ctrlX I/O

System Module XI812101
Power Feeding U_P with Diagnostics

DOK-XIO***-XI812101***-DA02-EN-P

R911421208
Edition 02

1 Functional description

The active power feeding XI812101 is used to feed in the peripheral circuitry again (U_P) in a ctrlX I/O station. It supplies the connected I/O modules with the peripheral voltage (U_P) of DC 24 V, 8 A, which is internally galvanically isolated from the peripheral voltage supply of the preceding modules. The voltage and the current fed in are measured internally and applied to the process data.

The logic voltage supply as well as the EtherCAT-based module communication are routed through the module.

Fig. 1: Module XI812101

ℹ For an application manual of the ctrlX I/O modules, refer to the media directory ➦ www.boschrexroth.com/mediadirectory and enter the search term ➦ "R911423458".

ℹ Ensure that the current documentation is consulted. For the current documentations, go to ➦ www.boschrexroth.com/mediadirectory and enter the module type as search term.

ℹ For the integration into the parent system, the respective ESI files are available. For the ESI files, go to ➦ http://www.boschrexroth.com/electrics, search term "➦ ESI-Files".

2 Ordering data

2.1 Module

Type	Part number	Description
XI812101	R911406094	Power feeder module U_P 8 A (active)

2.2 Power connector, 24 V

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

3 Technical data

3.1 General technical data

	XI812101
Connection technique	Push-in
Nominal voltage (U_L/U_P)	DC 24 V (19.2 V to 30 V, including tolerance and residual ripple) PELV/SELV (safety extra-low voltage)
Current consumption U_L at a nominal voltage of 24 V	40 mA
Current consumption U_P at a nominal voltage of 24 V	Typ. 5 mA (without I/O modules, 8 A max. (complete system with I/O modules)
Max. power consumption of the module	2.64 W
Power consumption U_P at a nominal voltage of 24 V	Typ. 0.12 W (without I/O modules), 192 W max. (complete system with I/O modules)
Reverse polarity protection (U_P)	Present
Fuse protection (U_P)	No internal fuse protection. The operator has to provide protection against overload by an external fuse.
Overvoltage protection U_P	Present, external fuses can trigger in case of overvoltage.
Transient protection U_P	Present, suppressor diodes, pulse load up to 1500 W
Voltage dips at power supply interfaces	PS1 < 1 ms, evaluation criterion A
Bit width, input data in the process data image (including fill bits)	6 bytes
Configuration	No address or configuration setting required
Dimensions	20 mm × 105 mm × 99 mm (width × height × depth)
Weight	100 g (module including connector)
Electrical isolation	DC 1200 V U_P to U_L, DC 707 V U_P/U_L to FE, tested for 60 s each (not evaluated by UL)
EMC resistance	Acc. to EN 61000-6-2 and EN 61000-6-4
Mounting position	Vertical, on a horizontal mounting rail
Labeling, approvals	CE, UKCA, UL

3.2 Internal schematic diagram

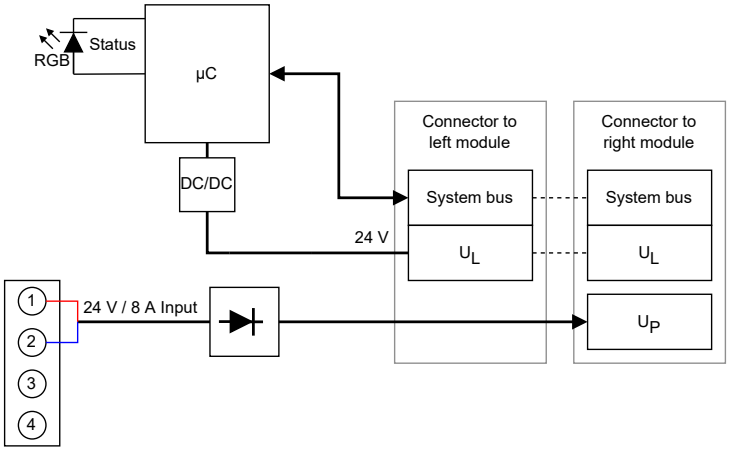


Fig. 2: Internal schematic diagram

3.3 Ambient conditions

Ambient temperature	
≤ 2,000 m	-25 to +55 °C
2,000 m to 3,000 m:	-25 to +50 °C
3,000 m to 4,000 m:	-25 to +45 °C
4,000 m to 5,000 m:	-25 to +40 °C
Maximum operating altitude Acc. to DIN 60204	5,000 m
Ambient temperature (storage and transport)	-40 to +70 °C
Permitted air humidity according to DIN EN 61131-2 (Operation, storage, transport)	10 to 95 %
Degree of protection Acc. to DIN EN 60 529	IP20 (not evaluated by UL)
Protection class Acc. to DIN EN 61010-2-201	III
Overvoltage category Acc. to IEC 60664-1	2
Contamination level Acc. to EN 61010-1	2, no condensation

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_2) and hydrogen sulphide (H_2S)). The device is not resistant against these gases.

NOTICE

Defective device due to overheating

To avoid overheating and to ensure a trouble-free operation of the device, the ambient air has to circulate. Also refer to the section “Installation notes”.

3.4 Mechanical tests

Vibration resistance Acc. to DIN EN 60068-2-6	Oscillations, sinusoidal in all three axes, 5 Hz - 8,4 Hz with 3.5 mm amplitude
	8.4 Hz -150 Hz with 1 g peak acceleration
Shock test Acc. to DIN EN 60068-2-27	Shock stress: Shock resistance in all three axes
	11 ms semi-sinusoidal 15 g
Broadband noise Acc. to DIN EN 60068-2-64	20-500 Hz with 1.22 g RMS (Root Mean Square), 30 min in all three axes

For the current approvals, go to
➦ www.boschrexroth.com/electrics.

4 For your safety

4.1 Intended use

Use the module only as specified in the data sheet.

4.2 User qualification

The product use described in this data sheet is only intended for qualified electricians and staff trained by these qualified electricians. The user has to be familiar with the known safety concepts on automation technology, applicable standards and other guidelines.

4.3 Electrical safety

NOTICE

Loss of electric safety

Unintended handling can affect the device safety! Observe the notes in the present data sheet during installation, commissioning and operation.

5 Object directory

5.1 CoE standard objects

The object directory contains objects that can be triggered via SDO services. These are defined in the ETG standards:

Index (hex)	Name
1000	Device type
1001	Error register
1008	Device name
1009	Hardware version
100A	Software version
1018	Identify
10F1	Error settings
10F3	Diagnosis history
10F8	Timestamp object
1Ann	PDO Mapping TxPDO
1C00	Sync manager type
1C12	Sync manager 2 assignment
1C13	Sync manager 3 assignment
1C33	SM input parameter
F000	Modular device profile

5.2 Module-specific CoE objects

Objects with a module-specific design are described in the following table.

Index (hex)	Object name	Data type	Access	Description
A000	**ModuleIdentification**			
A000:0	Material number	String(20)	RO	Part number of the module
A010:0	Full serial number	String(20)	RO	Complete serial number of the module
F100	**Module diagnostics and information**			
F100:01	Periphery voltage OK	BIT1	RO	Indicates the peripheral voltage state, 1 = OK; 0 = Not OK
F100:02	Error	BIT1	RO	General module error

6 Process data

6.1 Process data of the module

Index (hex)	Object name	Data type	Access	Description
6000	**U_P Supply periphery**			
6000:01	U_P Voltage	Uint16	RO	Voltage of U_P in mV
6000:02	U_P Current	Uint16	RO	Current of U_P in mA
6020	**State**			
6020:01	U_P Undervoltage	Bit	RO	In case of undervoltage of U_P, the bit is set to 1.
6020:02	U_P Overvoltage	Bit	RO	In case of overvoltage of U_P, the bit is set to 1.
6020:03	U_P Overcurrent	Bit	RO	In case of overcurrent of U_P, the bit is set to 1.
6020:04	–	Bit13	–	Fill bits

Table 1: Process data

7 Diagnostic strategy

7.1 Mechanisms

Mechanism	Diagnostics
EtherCAT state machine	EtherCAT system diagnostics
EtherCAT hardware watchdog	
Diagnostic objects in the CoE object directory	Extended diagnostics, e.g. peripheral errors
10F1	Error settings
Diagnosis history object	20 diagnostic messages can be stored
10F3	Diagnosis history
Module status LED	Shows the general module status
Channel status LED	Signals the state of the voltage supply

7.2 Status codes

Error, warning	Text ID (hex)	Text
1000	Error	Module error %s
1020	Warning	Error during update, data corrupted, please update again
2316	Error	Overcurrent at periphery power supply (U_P)
3410	Warning	Periphery supply voltage (U_P) is too high
3420	Warning	Periphery supply voltage (U_P) is too low

7.3 Module status LED

Device state	LED flashing pattern
Booting	BU BU BU BU BU -- -- -- -- -- ⮌
Initialization	BU BU BU BU BU BU BU BU BU BU ⮌
It is currently configured. Module not yet ready.	GN GN GN GN GN -- -- -- -- -- ⮌
Process data transmission, outputs inactive.	GN GN GN GN GN GN GN GN GN -- ⮌
Module in "Run" state	GN GN GN GN GN GN GN GN GN GN ⮌
Error and warning states	
Logic or peripheral voltage error	RD RD RD RD RD RD RD RD RD RD ⮌
Communication or configuration error	RD RD RD RD RD -- -- -- -- -- ⮌

One square corresponds to a period of 200 ms.
The arrow represents the end of a cycle.

-- LED is not on.

BU LED is blue.

GN LED is green.

RD LED is red.

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.

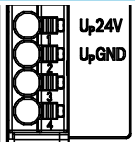
7.4 Channel status LED

The voltage supply input has an LED on the 24V pin.

LED	Meaning
Green	Voltage applied
Off	Voltage missing or incorrectly wired

8 Installation

8.1 Clamping point assignment

Clamping point	Assignment	Color	Maximum current
	U_P 24 V	Red	8 A
	U_P GND	Blue	8 A
	Not contacting	Red	
	Not contacting	Blue	

8.2 Connection instructions

8.2.1 Connecting the voltage supply

The voltage supply for logic and peripherals is provided via the front connector. Logic and peripheral voltages are galvanically isolated internally. Both inputs have reverse polarity protection.

Peripheral voltage supply

The peripheral voltage is measured in the bus coupler and forwarded directly to the I/O modules. The input has no internal protection against overcurrent.

NOTICE

Electronic damages

An overcurrent protective device with a maximum rating of 10 A must be fitted when the device is installed, e.g:

- main circuit breaker acc. to UL489(*) (B-, C-, D-, K- or Z-characteristics)
- Class CC or Class J fuse acc. to UL248(*)

The overcurrent protective devices marked with "*" should be used in installations conforming to UL standards.

8.3 Connection example

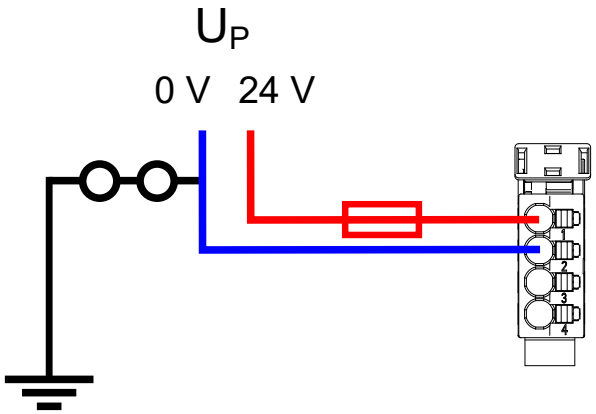


Fig. 3: Connection example

8.4 Mounting and installation

The application manual for the ctrlX I/O modules contains notes on installation, mounting and dismounting. For the application description, go to:

- ➦www.boschrexroth.com/MediaDirectory, Search term: ➦"R911423458"
  or
- ➦https://docs.automation.boschrexroth.com/doc/4126711705/ctrx-i-o-anwendungsbeschreibung/latest/en/.

NOTICE

Destruction of the device due to non-compliance with the application manual

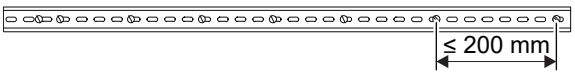
Follow the mounting instructions in the application manual to ensure a correct mounting and to prevent damage to the device.

NOTICE

Device destruction 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 module.

- Mounting location
  The module has the degree of protection IP 20 and is thus intended for use in a closed control cabinet or control box (terminal box) with the degree of protection IP 54 or higher. The control cabinet fulfills the function of the final safety enclosure. The modules must be installed in the final safety enclosure. They have to be provided with sufficient rigidity according to UL 61010-1, 61010-2-201 and have to meet the requirements with regard to fire propagation.
- End clamps
  Fasten end clamps of the type SUP-M01-ENDHALTER (R911170685) on both sides of the station. End clamps ensure the correct fastening on the support rail and are used as lateral end elements. Always fasten one end clamp of the station before mounting the station. This ensures the following:
  - It impedes the shifting of the modules
  - The installation place for the end clamp is secured.
- Endcover
  At the end of each ctrlX I/O station, slide an endcover of type XACC-2-END-COVR onto the last module. The endcover is included in the scope of delivery of the bus coupler. Sliding on the endcover ensures protection against accidental contact.
- Mounting rail
  Mount the module on a 35 mm standard support rail. Use only a TH 35-7.5 support rail acc. to EN 60715. The fastening distance of the support rails may not exceed 200 mm. This distance is required to ensure stability while mounting and dismounting the module.



- Provide the following minimum distances for sufficient cooling:

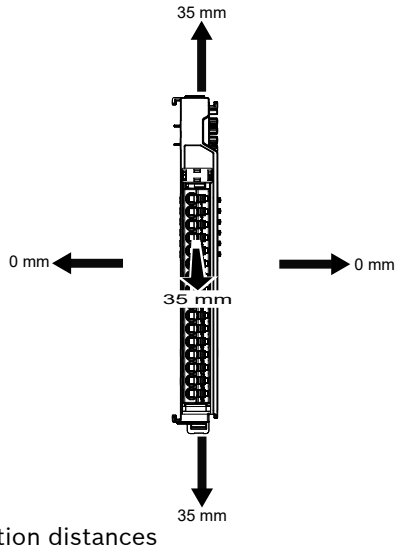


Fig. 4: Ventilation distances

- Additionally, provide sufficient distance for mounting, dismounting, plugs and cables.
- If more devices are connected in series to the station on the left or right, the surface temperature may not exceed 60° C
- 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 permitted values, refer to the chapter "Ambient conditions" of the respective module data sheet.

8.4.1 Mounting the ctrlX I/O module

NOTICE

Damage of the device by plug mounting under voltage!

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

NOTICE

Damage of the device by short circuit of patch connectors

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

NOTICE

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

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

NOTICE

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

Before mounting, ensure that the support arm mounting of the control is not in open position. If required, release the clamping of the open position using the locking lever, refer to the following figure Fig. 5.

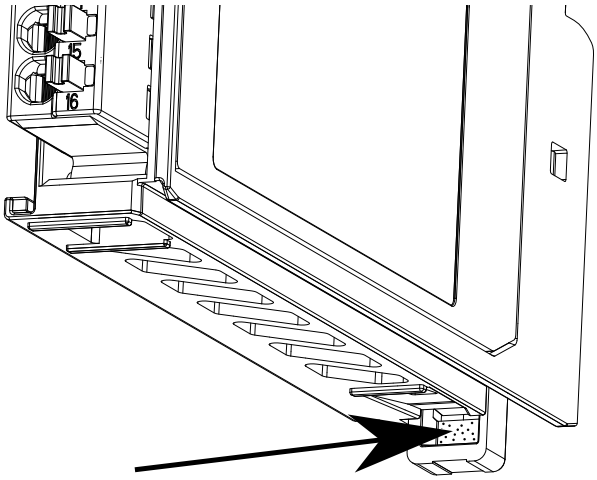


Fig. 5: Locking lever to release the clamping of the open position.

Each module has to be snapped separately.

8.4.2 Positioning plug

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

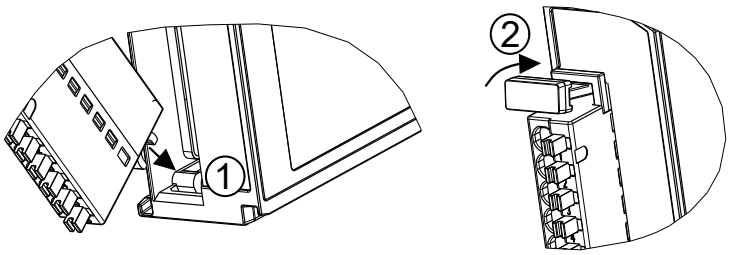


Fig. 6: Positioning plug

8.4.3 Removing plug

1. Press the locking lever of the plug at the top, see ①
2. Remove the plug , see ②.

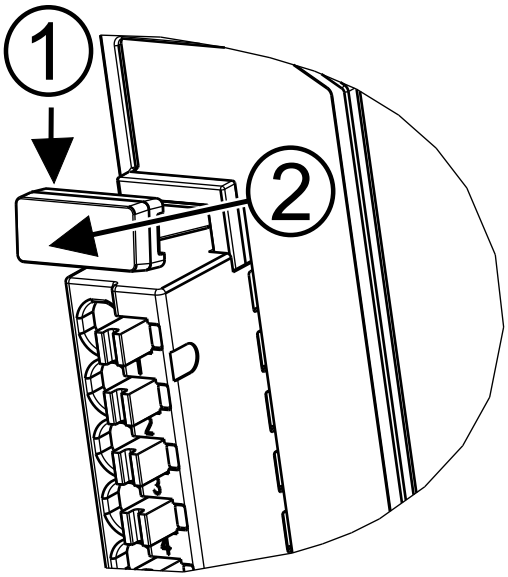


Fig. 7: Removing plug

8.4.4 Dismounting module

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

NOTICE

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

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

Removing module from support rail

1. Use a suitable tool (e.g. slotted screwdriver) and put it into the lower disengaging mechanism (base latch) of the module and disengage the module (see (A) in the following figure). The base latch is locked in the open position.
2. Remove the module vertically to the support rail [see (B) in the following figure].

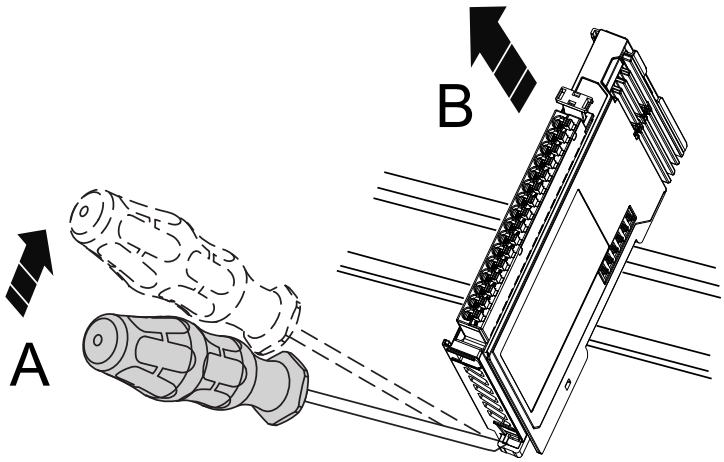


Fig. 8: Removing module from support rail

ℹ Before mounting the module on the support rail again, release the clamping of the open position again. Press the locking lever, refer to the figure Fig. 5.

8.4.5 Electric installation

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_L) and peripheral voltage (U_P).
- Use only insulated copper wires suitable for at least 75 °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^2, maximum 1.5 mm^2) to avoid an excessive increase in temperature. A cable cross-section of 1.5 mm^2 is specified for the power supply (U_P) of 8 A. The minimum cable cross-section for the power supply (U_L) is 0.75 mm^2.
- 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.

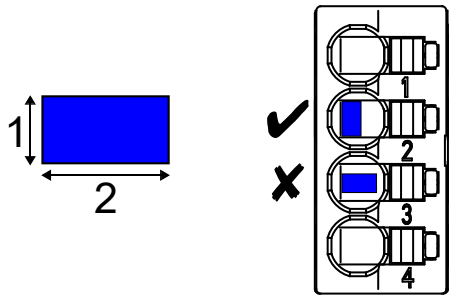


Fig. 9: Orientation of the wire end ferrules in the clamping point
1 Height of the crimped wire end ferrule
2 Width of the crimped wire end ferrule

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 mm²	Ordering numbers of the wire end ferrules (Weidmüller company)
24 AWG	0.2 mm²	9025760000, 500 pieces
22 AWG	0.35 mm²	9025770000, 500 pieces
20 AWG	0.5 mm²	0690700000, 500 pieces
		1476230000, 100 pieces
18 AWG	0.75 mm²	0462900000, 500 pieces
		1476240000, 100 pieces
-	1 mm²	0463000000, 500 pieces
		1476250000, 100 pieces
16 AWG	1.5 mm²	0463100000, 500 pieces
		1476270000, 100 pieces

Orientation of wire end ferrules

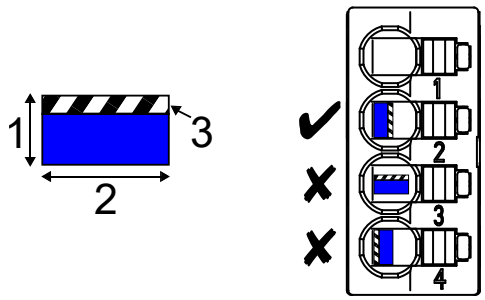


Fig. 10: Orientation of the wire end ferrules in the clamping point
1 Height of the crimped wire end ferrule
2 Width of the crimped wire end ferrule
3 Crimped side of the wire end ferrule

9 Firmware update via FoE

⚠ WARNING
Risk of injury due to unsafe machine states
The machine has to be in a safe state before updating.

The firmware of the module can be updated via FoE. For new firmware files, go to ➦ www.boschrexroth.com/mediadirectory and search for the type code of the module.

A firmware module can be updated with all EtherCAT masters supporting the file download via FoE. The module has to be in the BOOTSTRAP state. Entering a password or a file name is not required.

If the update has been completed successfully, the module is restarted as soon as the module state changes from BOOTSTRAP to another state. The reloaded firmware is started.

ℹ Do not disconnect the voltage supply of the module during the file transfer.
Please note that the logic voltage supply is temporarily interrupted for the following modules when completing the firmware update of the bus coupler and a subsequent restart.

ℹ If switching to INIT is not possible, disconnect the ctrlX I/O from the power supply and connect it again.

ℹ The new firmware version might require an updated description file in the Engineering to use new functions. For details, refer to the release notes.
Check whether the latest version of the description file is installed.

9.1 ctrlX I/O Engineering

Within the ctrlX I/O Engineering, the required user interface is only displayed for modules supporting a firmware update.

1. Switch the EtherCAT master of the ctrlX CORE to the "INIT" state.
2. First change to the active state in the ctrlX I/O Engineering by enabling “Show online data”.
   ➦ This is the requirement to update the firmware. The corresponding user interface tab is only displayed if the requirement is met.
3. To open the device editor, double-click on the module in the ctrlX I/O Engineering device tree and select the “FoE”. tab.
4. In the “Download” section, select the firmware file (*.EFW) under “Local file name”. Ensure that this is the correct file for the module to be updated.
5. Check that the option “Required state” is active under “Details” and that "BOOTSTRAP" is selected.
6. Use the “Download” button to start the firmware update.

10 License information

10.1 EtherCAT®

The ctrlX I/O modules use EtherCAT® technology. "EtherCAT®" is a registered trademark and patented technology licensed by the Beckhoff Automation GmbH, Germany. EtherCAT is an open, internationally standardized standard and developed further by the "EtherCAT Technology Group" (ETG).

10.2 Libhydrogen

10.3 Ring-buffer

Bosch Rexroth AG
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr a.Main
Germany
Tel. +49 9352 18 0
Fax +49 9352 18 8400
www.boschrexroth.com/electrics