Mobile Panel

User's Manual

Version: **2.10 (April 2007)**

Model number: **MAMP100.200-ENG**

Chapter 7: Maintenance / Servicing

Appendix A

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Chapter 1 • General information

Information:

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 However, sometimes a newer version of the user's manual can be downloaded in electronic form (pdf) from the B&R homepage www.br-automation.com.

1. Manual history

Version	Date	Comment
1.0	16.03.2004	First edition, created with BuR HB manual template V33_09_2003
1.1	17.09.2004	Changes / new features - New image for "Automation Runtime summary screen" on page 162 and corresponding description in the table "Automation Runtime summary screen" on page 162. - New image for "Wall mount" on page 100. - Section for wall mount installation of the Mobile Panel using 4MPBRA.0000-00 added (see section "Storing the Mobile Panel device" on page 102). - Replacement touch screen pen added, see section "Touch screen pen" on page 198. - Section "Recommended monitoring devices" on page 107 updated - Note regarding unwanted safety category 4 according to EN 954-1 was added. - Section "Switching cabinet cable (straight thru) 5ACMPC.0020-11" on page 96 (5CAMPC.0020-01) added. - Chapter 5 "Standards and certifications" updated. - Safety-related texts matched to the current BGFE guidelines. - Section "Current load of the enable switch and command device circuit" on page 116 added - Section "Features" on page 30 for Mobile Panel devices updated. - Section "Entire device" on page 32 updated. - Figure "Dimensions - Entire device" on page 32 added. - "Appendix A" updated. - Section "CompactFlash cards 5CFCRD.xxxx-02" on page 199 updated. - Technical data for all operating units was expanded.

Table 1: Manual history

Version	Date	Comment
1.1	17.09.2004	- 2 GB Compact Flash card (5CFCRD.2048-02) added. - Length tolerance values for connection and switching cabinet cables added. - Connection and switching cabinet cable weight values per meter added. - USB memory sticks (5MMUSB.0128-00, 5MMUSB.0256-00, 5MMUSB.0512-00) added. - New "Connection example - Enable switch" on page 113 with new monitoring device. - Connection example for E-stop and key switch added for "Category 3 according to EN 954-1", on page 86. - Connection example for E-stop and key switch added for "Category 2 according to EN 954-1", on page 87. - Connection example for E-stop and key switch added for "Connection example for safety circuits up to category 1 according to EN 954-1", on page 85. - Connection example for E-stop and key switch added for "Category B according to EN 954-1", on page 91. - Connection example for enable switch added for "Category 3, 2, 1 and B according to EN 954-1", on page 94. - 7 meter long Mobile Panel attachment cable (5CAMPH.0070-00) added. - Application example for the Mobile Panel with Automation Runtime expanded (see section "Control and visualization with the Mobile Panel" on page 160 or section "Operation and monitoring with the Mobile Panel" on page 161). - Application example for the Mobile Panel with BIOS expanded (see section "Mobile Panel as a thin client" on page 165). - Model numbers for Windows CE added (see section 5.8 "Software" on page 27). - Shock and vibration values added to the general device data. - Section 3.4 "Serial ActiveSync connection" on page 164 (cable specifications) added. - Windows XP Embedded section added. - SanDisk White Paper added for calculating Compact Flash lifespan. - Mobile Panel labeling sticker added (see "Type plate" on page 44).
1.2	18.10.2004	Changes / new features - New notes for the device components listed in Appendix A. - Section 3.1.7 "Switches, buttons and batteries" moved to chapter 2 "Technical data". - Description for the mode/node switch settings for the Mobile Panel with BIOS updated (see table 16 "BIOS switch settings for the mode / node switch"). - Information for securing the enable switch and command device circuit added (see page 116).
1.3	22.10.2004	Changes / new features - Standard overview changed: EN418 added, PSA guidelines removed. - Existing note for the limited enable function on the controller-side that is time or program step dependent is defined as warning (see section 4.6.3 "Enable switch" on page 22).
1.4	28.10.2004	Changes / new features - Correction of E-stop button properties to pre-emption. - Text changed in "General Information" section for the type plate. - Chapter 3 Start-up / Operation updated (e.g. removal of safety circuits). - Text changed in Chapter 5 Standards and Certifications - section Standards and Definitions for Safety Technology - footnote 1.
1.5	29.10.2004	Changes / new features - Correction of the maximum current load limit for the enable switch circuit from 0.5 to 0.4 A. - Fuse type for protecting the E-stop circuit and enable switch circuit changed from 0.5 to 0.4 A. - Text changes concerning using the PNOZ e2.1p as monitoring device for the enable switch made on page 107.
1.6	01.03.2005	Changes / new features - Safety certification added (see chapter 5 "Standards and certifications", section 8.1 "Safety certification" on page 188) - Section 4 "Connection and Shielding" on page 117 added
1.7	23.03.2005	Changes / new features - Information regarding reverse polarity protection for supply voltage added.

Table 1: Manual history (cont.)

Version	Date	Comment
1.80	26.09.2006	Changes / new features - Specification for IP54 protection revised (additional information: protection from dust and sprayed water) - Length value for the 20 meter attachment cable corrected in 28 "Technical data - Mobile Panel cable 5CAMPH.0xxx-10"(previously 15 meters). - Name change for CompactFlash abbreviation. - "Key and LED configurations" on page 119 added. - "HMI Drivers & Utilities DVD 5SWHMI.0000-00" on page 170 added. - Glossary created. - Viewing angle/contrast added for each operating unit. - Accessories revised. - "Mobile Panel with BIOS" on page 123 added. - In figure "Connection and Shielding" on page 117, pin assignments changed. - Safety guidelines revised (ESD problems). - "Protective caps" on page 225 added. - New cable added. - Photos updated. - New model numbers for Windows CE and Windows XPe. - Chapter 3 renamed to "Commissioning". - 2 USB flash drive 5MMUSB.2048-00 from SanDisk added.
1.90	15.01.2007	Changes / new features - Perspective description modified. - "Perspectives" on page 251 added. - Key switch information modified. - Cable photos changed and manufacturer ID deleted. - Drilling templates changed. - "Connection and Shielding" on page 117 changed. - "Current load of the enable switch and command device circuit" on page 116 changed. - Text changes: Cover changed to cap. - Caps added. - "Connection box 4MPBCBX.0000-00" added on page 104. - "Box cable 5CAMPB.0100-10" added on page 100. - Hot plug button added on page 252. - "Exchanging the box cable" added on page 249. - "Attaching cable / cover screw" on page 239. - "Connection example - safety circuits up to category 3 according to EN 954-1" on page 122 and "Connection example - safety circuits up to category 3 according to EN 954-1" on page 124 added. - USB flash drive 5MMUSB.0256-00 and USB flash drive 5MMUSB.1024-00 cancelled.
2.00	27.03.2007	Changes / new features - Connection box 4MPCBX.0000-00 and box cable 5CAMPB.0100-10 revised and moved to chapter 6, Accessories. - Hot plug button removed from page 252. - Exchanging the box cable removed. - Attaching cable / cover screw removed. - Connection examples revised. - Description of switching cabinet cable revised. - "Strapping plug" on page 103 added.
2.10	18.04.2007	Changes / new features - "Application examples" on page 121 added. - "Features" on page 229 added. - Section "USB flash drive" on page 220 updated. - Installation of the attachment cable protective cap on page 227 and installation of the switching cabined cable cap on page 228 added. - "Application examples" on page 121 added.

Table 1: Manual history (cont.)

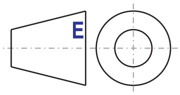
2. Organization of safety notices

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 dimension diagrams (e.g. dimension diagrams, etc.) are drawn according to European dimension standards.

4. Safety regulations

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 for storage!
- 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.

Only qualified personnel may perform tasks such as installation, commissioning, and maintenance. 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.).

4.5 Installation

- Installation must take place according to the documentation, using suitable equipment and tools.
- Devices may only 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 according to EN 954-1, the function of the E-stop circuit must be checked at least monthly.

4.6.1 Supply voltage

Caution!

- **The 24 VDC 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 and switching cabinet cable must be taken into consideration.**
- **The supply circuit must be protected using a 3 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 after 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-relevant equipment (e.g. E-stop 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 E-stop system

The E-stop safety equipment found on the Mobile Panel meets EN418 requirements and can be used together with a corresponding monitoring system for safety-relevant control tasks (up to category 4 according to EN 954-1).

Danger!

- **When unplugged, the Mobile Panel must be kept away from dangerous areas on the machine or system and must be locked up. An E-stop that is not connected must be kept out of sight, because when an emergency occurs the user will press the closest E-stop. If the disconnected E-stop is pressed nothing will happen.**
- **The E-stop must be effective in every operating mode of the machine or system.**
- **Deactivation of the E-stop must never cause an automatic restart.**
- **The E-stop is not a replacement for safety equipment.**
- **If the machine or system was brought to a standstill using the E-stop button, the E-stop button is only to be deactivated and the system being monitored is only to be restarted after the reason for stopping has been corrected and the dangerous situation no longer exists.**

Caution!

Dropping the Mobile Panel can trigger the E-stop button and cause the system being monitored to come to a standstill.

Connection examples for the E-stop button and the key switch for various categories (EN 954-1) can be found in chapter 3 "Commissioning", section "Connection examples - E-stop and key switch" on page 108.

4.6.3 Enable switch

The enabling equipment consists of the enable button as seen in figure 24 "Handle 4MPHDL.0000-00" on page 67 and is part of the Mobile Panel safety equipment.

Obtaining safety category 4 according to EN 954-1 is possible through the implementation of enabling equipment with 2-circuits and using a corresponding monitoring device.

The enabling functionality is described in EN60204. 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 EN60204 and IEC60204-1 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 "Commissioning", section 3.2 "Connection example - Enable switch" on page 113.

5. Model numbers

5.1 Operating unit

Model number	Product ID	Note
4MP181.0843-03	**MP181 TFT C VGA 8.4" FT** Operating unit with 8.4" VGA color LCD with touch screen (resistive); 19 system keys; 64 MB SDRAM; CompactFlash slot (type I); ETH10/100; RS232 (RxD, TxD); USB; E-stop; key switch; IP54 protection (only with handle 4MPHDL.0000-00).	See page 47
4MP251.0571-12	**MP251 LCD C QVGA 5.7" F** Operating unit with 5.7" QVGA color LCD; 14 softkeys and 19 system keys; 64 MB SDRAM; CompactFlash slot (type I); ETH10/100; RS232 (RxD, TxD); CAN; USB; E-stop; key switch; IP54 protection (only with handle 4MPHDL.0000-00).	See page 51
4MP281.0571-12	**MP281 LCD C QVGA 5.7" FT** Operating unit with 5.7" QVGA color LCD with touch screen (resistive); 14 softkeys and 19 system keys; 64 MB SDRAM; CompactFlash slot (type I); ETH10/100; RS232 (RxD, TxD); CAN; USB; E-stop; key switch; IP54 protection (only with handle 4MPHDL.0000-00).	See page 55
4MP281.0843-13	**MP281 TFT C VGA 8.4" FT** Operating unit with 8.4" VGA color LCD with touch screen (resistive); 19 system keys; 64 MB SDRAM; CompactFlash slot (type I); ETH10/100; RS232 (RxD, TxD); CAN; USB; E-stop; key switch; IP54 protection (only with handle 4MPHDL.0000-00).	See page 59
5MP181.0843-07	**MP181 TFT C VGA 8.4" FT** Operating unit with 8.4" VGA color LCD with touch screen (resistive); 19 system keys; 128 MB SDRAM; CompactFlash slot (type I); ETH10/100; RS232 (RxD, TxD); USB; E-stop; key switch; IP54 protection (only with handle 4MPHDL.0000-00).	See page 63

Table 3: Model numbers - Mobile Panel operating units

5.2 Handle

Model number	Product ID	Note
4MPHDL.0000-00	**Mobile Panel handle** Mobile Panel handle with integrated three-step enable switch.	See page 67

Table 4: Model number - Mobile Panel handle

5.3 Attachment cable

Model number	Product ID	Note
5CAMPH.0050-00	**Mobile Panel attachment cable, 5 m**[1)] Mobile Panel attachment cable, 5 meters long; with plug contacts for cabling the Mobile Panel and an industrial connector for the switching cabinet cable.	See page 74
5CAMPH.0070-00	**Mobile Panel attachment cable, 7 m**[1)] Mobile Panel attachment cable, 7 meters long; with plug contacts for cabling the Mobile Panel and an industrial connector for the switching cabinet cable.	See page 74
5CAMPH.0100-00	**Mobile Panel attachment cable, 10 m**[1)] Mobile Panel attachment cable, 10 meters long; with plug contacts for cabling the Mobile Panel and an industrial connector for the switching cabinet cable.	See page 74

Table 5: Model numbers - Mobile Panel attachment cables

Model number	Product ID	Note
5CAMPH.0150-00	**Mobile Panel attachment cable, 15 m 1)** Mobile Panel attachment cable, 15 meters long; with plug contacts for cabling the Mobile Panel and an industrial connector for the switching cabinet cable.	See page 74
5CAMPH.0200-00	**Mobile Panel attachment cable, 20 m 1)** Mobile Panel attachment cable, 20 meters long; with plug contacts for cabling the Mobile Panel and an industrial connector for the switching cabinet cable.	See page 74
5CAMPH.0050-10	**Mobile Panel attachment cable, 5 m 1)** Mobile Panel attachment cable, 5 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	See page 88
5CAMPH.0100-10	**Mobile Panel attachment cable, 10 m 1)** Mobile Panel attachment cable, 10 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	See page 88
5CAMPH.0150-10	**Mobile Panel attachment cable, 15 m 1)** Mobile Panel attachment cable, 15 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	See page 88
5CAMPH.0200-10	**Mobile Panel attachment cable, 20 m 1)** Mobile Panel attachment cable, 20 meters long; with plug contacts for cabling the Mobile Panel and a circular plug for the switching cabinet cable.	See page 88

Table 5: Model numbers - Mobile Panel attachment cables (cont.)

1) Proper operation of the serial interface is only guaranteed up to a total cable length of 15 meters (attachment cable + switching cabinet cable + application-specific cables).

5.4 Switching cabinet cable

Model number	Product ID	Note
5CAMPC.0020-00	**Switching cabinet cable (crossover) 2 m 1)** Switching cabinet cable, 2 meters long; with wire tip sleeves for connection in the switching cabinet and built-in socket for the Mobile Panel attachment cable.	See page 78
5CAMPC.0020-01	**Switching cabinet cable (straight thru) 2 m 1)** Switching cabinet cable, 2 meters long; with wire tip sleeves for connection in the switching cabinet and built-in socket for the Mobile Panel attachment cable.	See page 83
5CAMPC.0020-10	**Switching cabinet cable (crossover) 2 m 1)** Switching cabinet cable, 2 meters long; with wire tip sleeves for connection in the switching cabinet and receptacle for the Mobile Panel attachment cable.	See page 92
5CAMPC.0020-11	**Switching cabinet cable (straight thru) 2 m 1)** Switching cabinet cable, 2 meters long; with wire tip sleeves for connection in the switching cabinet and receptacle for the Mobile Panel attachment cable.	See page 96

Table 6: Model numbers - Mobile Panel switching cabinet cables

1) Proper operation of the serial interface is only guaranteed up to a total cable length of 15 meters (attachment cable + switching cabinet cable + application-specific cables).

5.5 Wall mount

Model number	Product ID	Note
4MPBRA.0000-00	**Wall mount with cable supports** Wall mount for storing the Mobile Panel; with supports for the Mobile Panel attachment cable.	See page 100

Table 7: Model number - Mobile Panel wall mount

5.6 Strapping plug

Model number	Product ID	Note
4MPBYP.0000-00	**Strapping plug** Used to bridge the E-stop contacts on the switching cabinet socket of the Mobile Panel switching cabinet cable.	See page 103
4MPBYP.0000-10	**Strapping plug** Used to bridge the E-stop contacts on the switching cabinet socket of the Mobile Panel switching cabinet cable.	See page 103

Table 8: Model number - Mobile Panel strapping plug

5.7 Accessories

Model number	Product ID	Note
0AC201.9	**Lithium batteries (5x)** Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell	See page 197
4A0006.00-000	**Lithium battery (1x)** Lithium battery, 1 pc., 3 V / 950 mAh, button cell	See page 197
5AC900.1100-00	**Touch screen pen (5x)** Five replacement touch screen pens	See page 198
5CFCRD.0032-02	**CompactFlash 32 MB SanDisk/A** CompactFlash card with 32 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0064-02	**CompactFlash 64 MB SanDisk/A** CompactFlash card with 64 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0128-02	**CompactFlash 128 MB SanDisk/A** CompactFlash card with 128 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0256-02	**CompactFlash 256 MB SanDisk/A** CompactFlash card with 256 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0512-02	**CompactFlash 512 MB SanDisk/A** CompactFlash card with 512 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.1024-02	**CompactFlash 1024 MB SanDisk/A** CompactFlash card with 1024 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.2048-02	**CompactFlash 2048 MB SanDisk/A** CompactFlash card with 2048 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0064-03	**CompactFlash 64 MB SSI** CompactFlash card with 64 MB SLC NAND flash and IDE/ATA interface	*Replacement for 5CRCRD.0064-02* See page 208

Table 9: Model numbers - Accessories

Model number	Product ID	Note
5CFCRD.0128-03	**CompactFlash 128 MB SSI** CompactFlash card with 128 MB SLC NAND flash and IDE/ATA interface	*Replacement for 5CRCRD.0128-02* See page 208
5CFCRD.0256-03	**CompactFlash 256 MB SSI** CompactFlash card with 256 MB SLC NAND flash and IDE/ATA interface	*Replacement for 5CRCRD.0256-02* See page 208
5CFCRD.0512-03	**CompactFlash 512 MB SSI** CompactFlash card with 512 MB SLC NAND flash and IDE/ATA interface	*Replacement for 5CRCRD.0512-02* See page 208
5CFCRD.1024-03	**CompactFlash 1024 MB SSI** CompactFlash card with 1024 MB SLC NAND flash and IDE/ATA interface	*Replacement for 5CRCRD.1024-02* See page 208
5CFCRD.2048-03	**CompactFlash 2048 MB SSI** CompactFlash card with 2048 MB SLC NAND flash and IDE/ATA interface	*Replacement for 5CRCRD.2048-02* See page 208
5CFCRD.4096-03	**CompactFlash 4096 MB SSI** CompactFlash card with 4096 MB SLC NAND flash and IDE/ATA interface	See page 208
5CFCRD.8192-03	**CompactFlash 8192 MB SSI** CompactFlash card with 8192 MB SLC NAND flash and IDE/ATA interface	See page 208
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	*Canceled since 03/2007 - Replaced by 5MMUSB.0512-00*
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	See page 220
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	*Canceled since 03/2007 - Replaced by 5MMUSB.2048-00*
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	See page 220
5CAMPP.0000-00	**Protective cap for add-on socket (on attachment cable)** Protection for attachment cable during transport	See page 225
5CAMPP.0000-10	**Protective cap for circular plug (on attachment cable)** Protection for attachment cable during transport	See page 225
5CAMPP.0001-10	**Protective cap for receptacle (on switching cabinet cable)** Protection for switching cabinet cable during transport	See page 225
4MPCBX.0000-00	**MP connection box** Connection box for adapting the connection points for Mobile Panel devices.	See page 229
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.	See page 230

Table 9: Model numbers - Accessories

5.8 Software

Model number	Product ID	Note
5SWHMI.0000-00	**HMI Drivers & Utilities DVD** Contains drivers, utilities, software upgrades and user's manuals for B&R panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).	See page 170
9S0001.13-010	**OEM Microsoft Windows CE 4.1 German** OEM Microsoft Windows CE 4.1 German license, only supplied together with a Mobile Panel BIOS device.	
9S0001.13-020	**OEM Microsoft Winindows CE 4.1 English** OEM Microsoft Windows CE 4.1 English license, only supplied together with a Mobile Panel BIOS device.	
9S0001.17-020	**OEM Microsoft Windows CE 4.2 English** OEM Microsoft Windows CE 4.2 English license, only supplied together with a Mobile Panel BIOS device.	
9S0001.29-020	**OEM Microsoft Windows CE 5.0 English** OEM Microsoft Windows CE 5.0 English license, only supplied together with a Mobile Panel BIOS device.	
9S0001.21-020	**OEM Microsoft Windows XPe MP100/200 w/CF English** Only delivered with a Mobile Panel BIOS device!	
9S0001.26-020	**OEM Microsoft Windows XPe MP100/200 w/CF English** Only delivered with a Mobile Panel BIOS device!	

Table 10: Model numbers - Mobile Panel software

Chapter 2 • Technical data

1. Introduction

The Mobile Panel is a portable operating, display and control device that can be used anywhere machine operation and monitoring require the maximum amount of flexibility. This Mobile Panel advantage is evident in the areas of material handling, robotics, tools, special machines, and more. The machine operator is always near the machine, allowing him to have a direct influence on the current process.

Depending on the model, Mobile Panel devices can have a 5.7" QVGA color display with or without touch screen or an 8.4" VGA color display with touch screen. In addition, Mobile Panel devices have a Mylar keypad (numeric and alphanumeric keys). Integrated safety functions consist of a three-step enable switch (2-channel) and an E-stop button (2-channel). They are operated using a Mylar keypad and a touch screen (with a touch screen pen).

Figure 1: Mobile Panel

Depending on the design, Mobile Panel devices come with the operating system Automation Runtime (AR) or with BIOS.

The AR devices are programmed uniformly into the entire B&R automation system using B&R Automation Studio (Visual Components).

1.1 Features

- 266 MHz processor, MMX compatible
- 5.7" QVGA or 8.4" VGA display 1)
- CompactFlash card (Type I) 2)
- USB 1.1 connection 2)
- 24 VDC supply voltage
- Ethernet 10/100 Mbit interface
- RS232 interface (RxD, TxD), not modem-capable
- CAN interface1)
- 2 operating mode switches (2 x 16 digit)
- Touch screen (analog resistive)
- Filter glass (multiple-coated, non-reflective)1)
- Mylar keypad
- Fan-free operation
- Automation Runtime or BIOS 1)
- Real-time clock (battery-buffered)1)
- Up to 128 MB SDRAM main memory1)
- Integrated E-stop button and key switch
- Touch screen pen (only with touch screen devices)
- IP54 protection against dust and sprayed water (only with handle 4MPHDL.0000-00)
- Left and right handed operation
- Amount handle can be turned in relation to the operating unit:
  ± 45° from the middle position

1) Depending on the design of the particular Mobile Panel device.

2) Can be accessed from behind the CF/USB cover on the front of the Mobile Panel's operator panel.

1.2 Construction

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

- Operating unit
- Handle
- Attachment cable
- Switching cabinet cable

Figure 2: Mobile Panel device construction

An optional wall mount is available for storing all the Mobile Panel device and attachment cable during stationary operation of the system (for more see section 3.4 "Wall mount" on page 100).

2. Entire device

2.1 Dimensions

The dimensions of the 5.7" and 8.4" display versions for the Mobile Panel devices are the same.

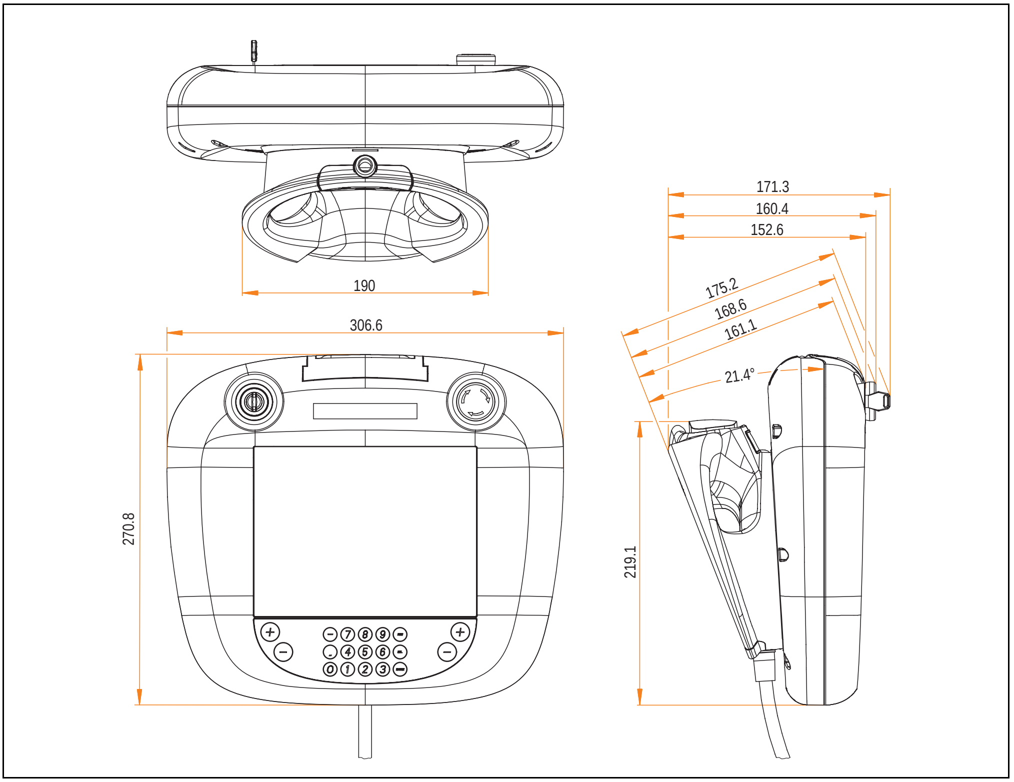


Figure 3: Dimensions - Entire device

2.2 Technical data

Features	5.7" display versions	8.4" display versions
Power supply Rated voltage Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) For short time (approx. 1 ms) 20 A Approx. 8 watts typically, 10 watts max. -	
Safety elements / entry devices E-stop button Key switch Enable switch Current load	 2 N.C., located on right side of operating unit 1 N.O., located on left side of operating unit 3-step, 2-channel, located on front of handle See section "Current load of the enable switch and command device circuit" on page 116.	
Mechanics		
Operating unit Material Paint, color	 Double-walled plastic housing (Cycoloy C2950) Soft-touch coating, similar to RAL7016	
Handle Material Paint, color	 Plastic (pure compact foam) Soft-touch coating, similar to RAL7016	
Outer dimensions in mm (WxHxD) Without handle With handle	 306.6 x 76 x 270.8 306.6 x 152.6 x 270.8	
Weight (without handle, CompactFlash card or attachment cable) (with handle and CompactFlash card, without attachment cable)	1650 grams 2210 grams	1900 grams 2460 grams
Environment[1)]		
Ambient temperature Operation Storage Transport	 0°C to 45 °C -20°C to +60 °C -20°C to +60 °C	 0°C to 45 °C -20°C to +70 °C -20°C to +70 °C
Relative humidity Operation Storage Transport	 45% to 85%, non-condensing 8% to 85%, non-condensing 8% to 85%, non-condensing	
Vibration Operation (continuous) Operation (occasional) Storage Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 200 Hz: 1 g (9.8 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak)	
Shock Operation Storage Transport	 15 g (147 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length	
Height above sea level (operation)	2000 meters	
Drop height	1 meter on industrial surfaces	
Flame resistant	UL94V-0	

Table 11: Entire device

Environment[2)]	5.7" display versions	8.4" display versions
Protection type	IP54 protection against dust and sprayed water (only with handle 4MPHDL.0000-00)	
Electromagnetic compatibility[3)]		
Requirements for emissions Network-related emissions Electromagnetic emissions	 EN 61000-6-3, EN 55011 class A, EN 55022 class A, EN 61131-2 EN 61000-6-4, EN 55011 class A, EN 55022 class A, EN 61131-2	
Requirements for immunity to disturbances Electrostatic discharge (ESD) High-frequency electromagnetic fields High-speed transient elect. disturbance values Surges Conducted disturbances Magnetic fields with electrical frequencies Voltage dips, fluctuations, and short-term interruptions Damped vibration	 EN 61000-6-2, EN 61131-2, EN 55024 EN 61000-6-2, EN 61131-2, EN 55024 EN 61000-6-2, EN 61131-2, EN 55024 EN 61000-6-2, EN 61131-2, EN 55024 EN 61000-6-2, EN 61131-2, EN 55024 EN 61000-6-2, EN 61131-2, EN 55024 EN 61000-6-2, EN 61131-2, EN 55024 EN 61131-2	

Table 11: Entire device (cont.)

1) For test requirements and limits for mechanical and climate conditions, see chapter 5 "Standards and certifications" on page 173.

2) For test requirements and limits for mechanical and climate conditions, see chapter 5 "Standards and certifications" on page 173.

3) In preparation. For test requirements and limits for electromagnetic compatibility, see chapter 5 "Standards and certifications" on 173.

3. Individual components

3.1 Operating unit

Figure 4: Mobile Panel operating unit

The operating unit contains all the electronics such as the display, the command devices and the Mylar keypad. For data storage and data exchange, a CompactFlash slot (Type I) and a USB 1.1 interface are available and accessible from the outside (behind the CF / USB cover). For operating touch screen devices, a touch screen pen is integrated on the top center of the Mobile Panel.

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 chapter 6 "Accessories", section "Cleaning" on page 231.

3.1.1 Dimensions

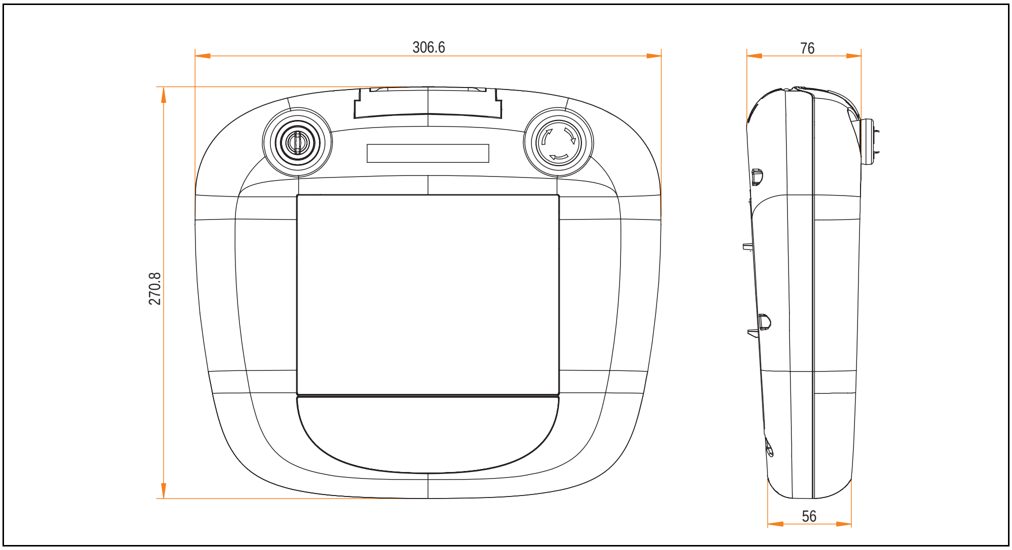


Figure 5: Dimensions - Operating unit

3.1.2 Mylar keypad

Depending on the design of the Mobile Panel operating unit, it is available with softkeys or system keys, each with or without LEDs.

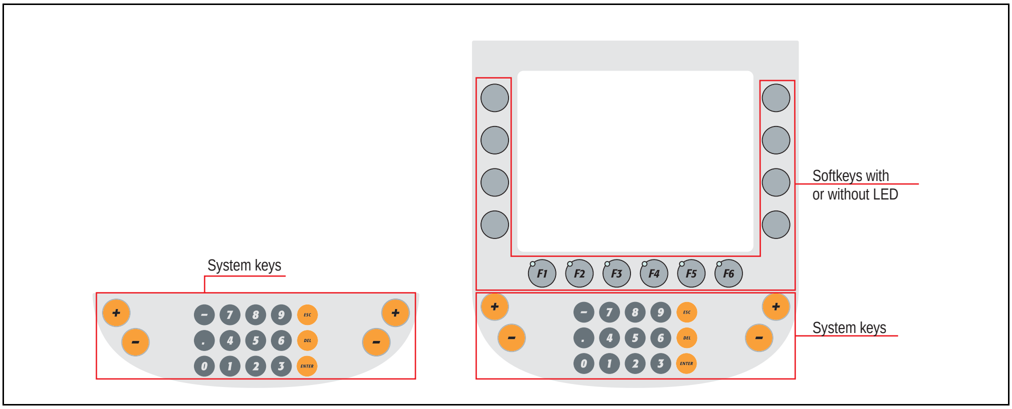


Figure 6: Example of a Mylar keypad

Softkeys

Softkeys are located along the edges of the display, and each key refers to a function shown on the display beside it (in the form of an icon, for example). The softkeys have **no legend sheets**.

System keys

Keys such as number block keys, cursor block keys, special keys for Windows functions or letter block keys are referred to as system keys.

3.1.3 Entry devices

All operating units have an E-stop button and a key switch.

E-stop button

- 2 N.C. (2-channel)
- Pre-emptive contacts
- Manipulation-proof according to EN 418
- Protection against blocking
- Removal by 1/4 turning of the tappet
- Housing protection IP65 according to IEC60529

For more detailed technical data on the E-stop button and its switching element see section "E-stop button" on page 241.

Key switch

Each restart after an emergency stop must be acknowledged by the key switch. This rules out the accidental bypassing of this acknowledgement. In addition, the key switch must be used for acknowledgement each time the Mobile Panel is started. This provides protection against unexpected restarts and protection against restarts after the power fails and is restored, for example.

- Key function, 1 N.O.
- Key can only be removed in 0 position
- IP65 housing according to IEC60529

For more detailed technical data on the key switch and its switching element see section "Key switch" on page 243.

See section "Connection examples - E-stop and key switch" on page 108 for a connection example for the E-stop button and the key switch using a recommended monitoring device.

3.1.4 Touch screen pen

The touch screen pen is held easily accessible on the top of Mobile Panel devices with a touch screen, below the CF / USB cover.

Figure 7: Touch screen pen

Technical data

Touch screen pen	
Material	Plastic (Cycoloy C2950), non-slip
Color	Similar to Pantone 151 CV
Dimensions	118 mm with 7 mm diameter

Table 12: Technical data - Touch screen pen

3.1.5 CF / USB cover

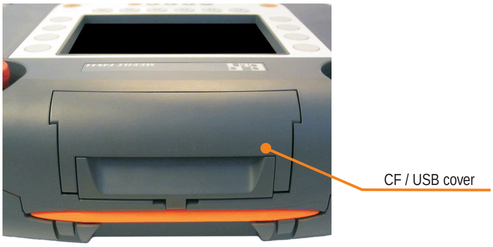


Figure 8: CF / USB cover

Behind the CF / USB cover there is a CompactFlash slot (Type I) and a type A USB 1.1 port. The cover can easily be opened without tools and also while wearing gloves.

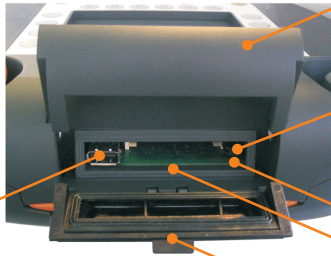


Figure 9: CompactFlash and USB slot

CompactFlash slot

The CompactFlash slot is designed for Type I CompactFlash cards and can be used as application memory and operating system memory (for a description of how to open the CF/ USB cover see section "Inserting a CompactFlash card" on page 41).

Warning!

The power must be shut off before inserting or removing the CompactFlash card.

Type A USB port

A USB flash drive, for example, can be used for data storage or for data or recipe exchange on the type A USB port slot.

Technical data - USB port	
Transfer rate	Low speed (1.5 Mbit/s) to full speed (12 Mbit/s)
Power supply	500 mA
Maximum cable length	5 m

Table 13: Technical data - USB port connection

Warning!

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

Warning!

Because of general PC specifications, this interface should be handled with extreme care with regard to EMC, location of cables, etc.

CF LED

Information:

Mobile Panel devices with Revision C0 or higher have a CF LED.

LED	Color	Function
CF	Yellow	A lit LED indicates access to a CompactFlash card.

Table 14: CF LED

Inserting a CompactFlash card

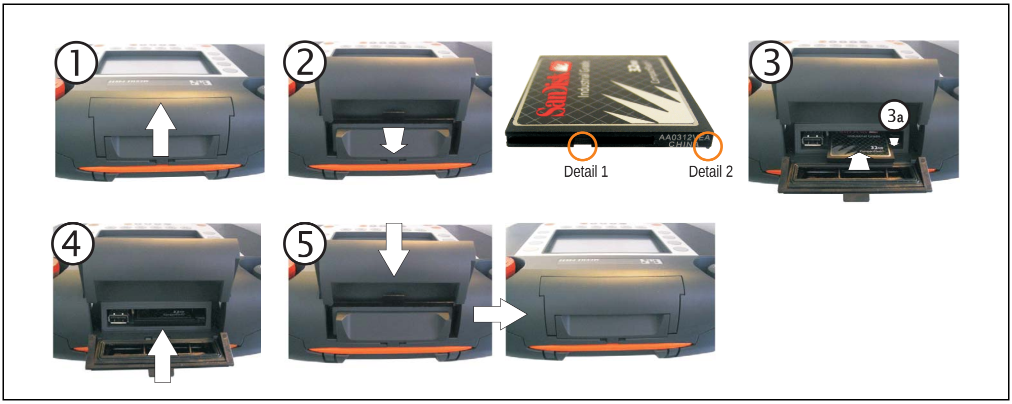


Figure 10: Inserting a CompactFlash card

1) Lift release.
2) Open cover.
3) Ensure that the CompactFlash card is inserted in the correct position in the CompactFlash slot (the ridge (Detail 1) and notch (Detail 2) must be found on the underside of the CompactFlash card and in the direction of the cover). Make sure that the CompactFlash card is pushed into the CompactFlash slot until it is flush with the opened CompactFlash ejection lever (see position 3a).
4) Close cover (as before position 2).

Warning!

Before closing the cover, make sure that the seal is in good condition and that it is sitting correctly!

5) Push release all the way down, as shown. Only then is IP54 protection guaranteed.

Removing a CompactFlash card

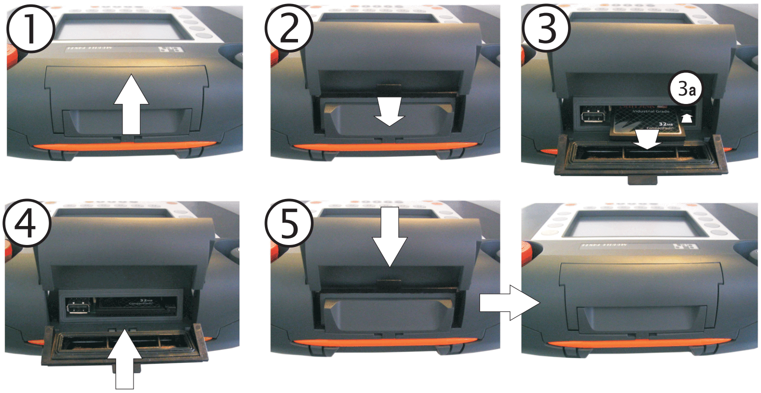


Figure 11: Removing a CompactFlash card

1) Lift release.
2) Open cover.
3) Press the CompactFlash ejection lever (position 3a) and remove the CompactFlash card.
4) Close cover (as before position 2).

Warning!

Before closing the cover, make sure that the seal is in good condition and that it is sitting correctly!

5) Push release all the way down, as shown. Only then is IP54 protection guaranteed.

3.1.6 Rear view of an operating unit

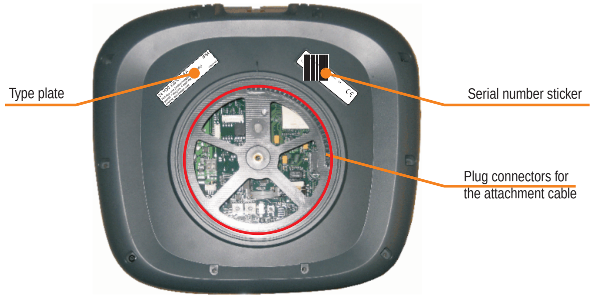


Figure 12: Rear view - Operating unit

All the required interfaces and software switches and buttons for connecting the Mobile Panel attachment cable can be found on the back (see also section "Switches, buttons and batteries" on page 45.

If the attachment cable needs to be changed, you can find the connection plan as well as instructions for changing it in section "Exchanging the attachment cable" on page 232.

Serial number sticker

General information

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

Design/Dimensions

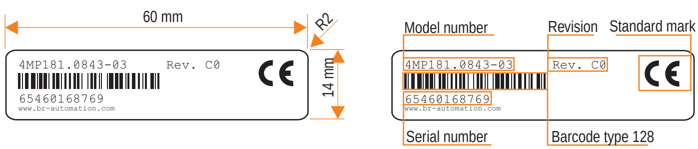


Figure 13: Design/dimensions - Serial number sticker

Type plate

General information

For the enable switch, the Mobile Panel device is additionally equipped with a type plate with the following information.

Design/Dimensions

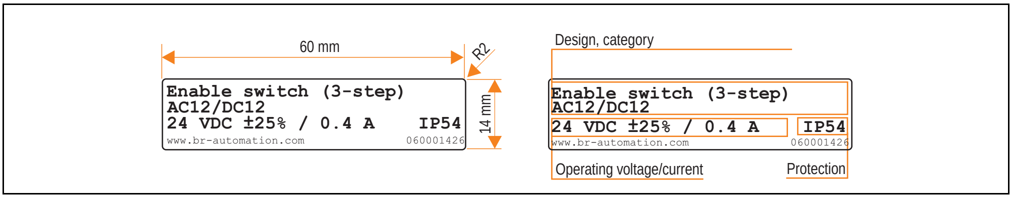


Figure 14: Design/dimensions - Type plate

The type plate is attached to the back of the Mobile Panel operating unit.

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

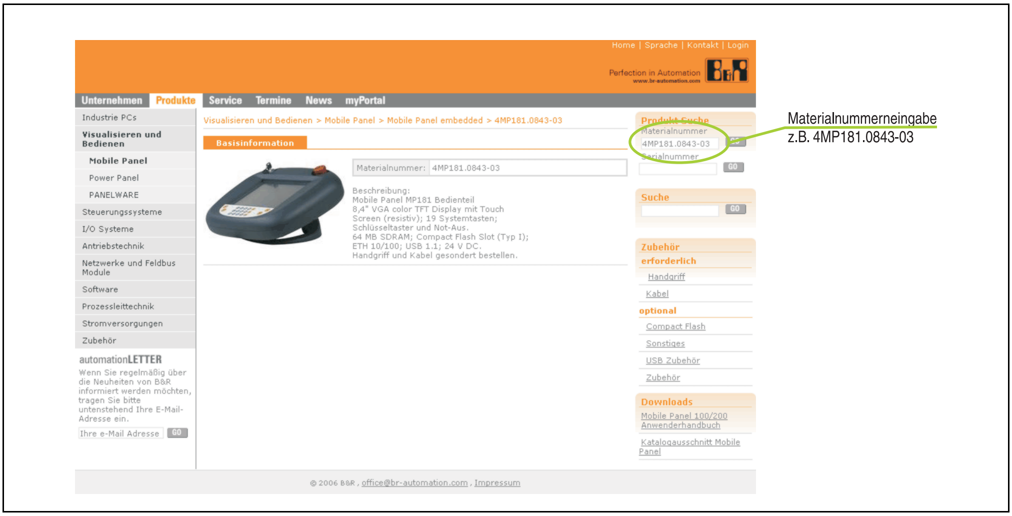


Figure 15: Example - Model number search: 4MP181.0843-03

3.1.7 Switches, buttons and batteries

The following buttons and switches are found on the back of the operating unit for setting parameters and configuring the Mobile Panel motherboard:

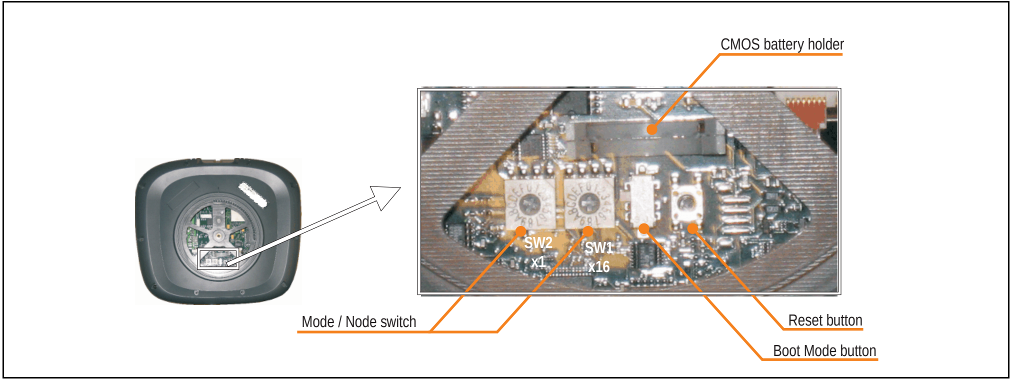


Figure 16: Back of the operating unit - Switches, buttons and batteries

Mode/node switches

Power Panel devices are equipped with 2 hex switches, which are used as operating mode switches for Automation Runtime devices. Switch positions 01 to FD are available for any purpose in an application and can be evaluated by the application program.

Switch position		Function	Description
SW1 (x16)	SW2 (x1)	Operating mode switch	
0	0	Boot	Automation Runtime boot mode for operating system (firmware) upgrade (default: Automation Runtime). In this position, a new or missing operating system can be downloaded.
0 to F	0 to F	Node	Automation Runtime run mode with node 01-FD (CompactFlash Automation Runtime or terminal operation). Freely available for use in an application, e.g. setting the INA2000 node number for the Ethernet interface.
F	E	Dyn. mode	Automation Runtime run mode with node 01-FD (CompactFlash Automation Runtime or terminal operation). Device addresses can be assigned through the software.
F	F	Diagnostics	Automation Runtime diagnostics mode (CompactFlash Automation Runtime or terminal operation).

Table 15: Automation Runtime switch settings for the mode / node switch

For Mobile Panel BIOS devices, the mode/node switches have the following meaning:

Switch position		Function	Description
SW1 (x16)	SW2 (x1)	Operating mode switch	

Table 16: BIOS switch settings for the mode / node switch

Switch position		Function	Description
0	0	Service mode	• When booting Windows CE, the touch screen calibration tool is started (regardless of whether the touch screen is already calibrated). This function is only advantageous if the touch screen can no longer be operated (incorrect calibration, calibration data lost, etc.). • The resolution for the display used is automatically configured. • Contrast and brightness settings for the display are set to default values. • Legacy USB support is always set to "enabled", regardless of the BIOS setting.
x	x	Other switch positions have no significance.	

Table 16: BIOS switch settings for the mode / node switch

CMOS battery holder

Used for inserting a lithium battery. The lithium battery buffers the internal real-time clock (RTC), SRAM data, and individually saved BIOS settings.

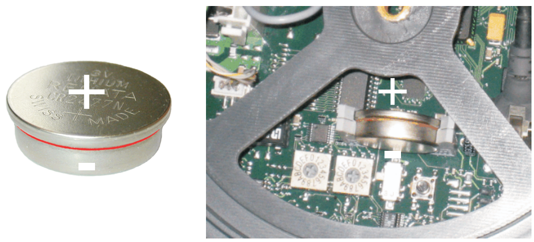


Figure 17: Inserted lithium battery

The battery status (good or bad) can be queried using software. From the point when battery capacity is recognized as insufficient, data buffering is guaranteed for approximately another 500 hours. When changing the battery, data is buffered for approximately another 10 minutes by a gold leaf capacitor. The buffer duration of the battery lasts at least 2 years (at 50 °C).

For more on changing the lithium battery, see chapter 7 "Maintenance / Servicing", section "Changing the battery" on page 238.

Boot mode switch

> **Warning!**
>
> **This switch is reserved. The switch position must not be changed.**

Reset button

This button is used for resetting the Mobile Panel device.

3.1.8 Technical data

Operating unit 4MP181.0843-03

Figure 18: Front view - 4MP181.0843-03

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	4MP181.0843-03
Boot loader / Operating system	Automation Runtime
Processor Type MMX compatible L1 cache L2 cache Floating point unit (FPU) Cooling	 Geode SC2200 266 MHz, 32-bit x86 Yes 16 KB - Yes No cooler
Flash	2 MB, onboard, for firmware
Memory Type Size Socket	 DRAM 64 MB SO-DIMM 144-pin
Graphics Controller Memory	 Geode SC2200 4 MB shared memory (reserved by main memory)

Table 17: Technical data - 4MP181.0843-03

Features	4MP181.0843-03
SRAM Size Battery-buffered	-
Watchdog Controller	-
Power failure logic Controller Buffer time	-
Real-time clock 1) Battery-buffered Accuracy	 Not battery buffered ±20 ppm
Battery Type Removable Lifespan Backup capacitor Buffer time	- -
Ethernet Controller Transfer rate Connection Cable	 MacPhyter DP83816 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
CAN bus Controller Transfer rate Connection	-
CompactFlash Type Amount Connection	Accessible behind the CF / USB cover Type I 1 Primary IDE
Serial interface Type UART Transfer rate Connection	 RS232 (RxD and TxD), not modem-capable 16550-compatible, 16-byte FIFO Max. 115 kBaud Connection using the Mobile Panel cable
USB interface Type Amount Transfer rate Connection	Accessible behind the CF / USB cover USB 1.1 2 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A
Reset button	Yes (accessible on back above handle)
Mode/node switches	2 pcs. each 16 digits (accessible on back above handle)
LED 2)	1 LED CF (yellow) - can be accessed behind the CF / USB cover
Keys Function keys Soft keys Cursor keys Number block Other keys Key lifespan	19 keys total - - - 15 without LED 4 without LED > 1000000 actions at 1 ±0.3N to 3 ±0.3 N force

Table 17: Technical data - 4MP181.0843-03 (cont.)

Features	4MP181.0843-03
Display Type Diagonal Colors Resolution Contrast Perspective (see page 251) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 8.4" 256 colors VGA, 640 x 480 pixels 250:1 Direction a / direction b = 55° Direction c = 55°/ direction d = 40° 120 cd/m² 50000 hours
Filter glass Degree of transmission Coating	-
Touch screen Technology Controller Degree of transmission	 Analog, resistive Hampshire, serial, 12-bit 78%
Power supply Rated voltage Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) for short time (approx. 1 ms) 20 A Approx. 8 watts typically, 10 watts max. -
Mechanics	
Operating unit Paint, color	Double-walled plastic housing (Cycoloy C2950) Soft-touch coating, similar to RAL7016
E-stop	Yes (2 normally closed), right position
Key switch	Yes (1 normally open), left position
Touch screen pen Color	Yes Similar to Pantone 151 CV
Outer dimensions in mm (WxHxD) Without handle	 306.6 x 76 x 270.6
Weight (without handle, CompactFlash card or attachment cable)	1900 grams
Front Design Membrane Light background Orange keys Dark gray keys Gasket	 Gray Polyester Similar to Pantone 427CV Similar to Pantone 151CV Similar to Pantone 431CV Flat gasket around display front
Environment	
Ambient temperature Operation Storage Transport	 0°C to 45 °C -20°C to +70 °C -20°C to +70 °C

Table 17: Technical data - 4MP181.0843-03 (cont.)

Environment	4MP181.0843-03
Relative humidity Operation Storage Transport	 Max. 95% at T ≤40°C, non-condensing Max. 95% at T ≤40°C, non-condensing Max. 95% at T ≤40°C, non-condensing
Vibration Operation (continuous) Operation (occasional) Storage Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 200 Hz: 1 g (9.8 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak)
Shock Operation Storage Transport	 15 g (147 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length
Protection type	IP54 protection against dust and sprayed water (only with handle 4MPHDL.0000-00)
Altitude	2000 meters
Drop height	1 meter on industrial surfaces
Flame resistant	UL94V-0

Table 17: Technical data - 4MP181.0843-03 (cont.)

1) The quartz used with the Mobile Panel has an accuracy of ±20ppm. That means the deviation is typically 5 seconds per day taking into consideration influences such as temperature and wiring of the quartz.

2) Mobile Panel devices Revision C0 or higher have a CompactFlash write/read access LED.

Operating unit 4MP251.0571-12

Figure 19: Front view - 4PP251.0571-12

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	4MP251.0571-12
Boot loader / Operating system	Automation Runtime
Processor Type MMX compatible L1 cache L2 cache Floating point unit (FPU) Cooling	 Geode SC2200 266 MHz, 32-bit x86 Yes 16 KB - Yes No cooler
Flash	2 MB, onboard, for firmware
Memory Type Size Socket	 DRAM 64 MB SO-DIMM 144-pin
Graphics Controller Memory	 Geode SC2200 4 MB shared memory (reserved by main memory)
Reset button	Yes (accessible on back above handle)

Table 18: Technical data - 4MP251.0571-12

Features	4MP251.0571-12
SRAM Size Battery-buffered	 256 KB Yes
Watchdog Controller	 SMC 1)
Power failure logic Controller Buffer time	-
Real-time clock 2) Battery-buffered Accuracy	 Yes ±20 ppm
Battery Type Removable Lifespan Backup capacitor Buffer time	 Lithium Renata 950 mAh Yes, on back above handle At least 2 years at 50° C Yes 10 minutes
Ethernet Controller Transfer rate Connection Cable	 MacPhyter DP83816 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
CAN bus Controller Transfer rate Connection	Electrically isolated SJA1000 Max. 1 Mbits/s Connection via Mobile Panel cable
CompactFlash Type Amount Connection	Accessible behind the CF / USB cover Type I 1 Primary IDE
Serial interface Type UART Transfer rate Connection	 RS232 (RxD and TxD), not modem-capable 16550-compatible, 16-byte FIFO Max. 115 kBaud Connection using the Mobile Panel cable
USB interface Type Amount Transfer rate Connection	Accessible behind the CF / USB cover USB 1.1 2 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A
Mode/node switches	2 pcs. each 16 digits (accessible on back above handle)
LED 3)	1 LED CF (yellow) - can be accessed behind the CF / USB cover
Power supply Rated voltage Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) for short time (approx. 1 ms) 20 A Approx. 8 watts typically, 10 watts max. -

Table 18: Technical data - 4MP251.0571-12 (cont.)

Features	4MP251.0571-12
Display Type Diagonal Colors Resolution Contrast Perspective (see page 251) Horizontal Vertical Background lighting Brightness Half-brightness time	 LCD 5.7" 256 colors QVGA, 320 x 240 pixels 250:1 Direction a / direction b = 55° Direction c = 55°/ direction d = 40° 150 cd/m² 50000 hours
Touch screen Technology Controller Degree of transmission	-
Filter glass Degree of transmission Coating	 > 98% Multiple double-sided
Keys/LED[4)] Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	Total of 33 keys / 4 LEDs - 8 without LED 6 with LED (yellow) 15 without LED 4 without LED > 1000000 actions at 1 ±0.3N to 3 ±0.3 N force Typ. 12 mcd (yellow)
Mechanics	
Operating unit Paint, color	Double-walled plastic housing (Cycoloy C2950) Soft-touch coating, similar to RAL7016
E-stop	Yes (2 normally closed), right position
Key switch	Yes (1 normally open), left position
Touch screen pen Color	-
Outer dimensions in mm (WxHxD) Without handle	 306.6 x 76 x 270.6
Weight (without handle, CompactFlash card or attachment cable)	1650 grams
Front Design Membrane Light background Orange keys Dark gray keys Gray keys Gasket	 Gray Polyester Similar to Pantone 427CV Similar to Pantone 151CV Similar to Pantone 431CV Similar to Pantone 429CV Flat gasket around display front

Table 18: Technical data - 4MP251.0571-12 (cont.)

Environment	4MP251.0571-12
Ambient temperature Operation Storage Transport	 0°C to 45 °C -20°C to +60 °C -20°C to +60 °C
Relative humidity Operation Storage Transport	 Max. 95% at T ≤40°C, non-condensing Max. 95% at T ≤40°C, non-condensing Max. 95% at T ≤40°C, non-condensing
Vibration Operation (continuous) Operation (occasional) Storage Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 200 Hz: 1 g (9.8 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak)
Shock Operation Storage Transport	 15 g (147 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length
Protection type	IP54 protection against dust and sprayed water (only with handle 4MPHDL.0000-00)
Altitude	2000 meters
Drop height	1 meter on industrial surfaces
Flame resistant	UL94V-0

Table 18: Technical data - 4MP251.0571-12 (cont.)

1) **S**ystem **M**anagement **C**ontroller

2) The quartz used with the Mobile Panel has an accuracy of ±20ppm. That means the deviation is typically 5 seconds per day taking into consideration influences such as temperature and wiring of the quartz.

3) Mobile Panel devices Revision C0 or higher have a CompactFlash write/read access LED.

4) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

Operating unit 4MP281.0571-12

Figure 20: Front view - 4MP281.0571-12

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	4MP281.0571-12
Boot loader / Operating system	Automation Runtime
Processor Type MMX compatible L1 cache L2 cache Floating point unit (FPU) Cooling	 Geode SC2200 266 MHz, 32-bit x86 Yes 16 KB - Yes No cooler
Flash	2 MB, onboard, for firmware
Memory Type Size Socket	 DRAM 64 MB SO-DIMM 144-pin
Graphics Controller Memory	 Geode SC2200 4 MB shared memory (reserved by main memory)
Reset button	Yes (accessible on back above handle)

Table 19: Technical data - 4MP281.0571-12

Features	4MP281.0571-12
SRAM Size Battery-buffered	 256 KB Yes
Watchdog Controller	 SMC 1)
Power failure logic Controller Buffer time	-
Real-time clock 2) Battery-buffered Accuracy	 Yes ±20 ppm
Battery Type Removable Lifespan Backup capacitor Buffer time	 Lithium Renata 950 mAh Yes, on back above handle At least 2 years at 50° C Yes 10 minutes
Ethernet Controller Transfer rate Connection Cable	 MacPhyter DP83816 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
CAN bus Controller Transfer rate Connection	Electrically isolated SJA1000 Max. 1 Mbits/s Connection via Mobile Panel cable
CompactFlash Type Amount Connection	Accessible behind the CF / USB cover Type I 1 Primary IDE
Serial interface Type UART Transfer rate Connection	 RS232 (RxD and TxD), not modem-capable 16550-compatible, 16-byte FIFO Max. 115 kBaud Connection using the Mobile Panel cable
USB interface Type Amount Transfer rate Connection	Accessible behind the CF / USB cover USB 1.1 2 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A
Mode/node switches	2 pcs. each 16 digits (accessible on back above handle)
LED 3)	1 LED CF (yellow) - can be accessed behind the CF / USB cover
Power supply Rated voltage Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) for short time (approx. 1 ms) 20 A Approx. 8 watts typically, 10 watts max. -

Table 19: Technical data - 4MP281.0571-12 (cont.)

Features	4MP281.0571-12
Display Type Diagonal Colors Resolution Contrast Perspective (see page 251) Horizontal Vertical Background lighting Brightness Half-brightness time	 LCD 5.7" 256 colors QVGA, 320 x 240 pixels 250:1 Direction a / direction b = 55° Direction c = 55°/ direction d = 40° 150 cd/m² 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive Hampshire, serial, 12-bit 78%
Filter glass Degree of transmission Coating	-
Keys/LED[4)] Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	Total of 33 keys / 4 LEDs - 8 without LED 6 with LED (yellow) 15 without LED 4 without LED > 1000000 actions at 1 ±0.3N to 3 ±0.3 N force Typ. 12 mcd (yellow)
Mechanics	
Operating unit Paint, color	Double-walled plastic housing (Cycoloy C2950) Soft-touch coating, similar to RAL7016
E-stop	Yes (2 normally closed), right position
Key switch	Yes (1 normally open), left position
Touch screen pen Color	Yes Similar to Pantone 151 CV
Outer dimensions in mm (WxHxD) Without handle	 306.6 x 76 x 270.6
Weight (without handle, CompactFlash card or attachment cable)	1650 grams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 45 °C -20°C to +60 °C -20°C to +60 °C
Relative humidity Operation Storage Transport	 Max. 85% at T ≤40 °C, non-condensing Max. 85% at T ≤40 °C, non-condensing Max. 85% at T ≤40 °C, non-condensing

Table 19: Technical data - 4MP281.0571-12 (cont.)

Environment	4MP281.0571-12
Vibration Operation (continuous) Operation (occasional) Storage Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 200 Hz: 1 g (9.8 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak)
Drop height	1 meter on industrial surfaces
Flame resistant	UL94V-0
Shock Operation Storage Transport	 15 g (147 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length
Protection type	IP54 protection against dust and sprayed water (only with handle 4MPHDL.0000-00)
Altitude	2000 meters

Table 19: Technical data - 4MP281.0571-12 (cont.)

1) **S**ystem **M**anagement **C**ontroller

2) The quartz used with the Mobile Panel has an accuracy of ±20ppm. That means the deviation is typically 5 seconds per day taking into consideration influences such as temperature and wiring of the quartz.

3) Mobile Panel devices Revision C0 or higher have a CompactFlash write/read access LED.

4) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

Operating unit 4MP281.0843-13

Figure 21: Front view - 4MP281.0843-13

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	4MP281.0843-13
Boot loader / Operating system	Automation Runtime
Processor Type MMX compatible L1 cache L2 cache Floating point unit (FPU) Cooling	 Geode SC2200 266 MHz, 32-bit x86 Yes 16 KB - Yes No cooler
Flash	2 MB, onboard, for firmware
Memory Type Size Socket	 DRAM 64 MB SO-DIMM 144-pin
Graphics Controller Memory	 Geode SC2200 4 MB shared memory (reserved by main memory)
Reset button	Yes (accessible on back above handle)

Table 20: Technical data - 4MP281.0843-13

Features	4MP281.0843-13
SRAM Size Battery-buffered	 256 KB Yes
Watchdog Controller	 SMC [1)]
Power failure logic Controller Buffer time	-
Real-time clock [2)] Battery-buffered Accuracy	 Yes ±20 ppm
Battery Type Removable Lifespan Backup capacitor Buffer time	 Lithium Renata 950 mAh Yes, on back above handle At least 2 years at 50° C Yes 10 minutes
Ethernet Controller Transfer rate Connection Cable	 MacPhyter DP83816 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
CAN bus Controller Transfer rate Connection	Electrically isolated SJA1000 Max. 1 Mbits/s Connection via Mobile Panel cable
CompactFlash Type Amount Connection	Accessible behind the CF / USB cover Type I 1 Primary IDE
Serial interface Type UART Transfer rate Connection	 RS232 (RxD and TxD), not modem-capable 16550-compatible, 16-byte FIFO Max. 115 kBaud Connection using the Mobile Panel cable
USB interface Type Amount Transfer rate Connection	Accessible behind the CF / USB cover USB 1.1 2 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A
Mode/node switches	2 pcs. each 16 digits (accessible on back above handle)
LED [3)]	1 LED CF (yellow) - can be accessed behind the CF / USB cover
Power supply Rated voltage Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) for short time (approx. 1 ms) 20 A Approx. 8 watts typically, 10 watts max. -

Table 20: Technical data - 4MP281.0843-13 (cont.)

Features	4MP281.0843-13
Display Type Diagonal Colors Resolution Contrast Perspective (see page 251) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 8.4" 256 colors VGA, 640 x 480 pixels 250:1 Direction a / direction b = 55° Direction c = 55°/ direction d = 40° 120 cd/m² 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive Hampshire, serial, 12-bit 78%
Filter glass Degree of transmission Coating	-
Keys Function keys Soft keys Cursor keys Number block Other keys Key lifespan	19 keys total - - - 15 without LED 4 without LED > 1000000 actions at 1 ±0.3N to 3 ±0.3 N force
Mechanics	
Operating unit Paint, color	Double-walled plastic housing (Cycoloy C2950) Soft-touch coating, similar to RAL7016
E-stop	Yes (2 normally closed), right position
Key switch	Yes (1 normally open), left position
Touch screen pen Color	Yes Similar to Pantone 151 CV
Outer dimensions in mm (WxHxD) Without handle	 306.6 x 76 x 270.6
Weight (without handle, CompactFlash card or attachment cable)	1900 grams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 45 °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 ≤40°C, non-condensing Max. 95% at T ≤40°C, non-condensing

Table 20: Technical data - 4MP281.0843-13 (cont.)

Environment	4MP281.0843-13
Vibration Operation (continuous) Operation (occasional) Storage Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 200 Hz: 1 g (9.8 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak)
Shock Operation Storage Transport	 15 g (147 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length
Protection type	IP54 protection against dust and sprayed water (only with handle 4MPHDL.0000-00)
Altitude	2000 meters
Drop height	1 meter on industrial surfaces
Flame resistant	UL94V-0

Table 20: Technical data - 4MP281.0843-13 (cont.)

1) **S**ystem **M**anagement **C**ontroller

2) The quartz used with the Mobile Panel has an accuracy of ±20ppm. That means the deviation is typically 5 seconds per day taking into consideration influences such as temperature and wiring of the quartz.

3) Mobile Panel devices Revision C0 or higher have a CompactFlash write/read access LED.

Operating unit 5MP181.0843-07

Figure 22: Front view - 5MP181.0843-07

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	5MP181.0843-07
Boot loader / Operating system	BIOS
Processor Type MMX compatible L1 cache L2 cache Floating point unit (FPU) Cooling	 Geode SC2200 266 MHz, 32-bit x86 Yes 16 KB - Yes No cooler
Flash	2 MB, onboard, for firmware
Memory Type Size Socket	 DRAM 128 MB SO-DIMM 144-pin
Graphics Controller Memory	 Geode SC2200 4 MB shared memory (reserved by main memory)
Reset button	Yes (accessible on back above handle)

Table 21: Technical data - 5MP181.0843-07

Features	5MP181.0843-07
SRAM Size Battery-buffered	-
Watchdog Controller	-
Power failure logic Controller Buffer time	-
Real-time clock [1] Battery-buffered Accuracy	 Yes ±20 ppm
Battery Type Removable Lifespan Backup capacitor Buffer time	 Lithium Renata 950 mAh Yes, on back above handle At least 2 years at 50° C Yes 10 minutes
Ethernet Controller Transfer rate Connection Cable	 MacPhyter DP83816 10/100 Mbit/s RJ45 twisted pair (10 BaseT / 100 BaseT) S/STP (Category 5, using Mobile Panel cable)
CAN bus Controller Transfer rate Connection	-
CompactFlash Type Amount Connection	Accessible behind the CF / USB cover Type I 1 Primary IDE
Serial interface Type UART Transfer rate Connection	 RS232 (RxD and TxD), not modem-capable 16550-compatible, 16-byte FIFO Max. 115 kBaud Connection using the Mobile Panel cable
USB interface Type Amount Transfer rate Connection	Accessible behind the CF / USB cover USB 1.1 2 1.5 Mbit/s (low speed), 12 Mbit/s (full speed) Type A
Mode/node switches	2 pcs. each 16 digits (accessible on back above handle)
LED [2]	1 LED CF (yellow) - can be accessed behind the CF / USB cover
Power supply Rated voltage Starting current Power consumption Electrical isolation	 24 VDC ± 25% (integrated reverse polarity protection) for short time (approx. 1 ms) 20 A Approx. 8 watts typically, 10 watts max. -

Table 21: Technical data - 5MP181.0843-07 (cont.)

Features	5MP181.0843-07
Display Type Diagonal Colors Resolution Contrast Perspective (see page 251) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 8.4" 262144 colors VGA, 640 x 480 pixels 250:1 Direction a / direction b = 55° Direction c = 55°/ direction d = 40° 120 cd/m² 50000 hours
Touch screen Technology Controller Degree of transmission	 Analog, resistive Hampshire, serial, 12-bit 78%
Filter glass Degree of transmission Coating	-
Keys Function keys Soft keys Cursor keys Number block Other keys Key lifespan	19 keys total - - - 15 without LED 4 without LED > 1000000 actions at 1 ±0.3N to 3 ±0.3 N force
Mechanics	
Operating unit Paint, color	Double-walled plastic housing (Cycoloy C2950) Soft-touch coating, similar to RAL7016
E-stop	Yes (2 normally closed), right position
Key switch	Yes (1 normally open), left position
Touch screen pen Color	Yes Similar to Pantone 151 CV
Outer dimensions in mm (WxHxD) Without handle	 306.6 x 76 x 270.6
Weight (without handle, CompactFlash card or attachment cable)	1900 grams
Environment	
Ambient temperature Operation Storage Transport	 0°C to 45 °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 ≤40°C, non-condensing Max. 95% at T ≤40°C, non-condensing

Table 21: Technical data - 5MP181.0843-07 (cont.)

Environment	5MP181.0843-07
Vibration Operation (continuous) Operation (occasional) Storage Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 200 Hz: 1 g (9.8 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak) 2 - 500 Hz: 4 g (39.2 m/s² 0-peak)
Shock Operation Storage Transport	 15 g (147 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length 30 g (980 m/s² 0-peak) and 11 ms length
Protection type	IP54 protection against dust and sprayed water (only with handle 4MPHDL.0000-00)
Altitude	2000 meters
Drop height	1 meter on industrial surfaces
Flame resistant	UL94V-0

Table 21: Technical data - 5MP181.0843-07 (cont.)

1) The quartz used with the Mobile Panel has an accuracy of ±20ppm. That means the deviation is typically 5 seconds per day taking into consideration influences such as temperature and wiring of the quartz.

2) Mobile Panel devices Revision C0 or higher have a CompactFlash write/read access LED.

3.2 Handle

Figure 23: Operating unit, handle and attachment cable

The handle is designed ergonomically for both left and right-handed operators. It is attached to the operating unit using the included threaded screws. The threaded screws can be tightened and loosened with a 4 mm hex key (for more on this, see section "Attaching to operating unit" on page 71).

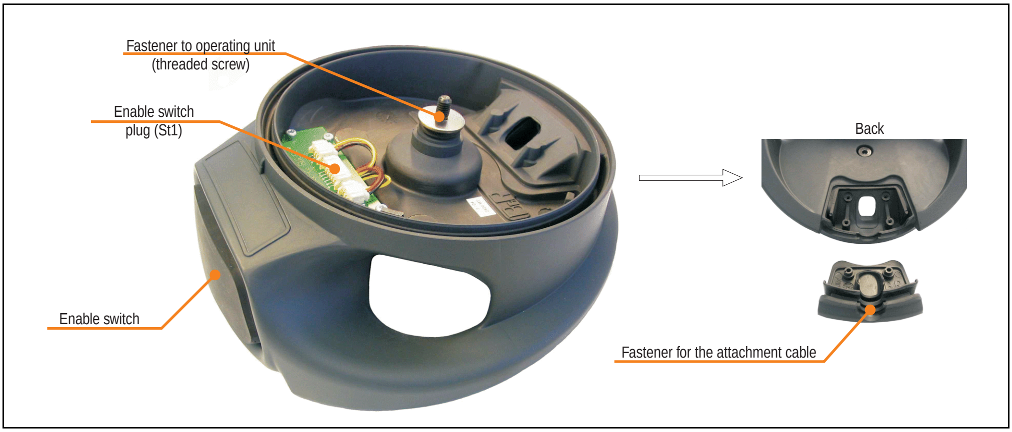


Figure 24: Handle 4MPHDL.0000-00

3.2.1 Dimensions

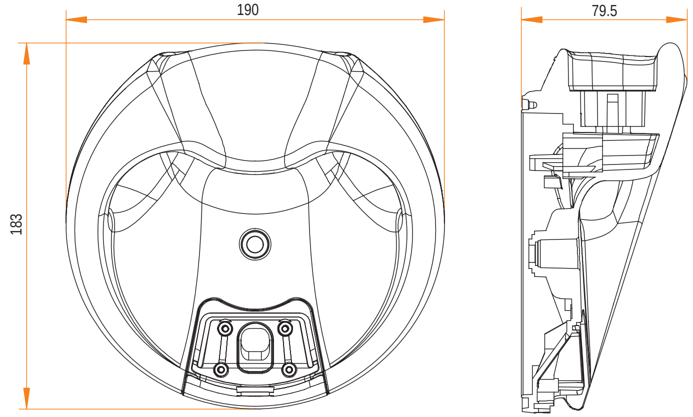


Figure 25: Dimensions - Handle

3.2.2 Technical data

Mechanics	4MPHDL.0000-00
Material Paint, color	Plastic (pure compact foam) Soft-touch coating, similar to RAL7016
Dimensions (WxHxD)	190 x 79.5 x 183
Weight	540 grams
Enable switch	3-step (null, confirm, panic position)

Table 22: Technical data - 4MPHDL.0000-00

3.2.3 Enable switch

The handle has a 3-step, 2-channel enable switch, which is located in the middle of the front side of the handle.

The enable switch is used to implement enabling equipment as a protective function for machines or systems in special operating modes. The enable switch is only one part of this setup.

- 3-step: Null, enable and panic position

For more detailed technical data on the enable switch see section "Enable switch" on page 245.

Functionality

The enable switch has 2 channels, each with 3 switch positions.

Position	Enable switch activation
Null	Not pressed
Enable	Pressed
Panic	Pushed all the way in

Table 23: Switch positions for the enable switch

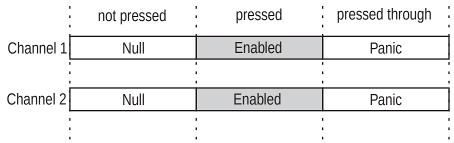


Figure 26: Possible enable switch positions

Both enable switches must always have the same position in order for the monitoring device to consider the switch position OK.

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

Null position

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

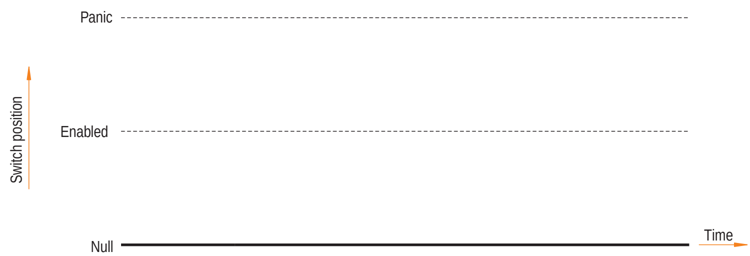


Figure 27: Enable switch - Null position

Enable position

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.

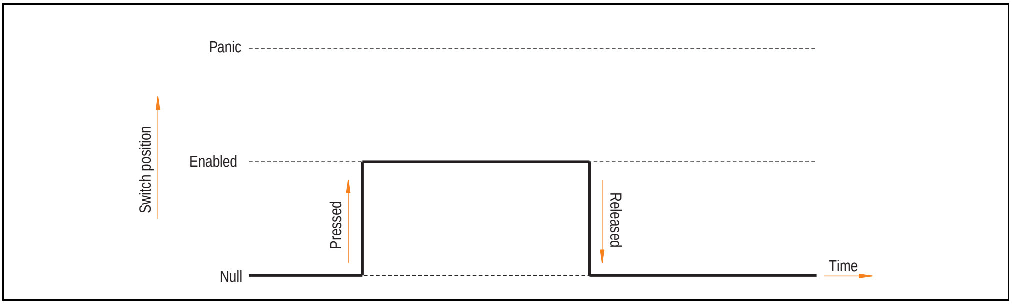


Figure 28: Enable switch - Enable position

Panic position

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 null position.

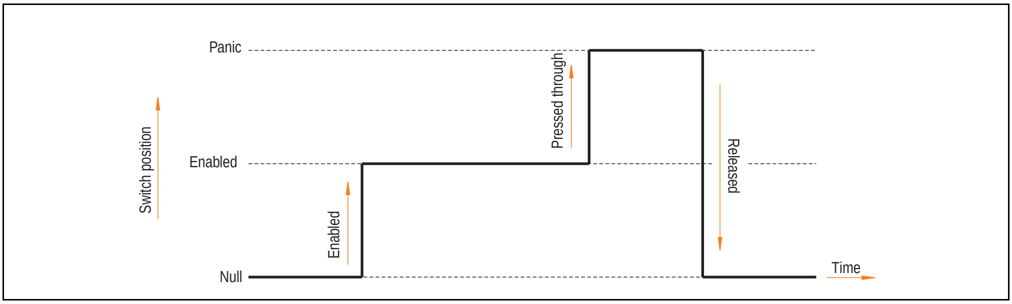


Figure 29: Enable switch - Panic position

See section "Connection example - Enable switch" on page 113 for a connection example for the enable button with a recommended monitoring device.

3.2.4 Attaching to operating unit

The threaded screws can be loosened with a hex key (4 mm). The handle and the operating unit are fastened together using the threaded screw.

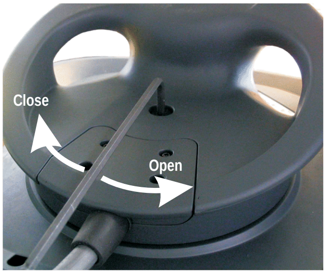


Figure 30: Fastening/removing the handle to/from the operating unit

The handle can also be turned without unfastening it.

3.2.5 Attachment cable fastener

The attachment cable is connected using a stress relief fastener and screwed tight. A size 10 Torx screwdriver is needed for this.

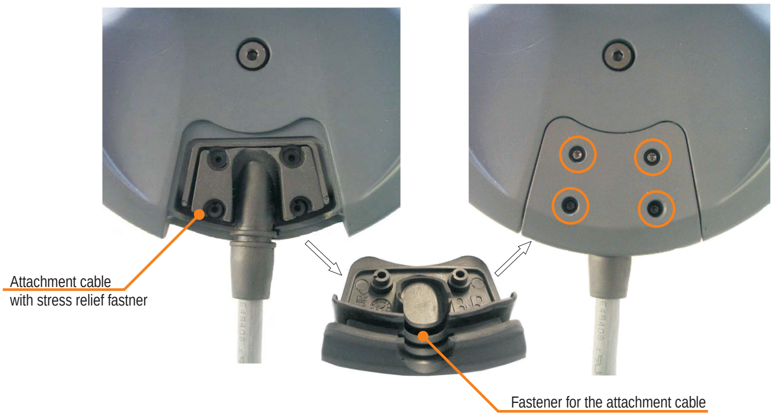


Figure 31: Attachment cable fastener

This page is only used as a place holder.

3.3 Cables

3.3.1 Overview

Model number	Short description	Note
5CAMPH.0050-00	Mobile Panel attachment cable, 5 meters long; with plug contacts for cabling the Mobile Panel, including an industrial plug for the switching cabinet cable.	
5CAMPH.0070-00	Mobile Panel attachment cable, 7 meters long; with plug contacts for cabling the Mobile Panel, including an industrial plug for the switching cabinet cable.	
5CAMPH.0100-00	Mobile Panel attachment cable, 10 meters long; with plug contacts for cabling the Mobile Panel, including an industrial plug for the switching cabinet cable.	
5CAMPH.0150-00	Mobile Panel attachment cable, 15 meters long; with plug contacts for cabling the Mobile Panel, including an industrial plug for the switching cabinet cable.	
5CAMPH.0200-00	Mobile Panel attachment cable, 20 meters long; with plug contacts for cabling the Mobile Panel, including an industrial plug for the switching cabinet cable.	
5CAMPH.0050-10	Mobile Panel attachment cable, 5 meters long; with plug contacts for cabling the Mobile Panel, including a circular plug for the switching cabinet cable.	
5CAMPH.0100-10	Mobile Panel attachment cable, 10 meters long; with plug contacts for cabling the Mobile Panel, including a circular plug for the switching cabinet cable.	
5CAMPH.0150-10	Mobile Panel attachment cable, 15 meters long; with plug contacts for cabling the Mobile Panel, including a circular plug for the switching cabinet cable.	
5CAMPH.0200-10	Mobile Panel attachment cable, 20 meters long; with plug contacts for cabling the Mobile Panel, including a circular plug for the switching cabinet cable.	
5CAMPC.0020-00	Switching cabinet cable (crossover), 2 meters long; with wire tip sleeves for connection in the switching cabinet, including built-in socket for the Mobile Panel attachment cable.	
5CAMPC.0020-01	Switching cabinet cable (straight thru), 2 meters long; with wire tip sleeves for connection in the switching cabinet, including built-in socket for the Mobile Panel attachment cable.	
5CAMPC.0020-10	Switching cabinet cable (crossover), 2 meters long; with wire tip sleeves for connection in the switching cabinet, including receptacle for the Mobile Panel attachment cable.	
5CAMPC.0020-11	Switching cabinet cable (straight thru), 2 meters long; with wire tip sleeves for connection in the switching cabinet, including receptacle for the Mobile Panel attachment cable.	

Table 24: Model number overview - Cables

3.3.2 Attachment cable 5ACMPH.0xxx-00

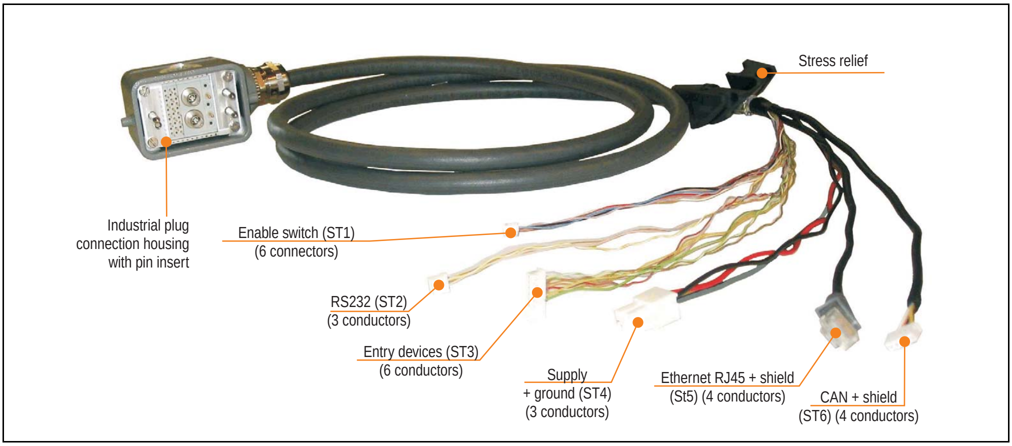


Figure 32: Attachment cable 5CAMPH.0xxx-00

The attachment cable establishes the electrical and mechanical connection between the switching cabinet and Mobile Panel. It includes lines for the network (Ethernet 10/100 Mbit/s), 24 VDC supply, entry devices, enable switch, serial data transfer and CAN.

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

On the Mobile Panel, the attachment cable is mounted into the handle. On the switching cabinet end, the attachment cable has an industrial plug. The attachment cable is available in different lengths (see table 5 "Model numbers - Mobile Panel attachment cables" on page 23). Information regarding the procedure for exchanging the attachment cable can be found in section 2 "Exchanging the attachment cable" on page 232.

Figure 33: Attachment cable and handle

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.0050-00	5CAMPH.0070-00	5CAMPH.0100-00	5CAMPH.0150-00	5CAMPH.0200-00
Length and tolerance	5 m ± 10 cm	7 m ± 10 cm	10 m ± 10 cm	15 m ± 15 cm	20 m ± 15 cm
Connector Industrial plug	 Connection housing with pin insert				
Cable Total diameter Weight per meter Sheathing material Available lengths Minimum flex radius Supply lines Permissible operating voltage Material Conductor resistance Max. tension stress Color	Hybrid cable, 33 wire 10 mm 153 grams Silicon and halogen free, flame retardant PUR outer sheathing See table 5 "Model numbers - Mobile Panel attachment cables" on page 23 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 RJ45 plug) Direct connection between the enable switch and the monitoring device (6-wire) 2 pairs with shielding (4-wire) Direct connection between the entry device and the monitoring device (6-wire) Supply voltage + 24 VDC (2-wire) 3 wires				
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				

Table 25: Technical data - Mobile Panel cable 5CAMPH.0xxx-00

Cable specifications

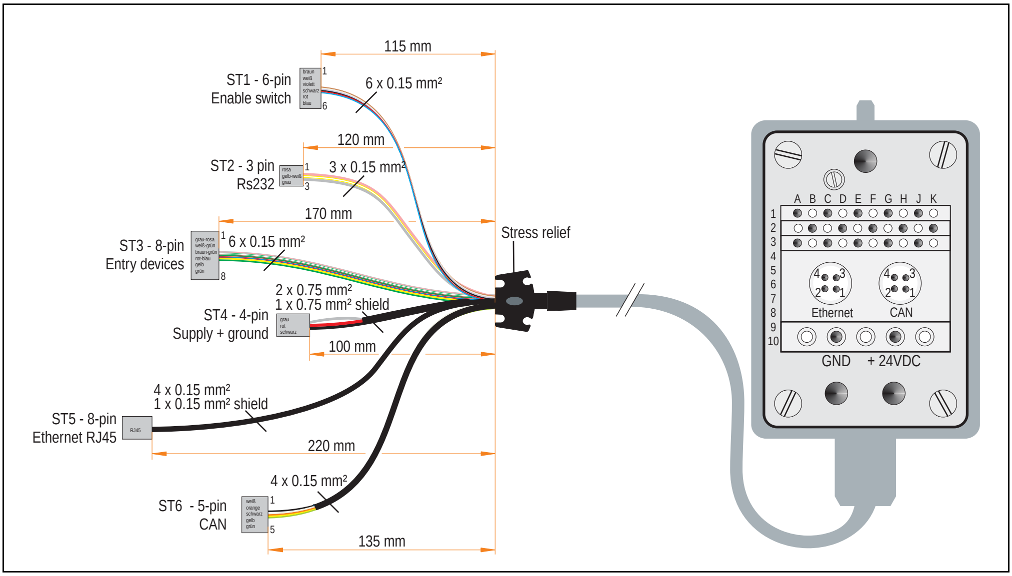


Figure 34: Cable specifications - attachment cable

ST1 enable switch, 6-pin male connector		Wire colors - Attachment cable	Assignment in connection housing
C1	Pin 1	Brown	A1
NO1	Pin 2	White	A3
NC1	Pin 3	Violet	B2
C2	Pin 4	Black	C1
NO2	Pin 5	Red	C3
NC2	Pin 6	Blue	D2
ST2 RS232, 3-pin male connector		**Wire colors - Attachment cable**	**Assignment in connection housing**
RxD	Pin 1	Pink	J1
GND	Pin 2	White-Yellow	K2
TxD	Pin 3	Gray	J3
ST3 entry device, 8-pin male connector		**Wire colors - Attachment cable**	**Assignment in connection housing**
E-stop normally closed contact 1 (11)	Pin 1	Gray-Pink	E1
E-stop normally closed contact 1 (12)	Pin 2	White-Green	E3
E-stop normally closed contact 2 (21)	Pin 3	Brown-Green	G1
E-stop normally closed contact 2 (22)	Pin 4	Red-Blue	G3
Key switch (13)	Pin 5	Yellow	F2
Key switch (14)	Pin 6	Green	H2
n.c.	Pin 7	-	-
n.c.	Pin 8	-	-

ST4 supply		**Wire colors - Attachment cable**	**Assignment in connection housing**
+ 24 VDC supply	Pin 1	Red	+ 24 VDC
Shielding	Pin 2	Gray	Plug housing (outer shield)
Ground	Pin 3	Black	GND
n.c.	Pin 4	-	-
ST5 Ethernet RJ45 connector		**Wire colors - Attachment cable**	**Assignment in connection housing**
TX	Pin 1	Green	Pin 1
$\overline{TX}$	Pin 2	Yellow	Pin 4
RX	Pin 3	Pink	Pin 2
n.c.	Pin 4	-	-
n.c.	Pin 5	-	-
$\overline{RX}$	Pin 6	Blue	Pin 3
n.c.	Pin 7	-	-
n.c.	Pin 8	-	-
Shielding	-	Shielding	Ethernet shield
ST6 CAN, 5-pin male connector		**Wire colors - Attachment cable**	**Assignment in connection housing**
CAN 1 High	Pin 1	White	Pin 1
CAN 1 Low	Pin 2	Orange	Pin 4
Shielding	Pin 3	Black	CAN shield
CAN 2 High	Pin 4	Yellow	Pin 2
CAN 2 Low	Pin 5	Green	Pin 3

3.3.3 Switching cabinet cable (crossover) 5ACMPC.0020-00

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

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

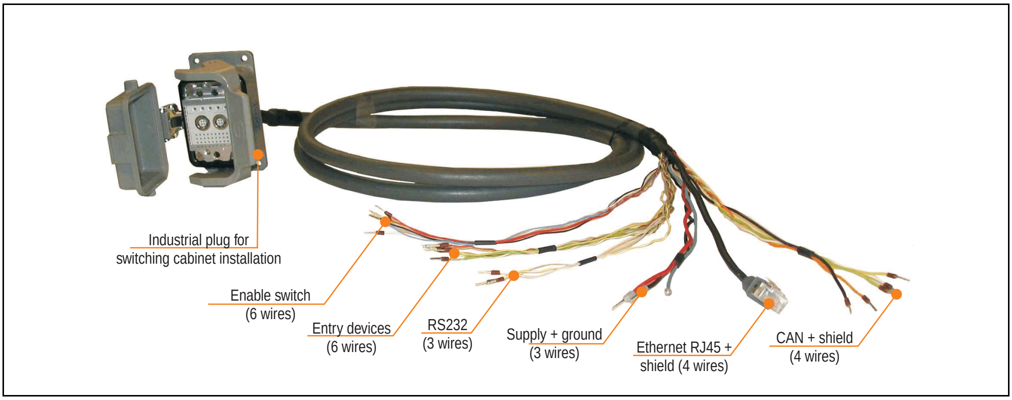


Figure 35: Mobile Panel switching cabinet cable 5CAMPC.0020-00

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

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 37 "Drilling template - Switching cabinet socket" on page 82). 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.

Information:

The seal, which is attached to the connection housing with a cable tie, must be placed between the connection housing and the switching cabinet door.

Connections and shielding in the switching cabinet

This topic is addressed in more detail in chapter 3 "Commissioning", section 4 "Connection and Shielding" on page 117.

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.0020-00
Length and tolerance	2 meters ± 5 cm
Connector Industrial socket	 Connection housing with socket insert
Cable Total diameter Weight per meter Sheathing material Available lengths 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 See table 6 "Model numbers - Mobile Panel switching cabinet cables" on page 24 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 between the enable switch and the monitoring device (6-wire) 2 pairs with shielding (5-wire) Direct connection between the entry device and the monitoring device (6-wire) Supply voltage 24 VDC and ground (3-wire) 3 wires
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 26: Technical data -Switching cabinet cable 5CAMPC.0020-00

Cable specifications

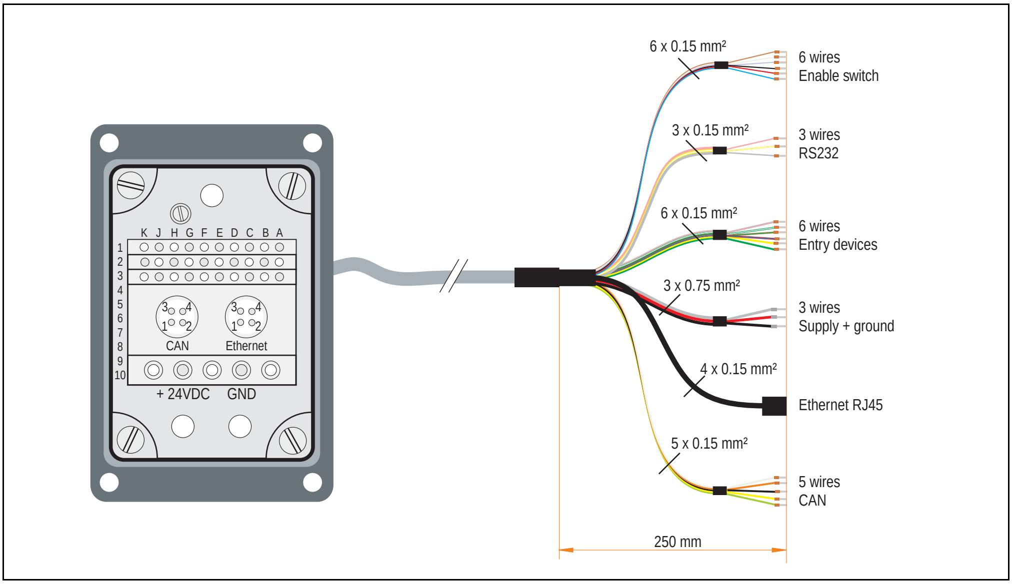


Figure 36: Cable layout - Switching cabinet cable

Assignments in connection housing	Wire color - Switching cabinet cable	Enable switch wires
A1	Brown	C1
A3	White	NO1
B2	Violet	NC1
C1	Black	C2
C3	Red	NO2
D2	Blue	NC2
Assignments in connection housing	**Wire color - Switching cabinet cable**	**RS232 wires**
J1	Pink	RxD
J3	Gray	TxD
K2	White-Yellow	GND
Assignments in connection housing	**Wire color - Switching cabinet cable**	**Entry device wires**
E1	Gray-Pink	E-stop normally closed contact 1 (11)
E3	White-Green	E-stop normally closed contact 1 (12)
G1	Brown-Green	E-stop normally closed contact 2 (21)
G3	Red-Blue	E-stop normally closed contact 2 (22)
F2	Yellow	Key switch (13)
H2	Green	Key switch (14)

Assignments in connection housing	Wire color - Switching cabinet cable	Supply wires
GND	Black	Ground
+ 24 VDC	Red	+ 24 VDC supply
Plug housing (outer shield)	Gray	Shielding
Assignments in connection housing	**Wire color - Switching cabinet cable**	**Ethernet RJ45 plug**
Pin 1	Green	Pin 3 (RX)
Pin 2	Pink	Pin 1 (TX)
Pin 3	Blue	Pin 2 ($\overline{TX}$)
Pin 4	Yellow	Pin 6 ($\overline{RX}$)
Ethernet shield	Shielding	
Assignments in connection housing	**Wire color - Switching cabinet cable**	**CAN wires**
Pin 1	White	CAN 1 High
Pin 2	Yellow	CAN 2 High
Pin 3	Green	CAN 2 Low
Pin 4	Orange	CAN 1 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 - Connection housing

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

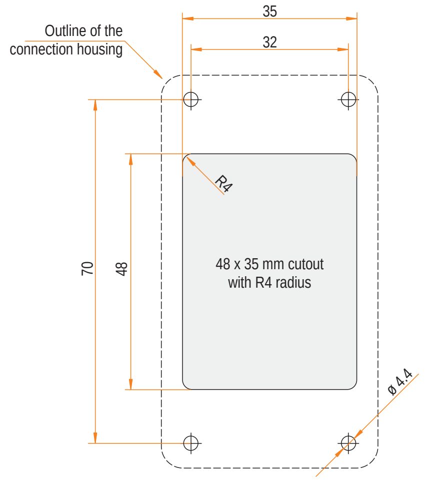


Figure 37: Drilling template - Switching cabinet socket

3.3.4 Switching cabinet cable (straight thru) 5CAMPC.0020-01

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.

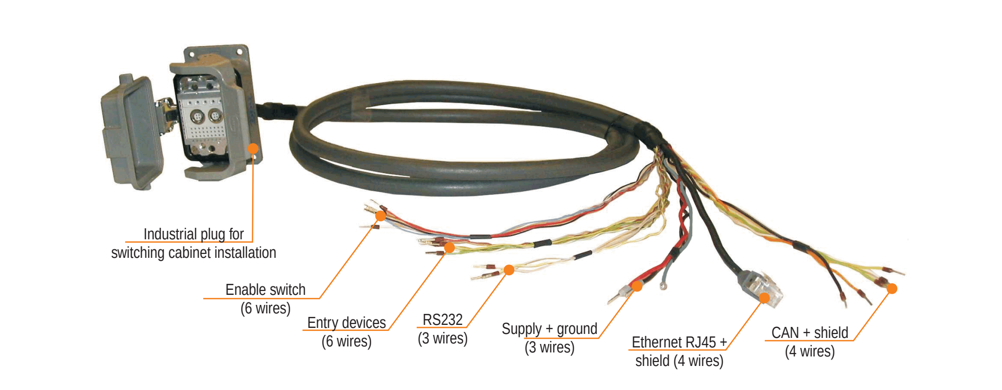


Figure 38: Mobile Panel switching cabinet cable 5CAMPC.0020-01

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

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 40 "Drilling template - Switching cabinet socket" on page 87). 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.

Information:

The seal, which is attached to the connection housing with a cable tie, must be placed between the connection housing and the switching cabinet door.

Shielding in the switching cabinet

This topic is addressed in more detail in chapter 3 "Commissioning", section 4 "Connection and Shielding" on page 117.

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.0020-01
Length and tolerance	2 meters ± 5 cm
Connector Industrial socket	 Connection housing with socket insert
Cable Total diameter Weight per meter Sheathing material Available lengths 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 See table 6 "Model numbers - Mobile Panel switching cabinet cables" on page 24 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 between the enable switch and the monitoring device (6-wire) 2 pairs with shielding (5-wire) Direct connection between the entry device and the monitoring device (6-wire) Supply voltage 24 VDC and ground (3-wire) 3 wires
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 27: Technical data - Switching cabinet cable 5CAMPC.0020-01

Cable specifications

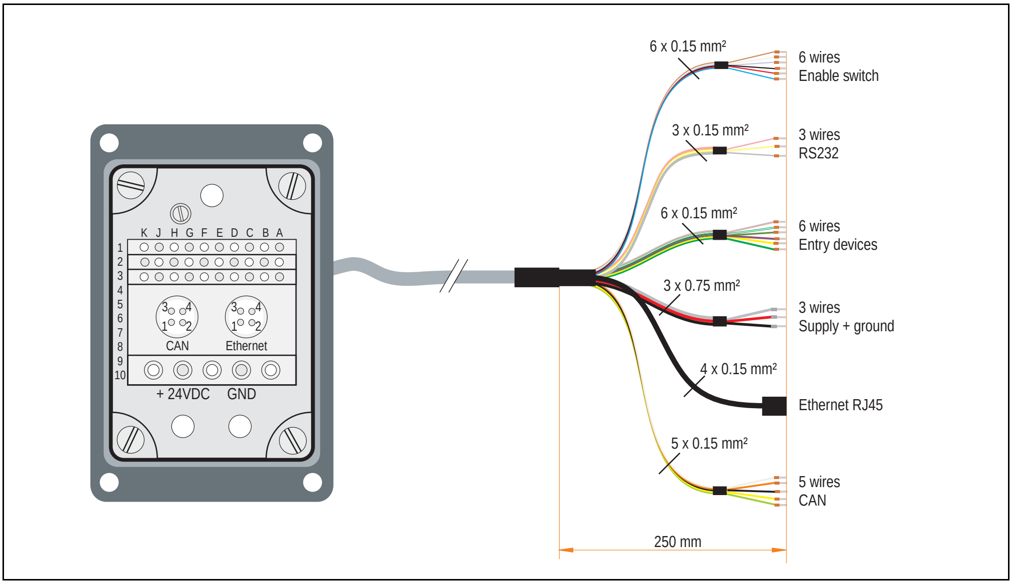


Figure 39: Cable layout - Switching cabinet cable

Assignments in connection housing	Wire color - Switching cabinet cable	Enable switch wires
A1	Brown	C1
A3	White	NO1
B2	Violet	NC1
C1	Black	C2
C3	Red	NO2
D2	Blue	NC2
Assignments in connection housing	**Wire color - Switching cabinet cable**	**RS232 wires**
J1	Pink	RxD
J3	Gray	TxD
K2	White-Yellow	GND
Assignments in connection housing	**Wire color - Switching cabinet cable**	**Entry device wires**
E1	Gray-Pink	E-stop normally closed contact 1 (11)
E3	White-Green	E-stop normally closed contact 1 (12)
G1	Brown-Green	E-stop normally closed contact 2 (21)
G3	Red-Blue	E-stop normally closed contact 2 (22)
F2	Yellow	Key switch (13)
H2	Green	Key switch (14)

Assignments in connection housing	**Wire color - Switching cabinet cable**	**Supply wires**
GND	Black	Ground
+ 24 VDC	Red	+ 24 VDC supply
Plug housing (outer shield)	Gray	Shielding
Assignments in connection housing	**Wire color - Switching cabinet cable**	**Ethernet RJ45 plug**
Pin 1	Green	Pin 1 (TX)
Pin 2	Pink	Pin 3 (RX)
Pin 3	Blue	Pin 6 ($\overline{RX}$)
Pin 4	Yellow	Pin 2 ($\overline{TX}$)
Ethernet shield	Shielding	
Assignments in connection housing	**Wire color - Switching cabinet cable**	**CAN wires**
Pin 1	White	CAN 1 High
Pin 2	Yellow	CAN 2 High
Pin 3	Green	CAN 2 Low
Pin 4	Orange	CAN 1 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 - Connection housing

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

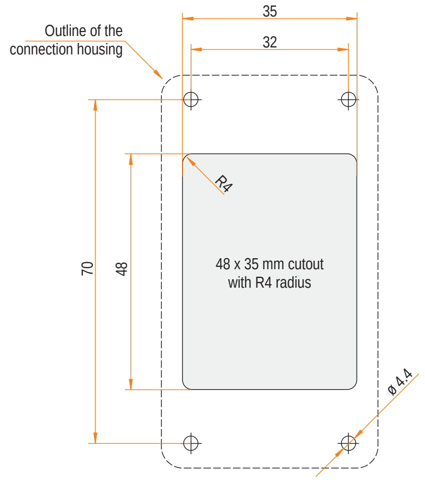


Figure 40: Drilling template - Switching cabinet socket

3.3.5 Attachment cable 5ACMPH.0xxx-10

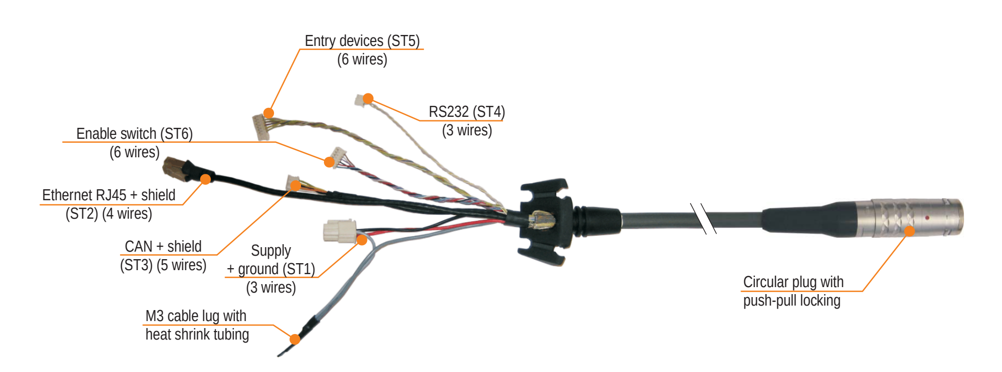


Figure 41: Attachment cable 5CAMPH.0xxx-10

The attachment cable establishes the electrical and mechanical connection between the switching cabinet and Mobile Panel. It includes lines for the network (Ethernet 10/100 Mbit/s), supply 24 VDC, entry devices, enable switch, serial data transfer and CAN.

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

On the Mobile Panel, the attachment cable is mounted into the handle. On the switching cabinet end, the attachment cable has a circular plug. The attachment cable is available in different lengths (see table 5 "Model numbers - Mobile Panel attachment cables" on page 23). Information regarding the procedure for exchanging the attachment cable can be found in section "Exchanging the attachment cable" on page 232.

Figure 42: Attachment cable and handle

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.0050-10	5CAMPH.0100-10	5CAMPH.0150-10	5CAMPH.0200-10
Length and tolerance	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)			
Cable Total diameter Weight per meter Sheathing material Available lengths 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 See table 5 "Model numbers - Mobile Panel attachment cables" on page 23 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 RJ45 plug) Direct connection between the enable switch and the monitoring device (6-wire) 2 pairs with shielding (4-wire) Direct connection between the entry device and the monitoring device (6-wire) Supply voltage + 24 VDC (2-wire) 3 wires			
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			

Table 28: Technical data - Mobile Panel cable 5CAMPH.0xxx-10

Cable specifications

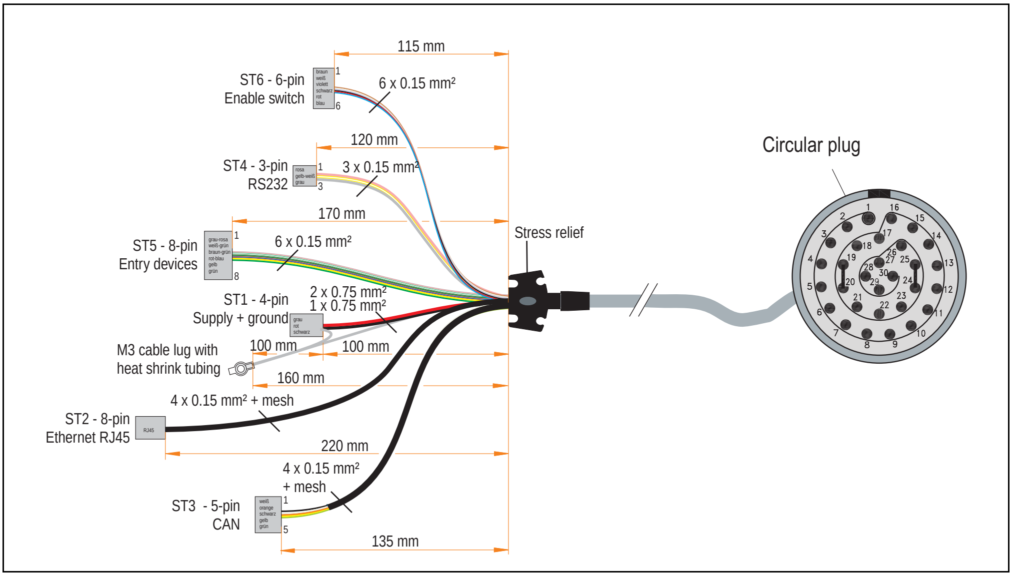


Figure 43: Cable specifications - Attachment cable

ST6 enable switch, 6-pin male connector		Wire colors - Attachment cable	Assignment in connection housing
C1	Pin 1	Brown	Pin 4
NO 1	Pin 2	White	Pin 5
NC 1	Pin 3	Violet	Pin 6
C 2	Pin 4	Black	Pin 9
NO 2	Pin 5	Red	Pin 8
NC 2	Pin 6	Blue	Pin 7
ST4 RS232, 3-pin male connector		**Wire colors - Attachment cable**	**Assignment in connection housing**
RxD	Pin 1	Pink	Pin 21
RS232_GND	Pin 2	White-Yellow	Pin 22
TxD	Pin 3	Gray	Pin 23
ST5 entry device, 8-pin male connector		**Wire colors - Attachment cable**	**Assignment in connection housing**
E-stop normally closed contact 1 (11)	Pin 1	Gray-Pink	Pin 1
E-stop normally closed contact 1 (12)	Pin 2	White-Green	Pin 15
E-stop normally closed contact 2 (21)	Pin 3	Brown-Green	Pin 2
E-stop normally closed contact 2 (22)	Pin 4	Red-Blue	Pin 16
Button (S13)	Pin 5	Yellow	Pin 18
Button (S14)	Pin 6	Green	Pin 26
n.c.	Pin 7	-	-
n.c.	Pin 8	-	-

ST1 supply + ground		**Wire colors - Attachment cable**	**Assignment in connection housing**
+ 24 VDC supply	Pin 1	Red	Pin 3
Shielding	Pin 2	Gray	Pin 17
Ground	Pin 3	Black	Pin 14
n.c.	Pin 4	-	-
ST2 Ethernet RJ45 connector		**Wire colors - Attachment cable**	**Assignment in connection housing**
TX	Pin 1	Green	Pin 27
$\overline{TX}$	Pin 2	Yellow	Pin 29
RX	Pin 3	Pink	Pin 28
n.c.	Pin 4	-	-
n.c.	Pin 5	-	-
$\overline{RX}$	Pin 6	Blue	Pin 30
n.c.	Pin 7	-	-
n.c.	Pin 8	-	-
Shielding	-	Shielding	Ethernet shield
ST6 CAN, 5-pin male connector		**Wire colors - Attachment cable**	**Assignment in connection housing**
CAN 1 High	Pin 1	White	Pin 10
CAN 1 Low	Pin 2	Orange	Pin 11
Shielding	Pin 3	Black	CAN shield
CAN 2 High	Pin 4	Yellow	Pin 12
CAN 2 Low	Pin 5	Green	Pin 13

3.3.6 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 like the X20 or to the first Ethernet connection (MDIX) of 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.

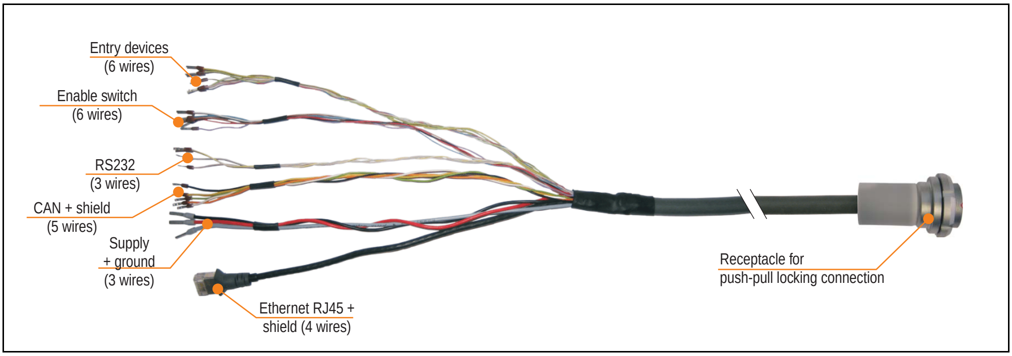


Figure 44: Mobile Panel switching cabinet cable 5CAMPC.0020-10

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

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 46 "Drilling template - Receptacle" on page 95). 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.

Connections and shielding in the switching cabinet

This topic is addressed in more detail in chapter 3 "Commissioning", section 4 "Connection and Shielding" on page 117.

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 Available lengths 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 See table 6 "Model numbers - Mobile Panel switching cabinet cables" on page 24 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 between the enable switch and the monitoring device (6-wire) 2 pairs with shielding (5-wire) Direct connection between the entry device and the monitoring device (6-wire) Supply voltage 24 VDC and ground (3-wire) 3 wires
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 29: Technical data - Switching cabinet cable 5CAMPC.0020-10

Cable specifications

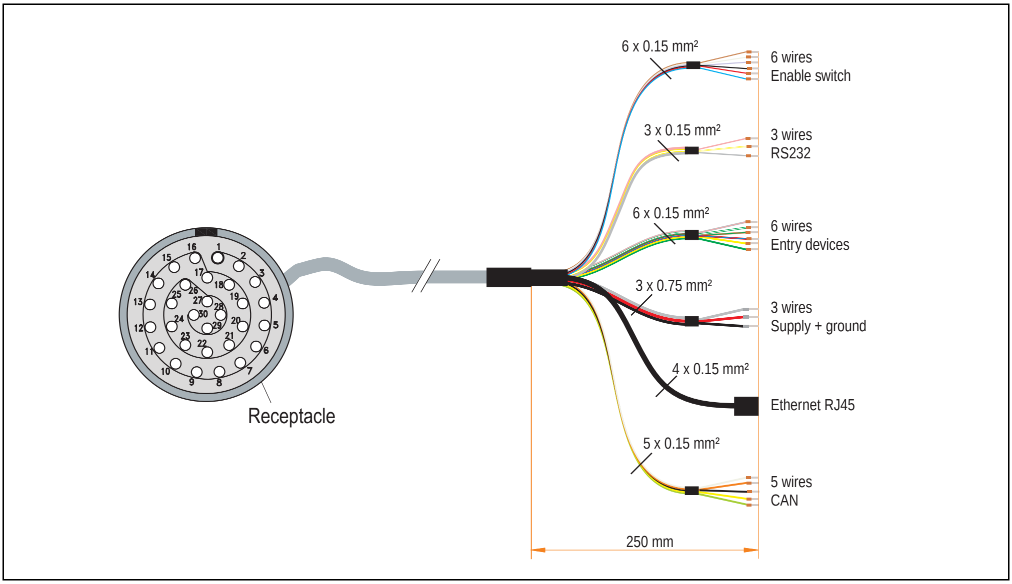


Figure 45: Cable layout - Switching cabinet cable

Pin assignments - Receptacle	Wire color - Switching cabinet cable	Enable switch wires
4	Brown	C1
5	White	NO1
6	Violet	NC1
9	Black	C2
8	Red	NO2
7	Blue	NC2
Pin assignments - Receptacle	**Wire color - Switching cabinet cable**	**RS232 wires**
21	Pink	RxD
23	Gray	TxD
22	White-Yellow	GND
Pin assignments - Receptacle	**Wire color - Switching cabinet cable**	**Entry device wires**
1	Gray-Pink	E-stop normally closed contact 1 (11)
15	White-Green	E-stop normally closed contact 1 (12)
2	Brown-Green	E-stop normally closed contact 2 (21)
16	Red-Blue	E-stop normally closed contact 2 (22)
18	Yellow	Button (S13)
26	Green	Button (S14)

Pin assignments - Receptacle	Wire color - Switching cabinet cable	Supply wires
14	Black	Ground
3	Red	+ 24 VDC supply
17	Gray	Shielding
Pin assignments - Receptacle	**Wire color - Switching cabinet cable**	**Ethernet RJ45 plug**
27	Green	Pin 3 (RX)
28	Pink	Pin 1 (TX)
30	Blue	Pin 2 ($\overline{\text{TX}}$)
29	Yellow	Pin 6 ($\overline{\text{RX}}$)
Ethernet shield	Shielding	Shielding
Pin assignments - Receptacle	**Wire color - Switching cabinet cable**	**CAN wires**
10	White	CAN 1 High
12	Yellow	CAN 2 High
13	Green	CAN 2 Low
11	Orange	CAN 1 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).

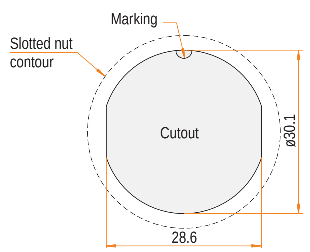


Figure 46: Drilling template - Receptacle

3.3.7 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.

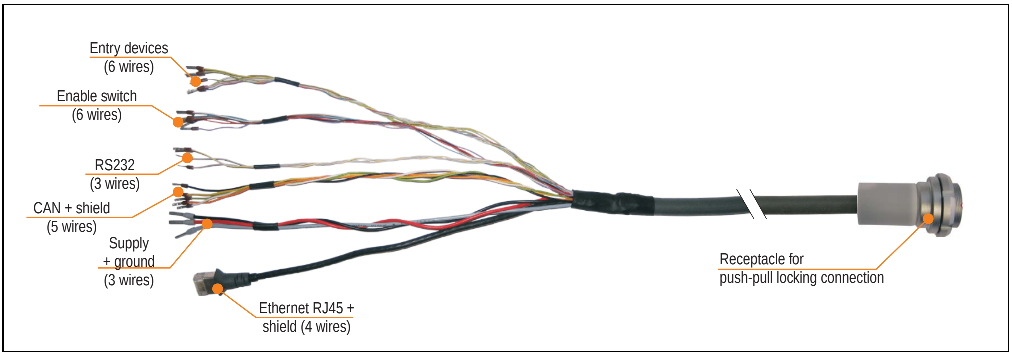


Figure 47: Mobile Panel switching cabinet cable 5CAMPC.0020-11

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

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 49 "Drilling template - Receptacle" on page 99). 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.

Shielding in the switching cabinet

This topic is addressed in more detail in chapter 3 "Commissioning", section 4 "Connection and Shielding" on page 117.

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 Available lengths 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 See table 6 "Model numbers - Mobile Panel switching cabinet cables" on page 24 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 between the enable switch and the monitoring device (6-wire) 2 pairs with shielding (5-wire) Direct connection between the entry device and the monitoring device (6-wire) Supply voltage 24 VDC and ground (3-wire) 3 wires
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 30: Technical data - Switching cabinet cable 5CAMPC.0020-11

Cable specifications

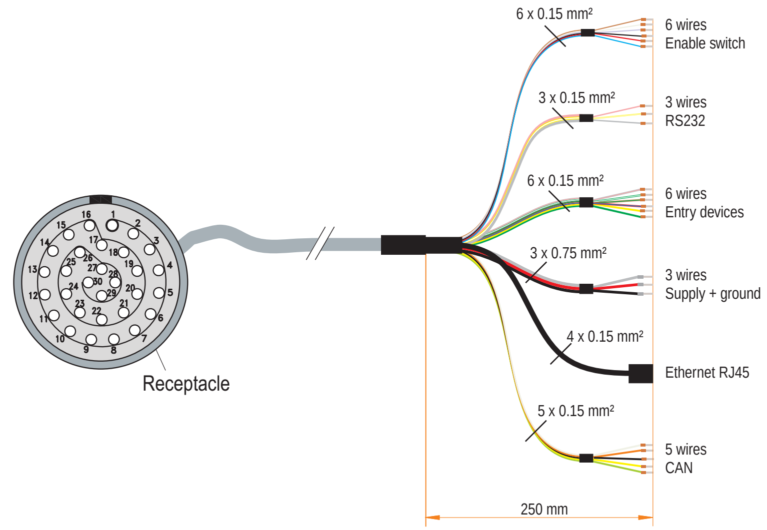


Figure 48: Cable layout - Switching cabinet cable

Assignments in connection housing	Wire color - Switching cabinet cable	Enable switch wires
4	Brown	C1
5	White	NO1
6	Violet	NC1
9	Black	C2
8	Red	NO2
7	Blue	NC2
Assignments in connection housing	**Wire color - Switching cabinet cable**	**RS232 wires**
21	Pink	RxD
23	Gray	TxD
22	White-Yellow	GND
Assignments in connection housing	**Wire color - Switching cabinet cable**	**Entry device wires**
1	Gray-Pink	E-stop normally closed contact 1 (11)
15	White-Green	E-stop normally closed contact 1 (12)
2	Brown-Green	E-stop normally closed contact 2 (21)
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
14	Black	Ground
17	Red	+ 24 VDC supply
3	Gray	Shielding
Assignments in connection housing	**Wire color - Switching cabinet cable**	**Ethernet RJ45 plug**
27	Green	Pin 1 (RX)
28	Pink	Pin 3 (TX)
30	Blue	Pin 6 ($\overline{TX}$)
29	Yellow	Pin 2 ($\overline{RX}$)
Ethernet shield	Shielding	Shielding
Assignments in connection housing	**Wire color - Switching cabinet cable**	**CAN wires**
10	White	CAN 1 High
12	Yellow	CAN 2 High
13	Green	CAN 2 Low
11	Orange	CAN 1 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).

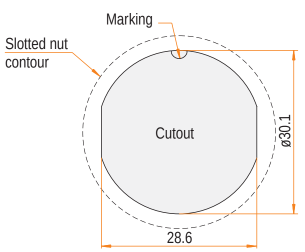


Figure 49: Drilling template - Receptacle

3.4 Wall mount

The wall mount 4MPBRA.0000-00 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.

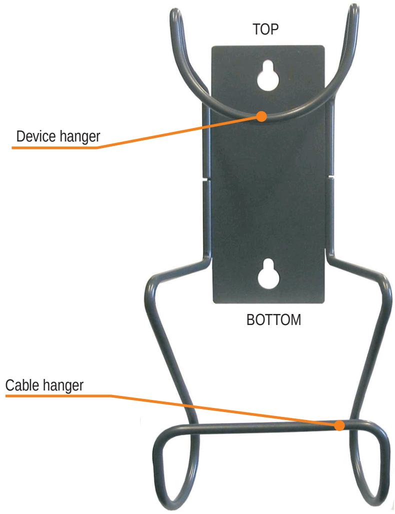


Figure 50: Wall mount 4MPBRA.0000-00

Drilling holes for attaching the wall mount must be made in accordance with diagram 51 "Dimensions - Wall mount 4MPBRA.0000-00" on page 101.

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 when placed on it. The wall mount should also be positioned so that operation of the E-stop 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 E-stop button can be activated.

3.4.1 Technical data

Mechanics	4MPBRA.0000-00
Material Paint, color	St37 Powder-coated (semi gloss), similar to RAL 7016
Dimensions (WxHxD)	140 x 305 x 109
Weight	680 grams

Table 31: Technical data - 4MPBRA.0000-00

3.4.2 Dimensions

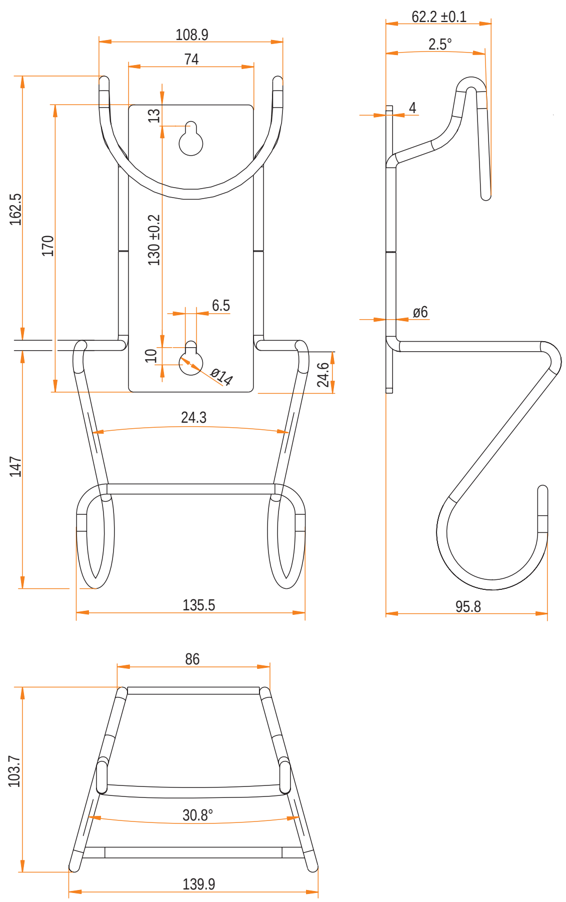


Figure 51: Dimensions - Wall mount 4MPBRA.0000-00

3.4.3 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	Side view
	

Table 32: Storing a Mobile Panel device on a wall mount

3.5 Strapping plug

The strapping plug is used to bridge the E-stop contact on the switching cabinet when the Mobile Panel is unplugged. This plug is inserted in the connection housing / receptacle for the switching cabinet cable.

3.5.1 Order data

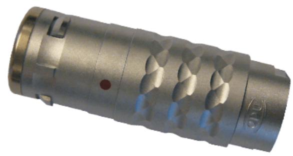
Model number	Description	Image
4MPBYP.0000-00	**Strapping plug**	
4MPBYP.0000-10	**Strapping plug**	

Table 33: Order data - Strapping plug

3.5.2 Technical data

Mechanics	4MPBYP.0000-00	4MPBYP.0000-10
Connector Industrial plug	Connection housing with pin insert	Circular plug with push-pull locking
Dimensions	43 x 80 x 50	74 x ø25
Weight	170 grams	172.3 grams

Table 34: Technical data - Strapping plug

3.5.3 Cable layout - 4MPBYP.0000-00

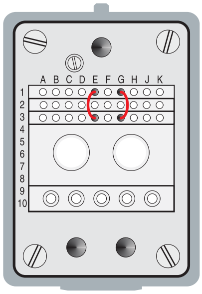


Figure 52: Cable layout - Strapping plug 4MPBYP.0000-00

In the strapping plug, E-stop contacts **E1 - E3** as well as **G1 - G3** are connected with each other.

3.5.4 Cable layout - 4MPBYP.0000-10

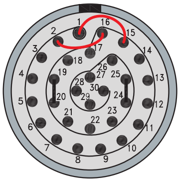


Figure 53: Cable layout - Strapping plug 4MPBYP.0000-10

In the strapping plug, E-stop contacts **Pin 1 - Pin 15** as well as **Pin 2 - Pin 16** are connected with each other.

Information:

When using the strapping plug, the two contacts for the key switch (F2, H2 - 4MPBYP.0000-00 and Pin 5, Pin 6 - 4MPBYP.0000-10) are not connected with each other. They must be wired externally. If the attachment cable of the Mobile Panel device is reconnected with the switching cabinet cable, the key switch could be triggered at two different positions (Mobile Panel + external wiring)!

Chapter 3 • Commissioning

1. Commissioning from a safety perspective

In order to begin operating the Mobile Panel device, the E-stop function must first be acknowledged using the key switch. This causes the E-stop safety relay to begin monitoring the E-stop button. If the E-stop is not pressed, and the enable switch is pressed to the enable position or a safety door on the system is closed, then the main circuit, which has to be implemented via external positively driven safeguards, is closed.

When the E-stop button is pressed, it locks in the engaged position. The E-stop monitoring device then shuts down the machine or system. A quarter turn clockwise releases the E-stop button once again to its original position. Releasing the E-stop button must never cause the machine to automatically begin running again. The E-stop action must first be acknowledged with the key switch before the machine or system can be put back into operation. Bypassing the key switch will be detected by the monitoring device.

The machine's safety circuit remains interrupted as long as the 3-step enable switch has not been pressed or the assembly's safety door has not been closed. The enable switch has three steps, and the enable signal is only passed on when it's set in the middle position. In other words, the enable switch must be pressed to the middle position in order for the Mobile Panel to carry out user commands (see also "Functionality" in "Enable switch" on page 68).

1.1 Intended use

The Mobile Panel device may only be used for the applications described in section "Introduction" on page 29.

Information:

The responsibility for the correctness and functionality of the wiring, adherence to prescribed standards, and safety engineering rests solely with the project engineers.

2. Operating the Mobile Panel device

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 may 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 connection 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 E-stop button can be activated if necessary.**
- **When setting down the Mobile Panel device for a short period of time, do not place it in such a way that its entry devices could be damaged or where it may inadvertently trigger an action. Also, do not place it on unstable surfaces where it may fall. It should never be placed near heat sources or in direct sunlight.**
- **Although the Mobile Panel device has been designed for use in harsh industrial environments, it should still not come into contact with large amounts of dust or humidity, excessive mechanical shocks, or strong magnetic fields.**
- **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 38). 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.**
- **If the Mobile Panel device has sustained a severe shock (e.g. if it has fallen), then the CF / USB cover fitting must be checked directly afterwards. If a CompactFlash card was in the CompactFlash slot at the time of impact, this should also be checked to ensure a proper fit. The safety features on the Mobile Panel must also be inspected (E-stop button, key switch, enable switch).**

Caution!

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 231.**

3. Recommended monitoring devices

B&R recommends using PNOZ e1.1p or PNOZ e2.1p safety relays from the Pilz company (www.pilz.com) in order to achieve Safety Category 4 in accordance with EN 954-1. As a monitoring device for the E-stop button, the PNOZ e1.1p can be used for safety circuits up to Safety Category 4 according to EN 954-1. It is imperative to use the PNOZ e2.1p as a monitoring device for the enable switch for safety circuits up to Category 4 (EN 954-1).

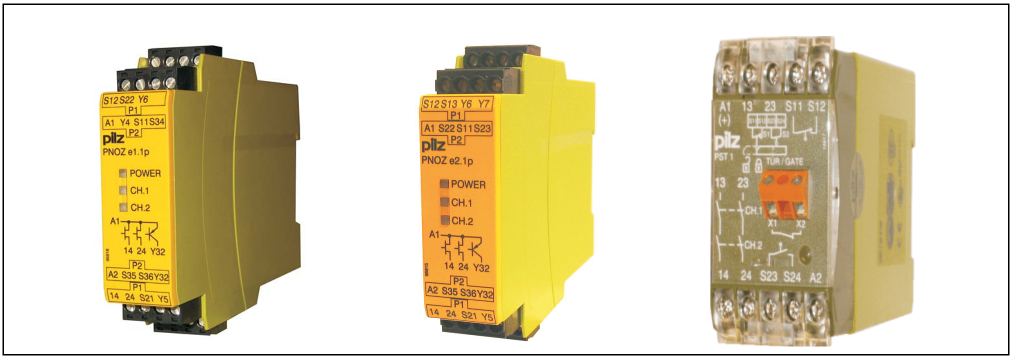


Figure 54: Pilz PNOZ e1.1p (left) and Pilz PONZ e2.1p (right)

Warning!

If EN 954-1 Safety Categories 2, 3, and 4 are not necessary, safeguards can be switched directly on the E-stop circuit for Categories B and 1. When doing so, be aware of EN 954-1 and EN ISO 13849-2 guidelines as well as the max. permitted current load on the E-stop button and the key switch! More information can be found in section 3.3 "Current load of the enable switch and command device circuit" on page 116.

3.1 Connection examples - E-stop and key switch

Warning!

The highest safety category that can be reached for an entire system is always determined by the lowest safety circuit category being used.

3.1.1 Connection example - Safety circuits up to EN 954-1 Category 4

This circuit has two channels which monitor starts and detect short circuits. Ground faults, errors in the safety circuit, and errors or faulty connections in the E-stop button are detected.

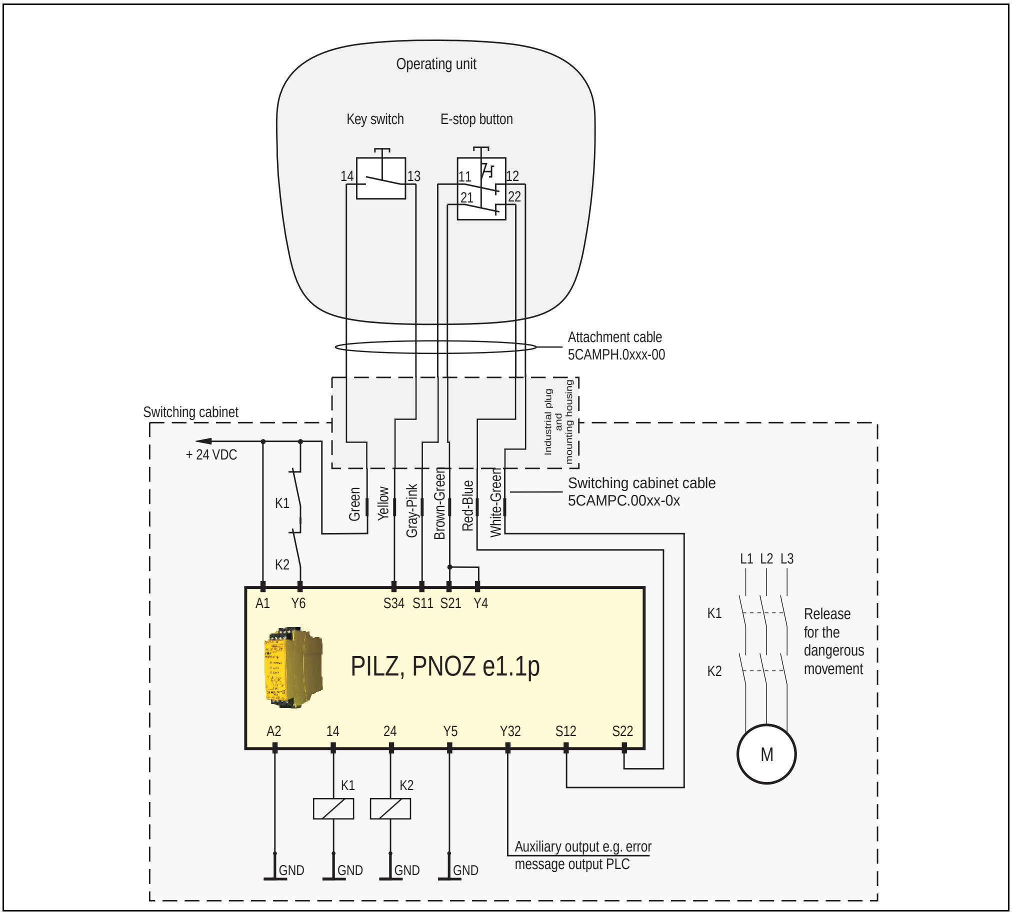


Figure 55: Connection example - Safety circuits up to EN 954-1 Category 4

Warning!

All K1 and K2 contacts must be positively driven.

Danger!

To guarantee EN 418 and Safety Category 4 accordance with EN 954-1, the instructions for the monitoring device being used must be followed.

3.1.2 Connection example - Safety circuits up to EN 954-1 Category 3

This circuit has two channels; the key switch is not wired. To start, an external switch must be connected.

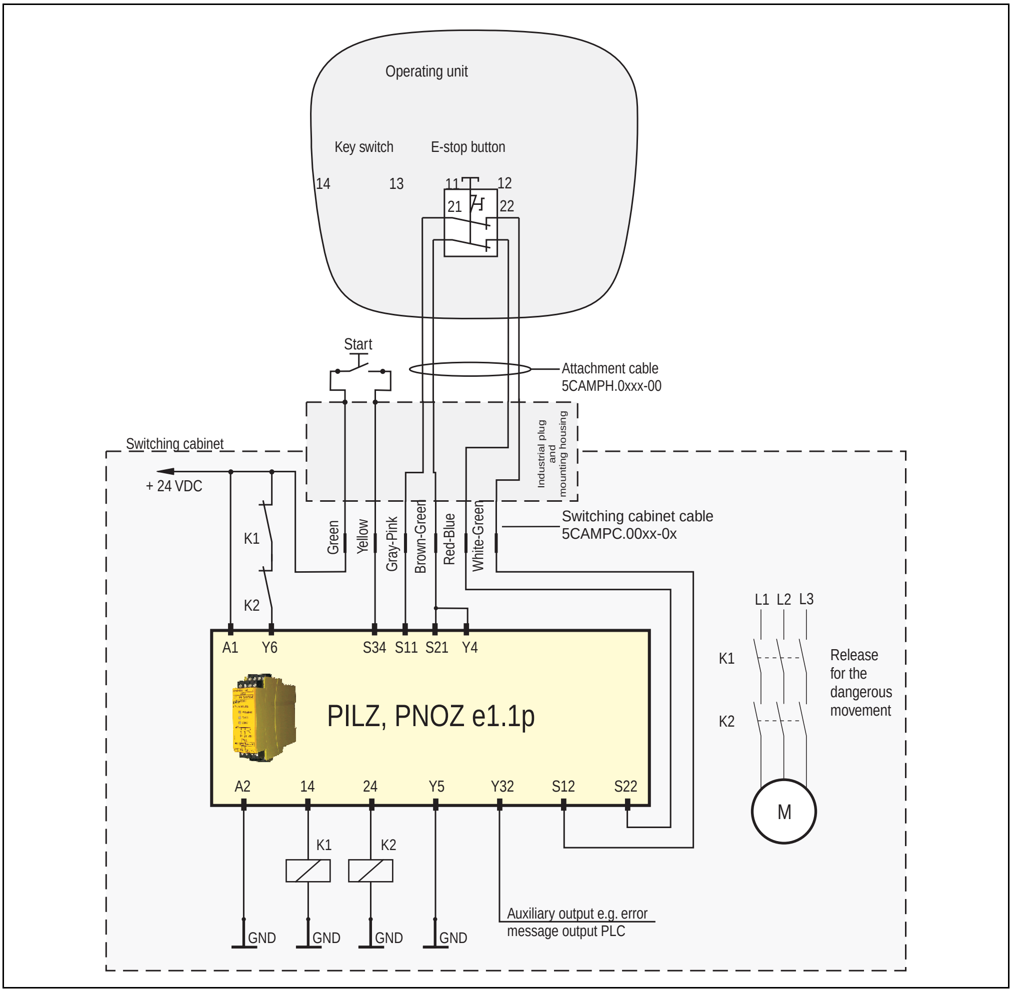


Figure 56: Connection examples - E-stop and key switch

3.1.3 Connection example - safety circuits up to EN 954-1 Category 1

This switch has one channel. Ground faults are recognized.

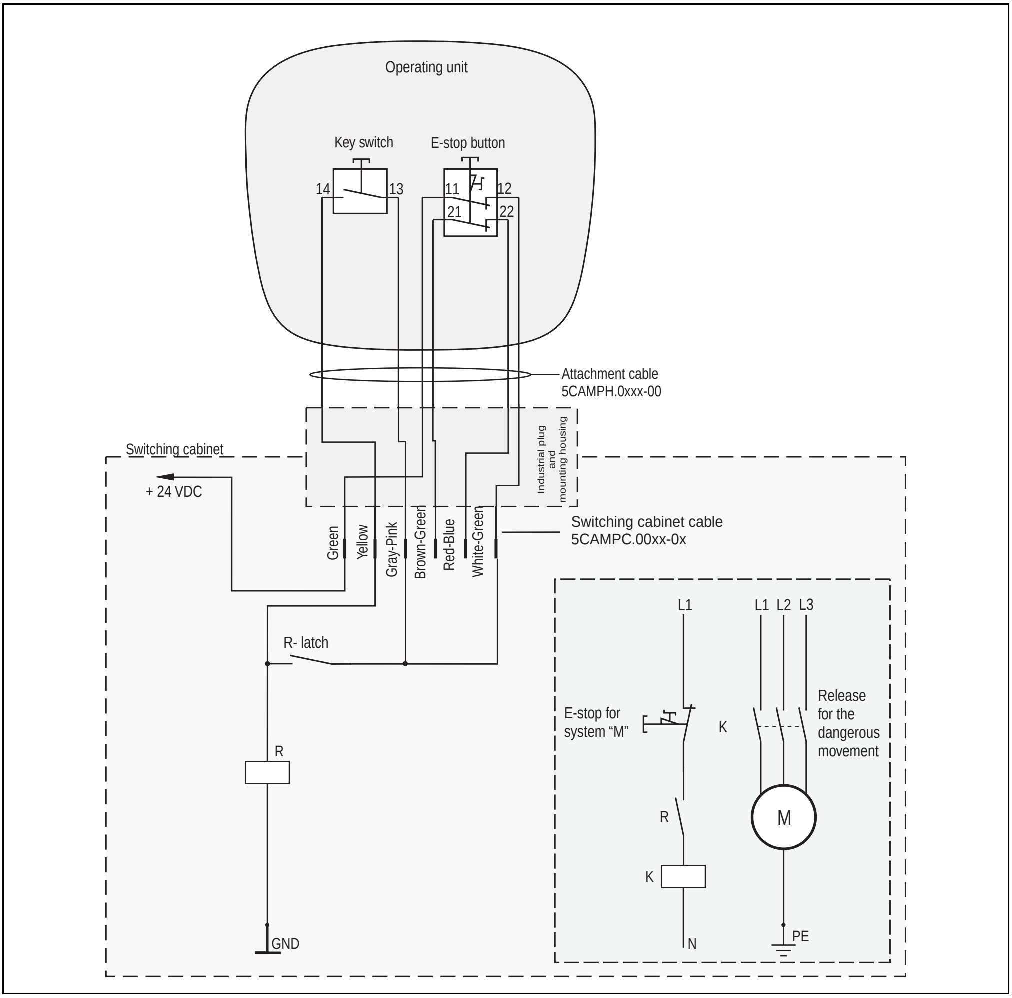


Figure 57: Connection example - Safety circuits up to EN 954-1 Category 1

Warning!

Pay attention to the max. permitted current load of the E-stop button, the key switch, and the enable switch! More information can be found in section 3.3 "Current load of the enable switch and command device circuit" on page 116.

The Mobile Panel device should never be operated while the functions which protect the Mobile Panel device are out of order!

3.2 Connection example - Enable switch

Warning!

The highest safety category that can be reached for an entire system is always determined by the lowest safety circuit category being used.

3.2.1 Connection example - Safety circuits up to EN 954-1 Category 4

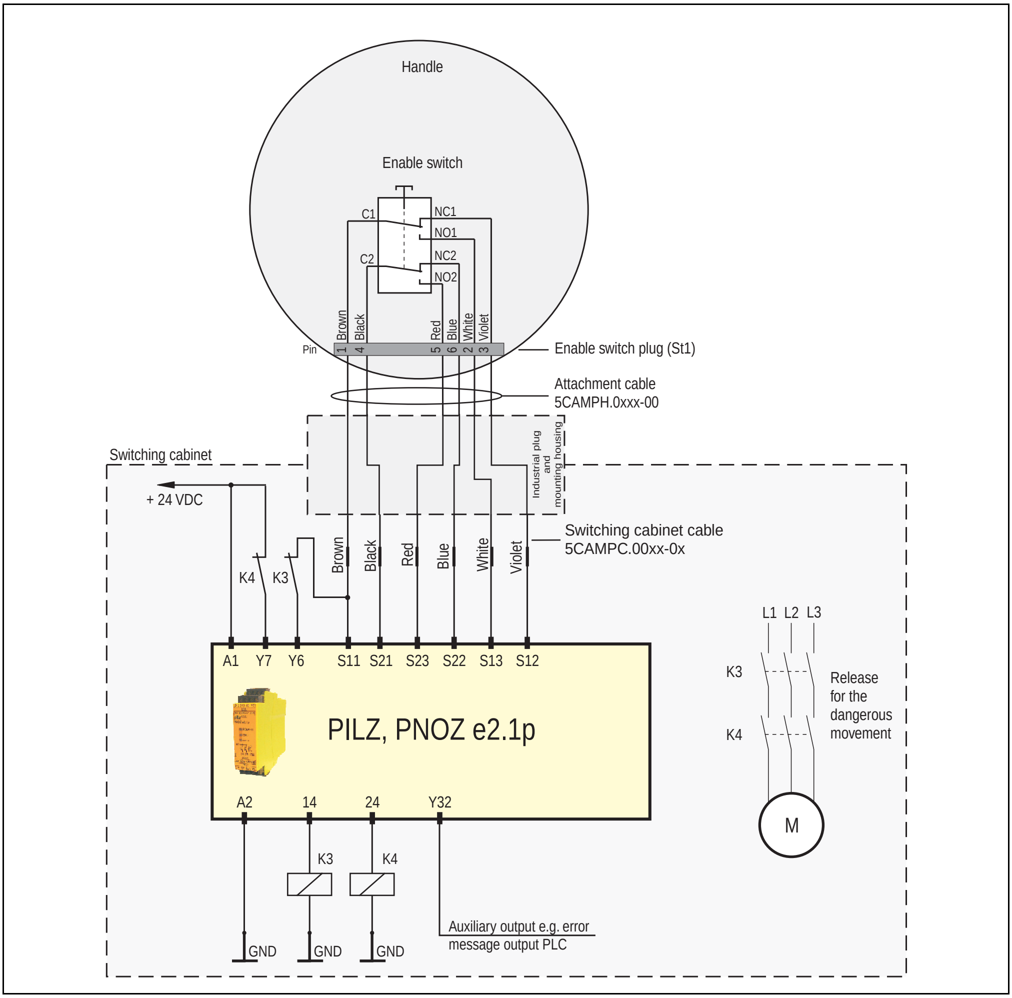


Figure 58: Connection example for using in safety circuits up to Category 4 in accordance with EN 954-1 with Pilz PNOZ e2.1p safety relay (with short circuit detection and simultaneous operation monitoring)

Warning!

All K3 and K4 contacts must be positively driven.

Danger!

To guarantee EN 418 and Safety Category 4 accordance with EN 954-1, the instructions for the monitoring device being used must be followed.

3.2.2 Connection example - Safety circuits up to EN 954-1 Category 3

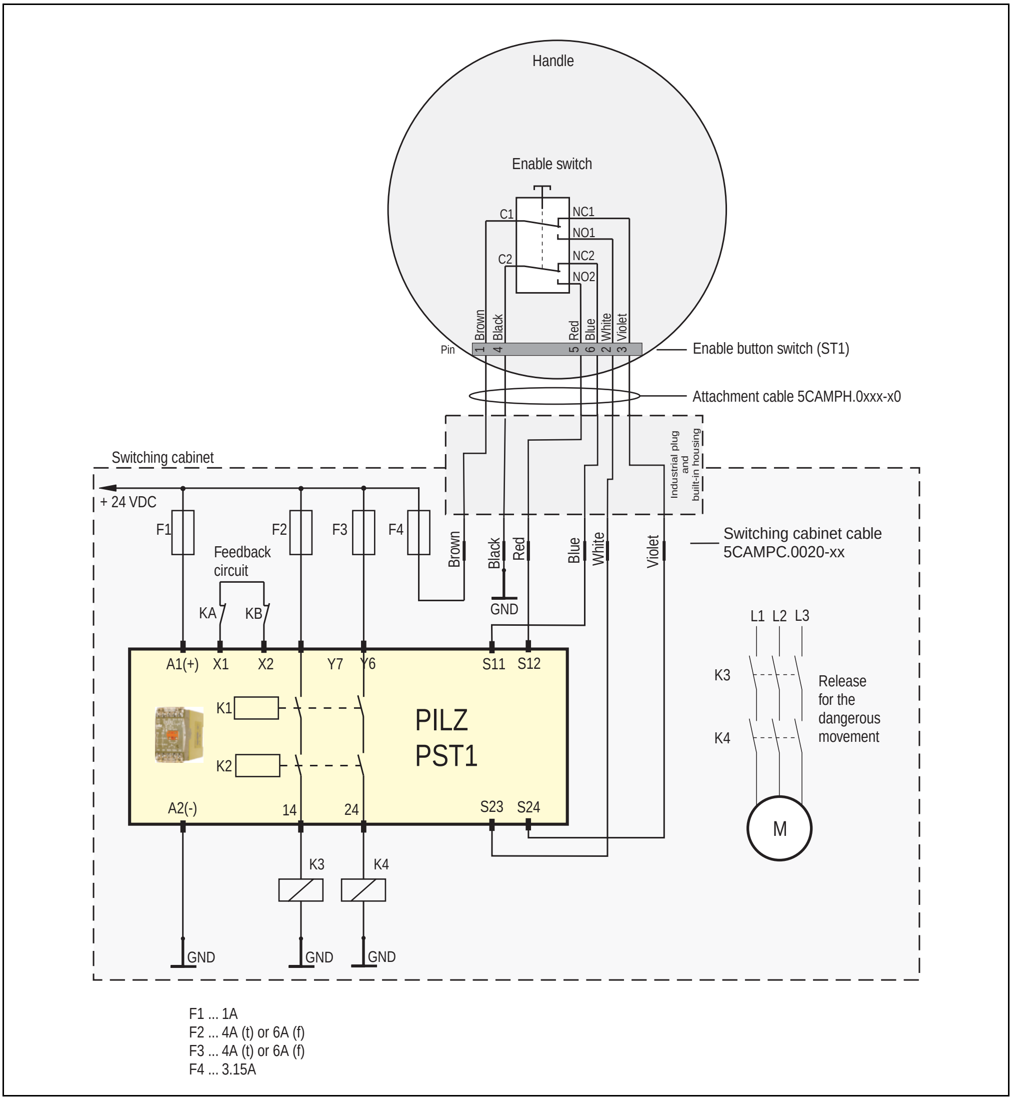


Figure 59: Connection example - Enable switch (MP40/50)

3.3 Current load of the enable switch and command device circuit

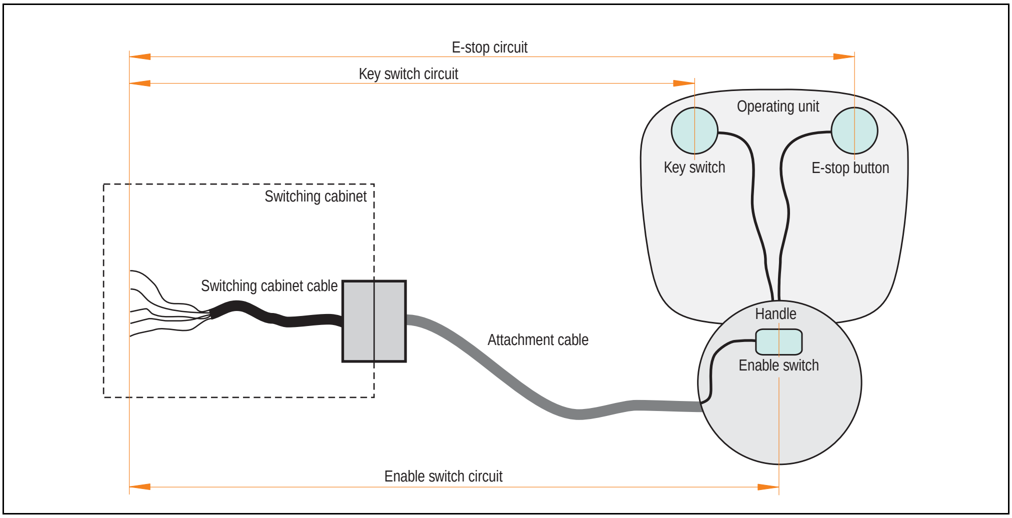


Figure 60: Current load of the enable switch and command device circuit

The limit values in the following table result from the different current loads of the components in the enable switch and command device circuit (circuit boards, cables, buttons, etc.). These values apply beginning from the start of the cable in the switching cabinet (switching cabinet cable) to the respective safety feature or unit (key switch, E-stop button, and enable switch) on the operator panel or handle.

	Max. current load	Max. voltage
E-stop circuit	0.4 A	32 VDC
Key switch circuit	0.1 A	32 VDC
Enable switch circuit (adhere to Category AC12/DC12)	0.4 A	30 VDC

Table 35: Current load of the enable switch and command device circuit

Information:

If you wish to use an additional fuse to protect a circuit, then the following fuse types should be used for the respective circuits:

E-stop circuit: 0.4 A slow-blow glass tube fuse
Key switch circuit: 0.1A slow-blow glass tube fuse
Enable switch circuit: 0.4 A slow-blow glass tube fuse

4. Connection and Shielding

The following figure shows a schematic of a Mobile Panel device.

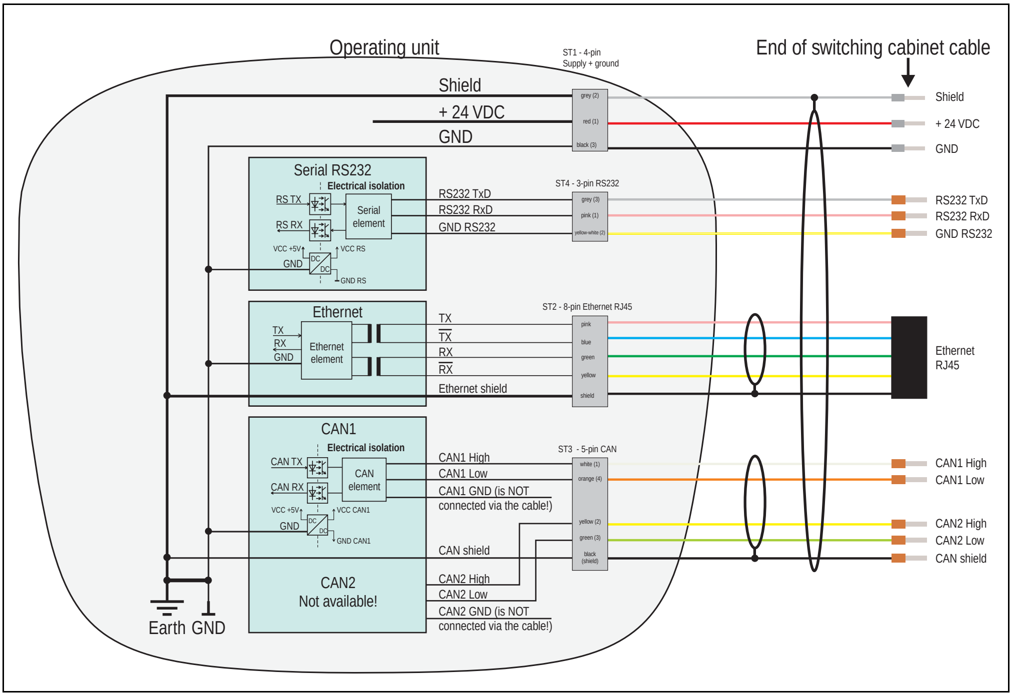


Figure 61: Connection and Shielding

4.1 Power supply

Earth and GND are connected internally in the operating unit! The shield line (gray wire) and GND line (black wire) must be connected to a part of the switching cabinet that is grounded.
The supply voltage is internally protected (self-healing fuse), so that the device cannot be damaged if there is an overload or if the voltage supply is connected incorrectly (reverse polarity protection).

4.2 Serial interface

The RS232 interface is electrically isolated internally.

Warning!

If the RS232 GND line (white-yellow wire) is connected to GND, then electrical isolation no longer exists.

4.3 Ethernet

The Ethernet shield is internally connected to Earth/GND from the operating unit. The plug can in be linked to a shielded socket.

4.4 CAN

Information:

The Mobile Panel can only be connected to a CAN network as the last station.

The CAN1 interface is electrically isolated internally. CAN1 GND is NOT connected to external GND via a cable. The CAN shield line (black wire) corresponds to Earth/GND for the operating unit.

Warning!

If the CAN shield line (black wire) is connected to GND, then electrical isolation no longer exists.

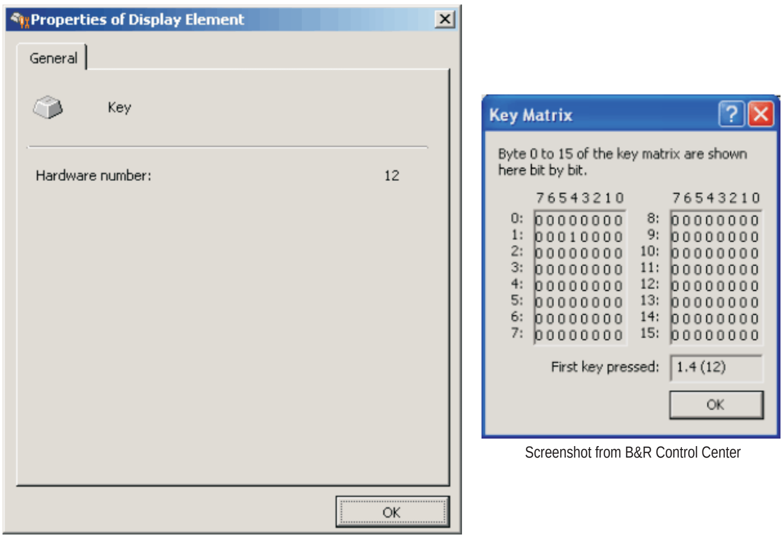
5. Key and LED configurations

Each key or LED can be configured individually and adjusted to suit the application. Various B&R tools are available for this purpose:

- B&R Key Editor for Windows operating systems
- Visual Components for Automation Runtime

Keys and LEDs from each device are processed by the matrix controller in a bit sequence of 128 bits each.

The positions of the keys and LEDs in the matrix are shown as hardware numbers. The hardware numbers can be read directly on the target system, for example with the B&R Key Editor and the B&R Control Center.



Screenshot from B&R Control Center

Screenshot from B&R Key Editor

Figure 62: Example - Hardware number in B&R Key Editor or in B&R Control Center

The following graphics show the positions of the keys and LEDs in the matrix. They are shown as follows.

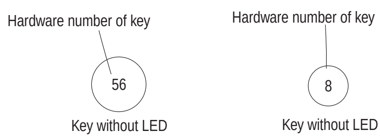


Figure 63: Display - Keys and LEDs in the matrix

5.1 Hardware numbers - BIOS device

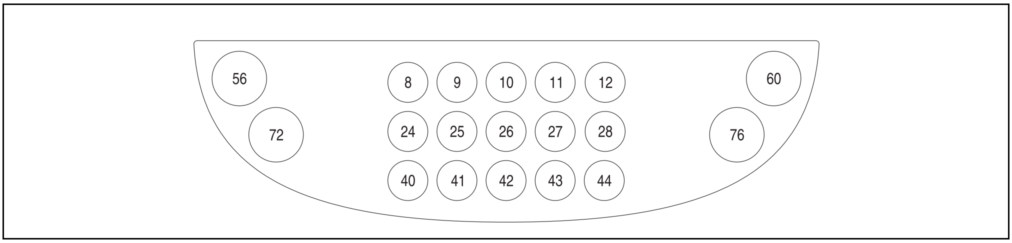


Figure 64: Hardware numbers - BIOS device keys

6. Application examples

6.1 Connection to a B&R controller (X20)

6.1.1 MP100

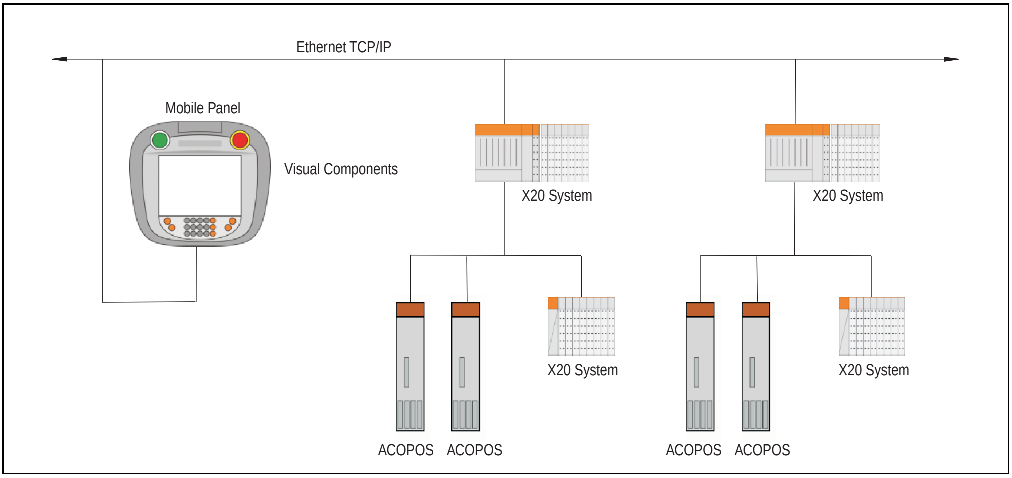


Figure 65: Application example - MP100

6.1.2 MP200

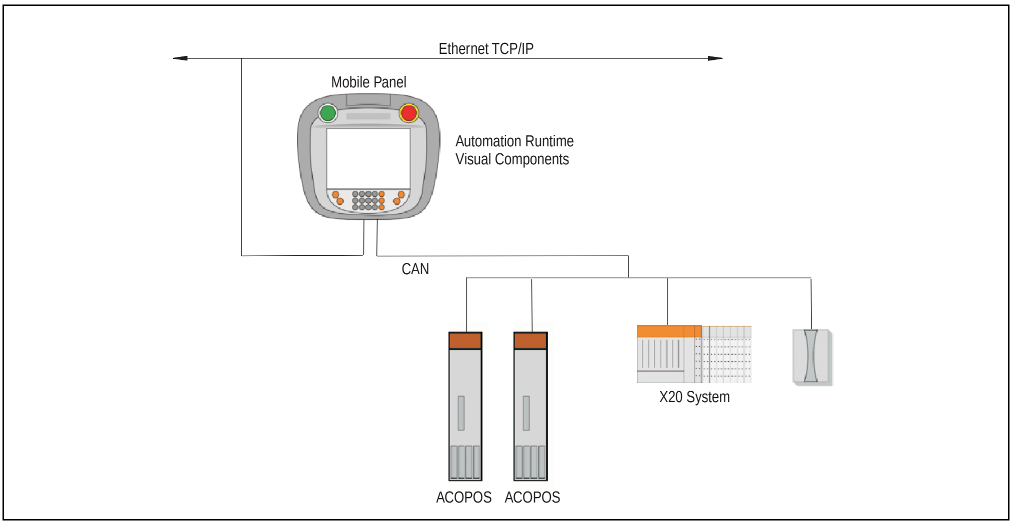


Figure 66: Application example - MP200

6.2 Mobile thin client

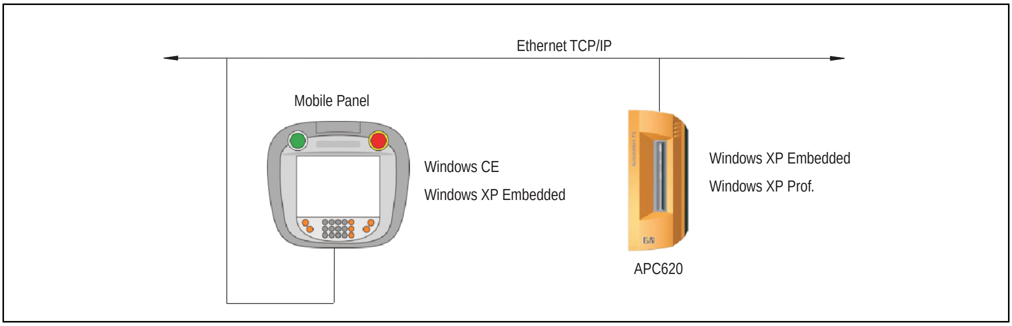


Figure 67: Mobile thin client

Chapter 4 • Software

1. Mobile Panel with BIOS

Information:

The following diagrams and BIOS menu items including descriptions refer to BIOS Version 1.16. It is therefore possible that these diagrams and BIOS descriptions do not correspond with your installed BIOS version.

1.1 General information

BIOS is an abbreviation for "**B**asic **I**nput and **O**utput **S**ystem". It is the most basic standardized communication between the user and the system (hardware). A B&R-modified BIOS from Insyde is used in the Mobile Panel devices.

BIOS setup lets you modify basic system configuration settings. These settings are saved in CMOS RAM.

The CMOS RAM is a nonvolatile, battery-backed memory that retains information when power is not applied to the Mobile Panel.

BIOS is immediately activated when switching on the power supply of the Mobile Panel.

BIOS reads the system configuration information in CMOS RAM, checks the system, and configures it using the power-on self-test (POST).

Information:

After 3 unsuccessful attempts at booting the Mobile Panel device, BIOS overwrites the current CMOS settings with the CMOS backup values. If there is no valid CMOS backup present, then CMOS settings are set to their default values (as with "Load optimized defaults").

When these preliminaries are finished, the BIOS seeks an operating system in the data storage devices available (CompactFlash card, drive, floppy drive). BIOS launches the operating system and hands over control of system operations to it.

Optionally, a BIOS summary screen can be displayed at the end of the POST. This shows the following information:

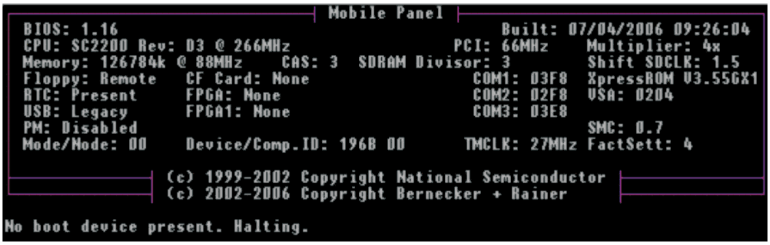


Figure 68: BIOS summary screen - VGA Mobile Panel devices

For info on deactivating this summary screen, see section "Advanced BIOS features" on page 137 for VGA Mobile Panel devices.

To make changes in BIOS setup: while the Mobile Panel device is booting, press the DEL key as soon as the following message appears in the upper margin of the display (during POST):

Figure 69: Press DEL for setup

If the message disappears before DEL has been pressed[1)] , the Mobile Panel must be rebooted in order to enter BIOS setup.

Important!

The following general rule applies: Only modify those settings that you completely understand. On no account should settings be changed without a good reason. The BIOS settings have been carefully chosen by B&R to guarantee ideal performance and reliability. Even a seemingly minor change to the settings may cause the system to become unstable.

Information:

The settings recommended by B&R can be loaded with "Load optimized defaults".

The following keys[2)] help you navigate in BIOS setup:

1) A USB keyboard or the REMHOST program is required to enter characters and operate BIOS setup pages.
2) A USB keyboard or the REMHOST program is required to enter characters and operate BIOS setup pages.

Key	Function
Cursor ↑	Moves to the previous item.
Cursor ↓	Moves to the next item.
Cursor ←	Moves to the previous item.
Cursor →	Moves to the next item.
ESC	Exits the submenu.
Enter or press highlighted character shortcut	Changes to the selected menu.
F1 and ALT+H	Opens up a help window that describes the possible values for the highlighted item. Press ESC to exit the help window. In a help window, the cursor ↑ , Cursor ↓, Home, End, Page Up, and Page Down keys can be used to navigate when help texts are longer than the displayable area.
Home	Jumps to the first BIOS menu item or object.
End	Jumps to the last BIOS menu item or object.
ALT+Q and ALT+X	Enters the BIOS main menu.
- (Minus)	Decreases the numerical value or selects the previous parameter value.
+ (Plus)	Increases the numerical value or selects the next parameter value.

Table 36: BIOS-relevant keys

1.2 BIOS settings - VGA Mobile Panel devices

Information:

The following diagrams and BIOS menu items including descriptions refer to BIOS Version 1.16. It is therefore possible that these diagrams and BIOS descriptions do not correspond with your installed BIOS version.

In the following pages, the individual BIOS setup pages for a VGA Mobile Panel device will be described in more detail.

1.2.1 BIOS setup main menu

The BIOS setup main menu appears immediately after pressing the DEL button while the system is booting:

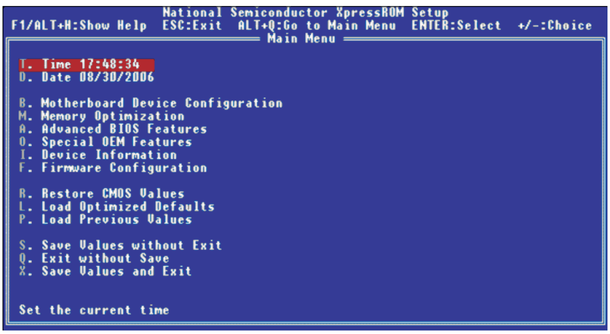


Figure 70: BIOS setup main menu

The individual menu items are explained in detail in the following sections.

Shortcut	BIOS setup menu	Function
T	Time 05:15:23 AM	The system time can be configured here.
D	Date 02/17/2004	The system date can be configured here.
B	Motherboard device configuration	Motherboard resources can be configured here.
M	Memory optimization	The settings for memory management can be made here.
A	Advanced BIOS features	Advanced BIOS options (boot logo, summary screen, cache areas) can be configured here.
O	Special OEM features	Specific B&R settings can be made here.
I	Device information	Important parameters (temp., mode/node position, etc.) for the Mobile Panel device.
F	Firmware configuration	Onboard firmware for FPGA modules can be configured here.
R	Restore CMOS values	Restores the last saved CMOS values from flash memory.

Table 37: Overview of BIOS main menu functions

Shortcut	BIOS setup menu	Function
L	Load optimized defaults	Load the optimal BIOS settings for best performance.
P	Load previous values	Reloads values configured when BIOS setup was opened. All changes are lost.
S	Save values without exit	Saves BIOS values without exiting BIOS setup.
Q	Exit without save	Exits BIOS setup without saving any changes.
X	Save values and exit	Saves settings and exits BIOS setup.

Table 37: Overview of BIOS main menu functions (cont.)

Information:

If using a German keyboard, press the "z" key to enter "y".

1.2.2 Time

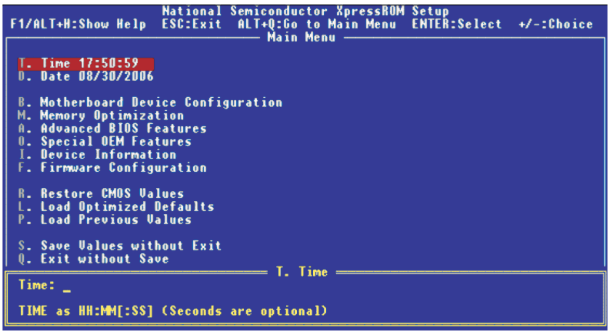


Figure 71: BIOS time menu

The currently configured system time is displayed here. The time is buffered by a battery (CMOS battery) after the Mobile Panel device has been switched off.

A new system time can be entered with the shortcut "A" or by selecting "Time" and then confirming with Enter. The format HH:MM[:SS] must be entered as follows:

Example: Set time to 13:00:00.

The entry can be made in three different ways using the keyboard:

- 01:00:00 PM - Confirm with Enter
- 13:00 - Confirm with Enter
- 13: - Confirm with Enter

Information:

If using a German keyboard, press Shift + ö to enter ":".

1.2.3 Date

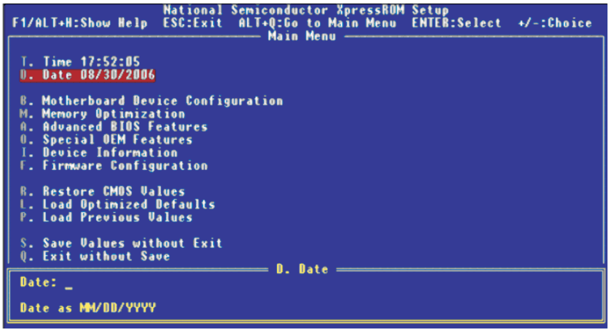


Figure 72: BIOS date menu

The current system date is displayed here. The date is buffered by a battery (CMOS battery) after the Mobile Panel device has been switched off.

A new system date can be entered with the shortcut "B" or by selecting "Date" and then confirming with Enter. The format MM:DD:YYYY must be entered as shown in the following example:

Example: Set date to 2/12/2003.

Entry using keyboard:

- 02/12/2003 - Confirm with Enter

Information:

If using a German keyboard, press the "-" key (next to the Shift key) to enter "/".

1.2.4 Motherboard device configuration

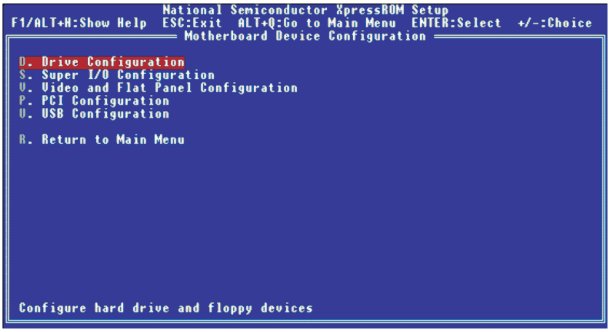


Figure 73: BIOS motherboard device configuration menu

Shortcut	BIOS setup menu	Function
D	**Drive configuration**	Settings for the floppy drive and CompactFlash card.
S	**Super I/O configuration**	Configures the super I/O device.
V	**Video and flat panel configuration**	Displays the video settings and configuration for resolution, brightness, and contrast display parameters.
P	**PCI configuration**	Configures PCI bus settings.
U	**USB configuration**	Configures USB settings.
R	**Return to main menu**	Exits the current page and returns to the BIOS main menu.

Table 38: BIOS motherboard device configuration menu

Drive configuration

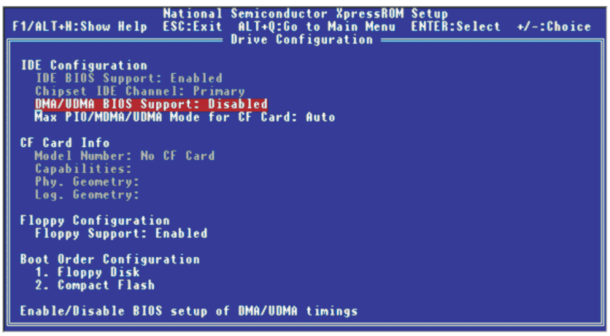


Figure 74: BIOS drive configuration menu

BIOS setting	Meaning	Setting options	Effect
IDE BIOS support	Displays the IDE configuration for the Mobile Panel device.	None	-
Chipset IDE channel	Displays the IDE channel used.	None	-
DMA/UDMA BIOS support	DMA/UDMA BIOS support can be configured here.	Enabled	Enables this function.
		Disabled	Only PIO modes for data transfer to and from CompactFlash cards are used.
Max PIO/MDMA/UDMA mode for CF card	The maximum data transfer mode to and from a CompactFlash card can be configured here. **Information:** **If a mode is configured that is not supported by the CompactFlash card, then the fastest supported mode is configured.**	Auto	Configures the fastest mode supported by the inserted CompactFlash card.
		PIO 0 to PIO 4	Manual configuration option for PIO mode.
		MDMA 0 to MDMA 2	Manual configuration option for MDMA mode.
		UDMA 0 to UDMA 2	Manual configuration option for UDMA mode.
Model number	Displays the CompactFlash model ID.	None	-
Capabilities	Displays the possible data transfer mode speeds to and from an inserted CompactFlash card.	None	-
Phy. geometry	Displays the physical geometry of the inserted CompactFlash card in cylinders, heads and sectors.	None	-
Log. geometry	Displays the logical geometry of the inserted CompactFlash card in cylinders, heads and sectors.	None	-
Floppy configuration	Floppy support (USB) can be enabled here. It is also possible to access a remote floppy drive and e.g. upgrade BIOS using the REMHOST program (see section "REMHOST utility disk" on page 151).	Enabled	Enables USB floppy support.
		Disabled	Disables USB floppy support.
Boot order configuration	Configures the order in which memory media is booted. **If two identical devices are selected, a conflict warning is displayed.**	1: Floppy disk [1] / CompactFlash / NONE	The device attempts to boot from this drive first.
		2: Floppy disk [1] / CompactFlash / NONE	The device attempts to boot from this drive second.

Table 39: BIOS drive configuration menu

1) Only HD diskettes (1.44 MB) are supported by BIOS.

Super I/O configuration

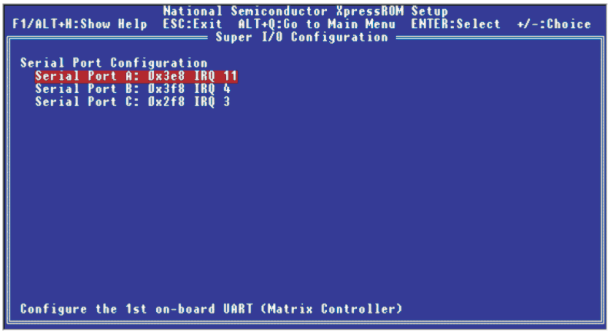


Figure 75: BIOS super I/O configuration menu

BIOS setting	Meaning	Setting options	Effect
Serial port A:	Configures the first UART address range and the corresponding interrupt for the matrix controller. **BIOS default setting: 0x3e8 IRQ 11.** **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x3e8 IRQ 11	Use this address range and interrupt.
		0x3f8 IRQ 4	
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x2f8 IRQ 3	
		0x2f8 IRQ 11	
Serial port B:	Configures the second UART address range and the corresponding interrupt for the serial interface. **BIOS default setting: 0x3f8 IRQ 4.** **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x3f8 IRQ 4	Use this address range and interrupt.
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x2f8 IRQ 3	
		0x3e8 IRQ 11	
		0x2f8 IRQ 11	
Serial port C:	Configures the third UART address range and the corresponding interrupt for the touch controller. **BIOS default setting: 0x2f8 IRQ 3.** **Information:** **Two ports cannot use the same address range and interrupt.**	Disabled	No assignment.
		0x2f8 IRQ 3	Use this address range and interrupt.
		0x3f8 IRQ 4	
		0x2f8 IRQ 3	
		0x3e8 IRQ 4	
		0x3e8 IRQ 11	
		0x2f8 IRQ 11	

Table 40: BIOS super I/O configuration menu

Video and flat panel configuration

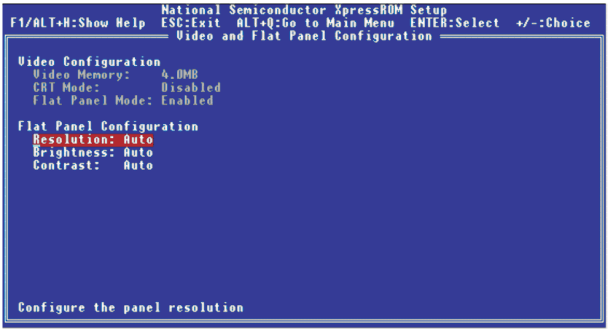


Figure 76: BIOS video configuration menu

BIOS setting	Meaning	Setting options	Effect
Video memory	Displays the current video memory reserved by the main memory.	None	-
CRT mode	Displays on an external screen.	None	-
Flat panel mode	Displays on a Mobile Panel display.	None	-
Resolution	Setting for the maximum resolution for the display. **Note: Only the resolution specified for the Mobile Panel device should be configured! Otherwise, the display can be damaged by incorrect timing values.** **If the mode/node switches are set to 0/0, then the resolution is automatically reset every time the Mobile Panel device is restarted.**	Auto	The maximum resolution is read from the factory settings and correctly configured automatically.
		QVGA (320x240) LCD	Optimum setting for a QVGA LCD Mobile Panel.
		QVGA (320x240) TFT	Optimum setting for a QVGA TFT Mobile Panel.
		VGA (640x480)	Optimum setting for a VGA Mobile Panel.
		SVGA (800x600)	Optimum setting for an SVGA Mobile Panel.
		XGA(1024x768)	Optimum setting for an XGA Mobile Panel.
Brightness	Setting for the background lighting of the display. **Note: If the mode/node switches are set to 0/0, then brightness settings are automatically set to the default values from the factory settings every time the Mobile Panel device is restarted.**	Auto	The optimal brightness is automatically configured using the factory settings. A brightness value between 100% and 0% is set.
		0% to 100%	Manual setting of the desired brightness within factory settings limits.
Contrast	Setting for the contrast of the display. **Note: Contrast settings can only be configured for passive displays. If the mode/node switches are set to 0/0, then contrast settings are automatically set to the default factory settings every time the Mobile Panel device is restarted.**	Auto	The optimal contrast is automatically configured using the factory settings. A contrast value between 100% and 0% is set.
		0% to 100%	Manual setting of the desired contrast within factory settings limits.

Table 41: BIOS video configuration menu

PCI configuration

Figure 77: BIOS PCI configuration menu

BIOS setting	Meaning	Setting options	Effect
PCI INTA#	Activates the IRQ for the Ethernet controller. **BIOS default setting: IRQ 9.**	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Assigns these IRQs.
PCI INTB#	Activates IRQ for the USB controller. **BIOS default setting: IRQ 5.** First IRQ for the USB controller.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Assigns these IRQs.
PCI INTC#	Activates IRQ for the FPGA. **BIOS default setting: IRQ 10.** Second IRQ for the FPGA.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Assigns these IRQs.
PCI INTD#	Activates IRQ for the FPGA. **BIOS default setting: IRQ 7.** First IRQ for the FPGA.	Disabled	No IRQ is reserved.
		3, 4, 5, 6, 7, 9, 10, 11, 12, 14 or 15	Assigns these IRQs.

Table 42: BIOS PCI configuration menu

USB configuration

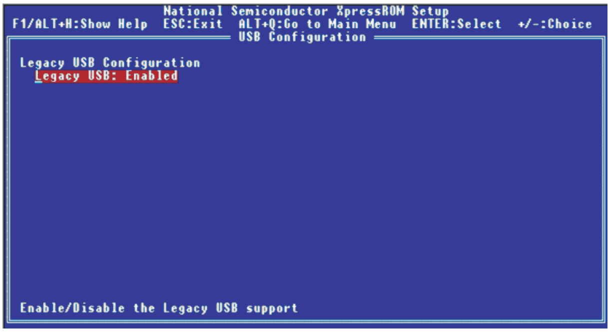


Figure 78: BIOS USB configuration menu

BIOS setting	Meaning	Setting options	Effect
Legacy USB	This function enables USB support in order to make BIOS settings, e.g. using a USB keyboard, even before the operating system with USB support is loaded. **Note: If the mode/node switch is set to 0/0, then Legacy USB support is always set to "enabled".**	Enabled	Enables USB Legacy support.
		Disabled	Disables USB Legacy support. **Note: After deactivating this support, booting from a USB floppy drive is no longer possible.**

Table 43: BIOS USB configuration menu

1.2.5 Memory optimization

Warning!

The parameters in this screen are for system designers, service personnel, and technically competent users only. Only modify those settings that you completely understand.

Incorrectly setting "Memory optimization" values can cause instability and even cause the entire system not to boot. If the Mobile Panel device can no longer be booted, then the default values can be restored by restarting three times.

Information:

More detailed information about the meaning and effects of the settings can also be found in the corresponding user's manual for the processor.

Figure 79: BIOS memory optimization menu

BIOS setting	Meaning	Setting options	Effect
Memory optimization	Defines how memory optimization is handled. With this option, it is recommended that the user upload the current base values being used by the system from the CPU to this BIOS page when setting values manually for the first time.	Conservative	The BIOS automatically uses PC66 timing.
		Optimized	BIOS uses optimized memory settings for the memory chips used. This allows faster timing.
		Aggressive	BIOS uses "aggressive" memory settings based on the SPD and CPU speed. **Important!** **Aggressive memory settings can cause stability problems for the system.**
		Manual	If "Manual" is selected, then the remaining values can be configured on this BIOS menu page. Values only become active when the user saves them before exiting BIOS and the Mobile Panel is rebooted.
Load current values from CPU	All the specified values are configured on this BIOS setup page with the current configured values.	None	The memory timing values currently used are uploaded by the CPU. It is recommended that when using this option, the user uploads optimal base values (that the system uses) from the CPU to this BIOS page when setting the values manually for the first time.
MD control	Configures MD[63:0] drive strength.	0 to 3	0 = weakest, 3 = strongest
MA/BA control	Configures MA[12:0] and BA[1:0] drive strength.	0 to 3	0 = weakest, 3 = strongest
MEM control	Configures RASA#, CASA#, WEA#, CS[1:0]#, CKEA, DQM[7:0] drive strength.	0 to 3	0 = weakest, 3 = strongest
SDRAM clock ratio	Configures SDRAM timing.	2; 2,5; 3; 3.5; 4; 4,5; 5	Sets DRAM clock timing.
Refresh interval	This parameter defines the number of processor core clocks that are multiplied by 64 between refresh cycles of the DRAM memory.	00 to FF	

Table 44: BIOS memory optimization menu

BIOS setting	Meaning	Setting options	Effect
Refresh stagger	This parameter defines the number of cycles between the RFSH command and each of the four rows.	0 SDRAM clocks to 3 SDRAM clocks	
2 CLK ADDR setup	Enables the two-clock address setup function.	Enabled	Enables this function.
		Disabled	Disables this function.
SMM mapping	Maps the SMM memory area from GX_BASE+400000 to the physical address A0000 to BFFFF in SDRAM.	Enabled	Enables this function.
		Disabled	Disables this function.
X-bus round robin	Configures the priority levels for processor, graphic and display controller requests.	Enabled	Processor, graphic and display controller requests are treated with the same priority level.
		Disabled	Processor requests are given a higher priority level. Display controller requests always have the highest priority.
SDRAM shift SDCLK	This function makes switching possible for SDCLK SDRAM hold time requests.	0.5, 1, 1.5, 2, 2.5, or 3	
		No shift	No switching.
Read data phase	Configures the read data phase. Regulates whether read data is latched to one or two core clocks for the rising edges of the SDCLK.	1 core clock	After one core clock.
		2 core clocks	After two core clocks.
Fast read mask	Prevents the bypassing of FIFO requests via the core.	Enabled	Enables this function.
		Disabled	Disables this function.
CAS latency	Column Address Strobe (CAS) latency describes the time it takes between addressing in a RAM block and preparing the data stored at this address. The higher the subsequent value, the greater the delay.	2, 3, 4, 5, 6, or 7 clk	Sets the desired cycle time.
tRC	Sets the minimum number of SDRAM cycles between RFSH and RFSH/ACT commands.	2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15 or 16 Clk	Sets the desired cycle time.
tRAS	Sets the minimum number of SDRAM cycles between ACT and PRE commands.	2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15 or 16 Clk	Sets the desired cycle time.
tRP	Sets the minimum number of SDRAM cycles between PRE and ACT commands.	1; 2; 3; 4; 5; 6 or 7 Clk	Sets the desired cycle time.
tRCD	Configures the delay between the ACT and READ/WRITE command. (tRCD) Sets the minimum number of SDRAM cycles between ACT and READ/WRITE commands.	1; 2; 3; 4; 5; 6 or 7 Clk	Sets the desired cycle time.
tRRD	Configures the time between ACT(0) to ACT(1) command period.	0-7	
tDPL	Sets the minimum number of SDRAM cycles between the time for the last record date until the memory area is reloaded.	1; 2; 3; 4; 5; 6; 7 Clk	Sets the desired cycle time.

Table 44: BIOS memory optimization menu (cont.)

1.2.6 Advanced BIOS features

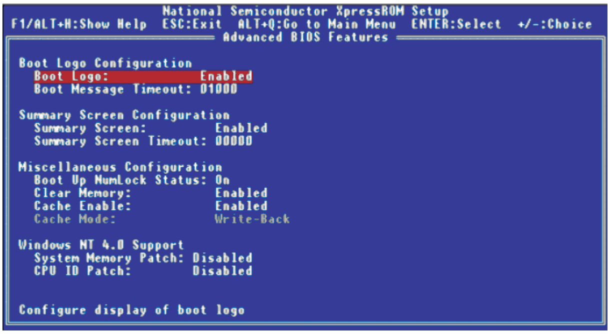


Figure 80: Advanced BIOS features menu

BIOS setting	Meaning	Setting options	Effect
Boot logo	Displays a boot logo while the Mobile Panel is starting.	Disabled	No boot logo displayed during booting.
		Enabled	A B&R boot logo is displayed during booting as long as a bitmap created by a user has not been added.
Boot message timeout	Defines the duration of the "Press DEL for Setup" message on the display and how much time the user has to change to the BIOS configuration. **Can be resumed before the timeout expires by pressing any button.**	0	No waiting.
		1-65535 [milliseconds]	The system waits for the manually set value in milliseconds and then resumes the boot procedure.
Summary screen	Displays information about BIOS, VGA, VSA versions, devices found, etc.	Enabled	Shows the summary screen.
		Disabled	Hides the summary screen.
Summary screen timeout	Defines how long the summary screen is displayed. **Can be resumed before the timeout expires by pressing any button.**	0	No waiting.
		1-65535 [milliseconds]	The manually set value in milliseconds that must pass.
Boot up NumLock status	Defines the status of an existing numeric keypad when the system is booted.	On	Enables the numeric keypad.
		Off	Disables the numeric keypad.
Clear memory	After starting, the BIOS automatically clears the entire main memory. Note: Clearing e.g. 256 MB RAM takes approximately 3 seconds.	Enabled	The entire main memory is cleared. This makes sense, e.g. when the system to be booted requires initialized main memory when booting.
		Disabled	Disables this function.
Cache enable	The processor has a 16 kB fast L1 cache. The data for fast access is provided in this memory.	Enabled	Recurring commands are processed in the fast L1 cache.
		Disabled	Disables this function.

Table 45: Advanced BIOS features menu

BIOS setting	Meaning	Setting options	Effect
Cache mode	Using cache mode, write accesses are determined on the cache. This option is permanently set to "Write back". The information is only written in the main memory if necessary (main memory and cache do not have the same information content).	None	-
System memory patch	When activated, the buffer address length is not returned as zero from the national specific software interrupt 15h, the system service function E8h and the sub-function 20h (Get system memory map). **This function should be activated only when using the Windows NT 4.0 operating system.**	Enabled	Enables this function.
		Disabled	Disables this function.
CPU ID patch	If Windows NT 4.0 checks the CPU ID and recognizes a Geode CPU, it will not be able to be operated with it. Recognition is implemented starting from Service Pack 6. For this reason, this function must be enabled during installation of Windows NT 4.0 until Service Pack 6 has been installed. **This function should be activated only when using the Windows NT 4.0 operating system.**	Enabled	Enables this function.
		Disabled	Disables this function.

Table 45: Advanced BIOS features menu (cont.)

1.2.7 Special OEM features

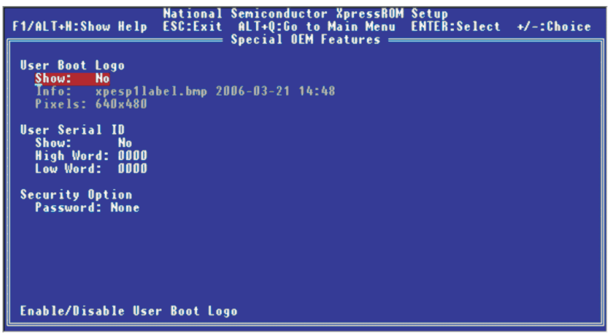


Figure 81: BIOS special OEM features menu

BIOS setting	Meaning	Setting options	Effect
Show (user boot logo)	A boot logo that has been created by a user can be displayed here instead of the B&R boot logo.[1)]	Yes	Display
		No	

Table 46: BIOS special functions menu

BIOS setting	Meaning	Setting options	Effect
Info	Displays the name and the creation date of the user boot logo.	None	-
Pixels	Displays the resolution of the user boot logo.	None	-
User serial ID show	A user serial number can be displayed in the summary screen using this function when the system is started.	Yes	Displays the assigned user serial ID.
		No	Hides the assigned user serial ID.
High word	Input possibilities for the first 4 bytes for the user serial number.	0000-FFFF	The hexadecimal value entered defines the first 4 positions of the user serial ID.
Low word	Input possibilities for the second 4 bytes of the user serial number.	0000-FFFF	The hexadecimal value entered defines the second 4 positions of the user serial ID.
Password	A password can be defined here which must be entered by the user when the BIOS setup is opened.	Max. 8 characters	The password must be confirmed by being entered a second time. The password can be removed again by entering a blank password (just pressing Enter). **Important: The password is also saved in the CMOS backup and is impossible to delete.**

Table 46: BIOS special functions menu (cont.)

1) See section 1.3.2 "User boot logo upgrade disk" on page 149 regarding guidelines for creating a user boot logo.

1.2.8 Device information

Figure 82: BIOS device information menu

BIOS setting	Meaning	Setting options	Effect
Mode/Node	Displays the current mode/node switch position.	None	-
Write protect	Displays the switch position for the "write protect" switch.	None	-
I/O address	Displays the Ethernet I/O address.	None	-
MAC address	Displays the assigned MAC address.	None	-

Table 47: BIOS device information menu

BIOS setting	Meaning	Setting options	Effect
CPU intern	Displays the current internal processor temperature.	None	-
Board I/O	Indicates the current board I/O temperature.	None	-
Status	The status for the last automatically saved CMOS backup is displayed here.	None	If the boot procedure is successful, then the CMOS values are automatically saved by BIOS in flash memory. Values are therefore only saved in flash memory if the backup is not equal to the current CMOS, the backup is not available, or the backup checksum is incorrect.
Date	Date of the last automatically saved CMOS backup.	None	
Time	Time of the last automatically created CMOS backup.	None	
Status	Status display for factory settings.	None	-
Version	Version display for factory settings.	None	-
Device ID	Hex value for the device code of the Mobile Panel device.	None	-
Compatibility ID	The compatibility code of the Mobile Panel device is displayed here.	None	-
Display ID	Shows the display ID used. Possible display IDs are: 00h - Unknown 10h - Passive displays (STN) 11h - LCD B/W QVGA 12h - LCD COL QVGA 20h - Active displays (TFT) with QVGA 30h - Active displays (TFT) with VGA 40h - Active displays (TFT) with SVGA 50h - Active displays (TFT) with XVGA	None	-
Brightness	The defined brightness values (minimum, default, maximum) for the display used are shown here as hex values.	None	-
Contrast	The defined contrast values (minimum, default, maximum) for the display used are shown here as hex values.	None	-

Table 47: BIOS device information menu (cont.)

1.2.9 Firmware configuration

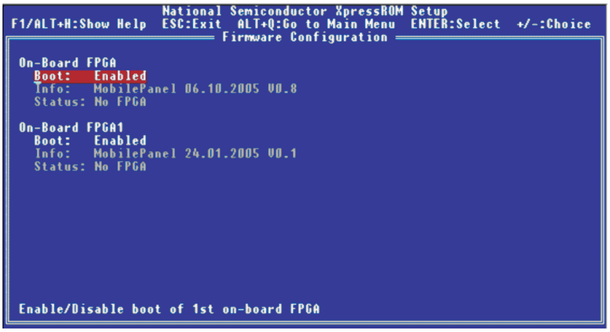


Figure 83: BIOS firmware configuration menu

BIOS setting	Meaning	Setting options	Effect
Onboard FPGA Boot	The onboard FPGA controls the image output for Mobile Panel 200 devices with BIOS.	Enabled	The onboard FPGA is enabled and initialized.
		Disabled	Deactivates the FPGA. If this function is deactivated, then no picture is output on Mobile Panel 200 devices. This function can only be re-enabled using the program "REMHOST" (see section "REMHOST utility disk" on page 151).
Info	Information about the FPGA firmware.	None	-
Status	Status display for the onboard FPGA.	None	-
Onboard FPGA1 Boot	The onboard FPGA controls the image output for Mobile Panel 200 devices with BIOS.	Enabled	The onboard FPGA is enabled and initialized.
		Disabled	Deactivates the FPGA. If this function is deactivated, then no picture is output on Mobile Panel 200 devices. This function can only be re-enabled using the program "REMHOST" (see section "REMHOST utility disk" on page 151).
Info	Information about the FPGA firmware.	None	-
Status	Status display for the onboard FPGA.	None	-

Table 48: BIOS firmware configuration menu

1.2.10 Restore CMOS values

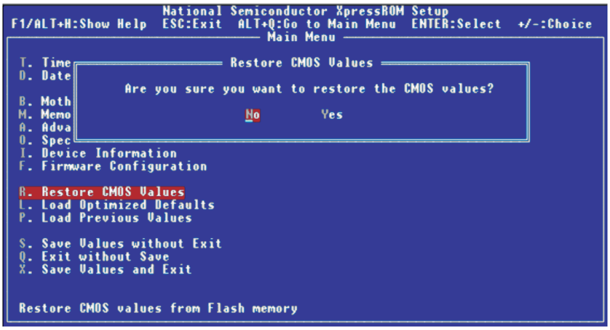


Figure 84: BIOS restore CMOS values menu

Selecting "Yes" under this BIOS menu (R shortcut) restores the last CMOS values stored in flash memory. All configurable CMOS values (besides date and time) are restored again in the BIOS setup.

Information:

If the boot procedure is successful, then the CMOS values are automatically saved by BIOS in flash memory. Values are therefore only saved in flash memory if the backup is not equal to the current CMOS, the backup is not available, or the backup checksum is incorrect.

To protect CMOS data, a CMOS backup was integrated into BIOS. If BIOS setup was ended using "Save Values and Exit" and the Mobile Panel device was correctly restarted, then the CMOS data is burned in the flash memory. If the CMOS checksum is incorrect during startup (battery empty) or the Mobile Panel device cannot be booted correctly three times consecutively, then the salvaged data from flash memory is copied again to CMOS. Setup is back to its original state, except for the time.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.2.11 Load optimized defaults

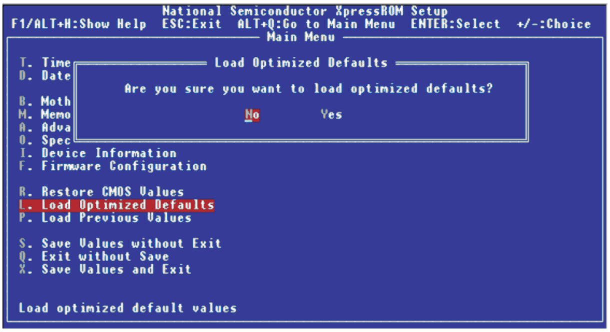


Figure 85: BIOS load optimized defaults menu

By clicking on "Yes", optimal BIOS settings for best performance can be loaded using this BIOS menu item (L shortcut).

Information:

These settings are also recommended by B&R.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.2.12 Load previous values

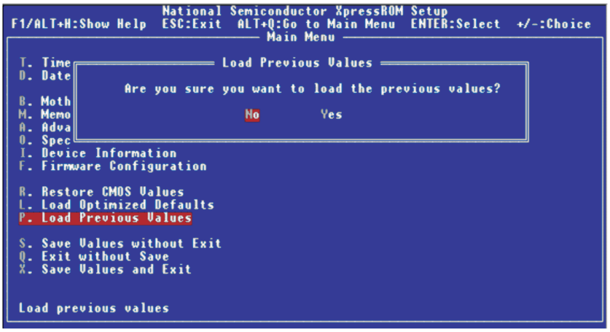


Figure 86: BIOS load previous values menu

Selecting "yes" under this BIOS menu item (P shortcut) reloads the values at the point when BIOS setup was opened. All changes which had been made up to that point are lost as a result.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.2.13 Save values without exit

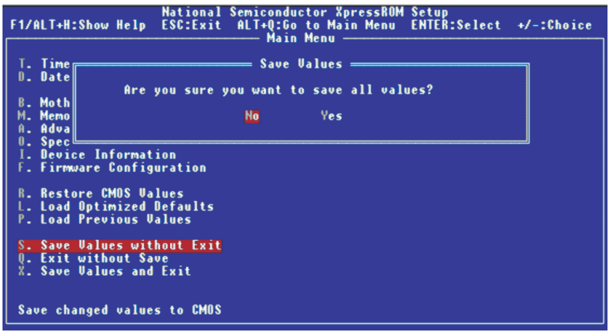


Figure 87: BIOS save values without exit menu

BIOS values are saved using this menu item (S shortcut) by selecting "Yes". The user can then make additional settings or exit BIOS setup.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.2.14 Exit without save

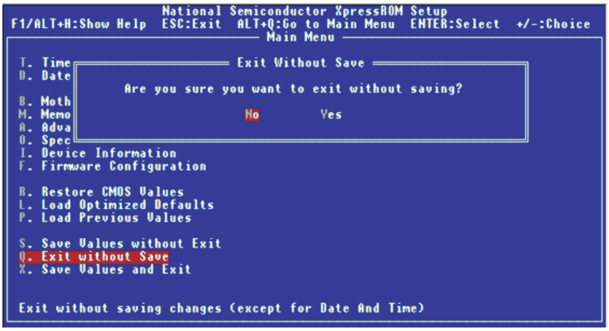


Figure 88: BIOS exit without save menu

BIOS setup can be exited by selecting "Yes" under this menu item (shortcut "Q") without saving any changes that might have been made. The system is then automatically restarted.

Information:

If using a German keyboard, press the "z" key to enter "y".

1.2.15 Save values and exit

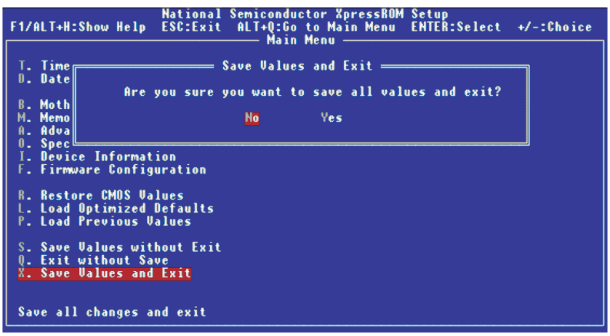


Figure 89: BIOS save values and exit menu

If "Yes" is selected under this menu item (X shortcut), the system saves the settings, automatically exits BIOS setup, and reboots the system.

For more information about the CMOS backup, see the section 1.4 "CMOS backup".

Information:

If using a German keyboard, press the "z" key to enter "y".

1.3 BIOS upgrade und utilities

Information:

The following diagrams and BIOS menu items including descriptions refer to BIOS Version 1.16. It is therefore possible that these diagrams and BIOS descriptions do not correspond with your installed BIOS version.

BIOS Upgrade & Utilities consists of the following parts:

- BIOS upgrade disk
- User boot logo upgrade disk
- REMHOST utility disk

1.3.1 BIOS upgrade disk

An upgrade might be necessary for the following reason:

- To update implemented functions or to add newly implemented functions or components to the BIOS setup (information about changes can be found in the Readme files of the BIOS upgrade).

A current BIOS upgrade can be found on the HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00) or directly downloaded from the download area on the B&R homepage (www.br-automation.com).

Procedure

The following steps should be carried out to upgrade or save BIOS:

- First, a blank HD disk must be made bootable (command line "sys a:" or "format a: /s").

Information:

For the upgrade, a boot disk must be created (or a bootable CompactFlash card) with Windows ME, Windows XP or MS-DOS 6.22.

MS-DOS boot disks function with BIOS versions earlier than 1.02 only with REMHOST.

- Copy the contents of the *.zip file to this diskette.
- Insert diskette in the USB floppy disk drive and reboot the Mobile Panel device (possibly from the floppy disk drive of a remote PC using REMHOST, see also section 1.3.3 "REMHOST utility disk" on page 151). For the settings required when booting the Mobile Panel device from a diskette, see section "Drive configuration" on page 129 for VGA Mobile Panel devices.
- After booting from the diskette, the following start menu opens up:

```
Microsoft Windows Startup Menu
===================================

1. Upgrade complete System (BIOS,FPGA)
2. Upgrade XpressROM BIOS
3. Upgrade FPGA Firmware
4. Save complete System (BIOS, FPGA)
5. Save XpressROM BIOS
6. Save FPGA Firmware
7. Exit

Enter a choice:_
```

Figure 90: BIOS upgrade start menu

Item	Menu item	Description
1	Upgrade complete system (BIOS, FPGA)	All BIOS areas (XpressROM and FPGA firmware) are automatically updated (default after 5 sec).
2	Upgrade XpressROM BIOS only	Only the XpressROM BIOS is automatically updated.
3	Upgrade FPGA firmware only	Only the FPGA firmware is automatically updated.
4	Save complete system	All BIOS areas (XpressROM and FPGA firmware) are automatically protected. **Information:** **There must be up to 448 KB free space on the disk.**
5	Save XpressROM BIOS only	Only the XpressROM BIOS is automatically protected. **Information:** **There must be approximately 256 KB free space on the disk.**
6	Save FPGA firmware only	Only the FPGA firmware is automatically protected. **Information:** **There must be up to 192 KB free space on the disk.**
7	Exit	Returns to the shell (MS-DOS).

Table 49: BIOS upgrade menu description

Information:

If you do not press a button within 5 seconds, then step 1 "Upgrade complete system" (BIOS, FPGA) is automatically carried out and the Mobile Panel is automatically updated.

If you want to individually upgrade the XpressROM or the FPGA firmware, then these options can be selected in the start menu (2 or 3). It is also possible to protect the existing BIOS or individual components. For this, there must be approximately 448 KB free space on the disk. Otherwise, "Save..." functions might not be able to be executed.

- The system must be rebooted after a successful upgrade.

1.3.2 User boot logo upgrade disk

A software tool for updating, backing up, or deleting the user boot logo can be downloaded directly from the service portal of the B&R homepage (www.br-automation.com).

Procedure

The following steps should be taken to update, save or delete a user boot:

- First, a blank HD disk must be made bootable (command line "sys a:" or "format a: /s").

Information:

For the upgrade, a boot disk must be created (or a bootable CompactFlash card) with Windows ME, Windows XP or MS-DOS 6.22.

MS-DOS boot disks function with BIOS versions earlier than 1.02 only with REMHOST.

- Copy the contents of the *.zip file to this diskette.
- Creates the user boot logo according to section "Guidelines for creating a user boot logo" on page 151 and copies to the disk.
- Insert diskette in the USB floppy disk drive and reboot the Mobile Panel device (possibly from the floppy disk drive of a remote PC using REMHOST, see also section 1.3.3 "REMHOST utility disk" on page 151). For the settings required when booting the Mobile Panel device from a diskette, see section "Drive configuration" on page 129 for VGA Mobile Panel devices.
- After booting from the diskette, the following start menu opens up:

```
Microsoft Windows Startup Menu
===================================

1. Update User Boot Logo
2. Save User Boot Logo
3. Delete User Boot Logo
4. Exit

Enter a choice:_
```

Figure 91: User boot logo upgrade start menu

Item	Menu item	Description
1	Update user boot logo	The user boot logo is automatically updated with the file USERLOGO.ROM (default after 5 seconds).
2	Save user boot logo	The user boot logo is automatically saved in the file USERLOGO.SAV. **Information:** **There must be up to 192 KB free space on the disk.**
3	Delete user boot logo	An existing user boot logo is deleted in the flash. **Information:** **The B&R boot logo is then automatically displayed again by BIOS.**
4	Exit	Returns to the shell (MS-DOS).

Table 50: User boot logo upgrade menu description

Information:

If you do not press a button within 5 seconds, then step 1 "Update User Boot Logo" is automatically carried out and the Mobile Panel is automatically updated.

- The system must be rebooted after a successful upgrade.
- In the BIOS CMOS setup, the display of the boot logo must be set from "No" to "Yes" (see section 1.2.7 "Special OEM features" on page 138 for VGA Mobile Panel devices).

Guidelines for creating a user boot logo

To update the user boot logo, a bitmap must be created according to the following guidelines and then copied to the user boot logo upgrade disk:

1) A Windows bitmap with a maximum of 256 colors must be created with the appropriate resolution for the Mobile Panel: 640x480 (VGA). The bitmap is not allowed to be compressed.
2) Since status messages are output on the top of the display when booting the Mobile Panel, there should not be any user boot logo pixels positioned here in the bitmap (approximately 10 rows of pixels), as these would be covered up. These status messages use bitmap palette index 0 as the background color and index 7 as the foreground color (starting from BIOS V1.05; index 63 with older versions).
3) Using the utility USERLOGO.EXE, the bitmap file must then be converted into a ROM file that can be read by BIOS (please refer to the online help for the utility for more instructions about this).
4) The userlogo.rom file created by the utility is only permitted to have a maximum size of 192 KB. If this size is exceeded, a warning appears. The user can e.g. reduce the details in the Windows bitmap in order not to exceed the maximum byte size.
5) After this, the userlogo.rom file should be copied to the disk.

1.3.3 REMHOST utility disk

The REMHOST (remote host) software tool can be downloaded directly from the service portal on the B&R homepage (www.br-automation.com).

General information

REMHOST is an MS-DOS program (REMHOST.EXE) that can be used by a remote PC to operate a BIOS Mobile Panel device. The Mobile Panel receives keyboard entries from a remote PC using REMHOST. Screen outputs for the Mobile Panel device are redirected to the screen of the remote PC. The Mobile Panel can access the floppy drive (internal or external) of the remote PC or an individual floppy drive (USB) and boot from this as well.

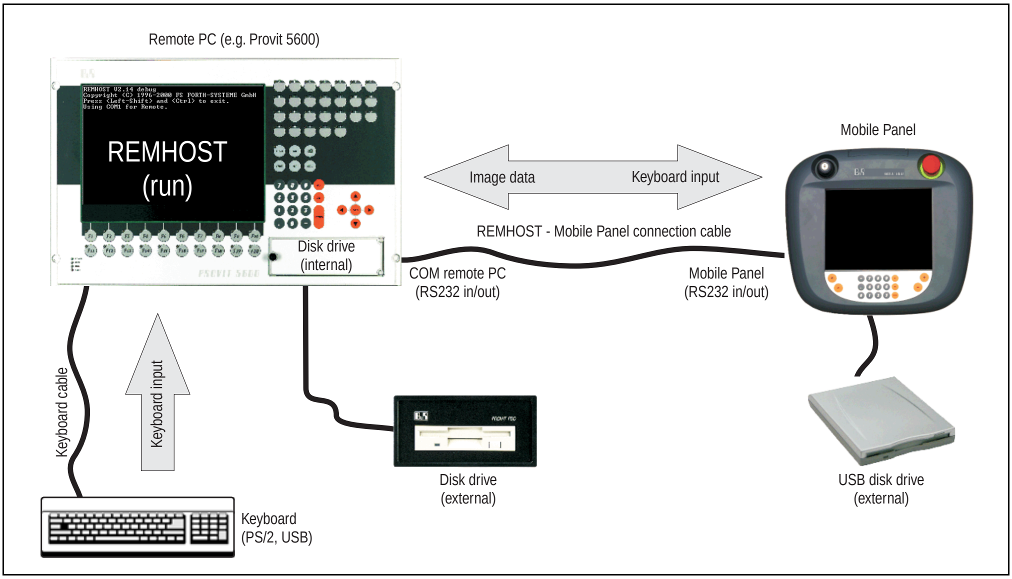


Figure 92: REMHOST communication model

REMHOST can be used if :

- The display for the Mobile Panel device is not functioning.
- Brightness and contrast settings for the Mobile Panel display are adjusted in such a way that outputs can no longer be seen.
- There is no USB floppy present and the BIOS for the Mobile Panel device should be updated.

Requirements

The Mobile Panel must be connected to the remote PC using a serial cable (see figure "Pin assignments - REMHOST / Mobile Panel connection cable" on page 156 for the necessary assignment). The serial cable must be connected to a COM interface on the remote PC and to the COM interface on the Mobile Panel device (see figure 92 "REMHOST communication model"). The mode/node switches on the Mobile Panel device must be set to 00 (service mode) see figure "Mode/node switches" on page 45.

Important notes

Information:

- **REMHOST only functions when the "diverted" functions for the Mobile Panel device are operated using BIOS calls. This means, for example, that if a program writes directly to the video memory on the Mobile Panel, then these outputs cannot be redirected to the screen of a remote PC. Generally, only programs which work in text mode should be used. Therefore, a MS-DOS start diskette must be used when booting the Mobile Panel using REMHOST. If a Windows start diskette is used, illegible symbols are output on the remote screen and the user's inputs are not correctly displayed.**
- **REMHOST must be run from MS-DOS. In the MS-DOS command prompt in Windows, error-free operation of REMHOST is not guaranteed: e.g. very slow screen outputs (in Windows NT4.0 and 2000), errors with write accesses to the remote floppy, etc.**

Warning!

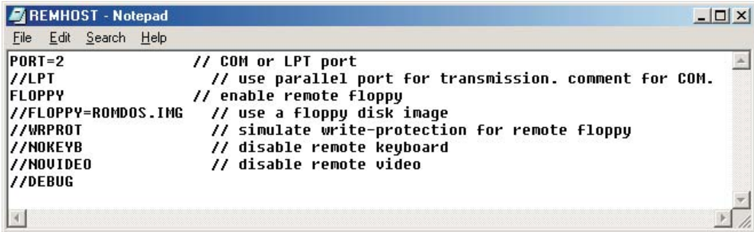
When upgrading BIOS using REMHOST, note that the Mobile Panel, the remote PC and the serial connection must all remain connected to each other while the upgrade is taking place.

Caution!

The Mobile Panel can no longer be started if the BIOS upgrade is aborted. Therefore, when upgrading BIOS with REMHOST, REMHOST should be started in MS-DOS (not in the MS-DOS command prompt from Windows).

REMHOST configuration

The function of REMHOST is controlled by a REMHOST.INI configuration file. REMHOST.INI is an ASCII text file that can be opened and edited with any text editor (e.g. Notepad).



```
PORT=2                  // COM or LPT port
//LPT                     // use parallel port for transmission. comment for COM.
FLOPPY                  // enable remote floppy
//FLOPPY=ROMDOS.IMG       // use a floppy disk image
//WRPROT                  // simulate write-protection for remote floppy
//NOKEYB                  // disable remote keyboard
//NOVIDEO                 // disable remote video
//DEBUG
```

Figure 93: Example of REMHOST.INI

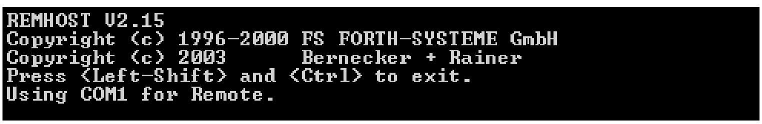
The following table lists all commands supported by REMHOST. If the commands begin with consecutive slash symbols ("//") , then these are evaluated as the beginning of a comment. This can be used to disable individual parameters.

Setting option	Description
PORT=x	Specifies the COM interface on the remote PC that is being used for the serial connection to the Mobile Panel. "x" stands for the COM number, e.g. COM2 is used for PORT=2.
LPT	The parallel interface is used for communication. This option cannot be used with the Mobile Panel.
FLOPPY	The floppy disk drive in the remote PC is used as the floppy disk drive for the Mobile Panel. Therefore, a USB floppy disk drive connected to the Mobile Panel cannot be used.
FLOPPY=ROMDOS.IMG	A floppy image file can be used for the simulation of a floppy disk drive on the hard disk of the remote PC. A floppy image can be created with the program WINIMAGE (a shareware version can be downloaded from www.winimage.com). In this way, several versions of BIOS upgrades can be easily stored on the hard disk of the remote PC.
WRPROT	Write protection for the floppy disk drive can be simulated using this parameter.
NOKEYB	If this parameter is activated, then the keyboard of the remote PC is not used by REMHOST. Input must then take place on the Mobile Panel, e.g. using a USB keyboard.
NOVIDEO	If this parameter is activated, then the screen output is not made on the remote PC. Outputs take place on the display of the Mobile Panel device.
DEBUG	REMHOST outputs debug information.

Table 51: Description of REMHOST.INI configuration options

Program start

The name of the configuration file can be specified when starting the program. If no name is specified, then the REMHOST.INI file is used by default.



```
REMHOST V2.15
Copyright (c) 1996-2000 FS FORTH-SYSTEME GmbH
Copyright (c) 2003      Bernecker + Rainer
Press <Left-Shift> and <Ctrl> to exit.
Using COM1 for Remote.
```

Figure 94: REMHOST program start

After the program is started, REMHOST displays the current version as well as the COM interface of the remote PC that is used for communication with the Mobile Panel.

The connection with the Mobile Panel device is established when it is rebooted and its mode/node switches are set to 00h.

Information:

If the Mobile Panel is already started, then a connection can NOT be established using a subsequent REMHOST start.

Program end

REMHOST can be ended by pressing the left SHIFT key and the CTRL key simultaneously.

Information:

The Mobile Panel must be restarted in order to undo the redirections for keyboard, floppy disk drive and display.

Pin assignments - Connection cable

In order to establish a serial connection between a Mobile Panel CE device and a remote PC (e.g. Provit 5600), an RS232 cable needs to be connected correctly.

The cable can be a maximum of 15 meters, and the pins must be connected as follows:

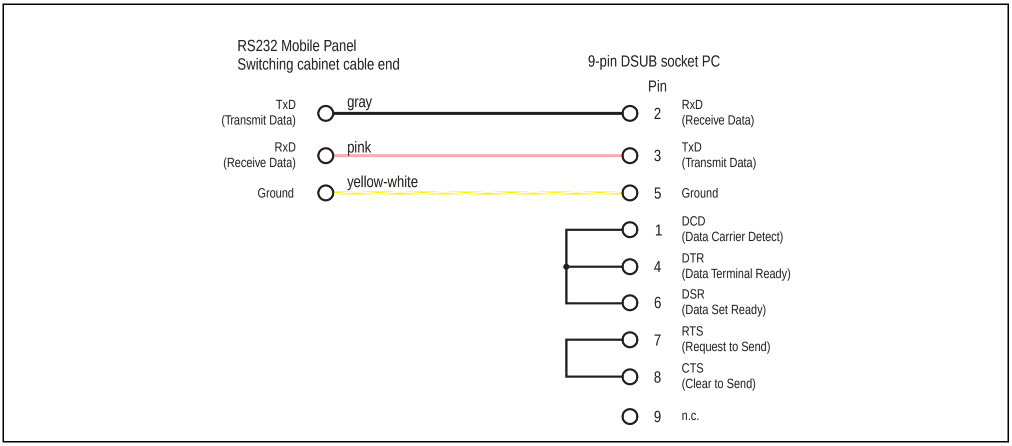


Figure 95: Pin assignments - REMHOST / Mobile Panel connection cable

The three ends of the RS232 Mobile Panel switching cabinet cable (grey, pink, and yellow-white) must be connected to a 9-bin DSUB socket as shown in the above image. Some of the pins of the 9-pin DSUB socket must be connected with each other as well.

1.4 CMOS backup

To protect CMOS data, a CMOS backup has been integrated into BIOS. If BIOS setup was ended using "Save Values and Exit“ (see section 1.2.15 "Save values and exit" on page 145 for VGA Mobile Panel devices) and the Mobile Panel device was successfully restarted, then the CMOS data is burned in the flash memory. If the CMOS checksum is incorrect during startup (battery empty) or the Mobile Panel device cannot be booted correctly on three consecutive attempts, then the salvaged data from flash memory is copied again to CMOS. Setup is back to its original state, except for the time.

1.5 Distribution of resources

1.5.1 RAM address assignment

RAM address	Resource
00000000 - 000003FF	Interrupt vectors
00000400 - 000004FF	BIOS data area
00000500 - 0009FBFF	Freely available for the operating system (MS-DOS program area)
0009FC00 - 0009FFFF	Advanced BIOS data area
000A0000 - 000BFFFF	VGA memory
000C0000 - 000C7FFF	VGA BIOS
000C8000 - 000CBFFF	Reserved
000CC000 - 000EFFFF	XpressROM expansion ROMS. Unused areas can be used for HMA.
000F0000 - 000FFFFF	XpressROM BIOS
00100000 - BC_RAM_TOP	Remaining DRAM
40000000	GX_Base Register (determined by BIOS)
40000000 - 40000BFF	L1 scratchpad
40008000 - 400080FF	Internal BUS IF unit registers
40008100 - 400082FF	Graphics pipeline registers
40008300 - 400083FF	Display controller registers
40008400 - 400084FF	Memory controller registers
40009000 - 403FFFFF	PCI Accessible
40010000 - 40010FFF	Video configuration registers
40011000 - 40011FFF	Audio configuration registers
40015000 - 40015FFF	VIP interface registers
40800000 - 40BFFFFF	VGA frame buffer
D0000000 - FBFFFFFF	PCI memory and PCI ROM (are dynamically assigned during POST)
FFE00000 - FFFFFFFF	High BIOS area (flash memory)

Table 52: RAM address assignment

1.5.2 DMA channel assignment

DMA channel	Resource
0	Free
1	Free
2	Disk drive
3	Free
4	Free
5	Free

Table 53: DMA channel assignment

DMA channel	Resource
6	Free
7	Free

Table 53: DMA channel assignment (cont.)

1.5.3 I/O address assignment

I/O address	Resource
0000 - 000F	DMA controller channels 0-3
0020 - 0021	Master programmable interrupt controller
0022 - 0023	CPU configuration registers
0040 - 0043	Programmable interval timer
0060 - 0066	Keyboard controller (emulated by Legacy USB)
0070 - 0071	RTC (real-time clock)
0072 - 0073	Extended RTC (real-time clock)
0080	BIOS POST debug output port
0081 - 0083	DMA channel low page registers
0084	VSA debug output port
0085 - 008F	DMA channel low page registers
0092	Port A control register
00A0 - 00A1	Slave programmable interrupt controller
00C0 - 00CF	DMA controller channels 4-7
00D0 - 00DF	DMA status/control/mode registers channel 0-7
00F0 - 00F1	Co-processor error register
015C - 015D	On-chip SIO configuration
0170 - 0177	Primary IDE
01F0 - 01F7	Primary IDE
0220 - 022F	Audio (not supported)
02F8 - 02FF	COM2
0376 - 0377	Secondary IDE channel
03B0 - 03BB	Video controller
03C0 - 03DF	Video controller
03E8 - 03EF	COM3
03F0 - 03F5	Floppy controller (emulated by Legacy USB)
03F6 - 03F7	Primary IDE
03F8 - 03FF	COM1
0480 - 048F	DMA channel high page registers
04D0 - 04D1	Interrupt edge/level registers
0CF8 - 0CFF	PCI configuration registers

Table 54: I/O address assignment

I/O address	Resource
5000 - 500F	IDE controller configuration registers (F2BAR4)
6000 - 60FF	SMI status
6200 - 623F	X-Bus expansion support registers (F5BAR0)
6400 - 643F	GPIO runtime and configuration registers (F0BAR0)
6600 - 663F	LPC support registers (F0BAR1)
9000 - 903F	CPU configuration registers
AC00 - ACFF	aCPI registers (F1BAR1)
AD00 - AFFF	PCI assignment (dynamically assigned during POST)
B000 - BFFF	PCI assignment (dynamically assigned during POST)
C000 - CFFF	PCI assignment (dynamically assigned during POST)
D000 - DFFF	PCI assignment (dynamically assigned during POST)
E000 - EFFF	PCI assignment (dynamically assigned during POST)
F000 - FFFF	Reserved

Table 54: I/O address assignment (cont.)

1.5.4 Interrupt assignment

Interrupt	Resource
IRQ 0	System timer
IRQ 1	Keyboard (Legacy USB emulation)
IRQ 2	2nd PIC IRQ cascade
IRQ 3	COM2 [1)]
IRQ 4	COM1 [1)]
IRQ 5	USB
IRQ 6	Disk drive
IRQ 7	FPGA [1)] (1st interrupt)
IRQ 8	RTC (real-time clock)
IRQ 9	Ethernet (MacPhyter) [1)]
IRQ 10	FPGA (2nd interrupt)[1)]
IRQ 11	COM3 [1)]
IRQ 12	PS/2 mouse (Legacy USB emulation)
IRQ 13	FPU (co-processor)
IRQ 14	Primary IDE (primary hard disk)
IRQ 15	Secondary IDE (secondary hard disk)

Table 55: Interrupt assignment

1) BIOS setup default setting

2. Mobile Panel with Automation Runtime

2.1 General information

B&R Automation Runtime guarantees a uniform runtime environment for Automation Studio programs on all target systems. This ensures uniform programming and operation on all devices.

Automation Runtime™ possesses a multitasking operating system adapted especially for use with control technology. The cycle time for your application can be separated among several task classes. Automation Runtime ensures that all application programs are executed within defined time periods, proving itself to be a configurable, deterministic real-time multitasking system.

An extensive project can be divided into small individual tasks. This way of working increases modularity and makes it much easier to maintain projects.

2.2 Control and visualization with the Mobile Panel

Both the control program and the visualization application run on the Mobile Panel. I/O peripherals and drives are connected via the CAN bus. Communication to higher-level systems is handled by Ethernet.

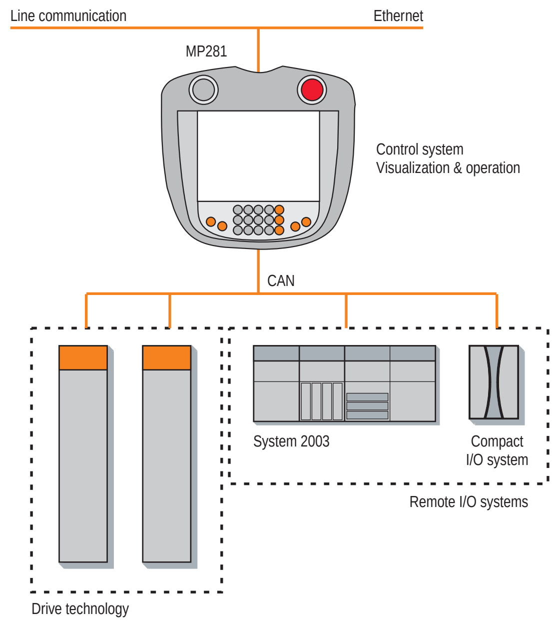


Figure 96: Control and visualization with the Mobile Panel

2.3 Operation and monitoring with the Mobile Panel

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 take place on a central Mobile Panel, which uses Ethernet to communicate with the controllers.

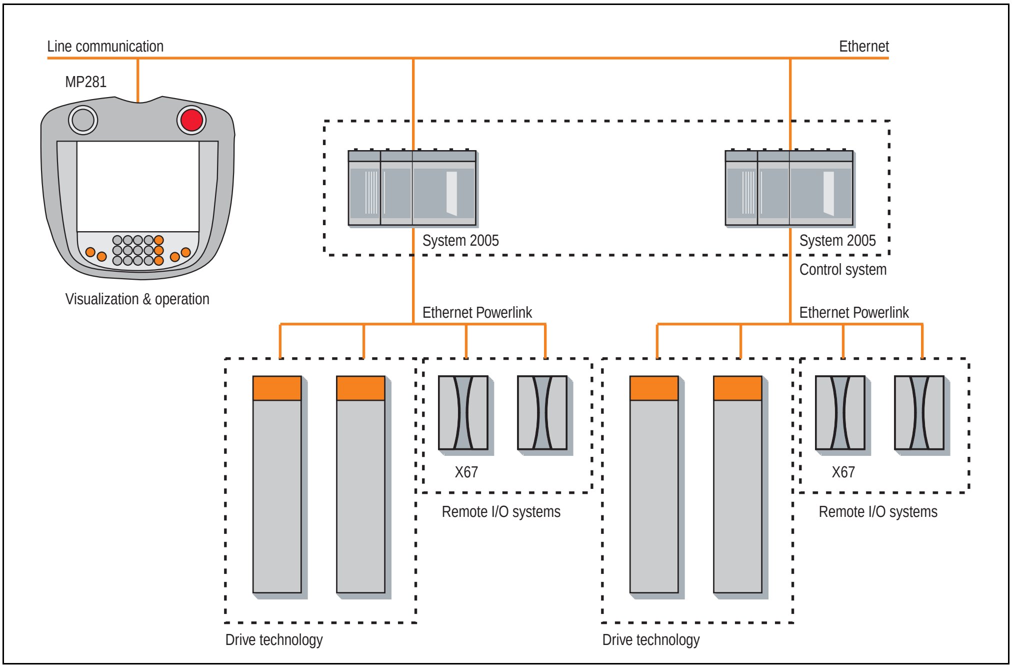


Figure 97: Operation and monitoring with the Mobile Panel

2.4 Summary screen

When the Mobile Panel device is turned on, a summary screen is briefly displayed which shows the parameters most important to an Automation Runtime Mobile Panel device.

Information:

The following image and description refer only to Automation Runtime V2.66. For this reason, this image may not match with Automation Runtime version installed on your device.

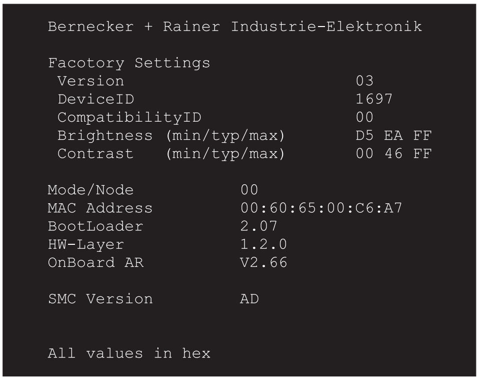


Figure 98: Automation Runtime summary screen

Information	Example value	Meaning
Version	03	Displays the factory settings version. These factory settings determine the device ID, display ID, display-specific initialization sequences, and other important parameters. **Information:** **Factory settings are set by B&R and cannot be changed by the user!**
Device ID	1697	Displays the hexadecimal value of the hardware device number.
Compatibility ID	00	Displays the version of the device within the same B&R device code. This ID is needed for Automation Runtime.
Brightness (min / typ / max)	D5 EA FF	Displays the minimum, typical, and maximum values for the brightness settings of the display as hexadecimal values.
Contrast (min / typ / max)	00 46 FF	Displays the minimum, typical, and maximum values for the contrast settings of the display as hexadecimal values.
Mode/Node	00	Displays the current operating mode switch positions.
MAC address	00:60:65:00:C6:A7	Displays the assigned media access control (MAC) address.
Boot loader	2.07	Displays the version of the boot loader.
HW layer	1.2.0	Displays the version of the hardware layer.
Onboard AR	V2.66	Displays the current onboard Automation Runtime version.
SMC version	AD	Displays the current SMC (system management controller) software version.

Table 56: Automation Runtime summary screen

3. Mobile Panel with Windows CE

Figure 99: Windows CE logo

Model number	Short description	Note
9S0001.13-010	**OEM Microsoft Windows CE 4.1 German** OEM Microsoft Windows CE 4.1 German license, only supplied together with a Mobile Panel BIOS device.	
9S0001.13-020	**OEM Microsoft Windows CE 4.1 English** OEM Microsoft Windows CE 4.1 English license, only supplied together with a Mobile Panel BIOS device.	
9S0001.17-020	**OEM Microsoft Windows CE 4.2 English** OEM Microsoft Windows CE 4.2 English license, only supplied together with a Mobile Panel BIOS device.	
9S0001.29-020	**OEM Microsoft Windows CE 5.0 English** OEM Microsoft Windows CE 5.0 English license, only supplied together with a Mobile Panel BIOS device.	

Table 57: Model numbers - Windows CE

3.1 General information

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

Advantages

- Windows CE is a 32-bit operating system with multitasking and multithreading capabilities.
- In addition to being compact, it also offers high performance for configurations with limited RAM.
- Windows CE is best suited for integrated automation used in industrial systems.
- Windows CE is also less expensive than other Windows licenses.

The Windows CE version available from B&R has been developed for Mobile Panel BIOS devices and is only available with a Mobile Panel BIOS device.

3.2 Requirements

The Mobile Panel device must meet the following criteria to run Windows CE.

- Mobile Panel device with BIOS
- At least 128 MB SDRAM main memory

3.3 Installation

Windows CE is usually preinstalled at B&R Austria.

3.4 Serial ActiveSync connection

In order to establish a serial connection between a Mobile Panel CE device and a desktop PC, an RS232 cable needs to be connected correctly.

Information:

Serial ActiveSync connections are offered on Mobile Panel devices beginning with Revision C0.

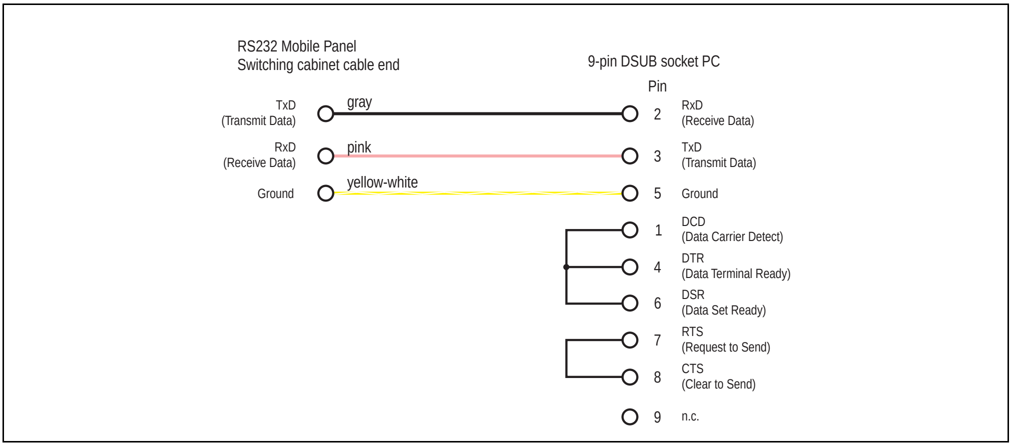


Figure 100: Directions for establishing an ActiveSync connection

The three ends of the RS232 Mobile Panel switching cabinet cable (grey, pink, and yellow-white) must be connected to a 9-bin DSUB socket as shown in the above image. Some of the pins of the 9-pin DSUB socket must be connected with each other as well.

Additional information can also be found in the B&R Windows CE help system.

3.5 Mobile Panel as a thin client

The Mobile Panel with Windows CE is connected as a thin client to an industrial PC with Windows XP Professional/Embedded via Ethernet. The control program runs on the industrial PC, and I/O peripherals and drives are connected to the industrial PC via a fieldbus.

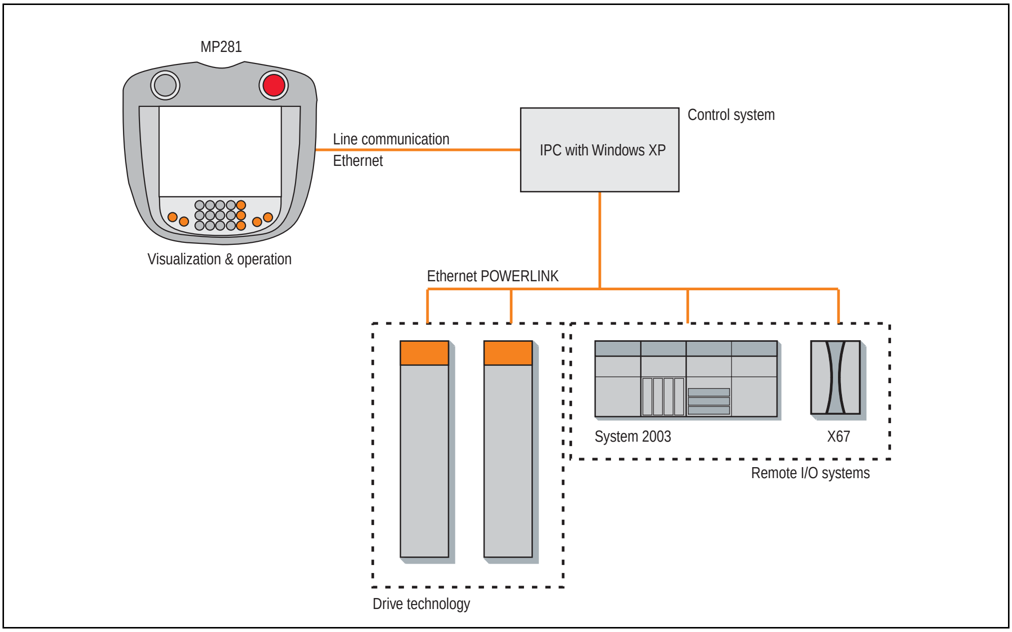


Figure 101: Mobile Panel as a thin client

4. Mobile Panel with Windows XP Embedded

Figure 102: Windows XP Embedded Logo

Model number	Short description	Note
9S0001.21-020	**OEM Microsoft Windows XPe MP100/200 w/CF English** Only available with a Mobile Panel BIOS device!	
9S0001.26-020	**OEM Microsoft Windows XPe MP100/200 w/CF English** Only available with a Mobile Panel BIOS device!	

Table 58: Model numbers - Windows XP Embedded

4.1 General information

Windows XP Embedded is the most modular version of the Windows XP Professional desktop operating system and makes it possible to quickly develop reliable and advanced embedded devices. Windows XP Embedded is based on the same binary files as Windows XP Professional and is optimally tailored to the hardware being used. In other words, only the functions and modules required by the respective device are included. Windows XP Embedded is also based on the same reliable code as Windows XP Professional. It provides industry with leading reliability, improvements in security and performance, and the latest technology for Web browsing and extensive device support.

The Windows XP Embedded version available from B&R has been developed for Mobile Panel BIOS devices and is only available with a Mobile Panel BIOS device.

4.2 Requirements

The Mobile Panel device must meet the following criteria to run Windows XP Embedded.

- Mobile Panel device with BIOS
- At least 128 MB RAM

4.3 Installation procedures

Windows XP Embedded is usually preinstalled at B&R Austria on a suitable CompactFlash card (256 MB). The Mobile Panel device is then automatically configured after it has been switched on for the first time. This procedure takes approximately 30 minutes, and the device will be rebooted a number of times.

A short guide to creating your own Windows XP Embedded images as well as a suitable target designer export file for Mobile Panel BIOS devices can be found on the HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00) or downloaded directly from B&R's homepage (www.br-automation.com).

The B&R eMbedded OS Installer allows you to install existing B&R Windows CE images. The four files (NK.BIN, BLDR, LOGOXRES.BMP, and LOGOQVGA.BMP) must be provided from an already functioning B&R Windows CE installation.

The B&R eMbedded OS Installer can be downloaded for free from the download area on the B&R homepage (www.br-automation.com). Further information is available in the online help for the B&R eMbedded OS Installer.

5. B&R Key Editor

On display units, it is often necessary to adjust the function keys and LEDs for the application software being used. With the B&R Key Editor, it is possible to quickly and easily set up the application individually.

Figure 103: B&R Key Editor screenshots (Version 2.10)

Features:

- Configuration of normal keys like on a keyboard (A, B, C, etc.)
- Key combinations/shortcuts (CTRL+C, SHIFT+DEL, etc.) on one key
- Special key functions (change brightness, etc.)
- Assign functions to LEDs (HDD access, power, etc.)
- 4 assignments per key possible (using layer function)
- Configuration of panel locking time when multiple Automation Panel 900 devices are connected to Automation PC 620 and Panel PC 700 devices

Supports following systems:

- Automation PC 620
- Automation Panel 800
- Automation Panel 900
- Panel PC 700
- Provit 2000
- Provit 5000
- Power Panel BIOS devices
- Mobile Panel BIOS devices

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**). Additionally, it can also be found on the B&R HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00).

6. HMI Drivers & Utilities DVD 5SWHMI.0000-00

Figure 104: HMI Drivers & Utilities DVD 5SWHMI.0000-00

Model number	Short description	Note
5SWHMI.0000-00	**HMI Drivers & Utilities DVD** Contains drivers, utilities, software upgrades and user's manuals for B&R panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).	

Table 59: Model number - HMI Drivers & Utilities DVD

This DVD contains drivers, utilities, software upgrades and user's manuals for B&R Panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).
Information in detail:

BIOS upgrades for the products

- Automation PC 620
- Panel PC 700
- Automation PC 680
- Provit 2000 product family - IPC2000/2001/2002
- Provit 5000 product family - IPC5000/5600/5000C/5600C
- Power Panel 100 BIOS devices
- Mobile Panel 100 BIOS devices
- Power Panel 100 / Mobile Panel 100 user boot logo
- Power Panel 100 / Mobile Panel 100 REMHOST utility

Drivers for the devices

- Automation Device Interface (ADI)
- Audio
- Chipset
- CD-ROM
- LS120
- Graphics
- Network
- PCI RAID controller
- Touch screen
- Touchpad
- Interface board

Updates

- Firmware upgrades (e.g. MTCX, SMXC)

Utilities/Tools

- Automation Device Interface (ADI)
- Miscellaneous
- MTC utilities
- Key editor
- MTC & Mkey utilities
- Mkey utilities
- UPS configuration software
- ICU ISA configuration
- Intel PCI NIC boot ROM
- Diagnostics
- Lifespan calculation - Silicon Systems CompactFlash cards 5CFCRD.xxxx-03

Windows and embedded operating systems

- Thin client
- Windows CE
- Windows NT Embedded
- Windows XP Embedded

MCAD templates for

- Industrial PCs
- Visualization and operating devices
- Legend strip templates

Documentation for

- B&R Windows CE
- Automation PC 620
- Automation PC 680
- Automation Panel 900
- Panel PC 700
- Power Panel 15/21/35/41
- Power Panel 100/200
- Provit 2000
- Provit 3030
- Provit 4000
- Provit 5000
- Provit Benchmark
- Provit Mkey
- Windows NT Embedded application guide
- Windows XP Embedded application guide
- Uninterruptible power supply

Service tools

- Acrobat Reader 5.0.5 (freeware in German, English, and French)
- Power Archiver 6.0 (freeware in German, English, and French)
- Internet Explorer 5.0 (German and English)
- Internet Explorer 6.0 (German and English)

Chapter 5 • Standards and certifications

1. Applicable European guidelines

- EMC guidelines 89/336/EWG
- Low-voltage guidelines 73/23/EWG
- Machine guidelines 98/37/EG

2. Overview of standards

Standard	Description
EN 418	Safety of machines, E-stop equipment, functional aspects, design principles
EN 50081-1	Electromagnetic compatibility (EMC), generic emission standard - part 1: Residential, commercial, and light industrial environments (EN 50081-1 has been replaced by EN 61000-6-3)
EN 50081-2	Electromagnetic compatibility (EMC), generic emission standard - part 2: Industrial environments (EN 50081-2 has been replaced by EN 61000-6-4)
EN 50082-1	Electromagnetic compatibility (EMC), generic immunity standard - part 1: Residential, commercial, and light industrial environments (EN 50082-1 has been replaced by EN 61000-6-1)
EN 50082-2	Electromagnetic compatibility (EMC), generic immunity standard - part 2: Industrial environments (EN 50082-2 has been replaced by EN 61000-6-2)
EN 55011 Class A	Electromagnetic compatibility (EMC), radio disturbance product standard, industrial, scientific, and medical high-frequency devices (ISM devices), limit values and measurement procedure; group 1 (devices that do not create HF during material processing) and group 2 (devices that create HF during material processing)
EN 55022 Class A	Electromagnetic compatibility (EMC), radio disturbance characteristics, information technology equipment (ITE devices), limits and methods of measurement
EN 55024 Class A	Electromagnetic compatibility (EMC), immunity characteristics, information technology equipment (ITE devices), limits and methods of measurement
EN 60068-2-1	Environmental testing - part 2: Tests; test A: Cold
EN 68068-2-2	Environmental testing - part 2: Tests; test B: Dry heat
EN 60068-2-3	Environmental testing - part 2: Tests; test and guidance: Damp heat, constant
EN 60068-2-6	Environmental testing - part 2: Tests; test: Vibration (sinusoidal)
EN 60068-2-14	Environmental testing - part 2: Tests; test N: Change of temperature
EN 60068-2-27	Environmental testing - part 2: Tests; test and guidance: Shock
EN 60068-2-30	Environmental testing - part 2: Tests; test and guidance: Damp heat, cyclic
EN 60068-2-31	Environmental testing - part 2: Tests; test: Drop and topple, primarily for equipment-type specimens

Table 60: Overview of standards

Standard	Description
EN 60068-2-32	Environmental testing - part 2: Tests; test: Free fall
EN 60204-1	Safety of machinery, electrical equipment on machines - part 1: General requirements
EN 60721-1	Classification of environmental conditions - part 1: Environmental parameters and their severities
EN 60721-3-2	Classification of environmental conditions - part 3: Classification of groups of environmental parameters and their severities, section 2: Transport
EN 60721-3-3	Classification of environmental conditions - part 3: Classification of groups of environmental parameters and their severities, section 3: Stationary use at weather-protected locations
EN 61000-4-2	Electromagnetic compatibility (EMC) - part 4-2: Testing and measuring techniques; electrostatic discharge immunity test
EN 61000-4-3	Electromagnetic compatibility (EMC) - part 4-3: Testing and measuring techniques; radiated radio-frequency electromagnetic field immunity test
EN 61000-4-4	Electromagnetic compatibility (EMC) - part 4-4: Testing and measuring techniques; electrical fast transient/burst immunity test
EN 61000-4-5	Electromagnetic compatibility (EMC) - part 4-5: Testing and measuring techniques; surge immunity test
EN 61000-4-6	Electromagnetic compatibility (EMC) - part 4-6: Testing and measuring techniques; immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-8	Electromagnetic compatibility (EMC) - part 4-8: Testing and measuring techniques; power frequency magnetic field immunity test
EN 61000-4-11	Electromagnetic compatibility (EMC) - part 4-11: Testing and measuring techniques; voltage dips, short interruptions and voltage variations immunity tests
EN 61000-4-12	Electromagnetic compatibility (EMC) - part 4-12: Testing and measuring techniques; oscillatory waves immunity test
EN 61000-6-1 (EN 50082-1)	Electromagnetic compatibility (EMC), generic immunity standard - part 1: residential, commercial, and light industrial environments (EN 50082-1 has been replaced by EN 61000-6-1)
EN 61000-6-2 (EN 50082-2)	Electromagnetic compatibility (EMC), generic immunity standard - part 2: industrial environments (EN 50082-2 has been replaced by EN 61000-6-2)
EN 61000-6-3 (EN 50081-1)	Electromagnetic compatibility (EMC), generic emission standard - part 1: residential, commercial, and light industrial environments (EN 50081-1 has been replaced by EN 61000-6-3)
EN 61000-6-4 (EN 50081-2)	Electromagnetic compatibility (EMC), generic emission standard - part 2: industrial environments (EN 50081-2 has been replaced by EN 61000-6-4)
EN 61131-2 IEC 61131-2	Product standard, programmable logic controllers - part 2: equipment requirements and tests
EN 61508-1	Functional safety of electrical/electronic/programmable electronic safety-related systems - part 1: General requirements
EN 61508-2	Functional safety of electrical/electronic/programmable electronic safety-related systems - part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
EN 954-1	Safety of machinery - safety-related parts of control systems • Part 1: General design principles 1)
UL 508	Industrial control equipment (UL = Underwriters Laboratories)

Table 60: Overview of standards (cont.)

1) Government safety organization: The sample test for the category 4 E-stop and enable switch parts according to EN 954-1 is in preparation.

3. Emission requirements

Emission	Test carried out according to	Limits according to
Network-related emissions	EN 55011 / EN 55022	EN 61000-6-4: Generic standard (industrial areas)
		EN 55011: Industrial product standard, scientific and medical high-frequency devices (ISM devices) class A (industrial area)
		EN 55022: Product standard equipment for Information Technology (ITE devices) class A (industrial area)
		EN 61131-2: Programmable logic controllers
Electromagnetic emissions	EN 55011 / EN 55022	EN 61000-6-4: Generic standard (industrial areas)
		EN 55011: Industrial product standard, scientific and medical high-frequency devices (ISM devices) class A (industrial area)
		EN 55022: Product standard equipment for Information Technology (ITE devices) class A (industrial area)
		EN 61131-2: Programmable logic controllers
		47 CFR Part 15 Subpart B Class A (FCC)

Table 61: Overview of limits and testing guidelines for emissions

3.1 Network-related emissions

Test carried out according to EN 55011 / EN 55022	Limits according to EN 61000-6-3	Limits according to EN 55011 class A	Limits according to EN 55022 class A
Power mains connections 150 kHz - 500 kHz	79 dB (µV) quasi-peak value 66 dB (µV) average	79 dB (µV) quasi-peak value 66 dB (µV) average	79 dB (µV) quasi-peak value 66 dB (µV) average
Power mains connections 500 kHz - 30 MHz	73 dB (µV) quasi-peak value 60 dB (µV) average	73 dB (µV) quasi-peak value 60 dB (µV) average	73 dB (µV) quasi-peak value 60 dB (µV) average
Other connections 150 kHz - 500 kHz	97 - 87 dB (µV) and 53 - 43 dB (µA) quasi-peak value 84 - 74 dB (µV) and 40 - 30 dB (µA) average	97 - 87 dB (µV) and 53 - 43 dB (µA) quasi-peak value 84 - 74 dB (µV) and 40 - 30 dB (µA) average	97 - 87 dB (µV) and 53 - 43 dB (µA) quasi-peak value 84 - 74 dB (µV) and 40 - 30 dB (µA) average
Other connections 500 kHz - 30 MHz	87 dB (µV) and 43 dB (µA) quasi-peak value 74 dB (µV) and 30 dB (µA) average	87 dB (µV) and 43 dB (µA) quasi-peak value 74 dB (µV) and 30 dB (µA) average	87 dB (µV) and 43 dB (µA) quasi-peak value 74 dB (µV) and 30 dB (µA) average

Table 62: Test requirements - Network-related emissions for industrial areas

Test carried out according to EN 55011 / EN 55022	Limits according to EN 61131-2		
Power mains connections [1] 150 kHz - 500 kHz	79 dB (µV) quasi-peak value 66 dB (µV) average		
Power mains connections 500 kHz - 30 MHz	73 dB (µV) quasi-peak value 60 dB (µV) average		
Other connections 150 kHz - 500 kHz	-		
Other connections 500 kHz - 30 MHz	-		

Table 62: Test requirements - Network-related emissions for industrial areas (cont.)

1) AC network connections only with EN 61131-2

3.2 Electromagnetic emissions

Test carried out according to EN 55011 / EN 55022	Limits according to EN 61000-6-4	Limits according to EN 55011 class A	Limits according to EN 55022 class A
30 MHz - 230 MHz measured at a distance of 10 m	< 40 dB (µV/m) quasi-peak value	< 40 dB (µV/m) quasi-peak value	< 40 dB (µV/m) quasi-peak value
230 MHz - 1 GHz measured at a distance of 10 m	< 47 dB (µV/m) quasi-peak value	< 47 dB (µV/m) quasi-peak value	< 47 dB (µV/m) quasi-peak value
Test carried out according to EN 55011 / EN 55022	**Limits according to EN 61131-2**		
30 MHz - 230 MHz measured at a distance of 10 m	< 40 dB (µV/m) quasi-peak value		
230 MHz - 1 GHz measured at a distance of 10 m	< 47 dB (µV/m) quasi-peak value		

Table 63: Test requirements - Electromagnetic emissions for industrial areasd operating element

4. Requirements for immunity to disturbances

Immunity	Test carried out according to	Limits according to
Electrostatic discharge (ESD)	EN 61000-4-2	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to high-frequency electromagnetic fields (HF field)	EN 61000-4-3	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to high-speed transient electrical disturbances (burst)	EN 61000-4-4	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to surge voltages	EN 61000-4-5	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to conducted disturbances	EN 61000-4-6	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity against magnetic fields with electrical frequencies	EN 61000-4-8	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to voltage dips, short-term interruptions and voltage fluctuations	EN 61000-4-11	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to damped vibration	EN 61000-4-12	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)

Table 64: Overview of limits and testing guidelines for immunity

Evaluation criteria according to EN 61000-6-2

Criteria A:
The operating equipment must continue to work as intended **during** the test. There should be no interference in the operating behavior and no system failures below a minimum operating quality as defined by the manufacturer.

Criteria B:
The operating equipment must continue to work as intended **after** the test. There should be no interference in the operating behavior and no system failures below a minimum operating quality as defined by the manufacturer.

Criteria C:
A temporary function failure is permitted when the function restores itself, or the function can be restored by activating configuration and control elements.

Criteria D:
Impairment or failure of the function, which can no longer be established (operating equipment destroyed).

4.1 Electrostatic discharge (ESD)

Test carried out according to EN 61000-4-2	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Contact discharge to powder-coated and bare metal housing parts	± 4 kV, 10 discharges, criteria B	± 4 kV, 10 discharges, criteria B	± 4 kV, 10 discharges, criteria B
Discharge through the air to plastic housing parts	± 8 kV, 10 discharges, criteria B	± 8 kV, 10 discharges, criteria B	± 8 kV, 10 discharges, criteria B

Table 65: Test requirements - Electrostatic discharge (ESD)

4.2 High-frequency electromagnetic fields (HF field)

Test carried out according to EN 61000-4-3	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Housing, completely wired	80 MHz - 1 GHz, 10 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	80 MHz - 1 GHz, 1,4 - 2 GHz, 10 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A 800-960 MHz (GSM), 10 V/m, pulse modulation with 50% duty cycle, criteria A	80 MHz - 1 GHz, 1,4 - 2 GHz, 3 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A

Table 66: Test requirements - High-frequency electromagnetic fields (HF field)

4.3 High-speed transient electrical disturbances (burst)

Test carried out according to EN 61000-4-4	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O	± 2 kV, criteria B	-	± 1 kV, criteria B
AC power inputs	-	± 2 kV, criteria B	-
AC power outputs	-	± 1 kV, criteria B	-
DC power I/O >10 m 1)	± 2 kV, criteria B	-	± 0.5 kV, criteria B
DC power inputs >10 m	-	± 2 kV, criteria B	-
DC power outputs >10 m	-	± 1 kV, criteria B	-
Functional ground connections, signal lines and I/Os >3 m	± 1 kV, criteria B	± 1 kV, criteria B	± 0.5 kV, criteria B
Unshielded AC I/O >3 m	-	± 2 kV, criteria B	-
Analog I/O	± 1 kV, criteria B	± 1 kV, criteria B	-

Table 67: Test requirements - High-speed transient electrical disturbances (burst)

1) For EN 55024 without length limitation.

4.4 Surge voltages

Test carried out according to EN 61000-4-5	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O, L to L	± 1 kV, criteria B	± 1 kV, criteria B	± 1 kV, criteria B
AC power I/O, L to PE	± 2 kV, criteria B	± 2 kV, criteria B	± 2 kV, criteria B
DC power I/O, L+ to L-, >10 m	± 0.5 kV, criteria B	-	-
DC power I/O, L to PE, >10 m	± 0.5 kV, criteria B	-	± 0.5 kV, criteria B
DC power inputs, L+ to L-	-	± 0.5 kV, criteria B	-
DC power inputs, L to PE	-	± 1 kV, criteria B	-
DC power outputs, L+ to L-	-	± 0.5 kV, criteria B	-
DC power outputs, L to PE	-	± 0.5 kV, criteria B	-
Signal connections >30 m	± 1 kV, criteria B	± 1 kV, criteria B	± 1 kV, criteria B
All shielded cables	-	± 1 kV, criteria B	-

Table 68: Test requirements - Surge voltages

4.5 Conducted disturbances

Test carried out according to EN 61000-4-6	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O	150 kHz - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A

Table 69: Test requirements - Conducted disturbances

Test carried out according to EN 61000-4-6	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
DC power I/O	150 kHz - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A
Functional ground connections	0,15 - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, Length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	-
Signal connections >3 m	0,15 - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, Length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A

Table 69: Test requirements - Conducted disturbances (cont.)

4.6 Magnetic fields with electrical frequencies

Test carried out according to EN 61000-4-8	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Test direction x, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A
Test direction y, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A
Test direction z, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A

Table 70: Test requirements - Magnetic fields with electrical frequencies

4.7 Voltage dips, fluctuations, and short-term interruptions

Test carried out according to EN 61000-4-11	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power inputs	Voltage dip 70% (30% reduction), 0.5 periods, criteria B	-	Voltage dip < 5% (> 95% reduction), 0.5 half-oscillations, criteria B
AC power inputs	Voltage dip 40% (60% reduction), 5 periods, criteria C	-	Voltage dip 70% (30% reduction), 25 half-oscillations, criteria C
AC power inputs	Voltage dip 40% (60% reduction), 50 periods, criteria C	-	-
AC power inputs	Voltage interruptions < 5% (> 95% reduction), 250 periods, criteria C	-	Voltage interruptions < 5% (> 95% reduction), 250 half-oscillations, criteria C
AC power inputs	-	20 interruptions, 0.5 periods, criteria A	-
DC power inputs	-	20 interruptions for 10 ms, < UN - 15%, criterion A	-

Table 71: Test requirements - Voltage dips, fluctuations, and short-term interruptions

4.8 Damped vibration

Test carried out according to EN 61000-4-12	Limits according to EN 61131-2		
Power I/O, L to L	± 1 kV, 1 MHz, repeat rate 400/seconds, length 2 seconds, connection lengths 2 m, criteria B		
Power I/O, L to PE	± 2.5 kV, 1 MHz, repeat rate 400/seconds, length 2 seconds, connection lengths 2 m, criteria B		

Table 72: Test requirements - Damped vibration

5. Mechanical conditions

Vibration	Test carried out according to	Limits according to
Vibration operation	EN 60068-2-6	EN 61131-2: Programmable logic controllers
Vibration during transport	EN 60068-2-6	EN 60721-3-2 class 2M1
		EN 60721-3-2 class 2M2
		EN 60721-3-2 class 2M3
Shock during operation	EN 60068-2-27	EN 61131-2: Programmable logic controllers
		EN 60721-3-3 class 3M4
Shock during transport (packaged)	EN 60068-2-27	EN 60721-3-2 class 2M1
		EN 60721-3-2 class 2M2
Toppling	EN 60068-2-31	EN 60721-3-2 class 2M1
		EN 60721-3-2 class 2M2
		EN 60721-3-2 class 2M3
Free fall (packaged)	EN 60068-2-32	EN 61131-2: Programmable logic controllers

Table 73: Overview of limits and testing guidelines for vibration

5.1 Vibration operation

Test carried out according to EN 60068-2-6	Limits according to EN 61131-2			
Vibration operation: Uninterrupted duty with moveable frequency in all 3 axes (x, y, z), 1 octave per minute	10 sweeps for each axis			
	Frequency	**Limit value**		
	5 - 9 Hz	Amplitude 3 mm Periodic		
	9 - 150 Hz	Acceleration 1 g Periodic		

Table 74: Test requirements - Vibration operation

5.2 Vibration during transport

Test carried out according to EN 60068-2-6	Limits according to EN 60721-3-2 class 2M1		Limits according to EN 60721-3-2 class 2M2		Limits according to EN 60721-3-2 class 2M3	
Vibration during transport: Uninterrupted duty with moveable frequency in all 3 axes (x, y, z)	10 sweeps for each axis, packaged		10 sweeps for each axis, packaged		10 sweeps for each axis, packaged	
	Frequency	**Limit value**	**Frequency**	**Limit value**	**Frequency**	**Limit value**
	2 - 9 Hz	Amplitude 3.5 mm	2 - 9 Hz	Amplitude 3.5 mm	2 - 8 Hz	Amplitude 7.5 mm
	9 - 200 Hz	Acceleration 1 g	9 - 200 Hz	Acceleration 1 g	8 - 200 Hz	Acceleration 2 g
	200 - 500 Hz	Acceleration 1.5 g	200 - 500 Hz	Acceleration 1.5 g	200 - 500 Hz	Acceleration 4 g

Table 75: Test requirements - Vibration during transport

5.3 Shock during operation

Test carried out according to EN 60068-2-27	Limits according to EN 61131-2	Limits according to EN 60721-3-3 class 3M4	
Shock operation: Pulse (half-sine) stress in all 3 axes (x, y, z)	Acceleration 15 g, Length 11 ms, 18 shocks	Acceleration 15 g, Length 11 ms	

Table 76: Test requirements - Shock operation

5.4 Shock during transport (packaged)

Test carried out according to EN 60068-2-27	Limits according to EN 60721-3-2 class 2M1	Limits according to EN 60721-3-2 class 2M2	
Pulse (half-sine) stress in all 3 axes (x, y, z)	Acceleration 10 g, Length 11 ms, each 3 shocks, packaged	Acceleration 30 g, Length 6 ms, each 3 shocks, packaged	

Table 77: Test requirements - Shock transport

5.5 Toppling

Test carried out according to EN 60068-2-31	Limits according to EN 60721-3-2 class 2M1		Limits according to EN 60721-3-2 class 2M2		Limits according to EN 60721-3-2 class 2M3	
Toppling and knocking over	Devices: Toppling/knocking over on each edge		Devices: Toppling/knocking over on each edge		Devices: Toppling/knocking over on each edge	
	Weight	**Required**	**Weight**	**Required**	**Weight**	**Required**
	<20 kg	Yes	<20 kg	Yes	<20 kg	Yes
	20 - 100 kg	-	20 - 100 kg	Yes	20 - 100 kg	Yes
	>100 kg	-	>100 kg	-	>100 kg	Yes

Table 78: Test requirements - Toppling

5.6 Free fall (packaged)

Test carried out according to EN 60068-2-32	Limits according to EN 61131-2		Limits according to EN 60721-3-2 class 2M1		Limits according to EN 60721-3-2 class 2M2		Limits according to EN 60721-3-2 class 2M3	
Free fall	Devices with delivery packaging each with 5 fall tests		Devices packaged		Devices packaged		Devices packaged	
	Weight	**Height**	**Weight**	**Height**	**Weight**	**Height**	**Weight**	**Height**
	<10 kg	1.0 m	<20 kg	0.25 m	<20 kg	1.2 m	<20 kg	1.5 m
	10 - 40 kg	0.5 m	20 -100 kg	0.25 m	20 -100 kg	1.0 m	20 -100 kg	1.2 m
	>40 kg	0.25 m	>100 kg	0.1 m	>100 kg	0.25 m	>100 kg	0.5 m
	Devices with product packaging each with 5 fall tests							
	Weight	**Height**						
	<10 kg	0.3 m						
	10 - 40 kg	0.3 m						
	>40 kg	0.25 m						

Table 79: Test requirements - Toppling

6. Climate conditions

Temperature / humidity	Test carried out according to	Limits according to
Worst case operation	UL 508	UL 508: Industrial control equipment EN 61131-2: Programmable logic controllers
Dry heat	EN 60068-2-2	EN 61131-2: Programmable logic controllers
Dry cold	EN 60068-2-1	EN 61131-2: Programmable logic controllers
Large temperature fluctuations	EN 60068-2-14	EN 61131-2: Programmable logic controllers
Temperature fluctuations in operation	EN 60068-2-14	EN 61131-2: Programmable logic controllers
Humid heat, cyclic	EN 60068-2-30	EN 61131-2: Programmable logic controllers
Humid heat, constant (storage)	EN 60068-2-3	EN 61131-2: Programmable logic controllers

Table 80: Overview of limits and testing guidelines for temperature and humidity

6.1 Worst case operation

Test carried out according to UL 508	Limits according to UL 508	Limits according to EN 61131-2	
Worst case operation. Operation of the device with the max. ambient temperature specified in the data sheet at the max. specified load	Max. ambient temperature (min. +40°C) for 3 hours, length 5 hours	Max. ambient temperature (min. +40°C) for 3 hours, length 5 hours	

Table 81: Test requirements - Worst case operation

6.2 Dry heat

Test carried out according to EN 60068-2-2	Limits according to EN 61131-2		
Dry heat	1 cycle +70° C for 16 hours, then 1 hour acclimatization and testing functions, length 17 hours		

Table 82: Test requirements - Dry heat

6.3 Dry cold

Test carried out according to EN 60068-2-1	Limits according to EN 61131-2		
Dry cold	1 cycle -40° C for 16 hours, then 1 hour acclimatization and testing functions, length 17 hours		

Table 83: Test requirements - Dry cold

6.4 Large temperature fluctuations

Test carried out according to EN 60068-2-14	Limits according to EN 61131-2		
Large temperature fluctuations	2 cycles - 25° C / + 70° C for each hour, then 2 hours acclimatization and testing of functions, length 14 hours		

Table 84: Test requirements - Large temperature fluctuations

6.5 Temperature fluctuations in operation

Test carried out according to EN 60068-2-14	Limits according to EN 61131-2		
Open devices: These can also have a housing and are installed in switching cabinets	5 cycles +5°C / +55°C for every 3 hours, temperature gradient 3°C / min, during the test, the device is occasionally supplied with voltage, length 30 hours		
Closed devices: These are devices whose data sheet specifies a surrounding housing (enclosure) with the corresponding safety precautions	5 cycles +5°C / +40°C for every 3 hours, temperature gradient 3°C / min, during the test, the device is occasionally supplied with voltage, length 30 hours		

Table 85: Test requirements - Temperature fluctuations in operation

6.6 Humid heat, cyclic

Test carried out according to EN 60068-2-30	Limits according to EN 61131-2		
Alternating climate	2 cycles +25°C / +55°C and 97% / 83% RH for every 24 hours, then 2 hours acclimatization as well as performing function and isolation tests, length 50 hours		

Table 86: Test requirements - Humid heat, cyclic

6.7 Humid heat, constant (storage)

Test carried out according to EN 60068-2-3	Limits according to EN 61131-2		
Humid heat, constant (storage)	+40°C and 92.5% RH for 48 hours, then within 3 hours isolation test, length 49 hours		

Table 87: Test requirements - Humid heat, constant (storage)

7. Further limit values

Safety	Test carried out according to	Limits according to
Ground resistance	EN 61131-2	EN 60204-1: Electrical equipment of machines
		EN 61131-2: Programmable logic controllers
Insulation resistance		EN 60204-1: Electrical equipment of machines
High voltage	EN 60060-1	EN 61131-2: Programmable logic controllers
		UL 508: Industrial control equipment
Residual voltage	EN 61131-2	EN 60204-1: Electrical equipment of machines
		EN 61131-2: Programmable logic controllers
Leakage current		VDE 0701-1: Service, changes and testing of electrical devices
Overload	UL 508	EN 61131-2: Programmable logic controllers
		UL 508: Industrial control equipment
Simulation component defect	UL 508	EN 61131-2: Programmable logic controllers
		UL 508: Industrial control equipment
Voltage range		EN 61131-2: Programmable logic controllers

Table 88: Further limit values

8. 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 c UL US	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 CE	All harmonized EN standards for the applicable guidelines are met.

Table 89: International certifications

8.1 Safety certification

Fachausschuss Elektrotechnik
Prüf- und Zertifizierungsstelle
im BG-PRÜFZERT

Hauptverband der gewerblichen
Berufsgenossenschaften

BG-Prüfbescheinigung

04216
Bescheinigungs-Nummer

Name und Anschrift des Bescheinigungsinhabers: (Auftraggeber)	Bernecker & Rainer Industrie-Elektronik GmbH B & R-Straße 1 5142 Eggelsberg Austria
Name und Anschrift des Herstellers:	siehe Auftraggeber

Zeichen des Auftraggebers:	Zeichen der Prüf- und Zertifizierungsstelle: 23.520.17/03-128-443 Wld/Ow	Ausstellungsdatum: 23.12.2004

Produktbezeichnung:	Handbedien-Terminal mit Zustimmungsschalter (dreistufig) und NOT-AUS-Befehlsgerät
Typ:	Mobile Panel, Serie 100 und 200
Bestimmungsgemäße Verwendung:	Zum Anschluss an die Signalverarbeitung von Industrierobotern und automatisierten Fertigungssystemen.
Prüfgrundlage:	GS-ET-22 „Grundsätze für die Prüfung und Zertifizierung von elektromechanischen Zustimmungsschaltern und Zustimmungseinrichtungen" (2003-06)
Bemerkungen:	Das Handbedienterminal ist geeignet zum Einsatz in NOT-AUS-Einrichtungen nach EN 418. Das Zertifikat beschränkt sich auf den integrierten Zustimmungsschalter. Im BG-PRÜFZERT-Zeichen ist als zusätzlicher Hinweis aufzunehmen: „Zustimmungsschalter".

Das geprüfte Baumuster entspricht der oben angegebenen Prüfgrundlage.
Der Bescheinigungsinhaber ist berechtigt, das umseitig abgebildete BG-PRÜFZERT-Zeichen an den mit dem geprüften Baumuster übereinstimmenden Produkten anzubringen, gegebenenfalls mit dem unter 'Bemerkungen' genannten Hinweis.

Diese Bescheinigung wird spätestens ungültig am:

30.06.2009

Weiteres über die Gültigkeit, eine Gültigkeitsverlängerung und andere Bedingungen regelt die Prüf- und Zertifizierungsordnung vom April 2004.

HAUPTVERBAND DER GEWERBLICHEN BERUFSGENOSSENSCHAFTEN · FACHAUSSCHUSS ET

Dipl.-Ing. Stefan Stommel
Leiter der Zertifizierungsstelle

PZB08D
10.04

Postadresse: Postfach 51 05 80 50941 Köln	Hausadresse: Gustav-Heinemann-Ufer 130 50968 Köln	Telefon: 0221 / 3778 - 6301 Telefax: 0221 / 3778 - 6322

Figure 105: Safety certification - page 1 of 2

Reverse side of the BG Test Certificate

BG-PRÜFZERT mark

BG-PRÜFZERT

ET 04216
„additional reference“ 1)

Sicherheit geprüft
tested safety

1) additional reference: **"Enabling device"**

Where necessary, the BG-PRÜFZERT mark must be supplemented by additional wording reflecting the details given in the certificate. In such cases, the mark may look slightly different from the image shown here.

Figure 106: Safety certification - page 2 of 2

9. Standards and definitions for safety technology

Stop functions according to IEC 60204-1/11.98
(electrical equipment for machines, 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 90: 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 a dangerous state.

Emergency stops according to IEC 60204-1/11.98
(electrical equipment for machines, part 1: general requirements)

The following requirements apply to 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 E-stop function must not reduce the effectiveness of the safety equipment or of equipment with safety-related functions.
- The E-stop function must not interfere with equipment designed to free personnel from dangerous situations.

Emergency stops must be category 0 or 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)] .

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.

Safety category according to EN 954-1/03.97
(safety of machines - safety related parts of control systems, part 1: general design principles) 1)

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.**
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 91: 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.

1) 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.

Information:

Connection examples with a suitable monitoring device in chapter 3 "Commissioning", section "Connection examples - E-stop and key switch" on page 108 and section "Connection example - Enable switch" on page 113 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:

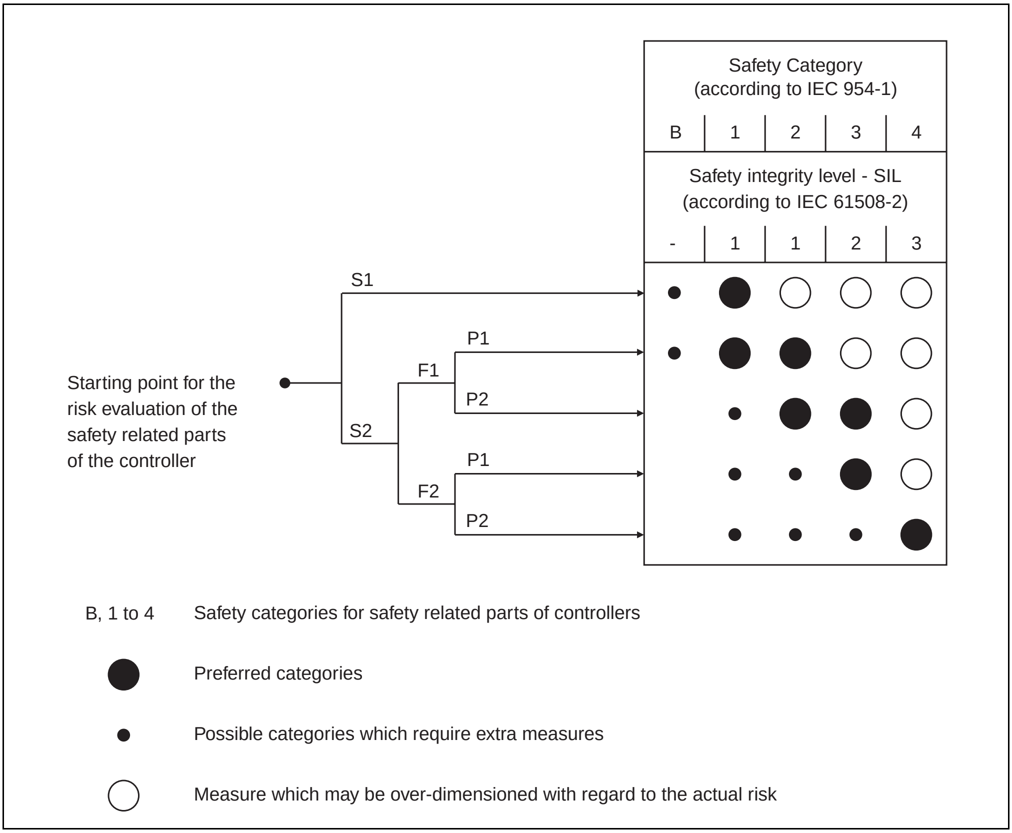


Figure 107: Risk graph according to EN 954-1, Appendix B

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 92: 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
0AC201.9	**Lithium batteries (5x)** Lithium batteries, 5 pcs., 3 V / 950 mAh, button cell	
4A0006.00-000	**Lithium battery (1x)** Lithium battery, 1 pc., 3 V / 950 mAh, button cell	
5AC900.1100-00	**Touch screen pen** Five replacement touch screen pens	
5CFCRD.0032-02	**CompactFlash 32 MB SanDisk/A** CompactFlash card with 32 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0064-02	**CompactFlash 64 MB SanDisk/A** CompactFlash card with 64 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0128-02	**CompactFlash 128 MB SanDisk/A** CompactFlash card with 128 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0256-02	**CompactFlash 256 MB SanDisk/A** CompactFlash card with 256 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0512-02	**CompactFlash 512 MB SanDisk/A** CompactFlash card with 512 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.1024-02	**CompactFlash 1024 MB SanDisk/A** CompactFlash card with 1024 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.2048-02	**CompactFlash 2048 MB SanDisk/A** CompactFlash card with 2048 MB flash PROM and IDE/ATA interface	*Cancelled since 12/2005*
5CFCRD.0064-03	**CompactFlash 64 MB SSI** CompactFlash card with 64 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.0128-03	**CompactFlash 128 MB SSI** CompactFlash card with 128 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.0256-03	**CompactFlash 256 MB SSI** CompactFlash card with 256 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.0512-03	**CompactFlash 512 MB SSI** CompactFlash card with 512 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.1024-03	**CompactFlash 1024 MB SSI** CompactFlash card with 1024 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.2048-03	**CompactFlash 2048 MB SSI** CompactFlash card with 2048 MB SLC NAND flash and IDE/ATA interface	
5CFCRD.4096-03	**CompactFlash 4096 MB SSI** CompactFlash card with 4096 MB SLC NAND flash and IDE/ATA interface	

Table 93: Model numbers - Accessories

Model number	Product ID	Note
5CFCRD.8192-03	**CompactFlash 8192 MB SSI** CompactFlash card with 8192 MB SLC NAND flash and IDE/ATA interface	In preparation
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	*Cancelled since 03/2007*
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	*Cancelled since 03/2007*
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	
5CAMPP.0000-00	**Attachment cable - protective cap for add-on socket** Protection for attachment cable during transport	
5CAMPP.0000-10	**Attachment cable - protective cap for circular plug** Protection for attachment cable during transport	
5CAMPP.0001-10	**Switching cabinet cable - protective cap for receptacle** Protection for switching cabinet cable during transport	
4MPCBX.0000-00	**MP connection box** Connection box for adapting the connection points for Mobile Panel devices.	
5CAMPB.0100-10	**MP box cable, 10 m 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 93: Model numbers - Accessories

2. Replacement CMOS batteries

The lithium battery is needed for buffering the BIOS and real-time clock.

2.1 Order data

Model number	Description	Image
0AC201.9	Lithium batteries, 5 pcs., 3 V / 950 mAh button cell	
4A0006.00-000	Lithium battery, 1 pc., 3 V / 950 mAh, button cell	

Table 94: Order data - Lithium batteries

2.2 Technical data

Information:

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

Name	0AC201.9, 4A0006.00-000
Capacity	950 mAh
Voltage	3 V
Self discharge at 23°C	< 1% per year
Storage time	Max. 3 years at 30 °C
Storage temperature	-20°C to +60 °C
Relative humidity	0 to 95%, non-condensing

Table 95: Technical data - Lithium batteries

3. Touch screen pen

A replacement part is available consisting of 5 touch screen pens for the operation of the Mobile Panel touch screen. See section "Touch screen pen" on page 38 for technical data regarding touch screen pens.

3.1 Order data

Model number	Description	Image
5AC900.1100-00	**Touch screen pen (5x)**	

Table 96: Order data - Touch screen pen

4. CompactFlash cards 5CFCRD.xxxx-02

4.1 General information

CompactFlash cards are easy-to-exchange storage media. Due to their robustness against environmental influences (e.g. temperature, shock, vibration, etc.), CompactFlash cards are ideal for use as storage media in industrial environments.

4.2 Order data

Model number	Description	Image
5CFCRD.0032-02	CompactFlash 32 MB SanDisk/A	
5CFCRD.0064-02	CompactFlash 64 MB SanDisk/A	
5CFCRD.0128-02	CompactFlash 128 MB SanDisk/A	
5CFCRD.0256-02	CompactFlash 256 MB SanDisk/A	
5CFCRD.0512-02	CompactFlash 512 MB SanDisk/A	
5CFCRD.1024-02	CompactFlash 1024 MB SanDisk/A	
5CFCRD.2048-02	CompactFlash 2048 MB SanDisk/A	

Table 97: Order data - CompactFlash cards

4.3 Technical data

Information:

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

Features	5CFCRD.xxxx-02
MTBF (@ 25 °C)	> 3000000 hours
Maintenance	None
Data reliability	< 1 unrecoverable error in 10^{14} bit read accesses < 1 faulty correction in 10^{20} bit read accesses
Mechanical characteristics	
Write/erase procedures	> 2,000,000 times

Table 98: Technical data - CompactFlash cards 5CFCRD.xxxx-02

Mechanical characteristics	5CFCRD.xxxx-02
Dimensions Length Width Thickness	 36.4 ± 0.15 mm 42.8 ± 0.10 mm 3.3 mm ± 0.10 mm
Weight	11.4 g
Environmental characteristics	
Ambient temperature Operation Storage Transport	 0°C to +70 °C -25°C to +85 °C -25°C to +85 °C
Relative humidity Operation / Storage	 8% to 95%, non-condensing
Vibration Operation / Storage	 Maximum 30 g (point to point)
Shock Operation / Storage	 Maximum 3000 g
Altitude	24000 meters

Table 98: Technical data - CompactFlash cards 5CFCRD.xxxx-02 (cont.)

4.4 Contents of delivery

Amount	Component
1	CompactFlash card in desired size

Table 99: Contents of delivery - CompactFlash cards 5CFCRD.xxxx-02

4.5 Dimensions

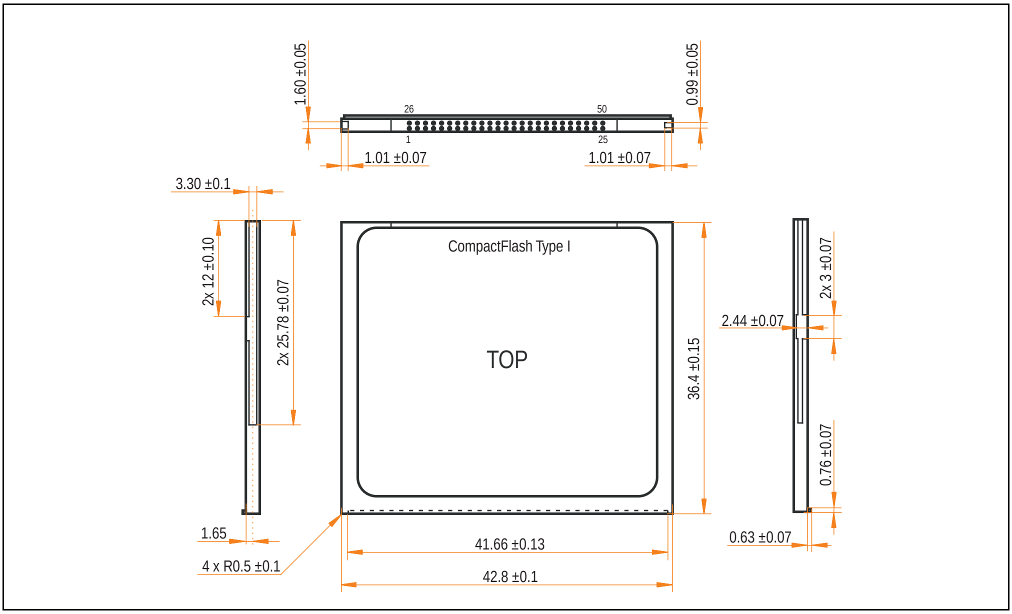


Figure 108: Dimensions - CompactFlash card Type I

4.6 Calculating the lifespan

SanDisk provides a 6-page "white paper" for calculating the lifespan of CompactFlash cards (see the following pages). This document can also be found on the SanDisk homepage.

Chapter 6
Accessories

SanDisk

WHITE PAPER

SANDISK FLASH MEMORY CARDS

WEAR LEVELING

October 2003

140 Caspian Court • Sunnyvale, California 94089 • Phone: 408-542-0500 • Fax: 408-542-0503

Figure 109: SanDisk white paper - page 1 of 6

Lit. No. 80-36-00278 10/03 Printed in U.S.A.

Figure 110: SanDisk white paper - page 2 of 6

OVERVIEW

This purpose of this white paper is to help SanDisk customers understand the benefits of wear leveling and to assist customers in calculating life expectancy of SanDisk cards in specific applications.

Flash memory is susceptible to wear as a result of the repeated program and erase cycles that are inherent in typical data storage applications. Applications in which this is a major concern include hard disk replacement applications where write operations occur frequently. How a storage system manages the wear of the memory is key to understanding the extended reliability of the host that relies on these storage systems.

WEAR LEVELING METHODOLOGY

Current products available in the industrial channel use NAND flash memory. It is important to understand the NAND memory architecture to gain insight into the wear leveling mechanism.

Each memory chip is divided into blocks. A block is an array of memory cells organized as sectors. The number of blocks and sectors vary from product to product. The minimum unit for a write or read operation is a page (or sector). The minimum unit for an erase operation is a block. Physical blocks are logically grouped into zones. For the current technology, a typical zone size is 4 MB. However, this may change from product to product. Wear leveling is done within a zone. The current firmware does not spread the wear across the capacity of the card. Each zone has about 3% additional “spare blocks” beyond what is assigned to meet the logical capacity of the flash card. This group of blocks is commonly referred to as the “Erase Pool”.

With the introduction of SanDisk’s Write-before-Erase architecture, each time a host writes data to the same logical address (CHS or LBA), data is written into a newly assigned, empty physical block from the “Erase Pool”. The intrinsic nature of writing to a new physical location each time a logical address is written to is the basis for wear leveling found in SanDisk cards. This action spreads the writes over the zone, thus greatly extending the overall life of the card. The methodology of using a large number of physical addresses to manage a smaller logical address table allows for rotation of the physical addresses among the entire group of physical blocks within a zone. The resulting wear leveling optimizes the effective life of the media and avoids prematurely reaching the end of life on frequently written to host addresses.

When a card detects that a block has reached the end of its useful life, it removes that block from the blocks that are available for write operations. The result is a reduction of the size of the erase pool. This does not affect the capacity of the card as seen by the host. When the pool of blocks available for write operations has been exhausted due to wear, the card will reach the end of its useful life for write operations.

Figure 111: SanDisk white paper - page 3 of 6

Current SanDisk products do not preempt wear leveling events during normal operation of the card. Applications typically don't require such management beyond the natural wear leveling that occurs during normal host operations. As a result, the effectiveness of wear leveling in current SanDisk products is dependent upon host usage. It is important for customers whose applications do not fall into this typical usage pattern to understand how their applications will affect the lifetime of the card.

LIFE EXPECTANCY SCENARIOS

►best case analysis

In a typical application, large data files are written to the card occupying contiguous sequential logical address space. This results in optimal wear leveling and provides card life exceeding the specification for card endurance. This increased endurance is achieved as follows: The 2,000,000 endurance cycles specification (I-Grade only) is a result of large amounts of test data collected from a very large sample set that accounts for the extreme limits of the test population. With the 3% additional erase pool being used in an ideal fashion, the distribution is narrowed and the card will survive beyond its specified lifetime.

►worst case analysis

In the worst-case application, data will be written as single sectors to random addresses across the card. These single sector writes will exercise the erase pool more rapidly, requiring the system to perform a “garbage collection” operation to free up new blocks for subsequent write operations. At the extreme, each single sector write would cause one block to be programmed and erased. As a typical block size is 16kB or 32 sectors, the amount of wear is increased by a factor of 31 since 32 physical sectors are written and erased for each sector the host writes. Spreading this wear across the erase pool results in an effective 1/30 usable lifetime. This case is an extreme example and is only included to show the range of application dependence. This result is comparable to other vendor's cards based on memory with a 16kB erase block.

►analysis of host dependence

In assessing the life expectancy of a card in a given system several factors need to be understood. These factors include the types of files and their corresponding sizes, frequency of card write operations and file system behavior (including data structures). The types of files must be considered since some files, such as operating systems or executable files, typically remain in fixed locations once they are stored in the card. This limits the number of physical blocks available for circulation into the erase pool. The remaining capacity after these files have been accounted for can then be divided by the typical size of files that will be updated over the lifetime of the card. Related to this calculation is how the file system overwrites existing files. Typical operating system behavior, such as DOS, will allocate new blocks from the file allocation table, or FAT, and so repeated file writes will occupy a new set of addresses on the card. This is very beneficial in spreading wear across the card since it forces the card to cycle the entire physical

Figure 112: SanDisk white paper - page 4 of 6

area being used for such files. Special cases to consider include those where the files being updated are very small. Typically an operating system uses a minimum number of sectors to store a file, referred to as a cluster. Typical cluster sizes range from 8 to 64 sectors in size. The cluster size is important for files that are the same or smaller than the 32-sector block since these may trigger garbage collection operations. If these updates happen in a random fashion (sequential updates would not be affected by cluster size) lifetime may be reduced as a result. Finally, the frequency of such updates is then used to determine how long it will take before the card reaches its statistical limit for endurance. These factors can be combined in an equation that can be used to calculate the minimum time a card will function in that application:

$$lifetime = 2{,}000{,}000 \times \frac{\left(C_{tzone} - C_{fixed}\right) \times \left(1 - k_r \times \frac{32 - N_{cluster}}{32}\right)}{FS_{typ}} \times \frac{1}{f_w}$$

where Czone is the total capacity of the zone, Cfixed is the capacity used by fixed files, Ncluster is the cluster size, FStyp is the average file size and fw is the average frequency at which files are updated. kr is a factor that is 0 for file sizes that are typically over 16kB or for applications that are not random in the order in which such files are updated.

Example 1

In this example 128 KB of data is updated once a day. The zone has 500 KB worth of fixed files. A 4 MB zone size is assumed.

$$lifetime = 2{,}000{,}000 \times \frac{(4000 - 500) \times (1 - 0)}{128} \times \frac{1}{1/day}$$

$$lifetime = 149828\, years$$

Example 2

This example is a data logging operation using a 1GB card where a 4kB file is updated every five seconds. This would result in sequential address being written.

$$lifetime = 2{,}000{,}000 \times \frac{4000}{4} \times \frac{1}{1/5\sec}$$

$$lifetime = 317\, years$$

Figure 113: SanDisk white paper - page 5 of 6

Example 3

This example is a data logging operation using the same 1GB card where a new 4kB file is written every five seconds. But in this case the cluster size is 4kB and it is expected that, due to file system fragmentation, the logical addresses will be written randomly.

$$lifetime = 2{,}000{,}000 \times \frac{4 \times \left(1 - 1 \times \frac{32-8}{32}\right)}{.004} \times \frac{1}{1/5\,\text{sec}}$$

$$lifetime = 79.3\,years$$

CONCLUSION

These examples are general in nature but show how the equation can be used as a guideline for calculating card lifetime in different applications. They also demonstrate that SanDisk card architecture exceeds reasonable life expectancy in typical applications. If a particular applications behaves in such a way that this equation cannot be applied, the SanDisk Applications Engineering group can assist in performing card lifetime analysis.

For more information, please visit the SanDisk Web site at: www.sandisk.com

SanDisk Corporation

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Sunnyvale, CA 94089
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FAX: 408-542-0503
URL: http://www.sandisk.com

Figure 114: SanDisk white paper - page 6 of 6

5. CompactFlash cards 5CFCRD.xxxx-03

5.1 General information

CompactFlash cards are easy-to-exchange storage media. Due to their robustness against environmental influences (e.g. temperature, shock, vibration, etc.), CompactFlash cards are ideal for use as storage media in industrial environments.

5.2 Order data

Model number	Description	Image
5CFCRD.0064-03	CompactFlash 64 MB SSI	 Example: 256 MB CompactFlash card
5CFCRD.0128-03	CompactFlash 128 MB SSI	
5CFCRD.0256-03	CompactFlash 256 MB SSI	
5CFCRD.0512-03	CompactFlash 512 MB SSI	
5CFCRD.1024-03	CompactFlash 1024 MB SSI	
5CFCRD.2048-03	CompactFlash 2048 MB SSI	
5CFCRD.4096-03	CompactFlash 4096 MB SSI	
5CFCRD.8192-03	CompactFlash 8192 MB SSI	

Table 100: Order data - CompactFlash cards

5.3 Technical data

Information:

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

Features	5CFCRD.xxxx-03
MTBF (at 25 °C)	> 4000000 hours
Maintenance	None
Data reliability	< 1 unrecoverable error in 10^{14} bit read accesses
Write/erase procedures	> 2,000,000 times
Data retention	10 years
Mechanical characteristics	**5CFCRD.xxxx-03**
Dimensions Length Width Thickness	 36.4 ± 0.15 mm 42.8 ± 0.10 mm 3.3 ± 0.10 mm
Weight	11.4 grams

Table 101: Technical data - CompactFlash cards 5CFCRD.xxxx-03

Environmental characteristics	
Ambient temperature Operation Storage Transport	 0°C to +70 °C -50°C to +100 °C -50°C to +100 °C
Relative humidity Operation / Storage	 8% to 95%, non-condensing
Vibration Operation Storage / Transport	 Maximum 16.3 g (point to point) Maximum 30 g (point to point)
Shock Operation Storage / Transport	 Maximum 1000 g Maximum 3000 g
Altitude	Maximum 80000 feet (24383 meters)

Table 101: Technical data - CompactFlash cards 5CFCRD.xxxx-03 (cont.)

5.3.1 Temperature humidity diagram - operation and storage

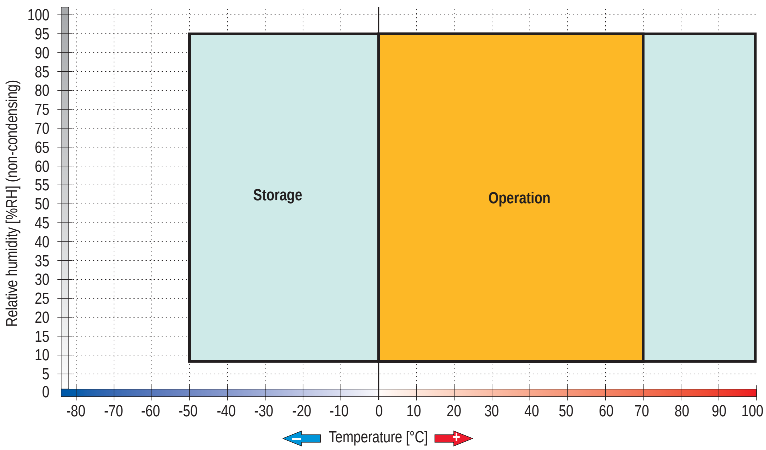

Figure 115: Temperature humidity diagram - CompactFlash cards 5CFCRD.xxxx-03

5.4 Contents of delivery

Amount	Component
1	CompactFlash card in desired size

Table 102: Contents of delivery - CompactFlash cards 5CFCRD.xxxx-03

5.5 Dimensions

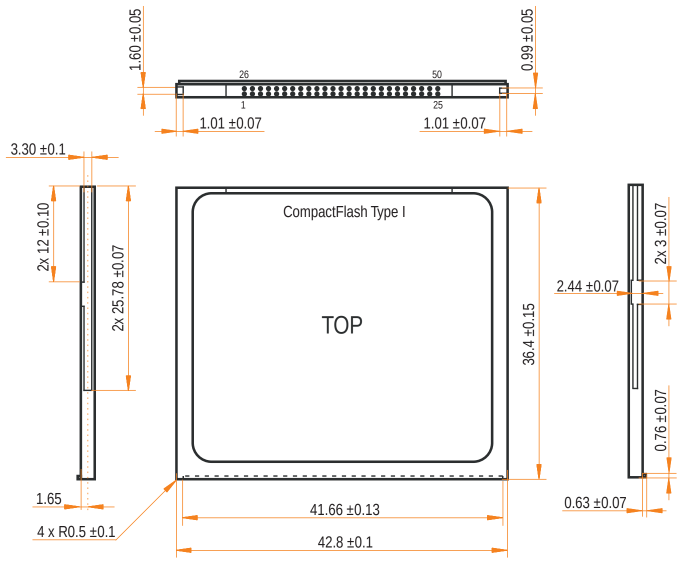

Figure 116: Dimensions - CompactFlash card Type I

5.6 Calculating the lifespan

Silicon Systems provides a 9-page "white paper" for the lifespan calculation for CompactFlash cards (see following pages). This document can also be found on the Silicon Systems homepage (**www.siliconsystems.com**).

Information:

A software tool for calculating the statistical lifespan of the Silicon Systems CompactFlash cards in various settings can be downloaded from the B&R Homepage (www.br-automation.com).

SILICON SYSTEMS The Future of Storage...Today™ Advanced Storage Technology

SILICONDRIVE™ WHITE PAPER
ENDURANCE CONSIDERATIONS

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WP401
Revision D
January 2006

SILICONSYSTEMS, INC.

Figure 117: Silicon Systems white paper - page 1 of 9

SILICONDRIVE™ WHITE PAPER
WP401D

INTRODUCTION

SiliconSystems' SiliconDrive™ technology is specifically designed to meet the high performance and high reliability requirements of Enterprise System OEMs in the netcom, military, industrial, interactive kiosk and medical markets. One of the measures of storage reliability in Enterprise System OEM applications is endurance – the number of write/erase cycles that can be performed before the storage product "wears out."

BACKGROUND

It is important to note that endurance is not just a function of the storage media. Rather, it is the combination of the storage media and the controller technology that determines the endurance. For example, magnetic media is an order of magnitude less reliable than NAND flash, yet the controller technology employed by rotating hard drives can compensate for this deficiency to yield reliability results that meet those of solid-state storage.

{NOTE: This is a completely different discussion from the mechanical reliability involving rotating hard drives versus solid-state storage that has no moving parts. This is just an example of how a controller, if it is good enough, can compensate for the deficiencies of the media}.

Write/erase cycle endurance for solid-state storage is specified in many ways by many different vendors. Some specify the endurance at the physical block level, while others specify at the logical block level. Still others specify it at the card or drive level. Since endurance is also related to data retention, endurance can be specified at a higher level if the data retention specification is lower. For these reasons, it is often difficult to make an "apples to apples" comparison of write/erase endurance by solely relying on these numbers in a datasheet.

A better way to judge endurance is to break the specification down into the main components that affect the endurance calculation:

1. Storage Media
2. Wear Leveling Algorithm
3. Error Correction Capabilities

Other factors that affect endurance include the amount of spare sectors available and whether or not the write is done using a file system or direct logical block addressing. While these issues can contribute to the overall endurance calculation, their effects on the resulting number is much lower than the three parameters above. Each of those factors will be examined individually, assuming ten-year data retention.

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Figure 118: Silicon Systems white paper - page 2 of 9

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STORAGE MEDIA

The scope of this white paper is confined to non-volatile storage – systems that do not lose their data when the power is turned off. The dominant technology for non-volatile solid-state storage is NAND flash. While NOR flash is also a possible solution, implementation of NOR technology is generally confined to applications like cell phones that require the functionality of DRAM, boot PROM and storage component in a single chip. The economies of scale and component densities of NAND relative to NOR make it the ideal solution for non-volatile, solid-state storage subsystems.

The two dominant NAND technologies available today are SLC (single-level cell, sometimes called binary) and MLC (multi-level cell). SLC technology stores one bit per cell and MLC stores two bits. A comparison of SLC and MLC is shown in figure 1.

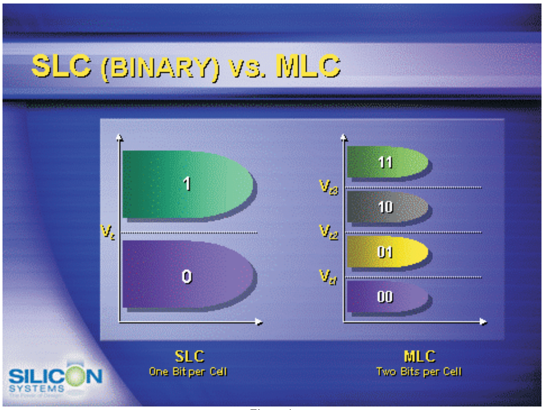

Figure 1

SLC NAND is generally specified at 100,000 write/erase cycles per block with 1-bit ECC (this is explained below). MLC NAND is specified at 10,000 write/erase cycles per block with ECC. The MLC datasheet does not specify a number of bits of ECC required. Therefore, when using the same controller, a storage device using SLC will have an endurance value roughly 10x that of a similar MLC-based product. In order to achieve maximum endurance, capacity and speed, SiliconSystems currently uses SLC NAND in our SiliconDrive technology.

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A more thorough discussion of SLC vs. MLC can be found from the component manufacturers:

Samsung: http://www.samsung.com
Toshiba: http://www.toshiba.com

WEAR LEVELING

Wear leveling is defined as the allowing data writes to be evenly distributed over the entire storage device. More precisely, wear leveling is an algorithm by which the controller in the storage device re-maps logical block addresses to different physical block addresses in the solid-state storage array. The frequency of this re-map, the algorithm to find the "least worn" area to which to write and any data swapping capabilities are generally considered proprietary intellectual property of the controller vendor.

It is important to note that the wear leveling is done in the solid-state memory controller and is independent of the host system. The host system performs its reads and writes to logical block addresses only, so as far as the host is concerned, the data stays in the same place.

To illustrate the effects of wear leveling on overall endurance, assume three different storage devices with the following characteristics:

1. Flash Card with No Wear Leveling
2. Flash Card with Dynamic Wear Leveling
3. SiliconDrive with Static Wear Leveling

In addition, assume that all three storage devices use the same solid-state storage technologies (SLC or MLC – for purposes of this discussion, it doesn't matter). All three devices will have 75% of the capacity as static data, which is defined below:

Static Data: Any data on a solid-state storage device that does not change. Examples include: operating system files, look-up tables and executable files.

Finally, the same type of write is performed to all three systems. The host system is writing a single block of data to the same logical block address over and over again.

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No Wear Leveling

Figure 2 shows a normalized distribution of writes to a flash card that does not use wear leveling. In this instance, the data gets written to the same physical block. Once that physical block wears out and all spare blocks are exhausted (see discussion below), the device ceases to operate, even though only a small percentage of the card was used.

In this instance, the endurance of the card is only dependent on the type of flash used and any error correction capabilities in excess of one byte per sector. Early flash cards did not use wear leveling and thus failed in write-intensive applications. For this reason, flash cards with no wear leveling are only useful in consumer electronic applications.

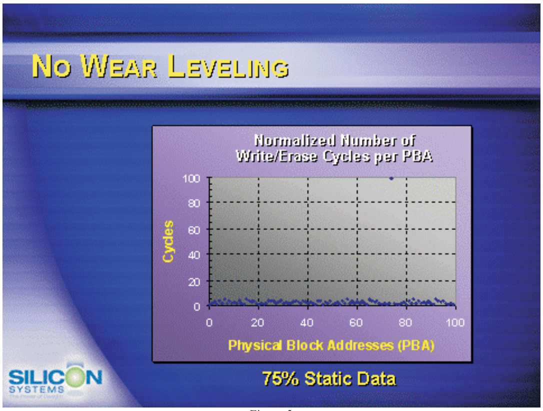

Figure 2

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Dynamic Wear Leveling

Figure 3 shows a normalized distribution of writes to a flash card that employs dynamic wear leveling. This algorithm only wear levels over "free" or "dynamic" data areas. That is to say, if there is static data as defined above, this area is never involved in the wear leveling process. In the current example, since 75% of the flash card is used for static data, only 25% of the card is available for wear leveling. The endurance of the card is calculated to be 25 times better than for the card with no wear leveling, but only one-fourth that of static wear leveling.

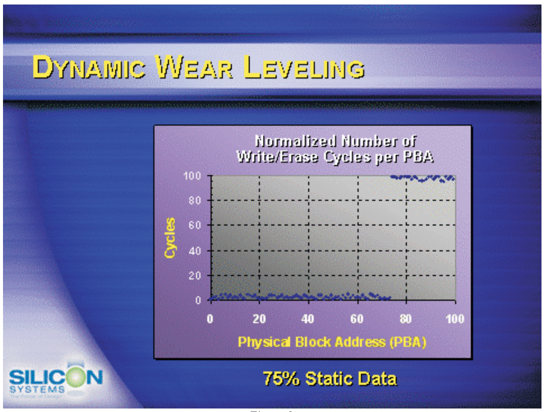

Figure 3

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Static Wear Leveling

Figure 4 shows a normalized distribution of writes to a SiliconDrive that employs static wear leveling. This algorithm evenly distributes the data over the entire SiliconDrive. The algorithm searches for the least-used physical blocks and writes the data to that location. If that location is empty, the write occurs normally. If that location contains static data, the static data is moved to a more heavily-used location prior to the new data being written. The endurance of the SiliconDrive is calculated to be 100 times better than for the card with no wear leveling and four times the endurance of the card that uses dynamic wear leveling.

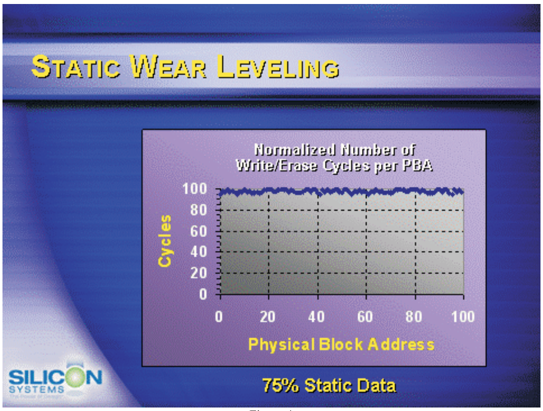

Figure 4

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ERROR CORRECTION

Part of the solid-state memory components specification is related to error correction. For example, SLC NAND components are specified at 100,000 write/erase cycles with one-bit ECC. It goes to reason that the specification increases with a better error correction algorithm. Most flash cards employ error correction algorithms ranging from two-bit to four-bit correction. SiliconSystems' SiliconDrive technology uses six-bit correction.

The term six-bit correction may be slightly confusing. Six-bit correction really defines the capability of correcting up to six bytes in a 512-byte sector. Since a byte is eight bits, this really means the SiliconDrive can correct 48 bits as long as those bits are confined to six bytes in the sector. The same definition holds for two-bit and four-bit correction.

The relationship between the number of bytes per sector the controller can correct does not appear to be directly proportional to the overall endurance, since the bit error rate of the NAND flash is not linear. To state it another way, six-bit error correction is not necessarily three times better than two-bit ECC. In most cases, it is significantly better than that.

SUMMARY OF MEDIA, WEAR LEVELING AND ECC

The matrix below summarizes the effects of the different items discussed above. In the table, a "1" indicates the best possible scenario, and a "10" indicates the least desirable in terms of endurance.

N = No Wear Leveling; D = Dynamic Wear Leveling; S = Static Wear Leveling

ECC	SLC NAND			MLC NAND		
	N	D	S	N	D	S
2-bit	6	5	4	10	9	8
4-bit	5	4	2	9	8	7
6-bit	4	3	1*	8	7	6

= SiliconSystems' SiliconDrive Configuration

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ENDURANCE CALCULATIONS

To get an idea of how long a solid-state storage device will last in an application, the following calculations can be used. Note: These calculations are valid only for products that use either dynamic or static wear leveling. Use the solid-state memory component specifications for products that do not use wear leveling.

To calculate the expected life in years a product will last:

$$\text{Years} = \frac{(\alpha - \beta) \times \lambda \times (1 - \varphi)}{(\omega \times \xi) \times k}$$

Where:

- α = Capacity in MB (when converting from MB to GB, MB = GB x 1,024)
- β = Amount of Static Data in MB (this value should be 0 for static wear leveling)
- λ = Endurance Specification
- φ = Safety Margin
- ω = File Size in MB (when converting from KB to MB, KB = MB x 1,024)
- ξ = Number of Writes of file size ω per minute
- k = Number of minutes per year = 525,600

To calculate the number of data transactions:

$$\text{Transactions} = \frac{(\alpha - \beta) \times \lambda \times (1 - \varphi)}{\omega}$$

Where:

- α = Capacity in MB (when converting from MB to GB, MB = GB x 1,024)
- β = Amount of Static Data in MB (this value should be 0 for static wear leveling)
- λ = Endurance Specification
- φ = Safety Margin Percentage (usually 25%)
- ω = File Size in MB (when converting from KB to MB, KB = MB x 1,024)

Figure 125: Silicon Systems white paper - page 9 of 9

6. 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. Therefore, the following measures might be necessary in order to boot from these flash drives (e.g. the SanDisk Cruzer Micro flash drive with 512 MB):

- **The flash drive must be reformatted or in some cases even re-partitioned (set active partition).**
- **The flash drive must be at the top of the BIOS boot order, or alternatively the IDE controllers can also be deactivated in the BIOS. This can be avoided in most cases if a "`fdisk /mbr`" command is also executed on the USB flash drive.**

6.1 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" - except with Windows 98SE), the USB flash drive can be converted immediately into an additional drive where data can be read or written. Only USB flash drives from the memory specialists SanDisk are used.

6.2 Order data

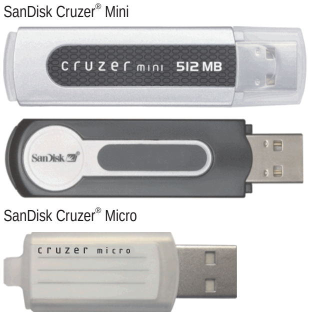
Model number	Description	Image
5MMUSB.0256-00	USB flash drive 256 MB SanDisk Cruzer Mini	SanDisk Cruzer® Mini  SanDisk Cruzer® Micro
5MMUSB.0512-00	USB flash drive 512 MB SanDisk Cruzer Mini up to Rev. E0 or Cruzer Micro starting with Rev. E0	
5MMUSB.1024-00	USB flash drive 1 GB SanDisk Cruzer Mini up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

Table 103: Order data - USB flash drives

6.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those 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			

Table 104: Technical data - USB flash drive 5MMUSB.xxxx-00

Features	5MMUSB.0256-00	5MMUSB.0512-00	5MMUSB.1024-00	5MMUSB.2048-00
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 104: Technical data - USB flash drive 5MMUSB.xxxx-00 (cont.)

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

6.3.1 Temperature humidity diagram - operation and storage

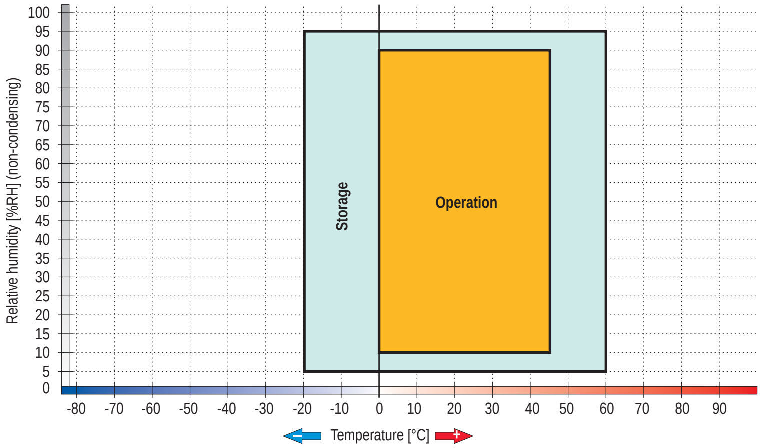


Figure 126: Temperature humidity diagram - USB flash drive - 5MMUSB.xxxx-00

6.4 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 105: 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.

6.5 Creating a bootable USB flash drive

When used in connection with an Automation PC 620 / Panel PC 700, it is possible to boot the system from one of the flash drives available from B&R (5MMUSB.0512-00, 5MMUSB.1024-00 and 5MMUSB.2048-00). The flash drive must be specially prepared for this.

6.5.1 Requirements

The following peripherals are required for creating a bootable flash drive:

- B&R USB flash drive (see model numbers for USB flash drives in chapter 1, section 5.7)
- Automation PC 620 or Panel PC 700
- USB floppy drive (external or slide-in USB floppy 5AC600.FDDS-00)
- PS/2 or USB keyboard
- A start disk created using MS-DOS 6.22 or Windows 98 - 1.44MB HDD (Windows Millennium, NT4.0, 2000, XP start disks cannot be used).
  The tools "`format.com`" and "`fdisk.exe`" must be located on the diskette!

6.5.2 Procedure

- Plug in the flash drive and boot from the start disk.
- Set active partition on the flash drive using "`fdisk`" and follow the further instructions.
- Reboot the system from the start disk.
- Format and simultaneously transfer the system files to the flash drive with the command "`format c: /s`".

7. Protective caps

The protective caps protect all Mobile Panel attachment cables and switching cabinet cables 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.0000-00	**Protective cap for add-on socket (attachment cable)** Protection for attachment cable and switching cabinet cable	"Attachment cable 5ACMPH.0xxx-00" on page 74 "Switching cabinet cable (crossover) 5ACMPC.0020-00" on page 78 "Switching cabinet cable (straight thru) 5CAMPC.0020-01" on page 83
5CAMPP.0000-10	**Protective cap for circular plug (attachment cable)** Protection for attachment cable during transport	"Attachment cable 5ACMPH.0xxx-10" on page 88
5CAMPP.0001-10	**Protective cap for receptacle (switching cabinet cable)** Protection for switching cabinet cable during transport	"Switching cabinet cable (crossover) 5ACMPC.0020-10" on page 92 "Switching cabinet cable (straight thru) 5ACMPC.0020-11" on page 96

Table 106: Order data - Protective caps

7.1 Attachment cable protective cap 5CAMPH.0xxx-00

Figure 127: Attachment cable protective cap 5CAMPP.0000-00

Chapter 6
Accessories

7.2 Attachment cable protective cap 5CAMPP.0000-10

Figure 128: Attachment cable protective cap 5CAMPP.0000-10

7.2.1 Installation

- Feed the circular plug through the loop.

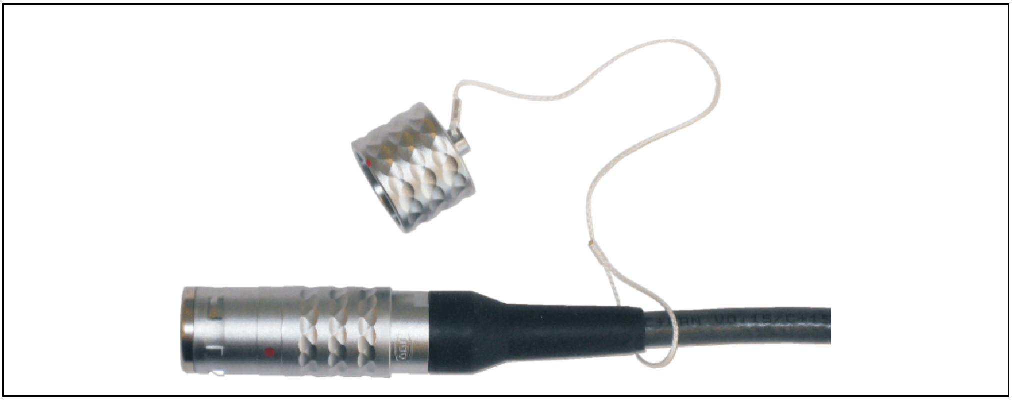


Figure 129: Attaching the protective cap - feed plug through loop

- 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).

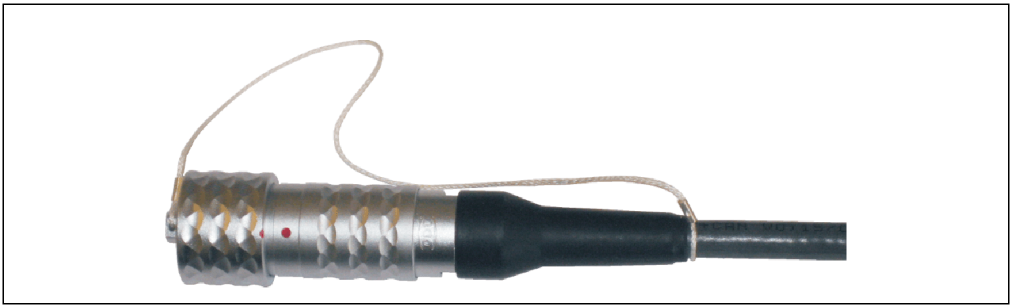


Figure 130: Attaching the protective cap - pull tight

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

Figure 131: Switching cabinet cable protective cap 5CAMPP.0001-10

7.3.1 Installation

Attaching the switching cabinet cable protective cap (e.g. to the connection box)

- Fasten the protective cap with a size 10 Torx screw.
- Insert the cap into the socket.

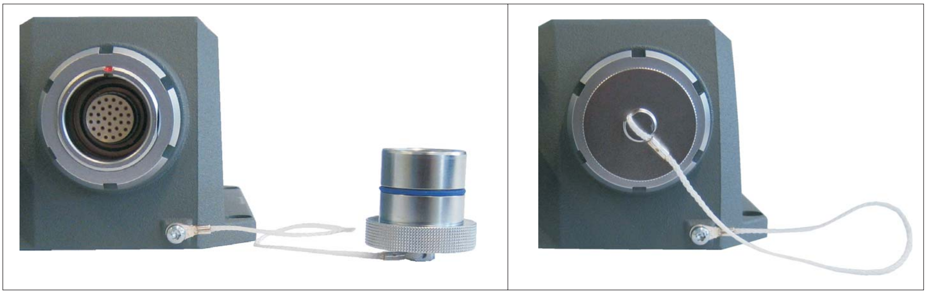


Figure 132: Attaching the switching cabinet cable protective cap

8. 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 133: Connection box 4MPCBX.0000-00

8.1 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

8.2 Box cable 5CAMPB.0100-10

The box cable establishes the electrical connection between the switching cabinet 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, serial data transfer 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.

2. Exchanging the attachment cable

Danger!

The attachment cable may only be exchanged by trained personnel when the Mobile Panel device and the entire system are turned off.

2.1 Procedure

Warning!

Before dismounting, place the Mobile Panel device on a clean flat surface with the display facing down so that the operating elements are not damaged.

1) Remove the handle by loosening the screw with a 4 mm hex key.

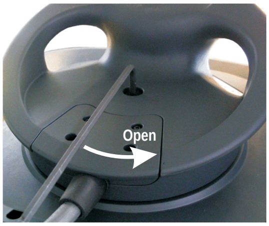


Figure 134: Taking out the locking screw

2) Tip up the side of handle to release the connectors of the old attachment cable to the panel.

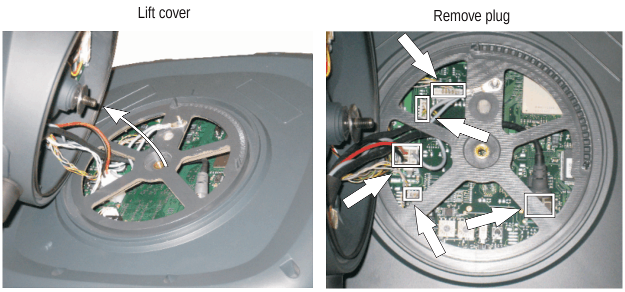


Figure 135: Removing the attachment cable

3) Remove the enable switch connector.

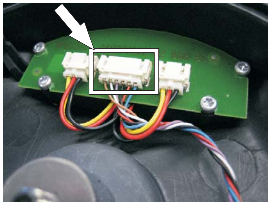


Figure 136: Removing the enable switch connector

4) Separate the attachment cable from the handle. To do so, the four cover screws need to be removed (using a Torx size 10 screwdriver) and the old attachment cable pulled through the cable opening.

Figure 137: Handle clasp screw positions

5) Lead the new attachment cable through the opening careflully, one connector at a time (1). Set the stress relief fastener in place (2). Put on the cover and replace the screws tightly (3).

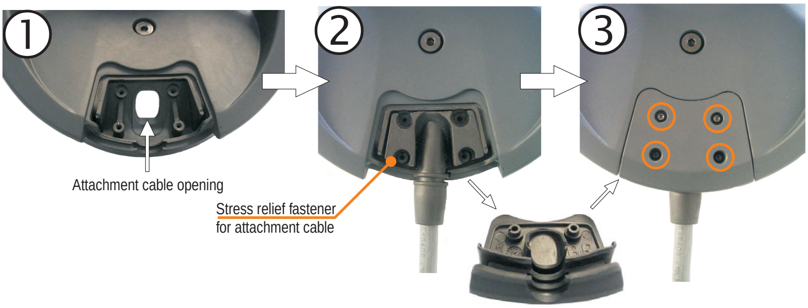


Figure 138: Connecting the attachment cable and handle

6) Connect the enable switch connector to the handle.

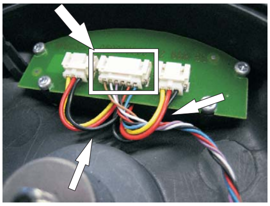


Figure 139: Connecting the enable switch connector (ST1)

Information:

The plug must first be fed through one of the two loops of the enable switch circuit before it is connected to the handle circuit board.

7) Connect the Mobile Panel attachment cable to the panel (ST2, ST3, ST4, ST5, ST6). See figure 41 "Attachment cable 5CAMPH.0xxx-10" on page 88 for connecting the cable. Cables may only be guided through the housing opening identified in the image 140 "Connectors and cable arrangement" (see arrow).

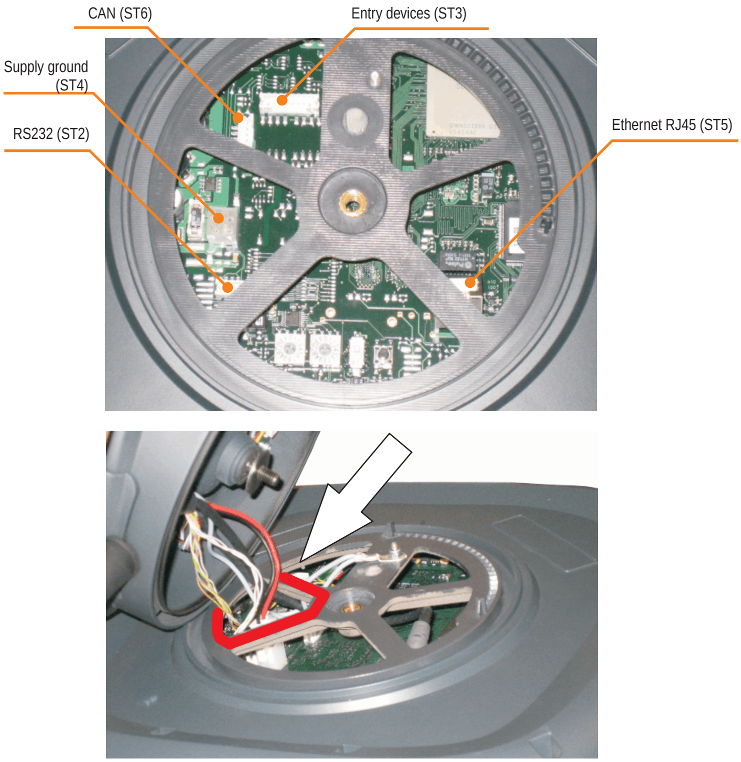


Figure 140: Connectors and cable arrangement

Information:

When connecting the Ethernet RJ45 connector (ST5) and the power supply connector (ST4), make sure that the connector locking mechanisms are engaged.

8) The grounding wire must be fed clockwise up through the next opening and fastened onto the lock washer with a nut. A nut is included with new cables. Before fastening, the heat shrink tubing must be removed from the cable lug.

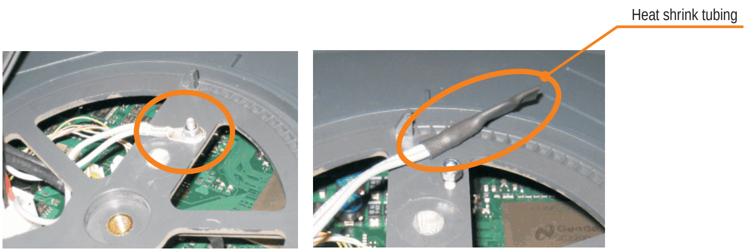


Figure 141: Attaching the ground

9) Put the handle and panel back together again. Note the following when doing so: All cables must be guided through to the left of the cover screws (1) (2). When setting the handle in place, the two markings (3) must line up.

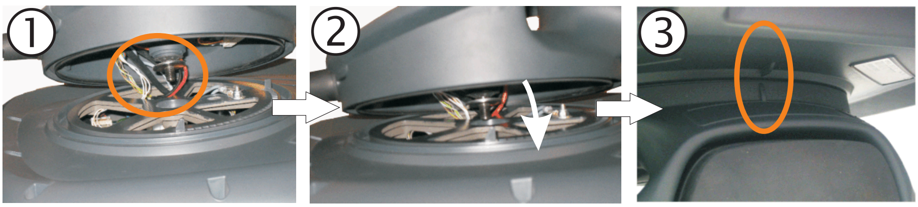


Figure 142: Connecting the handle with the panel

Danger!

Before putting the handle and the panel back together again, all connectors - especially those for the safety equipment (enable switch connector (ST1) and the entry device (ST3)) - must be checked for contact with the attachment cable!

Warning!

Cables must not be pinched when the unit is put back together.

10) Screw in the cover screw.

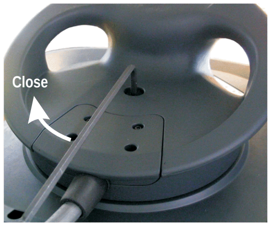


Figure 143: Tightening the cover screw

Danger!

Before commissioning the machine or system, all safety features of the Mobile Panel device must be checked for functionality.

3. Changing the battery

Batteries only need to be changed on devices that have a lithium battery.

The lithium battery buffers the internal real-time clock (RTC), SRAM data, and individually saved BIOS settings. The battery status (good or bad) can be queried using software. From the point when battery capacity is recognized as insufficient, data buffering is guaranteed for approximately another 500 hours. When changing the battery, data is buffered for approximately another 10 minutes by a gold leaf capacitor. The buffer duration of the battery lasts at least 2 years (at 50 °C).

Danger!

The battery may only be exchanged by trained personnel when the Mobile Panel device and the entire system are turned off.

3.1 Procedure

Warning!

Before disassembling, place the Mobile Panel device on a clean flat surface with the display facing down so that the operating elements are not damaged.

1) Remove the handle by loosening the screw with a 4 mm hex key.

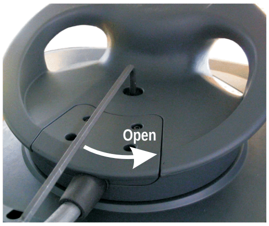


Figure 144: Taking out the locking screw

2) Tip up the side of the handle and remove the battery from the fixture (don't use pliers or uninsulated tools --> risk of short circuit). The battery should not be held by its edges. Insulated tweezers may also be used for removing the battery.

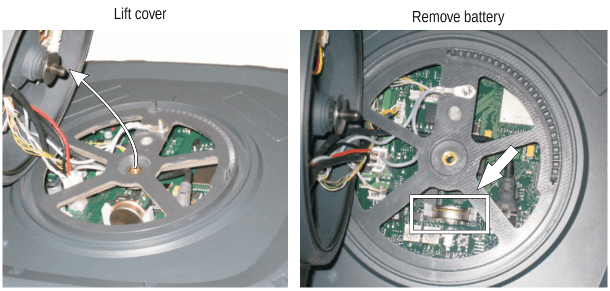


Figure 145: Removing the battery

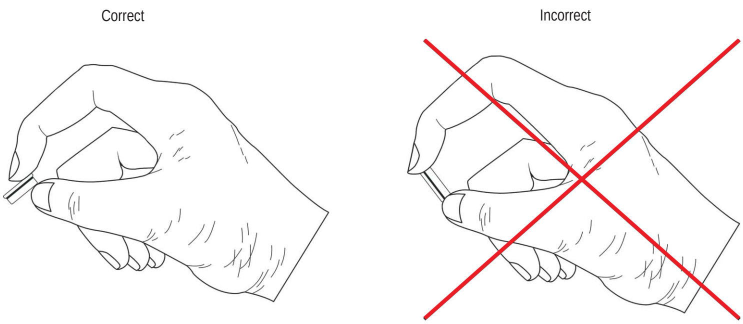


Figure 146: Battery handling

3) After removing the battery, the data is buffered for at least another 10 minutes by a gold leaf capacitor so that data is not lost. Insert the new battery with correct polarity.

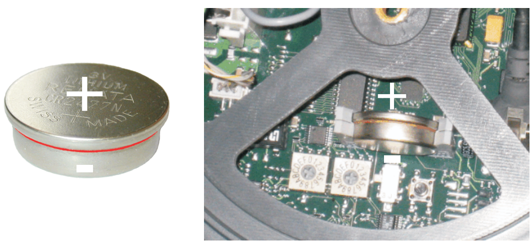


Figure 147: Inserted lithium battery

4) Put the handle and panel back together again. Note the following when doing so: All cables must be guided through to the left of the cover screws (1) (2). When setting the handle in place, the two markings (3) must line up.

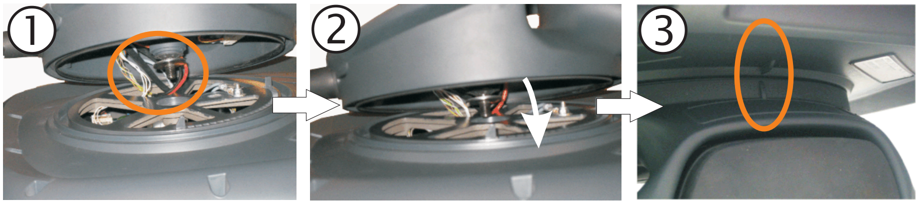


Figure 148: Connecting the handle with the panel

Danger!

Before putting the handle and the panel back together again, all connectors - especially those for the safety equipment (enable switch connector (ST1) and the entry device (ST3)) - must be checked for contact with the attachment cable!

Warning!

Cables must not be pinched when the unit is put back together.

5) Screw in the cover screw.

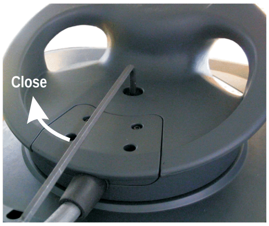


Figure 149: Tightening the cover screw

Danger!

Before commissioning the machine or system, all safety features of the Mobile Panel device must be checked for functionality.

Appendix A

Information:

The following characteristics, features and limits values only refer to the entry device and do not apply to the Mobile Panel device as a whole. For the entire device, refer to chapter 2 "Technical data", section 2 "Entire device" on page 32 and the technical data sections for each of the operating units (see section "Technical data" on page 47).

1. E-stop button

The E-stop unit consists of an E-stop switching element and an E-stop button.

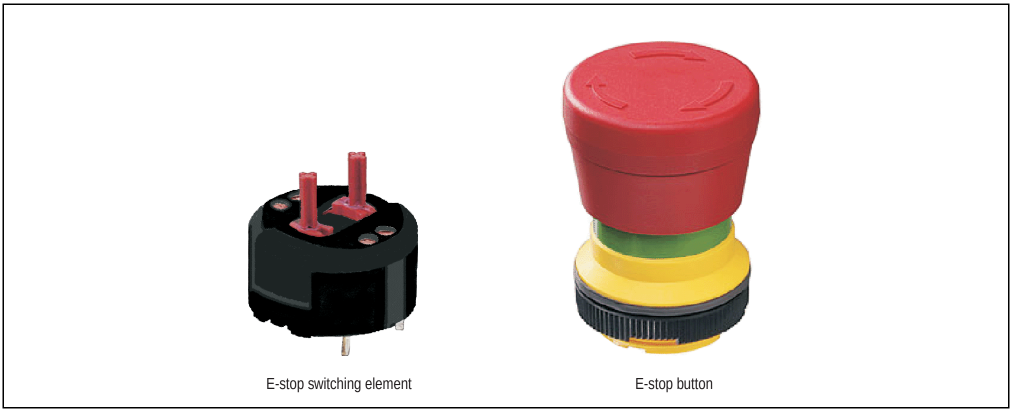


Figure 150: E-stop entry device

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.

E-stop button

Property	E-stop switching element	E-stop button
Manufacturer Type	RAFI 22FS switching element E-stop, 2 N.C. contacts	RAFI 22FS E-stop, not illuminated
Operating voltage AC/DC	Max. 120 V	-
Operating current AC/DC	Max. 550 mA	-
Contact system	Self-cleaning bridge contact	-
Standards Normally closed contact Weathering resistance Salt mist Protection (front side) Approbations	 Positive opening contact according to IEC 947-5-1 - - - -	 - According to IEC 68-1-2, 2-2 and 2-30 According to IEC 68-2-11 IP65 IEC 947, 1058; UL 508;CSA 22.2; EU-NSR 73/23; Ulc
Impact resistance	At least 100 N	
Operating force	Approx. 5 N per contact element	-
Lifespan	1 million actuations at 10 mA/24 VDC	50000 actuations
Ambient temperature Operation Storage Transport	 -25°C to +70 °C -40°C to +80 °C -40°C to +80 °C	

Table 107: Technical data - E-stop switching element and E-stop button

2. Key switch

The key switch unit consists of a switching element and an operating element.

Key switch switching element

Key switch operating element

Figure 151: Key switch entry device

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	Key switch switching element	Key switch operating element
Manufacturer Type	RAFI 22FS universal switching element, 1 N.O. contact	RAFI 22FS key switch, round collar
Contact function	Key	
Operating voltage AC/DC	Max. 42 V	-
Operating current AC/DC	Max. 100 mA	-
Contact system	Self-cleaning bridge contact	-
Standards Normally open contact Weathering resistance Salt mist Protection (front side) Approbations	 - - - - -	 - According to IEC 68-1-2, 2-2 and 2-30 According to IEC 68-2-11 IP65 IEC 947, 1058; UL 508;CSA 22.2; EU-NSR 73/23; ULc
Impact resistance	At least 100 N	
Rotation angle	1 x 40 degrees, clockwise	
Outlet position for the key	0	

Table 108: Technical data - Key switch switching element and operating element

Property	Key switch switching element	Key switch operating element
Lifespan	1 million actuations at 10 mA/24 VDC	0.3 million, operations
Ambient temperature Operation Storage Transport	 -25°C to +70 °C -40°C to +80 °C -40°C to +80 °C	

Table 108: Technical data - Key switch switching element and operating element (cont.)

2.1 Angle of rotation

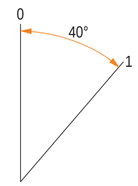


Figure 152: Angle of rotation - key switch

3. Enable switch

The enable switch is part of the enabling equipment and is integrated in the enable switch cover.

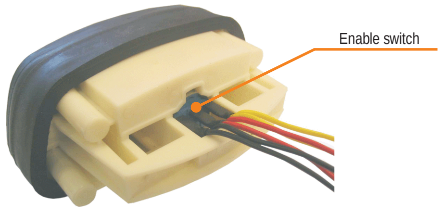


Figure 153: Enable switch

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.

Properties	Enable switch
Manufacturer Type	idec HE5B-M2
Ambient temperature Operation Storage Transport	 -25°C to +60 °C -40°C to +80 °C -40°C to +80 °C
Relative humidity Operation	 45% to 85%, non-condensing
Altitude	Max. 2000 meters
Operating voltage AC/DC	Max. 125 V
Operating current AC DC	 Max. 0.5 A at 125 V resistive load Max. 0.3 A inductive load Max. 1 A at 30 V resistive load Max. 0.7 A inductive load
Minimum operating requirements	3 V AC/DC, 5 mA
Insulation resistance	100 MOhm
Vibration Operation	 5 to 55 Hz, 0.5 mm amplitude
Shock Operation	 Max. 100 m/s²
Impact resistance	At least 250 N

Table 109: Technical data - Enable switch

Enable switch

Properties	Enable switch
Lifespan Mechanical Electrical	 Position [1] 0 -> 1 -> 0: At least 1 million operations Position [1] 0 -> 1 -> 2 -> 0: At least 100000 operations
Standards	IP65 protection according to IEC60529 IEC60947-5-1 EN60947-5-1 JIS C8201-5-1 UL508 CSA C22.2 No. 14 ISO12100/EN292 IEC60204-1/EN60204-1 ISO11161/prEN11161 ISO10218/EN775 ANSI/RIA R15.06, B11.19

Table 109: Technical data - Enable switch

1) For switch positions, see table 23 "Switch positions for the enable switch" on page 69.

4. Touch screen

4.1 3M touch

This touch screen is used in 8.4" Mobile Panel designs.

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.

3M touch	Specifications
Manufacturer	3M (www.3M.com)
Accuracy	-
Reaction time	-
Release pressure	10 to 80 grams
Resolution	-
Light permeability	Up to 85%
Temperature Operation Storage Transport	 - 20°C to + 50 °C - 40°C to + 70 °C - 40°C to + 70 °C
Waterproofing	-
Lifespan	35 million contacts on the same point
Chemical resistance 1)	Tea, coffee, ketchup, mustard, vinegar, beer, cola, red wine, cooking oil, whiskey, universal cleaning agents, washing detergent, bleach (5.25%), hydrogen peroxide (3%), Lysol, ethyl, alcohol, isopropyl alcohol, acetone, methyl ethyl ketone (MEK), toluene, concentrated hydrochloric acid, naphtha, mineral oil, motor oil, diesel, gear fluid, brake fluid, antifreeze, hydraulic oil
Activation	Finger, pointer, credit card, glove

Table 110: 3M touch

1) The active area of the touch screen is resistant to these chemicals for one hour at 22°Cand 45% relative humidity.

4.1.1 Cleaning

The touch screen should be cleaned with a moist lint-free cloth. 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 and not sprayed directly onto the touch screen itself. Never use aggressive solvents, chemicals, or scouring agents.

4.2 Gunze touch

This touch screen is used in 5.7" Mobile Panel designs.

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.

Gunze touch	Specifications
Manufacturer	Gunze (www.gunzeusa.com)
Accuracy	-
Reaction time	-
Release pressure	< 50 grams (with finger)
Resolution	-
Light permeability	Up to 84%
Temperature Operation Storage Transport	 - 10°C to + 60 °C - 20°C to + 70 °C - 20°C to + 70 °C
Waterproofing	-
Lifespan	1 million contacts on the same point
Chemical resistance	Alcoholic-based compound, such as ethanol.
Activation	Finger, pointer, credit card, glove

Table 111: Gunze touch

4.2.1 Cleaning

The touch screen should be cleaned with a moist lint-free cloth. 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 and not sprayed directly onto the touch screen itself. Never use aggressive solvents, chemicals, or scouring agents.

5. Mylar

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.

The Mylar conforms to DIN 42115 (section 2). This means it is resistant to exposure to the following chemicals for a 24-hour period with no visible signs of damage:

Ethanol Cyclohexanol Diacetone alcohol Glycol Isopropanol Glycerine Methanol Triacetin Dowandol DRM/PM	Formaldehyde 37%-42% Acetaldehyde Aliphatic hydrocarbons Toluene Xylene White spirits	1.1.1.Trichloroethane Ethyl acetate Diethyl ether N-Butyl acetate Amyl acetate Butylcellosolve Ether
Acetone Methyl ethyl ketone Dioxan Cyclohexanone MIBK Isophorone	Formic acid <50% Acetic acid <50% Phosphoric acid <30% Hydrochloric acid <36% Nitric acid <10% Trichloracetic acid <50% Sulphuric acid <10%	Sodium hypochlorite <20% Hydrogen peroxide <25% Potassium carbonate Washing agents Fabric conditioner Ferric chloride Ferrous chloride (FeCl2) Ferrous chloride (FeCl3) Dibutyl phthalate Dioctyl phthalate Sodium carbonate
Ammonia <40% Caustic soda <40% Potassium hydroxide Alkali carbonate Bichromate Potassium Acetonitrile Sodium bisulphate	Cutting oil Diesel oil Linseed oil Paraffin oil Blown castor oil Silicon oil Turpentine oil substitute Universal brake fluid Aviation fuel Petrol Water Sea water Decon	

Table 112: Chemical resistance of the mylar

The Mylar conforms to DIN 42115 section 2 for exposure to glacial acetic acid for less than one hour without visible damage.

6. Filter glass

If the Mobile Panel is not equipped with a touch screen, then a filter glass with the following properties is used.

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.

6.1 Mechanical characteristics

Abrasion-resistant according to DIN 52347

Adhesive strength according to DIN 58 196-K2 (section 6)

6.2 Chemical properties

Durability according to DIN 50021 - CASS

7. Housing

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.

The housing surface (paint) is resistant to the following chemicals:

Ethanol Glycol Isopropanol Glycerine Methanol	Vinigar-based cleaning agent Soaps Cleaning agent (such as for auto maintentance or industrial use)	Beer Wine Coffee Fruit

Table 113: Chemical resistance of the mylar

8. Perspectives

The perspectives can be seen in the technical data for the individual components.

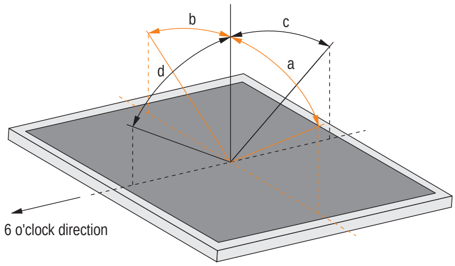


Figure 154: Perspectives

9. Glossary

A

APC

Abbreviation for "**A**utomation **PC**".

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.

BIOS

An abbreviation for "**B**asic **I**nput/**O**utput **S**ystem". Core software for computer systems with essential routines for controlling input and output processes on hardware components, for performing tests after system start, and for loading the operating system. Although BIOS is used to configure a system's performance, the user does not usually come into contact with it.

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.

Bus unit

Provit bus units consist of the housing, interface board slots and the power supply for the system units.

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

CAN

An abbreviation for "**C**ontroller **A**rea **N**etwork" (serial bus system). Structure according to ISO 11898. Bus medium: twisted pair. Good transfer properties in short distances less than 40 m with a 1 Mbit/sec data transfer rate. Maximum number of stations: unlimited in theory, up to 64 with real-time capability in practice, i.e. defined maximum delay times for messages with high priority. High reliability using error detection, error handling, troubleshooting. Hamming distance.

CD-ROM

Abbreviation for »**C**ompact **D**isc **R**ead-**O**nly **M**emory« A removable data medium with a high capacity of ~700 MB. CD-ROMs are optically scanned.

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.

CMOS

"CMOS" is a battery powered memory area where fundamental parameters of an IBM (or compatible) personal computer are stored. Information such as the type of hard drive, size of the working memory and the current date and time are required when booting the computer. As the name suggests, the memory is based on CMOS technology standards.

CompactFlash®

CompactFlash memory cards [CF cards] are removable, nonvolatile mass storage systems with very small dimensions [43 x 36 x 3.3 mm, approximately half the size of a credit card]. In addition to the flash memory chips, the controller is also present on the cards. CF cards provide complete PC card / ATA functionality and compatibility. A 50-pin CF card can be simply inserted in a passive 68-pin type II adapter card. It conforms to all electrical and mechanical PC card interface specifications. CF cards were launched by SanDisk back in 1994. Currently, memory capacities reach up to 8 GB per unit. Since 1995, CompactFlash Association [CFA] has been looking after standardization and the worldwide distribution of CF technology.

Controller

A device component which allows access to other devices on a computer subsystem. A disk controller, for example, allows access to hard disks and disk drives and is responsible both for physical and logic drive access.

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.

D

DVD

An abbreviation for "**D**igital **V**ersatile **D**isc". The next generation of optical data carrier technology. Using this technology it is possible to encode video, audio and computer data on CD. DVDs can store a higher volume of data than conventional CDs. Standard DVDs , which have a single coating, can hold 4.7 GB. Double coated DVDs can hold 8.5 GB. Double sided DVDs can hold up to 17 GB. A special drive is needed for DVDs. Conventional CDs can also be played on DVD drives.

E

EDO-RAM

An abbreviation for "**E**xtended **D**ata **O**ut **R**andom **A**ccess **M**emory". Dynamic RAM that provides data for the CPU while the next memory access is being initialized. This increases speed.

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].

Encode, encoding

When processing information, it is often necessary to change the information from one form of representation to another. This conversion process is called encoding, and the rules used to assign one character set to another are referred to as encoding rules. A differentiation is made between ambiguous and unambiguous encoding depending on if one set is a direct reflection of the other. Most codes use unambiguous encoding with one set directly reflecting the other. A differentiation is also made between redundant and non-redundant encoding. With non-redundant encoding, the full range of the available character set is used, i.e. each code is defined. With redundant encoding, the available character set also contains codes that are not used. This differentiation is important during data transfer when detecting and, if necessary, correcting data transfer errors.

EPROM

Erasable **PROM** >(completely with ultraviolet light).

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

FDD

Abbreviation for "**F**loppy **D**isk **D**rive". Reading device for removable magnetic memory from the early days of PC technology. Due to their sensitivity and moving components, FDDs have been almost completely replaced by CompactFlash memory in modern automation solutions.

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.

Floppy

Also known as a diskette. A round plastic disk with an iron oxide coating that can store a magnetic field. When the floppy disk is inserted in a disk drive, it rotates so that the different areas (or sectors) of the disk's surface are moved under the read/write head. This allows the magnetic orientation of the particle to be modified and recorded. Orientation in one direction represents binary 1, while the reverse orientation represents binary 0.

FPC

An abbreviation for "**F**lat **P**anel **C**ontroller".

FPD

An abbreviation for "**F**lat **P**anel **D**isplay".

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.

G

GB

Gigabyte (1 GB = 230 or 1,073,741,824 bytes)

H

Handshake

Method of synchronization for data transfer when data is sent at irregular intervals. The sender signals that data can be sent, and the receiver signals when new data can be received.

HDD

An abbreviation for "**H**ard **D**isk **D**rive". Fixed magnetic mass memory with high capacities, e.g. 120 GB.

I

IDE

An abbreviation for "**I**ntegrated **D**rive **E**lectronics". A drive interface where the controller electronics are integrated in the drive.

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.

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).

K

Keypad modules

Keypad modules are divided into two groups: **standard keypad modules** (can be cascaded to a controller) and **special keypad modules** (must be connected by an electrician according to function, e.g. E-stop).

L

LD

Ladder Diagram (Graphical programming language according to IEC 1131-3 and DIN EN 61131-3 for creating PLC application programs. LAD).

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).

Microprocessor

Highly integrated circuit with the functionality of a CPU, normally housed on a single chip. It comprises a control unit, arithmetic and logic unit, several registers and a link system for connecting memory and peripheral components. The main performance features are the internal and external data bus and address bus widths, the command set and the clock frequency. Additionally, a choice can be made between CISC and RISC processors. The first commercially available worldwide microprocessor was the Intel 4004. It came on the market in 1971.

MIPS

Million instructions per second. Measurement for the computing speed of computers.

Motherboard

A circuit board that houses the main components of a computer such as the CPU switching circuit, co-processors, RAM, ROM for firmware, interface circuits, and expansion slots for hardware expansions.

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).

MTC

An abbreviation for "**M**ain**t**enance **C**ontroller". The MTC is an independent processor system that provides additional functions for a B&R industrial PC that are not available with a normal PC. The MTC communicates with the B&R industrial PC via the ISA bus (using a couple register).

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.

N

.NET

DOTNET, Microsoft's new development platform that provides a common runtime library and type system for all programming languages. DOTNET is the umbrella term for the following products, strategies and technologies: .NET Framework, a new software platform, Visual Studio .NET, a new development environment that supports several .NET programming languages (e.g. C# or VB.NET, specially created for .NET), .NET My Services, a group of services taking over functions such as authentication, .NET Enterprise Server, which, apart from its name, is independent of the other technologies and includes the products Exchange Server 2000, Application Center 2000, and SQL Server 2000. .NET devices, supported by a slimmed down version of .NET Framework (.NET Compact Framework).

Node

Branching point in a network.

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.

OPC

OLE for Process Control. A communication standard for components in the area of automation. The goal of OPC development is to provide an open interface that builds on Windows-based technologies such as OLE, COM and DCOM. It allows problem-free standardized data transfer between controllers, operating and monitoring systems, field devices and office applications from different manufacturers. This development is promoted by the OPC Foundation, which is made up of over 200 companies from around the world, including Microsoft and other leading companies. Lately, OPC is interpreted as a synonym for "openness, productivity, and connectivity", symbolizing the new possibilities that this standard opens up.

OPC server

The missing link between connection modules for the Interbus and the visualization application. It communicates serially with the connection modules via the ISA or PCI bus or Ethernet.

P

Panel

A common term for B&R display units (with or without keys).

Panelware

A generic term given for standard and special keypad modules offered by B&R.

PC card

Registered trademark of PCMCIA for add-on cards conforming to PCMCIA specifications.

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.

POST

An abbreviation for "**P**ower-**O**n **S**elf **T**est". A set of routines that are stored in ROM on the computer and that test different system components, e.g. RAM, disk drive and the keyboard in order to determine that the connection is operating correctly and ready for operation. POST routines notify the user of problems that occur. This is done using several signal tones or by displaying a message that frequently accompanies a diagnosis value on the standard output or standard error devices (generally the monitor). If the POST runs successfully, control is transferred over to the system's bootstrap loader.

Power Panel

Power Panel is part of the B&R product family and is a combination of an operator panel and controller in one device. This covers the PP21 and PP41 products.

POWERLINK

See "Ethernet POWERLINK".

PROFIBUS DP

PROFIBUS for "decentralized peripherals". PROFIBUS DP can be used to allow simple digital and analog I/O modules as well as intelligent signal and data processing units to be installed in the machine room, which among other things can significantly reduce cabling costs. Often used for time-critical factory automation applications.

PV

Process variable. Logical storage location for values and states in a program.

Q

QVGA

Abbreviation for **Q**uarter **V**ideo **G**raphics **A**rray. Usually a screen resolution of 320 × 240 pixels.

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".

ROM

An abbreviation for "**R**ead-**O**nly **M**emory". Semiconductor memory where programs or data were permanently stored during the production process.

RS232

Recommended **S**tandard **N**umber **232**. Oldest and most widespread interface standard, also called a V.24 interface. All signals are referenced to ground making this an unbalanced interface. High level: -3 ... -30 V, Low level: +3 ... +30 V; cable lengths up to 15 m, transfer rates up to 20 kBit/s; for point-to-point connections between 2 participants.

RTS

An abbreviation for "**R**equest **T**o **S**end". A signal used in serial data transfer for requesting send permission. For example, it is sent from a computer to the modem connected to it. The RTS signal is assigned to pin 4 according to the hardware specifications of the RS-232-C standard.

RXD

An abbreviation for "Receive (**RX**) **D**ata". A line for transferring serial data received from one device to another, e.g. from a modem to a computer. For connections complying with the RS-232-C standard, the RXD is connected to pin 3 of the plug.

S

SCADA

Supervision, **C**ontrol **A**nd **D**ata **A**cquisition. SCADA systems are used to control, monitor, and log industrial processes. A high degree of configurability allows customization for various processes.

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.

Special keypad modules

The following keypad modules are offered by B&R: Dummy module, emergency stop module, key switch module (made up of 1 key switch and 1 on /off switch) and a start/stop module (made up of 2 buttons and a label field).

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.

Standard keypad module

The following keypad modules are offered by B&R: 16 keys with 16 LEDs, 12+4 keys with 4 LEDs, 8 keys with 4 LEDs and a label field and 4 keys with 4 LEDs and 4 label fields.

Switch

Device similar to a hub that takes data packets received in a network and, unlike a hub, passes them only to the respective addressee, not to all network nodes. Unlike a hub, a switch provides targeted communication within a network that only takes place between sender and receiver. Other network nodes are not involved.

System units

Provit system units consist of a mainboard (without processor), slots for RAM modules, VGA controller, serial and parallel interfaces, and connections for the FPD, monitor, PS/2 AT keyboard, PS/2 mouse, USB, Ethernet (for system units with Intel Celeron and Pentium III processors), Panelware keypad modules and external FDD.

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.

Touch screen

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

TXD

An abbreviation for "Transmit (**TX**) **D**ata". A line for the transfer of serial data sent from one device to another, e.g. from a computer to a modem. For connections complying with the RS-232-C standard, the TXD is connected to pin 2 of the plug.

U

UART

An abbreviation for "**U**niversal **A**synchronous **R**eceiver-**T**ransmitter". A module generally consisting of a single integrated circuit that combines the circuits required for asynchronous serial communication for both sending and receiving. UART represents the most common type of circuit in modems for connecting to a personal computer.

UDMA

An abbreviation for "**U**ltra **D**irect **M**emory **A**ccess". A special IDE data transfer mode that allows high data transfer rates for drives. There have been many variations in recent times.
UDMA33 mode transfers 33 megabytes per second.
UDMA66 mode transfers 66 megabytes per second.
UDMA100 mode transfers 100 megabytes per second.
Both the mainboard and the hard drive must support the specification to implement modifications.

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.

Visual Components

Integrated in B&R Automation Studio. Visual Components can be used to configure visualization projects that use text and graphics.

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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Symbole

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