BECKHOFF New Automation Technology

Manual | EN

CX9240

Embedded PC

2025-02-04 | Version: 1.1

Table of contents

1 Notes on the documentation

This description is intended exclusively for trained specialists in control and automation technology who are familiar with the applicable national standards.
The documentation and the following notes and explanations must be complied with when installing and commissioning the components.
The trained specialists must always use the current valid documentation.

The trained specialists must ensure that the application and use of the products described is in line with all safety requirements, including all relevant laws, regulations, guidelines, and standards.

Disclaimer

The documentation has been compiled 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 notice.
Claims to modify products that have already been supplied may not be made on the basis of the data, diagrams, and descriptions in this documentation.

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1.1 Representation and structure of warnings

The following warnings are used in the documentation. Read and follow the warnings.

Warnings relating to personal injury:

⚠ DANGER
Hazard with high risk of death or serious injury.

⚠ WARNING
Hazard with medium risk of death or serious injury.

⚠ CAUTION
There is a low-risk hazard that can result in minor injury.

Warnings relating to damage to property or the environment:

NOTICE
There is a potential hazard to the environment and equipment.

Notes showing further information or tips:

This notice provides important information that will be of assistance in dealing with the product or software. There is no immediate danger to product, people or environment.

1.2 Documentation issue status

Version	Changes
1.0	First release
1.1	Technical data (TPM) adapted

2 For your safety

Read the chapter on safety and follow the instructions in order to protect from personal injury and damage to equipment.

Limitation of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Unauthorized modifications and changes to the hardware or software configuration, which go beyond the documented options, are prohibited and nullify the liability of Beckhoff Automation GmbH & Co. KG.
In addition, the following actions are excluded from the liability of Beckhoff Automation GmbH & Co. KG:

- Failure to comply with this documentation.
- Improper use.
- Use of untrained personnel.
- Use of unauthorized replacement parts.

2.1 Intended use

The embedded PC is a control system for use in machine and system engineering for automation, visualization and communication. The embedded PC is designed for installation in a control cabinet or terminal box and is used together with Bus or EtherCAT Terminals to receive digital and analog signals from sensors and output them to actuators or forward them to higher-level controllers.

The Embedded PC is designed for a working environment that meets the requirements of protection class IP20. This involves finger protection and protection against solid foreign objects up to 12.5 mm, but not protection against water. Operation of the devices in wet and dusty environments is not permitted, unless specified otherwise. The specified limits for electrical and technical data must be adhered to.

Improper use

The Embedded PC is not suitable for operation in the following areas:

- Potentially explosive atmospheres.
- Areas with an aggressive environment, e.g. aggressive gases or chemicals.
- Living areas. If the devices are to be used in living areas, the relevant standards and guidelines for interference emissions must be adhered to, and the devices must be installed in housings or control boxes with suitable shielding.

2.2 Staff qualification

All operations involving Beckhoff software and hardware may only be carried out by qualified personnel with knowledge of control and automation engineering. The qualified personnel must have knowledge of the administration of the Industrial PC and the associated network.

All interventions must be carried out with knowledge of control programming, and the qualified personnel must be familiar with the current standards and guidelines for the automation environment.

2.3 Safety instructions

The following safety instructions must be followed during installation and working with networks and the software.

Mounting

- Never work on live equipment. Always switch off the power supply for the device before installation, troubleshooting or maintenance. Protect the device against unintentional switching on.

- Observe the relevant accident prevention regulations for your machine (e.g. the BGV A 3, electrical systems and equipment).
- Ensure standard-compliant connection and avoid risks to personnel. Ensure that data and supply cables are laid in a standard-compliant manner and ensure correct connection.
- Observe the relevant EMC guidelines for your application.
- Avoid polarity reversal of the data and supply cables, as this may cause damage to the equipment.
- The devices contain electronic components, which may be destroyed by electrostatic discharge when touched. Observe the safety precautions against electrostatic discharge according to DIN EN 61340-5-1/-3.

Working with networks

- Restrict access to all devices to an authorized circle of persons.
- Change the default passwords to reduce the risk of unauthorized access.
- Protect the devices with a firewall.
- Apply the IT security precautions according to IEC 62443, in order to limit access to and control of devices and networks.

Working with the software

- The sensitivity of a PC against malicious software increases with the number of installed and active software.
- Uninstall or disable unnecessary software.

Further information on the safe handling of networks and software can be found in the Beckhoff Information System:
http://infosys.beckhoff.com

Document name
IPC Security Guideline

2.4 Notes on information security

The products of Beckhoff Automation GmbH & Co. KG (Beckhoff), insofar as they can be accessed online, are equipped with security functions that support the secure operation of plants, systems, machines and networks. Despite the security functions, the creation, implementation and constant updating of a holistic security concept for the operation are necessary to protect the respective plant, system, machine and networks against cyber threats. The products sold by Beckhoff are only part of the overall security concept. The customer is responsible for preventing unauthorized access by third parties to its equipment, systems, machines and networks. The latter should be connected to the corporate network or the Internet only if appropriate protective measures have been set up.

In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our https://www.beckhoff.com/secguide.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

To stay informed about information security for Beckhoff products, subscribe to the RSS feed at https://www.beckhoff.com/secinfo.

3 Transport and storage

Transport

NOTICE

Short circuit due to moisture

Moisture can form during transport in cold weather or in the event of large temperature fluctuations.

Avoid moisture formation (condensation) in the embedded PC, and leave it to adjust to room temperature slowly. If condensation has occurred, wait at least 12 hours before switching on the embedded PC.

Despite the robust design of the unit, the components are sensitive to strong vibrations and impacts. Transporting a control cabinet with a built-in embedded PC can result in excessive impact on the embedded PC.

- During transport, the device must therefore be protected from excessive mechanical stress.
- Appropriate packaging of the industrial PC, in particular the original packaging, can improve vibration resistance during transport.
- Send the embedded PC in the original packaging and additional outer packaging.

Table 1: Dimensions and weight.

	CX9240
Dimensions (W x H x D)	84 mm x 100 mm x 91 mm
Weight	approx. 650 g

Storage

- Store the Embedded PC in the original packaging.

4 Product overview

The CX9240 Embedded PC is a compact, DIN rail-mountable Ethernet controller with a 1.2 GHz Arm® Cortex® A53 CPU with four cores and 2 GB LPDDR4 RAM. The CX9240 Embedded PC is a full-fledged PC with the following basic configuration:

- a microSD card slot,
- two independent 1 Gbit Ethernet interfaces,
- four USB 3.0 interfaces,
- and a DisplayPort interface

The embedded PC features an internal 1-second UPS as persistent data memory. The 1-second UPS enables up to 1 MB of persistent data to be saved to the microSD card in the event of a power failure. Beckhoff RT Linux® can be used as the operating system.

Optional interface

The embedded PC can be ordered ex factory with an optional interface. The optional interface cannot be retrofitted.

Table 2: Available optional interfaces for the CX9240.

CX9240-xxxx	Optional interfaces
CX9240-N030	RS232 interface, D-sub connector, 9-pin (RXD, TXD, RTS, CTS)
CX9240-N031	RS485 interface, D-sub socket, 9-pin
CX9240-B110	EtherCAT slave, EtherCAT IN and OUT (2 x RJ45).
CX9240-M310	PROFIBUS master, D-sub socket, 9-pin.
CX9240-B310	PROFIBUS slave, D-sub socket, 9-pin.
CX9240-M510	CANopen master, D-sub connector, 9-pin.
CX9240-B510	CANopen slave, D-sub connector, 9-pin.
CX9240-M910	Ethernet (2 x RJ45 switch), expandable for real-time protocols, e.g. PROFINET, EtherNet/IP, BACnet/IP

Power supply terminal

On the right-hand side of the embedded PC is the power supply terminal with an integrated, electrically isolated 24 V DC power supply that supplies the embedded PC with power. Bus terminals (K-bus) or EtherCAT Terminals (E-bus) can be attached on the right-hand side of the power supply terminal. The power supply terminal automatically recognizes the respective bus system (K-bus or E-bus).

Software

The TwinCAT automation software transforms a CX9240 system into a powerful PLC and Motion Control system that can be operated with or without visualization. The device can optionally be ordered with a fieldbus or serial interface.

4.1 Structure

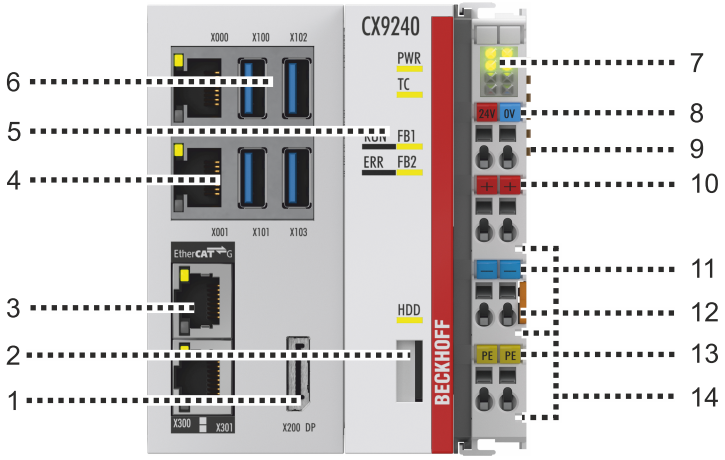


Fig. 1: Example configuration of a CX9240 Embedded PC.

Table 3: Legend for the structure.

No.	Component	Description
1	DisplayPort (X200).	Interface for a monitor or panel.
2	microSD card slot	Slot for industrial microSD cards.
3	Optional interface (X300).	Space for interfaces such as RS232, EtherCAT, CANopen or others. The optional interface must be pre-ordered ex factory and cannot be retrofitted.
4	Ethernet interfaces RJ45 (X000, X001).	For connecting to local networks or the internet.
5	Diagnostic LEDs.	Diagnostic LEDs for power supply, TwinCAT and the optional interface.
6	USB 3.0 interfaces (X100, X101, X102, X103).	Interfaces for peripheral devices such as mouse, keyboard or USB memory.
7	Diagnostic LEDs, power supply terminal.	Diagnosis of the power supply for the embedded PC and the terminal bus. Status of the E-bus and K-bus communication.
8	Spring-loaded terminals, +24 V and 0 V	Power supply for embedded PC.
9	Terminal bus (K-bus or E-bus)	Interface for EtherCAT Terminals or bus terminals. Data exchange and supply.
10	Spring-loaded terminal, +24 V	Power supply for bus terminals via power contact.
11	Spring-loaded terminal, 0 V	Power supply for bus terminals via power contact.
12	Terminal release	Releases the power supply terminal and thus the embedded PC from the DIN rail.
13	Spring-loaded terminal, PE	Spring-loaded terminal for power contact PE.
14	Power contacts, +24 V, 0 V, PE	Power contacts for bus terminals.

4.2 Name plate

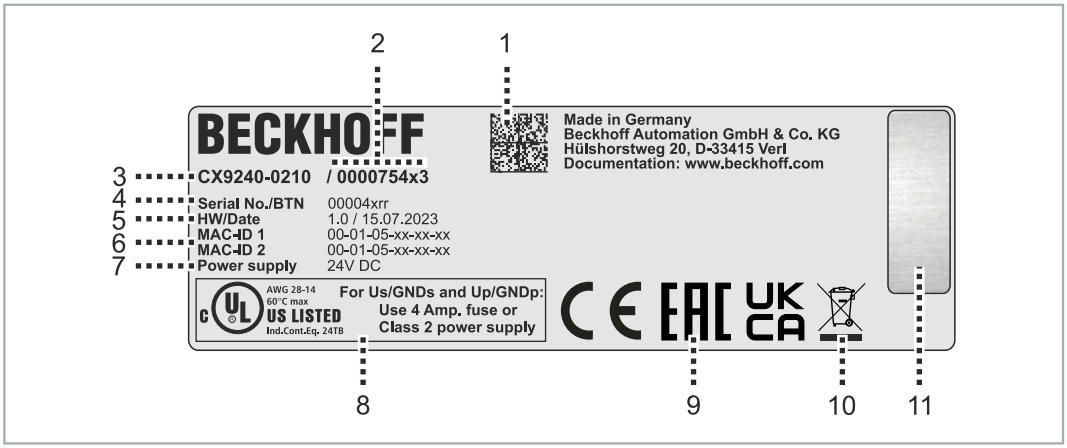


Fig. 2: Name plate example.

Table 4: Information on the name plate.

No.	Description
1	Machine-readable information in the form of a Data Matrix Code (DMC, code scheme ECC200) that you can use for better identification and management.
2	Variant number for identification of the embedded PC configuration. With this number, the exact configuration of embedded PC, operating system, options and TwinCAT can be reordered.
3	Product designation for identification of the embedded PC.
4	Serial number/Beckhoff Traceability Number (BTN) for the unambiguous identification of the product.
5	Hardware version and date of manufacture.
6	MAC addresses of the built-in Ethernet interfaces. The host name is made up of CX and the last three bytes of the MAC address. Example: the MAC address: 00-01-05-aa-bb-cc results in the host name **CX-aabbcc**.
7	Power supply 24 V DC
8	UL marking with prescribed information on power supply, fuse, temperature, and cable cross-sections.
9	CE, EAC and UKCA marking.
10	Marking for garbage disposal. Do not dispose of this product with household waste.
11	License sticker for operating system (optional).

4.3 Types

The CX9240 Embedded PC can be ordered with different software options. Use this overview in conjunction with the information on the name plate to ascertain the operating system and the TwinCAT version of the embedded PC.

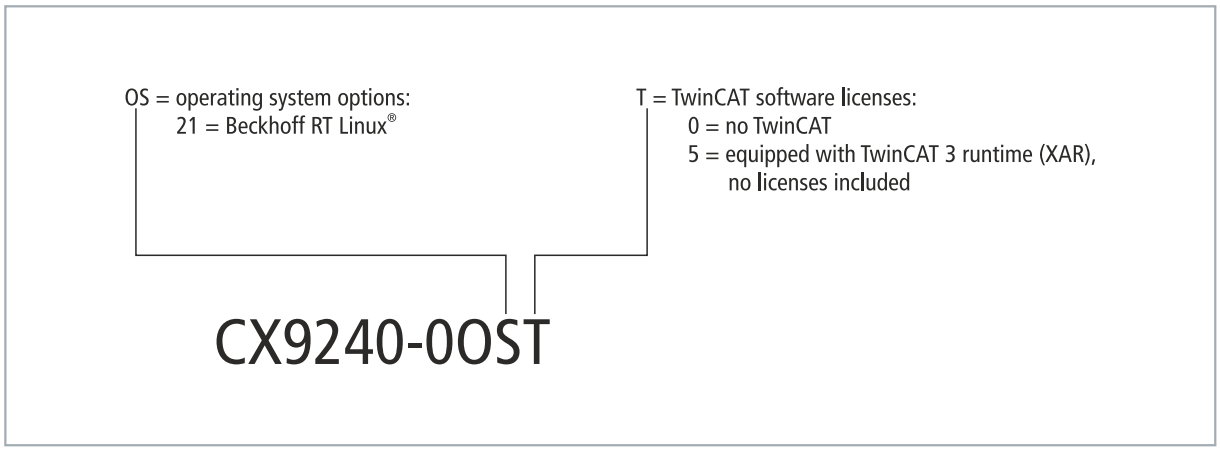


Fig. 3: Nomenclature for the CX9240 Embedded PC.

The CX9240 Embedded PC is available with the following software options:

Table 5: CX9240, ordering information for software.

Ordering information	Description
CX9240-0210	CPU module, Beckhoff RT Linux®, no TwinCAT
CX9240-0215	CPU module, Beckhoff RT Linux®, TwinCAT Runtime 3 (XAR), no licenses included

TwinCAT 3 runtime (XAR) is pre-installed, without licenses. Please refer to the TwinCAT 3 price list for the TwinCAT 3 licenses to be ordered separately.

5 Interface description

5.1 USB 3.0 (X100, X101, X102, X103)

The embedded PC has four independent USB interfaces. for connecting keyboards, mice, touch screens and other input or data storage devices.

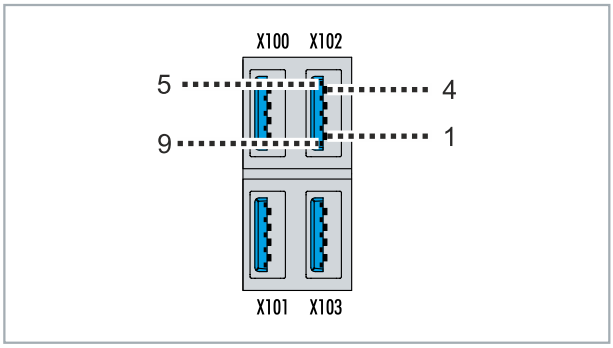


Fig. 4: USB interfaces X100, X101, X102, X103.

The USB interfaces are type A and comply with the USB 3.0 specification.

Table 6: USB interfaces (X100, X101, X102, X103), pin assignment.

Pin	Connection	Typical assignment
1	VBUS	Red
2	D-	White
3	D+	Green
4	GND	Black
5	StdA_SSRX−	Blue
6	StdA_SSRX+	Yellow
7	GND_DRAIN	N/A
8	StdA_SSTX−	Purple
9	StdA_SSTX+	Orange
Shell	Shield	Drain Wire

Note the power consumption of the connected devices. The USB interfaces of the CX9240 are limited to 1.1 A in pairs, X100 and X102 or X101 and X103. No more than 900 mA and 4.5 W of power can be output per interface. The USB interfaces support data rates of up to 5 Gbit/s.

5.2 Ethernet RJ45 (X000, X001)

The two Ethernet interfaces are independent; no switch is integrated. The independent Ethernet interfaces can be configured in different ways. In their delivered state, the Ethernet interfaces (X000, X001) are configured for EtherCAT communication.

Note that an additional switch is required for a line topology.

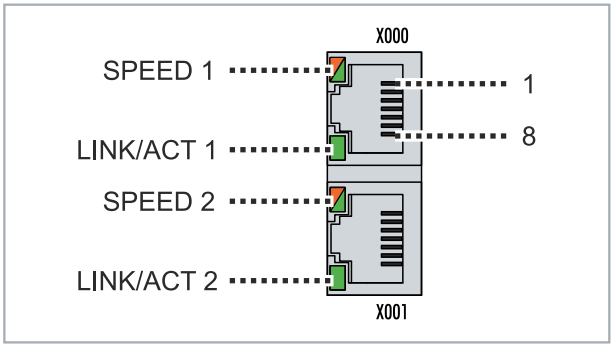


Fig. 5: Ethernet interfaces X000, X001.

Both Ethernet interfaces reach speeds of 10/100/1000 Mbits. The LEDs on the left of the interfaces show the connection status. The lower LED (LINK/ACT) indicates whether the interface is connected to a network. If this is the case, the LED lights up green. The LED flashes when data is being transferred on the interface.

The upper LED (SPEED) indicates the connection speed. At a speed of 10 Mbits, the LED does not light up. If the speed is 100 Mbits, the LED lights up green. If the speed is 1000 Mbits (gigabit) the LED lights up red.

Table 7: Ethernet interface X000 and X001, pin assignment.

PIN	Signal	Description
1	T2 +	Pair 2
2	T2 -	
3	T3 +	Pair 3
4	T1 +	Pair 1
5	T1 -	
6	T3 -	Pair 3
7	T4 +	Pair 4
8	T4 -	

5.3 DisplayPort (X200)

The DisplayPort transmits image and sound signals and enables monitors or panels to be connected to the embedded PC.

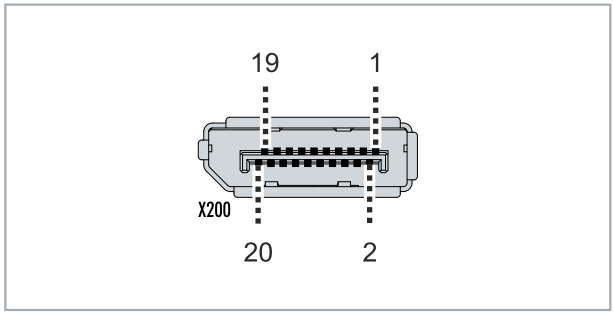


Fig. 6: DisplayPort X300.

In this version, the embedded PC supports DisplayPort version 1.2. This enables high resolutions of up to 4K at 30 Hz and the transmission of HDR (High Dynamic Range) content.

The connection is backwards compatible with older DisplayPort versions and also supports adapter solutions, such as DisplayPort to HDMI or DisplayPort to DVI, for monitors without a DisplayPort connection.

Table 8: DisplayPort, pin assignment.

Pin	Connection	Pin	Connection
1	LVDS lane 0+	2	Ground
3	LVDS lane 0-	4	LVDS lane 1+
5	Ground	6	LVDS lane 1-
7	LVDS lane 2+	8	Ground
9	LVDS lane 2-	10	LVDS lane 3+
11	Ground	12	LVDS lane 3-
13	Config 1	14	Config 2
15	AUX channel+	16	Ground
17	AUX channel-	18	Hot-plug detection
19	Power supply: ground	20	Power supply: 3.3 V / 500 mA

Table 9: DisplayPort X300, resolution at the monitor.

Interface	Resolution in pixels
DisplayPort	(2560 x 1440) @60 Hz
	(3840 x 2160) @30 Hz

5.4 Optional interfaces

An optional interface is an additional interface that can be equipped with a wide range of signal types ex factory and extends the Embedded PC beyond the basic equipment. The optional interface must be ordered in advance and cannot be retrofitted to the device.

5.4.1 RS422/RS485 (N031)

The optional N031 interface provides an RS422 or RS485 interface (X300). The interface is executed on a 9-pin D-sub socket.

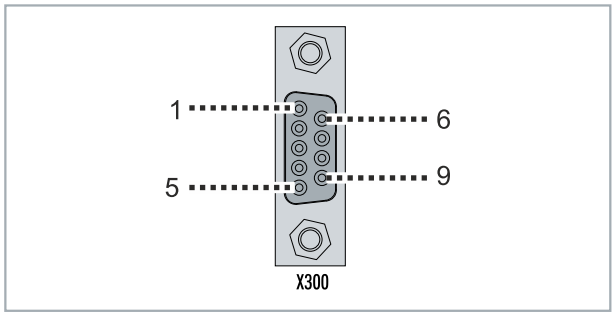


Fig. 7: RS485 interface X300.

The maximum baud rate on both channels is 115 kbit. The interface parameters are set via the operating system or from the PLC program.

Table 10: RS422/485 interface, pin assignment.

PIN	Signal	Type	Description
2	TxD+	Data-Out +	Transmit 422
3	RxD+	Data-In +	Receive 422
5	GND	Ground	Ground
6	VCC	VCC	+5 V
7	TxD-	Data-Out -	Transmit 422
8	RxD-	Data-In -	Receive 422

For RS 485 pins 2 and 3 (data +) must be connected, and pins 7 and 8 (data -).

By default the interface is parameterized as follows on delivery:

Table 11: Default setting, RS485 without echo with end point (terminated).

Function	Status
Echo on	off
Echo off	on
Auto send on	on
Always send on	off
Auto receive on	on
Always receive on	off
Term on	on
Term on	On

Other configurations for the RS485 interface

Other configurations for the RS485 interface can be ordered ex factory. The following options are available:

- N031-0001 RS485 with echo, end point (terminated).
- N031-0002 RS485 without echo, stub (without termination).
- N031-0003 RS485 with echo, stub (without termination).

- N031-0004 RS422 full duplex end point (terminated).

An RS485 interface cannot be configured retrospectively and must always be ordered ex factory as required.

5.4.2 EtherCAT slave (B110)

The latest generation of embedded PCs can be ordered ex factory with an EtherCAT slave interface (B110). On the devices, the optional B110 interface is referred to as X300.

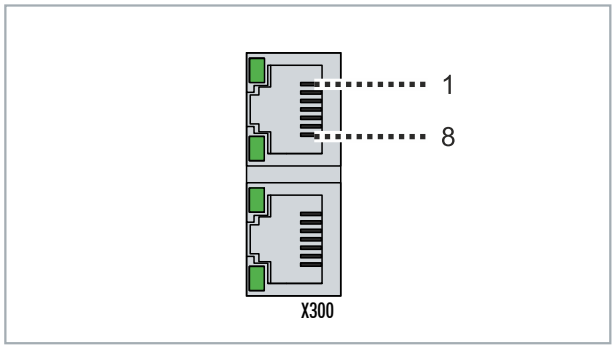


Fig. 8: EtherCAT slave interface X300.

The incoming EtherCAT signal is connected to the upper LAN interface. The lower LAN interface relays the signal to other EtherCAT slave devices.

Table 12: EtherCAT slave interface X300, pin assignment.

PIN	Signal	Description
1	TD +	Transmit +
2	TD -	Transmit -
3	RD +	Receive +
4	connected	reserved
5		
6	RD -	Receive -
7	connected	reserved
8		

For the EtherCAT slave optional interface (B110), documentation with further information is available: https://infosys.beckhoff.com/content/1033/b110_ethercat_optioninterface/index.html?id=2623834056269338700

Document name
CXxxxx-B110 | EtherCAT Slave Optional Interface.

5.4.3 PROFIBUS (x310)

Pin 6 transfers 5 V_{DC}, pin 5 transfers GND for the active termination resistor. These must never be used for other functions, as this can lead to destruction of the device.

Pins 3 and 8 transfer the PROFIBUS signals. These must never be swapped over, as this will prevent communication.

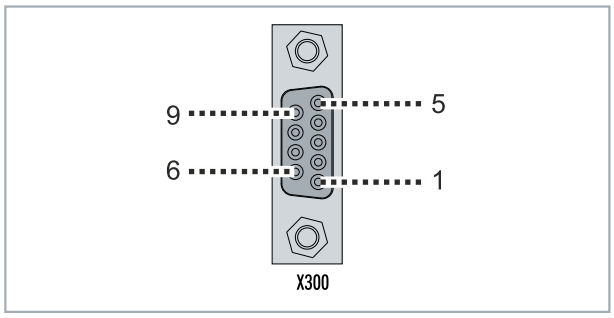


Fig. 9: PROFIBUS interface X310.

The Profibus bus line is connected via a 9-pin D-sub with the following pin assignment:

Table 13: PROFIBUS interface X310, pin assignment.

Pin	Connection
1	Shielding
2	not used
3	RxD/TxD-P
4	not used
5	GND
6	+5 V_{DC}
7	not used
8	RxD/TxD-N
9	not used

Table 14: Wire colors of the PROFIBUS line.

PROFIBUS line	D-sub
B red	Pin 3
A green	Pin 8

For the PROFIBUS optional interface (x310), documentation with further information is available:
https://infosys.beckhoff.com/content/1033/m310_b310_profibus_optioninterface/index.html?id=2233561431434830097

Document name
CXxxxx-M310/B310 | Profibus Optional Interface

5.4.4 CANopen (x510)

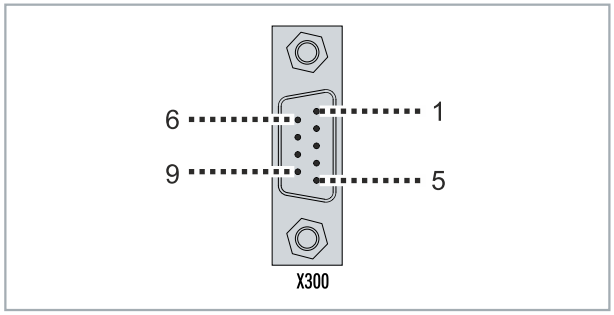


Fig. 10: CANopen interface X510.

The CAN bus line is connected via a 9-pin D-sub connector with the following pin assignment:

Table 15: CANopen interface X510, pin assignment.

Pin	Connection
1	not used
2	CAN low (CAN-)
3	CAN Ground (internally connected to pin 6)
4	not used
5	Shield
6	CAN Ground (internally connected to pin 3)
7	CAN high (CAN+)
8	not used
9	not used

For the CANopen optional interface (x510), documentation with further information is available:
https://infosys.beckhoff.com/content/1033/m510_b510_canopen_optioninterface/index.html?id=1404127979601372947

Document name
CXxxxx-M510/B510 | CANopen Optional Interface

5.4.5 Ethernet (M910)

Various protocols such as PROFINET, EtherNet/IP™ and BACnet/IP can be used via the M910 Ethernet interface. The configuration and licensing of the fieldbuses takes place in TwinCAT.

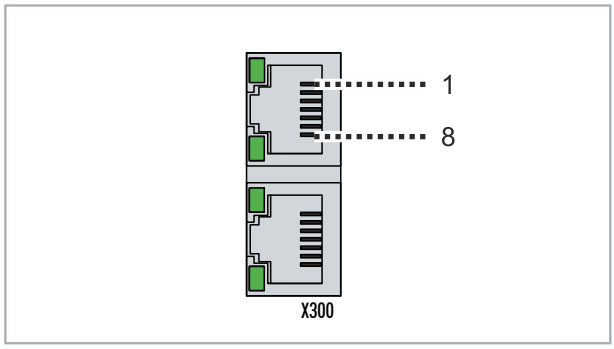


Fig. 11: Ethernet interface M910.

Table 16: Ethernet interface, PIN assignment.

PIN	Signal	Description
1	TD +	Transmit +
2	TD -	Transmit -
3	RD +	Receive +
4	connected	reserved
5		
6	RD -	Receive -
7	connected	reserved
8		

6 Commissioning

6.1 Assembly

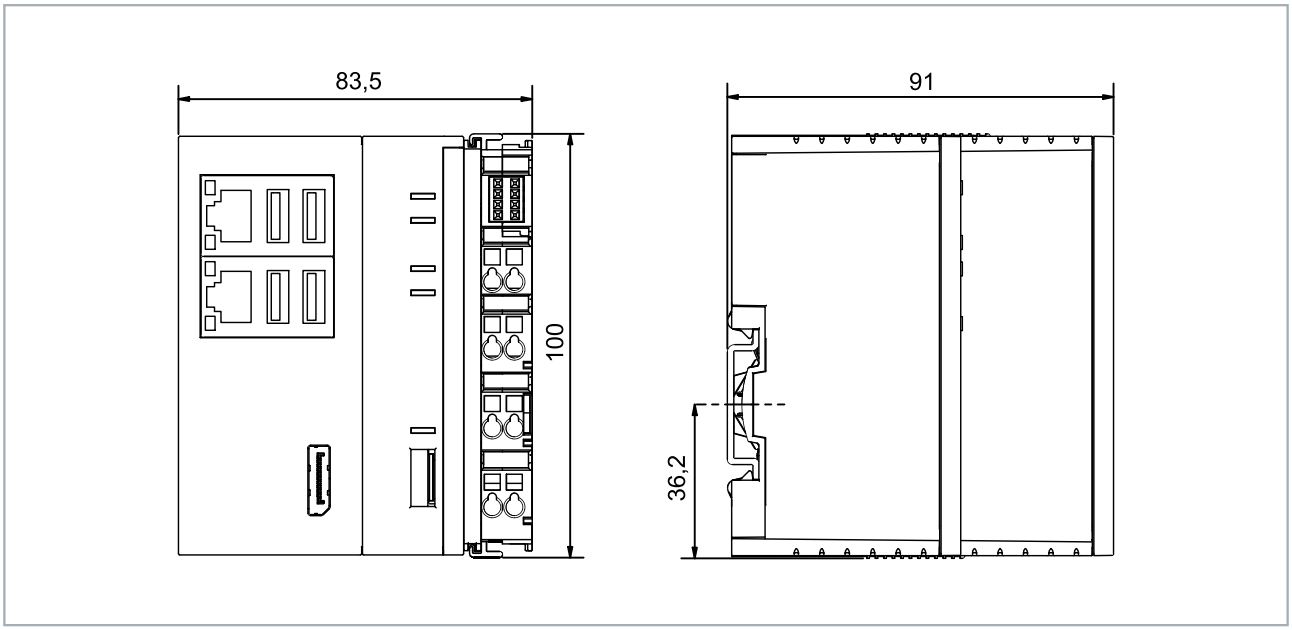


Fig. 12: CX9240 Embedded PC, dimensions.

6.1.1 Permissible installation positions

NOTICE

Overheating

The embedded PC may overheat if the installation position is incorrect or the minimum distances are not adhered to. Adhere to the maximum ambient temperature of 60°C and the mounting instructions.

Install the embedded PC horizontally in the control cabinet on a DIN rail, in order to ensure optimum heat dissipation.

Note the following specifications for the control cabinet:

- The embedded PC should only be operated at ambient temperatures between -25 °C and 60 °C. Measure the temperature below the embedded PC at a distance of 30 mm to the cooling fins, in order to determine the ambient temperature correctly.
- Adhere to the minimum distances of 30 mm above and below the embedded PC.
- Additional electrical equipment affects the heat generation in the control cabinet. Select a suitable control cabinet enclosure depending on the application, or ensure that excess heat is dissipated from the control cabinet.

The embedded PC must be mounted horizontally on the DIN rail. Ventilation openings are located at the top and bottom of the housing. This ensures an optimum airflow through the embedded PC in vertical direction. In addition, a minimum clearance of 30 mm above and below the embedded PC is required, in order to ensure adequate ventilation.

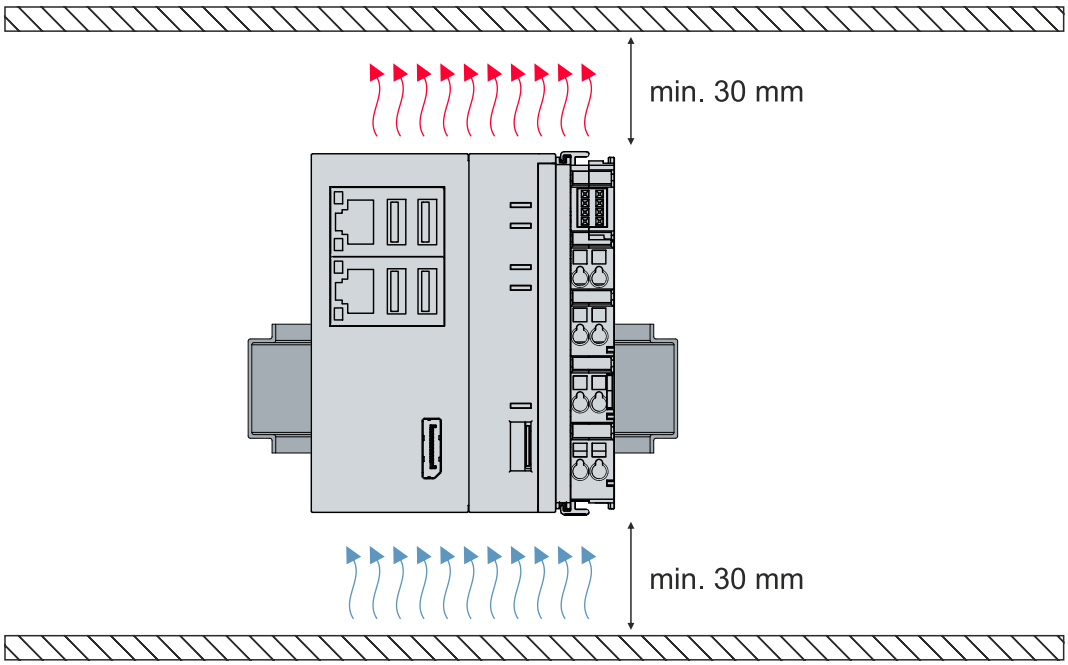


Fig. 13: CX9240 Embedded PC, permitted installation position.

If vibrations and impact occur in the same direction as the DIN rail, the embedded PC must be secured with an additional bracket, in order to prevent it slipping.

6.1.2 Fastening to the DIN rail

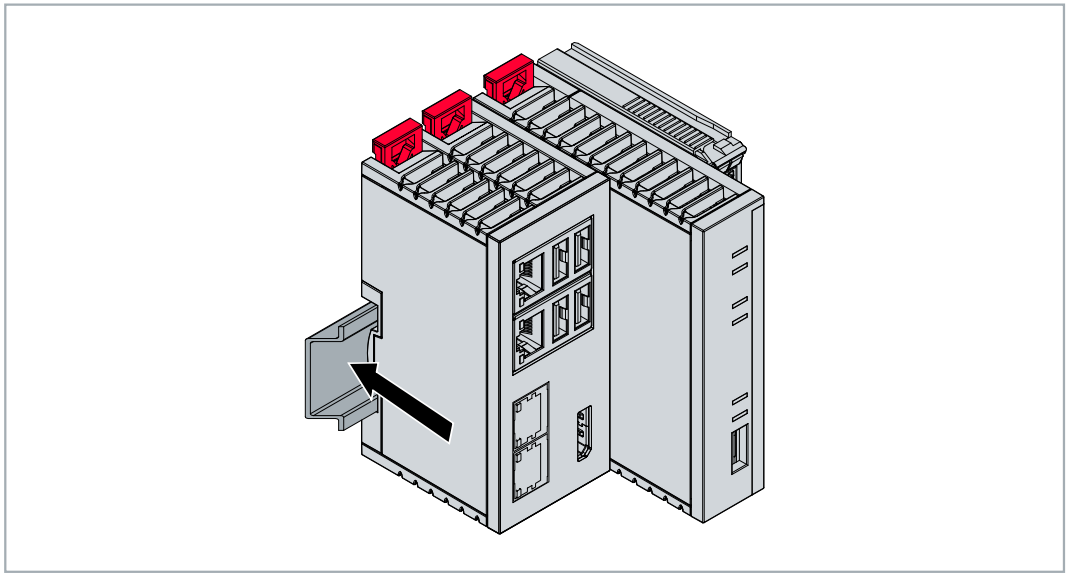
The housing is designed such that the embedded PC can be pushed against the DIN rail and latched onto it.

Requirements:

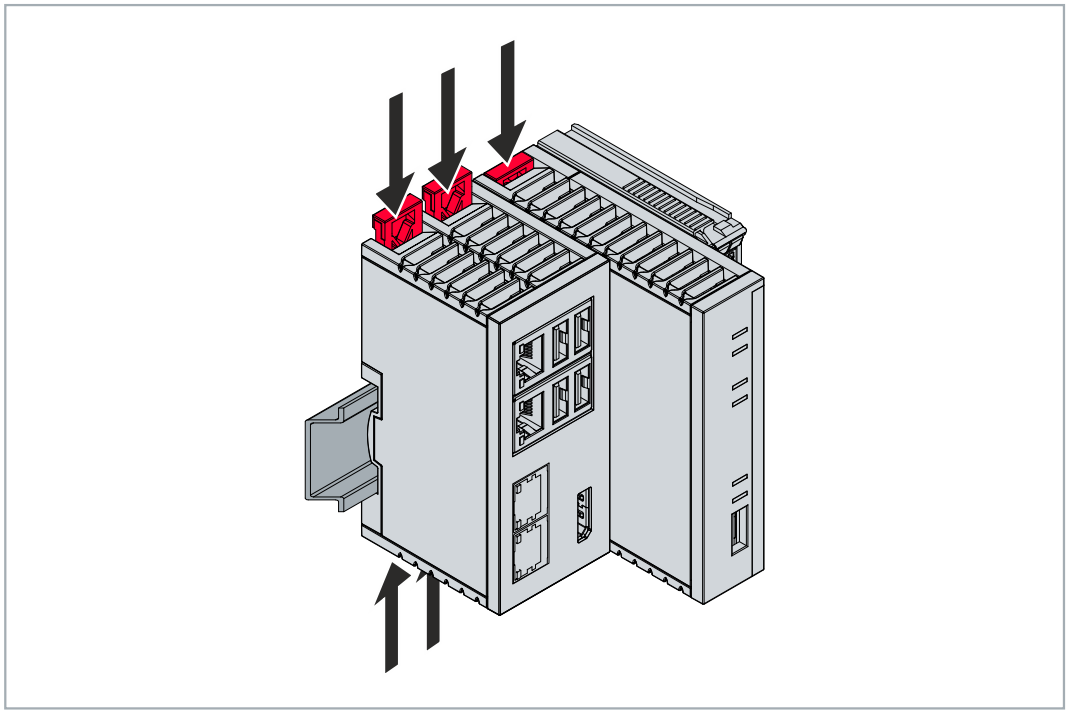
- DIN rail of the type TS35/7.5 or TS35/15 according to EN 60715.

Fasten the embedded PC to the DIN rail as follows:

1. Unlock the latches at the top and bottom.
2. Place the embedded PC on the DIN rail. Slightly press the embedded PC onto the DIN rail until a soft click can be heard and the embedded PC has latched.



3. Then lock the latches again.



⇨ You have installed the embedded PC successfully. Check again that the mounting is correct and that the embedded PC is engaged on the DIN rail.

6.1.3 Changing the MicroSD card

Loss of data

microSD cards are subjected to heavy load during operation and have to withstand many write cycles and extreme ambient conditions. microSD cards from other manufacturer may fail, resulting in data loss.

Only use industrial microSD cards provided by Beckhoff.

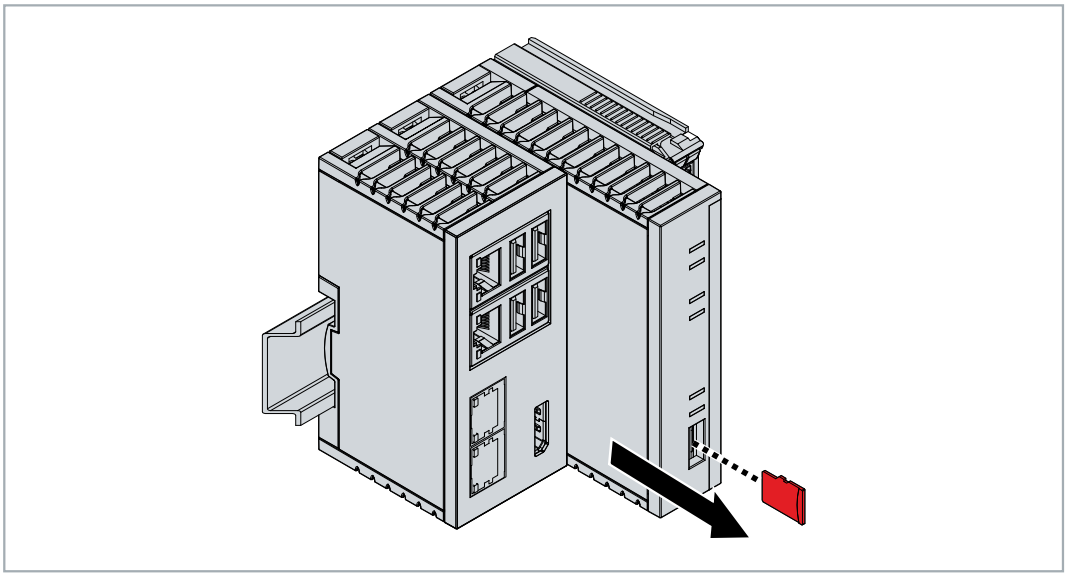
The eject mechanism is based on the push/push principle. Below, we show you how to change the microSD card.

Requirements:

- The embedded PC must be switched off. The microSD card may only be installed or removed in switched-off state.

Changing the microSD card

1. Press lightly on the microSD card.
   The card is unlocked with a soft click.



2. The card protrudes approx. 2-3 mm from the housing.
3. Push the new microSD card into the card slot with the contacts at the front. The contacts face to the right.
4. A soft click can be heard when the microSD card engages.

⇨ The card is seated correctly when it is about 1 mm deeper than the front side of the housing.

6.1.4 Installing passive EtherCAT Terminals

Incorrectly installed passive EtherCAT Terminals

The E-bus signal between an embedded PC and the EtherCAT Terminals can be impaired due to incorrectly installed passive EtherCAT Terminals.

Passive EtherCAT Terminals should not be installed directly on the power supply unit.

EtherCAT Terminals that do not take part in active data exchange are referred to as passive terminals. Passive EtherCAT Terminals have no process image and do not require current from the terminal bus (E-bus).

Passive EtherCAT Terminals (e.g. EL9195) can be detected in TwinCAT. The EtherCAT Terminal is displayed without process image in the structure tree, and the value in column "E-bus (mA)" does not change, compared to the preceding EtherCAT Terminal.

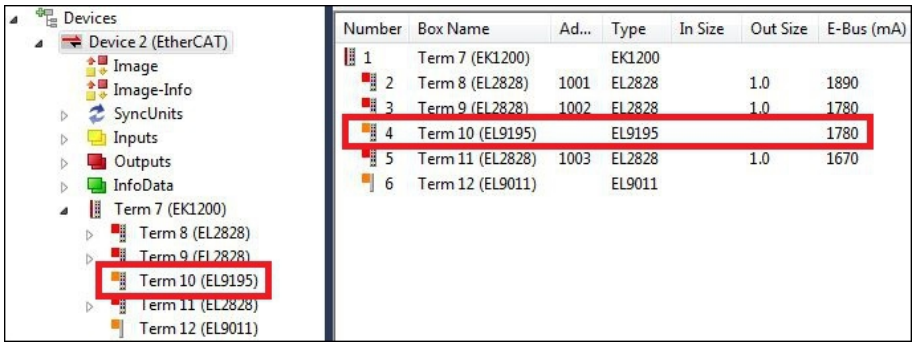


Fig. 14: Identifying a passive EtherCAT Terminal in TwinCAT.

The entry "Current consumption via E-Bus" in the technical data of an EtherCAT Terminal indicates whether a particular EtherCAT Terminal requires power from the terminal bus (E-bus).

The following diagram shows the permissible installation of a passive EtherCAT Terminal. The passive EtherCAT Terminal was not directly attached to the power supply unit.

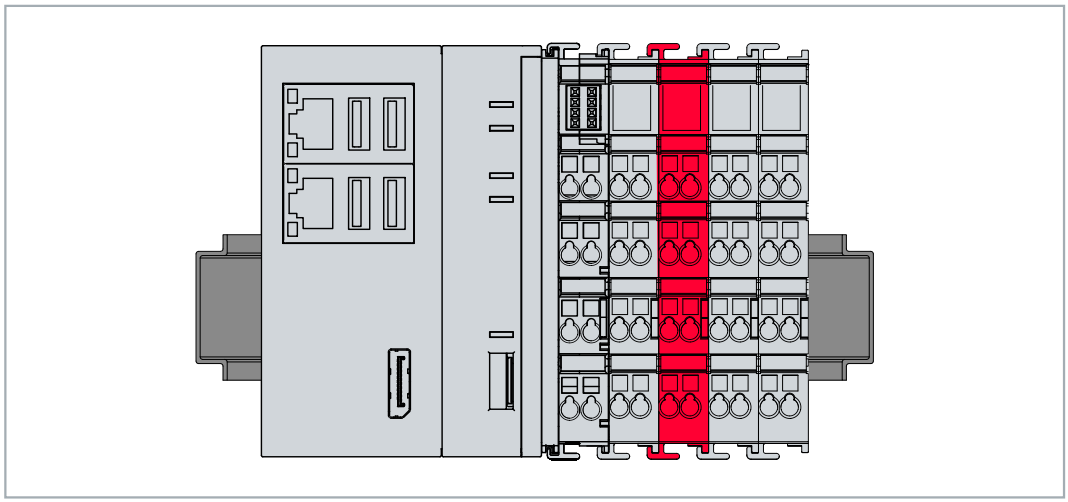


Fig. 15: Passive EtherCAT Terminals, permissible installation.

6.2 Power supply

NOTICE

Damage to the Embedded PCs

The Embedded PCs may be damaged during wiring.

- The cables for the power supply should only be connected in de-energized state.

The power supply terminal requires an external voltage source, which provides 24 V DC (-15 % / +20 %). The power supply terminal must provide 4 A at 24 V, in order to ensure the operation of the embedded PC in all situations.

The cabling of the Embedded PC in the control cabinet must be done in accordance with the standard EN 60204-1:2006 PELV = Protective Extra Low Voltage:

- The "PE" and "0 V" conductors of the voltage source for a basic CPU module must be on the same potential (connected in the control cabinet).
- Standard EN 60204-1:2006, section 6.4.1:b stipulates that one side of the circuit, or a point of the energy source for this circuit must be connected to the protective earth conductor system.

Connections

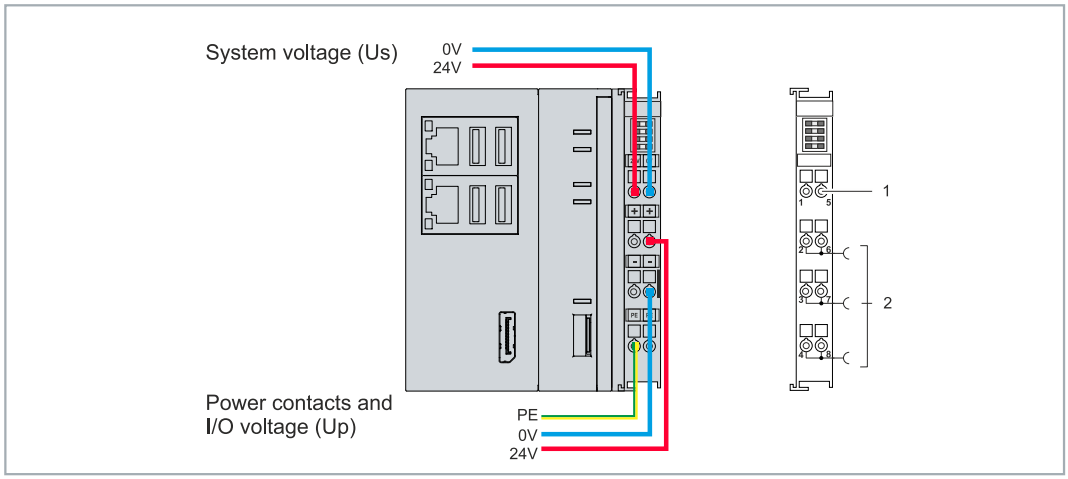


Fig. 16: Connections for system voltage (Us) and power contacts (Up).

No.	Description
1	The upper spring-loaded terminals (Us) identified with "24 V" and "0 V" supply the embedded PC and the terminal bus (data transmission via K-bus or E-bus).
2	The spring-loaded terminals (Up) identified as "+", "-" and "PE" supply the bus terminals via the power contacts and the sensors or actuators connected to the bus terminals.

Fuse

- When dimensioning the fuse for the system voltage (Us), observe the maximum power consumption of the embedded PC (see: Technical data)
- Protect the power contacts (Up) with a fuse with a max. rating of 10 A (slow-blow).

Interrupting/switching off the power supply

To switch off the embedded PC, do not disconnect the ground (0 V), because otherwise current may continue to flow via the shielding, depending on the device, and damage the embedded PC or peripheral devices.

Always disconnect the 24 V line. Devices connected to the embedded PC with their own power supply (e.g. a panel) must have the same potential for "PE" and "0 V" as the embedded PC (no potential difference).

6.2.1 Connect Embedded PC

The cables of an external voltage source are connected to spring-loaded terminals on the power supply terminal. Observe the required conductor cross-sections and strip lengths.

Table 17: Required conductor cross-sections and strip lengths.

Conductor cross-section	0.5 ... 2.5 mm²	AWG 20 ... AWG 14
Strip length	8 ... 9 mm	0.33 inch

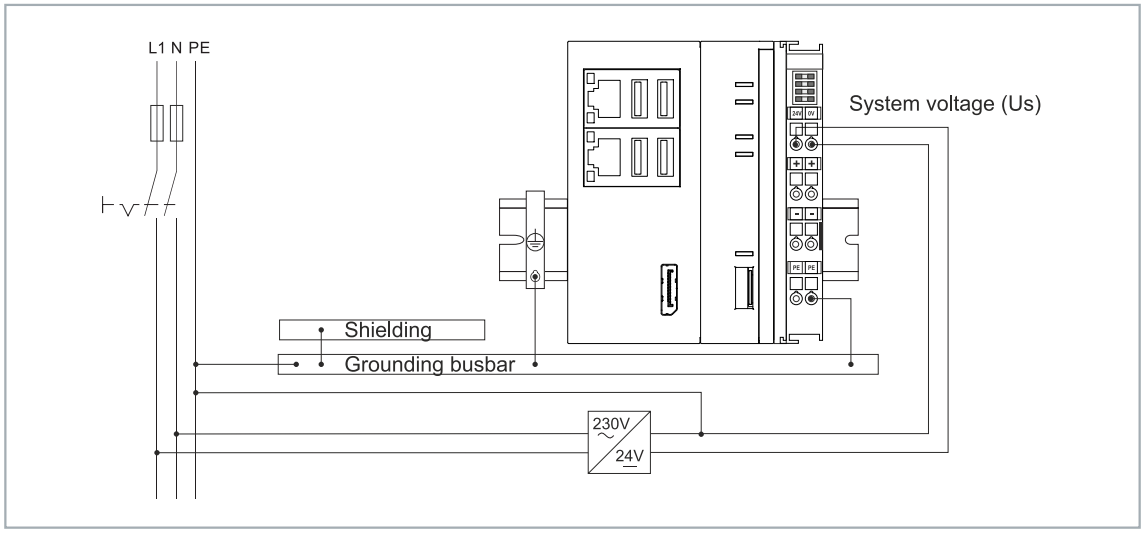
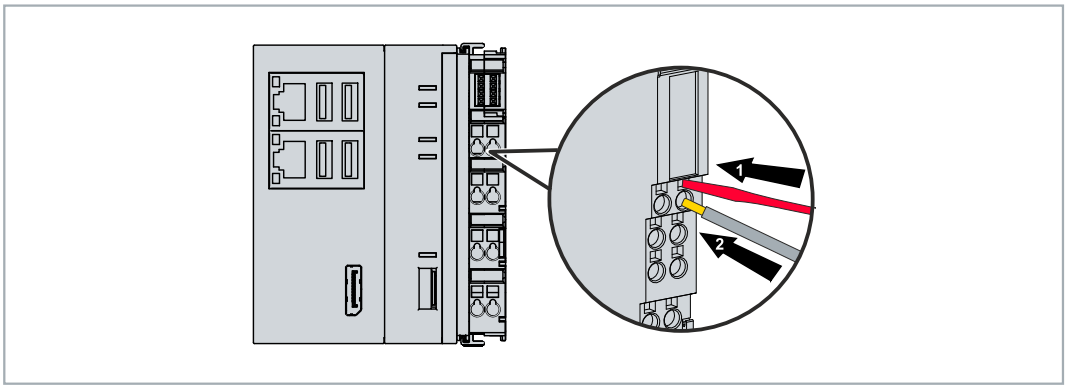


Fig. 17: Connection example with a CX9240.

Connect the embedded PC as follows:

1. Open a spring-loaded terminal by slightly pushing with a screwdriver or a rod into the square opening above the terminal.



2. The wire can now be inserted into the round terminal opening without any force.
3. The terminal closes automatically when the pressure is released, holding the wire safely and permanently.

⇨ You have successfully connected the voltage source to the power supply terminal when the two upper LEDs of the power supply terminal light up green.

The left LED (Us 24 V) indicates the supply of the basic CPU module and the terminal bus. The right LED (Up 24 V) indicates the bus terminal supply via the power contacts.

6.2.2 UL requirements

The CX9240 Embedded PCs are UL-certified. The corresponding UL label can be found on the name plate.

Fig. 18: UL label for CX9240.

The CX9240 Embedded PCs can thus be used in areas in which special UL requirements have to be met. These requirements apply to the system voltage (Us) and the power contacts (Up). Applications without special UL requirements are not affected by UL regulations.

UL requirements:

- The embedded PCs must not be connected to unlimited voltage sources.
- Embedded PCs may only be supplied from a 24 V DC voltage source. The voltage source must be insulated and protected with a fuse of maximum 4 A (corresponding to UL248).
- Or the power supply must originate from a voltage source that corresponds to NEC class 2. An NEC class 2 voltage source must not be connected in series or parallel with another NEC class 2 voltage source.

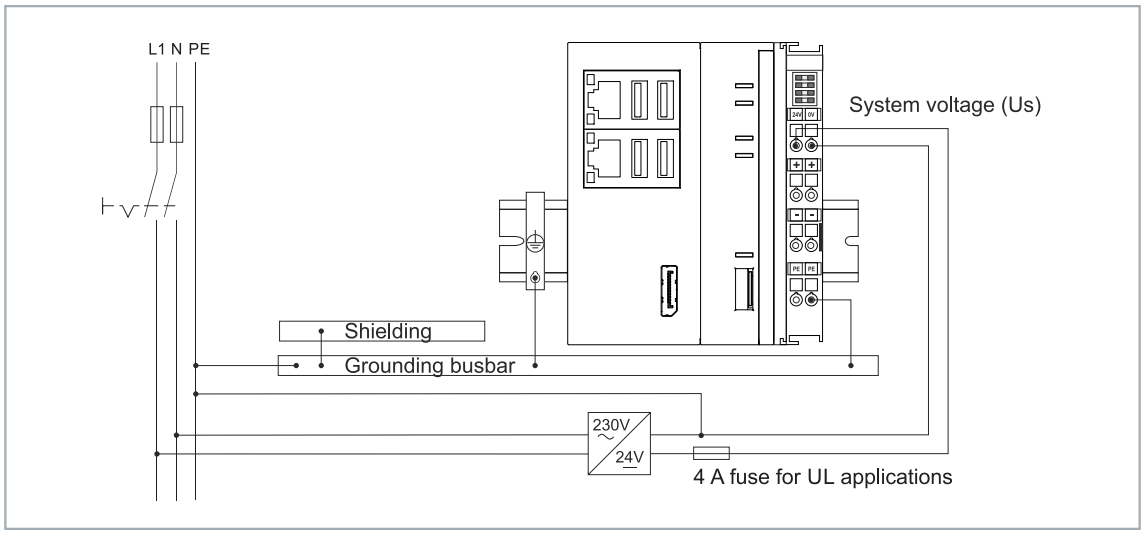


Fig. 19: Connection example for areas with special UL requirements.

6.3 Switching on

Please ensure that the embedded PC is fully configured before switching on the embedded PC.

Switch on the embedded PC as follows:

1. Check that you have chosen the correct installation position.
2. Check whether the embedded PC is mounted securely on the DIN rail and all required bus terminals are connected.
3. Only then switch on the power supply for the power supply unit.

⇨ The embedded PC starts automatically when the external power supply is switched on. The pre-installed operating system is started.

6.4 Switching off

Loss of data

If you switch off the embedded PC during operation, data on the microSD card may be lost.

Do not disconnect the embedded PC during operation.

To switch off the embedded PC, do not disconnect the ground (0 V), because otherwise current may continue to flow via the shielding, depending on the device, and damage the embedded PC or peripheral devices.

Always switch off the power supply unit first and then disconnect the 24 V line.

Switch off the embedded PC as follows:

1. Stop all running programs properly, e.g. the control software on the embedded PC.
2. Shut down the operating system.
3. Do not switch off the external power supply until all other tasks have been completed, in order to switch off the embedded PC.

7 1-second UPS (persistent variables)

Loss of data

Use only TwinCAT to control the 1-second UPS and save only persistent data with a maximum size of 1 MB. Use beyond this may result in data loss or corrupt data.

The 1-second UPS is an UltraCap capacitor that continues to supply the processor with power in the event of a power failure. During this period persistent data can be saved, which are available on switching on again.

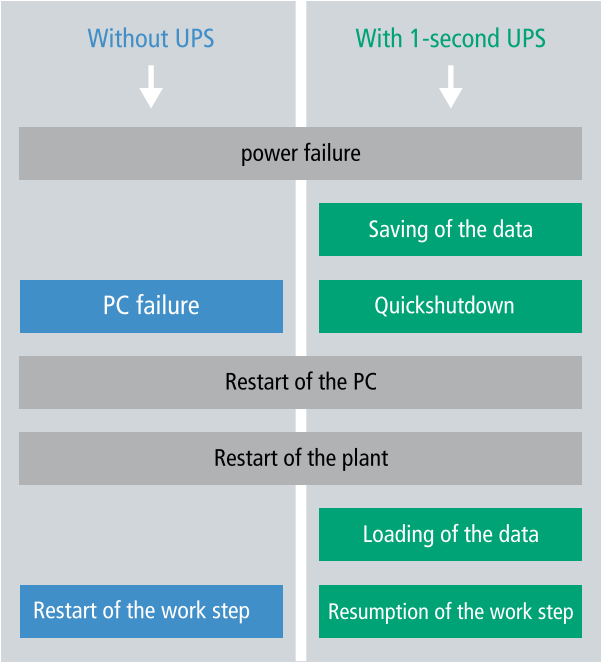


Fig. 20: Behavior of systems in the event of a power failure without and with a 1-second UPS.

Since the 1-second UPS is designed for the entire service life, the holding time is considerably longer with new devices. The capacitors age over the course of time and the holding time decreases. Therefore a maximum of 1 MB persistent data can be reliably saved over the entire service life. Do not save any other data and do not use any other applications to control the 1-second UPS.

Please note that the 1-second UPS does not supply power to the K-bus or the E-bus and that their data may already be invalid when the 1-second UPS is activated. Also, the fieldbus system (or Ethernet) may not work or not work properly once the 1-second UPS was activated.

Table 18: Storage location and names of the files in TwinCAT 3.

Development environment	File path	File name
TwinCAT 3	\\TwinCat\3.1\Boot\Plc	Port_85x.bootdata Port_85x.bootdata-old (backup) The x in the file name stands for the number of the runtime system.

Configuration of the 1-second UPS

- Declare important data such as counter values in the PLC as VAR PERSISTENT. Then call the function block FB_S_UPS_BAPI cyclically in TwinCAT in order to control the 1-second UPS (see: FB_S_UPS_BAPI [▶ 35]).
- Select the mode in the function block in order to specify what should happen in the case of a power failure. Specify, for example, whether persistent data are saved and a quick shutdown is executed (see: Data types [▶ 37]).
- You can then check the validity of the variables and monitor whether the persistent variables are loaded without error (see: PlcAppSystemInfo [▶ 37]).

Sample project:
https://infosys.beckhoff.com/content/1033/CX9240_HW/Resources/1937303563.pro.

Saving and loading persistent data

The persistent data are saved in the Port_85x.bootdata file on the memory card. On starting the PLC the Port_85x.bootdata file is loaded from the memory card, backed up there as Port_85x.bootdata_old (backup) and then deleted.

Another current Port_85x.bootdata file is not written until the system is shut down or the 1-second UPS is activated.

If no Port_85x.bootdata file exists when starting the embedded PC, the persistent data are invalid and will be deleted (standard setting). The reason for this is that the 1-second UPS was activated before the TwinCAT PLC was started during startup of the embedded PC. In this case no persistent data were saved, since the system was unable to ensure sufficient buffer time for saving the data.

Always call the function block from the PLC and always use the fastest task to do so. In the case of a power failure Beckhoff recommends not calling the rest of the application in order to ensure that sufficient time remains for writing the data.

```
IF NOT FB_S_UPS_BAPI.bPowerFailDetect THEN
    ;//Call programs and function blocks
END_IF
```

The rest of the application influences the CPU load and the CPU load in turn affects the period during which the persistent data are written.

Loading a backup of the persistent data

A registry setting can be used to determine whether the backup file is deleted or used. The backup file is used by default (setting 0):

```
[HKEY_LOCAL_MACHINE\SOFTWARE\Beckhoff\TwinCAT\Plc]"ClearInvalidPersistentData"= 0
```

If the backup file is to be deleted, the value of "ClearInvalidPersistentData" in the registry must be set to 1.

It is also possible in TwinCAT to specify on the left in the tree view under **PLC** whether the backup file is to be used or not.

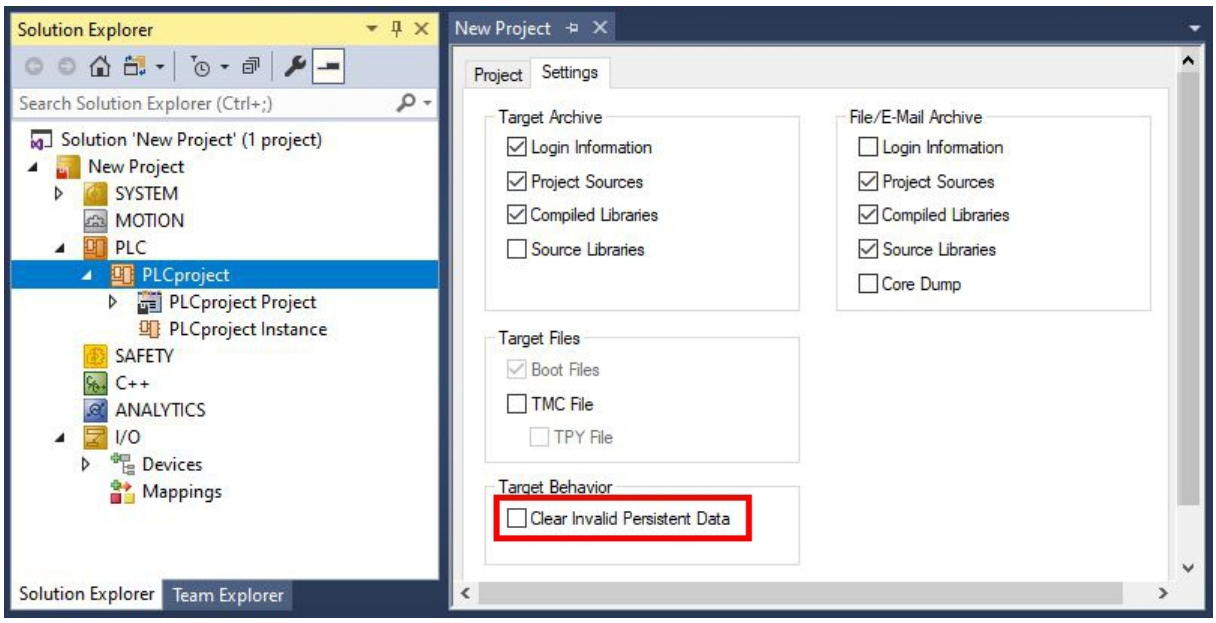


Fig. 21: Loading a backup of the persistent data. Settings in TwinCAT 3.

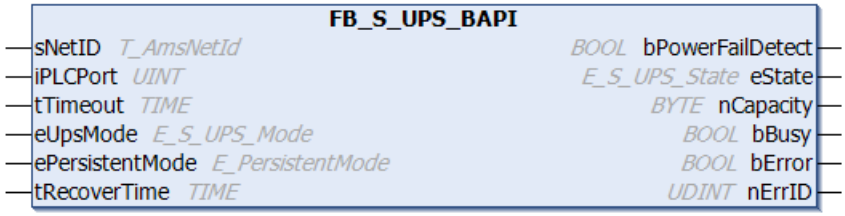
The backup files will be deleted if the option **Clear Invalid Persistent Data** is activated. Corresponds to registry entry 1.

7.1 FB_S_UPS_BAPI

NOTICE

Loss of data

If other applications or the PLC keep further files open or write to them, file errors may occur if the 1-second UPS switches off the controller.



The function block FB_S_UPS_BAPI can be used on devices with 1-second UPS and with BIOS-API from version v1.15, in order to control the 1-second UPS from the PLC.

When the function block is first called, the data for accessing the 1-second UPS are determined via BIOS-API. This process takes several cycles. This is followed by cyclic testing for power failure. When the persistent data are written next, the access data for the PLC are saved persistently, so that during subsequent boot operations the check for power failures can take place immediately after the PLC start.

In the event of a power failure the charge state of the 1-second UPS is checked every 50 ms, every 200 ms if voltage is present and the capacity is less than 90%, and every second if voltage is present and the capacity is more than 90%. This also takes place via BIOS-API access.

In the event of a power failure the function block FB_S_UPS_BAPI can be used to save the persistent data and/or execute a quick shutdown, depending on the selected mode. The default input values of the FB_S_UPS_BAPI should be retained.

The 1-second UPS can be used only for a few seconds in the event of a power failure in order, to save persistent data. The data must be saved in the fast “persistent mode” “SPDM_2PASS”, even though this can lead to real-time violations. Make sure you configure adequate router memory for saving the persistent data.

Irrespective of the mode and irrespective of whether data were saved or the quick shutdown was executed, the 1-second UPS switches off the mainboard after the discharging of the capacitors.

Function block modes

A QuickShutdown is performed automatically in the eSUPS_WrPersistData_Shutdown mode (standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown mode only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown mode a quick shutdown is executed immediately, without saving data.

In the eSUPS_CheckPowerStatus mode only a check is performed as to whether a power failure has occurred. If this is the case, the function block only switches back to the PowerOK state after the expiry of tRecoverTime (10s).

Inputs

```
VAR_INPUT
    sNetID          : T_AmsNetId:= ''; (* '' = local netid *)
    iPLCPort        : UINT; (* PLC Runtime System for writing persistent data *)
    tTimeout        : TIME := DEFAULT_ADS_TIMEOUT; (* ADS Timeout *)
    eUpsMode        : E_S_UPS_Mode := eSUPS_WrPersistData_Shutdown; (* UPS mode (w/
wo writing persistent data, w/wo shutdown) *)
    ePersistentMode : E_PersistentMode := SPDM_2PASS; (* mode for writing persistent data *)
    tRecoverTime    : TIME := T#10s; (* ON time to recover from short power failure in mode eSUPS_Wr
PersistData_NoShutdown/eSUPS_CheckPowerStatus *)
END_VAR
```

Name	Type	Description
sNetID	T_AmsNetId	AmsNetID of the controller
iPLCPort	UINT	Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, etc.). If you do not specify a port number, the function block then automatically determines the port of the PLC runtime system.
tTimeout	TIME	Timeout for writing the persistent data or the quick shutdown
eUpsMode	E_S_UPS_Mode	Defines whether persistent data are to be written and whether a quick shutdown is to be executed. The default value is eSUPS_WrPersistData_Shutdown, i.e. a quick shutdown is executed automatically once the persistent data have been saved.
ePersistentMode	E_PersistentMode	Mode for writing the persistent data. Default value is SPDM_2PASS.
tRecoverTime	TIME	Time after which the UPS reverts to the PowerOK status in the event of UPS modes without shutdown. tRecoverTime must be somewhat longer than the maximum holding time of the UPS in order to ensure that the capacitors are fully charged.

Outputs

```
VAR_OUTPUT
    bPowerFailDetect  : BOOL; (* TRUE while powerfailure is detected *)
    eState            : E_S_UPS_State; (* current ups state *)
    nCapacity         : BYTE; (* actual capacity of UPS *)
    bBusy             : BOOL; (* TRUE: function block is busy *)
    bError            : BOOL; (* FALSE: function block has error *)
    nErrID            : UDINT; (* FB error ID *)
END_VAR
```

Name	Type	Description
bPowerFailDetect	BOOL	TRUE during power failure. FALSE if the supply voltage is present.
eState	E_S_UPS_State	Internal state of the function block
nCapacity	BYTE	Current charge state of the capacitors in percent (0..100%)
bBusy	BOOL	TRUE, as long as the function block is active.
bError	BOOL	FALSE if an error has occurred.
nErrID	UDINT	Error number

Requirements

Development environment	Target platform	PLC libraries to include
TwinCAT v3.1 B4020.32	Platforms that support the BIOS API from v1.15	Tc2_SUPS

7.2 Data types

E_S_UPS_Mode

With the mode selected in the function block you can specify what should happen in the case of a power failure.

```
eSUPS_WrPersistData_Shutdown: Writing of persistent data and then a QuickShutdown

eSUPS_WrPersistData_NoShutdown: Only writing of the persistent data (no QuickShutdown)

eSUPS_ImmediateShutdown: Only QuickShutdown (no writing of persistent data)

eSUPS_CheckPowerStatus: Only check status (neither writing of persistent data nor a QuickShutdown)
```

E_S_UPS_State

The internal state of the function block can be read with E_S_UPS_State.

```
eSUPS_PowerOK:
in all modes: Power supply is OK

eSUPS_PowerFailure:
in all modes: Power supply is faulty (only shown for one PLC cycle)

eSUPS_WritePersistentData:
in mode eSUPS_WrPersistData_Shutdown: Writing of persistent data is active
in mode eSUPS_WrPersistData_NoShutdown: Writing of persistent data is active

eSUPS_QuickShutdown:
in mode eSUPS_WrPersistData_Shutdown: QuickShutdown ist active
in Mode eSUPS_ImmediateShutdown: QuickShutdown is active

eSUPS_WaitForRecover:
in mode eSUPS_WrPersistData_NoShutdown: Wait for the reestablishment of the power supply
in mode eSUPS_CheckPowerStatus: Wait for the reestablishment of the power supply

eSUPS_WaitForPowerOFF:
in mode eSUPS_WrPersistData_Shutdown: Wait for switching off of the PC by the UPS
in mode eSUPS_ImmediateShutdown: Wait for switching off of the PC by the UPS
```

7.3 PlcAppSystemInfo

Each PLC contains an instance of type 'PlcAppSystemInfo' with the name '_AppInfo'.

The corresponding namespace is 'TwinCAT_SystemInfoVarList'. This must be specified for use in a library, for example.

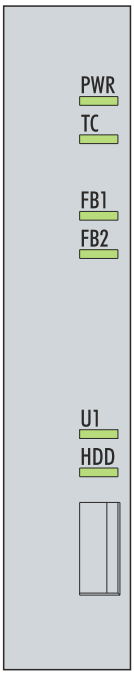
```
TYPE PlcAppSystemInfo
STRUCT
     ObjId              : OTCID;
```

```
    TaskCnt             : UDINT;
    OnlineChangeCnt     : UDINT;
    Flags               : DWORD;
    AdsPort             : UINT;
    BootDataLoaded      : BOOL;
    OldBootData         : BOOL;
    AppTimestamp        : DT;
    KeepOutputsOnBP     : BOOL;
    ShutdownInProgress  : BOOL;
    LicensesPending     : BOOL;
    BSODOccured         : BOOL;

    TComSrvPtr          : ITComObjectServer;

    AppName             : STRING(63);
    ProjectName         : STRING(63);
END_STRUCT
END_TYPE
```

ObjId	Object ID of the PLC project instance
TaskCnt	Number of tasks in the runtime system
OnlineChangeCnt	Number of online changes since the last complete download
Flags	Reserved
AdsPort	ADS port of the PLC application
BootDataLoaded	PERSISTENT variables: LOADED (without error)
OldBootData	PERSISTENT variables: INVALID (the back-up copy was loaded, since no valid file was present)
AppTimestamp	Time at which the PLC application was compiled
KeepOutputsOnBP	The flag can be set and prevents that the outputs are zeroed when a breakpoint is reached. In this case the task continues to run. Only the execution of the PLC code is interrupted.
ShutdownInProgress	This variable has the value TRUE if a shutdown of the TwinCAT system is in progress. Some parts of the TwinCAT system may already have been shut down.
LicensesPending	This variable has the value TRUE if not all licenses that are provided by license dongles have been validated yet.
BSODOccured	This variable has the value TRUE if Windows is in a BSOD.
TComSrvPtr	Pointer to the TcCOM object server
AppName	Name generated by TwinCAT, which contains the port.
ProjectName	Name of the project

8 Error handling and diagnostics

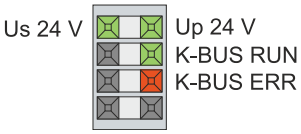
8.1 Diagnostic LEDs

Display	LED	Meaning
	PWR	Power supply The power LED lights green if the device is connected to a power supply unit and the unit is switched on. Die SUPS is active (violet). Bootloader is started and runs without errors (the colors red and yellow light up for one second).
	TC	TwinCAT status LEDs TwinCAT is in Run Mode (green) TwinCAT is in Stop Mode (red) TwinCAT is in Config Mode (blue) Error or crash of the PLC (yellow). Applies only to TwinCAT 3
	FB1	Status LED1 for fieldbus (function is described in the fieldbus interface)
	FB2	Status LED2 for fieldbus (function is described in the fieldbus interface)
	U1	User LED for free use. The RGB LED is switched by the function block FB_SetLedColorEx_BAPI. Use the user LEDs, for example, to make the states of the PLC program, communication or other indications externally visible.
	HDD	Read/Write storage medium (red) Indicates an access to the storage medium.

8.1.1 K-bus

The power supply unit checks the connected Bus Terminals for errors. The red LED "K-bus ERR" is off if no error is present. The red LED "K-bus ERR" flashes if Bus Terminal errors are present.

Table 19: Diagnostic LEDs in K-Bus mode.

Display	LED	Meaning
	Us 24 V	Power supply for basic CPU module. The LED lights green if the power supply is correct.
	Up 24V	Power supply for terminal bus. The LED lights green if the power supply is correct.
	K-BUS RUN	Diagnostic K-bus. The green LED lights up in order to indicate fault-free operation. "Error-free" means that the communication with the fieldbus system is also running.
	K-BUS ERR	Diagnostic K-bus. The red LED flashes to indicate an error. The red LED blinks with two different frequencies.

The frequency and number of the flashes can be used to determine the error code and the error argument. An error is indicated by the "K-bus ERR" LED in a particular order.

Table 20: K-bus ERR LED, fault indication sequence through the LED.

Order	Meaning
Fast blinking	Starting the sequence
First slow sequence	**Error code**
No display	Pause, the LED is off
Second slow sequence	**Error code argument**

Count how often the red LED K-bus ERR flashes, in order to determine the error code and the error argument. In the error argument the number of pulses shows the position of the last Bus Terminal before the error. Passive Bus Terminals, such as a power feed terminal, are not included in the count.

Table 21: K-BUS ERR LED, fault description and troubleshooting.

Error code	Error code argument	Description	Remedy
Persistent, continuous flashing		EMC problems.	• Check power supply for undervoltage or overvoltage peaks. • Implement EMC measures. • If a K-bus error is present, it can be localized by a restart of the power supply (by switching it off and then on again)
3 pulses	0	K-bus command error.	• No Bus Terminal inserted. • One of the Bus Terminals is defective; halve the number of Bus Terminals attached and check whether the error is still present with the remaining Bus Terminals. Repeat this procedure until the faulty Bus Terminal has been found.
4 pulses	0	K-bus data error, break behind the power supply unit.	Check whether the Bus End Terminal 9010 is connected.
	n	Break behind Bus Terminal n	Check whether Bus Terminal n+1 after the power supply unit is connected correctly; replace if necessary.
5 pulses	n	K-bus error in register communication with Bus Terminal n.	Replace Bus Terminal at location n.
6 pulses	0	Error at initialization.	Replace Embedded PC.
	1	Internal data error.	Hardware reset of the Embedded PC (switch off and back on again).
	8	Internal data error.	Hardware reset of the Embedded PC (switch off and back on again).
7 pulses	0	Process data lengths of the set and actual configurations do not correspond.	Check the configuration and the Bus Terminals for consistency.

For some error the LED "K-BUS ERR" does not go out, even if the error was rectified. Switch the power supply for the power supply unit off and back on again to switch off the LED after the error has been rectified.

State variable

In TwinCAT there is a State variable under the Bus Coupler for K-bus diagnostics.

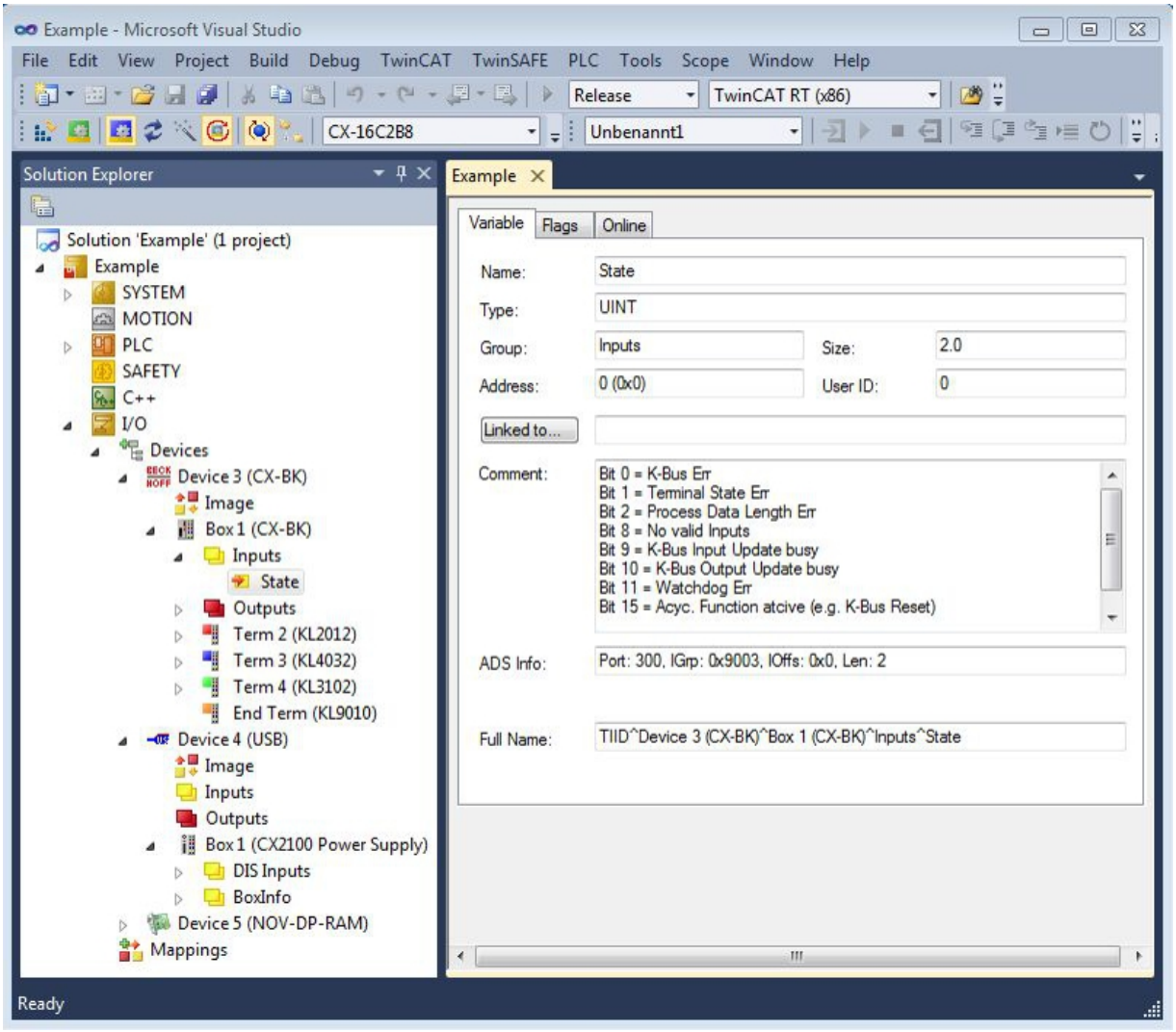


Fig. 22: Status variable for error handling and diagnostics under TwinCAT.

If the value is "0", the K-bus operates synchronous and without error. If the value is <> "0" there may be a fault, or it may only be an indication that the K-bus cycle is longer than the task. In which case it would no longer be synchronous with the task. The task time should be faster than 100 ms. We recommend a task time of less than 50 ms. The K-bus update time typically lies between one and five ms.

Table 22: Description of the State variable values.

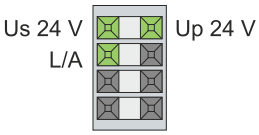
Bit	Description
Bit 0	K-bus error.
Bit 1	Terminal configuration has changed since the start.
Bit 2	Process image lengths do not match.
Bit 8	(still) no valid inputs.
Bit 9	K-bus input update not yet complete.
Bit 10	K-bus output update not yet complete.
Bit 11	Watchdog.
Bit 15	Acyclic K-bus function active (e.g. K-bus reset).

If there is a K-bus error, this can be reset via the IOF_DeviceReset function block (in the TcIoFunctions.lib).

8.1.2 E-bus

The power supply unit checks the connected EtherCAT Terminals. The "L/A" LED is lit in E-bus mode. The "L/A" LED flashes during data transfer.

Table 23: Diagnostic LEDs in K-Bus mode.

Display	LED		Meaning
	Us 24 V		Power supply for basic CPU module. The LED lights green if the power supply is correct.
	Up 24 V		Power supply for terminal bus. The LED lights green if the power supply is correct.
	L / A	off	E-bus not connected.
		on	E-bus connected / no data traffic.
		flashes	E-bus connected / data traffic on the E-bus.

8.2 Faults

Possible faults and their correction

Fault	Cause	Measures
no function after the embedded PC has been switched on	No power supply to the embedded PC Other cause	Check fuse Check the supply voltage and the pin assignment Call Beckhoff Service
Embedded PC does not boot fully	Data carrier ejected from card slot File system damaged (e.g. by switching off while software is running) BIOS setup settings incorrect (does not apply to every model) Other cause	Check the position of the data carrier in the card slot Restart system, import backup Check BIOS setup settings (load defaults) Call Beckhoff Service
Embedded PC boots, software starts, but controller does not work properly	Cause of the fault is either in the software or in parts of the plant outside the embedded PC	Call the machine and software manufacturer

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

1. Precise device ID: CXxxxx-xxxx
2. Serial number/BTN
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 https://www.beckhoff.com or ask your distribution partner.

9 Care and maintenance

NOTICE

Use of incorrect spare parts

The use of spare parts not ordered from Beckhoff Service can lead to unsafe and faulty operation.

- Only use spare parts that you have ordered from Beckhoff Service.

Beckhoff industrial PCs are manufactured from components of the highest quality and robustness. They are selected and tested for best interoperability, long-term availability and reliable function under the specified environmental conditions.

Nevertheless, some components of the industrial PC may be subject to a limited service life if they are operated under certain conditions, such as more demanding ambient conditions during operation or during storage, or if they are out of service for long periods of storage.

Beckhoff therefore recommends replacing some of the industrial PC components after the time after which predictions of the remaining service life of such components can no longer be reliably calculated.

Depending on the device used, the following components are involved:

- Battery
- Storage medium
- Fan cartridge

The following table provides recommendations for the regular, precautionary replacement of the PC components:

Table 24: Replacement recommendations for PC components

Component	Recommendation for replacement intervals (years)
UPS, battery pack	5 years
2.5-inch hard disk	5 years or after 20,000 operating hours at more than 40 °C or after 30,000 operating hours at less than 40 °C
Fan	5 years
CFast, SSD, MicroSD, CompactFlash®	10 years
Motherboard battery	5 years

Beckhoff is excluded from liability in the event of possible damage occurring during maintenance work. Before working on the device, you should have established ESD protection to prevent damage to the device through electrostatic discharge.

ESD protection

NOTICE

Electrostatic discharge

The replacement of device components without ESD protection can lead to functional impairment and destruction of the device.

- If possible, apply ESD protection measures during maintenance work.

When working on electronic devices, there is a risk of damage due to ESD (electrostatic discharge), which can impair the function or destroy the device.

Protect the industrial PC and create an ESD-protected environment in which any electrostatic charges are discharged to the ground in a controlled manner and charging is prevented.

An ESD-protected environment can best be created by setting up ESD protection zones. The following measures serve this purpose:

- ESD-compliant floors with sufficient conductivity to the reference potential PE;

- ESD-compatible work surfaces such as tables and shelves;
- Wrist grounding strap, especially for sedentary activities;
- grounded and electrostatically dissipating equipment and operating materials (e.g. tools) within the ESD protection zone.

If it is not possible to create an ESD protection zone, you can still protect the device against ESD damage. For example, the following measures can be used:

- Use conductive mats connected to the ground potential as underlays.
- Dissipate possible charges from your own body by touching grounded metal (e.g. control cabinet door).
- Wear a wrist grounding strap.
- Only remove new electronic components from the ESD packaging (tinted plastic bag) after putting on the wrist grounding strap.
- Do not walk around with electronic components in your hand if they are not in ESD packaging.

10 Decommissioning

10.1 Removing cables

NOTICE

Electrical voltage

If the power supply is switched on during dismounting, this can lead to damage to the Embedded PCs. Switch off the power supply for the Embedded PCs during dismounting.

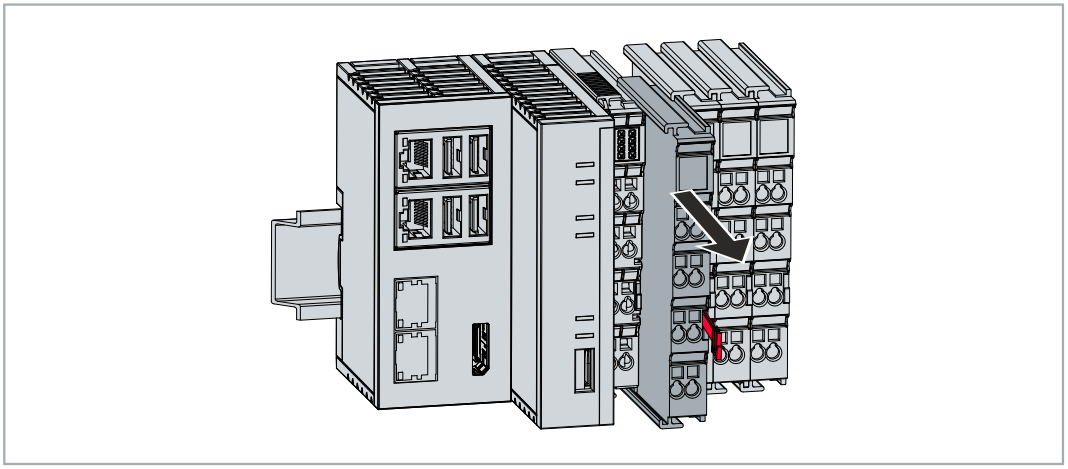
Before dismantling the Embedded PC, shut down the Embedded PC and switch off the power supply. Only then can you remove all the cables. Also remove all cables from the first terminal after the power supply terminal.

Requirements:

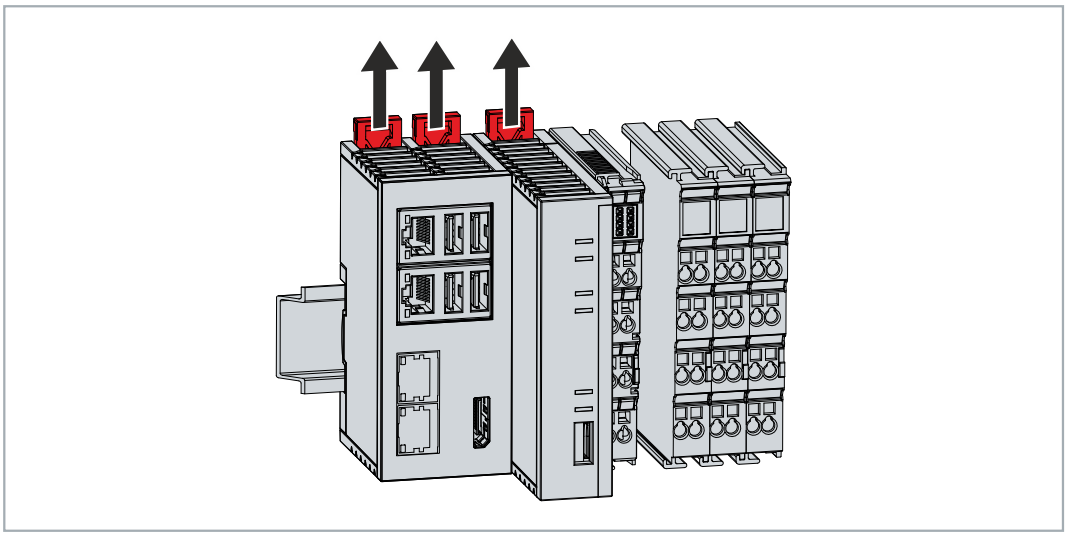
- Terminate your software and shut down the Embedded PC.
- Switch off the power supply.

Remove the cables as follows:

1. Remove the cabling from the embedded PC.
2. Remove the wiring from the first terminal next to the power supply terminal.
3. Pull the orange strap to remove the first terminal after the power supply terminal by pulling it forward.



⇨ In the next step the embedded PC can be removed from the DIN rail and dismantled.



10.2 Dismantling the Embedded PC

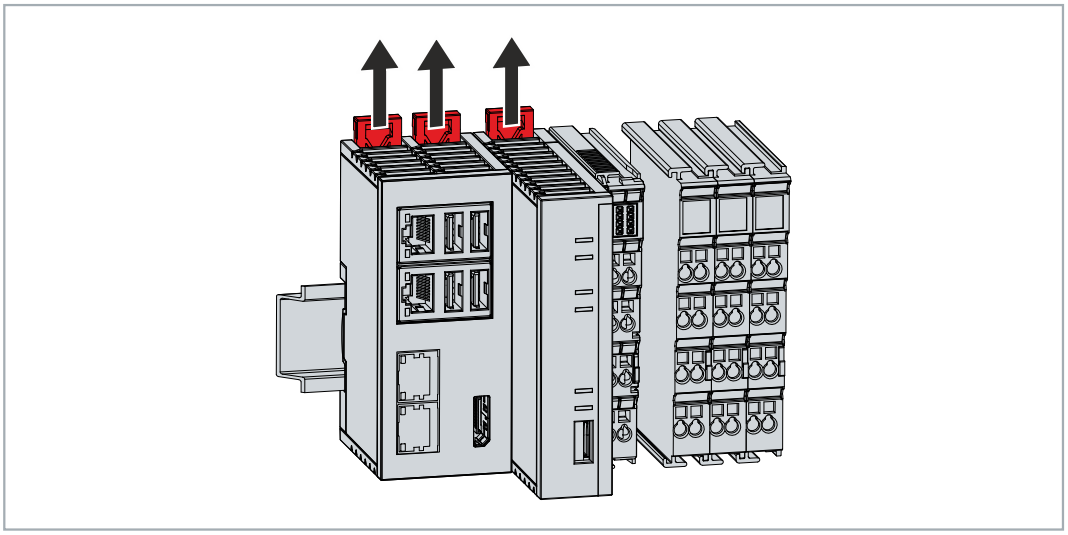
This chapter explains how to dismantle the embedded PC and remove it from the DIN rail.

Requirements:

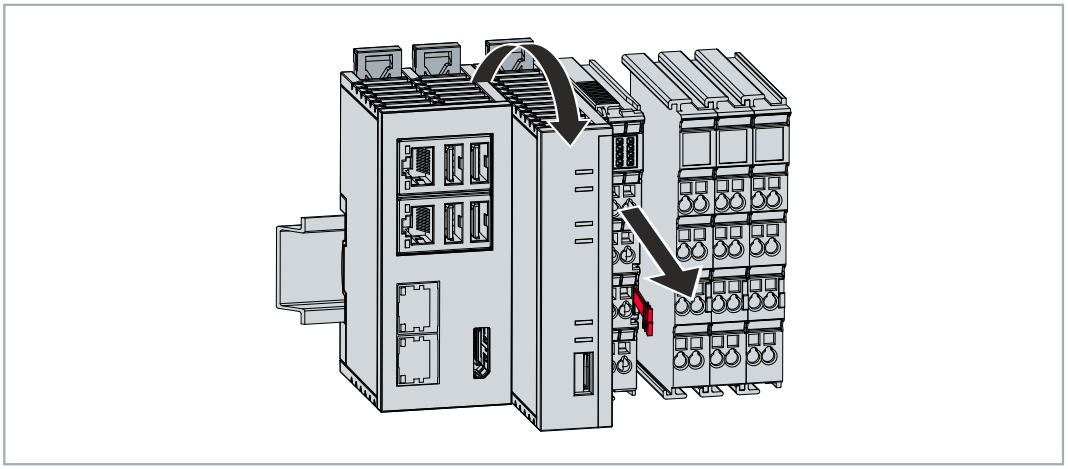
- All cables were removed from the embedded PC.

Remove the embedded PC as follows:

1. Release the DIN rail mounting by pushing the latches outwards with a screwdriver.



2. Pull the orange strap on the power supply terminal and gently remove the device from the DIN rail.



⇨ You have removed the embedded PC successfully.

Disposal

The device must be fully dismantled in order to dispose of it. Electronic components must be disposed of according to national electronic waste regulations.

11 Technical data

Table 25: Technical data, dimensions and weights.

Technical data	CX9240
Weight	approx. 650 g
Dimensions (W x H x D)	84 mm x 100 mm x 91 mm

Table 26: Technical data, general data.

Technical data	CX9240
Processor	Arm® Cortex®-A53, 1.2 GHz
Number of cores	4
Flash memory	Slot for microSD card, card not included (requires at least a 16 GB microSD card)
Main memory	2 GB LPDDR4 RAM (not expandable)
1-second UPS	integrated (1 MB on microSD card)
Interfaces	2 x RJ45 10/100/1000 Mbit/s, 1 x DisplayPort, 4 x USB 3.0, 1 x optional interface
Cooling	passive
Diagnostic LED	1 x power, 1 x TC status, 1 x flash access, 2 x bus status
Clock	internal, capacitor-buffered real-time clock for time and date (memory > 21 days)
Operating system	Beckhoff RT Linux®
Control software	TwinCAT 3 Runtime (XAR) from TwinCAT 3.1 Build 4026
Secure element	discrete TPM 2.0 chip
Power supply	24 V DC (-15%/+20%), electrical isolation
Max. power consumption	7 W
Max. power consumption (with UPS charging)	12 W
Max. power consumption E-bus/K-bus	10 W (5 V/max. 2 A)
Approvals/markings	CE, UL

Table 27: Technical data, I/O terminals.

Technical data	Description
I/O connection	E-bus or K-bus, automatic recognition
Power supply E-bus/K-bus	2 A
Power contacts current load	max. 10 A
Process data on the K-bus	max. 2048 bytes input and 2048 bytes output
max. number of terminals (K-bus)	64 (255 with K-bus extension)
E-bus process data	max. 3328 bytes
max. number of terminals (E-bus)	up to 65534 terminals.

Table 28: Technical data, environmental conditions.

Technical data	Description
Ambient temperature during operation	-25…+60 °C
Ambient temperature during storage	-40…+85 °C See notes under: Transport and storage
Relative humidity	95%, no condensation
Vibration resistance	10 frequency sweeps, in 3-axis 10 Hz < f < 58.1 Hz displacement 0.15 mm, constant amplitude 58.1 Hz < f < 500 Hz acceleration 2 g (~ 20 m/s2), constant amplitude conforms to EN 60068-2-6
Shock resistance	1000 shocks in each direction, in 3 axes 15 g, 11 ms conforms to EN 60068-2-27
EMC immunity	conforms to EN 61000-6-2
EMC emission	conforms to EN 61000-6-4
Protection rating	IP20

Table 29: Technical data, graphic specifications.

Technical data	Description
Processor graphics	Integrated graphics, Arm®

Table 30: Technical data, interfaces.

Technical data	Description
LAN	2 x RJ45 10/100/1000 Mbit/s
USB	4 x USB 3.0, limited to 1.1 A in pairs
DisplayPort	Resolution on the monitor in pixels: max. 2560x1600@60Hz

Table 31: Technical data, optional interfaces.

Technical data	Description
RS232	D-sub connector, 9-pin Electrical isolation 500 V
RS422/RS485	D-sub connector, 9-pin Electrical isolation 500 V
EtherCAT slave	2 x RJ 45, EtherCAT IN and OUT 100 Mbaud
EtherCAT G slave	2 x RJ45, EtherCAT IN and OUT
PROFIBUS	D-sub connector, 9-pin 9.6 kbaud to 12 Mbaud
CANopen	D-sub connector, 9-pin 10 kbaud to 1,000 kbaud
Ethernet, expandable for real-time protocols	2 x RJ-45 switches

12 Appendix

12.1 Accessories

Table 32: microSD cards.

Order number	Description
CX1900-0122	512 MB microSD card
CX1900-0132	16 GB microSD card

12.2 Certifications

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.

12.3 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.

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List of tables

List of figures

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