

3.2 Internal schematic diagram

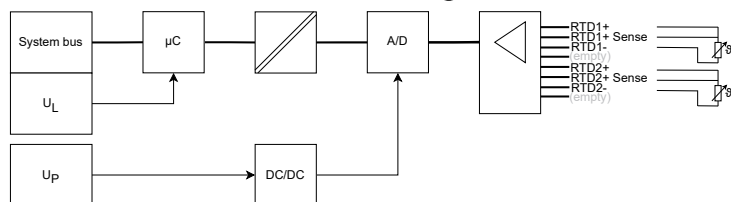


Fig. 2: Internal schematic diagram

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	5,000 m
Acc. to DIN 60204	
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	IP20
Acc. to DIN EN 60 529	(not evaluated by UL)
Protection class	III
Acc. to DIN EN 61010-2-201	
Overvoltage category	2
Acc. to IEC 60664-1	
Contamination level	2, no condensation
Acc. to EN 61010-1	

NOTICE

Defective device due to contaminated air!

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

NOTICE

Defective device due to gases jeopardizing functions

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

NOTICE

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

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 Signal processing

5.1 General information on signal processing

The signal processing of the module consists of several components shown in this section. The low-pass filter and the 50/60 Hz filter are implemented in hardware components while other components are implemented as firmware functions.

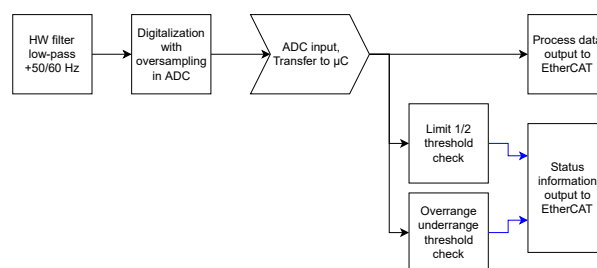


Fig. 3: Signal processing

5.2 Supported sensor types

Sensor	Minimum value		Maximum value	
	°C	°F	°C	°F
PT100 (standard)	-200	-328	850	1562
PT200	-200	-328	850	1562
PT500	-200	-328	850	1562
PT1000	-200	-328	850	1562
NI100	-80	-112	250	482
NI120	-80	-112	250	482
NI500	-60	-76	250	482
NI1000	-60	-76	250	482
NI1000 (TK5000)	-60	-76	250	482
KTY81-110	-55	-67	150	302
KTY 81-210	-55	-67	150	302
KTY 84-130/150	-40	-40	300	572
Resistance measurement	10 Ω		3276 Ω	

There are no restrictions with regard to accuracy in the specified value ranges.

For a resistance measurement, the "Temperature unit" (object F800:01 (hex)) must be set to "Celsius".

5.3 Synchronizing the application

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

5.4 Signal filtering

In addition to a low-pass filter at the input of the analog-to-digital converter (ADC), this ADC contains a configurable digital notch filter to attenuate mains frequencies.

Possible values: 50 Hz, 55 Hz (Presetting), 60 Hz.

The filter is configured via the object xF800:02.

5.5 Limit value check of the upper and lower range limit

The input data from the analog-to-digital converter (ADC) is used to check whether the values are above or below the valid range.

Accordingly, the status bits "Overrange" and "Underrange" are set in the process data and the corresponding diagnostic messages are sent.

The limit values at which diagnostics are set and reset differ depending on the sensor type.

5.6 Limit value check of the process data

There are two individual and independent limit value checks per channel specifying whether the process data value is lower, equal to or higher than the limit value set.

The limit value to be checked is set in the parameter "Limit 1" or in the parameter "Limit 2" of the object "Channel x settings". The format of the limit value corresponds to that of the process data.

Each individual limit check is enabled using the parameter "Limit y enable" in the object "Channel x settings".

The result of the check is output in the process data "Ch. x Limit y". Alternatively, it can be retrieved either via the CoE object 60x0:04(hex) ("Channel x Limit 1") or the CoE object 60x0:06(hex) ("Channel x Limit 2"). Meaning of the bits:

Bit	Meaning
0	1 if the value is lower than or equal to the set date.
1	1 if the value is higher than or equal to the set date.

5.7 Error detection and response

The module is provided with different error detection mechanisms:

- Limit value check of the upper and lower range limit (refer to the respective chapter) → Chapter 5.5 "Limit value check of the upper and lower range limit" on page 3
- Detection of sensor and wiring errors
Possible causes: Sensor not connected, sensor lines interrupted or short-circuited.
- Error detection during conversion
Possible causes: Value beyond the value range of the ADC, only for the module XI361002 for thermocouples: Error in the cold junction compensation
- Undervoltage detection peripheral voltage supply

Error	Process data	Status bit	Diagnostic message
Limit value check	Measured temperature	Channel: Underrange / Overrange	8920(hex) Underrange 8910(hex) Overrange
Sensor/wiring error	-9990 (= -999.0°)	Channel: Error Bit	8940(hex) Sensor fault
Error during conversion	-9990 (= -999.0°)	Channel: Error Bit	1010(hex) Error at channel X
Peripheral voltage supply	-9990 (= -999.0°)	Device State: Error Bit + Periphery voltage OK	3400(hex) Periphery supply voltage (UP) missing

For detailed diagnostic messages, see chapter "Status codes".

6 Object directory

6.1 CoE standard objects

The object directory of the module 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
F100	Device state
F800	Device settings

6.2 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	Module identification			
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

6.3 COE objects for parameterization

The module can be parameterized using these objects. Each channel can be freely parameterized.

! The module does not remanently store the parameter values. To automatically load the settings required upon each bus start, set the values in the start parameters of the Engineering application "ctrlX I/O Engineering".

Index (hex)	Object name	Data type	Access	Description	Default (hex)
8000	Channel 1, 2 settings				
8010					
80x0:01	Limit 1	Int16	RW	Value for limit value check 1 of the channel, specified in 0.1 °C / °F / Ω	0
80x0:02	Limit 2	Int16	RW	Value for limit value check 2 of the channel, specified in 0.1 °C / °F / Ω	0
80x0:03	Limit 1 enable	Bit	RW	Enables the limit value check 1 of the channel 0: Disabled 1: Enabled	0
80x0:04	Limit 2 enable	Bit	RW	Enables the limit value check 2 of the channel 0: Disabled 1: Enabled	0
80x0:05	-	Bit6	-	Fill bits	

Index (hex)	Object name	Data type	Access	Description	Default (hex)
80x0:06	Sensor type	Bit8, ENUM	RW	Selection of the sensor type 0x00: PT100 0x01: PT200 0x02: PT500 0x03: PT1000 0x04: NI100 0x05: NI120 0x06: NI500 0x07: NI1000 0x08: NI1000TK5000 0x09: KTY81-110 0x0A: KTY81-210 0x0B: KTY84-130/150 0x0C: Resistor	0

F800 Device Settings					
F800:01	Temperature unit	8 bits (ENUM)	RW	Temperature unit for process data and all CoE objects 0x00: Celsius 0x01: Fahrenheit	0: Celsius
F800:02	Filter settings	8 bits (ENUM)	RW	Frequency selection for the mains frequency filter 0x00: 55 Hz 0x01: 60 Hz 0x02: 50 Hz	0: 55 Hz

7 Process data

7.1 Process data of the module

Index (hex)	Object name	Data type	Access	Description	Default (hex)
6000 Channel 1, 2					
6010					
60x0:01	Value	Int16	RO	Measured value 0 in 0.1 °C / °F / Ω	0
60x0:02	Error	Bit	RO	Channel error (short circuit, cable break)	0
60x0:03	Underrange	Bit	RO	Measurement underrange	0
60x0:04	Overrange	Bit	RO	Measurement overrange	0
60x0:05	Limit 1	Bit2	RO	Result of limit value check 1 Bit0: Value ≤ Limit 1 Bit1: Value ≥ Limit 1	0
60x0:07	Limit 2	Bit2	RO	Result of limit value check 2 Bit0: Value ≤ Limit 2 Bit1: Value ≥ Limit 2	0
60x0:08	-	Bit9	-	Fill bits	

The representation of the measured values (both in the process data and in the CoE objects) is standardized to the set temperature unit (°C / °F / Ω). The value is specified with one decimal place.

Temperature (°C / °F)	Data
36.8	368
0.0	0
-31.4	-314

Table 1: Example representation of temperature values

7.2 Disabling channels

Do not disable unused channels in the process data image. This reduces the data width in the process data image. Disabled channels are also disabled in the signal processing. No diagnostic messages are generated for these channels and the error bits in the respective CoE object no longer contain any valid information.

To disable a channel, edit the process data mapping (PDO assignment) of the module in the I/O Engineering Tool. The mapping can be set separately for input and output data. Disable process data of the channel. If the channel has its own Control/Status object in the input/output data, disable it as well.

8 Diagnostic strategy

8.1 Mechanisms

Different mechanisms are used for the diagnostics of the module.

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(hex)	Error settings
Diagnosis history object	20 diagnostic messages can be stored
10F3(hex)	Diagnosis history
Module status LED	Shows the general module status

8.2 Diagnosis history

The object 10F3(hex) is implemented as ring memory into the "Overwrite mode". The latest 20 diagnostic messages are stored. Older messages are deleted.

The following table shows the structure of the Diagnosis History object.

Index (hex)	Sub-index	Object name	Data type	Rights	Meaning
10F3		Diagnosis history			Diagnostic statistics
	01	Maximum messages	UINT8	R	Maximum number of messages
	02	Newest message	UINT8	R	Latest message
	03	Newest acknowledged message	UINT8	R/W	Latest confirmed message. Writing "0" deletes the messages in the ring memory.
	04	New messages available	Boolean	R	New message available
	05	Flags	UINT16	R/W	Setting of the object response. Refer to ETG.1020
	06 - 26	Diagnosis message	String	R	Diagnostic message according to ETG.1020

8.3 Status codes

Text ID (hex)	Error, warning, information	Text
1000	Error	Module error <opt. info> - internal Error, Temperature, Error bit is set
1010	Error	Error at channel <Channel no.>
1020	Warning	Error during update, data corrupted, please update again
3400	Error	Periphery supply voltage (U _P) missing
6820	Warning	Complete Access of subindex <index>:<subindex> not allowed
8910	Warning	Overrange at channel <Channel no.>
8920	Warning	Underrange at channel <Channel no.>
8940	Warning	Sensor fault at channel <Channel no.>

8.4 Module status LED (diagnostic and device status)

Device state	LED flashing pattern
Booting or firmware update	BU BU BU BU BU -- -- -- -- -- →
Initialization or firmware update completed	BU 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 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 -- -- -- -- -- →
Channel error	YE YE YE YE YE -- -- -- -- -- →

ⓘ 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.
- [YE] LED is yellow.

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

8.5 Channel status LED

The modules have no channel status LED. Apart from the diagnostics via EtherCAT at the module, channel errors are only displayed via the state of the module status LED.

9 Installation

9.1 Clamping point assignment

Clamping point	Signal	LED	Pusher
1	Channel 1+	None	Grey
2	Channel 1+ Sense	None	Grey
3	Channel 1-	None	Grey
4	Not used	None	Grey
5	Channel 2+	None	Grey
6	Channel 2+ Sense	None	Grey
7	Channel 2-	None	Grey
8	Not used	None	Grey

9.2 Connection instructions

9.2.1 Differential input and potential reference

For analog inputs, there are inputs without a reference to an external mass. Thus, note that the "Common Mode" – the average value of the signals at the +, Sense and - pin – is not higher compared to the internal mass U_P GND than the values specified in the technical data.

For the 2-wire connection, connect the "+" pin to the "Sense" pin.

ⓘ The 2-wire connection technique only allows short line lengths that also depend on the cable cross-section used. The line effects are only factored out at the input in 3-wire technique. Thus, the 3-wire technique with shielded cables is recommended for longer cables.

9.2.2 Cable and shielding

NOTICE

Electronic damages and measuring errors

Unshielded cables can cause that tolerance limits are easily exceeded in an environment prone to interferences.

Always connect the components with shielded cables twisted in pairs.

Connect the cable shielding to the functional earth immediately after entering the control cabinet. Route the cable with its shielding up to the module. The signal cables should be routed the shortest possible without shielding.

For the best connection directly in front of the module, the shield connection set (R911173030) is provided together with the busbar (R911173283).

9.3 Connection examples

It is recommended to connect the temperature sensor with the 3-wire wiring. The module measures the cable resistance via the Sense pin to increase the measurement accuracy.

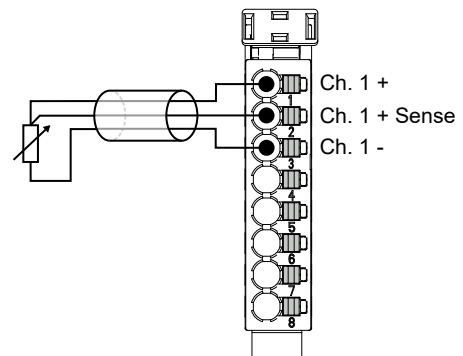


Fig. 4: Connection example

To connect 2-wire sensors, connect "Sense" and "+". This connection is required to allow a correct measurement. The accuracy is greater the closer the connection to the sensor.

9.4 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 dismantling the module.
- Provide the following minimum distances for sufficient cooling:

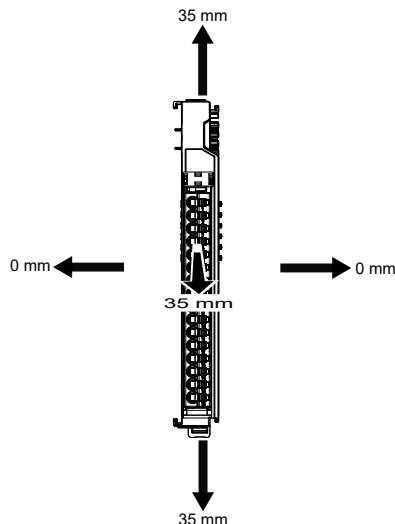


Fig. 5: Ventilation distances

- 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.

9.4.1 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 dismantling.

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. 6.

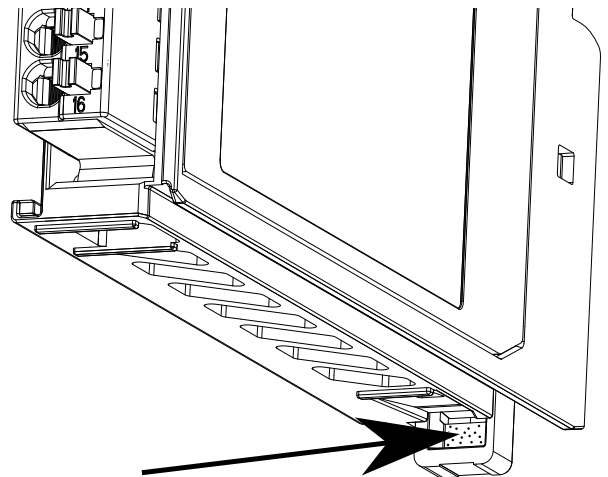


Fig. 6: Locking lever to release the clamping of the open position.

Each module has to be snapped separately.

9.4.2 Positioning plug

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

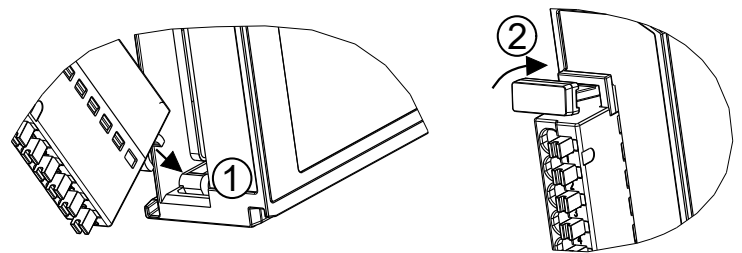


Fig. 7: Positioning plug

9.4.3 Removing plug

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

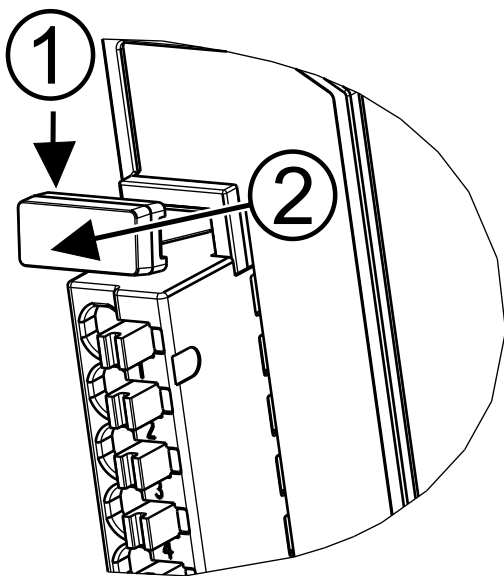


Fig. 8: Removing plug

9.4.4 Dismounting module

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].

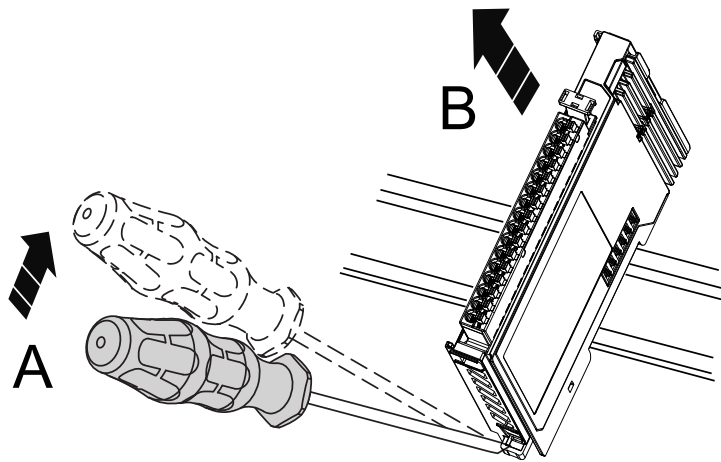


Fig. 9: Removing module from support rail

Before mounting the module on the support rail again, release the clamping of the open position. Press the locking lever, refer to the figure Fig. 6.

9.4.5 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 \pm 0.5 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 \pm 0.5 mm
- Flexible line with wire end ferrule
- Use a cable cross-section corresponding to the current (minimum 0.2 mm², maximum 1.5 mm²) to avoid an excessive increase in temperature. A cable cross-section of 1.5 mm² 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 mm².
- 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.

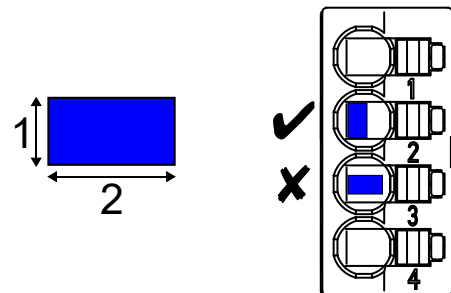


Fig. 10: Orientation of the wire end ferrules in the clamping point

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

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 ²	Ordering numbers of the wire end ferrules (Weidmüller company)
24 AWG	0.2 mm ²	9025760000, 500 pieces
22 AWG	0.35 mm ²	9025770000, 500 pieces
20 AWG	0.5 mm ²	0690700000, 500 pieces 1476230000, 100 pieces
18 AWG	0.75 mm ²	0462900000, 500 pieces 1476240000, 100 pieces
-	1 mm ²	0463000000, 500 pieces 1476250000, 100 pieces
16 AWG	1.5 mm ²	0463100000, 500 pieces 1476270000, 100 pieces

Orientation of wire end ferrules

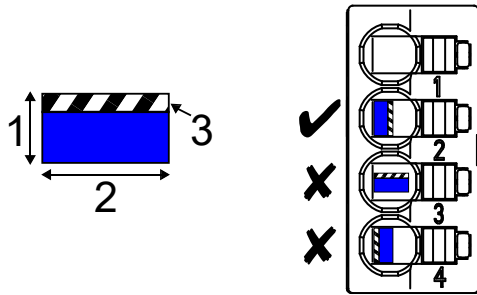


Fig. 11: Orientation of the wire end ferrules in the clamping point

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

9.5 Electric installation

9.5.1 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 \pm 0.5 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 \pm 0.5 mm
- Flexible line with wire end ferrule
- Use a cable cross-section corresponding to the current (minimum 0.2 mm², maximum 1.5 mm²) to avoid an excessive increase in temperature. A cable cross-section of 1.5 mm² 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 mm².
- 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.

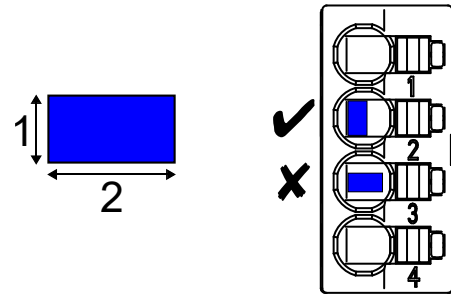


Fig. 12: Orientation of the wire end ferrules in the clamping point

- 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 ²	Ordering numbers of the wire end ferrules (Weidmüller company)
24 AWG	0.2 mm ²	9025760000, 500 pieces
22 AWG	0.35 mm ²	9025770000, 500 pieces
20 AWG	0.5 mm ²	0690700000, 500 pieces 1476230000, 100 pieces
18 AWG	0.75 mm ²	0462900000, 500 pieces 1476240000, 100 pieces
-	1 mm ²	0463000000, 500 pieces 1476250000, 100 pieces
16 AWG	1.5 mm ²	0463100000, 500 pieces 1476270000, 100 pieces

Orientation of wire end ferrules

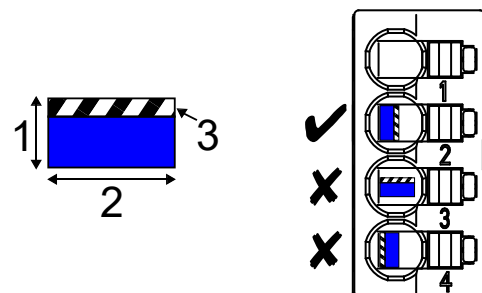


Fig. 13: Orientation of the wire end ferrules in the clamping point

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

10 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.

⚠ 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.

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

⚠ 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.

10.1 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.

11 License information

11.1 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).

11.2 Libhydrogen

ISC License

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11.3 Ring-buffer

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