

BECKHOFF New Automation Technology

Manual | EN

CPX37xx

Multi-touch Panel PC for use in hazardous areas classified zone 2/22



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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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2 For your safety

The signal words and their meanings are explained in the chapter on safety. They contain fundamental safety instructions that are essential for preventing personal injuries and damage to property.

Exclusion of liability

Beckhoff shall not be held liable in the event that this documentation is not complied with and the devices are therefore not used in line with the documented operating conditions.

2.1 Signal words

The signal words used in the documentation are classified below.

Warning on personal injuries

 DANGER
High-risk hazard that will result in death or serious injury.
 WARNING
Medium-risk hazard that may result in death or serious injury.
 CAUTION
Low-risk hazard that may result in minor injury.

Warning on property and environmental damage

NOTICE
The environment, equipment, or data may be damaged.

2.2 Intended use

The device is intended for use as a control system for automation, visualization and communication in machine and system engineering.

The device has been developed for an IP65 working environment. It offers full protection against contact (dust-tight) and against water jets (nozzle) from any angle.

The specified limits for technical data must be adhered to.

The device can be used within the documented operating conditions.

Potentially hazardous area

This device is only suitable for the following hazardous areas:

- For Zone 2 where gas is present as a combustible material. Zone 2 means that the environment is usually either not explosive or only for a short period of time.
- For Zone 22 where dust is present as a combustible material. Zone 22 means that the surrounding area in the form of a cloud is either not at risk of explosion or only for a short period of time.

Improper use

Do not use the device outside the documented operating conditions.

The device is not suitable for use in the following environments:

- The device may only be used in Zone 2/22 environments.
- The device is not suitable for use in aggressive environments, for example with aggressive gases or chemicals.

- The device is not suitable for residential areas. Relevant standards regarding interference emissions must be observed. The device must be installed in a housing or a control cabinet with suitable shielding.

2.3 Fundamental safety instructions

The following safety instructions must be observed when handling the device.

Application conditions

- Do not use the device under extreme environmental conditions.
- Do not use the device in hazardous areas.
- Do not carry out any work on the device while it is live. Always switch off the supply voltage for the device before mounting it, replacing device components or rectifying malfunctions.
- Never plug or unplug connectors during thunderstorms. There is a risk of electric shock.
- Ensure that the device has a protective and functional earth connection.

Damage to property, loss of data and impairment of functions

- If you change the hardware and software configurations, you must keep within the specified limits of power consumption and power loss (please refer to the respective data sheet).
- Ensure that only trained specialists with a control and automation engineering background, operate the device. Use by unauthorized persons can lead to damage to property and loss of data.
- Fuse the power supply line to protect the supply line in the event of a short circuit according to its cross-section.
- In case of fire, extinguish the device with powder or nitrogen.

2.4 Operator's obligation to exercise diligence

The operator must ensure that

- the products are used only for their intended purpose (see Chapter 2.2 [Intended use](#) ▶ 61).
- the products are only operated in sound condition and in working order.
- the products are operated only by suitably qualified and authorized personnel.
- the personnel is instructed regularly about relevant occupational safety and environmental protection aspects, and is familiar with the operating instructions and in particular the safety instructions contained herein.
- the operating instructions are in good condition and complete, and always available for reference at the location where the products are used.

2.5 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>.

2.6 Special conditions (ATEX)

WARNING

Danger of explosion

Gases can be ignited in potentially explosive areas. Read and follow the safety instructions to prevent deflagration or explosions.

Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 119 V.

If the temperatures during rated operation are higher than 70 °C at the feed-in points of cables, lines or pipes, or higher than 80°C at the wire branching points, then cables must be selected whose temperature data correspond to the actual measured temperature values.

Observe the permissible ambient temperature during operation in potentially explosive areas. The permissible ambient temperature range during operation is 0 °C to +45 °C (CPX37xx-0010) and 0 °C to +50 °C (CPX37xx-0030).

The connections of the Panel PC may only be connected or disconnected if the supply voltage has been switched off or if a non-explosive atmosphere is ensured.

Switch off the power supply and ensure that no explosive atmosphere occurs when the CFast card is replaced.

Switch off the power supply and ensure that no explosive atmosphere occurs when changing the battery of the system clock.

The connectors on the backside of the Panel PC must be protected against mechanical damage either with Beckhoff mounting arm adapter C9900-M763 or on site by customer installation.

The protective cap of the USB socket (X102, X103) must be fully tightened to meet the IP65 rating.

Do not use the USB socket on the back side of the Panel PC unless the area is known to be non-hazardous.

The Ethernet sockets (X104, X105) must be closed with the connector of the connection cables (Accessories) or by the protection cover mounted with the nylon cord to meet the IP65 rating.

The cover plate of the CFast card and the battery must be tightened with a torque of 0.5 - 0.6 Nm.

The equipment shall be installed in such a way that the risk of mechanical danger is low.

The equipment shall only be used in an area of not more than pollution degree 2, as defined in IEC 60664-1.

The Panel PC may only be mounted horizontally (see: Mounting).

2.7 Special conditions (IECEx)

WARNING

Danger of explosion

Gases can be ignited in potentially explosive areas. Read and follow the safety instructions to prevent deflagration or explosions.

Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 119 V.

If the temperatures during rated operation are higher than 70 °C at the feed-in points of cables, lines or pipes, or higher than 80°C at the wire branching points, then cables must be selected whose temperature data correspond to the actual measured temperature values.

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The equipment shall be installed in such a way that the risk of mechanical danger is low.

The equipment shall be installed only be used in an area of not more than pollution degree 2, as defined in IEC 60664-1.

The Panel PC may only be mounted horizontally (see: Mounting).

3 Product overview

With the CPX37xx panel PC series, you can use multi-touch directly in the field. The robustness of the devices allows them to be used in Zone 2/22 hazardous areas and they are designed for mounting arm installation. The connection cables are routed through the mounting arm.

You can use a CPX37xx for the following applications, among others:

- various automation and visualization tasks
- a wide range of IoT tasks with data preprocessing
- simple HMI applications
- axis control
- short cycle times
- high-volume data handling
- other PC applications

The device is available in the following display sizes, with corresponding resolutions in 4:3, 5:4 and 16:9 formats:

- 15-inch (1025 x 768) 4:3
- 19-inch (1280 x 1024) 5:4
- 21.5-inch (1920 x 1080) 16:9

The device has a multi-finger touch screen and an aluminum housing with an all-round IP65 protection rating. The mounting arm adapter for installation on the mounting arm is freely selectable.

In its basic configuration, the device includes the following features:

- Intel® processor
- DRAM
- CFast
- 24 V DC power supply

3.1 Structure

The following figure shows the structure of the device as an example for all CPX37xx variants.



Fig. 1: Structure

Table 1: Legend - Structure

No.	Component	Description
1	Display and touch screen glass	Operating the device
2	Name plate	Information on the equipment of the device
3	Connection compartment	Access to the interfaces

3.2 Interface description

The basic version of the device includes the following interfaces:

- Power supply (X101)
- USB (X102, X103)
- Ethernet RJ45 (X104)

The interfaces are located at the rear of the device in the connection compartment.

With a mounting arm adapter installed on the device, you must first gain access to the connection compartment. Follow the steps below:

1. Insert a screwdriver into the recesses on the bottom of the mounting arm adapter.

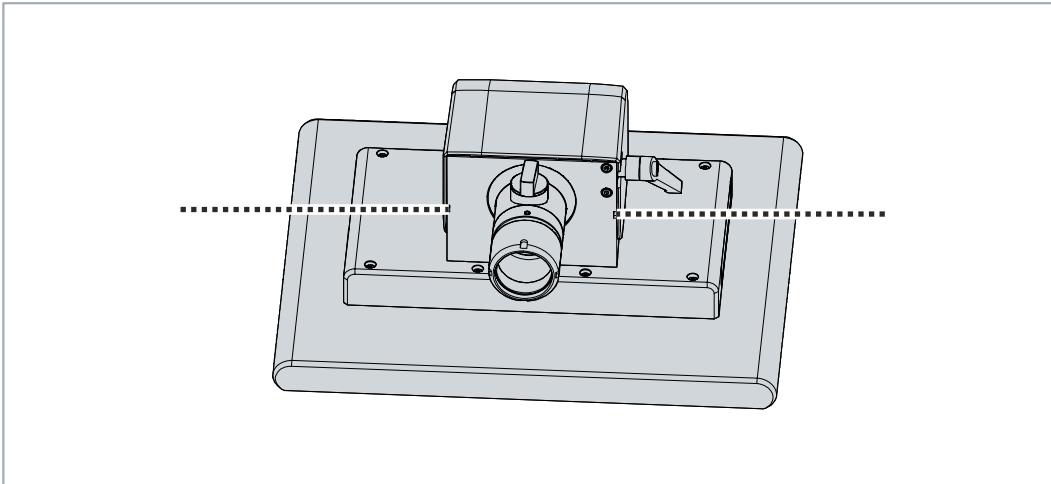


Fig. 2: Opening the cover

2. Bend the cover slightly outwards so that you can push out the latching lugs.
3. Slide the cover upwards off the mounting arm adapter.

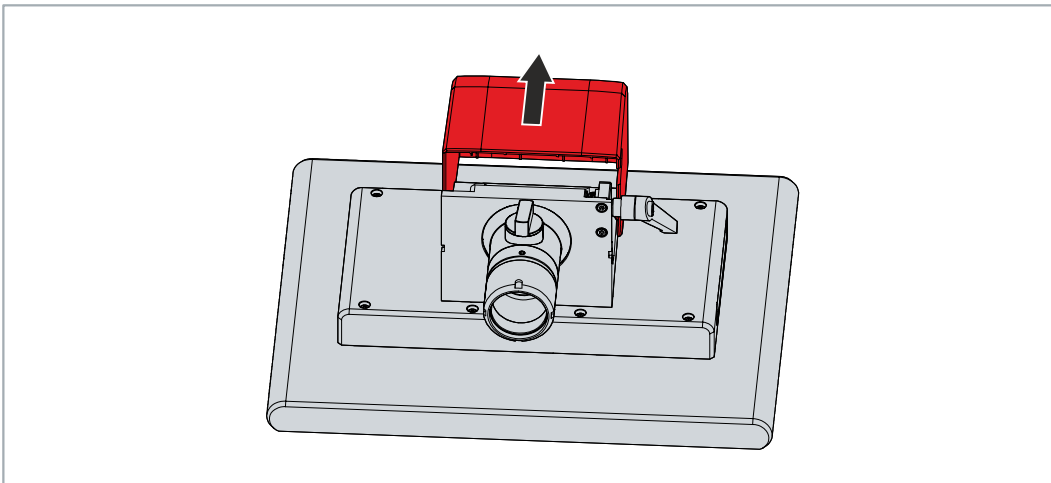


Fig. 3: Removing the cover

⇒ You now have access to the connection compartment of the device.

4. Push the cover back onto the mounting arm adapter from top to bottom until the latching lugs snap back into place.

⇒ You have closed the mounting arm adapter again.

3.2.1 Power supply

The device is supplied with a rated voltage of 24 V. The power supply is connected via a 4-pin M12 socket (X101). The socket is connected to +24 V and GND.

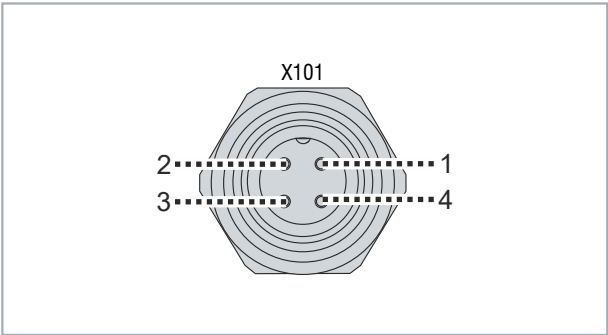


Fig. 4: Voltage socket pin numbering

Table 2: Voltage socket pin assignment

Pin	Signal
1	24 V
2	GND
3	GND
4	24 V

The plug for the power supply is specified for 7.5 A and can accommodate wire cross-sections of up to 1.5 mm². For long supply lines, use 1.5 mm² cables to achieve a low voltage drop on the supply lines. At least 22 V should be present at the power supply plug of the device so that the device remains switched on in the event of voltage fluctuations. The plug is included in the scope of delivery.

3.2.2 USB

The device has a 2-port USB-A socket (X102, X103) with a cover cap in IP65. The interfaces are used to connect peripheral devices with a USB connection. The USB 2.0 standard is supported.

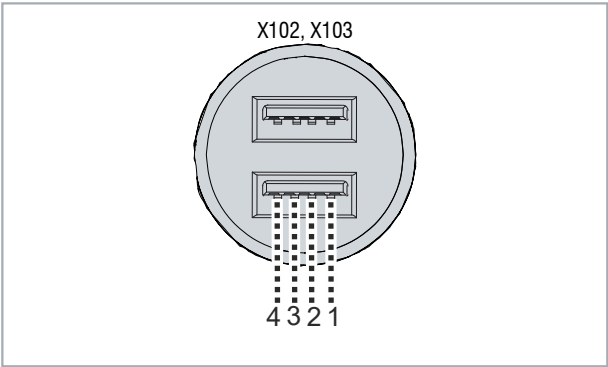


Fig. 5: USB interfaces pin numbering

Pin	Connection
1	Vbus
2	D -
3	D +
4	GND

3.2.3 Ethernet RJ45

The basic version of the device includes an Ethernet RJ45 interface (X104) in the form of a push-pull socket. The 100Base-T, 1000Base-T, and 2500Base-T Ethernet standards enable the connection of corresponding network components and data rates of 100/1000/2500 Mbit/s. The required speed is selected automatically.

The RJ45 connection technology with twisted-pair cables is used. The maximum length of the cable connection is 100 m. The Ethernet port is suitable for cycle times ≤ 1 ms and for distributed clock applications with EtherCAT.

The controller used and the data rates differ depending on the device generation. The following table provides information on the assignment of the controller and the data rates:

Table 3: Assignment of controller and data rates

Device generation	Controller	Mbit/s
CPX37xx-0010	Intel® i210	100/1000
CPX37xx-0030	Intel® i226	100/1000/2500

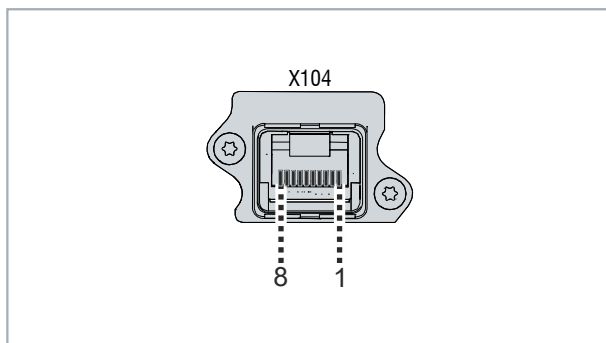


Fig. 6: Ethernet interface pin numbering

Table 4: Ethernet interface 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 -	

3.3 Optional interface

You can optionally order your device with a second on-board Ethernet interface (X105) in the form of a push-pull socket. The 100Base-T, 1000Base-T, and 2500Base-T Ethernet standards enable the connection of corresponding network components and data rates of 100/1000/2500 Mbit/s. The required speed is selected automatically.

The RJ45 connection technology with twisted-pair cables is used. The maximum length of the cable connection is 100 m. The Ethernet port is suitable for cycle times ≤ 1 ms and for distributed clock applications with EtherCAT.

The controller used and the data rates differ depending on the device generation. The following table provides information on the assignment of the controller and the data rates:

Table 5: Assignment of controller and data rates

Device generation	Controller	Mbit/s
CPX37xx-0010	Intel® i210	100/1000
CPX37xx-0030	Intel® i226	100/1000/2500

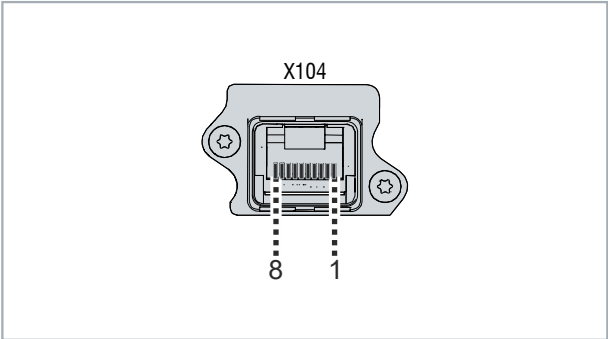


Fig. 7: Ethernet interface pin numbering

Table 6: Ethernet interface 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 -	

3.4 Name plate

The name plate provides information about the equipment of your device. The name plate shown here only serves as an example for a CPX37xx-0010.

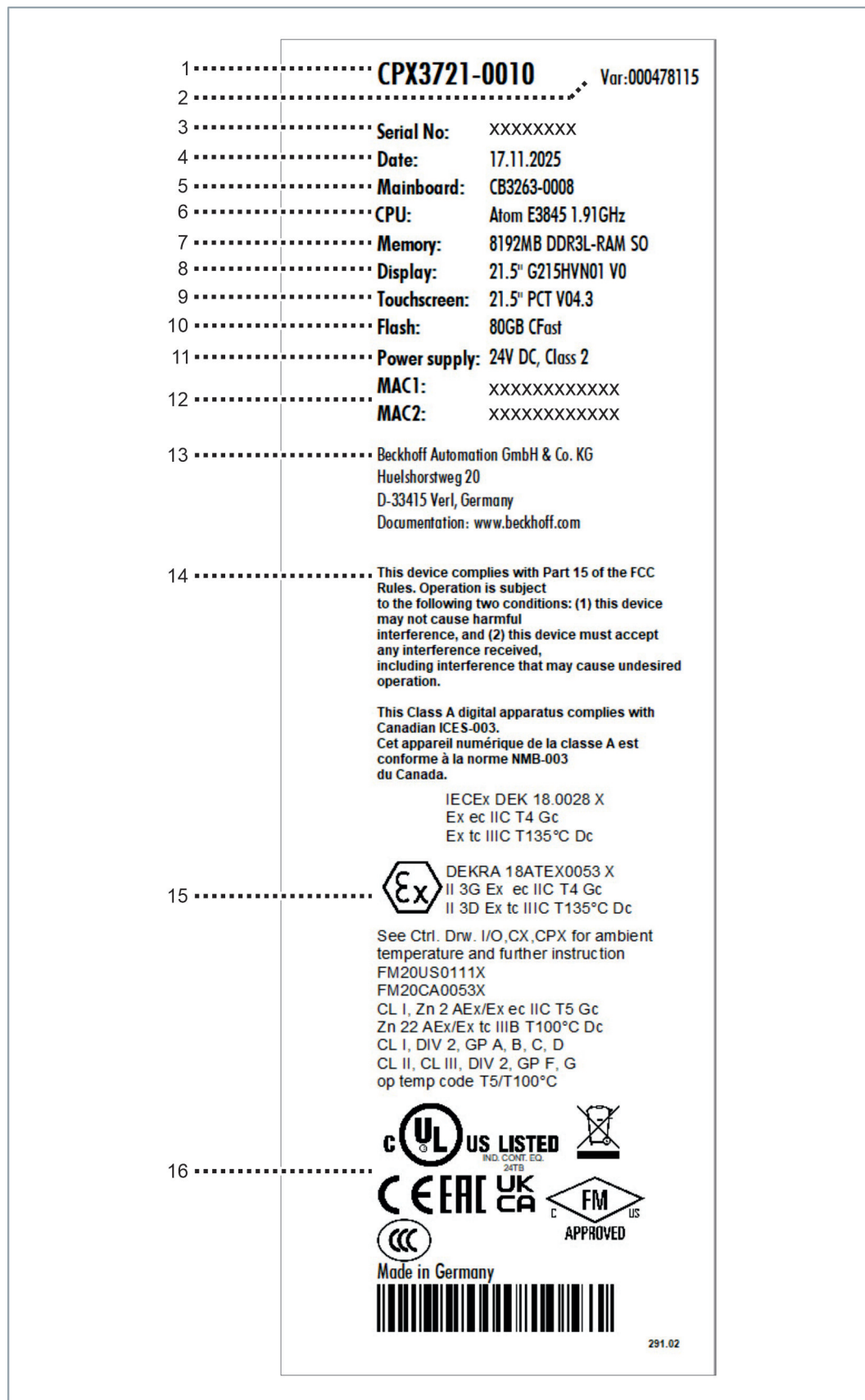


Fig. 8: Name plate -CPX37xx-0010

Table 7: Name plate key

No.	Description
1	Model: The last four digits indicate the device generation.
2	Variant number: commercial number of the order code including ordering options
3	Serial number = Beckhoff Traceability Number (BTN)
4	Date of manufacture
5	Mainboard
6	CPU
7	Main memory
8	Display
9	Touch screen
10	Storage medium
11	Power supply
12	MAC addresses of the Ethernet interfaces (X104, X105)
13	Address of the vendor
14	FCC approval
15	Marking for use in potentially explosive atmospheres
16	Symbols, certifications

The name plate shown here only serves as an example for a CPX37xx-0030.

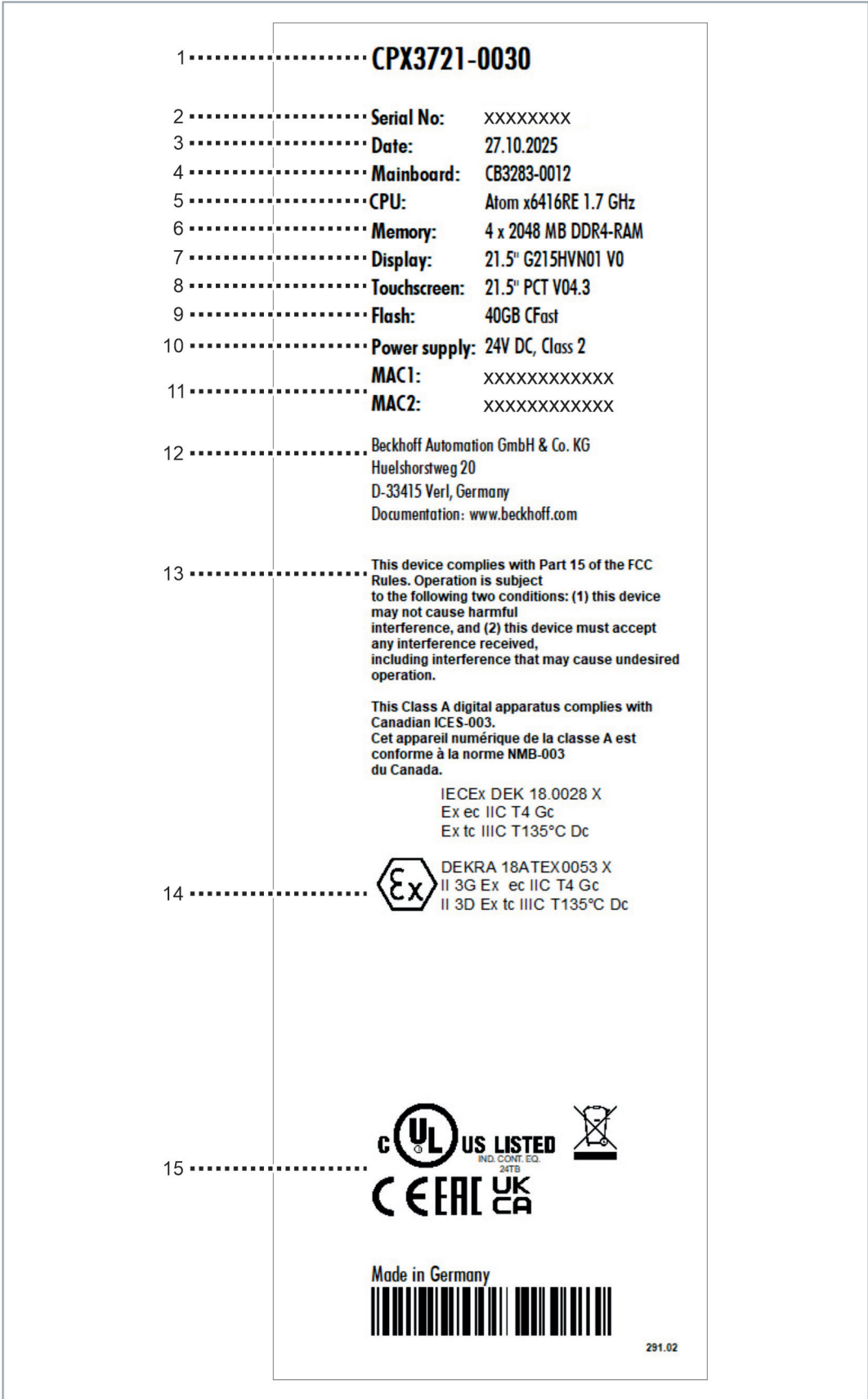


Fig. 9: Name plate -0030

Table 8: Name plate key

No.	Description
1	Model: The last four digits indicate the device generation.
2	Serial number = Beckhoff Traceability Number (BTN)
3	Date of manufacture
4	Mainboard
5	CPU
6	Main memory
7	Display
8	Touch screen
9	Storage medium
10	Power supply
11	MAC addresses of the Ethernet interfaces (X104, X105)
12	Address of the vendor
13	FCC approval
14	Marking for use in potentially explosive atmospheres
15	Symbols, certifications

The device is certified for potentially explosive atmospheres and bears the following markings: For a CPX37xx-0030, only the statements on ATEX and IECEx standards is relevant:

ATEX:

DEKRA 18ATEX0053 X

II 3G Ex ec IIC T4 Gc

II 3D Ex tc III T135°C Dc

IECEx:

IECEx DEK 18.0028 X

Ex ec IIC T4 Gc

Ex tc III T135°C Dc

See Ctrl. Drw. I/O,CX,CPX for ambient temperature and further instruction

FM20US0111X

FM20CA0053X

CL I, Zn 2 AEx/Ex ec IIC T5 Gc

Zn 22 AEx/Ex tc IIIB T100°C Dc

CL I, DIV 2, GP A, B, C, D

CL II, CL III, DIV 2, GP F, G

op temp code T5/T100°C

4 Commissioning

In order to use the device, you must first commission it. The first step is to transport the device to its operating location and unpack it. This is followed by the installation of the device on the mounting arm, the connection of the cables and the power supply and finally the switching on of the device.

Operating the device

The device is operated via the touch screen.

NOTICE

Damage to the touch screen

Operating the touch screen with unsuitable objects may damage the touch screen.

- Operate the touch screen only with bare fingers or wearing suitable gloves.
- If you use gloves, make sure that no hard particles such as metal shavings, glass splinters or similar adhere to the glove.

If you, as the user, require additional protection for the touch screen against dirt and scratching, for example due to dirty hands, this can be achieved with a protective film. The film provides short-term protection for a few days.

You can either order a protective film individually and fit it yourself retrospectively, or you can order the film for fitting directly ex factory. The protective films available for the display size of your device can be found on the Beckhoff website.

Proceed as follows to attach the protective film to the touch screen:

1. Ensure that the environment is as dust-free as possible.
 2. Thoroughly clean the surface of the device to be fitted with the film and remove all grease residues.
 3. Detach the film from the backing at the short edge and place it on the surface.
 4. Gradually remove the film from the backing. At the same time, use a doctor blade or other object with a soft rubber or felt edge to apply the film.
 5. Brush away air bubbles towards the edge with a doctor blade or other object with a soft rubber or felt edge.
- ⇒ The film is now fitted.

You can use the Dimming, Screensaver and Cleaning mode functions with the Display Control Tool. The Beckhoff Information System provides more information about the tool: <https://infosys.beckhoff.com/content/1031/panelconfigurationtools/11725543179.html?id=7993182328699786200>.

4.1 Transport and unpacking

Note the specified transport and storage conditions (see Chapter 9 Technical data).

Despite the robust design of the unit, the components are sensitive to strong vibrations and impacts. During transport the device must therefore be protected from mechanical stress. Appropriate packaging of the device, such as the original packaging, can improve the vibration resistance during transport.

NOTICE

Hardware damage due to condensation

Unfavorable weather conditions during transport can cause damage to the device.

- Protect the device against moisture (condensation) during transport in cold weather or in case of extreme temperature fluctuations.
- Do not put the device into operation until it has slowly adjusted to the room temperature.
- Should condensation occur, wait for about 12 hours before switching the device on.

Unpacking

Proceed as follows to unpack the unit:

1. Check the packaging for transport damage.
 2. Remove packaging.
 3. Keep the packaging for possible future transport.
 4. Check your delivery for completeness by comparing it with your order.
 5. Check the contents for visible shipping damage.
 6. Inform the Beckhoff Service Dept. in case of discrepancies between the packaging content and the order or in the event of transport damage.
- ⇒ You have unpacked the device.

4.2 Mounting

NOTICE

Extreme environmental conditions

Extreme environmental conditions can cause damage to the device.

- Avoid extreme environmental conditions.
- Protect the device from moisture and heat.

The device is designed for installation on a mounting arm system. The environmental conditions specified for operation must be observed.

The device is installed on the mounting arm system using a mounting arm adapter. At the rear of the device there are four M6 threaded holes spaced 100 x 100 mm apart for installing the mounting arm adapter. If you require a Beckhoff mounting arm adapter for the installation, two ordering options are available for this purpose:

Table 9: Mounting arm adapter ordering options

Order identifier	Version
C9900-M761	Rotatable and tiltable mounting arm adapter, clamping lever to fix the tilt
C9900-M763	Rotatable and tiltable mounting arm adapter

The following figure shows the two available mounting arm adapters. Both adapters have a locking screw to prevent rotation (1). C9900-M761 has an additional clamping lever (2) to lock the tilt. Both mounting arm adapters can be rotated by $\pm 165^\circ$. The adapter adapts the device with a 48 mm circular tube. The permissible tolerance is 0.3 mm.

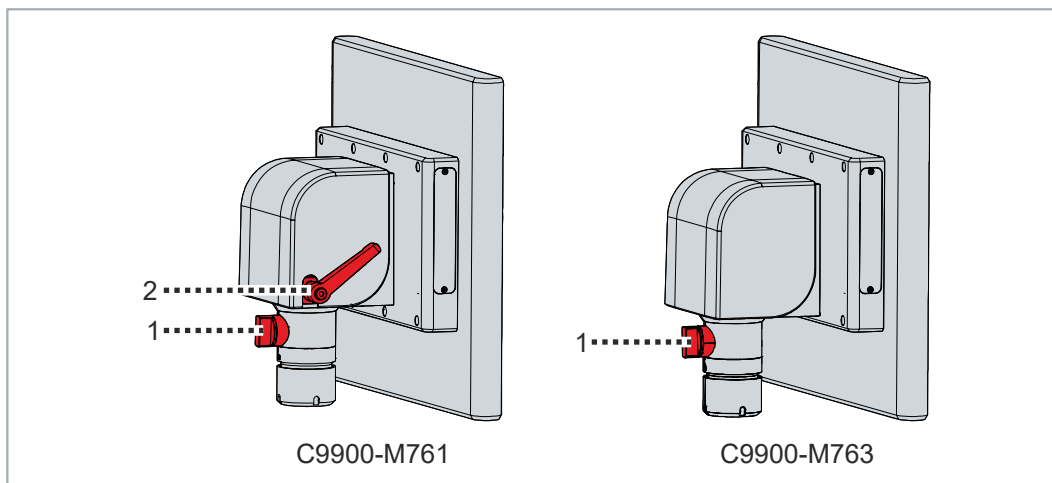


Fig. 10: Mounting arm adapter

Regardless of which of the two mounting arm adapters you have chosen, you will have to install the adapters yourself. You can choose whether you want to mount it from below or above. The procedure is the same in both cases. The cable is routed through the mounting arm.

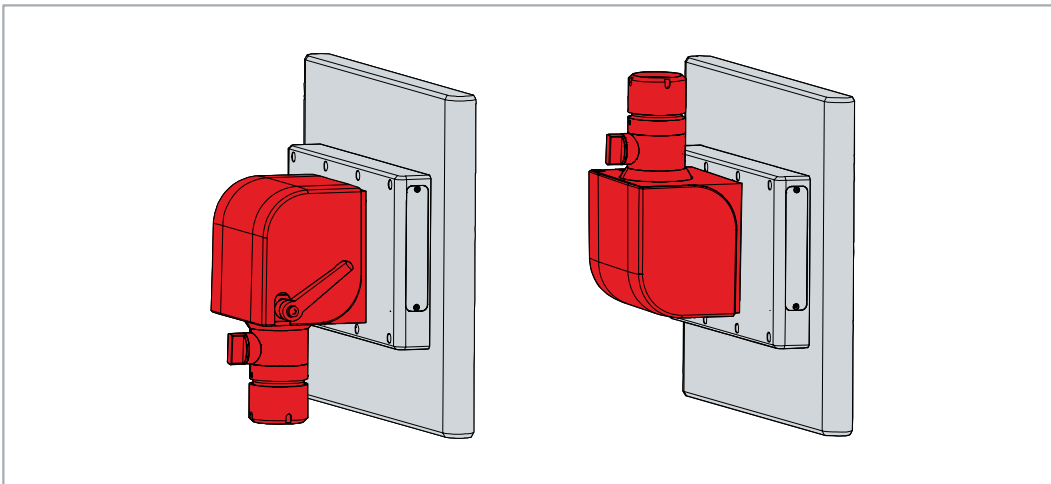


Fig. 11: Orientation of the mounting arm adapter

For more information on the two mounting arm adapters, please refer to the corresponding data sheet.

Mounting arm adapter installation

In the following, the mounting arm adapter is installed facing downwards:

1. Remove the cover of the mounting arm adapter (section A). For the exact procedure, see chapter 3.2 [Interface description](#) ► 13].
2. Place the mounting arm adapter with the four M6 screws in front of the four M6 threaded holes at the rear side of the device (section B).

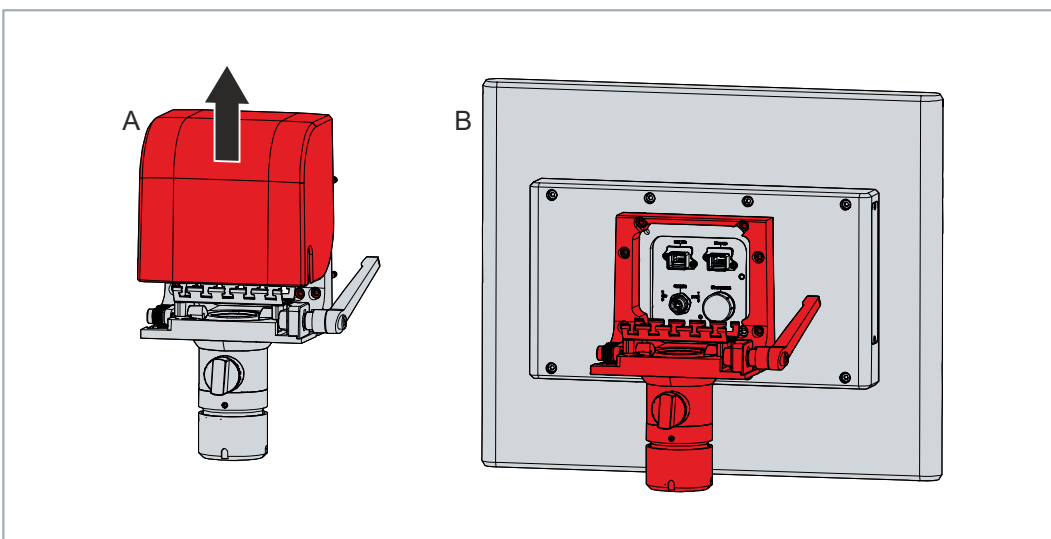


Fig. 12: Mounting arm adapter installation

3. Tighten the four M6 screws with a tightening torque of 6 Nm.
 4. Put the cover back on the mounting arm adapter.
- ⇒ You have installed the mounting arm adapter on the device.

A strain relief plate is located inside the mounting arm adapter. You can relocate this according to your requirements.

4.2.1 Dimensions

All dimensions are in mm.

The following figure shows the dimensions of the 15-inch device.

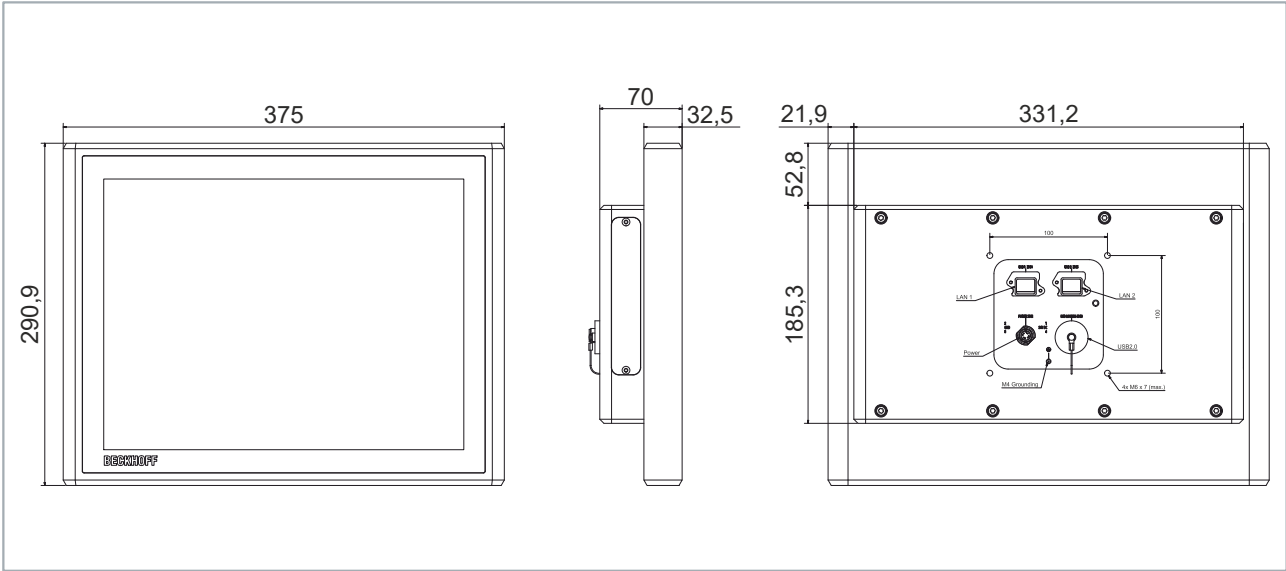


Fig. 13: Dimensions 15-inch

The following figure shows the dimensions of the 19-inch device.

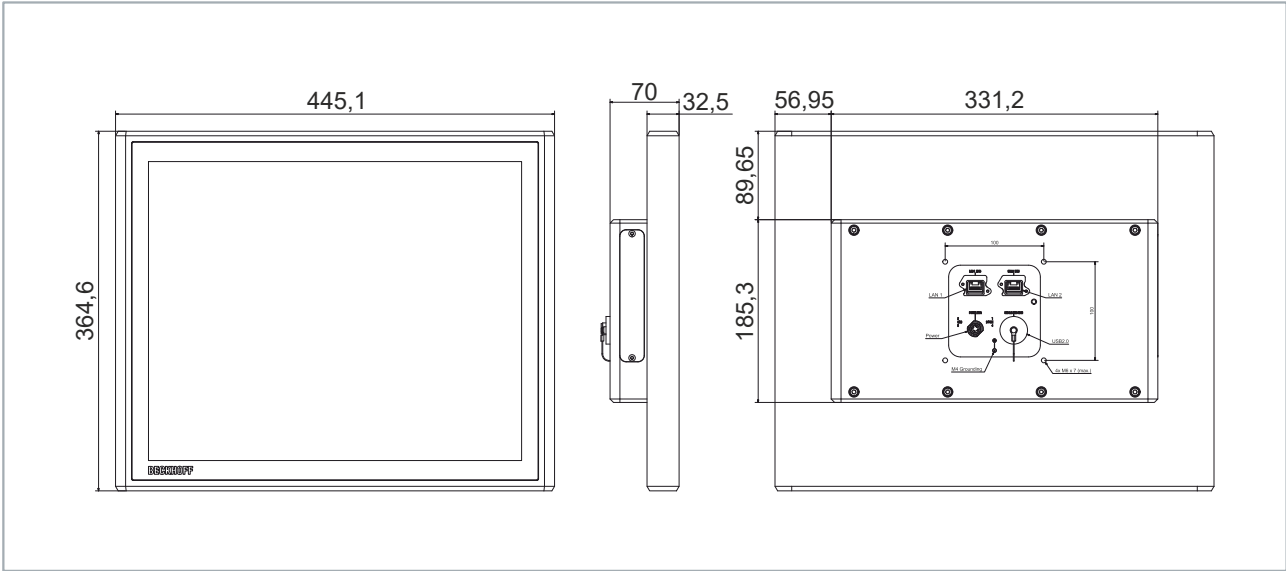


Fig. 14: Dimensions 19-inch

The following figure shows the dimensions of the 21.5-inch device.

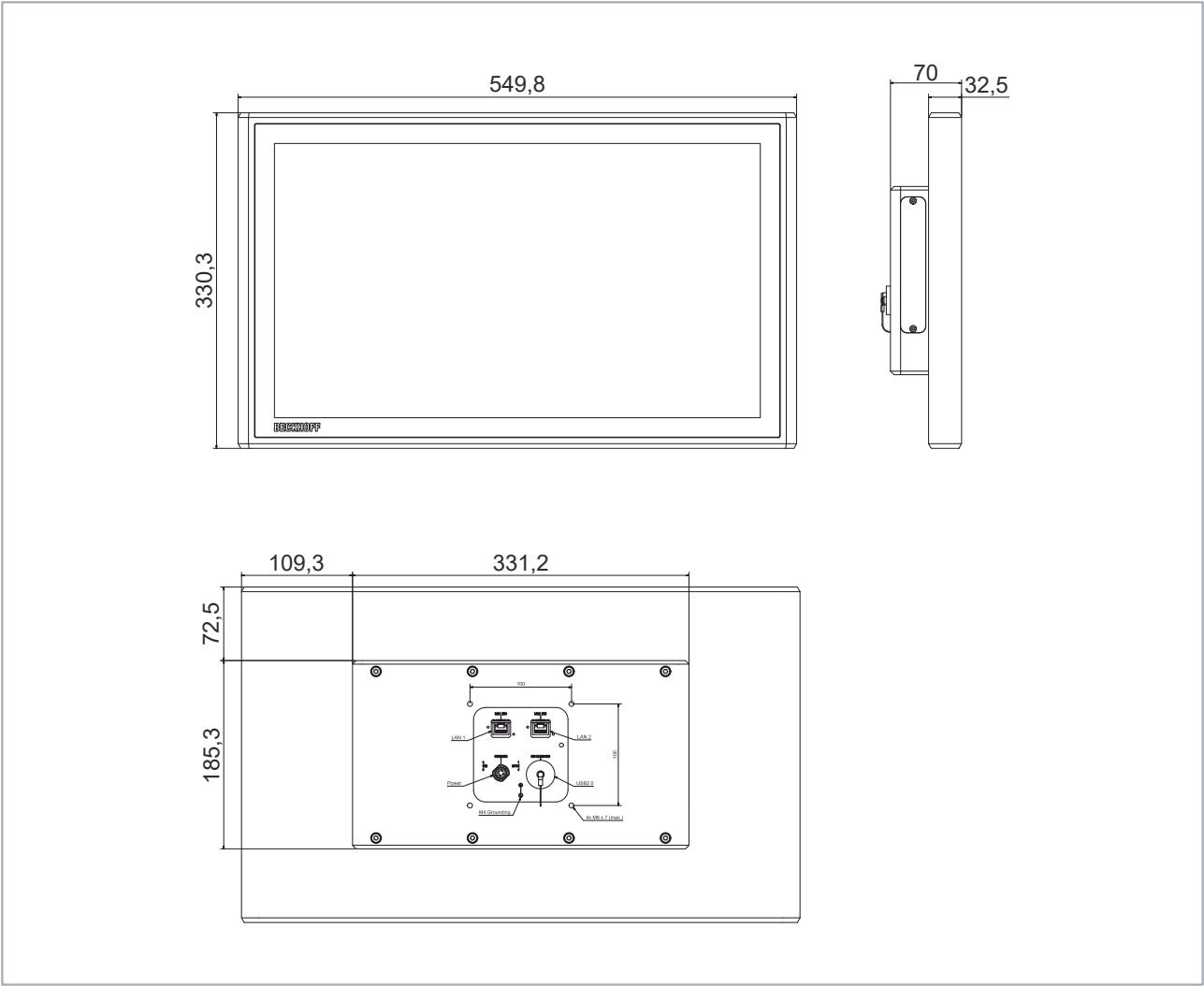


Fig. 15: Dimensions 21.5-inch

4.2.2 Mounting arm tube installation

Observe the following points when installing the mounting arm tube on the mounting arm adapter:

- For the correct installation height, use the position of the screen for guidance. This should always be optimally visible to the user.
- Do not expose the device to direct sunlight.

Regardless of the orientation of the mounting arm adapter, you must follow in the same procedure to install the mounting arm tube. Depending on whether you have oriented the mounting arm adapter upwards or downwards, the mounting arm tube has to be installed on the adapter in the same direction.

Among other tools you need a hook wrench for the installation. You can order this from your Beckhoff Sales using the following order identifier:

- C9900-Z263: Hook wrench size 58-62 for tightening and loosening the slotted nut of the C9900-M75x mounting arm adapter

To install the mounting arm tube on the mounting arm adapter, proceed as follows:

1. Unscrew the hexagon socket screw (1) a few turns with a 3 mm Allen key.

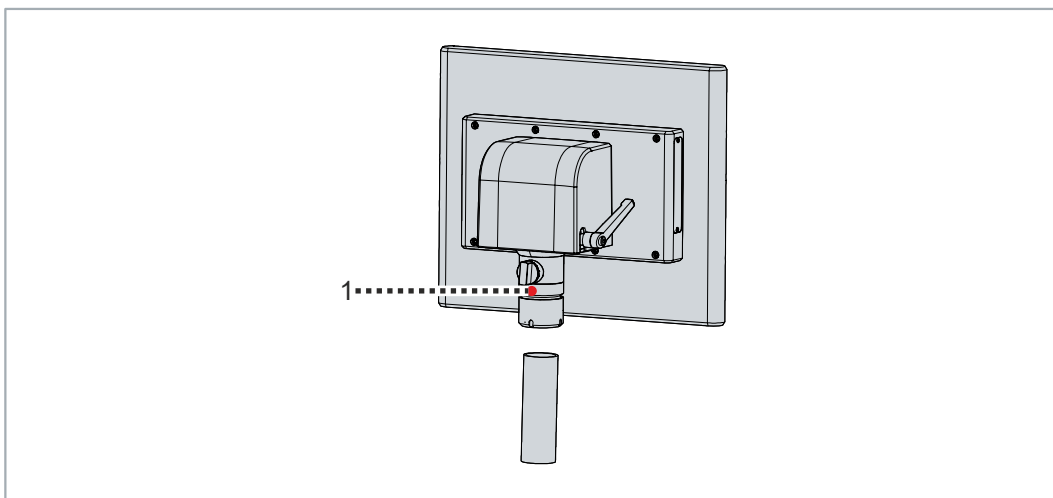


Fig. 16: Loosening the hexagon socket screw

2. Push the connection cables of the device through the mounting arm tube.
3. Insert the mounting arm tube 50.2 mm into the mounting arm adapter to the stop.

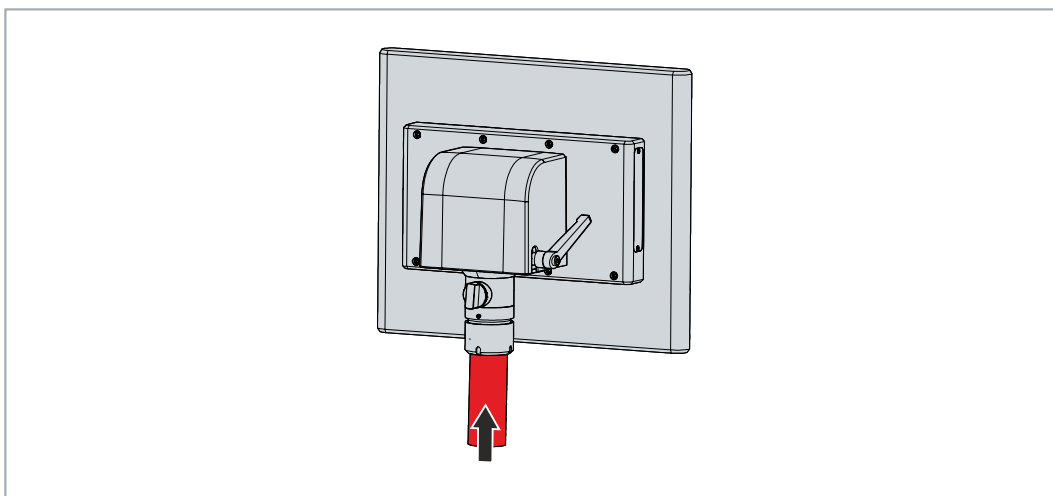


Fig. 17: Inserting the mounting arm tube

4. Retighten the hexagon socket screw with a torque of 3 Nm to additionally secure the mounting arm tube.
5. Tighten the slotted nut of the mounting arm adapter with a hook wrench size 58-62 clockwise with a torque of 20 Nm.

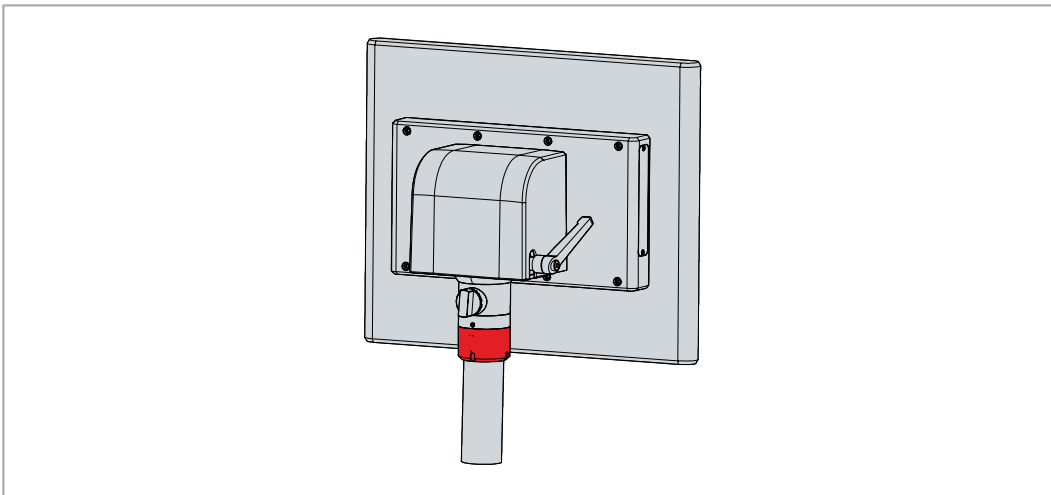


Fig. 18: Tightening the slotted nut

⇒ You have installed the mounting arm tube on the mounting arm adapter.

4.3 Connecting the panel PC

⚠ CAUTION

Risk of electric shock

Dangerous touch voltages can lead to electric shock. To avoid electric shock, observe the following:

- Never connect or disconnect the device cables during a thunderstorm.
- Provide protective earthing for handling the device.

To make the device ready for operation, you have to connect it. The first step is to ground the device. Then you can connect the cables and the power supply.

An external 24 V DC power supply is required to operate the device. A nominal voltage of at least 22 V must be applied to the power supply plug of the device at all times.

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

- The PE conductor (protective earth) and the "0 V" conductor of the voltage source 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 conductor system.

Peripheral devices connected to the device with their own power supply must have the same potential for the PE and "0 V" conductors as the control panel (no potential difference).

4.3.1 Power supply cable installation

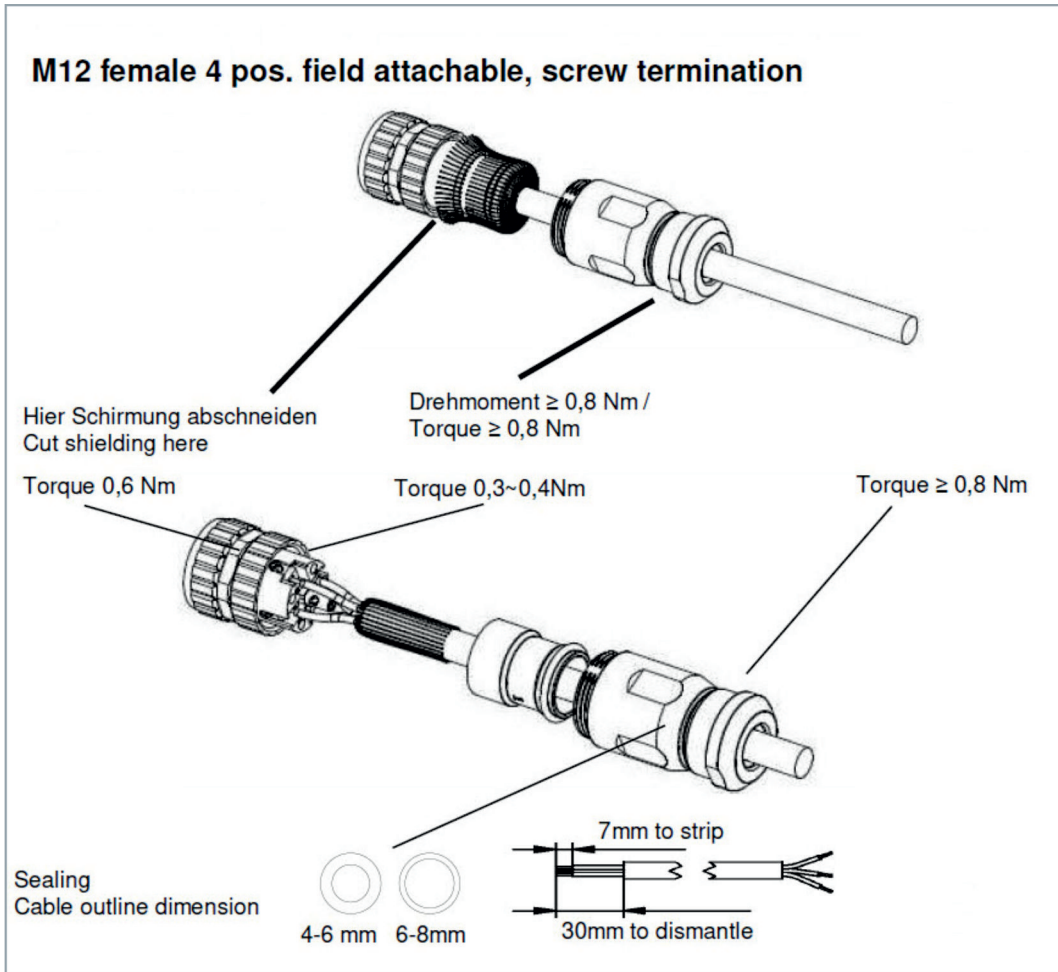


Fig. 19: Power supply cable installation

4.3.2 Grounding the panel PC

Potential differences are minimized and electrical currents are diverted to the ground through grounding or potential equalization of electronic devices. This is to prevent dangerous touch voltages and electromagnetic interference.

EMC

NOTICE

Hardware damage due to electromagnetic interference

The use of the device without a functional earth can lead to material damage due to electromagnetic interference.

- Only use the device with functional earth.

Electromagnetic compatibility (EMC) of the device includes on the one hand not affecting other devices and equipment by electromagnetic interference and on the other hand not being disturbed by electrical or electromagnetic effects itself.

To do this, the device must comply with certain protection requirements. The device has EMC interference immunity according to EN 61000-6-2. The EMC interference emission of the device meets the requirements of EN 61000-6-4.

The functional earth is necessary for the EMC. Establish the functional earthing via the grounding bolt in the connection compartment of the device. Use cables with a minimum cross-section of 4 mm² for the ground connection.

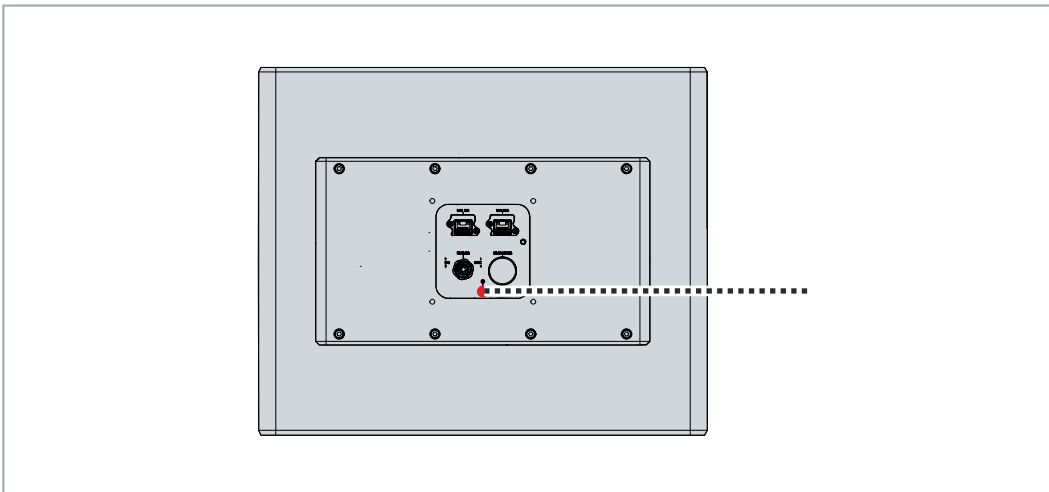


Fig. 20: Grounding bolt for functional earthing

4.3.3 Connecting cables and power supply

NOTICE

Incorrect connection procedure

Incorrect procedure when connecting the cables and the power supply can cause hardware damage.

- Follow the documented procedure for connecting the cables and the power supply.
- Always connect the cables first and only then switch on the power supply.
- Please read the documentation for the external devices prior to connecting them.

The connections are located at the rear in the connection compartment of the device. The cables are routed through the mounting arm tube. To gain access to the connection compartment, first remove the cover of the mounting arm adapter (see chapter 3.2 [Interface description](#) [► 13]).

Connecting cables

Make sure that you first ground the device (see chapter 4.3.1 [Grounding the panel PC](#) [► 30]) and then plug in all data transmission cables.

Connecting the power supply

Cables with a maximum cable cross-section of 1.5 mm² can be used for connecting the power supply. For long supply lines, use 1.5 mm² cables to achieve a low voltage drop on the supply line. There should be at least 22 V at the voltage connector of the device, so that the device remains switched on during voltage fluctuations.

Proceed as follows to connect the 24 V DC power supply:

1. Plug the power supply cable into the power supply socket on the device.
 2. Connect the device to your external 24 V power supply.
 3. Switch on the 24 V power supply.
- ⇒ You have connected the 24 V DC power supply.

After you have connected all data transmission lines and the power supply, you can fix the cables with cable ties to the strain relief plate inside the mounting arm adapter.

4.4 Switching the panel PC on and off

NOTICE

Public networks

Connecting the device to public networks without additional protective measures can compromise the safety of the device.

- Protect the device before connecting it to public networks.

NOTICE

Data loss due to switching off the device while the software is running

Switching off the device before the running software is terminated and the operating system is shut down can lead to data loss.

- Quit the running software and shut down the operating system before switching off the device.

The industrial PC is started or switched off when the system is switched on or off or when the power supply to the PC is connected or disconnected.

You can use the PC-ON input of the PC to control the startup and shutdown of the operating system. The PC-ON signal is inverted, which is why the operating system boots up at 0 V at the input and shuts down at 24 V. During operation, 0 V must therefore be permanently applied to the input. If you want to shut down the operating system, you must apply 24 V to the PC-ON input. Once the operating system has shut down, the PC power supply unit sets the Power Status output from 24 V to 0 V. This indicates that the shutdown is complete. You can then switch off the power supply. If you remove the 24 V from the PC-ON input before you have switched off the power supply, the operating system restarts. Therefore, 24 V must be applied to the PC-ON input until you have switched off the power supply.

To shut down the operating system properly, you can install an additional ON/OFF switch next to the machine's main switch to turn the machine on and off. The main switch can thus remain switched on in principle and thus ensures that the PC is still supplied with power during the shutdown of the operating system. Via the Power Status output, you can switch, for example, a contactor that switches off the entire system. The load capacity of the Power Status output is limited to max. 0.5 A. No fuse protection is required.

Driver installation

When you switch on the device for the first time, the optionally pre-installed operating system will be started. For any additional hardware you have connected, you have to install the drivers yourself afterwards. In addition, the Beckhoff Device Manager starts automatically. The Device Manager is a software from Beckhoff that supports you in configuring the device.

If you have ordered the device without an operating system, you must install this and the driver software for the additional hardware you have connected and for the components inside the device. Please follow the instructions in the documentation for the operating system and the additional components.

5 Configuration

The configuration chapter provides an overview of the Beckhoff Device Manager and the Wake on LAN (WOL) function.

The Beckhoff Device Manager is a tool for detailed system diagnostics of hardware and software components. The procedure after the first start and after manually starting Beckhoff Device Manager is explained.

Using the Wake on LAN (WOL) function, you can switch on your device remotely.

5.1 Beckhoff Device Manager

The Beckhoff Device Manager enables detailed system diagnostics with uniform secure access to the existing hardware and software components. System data is recorded, analyzed and evaluated during operation. The data helps to detect deviations at an early stage and prevent device downtimes.

The user interface screenshots shown in this chapter are examples only and do not represent the actual state of your device.

The Beckhoff Device Manager always starts automatically after the device has been booted. In addition, you have the option of manually starting the previously closed Device Manager at any time.

The device is supplied with predetermined access data by default:

- User name: Administrator
- Password: 1

You also have the option of using the Beckhoff Device Manager to remotely configure the device via a web browser. More detailed information is available in the Beckhoff Device Manager [manual](#).

First start of Beckhoff Device Manager

When your device is booted for the first time, the Beckhoff Device Manager also starts automatically for the first time. The Security Wizard opens. It informs you that you should reset the default password set by Beckhoff. Proceed as follows:

1. Click **Next** on the Security Wizard start page.
⇒ This will take you to the **Change Passwords** page:

Fig. 21: Beckhoff Device Manager – Change passwords

2. Enter the access data of the Device Manager on delivery.
3. Choose a secure new password. Instructions for choosing a secure password are given below.
4. Confirm the changes by clicking on the tick in the red box on the right.
5. Exit the Security Wizard.

⇒ You have reached the Device Manager start page.

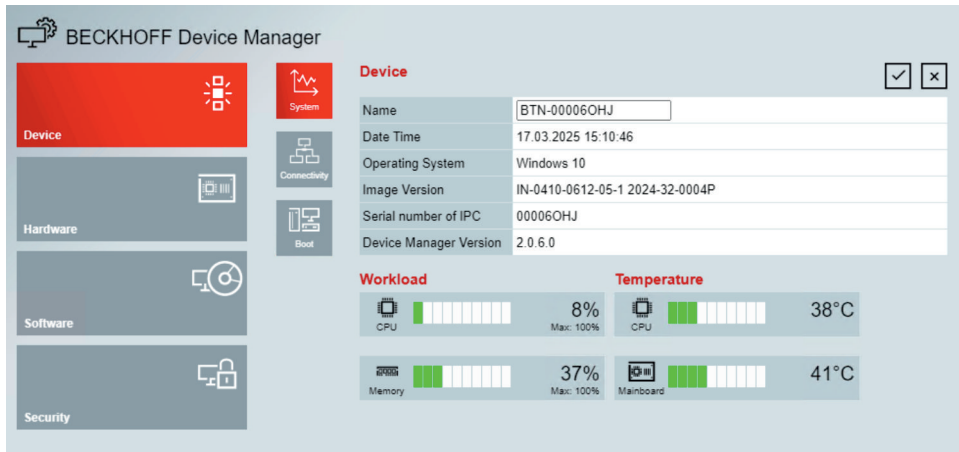


Fig. 22: Beckhoff Device Manager – Start page

Continue to navigate in the menu and to configure the device. Note that modifications only become active once they have been confirmed.

Manual start of Beckhoff Device Manager

To start the Beckhoff Device Manager manually, proceed as follows:

1. Open a web browser locally on the device.
2. Enter `localhost/config` in the web browser to start the Beckhoff Device Manager.

⇒ The Beckhoff Device Manager starts. The Security Wizard appears.

Secure passwords

Strong passwords are an important prerequisite for a secure system.

Beckhoff supplies the device images with standard user names and standard passwords for the operating system. It is imperative that you change these.

Controllers are shipped without a password in the UEFI/BIOS setup. Beckhoff recommends assigning a password here as well.

Please note the following:

- Passwords should be unique for each user and service.
- Only change passwords after an incident in which passwords have become known without authorization.
- Train the device users in the use of passwords.

A secure password has the following characteristics:

- Password complexity: The password should contain capital and lower-case letters, numbers, punctuation marks and special characters.
- Password length: The password should be at least 10 characters long.

5.2 Wake on LAN (WOL)

Wake on LAN (WOL) allows you to turn on your device remotely when it receives a special network signal. WOL is enabled by default in Beckhoff standard images. You can configure this function in the operating system.

Configuration under Windows

To configure the Wake on LAN function, follow these steps:

1. Open the Device Manager.
2. Navigate to the **Network adapters** section.
3. Double-click the appropriate Ethernet controller.
 - ⇒ A window containing the Ethernet controller's properties will open.
4. Klick on the **Advanced** tab.
5. Set the **Wake on Magic Packet** and **Wake on Magic Packet from S5** properties to **Enabled**.
6. Confirm with **OK**.

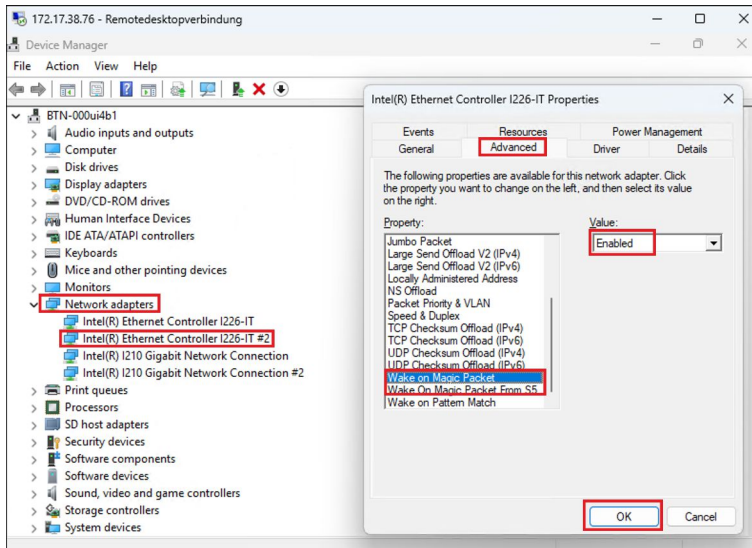


Fig. 23: Activate function

7. Click the **Power Management** tab.
8. Check the box next to **Allow this device to wake the computer**.
9. Confirm with **OK**.

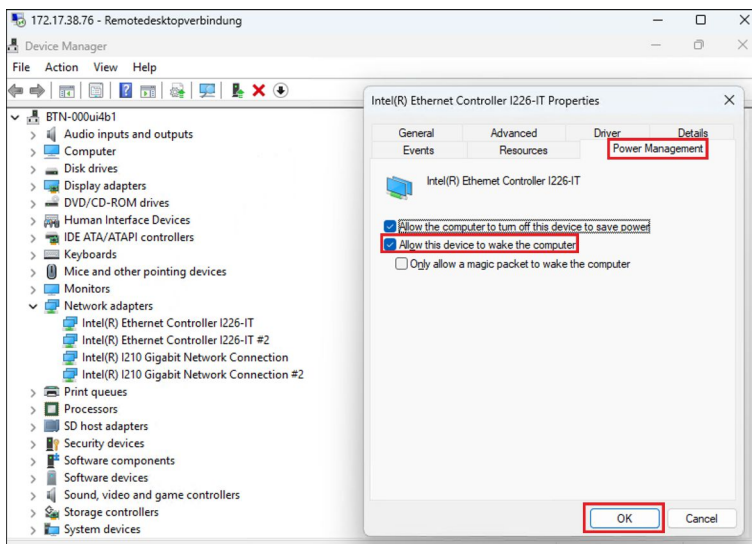


Fig. 24: Enable Function

- ⇒ You have configured the Wake on LAN function.

6 Decommissioning

NOTICE

Hardware damage due to power supply

A connected power supply can cause damage to the device during disassembly.

- Disconnect the power supply from the device before starting to disassemble it.

As part of the decommissioning of the device, you must first disconnect the power supply and cables. Afterwards, you can dismount the device from the mounting arm. If you do not wish to use the device any further, chapter Disassembly and disposal provides information on the correct disposal of the device.

6.1 Disconnecting the power supply and cables

⚠ CAUTION

Risk of electric shock

Dangerous touch voltages can lead to electric shock. To avoid electric shock, observe the following:

- Never connect or disconnect the device cables during a thunderstorm.
- Provide protective earthing for handling the device.

Before disassembling the device, you must disconnect the cables and the power supply. Follow the steps below:

1. Shut down the device.
 2. Gain access to the connection compartment of the device (see chapter 3.2 [Interface description](#) [► 13]).
 3. Disconnect the device from your external 24 V power supply.
 4. Pull the power supply plug out of the power supply socket.
 5. Make a note of the wiring of all data transmission cables if you want to restore the cabling with another device.
 6. Disconnect all data transmission cables from the device.
 7. Finally, disconnect the ground connection.
- ⇒ You have disconnected the cables and the power supply.

6.2 Disassembly and disposal

NOTICE

Material damage due to falling down

If the device is suspended from the ceiling and you undo the slotted nut of the mounting arm adapter without securing it, the device will fall down.

- Make sure the device is secured against falling down before you undo the slotted nut of the mounting arm adapter.

Before you can remove the device from the mounting arm, you must first disconnect the power supply and cables (see chapter Disconnecting the power supply and cables).

Disassembly of the mounting arm tube

To remove the mounting arm tube from the mounting arm adapter, follow the steps below:

1. Loosen the slotted nut of the mounting arm adapter with a hook wrench size 58-62 (C9900-Z263) in counterclockwise direction.

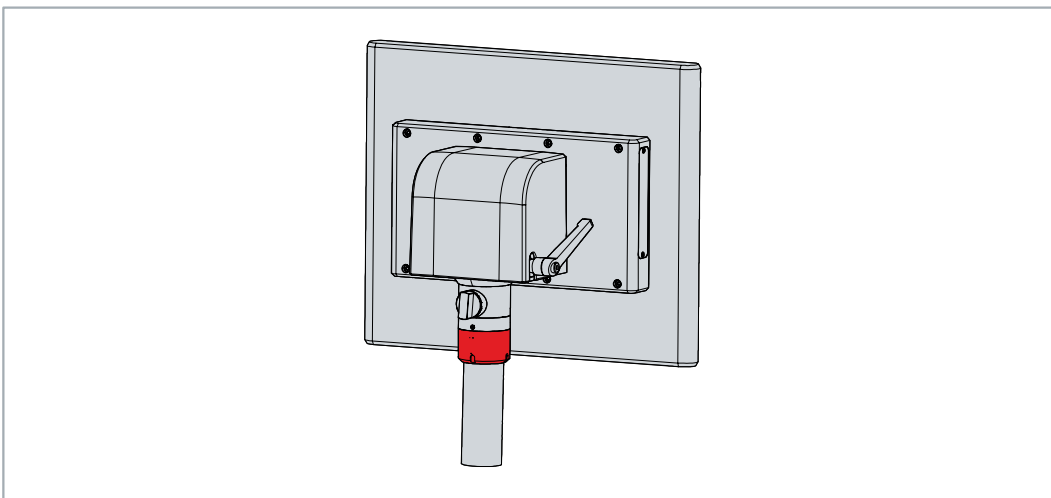


Fig. 25: Loosening the slotted nut

2. Unscrew the hexagon socket screw (1) a few turns with a 3 mm Allen key.

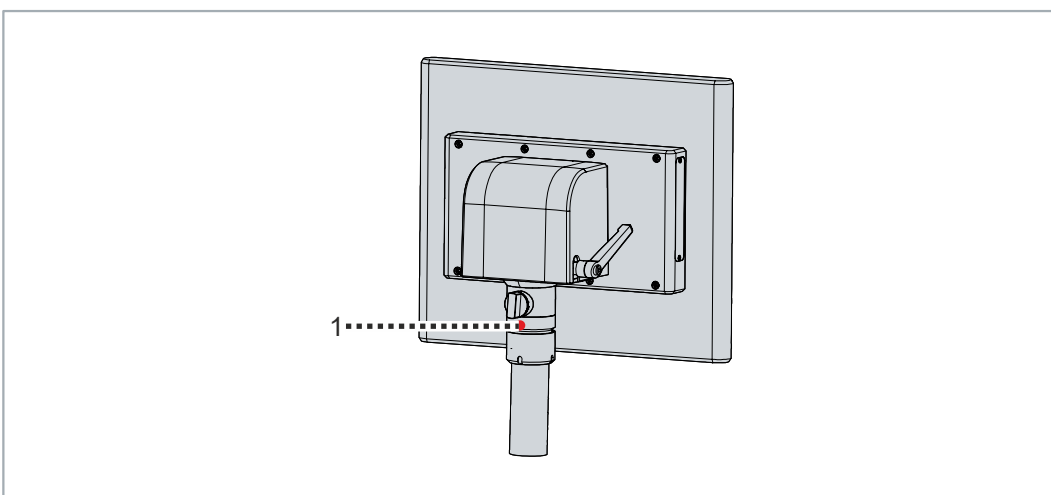


Fig. 26: Loosening the hexagon socket screw

3. Pull the mounting arm tube out of the mounting arm adapter.

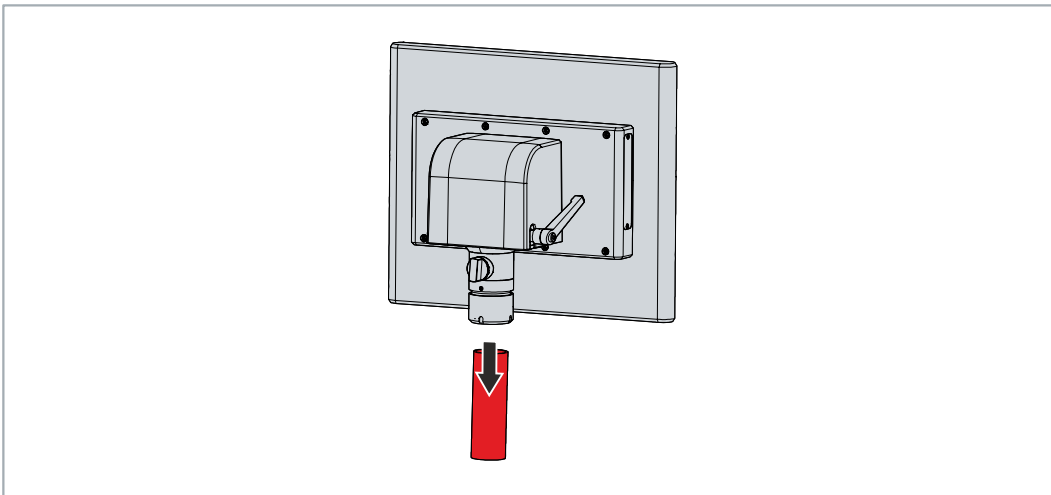


Fig. 27: Removing the mounting arm tube

4. Pull the connecting cables out of the mounting arm tube.
 5. Screw in the hexagon socket screw until it no longer protrudes on the outside.
- ⇒ You have removed the mounting arm tube from the mounting arm adapter.

Disassembly of the mounting arm adapter

To remove the mounting arm adapter from the device, follow the steps below:

1. Remove the cover of the mounting arm adapter (section A). For the exact procedure, see chapter 3.2 [Interface description](#) [► 13].
2. Loosen the four M6 screws securing the mounting arm adapter to the device.
3. Remove the mounting arm adapter from the device.

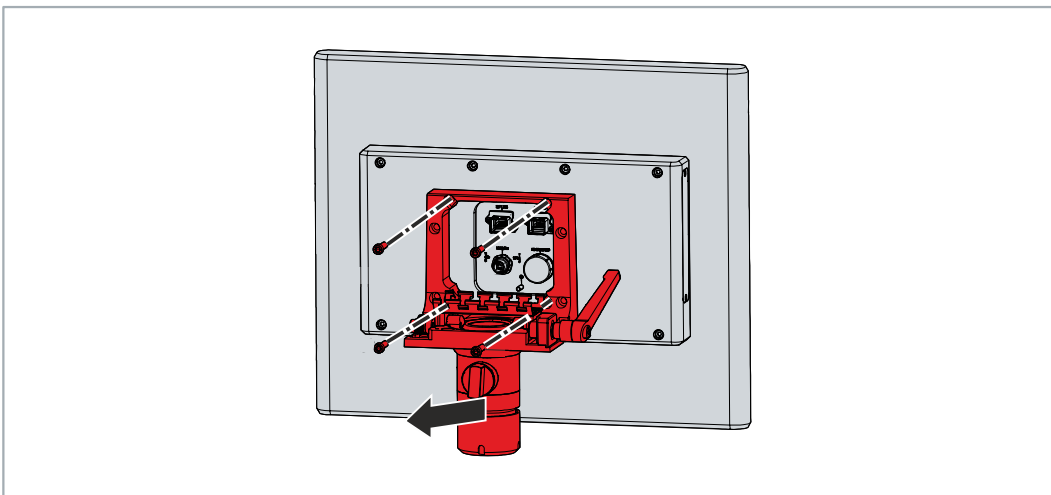


Fig. 28: Removing the mounting arm adapter

⇒ You have removed the mounting arm adapter from the device.

When disposing of the device follow the national electronic scrap regulations. In order to dispose of the device, it must be removed and fully dismantled. Dispose of the components in the following way:

- Send plastic parts (polycarbonate, polyamide (PA6.6)) for plastics recycling.
- Take metal parts to the metal recycling collection point.
- Electronic parts such as fans and circuit boards must be disposed of in accordance with national electronic scrap regulations.
- Stick insulating tape over the poles of the CR2032 battery on the motherboard and dispose of the battery via the local battery recycling.

7 Maintenance

⚠ CAUTION

Risk of electric shock

Working on the device when live can lead to electric shock.

- Switch off the power supply before replacing device components.

Maintenance measures increase the efficiency of the device by ensuring long-term functionality. Cleaning and maintenance by replacing certain device components contribute to this.

7.1 Cleaning

NOTICE

Unsuitable cleaning agents

The use of unsuitable cleaning agents can damage the device.

- Clean the device only as specified.

NOTICE

Faulty touch screen function

Cleaning the front screen without cleaning the edge of the glass screen can lead to faulty touch screen functions due to liquid residue.

- Always clean the front screen including the edge of the glass pane to avoid liquid residue.

It is essential to observe the following points when cleaning the device:

- Keep to the boundary conditions of protection rating IP65.
- Never use compressed air to clean the device.
- Maintain an ambient temperature range of 0 °C to +45 °C (CPX37xx-0010) and 0 °C to +50 °C (CPX37xx-0030).

Cleaning agents

You must use suitable cleaning agents to avoid damaging the front of the device during cleaning. Examples include:

- Benzine
- Spirit
- Glass cleaner

Avoid the following cleaning agents:

- Detergents with scouring or abrasive components
- Metal cleaning objects such as razor blades or steel spatulas
- Steam jet cleaner or very hot water
- Cold water with a heated device
- High water pressure, e.g. high-pressure cleaner

Cleaning the front screen

You can clean the front screen of the device during operation. In order to avoid inadvertent touch entries when doing this, you must first set the device to "Cleaning Mode" with the help of the Beckhoff Display Control Tool. Also make sure that you not only clean the display area, but also the edge of the glass pane. Impurities in the edge area or liquids that do not run down the glass pane as drops but as a long short-circuit bridge create an electrically conductive connection between the touch screen area and the metal housing of the device. This unintentionally triggers a touch event at the edge of the touch screen, which can lead to incorrect operation.

The Beckhoff Display Control Tool does not start automatically when the device starts up. Proceed as follows to activate the "Cleaning Mode" of the tool:

1. Click the Beckhoff Display Control Tool icon to start it.
⇒ When the tool is started, a small sun symbol appears in the taskbar.
2. Right-click the sun symbol.
3. Select the "Cleaning Mode" (see Fig.).

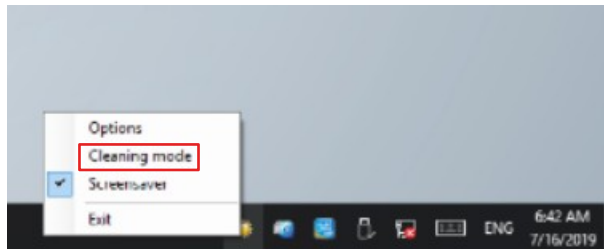


Fig. 29: Select "Cleaning Mode"

⇒ "Cleaning Mode" is activated. You can now clean the front panel.

You can set the duration for which the device should remain in "Cleaning Mode". The period can be set between 5 and 120 seconds. Right-click the sun symbol again and click "Options". Now select the appropriate duration (see figure.).

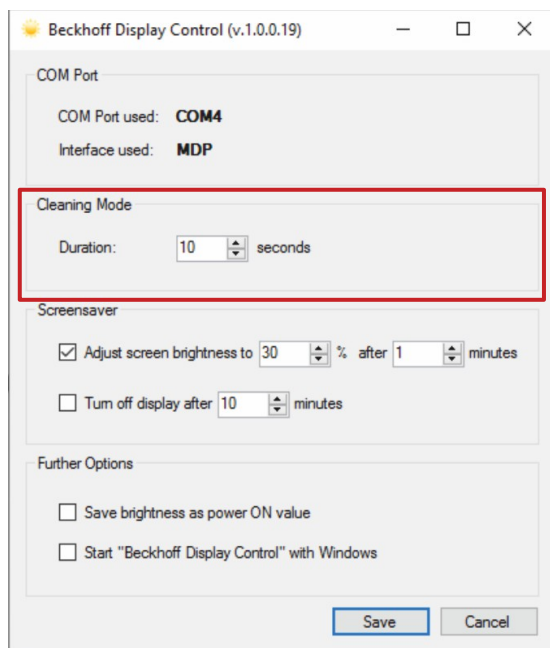


Fig. 30: Configuration "Cleaning Mode"

7.2 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 devices 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 devices may be subject to a limited service life if they are operated under certain conditions, such as at increased ambient temperatures during operation or during storage or during long periods of storage out of operation.

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

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

Table 10: Device component replacement recommendations

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
3.5-inch hard disk	5 years, irrespective of the operating hours
Fan	7 years
CFAST, SSD, MicroSD, Compact Flash	10 years
Motherboard battery	5 years

Beckhoff is excluded from liability in the event of possible damage occurring during maintenance work. In order to avoid damage caused by electrostatic discharge when replacing device components, protective measures are recommended. Below are some suggestions.

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 device and create an ESD-protected environment in which existing electrostatic charges are safely discharged to ground 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.

Access to battery and storage medium

To be able to replace the battery and the storage medium, you must first gain access to these device components. Follow the steps below:

1. Remove both M3 screws from the cover.
2. Remove the cover.

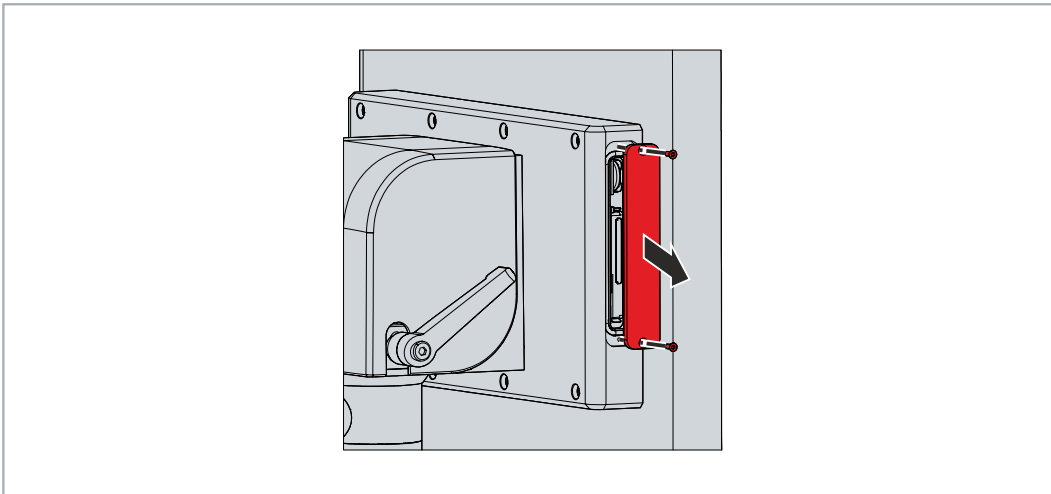


Fig. 31: Access to battery and storage medium

⇒ You now have access to the battery (1) and the storage medium (2)

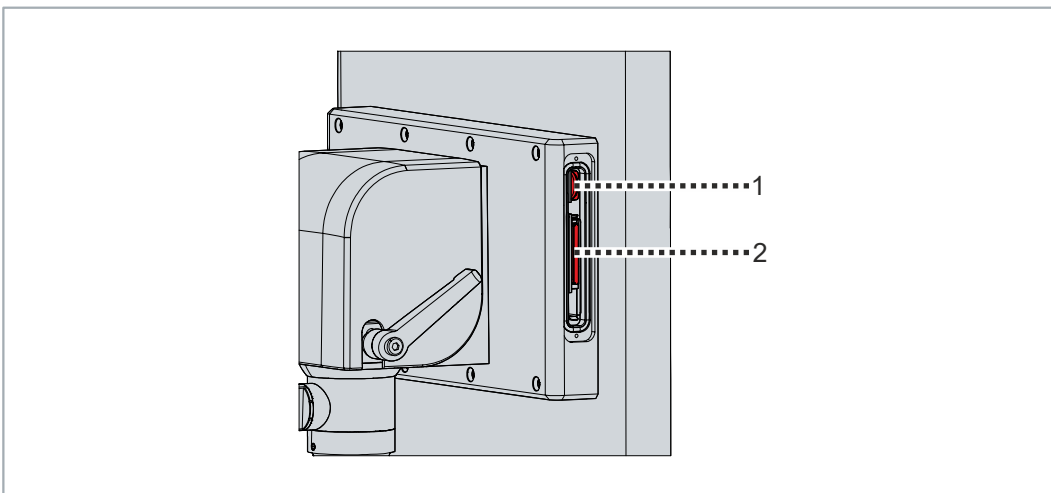


Fig. 32: Battery and storage medium

7.2.1 Replacing the battery

⚠ WARNING

Incorrect battery type

Using a different type of battery can lead to a fire or explosion.

- Only replace the battery with a type R/C (BBCV2) battery, article number RC2032, nominal voltage 3 V.
- When replacing the battery, make sure that the polarity is correct.

⚠ WARNING

Incorrect handling of the battery

Handling the motherboard battery incorrectly can cause an explosion.

- Do not recharge the battery.
- Do not disassemble the battery.
- Do not dispose of the battery in fire.
- Do not open the battery.
- Protect the battery against direct sunlight and moisture.

NOTICE

Failure of the electronics due to mechanical damage

Scratches or damaged components on PCBs can cause the electronics to fail.

- Be very careful when replacing the battery and avoid mechanical damage to the electronics.

The device does not contain a lithium-ion battery. The motherboard battery is a CR2032 lithium-metal cell. It is used to supply power to the clock integrated on the motherboard. If the battery is depleted or missing, the date and time are displayed incorrectly.

Table 11: Technical data of the battery

Battery type	Electrical properties (at 20 °C)		Dimensions		
	Nominal voltage	Nominal capacity	Diameter	Height	Weight
CR2032	3.0 V	225 mAh	20.0 mm	3.20 mm	3.1 g

To replace the battery, proceed as follows:

1. Pull the battery out of the device with needle-nose pliers.

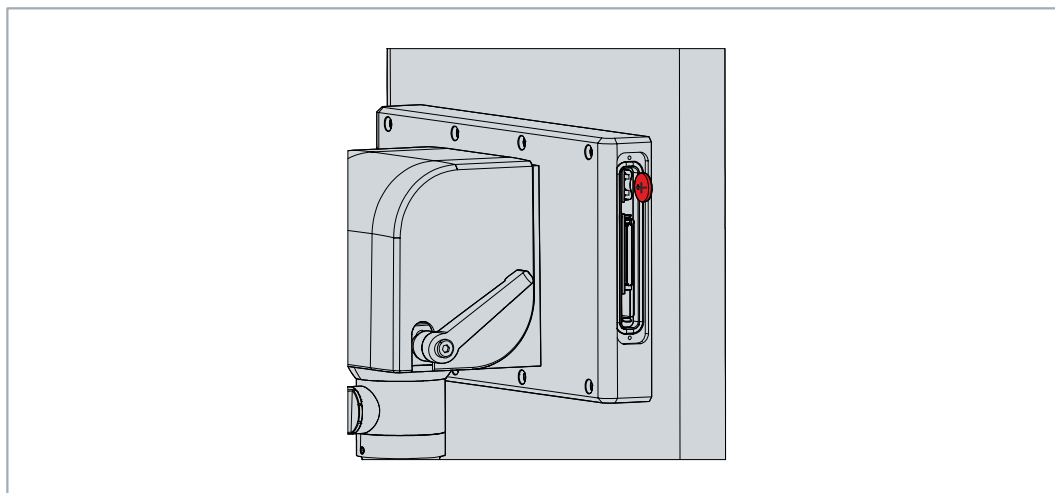


Fig. 33: Replacing the battery

2. Insert the new battery into the device by hand. Make sure that the positive pole of the battery is facing the back of the device.

⇒ You have successfully replaced the battery.

Battery disposal

To dispose of the battery, remove it, tape off the poles and put it in the battery disposal.

7.2.2 Replacing the storage medium

For new storage media, please contact your Beckhoff Sales only. Hard disks from Beckhoff are optimized for industrial applications. SSDs from Beckhoff have a considerably higher lifetime expectancy than commercially available SSDs.

Data transmission before replacement

If you want to exchange a storage medium according to Beckhoff's recommendation, you must copy the data from the old to the new storage medium. You can use the Beckhoff Service Tool (BST) for this purpose. BST is a graphical backup and restore program for devices with a Windows operating system. You can create an image of your operating system and use it to back up the operating system. Then you can restore the created image to a new data carrier. The BST is available on a bootable BST USB flash drive. This includes Windows and a backup tool. Select the size of the BST USB flash drive according to the size of the backup copy of your operating system. You can then keep the flash drive as a backup copy. For this purpose, the BST USB flash drives are designed for particularly long data preservation by means of special flash. For more information on the function of the BST, please refer to the corresponding [manual](#).

If your storage medium is defective and there is no backup, Beckhoff Service can provide you with a fresh Windows image. For this to be possible, your Beckhoff device must already have been delivered with a valid operating system license. After installing the fresh image, the applications must be reinstalled.

Replacing CFast

Chapter 7.2 [Maintenance](#) [► 40] shows how to access the CFast.

To replace the CFast, follow the steps below:

1. Press lightly against the CFast, as if pressing a button.
⇒ When you release the CFast, the push-pull mechanism guides the CFast out of the slot far enough for you to grab it.
2. Pull the CFast out of the device.

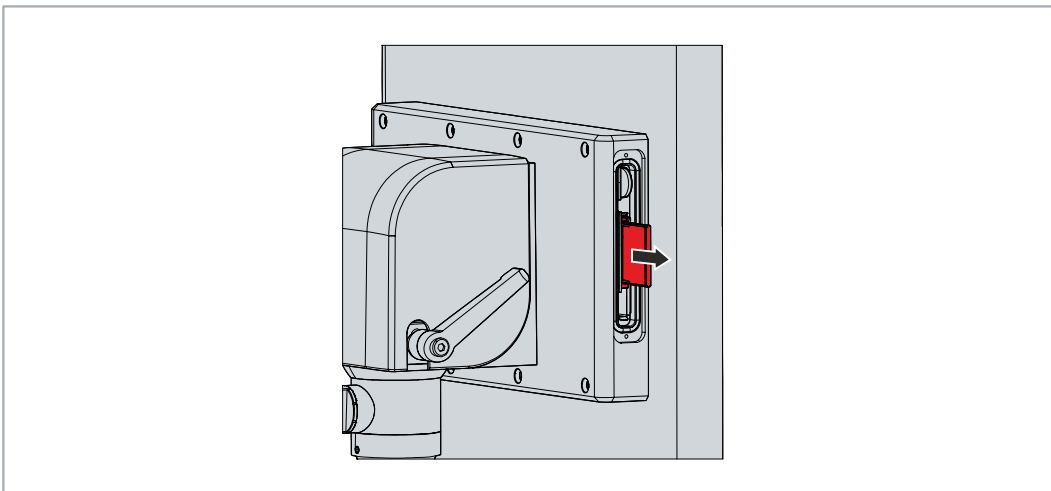


Fig. 34: Replacing CFast

3. Insert the new CFast into the device in the same orientation until it protrudes just a bit from the device.
4. Press the CFast into the device.
⇒ You have replaced the CFast.

Disposal of storage media

Delete confidential or technologically important data from the storage media before disposing of it. If a storage medium is defective, you must destroy it mechanically to prevent access to the data.

The old storage media must be disposed of in accordance with the national electronic waste regulations.

8 Troubleshooting

Table 12: Troubleshooting

Fault	Cause	Measures
No function of the panel PC	No power supply to the panel PC Other cause	Check the power supply cable Call Beckhoff Service
The panel PC does not boot completely	BIOS setup settings are incorrect Other causes	Check BIOS setup settings (load defaults) Call Beckhoff Service
Panel PC boots, software starts, but controller does not work properly	The cause of the error is the software or plant parts outside of the panel PC	Call the machine and software manufacturer
The panel PC only works partially or only temporarily (e.g. dark screen image or none at all)	Defective backlight in the display Defective components in the panel PC	Call Beckhoff Service Call Beckhoff Service
Malfunction of the touch screen	Poor or missing functional earth of the device Poor or missing ground connection of the user	Establish functional earth User must stand on the floor with normal shoes
USB error during access with TwinCAT via USB	Cycle times in TwinCAT set to 10 ms (default)	Increase the cycle times to between 50 ms and 80 ms

9 Technical data

Table 13: Technical data

Product designation	CPX37xx		
Weight	CPX3715: 6.9 kg CPX3719: 9 kg CPX3721: 9.6 kg		
Supply voltage	24 V DC (22 – 30 V DC)		
Power consumption	Data sheet for power consumption and power loss in the download finder: https://www.beckhoff.com/en-en/support/download-finder/search-result/?download_group=691754572		
UL-compliance	• Using a power supply class 2 or • Products shall be supplied by an isolating source rated 24Vdc and protected by means of a fuse in accordance with UL 248, rated maximum 4 A.		
Secure element	fTPM 2.0 activated (see TPM documentation)		
Protection rating	IP65		
Vibration resistance (sinusoidal vibration)	EN 60068-2-6:	10 ... 58 Hz:	0.035 mm
		58 ... 500 Hz:	0.5 G (~ 5 m/ s²)
Shock resistance (shock)	EN 60068-2-27:	5 G (~ 50 m/s²), duration: 30 ms	
EMC interference immunity	Conforms to EN 61000-6-2		
EMC interference emission	Conforms to EN 61000-6-4		
Permissible ambient temperature	Operation CPX37xx-0010: 0 °C to +45 °C Operation CPX37xx-0030: 0 °C to +50 °C Transport/storage: -20 °C to +65 °C		
Permissible relative air humidity	Maximum 95%, no condensation		
Transport and storage	The values for air humidity and shock resistance are to be observed during transport and storage and in operation. The vibration resistance during transport can be improved by suitable packaging of the device.		

10 Appendix

In the appendix you will find information for servicing and details of the approvals that your device has.

10.1 Service and support

Beckhoff and its worldwide subsidiaries offer comprehensive service and support, providing fast and competent assistance for all issues relating to Beckhoff products and system solutions.

Beckhoff Service

The Beckhoff service center provides support in all forms of after-sales service:

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

Hotline: + 49 5246/963-460
email: service@beckhoff.com

If your device requires attention, please state its serial number, which you can find on the name plate.

Beckhoff Support

Support offers you comprehensive technical assistance to help you with the application of individual Beckhoff products, and also with other extensive services:

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

Hotline: + 49 5246/963-157
email: support@beckhoff.com

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email: info@beckhoff.de

The addresses of the worldwide Beckhoff branches and agencies can be found on our website at <http://www.beckhoff.com/>.

You can also find further documentation for Beckhoff components there.

10.2 Approvals

Your device has at least the following approvals:

- CE
- FCC

You will find all other applicable approvals on the name plate of your device.

FCC approvals for the United States of America

FCC: Federal Communications Commission Radio Frequency Interference Statement

This device was tested and complies with the limits for a digital device of class A, according part 15 of the FCC regulations. These limits are designed to provide adequate protection against adverse interference, if the device is used in a commercial environment. This device generates, uses and may emit radio frequency energy and may cause adverse interference with radio communications, if it is not installed and used in accordance with the operating instructions. If this device is used in a residential area it is likely to cause adverse interference, in which case the user must take appropriate countermeasures in order to eliminate the interference at his own expense.

FCC approvals for Canada

FCC: Canadian Notice

This device does not exceed the class A limits for radiation, as specified by the Radio Interference Regulations of the Canadian Department of Communications.

10.3 Standards reference for explosive atmospheres

The following standards have been used:

ATEX

Standard	Description
EN 60079-0:2012+A11:2013	Explosive atmospheres - Part 0: Equipment - General requirements
EN 60079-7:2015+A1:2018	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"
EN 60079-31:2014	Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure "t"

IECEx

Standard	Description
IEC 60079-0:2011	Explosive atmospheres - Part 0: Equipment - General requirements
IEC 60079-7:2017	Explosive atmospheres – Part 7: Equipment protection by increased safety "e"
IEC 60079-31:2013	Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure "t"

cFMus

Standard	Description
FM Class 3600:2018	Electrical Equipment for Use in Hazardous (Classified) Locations – General Requirements
FM Class 3611:2018	Nonincendive electrical equipment for use in Class I and II, Division 2 and Class III, Divisions 1 and 2 hazardous (classified) locations
FM Class 3810:2018	Electrical Equipment for Measurement, Control and Laboratory Use
ANSI/UL 121201:2019	Nonincendive electrical equipment for use in Class I and II, Division 2 and Class III, Divisions 1 and 2 hazardous (classified) locations
ANSI/ISA 61010-1:2012	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
ANSI/UL 60079-0:2020	Explosive atmospheres – Part 0: Equipment – General requirements
ANSI/UL 60079-7:2017	Explosive atmospheres – Part 7: Equipment protection by increased safety “e”
ANSI/UL 60079-31:2015	Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure “t”
CAN/CSA C22.2 No. 213-17:2017	Nonincendive electrical equipment for use in Class I and II, Division 2 and Class III, Divisions 1 and 2 hazardous (classified) locations
CSA C22.2 No. 60079-0:2019	Explosive atmospheres – Part 0: Equipment – General requirements
CAN/CSA C22.2 No. 60079-7:2016	Explosive atmospheres – Part 7: Equipment protection by increased safety “e”
CAN/CSA C22.2 No. 60079-31:2015	Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure “t”
CAN/CSA C22.2 No. 61010-1:2012	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

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