Areas of use include machine tool manufacture and systems engineering, process technology and the automotive industry, in particular.</p> <p>→ <a href="http://www.safetybus.de">www.safetybus.de</a></p>

Term	Explanation
SCC	<p>Standard Council of Canada</p> <p>The Canadian Standard Council is a federal authority with the task of effectively and efficiently promoting standardisation. The organisation reports to Parliament via the Minister of Trade and Commerce and monitors national Canadian standards.</p> <p>→ <a href="http://www.scc.ca">www.scc.ca</a></p>
SDL	<p>Safety Data Link</p> <p>SICK safety interface (connection for OSSDs and EFI)</p>
Selection of several protective fields	<p>An AOPDDR can have several switchable protective fields.</p>
Self-monitoring	<p>Text from ISO 12100-1: Self-monitoring ensures that safety functions implemented by protective measures are also executed if the functionality of a component or element is reduced, or the process conditions have changed such that there are hazards. Self-monitoring detects a fault either immediately or performs periodic checks so that the fault is detected before the safety function is called up again. In both cases, the protective measure can be triggered immediately or delayed until a specific event occurs. (e.g. the start of a working cycle on the machine).</p>
SELV	<p>Safety Extra Low Voltage</p> <p>Protection by safety extra-low voltage (see DIN VDE 0100-410/01.97).</p> <p>The protective measure SELV, differs from → PELV (Protective Extra Low Voltage) only in the type of connection to earth. SELV circuits must not be earthed on the secondary side or connected to other voltage systems. The maximum permissible nominal voltage for the protective measures SELV and PELV is 50 V AC and 120 V DC. To ensure that this is the case, it must be demonstrated during the voltage measurement that the maximum values are not exceeded, and that there is adequate insulation resistance between all conductors and earth.</p>
Sensor detection capability (resolution)	<p>The limit for the sensor parameter defined by the manufacturer that causes the item of electro-sensitive protective equipment (ESPE) to trigger.</p>
SIL	<p>Safety Integrity Level</p> <p>Requirement class in relation to the functional safety of control systems as per IEC 61508. There are four levels specifying the requirements for the safety integrity of the safety functions allocated to an electromechanical, electronic or programmable electronic safety system (E/E/PE).</p> <ul style="list-style-type: none"> <li>▪ Lowest level SIL1: Not more than one hazardous failure of the safety function in 10 years.</li> <li>▪ Highest level SIL4: Not more than one hazardous failure of the safety function in 10,000 years.</li> </ul>
Single break/double break PSDI mode	<p>This operating mode is advantageous if parts must be manually inserted or removed periodically. In this mode the machine cycle is automatically re-initiated after the protective field becomes clear again after one or two interruptions.</p> <p>The reset device is to be operated under the following conditions:</p> <ul style="list-style-type: none"> <li>▪ On machine start</li> <li>▪ On restart if the AOPD is interrupted during a dangerous movement</li> <li>▪ To initiate a restart after a period of more than 30 s (cf. IEC 61496)</li> </ul> <p>→ Further information e.g. EN 692</p> <p>Nevertheless, it is necessary to check that the operator cannot be placed at risk during the working process. This situation limits use to small machines on which the hazardous area cannot be entered and there is point-of-operation protection. All other sides of the machine must also be protected using suitable measures.</p> <p>If this operating mode is used, the resolution of the AOPD must be less than or equal to 30 mm (cf. ISO 13855, EN 692, EN 693).</p> <p>In general the following errors must be excluded when mounting protective devices: Reaching over, reaching under, reaching around, standing behind.</p>
Slave	<p>Participant in a network that can participate in the exchange of data only after contact from the master.</p>
Standard housing	<p>Defines whether the housing for a position switch complies with DIN 43 693.</p>

Term	Explanation
Standards	During the design of the safety equipment and the related components, specific regulations, standards, directives and recommendations must be taken into account.
Switch-off delay	Time by which the shutdown of the output contacts is delayed. This time is either fixed or adjustable depending on the device type.
Switching element function	Design of the switching element as normally closed contact, normally open contact, positive action normally closed contact or changeover contact.
Switching elements	<p>The switching elements on safety switches have actuating elements driven by a shaped fitting. The switching element related to the safety function must be positively driven or, in the case of spring-action switching elements, must guarantee safe opening of the normally closed contacts when the positive separation point is reached. A differentiation is made as follows depending on the switching behaviour:</p> <ul style="list-style-type: none"> <li>▪ Slow-action switching element that opens or closes depending on the speed of its actuation.</li> <li>▪ Snap-action switching element that opens or closes independent of the speed of its actuation.</li> </ul>
Switching frequency	Number of sensor switching operations in a defined time interval.
Switching principle of safety switches	<ul style="list-style-type: none"> <li>▪ Slow-action switch: has a switching element that opens and closes depending on the speed of its actuation.</li> <li>▪ Snap-action switch: has a switching element that opens and closes independent of the speed of its actuation.</li> </ul>
Switching voltage OSSD HIGH, max.	Maximum switching voltage of the OSSD in the status HIGH.
Switching voltage OSSD LOW, min.	Minimum switching voltage of the OSSD in the status LOW.
Synchronisation	To avoid mutual interference between neighbouring sensors a synchronisation input is used to start a measuring cycle.
Synchronisation time monitoring	<p>The switching of the input circuits within a defined time is monitored (only on automatic reset).</p> <p>Enabling takes place only if input circuit 2 closes at most 0.5 s <i>after</i> input circuit 1. If input circuit 2 closes <i>before</i> input circuit 1, the control is not active.</p>
<b>T</b>	
Time function	<p>The time function can be useful for improving provision of the acquired signal to other connected devices:</p> <ul style="list-style-type: none"> <li>▪ Activation delay: Rapid bursts are suppressed.</li> <li>▪ Release delay: Lengthens the signal by the set period of time.</li> <li>▪ One shot delay: The signal provided has a defined signal length irrespective of the length of the input signal.</li> </ul>
Transmission medium	Medium via which the interface transmits the data.
TÜV	<p>Technischer Überwachungsverein</p> <p>→ <a href="http://www.tuevs.de">www.tuevs.de</a></p>
Type	<p>The machine or system manufacturer must perform a risk analysis as per the Machinery Directive.</p> <p>The standard ISO 13849-1 will help the manufacturer to define the control category for the safety-related parts of the control. Each of the safety sensors shown meets the particular requirements of the defined control category in accordance with ISO 13849-1.</p>
Type of electrical connection	Mechanical design of the electrical connection on the item of equipment. Designed as plug-in connection, soldered connection, crimp connection, screw connection, spring-action terminal, wire-wrap connection, cable entry via gland or plug.

Term	Explanation
<b>V</b>	
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik e. V. → <a href="http://www.vde.de">www.vde.de</a>
VDMA	Verband Deutscher Maschinen- und Anlagenbau e. V. → <a href="http://www.vdma.org">www.vdma.org</a>
Voltage type	Design of the sensor as DC, AC or AC/DC.
<b>W</b>	
Warning field output on safety laser scanners	The part of the electro-sensitive protective equipment (ESPE) that is connected to the machine control and that changes to the off state when the warning field for the sensor section is triggered during correct operation.
Warning field with safety laser scanners	The warning field can be placed in front of the protective field and thus in front of the actual hazardous area. Objects in the warning field trigger, e.g. a warning signal. The size and shape of the warning field can be configured with the aid of the → CDS.

# Appendix – Sensor systems and safe control solutions from SICK

The following table gives an overview of the possible combinations between sensors and safe control solutions.

- Combination:
- recommended
  - ◐ possible
  - on request
  - not possible

		Connection via																													
		S3000 Professional	S3000 Advanced	S3000 Standard	S3000 Professional CMS	S3000 Remote	S300 Professional	S300 Advanced	S300 Standard	S200	V4000 Press Brake	C4000 Advanced	M4000 Advanced Curtain	C4000 Standard	C4000 Micro	C4000 Basic	C4000 Basic Plus	C4000 Entry/Exit	C4000 Palletizer	C4000 Eco	C2000 Standard	C2000 RES/EDM	C2000 Cascadable	LGT	M4000 Advanced	M4000 Advanced A/P	M4000 Advanced with UE403	M4000 Standard	M4000 Standard A/P	M4000 Area	
<b>Safety relays</b>																															
UE10-30S	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●
UE23-2MF	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UE42-2HD	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UE43-2MF	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UE43-3MF	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UE43-6MF	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UE44-3SL	Signal inputs	○	○	○	○	-	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
UE45-3S1	Signal inputs	○	○	○	○	-	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
UE48-20S	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●
UE48-30S	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●
UE49-2MM	Signal inputs	●	●	●	●	-	●	●	●	●	○	●	○	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○
UE49-3MM	Signal inputs	●	●	●	●	-	●	●	●	●	○	●	○	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○
LE20	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LE20 Muting	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UE10-4XT	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UE11-4DX	Signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Safety controllers</b>																															
UE410 Flexi MU	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●
UE410 Flexi XU	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●
UE410 Flexi 8DI	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●
UE440	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●
	SDL/EFI	●	●	●	●	●	●	●	●	-	-	●	●	-	-	-	●	●	-	-	-	-	-	-	-	●	●	-	-	-	●
UE470	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●
	SDL/EFI	●	●	●	●	●	●	●	●	-	-	●	●	-	-	-	●	●	-	-	-	-	-	-	-	●	●	-	-	-	●
UE4427	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●
UE4457	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●
	SDL/EFI	●	●	●	●	●	●	●	●	-	-	●	●	-	-	-	●	●	-	-	-	-	-	-	-	●	●	-	-	-	●
UE4470	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●
<b>Safety network solutions</b>																															
<b>PROFIsafe</b>																															
UE4120	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
UE4150	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
	SDL/EFI	●	●	●	●	●	●	●	●	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	-	●	●	○	○	○	○
UE4155	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
	SDL/EFI	●	●	●	●	●	●	●	●	○	○	●	●	○	○	○	○	○	○	○	○	○	○	-	●	●	○	○	○	○	○
<b>AS-i Safety at Work</b>																															
UE3212	Field signal inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UE4215	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
UE4231, UE4232, UE4233, UE4234	Only outputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>DeviceNet Safety</b>																															
UE4420, UE4427	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
UE4421	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
UE4450	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
	SDL/EFI	●	●	●	●	●	●	●	●	○	○	●	●	○	○	○	○	○	○	○	○	○	○	-	●	●	○	○	○	○	○
UE4455, UE4457	Field signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
	SDL/EFI	●	●	●	●	●	●	●	●	○	○	●	●	○	○	○	○	○	○	○	○	○	○	-	●	●	○	○	○	○	○
UE4470	Signal inputs	●	●	●	●	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●	●	●
<b>Gateways</b>																															
UE1140 PROFIBUS	EFI	●	●	●	●	●	●	●	●	-	-	●	●	-	-	-	●	●	-	-	-	-	-	-	-	●	●	●	-	-	●
UE1840 Ethernet (TCP/IP)	EFI	●	●	●	●	●	●	●	●	-	-	●	●	-	-	-	●	●	-	-	-	-	-	-	-	●	●	●	-	-	●
UE1940 CANopen	EFI	●	●	●	●	●	●	●	●	-	-	●	●	-	-	-	●	●	-	-	-	-	-	-	-	●	●	●	-	-	●
UE4140 PROFIsafe	EFI	●	●	●	●	●	●	●	●	-	-	●	●	-	-	-	●	●	-	-	-	-	-	-	-	●	●	●	-	-	●
<b>Other safety relays</b>																															
UE402	EFI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UE403	EFI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	





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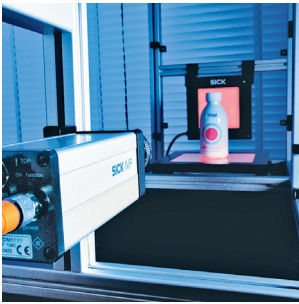
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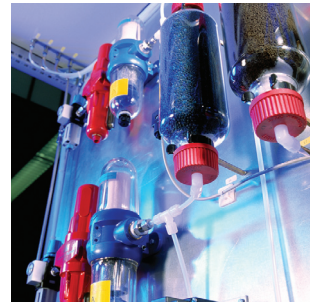
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