Mobile Panel 40/50

User's Manual

Version: **1.41 (January 2008)**

Model number: **MAMP40.50-ENG**

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Chapter 1 • General

Information:

B&R does its best to keep the printed versions of its user's manuals as current as possible. However, any newer versions of the User's Manual can always be downloaded in electronic form (pdf) from the B&R homepage www.br-automation.com.

1. Manual history

Version	Date	Change
0.10 Preliminary	October 2006	- First version
1.00	13.02.2007	- Chapter 3 "Start-up", Chapter 4 "Software", Chapter 5 "Standards and certifications", Chapter 6 "Accessories" and Chapter 7 "Maintenance / Servicing" expanded. - Chapter 2 "Technical data" completed.
1.10	26.03.2007	- USB flash drive 5MMUSB.0256-00 and USB flash drive 5MMUSB.1024-00 cancelled - Operating unit model numbers expanded. - Connection box and box cable moved to Chapter 6 "Accessories" on page 115. - Chapter "Standards and certifications" on page 103 updated. - Images updated. - Windows CE order numbers added. - Description of "Attachment cable 5CAMPH.0xxx-30" on page 64 expanded. - E-stop changed to stop button.
1.20	18.04.2007	- Introduction updated. - Section "Entire device" updated. - Diagrams updated. - Technical data for entire device and individual components revised. - Mylar keypad description updated. - "Storing the Mobile Panel device" on page 78 added - "Connecting a Mobile Panel 100/200" on page 88 added - Section 5 "USB interface" on page 89 updated. - Chapter 4 "Software" on page 95 updated. - Chapter 6 "Accessories" on page 115 updated. - Section 3 "Viewing angle" on page 129 added - Section 6 "Application examples" on page 90 added - "Features" on page 122 added

Table 1: Manual history

Version	Date	Change
1.30	18.07.2007	- Section 2.5 "Stickers" on page 34 added - Technical data of device expanded (ambient temperatures, humidity, altitude) - "Temperature humidity diagram - Operation and storage" on page 33 added - Technical data of operating units updated (Ethernet controller). - Short description of devices in model number overview revised. - Technical data of connection cable 5CAMPH.0xxx-30 revised. - New model numbers for Windows CE and section "Windows CE" on page 95 revised. - Section 7 "Touch screen calibration:" on page 92 added - Section 2 "Preventing after-image effect in LCD/TFT monitors" on page 126 added - Additional temperature humidity diagram information - Note in Chapter "Appendix A" on page 127 expanded.
1.40	17.10.2007	- Typical topologies from page 90 expanded ("Mobile operation and monitoring" and "The mobile thin client"). - Viewing angle definition changed (a, b, c, d to R, L, U, D) - Information for avoiding after-image effect expanded. - ADI control center description (see section "Automation Device Interface (ADI) driver - B&R Control Center" on page 99) expanded. - Information on touch calibration expanded. - Information on stop circuit loop resistance expanded. - Section "Date / time settings" on page 92 added - Index Revision - Section "B&R Key Editor" on page 101 added - Section "Key configuration" on page 93 added - Windows CE description (see section "Windows CE" on page 95) expanded. - Section "Configuring Windows CE ProPlus Thin Client Automation Runtime (TCAR)" on page 98 added
1.41	06.11.2007	-Makeup of the serial number sticker changed (see section "Design/Dimensions" on page 34). -API replaced by ADI (Automation device interface). - UL test for robotic applications (UL 1740, 1998) removed.

Table 1: Manual history (cont.)

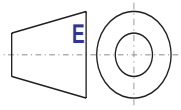
2. Organization of safety notices

The safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding the safety regulations and guidelines can be life-threatening.
Caution!	Disregarding the safety regulations and guidelines can result in severe injury or major damage to material.
Warning!	Disregarding the safety regulations and guidelines can result in injury or damage to material.
Information:	Important information for preventing errors.

Table 2: Organization of safety notices

3. Guidelines



All measurements (e.g. dimension diagrams, etc.) are made according to European measurement standards.

4. Safety guidelines

Information:

The instructions in this manual regarding the wiring and devices that are used to ensure safety must be followed precisely at all times. Failure to do so may result in dangerous situations in which the safety equipment integrated in the Mobile Panel device is made ineffective.

Danger!

The specific safety guidelines for safety and accident prevention regulations must also be reviewed with respect to the particular operating environment in addition to and independent of this document.

4.1 Intended use

Programmable logic controllers (PLCs), operating and monitoring devices (industrial PCs, Power Panels, Mobile Panels, etc.), and B&R uninterruptible power supplies have been designed, developed, and manufactured for conventional use in industry. They were not designed, developed, and manufactured for any use involving serious risks or hazards that could lead to death, injury, serious physical damage, or loss of any kind without the implementation of exceptionally stringent safety precautions. In particular, such risks and hazards include the use of these devices to monitor nuclear reactions in nuclear power plants, as well as flight control systems, flight safety, the control of mass transit systems, medical life support systems and the control of weapons systems.

4.2 Protection against electrostatic discharges

Electrical components that are vulnerable to electrostatic discharge (ESD) must be handled accordingly.

4.2.1 Packaging

- Electrical components with housing
  … do not require special ESD packaging, but must be handled properly
  (see "Electrical components with housing").
- Electrical components without housing
  … must be protected by ESD-suitable packaging.

4.2.2 Guidelines for proper ESD handling

Electrical components with housing

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

Electrical components without housing

In addition to "Electrical components with housing", the following also applies:

- Any persons handling electrical components or devices that will be installed in the electrical components must be grounded.
- Components can only be touched on the small sides or on the front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.).
  Metallic surfaces are not suitable storage surfaces!
- Electrostatic discharges should be avoided on the components (e.g. through charged plastics).
- A minimum distance of 10 cm must be kept from monitors and TV sets.
- Measurement devices and equipment must be grounded.
- Measurement probes on potential-free measurement devices must be discharged on sufficiently grounded surfaces before taking measurements.

Individual components

- ESD protective measures for individual components are thoroughly integrated at B&R (conductive floors, footwear, arm bands, etc.).

The increased ESD protective measures for individual components are not necessary for our customers for handling B&R products.

4.3 Policy and procedures

Electronic devices are generally not failsafe. In the event of a failure on the programmable control system, operating or monitoring device, or uninterruptible power supply, the user is responsible for ensuring that other devices that may be connected, e.g. motors, are in a secure state.

Both when using programmable logic controllers and when using operating and monitoring devices as control systems in conjunction with a soft PLC (e.g. B&R Automation Runtime or comparable products) or a slot PLC (e.g. B&R LS251 or comparable products), the safety precautions applying to industrial control systems (e.g. the provision of safety devices such as

emergency stop circuits, etc.) must be observed in accordance with applicable national and international regulations. The same applies for all other devices connected to the system, such as drives.

All tasks such as installation, commissioning, and maintenance are only permitted to be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, mounting, installation, commissioning, and operation of the product and who have the appropriate qualifications (e.g. IEC 60364). National accident prevention guidelines must be followed.
The safety guidelines, connection descriptions (rating plate and documentation) and limit values listed in the technical data must be read carefully and must be observed before installation and commissioning.

4.4 Transport and storage

During transport and storage, devices must be protected from excessive stress (mechanical load, temperature, humidity, aggressive atmosphere, etc.).

4.4.1 Transport conditions

The following transport conditions must be upheld so the device is not damaged during an additional or return transfer:

- Always use original packaging during transport.
- Environmental conditions (see "Technical data" of the individual components) for the device must be maintained during transport.

4.5 Installation

- Installation must take place according to the documentation, using suitable equipment and tools.
- Devices must be installed without voltage applied and by qualified personnel.
- General safety regulations and nationally applicable accident prevention guidelines must be observed.
- Electrical installation must be carried out according to the relevant guidelines (e.g. line cross section, fuse, protective ground connection).

4.6 Operation

Warning!

- **When operating a system with a Mobile Panel, ensure that operation is only possible using the Mobile Panel and is not possible from any other point in the system.**
- **If the safety equipment (safety door, etc.) is not active, movements may only be carried out using the Mobile Panel at reduced speed and with the enable switch activated.**

Danger!

When using an E-stop circuit or stop circuit in compliance with EN 954-1, functionality should be checked at least once per month.

4.6.1 Supply voltage

Caution!

- **The device conforms to safety class III in compliance with EN61131-2, or EN50178. All supply voltages and interfaces must be operated using safety extra low voltage circuits (in compliance with EN 50178 and EN 61131-2).**
- **The 24VDC supply must be separated from the low voltage signals in a secure manner to provide protection from dangerous voltages. This can be done, for example, using a safety transformer or similar equipment.**
- **When dimensioning the supply, the voltage drop on the Mobile Panel attachment cable must be taken into consideration.**
- **The supply circuit must be protected using a max. 1.5 A (slow-blow) fuse.**

Warning!

- **The project engineer for a machine or system must take steps to ensure that an interrupted program is started again properly following voltage dips and power failures. No potentially dangerous operating states should be permitted to occur - not even temporarily.**
- **Errors that occur on automation systems can cause personal injury and damage to materials; therefore, additional measures must be taken to ensure safe operation of the entire system even when errors occur.**
- **The functionality of the safety-related equipment (e.g. stop button and enable switch) must be monitored cyclically.**
- **After heavy loads, e.g. shock to the device or dropping the device, the safety-relevant equipment must be checked.**

4.6.2 Stop system

The stop button is wired with two circuits and N.C. contacts.

The grey stop button on the Mobile Panel meets the requirements of EN 418. Its operation must be designed for the machine according to risk evaluation as a category 0 / category 1 stop (see EN 60204-1, Chapter 9.2.5.4.2). The connection of the positive opening switching contacts must meet the particular safety category (according to EN 954-1) for the machine determined in the risk evaluation.

The grey stop button has the same function as the red-yellow E-stop switch. Its color scheme (grey) should help prevent using the stop button in a dangerous situation when the hand terminal is unplugged.

Warning!

- **Deactivation of the stopping device must never cause an uncontrolled restart.**
- **The stop button is not a replacement for safety equipment.**
- **The stop button on the hand-held device is not a replacement for the E-stop switch directly on the machine.**
- **Certain mechanical errors in the stop button can only be detected when activated.**
- **Following severe impact on the device (e.g. dropping the device), the stop button must be checked for functionality.**

Servicing note:

Additionally, the stop button must be checked every six months by activating the switch and monitoring if the machine switches off.

- **Refer to the Chapter "CE conformity, standards and guidelines" for additional information concerning the stop button.**

4.6.3 Enable switch

The enabling equipment consists of two enable buttons and is part of the Mobile Panel safety equipment.

The enabling functionality is described in EN 60204. The 3-step enable switch is state-of-the-art technology. The "Null" and "Panic" positions on the enable switch represent off functions. Only the "Enable" position allows activation. The standards EN 60204 and IEC 60204-1 are identical, which provides the 3-step enabling switch with international significance.

Warning!

When applicable, the enable function should be limited on the controller according to time or program step.

The electromechanical enable switch and equipment are to be linked with the controller so that the safety-related circuit requirements are met according to DIN EN 775, DIN EN 60204-1, DIN EN 954-1, DIN EN 1088 and VDI 2854.

Any cables and lines used to set up the system (except for protective ground conductors) that are accessible or open to other conductive parts without opening or removing a cover must either have double or reinforced insulation between the wires and the surface. Otherwise, they must have a metal sheath that can handle the current if a short-circuit occurs between the wire and sheath.

Warning!

• The enable switch is only suitable as a protective function if the person activating the enable switch can recognize the danger in time and immediately take appropriate action!

• Commands for dangerous states must not be initiated by the enable switch alone. A second conscious start command is required here. The only person permitted in the danger area is the person activating the enable switch.

An enable switch connection example for a monitoring device can be found in Chapter 3 "Start-up", Section 4.2 "Connection example - Enable switch" on page 87.

4.7 Disposal note

Note the national regulations regarding disposal of electronic parts!

5. Model numbers

5.1 Operating unit

Model number	Product ID	Note
5MP040.0381-01	**MP40 LCD B/W QVGA 3 8" F SB** Operating unit with 3 8" QVGA LC-Displays; 51 system keys; 7 LEDs; 256 MB SDRAM; USB; stop button; IP65 protection.	
5MP040.0381-02	**MP40 LCD B/W QVGA 3.8" F SB KS HW** Operating unit with 3 8" QVGA LC-Displays; 51 system keys; 7 LEDs; 256 MB SDRAM; USB; stop button; key switch; handwheel; IP65 protection.	
5MP050.0653-01	**MP50 TFT C VGA 6.5" FT SB PB HW** Operating unit with 6.5" VGA color LCD with touch screen (resistive); 31 system keys; 4 LEDs; 256 MB SDRAM; USB; stop button; illuminated button; handwheel; IP65 protection.	
5MP050.0653-02	**MP50 TFT C VGA 6.5" FT SB KS JS** Operating unit with 6.5" VGA color LCD with touch screen (resistive); 31 system keys; 4 LEDs; 256 MB SDRAM; USB; stop button; key switch; joystick; IP65 protection.	
5MP050.0653-03	**MP50 TFT C VGA 6.5" FT SB OP HW** Operating unit with 6.5" VGA color LCD with touch screen (resistive); 31 system keys; 4 LEDs; 256 MB SDRAM; USB; stop button; override potentiometer; handwheel; IP65 protection.	
5MP050.0653-04	**MP50 TFT C VGA 6.5" FT SB KS HW** Operating unit with 6.5" VGA color LCD with touch screen (resistive); 31 system keys; 4 LEDs; 256 MB SDRAM; USB; stop button; key switch; handwheel; IP65 protection.	

Table 3: Model numbers - Mobile Panel operating units

5.2 Cables

Model number	Product ID	Note
5CAMPH.0018-30	**Mobile Panel attachment cable, 1.8 m** Mobile Panel attachment cable, 1.8 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	
5CAMPH.0050-30	**Mobile Panel attachment cable, 5 m** Mobile Panel attachment cable, 5 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	
5CAMPH.0100-30	**Mobile Panel attachment cable, 10 m** Mobile Panel attachment cable, 10 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	
5CAMPH.0150-30	**Mobile Panel attachment cable, 15 m** Mobile Panel attachment cable, 15 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	
5CAMPH.0200-30	**Mobile Panel attachment cable, 20 m** Mobile Panel attachment cable, 20 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	

Table 4: Model numbers - cables

Model number	Product ID	Note
5CAMPC.0020-10	**Switching cabinet cable crossover, 2 m** Switching cabinet cable, 2 meters long; with wire tip sleeves for connection in the switching cabinet and receptacle for the Mobile Panel attachment cable.	Also used in Mobile Panel 100/200 as switching cabinet cable.
5CAMPC.0020-11	**Switching cabinet cable, 2 m (straight thru)** Switching cabinet cable, 2 meters long; with wire tip sleeves for connection in the switching cabinet and receptacle for the Mobile Panel attachment cable.	

Table 4: Model numbers - cables

5.3 Wall mount

Model number	Product ID	Note
4MPBRA.0000-01	**Wall mount** Wall mount with cable supports for storing Mobile Panel device	

Table 5: Model numbers - Mobile Panel wall mount

5.4 Accessories

Model number	Product ID	Note
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	Cancelled since 03/2007 Replaced by 5MMUSB.2048-00
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	Cancelled since 07/2007 Replaced by 5MMUSB.2048-00
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	Cancelled since 03/2007 Replaced by 5MMUSB.2048-00
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	
5CAMPP.0000-10	**Protective cap for circular plug (attachment cable)** Protective caps for Mobile Panel connection cable with circular connector.	
5CAMPP.0001-10	**Switching cabinet cable protective cap** Protective cap for Mobile Panel switching cabinet cable with circular connector and Mobile Panel connection box.	
4MPCBX.0000-00	**MP connection box** Connection box for adapting the connection points for Mobile Panel devices.	
5CAMPB.0100-10	**MP box cable, 10m PP** Box cable crossover, 10 meters long; with wire tip sleeves for connection in the switching cabinet; with plug contacts for wiring in the connection box.	

Table 6: Model numbers - accessories

5.5 Software

Model number	Product ID	Note
5SWWCE.0524-ENG	**WinCE5.0 Pro MP40 PXA270** Microsoft Windows CE 5.0 Professional, English, including license; for MP40 BIOS devices 5MP040.0381-01, 5MP040.0381-02.	
5SWWCE.0525-ENG	**WinCE5.0 Pro MP50 PXA270** Microsoft Windows CE 5.0 Professional, English, including license for MP50 BIOS devices 5MP050.0653-01, 5MP050.0653-02, 5MP050.0653-03, 5MP050.0653-04.	
5SWWCE.0624-ENG	**WinCE5.0 ProPlus MP40 PXA270** Microsoft Windows CE 5.0 Professional Plus, English, including license; for 5MP040.0381-01, 5MP040.0381-02.	
5SWWCE.0625-ENG	**WinCE5.0 ProPlus MP50 PXA270** Microsoft Windows CE 5.0 Professional, English, including license for MP50 BIOS devices 5MP050.0653-01, 5MP050.0653-02, 5MP050.0653-03, 5MP050.0653-04.	
5SWWCE.0724-ENG	**WinCE5.0 ProPlusTCAR MP40 PXA270** Microsoft Windows CE 5.0 Professional Plus, English, including license,VNC Viewer; for MP40 BIOS devices 5MP040.0381-01, 5MP040.0381-02.	
5SWWCE.0725-ENG	**WinCE5.0 ProPlusTCAR MP50 PXA270** Microsoft Windows CE 5.0 Professional Plus, English, including license, VNC Viewer; for MP50 BIOS devices 5MP050.0653-01, 5MP050.0653-02, 5MP050.0653-03, 5MP050.0653-04.	

Table 7: Model Numbers - Software

Chapter 2 • Technical data

1. Introduction

The Mobile Panel is a portable operating and display device featuring a robust design and Windows CE compatible electronics. Equipped with a powerful processor and Ethernet, the Mobile Panel is optimally suited for many different applications (see "Intended use" on page 80).

Depending on the model, Mobile Panel devices can have a 3.8" QVGA grey step display without touch screen or an 6.5" VGA color display with a touch screen.

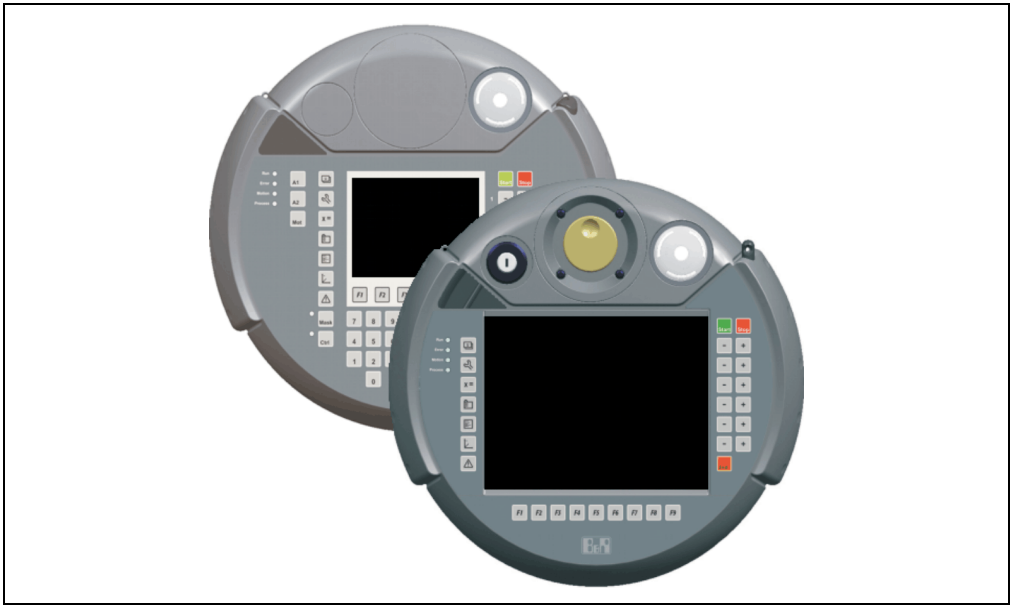


Figure 1: Examples - MP40/50

Onboard FLASH function blocks are available on the Mobile Panel in place of rotating mass memory that is not designed for use in harsh environments (diskette- and hard drives).
The Mobile Panel offers a Windows CE platform on which applications can be set up.

Furthermore, it is possible to connect the Mobile Panel as a RDP (Remote Desktop Protocol) client to a Windows NT-, Windows 2000- or Windows XP server or to access Automation Runtime-based visual components applications as a VNC (Virtual Network Computing) viewer.

With its optional operating and control elements, the Mobile Panel can be easily adjusted for each individual application.

2. Entire device

2.1 Construction

Mobile Panel devices are cable connected, which means they are connected to the switching cabinet using a cable. For operation, the following components are needed:

- Operating unit including handle
- Attachment cable

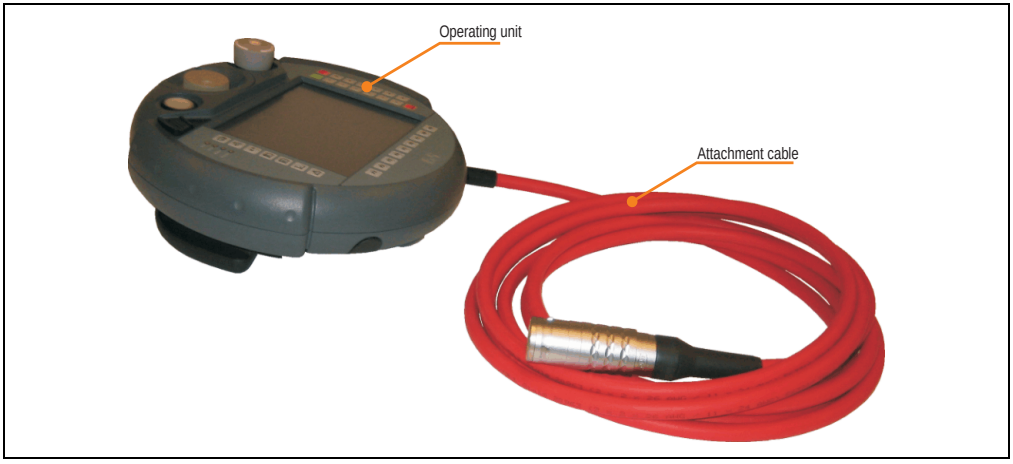


Figure 2: Construction

2.1.1 Ergonomic

- Functional multi grip
- Round housing
- Various gripping positions
- Left and right handed operation
- Operation on table
- Operation from wall mounts
- Position of cable outlet (on handle) left or right of the housing by simple, custom adjustment
- Clear display

2.1.2 Housing

- Vibration- and shock resistant
- Housing made from non-flammable material (UL 94V-0), impact-resistant, water-resistant, cleaning agents (alcohol and fabric conditioner), oils, cutting oils (drilling oils), fat and lubricants
- double-walled, extremely robust housing. Drop-tested from 1.5 m height onto industrial floor

2.1.3 Operating and display field

- Covered keys with mechanical pressure point
- 4 (on MP40) or 7 (on MP50) status LEDs
- Buzzer

2.1.4 Electronics

- Intel PXA270/416MHz CPU
- Memory size:
  - SDRAM: 256 MB
  - FLASH: 128 MB

2.1.5 Interfaces

- Ethernet 10/100MBit
- USB host for connection of different USB flash drives (with protective cap to guarantee IP65 protection when closed)
- USB client in cable shaft (Debug und ActiveSync device)

2.1.6 Touch screen pen

The touch screen pen is easy to find on the right side of a Mobile Panel touch screen device.

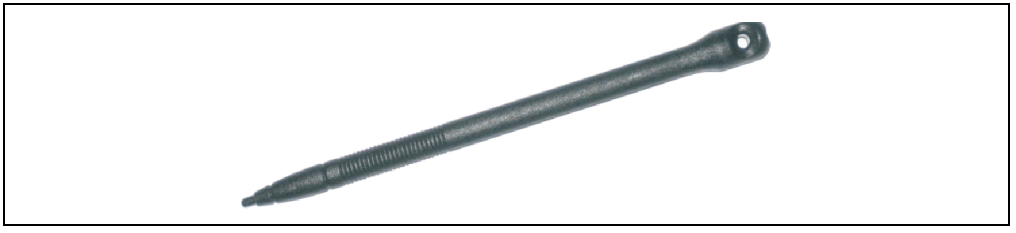


Figure 3: Touch screen pen

2.2 Options

This section describes the various possible additions for the Mobile Panel.

Information:

For detailed technical data on the entry device see "Appendix A" on page 127.

2.2.1 Override potentiometer

If the Mobile Panel is equipped with an override potentiometer, then it is evaluated using software and can be read by a program in the Mobile Panel ADI (Automation Device Interface Library).

The override potentiometer can be used for various application possibilities, e.g. setting the spindle speed and the feed on machine tools.

- Resolution: 0 – 127 linear

2.2.2 Handwheel

If the Mobile Panel is equipped with a handwheel, then the handwheel pulses are evaluated in the processor and can be read by a program in the Mobile Panel ADI (Automation Device Interface Library).

50 pulses are counted per revolution. A clockwise rotation of the handwheel increments and a counter-clockwise rotation decrements the counter value from 0 to 65535 (16-bit value).

Important Features:

- 50 notches / rotation
- 1 pulse / notch

Information:

If the Mobile Panel falls to the floor, the mechanical placement of the turning knob must be checked. The turning knob can be reattached, if necessary, by pushing it in place from the top.

2.2.3 Illuminated button

If the Mobile Panel is equipped with an illuminated button, then it is evaluated according to software and can be read by a program in the Mobile Panel ADI (Automation Device Interface Library).
The Illuminated buttons are momentary-contact buttons.

2.2.4 Key switch

If the Mobile Panel is equipped with a key switch, then it is evaluated using software and can be read by a program in the Mobile Panel ADI (Automation Device Interface Library).

The key switch has three placements - each of which clicks into place.
Removal position: the key can be removed in each of the three positions.

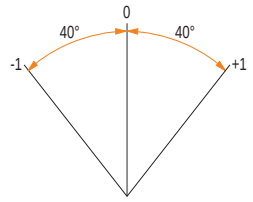


Figure 4: Key switch - Angle of rotation

Two key switches are delivered with each device.

2.2.5 Joystick

If the Mobile Panel is equipped with a joystick, then it is evaluated using software and can be read by a program in the Mobile Panel ADI (Automation Device Interface Library).
The stick of the joystick is short for drop protection. The joystick permits e.g.: operation of robot axes.
Value range: -15 to +15 per axis (31 increments)

2.3 Dimensions

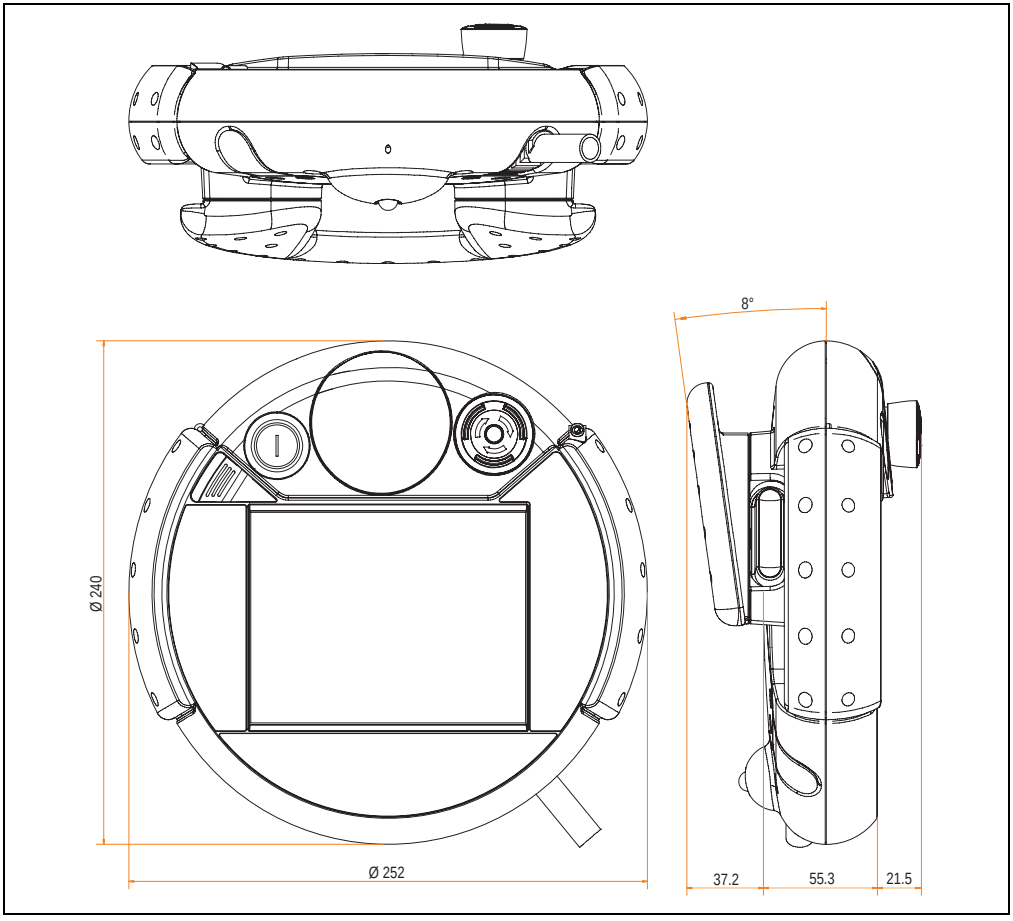


Figure 5: Dimensions - Entire device

2.4 Technical data

Features	MP40 3.8“ display versions	MP50 6.5“ display versions
Power supply Rated voltage Max. duration of supply interruption Starting current Electrical isolation	24 VDC ± 25% (integrated reverse polarity protection) ≤10 ms Max. 5.6 A (current limitation present) -	
Safety elements / entry devices Stop button Enable switch Additional entry devices	2 N.C., located on right side of operating unit 3 step, 2-channel, 2 buttons on both sides of the device different according to operating unit version	
Loop resistance per stop circuit	≤ 10 Ohm[1)]	
Mechanics		
Operating unit Material Paint, color	Housing from ABS Similar to RAL7011	
Outer dimensions Diameter Total height	250 mm 114 mm	
Weight (with stop button, with key switch, without handwheel override potentiometer and cable)	Approx. 1100 grams	Approx. 1250 grams
Environment[2)]		
Ambient temperature Operation Storage Transport	0°C to 50°C -20°C to +70°C -20°C to +70°C	
Relative humidity Operation Storage Transport	Max. 95%, (non-condensing) Max. 95%, (non-condensing) Max. 95%, (non-condensing)	
Vibration Operation	5 - 9 Hz: 7 mm amplitude / 9 - 150 Hz: 2 g	
Shock Operation	15 g (147 m/s² 0-peak) and 11 ms length	
Height above sea level (operation)	3000 meters	
Drop height	1.5 meters on industrial surfaces	
Flame resistant	UL94V-0	
Protection	IP65	

Table 8: Entire device

1) Measured section: Mobile Panel device + 20 meter connection cable + 2 meter switching cabinet cable; the exact value of the loop resistance can be determined with a loop resistance measuring device.

2) For test requirements and limits for mechanical and climate conditions, see Chapter 5 "Standards and certifications" starting on page 103.

2.4.1 Temperature humidity diagram - Operation and storage

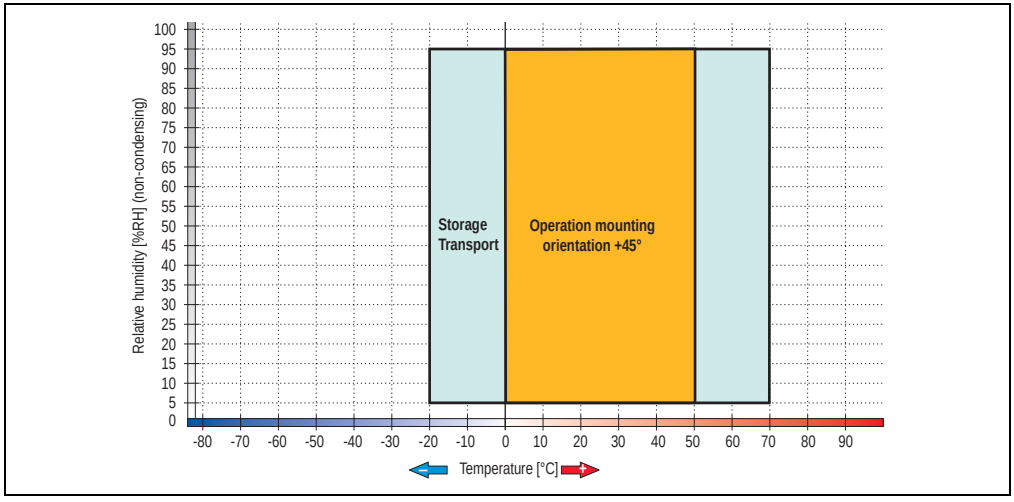


Figure 6: Temperature humidity diagram

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

2.5 Stickers

2.5.1 Serial number sticker

General

Each B&R device is given a unique serial number sticker with a barcode that allows the device to be clearly identified.

Design/Dimensions

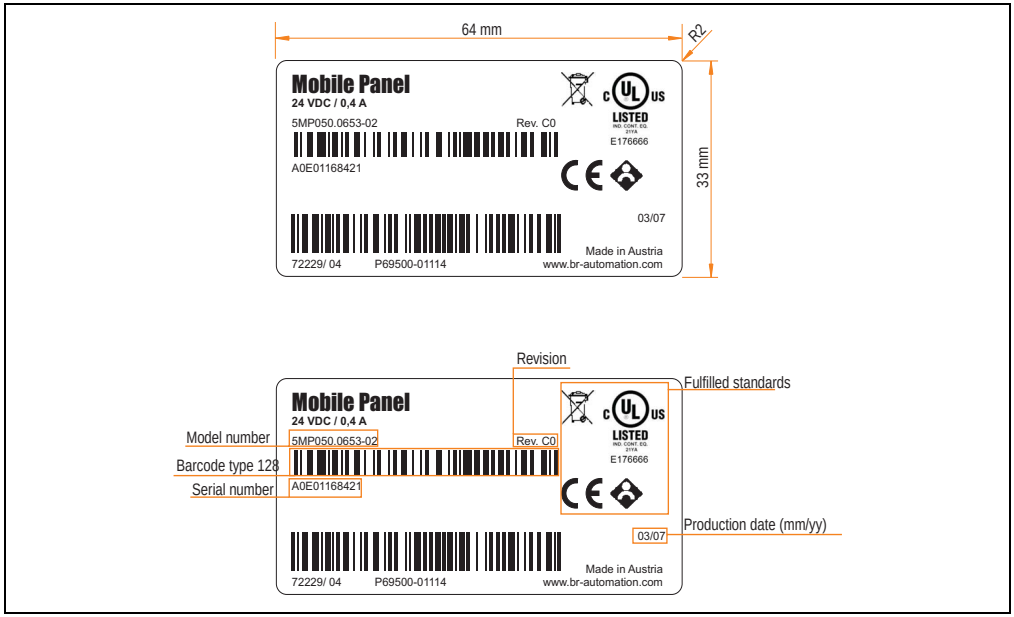


Figure 7: Design/dimensions - Serial number sticker

Information on the Internet

Information about each device can also be found on the B&R homepage. Enter the device's serial number in the serial number search field on the start page **www.br-automation.com**. The search also works if you enter the model number or the material number in the material number search field. The search provides you with a detailed list of the individual components.

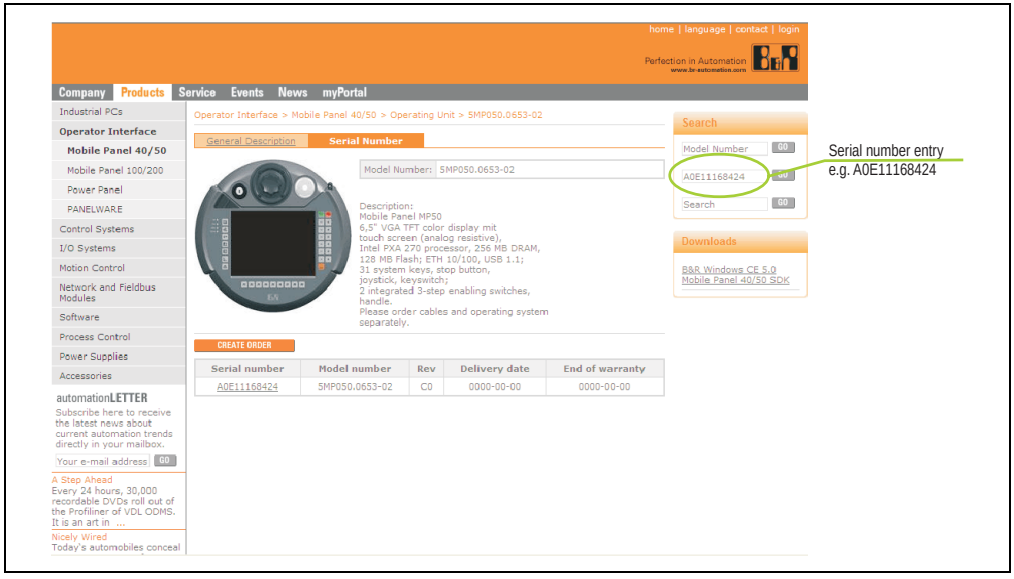


Figure 8: Example of serial number search: A0E11168424

3. Individual components

3.1 Operating unit

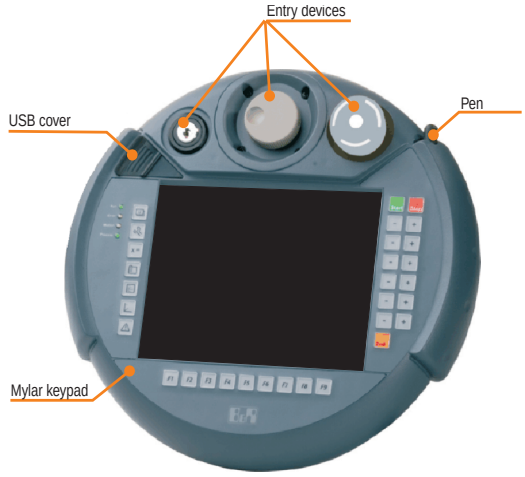


Figure 9: Mobile Panel operating unit

The operating unit contains all the electronics such as the display, the command devices and the Mylar keypad. An external USB 1.1 interface is located on the front side behind the USB cover for data backup and/or data exchange. The interface is specified for USB flash drives only.

The user interface for the operating unit is resistant to alcohol (e.g. ethanol, glycol, isopropanol, glycerine, methanol), diluted acids (e.g. vinegar-based cleaning agent), soap, cleaning agents as used in auto maintenance or industrial facilities (usually short-term exposure during the cleaning process) and normal foodstuffs (e.g. beer, wine, coffee, fruit). For instructions how to clean the device, see "Cleaning" on page 125.

3.1.1 Mylar keypad MP40

The assignments of the keys/LEDs depend on the intended use by the customer.

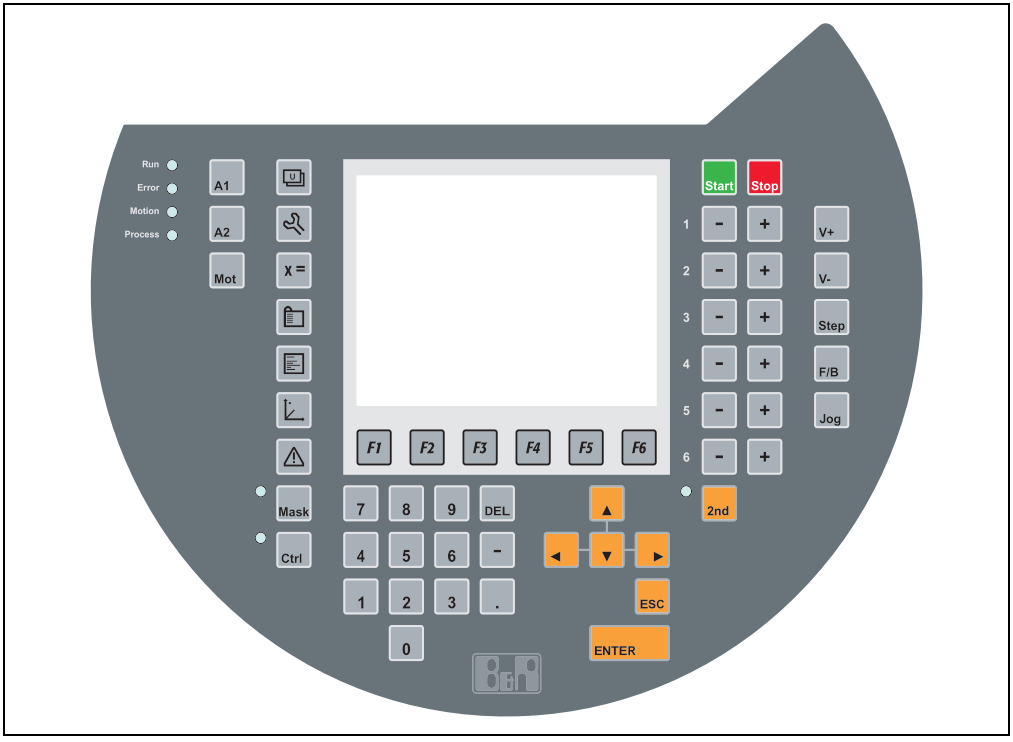


Figure 10: MP40 mylar keypad

Keys/LEDs

Symbol	Possible use
	Application mask 1
	Services
	Variable monitor

Table 9: MP40 mylar keypad symbols

Symbol	Possible use
	Project mask
	Program mask
	Position mask
	Alarm mask
Mask	Mask
Ctrl	Ctrl
F1 – F6	F1 - F6
A1 A2	A1 and A2
Mot	Axis enabling
Start	Start
Stop	Stop
- +	Jog keys
2nd	2nd level
Jog	Coordination system selection

Table 9: MP40 mylar keypad symbols (cont.)

Symbol	Possible use
F/B	Forward/backward
Step	Operating mode selection
V-	Speed -
V+	Speed +
Run Error Motion Process	Application running Error in the application Robot controller ready Process controller ready (cell/system ready)

Table 9: MP40 mylar keypad symbols (cont.)

3.1.2 Mylar keypad MP50

The assignments of the keys/LEDs depend on the intended use by the customer.

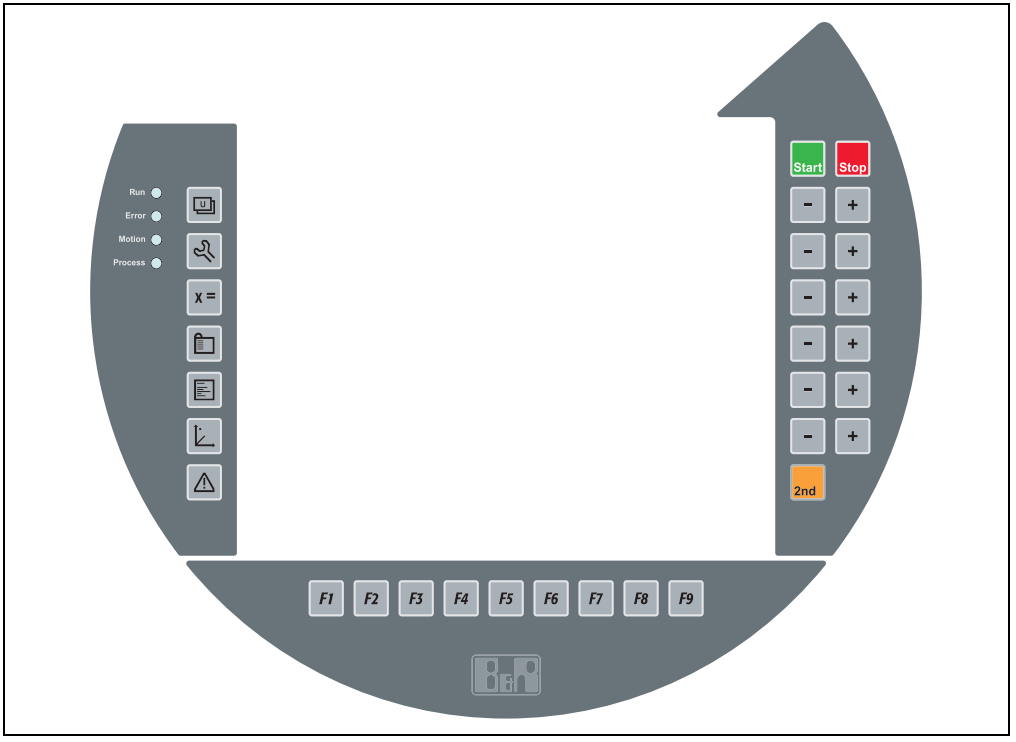


Figure 11: MP50 mylar keypad

Key labels

Symbol	Possible use
	Application mask 1
	Services
	Variable monitor

Table 10: MP50 mylar keypad symbols

Symbol	Possible use
	Project mask
	Program mask
	Position mask
	Alarm mask
F1 – F9	F1 - F9
Start	Start
Stop	Stop
- +	Jog keys
2nd	2 level
Run Error Motion Process	Application running Error in the application Robot controller ready Process controller ready (cell/system ready)

Table 10: MP50 mylar keypad symbols (cont.)

3.1.3 Enabling equipment

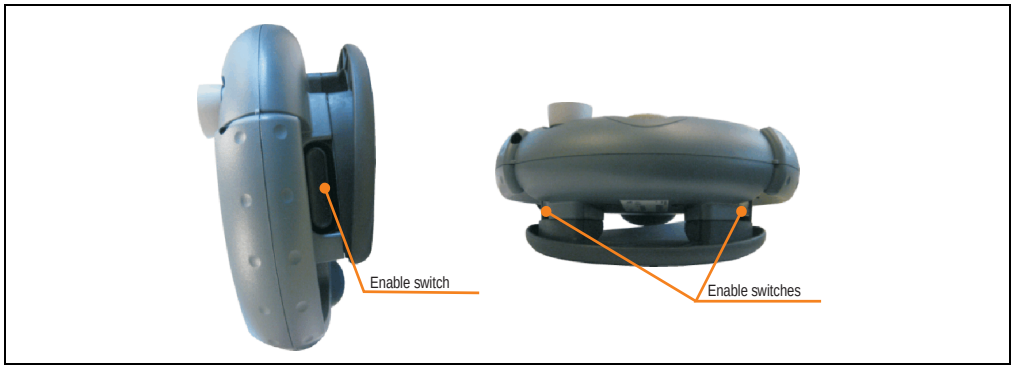


Figure 12: Enabling equipment

The Mobile Panel features two enable switches located on the sides of the device. This allows both left- and right-handed operation. Both enable switches are parallel-connected and have a similar effect on the overall safety circuits in the connection cable. Only one enable switch has to be activated.
The enable switch is comprised of a three-step display element and separate evaluation electronics. An important feature is the integrated, double circuit design, from the operating elements to the connection terminals. The evaluation circuits have been implemented with various technologies and circuits. The lifespan of the switching contacts is independent from the load through to the rated values (resistive, inductive and capacitive) because of their electronic implementation.

Enable switch - switching elements are protected against reverse polarity. The outputs of both circuits are protected against short circuit and overload:

Circuit 1: Thermal protective circuit

Circuit 2: Fold-back characteristics

Functionality

The operating element is composed of two symmetrically arranged rocker-actuated switches, whose position is determined using electrical buttons 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 pressed	Off (opened)
2	Enable	Pressed	On (engaged)
3	Panic	Pushed all the way in	Off (opened)

Table 11: Switch positions for the enable switch

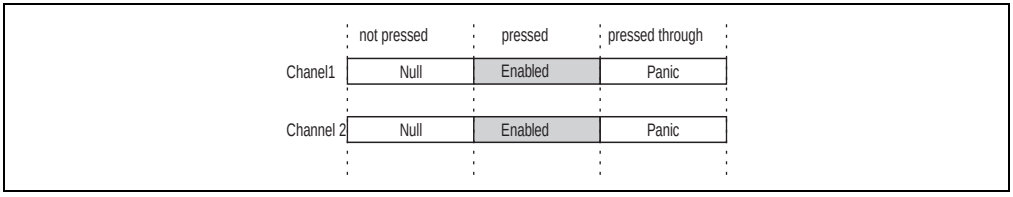


Figure 13: Possible enable switch positions

Information:

An enable switch must be activated so the switching position is recognized by the monitoring device.

The positions "null" and "panic" must trigger a category 0 or 1 stop command.

Zero position

When not pressed, the enable switch returns to the zero position (not enabled).

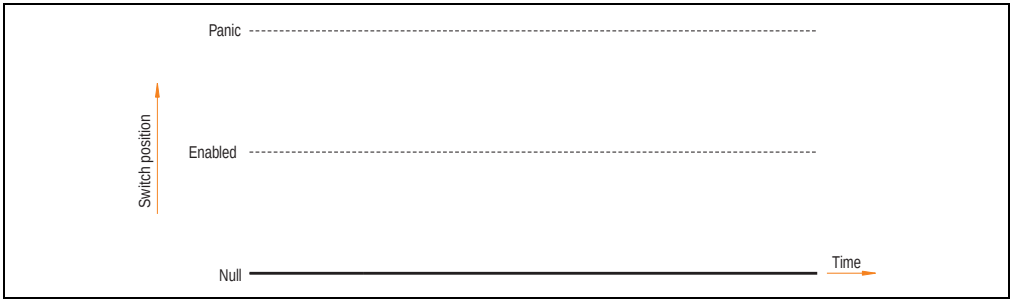


Figure 14: Enable switch - Zero position

Enable

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

The enable switch is pressed from the null position to the enable position. After being released, it goes back to the null position again.

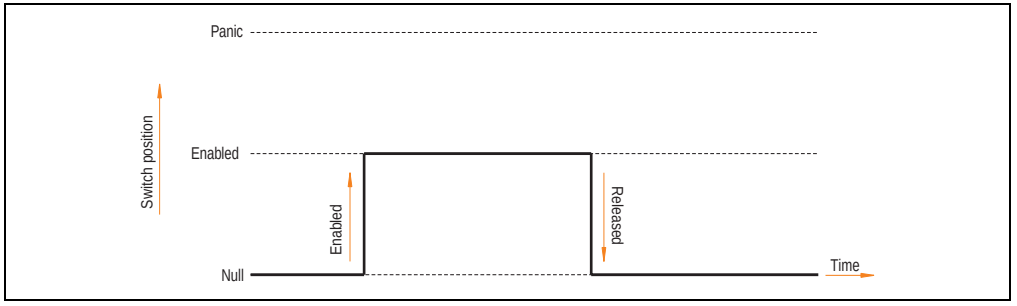


Figure 15: Enable switch - Enable

Panic

If the enable switch is pushed all the way in (from enable position to panic position) and released, the enable position is skipped and it goes directly back to the zero position.

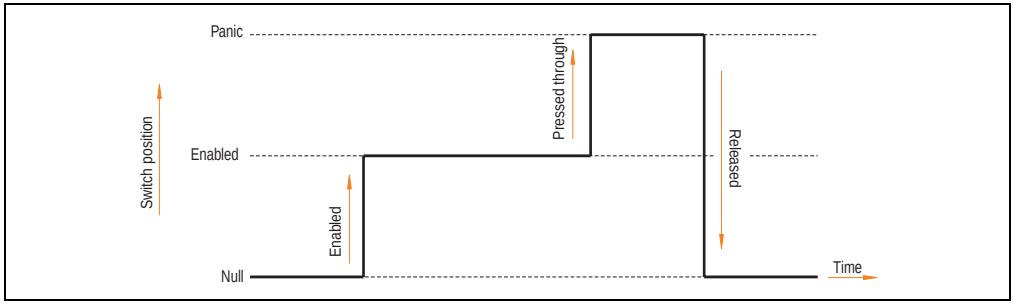


Figure 16: Enable switch - Panic

A safety category 3 in compliance with EN 954-1:1996 can be attained with 2 circuits by implementing enabling equipment.

Safety category 3 means that an error will not lead to the loss of safety and that individual errors can be appropriately detected when necessary.

Connection examples "Connection example for stop button" on page 86 and "Connection example - Enable switch" on page 87 illustrate how safety category 3 can be achieved using Mobile Panel and its safety-related parts. Take note that the entire system concept must be designed accordingly.

Foreseeable misuse of the enable switch

Predictable misuse refers to the unauthorized use of other materials to hold the enable switch in the enable position. This misuse should be minimized. The following measures are recommended for stopping the machine during manual operation:

- Query the enable switch when switching on the machine/system and when changing the operating mode from automatic to manual (enable switch should not be in the enable position).
- The enable switch must be released within a predetermined timeframe and reset in its enable position. The length of the time frame is chosen according to the task at hand.

Warning!

- **The enable switch is only suitable as a protective function if the person activating the enable switch can recognize the danger in time and immediately take appropriate action! Reducing the speed of movement can be employed as an additional measure. The allowable speed must be determined by a risk analysis.**
- **Commands for dangerous states must not be initiated by the enable switch alone. A second conscious start command is required here (key on operating unit).**
- **The only person permitted in the danger area is the person activating the enable switch.**
- **Refer to Chapter "Standards and certifications" on page 103 for further information regarding enabling equipment.**

3.1.4 Technical data - Operating unit

Operating unit 5MP040.0381-01

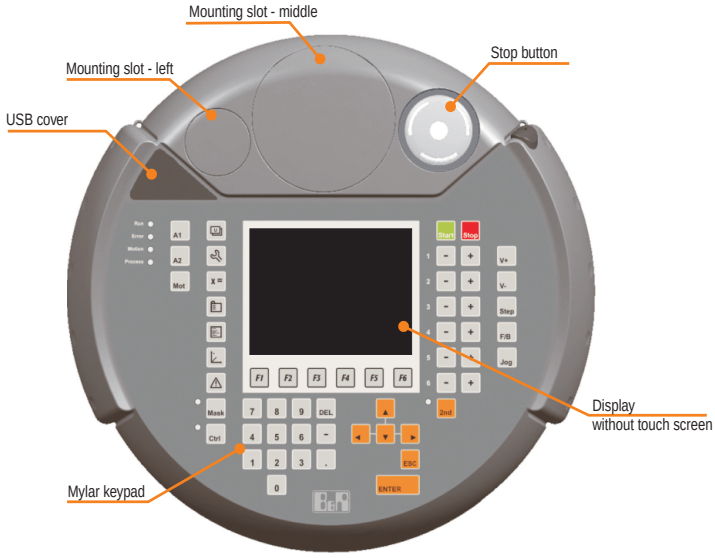


Figure 17: Operating unit - 5MP040.0381-01

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5MP040.0381-01
Boot loader / Operating system	Yes / Windows CE
Processor Type Cooling	 Intel PXA 270/416 MHz Passive cooling
Flash	128 MB
Memory Type Size	 SDRAM 256 MB
Graphics Controller	 Intel PXA

Table 12: Technical data - 5MP040.0381-01

Features	5MP040.0381-01
Ethernet Controller Transfer rate Connection Cables	 SMSC11X 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
USB interface Type Amount Transfer rate Connection Current load USB client	Accessible on the front, behind the cover USB 1.1 1 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A 500 mA Accessible in cable shaft
Reset button	Yes (in cable shaft)
Keyboard System keys Softkeys LEDs	 51 6 7
Display Type Diagonal Colors Resolution Contrast Perspective (see page 129) Horizontal Vertical Background lighting Brightness Half-brightness time	 STN-LC display 3.8" 96.5 mm 16 shades of gray QVGA, 320 x 240 pixels 20:1 Direction R / direction L =45° Direction U = 30°/ direction D = 60° 110 cd/m^2 50000 hours
Touch screen Technology Controller Degree of transmission	-
Power supply Rated voltage Max. interruption of supply Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) ≤10 ms Max. 5.6 A (current limitation present) 4.8 watts (200 mA at 24 VDC) -
Safety Standard	Class 3 according to EN 61131-2, or EN 50178
Mechanics	
Operating unit Paint, color	Housing from ABS Similar to RAL7011
Stop button	Yes (2 normally closed), right position
Enable switch	Yes (two 3-step switches), left and right position
Mounted in the middle Electronic handwheel 3-axis joystick	 - -

Table 12: Technical data - 5MP040.0381-01 (cont.)

Mechanics	5MP040.0381-01
Mounted on the left Illuminated button Key switch Override potentiometer	 - - -
Outer dimensions Diameter Total height	 250 mm 114 mm
Weight (without cable)	 Approx. 1100 grams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 50°C -20°C to +70°C -20°C to +70°C
Relative humidity Operation Storage Transport	 Max. 95%, (non-condensing) Max. 95%, (non-condensing) Max. 95%, (non-condensing)
Vibration Operation	 5 - 9 Hz: 7 mm amplitude / 9 - 150 Hz: 2 g
Shock Operation	 15 g (147 m/s² 0-peak) and 11 ms length
Altitude	3000 meters
Environment	
Drop height	1.5 meters on industrial surfaces
Protection type	IP65
Flame resistant	UL94V-0

Table 12: Technical data - 5MP040.0381-01 (cont.)

Operating unit 5MP040.0381-02

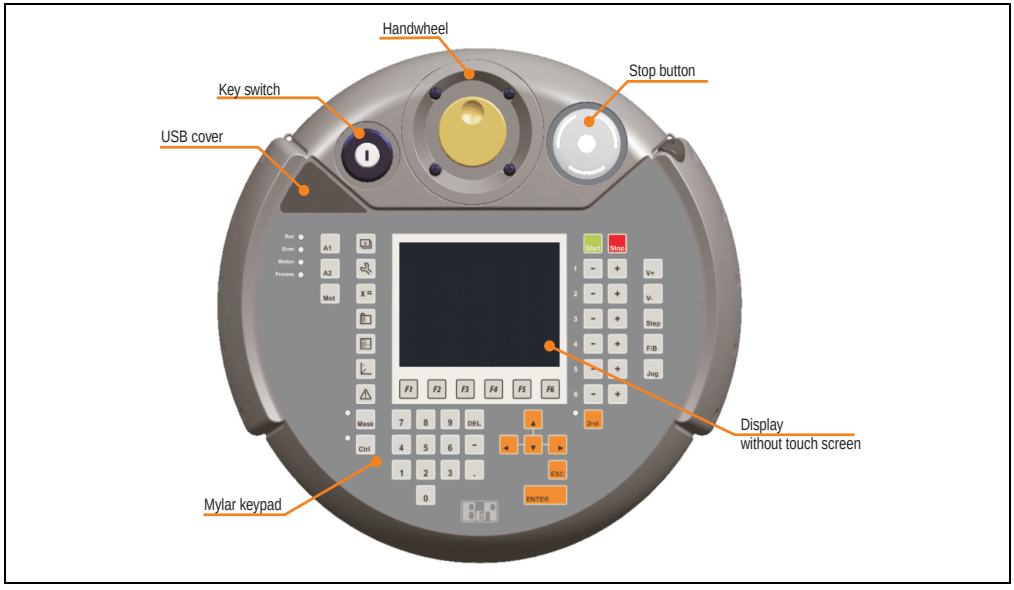


Figure 18: Operating unit - 5MP040.0381-02

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5MP040.0381-02
Boot loader / Operating system	Yes / Windows CE
Processor Type Cooling	 Intel PXA 270/416 MHz Passive cooling
Flash	128 MB
Memory Type Size	 SDRAM 256 MB
Graphics Controller	 Intel PXA

Table 13: Technical data - 5MP040.0381-02

Features	5MP040.0381-02
Ethernet Controller Transfer rate Connection Cables	 SMSC11X 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
USB interface Type Amount Transfer rate Connection Current load USB client	Accessible on the front, behind the cover USB 1.1 1 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A 500 mA Accessible in cable shaft
Reset button	Yes (in cable shaft)
Keyboard System keys Softkeys LEDs	 51 6 7
Display Type Diagonal Colors Resolution Contrast Perspective (see page 129) Horizontal Vertical Background lighting Brightness Half-brightness time	 STN-LC display 3.8" 96.5 mm 16 shades of gray QVGA, 320 x 240 pixels 20:1 Direction R / direction L =45° Direction U = 30°/ direction D = 60° 110 cd/m^2 50000 hours
Touch screen Technology Controller Degree of transmission	-
Power supply Rated voltage Max. interruption of supply Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) ≤10 ms Max. 5.6 A (current limitation present) 4.8 watts (200 mA at 24 VDC) -
Safety Standard	Class 3 according to EN 61131-2, or EN 50178
Mechanics	
Operating unit Paint, color	Housing from ABS Similar to RAL7011
Stop button	Yes (2 normally closed), right position
Enable switch	Yes (two 3-step switches), left and right position
Mounted in the middle Electronic handwheel 3-axis joystick	 Yes -

Table 13: Technical data - 5MP040.0381-02 (cont.)

Mechanics	5MP040.0381-02
Mounted on the left Illuminated button Key switch Override potentiometer	 - Yes -
Outer dimensions Diameter Total height	 250 mm 114 mm
Weight (without cable)	 Approx. 1100 grams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 50°C -20°C to +70°C -20°C to +70°C
Relative humidity Operation Storage Transport	 Max. 95%, (non-condensing) Max. 95%, (non-condensing) Max. 95%, (non-condensing)
Vibration Operation	 5 - 9 Hz: 7 mm amplitude / 9 - 150 Hz: 2 g
Shock Operation	 15 g (147 m/s² 0-peak) and 11 ms length
Altitude	3000 meters
Environment	
Drop height	1.5 meters on industrial surfaces
Protection type	IP65
Flame resistant	UL94V-0

Table 13: Technical data - 5MP040.0381-02 (cont.)

Operating unit 5MP040.0653-01

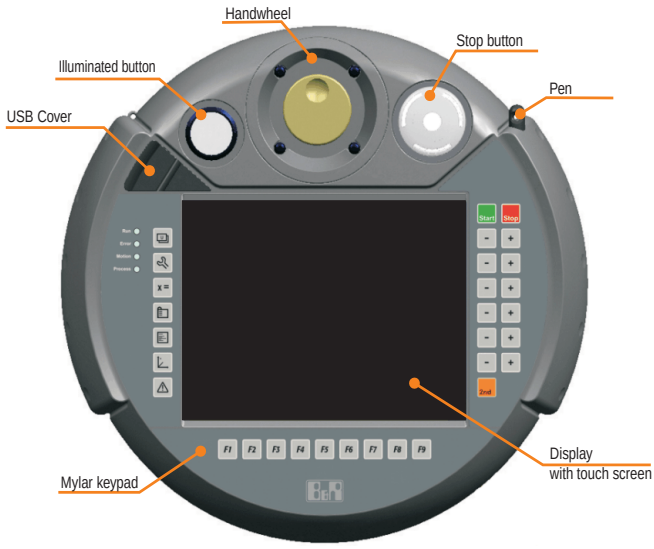


Figure 19: Operating unit - 5MP050.0653-01

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5MP050.0653-01
Boot loader / Operating system	BIOS
Processor Type Cooling	 Intel PXA 270/416 MHz Passive cooling
Flash	128 MB
Memory Type Size	 SDRAM 256 MB
Graphics Controller	 Intel PXA

Table 14: Technical data - 5MP050.0653-01

Features	5MP050.0653-01
Ethernet Controller Transfer rate Connection Cables	 SMSC11X 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
USB interface Type Amount Transfer rate Connection Current load USB client	Accessible on the front, behind the cover USB 1.1 1 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A 500 mA Accessible in cable shaft
Reset button	Yes (in cable shaft)
Keyboard System keys LEDs	 31 4
Display Type Diagonal Colors Resolution Contrast Perspective (see page 129) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT-LCD display 6.5" 165 mm 65535 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L =55° Direction U = 30°/ direction D = 60° 400 cd/m^2 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive
Power supply Rated voltage Max. interruption of supply Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) ≤10 ms Max. 5.6 A (current limitation present) 9.6 watts (400 mA at 24 VDC) -
Safety Standard	Class 3 according to EN 61131-2, or EN 50178
Mechanics	
Operating unit Paint, color	Housing from ABS Similar to RAL7011
Stop button	Yes (2 normally closed), right position
Enable switch	Yes (two 3-step switches), left and right position
Mounted in the middle Electronic handwheel 3-axis joystick	 Yes -
Mounted on the left Illuminated button Key switch Override potentiometer	 Yes (white) - -

Table 14: Technical data - 5MP050.0653-01 (cont.)

Mechanics	5MP050.0653-01
Outer dimensions Diameter Total height	 250 mm 114 mm
Weight (without cable)	 Approx. 1100 gramsgrams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 50°C -20°C to +70°C -20°C to +70°C
Relative humidity Operation Storage Transport	 Max. 95% at T ≤ 40°C, non-condensing Max. 95% at T ≤ 55°C, non-condensing Max. 95% at T ≤ 55°C, non-condensing
Vibration Operation	 5 - 9 Hz: 7 mm amplitude / 9 - 150 Hz: 2 g
Shock Operation	 15 g (147 m/s² 0-peak) and 11 ms length
Altitude	3000 meters
Environment	
Drop height	1.5 meters on industrial surfaces
Protection type	IP65
Flame resistant	UL94V-0

Table 14: Technical data - 5MP050.0653-01 (cont.)

Operating unit 5MP050.0653-02

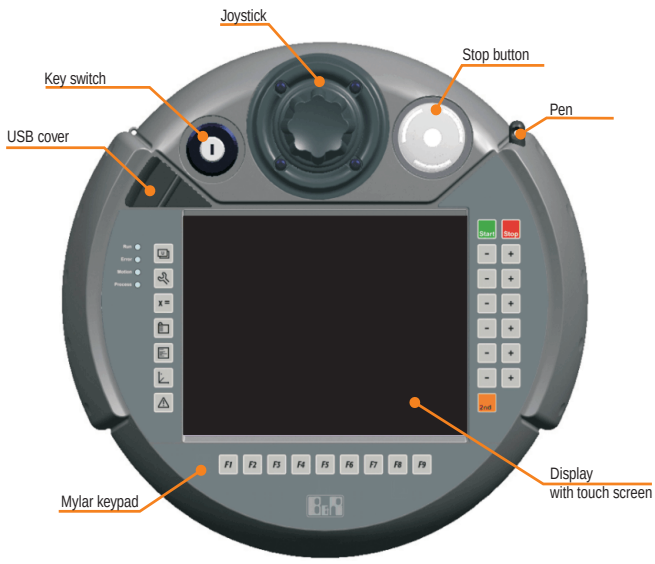


Figure 20: Operating unit 5MP050.0653-02

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5MP050.0653-02
Boot loader / Operating system	Yes / Windows CE
Processor Type Cooling	 Intel PXA 270/416 MHz Passive cooling
Flash	128 MB
Memory Type Size	 SDRAM 256 MB
Graphics Controller	 Intel PXA

Table 15: Technical data - 5MP050.0653-02

Features	5MP050.0653-02
Ethernet Controller Transfer rate Connection Cables	 SMSC11X 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
USB interface Type Amount Transfer rate Connection Current load USB client	Accessible on the front, behind the cover USB 1.1 1 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A 500 mA Accessible in cable shaft
Reset button	Yes (in cable shaft)
Keyboard System keys LEDs	 31 4
Display Type Diagonal Colors Resolution Contrast Perspective (see page 129) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT-LCD display 6.5" 165 mm 65535 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L =55° Direction U = 30°/ direction D = 60° 400 cd/m^2 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive
Power supply Rated voltage Max. interruption of supply Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) ≤10 ms Max. 5.6 A (current limitation present) 9.6 watts (400 mA at 24 VDC) -
Safety Standard	Class 3 according to EN 61131-2, or EN 50178
Mechanics	
Operating unit Paint, color	Housing from ABS Similar to RAL7011
Stop button	Yes (2 normally closed), right position
Enable switch	Yes (two 3-step switches), left and right position
Mounted in the middle Electronic handwheel 3-axis joystick	 - Yes
Mounted on the left Illuminated button Key switch Override potentiometer	 - Yes -

Table 15: Technical data - 5MP050.0653-02 (cont.)

Mechanics	5MP050.0653-02
Outer dimensions Diameter Total height	 250 mm 114 mm
Weight (without cable)	 Approx. 1100 grams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 50°C -20°C to +70°C -20°C to +70°C
Relative humidity Operation Storage Transport	 Max. 95%, (non-condensing) Max. 95%, (non-condensing) Max. 95%, (non-condensing)
Vibration Operation	 5 - 9 Hz: 7 mm amplitude / 9 - 150 Hz: 2 g
Shock Operation	 15 g (147 m/s² 0-peak) and 11 ms length
Altitude	3000 meters
Environment	
Drop height	1.5 meters on industrial surfaces
Protection type	IP65
Flame resistant	UL94V-0

Table 15: Technical data - 5MP050.0653-02 (cont.)

Operating unit 5MP050.0653-03

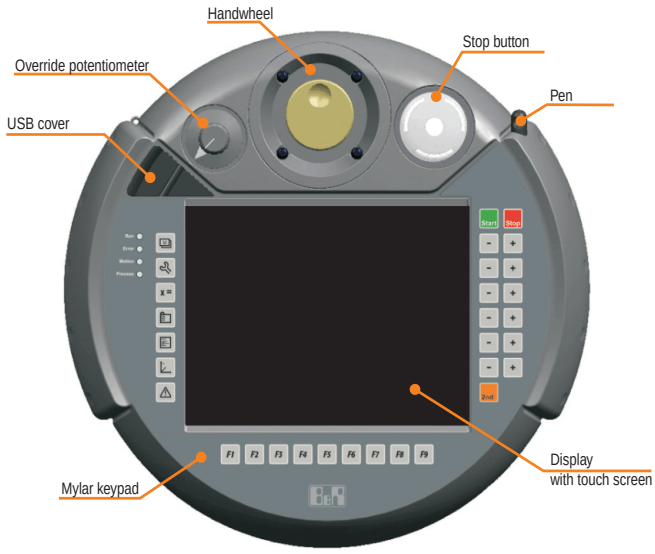


Figure 21: Operating unit 5MP050.0653-03

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5MP050.0653-03
Boot loader / Operating system	Yes / Windows CE
Processor Type Cooling	 Intel PXA 270/416 MHz Passive cooling
Flash	128 MB
Memory Type Size	 SDRAM 256 MB
Graphics Controller	 Intel PXA

Table 16: Technical data - 5MP050.0653-03

Features	5MP050.0653-03
Ethernet Controller Transfer rate Connection Cables	 SMSC11X 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
USB interface Type Amount Transfer rate Connection Current load USB client	Accessible behind the cover USB 1.1 1 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A 500 mA Accessible in cable shaft
Reset button	Yes (in cable shaft)
Keyboard System keys LEDs	 31 4
Display Type Diagonal Colors Resolution Contrast Perspective (see page 129) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT-LCD display 6.5" 165 mm 65535 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L =55° Direction U = 30°/ direction D = 60° 400 cd/m^2 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive
Power supply Rated voltage Max. interruption of supply Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) ≤10 ms Max. 5.6 A (current limitation present) 9.6 watts (400 mA at 24 VDC) -
Safety Standard	Class 3 according to EN 61131-2, or EN 50178
Mechanics	
Operating unit Paint, color	Housing from ABS Similar to RAL7011
Stop button	Yes (2 normally closed), right position
Enable switch	Yes (two 3-step switches), left and right position
Mounted in the middle Electronic handwheel 3-axis joystick	 Yes -
Mounted on the left Illuminated button Key switch Override potentiometer	 - - Yes

Table 16: Technical data - 5MP050.0653-03 (cont.)

Mechanics	5MP050.0653-03
Outer dimensions Diameter Total height	 250 mm 114 mm
Weight (without cable)	 Approx. 1100 grams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 50°C -20°C to +70°C -20°C to +70°C
Relative humidity Operation Storage Transport	 Max. 95%, (non-condensing) Max. 95%, (non-condensing) Max. 95%, (non-condensing)
Vibration Operation	 5 - 9 Hz: 7 mm amplitude / 9 - 150 Hz: 2 g
Shock Operation	 15 g (147 m/s² 0-peak) and 11 ms length
Altitude	3000 meters
Environment	
Drop height	1.5 meters on industrial surfaces
Protection type	IP65
Flame resistant	UL94V-0

Table 16: Technical data - 5MP050.0653-03 (cont.)

Operating unit5MP050.0653-04

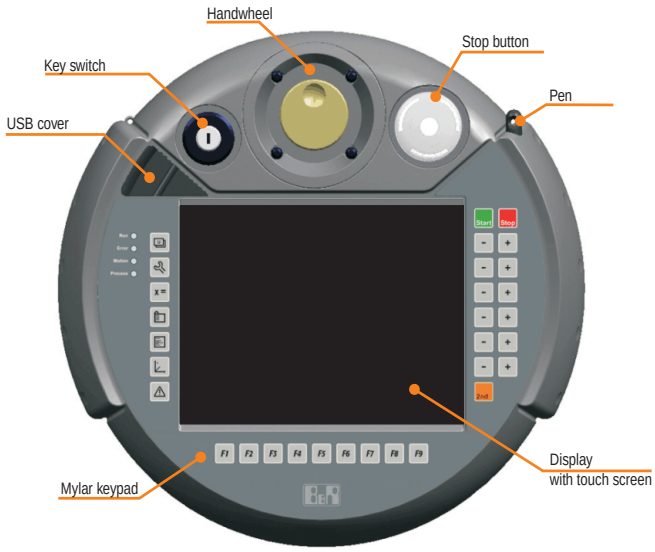


Figure 22: Operating unit - 5MP050.0653-04

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5MP050.0653-04
Boot loader / Operating system	Yes / Windows CE
Processor Type Cooling	 Intel PXA 270/416 MHz Passive cooling
Flash	128 MB
Memory Type Size	 SDRAM 256 MB
Graphics Controller	 Intel PXA

Table 17: Technical data - 5MP050.0653-04

Features	5MP050.0653-04
Ethernet Controller Transfer rate Connection Cables	 SMSC11X 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
USB interface Type Amount Transfer rate Connection Maximum current load USB client	Accessible on the front, behind the cover USB 1.1 1 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A 500 mA Accessible in cable shaft
Reset button	Yes (in cable shaft)
Keyboard System keys LEDs	 31 4
Display Type Diagonal Colors Resolution Contrast Perspective (see page 129) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT-LCD display 6.5“ 165 mm 65535 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L =55° Direction U = 30°/ direction D = 60° 400 cd/m^2 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive
Power supply Rated voltage Max. interruption of supply Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) ≤10 ms Max. 5.6 A (current limitation present) 9.6 watts (400 mA at 24 VDC) -
Safety Standard	Class 3 according to EN 61131-2, or EN 50178
Mechanics	
Operating unit Paint, color	Housing from ABS Similar to RAL7011
Stop button	Yes (2 normally closed), right position
Enable switch	Yes (two 3-step switches), left and right position
Mounted in the middle Electronic handwheel 3-axis joystick	 Yes -
Mounted on the left Illuminated button Key switch Override potentiometer	 - Yes -

Table 17: Technical data - 5MP050.0653-04 (cont.)

Mechanics	5MP050.0653-04
Outer dimensions Diameter Total height	 250 mm 114 mm
Weight (without cable)	 Approx. 1100 grams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 50°C -20°C to +70°C -20°C to +70°C
Relative humidity Operation Storage Transport	 Max. 95%, (non-condensing) Max. 95%, (non-condensing) Max. 95%, (non-condensing)
Vibration Operation	 5 - 9 Hz: 7 mm amplitude / 9 - 150 Hz: 2 g
Shock Operation	 15 g (147 m/s² 0-peak) and 11 ms length
Altitude	3000 meters
Environment	
Drop height	1.5 meters on industrial surfaces
Protection type	IP65
Flame resistant	UL94V-0

Table 17: Technical data - 5MP050.0653-04 (cont.)

3.2 Cables

3.2.1 Attachment cable 5CAMPH.0xxx-30

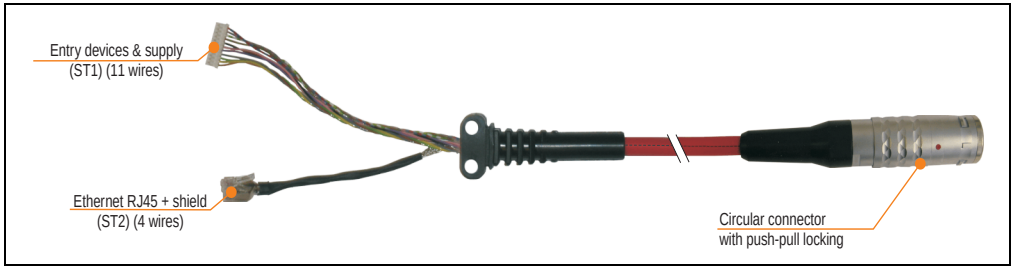


Figure 23: Attachment cable - 5CAMPH.0xxx-30

The attachment cable establishes the electrical and mechanical connection between the switching cabinet and Mobile Panel. It contains lines for the network (Ethernet 10/100 MBit/s) and for the entry devices & 24 VDC supply.

The surface is protected against water, oil (lubricating and hydraulic oils according to EN60811, section 2-1) and cooling lubricant.

On the Mobile Panel, the attachment cable is mounted into the attachment shaft. On the switching cabinet end, the attachment cable has a circular plug. The attachment cable is available in different lengths (see table 5 "Mobile Panel attachment cable model numbers", on page 23). Information regarding the procedure for connecting the attachment cable can be found in Chapter 3 "Start-up", section 3 "Connection" on page 82.

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5CAMPH.0018-30	5CAMPH.0050-30	5CAMPH.0100-30	5CAMPH.0150-30	5CAMPH.0200-30
Length and tolerance	1.8 meters ± 10 cm	5 meters ± 10 cm	10 meters ± 10 cm	15 meters ± 15 cm	20 meters ± 15 cm
Connector Industrial plug	Push-Pull circular plug (ODU circular plug with Push-Pull locking)				

Table 18: Technical data - Mobile Panel cable - 5CAMPH.0xxx-30

Features	5CAMPH.0018-30	5CAMPH.0050-30	5CAMPH.0100-30	5CAMPH.0150-30	5CAMPH.0200-30
Cables Total diameter Weight per meter Sheathing material Minimum flex radius Supply lines Permissible operating voltage Material Conductor resistance Max. tension stress Color	Hybrid cable, 25 wire 10 mm 153 grams Silicon and halogen free, flame retardant PUR outer sheathing 60 mm 30 VDC Tinned copper wires ≤ 30 Ohm/km 140 N Similar to RAL 7012				
Cable elements Network Enable switch Stop button Power supply	Twisted pair cable for Ethernet (10/100 Mbit/s) (4-wire RJ45 plug) Direct connection between the enable switch and the monitoring device (4-wire) Direct connection between the stop button and the monitoring device (4-wire) Supply voltage + 24 VDC (3-wire)				
Environment					
Operating temperature Non-moving Moving	-20°C to +80°C -5°C to +60°C				
Standards	Flame retardant according to IEC 60332-1 and VW1 / FT1 according to C-UL Shield damping according to IEC 60096-1, amendment 2 Mechanical characteristics according to DIN VDE 0472 section 603 test type H (100000 cycles) Oil resistant, hydrolysis resistant according to DIN VDE 0282 section 10				
Protection type	IP65 (connected or with attached cover 5CAMPP.0000-10.				

Table 18: Technical data - Mobile Panel cable - 5CAMPH.0xxx-30 (cont.)

Cable specifications

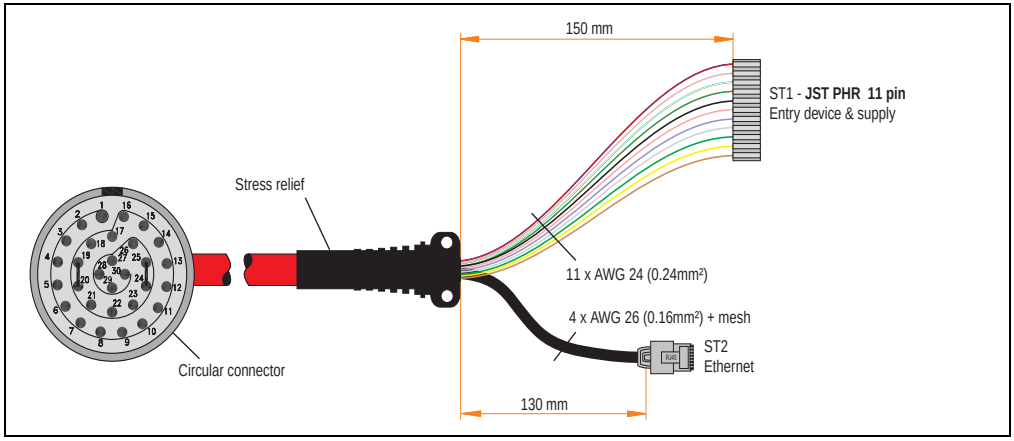


Figure 24: Attachment cable specifications - 5CAMPH.0xxx-30

ST1 entry devices & supply		Wire colors - Attachment cable	Assignment in connection housing
C 1	Pin 1	Brown	Pin 4
NO 1	Pin 2	Yellow	Pin 5
C 2	Pin 3	Green	Pin 9
NO 2	Pin 4	Gray	Pin 8
Not used	Pin 5	Violet	---
+24 VDC	Pin 6	Pink	Pin 3
GND	Pin 7	Black	Pin 14
Stop O11	Pin 8	Brown-Green	Pin 1
Stop O12	Pin 9	White-Green	Pin 15
Stop O21	Pin 10	Gray-Pink	Pin 2
Stop O22	Pin 11	Red-Blue	Pin 16
Ethernet shield		---	Pin 17
ST2 Ethernet		**Wire colors - Attachment cable**	**Assignment in connection housing**
TX	Pin 1	Blue	Pin 27
$\overline{TX}$	Pin 2	White	Pin 29
RX	Pin 3	Orange	Pin 28
n.c.	Pin 4	---	---
n.c.	Pin 5	---	---
$\overline{RX}$	Pin 6	Red	Pin 30
n.c.	Pin 7	---	---
n.c.	Pin 8	---	---
Shielding	Housing	Mesh	Pin 17

3.2.2 Switching cabinet cable crossover 5ACMPC.0020-10

The pin assignments for the Ethernet plug (crossover) make it possible to connect directly to a B&R controller e.g. X20 or to the first Ethernet connection (MDIX) on the B&R Ethernet Hub AC808 (model number 0AC808.9).

If a different Ethernet hub is used, it must support the crossover of the RX and TX lines.

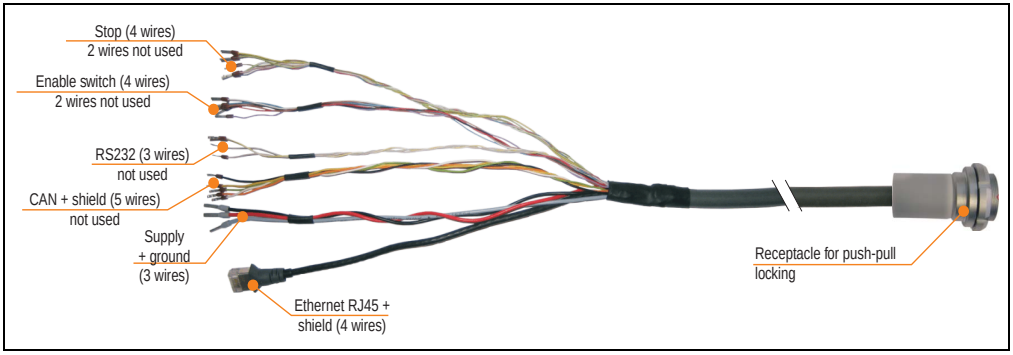


Figure 25: Mobile Panel switching cabinet cable - 5CAMPC.0020-10

The switching cabinet cable is required for the wiring inside the switching cabinet.

Information:

The switching cabinet cable is used in the Mobile Panel 40/50 as well as in Mobile Panel 100/200 product series. Not all wires are used in the Mobile Panel 40/50 wiring, which limits its functionality compared to Mobile Panel 100/20 devices.

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

The connection housing is used to connect the switching cabinet cable to the switching cabinet door (see image 27 "Drilling template - receptacle" on page 70). The other end of the switching cabinet cable has a prefabricated RJ45 Ethernet plug. The rest of the lines have an open end with wire tip sleeves. This makes it easier to wire the cable to safety equipment and the other connections.

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5CAMPC.0020-10
Length and tolerance	2 meters ± 5 cm
Connector Industrial socket	 Receptacle for push-pull locking connection
Cable Total diameter Weight per meter Sheathing material Minimum flex radius Supply lines Permissible operating voltage Material Conductor resistance Max. tension stress Color	Hybrid cable, 25 wire 10 mm 153 grams Silicon and halogen free, flame retardant PUR outer sheathing 60 mm 30 VDC Tinned copper wires ≤ 30 Ohm/km 140 N Similar to RAL 7012
Cable elements Network Enable switch 2 x CAN bus Entry devices Power supply Serial connection (RxD / TxD)	 Twisted pair cable for Ethernet (10/100 Mbit/s) (4-wire) Direct connection of the enable switch to the monitoring device (6 wires - 2 wires not used in MP40/50) 2 pairs with shielding (5 wires not used in MP40/50) Direct connection between the entry device and the monitoring device (6-wire) Supply voltage 24 VDC and ground (3-wire) 3 wires (not used in MP40/50)
Environment	
Permissible operating temperature Non-moving Moving	 -20°C to +80°C -5°C to +60°C
Standards	Flame retardant according to IEC 60332-1 and VW1 / FT1 according to C-UL Shield damping according to IEC 60096-1, amendment 2 Mechanical characteristics according to DIN VDE 0472 section 603 test type H (100000 cycles) Oil resistant, hydrolysis resistant according to DIN VDE 0282 section 10
Protection type	IP65 (connected or with attached cover 5CAMPP.0001-10

Table 19: Technical data - switching cabinet cable - 5CAMPC.0020-10

Cable specifications

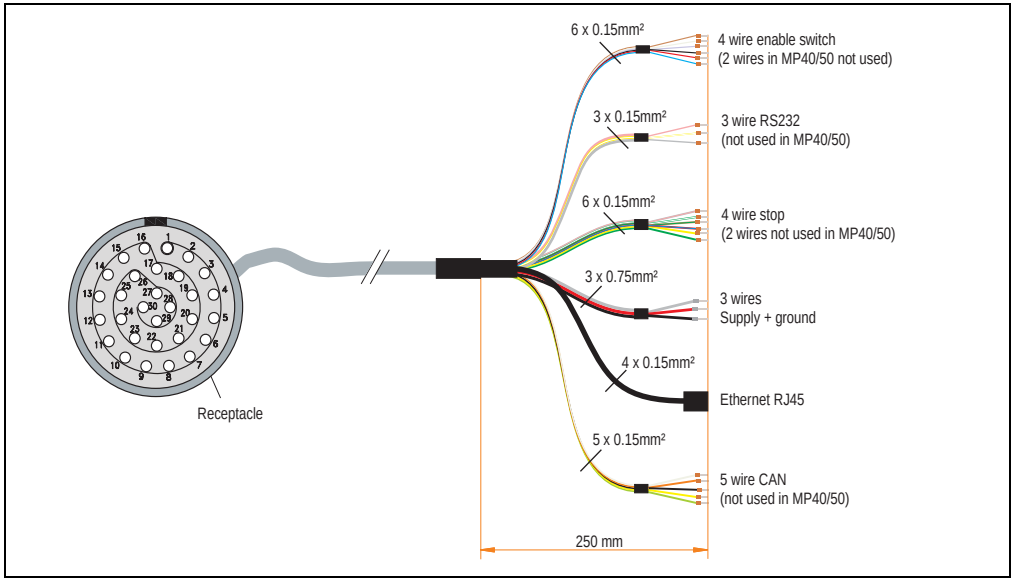


Figure 26: Cable layout - switching cabinet cable - 5CAMPC.0020-10

Pin assignments - Receptacle	Wire color - Switching cabinet cable	Enable switch wires	
4	Brown	C1	
5	White	NO1	
6	Violet	NC1	Not used
9	Black	C2	
8	Red	NO2	
7	Blue	NC2	Not used
Pin assignments - Receptacle	**Wire color - Switching cabinet cable**	**RS232 wires**	
21	Pink	RxD	Not used
22	White-Yellow	GND	
23	Gray	TxD	
Pin assignments - Receptacle	**Wire color - Switching cabinet cable**	**Entry device wires**	
1	Gray-Pink	Stop/normally closed contact 1 (11)	
2	Brown-Green	Stop/normally closed contact 2 (21)	
15	White-Green	Stop/normally closed contact 1 (12)	
16	Red-Blue	Stop/normally closed contact 2 (22)	
18	Yellow	Button (S13)	
26	Green	Button (S14)	

Pin assignments - Receptacle	Wire color - Switching cabinet cable	Supply wires	
3	Red	+ 24 VDC supply	
14	Black	Ground	
17	Gray	Shielding	
Pin assignments - Receptacle	**Wire color - Switching cabinet cable**	**Ethernet RJ45 plug**	
27	Green	Pin 3 (RX)	
28	Pink	Pin 1 (TX)	
29	Yellow	Pin 6 ($\overline{RX}$)	
30	Blue	Pin 2 ($\overline{TX}$)	
Ethernet shield	Shielding	Shielding	
Pin assignments - Receptacle	**Wire color - Switching cabinet cable**	**CAN wires**	
10	White	CAN 1 High	Not used
11	Orange	CAN 1 Low	
12	Yellow	CAN 2 High	
13	Green	CAN 2 Low	
CAN shield	Black	Shielding	

Information:

When installing the switching cabinet cable, make sure that it is not too loose or pulled too tight in the switching cabinet.

Drilling template for the receptacle

Drilling holes and a cutout must be made according to the following diagram for mounting the receptacle (e.g. to a switching cabinet door).

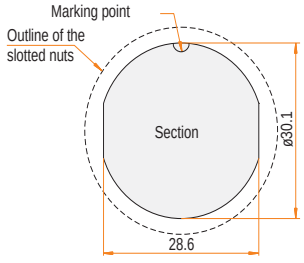


Figure 27: Drilling template - receptacle

3.2.3 Switching cabinet cable straight thru 5ACMPC.0020-11

The pin assignments for the Ethernet plug (1:1) make it possible to connect directly to a standard Ethernet hub.

If the first Ethernet connection on B&R Ethernet hub AC808 (model number 0AC808.9) is used, make sure that the crossover (MDIX) is not activated.

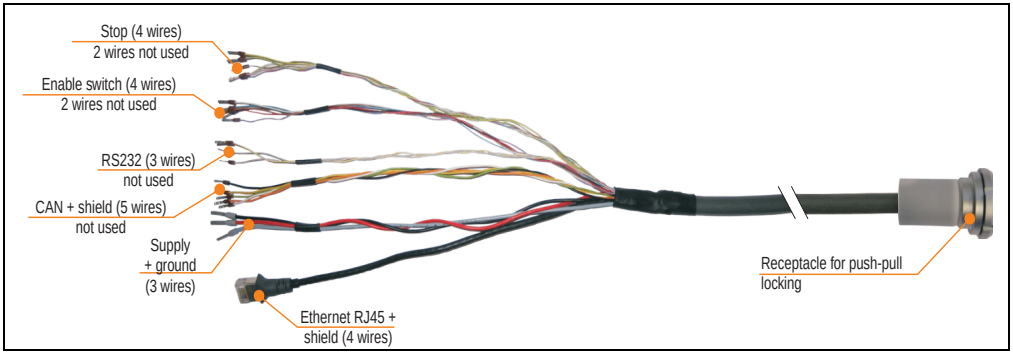


Figure 28: Mobile Panel switching cabinet cable - 5CAMPC.0020-11

The switching cabinet cable is required for the wiring inside the switching cabinet.

Information:

The switching cabinet cable is used in the Mobile Panel 40/50 as well as in Mobile Panel 100/200 product series. Not all wires are used in the Mobile Panel 40/50 wiring, which limits its functionality compared to Mobile Panel 100/20 devices.

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

The connection housing is used to connect the switching cabinet cable to the switching cabinet door (see image 30 "Drilling template - Receptacle" on page 74). The other end of the switching cabinet cable has a prefabricated RJ45 Ethernet plug. The rest of the lines have an open end with wire tip sleeves. This makes it easier to wire the cable to safety equipment and the other connections.

Technical data

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Features	5CAMPC.0020-11
Length and tolerance	2 meters ± 5 cm
Connector Industrial socket	 Receptacle for push-pull locking connection
Cable Total diameter Weight per meter Sheathing material Minimum flex radius Supply lines Permissible operating voltage Material Conductor resistance Max. tension stress Color	Hybrid cable, 25 wire 10 mm 153 grams Silicon and halogen free, flame retardant PUR outer sheathing 60 mm 30 VDC Tinned copper wires ≤ 30 Ohm/km 140 N Similar to RAL 7012
Cable elements Network Enable switch 2 x CAN bus Entry devices Power supply Serial connection (RxD / TxD)	 Twisted pair cable for Ethernet (10/100 Mbit/s) (4-wire) Direct connection of the enable switch to the monitoring device (6 wires - 2 wires not used in MP40/50) 2 pairs with shielding (5 wires not used in MP40/50) Direct connection between the entry device and the monitoring device (6-wire) Supply voltage 24 VDC and ground (3-wire) 3 wires (not used in MP40/50)
Environment	
Permissible operating temperature Non-moving Moving	 -20°C to +80°C -5°C to +60°C
Standards	Flame retardant according to IEC 60332-1 and VW1 / FT1 according to C-UL Shield damping according to IEC 60096-1, amendment 2 Mechanical characteristics according to DIN VDE 0472 section 603 test type H (100000 cycles) Oil resistant, hydrolysis resistant according to DIN VDE 0282 section 10

Table 20: Technical data - switching cabinet cable - 5CAMPC.0020-11

Cable specifications

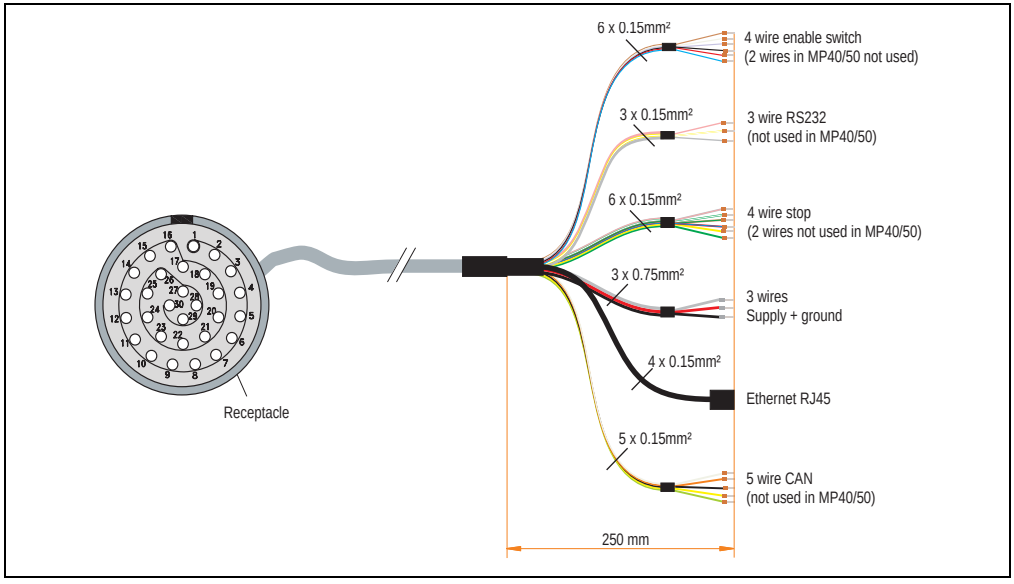


Figure 29: Cable layout - Switching cabinet cable - 5CAMPC.0020-11

Assignments in connection housing	Wire color - Switching cabinet cable	Enable switch wires	
4	Brown	C1	
5	White	NO1	
6	Violet	NC1	Not used
9	Black	C2	
8	Red	NO2	
7	Blue	NC2	Not used
Assignments in connection housing	**Wire color - Switching cabinet cable**	**RS232 wires**	
21	Pink	RxD	Not used
22	White-Yellow	GND	
23	Gray	TxD	
Assignments in connection housing	**Wire color - Switching cabinet cable**	**Entry device wires**	
1	Gray-Pink	E-stop normally closed contact 1 (11)	
2	Brown-Green	E-stop normally closed contact 2 (21)	
15	White-Green	E-stop normally closed contact 1 (12)	
16	Red-Blue	E-stop normally closed contact 2 (22)	
18	Yellow	Button (S13)	
26	Green	Button (S14)	

Assignments in connection housing	Wire color - Switching cabinet cable	Supply wires	
3	Gray	Shielding	
14	Black	Ground	
17	Red	+ 24 VDC supply	
Assignments in connection housing	**Wire color - Switching cabinet cable**	**Ethernet RJ45 plug**	
27	Green	Pin 1 (RX)	
28	Pink	Pin 3 (TX)	
29	Yellow	Pin 2 ($\overline{RX}$)	
30	Blue	Pin 6 ($\overline{TX}$)	
Ethernet shield	Shielding	Shielding	
Assignments in connection housing	**Wire color - Switching cabinet cable**	**CAN wires**	
10	White	CAN 1 High	Not used
11	Orange	CAN 1 Low	
12	Yellow	CAN 2 High	
13	Green	CAN 2 Low	
CAN shield	Black	Shielding	

Information:

When installing the switching cabinet cable, make sure that it is not too loose or pulled too tight in the switching cabinet.

Drilling template - Receptacle

Drilling holes and a cutout must be made according to the following diagram for mounting the receptacle (e.g. to a switching cabinet door).

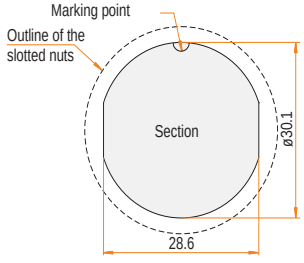


Figure 30: Drilling template - Receptacle

4. Wall mount

The wall mount 4MPBRA.0000-01 is used for storing the Mobile Panel (operating unit + handle) together with the Mobile Panel attachment cable and is only intended for upright, hanging installation.

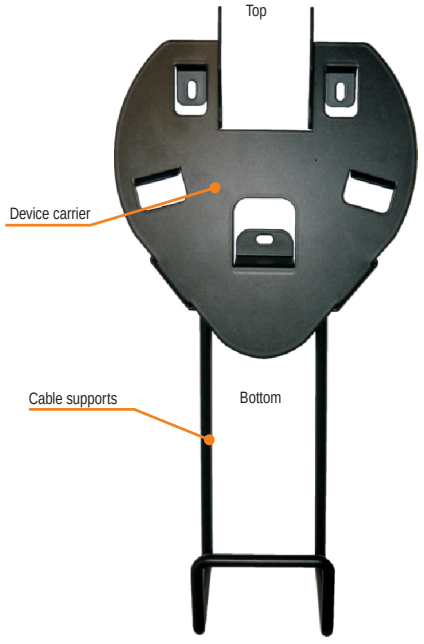


Figure 31: Wall mount - 4MPBRA.0000-01

Drilling holes for attaching the wall mount must be made in accordance with the diagram "Dimensions - Wall mount - 4MPBRA.0000-01" on page 77.

Caution!

The mounting location for the wall mount should be selected so that the Mobile Panel is not directly subjected to sources of heat or sunlight. The wall mount should also be positioned so that operation of the stop button is not impaired.

Danger!

When the Mobile Panel device is stored on its wall mount and located in a dangerous machine area, the attachment cable and the switching cabinet cable must still be completely connected so that the stop button can be activated.

4.1 Dimensions

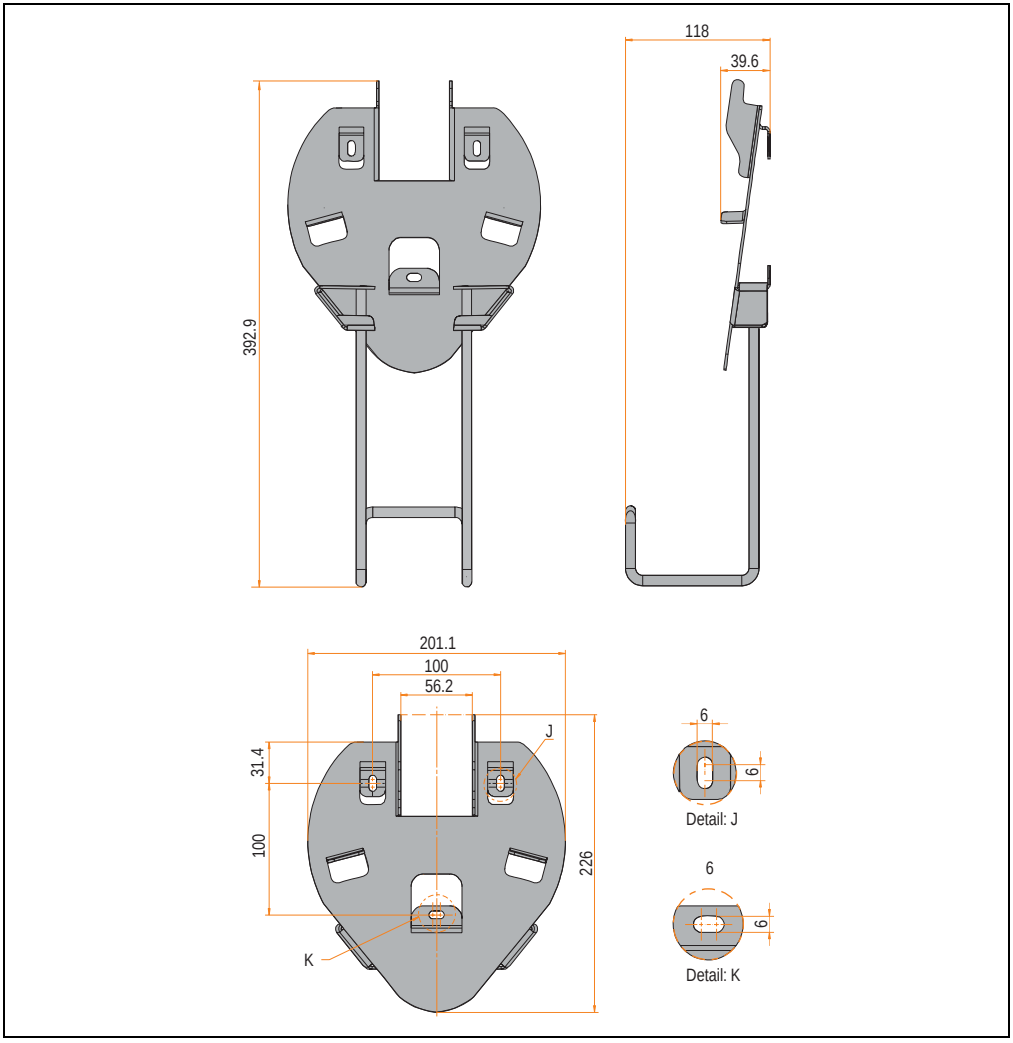


Figure 32: Dimensions - Wall mount - 4MPBRA.0000-01

4.2 Storing the Mobile Panel device

The following images illustrate the proper way to store a Mobile Panel device on a wall mount.

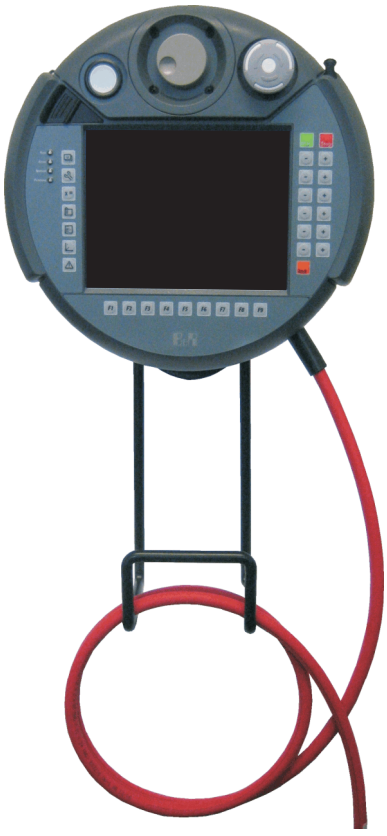
View from front	Sideview
	

Table 21: Storing a Mobile Panel device on a wall mount

Chapter 3 • Start-up

1. Commissioning from a safety perspective

The hand terminal was developed, manufactured, examined and documented in compliance with ergonomic guidelines and relevant safety standards. Given the instructions for intended use and safety information, no danger exists under normal product circumstances with regard to damage to property or personal injury.

The information contained in this manual must be followed in every case. Otherwise, dangerous situations may result or the integrated safety equipment in the hand terminal may prove ineffective.

Independent from the safety information in this manual, there are work safety and accident prevention guidelines that must be noted.

Warning!

The machine manufacturer must correctly configure the hand-held device according to the danger and risk analysis. The following safety aspects must be considered:

- Correct cable length for limiting the working area

- Stop button necessary (allowed)

- Satisfactory safety category for each use

- **The device must only be driven under the proper conditions with regard to the user's manual.**
- **The user must possess the required educational training as well as a detailed knowledge of the intended use as specified in the user's manual.**
- **The safety information in the following Chapters must be considered.**
- **Important additional information regarding safety and EMV is present in Chapter "CE conformity, standards and guidelines" and must be noted.**

1.1 Intended use

The intended use of the Mobile Panel spans from monitoring and configuration to operating machines, for example:

- Injection molding machines
- Robots
- Machine tools
- Textile machines
- Printing machines
- Theater backdrops
- and similar

normal operating modes, for example

- Automatic

as well as semi-automatic or manual special operating modes, for instance

- Setup
- Teach In
- Test run
- and others.

An enable switch and a stop button are available for safety functions.

All safety functions have a double circuit design so a safety category 3 according to EN 954-1 is possible.

Selection of the hand terminal designed for the machine as well as configuration of possible additional options must take place based on legally required danger- and risk evaluations performed by the machine manufacturer.

Refer to Chapter "CE conformity, standards and guidelines" for information regarding intended use of the hand terminal.

2. Operating the Mobile Panel

Caution!

- **Make sure that cables are safely out of the way on the floor to prevent any tripping which may result in the Mobile Panel device falling to the ground.**
- **The Mobile Panel attachment cable must not be pinched or come into contact with sharp corners, which would result in damage to the cable or its sheathing.**
- **Operating a Mobile Panel with a damaged attachment or switching cabinet cable is not permitted.**
- **When not using the Mobile Panel, it should be safely stowed away on its wall mount. When the Mobile Panel device is stored on its wall mount in a dangerous area around the machine, the attachment cable must still be connected so that the stop button can be activated if necessary.**
- **When laying down the Mobile Panel device for a short period of time, do not place it in such a way that its operating face could be damaged or where it may inadvertently trigger an action.**
- **The touch screen must not be operated with sharp objects such as ballpoint pens, knives, screwdrivers, etc. These objects will permanently damage the touch screen. The ideal object for operating the touch screen is the touch screen pen (see "Touch screen pen" on page 28). The touch screen can also be operated with a finger.**
- **When operating the touch screen, only touch one point at a time. Touching several places at once can cause unintended actions.**
- **Do not place objects on top of the touch screen.**
- **Never lay the device on unstable surfaces / storage shelves. It could fall and become damaged.**
- **Make sure that the device is never exposed to heat sources or direct sunlight.**
- **Ensure that no foreign substances or liquids access the interior of the device.**
- **Pressing several function or system keys at the same time may trigger unintended actions.**

Information:

- **Protective coverings on the device, housing screws, housing and cables should all be checked periodically for damage.**
- **For instructions on cleaning the Mobile Panel device, see "Cleaning" on page 125.**

3. Connection

The Mobile Panel is connected using the Mobile Panel attachment cable (see section "Attachment cable 5CAMPH.0xxx-30" on page 64).

3.1 Attachment shaft

The attachment cable is connected using the ST1 (entry devices + supply) and ST2 (Ethernet) plugs in the attachment shaft.

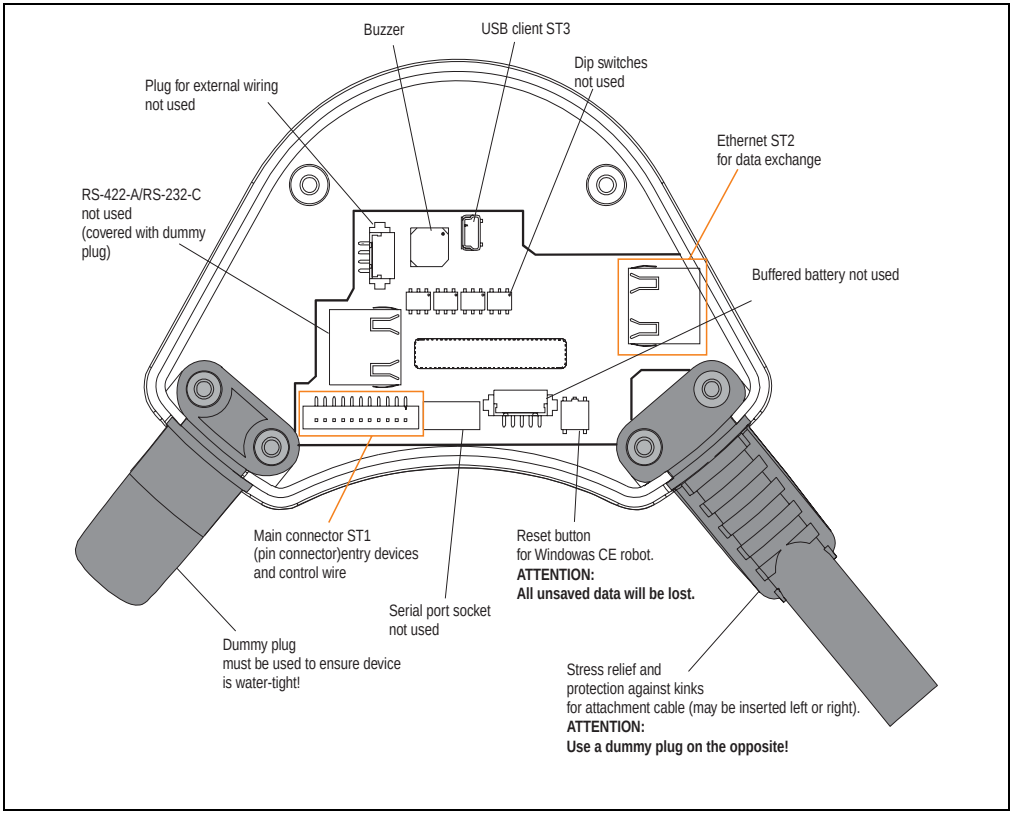


Figure 33: Attachment shaft

3.1.1 Cable extension in the attachment shaft

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

Tips for opening the attachment shaft

- Place the Mobile Panel device on a clean flat surface with the display facing down so that the Mobile Panel and its operating elements are not damaged (e.g. ESD mat).
- Loosen the screws with a size 2 Phillips head screwdriver.

Notes on changes in the attachment shaft

- Make sure the main connector (ST1) is removed by pulling the wire with the fingers (do not use any sharp objects).
- When removing the RJ-45 plug (ST2), make sure that the locking lever is pushed down:

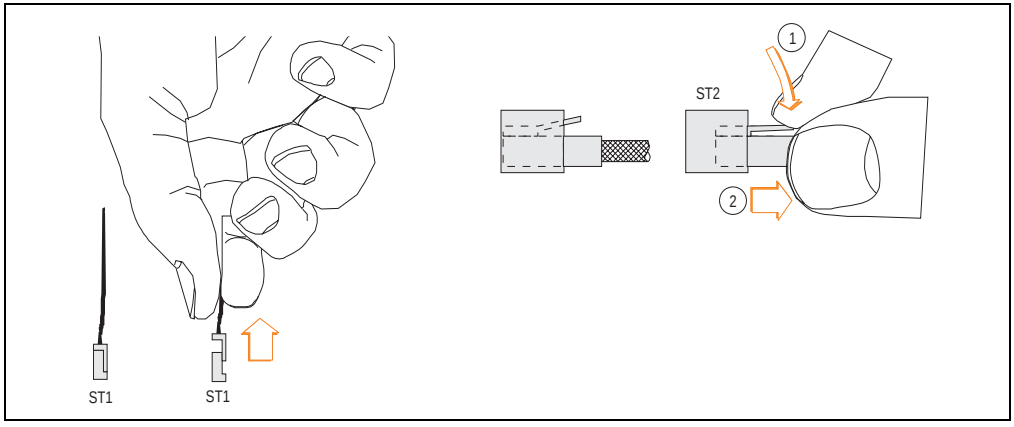


Figure 34: Removing ST1 and ST2

- Make sure that the lock clicks on the connector.

Note for closing the attachment shaft

- The seal must be clean, undamaged and located on the correct position in the attachment shaft cover.
- Cables are not permitted.
- The attachment shaft cover must be refastened with all 6 screws (torque: 0.4 to 0.5 Nm). Only then can the corresponding protection type be guaranteed.

3.1.2 Cable outlet

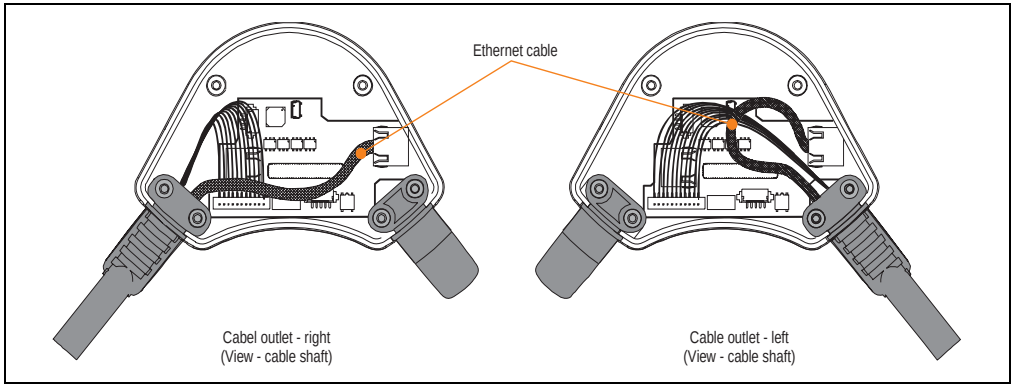


Figure 35: Cable outlet

4. Recommended monitoring devices

B&R recommends using PNOZ e1.1p and PNOZ PST1 safety relays from the Pilz company (www.pilz.com) in order to achieve Safety Category 3 in accordance with EN 954-1.

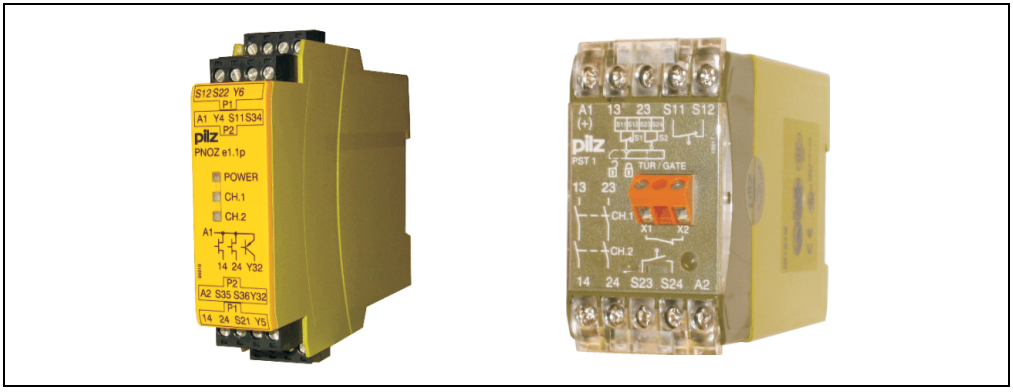


Figure 36: Pilz PNOZ e1.1p (left) and Pilz PNOZ PST1 (right)

4.1 Connection example for stop button

Connection example with monitoring device PILZ PNOZ e1.1p for safety circuits up to category 3 in accordance with EN 954-1.

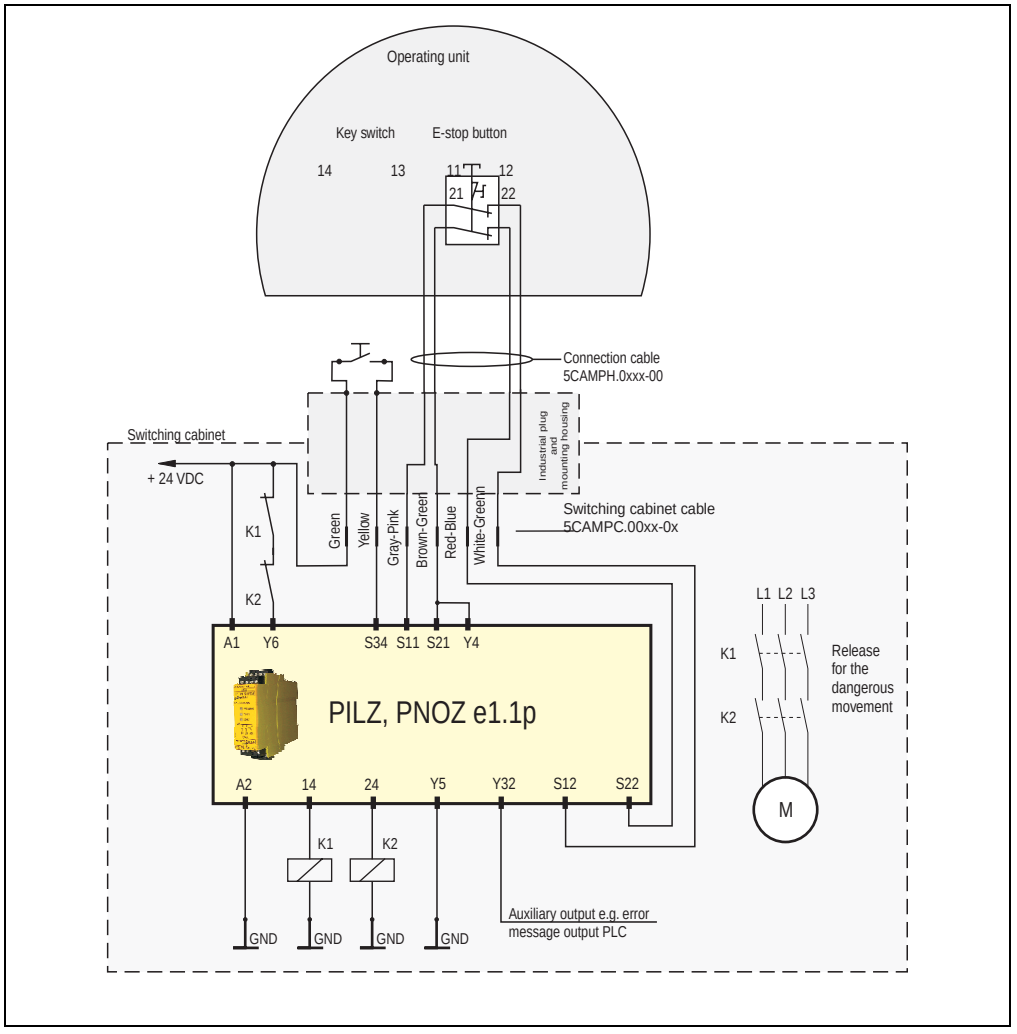


Figure 37: Connection example for stop button

4.2 Connection example - Enable switch

Connection example with monitoring device PILZ PST1 for safety circuits up to category 3 in accordance with EN 954-1.

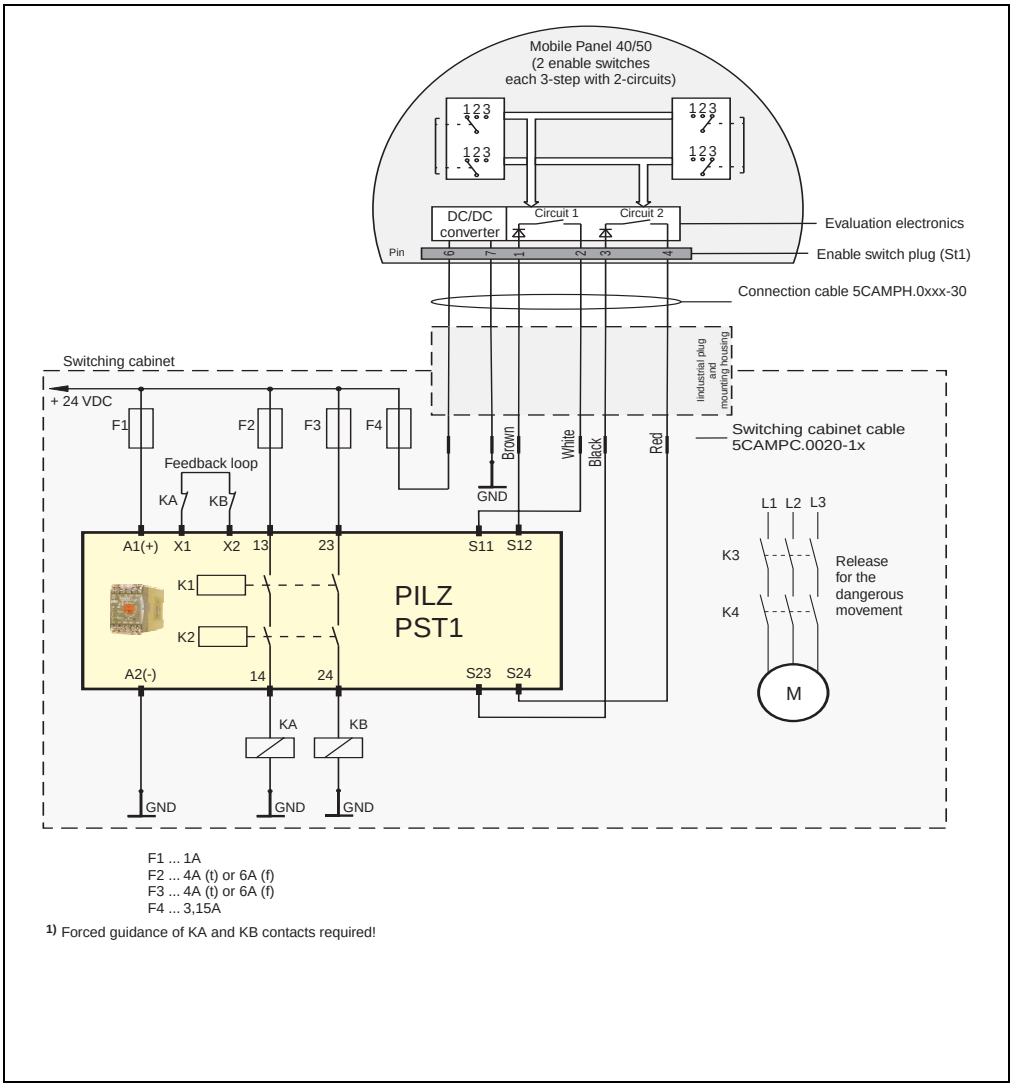


Figure 38: Connection example - enable switch

4.3 Connecting a Mobile Panel 100/200

A MP40/50 can be connected to the system in place of an MP100/200. The attachment cables feature the same round connectors allowing for simple exchange by removing and inserting.

When connecting an MP40/50, the differences of the device must be noted.

4.3.1 Differences between Mobile Panel 100/200 and Mobile Panel 40/50

Mobile Panel 100/200	Mobile Panel 40/50
Safety category: The devices support safety circuits up to category 4, a single-channel supports safety category 1 and, if a connection box is used, the safety circuits are supported up to category 3.	**Safety category:** Safety circuits up to category 3 are supported by the devices.
Connections: Entry devices (E-stop, key switch) Enable switch Supply + grounding **Interfaces:** Ethernet RS232 CAN	**Connections:** Entry devices (Stop button) Enable switch Supply + grounding All other entry devices (joystick, handwheel, override potentiometer, ect.) addressed using the software. **Interfaces:** Ethernet - -
Enabling equipment: A 3-step, 2 channel enable switch centrally located on the front side of the handle.	**Enabling equipment:** Two 3-step, 2-channel enable switches located on both sides of the device.

Table 22: Differences MP100/200 - MP40/50

5. USB interface

The front-side USB interface (accessible behind the protective cap) is specified solely for use of USB flash drives.

Warning!

Only USB devices tested and approved by B&R may be connected to the USB interface.

1) Open protective cap.

Figure 39: USB interface - open protective cap

2) Insert USB flash drive until it clicks.

Figure 40: USB interface - insert flash drive

Information:

When a USB device is inserted, IP65 protection is no longer guaranteed.

6. Application examples

6.1 Connection to a B&R controller (e.g. X20)

Control programs are distributed and run over several PLC stations. Fieldbus systems are used to connect I/O systems and drives to the PLCs. Machine operation and visualization takes place on a central Mobile Panel using a VNC client (with Windows CE ProPlus Thin Client Automation Runtime - TCAR), that communicates with the controller (VNC server) via Ethernet.

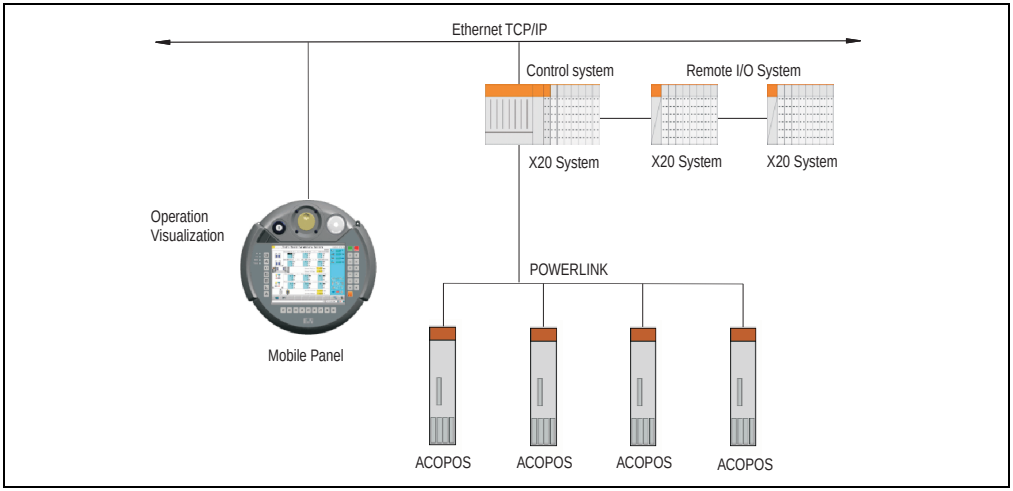


Figure 41: Connection to a B&R controller (e.g. X20)

Information:

- **Only one MP40/50 can be connected to the controller via the network. An additional participant in the network on the same controller would cause collisions and timeouts (in the library "AS_RfbExt").**
- **Jog key mode can only be updated with the library „AS_RfbExt“.**

Configuring Windows CE ProPlusTCAR version, see section "Configuring Windows CE ProPlus Thin Client Automation Runtime (TCAR)" on page 98.

6.2 Mobile thin client

The Mobile Panel with the Windows CE operating system is connected as a thin client to an APC620 with Windows XP Professional/Embedded. Communication takes place via Remote Desktop Protocol (RDP). The control program runs on the industrial PC, while I/O peripherals and drives are connected to the industrial PC via a fieldbus.

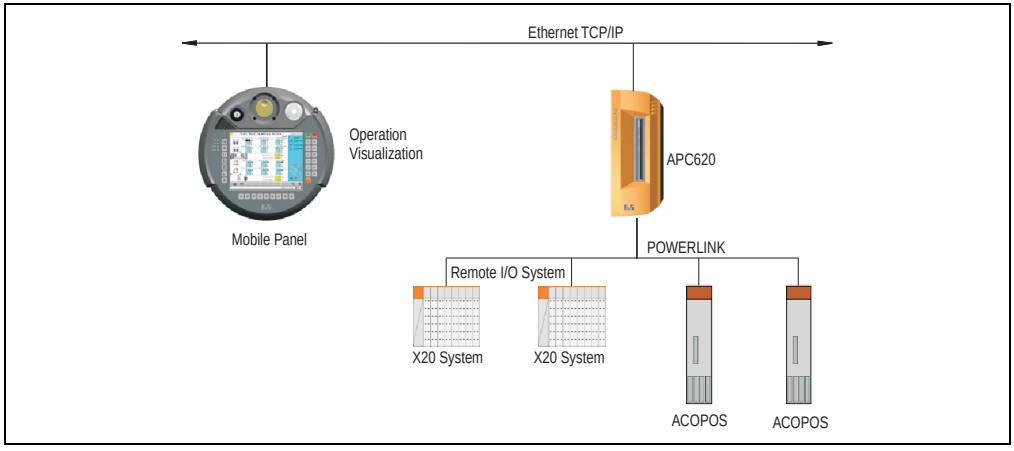


Figure 42: Mobile thin client

7. Touch screen calibration:

B&R touch screen devices are equipped with a Touch Controller, which supports hardware calibration. This means that the devices are pre-calibrated from stock (pre-calibration). This feature proves advantageous in the case of a replacement part because a new calibration is no longer required when exchanging devices (identical model / type). Nevertheless, we recommend calibrating the device in order to achieve the best results and to better readjust the touch screen to the user's preferences.

Regardless of this, the Touch Driver must be calibrated after it is installed.

7.1 Windows CE

Windows CE starts the touch calibration sequence during its first boot in the default configuration / delivered state.

The touch screen can also be configured via **Start > Settings > Control Panel > Touch Screen**.

8. Date / time settings

The real-time clock in the Mobile Panel 40/50 is not backed by a battery. The time must be reset each time the Mobile Panel 40/50 is restarted (loss of supply voltage or restart).

The time can be set by double-clicking the time display on the desktop or via **Start > Settings > Control Panel > Date/time**.

9. Key configuration

Not all keys are predefined when the Mobile Panel device is delivered. The keys can be configured easily with the B&R Key Editor (Version 2.60 or higher) - see also section "B&R Key Editor" on page 101.

Following configuration with the B&R Key Editor and creation of the project, the new *.kcf (Key Configuration File) can be transferred to the device using Control Center (**Start > Settings > Control Panel > Control Center**, **Keys** tab, "Update" online (e.g. using flash drive)).

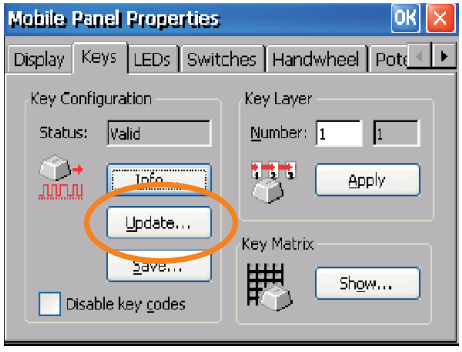


Figure 43: Key configuration update

Chapter 4 • Software

1. Windows CE

Figure 44: Windows CE logo

Model number	Short description	Note
5SWWCE.0524-ENG	**WinCE5.0 Pro MP40 PXA270** Microsoft Windows CE 5.0 Professional, English, including license; for MP40 BIOS devices 5MP040.0381-01, 5MP040.0381-02.	
5SWWCE.0525-ENG	**WinCE5.0 Pro MP50 PXA270** Microsoft Windows CE 5.0 Professional, English, including license for MP50 BIOS devices 5MP050.0653-01, 5MP050.0653-02, 5MP050.0653-03, 5MP050.0653-04.	
5SWWCE.0624-ENG	**WinCE5.0 ProPlus MP40 PXA270** Microsoft Windows CE 5.0 Professional Plus, English, including license; for 5MP040.0381-01, 5MP040.0381-02.	
5SWWCE.0625-ENG	**WinCE5.0 ProPlus MP50 PXA270** Microsoft Windows CE 5.0 Professional, English, including license for MP50 BIOS devices 5MP050.0653-01, 5MP050.0653-02, 5MP050.0653-03, 5MP050.0653-04.	
5SWWCE.0724-ENG	**WinCE5.0 ProProTCAR MP40 PXA270** Microsoft Windows CE 5.0 Professional Plus, English, including license,VNC Viewer; for MP40 BIOS devices 5MP040.0381-01, 5MP040.0381-02.	
5SWWCE.0725-ENG	**WinCE5.0 ProPlusTCAR MP50 PXA270** Microsoft Windows CE 5.0 Professional Plus, English, including license, VNC Viewer; for MP50 BIOS devices 5MP050.0653-01, 5MP050.0653-02, 5MP050.0653-03, 5MP050.0653-04.	

Table 23: Model numbers - Windows CE

1.1 General information

Windows CE is an operating system which is optimally tailored to B&R's devices. It includes only the functions and modules which are required by each device. This makes this operating system extremely robust and stable.

1.1.1 Advantages

- Internet Explorer 6.0 for Windows® CE - standard components
- Fonts for attractive text display
- TCP/IP for network and Internet communication
- Remote Desktop Protocol (RDP) for thin clients
- ActiveSync for synchronization with the PC
- Windows® Media Player application
- Compact Framework V1.0 Service Pack 2
- Network utilities
- VBScript 6.0
- JScript 6.0
- Viewers for Excel, Word, images, PDFs, PowerPoint (only in Windows CE ProPlus)
- VNC Viewer (only in Windows CE Pro TCAR - Thin Client Automation Runtime)
- Windows CE is also less expensive than other Windows licenses

1.2 Differences - CE versions (Pro - ProPlus - ProPlusTCAR)

Features	Pro 5SWWCE.0524-ENG 5SWWCE.0525-ENG	ProPlus 5SWWCE.0624-ENG 5SWWCE.0625-ENG	ProPlusTCAR 5SWWCE.0724-ENG 5SWWCE.0725-ENG
Windows CE Version	5.0	5.0	5.0
Screen resolution	QVGA, VGA	QVGA, VGA	QVGA, VGA
Color depth[1)]	16-bit / 65536 colors	16-bit / 65536 colors	16-bit / 65536 colors
Boot time	Approx. 25 seconds	Approx. 25 seconds	Approx. 15 seconds
Screen rotation	The desktop can be turned in 90° intervals	The desktop can be turned in 90° intervals	The desktop can be turned in 90° intervals
Web browser	Internet Explorer 6.0 for Windows CE	Internet Explorer 6.0 for Windows CE	-
.NET	Compact Framework 2.0 SP2	Compact Framework 2.0 SP2	-
Customer-specific key configuration	Yes	Yes	Yes
PVI	-	-	-
ADI - Control center	Yes	Yes	Yes

Table 24: Differences - CE versions (Pro - ProPlus - ProPlusTCAR)

Features	Pro 5SWWCE.0524-ENG 5SWWCE.0525-ENG	ProPlus 5SWWCE.0624-ENG 5SWWCE.0625-ENG	ProPlusTCAR 5SWWCE.0724-ENG 5SWWCE.0725-ENG
B&R VNC Viewer	Yes	Yes	Yes
PDF, Excel, Word, Power-Point and Image Viewer	-	Yes	Yes

Table 24: Differences - CE versions (Pro - ProPlus - ProPlusTCAR) (cont.)

1) The color depth depends on the display being used.

1.3 Installation / Update / Save

In general, Windows CE is preinstalled at B&R on the internal flash memory (128 MB).

An update or save of the Windows CE version can take place easily via the B&R Control Center (see page 99).

Access via **Start > Settings > Control Panel > Control Center** select "Update" tab.

Figure 45: Control Center - Update / Save

1.4 Configuring Windows CE ProPlus Thin Client Automation Runtime (TCAR)

1) Make sure that you are using a B&R Automation Runtime device with a Visual Components project installed on it. This visual components project must contain a **VNC server component from the MP40/50 family** because only then can the image content on the B&R Windows CE Thin Client device be transferred. If you want to use a hand wheel or keys on your thin client, the VNC server in the Visual Components project must support the B&R library "**AS_RfbExt**".

2) Connect the B&R Windows CE thin client device with the B&R Automation Runtime device via Ethernet.

3) Start the B&R Windows CE device and hold the **hotkey** down while it boots. When delivered, the hotkey is the red **Stop** button on an MP 40/50. Note:The hotkey can be changed with the Thin Client applet in the Control Panel.

4) If the hotkey was recognized, the system will ask for a password after booting. Enter the thin client password. The password is always **1234** when delivered.
   Note: The thin client password can be changed with the Thin Client applet in the Control Panel.

5) Open up the **Start > Settings > Control Panel > Network and dial-up connections dialog box**. Configure the properties of your network card (DHCP, gateway, etc.). Check for correct functionality by e.g. pinging.

6) Open up the **Start > Settings > Control Panel > Configuration Manager** dialog box and configure the password and hotkey.

7) Start the program **Start > Programs > Accessories > B&R VNC Viewer**. Establish a VNC connection to your Automation Runtime device. Configure VNC viewer options according to your needs.
   Note:Depending on your settings in the Options dialog box, the options Full-screen mode and Hide menu bar will always be enabled in thin client mode.

Information:

Detailed setting options for the B&R Windows CE VNC Viewer are available in the Windows CE Help (Version 3.30 or higher). This can be downloaded for free from the service area of the B&R homepage (www.br-automation.com).

8) Open up the **Start > Settings > Control Panel > Configuration Manager** dialog box and save the registry.

9) Restart the B&R Windows CE device.

2. Automation Device Interface (ADI) driver - B&R Control Center

The ADI (Automation Device Interface) driver enables access to specific functions of MP40/50 devices. The settings of these devices can be read and changed by the B&R Control Center applet (found under **Start > Settings > Control Panel > Control Center**). Control Center is already contained in every B&R Windows CE image and must not be separately installed.

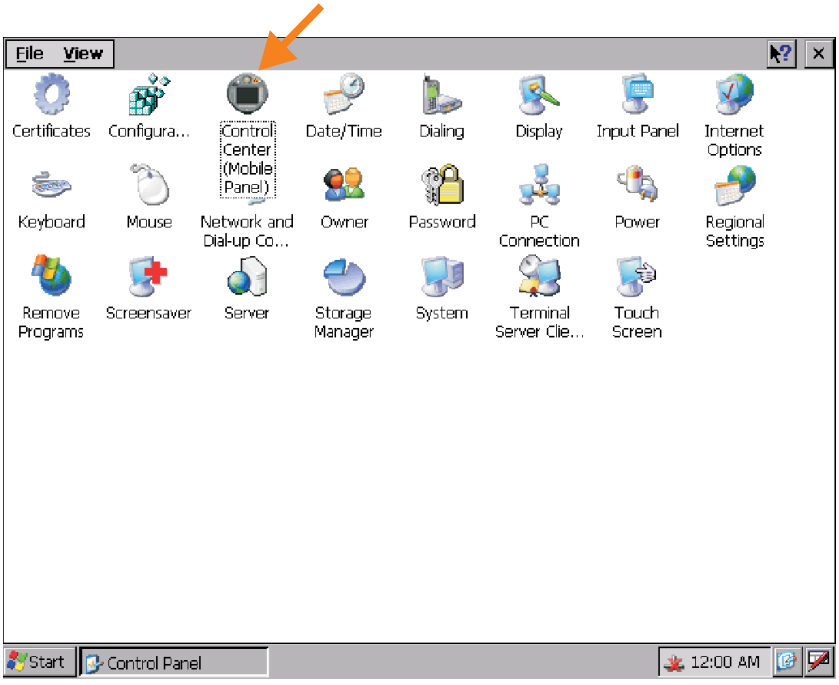


Figure 46: ADI Control Center icon in Control Panel

2.1 Control Center functions

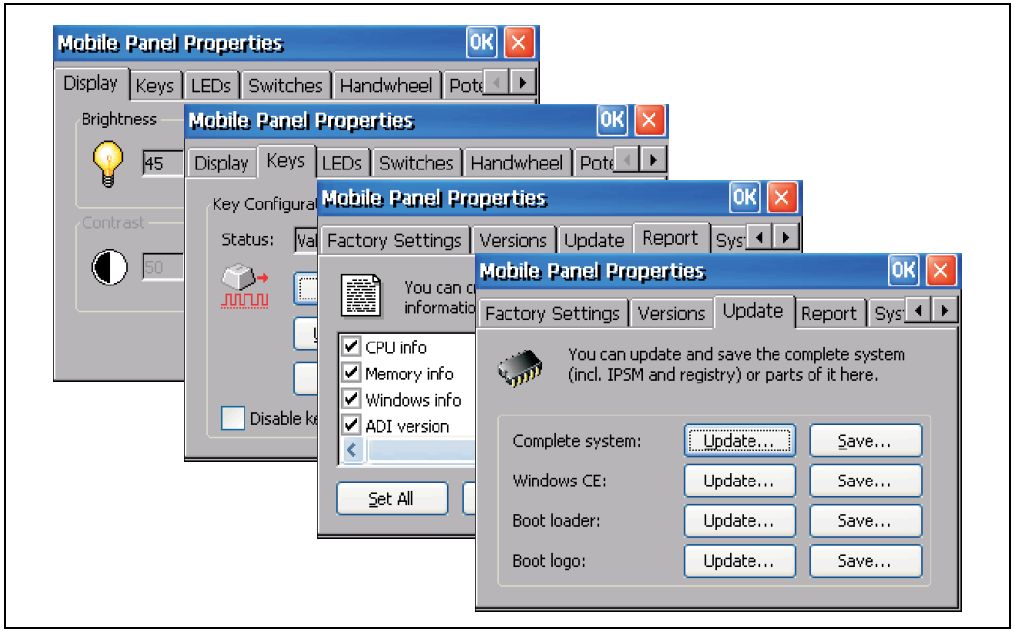


Figure 47: Control Center tabs - examples

- Change display brightness / contrast
- Read/update the key configuration (can be set up with the B&R key editor)
- LED activation
- Read or calibrating the entry devices (key switch, handwheel, joystick, potentiometer)
- Read the operating hours /power on hours)
- Read user settings and factory settings
- Read Software versions (Windows CE B&R image)
- Update or save the the software versions (systems, Windows CE, boot loader and boot logo)
- Create reports about the current system (support assistance)

3. B&R Key Editor

With the B&R Key Editor, it is possible to quickly and easily set up the application individually.

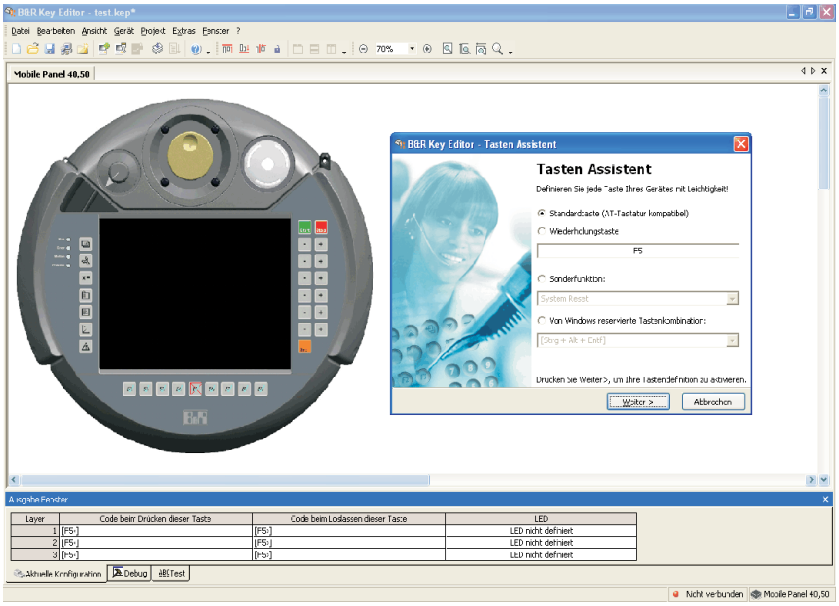


Figure 48: Screenshot of B&R Key Editor V2.60

A detailed guide for configuring keys and LEDs can be found in the B&R Key Editor's online help.

The B&R Key Editor can be downloaded for free from the download area on the B&R homepage (**www.br-automation.com**).

Chapter 5 • Standards and certifications

1. List of applicable EG regulations and standards

1.1 EG regulations

Standard	Description
98/37/EG	Machine guideline with changes to 98/79/EG
89/336/EWG	EMC guideline with changes to 91/263/EWG and 93/31/EWG

Table 25: EG regulations

1.2 Standards

The following legally non-binding European standards were used to examine the Mobile Panel's conformity to the guidelines.

1.3 Examining conformity to machine guidelines

Standard	Description
EN 418:1992	Safety of machinery - E-stop equipment, functional aspects, design principles
EN 954-1:1996	Safety of machinery - Safety-related controller components - Part 1: General design principles
EN 60204-1:1997, Ch. 9, Ch. 10	Safety of machinery - Electrical equipment on machines - Part 1: General requirements

Table 26: Examining conformity to machine guidelines

1.4 Examining conformity to EMC guidelines

Standard	Description
EN 61131-2:2003 Ch. 8, 9	Programmable logic controllers - Part 2: Equipment requirements and tests

Table 27: Examining conformity to EMC guidelines

Conformity with the following standards is also given:

Standard	Description
EN 61000-6-2:2001	EMC generic standard -- Immunity to disturbances in the industrial sector
EN 61000-6-4:2001	EMC generic standard -- Emission standard in the industrial sector

Table 28: Examining conformity to EMC guidelines

1.5 Other standards

The following legally non-binding European standards were consulted during planning of the safety concept:

1.5.1 General procedures and safety principles

Standard	Description
EN ISO 12100-1:2003	Machine safety - Basic concepts, General design guidelines - Part 1 Basic terminology, methods
EN ISO 12100-2:2003	Machine safety - Basic concepts, General design guidelines - Part 2 Technical guidelines

Table 29: General procedures and safety principles

1.5.2 Activating the enabling equipment

Standard	Description
EN 954-1:1996	Machine safety - Safety-related controller components - Part 1: General design principles
EN 60204-1:1997	Machine safety - Electrical equipment on machines - Part 1: General requirements
ISO 10218-1:2006	Manipulating industrial robots - Safety

Table 30: Activating the enabling equipment

1.5.3 Activating the stop button

Standard	Description
EN 418:1992	Machine safety - Stop equipment, functional aspects - Design principles
EN 60204-1:1997 Ch. 9, 10	Machine safety - Electrical equipment on machines - Part 1: General requirements

Table 31: Activating the stop button

1.5.4 Ergonomic design

Standard	Description
EN 614-1:1995	Machine safety - Ergonomic design basics - Part 1: Terminology and general guidelines
EN 894-1:1997	Machine safety - Ergonomic requirements for designing displays and controls - Part 1: General guidelines for user interaction with displays and controls
EN 894-2:1997	Machine safety - Ergonomic requirements for designing displays and controls - Part 2: Indicators
EN 894-3:1997	Machine safety - Ergonomic requirements for designing displays and controls - Part 3: Controls

Table 32: Ergonomic design

1.5.5 Stability and watertightness of the housing

Standard	Description
EN 60529:1991	Degree of protection provided by housing
EN 61131-2:2003 Ch. 12	Programmable logic controllers - Part 2: Requirements and tests

Table 33: Stability and watertightness of the housing

1.5.6 Electrical safety and fire prevention

Standard	Description
EN 61131-2:2003 Ch. 11	Programmable logic controllers - Part 2: Requirements and tests
EN 50178	Electronic equipment for high voltage systems

Table 34: Electrical safety and fire prevention

1.5.7 Requirements for environmental specifications

Standard	Description
EN 61131-2:2003 Ch. 4	Programmable logic controllers - Part 2: Requirements and tests
EN 50178	Electronic equipment for high voltage systems

Table 35: Requirements for environmental specifications

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

1.5.8 UL testing of industrial control equipment

Standard	Description
UL 508, 17th edition (=CSA C22.2 No.14)	Industrial control equipment (NRAQ, NRAQ7)

Table 36: UL testing of industrial control equipment

2. European Union guidelines

A fundamental goal of the European Union is the establishment of a single European market and the removal of trade barriers.

To achieve this goal, the "four freedoms" are guaranteed in the European contracts:

- Free movement of goods
- Freedom of establishment
- Free trade of services
- Free movement of capital

Free movement of goods signifies that quantitative import restrictions of goods between member states is forbidden.

Excluded from this are goods that threaten personal or environmental safety. Such products can be stopped when entering member states' territories.

In order to guarantee free movement of these products, the national safety regulations of the member states are unified following guidelines set by the European Union.

These guidelines exist for several product classes, e.g.: machinery, medical products and toys. Appropriate guidelines have also been developed for additional product safety aspects, such as electrical protection, explosion protection and electromagnetic compatibility.

The guidelines are directed at member states, who must transpose them into national laws. Therefore, the guidelines provide substance for laws.

With the "CE" label, the manufacture certifies that all of the obligations stipulated in the corresponding EU guidelines with regard to the product have been fulfilled.

The "CE" label, placed on the product by the manufacturer, is the "passport" within the EU and is present for the monitoring authorities.

Additionally, the conformity with EU guidelines can be examined by independent and accredited certification organizations and certified with an EG prototype certification.

In addition to the EMC guideline (EMC RL 89/336/EWG), the machine guideline (MRL 98/37/EG) should be applied for the hand terminal.

3. International certifications

B&R products and services comply with applicable standards. They 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 give special consideration to the reliability of our products in an industrial environment.

Certifications	
USA and Canada	All important B&R products are tested and listed by Underwriters Laboratories and checked quarterly by a UL inspector. This mark is valid for the USA and Canada and simplifies certification of your machines and systems in these areas.
Europe	All harmonized EN standards for the applicable guidelines are met.

Table 37: International certifications

4. Standards and definitions for safety technology

Stop functions according to IEC 60204-1/11.98 (Electrical equipment for machinery, Part 1: General requirements)

The following three stop function categories exist:

Category	Description
0	Stop by immediately switching off the power to the machine drive elements (i.e. uncontrolled stop).
1	A controlled stop, the power to the machine drive elements remains on until the stop procedure is completed. The power is switched off after the stop is complete.
2	A controlled stop, the power to the machine drive elements is not switched off.

Table 38: Overview of stop function categories

The necessary stop functions must be determined based on a risk evaluation for the machine. Stop functions in category 0 and category 1 must be able to function regardless of the operating mode. A category 0 stop must have priority. Stop functions must have priority over assigned start functions. Resetting the stop function must never result in a dangerous state.

Emergency stops according to IEC 60204-1/11.98 (Electrical equipment for machinery, Part 1: General requirements)

The following requirements are valid for emergency stops in addition to the requirements for the stop functions:

- It must have priority over all other functions and operations in all operating modes.
- The power to the machine drive elements which can cause a dangerous state must be switched off as quickly as possible without creating other dangers.
- Resetting is not permitted to cause a restart.
- The stop function must not reduce the effectiveness of the safety equipment or of equipment with safety-related functions.
- The stop function must not interfere with equipment designed to free personnel from dangerous situations.

Emergency stops must be category 0 / category 1 stop functions. The stop function required must be determined based on a risk evaluation for the machine.

For emergency stop functions in stop category 0, only hard wired, electromechanical equipment can be used. Additionally, the function 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)]

When using a category 1 stop function for the emergency stop function, it must be guaranteed that the power to the machine drive elements is completely switched off. These elements must be switched off using electromechanical equipment[1)] .

Safety category according to EN 954-1/03.97 (Safety of machinery - Safety related parts of control systems, Part 1: General design principles) [2)]

The safety related parts of control systems must meet one or more of the requirements for five defined safety categories. The safety categories define the required behavior of safety related controller parts regarding their resistance to errors.

Safety category (according to EN 954-1)	Safety integrity level - SIL (according to IEC 61508-2)	Short description	System behavior
B	-	Safety related parts must be designed and built so that they can meet the expected operational requirements. (No specific safety measures are implemented.)	**Caution!** **An error can cause the safety function to fail.**
1	1	Safety related parts must be designed and built so that only reliable components and safety principles are used. (e.g. prevention of short circuits by using sufficient distances, reducing the probability of errors by over-dimensioning components, defining the failure route - closed-circuit current principle, etc.)	**Caution!** **An error can cause the safety function to fail.**
2	1	Safety related parts must be designed so that their safety functions are checked in suitable intervals by the machine controller. (e.g. automatic or manual check during start-up)	**Caution!** **An error between checks can cause the safety function to fail. If the safety function fails, it will be recognized during the check.**

Table 39: Safety category overview

1) In accordance to the national foreword for the valid German version of IEC 60204-1/11.98, it is determined that electronic equipment (and especially emergency stop systems) can be used regardless of the stop category, if e.g. it provides the same safety using the standards EN 954-1 and/or IEC 61508 as required by IEC 60204-1.

2) To prevent confusing EN 951-1 categories with IEC 60204-1 stop categories, the term "safety categories" was used in the text shown above for EN 954-1 categories.

Safety category (according to EN 954-1)	Safety integrity level - SIL (according to IEC 61508-2)	Short description	System behavior
3	2	Safety related parts must be designed so that individual errors do not cause the safety function to fail. Individual errors should - if possible - be recognized the next time (or before) the safety function is required.	**Caution!** **The safety function remains active when an error occurs. Some, but not all errors are recognized. A buildup of errors can cause the safety function to fail.**
4	3	Safety related parts must be designed so that individual errors do not cause the safety function to fail. Individual errors must be recognized the next time (or before) the safety function is required. If this type of recognition is not possible, a buildup of errors is not permitted to cause the safety function to fail.	**Information:** **The safety function remains active when an error occurs. Errors are recognized in time to prevent the safety function from failing.**

Table 39: Safety category overview

These considerations lead to a safety category (B, 1, 2, 3, 4) that specifies how the safety-related parts on a machine must be implemented.

Information:

Connection examples with a suitable monitoring device in Chapter 3 "Start-up", section "Connection example for stop button" on page 86 and section "Connection example - Enable switch" on page 87 show how safety category 4 according to EN 954-1 can be achieved with the Mobile Panel and its safety-relevant parts. Take note that the entire system concept must be designed accordingly.

The safety category must be selected based on a risk evaluation. This risk evaluation is a part of the total risk evaluation for the machine.

The following risk graph (according to EN 954-1, Appendix B) provides a simplified procedure for risk evaluation:

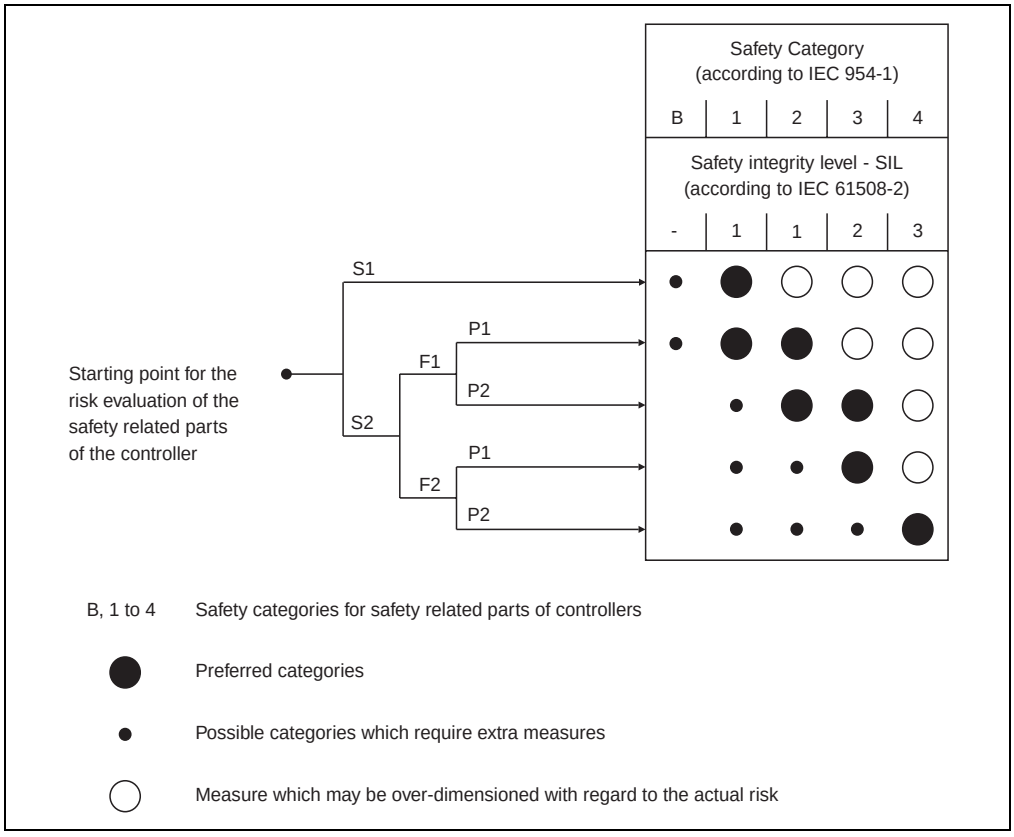


Figure 49: Risk graph according to EN 954-1, Appendix B

Begin at the starting point shown and follow the parameters S, F and P to the safety category to be used.

Parameter S ... Seriousness of injury	
S1	Light (usually reversible) injury.
S2	Serious (usually irreversible) injury.
Parameter F ... Frequency and/or duration of the danger exposure	
F1	Seldom to slightly more frequent and/or short exposure duration.
F2	Frequent to continuous and/or long exposure duration.
Parameter P ... Possibility to prevent danger	
P1	Possible under some conditions.
P2	Nearly impossible.

Table 40: Parameters S, F and P lead you to the safety category to be used

Restart inhibit according to EN 1037/04.96 (Safety of machinery - Prevention of unexpected start-up)

Keeping a machine in an idle state when people are working in the danger zone is one of the most important requirements for safe operation of machines.

Starting refers to the transition of a machine or its parts from an idle state to moving state. Any start is unexpected if it is caused by:

- A start command sent because of a controller failure or because of external influences on the controller.
- A start command sent because of incorrect operation of a start element or another part of the machine.
- Restoration of power supply after an interruption.
- External/internal influences on parts of the machine.

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

- Measures to prevent random start commands.
- Measures to prevent that random start commands cause unexpected starting.
- Measures to automatically stop dangerous parts of the machine before a dangerous situation can be caused by unexpected starting.

Chapter 6 • Accessories

1. Overview

Model number	Product ID	Note
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	Cancelled since 03/2007 Replaced by 5MMUSB.2048-00
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	Cancelled since 07/2007 Replaced by 5MMUSB.2048-00
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	Cancelled since 03/2007 Replaced by 5MMUSB.2048-00
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	
5CAMPP.0000-10	**Protective cap for circular plug (attachment cable)** Protective caps for Mobile Panel connection cable with circular connector.	
5CAMPP.0001-10	**Switching cabinet cable protective cap** Protective cap for Mobile Panel switching cabinet cable with circular connector and Mobile Panel connection box.	
4MPCBX.0000-00	**MP connection box** Connection box for adapting the connection points for Mobile Panel devices.	
5CAMPB.0100-10	**MP box cable, 10m PP** Box cable, 10 meters long; with wire tip sleeves for connection in the switching cabinet; with plug contacts for wiring in the connection box.	

Table 41: Model numbers - Accessories

2. USB flash drive

Information:

We reserve the right to supply alternative products due to the vast quantity of flash drives available on the market and their corresponding short product lifecycle.

2.1 General information

USB flash drives are easy-to-exchange storage media. Because of the fast data transfer (USB 2.0), the USB flash drives are ideal for use as a portable memory medium. Without requiring additional drivers ("Hot Plug & Play"), Windows CE converts the USB flash drive into an additional drive where data can be read or written. Only USB flash drives from the memory specialists SanDisk are used.

2.2 Order data

Model number	Description	Figure
5MMUSB.0256-00	USB flash drive 256 MB SanDisk Cruzer Mini	SanDisk Cruzer® Mini SanDisk Cruzer® Micro
5MMUSB.0512-00	USB flash drive 512 MB SanDisk Cruzer Mini up to Rev. E0 or Cruzer Micro starting with Rev. E0	
5MMUSB.1024-00	USB flash drive 1 GB SanDisk Cruzer Mini up to Rev. C0 or Cruzer Micro starting with Rev. C0	
5MMUSB.2048-00	USB flash drive 2 GB SanDisk Cruzer Micro	

Table 42: Order data - USB flash drives

2.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

Features	5MMUSB.0256-00	5MMUSB.0512-00	5MMUSB.1024-00	5MMUSB.2048-00
LED Cruzer Mini / Cruzer Micro	1 LED (green), signals data transfer (send and receive)			
Power supply Current requirements Cruzer Mini / Cruzer Micro	Via the USB port 650 µA sleep mode, 150 mA read/write			
Interface Cruzer Mini / Cruzer Micro Type Transfer rate Sequential reading Sequential writing Connection	USB specification 2.0 high speed device, mass storage class, USB-IF and WHQL certified USB 1.1 and 2.0-compatible Up to 480 Mbit (high speed) Max. 8.7 MB/second Max. 1.7 MB/second To each USB type A interface			
MTBF (at 25°C) Cruzer Mini / Cruzer Micro	100000 hours			
Data retention Cruzer Mini / Cruzer Micro	10 years			
Maintenance Cruzer Mini / Cruzer Micro	None			
Operating system support Cruzer Mini Cruzer Micro	Windows CE 4.1, CE 4.2, 98SE[1)] , ME, 2000, XP, Mac OS 9.1.x and Mac OS X 10.1.2 Windows CE 4.2, CE 5.0, ME, 2000, XP and Mac OS 9.1.x+, OS X v10.1.2+			
Mechanical characteristics				
Dimensions Height - Cruzer Mini / Cruzer Micro Width - Cruzer Mini / Cruzer Micro Depth - Cruzer Mini / Cruzer Micro	62 mm / 52.2 mm 19 mm / 19 mm 11 mm / 7.9 mm			
Environmental characteristics				
Environmental temperature Cruzer Mini / Cruzer Micro Operation Storage Transport	0°C .. +45°C -20°C .. +60°C -20°C .. +60°C			
Humidity Cruzer Mini / Cruzer Micro Operation Storage Transport	10 % .. 90 %, non-condensing 5 % .. 90 %, non-condensing 5 % .. 90 %, non-condensing			
Vibration Cruzer Mini / Cruzer Micro Operation Storage Transport	At 10 - 500 Hz: 2 g (19.6 m/s^2 0 peak), oscillation rate 1/minute At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute			
Shock Cruzer Mini / Cruzer Micro Operation Storage Transport	Max. 40 g (392 m/s^2 0-peak) and 11 ms length Max. 80 g (784 m/s^2 0-peak) and 11 ms length Max. 80 g (784 m/s^2 0-peak) and 11 ms length			
Altitude Cruzer Mini / Cruzer Micro Operation Storage Transport	3048 meters 12192 meters 12192 meters			

Table 43: Technical data - USB flash drive 5MMUSB.xxxx-00

1) For Win 98SE, a driver can be downloaded from the SanDisk homepage.

2.3.1 Temperature humidity diagram - Operation and storage

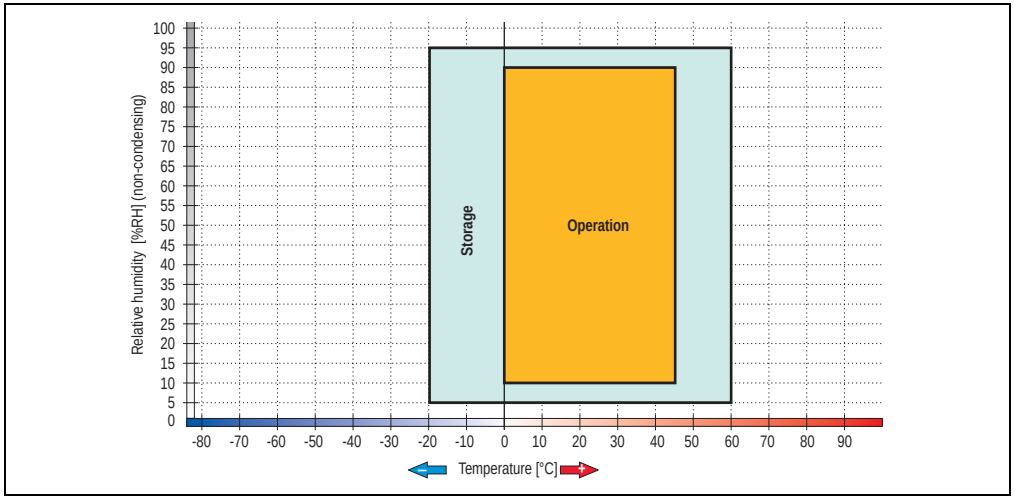


Figure 50: Temperature humidity diagram - USB flash drive - 5MMUSB.xxxx-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°°C per 1000 meters (from 500 meters above sea level).

2.4 Contents of delivery

SanDisk Cruzer Mini
1 USB flash drive in desired size + 1 strap
SanDisk Cruzer Micro
1 USB flash drive in desired size + 2 replacement covers (blue and pink) + 1 strap[1)]

Table 44: Contents of delivery - USB flash drives - 5MMUSB.xxxx-00

1) Due to a change in the contents of delivery from the manufacturer, it is possible that the USB flash drive (with white cap) is delivered without the replacement covers or strap.

3. Protective cap

The protective cap protects all Mobile Panel attachment cable plugs during transport. Each cap is secured to the cable with a strap so it cannot be lost. The protective cap ensures IP65 protection.

Model number	Description	Application
5CAMPP.0000-10	**Protective cap for circular plug (attachment cable)** Protective caps for Mobile Panel connection cable with circular connector.	"Attachment cable 5CAMPH.0xxx-30" on page 64
5CAMPP.0001-10	**Switching cabinet cable protective cap** Protective cap for Mobile Panel switching cabinet cable with circular connector and Mobile Panel connection box.	"Switching cabinet cable crossover 5ACMPC.0020-10" on page 67 "Switching cabinet cable straight thru 5ACMPC.0020-11" on page 71

Table 45: Model number - Protective cap

3.1 Attachment cable protective cap 5CAMPP.0000-10

Figure 51: Attachment cable protective cap - 5CAMPP.0000-10

3.1.1 Installation

- Feed the circular plug through the loop.

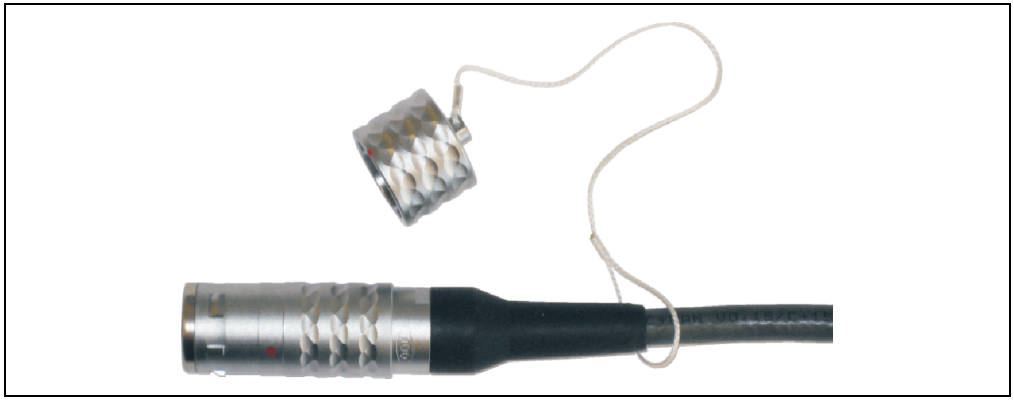


Figure 52: Attaching the protective cap - feed plug through loop

- Pull the loop tight with a pair of pliers and put the cap on the end of the circular plug (the red dot indicates how the cap must go on).

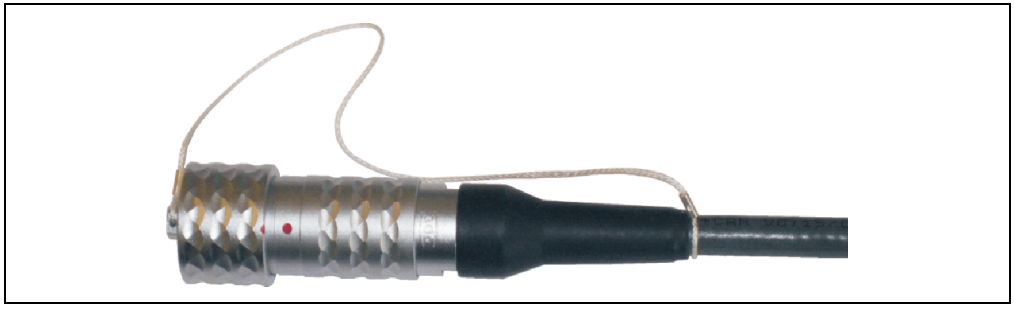


Figure 53: Attaching the protective cap - pull tight

3.2 Switching cabinet cable protective cap 5CAMPP.0001-10

Figure 54: Switching cabinet cable protective cap - 5CAMPP.0001-10

3.2.1 Mounting on the switching cabinet cable

Mount the cap near the switching cabinet cable and insert it after removing the cable.

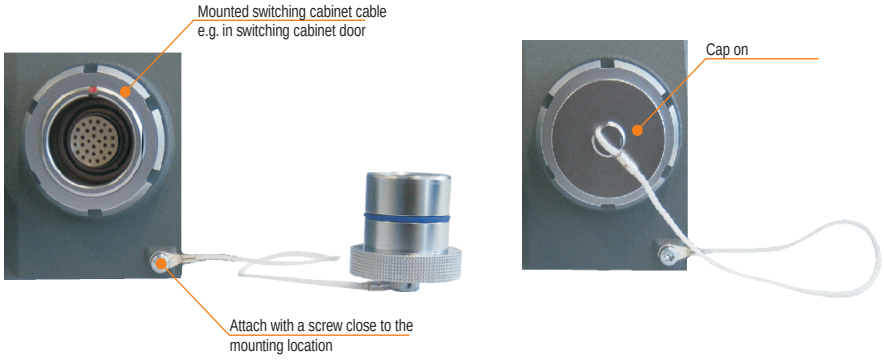


Figure 55: Attaching the switching cabinet cable protective cap

4. Connection box 4MPCBX.0000-00

Information:

For more detailed information about the connection box, see the Mobile Panel Connection Box User's Manual.

The connection box 4MPCBX.0000-00 enables a configuration where the Mobile Panel can be operated at various connection points while remaining integrated in the E-stop circuit.

The E-stop circuit remains closed, regardless of whether the Mobile Panel is connected or not. If the Mobile Panel is disconnected during operation, the E-stop circuit in the connection box is automatically closed, and no E-stop is triggered.

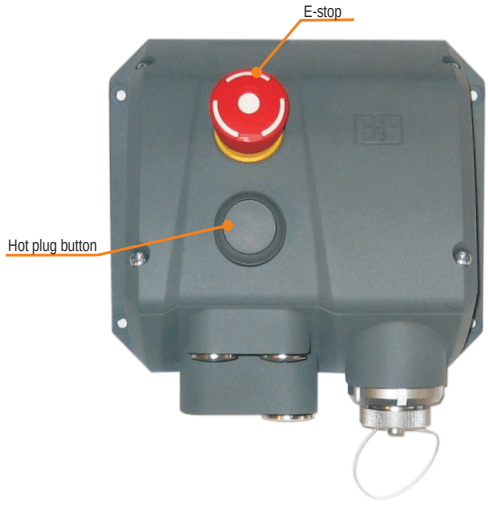


Figure 56: Connection box - 4MPCBX.0000-00

4.1 Features

- Plug and unplug during operation
- Mounting compatible
- Circular plug with push-pull locking
- Integrated E-stop
- Hot plug button
- IP65 protection
- Safety category 3 according to EN954-1

4.2 Box cable 5CAMPB.0100-10

The box cable establishes the electrical connection between the switching cabinet and the connection box. It includes lines for the network (Ethernet 10/100 Mbit/s), 24 VDC supply, entry devices / E-stop and key switch or push button, enable switch and CAN.

For info on exchanging and installing the box cable, see the Mobile Panel Connection Box User's Manual.

Chapter 7 • Maintenance / Servicing

1. Cleaning

Danger!

Mobile Panel devices may only be cleaned when switched off. This is to prevent unintended functions from being triggered when touching the touch screen or pressing the buttons or entry devices.

A moist towel should be used to clean the Mobile Panel device. When moistening the cloth, use only water with detergent, screen cleaning agent, or alcohol (ethanol). The cleaning agent should be applied to the cloth beforehand, not sprayed directly on the Mobile Panel device! Never use aggressive solvents, chemicals, or scouring agents.

Information:

Displays with touch screens should be cleaned at regular intervals.

In order to clean the touch screen during operation with Windows CE, the touch screen can be deactivated for 20 seconds. This function can be activated under **Start >Settings > Control Panel > Touch Screen Screen Cleaning** tab.

2. Preventing after-image effect in LCD/TFT monitors

After-image effect (after images, display memory effect, image retention or also image sticking) occurs in LCD/TFT monitors when a static image is displayed for a long period of time. This static screen content causes the build-up of parasitic capacities within the LCD components that prevent the liquid crystal molecules from returning to their original states. This condition may arise, is not predictable and depends on the following factors:

- Type of image displayed
- Color composition of the image
- Length of image output
- Ambient temperature

2.1 What measures can be taken against this?

The is no total solution, however, measures can be taken to significantly reduce this effect:

- Avoid static pictures or screen content
- Use screen savers (moving) when the display is not in use
- Change picture frequently
- Shut off the display when not in use

Turning off the background lighting (backlight) does not help prevent the after-image effect.

Appendix A

1. Stop button

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Property	
Power supply Rated voltage Minimum current Maximum current load	 24 V DC 10 mA (per contact) 1000 mA (per contact)
Utilization category	DC-13 (according to IEC 60947-5-1)

Table 46: Technical data - Stop button

2. Enable switch

Information:

The following characteristics, features, and limit values only apply to this individual component and can deviate from those for the entire device. For the entire device in which this individual component is used, refer to the data given specifically for the entire device.

Property	
Output type	Solid-state output
Switchable nominal voltage Switchable nominal current Maximum breaking current Circle 1 Circle 2 Maximum inductive load Circle 1 Circle 2 Reverse polarity protection Circle 1 Circle 2 Short circuit and overload protection Circle 1 Circle 2	24 V DC (voltage tolerance 19.2 V DC to 30 V DC in accordance with EN 61131-2) 500 mA (max.) 1.5 A 0.8 A 145mJ / 1.16 H @ 24 V DC, 500 mA (similar to DC13 in accordance with EN 60947-5-1) 145mJ / 1.16 H @ 24 V DC, 500 mA (similar to DC13 in accordance with EN 60947-5-1) Circle 1 yes Circle 2 yes Circle 1 yes (integrated in output-FET) Circle 2 yes (through protective circuit)
Switching cycles Switch position 2 Switch position 3	 10^5 5×10^4
Operating forces from switch position 1 to 2 from switch position 2 to 3	 Typically 5 N Typically 20 N

Table 47: Technical data - Enable switch

3. Viewing angle

The viewing angle information (R, L, U, D) can be seen in the technical data for the individual components.

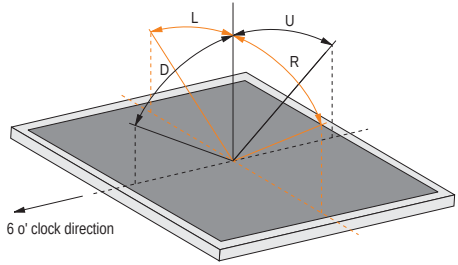


Figure 57: Viewing angle definition

4. Glossary

A

ACOPOS

Digital B&R servo motor drive

ACPI

Abbreviation for "**A**dvanced **C**onfiguration and **P**ower **I**nterface". Configuration interface that enables the operating system to control the power supply for each device connected to the PC. With ACPI, the computer's BIOS is only responsible for the details of communication with the hardware.

ADI

Abbreviation for »**A**utomation **D**evice **I**nterface«. The ADI interface allows access to specific functions (e.g. brightness control, firmware updates, static value read) of B&R devices. The settings can be read or changed in the Control Panel with the B&R Control Center Applet (already included in the B&R embedded operating system).

API

Abbreviation for "**A**pplication **P**rogram **I**nterface". The interface which allows applications to communicate with other applications or with the operating system.

Automation Runtime

A uniform runtime system for all B&R automation components.

B

Baud rate

Measurement unit for data transfer speed. It indicates the number of states for a transferred signal per second and is measured using the baud unit of measurement. 1 baud = 1 bit/sec or 1 bps.

Bit

Binary digit > binary position, binary character, smallest discrete unit of information. A bit can have the value 0 or 1.

Bit rate

The number of bits that can be transferred within a specified time unit. 1 bit/sec = 1 baud.

Bootstrap loader

A program that automatically runs when the computer is switched on or restarted. After some basic hardware tests have been carried out, the bootstrap loader starts a larger loader and hands over control to it, which in turn boots the operating system. The bootstrap loader is typically found in ROM on the computer.

Byte

Data format [1 byte = 8 bits] and a unit for characterizing information amounts and memory capacity. The following units are the commonly used units of progression: KB, MB, GB.

B&R Automation Runtime

Windows-based program for creating installation disks to install B&R Automation Runtime™ on the target system.

C

Cache

Background memory, also known as non-addressable memory or fast buffer memory. It is used to relieve the fast main memory of a computer. For example, data that should be output to slower components by the working memory (e.g. disk storage, printers) is stored temporarily in cache memory and output from there at an appropriate speed for the target devices.

CE mark

A CE mark for a product. It consists of the letters "CE" and indicates conformity to all EU guidelines for the labeled product. It indicates that the individual or corporate body who has performed or attached the label assures that the product conforms to all EU guidelines for complete harmonization. It also indicates that all mandatory conformity evaluation procedures have taken place.

CPU

An abbreviation for "**C**entral **P**rocessing **U**nit". Interprets and executes commands. It is also known as a "microprocessor" or "processor" for short. A processor is able to receive, decode and execute commands, as well as transfer information to and from other resources via the computer bus.

E

EMC

"**E**lectro**m**agnetic **C**ompatibility". The ability of a device or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment [IEV 161-01-07].

Ethernet

An IEEE 802.3 standard for networks. Ethernet uses bus or star topology and controls the traffic on communication lines using the access procedure CSMA/CD (Carrier Sense Multiple Access with Collision Detection). Network nodes are connected using coaxial cables, fiber optic cables or twisted pair cabling. Data transfer on an Ethernet network takes place in frames of variable lengths that consist of supply and controller information as well as 1500 bytes of data. The Ethernet standard provides base band transfers at 10 megabit and 100 megabit per second.

Ethernet POWERLINK

An enhancement of standard Ethernet. It enables data exchange under strict real-time conditions with cycle times down to 200 µs and jitter under 1 µs. This makes Ethernet power available on all communication levels of automation technology – from control levels to I/O. Ethernet POWERLINK was initiated by the company B&R Industrie-Elektronik and is now managed by the open end user and vendor association, EPSG - Ethernet POWERLINK Standardization Group (www.ethernet-powerlink.org).

F

Firmware

Programs stored permanently in read-only memory. Firmware is software used to operate computer-controlled devices that generally stays in the device throughout its lifespan or over a long period of time. Such software includes operating systems for CPUs and application programs for industrial PCs as well as programmable logic controllers (e.g. the software in a washing machine controller). This software is written in read-only memory (ROM, PROM, EPROM) and cannot be easily replaced.

FTP

"**F**ile **T**ransfer **P**rotocol". Rules for transferring data over a network from one computer to another computer. This protocol is based on TCP/IP, which has established itself as the standard for transferring data over Ethernet networks. FTP is one of the most used protocols on the Internet. It is defined in RFC 959 in the official regulations for Internet communication.

I

Interface

From the hardware point of view, an interface is the connection point between two modules/devices/systems. The units on both sides of the interface are connected by the interface lines so that data, addresses, and control signals can be exchanged. The term interface includes all functional, electrical and constructive conditions [encoding, signal level, pin assignments] that characterize the connection point between the modules, devices, or systems. Depending on the type of data transfer, a differentiation is made between parallel [e.g. Centronics, IEEE 488] and serial interfaces [e.g. V.24, TTY, RS232, RS422, RS485], which are set up for different transfer speeds and transfer distances. From the point of view of software, the term "interface" describes the transfer point between program modules using specified rules for transferring the program data.

ISA

An abbreviation for "**I**ndustry **S**tandard **A**rchitecture". A term given for the bus design which allows expansion of the system with plug-in cards that can be inserted in PC expansion slots.

ISO

International Organization for Standardization > Worldwide federation of national standardization institutions from over 130 countries. ISO is not an acronym for the name of the organization; it is derived from the Greek word "isos", meaning "equal" (www.iso.ch).

L

LCD

An abbreviation for "**L**iquid **C**rystal **D**isplay". A display type, based on liquid crystals that have a polarized molecular structure and are enclosed between two transparent electrodes as a thin layer. If an electrical field is applied to the electrodes, the molecules align themselves with the field and form crystalline arrangements that polarize the light passing through. A polarization filter, which is arranged using lamellar electrodes, blocks the polarized light. In this way, a cell (pixel) containing liquid crystals can be switched on using electrode gates, thus coloring this pixel black. Some LCD displays have an electroluminescent plate behind the LCD screen for lighting. Other types of LCD displays can use color.

LED

An abbreviation for "**L**ight **E**mitting **D**iode". A semiconductor diode which converts electrical energy into light. LEDs work on the principle of electroluminescence. They are highly efficient because they do not produce much heat in spite of the amount of light they emit. For example, "operational status indicators" on floppy disk drives are LEDs.

M

MB

Megabyte (1 MB = 220 or 1,048,576 bytes).

MTBF

An abbreviation for "**M**ean **t**ime **b**etween **f**ailure". The average time which passes before a hardware component fails and repair is needed. This time is usually expressed in thousands or ten thousands of hours, sometimes known as power-on hours (POH).

MTCX

Abbreviation for "**M**ain**T**enance **C**ontroller E**X**tended".

Multitasking

Multitasking is an operating mode in an operating system that allows several computer tasks to be executed virtually simultaneously.

O

OEM

Original **E**quipment **M**anufacturer. A company that integrates third-party and in-house manufactured components into their own product range and then distributes these products under its own name.

P

PnP

An abbreviation for "**P**lug and **P**lay". Specifications developed by Intel. Using Plug and Play allows a PC to automatically configure itself so that it can communicate with peripheral devices (e.g. monitors, modems, and printers). Users can connect a peripheral device (plug) and it immediately runs (play) without having to manually configure the system. A Plug and Play PC requires a BIOS that supports Plug and Play and a respective expansion card.

POH

An abbreviation for "**P**ower **O**n **H**ours". See MTBF.

POWERLINK

See "Ethernet POWERLINK".

R

RAM

An abbreviation for "**R**andom **A**ccess **M**emory". Semiconductor memory which can be read or written to by the microprocessor or other hardware components. Memory locations can be accessed in any order. The various ROM memory types do allow random access, but they cannot be written to. The term RAM refers to a more temporary memory that can be written to as well as read.

Real time

A system is operating in real-time or has real-time capability, if the input sizes (e.g. signals, data) are received and processed in a defined time period, and the results are made available in real-time for a partner system or the system environment. See also "real-time demands" and "real-time system".

S

SDRAM

An abbreviation for "**S**ynchronous **D**ynamic **R**andom **A**ccess **M**emory". A construction of dynamic semiconductor components (DRAM) that can operate with higher clock rates than conventional DRAM switching circuits. This is made possible using block access. For each access, the DRAM determines the next memory addresses to be accessed.

SRAM

An abbreviation for "**S**tatic **R**andom **A**ccess **M**emory". A semiconductor memory (RAM) made up of certain logic circuits (flip-flop) that only keeps stored information while powered. In computers, static RAM is generally only used for cache memory.

T

Task

Program unit that is assigned a specific priority by the real-time operating system. It contains a complete process and can consist of several modules.

TCP/IP

Transmission Control Protocol/Internet Suit of Protocols. Network protocol that has become the generally accepted standard for data exchange in heterogeneous networks. TCP/IP is used both in local networks for communication between various computer and also for LAN to WAN access.

TFT display

LCD (Liquid Crystal Display) technology where the display consists of a large grid of LCD cells. Each pixel is represented by a cell, whereby electrical fields produced in the cells are supported by thin film transistors (TFT) that result in an active matrix. In its simplest form, there is exactly one thin film transistor per cell. Displays with an active matrix are generally used in laptops and notebooks because they are thin, offer high-quality color displays and can be viewed from all angles.

Touch screen

Screen with touch sensors for activating an item with the finger.

U

USB

An abbreviation for "**U**niversal **S**erial **B**us". A serial bus with a bandwidth of up to 12 megabits per second (Mbit/s) for connecting a peripheral device to a microcomputer. Up to 127 devices can be connected to the system using a single multipurpose connection, the USB bus (e.g. external CD drives, printers, modems as well as the mouse and keyboard). This is done by connecting the devices in a row. USB allows devices to be changed when the power supply is switched on (hot plugging) and multi-layered data flow.

V

VGA

An abbreviation for "**V**ideo **G**raphics **A**dapter". A video adapter which can handle all EGA (Enhanced Graphics Adapter) video modes and adds several new modes.

W

Windows CE

Compact 32-bit operating system with multitasking and multithreading that Microsoft developed especially for the OEM market. It can be ported for various processor types and has a high degree of real-time capability. The development environment uses proven, well-established development tools. It is an open and scalable Windows operating system platform for many different devices. Examples of such devices are handheld PCs, digital wireless receivers, intelligent mobile phones, multimedia consoles, etc. In embedded systems, Windows CE is also an excellent choice for automation technology.

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