# Vision Sensors, Smart Cameras, 3D Cameras, Vision Accessories

### Vision Sensors

■ The Vision Sensors of SICK are easy to use, rugged and reliable. They are designed to do application-specific tasks where a standard sensor would not work. SICK provides Vision Sensors from part presence and identification to colour sorting and recognition. The SICK Vision Sensors are easy to set up and manage. With a teach-in and initial configuration, the devices are ready for immediate operation in the production line.

### Smart Cameras

■ The IVC-2D and IVC-3D are robust Smart Cameras working with 2D images and 3D images or 3D profiles, respectively. The cameras operate stand-alone or as part of the factory network. The application development is done in the flexible and straight-forward PC application development tool IVC Studio, which is common for both products. The inspection results can be sent directly to the PLC or handling equipment and also monitored via Ethernet.

### 3D Cameras

■ Ranger and Ruler cameras measure 3D features at unmatched speed, producing a series of profiles of the measured object. Providing a 3rd dimension adds height and shape measurement data, which can be critical when correctly classifying an object. The Ranger and Ruler cameras are key components in many market-leading in-line inspection machines for 3D vision. The generated 3D data is distributed over standard interfaces, such as CameraLink and Gigabit Ethernet, to a PC for analysis.

### Vision Accessories

■ We provide a wide range of accessories to enable us to provide complete solutions. Illumination, photoelectric sensors for triggering, I/O modules etc. are easily connected by standard industrial cabling from SICK.
■ Robust IP 65 or IP 67 rated lighting modules
■ Industrial powered by standard 24 V DC
■ High intensity for fast inspection speed
■ Easy trigger connection to the vision systems

# Contents

Machine Vision →

# What is Machine Vision?

Machine Vision replaces or complements manual inspection and measurement tasks using the latest digital imaging technology.

What our cameras will do for you:

## Measure

- Length, Width, Height
- Area, Volume, Size
- Number of objects

## Locate

- Presence
- Position [x,y], [x,y,z]

## Inspect

- Correct assembly
- Shape

## Identify

- Symbols
- Patterns

**Machine Vision solutions by SICK IVP save money by:**

- Improving product quality
- Improving production yield
- Reducing cost of manual inspection
- Using one camera instead of complex sensor arrangements
- Increasing customer satisfaction

▶ Our machine vision cameras identify defective products before they reach your customer

### Top Performance

The unsurpassed speed and performance is a result of SICK IVP's patented CMOS sensor technology. The powerful image processor integrated on the sensor chip allows for extremely fast image processing.
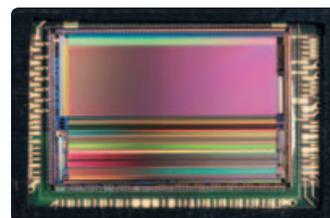


### Industrial Robustness

Our Vision Cameras are built for industrial environment. Every detail, from camera housings to cable connectors, are carefully designed with SICK's long time experience of industrial sensors for factory automation.

### Getting the Third Dimension

Our 3D products are based on laser line triangulation, a very robust way of gathering height information.
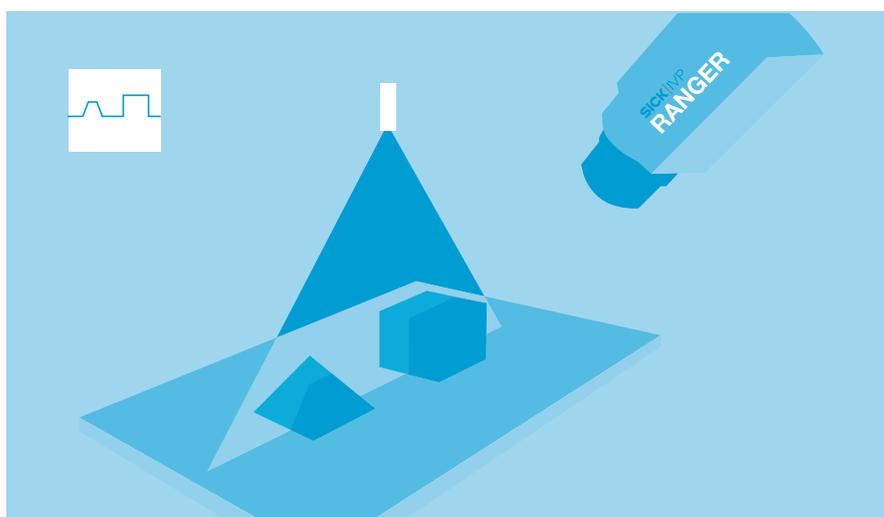


### 2D & 3D Cameras

Some applications are best solved by 3D and some by 2D. Of course we offer both types to give you the optimal solution!

Grey scale image from a 2D camera

**What is the difference?**

3D image where height is represented as intensity

Which connector pin is too low?

Which bracket is on top?

Which of them has a bad print?

# Intelligent Camera Sensor ICS: Teach-in, Detecting, Switching
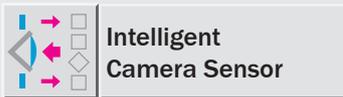
**T**he ICS intelligent camera sensor integrates many functions and components into a single device and thus saves expenditure and space. Its compact housing contains all the components of a complete image processing system such as optics, object lighting, evaluation hardware and software.

Four pre-programmed evaluation tools make the ICS especially flexible. With pixel sum comparison, minimum pixel sum, area comparison and shape comparison, it has the basic features for virtually any application. Its Advanced Se-ries even detects rotated contours and thus lends itself to difficult tasks. The cycle times are short throughout, making it suitable for machines with high cycle rates, assisted by simultaneous detection of up to four objects and the corresponding switching of four outputs.

Despite the variety of functions, parametrisation and set-up remains simple and secure. Teach-in is performed by the separate VSC operating device. During commissioning this displays all the parameters and also a grey scale image which makes alignment and adjustment very comfortable and secure. Parameter sets are easily read out via a serial interface and can be transferred to another or the same ICS – a convincing argument for flexibility during product format changes.

The internal memory of the ICS stores not only one, but twelve fully parameterised tasks and allows them to be called by a simple PLC signal. Ideal for systems with regular and fast product changes without extensive PC links.

▶ The ICS monitors whether the serial number has been fully printed on the packaging.

◀ Specialist for position and shape: the ICS checks the orientation of bottle tops in an automatic bottling plant.

▶ Is a gear tooth missing or was the surface incorrectly treated? The ICS already meets the requirements of different testing processes.

## Fields of view
20 x 20, 40 x 40 and
80 x 80 mm$^2$
**Intelligent Camera Sensor**

- Suitable for very fast operations
- Parameter transmission from/to PC or PLC
- Teach data selectable via PLC
- Flexible use through:
  - different evaluation methods
  - robust, durable industrial design
- Secure settings due to LC image display

CE

### Dimensional drawing

ICS100/110
142.8
19.6
13.2
39.8
25
M5

ICS101/111
145.7
104.4
6
25
M5

ICSL02
200
65.6
40.5
18
12
110
10
185

47.5
59.3

47.5

46
135
M6
M12x1
M12x1
50
61.8

47.5
59.3

VSC100 | 8
9
10
F1 F2 F3 F4
OK EXIT
ON
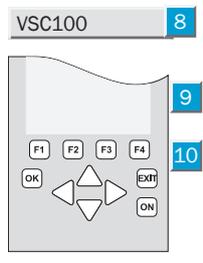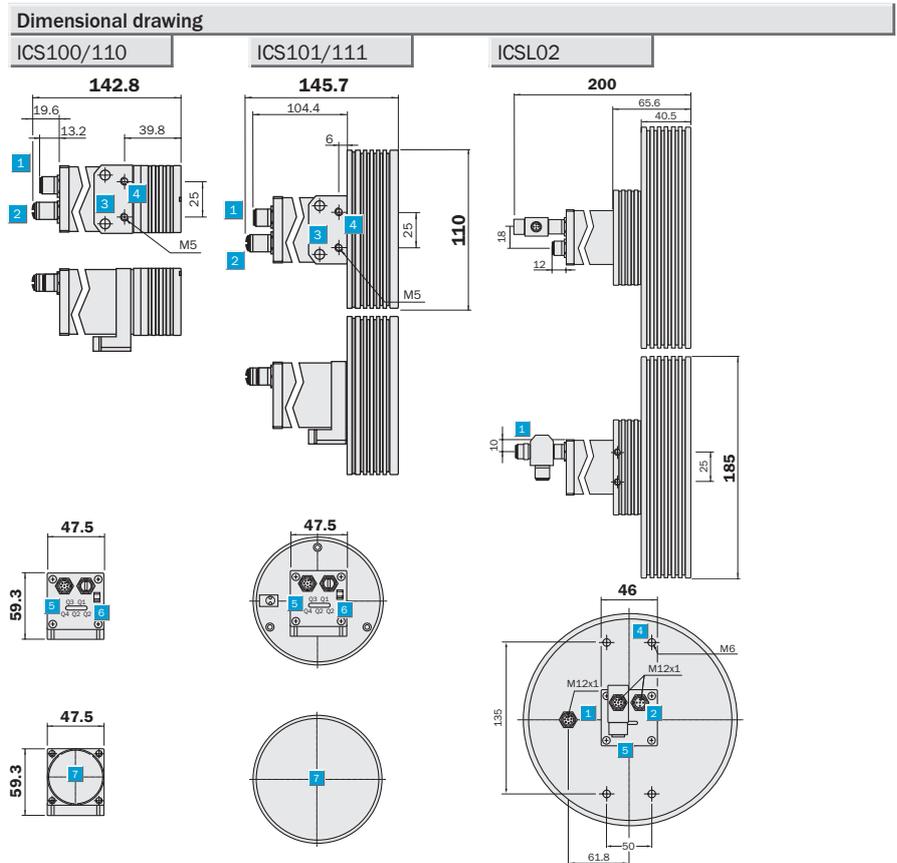
| 1 | Supply connection (external thread), 8-way, M12 |
|---|---|
| 2 | Operating device connection (internal thread), 8-way, M12/5-way, M12 for ICS L02 |
| 3 | Positioning hole |
| 4 | Mounting hole M5/M6 at ICS L02, 4-times |
| 5 | Switching output display (Q1-Q4) |
| 6 | Operational status indicator |
| 7 | Front lens |
| 8 | VSC 100: W x H x D = 150 x 82 x 31 mm$^3$ |
| 9 | LC Display |
| 10 | Keyboard |

### Connection type ICS100-B1111

| 8-pin, M12 (Output) | 8-/5-pin, M12 setup unit/control input | |
|---|---|---|
| | ICS100/110/101/111 | ICS L02 |

D
C
A B
A B

**A**
1
2 Control input/
3 Teach
4 GND
5

**B**

**C**
1 NC
2 RxD
3 GND
4 TxD

wht 1 Trigger input
brn 2 L+
grn 3 Q$_1$
yel 4 Q$_2$
gra 5 Q$_3$
pnk 6 Q$_4$
blu 7 M
red 8 Trigger external lighting

| A | Cable ICS–VSC, 2 m with plug M12, 5-pin | |
|---|---|---|
| | **Order no.** | 6025931 |

| Cable, 2 m with receptacles M12, 8-pin | |
|---|---|
| **Order no.** | 6020633 |

| B | Cable–control input, 2 m, M12, 4-pin | |
|---|---|---|
| | **Order no.** | 6028077 |

| C | Cable ICS-PC | |
|---|---|---|
| | **Order no.** | 6028622 |

| D | T-switch 8-/5-/4-way | |
|---|---|---|
| | **Order no.** | 6028485 |

| Technical data | | ICS100 -B1211 | ICS110 -B1211 | ICS101 -B1211 | ICS111 -B1211 | ICS L02 -B1111 | VSC 100 |
|---|---|:---:|:---:|:---:|:---:|:---:|:---:|
| Nominal scanning distance/ | 70 mm/20 x 20 mm² | ■ | ■ | | | | |
| Field of view | 140 mm/40 x 40 mm² | | | ■ | ■ | | |
| | 330 mm/80 x 80 mm² | | | | | ■ | |
| Flash time for LED lighting [1] | Adjustable, 50 µs to 1300 µs | ■ | ■ | ■ | ■ | ■ | |
| Exposure time for ext. lighting [2] | 8 ms … 23 ms | ■ | ■ | ■ | ■ | ■ | |
| Colour of light/Filters | Green (Filter: 450 … 550 nm) | ■ | ■ | ■ | ■ | ■ | |
| Image sensor | CMOS; 512 x 512 pixels | ■ | ■ | ■ | ■ | ■ | |
| Test modes | 1 … 4 (Explanation see below) | ■ | | ■ | | | |
| | 1 … 5 (Explanation see below) | | ■ | | ■ | | |
| Copying/Changing [3] | Mechanical, optical, parameters | ■ | ■ | ■ | ■ | ■ | |
| Supply voltage $V_S$ [4] | 24 V DC | ■ | ■ | ■ | ■ | ■ | |
| Residual ripple [5] | < 5 $V_{PP}$ | ■ | ■ | ■ | ■ | ■ | |
| Current consumption [6] | < 450 mA | ■ | ■ | | | | |
| | < 600 mA | | | ■ | ■ | | |
| | < 1.2 A | | | | | ■ | |
| Switching outputs | 4 x B (NPN/PNP) | ■ | ■ | ■ | ■ | ■ | |
| Output currents $I_A$ max. [7] | < 100 mA | ■ | ■ | ■ | ■ | ■ | |
| Response time/cycle time [8] | ≥ 2.5 ms | ■ | ■ | ■ | ■ | ■ | |
| Max. image frequency | 400/s | ■ | ■ | ■ | ■ | ■ | |
| Trigger input [9] | HIGH corresp. ≥ 10 V … 28.8 V | ■ | ■ | ■ | ■ | ■ | |
| Trigger output for ext. light. | TTL; LOW = active | ■ | ■ | ■ | ■ | ■ | |
| Serial interface [10] | RS 232 | ■ | ■ | ■ | ■ | ■ | |
| I/O + $V_S$ connection | M12, 8-pin | ■ | ■ | ■ | ■ | ■ | |
| VSC – ICS connection | M12, 8-pin [11] | ■ | ■ | ■ | ■ | ■ | |
| | M12, 5-pin | | | | | ■ | ■ |
| Teach field, Search field | Adjustable size and position | ■ | ■ | ■ | ■ | ■ | |
| Ambient temperature $T_A$ | Operation:        0 °C … +50 °C | ■ | ■ | ■ | ■ | ■ | |
| | Storage:     −25 °C … +75 °C | ■ | ■ | ■ | ■ | ■ | |
| | Storage:     −20 °C … +60 °C | | | | | ■ | |
| Shock load | 15 g, 6 directions | ■ | ■ | ■ | ■ | ■ | |
| Enclosure rating | IP 64 | ■ | ■ | ■ | ■ | ■ | |
| Weight | 240 g | | | | | | ■ |
| | 350 g | ■ | ■ | | | | |
| | 780 g | | | ■ | ■ | | |
| | 2,200 g | | | | | ■ | |

[1] Average service life 50,000 h at $T_A$ = +25 °C
[2] In flash mode = pulse duration
[3] Mechanical: with adapter plate; optical: calibration tube Parameters: via PLC/PC download
[4] Limit values ±20 %
[5] May not exceed or fall short of $V_S$ tolerances
[6] Without load
[7] Amount total for all four outputs
[8] With resistive load
[9] Falling edge; pulse length ≥ 0.5 ms; response time ≥ 1.3 ms
[10] Parameter transmission and data output
[11] Connection using T-switch M12, 8-/5-/4- way and 5-way connecting lead

| Check Mode | Procedure [12] |
|---|---|
| 1. Pixel sum | Checking the number of pixels for exceeding or falling below the limit values |
| 2. Minimum pixel sum | Checking pixel number exceeding a limit |
| 3. Multi-area evaluation | Connected surfaces are compared in respect of number and area |
| 4. Shape check | All pixels in the teach-in field should appear identically arranged (no tilt) in any position in the search field |
| 5. Rotational contour check | Taught-in contours (=limit pixels between black and white) are searched for in the image to be checked – even if these are tilted or displaced |

[12] All procedures are used in the binary image. A comparison is made each time between the taught-in reference image and the image to be checked.

## Order information

| Intelligent Camera Sensor | | Mounting technology | |
|---|---|---|---|
| **Type** | **Order no.** | **Type** | **Order no.** |
| ICS100-B1211 | 1026253 | Bracket mounting (set) ICS100/110 | 2027839 |
| ICS110-B1211 | 1026255 | Universal rod mount clamp ICS100/110 | 2022464 |
| ICS101-B1211 | 1026254 | Fixing plate [13] ICS100/110/101/111 | 2029533 |
| ICS111-B1211 | 1026256 | Rod mounting, ICS101/111 | 2029925 |
| ICS L02-B1111 | 1025547 | Calibration tube for field of view 20 mm x 20 mm | 2030744 |
| VSC 100 | 2025857 | Calibration tube for field of view 40 mm x 40 mm | 2030808 |

[13] Enables dismantling without loss of alignment.

Fields of view 20 x 20, 40 x 40, 80 x 80 and 160 x 160 mm$^2$

**Intelligent Camera Sensor**

- Suitable for fast operations
- Flexibly used with external lighting
- Easy product format change through memory selection via PLC
- Secure settings due to LC image display
- Robust design

$C\epsilon$

**Dimensional drawing**

ICS00X

157.8

53.3

18

25

47.5

12

47.5

2

10

1

3

ø 46.5

M12x1

4    5

6

M5

VSC100    9

7

F1  F2  F3  F4

OK          EXIT

ON

8
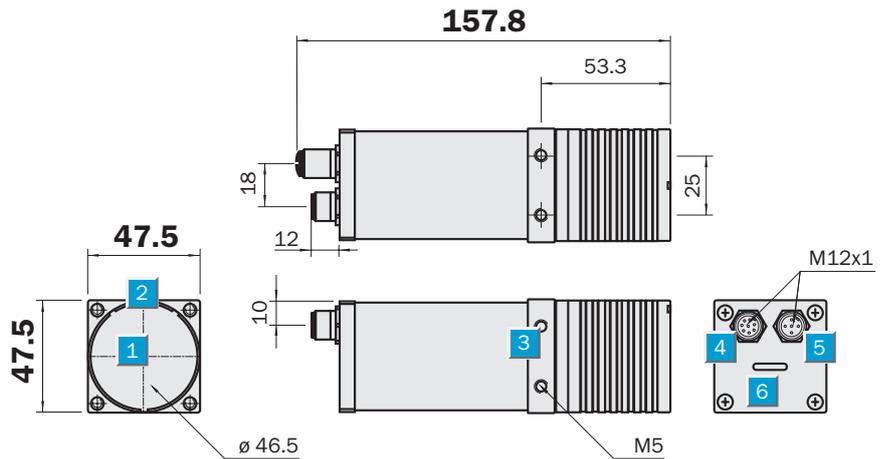
| | |
|---|---|
| 1 | Lens/"C" mounting thread |
| 2 | Hood |
| 3 | Fixing hole M5, 4-times |
| 4 | Output, 8-pin, M12 |
| 5 | Setup unit connection, 5-pin, M12 |
| 6 | Display of output switching state |
| 7 | LC Display |
| 8 | Keyboard |
| 9 | VSC100: W x H x D = 150 x 82 x 31 mm$^3$ |

**Connection type**

| ICS00X | 8-pin, M12 (Output) | 5-pin, M12 setup unit/control input |
|---|---|---|

| wht | 1 | Trigger input |
| brn | 2 | L+ |
| grn | 3 | Q$_1$ |
| yel | 4 | Q$_2$ |
| gra | 5 | Q$_3$ |
| pnk | 6 | Q$_4$ |
| blu | 7 | M |
| red | 8 | Trigger external lighting |

| 1 | |
| 2 | Control input |
| 3 | |
| 4 | GND |
| 5 | |

| Cable, 2 m with plug M12, 5-pin | |
|---|---|
| Order no. | 6025931 |

| Cable, 2 m with receptacles M12, 8-pin | |
|---|---|
| Order no. | 6020633 |

| Cable-control input, 2 m, M12, 4-pin | |
|---|---|
| Order no. | 6028077 |

| Technical data | | ICS000 -B2111 | ICS001 -B1111 | ICS001 -B2111 | ICS002 -B1111 | ICS002 -B2111 | ICS003 -B2111 | ICS009 -B0111 | VSC 100 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal scanning distance/ | 70 mm/20 x 20 mm$^2$ | ✓ | | | | | | | | | |
| Field of view | 140 mm/40 x 40 mm$^2$ | | ✓ | ✓ | | | | | | | |
| | 330 mm/80 x 80 mm$^2$ | | | | ✓ | ✓ | | | | | |
| | 650 mm/160 x 160 mm$^2$ | | | | | | ✓ | | | | |
| | Provided by customer | | | | | | | ✓ | | | |
| Filters/lens | Lens with green filter (450 ... 550 nm) | | ✓ | | ✓ | | | | | | |
| | Lens with red filter (610 ... 690 nm) | ✓ | | ✓ | | ✓ | ✓ | | | | |
| | Without lens ("C" mounting thread) | | | | | | | ✓ | | | |
| Image sensor | CMOS; 512 x 512 pixels | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Supply voltage $V_S$ [1] | 24 V DC | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Residual ripple [2] | < 5 $V_{PP}$ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Power consumption [3] | < 350 mA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Switched outputs | 4 x B (NPN/PNP) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Output currents $I_A$ max. [4] | < 100 mA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Response time/cycle time [5] | ≥ 2.5 ms | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Switching frequency max. | 400/s | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Trigger output for ext. light. [6] | TTL; low = active | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Trigger input [7] | Falling edge; | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| | High corresp. ≥ 10 V ... 28.8 V | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| I/O + $V_S$ connection | M12, 8-pin, plug on ICS side | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Programming unit connection [8] | M12, 5-pin, receptacle | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Software features | 4 evaluation methods (see below) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Teach field, search field | Adjustable size and position | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Autoform teach field [9] | Object selectable by arrow | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Number of teach fields (test programs) | 4 simultan. + max. 12 in memory | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Ambient temperature | Operation:    0 °C ... +50 °C | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| | Storage:   –20 °C ... +60 °C | | | | | | | | ✓ | | |
| | Storage:   –25 °C ... +70 °C | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Shock load | 15 g, 6 directions | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Enclosure rating | IP 64 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| | IP 40 | | | | | | | | ✓ | | |
| Weight | Approx. 350 g | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| | Approx. 240 g | | | | | | | | ✓ | | |
| Housing material | Aluminium and brass | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |

[1] Limit values ± 20 %
[2] May not exceed or fall short of $V_S$ tolerances
[3] Without load
[4] Total amount for all four outputs
[5] Signal run-time with resistive load
[6] Flash length adjustable between 50 μs and 1.3 ms
[7] Trigger pulse ≥ 2.5 ms
[8] Cable length 2 m, PVC, Ø 5 mm, do not distort cable below 0 °C
[9] Contour of teach field = contour of object selected

| Test mode | Process [10] | Typical applications |
|---|---|---|
| Shape check (pattern matching) | The patterns taught are sought in the image being checked, even when shifted | Shape, position and dimension check, object detection, presence monitoring, completeness |
| Multi-area evaluation | Pixels are compared with respect to number and area | Presence monitoring, completeness check |
| Minimum pixel sum | Checking pixel number exceeding a limit | Presence monitoring, e.g. for transparent objects with reflective surfaces, completeness monitoring, object detection with shiny surfaces[11] |
| Pixel sum | Comparison of the absolute number of white and black pixels | Presence monitoring, completeness check |

[10] All procedures are used in the binary image. A comparison is made each time between the taught-in reference image and the image to be checked

[11] Made possible by the special resistance of the sensor against blooming using a CMOS receiver

## Order information

| Intelligent Camera Sensor | | Intelligent Camera Sensor | | Mounting technology | | Adapter rings M30x1 on "C" mount | |
|---|---|---|---|---|---|---|---|
| Type | Order no. | Type | Order no. | Type | Order no. | Type | Order no. |
| ICS000-B2111 | 1026154 | ICS002-B2111 | 1025314 | Bracket mounting (set) | 2027839 | With red filter | 2030743 |
| ICS001-B1111 | 1025310 | ICS003-B2111 | 1025315 | Uni. rod mount clamp | 2022464 | With green filter | 2030746 |
| ICS001-B2111 | 1025313 | ICS009-B0111 | 1025312 | "C" mount lens 1 : 1.3/25 mm | 5312900 | Without filter | 4039708 |
| ICS002-B1111 | 1025308 | | | | | | |

Fields of view 20 x 20, 40 x 40, 80 x 80 and 160 x 160 mm²

Intelligent Camera Sensor

- Suitable for fast operations
- Flexibly used with external lighting
- Easy product format change through memory selection via PLC
- Secure settings due to LC image display
- Robust design

$C\epsilon$

## Dimensional drawing

ICS0XX

**157.8**

53.3

18

**47.5**

**47.5**

ø 46.5

12

25

10

M12x1

4   5

6

M5

| VSC100 | 9 |

7

8

| 1 | Lens/"C" mount thread |
| 2 | Hood |
| 3 | Fixing hole M5, 4-times |
| 4 | Output, 8-pin, M12 |
| 5 | Setup unit connection, 5-pin, M12 |
| 6 | Display of output switching state |
| 7 | LC Display |
| 8 | Keyboard |
| 9 | VSC 100: W x H x D = 150 x 82 x 31 mm³ |

## Connection type

| ICS0XX | 8-pin, M12 (Output) | 5-pin, M12 setup unit/control input |
|---|---|---|

| | | |
|---|---|---|
| wht | 1 | Trigger input |
| brn | 2 | L+ |
| grn | 3 | $Q_1$ |
| yel | 4 | $Q_2$ |
| gra | 5 | $Q_3$ |
| pnk | 6 | $Q_4$ |
| blu | 7 | M |
| red | 8 | Trigger external lighting |

| | |
|---|---|
| 1 | |
| 2 | Control input |
| 3 | |
| 4 | GND |
| 5 | |

| Cable, 2 m with plug M12, 5-pin | |
|---|---|
| Order no. | 6025931 |

| Cable, 2 m with receptacles M12, 8-pin | |
|---|---|
| Order no. | 6020633 |

| Cable-control input, 2 m, M12, 4-pin | |
|---|---|
| Order no. | 6028077 |

| Technical data | | ICS010 -B2111 | ICS011 -B1111 | ICS011 -B2111 | ICS012 -B1111 | ICS012 -B2111 | ICS013 -B2111 | ICS019 -B0111 | VSC 100 |
|---|---|---|---|---|---|---|---|---|---|
| Nominal scanning distance/ | 70 mm/20 x 20 mm$^2$ | ■ | | | | | | | |
| Field of view | 140 mm/40 x 40 mm$^2$ | | ■ | ■ | | | | | |
| | 330 mm/80 x 80 mm$^2$ | | | | ■ | ■ | | | |
| | 650 mm/160 x 160 mm$^2$ | | | | | | ■ | | |
| | Provided by customer | | | | | | | ■ | |
| Filters/lens | Lens with green filter (450 ... 550 nm) | | ■ | | ■ | | | | |
| | Lens with red filter (610 ... 690 nm) | ■ | | ■ | | ■ | ■ | | |
| | Without lens ("C" mounting thread) | | | | | | | ■ | |
| Image sensor | CMOS; 512 x 512 pixels | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Supply voltage $U_V$ [1] | 24 V DC | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Residual ripple [2] | < 5 $V_{PP}$ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Current consumption [3] | < 350 mA | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Switched outputs | 4 x B (NPN/PNP) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Output currents $I_A$ max. [4] | < 100 mA | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Response time/cycle time [5] | ≥ 2.5 ms | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Switching sequence [6] | 400/s | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Trigger output for ext. light. [7] | TTL; low = active | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Trigger input [8] | Falling edge; | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| | High corresp. ≥ 10 V ... 28.8 V | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| I/O + $V_S$ connection | M12, 8-pin, plug on ICS side | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Programming unit connection [9] | M12, 5-pin, receptacle | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Software features | 5 evaluation methods (see below) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Teach field, search field | Adjustable size and position | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Autoform teach field [10] | Object selectable by arrow | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Number of teach fields (test programs) | 4 simultan. + max. 12 in memory | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Ambient temperature | Operation:　　0 °C ... +50 °C | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| | Storage:　–20 °C ... +60 °C | | | | | | | | ■ |
| | Storage:　–25 °C ... +70 °C | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Shock load | 15 g, 6 directions | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Enclosure rating | IP 64 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| | IP 40 | | | | | | | | ■ |
| Weight | Approx. 350 g | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| | Approx. 240 g | | | | | | | | ■ |
| Housing material | Aluminium and brass | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |

[1] Limit values ± 20 %
[2] May not exceed or fall short of $V_S$ tolerances
[3] Without load
[4] Total amount for all four outputs
[5] Signal run-time with resistive load
[6] With light/dark ratio 1:1
[7] Flash length adjustable between 50 µs and 1.3 ms
[8] Trigger pulse ≥ 2.5 ms
[9] Cable length 2 m, PVC, Ø 5 mm, do not distort cable below 0 °C
[10] Contour of teach field = contour of object selected

| Test mode | Process [11] | Typical applications |
|---|---|---|
| Rotational contour check | The contours taught are sought in the image being checked, even when rotated and/or shifted | Shape, position and dimension check, object detection, presence monitoring, completeness |
| Comparison of shapes (pattern matching) | The patterns taught are sought in the image being checked, even when shifted | Shape, position and dimension check, object detection, presence monitoring, completeness |
| Multi-area evaluation | Pixels are compared with respect to number and area | Presence monitoring, completeness check |
| Minimum pixel sum | Checking pixel number exceeding a limit | Presence monitoring, e.g. for transparent objects with reflective surfaces, completeness monitoring, object detection with shiny surfaces [12] |
| Pixel sum | Comparison of the absolute number of white and black dots | Presence monitoring, completeness check |

[11] All procedures are used in the binary image. A comparison is made each time between the taught-in reference image and the image to be checked
[12] Made possible by the special resistance of the sensor against blooming using a CMOS receiver

| Order information | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intelligent Camera Sensor | | Intelligent Camera Sensor | | Mounting technology | | Adapter rings M30x1 on "C" mount | |
| Type | Order no. | Type | Order no. | Type | Order no. | Type | Order no. |
| ICS010-B2111 | On request | ICS012-B2111 | On request | Bracket mounting (set) | 2027839 | With red filter | 2030743 |
| ICS011-B1111 | On request | ICS013-B2111 | On request | Uni. rod mount clamp | 2022464 | With green filter | 2030746 |
| ICS011-B2111 | On request | ICS019-B0111 | On request | "C" mount lens | 5312900 | Without filter | 4039708 |
| ICS012-B1111 | On request | | | 1 : 1.3/25 mm | | | |
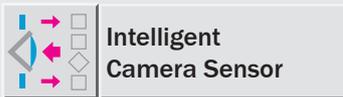
**Intelligent Camera Sensor**

# AGD and DCI: Area Gloss Detection and Date Code Inspection

**T**he AGD and DCI camera sensors each perform one task exceptionally well, Area Gloss Detection and Date Code Inspection. Optimised to perform these tasks, the camera sensors are easy to operate using a simple teach process to set-up.

The DCI is used for simple presence checks and more demanding tasks such as on-line monitoring of printed code quality. It does this by comparing the number of dark pixels in a search field against a taught-in example and the applied tolerances. The DCI is ideal for checking the presence of codes on food packaging, bottles and pharmaceutical products.

The AGD detects surface reflections to provide valuable process information. It looks for reflections caused by the shape of a feature or a change in the surface finish from shiny or dull. This helps solve problems to detect product presence or orientation such as checking for chamfered edges and presence of grip mouldings.

Alignment of the camera sensors are easy using a keypad display and are set-up by using a two page menu. Once they have been set the sensors can be quickly changed to new products via a teach signal.

Both the AGD and DCI are very reliable in operation. The evaluation algorithms are so sturdy that rotation and shifts of objects have little influence on their operation. This is especially important for ensuring a high degree of system reliability and problem-free operation at clock rates of more than 200 images per second.
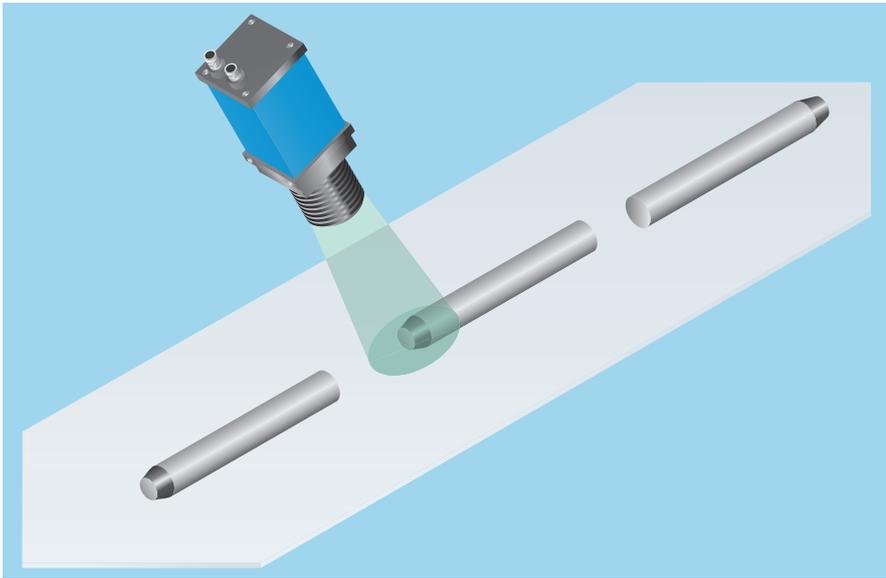
◄ The AGD detects chamfered edges which can be used to check the position and orientation of machined objects.

▼ Is the date print present and complete? The DCI easily answers this question.

▲ Threads generate characteristic reflections which the AGD detects.
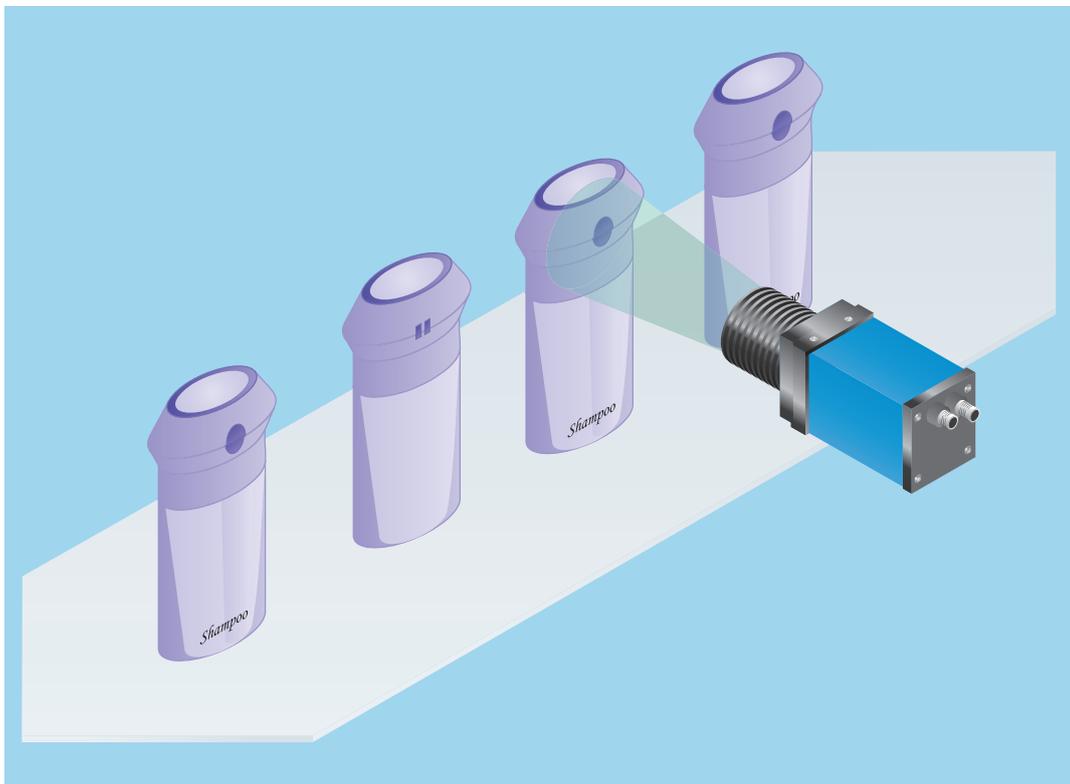
▶ Features such as grip mouldings, which reveal themselves by their reflective properties, can be used to control position.

**Fields of view
20 x 20 mm²**

Intelligent Camera Sensor

- Simple set-up and operation
- High clock cycle rate for fast processes
- Sturdy evaluation procedure
- DCI 10: warning in advance if pixel number is near the tolerance limit
- Reflections can be detected on shiny objects

CE

## Dimensional drawing

| AGD10 |
| DCI10 |

**142.8**

19.6

13.2

39.8

1

2

3

25

M5

**47.5**

**47.5**

**47.5**

**47.5**

6

4

5

Q3 Q1
Q4 Q2 ON

| VSC100 | 7 |

8

9
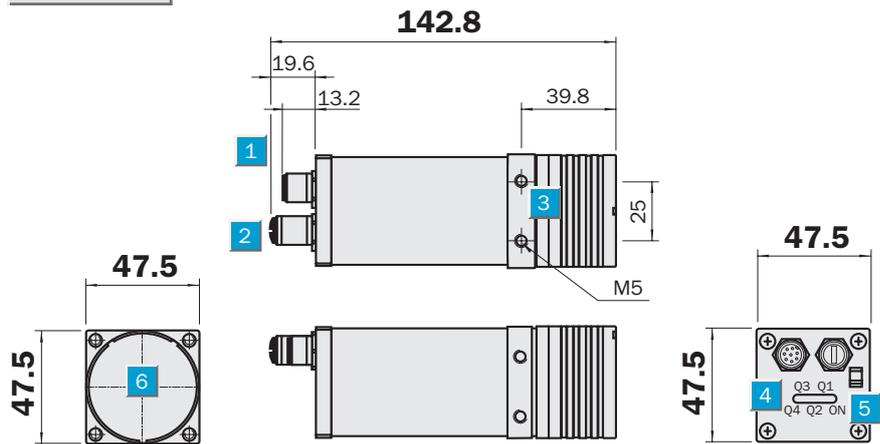
| | |
|---|---|
| 1 | Power connection (external thread), 8-pin, M12 |
| 2 | Operating part connection (internal thread), 5-pin, M12 |
| 3 | Fixing hole M5 |
| 4 | Switch output indicator (Q1-Q4) |
| 5 | Power indicator |
| 6 | Optical axis sender, optical axis receiver |
| 7 | VSC 100: W x H x D = 150 x 82 x 31 mm³ |
| 8 | LC Display |
| 9 | Keyboard |

F1 F2 F3 F4
OK EXIT
ON

## Connection type AGD 10 and DCI 10
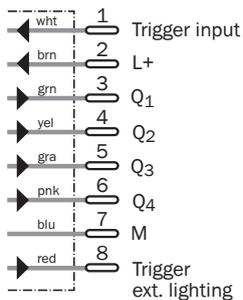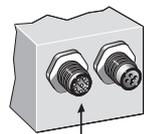
| 8-pin, M12 (output) | 5-pin, M12 setup unit/Teach input |
|---|---|

| | | | |
|---|---|---|---|
| wht | 1 | Trigger input | |
| brn | 2 | L+ | |
| grn | 3 | Q₁ | |
| yel | 4 | Q₂ | |
| gra | 5 | Q₃ | |
| pnk | 6 | Q₄ | |
| blu | 7 | M | |
| red | 8 | Trigger ext. lighting | |

A

1
2  Control
3  input/Teach
4  GND
5

B

brn
wht
blu
blk
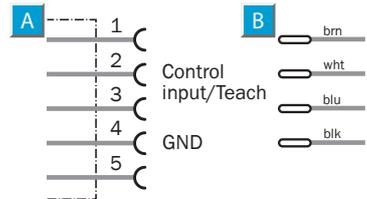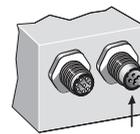
| | Cable, 2 m with receptacles M12, 8-pin | |
|---|---|---|
| **Order no.** | | 6020633 |

| A | Cable AGD–VSC, 2 m with plug M12, 5-pin | |
|---|---|---|
| **Order no.** | | 6025931 |

| B | Connection cable for control input, 2 m, plug M12, 4-pin | |
|---|---|---|
| **Order no.** | | 6028077 |

| Technical data | | AGD10 -B1111 | DCI10 -B1111 | VSC100 | | | | | | |
|---|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Nominal scanning distance/ Field of view | 70 mm/20 x 20 mm² | ✓ | ✓ | | | | | | | |
| Filters – lens | Green (filter: 450 … 550 nm) | ✓ | ✓ | | | | | | | |
| Light source [1] | 15 x LED; focused green | ✓ | ✓ | | | | | | | |
| Image sensor | CMOS; 512 x 512 Pixel | ✓ | ✓ | | | | | | | |
| Real resolution | 320 x 320 Pixel | ✓ | ✓ | | | | | | | |
| Test mode | Pixel sum | | ✓ | | | | | | | |
| | Minimum pixel sum | ✓ | | | | | | | | |
| Teach field, search field | Size can be changed | ✓ | ✓ | | | | | | | |
| | Position can be changed | | ✓ | | | | | | | |
| Supply voltage $V_S$ [2] | 24 V DC | ✓ | ✓ | | | | | | | |
| Residual ripple [3] | < 5 $V_{PP}$ | ✓ | ✓ | | | | | | | |
| Current consumption [4] | < 450 mA | ✓ | ✓ | | | | | | | |
| Switched outputs | B (NPN/PNP) | ✓ | ✓ | | | | | | | |
| | Q1: Value in tolerance range | ✓ | ✓ | | | | | | | |
| | Q2: Value outside of tolerance | ✓ | ✓ | | | | | | | |
| | Q3: Value near to or below lower tolerance limit | ✓ | | | | | | | | |
| | Q4: Value near to or above upper tolerance limit | ✓ | | | | | | | | |
| Output currents $I_A$ max. [5] | < 100 mA | ✓ | ✓ | | | | | | | |
| Response time/cycle time [6] | 3 ms … 6.4 ms | ✓ | ✓ | | | | | | | |
| Max. image frequency | Approx. 285/s | ✓ | ✓ | | | | | | | |
| Trigger input [7] | HIGH corresp. ≥ 10 V … 28.8 V | ✓ | ✓ | | | | | | | |
| Trigger output for ext. light. | TTL; LOW = active | ✓ | ✓ | | | | | | | |
| I/O + $V_S$ connection | M12, 8-pin | ✓ | ✓ | | | | | | | |
| VSC – AGD/DCI connection | M12, 5-pin | ✓ | ✓ | ✓ | | | | | | |
| Ambient temperature | Operation: 0 °C … +50 °C | ✓ | ✓ | ✓ | | | | | | |
| | Storage: –25 °C … +75 °C | ✓ | ✓ | | | | | | | |
| | Storage: –20 °C … +60 °C | | | ✓ | | | | | | |
| Shock load | 15 g, 6 directions | ✓ | ✓ | | | | | | | |
| Enclosure rating | IP 64 | ✓ | ✓ | | | | | | | |
| | IP 40 | | | ✓ | | | | | | |
| Weight | 240 g | | | ✓ | | | | | | |
| | 350 g | ✓ | ✓ | | | | | | | |
| Housing material | Aluminium and brass | ✓ | ✓ | | | | | | | |
| | Plastic | | | ✓ | | | | | | |

[1] Average service life 50,000 h at $T_A$ = +25 °C
[2] Limit values ± 20 %
[3] May not exceed or fall short of $V_S$ tolerances
[4] Without load
[5] Total amount for all four outputs
[6] Signal transit time with resistive load
[7] Falling edge; pulse length ≥ 0.5 ms; reaction time = 3.5 ms

| Test mode | Process[8] |
|---|---|
| Pixel sum | Check of the number of pixels at exceeding or falling below the limit values |
| Minimum pixel sum | Checking pixel number exceeding a limit |

[8] All procedures are used in the binary image.
A comparison is made each time between the taught-in reference image and the image to be checked.

| Order information | | | |
|---|---|---|---|
| **Intelligent Camera Sensor** | | **Mounting technology** | |
| Type | Order no. | Type | Order no. |
| AGD10-B1111 | 1026384 | Bracket mounting (set) ICS100/110 | 2027839 |
| DCI10-B1111 | 1026385 | Universal rod mount clamp ICS100/110 | 2022464 |
| VSC100 | 2025857 | | |

# Colour Vision Sensors: Detects colours, distinguishes colours.

If colour plays an important role in your process and a simple colour sensor does not have the capability for more complex checks, the Colour Vision Sensors is the economic solution. They count the pixels of all colours or specifically selected colours in a monitored area and compares the result with a taught-in number.

A built-in colour display helps to optimally align the sensor for set up and teaching. The continually updated measurement values are shown so that all parameters which are needed for reliable operation are displayed. If the CVS is mounted in a way where the built-in display can't be seen, such as when embedded into a packaging machine, a separate keypad with its own colour display can be connected. This solves the problem and helps prevent any dislocating twists or sprains to the set up person.

Each parameter can of course be easily edited subsequently if adjustments are required. The CVS2 has memory space for 16 complete parameter sets, which can be selected via external signals. Consequently, it can be optimally set up for fast product changes.

The CVS family has no problem in environments where broken glass must be avoided thanks to its sturdy plastic housing and front window. With its IP 67 enclosure rating it is particularly suitable for harsh industrial environment.
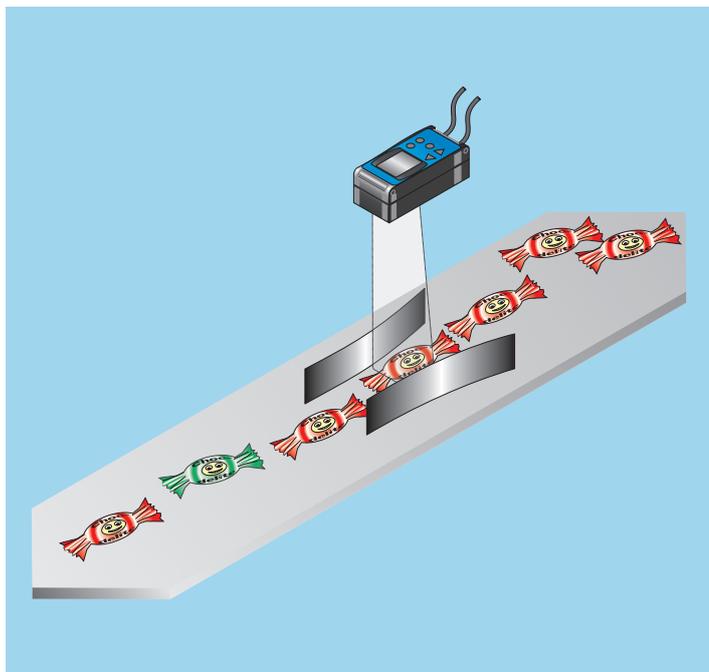
▲ Even parts with greatly varying appearance and position can be
sorted by the CVS2, using their colour.

▼ The label is on – but is it the right one? The CVS1 Easy
recognises incorrect labels by colour.
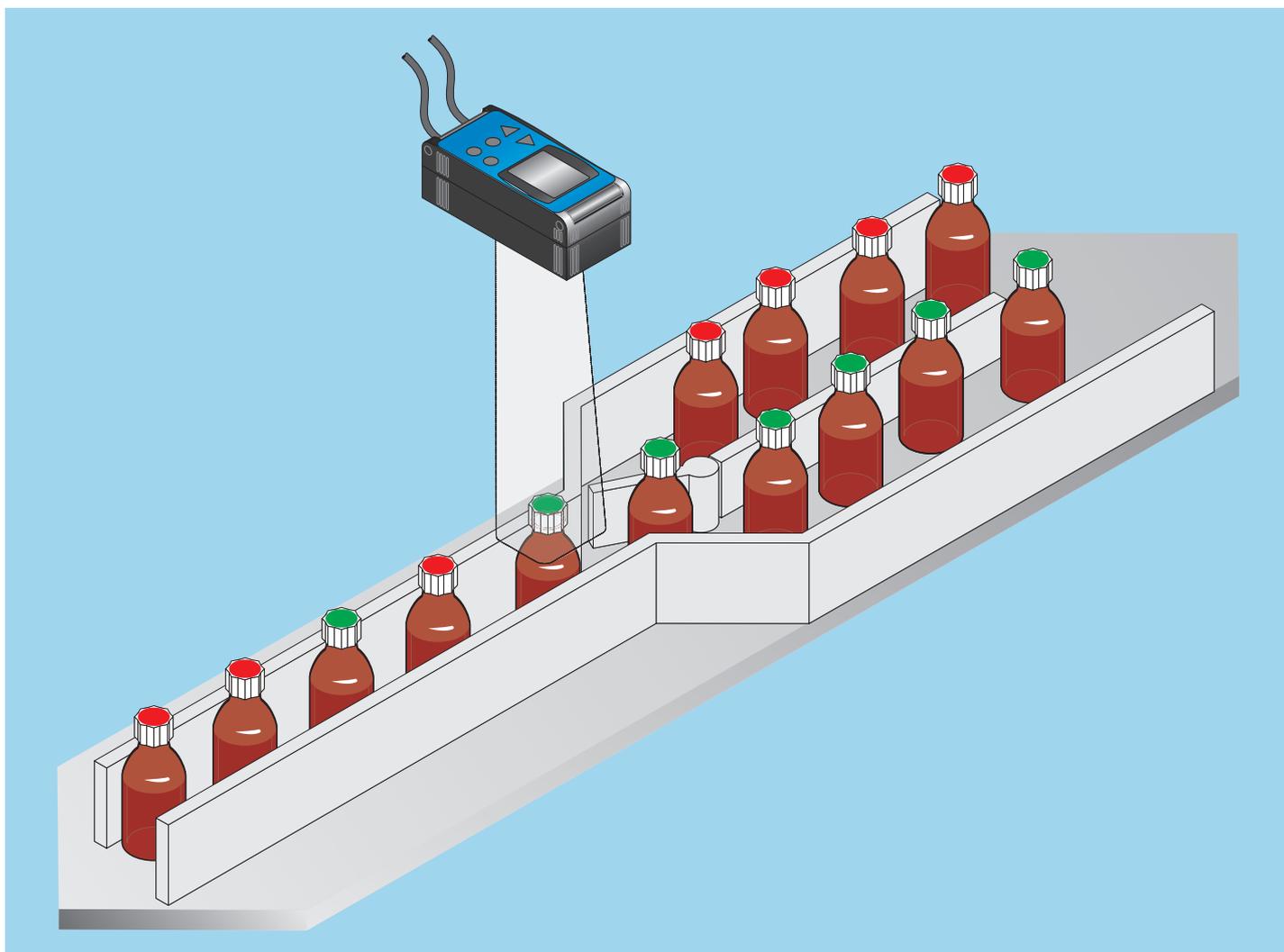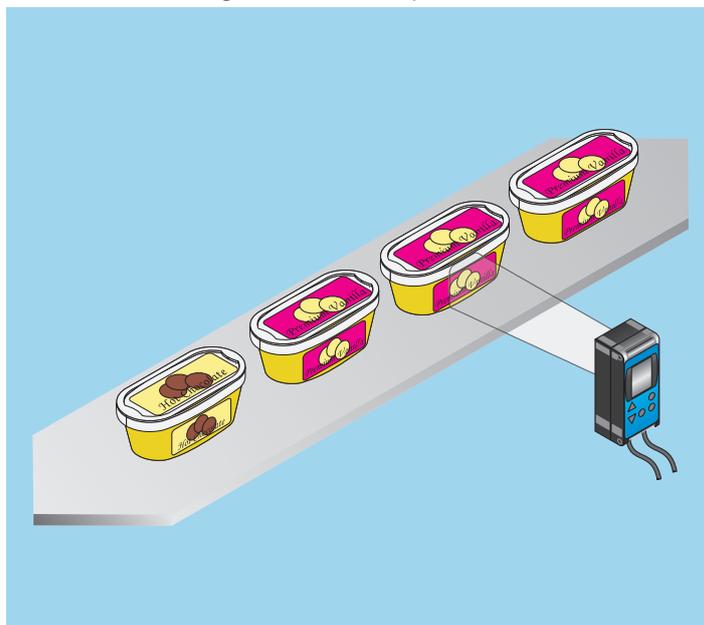




▲ The same shape, different contents: a camera sensor assists in sorting if colour
remains the only distinguishing feature.

# Colour Vision Sensor CVS1 Easy

**Colour Vision Sensors**

- ■ Detecting colour
- ■ Plug and play teach
- ■ Memory capacity for 8 colours

## Dimensional drawing

21

28.2

2

1

3

4

33.8

2–Ø4.3

4

4.2

5

87

5

42

6

7

95

11

## Adjustments possible

6

7
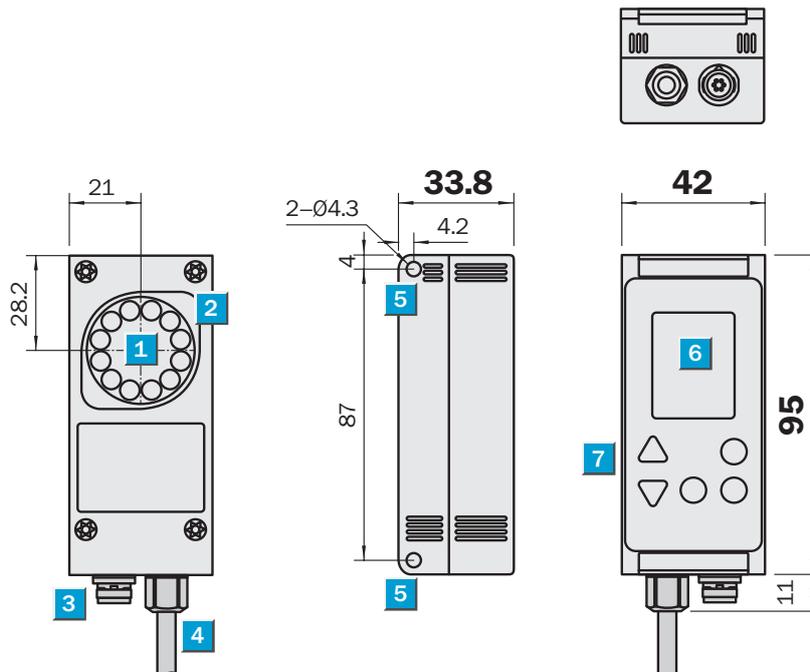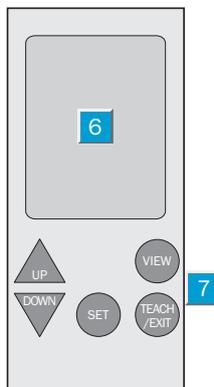
| | |
|---|---|
| 1 | Front screen |
| 2 | Lighting |
| 3 | Connection: external lighting/monitor |
| 4 | Connecting cable |
| 5 | Fixing hole |
| 6 | Colour display |
| 7 | Input keypad |

UP
DOWN
VIEW
SET
TEACH /EXIT

## Connection type

All types
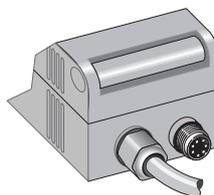
3 Connection: external lighting/monitor

Cable, 7-wire
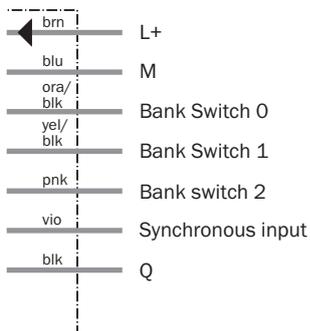
| Wire | Signal |
|---|---|
| brn | L+ |
| blu | M |
| ora/blk | Bank Switch 0 |
| yel/blk | Bank Switch 1 |
| pnk | Bank switch 2 |
| vio | Synchronous input |
| blk | Q |

| Technical data | CVS1- | P112 | P122 | P142 | N112 | N122 | N142 | Easy |
|---|---|---|---|---|---|---|---|---|
| Nominal scanning distance/Field of view | 210 … 270 mm/40 x 50 … 55 x 65 mm$^2$ | ✓ | | | ✓ | | | |
| | 90 … 150 mm/40 x 50 … 65 x 75 mm$^2$ | | ✓ | | | ✓ | | |
| | 50 … 100 mm/50 x 65 … 100 x 115 mm$^2$ | | | ✓ | | | ✓ | |
| Light source [1] | 12 x LED, white | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Resolution | Max. 200 x 240 x 3 (RGB) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Teach procedure | 1-point | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Lower limit | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Supply voltage $V_s$ [2] | 12 … 24 V DC | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Residual ripple [3] | < 5 $V_{pp}$ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Current consumption [4] | < 220 mA (at 24 V), | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | < 120 mA (at 12 V) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Switching outputs | PNP | ✓ | ✓ | ✓ | | | | |
| | NPN | | | | ✓ | ✓ | ✓ | |
| Output current $I_A$ max. | < 100 mA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Response time [5] | 0.6 … 22 ms | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Trigger input | HIGH corresp. 8 V | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| I/O + $V_S$ connection | Cable 7-pin, L = 2 m | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Connection of additional device | HRS, 6-pin | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Ambient temperature $T_A$ [6] | Operation:    0 °C … +40 °C | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Storage:    -20 °C … +70 °C | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Shock load | 5 g, 6 directions | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Housing material | ABS, acrylic, polycarbonate | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Enclosure rating | IP 67 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Weight | 180 g | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |

[1] Average service life 50,000 h at $T_A$ = +25 °C; 50 % intensity fall
[2] Limit values ± 10%
[3] May not exceed or fall short of $V_S$ tolerances
[4] Without load
[5] Dependent on settings; see display on device
[6] Rel. humidity: 35 … 85 % at operation, 95% at storage

| Teach procedure | Explanation |
|---|---|
| 1-point | Colour parts of the object are taught in. Switching limit = 50% of the taught-in colour pixel sum (manually adjustable). |
| Lower limit | Lower switching limit of the object colour is taught in. |

**Order information**

| Colour Vision Sensor | | Accessories | |
|---|---|---|---|
| **Type** | **Order no.** | **Type** | **Order no.** |
| CVS1-P112 Easy | 1028668 | CVSM-1, external operating unit incl. monitor and keypad | 1026355 |
| CVS1-P122 Easy | 1028669 | CVSL-S5, external lighting, 12 x LED, white | 1026356 |
| CVS1-P142 Easy | 1028670 | Cable DSL-SH06-G03M, 3 m | 6028659 |
| CVS1-N112 Easy | 1028665 | | |
| CVS1-N122 Easy | 1028666 | | |
| CVS1-N142 Easy | 1028667 | | |

**Nominal scanning dist.
210 ... 270/90 ... 150/
50 ... 100 mm**

**Colour Vision Sensors**

- Detecting colour
- Sorting colours
- Detecting objects
  using two colours
- Memory capacity
  for 15 colours
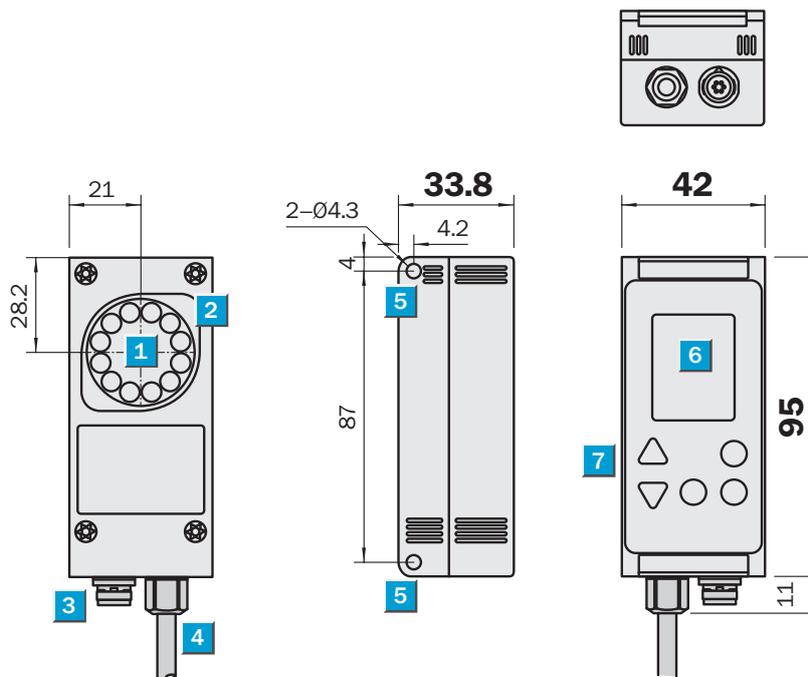
CE

**Dimensional drawing**

21

28.2

**2**

**1**

**3**

**4**

33.8

2–Ø4.3

4.2

4

**5**

87

**5**

42

**6**

**7**

95

11

**5**

**Adjustments possible**

**6**

UP

DOWN

VIEW

SET

TEACH/EXIT

**7**

| | |
|---|---|
| **1** | Front screen |
| **2** | Lighting |
| **3** | Connection: external lighting/ monitor/ PC |
| **4** | Connecting cable |
| **5** | Fixing hole |
| **6** | Colour display |
| **7** | Input keypad |

**Connection type**

All types

**3** Connection: external
lighting/ monitor/ PC

Cable, 8-wire
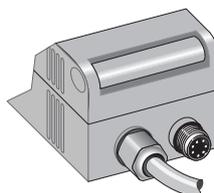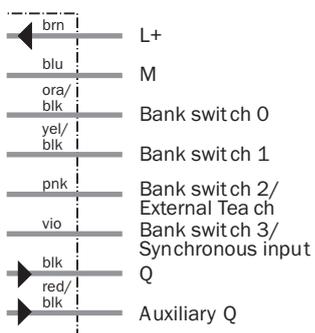
| brn | L+ |
|---|---|
| blu | M |
| ora/blk | Bank switch 0 |
| yel/blk | Bank switch 1 |
| pnk | Bank switch 2/ External Teach |
| vio | Bank switch 3/ Synchronous input |
| blk | Q |
| red/blk | Auxiliary Q |

| Technical data | CVS2- | P112 | P122 | P142 | N112 | N122 | N142 | | | |
|---|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Nominal scanning distance/Field of view | 210 … 270 mm/40 x 50 … 55 x 65 mm$^2$ | ■ | | | ■ | | | | | |
| | 90 … 150 mm/40 x 50 … 65 x 75 mm$^2$ | | ■ | | | ■ | | | | |
| | 50 … 100 mm/50 x 65 … 100 x 115 mm$^2$ | | | ■ | | | ■ | | | |
| Light source [1] | 12 x LED, white | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Resolution | Max. 208 x 236 x 3 (RGB) | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Teach procedure | 1-point | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| | 2-point | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| | Upper/lower limit | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Supply voltage $V_S$ [2] | 12 … 24 V DC | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Residual ripple [3] | < 5 $V_{pp}$ | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Current consumption [4] | < 240 mA (at 24 V), | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| | < 140 mA (at 12 V) | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Interface | RS 232 TTL | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Switching outputs | PNP | ■ | ■ | ■ | | | | | | |
| | NPN | | | | ■ | ■ | ■ | | | |
| Output current $I_A$ max. | < 100 mA | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Response time [5] | 5 … 26.6 ms | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Trigger input | HIGH corresp. 8 V | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| I/O + $V_S$ connection | Cable 8-pin, L = 2 m | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Connection of additional device | HRS, 6-pin | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Ambient temperature $T_A$ [6] | Operation:    0 °C … +40 °C | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| | Storage:    -20 °C … +70 °C | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Shock load | 5 g, 6 directions | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Housing material | ABS, acrylic, polycarbonate | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Enclosure rating | IP 67 | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| Weight | 180 g | ■ | ■ | ■ | ■ | ■ | ■ | | | |

[1] Average service life 50,000 h at $T_A$ = +25 °C; 50 % intensity fall
[2] Limit values ± 10%
[3] May not exceed or fall short of $V_S$ tolerances
[4] Without load
[5] Dependent on settings; see display on device
[6] Rel. humidity: 35 … 85 % at operation, 95% at storage

| Teach procedure | Explanation |
|---|---|
| 1-point | Colour parts of the object are taught in. Switching limit = 50% of the taught-in colour pixel sum (manually adjustable). Teach with automatic colour selection. |
| 2-point | Colour parts of the object and the background are taught in. Switching limit = average between object and background. |
| Upper/lower limit | Upper and lower switching limit of the object colour are taught in. |

### Order information

| Colour Vision Sensor | | Accessories | |
|---|---|---|---|
| **Type** | **Order no.** | **Type** | **Order no.** |
| CVS2-P112 | 1027332 | CVSM-1, external operating unit incl. monitor and keypad | 1026355 |
| CVS2-P122 | 1027333 | CVSL-S5, external lighting, 12 x LED, white | 1026356 |
| CVS2-P142 | 1027334 | Cable DSL-SH06-G03M, 3 m | 6028659 |
| CVS2-N112 | 1027329 | Connection cable DSL-DH06-G02M, 2 m for CVS data transfer and save/load configuration files to/from PC | 6029801 |
| CVS2-N122 | 1027330 | | |
| CVS2-N142 | 1027331 | | |
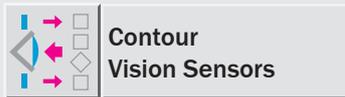
**Contour Vision Sensors**

# Contour Vision Sensor: Detection of Shapes, Profiles and Reliefs in any Position.

U

Using contour detection, processes are controlled more efficiently and with less interference.

Detecting and evaluating characteristic profiles — easily and flexibly. Contours, shapes and sizes are captured irrespective of position — for scanning distances up to 150 mm and fields of view up to 65 x 75 mm$^2$.

The intelligent Contour Vision Sensor CVS3 with integrated evaluation software differentiates between objects using shape or size; it detects the presence of, or damage to, printed labels and checks surfaces for contamination.

▼ The CVS3 distinguishes objects using the taught-in contour.
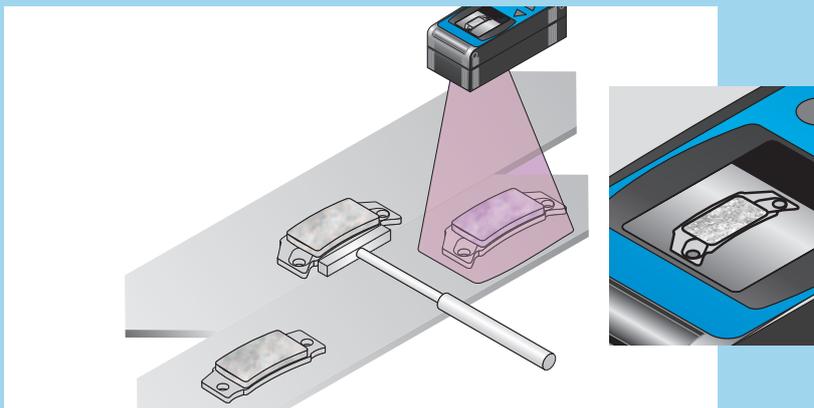


◄ The integrated memory can take teach-in data for up to 15 different objects; digital switching inputs permit external selection and, thus, fast and flexible product change-overs. During operation, all operational data required remains in view on the LCD display. Thus, the CVS3 combines all components of an image processing system in the smallest space.

▶ During setting and Teach-in, the LCD display supports the CVS3's optimum alignment. The parametrisation is done directly via the device's keypad. Automatic calculation of complex parameters and the serial interface also facilitate parametrisation; once settings are made, they can be stored on a PC and made available to other CVS3 units.

▼ Final checking of sunglasses. The CVS3 checks whether frames, lenses and ear pieces are where they belong.
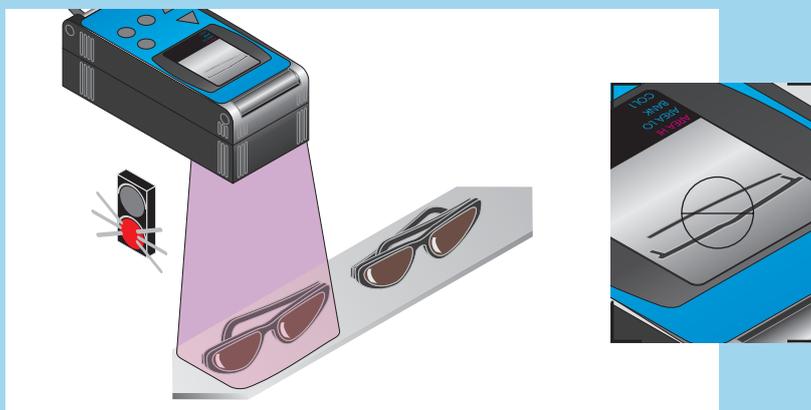


▼ Does the cap fit properly? The CVS3 ensures that only correctly assembled products are packaged.
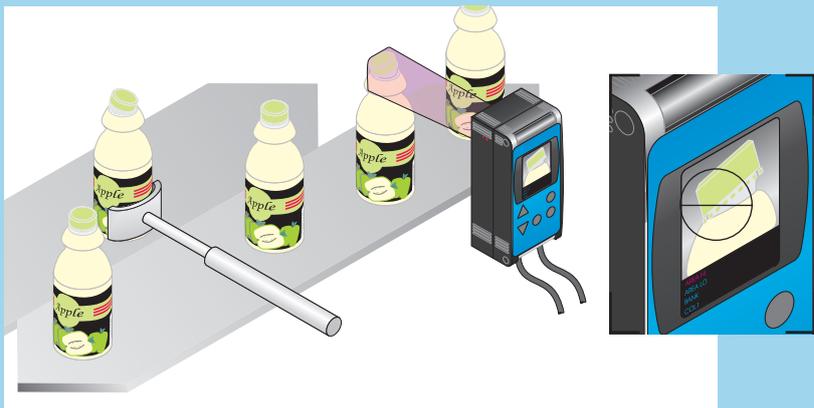


◄ With its robust and compact plastic housing and plastic front screen, the CVS3 is also particularly suitable for use in the food and beverage or pharmaceutical industries. And, thanks to IP 67 enclosure rating, it is particularly suitable for harsh industrial environments.

## Nominal scanning dist. 90 ... 150/ 31 ... 39 mm

**Contour Vision Sensors**

- ■ **Object detection**
  using shape or size
- ■ **Check for surface contamination**
- ■ **Memory capacity for 15 images**

C E

### Dimensional drawing

21

28.2

**2**

**1**

**3**

**4**

**33.8**

2–Ø4.3

4

4.2

**5**

87

**5**

**42**

**6**

**7**

**95**

11

### Adjustments possible

**6**

UP

DOWN

SET

VIEW

TEACH /EXIT

**7**

| | |
|---|---|
| 1 | Front screen |
| 2 | Lighting |
| 3 | Connection: external lighting/ monitor/ PC |
| 4 | Connecting cable |
| 5 | Fixing hole |
| 6 | Colour display |
| 7 | Input keypad |

### Connection type

**All types**

**3** Connection: external lighting/ monitor/ PC

**Cable, 8-wire**

| | | |
|---|---|---|
| brn | | L+ |
| blu | | M |
| ora/ blk | | Bank switch 0 |
| yel/ blk | | Bank switch 1 |
| pnk | | Bank switch 2/ External Teach |
| vio | | Bank switch 3/ Synchronous input |
| blk | | Q |
| red/ blk | | Auxiliary Q/ Lighting control output |

| Technical data | CVS3- | P122 | P132 | N122 | N132 | |
|---|---|:-:|:-:|:-:|:-:|---|
| Nominal scanning distance/Field of view | 90 ... 150 mm/40 x 50 ... 65 x 75 mm² | ■ | | ■ | | |
| | 31 ... 39 mm/15 x 18 ... 19 x 22 mm² | | ■ | | ■ | |
| Light source [1] | 12 x LED, white | ■ | ■ | ■ | ■ | |
| Resolution | Max. 208 x 236 x 3 (RGB) | ■ | ■ | ■ | ■ | |
| Supply voltage $V_S$ [2] | 12 ... 24 V DC | ■ | ■ | ■ | ■ | |
| Current consumption [3] | < 140 mA (at 24 V) | ■ | ■ | ■ | ■ | |
| Interface | RS 232 TTL (4800 ... 57600 Baud) | ■ | ■ | ■ | ■ | |
| Switching outputs | PNP | ■ | ■ | | | |
| | NPN | | | ■ | ■ | |
| Output current $I_A$ max. | < 100 mA | ■ | ■ | ■ | ■ | |
| Response time (min./typ./max.) [4] | 7/48/398 ms | ■ | ■ | ■ | ■ | |
| Switching inputs | External trigger, Teach and | ■ | ■ | ■ | ■ | |
| | memory selection | ■ | ■ | ■ | ■ | |
| I/O + $V_S$ connection | Cable 8-pin cable, L = 2 m | ■ | ■ | ■ | ■ | |
| Ambient temperature $T_A$ [5] | Operation:    0 °C ... +40 °C | ■ | ■ | ■ | ■ | |
| | Storage:   −20 °C ... +70 °C | ■ | ■ | ■ | ■ | |
| Shock load | 5 g, 6 directions | ■ | ■ | ■ | ■ | |
| Housing material | ABS, acrylic, polycarbonate | ■ | ■ | ■ | ■ | |
| Enclosure rating | IP 67 | ■ | ■ | ■ | ■ | |
| Weight | 180 g | ■ | ■ | ■ | ■ | |

1) Average service life 50,000 h
at TA = +25 °C; 50 % drop-in intensity
2) Limit values ± 10%
3) Without load

4) Dependent on settings;
as displayed
5) Rel. humidity: 35 ... 85 % at operation,
95% at storage

**Order information**

| Contour Vision Sensor CVS3 | | Accessories | |
|---|---|---|---|
| **Type** | **Order no.** | **Type** | **Order no.** |
| CVS3-P122 | 1028673 | CVSM-1, external operating device incl. monitor and keypad | 1026355 |
| CVS3-P132 | 1028674 | CVSL-S5, external lighting, 12 x LED, white | 1026356 |
| CVS3-N122 | 1028671 | Connecting Cable DSL-SH06-G03M, 3 m | 6028659 |
| CVS3-N132 | 1028672 | Connection cable DSL-DH06-G02M, 2 m for save/load configuration files to/from PC | 6029801 |
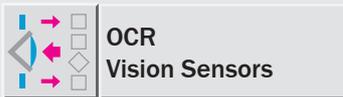
# OCR Vision Sensor: Detection and Readout of Dates, Times, Strings and Batch Numbers.

**F**lexible image processing in the smallest space.

For scanning distances up to 150 mm and fields of view up to 79 x 76 mm$^2$, the CVS4 detects, recognises and, if required, counts characters. The CVS4's integrated OCR evaluation software reads 60 characters on up to six lines, securely capturing up to four different formats such as two dates and times each.

Further more the CVS4 can with advantage be used for batch code checking with its support for count-up at trigger input.

▼ Some products must be uniquely identifiable via a serial number. The CVS4 also counts the characters.
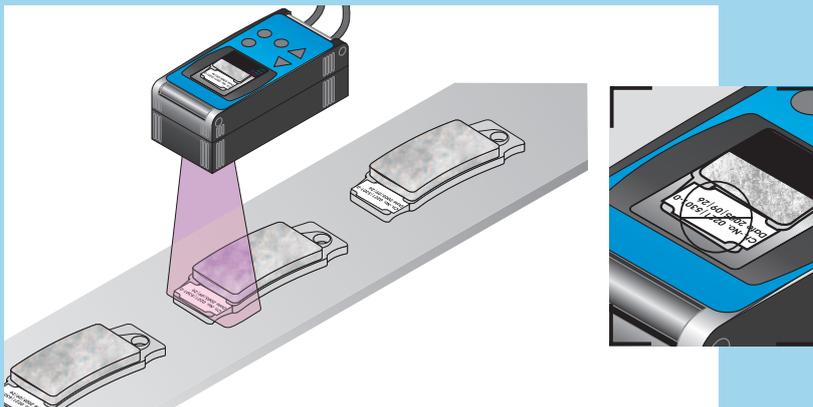


◄ Integrated character set database and clock as well as 18 predefined date and time formats allow fast setup. The character set can be extended by up to 57 user-defined characters; the internal clock ensures automatic date change at midnight. Even the recognition of consecutive or sequenced serial numbers presents the CVS4 with no challenge, thanks to the pulse counting input. The memory has a maximum capacity for 16 date/time formats, which can be selected via external signals. And up to 30 error images can be stored, for complete process control.

► During setting and Teach-in, the display supports the sensor's optimum alignment. The parameterisation is done directly via the device's keypad. Automatic calculation of complex parameters also simplifies commissioning. During operation, all operational data required remains on view via the LCD display. Thus, the CVS4 combines all components of an image processing system in the smallest space.

▼ Attention to detail is essential for similar-looking but different products: The CVS4 ensures that the label shows what is inside.
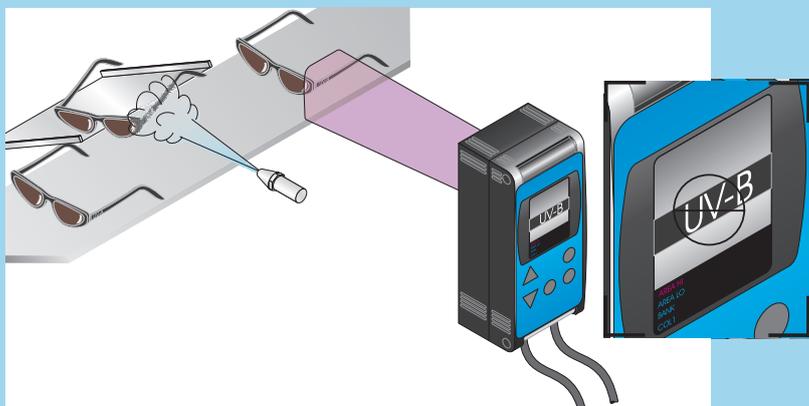


▼ The unique identification of a product is key in the food industry. The CVS4 checks if the batch number is correct and, by controlling the use-by date, ensures transparency for the customer.
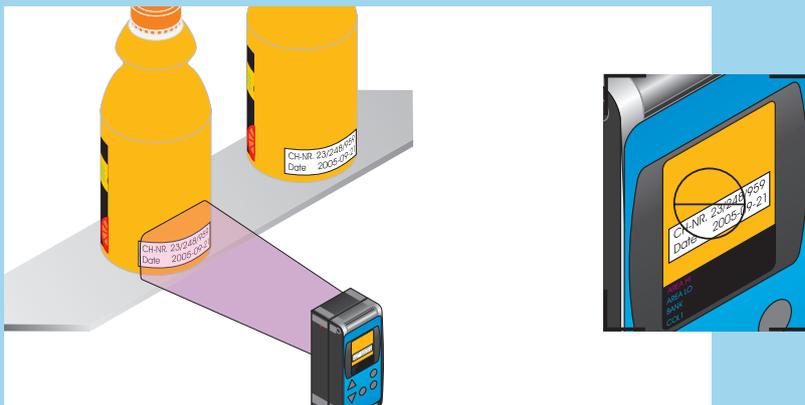


◄ With its robust and compact plastic housing and plastic front screen, the CVS4 is also particularly suitable for use in the food and beverage or pharmaceutical industries. And, thanks to IP 67 enclosure rating, it is particularly suitable for harsh industrial environments.

**Nominal scanning dist.**
90 … 150/40 … 100/
44 … 56/31 … 39 mm

OCR Vision Sensors

■ **Detecting date,**
**time, string or batch number**

■ **Memory capacity of 16**
**teach configurations**
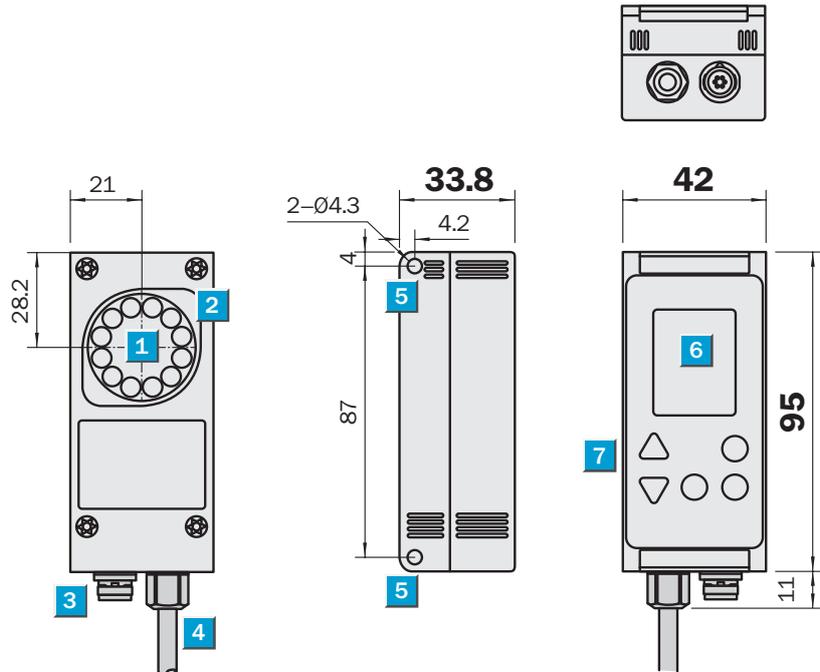
CE

**Dimensional drawing**

21
28.2
2
1
3
4

33.8
2–Ø4.3
4
4.2
5
87
5

42
6
7
95
11

**Adjustments possible**

6
7

| | |
|---|---|
| 1 | Front screen |
| 2 | Lighting |
| 3 | Connection: external lighting/ monitor/ PC |
| 4 | Connecting cable |
| 5 | Fixing hole |
| 6 | Colour display |
| 7 | Input keypad |

**Connection type**

All types
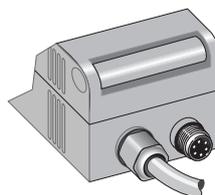
3 Connection: external
lighting/ monitor/ PC

Cable, 8-wire

| | | |
|---|---|---|
| brn | | L+ |
| blu | | M |
| ora/blk | | Bank switch 0/Encode input |
| yel/blk | | Bank switch 1/String+ input |
| pnk | | Bank switch 2/External Teach |
| vio | | Bank switch 3/Synchronous input |
| blk | | Q |
| red/blk | | Auxiliary Q/Lighting control output |

| Technical Data | CVS4- | N122 | N132 | N152 | N150 | N142 | P122 | P132 | P152 | P150 | P142 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal scanning distance/Field of view | 90 ... 150 mm/ 53 x 25 ... 79 x 38 mm²; | ■ | | | | | ■ | | | | |
| | 53 x 50 ... 79 x 76 mm² | ■ | | | | | ■ | | | | |
| | 40 ... 100 mm/ 53 x 25 ... 115 x 53 mm² | | ■ | | | | | ■ | | | |
| | 44 ... 56 mm/ 30 x 15; 30 x 30 mm² | | | ■ | | | | | ■ | | |
| | 44 ... 56 mm/ 15 x 30; 30 x 30 mm² | | | | ■ | | | | | ■ | |
| | 31 ... 39 mm/ 21 x 10; 21 x 20 mm² | | | | | ■ | | | | | ■ |
| Character width/ height (min ... max.) | 2.8 ... 30 mm/2.8 ... 62 mm | ■ | | | | | ■ | | | | |
| | 1.0 ... 11 mm/1.1 ... 24 mm | | | ■ | ■ | | | | ■ | ■ | |
| | 0.75 ... 8,2 mm/0.75 ... 16 mm | | | | | ■ | | | | | ■ |
| | 2.8 ... 44 mm/ 2.8 ... 43 mm | | ■ | | | | | ■ | | | |
| Light source [1] | 12 x LED, white | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Resolution | Max. 512 x 244 pixels (b/w) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Supply voltage $V_S$ [2] | 12 ... 24 V DC | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Current consumption [3] | < 140 mA (at 24 V) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Interface | RS 232 TTL (4800 ... 15200 Baud) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Switching outputs | NPN | ■ | ■ | ■ | ■ | ■ | | | | | |
| | PNP | | | | | | ■ | ■ | ■ | ■ | ■ |
| Output currents $I_A$ max. | < 100 mA | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Response time [4] | 23 ... 48 ms [5] | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Switching inputs | External trigger, Teach, pulse counter, | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | string+ and memory selection | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Filter switching inputs | < 12 ms [6] | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | < 48 µs (on)/< 450 µs (off) [7] | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Accuracy of integrated clock | Approx. -45 s ... +75 s per month | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Power reserve of integrated clock | Stage 1: 3 days approx. [8] | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Stage 2: 5 years approx. [9] | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| I/O + $U_S$ connection | 8-pin cable, L = 2 m | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Ambient temperature $T_A$ [10] | Operation:    0 °C ... +40 °C | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Storage:   −20 °C ... +70 °C | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Shock load | 5 g, 6 directions | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Housing material | ABS, acrylic, polycarbonate | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Enclosure rating | IP 67 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Weight | 200 g | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Number of recognisable characters | 60 characters max. (across all lines) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 6 lines max. | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 30 characters max. per line | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Recognisable date formats | Date, time, continuous serial/batch no. | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Max. of 4 different formats simultaneously [11] | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Inbuilt dictionary | . / 0 to 9 : A to Z | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| User defined characters | 56 characters [12] | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

[1] Average service life 50,000 h at $T_A$ = +25 °C; 50% drop-in intensity
[2] Limit values ± 10%
[3] Without load
[4] Dependent on settings; as displayed
[5] 20-character date code in 2 lines
[6] For string + , teach and memory selection
[7] For external trigger and pulse counters
[8] With capacitor without $V_S$
[9] With battery, without $V_S$
[10] Rel. humidity: 35 ... 85 % at operation, 95% at storage
[11] Max. 2 date and/or time formats each, plus serial/batch number can be combined
[12] Can be created and transmitted by PC

## Order information

### OCR Vision Sensor CVS4

| Type | Order no. | Type | Order no. |
|---|---|---|---|
| CVS4-P122 | 1028679 | CVS4-N122 | 1028675 |
| CVS4-P132 | 1028680 | CVS4-N132 | 1028676 |
| CVS4-P142 | 1028965 | CVS4-N142 | 1028966 |
| CVS4-P150 | 1028682 | CVS4-N150 | 1028678 |
| CVS4-P152 | 1028681 | CVS4-N152 | 1028677 |

### Accessories

| Type | Order no. |
|---|---|
| CVSM-1, external operating device incl. monitor and keypad | 1026355 |
| CVSL-S5, external lighting, 12 x LED, white | 1026356 |
| Connection cable DSL-SH06-G03M, 3 m | 6028659 |
| Connection cable DSL-DH06-G02M, 2 m for CVS data transfer and save/load configuration files to/from PC | 6029801 |
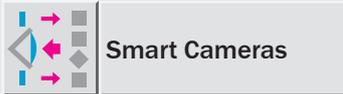
**Smart Cameras**

# IVC-2D: High Performance Smart Camera for Industrial Environment

Top-Performance to meet production demands of tomorrow: A powerful processor, optimized pixel processing in FPGA and advanced machine vision tools ensure that you never fail to inspect the object in time, even at the highest production speed.

Benefits with IVC-2D:
- Robust design for industrial environments
- Equipped with industrial lighting modules
- Multiple inspections in one camera
- Industrial solutions with a complete set of accessories
- Sub-pixel measurements

IVC-2D is a high performance smart camera for flexible automation solutions. Rapid prototyping is ensured by the user-friendly IVC Studio software, giving the user quick and easy access to more than 100 powerful image processing tools. Once configured the camera works in stand-alone mode, without the need for a PC.

Examples:
- Cap position and angle measurement
- Fill level inspection
- Precision measurements and verification of tolerances
- Packaging and printing checked in one step
- Type identification by OCR, barcode and 2D code tools

► The flexible IVC-2D camera can easily inspect many features simultaneously - in this case cap position, fill level and label.



► IVC-2D can reach accuracy in the micrometer range using advanced sub-pixel measurement tools.
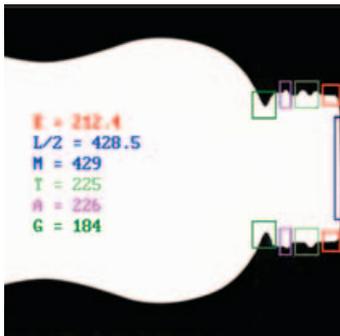




◄ Packaging and printing using OCR/OCV; The IVC-2D camera can not only check geometries, but simultaneously detect and read figures, letters, 2D codes and bar codes, e.g. sell-by dates for food or batch numbers on pharmaceutical packages. The camera system thus becomes a complete solution for inspecting a product's packaging and printing in a single pass.
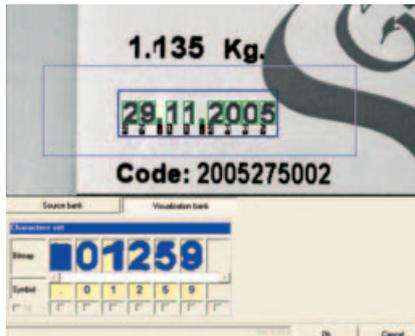
## Resolution
**640x480**
**1024x768**
Smart Cameras

- **Robust design for industrial environments**
- **Equipped with industrial lighting modules**
- **Multiple inspections in one camera**
- **Industrial solutions with a complete set of accessories**
- **Sub-pixel measurements**

CE

### Dimensional drawing
Camera IVC-2D

13.7
29.7
45.7
60
32
11
13.2
16.7
11.3
26.8
**54.5**
**160.6**
M5
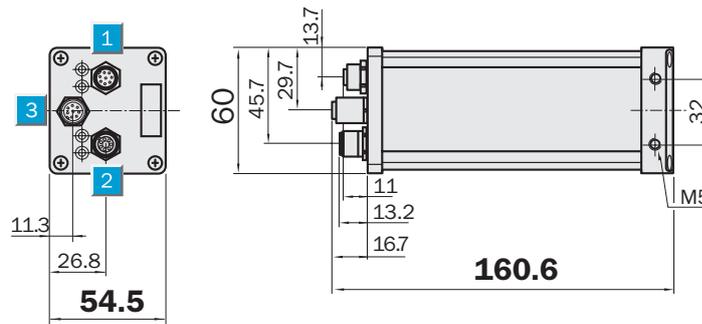
| 1 | Power I/O: M12, 8-pin, male (Illumination trigger output) |
| 2 | Ethernet: M12, 4-pin, D-coded, female |
| 3 | RS 485 M12, 8-pin, female |

### Camera IVC-2D with adapter plate for ring light
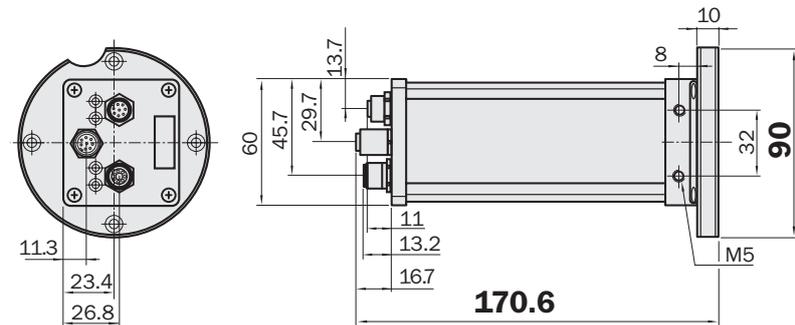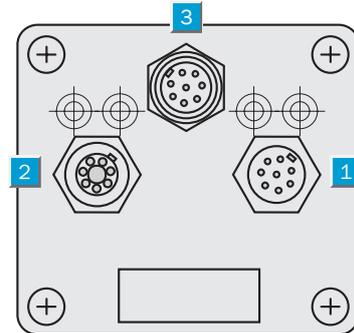
13.7
29.7
45.7
60
10
8
32
**90**
11
13.2
16.7
11.3
23.4
26.8
**170.6**
M5

### Connection type

| 1 | Power I/O: M12, 8-pin, male |
| 2 | Ethernet: M12, 4-pin, D-coded, female |
| 3 | RS 485: M12, 8-pin, female |

**1**
| wht | 1 | Trigger In/In 0 |
| brn | 2 | DC 24V |
| grn | 3 | Out 0 |
| yel | 4 | Out 1 |
| gra | 5 | In 1 |
| pnk | 6 | In 2 |
| blu | 7 | GND |
| red | 8 | Trigger Out |

**2**
| 1 | TX+ |
| 2 | RX+ |
| 3 | TX- |
| 4 | RX- |
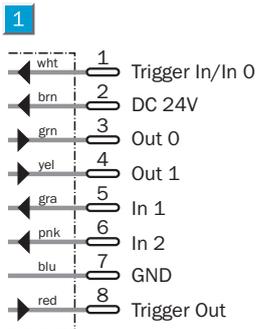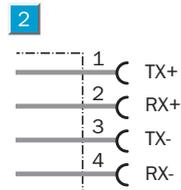
**3**
| wht | 1 | TRA |
| brn | 2 | not con. |
| grn | 3 | Out 2 |
| yel | 4 | not con. |
| gra | 5 | GND |
| pnk | 6 | GND |
| blu | 7 | TRB |
| red | 8 | In 3 |

| M12, 8-pin, female plug with cable, 2 m, for power and I/0 | |
|---|---|
| **Order no.** | 6020633 |

| M12, 4-pin, (D-coded) to RJ45 Ethernet cable, 3 m | |
|---|---|
| **Order no.** | 6029630 |

| M12, 8-pin, male with 2 m cable for RS485 and secondary I/0 | |
|---|---|
| **Order no.** | 6029330 |

| M12, 8-pin, female plug with cable, 5 m, for power and I/0 | |
|---|---|
| **Order no.** | 6020993 |

| M12, 8-pin, male with 5 m cable for RS485 and secondary I/0 | |
|---|---|
| **Order no.** | 6029331 |
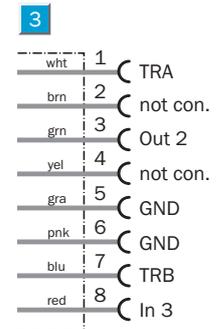
## Technical data

| Technical data | IVC-2D | M1111 IVC-2D Standard | M1121 IVC-2D HiRes | M1112 IVC-2D Reader | M1122 IVC-2D HiRes Rdr | R1111 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Performance | 800 MHz processor and FPGA | ■ | ■ | ■ | ■ | | | | | |
| | 150 MHz processor and FPGA | | | | | ■ | | | | |
| Memory | 128 MB RAM 16 MB flash | ■ | ■ | ■ | ■ | | | | | |
| | 64 MB RAM 16 MB flash | | | | | ■ | | | | |
| Interface | 10/100 MB Fast Ethernet TCP/IP, UDP/IP | ■ | ■ | ■ | ■ | ■ | | | | |
| Serial interface | RS 485 | ■ | ■ | ■ | ■ | ■ | | | | |
| Digital I/O | 4 program control inputs (1 trigger input) | ■ | ■ | ■ | ■ | ■ | | | | |
| | 3 program control output | ■ | ■ | ■ | ■ | ■ | | | | |
| | Illumination trigger output | ■ | ■ | ■ | ■ | ■ | | | | |
| Enclosure rating | IP 65 with hood | ■ | ■ | ■ | ■ | ■ | | | | |
| Options | Stainless steel enclosure | ■ | ■ | ■ | ■ | ■ | | | | |
| Dimensions (L x H x D) | 161 x 55 x 60 mm | ■ | ■ | ■ | ■ | ■ | | | | |
| Resolution | 640 x 480 | ■ | | ■ | | ■ | | | | |
| | 1024 x 768 | | ■ | | ■ | | | | | |
| OCR/OCV | | | | ■ | ■ | | | | | |
| 2D codes/ Bar codes[1] | | | | ■ | ■ | | | | | |
| Imager | CCD, electronic shutter | ■ | ■ | ■ | ■ | ■ | | | | |
| Frame rate | 30 Fps | ■ | | ■ | | ■ | | | | |
| | 24 Fps | | ■ | | ■ | | | | | |
| Lens adapter | CS-mount and C-mount [2] | ■ | ■ | ■ | ■ | ■ | | | | |
| Images size | 1/3", 4.8 mm x 3.6 mm | ■ | ■ | ■ | ■ | ■ | | | | |
| Ambient temperature | Operation: 0 ºC … 50 ºC | ■ | ■ | ■ | ■ | ■ | | | | |
| | Storage: −20 ºC … 70 ºC | ■ | ■ | ■ | ■ | ■ | | | | |
| Weight | Approx. 505 g | ■ | ■ | ■ | ■ | ■ | | | | |
| Housing material | Aluminium, anodized | ■ | ■ | ■ | ■ | ■ | | | | |
| | Connectors = Nickel plated brass | ■ | ■ | ■ | ■ | ■ | | | | |
| | Front window of hood = PMMA | ■ | ■ | ■ | ■ | ■ | | | | |

[1] For example: EAN-13, UPC-A, EAN-8, code 39, code 128, pharmacode, i2of5, code 32, DATAMATRIX
[2] For CS-mount an adaptor ring should be removed

IVC Studio PC application development tool. Min system req. 550 MHz CPU, 128 MB RAM, CD-ROM or DVD, Fast Ethernet, Win 2000/WinXP.
Graphics driver support for OpenGL 1.3 or higher. IVC Studio in English and German

## Diagrams
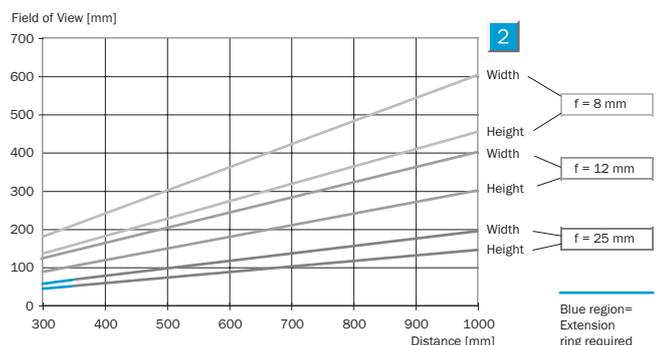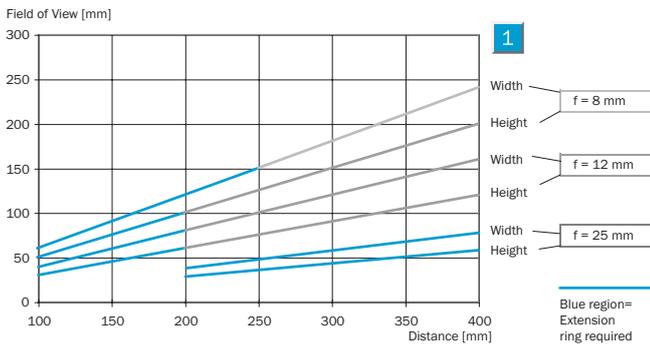


Field of views for a selection of SICK IVP lenses from
**1** 100 mm to 400 mm **2** 0.3 m to 1 m

## Order information

### Smart Cameras

| Type | Order no. |
|---|---|
| IVC-2DM1111 IVC-2D Standard | 1027190 |
| IVC-2DM1121 IVC-2D HiRes | 1028407 |
| IVC-2DM1112 IVC-2D Reader | 1029135 |
| IVC-2DM1122 IVC-2D HiRes Rdr | 1029136 |
| IVC-2DR1111 | 1040057 |

### Lenses

| Type | Order no. |
|---|---|
| Lens, 8 mm focal length | 5314041 |
| Lens, 12 mm focal length | 5314042 |
| Lens, 25 mm focal length | 5314043 |

### Lighting

| Type | Order no. |
|---|---|
| Ring light for IVC-2D with 12 high power LEDs, white, for working distances from 100 to 300 mm | 1027286 |
| Adapter plate for ring light 1027286 | 2033105 |
| T-splitter, M12, 8-pin for external light connection | 6026503 |
| M12-M12, 8-pin connector for external light | 6026625 |

### Optional as accessories

| Type | Order no. |
|---|---|
| Mounting bracket | 2032753 |
| Hood for IP65 | 2032637 |
| Hood for IP65 with ICL110 | 2032968 |
| Extension ring | 4041112 |

Smart Cameras

# IVC-3D: The First 3D Smart Camera in the World!

IVC-3D is the Key to True Shape Inspection:

The break pad application is an example of several inspections in one single shot:

- Surface defects
- Height position of the plug
- Angle of the metallic spring

All features are very difficult to detect by 2D cameras, but with IVC-3D the application is quickly developed in the graphical IVC Studio user interface.

Contrast-Independent Inspection by 3D Measurement:

The verification of praline box content requires a system that can check dark objects on a dark background. 3D is superior when there is low contrast. The praline application is an example of:

- Correct 3D shape inspection
- Verification of individual praline position
- Missing praline detection by robust height measurement

The IVC-3D is the first Smart Camera in the world that is designed to inspect and measure in three dimensions. With tools that are designed to measure height, volume, shape and profiles, 3D applications are now easily solved with the IVC-3D Smart Camera.

Calibrated 3D Inspection at Production Speeds:
With the factory-calibrated IVC-3D your glue string inspection is done extremely fast and accurate. With a conveyor speed of 1 meter/ second the verification of the glue string cross-section is done each half millimeter.

▶ The break pad application



▶ Contrast-Independent
Inspection by 3D Measurement
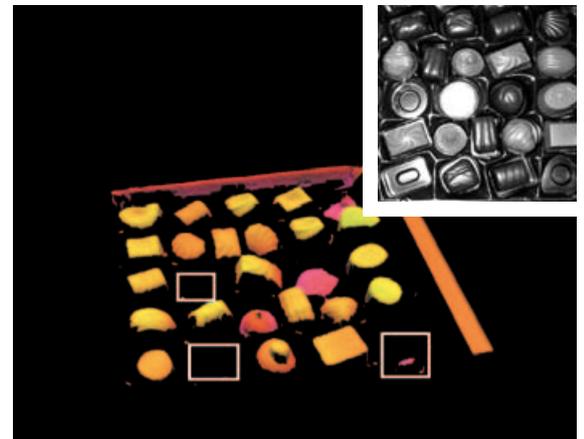


▶ Calibrated 3D Inspection
at Production Speeds



## Field of view (mm)



265

440

395

Example
field of view

810

**IVC-3D 200**

184

135

84

Example
field of view
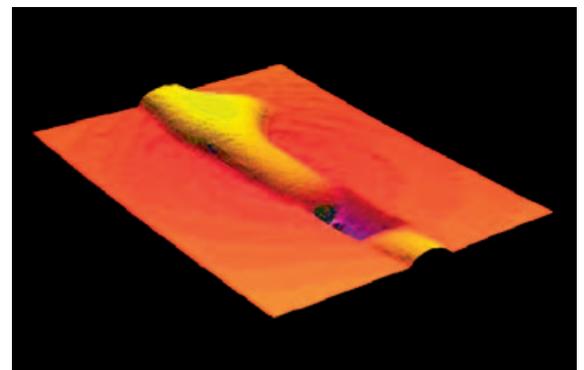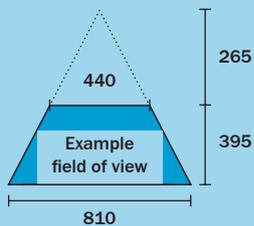
180
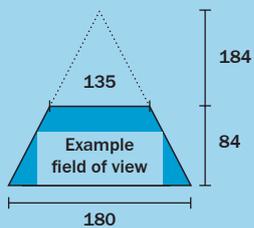
**IVC-3D 50**

## Field of view (HxW)
**200x600 mm**
**50x150 mm**
Smart Cameras

- **The first 3D Smart Camera available**
- **Calibrated 3D inspection at production speed**
- **Contrast independent inspection**
- **Robust industrial design**

CE

**Dimensional drawing**

**IVC-3D 200**
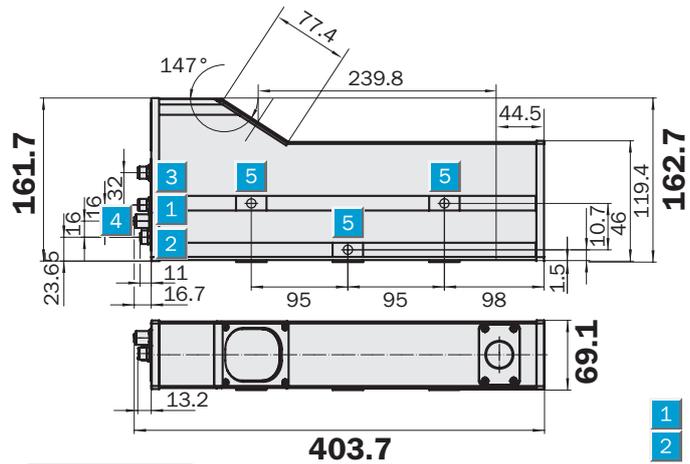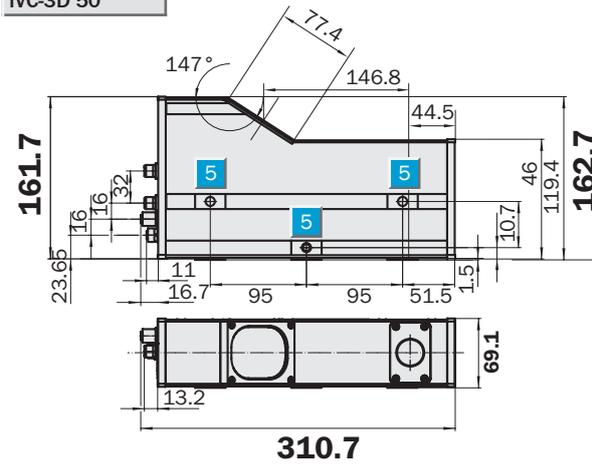
147° · 77.4 · 239.8 · 44.5
161.7 · 162.7
16 · 32 · 16
23.65 · 11 · 16.7 · 95 · 95 · 98 · 1.5
119.4 · 46 · 10.7
**403.7**
13.2 · **69.1**

**IVC-3D 50**

147° · 77.4 · 146.8 · 44.5
161.7 · 162.7
16 · 32 · 16
23.65 · 11 · 16.7 · 95 · 95 · 51.5 · 1.5
119.4 · 46 · 10.7
**310.7**
13.2 · **69.1**

1 Power I/O: M12, 8-pin, male
2 Ethernet: M12, 4-pin, D-coded, female
3 Encoder: M12, 5-pin, male
4 RS 485: M12, 8-pin, female
5 The mounting holes have the same position on the back and the upper side

**Connection type**

1 Power I/O: M12, 8-pin, male
2 Ethernet: M12, 4-pin, D-coded, female
3 Encoder: M12, 5-pin, male
4 RS 485: M12, 8-pin, female

**1**
| | | |
|---|---|---|
| wht | 1 | Trigger In/In 0 |
| brn | 2 | DC 24V |
| grn | 3 | Out 0 |
| yel | 4 | Out 1 |
| gra | 5 | In 1 |
| pnk | 6 | In 2 |
| blu | 7 | GND |
| red | 8 | Trigger Out |

**2**
| | | |
|---|---|---|
| | 1 | TX+ |
| | 2 | RX+ |
| | 3 | TX- |
| | 4 | RX- |

**3**
| | | |
|---|---|---|
| | 1 | In1⁻ |
| | 2 | In2 |
| | 3 | In2⁻ |
| | 4 | In1 |
| | 5 | GND |
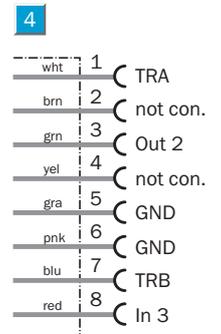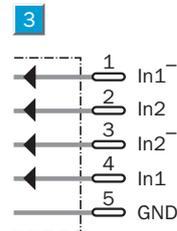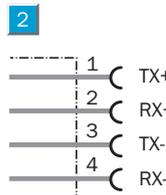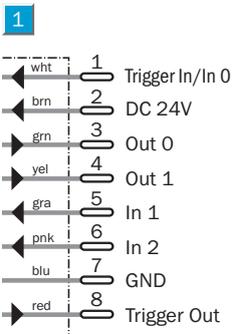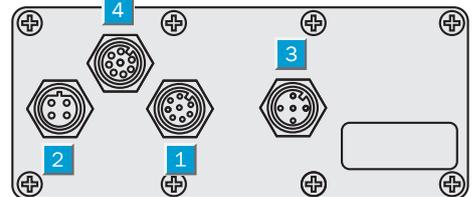
**4**
| | | |
|---|---|---|
| wht | 1 | TRA |
| brn | 2 | not con. |
| grn | 3 | Out 2 |
| yel | 4 | not con. |
| gra | 5 | GND |
| pnk | 6 | GND |
| blu | 7 | TRB |
| red | 8 | In 3 |

| M12, 8-pin, female plug with cable, 2 m, for power and I/O | M12, 4-pin, (D-coded) to RJ45 Ethernet cable, 3 m | M12, 5-pin, female with 2 m cable for Encoder | M12, 8-pin, male with 2 m cable for RS 485 and secondary I/O |
|---|---|---|---|
| Order no. 6020633 | Order no. 6029630 | Order no. 6008899 | Order no. 6029330 |

| M12, 8-pin, female plug with cable, 5 m, for power and I/O | | M12, 5-pin, female with 5 m cable for Encoder | M12, 8-pin, male with 5 m cable for RS 485 and secondary I/O |
|---|---|---|---|
| Order no. 6020993 | | Order no. 6009868 | Order no. 6029331 |

| M12, 5-pin, female with 10 m cable for Encoder |
|---|
| Order no. 6010544 |

05-08-2006

| Technical data | IVC-3D | 11111 IVC-3D 200 | 21111 IVC-3D 50 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance | 5000 profiles/second, | ■ | ■ | | | | | | | | |
| | 800 MHZ processor and FPGA | | | | | | | | | | |
| Interface | 10/100 MB Fast Ethernet TCP/IP, UDP/IP | ■ | ■ | | | | | | | | |
| Serial interface | RS 485 | ■ | ■ | | | | | | | | |
| Digital I/O | 3 program control inputs (1 trigger input) | ■ | ■ | | | | | | | | |
| | 3 program control output | ■ | ■ | | | | | | | | |
| | Trigger output | ■ | ■ | | | | | | | | |
| Encoder interface | RS 422 | ■ | ■ | | | | | | | | |
| Max encoder frequency | 2 MHz | ■ | ■ | | | | | | | | |
| Enclosure rating | IP 65 | ■ | ■ | | | | | | | | |
| Laser class | 2M/2 | ■ | ■ | | | | | | | | |
| Example field of view (H x W) | 200 x 600 mm | ■ | | | | | | | | | |
| | 50 x 150 mm | | ■ | | | | | | | | |
| 3D height resolution | 0.2 mm | ■ | | | | | | | | | |
| | 0.04 mm | | ■ | | | | | | | | |
| Max profile width | 1024 points | ■ | ■ | | | | | | | | |
| Dimensions (L x H x D) | 387 x 163 x 69 mm | ■ | | | | | | | | | |
| | 294 x 163 x 69 mm | | ■ | | | | | | | | |
| Laser wavelength | Typ 660 nm ± 10 nm | ■ | ■ | | | | | | | | |
| Power supply | 24 V DC 20% | ■ | ■ | | | | | | | | |
| Current consumption | < 1 A | ■ | ■ | | | | | | | | |
| Ambient temperature | Operation:    0 ºC ... +40 ºC | ■ | ■ | | | | | | | | |
| | Storage:   –20 ºC ... +70 ºC | ■ | ■ | | | | | | | | |
| Weight | Approx. 4 kg | ■ | | | | | | | | | |
| | Approx. 3.2 kg | | ■ | | | | | | | | |
| Housing material | Aluminium, anodized | ■ | ■ | | | | | | | | |
| | Connectors = Nickel plated brass | ■ | ■ | | | | | | | | |
| | Front windows = compound glass | ■ | ■ | | | | | | | | |

IVC Studio PC application development tool

Min. system req. 550 MHz CPU, 128 MB RAM, CD-ROM or DVD, Fast Ethernet, Win 2000/WinXP. Graphics driver support for OpenGL 1.3 or higher.

IVC Studio in English and in German.

| Order information | |
|---|---|
| **Smart Cameras** | |
| **Type** | **Order no.** |
| IVC-3D11111 IVC-3D 200 | 1027539 |
| IVC-3D21111 IVC-3D 50 | 1027538 |

**3D Cameras**
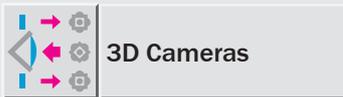
# Ranger C: Fastest 3D Available!

Benefits with Ranger C:
- The fastest 3D available!
- Easy to integrate into existing CameraLink systems
- Flexible product for a wide range of applications
- Best market price/ performance
- Flexible field of view due to free choice of lens and geometry

Examples:
- Volume measurement of solder paste
- Quality of substrates and components
- True shape of logs in sawmill
- Food portioning
- Glue string measurement
- Robot guidance
- Tire inspection
- Rail inspection

The Ranger C is the ultimate 3D camera for the most advanced needs. With its extreme speed, flexible choice of illumination and optics and with 3rd party imaging software it can be used to solve almost any problem.

The Ranger C can acquire up to 30,000 profiles per second, each containing up to 1536 high-quality 3D coordinates. The complete 3D calculation is done inside the camera and the ready-to-use 3D coordinates are sent directly to a standard PC via CameraLink.

▶ The 3D data is transferred to the PC via CameraLink for easy access. This enables you to base your application as your own, or commercially available imaging libraries.
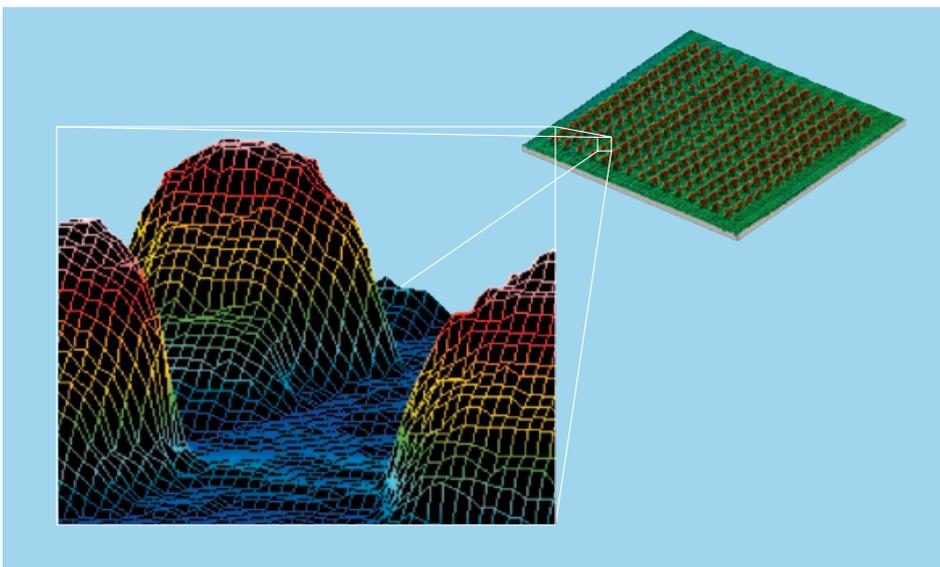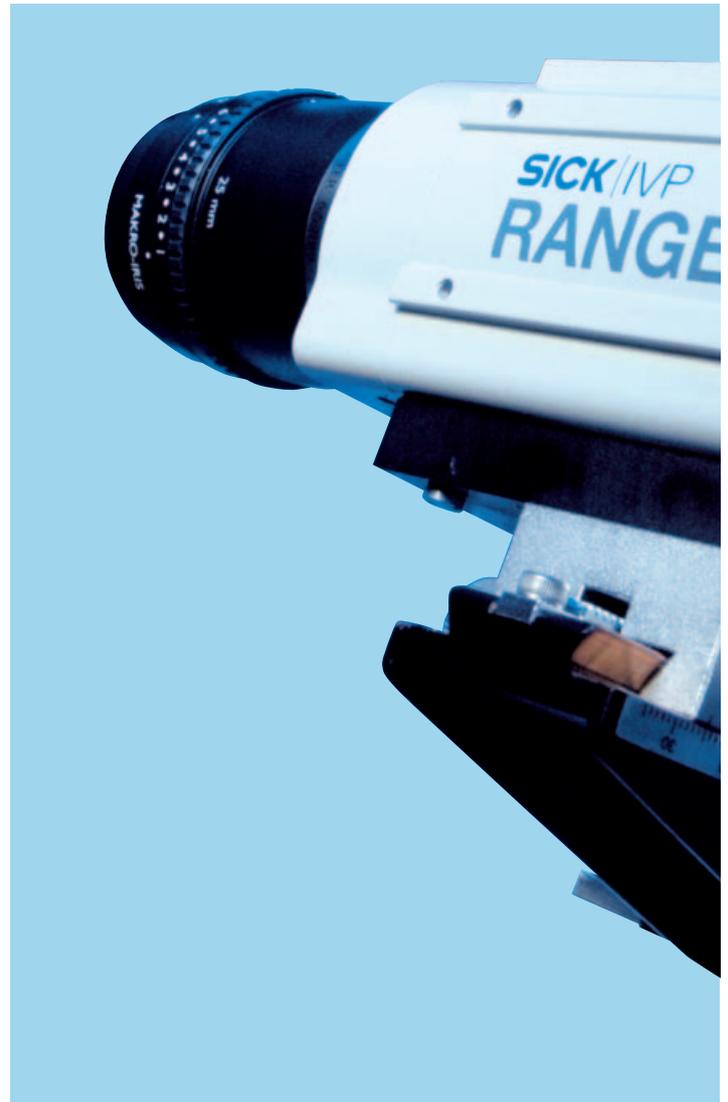
**Component Inspection**

**Board Inspection**
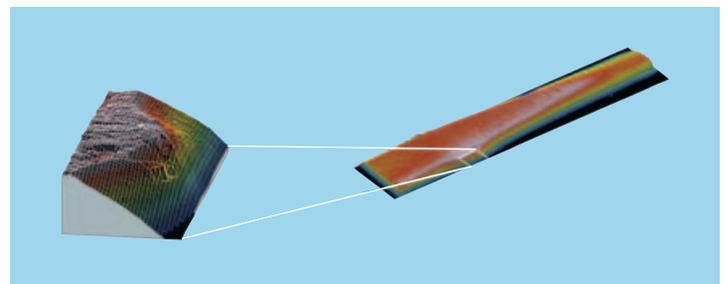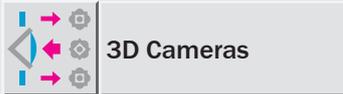
# MultiScan on Ranger C: Measure it All at Once!
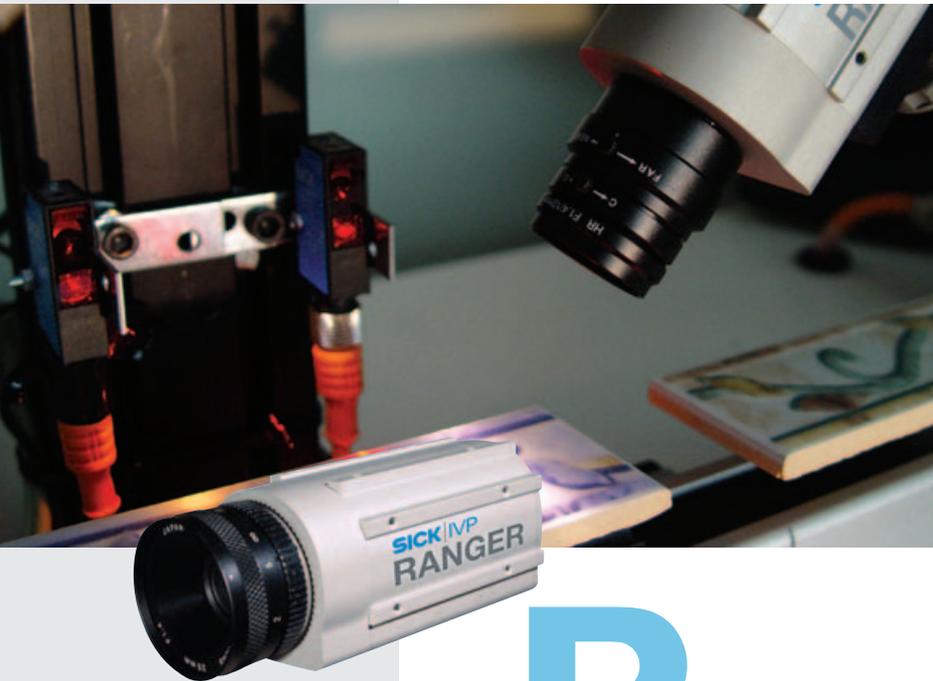
Benefits with MultiScan on Ranger C :

- One camera instead of many
- Up to 1536 pixel 3D width
- Up to 3072 pixel greyscale line width
- Best market price/ performance

Examples:

- Wood quality grading
- Ceramic tile quality grading
- Size and quality grading of fruits
- Rubber and plastic extrusion

Ranger C supports MultiScan measurement – this means that the camera can acquire a number of properties (such as 3D, grey-scale and scatter) of the measured object in the same scan.

One of the benefits of the Multi-Scan feature is a more robust result by combining 3D and greyscale information for decision making. A second advantage is the need of only one camera, where in other cases there is need for one area camera and one or several line scan cameras to produce the same result.

◀ The speed and performance is extremely high thanks to SICK IVP's unique and patented sensor technology. MultiScan is the solution for any in-line inspection task where 2D or 3D alone does not solve the problem.

## High Speed 3D
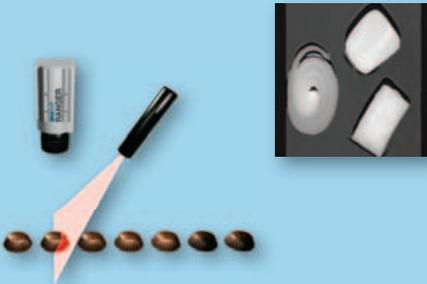
## High resolution greyscale
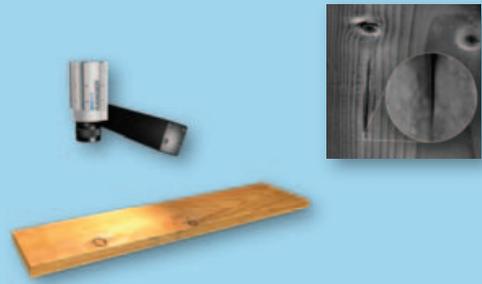
## Gloss measurement
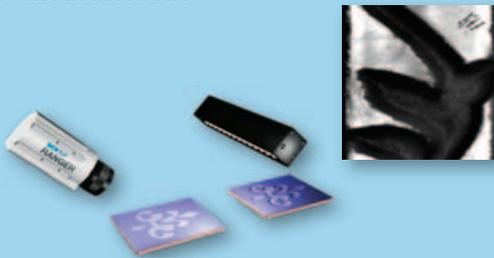
## Laser Scatter
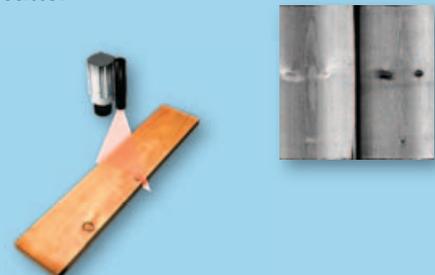
| | Sensor Resolution |
|---|---|
| | 1536x512 |
| | 512x512 |
| 3D Cameras | |

- **The fastest 3D available!**
- **Multiscan technology**
- **Easy to integrate into existing CameraLink systems**
- **Flexible product for a wide range of applications**
- **Best market price/ performance**
- **Flexible field of view due to free choice of lens and geometry**

**Dimensional drawing**

Ranger C Camera dimension, mid (mm)
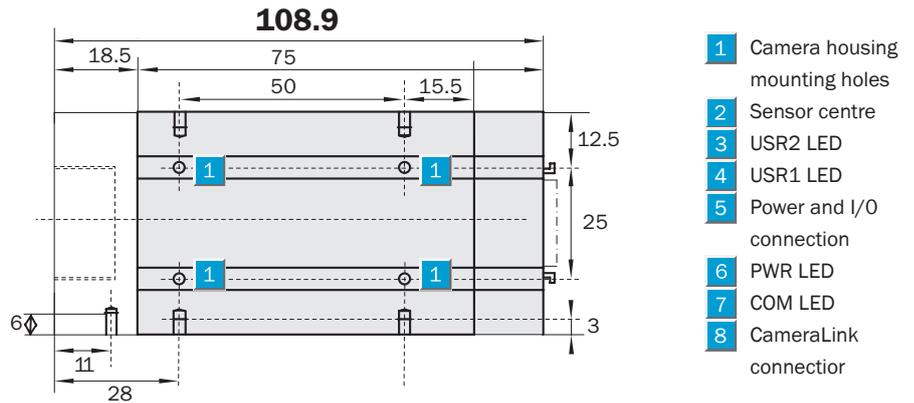


| 1 | Camera housing mounting holes |
|---|---|
| 2 | Sensor centre |
| 3 | USR2 LED |
| 4 | USR1 LED |
| 5 | Power and I/0 connection |
| 6 | PWR LED |
| 7 | COM LED |
| 8 | CameraLink connection |

Ranger C Camera dimension, rear (mm)
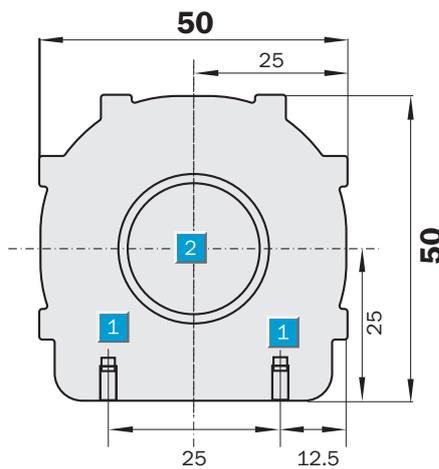
Ranger C Camera dimension, front (mm)
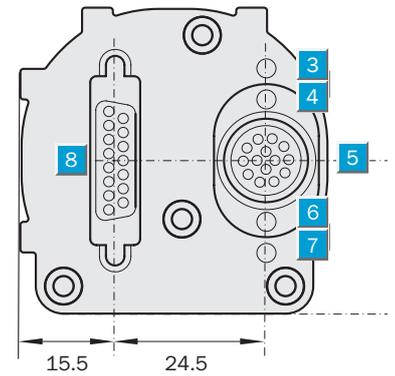


**Connection type**

Power and I/0

CameraLink Connector
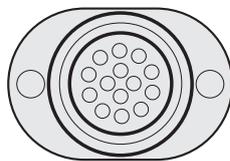


| 1 | Reserved |
|---|---|
| 2 | Reserved |
| 3 | In2 |
| 4 | In1 |
| 5 | In0 |
| 6 | In4 |
| 7 | In3 |
| 8 | Out0 |
| 9 | Reserved |
| 10 | Reserved |
| 11 | nReset |
| 12 | Reserved |
| 13 | Gnd |
| 14 | Pwr |

The CameraLink Connector is specified in the CameraLink standard and is a 26-position high-density Mini D Ribbon (MDR) female plug.

| Power and I/0 cable, 3 m | |
|---|---|
| **Order no.** | 1014266 |

| CameraLink cable, 3 m | |
|---|---|
| **Order no.** | 1014310 |

## Technical data

| Technical data | Ranger C | 55 | 50 | 40 | 50-IR | 55-IR |
|---|---|---|---|---|---|---|
| Performance | Up to 30,000 3D profiles per second | ■ | ■ | ■ | ■ | ■ |
| | Up to 10,000 Multi Scan blocks per | ■ | ■ | ■ | ■ | ■ |
| | second, each containing 3 features | ■ | ■ | ■ | ■ | ■ |
| Host platform[1] | PC, Windows XP | ■ | ■ | ■ | ■ | ■ |
| Communication interface [2] | CameraLink | ■ | ■ | ■ | ■ | ■ |
| Development environment | C++ (VS .NET 2003) or | ■ | ■ | ■ | ■ | ■ |
| | C (VS .NET 2003, VS6) | ■ | ■ | ■ | ■ | ■ |
| Synchronisation of data | Free running, light switch enable, | ■ | ■ | ■ | ■ | ■ |
| | rotary encoder trig | ■ | ■ | ■ | ■ | ■ |
| Dimensions  (L x H x D) | 50 x 50 x 110 mm | ■ | ■ | ■ | ■ | ■ |
| IR filter | Band pass filter for separation of | | | | ■ | ■ |
| | multiple light sources | | | | ■ | ■ |
| HiRes grey line resolution | 3072 | ■ | | | | ■ |
| Grey line resolution | 1536 | ■ | ■ | | ■ | ■ |
| | 512 | | | ■ | | |
| 3Dprofile resolution | 1536 | ■ | ■ | | ■ | ■ |
| | 512 | | | ■ | | |
| Scatter resolution | 1536 | ■ | ■ | | ■ | ■ |
| | 512 | | | ■ | | |
| Maximum 3D height resolution | 13 bits $^1/_{16}$ pixel | ■ | ■ | ■ | ■ | ■ |
| C-mount optics | 1 inch | ■ | ■ | | ■ | ■ |
| | ½ inch | | | ■ | | |
| Camera I/O | 5 in, 1 out, TTL level | ■ | ■ | ■ | ■ | ■ |
| Power | 12 … 24 V CD | ■ | ■ | ■ | ■ | ■ |
| Camera house temperature | 5 … 50 ºC | ■ | ■ | ■ | ■ | ■ |

[1]  PC requirements: Min Pentium III, 1,5 GHz, 256 MB RAM, half-length PCI slot.

[2]  Frame Grabber requirements: 33/66 MHz, PCI 32bit@33MHz. Support for Com port mapping, 2x8 bit two-taps
interleave data mode. Line-scan, true line-scan. Pixels/line: 512-64kB depending on application

## Diagrams

| Max. speed ½ pixel resolution | Best resolution ¹/₁₆ pixel resolution | MultiScan measurement speed |
|---|---|---|



kHz — 3D measurement speed (Sensor Rows)



kHz — Hi3D speed (Sensor Rows)



kHz — 4 multiscan components (3D, HiRes-gray, Gray, Scatter) (3D Rows)
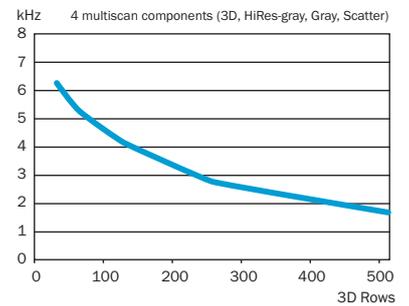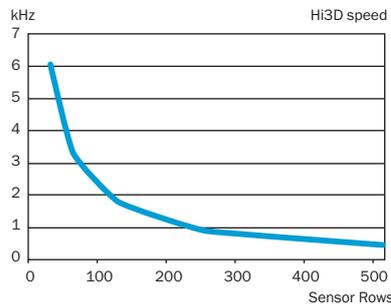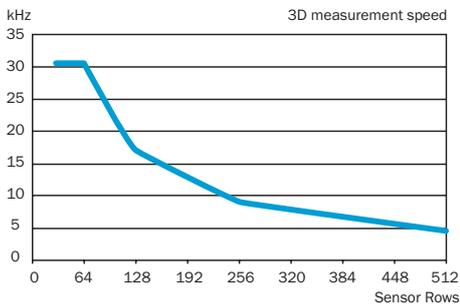
## Order information

| 3D Cameras | | | Accessories | |
|---|---|---|---|---|
| Type | Order no. | | Type | Order no. |
| Ranger C40 | 1014218 | | X64 CL Single Board | 6030530 |
| Ranger C50 | 1014216 | | Ranger C Development SW | 1014314 |
| Ranger C50-IR | 1014203 | | Ranger C Camera Accessories | 1014313 |
| Ranger C55 | 1014217 | | Laser Accessories | 1014257 |
| Ranger C55-IR | 1014205 | | | |

## 3D Cameras

# Ruler E: Gigabit 3D for Tough Environments!

Ruler E is a camera with in-built laser and optics for a predefined field of view, which makes it very easy to install. The data output from the Ruler is calibrated world coordiantes (x, y, z) in milli-metres which are delivered on a high speed Gigabit Ethernet interface to a hosting PC. Application development is made in a high level VB .Net or C/C++ programming environment.

**R**uler E is a perfect tool for in-line 3D-scanning applications. Our OEM customers and Vision Integrators use the Ruler E to build 3D scanners with the highest performance and accuracy on the market. It can be used to measure object height, shape and volume, to detect and locate shape defects, to make quality grading, etc. It is designed for tough environment of wood, steel and automotive industries and with the heating option it can operate at temperatures down to –30 ºC.

Benefits with Ruler E:
- High speed 3D data
- Factory calibrated
- Easy to install and integrate
- Data from several Rulers can be combined
- Free choice of image analysis routines
- Standard interface, Gigabit Ethernet
- Robust housing
- Operates in low temperatures
- Best market price/ performance

Examples:
- Log sorting
- Board optimization
- Pallet quality grading
- Bulk volume measurement
- Meat cut-up optimization

▶ Ruler E for the toughest environments
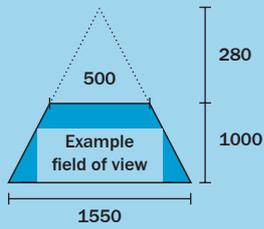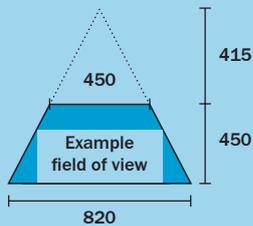


▶ High quality 3D in production speed



## Field of view (mm)



500

280

Example field of view

1000

1550

**Ruler E 1200**

450

415

Example field of view

450

820

**Ruler E 600**
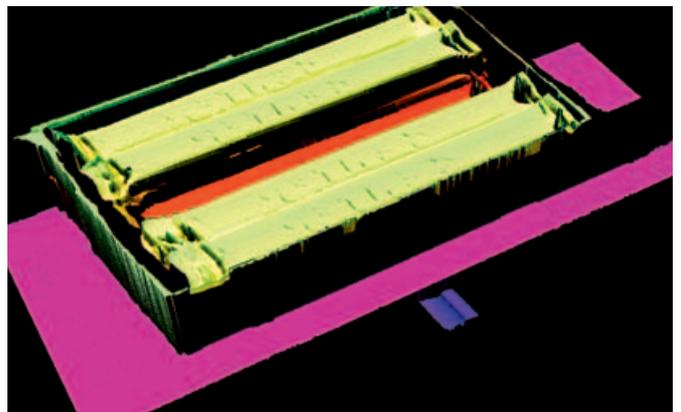
**Field of view (HxW)**
**250x1200 mm**
**250x600 mm**
3D Cameras

- **Easy to integrate**
- **Data as world coordinates**
- **Robust housing**
- **Operates in low temperature**
- **Best market price/ performance**

CE

Laser class 2M/3B

## Dimensional drawing
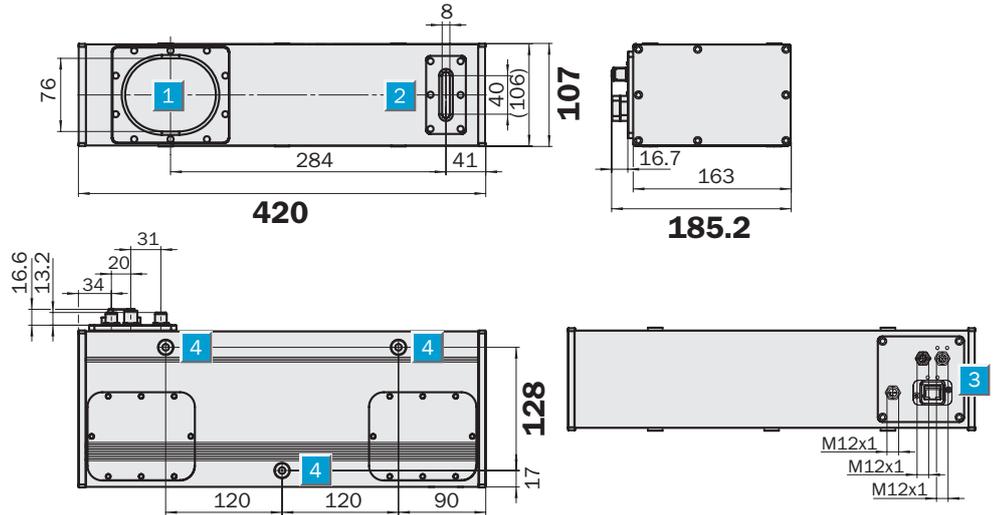
1 Image sensor
2 Laser unit
3 Connectors
4 Fastening threads (M8 x 15 length)

## Connection type
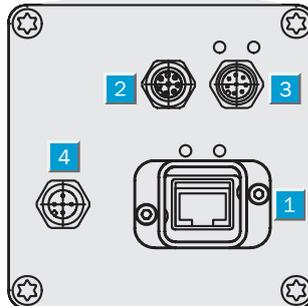
1 Ethernet
2 Encoder
3 Power I/0
4 Heating

**1**

Pin configuration according to the Gigabit Ethernet standard defined by IEEE 802.3ab

**2**

| | | |
|---|---|---|
| wht | 1 | In 1+ |
| brn | 2 | In 2+ |
| grn | 3 | In 2- |
| yel | 4 | In 1- |
| gra | 5 | GND |
| pnk | 6 | - |
| blu | 7 | In4 |
| red | 8 | Out 2 |

**3**

| | | |
|---|---|---|
| wht | 1 | In 1 |
| brn | 2 | Power |
| grn | 3 | Out 1 |
| yel | 4 | In 2 |
| gra | 5 | TRA |
| pnk | 6 | TRB |
| blu | 7 | GND |
| red | 8 | In 3 |

**4**

| | | |
|---|---|---|
| brn | 1 | Power |
| wht | 2 | GND |
| blu | 3 | GND |
| blck | 4 | Power |
| grnyel | 5 | Out A |

### Gigabit Ethernet cable

| Type | Order no. |
|---|---|
| 5 m | 6032321 |
| 10 m | 6032322 |
| 20 m | 6032323 |
| 70 m | 6033028 |

### Encoder cable open

| Type | Order no. |
|---|---|
| 2 m | 6029330 |
| 5 m | 6029331 |
| 10 m | 6032324 |

### Power I/0 cable open

| Type | Order no. |
|---|---|
| 2 m | 6020633 |
| 5 m | 6020993 |
| 10 m | 6022152 |
| 15 m | 6022153 |

### Heating cable

| Type | Order no. |
|---|---|
| 2 m | 6032485 |
| 5 m | 6032486 |

## Technical data — Ruler E

| Technical data | Ruler E | 2111 | 2112 | 2121 | 2122 | 1111 | 1112 | 1211 | 1121 | 1212 | 1122 | 1221 | 1222 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Performance | 10.000 3D profiles /second | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Interface | Gigabit Ethernet | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Host platform[1] | PC, Windows XP | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Development environment | .Net Assembly, C, or C++ (VS .NET 2003) | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Synchronisation of data | Free running, light switch enable, | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | rotary encoder trig | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Encoder interface | RS 422 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Max. encoder frequency | 2 MHz | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Digital inputs | 3 x HIGH = 10 V … 28.8 V | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Digital outputs | 1 x B – type; < 100 mA | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Power supply | 24 VDC | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Current consumption | < 1 A | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Ripple | < 5 Vpp | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Dimensions (L x H x D) | 420 x 163 x 105 mm | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Weight | 7.0 kg | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Enclosure rating | IP 65 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Housing material | Aluminium, surface grey varnished | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Connectors: nickel-plated brass | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Windows: float glass, AR coated | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Shock load | 15 g, 3 x 6 directions | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Vibration load | 5 g, 58 … 150 Hz | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Laser class | 2M | ■ | ■ |  |  | ■ | ■ | ■ |  | ■ |  |  |  |
| | 3B |  |  | ■ | ■ |  |  |  | ■ |  | ■ | ■ | ■ |
| Laser wavelength | 660 ±15 nm | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Laser filter | 60 nm FWHM | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Imager | CMOS | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Max. profile width | 1024 |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 1536 | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |  |
| Typical height resolution | 0.4 mm |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 0.2 mm | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |  |
| Example field of view (H x W) | 250 x 1200 mm |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | 250 x 600 mm | ■ | ■ | ■ | ■ |  |  |  |  |  |  |  |  |
| Scatter measurement | |  | ■ |  | ■ |  | ■ |  |  | ■ | ■ |  | ■ |
| Heating elements | |  |  |  |  |  |  | ■ |  | ■ |  | ■ | ■ |
| Ambient temperature | Operation: 0 … +40 ℃ | ■ | ■ | ■ | ■ | ■ | ■ |  | ■ |  | ■ |  |  |
| | Operation: –30 … +40 ℃ |  |  |  |  |  |  | ■ |  | ■ |  | ■ | ■ |
| | Storage: –30 … +70 ℃ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

[1] Recommended PC for Vision System: 3.0 GHz CPU, 800 MHz bus speed, 512 MB RAM
(For evaluation purposes, a PC with lower performance may be sufficient)

## Order information

### 3D cameras

| Version | Type | Order no. | Scatter | Heating | 3B Laser |
|---|---|---|---|---|---|
| Ruler E600 | Ruler-E2111 | 1029237 | | | |
| Ruler E600S | Ruler-E2112 | 1029238 | ■ | | |
| Ruler E600B | Ruler-E2121 | 1028042 | | | ■ |
| Ruler E600SB | Ruler-E2122 | 1029239 | ■ | | ■ |
| Ruler E1200 | Ruler-E1111 | 1028041 | | | |
| Ruler E1200S | Ruler-E1112 | 1029230 | ■ | | |
| Ruler E1200H | Ruler-E1211 | 1029231 | | ■ | |
| Ruler E1200B | Ruler-E1121 | 1029233 | | | ■ |
| Ruler E1200SH | Ruler-E1212 | 1029232 | ■ | ■ | |
| Ruler E1200SB | Ruler-E1122 | 1029234 | ■ | | ■ |
| Ruler E1200HB | Ruler-E1221 | 1029235 | | ■ | ■ |
| Ruler E1200SHB | Ruler-E1222 | 1029236 | ■ | ■ | ■ |

### Ruler E accessories

| Type | Order no. |
|---|---|
| Ruler E accessory kit | 1014241 |
| Gigabit Ethernet board | 6032329 |
| Ruler development SW | 2038800 |
| Gigabit network switch x5 | 6032330 |
| Ruler E key box | 1029242 |
| T-junction connector | 6026503 |
| Power supply | 1014242 |

### Opto fibre accessories

| Type | Order no. |
|---|---|
| Opto adapter | 6032331 |
| Opto fibre, 100m | 1014338 |

### Content of Ruler E accessory kit (1014241)

| Type | Order no. |
|---|---|
| T-junction connector | 6026503 |
| Power supply | 1014242 |
| Gigabit Ethernet cable, 10 m | 6032322 |
| Power and I/O cable, M12 to M12, 2 m | 6030121 |
| I/O cable, M12 to open, 2 m | 6029330 |
| Encoder cable, M12 to open, 2 m | 6029330 |

# Lighting Modules: Incident Light, Back Light and Line Laser

Wherever tasks based on height information must be solved, the Industrial Laser Projector together with a 2D-sensor can be the basis for a reliable solution. A laser line is projected on a part and a matrix camera takes a picture of the line from a different angle. This way a height profile can be calculated.

All components of the Industrial Laser projector are easily connected to each other: The cameras are connected to the ICT-B laser control box via standard M12 cables and via T-splitter to power supply. The lasers are connected to the prepared terminals in the ICT-B. Additionally a trigger sensor for the camera can be easily connected to the ICT-B.

By applying a filter to the camera, from our accessories, the solutions become very robust against ambient light changes.

There is no optical recognition without light – a simple rule. However, it is not as easy to provide the perfect illumination for camera sensors. High cycle rates, fast moving products, difficult to capture objects and ambient conditions all have an affect on illumination.

ICL lighting, incident lighting and back light, offers nonfluctuating, high intensity illumination through constant-current regulation. ICL lighting does not require a ballast and has a dedicated input receiving the camera trigger signals from the camera.

In automatic packaging plants, big and small objects are checked by camera sensors. Correct illumination plays an essential part in this.
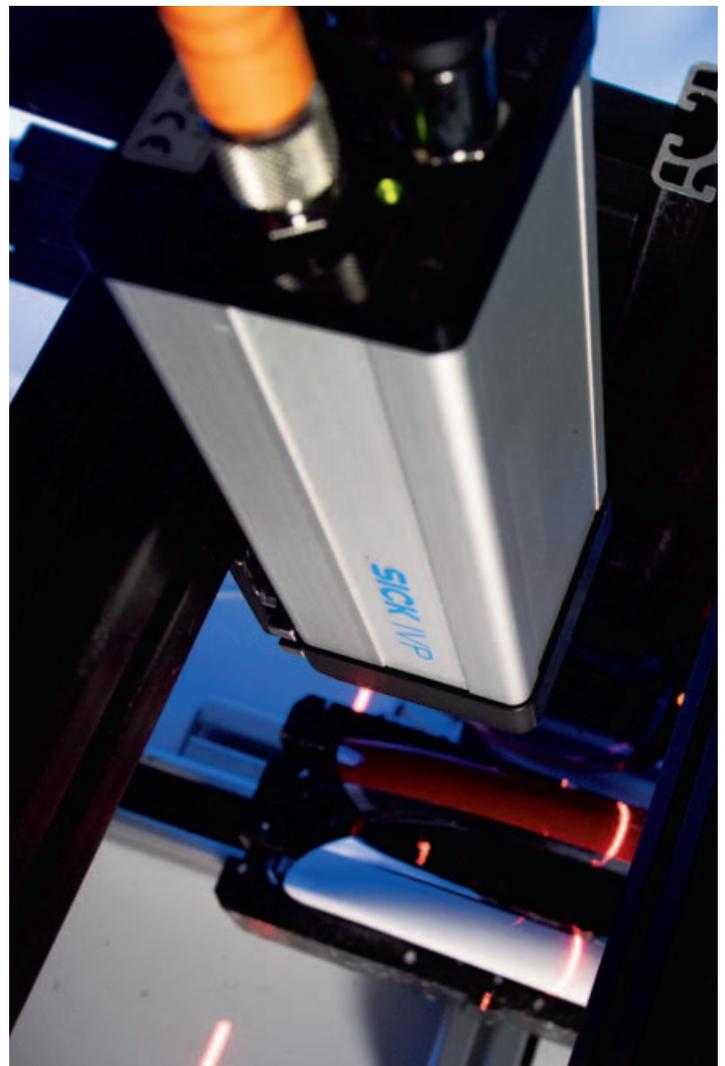
Area illuminated
100 x 100 m²/
180 x 180 m²
Back lights

- Sturdy housing (IP 67)
- Flat design
  (15 mm/20 mm)
- Intense illumination
  (≥ 8 W/m²)
- Enhanced edge inten-
  sity to compensate for lens
  characteristics (vignetting)
- Constant current control
- Trigger input

CE
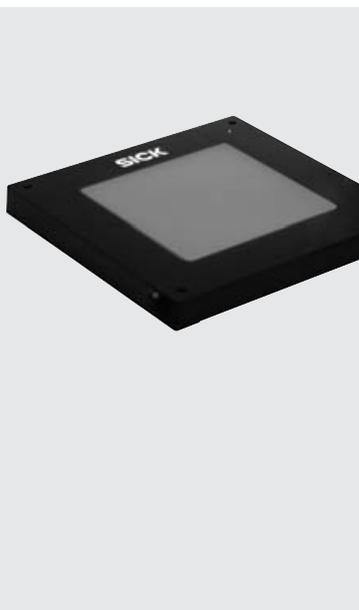
See chapter Accessories
Cables and connectors

**Dimensional drawing**
ICL100B

160
100
3
1
142
100
160
2
17
17
142
M 5 (4x)

6.7
Ø 9.9
15
17

ICL180B

240
180
3
1
222
240
2
17
17
222
M 5 (4x)

6.7
Ø 9.9
20
17
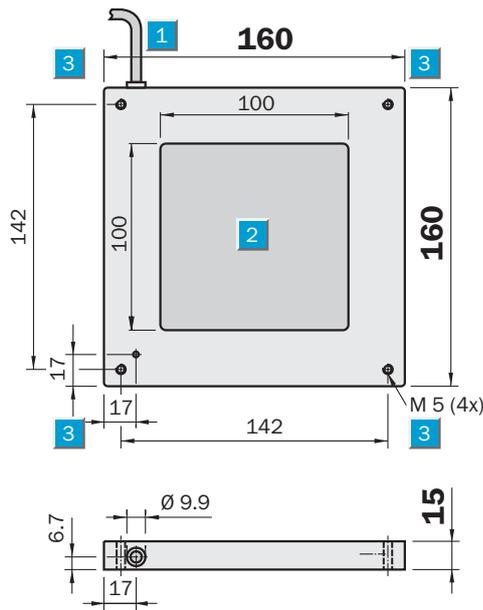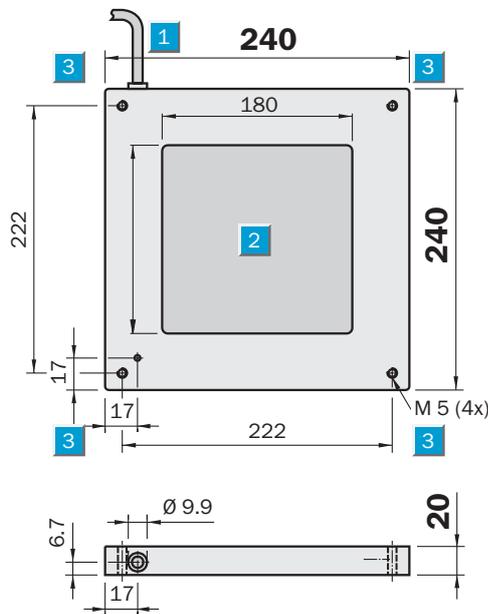
1  Cable with M12 plug, 8-pin
2  Area illuminated
3  Mounting hole, M5

**Connection types**
ICL100B
ICL180B

8-pin, M12
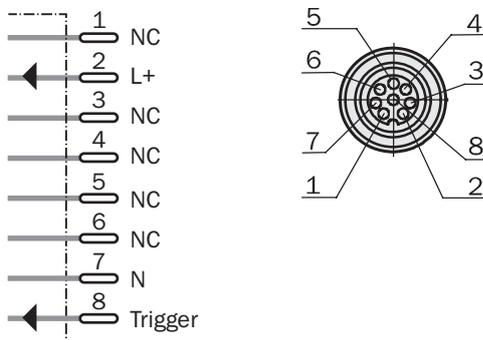
| Pin | Signal |
|-----|--------|
| 1 | NC |
| 2 | L+ |
| 3 | NC |
| 4 | NC |
| 5 | NC |
| 6 | NC |
| 7 | N |
| 8 | Trigger |

| Technical data | ICL | 100B | 180B | | | | | | | |
|---|---|:---:|:---:|---|---|---|---|---|---|---|
| **Optical characteristics** | | | | | | | | | | |
| Area illuminated | 100 x 100 mm² | ■ | | | | | | | | |
| | 180 x 180 mm² | | ■ | | | | | | | |
| Light source | LED, 630 nm | ■ | ■ | | | | | | | |
| Emittance [1] | ≥ 8 W/m² | ■ | ■ | | | | | | | |
| Higher emittance on outer regions | Approx. 20 % [2] | ■ | ■ | | | | | | | |
| Degradation period of LEDs [3] | > 50,000 h [4]/> 35,000 h | ■ | ■ | | | | | | | |
| Regulation of emittance on $V_S$ | Constant at $V_s$ = 19.2 to 28.8 V | ■ | ■ | | | | | | | |
| **Electrical characteristics** | | | | | | | | | | |
| Supply voltage $V_S$ | 19.2 ... 28.8 V DC [5] | ■ | ■ | | | | | | | |
| Residual ripple | 5 $V_{PP}$ | ■ | ■ | | | | | | | |
| Current consumption | Approx. 250 mA | ■ | | | | | | | | |
| | Approx. 550 mA | | ■ | | | | | | | |
| Trigger input | TTL, 28.8 V max. [5], LOW = lighting on | ■ | ■ | | | | | | | |
| VDE protection class [6] | V | ■ | ■ | | | | | | | |
| Connecting cable | M12 plug, 8-pin, L = 0.8 m [7] | ■ | | | | | | | | |
| | M12 plug, 8-pin, L = 1.2 m [7] | | ■ | | | | | | | |
| **Mechanical characteristics** | | | | | | | | | | |
| Enclosure rating | IP 67 | ■ | ■ | | | | | | | |
| Weight | 800 g | ■ | | | | | | | | |
| | 2.0 kg | | ■ | | | | | | | |
| **Ambient conditions** | | ■ | ■ | | | | | | | |
| Ambient temperature | Operation:    0 °C ... +50 °C | ■ | ■ | | | | | | | |
| | Storage:    −25 °C ... +70 °C | ■ | ■ | | | | | | | |
| Shock load | Single: 15 g | ■ | ■ | | | | | | | |
| | Continuous: 10 g | ■ | ■ | | | | | | | |
| Vibration | ± 0,35 mm at 10 ... 58/s | ■ | ■ | | | | | | | |
| | 5 g, at 58 ... 150/s | ■ | ■ | | | | | | | |
| Humidity | 93 %, relative | ■ | ■ | | | | | | | |

[1] Emittance at distance of 0 m, mean value over entire area illuminated
[2] This compensates for normal lens vignetting (see vignetting compensation)
[3] Drop in intensity to 50 %
[4] In triggered mode at pulse-interval ratio of ≤ 20 %
[5] Reverse-polarity protection
[6] Reference voltage 50 V DC
[7] Assignment, see connection diagram

| Vignetting compensation | |
|---|---|
| ICL100B | A = 100 mm |
| ICL180B | A = 180 mm |



| Order information | |
|---|---|
| **Type** | **Order no.** |
| ICL100B 321 | 1024224 |
| ICL180B 321 | 1024225 |

| Filter for ICV-2D with C-mount lenses | |
|---|---|
| **Type** | **Order no.** |
| OBF-IVC-630-1 | 2039202 |
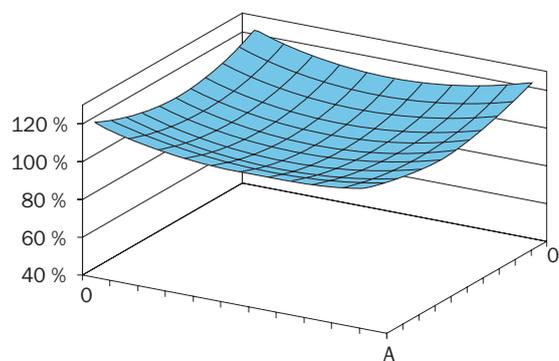
Area illuminated
20 x 20 mm$^2$/
40 x 40 mm$^2$/
110 x 110 mm$^2$

Direct lights

- **Sturdy housing (IP 65)**
- **Intense illumination (approx. 50 W/m$^2$)**
- **Enhanced edge intensity to compensate for lens characteristics (vignetting)**
- **Constant current control**
- **Trigger input**

CE

See chapter Accessories

Cables and connectors

Mounting systems

**Dimensional drawing**
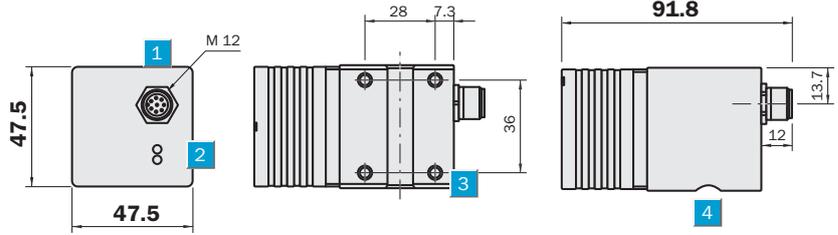
ICL20S



ICL40S
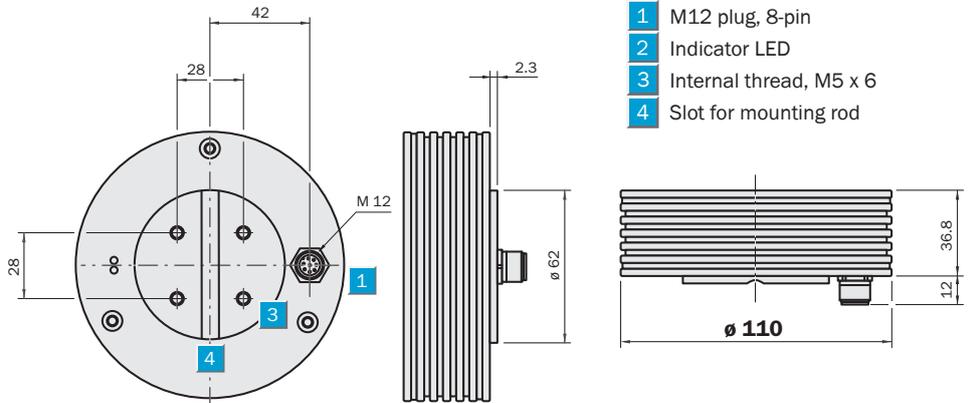


| 1 | M12 plug, 8-pin |
| 2 | Indicator LED |
| 3 | Internal thread, M5 x 6 |
| 4 | Slot for mounting rod |

ICL110-F142
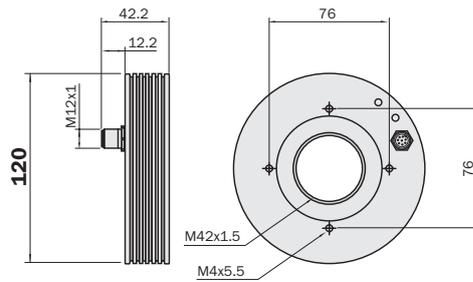


**Connection types**

ICL20S

ICL40S

ICL110-F142



| 1 | NC |
| 2 | L+ |
| 3 | NC |
| 4 | NC |
| 5 | NC |
| 6 | NC |
| 7 | N |
| 8 | Trigger |

accessory 6026503

accessory 2033105

| Technical data | ICL | 20S | 40S | 110–F142 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Optical characteristics** | | | | | | | | | | |
| Area illuminated | Ø 28 mm; □ 20 x 20 mm² | ● | | | | | | | | |
| | Ø 50 mm; □ 35 x 35 mm² | | ● | | | | | | | |
| | 110 mm x 110 mm at 250 mm dist. | | | ● | | | | | | |
| Nominal distance | 70 mm | ● | | | | | | | | |
| | 140 mm | | ● | | | | | | | |
| | 100 ... 300 mm | | | ● | | | | | | |
| Light source | LED, 525 nm | ● | ● | ● | | | | | | |
| Emittance [1] | Approx. 50 W/m² | ● | ● | ● | | | | | | |
| Higher emittance on outer regions | Approx. 20 % [2] | ● | ● | ● | | | | | | |
| Degradation period of LEDs [3] | ≥ 50,000 h | ● | ● | ● | | | | | | |
| Regulation of emittance on $V_S$ | Constant at $V_S$ = 19.2 ... 28.8 V | ● | ● | ● | | | | | | |
| **Electrical characteristics** | | | | | | | | | | |
| Supply voltage $V_S$ | 19.2 ... 28.8 V DC [4] | ● | ● | ● | | | | | | |
| Residual ripple | 5 $V_{PP}$ | ● | ● | ● | | | | | | |
| Current consumption | Max. 150 mA | ● | | | | | | | | |
| | Max. 250 mA | | | ● | | | | | | |
| | Max. 400 mA | | ● | | | | | | | |
| Trigger input | TTL, max. 28.8 V [4], LOW = lighting on | ● | ● | ● | | | | | | |
| VDE protection class [5] | III | | | ● | | | | | | |
| | V | ● | ● | | | | | | | |
| Connecting cable | M12 plug, 8-pin [6] | ● | ● | ● | | | | | | |
| **Mechanical characteristics** | | | | | | | | | | |
| Enclosure rating | IP 65 | ● | ● | ● | | | | | | |
| Weight | 230 g | ● | | | | | | | | |
| | 540 g | | ● | | | | | | | |
| | 580 g | | | ● | | | | | | |
| **Ambient conditions** | | | | | | | | | | |
| Ambient temperature | Operation: 0 °C ... +50 °C | ● | ● | ● | | | | | | |
| | Storage: −25 °C ... +70 °C | ● | ● | ● | | | | | | |
| Shock load | Single: 15 g | ● | ● | ● | | | | | | |
| | Continuous: 10 g | ● | ● | ● | | | | | | |
| Vibration | ± 0.35 mm at 10 ... 58/s | ● | ● | ● | | | | | | |
| | 5 g at 58 ... 150/s | ● | ● | ● | | | | | | |
| Humidity | 93 %, relative | ● | ● | ● | | | | | | |

[1] At nominal distance  
[2] This compensates for normal lens vignetting  
[3] Drop in intensity to 50 %  
[4] Reverse-polarity protection  
[5] Reference voltage 32 V DC  
[6] Assignment, see connection diagram

| Vignetting compensation | |
|---|---|
| ICL20S | A = 28 mm |
| ICL40S | A = 50 mm |

| Order information | |
|---|---|
| **Type** | **Order no.** |
| ICL 20-S212 | 1024222 |
| ICL 40-S212 | 1024223 |
| Rod mounting | 2029022 |
| ICL110-F142 | 1027286 |

### ICL110-F142
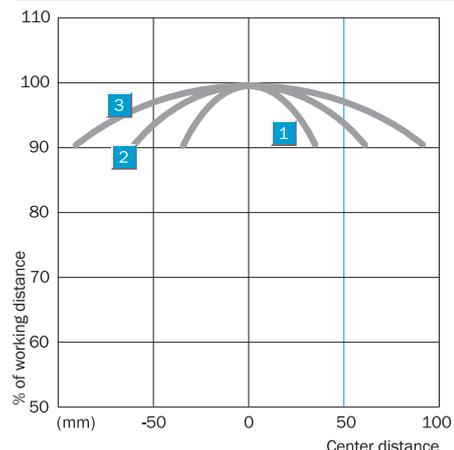


- [1] 100 mm: ≤ ~20 W/m²
- [2] 200 mm: ≤ ~7 W/m²
- [3] 300 mm: ≤ ~4 W/m²

### ICL20S, ICL40S

**Line Laser 45°, red**

Laser Projector
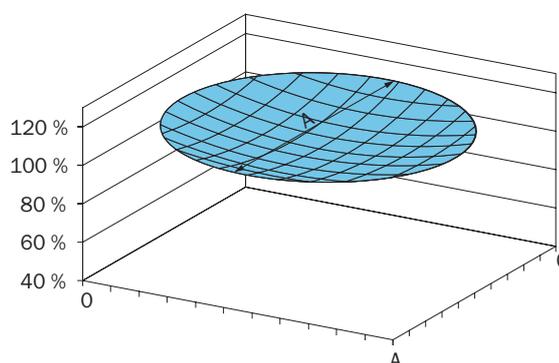
- Robust mechanical, electrical and optical design
- Long life time
- Flexible mechanical set-up
- Easy connection to IVC-2D and ICS
- High availability and reliability due to shock and water proof housing

CE

## Dimensional information ILP2 and ILP3

121

24

## Dimensional information ICT-B

29.5

30.5

2

16.3   32.5   15.9
65

162.3

80.1   26.4

68.7

24.5

3

4

13

| 1 | key switch |
| 2 | transparent cover |
| 3 | M12, 8-pin, male connector |
| 4 | cable glands |
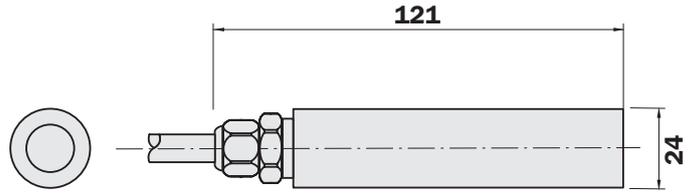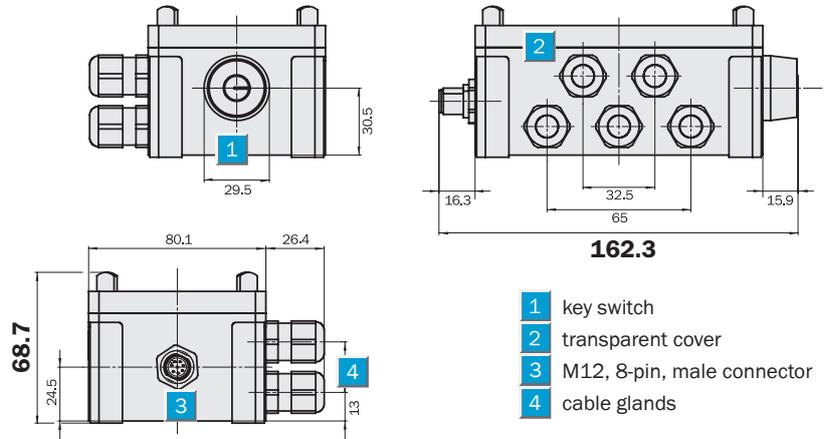
## Electrical connections ILP2 and ILP3

### ILP

red — L+ (DC 5 V)

blk — M (0 V)

grn — Trigger

brn

### ILP with IVC-2D

**1 Laser**

| ICT-B | Laser 1 |
|---|---|
| 8 | 5 V |
| 7 | M (0V) |
| 9 | Trigger |

**2 Laser**

| ICT-B | Laser 1 | ICT-B | Laser 2 |
|---|---|---|---|
| 8 | 5 V | 11 | 5 V |
| 7 | M (0V) | 10 | M (0V) |
| 9 | Trigger | 12 | Trigger |

### ILP with ICS

**1 Laser**

| ICT-B | Laser 1 |
|---|---|
| 8 | 5 V |
| 7 | M (0V) |
| 5 | Trigger |

**2 Laser**

| ICT-B | Laser 1 | ICT-B | Laser 2 |
|---|---|---|---|
| 8 | 5 V | 11 | 5 V |
| 7 | M (0V) | 10 | M (0V) |
| 5 | Trigger | 5 | Trigger |

## Electrical connections ICT-B

2   T2.0A   DC-DC 24V/5V   gn

13 14 15 16 17 18

4
1
8
7
5
6
3

24V/5V

24V/5V

rd

1 2 3 4 5 6      7 8 9 10 11 12
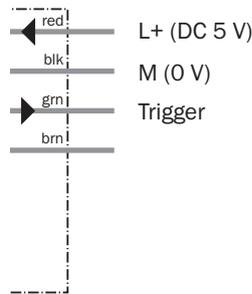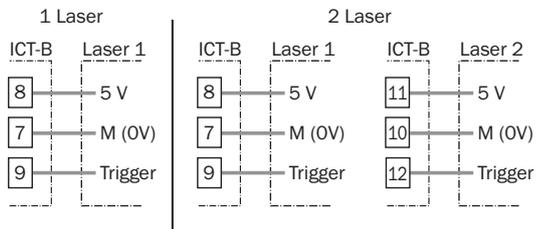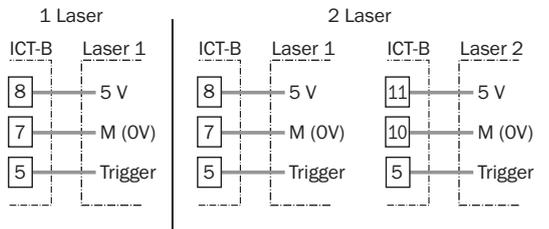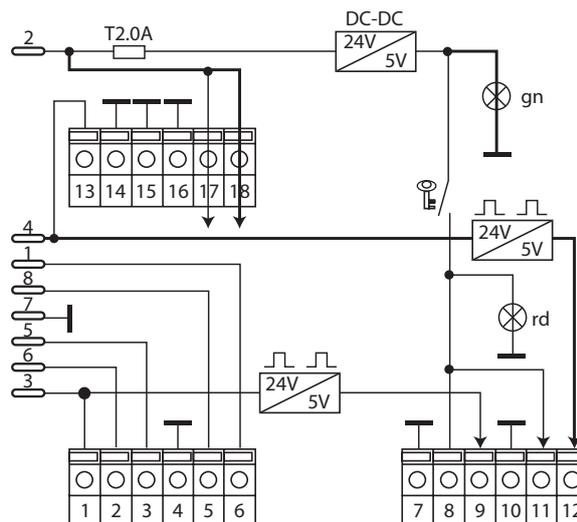
| Technical data | | ILP2-L11111 | ILP3-L11111 | ICT-B | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Laser fan angle | 45° | �® | ▦ | | | | | | | |
| Laser wavelength | 660 nm ± 10 nm (red) | ▦ | ▦ | | | | | | | |
| Laser class after optics | II/2M | ▦ | | | | | | | | |
| DCRH/IEC | III/3B | | ▦ | | | | | | | |
| Laser line homogeneity | ± 25 % | ▦ | ▦ | | | | | | | |
| Beam divergence | ≤ ± 1.5 mrad | ▦ | ▦ | | | | | | | |
| Focal length | ∞ | ▦ | ▦ | | | | | | | |
| Laser power output | < 1 mW | ▦ | | | | | | | | |
| | < 5 mW | | ▦ | | | | | | | |
| Pulsed operation | Controlled by trigger input[1] | ▦ | ▦ | | | | | | | |
| Minimum pulse length | 10 µs | ▦ | ▦ | | | | | | | |
| Pulse rise + delay time | < 3 µs | ▦ | ▦ | | | | | | | |
| Power down time | < 1 µs | ▦ | ▦ | | | | | | | |
| Duty cycle | Any[2] | ▦ | ▦ | | | | | | | |
| Life time of laser diode | 50.000...100.000h h MTTF at 20°C | ▦ | ▦ | | | | | | | |
| Power requirement $V_S$ | 4.5 ... 6 V DC | ▦ | ▦ | | | | | | | |
| | 24 V DC ± 20% | | | ▦ | | | | | | |
| Delay after power on | < 10 ms | | | ▦ | | | | | | |
| Operating current | <150 mA at VS = 5 V ± 5% | ▦ | ▦ | | | | | | | |
| | < 50 mA[3] | | | ▦ | | | | | | |
| Output voltage for laser | 5.3 V DC ± 2% | | | ▦ | | | | | | |
| Max output current for lasers | ≤ 500 mA[4] | | | ▦ | | | | | | |
| Residual ripple | < 5 $V_{PP}$ | | | ▦ | | | | | | |
| Circuit protection | A[5] | ▦ | ▦ | | | | | | | |
| Connection type | 5 m cable, 4-pin, terminal end | ▦ | ▦ | | | | | | | |
| | M12, 8-pin, male connector | | | ▦ | | | | | | |
| | for camera connection | | | ▦ | | | | | | |
| | Cable glands and terminals | | | ▦ | | | | | | |
| | for laser connection | | | ▦ | | | | | | |
| Shock load | Single 15 g; continuous 10 g | ▦ | ▦ | | | | | | | |
| Vibration resistance | ± 0.35 mm at 10 ... | ▦ | ▦ | | | | | | | |
| | 58/s; 5 g at 58 ... 150/s | ▦ | ▦ | | | | | | | |
| | 1g, 10 ... 2000 Hz, 3 axes | | | ▦ | | | | | | |
| Ambient Temperature | Operation: −10 ... +48 °C | ▦ | ▦ | ▦ | | | | | | |
| | Storage: −20 ... +70 °C | ▦ | ▦ | ▦ | | | | | | |
| Enclosure rate | IP67 | ▦ | ▦ | ▦ | | | | | | |
| Weight | Approx . 400 g | ▦ | ▦ | | | | | | | |
| | Approx. 350 g | | | ▦ | | | | | | |
| Housing material | Aluminum, anodized | ▦ | ▦ | | | | | | | |
| | Plastics | | | ▦ | | | | | | |

[1] HIGH (4.5 ... 6V DC) = Laser on, LOW or not connected = Laser off
[2] Continuous wave allowed
[3] Current for ICT-B only (increased when Laser connected to ICT-B is on)
[4] Total sum of all connected lasers
[5] A = reverse polarity protection

### Ordering information

**Main Components**

| Type | Order no. |
|---|---|
| ILP2-L11111 | 1028625 |
| ILP3-L11111 | 1028626 |
| ICT-B | 1028342 |

**Accessories**

| Type | Order no. |
|---|---|
| Mounting bracket for lasers | 2034486 |
| Optical filter, red, for lenses 5314041 and 5314042 | 2034437 |
| OBF-IVC-660-1 IVC-2D filter for C-mount lenses | 2039191 |
| T-Splitter | 6026503 |
| Extension cable, M12, 8-pin, 1 m, | 6026625 |
| Female connector, M12, 8-pin, straight, with 2 m cable | 6020633 |