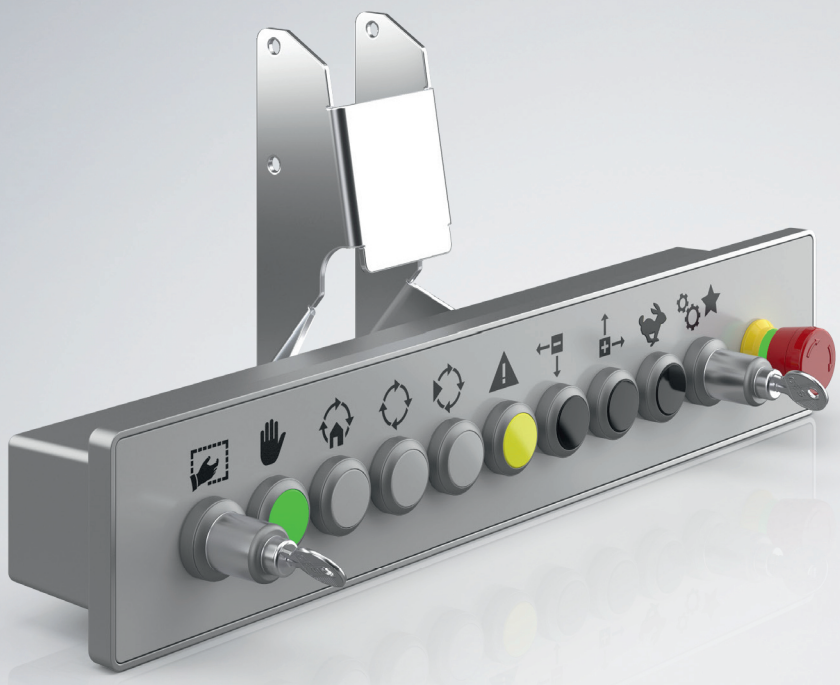
BECKHOFF New Automation Technology

Manual | EN

C9900-M800

Push button extension



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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.
For installation and commissioning of the components, it is absolutely necessary to observe the documentation and the following notes and explanations.
The qualified personnel is obliged to always use the currently valid documentation.

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

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.
We reserve the right to revise and change the documentation at any time and without notice.
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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

NOTICE
Disregarding the notice may lead to damage to property.

2.2 Intended use

The push button extension enables application-specific arrangement of electromechanical illuminated push buttons directly on the operating unit of a Panel PC. This allows the Panel PC to be precisely adapted to the requirements of the machine control system. The push button extension is mounted on the C9900-M802, -M803, -M804 or -M805 mounting arms via a mounting arm adapter.

The push button extension is designed for a working environment that meets the requirements of protection rating IP54, offering protection against dust and splash water. A certain tolerance range is permitted with regard to the ambient humidity. The specified limits for technical data must be adhered to.

The push button extension can be used within the documented operating conditions and in accordance with national regulations. It is approved only for applications with a defined fail-safe state. This safe state is the wattless state.

Improper use

Do not use the push button extension outside the documented operating conditions.

2.3 Fundamental safety instructions

The following safety instructions must be observed when handling the push button extension.

Application conditions

- Do not use the push button extension in extreme environmental conditions.
- Never use the push button extension in potentially explosive atmospheres.
- The push button extension should only be used inside buildings.
- The push button extension should not be used at altitudes of more than 2000 m.
- The push button extension should not be used beyond the scope of overvoltage category II.
- Make sure that the environment in which the push button extension is used has a maximum degree of pollution of 2.
- Never carry out any work on the push button extension when it is live. Always switch off the supply voltage for the device before mounting or troubleshooting.
- Never plug or unplug connectors during thunderstorms. There is a risk of electric shock.
- Ensure that the device has a functional earth connection.
- Ensure the traceability of the push button extension via the serial number.

Damage to property, loss of data and impairment of functions

- Use the device only in the manner specified by the manufacturer. Otherwise, the protection supported by the device may be compromised.
- 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 technical personnel trained in control and automation engineering operate the push button extension. 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.
- If it should catch fire, extinguish the push button extension 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 [▶ 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.

The operator is also responsible for the safe operation of the system. This includes risk assessment of each F-System. The following standards apply for risk assessment:

- EN ISO 12100:2010, Safety of machinery – General principles for design – Risk assessment and risk reduction
- ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design

Beckhoff is not responsible for the safe operation of the system.

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.

3 Product overview

The C9900-M800 push button extension can be used to control the central functions of a machine or system such as emergency stop, start or stop by means of electromechanical keys. The push button extension is tailored to the CP32xx-2xxx-0020 and can be mounted directly on the mounting arm via the already mounted mounting arm adapter. The C9900-M800 push button extension has a PROFINET interface and supports data transmission of safe inputs via PROFIsafe version 2.4.

The push button extension includes the following items:

- 1 x emergency stop switch
- 5 x illuminated push buttons
- 3 x push buttons
- 2 x key switches
- 2 x push-pull built-in socket for power supply and forwarding
- 2 x push-pull Ethernet built-in socket with 100/1000Base-T connection
- 8-pin M12 circular connector for optional connection of five digital outputs

3.1 Structure

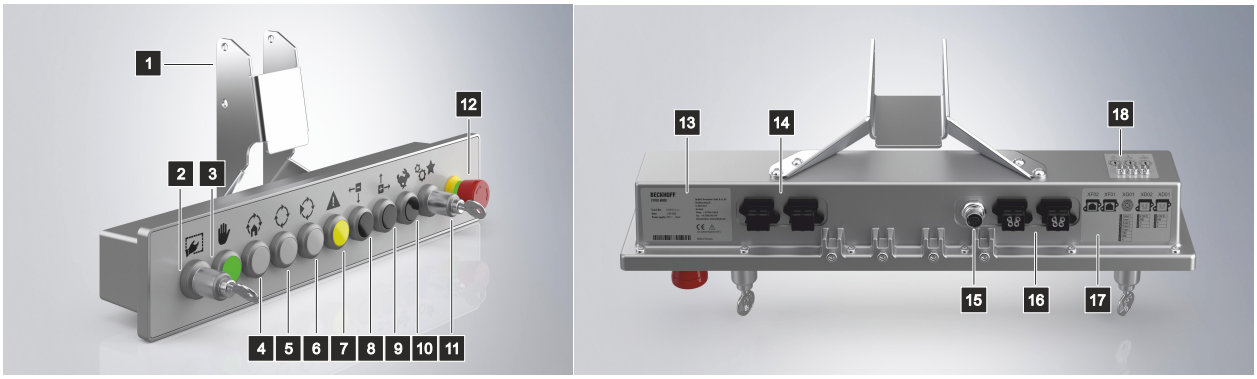


Fig. 1: Structure

Table 1: Legend for C9900-M800 structure

No.	Component	Description
1	Mounting arm adapter	Adapter for installation on mounting arm
2	Key switch SSG1	
3	Illuminated push button, green	
4	Illuminated push button, clear	
5	Illuminated push button, clear	
6	Illuminated push button, clear	
7	Illuminated push button, yellow	safety-related and functionally recorded, connected via PROFIsafe
8	Push button, black	
9	Push button, black	
10	Push button, black	
11	Key switch SSG10	safety-related and functionally recorded, connected via PROFIsafe
12	Emergency stop	Safe state of the connected machine, safety-related and functionally recorded, connected via PROFIsafe
13	Name plate	Information on the features of the push button extension
14	RJ45 Ethernet interfaces (XF01, XF02)	Connecting the push button extension to a 100/1000Base-T network
15	8-pin M12 USB round connector (XG01)	Optional connection of digital outputs
16	Power supply and transmission (XD01, XD02)	Connection and transmission of the power supply, external wiring of the push button extension
17	Interface configuration sticker	Illustration of the interface layout with pin assignment
18	Address selection switch with sticker	Setting the safety address

3.2 Interface description

The push button extension includes the following interfaces:

- Power supply (XD01, XD02)
- Connection of digital outputs (XG01)
- Ethernet (XF01, XF02)

The interfaces are located on the underside of the push button extension.

3.2.1 Power supply

The push button extension is supplied with a nominal voltage of 24 V. The power supply and a Beckhoff CP3xxx-2xxx-00x0 are connected at the push-pull power built-in sockets (XD01, XD02). The maximum current including supply of a Beckhoff CP3xxx-2xxx-00x0 and the operation of the digital outputs is 9 A_{DC}. The maximum current for the supply of the CP3xxx-2xxx-00x0 (XD02) is 4 A_{DC}. The connection cables are located inside the column unit of the mounting arm.

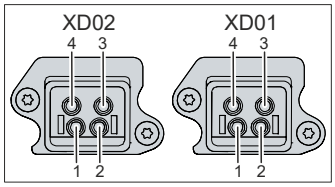


Fig. 2: Voltage socket pin numbering

Table 2: Voltage socket pin assignment

Pin	Signal	Description
1	+ 24 V	Power supply
2	GND	0 V
3	nc	not connected
4	nc	not connected

3.2.2 External digital outputs

The push button extension has additional digital outputs that are accessible via an 8-pin M12 round connector. The maximum current for operation of the digital outputs is 5 x 0.6 A DC. The nominal voltage of the outputs is 24 V DC. They are Type 1 outputs. The outputs are short-circuit proof.

The outputs may be loaded with lamp loads, ohmic or inductive loads. Loads that have their own power supply must not be switched by the outputs (XG01), since in this case feedback via the load cannot be excluded.

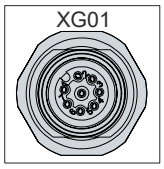


Fig. 3: Connection of digital outputs

Table 3: Connection of digital outputs pin assignment

Pin	Description	Output
1	Output 1	2 Byte Output[0].0
2	Output 2	2 Byte Output[0].1
3	Output 3	2 Byte Output[0].2
4	Output 4	2 Byte Output[0].3
5	Output 5	2 Byte Output[0].4
6	GND (Ground)	
7	GND (Ground)	
8	nc (not connected)	

3.2.3 Ethernet

The push button extension has two Ethernet RJ45 interfaces (XF01, XF02) in the form of push-pull Ethernet built-in sockets. The 100Base-T and 1000Base-T Ethernet standards enable the connection of corresponding network components and data rates of 100/1000 Mbit/s. The required speed is selected automatically. The connection cables are located inside the column unit of the mounting arm.

The push button extension may only be connected to internal Ethernet networks without leaving the device. The push button extension must not be connected to external telecommunication networks.

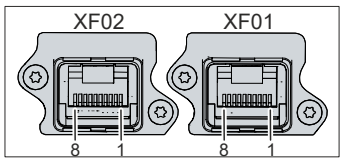


Fig. 4: Ethernet interface pin numbering

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 Switches and push buttons

Various faults can be displayed via the LEDs on the push buttons. This provides you with a diagnostic option. Further information can be found in chapter 4.5.3 Process image and diagnostics [▶ 25].

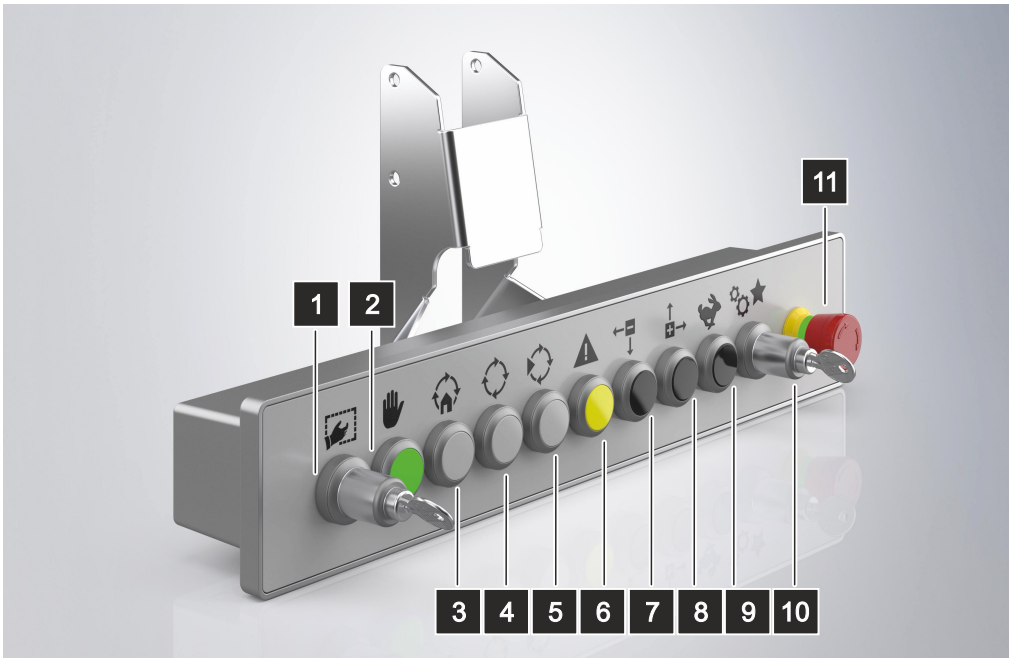


Fig. 5: Switches and push buttons

Table 5: Description of C9900-M800 switches and push buttons

Push button	Description	PROFINET signals	PROFIsafe signals	Output (light source)
1 (SW700)	Key switch SSG1, left non-latching	1 Byte Input[0].0		
	Key switch SSG1, right latching	1 Byte Input[0].1		
2 (SW701)	Illuminated push button, green	1 Byte Input[0].2		1 Byte Output[0].2
3 (SW702)	Illuminated push button, clear	1 Byte Input[0].3		1 Byte Output[0].3
4 (SW703)	Illuminated push button, clear	1 Byte Input[0].4		1 Byte Output[0].4
5 (SW704)	Illuminated push button, clear	1 Byte Input[0].5		1 Byte Output[0].5
6 (SW705.2)	Illuminated push button, yellow	1 Byte Input[0].6	PROFIsafe_2B[0].4	1 Byte Output[0].6
7 (SW706)	Push button, black	1 Byte Input[0].7		
8 (SW707)	Push button, black	2 Byte Input[0].0		
9 (SW708)	Push button, black	2 Byte Input[0].1		
10 (SW709.1/.2)	Key switch SSG10, left non-latching		PROFIsafe_2B[0].2	
	Key switch SSG10, right latching		PROFIsafe_2B[0].3	
11 (SW710.1/.2)	Emergency stop (2 x normally closed contacts)		PROFIsafe_2B[0].0 PROFIsafe_2B[0].1	1 Byte Output[0].7

Address selection switch

At the back of the push button extension there are three address selection switches with corresponding stickers. They can be used to set the safety address. The composition of the address and the procedure for setting it is shown on the sticker (see Fig. 6).

The address is set in hexadecimal form:

- A: x1 (x1h)
- B: x16 (x10h)
- C: x256 (x100h)

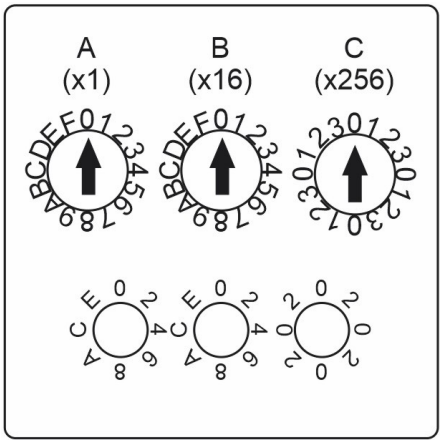


Fig. 6: Address selection switch sticker

3.4 Name plate

The name plate provides information on the features of the push button extension.

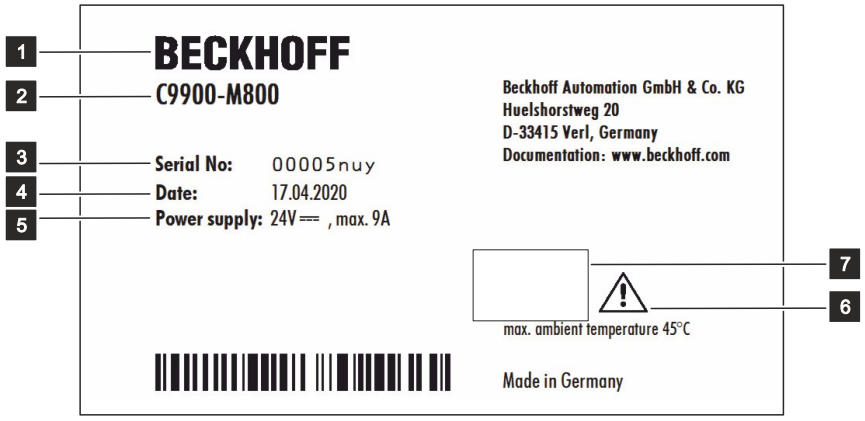


Fig. 7: Name plate

Table 6: Legend for C9900-M800 name plate

No.	Description
1	Manufacturer, including address
2	Model
3	Serial number (BTN)
4	Date of manufacture
5	Power supply unit: 24 V_{DC}, max. 9 A
6	Note: be sure to read the device manual.
7	Symbols Note: Here are the symbols applicable to the device such as CE, EAC, UKCA,  . The approvals of your device can be found on the name plate and in chapter 9.2 Approvals [▶ 37].

3.5 Connecting cable

Pre-assembled connection cables for connecting the power supply and pre-assembled Ethernet connection cables are optionally available. You can order them from Beckhoff Customer Service by specifying the following article descriptions (see Chapter 9.1 Service and support [▶ 36]).

Table 7: Power supply connection cable

Connection cable	Power supply cable with IP65 plug
C9900-K785	Power supply cable for CP32xx-2xxx, length 1.85 m, pre-assembled, push-pull power plug IP 65, other end HAN Modular
C9900-K788	Power supply cable for CP32xx-2xxx, length 0.75 m, pre-assembled, push-pull power plug IP 65, other end push-pull Ethernet plug IP 65
C9900-K791	Power supply cable for CP32xx-2xxx, length 0.85 m, pre-assembled, push-pull power plug IP 65, other end HAN Modular

Table 8: Ethernet connection cable

Patch cable	Network cable with IP65 plug
C9900-K786	Network cable for CP32xx-2xxx, length 1.85 m, pre-assembled, push-pull Ethernet plug IP 65, other end HAN Modular RJ45 socket, IP 20
C9900-K313	Network cable for CP32xx-2xxx, length 0.75 m, pre-assembled, push-pull Ethernet plug IP 65, other end push-pull Ethernet plug IP 65
C9900-K792	Network cable for CP32xx-2xxx, length 0.85 m, pre-assembled, push-pull Ethernet plug IP 65, other end HAN Modular RJ45 socket, IP 20

4 Commissioning

⚠ CAUTION

Personal injury and property damage due to non-compliance with the machinery directive

If the machine operated with the push button extension documented here does not comply with the Machinery Directive 2006/42/EC, serious personal injury and material damage may result.

- Do not operate the machine under any circumstances until compliance with the Machinery Directive has been confirmed.
- Before commissioning the machine, be sure to check compliance with the Machinery Directive.

NOTICE

Logical faults in the interaction of sensors and actuators

If you use the push button extension for safety-related tasks without first having performed a commissioning test, undetected logical faults in the interaction of sensors and actuators in the context of the costumer application may occur.

- In any case, carry out a commissioning test before using the push button extension for safety-related tasks.

To be able to use the push button extension, you must first commission it. The first step is to transport the device to is operating location and unpack it. This is followed by mounting the device on the mounting arm and connecting the cables and power supply, and finally switching on the push button extension.

4.1 Transport and storage

Note the specified transport and storage conditions (see Chapter 8 Technical data [▶ 35]).

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 push button extension, in particular 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 device:

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. In case of discrepancies between the package contents and the order, or in case of transport damage, please inform Beckhoff Service (see Chapter 9.1 Service and support [▶ 36]).

4.2 Mounting

The C9900-M800 push button extension is designed for mounting on a mounting arm. The environmental conditions specified for operation must be observed (see chapter 8 Technical data [▶ 35]).

It is mounted below the CP32xx via a mounting arm adapter, which is already mounted ex factory.

Four different mounting arms are available for mounting your devices according to your requirements. Figure 8 shows the four available mounting arms for mounting on the ceiling (1), on the control cabinet (2), on the floor (3) and on the wall (4).

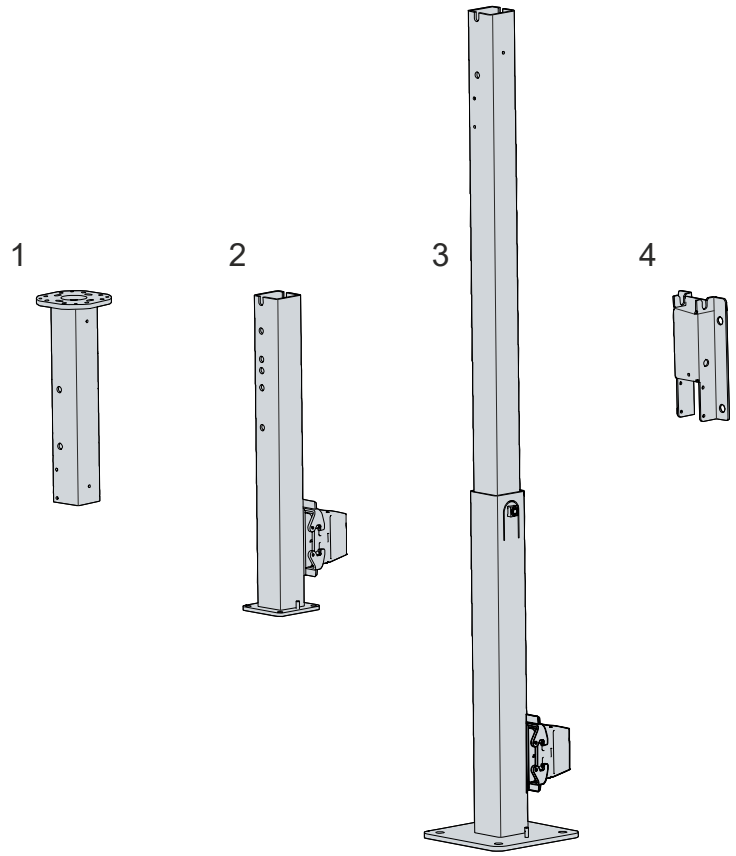


Fig. 8: Mounting arms CP32xx

You can select from the following ordering options:

Table 9: Mounting arm ordering options

Order identifier	Version
C9900-M802	Mounting arm for mounting on ceiling
C9900-M803	Stand for mounting on the control cabinet
C9900-M804	Stand for mounting on hall floors
C9900-M805	Bracket for mounting on the wall

Regardless of which mounting arm you use, the device is mounted via the mounting arm adapter using the same procedure. Chapter 4.2.2 Mounting arm installation [▶ 20] shows how to proceed.

The C9900-M803 and M804 mounting arms are equipped with a cable set for the CP32xx-2xxx-0020 or the C9900-M800 push button extension. These cables are connected to a HAN connection socket in the lower part of the mounting arms. Figure 8 shows the connection sockets on the two mounting arms mentioned (2, 3). Both mounting arms are supplied with a plug to match the connection socket. Further information on the HAN plug can be found in the corresponding plug documentation.

4.2.1 Dimensions

The dimensions of the push button extension are used to align and mount the device to the mounting arm.

All dimensions are in mm.

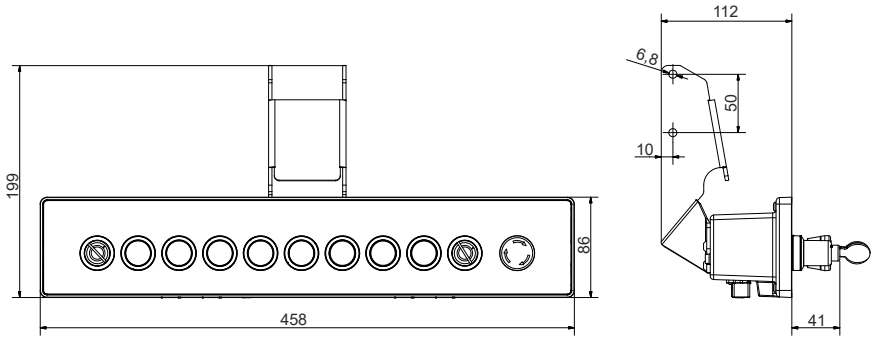


Fig. 9: Dimensions

4.2.2 Mounting arm installation

NOTICE

Extreme environmental conditions

Extreme environmental conditions can cause damage to the device.

- Avoid extreme environmental conditions.
- Protect the device against dust, moisture and heat.

Observe the following points when mounting on the mounting arm:

- Provide 5 cm of free space around the device for air circulation of the push button extension.
- Install the push button extension so that the operation of the disconnecting device is not impaired.
- Do not expose the push button extension to direct sunlight.

Mounting on the mounting arm

Four different mounting arm options are available (see chapter 4.2 Mounting [▶ 18]). Regardless of which of these options you have selected, the device is mounted on the mounting arm using the same procedure via the mounting arm adapter. Figure 10 shows an example of the procedure using the mounting arm with mounting above the floor.

To mount the push button extension on the mounting arm, proceed as follows:

1. Remove the four M6x8 socket head cap screws (I6Kt-8) from the mounting arm adapter (section A).
2. Place the mounting arm adapter over the corresponding holes in the mounting arm (section B).
3. Re-insert the M6x8 socket head cap screws (I6Kt-8) of the mounting arm adapter (section C).
4. Tighten the screws.

⇨ You have successfully mounted the push button extension on the mounting arm (section D).

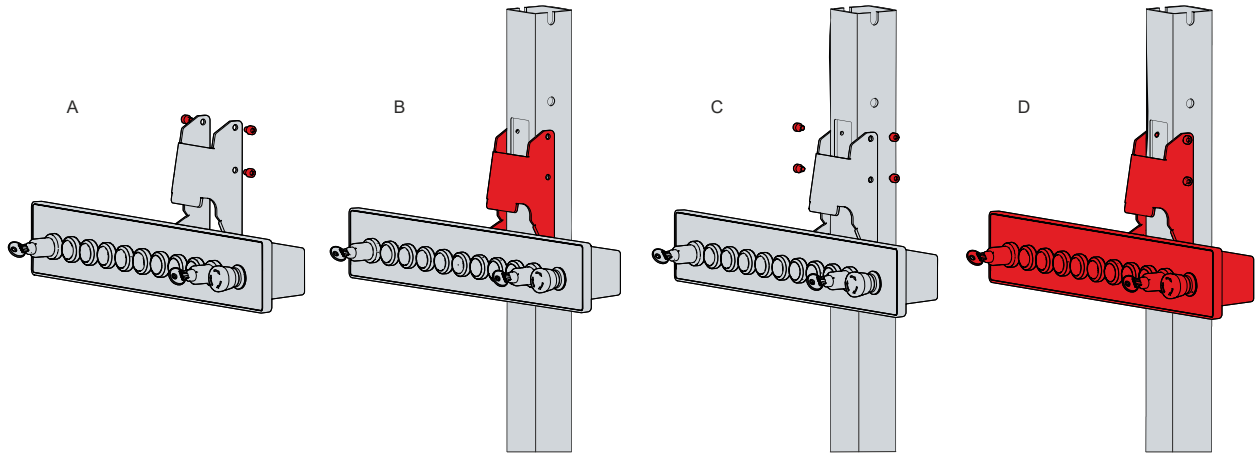


Fig. 10: Mounting arm installation

4.3 Connecting the push button extension

⚠ CAUTION

Risk of electric shock

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

- Never connect or disconnect the device cables during a thunderstorm.

To prepare the push button extension for operation, you must connect it. The first step is to ground the device. Then you can connect the cables and the power supply.

4.3.1 Grounding of the push button extension

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

Using the push button extension without functional earthing can lead to equipment damage due to electromagnetic interference.

- Only use the device with functional earth.

Electromagnetic compatibility (EMC) refers to the ability of the push button extension 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 push button extension must comply with certain protection requirements. It 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. The functional earthing is established via the mounting arm adapter during mounting on the mounting arm. This is ensured by the paint-free surface on the mounting arm adapter. The mounting arm adapter is screwed to the mounting arm on this surface (1) (see Fig. 11). In this way, the functional earthing is established starting from the mounting arm via the screw connections on the push button extension.

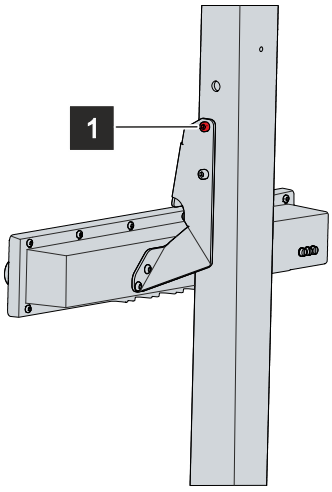


Fig. 11: Functional earth

4.3.2 Connecting cables and power supply

⚠ WARNING

Wrong power supply unit

Using the wrong power supply unit can lead to loss of safety.

- Only use a SELV/PELV power supply unit with a voltage limit of U_{max}=36 V_{DC} on the output side.

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.

NOTICE

Unsuitable connection cables

Using unsuitable connection cables can cause damage to equipment.

- Only use suitable connection cables that are designed for the ambient conditions.

When you mount the push button extension to the C9900-M803 (2) or C9900-M804 (3) mounting arm, the wiring runs through the mounting arms. At the foot of the mounting arms is the HAN connection socket with the HAN plug. From there, the power cables and Ethernet cables are fed through the mounting arms upwards to the opening (see Figure 12). Insert the plug connectors protruding from the mounting arm into the push button extension.

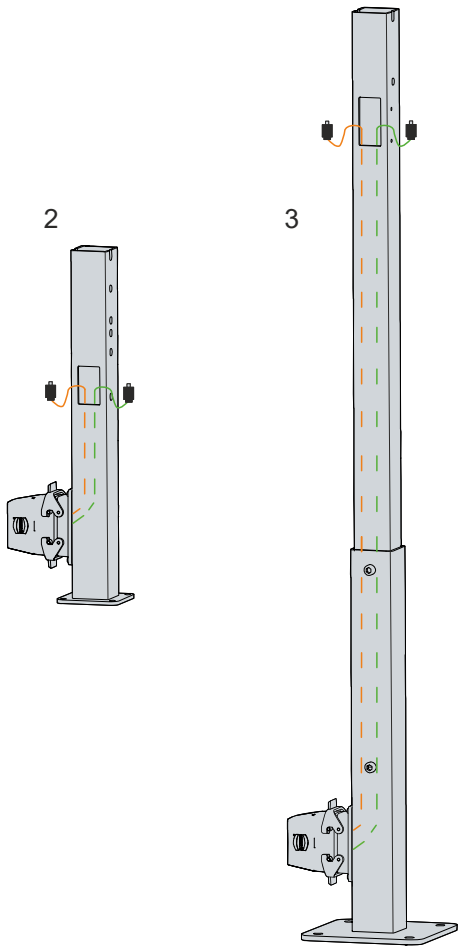


Fig. 12: Wiring CP32xx

If you mount the push button extension to the mounting arm C9900-M802 (1) or C9900-M805 (4), an adapter cable (15 cm) from push-pull to a HAN adapter piece is provided for the voltage transmission. You will have to lay the Ethernet cable yourself at that point.

Connecting cables

The connections are located on the underside of the push button extension and are documented in Chapter 3.1 Structure [▶ 10].

Make sure that you first ground the push button extension (see chapter 4.3.1 Grounding of the push button extension [▶ 21]) and then plug in all data transmission cables.

Connecting the power supply

To avoid reverse polarity when connecting the power supply, the push button extension has reverse polarity protection.

Cables with a maximum cable cross-section of 2.5 mm^2 must be used for connecting the power supply. To achieve the lowest possible voltage drop on the supply line, we recommend connecting the maximum possible cross-section. For larger distances between the voltage source and the push button extension, take into account the voltage drop depending on the cable cross-section as well as voltage fluctuations of your supply voltage to ensure that the voltage at the power supply unit does not drop below 22 V.

Protect the power supply cable with a fuse with a maximum nominal value of 16 A. The fuse serves to protect the supply line in the event of a short circuit. Power supply cables must be made of copper. The minimum temperature of the cables must be 75 °C.

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

1. Check the correct voltage of your external power supply.
2. Plug the power cable into the push-pull built-in power socket.
3. Connect the push button extension to your external 24 V power supply.
4. Switch on the 24 V power supply.

4.4 Switching the push button extension on and off

The push button extension does not have its own power switch. When the system is switched on, the push button extension connected to the power supply is also switched on.

When the system is switched off or the power supply is interrupted, the push button extension is also switched off.

4.5 Commissioning Safety

In addition to assembly, connecting and switching on, the commissioning of the push button extension also includes the commissioning of the safety components. This includes setting the safety address, installing the GSDML file and using process image and diagnostics.

In chapter 8.4 of the Application Guide TwinSAFE you will find the application example for the C9900-M800 push button extension with calculations of the safety parameters for safety functions.

4.5.1 Setting the safety addresses

Once you have prepared the push button extension for operation and switched it on, you can set the safety address using the three address selection switches at the back of the device. For more information, please refer to Chapter 3.3 Switches and push buttons [▶ 13].

4.5.2 Installing the GSDML file

You must use the file *GSDML-V2.34-beckhoff-Conf#c9900-m800-20200929.xml* for the C9900-M800 push button extension. After successful installation you will find the push button extension under:

other field devices →PROFINET I/O →I/O →Beckhoff Automation →TwinCAT CCAT Device

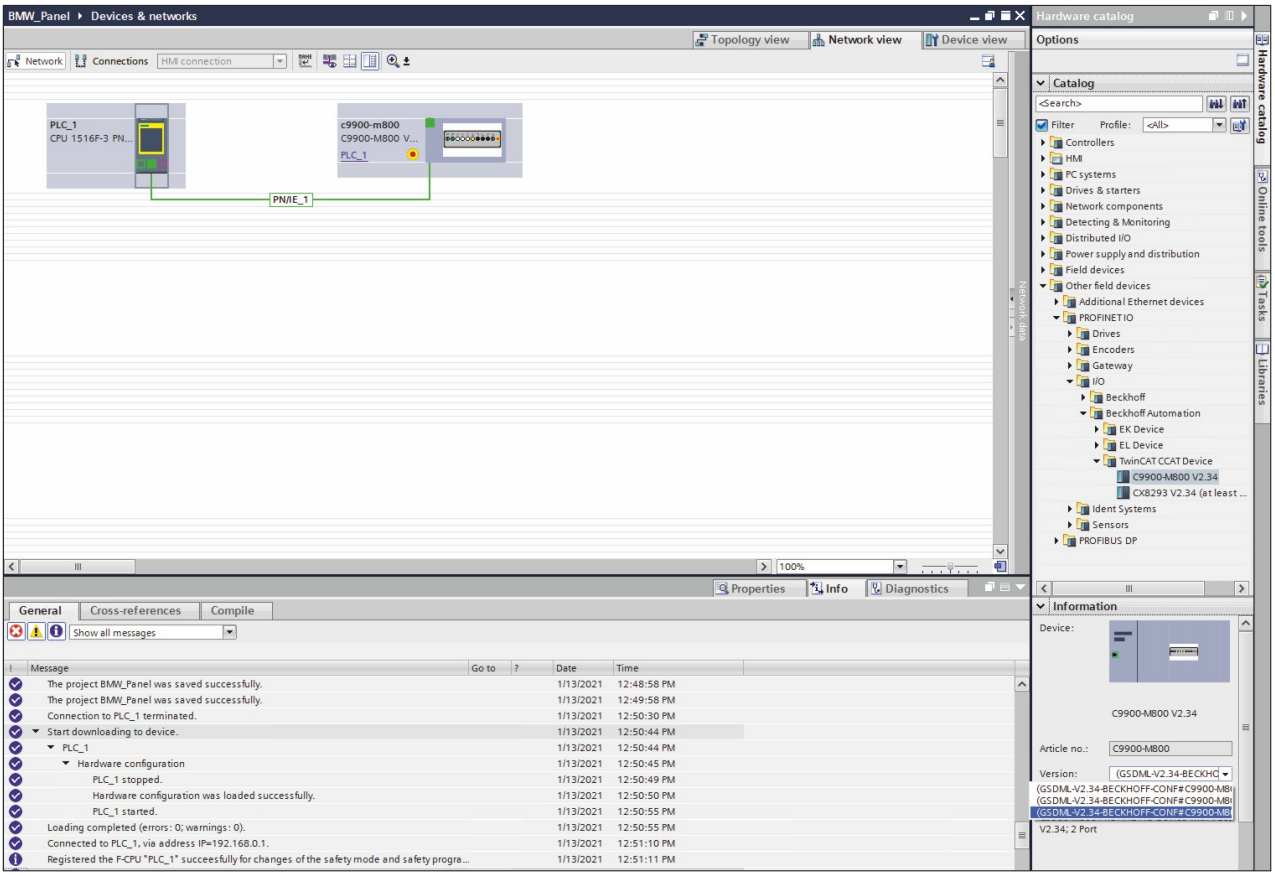


Fig. 13: Use of GSDML file

If the configured firmware version and the firmware version loaded in the device differ, a corresponding message appears in the diagnostic status. This is not an error message. The firmware version loaded in the device may be higher than the configured version.

4.5.3 Process image and diagnostics

Figure 14 shows the C9900-M800 device overview. The following information is provided:

- two-byte inputs and outputs for keys 1 to 9
- a data word for diagnostic values
- three bytes for safety inputs and outputs

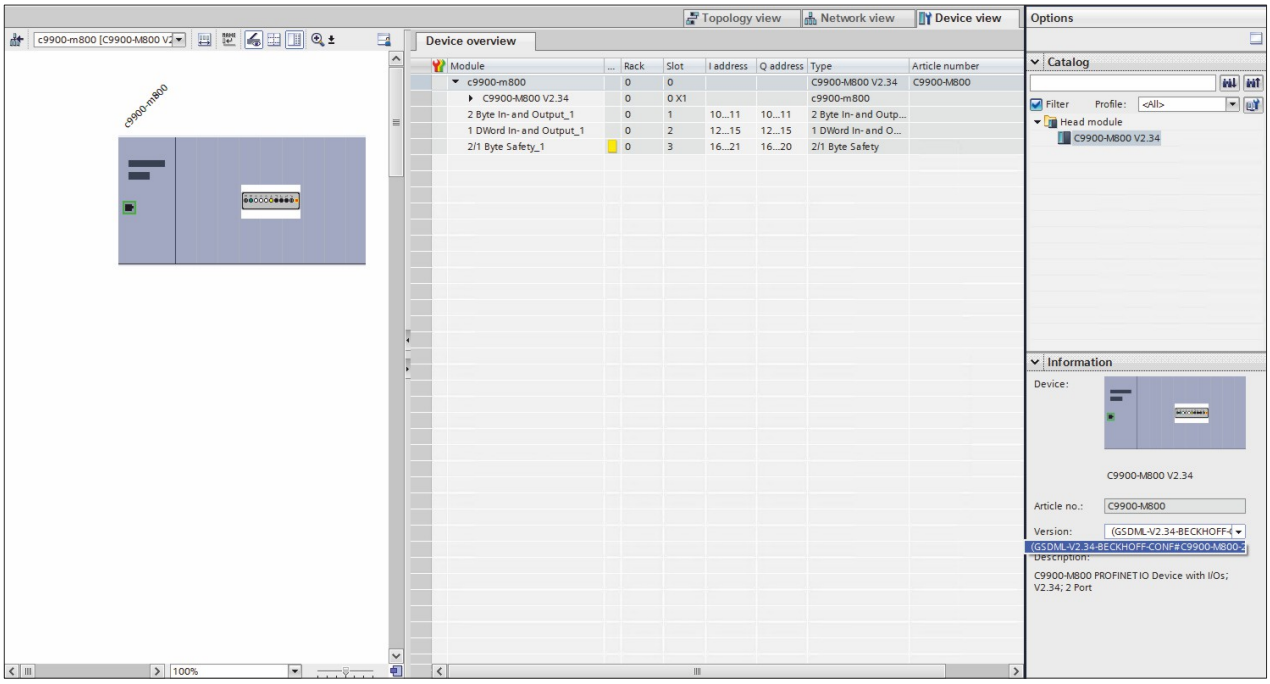
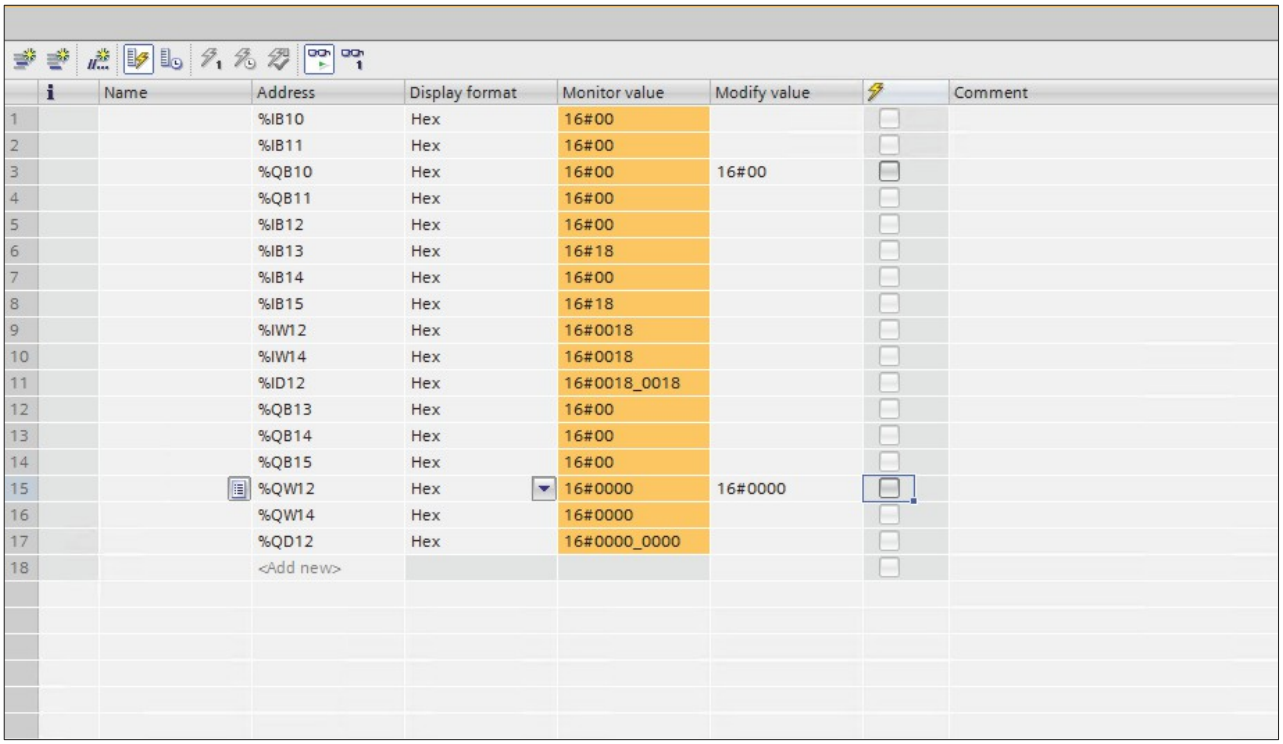


Fig. 14: Device Overview

Figure 15 shows the process image of the push button extension. In addition to the input and output variables, you can read out diagnostic values via the process image.



	Name	Address	Display format	Monitor value	Modify value	Comment
1		%IB10	Hex	16#00		
2		%IB11	Hex	16#00		
3		%QB10	Hex	16#00	16#00	
4		%QB11	Hex	16#00		
5		%IB12	Hex	16#00		
6		%IB13	Hex	16#18		
7		%IB14	Hex	16#00		
8		%IB15	Hex	16#18		
9		%IW12	Hex	16#0018		
10		%IW14	Hex	16#0018		
11		%ID12	Hex	16#0018_0018		
12		%QB13	Hex	16#00		
13		%QB14	Hex	16#00		
14		%QB15	Hex	16#00		
15		%QW12	Hex	16#0000	16#0000	
16		%QW14	Hex	16#0000		
17		%QD12	Hex	16#0000_0000		
18		<Add new>				

Fig. 15: Process image in normal operation

The safety-relevant data can be found in the process image at the following offsets:

Table 10: Description of switches and push buttons

Push button	Inputs	Outputs
Illuminated push button, yellow	1 Byte Input[0].6 PROFIsafe_2B[0].4	1 Byte Output[0].6
Key switch SSG10, left non-latching, right latching	PROFIsafe_2B[0].2 PROFIsafe_2B[0].3	
Emergency stop	PROFIsafe_2B[0].0 PROFIsafe_2B[0].1	1 Byte Output[0].7

For example, in the safety-related application, you can access the safe data as follows:

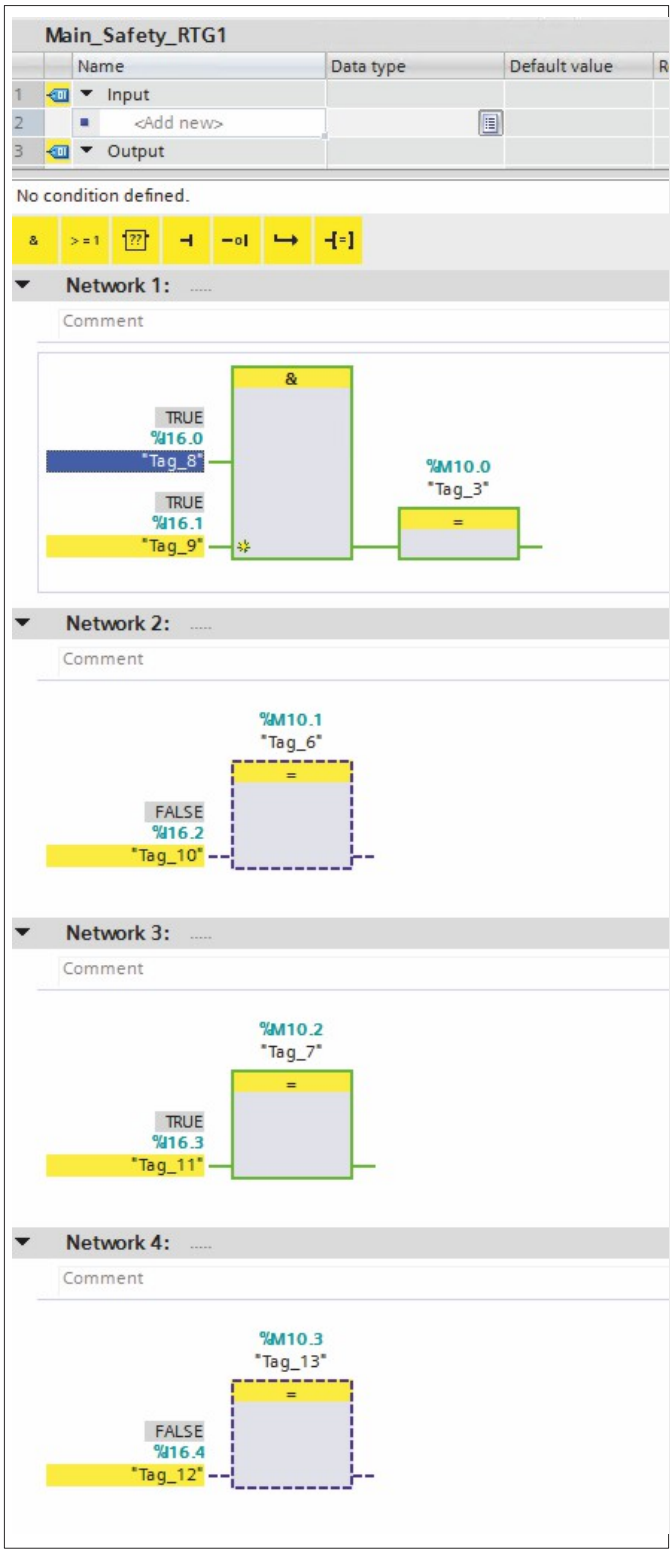


Fig. 16: Safety-relevant application

Reading the safety address

Input word 12 (line 9, Figure 15) shows the safety address set on the push button extension (see Chapter 4.5.1 Setting the safety addresses [▶ 24]). Input word 14 (line 10, Figure 15) shows the configured safety address. In this example, the two values match: 16#0018.

Module error

If input byte 12 shows the value 16#80, an error has occurred. Input byte 13 provides a more precise error message. The following errors may be displayed:

Table 11: Overview of module faults

Error	Position	Hexadecimal value	Decimal value	Binary value
General error	IB12	80	128	1000 0000
CPU not in OP state	IB13	01	1	0000 0001
Safety CPU not in OP state	IB13	02	2	0000 0010
Internal temperature above 90 °C	IB13	04	4	0000 0100
Internal temperature above 95 °C	IB13	0C	12	0000 1100
Overvoltage	IB13	10	16	0001 0000
Undervoltage	IB13	20	32	0010 0000

Figure 17 shows an example of an error message. Input byte 12 shows the value 16#80, indicating an error. Input byte 13 shows error 16#01, so the CPU is not in OP state.

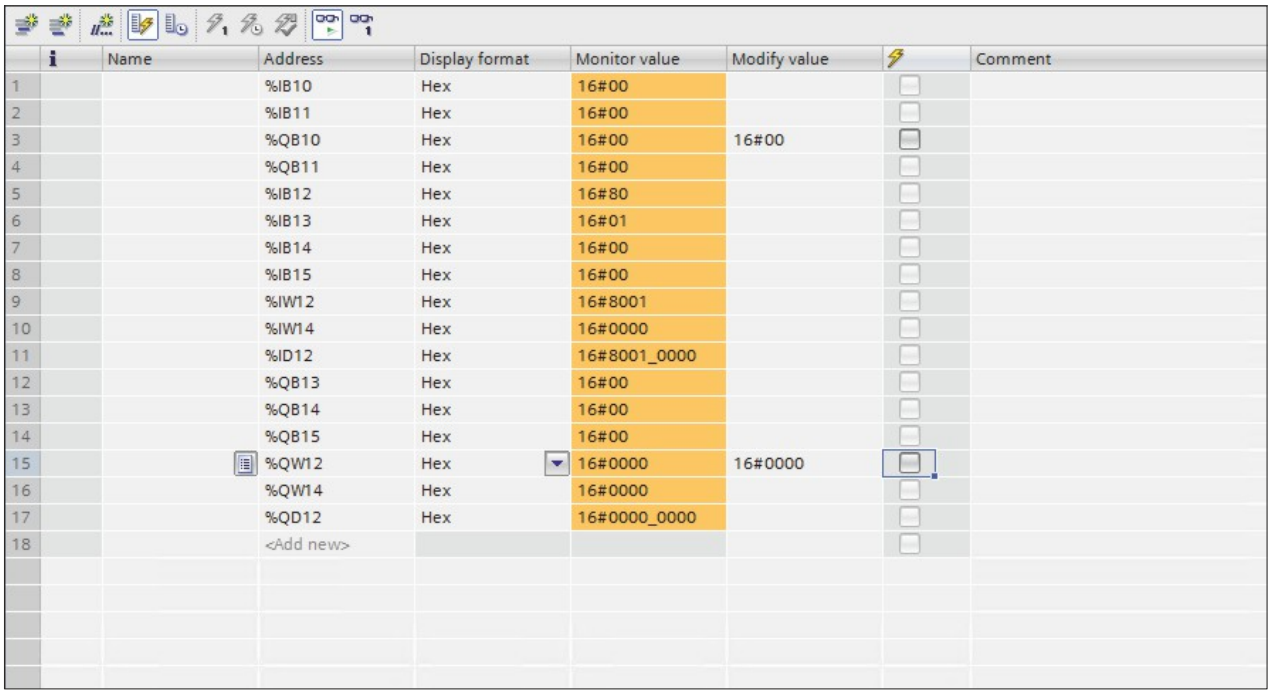


Fig. 17: Example error message

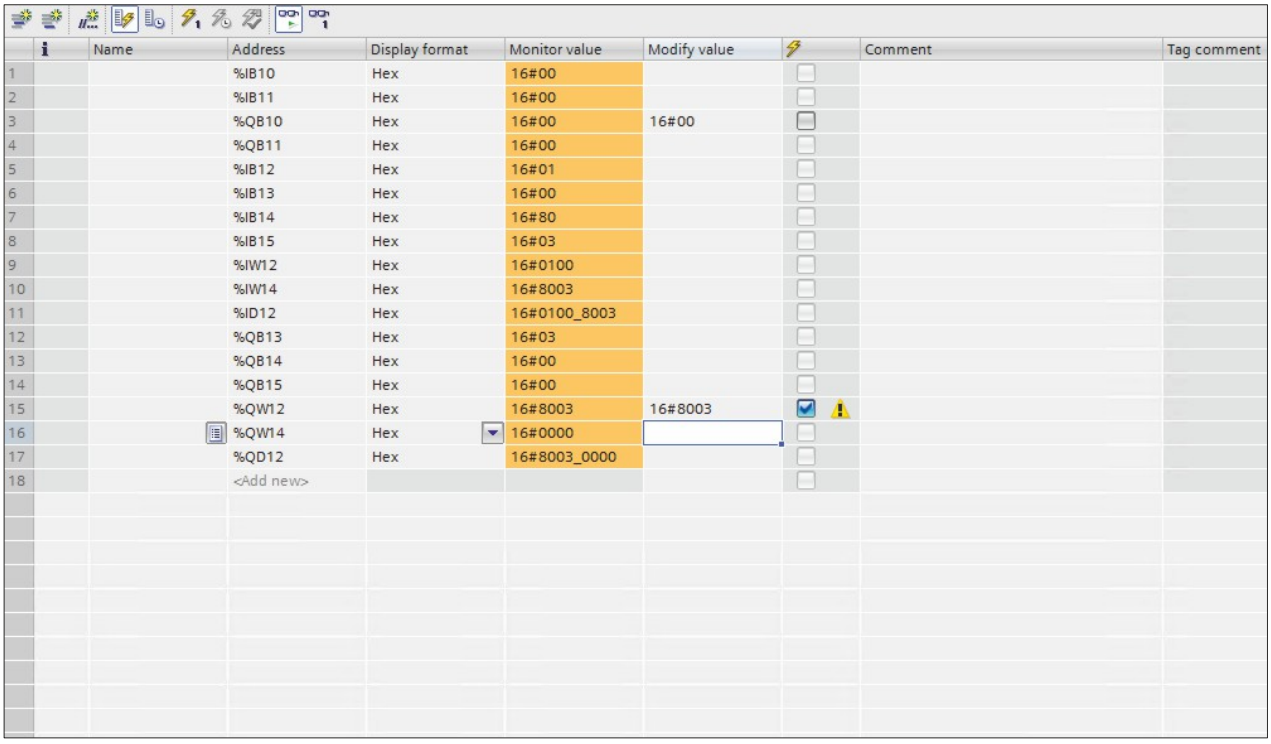
Link status

Input byte 12 also indicates the link status. The following table provides corresponding examples:

Table 12: Link status overview

Error	Position	Hexadecimal value	Decimal value	Binary value
No link at port 1	IB12	01	1	0000 0001
No link at port 2	IB12	02	2	0000 0010

Figure 18 shows the state in the process image when there is no link at port 1.



	Name	Address	Display format	Monitor value	Modify value	Comment	Tag comment
1		%IB10	Hex	16#00			
2		%IB11	Hex	16#00			
3		%QB10	Hex	16#00	16#00		
4		%QB11	Hex	16#00			
5		%IB12	Hex	16#01			
6		%IB13	Hex	16#00			
7		%IB14	Hex	16#80			
8		%IB15	Hex	16#03			
9		%IW12	Hex	16#0100			
10		%IW14	Hex	16#8003			
11		%ID12	Hex	16#0100_8003			
12		%QB13	Hex	16#03			
13		%QB14	Hex	16#00			
14		%QB15	Hex	16#00			
15		%QW12	Hex	16#8003	16#8003		
16		%QW14	Hex	16#0000			
17		%QD12	Hex	16#8003_0000			
18		<Add new>					

Fig. 18: Process image, no link to port 1

Diagnostic LEDs

Another diagnostic option is provided by the LEDs of the push buttons on the push button extension. A more detailed description of the push buttons can be found in Chapter 3.3 Switches and push buttons [▶ 13]. The LEDs can indicate various errors. The following table shows the possible errors and their identification by means of the LEDs:

Table 13: Error indication LEDs

	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6 Emergency stop
Start-up	1 sec on / 1 sec off	1 sec on / 1 sec off	1 sec on / 1 sec off	1 sec on / 1 sec off	1 sec on / 1 sec off	1 sec on / 1 sec off
Error:						
No link[1)]	200 ms cycle	ON	OFF	OFF	OFF	OFF
No PN name	200 ms cycle	OFF	ON	OFF	OFF	OFF
No data exchange	200 ms cycle	OFF	OFF	OFF	ON	OFF
General PN error	200 ms cycle	OFF	OFF	ON	OFF	OFF
PROFINET safety address does not match	200 ms cycle	OFF	OFF	OFF	OFF	200 ms cycle
No PROFIsafe address assigned "0"	200 ms cycle	OFF	OFF	OFF	OFF	500 ms cycle
Messages:						
Let device flash PN Service[2)]	500 ms cycle	500 ms cycle	500 ms cycle	500 ms cycle	500 ms cycle	OFF

Table legend:

- 1): The error is only displayed if both Ethernet ports have no link.
- 2): The error is also displayed if data exchange is already in progress. The process data of the LEDs are then overwritten.

If more than one error cause is diagnosed, only the cause with the highest priority is displayed. The priority is derived from Table 12 with descending priority from top to bottom.

Figure 19 shows the assignment of the LEDs.

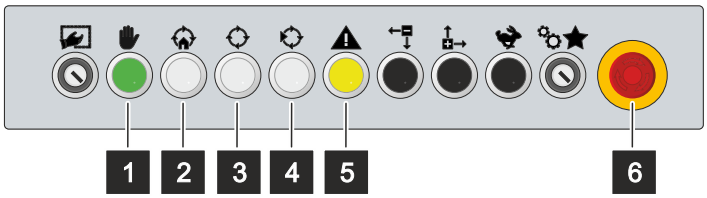


Fig. 19: Diagnostic LEDs

5 Decommissioning

NOTICE

Hardware damage due to power supply

A connected power supply can cause damage to the push button extension during disassembly.

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

When taking the push button extension out of operation, you must first disconnect the power supply and cables. Afterwards, you can dismount the device from the mounting arm.

If you do not want to continue using the push button extension, Chapter 5.2 Disassembly and disposal [▶ 32] provides information on the correct disposal of the device.

5.1 Disconnecting the power supply and cables

⚠ CAUTION

Risk of electric shock

Disconnecting the push button extension during a thunderstorm can cause electric shock.

- Never disconnect the push button extension during a thunderstorm.

Before you remove the push button extension, you must follow the steps below:

1. Disconnect the push button extension from the power supply (see below).
2. Disconnect the data transmission lines between the push button extension and the connected devices (see below).

Disconnect the power supply

Proceed as follows to disconnect the power supply:

1. Disconnect the push button extension from the external 24 V power supply.
2. Pull the power cable out of the push-pull power socket.

Disconnecting cables

To disconnect the lines from the push button extension, proceed as follows:

1. Make a note of the wiring configuration, if you wish to restore it with another device.
2. Disconnect all data transmission lines from the push button extension.
3. Finally, disconnect the ground connection.

5.2 Disassembly and disposal

Before you can remove the push button extension from the mounting arm, you must first disconnect the power supply and the cables (see chapter 5.1 Disconnecting the power supply and cables [▶ 31]).

Dismounting from the mounting arm

To remove the push button extension from the mounting arm, follow the steps below, shown in Fig. 20:

1. Remove the four M6x8 socket head cap screws (I6Kt-8) from the mounting arm adapter that secure it to the mounting arm (A in the diagram).
2. Pull the push button extension with the mounting arm adapter off the mounting arm (B in the diagram).

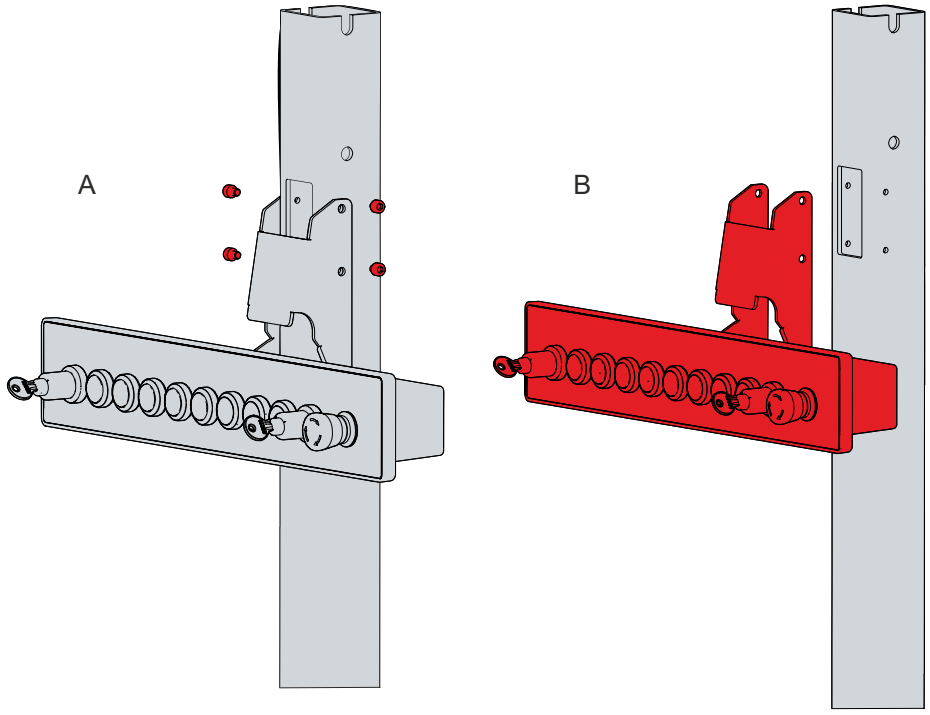


Fig. 20: Dismounting from the mounting arm

⇨ You have successfully removed the push button extension from the mounting arm.

Disposing of the push button extension

When disposing of the push button extension the national electronic waste regulations must be followed.

For disposal, you must remove the device from the mounting arm.

6 Servicing and maintenance

⚠ CAUTION

Risk of electric shock

Working on the push button extension when live can lead to electric shock.

- Switch off the supply voltage before cleaning the device.

Maintenance measures increase the efficiency of the device by ensuring long-term functionality. Cleaning the device contributes to this.

Cleaning

NOTICE

Unsuitable cleaning agents

The use of unsuitable cleaning agents can damage the device.

- Clean the push button extension only as indicated.

It is essential to observe the following aspects when cleaning the push button extension:

- Keep to the boundary conditions of protection rating IP54.
- Maintain an ambient temperature range of 0 °C to 45 °C.
- Only use a vacuum cleaner to clean the device. The push button extension does not have to be switched off for this.
- Never use compressed air to clean the push button extension.

Repair

Only the manufacturer may repair the device. If a repair should be necessary, contact Beckhoff Service (see Chapter 9.1 Service and support [▶ 36]).

7 Troubleshooting

Table 14: Troubleshooting

Fault	Cause	Measures
Push button extension doesn't work	No supply of power via the 19-pin round connector	Check the cable for the power supply
	Other cause	Call Beckhoff Service
USB devices not found (TwinCAT System Manager)	No USB connection	Check the cables Check the transmitter box
	Other cause	Beckhoff Service

8 Technical data

Table 15: Technical data

Product designation	C9900-M800
Dimensions (W x H x D)	458 x 87 x 70 mm
Weight	Approx. 2.8 kg
Supply voltage	20.4-30 V_{DC} (24 V SELV/PELV power supply unit with max. error voltage 36 V, max. 9 A)
Power consumption	Max. 270 W
Protection rating	IP54 (not evaluated by UL)
External digital outputs	5 x 1 A_{DC} Output Type 1 Short-circuit proof
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	Operation: 0 to +45 °C Transport/storage: -20 to +65 °C
Permissible air humidity	Maximum 95 %, no condensation
Climate category according to EN 60721-3-3	3K3 (Climate category values apply unless otherwise specified in the documentation; optimum ambient conditions are a prerequisite for deviations)
Operating height	max. 2000 m
Overvoltage category	II
Degree of pollution	2
Inadmissible operating conditions	• under the influence of ionizing radiation (exceeding the natural background radiation) • in corrosive environments • in an environment that leads to unacceptable soiling
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 suitable packaging of the push button extension.

Refer to the application example in chapter 8.4 of the Application Guide TwinSAFE for the safety-related parameters of the entire push button extension, the safety card and the corresponding push buttons and switches.

9 Appendix

9.1 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 Center supports you in all matters of after-sales service:

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

Hotline: + 49 (0) 5246/963-460
Fax: + 49 (0) 5246/963-479
email: 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

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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.

9.2 Approvals

The push button extension is CE certified.

List of figures

List of tables

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