BECKHOFF New Automation Technology

Manual | EN

C6017

Industrial PC

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1 Notes on the documentation

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

The following instructions and explanations must be followed during installation and commissioning of the components. The qualified personnel must ensure that the application of the described products meets all safety requirements, including all applicable laws, specifications, regulations and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics. In the event that it contains technical or editorial errors, we retain the right to make alterations at any time and without warning. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams, and descriptions in this documentation. All illustrations shown are only examples. The configurations depicted may deviate from the standard.

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Patents

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, DE102004044764, DE102007017835 with the corresponding applications and registrations in various other countries. The TwinCAT Technology is covered, including but not limited to the following patent applications and patents: EP0851348, US6167425 with corresponding applications or registrations in various other countries.

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Delivery state

All the components are supplied in particular hardware and software configurations appropriate for the application. Changes to the hardware or software configuration are permitted, provided they are within the specified limits for power consumption and power dissipation (please refer to the respective data sheet).

Delivery conditions

In addition, the general delivery conditions of the company Beckhoff Automation GmbH & Co. KG apply.

2 For your safety

The Safety chapter first explains the safety symbols used in the documentation and their meanings. They contain fundamental safety instructions that are essential for the avoidance of personal injuries and damage to property.

Exclusion of liability

Beckhoff shall not be liable in the event of non-compliance with this documentation and thus the use of the devices outside the documented operating conditions.

2.1 Description of safety symbols

The following safety symbols are used in these operating instructions. In order to avoid personal injuries and damage to property, read and follow the safety and warning notices.

Warning of personal injuries:

⚠ DANGER
Disregarding the safety notice will lead to death or serious injuries.

⚠ WARNING
Disregarding the safety notice may lead to death or serious injuries.

⚠ CAUTION
Disregarding the safety notice may lead to minor injuries.

Warning of damage to property:

NOTE
Disregarding the notice may lead to damage to property.

2.2 Intended use

The Industrial PC is designed for space-saving control cabinet installation and for use as a control system in machine construction and plant engineering for automation, visualization and communication.

The Industrial PC has been developed for an IP20 working environment. It is protected against the penetration of fingers and solid foreign bodies of 12.5 mm or larger in size. It is not protected against water. Operation of the devices in wet and dusty environments is not permitted.

The specified limits for technical data must be adhered to.

The Industrial PC can be used within the documented operating conditions.

Improper use

Do not use the Industrial PC outside the documented operating conditions.

2.3 Fundamental safety instructions

The following safety instructions must be observed when handling the Industrial PC.

Application conditions

- Do not use the Industrial PC under extreme environmental conditions. Keep the ventilation slots clear.
- Never use the Industrial PC in potentially explosive atmospheres.
- Do not carry out any work on the Industrial PC when it is live. Always switch off the supply voltage for the device before mounting it, replacing device components or rectifying malfunctions. This does not apply to the replacement of hard disks in a RAID configuration.
- 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 dissipation (please refer to the respective data sheet).
- Ensure that only trained specialists with a control and automation technology background, operate the Industrial PC. Use by unauthorized persons can lead to damage to property and loss of data.
- Protect the power supply cable with a fuse with a max. rating of 16 A. The fuse serves to protect the supply line in the event of a short circuit.
- In case of fire, extinguish the Industrial PC 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 <u>Intended use</u> [▶ 6]).
- 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.

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3 Product overview

The C6017 Industrial PC is part of the series of ultra-compact Industrial PCs for space-saving control cabinet installation. It is a high-performance device. This variant with further optional interfaces enables adaptation to specific applications and requirements.

Thanks to the existing processors, the Industrial PC has sufficient performance reserves for the following applications, among others:

- diverse automation and visualization tasks
- axis control
- wide range of IoT tasks, for example when used as an IoT gateway
- simple HMI applications
- short cycle times
- high-volume data handling
- other PC applications

The basic configuration of the C6017 includes the following aspects:

- M.2-SSD
- Graphic adapter integrated in the Intel$^®$ processor, 1 DisplayPort connection
- on-board Ethernet adapter with 2 x 100/1000BASE-T connection
- 1x USB 3.0
- 1x USB 2.0
- 1 slot accessible for M.2 SSD

An internal uninterruptible power supply (UPS) is optional. Furthermore, the device can be extended with additional interfaces.
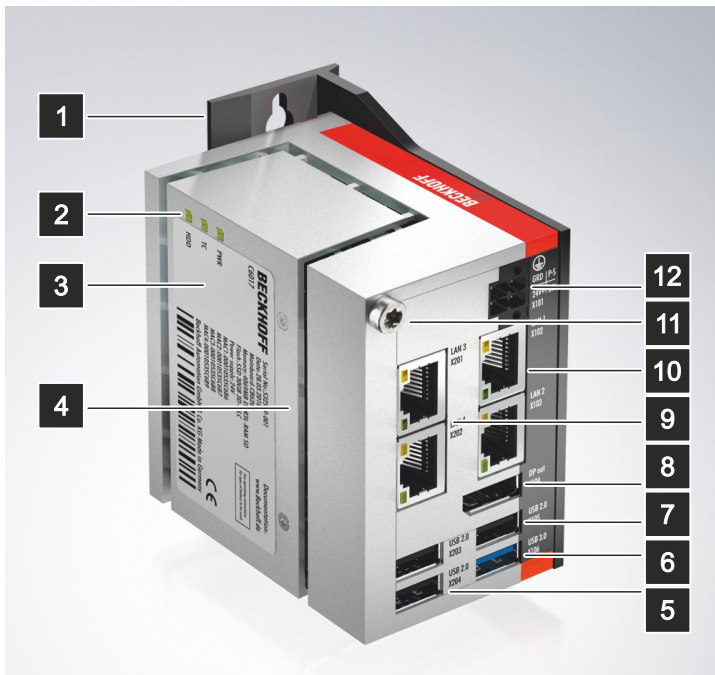
3.1 Structure

Fig. 1: C6017_Structure – basic configuration

Table 1: Key - C6017 structure

No.	Component	Description
1	Mounting plate	Plate for mounting the Industrial PC over the narrow sides in the control cabinet
2	Status LEDs	Status display for power, hard disk, TwinCAT
3	Name plate	Information on the equipment of the Industrial PC
4	Side cover	Access to battery and storage medium
5	Optional USB 2.0 interfaces (X203, X204)	Connection of peripheral devices, USB 2.0 standard supported
6	USB interface (X106)	Connection of peripheral devices
7	USB interface (X105)	Connection of peripheral devices
8	DisplayPort (X104)	Transmission of the video signal
9	Optional RJ45 Ethernet interface (X201, X202)	Connection of the Industrial PC to a 100/1000BASE-T network
10	RJ45 Ethernet interface (X102, X103)	Connection of the Industrial PC to a 100/1000BASE-T network
11	Protective conductor connection PE	Low-resistance protective earthing and functional earthing of the Industrial PC
12	Power supply (X101)	Connection of the power supply and external wiring of the Industrial PC

3.2   Interface description

The basic version of the C6017 has the following interfaces:

- Power supply (X101)
- Ethernet RJ45 (X102, X103)
- DisplayPort (X104)
- USB (X105, X106)

3.2.1   Power supply

The Industrial PC is supplied with a rated voltage of 24 V. The 2x2-pin power socket (X101) is used for connection to the power supply and the external wiring of the Industrial PC. The main supply voltage is applied between PIN 3 (0 V) and PIN 4 (24 V) of the socket.
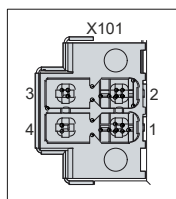

Fig. 2: C6017_Power socket pin numbering

Table 2: Power socket pin assignment

Pin	Signal	Description
1	ON	PC_ON input
2	P-S	Power status output
3	GND	0 V
4	24 V	Power supply

The plug for the power supply is specified for 8 A and can accommodate cable cross-sections of up to 1.5 mm^2. The plug is included in the delivery. If you need a replacement connector, please contact your Beckhoff service team, quoting the order identifier C9900-P943 (see Chapter 10.1 Service and support).

3.2.2   Ethernet RJ45

The C6017 has two Gigabit LAN ports (X102, X103). The Ethernet standards 100Base-T and 1000Base-T enable connection of corresponding network components with data rates of 100/1000 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 controllers are used as follows, based on the device generations:

Table 3: Controller classification based on device generations

Generation	Controller
C6017-0010	Intel$^®$ i210 for LAN1 and LAN2
C6017-0020	Intel$^®$ i210 for LAN1 and LAN2
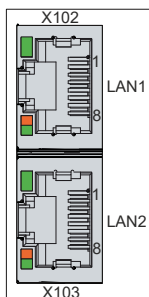
Fig. 3: C6017_Ethernet interface pin numbering

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 -	

The LEDs of the LAN interfaces indicate the activity and the speed of the data transfer (Mbit/s). The LED on the left indicates whether the interface is connected to a network. If this is the case, the LED lights up green. The LED flashes when data transfer is in progress.

The LED on the right indicates the speed of the data transfer. If the speed is 100 Mbit/s the LED is orange, at 1000 Mbit/s it is green.

3.2.3　USB

The Industrial PC has two USB interfaces (X105, X106). They are used to connect peripheral devices with USB interfaces. The following table shows the interface assignment based on the device generation:

Table 5: USB interfaces based on device generation

Generation	USB interfaces
C6017-0010	1x USB 2.0 (X105)
	1x USB 3.0 (X106)
C6017-0020	2x USB 3.0 (X105, X106)

The two USB interfaces each supply up to 500 mA current and are electronically protected.

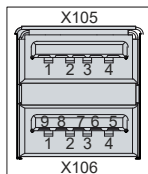For USB 2.0 only the first four pin assignments are relevant.

Fig. 4: C6017_USB interface pin numbering

Table 6: USB interface pin assignment

Pin	Connection	Typical assignment
Shell	Shield	Drain Wire
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

3.2.4 DisplayPort

The Industrial PC has a DisplayPort (X104) that enables connection of devices with DisplayPort. It facilitates transfer of image signals.

In addition, DVI signals can be transferred via an adapter. Please order it from your Beckhoff sales team, quoting order identifier C9900-Z468 adapter cable DisplayPort to DVI, 40 cm.

DisplayPort signals are led out via the interface by default. With the use of a level shifter cable the board switches the DisplayPort specification automatically to HDMI signals.
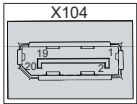

Fig. 5: C6017_DisplayPort pin numbering

Table 7: Pin assignment of DisplayPort

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

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3.3 Optional interfaces

You can extend the Industrial PC beyond the basic configuration by additional interfaces. The following ordering options are available:

- Ethernet RJ45 and USB 2.0 (order identifier: C9900-E302)
- RS232 (order identifier: C9900-E311)

Further interfaces are available on request. Any interfaces that are ordered are installed ex factory.

3.3.1 USB 2.0

The Industrial PC optionally contains two additional USB interfaces. Both support the USB 2.0 specification. They each supply up to 500 mA current and are electronically protected.

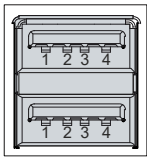They are used to connect peripheral devices with USB interfaces.

Fig. 6: C6017_USB interface pin numbering

Table 8: USB interface pin assignment

Pin	Connection	Typical assignment
1	VBUS	Red
2	D -	White
3	D +	Green
4	GND	Black
Shell	Shield	Drain Wire

3.3.2 Ethernet RJ45

The two additional Ethernet ports enable connection of corresponding network components with data rates of 100/1000 Mbit/s in accordance with the 100Base-T and 1000Base-T Ethernet standards.

The RJ45 connection technology with twisted-pair cables is used. The maximum length of the cable connection is 100 m.

The Intel® i210 (MAC/PHY) controller is used for both ports.

The Ethernet ports are not switched. They are suitable for cycle times <= 1 ms and for distributed clock applications in EtherCAT.
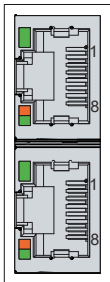

Fig. 7: C6017_Ethernet interface pin numbering

Table 9: 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 -	

The LEDs of the LAN interfaces indicate the activity and the speed of the data transfer (Mbit/s). The LED on the left indicates whether the interface is connected to a network. If this is the case, the LED lights up green. The LED flashes when data transfer is in progress.

The LED on the right indicates the speed of the data transfer. If the speed is 10 Mbit/s, the LED is not lit. At 100 Mbit/s the LED lights up orange, at 1000 Mbit/s it lights up green.

3.3.3   RS232

The additional RS232 interfaces include two electrically isolated 9-pin D-Sub sockets. The interfaces provide an asynchronous, serial communication method defined in the RS232 standard.
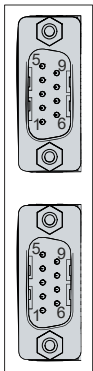

Fig. 8: C6017_RS232 interface pin numbering

Table 10: RS232 pin assignment

Pin	Signal	Type	Description
1	-	-	-
2	RxD	Signal in	Receive Data
3	TxD	Signal out	Transmit Data
4	-	-	-
5	GND	Ground	Ground
6	-	-	-
7	RTS	Signal out	Request to Send
8	CTS	Signal in	Clear to Send
9	RI	Signal in	Ring Indicator

3.4   Status LEDs

The Industrial PC has three status LEDs: PWR, TC, HDD. They provide information on the following aspects:

- the status of the power controller

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- the TwinCAT status
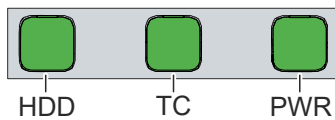- the hard disk activity

HDD   TC   PWR

Fig. 9: Status LEDs

3.4.1   PWR LED

The PWR (power) LED indicates the status of the power controller. The colors and flashing intervals have the following meanings:

Table 11: Meaning of the PWR LED

Color	Flashing interval	Meaning
None	Steadily lit	PC is off
White	Steadily lit	VCC power fail
Magenta	Steadily lit	S UPS active (if existent)
Yellow	Steadily lit	Windows shut down, supply voltage still present
Green	Steadily lit	Normal operation
Red	Steadily lit	Reset/power fail
Green/yellow	Flashing	Bootloader running without error
Red/yellow	Flashing	Bootloader is starting (start sequence is being run through)
Magenta	Flashing (0.5 s)	S UPS capacitance test (if S UPS exists)
Red/magenta	Flashing	Checksum error during the I2C transmission in the bootloader
Cyan	Flashing (2 s)	contact Beckhoff Service

3.4.2   HDD LED

The HDD LED indicates the activity of the storage medium. The colors and flashing intervals have the following meanings:

Table 12: Meaning of the HDD LED

Color	Flashing interval	Meaning
Red	Flashing	Activity (access to storage medium)

3.4.3   TC LED

The TC LED indicates the TwinCAT status. The colors and flashing intervals have the following meanings:

Table 13: Meaning of the TC LED

Color	Flashing interval	Meaning
Green	Steadily lit	TwinCAT Run Mode
Blue	Steadily lit	TwinCAT Config Mode
Red	Steadily lit	TwinCAT Stop
-	-	TwinCAT not started

3.5 Name plate

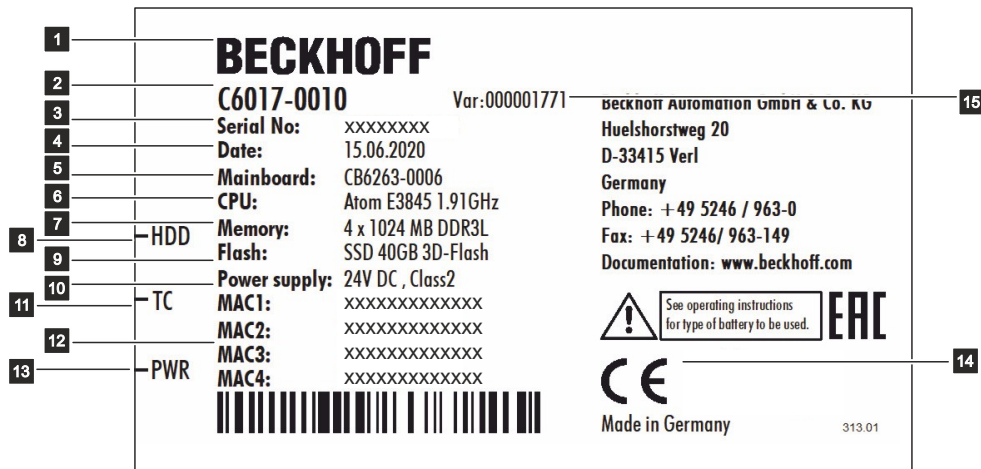The name plate provides information on the equipment fitted to the Industrial PC.

Fig. 10: C6017 _Name plate example

Table 14: Key - C6017 name plate

No.	Description
1	Manufacturer, including address
2	Model: The last four digits indicate the device generation
3	Serial number (BTN)
4	Date of manufacture
5	Mainboard
6	CPU
7	Main memory
8	Hard disk LED
9	Storage medium
10	Power supply unit: 24 $V_{DC,}$ NEC class 2
11	TwinCAT LED
12	MAC addresses of the Ethernet interfaces (X102, X103, X201, X202)
13	Power LED
14	CE conformity, EAC conformity
15	Variant number: Commercial number of the order code including ordering options

3.6   1-second UPS

NOTE
Loss of data
The use of the 1-second UPS outside of the documented possibilities can lead to loss or corruption of data.   • Use only TwinCAT to control the 1-second UPS and save only persistent data with a maximum size of 1 MB.

The C6017 can optionally be ordered with internal uninterruptible power supply (UPS). This is a capacitive 1-second UPS for secure storage of persistent application data on the M.2 SSD. It requires TwinCAT and Windows Embedded Compact 7, Windows Embedded Standard 7 or Windows 10 IoT Enterprise.

You can order the C6017 with internal UPS from the factory by specifying the order identifier C9900-U215.

The capacitive 1-second UPS continues to supply the processor with power if the power supply fails. During this period persistent data can be saved, which are available on switching on again. Since the capacity of the 1-second UPS is neither sufficient for bridging power failures nor for operating a hard disk, in the event of a power failure the data is only stored on the Compact Flash/CFast/MicroSD card. The 1-second UPS only works for a few seconds.
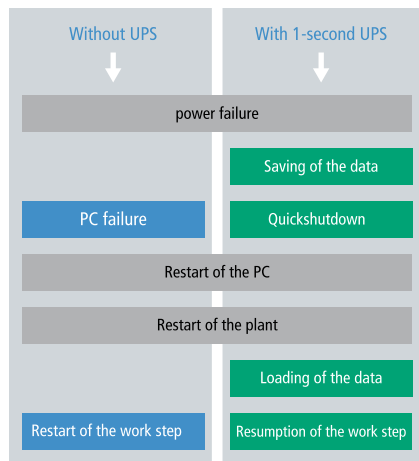

Fig. 11: UPS function

The UPS can be controlled from the PLC with the function block FB_S_UPS_BAPI. More detailed information can be found in the Beckhoff Information System under the following link: https://infosys.beckhoff.com/index.php?content=../content/1031/tcplclib_tc2_sups/2702160148074 7275.html&id=7167070070491500024.

4 Commissioning

To be able to use the Industrial PC, you must first commission it. The first step is to transport the device to is operating location and unpack it. This is followed by installing the device in the control cabinet, connecting the cables and the power supply and finally switching on the Industrial PC.

4.1 Transport and unpacking

Note the specified transport and storage conditions (see Chapter 9, Technical data [▶ 43]).

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

NOTE
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. Remove packaging.
2. Keep the packaging for possible future transport.
3. Check your delivery for completeness by comparing it with your order.
4. Check the contents for visible shipping damage.
5. In case of discrepancies between the package contents and the order, or in case of transport damage, please inform Beckhoff Service (see Chapter 10.1 Service and support [▶ 44]).

4.2   Installation in the control cabinet

The C6017 Industrial PC is designed for installation in control cabinets in machine and plant technology. Please observe the environmental conditions prescribed for the operation (see Chapter 9 Technical data [▶ 43]).

Using different mounting plates, you can align the cable entry based on the application requirements.

Figure 12 shows the three available mounting plates: the standard mounting plate 1, the optional mounting plate 2 and the optional mounting plate 3 with DIN rail adapter. In all cases, the plate is attached to the right-hand side wall of the Industrial PC with four Torx TX10 screws and a tightening torque of approx. 0.5 Nm. You can turn all mounting plates before fastening them such that the PC can be mounted in the desired orientation for the cable entry in the control cabinet (see Chapter 4.2.1 Mounting options [▶ 22]).
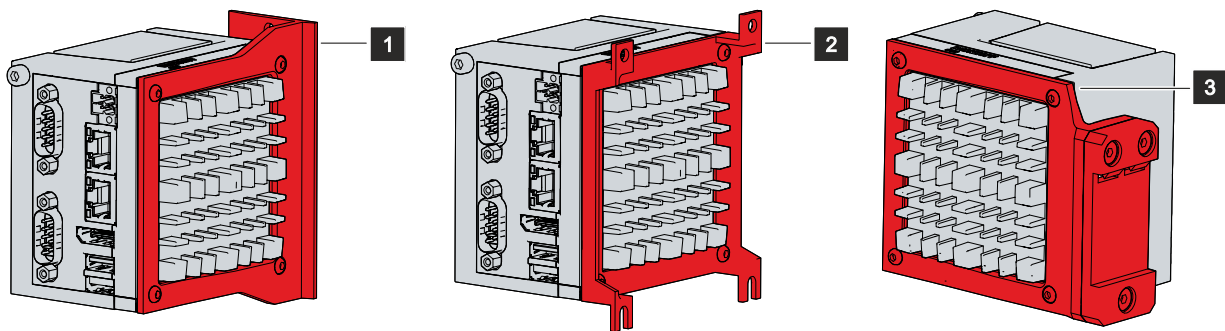

Fig. 12: C6017 _Mounting plates

By default, the Industrial PC is delivered with the standard mounting plate 1 already mounted as shown in Fig. 12. Alternatively, you can select one of the ordering options listed below.

The following ordering options are available to you:

Table 15: Mounting plate ordering options

Order designation	Execution
C9900-M664	Mounting plate for C601x on the side wall, instead of the standard mounting plate
C9900-M665	Mounting plate for side mounting of the C601x, single part, not mounted
C9900-M666	Mounting plate with DIN rail adapter for C601x, instead of the standard mounting plate
C9900-M667	Mounting plate with DIN rail adapter for C601x, single part, not mounted

4.2.1   Mounting options

NOTE
Incorrect installation
Mounting the device in a way that deviates from the documentation can impair its functionality.
• Mount the device only according to the orientations shown in the documents.

Before attaching the mounting plates shown in Fig. 12 to the device, you have various options for aligning the device according to the desired cable entry. This results in various options for mounting the device in the control cabinet.

The following drawings show the possible mounting options.

With the standard mounting plate 1, you can mount the Industrial PC in the control cabinet using the narrow sides. You have the following mounting options, which are shown in Fig. 13:

- Mounting via the rear of the device (A)
- Mounting via the top of the device (B)
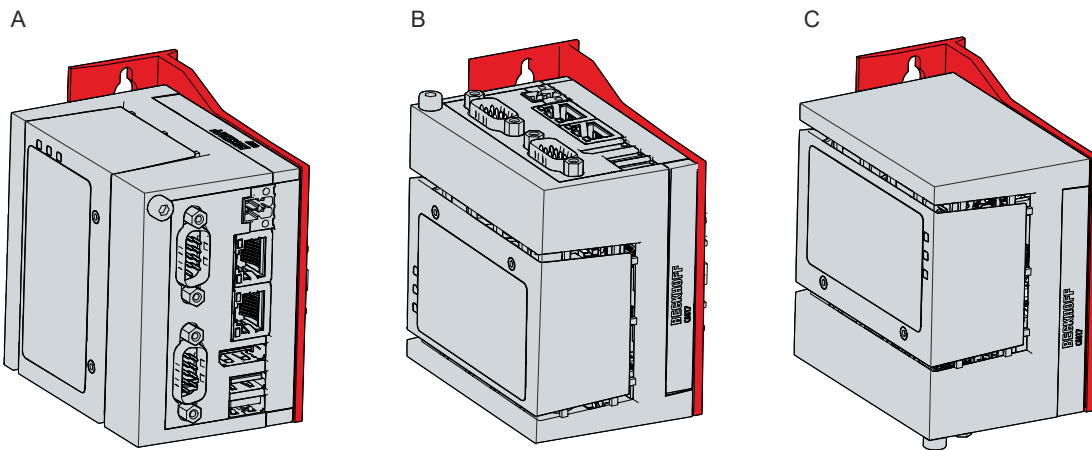- Mounting via the bottom of the device (C)

Fig. 13: C6017_Mounting options for mounting plate 1

With the optional mounting plate 2, you can mount the Industrial PC only via the right-hand side panel. You can rotate the PC as required to align the connections in the control cabinet. You have the following mounting options, which are shown in Fig. 14:

- Connections point upwards (A)
- Connections point downwards (B)
- Connections point to the right (C)
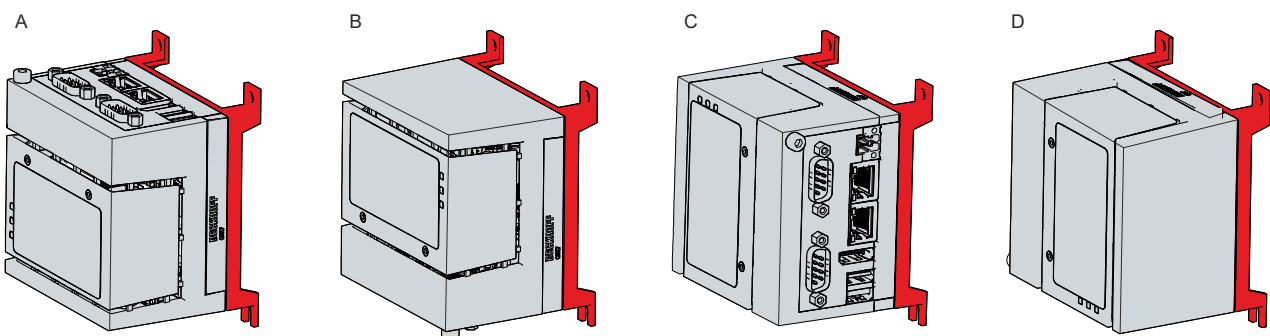- Connections point to the left (D)

Fig. 14: C6017 _Mounting options for mounting plate 2

With the optional mounting plate 3 with DIN rail adapter, you can mount the Industrial PC on the DIN rail in the control cabinet via the narrow sides. You have the following mounting options, which are shown in Fig. 15:

- Mounting via the rear of the device (A)
- Mounting via the top of the device (B)
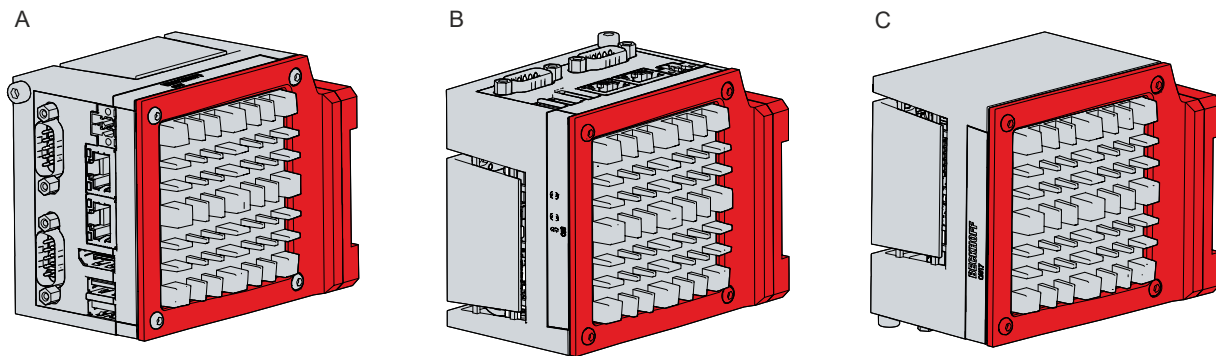- Mounting via the bottom of the device (C)

Fig. 15: Mounting options for mounting plate 3

4.2.2 Dimensions

The dimensions of the Industrial PC and the mounting plates are used to prepare the control cabinet and to mount the device correctly in the control cabinet.

All dimensions are in mm.

Fig. 16 gives an example of the dimensions using the mounting option via the rear of the device with mounting plate 1.
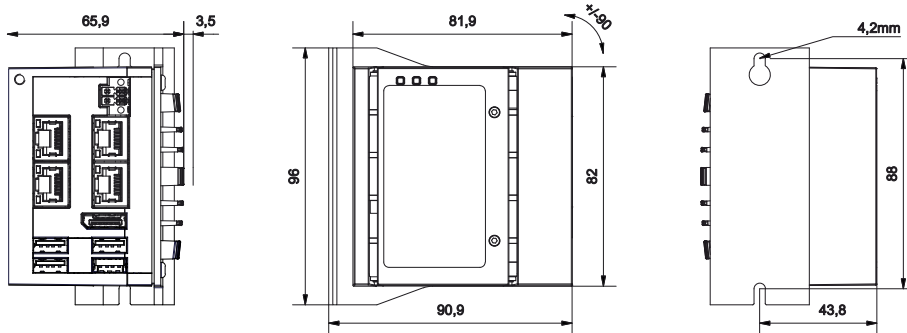

Fig. 16: C6017 _Mounting plate narrow side

Fig. 17 shows the dimensions using the mounting option with the connections pointing to the right with mounting plate 2 as an example.
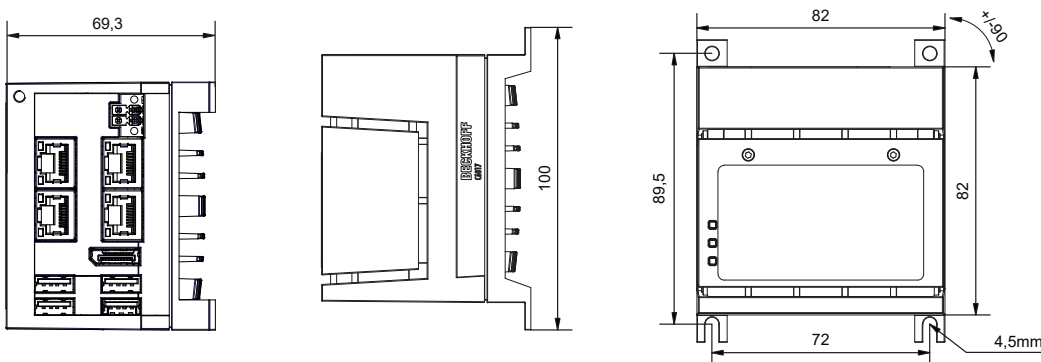

Fig. 17: C6017 _Mounting plate side panel

Fig. 18 illustrates the dimensions using the mounting options via the rear of the device with mounting plate 3 with DIN rail adapter as an example.
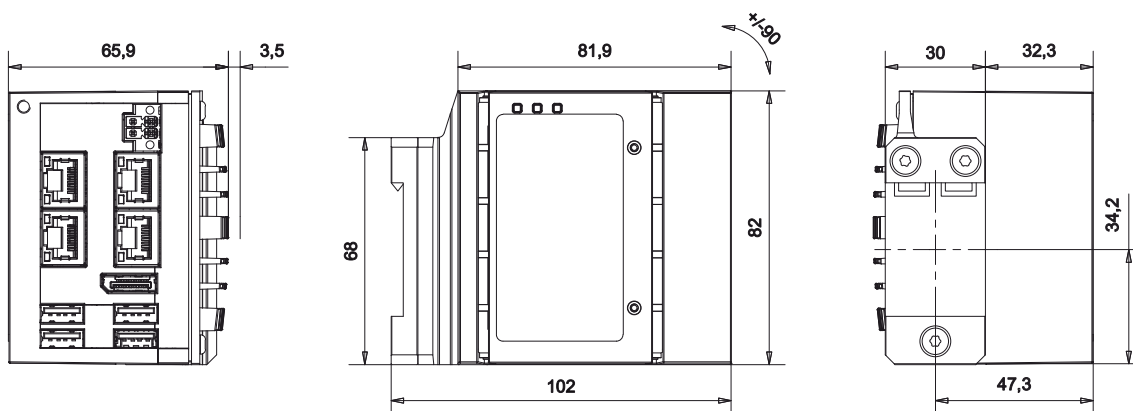

Fig. 18: C6017 _Mounting plate DIN rail adapter

4.2.3 Installation in the control cabinet

NOTE
Extreme environmental conditions
Extreme environmental conditions can cause damage to the device.
• Avoid extreme environmental conditions.
• Protect the device against dust, moisture and heat.
• Do not block the ventilation slits of the device.

When installing in the control cabinet, make sure that there is 5 cm free space above and below the device and 2 cm on the side of the device that is accessible for air circulation and for opening the PC.

Mounting via mounting plates

In order to mount the Industrial PC with mounting plate 1 or 2 in the control cabinet, it must be furnished with the holes for the fastening screws according to the dimensions of the PC (see Chapter 4.2.2 Dimensions [▶ 24]). You need M4 screws for mounting.

After you have drilled the holes for the fastening screws in the control cabinet, you can mount the Industrial PC in the control cabinet with mounting plates 1 or 2.
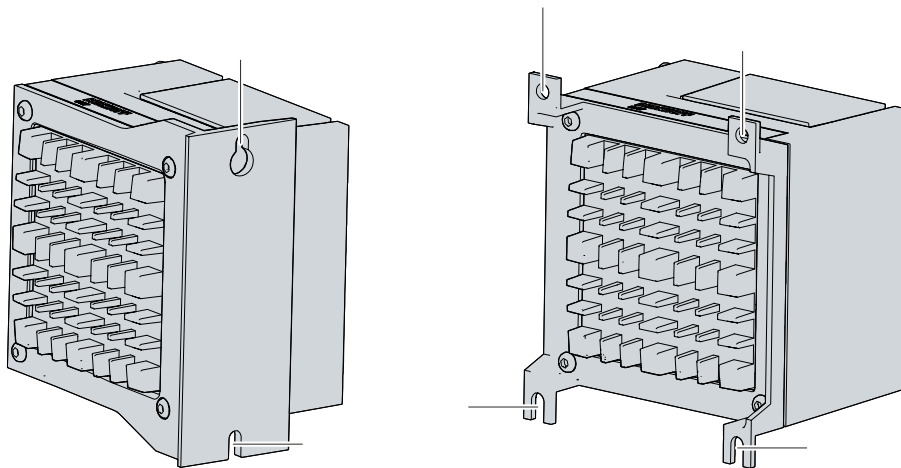

Fig. 19: C6017 _Mounting plates for control cabinet installation

To install the Industrial PC in the control cabinet, follow the steps below:

1. Place the fastening screws in the drill holes in the rear panel of the control cabinet.
2. Hang the PC onto the screws at the marked points on the mounting plate (see Fig.19).
3. Tighten the fastening screws.
⇨ You have successfully installed the Industrial PC in the control cabinet.

Mounting via DIN rail adapter

If you want to install the Industrial PC in the control cabinet via the DIN rail adapter, no preparation of the control cabinet is necessary. All you need to do is attach the device to the DIN rail using the adapter. To do this, follow the steps shown in Fig. 20:
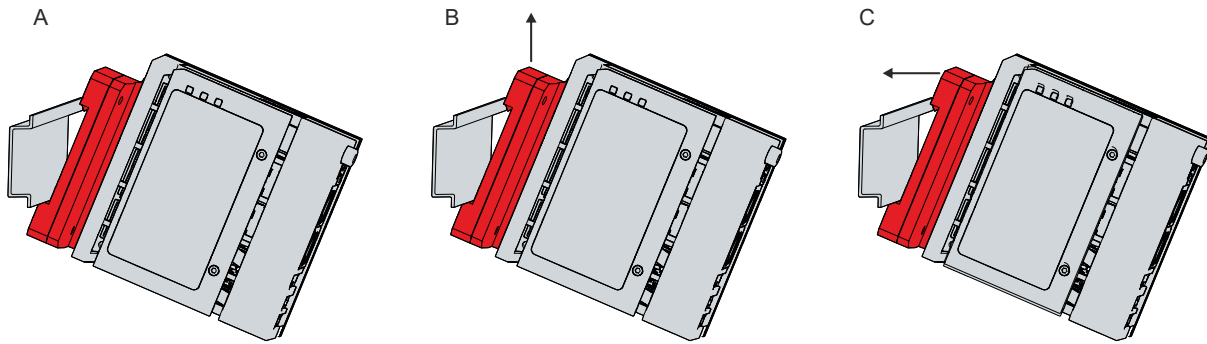
Fig. 20: C6017_DIN rail adapter for control cabinet installation

1. Hook the lower side of the adapter into the DIN rail (A).
2. Push the device upwards so that the spring contacts of the adapter are pressed in (B).
3. Keep the device pressed upwards and also hook the upper side of the adapter into the DIN rail (C).
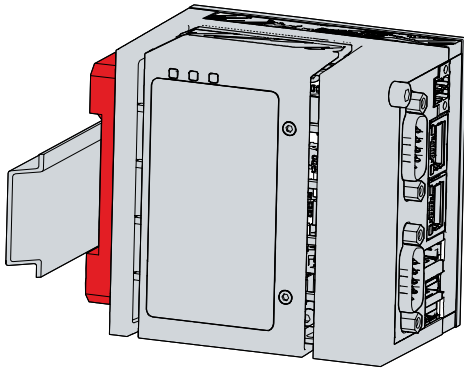⇨ You have successfully installed the Industrial PC on the DIN rail.

Fig. 21: C6017_DIN rail adapter mounted

4.3   Connecting the Industrial 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 prepare the Industrial PC for operation, it must be connected. The first step is to ground the device. Then you can connect the cables and the power supply.

An external power supply unit is required to supply 24 V DC (-15 %/+20 %) for operating the device.

Wire the Industrial PC in the control cabinet in accordance with the EN 60204-1:2006 standard on Protective Extra Low Voltage (PELV) so that one side of the circuit or a point on the power source of this circuit is connected to the protective conductor system.

Set "PE" and "0 V" (24 V power supply) to the same potential (connected in the control cabinet).

Connected devices that have their own power supply must have the same potential for "PE" and "GND" as the Industrial PC system (no potential difference).
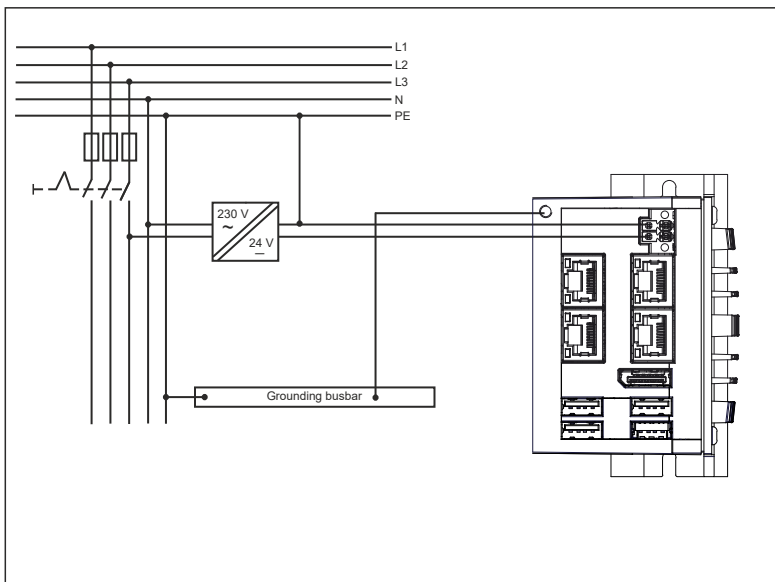

Fig. 22: C6017 _Wiring example

4.3.1 Grounding of the Industrial 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.

The protective conductor connection PE is located on the housing of the Industrial PC (see also Chapter 3.1 Structure [▶ 9]), which ensures both the protective earthing of the PC and the functional earthing. Therefore, use cables with a cross-section of at least 4 mm^2 for the connection of the protective conductor.

Protective earth

By connecting the PE protective conductor connection to the central grounding point of the control cabinet panel in which the PC is installed, you establish low-resistance protective earthing of the Industrial PC and thus avoid dangerous touch voltages.

EMC

NOTE
Hardware damage due to electromagnetic interference
Using the Industrial PC without functional earthing can lead to hardware damage due to electromagnetic interference.   • Only use the device with functional earthing.

Electromagnetic compatibility (EMC) refers to the Industrial PC's ability not to interfere with other devices and equipment through electromagnetic interference, and not to be disturbed by electrical or electromagnetic effects.

For this purpose, the Industrial PC must comply with certain protection requirements. The Industrial PC 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 EMC of the device is improved by functional earthing. You also establish the functional earthing by connecting the PE protective conductor connection to the central grounding point of the control cabinet panel in which the PC is installed.

4.3.2   Connecting cables and power supply

NOTE
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.

Connecting cables

The connections are located in the front of the Industrial PC and are documented in Chapter 3.1 Structure [▶ 9].

Make sure that you first ground the PC (see Chapter 4.3.1 Grounding of the Industrial PC [▶ 28]) and then plug in all data transfer cables.

Connecting the power supply

Cables with a maximum cable cross-section of 1.5 mm^2 must be used for connecting the power supply. To achieve the lowest possible voltage drop on the supply cable, we recommend connecting the maximum possible cross-section. In the case of longer distances between the voltage source and the PC, take into account the voltage drop in relation to the cable cross-section and voltage fluctuations in your supply voltage. This ensures that the voltage at the power supply unit does not drop below 20.4 V.

Proceed as follows to connect the 24 V_{DC} power supply unit:

1. Check the correct voltage of your external power supply.
2. Install the power cable.
3. Plug the power cable into the four-pin voltage connector of the Industrial PC.
4. Fasten the power cable to the power plug of the Industrial PC.
5. Connect the PC to your external 24 V power supply.
6. Switch on the 24 V power supply.

4.4 Switching the Industrial PC on and off

The Industrial PC does not have its own mains switch. Instead, the wiring for starting up and shutting down the PC is connected via input PC_ON. You can connect a simple push switch to the PC_ON input and use it as a standard power switch. This allows you to position the switch as desired and make it easily accessible.

The Power Status signal indicates whether the PC is switched on or off. Read this signal to find out when you can switch off the main supply voltage.

First switching on and driver installation

NOTE
Public networks
Connecting the PC to public networks without additional protective measures can compromise the safety of the device.
• Protect the PC before connecting it to public networks.

The Industrial PC is started when the system is switched on or when the power supply is connected.

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

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

Switching off the Industrial PC

NOTE
Data loss due to running software
Switching off the Industrial PC before ending the running software and shutting down the device can lead to data loss.
• Quit the running software and shut down the device before switching it off.

When the system is switched off or disconnected from its own power supply, the Industrial PC is also switched off.

If 24 V are applied to the PC_ON input, the PC shuts down properly. The PC_ON signal is inverted, i.e. the PC shuts down if the 24 V connection is live.

Once the PC has shut down, the Power Status output is switched from 24 V to 0 V. This output can be used, for example, to switch a contactor that disconnects the entire system from the power supply. The maximum load for the Power Status output is 0.5 A and a suitable fuse should be provided.

You can assign different access rights to all users in the operating system and in the application software. Since there is a risk of data loss if the Industrial PC is switched off incorrectly, assign the rights advisedly. A user who is not allowed to terminate the software should not be allowed to switch off the Industrial PC.

5 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 PC downtime.

The Beckhoff Device Manager always starts automatically after the Industrial PC has been booted. You also have the option of manually restarting a previously closed Beckhoff Device Manager at any time.

The Industrial PC is delivered with predefined access data as standard:

- User name: Administrator
- Password: 1

You also have the option of using the Beckhoff Device Manager to configure the Industrial PC remotely via a web browser. More detailed information is available in the Beckhoff Device Manager manual.

First start Beckhoff Device Manager

When your Industrial PC is booted for the first time, the Beckhoff Device Manager also starts automatically for the first time. The Security Wizard opens. This tells 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. 23: 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.
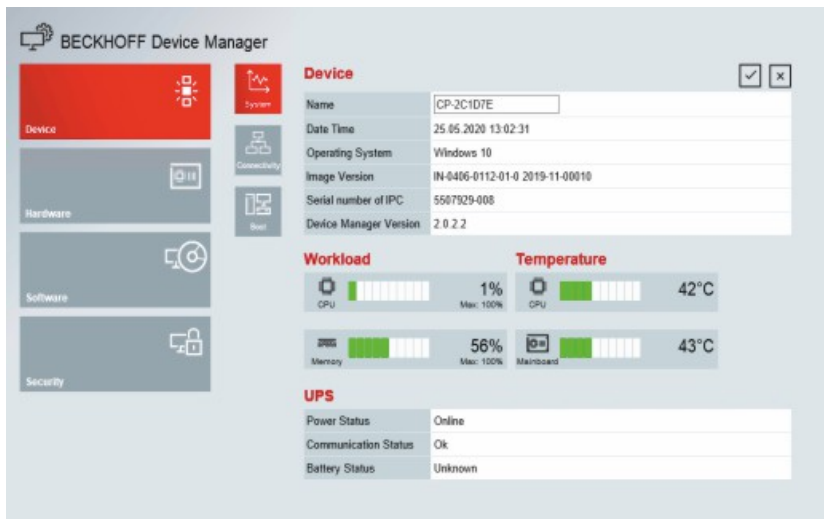5. Exit the Security Wizard to switch to the Device Manager home page:

BECKHOFF

Fig. 24: Beckhoff Device Manager home page

Navigate forward in the menu and configure the Industrial PC. Note that modifications only become active once they have been confirmed. It may be necessary to restart the Industrial PC.

Starting the Beckhoff Device Manager manually

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

1. Open a web browser on the host PC.
2. Enter the IP address or the host name of the Industrial PC in the web browser to start the Beckhoff Device Manager.

- Example with IP address: https://169.254.136.237/config
- Example with host name: https://CP-2C1D7E/config

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 delivered without password in the UEFI/BIOS. 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.

You can generate the password in different ways. An example is shown in the following table:

Table 16: Password generation

Procedure	Example
Start with one or two sentences.	Complex passwords are more secure
Remove the spaces.	Complexpasswordsaremoresecure
Abbreviate words or remove all vowels.	Cmplxpsswrdsrmrscr
Insert numbers and special characters to extend the password.	Cmplxpsswrdsrmrscr#529954#

The following passwords are not secure:

- Words from a dictionary
- Words written backwards, common spelling mistakes, and abbreviations
- Repetitive sequences, e.g. 123456789 or abcdefgh
- Personal information, e.g. birthdays, ID numbers, telephone numbers

6 Decommissioning

NOTE
Hardware damage due to power supply
A connected power supply can cause damage to the Industrial PC during disassembly.
• Disconnect the power supply from the device before starting to disassemble it.

When taking the Industrial PC out of operation, you must first disconnect the power supply and cables. You can then remove the device from the control cabinet.

If you do not want to continue using the Industrial PC, Chapter 6.2 <u>Disassembly and disposal [▶ 35]</u> provides information on the correct disposal of the device.

6.1 Disconnecting the power supply and cables

⚠ CAUTION
Risk of electric shock
Disconnecting the Industrial PC during a thunderstorm can lead to electric shock.
• Never disconnect the cables of the Industrial PC during a thunderstorm.

Before you remove the Industrial PC from the control cabinet, you must follow the following steps:

1. Shut down the Industrial PC.
2. Disconnect the Industrial PC from the power supply (see below).
3. Disconnect the data transfer cables between the Industrial PC and the connected devices (see below).

Disconnect the power supply

Proceed as follows to disconnect the power supply:

1. Disconnect the PC from your external 24 V power supply.
2. Unscrew the four-pin power plug and pull it out of the PC.
3. Disassemble the power cable if the four-pin plug is to remain with the PC.

Disconnecting cables

To disconnect the cables from the Industrial PC, proceed as follows:

1. Make a note of the wiring configuration, if you wish to restore it with another device.
2. Disconnect all data transfer cables from the Industrial PC.
3. Finally, disconnect the grounding strap.

6.2   Disassembly and disposal

Before you can remove the Industrial PC from the control cabinet, you must first disconnect the power supply and the cables (see Chapter 6.1 <u>Disconnecting the power supply and cables</u> [▶ <u>34</u>]).

Disassembly via mounting plates

To remove the Industrial PC with the corresponding mounting plate 1 or 2 from the control cabinet, proceed as follows:

1. Loosen the fastening screws just enough so that they remain attached to the control cabinet.
2. Lift the PC until the fastening screws slide into the keyholes (see Fig. 25).
3. Remove the PC from the control cabinet.
⇨ You have successfully disassembled the PC.
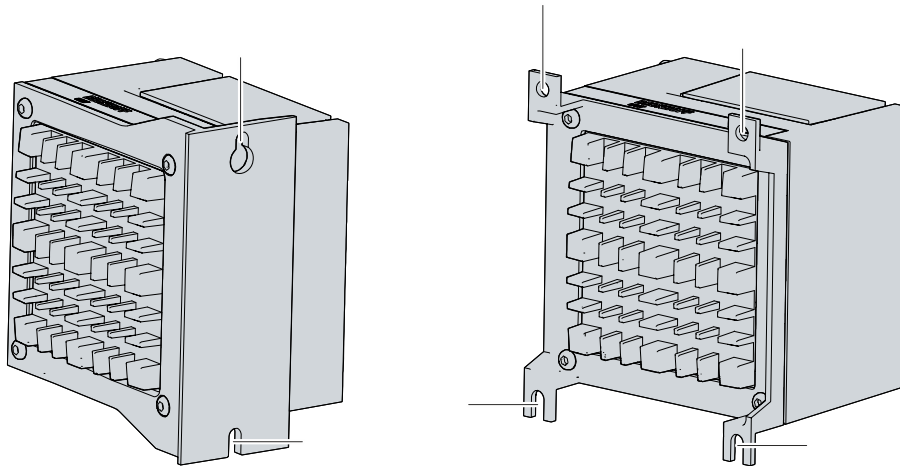
Fig. 25: C6017 _Position of the fastening screws

Disassembly via DIN rail adapter

To remove the Industrial PC from the control cabinet via mounting plate 3 with the DIN rail adapter, follow the steps below, which are shown in Fig. 26:

1. Push the PC upwards to press in the spring contacts on the DIN rail adapter (A).
2. Unhook the upper side of the adapter from the DIN rail (B).
3. Also unhook the lower side of the adapter from the DIN rail.
⇨ You have successfully removed the Industrial PC from the control cabinet.
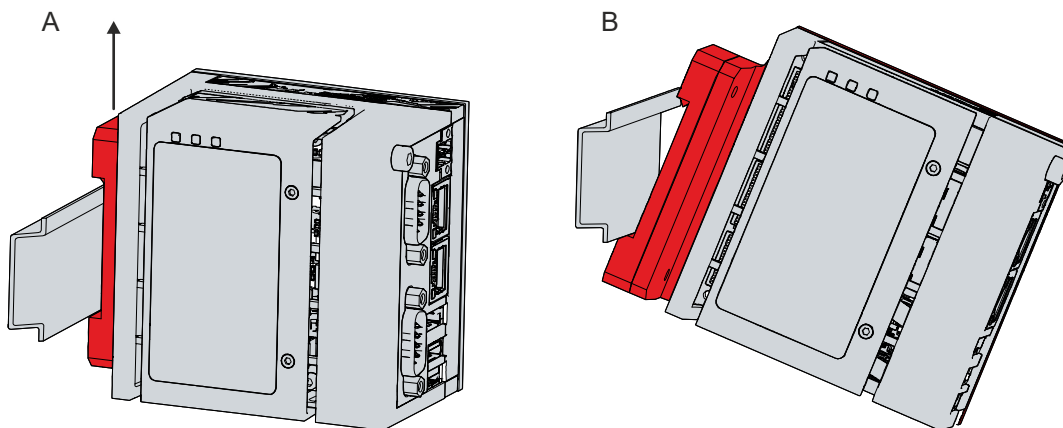

Fig. 26: C6017_Dismantling the DIN rail adapter

Disposal of the Industrial PC

Be sure to observe the national electronic scrap regulations when disposing of the Industrial PC.

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.

7   Maintenance

⚠ CAUTION
Risk of electric shock
Working on the Industrial PC while it is live can lead to electric shock.
• Turn off the supply voltage before cleaning the device or replacing device components. This does not apply to the replacement of hard disks in a RAID configuration.

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

Repair

Only the manufacturer may repair the device. If a repair should be necessary, contact Beckhoff Service (see Chapter 10.1 Service and support).

7.1   Cleaning

NOTE
Unsuitable cleaning agents
The use of unsuitable cleaning agents can damage the device.
• Only clean the Industrial PC as specified.

It is essential to observe the following aspects when cleaning the Industrial PC:

- Make sure that no dust gets into the PC.
- Always keep the ventilation slots clear.
- Only use a vacuum cleaner to clean the PC. The Industrial PC does not have to be switched off for this.
- Never use compressed air to clean the PC.

7.2   Maintenance

NOTE
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.

These are the following components:

- Battery
- Storage medium

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

Table 17: 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
3.5 inch hard disk	5 years, irrespective of the operating hours
Fan	7 years
Compact Flash, CFast or SSD	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

NOTE
Electrostatic discharge
Handling the Industrial PC without ESD protection can lead to functional impairment and destruction of the device.
• Provide an ESD protected working environment for handling the device.

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 working environment in which any electrostatic charges are discharged to the ground in a controlled manner and charging is prevented.

The best way to create an ESD-protected working environment is to set up ESD protection zones. The following measures serve this purpose:

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

- ESD-compatible, dissipative clothing such as shoes and safety shoes, protective gloves, protective clothing over normal clothing;
- 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. The following means can be used for this purpose:

- Wrist grounding strap
- Conductive mats connected to the ground potential for temporary storage of components
- ESD-compliant, conductive tool

Access to exchangeable device components

You can access the device components to be replaced via the cover on the left-hand side. You gain access to the battery and the storage medium. To do this, remove the two Torx TX6 screws and take off the cover (see Fig. 27).
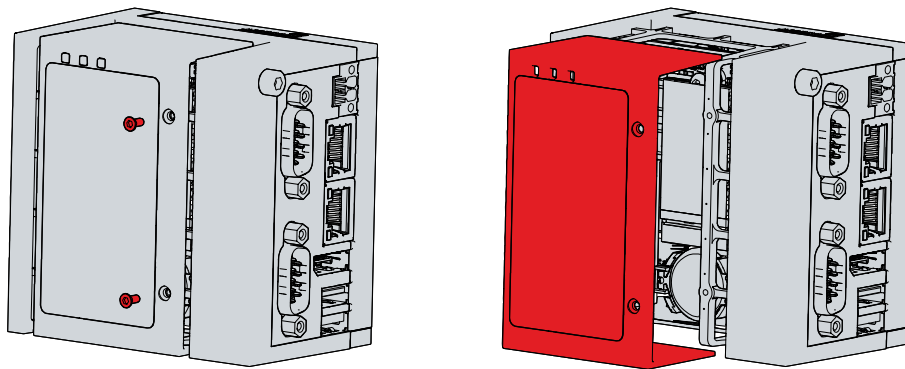
Fig. 27: C6017 _Access to battery and storage media

You now have access to the battery (1) and storage medium (2) (see Fig. 28).
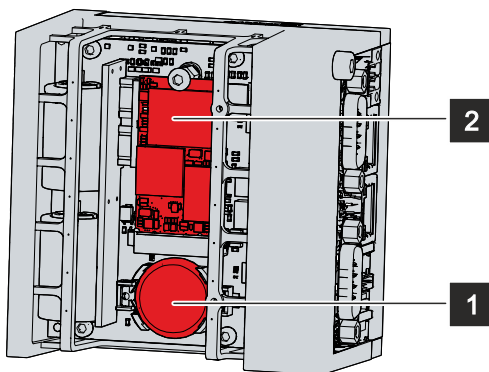
Fig. 28: C6017 _Battery and storage media

7.2.1   Replacing the battery

NOTE
Incorrect battery type
Inserting the wrong type of battery can damage the device.
• Only replace the battery with a replacement battery from Beckhoff Service.
• When replacing the battery, make sure that the polarity is correct.

NOTE
Battery damage
Incorrect handling of the motherboard battery can damage it.
• Do not recharge the battery.
• Do not throw the battery on the fire.
• Do not open the battery.
• Protect the battery against direct sunlight and moisture.

NOTE
Motherboard failure
Scratches on the motherboard may cause the motherboard to fail.
• Be very careful with the battery replacement lever and be sure to avoid scratching the motherboard.

The Industrial PC 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.

Replacement batteries should only be obtained from Beckhoff Service (see Chapter 10.1 Service and support).

Table 18: 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

Chapter 7.2 Maintenance [▶ 38] shows how to access the battery.

To change the battery, proceed as follows:

1. Place a lever made of non-electrically conductive material on the negative pole of the battery holder below the battery.
2. Lift the battery side out of the holder.
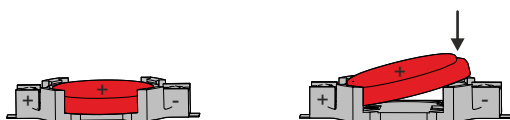   ⇨ The battery is now in an inclined position (see Fig. 29).

Fig. 29: C6017 _Battery change

3. Remove the battery completely from the battery holder.
4. Insert the new battery with the correct polarity back into the inclined position on the positive pole of the battery holder. The correct polarity is shown in the figure.
5. Push the protruding side of the battery into the battery holder (see Fig. 29).
   ⇨ You have successfully replaced the battery.

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

7.2.2 Replacing the storage media

New storage media should only be obtained from Beckhoff Service (see Chapter 10.1 Service and support).

The C6017 contains one M.2 SSD.

Data transfer before replacement

If you want to exchange the SSD as recommended by Beckhoff, you must copy the data from the old to the new SSD. You can use the Beckhoff Service Tool (BST) for this purpose. The BST is a graphical backup and restore program for Industrial PCs with a Windows operating system. You can create an image of your operating system and use it to back up the operating system. You can then restore the images created in this way. You will receive the BST on a BST stick. For more information on the function of the BST, please refer to the corresponding documentation.

If your SSD is defective and no backup copy of the data is available, Beckhoff Service will provide you with a fresh Windows image. In this case the applications must be reinstalled.

Replacing the storage media

Chapter 7.2 Maintenance [▶ 38] shows how to access the storage media.

To change the storage media, follow the steps shown in Fig. 30:

1. Remove the Torx TX10 fastening screw and the SW5 bolt of the storage medium you want to remove (section A).
   ⇨ The storage medium automatically places itself in an inclined position (section B).
2. Pull the storage medium out of the slot in the inclined position (section C).

A   B   C
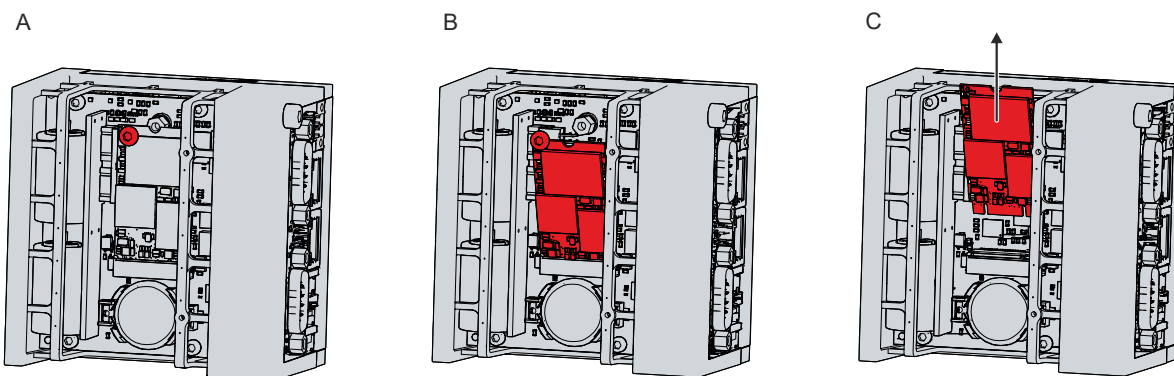
Fig. 30: C6017 _Replace storage media

3. Insert the new storage medium into the slot in the same inclined position.
4. Push down the protruding side of the storage medium.
5. Replace the bolt and the fastening screw and tighten them with a tightening torque of approx. 0.3 Nm.
⇨ You have successfully replaced the storage medium.

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

8 Troubleshooting

Table 19: Troubleshooting

Fault	Cause	Measures
Nothing happens after the Industrial PC has been switched on	Missing power supply of the Industrial PC	Check the power supply cable
	Other cause	Call Beckhoff Service
The Industrial PC does not boot fully	Setup settings are incorrect	Check the setup settings
	Other cause	Call Beckhoff Service
Computer boots, software starts, but control does not operate correctly	Cause of the fault is either in the software or in parts of the plant outside the Industrial PC	Call the machine and software manufacturer

9 Technical data

Table 20: Technical data

Product designation	C6017
Dimensions (W x H x D)	82 x 82 x 66 mm, without mounting plate
Weight	approx. 550 g without mounting plate
	approx. 610 g with mounting plate
Supply voltage	20.4-30 V_{DC} (24 V_{DC} power supply unit, NEC class 2)
Power consumption	max. 14 W with basic configuration
Protection class	IP20
Vibration resistance (sinusoidal vibration)	EN 60068-2-6: 10 to 58 Hz: 0.035 mm
	58 to 500 Hz: 0.5 G (approx. 5 m/s^2)
Shock resistance (shock)	EN 60068-2-27: 5 G (approx. 50 m/s^2), duration: 30 ms
EMC interference immunity	conforms to EN 61000-6-2
EMC interference emission	conforms to EN 61000-6-4
Permissible ambient temperature	0 °C to +55 °C (operation)
	-25 °C to +65 °C (transport / storage)
Permissible air humidity	Maximum 95 %, no condensation
Transport and storage	The same values for air humidity and shock resistance are to be observed during transport and storage as in operation. The shock resistance during transport can be improved by means of suitably packing the Industrial PC.

10 Appendix

10.1 Service and support

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

Beckhoff Service

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

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

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

If servicing is required, please quote the serial number of your Industrial PC, which can be found on the name plate.

Beckhoff Support

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

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

Hotline: + 49 (0) 5246/963-157
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The addresses of the worldwide Beckhoff branches and agencies can be found on our website at http://www.beckhoff.com/.

You will also find further documentation for Beckhoff components there.

10.2   Approvals

The following table shows the certifications of the Industrial PC based on the device generation:

Table 21: C6017 certifications

Device generation	Certifications
C6017-0010	CE, EAC, UL
C6017-0020	CE, EAC, UL

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.

List of figures

List of tables

More Information:
www.beckhoff.com/C6017/