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1 Foreword

1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.

It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.

It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents:

EP1590927, EP1789857, DE102004044764, DE102007017835

with corresponding applications or registrations in various other countries.

The TwinCAT Technology is covered, including but not limited to the following patent applications and patents:

EP0851348, US6167425 with corresponding applications or registrations in various other countries.



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1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!

Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability






All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

 DANGER	Serious risk of injury! Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.
 WARNING	Risk of injury! Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.
 CAUTION	Personal injuries! Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.
 Attention	Damage to the environment or devices Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.
 Note	Tip or pointer This symbol indicates information that contributes to better understanding.

1.3 Documentation issue state

Version	Changes
1.0	first Version

2 Product overview

2.1 Intended use

The CX20x0 device series is a modular control system designed for DIN rail installation. The system is scalable, so that the required modules can be assembled and installed in the control cabinet or terminal box as required.

Only switch the PC off after closing the software

Before the Embedded PC is switched off, the software currently running on it should be stopped properly in order to avoid data loss on the hard disk. Please read the section on "Switching off".

Switch off all system components and uncouple the Industrial PC from the system if the PC is not used for control purposes, e.g. during a function test. To disconnect first pull the first terminal behind the power supply unit (optional), then pull the connectors of the fieldbus connections.

System components that have been switched off must be secured against being switched on again.

The Embedded PC's power supply unit must be supplied with 24 V_{DC}.



Attention

Damage to the environment or devices

Do not exchange any parts when under power! The exchange of controller parts when live can lead to short-circuits or overvoltages. These can damage the controller itself and connected peripherals (terminals, monitors, input devices, etc.).

When components are being fitted or removed, the supply voltage must be switched off.

Software knowledge



Attention

System malfunctions

Mandatory software knowledge! Every user must be familiar with any of the functions of the software installed on the PC that he can reach.

2.2 System overview

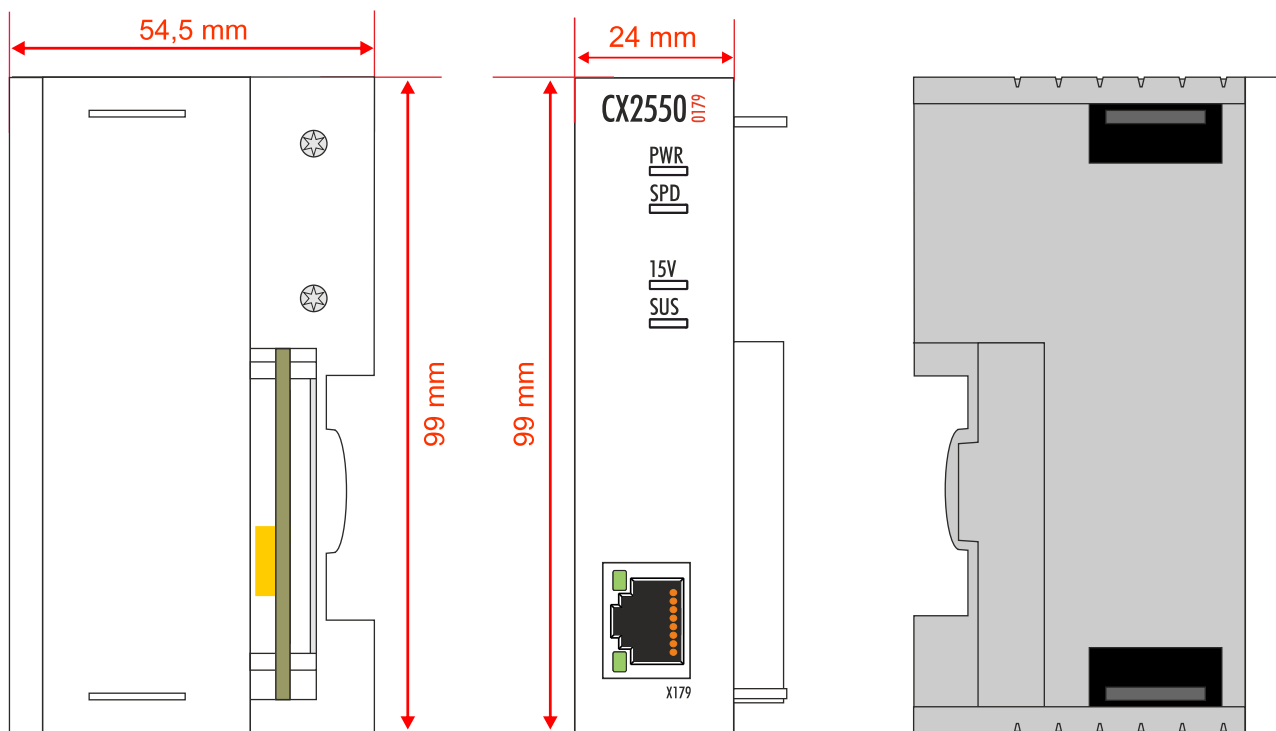


CX2550-0x79 system module USB extension

The CX2550-0x79 systems modules are attachments for the CX2000 Embedded PC series. They transmit USB signals via a CAT 5e cable over distances of up to max. 50 m. The CX2550-0179 system module transmits USB signals according to the USB 1.1 standard (full speed, max. 12 Mbit/s) while the CX2550-0279 system module transmits USB signals according to the USB 2.0 standard (high speed, max. 480 Mbit/s). Both modules can be attached at the right-hand side of a CX20x0-CPU and are placed between the power supply unit and the CPU. The internal connection is made via a USB port of the CX20x0-CPU; this way, no PCI Express resources are required or used. No additional drivers are required for operation since signal transformation and forwarding of the USB signals take place at the electrical level and are completely transparent for the operating system.

The CX2550-0179 and CX2550-0279 modules enable the direct connection of Beckhoff Control Panels with USB Extended interface. The CX2550-0179 system module is suitable for the connection of the Beckhoff CP69xx and CP79xx Control Panel series with USB Extended 1.1 connection. The CX2550-0279 system module is suitable for the connection of the Beckhoff CP29xx and CP39xx Control Panel series with USB Extended 2.0 connection.

2.3 CX2550-0179 - Technical data

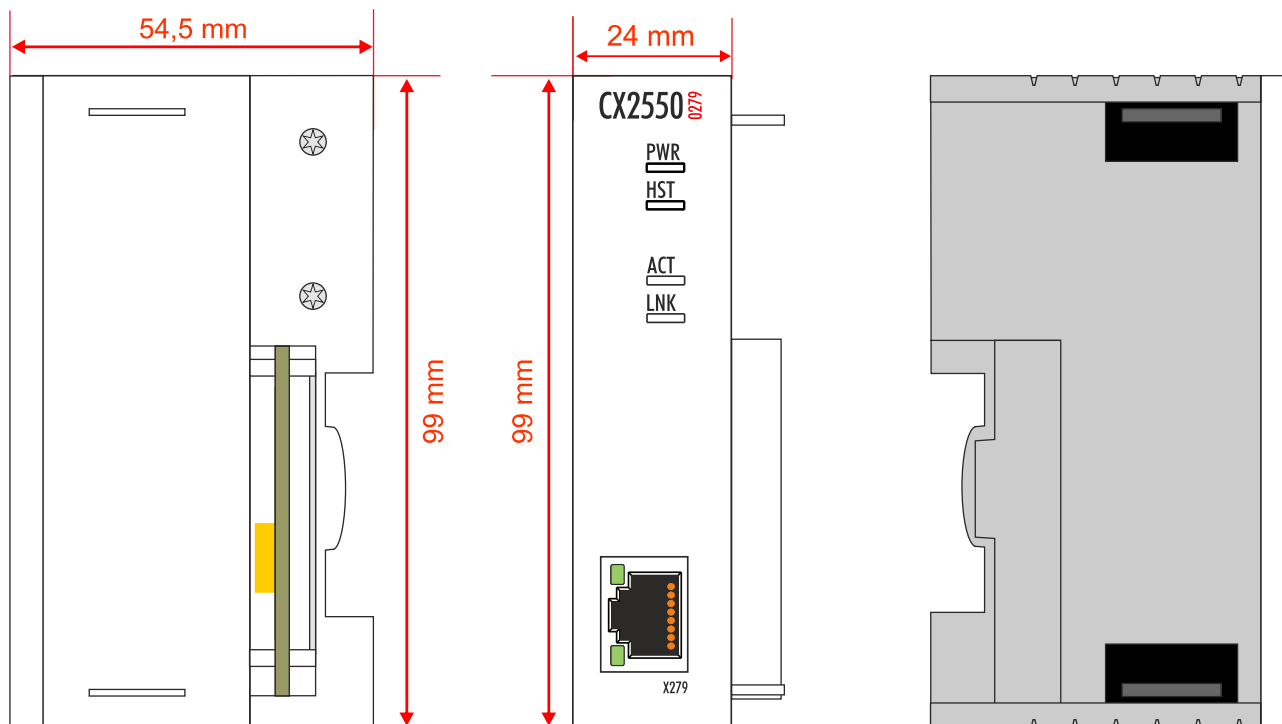


The system module CX2550-0179 transmits USB signals according to USB 1.1 standard (full speed, max. 12 Mbit/s).

Technical data	CX2550-0179
Interfaces	1 x USB Extended 1.1
Type of connection	RJ 45socket
Properties	transmission of USB1.1 up to max. 50 m via CAT-5e cable
Diagnostics LED	1 x power, 1 x speed, 1 x +15V, 1 x suspend
Power supply	via system bus (via power supply module CX2100-0xxx)
Dimensions (W x H x D)	24 mm x 99 mm x 54.5 mm
Weight	approx. 189 g
Operating/Storage temperature	-25° C ... +60° C / -40° C ... +85° C
Relative humidity	95% no condensation
Vibration/shock resistant	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20

Further Information: www.beckhoff.de/CX2000

2.4 CX2550-0279 - Technical data



The system module CX2550-0279 transmits USB signals according to USB 2.0 standard (full speed, max. 480 Mbit/s).

Technical data	CX2550-0279
Interfaces	1 x USB Extended 2.0
Type of connection	RJ 45socket
Properties	transmission of USB2.0 up to max. 50 m via CAT-5e cable
Diagnostics LED	1 x power, 1 x host, 1 x activity, 1 x link
Power supply	via system bus (via power supply module CX2100-0xxx)
Dimensions (W x H x D)	24 mm x 99 mm x 54.5 mm
Weight	approx. 189 g
Operating/Storage temperature	-25° C ... +60° C / -40° C ... +85° C
Relative humidity	95% no condensation
Vibration/shock resistant	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20

Further Information: www.beckhoff.de/CX2000

3 Mounting and wiring

3.1 Unpacking, installation and transport

The specified storage conditions must be adhered to (see "Technical data").

Dimensions and weight of the individual modules:

Dimensions (W x H x D): 24 mm x 100 mm x 55 mm

Weight: approx. 195 g (system interface)

Unpacking

Proceed as follows to unpack the unit:

1. Remove packaging.
2. Do not discard the original packaging. Keep it for transporting the device in the future.
3. Check the delivery for completeness by comparing it with your order.
4. Please keep the associated paperwork. It contains important information for handling the unit.
5. Check the contents for visible shipping damage.
6. If you notice any shipping damage or inconsistencies between the contents and your order, you should notify Beckhoff Service.



Attention

Danger of damage to the device!

During transport in cold conditions, or if the device is subjected to extreme temperature differences, condensation on and inside the device must be avoided. Prior to operation, the device must be allowed to slowly adjust to room temperature. Should condensation occur, a delay time of approximately 12 hours must be allowed before the unit is switched on.

Installation

The devices are designed for installation in control cabinets.

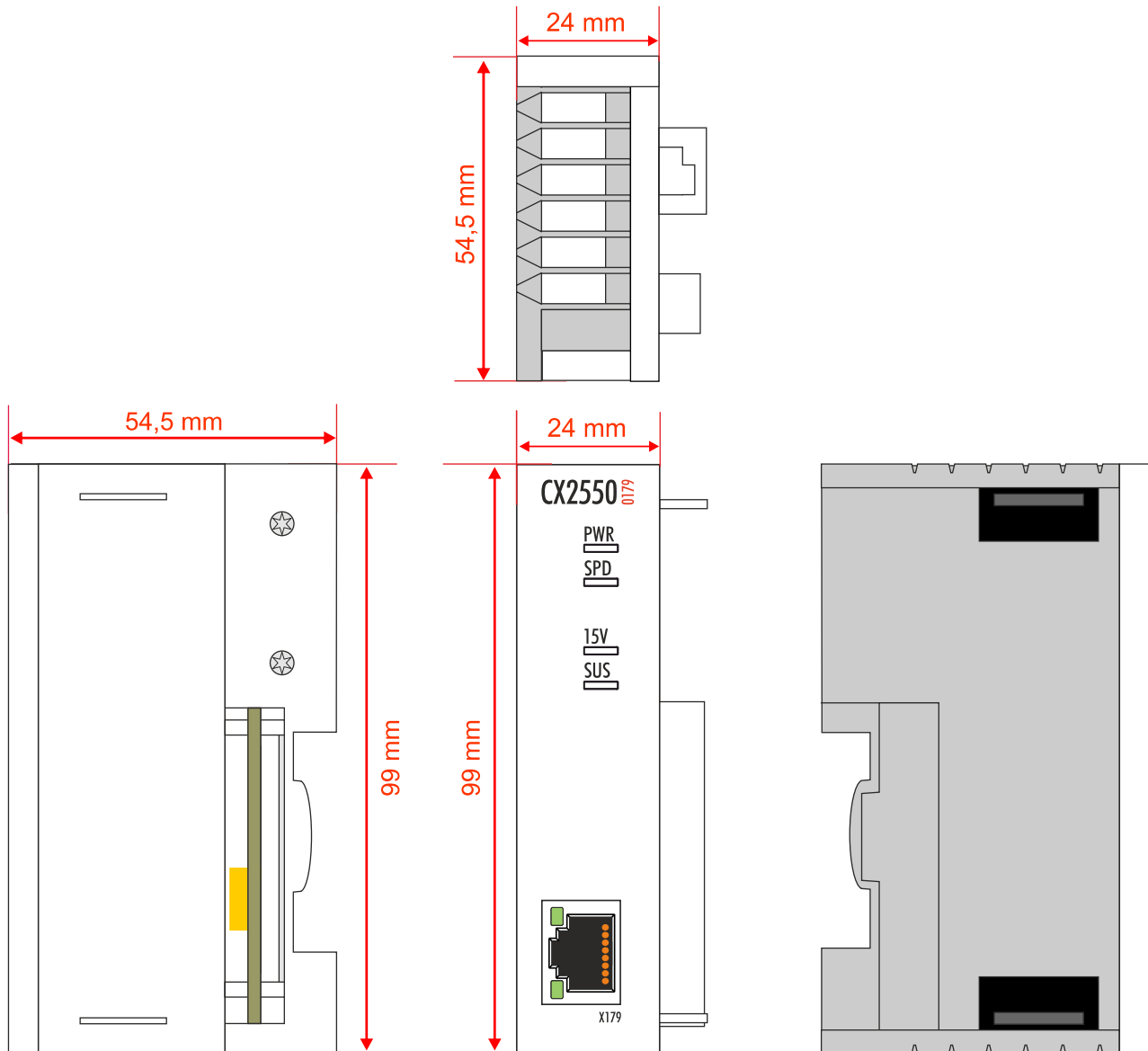
Shipping and relocation

Despite the robust design of the unit, the components are sensitive to strong vibrations and impacts. During transport, your computer should therefore be protected from excessive mechanical stress. Therefore, please use the original packaging.

3.2 Dimensions

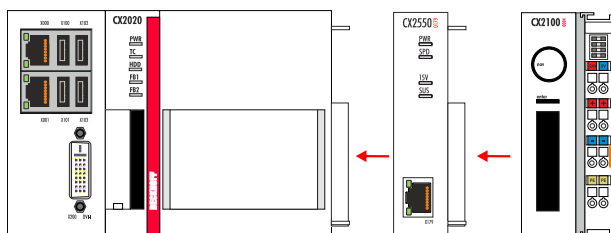
The following drawings show the dimensions of the CX2550-0x79 interface. Both variants CX2550-0179 (USB1.1) and CX2550-0279 (USB 2.0) have the same dimensions

Dimensions

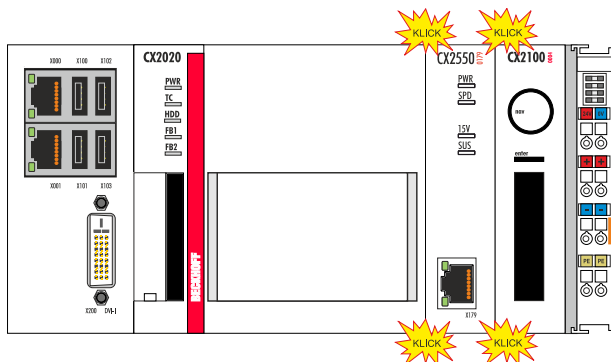


3.3 Attaching the system interface to the CX20x0 system

The USB extension is positioned directly between the CPU and the power supply unit.



When the module is connected to the CPU it engages audibly.



Further modules can be connected to the system in the same way. Please note that some modules are connected on the left-hand side of the CPU. Once all modules are connected, the system can be placed on the DIN rail as a block. For details please refer to the section on DIN rail mounting.



Note

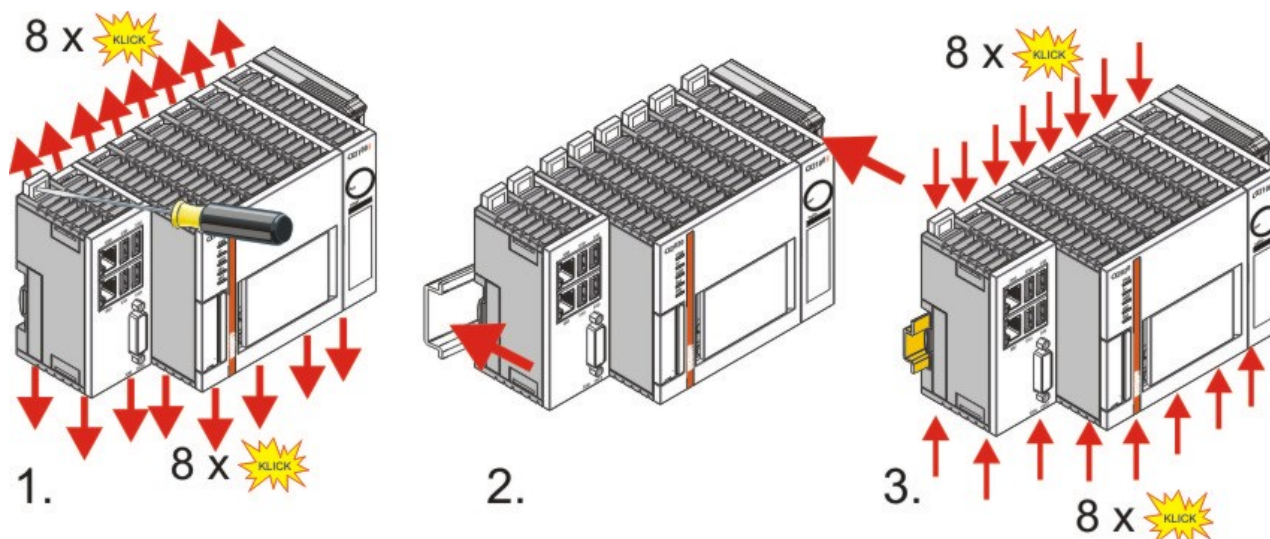
Maximum number of extension modules

Up to two extension modules can be attached on the right-hand side of the system.

3.4 Installation on the mounting rail

Snapping onto the mounting rail

The CX20x0 can simply be snapped onto the mounting rail. The bar clips are inserted on the top side and underside. Then simply position the block on the mounting rail and push it slightly until it engages on the right-hand side. This is indicated by a distinct click. The bars are then engaged again. The engagement of the individual bars is indicated by a distinct click.



Attention

Avoid damage!

Do not force the module or apply excessive pressure!

Installation position



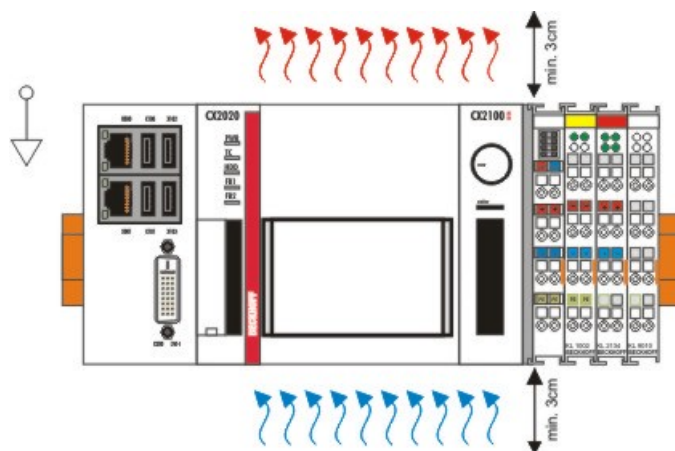
Attention

Comply with the permitted installation position and minimum distances!

The maximum ambient temperature for CPU modules mounted on a DIN rail is 60°C. The orientation in which the device is fitted must be selected in such a way that cooling air can flow vertically through the ventilation holes. The images below show the permitted and two incorrect installation positions. Mounting must provide a clearance of 30 mm both above and below a CX20x0 device combination to ensure adequate ventilation of the base CPU module and the power supply unit.

Correct installation position

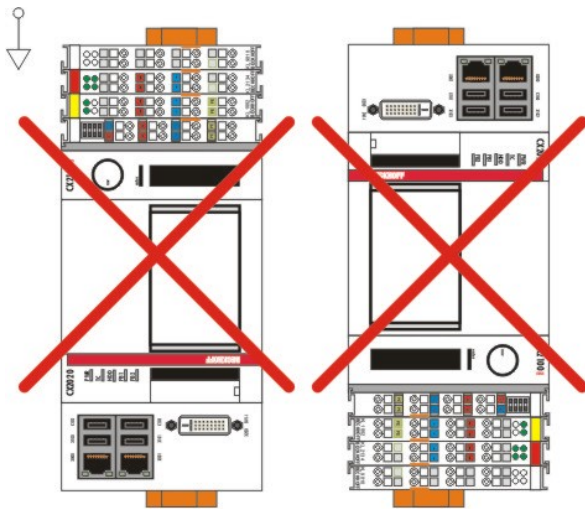
The high performance and the compact design of the CX20x0 systems may result in increased heat generation. The heat is dissipated via a passive ventilation system. This system requires the unit to be mounted correctly. Ventilation openings are located at the top and bottom of the housing. The system therefore has to be installed horizontally. This ensures optimum air flow.



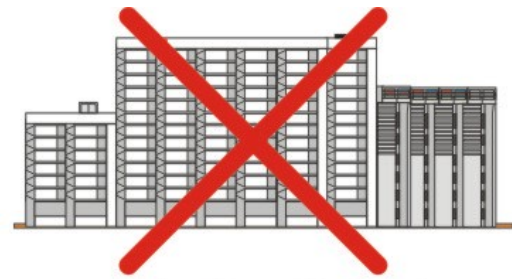
gültige Installationslage
valid position

Incorrect installation positions

The CX20x0 system must not be operated vertically on the DIN rail. A vertical position would lead to insufficient CPU ventilation, since the ventilation openings are located on the top and bottom of the housing. Installation of the system on its side would also lead to inadequate ventilation.



ungültige Installationslage
invalid position

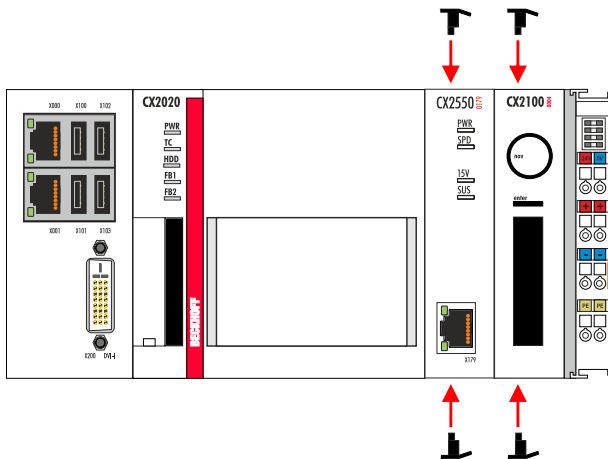


ungültige Installationslage
invalid position

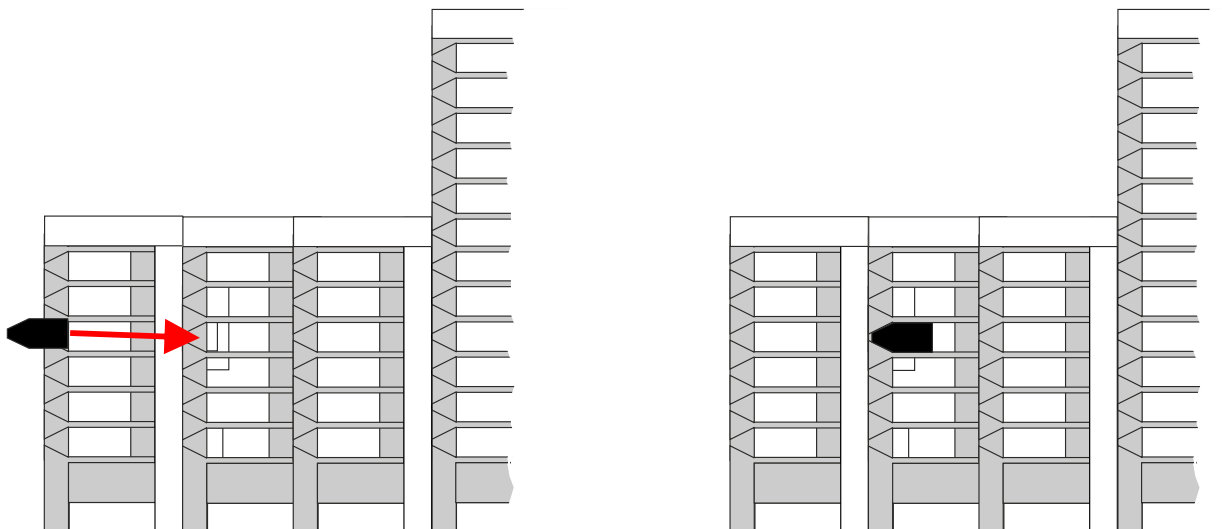
3.5 Mounting the module lock

Mounting the lock

The CX20x0 controller system is fully modular, i.e. all system interfaces of the system are field-configurable. As a rule the latching of the modules to each other is sufficiently strong. However, it is possible for the controller and its modules to be exposed to vibrations, shocks or impacts. The modules can be securely connected to one another with the aid of bar clips.



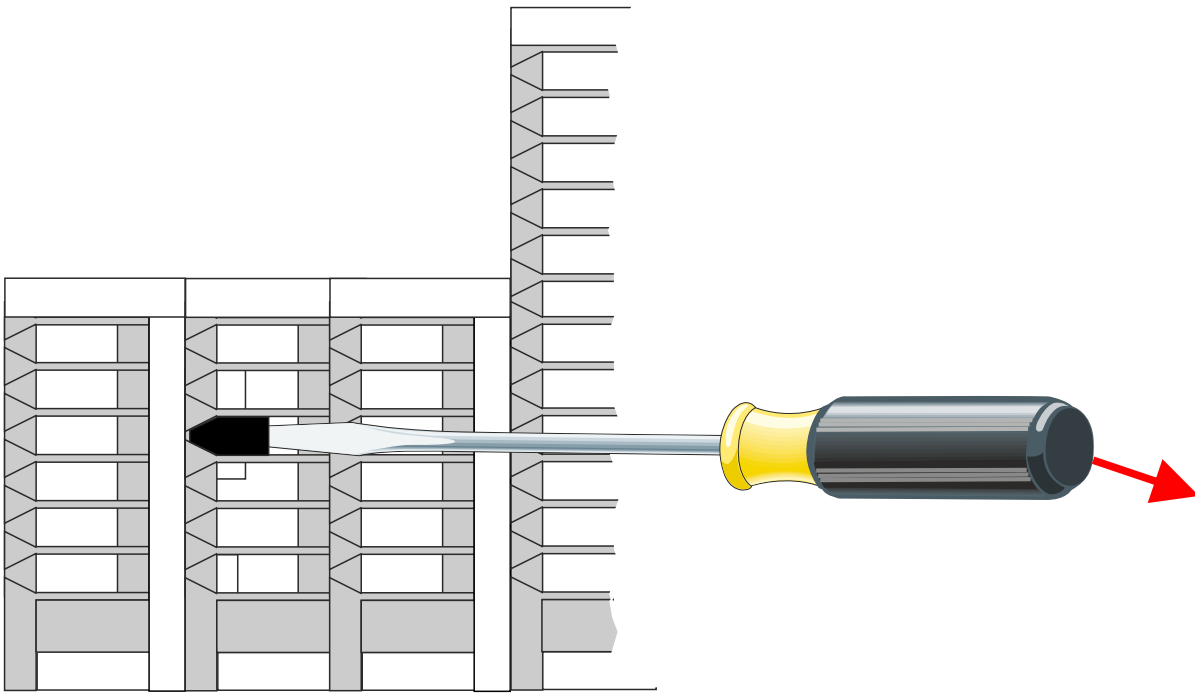
The bar clips are inserted on the top side and underside.



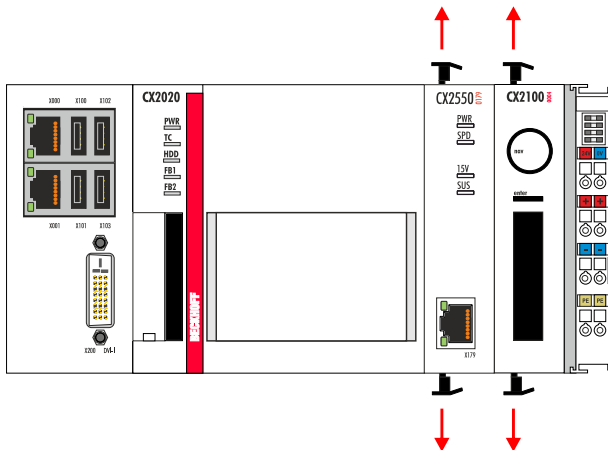
If all system interfaces are locked, then the entire assembly can be snapped onto the support rail.

Dismounting the lock

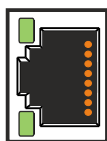
In order to dismantle the assembly it must first be removed from the support rail. Afterwards the bar clips can be removed with the aid of a screwdriver:



Once the bar clips have been raised they can be pulled out. Subsequently, the system interfaces can be separated again.



3.6 USB connection



RJ 45 interface for CX2550-0179 (USB1.1) (X179):

EtherCAT cable, category CAT5e.

Table 1: Assignment of RJ 45 interface:

PIN	Signal	Description
1	15 V	15 V +
2	GND	Ground
3	TX	USB TX
4	RX	USB RX
5	RX	USB RX
6	TX	USB TX
7	15 V	15 V +
8	GND	Ground

the LEDs of the RJ 45 sockets are redundantly implemented on the lower [diagnostic LEDs](#) [► 25].

RJ 45 interface for CX2550-0279 (USB2.0) (X279):

EtherCAT cable, category CAT5e.

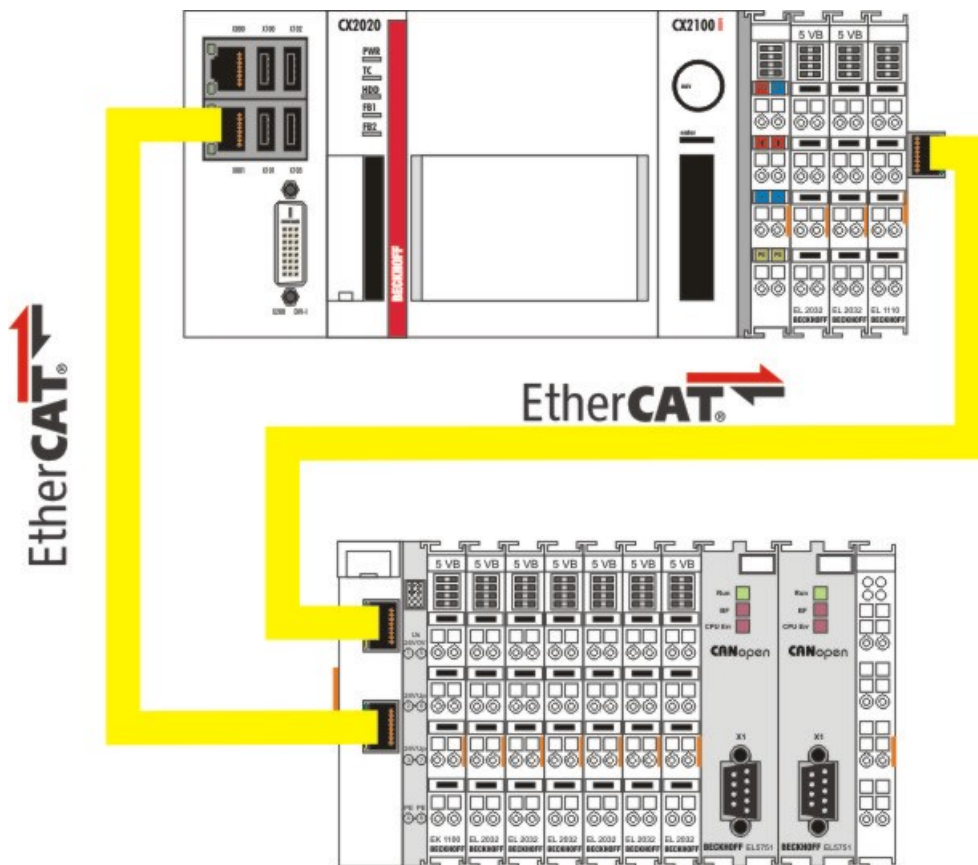
Table 2: Assignment of RJ 45 interface:

PIN	Signal
1	MX0+
2	MX0-
3	MX1+
4	MX1-
5	MX2+
6	MX2-
7	MX3+
8	MX3-

the LEDs of the RJ 45 sockets are redundantly implemented on the lower [diagnostic LEDs](#) [► 25].

4 Commissioning / Configuration

4.1 EtherCAT cable redundancy



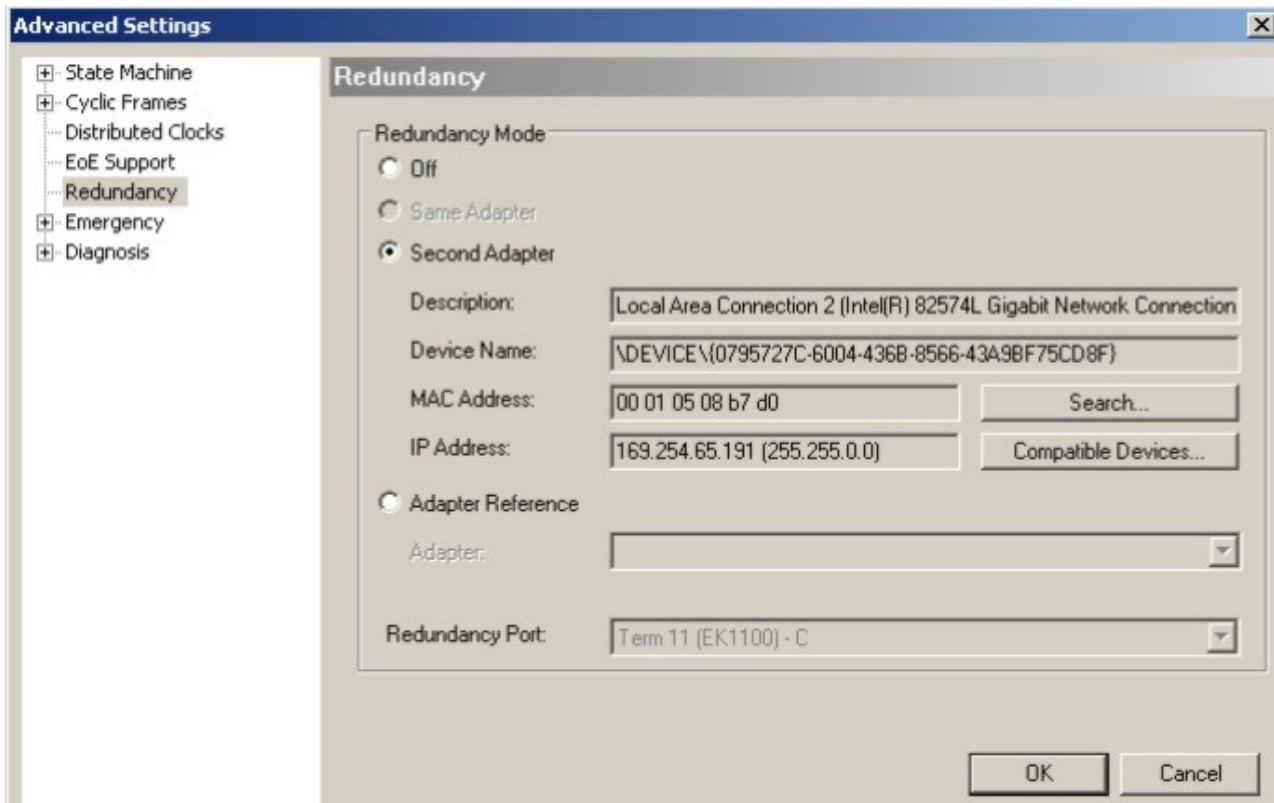
EtherCAT cable redundancy can be realised in the CX20x0 systems through the two independent Ethernet ports. Minimum requirements:

1. EtherCAT redundancy supplement
2. EK1110 (Bus extension)
3. EK1100 (Bus Coupler)

The supplement product on the Beckhoff website at

http://download.beckhoff.com/download/Software/TwinCAT/TwinCAT2/Supplement/TwinCAT_EtherCAT_Redundancy/Install/TcEcRedundancy.exe

can be downloaded. The required licence key can be ordered from our sales division. The required couplers are ordered together with the other hardware. These components can then be used to configure the controller. The upper figure shows a minimum configuration example for cable redundancy. Once the hardware has been wired and commissioned, the supplement must be installed on the device, for example via a USB stick or the IT network. During the installation the system asks for the licence key. The cable redundancy can be set up in the System Manager. The first step involves reading the terminal configuration. Then select "Advanced Settings" under the "EtherCAT" tab in the EtherCAT device properties. The second adapter can be set under the "Redundancy" menu. Use the "Search" button to open the selection menu. Select "Local Area Connection 2 (Intel(R).....)" for the lower network connection (X001). Click "OK" to complete the configuration.



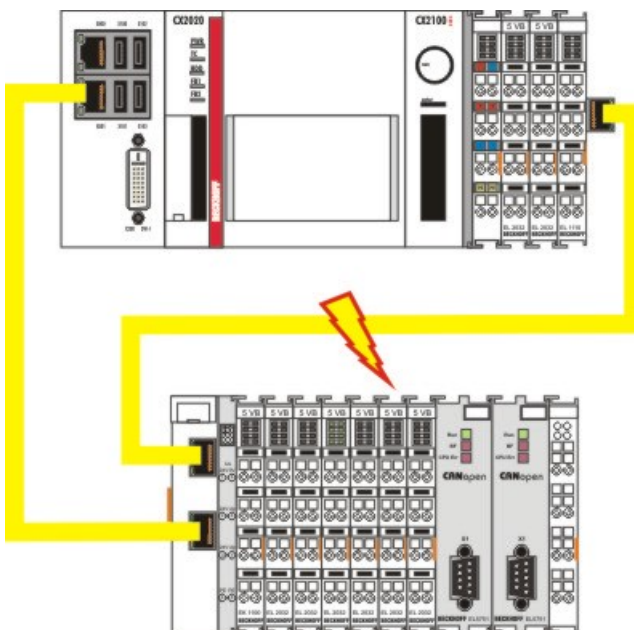
Note

The supplement only supports CABLE REDUNDANCY

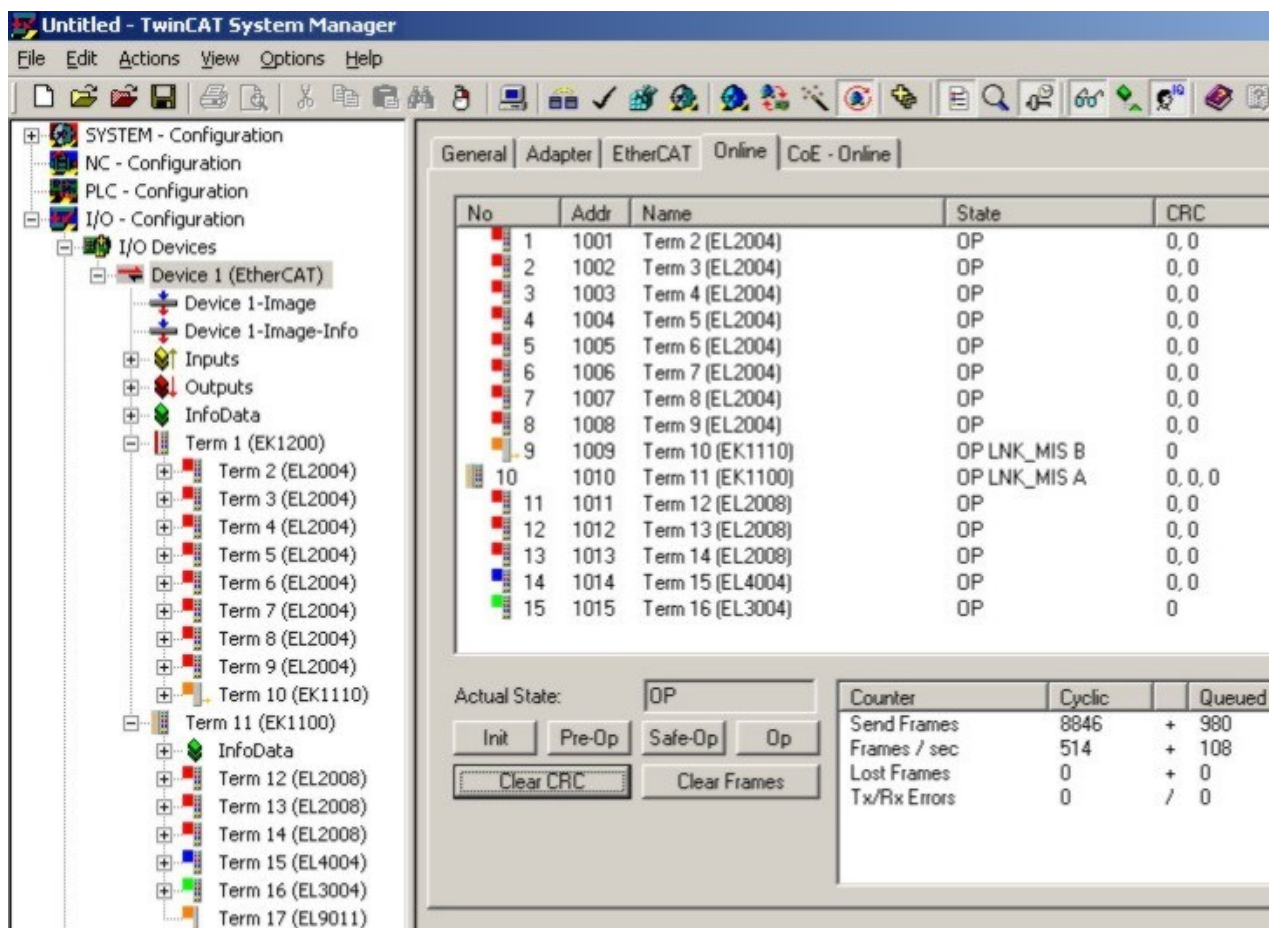
This supplement only supports cable redundancy. This means that fail safety exists only for the cable sections. That means the connections between the couplers. Failures of individual terminals are not covered. Further details can be found in the Beckhoff Information System under EtherCAT cable redundancy.

Cases of failure

The two possible failures are described in the example below.

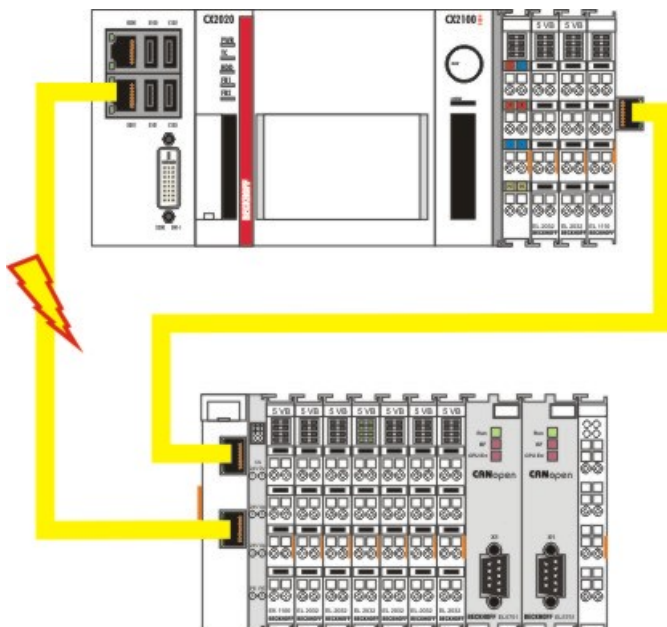


In this example the supply line for coupler EK1100 is faulty. The EK1100 terminals continue to run despite the cable failure. The System Manager indicates the failure as follows:

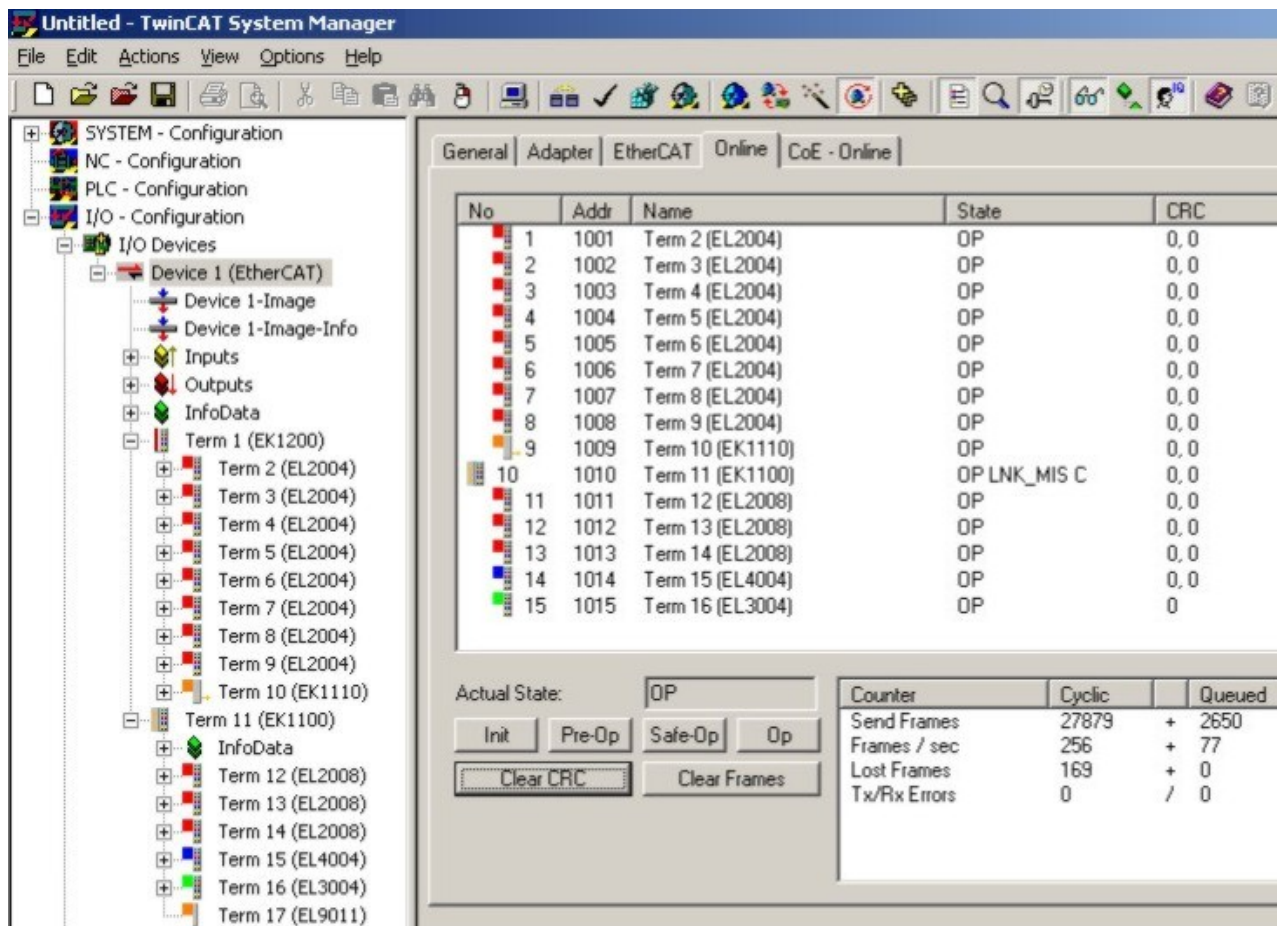


The interruption is indicated by "LNK_MIS B" and "LNK_MIS A".

The next example shows a failure of the "return line":



In this case the second cable is faulty. The terminals at the coupler continue to run without malfunction. The System Manager indicates the behaviour as follows:



The interruption is indicated by "LNK_MIS C" at coupler EK1100.

The EtherCAT ring is expandable. The number of devices in the ring is controlled by licenses: up to 250, up to 1000, more than 1000. A master is only able to bridge one failure. In the event of two failures the ring components will continue to run up to the breaking points.

4.2 Switching on and off

Switching on

The power supply for the basic CPU module comes from the power supply unit. The basic CPU module starts automatically when the power supply unit is connected to the mains.

Switching on for the first time

When you switch on the PC for the first time, the pre-installed operating system (optional) will be started.

Switching off

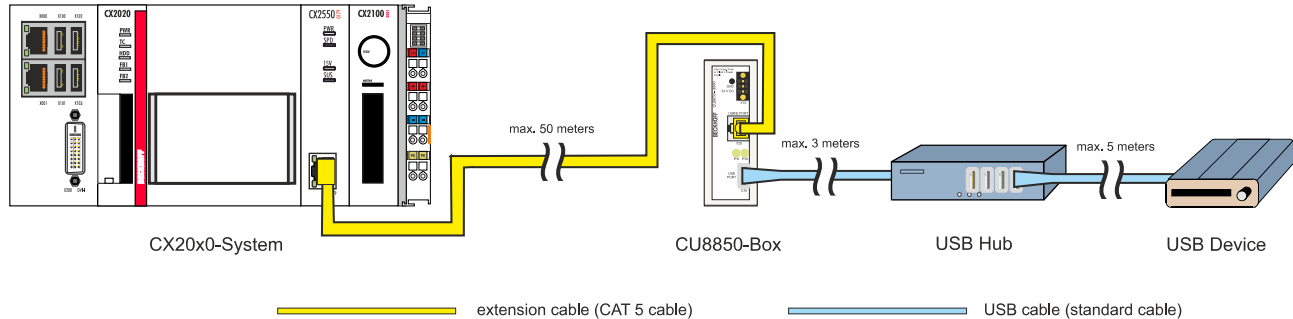
The Embedded PC switches off when the power supply unit is switched off. The control software typically running on Embedded PCs should be shut down or stopped correctly. A user who may not close software may also not switch the Embedded PC off, since data can be lost from the hard disk by switching off while software is running.

Once the software has been stopped, the operating system can be shut down. Only then should the power supply be interrupted.

5 CX2550-0179 - Architecture description

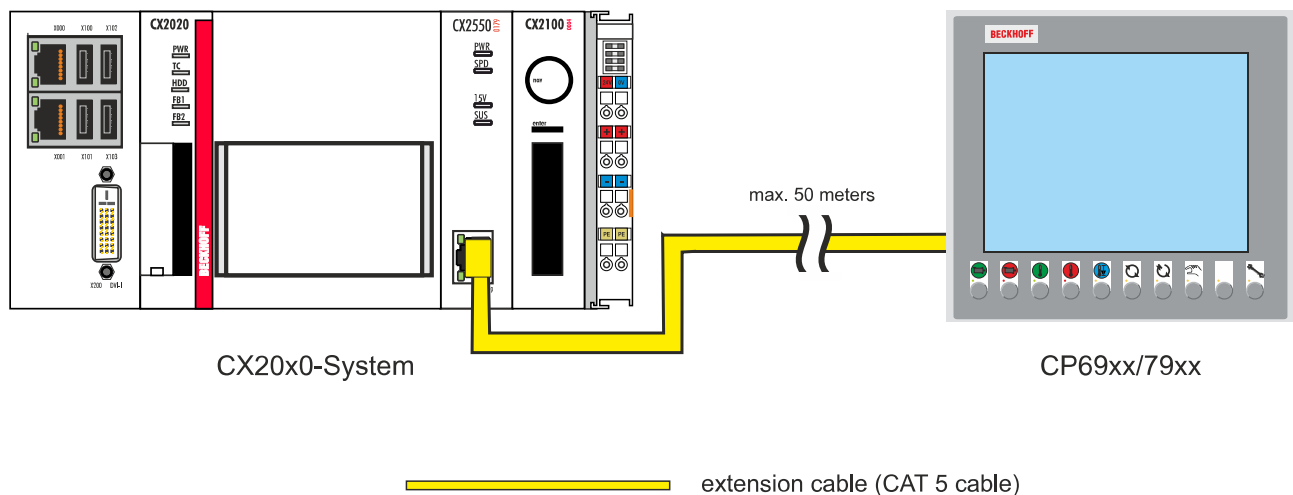
Within the USB extension the length of USB data transmission can be increased from 5 meters up to 58 meters. This is a USB 1.1 connection. Due to the USB signal runtime, it is not possible to connect more than one USB hub in the chain.

The following image shows the possible configuration with the maximal allowed distances:



The USB hub has to be connected after the extension. The maximal distance is 58 meters: 50 Meter cable from CX2550-0179 to the extension box CU8850, 3 meters from the extension box to the USB hub and 5 meters from the USB hub to the USB device.

Via the USB extension a Beckhoff Touch Panel can be connected. Thus a panel of type CP69xx/79xx can be operated up to 50 meters from the CX system without additional devices.

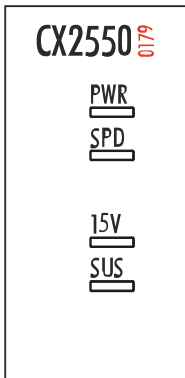


6 Error handling and diagnostics

6.1 LEDs Diagon the USB extension

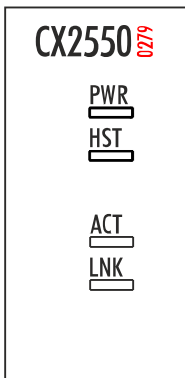
LEDs diagnosis for CX2550-0179

The following table shows the states for the LEDs of the CX2550-0179 (USB 1.1):

Display	LED	Meaning
	PWR	Power supply The Power LED lights if the device is connected to a live power supply unit (green).
	SPD	Speed The LED lights green if an USB device with full speed (1,5 MBit/s) is connected. The LED lights yellow if an USB device low low speed (12 MBit/s) is connected. The LED doesn't light if the no device is connected.
	15 V	The LED lights (green) if 15 V is supplied to USB extension.
	SUS	Suspend The LED doesn't light if the USB extension is operational. The LED lights (red),if the USB extension is in suspend mode resp. no device connected.

LEDs diagnosis for CX2550-0279

The following table shows the states for the LEDs of the CX2550-0279 (USB 2.0):

Display	LED	Meaning
	PWR	Power supply The Power LED lights if the device is connected to a live power supply unit (green).
	HST	Host The LED lights green if an USB host device is detected. The LED doesn't light if the no device is connected.
	ACT	Activity The LED blinks (orange) if there is USB communication via the USB-E extension. The LED doesn't light if there is no communication.
	LNK	Link The LED doesn't light if the USB extension is not operational. The LED lights (green) if the USB extension is connected and running0.

6.2 Faults

Please also refer to the Safety instructions section.

Possible faults and their correction

Fault	Cause	Measures
no function after the Embedded PC has been switched on	no power supply for the Embedded PC other causes	1. Check the fuse 2. Measure voltage at connection, check plug wiring, call Beckhoff support
Embedded PC does not boot fully	Hard disk damaged (e.g. due to switching off while software is running), incorrect setup, other causes	Check setup Call Beckhoff Support
Computer boots, software starts, but control does not operate correctly	Cause of the fault is either in the software or in parts of the plant outside the Embedded PC	Call the manufacturer of the machine or the software.
CF card access error	Faulty CFast card, faulty CFast slot	Use a different CFast card to check the CFast slot Call Beckhoff Support
Embedded PC only works partially or temporarily	Defective components in the Embedded PC	Call Beckhoff support

Please make a note of the following information **before** contacting Beckhoff service or support:

1. Precise device ID: CXxxxx-xxxx
2. Serial number
3. Hardware version
4. Any interfaces (N030, N031, B110, ...)
5. TwinCAT version used
6. Any components / software used

The quickest response will come from support / service in your country. Therefore please contact your regional contact. For details please refer to our website at www.beckhoff.de or ask your distribution partner.

7 Decommissioning

7.1 Disassembly and disposal

The disassembly of a CX20x0 hardware configuration with system interfaces takes place in 3 steps

1. Switching off and disconnecting the power supply

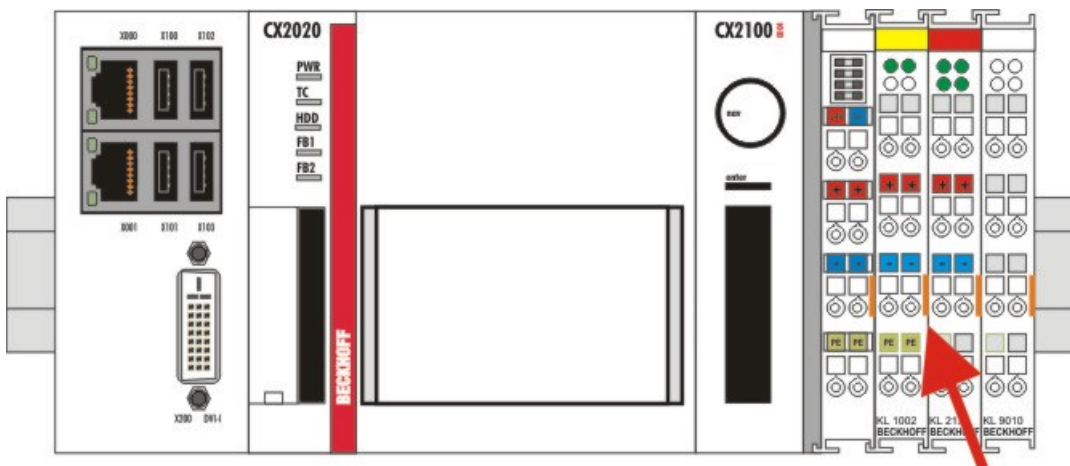
Before a CX20x0 system can be dismantled, the system should be switched off, and the power supply should be disconnected.

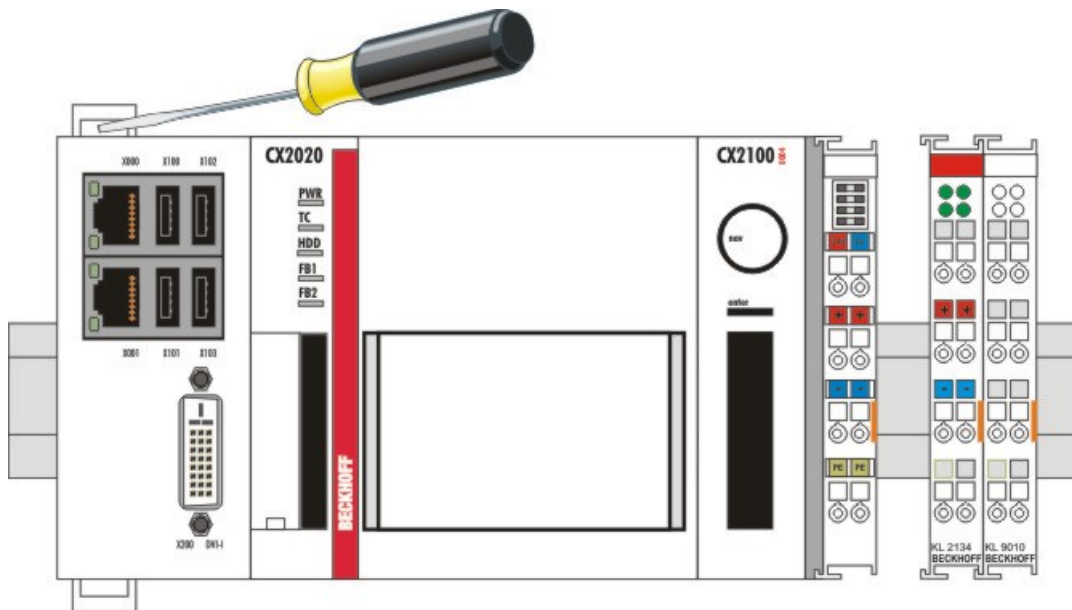
2. Removing from the DIN rail

Before the individual modules are disconnected, the whole CX20x0 hardware block should be removed from the DIN rail. Proceed as follows:

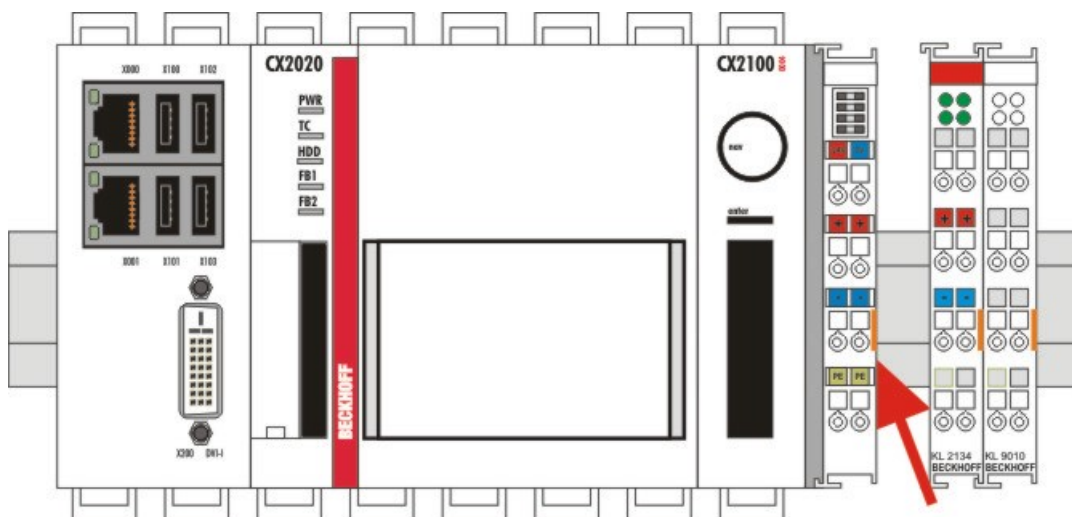
2.1. Release and remove the first Terminal next to the power supply unit on the DIN rail.

First remove any wiring from power supply unit *and* then from the first terminal on the DIN rail next to the power supply unit. If the wiring is to be reused for another system, it is advisable to make a note of the connections. Then pull the orange terminal release (see arrow) to release the terminal and pull it out.





After pulling on the terminal release of the power supply unit (see arrow) the block can be **carefully** removed from the DIN rail.



Disposal

The device must be fully dismantled in order to dispose of it.

Electronic parts must be disposed of in accordance with national electronics scrap regulations.

3. Disconnecting the system interface

Disconnecting the system modules from the basic module

If the modules are locked, i.e. attached with tie clips, the clips must be released. To this end lift the tie clips with a screwdriver and pull them out. Subsequently, the system interfaces can be separated again.



Attention

Do not use force to open the device!

Opening the module housing by force would destroy it. The devices may only be opened by Beckhoff service personnel.

8 Appendix

8.1 Certifications

All products of the Embedded PC family are CE, UL and GOST-R certified. Since the product family is continuously developed further, we are unable to provide a full listing here. The current list of certified products can be found at www.beckhoff.com.

FCC Approvals for the United States of America

FCC: Federal Communications Commission Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Approval for Canada

FCC: Canadian Notice

This equipment does not exceed the Class A limits for radiated emissions as described in the Radio Interference Regulations of the Canadian Department of Communications.

8.2 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff's branch offices and representatives

Please contact your Beckhoff branch office or representative for local support and service on Beckhoff products!

The addresses of Beckhoff's branch offices and representatives round the world can be found on her internet pages:

<http://www.beckhoff.com>

You will also find further documentation for Beckhoff components there.

Beckhoff Headquarters

Beckhoff Automation GmbH & Co. KG

Huelshorstweg 20
33415 Verl
Germany

Phone:	+49(0)5246/963-0
Fax:	+49(0)5246/963-198
e-mail:	info@beckhoff.com

Beckhoff Support

Support offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with other, wide-ranging services:

- support
- design, programming and commissioning of complex automation systems
- and extensive training program for Beckhoff system components

Hotline:	+49(0)5246/963-157
Fax:	+49(0)5246/963-9157
e-mail:	support@beckhoff.com

Beckhoff Service

The Beckhoff Service Center supports you in all matters of after-sales service:

- on-site service
- repair service
- spare parts service
- hotline service

Hotline:	+49(0)5246/963-460
Fax:	+49(0)5246/963-479
e-mail:	service@beckhoff.com