Mobile Panel 7200

User's manual

Version: **1.20 (April 2023)**
Order no.: **MAMP7200-ENG**

Translation of the original documentation

Publishing information

B&R Industrial Automation GmbH

B&R Strasse 1

5142 Eggelsberg

Austria

Telephone: +43 7748 6586-0

Fax: +43 7748 6586-26

office@br-automation.com

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1 General information

1.1 Manual history

Version	Date	Comment[1)]
1.20	April 2023	• Updated section "Accessories" on page 62. • Updated section "Operating the Mobile Panel" on page 46. • Updated section "Using the USB interface" on page 48. • Updated section "Cable construction and cable pinout", see "Individual components" on page 26. • Corrected terminology in German edition. • Corrected B10d value in section "Enabling control device" on page 76.
1.15	December 2022	• Updated sections "Key configuration" on page 59 and "Connection example with a safety controller" on page 23.
1.14.a	September 2022	• Updated section "Automation Device Interface (ADI)" on page 54.
1.14	September 2022	• Updated selection guide under "Configuration" on page 13.
1.12	October 2021	• Updated document. • Updated order data and technical data of all products. • EN 60950 replaced by IEC 61010-2-201. • Corrected "Connection example with a safety controller" on page 23.
1.11	April 2021	• Updated document. • Added selection guide under "Configuration" on page 13. • Updated section "Key configuration" on page 59. • "USB mass storage device" on page 62 are described in a separate document starting with this version.
1.10	August 2020	• Editorial revisions. • Updated section "Software" on page 50.
1.01	April 2020	• Updated section "Software" on page 50.
1.00	March 2020	First version.

1) Editorial corrections are not listed.

1.2 General safety guidelines

1.2.1 Intended use

In all cases, applicable national and international standards, regulations and safety measures must be taken into account and observed!

The B&R products described in this manual are intended for use in industry and industrial applications.
The intended use includes control, operation, monitoring, drive and HMI tasks as part of automation processes in machines and systems.

B&R products are only permitted to be used in their original condition. Modifications and extensions are only permitted if they are described in this manual.

B&R excludes liability for damage of any kind resulting from the use of B&R products in any intended way.

B&R products have not been designed, developed and manufactured for use that involves fatal risks or hazards that could result in death, injury, serious physical harm or other loss without the assurance of exceptionally stringent safety precautions.

B&R products are explicitly not intended for use in the following applications:

- Monitoring and control of thermonuclear processes
- Weapon systems control
- Flight and traffic control systems for passenger and freight transport
- Health monitoring and life support systems

1.2.2 Protection against electrostatic discharge

Electrical assemblies that can be damaged by electrostatic discharge (ESD) must be handled accordingly.

1.2.2.1 Packaging

- **Electrical assemblies with housing:**
  Do not require special ESD packaging but must be handled properly (see "Electrical assemblies with housing").
- **Electrical assemblies without housing:**
  Are protected by ESD-suitable packaging.

1.2.2.2 Regulations for proper ESD handling

Electrical assemblies with housing

- Do not touch the connector contacts of connected cables.
- Do not touch the contact tips on circuit boards.

Electrical assemblies without housing

The following applies in addition to "Electrical assemblies with housing":

- All persons handling electrical assemblies and devices in which electrical assemblies are installed must be grounded.
- Assemblies are only permitted to be touched on the narrow sides or front plate.
- Always place assemblies on suitable surfaces (ESD packaging, conductive foam, etc.). Metallic surfaces are not suitable surfaces!
- Assemblies must not be subjected to electrostatic discharges (e.g. due to charged plastics).
- A minimum distance of 10 cm from monitors or television sets must be maintained.
- Measuring instruments and devices must be grounded.
- Test probes of floating potential measuring instruments must be discharged briefly on suitable grounded surfaces before measurement.

Individual components

- ESD protective measures for individual components are implemented throughout B&R (conductive floors, shoes, wrist straps, etc.).
- The increased ESD protective measures for individual components are not required for handling B&R products at customer locations.

1.2.3 Regulations and measures

Electronic devices are generally not failsafe. If the programmable logic controller, operating or control device or uninterruptible power supply fails, the user is responsible for ensuring that connected devices (such as motors) are brought to a safe state.

When using programmable logic controllers as well as when using operating and monitoring devices as control systems in conjunction with a Soft PLC (e.g. B&R Automation Runtime or similar product) or Slot PLC (e.g. B&R LS251 or similar product), the safety measures that apply to industrial controllers (protection by protective equipment such as emergency stops) must be observed in accordance with applicable national and international regulations. This also applies to all other connected devices, such as drives.

All work such as installation, commissioning and servicing are only permitted to be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, installation, assembly, commissioning and operation of the product and have the appropriate qualifications for their job (e.g. IEC 60364). National accident prevention regulations must be observed.
The safety guidelines, information about connection conditions (nameplate and documentation) and limit values specified in the technical data must be read carefully before installation and commissioning and must be strictly observed.

1.2.4 Transport and storage

During transport and storage, devices must be protected against undue stress (mechanical stress, temperature, humidity, aggressive atmosphere).

1.2.5 Installation

- The devices are not ready for use and must be installed and wired according to the requirements of this documentation in order to comply with EMC limit values.
- Installation must be carried out according to the documentation using suitable equipment and tools.
- Devices are only permitted to be installed in a voltage-free state and by qualified personnel. The control cabinet must first be disconnected from the power supply and secured against being switched on again.
- General safety regulations and national accident prevention regulations must be observed.
- The electrical installation must be carried out in accordance with relevant regulations (e.g. line cross section, fuse protection, protective ground connection).

1.2.6 Operation

1.2.6.1 Protection against contact with electrical parts

In order to operate programmable logic controllers, operating and monitoring devices and uninterruptible power supplies, it is necessary for certain components to carry dangerous voltages over 42 VDC. Touching one of these components can result in a life-threatening electric shock. There is a risk of death, serious injury or damage to property.

Before switching on programmable logic controllers, operating and monitoring devices and uninterruptible power supplies, it must be ensured that the housing is properly connected to ground potential (PE rail). Ground connections must also be made if the operating and monitoring device and uninterruptible power supply are only connected for testing purposes or only operated for a short time!

Before switching on, live parts must be securely covered. All covers must be kept closed during operation.

1.2.6.2 Ambient conditions - Dust, moisture, aggressive gases

The use of operating and monitoring devices (e.g. industrial PCs, Power Panels, Mobile Panels) and uninterruptible power supplies in dusty environments must be avoided. This can otherwise result in dust deposits that affect the functionality of the device, especially in systems with active cooling (fans), which may no longer ensure sufficient cooling.

The presence of aggressive gases in the environment can also result in malfunctions. In combination with high temperature and relative humidity, aggressive gases – for example with sulfur, nitrogen and chlorine components – trigger chemical processes that can very quickly impair or damage electronic components. Blackened copper surfaces and cable ends in existing installations are indicators of aggressive gases.

When operated in rooms with dust and condensation that can endanger functionality, operating and monitoring devices such as Automation Panels or Power Panels are protected on the front against the ingress of dust and moisture when installed correctly (e.g. cutout installation). The back of all devices must be protected against the ingress of dust and moisture, however, or the dust deposits must be removed at suitable intervals.

1.2.6.3 Programs, viruses and malicious programs

Any data exchange or installation of software using data storage media (e.g. floppy disk, CD-ROM, USB flash drive) or via networks or the Internet poses a potential threat to the system. It is the direct responsibility of the user to avert these dangers and to take appropriate measures such as virus protection programs and firewalls to protect against them and to use only software from trustworthy sources.

1.2.7 Cybersecurity disclaimer for products

B&R products communicate via a network interface and were developed for secure connection with internal and, if necessary, other networks such as the Internet.

Information:

In the following, B&R products are referred to as "product" and all types of networks (e.g. internal networks and the Internet) are referred to as "network".

It is the sole responsibility of the customer to establish and continuously ensure a secure connection between the product and the network. In addition, appropriate security measures must be implemented and maintained to protect the product and entire network from any security breaches, unauthorized access, interference, digital intrusion, data leakage and/or theft of data or information.

B&R Industrial Automation GmbH and its subsidiaries are not liable for damages and/or losses in connection with security breaches, unauthorized access, interference, digital intrusion, data leakage and/or theft of data or information.

The aforementioned appropriate security measures include, for example:

- Segmentation of the network (e.g. separation of the IT network from the control network[1)])
- Use of firewalls
- Use of authentication mechanisms
- Encryption of data
- Use of anti-malware software

Before B&R releases products or updates, they are subjected to appropriate functional testing. Independently of this, we recommend that our customers develop their own test processes in order to be able to check the effects of changes in advance. Such changes include, for example:

- Installation of product updates
- Significant system modifications such as configuration changes
- Deployment of updates or patches for third-party software (non-B&R software)
- Hardware replacement

These tests should ensure that implemented security measures remain effective and that systems in the customer's environment behave as expected.

1) The term "control network" refers to computer networks used to connect control systems. The control network can be divided into zones, and there can be several separate control networks within a company or site. The term "control systems" refers to all types of B&R products such as controllers (e.g. X20), HMI systems (e.g. Power Panel T30), process control systems (e.g. APROL) and supporting systems such as engineering workstations with Automation Studio.

1.3 Information about this document

This document is not intended for end customers! The safety guidelines required for end customers must be incorporated into the operating instructions for end customers in the respective national language by the machine manufacturer or system provider.

1.3.1 Organization of notices

Safety notices

Contain **only** information that warns of dangerous functions or situations.

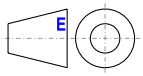
Signal word	Description
Danger!	Failure to observe these safety guidelines and notices will result in death, severe injury or substantial damage to property.
Warning!	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
Caution!	Failure to observe these safety guidelines and notices can result in minor injury or damage to property.
Notice!	Failure to observe these safety guidelines and notices can result in damage to property.

General notices

Contain **useful** information for users and instructions for avoiding malfunctions.

Signal word	Description
Information:	Useful information, application tips and instructions for avoiding malfunctions.

1.3.2 Guidelines



European dimension standards apply to all dimension diagrams.

All dimensions in millimeters.

Unless otherwise specified, the following general tolerances apply:

Nominal dimension range	General tolerance per DIN ISO 2768 medium
Up to 6 mm	±0.1 mm
Over 6 to 30 mm	±0.2 mm
Over 30 to 120 mm	±0.3 mm
Over 120 to 400 mm	±0.5 mm
Over 400 to 1000 mm	±0.8 mm

2 Technical data

2.1 Introduction

The Mobile Panel is a portable operating and display device with a rugged design. Equipped with powerful processors and Ethernet technology, the Mobile Panel is optimally suited for a wide range of applications.

All tasks can be solved graphically with the color display. The touch screen enables intuitive user guidance.

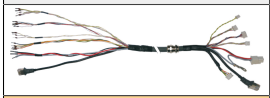
Ergonomics

- Functional multigrip
- Rounded housing
- Desktop operation
- Wall mount operation
- Easy-to-read display

2.1.1 Configuration

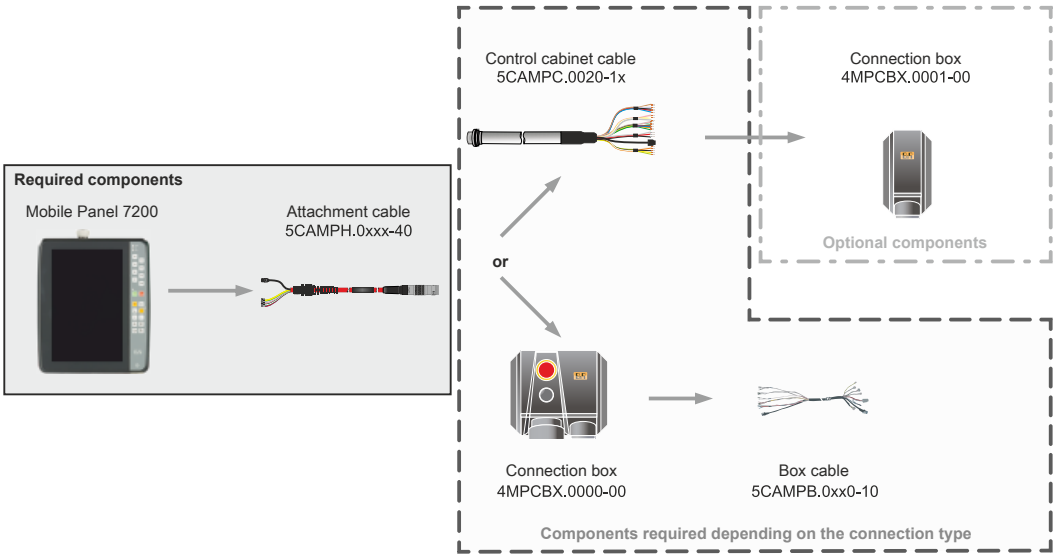
The following components are mandatory for a functional Mobile Panel 7200:

- Operator panel
- Attachment cables

MP7200 configuration				
Operator panels				
	5MP7251.101P-000			
Cables				
Attachment cables				Select 1
	5CAMPH.0018-40 5CAMPH.0100-40 5CAMPH.0200-40		5CAMPH.0050-40 5CAMPH.0150-40 -	
Control cabinet cables				Optional, select 1[1)]
	5CAMPC.0020-10		5CAMPC.0020-11	
Connection box				Optional, select 1
	4MPCBX.0000-00		4MPCBX.0001-00	
Box cables				Optional, select 1[1)]
	5CAMPB.0050-10		5CAMPB.0100-10	
Wall mount				Optional selection
	5ACCWB70.0000-000			
Accessories				Optional selection
	5MMUSB.2048-01	5MMUSB.4096-01	5MMUSB.4096-02	5MMUSB.032G-02

1) Only necessary if connection box 4MPCBX.0001-00 or no connection box is selected.
2) Only necessary if connection box 4MPCBX.0000-00 is selected.

Selection guide



A attachment cable type with different lengths is available for selection for the Mobile Panel 7200 (5CAMPH.xxxx-40). This cable is required regardless of the selected connection type. It is possible to choose between the following connection types:

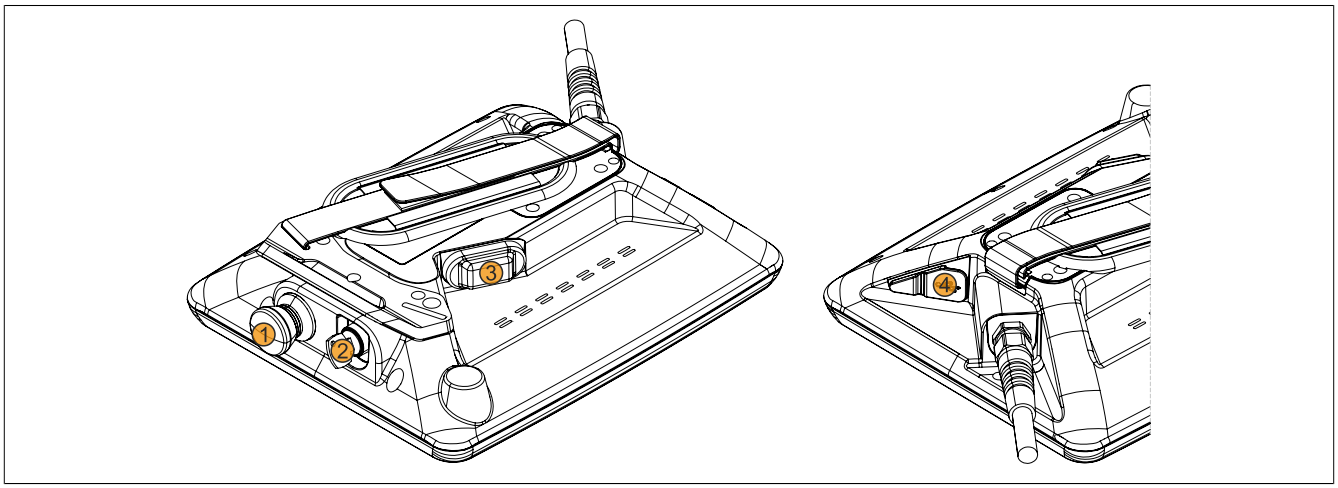
- Direct cable connection to the control cabinet (5CAMPC.0020-1x).
  - Optionally with connection box 4MPCBX.0001-00.
- Connection via connection box 4MPCBX.0000-00 with associated box cable (5CAMPB.0xxx-10).

2.1.2 Overview

Order number	Short description	Page
	Attachment cables	
5CAMPH.0018-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 1.8 m	29
5CAMPH.0050-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 5 m	29
5CAMPH.0100-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 10 m	29
5CAMPH.0150-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 15 m	29
5CAMPH.0200-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 20 m	29
	Control cabinet cables	
5CAMPC.0020-10	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet crossover - 2 m	32
5CAMPC.0020-11	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet straight-through - 2 m	36
	Control devices	
5MP7251.101P-000	Mobile Panel 7200 10.1" WXGA TFT - 800 x 1280 pixels - Multi-touch (projected capacitive) - Intel Celeron N2807 processor 2*1.58 GHz - 4 GB RAM - For Windows W10 2016 - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 1x enable switch - 21x system keys, 5x LEDs	26

2.2 Complete system

2.2.1 Device interface overview



Legend			
1	"Stop button" on page 20	2	"Key switch" on page 20
3	"Enabling control device" on page 21	4	"USB interface" on page 17

2.2.1.1 +24 VDC power supply

The power supply is provided with an individually selected attachment cable (see "Attachment cables" on page 29) and control cabinet cable (see "Control cabinet cables" on page 32). Alternatively, a large connection box (4MPCBX.0000-00) with associated box cable (see "Box cables" on page 71) can be used.

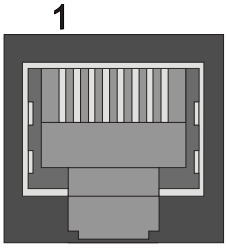
For the pinout, see the description of the corresponding cable type.

Danger!

- **This device is only permitted to be supplied with a SELV/PELV power supply unit or with safety extra-low voltage (SELV) per IEC 61010-2-201.**
- **Safety extra-low voltage circuits must always be safely isolated from circuits with dangerous voltage.**
- **In the end application, the 24 VDC power supply of the device must be adequately protected! A fuse with max. 3.15 A and UL 248 certification must be used for this.**

2.2.1.2 Ethernet interface

The Ethernet interface is located inside the device. The connection is made via the connector integrated in the connection cable or control cabinet cable.

Ethernet interface (ETH)		
Variant	RJ45, female	
Wiring	Up to star-quad cables	
Transfer rate	10/100 Mbit/s[1)]	
Cable length	Max. 20 m (min. Cat 5e)	
Protocol	TCP/IP	
-		

1) A transfer rate of 100 Mbit/s is only possible with a suitable attachment cable. Switching takes place automatically.

Information:

Necessary drivers must be downloaded from the B&R website, not from manufacturer websites.

2.2.1.3 USB interface

MP7200 devices are equipped with an externally routed USB 2.0 interface with interface cover. This interface is only to be used for service purposes; see "Using the USB interface" on page 48.

Caution!

IP65 protection can only be achieved if the USB protective cover is properly installed.

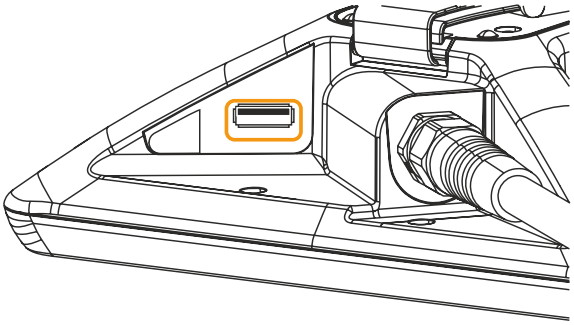
Warning!

USB peripheral devices can be connected to the USB interfaces. Due to the variety of USB devices available on the market, B&R cannot guarantee their functionality. The functionality of USB devices available from B&R is ensured.

Notice!

Due to the general PC specification, these USB interfaces must be handled with the utmost care with regard to EMC, cable routing, etc.

	USB1
Standard	USB 2.0
Variant	Type A, female
Quantity	1
Transfer rate	Low speed (1.5 Mbit/s)
	Full speed (12 Mbit/s)
	High speed (480 Mbit/s)
Current-carrying capacity[1)]	Max. 0.5 A
Cable length	
USB 2.0	Max. 5 m
-	



1) The USB interface is protected by a maintenance-free "USB current-limiting switch" (max. 0.5 A).

2.2.2 Operating and display elements

2.2.2.1 Touch screen

5MP7251.101P-000 uses a projected capacitive multi-touch screen.

The touch screen can be operated with one or more fingers (with or without gloves). The following operation guidelines should be observed to ensure long life of the touch screen:

- The touch screen is not permitted to be operated with gloves or other suitable operating devices if they have been contaminated with chemicals (see "Chemical resistance" on page 77) or hard, sharp-edged substances (e.g. sand, grinding paste, metal cuttings of all kinds).
- The touch screen is not permitted to be operated with pointed, sharp metallic objects (e.g. screwdrivers) or with ballpoint pens or pencils.
- The touch screen is not permitted to be exposed to continuous sunlight.

> **Caution!**
>
> **Failure to observe these guidelines may significantly reduce the service life of the touch screen or result in immediate damage or failure.**

2.2.2.2 Mobile Panel 7251 - Membrane keypad

How keys/LEDs are assigned depends on how they will be used by the customer.

Some keys are preconfigured at the factory. The key configuration can be changed in a text file and transferred to the device using the ADI Control Center (included in Windows, see "Keys and LEDs" on page 19).

The states of the keys or LEDs can be read or switched by a program using the Automation Device Interface (ADI library).

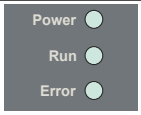
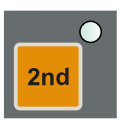
> **Information:**
>
> **This color print is not a true color print, i.e. the colors of the panel overlay may therefore deviate slightly.**

2.2.2.2.1 Keys and LEDs

Information:

The MP7251 does not support fast blinking; the ADI library handles fast blinking the same as slow blinking.

Key	Default value	Key	Default value
F1	F1	F2	F2
F3	F3	F4	F4
F5	F5	F6	F6
F7	F7	F8	F8

Keys		
Icon	**Possible use**	**Factory key configuration**
	Application screen 1	Not preset
	Customer settings	Not preset
	Project screen	Not preset
	Shortcut menu	APPS
	Positioning screen	Not preset
	Alarm screen	Not preset
	Start	Left Windows key
	Stop	Not preset
	2nd level	LEFT SHIFT
	Cancel	ESC
	Speed -	Page down
	Speed +	Page up
LEDs		
Name	**Cannot change usage**	
	Power: The device is supplied.	
	Possible use	**Factory configuration**
	Run: Application in operation	-
	Error: Error in application	-
	Feedback for startup	-
	2nd level enabled	-

2.2.2.3 Stop button

The stop button has a dual-circuit design with normally closed contacts.

The gray stop button on the Mobile Panel satisfies the requirements of EN ISO 13850. It must be able to trigger a category 0 or category 1 stop in accordance with the risk assessment of the machine (see EN 60204-1). The wiring of the direct opening action switching contacts must satisfy the category (per EN ISO 13849-1) determined during the machine's risk analysis (per EN ISO 12100:2010).

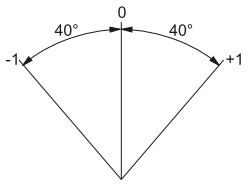
The gray stop button meets all mechanical requirements of EN ISO 13850 and differs only in the color of the emergency stop switches.

Warning!

- **Handheld control devices with a gray stop button that are not connected to a machine should also be stored separately. This is to prevent confusion with functional equipment in emergencies.**
- **Resetting the stop device is not permitted to result in an uncontrolled restart.**
- **The stop button is not a substitute for safety equipment.**
- **The stop button on the handheld control device is not a substitute for an emergency stop switch directly on the machine.**
- **Certain mechanical faults in the stop button can only be detected when the button is actuated. In the event of severe impact to the device (e.g. the device is dropped), the stop button must be inspected to ensure functionality. In addition, the stop button must be tested cyclically (every 6 months) by actuation.**
- **See section "International and national certifications" on page 61 for additional important information about the stop button.**

2.2.2.4 Key switch

The Mobile Panel is equipped with a key switch that is evaluated using software. This can be read out on a Mobile Panel 7251, with a program using the Automation Device Interface (ADI library), see 3.6 "Key and LED configuration").
The key switch has 3 positions, each of which clicks into place. The key can be removed in any of these 3 switch positions. 2 identical keys are included in the content of delivery.



Rotation angle
of the key switch

2.2.2.5 Enabling control device

The 5MP7251.101P-000 is equipped with an enabling control device. The enabling control device consists of a three-position operating element. A significant feature is the dual-circuit design and direct opening action of the third switch position per EN 60947-1 and EN 60947-5-8.

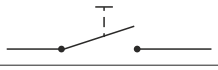
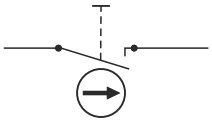
Danger!

Suitable measures and precautions must be in place to detect or prevent mechanical securing or any other manipulations that give the impression of safe operation *(reasonably foreseeable misuse*). Operating a manipulated MP7200 is not permitted.

Warning!

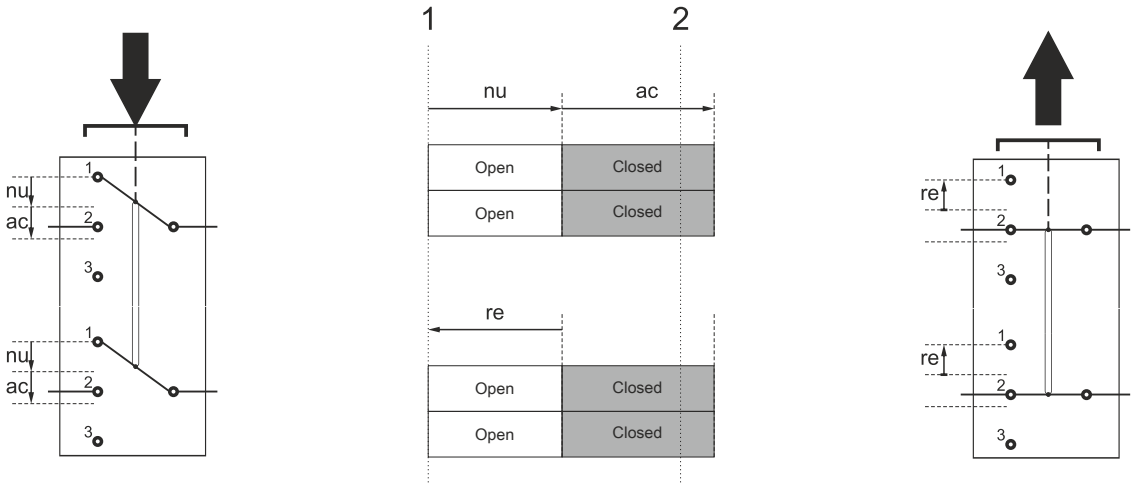
The enabling control device must be tested periodically (every 6 months) by actuating it to the panic position. This test must be performed to determine whether the panic position is functional.

Functionality

Switch position	Function	Enabling control device	Switching contact	
1	Zero position	Not actuated	Off (opened)	
2	Enable	Actuated	On (closed)	
3	Panic	Fully pressed	Off (opened)	

2.2.2.5.1 Normal actuation

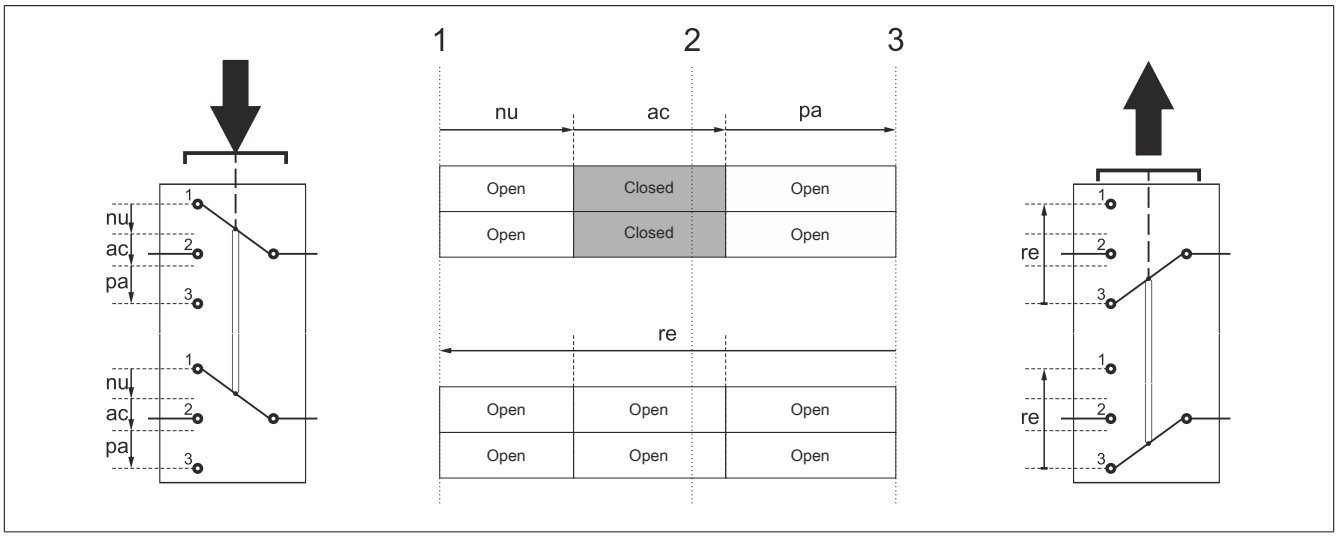
The following figure shows the circuit diagram and switching paths of the enable switch during normal actuation. Both circuits behave the same way. Enable position "ac" is implemented to compensate for differences in actuating pressure during operation. After releasing enable position "re", the device returns to zero position "nu" for enabling control.



Actuator travel			
nu	Zero position	ac	Enable position
re	Release	-	
↓	Actuates the enable device	↑	Releases the enable device
Switch positions			
1	Switch position 1 of the enable device (zero position)	2	Switch position 2 of the enable device (enable position)

2.2.2.5.2 Panic actuation

The following figure shows the circuit diagram and switching paths of the enable switch during a panic actuation. Both circuits behave the same way. Enable position "ac" is implemented to compensate for differences in actuating pressure during operation. Panic press "pa" from the enable position is achieved by pressing firmly. When panic position "re" is released, the enable position is skipped due to the mechanical design of the enable switch. The enabling control device then returns to zero position "nu".



Actuator travel			
nu	Zero position	ac	Enable position
pa	Panic position, fully pressed	re	Release
↓	Actuates the enable device	↑	Releases the enable device
Switch positions			
1	Switch position 1 of the enable device (zero position)	2	Switch position 2 of the enable device (enable position)
3	Switch position 3 of the enable device (panic position, fully pressed)	-	

Category 4 PL e can be achieved per EN ISO 13849-1 by implementing the enabling control devices with 2 circuits and the suitable dynamic monitoring while taking into account the actuation cycles with regard to the B_{10D} value of the safety components.

Per EN 60204-1, the enabling control device must be implemented such that at least stop category 0, 1 or 2 is initiated at zero position 1 ("off" function of switch, operating element not actuated) and panic position 3 (function "off", operating element fully pressed).

To calculate the PL of the enabling safety function, the safety characteristics (PL, PFH_D and B_{10D} values) of the involved components must be included in the calculation.

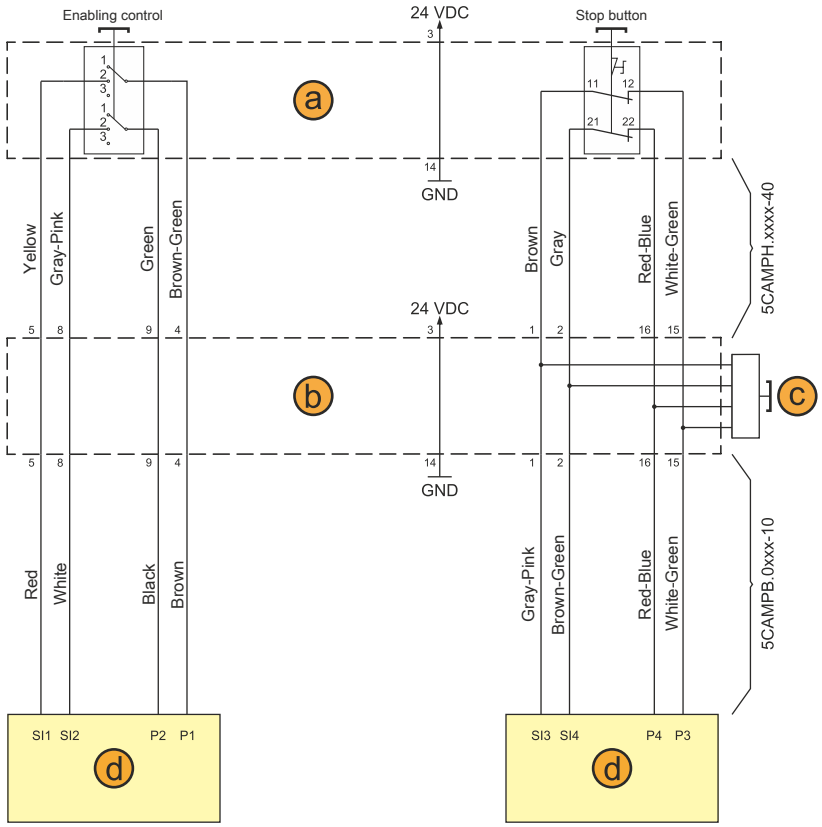
Simultaneity monitoring is required if fault exclusion is not possible due to short circuits in the enable circuit; otherwise, an undetected accumulation of errors could occur that would result in a loss of safety. Simultaneity monitoring is achieved by connecting to a safe DI module from B&R or suitable safety monitoring device, for example.

The following connection example shows how an enable function up to category 4 PL e can be achieved with the MP7200 enabling control device. It is important to note that the entire concept of the machine must be designed for this.

2.2.2.5.3 Connection example with a safety controller

When using the B&R safety controller, the stop button can also be connected to this in addition to the enabling control device.

The following example is intended as support for implementation in the end application and shows a wiring suggestion for the enabling control device and stop button with a suitable safety monitoring device.



Legend					
a	MP7200	b	Connection box 4MPCBX.0000-00	c	Emergency stop on the connection box
d	Safety monitoring device				
	Connection (e.g. with X20SC0842 from B&R): • Px = Pulse x • SIx = Safe Input x For the corresponding pinout of the safety monitoring devices, see the manufacturer documentation.				

The following configurations must be made in the safety controller in order to achieve category 4 PL e:

- Cross fault detection must be enabled.
- A startup test must be performed. Each time the safety controller is switched on, a test must be performed that checks the sensor in the low signal level direction (i.e. defined safe status), e.g. by actuating the enable switch.

It is important to observe the configuration manual of the safety controller, the operating instructions of the safety application programming tool and the functional safety manual.

The Mobile Panel, safety controller and all subsequent components must be taken into account when calculating the entire "approval via enabling control device" safety function.

2.2.2.5.4 Reasonably foreseeable misuse of the enabling control device (enable switch)

Reasonably foreseeable misuse refers to the unauthorized use of other materials to hold the enable switch in the enable position. Reasonably foreseeable misuse must be prevented by appropriate corrective measures.

The following measures are therefore recommended for stopping the machine during manual operation:

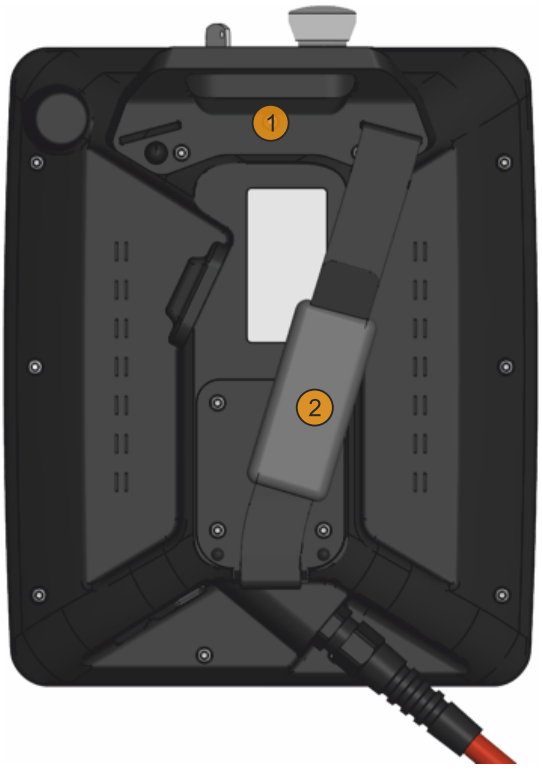
- Querying the enabling control device when switching on the machine/system and when switching from automatic to manual operating mode (the enabling control device is not permitted to be in the enable position).
- The enabling control device must be released within a defined time frame and then brought back to the enabling position again. The length of this time frame can be chosen according to the task at hand.

Warning!

- **The enabling control device is only suitable as a protective function if the person activating it is able to recognize danger to personnel early enough to immediately take appropriate action to prevent it! As an additional measure, reduced speed of the movement may be required. The permissible speed must be determined by a risk assessment.**
- **Using the enabling control device by itself to issue commands that initiate dangerous states is not permitted. A second, deliberate start command is required for this (e.g. actuating a specific key on the handheld control device).**
- **The only person permitted in the danger zone is the person actuating the enabling control device.**

2.2.3 Handle and hand strap

A **handle (1)** can be installed on the MP7200 with or without a **hand strap (2)**. The handle is secured with 3 screws (Torx, size 10). The hand strap can only be used if the handle is installed.



2.3 Individual components

2.3.1 Control devices

2.3.1.1 5MP7251.101P-000

2.3.1.1.1 General information

- 10.1" TFT WXGA color display
- Multi-touch (projected capacitive)
- Intel Celeron E2807 dual core with 1.58 GHz
- 21 system keys, 5 LEDs
- Stop button
- 3-position enable switch
- Key switch

2.3.1.1.2 Order data

Order number	Short description	Figure
	Control devices	
5MP7251.101P-000	Mobile Panel 7200 10.1" WXGA TFT - 800 x 1280 pixels - Multi-touch (projected capacitive) - Intel Celeron N2807 processor 2*1.58 GHz - 4 GB RAM - For Windows W10 2016 - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 1x enable switch - 21x system keys, 5x LEDs	
	Required accessories	
	Windows 10 IoT Enterprise 2016 LTSB	
5SWW10.0561-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Entry - Multilingual - MP7251 (Legacy BIOS boot) - CPU E3930/N2807 - License - Only available with a new device	
	Optional accessories	
	Accessories	
4MPCBX.0000-00	Mobile Panel connection box - For cables with push-pull circular connectors	
4MPCBX.0001-00	Mobile Panel small connection box - For cables with push-pull circular connectors	
5ACCWB70.0000-000	Mobile Panel 7200 wall mount - For MP7251	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts - 5 m	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts - 10 m	
	Attachment cables	
5CAMPH.0018-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 1.8 m	
5CAMPH.0050-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 5 m	
5CAMPH.0100-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 10 m	
5CAMPH.0150-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 15 m	
5CAMPH.0200-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 20 m	
	Control cabinet cables	
5CAMPC.0020-10	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet crossover - 2 m	
5CAMPC.0020-11	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet straight-through - 2 m	

2.3.1.1.3 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.

Order number	5MP7251.101P-000
General information	
B&R ID code	0xFB26
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment

Order number	5MP7251.101P-000
Controller	
Processor	
Type	Intel Celeron N2807
Clock frequency	1580 MHz
Standard memory	
RAM	4 GB DDR3L
Application memory	
Type	32 GB SSD
Writable data amount	
Guaranteed	45 TB
Error-correcting code (ECC)	Yes
Display	
Type	TFT color
Diagonal	10.1"
Colors	16.7 million [1]
Resolution	WXGA, 1280 x 800 px
Contrast	800:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 85° / Direction D = 85°
Backlight	
Brightness	400 cd/m²
Half-brightness time	100,000 h
Touch screen	
Technology	Projected capacitive
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Variant	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 0.5 A
Ethernet	
Quantity	1 [2]
Variant	RJ45, shielded, female
Transfer rate	10/100 Mbit/s
Max. baud rate	100 Mbit/s
Keys	
System keys	21
Stop button	Yes (2 normally closed contacts)
Enable switch	Yes, 3-position button
Key switch	Yes, 3-position
LEDs	5
Operating system	
Edition	Windows 10 IoT 2016 LTSB
Architecture	64-bit
Language	English
Preinstallation	Yes
Electrical properties	
Nominal voltage [3]	24 VDC ±25% (integrated reverse polarity protection), SELV [4]
Inrush current	Max. 5.6 A (current limiting available)
Power consumption	Max. 15 W (500 mA at 24 VDC)
Max. interruption of power supply	≤10 ms
Operating conditions	
Drop height	1 m to industrial floor
Flame-retardant	UL 94-V0
Degree of protection per EN 60529	IP65 [5]
Protection class	Class 3 per EN 61131-2 and EN 50178
Ambient conditions	
Temperature	
Operation	0 to 45°C
Storage	-25 to 70°C
Transport	-25 to 70°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 8.4 Hz: 3.5 mm amplitude 8.4 to 150 Hz: 1g
Shock	
Operation	15 g, 11 ms
Elevation	
Operation	Max. 2000 m

Order number	5MP7251.101P-000
Mechanical properties	
Housing	
Material	PPE/PS
Front	
Panel overlay	
Material	Polyester
Dimensions	
Width	215 mm
Length	284 mm 6)
Depth	Without handle: 69 mm With handle: 76 mm
Weight	Approx. 1200 g

1) The actual number of available colors depends on the graphics memory, configured graphics mode and graphics driver being used.
2) Connection via Mobile Panel cable.
3) Connected via attachment cable 5CAMPH.0xxx-40.
4) IEC 61010-2-201 requirements must be observed.
5) At least IP54 after 2 falls from 1 m height.
6) With stop button and key switch (without key).

2.3.2 Cables

2.3.2.1 Attachment cables

2.3.2.1.1 5CAMPH.xxxx-40

2.3.2.1.1.1 General information

An attachment cable establishes the electrical and mechanical connection between the control cabinet and device. It includes lines for the network (Ethernet 10/100 Mbit/s) as well as for the control devices and 24 VDC power supply[2)].

The surface is protected against water, oil (lubricating and hydraulic oils per EN 60811 Part 2-1) and cooling lubricant.

The attachment cable is installed in the attachment shaft on the side of the Mobile Panel. The attachment cable ends with a circular connector on the control cabinet side. Attachment cables are available in different lengths. For the procedure for connecting the attachment cable, see "Commissioning" on page 40.

2.3.2.1.1.2 Order data

Order number	Short description	Figure
	Attachment cables	
5CAMPH.0018-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 1.8 m	
5CAMPH.0050-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 5 m	
5CAMPH.0100-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 10 m	
5CAMPH.0150-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 15 m	
5CAMPH.0200-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 20 m	
	Required accessories	
	Control cabinet cables	
5CAMPC.0020-10	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet crossover - 2 m	
5CAMPC.0020-11	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet straight-through - 2 m	
	Optional accessories	
	Accessories	
4MPCBX.0000-00	Mobile Panel connection box - For cables with push-pull circular connectors	
4MPCBX.0001-00	Mobile Panel small connection box - For cables with push-pull circular connectors	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts - 5 m	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts - 10 m	

[2)] IEC 61010-2-201 requirements must be observed.

2.3.2.1.1.3 Technical data

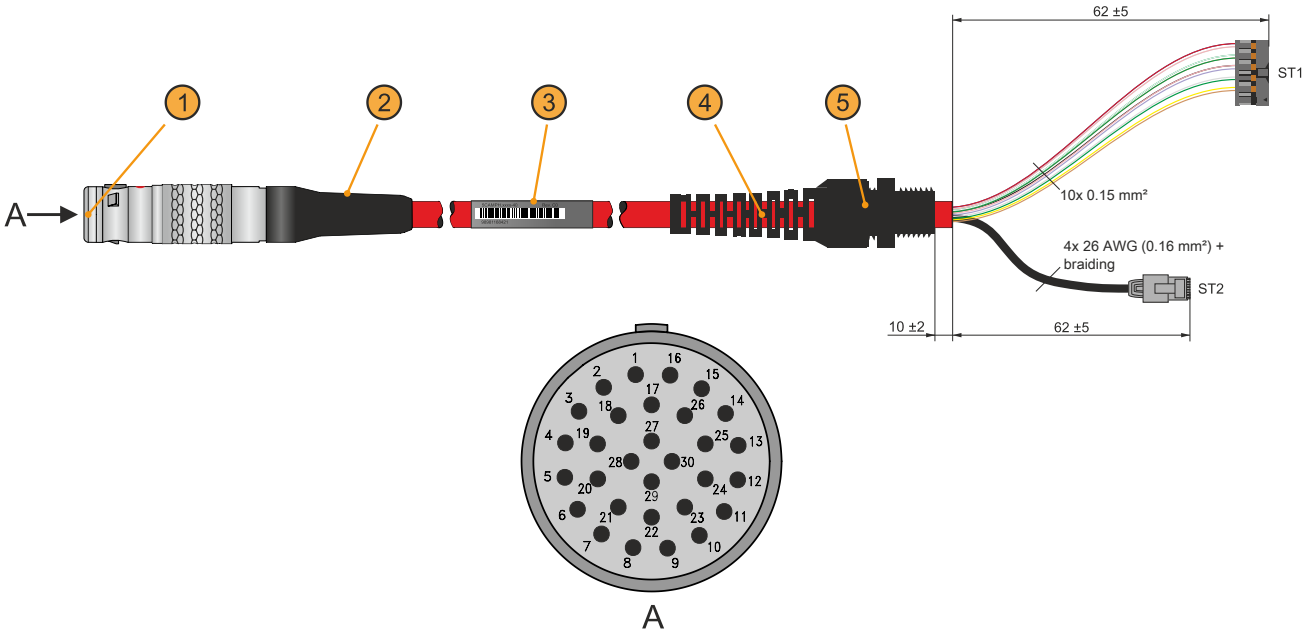
Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.

Order number	5CAMPH.0018-40	5CAMPH.0050-40	5CAMPH.0100-40	5CAMPH.0150-40	5CAMPH.0200-40
General information					
Durability	Mechanical properties per DIN VDE 0472 section 603 test type H (100000 cycles)				
Certifications					
CE	Yes				
UL	cULus E115267 Industrial control equipment				
EAC	Product family certification				
Cable construction					
Type	Hybrid cable, 25 wires				
Supply lines					
Material	Tinned copper stranded wire				
Outer jacket					
Material	Silicone- and halogen-free, flame-retardant PUR outer jacket				
Color	Similar to RAL 7012				
Cable elements					
Control devices	Direct connection between stop button and monitoring device (4 wires)				
Network	Star-quad cable for Ethernet (10/100 Mbit/s) (4 wires, male RJ45 connector)				
Power supply	24 VDC supply voltage and grounding (3 wires), SELV [1]				
Enable switch	Direct connection between enable switch and monitoring device (4 wires)				
Connector					
Type	ODU circular connector with push-pull locking mechanism				
Electrical properties					
Operating voltage	Max. 30 VDC				
Conductor resistance	≤30 Ω/km				
Operating conditions					
Shield attenuation	Per IEC 60096-1, Amendment 2				
Flame-retardant	Per IEC 60332-1 and VW1 / FT1 in accordance with C-UL				
Oil and hydrolysis resistance	Per VDE 0282-10				
Ambient conditions					
Temperature					
Moving	-25 to 80°C				
Static	-40 to 80°C				
Mechanical properties					
Dimensions					
Length	1.8 m ±0.1 m	5 m ±0.1 m	10 m ±0.1 m	15 m ±0.15 m	20 m ±0.15 m
Diameter	7.6 mm				
Bend radius	Min. 60 mm				
Weight	153 g/m				
Tension	Max. 140 N				

1) IEC 61010-2-201 requirements must be observed.

2.3.2.1.1.4 Cable construction and cable pinout



Cable construction			
ODU circular connector **(1)**	Anti-kink sleeve **(2)**	Cable label **(3)**	Strain relief **(4)**
Cable gland **(5)**		-	
(ST1) Control devices and power supply, 12-pin with connector contacts		**(ST2)** Ethernet, 8-pin, RJ45	
Cable pinout			
ST1	**ST1 - Pinout**	**Attachment cable - Wire colors**	**Circular connector - Pinout**
+24 VDC	Pin 1	Pink	Pin 3
GND[1)]	Pin 2	Black	Pin 14
Stop button NC11	Pin 3	Brown	Pin 1
Stop button NC12	Pin 4	White-Green	Pin 15
Stop button NC21	Pin 5	Gray	Pin 2
Stop button NC22	Pin 6	Red-Blue	Pin 16
C 1	Pin 7	Brown-Green	Pin 4
NO 1	Pin 8	Yellow	Pin 5
C 2	Pin 9	Green	Pin 9
NO 2	Pin 10	Gray-Pink	Pin 8
ST2	**ST2 - Pinout**	**Attachment cable - Wire colors**	**Circular connector - Pinout**
TX	Pin 1	Blue	Pin 27
$\overline{TX}$	Pin 2	White	Pin 29
RX	Pin 3	Orange	Pin 28
$\overline{RX}$	Pin 6	Red	Pin 30
Shielding	Housing	Braiding	Pin 17

1) GND is connected with low resistance to the housing ground (earth).

2.3.2.2 Control cabinet cables

2.3.2.2.1 5CAMPC.0020-10

2.3.2.2.1.1 General information

A crossover control cabinet cable is required for the wiring inside the control cabinet.
The pinout of the Ethernet connector (crossover) makes it possible to connect directly to a B&R controller (e.g. X20CPxxxx). For other devices, e.g. Ethernet hubs, it is important to ensure that they support crossover of the RX and TX lines.

Information:

The control cabinet cable is used for all Mobile Panel product series. Not all wires are used when wiring the MP7x00 and MP40/50. Functionality therefore differs from MP100/200 devices.

The surface is protected against water, oil (lubricating and hydraulic oils per EN 60811 Part 2-1) and cooling lubricant.

The control cabinet cable is secured to the control cabinet door via the connection housing (see "Receptacle - Drilling template" on page 35). The other end of the control cabinet cable has a pre-assembled RJ45 Ethernet connector. The remaining lines have an open end with line end sleeves to make it easier to line to safety equipment and other interfaces.

2.3.2.2.1.2 Order data

Order number	Short description	Figure
	Control cabinet cables	
5CAMPC.0020-10	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet crossover - 2 m	
	Optional accessories	
	Accessories	
4MPCBX.0001-00	Mobile Panel small connection box - For cables with push-pull circular connectors	

2.3.2.2.1.3 Technical data

Information:

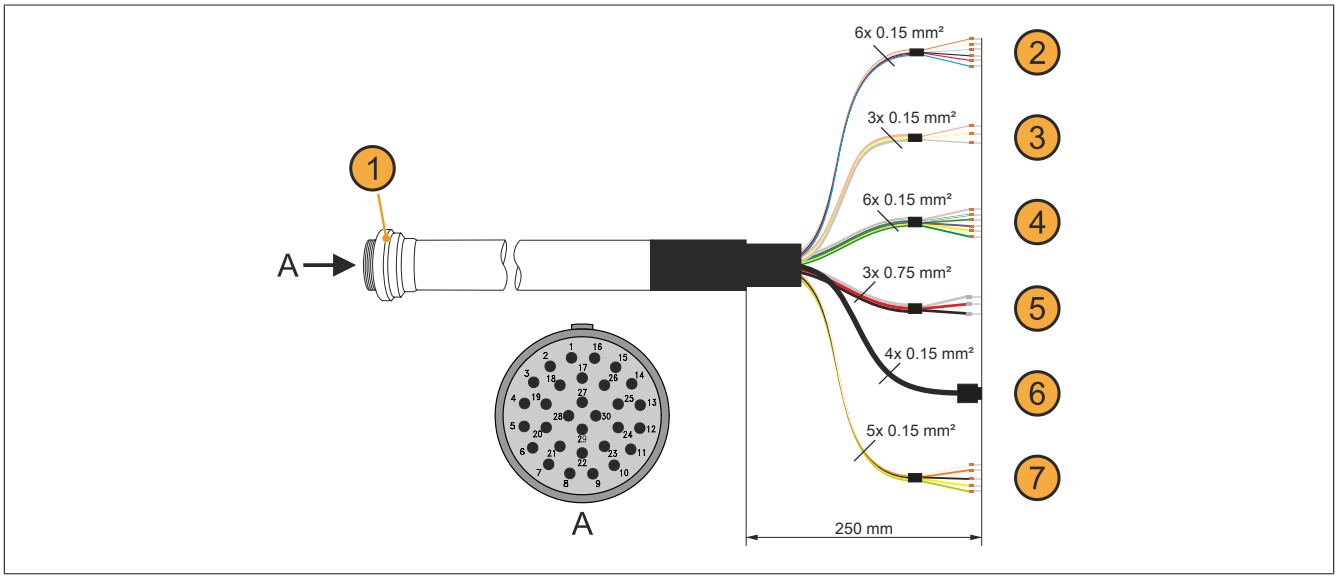
The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.

Order number	5CAMPC.0020-10
General information	
Certifications	
CE	Yes
UKCA	Yes
UL	cULus E115267 Industrial control equipment
Cable construction	
Type	Crossover
Supply lines	
Conductor resistance	≤30 Ω/km
Material	Tinned copper stranded wire
Permissible operating voltage	30 VDC
Outer jacket	
Material	Silicone- and halogen-free, flame-retardant PUR outer jacket
Color	Similar to RAL 7012
Cable elements	
Control devices	Direct connection between control devices and monitoring device (6 wires) (2 wires not used on the MP40/50 and MP7x00)
CAN	2 pairs with shielding (5 wires) Not used on the MP40/50 and MP7x00
Network	Twisted pair cable for Ethernet (10/100 Mbit/s) (4 wires, RJ45 connector)
Serial	3 wires Not used on the MP40/50 and MP7x00
Power supply	24 VDC supply voltage and grounding (3 wires), SELV [1)]
Enable switch	Direct connection between enable switch and monitoring device (6 wires) (2 wires not used on the MP40/50 and MP7x00)
Connector	
Type	Receptacle for push-pull locking mechanism

Order number	5CAMPC.0020-10
Operating conditions	
Shield attenuation	Per IEC 60096-1, Amendment 2
Flame-retardant	Per IEC 60332-1 and VW1 / FT1 in accordance with C-UL
Oil and hydrolysis resistance	Per VDE 0282-10
Ambient conditions	
Temperature	
Moving	-5 to 60°C
Static	-20 to 80°C
Mechanical properties	
Dimensions	
Length	2 m ±0.05 m
Diameter	10 mm
Bend radius	Min. 60 mm
Weight	153 g/m
Tension	Max. 140 N

1) IEC 61010-2-201 requirements must be observed.

2.3.2.2.1.4 Cable construction and cable pinout



Cable construction			
Receptacle **(1)** for push-pull locking mechanism	Enabling switch **(2)**, 4 of 6 wires used	RS232 **(3)**, not used	Control device **(4)**, stop button / emergency stop, 4 of 6 wires used
Power supply and grounding **(5)**, 3 wires	Ethernet **(6)**, RJ45 shielded	CAN **(7)**, not used	-

Cable pinout		
Receptacle - Pinout	**Wire colors**	**Enable switch (2)**
4	Brown	C 1
5	White	NO 1
9	Black	C 2
8	Red	NO 2
Receptacle - Pinout	**Wire colors**	**Control devices (4)**
1	Gray-Pink	Stop / Emergency stop normally closed contact 1 (11)
2	Brown-Green	Stop / Emergency stop normally closed contact 2 (21)
15	White-Green	Stop / Emergency stop normally closed contact 1 (12)
16	Red-Blue	Stop / Emergency stop normally closed contact 2 (22)
Receptacle - Pinout	**Wire colors**	**Power supply (5)**
3	Red	+24 VDC power supply
14	Black	GND[1)]
17	Gray	Shielding
Receptacle - Pinout	**Wire colors**	**Ethernet (6)**
27	Green	Pin 3 (RX)
28	Pink	Pin 1 (TX)
29	Yellow	Pin 6 ($\overline{RX}$)
30	Blue	Pin 2 ($\overline{TX}$)
Shielding	Shielding	Shielding

1) GND is connected with low resistance to the housing ground (earth).

Information:

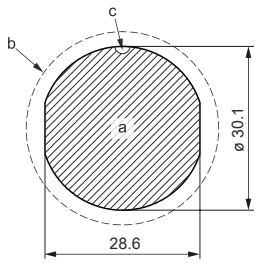
When installing the control cabinet cable, it is important to ensure that it is not too loose or too tight in the control cabinet.

2.3.2.2.1.5 Receptacle - Drilling template

A cutout or drill hole must be made (e.g. in a control cabinet door) according to the following diagram to fasten the receptacle.

Legend					
a	Cutout (hatched)	b	Outline of locknut	c	Marking point

-



2.3.2.2.2 5CAMPC.0020-11

2.3.2.2.2.1 General information

A straight-through control cabinet cable is required for the wiring inside the control cabinet.
The pinout of the Ethernet connector makes it possible to connect directly to a standard Ethernet hub.

> **Information:**
>
> **The control cabinet cable is used for all Mobile Panel product series. Not all wires are used when wiring the MP7x00 and MP40/50. Functionality therefore differs from MP100/200 devices.**

The surface is protected against water, oil (lubricating and hydraulic oils per EN 60811 Part 2-1) and cooling lubricant.

The control cabinet cable is secured to the control cabinet door via the connection housing (see "Receptacle - Drilling template" on page 39). The other end of the control cabinet cable has a pre-assembled RJ45 Ethernet connector. The other connecting cables are open with wire end sleeves to simplify further wiring to the safety equipment and other connections.

2.3.2.2.2.2 Order data

Order number	Short description	Figure
	Control cabinet cables	
5CAMPC.0020-11	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet straight-through - 2 m	
	Optional accessories	
	Accessories	
4MPCBX.0001-00	Mobile Panel small connection box - For cables with push-pull circular connectors	

2.3.2.2.2.3 Technical data

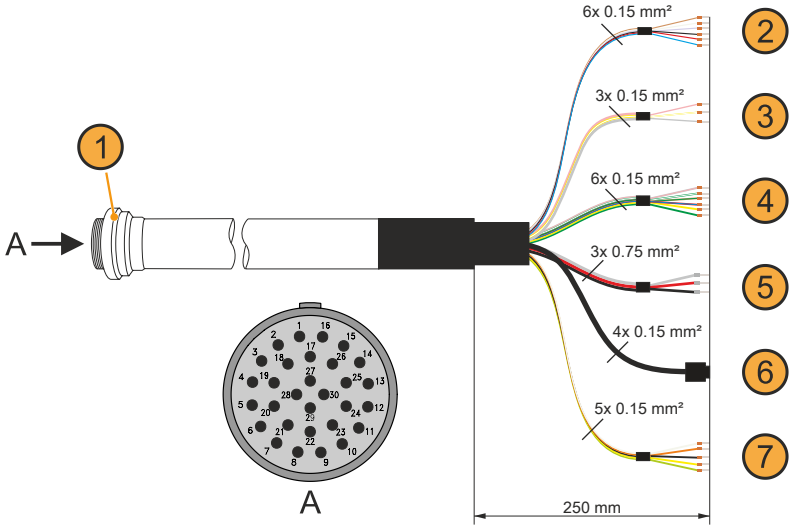
> **Information:**
>
> **The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.**

Order number	5CAMPC.0020-11
General information	
Certifications	
CE	Yes
UKCA	Yes
UL	cULus E115267 Industrial control equipment
Cable construction	
Type	Straight-through
Supply lines	
Conductor resistance	≤30 Ω/km
Material	Tinned copper stranded wire
Permissible operating voltage	30 VDC
Outer jacket	
Material	Silicone- and halogen-free, flame-retardant PUR outer jacket
Color	Similar to RAL 7012
Cable elements	
Control devices	Direct connection between control devices and monitoring device (6 wires) (2 wires not used on the MP40/50 and MP7x00)
CAN	2 pairs with shielding (5 wires) Not used on the MP40/50 and MP7x00
Network	Twisted pair cable for Ethernet (10/100 Mbit/s) (4 wires, RJ45 connector)
Serial	3 wires Not used on MP40/50 and MP7x00
Power supply	24 VDC supply voltage and grounding (3 wires), SELV [1)]
Enable switch	Direct connection between enable switch and monitoring device (6 wires) (2 wires not used on the MP40/50 and MP7x00)
Connector	
Type	Receptacle for push-pull locking mechanism
Operating conditions	
Shield attenuation	Per IEC 60096-1, Amendment 2
Flame-retardant	Per IEC 60332-1 and VW1 / FT1 in accordance with C-UL
Oil and hydrolysis resistance	Per VDE 0282-10

Order number	5CAMPC.0020-11
Ambient conditions	
Temperature	
Moving	-5 to 60°C
Static	-20 to 80°C
Mechanical properties	
Dimensions	
Length	2 m ±0.05 m
Diameter	10 mm
Bend radius	Min. 60 mm
Weight	153 g/m
Tension	Max. 140 N

1) IEC 61010-2-201 requirements must be observed.

2.3.2.2.2.4 Cable construction and cable pinout



Cable construction			
Receptacle **(1)** for push-pull locking mechanism	Enabling switch **(2)**, 4 of 6 wires used	RS232 **(3)**, not used	Control device **(4)**, stop button / emergency stop, 4 of 6 wires used
Power supply and grounding **(5)**, 3 wires	Ethernet **(6)**, RJ45 shielded	CAN **(7)**, not used	-
Cable pinout			
Receptacle - Pinout	**Wire colors**	**Enable switch (2)**	
4	Brown	C 1	
5	White	NO 1	
9	Black	C 2	
8	Red	NO 2	
Receptacle - Pinout	**Wire colors**	**Control devices (4)**	
1	Gray-Pink	Stop / Emergency stop normally closed contact 1 (11)	
2	Brown-Green	Stop / Emergency stop normally closed contact 2 (21)	
15	White-Green	Stop / Emergency stop normally closed contact 1 (12)	
16	Red-Blue	Stop / Emergency stop normally closed contact 2 (22)	
Receptacle - Pinout	**Wire colors**	**Power supply (5)**	
3	Red	+24 VDC power supply	
14	Black	GND[1)]	
17	Gray	Shielding	
Receptacle - Pinout	**Wire colors**	**Ethernet (6)**	
27	Green	Pin 1 (TX)	
28	Pink	Pin 3 (RX)	
29	Yellow	Pin 2 ($\overline{TX}$)	
30	Blue	Pin 6 ($\overline{RX}$)	
Shielding	Shielding	Shielding	

1) GND is connected with low resistance to the housing ground (earth).

Information:

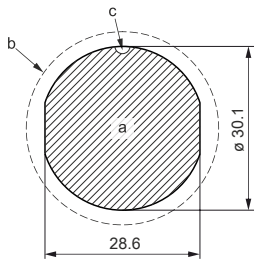
When installing the control cabinet cable, it is important to ensure that it is not too loose or too tight in the control cabinet.

2.3.2.2.2.5 Receptacle - Drilling template

A cutout or drill hole must be made (e.g. in a control cabinet door) according to the following diagram to fasten the receptacle.

Legend					
a	Cutout (hatched)	b	Outline of locknut	c	Marking point

-



3 Commissioning

3.1 Commissioning from a safety point of view

This handheld terminal was developed, manufactured, tested and documented in accordance with ergonomic guidelines and relevant safety standards. When the guidelines for intended use and safety functionality are observed, there is no danger of damage to property or injury to personnel under normal operating conditions.

The instructions contained in this manual must be observed exactly in every case. Otherwise, hazard sources may be created or the integrated safety equipment in the handheld terminal may be disabled.

In addition to the safety guidelines in this manual, all applicable occupational safety and accident prevention guidelines must be observed.

Warning!

The machine manufacturer must configure the handheld control device properly according to the danger and risk assessment. The safety aspects listed below must be considered for this purpose.

Safety aspects that the machine manufacturer must observe and comply with:

- Cable length is selected according to the work area restriction.
- Using a stop button is necessary and permissible.
- Safety category is sufficient for the respective application.
- Power supply protection is implemented according to the specifications.

Additional aspects that operators and users must observe and comply with:

- The device is only permitted to be operated in good order and condition and in accordance with the instructions in this manual.
- The user must possess the required level of training and detailed knowledge of the intended use as specified in the user's manual.
- The safety guidelines in the following chapters must be taken into account.
- Additional important information regarding safety and EMC is provided in section "International and national certifications" on page 61 and must be observed.

3.1.1 Proper use of the machine or system

Intended use of the MP7200 covers observation and configuration to the operation of machines (e.g. printing, textile and injection molding machines or robots). This can be done in normal operation (automatic) or in special operating modes (semi-automatic or manual), e.g. during setup and teaching or during test runs.

An enabling control device and stop switch are available as safety functions.

All safety functions are designed with a dual circuit and make it possible to implement category 4 PL e per EN ISO 13849-1. The actuating cycles must be taken into account with regard to the B_{10D} values of the safety components.

Handheld terminals intended for temporary connection are not permitted to be equipped with a red-yellow emergency stop switch. In this use case, a handheld terminal with a gray stop switch must be used.

It is the machine manufacturer's responsibility to select a handheld terminal suitable for the machine and to configure any additional add-on options in accordance with the legally required danger and risk assessment.

3.2 Cable installation

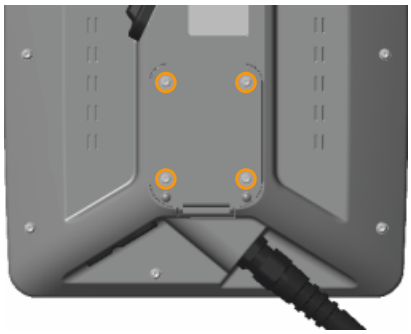
This section describes all the necessary procedures for installing a attachment cable for the Mobile Panel (see "Attachment cables" on page 29 for available cables).

To install an attachment cable, the Mobile Panel must be placed with the display facing downwards. The surface used for this must therefore be flat, clean and as soft as possible to avoid damaging the device.

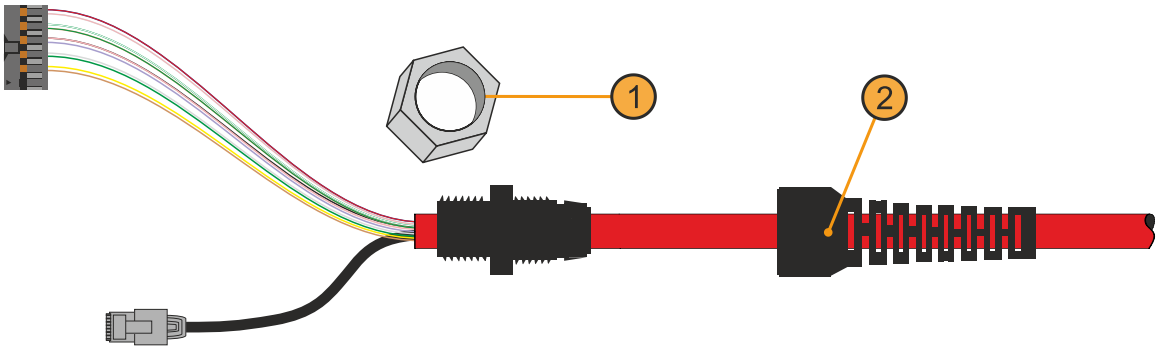
Necessary support and tools

- Torx 10 screwdriver
- Wrench, hex-head 19

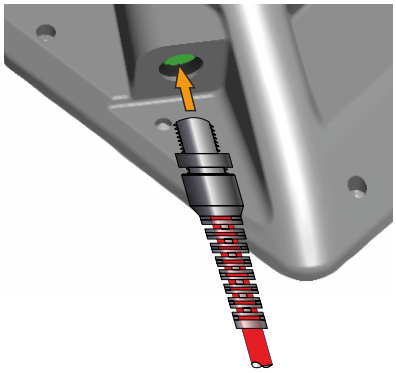
1. Loosen the orange highlighted screws on the cover (Torx 10).



2. Open the cover. Proceed with caution in order to avoid damaging the cables of the enabling control device.
3. Loosen the gray screw nut **(1)** and the strain relief **(2)** from the attachment cable. The gray screw nut is then no longer required.



4. Insert the attachment cable into the Mobile Panel through the intended opening. A corresponding screw thread for securing the attachment cable is integrated in this opening.



5. Secure the bushing with a size 19 wrench and a torque of 3 Nm.
6. Insert the main connector and RJ45 connector into the intended female connectors. It is important to ensure that the connectors are connected and engaged correctly, see "Installing cables in the attachment shaft" on page 43.
7. Secure the strain relief with the wrench. There should still be several millimeters overlap of the cable jacket inside the housing. It is important to ensure that the rubber ring for the strain relief is correctly positioned under the bushing.
8. Install the cover with the previously loosened screws (Torx 10), taking into account the following torque.
    - MP7200: 0.8 to 1.0 Nm

✓ The attachment cable is installed and meets the degree of protection requirements.

3.2.1 Notes about compliance with the degree of protection

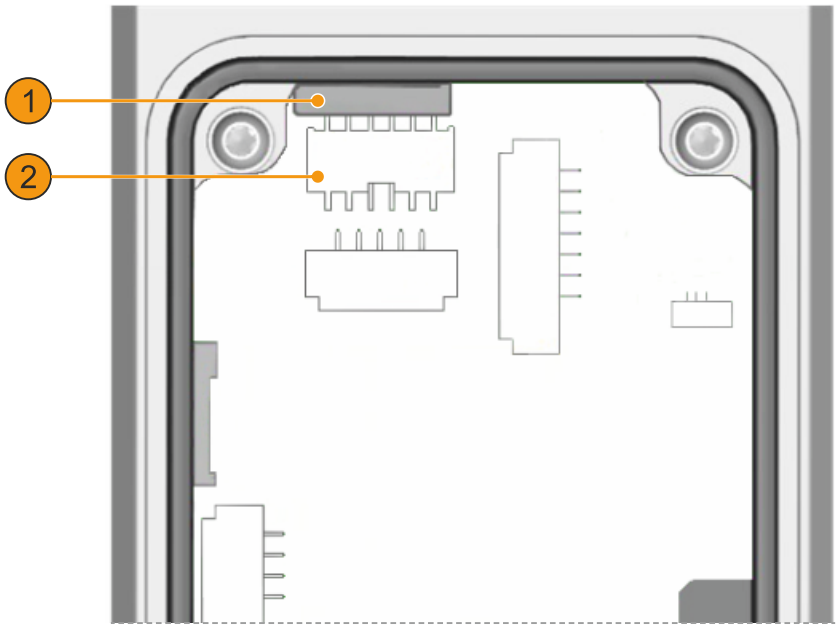
The following points must be observed to ensure that the degree of protection is maintained for the Mobile Panel.

- The gaskets of the device are not permitted to be contaminated or damaged. If necessary, clean or replace the gaskets with suitable cleaning agents.
- Cables are not permitted to be pinched. This can result in damage to the cable as well as loss of leak tightness.
- All loosened screws of the device must be reinstalled and tightened. Screws that are not installed or not installed correctly can result in loss of leak tightness. This must also be observed during storage and transport or when the device is not in use.
- Cables, covers and components must be correctly connected or installed.

3.3 Attachment shaft

Notice!

The attachment shaft is not permitted be opened while voltage is applied. The device can be damaged, or undefined signal states may occur.



Legend			
1	Ethernet connection - Communication interface	2	Multipoint connector - Main connection for power supply and control lines

3.3.1 Installing cables in the attachment shaft

This section contains details about wiring the Mobile Panel.

Accessing the device connections is only possible when the cover plate of the attachment shaft is open. The procedure is described in section "Cable installation" on page 40 and must be observed.

Notice!

Connecting while voltage is applied is not permitted; the device may be damaged.

Connecting:

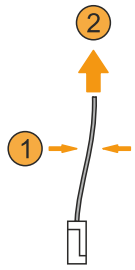
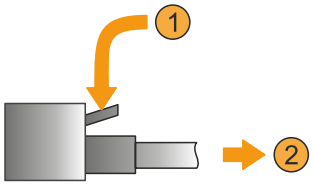
When connecting the main connector and RJ45 connector, it is important to make sure that they engage correctly.

Warning!

The Mobile Panel stop and enable functions must be checked before being put back into operation.

The stop and enable functionalities must be checked before commissioning the machine/system.

Disconnecting:

Main connector	RJ45 connector
	
The main connector is held with the hand or fingers on the wires **(1)** and disconnected **(2)**. It is not permitted to use pointed or sharp objects.	The locking mechanism of the RJ45 connector must be released **(1)** before the connector is disconnected **(2)**.

Notice!

If an attachment cable is removed, the locking mechanism of the RJ45 connector should be secured with adhesive tape. Otherwise, the locking mechanism can break off when the cable is removed from the cable grommet.

3.4 Installing the handle and hand strap

This section describes how to install the handle and hand strap.

To install the handle and hand strap, the MP7200 must be placed with the display facing downwards. The surface used for this must therefore be flat, clean and as soft as possible to avoid damaging the device.

Caution!

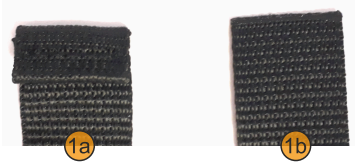
Before assembly, installation and maintenance work, the supply voltage and any interface cables must be disconnected.

Necessary support and tools

- Torx 10 screwdriver

If the hand strap is not required, only assembly steps 1 to 3 and 7 described below are necessary.

1. Switch off the supply voltage.
2. Disassemble the handheld control device.
3. Place the handheld control device with the display facing downwards on a suitable surface or base.
4. Feed the non-welded end of the hand strap belt (1b) through the right opening on the handle (2a). The hook-and-loop fastener must be facing upwards.



If the MP7200 is mainly held with the left hand, it could make more sense to install it on the left-hand opening of the handle (2b).

Information:

The belt is not permitted to be twisted here or during subsequent installation steps.

5. Pull the entire belt of the hand strap through until the welded end (1a of the figure in step 4) is stopped by the opening on the handle.
6. Attaching the upholstery (optional). The hook-and-loop fastener must be facing upwards (1).

7. Tighten the handle with a screwdriver (torque: 0.8 - 1.0 Nm) at the top of the handheld control device.

8. Feed the hand strap through the opening at the bottom of the handheld control device (1).

9. Pull the hand strap belt through until a tight but comfortable hold is achieved.
10. Close the hook-and-loop fasteners.

✓ The handle and hand strap are now completely installed and ready for use.

3.5 Operating the Mobile Panel

Caution!

The following points must be observed when operating the Mobile Panel.

- The operating point must be selected in such a way that danger points can be seen completely.
- When routing or installing cables, it is important to ensure that there is no risk of people falling or tripping or of the Mobile Panel falling to the ground due to unintentional impact on the cable (e.g. by transportation devices rolling over it).
- The cable used to connect the Mobile Panel must is not permitted to be pinched or routed over sharp edges or rough surfaces. This can result in damage or chafing of the cable jacket.
- It is not permitted to operate a Mobile Panel with damaged cables.
- When the Mobile Panel is not in use, it should be safely stowed away on the intended wall mount. If the Mobile Panel is stored on a wall mount in the machine's danger zone, stop button functionality must be ensured, i.e. the attachment cable must be connected.
- It is important to ensure that the Mobile Panel is not placed on the operating side when setting it down. This may cause mechanical damage to the control devices or trigger an unintended action.
- The Mobile Panel is not permitted to be placed on unstable surfaces or shelves. It could fall and become damaged.
- The Mobile Panel is not permitted to be placed near or directly on heat sources.
- The touch screen is not permitted to be operated with sharp objects such as ballpoint pens, blades, screwdrivers, etc. These objects can result in damage to the touch screen.
- Placing objects on top of the touch screen is not permitted. The touch screen could be damaged, or unintended actions could be triggered.
- Only one entry is permitted to be made on the touch screen or the system keys at a time. Multiple entries can trigger unintended actions.
- In order to maintain the service life and functionality of the Mobile Panel, unnecessary ingress of foreign objects, liquids or gases should be avoided.
- All protective coverings, housing screws, cable grommets and the device housing must be checked periodically for damage.
- The cleaning instructions for the Mobile Panel in section "Cleaning" on page 74 must be observed and complied with.

3.5.1 Touch screen calibration

Touch screen devices are pre-calibrated at the factory. This feature offers great advantages especially for replacement parts since recalibration is usually no longer required when replacing a device (identical model/type). B&R still recommends calibration for best results and to optimally adapt the touch screen to the needs of the user.

During the calibration procedure, the specified point must be pressed four times in succession within a certain time.

If calibration is not carried out correctly, an error message appears.

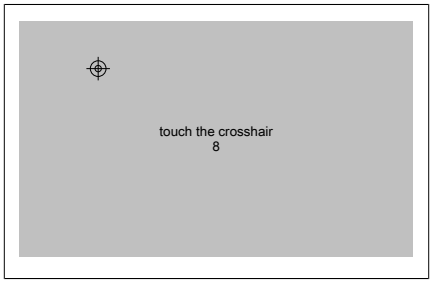


Figure: Touch screen calibration

3.5.1.1 Windows 10 IoT Enterprise 2016 LTSB

Microsoft multi-touch drivers are installed on the device during installation of Windows 10 IoT Enterprise 2016 LTSB. After successful installation of Windows 10 IoT Enterprise 2016 LTSB, the device is immediately ready for operation.

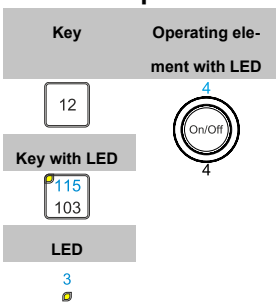
3.6 Key and LED configuration

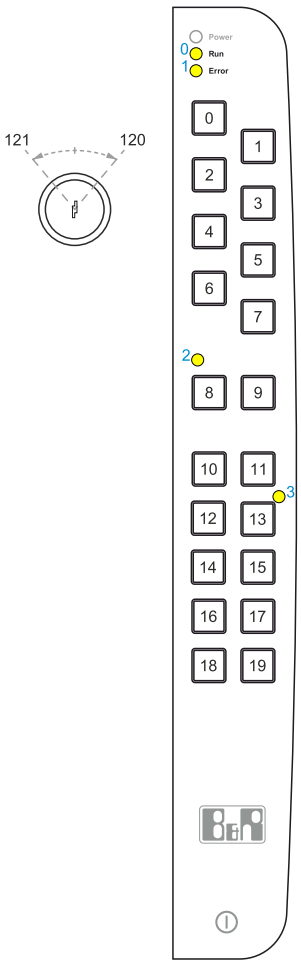
The positions of the keys and LEDs in the matrix are represented as hardware numbers.

Keys and LEDs in the matrix:

- Hardware numbers of keys are specified in the following with black indexes.
- Hardware numbers of LEDs are specified in the following with blue indexes.

Illustration examples:





Information:

When using keyboard shortcuts with 3 or more keys, key ghosting [3] may occur due to the key hardware. Only the functionality of keyboard shortcuts with 2 keys is guaranteed.

[3])https://en.wikipedia.org/wiki/Rollover_(key) (as of 2020-02-10)

3.7 Using the USB interface

Caution!

IP65 protection can only be achieved if the USB protective cover is properly installed.

Connecting a USB device

1. Open the USB protective cover..
2. Connect the USB device until it clicks into place.

✓ The USB device is recognized and can be used.

Information:

If a USB device is disconnected during a save procedure, data may be lost.

Disconnecting a USB device

1. Complete all processes that access the USB device.
2. Disconnect the USB device from the USB interface.
3. Press the protective cover down firmly and completely.

✓ The USB device is disconnected and the degree of protection is restored.

3.8 User tips for increasing the service life of the display

3.8.1 Backlight

The service life of the backlight is specified by its "half-brightness time". An operating time of 50,000 hours would mean that the display brightness would still be 50% after this time.

3.8.1.1 Measures to maintain backlight service life

- The display brightness can be set to the lowest level that is comfortable for the user's eyes.
- Bright images should be avoided as far as possible.
- A 50% reduction in brightness can increase the half-brightness time by about 50%.

3.8.2 Image persistence

Image persistence refers to the "burning in" of a static image on a display after being displayed for a long time. It does not only occur with static images, however. Image persistence is also referred to in the technical literature as screen burn-in, image retention, memory effect, memory sticking or ghost image.

There are 2 different types:

- Area type: This type can be seen in a dark gray image. The effect disappears if the display is switched off for a long time.
- Line type: This can result in permanent damage.

3.8.2.1 What causes image persistence?

- Static images
- No screensaver
- Sharp transitions in contrast (e.g. black/white)
- High ambient temperatures
- Operation outside of specifications

3.8.2.2 How can image persistence be reduced?

- Switch continuously between static and dynamic images.
- Prevent excessive differences in brightness between foreground and background elements.
- Use colors with similar brightness.
- Use complementary colors for subsequent images.
- Use screensavers.

3.9 Pixel errors

Information:

Displays can contain faulty pixels (pixel errors) due to the manufacturing process. They are not grounds for initiating a complaint or warranty claim.

4 Software

4.1 BIOS options

4.1.1 General information

BIOS is the abbreviation for *Basic Input and Output System*. It is the basic standardized connection between user and system (hardware). The MP7251 uses a BIOS in which the settings in the system configuration are permanent and do not need to be modified further.

4.1.2 BIOS Setup and start procedure

BIOS is enabled immediately after switching on the power supply of the Mobile Panel. BIOS reads the system configuration information, checks the system and configures it via the *power-on self-test* (POST). The BIOS then searches the available data storage for an operating system. BIOS starts the operating system and transfers to it control over system operations.

To open BIOS or the boot menu, suitable input devices for operation and, if necessary, a bootable USB mass storage device must be connected via a USB hub before switching on the Mobile Panel.

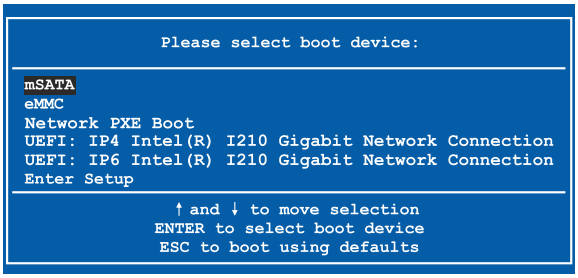
BIOS can be opened during POST using **[Del]**. "7090" must be specified as the password. It is not possible to make changes in BIOS.

The boot menu can be opened during POST using **[F7]**. "7090" must be specified as the password.

4.1.3 Keys for BIOS Setup and boot menu

The following keys are enabled during POST:	
Keys	**Function**
[Del]	Access to the BIOS Setup menu.
[F7]	Opens the boot menu. Lists all bootable devices connected to the system.
The following keys are used in the boot menu:	
Keys	**Function**
[↑], [↓]	Selects the device to boot from.
[Enter]	Starts the boot procedure with the marked device.
[Esc]	Exits the boot menu and boots with the default settings.

Boot menu image



Information:

The key signals of the USB keyboard are only accepted after the USB controller in initialized.

4.2 Operating systems

4.2.1 5SWW10.0561-MUL

4.2.1.1 General information

Windows 10 IoT Enterprise 2016 LTSB is a version of Windows 10 Enterprise specifically developed for use in industrial applications (Long-Term Servicing Branch).

> **Information:**
>
> **For detailed information, see the user's manual of the operating system. This is available for download on the B&R website (www.br-automation.com).**

4.2.1.2 Order data

Order number	Short description	Figure
	Windows 10 IoT Enterprise 2016 LTSB	
5SWW10.0561-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Entry - Multilingual - For MP7251 - Installation (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	Windows 10 IoT Enterprise 2016 LTSB	
5SWW10.0800-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Language Pack DVD	

4.2.1.3 Overview

Order number	5SWW10.0561-MUL
Operating system	
Target systems	
Processor	N2807
Chipset	Bay Trail
Edition	Entry
Architecture	64-bit
Support	
Hardware	Mobile Panel 7200

4.2.1.4 Features

The feature list shows the most important device functions in Windows 10 IoT Enterprise 2016 LTSB.

Function	Windows 10 IoT Enterprise 2016 LTSB
Range of functions in Windows 10 Enterprise	✓
Internet Explorer 11 including Enterprise Mode	✓
Multi-touch support	✓
Multilingual support	Can be installed via Language Pack DVDs (default language is English)
Page file	Configurable (disabled by default in the image by the UWF)
Hibernate file	Configurable (disabled by default in the image)
System restore	Configurable (disabled by default in the image by the UWF)
SuperFetch	Configurable (disabled by default in the image by the UWF)
File indexing service	Configurable (disabled by default in the image by the UWF)
Fast boot	Configurable (disabled by default in the image by the UWF)
Defragmentation service	✓ (Disabled when enabling the UWF)
Additional embedded lockdown functions	
Assigned access	Configurable
AppLocker	Configurable
Shell Launcher	Configurable
Unified Write Filter	✓
Keyboard Filter	Configurable

Table 11: Device functions in Windows 10 IoT Enterprise 2016 LTSB

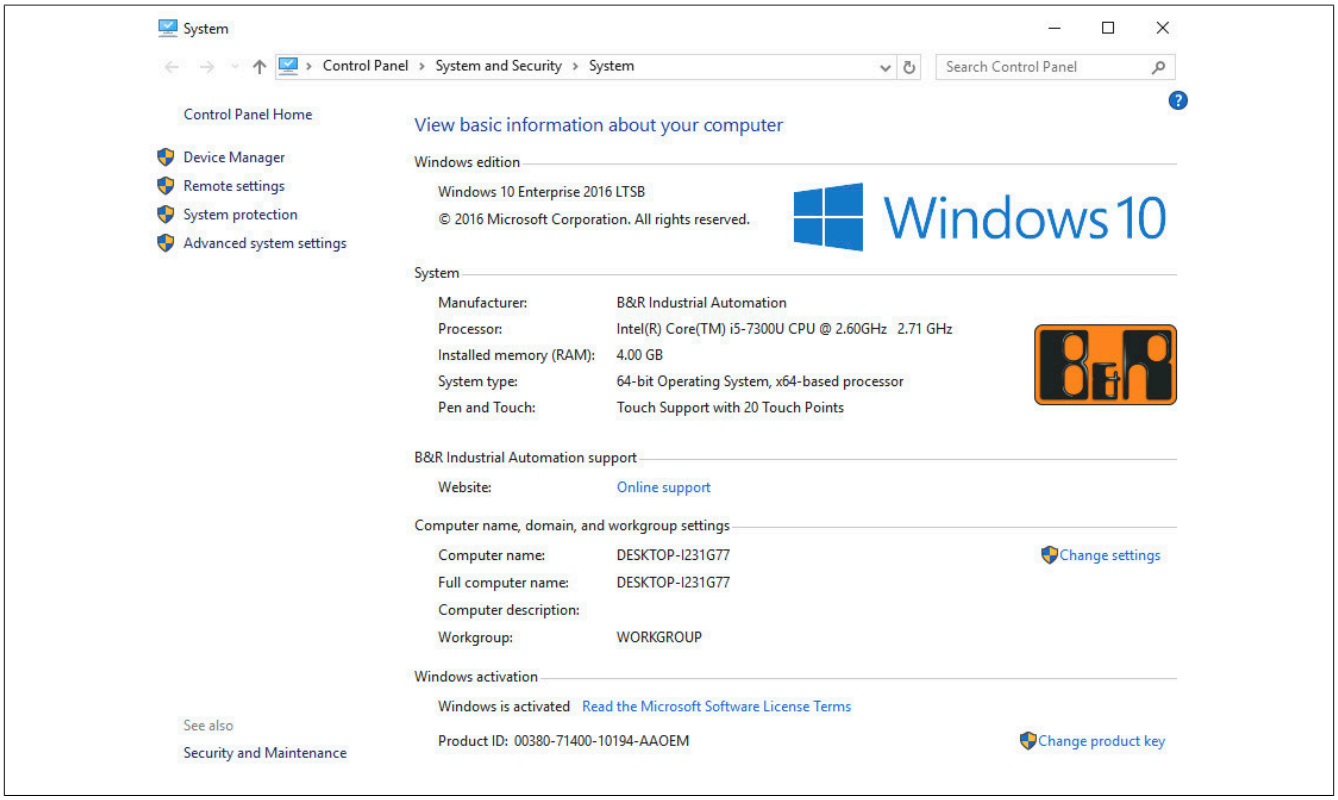
4.2.1.5 Installation

Windows 10 IoT Enterprise 2016 LTSB is preinstalled by B&R on a suitable data storage medium (64-bit: at least 20 GB). After the system has been switched on for the first time, it runs through the out-of-box experience (OOBE), which allows different settings to be made (e.g. language, region, keyboard, computer name, username).

4.2.1.6 Activation

Windows 10 IoT Enterprise 2016 LTSB must be activated like its predecessor Windows 10 IoT Enterprise 2015 LTSB. This takes place at B&R.

The activation status can be checked in the Control Panel:



Activation carried out by B&R is supported by special B&R extensions in the operating system and theoretically not lost when the hardware is changed (e.g. replacement of components in the event of repair) or when the system is reinstalled, unlike Windows 10 IoT Enterprise 2015 LTSB (Microsoft reserves the right to make technical changes without notice).

Information:

It is not required to enter a product key for activation.

4.2.1.7 Characteristics, limitations

- Unlike standard Windows 10 Enterprise, Windows 10 IoT Enterprise 2016 LTSB does not include Cortana, the Microsoft Edge browser or the Microsoft Store, for example.
- The LTSB version is based on build 14393 of Windows 10 and does not receive any feature updates.

The version installed by B&R contains optimized settings for operation in an industrial environment. These are described in detail in a manual for Windows 10 IoT Enterprise 2016 LTSB. This can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com) (login required).

Information:

These settings as well as the features not included in the LTSB version cause different behavior compared to a standard Windows 10 Enterprise installation.

Using the Automation Device Interface

Information:

Programs that use Automation Device Interface (ADI) functions must be executed with administrator rights. This also affects B&R programs such as the ADI Control Center and the B&R VNC Viewer (when using the RFB extension).

4.2.1.8 Supported display resolutions

Per Microsoft requirements, Windows 10 IoT Enterprise 2016 LTSB requires SVGA resolution (800 x 600) or higher to enable full operation of the Windows user interface (including system dialog boxes, apps, etc.). A lower resolution can be selected for applications.

4.3 Automation Device Interface (ADI)

The Automation Device Interface (ADI) enables access to specific functions of B&R devices.

> **Information:**
>
> **On the MP7200, administrator rights are required to access ADI functions.**

4.3.1 ADI driver

4.3.1.1 Installation

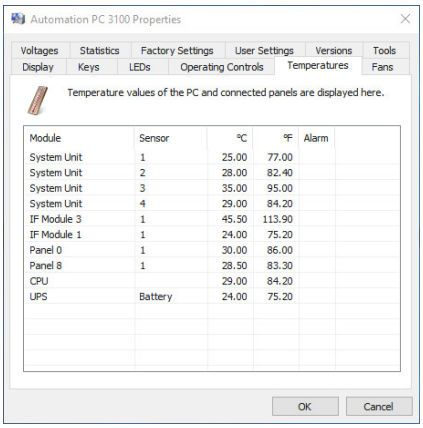
The ADI driver is included in B&R Windows operating systems.

The ADI driver (also includes the ADI Control Center) can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com). If a more recent version is available, it can be installed later.

> **Information:**
>
> **The *Write filter* must be disabled during installation.**

4.3.1.2 ADI Control Center

The settings of B&R devices can be read out and changed in Windows using the ADI Control Center in the Control Panel. The figure shown is a symbolic image; the representation may vary depending on the device.



> **Information:**
>
> **The displayed temperature and voltage values (e.g. CPU temperature, core voltage, battery voltage) represent uncalibrated information values. No conclusions about possible alarms or hardware malfunctions can be drawn from this. The hardware components used have automatic diagnostic functions in the event of error.**

4.3.1.2.1 Functions

The ADI Control Center offers the following functions, for example:

- Changing display-specific parameters
- Reading out device-specific keys
- Updating the key configuration
- Testing keys or device-specific LEDs of a membrane keypad
- Reading out control devices (e.g. key switch, handwheel)
- Reading out temperatures, fan speeds and statistical data
- Reading out operating hours (power-on hours)
- Reading user settings and factory settings
- Reading out software versions
- Updating and backing up firmware
- Creating reports for the current system (support)
- Setting the SDL equalizer value for the SDL cable adjustment
- Changing the user serial ID

For a detailed description, see the integrated help documentation for the ADI Control Center.

> **Information:**
>
> **The functions available in the ADI Control Center depend on the device family.**

4.3.1.3 Characteristics, limitations

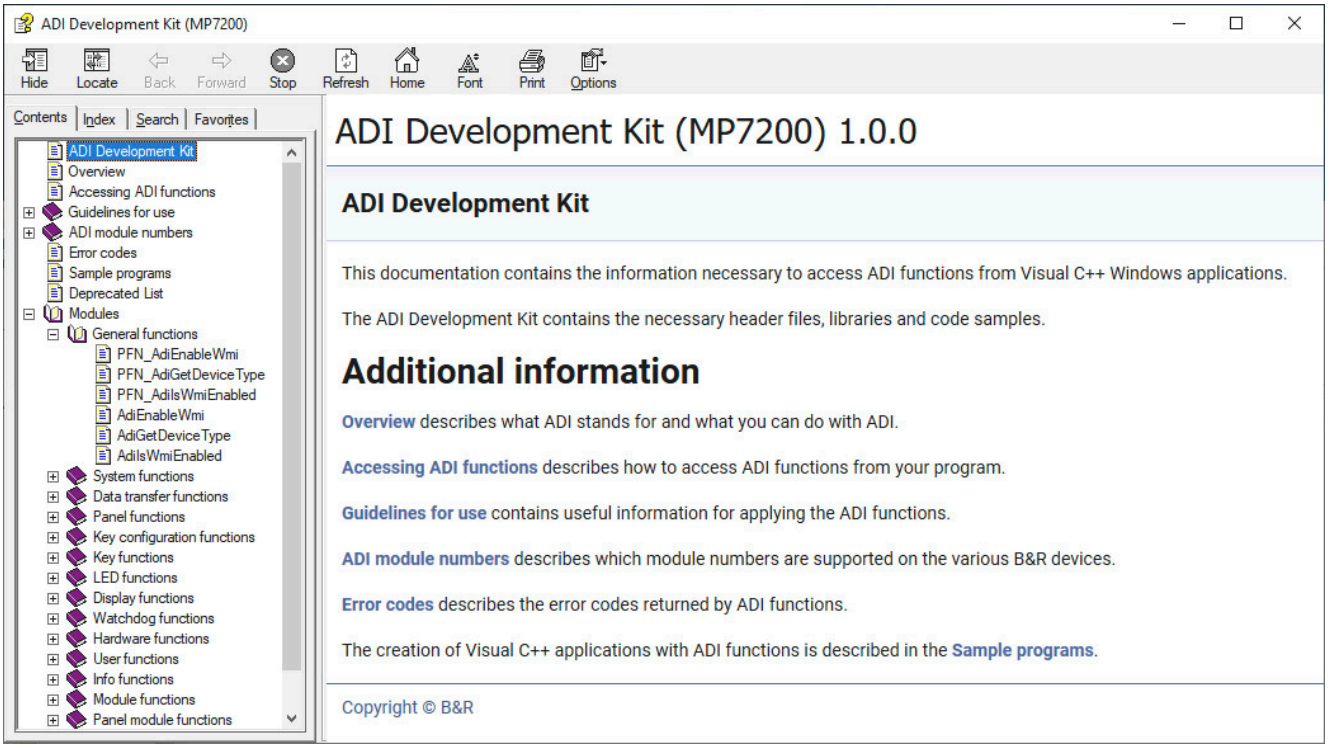
To permanently store the display brightness (e.g. using the ADI Control Center or ADI library), the application must be executed for at least 5 seconds after the display brightness has been set. Alternatively, the display brightness can be set under **Start / Settings / System / Display / Adjust brightness level**.

4.3.2 ADI Development Kit

This software allows *ADI* functions to be accessed from Windows applications created with Microsoft Visual Studio, for example:

Information:

Only 32-bit ADI Windows applications are supported on the MP7251.



Features:

- Header files and import libraries
- Help files
- Example projects
- ADI DLL: For testing applications if no ADI driver is installed.

The appropriate ADI driver must be installed for the device. The ADI driver is already included in B&R images of embedded operating systems.

For a detailed description of how to use ADI functions, see Automation Help.

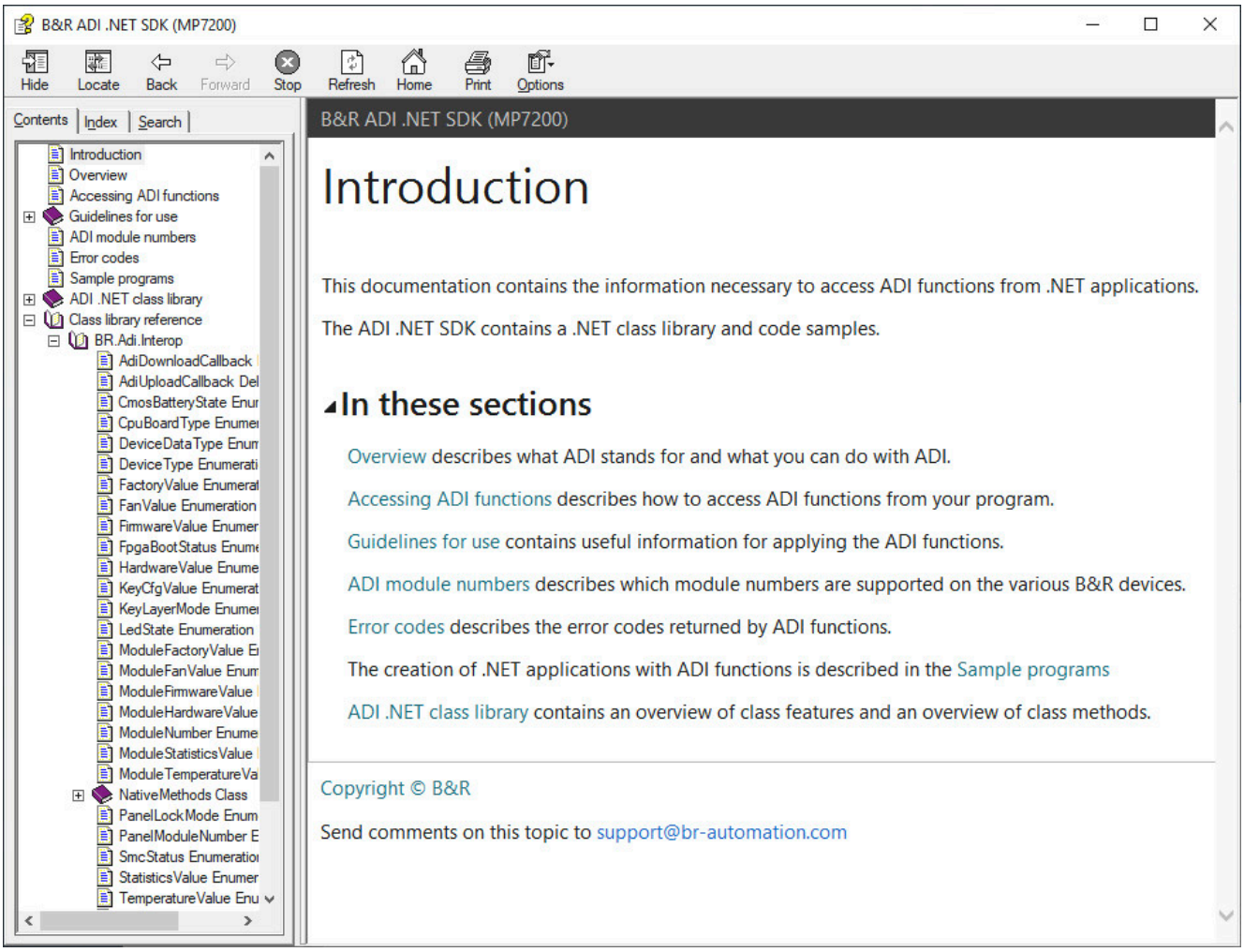
The ADI Development Kit can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

4.3.3 ADI .NET SDK

This software allows *ADI* functions to be accessed from .NET applications created with Microsoft Visual Studio.

Information:

Only 32-bit ADI Windows applications are supported on the MP7251.



Features:

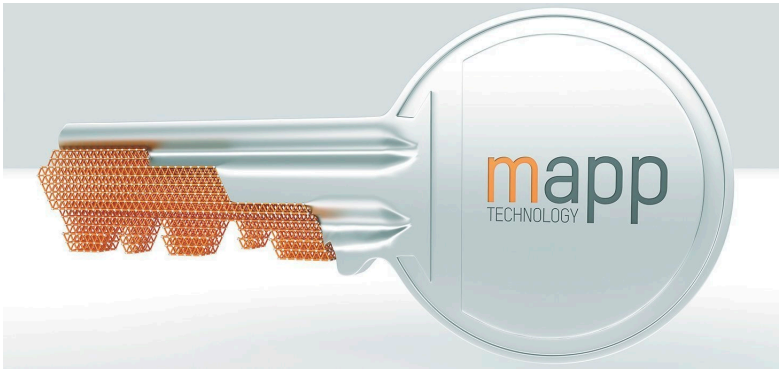
- ADI .NET class library
- Help file (in English)
- Sample projects
- ADI DLL: For testing applications if no ADI driver is installed.

The appropriate ADI driver must be installed for the device. The ADI driver is already included in B&R images of embedded operating systems.

For a detailed description of how to use ADI functions, see Automation Help.

The ADI .NET SDK can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

4.4 mapp Technology



mapp Technology is revolutionizing the creation of machine and plant software. "mapps" are as easy to use as smartphone apps. Instead of programming user/role systems, alarm systems or the control of axes line by line, the machine software developer simply configures the finished mapps. Complex algorithms are easy to master. The programmer can concentrate fully on the machine process.

Information:

For detailed information, see Automation Help or the B&R website (www.br-automation.com).

5 Configuration

5.1 Key configuration

Some keys on MP7251 have predefined key codes. Key assignments can be changed using the *key configuration mapping* (KCM). The KCM file is a text file loaded to or from the device via the ADI or B&R Control Center.

The file contains two sections: *Information* and *ScanCodeMapping*.

The following listing shows the default key configuration:

```
[Information]
Version=01.00
BuildDate=2019-09-11
UserInfo=5MP7251.101P-000
```

```
[ScancodeMapping]
KEY_000=00,3B,00,00,00,00,00,00; F1
KEY_001=00,3C,00,00,00,00,00,00; F2
KEY_002=00,3D,00,00,00,00,00,00; F3
KEY_003=00,3E,00,00,00,00,00,00; F4
KEY_004=00,3F,00,00,00,00,00,00; F5
KEY_005=00,40,00,00,00,00,00,00; F6
KEY_006=00,41,00,00,00,00,00,00; F7
KEY_007=00,42,00,00,00,00,00,00; F8
KEY_008=E0,5B,00,00,00,00,00,00; Windows left
KEY_009=00,00,00,00,00,00,00,00
KEY_010=00,01,00,00,00,00,00,00; ESC
KEY_011=00,00,00,00,00,00,00,00
KEY_012=00,00,00,00,00,00,00,00
KEY_013=00,2A,00,00,00,00,00,00; Shift left
KEY_014=00,1C,00,00,00,00,00,00; Return
KEY_015=00,45,00,00,00,00,00,00; Num lock
KEY_016=00,00,00,00,00,00,00,00
KEY_017=00,00,00,00,00,00,00,00
KEY_018=00,00,00,00,00,00,00,00
KEY_019=E0,5D,00,00,00,00,00,00; Context
```

5.1.1 Editing the KCM file

Section *Information* defines the attributes of the KCM file that can be read and displayed via ADI or the B&R Control Center.

Information	
`Version`	Version of the KCM file [xx.yy]
`Build-Date`	Creation date of the KCM file [yyyy-mm-dd]
`UserInfo`	User information [String, max. 88 characters]

Section *ScanCodeMapping* is where the scan codes for the individual keys are configured. Possible entries are **`KEY_000`** to **`KEY_255`**. The number in **KEY_xxx** defines the key number, which corresponds to the key's bit position in the key matrix. Each entry defines a scan code (CN) and three modifier codes (MF1 to MF3). Scan codes and modifier codes each have a length of 2 bytes.

The following example shows how a ScanCodeMapping entry is structured.

ScanCodeMapping	
`KEY_xxx=SC,SC,MF1,MF1,MF2,MF2,MF3,MF3`	Schematic diagram of an entry

Scan code set 1 is used for the configuration. For a current listing, see "Key codes" on page 60.

Example configuration Key 1 with scan code 0x01 **[ESC]**.	`KEY_001=00,01,00,00,00,00,00,00; ESC`

When configuring a keyboard shortcut, note that the last key is defined as a scan code and the previous keys as modifiers.

Example configuration Key 1 with keyboard shortcut **[Ctrl]** + **[Alt]** + **[Del]**	`KEY_001=E0,53,00,1D,00,38,00,00; CTRL+ALT+DEL`

5.1.2 Key codes

The following tables contain an excerpt of available PS/2 codes (set 1).

Modifiers

Key	PS/2 code (0x)	Key	PS/2 code (0x)
Left CTRL	00 1D	Right CTRL	E0 1D
Left SHIFT key	00 2A	Right SHIFT key	00 36
Left ALT key	00 38	Right ALT key	E0 38
Left Windows key	E0 5B	Right Windows key	E0 5C

Keys (English keyboard layout)

Key	PS/2 code (0x)	Key	PS/2 code (0x)
' "	00 28	Numeric keypad -	00 4A
, <	00 33	Numeric keypad . Del	00 53
- _	00 0C	Numeric keypad /	E0 35
. >	00 34	Numeric keypad 0 (INS)	00 52
/ ?	00 35	Numeric keypad 1 (End)	00 4F
0)	00 0B	Numeric keypad 2 (down)	00 50
1 !	00 02	Numeric keypad 3 (PgDn)	00 51
2 @	00 03	Numeric keypad 4 (left)	00 4B
3 #	00 04	Numeric keypad 5	00 4C
4 $	00 05	Numeric keypad 6 (right)	00 4D
5 %	00 06	Numeric keypad 7 (Home)	00 47
6 ^	00 07	Numeric keypad 8 (up)	00 48
7 &	00 08	Numeric keypad 9 (PgUp)	00 49
8 *	00 09	Numeric keypad =	00 59
9 (	00 0A	Numeric keypad Enter	E0 1C
; :	00 27	NUM LOCK	00 45
= +	00 0D	Page down	E0 51
Arrow down	E0 50	Page up	E0 49
Arrow left	E0 4B	Print screen / System request	E0 37
Arrow right	E0 4D	Enter	00 1C
Arrow up	E0 48	Roles	00 46
Backspace	00 0E	Space bar	00 39
Capslock key	00 3A	Tabulator	00 0F
Del	E0 53	[{	00 1A
End	E0 4F	\ |	00 2B
Esc	00 01	] }	00 1B
F1	00 3B	` ~	00 29
F2	00 3C	a A	00 1E
F3	00 3D	b B	00 30
F4	00 3E	c C	00 2E
F5	00 3F	d D	00 20
F6	00 40	e E	00 12
F7	00 41	f F	00 21
F8	00 42	g G	00 22
F9	00 43	h H	00 23
F10	00 44	i I	00 17
F11	00 57	j J	00 24
F12	00 58	k K	00 25
F13	00 64	l L	00 26
F14	00 65	m M	00 32
F15	00 66	n N	00 31
F16	00 67	o O	00 18
F17	00 68	p P	00 19
F18	00 69	q Q	00 10
F19	00 6A	r R	00 13
F20	00 6B	s S	00 1F
F21	00 6C	t T	00 14
F22	00 6D	u U	00 16
F23	00 6E	v V	00 2F
F24	00 76	w W	00 11
Home	E0 47	x X	00 2D
Ins	E0 52	y Y	00 15
Numeric keypad *	00 37	z Z	00 2C
Numeric keypad +	00 4E	-	

6 International and national certifications

6.1 Standards

The products meet the requirements of EU directive "Electromagnetic compatibility 2014/30/EU" and are designed for industrial applications:

EN 61131-2:2007	Programmable controllers - Part 2: Equipment requirements and tests
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-4:2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

Information:

Declarations of conformity are available on the B&R website under Downloads > Certificates > Declarations of conformity.

The following legally non-binding European standards were also used to verify the MP7200's conformity to these directives.

Verifying the conformity to machine directives	
EN ISO 13850:2015	Safety of machinery - Emergency stop function - Principles for design
EN 60204-1:2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN ISO 10218-1:2011	Robots and robotic equipment - Safety requirements for industrial robots - Part 1: Robots

Verifying conformity with the EMC Directive	
EN 61131-2:2007 chap. 8, 9 and 10	Programmable controllers - Part 2: Equipment requirements and tests

Other standards

The following legally non-binding European standards were also consulted in part when planning the safety concept:

Design of the enabling control device	
EN 60204-1:2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN ISO 10218-1:2011	Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots

Emergency stop switch design	
EN ISO 13850:2015	Safety of machinery - Emergency stop function - Principles for design
EN 60204-1:2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Stability and leak tightness of the housing	
EN 60529:1991	Degrees of protection provided by enclosures
EN 61131-2:2007 chap. 12	Programmable controllers - Part 2: Equipment requirements and tests

Other product-related standards and principles	
EN 61131-2:2007	Programmable controllers - Part 2: Equipment requirements and tests
EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
EN IEC 61010-2-201:2018	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment (without functional safety)

The following standards have also been taken into consideration for the American market:

UL testing of industrial control equipment	
UL/IEC 61010-2-201	Requirements for control equipment, including programmable logic controllers (PLCs) and applicable requirements from UL/IEC 61010-1

7 Accessories

The following accessories have undergone functional testing by B&R in connection with the device used and can be operated with this device. Possible limitations regarding operation with individual components other than the complete system must be taken into account, however. All individual specifications of the components must be observed when operating the complete system.

All components listed in this manual have undergone intensive system and compatibility testing and been approved accordingly. B&R cannot assume any functional warranty for accessories that have not been approved.

7.1 USB mass storage device

For additional information about compatible USB mass storage devices, see the B&R website (USB mass storage devices).

7.2 Wall mounts

Danger!

If a Mobile Panel stored in the wall mount is located in the danger zone of a machine or system, the functionality of the stop button must be ensured.

The wall mount must therefore be positioned in a way that does not impair operation of the stop button.

Caution!

The wall mount should be installed in a location where the Mobile Panel is not exposed to direct heat sources or sunlight.

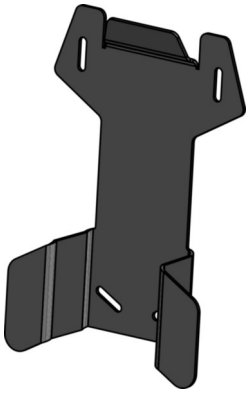
7.2.1 5ACCWB70.0000-000

7.2.1.1 General information

The wall mount is used to store Mobile Panel 5MP7251.101P-000 and is only suitable for vertical, hanging installation. In order to use the wall mount, the supplied handle must be installed on the MP7200.

- Wall mount for 5MP7251.101P-000

7.2.1.2 Order data

Order number	Short description	Figure
	Accessories	
5ACCWB70.0000-000	Mobile Panel 7200 wall mount - For MP7251	

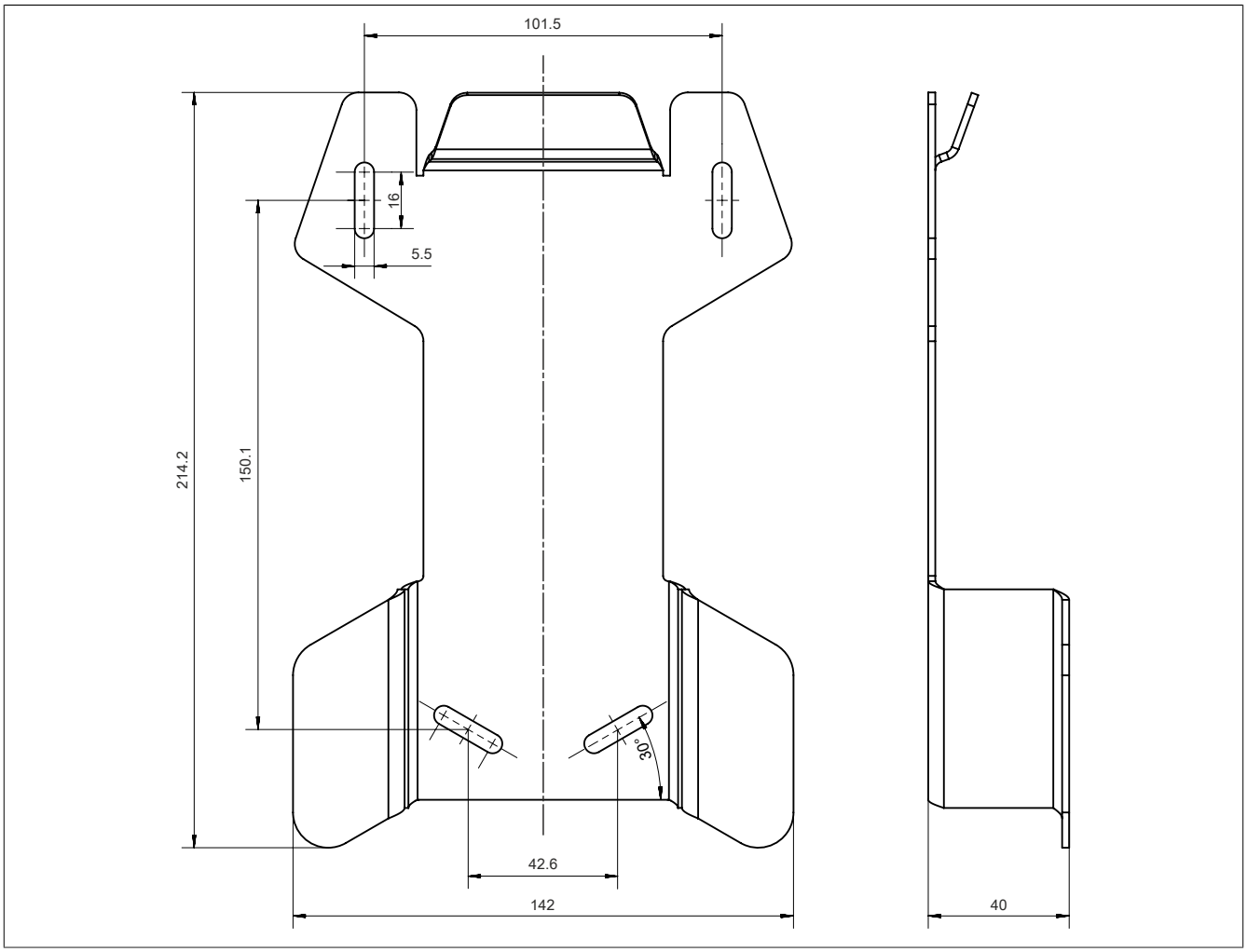
7.2.1.3 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this accessory is installed, for example.

Order number	5ACCWB70.0000-000
General information	
Certifications	
CE	Yes
Mechanical properties	
Dimensions	
Width	142.0 mm
Height	214.1 mm
Depth	40.0 mm

7.2.1.4 5ACCWB70.0000-000 - Dimensions



7.3 Connection boxes

7.3.1 4MPCBX.0000-00

7.3.1.1 General information

Connection box 4MPCBX.0000-00 makes it possible to set up a configuration where a Mobile Panel can be operated at various system connection points while still remaining integrated in the emergency stop circuit.

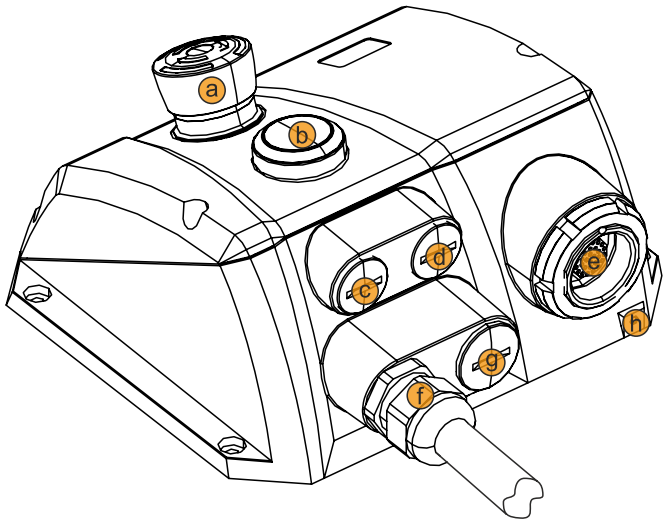
- Compatible for connections with Mobile Panel 7x00
- Emergency stop circuit not interrupted when disconnecting and connecting the Mobile Panel during operation (hot plugging function)
- IP65 protection
- Classification according to EN ISO 13849-1:2015 category 3, performance level (PL) d
- Circular connector with push-pull locking mechanism
- Emergency stop switch
- Hot plug button
- 3x optional cable outlets
- Compact dimensions
- Robust construction

7.3.1.2 Order data

Order number	Short description	Figure
	Accessories	
4MPCBX.0000-00	Mobile Panel connection box - For cables with push-pull circular connectors	
	Required accessories	
	Accessories	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts - 5 m	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts - 10 m	

7.3.1.3 Interfaces

Connection box 4MPCBX.0000-00 is equipped with the following interfaces that are accessible from the outside or routed externally.



Legend			
a	Emergency stop	b	Hot plug button
c	Screw plug M16 (opt. connection)	d	Screw plug M16 (opt. connection)
e	Connection position (Mobile Panel), protective cover	f	Connection position (box cable)
g	Screw plug M20 (opt. connection)	h	Screw point for anti-loss strap (protective cover)

7.3.1.4 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this accessory is installed, for example.

Order number	4MPCBX.0000-00
General information	
Certifications	
CE	Yes
UKCA	Yes
Functional safety [1]	Yes
UL	cULus E115267 Industrial control equipment
Keys	
Hot plug button	Yes (2 normally closed contacts)
Emergency stop	Yes (2 normally closed contacts)
Connector	
Internal connector [2]	Key switch or pushbutton Emergency stop Enable switch RS232 Power supply CAN Ethernet
Additional connectors	Slot ID (monitoring contacts) Enable switch Key switch or pushbutton Emergency stop contacts Power supply
Push-pull connector	For connecting the Mobile Panel
Electrical properties	
Nominal voltage	18 to 30 VDC [3]
Nominal current	150 mA
Power consumption	Approx. 2 W
Operating conditions	
Degree of protection per EN 60529	IP65 (only with installed screw plugs and protective cover or with connected Mobile Panel)
Ambient conditions	
Temperature	
Operation	0 to 50°C
Storage	-20 to 60°C
Transport	-20 to 60°C

Order number	4MPCBX.0000-00
Relative humidity	
Operation	0 to 95%, non-condensing
Storage	0 to 95%, non-condensing
Transport	0 to 95%, non-condensing
Vibration	
Operation (continuous)	2 to 9 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g
Operation (occasional)	2 to 9 Hz: 3.5 mm amplitude / 9 to 200 Hz: 1 g
Storage	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Transport	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Shock	
Operation	15 g, 11 ms
Storage	30 g, 15 ms
Transport	30 g, 15 ms
Mechanical properties	
Housing	
Material	GK-AlSi11Mg (gravity die casting)
Coating	Powder-coated RAL 7012, fine structure
Cover plate [4]	
Material	GK-AlSi9Mg (gravity die casting)
Dimensions	
Width	172.5 mm
Height	158.7 mm
Depth	81.7 mm
Weight	Approx. 1600 g (without attachment cable)

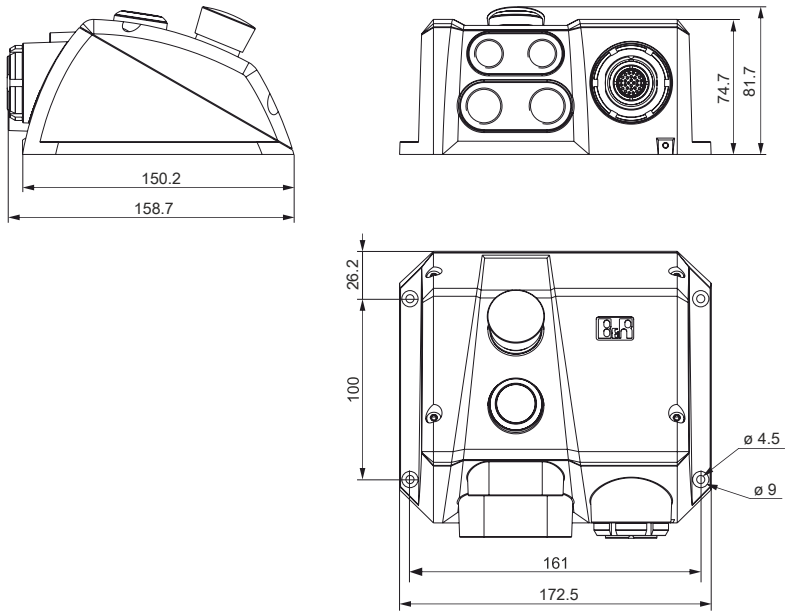
1) Achievable safety classifications (safety integrity level, safety category, performance level) are documented in the user's manual (section "Safety technology").
2) For the box cable.
3) IEC 61010-2-201 requirements must be observed.
4) The protective cover must be connected if no Mobile Panel is connected.

7.3.1.5 Safety characteristics

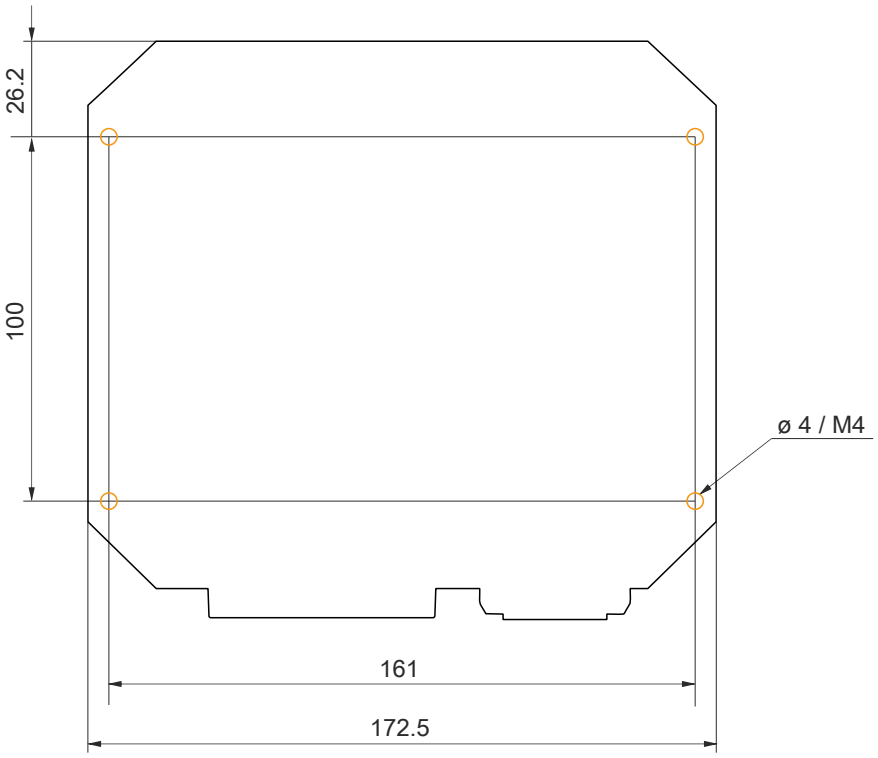
Criteria	Characteristic value
Maximum performance level (PL) per EN ISO 13849-1:2015	PL d
$MTTF_d$ (mean time to dangerous failure)	>100 years (high)
DC_{avg} (diagnostic coverage)	60% < DC < 90% (low)
PFH_D (probability of dangerous failure per hour)	$<6.4 \times 10^{-8}$
Mission time	20 years

Table 16: 4MPCBX.0000-00 - Safety characteristics

7.3.1.6 Dimensions



7.3.1.7 Drilling template 4MPCBX.0000-00



7.3.1.8 Content of delivery

Quantity	Component
1	Connection box 4MPCBX.0000-00
2	Screw plugs M16x1.5 (screwed on)
1	Screw plugs M20x1.5 (screwed on)
1	Protective cover in place (design similar to 5CAMPP.0001-10)

A box cable (5CAMPB.0xxx-10) is necessary to establish the electrical connection between the control cabinet and connection box.

7.3.2 4MPCBX.0001-00

7.3.2.1 General information

Connection box 4MPCBX.0001-00 is a mounting adapter and provides a connection point with a vertical outlet of the control cabinet cable but does not have emergency stop hot plugging functionality.

- Vertical connection of the Mobile Panel attachment cable to the control cabinet
- IP65 protection
- Compact dimensions
- Robust construction

7.3.2.2 Order data

Order number	Short description	Figure
	Accessories	
4MPCBX.0001-00	Mobile Panel small connection box - For cables with push-pull circular connectors	
	Optional accessories	
	Accessories	
5CAMPP.0001-10	Protective cover for Mobile Panel control cabinet cables with circular connector.	
	Control cabinet cables	
5CAMPC.0020-10	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet crossover - 2 m	
5CAMPC.0020-11	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet straight-through - 2 m	

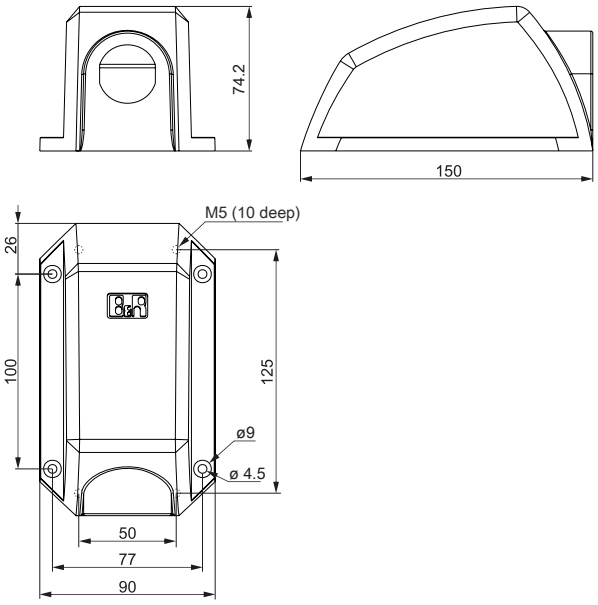
7.3.2.3 Technical data

Information:

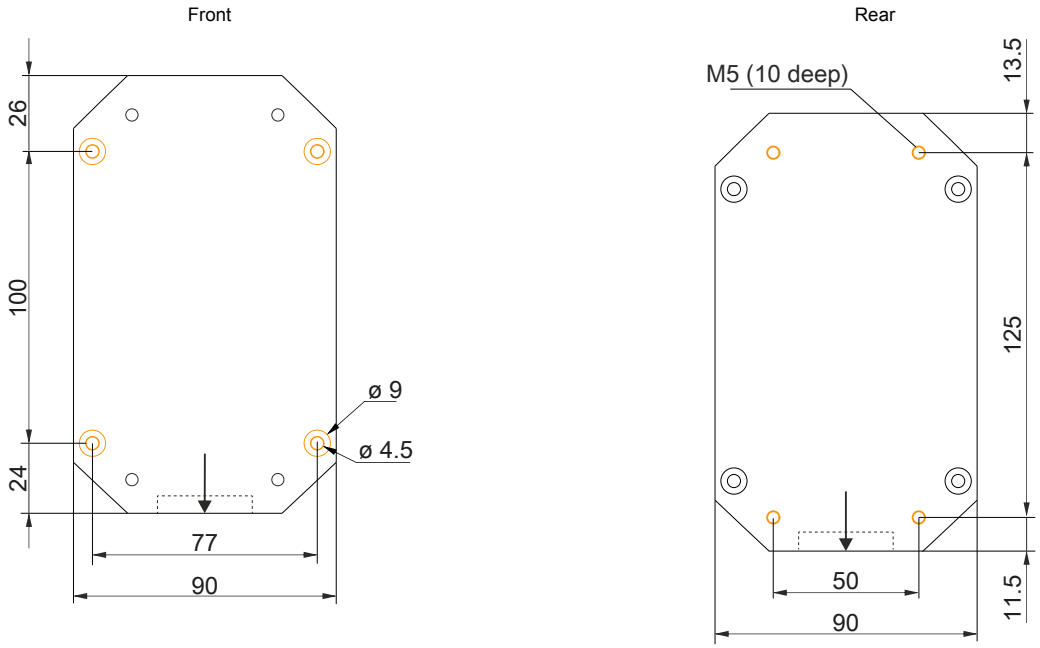
The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this accessory is installed, for example.

Order number	4MPCBX.0001-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Keys	
Hot plug button	No
Emergency stop	No
Operating conditions	
Degree of protection per EN 60529	IP65 (only with protective cover or with connected Mobile Panel)
Mechanical properties	
Housing	
Material	GK-AlSi11Mg (gravity die casting)
Coating	Powder-coated RAL 7012, fine structure
Cover plate	
Material	GK-AlSi9Mg (gravity die casting)
Dimensions	
Width	90 mm
Height	74.2 mm
Depth	150 mm
Weight	Approx. 500 g

7.3.2.4 Dimensions



7.3.2.5 Drilling template 4MPCBX.0000-01



7.3.2.6 Content of delivery

Quantity	Component
1	Connection box 4MPCBX.0001-00

7.4 Box cables

7.4.1 5CAMPB.0xxx-10

7.4.1.1 General information

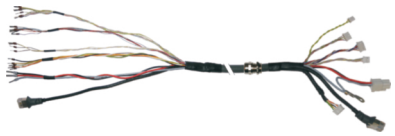
A box cable establishes the electrical connection between the control cabinet and connection box 4MPCBX.0000-00. It includes lines for the network (Ethernet 10/100 Mbit/s), +24 VDC power supply, control devices or stop / emergency stop and key switches or pushbuttons, enable switches, serial transfer and CAN.

The connection side has a pre-assembled RJ45 Ethernet connection. The remaining lines are open with line end sleeves to simplify further wiring to the safety equipment and other connections. The box cable is installed in the connection box on the other side (connection box side).

The pinout of the RJ45 Ethernet connection (crossover) permits direct connection to a B&R controller. If an Ethernet hub is used, it must support crossover RX and TX lines.

The surface is protected against water, oil (lubricating and hydraulic oils per EN 60811 Part 2-1) and cooling lubricant.

7.4.1.2 Order data

Order number	Short description	Figure
	Accessories	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts - 5 m	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts - 10 m	

7.4.1.3 Technical data

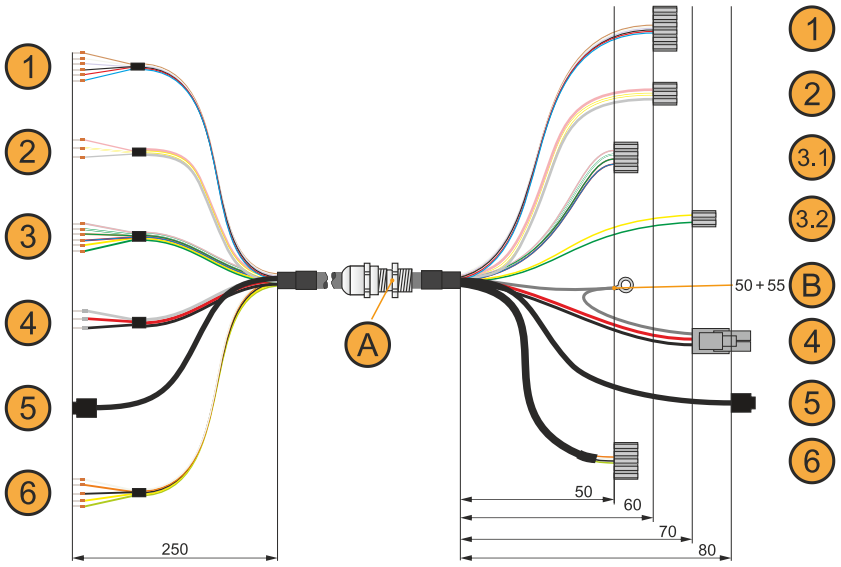
Information:

The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this accessory is installed, for example.

Order number	5CAMPB.0050-10	5CAMPB.0100-10
General information		
Certifications		
CE	Yes	
UKCA	Yes	
UL	cULus E115267 Industrial control equipment	
Cable construction		
Type	Hybrid cable, 25 wires	
Properties	Halogen- and silicone-free	
Supply lines		
Material	Tinned copper stranded wire	
Permissible operating voltage	+30 VDC	
Outer jacket		
Material	Flame-retardant PUR	
Color	Similar to RAL 7012	
Cable elements		
Control devices	Direct connection between control devices and monitoring device (6 wires)	
CAN	2 pairs with shielding (5 wires)	
Ethernet	Twisted pair cable for Ethernet (10/100 Mbit/s) (4 wires, male RJ45 connector)	
Serial	3 wires	
Power supply	24 VDC supply voltage and grounding (3 wires), SELV [1]	
Enable switch	Direct connection between enable switch and monitoring device (6 wires)	
Connector		
Type	Jacob GmbH type: PERFECT 50.620 M	
Electrical properties		
Conductor resistance	≤140 Ω/km (0.15 mm² conductor) ≤27 Ω/km (0.75 mm² conductor)	
Insulation resistance	≤500 Ω/km	
Operating conditions		
Shield attenuation	Per IEC 60096-1, Amendment 2	
Flame-retardant	Per IEC 60332-1 and VW1 / FT1 in accordance with C-UL	
Oil and hydrolysis resistance	Per VDE 0282-10	
Ambient conditions		
Temperature		
Moving	-20 to 60°C	
Static	-20 to 80°C	
Mechanical properties		
Dimensions		
Length	5 m ±14 cm	10 m ±20 cm
Diameter	10 mm	
Bend radius		
Moving	60 mm	
Fixed installation	30 mm	
Weight	160 g/m	
Tension	Max. 140 N	

1) IEC 61010-2-201 requirements must be observed.

7.4.1.4 Cable pinout



	Connection side - Control cabinet		Wire colors	Connection side - Box	
1	Enabling device, 6-wire			Enabling device, 6-wire (ST7)	1
	C1		Brown	Pin 1	
	NO1		White	Pin 2	
	NC1		Violet	Pin 3	
	C2		Black	Pin 4	
	NO2		Red	Pin 5	
	NC2		Blue	Pin 6	
2	RS232, 3-wire			RS232, 3-wire (ST4)	2
	RXD		Pink	Pin 1	
	RS232_GND		White-Yellow	Pin 2	
	TxD		Gray	Pin 3	
3	Control devices, 6-wire			Control devices, 4-wire (stop / emergency stop, ST5)	
	Stop / Emergency stop normally closed contact 1 (11)		Gray-Pink	Pin 1	3.1
	Stop / Emergency stop normally closed contact 2 (21)		Brown-Green	Pin 2	
	Stop / Emergency stop normally closed contact 1 (12)		White-green	Pin 3	
	Stop / Emergency stop normally closed contact 2 (22)		Red-Blue	Pin 4	
	-			Control device[1], 2-wire (ST6)	
	Button S13		Yellow	Pin 1	3.2
	Button S14		Green	Pin 2	
4	Power supply / Ground, 3-wire			Power supply / Ground, 3-wire (ST1)	4
	+24 VDC		Red	Pin 1	
	Shielding		Gray	Pin 2	
	GND[2]		Black	Pin 3[2]	
	n.c.		-	Pin 4	
5	Ethernet RJ45			Ethernet RJ45	5
	TX	Pin 3	Green	Pin 1	
	$\overline{TX}$	Pin 6	Yellow	Pin 2	
	RX	Pin 1	Pink	Pin 3	
	n.c.	Pin 4	-	Pin 4	
	n.c.	Pin 5	-	Pin 5	
	$\overline{RX}$	Pin 2	Blue	Pin 6	
	n.c.	Pin 7	-	Pin 7	
	n.c.	Pin 8	-	Pin 8	
	Shielding		-	Shielding	
6	2x CAN, 5-wire			2x CAN, 5-wire (ST3)	6
	CAN1 High		White	Pin 1	
	CAN1 Low		Orange	Pin 2	
	Shielding		Black	Pin 3	
	CAN2 High		Yellow	Pin 4	
	CAN2 Low		Green	Pin 5	
	-				
A	Cable gland				
B	M3 ring terminal end				

1) Key switch or pushbutton (depends on configuration).
2) GND is connected with low resistance to the housing ground (earth).

8 Maintenance

The following chapter describes the maintenance work that can be carried out by a qualified and trained end user.

Information:

Only components approved by B&R are permitted to be used for maintenance work.

8.1 Cleaning

Danger!

In order to prevent unintentional operation (by touching the touch screen or keys), the device is only permitted to be cleaned when the power is switched off.

- Use a cloth moistened with dishwashing detergent, screen cleaner or alcohol (ethanol) to clean the device.
- The cleaning agent is not permitted to be applied directly to the device.
  Abrasive cleaners, aggressive solvents and chemicals, compressed air or steam cleaners are not permitted to be used.
- When cleaning, areas with adhesive labels and product information should be left out to avoid damage.

Information:

Displays with a touch screen should be cleaned at regular intervals.

8.2 Repairs/Complaints and replacement parts

Danger!

Unauthorized opening or repair of a device may result in personal injury and/or serious damage to property. Repairs are therefore only permitted to be carried out by authorized qualified personnel at the manufacturer's premises.

To process a repair/complaint, a repair order or complaint must be created via the B&R Material Return Portal on the B&R website (www.br-automation.com).

Appendix A Stop button

The stop button described below is installed in the MP7200.

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.

Stop button		
Nominal voltage	24 VDC, SELV[1)]	
Current-carrying capacity	Max. 1000 mA (per contact)	
Utilization category	DC-13 (per IEC 60947-5-1)	
B10d value (switching cycles)	250,000	
Variant	Dual-circuit, external wiring	
Electrical isolation	500 VAC to rest for 1 minute	

1) IEC 61010-2-201 requirements must be observed.

Appendix B Enabling control device

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.

Information:

In order to ensure the specified safety characteristics, the enabling electronics must be taken out of operation after 20 years at the latest.

Properties		Enabling control device with one enable switch
Output type		Electromechanical switching contact
Switchable nominal voltage (Ue)		24 VDC, SELV[1)] (voltage tolerance 19.2 VDC to 30 VDC per EN 61131-2)
Switchable nominal current (Ie)		500 mA (max.)
Short circuit and overload protection		No
Reverse polarity protection		No
Utilization category		DC13
Operating cycles (B_{10d})		
	Switch position 2	1,000,000
	Switch position 3	1,000,000
Actuating force		
	From switch position 1 to 2	Typically 3 N
	From switch position 2 to 3	Typically 17 N
Electrical isolation		500 VAC to rest for 1 minute
Output testing		-
Changing grip function		-
Output synchronization		-
Specifications for EN ISO 13849-1:2015		
Enable		
	Category	4
	Performance level	e
	Proof test interval	20 years
Specifications for EN 64508		

1) IEC 61010-2-201 requirements must be observed.

Appendix C Chemical resistance

The following table provides an overview of the basic chemical resistance of the materials used for the 5MP7251.101P-000. The list makes no claim to completeness and is intended only as a guideline.

Extended properties such as creep or environmental influences such as temperature or pressure are not taken into account. Tests for substances not mentioned, with or without taking other properties and influences into account, should be carried out separately if required.

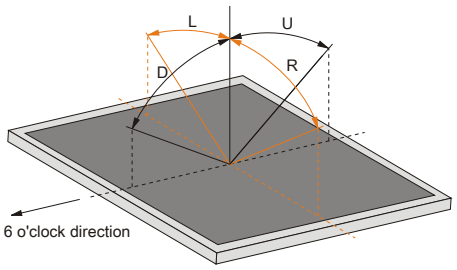
Legend					
GS	Housing and cover	T	Keypad	GR	Handle
TS	Touch screen	HS	Hand strap	NH	Emergency stop / stop button
ZT	Enable switch	USB	USB protective cover	AK	Attachment cables
Classification					
+	Good durability	○	Conditional durability	-	Insufficient durability

Medium	GS	T	GR	TS	HS	NH	ZT	USB	AK
Acetone CAS[1]: 000067-64-1	○	+	+	+	+	+	+	○	+
Ammonia (10%) CAS: 001336-21-6	+	+	+	+	+	+	+	+	+
Gasoline CAS: 086290-81-5	+	+	+	+	+	+	+	+	+
Diesel	+	+	+	+	+	+	+	-	+
Acetic acid (10%) CAS: 000064-19-7	+	+	+	+	+	+	+	-	+
Ethanol (95%) CAS: 000064-17-5	+	+	+	+	+	+	+	+	+
Hydraulic oil on mineral oil basis	+	+	+	+	+	+	+	○	+
Potassium hydroxide (10%) CAS: 001310-58-3	+	+	+	+	+	+	+	○	+
Linseed oil CAS: 008002-26-1	+	○	+	+	+	+	○	○	+
Cutting/Grinding oil	+	○	+	+	+	+	○	○	+
Methanol CAS: 000067-56-1	+	+	+	+	+	+	+	+	+
Methylbenzene (toluene) CAS: 000108-88-3	+	+	+	+	+	+	○	-	+
Methyl ethyl ketone (butanone) CAS: 000078-93-3	○	○	○	+	+	+	○	-	○
Motor oil	+	○	+	+	+	+	+	○	+
Sodium hydroxide (10%) CAS: 001310-73-2	○	-	+	○	+	+	+	+	○
Petroleum ether (light gas) CAS: 008032-32-4	+	+	+	+	+	+	+	+	+
Hydrochloric acid (10%) CAS: 007647-01-0	+	+	+	+	+	-	+	-	○
Lubricating grease	+	○	+	+	+	+	+	+	+
Sulphuric acid (10%) CAS: 007664-93-9	+	+	+	+	+	+	○	○	+
Silicon oil	+	+	+	+	+	+	+	+	+
Ethyl alcohol	+	+	+	+	+	+	+	○	+
Turpentine	+	+	+	+	+	+	+	-	+

1) *Chemical Abstracts Service* registration number

Appendix D Viewing angles

For viewing angle specifications (R, L, U, D) of the display types, see the technical data of the individual components.



Appendix E Abbreviations

Abbreviations used in the document are explained here.

Abbreviation	Stands for	Description
NC	Normally closed	Stands for a normally closed relay contact.
	Not connected	Used in pinout descriptions if a terminal or pin is not connected on the module side.
ND	Not defined	Stands for an undefined value in technical data tables. This may be because the cable manufacturer has not provided a value for certain technical data.
NO	Normally open	Stands for a normally open relay contact.
TBD	To be defined	Used in technical data tables if there is currently no value for specific technical data. The value will be supplied later.
B_{10D}	-	Number of cycles until 10% of the components fail dangerously (per channel).
MTBF	Mean time between failures	The expected value of the operating time between two consecutive failures.
$MTTF_D$	Mean time to dangerous failure	Mean time to dangerous failure (per channel).
DC	Diagnostic coverage	Degree of diagnostic coverage
PL	Performance level	Discrete level specifying the ability of safety-related devices to perform a safety function under foreseeable conditions.
PFH	Probability of failure per hour	Probability of a failure per hour.
SIL	Safety integrity level	Safety integrity level