

ctrlX CORE^{plus} X3

Controls



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Table of contents

1	About this documentation	6
1.1	Revision history.	6
1.2	Overview on target groups and product phases.	6
1.3	Scope.	7
1.4	Related documents.	7
1.5	Customer feedback.	7
2	Product identification and scope of delivery	8
2.1	Product identification.	8
2.2	Scope of delivery.	9
3	Using safety instructions	9
3.1	Structure of the safety instructions.	9
3.2	Explaining signal words and the safety alert symbol.	9
3.3	Symbols used.	10
3.4	Explaining the signal alert symbol on the device.	10
4	Intended use	10
4.1	General information on the intended use.	10
5	Spare parts, accessories and wear parts	11
5.1	Power connector, 24 V.	11
5.2	SD card.	11
5.3	RJ45 cable.	11
5.4	End clamp.	11
5.5	Endcover.	11
5.6	License dongle.	11
5.7	Wear parts.	11
6	Ambient conditions	12
6.1	Ambient conditions of the ctrIX CORE.	12
7	Technical data	13
7.1	General technical data.	13
7.2	Voltage supply and current consumption.	14
8	Standards	15
8.1	Standards used.	15
8.2	CE marking.	16
8.2.1	Declaration of conformity	16

8.3	UL/CSA certified.	17
8.4	UK declaration of conformity.	17
9	Interfaces	18
9.1	Interface description.	18
9.1.1	Local bus interface Ethercat of ctrlX CORE ^{PLUS} X3.	19
10	Mounting, dismounting and electric installation	21
10.1	Housing dimensions.	21
10.2	Installation notes.	22
10.3	Mounting the control.	24
10.3.1	Mounting the ctrlX I/O module.	25
10.4	Dismounting the control.	26
10.4.1	Dismounting steps.	26
10.5	Electric installation.	27
10.5.1	External power supply unit.	27
10.5.2	Power connector XD10.	28
10.5.3	24 V voltage supply.	29
10.5.4	Grounding	30
10.5.5	Shielding.	31
11	Commissioning	31
11.1	Commissioning steps.	31
11.1.1	General information.	31
11.2	Safe decommissioning.	32
11.2.1	Notes on safe decommissioning.	32
12	Device description	32
12.1	ctrlX CORE control.	32
12.2	Status displays.	32
12.2.1	ctrlX CORE status LED.	32
12.2.2	Status display at the power connector XD10 ctrlX CORE ^{plus}	33
12.2.3	Status display PF30-NET-ST-LED.	33
12.2.4	Status displays PF56 to PF59-NET-ST-LED.	33
12.2.5	Status display of device status LED.	33
12.3	Initial firmware.	34
12.4	Bootng.	34
12.4.1	Secure Boot.	34

12.5	Backing up remanent data	34
12.6	Real-time clock	34
12.7	SD card	35
12.8	USB interface	35
12.9	RJ45 interface	35
12.10	Battery	35
12.11	License information	36
12.11.1	General information	36
13	Error causes and troubleshooting	36
13.1	General information	36
14	Maintenance	37
14.1	General maintenance information	37
14.2	Scheduled maintenance tasks	37
14.3	Battery change	37
15	Ordering information	38
15.1	General information on the ordering information	38
15.2	Type code	39
15.3	Accessories and spare parts	39
16	Disposal	40
16.1	General information	40
16.2	Return	40
16.3	Packaging	40
17	Service and support	41
	Index	42

1 About this documentation

1.1 Revision history

Table 1: Editions of this documentation

Edition	Release date	Note
Edition 01	2023-05	First edition

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.

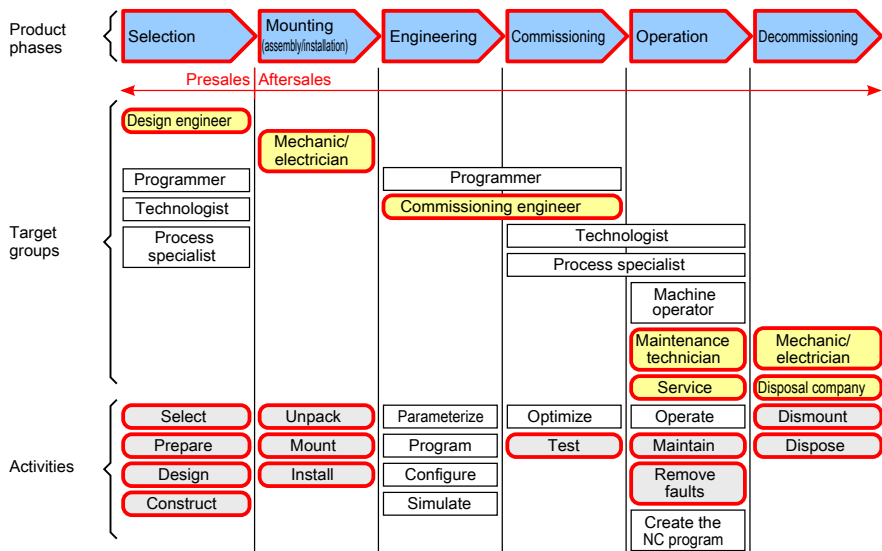


Fig. 1: Assigning the present documentation to the target groups, product phases and activities of the target group

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-M X3

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.

2 Product identification and scope of delivery

2.1 Product identification

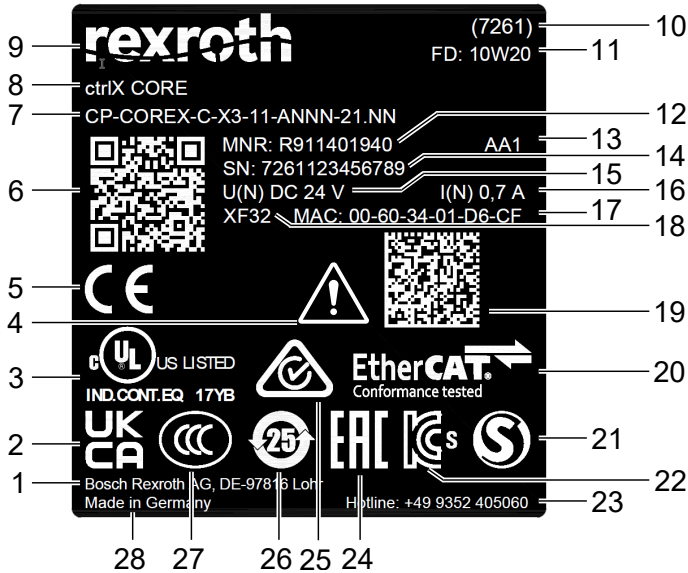


Fig. 2: Type plate (example)

- | | | | |
|----|--|----|----------------------------------|
| 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

- Control ctrlX COREplus
- 24 V power connector, 4-pin
- Endcover

3 Using safety instructions

3.1 Structure of the safety instructions

The safety instructions are structured as follows:

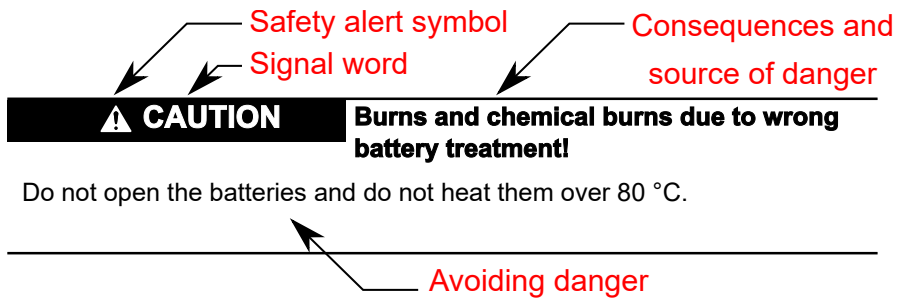


Fig. 3: Structure of the safety instructions

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.

▲ DANGER	In case of non-compliance with this safety instruction, death or serious injury will occur.
▲ WARNING	In case of non-compliance with this safety instruction, death or serious injury can occur.
▲ CAUTION	In case of non-compliance with this safety instruction, minor or moderate injury can occur.
NOTICE	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-CSPWRM	R911416670	24 V power connector

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 Endcover

Ordering code	Part number	Description
XACC-2-ENDCOVER	R911412178	Endcover

5.6 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

5.7 Wear parts

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

Notes on sensor values:

- "0 - 10% of eMMC life time used" means that up to 10 % of the maximum write cycles can be used.
- Create a backup if the value exceeds 80%.

Ambient conditions of the ctrlX CORE

- Replace the hardware if the value exceeds 80%.
- Use an external memory to extend the service life of the permanent 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 acc. to DIN 60204	Up to 5,000 m above sea level
Permitted air humidity according to DIN EN 61131-2	5% to 85%, no condensation
Protection class acc. to DIN EN 60 529	IP 20 (not evaluated by UL)
Protection class acc. to DIN 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	5-20-150 Hz with 0.572 g, 5 h per axis
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**Failure of the product 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 housing 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 product due to gases jeopardizing functions**

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

NOTICE**Failure of the product due to overheating**

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-M-X3
Processor	Zync Ultrascale+, 64 bit, 4 × ARM A53
RAM	2 GByte DRAM
Internal physical read-only memory (eMMC)	4 GByte, also refer to → Chapter 5.7 “Wear parts” on page 11
Internal non-volatile random-access memory (NVRAM)	1 Mbyte
Extension option 1	Multi-Ethernet, COM.2 (weight: 74 g) or Multi-Ethernet M/S 4 × RJ45 COM.20 (weight: 106 g)
Extension option 2	Multi-Ethernet M/S 4 × RJ45 COM.20 (weight: 106 g)
Communication interfaces	RJ-45 • 3 × Ethernet connection (10 Mbit, 100 Mbit, 1 Gbit)
USB	1 × USB host, TYPE C (USB2.0), maximum cable length of 3 m
SD card	Slot for SD card
Battery	CR1025

COREX-M-X3	
Weight without extensions	469 g
Total weight	469 g + extension options
Dimensions	Refer to → Chapter 10.1 “Housing dimensions” on page 21

7.2 Voltage supply and current consumption

Table 3: ctrlX COREplus X3

Nominal voltage at U_L and U_P	DC 24 V SELV/PELV
Maximum permitted voltage range of the supply voltage U_L and U_P	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	Without I/O modules at $U_L = 24$ V: <ul style="list-style-type: none"> • COREplus X3: 375 mA • COREplus X3 with COM.2: 420 mA • COREplus X3 with COM.20: 510 mA With I/O modules at $U_L = 24$ V plus up to 3 A
Power consumption of the control from U_L at a nominal voltage of 24 V	Without I/O modules at $U_L = 24$ V: <ul style="list-style-type: none"> • COREplus X3: 9 W • COREplus X3 with COM.2: 10.1 W • COREplus X3 with COM.20: 12.3 W With I/O modules at $U_L = 24$ V plus up to 72 W
Current consumption U_P	Typ. 5 mA (without I/O modules), 8 A max., at $U_P = 24$ V
Power consumption from U_P	Typ. 0.12 W (without I/O modules), 192 W max., at $U_P = 24$ V
Reverse polarity protection of the supply voltage U_L and U_P	Present
Fuse protection U_L	Internal with a protective fuse of 10 A
Fuse protection U_P	No internal fuse protection. The operator has to provide protection against overload by an external fuse.
Overvoltage protection U_L and U_P	Present, fuses can trigger in case of overvoltage.
Transient protection U_L and U_P	Present, suppressor diodes Pulse load up to 1,500 W
Voltage dips at current supply interfaces	PS1 < 1 ms, evaluation criterion A
Electrical isolation	DC 707 V (not evaluated by UL)
24 V supply (U_L/U_L GND) to the functional earth	
24 V supply (U_P/U_P GND) to the functional earth	

24 V supply voltage (U_L/U_L GND and U_P/U_P GND) to XF10, XF50, XF51 und XF23, XF24 at ctrlX CORE^{plus} X3
 U^L/U^L GND to U^P/U^P GND DC 1200 V (not evaluated by UL)
 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 Standards used

Table 4: Angewandte Normen – Standards used – Normes appliquées

Norm	Bedeutung	Ausgabe
Standard	Meaning	Edition
Norme	Signification	Édition
DIN EN 60204-1	Sicherheit von Maschinen Elektrische Ausrüstung von Maschinen – Safety of machinery Electrical equipment of machines – Sécurité des machines Équipement électrique des machines	2019
DIN EN 61131-2	Speicherprogrammierbare Steuerungen Teil 2: Betriebsmittelanforderungen und Prüfungen – Programmable controllers Part 2: Equipment requirements and tests – Automates programmables Partie 2: Spécifications et essais des équipements	2008
DIN EN 60529	Schutzarten durch Gehäuse (IP-Code) – Degrees of protection provided by enclosures (IP Code) – Degrés de protection procurés par les enveloppes (Code IP)	2014

Norm	Bedeutung	Ausgabe
Standard	Meaning	Edition
Norme	Signification	Édition
DIN EN 61010-2-201	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte 2014 Teil 2-201: Besondere Anforderungen für Steuer- und Regelgeräte – Safety requirements for electrical equipment for measurement, control and laboratory use 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	
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	

8.2 CE marking

8.2.1 Declaration of conformity



The electronic products described in the present operating instructions comply with the requirements and the target of the following EU directive and with the following harmonized European standards:

Table 5: Normen zur elektromagnetischen Verträglichkeit (EMV) – Standards for electromagnetic compatibility (EMC) – Normes sur la compatibilité électromagnétique (CEM)

Norm	Bedeutung	Ausgabe
Standard	Meaning	Edition
Norme	Signification	Édition
DIN EN 61000-6-2	Elektromagnetische Verträglichkeit (EMV) Teil: 6-2: Fachgrundnormen – Störfestigkeit für Industriebereiche Normes génériques – Immunité pour les environnements industriels	November 2019
DIN EN 61000-6-4	Elektromagnetische Verträglichkeit (EMV) Teil: 6-4: Fachgrundnormen – Störaussendung für Industriebereiche Normes génériques – Norme sur l'émission pour les environnements industriels	September 2011



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

8.3 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 60 °C

8.4 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

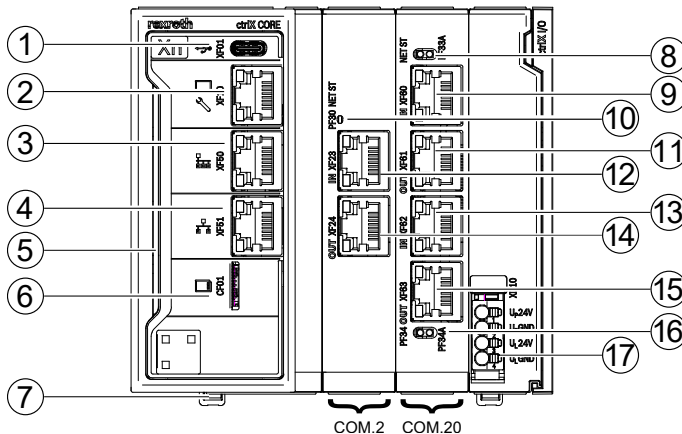


Fig. 4: Interfaces
COM.2 Optional
COM.20 Optional

NOTICE

Damage of the device by plug mounting under voltage!

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

Table 6: Control interfaces

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

No.	Name	Connection type	Connector type	Mating connector and cable
			(integrated)	(From outside)
④	XF51	Ethernet 10/100/1000 MBit 1G Bit/s Ethernet (configurable) TSN-capable (Time-Sensitive Networking)	RJ45 socket 8-pin	RJ45 plug (twisted pair, 8-wire)
⑤	-	Status LED	–	–
⑥	CF01	Slot for SD card	–	SD card
⑦	GB01	Battery case	–	–
⑧	PF56	Status display PF56-NET-ST-LED	–	–
	PF57	Status display PF57-NET-ST-LED	–	–
⑨	XF56	Multi-Ethernet 10/100 MBit field bus master, field bus slave (configurable)	RJ45 socket 8-pin	RJ45 plug (twisted pair, 8-wire)
⑩	PF 30	Status display PF30-NET-ST-LED	–	–
⑪	XF57	Multi-Ethernet 10/100 MBit field bus master, field bus slave (configurable)	RJ45 socket 8-pin	RJ45 plug (twisted pair, 8-wire)
⑫	XF23	Multi-Ethernet 10/100 MBit field bus slave (con- figurable)	RJ45 socket 8-pin	RJ45 plug (twisted pair, 4-wire)
⑬	XF58	Multi-Ethernet 10/100 MBit field bus master, field bus slave (configurable)	RJ45 socket 8-pin	RJ45 plug (twisted pair, 4-wire)
⑭	XF24	Multi-Ethernet 10/100 MBit field bus slave (con- figurable)	RJ45 socket 8-pin	RJ45 plug (twisted pair, 4-wire)
⑮	XF59	Multi-Ethernet 10/100 MBit field bus master, field bus slave (configurable)	RJ45 socket 8-pin	RJ45 plug (twisted pair, 4-wire)
⑯	PF58	Status display PF58-NET-ST-LED	–	–
	PF59	Status display PF59-NET-ST-LED	–	–
⑰	XD10	24 V plug U_L , U_P , with status display	4-pin	4-pin

9.1.1 Local bus interface Ethercat of ctrlX CORE^{PLUS} X3

The local bus connected to the ctrlX CORE^{PLUS} at the right is a 100 MBit/s LVDS Ethercat bus and the cycle time is between 2 ms and 10 ms. The ctrlX CORE^{PLUS} can be extended with up to 20 ctrlX I/O modules. The number of connectable modules depends on the total current consumption of the ctrlX I/O modules. The ctrlX CORE^{PLUS} can provide up to 3 A for the current supply of the modules. The ctrlX CORE^{PLUS} supplies the connected I/O modules with the logic voltage U_L and the periphery voltage U_P . The voltages and currents fed in are measured internally and applied to the process data. For U_L , only the current consumption of the infeed terminal and the I/O modules. For the integration into the parent system, the respective ESI files are available. For the ESI files, go to <http://www.boschrexroth.com/electrics>.

Synchronizing the application

The application is synchronized in the "SM synchronous" mode.

EtherCAT process data

The bus coupler and the ctrlX CORE are provided with data that is inserted into the cyclic process image. This data length is 5 words in total. According to the EtherCAT standard, this data before the input process data is shown in the process image.

The process data words 0...3 contain the voltage and current values of U_P and U_L (only the current consumption of the infeed terminal and the I/O modules) as well as their bits for the supply voltage diagnostics. This information can also be retrieved via acyclic services using CoE. These are shown as the indices 6000, 6010 and 6020 hex.

Word 0	U_P Voltage
Word 1	U_P Current
Word 2	U_L Voltage
Word 3	U_L Current
	(Only the current consumption of the infeed terminal (typ. 50 mA) and the I/O modules (3 A max.) is measured. In addition to the transferred measured value, the ctrlX CORE ^{PLUS} consumes more than shown here.)
Word 4	
0	U_P Undervoltage
1	U_P Overvoltage
2	U_P Overcurrent
3	U_L Undervoltage
4	U_L Overvoltage
5	U_L Overcurrent
6-15	Reserved

10 Mounting, dismounting and electric installation

10.1 Housing dimensions

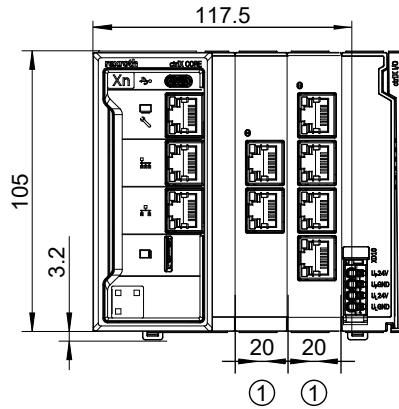


Fig. 5: Front view

① Optional

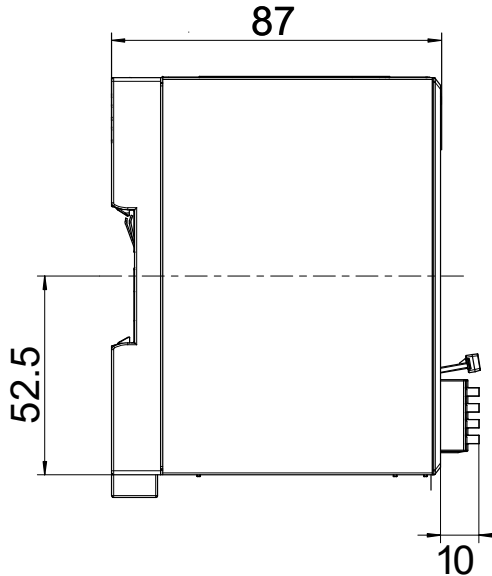


Fig. 6: Side view

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 (acc. to DIN EN 60529) 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.

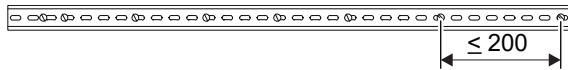


Fig. 7: Support rail fastening (in mm)

- 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.

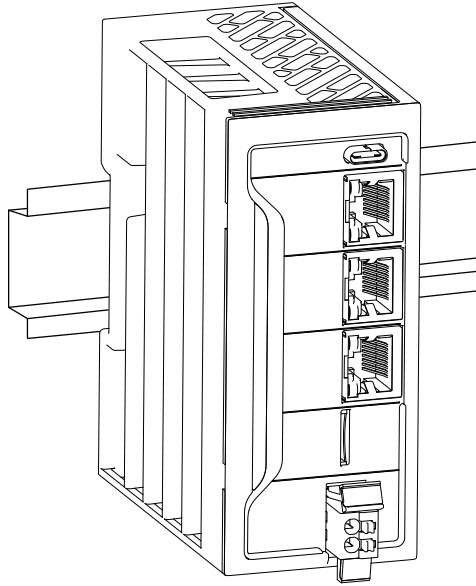


Fig. 8: Permitted mounting position for all ctrlX CORE controls

- 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.

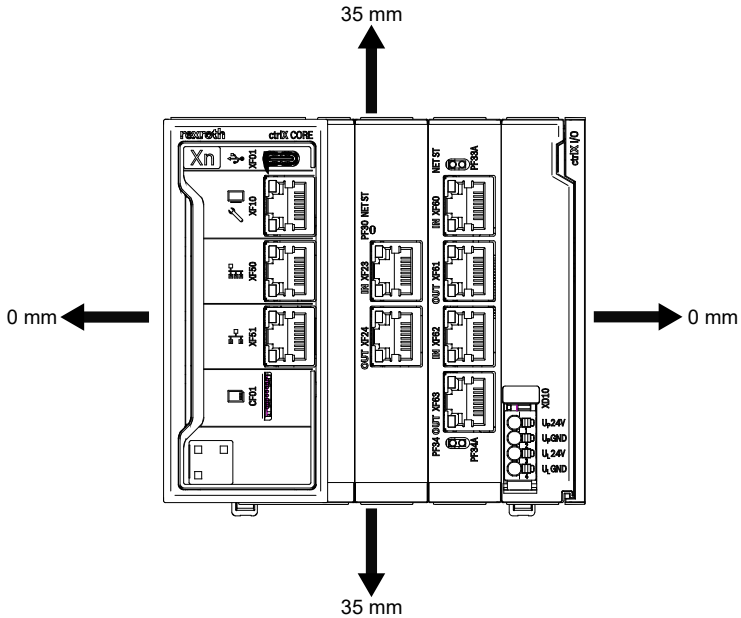


Fig. 9: Minimum distances for the circulation of ambient air

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

10.3 Mounting the control

NOTICE	<p>Damage of the device by plug mounting under voltage!</p> <ul style="list-style-type: none"> – 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	<p>Possible damage to property due to unintended mounting of the support rail</p> <ul style="list-style-type: none"> – Fasten the support rail adequately. – Connect the support rail to a functional ground. – Mount the control on the support rail, as the support rail is also used for heat dissipation and grounding. – Install the control in a control cabinet or an appropriate housing.
NOTICE	<p>Control not fixed due to clamped support arm mounting!</p> <p>Before mounting, ensure that the support arm mounting of the control is not in open position. If required, release the clamping of the open position using the locking lever, see Figure 10.</p>

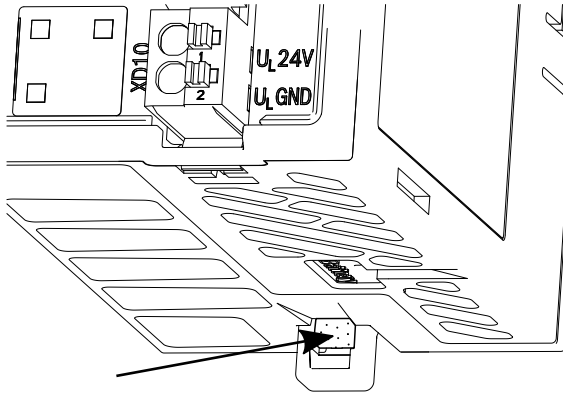


Fig. 10: Locking lever to release the clamping of the open position

Mounting steps

1. ➤ Mounting the control
2. ➤ Connecting ctrlX I/O modules in series (optional)
3. ➤ Fastening endcover
4. ➤ Fastening end clamp



The control has up to 50 mounting cycles.

10.3.1 Mounting the ctrlX I/O module

NOTICE	<p>Damage of the device by plug mounting under voltage!</p> <p>Disconnect the module and all connected module components from voltage before mounting or dismantling.</p>
NOTICE	<p>Possible damage to property due to unintended mounting of the support rail</p> <ul style="list-style-type: none"> – Connect the support rail to a functional ground. – Mount the module on a support rail. – Install the module in a control cabinet or an appropriate housing.
NOTICE	<p>Module is not fixed correctly due to engaged support arm mounting!</p> <p>Before mounting, ensure that the support arm mounting of the control is not in open position. If required, release the clamping of the open position using the locking lever, refer to the following figure 11.</p>
NOTICE	<p>Damage of the device by short circuit of patch connectors</p> <p>There is an endcover on the right upon delivery. Remove this endcover to connect the modules in series. Position the endcover on the last module of the station to protect it against short circuit and contamination.</p>

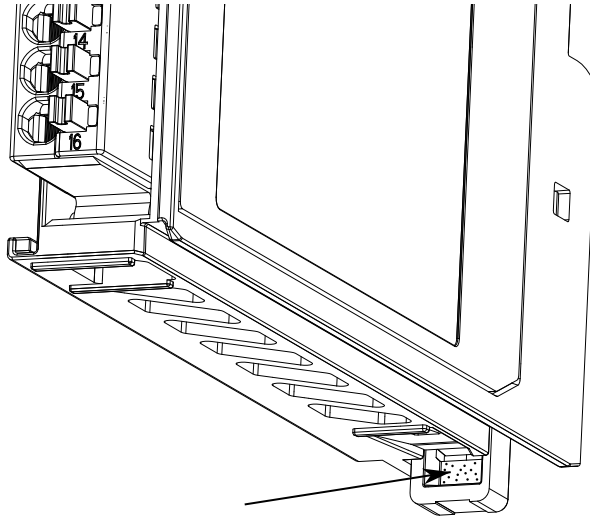


Fig. 11: Locking lever to release the clamping of the open position
Each module has to be snapped separately.

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 control - including its components - from voltage.
- Connect the voltage only after the control and its components have been set up.

For a secure decommissioning with regard to IT security, refer to ➔ Chapter 11.2.1 “Notes on safe decommissioning” on page 32.

Removing the control from the support rail

1. ➔ Remove the left or the right end clamp.
2. ➔ Remove the first ctrlX IO terminal from the ctrlX CORE^{plus} if required.

3. → 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.
4. → Remove the control vertically to the support rail [see (B) in the following figure].

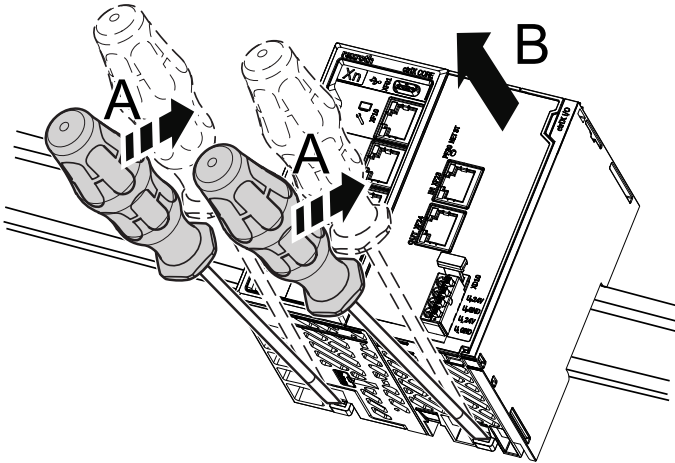


Fig. 12: Removing the control from the support rail



Before mounting the control on the support rail again, release the clamping of the open position again. Press the locking lever, see Fig. 10.

10.5 Electric installation

10.5.1 External power supply unit

▲ WARNING

Danger of lethal injury due to hazardous electric voltage

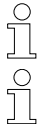
- Connect power supply units generating protective extra-low voltage (24 V) only to supply voltages designed for these power supply units. Note the overvoltage categories (refer to the documentation of the power supply unit).
- Do not apply the supply voltage to the protective extra-low voltage.

All control components are supplied from 24 V voltage supplies (SELV/PELV, NEC class 2).

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 peripherals, such as digital sensors or actuators connected to the interfaces of the control, also have to comply with the criteria of safety-separated 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).

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 11).



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.

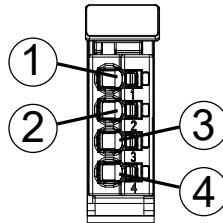


Fig. 13: Power connector XD10

Table 7: Pin assignment of the power connector XD10

Plug contact	Signal	Function	Color
1	24 V	DC +24 V supply voltage (U_P)	Red
2	0 V	GND (U_P) (supply voltage grounding)	Blue
3	24 V	DC +24 V supply voltage (U_L)	Red
4	0 V	GND (U_L) (supply voltage grounding)	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 1 and 1.5 mm² (AWG 16, AWG 17).
- 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.

Setup with electrical isolation

Provide electrical isolation between the logic supply U_L and the periphery supply U_P of the I/O terminals acc. to DIN EN 60204-1. Accordingly, the voltage U_L (24 V logic voltage) at the control is electrically isolated from the peripheral voltages U_P (24 V segment voltage).

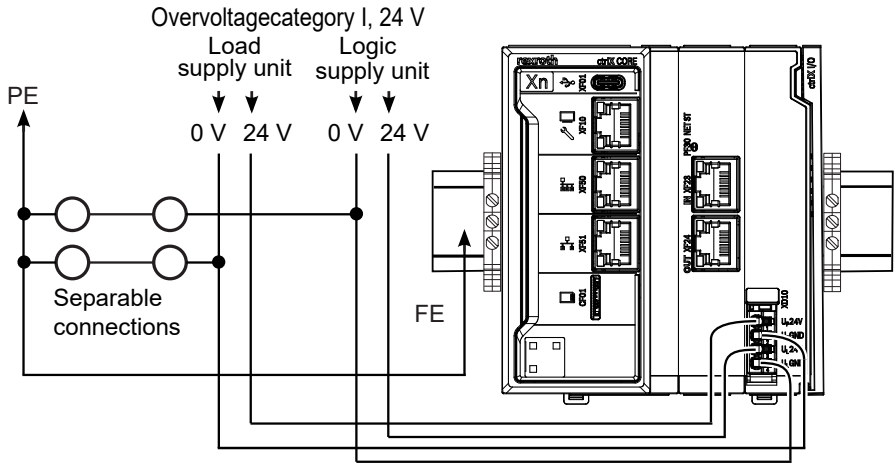


Fig. 15: Setup of the voltage supply ctrlX CORE^{plus} X3

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 , U_P) 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 Commissioning steps

11.1.1 General information


To commission the device, proceed as follows:

1. Mount the control.
For details, refer to Chapter 10.2 "Installation notes" on page 22.
2. Connect the voltage supply to the XD10 connection of the control.
Refer to Chapter 10.5.2 "Power connector XD10" on page 28.


11.2 Safe decommissioning

11.2.1 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

12.2.1 ctrlX CORE status LED

There are following status displays on the ctrlX CORE^{PLUS}: The ctrlX CORE status LED, PF30-NET-ST-LED, PF56- to PF59-NET-ST-LED and device status LED.

The following functions are assigned to the ctrlX CORE status LED when the system firmware is running:

State	Color	
Control in "Run" state	Green	
Control in "Stop" state	Blue	
Warning in the ctrlX CORE Runtime	Flashing yellow	 →
Errors (F0 – F7 [Ⓞ]) in the ctrlX CORE Runtime	Flashing red	 →
App execution faulty	Flashing red	 →

State	Color	
Service mode active	Flashing blue	
Identification	Flashing white	
The ctrIX CORE Rescue system is active	Flashing red and blue	
Bootling active or shut down	Flashing blue	
System error (F8 and F9 [Ⓢ]) in the ctrIX CORE Runtime	Red	

① For the error codes, refer to:

➔ <https://docs.automation.boschrexroth.com/doc/2331677038/main-diagnostics/latest/en/>



- One square corresponds to a period of 200 ms.
- The arrow represents the end of a cycle.
- --: LED is not on.
- BU: LED is blue.
- GN: LED is green.
- RD: LED is red.
- WH: LED is white.
- YE: LED is yellow.



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 ctrIX CORE^{plus}

The voltages U_L and U_P applied at the connection points are signaled via an own green LED next to the respective red pusher.

Off = Voltage not present

On = Voltage present

12.2.3 Status display PF30-NET-ST-LED

The status display PF30-NET-ST-LED is a field bus diagnostic LED. For a detailed description, refer to the documentation. See ➔ R911386579.

12.2.4 Status displays PF56 to PF59-NET-ST-LED

The status displays PF56 to PF59-NET-ST-LED are field bus slave LEDs. For a detailed description, refer to the documentation. See ➔ R911386579.

12.2.5 Status display of device status LED

For the status displays of the device status LED of the infeed terminal, refer to the bus coupler documentation, see ➔ R911416731.

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 Booting

The ctrlX CORE control starts booting after switching on the 24 V voltage supply. Booting 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

Booting 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 booting. 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 37.

It is recommended to set the time via SNTP.

12.7 SD card

There is a slot (CD01) for the micro SD card on the front of the control. The SD card host controller supports the version 2.0 (standard SDHC), i.e. 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.

12.8 USB interface

There is a USB interface (XF01) (type C, USB 2.0) on the front side of the control. The USB interface can be used to connect USB storage media (only FAT16 and FAT32), scanners and similar USB devices.

The USB interface provides a voltage supply with DC 5 V and 0.5 A for external devices. The USB interface is switched off up to the next voltage cycle 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 grounding at the 24 V power connector XD10 always has to be connected.

12.9 RJ45 interface

XF10	HMI and engineering port
XF50	Field bus master (EtherCAT)
XF51	GBit/s Ethernet (configurable)
XF23	Ethernet 10/100 MBit Ethernet (configurable)
XF24	Ethernet 10/100 MBit Ethernet (configurable)
XF56	Ethernet 10/100 MBit Ethernet (configurable)
XF57	Ethernet 10/100 MBit Ethernet (configurable)
XF58	Ethernet 10/100 MBit Ethernet (configurable)
XF59	Ethernet 10/100 MBit Ethernet (configurable)

12.10 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 mA·h).

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 37.



A discharged battery causes an incorrect system time.

12.11 License information

12.11.1 General information

This product contains software components that are licensed by the holder of the rights under GNU General Public License (GPL), GNU Lesser General Public License (LGPL) or any other Open Source Software license, which requires a provided source code.

The source code of these software components is not delivered together with this product. You can obtain the source code for these software components on a physical medium (CD or DVD) by submitting a written request to our Open Source Office address listed below or by sending an email to open.source@boschrexroth.de. When sending such a request, please name the relevant product and its date of purchase.

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

We may charge you a fee (up to max. 20,- €) to cover the cost of the source code provision.

You may send your request (i) within three (3) years from the date you received the product that includes the binary file that is subject of your request or (ii) in case of code licensed under the GPL v3 for as long as Bosch Rexroth offers spare parts or customer support for that product.

13 Error causes and troubleshooting

13.1 General information

Table 8: Error causes and troubleshooting XF 10

Error	Troubleshooting actions
The engineering PC cannot reach the control via the Ethernet interface "XF10"	<ul style="list-style-type: none">• 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 mA), manufacturer: Renata, part number: CR1025.IB.

15 Ordering information

15.1 General information on the ordering information

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.

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](mailto:service.svc@boschrexroth.de)

Internet: [↪ http://www.boschrexroth.com](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)

Index

A

Accessories	11
Air humidity	12
Ambient conditions	12
Ambient temperature	12
ANSI Z535.6	9
Application synchronization	20

B

Back up remanent data	34
Battery	35
Battery change	37
Booting	34
Broadband noise	12

C

CE marking	16
Clamping support arm mounting	24
Clock	34
Commission	31
Commissioning	31
Connections at front side	18
Control	
Dismount	26
Control, mounting	24

D

Declaration of conformity	16
UK declaration of conformity	17
Decommissioning	32
Device description	32
Dimensions	21
Dismounting	26
Disposal	40
Distances	22
Distances for cooling	22
Documentation	
Revision history	6

E

Electric installation	27
Elektromagnetischen Verträglichkeit	16
Emitted interference	12
eMMC	11, 13
EMV	16
Enabling bootloader	34

End clamp	11
End clamps	23
Endcover	11
Error causes	36
ESD resistance	12
Ethercat	19
EtherCAT process data	20
External power supply unit	27

F

Firmware	34
Functional earth	31

G

Grounding	30
-----------------	----

H

Hazard warnings	9
Helpdesk	41
Hotline	41
Housing dimensions	21

I

Identification	8
Initial firmware	34
Installation notes	22
Installation, electric	27
Intended use	10
Interfaces	18

L

LED	32
License dongle	11
License information	36
Local bus interface	19

M

Maintenance	37
Memory card	11
Minimum distances	22
Module mounting	25
Mounting	21
Control	24
I/O module	25
Mounting location	22
Mounting position	22

N	
Normen	
EMV.....	16
O	
Operating altitudes.....	12
Ordering information.....	38
P	
Packaging.....	40
Plug, voltage supply.....	28
Position power connector.....	29
Potential equalization.....	31
Power connector XD10.....	28
Power connector, 24 V.....	11
Power supply unit.....	7
Power supply unit, external.....	27
Process data.....	20
Product identification.....	8
Protective conductor.....	30
R	
RAM.....	13
Read-only memory.....	11, 13
Real-time clock.....	34
Return.....	40
Revision history.....	6
RJ45 cable.....	11
RJ45 interface.....	35
S	
Safety instructions.....	9
Scope.....	7
Scope of delivery.....	8
SD card.....	11, 35
Secure Boot.....	34
Service hotline.....	41
Shielding.....	31
Shock test.....	12
Signal alert symbol.....	9
Signal words.....	9
24 V voltage supply.....	29
Spare parts.....	11
Standards.....	15
Status display.....	32
Stranded cable.....	28
Stripping length.....	28
Support.....	41
Support arm mounting.....	24
Support rail.....	22
Symbols.....	10
Synchronizing the application.....	20
T	
Target groups.....	6
Technical data.....	13
Temperature.....	12
Time-Sensitive Networking.....	19
Troubleshooting.....	36
Type code.....	39
U	
UK declaration of conformity.....	17
UL/CSA certified.....	17
UPS.....	7
USB interface.....	35
Use, intended.....	10
V	
Vibration resistance.....	12
Voltage infeed, dimensioning.....	30
Voltage supply.....	29
W	
Warnings.....	9
Wear parts.....	11
Wire end ferrules.....	28
X	
XD10.....	28

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