

# ctrlX CORE<sup>plus</sup> X5 and X7

Controls

Operating Instructions  
(Translation of the original)



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# 1 About this documentation

## 1.1 Revision history

| Edition    | Release date | Note                                                                           |
|------------|--------------|--------------------------------------------------------------------------------|
| Edition 01 | 2022-12      | First edition                                                                  |
| Edition 02 | 2024-03      | X5 supplemented                                                                |
| Edition 03 | 2024-07      | Editorial changes, reference to document on the ctrlX CORE status LED inserted |
| Edition 04 | 2025-02      | Data of AI accelerator module supplemented                                     |
| Edition 05 | 2025-09      | Multi-Ethernet module supplemented                                             |

## 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.

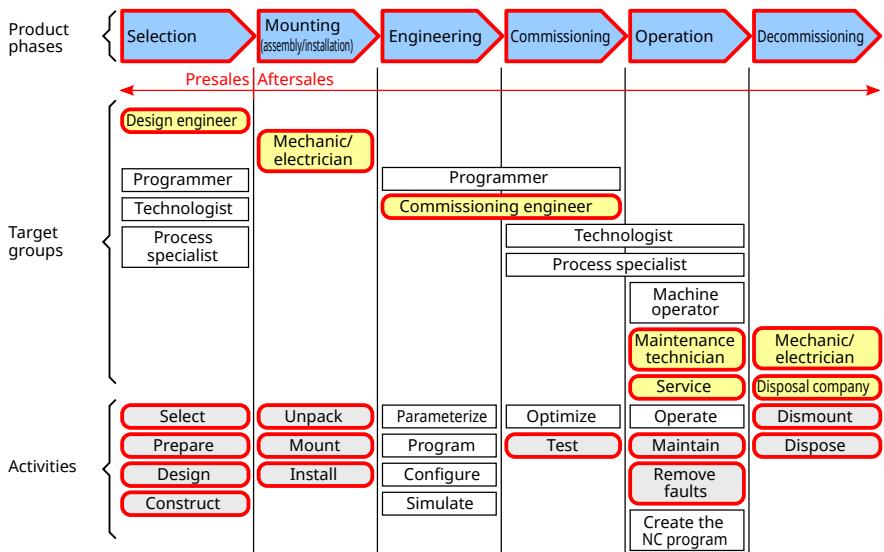


Fig. 1: Assigning the present documentation to the target groups, product phases and activities of the target group

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 X7 or COREX-M X5

The type code specifications are located on the type plate of the device. Also refer to ➔ Chapter 2.1 “Product identification” on page 7.

### 1.4 Related documents

Table 1: Related documentation

| Title                            | Part number and document type |
|----------------------------------|-------------------------------|
| Security Manual                  | ➔ R911342562                  |
| Electric Drives<br>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](mailto: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



The image of the type plate is used to illustrate a complete type plate layout. For the specific values of the respective device, see the corresponding type plate directly on the device. For information on relevant certifications, either refer to the type plate of the device or to the "Standards" chapter in this documentation.

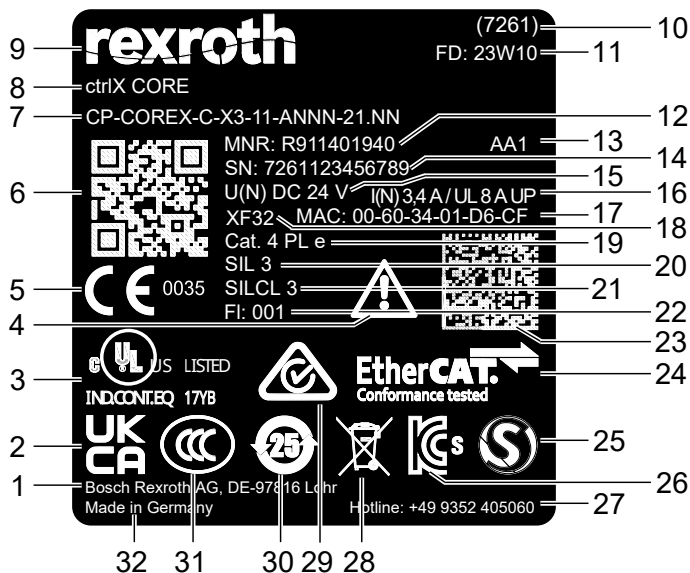


Fig. 2: Type plate (example)

- |                                                      |                                           |
|------------------------------------------------------|-------------------------------------------|
| 1 Company address                                    | 17 MAC address (Ethernet ID)              |
| 2 UKCA marking                                       | 18 Free text on the MAC address           |
| 3 Underwriters Laboratories Inc. mark                | 19 Performance Level                      |
| 4 Symbol for reference to the operating instructions | 20 Safety integrity level                 |
| 5 CE conformity mark                                 | 21 SIL claim limit                        |
| 6 QR or data matrix code, Rexroth, 2D code           | 22 Functional index, marine certification |
| 7 Type code                                          | 23 MAC code (2D code), data matrix        |
| 8 Product                                            | 24 EtherCAT identifier                    |
| 9 Trademark                                          | 25 S-mark logo                            |
| 10 Plant number                                      | 26 KCs mark                               |
| 11 Manufacturing date                                | 27 Service hotline number                 |
| 12 Part number                                       | 28 Symbol for "separate disposal"         |
| 13 State of revision                                 | 29 Regulatory Compliance Mark (RCM)       |
| 14 Serial number                                     | 30 China-RoHS 2 label                     |
| 15 Rated voltage                                     | 31 CCC marking                            |
| 16 Rated current                                     | 32 Name of origin                         |

## 2.2 Scope of delivery

- ctrlX CORE control
- 24 V power connector, 4-pin (ctrlX CORE X7<sup>plus</sup>)
- Endcover

### 3 Using safety instructions

#### 3.1 Structure of the safety instructions

The safety instructions are structured as follows:

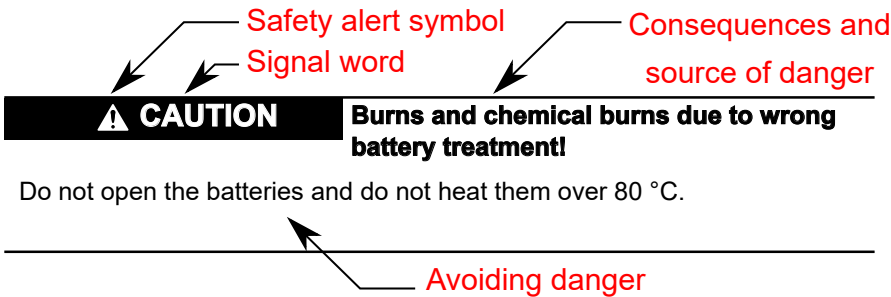


Fig. 3: Structure of the safety instructions

#### 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.

|                  |                                                                                                    |
|------------------|----------------------------------------------------------------------------------------------------|
| <b>▲ DANGER</b>  | In case of non-compliance with this safety instruction, death or serious injury <b>will</b> occur. |
| <b>▲ WARNING</b> | In case of non-compliance with this safety instruction, death or serious injury <b>can</b> occur.  |
| <b>▲ CAUTION</b> | In case of non-compliance with this safety instruction, minor or moderate injury can occur.        |
| <b>NOTICE</b>    | 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 in the industrial sector

### ⚠ 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 Ordering information

The ctrlX CORE controls are provided with the ctrlX OS operating system upon delivery. They can also be delivered including licenses for function packages. Thus, variants with individual ordering information result from the required functional scope.

To configure the functional scope, go to "[→ ctrlX Configurator](#)".

## 5.2 Power connector, 24 V

| Ordering code | Part number | Description          |
|---------------|-------------|----------------------|
| XACC-1-CSPWRM | R911416670  | 24 V power connector |

## 5.3 SD card

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

## 5.4 RJ45 cable

| Ordering code | Part number | Description |
|---------------|-------------|-------------|
| RKB0020       | R911340676  | Bus cable   |

## 5.5 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 |

## 5.6 Fan

| Ordering code | Part number | Description            |
|---------------|-------------|------------------------|
| XACC-1-FAN    | R911423619  | Fan unit for X5 and X7 |

## 5.7 Fan for AI accelerator module

| Ordering code  | Part number | Description                   |
|----------------|-------------|-------------------------------|
| XACC-1-FAN-EXT | R911428389  | Fan for AI accelerator module |

## 5.8 End cover

| Ordering code   | Part number | Description |
|-----------------|-------------|-------------|
| XACC-2-ENDCOVER | R911412178  | End cover   |

## 5.9 License dongle

| Ordering code   | Part number | Description    |
|-----------------|-------------|----------------|
| XACC-1-SDC*008L | R911416693  | License dongle |

## 5.10 Wear parts

### 5.10.1 Read-only memory

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.

### 5.10.2 Fan

The maximum service life of the fans is 50,000 hours. A fan unit then needs to be replaced. For the ordering data, refer to ➔ Chapter 5.6 "Fan" on page 11 and ➔ Chapter 5.7 "Fan for AI accelerator module" on page 11.

## 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<br>Up to 2,000 m: -25 °C to +50 °C if extension options 1 to 3 are each equipped with the AI accelerator module.<br>X5: 50 °C to 55 °C with fan<br>2,000 m to 3,000 m: -25 °C to +50 °C<br>3,000 m to 4,000 m: -25 °C to +45 °C<br>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                                                                                                                                                                                                                                                                              |
| <b>Mechanical tests</b>                          |                                                                                                                                                                                                                                                                                                         |

|                                                            |                                                                                                                                 |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Vibration resistance acc. to DIN EN 60068-2-6 <sup>①</sup> | Oscillations, sinusoidal in all three axes<br>5 Hz - 8.4 Hz with 3.5 mm amplitude<br>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                                                          |
| <b>Electrostatic discharge</b>                             |                                                                                                                                 |
| ESD resistance acc. to DIN EN 61131-2                      | Criterion B                                                                                                                     |
| • Test voltage                                             | 8 kV for air discharge<br>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 (SO<sub>2</sub>) and hydrogen sulphide (H<sub>2</sub>S)). 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-M-X7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | COREX-M-X5                                                                                                  |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Processor                                          | 11th Generation Intel® Core™/i7 Quad Core Processor i7-1185GRE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | INTEL ATOM X 6425RE Quad Core                                                                               |
| RAM                                                | 16 gigabytes of DRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 8 gigabyte DRAM                                                                                             |
| Internal physical read-only memory                 | 32 gigabyte, see also ➔ Chapter 5.10.1 “Wear parts” on page 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 16 gigabyte, see also ➔ Chapter 5.10.1 “Wear parts” on page 12                                              |
| Internal non-volatile random-access memory (NVRAM) | 2 megabyte                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2 megabyte                                                                                                  |
| Extensions                                         | <ul style="list-style-type: none"> <li>Extension option 1:<br/>Multi-Ethernet master/slave, 4 × RJ45 (weight: 106 g)<br/>or<br/>SSD memory 80 gigabyte (weight: 80 g)<br/>or<br/>AI accelerator module (weight: 150 g)</li> <li>Extension option 2:<br/>Multi-Ethernet master/slave, 4 × RJ45 (weight: 106 g)<br/>or<br/>SSD memory 80 gigabyte (weight: 80 g)<br/>or<br/>AI accelerator module (weight: 150 g)</li> <li>Extension option 3:<br/>Multi-Ethernet master/slave, 4 × RJ45 (weight: 106 g)<br/>or<br/>SSD memory 80 gigabyte (weight: 80 g)<br/>or<br/>AI accelerator module (weight: 150 g)</li> </ul> |                                                                                                             |
| Communication interfaces                           | RJ-45 <ul style="list-style-type: none"> <li>5 × Ethernet connection (10 Mbit, 100 Mbit, 1 Gbit)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | RJ-45 <ul style="list-style-type: none"> <li>5 × Ethernet connection (10 Mbit, 100 Mbit, 1 Gbit)</li> </ul> |
| Display port                                       | <ul style="list-style-type: none"> <li>1 × display port</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>1 × display port</li> </ul>                                          |
| USB                                                | 3 × USB host, TYPE C (USB3.1), maximum cable length of 3 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3 × USB host, TYPE C (USB3.1), maximum cable length of 3 m                                                  |
| Pushbutton                                         | —                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | —                                                                                                           |
| SD card                                            | Slot for SD card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Slot for SD card                                                                                            |
| Battery                                            | CR1025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CR1025                                                                                                      |
| Weight without extensions                          | 1200 g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1200 g                                                                                                      |
| Dimensions                                         | Refer to ➔ Chapter 10.1 “Housing dimensions” on page 21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                             |

## 7.2 Voltage supply and current consumption

|                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal voltage at U <sub>L</sub> and U <sub>P</sub>                                    | DC 24 V SELV/PELV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Maximum permitted voltage range of the supply voltage U <sub>L</sub> and U <sub>P</sub> | 19.2 V DC to 30 V DC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Current consumption of the control from U <sub>L</sub> at a nominal voltage of 24 V     | <div>Without I/O modules at U<sub>L</sub> = 24 V:</div> <ul style="list-style-type: none"><li>• COREplus X7: 2 A</li><li>• COREplus X7 with 80 GB SSD memory: 2.1 A</li><li>• COREplus X7 with Multi-Ethernet master/slave, 4 × RJ45: 2.2 A</li><li>• COREplus X7 with 3 × Multi-Ethernet master/slave, 4 × RJ45: 2.6 A</li><li>• COREplus X7 with AI: 2.6 A</li><li>• COREplus X5: 1.3 A</li><li>• COREplus X5 with SSD memory 80 GB: 1.4 A</li><li>• COREplus X5 with Multi-Ethernet master/slave 4 × RJ45: 1.5 A</li><li>• COREplus X5 with 3 × Multi-Ethernet master/slave, 4 × RJ45: 1.9 A</li><li>• COREplus X5 with AI: 1.9 A</li></ul> <div>With I/O modules at U<sub>L</sub> = 24 V plus up to 3 A</div>             |
| Power consumption of the control from U <sub>L</sub> at a nominal voltage of 24 V       | <div>Without I/O modules at U<sub>L</sub> = 24 V:</div> <ul style="list-style-type: none"><li>• COREplus X7: 48 W</li><li>• COREplus X7 with 80 GB SSD memory: 50.4 W</li><li>• COREplus X7 with Multi-Ethernet master/slave, 4 × RJ45: 52.8 W</li><li>• COREplus X7 with 3 × Multi-Ethernet master/slave, 4 × RJ45: 62.4 W</li><li>• COREplus X7 with AI: 62.4 W</li><li>• COREplus X5: 31.2 W</li><li>• COREplus X5 with SSD memory 80 GB: 33.6 W</li><li>• COREplus X5 with Multi-Ethernet master/slave, 4 × RJ45: 36.0 W</li><li>• COREplus X5 with 3 × Multi-Ethernet master/slave, 4 × RJ45: 45.6 W</li><li>• COREplus X5 with AI: 45.6 W</li></ul> <div>With I/O modules at U<sub>L</sub> = 24 V plus up to 72 W</div> |
| Current consumption U <sub>P</sub>                                                      | Typ. 5 mA (without I/O modules), 8 A max., at U <sub>P</sub> = 24 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Power consumption from U <sub>P</sub>                                                   | Typ. 0.12 W (without I/O modules), 192 W max., at U <sub>P</sub> = 24 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Reverse voltage protection of the supply voltage U <sub>L</sub> and U <sub>P</sub>      | Present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Fuse protection U <sub>L</sub>                                                          | Internal with a protective fuse of 10 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fuse protection U <sub>P</sub>                                                                                                     | <p>No internal fuse protection. The operator has to provide protection against overload by an external fuse.</p> <p>An overcurrent protective device with a maximum rating of 10 A must be fitted when the device is installed, e.g:</p> <ul style="list-style-type: none"><li>• Main switch acc. to <sup>UL489*</sup> (B-, C-, D-, K- or Z-characteristic)</li><li>• Class CC or Class J fuse acc. to UL248*</li></ul> <p>The overcurrent protective devices marked with "*" should be used in installations complying with UL standards.</p> |
| Overvoltage protection U <sub>L</sub> and U <sub>P</sub>                                                                           | Present; fuses can trigger in case of overvoltage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Transient protection U <sub>L</sub> and U <sub>P</sub>                                                                             | 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 <sub>L</sub> /U <sub>L</sub> GND) to the functional earth                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 24 V supply (U <sub>P</sub> /U <sub>P</sub> GND) to the functional earth                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 24 V supply voltage (U <sub>L</sub> /U <sub>L</sub> GND and U <sub>P</sub> /U <sub>P</sub> GND) to XF10, XF11, XF12, XF50 and XF52 | 1200 V DC (not evaluated by UL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| U <sub>L</sub> /U <sub>L</sub> GND to U <sub>P</sub> /U <sub>P</sub> GND                                                           | 1200 V DC (not evaluated by UL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>NOTICE</b>                                                                                                                      | <p><b>Electronic damage due to polarity reversal or due to a nominal current that is too low</b></p> <p>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.</p>                                                                                                                                                                                                                                                       |

## 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.

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

### 8.2 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 last published version of the EU declaration of conformity, go to the Bosch Rexroth download center: ➔ <https://www.boschrexroth.com/en/us/downloads/>, search term ➔ "DCTC-30455-001". For other versions (e.g. for older products), please contact your Bosch Rexroth representative.

## 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)

The proof of certification is available under the file number=E210730, see ➔ <https://iq.ulprospector.com/en/>.

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

## 8.4 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](http://www.boschrexroth.com/mediadirectory), search term: ➔ "DCTC-30455-031".



## 9 Interfaces

### 9.1 Interface description

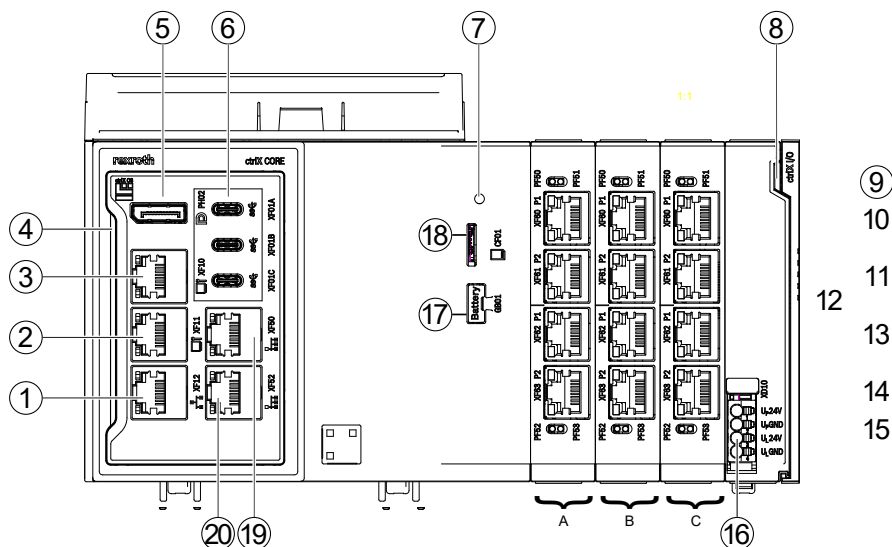


Fig. 4: Interfaces

- A Extension option 1 (optional)  
 B Extension option 2 (optional)  
 C Extension option 3 (optional)

| No. | Name  | Connection type          | Connector type     |  | Mating connector and cable |  |
|-----|-------|--------------------------|--------------------|--|----------------------------|--|
|     |       |                          | (Integrated)       |  | (From outside)             |  |
| ①   | XF12  | Ethernet                 | RJ45 socket        |  | RJ45 plug                  |  |
| ②   | XF11  | 10/100/1000 MBit         | 8-pin              |  | (twisted pair, 8-wire)     |  |
| ③   | XF10  | HMI and engineering port |                    |  |                            |  |
| ④   | –     | ctrlX CORE status LED    | –                  |  | –                          |  |
| ⑤   | PH02  | Display port             | Displayport socket |  | Displayport plug           |  |
| ⑥   | XF01A | USB host, USB 3.1        | USB socket, type C |  | USB plug, type C           |  |
|     | XF01B |                          |                    |  |                            |  |
|     | XF01C |                          |                    |  |                            |  |
| ⑦   | –     | Pushbutton               | –                  |  | –                          |  |
| ⑧   | –     | Device status LED        | –                  |  | –                          |  |
| ⑨   | PF50  | Status display PF50      | –                  |  | –                          |  |
|     | PF51  | Status display PF51      |                    |  |                            |  |

| No. | Name | Connection type                                                             | Connector type       | Mating connector and cable            |
|-----|------|-----------------------------------------------------------------------------|----------------------|---------------------------------------|
|     |      |                                                                             | (Integrated)         | (From outside)                        |
| ⑩   | XF60 | Multi-Ethernet, master/slave, 10/100 MBit, (configurable)                   | RJ45 socket<br>8-pin | RJ45 socket<br>(twisted pair, 8-wire) |
| ⑪   | XF61 | Multi-Ethernet, master/slave, 10/100 MBit, (configurable)                   | RJ45 socket<br>8-pin | RJ45 socket<br>(twisted pair, 8-wire) |
| ⑫   | –    | Endcover                                                                    | –                    | –                                     |
| ⑬   | XF62 | Multi-Ethernet, master/slave, 10/100 MBit, (configurable)                   | RJ45 socket<br>8-pin | RJ45 socket<br>(twisted pair, 8-wire) |
| ⑭   | XF63 | Multi-Ethernet, master/slave, 10/100 MBit, (configurable)                   | RJ45 socket<br>8-pin | RJ45 socket<br>(twisted pair, 8-wire) |
| ⑮   | PF52 | Status display PF52                                                         | –                    | –                                     |
|     | PF53 | Status display PF53                                                         |                      |                                       |
| ⑯   | XD10 | 24 V power connected, U <sub>i</sub> , U <sub>P</sub> , with status display | 4-pin                | 4-pin                                 |
| ⑰   | –    | Battery compartment                                                         | –                    | –                                     |
| ⑱   | –    | SD card holder                                                              | –                    | –                                     |
| ⑲   | XF50 | Ethernet                                                                    | RJ45 socket          | RJ45 plug                             |
| ⑳   | XF52 | 10/100/1000 MBit                                                            | 8-pin                | (twisted pair, 8-wire)                |

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.

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 (FAT16, FAT32 and EXT4 only) and USB devices that are supported by the system. 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 following velocities are supported:

- Low speed
- Full speed
- High speed
- Super speed

The maximum USB speed is 5 Gb/s



The maximum cable length allowed is 3 m.

**NOTICE****Device damage due to external supply via the USB interface**

The supply voltage (GND (U<sub>L</sub>)) at the 24 V power connector XD10 has to be connected always.

## 9.3 RJ45 interface

|      |                                              |
|------|----------------------------------------------|
| XF10 | HMI and engineering port                     |
| XF50 | Ethernet (configurable)                      |
| XF52 | Ethernet (configurable)                      |
| XF11 | HMI and engineering port                     |
| XF12 | HMI and engineering port                     |
| XF60 | Ethernet 10/100 MBit Ethernet (configurable) |
| XF61 | Ethernet 10/100 MBit Ethernet (configurable) |
| XF62 | Ethernet 10/100 MBit Ethernet (configurable) |
| XF63 | Ethernet 10/100 MBit Ethernet (configurable) |

## 9.4 Display port interface

A display port interface with the following specifications is located on the front side of the control:

- Standard DP++
- Maximum resolution 4096 × 2304, 60 Hz
- Automatic display detection (AUX channel)
- Compatible via adapter with DVI and HDMI
- The display port interface provides a voltage supply with DC 5 V and 0.5 A for external devices



The maximum cable length allowed is 3 m.

**NOTICE****Device damage due to external supply via the display port interface**

The supply voltage (GND (U<sub>L</sub>)) at the 24 V power connector XD10 has to be always connected.

## 9.5 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 5.3 “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.

## 9.6 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 43.



A discharged battery causes an incorrect system time.

## 10 Mounting, dismounting and electric installation

### 10.1 Housing dimensions

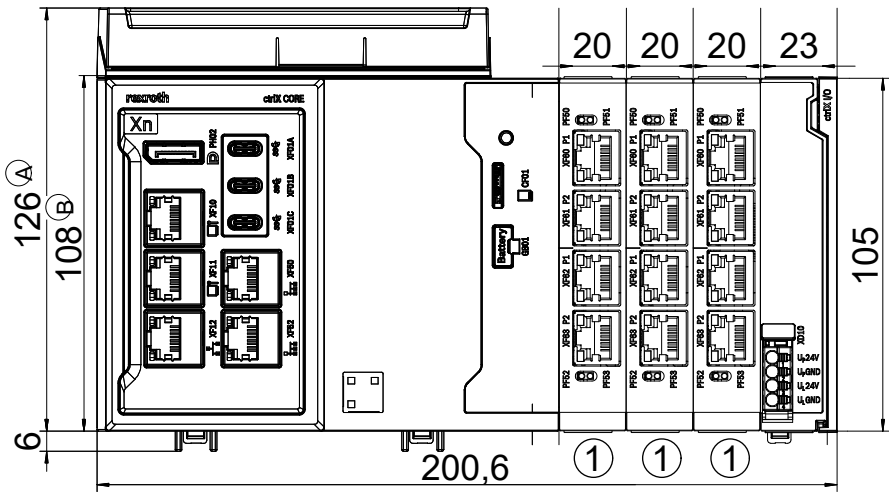


Fig. 5: Front view

- A Dimensions for X7 and X5 with optional fan
- B X5
- ① Optional

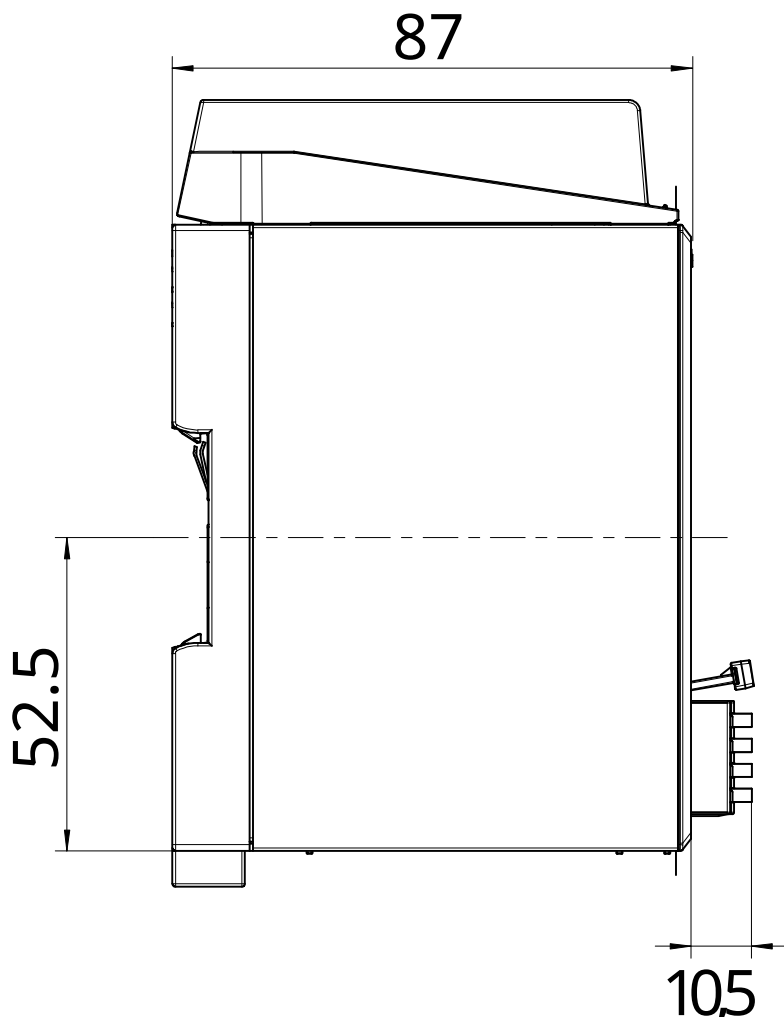


Fig. 6: Side view

## 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).

- Mounting rail

Mount the control on an electrically conductive 35 mm standard mounting rail. Its connection to the functional earth is sufficient. Only use a mounting rail with an design height of 7.5 mm (corresponds to TH 35-7.5 acc. to EN 60715).

The fastening distance of the mounting rails may not exceed 200 mm. This distance is required to ensure stability while mounting and dismounting the control.

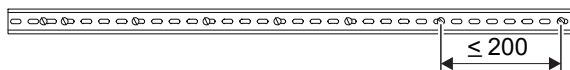


Fig. 7: Mounting rail fastening (in mm)

- Mounting position

To ensure air cooling in the device by convection, mount the control only vertically on a horizontal mounting 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.

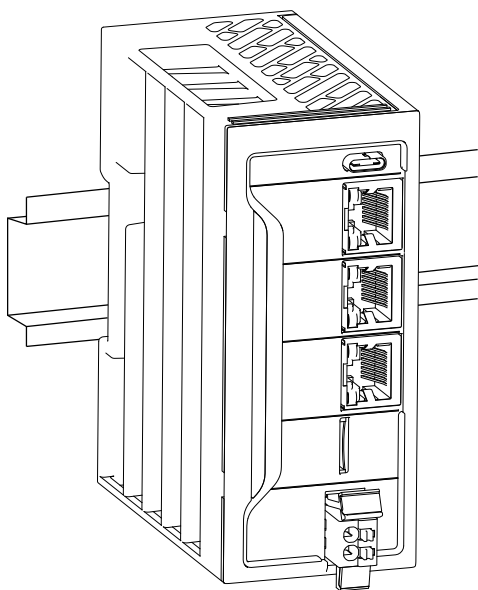


Fig. 8: Permitted mounting position for all ctrlX CORE controls

- 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 mounting 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 clamp 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 mounting 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.

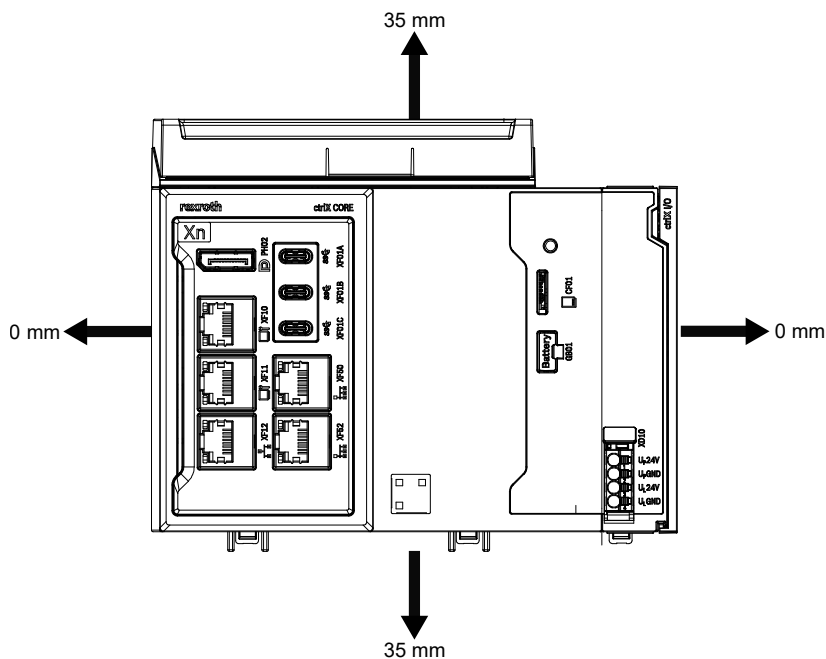


Fig. 9: Minimum distances for the circulation of ambient air

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

## 10.3 Mounting the control

### 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.

### 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.

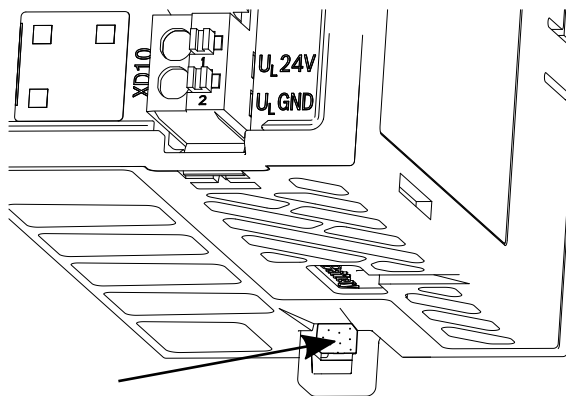


Fig. 10: Locking lever to release the clamping of the open position

### Mounting steps

1. ➤ Mount the control
2. ➤ Connect ctrlX I/O modules in series (optional)
3. ➤ Fasten endcover
4. ➤ Fasten end clamp



The control has up to 50 mounting cycles.

### 10.3.1 Mounting ctrlX I/O module

|                  |                                                                                                                                                                                                                                                                                                                                  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>▲ WARNING</b> | <b>Possible personal injury during plug assembly under voltage</b><br>For voltages outside SELV/PELV, the plug may only be mounted or dismounted in a de-energized state.<br>Observe the notes in the module data sheet.                                                                                                         |
| <b>NOTICE</b>    | <b>Damage of the device by plug mounting under voltage!</b><br>Disconnect the module and all connected module components from voltage before mounting or dismounting.                                                                                                                                                            |
| <b>NOTICE</b>    | <b>Damage of the device by short circuit of patch connectors</b><br>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. |
| <b>NOTICE</b>    | <b>Possible damage to property due to unintended mounting of the mounting rail</b> <ul style="list-style-type: none"><li>– Connect the mounting rail to a functional earth.</li><li>– Mount the module on a mounting rail.</li><li>– Install the module in a control cabinet or in an appropriate housing.</li></ul>             |
| <b>NOTICE</b>    | <b>Module is not fixed correctly due to open mounting rail fixture!</b><br>Before mounting, ensure that the mounting rail fixture of the control is not clamped in open position. If required, release the clamping using the locking lever as shown in the following figure.                                                    |

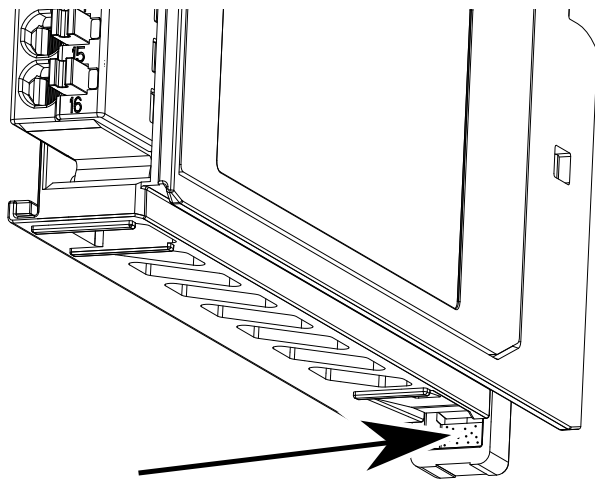


Fig. 11: Locking lever to release the clamping of the open position.

Each module has to be snapped separately.

### 10.3.2 Mounting the fan

1. ➤ Remove the housing cover on the X5 before installing the fan.
2. ➤ Engaging hook at the rear side of the fan ② into the control.
3. ➤ Hinge down the fan until the locking hook ① is engaged at the front of the control.

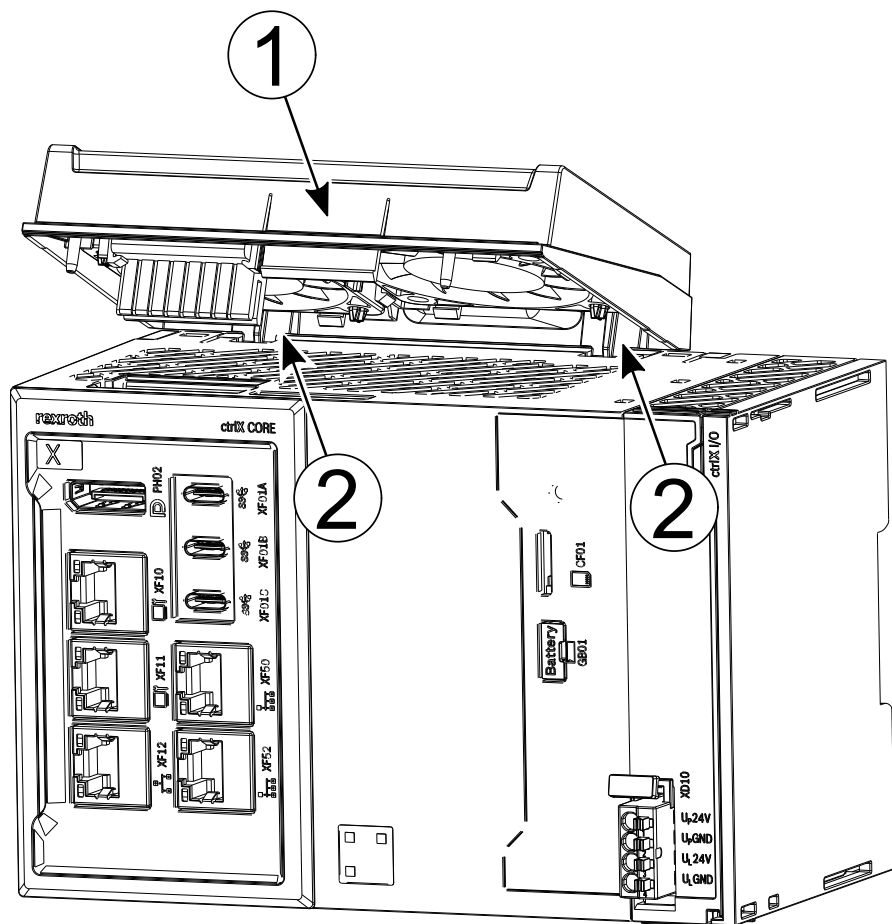


Fig. 12: Fan mounting

## 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 “Notes on safe decommissioning” on page 37.

### Removing the control from the top-hat rail

1. ➔ Remove the left or the right end clamp.
2. ➔ Remove the first ctrlX IO terminal from the ctrlX CORE<sup>PLUS</sup> 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].

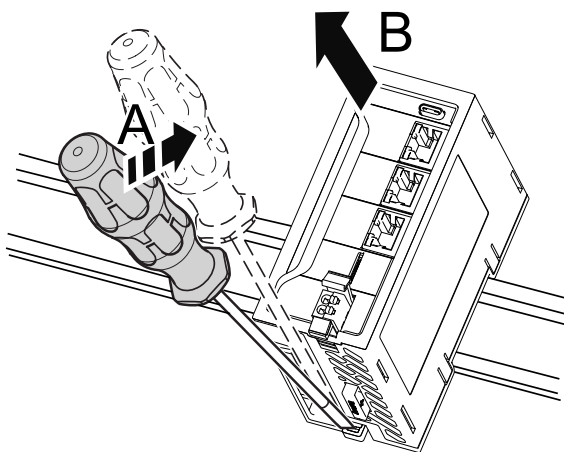


Fig. 13: Removing the control from the support rail



Before mounting the control on the support rail again, release the clamping of the open position again. Press the locking lever, see [Locking lever to release the clamping of the open position](#).

## 10.4.2 Dismounting the fan

1. ➔ Release the locking hook of the fan at the front, see ① in Fig. 12.
2. ➔ Hinge up the fan and disengage from device.

## 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 5.2 “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.

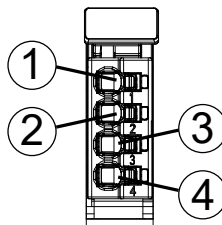


Fig. 14: Power connector XD10

Table 2: Pin assignment of the power connector XD10

| Plug contact | Signal | Function                                         | Color |
|--------------|--------|--------------------------------------------------|-------|
| 1            | 24 V   | +24 V DC supply voltage (U <sub>P</sub> )        | Red   |
| 2            | 0 V    | GND (U <sub>P</sub> ) (supply voltage grounding) | Blue  |
| 3            | 24 V   | +24 V DC supply voltage (U <sub>L</sub> )        | Red   |
| 4            | 0 V    | GND (U <sub>L</sub> ) (supply voltage grounding) | Blue  |

Notes on the electrical connection

- To avoid EMC interferences due to loop formation, 24 V voltage potential and ground (GND) have to be connected in star shape from the 24 V power supply unit to the connections for logic voltage (U<sub>L</sub>) and peripheral voltage (U<sub>P</sub>).
- Use only insulated copper wires suitable for at least 60 °C.

Tools

- Use the "Phoenix Crimpfox 6" crimping plier to crimp wire end ferrules. The ordering number is: "1212034 Crimpfox 6" at Phoenix Contact.
- Use a slotted screwdriver with a 2.5 mm blade.

Permitted lines

- Rigid lines  
Stripping length: 8.5 mm ±.5 mm, burr-free
- Flexible line without wire end ferrule  
Stripping length: The length of the stripped and 360° twisted braids has to be 8.5 mm ±0.5 mm
- Flexible line with wire end ferrule
- Use a cable cross-section corresponding to the current (minimum 0.2 mm<sup>2</sup>, maximum 1.5 mm<sup>2</sup>) to avoid an excessive increase in temperature. A cable cross-section of 1.5 mm<sup>2</sup> is specified for the power supply (U<sub>P</sub>) of 8 A. The minimum cable cross-section for the power supply (U<sub>L</sub>) is 0.75 mm<sup>2</sup>.
- The insulation of the cables used has to correspond to the rated voltage.

Wire end ferrules

- Wire end ferrules with and without insulating collar are permitted with a contact length of 8 mm according to DIN 46228.
- Maximum dimensions of the crimped wire end ferrule:  
Height 1.45 mm  
Width 2.34 mm
- Twin wire end ferrules are not permitted.

Orientation of the wire end ferrules

- The orientation of the wire end ferrule in the clamping point has to be vertical.

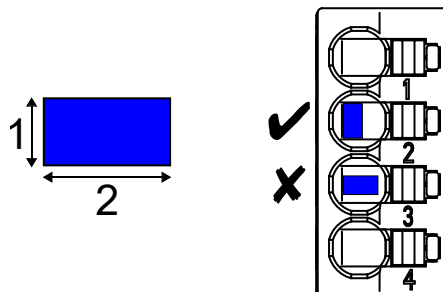


Fig. 15: Orientation of the wire end ferrules in the clamping point

- 1 Height of the crimped wire end ferrule
- 2 Width of the crimped wire end ferrule

### Installing lines

- Press the pusher with a suitable slotted screwdriver.
- Insert the line into the clamping point as far as possible.
- Release the pusher.

### Uninstalling lines

- Press the pusher with a suitable slotted screwdriver.
- Remove line.
- Release the pusher.

### Mounting notes for UL certification

#### Permitted lines

- Use flexible lines with wire end ferrules for UL devices.
- The following wire end ferrules are permitted:
  - Wire end ferrules with insulating collar as per the table:

| Cable cross-section in AWG | Cable cross-section mm <sup>2</sup> | Ordering numbers of the wire end ferrules (Weidmüller company) |
|----------------------------|-------------------------------------|----------------------------------------------------------------|
| 24 AWG                     | 0.2 mm <sup>2</sup>                 | 9025760000, 500 pieces                                         |
| 22 AWG                     | 0.35 mm <sup>2</sup>                | 9025770000, 500 pieces                                         |
| 20 AWG                     | 0.5 mm <sup>2</sup>                 | 0690700000, 500 pieces                                         |
|                            |                                     | 1476230000, 100 pieces                                         |
| 18 AWG                     | 0.75 mm <sup>2</sup>                | 0462900000, 500 pieces                                         |
|                            |                                     | 1476240000, 100 pieces                                         |

|        |                     |                        |
|--------|---------------------|------------------------|
| -      | 1 mm <sup>2</sup>   | 0463000000, 500 pieces |
|        |                     | 1476250000, 100 pieces |
| 16 AWG | 1.5 mm <sup>2</sup> | 0463100000, 500 pieces |
|        |                     | 1476270000, 100 pieces |

## Orientation of wire end ferrules

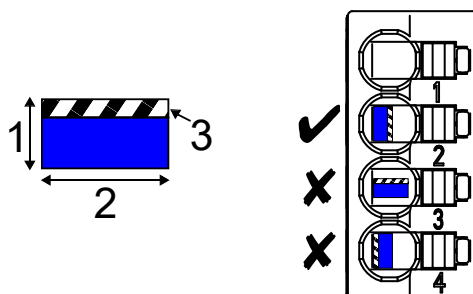


Fig. 16: Orientation of the wire end ferrules in the clamping point

- 1 Height of the crimped wire end ferrule
- 2 Width of the crimped wire end ferrule
- 3 Crimped side of the wire end ferrule

## Positioning peripheral plug

1. ➞ Position the peripheral plug on the peripheral plug holder, see ①.
2. ➞ The peripheral plug engages at the locking lever, see ②

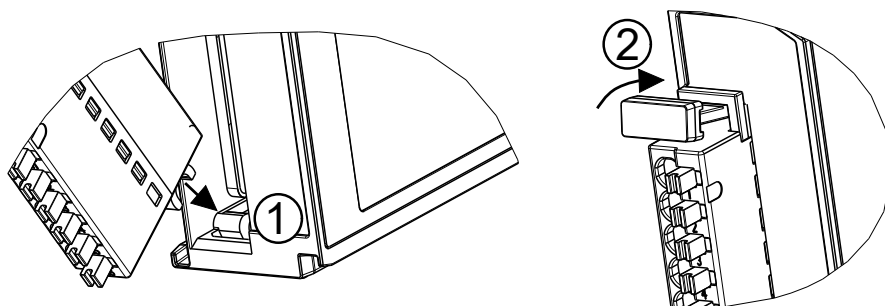


Fig. 17: Positioning peripheral plug

## Removing peripheral plug

1. ➞ Press the locking lever of the peripheral plug, see ①.
2. ➞ Remove the peripheral plug, see ②.

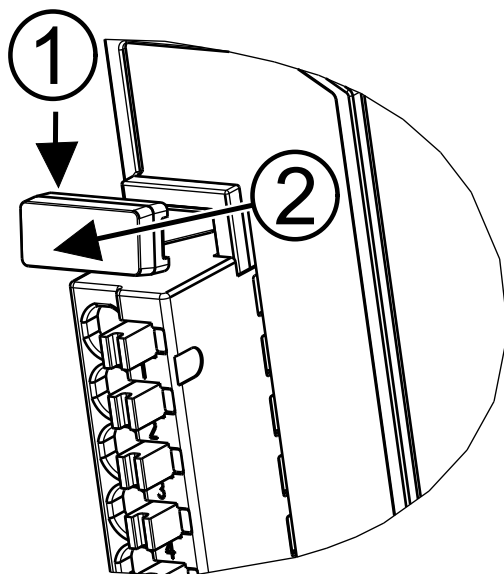


Fig. 18: Removing peripheral plug

### 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 30.



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

## Setup without electrical isolation

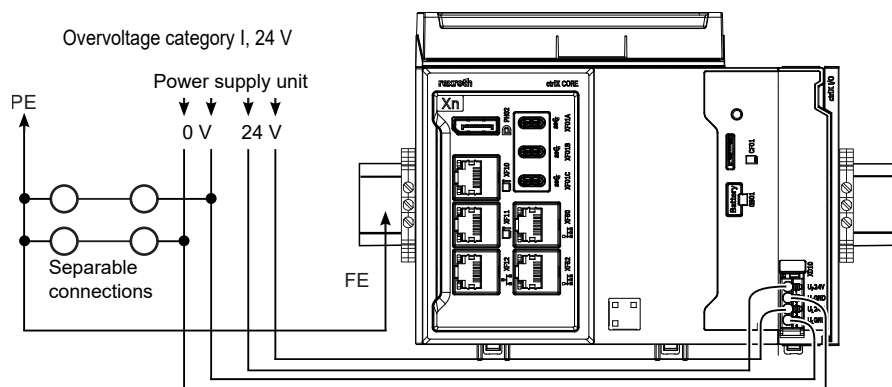


Fig. 19: Setup of the voltage supply



Control does not start in case of reverse input voltage.

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

## 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).

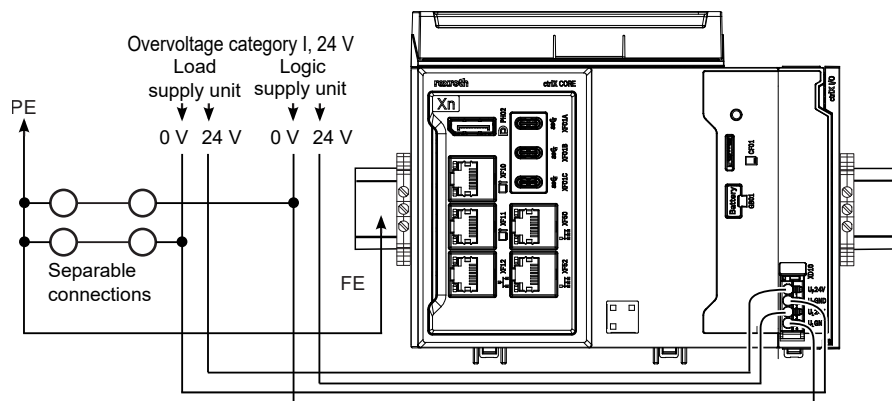


Fig. 20: Setup of the voltage supply

## 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 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 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 30](#).

### 11.3 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 is a high performance compact control in embedded format suitable for the support rail mounting and for its use in a control cabinet.

With Quad Core Intel® Core™/i7-CPU of the 11th generation for the X7 or with the INTEL ATOM X 6425RE Quad Core CPU for the X5, 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 Multi-Ethernet, master/slave, 4 × RJ45

The Multi-Ethernet module "Master/Slave 4 × RJ45" is a Dual 10/100 Mbit master/slave field bus extension.

The field bus functionality can be configured via the software.

### ▲ WARNING



#### Risk of injury by hot surfaces

In the event of a fault, the surface of the module can become very hot.

- Disconnect from supply voltage.
- Allow the device to cool down.
- For further information, contact the Bosch Rexroth Service.

## 12.3 SSD

The SSD (solid state disk) is an optical memory extension.

## 12.4 AI accelerator module

The AI extension is an accelerator module for AI applications based on the Hailo-8 AI processor with 26 tera operations per second (TOPS) and high energy efficiency to enable low-power neural network computations.

## 12.5 Fan of AI accelerator module

The fan unit, with the two axial fans suitable for industrial use, ensures an optimum cooling of the AI accelerator module.

The fan unit is essential to operate the AI accelerator module. A missing fan unit or a defective fan can cause overheating and thus the shutdown of the AI extension. The fan is not speed-controlled. The user has to replace the fan unit before the end of its service life.

The fan unit can be changed without tools, see ➔ Chapter 10.3.2 "Mounting the fan" on page 27.

### NOTICE

#### Material damage due to fan replacement during operation

Only change the fans when the power is switched off

The fan unit can be ordered as spare part, see ➔ Chapter 5.7 "Fan for AI accelerator module" on page 11.

## 12.6 Fan

The fan unit, with the two axial fans suitable for industrial use, ensures an optimum cooling of the ctrlX CORE<sup>PLUS</sup>. The fan unit is essential to operate the X7 and the X5 above 50 °C. A missing fan unit or a defective fan can cause overheating and thus the safe shutdown of the ctrlX CORE<sup>PLUS</sup>. The fans are speed-controlled; depending on the CPU temperature. The fans are monitored and a failure is reported to the user. The fan unit can be changed without tools, see ➔ Chapter 10.3.2 “Mounting the fan” on page 27.

### NOTICE

#### Material damage due to fan replacement during operation

Only change the fans when the power is switched off

The fan unit can be ordered as spare part, see ➔ Chapter 5.6 “Fan” on page 11.

## 12.7 License dongle

The license dongle is a MicroSD card with a serial number. It can be inserted into the ctrlX CORE to enable functions on the control. Licenses can be assigned to the dongle instead of directly to the ctrlX CORE control. This allows the dongle to easily transfer licenses between different controllers.

In addition, the dongle has a memory area in which setup files or images can be stored. This enables device replacement without PC in the event of servicing, see also:

➔ Apply external data carrier to device.

## 12.8 Status displays

There are following status displays on the ctrlX CORE<sup>PLUS</sup>: The ctrlX CORE status LED, PF30-NET-ST-LED, PF50 to PF53 and device status LED.

### 12.8.1 ctrlX CORE status LED

The ctrlX CORE status LED is a device diagnostics LED. The exact description can be found in the following documentation:

- ctrlX OS Runtime, Application Manual ➔ R911421590
- ➔ [https://docs.automation.boschrexroth.com/cdphelp?keyword=ctrlX\\_CORE\\_MANUAL\\_diagnostics\\_LED\\_state](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.

### 12.8.2 Status display at the power connector XD10 ctrlX CORE<sup>plus</sup>

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

### 12.8.3 Status displays PF50 to PF53 LED

The status displays PF50 to PF53 are field bus slave LEDs. For a detailed description, refer to the documentation. See ➔ [R911386579](#).

### 12.8.4 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](#).

## 12.9 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.

## 12.10 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.

### 12.10.1 Secure Boot

Bootng 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.

## 12.11 Backing up remanent data

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

## 12.12 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 43.

It is recommended to set the time via SNTP.

## 12.13 License information

### 12.13.1 General information

This product contains software components licensed by the right holders as Free Software respectively Open Source Software under one or more of the licenses mentioned below and thus require their source code to be made available. The source code of these software components is not being delivered altogether with the product. Instead, for the licenses listed below, Bosch Rexroth offers to provide the source code on request. Please send your query to obtain the source code via email to ➔ [open.source@boschrexroth.de](mailto:open.source@boschrexroth.de) or via mail to the following address:

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

- a. For those software components that are licensed under the GNU General Public License version 2 and/or 3, respectively the GNU Library General Public License version 2, and/or GNU Lesser General Public License version 2.1 and/or 3.0, Affero General Public License version 1,2 and/or 3, the 7-Zip License or eCos License 2.0 the following applies:
  - Everyone has the right to receive the corresponding source code of these software components from us.
  - This offer is valid for a time period of up to three years after the last assignment of the object code by Bosch Rexroth; notwithstanding the foregoing, in case of a licensing under the GNU General Public License version 3, the Affero General Public License version 3 or the GNU Lesser General Public License version 3.0 the offer remains valid as long as Bosch Rexroth offers spare parts or support for the product.
  - The corresponding source code will include, to the extent required by the applicable license, all the source code needed to generate, install and (if it is an executable work) run the object code and to modify the work.
  - Bosch Rexroth reserves the right to charge for performing the distribution of the corresponding source code the incidental costs of creating the data carrier (CD-ROM, DVD or USB memory stick) plus postage.
  - Please state where the corresponding source code shall be sent to. Additional information to the product (e.g. product identification, serial number) would help us to identify the corresponding source code.

- For those software components or corresponding source code that are either licensed under Mozilla Public License (MPL) version 1.0, 1.1 or 2.0, the Common Development and Distribution License (CDDL) version 1.0, Nokia Open Source License (Nokia or NOKOS) Version 1.0a, Common Public Attribution License v.1.0 or fall under the exception of the Modified GPLv2 FreeRTOS License (Exception), the following applies:
  - If you have received such software components from Bosch Rexroth, Bosch Rexroth will provide to you upon request the corresponding source code of the software component licensed under the terms of the applicable above-mentioned license either, depending on the volume, via email or file hosting service.
  - 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 3: 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"><li>• Check whether the device driver was correctly installed in the “Device manager” of the system control.</li><li>• 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.</li></ul> |



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

|               |                                                                                                                                                                                                                                                     |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOTICE</b> | <b>Maintenance work in the device is only permitted by trained staff!</b><br>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 ordering information

The ctrlX CORE controls are provided with the ctrlX OS operating system. They can also be delivered including licenses for function packages. Thus, variants with individual ordering information result from the required functional scope.

The corresponding functional scope can be configured in the ctrlX Configurator, see ➔ <https://www.boschrexroth.com/ctrlx-configurator/>.

## 15.2 Type code

|         |       |   |   |   |    |   |    |   |   |   |   |   |   |    |   |    |   |    |    |   |    |    |   |    |
|---------|-------|---|---|---|----|---|----|---|---|---|---|---|---|----|---|----|---|----|----|---|----|----|---|----|
| No.     | 1     | . | 2 | . | 3  | . | 4  | 5 | 6 | 7 | 8 | . | 9 | 10 | . | 11 | . | 12 | 13 | . | 14 | 15 | . | 16 |
| Example | COREX | - | M | - | X7 | - | 31 | B | 7 | 7 | 7 | - | 2 | 1  | - | 01 | - | 02 | RS | - | N  | N  | - | L1 |

| No. | Characteristic name            | Characteristic value | Text                                                                                            |
|-----|--------------------------------|----------------------|-------------------------------------------------------------------------------------------------|
| 1   | Product                        | COREX                | ctrlX CORE                                                                                      |
| 2   | Design                         | C                    | Compact                                                                                         |
|     |                                | M                    | Modular                                                                                         |
| 3   | Performance class              | X2                   | CPU version X2                                                                                  |
|     |                                | X3                   | CPU version X3                                                                                  |
|     |                                | X5                   | CPU version X5                                                                                  |
|     |                                | X7                   | CPU version X7                                                                                  |
| 4   | Device configuration           | 11                   | Device configuration 11, CPU basic device (2 GB RAM, 4 GB hard drive, 1 MBit retentive memory)  |
|     |                                | 21                   | Device configuration 21, CPU basic device (8 GB RAM, 16 GB hard drive, 2 MBit retentive memory) |
|     |                                | 31                   | Device configuration 31, CPU basic device (16 GB RAM, 32 GB hard drive, 2 MB retentive memory)  |
| 5   | Basic interfaces               | A                    | Configuration A, 1 × HMI/Engineering, 1 × Fieldbus master, 1 × configurable                     |
|     |                                | B                    | Configuration B, 1 × HMI/Engineering, 1 × Fieldbus master, 1 × configurable, 1 × IO connection  |
| 6   | Onboard extensions 1           | N                    | None                                                                                            |
|     |                                | 1                    | Multi-Ethernet Slave, 2 × RJ45                                                                  |
|     |                                | 2                    | Multi-Ethernet Master/Slave, 4 × RJ45                                                           |
|     |                                | 4                    | AI module                                                                                       |
|     |                                | 7                    | Memory 80 GB                                                                                    |
| 7   | Onboard extensions 2           | N                    | None                                                                                            |
|     |                                | 2                    | Multi-Ethernet Master/Slave, 4 × RJ45                                                           |
|     |                                | 4                    | AI module                                                                                       |
|     |                                | 7                    | Memory 80 GB                                                                                    |
| 8   | Onboard extensions 3           | N                    | None                                                                                            |
|     |                                | 2                    | Multi-Ethernet Master/Slave, 4 × RJ45                                                           |
|     |                                | 4                    | AI module                                                                                       |
|     |                                | 7                    | Memory 80 GB                                                                                    |
| 9   | Protection class               | 2                    | IP20                                                                                            |
| 10  | Reserve                        | 1                    | Reserve                                                                                         |
| 11  | Device version                 | 01                   | Without                                                                                         |
| 12  | Runtime version                | 01                   | Version 01                                                                                      |
|     |                                | 02                   | Version 02                                                                                      |
| 13  | Runtime release                | RS                   | Current release                                                                                 |
| 14  | Extended certification         | N                    | None                                                                                            |
| 15  | Subject to export control (EU) | N                    | No export license required                                                                      |

| No. | Characteristic name | Characteristic value | Text                |
|-----|---------------------|----------------------|---------------------|
| 16  | Special variant     | NN                   | None                |
|     |                     | B1                   | Robert Bosch 1      |
|     |                     | W1                   | Customer specific 1 |
|     |                     | L1                   | Customer specific 2 |

## 15.3 Accessories and spare parts

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

### 15.3.1 ctrlX Configurator

The ctrlX Configurator is a web-based application to configure ctrlX AUTOMATION solutions, ➔ <https://www.boschrexroth.com/ctrlx-configurator/>.

## 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>

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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R911419122 05