Mobile Panel 7100

User's manual

Version: **1.51 (April 2020)**
Order no.: **MAMP7100-ENG**

Translation of the original documentation

1 General information

1.1 Manual history

Version	Date	Change
1.51	April 2020	• Editorial changes. Updated the following sections: • "mapp View and VNC client" on page 86
1.50	March 2020	• Editorial changes. Updated the following sections: • "General safety guidelines" on page 9 • Technical data for the attachment cable "5CAMPH.xxxx-40" on page 59 Updated the following sections: • "mapp View and VNC client" on page 86 Updated the following sections: • "USB flash drives" on page 125
1.15	April 2018	• Documented control device "5MP7151.101E-001" on page 55. • Updated the following control devices: ° "5MP7121.034F-000" on page 39 ° "5MP7150.101E-000" on page 47 ° "5MP7151.101E-000" on page 51 • Updated section "Handwheel" on page 23. • Updated the following sections: ° "Enabling control devices (enabling devices)" on page 18 ° "5CAMPH.xxxx-40" on page 59 ° "Proper use of the machine or system" on page 68 ° "Connection" on page 72 ° "Machinery directive" on page 118 ° "Design of the enabling control device" on page 119 ° "Enabling control device with one enable switch (enabling device)" on page 123 ° "Enabling control device with two enable switches (enabling device)" on page 123 • Updated "Appendix A" on page 143. • Updated "Connection example for enabling control device with two enable switches" on page 77.
1.10	November 2017	• Documented box cable 5CAMPB.0050-10 on page 137. • Updated the following sections: ° "Configuration" on page 15 ° "Key and LED configuration" on page 79 ° "Illuminated pushbutton" on page 23 ° "Key switch" on page 24 ° "Service pages" on page 87 ° "Software-specific information" on page 146 • Updated the following sections: ° "BIOS options" on page 85 ° "Update" on page 111 ° "EAC" on page 124 ° "KC" on page 124 ° "Repairs/Complaints and replacement parts" on page 142
1.05	January 2017	• Documented the following control devices: ° "5MP7120.034F-000" on page 35 ° "5MP7121.034F-000" on page 39 • Updated the following sections: ° "Chemical resistance" on page 145 ° "Software-specific information" on page 146 • Updated the following section: ° "mapp View and VNC client" on page 86 ° "Membrane keypad" on page 25 ° "Key and LED configuration" on page 79 ° "USB interface" on page 78

Version	Date	Change
1.00	September 2016	• Updated chapter 4 "Software" on page 85. • Updated chapter A "Appendix A" on page 143. • Updated terminology for emergency stop in German edition. • Updated the following sections: ° "Device interfaces" on page 17 ° "Control cabinet cables" on page 62 ° "Connection examples" on page 75 ° "USB interface" on page 78 • Revised chapter 5 "Standards and certifications".
0.10 Preliminary	August 2016	• First version

1.2 General safety guidelines

1.2.1 Intended use

Programmable logic controllers, operating and monitoring devices (e.g. industrial PCs, Power Panels, Mobile Panels) as well as uninterruptible power supplies from B&R have been designed, developed and manufactured for normal use in industry. They 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. In particular, this includes the use of these systems to monitor nuclear reactions in nuclear power plants, flight control systems, air traffic control, the control of mass transport vehicles, medical life support systems and the control of weapon 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 by qualified personnel when the power is switched off. 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. wire 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). The ground connection 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 Environmentally friendly disposal

All programmable logic controllers, operating and monitoring devices and uninterruptible power supplies from B&R are designed to have as little impact on the environment as possible.

1.2.7.1 Separation of materials

To ensure that devices can be recycled in an environmentally friendly manner, it is necessary to separate out the different materials.

Component	Disposal
Programmable logic controllers Operating and monitoring devices Uninterruptible power supplies Batteries and rechargeable batteries Cables	Electronics recycling
Paper/Cardboard packaging	Paper/Cardboard recycling
Plastic packaging material	Plastic recycling

Disposal must be carried out in accordance with applicable legal regulations.

1.2.8 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, malfunctions, 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.

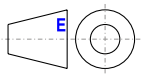
1.3 Organization of safety notices

Safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
Warning!	Failure to observe these safety guidelines and notices can result in severe injury or substantial damage to property.
Caution!	Failure to observe these safety guidelines and notices can result in injury or damage to property.
Information:	These instructions are important for avoiding malfunctions.

Table 1: Description of the safety notices used in this documentation

1.4 Guidelines



European dimension standards apply to all dimension diagrams.

All dimensions in mm.

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

Table 2: Nominal dimension ranges

1.5 Overview

Model number	Short description	Page
	Accessories	
4MPCBX.0000-00	Mobile Panel connection box - For cables with push-pull circular connectors	133
4MPCBX.0001-00	Mobile Panel small connection box - For cables with push-pull circular connectors	136
5AC900.1100-01	Mobile Panel touch screen stylus pen - 5 pcs. - For MP40/50/7100	141
5ACCWB20.0000-000	Mobile Panel 7100 wall mount - For MP7120 and MP7121	130
5ACCWB40.0000-000	Mobile Panel 7100 wall mount - For MP7140	131
5ACCWB50.0000-000	Mobile Panel 7100 wall mount - For MP7150/MP7151	132
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	138
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	138
	Attachment cables	
5CAMPH.0018-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 1.8 m	59
5CAMPH.0050-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 5 m	59
5CAMPH.0100-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 10 m	59
5CAMPH.0150-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 15 m	59
5CAMPH.0200-40	Attachment cable for MP7100 and MP7200 - Push-Pull circular connector - 20 m	59
	Control cabinet cables	
5CAMPC.0020-10	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet crossover - 2 m	62
5CAMPC.0020-11	Mobile Panel control cabinet cable - Push-Pull circular connector - Ethernet straight-through - 2 m	65
	System units	
5MP7120.034F-000	Mobile Panel 7100 3,4" WQVGA TFT - 480 x 272 pixels - Single-touch (analog resistive) - Cortex A8 processor - For VNC - 1x Ethernet 10/100, 1x USB 2.0 OTG mini - 1x key switch, 1x pushbutton - 1x stop button - 1x enable switch - 36x system key, 4x LED	35
5MP7121.034F-000	Mobile Panel 7100 3.4" WQVGA TFT - 480 x 272 pixels - Single-touch (analog resistive) - Cortex A8 processor - For VNC - 1x Ethernet 10/100, 1x USB 2.0 OTG mini - 1x key switch, 1x pushbutton - 1x stop button - 1x enable switch - 20x system key, 4x LED - 1x handwheel	39
5MP7140.070N-000	Mobile Panel 7100 7.0" WSVGA TFT - 600 x 1024 pixels - Single-touch (analog resistive) - Cortex-A9 processor - For mapp View and VNC - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 1x enable switch - 20x system key, 5x LED	43
5MP7150.101E-000	Mobile Panel 7100 10.1" WXGA TFT - 1280 x 800 pixels - Single-touch (analog resistive) - Cortex-A9 processor - For mapp View and VNC - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 1x enable switch - 21x system key, 5x LED	47
5MP7151.101E-000	Mobile Panel 7100 10.1" WXGA TFT - 1280 x 800 pixels - Single-touch (analog resistive) - Atom E3815 processor, 4 GB RAM - For Windows WES7 - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 1x enable switch - 21x system keys, 5x LEDs	51
5MP7151.101E-001	Mobile Panel 7100 10.1" WXGA TFT - 1280 x 800 pixels - Single-touch (analog resistive) - Atom E3815 processor, 4 GB RAM - For Windows WES7 - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 2x enable switch - 21x system keys, 5x LEDs	55
	USB accessories	
5MMUSB.032G-02	USB 3.0 flash drive 32 GB MLC	128
5MMUSB.2048-01	USB 2.0 flash drive 2048 MB B&R	125
5MMUSB.4096-01	USB 2.0 flash drive 4096 MB B&R	125
	Windows Embedded Standard 7	
5SWWI7.1848-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Service Pack 1 - Multilingual - For MP7151 - Installation (without Recovery DVD) - Only available with a new device	113

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 (see "Proper use of the machine or system" on page 68).

A color display ensures that all tasks can be managed visually, while the touch screen ensures an intuitive user interface.

2.1.1 Configuration

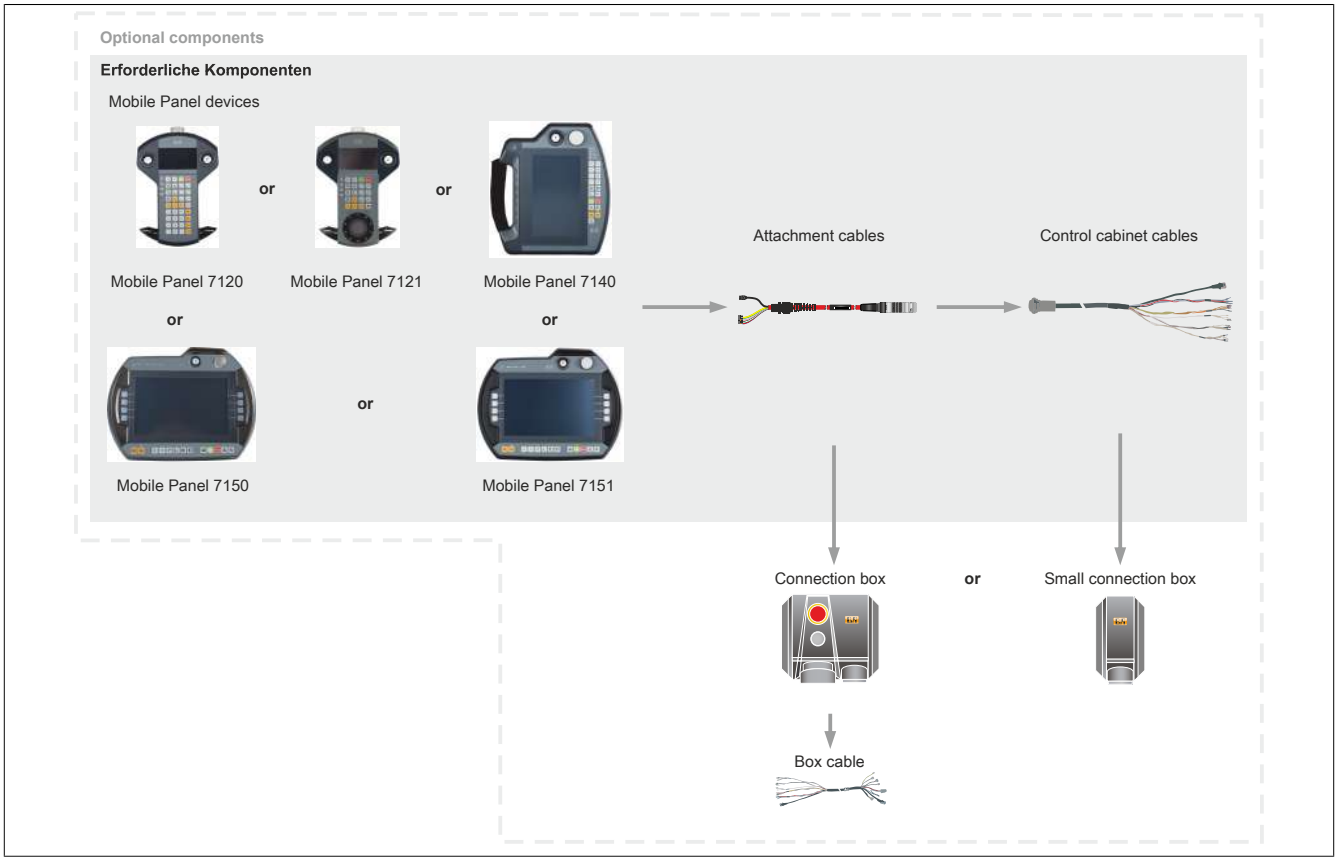


Figure 1: Mobile Panel selection guide

The attachment cable for Mobile Panel 7100 devices is available in various lengths (5CAMPH.xxxx-40). Once the desired length has been selected, there are 2 variants to choose from:

- Direct cable connection to the control cabinet (5CAMPC.0020-10 or 5CAMPC.0020-11) with optional small connection box (4MPCBX.0001-00).
- Alternatively, a large connection box (4MPCBX.0000-00) and the corresponding box cable (5CAMP-B.0xxx-10) can be used.

2.2 Complete system

2.2.1 Design

Mobile Panel devices are wired systems, i.e. they are connected to the control cabinet using a cable. The following individual components are needed for operation:

- Control device including handle
- Attachment cable

Figure 2: Design

2.2.1.1 Ergonomics

- Functional multigrip
- Round housing
- Various handling positions
- Left- and right-handed operation
- Desktop operation
- Wall mount operation
- Cable outlet position (on handle) easily adjustable to left or right side of housing
- Easy-to-read display

2.2.1.2 Housing

- Vibration- and shock-resistant
- Housing made from non-flammable material (UL 94V-0), impact-resistant with protection against water, cleaning agents (alcohol and surfactants), oils, cutting oils (drilling oils), grease and lubricants
- Double-walled, extremely rugged housing. Drop-tested from height of 1.5 m onto industrial floor.

2.2.1.3 Device interfaces

Interfaces are located on the bottom of Mobile Panel 715x and Mobile Panel 7140 and on the side of Mobile Panel 712x.

- Ethernet (10/100 Mbit)
- USB host for connecting various USB flash drives (MP7140 and MP715x)
- USB host for connecting USB OTG adapter cable (MP712x)

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

2.2.1.3.1 +24 VDC power supply

The power supply is provided with an individually selected attachment cable (see "Attachment cables" on page 59) and control cabinet cable (see "Control cabinet cables" on page 62). Alternatively, a large connection box (4MPCBX.0000-00) with associated box cable (see "Box cables" on page 137) can be used.

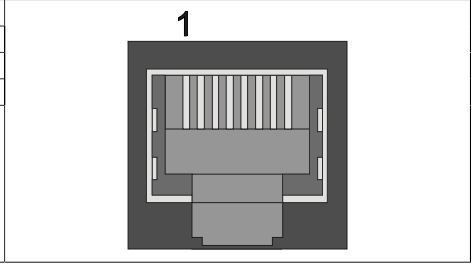
For the pinout, see the description of the corresponding cable type.

Danger!

- **The device is only permitted to be supplied with a SELV/PELV power supply or with safety extra-low voltage (SELV) per EN 60950.**
- **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.**

2.2.1.3.2 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)	
-		

1) Switching takes place automatically.

Information:

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

2.2.1.3.3 USB interface

Mobile Panel devices are equipped with a USB 2.0 interface designed solely for use with USB devices.

- Accessible behind the protective cover on MP712x and MP7140
- MP7150/MP7151: Exposed

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 guaranteed.

Warning!

Because this interface is designed according to general PC specifications, extreme care should be exercised with regard to EMC, cable routing, etc.

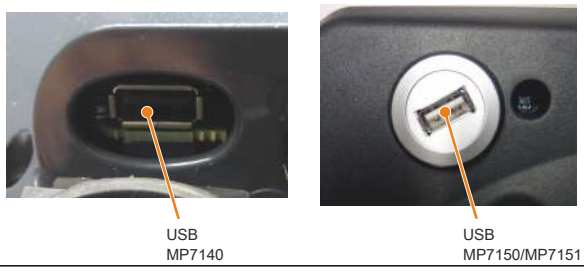
Universal Serial Bus (USB)		
Type	USB 2.0	1x USB type A, female
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current-carrying capacity[1)] USB	Max. 500 mA	
		

Table 3: MP7140 and MP715x USB interface

1) The USB interface is protected by a maintenance-free "USB current-limiting circuit breaker" (max. 500 mA).

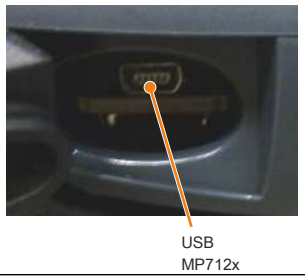
Universal Serial Bus (USB)		
Type	Mini USB 2.0 OTG	1x USB type B, female
Design	Type B	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current-carrying capacity[1)] USB	Max. 500 mA	
		

Table 4: MP712x USB interface

1) The USB interface is protected by a maintenance-free "USB current-limiting circuit breaker" (max. 500 mA).

2.2.1.4 Touch screen stylus pen

The touch screen stylus pen is attached and easy to access on the right side of the Mobile Panel 7140 housing. The stylus pen is not attached to Mobile Panel 715x devices.

Figure 3: Touch screen stylus pen

2.2.2 Enabling control devices (enabling devices)

The Mobile Panel can be equipped with two variants of enabling devices.

One variant has an enable switch located centrally on the back of the MP712x and MP7140 and on the side of the MP715x. This enabling device requires external evaluation electronics.

The variant with 2 enable switches is only available on the MP715x. The 2 enabling switches are located on the left and right sides of the Mobile Panel. This enabling device is equipped with internal evaluation electronics.

Both enabling devices allow for left- and right-handed operation. An enable switch consists of a three-position operating element. Significant features include the dual-circuit design, direct opening action per EN 60947-1 and direct opening action of the third switch position per EN 60947-5-8.

On a one- or two-button Mobile Panel 7151, the button can be read by the Control Center or a program using the Automation Device Interface (ADI library) for testing purposes.

Figure 4: Enabling control device

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.

2.2.2.1 Enabling control device with 2 enable switches

The Mobile Panel with two enable switches is equipped with internal evaluation electronics.

The enabling electronics filter out possible asynchronous output signals of the two-channel mechanical switching elements of the enabling device. As a result, both outputs of the enabling device are always synchronous.

If two enable switches are equipped, they are connected in parallel and have a similar effect on the overall safety circuits in the attachment cable. For the enabling function, it is sufficient to press one of the two buttons. Pressing both buttons simultaneously for more than 2 seconds causes the enabling signal on the output to be canceled when one of the two buttons is released. The enabling electronics also allow changing grip (left ↔ right) between the enable switches without switching off the signal on the output. It is important to ensure that both enable switches are not pressed simultaneously for more than 2 seconds in order to allow changing grip.

2.2.2.2 Functionality

The actuating element is composed of a rocker switch whose position is determined by electrical switches and passed on to the evaluation electronics.

The enable switch can have three different switch positions:

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

Table 5: Enable switch positions

Positions "Zero" and "Panic" must trigger a category 0 or 1 stop command.

Enable

Position "Enable" is the normal operating mode for the enable switch. In this position, it is possible to initiate an axis movement by subsequently pressing a direction key, for example.

When actuated, the enable switch moves from position "Zero" to position "Enable". When released, it returns to position "Zero".

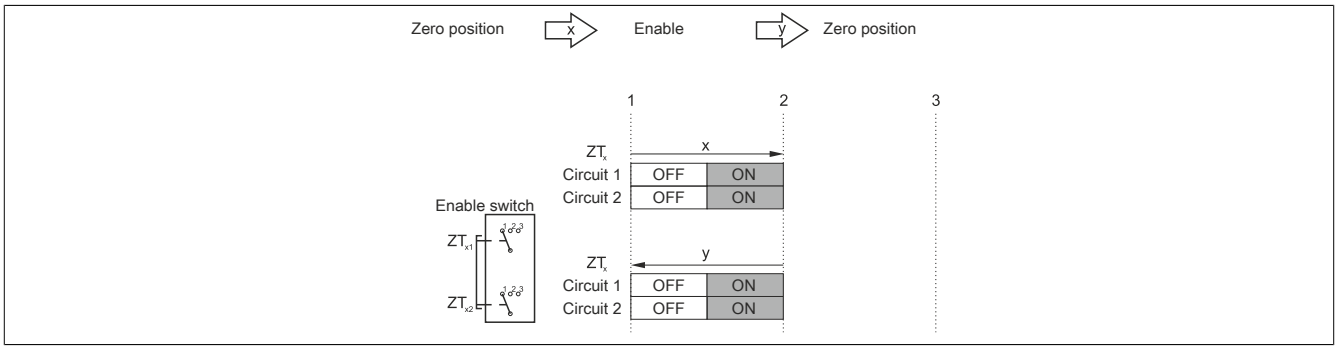


Figure 5: Contact travel diagram for normal actuation

Panic

If the enable switch is fully actuated (position "Enable" to position "Panic") and released, then the switch will return to position "Zero" by skipping over position "Enable".

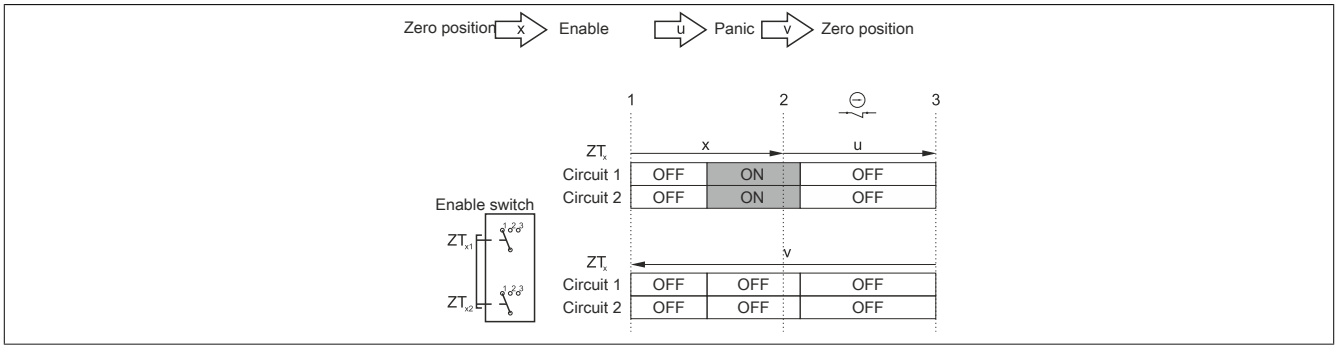


Figure 6: Contact travel diagram for panic actuation

Category 4 PL e can be achieved per EN ISO 13849-1:2015 by implementing the enabling device with 2 circuits, suitable dynamic monitoring for short circuits and cross faults and ensuring the simultaneity of these circuits of the safety components.

Category 4 PL e means that a single fault is not permitted to lead to the loss of the safety function, and that a single fault shall be detected at or before the next demand upon the safety function (e.g. immediately when switching on or at the end of a machine cycle).

In accordance with EN 60204-1, the enabling device must be implemented such that at least stop category 0, 1 or 2 is initiated at position 1 ("off" function of switch, operating element not actuated) and position 3 ("off" function, operating element actuated to position "Panic").

To calculate the PL of the enabling safety function, the safety characteristics (PL and B_{10d} values) of the involved components must be included in the calculation. For details about calculating the PL for the entire safety function, see EN ISO 13849-1 (listed in chapter 5 "Standards and certifications" on page 118).

Device with 1 enable switch

Category 4 PL e can be achieved per EN ISO 13849-1:2015 by implementing the enabling device with 2 circuits, suitable dynamic monitoring for short circuits and cross faults and ensuring the simultaneity of these circuits while taking into account the actuation cycles with regard to the B_{10d} value of the safety components.

Simultaneity monitoring by an external monitoring device is required since otherwise an accumulation of undetected faults could occur that would lead to a loss of the safety function.

Device with 2 enable switches

The internal monitoring device cyclically tests the enabling electronics for short circuits and cross faults. In this self-test, the enable signal is removed for the duration of the test pulse (max. 1 ms). Interferences in the enabling electronics are detected and cause the enable signal to be canceled on the output.

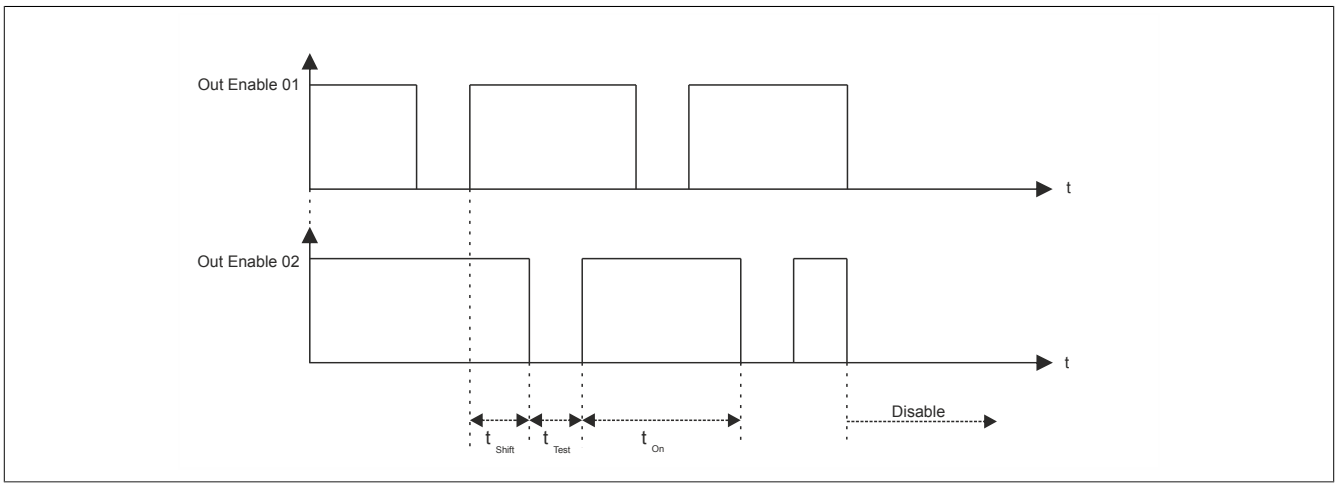


Figure 7: Enabling electronics - Testing for short circuits and cross faults

No external simultaneity monitor is required. It is recommended for detecting errors in the wiring, however.

2.2.2.3 Reasonably foreseeable misuse of the enable switch

"Reasonably foreseeable misuse" refers to the unauthorized use of other materials to hold the enable switch in the enable position. This reasonably foreseeable misuse must be minimized.

Warning!

- **The enable switch 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 enable switch by itself to issue commands that initiate dangerous states is not permitted. A second intentional start command is required for this (key on control device).**
- **The only person permitted in the danger zone is the person actuating the enable switch.**
- **See chapter "Standards and certifications" on page 118 for additional important information regarding the enabling device.**

Device with 1 enable switch

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

- Querying the enable switch when switching on the machine/system and when switching from automatic to manual mode (the enable switch is not permitted to be in position "Enable").
- Setting up a mechanism whereby the enable switch must be released within a predetermined period of time and only then brought back to position "Enable". The length of this time frame can be chosen according to the task at hand.

Device with 2 enable switches

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

- If one of the enable switches is already pressed when switching on manual operation, the enabling signal at the output will not be enabled.
- If an enable switch is held down in the enabling position for more than 15 minutes during operation, the enabling signal is canceled. The enabling signal is canceled until the enable switch is released and pressed again.

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, stop functionality must be tested periodically (every 6 months) by actuating the stop button.**
- **See section "Standards and certifications" on page 118 for additional important information about the stop button.**

2.2.4 Handwheel

If the Mobile Panel is equipped with a handwheel, then it will be evaluated by software and can be transfered to the controller in VNC mode via the RFB extension.

400 pulses are counted per revolution. A clockwise rotation of the handwheel increments, a counterclockwise rotation decrements the counter value 0 to 4294967295 (32-bit value).

Key features:

- 4 pulses/notching
- 100 notchings/revolution

Information:

- **It is not possible to reset the handwheel value.**
- **If the Mobile Panel falls to the floor, the mechanical position of the rotary knob must be checked. If necessary, the control knob can be reattached by pushing it into place from the top.**

2.2.5 Illuminated pushbutton

If the Mobile Panel is equipped with an illuminated pushbutton, then it can be evaluated using software. On the Mobile Panel 7151, the button or LED can be read or enabled by the Control Center or a program using the Automation Device Interface (ADI library). On the Mobile Panel 7120, 7121, 7140 and 7150, the button or LED can be transferred to the controller or switched via the RFB extension in VNC mode (for the hardware numbers of the button and LED, see 3.6 "Key and LED configuration").

2.2.6 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 7x51 using a program via the Automation Device Interface (ADI Library)..
On the Mobile Panel 7120, 7121, 7140 and 7150, the switch can be transferred to the controller via the RFB extension in VNC mode (for the hardware numbers of switch positions, 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.

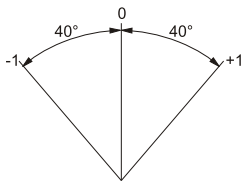


Figure 8: Key switch - Angle of rotation

Rotation angle of the key switch

2.2.7 Membrane keypad

2.2.7.1 Mobile Panel 7120

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

All keys are preconfigured when delivered.

Preconfigured keys can be used in web mode for mapp View keyboard events.

> **Information:**
>
> **Keys *Super L* and *Super R* correspond to the *left* and *right Windows* keys, respectively; key *Menu* corresponds to the Windows *Apps* key.**

The states of the keys or LEDs can be transferred to the controller or switched by the controller via the RFB extension in VNC mode.

> **Information:**
>
> **The Mobile Panel does not support fast blinking. Configuring fast blinking on a control page will be handled as slow blinking on the device.**

Figure 9: MP7120 - Membrane keypad

2.2.7.1.1 Keys/LEDs

Icon	Possible use	Factory key configuration
V+	Speed +	PAGE UP
V-	Speed -	PAGE DOWN
Start	Start	Super L
Stop	Stop	Pause
U	Application screen 1	F9
⚠	Alarm screen	F10

Table 6: MP7120 - Membrane keypad labels

Icon	Possible use	Factory key configuration
	F1	F1
	F2	F2
	Customer settings	Super R
	Positioning screen	F12
	F3	F3
	F4	F4
	Service page	Menu
	F5	F5
	F6	F6
	Up arrow	CURSOR UP
	Left	CURSOR LEFT
	Down arrow	CURSOR DOWN
	Right	CURSOR RIGHT
	Ctrl	CTRL RIGHT
	Number 0	0
	Number 1	1
	Number 2	2
	Number 3	3
	Number 4	4
	Number 5	5
	Number 6	6
	Number 7	7
	Number 8	8
	Number 9	9

Table 6: MP7120 - Membrane keypad labels

Icon	Possible use	Factory key configuration
.	Comma	.
-	Jog key	-
ESC	Cancel	ESC
DEL	DEL	DEL
2nd	2. Plane	LEFT SHIFT
↵	ENTER	RETURN
Run Error Motion Process	Application running Error in application Robot controller ready Process controller ready (cell/system ready)	

Table 6: MP7120 - Membrane keypad labels

2.2.7.2 Mobile Panel 7121

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

All keys are preconfigured when delivered.

Preconfigured keys can be used in web mode for mapp View keyboard events.

Information:

Keys *Super L* and *Super R* correspond to the *left* and *right Windows* keys, respectively; key *Menu* corresponds to the Windows *Apps* key.

The states of the keys or LEDs can be transferred to the controller or switched by the controller via the RFB extension in VNC mode.

Information:

The Mobile Panel does not support fast blinking. Configuring fast blinking on a control page will be handled as slow blinking on the device.

Figure 10: MP7121 - Membrane keypad

2.2.7.2.1 Keys/LEDs

Icon	Possible use	Factory key configuration
V+	Speed +	PAGE UP
V-	Speed -	PAGE DOWN
Start	Start	Super L
Stop	Stop	Pause
U	Application screen 1	F9
⚠	Alarm screen	F10

Table 7: MP7121 - Membrane keypad labels

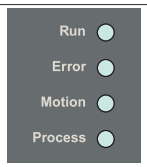
Icon	Possible use	Factory key configuration
	F1	F1
	F2	F2
	Customer settings	Super R
	F12	F12
	F3	F3
	F4	F4
	Service page	Menu
	F5	F5
	F6	F6
	Up arrow	CURSOR UP
	Left	CURSOR LEFT
	Down arrow	CURSOR DOWN
	Right	CURSOR RIGHT
	Ctrl	CTRL RIGHT
	Application running Error in application Robot controller ready Process controller ready (cell/system ready)	

Table 7: MP7121 - Membrane keypad labels

2.2.7.3 Mobile Panel 7140

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

All keys are preconfigured when delivered.

Preconfigured keys can be used in web mode for mapp View keyboard events.

Information:

Keys *Super L* and *Super R* correspond to the *left* and *right Windows* keys, respectively; key *Menu* corresponds to the Windows *Apps* key.

The states of the keys or LEDs can be transferred to the controller or switched by the controller via the RFB extension in VNC mode.

Information:

The Mobile Panel does not support fast blinking. Configuring fast blinking on a control page will be handled as slow blinking on the device.

Figure 11: MP7140 - Membrane keypad

2.2.7.3.1 Keys/LEDs

Icon	Possible use	Factory key configuration
	Application screen 1	F9
	Customer settings	Super R
	Variable monitor	Home
	Project screen	End
	Service page	Menu
	Positioning screen	F12

Table 8: MP7140 - Membrane keypad labeling

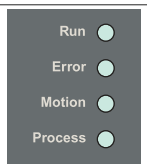
Icon	Possible use	Factory key configuration
	Alarm screen	F10
	Start	Super L
	Stop	Pause
	F1, F3, F5	F1, F3, F5
	F2, F4, F6	F2, F4, F6
	2. Plane	LEFT SHIFT
	Cancel	ESC
	Speed -	PAGE DOWN
	Speed +	PAGE UP
	Ctrl	LEFT CTRL
	Application running Error in application Robot controller ready Process controller ready (cell/system ready)	

Table 8: MP7140 - Membrane keypad labeling

2.2.7.4 Mobile Panel 7150

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

All keys are preconfigured when delivered.

Preconfigured keys can be used in web mode for mapp View keyboard events.

Information:

Keys *Super L* and *Super R* correspond to the *left* and *right Windows* keys, respectively; key *Menu* corresponds to the Windows *Apps* key.

The states of the keys or LEDs can be transferred to the controller or switched by the controller via the RFB extension in VNC mode.

Information:

The Mobile Panel does not support fast blinking. Configuring fast blinking on a control page will be handled as slow blinking on the device.

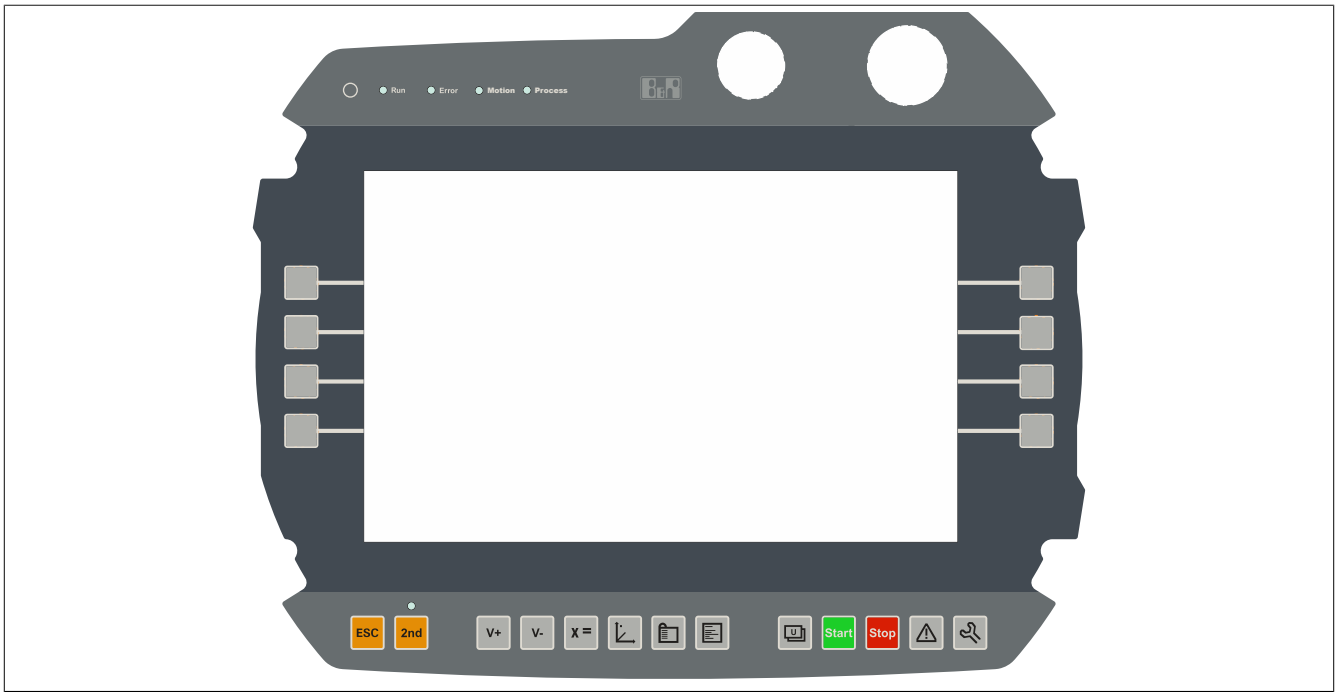


Figure 12: MP7150 - Membrane keypad

2.2.7.4.1 Keys/LEDs

Icon	Possible use	Factory key configuration
	Application screen 1	F9
	Customer settings	Super R
	Variable monitor	Home
	Project screen	End
	Service page	Menu
	Positioning screen	F12

Table 9: MP7150 - Membrane keypad labeling

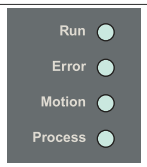
Icon	Possible use	Factory key configuration
	Alarm screen	F10
	Start	Super L
	Stop	Pause
	2. Plane	LEFT SHIFT
	Cancel	ESC
	Speed -	PAGE DOWN
	Speed +	PAGE UP
	Ctrl	LEFT CTRL
	F1 to F8	F1 to F8
	Application running Error in application Robot controller ready Process controller ready (cell/system ready)	

Table 9: MP7150 - Membrane keypad labeling

2.2.7.5 Mobile Panel 7151

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

Nearly all keys are preconfigured when delivered. The key configuration can be changed in a text file and transferred to the device using the ADI Control Center (included in Windows, see "MP7151 key configuration" on page 81).

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

Information:

The MP7151 does not support fast blinking; the ADI library handles fast blinking the same as slow blinking.

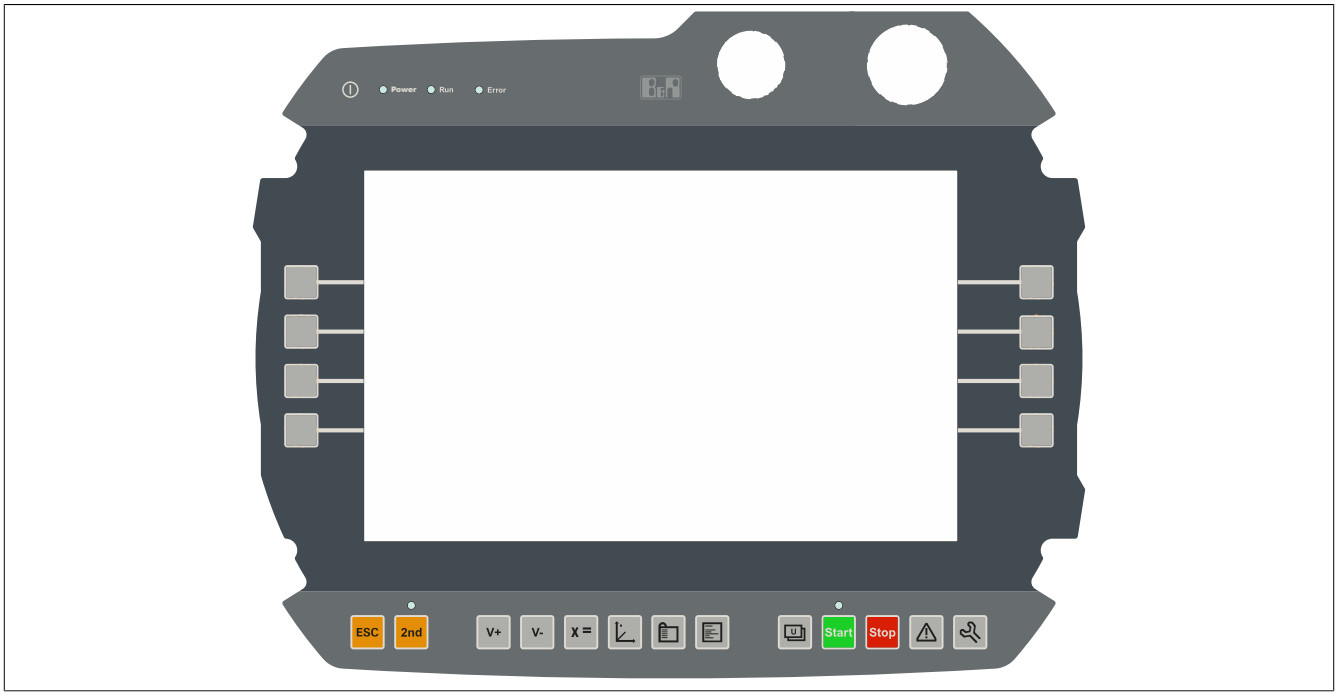


Figure 13: MP7151 - Membrane keypad

2.2.7.5.1 Keys/LEDs

Icon	Possible use	Factory key configuration
	Application screen 1	Not preset
	Customer settings	Not preset
	Variable monitor	Not preset
	Project screen	Not preset
	Shortcut menu	APPS
	Positioning screen	Not preset
	Alarm screen	Not preset
Start	Start	Left Windows key

Table 10: MP7151 - Membrane keypad labeling

Icon	Possible use	Factory key configuration
Stop	Stop	Not preset
2nd	2. Plane	LEFT SHIFT
ESC	Cancel	ESC
V-	Speed -	PAGE DOWN
V+	Speed +	PAGE UP
Power Run Error	Device running Application running Error in application	

Table 10: MP7151 - Membrane keypad labeling

2.3 Individual components

2.3.1 Control devices

2.3.1.1 5MP7120.034F-000

2.3.1.1.1 General information

- 3.4" TFT WQVGA color display
- Single-touch (analog resistive)
- ARM Cortex A8 architecture 600 MHz
- 36 system keys
- Stop button
- 3-position enable switch
- Key switch

2.3.1.1.2 Order data

Model number	Short description	Figure
	System units	
5MP7120.034F-000	Mobile Panel 7100 3,4" WQVGA TFT - 480 x 272 pixels - Single-touch (analog resistive) - Cortex A8 processor - For VNC - 1x Ethernet 10/100, 1x USB 2.0 OTG mini - 1x key switch, 1x pushbutton - 1x stop button - 1x enable switch - 36x system key, 4x LED	
	Required accessories	
	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	
	VNC Client	
5SWVIS.VC52-ENG	VNC client - English - For MP7120 and MP7121 - Installation (without Recovery DVD) - Only available with a new device	

Table 11: 5MP7120.034F-000 - Order data

Model number	Short description	Figure
	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	
5ACCWB20.0000-000	Mobile Panel 7100 wall mount - For MP7120 and MP7121	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	

Table 11: 5MP7120.034F-000 - Order data

2.3.1.1.3 Components

Figure 14: 5MP7120.034F-00 - Components

2.3.1.1.4 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.

Model number	5MP7120.034F-000
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
EAC	Yes
KC	Yes
Controller	
Processor	
Type	ARM Cortex-A8 architecture
Clock frequency	600 MHz
Flash	256 MB
Display	
Type	TFT color
Diagonal	3.4"
Colors	65535 colors [1)]

Table 12: 5MP7120.034F-000 - Technical data

Model number	5MP7120.034F-000
Resolution	WQVGA, 480 x 272 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Brightness	400 cd/m²
Half-brightness time	50,000 h
Touch screen	
Technology	Analog, resistive
Interfaces	
USB	
Quantity	1
Type	Mini USB 2.0 OTG
Variant	Type B
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	500 mA
Ethernet	
Quantity	1 [2)]
Variant	RJ45, shielded
Transfer rate	10/100 Mbit/s
Max. baud rate	100 Mbit/s
Keys	
System keys	36 numeric keys, cursor block
Illuminated button	Yes (white)
Stop button	Yes (2 normally closed contacts)
Enable switch	Yes (3-position button)
Key switch	Yes
LEDs	4
Operating system	
Edition	VNC client (Linux)
Architecture	ARM
Language	English
Preinstallation	Yes
Electrical properties	
Nominal voltage [2)]	24 VDC ±25% (integrated reverse polarity protection), SELV [3)]
Inrush current	Max. 5.6 A (current limiting available)
Power consumption	6 W (250 mA at 24 VDC)
Max. interruption of power supply	≤10 ms
Operating conditions	
Drop height	1 m to industrial floor
Flame-retardant	UL 94 / V-0
Degree of protection per EN 60529	IP65
Protection class	Class 3 per EN 61131-2 or EN 50178
Ambient conditions	
Temperature	
Operation	0 to 45°C
Storage	-20 to 70°C
Transport	-20 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	10 to 57 Hz: 0.15 mm amplitude / 9 to 150 Hz: 2 g
Shock	
Operation	25 g, 11 ms
Elevation	
Operation	Max. 2000 m
Mechanical properties	
Housing	
Material	ABS/PC
Front	
Panel overlay	
Material	Polyester

Table 12: 5MP7120.034F-000 - Technical data

Model number	5MP7120.034F-000
Dimensions	
Width	162 mm
Height	238.4 mm (with stop button)
Depth	49 mm
Weight	Approx. 480 g

Table 12: 5MP7120.034F-000 - Technical data

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) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.

2.3.1.1.5 Temperature/Humidity diagram

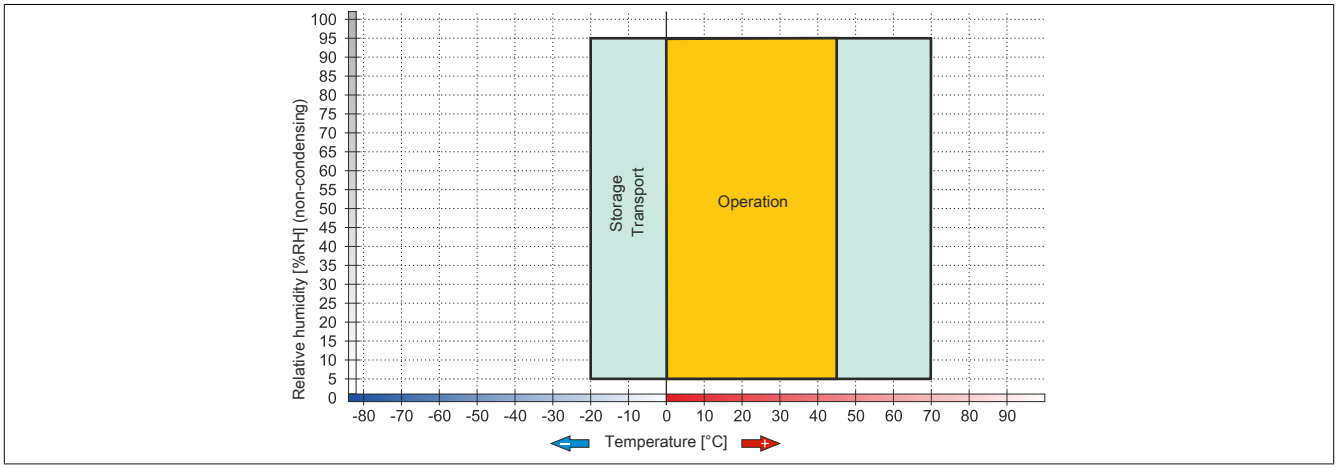


Figure 15: 5MP7120.034F-000 - Temperature/Humidity diagram

2.3.1.1.6 Dimensions

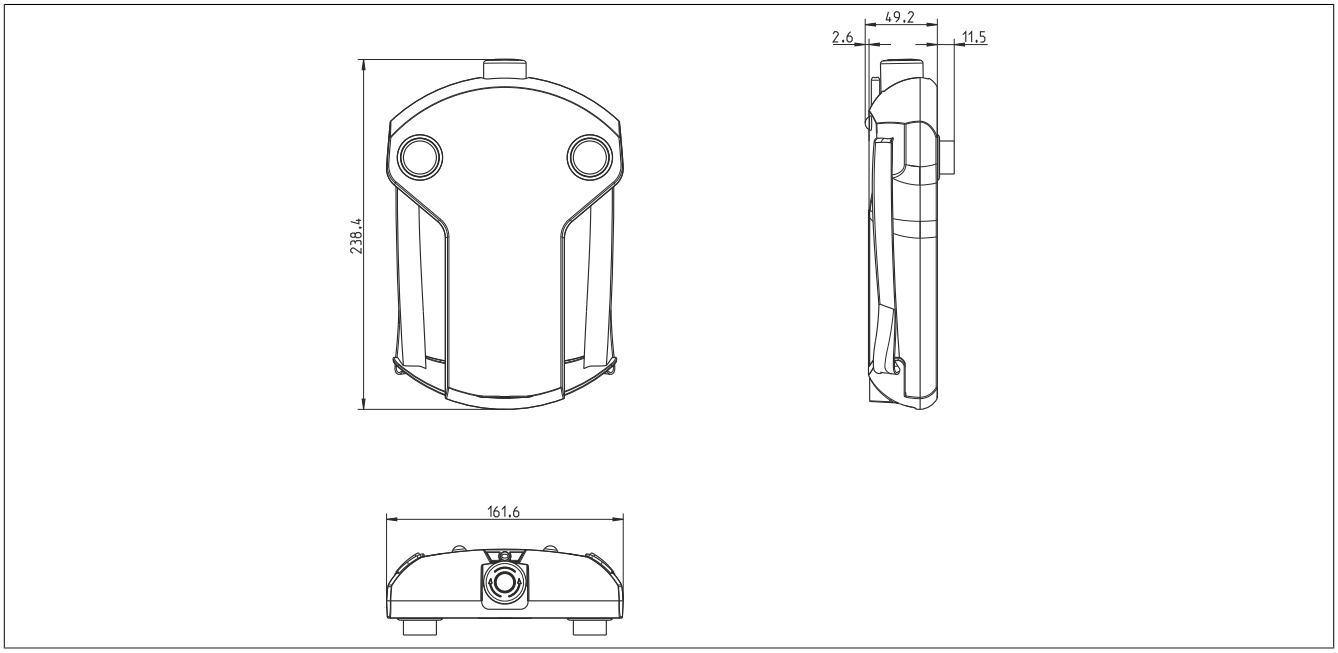


Figure 16: 5MP7120.034F-000 - Dimensions

2.3.1.2 5MP7121.034F-000

2.3.1.2.1 General information

- 3.4" TFT WQVGA color display
- Single-touch (analog resistive)
- ARM Cortex A8 architecture 600 MHz
- 20 system keys
- Stop button
- 3-position enable switch
- Handwheel
- Key switch

2.3.1.2.2 Order data

Model number	Short description	Figure
	System units	
5MP7121.034F-000	Mobile Panel 7100 3.4" WQVGA TFT - 480 x 272 pixels - Single-touch (analog resistive) - Cortex A8 processor - For VNC - 1x Ethernet 10/100, 1x USB 2.0 OTG mini - 1x key switch, 1x pushbutton - 1x stop button - 1x enable switch - 20x system key, 4x LED - 1x handwheel	
	Required accessories	
	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	
	VNC Client	
5SWVIS.VC52-ENG	VNC client - English - For MP7120 and MP7121 - Installation (without Recovery DVD) - 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	
5ACCWB20.0000-000	Mobile Panel 7100 wall mount - For MP7120 and MP7121	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	

Table 13: 5MP7121.034F-000 - Order data

2.3.1.2.3 Components

Figure 17: 5MP7121.034F-000 - Components

2.3.1.2.4 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.

Model number	5MP7121.034F-000
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
EAC	Yes
KC	Yes
Controller	
Processor	
Type	ARM Cortex A8 architecture
Clock frequency	600 MHz
Flash	256 MB
Display	
Type	TFT color
Diagonal	3.4"
Colors	65535 colors [1)]
Resolution	WQVGA, 480 x 272 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Brightness	400 cd/m²
Half-brightness time	50,000 h
Touch screen	
Technology	Analog, resistive

Table 14: 5MP7121.034F-000 - Technical data

Model number	5MP7121.034F-000
Interfaces	
USB	
Quantity	1
Type	Mini USB 2.0 OTG
Variant	Type B
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current-carrying capacity	500 mA
Ethernet	
Quantity	1 [2)]
Variant	Shielded RJ45
Transfer rate	10/100 Mbit/s
Max. baud rate	100 Mbit/s
Keys	
System keys	20 numeric keys, cursor block
Electronic handwheel	Yes
Illuminated button	Yes (white)
Stop button	Yes (2 normally closed contacts)
Enable switch	Yes (3-position switch)
Key switch	Yes
LEDs	4
Operating system	
Edition	VNC client (Linux)
Architecture	ARM
Language	English
Preinstallation	Yes
Electrical properties	
Nominal voltage [2)]	24 VDC ±25% (integrated reverse polarity protection), SELV [3)]
Inrush current	Max. 5.6 A (current limiting available)
Power consumption	6 W (250 mA at 24 VDC)
Max. interruption of power supply	≤10 ms
Operating conditions	
Drop height	1 m to industrial floor
Flame-retardant	UL94-V0
Degree of protection per EN 60529	IP65
Protection class	Class 3 in accordance with EN 61131-2 or EN 50178
Ambient conditions	
Temperature	
Operation	0 to 45°C
Storage	-20 to 70°C
Transport	-20 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	10 to 57 Hz: 0.15 mm amplitude / 9 to 150 Hz: 2 g
Shock	
Operation	25 g, 11 ms
Elevation	
Operation	Max. 2000 m
Mechanical properties	
Housing	
Material	ABS/PC
Front	
Panel overlay	
Material	Polyester
Dimensions	
Width	162 mm
Height	238.4 mm (with stop button)
Depth	49 mm
Weight	Approx. 480 g

Table 14: 5MP7121.034F-000 - Technical data

1) The actual number of colors depends on the graphics memory, the configured graphics mode and the graphics driver being used.
2) Connection via Mobile Panel cable.
3) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.

2.3.1.2.5 Temperature/Humidity diagram

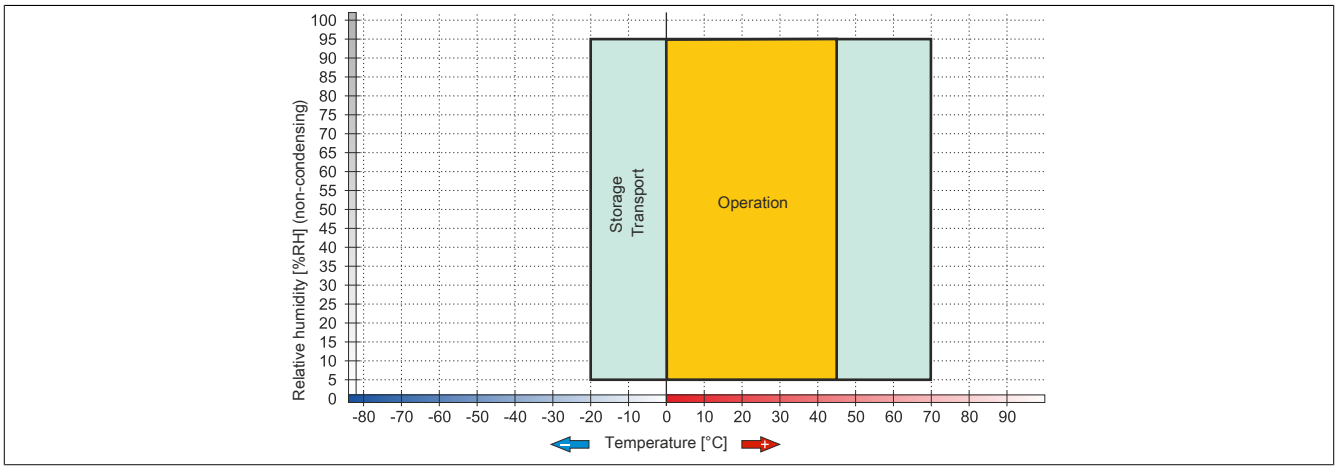


Figure 18: 5MP7121.034F-000 - Temperature/Humidity diagram

2.3.1.2.6 Dimensions

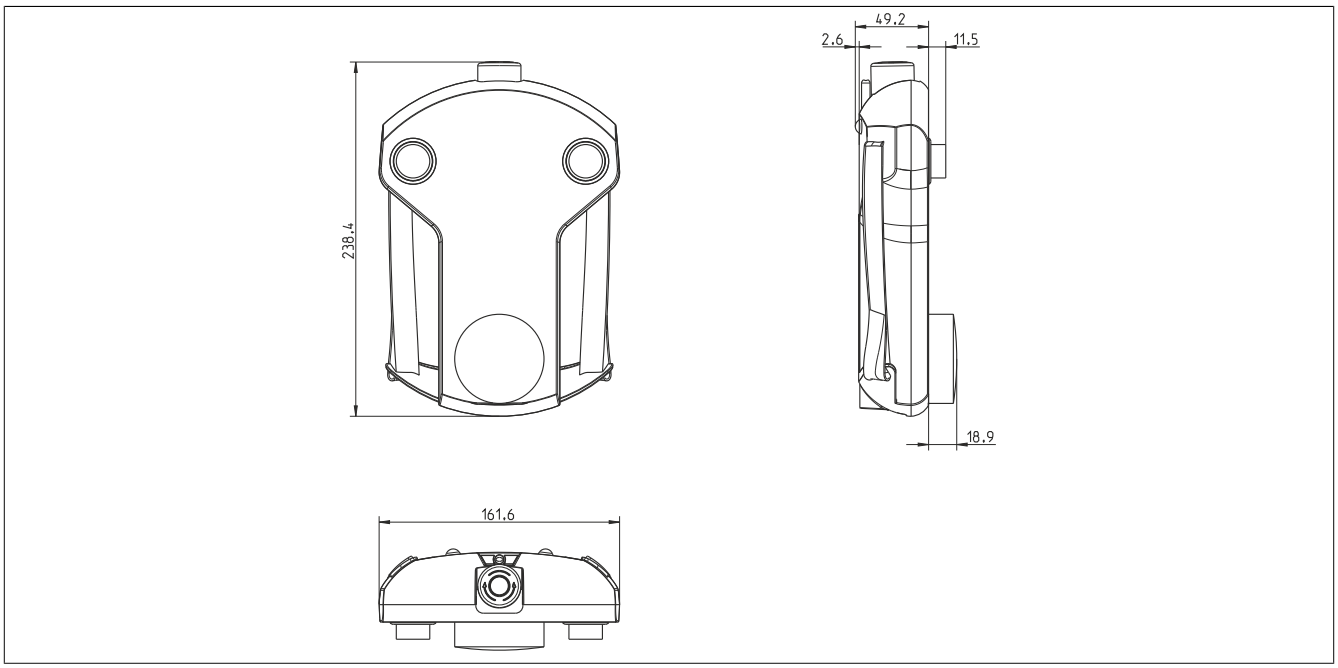


Figure 19: 5MP7121.034F-000 - Dimensions

2.3.1.3 5MP7140.070N-000

2.3.1.3.1 General information

- 7.0" TFT WSVGA color display
- Single-touch (analog resistive)
- Freescale i.MX6 single core 1 GHz
- 20 system keys
- Stop button
- 3-position enable switch
- Key switch

2.3.1.3.2 Order data

Model number	Short description	Figure
	System units	
5MP7140.070N-000	Mobile Panel 7100 7.0" WSVGA TFT - 600 x 1024 pixels - Single-touch (analog resistive) - Cortex-A9 processor - For mapp View and VNC - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 1x enable switch - 20x system key, 5x LED	
	Required accessories	
	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	
	mapp View and VNC Client	
5SWVIS.MP46-ENG	mapp View and VNC client - English - For MP7140 - Installation (without Recovery DVD) - 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	
5ACCWB40.0000-000	Mobile Panel 7100 wall mount - For MP7140	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	

Table 15: 5MP7140.070N-000 - Order data

2.3.1.3.3 Components

Figure 20: 5MP7140.070N-000 - Components

2.3.1.3.4 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.

Model number	**5MP7140.070N-000**
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
EAC	Yes
KC	Yes
Controller	
Processor	
Type	Freescale i.MX6 single core
Clock frequency	1000 MHz
Flash	4 GB
Display	
Type	TFT color
Diagonal	7.0"
Colors	16.7 million [1)]
Resolution	WSVGA, 1024 x 600 pixels
Contrast	500:1
Viewing angles	
Horizontal	Direction R = 75° / Direction L = 75°
Vertical	Direction U = 70 to 75° / Direction D = 70 to 75°
Backlight	
Brightness	320 cd/m²
Half-brightness time	20,000 h
Touch screen	
Technology	Analog, resistive
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Variant	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA

Table 16: 5MP7140.070N-000 - Technical data

Model number	5MP7140.070N-000
Ethernet	
Quantity	1 [2]
Variant	Shielded RJ45
Transfer rate	10/100 Mbit/s
Max. baud rate	100 Mbit/s
Keys	
System keys	20 numeric keys, cursor block
Stop button	Yes (2 normally closed contacts)
Enable switch	Yes (3-position switch)
Key switch	Yes
LEDs	5
Operating system	
Edition	mapp View and VNC client [3]
Architecture	ARM
Language	English
Preinstallation	Yes
Electrical properties	
Nominal voltage [2]	24 VDC ±25% (integrated reverse polarity protection), SELV [4]
Inrush current	Max. 5.6 A (current limiting available)
Power consumption	12 W (500 mA at 24 VDC)
Max. interruption of power supply	≤10 ms
Operating conditions	
Drop height	1.5 m to industrial floor, then at least IP54 protection
Flame-retardant	UL94-V0
Degree of protection per EN 60529	IP65
Protection class	Class 3 in accordance with EN 61131-2 or EN 50178
Ambient conditions	
Temperature	
Operation	0 to 45°C
Storage	-20 to 70°C
Transport	-20 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: 1 g
Shock	
Operation	15 g, 11 ms
Elevation	
Operation	Max. 2000 m
Mechanical properties	
Housing	
Material	ABS
Front	
Panel overlay	
Material	Polyester
Dimensions	
Width	212 mm
Height	251 mm
Depth	73 mm (with stop button)
Weight	Approx. 950 g

Table 16: 5MP7140.070N-000 - Technical data

1) The actual number of colors depends on the graphics memory, the configured graphics mode and the graphics driver being used.
2) Connection via Mobile Panel cable.
3) mapp View and VNC client: For specifications, see sections "VNC service page" and "Web service page" in the user's manual.
4) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.

2.3.1.3.5 Temperature/Humidity diagram

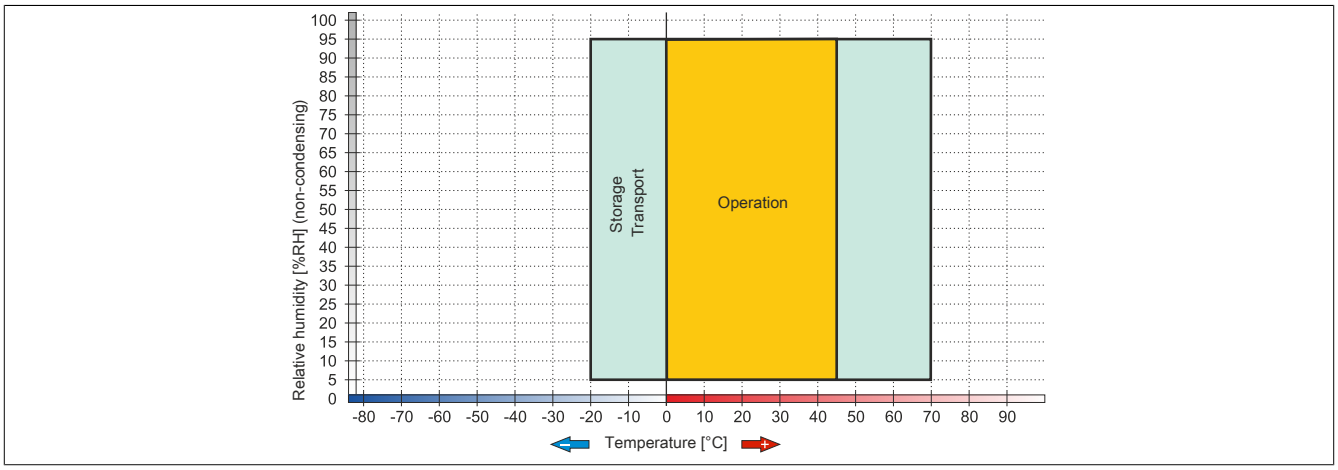


Figure 21: 5MP7140.070N-000 - Temperature/Humidity diagram

2.3.1.3.6 Dimensions

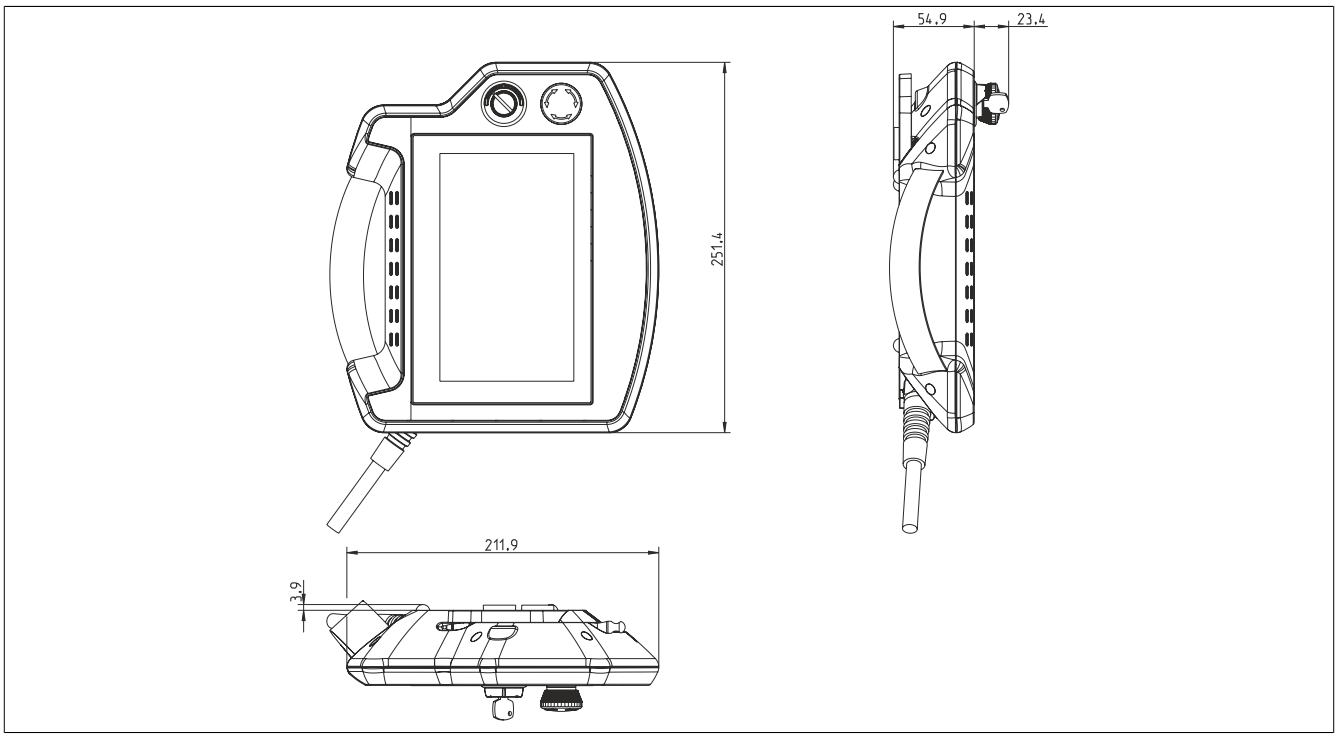


Figure 22: 5MP7140.070N-000 - Dimensions

2.3.1.4 5MP7150.101E-000

2.3.1.4.1 General information

- 10.1" TFT WXGA color display
- Single-touch (analog resistive)
- Freescale i.MX6 single core 1 GHz
- 22 system keys
- Stop button
- 3-position enable switch
- Key switch

2.3.1.4.2 Order data

Model number	Short description	Figure
	System units	
5MP7150.101E-000	Mobile Panel 7100 10.1" WXGA TFT - 1280 x 800 pixels - Single-touch (analog resistive) - Cortex-A9 processor - For mapp View and VNC - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 1x enable switch - 21x system key, 5x LED	
	Required accessories	
	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	
	mapp View and VNC Client	
5SWVIS.MP47-ENG	mapp View and VNC client - English - For MP7150 - Installation (without Recovery DVD) - 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	
5ACCWB50.0000-000	Mobile Panel 7100 wall mount - For MP7150/MP7151	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	

Table 17: 5MP7150.101E-000 - Order data

2.3.1.4.3 Components

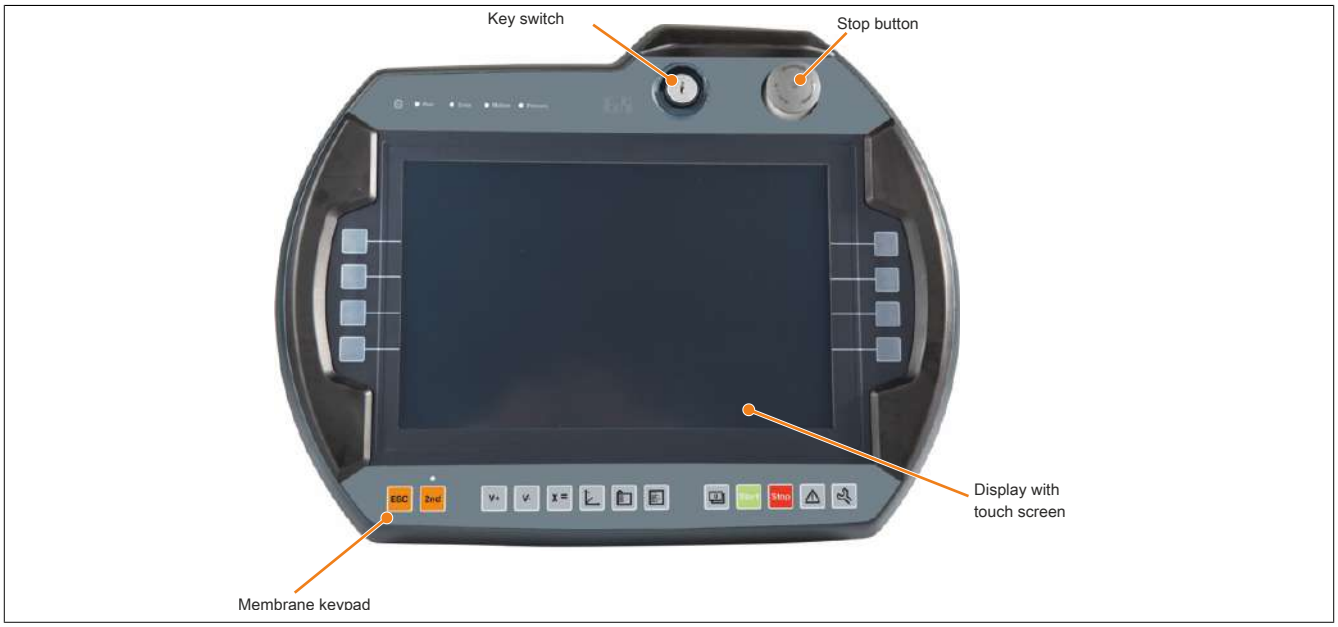


Figure 23: 5MP7150.101E-000 - Components

2.3.1.4.4 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.

Model number	5MP7150.101E-000
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
EAC	Yes
KC	Yes
Controller	
Processor	
Type	ARM Cortex-A9 i.MX6
Clock frequency	1000 MHz
Flash	4 GB
Display	
Type	TFT color
Diagonal	10.1"
Colors	16.7 million [1)]
Resolution	WXGA, 1280 x 800 pixels
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	Analog, resistive
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Variant	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA

Table 18: 5MP7150.101E-000 - Technical data

Model number	5MP7150.101E-000
Ethernet	
Quantity	1 [2]
Variant	Shielded RJ45
Transfer rate	10/100 Mbit/s
Max. baud rate	100 Mbit/s
Keys	
System keys	22 numeric keys, cursor block
Stop button	Yes (2 normally closed contacts)
Enable switch	Yes (3-position button, right position)
Key switch	Yes
LEDs	5
Operating system	
Edition	mapp View and VNC client [3]
Architecture	ARM
Language	English
Preinstallation	Yes
Electrical properties	
Nominal voltage [2]	24 VDC ±25% (integrated reverse polarity protection), SELV [4]
Inrush current	Max. 5.6 A (current limiting available)
Power consumption	12 W (500 mA at 24 V DC), max. 15 W (with USB load)
Max. interruption of power supply	≤10 ms
Operating conditions	
Drop height	1 m to industrial floor
Flame-retardant	UL94-V0
Degree of protection per EN 60529	IP65
Protection class	Class 3 in accordance with EN 61131-2 or 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: 1 g
Shock	
Operation	15 g, 11 ms
Elevation	
Operation	Max. 2000 m
Mechanical properties	
Housing	
Material	ABS
Front	
Panel overlay	
Material	Polyester
Dimensions	
Width	353 mm
Height	274 mm
Depth	109.5 mm (with stop button)
Weight	Approx. 2000 g

Table 18: 5MP7150.101E-000 - Technical data

1) The actual number of colors depends on the graphics memory, the configured graphics mode and the graphics driver being used.
2) Connection via Mobile Panel cable.
3) mapp View and VNC client: For specifications, see sections "VNC service page" and "Web service page" in the user's manual.
4) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.

2.3.1.4.5 Temperature/Humidity diagram

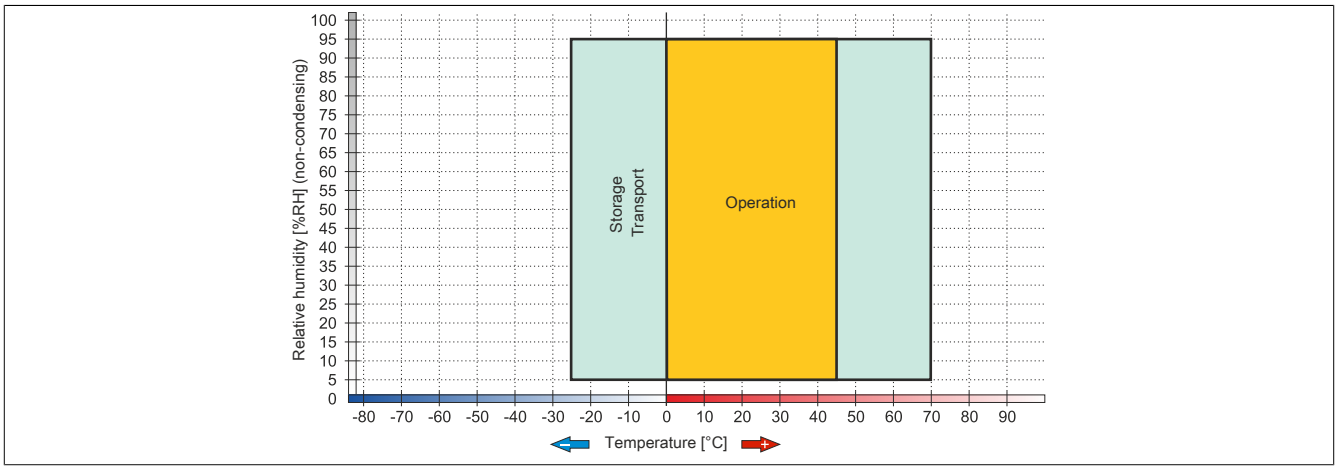


Figure 24: MP715x.101E-00x - Temperature/Humidity diagram

2.3.1.4.6 Dimensions

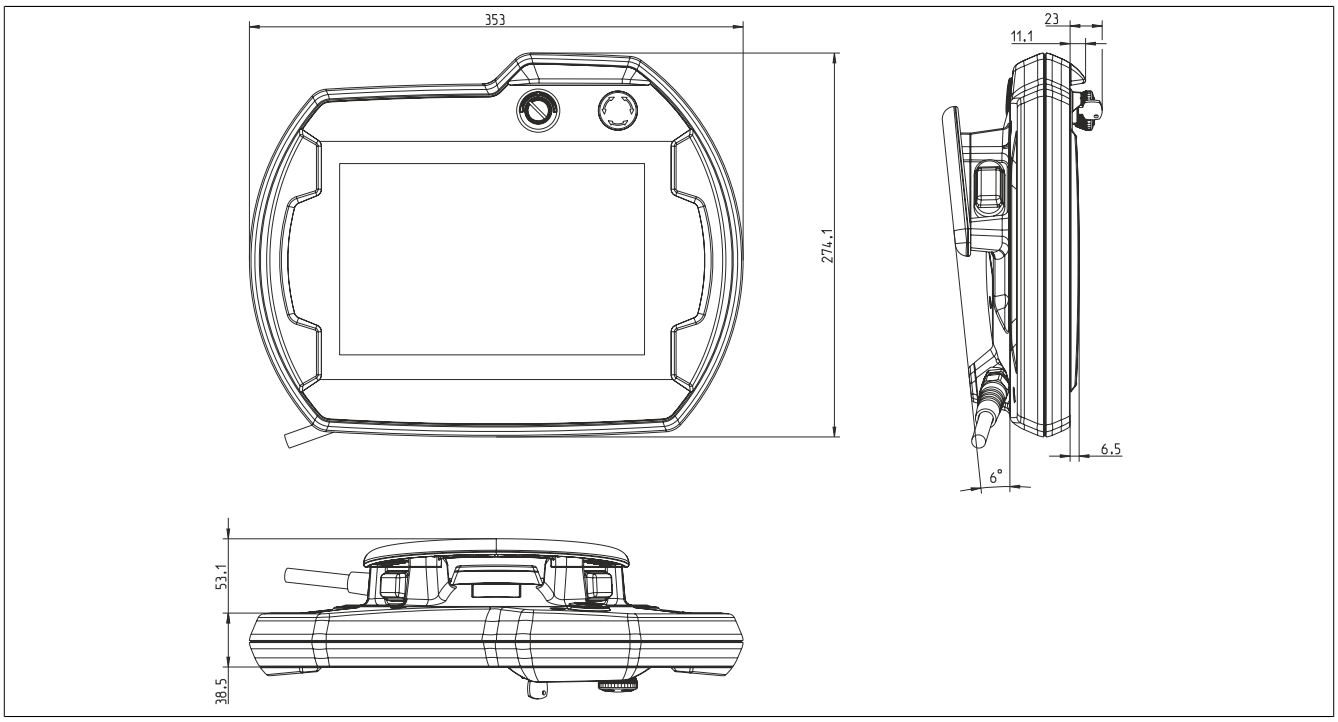


Figure 25: 5MP7150.101E-000 - Dimensions

2.3.1.5 5MP7151.101E-000

2.3.1.5.1 General information

- 10.1" TFT WXGA color display
- Single-touch (analog resistive)
- Intel Atom E3815 1.46 GHz
- 22 system keys
- Stop button
- 3-position enable switch
- Key switch

2.3.1.5.2 Order data

Model number	Short description	Figure
	System units	
5MP7151.101E-000	Mobile Panel 7100 10.1" WXGA TFT - 1280 x 800 pixels - Single-touch (analog resistive) - Atom E3815 processor, 4 GB RAM - For Windows WES7 - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 1x enable switch - 21x system keys, 5x LEDs	
	Required accessories	
	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	
	Windows Embedded Standard 7	
5SWWI7.1848-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Service Pack 1 - Multilingual - For MP7151 - Installation (without Recovery DVD) - 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	
5ACCWB50.0000-000	Mobile Panel 7100 wall mount - For MP7150/MP7151	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	

Table 19: 5MP7151.101E-000 - Order data

2.3.1.5.3 Components

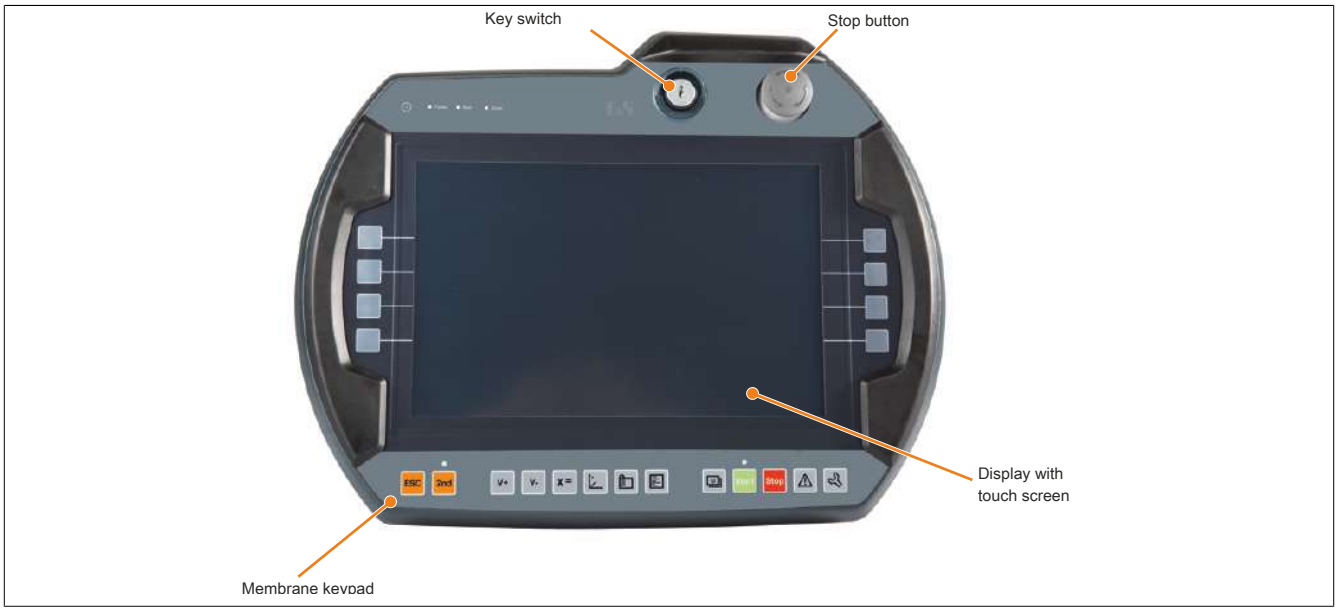


Figure 26: 5MP7151.101E-00x - Components

2.3.1.5.4 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.

Model number	5MP7151.101E-000
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
EAC	Yes
KC	Yes
Controller	
Processor	
Type	Intel Atom E3815
Clock frequency	1460 MHz
Flash	32 GB
Display	
Type	TFT color
Diagonal	10.1"
Colors	16.7 million [1)]
Resolution	WXGA, 1280 x 800 pixels
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	Analog, resistive
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Variant	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA

Table 20: 5MP7151.101E-000 - Technical data

Model number	5MP7151.101E-000
Ethernet	
Quantity	1 [2]
Variant	Shielded RJ45
Transfer rate	10/100 Mbit/s
Max. baud rate	100 Mbit/s
Keys	
System keys	22 numeric keys, cursor block
Stop button	Yes (2 normally closed contacts)
Enable switch	Yes (3-position button, right position)
Key switch	Yes
LEDs	5
Operating system	
Edition	Windows Embedded Standard 7
Architecture	64-bit
Service pack	SP1
Language	English
Preinstallation	Yes
Electrical properties	
Nominal voltage [2]	24 VDC ±25% (integrated reverse polarity protection), SELV [3]
Inrush current	Max. 5.6 A (current limiting available)
Power consumption	12 W (500 mA at 24 V DC), max. 15 W (with USB load)
Max. interruption of power supply	≤10 ms
Operating conditions	
Drop height	1 m to industrial floor
Flame-retardant	UL94-V0
Degree of protection per EN 60529	IP65
Protection class	Class 3 in accordance with EN 61131-2 or 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: 1 g
Shock	
Operation	15 g, 11 ms
Elevation	
Operation	Max. 2000 m
Mechanical properties	
Housing	
Material	ABS
Front	
Panel overlay	
Material	Polyester
Dimensions	
Width	353 mm
Height	274 mm
Depth	109.5 mm (with stop button)
Weight	Approx. 2000 g

Table 20: 5MP7151.101E-000 - Technical data

1) The actual number of colors depends on the graphics memory, the configured graphics mode and the graphics driver being used.
2) Connection via Mobile Panel cable.
3) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.

2.3.1.5.5 Temperature/Humidity diagram

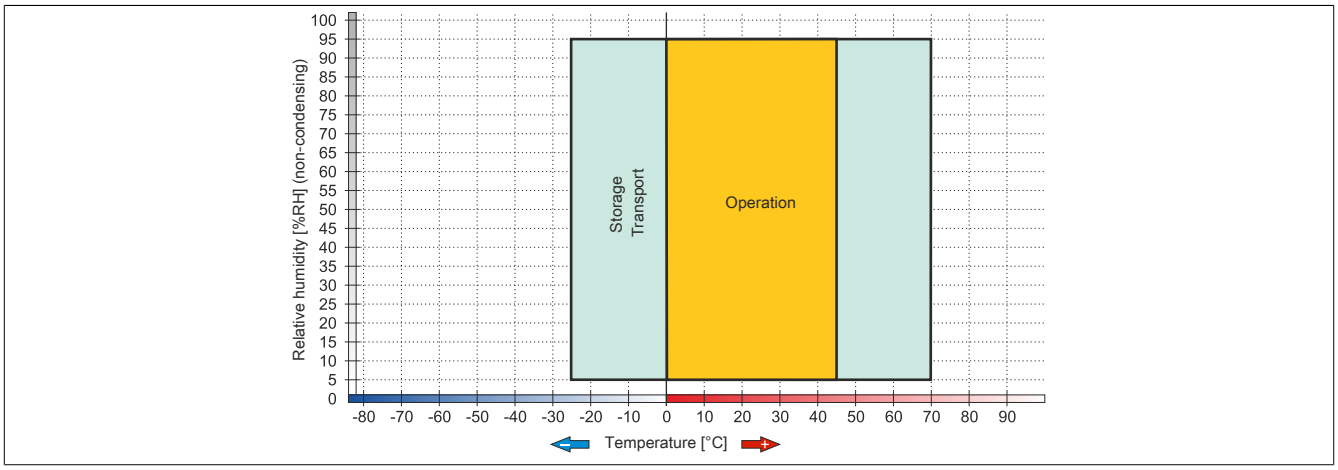


Figure 27: MP715x.101E-00x - Temperature/Humidity diagram

2.3.1.5.6 Dimensions

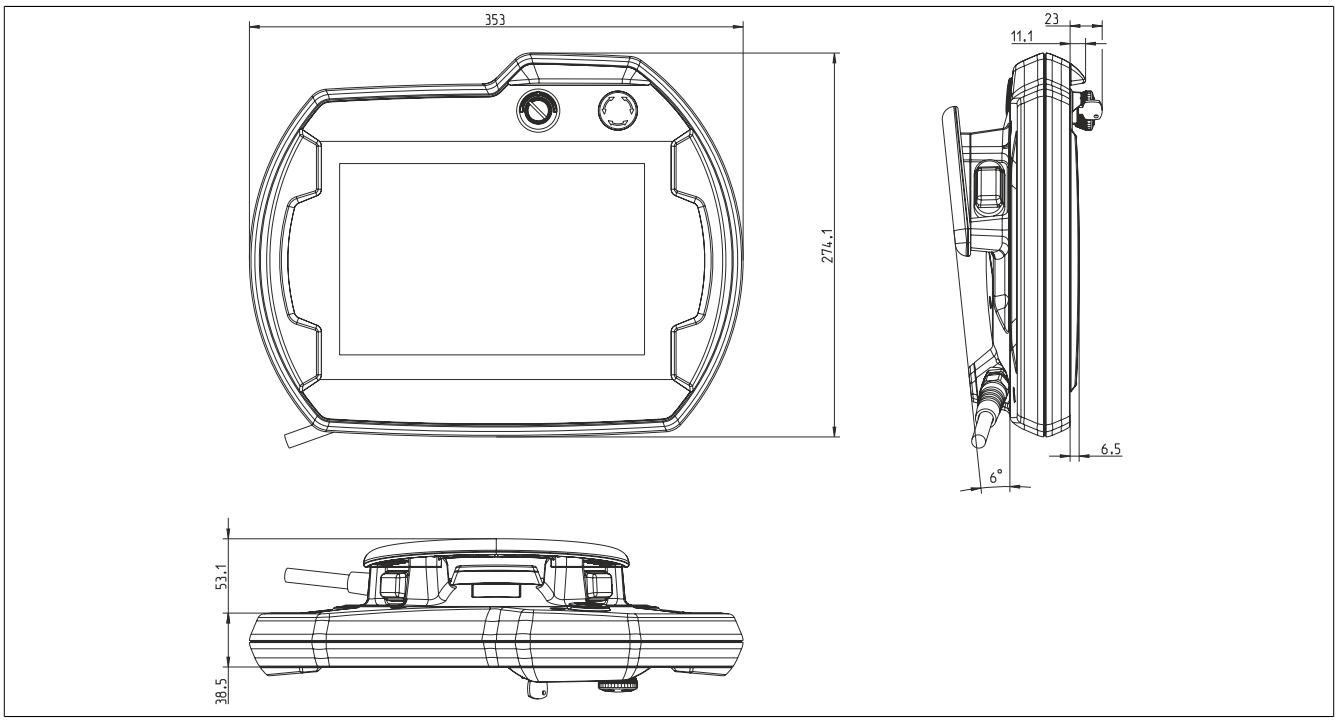


Figure 28: 5MP7151.101E-000 - Dimensions

2.3.1.6 5MP7151.101E-001

2.3.1.6.1 General information

- 10.1 TFT WXGA color display
- Single-touch (analog resistive)
- Intel Atom E3815 1.46 GHz
- 22 system keys
- Stop button
- Two 3-position enable switches
- Key switch

2.3.1.6.2 Order data

Model number	Short description	Figure
	System units	
5MP7151.101E-001	Mobile Panel 7100 10.1" WXGA TFT - 1280 x 800 pixels - Single-touch (analog resistive) - Atom E3815 processor, 4 GB RAM - For Windows WES7 - 1x Ethernet 10/100, 1x USB 2.0 - 1x key switch - 1x stop button - 2x enable switch - 21x system keys, 5x LEDs	
	Required accessories	
	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	
	Windows Embedded Standard 7	
5SWWI7.1848-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Service Pack 1 - Multilingual - For MP7151 - Installation (without Recovery DVD) - 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	
5ACCWB50.0000-000	Mobile Panel 7100 wall mount - For MP7150/MP7151	
5CAMPB.0050-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	

Table 21: 5MP7151.101E-001 - Order data

2.3.1.6.3 Components

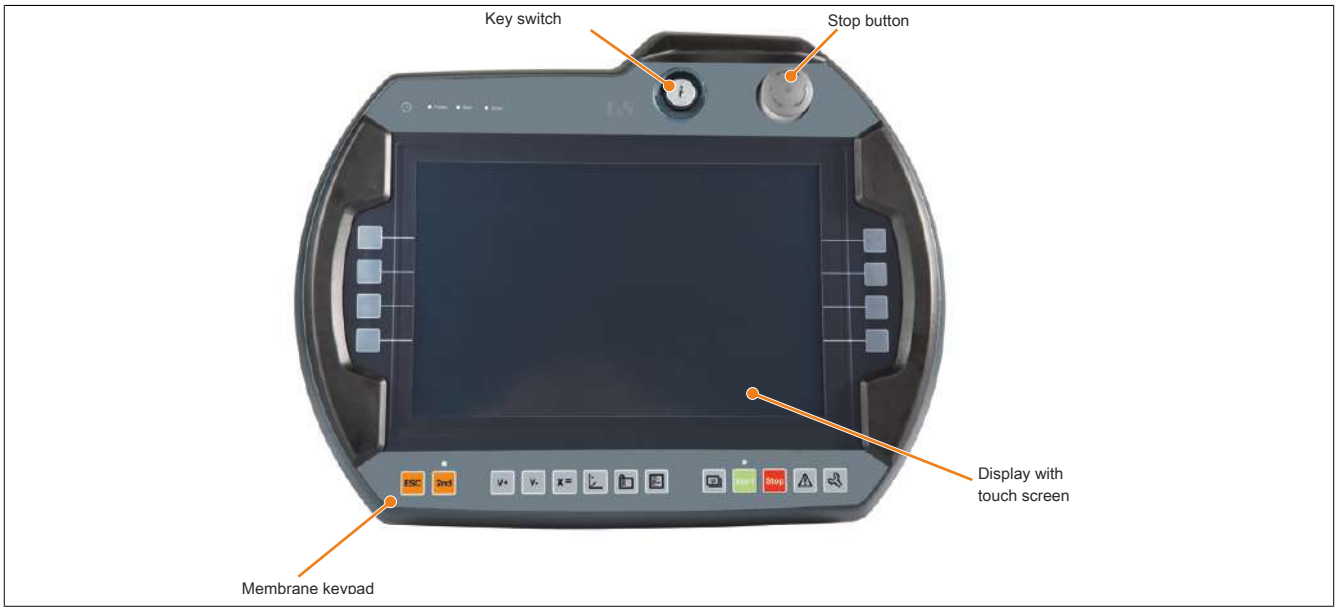


Figure 29: 5MP7151.101E-00x - Components

2.3.1.6.4 Technical data

Model number	5MP7151.101E-001
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
EAC	Yes
Controller	
Processor	
Type	Intel Atom E3815
Clock frequency	1460 MHz
Flash	32 GB
Display	
Type	TFT color
Diagonal	10.1"
Colors	16.7 million [1]
Resolution	WXGA, 1280 x 800
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	Analog, resistive
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Variant	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Ethernet	
Quantity	1 [2]
Variant	Shielded RJ45
Transfer rate	10/100 Mbit/s
Max. baud rate	100 Mbit/s
Keys	
System keys	22 numeric keys, cursor block
Stop button	Yes (2 normally closed contacts)
Enable switch	Yes (2x 3-position buttons, left and right position)
Key switch	Yes
LEDs	5

Table 22: 5MP7151.101E-001 - Technical data

Model number	5MP7151.101E-001
Operating system	
Edition	Windows Embedded Standard 7
Architecture	64-bit
Service pack	SP1
Language	English
Preinstallation	Yes
Electrical properties	
Nominal voltage [2]	24 VDC ±25% (integrated reverse polarity protection), SELV [3]
Inrush current	Max. 5.6 A (current limiting available)
Power consumption	12 W (500 mA at 24 V DC), max. 15 W (with USB load)
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
Protection class	Class 3 per EN 61131-2 or 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
Mechanical properties	
Housing	
Material	ABS
Front	
Panel overlay	
Material	Polyester
Dimensions	
Width	353 mm
Length	274 mm
Height	109.5 mm (with stop button)
Weight	Approx. 2000g

Table 22: 5MP7151.101E-001 - Technical data

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) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.

2.3.1.6.5 Temperature/Humidity diagram

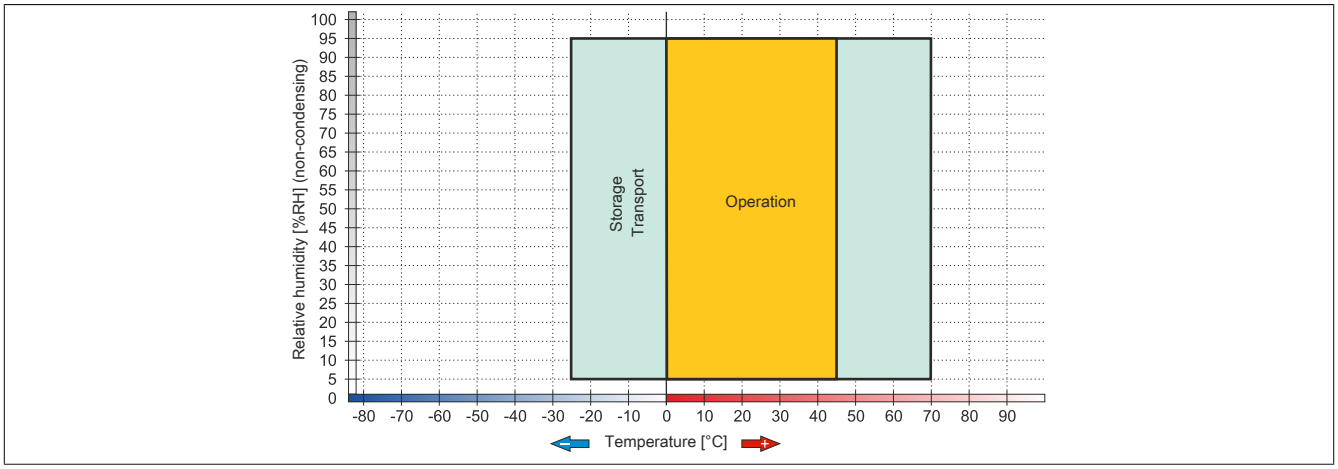


Figure 30: MP715x.101E-00x - Temperature/Humidity diagram

2.3.1.6.6 Dimensions

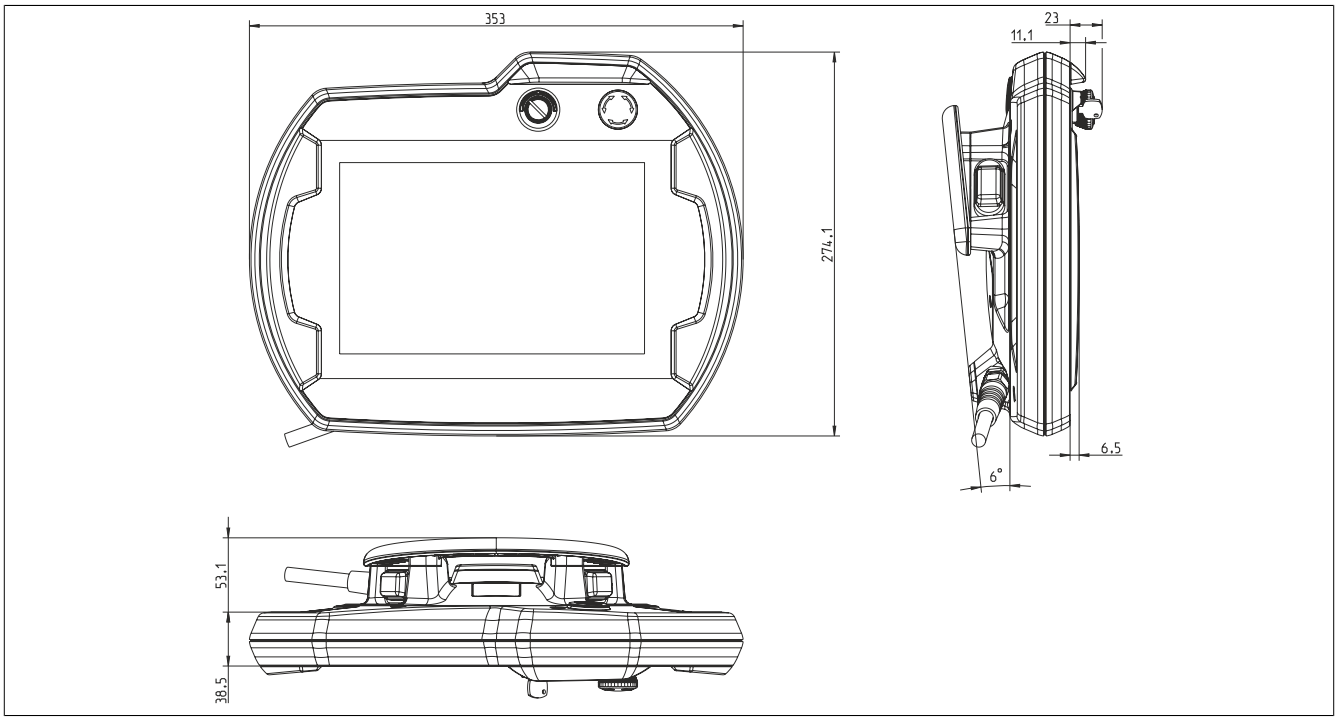


Figure 31: 5MP7151.101E-000 - Dimensions

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 contains 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 Mobile Panel device side. The control cabinet end of the attachment cable has a circular connector. Attachment cables are available in different lengths. For the procedure for connecting the attachment cable, see "Commissioning" on page 68.

2.3.2.1.1.2 Order data

Model 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	

Table 23: 5CAMPH.0018-40, 5CAMPH.0050-40, 5CAMPH.0100-40, 5CAMPH.0150-40, 5CAMPH.0200-40 - Order data

[2)] EN 60950 requirements must be observed.

2.3.2.1.1.3 Technical data

Information:

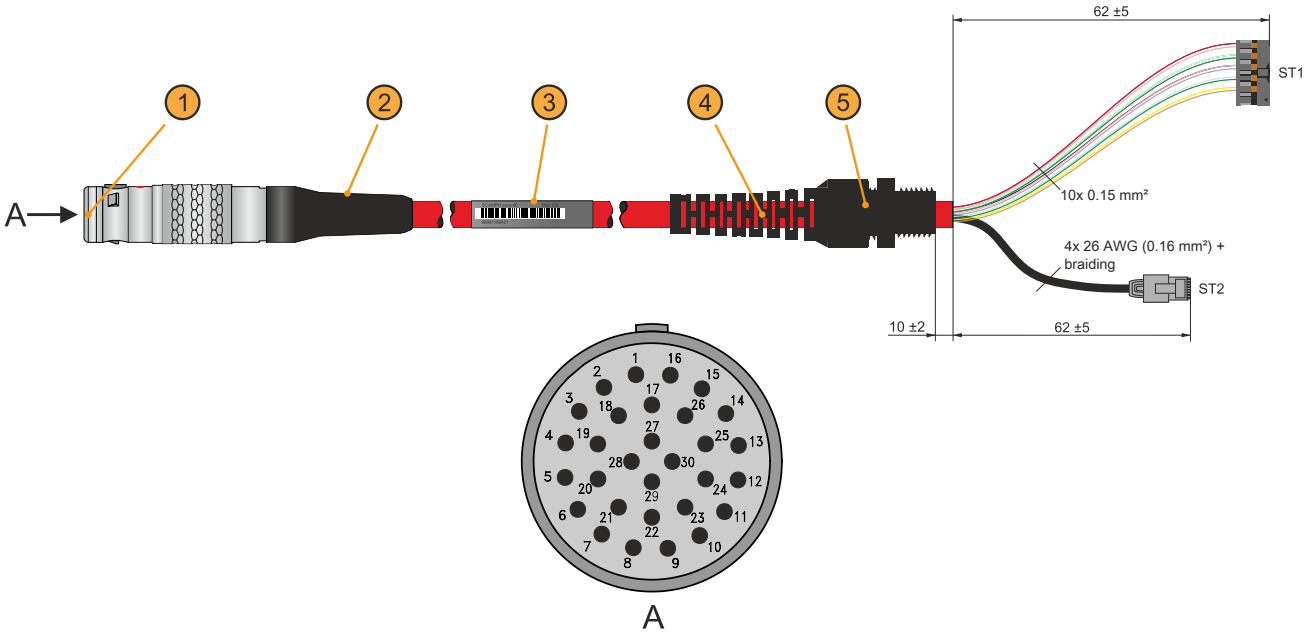
The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.

Model 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 (100,000 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					
Network	Star-quad cable for Ethernet (10/100 Mbit/s) (4 wires, male RJ45 connector)				
Stop button	Direct connection between stop button and monitoring device (4 wires)				
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				
Electrical properties					
Operating voltage	Max. 30 VDC				
Conductor resistance	≤30 Ω/km				
Operating conditions					
Flame-retardant	Per IEC 60332-1 and VW1 / FT1 in accordance with C-UL				
Shield attenuation	Per IEC 60096-1, Amendment 2				
Oil and hydrolysis resistance	Per VDE 0282-10				
Ambient conditions					
Temperature					
Moving	0 to 70°C				
Static	-20 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 mm				
Bend radius	Min. 60 mm				
Weight	153 g/m				
Tension	Max. 140 N				

Table 24: 5CAMPH.0018-40, 5CAMPH.0050-40, 5CAMPH.0100-40, 5CAMPH.0150-40, 5CAMPH.0200-40 - Technical data

1) EN 60950 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	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

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 PLC (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 64). The other end of the control cabinet cable has a pre-assembled RJ45 Ethernet connector. The remaining lines have an open end with wire end sleeves to make it easier to wire to safety equipment and other interfaces.

2.3.2.2.1.2 Order data

Model 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.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	

Table 25: 5CAMPC.0020-10 - Order data

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.

Model number	5CAMPC.0020-10
General information	
Certifications	
CE	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

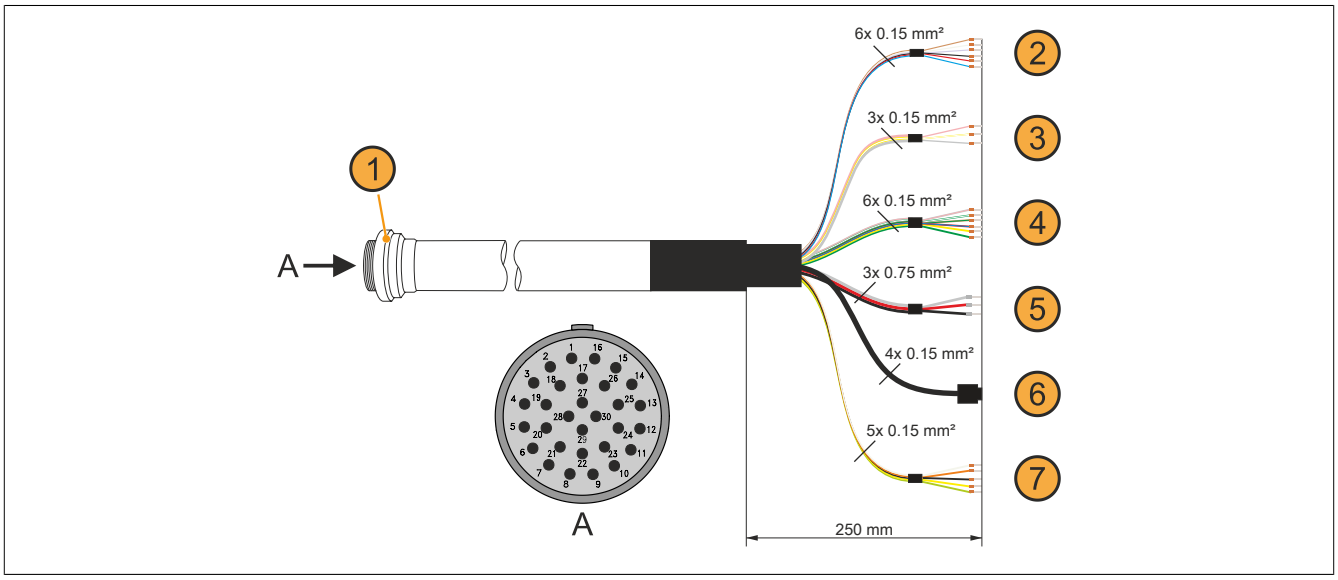
Table 26: 5CAMPC.0020-10 - Technical data

Model number	5CAMPC.0020-10
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
Operating conditions	
Flame-retardant	Per IEC 60332-1 and VW1 / FT1 in accordance with C-UL
Shield attenuation	Per IEC 60096-1, Amendment 2
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

Table 26: 5CAMPC.0020-10 - Technical data

1) EN 60950 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

Cable construction		
14	Black	Ground
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

Information:

When installing the control cabinet cable, make sure 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

-

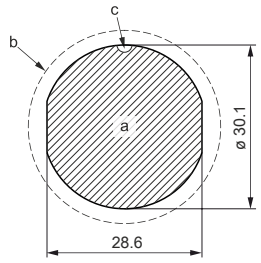


Figure 32: Receptacle - Drilling template

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 67). 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

Model 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.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	

Table 27: 5CAMPC.0020-11 - Order data

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.

Model number	5CAMPC.0020-11
General information	
Certifications	
CE	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

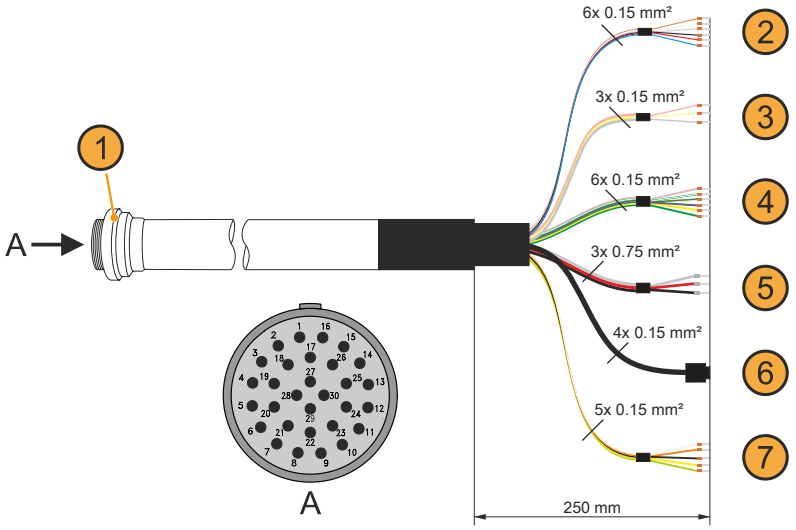
Table 28: 5CAMPC.0020-11 - Technical data

Model number	5CAMPC.0020-11
Operating conditions	
Flame-retardant	Per IEC 60332-1 and VW1 / FT1 in accordance with C-UL
Shield attenuation	Per IEC 60096-1, Amendment 2
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

Table 28: 5CAMPC.0020-11 - Technical data

1) EN 60950 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	Ground	
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	

Information:

When installing the control cabinet cable, make sure 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

-

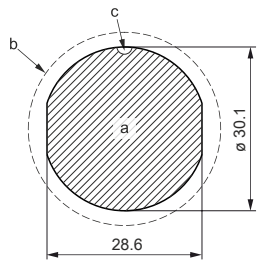


Figure 33: Receptacle - Drilling template

3 Commissioning

3.1 Installation from a safety perspective

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 information 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 following safety aspects must be considered:

- Correct cable length for restricting the work area

- Stop button necessary or permitted

- Sufficient safety category for the respective application

- **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 information in the following chapters must be taken into account.**
- **Additional important information regarding safety and EMC can be found in chapter "Standards and certifications" and must be observed.**

3.1.1 Proper use of the machine or system

Mobile Panel devices are intended for use in monitoring, configuring and operating machinery. Examples include:

- Injection molding machines
- Robots
- Machine tools
- Textile machines
- Printing machines
- Theater backdrops
- Etc.

Intended use in normal operating modes, for example:

- Automatic

Intended use in special semiautomatic or manual special operating modes, for example:

- Setup
- Teach-in
- Test runs
- Etc.

An enabling device with one or two enable switches and a stop button are available as safety functions.

All safety functions have a dual-circuit design so that up to safety category 4 PL e can be achieved per EN ISO 13849-1:2015.

Safety category 4 PL e per EN ISO 13849-1:2015 is an option for an enabling device with one enable switch, taking into account the actuation cycles per B_{10d} values of the safety component.

Safety category SIL 3 per EN 61508 is an option for the enabling device with two enable switches.

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.

The information in chapter "Standards and certifications" on page 118 regarding the intended use of the handheld terminal must also be observed.

3.2 Operating the Mobile Panel

Caution!

- **When routing or laying cables, make sure that there is no danger of tripping that could cause the Mobile Panel device to fall to the ground.**
- **The Mobile Panel attachment cable is not permitted to be crushed or run over sharp edges that which can damage or chafe the cable jacket.**
- **Operating a Mobile Panel with a damaged attachment or control cabinet cable is not permitted.**
- **When the Mobile Panel is not in use, it should be safely stowed away on the intended wall mount. If the Mobile Panel device 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.**
- **If temporarily putting down the Mobile Panel device, do not place it face down in a way that could damage the control devices or inadvertently trigger actions.**
- **The touch screen is not permitted to be operated with sharp objects such as ballpoint pens, knives, screwdrivers, etc. These objects will cause irreparable damage to the touch screen. The ideal object for operating the touch screen is the integrated touch screen stylus pen (2.2.1.4 "Touch screen stylus pen" on page 18). The touch screen can also be operated with a finger.**
- **Only one point on the touch screen is permitted to be touched at a time. Touching several places simultaneously can trigger unintended actions.**
- **Placing objects on top of the touch screen is not permitted.**
- **Never lay the device down on unstable surfaces or shelves. It could fall and become damaged.**
- **Never expose the device to heat sources or direct sunlight.**
- **Ensure that no foreign bodies or liquids penetrate the interior of the device.**
- **Pressing several function or system keys simultaneously can trigger unintended actions in some circumstances.**

Information:

- **All protective coverings, housing screws, cable grommets and the device housing must be checked periodically for damage.**
- **For instructions on how to clean the Mobile Panel device, see "Cleaning" on page 142.**

3.2.1 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.

Information:

A stylus pen (e.g. 5AC900.1100-01) is recommended for touch screen calibration.

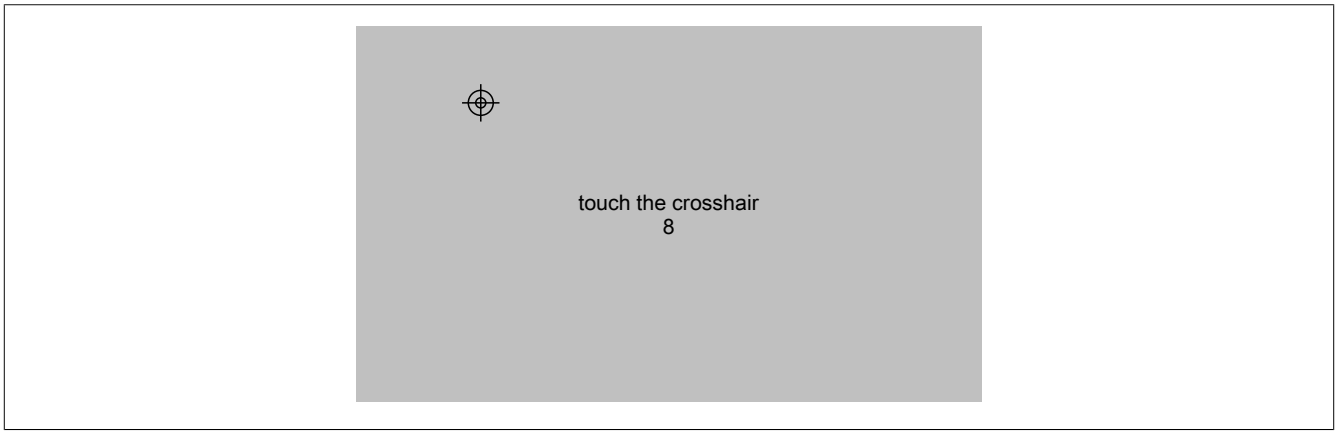


Figure: Touch screen calibration

Touch screen calibration can be started via service page *Screen → Calibrate touch* (see "Service page "Screen"" on page 97).

Information:

This type of calibration applies only to the Mobile Panel 712x, Mobile Panel 7140 and Mobile Panel 7150.

Touch screen calibration can also be started from the application using the RFB function.

See section "Starting touch screen calibration" on page 147.

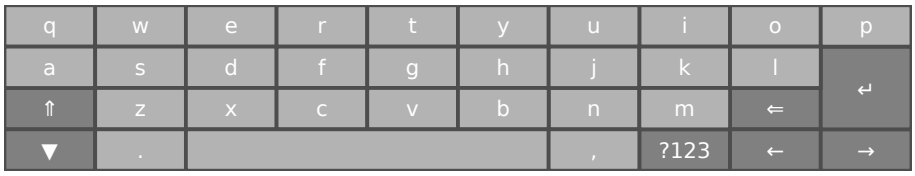
3.2.2 Keyboard

Text can be entered using a USB keyboard or a virtual keyboard.

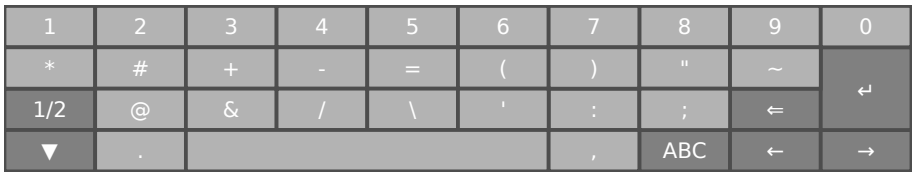
The virtual keyboard is shown as soon as a text input field (blinking text input cursor "|") has the focus.

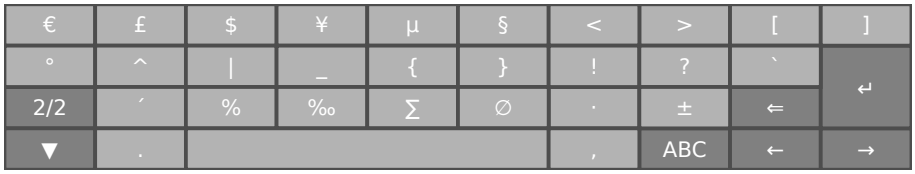
Information:

The virtual keyboard is only supported by Mobile Panel 712x, Mobile Panel 7140 and Mobile Panel 7150.



The [**?123**], [**ABC**], [**1/2**] and [**2/2**] keys can be used to open additional keyboard layouts:





3.2.3 Mouse

The mouse cursor automatically appears if a USB mouse is connected to the Mobile Panel.

If the left and right mouse buttons are pressed simultaneously for more than 2 seconds, the Mobile Panel navigates to the service pages.

Information:

This description applies to Mobile Panel 7140 and Mobile Panel 7150.

3.3 Connection

The Mobile Panel is connected using the Mobile Panel attachment cable ("Attachment cables" on page 59).

3.3.1 Attachment shaft

Attachment shafts 5MP7120.034F-000, 5MP7121.034F-000

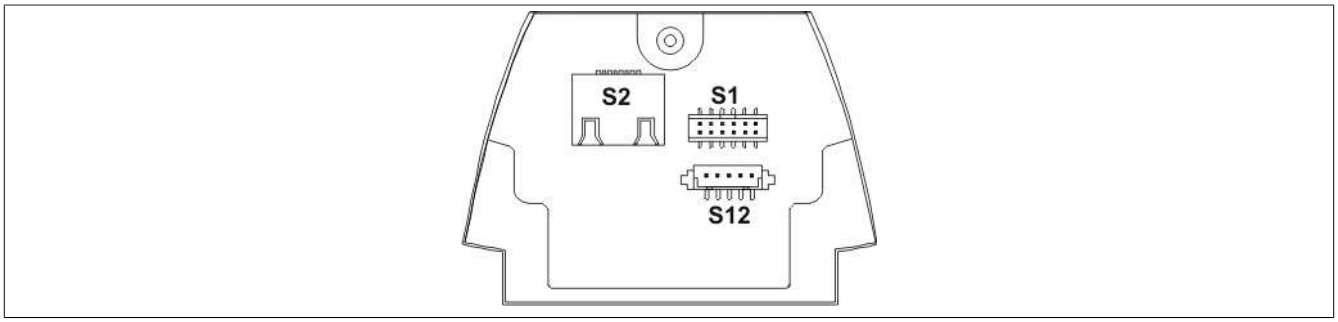


Figure 34: Attachment shafts 5MP7120.034F-000, 5MP7121.034F-000

① S1: Main connector: Power supply, enable, stop button
② S2: Communication interface
③ S12: External wiring (for options)

Attachment shaft 5MP7140.070N-000

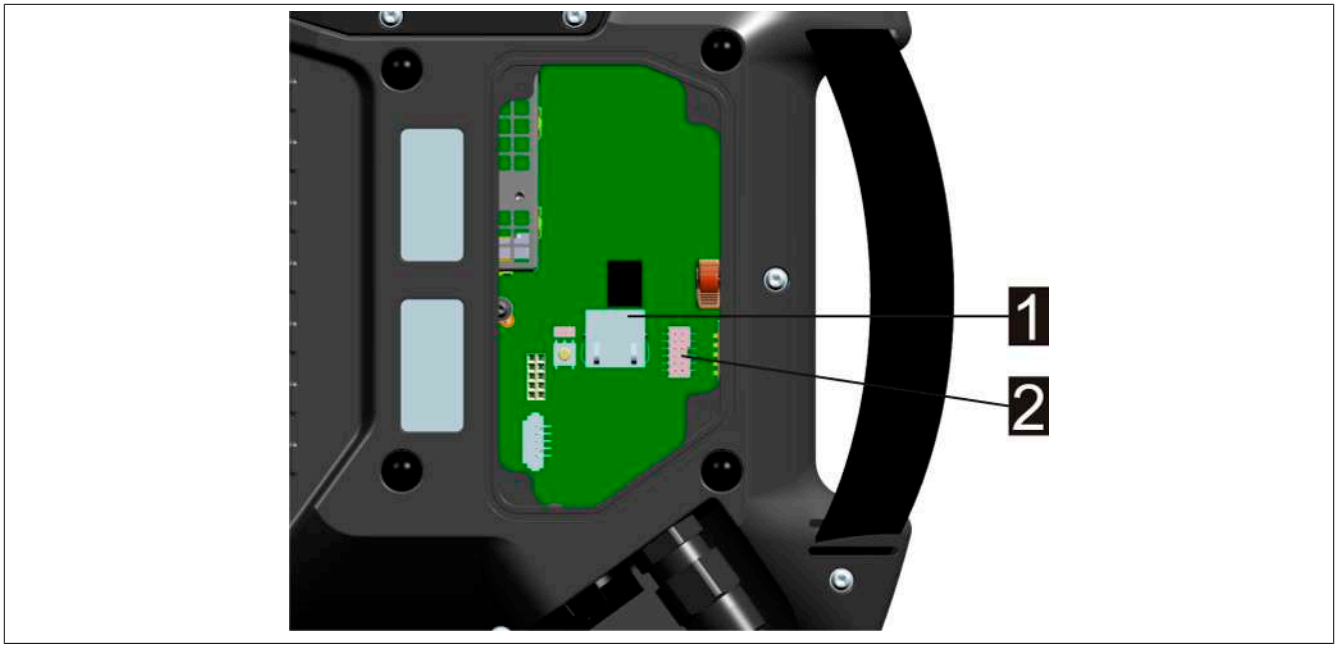


Figure 35: Attachment shaft 5MP7140.070N-000

① Ethernet connector / communication interface
② Multipoint connector: Main connector / Power supply and control lines

Attachment shafts 5MP7150.101E-000, 5MP7151.101E-000 and 5MP7151.101E-001

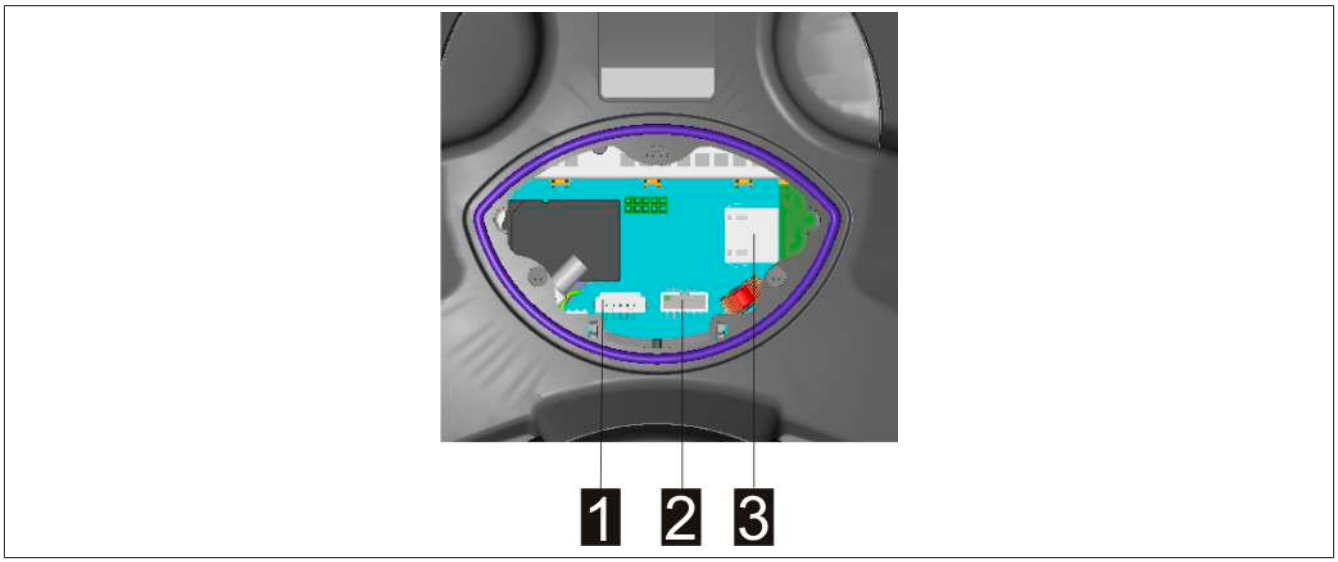


Figure 36: Attachment shafts 5MP7150.101E-000,5MP7151.101E-000 and 5MP7151.101E-001

① Multipoint connector: Connector for operating element signals
② Multipoint connector: Main connector / Power supply and control lines
③ Ethernet connector / communication interface

3.3.2 Installing cables in the attachment shaft

After opening the attachment shaft, the connecting lines can be installed as shown in the following section.

Information about opening the attachment shaft

- **Place the Mobile Panel device on a clean flat surface with the display facing down in a way that does not damage the Mobile Panel or its operating elements (e.g. ESD mat).**
- **Use a size 10 Torx screwdriver to open and close the attachment shaft.**

Information about changes in the attachment shaft

- **Disconnect the main connector (ST1) by pulling carefully on its wires with your fingers (do not use sharp objects to help).**
- **When disconnecting the RJ45 connector (ST2), make sure that the locking clip is pushed down.**

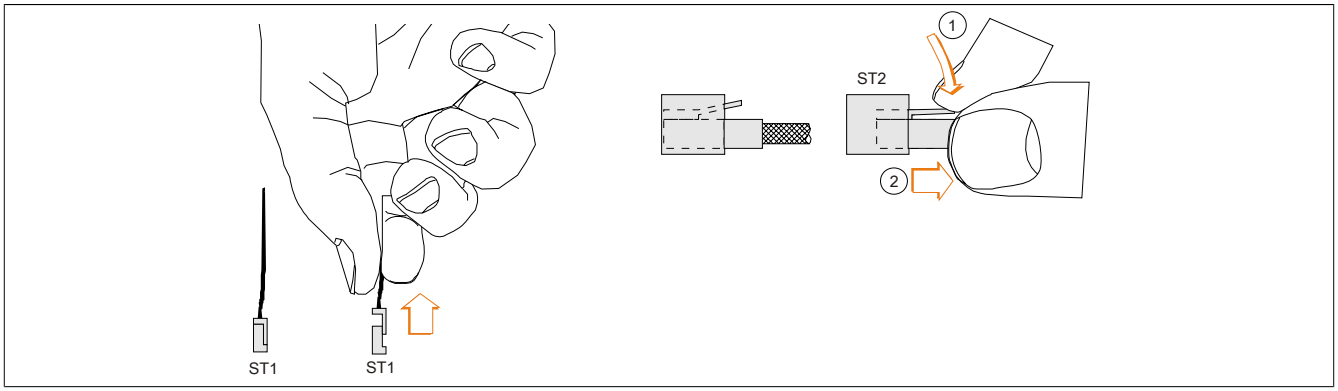


Figure 37: Disconnecting ST1 and ST2

Warning!

- **When connecting the main connector and RJ45 connector, it is important to ensure that they snap into place. Otherwise, the stop/enabling functionality or correct shielding cannot be ensured.**
- **Before the Mobile Panel is recommissioned, the stop and enabling functionality must be checked.**

Information about closing the attachment shaft

- **The gasket must be clean, undamaged and positioned correctly in the attachment shaft cover.**
- **Pinched cables are not permitted.**
- **The attachment shaft cover must be refastened with all previously removed screws (torque for 5MP7120.034F-000 and 5MP7121.034F-000: 0.4 to 0.5 Nm, torque for 5MP7140.070N-000: 0.8 to 1.0 Nm, torque for 5MP7150.101E-000, 5MP7151.101E-000 and 5MP7151.101E-001: 0.5 to 0.7 Nm). Only then can the corresponding degree of protection be ensured again.**

3.4 Connection examples

Information:

The monitoring device and subsequent components must also be included when calculating the entire enabling safety function.

A suitable monitoring device must be used to detect short and cross faults in the connecting cable.

3.4.1 Connection example for stop button

Connection example with monitoring device for safety circuits up to category 4 PL e per EN ISO 13849-1:2015.

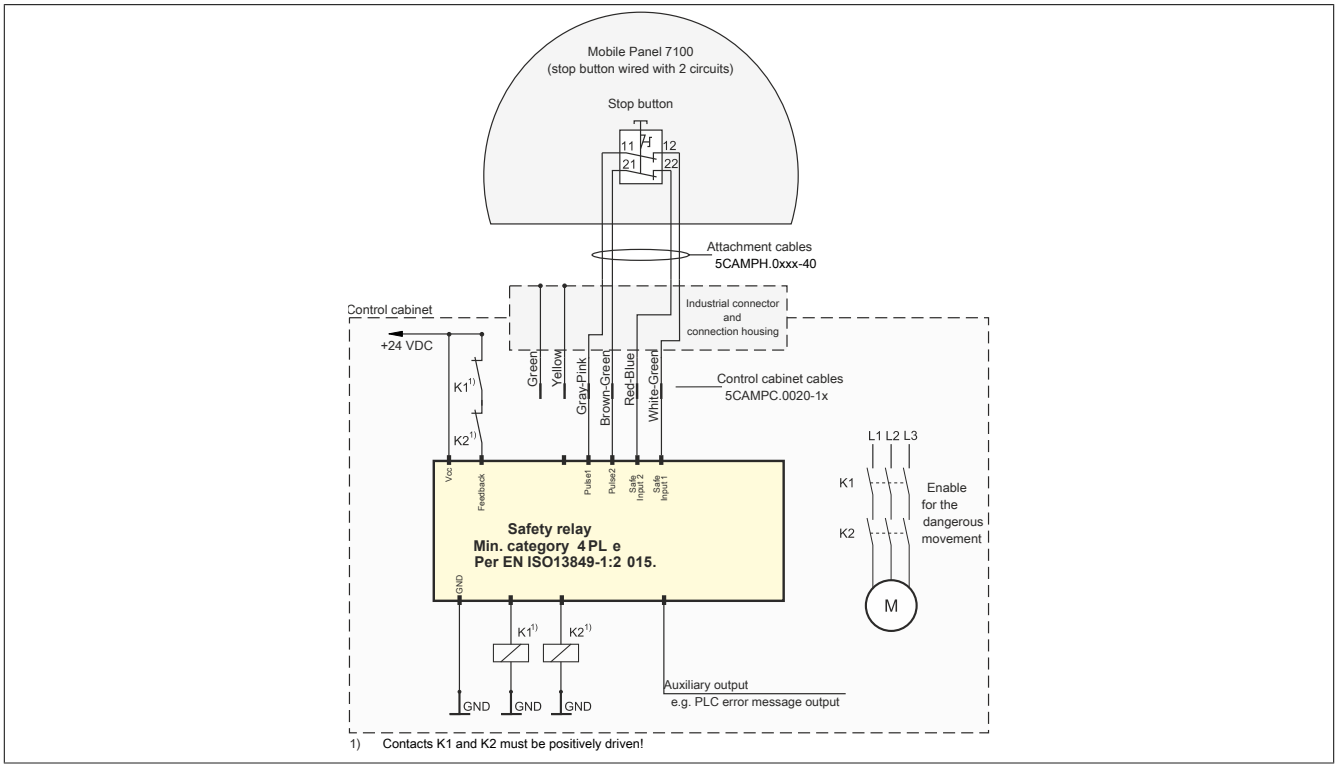
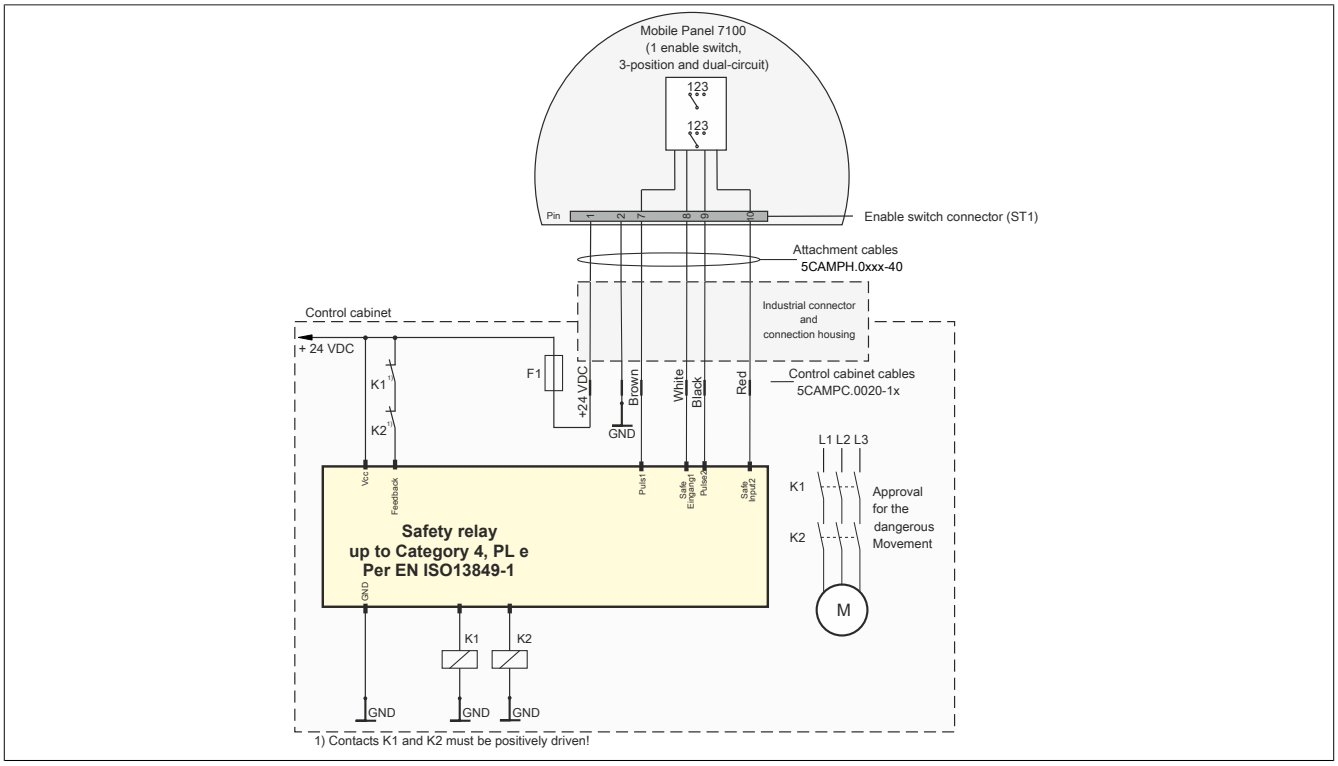


Figure 38: Connection example for stop button for MP7100

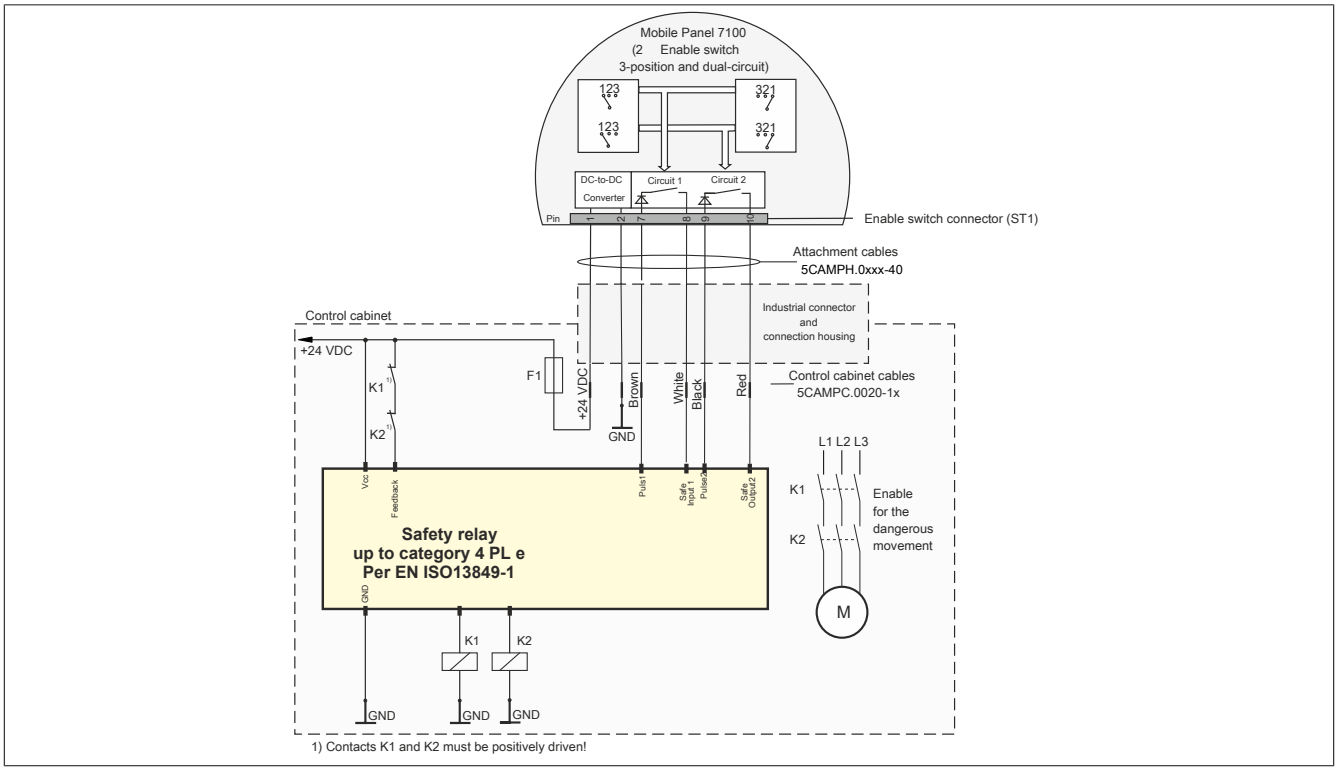
3.4.2 Connection example for enabling control device with one enable switch

Connection example with monitoring device for safety circuit up to category 4 PL e per EN ISO 13849-1:2015.



3.4.3 Connection example for enabling control device with two enable switches

Connection example with monitoring device for safety circuit up to category 4 PL e per EN ISO 13849-1:2015.



3.5 USB interface

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 guaranteed.

Caution!

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

1. On Mobile Panel 712x and Mobile Panel 7140, open the protective cover.

Figure 39: USB interface - Opening the protective cover

On Mobile Panel 715x, the USB interface is freely accessible.

Figure 40: USB interface - Freely accessible interface

2. Connect the USB device until it locks into place on MP7140 and MP715x devices. On the MP712x, a standard USB OTG adapter cable is necessary.

Figure 41: USB interface - Connecting the USB device

Information:

IP65 protection is no longer guaranteed when a USB device is connected.

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 numbers.
- Hardware numbers of LEDs are specified in the following with blue numbers.
- Presentation examples:

Key	Key with LED	LED
12	115 103	3

Information:

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

3.6.1 Mobile Panel 5MP7120.034F-000

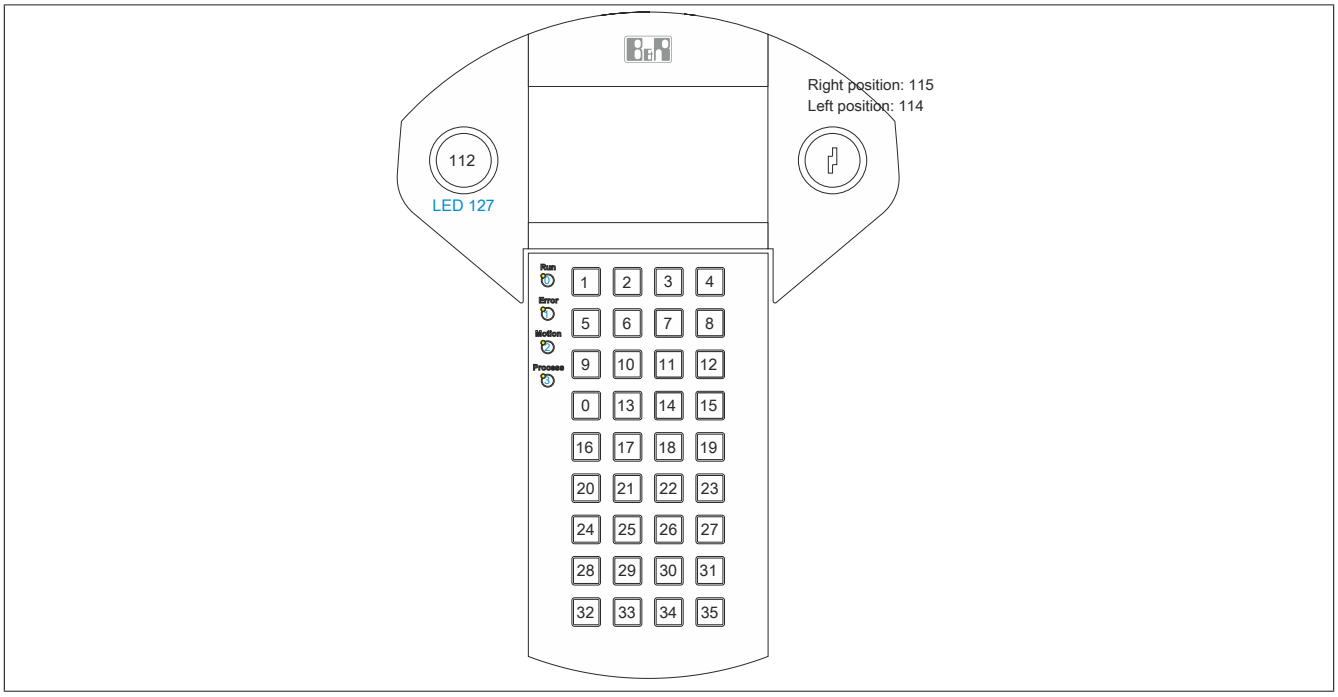


Figure 42: 5MP7120.034F-000 - Hardware numbers

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

3.6.2 Mobile Panel 5MP7121.034F-000

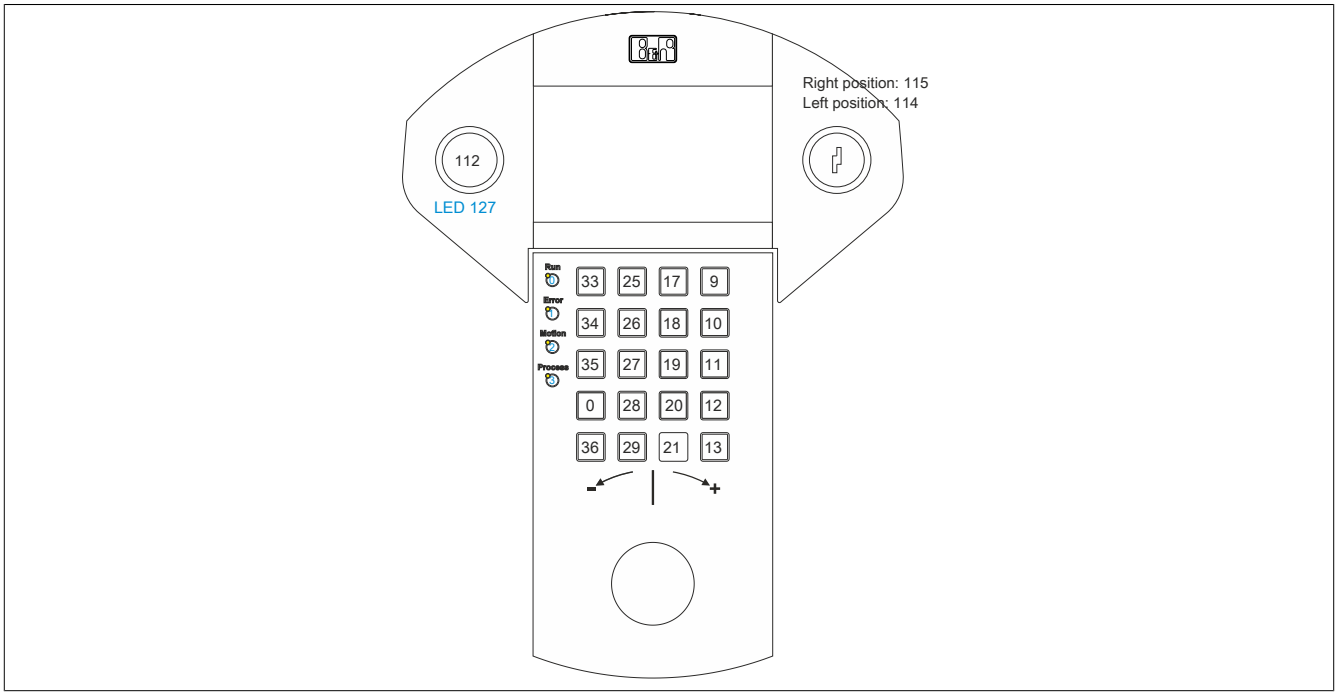


Figure 43: 5MP7121.034F-000 - Hardware numbers

3.6.3 Mobile Panel 5MP7140.070N-000

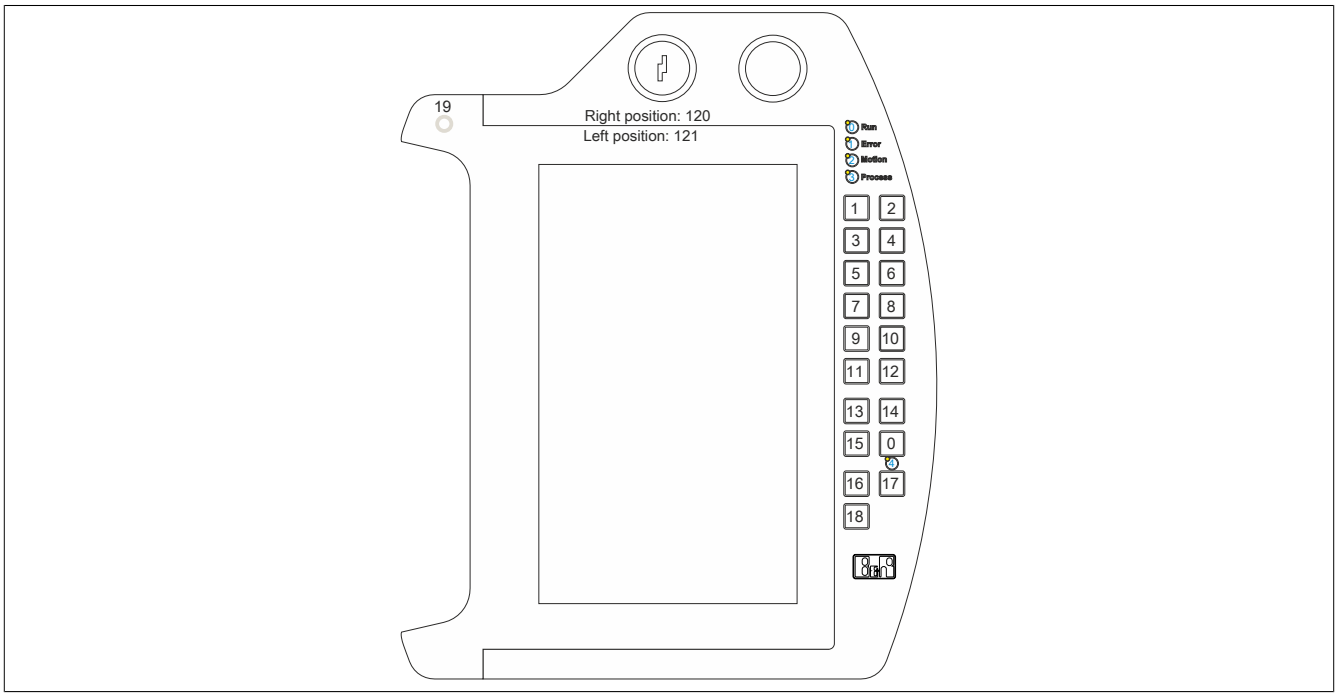


Figure 44: 5MP7140.070N-000 - Hardware numbers

3.6.4 Mobile Panel 5MP7150.101E-000

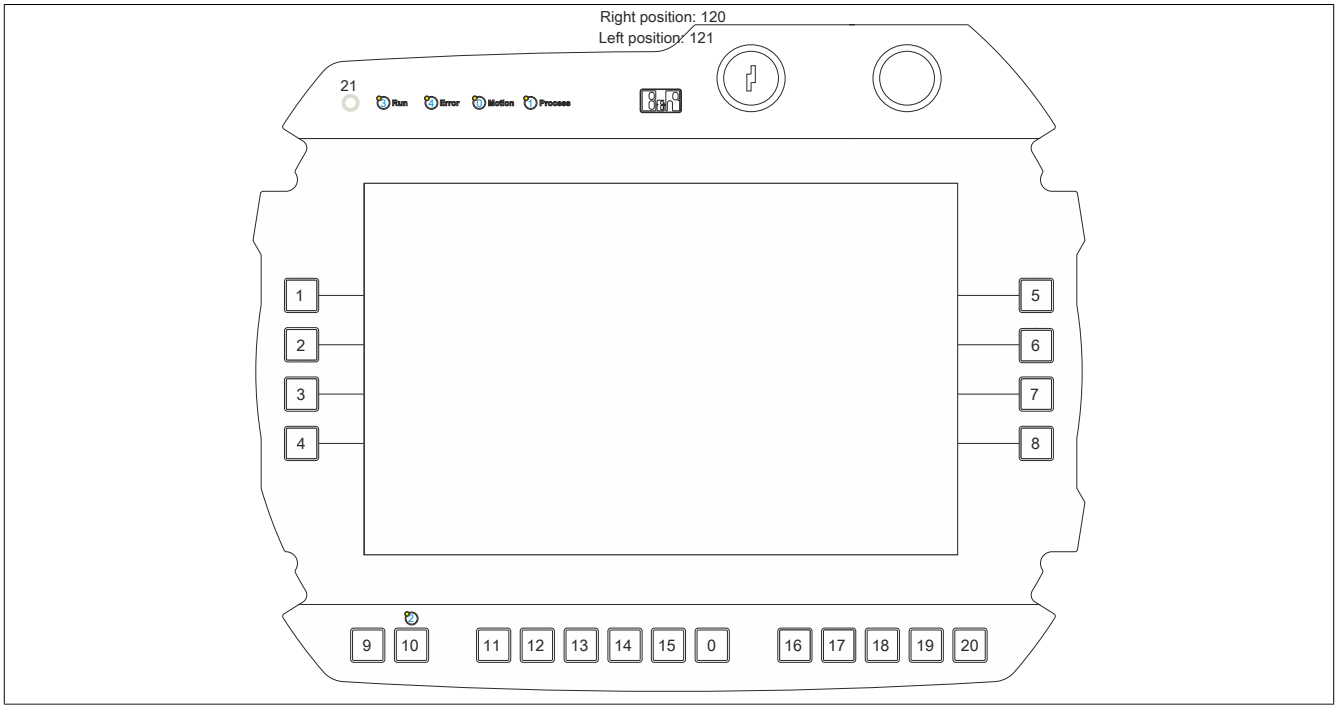


Figure 45: 5MP7150.101E-000 - Hardware numbers

3.6.5 Mobile Panels 5MP7151.101E-000 and 5MP7151.101E-001

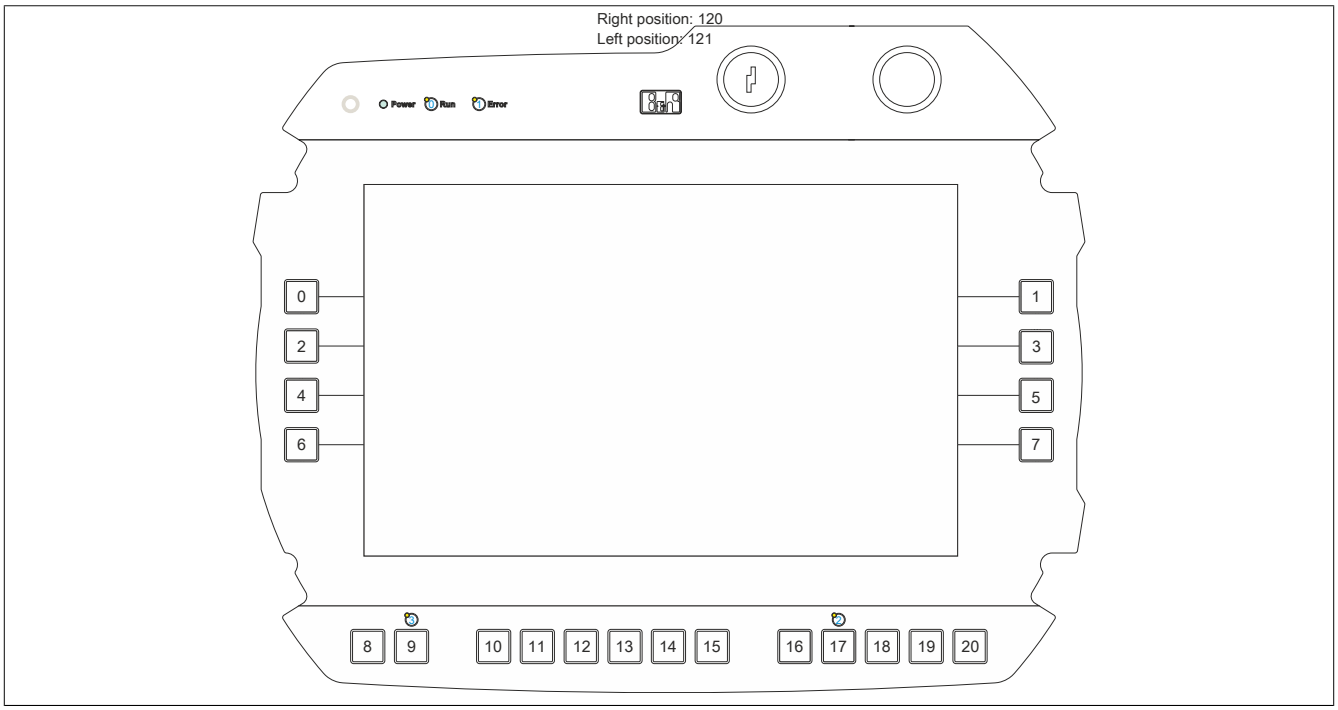


Figure 46: 5MP7151.101E-000 and 5MP7151.101E-001 - Hardware numbers

3.6.5.1 MP7151 key configuration

Some keys on MP7151 have predefined key codes. These assignments as well as unassigned keys can be changed in a key configuration mapping file (.kcm). The .kcm file is a text file loaded to or from the device via the ADI or Control Center.

The following listing shows the default key configuration:

```
[Information]
Version=01.00
BuildDate=2016-10-06
UserInfo=5MP7151.101E-000
```

```
[ScancodeMapping]
KEY_000=00,00,00,00,00,00,00,00
KEY_001=00,00,00,00,00,00,00,00
KEY_002=00,00,00,00,00,00,00,00
KEY_003=00,00,00,00,00,00,00,00
KEY_004=00,00,00,00,00,00,00,00
KEY_005=00,00,00,00,00,00,00,00
KEY_006=00,00,00,00,00,00,00,00
KEY_007=00,00,00,00,00,00,00,00
KEY_008=00,01,00,00,00,00,00,00; ESC
KEY_009=00,2A,00,00,00,00,00,00; Shift Left
KEY_010=E0,49,00,00,00,00,00,00; Page up
KEY_011=E0,51,00,00,00,00,00,00; Page down
KEY_012=00,00,00,00,00,00,00,00
KEY_013=00,00,00,00,00,00,00,00
KEY_014=00,00,00,00,00,00,00,00
KEY_015=E0,5D,00,00,00,00,00,00; Context
KEY_016=00,00,00,00,00,00,00,00
KEY_017=E0,5B,00,00,00,00,00,00; Windows left
KEY_018=00,00,00,00,00,00,00,00
KEY_019=00,00,00,00,00,00,00,00
KEY_020=00,00,00,00,00,00,00,00
KEY_021=00,00,00,00,00,00,00,00
KEY_022=00,00,00,00,00,00,00,00
KEY_023=00,00,00,00,00,00,00,00
```

The file contains 2 sections: `Information` and `ScanCodeMapping`.

Section `Information` defines the attributes of the .kcm file; `Version` specifies the version of the .kcm file. It has the format `XX.YY.BuildDate` and specifies the creation date of the .kcm file. This has the format `YYYY-MM-DD.UserInfo` and can contain user information up to 88 characters in length. These attributes can be read and displayed using the ADI or Control Center.

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.

```
KEY_001=SC,SC,MF1,MF1,MF2,MF2,MF3,MF3
```

Scan code set 1 is used for the configuration. For a current listing, see "Key codes" on page 83.

The example configuration defines scan code 0x01 for key 1.

```
KEY_001=00,01,00,00,00,00,00,00; ESC
```

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

The following example shows the configuration for keyboard shortcut CTRL+ALT+DEL.

```
KEY_001=E0,53,00,1D,00,E2,00,00; CTRL+ALT+DEL
```

Information:

When using keyboard shortcuts with 3 or more keys, key ghosting [4] may occur due to the key hardware. Only the functionality of keyboard shortcuts with 2 keys is guaranteed.

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

3.6.5.1.1 Key codes

The following tables contain an outfeed of the 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	Scroll lock	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	-	

3.7 User tips for increasing the service life of the display

3.7.1 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.

3.7.1.1 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%.

3.7.2 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.

3.7.2.1 What causes image persistence?

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

3.7.2.2 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.

3.8 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 an acronym for "Basic Input/Output System". It is the most basic standardized interface between the user and the system (hardware). The Mobile Panel 7151 uses a BIOS in which the settings in the system configuration are permanent and do not need to be changed further.

4.1.2 BIOS Setup and boot procedure

BIOS is enabled immediately after switching on the power supply of the Mobile Panel. BIOS reads the system configuration information, checks and configures the system with the Power-On Self-Test (POST).

When these "preparations" are completed, BIOS searches the system for an operating system in the available data storage devices. BIOS then launches the operating system and hands over to it the control of system operations.

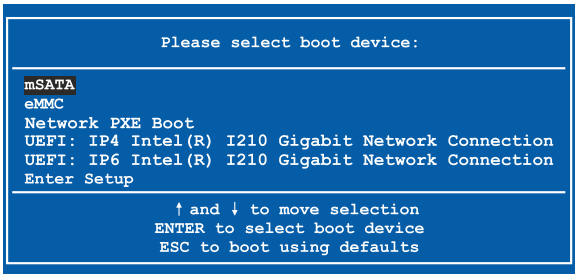
To enter BIOS Setup, key "Del" must be pressed (during POST) and password "7090" entered. Although it is possible to select various options in BIOS, none of the changes will be applied.

To enter the boot menu and, for example, boot from another data storage device (USB flash drive), key "F7" must be pressed (during POST) and password "7090" entered. The USB keyboard and USB flash drive must be connected to the Mobile Panel beforehand via the USB hub.

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 mapp View and VNC client

4.2.1 General information

Mobile Panel 712x, 7140 and 7150 are display devices that can be used in 1 or 2 different operating modes depending on the device:

- Web browser together with a mapp View HMI application = mapp View client:
- VNC together with a Visual Components HMI application = VNC client

Full-screen mode is used in both operating modes. The operating mode can be configured via the integrated service interface (see "Service pages" on page 87).

4.2.2 Order data

Order number	Short description
5SWVIS.MP46-ENG	mapp View and VNC client - English - For MP7140 - Installation (without Recovery DVD) - Only available with a new device
5SWVIS.MP47-ENG	mapp View and VNC client - English - For MP7150 - Installation (without Recovery DVD) - Only available with a new device
5SWVIS.VC52-ENG	VNC client - English - For MP7120 and MP7121 - Installation (without Recovery DVD) - Only available with a new device

4.2.3 Installation

mapp View and the VNC client operating system are preinstalled at B&R.

4.2.4 Service pages

Mobile Panels can be configured via the integrated service page. This service page can be opened in various ways:

Opening the service page with button

The service page can be opened with a button if this has been configured (see Configuring the service button).

Button for opening the service page: 

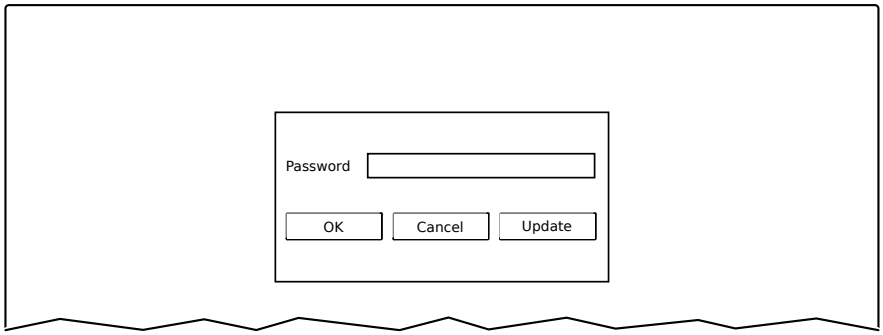
Additional options for launching the service page

The following options are also available to launch the service page:

- Pressing the left and right buttons of the mouse simultaneously for at least 2 seconds
- Opened automatically after restarting the Mobile Panel if the corresponding *start mode* is configured on service page *Startup* (see service page *"Startup" on page 91*)

Entering the service password

If a service password has been configured in the settings (see "Service page "Security"" on page 108), then this password must be entered each time the service pages are called before the respective service page is displayed.

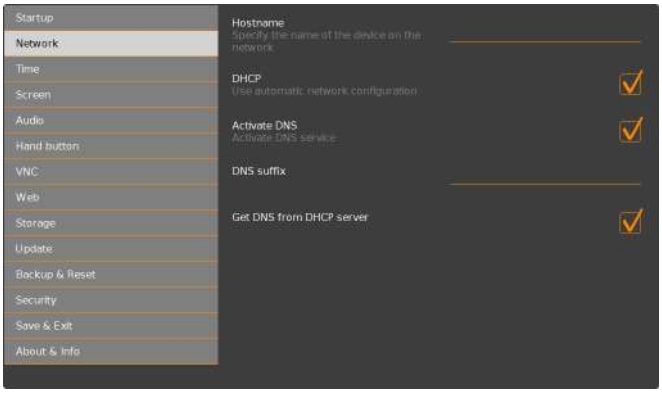
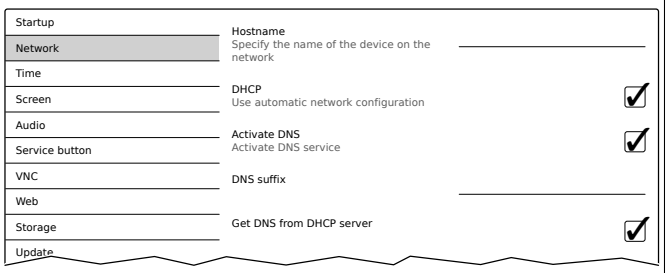


The service password must be entered in the corresponding text input field.

Button	Description
[OK]	Confirming password entry
[Cancel]	Canceling password entry
[Update]	Pressing the update button causes the Mobile Panel to attempt an update. If an update is found on a USB flash drive or on the network), then it will be downloaded and installed. In the next step, the Mobile Panel will be started in configured mode (see "Service page "Startup"" on page 91) regardless of whether an update is found or not.

Representation of the service pages in this user's manual

In this user's manual, the service pages are not represented as original screenshots. For better readability, the service pages are displayed as black text on a white background:

Original Mobile Panel screenshot	Representation in this documentation
	

Language of the service pages

As can be seen in the previous service page example, all of the content on the service pages for the Mobile Panel is **generally in English** .

Saving the settings

When editing the settings on the service pages, final version of the changed settings is not saved. The final version is saved when one of the following commands on service page Save & Exit is called:

- *Save changes & exit*
- *Save changes*

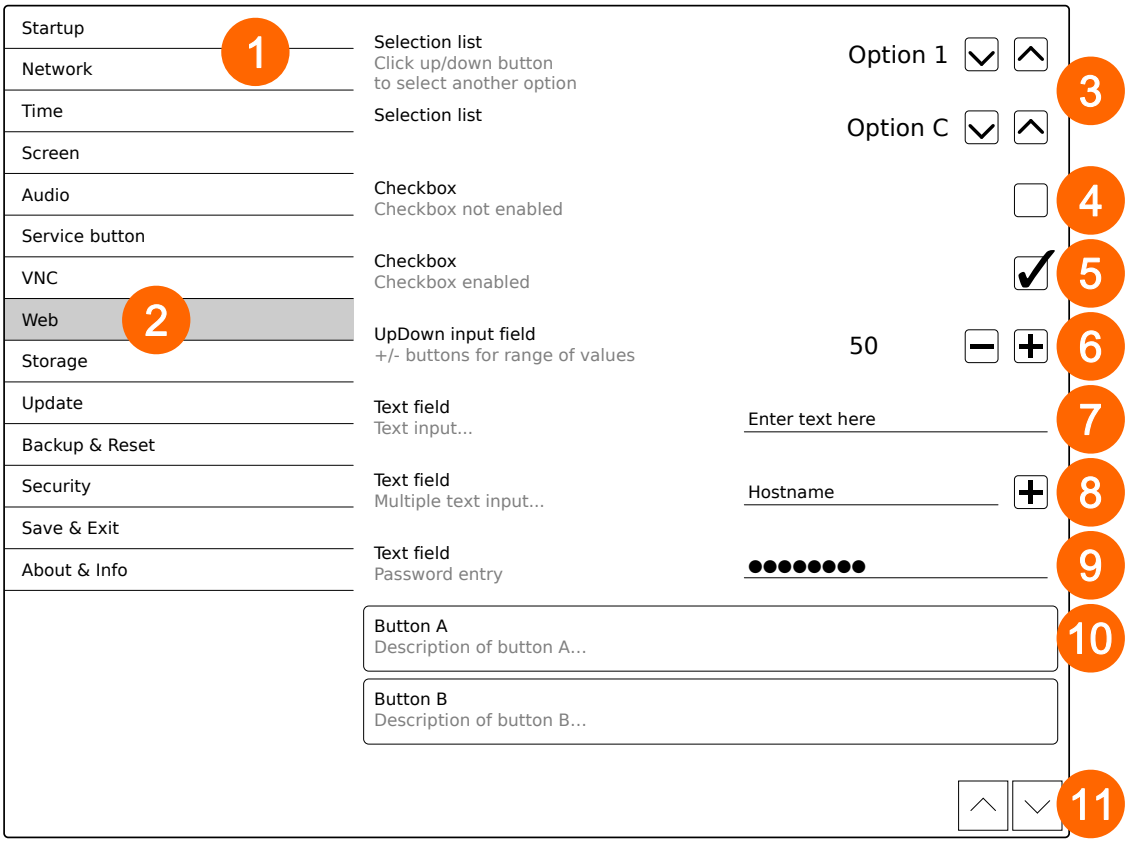
See section "Service page "Save & exit"" on page 109.

Information:

Changes only become active if they have been saved and after the service pages are exited (command *Save changes & exit*).

Information:

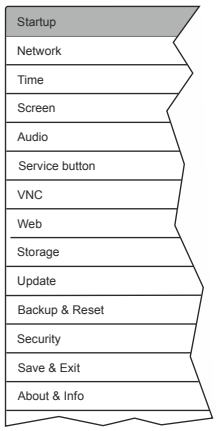
All settings on the service pages are saved on the Mobile Panel in XML file `MP71xxConfig.xml (xx = 20, 21, 40 or 50)`. When backing up or restoring the panel settings, a file with this name is created or expected to be on the storage medium (see "Service page "Backup & reset"" on page 107 and "Service page "Update"" on page 105).



1	Menu for selecting individual service pages "Startup", "Network", etc. "About & Info".
2	The active or selected service page is marked in the menu using a different background color.
3	The selection list indicates the selected option. Pressing the up/down arrows moves between the available options.
4	Checkbox not activated.
5	Checkbox activated.
6	UpDown input field for entering values within a certain range. The value can be increased/decreased using the "-" or "+" symbols. The value can also be changed directly using the keyboard.
7	Text field where text can be entered with the keyboard.
8	Text field where text can be entered with the keyboard. The "+" symbol can be used to add the entered text to a text list.
9	Text field for entering a password. The password will be displayed as plain text or wildcard characters (●●●●●●) depending on the setting.
10	Button that can be used to trigger a specific function. Under the short title, a more detailed description of the function is displayed as gray text.
11	If the service page contains more elements than fit on the display, it is possible to scroll through the content using the up/down buttons.

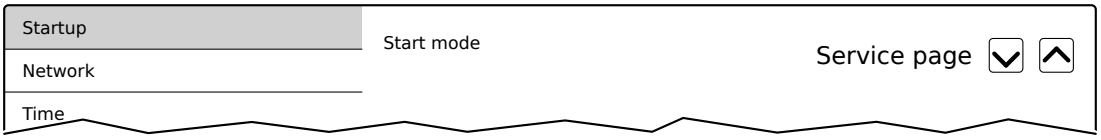
4.2.4.1 Overview

The following service pages are available:

Menu for the service pages	Menu option (English)	Description
	Startup	Settings that take affect when restarting the Mobile Panel
	Network	Settings for the Ethernet network
	Time	Time settings (time server, daylight savings time)
	Screen	Screen settings (screensaver, rotation, etc.)
	Audio	Buzzer settings
	Service button	Functionality of the *Service button*
	VNC	Settings for the VNC client on Mobile Panel
	Web[1)]	Settings for the web browser
	Storage[1)]	Settings for accessing memory (USB flash memory, user memory)
	Update	Updates the Mobile Panel (manual)
	Backup & Reset	Backing up Mobile Panel settings or resetting the Mobile Panel to factory settings
	Security	Security settings (password query when opening the service page)
	Save & Exit	Saving the Mobile Panel settings and closing/exiting the servicepage.
	About & Info	Information about the Mobile Panel (MP7100 system version, licenses for the software being used)

1) These service pages are only supported by Mobile Panel 7140 and Mobile Panel 7150.

4.2.4.2 Service page "Startup"



The start mode is configured the service page *Startup* and determines how the Mobile Panel behaves after being switched on. The Mobile Panel is started in one of the following modes (*Start mode*) in accordance with this setting:

- *Service page* (default setting)
- *VNC*
- *Web*[5)]

Service page "Start mode"

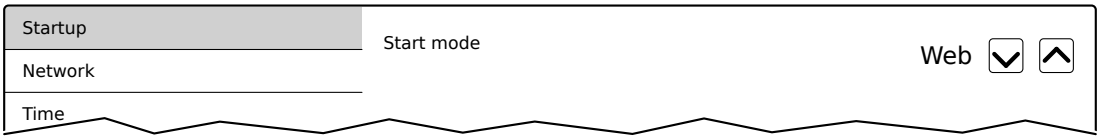
This setting is typically used during the development phase of an application because the service page is opened immediately after every Mobile Panel restart.

Start mode "VNC"

In start mode, the Mobile Panel is started as a VNC client in order to display an HMI application that is available on a VNC server.

Start mode "Web"

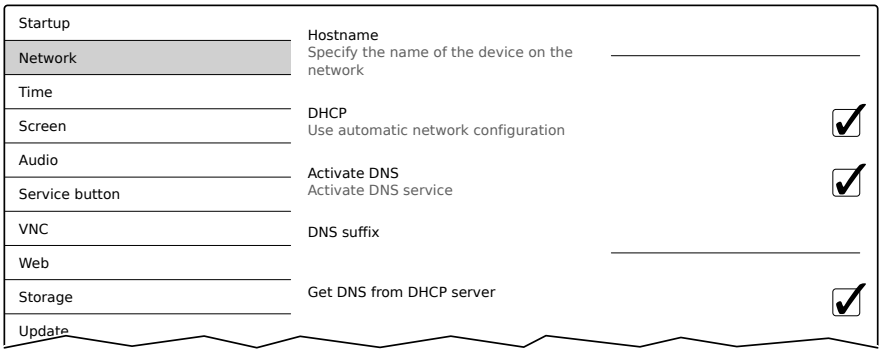
In starting mode *Web*, a web browser that displays web server content is started immediately after restarting the Mobile Panel.



[5)] Service page "Web" is only supported by Mobile Panel 7140 and Mobile Panel 7150.

4.2.4.3 Service page "Network"

The default settings for service *Network* are as follows:



Information:

Network configuration changes do not require the Mobile Panel to be rebooted and are applied by the system and processed immediately after saving the settings and exiting the service pages (see "Service page "Save & exit"" on page 109).

Hostname

Default setting: Blank (no hostname defined)

The Mobile Panel is identified in the network using its IP address or hostname. If a hostname is entered here, the Mobile Panel can be identified in the network using this name, which allows it to be accessed (e.g. by Automation Studio).

Important information

- The hostname must be unique in the network.
- The name can have a maximum length of 64 characters.

DHCP

Default setting: Enabled

When the Dynamic Host Configuration Protocol (DHCP) is enabled, the network configuration is automatically taken from the DHCP server and assigned to the Mobile Panel; otherwise, it must be entered manually (e.g. the IP address of the device, the IP address of the gateway, etc.).

For information about manual network configuration: see "Network configuration without DHCP" on page 94

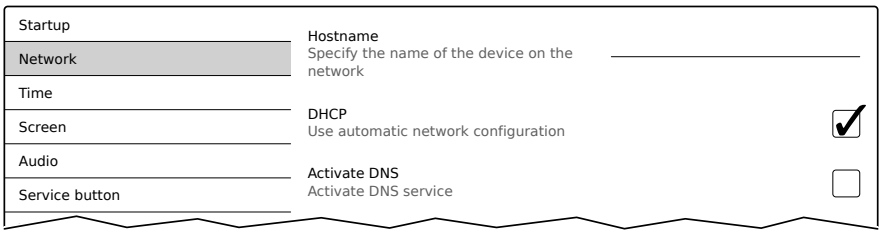
Activate DNS

Default setting: Enabled

If the two options *Activate DNS* and *DHCP* are enabled, then the device passes the defined hostname on to the DNS server. The hostname is thus entered in the DNS directory and the device can be identified within the network using the hostname and accessed by other devices.

If a hostname is entered in VNC or web mode, this option must be enabled so the hostname of the VNC or web server can be deactivated and the associated IP address can be obtained from the DNS server.

If this option is disabled, the device can only be accessed using an IP address assigned by the DHCP. In this case, options *DNS suffix* and *Get DNS from DHCP server* are hidden and not available:



DNS suffix

Default setting: Blank (no DNS suffix defined)

A DNS suffix is usually entered when a hostname is defined. The DNS suffix is specific to the network in which the device is being operated. Information about this must be obtained from the network administrator.

The hostname and the DNS suffix make up the full domain name (FQDN: Fully Qualified Domain Name) for the device:

```
hostname.dns-suffix
```

Hostname:	`mp7100-visualization-machine-01`
DNS suffix:	`network-domain.com`
Fully qualified domain name (FQDN):	`mp7100-visualization-machine-01.network-domain.com`

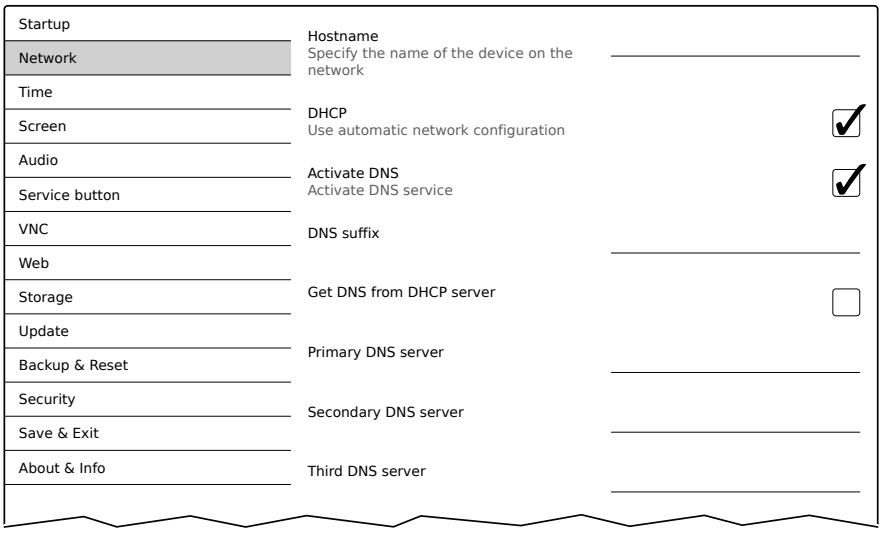
Table 29: The full domain name could, for example, look like this:

Get DNS from DHCP server

Default setting: Enabled

By default, the IP addresses for the DNS server are automatically obtained from the DHCP server.

If it be necessary to manually enter the IP addresses for the DNS server (without generally disabling DHCP), this can be done by disabling this option:



Primary DNS server / Secondary DNS server / Third DNS server

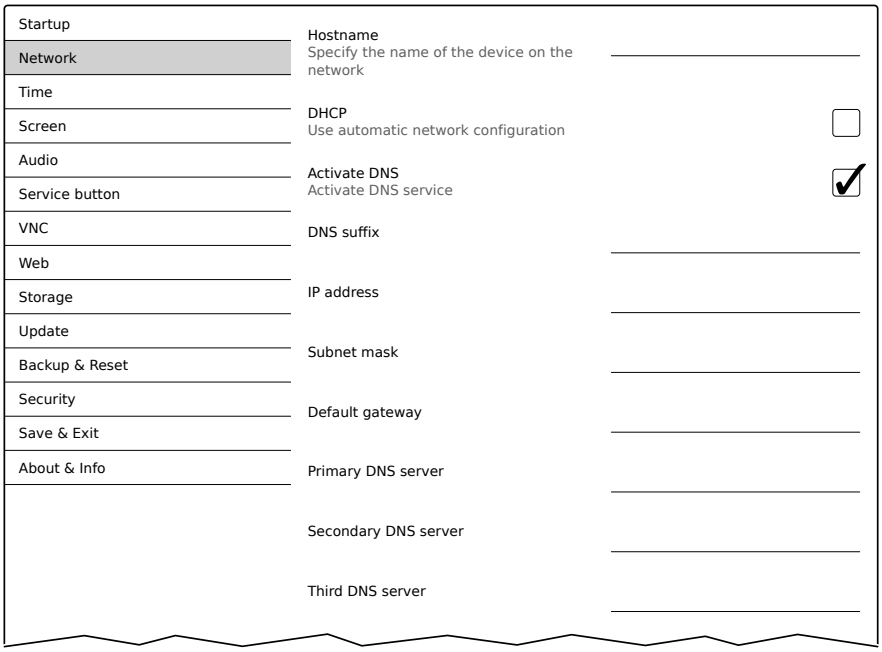
Default setting: Blank

The IP addresses for the DNS server.

This input option for the DNS server is only displayed if option *Activate DNS* is enabled.

4.2.4.3.1 Network configuration without DHCP

The entire network configuration can be completed manually by disabling option *DHCP*:



Information:

The data required for manual network configuration can be obtained from the network or system administrator.

Information:

IP addresses are checked for validity when they are entered. Only characters that build a valid IP address can be entered.

If the IP address entered is incomplete or the network configuration is incorrect, error messages will be output when starting up the device.

Hostname* / *DHCP* / *Activate DNS* / *DNS suffix

Description of these options: See service page *"Network" on page 92*

IP address

Default setting: Blank

Here you have to enter the IP address of the Mobile Panel within the network.

Subnet mask* / *Default gateway

Default setting: Blank

Subnet mask and IP address of the default gateway.

***Primary DNS server* / *Secondary DNS server* / Third DNS server**

Default setting: Blank

The IP addresses for the DNS server.

The input option for the DNS server is only displayed if option *Activate DNS* is enabled.

4.2.4.3.2 Reading the I/O mapping with Automation Studio

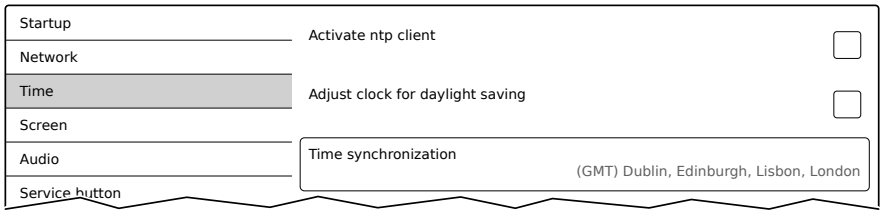
In rare cases, the I/O mapping cannot be read in Automation Studio if the MP7100 is used with a fixed IP address (under Network, options *DHCP*, *Activate DNS*, *Get DNS from DHCP server* are all disabled). This can be corrected with the following adjustments.

Necessary adjustments in the Automation Studio project:		
	Parameter	Value to be set
CPU configuration (e.g. X20CPxxxx)	DNS parameters / Activate DNS service	**On**
	DNS parameters / Get DNS from DHCP server	**On**
	OPC UA system / Activate OPC UA system	**On**
MP71xx configuration	Network/Hostname	[Hostname of the Mobile Panel]
Necessary adjustments in the service app of the Mobile Panel:		
Service page "Network"	Hostname	[Hostname of the Mobile Panel]
	IP address[1)]	IP address

1) This parameter is only displayed if options *DHCP*, *Activate DNS* and *Get DNS from DHCP server* are disabled.

4.2.4.4 Service page "Time"

On this service page you can configure various settings for the time server and daylight saving time.

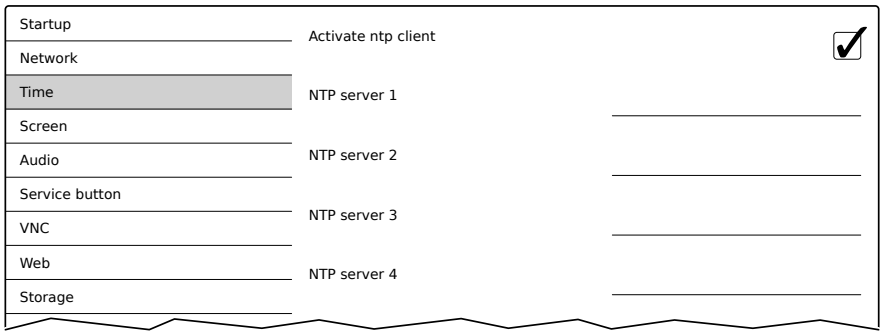


Activate ntp client

Default setting: Disabled

With this option, an NTP Client can be enabled on the Mobile Panel, which synchronizes the time on the Mobile Panel with a time server (NTP server).

After enabling the option, one to four NTP servers can be entered:



Synchronization takes place cyclically. The interval between synchronization is increased once a certain degree of accuracy has been achieved on the system.

Adjust clock for daylight saving

Default setting: Disabled

If this option is enabled, time changes related to daylight savings time take place automatically.

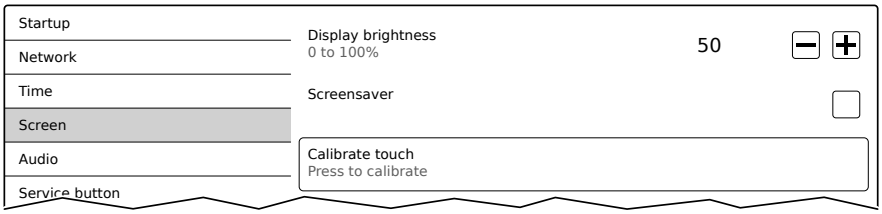
Time synchronization

Default setting: (GMT) Dublin, Edinburgh, Lisbon, London

When making a selection (via touch or mouse click), a list of all time zones is shown and the appropriate one can be selected.

4.2.4.5 Service page "Screen"

On this service page, some settings for the display can be changed. The following graphic shows the default settings:



Display brightness

Default setting: 50

Input range: 0 to 100

Unit: %

Sets the display brightness used after the device is restarted.

Screensaver

Default setting: Disabled

The options for the selected screen saver is described in the following section "Screensaver settings" on page 97 .

Calibrate touch **(button)**

Function: Start touch calibration (see "Touch screen calibration" on page 70).

4.2.4.5.1 Screensaver settings

If option *Screensaver* is enabled, additional options are shown:

Start screensaver after

Default setting: 15

Input range: 1 to 60

Unit: Minutes

If there is no touch screen activity for the specified duration, the screensaver is started. Touching the screen exits the screensaver and the last active screen contents are shown.

Screensaver type

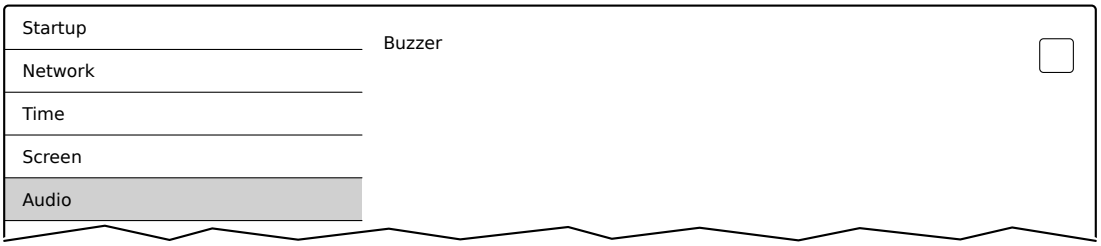
Default setting: Backlight off

If the screensaver is started after a period of inactivity, the display goes into the selected mode:

Black	The display is dark. The backlight remains on.
Backlight off	The display is dark. The backlight is switched off (result: lower power consumption).

4.2.4.6 Service page "Audio"

On this service page, an audio signal can be configured for a touch gesture or controlled by an application.



Information:

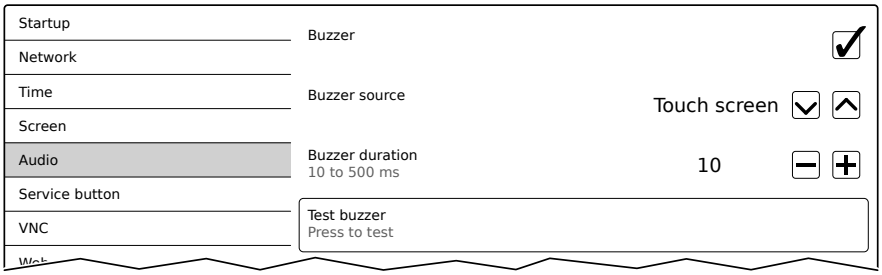
Service page "Audio" is only supported by the Mobile Panel 7140 and Mobile Panel 7150.

Buzzer

Default setting: Disabled

If this option is disabled, an audio signal is not output for a touch gesture on the Mobile Panel.

The following settings can be made when *Buzzer* is enabled:



Buzzer source

Default setting: Touch

The following options are available for triggering a buzzer:

Touch screen	In VNC and web mode, an audio signal is output for each touch operation. This takes place independently of the application controlled by the Mobile Panel operating system.
App	The RFB extension and corresponding library can be used to allow the application to trigger the audio signal. See: "Audio signal output" on page 147

Buzzer duration

Default setting: 10

Input range: 10 to 500

Unit: ms (milliseconds)

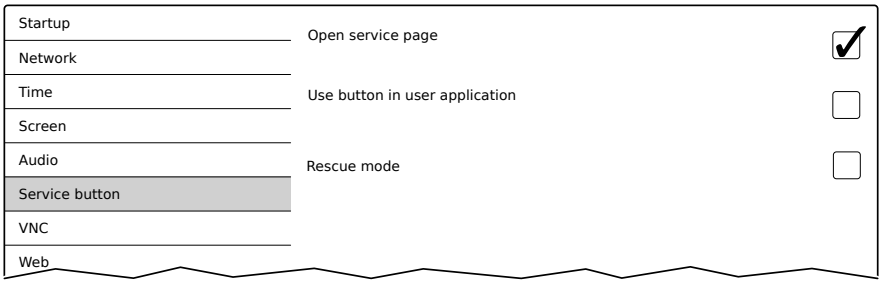
This setting is used to configure the duration of the generated audio signal.

Test buzzer **(button)**

Function: Testing the buzzer (sound is produced).

4.2.4.7 Service page "Service button"

The settings on this service page configure the button for opening the service page:



Open service page

Default setting: Enabled

Enabled	In VNC/web mode, the service page can be opened using the Service button.
Disabled	In VNC/web mode, the service page cannot be opened using the Service button.

> **Information:**
>
> **A mouse must be connected in order to open the service page in VNC/web mode (see "Mouse" on page 71). A mouse can only be connected to the Mobile Panel 7140 and Mobile Panel 7150. If this setting is disabled on a Mobile Panel 712x, the service page can only be launched if start mode "Service page" has been set (see 4.2.4.2 "Service page "Startup"").**

Use button in user application

Default setting: Disabled

Enabled	The Service button can be used for applications in the VNC/web mode. If the Service button is pressed, this information is transferred to the server (configuration in Automation Studio). The service page can be opened using the Service button by pressing it for more that 5 seconds when option *Open service page* is enabled.
Disabled	The Service button behaves as described in option *Open service page*.

Rescue mode

Default setting: Disabled

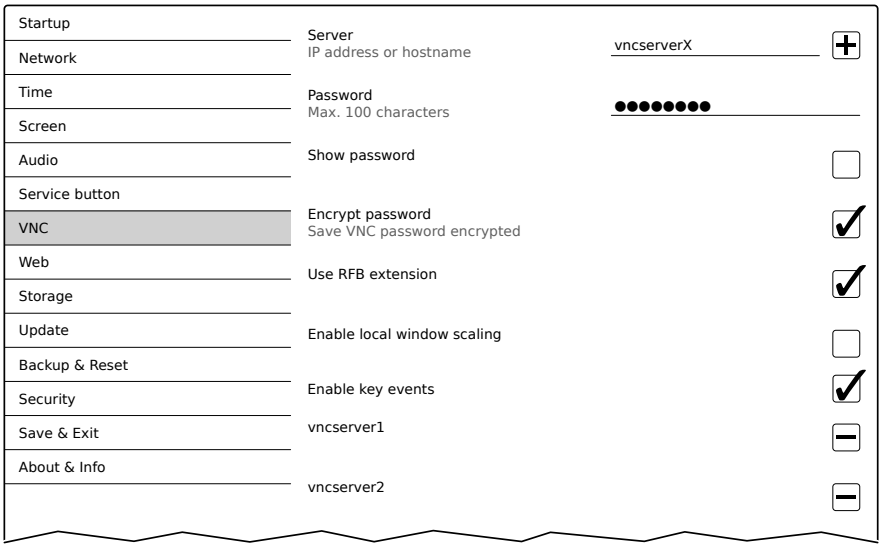
Enabled	Rescue mode makes it possible to start the Mobile Panel in the service app instead of in VNC mode. If rescue mode is enabled, the service button must be pressed within 5 seconds after all LED status indicators of the Mobile Panel blink. The Mobile Panel then starts the service app.
Disabled	The service button behaves as described in option *Open service page*. **Information:** **If both *Rescue mode* and *Open service page* are disabled, more access to the service app may be possible. In this case, the default image must be reinstalled.**

This function is available for all MP7100 variants starting with the following image versions.

- MP712x: V1.3.0 or later
- MP7140/MP7150: V1.4.0 or later

4.2.4.8 Service page "VNC"

In order to use the Mobile Panel as a VNC client, the following settings are necessary:



Server

Default setting: Blank (no server entered or selected)

In order to use the Mobile Panel as a VNC client, a hostname or IP address for the VNC server must be specified.

It is possible here to enter multiple server in a list. Entering the hostname or IP address and then clicking on the [+] icon) adds the specified server in the list at the end of this services page (see "vncserver1" and "vncserver2" in the previous image).

To use a specific VNC server from this list, it must be selected in the server list (via touch gesture or mouse click). The currently selected VNC server is displayed in input field *Server*.

Information:

If the specified IP address is incomplete or a VNC server does not exist for the IP address or the specified hostname, a message is output indicating that a network connection could not be established in VNC mode.

Password

Default setting: Blank (no password entered)

Input range: Max. 100 characters

Information:

Only one password can be entered, which is only used for the currently selected VNC server.

If a password has been entered, then the VNC client (Mobile Panel) is connected to the VNC server without an additional password query.

If no password has been entered, then the password on the Mobile Panel will be queried each time a connection to the VNC server is established.

The password is stored in configuration file `MP71xxConfig.xml` on the device.

Information:

The filename depends on the respective device.

- **MP7120:** **`MP7120Config.xml`**
- **MP7121:** **`MP7121Config.xml`**
- **MP7140:** **`MP7140Config.xml`**
- **MP7150:** **`MP7150Config.xml`**

Show password

Default setting: Disabled

Enabled	The password is shown in the entry field as plain text.
Disabled	The password is hidden in the entry field using placeholder characters (●●●●●●).

Encrypt password

Default setting: Enabled

Enabled	The password is stored on the device in encrypted form.
Disabled	The password is stored on the device as plain text.

Use RFB extension

Default setting: Disabled

With the RFB extension enabled, a B&R VNC server (VNC-based HMI application) can query data from the VNC client and execute a variety of functions.

See: "RFB extension" on page 146

Enable local window scaling

Default setting: Disabled

Enabled	The VNC application is scaled to the Mobile Panel screen size.
Disabled	The VNC application is shown on the Mobile Panel screen in its original size.

Information:

Enabling option *Enable local window scaling* reduces the performance of the Mobile Panel because of increased demands on processing power.

Enable key events

Default setting: Enabled

Enabled	Transfers the key matrix and key events.
Disabled	Only transfers the key matrix.

Information:

Enabling option *Enable key events* reduces the performance of the Mobile Panel because of increased demands on processing power.

This function is only available for 5MP712x.xxxx-000 starting with image version 1.3.0.

4.2.4.9 Service page "Web"

MP7140 and MP7150 can be configured as a web client on this service page. In this case, a web browser is operated in full screen mode and an HMI application or other application running on a web server (e.g. mapp View) is displayed in the browser.

Information:

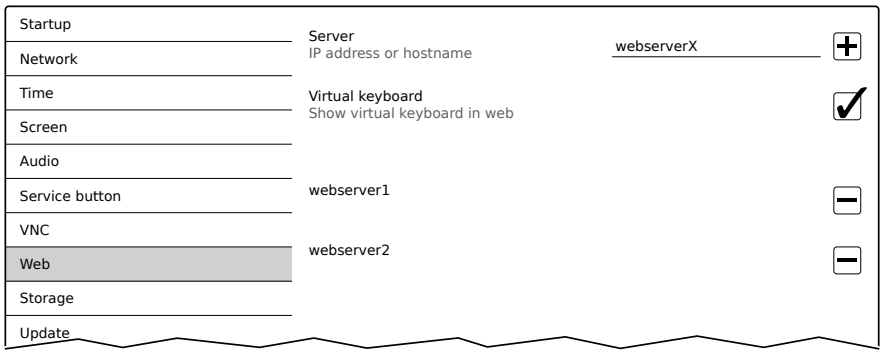
Service page "Web" is only supported by Mobile Panel 7140 and Mobile Panel 7150.

The following features are not supported:

- Java
- Flash

The web browser provides full JavaScript support!

The following image shows service page *Web* with the default settings:



Server

Default setting: Blank (no server entered or selected)

In order to use MP7140 or MP7150 as a web client, a hostname or IP address for the VNC server must be specified.

It is possible here to enter multiple server in a list. Entering the hostname or IP address and then clicking on the [+] icon) adds the specified server in the list at the end of this services page (see "webserver1" and "webserver2" in the previous image).

To use a specific web server from this list, it must be selected in the server list (via touch gesture or mouse click). The currently selected web server is displayed in input field *Server*.

If a port number is not specified together with the server, port 80 is used by default.

If the web server is available on a different port, the port must be specified explicitly together with the IP address or hostname:

Syntax	Example	Description
`IP address:Port`	`10.23.20.17:8080`	A connection to IP address `10.23.20.17` is established on port `8080`.
`Hostname:Port`	`webserver1:8081`	A connection to the host `webserver1` is established on port `8081`.

Information:

If the specified IP address is incomplete or a web server does not exist for the IP address or the specified hostname, a message is output indicating that a network connection could not be established in web mode.

Virtual keyboard

Default setting: Enabled

Enabled	The virtual keyboard is automatically shown on the screen if a text input field in the web browser has the focus (see "Keyboard" on page 71).
Disabled	The virtual keyboard for the web page is automatically shown if a text input field in the web browser has the focus. This functionality must be made available by the web server.

4.2.4.10 Service page "Storage"

On this service page, MP7140 and MP7150 memory can be shared to allow access from the network. The following memory areas can be shared for network access:

- Connected USB data storage devices
- Internal user memory

Information:

Service page "Storage" is only supported by Mobile Panel 7140 and Mobile Panel 7150.

Sharing takes place using the CIFS protocol (**C**ommon **I**nternet **F**ile **S**ystem). In this case, the Mobile Panel functions as a server and makes resources (a memory area) available to a client in the network using an access mechanism. CIFS uses a user, password and memory for authentication.

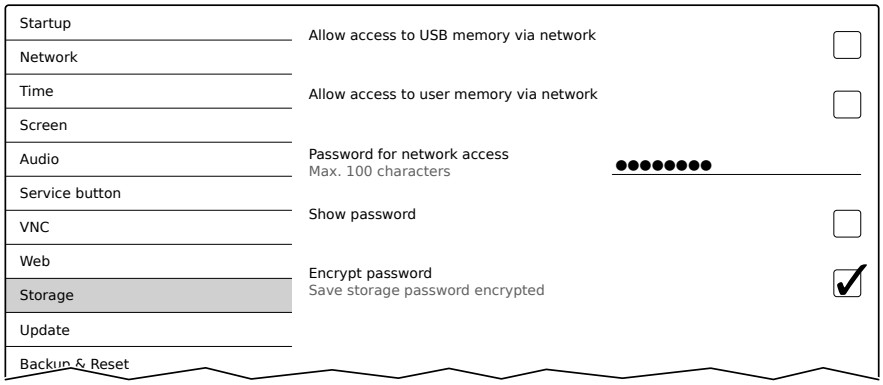
The client will require the following information to access the memory area shared on Mobile Panel:

CIFS user	The CIFS user cannot be configured. "`mp7100-user`" must always be used as the CIFS user.	
CIFS password	The password configured on this service page password is used.	
CIFS memory location	The following names can be used to specify the memory location:	
	Name	Description
	usbshare	USB memory connected to USB1 (IF3).
	usbshare2	USB memory connected to USB2 (IF4).
	usershare	Internal user memory (flash) on the Mobile Panel.

Information:

The USB memory must be formatted using the FAT32 file system.

The following image shows the default settings for service page *Storage*:



Allow access to USB memory via network

Default setting: Disabled

If this option is enabled, access to the connected USB memory will be shared on the network.

Allow access to user memory via network

Default setting: Disabled

If this option is enabled, access to the internal user memory will be shared on the network.

Password for network access

Default setting: Blank (no password entered)

Input range: Max. 100 characters

The CIFS password for network sharing is configured here. This password is used share USB memory internal user memory.

The password is stored in configuration file `MP71xxConfig.xml` on the device.

Information:

The filename depends on the respective device.

- **MP7120:** **`MP7120Config.xml`**
- **MP7121:** **`MP7121Config.xml`**
- **MP7140:** **`MP7140Config.xml`**
- **MP7150:** **`MP7150Config.xml`**

Show password

Default setting: Disabled

Enabled	The password is shown in the entry field as plain text.
Disabled	The password is hidden in the entry field using placeholder characters (●●●●●●).

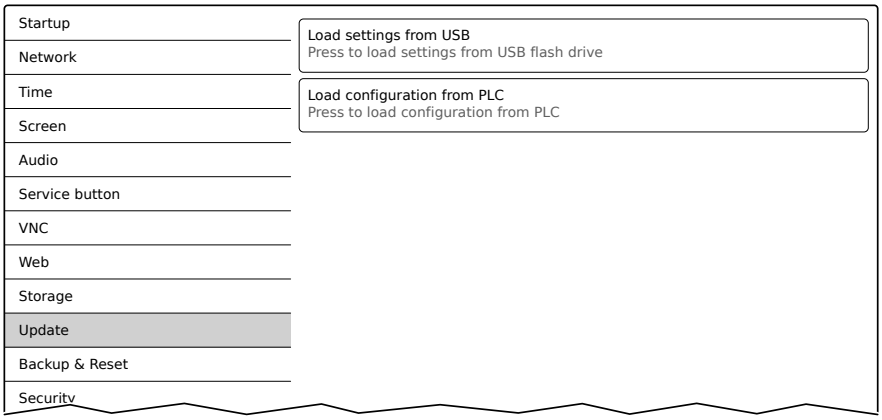
Encrypt password

Default setting: Enabled

Enabled	The password is stored on the device in encrypted form.
Disabled	The password is stored on the device as plain text.

4.2.4.11 Service page "Update"

On this service page, various parts of the system can be updated from a range of different sources.



***Load settings from USB*(button)**

If no USB memory is connected, an appropriate message is shown.

If at least one USB memory device is connected, then a dialog box with USB interfaces IF3 and IF4 is shown. The name of the USB memory device is also shown to aid in selection. After the interface is selected, the settings are loaded from XML file `MP71xxConfig.xml`.

Information:

The filename depends on the respective device.

- **MP7120:** **`MP7120Config.xml`**
- **MP7121:** **`MP7121Config.xml`**
- **MP7140:** **`MP7140Config.xml`**
- **MP7150:** **`MP7150Config.xml`**

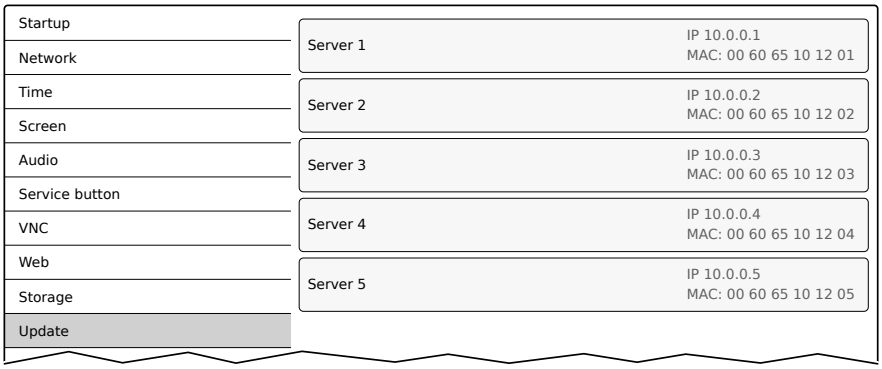
They can be checked and modified on the service pages if necessary after loading and before saving the settings. Data is stored using functions on service page *Save & Exit* (see "Service page "Save & exit"" on page 109).

Information:

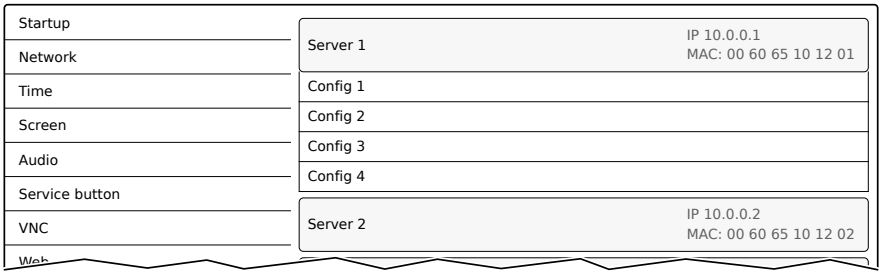
This function is only supported by Mobile Panel 7140 and Mobile Panel 7150.

***Load configuration from PLC*(button)**

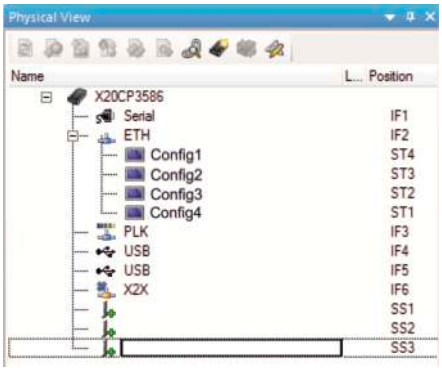
This function searches for controllers in the network that have a valid configuration for a Mobile Panel. After the search is complete (a few seconds), the discovered controllers are listed:



When selecting an entry, a list with the configurations of all Mobile Panels for the selected controller is displayed:



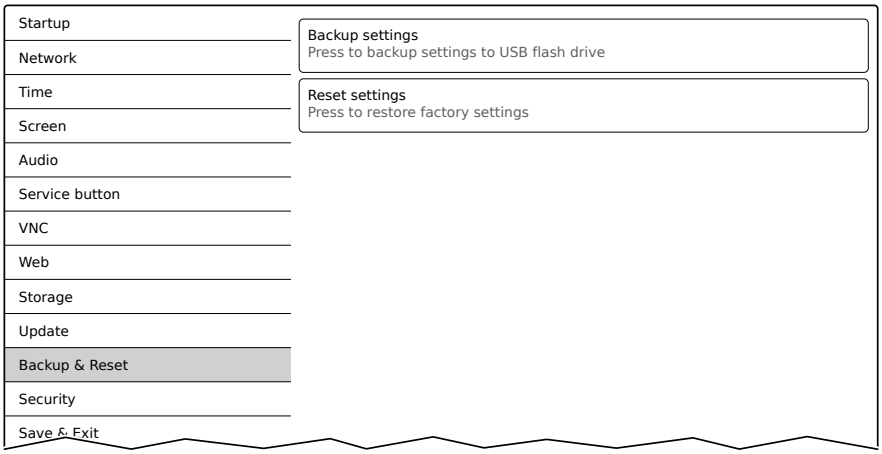
The names of the listed configurations match the names of the configurations in Automation Studio:



If a configuration entry is selected, a dialog box appears asking for installation of the configuration to be confirmed. After downloading the data, the application goes to service page *Save & Exit* and the data can be stored using a corresponding command. Alternatively, the user can check and – if necessary – modify the loaded settings on any of the service pages before saving.

4.2.4.12 Service page "Backup & reset"

On this service page, individual parts or the entire system can be backed up or restored. A factory reset is also possible:



Information:

Only settings that have already been saved using a function on service page *Save & Exit* are included when creating a backed up. Settings and service pages that have not been saved are not backed up.

Backup settings **(button)**

Accessing this function creates a backup of the settings and stores it on the USB flash drive.

Information:

This function is only supported by Mobile Panel 7140 and Mobile Panel 7150.

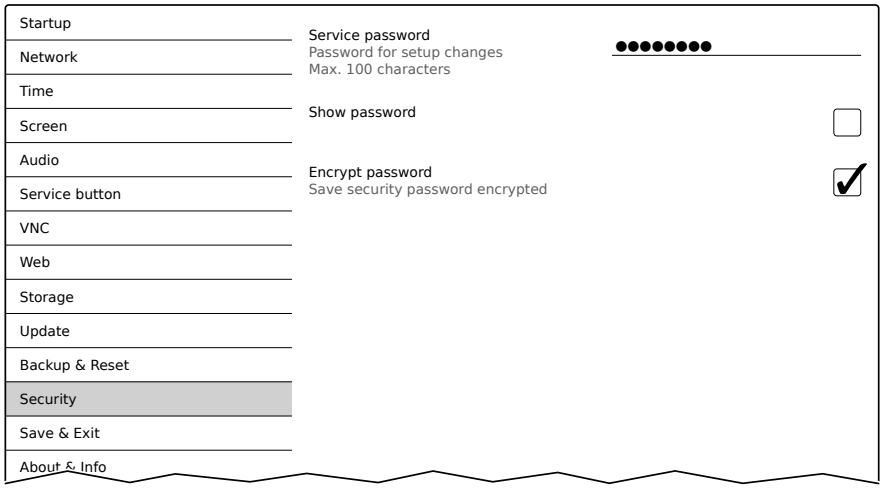
Reset settings **(button)**

Accessing this function loads the factory default settings.

Information:

The settings made on the service pages are not saved and will be lost.

4.2.4.13 Service page "Security"



Service password

Default setting: Blank (no password entered)

Input range: Max. 100 characters

The service password is used to control access to the service pages (see "Entering the service password" on page 88).

The password is stored in configuration file `MP71xxConfig.xml` on the device.

Information:

The filename depends on the respective device.

- **MP7120:** **`MP7120Config.xml`**
- **MP7121:** **`MP7121Config.xml`**
- **MP7140:** **`MP7140Config.xml`**
- **MP7150:** **`MP7150Config.xml`**

Show password

Default setting: Disabled

Enabled	The password is shown in the entry field as plain text.
Disabled	The password is hidden in the entry field using placeholder characters (●●●●●●).

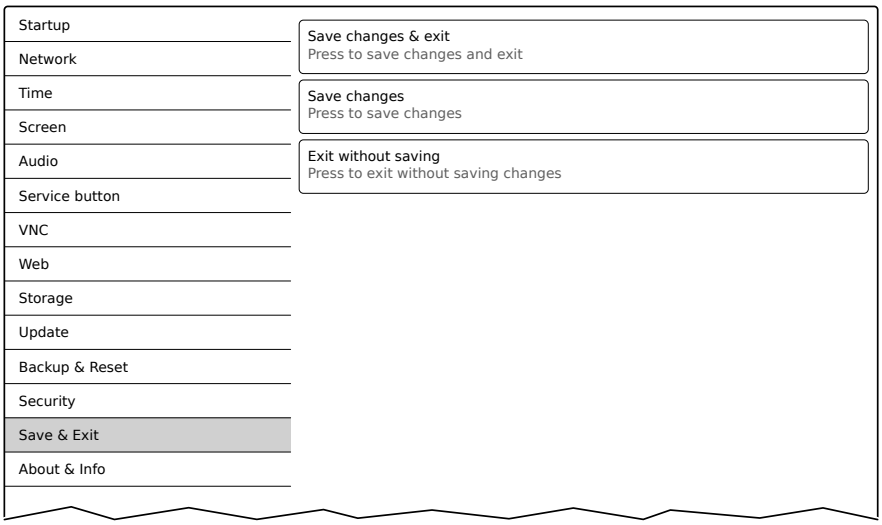
Encrypt password

Default setting: Enabled

Enabled	The password is stored on the device in encrypted form.
Disabled	The password is stored on the device as plain text.

4.2.4.14 Service page "Save & exit"

On this page, the settings currently made or modified on service pages can be saved using the *Save button*. Use *Exit* to leave the service pages and the Mobile Panel starts in the configured start mode (see "Service page "Startup"" on page 91).



Save changes & exit **(button)**

All changes that have been made are saved and the Mobile Panel is started with the specified settings (see "Service page "Startup"" on page 91)

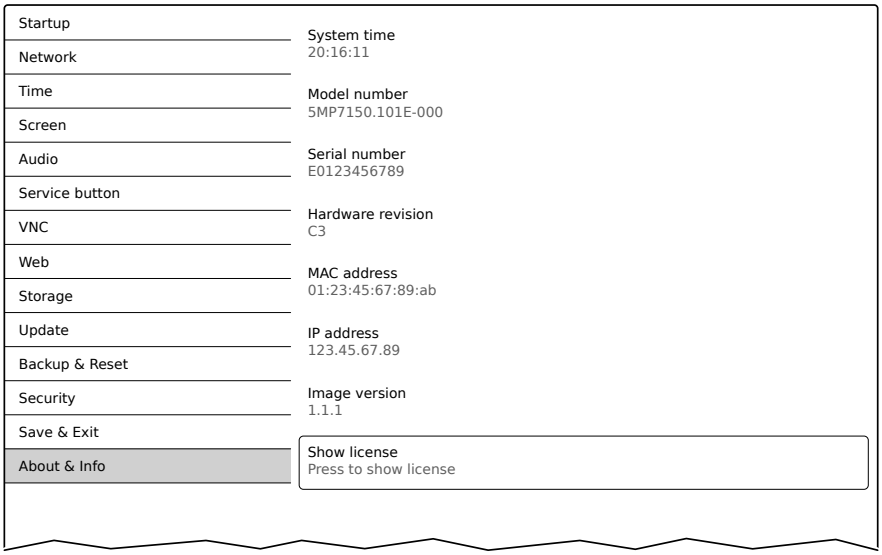
Save changes **(button)**

All changes made are saved. The service pages are exited and other settings can be made.

Exit without saving **(button)**

Changes made are not saved and will be lost. The Mobile Panel starts as configured with the last settings that were saved (see "Service page "Startup"" on page 91).

4.2.4.15 Service page "About & info"



The following information about the Mobile Panel is displayed on this service page:

System time	Current time
Model number	Device number/model number/order number
Serial number	Serial number of the device
Hardware revision	Hardware revision
MAC address	MAC address of the network interface
IP address	IP address currently being used in the network
Image version	Version number of MP7100 systems (MP7100 image)

Show license **(button)**

Accessing this function displays the licenses of the software components used on the Mobile Panel.

4.2.5 Update

When updating the Mobile Panel with a USB flash drive, it is important to note that the drive must have a capacity of at least 512 MB. In addition, an industrial-grade USB flash drive must be used (see "USB flash drives" on page 125).

Information:

All data in user memory on the Mobile Panel as well as user-specific settings are overwritten by the update.

4.2.5.1 Updating with a download from the website and a USB flash drive

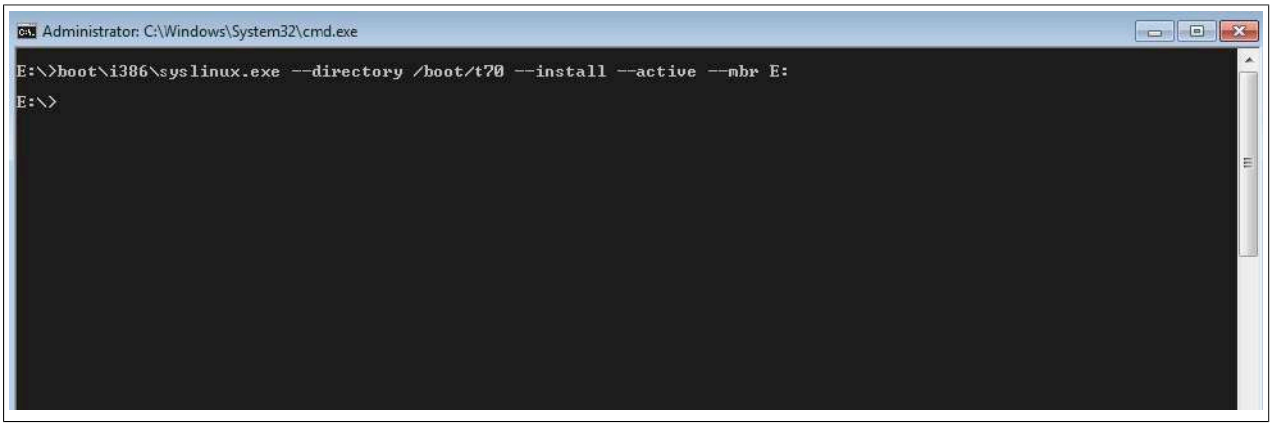
Updated versions of the Mobile Panel operating system are made available on the B&R website in the form of an upgrade package that includes a Mobile Panel image. To update the Mobile Panel system using an upgrade package, the following steps must be carried out.

1. The Mobile Panel MP7100 series upgrade package must be downloaded from the B&R website. This upgrade package is located at different locations on the website (login required):
   - Directly on the product page (it is possible to search for the model number) under tab "Downloads".
   - On the download page under "Industrial PCs > Mobile Panel".
2. Unzip the ZIP file. It contains the following files:
   - MP71xx.zip (xx stands for 20, 21, 40 or 50)
   - Liesmich.txt
   - Readme.txt
3. Unzip the contents of file MP71xx.zip directly in the root directory of a USB flash drive.

   ## Information:

   The USB flash drive must be reformatted with FAT32 before the procedure.
4. After unzipping, cmd.exe must be opened with administrator rights.
5. It is then necessary to switch to the USB flash drive in cmd.exe, e.g. drive E.
6. Then the following command must be executed:

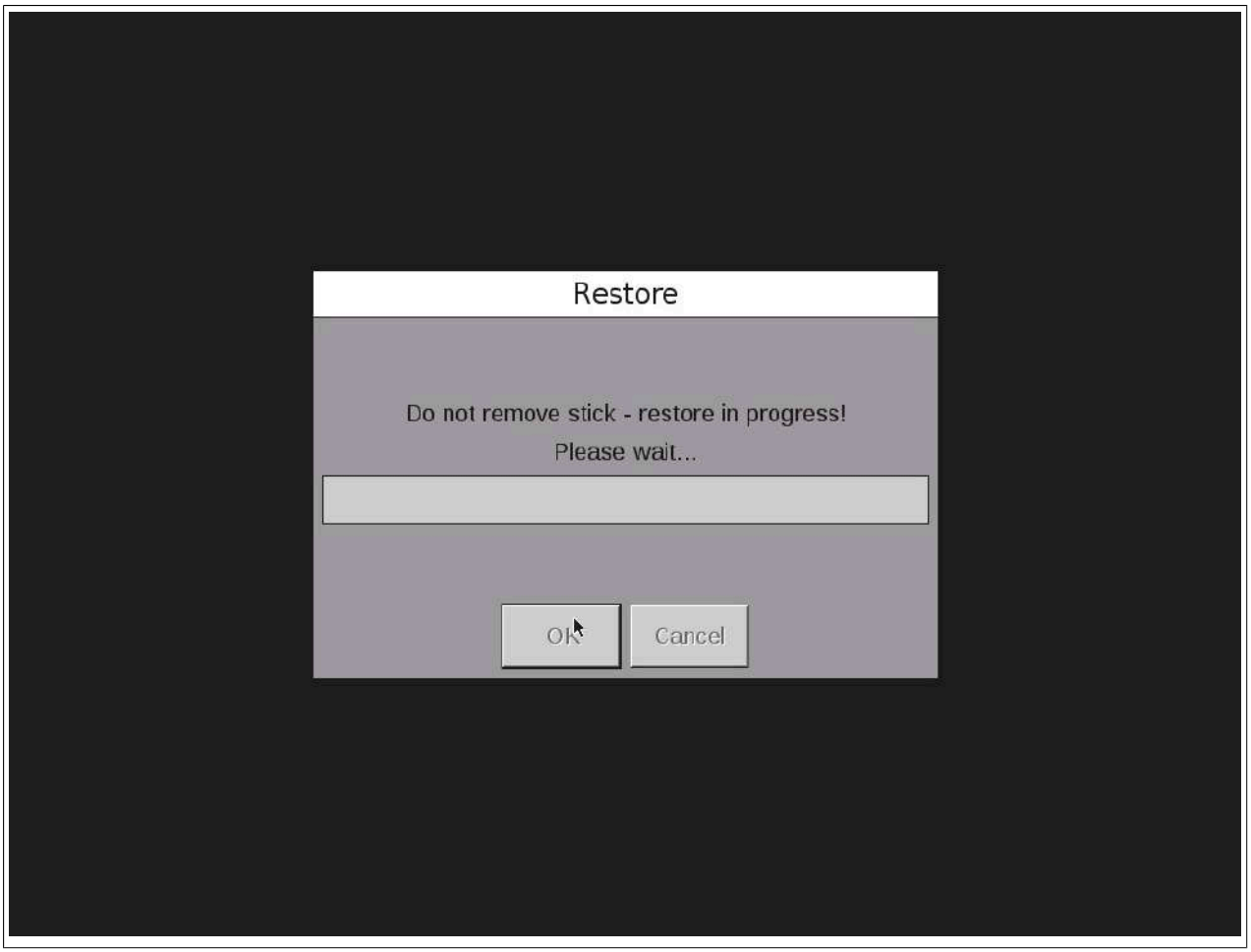
   ```
   E:\boot\i386\syslinux.exe --directory /boot/t70 --install --active --mbr E:
   ```

   No message will appear if execution takes place without errors.
7. The USB flash drive must be connected to the Mobile Panel before the boot procedure, and the image will be programmed automatically after the Mobile Panel is switched on.

   ## Information:

   On the MP7120 and MP7121, a standard USB OTG adapter cable is necessary for this.



After a successful restore, the USB flash drive must be removed and the system restarted. A corresponding message is displayed that must be confirmed with OK.

Information:

The Mobile Panel 7120 and 7121 must then be restarted once more in order for the device-specific key configuration to be set automatically.

4.2.5.2 Duplicating an existing installer with a USB flash drive

It is possible to back up the system settings of a Mobile Panel 7140 and 7150 to a USB flash drive and apply them to another Mobile Panel.

To do so, the following steps must be carried out:

1. Connect a USB flash drive to the Mobile Panel whose configuration should be copied.
2. The configuration can be backed up on a USB flash drive on service page "Backup & reset" (see "Service page "Backup & reset"" on page 107).
3. Then connect the USB flash drive to another Mobile Panel.
4. Update the Mobile Panel with the backed-up configuration using the corresponding function on service page "Update" (see "Service page "Update"" on page 105). The configuration (settings) can only be used on identical devices.

4.3 Windows Embedded Standard 7

4.3.1 General information

The successor to Windows XP Embedded is Windows Embedded Standard 7. As with previous versions, this embedded operating system offers full system support for B&R industrial PCs. In addition to new features that are also included in Windows 7 Professional, Windows Embedded Standard 7 includes embedded components such as Enhanced Write Filter, File-Based Write Filter, Registry Filter and USB Boot. Windows Embedded Standard 7 is available in 2 different versions. The main difference between them has to do with multilingual support. Windows Embedded Standard 7 is only available in a single language, whereas Windows Embedded Standard 7 Premium supports the installation of several languages simultaneously.

With Windows Embedded Standard 7, Microsoft has made substantial improvements in the area of security. The AppLocker program, available in the premium version, can prevent the execution of unknown or potentially undesired applications that are being installed over a network or from drives that are directly connected. A tiered approach allows the differentiation between scripts (.ps1, .bat, .cmd, .vbs and .js), installation files (.msi, .msp) and libraries (.dll, .ocx). AppLocker can also be configured to record undesired activity and display it in the Event Viewer. Windows Embedded Standard 7 is only offered in the 64-bit version for the Mobile Panel 7151. This ensures that even the most demanding 64-bit applications have the level of support they need[6)].

4.3.2 Order data

Model number	Short description	Figure
	Windows Embedded Standard 7	
5SWWI7.1848-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Service Pack 1 - Multilingual - For MP7151 - Installation (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	Windows Embedded Standard 7	
5SWWI7.2000-MUL	Windows Embedded Standard 7 SP1 - 64-bit - Language Pack DVD	

Table 30: 5SWWI7.1848-MUL - Order data

4.3.3 Features

The feature list shows the most important device functions in Windows Embedded Standard 7.

Function	Windows Embedded Standard 7	Windows Embedded Standard 7 Premium
Enhanced Write Filter (EWF)	✓	✓
File Based Write Filter (FBWF)	✓	✓
Administrator account	✓	✓
User account	Configurable	Configurable
Windows Explorer shell	✓	✓
Registry filter	✓	✓
Internet Explorer 11.0	✓	✓
Internet Information Service (IIS) 7.0	✓	✓
Anti-malware (Windows Defender)	-	✓
Add-ons (Snipping Tool, Sticky Notes)	-	✓
Windows firewall	✓	✓
.NET Framework 4.5	✓	✓
32-bit and 64-bit support	✓	✓
Remote Desktop Protocol 7.0	✓	✓
File compression utility	✓	✓
Windows Installer service	✓	✓
Windows XP mode	-	-
Media Player 12	✓	✓
DirectX	✓	✓
Multilingual user interface packs in the same image	-	✓
International components and language services	✓	✓
Language pack installer	✓	✓
Windows Update	Configurable	Configurable
Windows PowerShell 2.0	✓	✓
BitLocker	-	✓
AppLocker	-	✓
Tablet PC support	-	✓
Multi-touch support	-	✓

Table 31: Device functions in Windows Embedded Standard 7

6) Except ADI applications, which are only supported on a 32-bit basis.

Function	Windows Embedded Standard 7	Windows Embedded Standard 7 Premium
Boot from USB stick	✓	✓
Accessories	✓	✓
Page file	Configurable	Configurable
Number of fonts	134	134

Table 31: Device functions in Windows Embedded Standard 7

Information:

The device functions of Windows Embedded Standard 7 Premium apply to the Mobile Panel 7151.

4.3.4 Installation

Windows Embedded Standard 7 is preinstalled by B&R. The system is then automatically configured when it is switched on for the first time. This procedure takes approximately 15 minutes, with the device being rebooted a number of times.

4.3.5 Drivers

The operating system contains all drivers necessary for operation. If an older driver version is installed, the latest version can be downloaded and installed from the B&R website (www.br-automation.com). It is only important to ensure that "Enhanced Write Filter (EWF)" is disabled.

4.3.5.1 Touch screen driver

The single-touch screen on the Mobile Panel 7151 is operated with the default Microsoft HID driver in Windows touch mode. This driver is installed automatically; no other driver is necessary.

The touch screen behaves the same as single-touch devices in the Automation Panel series with the B&R touch screen driver in Windows touch mode.

4.3.6 Supported display resolutions

Per Microsoft requirements, Windows Embedded Standard 7 requires XGA resolution (1024 x 768) or higher to enable full operation of the Windows user interface (including system dialog boxes, etc.). A lower resolution can be selected for applications.

4.4 Automation Device Interface (ADI)

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

4.4.1 ADI driver

4.4.1.1 Installation

The ADI driver is included in most B&R Windows operating systems or can be installed on request.

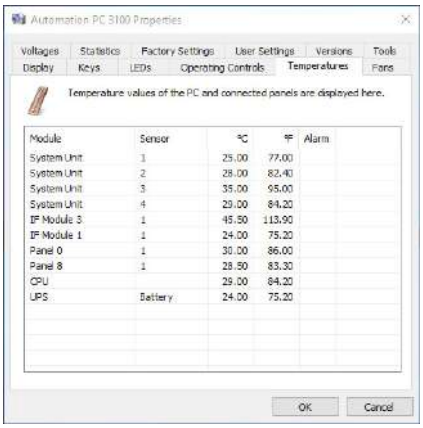
The ADI driver (also includes the Control Center) and user documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com). If a more recent version is available, it can be installed later.

Information:

The *Write filter* must be disabled during installation.

4.4.1.2 Control Center

The settings of B&R devices can be read out and changed in Windows using the 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.

4.4.1.2.1 Functions

The 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 or calibrating control devices (e.g. key switch, handwheel, joystick, potentiometer)
- Reading out temperatures, fan speeds, switch positions and statistical data
- Reading out operating hours (power-on hours)
- Reading user settings and factory settings
- Reading software versions
- Updating and backing up BIOS and firmware
- Creating reports for the current system (support)
- Setting the SDL equalizer value for the SDL cable adjustment
- Changing the user serial ID

Depending on the version, see either the Control Center's integrated online help or the user documentation for a detailed description.

Information:

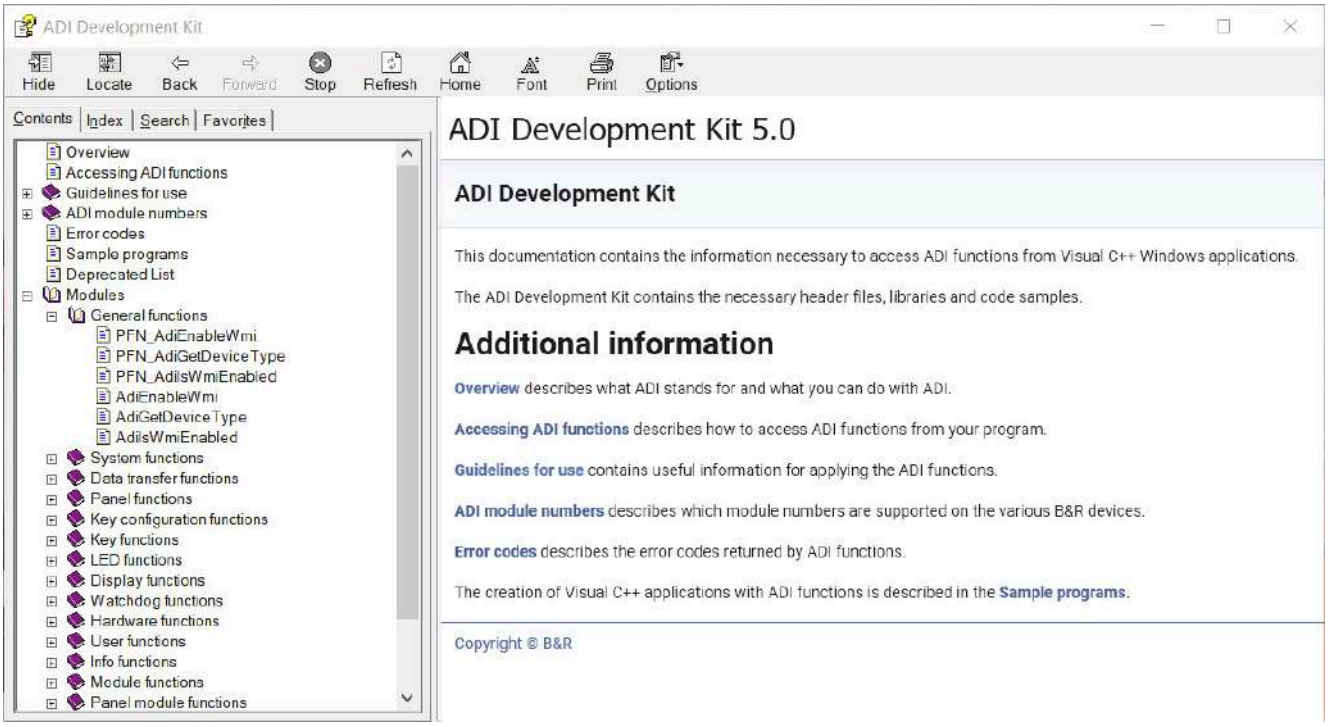
The functions available in the Control Center depend on the device family.

4.4.2 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 MP7x51.



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 for the device must be installed on the mentioned product family. 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.

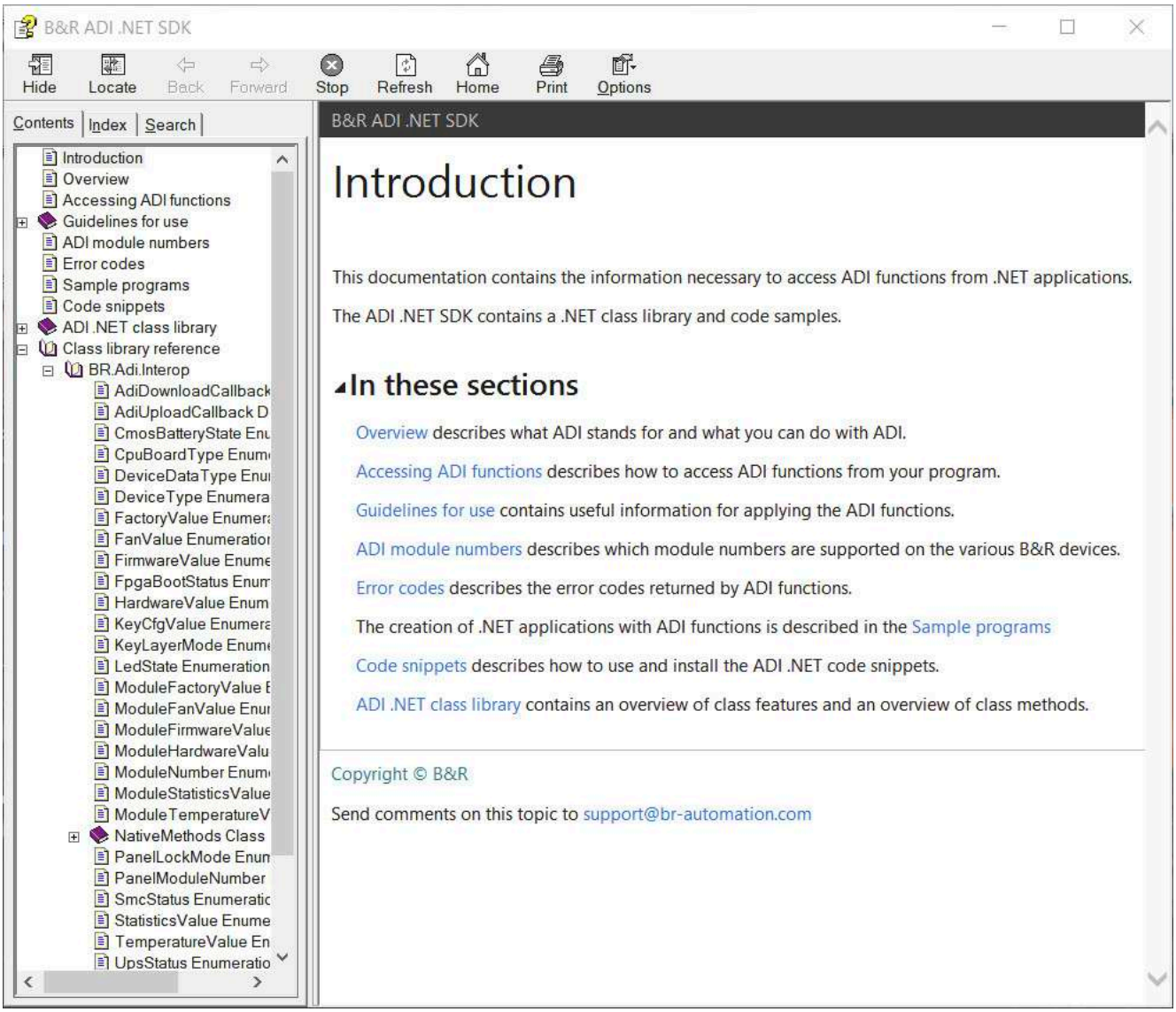
The B&R ADI Development Kit can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

4.4.3 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 MP7x51.



Features:

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

The appropriate ADI driver for the device must be installed on the mentioned product family. 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).

5 Standards and certifications

5.1 Directives and declarations

5.1.1 CE marking

All directives applicable to the respective product and their harmonized EN standards are met.

5.1.2 EMC Directive

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:

The declarations of conformity are available on the B&R website under Downloads - Certificates - Declarations of conformity.

5.1.3 Machinery directive

Conformity with Machinery Directive "2006/42/EC" is demonstrated by compliance with the following harmonized standards for the STOP button as well as the device for enabling control:

EN ISO 13850:2008	Safety of machinery - Emergency stop - Principles for design

If the device for enabling control is equipped with two enable switches, the following standard also applies:

EN ISO 13849-1:2015	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design

Information:

The stop button and the enabling devices are parts of the safety control circuits of a machine. The basic safety control circuits can therefore only be filled with the entire safety control circuits.

Information:

The declarations of conformity are available on the B&R website under Declarations of conformity.

5.1.4 Type approval certificate

Information:

The type approval certificate is available on the B&R website (see Certificates - Safety technology - Mobile Panel 7100).

5.2 Safety technology standards and definitions

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

5.2.1 General procedures and safety principles

EN ISO 12100-2010	Safety of machinery - General principles for design - Risk assessment and risk reduction

5.2.2 Design of the enabling control device

EN 60204-1:2006	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
EN 60947-5 -8:2006	Low-voltage switchgear and control gear - Part 5-8: Control circuit devices and switching elements - Three-position enabling switches
EN 60947-1:2007	Low-voltage switchgear and controlgear - Part 1: General rules
EN 60947-5 -1:2004	Low-voltage switchgear and control gear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices

For enabling devices with two enabling switches, the following standards also apply:

EN ISO 13849-1:2008	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN ISO 13849-2:2008	Safety of machinery - Safety-related controller components - Part 2: Validation
EN 62061:2005 (appendix E)	Safety of machinery - Functional safety of electrical, electronic and programmable electronic control systems (appendix E)

5.2.3 Design of the stop button

EN ISO 13850:2008	Safety of machinery - Emergency stop function - Principles for design
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

5.2.4 Stop functions per EN 60204-1:2006 (Electrical equipment of machines - Part 1: General requirements)

There are three categories of stop functions:

Category	Description
0	Stopping by immediate removal of power to the machine actuators (i.e. an uncontrolled stop).
1	A controlled stop with power left available to the machine actuators to allow for stopping. Power is only interrupted when standstill is achieved.
2	A controlled stop with power left available to the machine actuators.

Table 32: Overview of stop function categories

The necessary stop functions must be determined based on a risk assessment of the machine. Category 0 and category 1 stop functions must be functional regardless of operating mode. A category 0 stop must have priority. Stop functions must have priority over assigned start functions. Resetting the stop function is not permitted to trigger a dangerous state.

5.2.5 Emergency stops per EN 60204-1:2006 (Electrical equipment of machines - Part 1: General requirements)

In addition to the requirements for stop functions, the emergency stop function has the following requirements:

- It shall override all other functions and operations in all modes.
- Power to the machine actuators that can cause a hazardous situation shall be removed as quickly as possible without creating other hazards.
- A reset is not permitted to initiate a restart.
- The stop function is not permitted to reduce the effectiveness of the safety devices equipment or of equipment with safety-related functions.
- The stop function is not permitted to interfere with equipment designed to free personnel from hazardous situations.

Emergency stops must be category 0 or category 1 stop functions. The necessary stop function must be determined based on a risk assessment of the machine.

Only hardwired electromechanical equipment is permitted to be used for stop category 0 emergency stop functions. In addition, this functionality is not permitted to depend on electronic switching logic (hardware or software) or the transfer of commands via a communication network or data connection.[1)]

With a stop category 1 emergency stop function, it must be ensured that the power to the machine actuators is completely switched off. This switching off must take place using electromechanical equipment.

5.2.6 Safety categories in accordance with EN ISO 13849-1:2015 (Safety of machinery - Safety-related parts of control systems - Part 1: General design principles)

Safety category (per EN 13849-1:2015)	Short description	System behavior
B	SRP/CS and/or their protective equipment, as well as their components, shall be designed, constructed, selected, assembled and combined in accordance with relevant standards so that they can withstand the expected influence. Basic safety principles shall be used.	**Caution!** **The occurrence of a fault can lead to the loss of the safety function.**
1	Requirements of B shall apply. Well-tried components and well-tried safety principles shall be used.	**Caution!** **The occurrence of a fault can lead to the loss of the safety function but the probability of occurrence is lower than for category B.**
2	Requirements of B and the use of well-tried safety principles shall apply. Safety function shall be checked at suitable intervals by the machine control system.	**Caution!** **The occurrence of a fault can lead to the loss of the safety function between the checks.** **The loss of safety function is detected by the check.**
3	Requirements of B and the use of well-tried safety principles shall apply. Safety-related parts shall be designed so that: • A single fault in any of these parts does not lead to the loss of the safety function. • Whenever reasonably practicable, the single fault is detected.	**Caution!** **When a single fault occurs, the safety function is always performed.** **Some but not all faults will be detected.** **Accumulation of undetected faults can lead to the loss of the safety function.**
4	Requirements of B and the use of well-tried safety principles shall apply. Safety-related parts shall be designed so that: • A single fault in any of these parts does not lead to the loss of the safety function. • The single fault is detected at or before the next demand upon the safety function. If this detection is not possible, an accumulation of undetected faults is not permitted to lead to the loss of the safety function.	**Information:** **When a single fault occurs, the safety function is always performed.** **Detection of accumulated faults reduces the probability of the loss of the safety function (high DC).** **The faults will be detected in time to prevent the loss of the safety function.**

Table 33: Overview of safety categories

The following risk graph (per EN 13849-1:2015, annex A) provides a simplified procedure for risk assessment:

[1)] In accordance with the national foreword of the applicable German-language version of EN 60204-1:2006, electronic equipment – and especially emergency stop systems – are permitted to be used regardless of the stop category if the same degree of safety is provided by applying standard EN ISO 13849-1:2015 and/or IEC 61508, for example, as is required by EN 60204-1.

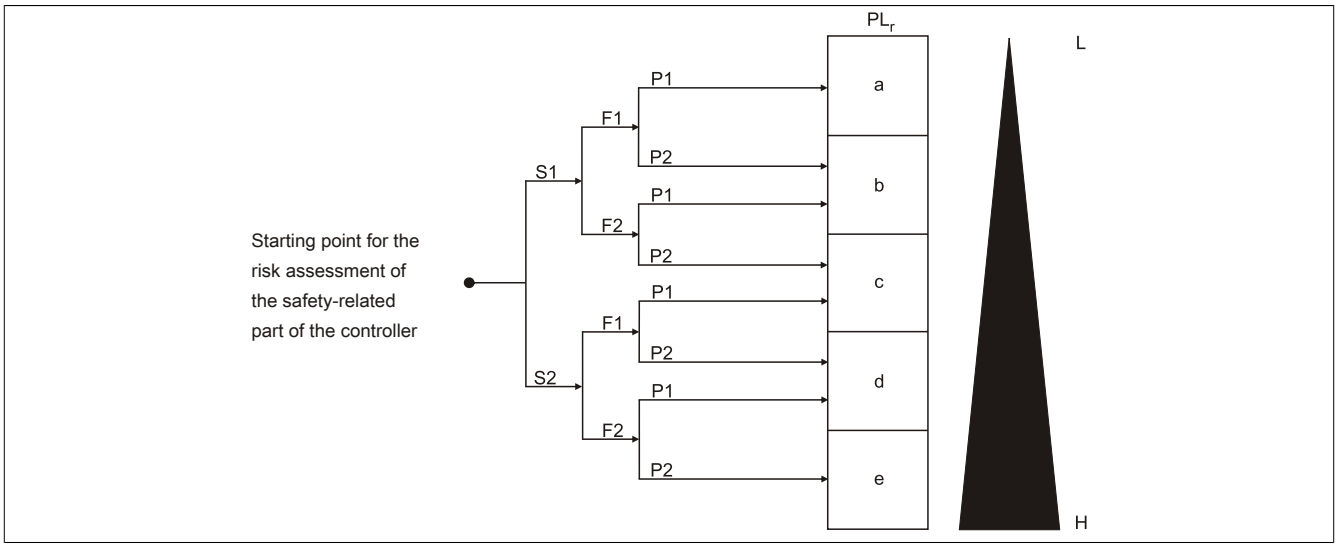


Figure 47: Risk graph for determining the PLr for each safety function

Parameter S ... Severity of injury	
S1	Slight (normally reversible injury).
S2	Serious (normally irreversible injury or death)
Parameter F ... Frequency and/or exposure to hazard	
F1	Seldom to less often and/or exposure time is short.
F2	Frequent to continuous and/or exposure time is long.
Parameter P ... Possibility of avoiding hazard or limiting harm	
P1	Possible under specific conditions.
P2	Scarcely possible.
Other	
L	Low contribution to risk reduction
H	High contribution to risk reduction
PL_r	Required performance level

Table 34: Legend for the risk graph

5.2.7 Selecting the performance level and category per EN ISO 13849-1

The machinery directive dictates that a defect in the logic of the control loop – or disturbance or damage to the control loop itself – is not permitted to result in a dangerous situation. This general approach is standardized in EN ISO 13849-1 "Safety-related parts of control systems", which defines performance levels (PL a to e) for safety-related control systems. The PL depends on the category, the $MTTF_d$ value and the DC of the corresponding safety circuit. The CCF examination must also be performed.

As in the earlier EN 954-1 standard, the category describes the structure of the safety functions. What is new is the performance level (PL), which describes the safety function's probability of failure and ability to detect faults.

The PL is selected by the machine manufacturer according to the actual potential for hazardous situations determined by the danger and risk assessment. At a minimum, PL d is normally required for dangers that can result in irreversible injury or death.

The category specified with the PL provides information about the following:

- Whether the system is designed as a 1-channel system, in which case a fault could lead to a loss of the safety function but component availability is high (category 1)
- Whether the system is designed as a 1-channel system, in which case a fault could lead to a loss of the safety function but the fault is detected by the system and indicated in one form or another (category 2)
- Whether the system is designed as a 2-channel system and a fault will not lead to a loss of the safety function (category 3)
- Whether the system is designed as a 2-channel system and an accumulation of faults will not lead to a loss of the safety function (category 4)

In this regard, it is important to note that in category 3 and later, single faults must be detected promptly in order to prevent an accumulation of faults, which could then result in a loss of the safety function.

In electrical and electronic systems, faults that must be detected include cross faults between circuits, interruptions, short circuits or stuck contacts. Specially certified safety relays with their own specific PL are often used for detecting faults in the individual safety circuits. The overall PL necessary for the safety function is only achieved, however, if the connection with the corresponding circuits has also been implemented for the respective PL in accordance with the product description and the PL of all components contributing to the safety function have been taken into account.

The PL for an overall safety function must therefore always be calculated from the individual components or modules.

Standard EN ISO 13849-1 provides guidelines for more easily determining the PL for a safety function consisting of multiple components.

Note that with safety components connected in series, the PL of the safety function is determined by the safety component with the lowest PL in the safety function. For example, a safety function consisting of 3 components with category 4 PL e, category 3 PL d and category 2 PL c would result in a performance level of PL c for the overall safety function. In addition, it is important to note that a fault would result in the loss of the safety function even though category 4 PL e components are integrated in the safety function. This is because one of the components being used is only category 2.

Combining several PLs can reduce the overall PL.

A FMEA (failure mode and effects analysis) can ensure that a fault will not lead to the loss of the safety function. This is done by theoretically, or even practically, running through all possible faults and showing that the requirements of the category are sufficiently fulfilled.

5.2.8 Restart interlock per EN 1037:1995 (Safety of machinery - Prevention of unexpected start-up)

Keeping a machine in a state of rest while personnel are working in the danger zone is one of the most important requirements for safely operating machines.

Startup refers to the transition of a machine or its parts from a state of rest to a moving state. A startup is considered unexpected if caused by one of the following:

- A startup command generated due to controller failure or external influences on the controller.
- A startup command generated due to incorrect operation of a startup control actuator or another part of the machine.
- Restoration of the power supply after an interruption.
- External/Internal influences on parts of the machine.

To prevent unexpected startup of machines or parts of machines, power should be removed and dissipated. If this is not practical (e.g. frequent brief interventions in danger zones), other measures must be taken:

- Measures to prevent randomly generated startup commands.
- Measures to prevent randomly generated startup commands from causing unexpected startup.
- Measures to automatically stop the dangerous part of the machine before a dangerous situation can be caused by unexpected startup.

5.3 Quantitative safety specifications for the stop button and enabling control device (enabling device)

5.3.1 Stop button:

B&R provides a B_{10d} value. B&R cannot provide other values (e.g. SIL, PL, category).

Reason: B&R provides only the switching element, not an evaluation of it. The customer is responsible for connecting the stop button in their application. The way in which the stop button is implemented in the machine determines the SIL or category with PL for the customer.

The B_{10d} value is specified in the user's manual under "Stop button" on page 143.

5.3.2 Enabling control device with one enable switch (enabling device)

B&R provides a B_{10d} value. B&R cannot provide other values (e.g. SIL, PL, category).

Reason: B&R provides only the switching element, not an evaluation of it. The customer is responsible for connecting the enabling control device in their application. The way in which the enabling control device is implemented in the machine determines the SIL or category with PL for the customer.

The B_{10d} value is specified in the user's manual under "Enabling control device" on page 143.

5.3.3 Enabling control device with two enable switches (enabling device)

B&R specifies a category and a PL per EN ISO 13849-1 as well as a PFH value and an SIL classification per EN 61508.

This is because the enabling devices were assessed per EN ISO 13849-1 and EN 61508. There is no B_{10d} value for the enabling device since setup consists of the mechanical element and an electronic evaluation. The electronic evaluation means that B&R specifies all the enabling devices in the categories with PL, SIL and PFH.

5.3.4 Relationship between performance level and safety integrity level

When assessing safety functions per IEC 61508-1, PL values can be translated into SIL values according to table 4 of standard EN ISO 13849-1:2015.

Performance level (PL) per EN ISO 13849-1	Safety integrity level (SIL) per IEC 61508-1
a	No correspondence
b	1
c	1
d	2
e	3

Table 35: EN ISO 13849-1:2015, table 4 - Relationship between performance level (PL) and safety integrity level (SIL)

Performance level (PL)	Probability of dangerous failure per hour
a	$\geq 10^{-5}$ to $<10^{-4}$
b	$\geq 3 \times 10^{-6}$ to $<10^{-5}$
c	$\geq 10^{-6}$ to $<3 \times 10^{-6}$
d	$\geq 10^{-7}$ to $<10^{-6}$
e	$\geq 10^{-8}$ to $<10^{-7}$

Table 36: EN ISO 13849-1:2015, table 3 - Performance levels (PL)

5.4 Certifications

Danger!

A complete system can only receive certification if all individual components installed and connected in it have the corresponding certifications. If an individual component is used that does not have the corresponding certification, the complete system will also not be certified.

B&R products and services comply with applicable standards. These are international standards from organizations such as ISO, IEC and CENELEC, as well as national standards from organizations such as UL, CSA, FCC, VDE, ÖVE, etc. We pay special attention to the reliability of our products in the industrial sector.

Information:

The certifications valid for the respective product are available on the website and in the user's manual under the technical data in section "Certifications" or in the associated certificates.

5.4.1 UL certification

Products with this mark are tested by Underwriters Laboratories and listed as "industrial control equipment". The mark is valid for the USA and Canada and facilitates the certification of your machines and systems in this economic area.

Underwriters Laboratories (UL) per standard UL 508
Canadian (CSA) standard per C22.2 no. 142-M1987

The UL certificates are available on the B&R website under Downloads - Certificates - UL.

Ind. Cont. Eq.
E115267

5.4.2 EAC

Products with this mark are tested by an accredited test laboratory and permitted to be imported into the Eurasian Customs Union (based on EU conformity).

5.4.3 KC

Products with this mark are tested by an accredited test laboratory and permitted to be introduced into the Korean market (based on EU conformity).

6 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.

6.1 USB flash drives

6.1.1 5MMUSB.xxxx-01

6.1.1.1 General information

USB flash drives are easily replaceable storage media. Due to the fast data transfer (USB 2.0), USB flash drives offer optimal values for use as portable storage media. Without additional drivers, the USB flash drive immediately reports itself as another drive from which data can be read or to which data can be written (hot plugging).

Information:

Due to the large number of USB flash drives available on the market and their short lifecycles, we reserve the right to supply alternative products. It may therefore be necessary to take the following measures in order to also boot from these USB flash drives:

- **The USB flash drive must be reformatted or, in some cases, repartitioned (set partition as active).**
- **The USB flash drive must be in the first position in the boot sequence; alternatively, the IDE controllers can be disabled in BIOS. In most cases, this can be avoided by running "fdisk / mbr" on the USB flash drive.**

6.1.1.2 Order data

Model number	Short description	Figure
	USB accessories	
5MMUSB.2048-01	USB 2.0 flash drive 2048 MB B&R	
5MMUSB.4096-01	USB 2.0 flash drive 4096 MB B&R	

Table 37: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

6.1.1.3 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.

Model number	5MMUSB.2048-01	5MMUSB.4096-01
General information		
Capacity	2 GB	4 GB
LEDs	1 LED (green) [1)]	
MTBF	>3,000,000 hours	
Type	USB 1.1, USB 2.0	
Servicing	None	
Default file system	FAT32	
Certifications		
CE	Yes	

Table 38: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Model number	5MMUSB.2048-01	5MMUSB.4096-01
Interfaces		
USB		
Type	USB 1.1, USB 2.0	
Connection	To any USB type A interface	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)	
Sequential reading	Full speed: Max. 1 MB/s High speed: Max. 32 MB/s	
Sequential writing	Full speed: Max. 0.9 MB/s High speed: Max. 23 MB/s	
Endurance		
SLC flash memory	Yes	
Data retention	>10 years	
Data reliability	<1 unrecoverable error per 10^{14} bits read	
Mating cycles	>1500	
Support		
Operating systems		
Windows 10 IoT Enterprise LTSB 64-bit	Yes	
Windows Embedded 8.1 Industry Pro 32-bit	Yes	
Windows Embedded 8.1 Industry Pro 64-bit	Yes	
Windows 7 32-bit	Yes	
Windows 7 64-bit	Yes	
Windows Embedded Standard 7 32-bit	Yes	
Windows Embedded Standard 7 64-bit	Yes	
Windows XP Professional	Yes	
Windows XP Embedded	Yes	
Windows 2000	Yes	
Windows CE 5.0	Yes	
Windows CE 4.2	Yes	
B&R Linux 9	Yes	
B&R Linux 8	Yes	
Electrical properties		
Current consumption	Max. 500 µA in sleep mode, max. 120 mA read/write	
Ambient conditions		
Temperature		
Operation	0 to 70°C [2]	0 to 70°C [2]
Storage	-50 to 100°C	
Transport	-50 to 100°C	
Relative humidity		
Operation	85%, non-condensing	
Storage	85%, non-condensing	
Transport	85%, non-condensing	
Vibration		
Operation	20 to 2000 Hz: 20 g (peak)	
Storage	20 to 2000 Hz: 20 g (peak)	
Transport	20 to 2000 Hz: 20 g (peak)	
Shock		
Operation	Max. 1500 g (peak)	
Storage	Max. 1500 g (peak)	
Transport	Max. 1500 g (peak)	
Elevation		
Operation	Max. 3048 m [2]	Max. 3048 m [2]
Storage	Max. 12192 m	
Transport	Max. 12192 m	
Mechanical properties		
Dimensions		
Width	17.97 mm	
Length	67.85 mm	
Height	8.35 mm	

Table 38: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

1) Signals data transfer (reception and transmission).
2) The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.

6.1.1.4 Temperature/Humidity diagram

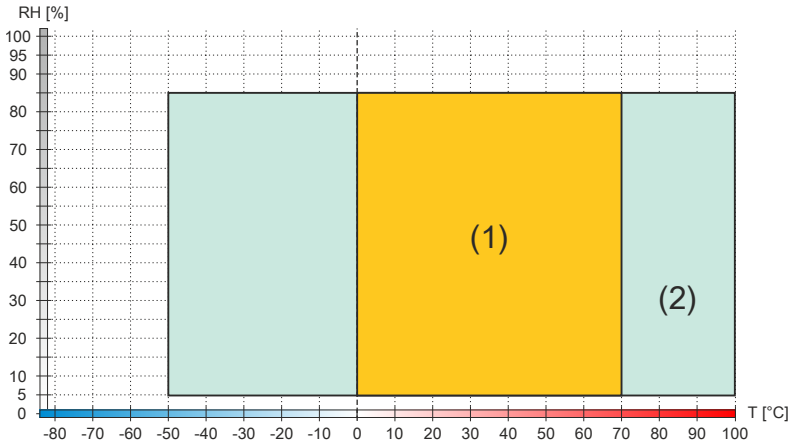


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

6.1.2 5MMUSB.032G-02

6.1.2.1 General information

USB flash drives are easily replaceable storage media. Due to the fast data transfer (USB 3.0), USB flash drives offer optimal values for use as portable storage media. Without additional drivers, the USB flash drive immediately reports itself as another drive from which data can be read or to which data can be written (hot plugging). USB 3.0 (XHCI) is supported in Windows 7 and later (USB 3.0 driver required).

> **Information:**
>
> **Due to the large number of USB flash drives available on the market and their short lifecycles, we reserve the right to supply alternative products. It may therefore be necessary to take the following measures in order to also boot from these USB flash drives:**
>
> - **The USB flash drive must be reformatted or, in some cases, repartitioned (set partition as active).**
> - **The USB flash drive must be in the first position in the boot sequence; alternatively, the IDE controllers can be disabled in BIOS. In most cases, this can be avoided by running "fdisk / mbr" on the USB flash drive.**

6.1.2.2 Order data

Model number	Short description	Figure
	USB accessories	
5MMUSB.032G-02	USB 3.0 flash drive 32 GB MLC	

Table 39: 5MMUSB.032G-02 - Order data

6.1.2.3 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.**

Model number	5MMUSB.032G-02
General information	
Capacity	32 GB
LEDs	1 LED (green) [1]
MTBF	>3,000,000 hours
Type	USB 2.0, USB 3.0
Servicing	None
Certifications	
CE	Yes
Interfaces	
USB	
Type	USB 2.0, USB 3.0
Connection	To any USB type A interface
Transfer rate	High speed (480 Mbit/s) to SuperSpeed (4 Gbit/s)
Sequential reading	USB 3.0 max. 100 MB/s
Sequential writing	USB 3.0 max. 50 MB/s
Endurance	
MLC flash memory	Yes
Data reliability	<1 unrecoverable error per 10^{14} bits read
Mating cycles	>1500
Electrical properties	
Current consumption	Max. 67 mA in sleep mode, max. 122 mA read, max. 141 mA write
Ambient conditions	
Temperature	
Operation	0 to 70°C [2]
Storage	-55 to 95°C
Transport	-55 to 95°C

Table 40: 5MMUSB.032G-02 - Technical data

Model number	5MMUSB.032G-02
Relative humidity	
Operation	10 to 95%, non-condensing
Storage	10 to 95%, non-condensing
Transport	10 to 95%, non-condensing
Vibration	
Operation	7 to 2000 Hz: 20 g
Storage	7 to 2000 Hz: 20 g
Transport	7 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Elevation	
Operation	Max. 3048 m [2]
Storage	Max. 12192 m
Transport	Max. 12192 m
Mechanical properties	
Dimensions	
Width	16.58 mm
Length	48.30 mm
Height	7.60 mm
Weight	10 g
Vendor information	
Manufacturer	Innodisk
Manufacturer's product ID	DEUA1-32GI61BCH88 (USB Drive 3ME)

Table 40: 5MMUSB.032G-02 - Technical data

1) Signals data transfer (reception and transmission).
2) The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.

6.1.2.4 Temperature/Humidity diagram

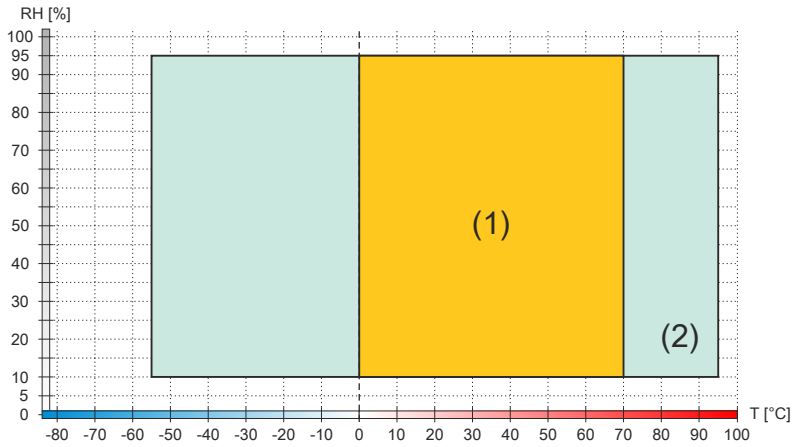


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

6.2 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.

6.2.1 5ACCWB20.0000-000

6.2.1.1 General information

The wall mount is used to store Mobile Panel 5MP712x and only suitable for vertical, hanging installation.

- Wall mount
- Stored for 5MP7120 and 5MP7121

6.2.1.2 Order data

Model number	Short description	Figure
	Accessories	
5ACCWB20.0000-000	Mobile Panel 7100 wall mount - For MP7120 and MP7121	

Table 41: 5ACCWB20.0000-000 - Order data

6.2.1.3 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.

Model number	5ACCWB20.0000-000
General information	
Certifications	
CE	Yes
Mechanical properties	
Dimensions	
Width	168.6 mm
Height	226.8 mm
Depth	94.4 mm

Table 42: 5ACCWB20.0000-000 - Technical data

6.2.2 5ACCWB40.0000-000

6.2.2.1 General information

This wall mount is used to store the Mobile Panel 5MP7140 and only suitable for vertical, hanging installation.

- Wall mount
- Storage for 5MP7140

6.2.2.2 Order data

Model number	Short description	Figure
	Accessories	
5ACCWB40.0000-000	Mobile Panel 7100 wall mount - For MP7140	

Table 43: 5ACCWB40.0000-000 - Order data

6.2.2.3 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.

Model number	5ACCWB40.0000-000
General information	
Certifications	
CE	Yes
Mechanical properties	
Dimensions	
Width	85 mm
Height	91 mm
Depth	27 mm

Table 44: 5ACCWB40.0000-000 - Technical data

6.2.3 5ACCWB50.0000-000

6.2.3.1 General information

This wall mount is used to store the Mobile Panel 5MP7150/5MP7151 and only suitable for vertical, hanging installation.

- Wall mount
- Storage for 5MP7150/5MP7151

6.2.3.2 Order data

Model number	Short description	Figure
	Accessories	
5ACCWB50.0000-000	Mobile Panel 7100 wall mount - For MP7150/MP7151	

Table 45: 5ACCWB50.0000-000 - Order data

6.2.3.3 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.

Model number	5ACCWB50.0000-000
General information	
Certifications	
CE	Yes
Mechanical properties	
Dimensions	
Width	201.4 mm
Height	226 mm
Depth	39.6 mm

Table 46: 5ACCWB50.0000-000 - Technical data

6.3 Connection boxes

6.3.1 4MPCBX.0000-00

6.3.1.1 General information

The 4MPCBX.0000-00 connection box 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.

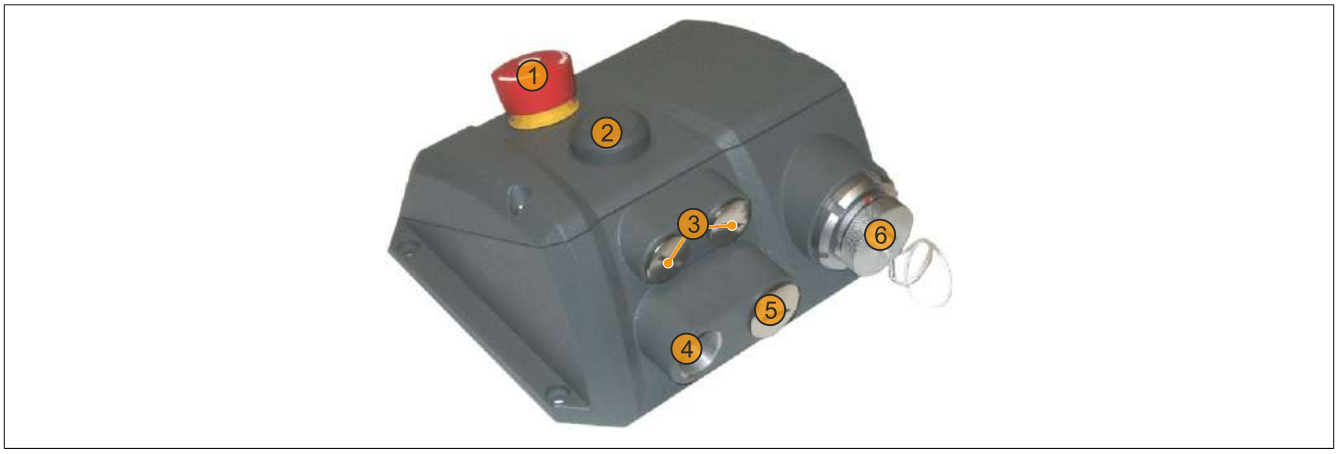
- Compatible for connections with Mobile Panel 7x00, Mobile Panel 40/50 and Mobile Panel 100/200
- Emergency stop circuit not interrupted when disconnecting and connecting the Mobile Panel during operation
- IP65 protection
- Satisfies EN ISO 13849-1:2015 category 4, performance level (PL) e requirements
- Circular connector with push-pull locking
- Emergency stop button
- Hot plug button
- Compact dimensions
- Robust construction

6.3.1.2 Order data

Model 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	
5CAMPB.0100-10	Mobile Panel box cable - With wire end sleeves - With connector contacts	

Table 47: 4MPCBX.0000-00 - Order data

6.3.1.3 Interfaces



Legend			
1	Emergency stop button	2	Hot plug button
3	M16 screw plug	4	Connection position (open)
5	M20 screw plug	6	Protective cover

6.3.1.4 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.

Model number	4MPCBX.0000-00
General information	
Certifications	
CE	Yes
Functional safety[1)]	Yes
UL	cULus E115267 Industrial control equipment
Keys	
Hot plug button	1 button, 2 normally closed contacts
Emergency stop	1 button, 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
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
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	Powdered RAL 7012, fine structure
Cover plate [3)]	
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)

Table 48: 4MPCBX.0000-00 - Technical data

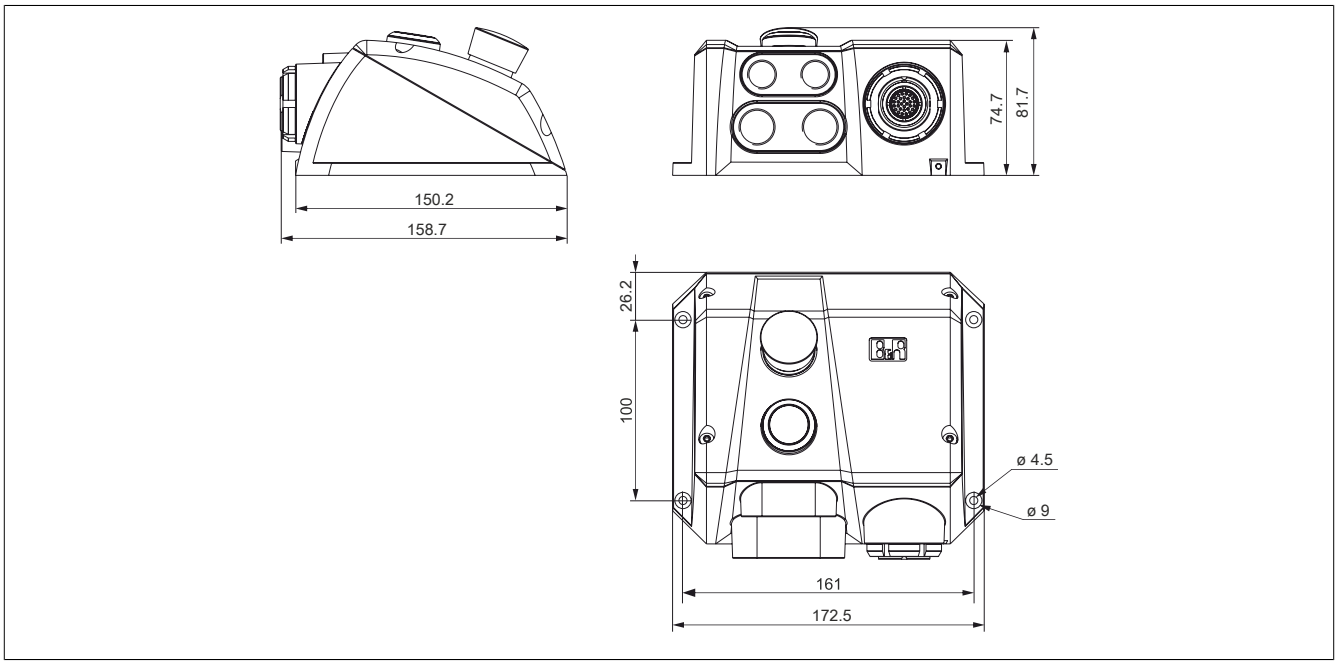
1) Achievable safety classifications (safety integrity level, safety category, performance level) are documented in the user's manual (section "Safety technology").
2) For the box cable.
3) The protective cover must be connected if no Mobile Panel is connected.

6.3.1.5 Safety characteristics

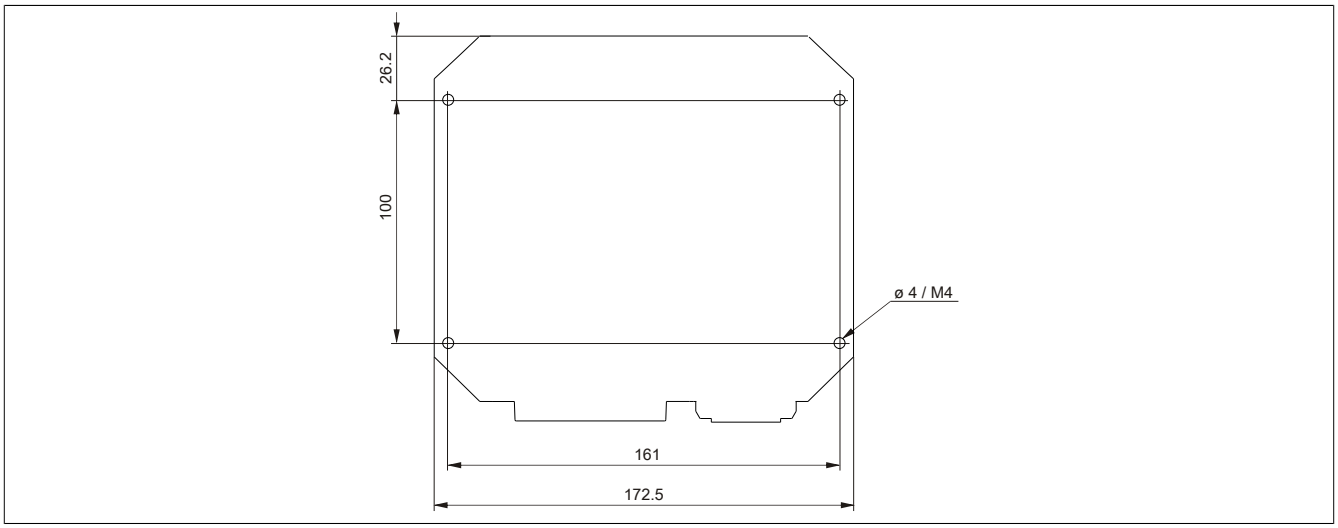
Criteria	Characteristic value
Maximum performance level (PL) per EN ISO 13849-1:2015	PL e
$MTTF_d$ (mean time to dangerous failure)	>100 years (high)
DC_{avg} (diagnostic coverage)	60% < DC < 90% (low)
PFH_D (probability of dangerous failure per hour)	$<6.4 \times 10^{-8}$
Mission time	20 years

Table 49: 4MPCBX.0000-00 - Safety characteristics

6.3.1.6 Dimensions



6.3.1.7 Drilling template 4MPCBX.0000-00



6.3.1.8 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.

6.3.2 4MPCBX.0001-00

6.3.2.1 General information

Connection box 4MPCBX.0001-00 makes it easy for the control cabinet cable to exit the control cabinet vertically, but it 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

6.3.2.2 Order data

Model 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	

Table 50: 4MPCBX.0001-00 - Order data

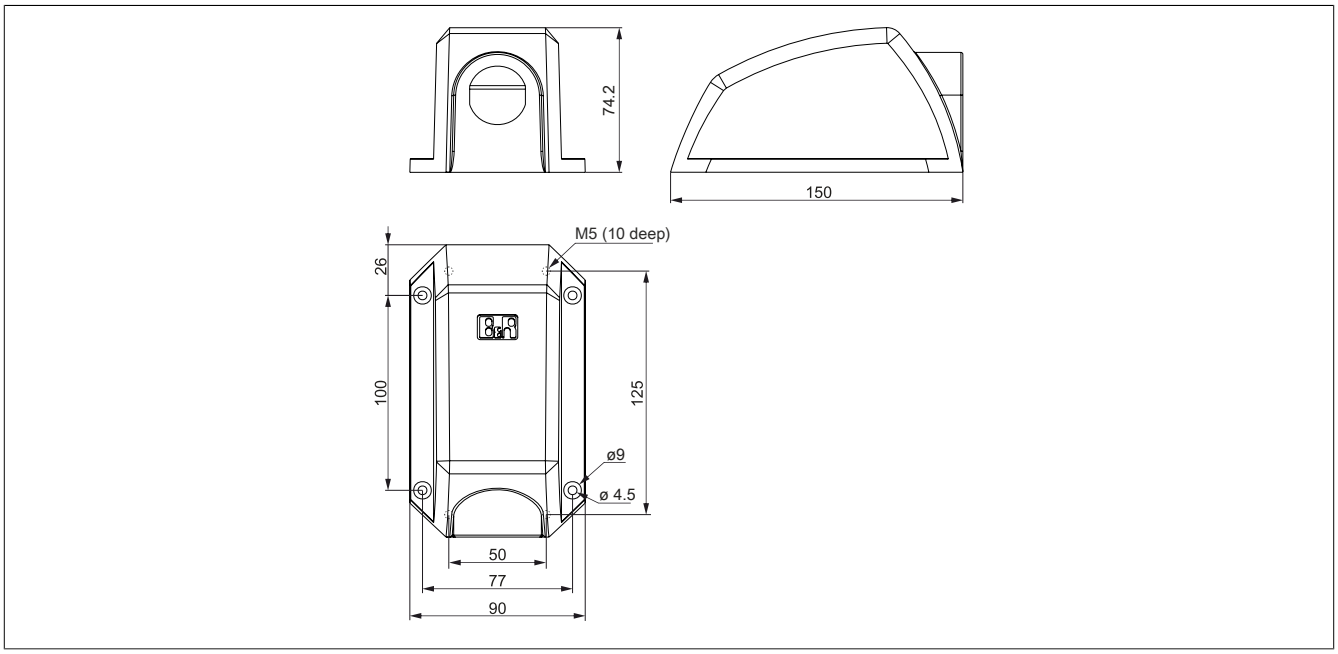
6.3.2.3 Technical data

> **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.**

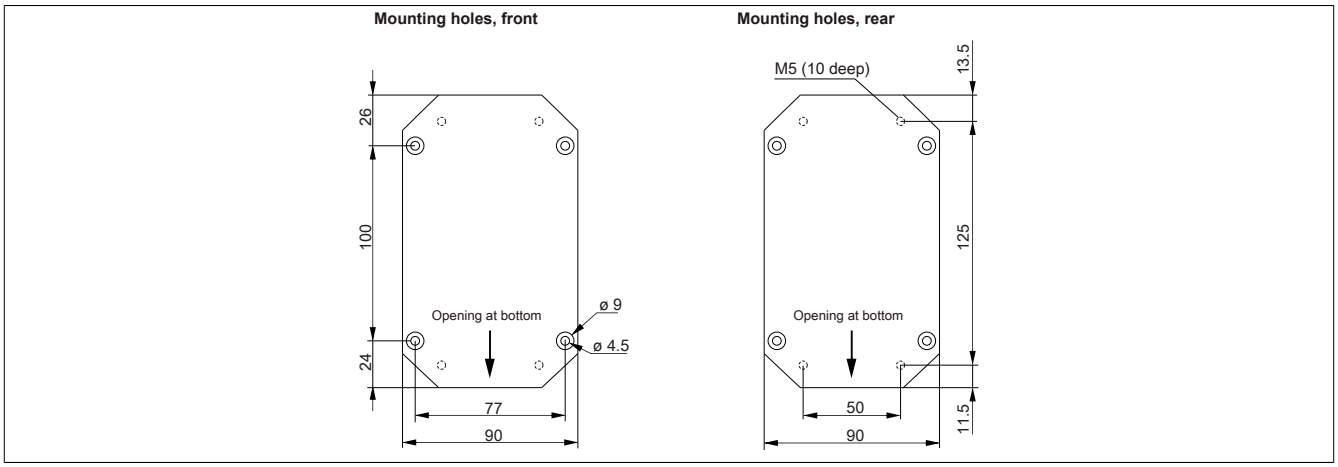
Model number	4MPCBX.0001-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Keys	
Hot plug button	No
Emergency stop	No
Operating conditions	
Degree of protection per EN 60529	IP65 (only with protective cover or with connected Mobile Panel)
Mechanical properties	
Housing	
Material	GK-AlSi11Mg (gravity die casting)
Coating	Powdered 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

Table 51: 4MPCBX.0001-00 - Technical data

6.3.2.4 Dimensions



6.3.2.5 Drilling template 4MPCBX.0000-01



6.3.2.6 Content of delivery

Quantity	Component
1	Connection box 4MPCBX.0001-00

Table 52: 4MPCBX.0001-00 - Content of delivery

6.4 Box cables

6.4.1 5CAMPB.0xxx-10

6.4.1.1 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 cables are open with wire 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.

6.4.1.2 Order data

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

Table 53: 5CAMPB.0050-10, 5CAMPB.0100-10 - Order data

6.4.1.3 Technical data

Information:

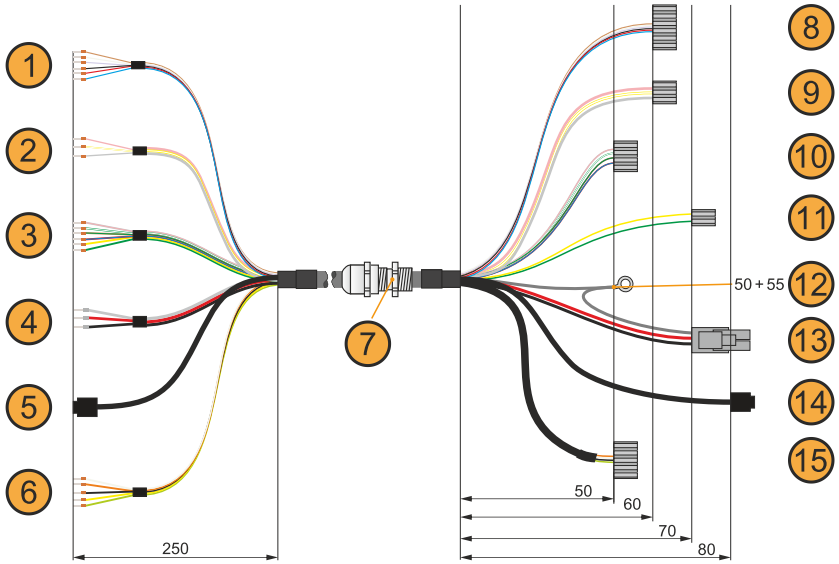
The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this accessory is installed, for example.

Model number	5CAMPB.0050-10	5CAMPB.0100-10
General information		
Certifications		
CE	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	FA. 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		
Flame-retardant	Per IEC 60332-1 and VW1 / FT1 in accordance with C-UL	
Shield attenuation	Per IEC 60096-1, Amendment 2	
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	

Table 54: 5CAMPB.0050-10, 5CAMPB.0100-10 - Technical data

1) EN 60950 requirements must be observed.

6.4.1.4 Cable pinout



Connection side - Control cabinet		Connection side - Box	
(1) Enable switch, 6-wire	(2) RS232, 3-wire	(8) STS7: Enable switch, 6-wire	(9) ST4: RS232, 3-wire
(3) Control devices (emergency stop), 6-wire	(4) Power supply and grounding, 3-wire	(10) ST5: Control devices (emergency stop), 4-wire	(11) ST6: Control devices (key switch / pushbutton), 2-wire
(5) RJ45 Ethernet	(6) 2x CAN, 5-wire	(12) M3 ring terminal end	(13) ST1: Power supply and grounding, 3-wire
(7) Cable gland	-	(14) ST2: RJ45 Ethernet	(15) ST3: 2x CAN, 5-wire
ST7	**Pin, wire color**	**ST7**	**Pin, wire color**
C1	Pin 1, brown	C2	Pin 4, black
NO1	Pin 2, white	NO2	Pin 5, red
NC1	Pin 3, violet	NC2	Pin 6, blue
ST4	**RS232, 3-pin male connector (connection box side)**		**Wire colors**
RxD	Pin 1		Pink
RS232_GND	Pin 2		White-Yellow
TxD	Pin 3		Gray
ST5	**Emergency stop (connection box side) Emergency stop control devices (connection side), 4-pin male connector**		**Wire colors**
Stop / Emergency stop normally closed contact 1 (11)	Pin 1		Gray-Pink
Stop / Emergency stop normally closed contact 2 (21)	Pin 2		Brown-Green
Stop / Emergency stop normally closed contact 1 (12)	Pin 3		White-Green
Stop / Emergency stop normally closed contact 2 (22)	Pin 4		Red-Blue
ST6	**Key switch or pushbutton (connection box side) Key switch or pushbutton control devices (connection side)**		**Wire colors**
Button S13	Pin 1		Yellow
Button S14	Pin 2		Green
ST1	**Power supply + Grounding (connection box side)**		**Wire colors**
+24 VDC power supply	Pin 1		Red
Shielding	Pin 2		Gray
Ground	Pin 3		Black
NC	Pin 4		-
ST2	**Ethernet connection RJ45 (connection box side)**	**Ethernet connection RJ45 (connection side)**	**Wire colors**
TX	Pin 1	Pin 3	Green
$\overline{TX}$	Pin 2	Pin 6	Yellow
RX	Pin 3	Pin 1	Pink
NC	Pin 4	Pin 4	-
NC	Pin 5	Pin 5	-
$\overline{RX}$	Pin 6	Pin 2	Blue
NC	Pin 7	Pin 7	-
NC	Pin 8	Pin 8	-
Shielding	Shielding	Shielding	Shielding
ST3	**Pin, wire color**	**ST3**	**Pin, wire color**
CAN 1 High	Pin 1		White
CAN 1 Low	Pin 2		Orange
Shielding	Pin 3		Black
CAN 2 High	Pin 4		Yellow
CAN 2 Low	Pin 5		Green

6.5 Touch screen stylus pen

6.5.1 5AC900.1100-01

6.5.1.1 General information

The ideal object for operating the touch screen is a touch screen stylus pen.

6.5.1.2 Order data

Model number	Short description	Figure
	Accessories	
5AC900.1100-01	Mobile Panel touch screen stylus pen - 5 pcs. - For MP40/50/7100	

Table 55: 5AC900.1100-01 - Order data

7 Servicing/Maintenance

The following chapter describes the servicing and 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 servicing and maintenance work.

7.1 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.

Information:

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

7.2 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

A.A Stop button

The following stop button is installed on Mobile Panel 7100 devices:

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.

SCHLEGEL BR FRVK stop button	
Nominal voltage[1)]	24 VDC, SELV
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

Figure 48: Stop button in revisions ≥ J0

1) EN 60950 requirements must be observed.

A.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	Enabling control device with two enable switches
Output type	Electromechanical switching contact	Solid-state output
Switchable nominal voltage (Ue)	24 VDC, SELV[1)] (voltage tolerance 19.2 VDC to 30 VDC per EN 61131-2)	24 VDC, SELV[1)] (voltage tolerance 19.2 VDC to 30 VDC per EN 61131-2)
Switchable nominal current (Ie)	500 mA (max.)	250 mA (max.)
Short circuit and overload protection	No	Yes
Reverse polarity protection	No	Yes
Utilization category	DC13	DC13
Operating cycles (B_{10d})		
Switch position 2	1,000,000	1,000,000
Switch position 3	5,000,000	5,000,000
Actuating force		
From switch position 1 to 2	Typically 3 N	Typically 3 N
From switch position 2 to 3	Typically 17 N	Typically 17 N
Electrical isolation	500 VAC to rest for 1 minute	500 VAC to rest for 1 minute
Output testing	-	Yes (test pulse duration ≤1 ms)
Changing grip function	-	Yes
Output synchronization	-	Yes
Specifications for EN ISO 13849-1:2015		
Enable		
Category	4	4
Performance level	e	e
Proof test interval	20 years	20 years
Specifications for EN 64508		
SIL	-	3
PH_d	-	5.07×10^9 1/h
Specifications for EN 60947-5-1		

Properties	Enabling control device with one enable switch	Enabling control device with two enable switches
Voltage (U_d)	-	Max. 2 V
Minimum operational current (I_m)	-	0 A
OFF-state current (I_r)	-	Max. 10 µA
Making and breaking capacities	-	DC13 ST 24 V / 250 mA; T0, 95 max. 180 ms
Conditional short-circuit current	-	Max. 2.5 A

1) EN 60950 requirements must be observed.

A.3 Chemical resistance

A.3.1 Mobile Panel 712x

Unless otherwise specified, the housing and cover, membrane overlay of the keypad/display, surface of the resistive touch screen, wrist straps, stop button, enabling device, USB cover / rubber feet and connection cable are resistant to and show no visible effects when subjected to the following chemicals for up to 24 hours:

- Acetone
- Ammonia 10%
- Gasoline
- Ethanol 95%
- Hydraulic oil (mineral oil-based)
- Potassium hydroxide 10%
- Linseed oil
- Cutting/Grinding oil
- Methanol
- Motor oil
- Petroleum ether (light gas)
- Lubricating grease
- Silicon oil
- Ethyl alcohol

A.3.2 Mobile Panel 7140

Unless otherwise specified, the housing and cover, membrane overlay of the keypad/display, holding bracket, surface of the resistive touch screen, wrist straps, stop button, enabling device, USB cover / rubber feet and connection cable are resistant to and show no visible effects when subjected to the following chemicals for up to 24 hours:

- Acetone
- Ammonia 10%
- Gasoline
- Diesel fuel
- Acetic acid 10%
- Ethanol 95%
- Hydraulic oil (mineral oil-based)
- Potassium hydroxide 10%
- Linseed oil
- Cutting/Grinding oil
- Methylbenzene (toluene)
- Methyl ethyl ketone (butanone)
- Motor oil
- Petroleum ether (light gas)
- Lubricating grease
- Sulphuric acid 10%
- Silicon oil
- Ethyl alcohol
- Turpentine

A.3.3 Mobile Panel 715x

Unless otherwise specified, the housing, handle, dummy plugs, key switch, stop button, handwheel dial, display gasket, housing gasket, cover gasket, slot covers and connection cable are resistant to and show no visible effects when subjected to the following chemicals for up to 24 hours:

- Transmission fluid
- Silicone spray
- Clinil window cleaner

A.3.4 Touch screen - Tested by manufacturer

Test duration: 1 hour

Chemicals:

- Coke
- Orange juice
- Coffee
- Vinegar
- Formula 409 cleaner
- Soda
- Beer
- Tea
- Alcohol
- Ink
- Lysol
- Naphtha
- Acetone
- Isopropyl alcohol (IPA)
- Chloral
- Methyl ethyl ketone
- Methanol
- Xylene
- Dimethyformamide
- Hydrochloric acid (pH = 3)
- Toluene
- Ethanol

A.4 Software-specific information

This chapter provides software-specific information (RFB extension, image formats) that has been referenced multiple times in other chapters.

- "Supported video formats"
- "RFB extension"
- "File formats"

A.4.1 Supported video formats

Videos can be displayed in web mode (see "Configuring web mode" on page 102). The following container formats are supported when embedding videos into a web-based HMI application:

- WebM

A.4.2 RFB extension

In addition to transferring screen content, the RFB protocol (remote frame buffer protocol) is also used to transfer data between a VNC client and the VNC server. This makes it possible to control VNC-based HMI applications. These extensions can be configured in Automation Studio using library AsRfbExt.

Library AsRfbExt library provides additional options for controlling VNC-based HMI applications and evaluating any input devices connected to the client (B&R device). B&R's VNC Viewer must be used on the client with the RFB extension enabled.

RFB extensions offer the following basic functions:

- Evaluate additional control devices on the Mobile Panel (e.g. Service button).
- Querying the temperature of the VNC client.
- Starting a process on the VNC client to carry out certain functions.
- Determining and limiting the number of connected VNC clients.
- Disconnecting VNC clients from the VNC server (Mobile Panel is not turned off, configurations remain).
- Read the controller's operating hours.

Information:

Additional information about the RFB extensions and programming with the *AsRfbExt* library can be found in Automation Help.

Information:

Only a Mobile Panel with RFB extensions enabled can be operated via B&R VNC server.

The following functions are described in this section:

- Starting touch screen calibration
- Adjusting display brightness
- Audio signal output

Information:

These function apply only to Mobile Panel 712x, Mobile Panel 7140 and Mobile Panel 7150.

A.4.2.1 Temperature monitoring

Function RfbExtTemperatureValue() of library AsRfbExt can read a temperature sensor, but the value is always 0 for technical reasons and cannot be used for temperature monitoring.

A.4.2.2 Starting touch screen calibration

Required function in library *AsRfbExt*: *RfbExtStartProcess()*

Function *RfbExtStartProcess()* is used to call the touch screen calibration process *touch-calib*. Here, parameter *pcmdLine* is used to call the command line process as follows:

Call syntax	`touch-calib [timeout]`
Parameter	timeout ... Touch screen calibration timeout in seconds. Valid range: 1 - 300 If `touch-calib` is called without a parameter, then touch screen calibration runs without a timeout.
Example	pcmdLine: `touch-calib 10` Touch screen calibration runs with a timeout of 10 seconds.
Implementation	The VNC-based HMI application must have a button that has been assigned a corresponding function, which calls *RfbExtStartProcess()* with the appropriate parameters.

See also the description for Touch screen calibration in section Commissioning.

A.4.2.3 Adjusting display brightness

Required function in library *AsRfbExt*: *RfbExtStartProcess()*

Function *RfbExtStartProcess()* is used to adjust the display brightness process *dim*. Here, parameter *pcmdLine* is used to call the command line process as follows:

Call syntax	`dim brightness`
Parameter	brightness ... Brightness of the display in percent [%]: Valid range: 0 - 100
Example	pcmdLine: `dim 75` The display brightness is set to 75%.
Implementation	The VNC-based HMI application includes a button that has been assigned a corresponding function, which calls *RfbExtStartProcess()* with the appropriate parameters. The application can get the display brightness from an input field, which has also been defined in the HMI application.

The display brightness set with *dim* changes the current display setting, but does not change the default setting used after restarting the device.

The default display brightness setting is configured on service page *Screen* or in Automation Studio.

Unlike the setting option on service page *Screen*, *dim* can be used to set the total brightness range of the display from 0 to 100% (see "Service page "Screen"" on page 97).

A.4.2.4 Audio signal output

Required function in library *AsRfbExt*: *RfbExtStartProcess()*

Function *RfbExtStartProcess()* is used to start the *beep* process and output an audio signal on the Mobile Panel. Here, parameter *pcmdLine* is used to call the command line process as follows:

Call syntax	`beep [frequency] [duration]`
Parameter	frequency ...Frequency of the audio signal in Hertz (Hz). duration Duration of the audio signal in milliseconds [ms]. Valid range: 10 - 500 If a value is not specified, the default setting is used.
Example	pcmdLine: `beep 880 400` An audio signal with 880 Hz[1)] and a duration of 400 ms is output.
Implementation	The VNC-based HMI application can output an audio signal using function *RfbExtStartProcess(),* in order to clearly illustrate certain states or actions.

1) The frequency is not influenced by the Mobile Panel but must still be specified.

Calling `beep` with specific parameters does not change the default setting for the device.

The default audio signal setting is configured on service page *Screen* or in Automation Studio.

> **Information:**
>
> **Emitting an audible tone with *beep* is always done independent of the setting on service page *Audio* (see "Service page "Audio"" on page 98).**

A.4.3 File formats

A.4.3.1 System settings

Filename: `MP71xxConfig.xml`

Information:

The filename depends on the respective device.

- **MP7120:** `MP7120Config.xml`
- **MP7121:** `MP7121Config.xml`
- **MP7140:** `MP7140Config.xml`
- **MP7150:** `MP7150Config.xml`

The system settings, which can be defined by the user on the service pages, are saved on the Mobile Panel in XML file `MP71xxConfig.xml`.

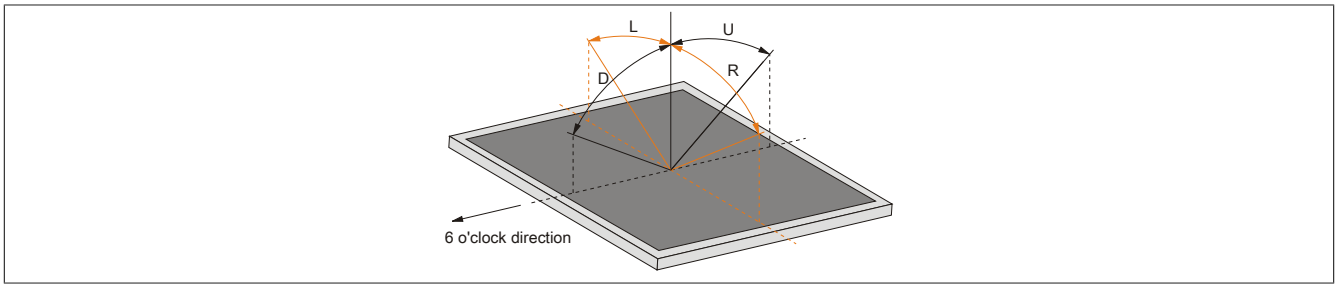
When you back up and restore (see the two service pages Backup & Reset and Update) the system settings, the data is exchanged using an XML file with the following name.

A.4.4 Limitations in web mode

Key switches and illuminated pushbuttons do not have a key configuration by default and can therefore not be evaluated in the browser or using mapp View keyboard events.

A.5 Viewing angles

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



A.6 Abbreviations

Abbreviation	Stands for	Description
NC	Normally closed	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	In technical data tables, this stands for a value that is not defined. This may be because a cable manufacturer does not provide a value for certain technical data, for example.
NO	Normally open	Normally open relay contact.
TBD	To be defined	Used in technical data tables when there is currently no value for specific technical data. The value will be provided at a later point in time.
B_{10D}	-	Number of cycles before 10% of the components have experienced hazardous failure (per channel).
$MTTF_D$	Mean time to dangerous failure	Average time before hazardous failure occurs (per channel).
DC	Diagnostic coverage	Diagnostic coverage
PL	Performance level	Discrete level that specifies the ability of safety-related devices to perform a safety function under foreseeable conditions.
PFH	Probability of failure per hour	Probability of failure per hour.
SIL	Safety integrity level	Safety integrity level

Table 56: Abbreviations used in this user's manual

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