Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

Rexroth IndraControl L20

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Project Planning Manual

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Contents

1 System Presentation

1.1 Brief Description of IndraControl L20

The IndraControl L20 is a modular and scalable control. It combines the benefits of a compact small control with a standardized I/O system on the basis of terminal technology. It is a hardware platform that can be used for PLC applications. It provides onboard interfaces, e. g. high-speed inputs and outputs (8 each) and communication interfaces, such as Ethernet, PROFIBUS and RS232. The locally available I/O units can be extended by the Rexroth Inline I/O system, just by simply mounting the components side by side. Application programs, incl. runtime, are completely stored to an easily accessible standardized Compact Flash medium.

1.2 View

Operating elements and interfaces are arranged on the front.

The eight-digit display with four operator keys, the Reset button with light-emitting diode, the RS232 interface, and the receptacle for the Compact Flash card are provided to the left of the unit. Further interfaces (Ethernet, PROFIBUS DP) are located in the central section of the unit. The terminals for digital inputs and outputs (eight each) and the voltage supply connectors are arranged to the right of the unit.

Fig. 1-1: View of a typical IndraControl L20 unit

1.3 Related Documentations

No.	Title	Identification
/1/	Rexroth Inline PROFIBUS DP; Application Manual	DOK-CONTRL-R-IL*PBSSYS-AW..-EN-P
/2/	Rexroth Inline PROFIBUS DP Terminal and Module Supply; Functional Description	DOK-CONTRL-R-IL*PB*-BK-FK..-EN-P
/3/	Rexroth IndraLogic L20; System Description	DOK-CONTRL-IC*L20*****-AW..-EN-P

Fig. 1-2: Related documentations

2 Important Directions for Use

2.1 Appropriate Use

Introduction

Rexroth products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operating safety and reliability.

The products may only be used in the manner that is defined as appropriate. If they are used in an inappropriate manner, then situations can develop that may lead to property damage or injury to personnel.

Note: Bosch Rexroth, as manufacturer, is not liable for any damages resulting from inappropriate use. In such cases, the guarantee and the right to payment of damages resulting from inappropriate use are forfeited. The user alone carries all responsibility of the risks.

Before using Rexroth products, make sure that all the pre-requisites for appropriate use of the products are satisfied:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with appropriate use.
- If the product takes the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software products or alter source codes.
- Do not mount damaged or faulty products or use them in operation.
- Make sure that the products have been installed in the manner described in the relevant documentation.

Areas of Use and Application

The IndraControl L20 of Rexroth is appropriate to logic applications.

Note: The IndraControl L20 may only be used with the accessories and parts specified in this document. If a component has not been specifically named, then it may not be either mounted or connected. The same applies to cables and lines.

Operation is only permitted in the specified configurations and combinations of components using the software and firmware as specified in the relevant function descriptions.

In case of non-observance the warranty claim expires automatically.

Typical applications of the IndraControl L20 are:

- Handling and assembly systems,
- Packaging and foodstuff machine,
- Printing and paper processing machines and
- Machine tools.

The IndraControl L20 may only be operated under the assembly, installation and ambient conditions as described here (temperature, system of protection, humidity, EMC requirements, etc.) and in the position specified.

In residential areas as well as in business and commercial areas Class A devices may be used with the following note:

Note: This is a Class A device. In a residential area, this device may cause radio interferences. In such a case, the user may be required to introduce suitable countermeasures at his own cost.

2.2 Inappropriate Use

Using the IndraControl L20 outside of the above-referenced areas of application or under operating conditions other than described in the document and the technical data specified is defined as “inappropriate use".

The IndraControl L20 may not be used, if

- it is subject to operating conditions that do not meet the above specified ambient conditions. This includes, for example, operation under water, in the case of extreme temperature fluctuations or extremely high maximum temperatures, or if
- Bosch Rexroth has not specifically released them for that intended purpose. Please note the specifications outlined in the general Safety Guidelines!

3 Safety Instructions for Electric Drives and Controls

3.1 Introduction

Read these instructions before the initial startup of the equipment in order to eliminate the risk of bodily harm or material damage. Follow these safety instructions at all times.

Do not attempt to install or start up this equipment without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation of the equipment prior to working with the equipment at any time. If you do not have the user documentation for your equipment, contact your local Bosch Rexroth representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the equipment is resold, rented or transferred or passed on to others, then these safety instructions must be delivered with the equipment.

WARNING

Improper use of this equipment, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!

3.2 Explanations

The safety instructions describe the following degrees of hazard seriousness in compliance with ANSI Z535. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions.

Warning symbol with signal word	Degree of hazard seriousness according to ANSI
 **DANGER**	Death or severe bodily harm will occur.
 **WARNING**	Death or severe bodily harm may occur.
 **CAUTION**	Bodily harm or material damage may occur.

Fig. 3-1: Hazard classification (according to ANSI Z535)

3.3 Hazards by Improper Use

DANGER

High voltage and high discharge current! Danger to life or severe bodily harm by electric shock!

DANGER

Dangerous movements! Danger to life, severe bodily harm or material damage by unintentional motor movements!

WARNING

High electrical voltage due to wrong connections! Danger to life or bodily harm by electric shock!

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

CAUTION

Surface of machine housing could be extremely hot! Danger of injury! Danger of burns!

CAUTION

Risk of injury due to improper handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock or incorrect handling of pressurized systems!

CAUTION

Risk of injury due to incorrect handling of batteries!

3.4 General Information

- Bosch Rexroth AG is not liable for damages resulting from failure to observe the warnings provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before starting up the machine. If you find that you cannot completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Only persons who are trained and qualified for the use and operation of the equipment may work on this equipment or within its proximity.
  - The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the equipment as well as an understanding of all warnings and precautionary measures noted in these instructions.
  - Furthermore, they must be trained, instructed and qualified to switch electrical circuits and equipment on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The equipment is designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Use only safety features and applications that are clearly and explicitly approved in the Project Planning Manual. If this is not the case, they are excluded.
  The following areas of use and application, for example, include safety features and applications: construction cranes, elevators used for people or freight, devices and vehicles to transport people, medical applications, refinery plants, transport of hazardous goods, nuclear applications, applications in which electrical devices with vital functions can be electromagnetically disturbed, mining, food processing, control of protection equipment (also in a machine).
- The information given in the documentation of the product with regard to the use of the delivered components contains only examples of applications and suggestions.
  The machine and installation manufacturer must
  - make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
  - make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Startup of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.
- Technical data, connections and operational conditions are specified in the product documentation and must be followed at all times.

- Operation is only permitted if the national EMC regulations for the application are met.
  The instructions for installation in accordance with EMC requirements can be found in the documentation "EMC in Drive and Control Systems".
  The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.

3.5 Protection Against Contact with Electrical Parts

Note: This section refers to equipment and drive components with voltages above 50 Volts.

Touching live parts with voltages of 50 Volts and more with bare hands or conductive tools or touching ungrounded housings can be dangerous and cause electric shock. In order to operate electrical equipment, certain parts must unavoidably have dangerous voltages applied to them.

DANGER

High electrical voltage! Danger to life, severe bodily harm by electric shock!

⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain or repair this equipment.

⇒ Follow general construction and safety regulations when working on high voltage installations.

⇒ Before switching on power the ground wire must be permanently connected to all electrical units according to the connection diagram.

⇒ Do not operate electrical equipment at any time, even for brief measurements or tests, if the ground wire is not permanently connected to the points of the components provided for this purpose.

⇒ Before working with electrical parts with voltage higher than 50 V, the equipment must be disconnected from the mains voltage or power supply. Make sure the equipment cannot be switched on again unintended.

⇒ The following should be observed with electrical drive and filter components:

⇒ Wait thirty (30) minutes after switching off power to allow capacitors to discharge before beginning to work. Measure the voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.

⇒ Never touch the electrical connection points of a component while power is turned on.

⇒ Install the covers and guards provided with the equipment properly before switching the equipment on. Prevent contact with live parts at any time.

⇒ A residual-current-operated protective device (RCD) must not be used on electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.

⇒ Electrical components with exposed live parts and uncovered high voltage terminals must be installed in a protective housing, for example, in a control cabinet.

To be observed with electrical drive and filter components:

DANGER

High electrical voltage on the housing!
High leakage current! Danger to life, danger of injury by electric shock!

⇒ Connect the electrical equipment, the housings of all electrical units and motors permanently with the safety conductor at the ground points before power is switched on. Look at the connection diagram. This is even necessary for brief tests.

⇒ Connect the safety conductor of the electrical equipment always permanently and firmly to the supply mains. Leakage current exceeds 3.5 mA in normal operation.

⇒ Use a copper conductor with at least 10 mm² cross section over its entire course for this safety conductor connection!

⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that lead to electric shock.

3.6 Protection Against Electric Shock by Protective Low Voltage (PELV)

All connections and terminals with voltages between 0 and 50 Volts on Rexroth products are protective low voltages designed in accordance with international standards on electrical safety.

WARNING

High electrical voltage due to wrong connections! Danger to life, bodily harm by electric shock!

⇒ Only connect equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) to all terminals and clamps with voltages of 0 to 50 Volts.

⇒ Only electrical circuits may be connected which are safely isolated against high voltage circuits. Safe isolation is achieved, for example, with an isolating transformer, an opto-electronic coupler or when battery-operated.

3.7 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of the connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring devices
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily injury and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

DANGER

Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!

⇒ Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation. Unintended machine motion is possible if monitoring devices are disabled, bypassed or not activated.

⇒ Pay attention to unintended machine motion or other malfunction in any mode of operation.

⇒ Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of motion:

- use safety fences
- use safety guards
- use protective coverings
- install light curtains or light barriers

⇒ Fences and coverings must be strong enough to resist maximum possible momentum, especially if there is a possibility of loose parts flying off.

⇒ Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the machine if the emergency stop is not working.

⇒ Isolate the drive power connection by means of an emergency stop circuit or use a starting lockout to prevent unintentional start.

⇒ Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone. Safe standstill can be achieved by switching off the power supply contactor or by safe mechanical locking of moving parts.

⇒ Secure vertical axes against falling or dropping after switching off the motor power by, for example:

- mechanically securing the vertical axes
- adding an external braking/ arrester/ clamping mechanism
- ensuring sufficient equilibration of the vertical axes

The standard equipment motor brake or an external brake controlled directly by the drive controller are not sufficient to guarantee personal safety!

⇒ Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:

- maintenance and repair work
- cleaning of equipment
- long periods of discontinued equipment use

⇒ Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such equipment cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

3.8 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated near current-carrying conductors and permanent magnets in motors represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

⇒ Persons with heart pacemakers, hearing aids and metal implants are not permitted to enter the following areas:

- Areas in which electrical equipment and parts are mounted, being operated or started up.
- Areas in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.

⇒ If it is necessary for a person with a heart pacemaker to enter such an area, then a doctor must be consulted prior to doing so. Heart pacemakers that are already implanted or will be implanted in the future, have a considerable variation in their electrical noise immunity. Therefore there are no rules with general validity.

⇒ Persons with hearing aids, metal implants or metal pieces must consult a doctor before they enter the areas described above. Otherwise, health hazards will occur.

3.9 Protection Against Contact with Hot Parts

CAUTION

Housing surfaces could be extremely hot! Danger of injury! Danger of burns!

⇒ Do not touch housing surfaces near sources of heat! Danger of burns!

⇒ After switching the equipment off, wait at least ten (10) minutes to allow it to cool down before touching it.

⇒ Do not touch hot parts of the equipment, such as housings with integrated heat sinks and resistors. Danger of burns!

3.10 Protection During Handling and Mounting

Under certain conditions, incorrect handling and mounting of parts and components may cause injuries.

CAUTION

Risk of injury by incorrect handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock!

⇒ Observe general installation and safety instructions with regard to handling and mounting.

⇒ Use appropriate mounting and transport equipment.

⇒ Take precautions to avoid pinching and crushing.

⇒ Use only appropriate tools. If specified by the product documentation, special tools must be used.

⇒ Use lifting devices and tools correctly and safely.

⇒ For safe protection wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.

⇒ Never stand under suspended loads.

⇒ Clean up liquids from the floor immediately to prevent slipping.

3.11 Battery Safety

Batteries contain reactive chemicals in a solid housing. Inappropriate handling may result in injuries or material damage.

CAUTION

Risk of injury by incorrect handling!

⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and cauterization).

⇒ Never charge non-chargeable batteries (danger of leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not dismantle batteries.

⇒ Do not damage electrical components installed in the equipment.

Note: Be aware of environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air and sea transport in the sense of the legal requirements (danger of explosion). Dispose batteries separately from other waste. Observe the legal requirements in the country of installation.

3.12 Protection Against Pressurized Systems

Certain motors and drive controllers, corresponding to the information in the respective Project Planning Manual, must be provided with pressurized media, such as compressed air, hydraulic oil, cooling fluid and cooling lubricant supplied by external systems. Incorrect handling of the supply and connections of pressurized systems can lead to injuries or accidents. In these cases, improper handling of external supply systems, supply lines or connections can cause injuries or material damage.

CAUTION

Danger of injury by incorrect handling of pressurized systems !

⇒ Do not attempt to disassemble, to open or to cut a pressurized system (danger of explosion).

⇒ Observe the operation instructions of the respective manufacturer.

⇒ Before disassembling pressurized systems, release pressure and drain off the fluid or gas.

⇒ Use suitable protective clothing (for example safety glasses, safety shoes and safety gloves)

⇒ Remove any fluid that has leaked out onto the floor immediately.

Note: Environmental protection and disposal! The media used in the operation of the pressurized system equipment may not be environmentally compatible. Media that are damaging the environment must be disposed separately from normal waste. Observe the legal requirements in the country of installation.

4 Technical Data

4.1 Equipment

Processor	STMicroelectronics ST40 with at least 192 MHz
Main memory	At least 16 Mbytes DRAM and at least 64 kbytes NvRAM
Interfaces: **Interface to I/O modules** **Communication interfaces**	• Rexroth Inline interface • 1 x Ethernet connection (RJ 45, 10/100 Base-T) • 1 x serial RS232 interface Optional: • 1 x PROFIBUS DP master-slave interface
Inputs and outputs	• 8 electrically isolated digital inputs • 8 electrically isolated digital outputs

4.2 Power Supply

The IndraControl L20 is supplied with a voltage of 24 V. The following values of the operating voltage comply with DIN EN 61131-2:

Nominal value	24 VDC
Tolerances	-15 % / +20 % (without residual ripple)
Residual ripple	+ / - 5 %
Umax	30 V
Umin	19.2 V

Fig. 4-1: Operating voltage according to DIN EN 61131-2

Current consumption by U_{LS}	Max. 1.5 A
Current consumption by U_M and U_S	Max. 8 A in total

Fig. 4-2: Current consumption

4.3 Ambient Conditions

	In operation	Storage/Transport
Max. surrounding air temperature	+5 °C... +55 °C	-25 °C to +70 °C
Relative humidity	RH-2; 5 % to 95 % according to DIN EN 61131-2, non-condensing.	
Air pressure	Up to 2,700 m above MSL according to DIN 60204	Up to 3,000 m above MSL according to DIN 60204
Mechanical strength	Max. vibration: Frequency range: 10...150 Hz Excursion: 0.075 mm for 10..0.57 Hz Acceleration: 1 g for 57...150 Hz According to EN 60068-2-6	Max. shock: 15 g according to EN 60 068-2-27, no disturbance of the function
Degree of pollution	2	2

Fig. 4-3: Ambient conditions

Note: The surrounding air must be free from acids, alkaline solutions, corrosive agents, salts, metal vapors, and other electrically conductive contaminants in high concentrations.

The ambient air must be free from dust. Housings and installation compartments must at least comply with degree of protection IP 54 according to DIN VDE 0470-1.

DANGER

Danger of destruction by overheating

⇒ Ensure a surrounding air temperature of less than 55 °C.

⇒ If the temperature in the device inside achieves 80 °C, the control switches automatically to operating mode Stop. The outputs enter the safe status, and the warning “Temp !!!” appears on the display.
This mode can only be quit by switching the power supply off/on.

⇒ By means of a lib function, the application program can read the internal temperature of the IndraControl L20, in order to trigger further reactions.

4.4 Used Standards

The IndraControl L20 complies with the following standards:

Standard	Meaning
DIN EN 60 204-1	Electrical equipment of machines
DIN EN 61,131-2	Programmable controllers Equipment requirements and tests
DIN EN 60 529	Degrees of protection (incl. housings and installation compartments)
DIN EN 50 178	Electronic equipment for use in power installations

Fig. 4-4: Used standards

Note: The IndraControl L20 complies with the CE requirements!

Note: Systems with IndraControl L20 components, that are used in residential areas (housing, business and commercial areas as well as small-sized enterprises), require a single approval by an authority or a testing agency. In Germany, such single approvals are issued by the “Regulierungsbehörde für Telekommunikation und Post (RegTP)” (German Regulatory Authority for Telecommunications and Posts).

UL/CSA Certification

The IndraControl L20 units are basically certificated according to

- **UL508** (Industrial Control Equipment) and
- **C22.2 No. 142-M1987** (CSA)

However, it is possible that there are combinations or extension stages with restricted or missing certification. Thus, verify the registration according to the UL marking on the device.

Note: To guarantee an UL/CSA-compliant operation, you have to fulfill the following conditions:

- Use 60/75 °C copper wire only.

4.5 Compatibility Test

All Rexroth controls and drives are developed and tested according to the latest state-of-the-art.

As it is impossible to follow the continuing development of all materials (e.g. lubricants in machine tools) which may interact with our controls and drives, it cannot be completely ruled out that any reactions with the materials used by Bosch Rexroth might occur.

For that reason, test new lubricants, cleaning agents, etc. for compatibility with our housings / our housing materials before using the particular material concerned.

5 Dimensions

5.1 Housing Dimensions

The IndraControl L20 housing is 175.4 mm long, 120 mm high and 75.9 mm deep. Please refer to the following figures for detailed dimensions:

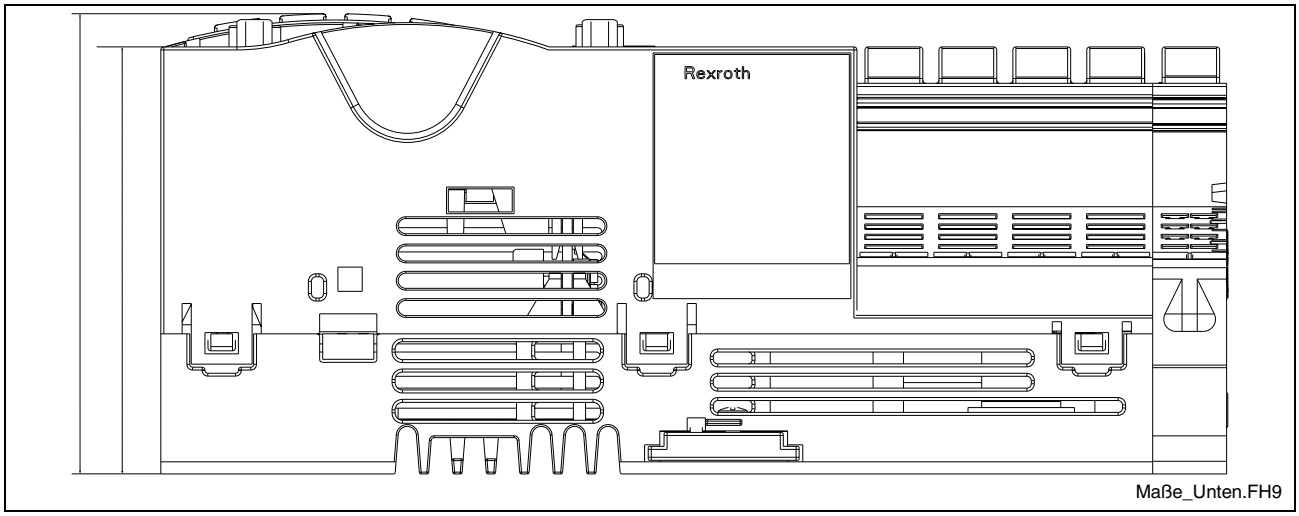


Fig. 5-1: Bottom view

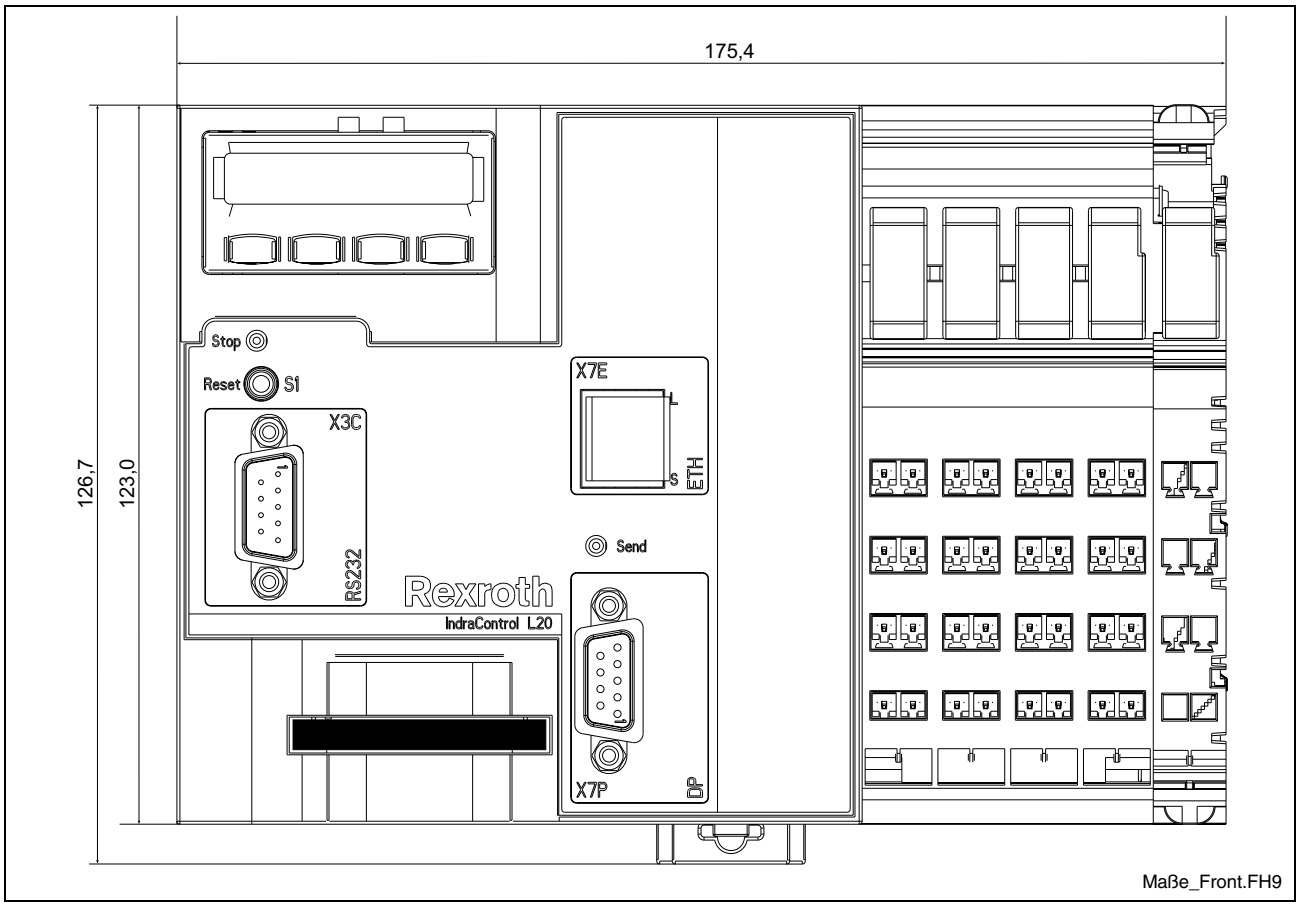


Fig. 5-2: Front view

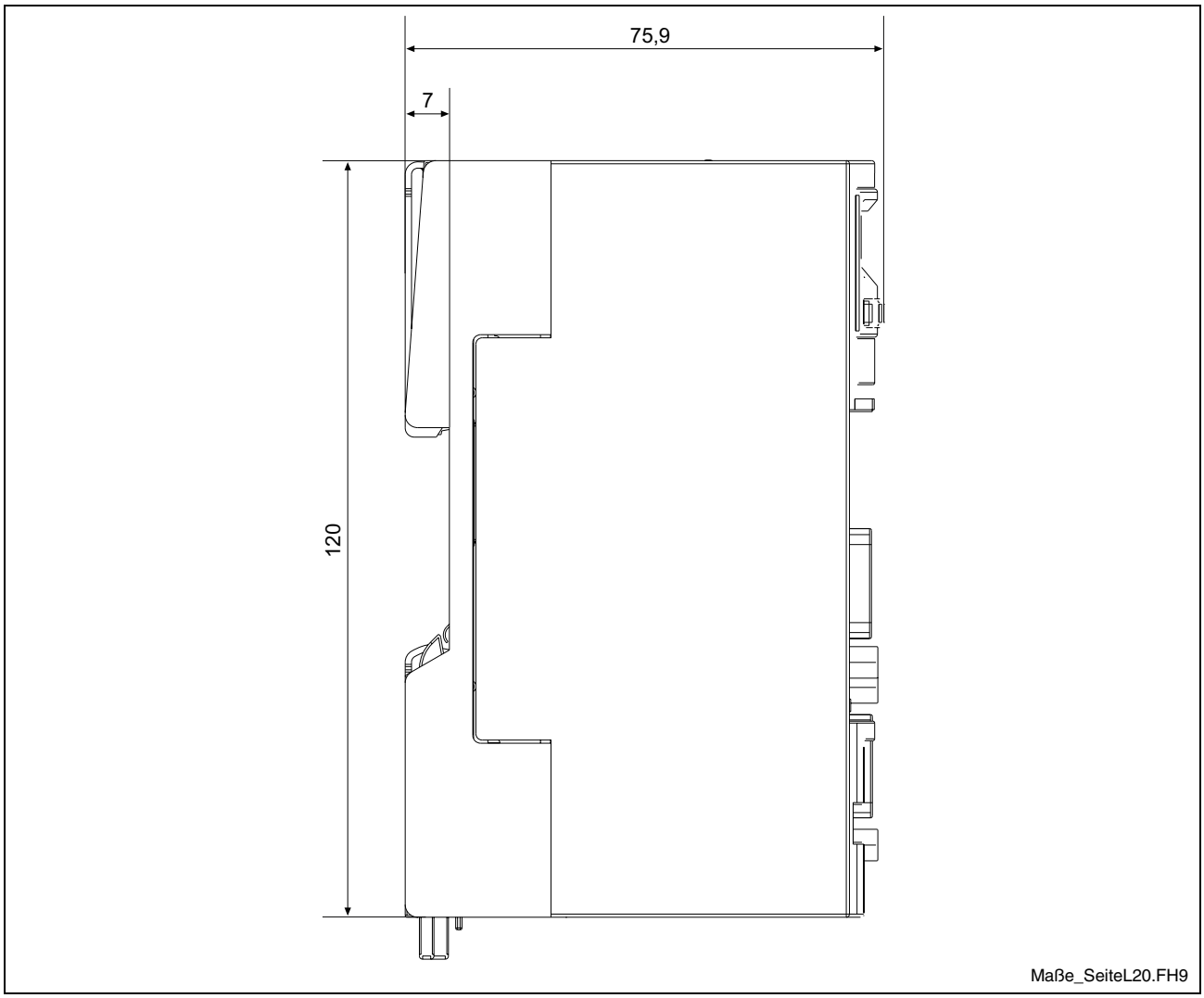


Fig. 5-3: Lateral view from the left
(the cutout for the top-hat rail is arranged centrally)

6 Display and Operating Components

On its front, the IndraControl L20 is provided with the following display and operating components: a single-line display with four operating keys as well as a light-emitting diode and a Reset button.

6.1 Display and Operating Keys

Display

The display is a LCD display comprising 8 digits (5 x 10 dot matrix).

Anzeige.jpg

Fig. 6-1: Display with four operating keys

Operating Keys

The following functions are assigned to the four operating keys at the bottom of the display (from left to right):

- Esc
  Move back to the last lower level.
  (Note: If you exit a menu with Esc, any changes you made in that menu will not be applied.)
- Down arrow
  Navigate within a menu (down) or decrement parameters to be set.
- Up arrow
  Navigate within a menu (up) or increment parameters to be set.
- Enter
  Confirm your entry or call the next higher menu level.

6.2 Reset Button and Light-Emitting Diode

The Reset button and a red light-emitting diode are arranged in the section below the display.

Reset.jpg

Fig. 6-2: Reset button and Stop LED

Reset Button

The Reset button can only be actuated with a tool, for instance with the tip of a pencil.

Actuating the Reset button will reset the complete assembly and force a restart of the unit without the supply voltages having to be turned off.

Note: Actuation of the Reset button will abort processing of a running program.

Light-Emitting Diode

The light-emitting diode is a diagnostic / status indicator.

The states indicated by the light-emitting diode depend on the firmware used and are included in the description of the particular system .

7 Connections and Interfaces

7.1 Overview of Connections on the Front

Des. on the housing	Type of connection	Type of connector (integrated)	Mating connector or cable (from outside)
X3C	Serial RS232 interface	D-Sub male connector, 9-pin	D-Sub female connector, 9-pin
X7E	Network connection: Ethernet 10Base T / 100Base X	RJ45 female connector, 8-pin	RJ45 male connector (8-core twisted pair)
X7P	PROFIBUS DP interface	D-Sub female connector, 9-pin	D-Sub male bus connector IP20, 9-pin

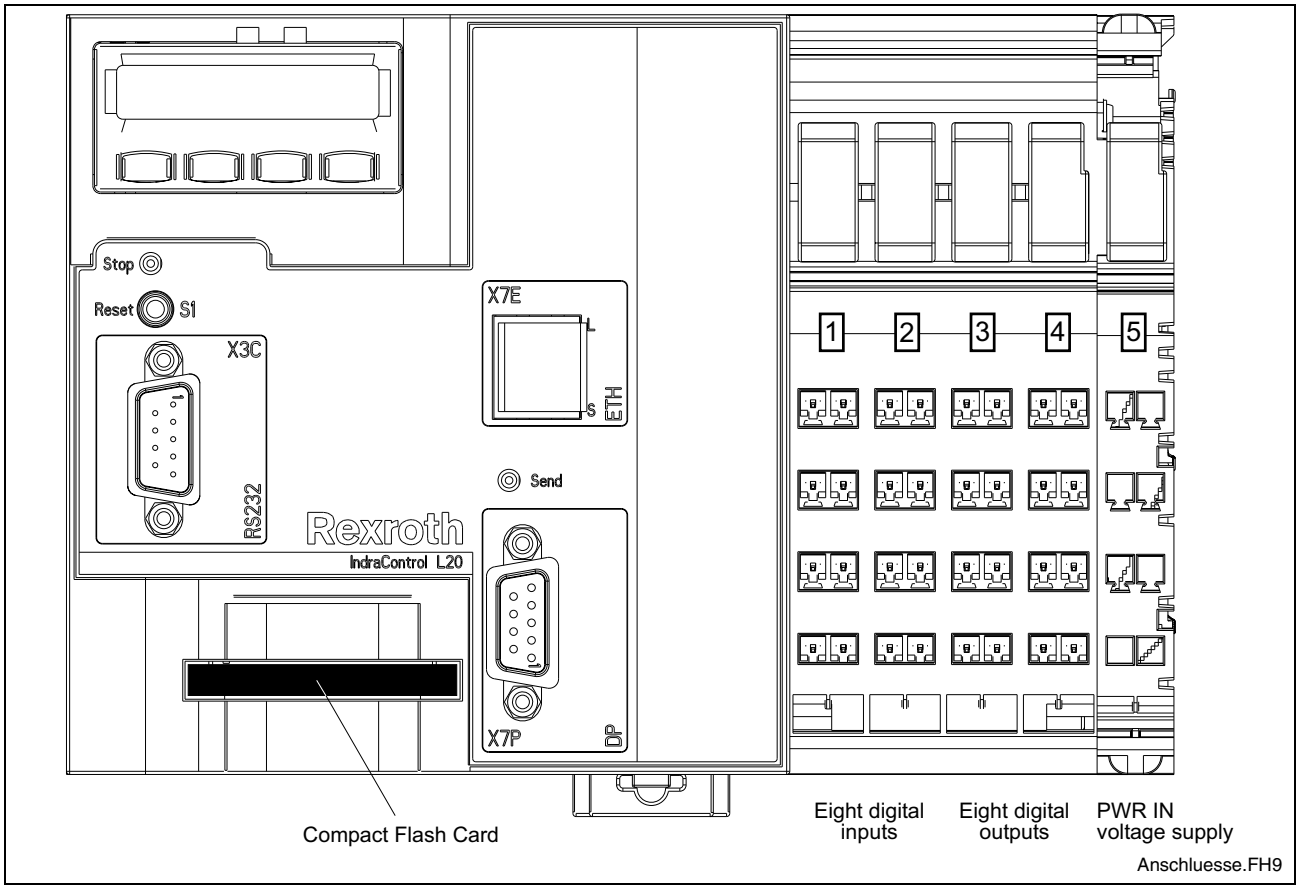


Fig. 7-1: IndraControl L20 connections

CAUTION

Fitting or removing connectors with the IndraControl L20 being live may damage the unit!

⇒ Turn off the supply voltage before establishing or breaking any connections!

7.2 Power Supply

External Supply Voltages

PWR IN The IndraControl L20 as well as any connected function modules and I/O assemblies are supplied with power via the black terminal strip to the right of the IndraControl L20 unit.

Slot 5:

PWR.tif

Fig. 7-2: Supply voltage connections

Note: Observe the color-coding of the connectors.

Note: To connect the operating voltages only the power connector included in the connector set R-IB IL CML S01-PLSET available for the IndraControl L20 is allowed (connector B2 in Fig. 9-4). Connector R-IB IL SCN-PWR IN-CP available for other power terminals is not permitted for the IndraControl L20 (connector B1 in Fig. 9-4).

This voltage module (PWR IN) is used to feed the following three voltages: U_{LS} (24 V supply voltage), Us (24 V segment voltage) and U_M (24 V main voltage):

Terminal	Signal
1.1	+ 24 V DC segment voltage (U_S)
1.2	+ 24 V DC supply voltage (U_{LS})
1.3	LGND (ground supply voltage)
1.4 and 2.4	FE (functional earth ground)
2.1 and 2.2	+ 24 V DC main voltage (U_M)
2.3	PGND (ground main and segment voltages)

Fig. 7-3: Pin assignment of the voltage module

Five light-emitting diodes are arranged at the upper edge. They have the following meaning:

"UM" LED	Meaning
Off	Main circuit supply is missing.
Green	24 V supply U_M of main circuit is present.

Fig. 7-4: Diagnostic LED of the power terminal

"US" LED	Meaning
Off	Segment circuit supply is missing.
Green	24 V supply U_S of segment circuit is present.

Fig. 7-5: Diagnostic LED of the segment terminal

"UL" LED	Meaning
Off	Supply voltage U_{LS} is missing.
Green	24 V supply voltage U_{LS} is present.

Fig. 7-6: Diagnostic LED of the supply voltage

"FS" and "FN" LEDs	Meaning
	No function at present.

Fig. 7-7: "FS" and "FN" LEDs

The 7.5 V Inline voltage U_L and the +24 V analog voltage U_{ANA} are derived from the external +24 V voltage U_{LS}.

24 V Supply Voltage U_{LS}

The internal voltages required in the IndraControl L20 are generated from the 24 V supply voltage U_{LS} (terminal 1.2).

Note: U_{LS} is electrically isolated from the voltages U_M and U_S.

Requirement: A power supply unit that is electrically isolated from the power supply units for U_M and U_S is used for U_{LS}.

U_M and U_S are not electrically isolated from each other.

+24 V Supply of Main Circuit U_M

The 24 V voltage for supplying the main circuit U_M that is to be fed in at terminals 2.1 and 2.2 is not used in the IndraControl L20.

The main circuit U_M starts at the IndraControl L20 or at a power terminal and is supplied by the lateral contacts (voltage routing) through all following modules up to the next power terminal. At the next power terminal, a new circuit is started; its potential is isolated from the previous one.

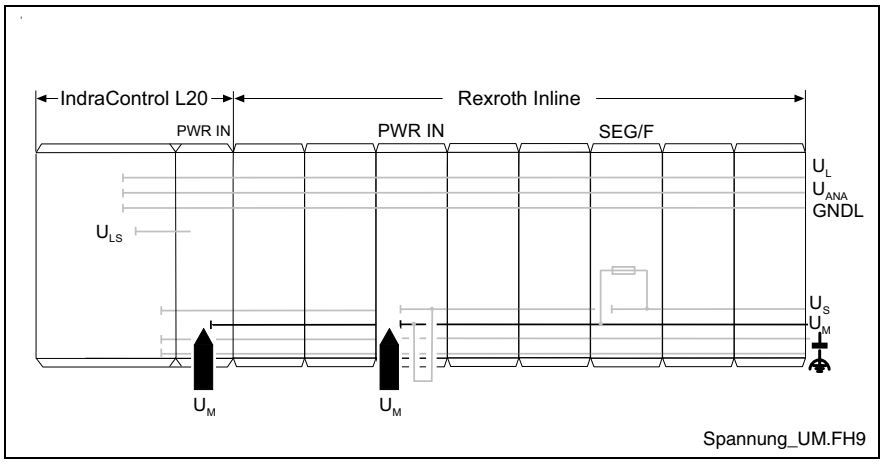
Several power terminals can be used within one station.

Function

Several independent segments can be created within the main circuit. The main circuit provides the voltage potential, from which the segment voltages (U_S) are derived. The splitting into segments permits to protect or switch e. g. the supply of several actuators separately.

Current Carrying Capacity

The maximum current carrying capacity is 8 A. If the limit has been reached, a new power terminal **must** be used.



L:	PWR IN	Voltage module at the IndraControl L20
	R-IL 24 PWR IN	Power terminal
	R-IL 24 SEG/F	Segment terminal with fuse

Fig. 7-8: Main circuit

Generation of U_M

In the simplest case, the main voltage U_M can be supplied at the IndraControl L20.

The main voltage U_M can also be supplied via a power terminal. A power terminal **must** be used in the following cases:

1 An electrical isolation is to be set up.

2 The maximum current carrying capacity of a voltage jumper (U_M, U_S or total current of U_S and U_M (GND)) has been reached.

+24 V Supply of Segment Circuit U_S

The segment circuit supply U_S is to be connected to terminal 1.1 and is supplied through the following series Rexroth Inline I/O modules by the lateral contacts (voltage jumper). It forms the segment circuit or auxiliary circuit of the Rexroth Inline modules and the onboard I/Os.

The segment circuit with the segment voltage U_S starts at the IndraControl L20 or a supply terminal (power terminal or segment terminal) and is supplied through all following modules up to the next supply terminal.

Function

From U_S the initiator supply as well as the signal voltage of the outputs is provided. You can use several segment terminals within a main circuit and thereby segment the latter. The reference to ground is the same as that of the main circuit. Thus, you can realize within the station differently fused electric circuits without any external cross wiring.

Voltage

The voltage in the segment circuit is 24 V DC.

Current Carrying Capacity

The maximum current carrying capacity is 8 A. If the limit for a voltage jumper U_M has been reached (U_M , U_S or total current of U_S and U_M (GND)), a new power terminal must be used.

Generation of U_S

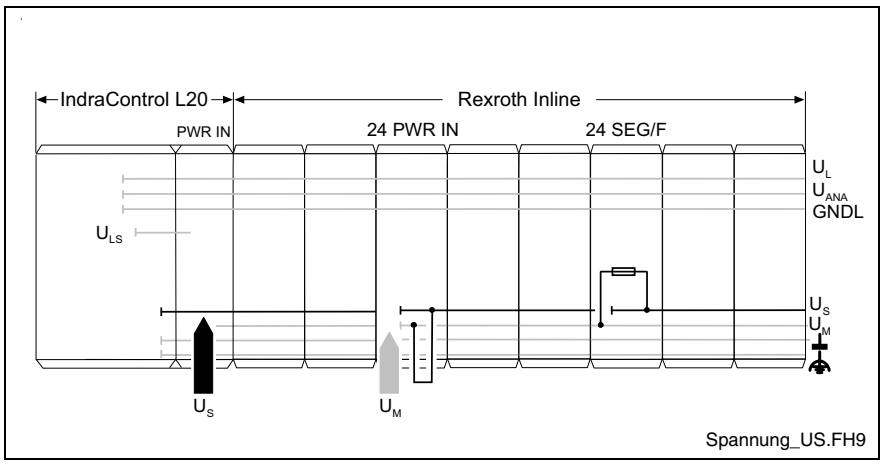
The segment voltage U_S can be provided in various ways:

1 You can feed in the segment voltage at the IndraControl L20 or at a power terminal.

2 You can tap the segment voltage from the main voltage, either at the IndraControl L20 or at a power terminal using a jumper or a switch.

3 You can use a segment terminal with fuse. In this terminal, the segment voltage is automatically tapped from the main voltage.

Note: At the 120 V and 230 V voltage levels, it is not possible to set up segments. In this case, only the main circuit is used. Special power terminals must be used.



L:	PWR IN	Voltage module at the IndraControl L20
	R-IL 24 PWR IN	Power terminal
	R-IL 24 SEG/F	Segment terminal with fuse

Fig. 7-9: Segment circuit

Note: Voltages U_M and U_S are electrically isolated from U_L.

Requirement: Power supply units that are electrically isolated from the power supply unit for U_{LS} are used for voltages U_M and U_S.

Note: When designing the station, please note that because of the common GND the total current in the segment circuit U_S and the main circuit U_M must not exceed 8 A.

Note: U_M is interrupted by the terminal PWR IN.

U_S is interrupted by the terminals PWR/IN and SEG/F.

Internal Voltages

+7.5 V Inline Supply U_L

The +7.5 V Inline supply voltage U_L is generated from the supply voltage U_{LS} inside the IndraControl L20 and is supplied through all connected Rexroth Inline I/O modules by the lateral contacts (voltage jumper).

Function Logic voltage is supplied from the Inline supply U_L to all modules of the station.

Voltage The voltage in this circuit is 7.5 V.

Generation of the Inline Supply Voltage The Inline supply U_L is generated from the supply voltage U_{LS} of the IndraControl L20.

Current Carrying Capacity The maximum current carrying capacity of the Inline voltage U_L is maximum 1 A. Thus, the total current consumption of all Inline modules must not exceed this value of 1 A.

+24 V Analog Supply (U_{ANA})

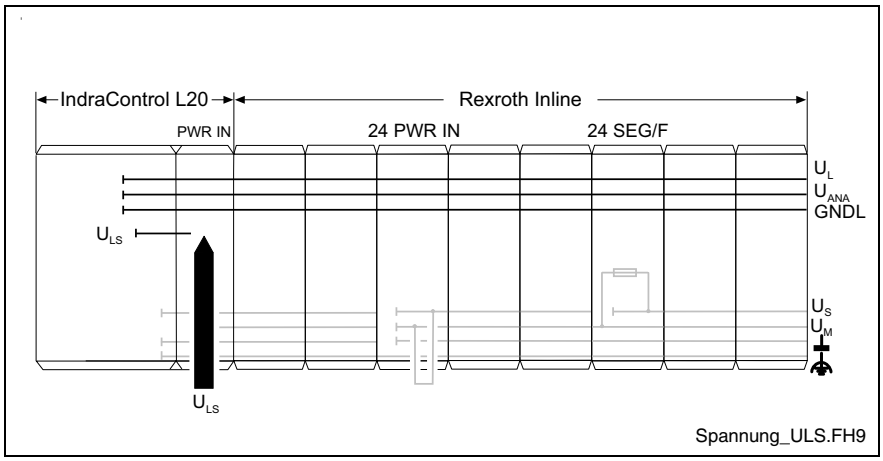
The +24 V analog voltage U_{ANA} is generated from the voltage U_{LS}. It starts in the IndraControl L20 and is supplied through all Rexroth Inline I/O modules by the lateral contacts (voltage jumper).

Function The output signals of the analog modules are generated from the analog circuit in the analog terminals.

Voltage The voltage in this circuit is 24 V.

Generation The analog voltage U_{ANA} is generated from the supply voltage U_{LS} of the IndraControl L20.

Current Carrying Capacity The maximum current carrying capacity of U_{ANA} is 0.5 A.



L:	PWR IN	Voltage module at the IndraControl L20
	R-IL 24 PWR IN	Power terminal
	R-IL 24 SEG/F	Segment terminal with fuse

Fig. 7-10: Inline supply and analog circuit

7.3 Digital Inputs and Outputs

Address Assignment of Inputs and Outputs

The eight digital inputs and outputs that are available on the slots 1 to 4 of the IndraControl L20 (from left to right) are assigned to light-emitting diodes and bit addresses according to the following table:

		Eight digital inputs								**Eight digital outputs**							
	Slot	1				2				3				4			
	Status LED	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Byte-bit view	Bytes	IX0.0 – 0.7 (default)								QX0.0 – 0.7 (default)							
	Bit	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Module	Terminal point (signal)	1.1	2.1	1.4	2.4	1.1	2.1	1.4	2.4	1.1	2.1	1.4	2.4	1.1	2.1	1.4	2.4
	Terminal point (24 V)	1.2	2.2	1.3	2.3	1.2	2.2	1.3	2.3	-	-	-	-	-	-	-	-
	Terminal point (last ground)	-	-	-	-	-	-	-	-	1.2	2.2	1.3	2.3	1.2	2.2	1.3	2.3

Fig. 7-11: Address assignment of inputs and outputs

Digital Onboard Inputs

The left-hand section of the plug panel provides eight digital inputs as onboard inputs.

Slots 1 and 2:

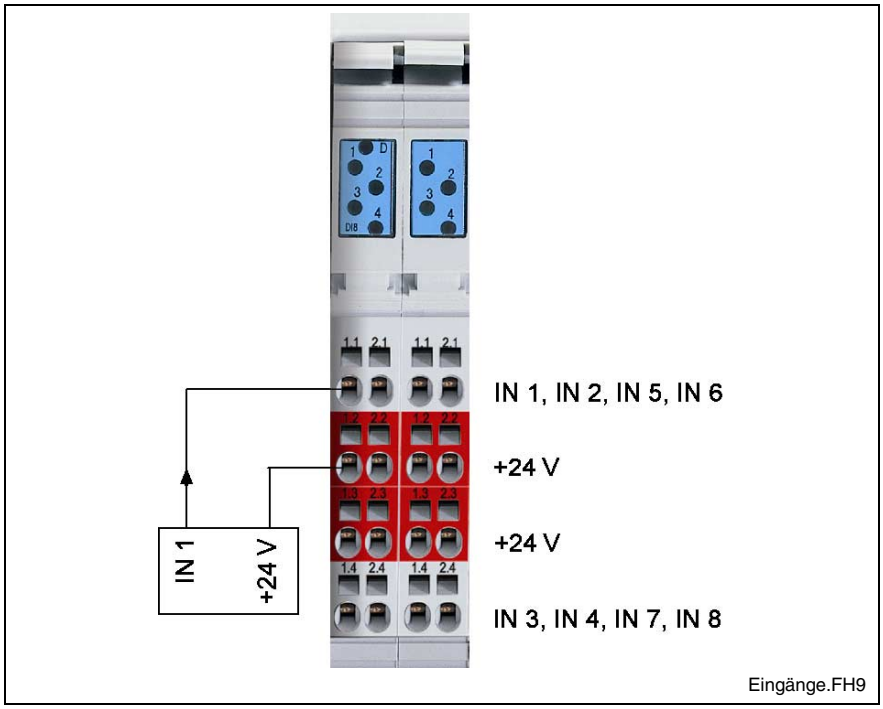


Fig. 7-12: Digital inputs

Note: Observe the color-coding of the connectors.

Number of inputs	8
Connection method	2-wire connection
Electrical isolation from U_S	No
Electrical isolation from U_L	Yes
Reverse voltage protection	Yes
Input voltage: Nominal value at "0" Nominal value at "1"	 -3 V ... +5 V 11 V ... 30 V
Input current: Nominal value at "0" Nominal value at "1"	 < 2.5 mA 2.8 mA ... 6 mA
Delay time: If "0" to "1" If "1" to "0"	 Typ. 50 µs Typ. 50 µs
Current consumption by 24 V supply (U_S)	Typ. 60 mA
Cable length (unshielded)	< 100 m
Interrupt inputs	8
Sensor supply	From U_S via a PTC fuse
Output voltage	Typ. Uext. – 1 V
Nominal current (total)	0.2 A
Short-circuit protection, overcurrent protection	Typ. 0.6 A

Criteria for connecting 2-wire proximity switches: Static current Voltage drop	 < 2.5 mA < 6 V

Fig. 7-13: Data of digital inputs

Light-emitting diodes indicating the current state of the inputs are arranged on top of the input terminals.

LEDs 1, 2, 3, 4	Meaning
Off	The assigned input is not set.
Yellow	The assigned input is set.

Fig. 7-33: Status LEDs of digital inputs

An additional two-color light-emitting diode (identified by D) emits green light in case the 24 V voltage is present and red light in case of a short-circuit or overload.

Light-emitting diode D	Meaning
Off	24 V voltage is missing.
Green	24 V voltage is present.
Red	Short-circuit or overload.

Fig. 7-14: Light-emitting diode D

Digital Outputs

Two terminal strips with a total of 8 digital outputs are arranged between the digital inputs and the terminals for the voltage supply.

Slots 3 and 4:

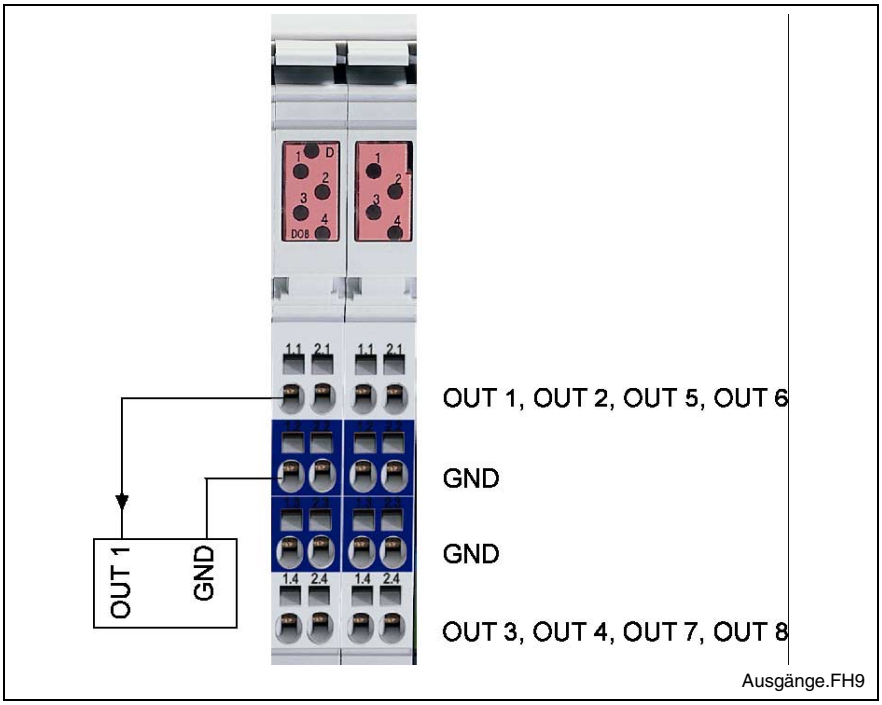


Fig. 7-15: Digital outputs

Note: Observe the color-coding of the connectors.

Number of outputs	8
Connection method	2-wire connection
Output type	• Semiconductor outputs, non-saving • Protected, with automatic restart • Current-carrying
Electrical isolation from U_S	No
Electrical isolation from U_L	Yes
Output voltage, nominal value	24 V
Rated output current: Nominal value Maximum value according to DIN EN 61131-2 1-signal 0-signal (leakage current) UL-Rating: • General Purpose • Tungsten	 0.5 A ≤ 0.6 A 2 mA ... 0.6 A ≤ 0.5 mA 0.5 A 5 W
Maximum total current of outputs	2 A
Parallel connection of outputs	Yes, but only within one terminal
Output delay time	< 500 µs
Contactor size (at 1 Hz)	SG1 (6.2 W)
Lamp load (at 8 Hz)	5 W
Switching frequency • With ohmic load • With inductive load	 100 Hz Function (contactor)
Overload protection: • Typical current level, causing switch-off • Minimum current level, causing switch-off • Automatic restart with reduced load	 1.2 A 0.6 A After approx. 10 msec
Overload indicator	Red collective LED for all 8 outputs
Voltage reduced on circuit interruption in the nominal operating mode	Electronically limited to (Vext – 50 V) Typ. 26 V
Reverse voltage protection	Ensured without connected load
Supply voltage according to EN 61131-2	24 V DC
Open-circuit power consumption from U_S	Typ. 50 mA
Cable length (unshielded)	< 100 m

Fig. 7-16: Data of digital outputs

Light-emitting diodes indicating the current status of the outputs are arranged above the output terminals.

LEDs 1, 2, 3, 4	Meaning
Off	The assigned output is not set.
Yellow	The assigned output is set.

Fig. 7-33: Status LEDs of digital outputs

An additional two-color light-emitting diode (identified by D) emits green light in case the 24 V voltage is present and red light in case of a short-circuit or overload.

Light-emitting diode D	Meaning
Off	24 V voltage is missing.
Green	24 V voltage is present.
Red	Short-circuit or overload.

Fig. 7-17: Light-emitting diode D

WARNING

Assembly destruction

If connected improperly, the assembly might be destroyed. For that reason, **avoid:**

⇒ Polarity reversal with simultaneous short-circuit of the output lines

⇒ Polarity reversal with simultaneous connection of externally polarized suppressor diodes

⇒ Applying an external voltage > UB

The 0 V reference voltage of the connected loads must be returned to the 0 V terminal of the IndraControl L20, i. e. a two-pin connection must be ensured. Otherwise, there will be no reliable protection from GND breakage.

7.4 Interfaces

Serial RS232 Interface

X3C
Serial RS232 Interface

A serial RS232 interface is provided at X3C.

D-Sub male connector, 9-pin	
Type:	RS232
Cable length:	Max. 15 m
Cable type:	Shielded, twisted

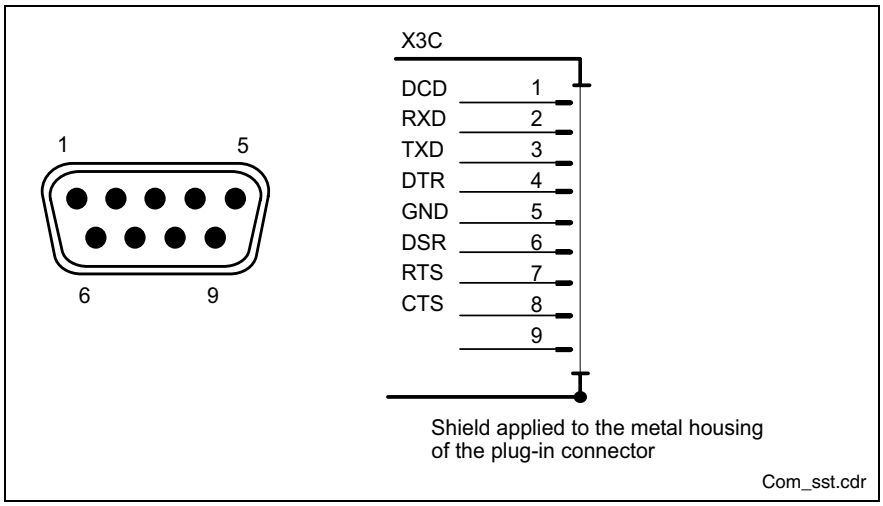


Fig. 7-18: RS232 interface

The interface is electrically isolated. A maximum potential difference of 2 V must be ensured by an appropriate potential equalization between the control and the remote station.

After power on, the following default parameters are set in the IndraControl L20:

- 9600 bauds
- No parity
- 8 data bits
- 1 stop bit

These parameters can be changed via the software or by the application program.

You will find cables for this interface on page 11-3.

Ethernet Interface

X7E
Ethernet Network Connection

Connector X7E can be used to connect the IndraControl L20 to an Ethernet network.

The connection requirements defined for 100BaseT in IEEE 802.3 are applicable to Ethernet network connections.

RJ45 female connector, 8-pin	
Type:	Ethernet 100BaseT
Cable length:	Max. 100 m
Cable type:	Shielded, twisted pair
Transmission rate:	10 or 100 Mbits/s

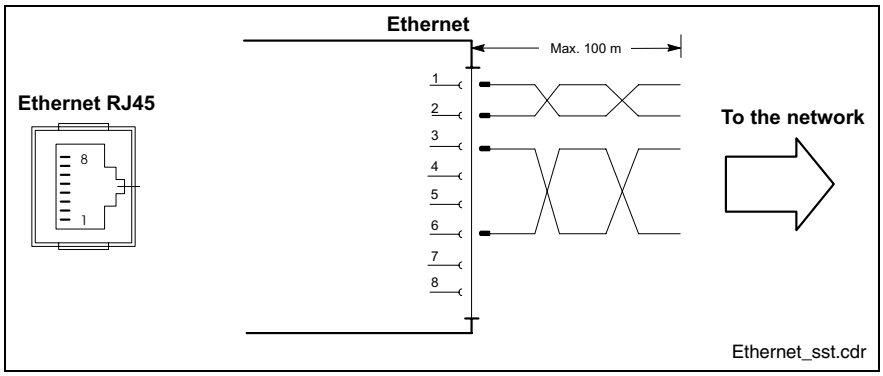


Fig. 7-19: Ethernet interface

Bosch Rexroth recommends the use of an STP cable of category 5. You will find the corresponding cables on page 11-3.

PROFIBUS DP (Optional)

X7P
PROFIBUS DP Interface

Optionally, the IndraControl L20 provides a PROFIBUS interface according to DIN EN 50170, Part 2.

D-Sub female connector, 9-pin	
Type:	RS485
Cable type:	Shielded, twisted pair
Transmission rate:	9,6 kbits/s up to 12 Mbits/s

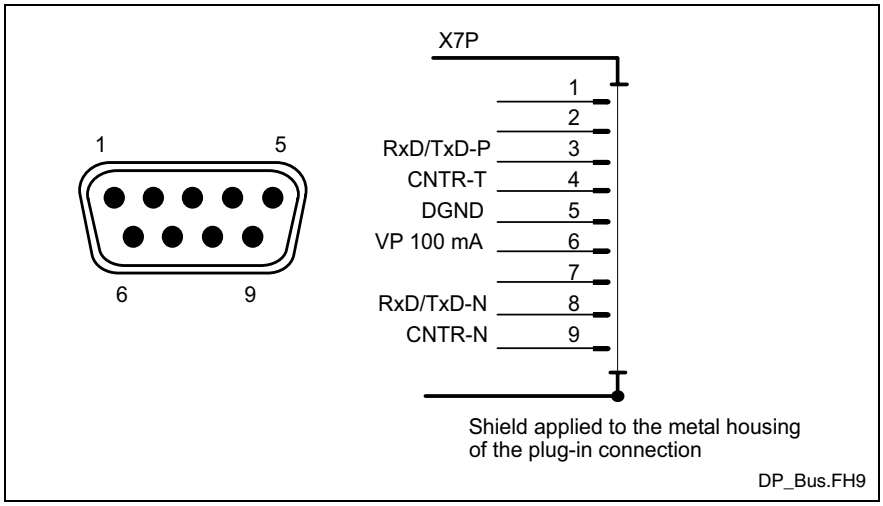


Fig. 7-20: PROFIBUS DP interface

The bus line is specified as cable type A according to EN 50 170, Part 8-2 and must comply with the cable parameters named in Fig. 7-21. You will find the corresponding cables and connectors on page 11-4.

Surge impedance at a frequency within a range from 3 to 20 MHz	135 to 156 ohms
Operating capacity	≤ 30 pF/m
Loop resistance	≤ 110 ohms/km
Outside diameter	> 0.64 mm
Core cross-section	> 0.34 mm²

Fig. 7-21: Parameters for PROFIBUS DP line

The above mentioned cable parameters of a standard cable of cable type A result in the following length extensions of a bus segment for the particular transmission rates:

Transmission rate in kbits/s	9,6	19,2	45,45	93,75	187,5	500	1500	3000	6000	12000
Max. segment length in m	1200	1200	1200	1200	1000	400	200	100	100	100

Fig. 7-22: Maximum segment length in relation to the transmission rate

A "Send" light-emitting diode is arranged on the top of the PROFIBUS interface.

“Send” LED	
LED on	Output of data by the IndraControl L20

Fig. 7-23: “Send” light-emitting diode

Interface for Compact Flash Card

Compact Flash

The IndraControl L20 is provided with a slot for a Compact Flash card. This slot can be used to insert the memory card containing the firmware (card to be ordered separately). In addition, data and programs are stored to this card. Operation without Flash card is not possible.

Note: It is only allowed to use Compact Flash cards of Bosch Rexroth.

DANGER

Operation without memory card causes uncontrolled movements!

⇒ Be sure not to remove the Compact Flash card as long as the IndraControl L20 is in operation.

7.5 Inline Bus

To its right, the IndraControl L20 can be extended by additional Rexroth Inline modules. Such modules permit an extension of the I/O unit to up to 32-byte inputs and 32-byte outputs (total of inputs and outputs).

The maximum number of Rexroth Inline modules that can be connected is 63.

8 Installation and Maintenance

8.1 Mechanical Installation of the IndraControl L20

Mounting Rail (Top-Hat Rail)

Mount the IndraControl L20 to a mounting rail (standard top-hat rail) according to DIN EN 50022 (35 mm x 7.5 mm).

Note: Ensure that the top-hat rail is attached such that it provides appropriate rigidity.

In addition to its holding function, this top-hat rail also assumes the function of ground connection and heat removal.

For that reason, the top-hat rail must be connected to a functional earth ground. In connection with the metal bottom frame of the IndraControl L20, the top-hat rail is furthermore provided as heat sink.

Note: Ensure a well heat-dissipating connection to the rear panel of the switch cabinet.

Install the IndraControl L20 horizontally in a switch cabinet or an appropriate housing.

If permitted by ambient conditions, the IndraControl L20 can also be mounted directly to the system.

CAUTION

Do not mount controls, modules or connectors while the unit is live!

⇒ Before mounting or dismounting components of the station, de-energize the entire station. Connect the voltage only after you have set up the entire station. Any non-observance of this requirement may cause destruction of components.

Mounting the IndraControl L20

Mounting the IndraControl L20 to the Top-Hat Rail

Mount the IndraControl L20 by hanging it onto the top-hat rail from above and then exerting slight pressure to engage the control in the lower section of the housing.

Mounting Rexroth Inline Modules in Series

If necessary, mount Rexroth Inline modules in series with the control. For more detailed information, please refer to section "Mechanical Installation of Rexroth Inline Modules" on page 8-3.

End Plate

The end plate **must** form the mechanical termination to the right of the station, irrespective of whether you have mounted Rexroth Inline modules in series or not. The end plate does not have any electrical function. It is intended to protect the station from ESD pulses and the user from dangerous contact voltages. The end plate is included in the scope of delivery of the IndraControl L20. It is, therefore, not necessary to order the end plate separately.

Attaching the End Clamps / CLIPFIX Clamps

Attach the end clamps to either side of the Rexroth Inline station. These end clamps ensure that the station is securely mounted to the top-hat rail and are also provided as lateral termination elements. These termination elements are included in the scope of delivery of the IndraControl L20.

Dismounting the IndraControl L20

If you want to dismount the IndraControl L20, first remove the left-hand end clamp (CLIPFIX).

Removing the First Rexroth Inline module

Thereafter, remove the first Rexroth Inline module that is mounted to the right of the IndraControl L20. Proceed as follows:

- Remove the labeling field, if present.

Note: If any of the modules is provided with more connectors than one, all these connectors must be removed from the module.

- Pry out the connector of the module to be removed by pressing on the rear connector shaft latch.
- Remove the connector(s).
- Remove the power plug from the IndraControl L20. This ensures that the feathers of the voltage jumpers and the keyway/feather key joint are prevented from damage. Moreover, the module can be accessed more easily.
- Actuate the release mechanism (1 in Fig. 8-1) and remove the electronic socket perpendicularly to the top-hat rail (2 in Fig. 8-1).

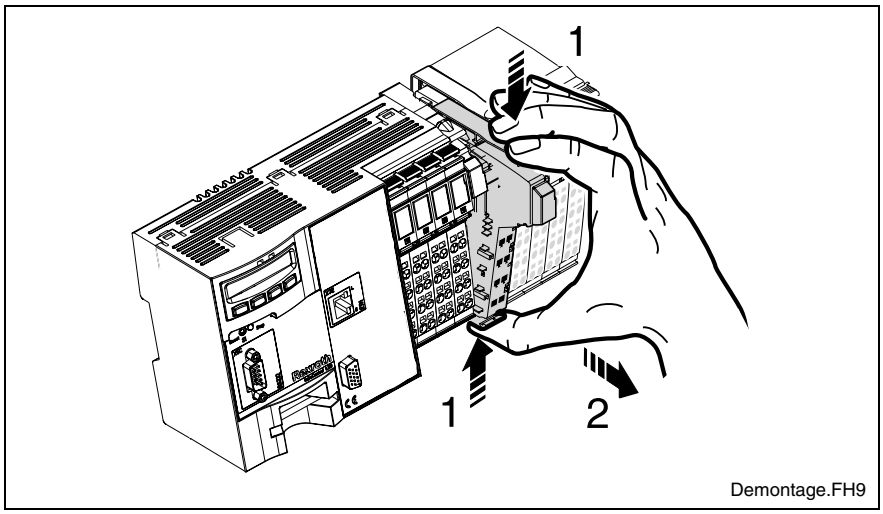


Fig. 8-1: Before dismounting the IndraControl L20, the first Rexroth Inline module must be removed.

Removing the IndraControl L20 from the Top-Hat Rail

You can now remove the IndraControl L20 from the top-hat rail by loosening the fixing claw on the bottom side by means of a tool (screwdriver) and pulling the IndraControl L20 off the top-hat rail from below, tilting it and removing it upwards.

8.2 Mechanical Installation of Rexroth Inline Modules

Rexroth Inline modules can be added in series to the right of the IndraControl L20 as appropriate. No tool is required. On connecting these modules in series, the potential and bus signal connection (voltage and data routing) between the individual components of the station is established automatically.

The modules must be mounted perpendicularly to the top-hat rail.

Once the station has been set up, individual modules can be replaced subsequently by being pulled out or plugged in without any additional tools.

Top-Hat Rail

The Rexroth Inline modules must be mounted to the right of the IndraControl L20 on the 35 mm standard top-hat rail.

Mounting the Inline Modules

Proceed as follows to latch on a module (Fig. 8-2):

- First latch on the electronic sockets, which are required to set up the station, perpendicularly to the top-hat rail (Fig. A).

Note: Ensure that **all** feather keys and keyways of neighboring modules are interlocked (Fig. B).

The keyway/feather key joint connects neighboring modules to each other and ensures, that the voltage jumper is set up securely.

- Then fit the connectors onto the pertinent sockets.

First fit the forward connector shaft latch in the forward release mechanism (Fig. C).

Then press the connector towards the socket until it clicks into place in the rear release mechanism (Fig. D).

Note: The keyways provided in the electronic socket are not continued in the connector. An electronic socket can only be latched on, if there is no connector to the left of it. If necessary, the latter must be removed.

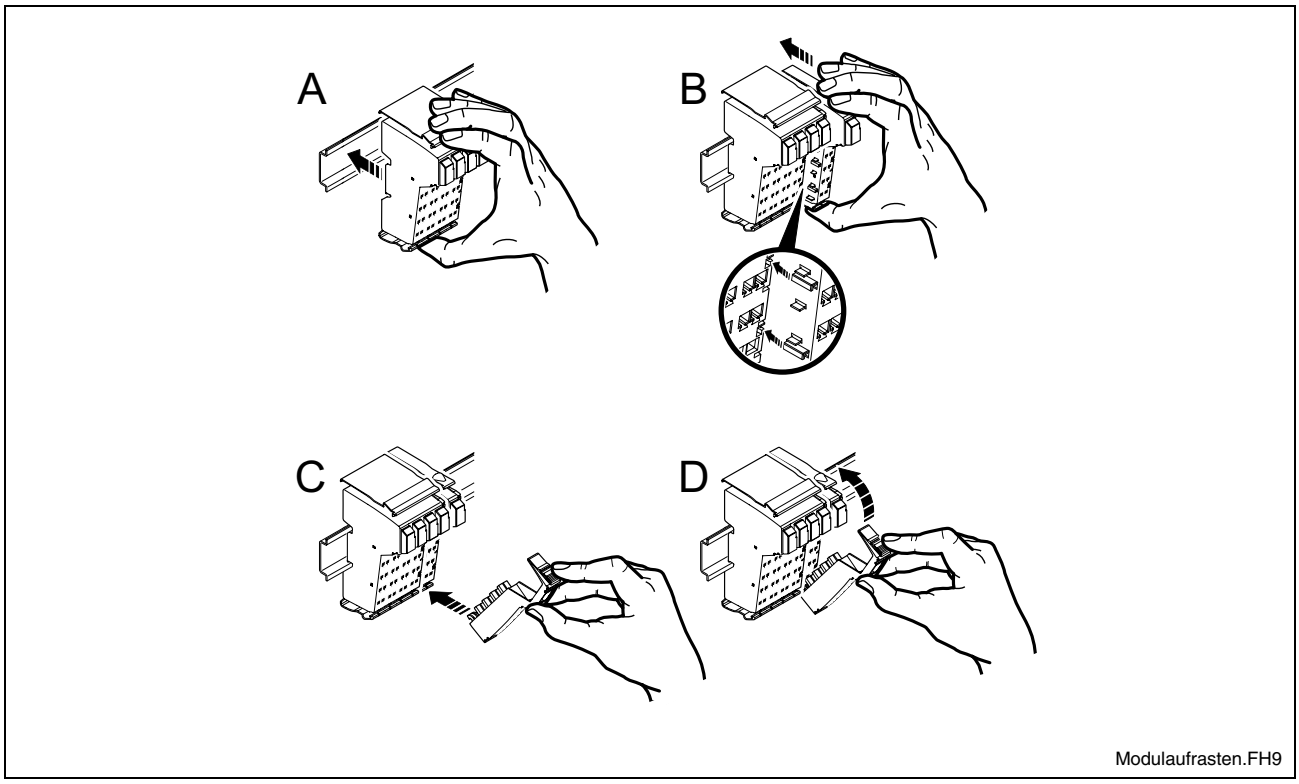


Fig. 8-2: Latching on a module

Dismounting the Inline Modules

Proceed as follows to remove a module (Fig. 8-3):

- Remove the labeling field, if present (A1 in Fig. A).

Note: If any of the modules is provided with more connectors than one, all these connectors must be removed from the module. The sections below describe the removal of a 2-slot module.

Pry out the connector of the module to be removed by pressing on the rear connector shaft latch (A2 in Fig. A).

- Remove the connector (Fig. B).
- Remove the adjacent connectors of the neighboring modules (Fig. C). This ensures that the feathers of the voltage jumpers and the keyway/feather key joint are prevented from damage. Moreover, the module can be accessed more easily.
- Actuate the release mechanism (D1 in Fig. D) and remove the electronic socket perpendicularly to the top-hat rail (D2 in Fig. D). If you have failed to loosen the connector of the neighboring module to the left, this connector now comes loose to protect the feathers of the voltage jumper and the keyway/feather key joint.

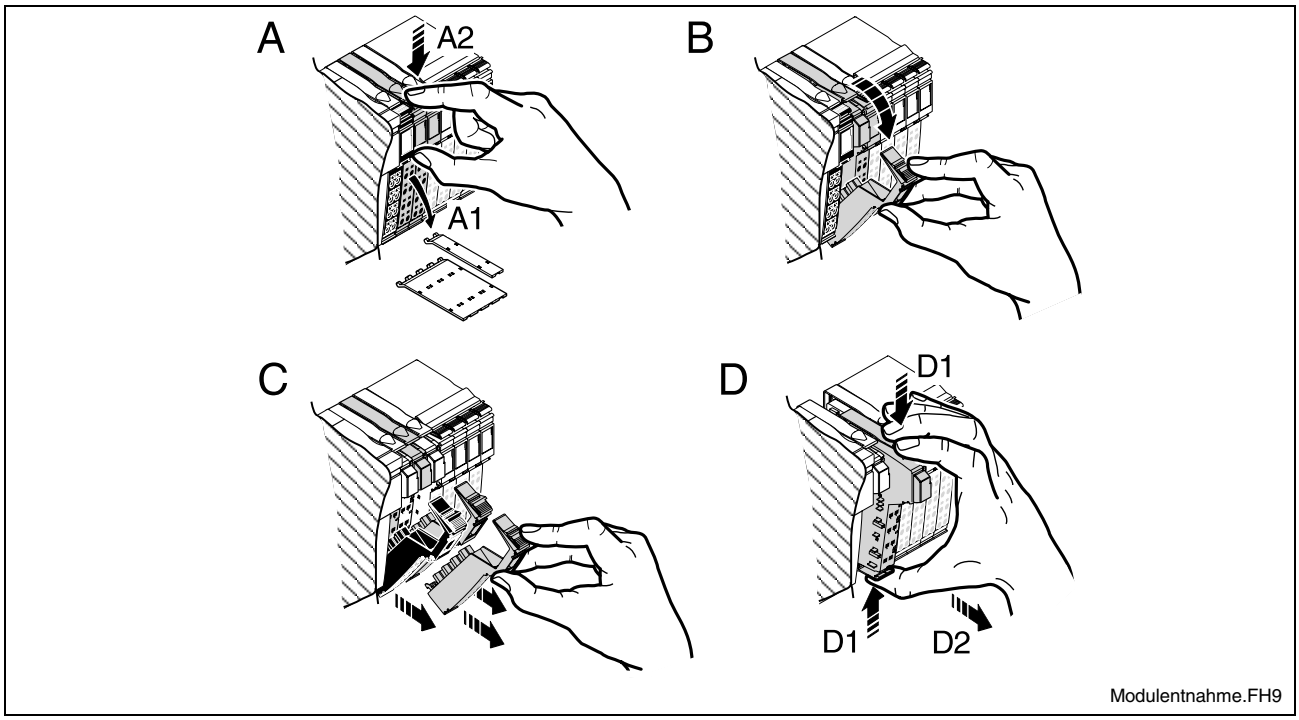


Fig. 8-3: Removing a module

Replacing a Module

If you intend to replace a module within the Rexroth Inline station, proceed as described above to remove it. Do not latch on the adjacent connector of the neighboring module to the left yet.

Insert the socket of the new module. Refit all connectors.

Fuse Replacement

If segment terminals with fuse are used, the connected voltage and the state of the fuse are monitored and indicated by diagnostic indicators (see the chapter entitled “Indicators on the Supply Terminals” on page 9-15).

Note: A missing fuse must be installed; a defective fuse must be replaced.

When replacing the fuse, please observe the following instructions on the safety of your health and the protection of your station!

1. Always use the screwdriver with care to prevent yourself and any other person from being injured.
2. Pry out the fuse at the metal contact. Do not pry the fuse out at the glass body to prevent the latter from being broken.
3. Pry out the fuse carefully on one side and then remove it by hand. Take care not to drop the fuse into your station.

Proceed as follows to replace the fuse (also see the illustrations in Fig. 8-4):

- Swing up the fuse lever (Fig. A).
- Put a screwdriver behind a metal contact of the fuse (Fig. B).
- Carefully pry out the metal contact of the fuse (Fig. C).
- Remove the fuse by hand (Fig. D).
- Latch in the new fuse (Fig. E).
- Press the fuse lever down again until it clicks into place (Fig. F).

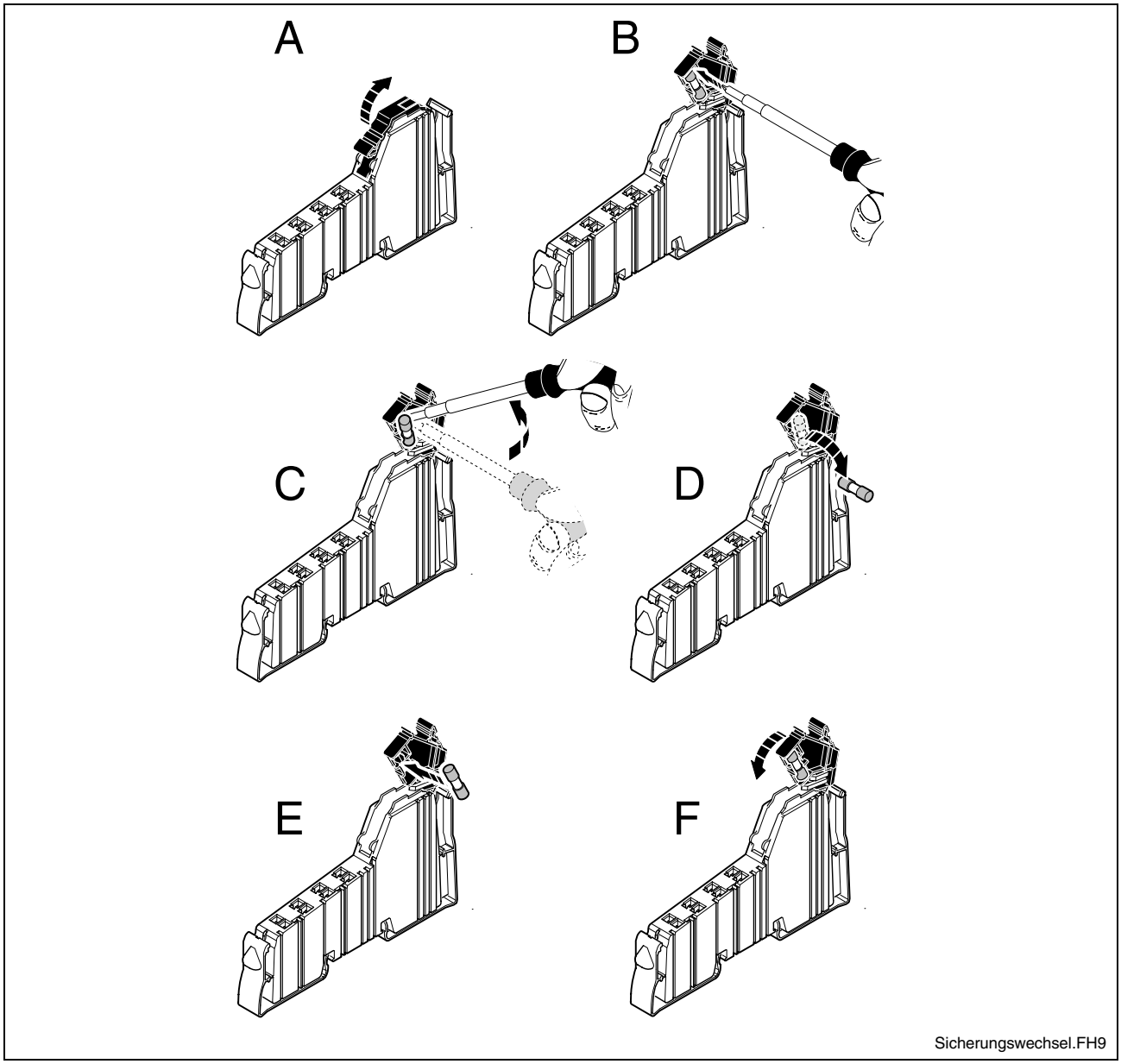


Fig. 8-4: Fuse replacement

8.3 Electric Installation

The following rules for setting up a system, in which the electrical equipment like control systems are used, must be adhered to:

- DIN VDE 0100
- DIN EN 60 204–1
- DIN EN 50 178

DANGER

Danger of personal injury and material damage!

⇒ Any dangerous states of the system which might cause personal injury or material damage must be prevented!

⇒ The rules and regulations for setting up EMERGENCY STOP equipment in accordance with EN 60 204-1 must be adhered to!

⇒ Any automatic restart of machines after power return, e. g. after an EMERGENCY STOP, must be excluded!

⇒ Protection for direct and indirect contact must be ensured by the measures prescribed (connection to protective conductor, isolation, etc.).

External Power Supply Unit

All components of the IndraControl L20 are supplied with 24 V supply voltages.

The power supply unit must be safety-separated in accordance with DIN EN 50 178, Section 5.2.18.1. Transformers must be designed with safety separation in accordance with DIN EN 60 742.

If these requirements are complied with, the 24 V supply voltage is rated as safety-separated extra-low voltage in accordance with DIN EN 50 178, Section 5.2.8.1. This voltage is designed either as safety extra-low voltage (SELV) without ground connection of the reference conductor or as protective extra-low voltage (PELV) with ground connection of the reference conductor.

A three-phase power supply unit with easy full-bridge rectification is appropriate. The ripple voltage content must not exceed 5 %.

All 24 V voltage supply lines must

- be laid such that they are isolated from lines carrying higher voltages, or
- be insulated to a particularly high degree, with the insulation having to be designed for the highest voltage present (see EN 60 204-1: 1997, Section 14.1.3).

Any peripherals, such as digital sensors/actuators, which are connected to the interfaces of the IndraControl L20, must also comply with the criteria of safety-separated circuit.

24 V Voltage Supply

Setup Without Electrical Isolation

The most easiest connection method is the establishment of an electrical isolation between the internal logic and the peripheral supply.

In this case, a power supply unit is appropriate to supply the IndraControl L20. It is not permitted to use an autotransformer to ensure compliance with overvoltage category II.

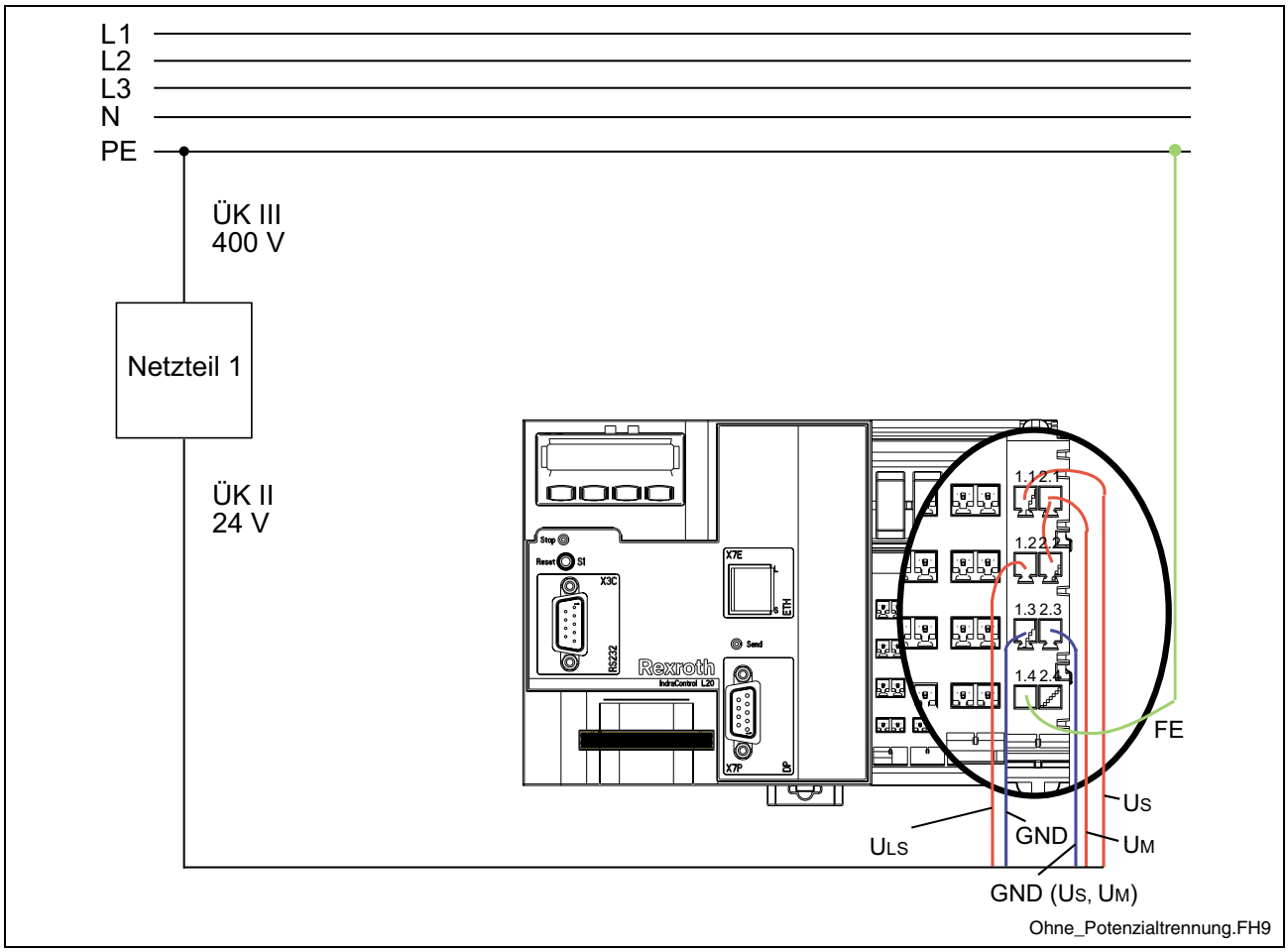


Fig. 8-5: Setup without electrical isolation

Setup With Electrical Isolation

According to DIN EN 60 204-1, electrical isolation should be provided between the logic of the central processing unit and the I/O interfaces of the peripheral assemblies. Accordingly, the voltage U_{LS} (24 V logic voltage) is electrically isolated from the voltages U_S (24 V segment voltage) and U_M (24 V main voltage) in the IndraControl L20.

The following is an example of a setup with electrical isolation:

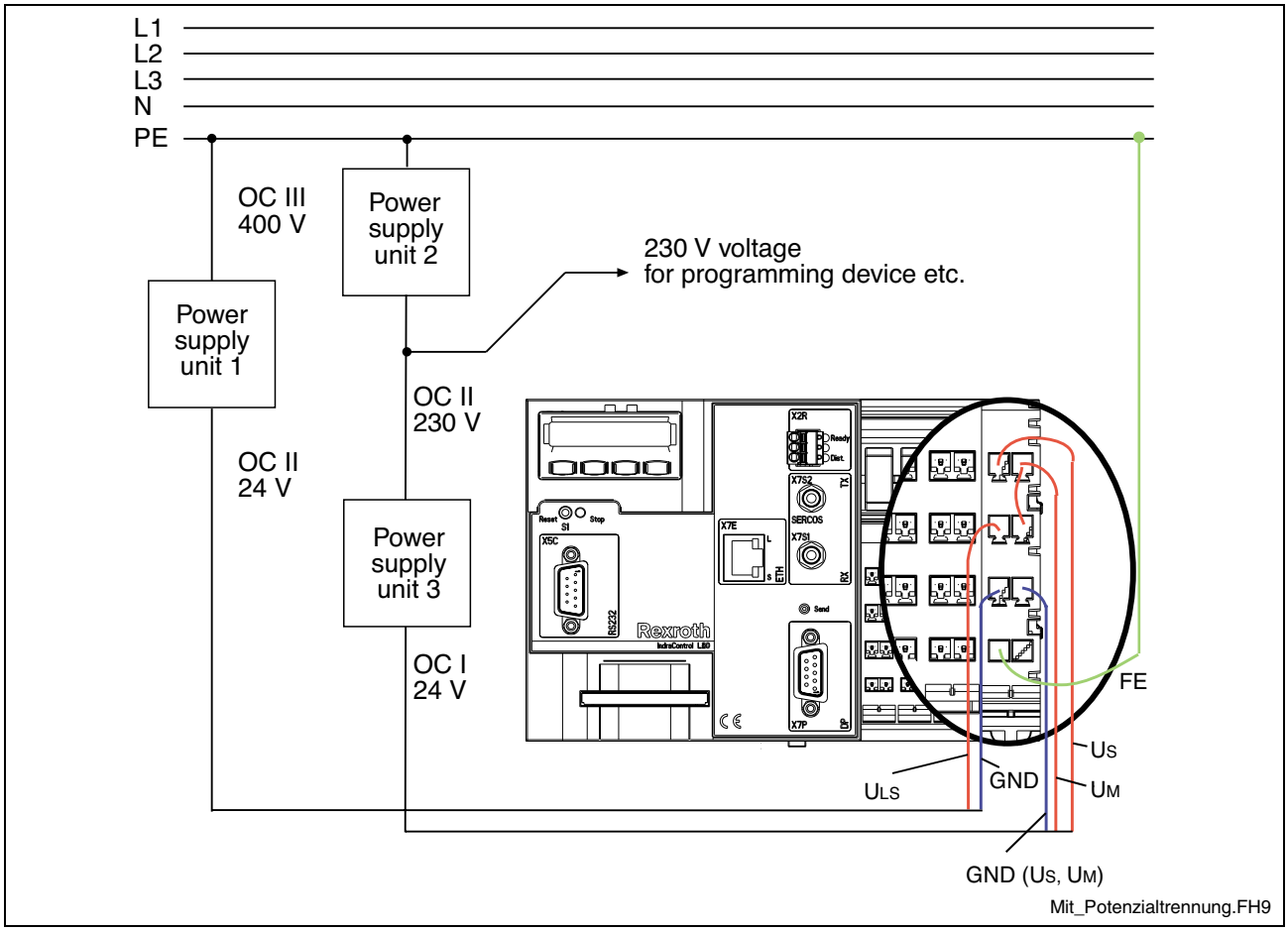


Fig. 8-6: Setup with electrical isolation

Reference Conductor Connected to the Protective Conductor

If the reference conductor (N, 0 V) is connected to the protective conductor system, then this connection must be arranged at a central point (e. g. at the load power supply unit or at the isolating transformer). In addition, it must be possible to break this connection for measuring ground leakage currents. Hence, the supply current circuit is a PELV circuit.

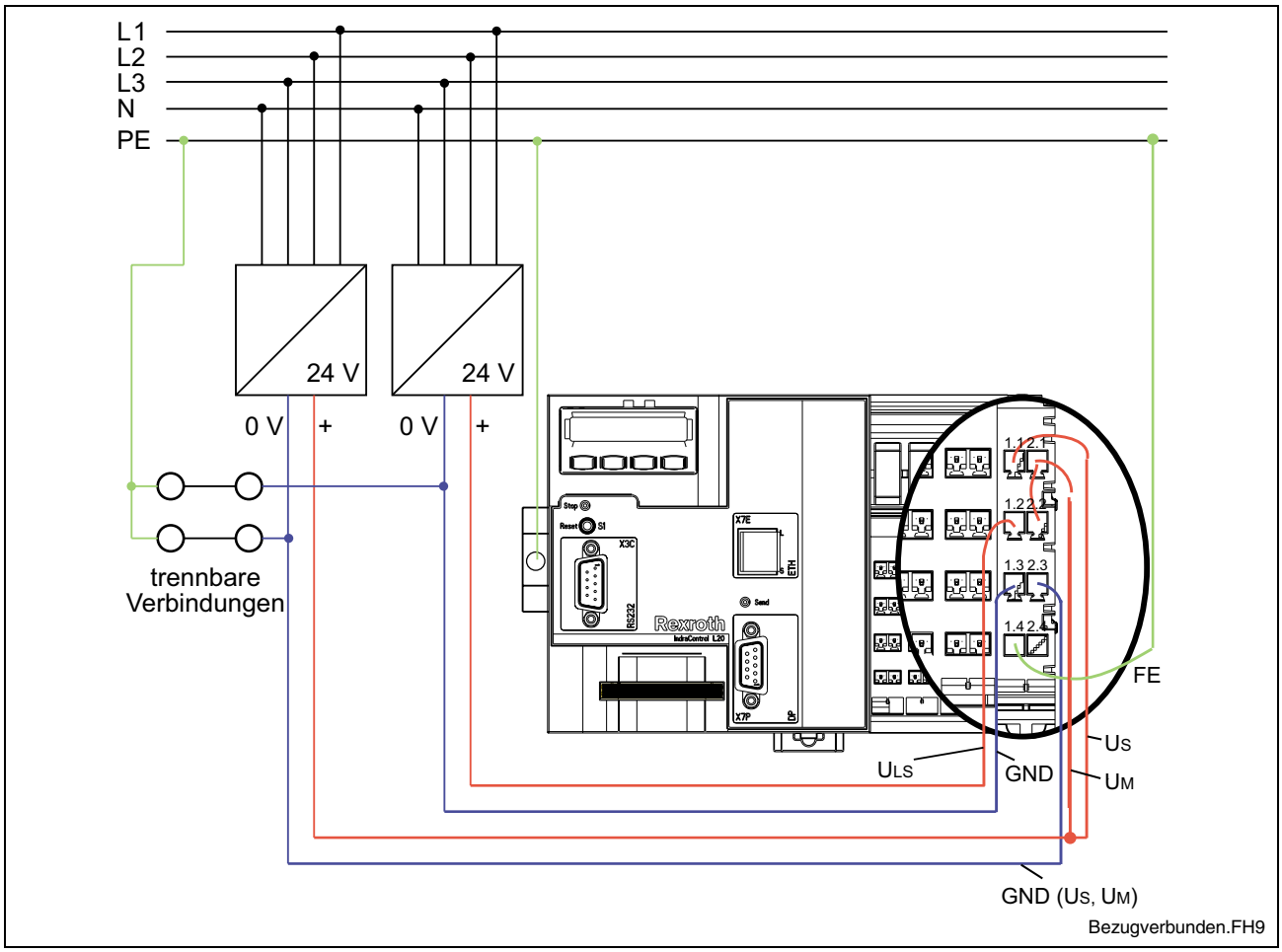


Fig. 8-7: Reference conductor connected to the protective conductor

Reference Conductor Not Connected to the Protective Conductor

If the reference conductor (N, 0 V) is not connected to the protective conductor system, then an appropriate ground fault detector must be used to prevent inadvertent power-up in case of insulation faults. Hence, the supply current circuit is a SELV circuit. Please note that any additionally connected equipment might also cancel the non-grounded setup.

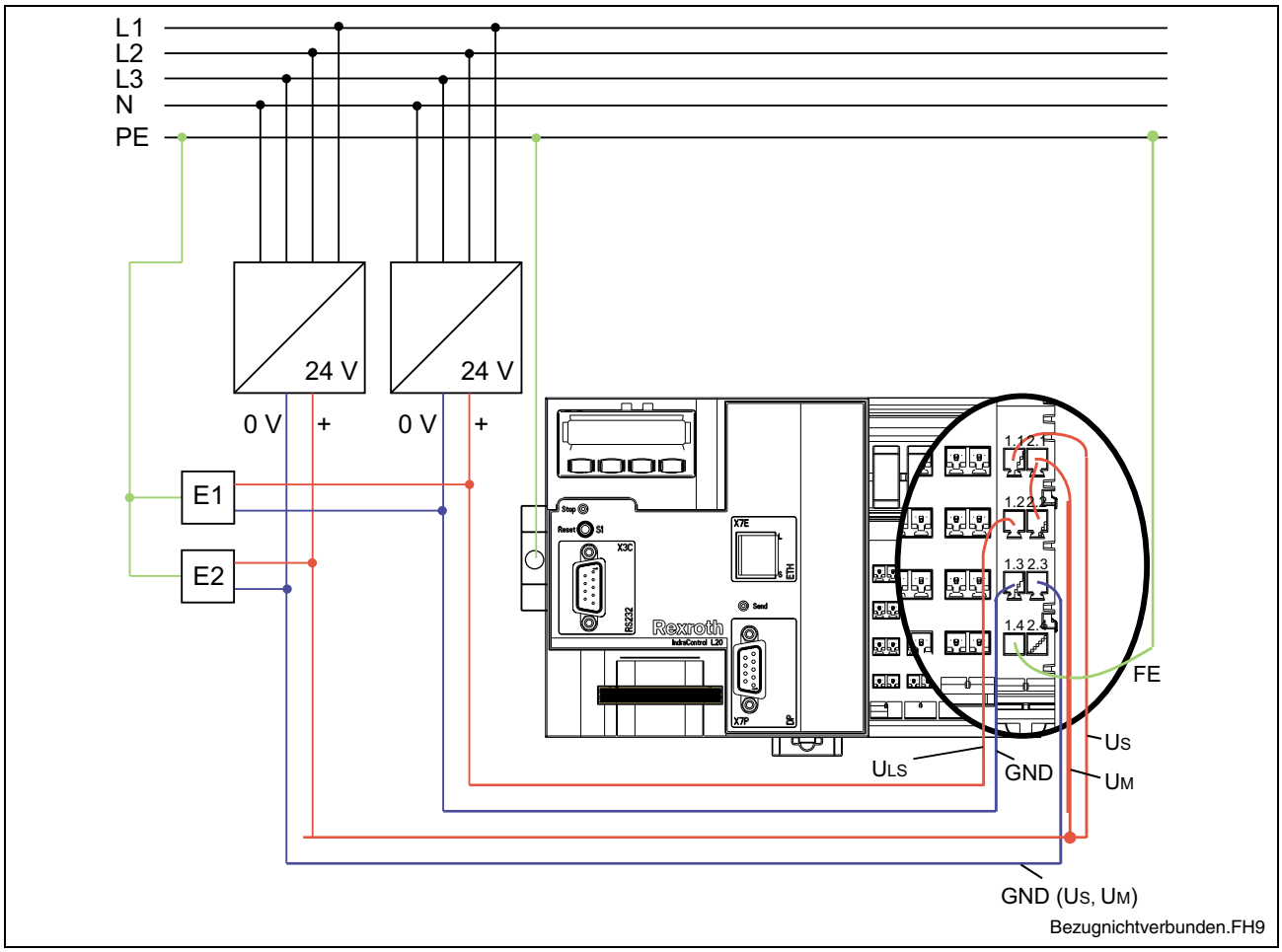


Fig. 8-8: Reference conductor not connected to the protective conductor

Programming Device and Ground Connection

Programming devices are almost always provided with a connection between the ground and the functional ground. This connection might give rise to problems, if the voltage supply of the IndraControl L20 is provided with a ground fault detector and the programming device is connected to the IndraControl L20. Owing to the non-isolated power supply unit assembly, the ground fault in the programming device has an effect on the ground fault detector via the central processing unit and the power supply unit assembly. In this case, the detector should not deactivate the system automatically, but only indicate the ground fault. Maintenance staff should be aware of this fact.

Dimensioning the Voltage Supply

When dimensioning the voltage supply, consider the maximum currents (see DIN VDE 0100-523). A voltage of 20.4 … 28.8 V must be applied directly to the unit.

The voltage must be maintained even if

- there are variations in the line voltage, for instance caused by differing loads of the power supply network,
- there are varying load states, such as short-circuit, normal load, lamp load, or no load.

The maximum line cross-section for the voltage supply is 1.5 mm^2.

Main Switch and Fuses

Main Switch

A main switch according to DIN VDE 0100 must be provided for the IndraControl L20 as well as sensors and actuators.

Fuses

Fuses and circuit-breakers are intended to protect the supply lines in a network. The voltage supply lines of the IndraControl L20 must be protected by fuses. The sensor supply and the actuator supply should each be protected by a separate fuse. If the supply lines are shorter than 3 m and are placed such that they are protected from ground faults and short-circuits, it is not necessary to provide fuses.

Further criteria for the selection of protective devices are the following:

- Nominal voltage
- Temperature
- Internal fuse resistances
- Inrush currents
- Cable lengths
- External impedance of the power supply system
- Possible fault location
- Vibration

For additional information, please refer to:

Manual No. 32
VDE publications
Dimensioning and protecting lines and cables according to DIN 57 100, VDE 0100–430 and –523.

Appropriate information is also provided by many manufacturers of fuses and circuit-breakers.

Ground Connection

An optimum ground connection is required to keep possible interferences away from the IndraControl L20 and the Rexroth Inline modules and to discharge them to the ground.

Functional Earth Ground

The top-hat rail used for mounting the IndraControl L20 must be mounted to a grounded metal carrier, e.g. the rear panel of the switch cabinet.

A functional earth ground is required to ensure optimum noise immunity. The functional earth ground must be connected via a cable that should be as short as possible or, better, via a grounding strip.

Recommended value: Length: Max. 1 m
Cross-section: 6 mm^2

Both the IndraControl L20 and the power and segment terminals are provided with FE springs (metal clips) at their bottom side, which establish an electric connection to the top-hat rail. To ensure a reliable ground connection even in case of dirt or a damaged metal clip, the IndraControl L20 must be additionally grounded via the FE terminal point, using a conductor with a cross-section of at least 1.5 mm^2.

The FE functional earth ground is intended to discharge disturbances. It is not provided as a protection against electric shock for persons.

Voltage Jumper

Starting at the IndraControl L20, the FE (functional earth ground) voltage jumper is routed through all connected Rexroth Inline modules. This ensures that these modules are grounded once the ground connection of the IndraControl L20, the supply terminals and the top-hat rail has been properly established.

Potential Equalization

Potential equalization according to DIN VDE 0100 Part 540 must be provided between the system parts and the voltage supply.

All components of the system must be connected to the PE protective conductor system at the connectors that are marked accordingly.

Shielding

The shielding is intended to reduce any effects of interferences on the system.

Both the PROFIBUS line and the connection lines to modules for analog signals must be shielded.

Observe the following when shielding:

- Fit the shield over an area as large as possible under the clip in the shield connector.
- Ensure proper contact between the connector and the module.
- Avoid damaging or squeezing of cores. Avoid stripping the lines too much.
- Connect the cores properly.

Shielding the PROFIBUS Line

To achieve an immune transmission, Bosch Rexroth recommends a two-core twisted and shielded line pair, as is specified as cable type A in EN 50 170, Part 8-2. Cable type B, which is also described in the above specification, is obsolete and must not be used any longer.

The cable parameters are described in the chapter entitled "Interfaces" on page 7-14.

The line shield must be applied in the bus connector. In case of installation in the switch cabinet, the line shield of the connected PROFIBUS line must be connected to a shield bus using cable clips, if possible directly behind the cable bushing. This requires the appropriate shield terminal.

Shielding in Case of Analog Sensors and Actuators

- Always connect analog sensors and actuators using shielded and twisted cable pairs.
- Connect the shield system via the shield connector.

Connection of the shield to the shield connector is described on page 8-17, "Connecting Shielded Lines Via the Shield Connector".

Depending on the analog input and output modules, there are several ways of grounding the shield. The length of the cables must also be taken into consideration.

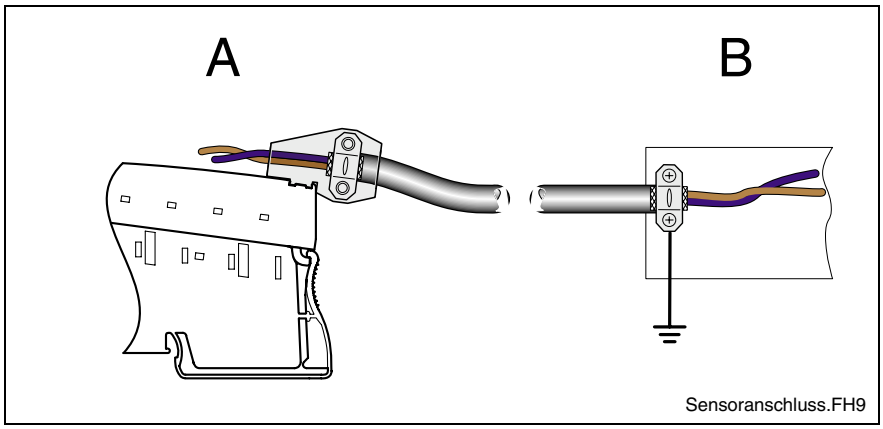
Module type	Connection to the module	Cable length	Connection to the sensor/actuator
Analog input module R-IB IL AI 2/SF	Ground connections are connected to FE via an RC element inside the module.	< 10 m	–
		> 10 m	Apply the sensor directly to the PE.
Analog output module IB R-IL AO...	Directly on FE using a shield clip.	< 10 m	–
		> 10 m	Decouple the actuator with RC element and apply it to the PE.

Fig. 8-9: Overview: Shield connection of analog sensors and actuators

Connecting the Analog Input Module R-IB IL 24 AI 2/SF

- Connect the shield system via the shield connector (see page 8-17, “Connecting Shielded Lines Via the Shield Connector”).
- Connect the shield system at the sensor to the FE potential over an area as large as possible.

The ground connection in the module is connected to FE via an RC element inside the module.



L: A Module side
B Sensor side

Fig. 8-10: Connection of analog sensors in case of signal lines > 10 m

Note: If you intend to use both channels of the module R-IB IL AI 2/SF, you may connect the shield system in several ways, depending on the line cross-section.

1 To connect the two sensors, you should use a multi-core line; connect the shield via the shield connector, as described above.

2 To connect the two sensors, you should use a thin line; connect the shield system for both lines via the shield connector.

Connecting the Analog Output Module R-IB IL AO ...

Note:

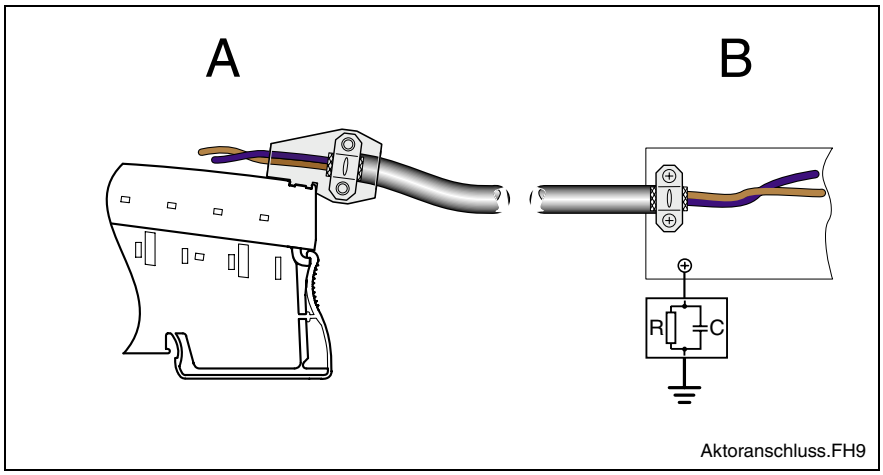
- Connect the shield system via the shield connector (see page 8-17, "Connecting Shielded Lines Via the Shield Connector").
- Connect the shield system to the FE potential over an area as large as possible.

Note: Development of ground loops!

⇒ The shielding system may be connected directly to the ground potential at one point only.

- If lines are more than 10 meters in length, they should always be decoupled by means of an RC element (on the actuator side).

The typical value of the capacitor C should range from 1 nF to 15 nF. The value of resistor R should be at least 10 MΩ.



L: A Module side
B Actuator side

Fig. 8-11: Connection of actuators, in case of signal lines > 10 m

Connecting Lines to Tension Spring Connection Points

Connect the lines for peripheral equipment and voltage supply to the tension spring connection points both at the IndraControl L20 and the Rexroth Inline modules.

Use unshielded lines for the digital inputs and outputs and the voltage supply. Use shielded lines to connect the analog inputs and outputs.

You can connect lines with a connection cross-section ranging from 0.2 mm² to 1.5 mm² (AWG 24 – 16). These lines permit the supply of signals of up to 250 V AC/DC and 5 A.

Connecting Unshielded Lines

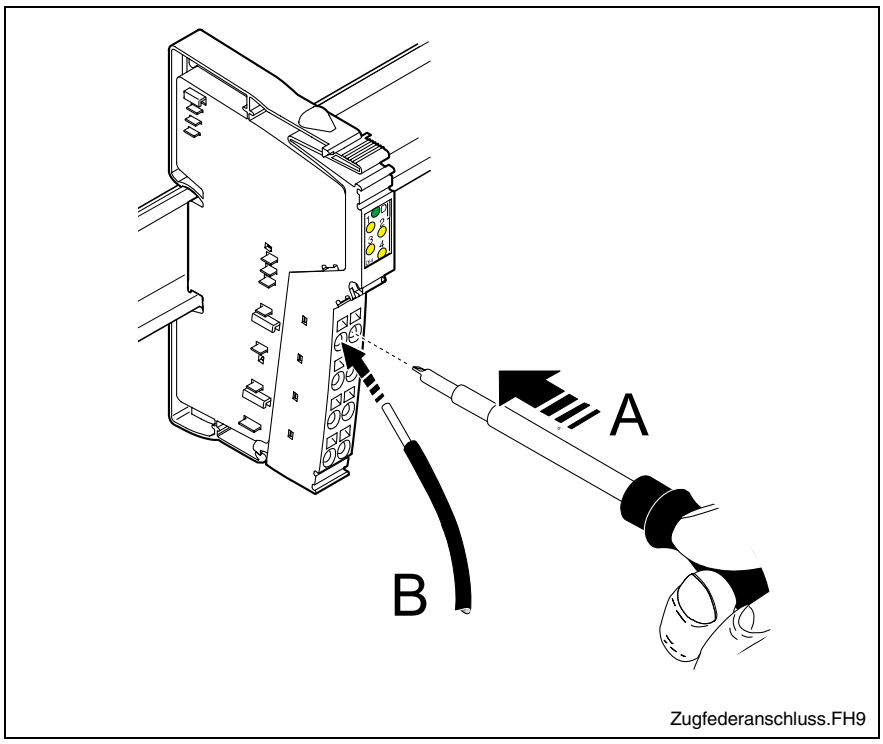


Fig. 8-12: Connecting lines to the tension spring connectors

Wire the connectors as required according to your application.

Proceed as follows to wire the connectors:

- Strip the line to a length of 8 mm. Wiring is provided without connector sleeves. However, connector sleeves may be used, if desired. In this case, the connector sleeves must be properly crimped.
- Put a screwdriver into the actuation slot of the appropriate terminal point (A in Fig. 8-12), as far as necessary to be able to insert the core into the opening of the spring. Insert the core ein (B in Fig. 8-12). Pull the screwdriver out of the opening. This fixes the core. We recommend to label both the cores and the terminal points after completed installation.

Note: For additional information on the connection method, please refer to Manual \2\ Rexroth Inline PROFIBUS DP; Application Manual (see chapter entitled "Further Documentation" on page 1-2).

Connecting Shielded Lines Via the Shield Connector

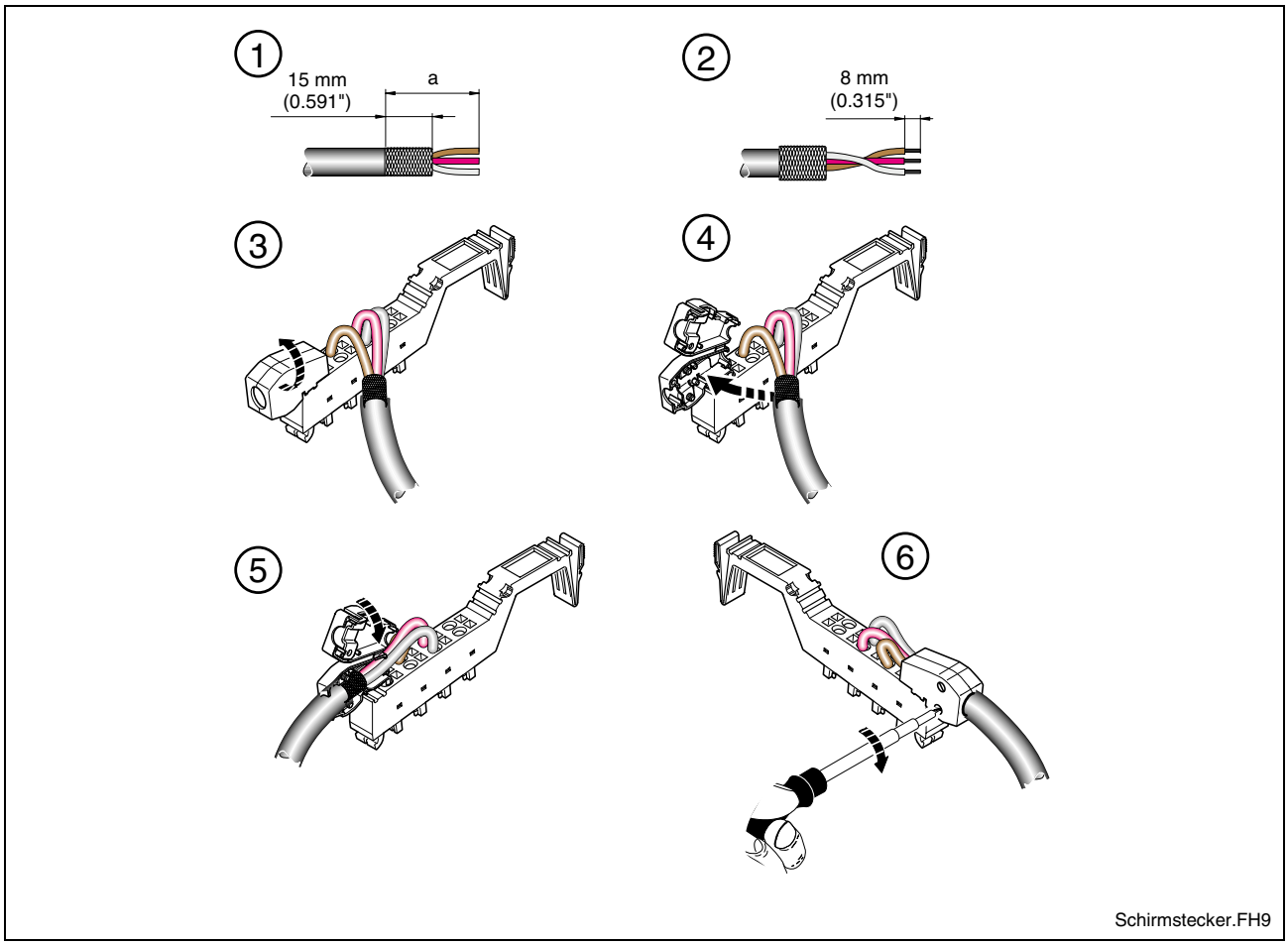


Fig. 8-13: Connecting the shield to the shield connector

Below, connection of a shielded line is described by example of an "analog line".

Proceed as follows (Fig. 8-12 and Fig. 8-13):

Stripping the Lines (Fig. 8-13)

- Strip the outer sheath of the line to the desired length (a) (Fig. 1).

  The desired length (a) depends on the position where you connect the cores and on whether you intend to place the cores between the connection point and shield connection in a generous or a tight arrangement.
- Shorten the braid to 15 mm (Fig. 1).
- Place the braid around the outer sheath (Fig. 2).
- Remove the protective foil.
- Strip the lines for 8 mm (Fig. 2).

Note: The Rexroth Inline wiring is provided without connector sleeves.

Wiring the Connectors (Fig. 8-12)

- Put a screwdriver into the actuation slot of the appropriate terminal point (A) as far as necessary to be able to insert the core into the opening of the spring.
- Insert the core (B). Pull the screwdriver out of the opening. This fixes the core.

Connecting the Shield (Fig. 8-13)

Please refer to the pertinent module-specific data sheet for information on the connector pin assignment .

- Open the shield connector (Fig. 3).
- Check the orientation of the shield clip in the shield connector.
- Place the line including surrounding braid in the shield connector (Fig. 4).
- Close the shield connector (Fig. 5).
- Tighten the screws on the shield connector using a screwdriver (Fig. 6).

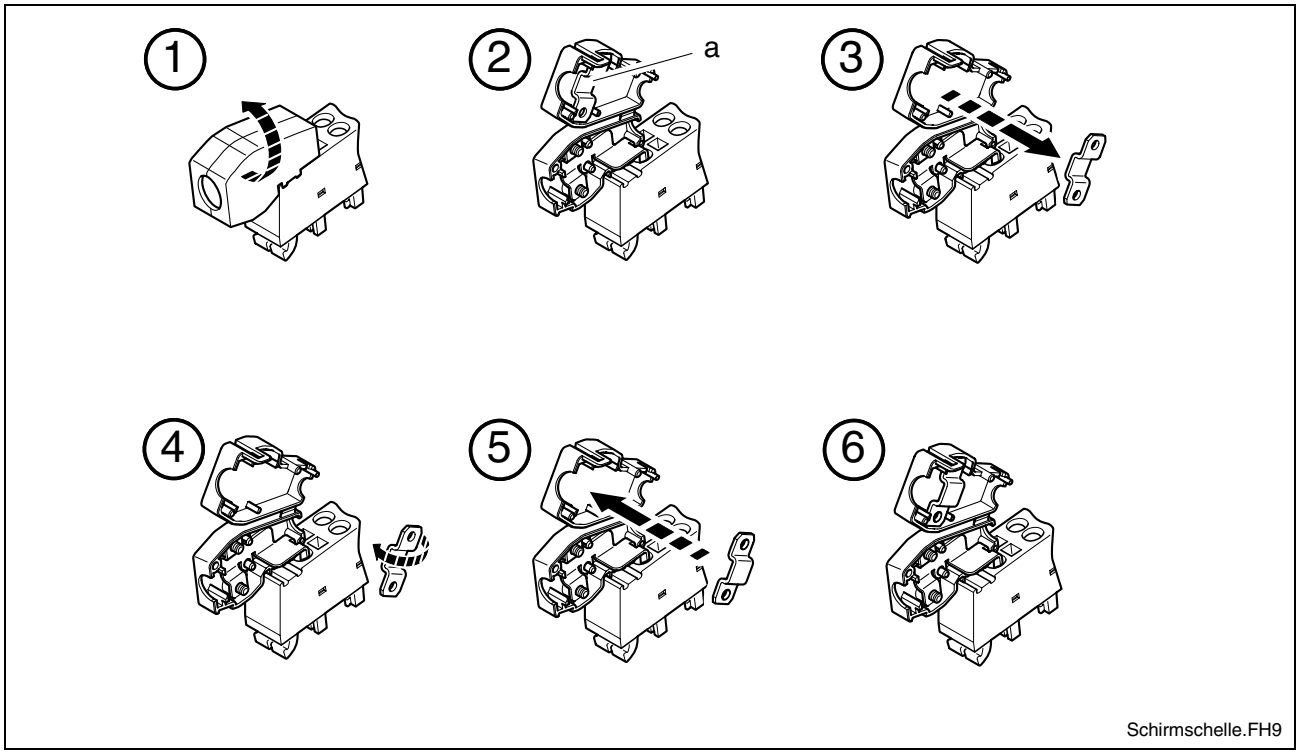


Fig. 8-14: Orientation of the shield clip

Shield Clip (Fig. 8-14)

The shield clip (a in Fig. 2) in the shield connector can be used according to the line cross-section. If thicker lines are used, the camber of the clip must be directed away from the line (Fig. 2). If thinner lines are used, the camber of the clip must be directed towards the line (Fig. 6).

If you have to change the orientation of the shield clip, proceed as described below and shown in Fig. 8-14:

- Open the housing of the shield connector (Fig. 1).
- On delivery, the shield connector is intended for the connection of thicker lines (Fig. 2).
- Remove the clip (Fig. 3), turn the clip according to the cross-section of the line used (Fig. 4), and fit the clip (Fig. 5).
- Figure 6 illustrates the clip, if a thin line is used.

8.4 Maintenance

Include the following measures in your maintenance schedule:

- At least once a year, check all plug and terminal connections for proper tightness and damage. Verify that lines and cables are not broken or squeezed. Replace damaged parts immediately.

Notes

9 Structure of the Rexroth Inline Terminals

9.1 Basic Structure of Terminals of the Low Signal Level

Independently of its function and its overall width, a Rexroth Inline module of the low signal level consists of the electronic socket (in short: socket) and the plug-in connector (in short: connector).

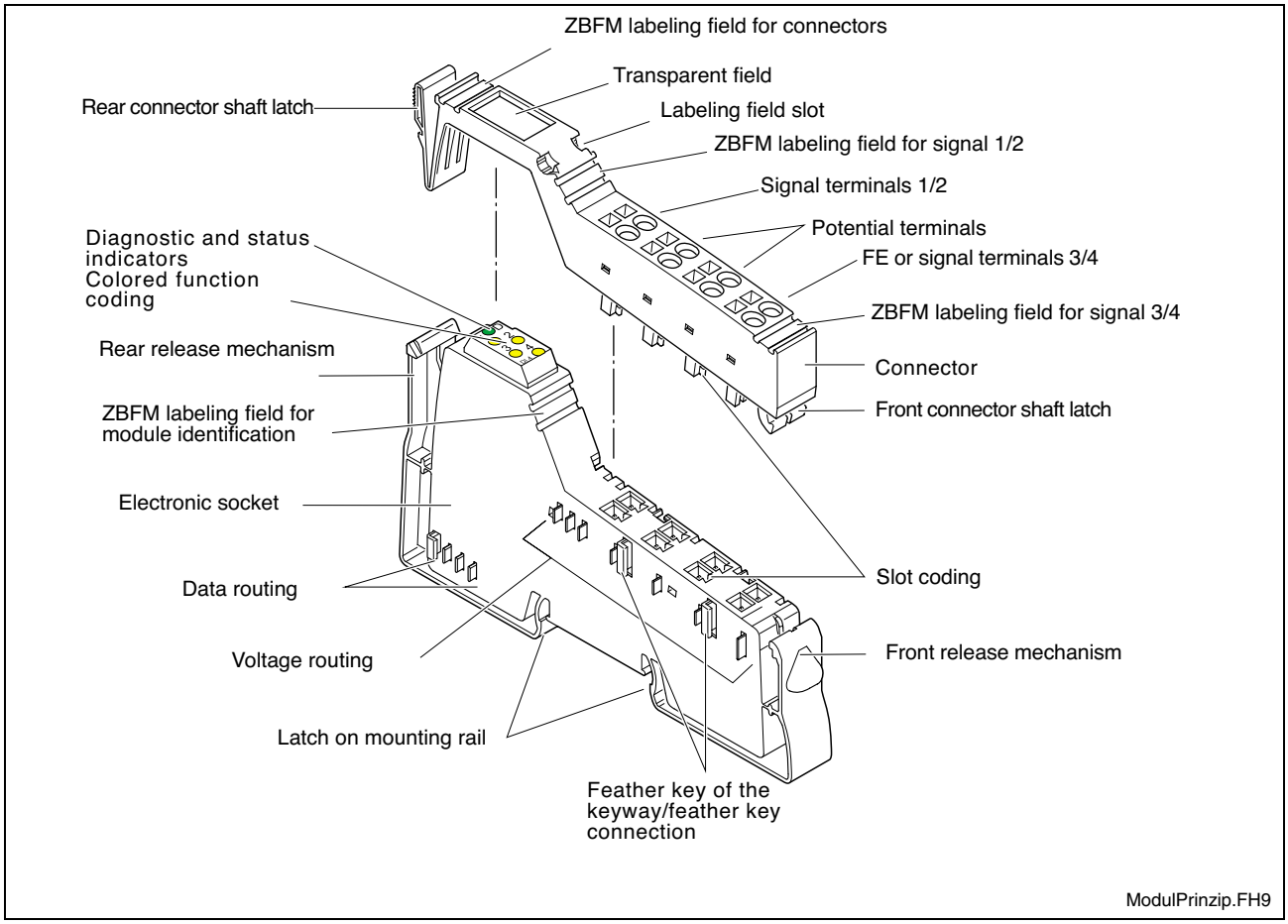


Fig. 9-1: Basic structure of a Rexroth Inline modules

The most important components of those shown in Fig. 9-1 are described in the chapters "Elektronic Socket" on page 9-1 and "Connectors" on page 9-2.

ZBFM: Zack marker strips, flat (also see the chapter entitled “Identification of Function and Labeling” on page 9-5).

9.2 Electronic Socket

All electronic parts of the Rexroth Inline module as well as the voltage and data jumpers are accommodated in the electronic socket.

Overall Widths

By default, the electronic sockets for terminals of the low signal level are available in terminal widths of 8 terminal points (8-slot connector) and 2 terminal points (2-slot connector). Any other dimensions are combinations of the two above mentioned basic terminal widths (also refer to the chapter entitled "Housing Dimensions of the Modules of the Low Signal Level" on page 9-8).

9.3 Connectors

The connection of the peripheral equipment or the supply voltages is provided in the form of a connector, that can be disconnected from the electronic socket.

Advantages

This pluggable connection has the following advantages:

- Easy replacement of electronic module parts for servicing. The wiring does not have to be removed.
- For different requirements, different connectors can be fitted on an electronic socket.

Connector Width

Irrespective of the width of the electronic socket, the connectors have a width of two terminal points. Accordingly, you must fit 1 connector on a 2-slot socket, 2 connectors on a 4-slot socket and 4 connectors on a 8-slot socket.

Connector Types

The following connector types are available:

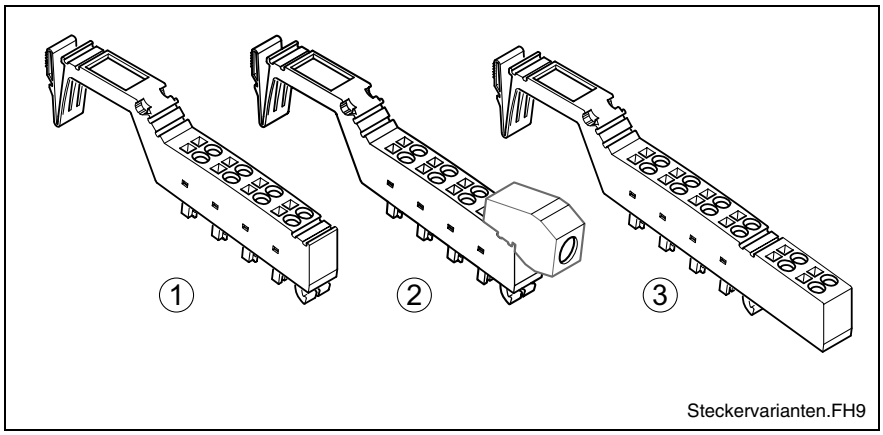


Fig. 9-2: Rexroth Inline connector types

Connector Identification

All connectors are available with colored print. If connectors are provided with colored print, the terminal points are color-coded according to their functions.

The signals of the terminal points are coded by the following colors:

1 Standard connector

The gray standard connector is used for connecting two signals as 4-wire connection (e.g. digital input/output signals). The black standard connector is used for supply terminals. Its neighboring contacts are internally jumpered (see B1 in Fig. 9-4). Connector B2 (FE jumpered only) must be used for the supply terminal of the IndraControl L20.

2 Shield connector

This gray connector is used for signals connected via shielded lines (e. g. analog input/output signals). The FE and/or shielding connection is not provided through terminal points, but through a shield clip.

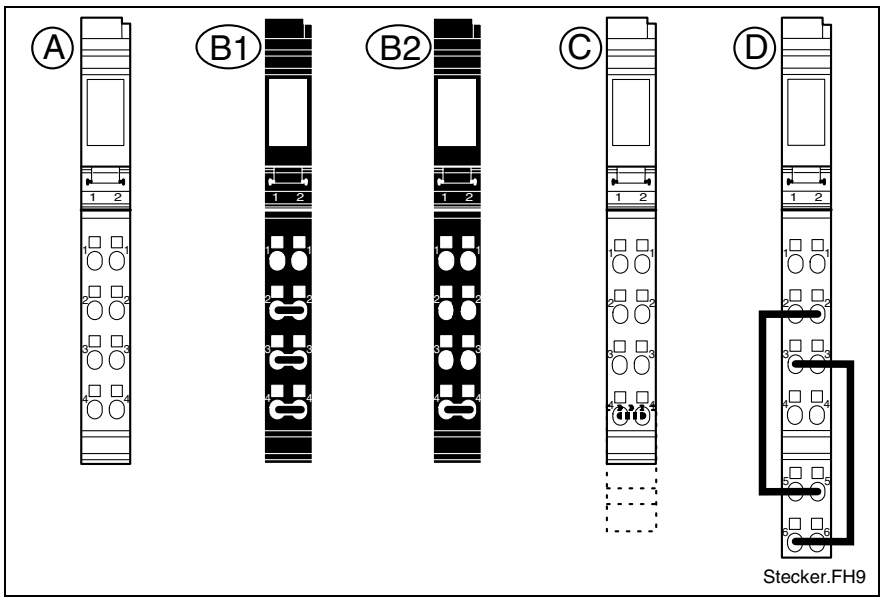
3 Extended double-signal connector

This gray connector is used for connecting four signals as 3-wire connection (e. g. digital input/output signals).

Color	Signal at the terminal point
Red	+
Blue	-
Green	Functional earth ground

Fig. 9-3: Color-coding of the terminal points

Interior Design of the Connectors



L: A Gray connector for peripheral connection
B1 Black connector for PWR/IN and SEG/F supply (Ordering designation: R-IB IL SCN-PWR IN-CP) SEG/F
B2 Black connector for supply terminals of the IndraControl L20 (from connector set R-IB IL CML S01-PLSET)
C Gray shield connector for analog terminals
D Large gray connector for peripheral connection

Fig. 9-4: Connector design

Note: Connector B1 must not be used for supplying the IndraControl L20.

Connectors with integrated jumpering of terminal points are shown in Fig. 9-4.

The shield connector is jumpered by the shield connection. All other connectors are jumpered by a connection of the terminal points.

Note: To avoid malfunctions, only latch the connector onto the terminal it is intended for. Refer to the specific data sheet of each module to select the appropriate connector. The black connector may not be latched onto a module that is intended for a double-signal connector. Any reversal would lead to a short-circuit between the two signal terminal points (1.4–2.4).

Important: Place only a black B2-type connector (from connector set R-IB IL CML S01-PLSET) on the supply terminal at the IndraControl L20! The terminal point jumpering ensures that the potential is transmitted via the jumpering in the connector and not via the module board.

Connector Coding

It is possible to prevent the mismatching of connectors by coding socket and connector.

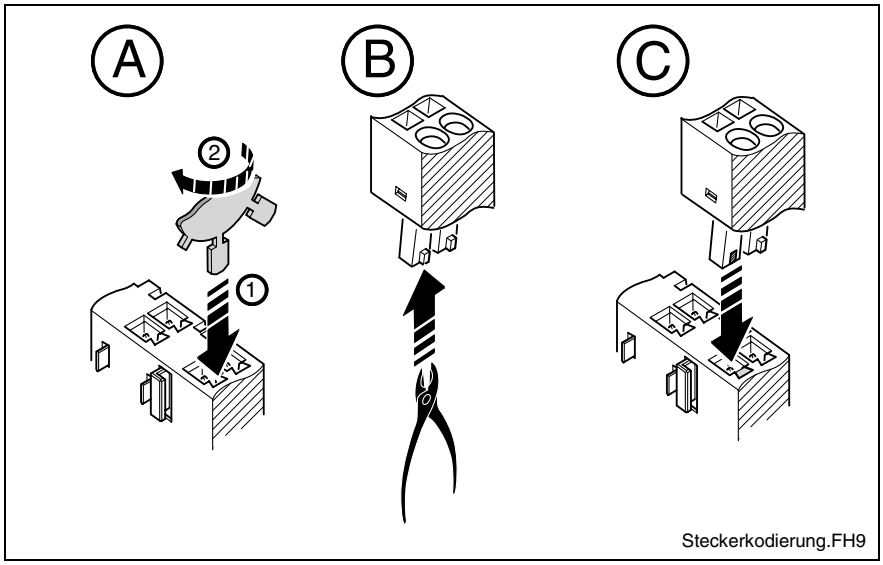


Fig. 9-5: Connector coding

- For this purpose, put a coding profile into the coding keyway in the socket (1) and pull it off the small plate (2) by rotation (Fig. 9-5/A).
- Use a side-cutting pliers to cut the respective coding tab off the connector (Fig. 9-5/B).

Now, only socket and connector of the same coding fit together (Fig. 9-5/C).

9.4 Identification of Function and Labeling

For visual identification of their function, the modules are color-coded (1 in Fig. 9-6).

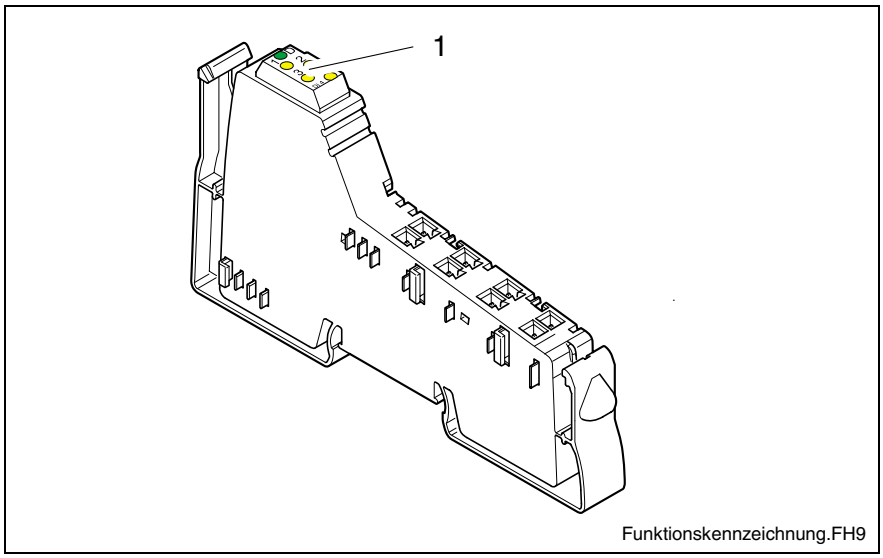


Fig. 9-6: Identification of function

The various functions are identified by the following colors:

Color	Module function
Light-blue	Digital input, 24 V range
Pink	Digital output, 24 V range
Blue	Digital input, 120/230 V range
Red	Digital output, 120/230 V range
Green	Analog input
Yellow	Analog output
Orange	Field bus coupler, function modules
Black	Power terminal / segment terminal

Fig. 9-7: Color coding of the modules

Note: All accepted modules are illustrated in chapter "Ordering Information" on page 11-2.

Connector Identification

The color coding of the terminal points is described above (on this page).

Labeling/Numbering of Terminal Points

Numbering of the terminal points is illustrated by means of an 8-slot module.

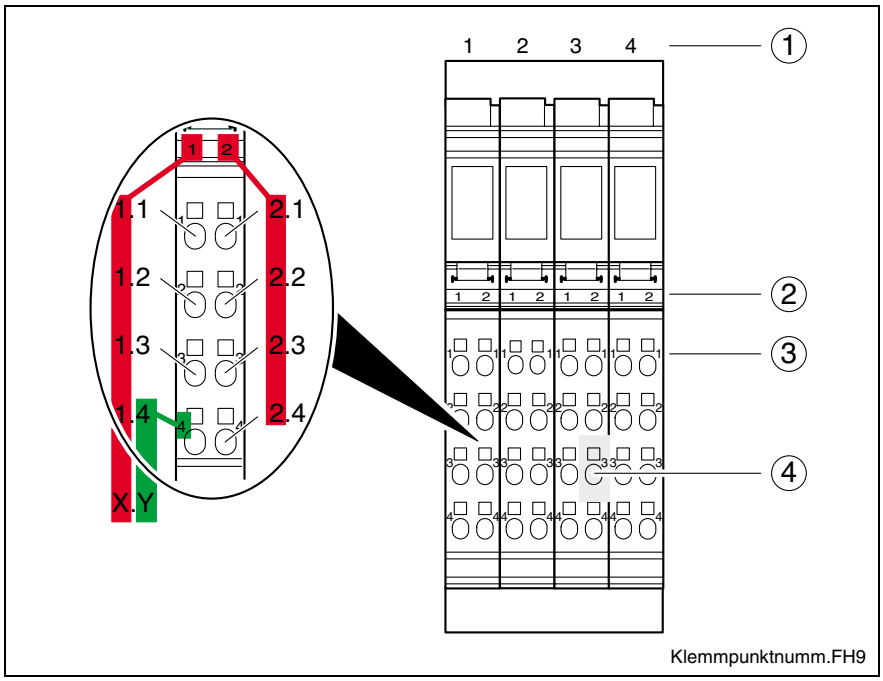


Fig. 9-8: Numbering of terminal points

Slot/Connector

The slots (connectors) on a socket are numbered consecutively (1 in Fig. 9-8). These numbers are **not** specified on the module.

Terminal Point

On each connector, the terminal points are identified by X.Y.

X is the number of the terminal point row on the connector and is indicated on the top of the respective terminal point row (2 in Fig. 9-8).

Y is the number of the terminal point in a row and is indicated directly at the terminal point (3 in Fig. 9-8).

Thus, the position of the slot and terminal point can be exactly determined. For instance, the gray connection (4 in Fig. 9-8) is numbered as follows:
slot 3, terminal point 2.3.

Additional Labeling

In addition to the above labeling of the modules, you can label the slots, terminal points and connections with zack marker strips (ZBFMs) and labeling fields.

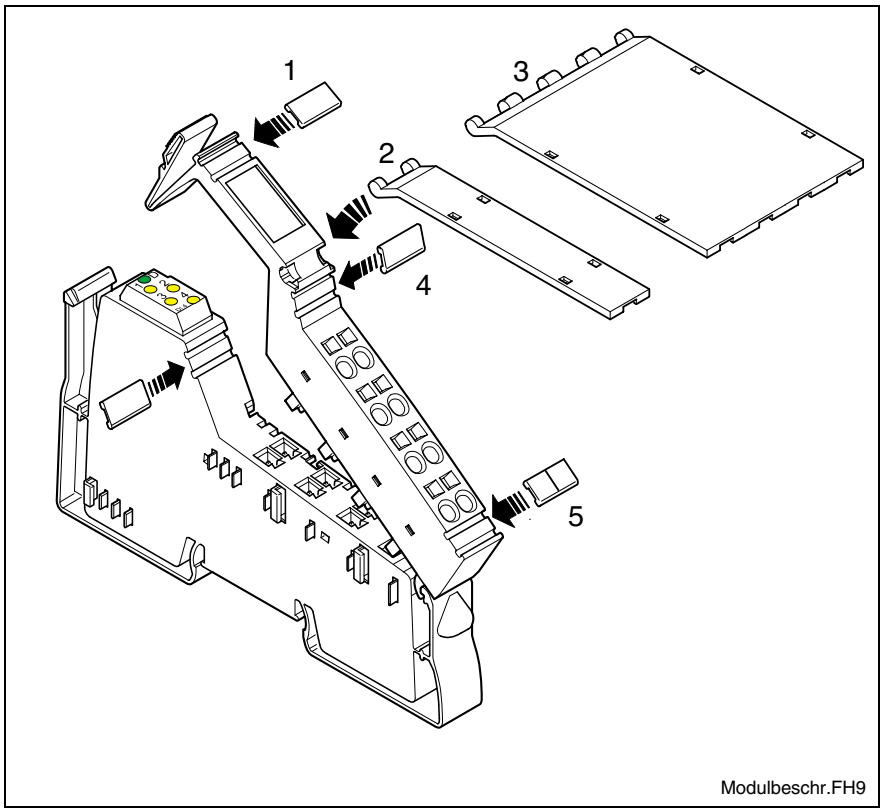


Fig. 9-9: Labeling of modules

There are various possibilities for labeling slots and terminal points:

1 You can label each connector individually with zack marker strips.

2 / 3 As an option, you can use a large labeling field. This labeling field is available in two widths, either as labeling field covering only one connector (2 in Fig. 9-9) or as labeling field covering four connectors (3 in Fig. 9-9). Thus, you can label each channel individually with continuous text. In the upper connector head, there is a keyway to attach the labeling field to the connector(s). The labeling field can be moved up and down. A small catch at both end positions allows the labeling field to keep its position.

4 / 5 You can label each signal with zack marker strips. With double-signal connectors, the upper keyway (4 in Fig. 9-9) is provided for labeling the signals 1/2, and the bottom keyway (5 in Fig. 9-9) for the signals 3/4.

6 The electronic socket provides the possibility of labeling each slot individually with zack marker strips. If the connector is latched onto the socket, this labeling is hidden.

You can clearly assign connector and slot by using the labeling field at the connector and on the electronic socket.

9.5 Housing Dimensions of the Modules of the Low Signal Level

Today, small I/O stations are often used in 80 mm standard control boxes. The Rexroth Inline modules have been designed for use in this type of control box.

The housing dimensions of a module are defined by the dimensions of the electronic socket and the connector.

The electronic sockets of the modules of the low signal level are available in three overall widths (12.2 mm; 24.4 mm; and 48.8 mm).

One, two or four connectors of a width of 12.2 mm are fitted on these sockets.

With connector, each module has a depth of 71.5 mm.

The height of the module depends on the connector used. The connectors are available in three versions (see Fig. 9-13).

2-Slot Housing

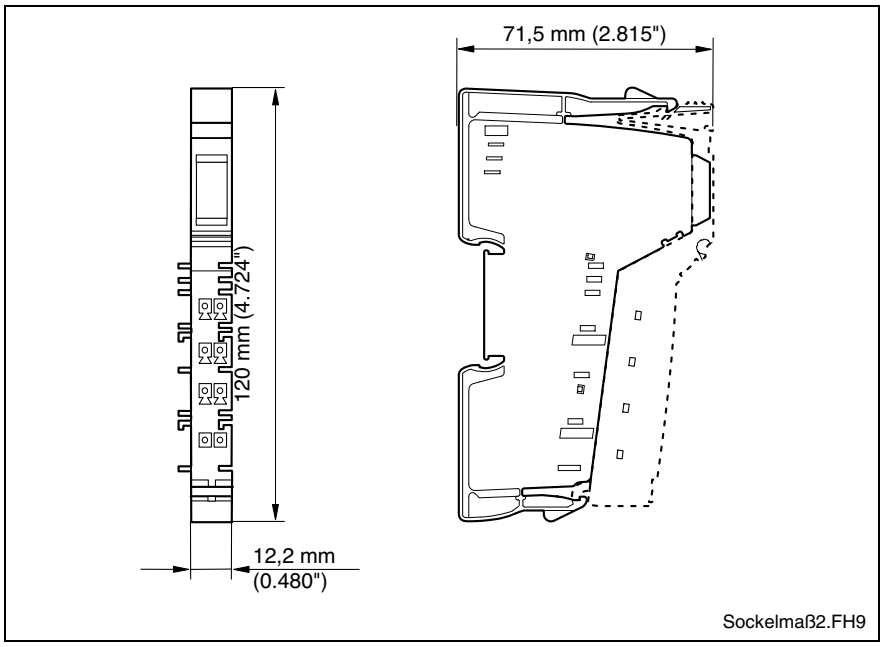


Fig. 9-10: Dimensions of the electronic sockets (2-slot housing)

4-Slot Housing

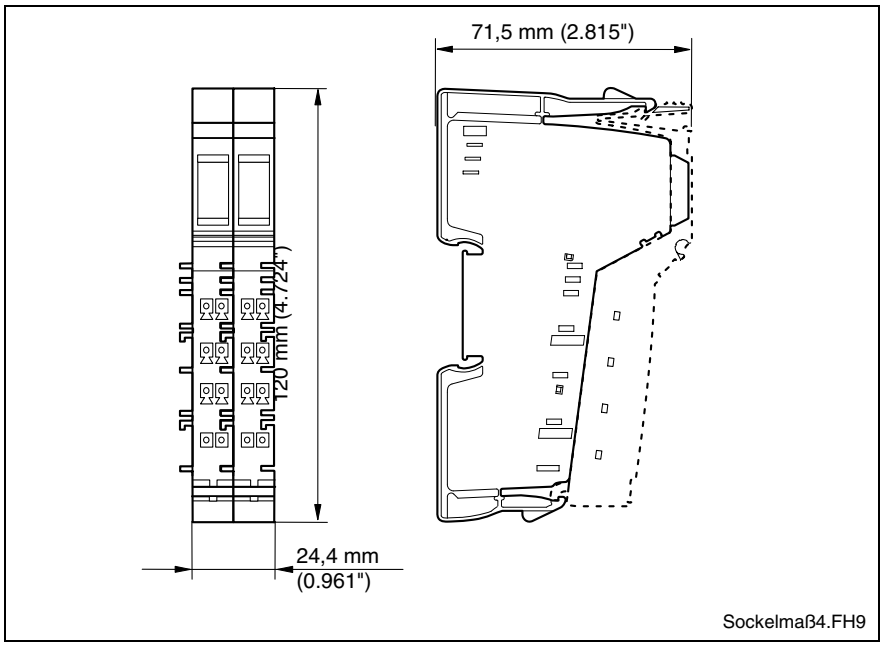


Fig. 9-11: Dimensions of the electronic sockets (4-slot housing)

8-Slot Housing

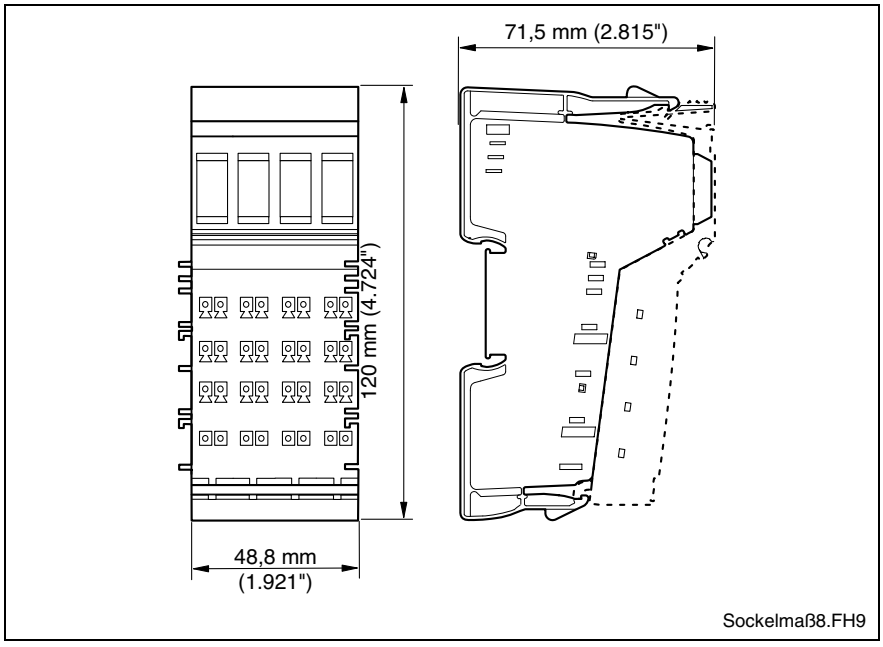
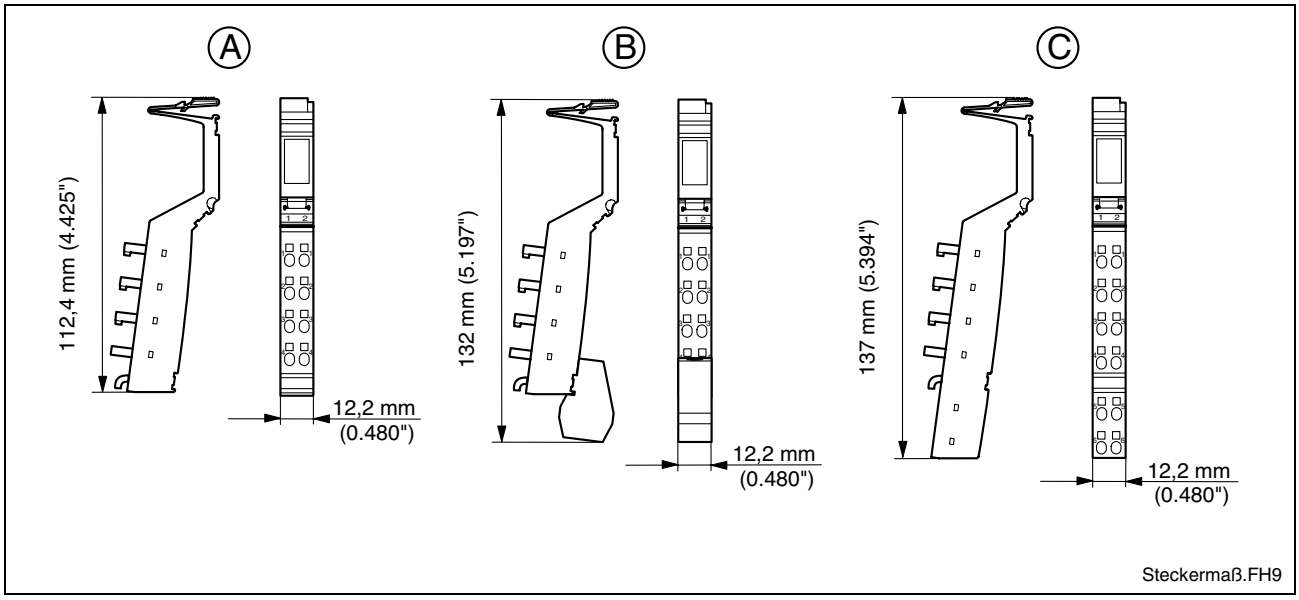


Fig. 9-12: Dimensions of the electronic sockets (8-slot housing)

Connectors



L: A Standard connector
B Shield connector
C Extended double-signal connector

Fig. 9-13: Connector dimensions

The connector depth is irrelevant as it has no effect on the overall module depth.

9.6 Electrical Voltage and Data Routing

An essential feature of the Rexroth Inline product family is the internal voltage routing system. The electrical connection between the individual station devices is established automatically when the station is set up. When the individual station devices are latched to each other, a conductor rail is set up for the respective electric circuit. Mechanically, this contact is realized by the blade and spring contacts of the neighboring modules latching into each other.

Using a special segment circuit, the user does not have to establish the additional external potential transmission to the neighboring modules.

In one station, two independent electric circuits have been realized:

- Logic circuit
- Circuit of peripheral equipment

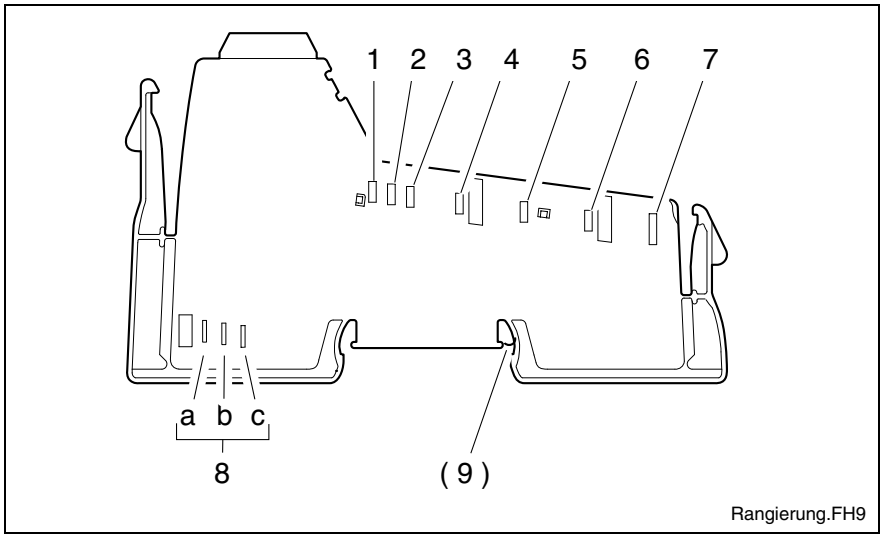


Fig. 9-14: Voltage and data routing

No.	Function		Meaning
1	7.5 V	U_L	Supply of module electronics (logic supply)
2	24 V	U_{ANA}	Peripheral supply voltage for analog modules
3	GND		Ground of the logic supply voltage and the peripheral supply voltage for analog modules
4	24 V	U_S	Supply of the segment circuit (if necessary protected against overload) This voltage jumper does not exist at the 120 V and 230 V voltage levels.
5	24 V	U_M	Supply of the main circuit (if necessary protected against overload)
6	GND	GND	Ground of the segment and main voltage supply (neutral conductor)
7	FE	FE	Functional earth ground
(9)	(FE spring)		FE contact to the top-hat rail (not in all modules)

Fig. 9-15: Voltage jumpers (see Fig. 9-14)

Important: **The GND voltage jumper carries the total current of the main and the segment circuit. It may not exceed the maximum current carrying capacity of the voltage jumpers of 8 A. If, during project planning, the limit of 8 A is reached at one of the U_S, U_M and GND voltage jumpers, a new power terminal must be used!**

Note: The FE voltage jumper must be connected to a ground terminal at the IndraControl L20 via the terminal point 1.4 or 2.4 (see Fig. 9-8). In addition, it must be connected to the grounded top-hat rail at each supply terminal via the FE spring and routed through all of the modules.

No.	Function	Meaning
8a	DI1	Local bus signal (Data In)
8b	DO1	Local bus signal (Data Out)
8c	DCLK	Clock signal, local bus

Fig. 9-16: Data jumpers (see Fig. 9-14)

9.7 Electric Circuits and Voltage Supply Within a Rexroth Inline Station

There are several electric circuits within a Rexroth Inline station. These circuits are set up automatically, when the modules are latched to each other. The voltages of the different electric circuits are supplied to the connected modules via the voltage jumpers.

Note: Please refer to the functional description for further information about the electric circuit, to which the peripheral circuit of a specific module has to be connected.

Current Carrying Capacity of the Jumper Contacts

The maximum current carrying capacity of the lateral jumper contacts must be observed for each electric circuit. The current carrying capacity for all voltage jumpers is specified in the sections below.

The arrangement of the voltage jumpers is illustrated in the chapter entitled “Voltage and Data Routing” on page 9-11.

The connection of the supply voltages is described in the chapter entitled ”Voltage Supply” on page 7-2.

For information on the connection of voltages, please refer to the notes in the module-specific data sheets.

9.8 Diagnostic and Status Indicators

For quick failure diagnosis on site, the IndraControl L20 and all modules are equipped with diagnostic and status LEDs.

Diagnosis

The diagnostic indicators (red/green) provide information on the failure type and location. A module operates faultlessly, when all of its green LEDs are lit.

After correction of the failure, the indicators immediately show the current status.

Status

The status indicators (yellow) show the state of the pertinent input/output and/or the connected unit.

Note: Please refer to the functional description for information on the diagnostic and status indicators provided on a specific module.

Indicators on the IndraControl L20

The meaning of the light-emitting diodes on the IndraControl L20 have already been described in detail in the related chapters. The sections below comprise a summary.

Interface LEDs

To its left, the IndraControl L20 comprises various LEDs particularly indicating the states of the interfaces.

"Stop" LED	Meaning (depending on the firmware)
Off	Normal state
Red	STOP / system fault
Flashing red	Outputs are disabled

Fig. 9-17: Meaning of the "STOP" LED (see chapter "Reset Button and Light-Emitting Diode" on page 6-2)

"Send" LED (optional)	Meaning
LED on	The IndraControl L20 outputs data via PROFIBUS DP.

Fig. 9-18: Meaning of the "Send" LED (see chapter "PROFIBUS DP" on page 7-14)

Voltage Supply LEDs

The following LEDs are arranged at the terminal strip for voltage supply:

"UM" LED	Meaning
Off	Main circuit supply is missing.
Green	24 V supply U_M of main circuit is present.

Fig. 9-19: Diagnostic LED of the power terminal

"US" LED	Meaning
Off	Segment circuit supply is missing.
Green	24 V supply U_S of segment circuit is present.

Fig. 9-20: Diagnostic LED of the segment terminal

"UL" LED	Meaning
Off	Supply voltage U_{LS} is missing.
Green	24 V supply voltage U_{LS} is present.

Fig. 9-21: Diagnostic LED of the supply voltage

"FS" and "FN" LEDs	Meaning
	No function at present.

Fig. 9-22: "FS" and "FN" LEDs

LEDs at the Onboard I/Os

An LED is assigned to each input and each output of the digital onboard I/Os, indicating the particular state of these inputs and outputs.

LEDs 1, 2, 3, 4	Meaning
Off	The assigned input/output is not set.
Yellow	The assigned input/output is set.

Fig. 9-33: Status LEDs of input/output terminals

Moreover, there is a light-emitting diode that is identified by D.

Light-emitting diode D	Meaning
Off	24 V voltage is missing.
Green	24 V voltage is present.
Red	Short-circuit or overload.

Fig. 9-23: Light-emitting diode D (see chapters "Digital Onboard Inputs" and "Digital Outputs" on page 7-8 and following pages)

Indicators on the Supply Terminals

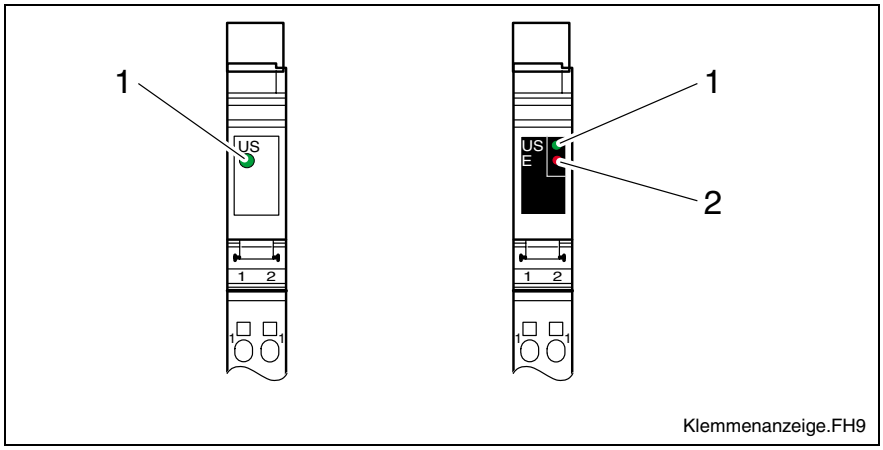


Fig. 9-24: Possible indicators on supply terminals (here: segment terminal without and with fuse)

Diagnosis The following states are indicated by the supply terminals:

LED	Color	Status	Description of LED states
UM (1)	Green	On	24 V supply of the main circuit is present.
		Off	Main circuit supply is not present.

Fig. 9-28: Diagnostic LED of the power terminal

LED	Color	Status	Description of LED states
US (1)	Green	On	24 V supply of the segment circuit is present.
		Off	Segment circuit supply is not present.

Fig. 9-29: Diagnostic LED of the segment terminal

LED	Color	Status	Description of LED states
E (2)	Red	On	No fuse, or tripped fuse
		Off	Fuse okay

Fig. 9-30: Additional LED for supply terminals with fuse

Note: In modules with fuse, the green LED indicates that the main or segment voltage is available **upstream** of the fuse. That means that, with the green LED being lit, the voltage is applied upstream of the fuse. If the red LED is lit as well, the voltage is not applied to the output side! Either there is no fuse, or the fuse is defective.

Indicators on the Input/Output Modules

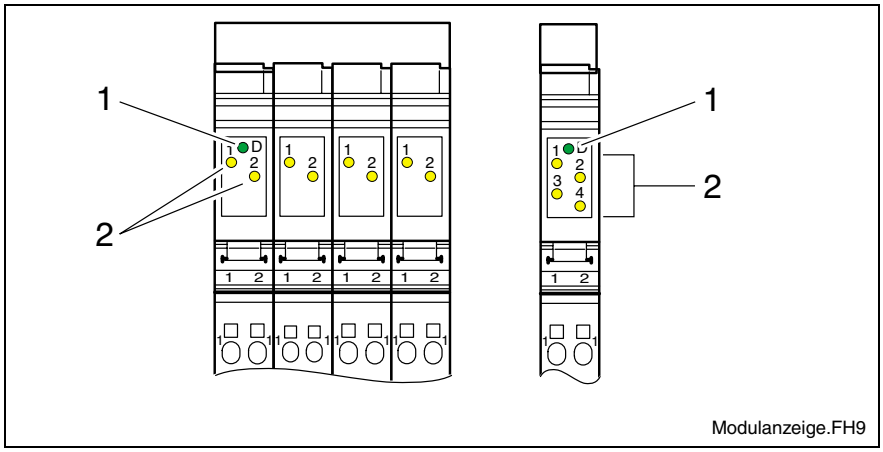


Fig. 9-25: Indicators on the input/output modules

Diagnosis The following states are indicated by the input/output modules:

LED	Color	Status	Description of LED states
D (1)	Green	On	Local bus active
		Flashing: 0.5 Hz (slow)	Logic voltage available, local bus not active
		2 Hz (medium)	Logic voltage available, local bus active, periphery error pending
		4 Hz (fast)	Logic voltage available; module upstream of the flashing module failed; or module itself is defective. Modules downstream of the flashing module are not included in the configuration scope.
		Off	Logic voltage not available, local bus not active

Fig. 9-26: Diagnostic LED of input/output modules

Status The state of the input or output is indicated by the corresponding yellow LED.

LED	Color	Status	Description of LED states
1, 2, 3, 4 (2)	Yellow	On	The assigned input/output is set.
		Off	The assigned input/output is not set.

Fig. 9-33: Status LEDs of input/output terminals

Assignment of status LED to input/output

Please refer to the functional description for information on the assignment of a status LED to the corresponding input/output.

Indicators on Other Inline Modules

Please refer to the functional description for information on the diagnostic and status indicators on other Inline modules (e. g. functional modules or power modules).

10 Disposal and Environmental Protection

10.1 Disposal

Products

Our products can be returned to us free of charge for disposal. It is a precondition, however, that the products are free of oil, grease or other dirt.

Furthermore, the products returned for disposal must not contain any undue foreign matter or foreign component.

Please send the products free domicile to the following address:

Bosch Rexroth AG
Electric Drives and Controls
Bürgermeister-Dr.-Nebel-Straße 2
D-97816 Lohr am Main

Packaging Materials

The packaging materials consist of cardboard, wood and polystyrene. These materials can be easily recycled. For ecological reasons, please refrain from returning the empty packages to us.

10.2 Environmental Protection

No Release of Hazardous Substances

Our products do not contain any hazardous substances, which may be released in the case of appropriate use. Accordingly, our products will normally not have any negative effect on the environment.

Materials Contained in the Products

Electronic Devices

Electronic devices mainly contain:

- steel
- aluminium
- copper
- synthetic materials
- electronic components and modules

Motors

Motors mainly contain:

- steel
- aluminium
- copper
- brass
- magnetic materials
- electronic components and modules

Recycling

Due to their high content of metal most of the product components can be recycled. In order to recycle the metal in the best possible way, the products must be disassembled into individual modules.

Metals contained in electric and electronic modules can also be recycled by means of special separation processes. The synthetic materials remaining after these processes can be thermally recycled.

If the products contain batteries or rechargeable batteries, these batteries are to be removed and disposed before they are recycled.

11 Ordering Information

11.1 Type Code

The IndraControl L20 is available in various versions according to the following type code.

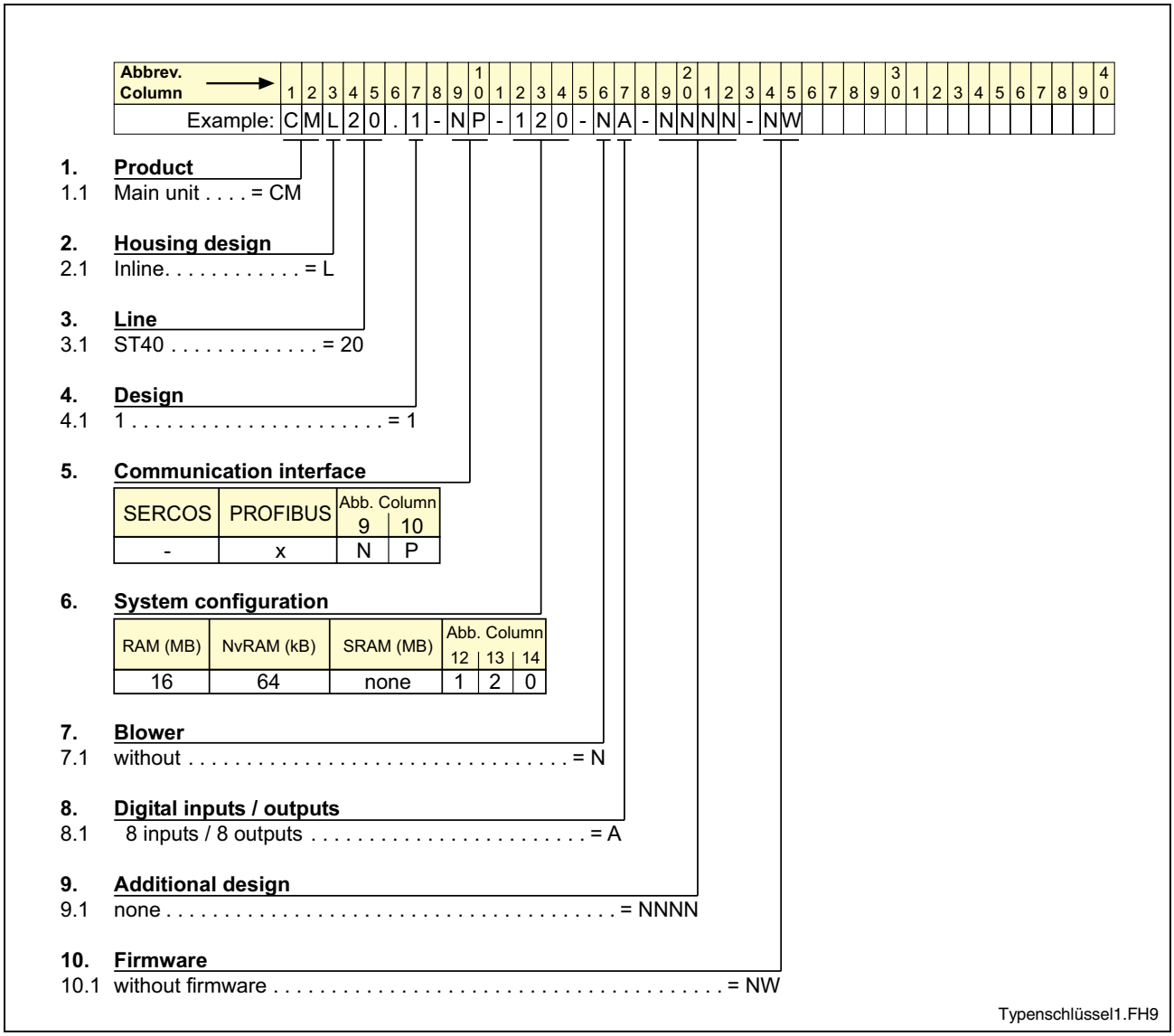


Fig. 11-1: Type code

11.2 Accessories

Required Accessories

Connector Set

The following connector set is required for connecting the IndraControl L20:

Ordering designation	Part number	Description
R-IB IL CML S01-PLSET	R911299856	Connector set for IndraControl L20

Additional Accessories

Rexroth Inline Modules

Ordering designation	Part number	Description
Digital input terminals:		
R-IB IL 24 DI 2	R911289286	2 inputs, 24 V DC, 4-wire connection, width: 12.2 mm
R-IB IL 24 EDI 2-DES	R911289292	2 Desina diagnostic inputs, overall width: 12.2 mm
R-IB IL 24 DI 4	R911289287	4 inputs, 24 V DC, 3-wire connection, width: 12.2 mm
R-IB IL 24 DI 8	R911289288	8 inputs, 24 V DC, 4-wire connection, width: 48.8 mm
R-IB IL 24 DI 16	R911289290	16 inputs, 24 V DC, 3-wire connection, width: 48.8 mm
R-IB IL 24 DI 32/HD	R911297188	32 inputs, 24 V DC, 1-wire connection, width: 48.8 mm
Digital output terminals:		
R-IB IL 24/230 DOR1/W	R911289301	1 relay change-over contact, 5-253 V AC, 3 A, gold plated, to switch lamp loads, width: 12.2 mm
R-IB IL 24 DO 2-2A	R911289294	2 outputs, 24 V DC, 2 A, 4-wire connection, width: 12.2 mm
R-IB IL 24 DO 4	R911289295	4 outputs, 24 V DC, 500 mA, 3-wire connection, overall width: 48.8 mm
R-IB IL 24/230 DOR4/W	R911289302	4 relay change-over contacts, 5-253 V AC, 3 A, gold plated, overall width: 48.8 mm
R-IB IL 24 DO 8	R911289297	8 outputs, 24 V DC, 500 mA, 4-wire connection, overall width: 48.8 mm
R-IB IL 24 DO 8-2A	R911289298	8 outputs, 24 V DC, 2 A, 4-wire connection, overall width: 48.8 mm
R-IB IL 24 DO 16	R911289299	16 outputs, 24 V DC, 500 mA, 3-wire connection, overall width: 48.8 mm
R-IB IL 24 DO 32/HD	R911297191	32 outputs, 24 V DC, 1 A, 1-wire connection, overall width: 48.8 mm
R-IB IL DOR LV-SET	R911291260	Spacing terminals to use the relay output terminals, overall width: 12.2 mm each
Analog input terminals:		
R-IB IL AI 2/SF	R911289306	2 inputs, 0-20 mA, 4-20 mA, ± 20 mA, 0-10 V, ± 10 V, overall width: 12.2 mm
R-IB IL TEMP 2 RTD	R911289305	2 inputs for resistance detectors, overall width: 12.2 mm

Analog output terminals:		
R-IB IL AO 1/SF	R911289303	1 output, 0-20 mA, 4-20 mA, 0-10 V, overall width: 24.4 mm
R-IB IL AO 2/U/BP	R911289381	2 outputs, 0-10 V, ±10 V, overall width: 12.2 mm
R-IB IL CNT	R911289315	Counter terminal
Connectors:		
R-IB IL AO/CNT-PLSET	R911289339	Connector set for analog output modules and counter terminal
R-IB IL DOR LV-PLSET	R911291261	Connector set for voltage spacer terminals 230 V/24 V
R-IB IL SCN-6 SHIELD	R911289331	Connector, 6-pin with shield connector for a cable
R-IB IL SCN-6 SHIELD-TWIN	R911289332	Connector, 6-pin with shield connector for two cables
R-IB IL SCN-8	R911291191	Connector, 8-pin
R-IB IL SCN-8-AC-REL	R911289337	Connector, 8-pin for relay terminals
R-IB IL SCN-8-CP	R911289323	Connector, 8-pin, color-coded
R-IB IL SCN-12-ICP	R911289326	Connector, 12-pin for inputs, color-coded
R-IB IL SCN-12-OCP	R911289327	Connector, 12-pin for outputs, color-coded
R-IB IL SCN-PWR IN-CP	R911289328	Connector for power terminal, color-coded
Labeling field:		
R-IB IL FIELD 2	R911289341	Labeling fields: 12.2 mm
R-IB IL FIELD 8	R911289342	Labeling fields: 48.8 mm

Interface Cable

Ordering designation	Part number	Description
Serial interface:		
RKB0009/005,0	R911170155	RS232 cable, 9-pin DSUB on both sides, 5 m
Ethernet interface:		
RKB0007/00,15	R911170146	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, on both sides with RJ45 connector, 0.15 m
RKB0007/002,5	R911170147	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 2.5 m
RKB0007/005,0	R911170148	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 5.0 m
RKB0007/010,0	R911170149	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 10.0 m
RKB0007/025,0	R911170150	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 25.0 m
RKB0008/002,5	R911170151	Ethernet cable, 10-Base-T, CAT.5, ready-made, on both sides with RJ45 connector, 2.5 m
RKB0008/005,0	R911170152	Ethernet cable, 10-Base-T, CAT.5, ready-made, on both sides with RJ45 connector, 5.0 m
RKB0008/010,0	R911170153	Ethernet cable, 10-Base-T, CAT.5, ready-made, on both sides with RJ45 connector, 10.0 m
RKB0008/025,0	R911170154	Ethernet cable, 10-Base-T, CAT.5, ready-made, on both sides with RJ45 connector, 25.0 m

Profibus DP:		
REB0001	R911170134	Profibus cable, Fast Connect, standard
REB0002	R911170136	Profibus cable, Fast Connect, cable carrier, tensile force 100 N
REB0003	R911170135	Profibus cable, cable carrier, tensile force 20 N
RBS0010/K02	R911170137	Profibus connector 12 Mbauds
RBS0011/K02	R911170138	Profibus connector 12 Mbauds, with PG female connector
RBS0012/K02	R911170139	Profibus connector 12 Mbauds, 180° offset
RBS0013/F03	R911170140	Profibus connector 12 Mbauds, 90° offset, Fast Connect
RBS0014/F03	R911170141	Profibus connector 12 Mbauds, 90° offset, Fast Connect, with PG female connector
RBS0015/F03	R911170142	Profibus connector 12 Mbauds, 180° offset, Fast Connect
WERKZ-ABISOLIERER-FC-KABEL	R911170143	Stripping tool for PROFIBUS Fast Connect cable
WERKZ-ABISOLIERER-FC-KABEL	R911170144	Spare knife for stripping tool (packaging seize: 5 pieces)

Fig. 11-2: Interface cable and accessories

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14 Service & Support

14.1 Helpdesk

Unser Kundendienst-Helpdesk im Hauptwerk Lohr am Main steht Ihnen mit Rat und Tat zur Seite. Sie erreichen uns

Our service helpdesk at our headquarters in Lohr am Main, Germany can assist you in all kinds of inquiries. Contact us

- telefonisch - by phone: **+49 (0) 9352 40 50 60**
  über Service Call Entry Center Mo-Fr 07:00-18:00
  - via Service Call Entry Center Mo-Fr 7:00 am - 6:00 pm
- per Fax - by fax: **+49 (0) 9352 40 49 41**
- per e-Mail - by e-mail: **service.svc@boschrexroth.de**

14.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service direkt ansprechbar unter

After helpdesk hours, contact our service department directly at

+49 (0) 171 333 88 26

oder - or **+49 (0) 172 660 04 06**

14.3 Internet

Unter **www.boschrexroth.com** finden Sie ergänzende Hinweise zu Service, Reparatur und Training sowie die **aktuellen** Adressen *) unserer auf den folgenden Seiten aufgeführten Vertriebs- und Servicebüros.

Verkaufsniederlassungen
Niederlassungen mit Kundendienst

Außerhalb Deutschlands nehmen Sie bitte zuerst Kontakt mit unserem für Sie nächstgelegenen Ansprechpartner auf.

*) Die Angaben in der vorliegenden Dokumentation können seit Drucklegung überholt sein.

At **www.boschrexroth.com** you may find additional notes about service, repairs and training in the Internet, as well as the **actual** addresses *) of our sales- and service facilities figuring on the following pages.

sales agencies
offices providing service

Please contact our sales / service office in your area first.

*) Data in the present documentation may have become obsolete since printing.

14.4 Vor der Kontaktaufnahme... - Before contacting us...

Wir können Ihnen schnell und effizient helfen wenn Sie folgende Informationen bereithalten:

1. detaillierte Beschreibung der Störung und der Umstände.
2. Angaben auf dem Typenschild der betreffenden Produkte, insbesondere Typenschlüssel und Seriennummern.
3. Tel.-/Faxnummern und e-Mail-Adresse, unter denen Sie für Rückfragen zu erreichen sind.

For quick and efficient help, please have the following information ready:

1. Detailed description of the failure and circumstances.
2. Information on the type plate of the affected products, especially type codes and serial numbers.
3. Your phone/fax numbers and e-mail address, so we can contact you in case of questions.

14.5 Kundenbetreuungsstellen - Sales & Service Facilities

Deutschland – Germany

vom Ausland: (0) nach Landeskennziffer weglassen!
from abroad: don't dial (0) after country code!

Vertriebsgebiet Mitte Germany Centre	SERVICE AUTOMATION	SERVICE AUTOMATION	SERVICE AUTOMATION
Bosch Rexroth Electrice Drives and Controls GmbH Bgm.-Dr.-Nebel-Str. 2 / Postf. 1357 97816 Lohr am Main / 97803 Lohr **Kompetenz-Zentrum Europa** Tel.: +49 (0)9352 40-0 Fax: +49 (0)9352 40-4885	CALL ENTRY CENTER Helpdesk MO – FR von 07:00 - 18:00 Uhr from 7 am – 6 pm **Tel. +49 (0) 9352 40 50 60** **Fax +49 (0) 9352 40 49 41** service.svc@boschrexroth.de	HOTLINE 24 / 7 / 365 außerhalb der Helpdesk-Zeit out of helpdesk hours **Tel.: +49 (0)172 660 04 06** oder / or **Tel.: +49 (0)171 333 88 26**	**ERSATZTEILE / SPARES** verlängerte Ansprechzeit - extended office time - ♦ nur an Werktagen - only on working days - ♦ von 07:00 - 18:00 Uhr - from 7 am - 6 pm - **Tel. +49 (0) 9352 40 42 22**
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vom Ausland: (0) nach Landeskennziffer weglassen, Italien: 0 nach Landeskennziffer mitwählen
from abroad: don't dial (0) after country code, Italy: dial 0 after country code

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