

# Rexroth IndraControl L10

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## Project Planning Manual



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Bgm.-Dr.-Nebel-Str. 2 ■ 97816 Lohr am Main, Germany  
 Phone +49 (0)93 52/ 40-0 ■ Fax +49 (0)93 52/ 40-48 85  
<http://www.boschrexroth.com/>  
 Dep. BRC/EPY (MK/MePe)  
 Dep. BRC/EAH2 (WW/MePe)

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# 1 System Representation

## 1.1 Brief Description IndraControl L10

The control IndraControl L10 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 communication interfaces. Examples include Ethernet as well as on board interfaces with 8 fast inputs and 4 fast outputs. 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. All application programs, including runtime, are stored on an easily accessible standardized compact flash medium.

## 1.2 View

Operating elements and interfaces are arranged on the front.

The Reset button, an LED (status), the Ethernet interface and the receptacle for the Compact Flash card are provided on the left. The terminals for 8 digital inputs and 4 digital outputs as well as the voltage supply connectors are provided on the right.



Fig. 1-1: View of a typical IndraControl L10 unit

System Representation

### 1.3 Related Documentations

No	Title	Identification
/1/	Rexroth IndraLogic L10; System Description	DOK-CONTRL-IC*L10****-AW..-EN-P

*Fig.1-2: Related Documentations*



## 2 Important Instructions on Use

### 2.1 Appropriate Use

#### 2.1.1 Introduction

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



#### **Physical and property damage due to the inappropriate use of products!**

The products are designed for their use within the industrial environment and may therefore only be used for the intended purpose. If the use is inappropriate, situations causing physical damage as well as property damage can occur.



Rexroth disclaims as manufacturer any warranty, liability or for damages occurring due to inappropriate use of the products. Furthermore, Rexroth is not paying any compensation. The user is responsible for any risks resulting from the products not being used as intended.

Before using Rexroth products, the following pre-requisites must be fulfilled to ensure an appropriate use of the products:

- Anyone handling one of the Rexroth products in any way has to read and understand the respective safety instructions as well as the instructions on the appropriate use.
- Hardware products have to remain in their original state, in other words, no modification regarding the design are allowed. Software products may not be decompiled and their source codes may not be modified.
- Damaged or faulty products are not to be implemented or put into operation.
- It is to be ensured that the corresponding products are installed according to the specifications of the documentation.

#### 2.1.2 Areas of Use and Application

The Steuerung IndraControl L10 of Rexroth is suitable for logic applications. It can be necessary to connect additional sensors and actuators to control and monitor the IndraControl L10.



The IndraControl L10 may only be used with the accessories and add-on components specified in this documentation. Components that are not named explicitly may neither be mounted nor connected. Same is applicable for cables and wires.

Operation may only be carried out in the configurations and combinations of the components specified and with the software and firmware determined in the respective functional description.

Each drive control device has to be programmed before commissioning so that the motor carries out the specific functions for the application.

Typical areas of application of the IndraControl L10:

- Handling systems and assembly systems
- General automation tasks

## Important Instructions on Use

The Steuerungen IndraControl L10 may only be operated under the assembly conditions and installation conditions, in the specified position of application and under the specified ambient conditions (temperature, degree of protection, humidity, EMC etc.) given in this documentation.

## 2.2 Inappropriate Use

The application of IndraControl L10 that are not within the specified areas of application or under operating conditions deviating from the operating conditions and technical data specified in the documentation is considered as "inappropriate".

IndraControl L10 may not be used if ...

- they are exposed to operating conditions that do not fulfill the ambient conditions specified. Operation under water, under extreme temperature fluctuations or extreme maximum temperatures is not allowed for example:.
- the Rexroth applications that are not released explicitly. Please note the general statements in the general safety instructions!
- when using in household devices or devices belonging to the categories 1 to 7 and 10 of the directive 2002/96/EC ("WEEE") in the appendix IA.

## 3 Safety Instructions for Electric Drives and Controls

### 3.1 Safety Instructions - General Information

#### 3.1.1 Using the Safety Instructions and Passing them on to Others

Do not attempt to install or commission this device without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with the device. If you do not have the user documentation for the device, contact your responsible Bosch Rexroth sales representative. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the device.

If the device is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the device in the official language of the user's country.



**Improper use of these devices, 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!**

Observe the safety instructions!

---

#### 3.1.2 How to Employ the Safety Instructions

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

- 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 commissioning 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 device.
- Only assign trained and qualified persons to work with electrical installations:
  - Only persons who are trained and qualified for the use and operation of the device may work on this device or within its proximity. The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the product, 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 devices 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.

## Safety Instructions for Electric Drives and Controls

- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The devices have been designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Only use safety-relevant applications that are clearly and explicitly approved in the Project Planning Manual. If this is not the case, they are excluded. Safety-relevant are all such applications which can cause danger to persons and material damage.
- 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.
- Commissioning 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.
- 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 section on EMC in the respective documentation (Project Planning Manuals of components and system).  
The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.
- Technical data, connection and installation conditions are specified in the product documentation and must be followed at all times.

*National regulations which the user must take into account*

- European countries: according to European EN standards
- United States of America (USA):
  - National Electrical Code (NEC)
  - National Electrical Manufacturers Association (NEMA), as well as local engineering regulations
  - regulations of the National Fire Protection Association (NFPA)
- Canada: Canadian Standards Association (CSA)
- Other countries:
  - International Organization for Standardization (ISO)
  - International Electrotechnical Commission (IEC)

### 3.1.3 Explanation of Warning Symbols and Degrees of Hazard Seriousness

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

## Safety Instructions for Electric Drives and Controls




Warning symbol	Signal word	Degree of hazard seriousness acc. to ANSI Z 535.4-2002
	Danger	Death or severe bodily harm will occur.
	Warning	Death or severe bodily harm may occur.
	Caution	Minor or moderate bodily harm or material damage may occur.

Fig.3-1: Hazard classification (according to ANSI Z 535)

## 3.1.4 Hazards by Improper Use

**DANGER****High electric voltage and high working current! Risk of death or severe bodily injury by electric shock!**

Observe the safety instructions!

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

Observe the safety instructions!

**WARNING****High electric voltage because of incorrect connection! Risk of death or bodily injury by electric shock!**

Observe the safety instructions!

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

Observe the safety instructions!

**CAUTION****Hot surfaces on device housing! Danger of injury! Danger of burns!**

Observe the safety instructions!

**CAUTION****Risk of injury by improper handling! Risk of bodily injury by bruising, shearing, cutting, hitting or improper handling of pressurized lines!**

Observe the safety instructions!



CAUTION

**Risk of injury by improper handling of batteries!**

Observe the safety instructions!

## 3.2 Instructions with Regard to Specific Dangers

### 3.2.1 Protection Against Contact with Electrical Parts and Housings



This section concerns devices and drive components with voltages of **more than 50 Volt**.

Contact with parts conducting voltages above 50 Volts can cause personal danger and electric shock. When operating electrical equipment, it is unavoidable that some parts of the devices conduct dangerous voltage.



DANGER

**High electrical voltage! Danger to life, electric shock and severe bodily injury!**

- Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain and repair this equipment.
- Follow general construction and safety regulations when working on power installations.
- Before switching on the device, the equipment grounding conductor must have been non-detachably connected to all electrical equipment in accordance with the connection diagram.
- Do not operate electrical equipment at any time, even for brief measurements or tests, if the equipment grounding conductor is not permanently connected to the mounting points of the components provided for this purpose.
- Before working with electrical parts with voltage potentials higher than 50 V, the device must be disconnected from the mains voltage or power supply unit. Provide a safeguard to prevent reconnection.
- With electrical drive and filter components, observe the following:  
Wait **30 minutes** after switching off power to allow capacitors to discharge before beginning to work. Measure the electric 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. Do not remove or plug in connectors when the component has been powered.
- Install the covers and guards provided with the equipment properly before switching the device on. Before switching the equipment on, cover and safeguard live parts safely to prevent contact with those parts.
- A residual-current-operated circuit-breaker or r.c.d. cannot be used for electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device according to the relevant standards.
- Secure built-in devices from direct touching of electrical parts by providing an external housing, for example a control cabinet.

## Safety Instructions for Electric Drives and Controls



For electrical drive and filter components with voltages of **more than 50 volts**, observe the following additional safety instructions.



### High housing voltage and high leakage current! Risk of death or bodily injury by electric shock!

- Before switching on, the housings of all electrical equipment and motors must be connected or grounded with the equipment grounding conductor to the grounding points. This is also applicable before short tests.
- The equipment grounding conductor of the electrical equipment and the devices must be non-detachably and permanently connected to the power supply unit at all times. The leakage current is greater than 3.5 mA.
- Over the total length, use copper wire of a cross section of a minimum of 10 mm<sup>2</sup> for this equipment grounding connection!
- Before commissioning, also in trial runs, always attach the equipment grounding conductor or connect to the ground wire. Otherwise, high voltages may occur at the housing causing electric shock.

## 3.2.2 Protection Against Electric Shock by Protective Extra-Low Voltage

Protective extra-low voltage is used to allow connecting devices with basic insulation to extra-low voltage circuits.

All connections and terminals with voltages between 5 and 50 volts at Rexroth products are PELV systems. <sup>1)</sup> It is therefore allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections and terminals.



### High electric voltage by incorrect connection! Risk of death or bodily injury by electric shock!

If extra-low voltage circuits of devices containing voltages and circuits of more than 50 volts (e.g. the mains connection) are connected to Rexroth products, the connected extra-low voltage circuits must comply with the requirements for PELV. <sup>2)</sup>

## 3.2.3 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of 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.

1) "Protective Extra-Low Voltage"

2) "Protective Extra-Low Voltage"

## Safety Instructions for Electric Drives and Controls

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 harm 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.

These measures have to be provided for by the user according to the specific conditions within the installation and a hazard and fault analysis. The safety regulations applicable for the installation have to be taken into consideration. Unintended machine motion or other malfunction is possible if safety devices are disabled, bypassed or not activated.

**To avoid accidents, bodily harm and/or material damage:**

- 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.
- Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the device if the emergency stop is not working.
- Isolate the drive power connection by means of an emergency stop circuit or use a safety related starting lockout to prevent unintentional start.
- Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone.
- Additionally 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 or
  - 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 devices 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.

### 3.2.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated by current-carrying conductors and permanent magnets in motors represent a serious personal danger to those 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 and metal implants are not permitted to enter following areas:
  - Areas in which electrical equipment and parts are mounted, being operated or commissioned.
  - Areas in which parts of motors with permanent magnets are being stored, repaired or mounted.
- If it is necessary for somebody with a pacemaker to enter such an area, a doctor must be consulted prior to doing so. The noise immunity of present or future implanted heart pacemakers differs greatly so that no general rules can be given.
- Those with metal implants or metal pieces, as well as with hearing aids, must consult a doctor before they enter the areas described above. Otherwise health hazards may occur.

### 3.2.5 Protection Against Contact with Hot Parts



CAUTION

#### Hot surfaces at motor housings, on drive controllers or chokes! Danger of injury! Danger of burns!

- Do not touch surfaces of device housings and chokes in the proximity of heat sources! Danger of burns!
- Do not touch housing surfaces of motors! Danger of burns!
- According to the operating conditions, temperatures can be **higher than 60 °C, 140°F** during or after operation.
- Before accessing motors after having switched them off, let them cool down for a sufficiently long time. Cooling down can require **up to 140 minutes!** Roughly estimated, the time required for cooling down is five times the thermal time constant specified in the Technical Data.
- After switching drive controllers or chokes off, wait 15 minutes to allow them to cool down before touching them.
- Wear safety gloves or do not work at hot surfaces.
- For certain applications, the manufacturer of the end product, machine or installation, according to the respective safety regulations, has to take measures to avoid injuries caused by burns in the end application. These measures can be, for example: warnings, guards (shielding or barrier), technical documentation.

### 3.2.6 Protection During Handling and Mounting

In unfavorable conditions, handling and mounting certain parts and components in an improper way can cause injuries.

**CAUTION****Risk of injury by improper handling! Bodily injury by bruising, shearing, cutting, hitting!**

- Observe the general construction and safety regulations on handling and mounting.
- Use suitable devices for mounting and transport.
- Avoid jamming and bruising by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- If necessary, use suitable protective equipment (for example safety goggles, safety shoes, safety gloves).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids because of the danger of skidding.

### 3.2.7 Battery Safety

Batteries consist of active chemicals enclosed in a solid housing. Therefore, improper handling can cause injury or material damage.

**CAUTION****Risk of injury by improper handling!**

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.
- When replacing the battery/batteries do not damage electrical parts installed in the devices.
- Only use the battery types specified by the manufacturer.



Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separate from other waste. Observe the local regulations in the country of assembly.

### 3.2.8 Protection Against Pressurized Systems

According to the information given in the Project Planning Manuals, motors cooled with liquid and compressed air, as well as drive controllers, can be partially supplied with externally fed, pressurized media, such as compressed air, hydraulics oil, cooling liquids and cooling lubricating agents. Improper handling of the connected supply systems, supply lines or connections can cause injuries or material damage.

Safety Instructions for Electric Drives and Controls

---



**CAUTION**

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**Risk of injury by improper handling of pressurized lines!**

- Do not attempt to disconnect, open or cut pressurized lines (risk of explosion).
  - Observe the respective manufacturer's operating instructions.
  - Before dismounting lines, relieve pressure and empty medium.
  - Use suitable protective equipment (for example safety goggles, safety shoes, safety gloves).
  - Immediately clean up any spilled liquids from the floor.
- 



Environmental protection and disposal! The agents used to operate the product might not be economically friendly. Dispose of ecologically harmful agents separately from other waste. Observe the local regulations in the country of assembly.

---

## 4 Technical Data

### 4.1 Equipment

Processor	STMicroelectronics ST40with at least 192 MHz
Random access memory (RAM)	At least 32 Mbytes DRAM and at least 32 Kbytes NvRAM
Interfaces:	
Interface to I/O modules	Rexroth Inline interface
Communication interface	1 x Ethernet connection (RJ 45, 10/100 Base-T)
Inputs and outputs	8 electrically isolated digital inputs 4 electrically isolated digital outputs

Fig.4-1: Equipment

### 4.2 Power Supply

The IndraControl L10 is supplied with 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 %
U <sub>max</sub>	30 V
U <sub>min</sub>	19.2 V

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

Three operating voltages can be applied on the IndraControl L10 (refer to [chapter 7.2.1 "External Supply Voltages" on page 24](#)). Current consumption from these voltages is as follows:

Current consumption by U <sub>LS</sub>	1.25 A max
Current consumption from U <sub>M</sub> and U <sub>S</sub>	Max. of 8 A in total

Fig.4-3: Current consumption



The power consumption of the IndraControl L10 (no I/O connected) is normally 4.6 watt.

### 4.3 Ambient Conditions

	In operation	Storage / Transport
Max. ambient temperature	+5 ... +55 °C	-25 °C bis +70 °C
Relative humidity	RH-2; 5 % to 95 % acc. to DIN EN 61131-2, Condensation not allowed.	

Technical Data

	In operation	Storage / Transport
Air pressure	Up to 2700 m above MSL according to DIN 60204	Up to 3000 m above MSL according to DIN 60204
Mechanical strength	Max. vibration: Frequency range: 10...150 Hz Excursion: 0.003 in at 10..0.57 Hz Acceleration: 1 g at 57...150 Hz According to EN 60068-2-6	Max. shock: 15 g according to EN 60068-2-27, no disturbance of the function
Degree of pollution	2	2

Fig.4-4: Ambient conditions



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.

## 4.4 Used Standards

The IndraControl L10 complies with the following standards:

Standard	Meaning
DIN EN 60 204-1	Electrical equipment of machines
DIN EN 61,131-2	Programmable logic controllers Requirements on the equipment 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.4-5: Used standards



The IndraControl L10 complies with the CE requirements!



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Systems with IndraControl L10 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 certified



The controls IndraControl L10 are generally certified acc. 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.



---

To guarantee an UL/CSA-compliant operation, the following conditions have to be fulfilled:

- Use 60/75°C insulated copper wire only.
- 

## 4.5 Compatibility Test

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

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 this reason, before using the respective material a compatibility test has to be carried out for new lubricants, cleaning agents etc. and our housings / our housing materials.





## 5 Dimensions

### 5.1 Housing Dimensions

The housing is IndraControl L10 123.5 mm long, 121 mm high and 70,4 mm deep. Please refer to the following figures for detailed dimensions:

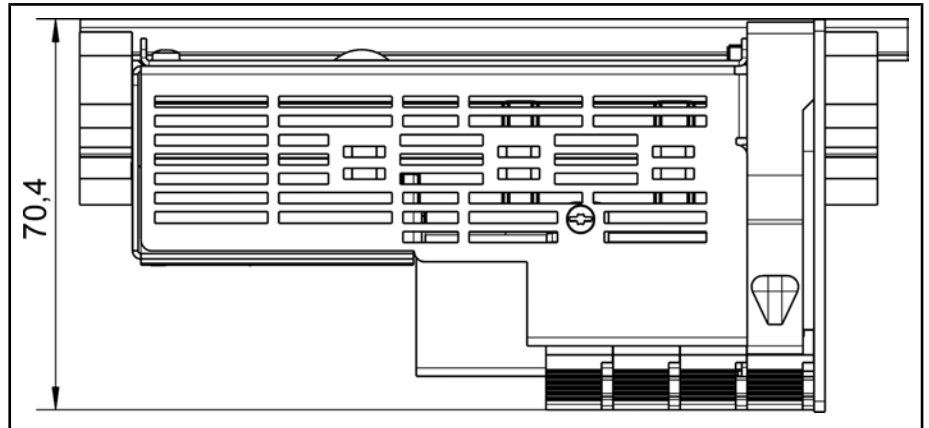


Fig.5-1: Bottom view

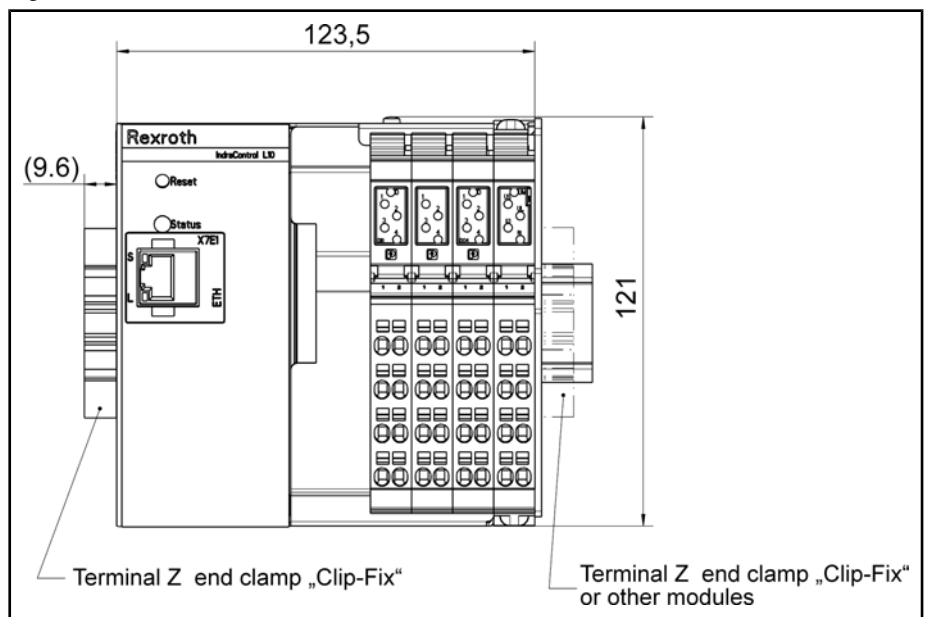


Fig.5-2: Front view

Dimensions

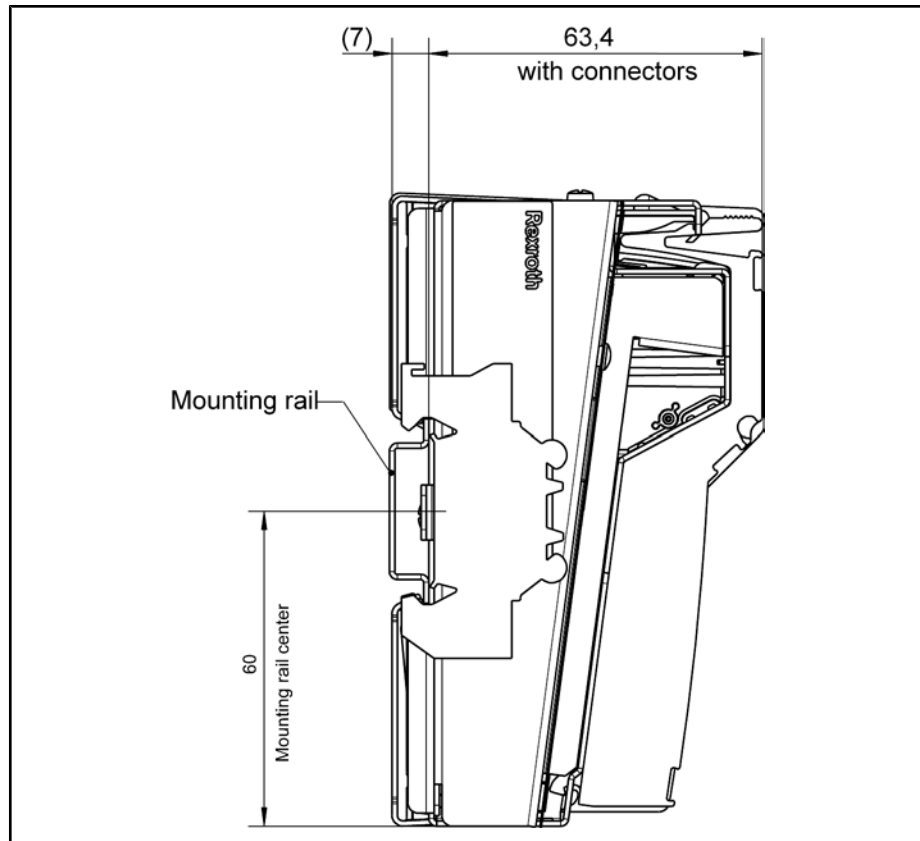


Fig.5-3: Lateral view from the left

## 6 Display and Operating Components

### 6.1 General Information

The web-based "IndraControl Service Tool" is integrated in the IndraControl L10 for the display and the operation. The control can be accessed with a web browser via an Ethernet interface. The IP address is set to 192.168.1.10 when shipped. Further information under /1/.

The reset button and the status LED are located on the front of the IndraControl L10.

### 6.2 Reset Button and Status LED

The Reset button and the multicolor LED are located on the left side of the device front.



Fig. 6-1: Recessed reset button and status LED

#### Reset button



Pressing the reset button will abort processing of a running program.

The reset button can only be pressed using a tool, for instance with the tip of a pencil.

Three different actions can be activated using the Reset button:

1. **Short** pressing of the reset button during the operation resets the complete assembly and forces a restart without a switch off of the supply voltages.
2. **Long** pressing of the reset button during the operation resets the complete assembly and forces a restart without a switch off of the supply voltages. Additionally, the IP address is reset to the delivery status (192.168.1.10). Therefore, the reset button is to be pressed till the booting phase ends. The period of the booting phase is indicated with an orange status light emitting diode.
3. If the reset button is pressed during the switch-on voltage of the power supply, the existing boot project is deleted.

## Display and Operating Components

**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 about the Connections on the Front Panel

Designation on the housing	Connection type	Connector type (integrated)	Mating connector or cable (from outside)
X7E	Network connection: Ethernet 10Base T / 100Base X	RJ45 female connector, 8-pin	RJ45 male connector (8-core twisted pair)

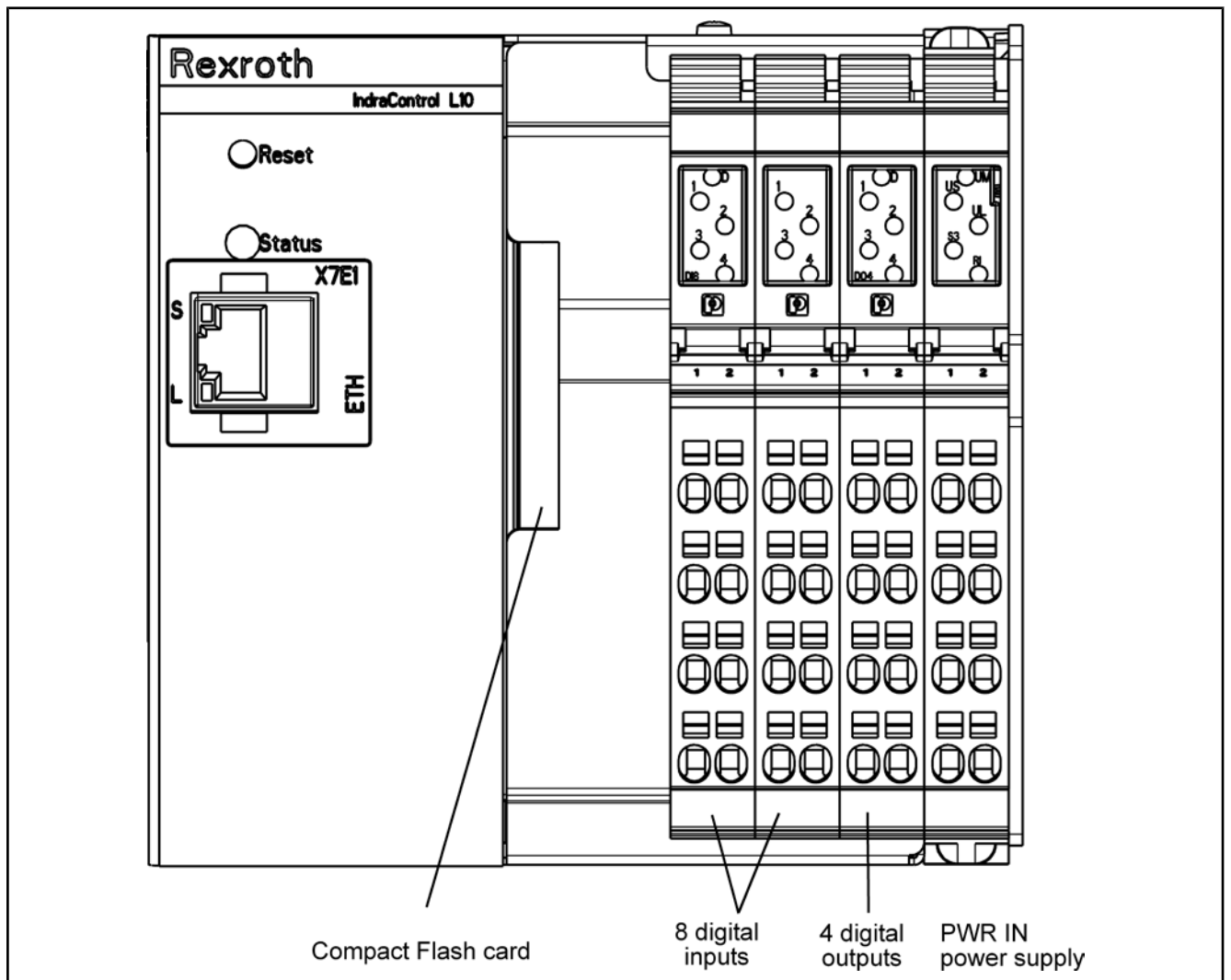


Fig.7-1: IndraControl L10 connections



**Fitting or removing connectors with the IndraControl L10 being live may damage the unit or an additional module!**

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

Connections and Interfaces

## 7.2 Power Supply

### 7.2.1 External Supply Voltages

#### General Information

**PWR IN** The IndraControl L10 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 L10.

**Slot 4:**

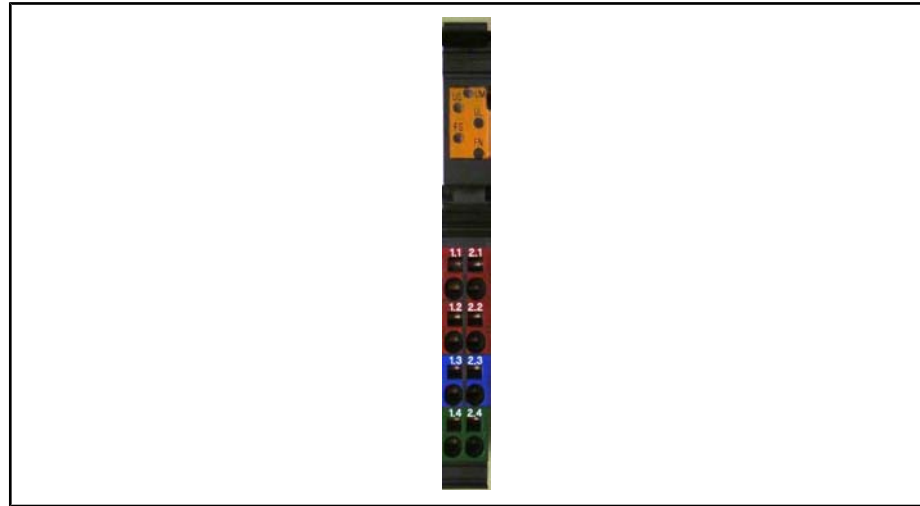


Fig.7-2: Supply voltage connections



Observe the color-coding of the connectors.



To connect the operating voltages only the power connector included in the connector set R-IB IL CML S01-PLSET available for the IndraControl L10 is allowed. Connector R-IB IL SCN-PWR IN-CP available for other power terminals is **not** permitted for the IndraControl L10 .

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

Terminal	Signal
1.1	+24 VDC segment voltage $U_S$ .
1.2	+24 VDC supply voltage $U_{LS}$ is present.
1.3	LGND (ground supply voltage)
1.4 and 2.4	FE (functional earth ground)
2.1 and 2.2	+24 VDC supply voltage $U_M$ is present.
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:

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

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

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

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

LED "UL"	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

LEDs "S3"	Meaning
	Status of Sercos III Communication. (In the variant L10 without function)

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

LEDs "RI"	Meaning
Off	-
Green	Local bus active
Red	Local bus stop (fatal error)

Fig.7-8: "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 L10 are generated from the 24 V supply voltage  $U_{LS}$  (terminal 1.2).



$U_{LS}$  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 L10.

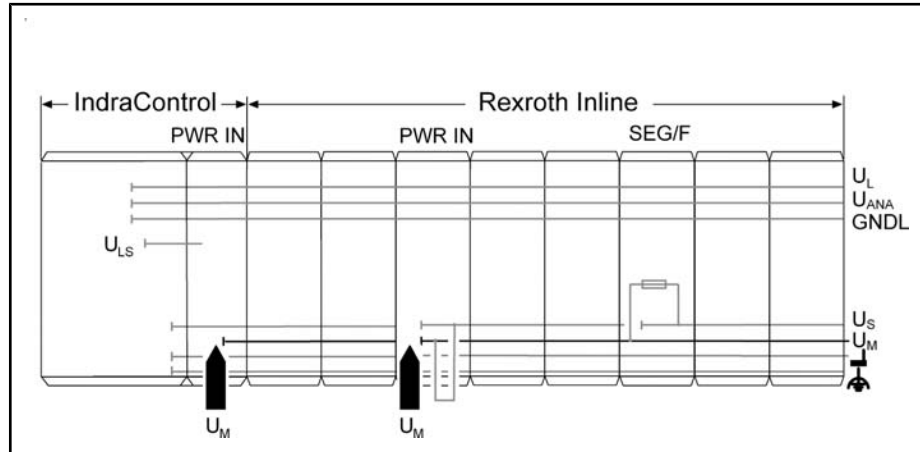
The main circuit  $U_M$  starts at the IndraControl L10 or at a power terminal and is supplied through all following modules up to the next power terminal. At the next power terminal, a new circuit is started; its potential is isolated from the previous one.

Several power terminals can be used within one station.

Connections and Interfaces

**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. When the limit value is reached, a new power terminal **has** to be used.



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

Fig.7-9: Main circuit

**Provision  $U_M$**  In the simplest case, the main voltage  $U_M$  can be supplied at the IndraControl L10.

$U_M$  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  $U_M$ ,  $U_S$ , total current of  $U_S$  and  $U_M$  (GND)) is 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 L10 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. Several segment terminals can be used within a main circuit and can thereby segment the main circuit. The reference to ground is the same as that of the main circuit. Thus, different fused electric circuits can be implemented within the station 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. When the limit value is reached for a voltage jumper  $U_M$  ( $U_M$ ,  $U_S$  or the total current of  $U_S$  and  $U_M$  (GND)), a new power terminal has to be used.

**Provision  $U_S$**  The segment voltage  $U_S$  can be provided in various ways:



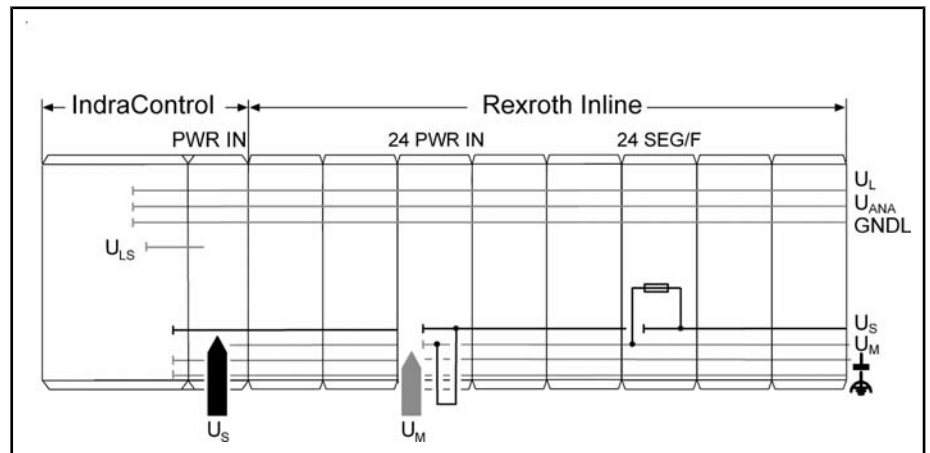
## Connections and Interfaces

1. The segment voltage can be fed at the IndraControl L10 or at a power terminal.
2. The segment voltage can be tapped from the main voltage, either at the IndraControl L10 or at a power terminal using a jumper or a switch.

A segment terminal with fuse can be used. In this terminal, the segment voltage is automatically tapped from the main voltage.



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.



PWR IN Voltage module at the IndraControl

R-IL 24 PWR IN Power terminal

R-IL 24 SEG/F Segment terminal with fuse

F

Fig. 7-10: Segment circuit



The 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  $U_S$ .



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.



$U_M$  is interrupted by the terminal PWR IN.

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

## 7.2.2 Internally Generated 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 L10 and is supplied through all connected Rexroth Inline I/O modules by the lateral contacts.

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

**Voltage** The voltage in this circuit is 7.5 V.

**Generation of the Inline Supply Voltage** The Inline voltage is generated from the supply voltage  $U_{LS}$  of the IndraControl L10.

Connections and Interfaces

**Current Carrying Capacity** The maximum current carrying capacity of the Inline voltage is 0.8 A. Thus, the total current consumption of all Inline modules must not exceed this maximum value of 0.8 A.

If the total power consumption of all the Inline modules exceeds this value of 0.8 A, the 7.5 V Inline supply voltage can be fed using the terminal R-IB IL 24 PWR IN/R-PAC. This terminal feeds additional 2 A.

**+24 V Analog Supply (UANA)**

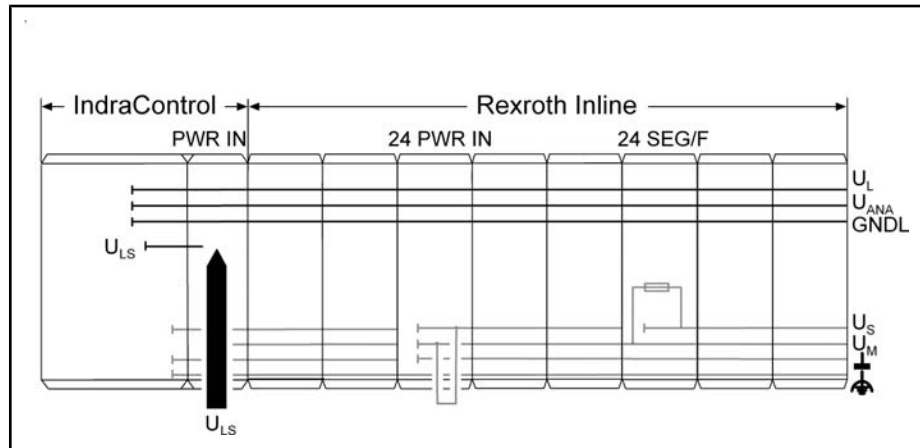
The +24 V analog voltage is generated from the voltage  $U_{LS}$ . It starts in the IndraControl L10 and is supplied through all Rexroth Inline I/O modules by the lateral contacts (voltage jumper).

**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 IndraControl L10 from the supply voltage  $U_{LS}$ .

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



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

Fig.7-11: Inline supply with analog circuit

Remarks for wiring, please refer to [chapter 8.2 "Electric Installation"](#) on page 36.

## 7.3 Digital Inputs and Outputs

### 7.3.1 Address Assignment of Inputs and Outputs

The 8 digital inputs and 4 digital outputs available on the slots 1 to 3 of the IndraControl L10 (from left to right) are assigned to light-emitting diodes and bit addresses according to the following table:

		8 digital inputs								4 digital outputs			
Slot		1				2				3			
Status LED		1	2	3	4	1	2	3	4	1	2	3	4

		8 digital inputs								4 digital outputs			
Byte-bit view	Byte	IX0.0 – 0.7 (default)								QX0.0 – 0.3 (default)			
	Bit	0	1	2	3	4	5	6	7	0	1	2	3
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
	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

Fig.7-12: Address assignment of inputs and outputs

### 7.3.2 Digital On-board Inputs

The left-hand section of the connector panel provides 8 digital inputs as on-board inputs.

**Slots 1 and 2:**

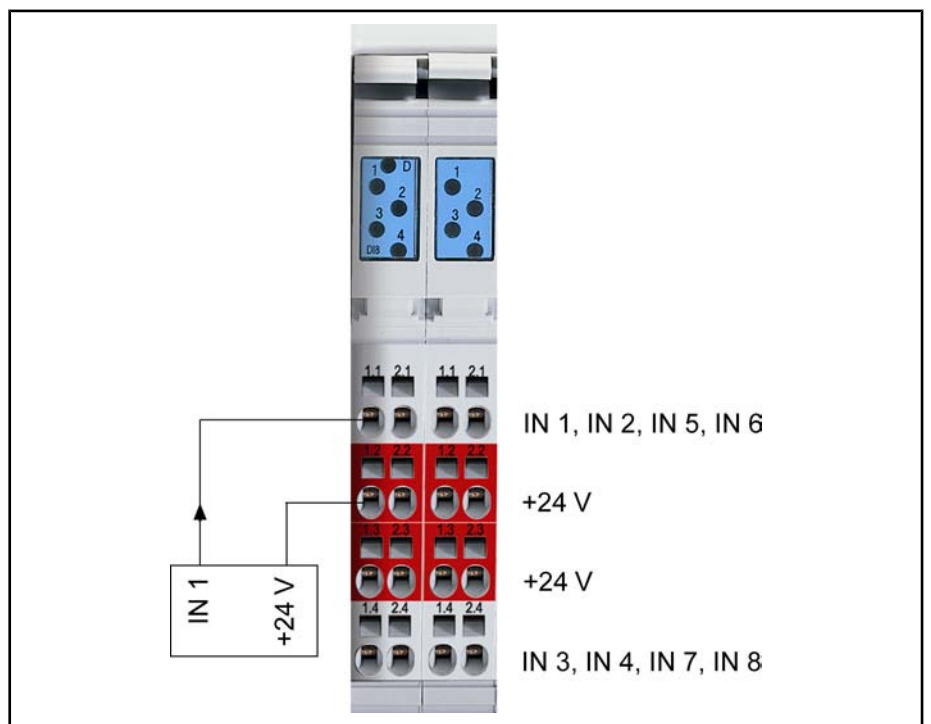


Fig.7-13: Digital inputs



Observe the color-coding of the connectors.

Number of inputs	8
Connection method	2-wire connection
Electrical isolation to $U_S$	No
Electrical isolation to $U_L$	Yes
Reverse voltage protection	Yes
Input voltage:	
Nominal value for "0"	-3 V ... + 5 V ...
Nominal value for "1"	11 V ... 30 V

Connections and Interfaces

Input current: Nominal value for "0" Nominal value for "1"	< 2.5 mA 2.8 mA ... 6 mA
Delay time: for "0" after "1" for "1" after "0"	Type 50 µs Type 50 µs
Current consumption by 24 V supply (U <sub>S</sub> )	Typ. 60 mA
Cable length (unshielded)	< 100 m
Interrupt inputs	8
Sensor supply	From U <sub>S</sub> via a PTC fuse
Output voltage	Type 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: Quiescent current Voltage drop	< 2.5 mA < 6 V

Fig. 7-14: Data of digital inputs

Light-emitting diodes indicating the current state of the inputs are arranged on the 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. 7-15: 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. 7-16: Light-emitting diode D

### 7.3.3 Digital Outputs

Two terminal strips with a total of 4 digital outputs are arranged between the digital inputs and the terminals for the voltage supply.

**Slots 3:**

Connections and Interfaces

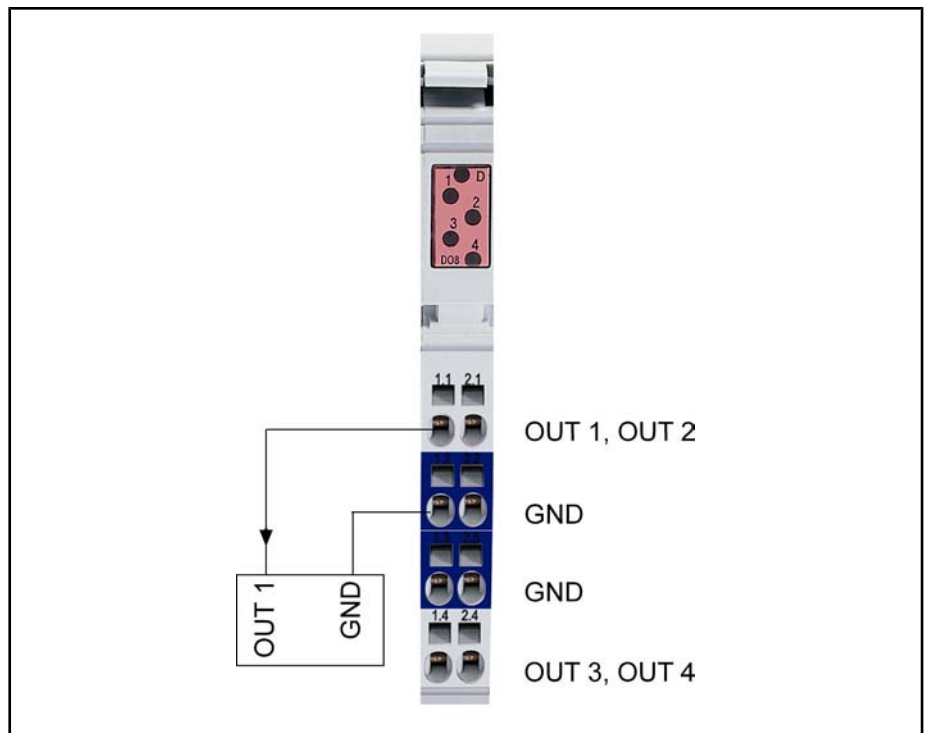


Fig.7-17: Digital outputs



Observe the color-coding of the connectors.

Number of outputs	8
Connection method	2-wire connection
Output type	<ul style="list-style-type: none"> <li>• Semiconductor outputs, non-saving</li> <li>• Protected, with automatic restart</li> <li>• Current-carrying</li> </ul>
Electrical isolation to $U_S$	No
Electrical isolation to $U_L$	Yes
Output voltage, nominal value	24 V
Rated output current:	
Nominal value	0.5 A
Maximum value acc. to DIN EN 61131-2	$\leq 0.6$ A
Signal 1	2 mA ... 0.6 A
Signal 0 (leakage current)	$\leq 0.5$ mA
UL rating:	
General Purpose	0.5 A
Tungsten	5 W
Maximum total current of outputs	2 A

Connections and Interfaces

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	100 Hz
With inductive load	Function (contactor)
Overload protection:	
• Typical current level, causing switch-off	1.2 A
• Minimum current level, causing switch-off	0.6 A
• Automatic restart with reduced load	After approx. 10 ms
Display overload	Red collective LED for all 8 outputs
Voltage reduced on circuit interruption in the nominal operating mode	Electronically limited to (Vext – 50 V) type 26 V
Reverse voltage protection	Ensured without connected load
Supply voltage according to EN 61131-2	24 VDC
No-load current consumption from U <sub>S</sub>	Typ. 50 mA
Cable length (unshielded)	< 100 m

Fig. 7-18: 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. 7-19: 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. 7-20: 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  $> U_B$

The 0 V reference voltage of the connected loads must be returned to the 0 V terminal of the IndraControl L10, i.e. a two-pin connection must be ensured. Otherwise, there will be no reliable protection from GND breakage.

## 7.4 Interfaces

### 7.4.1 Ethernet Interface

#### X7E Ethernet Network Connection

Connector X7E can be used to connect the IndraControl L10 to an Ethernet network.

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

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

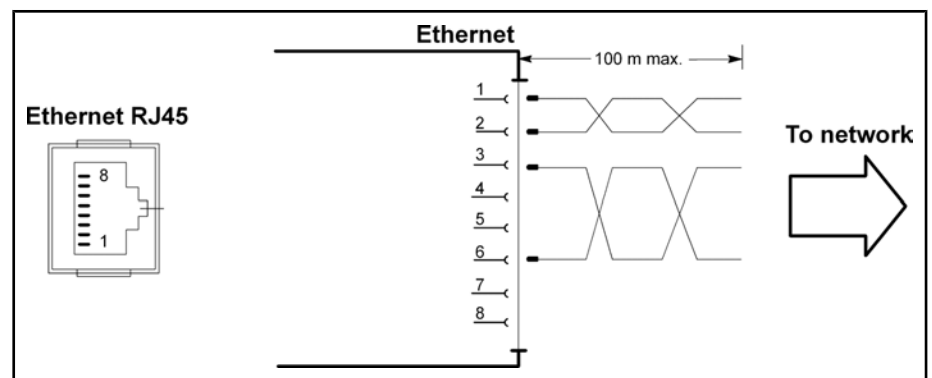


Fig.7-21: Ethernet Interface

Two LEDs are integrated in the RJ45 female connector indicating the connection status:

- LED at the top (Link): Flashes green, if there is an Ethernet connection
- LED at the bottom (Send): Flashes orange, if the data transmission occurs via this line

Bosch Rexroth recommends the use of an STP cable of category 5. Cables for this interface are listed in the order information.

### 7.4.2 Interface for the Compact Flash Card

#### Compact Flash

The IndraControl L10 is equipped with a slot for a compact flash card. This slot can be used to insert the memory card containing the firmware (card to be

## Connections and Interfaces

ordered separately). In addition, data and programs are stored to this card. Operation without flash card is not possible.



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

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**DANGER**

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### **Operation without memory card causes uncontrolled movements!**

Be sure not to remove the compact flash card as long as the IndraControl L10 is in operation.

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## 7.5 Inline Bus

To its right, the IndraControl L10 can be extended by additional Rexroth Inline modules. Such modules permit an extension of the I/O unit to 16-byte inputs and outputs.

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



For further information on the connection of Rexroth Inline modules, please refer to /6/ "Automation terminals of the Rexroth Inline product family" (DOK-CONTRL-ILSYSINS\*\*\*-AW..-EN-P, part number 911317021).

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## 8 Installation and Maintenance

### 8.1 Mechanical Installation of the IndraControl L10

#### 8.1.1 General Information

**Mounting Rail (Top-Hat Rail)** Mount the IndraControl L10 to a mounting rail (standard top-hat rail) according to DIN EN 50022 (35 mm x 7.5 mm).



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

Install the IndraControl L10 horizontally in a switch cabinet or an appropriate housing.

If permitted by ambient conditions, the IndraControl L10 can also be mounted directly to the system.



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

Before mounting or dismantling components of the station, deenergize the entire station and the components.

Connect the voltage only after the entire station was set up. Any non-observance of this requirement may cause destruction of components.

#### 8.1.2 Mounting the IndraControl L10

**Mounting the IndraControl L40 on the Top-Hat Rail**

Before mounting the control, please remove the power connector. Then, mount the IndraControl L10 on the mounting rail. Fix the IndraControl L10 on the left on the mounting rail using the end clamps.

**Mounting Rexroth Inline Modules in Series End Plate**

If necessary, mount Rexroth Inline modules in series with the control.

The end plate must form the mechanical termination to the right of the station, irrespective of whether Rexroth Inline modules have been mounted 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 L10. It is, therefore, not necessary to order the end plate separately.

**Attaching the End Clamps (CLIP-FIX)**

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 L10.

#### 8.1.3 Dismounting the IndraControl L10

If the IndraControl L10 should be dismantled, 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 L10. Proceed as follows:

- Remove the labeling field, if present.

## Installation and Maintenance



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 connector from the IndraControl L10. This ensures that the feathers of the voltage jumpers and the keyway/feather key connection are prevented from damage. Moreover, the module can be accessed more easily.
- Actuate the release mechanism (1 in figure 8-1 on page 36) and remove the electronic socket perpendicularly to the top-hat rail (2 in figure 8-1 on page 36).

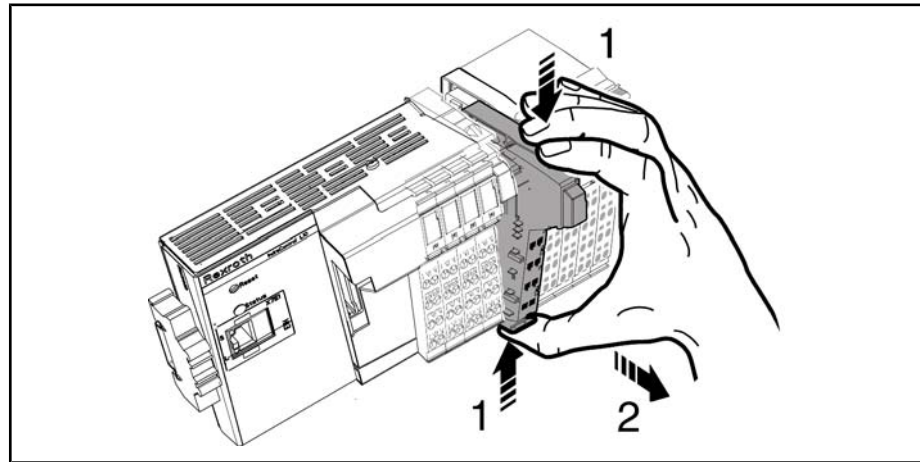


Fig.8-1: Before dismantling the IndraControl L10, the first Rexroth Inline module must be removed.

Removing the IndraControl from the top-hat rail

Actuate the release mechanism and remove the control from the mounting rail.

## 8.2 Electric Installation

### 8.2.1 General Information

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.).

### 8.2.2 External Power

All components of the IndraControl L10 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 have to

- 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 L10, have to comply also with the criteria of safety-separated circuits.

## 8.2.3 24 V Power 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 L10. It is not permitted to use an autotransformer to ensure compliance with overvoltage category II.

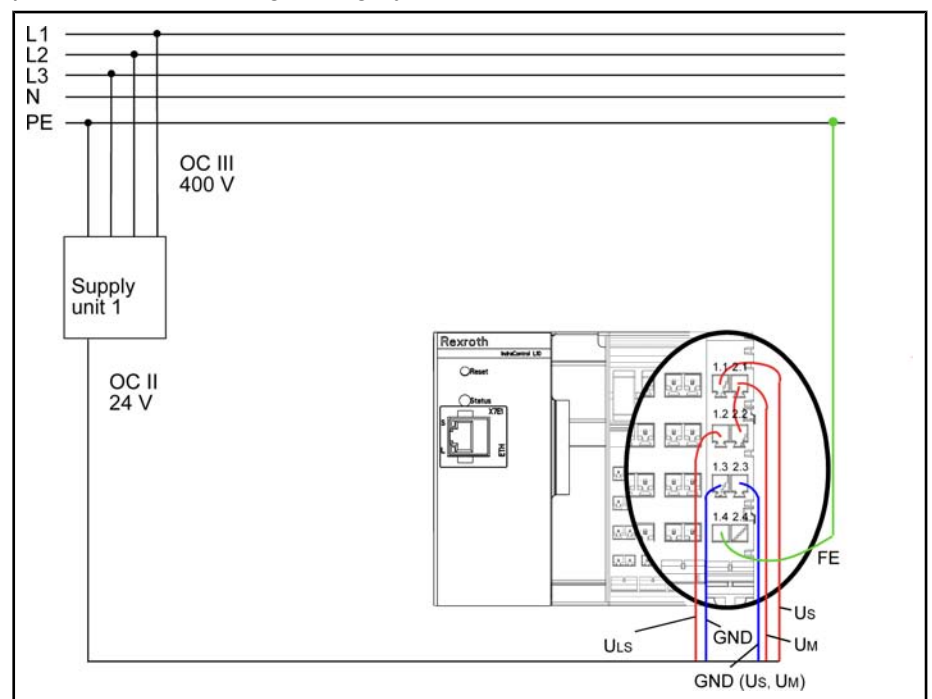


Fig. 8-2: Setup without electrical isolation

### 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

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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 L10.

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

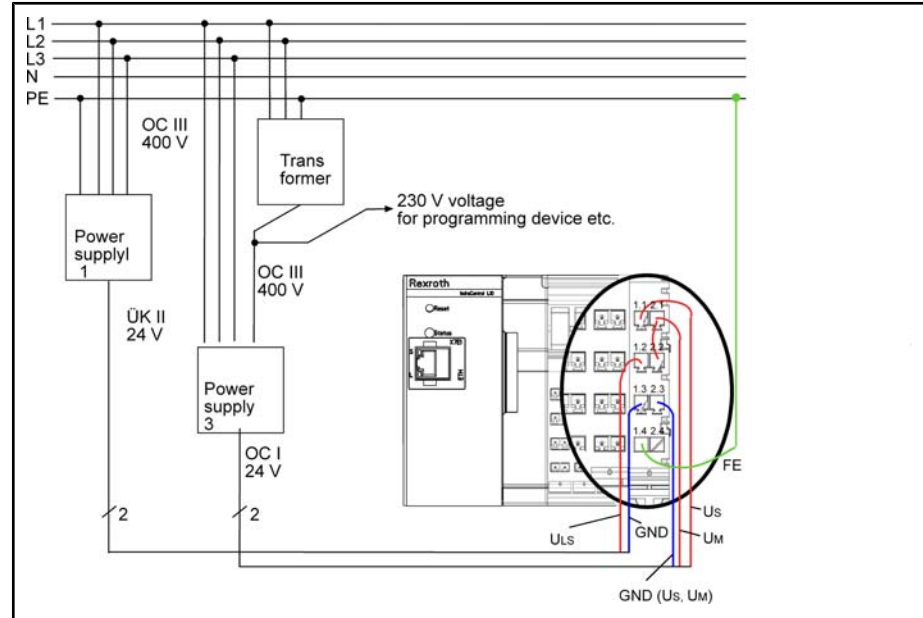


Fig. 8-3: Setup with electrical isolation

### 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.

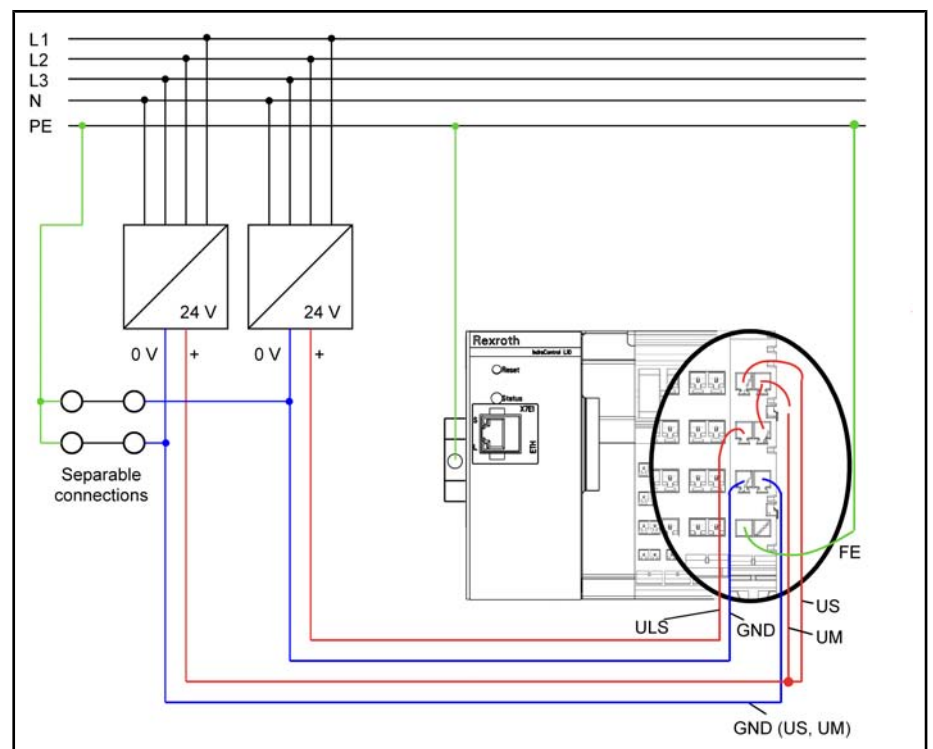


Fig. 8-4: Reference conductor connected to the protective conductor

### 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.

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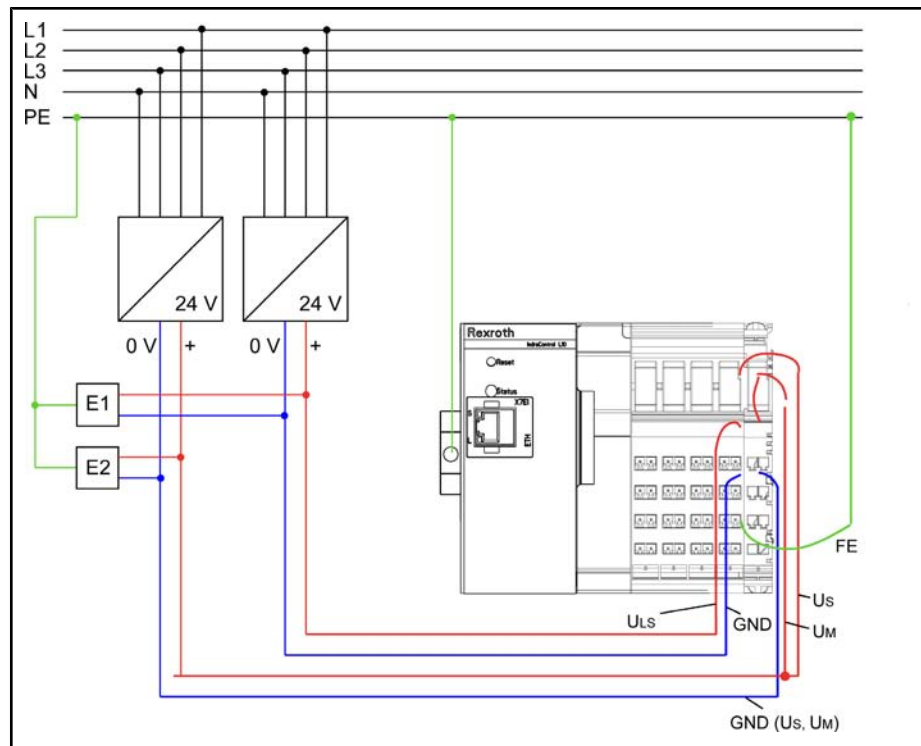


Fig.8-5: Reference conductor not connected to the protective conductor

### Programming Device and Ground Connection

Programming devices are almost always provided with a connection between the ground and the functional earth ground. This connection might give rise to problems, if the voltage supply of the IndraControl L10 is provided with a ground fault detector and the programming device is connected to the IndraControl L10. 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 also be maintained 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<sup>2</sup>.

## 8.2.4 Main Switches and Fuses

### Main Switches

A main switch according to DIN VDE 0100 must be provided for the IndraControl L10 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 L10 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.

## 8.2.5 Ground Connection

An optimum ground connection is required to keep possible interferences away from the IndraControl L10 and the Rexroth Inline modules and to discharge them to the ground.

### Functional Earth Ground

The top-hat rail used for mounting the IndraControl L10 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: 1 m max.

Cross-section: 6 mm<sup>2</sup>

Both the IndraControl L10 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 L10 must be additionally grounded via the FE terminal point, using a conductor with a cross-section of at least 1.5 mm<sup>2</sup>.

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 L10, 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

## Installation and Maintenance

- IndraControl L10, 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.

## 8.2.6 Shield System

### General Information

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.

## 8.2.7 Connecting Lines to Tension Spring Connection Points

### General Information

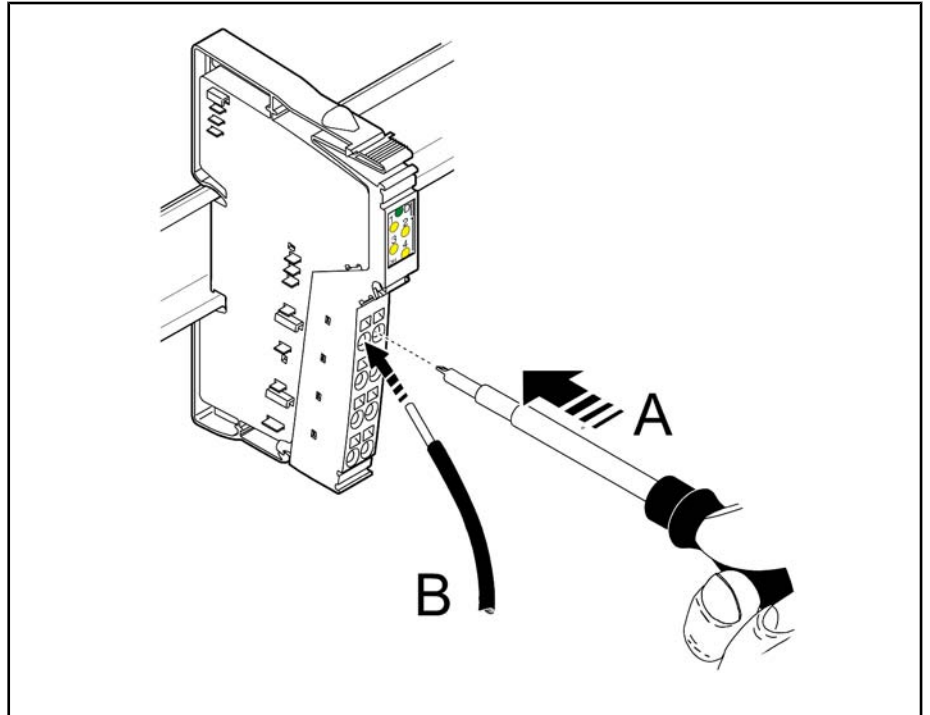
Connect the lines for peripheral equipment and voltage supply to the tension spring connection points both at the IndraControl L10 and the Rexroth Inline modules.

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

Lines with a connection cross-section ranging from 0.2 mm<sup>2</sup> to 1.5 mm<sup>2</sup> (AWG 24 – 16) can be connected. These lines permit the supply of signals of up to 250 V AC/DC and 5 A.



## Connecting Unshielded Lines



*Fig. 8-6: Connecting lines to the tension spring connectors*

Wire the connectors as required according to the 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 (figure 8-6, A) as far as necessary to be able to insert the core into the opening of the spring. Insert the core (figure 8-6, B). 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.

## 8.3 Maintenance

Include the following measures in the 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.



## 9 Disposal and Environmental Protection

### 9.1 Disposal

#### 9.1.1 Products

Our products can be returned to us free of charge for disposal. However, it is a precondition 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

#### 9.1.2 Packaging Materials

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

### 9.2 Environmental Protection

#### 9.2.1 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.

#### 9.2.2 Materials Contained in the Products

##### Electronic Devices

Electronic devices mainly contain:

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

##### Motors

Motors mainly contain:

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

## Disposal and Environmental Protection

### 9.2.3 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 before recycling and disposed of.



## Ordering Information

## 10.2 Accessories

### 10.2.1 Required Accessories

#### Connector Set

The following connector set is required for connecting the IndraControl L10:

Ordering designation	Part number	Description
R-IB IL CML S01-PLSET	R911299856	Connector set for IndraControl L10

### 10.2.2 Additional Accessories

#### Rexroth Inline Module

Ordering designation	Part number	Description
Power terminals and segment terminals:		
R-IB IL 24 PWR IN/R-PAC	R911170446	Power terminals for feeding the logic voltage, width 48.8 mm including connector
R-IB IL 24 SEG/F	R911289313	Segment terminal with fuse, width 12.2 mm
R-IB IL 24 SEG/F-D-PAC	R911170710	Segment terminal with fuse and dialog, width 12.2 including connector
Digital input terminals:		
R-IB IL 24 DI 2	R911289286	2 inputs, 24 V DC, 4-wire connection, width: 0.48 in
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: 0.48 in
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 VDC, 2 A, 4-wire connection, width: 12.2 mm
R-IB IL 24 DO 4	R911289295	4 outputs, 24 VDC, 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 VDC, 500 mA, 4-wire connection, overall width: 48.8 mm
R-IB IL 24 DO 8-2A	R911289298	8 outputs, 24 VDC, 2 A, 4-wire connection, overall width: 48,8 mm
R-IB IL 24 DO 16	R911289299	16 outputs, 24 VDC, 500 mA, 3-wire connection, overall width: 48.8 mm
R-IB IL 24 DO 32/HD	R911297191	32 outputs, 24 VDC, 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:		

## Ordering Information

Ordering designation	Part number	Description
R-IB IL AI 2/SF	R911289306	2 inputs, 0-20 mA, 4-20 mA, $\pm 20$ mA, 0-10 V, $\pm 10$ 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, $\pm 10$ 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-OCF	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: 0.48 in
R-IB IL FIELD 8	R911289342	Labeling fields: 48.8 mm

## Interface Cables

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, with RJ45 connector on both sides, 0.15 m
RKB0007/002,5	R911170147	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 2.73 yd
RKB0007/005,0	R911170148	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 5.47 yd
RKB0007/010,0	R911170149	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 10.94 yd
RKB0007/025,0	R911170150	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 25 m
RKB0008/002,5	R911170151	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 2.73 yd

## Ordering Information

Ordering designation	Part number	Description
RKB0008/005,0	R911170152	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 5.47 yd
RKB0008/010,0	R911170153	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 10.94 yd
RKB0008/025,0	R911170154	Ethernet cable, 10-Base-T, CAT.5, crosslink, ready-made, with RJ45 connector on both sides, 25 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 MBaud
RBS0011/K02	R911170138	Profibus connector 12 MBauds, with PG female connector
RBS0012/K02	R911170139	Profibus connector 12 MBaud, 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. 10-2: Interface cable and accessories*



# 11 Service and Support

## 11.1 Helpdesk

Our service helpdesk at our headquarters in Lohr, Germany, will assist you with all kinds of inquiries.

Contact us:

- By phone through the Service Call Entry Center  
Monday to Friday: 7:00 - 18:00 Central European Time  
**+49 (0) 9352 40 50 60**
- per Fax  
**+49 (0) 9352 40 49 41**
- By E-mail: [service.svc@boschrexroth.de](mailto:service.svc@boschrexroth.de)

## 11.2 Service Hotline

Out of helpdesk ours please contact our German service department directly:

**+49 (0) 171 333 88 26**

or

**+49 (0) 172 660 04 06**

Hotline numbers for other countries can be found in the addresses of each region on the Internet (see below).

## 11.3 Internet

Additional notes regarding service, maintenance and training, as well as the current addresses of our sales and service offices can be found on

<http://www.boschrexroth.com>

Outside Germany please contact our sales/service office in your area first.

## 11.4 Helpful Information

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

- detailed description of the fault and the circumstances
- Information on the name plate of the affected products, especially type codes and serial numbers
- Your phone and fax numbers and E-mail address, so we can contact you in case of questions.



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# Notes

Bosch Rexroth AG  
Electric Drives and Controls  
P.O. Box 13 57  
97803 Lohr, Germany  
Bgm.-Dr.-Nebel-Str. 2  
97816 Lohr, Germany  
Phone +49 (0)93 52-40-50 60  
Fax +49 (0)93 52-40-49 41  
service.svc@boschrexroth.de  
www.boschrexroth.com

