

ctrlX CORE X2, X3

Controls

Operating Instructions
(Translation of the original)



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1 About this documentation

1.1 Revision history

Table 1: Editions of this documentation

Edition	Release date	Note
Edition 01	2020-10	First edition
Edition 02	2020-12	Revision
Edition 03	2021-07	Variant X2 supplemented, UL notes supplemented
Edition 04	2022-04	Revision, UK conformity
Edition 05	2022-05	Variant X3+ supplemented
Edition 06	2023-06	Variant X3+ now as separate manual, see R911420136
Edition 07	2024-07	Editorial changes

1.2 Overview on target groups and product phases

In the following illustration, the framed activities, product phases and target groups refer to the present documentation.

Example: In the product phase “Mounting (assembly/installation)”, the target group “Mechanic/electrician” can execute the activity “install” using this documentation.

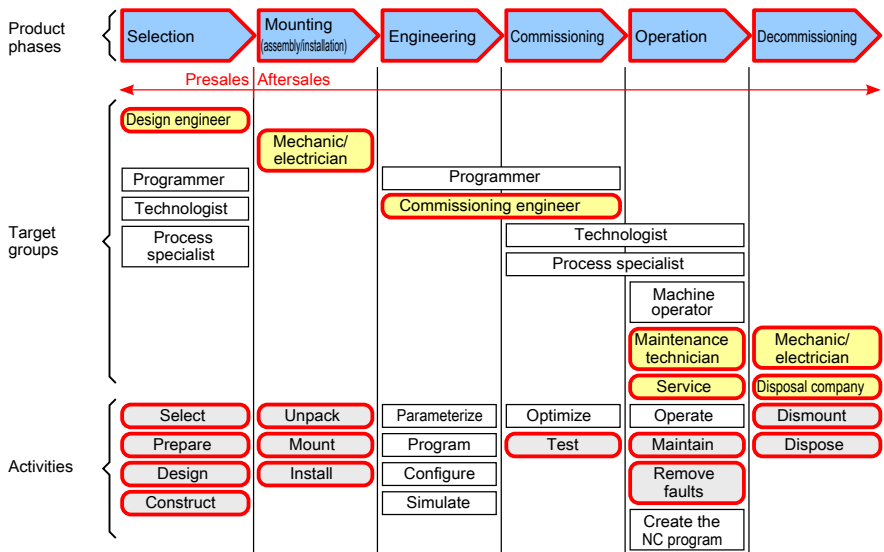


Fig. 1: Assigning the present documentation to the target groups, product phases and activities of the target group

This document instructs the technical staff of the machine manufacturer on how to safely perform the mechanical and electrical installation and on how to commission the device.

Required qualification: Individual who is able to assess the tasks assigned and to identify possible safety risks owing to qualification in the subject, knowledge and experience. The individual should also be familiar with the standards and regulations.

1.3 Scope

This operating instructions is valid for all variants of the control with a type code starting with: COREX-C

The type code specifications are located on the type plate of the device. Also refer to ➔ Chapter 2.1 “Product identification” on page 8.

1.4 Related documents

Table 2: Related documentation

Title	Part number and document type
Security Manual	➔ R911342562
Electric Drives and Controls	Project Planning Manual
Rexroth IndraControl	➔ R911336867
VAU 01.1	Operating Instructions
UPS with Communication Interface	

1.5 Customer feedback

Customer requests, comments or suggestions for improvement are of great importance. Please email your feedback on the documentations to ➔ Feedback.Documentation@boschrexroth.de. Directly insert comments into the electronic PDF document and send the PDF file to Bosch Rexroth.

About this documentation

2 Product identification and scope of delivery

2.1 Product identification

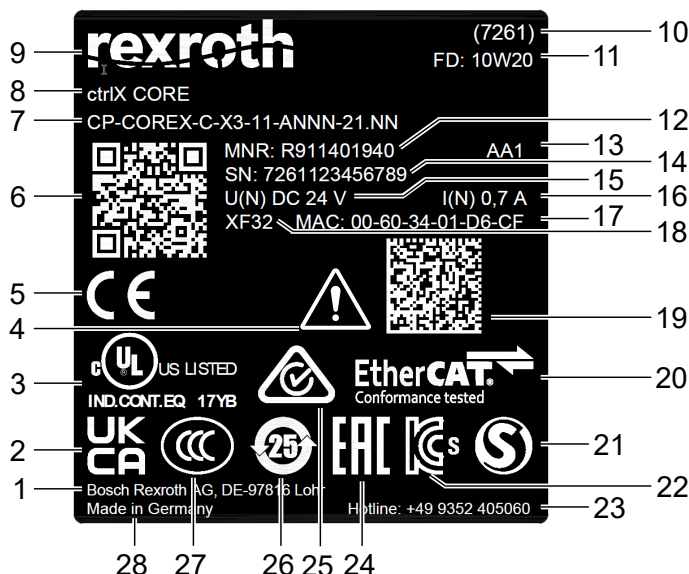


Fig. 2: Type plate (example)

- | | | | |
|----|--|----|----------------------------------|
| 1 | Company address | 15 | Rated voltage |
| 2 | UKCA marking | 16 | Rated current |
| 3 | Underwriters Laboratories Inc. mark | 17 | MAC address (Ethernet ID) |
| 4 | Symbol for reference to the operating instructions | 18 | Free text on the MAC address |
| 5 | CE conformity mark | 19 | MAC code (2D code), data matrix |
| 6 | QR or data matrix code, Rexroth, 2D code | 20 | EtherCAT |
| 7 | Type code | 21 | S-mark logo |
| 8 | Product | 22 | KCs mark |
| 9 | Trademark | 23 | Service hotline number |
| 10 | Plant number | 24 | EAC conformity mark |
| 11 | Manufacturing date | 25 | Regulatory Compliance Mark (RCM) |
| 12 | Part number | 26 | China-RoHS 2 label |
| 13 | State of revision | 27 | CCC marking |
| 14 | Serial number | 28 | Name of origin |

2.2 Scope of delivery

- ctrlX CORE control
- 24 V power connector, 2-pin

3 Using safety instructions

3.1 Structure of the safety instructions

The safety instructions are structured as follows:

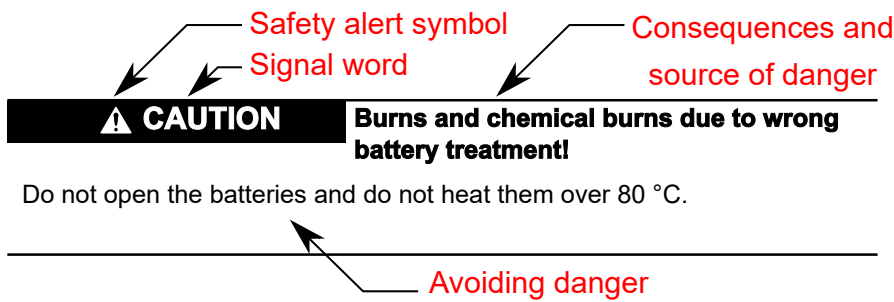


Fig. 3: Structure of the safety instructions

3.2 Explaining signal words and the safety alert symbol

The safety instructions in this documentation contain specific signal words (danger, warning, caution, notice) and, if necessary, a safety alert symbol (according to ANSI Z535.6).

The signal word draws attention to the safety instruction and indicates the risk potential.

The signal graphics (warning triangle with exclamation mark), added in front of the signal words Danger, Warning and Caution refer to hazards to individuals.

	In case of non-compliance with this safety instruction, death or serious injury will occur.
	In case of non-compliance with this safety instruction, death or serious injury can occur.
	In case of non-compliance with this safety instruction, minor or moderate injury can occur.
	In case of non-compliance with this safety instruction, material damage can occur.

3.3 Symbols used



This is a tip.

3.4 Explaining the signal alert symbol on the device



If this symbol is on your device, you have to observe the documentation on the device. The respective documentation informs on the type of hazard as well as the steps required to avoid this hazard.

4 Intended use

4.1 General information on the intended use

NOTICE

Risk of damaging the device if not expressly stated accessories, mounting parts and other components, cables, lines, software and firmware are used.

The ctrlX CORE control may only be used with the accessories and mounting parts listed in this documentation. Components that are not expressly mentioned must neither be attached nor connected. The same applies to cables and lines.

Only to be operated with the component configurations and combinations expressly defined and with the software and firmware specified in the corresponding functional description.

Typical areas of application of the control:

- Handling and assembly systems
- Packaging and food processing machines
- Printing and paper converting machines
- Machine tools
- Wood working machines
- General mechanical engineering
- Building automation

▲ WARNING

Danger due to unintended use

The protection specified by Bosch Rexroth cannot be ensured if not used as intended.

- Use the product exclusively as intended by Bosch Rexroth.
- Operate this device only under the mounting and installation conditions, in the position and under the ambient conditions (temperature, degree of protection, humidity, EMC etc.) specified in this documentation.

5 Spare parts, accessories and wear parts

5.1 Power connector, 24 V

Ordering code	Part number	Description
XACC-1-CSPWRC	R911410559	24 V plug for ctrlX CORE X2 and ctrlX CORE X3

5.2 SD card

Ordering code	Part number	Description
XACC-0-SD016GB	R911404022	Micro SD card, 16 GB

5.3 RJ45 cable

Ordering code	Part number	Description
RKB0020	R911340676	Bus cable

5.4 End clamp

Ordering code	Part number	Description
SUP-M01-ENDHALTER	R911170685	2 pieces of snap-on end brackets for 35 mm NS 35/7.5 support rail; width: 9.5 mm

5.5 License dongle

The license dongle allows to easily transmit licenses between ctrlX controls. The license dongle is a micro SD card with a serial number. The user can assign licenses to the dongle instead of to the ctrlX controls.

Ordering code	Part number	Description
XACC-1-SD*000L	R911416693	License dongle

5.6 Wear parts

The internal physical read-only memory of the control has a limited number of write cycles. Retrieve the current status of the read-only memories via the ctrlX CORE web interface: *"ctrlX CORE side navigation → Settings → Information → tab "Resources" → Sensors"*.

Notes on sensor values:

- "0 - 10% of life time used" means that up to 10 % of the maximum write cycles can be used.
- Create a backup if the value exceeds 80%.
- Replace the hardware if the value exceeds 80%.
- Use an external memory to prolong the service life of the read-only memory.
- The frequency of the refresh cycle depends on the service life of the memory. If a refresh cycle is not possible anymore, data can be lost.

Notes on the temperature display:

- "Temperature (CPU)" shows the internal CPU temperature.
- "Temperature" shows the temperature on the PCB.

6 Ambient conditions

6.1 Ambient conditions of the ctrlX CORE

Ambient temperature during operation	Up to 2,000 m: -25 °C to +55 °C 2,000 m to 3,000 m: -25 °C to +50 °C 3,000 m to 4,000 m: -25 °C to +45 °C 4,000 m to 5,000 m: -25 °C to +40 °C
Ambient temperature during storage and transport	-40 °C to +70 °C
Operating altitude according to DIN 60204	Up to 5,000 m above sea level
Permitted air humidity according to EN 61131-2	5 % to 85 %
Degree of protection acc. to EN 60529	IP 20 (not evaluated by UL)
Protection class acc. to EN 61010-2-201	III
Overvoltage category acc. to IEC 60664-1	2
Contamination level acc. to EN 61010-1	2, no condensation allowed
Mechanical tests	
Vibration resistance acc. to DIN EN 60068-2-6 ^①	Oscillations, sinusoidal in all three axes 5 Hz - 8.4 Hz with 3.5 mm amplitude 8.4 Hz -150 Hz with 1 g peak acceleration
Shock test acc. to DIN EN 60068-2-27	Shock stress: Shock resistance in all three axes, 11 ms semi-sinusoidal 15 g
Broadband noise acc. to DIN EN 60068-2-64	20-500 Hz with 1.22 g RMS (Root-Mean-Square), 30 min in all three axes
Electrostatic discharge	
ESD resistance acc. to DIN EN 61131-2	Criterion B
• Test voltage	8 kV for air discharge 4 kV for contact discharge
^① To avoid vibration, secure the cables at a short distance (< 20 cm).	

NOTICE

Defective device due to contaminated air!

- The ambient air must not contain acids, alkaline solutions, corrosive agents, salts, metal vapors and other electrically conductive contaminants in high concentrations.
- The devices to be installed into the housings and installation compartments must at least comply with the degree of protection IP 54 according to DIN EN 60529.
- The device shall be provided in a suitable fire enclosure in the end-use application.

NOTICE

Defective device due to gases jeopardizing functions

Due to the risk of corrosion, avoid sulphureous gases (e.g. sulphur dioxide (SO₂) and hydrogen sulphide (H₂S)). The device is not resistant against these gases.

NOTICE

Failure of the product due to overheating

To avoid overheating and to ensure a smooth operation of the product, sufficient air has to circulate according to the minimum distances specified, see Fig. 9.

 This is a product that corresponds to the limit values of the emitted interference of class A (industrial environments). This is a product that does not correspond to the limit values of the emitted interference of class B (residential area and small enterprises).

When using the product in residential areas or small enterprises, the operator has to take actions to prevent radio interferences (also refer to DIN EN 55022).

7 Technical data

7.1 General technical data

	COREX-C-X2	COREX-C-X3
Processor	Zync Ultrascale+, 64 bit, 4 × ARM A53	Zync Ultrascale+, 64 bit, 4 × ARM A53
RAM	2 gigabyte DRAM	2 gigabyte DRAM
Internal physical read-only memory (eMMC)	4 gigabyte, see also ➔ Chapter 5.6 “Wear parts” on page 11	4 gigabyte, see also ➔ Chapter 5.6 “Wear parts” on page 11
Internal non-volatile random-access memory (NVRAM)	128 kilobyte	128 kilobyte
Extensions	None	None
Communication interfaces	RJ-45 • 2 × Ethernet connection (10 Mbit, 100 Mbit, 1 Gbit)	RJ-45 • 3 × Ethernet connection (10 Mbit, 100 Mbit, 1 Gbit)
USB	Not enabled	1 × USB host, TYPE C (USB2.0), maximum cable length of 3 m
SD card	Slot for SD card	Slot for SD card
Battery	CR1025	CR1025
Weight	370 g	370 g
Dimensions	Refer to ➔ Chapter 10.1 “Housing dimensions” on page 19	Refer to ➔ Chapter 10.1 “Housing dimensions” on page 19

7.2 Voltage supply and current consumption

Nominal voltage at U _L	DC 24 V SELV/PELV
Maximum permitted voltage range of the supply voltage U _L	DC 18 V to DC 31.2 V (incl. all tolerances and ripple)
Current consumption of the control from U _L at a nominal voltage of 24 V	320 mA

Power consumption of the control from U_L at a nominal voltage of 24 V	7.68 W
Reverse polarity protection of the supply voltage U_L	Present
Fuse protection U_L	Internal with eFuse, 1.5 A
Overvoltage protection U_L	Available; the protective fuse can trigger in case of overvoltage
Transient protection U_L	Present, suppressor diodes
	Pulse load up to 1,500 W
Voltage dips at current supply interfaces	PS1 < 1 ms, evaluation criterion A
	Not evaluated by UL
Electrical isolation	DC 707 V
24 V supply (U_L/U_L GND) to the functional earth	Not evaluated by UL
24 V supply voltage (U_L/U_L GND) to XF10, XF50, XF51	DC 1200 V
	Not evaluated by UL

NOTICE

Electronic damage due to polarity reversal or due to a nominal current that is too low

The power supply unit has to be able to deliver the quadruple nominal current of the internal and external fuses to ensure that the fuse reliably triggers in case of error.

8 Standards

8.1 General notes on the standards

The products have been developed according to the German editions of the standards published at the time of product engineering.

For the applied standards, refer to the chapters "Technical data" and "Ambient conditions."

8.2 Standards used

Table 3: Angewandte Normen – Standards used – Normes appliquées

Norm	Bedeutung	Ausgabe
Standard	Meaning	Edition
Norme	Signification	Édition
DIN EN 60204-1	Sicherheit von Maschinen	2019
	Elektrische Ausrüstung von Maschinen	
	–	
	Safety of machinery	
	Electrical equipment of machines	
	–	
DIN EN 61131-2	Sicherheit des Maschinen	2008
	Equipement électrique des machines	
	Speicherprogrammierbare Steuerungen	
	Teil 2: Betriebsmittelanforderungen und Prüfungen	
	–	
	Programmable controllers	
DIN EN 60529	Part 2: Equipment requirements and tests	2014
	–	
	Automates programmables	
	Partie 2: Spécifications et essais des équipements	
	Schutzarten durch Gehäuse (IP-Code)	
	–	
DIN EN 61010-2-201	Degrees of protection provided by enclosures (IP Code)	2014
	–	
	Degrés de protection procurés par les enveloppes (Code IP)	
	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte	
	Teil 2-201: Besondere Anforderungen für Steuer- und Regelgeräte	
	–	
DIN EN 61010-2-201	Safety requirements for electrical equipment for measurement, control and laboratory use	2014
	Part 2-201: Particular requirements for control equipment	
	–	
	Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire	
	Partie 2-201: Exigences particulières pour les équipements de commande	
	–	

Norm	Bedeutung	Ausgabe
Standard	Meaning	Edition
Norme	Signification	Édition
UL 61010-2-201	UL Standard for Safety Requirements for Electrical Equipment for Measurement, 2014 Control, and Laboratory Use Part 2-201: Particular Requirements for Control Equipment	

8.3 EU declaration of conformity



Excerpt:

The undersigned, representing the manufacturer, hereby declares that the product is in conformity with the provisions of the following EU Directive(s) (including all applicable amendments) and that the standards and technical specifications stated in the EU Declaration of Conformity have been applied:

- ROHS DIRECTIVE 2011/65/EU
- EMC DIRECTIVE 2014/30/EU



Loss of EU conformity due to modifications at the device

EU marking applies only to the device upon delivery. After modifying the device, verify the EU conformity.



For the EU declaration of conformity, go to the Bosch Rexroth media directory: ➔ www.boschrexroth.com/MediaDirectory, search term ➔ "DCTC-30455-001".

8.4 UL/CSA-certified



The devices "ctrlX CORE" are certified according to:

- **UL 61010-2-201** (Industrial Control Equipment) and
- **CSA22.2 No. 61010-2-201** (CSA)

However, there can be combinations or extension stages with a limited or missing certification. Thus, verify the registration according to the UL marking on the device.



Loss of UL/CSA conformity due to modifications at the device.

UL and CSA marking applies only to the device upon delivery. After modifying the device, verify the UL and the CSA conformity.



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

- Use only insulated copper wires suitable for at least 75 °C

8.5 UK declaration of conformity

The products comply with the UK directive acc. to S.I. 2016/1091 (electromagnetic compatibility).

For the UK declaration of conformity, go to the Bosch Rexroth media directory: ➔ www.boschrexroth.com/mediadirectory, search term: ➔ "DCTC-30455-031".



9 Interfaces

9.1 Interface description

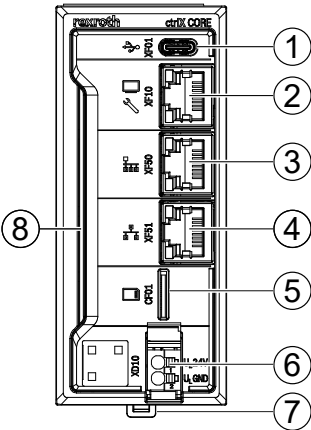


Fig. 4: Interfaces

NOTICE

Damage of the device by plug mounting under voltage!

- Before mounting or dismounting components, disconnect the control - including its components - from voltage.
- Connect the voltage only after the control and its components have been set up.

Table 4: Control interfaces

No.	Name	Connection type	Connector type	Mating connector and cable	X2	X3
			(integrated)	(From outside)		
①	XF01	USB host	USB socket,	USB plug,	–	✓
		USB 2.0	Type C	Type C		
②	XF10	Ethernet	RJ45 socket	RJ45 plug	✓	✓
		10/100/1000 MBit	8-pin	(twisted pair, 8-wire)		
		HMI and engineering port				
③	XF50	Ethernet	RJ45 socket	RJ45 plug	✓	✓
		10/100/1000 MBit	8-pin	(twisted pair, 8-wire)		
		Field bus master (Ethercat)				

No.	Name	Connection type	Connector type	Mating connector and cable	X2	X3
			(integrated)	(From outside)		
④	XF51	Ethernet	RJ45 socket	RJ45 plug	—	✓
		10/100/1000 MBit	8-pin	(twisted pair, 8-wire)		
		1G Bit/s Ethernet (configurable)				
		TSN-capable (Time-Sensitive Networking)				
⑤	CF01	Slot for SD card	—	SD card	✓	✓
⑥	XD10	24 V plug, U _L with status display	2-pin	2-pin	✓	✓
⑦	GB01	Battery case	—	—	✓	✓
⑧		ctrlX CORE status LED	—	—	✓	✓

9.2 USB interface

There are three USB interfaces (type C, USB 3.1) on the front side of the control. The USB interfaces can be used to connect USB storage media (only FAT16 and FAT32), scanners and similar USB devices. Not supported: Display port, Thunderbolt, HDMI, USB3.2, USB4.0 and USB PD (power delivery).

Each USB interface provides a voltage supply with DC 5 V and 0.9 A for external devices. The USB interface is switched off up to the next switch-off and switch-on if the current is exceeded.



The maximum cable length allowed is 3 m.

NOTICE

Device damage due to external supply via the USB interface

The supply voltage (GND (U_L)) at the 24 V power connector XD10 has to be connected always.

9.3 SD card

There is a slot (CF01) for the micro SD card on the front of the control. The SD card host controller supports the version 2.0 (standard SDHC). That means the maximum supported capacity of an SD card is 32 GB.



Use only SD cards available as accessories, see ➔ [Chapter 5.2 “SD card” on page 11](#). These SD cards are formatted and tested for the control.

A correct functioning of other SD cards cannot be ensured.

9.4 Battery

A battery with battery holder (GB01) is included and working in the device upon delivery. Battery designation: Lithium battery 3.0 V CR1025 (30 mAh).

The battery is used to buffer the real-time clock if the control is disconnected from voltage. A circuit monitors the battery state.

For notes on changing the battery, see ➔ [Chapter 14.3 “Battery change” on page 34](#).



A discharged battery causes an incorrect system time.

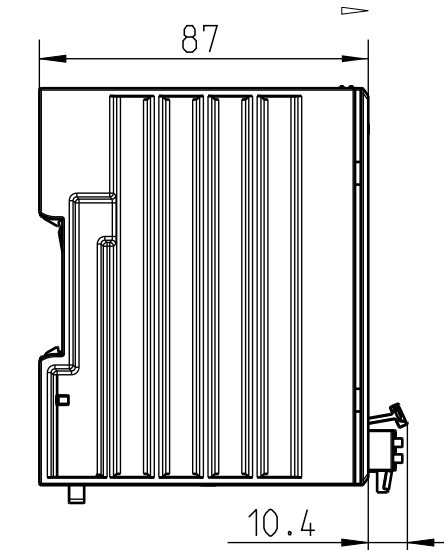


Fig. 6: Side view

10.2 Installation notes

NOTICE

Destruction of the device due to electrostatic discharge

The device contains components that can be damaged or destroyed by electrostatic discharge. Comply with the required safety measures against electrostatic discharge (ESD) acc. to EN 61340-5-1 when operating the control.

- **Mounting location**
The control has the degree of protection IP 20 and is thus intended for use in a closed control cabinet or control box (terminal box) of the degree of protection IP 54 or higher. The control cabinet has to be provided with sufficient stability and rigidity and has to comply with the requirement to impede fire spreading (acc. to UL 61010-1, 61010-2-201).
- **Support rail**
Mount the control on an electrically conductive 35 mm standard support rail. Its connection to the functional earth is sufficient. Only use a support rail with a design height of 7.5 mm (corresponds to TH 35-7.5 acc. to EN 60715).
The fastening distance of the support rails may not exceed 200 mm. This distance is required to ensure stability while mounting and dismantling the control.



Fig. 7: Support rail fastening (in mm)

- Mounting position

To ensure air cooling in the device by convection, mount the control only vertically on a horizontal support rail as shown in the following figure.

In the shown mounting position, the natural convection supports the forced cooling air flow. Heat pockets can thus not be caused in the device.

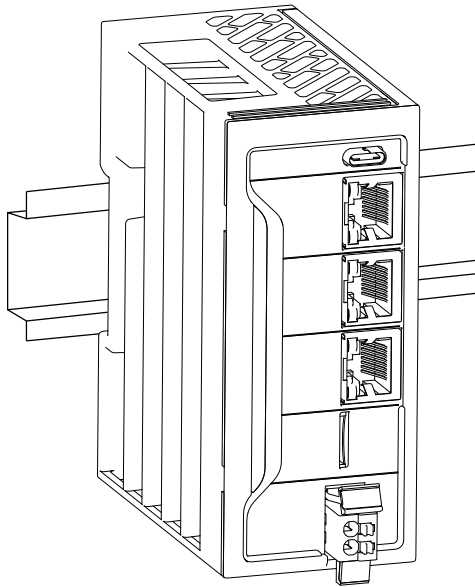


Fig. 8: Permitted mounting position for all ctrlX CORE controls

- End clamps

Fasten end clamps of the type SUP-M01-ENDHALTER on both sides of the control.

End clamps ensure a correct fastening of the control connected to them on the support rail and they are used as lateral end elements.

Always fasten one end clamp of the station before mounting the control. This ensures the following:

- It impedes the shifting of the control.
- The installation place for the end clamps is secured.
- Do not route cables parallel to motor cables or other strong interference sources to avoid the coupling of interferences.
- Observe the bending radii of the cables when routing.

- The cabling of the Ethernet wires may not be outside the building.
- Use strain reliefs for all cables and place them the closest possible to the connection of the control.
- Install the control only horizontally on a support rail attached to a wall.
- Keep the maximum possible distance from interference sources.
- Provide the following minimum distances for sufficient cooling:

In case of a several line design, the supply air has to be measured under each line and its limit value may not be exceeded. For information on ambient temperatures, refer to ➔ Chapter 6.1 “Ambient conditions of the ctrlX CORE” on page 12.

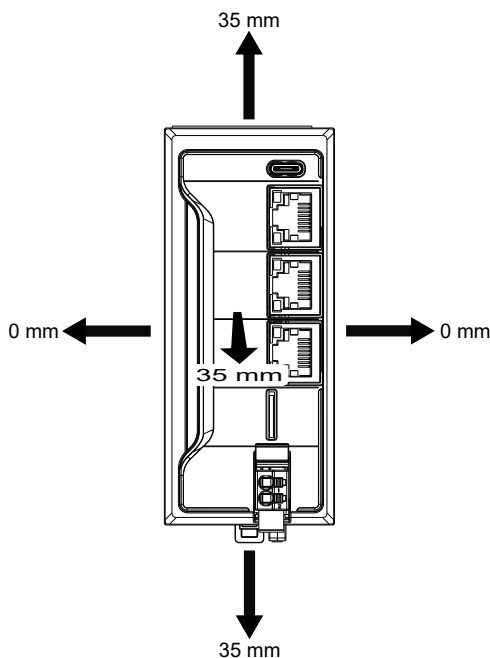


Fig. 9: Minimum distances for the circulation of ambient air

- Additionally, provide sufficient distance for mounting, dismounting, plugs and cables.

10.3 Mounting the control

NOTICE

Damage of the device by plug mounting under voltage!

- Before mounting or dismounting components, disconnect the control - including its components - from voltage.
- Connect the voltage only after the control and its components have been set up.

NOTICE**Possible damage to property due to unintended mounting of the support rail**

- Fasten the support rail adequately.
- Connect the support rail to a functional earth.
- Mount the IPC or the control on the support rail, as the support rail is also used for heat dissipation and grounding.
- Install the IPC or the control in a control cabinet or an appropriate housing.

NOTICE**Control not fixed due to clamped mounting rail fixture!**

Before mounting, ensure that the mounting rail fixture of the control is not in open position. If required, release the clamping of the open position using the locking lever, see Fig. 10.

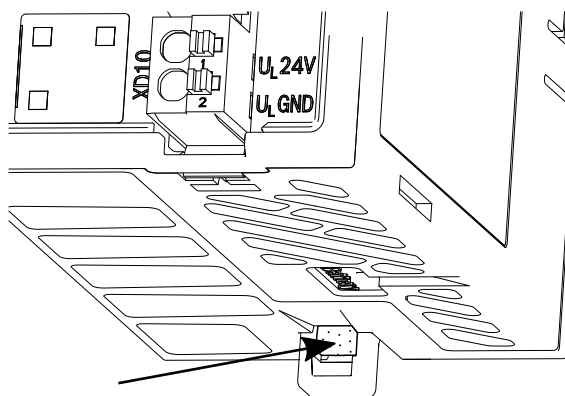


Fig. 10: Locking lever to release the clamping of the open position

Mounting steps

1. ➞ Mount the control

2. ➞ Fasten end clamp



The control has up to 50 mounting cycles.

10.3.1 Mounting the ctrlX I/O module

NOTICE**Damage of the device by plug mounting under voltage!**

Disconnect the module and all connected module components from voltage before mounting or dismounting.

NOTICE**Damage of the device by short circuit of patch connectors**

There is an endcover on the right upon delivery of the bus coupler. Remove this endcover to connect the modules at the bus coupler in series. Position the endcover on the last module of the station to protect it against short circuit and contamination.

NOTICE**Possible damage to property due to unintended mounting of the support rail**

- Connect the support rail to a functional earth.
- Mount the module on a support rail.
- Install the module in a control cabinet or in an appropriate housing.

NOTICE**Module is not fixed correctly due to open support arm mounting!**

Before mounting, ensure that the support arm mounting of the control is not clamped in open position. If required, release the clamping using the locking lever as shown in the following figure.

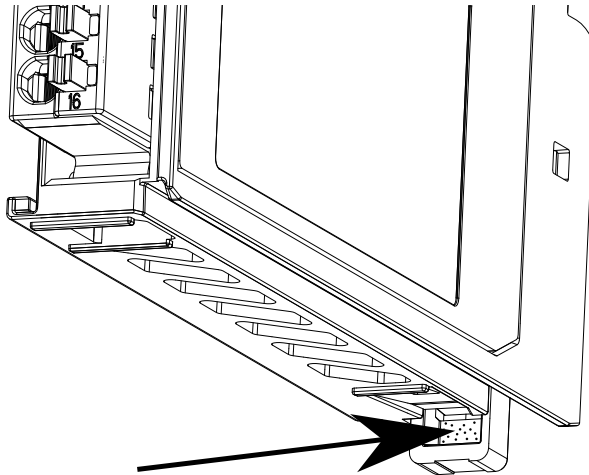


Fig. 11: Locking lever to release the clamping of the open position.

Each module has to be snapped separately.

10.4 Dismounting the control



For dismounting, use a common tool such as a slotted screwdriver with a 2.5 mm blade.

10.4.1 Dismounting steps

NOTICE

Destruction of components and devices due to mounting and dismounting under voltage!

- Before mounting or dismounting, disconnect the IPC or the control - including its components - from voltage.
- Connect the voltage only after the IPC or the control and its components have been set up.

For a secure decommissioning with regard to IT security, refer to ➔ Chapter 11.3.1 “Notes on safe decommissioning” on page 30.

Removing the control from the mounting rail

1. ➔ Remove the left or the right end clamp.
2. ➔ Use a suitable tool (e.g. slotted screwdriver) and put it into the lower disengaging mechanism (base latch) of the control and disengage the control (see (A) in the following figure). The base latch is locked in the open position.
3. ➔ Remove the control vertically to the mounting rail [see (B) in the following figure].

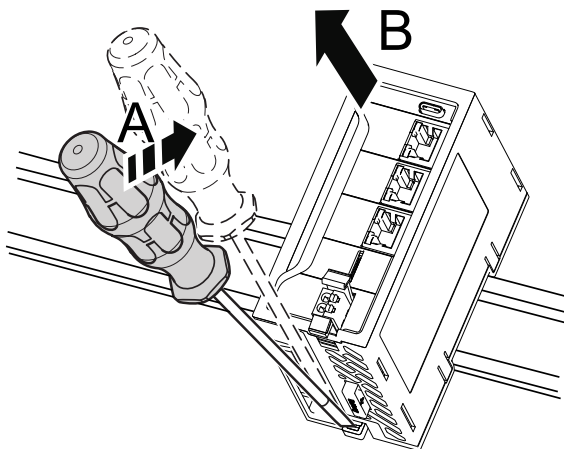


Fig. 12: Removing the control from the mounting rail



Before mounting the control on the mounting rail again, release the clamping of the open position again. Press the locking lever, see chapter 10.3 "Mounting the control".

10.5 Electric installation

10.5.1 External power supply unit

▲ WARNING

Danger of lethal injury due to hazardous electric voltage

- Connect power supply units generating protective extra-low voltage (24 V) only to supply voltages designed for these power supply units. Note the overvoltage categories (refer to the documentation of the power supply unit).
- Do not apply the supply voltage to the protective extra-low voltage.

All components of the control have to be supplied from SELV/PELV 24 V voltage supplies.

The power supply units used have to be able to deliver the quadruple nominal current of the internal and external fuses to ensure that the fuse reliably triggers in case of an error.

All lines of the 24 V voltage supply have to be routed separately from lines carrying higher voltages.

All peripheral devices, such as digital sensors or actuators connected to the interfaces of the control, also have to comply with the criteria of safety-separated SELV/PELV circuits.



The 24 V voltage supply can be grounded. For more detailed information, refer to the documentation of the power supply unit.



Use only power supply units that can bridge a half-wave failure (10 ms) at the maximum load connected.

10.5.2 Power connector XD10

The control is supplied via the XD10 power connector.



Use only copper wires to connect the connection terminals.



Only the power connector is permitted to connect the 24 V supply voltage for the control (see [Chapter 5.1 “Power connector, 24 V” on page 10](#)).



The power connector has a maximum number of 50 mating cycles. The mating cycles of the cables in the XD10 power connectors are limited to 50.

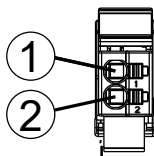


Fig. 13: Power connector XD10

Table 5: Pin assignment

Plug contact	Signal	Function	Color
1	24 V	DC +24 V supply voltage (U_L)	Red
2	0 V	GND (U_L) (ground supply voltage)	Blue

Mounting notes:

- For the power connector XD10, one-wire cables and stranded cables can be used with or without wire end ferrule (acc. to DIN 46228). These wire end ferrules can be with or without plastic collar. The contact surface has to be 8 mm.
- The cable cross-section allowed is between 0.75 and 1.5 mm² (AWG 19 to AWG 16).
- Use only cables approved for temperatures of at least 60°C.
- Use freely routed 1-wire cables. The wire distance has to be at least the wire diameter.
- The stripping length is 8 mm.
- To use stranded cables without wire end ferrules, twist the strand between 180° and 360°. The stripped area has to be 8 mm after twisting. If stranded cables are introduced, keep the pushbutton of the push-in terminal pressed.
- To remove the cables, press the pushbutton of the push-in terminal.

Positioning the power connector

1. ➞ Position the connector on the connector holder.
2. ➞ Engage the connector on top.

10.5.3 24 V voltage supply

For the voltage supply, use a power supply unit as described in the following chapter:
➞ Chapter 10.5.1 “External power supply unit” on page 26.



The GND (U_L) is not grounded to the device!

Setup without electrical isolation

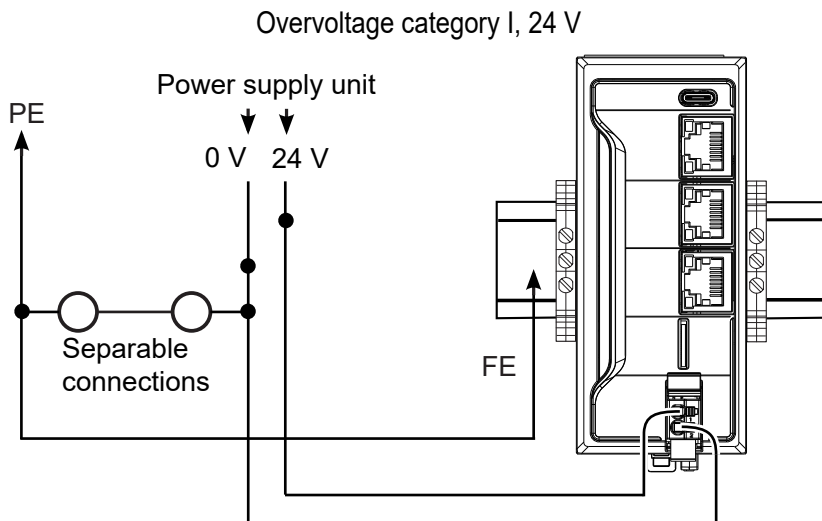


Fig. 14: Setup of the voltage supply ctrlX CORE X2 and ctrlX CORE X3



Control does not start in case of reverse input voltage

The 24 V feeding U_L at the XD10 connector is protected against polarity reversal. A polarity reversal of U_L and GND U_L feeding does not damage the device. However, the control does not start and the status displays are not on.

Dimensioning the voltage infeed

Observe the maximum currents when dimensioning the voltage supply. The operating voltage allowed has to be applied directly to the device.

The voltage must also not be exceeded if:

- there are variations in mains voltage, e.g. caused by different loads of the mains
- there are varying load states, such as short-circuit, normal load, lamp load or no load

Connecting the reference conductor to the protective conductor

If the reference conductor 0 V (U_L) is connected to the protective conductor system, this connection has to be arranged at a central place (e.g. at the load power supply unit). Hence, the supply current circuit is a PELV circuit.

10.5.4 Grounding

NOTICE**Failure due to insufficient grounding**

An optimum grounding is required to impede possible interferences from the control and to discharge them to the ground.

Functional earth



Only the functional earth (FE) is used for the device. The functional earth is only used to discharge disturbances. For individuals, the functional earth is not intended as protection against electric shock.

The control is grounded via the support rail. The support rail, on which the control is mounted, has to be mounted to a grounded metal carrier, e. g. the rear panel of the control cabinet.

The control is provided with FE springs (metal clips) at its bottom side creating an electric connection to the support rail while mounting.

If necessary, provide the support rail with a separate ground connection.

Potential equalization

Potential equalization acc. to DIN VDE 0100 part 540 has to be provided between the system parts and the voltage supply.

10.5.5 Shielding

NOTICE**Failure due to insufficient shielding**

Provide sufficient shielding.

The shielding reduces any effects of interferences on the system.

Observe the following when shielding:

- Fasten the shielding as extensively as possible
- Ensure proper contact between connector and terminal
- Avoid damaging or squeezing conductors
- Note the wire specifications when connecting the shielding
- Shield the closest possible to the signal terminal points



Route all power cables and data cables in separate cable channels.

11 Commissioning

11.1 IT security

Operating systems and machines requires the implementation of a comprehensive concept for state-of-the-art IT security. Bosch Rexroth products are part of this comprehensive concept. The properties of the Bosch Rexroth products have to be considered for a comprehensive IT Security concept. For the required properties, refer to the IT Security Guideline (➔ R911342562).

11.2 Commissioning steps

11.2.1 General information

To commission the device, proceed as follows:

1. ➤ Mount the control.
For details, refer to ➔ Chapter 10.2 “Installation notes” on page 20.
2. ➤ Connect the voltage supply to the XD10 connection of the control.
Refer to ➔ Chapter 10.5.2 “Power connector XD10” on page 26.

11.3 Safe decommissioning

11.3.1 Notes on safe decommissioning

To securely decommission the ctrlX CORE control with regard to IT security, delete all user data on the control. There are two options to delete user data:

1. ➤ Deleting configurations and apps
First, delete all configurations created on the control and then all installed apps. All user data belonging to the apps is also deleted.
2. ➤ Loading a new image to the control using an SD card
An SD card can be used to load an image to the control. All existing data is deleted when loading a new image. Please contact the Bosch Rexroth Service.



Please back up the user data before you delete it if you want to restore it on another control.

12 Device description

12.1 ctrlX CORE control

The ctrlX CORE compact control in embedded format is suitable for the support rail mounting and for its use in a control cabinet.

With the 64 bit Quad Core ARM CPU, the ctrlX CORE has sufficient computing performance for complex control tasks. The Linux-based operating system is open for the integration of all ctrlX CORE Runtime and ctrlX CORE engineering apps from the ctrlX WORKS function module kit and other further customized apps. A central ctrlX Data Layer is used to exchange the communication between the apps in realtime and non-realtime.

The onboard EtherCAT master is used to connect and control the drives, I/O modules and other devices from the open EtherCAT ecosystem.

12.2 Status displays

For error diagnostics, the ctrlX CORE status LED is located on the front of the controls and the voltage status LED is located on the XD10 plug.

12.2.1 Status display on the ctrlX CORE

The ctrlX CORE status LED is a device diagnostic LED. For the exact description, refer to the following documentation:

- ctrlX OS Runtime, Application Manual ➔ R911421590
- ➔ https://docs.automation.boschrexroth.com/cdphelp?keyword=ctrlX_CORE_MANUAL_diagnostics_LED_state



A new status is only displayed after the previous flashing cycle has elapsed. A change in status can thus be delayed up to two seconds.

12.2.2 Status display at the power connector XD10

The voltage U_L applied at the connection points is signaled via a green LED next to the respective red pusher.

Off = Voltage not present

On = Voltage present

12.3 Initial firmware

Upon delivery, the ctrlX CORE is provided with the operating system (Linux) including all system-relevant apps and optionally selected apps. The operating system provides commissioning and maintenance functions.

12.4 Bootling

The ctrlX CORE control starts bootling after switching on the 24 V voltage supply. Bootling can be monitored and checked using the status display.

The status display is red briefly after switching on the 24 V voltage supply. In the initialization phase, the operating system (Linux) is started, the respective hardware drivers are loaded and the ctrlX CORE application is then started. The status display of the control is flashing blue during that time. If the initialization phase is completed, the control is in "Run" mode and the status display is permanently green.

12.4.1 Secure Boot

Bootling is secured by "Secure Boot". Thus, it can only be loaded by a runtime system released by Bosch Rexroth. For the kernel development, this mechanism can be unlocked using an app and the respective license.

If the system is unlocked, the status display of the control flashes yellow during each bootling. The warning "080E0305 Bootloader enabled!" is entered into the logbook.

To purchase the app and the license for unlocking purposes, please contact the Bosch Rexroth Service.

NOTICE**Limitation of the security functions and the loss of the device warranty by unlocking the "Secure Boot" mechanism**

Unlocking the "Secure Boot mechanism" is at own risk. The productive device use is not supported anymore. The certification according to IEC 62443 is lost.

12.5 Backing up remanent data

At runtime, remanent data is saved to an internal remanent NVRAM. It is immediately available after booting.

12.6 Real-time clock

The real-time clock of the control is buffered in the switched-off state using the inserted battery. If no voltage is applied, the battery buffers the real-time clock for at least 3 years. For notes on changing the battery, see ➔ Chapter 14.3 "Battery change" on page 34.

It is recommended to set the time via SNTP.

12.7 License information

12.7.1 General information

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Bosch Rexroth AG
Open Source Office
Zum Eisengießer 1
97816 Lohr am Main
Germany

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 - If Bosch Rexroth has modified preexisting source code, the corresponding source code of this modification will be provided (licensed under the terms of the applicable above-mentioned license) for at least 12 months after the first time it was made available to a third party, however at least 6 months after a subsequent version of the modification has been made available to a third party.
 - Please provide information to the product with which you have received the software components (e.g. product identification, serial number) in order to help us to identify the corresponding source code.

13 Error causes and troubleshooting

13.1 General information

Table 6: Error causes and troubleshooting XF 10

Error	Troubleshooting actions
The engineering PC cannot reach the control via the Ethernet interface "XF10"	• Check whether the device driver was correctly installed in the "Device manager" of the system control. • Check whether the operating system assigned a valid IP address and a subnet mask to the network adapter (e.g. via the command "ipconfig"). If this is not the case, configure the IP address and the subnet mask manually.
 The customer may not repair the device. Exceptions are maintenance works listed in the chapter "Maintenance".	
For further information in the event of repair, please contact the Bosch Rexroth Service.	

14 Maintenance

14.1 General maintenance information

NOTICE

Maintenance work in the device is only permitted by trained staff!

If hardware or software components have to be exchanged, please contact the Bosch Rexroth Service or ensure that only skilled staff changes the respective components.

NOTICE

Loss of IP degree of protection due to incorrect maintenance.

Ensure that the IP degree of protection remains unchanged during maintenance!



Only the maintenance works at the device listed in this chapter are permitted.
For further information in the event of repair, please contact the Bosch Rexroth Service.

14.2 Scheduled maintenance tasks

Include the following tasks into the maintenance schedule:

- Check all plug and terminal connections of the components for proper tightness and possible damage at least annually.
- Ensure that cables are not broken or crushed.
- Replace damaged parts immediately.
- The device may not be opened.

14.3 Battery change

▲ WARNING

Risk of injury due to fire or explosions caused by batteries. Risk of chemical burns due to battery contact.

- Ensure that the batteries and accumulators are not short-circuited.
- Do not charge batteries and accumulators externally. Do not dismantle, destroy or burn them or do not heat them above 80 °C.
- Recycle old batteries and accumulators immediately and as intended.
- Use only the battery specified in this documentation.

It is recommended to change the battery of the control ctrlX CORE every three years.

The battery holder GB01 is located on the bottom side of the control (on the front side of the ctrlX CORE X7). Insert a common CR1025 lithium battery into a drawer of this battery holder. The design of the battery drawer ensures that inserting the battery is reverse polarity-protected. In order not to lose the time when changing the battery, a capacitor buffers the time for approximately 60 minutes.

Battery designation: Lithium battery 3.0 V CR1025 (30 mAh), manufacturer: Renata, part number: CR1025.IB.

15 Ordering information

15.1 General information on ordering

Function packages are also provided with the ctrlX CORE controls. The function packages are implemented into the control according to the system functions required in the application. Thus, variants with individual ordering information result from the required functional scope. Please contact the corresponding marketing organization and ask for the ordering information of the control variant optimized for your application.

15.2 Type code

Type short description	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0										
Example:	C	O	R	E	X	-	C	-	X	3	-	1	1	-	A	N	N	N	-	2	1	-	N	N	-	0	1	R	S	-	N	N	-	N	N	-	7	8	9	0
01 Product																																								
ctrlX CORE = COREX																																								
02 Design																																								
Compact = C																																								
Modular = M																																								
03 Performance class																																								
CPU version X2 = X2																																								
CPU version X3 = X3																																								
04 Device configuration																																								
Device configuration 11..... = 11																																								
CPU basic device (2 GB RAM, 4 GB hard drive, 1 MBit retentive memory)																																								
05 Basic interface																																								
Standard configuration = A																																								
1 x HMI, Engineering, 1 x fieldbus master, 1 x configurable																																								
Standard configuration = B																																								
1 x HMI, Engineering, 1 x fieldbus master, 1 x configurable, 1 x IO connection																																								
06 Extension option 1																																								
None = N																																								
MultiEthernet = 1																																								
07 Extension option 2																																								
None = N																																								
08 Extension option 3																																								
None = N																																								
09 Protection class																																								
IP 20 = 2																																								
10 Reserve																																								
Reserve = 1																																								
11 Device version																																								
01 = 01																																								
12 Runtime version																																								
Version 01 = 01																																								
13 Runtime release																																								
Current release = RS																																								
14 Extended certification																																								
None..... = N																																								
15 Subject to export control (EU)																																								
No export license required = N																																								
16 Special variante																																								
None = NN																																								
Robert Bosch = B1																																								
WAGO = W1																																								
LeAutomatix = L1																																								

Fig. 15: Type code

15.3 Accessories and spare parts

For ordering information on accessories and spare parts, refer to the chapter “Spare parts, accessories and wear parts”.

16 Disposal

16.1 General information

Dispose the products according to the respective valid national standards.

16.2 Return

For disposal, our products can be returned free of charge. However, the products must be free from remains such as oil, grease or other impurities.

Furthermore, the products returned for disposal must not contain any undue foreign substances or external components.

Send the products free of charge to the following address:

Bosch Rexroth AG
Bürgermeister-Dr.-Nebel-Straße 2
97816 Lohr a.Main
Germany

16.3 Packaging

The packaging material consists of cardboard, plastics, wood or styrofoam. Packaging material can be recycled anywhere. For ecological reasons, please do not return empty packages.

17 Service and support

Our worldwide service network provides an optimized and efficient support. Our experts provide you with advice and assistance. You can contact us **24/7**.

Service Germany

Our technology-oriented Competence Center in Lohr, Germany, is responsible for all your service-related queries for electric drive and controls.

Contact the **Service Hotline** and **Service Helpdesk** under:

Phone: **+49 9352 40 5060**

Fax: **+49 9352 18 4941**

Email: ➔ service.svc@boschrexroth.de

Internet: ➔ <http://www.boschrexroth.com>

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

Service worldwide

Outside Germany, please contact your local service office first. For hotline numbers, refer to the sales office addresses on the internet.

Preparing information

To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances
- Type plate specifications of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your e-mail address)

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