

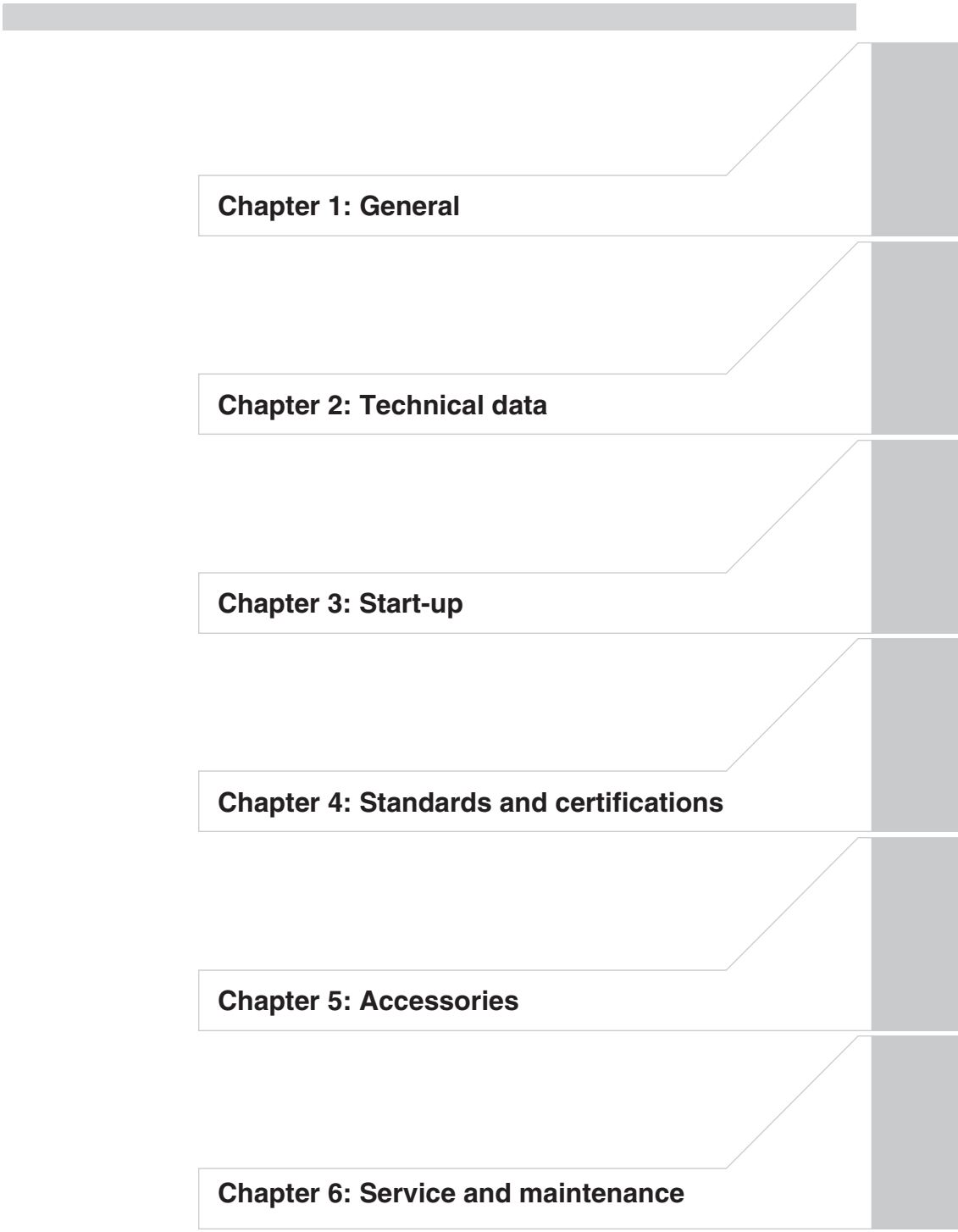
Automation Panel 900

User's Manual

Version: **1.60 (January 2008)**

Model number: **MAAP900-ENG**

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Chapter 1 • General

Information:

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

1. Manual history

| Version | Date | Changes |
|-----------------|------------|--|
| 1.0 Preliminary | 14.12.2004 | - First version |
| 1.1 Preliminary | 22.04.2005 | Changes / new features <ul style="list-style-type: none"> - Model numbers added - Keypad devices - Legend strip templates |
| 1.2 Preliminary | 31.01.2006 | Changes / new features <ul style="list-style-type: none"> - USB interface cover (cannot be lost) 5AC900.1200-00 added. - Information regarding the touch screen driver added. - Technical data for the SDL cable (flex radius, AWG, etc.) modified and corrected. - SDL cables (20, 25 and 30 m) added (5CASDL.0200-00, 5CASDL.0250-00 and 5CASDL.0300-00). - Conductor cross section and AWG change for the supply plug. - New front view photos of all Automation Panel devices. - Information about general tolerances according to DIN ISO 2768 added to dimension diagrams. - Safety guidelines revised - Lifespan of backlight on the 5AP920.1706-01 changed to 50000 hours (depending on revision). - Display protection specified in more detail (IP20 and IP65). - Installation diagrams and tolerance information revised for the dimensions sections |

Table 1: Manual history

| Version | Date | Changes |
|---------|------------|--|
| 1.30 | 30.10.2006 | <p>Changes / new features</p> <ul style="list-style-type: none"> - Safety guidelines updated to include ESD. - SDL cable with 45° plug on one end 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 added. - SDL cable with extender 5CASDL.0300-10 and 5CASDL.0400-10 added. - Elo touch screen specification updated (see Appendix A). - Extensive changes to the technical data for the Automation Panel display units - "Standards and certifications" chapter added. - HMI Drivers & Utilities DVD 5SWHMI.0000-00 added. - B&R Key Editor information added. - "Key and LED configurations" on page 208 added - "Example connections with an Automation PC 620" on page 179 added - "Glossary" on page 277 added - "USB flash drive" on page 247 added - "SDL flex cable 5CASDL.0xxx-03" on page 159 and "SDL flex cable with extender 5CASDL.0x00-13" on page 166 added. - Chapter "Service and maintenance" on page 251 added. - New terminal blocks added and mounting instructions edited. - Technical data for the 12.1" Automation Panel 5AP920.1214-01 added. - 12.1" Automation Panel 5AP920.1214-01 added. |
| 1.40 | 11.12.2006 | <p>Changes / new features</p> <ul style="list-style-type: none"> - 2 USB flash drive 5MMUSB.2048-00 from SanDisk added. - Cable overview of connection examples changed. - Temperatures for devices in Rittal housing added. - Installation dimensions for 5AP920.1214-01 device changed. - Perspective description modified. - "Perspectives" on page 263 added - "Mounting compatibilities" on page 266 added - Glossary revised. - Firmware ID modified. - Ambient temperatures for the 12.1" Automation Panel 5AP920.1214-01 added. - "Temperature humidity diagram - 5AP920.1214-01" on page 81 added - Figure 2 "Automation Panel and Automation Panel Link insert card" on page 26 changed. |
| 1.50 | 15.02.2007 | <p>Changes / new features</p> <ul style="list-style-type: none"> - Temperature and humidity data revised. - Technical data for individual components revised. - Figure "Temperature humidity diagram - 5AP920.1706-01" on page 121 changed. - Photos of SDL cable with extender 5CASDL.0x00-13 updated. - Image of "Pin assignments - SDL cable 5CASDL.0xxx-03" on page 162 changed, structure of SDL cable 5CASDL.0xxx-03 removed. |
| 1.60 | 31.10.2007 | <p>Changes / new features</p> <ul style="list-style-type: none"> - Cross-references deleted in chapter 3 "Commissioning" (replaced by "see User's Manual APC620"). - Technical data (flex radius information) for SDL cables Rev. - "SDL flex cable - test description" on page 234 added. - USB flash drive 5MMUSB.0256-00 and USB flash drive 5MMUSB.1024-00 cancelled. - Abschnitt "USB flash drive" on page 247 updated. - Diagram 134 "Example of the signal direction for the SDL cable with extender - APC620" on page 168 updated. - Devices 5AP951.1043-01, 5AP951.1505-01, 5AP952.1043-01 and 5AP920.2138-01 cancelled. - Connection examples for the X855 CPU boards and the 3PCI slot full size system unit updated. - Information on after-image effect added. - Information on touch calibration added. |

Table 1: Manual history (cont.)

2. Safety guidelines

2.1 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.

2.2 Protection against electrostatic discharges

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

2.2.1 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.

2.2.2 Guidelines for proper ESD handling

Electrical components with housing

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

Electrical components without housing

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

- Any persons handling electrical components or devices that will be installed in the electrical components must be grounded.
- Components can only be touched on the small sides or on the front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.).
Metallic surfaces are not suitable storage surfaces!

General • Safety guidelines

- 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.

2.3 Policy and procedures

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

Both when using programmable logic controllers and when using operating and monitoring devices as control systems in conjunction with a soft PLC (e.g. B&R Automation Runtime or comparable products) or a slot PLC (e.g. B&R LS251 or comparable products), the safety precautions applying to industrial control systems (e.g. the provision of safety devices such as emergency stop circuits, etc.) must be observed in accordance with applicable national and international regulations. The same applies for all other devices connected to the system, such as drives.

All tasks such as installation, commissioning, and maintenance are only permitted to be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, mounting, installation, commissioning, and operation of the product and who have the appropriate qualifications (e.g. IEC 60364). National accident prevention guidelines must be followed.

The safety guidelines, connection descriptions (rating plate and documentation) and limit values listed in the technical data must be read carefully and must be observed before installation and commissioning.

2.4 Transport and storage

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

2.5 Installation

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

2.6 Operation

2.6.1 Protection against touching electrical parts

To operate programmable logic controllers, operating and monitoring devices, and uninterruptible power supplies, certain components must carry dangerous voltage levels of over 42 VDC. A life-threatening electrical shock could occur if you come into contact with these parts. This could result in death, severe injury or material damage.

Before turning on the programmable logic controller, the operating and monitoring devices and the uninterruptible power supply, ensure that the housing is properly grounded (PE rail). The ground connection must be established when testing the operating and monitoring devices or the uninterruptible power supply, even when operating them for only a short time.

Before turning the device on, make sure that all voltage-carrying parts are securely covered. During operation, all covers must remain closed.

2.6.2 Environmental conditions - dust, humidity, aggressive gases

Use of operating and monitoring devices (e.g. industrial PCs, power panels, mobile panels, etc.) and uninterruptible power supplies in very dusty environments should be avoided. Dust collection on the devices influences their function and, especially in systems with active cooling (fans), sufficient cooling cannot be guaranteed.

The presence of aggressive gases in the environment can also lead to malfunctions. When combined with high temperature and humidity, aggressive gases - e.g. with sulfuric, nitric and chloric components- spur chemical chemical process that can damage electronic components very quickly. Signs of the presence of aggressive gases are blackened copper surfaces and cables on existing installations.

For operation in dusty or humid conditions, correctly installed (cutout installation) operating and monitoring devices like Automation Panel or Power Panel are protected on the front side. The rear side of all devices must be protected from dust and humidity and must be cleaned at suitable intervals.

2.6.3 Programs, viruses and dangerous programs

The system is subject to potential danger each time data is exchanged or software is installed from a data medium (e.g. diskette, CD-ROM, USB flash drive, etc.), a network connection, or the Internet. The user is responsible for assessing these dangers, implementing preventative measures such as virus protection programs, firewalls, etc. and obtaining software from reliable sources.

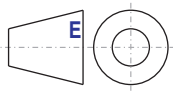
3. Organization of safety notices

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

4. Guidelines



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

5. Model numbers

5.1 Automation Panel 10.4" VGA

| Model number | Description | Note |
|----------------|--|--|
| 5AP920.1043-01 | AP920 TFT C VGA 10.4in T Automation Panel AP920; 10.4" VGA color TFT display with touch screen (resistive); 2 USB 2.0 interfaces; insert for Automation Panel link; IP65 protection (front). 24 VDC supply via Automation Panel Link insert card. | See page 30 |
| 5AP951.1043-01 | AP951 TFT C VGA 10.4in F Automation Panel AP951; 10.4" VGA color TFT display; 10 softkeys, 28 function keys and 20 system keys; 2 USB 2.0 interfaces; insert for Automation Panel Link; IP65 protection (front side). 24 VDC supply via Automation Panel Link insert card. | Cancelled since 05/2007 See page 38 |
| 5AP952.1043-01 | AP952 TFT C VGA 10.4in F Automation Panel AP952; 10.4" VGA color TFT display; 44 function keys and 20 system keys; 2 USB 2.0 interfaces; insert for Automation Panel Link; IP65 protection (front side). 24 VDC supply via Automation Panel Link insert card. | Cancelled since 05/2007 See page 46 |
| 5AP980.1043-01 | AP980 TFT C VGA 10.4in F T Automation Panel AP980; 10.4" VGA color TFT display with touch screen (resistive); 10 softkeys and 28 function keys; 2 USB 2.0 interfaces; insert for Automation Panel Link; IP65 protection (front side). 24 VDC supply via Automation Panel Link insert card. | See page 54 |
| 5AP981.1043-01 | AP981 TFT C VGA 10.4in F T Automation Panel AP981; 10.4" VGA color TFT display with touch screen (resistive); 10 softkeys; 28 function keys and 20 system keys; 2 USB 2.0 interfaces; insert for Automation Panel Link; IP65 protection (front side). 24 VDC supply via Automation Panel Link insert card. | See page 62 |
| 5AP982.1043-01 | AP982 TFT C VGA 10.4in F T Automation Panel AP982; 10.4" VGA color TFT display with touch screen (resistive); 44 function keys and 20 system keys; 2 USB 2.0 interfaces; insert for Automation Panel Link; IP65 protection (front side). 24 VDC supply via Automation Panel Link insert card. | See page 70 |

Table 3: Model numbers for Automation Panel 10.4" VGA

5.2 Automation Panel 12.1" SVGA

| Model number | Description | Note |
|----------------|---|-------------|
| 5AP920.1214-01 | AP920 TFT C SVGA 12.1in T Automation Panel AP920; 12.1" SVGA color TFT display with touch screen (resistive); 3 USB 2.0 interfaces; insert for Automation Panel link; IP65 protection (front). 24 VDC supply via Automation Panel Link insert card. | See page 78 |

Table 4: Model numbers for Automation Panel 12.1" SXGA

5.3 Automation Panel 15" XGA

| Model number | Description | Note |
|----------------|--|--|
| 5AP920.1505-01 | AP920 TFT C XGA 15in T Automation Panel AP920; 15" XGA color TFT display with touch screen (resistive); 3 USB 2.0 interfaces; insert for Automation Panel link; IP65 protection (front). 24 VDC supply via Automation Panel Link insert card. | See page 86 |
| 5AP951.1505-01 | AP951 TFT C XGA 15in F Automation Panel AP951; 15" XGA color TFT display; 12 function keys; 20 function keys and 92 system keys; 3 USB 2.0 interfaces; insert for Automation Panel Link; IP65 protection (front side). 24 VDC supply via Automation Panel Link insert card. | Cancelled since 05/2007 See page 94 |
| 5AP980.1505-01 | AP951 TFT C XGA 15in F T Automation Panel AP981; 15" XGA color TFT display with touch screen (resistive); 12 softkeys and 20 function keys; 3 USB 2.0 interfaces; insert for Automation Panel Link; IP65 protection (front side). 24 VDC supply via Automation Panel Link insert card. | See page 102 |
| 5AP981.1505-01 | AP951 TFT C XGA 15in F T Automation Panel AP981; 15" XGA color TFT display with touch screen (resistive); 12 softkeys; 20 function keys and 92 system keys; 3 USB 2.0 interfaces; insert for Automation Panel Link; IP65 protection (front side). 24 VDC supply via Automation Panel Link insert card. | See page 110 |

Table 5: Model numbers - Automation Panel 15" XGA

5.4 Automation Panel 17" SXGA

| Model number | Description | Note |
|----------------|--|--------------|
| 5AP920.1706-01 | AP920 TFT C SXGA 17" T Automation Panel AP920; 17" SXGA color TFT display with touch screen (resistive); 3 USB 2.0 interfaces; insert for Automation Panel link; IP65 protection (front). 24 VDC supply via Automation Panel Link insert card. | See page 118 |

Table 6: Model numbers for Automation Panel 17" SXGA

5.5 Automation Panel 19" SXGA

| Model number | Description | Note |
|----------------|--|--------------|
| 5AP920.1906-01 | AP920 TFT C SXGA 19" T Automation Panel AP920; 19" SXGA color TFT display with touch screen (resistive); 3 USB 2.0 interfaces; insert for Automation Panel link; IP65 protection (front). 24 VDC supply via Automation Panel Link insert card. | See page 126 |

Table 7: Model numbers for Automation Panel 19" SXGA

5.6 Automation Panel 21.3" UXGA

| Model number | Description | Note |
|----------------|--|---|
| 5AP920.2138-01 | AP920 TFT C UXGA 21.3" T Automation Panel AP920; 21.3" UXGA color TFT display with touch screen (resistive); 3 USB 2.0 interfaces; insert for Automation Panel link; IP65 protection (front). 24 VDC supply via Automation Panel Link insert card. | Cancelled since 05/2007 See page 134 |

Table 8: Model numbers for Automation Panel 21.3" UXGA

5.7 Automation Panel Link insert cards

| Model number | Description | Note |
|-----------------|--|--------------|
| 5DL DVI.1000-01 | AP Link DVI receiver Automation Panel Link DVI receiver; connections for DVI-D, RS232 and USB 2.0 (Type B); 24 VDC. Plug for power supply must be ordered separately (screw clamp: 0TB103.9; cage clamps: 0TB103.91). | See page 143 |
| 5DSLSDL.1000-00 | AP Link SDL receiver Automation Panel Link, SDL receiver, connection for SDL in; 24 VDC. Plug for power supply must be ordered separately (screw clamp: 0TB103.9; cage clamps: 0TB103.91). | See page 145 |
| 5DSLSDL.1000-01 | AP Link SDL transceiver Automation Panel Link, SDL transceiver, connections for SDL in and SDL out; 24 VDC. Plug for power supply must be ordered separately (screw clamp: 0TB103.9; cage clamps: 0TB103.91). | See page 148 |

Table 9: Model numbers for Automation Panel insert cards

5.8 Cables

| Model number | Description | Note |
|----------------|---|---|
| 5CADVI.0018-00 | DVI-D cable 1.8 m / single Single cable, DVI-D/m:DVI-D/m, length: 1.8 m | See page 150 |
| 5CADVI.0050-00 | DVI-D cable 5 m / single Single cable, DVI-D/m:DVI-D/m, length: 5 m | See page 150 |
| 5CADVI.0100-00 | DVI-D cable 10 m / single Single cable, DVI-D/m:DVI-D/m, length: 10 m | See page 150 |
| 5CASDL.0018-00 | SDL cable 1.8 m SDL cable, length: 1,8 m | Cancelled since 12/2006 Replaced by 5CASDL.0018-03 |
| 5CASDL.0018-01 | SDL cable 1.8 m 45° SDL cable, length: 1,8 m; single sided 45° plug | See page 156 |
| 5CASDL.0050-00 | SDL cable 5 m SDL cable, length: 5 m | Cancelled since 12/2006 Replaced by 5CASDL.0050-03 |
| 5CASDL.0050-01 | SDL cable 5 m 45° SDL cable, length: 5 m; single sided 45° plug | See page 156 |
| 5CASDL.0100-00 | SDL cable 10 m SDL cable, length: 10 m | Cancelled since 12/2006 Replaced by 5CASDL.0100-03 |
| 5CASDL.0100-01 | SDL cable 10 m 45° SDL cable, length: 10 m; single sided 45° plug | See page 156 |
| 5CASDL.0150-00 | SDL cable 15 m SDL cable, length: 15 m | Cancelled since 12/2006 Replaced by 5CASDL.0150-03 |
| 5CASDL.0150-01 | SDL cable 15 m 45° SDL cable, length: 15 m; single sided 45° plug | See page 156 |
| 5CASDL.0200-00 | SDL cable 20 m SDL cable, length: 20 m | Cancelled since 12/2006 Replaced by 5CASDL.0200-03 |

Table 10: Model numbers - Cables

General • Model numbers

| Model number | Description | Note |
|----------------|---|---|
| 5CASDL.0250-00 | SDL cable 25 m SDL cable, length: 25 m | Cancelled since 12/2006 Replaced by 5CASDL.0250-03 |
| 5CASDL.0300-00 | SDL cable 30 m SDL cable, length: 30 m | Cancelled since 12/2006 Replaced by 5CASDL.0300-03 |
| 5CASDL.0018-03 | SDL flex cable 1.8 m SDL cable, semi flexible, length: 1.8 m | See page 159 |
| 5CASDL.0050-03 | SDL flex cable 5 m SDL cable, semi flexible, length: 5 m | See page 159 |
| 5CASDL.0100-03 | SDL flex cable 10 m SDL cable, semi flexible, length: 10 m | See page 159 |
| 5CASDL.0150-03 | SDL flex cable 15 m SDL cable, semi flexible, length: 15 m | See page 159 |
| 5CASDL.0200-03 | SDL flex cable 20 m SDL cable, semi flexible, length: 20 m | See page 159 |
| 5CASDL.0250-03 | SDL flex cable 25 m SDL cable, semi flexible, length: 25 m | See page 159 |
| 5CASDL.0300-03 | SDL flex cable 30 m SDL cable, semi flexible, length: 30 m | See page 159 |
| 5CASDL.0300-10 | SDL cable with extender 30 m SDL cable, length: 30 m with extender | Cancelled since 01/2007 Replaced by 5CASDL.0300-13 |
| 5CASDL.0400-10 | SDL cable with extender 40 m SDL cable with extender, length: 40 m | Cancelled since 01/2007 Replaced by 5CASDL.0400-13 |
| 5CASDL.0300-13 | SDL flex cable with extender 30 m SDL cable, semi flexible, length: 30 m with extender | See page 166 |
| 5CASDL.0400-13 | SDL flex cable with extender 40 m SDL cable, semi flexible, length: 40 m with extender | See page 166 |
| 9A0014.02 | RS232 cable DB9/f:DB9/m 1.8 m RS232 extension cable for remote operation of a display unit with touch screen, length 1.8 m. | See page 170 |
| 9A0014.05 | RS232 cable DB9/f:DB9/m 5 m RS232 extension cable for remote operation of a display unit with touch screen, length 5 m. | See page 170 |
| 9A0014.10 | RS232 cable DB9/f:DB9/m 10 m RS232 extension cable for remote operation of a display unit with touch screen, length 10 m. | See page 170 |
| 5CAUSB.0018-00 | USB 2.0 cable, A/m:B/m 1.8 m USB 2.0 connection cable, Type A - Type B, length: 1.8 m | See page 172 |
| 5CAUSB.0050-00 | USB 2.0 cable, A/m:B/m 5 m USB 2.0 connection cable, Type A - Type B, length: 5 m | See page 172 |

Table 10: Model numbers - Cables (cont.)

5.9 Accessories

| Model number | Description | Note |
|----------------|---|---|
| 0TB103.8 | Plug/N 24V 5.08 3-pin screw clamps Accessory terminal block, 3-pin, screw clamp, 2.5 mm ² , protection against vibration with the screw flange | See page 238 |
| 0TB103.9 | Plug 24V 5.08 3-pin screw clamps 24 VDC 3-pin connector, female. Screw clamps, 2.5 mm ² , protected against vibration by the screw flange | See page 239 |
| 0TB103.91 | Plug 24V 5.08 3-pin cage clamps 24 VDC 3-pin connector, female. Cage clamps, 2.5 mm ² , protected against vibration by the screw flange | See page 239 |
| 5AC900.104X-03 | Legend strip template 10.4" for Automation Panel 5AP951.1043-01 and 5A981.1043-01, for 1 device. | See page 241 |
| 5AC900.104X-04 | Legend strip template 10.4" for Automation Panel 5AP952.1043-01 and 5A982.1043-01, for 1 device. | See page 241 |
| 5AC900.104X-05 | Legend strip template 10.4" for Automation Panel 5AP980.1043-01, for 3 devices. | See page 241 |
| 5AC900.150X-01 | Legend strip template 15" for Automation Panel 5AP951.1505-01, 5AP980.1505-01 and 5A981.1505-01, for 4 devices. | See page 241 |
| 5AC900.1200-00 | USB interface cover (cannot be lost) Front side USB interface cover (cannot be lost) for Automation Panel 900 and Panel PC 700 devices. | See page 243 |
| 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 244 |
| 5MMUSB.0256-00 | USB flash drive 256 MB SanDisk USB 2.0 flash drive 256 MB | Cancelled since 12/2005 Replaced by 5MMUSB.2048-00 |
| 5MMUSB.0512-00 | USB flash drive 512 MB SanDisk USB 2.0 flash drive 512 MB | Cancelled since 07/2007 Replaced by 5MMUSB.2048-00 |
| 5MMUSB.1024-00 | USB flash drive 1 GB SanDisk USB 2.0 flash drive 1 GB | Cancelled since 03/2007 Replaced by 5MMUSB.2048-00 |
| 5MMUSB.2048-00 | USB flash drive 2 GB SanDisk USB 2.0 flash drive 2 GB | See page 247 |

Table 11: Model numbers - Accessories

Chapter 2 • Technical data

1. Introduction

The Automation Panel series is a generation of B&R display units ranging from 10.4" to 19" that features a completely new type of modularity for the interfaces to the PC system. This allows picture information to be transferred independently of the display unit. This allows future innovations in the area of transfer technology to be implemented using a new Automation Panel Link.



Figure 1: Automation Panel devices

2. Entire device

This display units are composed of two components: an Automation Panel device and an Automation Panel Link insert card. Put together, these two components make up the complete display unit.

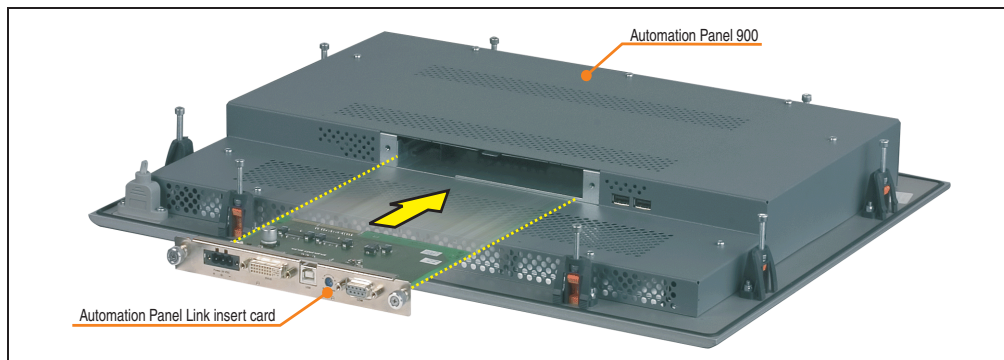


Figure 2: Automation Panel and Automation Panel Link insert card

Each device has at least one USB interface on the front and back so that data can be easily exchanged with the Automation PC (e.g. using a flash drive, etc.).

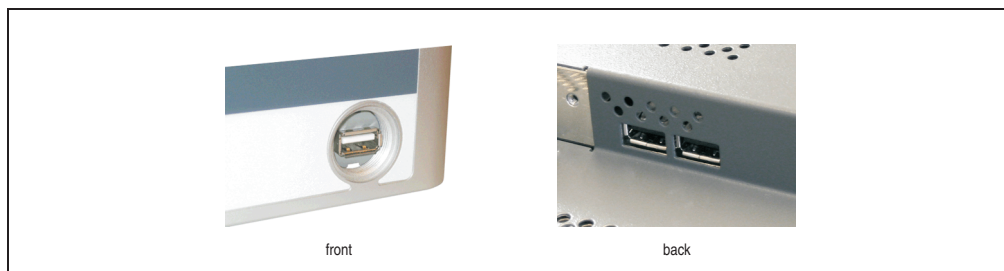


Figure 3: Automation Panel USB connections (front side - back side)

2.1 Ambient temperatures

The following table shows the specifications for minimum and maximum ambient temperature for all available Automation Panel 900 variants in operation, dependent on mounting orientation (for specifications, see Chapter 3 "Start-up", Section 2 "Mounting orientation" on page 177).

| Automation Panel 900 without Rittal housing | Automation Panel Link insert cards | | |
|---|------------------------------------|------------|------------|
| | 0° | Up to -45° | Up to +45° |
| 5AP920.1043-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +50°C |
| 5AP951.1043-01 | 0 .. +55°C | 0 .. +55°C | 0 .. +55°C |
| 5AP952.1043-01 | 0 .. +55°C | 0 .. +55°C | 0 .. +55°C |
| 5AP980.1043-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +50°C |
| 5AP981.1043-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +50°C |
| 5AP982.1043-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +50°C |
| 5AP920.1214-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +50°C |
| 5AP920.1505-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +45°C |
| 5AP951.1505-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +45°C |
| 5AP980.1505-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +45°C |
| 5AP981.1505-01 | 0 .. +50°C | 0 .. +50°C | 0 .. +45°C |
| 5AP920.1706-01 | 0 .. +40°C | 0 .. +45°C | 0 .. +35°C |
| 5AP920.1906-01 | 0 .. +40°C | 0 .. +40°C | 0 .. +40°C |
| 5AP920.2138-01 | 0 .. +35°C | 0 .. +35°C | 0 .. +30°C |
| Automation Panel 900 with Rittal housing | 0° | Up to -45° | Up to +45° |
| 5AP920.1043-01 | 0 .. +50°C | 0 .. +45°C | 0 .. +45°C |
| 5AP951.1043-01 | 0 .. +50°C | 0 .. +45°C | 0 .. +45°C |
| 5AP952.1043-01 | 0 .. +50°C | 0 .. +45°C | 0 .. +45°C |
| 5AP980.1043-01 | 0 .. +50°C | 0 .. +45°C | 0 .. +45°C |
| 5AP981.1043-01 | 0 .. +50°C | 0 .. +45°C | 0 .. +45°C |
| 5AP982.1043-01 | 0 .. +50°C | 0 .. +45°C | 0 .. +45°C |
| 5AP920.1505-01 | 0 .. +40°C | 0 .. +40°C | 0 .. +40°C |
| 5AP951.1505-01 | 0 .. +40°C | 0 .. +40°C | 0 .. +40°C |
| 5AP980.1505-01 | 0 .. +40°C | 0 .. +40°C | 0 .. +40°C |
| 5AP981.1505-01 | 0 .. +40°C | 0 .. +40°C | 0 .. +40°C |

Table 12: Ambient temperature according to mounting orientation

More detailed information regarding the temperature according to the humidity can be found in the "Technical data" for the individual components.

2.2 Humidity specifications

The following specifications list the minimum and maximum humidity for an ambient temperature of +30°C for operation and transport.

| Component | Operation | Storage / Transport |
|-----------------|-----------|---------------------|
| 5AP920.1043-01 | 5 - 90% | 5 - 90% |
| 5AP951.1043-01 | 5 - 95% | 5 - 95% |
| 5AP952.1043-01 | 5 - 95% | 5 - 95% |
| 5AP980.1043-01 | 5 - 90% | 5 - 90% |
| 5AP981.1043-01 | 5 - 90% | 5 - 90% |
| 5AP982.1043-01 | 5 - 90% | 5 - 90% |
| 5AP920.1214-01 | 5 - 90% | 5 - 90% |
| 5AP920.1505-01 | 5 - 90% | 5 - 90% |
| 5AP951.1505-01 | 5 - 95% | 5 - 95% |
| 5AP980.1505-01 | 5 - 90% | 5 - 90% |
| 5AP981.1505-01 | 5 - 90% | 5 - 90% |
| 5AP920.1706-01 | 20 - 90% | 5 - 90% |
| 5AP920.1906-01 | 20 - 90% | 5 - 90% |
| 5AP920.2138-01 | 20 - 90% | 5 - 90% |
| 5DL DVI.1000-01 | 5 - 95% | 5 - 95% |
| 5DLS DL.1000-00 | 5 - 95% | 5 - 95% |
| 5DLS DL.1000-01 | 5 - 95% | 5 - 95% |

Table 13: Overview of humidity specifications for individual components

More detailed information regarding the specified humidity according to the temperature can be found in the "Technical data" for the individual components.

2.3 Power consumption

The total consumption is composed of the consumption of the Automation Panel 900 device and the consumption of the Automation Panel Link insert card.

The following table shows the typical consumption for each component. The sum of the two is the total consumption. Both values can be found in the "Technical data" for the components.

| Component | Typical | Maximum | Maximum with USB |
|-----------------|---------|---------|------------------|
| 5AP920.1043-01 | 10 W | 13 W | 19 W |
| 5AP951.1043-01 | 10 W | 14 W | 20 W |
| 5AP952.1043-01 | 10 W | 14 W | 21 W |
| 5AP980.1043-01 | 10 W | 13 W | 20 W |
| 5AP981.1043-01 | 10 W | 14 W | 21 W |
| 5AP982.1043-01 | 10 W | 14 W | 21 W |
| 5AP920.1214-01 | 12 W | 15 W | 21 W |
| 5AP920.1505-01 | 24 W | 31 W | 41 W |
| 5AP951.1505-01 | 24 W | 32 W | 42 W |
| 5AP980.1505-01 | 24 W | 32 W | 42 W |
| 5AP981.1505-01 | 24 W | 32 W | 42 W |
| 5AP920.1706-01 | 27 W | 36 W | 46 W |
| 5AP920.1906-01 | 27 W | 38 W | 48 W |
| 5AP920.2138-01 | 50 W | 63 W | 73 W |
| 5DLDLVI.1000-01 | 3 W | 3 W | 3 W |
| 5DLSDL.1000-00 | 3 W | 3 W | 3 W |
| 5DLSDL.1000-01 | 3 W | 3 W | 3 W |
| | | | |
| Sum | | | |

Table 14: Power management according to mounting orientation

Specifications for the starting current can be found in the "Technical data" for each Automation Panel 900 variant.

3. Individual components

3.1 Automation Panel 10.4" VGA

3.1.1 Automation Panel 5AP920.1043-01

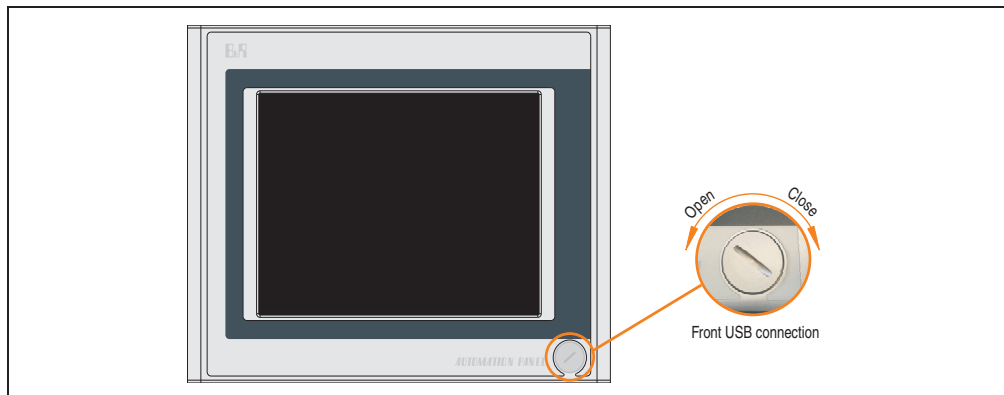


Figure 4: Front view - 5AP920.1043-01

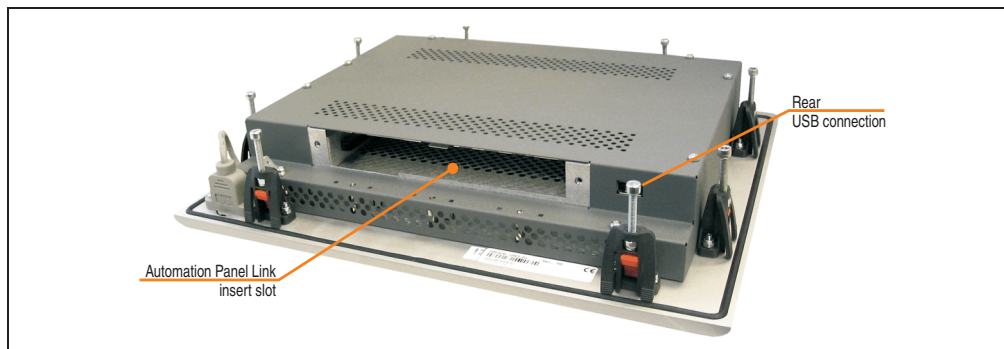


Figure 5: Rear view - 5AP920.1043-01

Technical data

| Features | 5AP920.1043-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 2 (1x front side, 1x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 26.42 cm (264 mm) 262144 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L = 70° Direction U = 40° / direction D = 70° 350 cd/m² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | - |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁴⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) typically 6 A, maximum 30 A for < 300 µs typically 10 W, maximum 13 W or 19 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Gasket | Aluminum, naturally anodized ⁵⁾ Gray ⁵⁾ Polyester Similar to Pantone 432CV ⁵⁾ Similar to Pantone 427CV ⁵⁾ Flat gasket around display front |

Table 15: Technical data - 5AP920.1043-01

Technical data • Individual components

| Mechanical characteristics | 5AP920.1043-01 |
|---------------------------------|---|
| Outer dimensions | |
| Width | 323 mm |
| Height | 260 mm |
| Depth | 55 mm |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁵⁾ |
| Weight | Approx. 2.9 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -30°C .. +70°C |
| Transport | -30°C .. +70°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 15: Technical data - 5AP920.1043-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 36.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 4) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 5) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

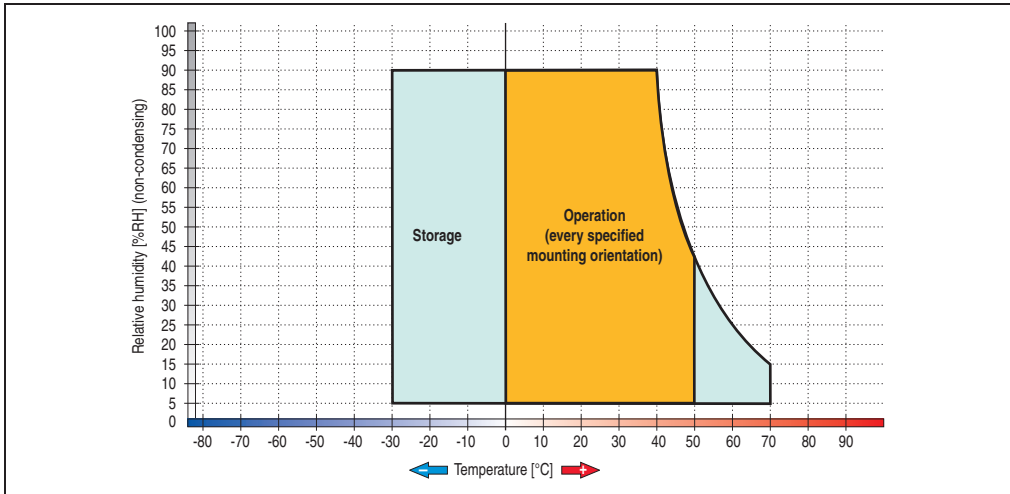


Figure 6: Temperature humidity diagram - 5AP920.1043-01

Dimensions

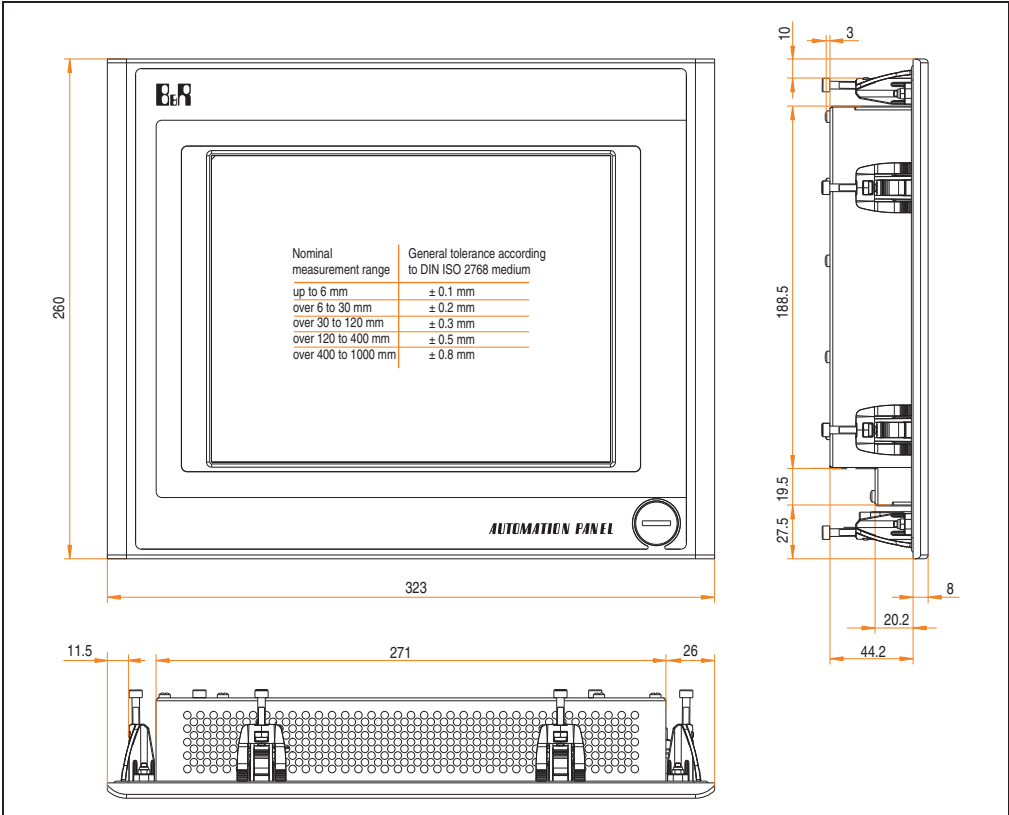


Figure 7: Dimensions 5AP920.1043-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|---|
| 1 | Automation Panel 920 TFT VGA 10.4in with touch screen |

Table 16: Delivery contents - 5AP920.1043-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

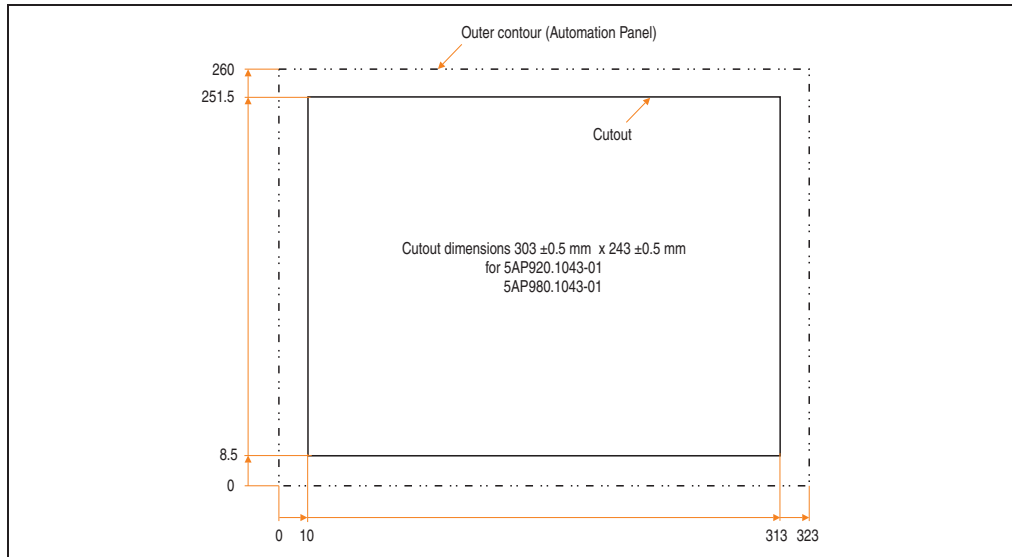


Figure 8: Cutout installation - 5AP920.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP920.1043-01 has two USB connections (Type A).

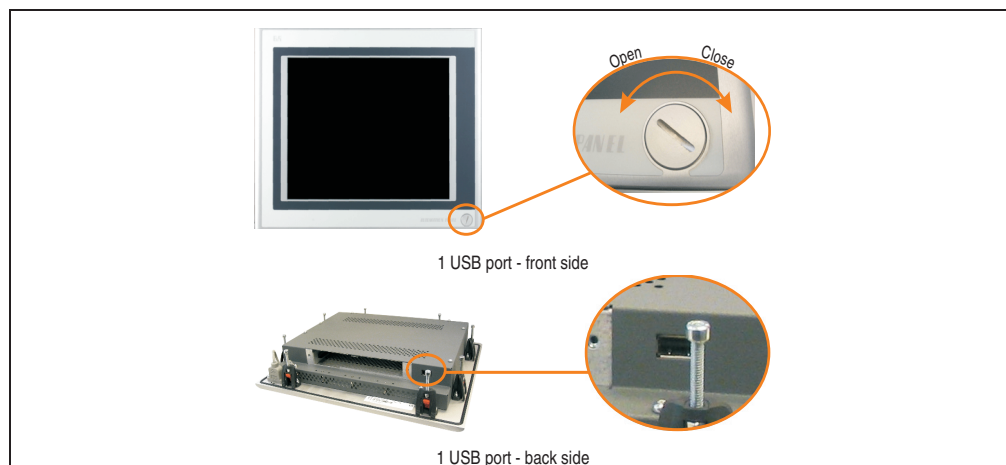


Figure 9: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the AutomationPanel housing.



Figure 10: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 11: Functional grounding clip

3.1.2 Automation Panel 5AP951.1043-01

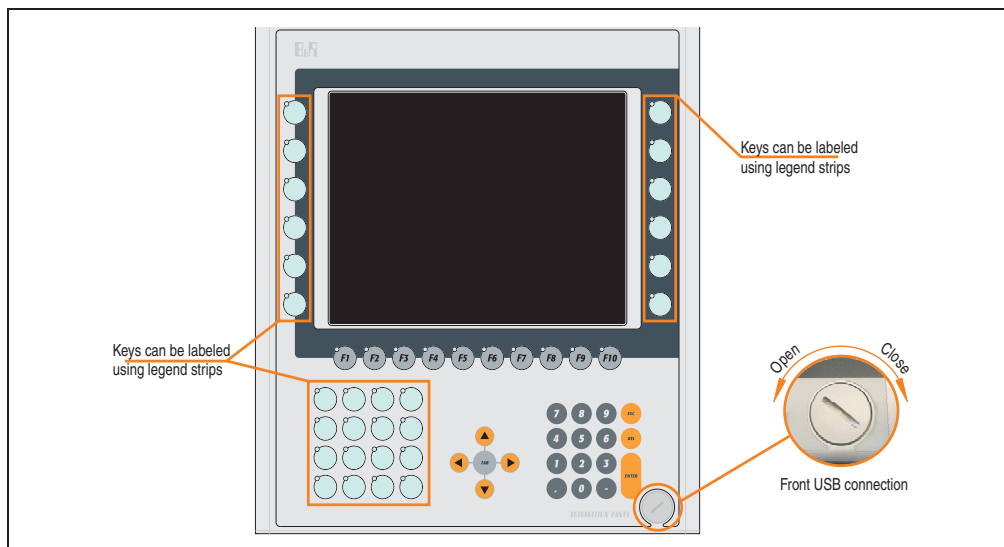


Figure 12: Front view - 5AP951.1043-01

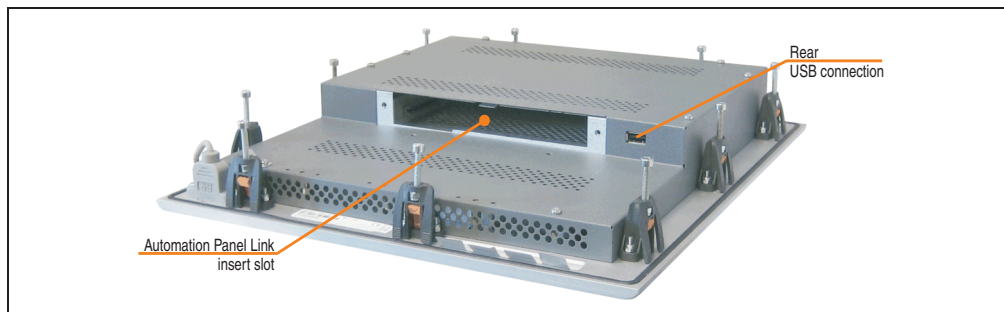


Figure 13: Rear view - 5AP951.1043-01

Technical data

| Features | 5AP951.1043-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 2 (1x front side, 1x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 26.42 cm (264 mm) 262144 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L = 70° Direction U = 40° / direction D = 70° 350 cd/m² 50000 hours |
| Touch screen Technology Controller Degree of transmission | - |
| Filter glass Degree of transmission Coating | 95% On both sides |
| Keys/LED ³⁾ Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | 28 with LED (yellow) 10 with LED (yellow) - 15 without LED 5 without LED > 10 ⁶ actuations with 1 ±0.3 to 3 ±0.3 N operating force Typically 12 mcd (yellow) |
| Caution! Pressing several keys at the same time may trigger unintended actions. | |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁴⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 10 W (without LED), maximum 14 W or 20 W with USB Yes |
| Mechanical characteristics | |
| Outer dimensions Width Height Depth | 323 mm 358 mm 55 mm |

Table 17: Technical data - 5AP951.1043-01

| Mechanical characteristics | 5AP951.1043-01 |
|---------------------------------|---|
| Front | |
| Frame | Aluminum, naturally anodized ⁵⁾ |
| Design | Gray ⁵⁾ |
| Membrane | Polyester |
| Dark gray border around display | Similar to Pantone 432CV ⁵⁾ |
| Light background | Similar to Pantone 427CV ⁵⁾ |
| Orange keys | Similar to Pantone 151CV ⁵⁾ |
| Dark gray keys | Similar to Pantone 431CV ⁵⁾ |
| Legend strips (gray) | Similar to Pantone 429CV ⁵⁾ |
| Gasket | Flat gasket around display front |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁵⁾ |
| Weight | Approx. 3.6 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -30°C .. +70°C |
| Transport | -30°C .. +70°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 95%, non-condensing T > 40°C: < 95%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 17: Technical data - 5AP951.1043-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 44.
- 3) 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).
- 4) The value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 5) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

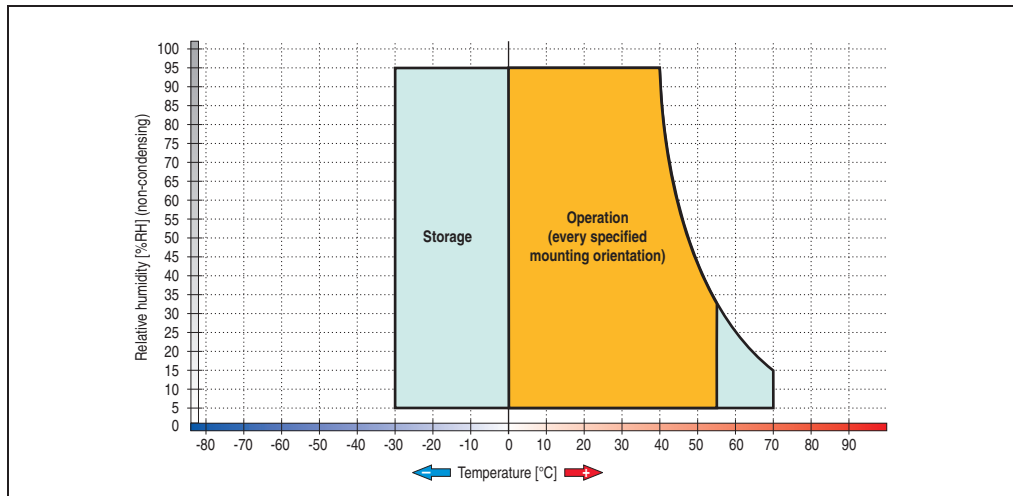


Figure 14: Temperature humidity diagram - 5AP951.1043-01

Dimensions

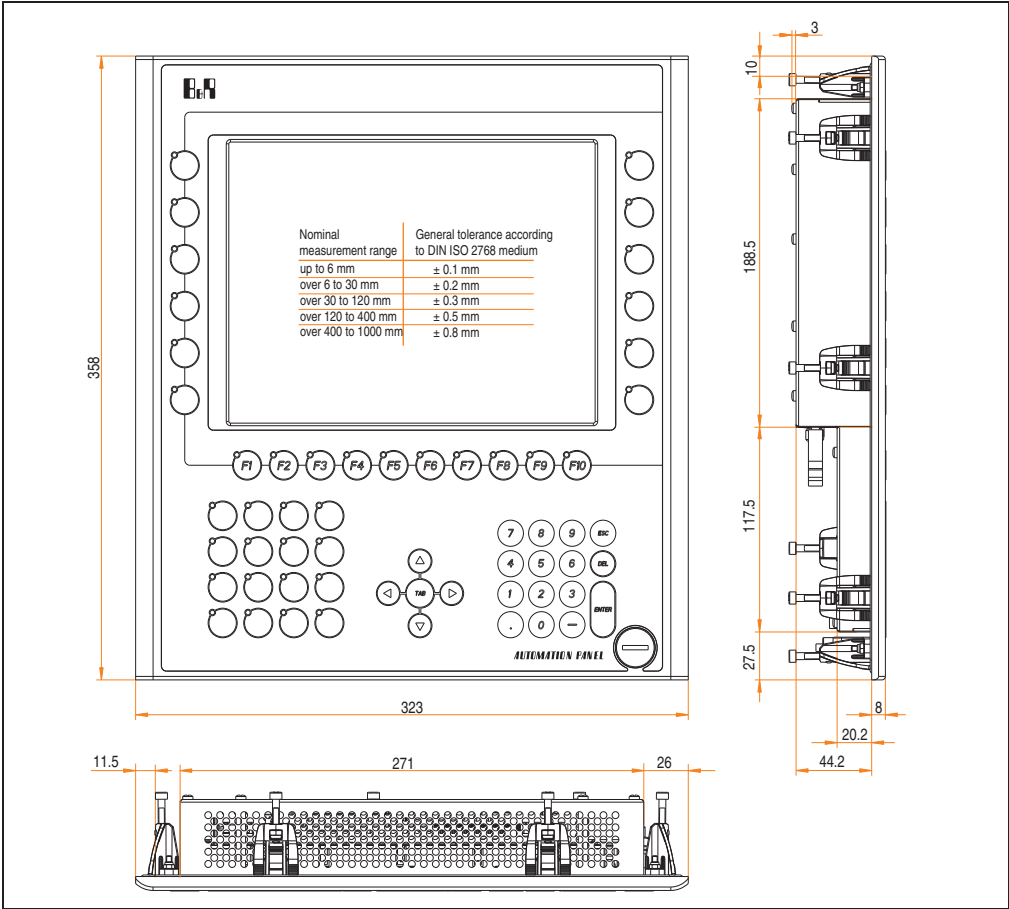


Figure 15: Dimensions 5AP951.1043-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|--|
| 1 | Automation Panel 951 TFT VGA 10.4" with keys |
| 6 | Insert strips without labels (inserted in the front) |

Table 18: Delivery contents - 5AP951.1043-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

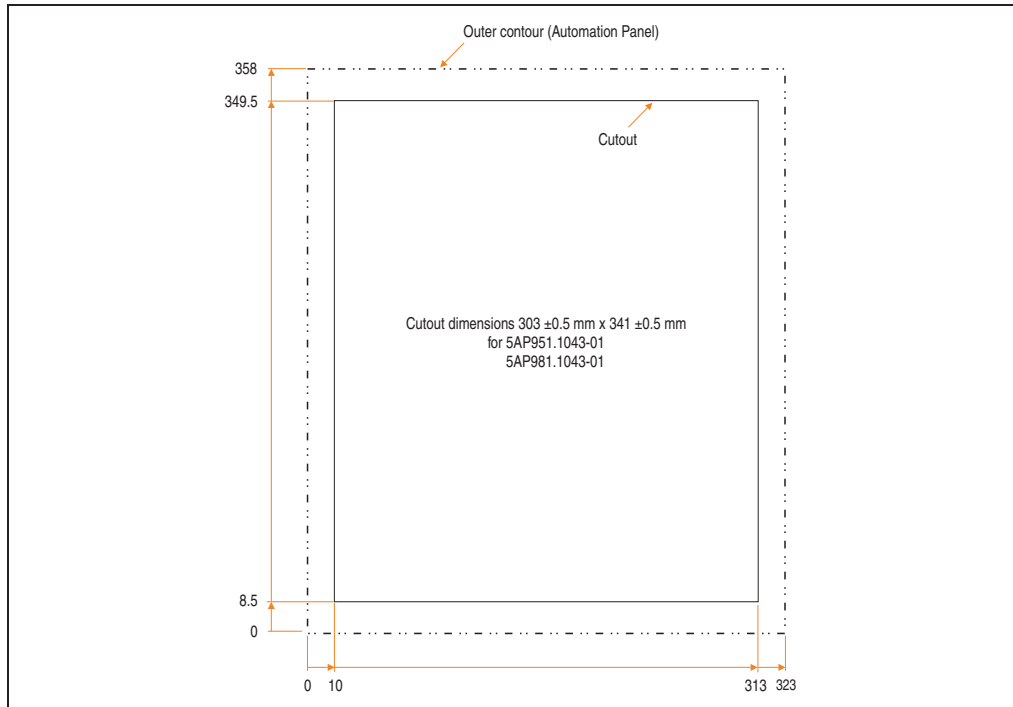


Figure 16: Cutout installation - 5AP951.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP951.1043-01 has two USB connectors (Type A).

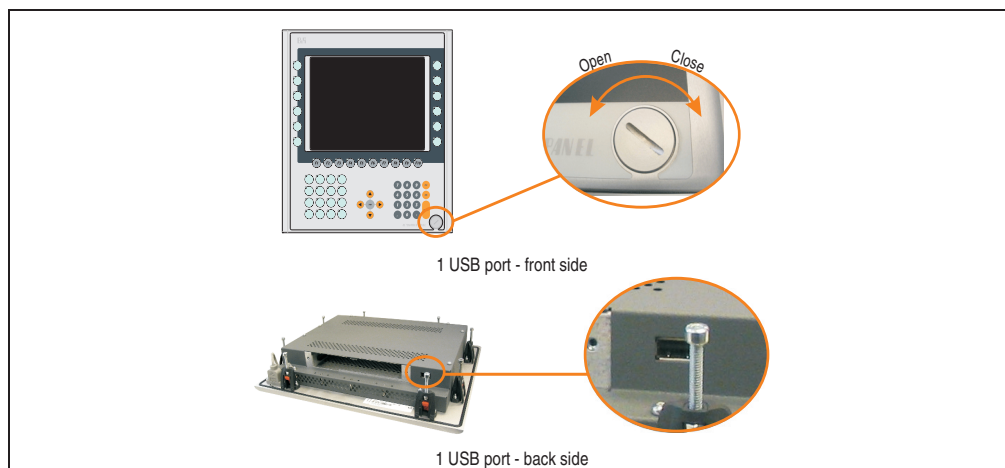


Figure 17: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the AutomationPanel housing.



Figure 18: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 19: Functional grounding clip

3.1.3 Automation Panel 5AP952.1043-01

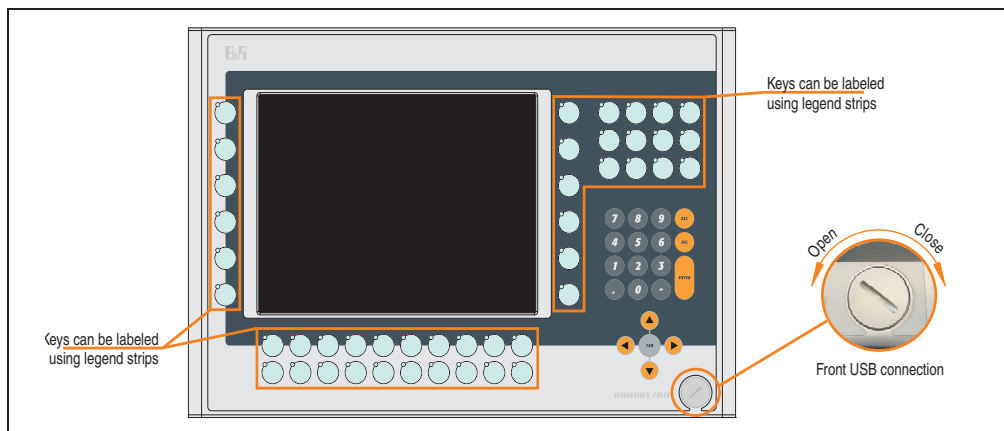


Figure 20: Front view - 5AP952.1043-01

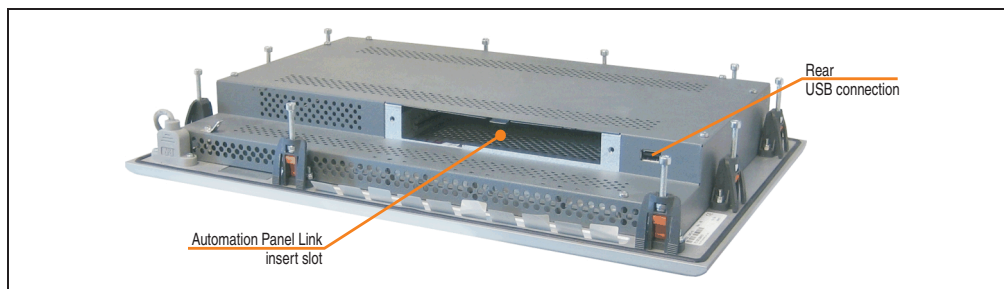


Figure 21: Rear view - 5AP952.1043-01

Technical data

| Features | 5AP952.1043-01 |
|--|---|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 2 (1x front side, 1x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 26.42 cm (264 mm) 262144 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L = 70° Direction U = 40° / direction D = 70° 350 cd/m² 50000 hours |
| Touch screen Technology Controller Degree of transmission | - |
| Filter glass Degree of transmission Coating | 95% On both sides |
| Keys/LED ³⁾ Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | 44 with LED (yellow) - - 15 without LED 5 without LED > 10 ⁶ actuations with 1 ±0.3 to 3 ±0.3 N operating force Typically 12 mcd (yellow) |
| Caution! Pressing several keys at the same time may trigger unintended actions. | |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁴⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) typically 6 A, maximum 30 A for < 300 µs Typically 10W (without LED), maximum 14W or 21W with USB Yes |
| Mechanical characteristics | |
| Outer dimensions Width Height Depth | 423 mm 288 mm 55 mm |

Table 19: Technical data - 5AP952.1043-01

| Mechanical characteristics | 5AP952.1043-01 |
|---------------------------------|---|
| Front | |
| Frame | Aluminum, naturally anodized ⁵⁾ |
| Design | Gray ⁵⁾ |
| Membrane | Polyester |
| Dark gray border around display | Similar to Pantone 432CV ⁵⁾ |
| Light background | Similar to Pantone 427CV ⁵⁾ |
| Orange keys | Similar to Pantone 151CV ⁵⁾ |
| Dark gray keys | Similar to Pantone 431CV ⁵⁾ |
| Legend strips (gray) | Similar to Pantone 429CV ⁵⁾ |
| Gasket | Flat gasket around display front |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁵⁾ |
| Weight | Approx. 3.9 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -30°C .. +70°C |
| Transport | -30°C .. +70°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 95%, non-condensing T > 40°C: < 95%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 19: Technical data - 5AP952.1043-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 52.
- 3) 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).
- 4) The value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 5) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

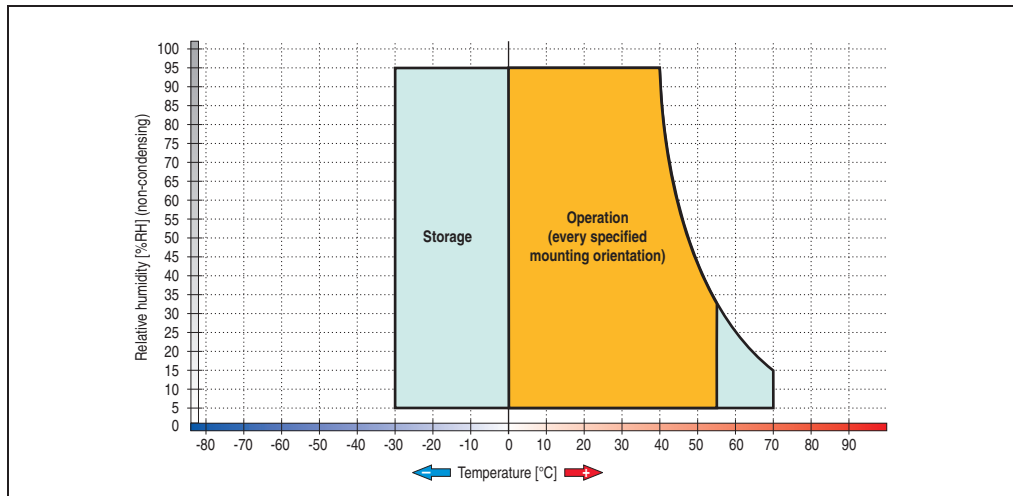


Figure 22: Temperature humidity diagram - 5AP952.1043-01

Dimensions

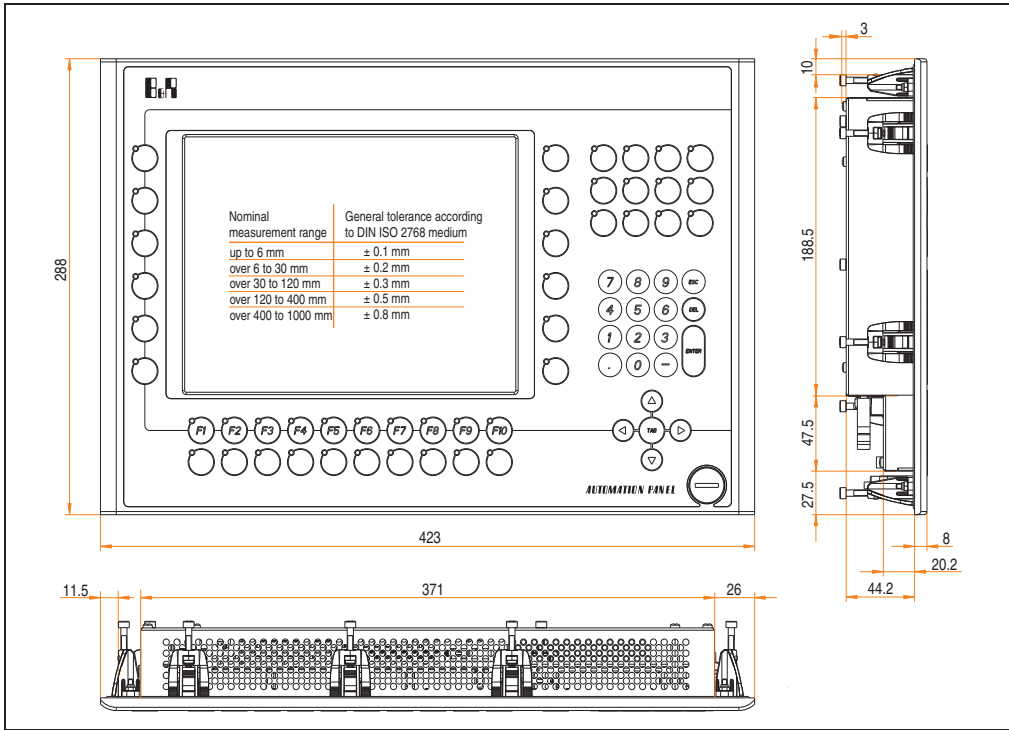


Figure 23: Dimensions 5AP952.1043-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|--|
| 1 | Automation Panel 952 TFT VGA 10.4" with keys |
| 16 | 6 insert strips without labels - 10 partially labeled "F1-F10" (inserted in the front) |

Table 20: Delivery contents - 5AP952.1043-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

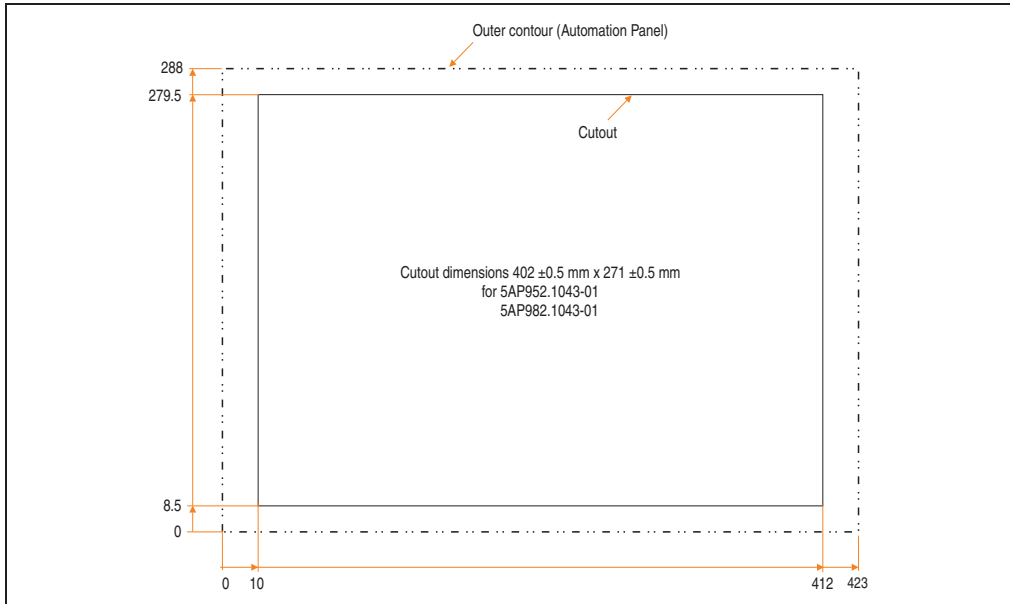


Figure 24: Cutout installation - 5AP952.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP952.1043-01 has two USB connectors (Type A).

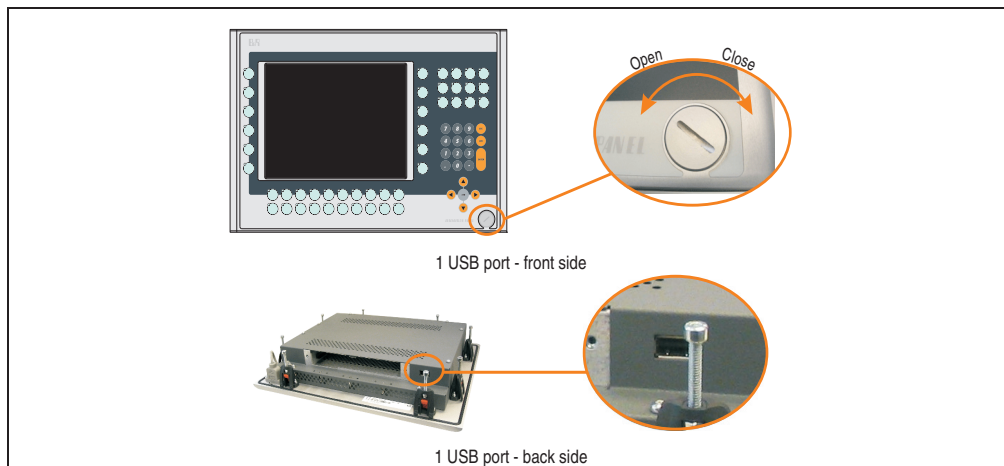


Figure 25: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel housing.



Figure 26: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).

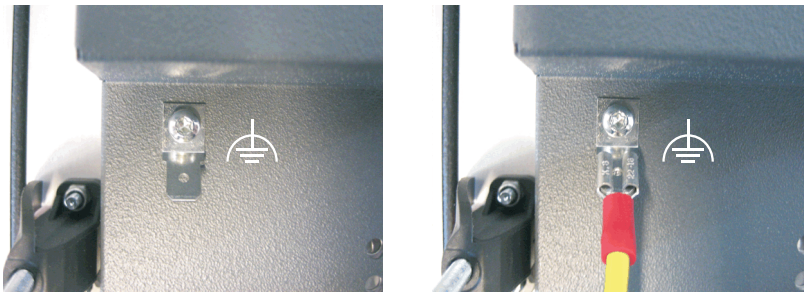


Figure 27: Functional grounding clip

3.1.4 Automation Panel 5AP980.1043-01

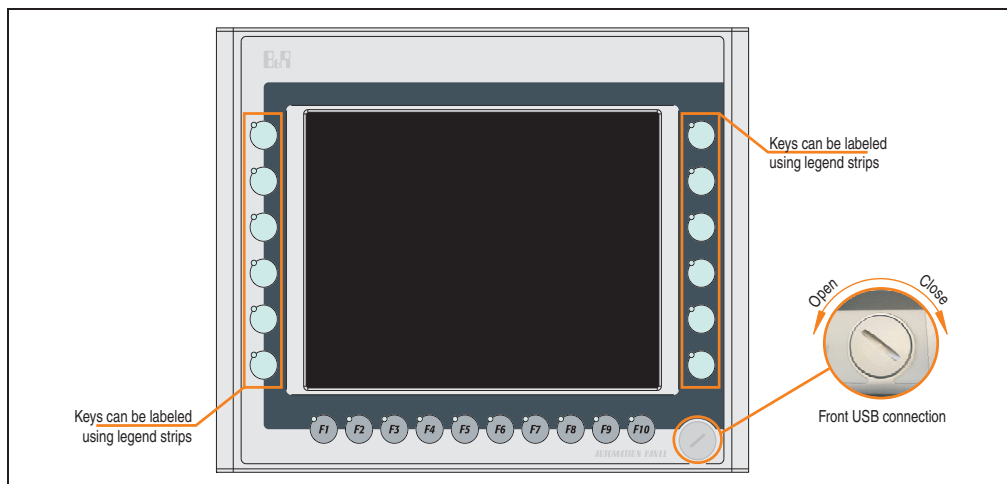


Figure 28: Front view - 5AP980.1043-01

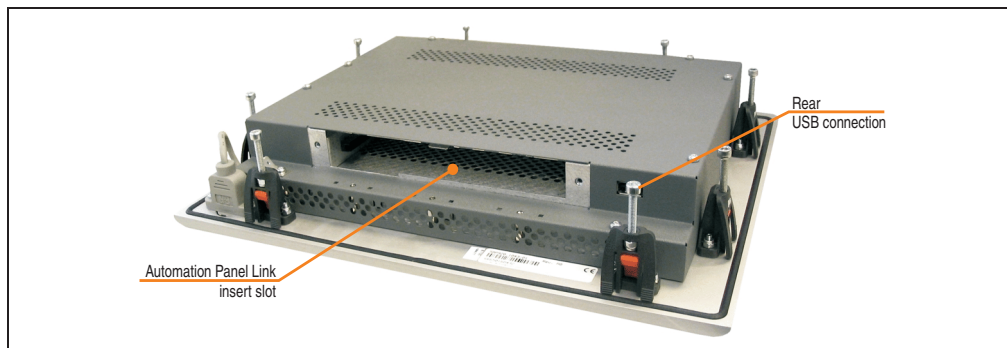


Figure 29: Rear view - 5AP980.1043-01

Technical data

| Features | 5AP980.1043-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 2 (1x front side, 1x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 26.42 cm (264 mm) 262144 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L = 70° Direction U = 40° / direction D = 70° 350 cd/m ² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED ⁴⁾ Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | 12 with LED (yellow) 10 with LED (yellow) - - - > 10 ⁶ actuations with 1 ±0.3 to 3 ±0.3 N operating force Typically 12 mcd (yellow) |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁵⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 10 W (without LED), maximum 13 W or 20 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Legend strips (gray) Gasket | Aluminum, naturally anodized ⁶⁾ Gray ⁶⁾ Polyester Similar to Pantone 432CV ⁶⁾ Similar to Pantone 427CV ⁶⁾ Similar to Pantone 429CV ⁶⁾ Flat gasket around display front |

Table 21: Technical data - 5AP980.1043-01

| Mechanical characteristics | 5AP980.1043-01 |
|---------------------------------|---|
| Outer dimensions | |
| Width | 323 mm |
| Height | 260 mm |
| Depth | 55 mm |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁶⁾ |
| Weight | Approx. 2.9 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -30°C .. +70°C |
| Transport | -30°C .. +70°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 21: Technical data - 5AP980.1043-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 60.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 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).
- 5) The value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 6) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

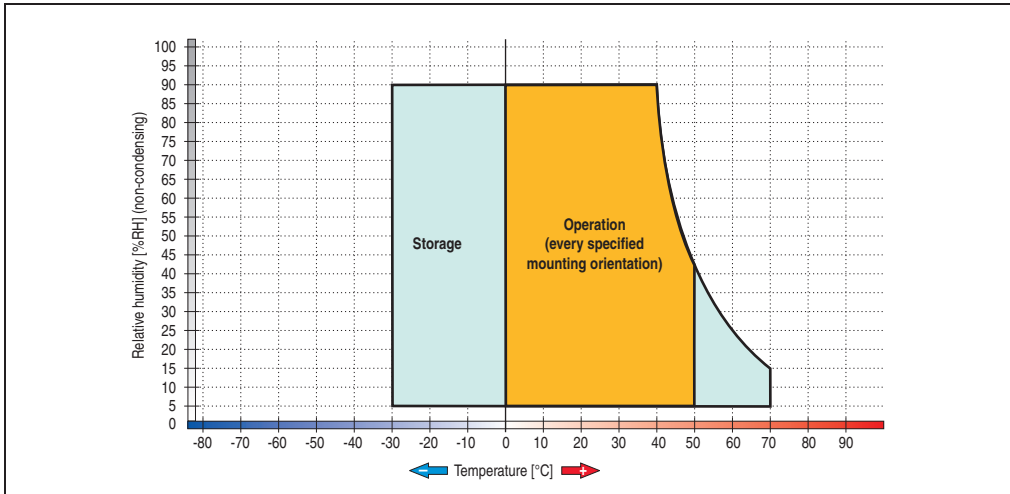


Figure 30: Temperature humidity diagram - 5AP980.1043-01

Dimensions

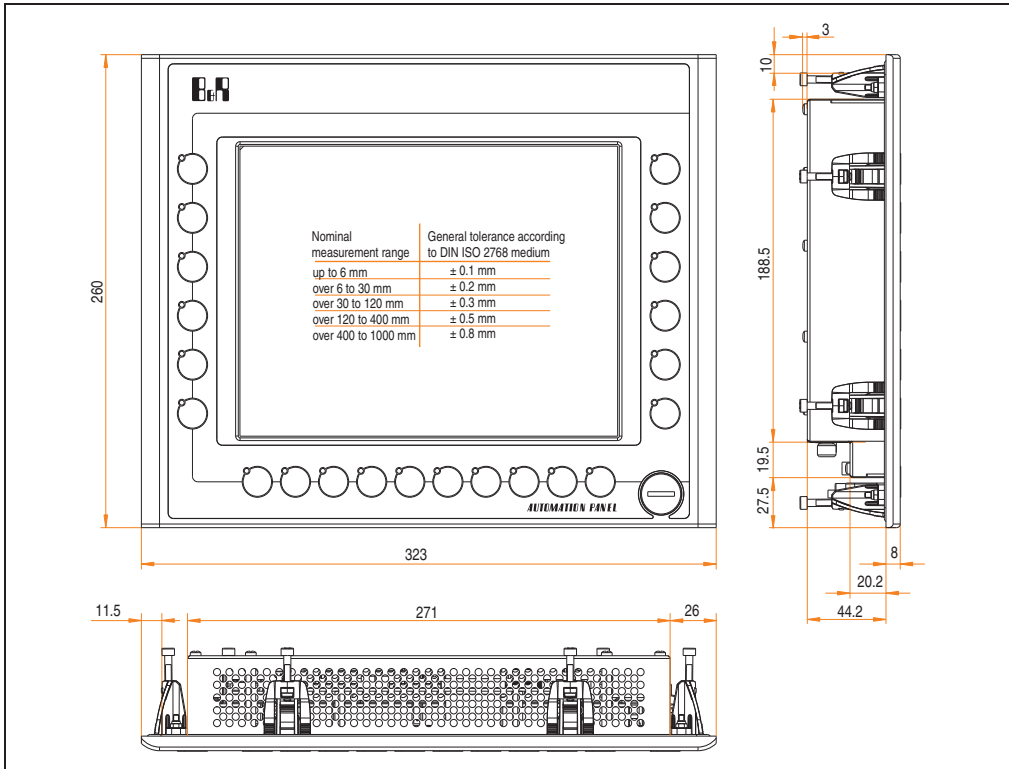


Figure 31: Dimensions 5AP980.1043-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|---|
| 1 | Automation Panel 980 TFT VGA 10.4" with touch screen and keys |
| 2 | Insert strips without labels (inserted in the front) |

Table 22: Delivery contents - 5AP980.1043-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

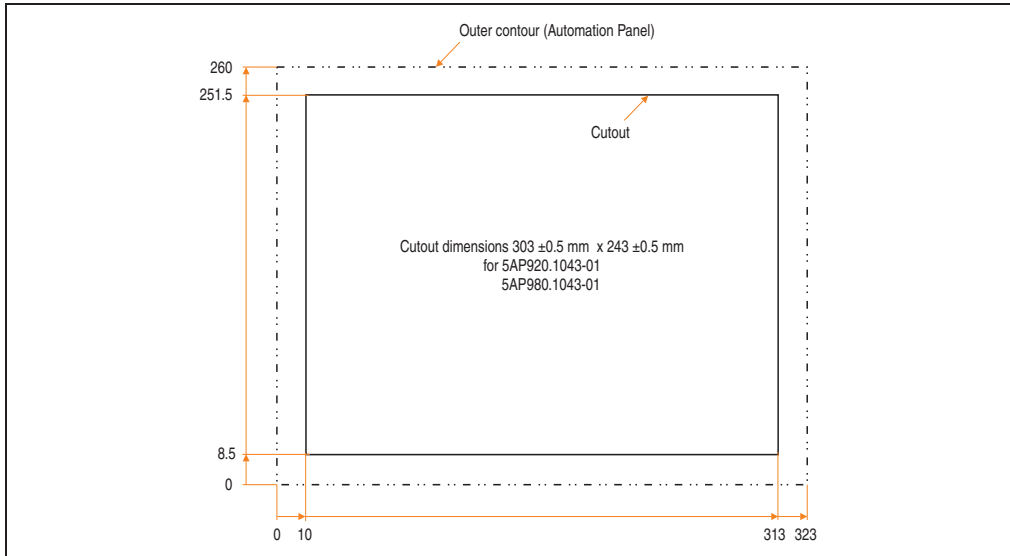


Figure 32: Cutout installation - 5AP980.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP980.1043-01 has two USB connectors (Type A).

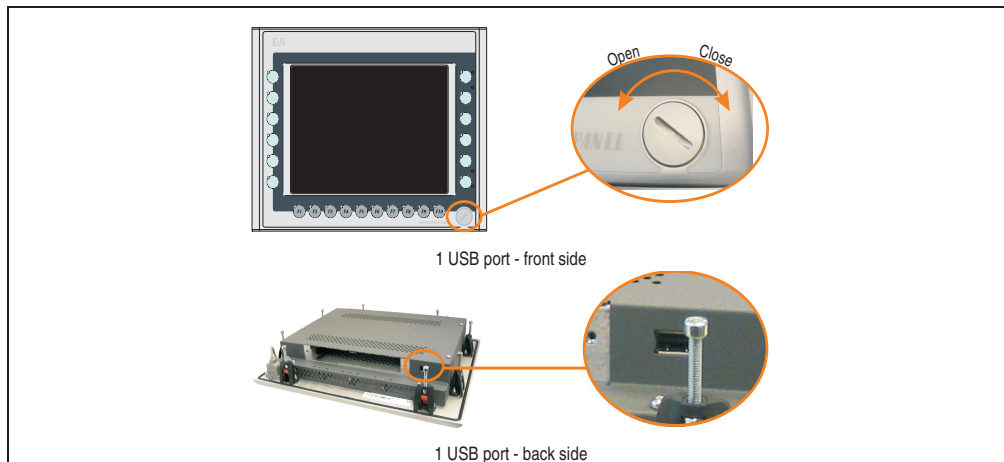


Figure 33: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel housing.



Figure 34: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 35: Functional grounding clip

3.1.5 Automation Panel 5AP981.1043-01

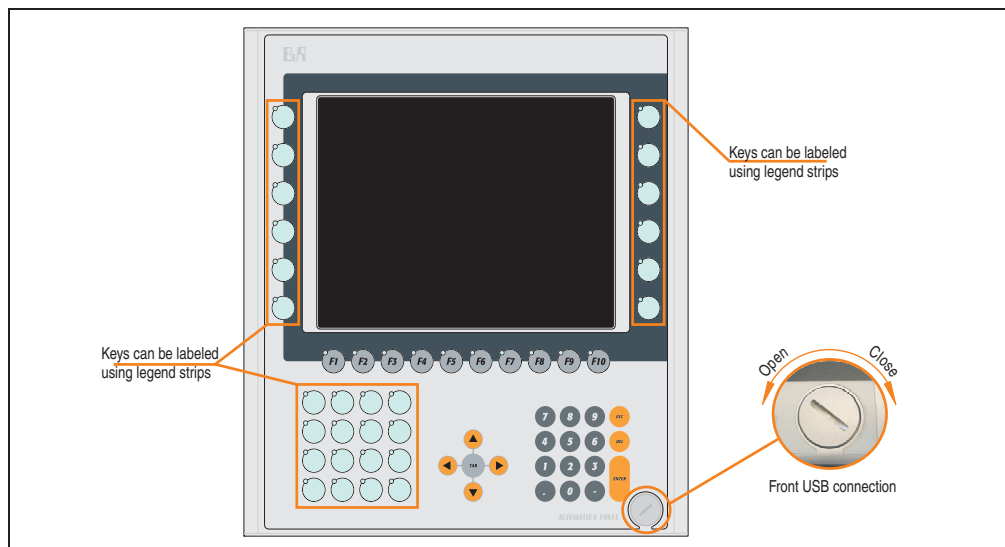


Figure 36: Front view - 5AP981.1043-01

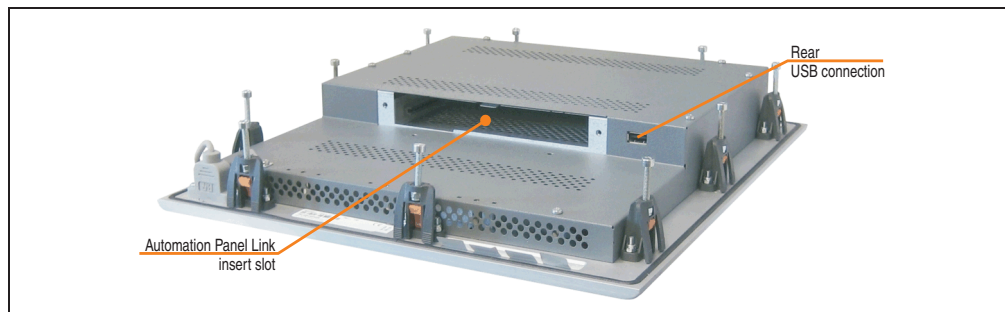


Figure 37: Rear view - 5AP981.1043-01

Technical data

| Features | 5AP981.1043-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 2 (1x front side, 1x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 26.42 cm (264 mm) 262144 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L = 70° Direction U = 40° / direction D = 70° 350 cd/m² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED ⁴⁾ Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | 28 with LED (yellow) 10 with LED (yellow) - 15 without LED 5 without LED > 10 ⁶ actuations with 1 ±0.3 to 3 ±0.3 N operating force Typically 12 mcd (yellow) |
| Caution! Pressing several keys at the same time may trigger unintended actions. | |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁵⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 10 W (without LED), maximum 14 W or 21 W with USB Yes |
| Mechanical characteristics | |
| Outer dimensions Width Height Depth | 323 mm 358 mm 55 mm |

Table 23: Technical data - 5AP981.1043-01

| Mechanical characteristics | 5AP981.1043-01 |
|---------------------------------|---|
| Front | |
| Frame | Aluminum, naturally anodized ⁶⁾ |
| Design | Gray ⁶⁾ |
| Membrane | Polyester |
| Dark gray border around display | Similar to Pantone 432CV ⁶⁾ |
| Light background | Similar to Pantone 427CV ⁶⁾ |
| Orange keys | Similar to Pantone 151CV ⁶⁾ |
| Dark gray keys | Similar to Pantone 431CV ⁶⁾ |
| Legend strips (gray) | Similar to Pantone 429CV ⁶⁾ |
| Gasket | Flat gasket around display front |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁵⁾ |
| Weight | Approx. 3.6 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -30°C .. +70°C |
| Transport | -30°C .. +70°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s ² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s ² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s ² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s ² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s ² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 23: Technical data - 5AP981.1043-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 68.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 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).
- 5) The value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 6) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

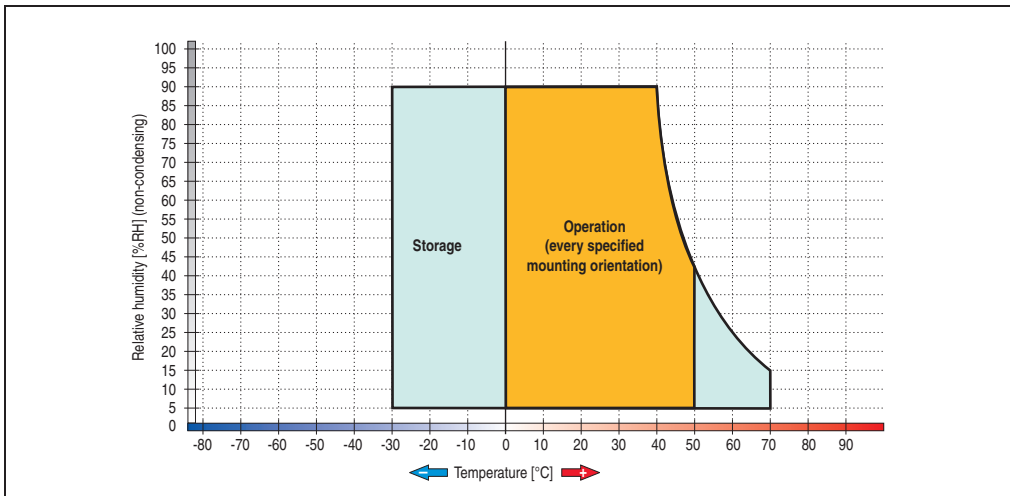


Figure 38: Temperature humidity diagram - 5AP981.1043-01

Dimensions

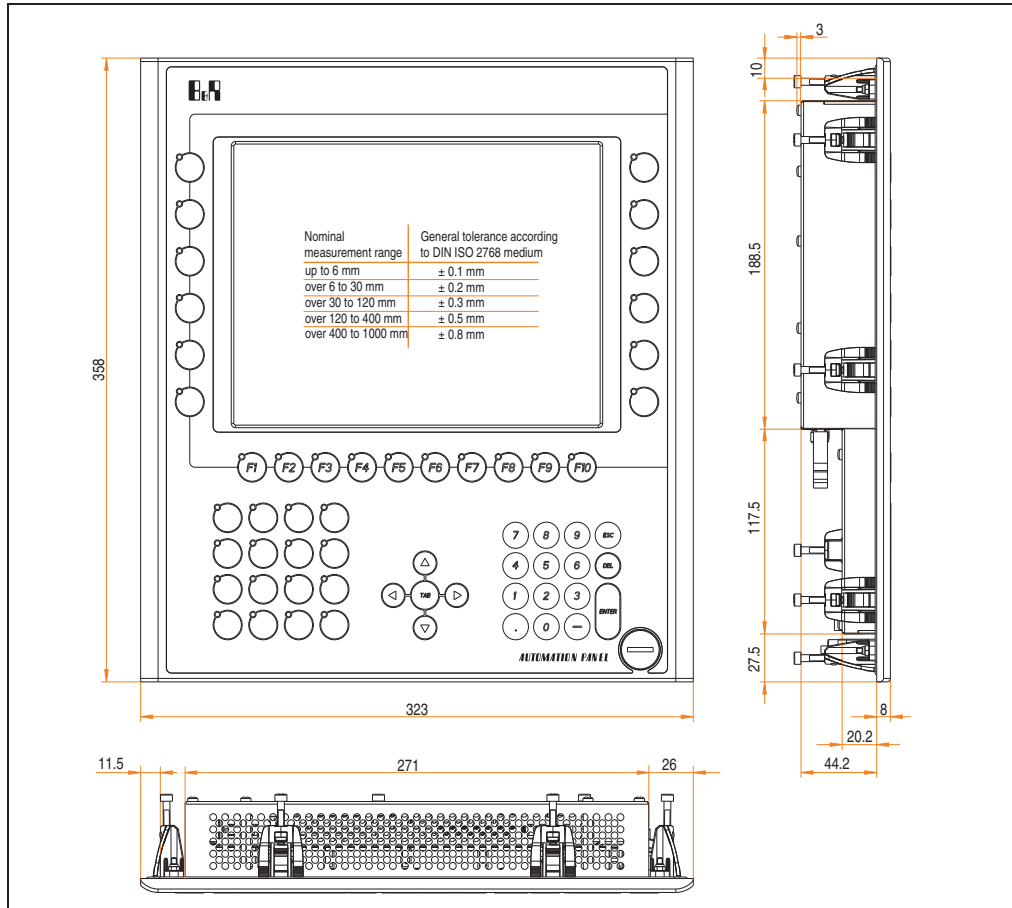


Figure 39: Dimensions 5AP981.1043-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|---|
| 1 | Automation Panel 981 TFT VGA 10.4" with keys and touch screen |
| 6 | Insert strips without labels (inserted in the front) |

Table 24: Delivery contents - 5AP981.1043-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

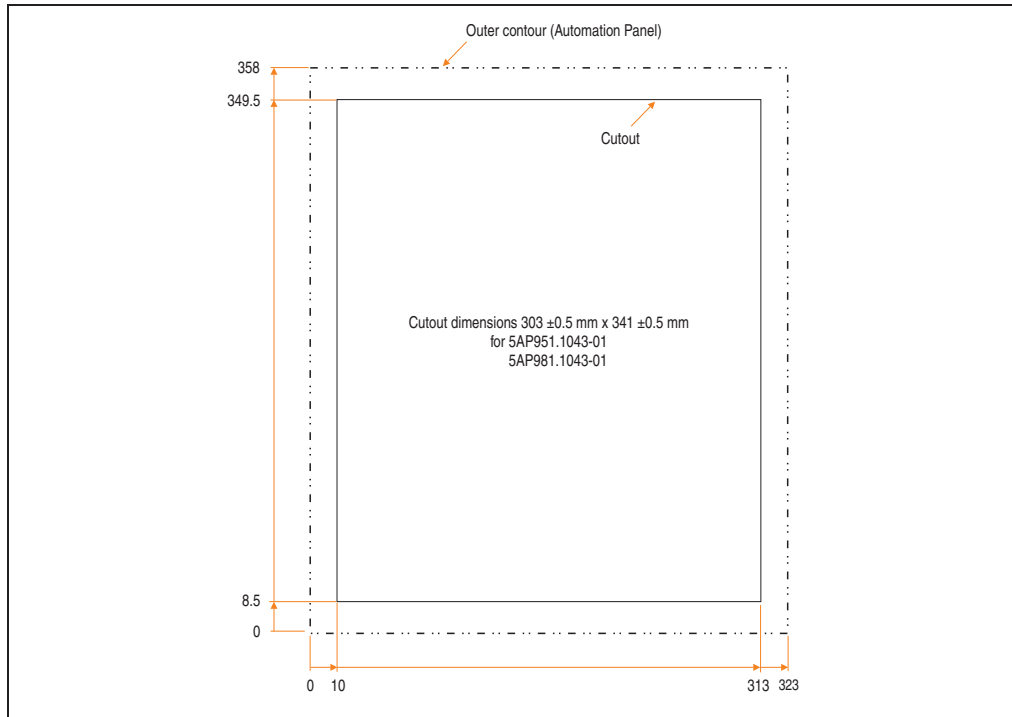


Figure 40: Cutout installation - 5AP981.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP981.1043-01 has two USB connectors (Type A).

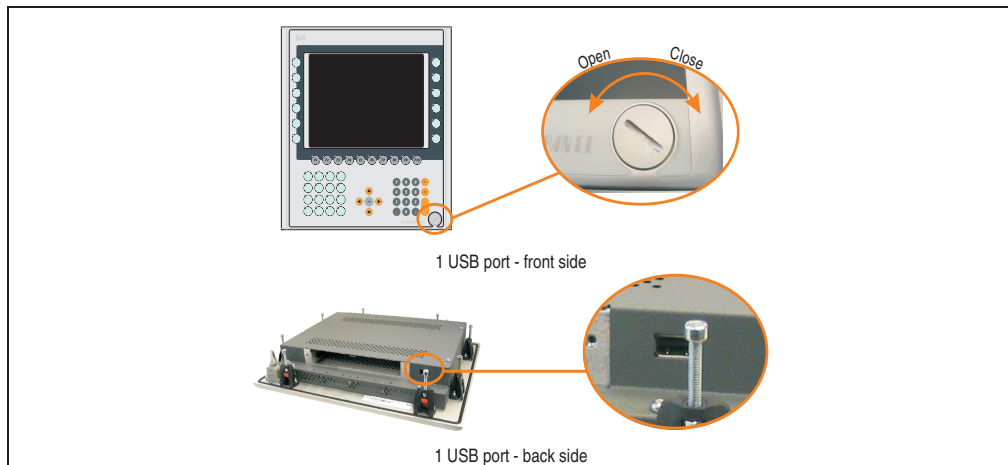


Figure 41: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel housing.

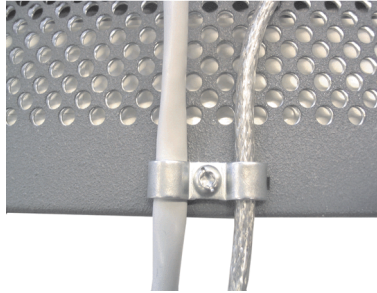


Figure 42: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 43: Functional grounding clip

3.1.6 Automation Panel 5AP982.1043-01

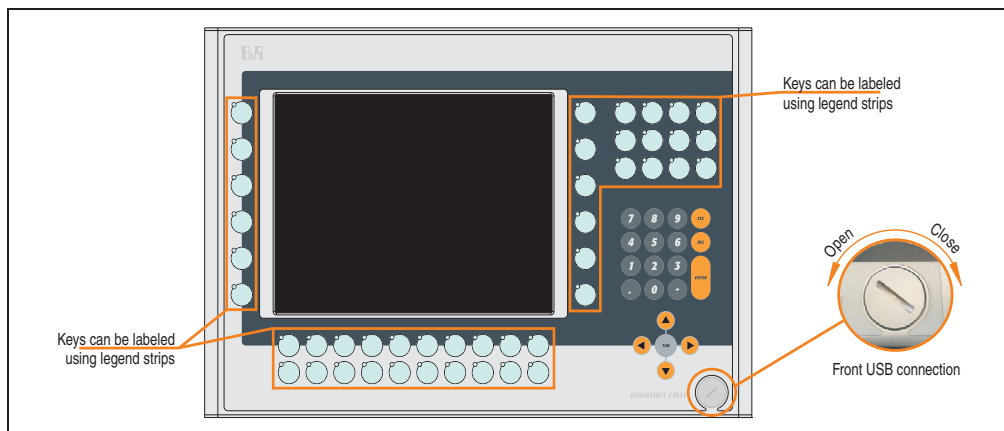


Figure 44: Front view - 5AP982.1043-01

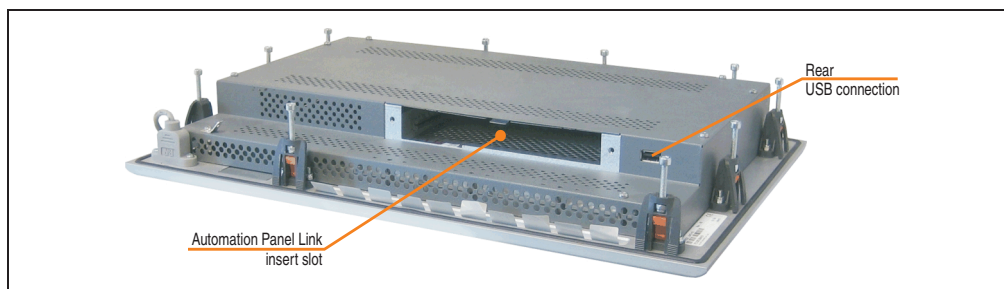


Figure 45: Rear view - 5AP982.1043-01

Technical data

| Features | 5AP982.1043-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 2 (1x front side, 1x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 26.42 cm (264 mm) 262144 colors VGA, 640 x 480 pixels 300:1 Direction R / direction L = 70° Direction U = 40° / direction D = 70° 350 cd/m² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED ⁴⁾ Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | 44 with LED (yellow) - - 15 without LED 5 without LED > 10 ⁶ actuations with 1 ±0.3 to 3 ±0.3 N operating force Typically 12 mcd (yellow) |
| Caution! Pressing several keys at the same time may trigger unintended actions. | |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁵⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 10 W (without LED), maximum 14 W or 21 W with USB Yes |
| Mechanical characteristics | |
| Outer dimensions Width Height Depth | 423 mm 288 mm 55 mm |

Table 25: Technical data - 5AP982.1043-01

| Mechanical characteristics | 5AP982.1043-01 |
|---|---|
| Front Frame Design Membrane Dark gray border around display Light background Orange keys Dark gray keys Legend strips (gray) Gasket | Aluminum, naturally anodized ⁶⁾ Gray ⁶⁾ Polyester Similar to Pantone 432CV ⁶⁾ Similar to Pantone 427CV ⁶⁾ Similar to Pantone 151CV ⁶⁾ Similar to Pantone 431CV ⁶⁾ Similar to Pantone 429CV ⁶⁾ Flat gasket around display front |
| Housing Paint | Metal Similar to Pantone 432CV ⁶⁾ |
| Weight | Approx. 3.9 kg |
| Environmental characteristics | |
| Ambient temperature Operation Storage Transport | See "Ambient temperatures" on page 27 -30°C .. +70°C -30°C .. +70°C |
| Relative humidity Operation / Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing |
| Vibration Operation (continuous) Operation (occasional) Storage / Transport | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s ² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s ² 0-peak) Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s ² 0-peak) |
| Shock Operation Storage / Transport | Max. 15 g (147 m/s ² 0-peak) and 11 ms duration Max. 50 g (490 m/s ² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 25: Technical data - 5AP982.1043-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 76.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 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).
- 5) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 6) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

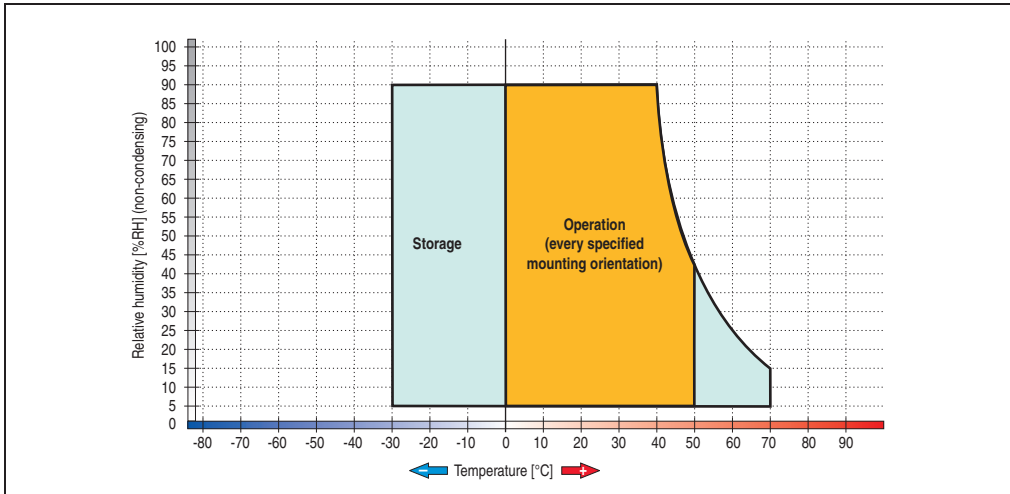


Figure 46: Temperature humidity diagram - 5AP982.1043-01

Dimensions

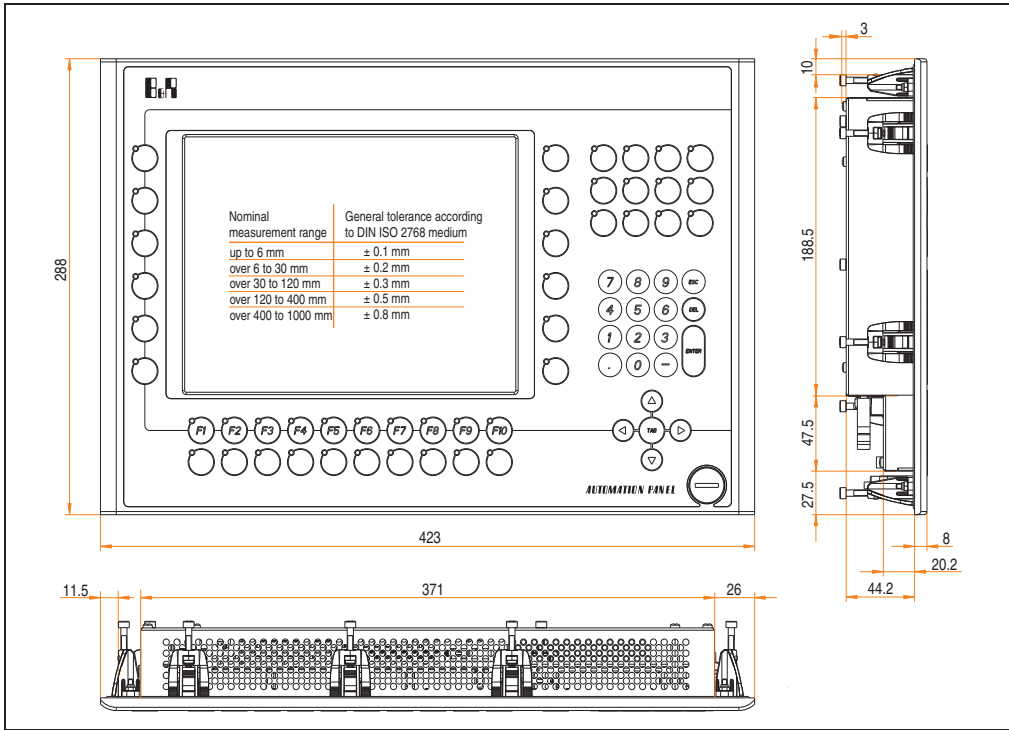


Figure 47: Dimensions 5AP982.1043-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|--|
| 1 | Automation Panel 982 TFT VGA 10.4" with touch screen and keys |
| 16 | 6 insert strips without labels - 10 partially labeled "F1-F10" (inserted in the front) |

Table 26: Delivery contents - 5AP982.1043-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

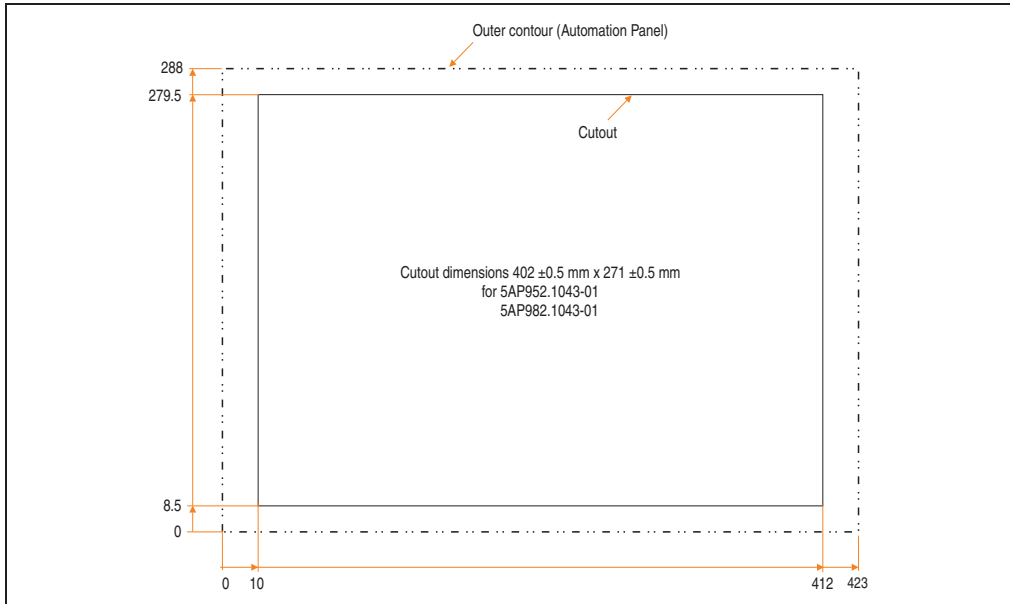


Figure 48: Cutout installation - 5AP982.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP982.1043-01 has two USB connectors (Type A).

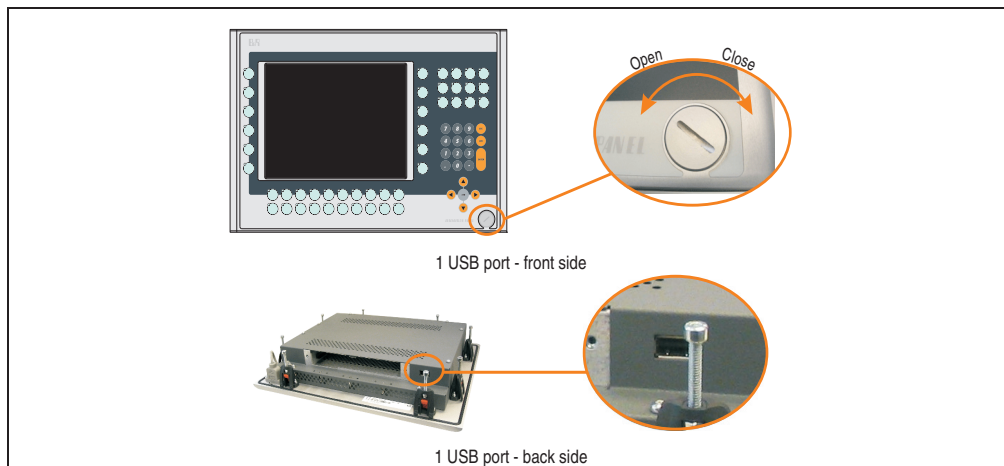


Figure 49: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel housing.



Figure 50: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 51: Functional grounding clip

3.2 Automation Panel 12.1" SVGA

3.2.1 Automation Panel 5AP920.1214-01

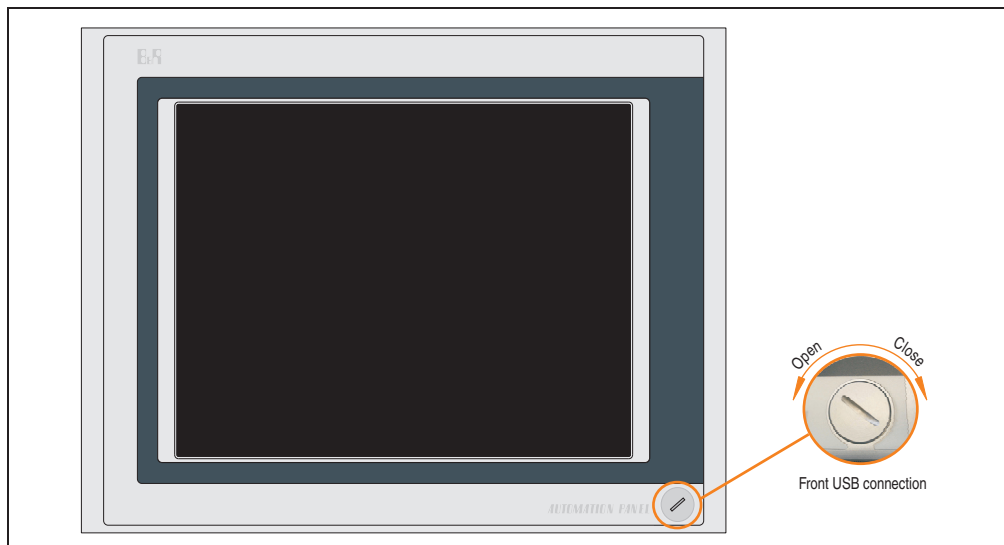


Figure 52: Front view - 5AP920.1214-01

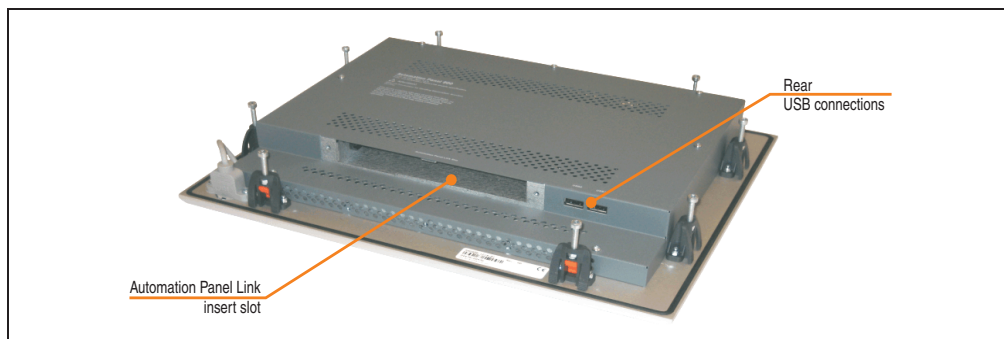


Figure 53: Rear view - 5AP920.1214-01

Technical data

| Features | 5AP920.1214-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 3 (1x front side, 2x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 12,1 in (307 mm) 262144 colors SVGA, 800 x 600 pixels 300:1 Direction R / direction L = 70° Direction U = 50° / direction D = 60° 350 cd/m² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | - |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁴⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 12 W, maximum 15 W or 21 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Gasket | Aluminum, naturally anodized ⁵⁾ Gray ⁵⁾ Polyester Similar to Pantone 432CV ⁵⁾ Similar to Pantone 427CV ⁵⁾ Flat gasket around display front |

Table 27: Technical data - 5AP920.1214-01

| Mechanical characteristics | 5AP920.1214-01 |
|---------------------------------|---|
| Outer dimensions | |
| Width | 362 mm |
| Height | 284 mm |
| Depth | 54 mm |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁵⁾ |
| Weight | Approx. 3.4 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -30°C .. +70°C |
| Transport | -30°C .. +70°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 27: Technical data - 5AP920.1214-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 92.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 4) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 5) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

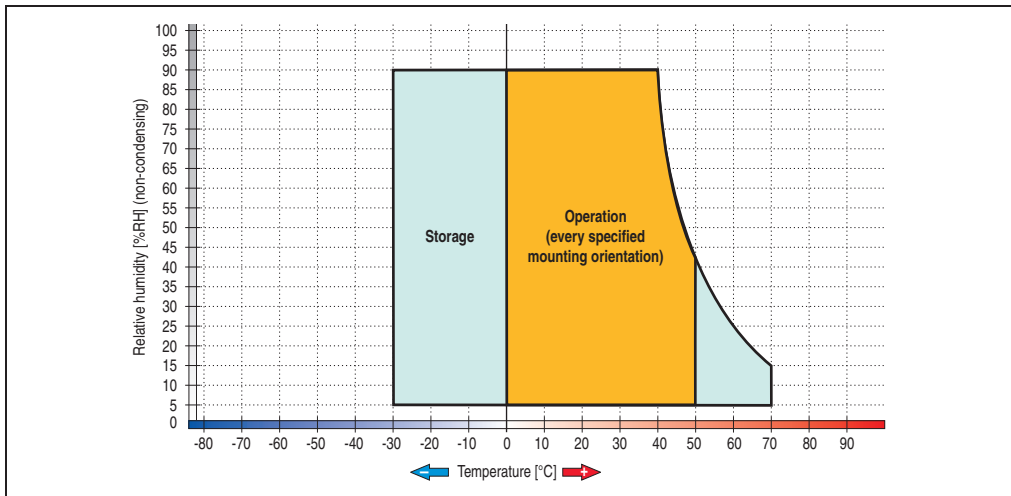


Figure 54: Temperature humidity diagram - 5AP920.1214-01

Dimensions

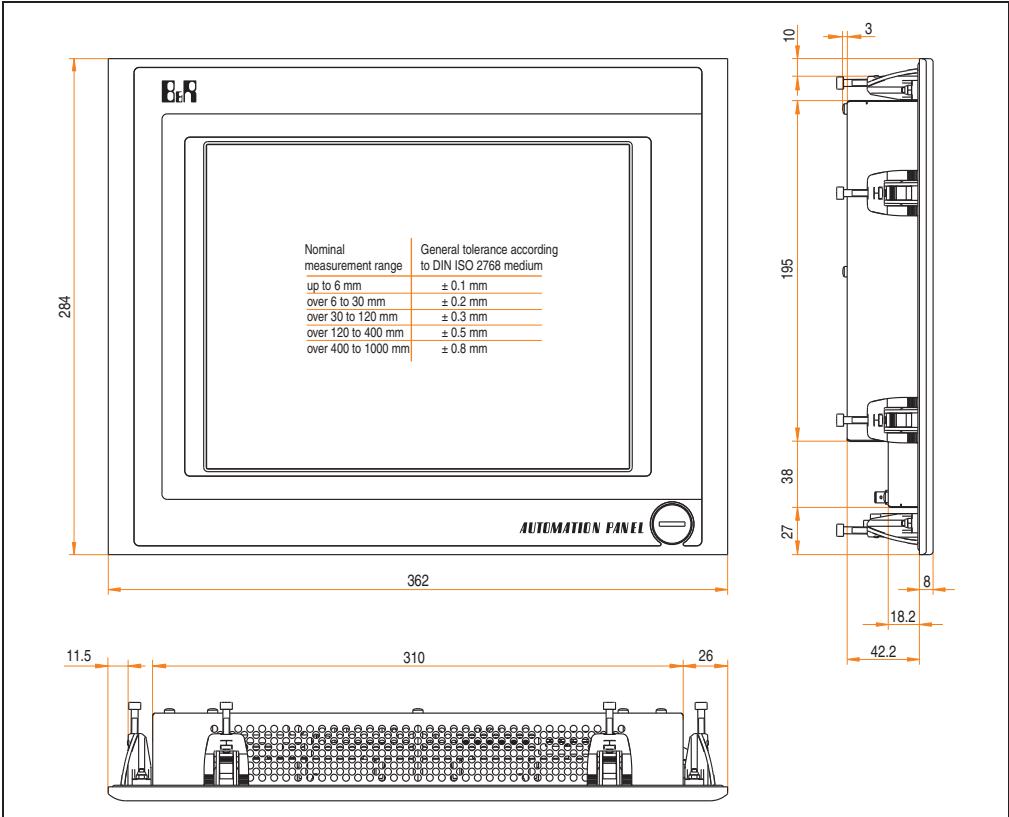


Figure 55: Dimensions - 5AP920.1214-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|--|
| 1 | Automation Panel 920 TFT XGA 15" with touch screen |

Table 28: Delivery contents - 5AP920.1214-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

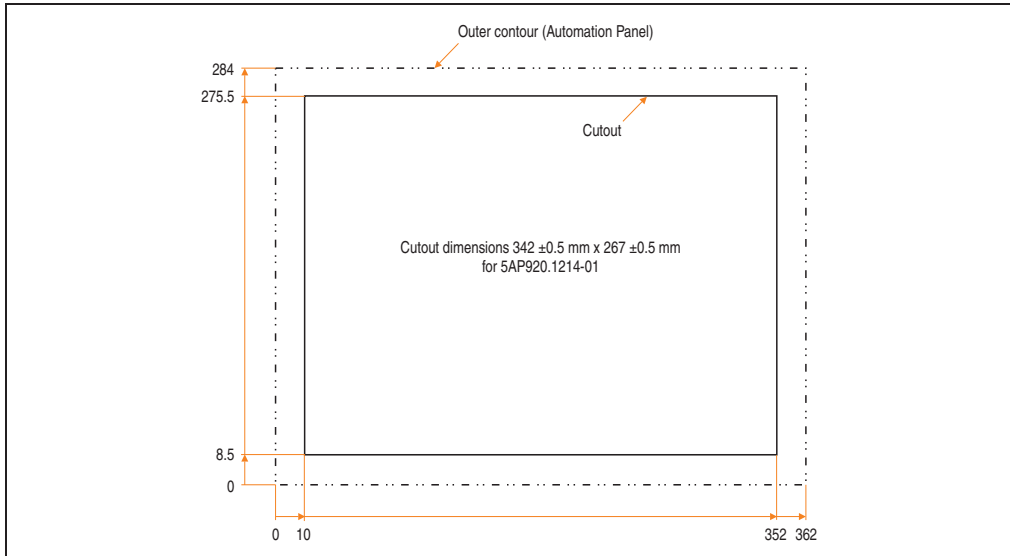


Figure 56: Cutout installation - 5AP920.1214-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP920.1214-01 has three USB connections (Type A).

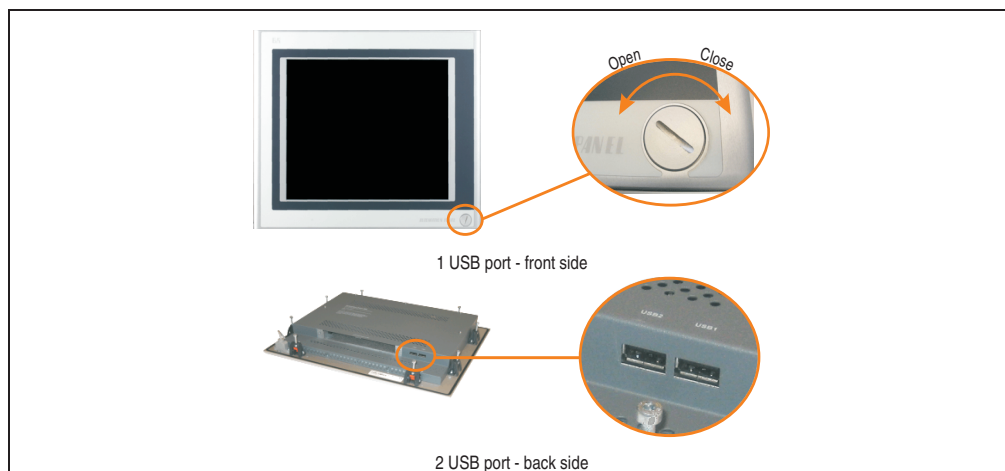


Figure 57: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel.



Figure 58: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 59: Functional grounding clip

3.3 Automation Panel 15" XGA

3.3.1 Automation Panel 5AP920.1505-01

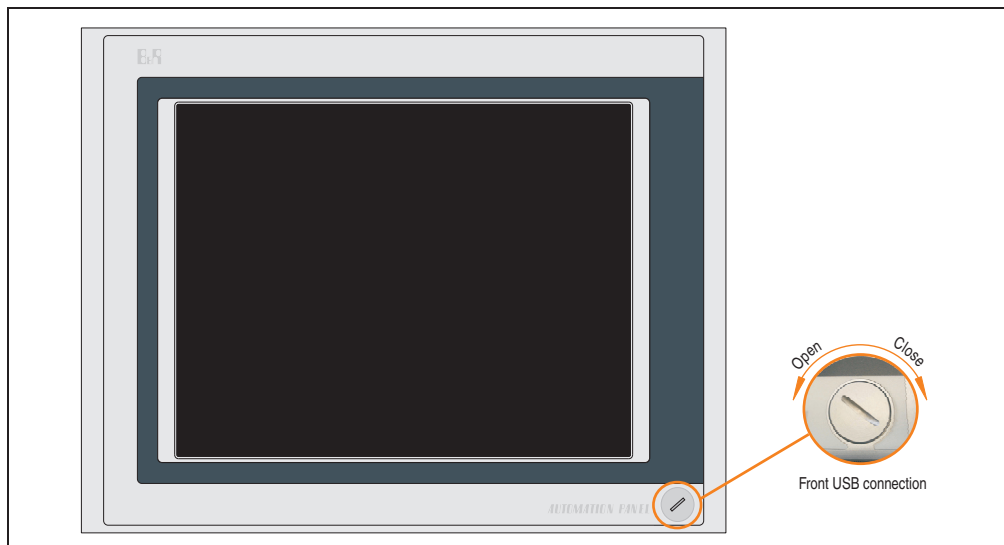


Figure 60: Front view - 5AP920.1505-01

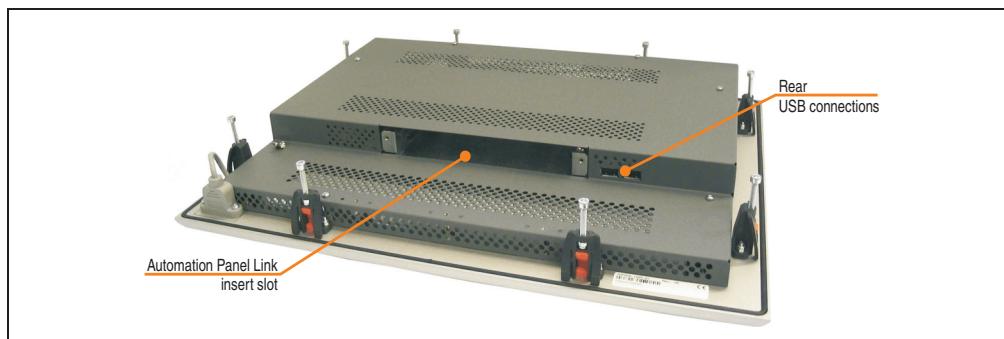


Figure 61: Rear view - 5AP920.1505-01

Technical data

| Features | 5AP920.1505-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 3 (1x front side, 2x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 15 in (381 mm) 16,7 million XGA, 1024 x 768 pixels 400:1 L direction / R direction = 85° U direction / D direction = 85° 250 cd/m² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | - |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁴⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 24 W, maximum 31 W or 41 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Gasket | Aluminum, naturally anodized ⁵⁾ Gray ⁵⁾ Polyester Similar to Pantone 432CV ⁵⁾ Similar to Pantone 427CV ⁵⁾ Flat gasket around display front |

Table 29: Technical data - 5AP920.1505-01

Technical data • Individual components

| Mechanical characteristics | 5AP920.1505-01 |
|---------------------------------|---|
| Outer dimensions | |
| Width | 435 mm |
| Height | 330 mm |
| Depth | 54 mm |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁵⁾ |
| Weight | Approx. 5.1 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -25°C .. +60°C |
| Transport | -25°C .. +60°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 29: Technical data - 5AP920.1505-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 92.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 4) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 5) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

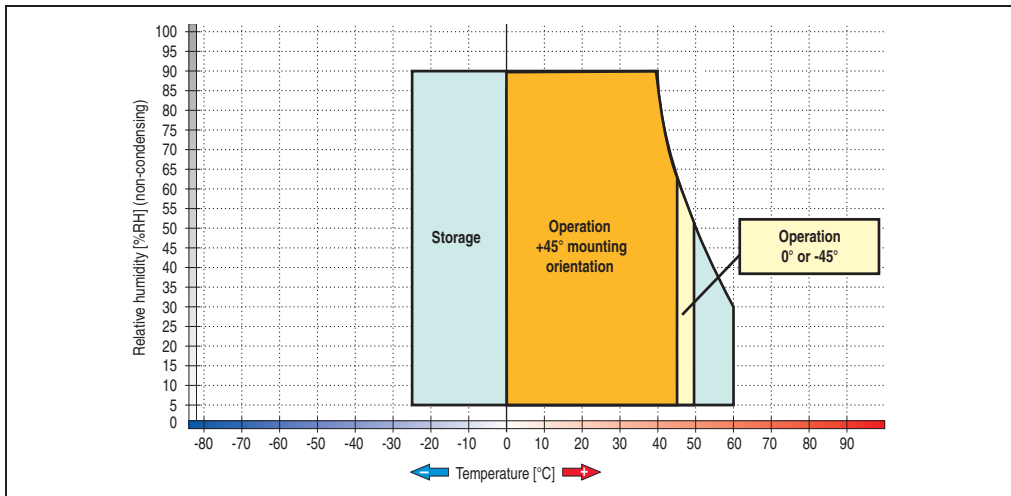


Figure 62: Temperature humidity diagram - 5AP920.1505-01

Dimensions

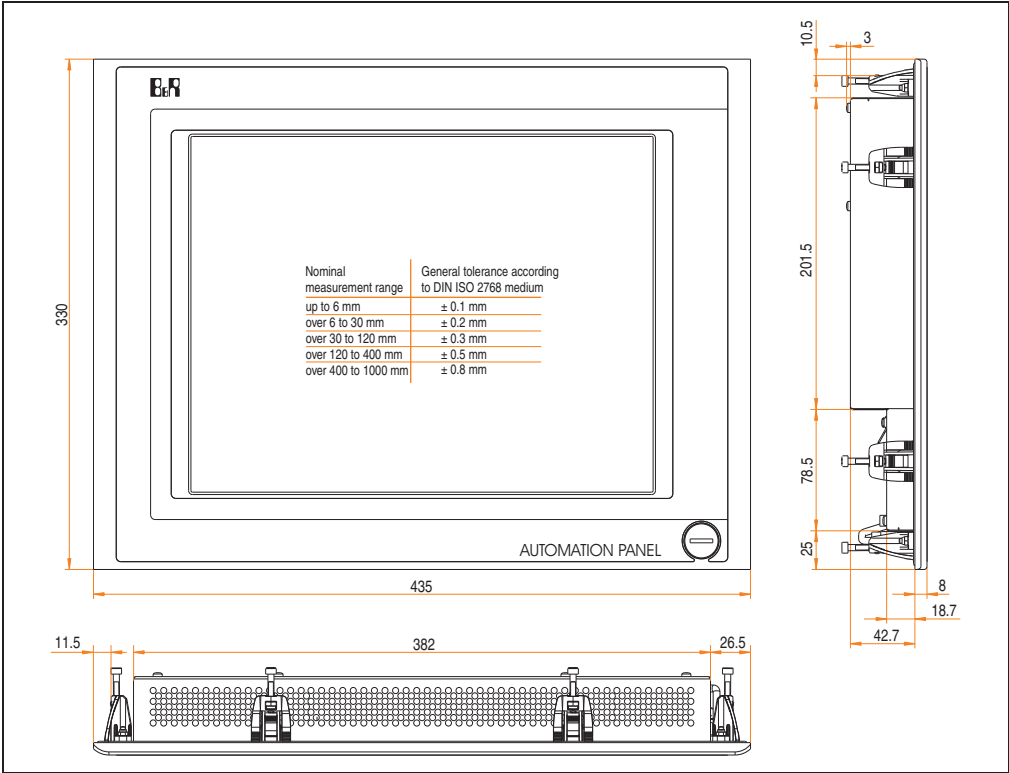


Figure 63: Dimensions 5AP920.1505-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|--|
| 1 | Automation Panel 920 TFT XGA 15" with touch screen |

Table 30: Contents of delivery - 5AP920.1505-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

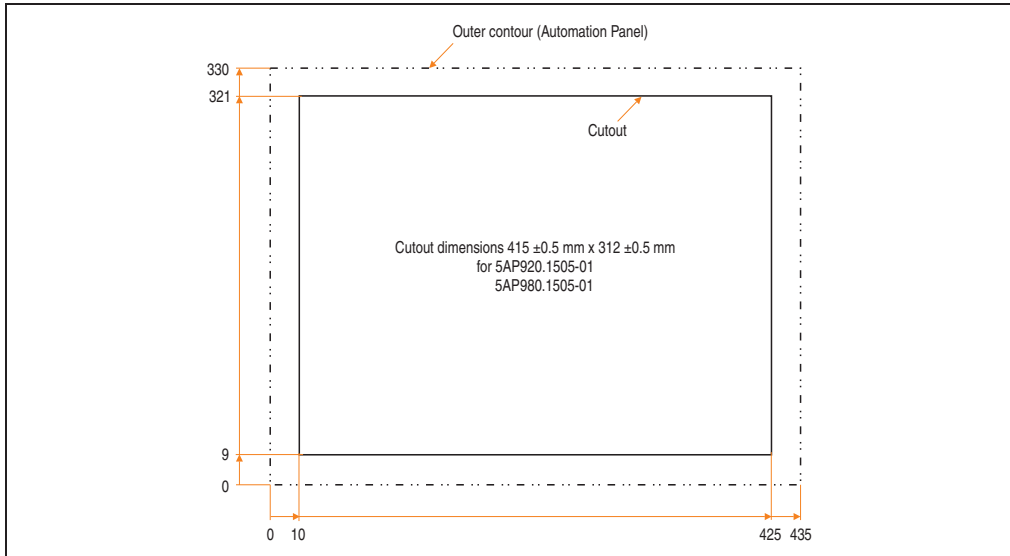


Figure 64: Cutout installation - 5AP920.1505-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP920.1505-01 has three USB connectors (Type A).

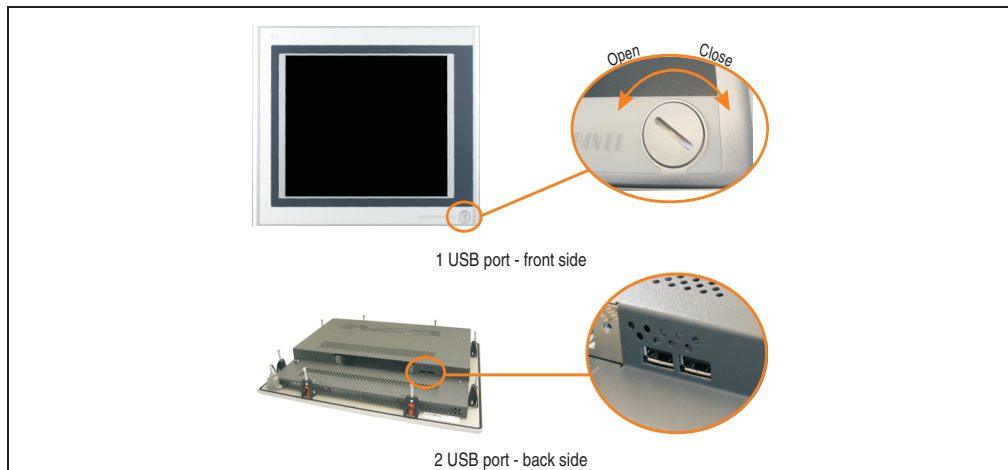


Figure 65: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel.



Figure 66: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 67: Functional grounding clip

3.3.2 Automation Panel 5AP951.1505-01

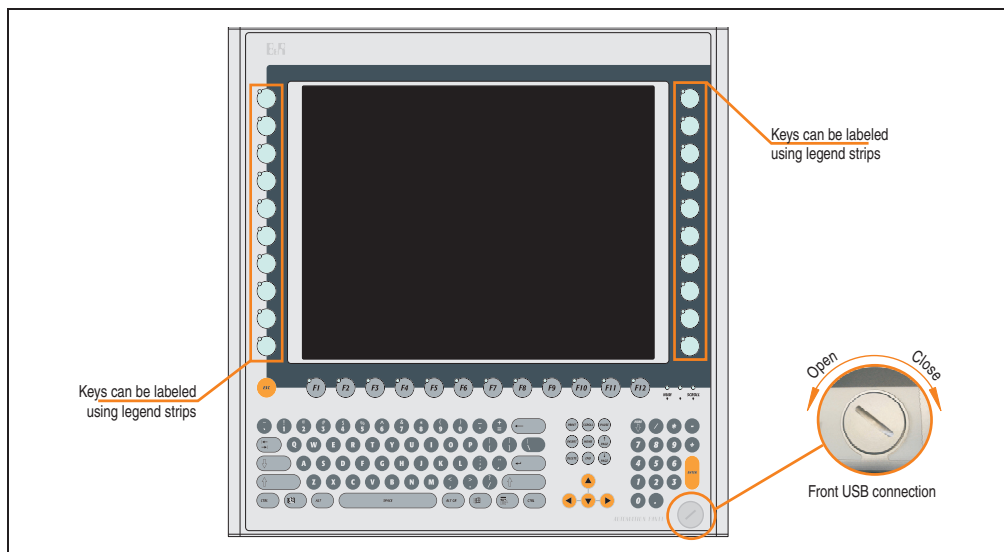


Figure 68: Front view - 5AP951.1505-01

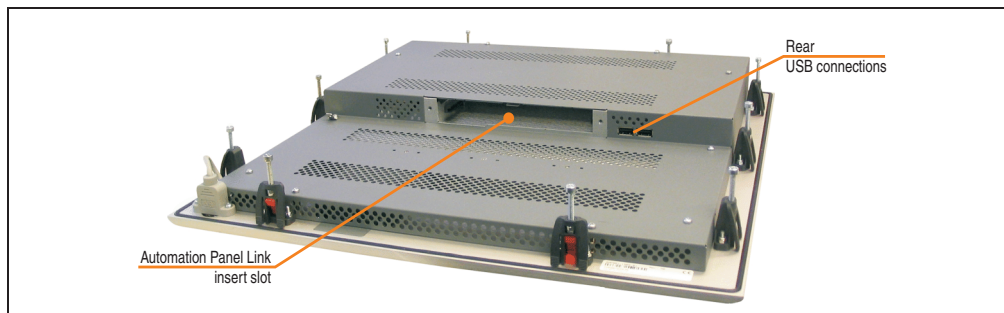


Figure 69: Rear view - 5AP951.1505-01

Technical data

| Features | 5AP951.1505-01 |
|--|---|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 2 (1x front side, 2x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 15 in (381 mm) 16,7 million XGA, 1024 x 768 pixels 400:1 Direction R / direction L = 85° U direction / D direction = 85° 250 cd/m² 50000 hours |
| Touch screen Technology Controller Degree of transmission | - |
| Filter glass Degree of transmission Coating | 95% On both sides |
| Keys/LED ³⁾ Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | 20 with LED (yellow) 12 with LED (yellow) - 15 without LED 77 without LED > 10 ⁶ actuations with 1 ±0.3 to 3 ±0.3 N operating force Typically 12 mcd (yellow) |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁴⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 24 W (without LED), maximum 32 W or 42 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Orange keys Dark gray keys Legend strips (gray) Gasket | Aluminum, naturally anodized ⁵⁾ Gray ⁶⁾ Polyester Similar to Pantone 432CV ⁵⁾ Similar to Pantone 427CV ⁵⁾ Similar to Pantone 151CV ⁵⁾ Similar to Pantone 431CV ⁵⁾ Similar to Pantone 429CV ⁵⁾ Flat gasket around display front |

Table 31: Technical data - 5AP951.1505-01

| Mechanical characteristics | 5AP951.1505-01 |
|---------------------------------|---|
| Outer dimensions | |
| Width | 435 mm |
| Height | 430 mm |
| Depth | 54 mm |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁵⁾ |
| Weight | Approx. 5.9 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -25°C .. +60°C |
| Transport | -25°C .. +60°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 95%, non-condensing T > 40°C: < 95%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s ² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s ² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s ² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s ² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s ² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 31: Technical data - 5AP951.1505-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 100.
- 3) 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).
- 4) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 5) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

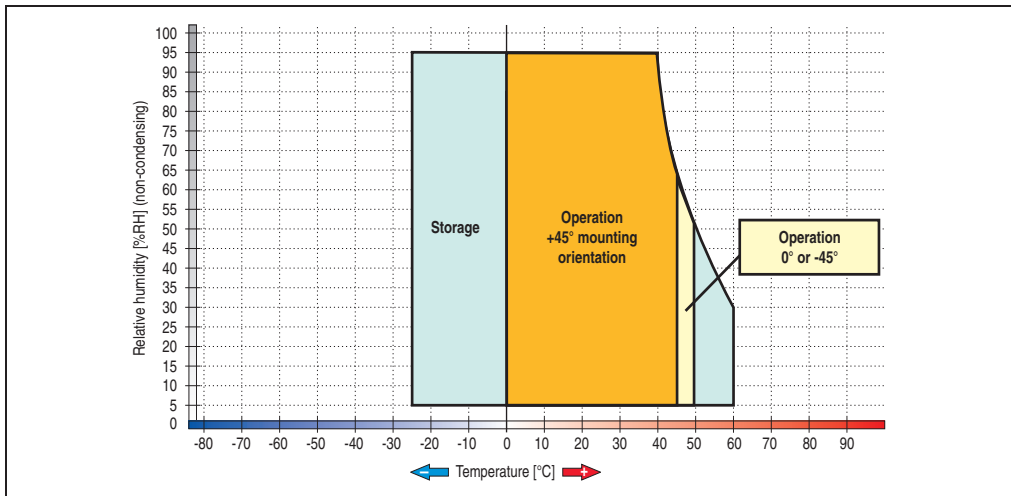


Figure 70: Temperature humidity diagram - 5AP951.1505-01

Dimensions

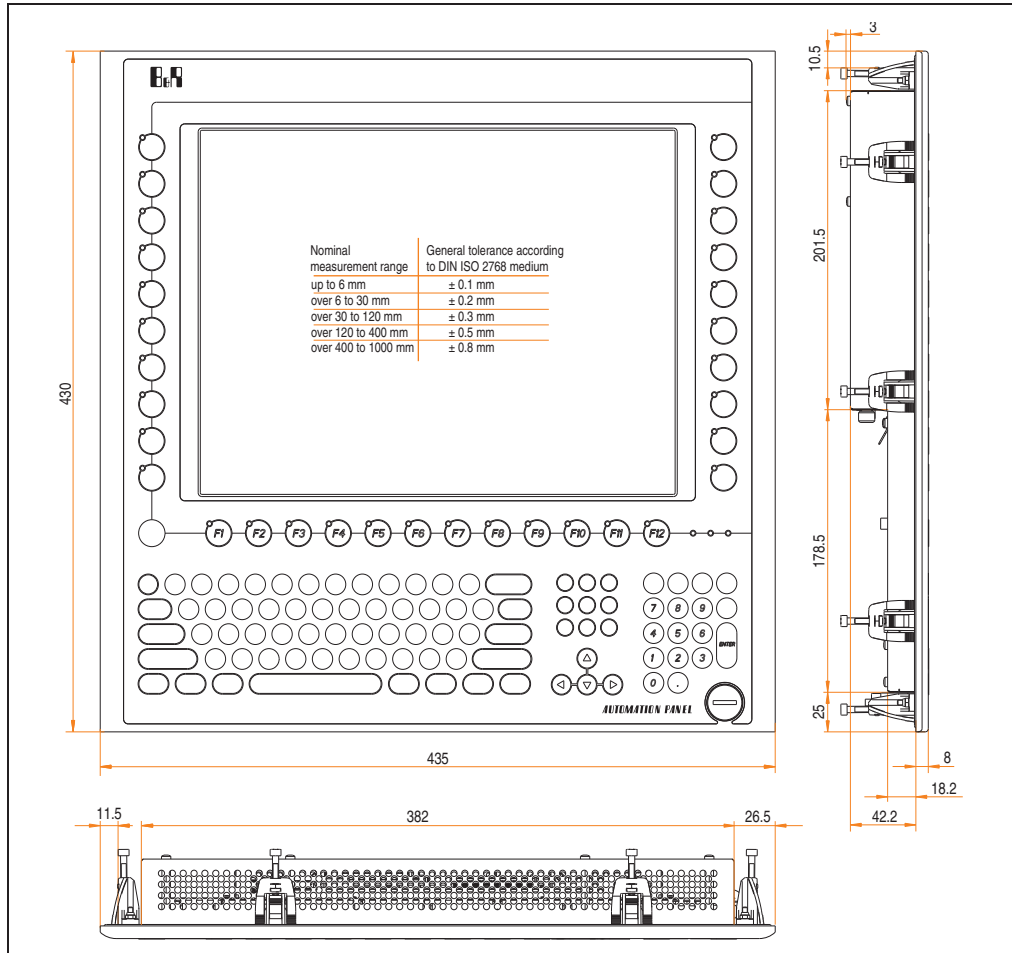


Figure 71: Dimensions 5AP951.1505-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|--|
| 1 | Automation Panel 951 TFT VGA 38.10cm with keys |
| 2 | 2 insert strips without labels (inserted in the front) |

Table 32: Contents of delivery - 5AP951.1505-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

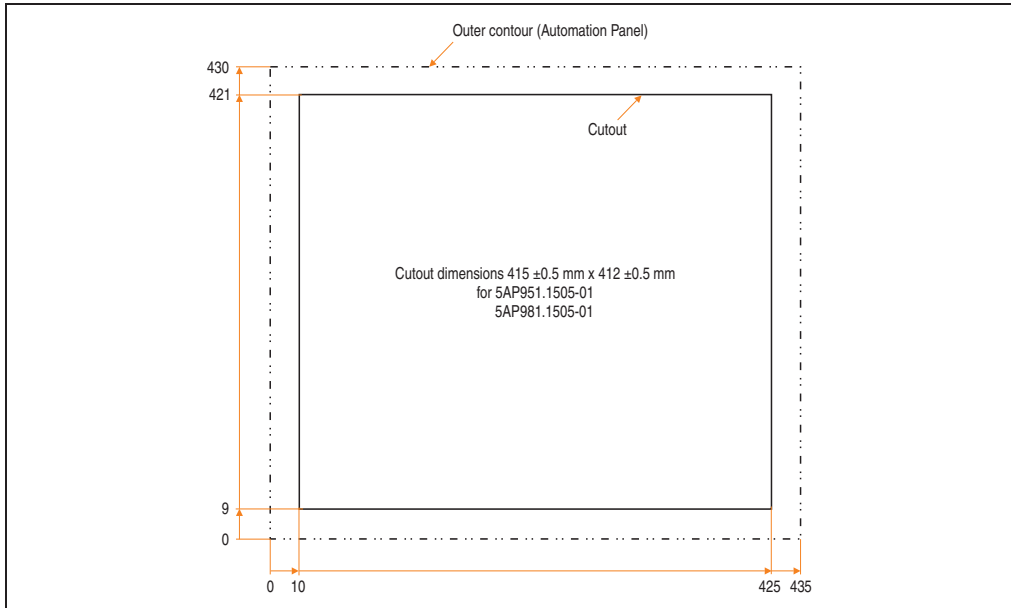


Figure 72: Cutout installation - 5AP951.1505-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP951.1505-01 has three USB connectors (Type A).

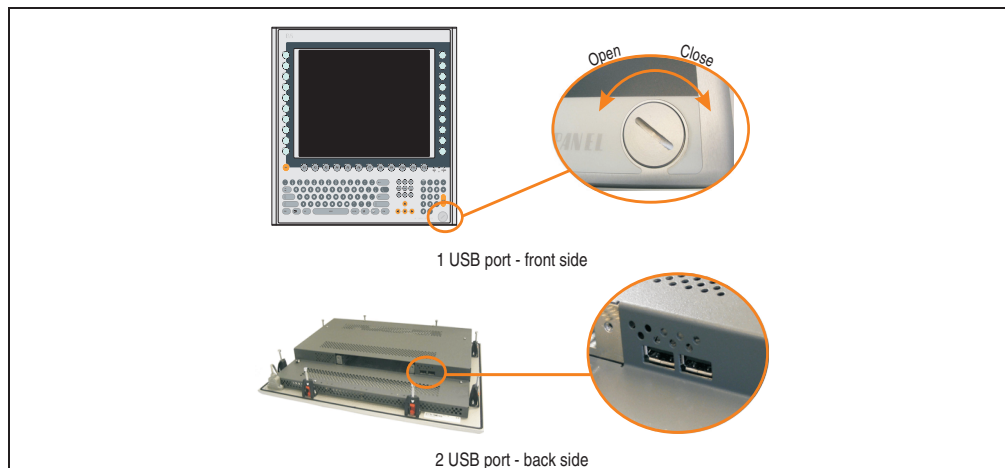


Figure 73: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel.



Figure 74: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 75: Functional grounding clip

3.3.3 Automation Panel 5AP980.1505-01

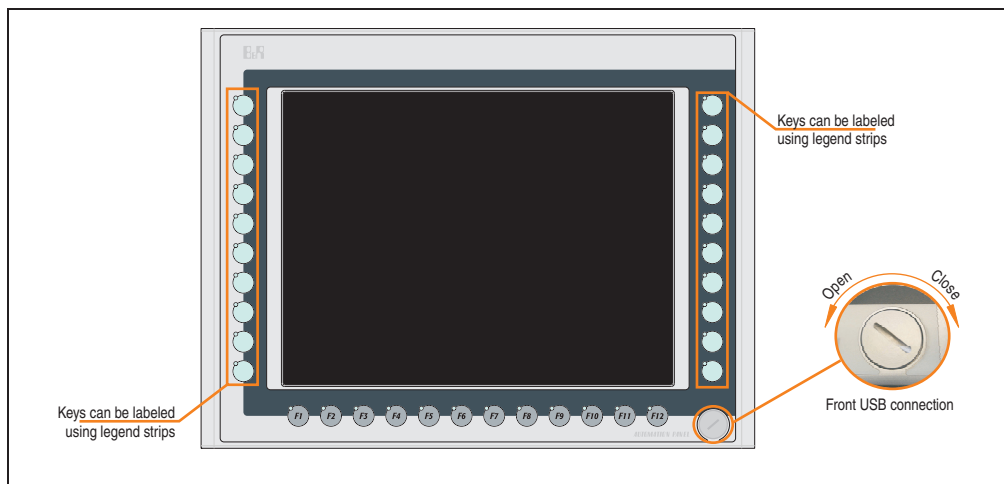


Figure 76: Front view - 5AP980.1505-01

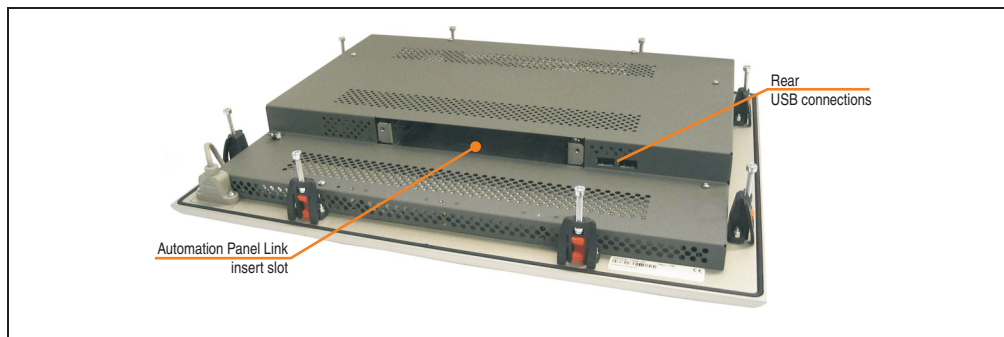


Figure 77: Rear view - 5AP980.1505-01

Technical data

| Features | 5AP980.1505-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 3 (1x front side, 2x back side) Low speed (1.5 Mbit/s), full speed (12 Mbit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 15 in (381 mm) 16,7 million XGA, 1024 x 768 pixels 400:1 Direction R / direction L = 85° U direction / D direction = 85° 250 cd/m² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED ⁴⁾ Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | 20 with LED (yellow) 12 with LED (yellow) - - - > 10 ⁶ actuations with 1 ±0.3 to 3 ±0.3 N operating force Typically 12 mcd (yellow) |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁵⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 24 W (without LED), maximum 32 W or 42 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Legend strips (gray) Gasket | Aluminum, naturally anodized ⁶⁾ Gray ⁶⁾ Polyester Similar to Pantone 432CV ⁶⁾ Similar to Pantone 427CV ⁶⁾ Similar to Pantone 429CV ⁶⁾ Flat gasket around display front |

Table 33: Technical data - 5AP980.1505-01

Technical data • Individual components

| Mechanical characteristics | 5AP980.1505-01 |
|---------------------------------|---|
| Outer dimensions | |
| Width | 435 mm |
| Height | 330 mm |
| Depth | 54 mm |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁶⁾ |
| Weight | Approx. 5.1 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -25°C .. +60°C |
| Transport | -25°C .. +60°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 33: Technical data - 5AP980.1505-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 108.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 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).
- 5) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 6) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

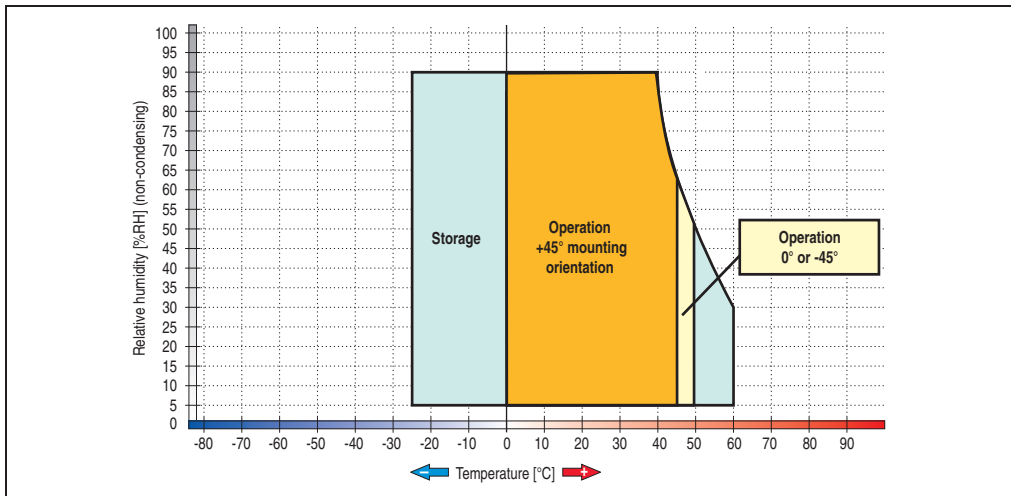


Figure 78: Temperature humidity diagram - 5AP980.1505-01

Dimensions

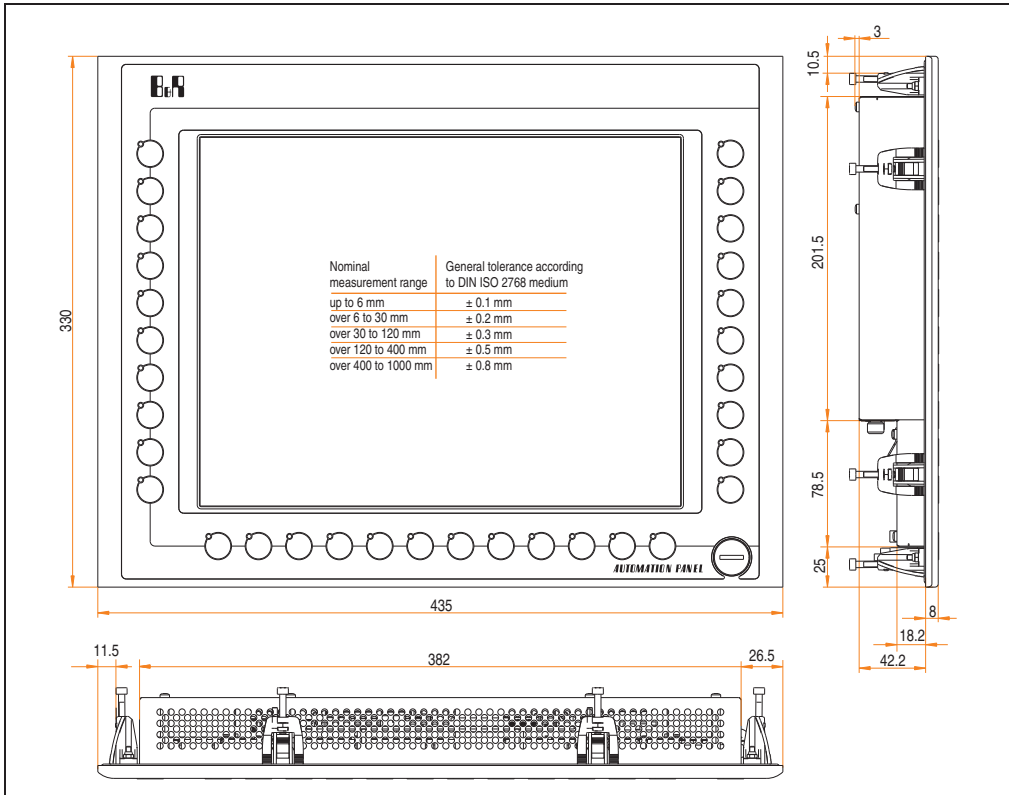


Figure 79: Dimensions 5AP980.1505-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|--|
| 1 | Automation Panel 980 TFT XGA 15" with touch screen |
| 2 | Insert strips without labels (inserted in the front) |

Table 34: Contents of delivery - 5AP980.1505-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

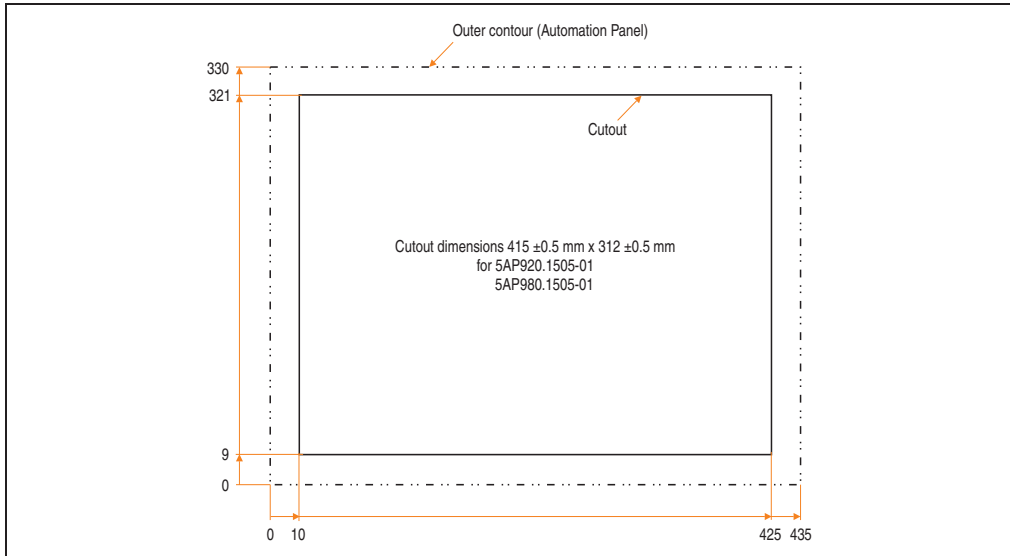


Figure 80: Cutout installation - 5AP980.1505-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP980.1505-01 has three USB connectors (Type A).

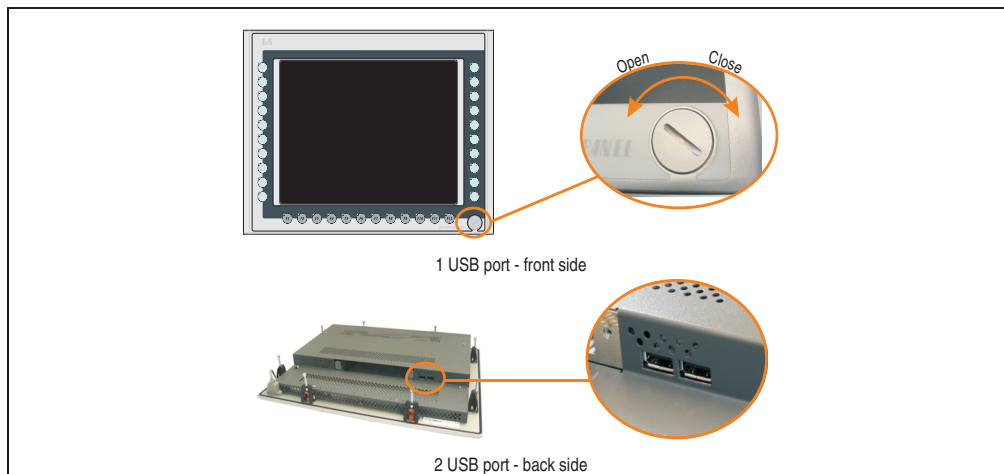


Figure 81: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel.



Figure 82: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 83: Functional grounding clip

3.3.4 Automation Panel 5AP981.1505-01

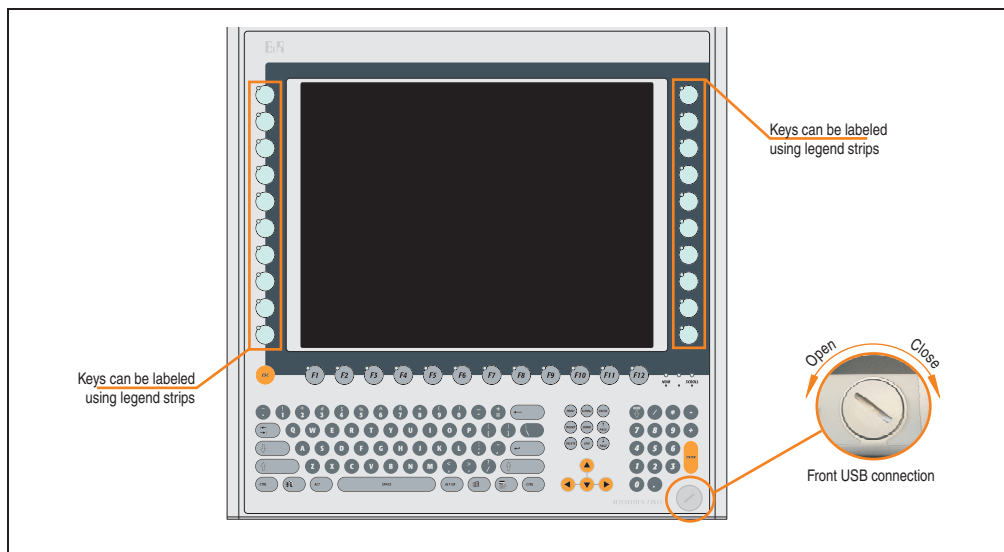


Figure 84: Front view - 5AP981.1505-01

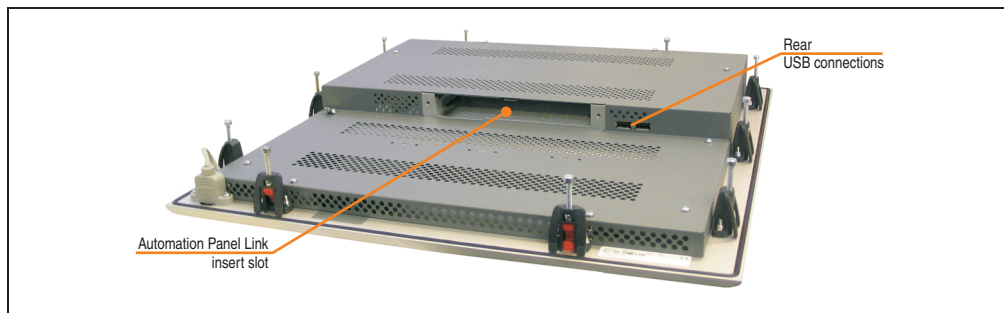


Figure 85: Rear view - 5AP981.1505-01

Technical data

| Features | 5AP981.1505-01 |
|--|---|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 3 (1x front side, 2x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 15 in (381 mm) 16,7 million XGA, 1024 x 768 pixels 400:1 Direction R / direction L = 85° U direction / D direction = 85° 250 cd/m² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED ⁴⁾ Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | 20 with LED (yellow) 12 with LED (yellow) - 15 without LED 77 without LED > 10 ⁶ actuations with 1 ±0.3 to 3 ±0.3 N operating force Typically 12 mcd (yellow) |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁵⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 24 W (without LED), maximum 32 W or 42 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Orange keys Dark gray keys Legend strips (gray) Gasket | Aluminum, naturally anodized ⁶⁾ Gray ⁶⁾ Polyester Similar to Pantone 432CV ⁶⁾ Similar to Pantone 427CV ⁶⁾ Similar to Pantone 151CV ⁶⁾ Similar to Pantone 431CV ⁶⁾ Similar to Pantone 429CV ⁶⁾ Flat gasket around display front |

Table 35: Technical data - 5AP981.1505-01

Technical data • Individual components

| Mechanical characteristics | 5AP981.1505-01 |
|---------------------------------|---|
| Outer dimensions | |
| Width | 435 mm |
| Height | 430 mm |
| Depth | 54 mm |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁶⁾ |
| Weight | Approx. 5.9 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -25°C .. +60°C |
| Transport | -25°C .. +60°C |
| Relative humidity | |
| Operation / Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage / Transport | Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 35: Technical data - 5AP981.1505-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 116.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 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).
- 5) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 6) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

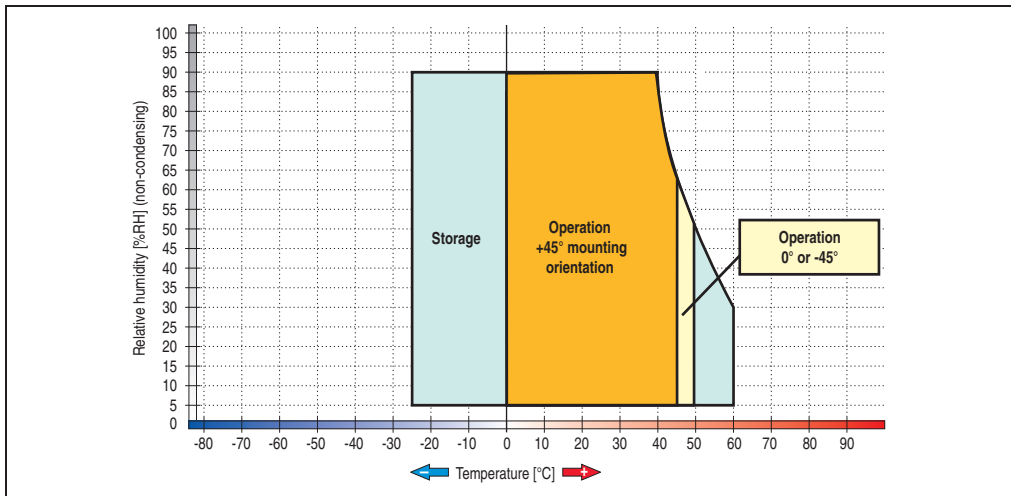


Figure 86: Temperature humidity diagram - 5AP981.1505-01

Dimensions

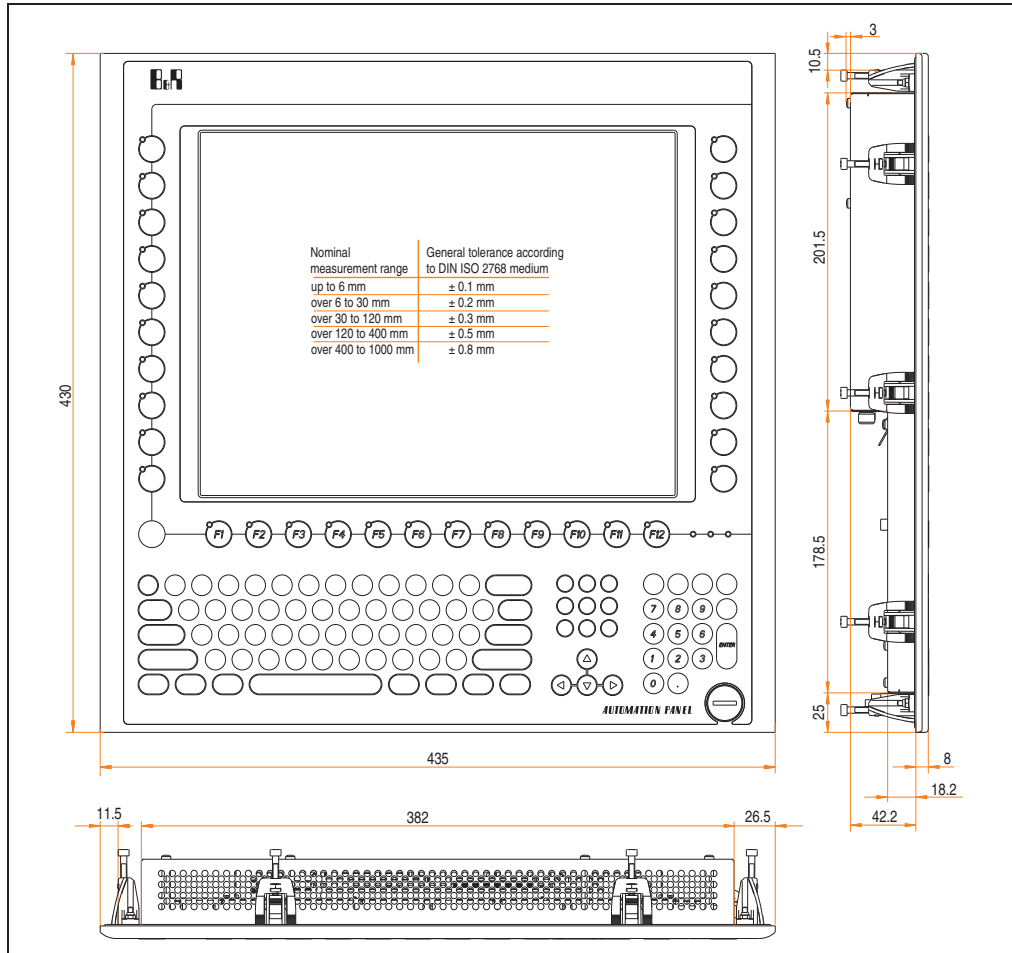


Figure 87: Dimensions 5AP981.1505-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|---|
| 1 | Automation Panel 981 TFT VGA 38.10cm with touch screen and keys |
| 2 | 2 insert strips without labels (inserted in the front) |

Table 36: Contents of delivery - 5AP981.1505-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

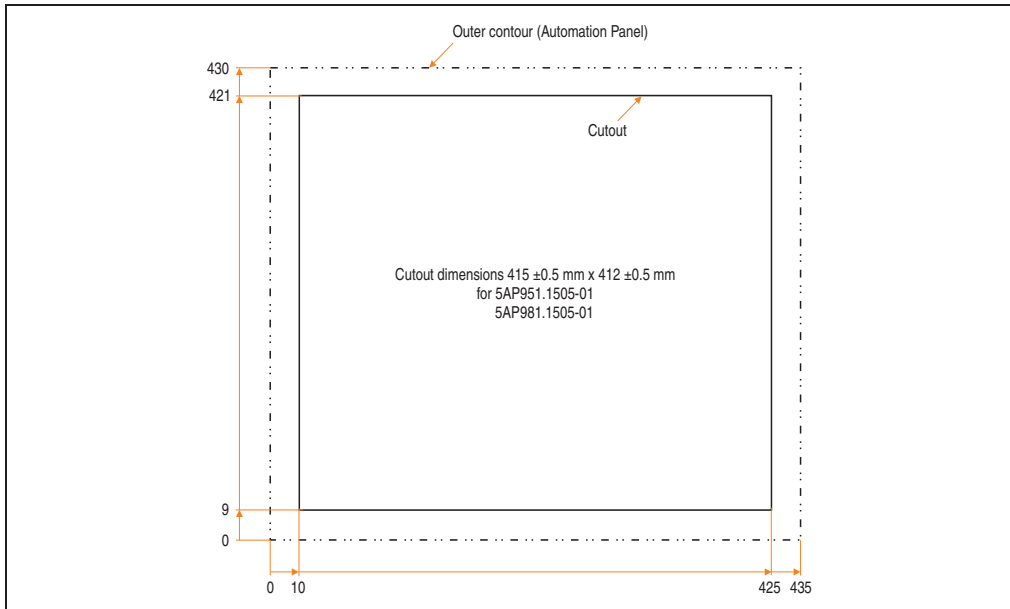


Figure 88: Cutout installation - 5AP981.1505-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP981.1505-01 has three USB connectors (Type A).

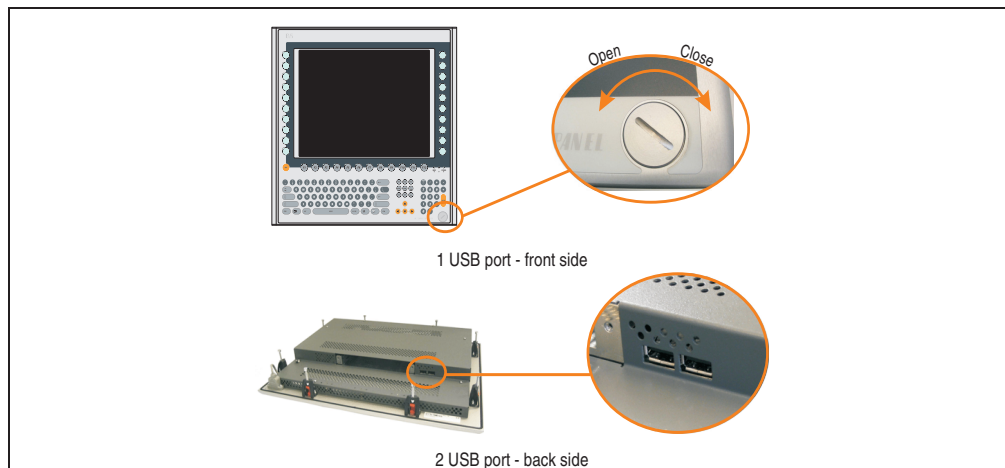


Figure 89: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel.



Figure 90: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 91: Functional grounding clip

3.4 Automation Panel 17" SXGA

3.4.1 Automation Panel 5AP920.1706-01

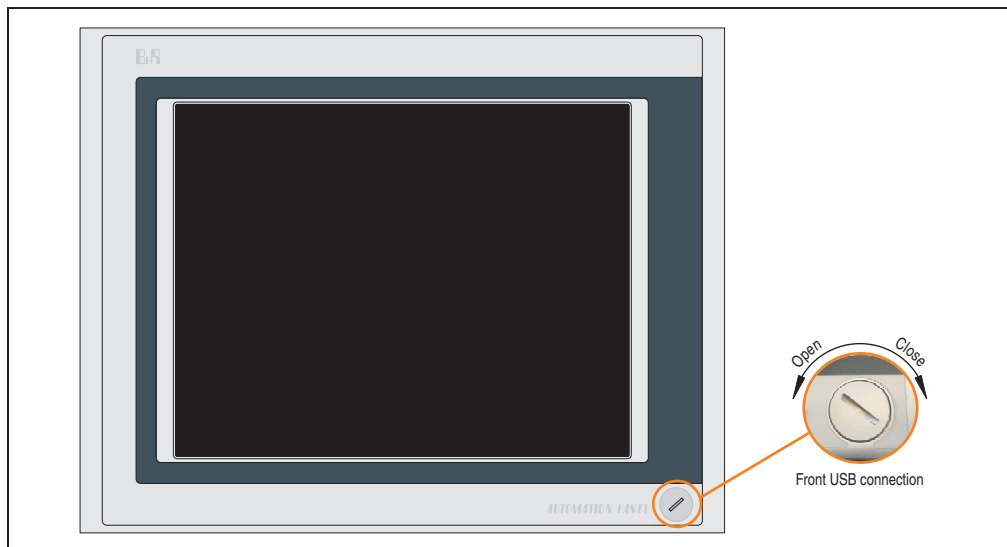


Figure 92: Front view - 5AP920.1706-01

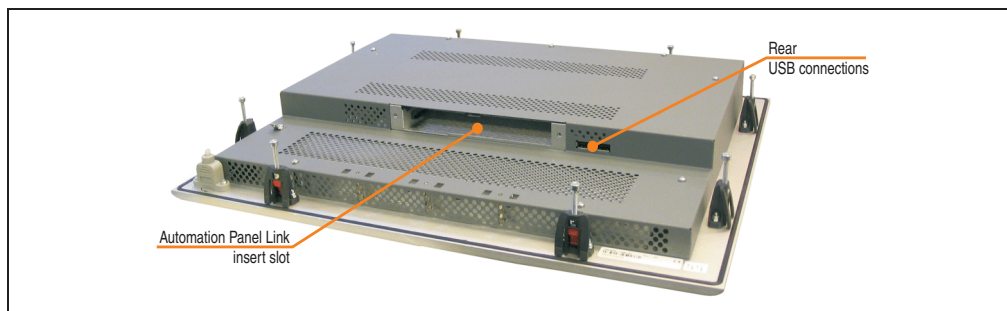


Figure 93: Rear view - 5AP920.1706-01

Technical data

| Features | 5AP920.1706-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 3 (1x front side, 2x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 17 in (431 mm) 16,7 million SXGA, 1280 x 1024 pixels 600:1 Direction R / direction L = 75° Direction U = 75° / direction D = 60° 250 cd/m ² 50000 hours ³⁾ |
| Touch screen ⁴⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | - |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁵⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 27 W, maximum 36 W or 46 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Gasket | Aluminum, naturally anodized ⁶⁾ Gray ⁶⁾ Polyester Similar to Pantone 432CV ⁶⁾ Similar to Pantone 427CV ⁶⁾ Flat gasket around display front |

Table 37: Technical data - 5AP920.1706-01

Technical data • Individual components

| Mechanical characteristics | 5AP920.1706-01 | |
|---|---|---|
| Outer dimensions Width Height Depth | 477 mm 390 mm 59 mm | |
| Housing Paint | Metal Similar to Pantone 432CV ⁶⁾ | |
| Weight | Approx. 7 kg | |
| Environmental characteristics | 5AP920.1706-01 < Rev. D0 | 5AP920.1706-01 Rev. D0 |
| Ambient temperature Operation Storage Transport | See "Ambient temperatures" on page 27 -20°C .. +60°C -20°C .. +60°C | See "Ambient temperatures" on page 27 -25°C .. +60°C -25°C .. +60°C |
| Relative humidity Operation Storage / Transport | 20% to 90%, non-condensing T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing | |
| Vibration Operation (continuous) Operation (occasional) Storage Transport | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) Max. 10 - 300 Hz and 1 g (9.8 m/s² 0-peak) Max. 10 - 300 Hz and 1 g (9.8 m/s² 0-peak) | |
| Shock Operation Storage / Transport | Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration | |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) | |
| Altitude | Max. 3000 m | |

Table 37: Technical data - 5AP920.1706-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 124.
- 3) Revision < D0 - lifespan limited to 30000 hours.
- 4) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 5) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 6) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

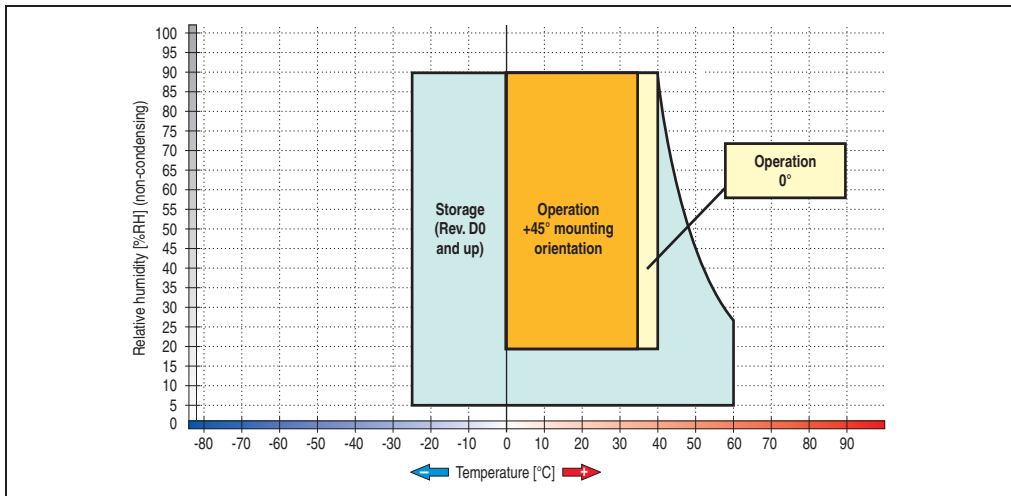


Figure 94: Temperature humidity diagram - 5AP920.1706-01

Dimensions

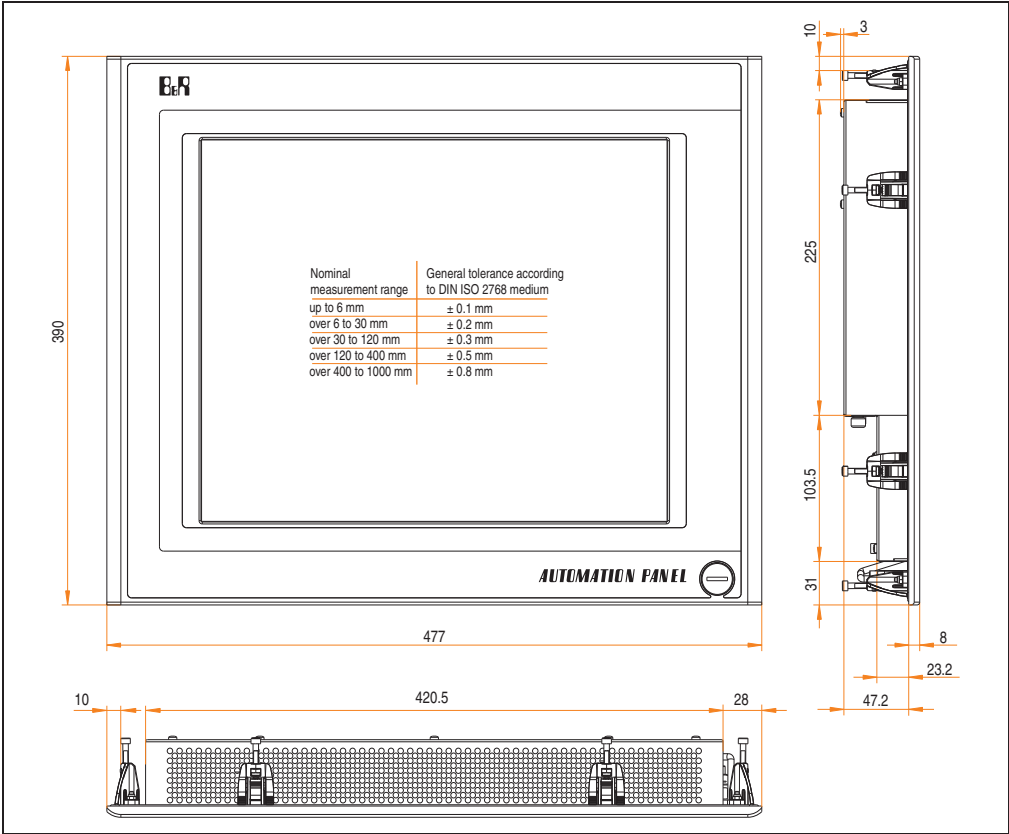


Figure 95: Dimensions 5AP920.1706-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|---|
| 1 | Automation Panel 920 TFT SXGA 17" with touch screen |

Table 38: Contents of delivery - 5AP920.1706-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

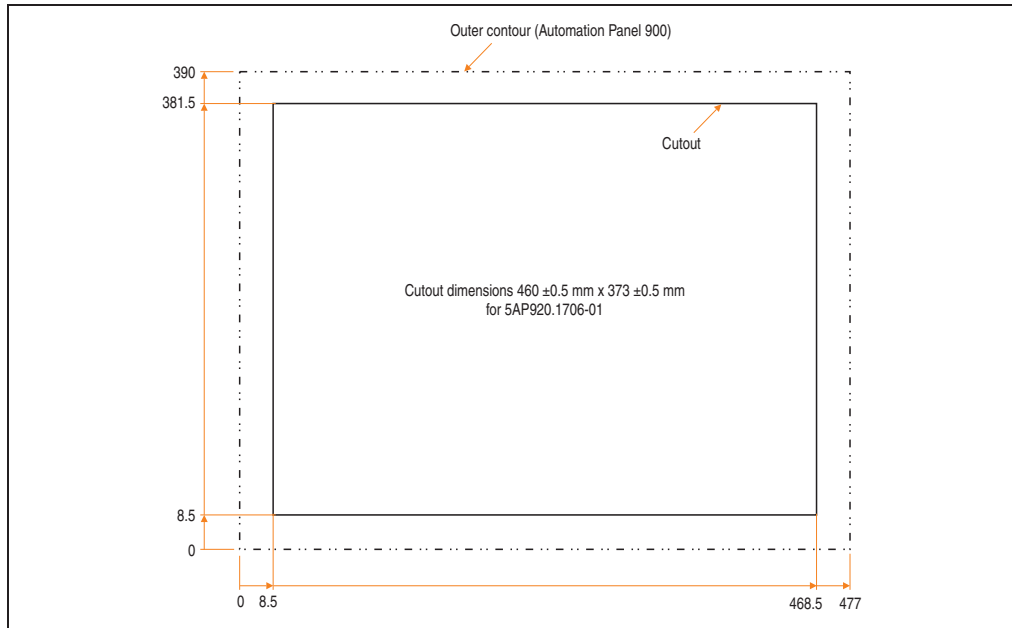


Figure 96: Cutout installation - 5AP920.1706-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP920.1706-01 has three USB connectors (Type A).

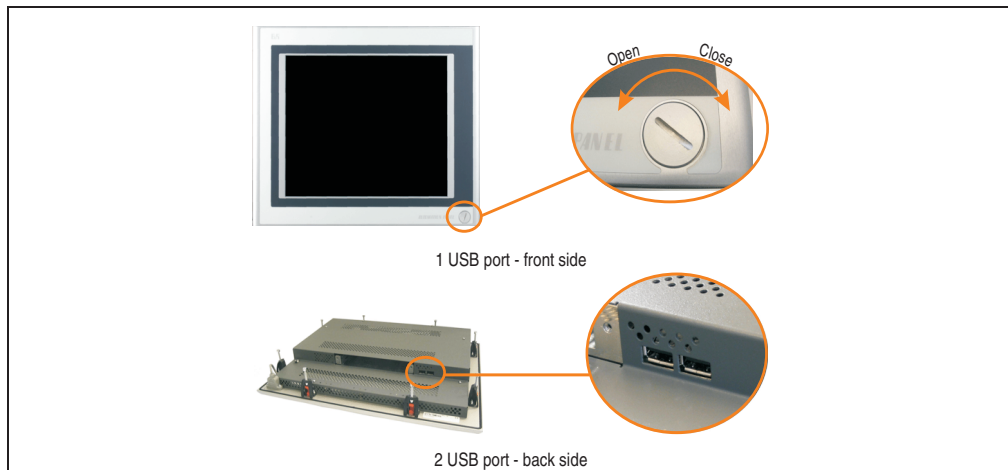


Figure 97: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel.



Figure 98: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).



Figure 99: Functional grounding clip

3.5 Automation Panel 19" SXGA

3.5.1 Automation Panel 5AP920.1906-01

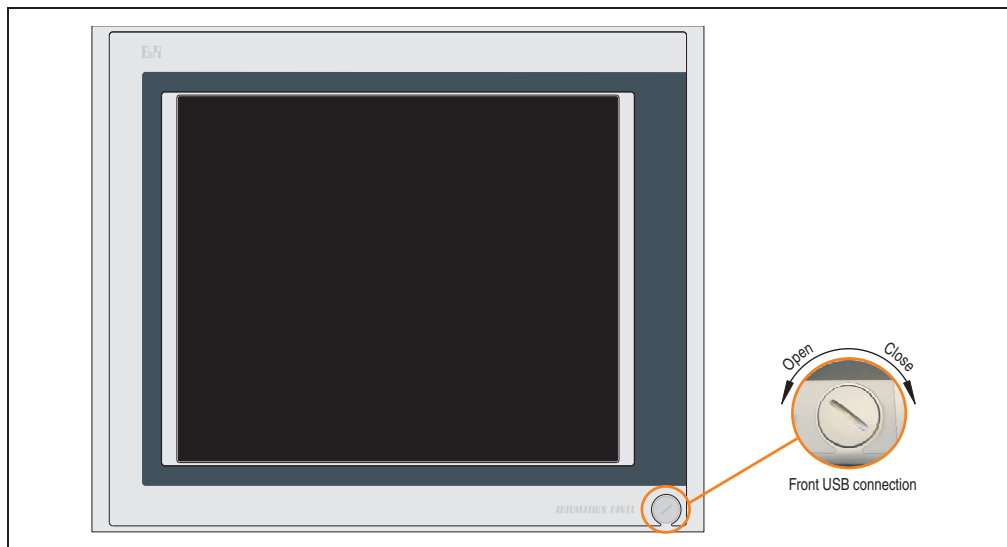


Figure 100: Front view - 5AP920.1906-01

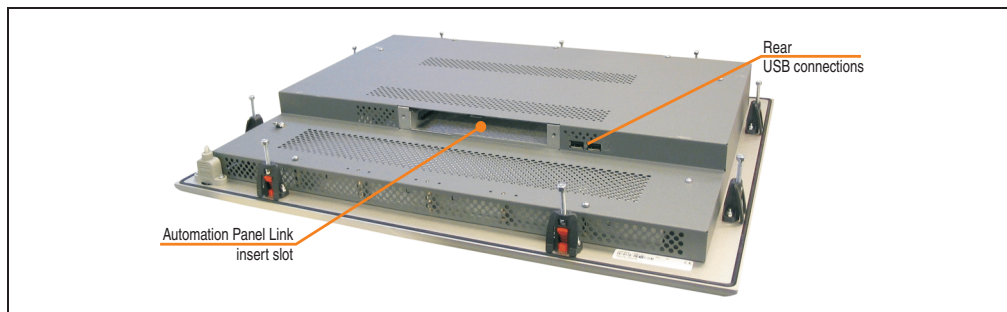


Figure 101: Rear view - 5AP920.1906-01

Technical data

| Features | 5AP920.1906-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 3 (1x front side, 2x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 19 in (482 mm) 16,7 million SXGA, 1280 x 1024 pixels 600:1 Direction R / direction L = 75° Direction U = 75° / direction D = 60° 250 cd/m ² 35000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | - |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁴⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 3.2 A (printed on back of housing) Typically 6 A, maximum 30 A for < 300 µs Typically 27 W, maximum 38 W or 48 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Gasket | Aluminum, naturally anodized ⁵⁾ Gray ⁵⁾ Polyester Similar to Pantone 432CV ⁵⁾ Similar to Pantone 427CV ⁵⁾ Flat gasket around display front |

Table 39: Technical data - 5AP920.1906-01

Technical data • Individual components

| Mechanical characteristics | | |
|-------------------------------|---|---------------------------------------|
| Outer dimensions | | |
| Width | 527 mm | |
| Height | 421 mm | |
| Depth | 62 mm | |
| Housing | Metal | |
| Paint | Similar to Pantone 432CV ⁵⁾ | |
| Weight | Approx. 8.1 kg | |
| Environmental characteristics | 5AP920.1906-01 < Rev. D0 | 5AP920.1706-01 Rev. D0 or higher |
| Ambient temperature | | |
| Operation | See "Ambient temperatures" on page 27 | See "Ambient temperatures" on page 27 |
| Storage | -20°C .. +60°C | -25°C .. +60°C |
| Transport | -20°C .. +60°C | -25°C .. +60°C |
| Relative humidity | | |
| Operation | 20% to 90%, non-condensing | |
| Storage / Transport | T ≤ 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing | |
| Vibration | | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) | |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) | |
| Storage | Max. 10 - 300 Hz and 1 g (9.8 m/s² 0-peak) | |
| Transport | Max. 10 - 300 Hz and 1 g (9.8 m/s² 0-peak) | |
| Shock | | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration | |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration | |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) | |
| Altitude | Max. 3000 m | |

Table 39: Technical data - 5AP920.1906-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 132.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 4) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 5) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

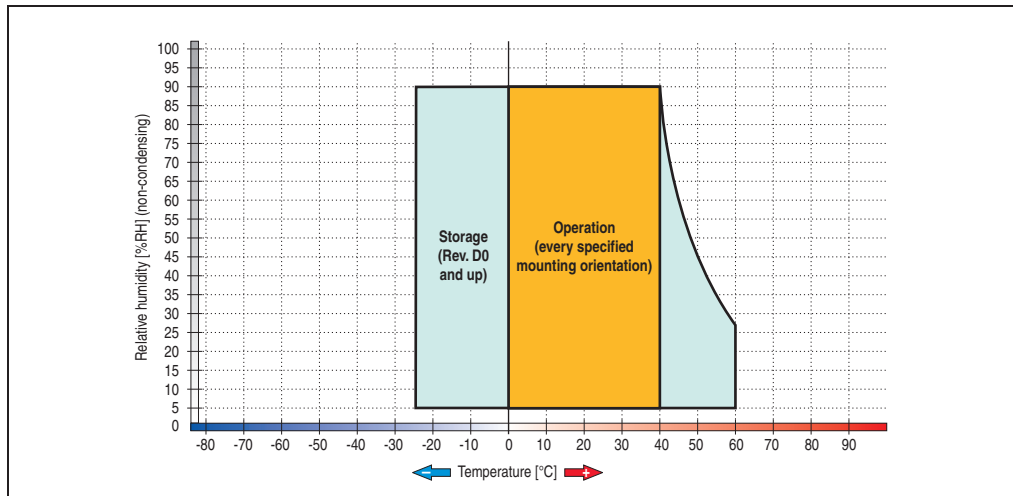


Figure 102: Temperature humidity diagram - 5AP920.1906-01

Dimensions

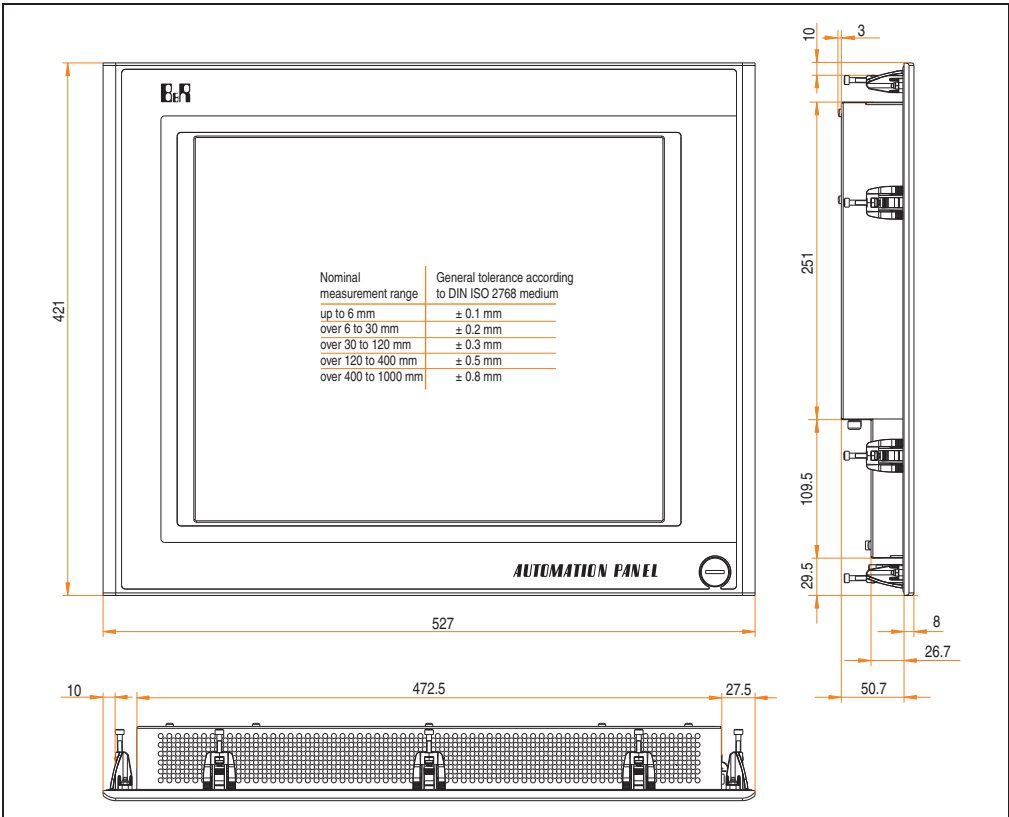


Figure 103: Dimensions 5AP920.1906-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|---|
| 1 | Automation Panel 920 TFT SXGA 48.26cm with touch screen |

Table 40: Contents of delivery - 5AP920.1906-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

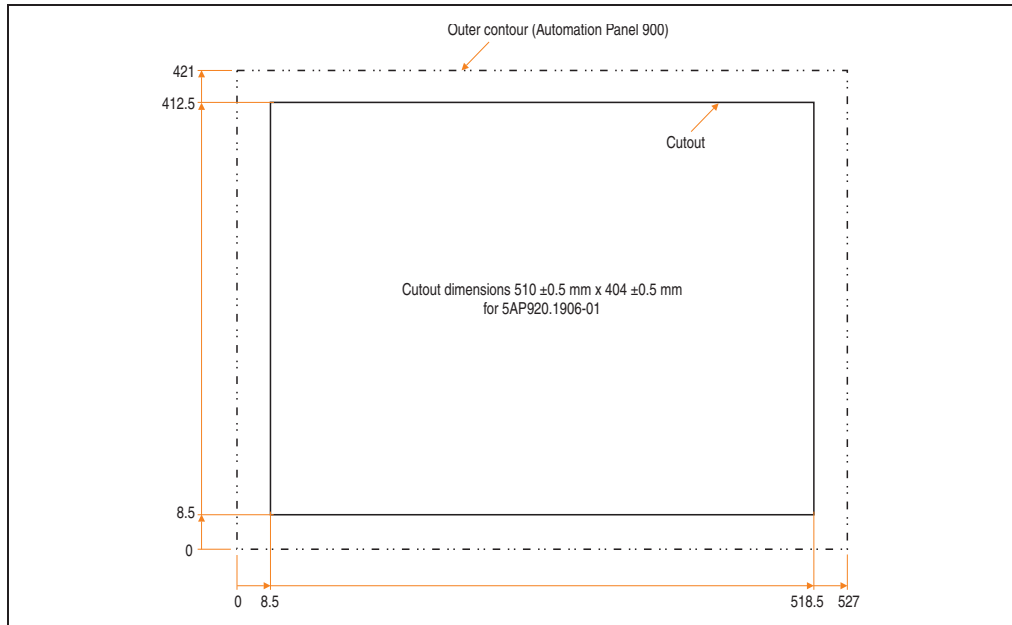


Figure 104: Cutout installation - 5AP920.1906-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP920.1906-01 has three USB connectors (Type A).

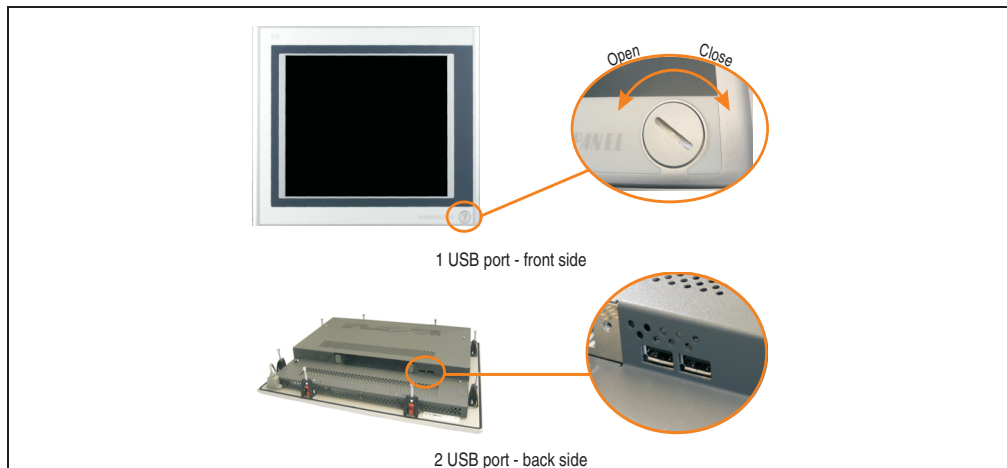


Figure 105: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel.



Figure 106: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).

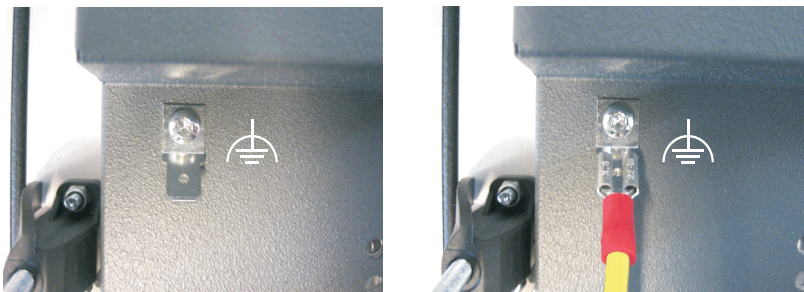


Figure 107: Functional grounding clip

3.6 Automation Panel 21.3" UXGA

3.6.1 Automation Panel 5AP920.2138-01

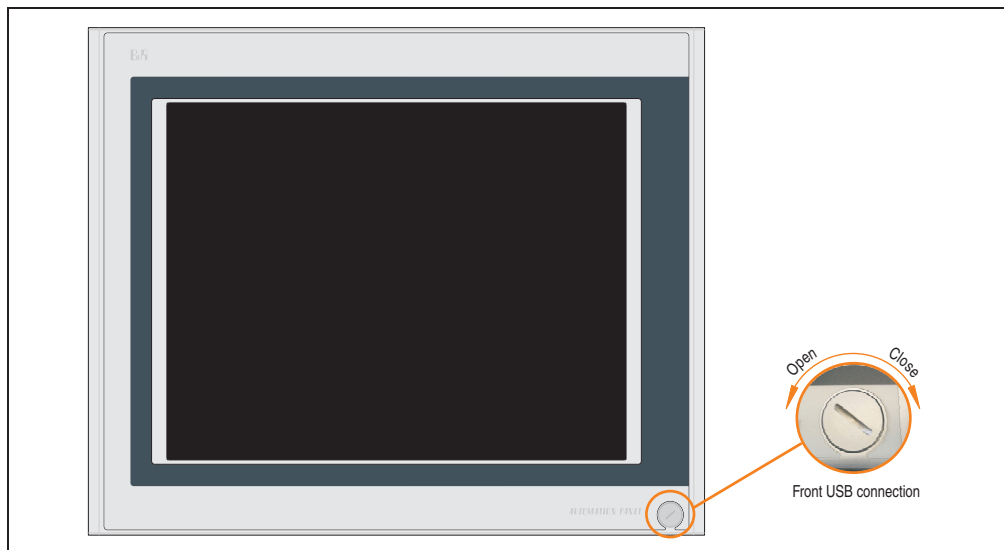


Figure 108: Front view - 5AP920.2138-01

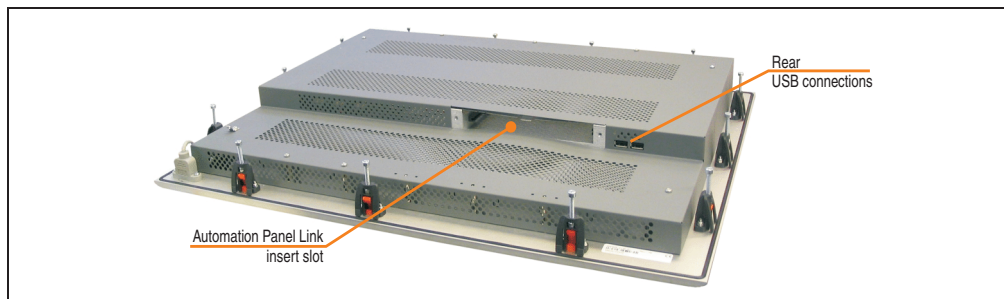


Figure 109: Rear view - 5AP920.2138-01

Technical data

| Features | 5AP920.2138-01 |
|--|--|
| USB interface ¹⁾ Type Amount Transfer rate ²⁾ Connection Current load | USB 2.0 ²⁾ 3 (1x front side, 2x back side) Low speed (1.5 MBit/s), full speed (12 MBit/s), to high speed (480 Mbit/s) Type A Max. 500 mA per connection |
| Display Type Diagonal Colors Resolution Contrast Perspective (see page 263) Horizontal Vertical Background lighting Brightness Half-brightness time | TFT 21,3 in (641 mm) 16,7 million UXGA, 1600 x 1200 pixels 500:1 Direction R / direction L = 60° U direction / D direction = 60° 250 cd/m ² 50000 hours |
| Touch screen ³⁾ Technology Controller Degree of transmission | Analog, resistive Elo, serial, 12-bit Up to 78% |
| Filter glass Degree of transmission Coating | - |
| Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness | - |
| Electrical characteristics | |
| Power supply Rated voltage Rated current ⁴⁾ Starting current Power consumption (without insert) Electrical isolation | Via Automation Panel Link insert card 24 VDC ± 25% (printed on back of housing) Maximum 4.2 A (printed on back of housing) Typically 8 A, maximum 40 A for < 300 µs Typically 50 W, maximum 63 W or 73 W with USB Yes |
| Mechanical characteristics | |
| Front Frame Design Membrane Dark gray border around display Light background Gasket | Aluminum, naturally anodized ⁵⁾ Gray ⁵⁾ Polyester Similar to Pantone 432CV ⁵⁾ Similar to Pantone 427CV ⁵⁾ Flat gasket around display front |

Table 41: Technical data - 5AP920.2138-01

Technical data • Individual components

| Mechanical characteristics | 5AP920.2138-01 |
|-------------------------------|---|
| Outer dimensions | |
| Width | 583 mm |
| Height | 464 mm |
| Depth | 64 mm |
| Housing | Metal |
| Paint | Similar to Pantone 432CV ⁵⁾ |
| Weight | Approx. 11 kg |
| Environmental characteristics | |
| Ambient temperature | |
| Operation | See "Ambient temperatures" on page 27 |
| Storage | -20°C .. +60°C |
| Transport | -20°C .. +60°C |
| Relative humidity | |
| Operation | 20% to 90%, non-condensing |
| Storage | T ≤ 40°C: 5% to 90%, non-condensing |
| | T > 40°C: < 90%, non-condensing |
| Transport | T ≤ 40°C: 5% to 90%, non-condensing |
| | T > 40°C: < 90%, non-condensing |
| Vibration | |
| Operation (continuous) | 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) |
| Operation (occasional) | 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) |
| Storage | Max. 10 - 300 Hz and 1 g (9.8 m/s² 0-peak) |
| Transport | Max. 10 - 300 Hz and 1 g (9.8 m/s² 0-peak) |
| Shock | |
| Operation | Max. 15 g (147 m/s² 0-peak) and 11 ms duration |
| Storage / Transport | Max. 50 g (490 m/s² 0-peak) and 11 ms duration |
| Protection type | IP20 back side (only with Automation Panel Link card inserted) IP65 / NEMA 250 type 4X, dust and sprayed water protection (front side) |
| Altitude | Max. 3000 m |

Table 41: Technical data - 5AP920.2138-01 (cont.)

- 1) USB devices can only be connected directly to the Automation Panel (without a hub).
- 2) Depends on the transfer technology, the transfer distance and the Automation Panel Link insert card used, see section "USB transfer speed" on page 108.
- 3) Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com).
- 4) The listed value applies to the Automation Panel device with an inserted Automation Panel Link card.
- 5) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

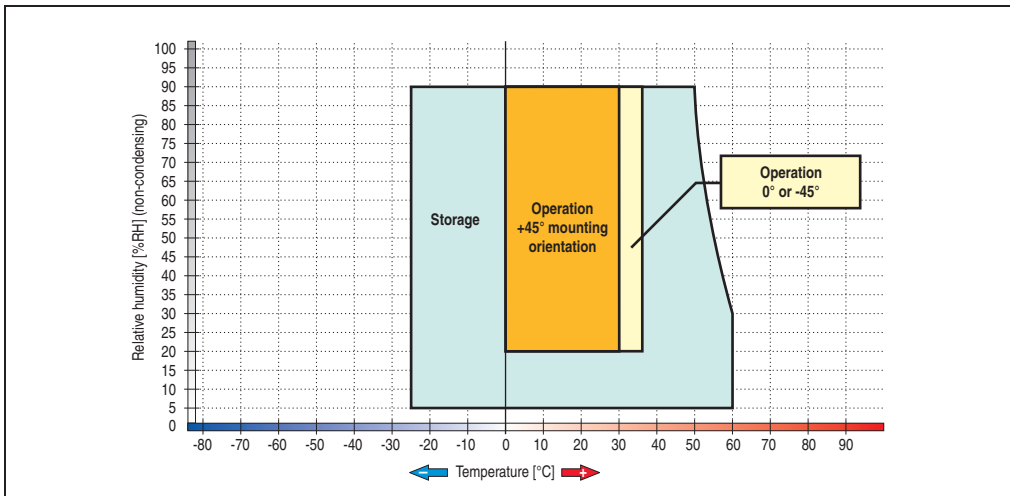


Figure 110: Temperature humidity diagram - 5AP920.2138-01

Dimensions

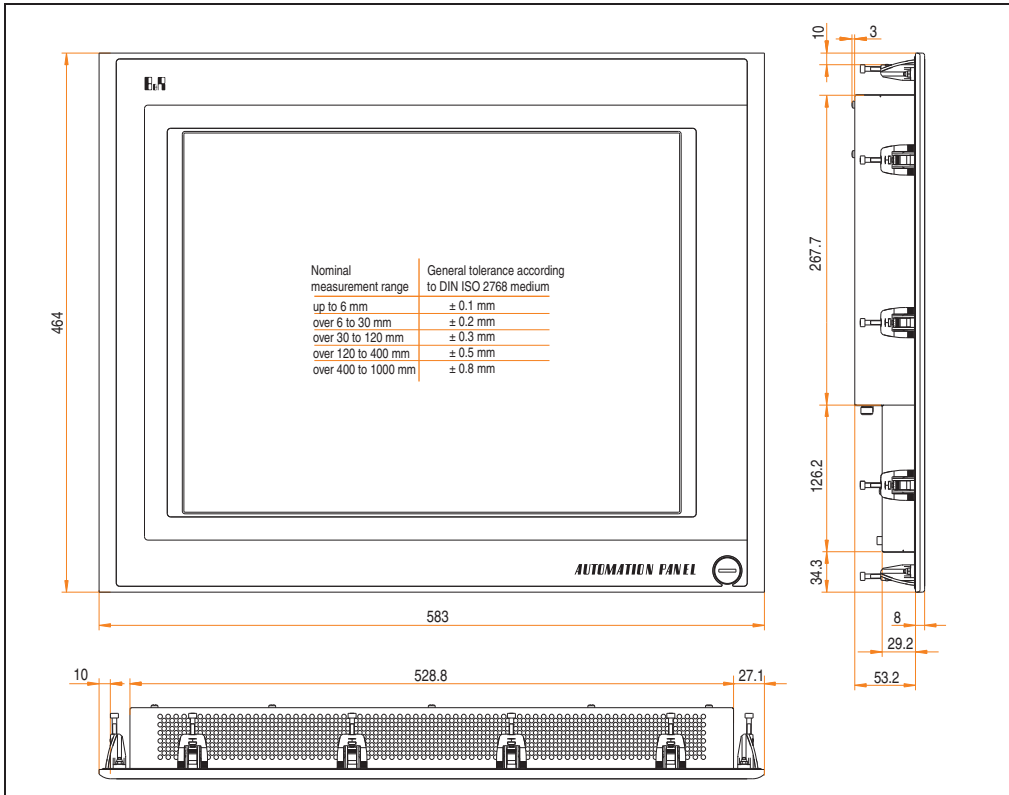


Figure 111: Dimensions 5AP920.2138-01

Contents of delivery

The following components are included in the delivery of the Automation Panel:

| Amount | Component |
|--------|---|
| 1 | Automation Panel 920 TFT SXGA 54.10cm with touch screen |

Table 42: Contents of delivery - 5AP920.2138-01

Cutout installation

The Automation Panel can be installed in a housing cutout using the preassembled mounting clamps. A cutout that corresponds to the following drawing must be made.

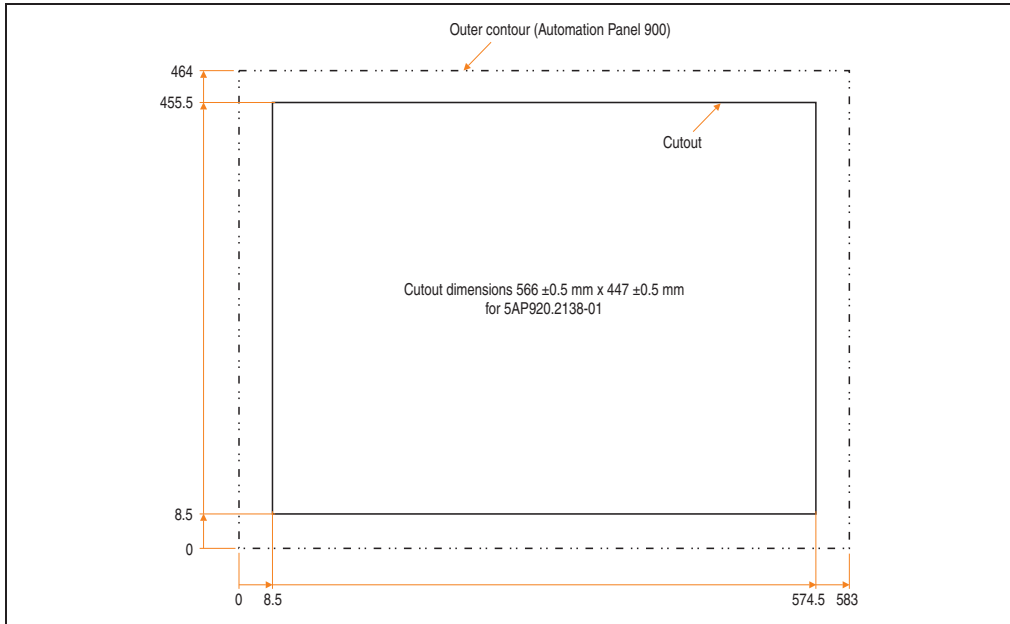


Figure 112: Cutout installation - 5AP920.2138-01

For further information regarding installation and mounting orientation, see Chapter 3 "Start-up" starting on page 175.

USB connections

The Automation Panel 5AP920.2138-01 has three USB connectors (Type A). They can be used if the Automation Panel Link insert card has been correctly connected to a USB port on the slot CPU.

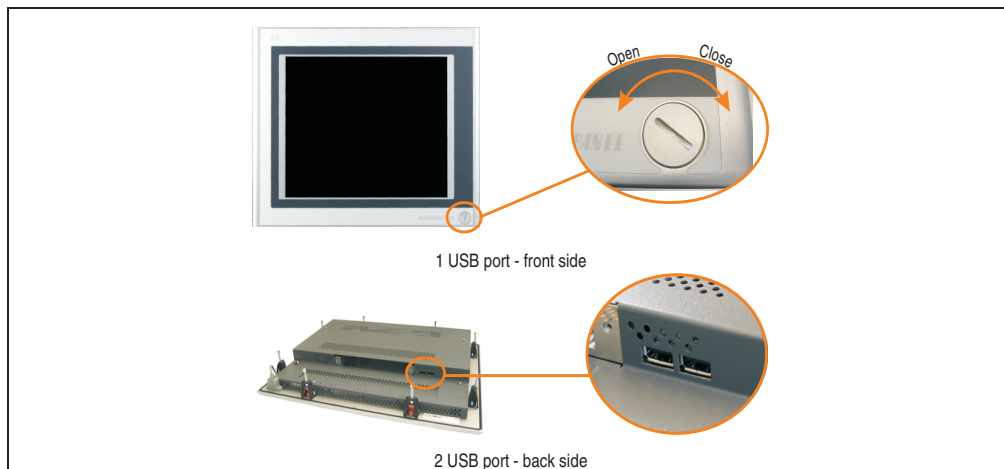


Figure 113: USB connections

USB devices can only be connected directly to the Automation Panel (without a hub).

USB transfer speed

The USB transfer speed depends on the type of Automation Panel Link card and transfer technology used.

Information:

With a DVI Automation Panel Link insert card, USB 2.0 is supported up to a cable length of 5 meters.

With an SDL (Smart Display Link) Automation Panel Link insert card, only USB 1.1 is supported, regardless of the cable length. USB 2.0 is not supported.

Fastening the cable

Cable clamps are provided with the Automation Panel that can be used to fasten the connected cable to the bottom of the back side of the Automation Panel.



Figure 114: Mounting the cable clamps

Functional grounding clip

On the back side on the left next to the Automation Panel Link slot, there is a functional grounding clip. The grounding clip (functional ground) must be connected with a central grounding point on the switching cabinet using a 6.3 mm blade connector via the shortest distance and with as little resistance as possible (e.g. copper strip, but must be at least 2.5 mm²).

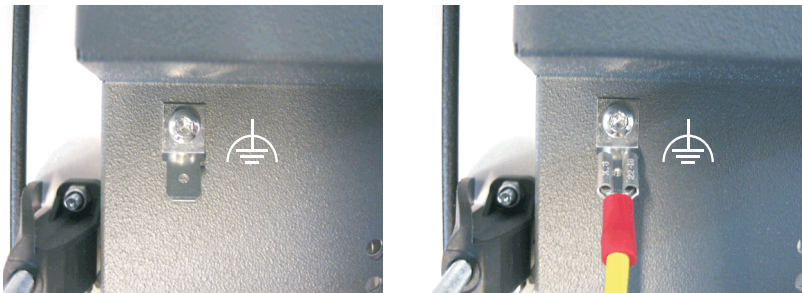


Figure 115: Functional grounding clip

3.7 Automation Panel Link insert cards

Automation Panel Link insert cards form the interface between an Automation PC 620 and an Automation Panel 900. The graphics signals from an industrial PC (e.g. Automation PC 620 monitor/panel output) are received, processed, and forwarded to the Automation Panel 900. In the other direction, the cable is used to transfer, for example, the touch screen, USB and SDL data to the respective interface on the industrial PC (e.g. Automation PC 620).

This insert card is simply inserted into the Automation Panel 900 slot provided and fastened to the Automation Panel using the two screws (max. torque 0.5 Nm).

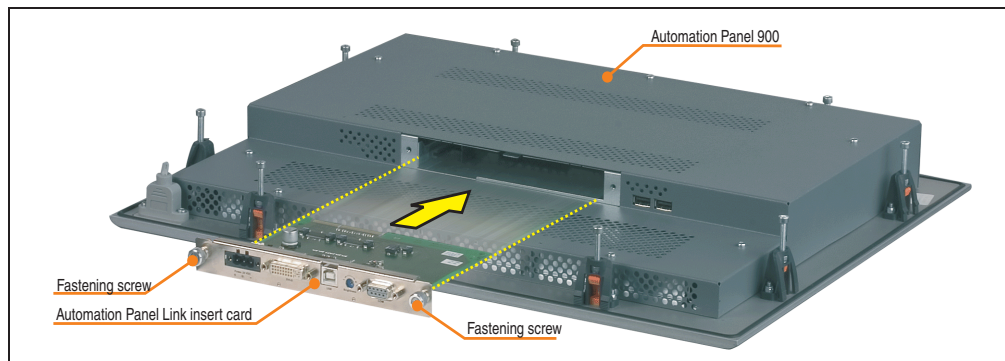


Figure 116: Automation Panel and Automation Panel Link insert card

3.7.1 Automation Panel Link DVI receiver 5DL DVI.1000-01

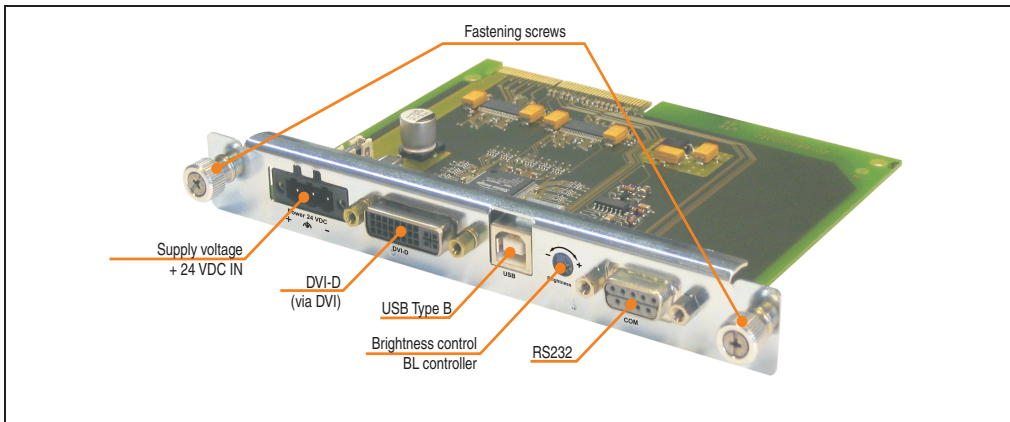


Figure 117: Components - 5DL DVI.1000-01

Technical data

| Features | 5DL DVI.1000-01 |
|-----------------------------|------------------|
| Power supply | |
| Rated voltage | 24 VDC \pm 25% |
| Rated current ¹⁾ | Max. 4.2 A |
| Power consumption | Typically 3 W |
| Fastening screws | 2 |
| Maximum fastening torque | 0.5 Nm |

Table 43: Technical data – 5DL DVI.1000-01

1) The listed value applies to the 19" Automation Panel device with an inserted Automation Panel Link card.

Interface descriptions

DVI-D

The Display Link insert card has a DVI digital input. Only the digital signals from a graphics adapter are processed and therefore a DVI digital cable must be used. B&R offers DVI cables up to a length of 10 meters (see Chapter 1 "General", Section 5.8 "Cables" on page 21).

USB type B

The USB type B connector makes it possible to use a USB connection cable (B&R offers USB cables up to a length of 5 meters; see Chapter 1 "General", Section 5.8 "Cables" on page 21) to connect the Display Link insert card with a USB type A output (e.g. a B&R Slot CPU, a B&R Automation PC 620, a B&R graphics adapter, etc.).

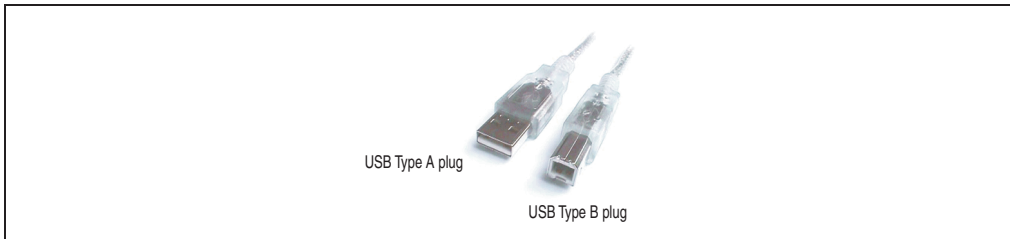


Figure 118: Comparison of USB type A-B connectors

If the Display Link is connected correctly, then the Automation Panel 900 is equipped with one or more (depending on the type) USB ports (front and back).

Information:

USB 2.0 is supported up to a cable length of 5 meters.

[BL adjuster](#)

This adjuster can be used to control the brightness of the background lighting on the Automation Panel 900.

[RS232](#)

The RS232 interface is used to transfer the Automation Panel 900 touch screen signals.

| Pin assignments - serial interface | | |
|---|------------|-----------------------|
| RS232 interface Not electrically isolated Up to 115 kBaud | | 9-pin DSUB socket |
| Pin | Assignment | |
| 1 | n.c. | |
| 2 | RXD | |
| 3 | TXD | |
| 4 | n.c. | |
| 5 | GND | |
| 6 | DSR | |
| 7 | RTS | |
| 8 | CTS | |
| 9 | n.c. | |

Table 44: Pin assignments - RS232

B&R offers RS232 cables up to a length of 10 meters (see Chapter 1 "General", Section 5.8 "Cables" on page 21).

Power + 24 VDC

To operate an Automation Panel 900, a +24 VDC power supply needs to be connected. When dimensioning the power supply, the maximum power consumption of the Automation Panel used must be taken into consideration (see Automation Panel 900 technical data).

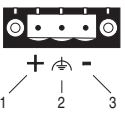
| Pin assignments - supply voltage | |  |
|----------------------------------|-----------------------------------|--|
| Pin | Assignment | |
| 1 | + | |
| 2 | Ground (safety extra low voltage) | |
| 3 | - | |

Table 45: Pin assignments - Supply voltage

Ground

The supply voltage connection (pin 2) must be connected to the ground using the largest possible wire (min. 2.5 mm²) via the shortest distance and with as little resistance as possible.

Example configuration

Example configuration with an Automation PC 620 - see section

- "One Automation Panel via DVI" on page 180

3.7.2 Automation Panel Link SDL receiver 5DLSDL.1000-00

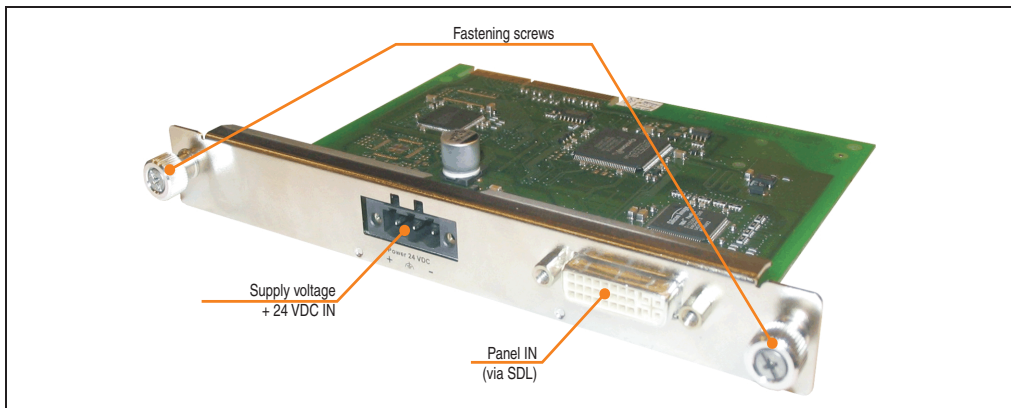


Figure 119: Components - 5DLSDL.1000-00

Technical data

| Features | 5DLSDL.1000-00 |
|--|---|
| Power supply Rated voltage ¹⁾ Power consumption | 24 VDC \pm 25% Max. 4.2 A Typically 3 W |
| Fastening screws Maximum fastening torque | 2 0.5 Nm |

Table 46: Technical data – 5DLSDL.1000-00

1) The listed value applies to the 19" Automation Panel device with an inserted Automation Panel Link card.

Interface descriptions

Power + 24 VDC

To operate an Automation Panel 900, a +24 VDC power supply needs to be connected. When dimensioning the power supply, the maximum power consumption of the Automation Panel used must be taken into consideration (see Automation Panel 900 technical data).

| Pin assignments - supply voltage | |
|----------------------------------|-----------------------------------|
| Pin | Assignment |
| 1 | + |
| 2 | Ground (safety extra low voltage) |
| 3 | - |

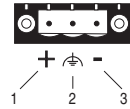


Table 47: Pin assignments - Supply voltage

Ground

The supply voltage connection (pin 2) must be connected to the ground using the largest possible wire (min. 2.5 mm²) via the shortest distance and with as little resistance as possible.

Panel IN

This is for the SDL (Smart Display Link) connection to a B&R industrial PC (Automation PC 629, Panel PC 700). The required SDL cables are available separately from B&R. See Chapter 1 "General", Section 5.8 "Cables" on page 21.

Example configurations

Example configuration with an Automation PC 620 - see section:

- "One Automation Panel via SDL (onboard)" on page 183
- "One Automation Panel via SDL (AP Link)" on page 191

3.7.3 Automation Panel Link SDL transceiver 5DLSDL.1000-01

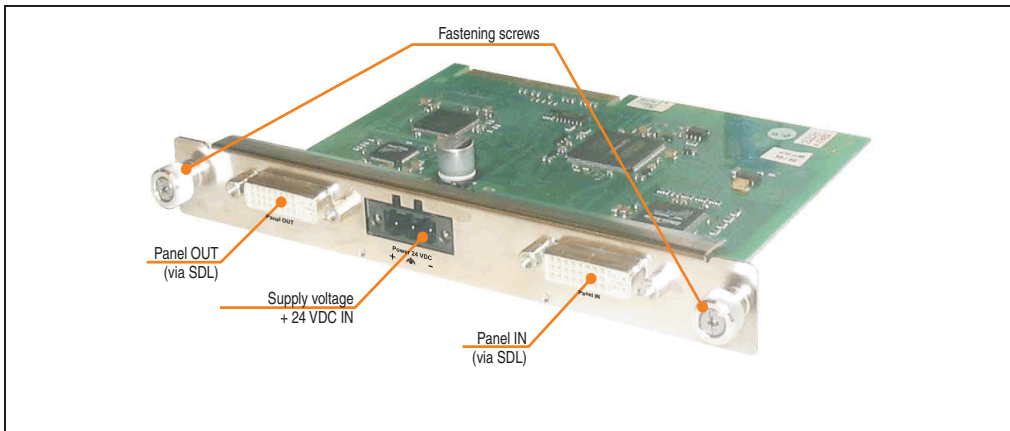


Figure 120: Components - 5DLSDL.1000-01

Technical data

| Features | 5DLSDL.1000-01 |
|-----------------------------|------------------|
| Power supply | |
| Rated voltage | 24 VDC \pm 25% |
| Rated current ¹⁾ | Max. 4.2 A |
| Power consumption | Typically 3 W |
| Fastening screws | 2 |
| Maximum fastening torque | 0.5 Nm |

Table 48: Technical data – 5DLSDL.1000-01

1) The listed value applies to the 19" Automation Panel device with an inserted Automation Panel Link card.

Interface descriptions

Power + 24 VDC

To operate an Automation Panel, a +24 VDC power supply needs to be connected. When dimensioning the power supply, the maximum power consumption of the Automation Panel used must be taken into consideration (see Automation Panel 900 technical data).

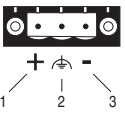
| Pin assignments - supply voltage | |  |
|----------------------------------|-----------------------------------|--|
| Pin | Assignment | |
| 1 | + | |
| 2 | Ground (safety extra low voltage) | |
| 3 | - | |

Table 49: Pin assignments - Supply voltage

Ground

The supply voltage connection (pin 2) must be connected to the ground using the largest possible wire (min. 2.5 mm²) via the shortest distance and with as little resistance as possible.

Panel IN

This is for the SDL (Smart Display Link) connection to a B&R industrial PC (Automation PC 629, Panel PC 700). The required SDL cables are available separately from B&R. See Chapter 1 "General", Section 5.8 "Cables" on page 21.

Panel OUT

This is for the SDL (Smart Display Link) connection to another Automation Panel 900 device. The required SDL cables are available separately from B&R. See Chapter 1 "General", Section 5.8 "Cables" on page 21.

Example configurations

Example configuration with an Automation PC 620 - see section:

- "Four Automation Panels via SDL (onboard)" on page 187
- "Four Automation Panels via SDL (AP Link)" on page 195
- "Two Automation Panels via SDL (onboard) and SDL (AP Link)" on page 199
- "Eight Automation Panels via SDL (onboard) and SDL (AP Link)" on page 203

3.8 Cables

3.8.1 DVI cable 5CADVI.0xxx-00

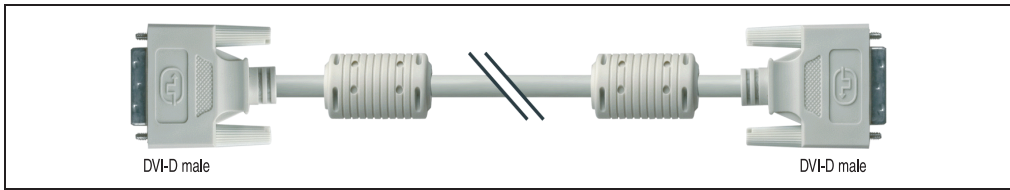


Figure 121: DVI extension cable - 5CADVI.0xxx-00 (similar)

Caution!

DVI cables can only be plugged in and unplugged when the device is turned off.

Order data

| Model number | Description | Note |
|----------------|---|------|
| 5CADVI.0018-00 | DVI-D cable 1.8 m / single Single cable, DVI-D/m:DVI-D/m, length: 1.8 m | |
| 5CADVI.0050-00 | DVI-D cable 5 m / single Single cable, DVI-D/m:DVI-D/m, length: 5 m | |
| 5CADVI.0100-00 | DVI-D cable 10 m / single Single cable, DVI-D/m:DVI-D/m, length: 10 m | |

Table 50: Model numbers - DVI cables

Technical data

| Features | 5CADVI.0018-00 | 5CADVI.0050-00 | 5CADVI.0100-00 |
|------------------------|--|----------------|----------------|
| Length | 1.8 m ± 30 mm | 5 m ± 50 mm | 10 m ± 100 mm |
| Outer diameter | Max. 8.5 mm | | |
| Shielding | Individual cable pairs and entire cable | | |
| Connector type | 2x DVI-D (18+1), male | | |
| Wire cross section | AWG 28 | | |
| Line resistance | Max. 237 Ω/km | | |
| Insulation resistance | Min. 100 MΩ/km | | |
| Flexibility | Flexible (not for use in drag chain installations) | | |
| Flex radius | Min. 146 mm | | |
| Plug connection cycles | 100 | | |
| Weight | Approx. 300 g | Approx. 590 g | Approx. 2100 g |

Table 51: Technical data - DVI cable 5CADVI.0xxx-00

Contents of delivery

| Amount | Component |
|--------|--|
| 1 | DVI cable in desired length, plug covers are attached at the cable ends. |

Table 52: Contents of delivery - DVI cables

Cable specifications

The following figure shows the pin assignments for the DVI cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The DVI cables provided by B&R are guaranteed to function properly.

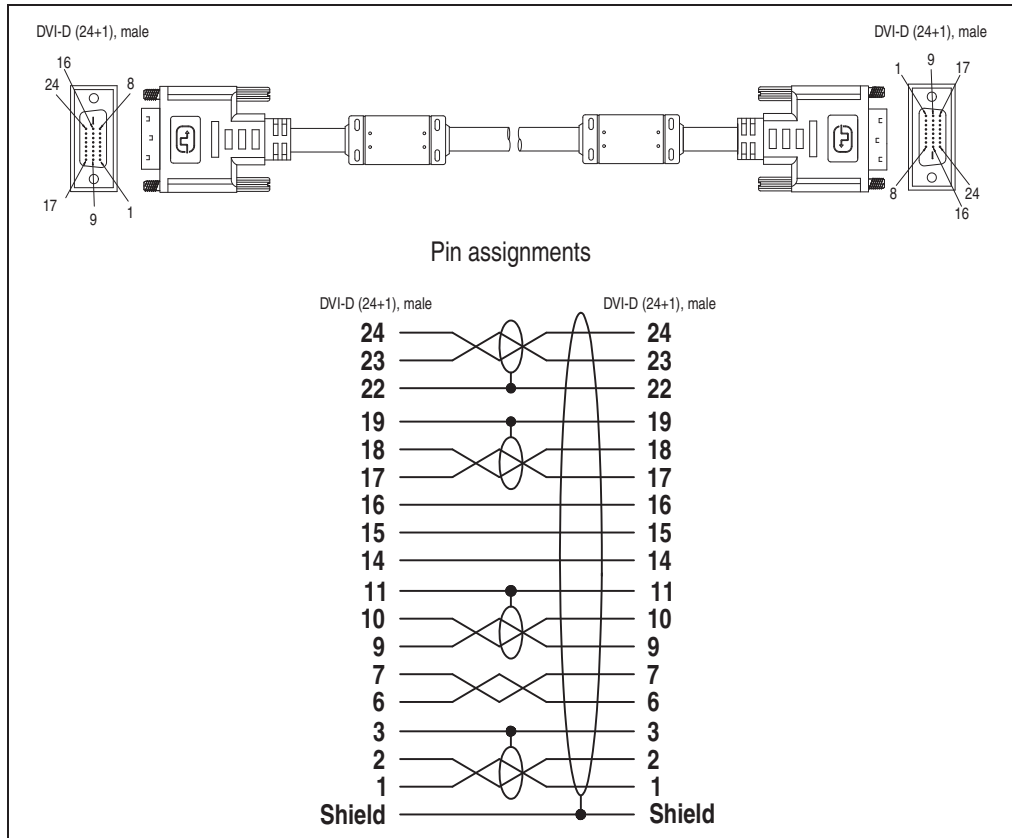


Figure 122: Pin assignments - DVI cable

3.8.2 SDL cable 5CASDL.0xxx-00

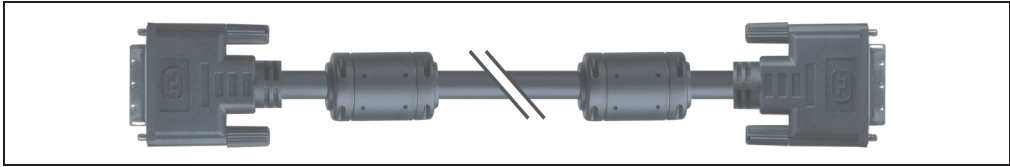


Figure 123: SDL cable 5CASDL.0xxx-00 (similar)

Caution!

SDL cables can only be plugged in and unplugged when the device is turned off.

Order data

| Model number | Description | Note |
|----------------|--|---|
| 5CASDL.0018-00 | SDL cable 1.8 m SDL cable, length: 1.8 m | Cancelled since 12/2006 Replaced by 5CASDL.0018-03 |
| 5CASDL.0050-00 | SDL cable 5 m SDL cable, length: 5 m | Cancelled since 12/2006 Replaced by 5CASDL.0050-03 |
| 5CASDL.0100-00 | SDL cable 10 m SDL cable, length: 10 m | Cancelled since 12/2006 Replaced by 5CASDL.0100-03 |
| 5CASDL.0150-00 | SDL cable 15 m SDL cable, length: 15 m | Cancelled since 12/2006 Replaced by 5CASDL.0150-03 |
| 5CASDL.0200-00 | SDL cable 20 m SDL cable, length: 20 m | Cancelled since 12/2006 Replaced by 5CASDL.0200-03 |
| 5CASDL.0250-00 | SDL cable 25 m SDL cable, length: 25 m | Cancelled since 12/2006 Replaced by 5CASDL.0250-03 |
| 5CASDL.0300-00 | SDL cable 30 m SDL cable, length: 30 m | Cancelled since 12/2006 Replaced by 5CASDL.0300-03 |

Table 53: Model numbers - SDL cables

Technical data

| Features | 5CASDL.0018-00 | 5CASDL.0050-00 | 5CASDL.0100-00 | 5CASDL.0150-00 | 5CASDL.0200-00 | 5CASDL.0250-00 | 5CASDL.0300-00 |
|---|---|------------------|-----------------------|-------------------|-------------------|-------------------|-------------------|
| Length | 1.8 m ± 50 mm | 5 m ± 80 mm | 10 m ± 100 mm | 15 m ± 120 mm | 20 m ± 150 mm | 25 m ± 200 mm | 30 m ± 200 mm |
| Outer diameter Typical Maximum | 8,6 ±0.2 mm 9 mm | | 11 ±0.2 mm 11.5 mm | | | | |
| Shielding | Individual cable pairs and entire cable | | | | | | |
| Connector type | 2x DVI-D (24+1), male | | | | | | |
| Wire cross section | AWG 28 | | AWG 24 | | | | |
| Line resistance | Max. 237 Ω/km | | Max. 93 Ω/km | | | | |
| Insulation resistance | Min. 10 MΩ/km | | | | | | |
| Flexibility | Occasional movement (not used in cable drag chains) | | | | | | |
| Flex radius Single ¹⁾ Moving | ≥ 5 x cable diameter ≥ 15 x cable diameter | | | | | | |
| Plug connection cycles | 100 | | | | | | |
| Weight | Approx. 300 g | Approx. 590 g | Approx. 2100 g | Approx. 3000 g | Approx. 4100 g | Approx. 5100 g | Approx. 6100 g |

Table 54: Technical data - SDL cables 5CASDL.0xxx-00

1) For example, for transport.

Contents of delivery

| Amount | Component |
|--------|--|
| 1 | SDL cable in desired length, plug covers are attached at the cable ends. |

Table 55: Contents of delivery - SDL cable 5CASDL.0xxx-00

Cable specifications

The following figure shows the pin assignments for the SDL cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The SDL cables provided by B&R are guaranteed to function properly.

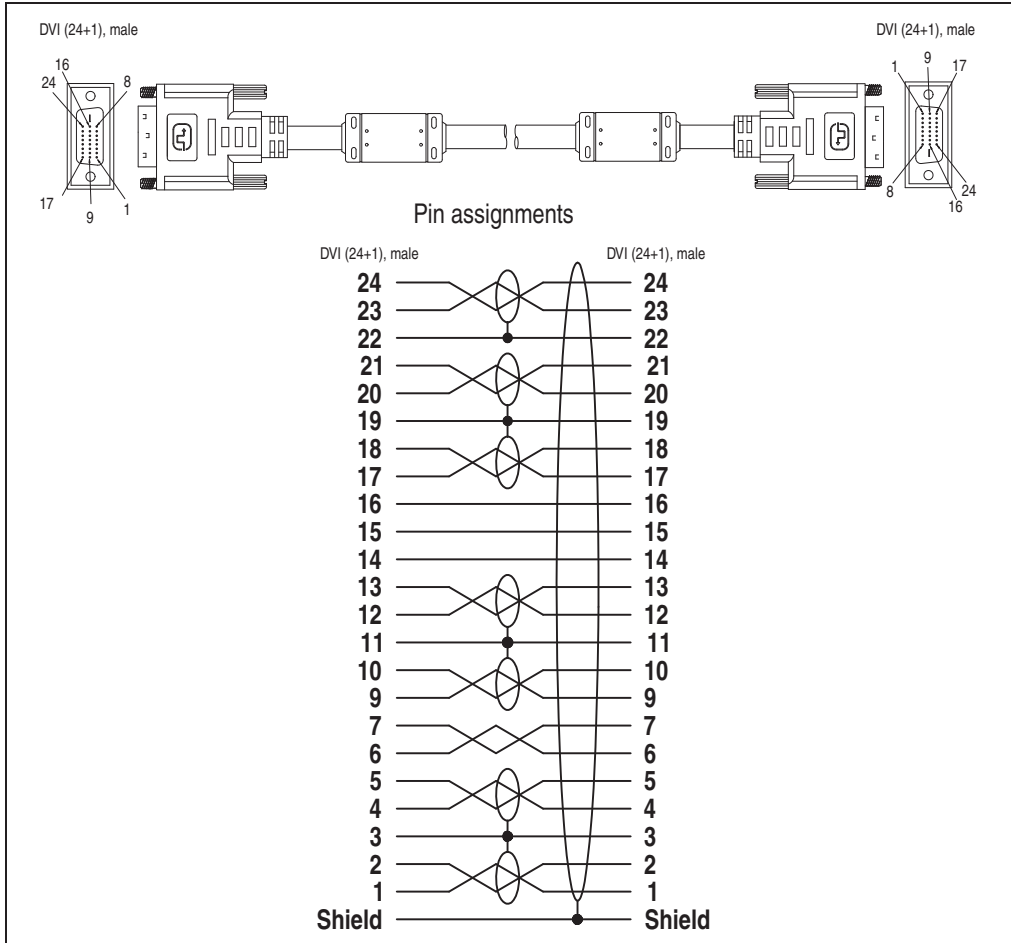


Figure 124: Pin assignments - SDL cable 5CASDL.0xxx-00

3.8.3 SDL cable with 45° plug 5CASDL.0xxx-01

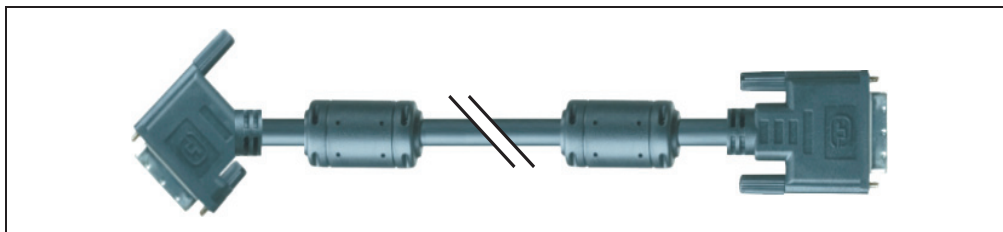


Figure 125: SDL cable with 45° plug (similar)

Caution!

SDL cables can only be plugged in and unplugged when the device is turned off.

Order data

| Model number | Description | Note |
|----------------|---|------|
| 5CASDL.0018-01 | SDL cable 1.8 m 45° SDL cable, length: 1.8 m; single sided 45° plug | |
| 5CASDL.0050-01 | SDL cable 5 m 45° SDL cable, length: 5 m; single sided 45° plug | |
| 5CASDL.0100-01 | SDL cable 10 m 45° SDL cable, length: 10 m; single sided 45° plug | |
| 5CASDL.0150-01 | SDL cable 15 m 45° SDL cable, length: 15 m; single sided 45° plug | |

Table 56: Model numbers - SDL cables with 45° plug

Technical data

| Features | 5CASDL.0018-01 | 5CASDL.0050-01 | 5CASDL.0100-01 | 5CASDL.0150-01 |
|---|--|----------------|----------------|----------------|
| Length | 1.8 m ± 50 mm | 5 m ± 80 mm | 10 m ± 100 mm | 15 m ± 120 mm |
| Outer diameter | Max. 9 mm | | Max. 11.5 mm | |
| Shielding | Individual cable pairs and entire cable | | | |
| Connector type | 2x DVI-D (24+1), male | | | |
| Wire cross section | AWG 28 | | AWG 24 | |
| Line resistance | Max. 237 Ω/km | | Max. 93 Ω/km | |
| Insulation resistance | Min. 10 MΩ/km | | | |
| Flexibility | for fixed installation | | | |
| Flex radius Single ¹⁾ Moving | ≥ 5 x cable diameter ≥ 19x cable diameter | | | |

Table 57: Technical data - SDL cable with 45° plug 5CASDL.0xxx-01

| Features | 5CASDL.0018-01 | 5CASDL.0050-01 | 5CASDL.0100-01 | 5CASDL.0150-01 |
|------------------------|----------------|----------------|----------------|----------------|
| Plug connection cycles | 100 | | | |
| Weight | Approx. 300 g | Approx. 590 g | Approx. 2100 g | Approx. 3000 g |

Table 57: Technical data - SDL cable with 45° plug 5CASDL.0xxx-01 (cont.)

1) For example, for transport.

Contents of delivery

| Amount | Component |
|--------|--|
| 1 | SDL cable with 45° plug in desired length, plug covers are attached at the cable ends. |

Table 58: Contents of delivery - SDL cable with 45° plug 5CASDL.0xxx-01

Cable specifications

The following figure shows the pin assignments for the SDL cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The SDL cables provided by B&R are guaranteed to function properly.

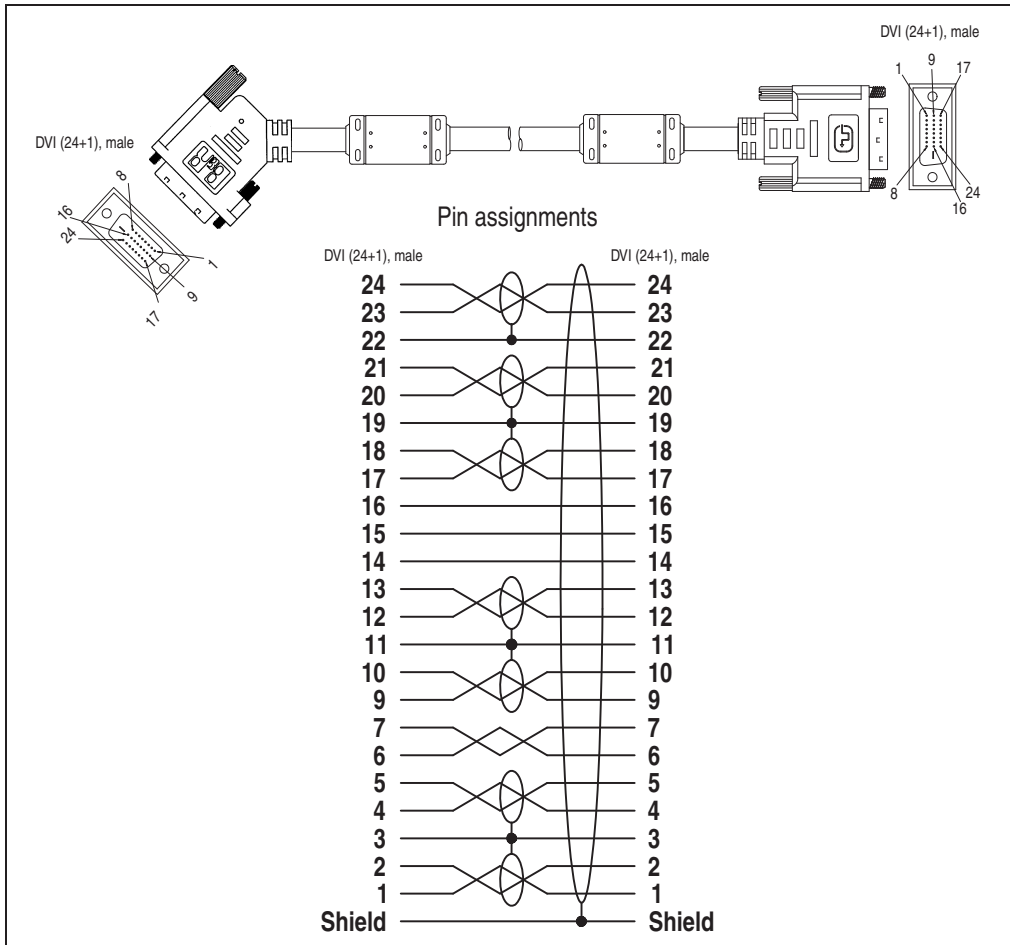


Figure 126: Pin assignments - SDL cable with 45° plug 5CASDL.0xxx-01

3.8.4 SDL flex cable 5CASDL.0xxx-03

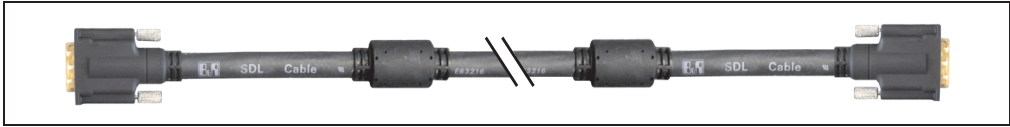


Figure 127: SDL cable 5CASDL.0xxx-03 (similar)

Caution!

SDL cables can only be plugged in and unplugged when the device is turned off.

Order data

| Model number | Description | Note |
|----------------|--|------|
| 5CASDL.0018-03 | SDL flex cable 1.8 m SDL cable, semi flexible, length: 1.8 m | |
| 5CASDL.0050-03 | SDL flex cable 5 m SDL cable, semi flexible, length: 5 m | |
| 5CASDL.0100-03 | SDL flex cable 10 m SDL cable, semi flexible, length: 10 m | |
| 5CASDL.0150-03 | SDL flex cable 15 m SDL cable, semi flexible, length: 15 m | |
| 5CASDL.0200-03 | SDL flex cable 20 m SDL cable, semi flexible, length: 20 m | |
| 5CASDL.0250-03 | SDL flex cable 25 m SDL cable, semi flexible, length: 25 m | |
| 5CASDL.0300-03 | SDL flex cable 30 m SDL cable, semi flexible, length: 30 m | |

Table 59: Model numbers - SDL cable 5CASDL.0xxx-03

Technical data

| Mechanical characteristics | 5CASDL.0018-03 | 5CASDL.0050-03 | 5CASDL.0100-03 | 5CASDL.0150-03 | 5CASDL.0200-03 | 5CASDL.0250-03 | 5CASDL.0300-03 |
|---|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Length | 1.8 m ± 20 mm | 5 m ± 45 mm | 10 m ± 90 mm | 15 m ± 135 mm | 20 m ± 180 mm | 25 m ± 230 mm | 30 m ± 280 mm |
| Weight | Approx. 450 g | Approx. 1000 g | Approx. 2000 g | Approx. 3000 g | Approx. 4000 g | Approx. 5000 g | Approx. 6000 g |
| Cable diameter | Max. 12 mm | | | | | | |
| Connectors | 2x DVI-D (24+1), male | | | | | | |
| Connection cycles | Min. 200 | | | | | | |
| Contacts | Gold plated | | | | | | |
| Mechanical protection | Metal cover with crimped stress relief | | | | | | |
| Flexibility ¹⁾ | Flexible (limited use in drag chain installations) | | | | | | |
| Flex radius | ≥ 10 x cable diameter ≥ 15 x cable diameter | | | | | | |
| Single ²⁾ | | | | | | | |
| Moving | | | | | | | |
| Max. tension | ≤400 N ≤50 N | | | | | | |
| During installation | | | | | | | |
| During operation | | | | | | | |
| Materials | RoHS compliant Aluminum foil clad + tinned copper mesh Black (similar to RAL 9005) | | | | | | |
| Cable shielding | | | | | | | |
| Color | | | | | | | |
| Shielding | Individual cable pairs and entire cable | | | | | | |
| Electrical properties (at +20°C) | | | | | | | |
| Wire cross section | 24 AWG (control wires) 26 AWG (DVI, USB, data) | | | | | | |
| Line resistance | ≤95 Ω/km ≤145 Ω/km | | | | | | |
| 24 AWG | | | | | | | |
| 26 AWG | | | | | | | |
| Insulation resistance | > 200 MΩ/km | | | | | | |
| Wave impedance | 100 ± 10 Ω | | | | | | |
| Test voltage | 1 kV _{eff} 0.5 kV _{eff} | | | | | | |
| Wire/wire | | | | | | | |
| Wire/shield | | | | | | | |
| Operating voltage | ≤30 V | | | | | | |
| Environmental characteristics | | | | | | | |
| Temperature resistance | -20°C .. +80°C -5°C .. +60°C -20°C .. +80°C | | | | | | |
| Fixed installation | | | | | | | |
| Moving | | | | | | | |
| Storage | | | | | | | |
| Standards and certifications | | | | | | | |
| Torsion load | 100000 cycles | | | | | | |
| Cable drag chain | 250000 cycles | | | | | | |

Table 60: Technical data - SDL cable 5CASDL.0xxx-03

| | | | | | | | |
|-------------------------------|--------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Approbation | UL AWM 20236 80°C 30 V | | | | | | |
| Standards and certifications | 5CASDL.0018-03 | 5CASDL.0050-03 | 5CASDL.0100-03 | 5CASDL.0150-03 | 5CASDL.0200-03 | 5CASDL.0250-03 | 5CASDL.0300-03 |
| Oil and hydrolysis resistance | According to VDE 0282-10 | | | | | | |

Table 60: Technical data - SDL cable 5CASDL.0xxx-03 (cont.)

- 1) Tested: 300000 cycles with: flex radius 180 mm; stroke 460 mm; speed 4800 cycles/hour.
- 2) For example, for transport.

Dimensions

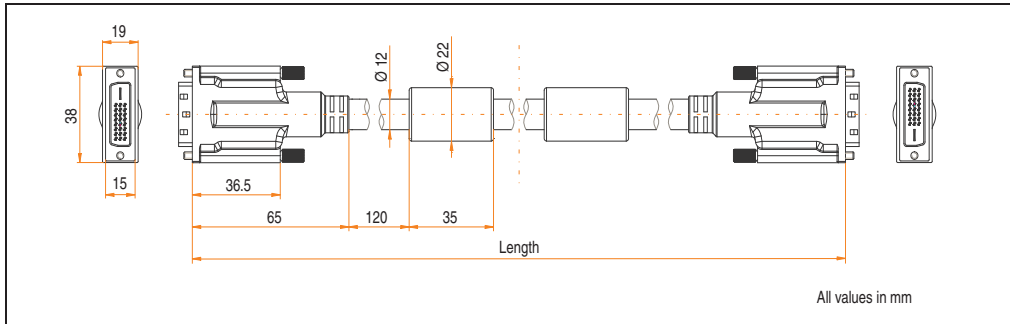


Figure 128: Dimensions - SDL cable 5CASDL.0xxx-03

Construction

| Element | Assignment | Cross section | |
|---------------|-----------------|---------------|--------------------------|
| DVI | TMDS data 0 | 26 AWG | <p>Schematic display</p> |
| | TMDS data 1 | 26 AWG | |
| | TMDS data 2 | 26 AWG | |
| | TMDS cycle | 26 AWG | |
| USB | XUSB0 | 26 AWG | |
| | XUSB1 | 26 AWG | |
| Data | SDL | 26 AWG | |
| Control wires | DDC cycle | 24 AWG | |
| | DDC data | 24 AWG | |
| | + 5 V | 24 AWG | |
| | Ground | 24 AWG | |
| | Hot Plug detect | 24 AWG | |

Table 61: Structure - SDL cable 5CASDL.0xxx-03

Cable specifications

The following figure shows the pin assignments for the SDL cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly.

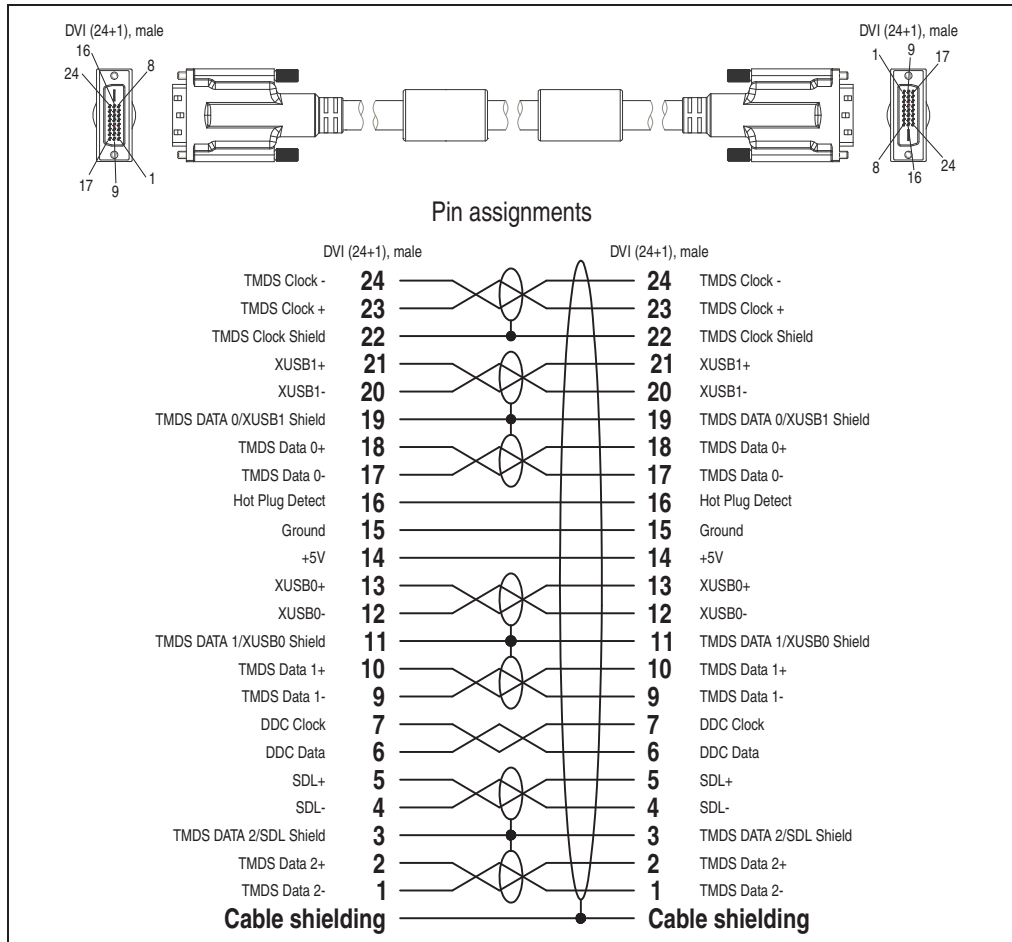


Figure 129: Pin assignments - SDL cable 5CASDL.0xxx-03

3.8.5 SDL cable with extender 5CASDL.0x00-10

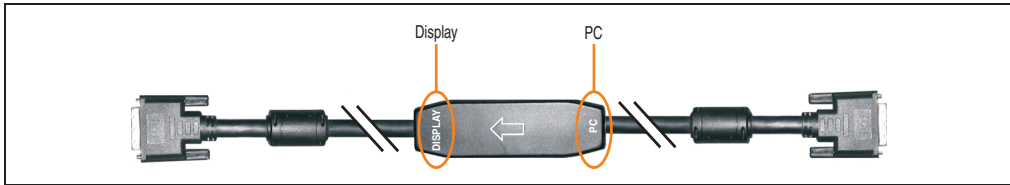


Figure 130: SDL cable with extender - 5CASDL.0x00-10 (similar)

Caution!

SDL cables with extender can only be plugged in and unplugged when the device is turned off. The correct direction of connection (Display, PC) for the wiring is illustrated on the middle of the extender.

Order data

| Model number | Description | Note |
|----------------|--|--------------------------------|
| 5CASDL.0300-10 | SDL cable with extender 30 m SDL cable, length: 30 m with extender | <i>Cancelled since 01/2007</i> |
| 5CASDL.0400-10 | SDL cable with extender 40 m SDL cable, length: 40 m with extender | <i>Cancelled since 01/2007</i> |

Table 62: Model numbers - SDL cable with extender

Technical data

| Features | 5CASDL.0300-10 | 5CASDL.0400-10 |
|----------------------------|--|----------------|
| Length | 30 m ± 200 mm | 40 m ± 200 mm |
| Dimensions of extender box | Height 18.5 mm, width 35 mm, length 125 mm | |
| Outer diameter | Max. 11.5 mm | |
| Shielding | Individual cable pairs and entire cable | |
| Connector type | 2x DVI-D (24+1), male | |
| Wire cross section | AWG 24 | |
| Line resistance | Max. 93 Ω/km | |
| Insulation resistance | Min. 10 MΩ/km | |
| Flexibility | Flexible (not for use in drag chain installations) | |
| Flex radius | Min. 220 mm | |
| Plug connection cycles | 100 | |
| Weight | Approx. 6100 g | Approx. 8100 g |

Table 63: Technical data - SDL cable with extender 5CASDL.0x00-10

Cable connection

The SDL cable with extender must be connected between the Automation PC 620 and Automation Panel 900 display unit in the correct direction. The correct signal direction is indicated on the extender unit for this purpose:

- Connect the end labeled "PC" with the video output of the Automation PC 620.
- The "Display" end should be connected to the display unit Automation Panel 900.

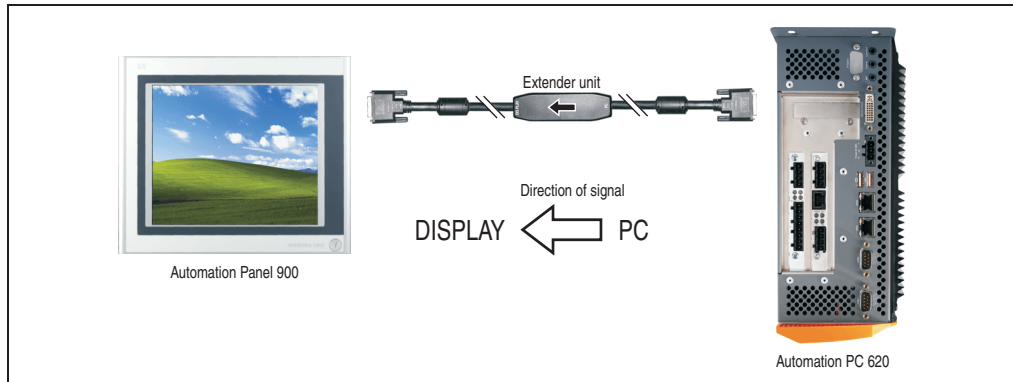


Figure 131: Example of the signal direction for the SDL cable with extender

Contents of delivery

| Amount | Component |
|--------|--|
| 1 | SDL cable with extender in desired length, plug covers are attached at the cable ends. |

Table 64: Contents of delivery - SDL cable with extender 5CASDL.0x00-10

Cable specifications

The following figure shows the pin assignments for the SDL cable with extender available at B&R.

Information:

Only B&R SDL cables with extender can be used.

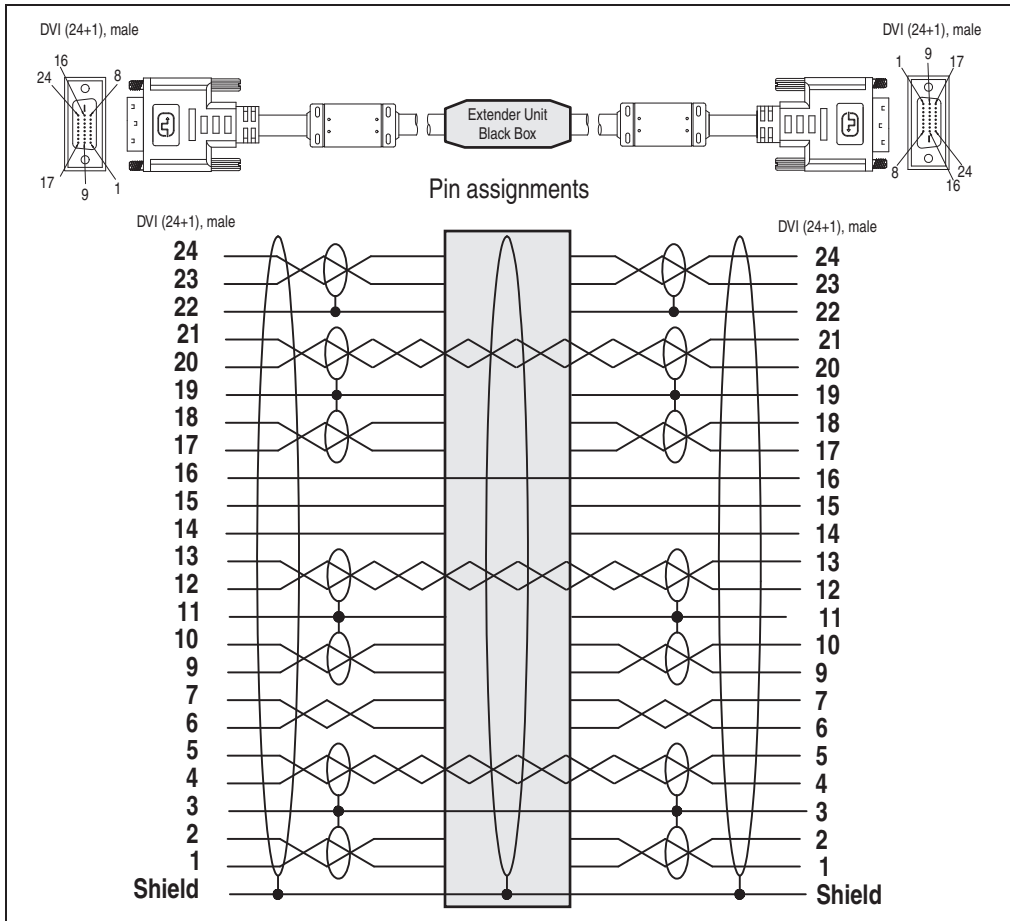


Figure 132: Pin assignments - SDL cable with extender 5CASDL.0x00-10

3.8.6 SDL flex cable with extender 5CASDL.0x00-13



Figure 133: SDL cable with extender - 5CASDL.0x00-13

Caution!

SDL cables with extender can only be plugged in and unplugged when the device is turned off. The correct direction of connection (Display, PC) for the wiring is illustrated on the middle of the extender.

Order data

| Model number | Description | Note |
|----------------|--|------|
| 5CASDL.0300-13 | SDL flex cable with extender 30 m SDL cable, semi flexible, length: 30 m with extender | |
| 5CASDL.0400-13 | SDL flex cable with extender 40 m SDL cable, semi flexible, length: 40 m with extender | |

Table 65: Model numbers - SDL cable with extender

Technical data

| Features | 5CASDL.0300-13 | 5CASDL.0400-13 |
|----------------------------|--|----------------|
| Length | 30 m ± 200 mm | 40 m ± 200 mm |
| Dimensions of extender box | Height 18.5 mm, width 35 mm, length 125 mm | |
| Cable diameter | Max. 12 mm | |
| Connectors | 2x DVI-D (24+1), male | |
| Connection cycles | Min. 200 | |
| Contacts | Gold plated | |
| Mechanical protection | Metal cover with crimped stress relief | |
| Flexibility ¹⁾ | Flexible (limited use in drag chain installations) | |
| Flex radius | ≥ 10 x cable diameter ≥ 15 x cable diameter | |
| Single ²⁾ | | |
| Moving | | |
| Max. tension | ≤400 N ≤50 N | |
| During installation | | |
| During operation | | |
| Materials | RoHS compliant Aluminum foil clad + tinned copper mesh Black (similar to RAL 9005) | |
| Cable shielding | | |
| Color | | |

Table 66: Technical data - SDL flex cable with extender 5CASDL.0x00-13

| Features | 5CASDL.0300-13 | 5CASDL.0400-13 |
|---|---|----------------|
| Shielding | Individual cable pairs and entire cable | |
| Electrical properties (at +20°C) | | |
| Wire cross section | 24 AWG (control wires) 26 AWG (DVI, USB, data) | |
| Line resistance 24 AWG 26 AWG | ≤95 Ω/km ≤145 Ω/km | |
| Insulation resistance | > 200 MΩ/km | |
| Wave impedance | 100 ± 10 Ω | |
| Test voltage Wire/wire Wire/shield | 1 kV _{eff} 0.5 kV _{eff} | |
| Operating voltage | ≤30 V | |
| Environmental characteristics | | |
| Temperature resistance Fixed installation Moving Storage | -20°C .. +60°C -5°C .. +60°C -20°C .. +60°C | |
| Standards and certifications | | |
| Torsion load | 100000 cycles | |
| Cable drag chain | 250000 cycles | |
| Approbation | UL AWM 20236 80°C 30 V | |
| Standards and certifications | | |
| Oil and hydrolysis resistance | According to VDE 0282-10 | |

Table 66: Technical data - SDL flex cable with extender 5CASDL.0x00-13 (cont.)

- 1) Tested: 300000 cycles with: flex radius 180 mm; stroke 460 mm; speed 4800 cycles/hour.
- 2) For example, for transport.

Cable connection

The SDL flex cable with extender must be connected between the Industrial PC and Automation Panel 900 display unit in the correct direction. The correct signal direction is indicated on the extender unit for this purpose:

- Connect the end labeled "SDL IN" with the video output of the Automation PC 620 (monitor/panel).
- The "SDL OUT" end should be connected to the display unit Automation Panel 900 via Automation Panel Link insert card.

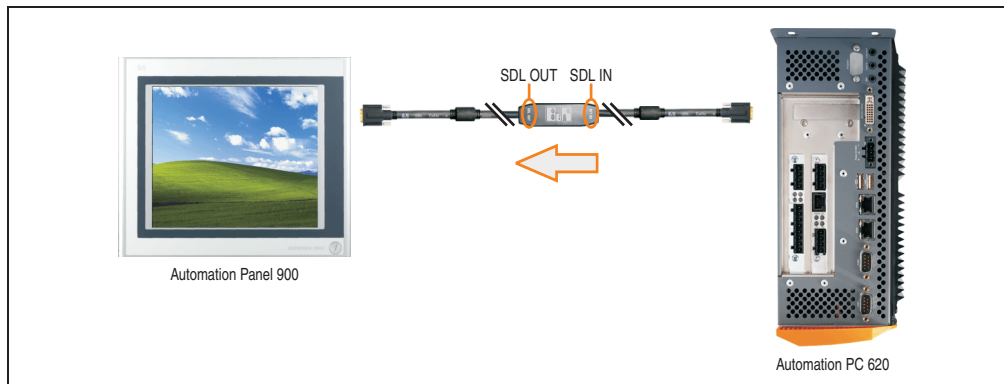


Figure 134: Example of the signal direction for the SDL cable with extender - APC620

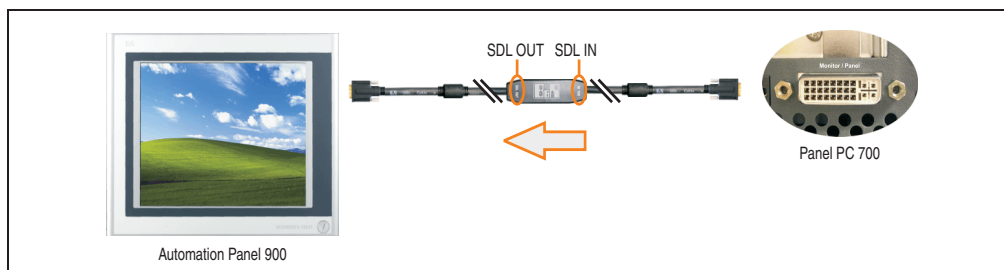


Figure 135: Example of the signal direction for the SDL cable with extender - PPC700

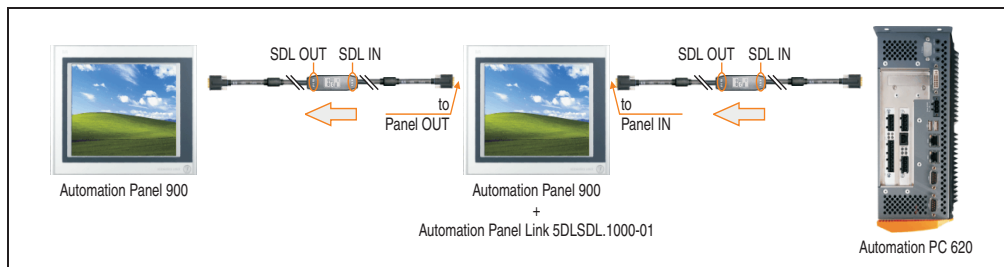


Figure 136: Example of the signal direction display - SDL flex cable with extender

Cable specifications

The following figure shows the pin assignments for the SDL flex cable with extender available at B&R.

Information:

Only B&R SDL flex cables with extender can be used.

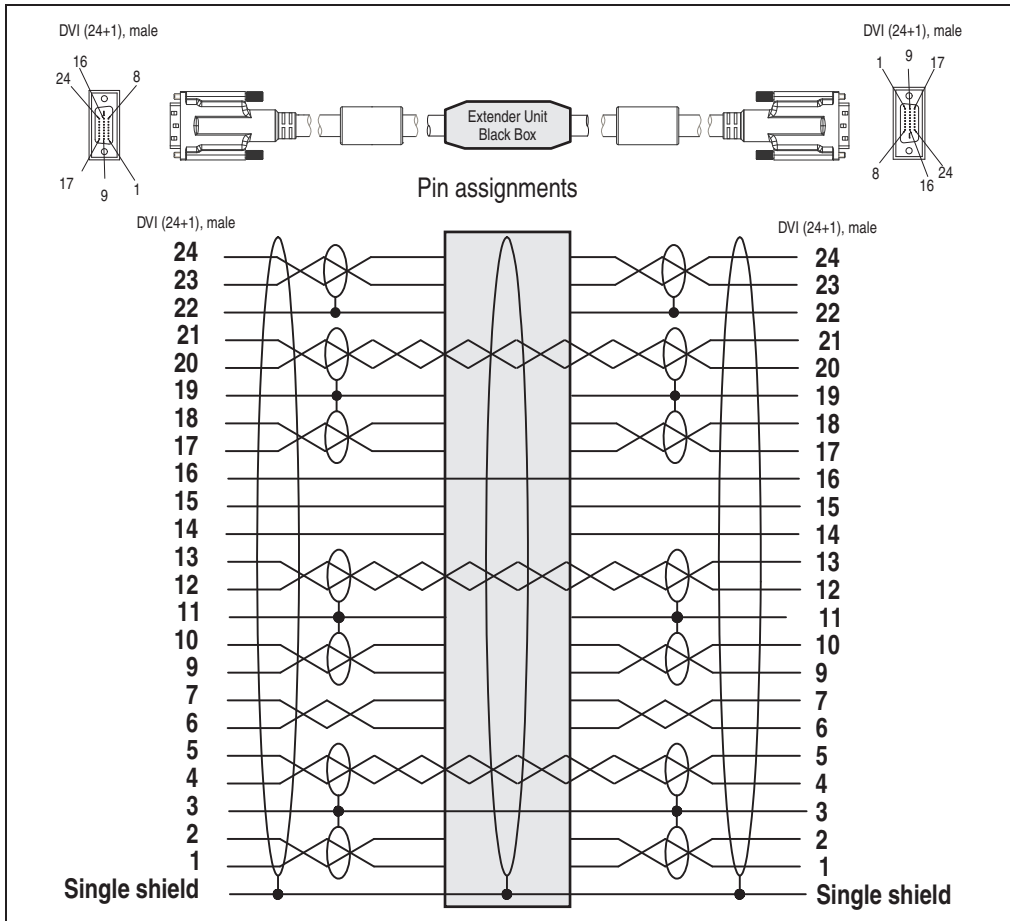


Figure 137: Pin assignments - SDL cable with extender 5CASDL.0x00-13

3.8.7 RS232 cable 9A0014.xx

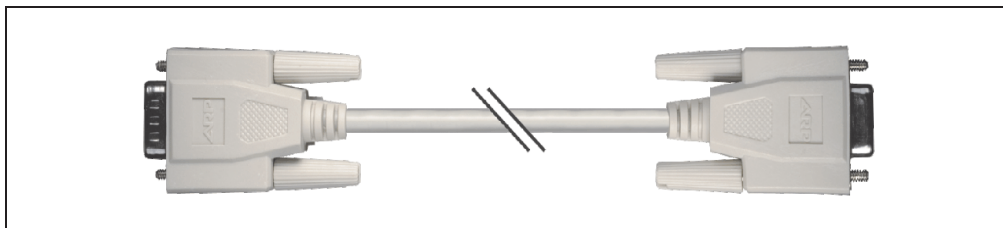


Figure 138: RS232 extension cable (similar)

Order data

| Model number | Description | Note |
|--------------|---|------|
| 9A0014.02 | RS232 cable DB9/f:DB9/m 1.8 m RS232 extension cable for remote operation of a display unit with touch screen, length 1.8 m. | |
| 9A0014.05 | RS232 cable DB9/f:DB9/m 5 m RS232 extension cable for remote operation of a display unit with touch screen, length 5 m. | |
| 9A0014.10 | RS232 cable DB9/f:DB9/m 10 m RS232 extension cable for remote operation of a display unit with touch screen, length 10 m. | |

Table 67: Model numbers - RS232 cables

Technical data

| Features | 9A0014.02 | 9A0014.05 | 9A0014.10 |
|--------------------|-----------------------------|-------------|---------------|
| Length | 1.8 m ± 50 mm | 5 m ± 80 mm | 10 m ± 100 mm |
| Outer diameter | Max. 5 mm | | |
| Shielding | Entire cable | | |
| Connector type | DSUB (9-pin), male / female | | |
| Wire cross section | AWG 26 | | |
| Flexibility | Flexible | | |
| Flex radius | Min. 70 mm | | |

Table 68: Technical data - RS232 cables

Contents of delivery

| Amount | Component |
|--------|-------------------------------|
| 1 | RS232 cable in desired length |

Table 69: Contents of delivery - RS232 cables

Cable specifications

The following figure shows the pin assignments for the RS232 cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The RS232 cables provided by B&R are guaranteed to function properly.

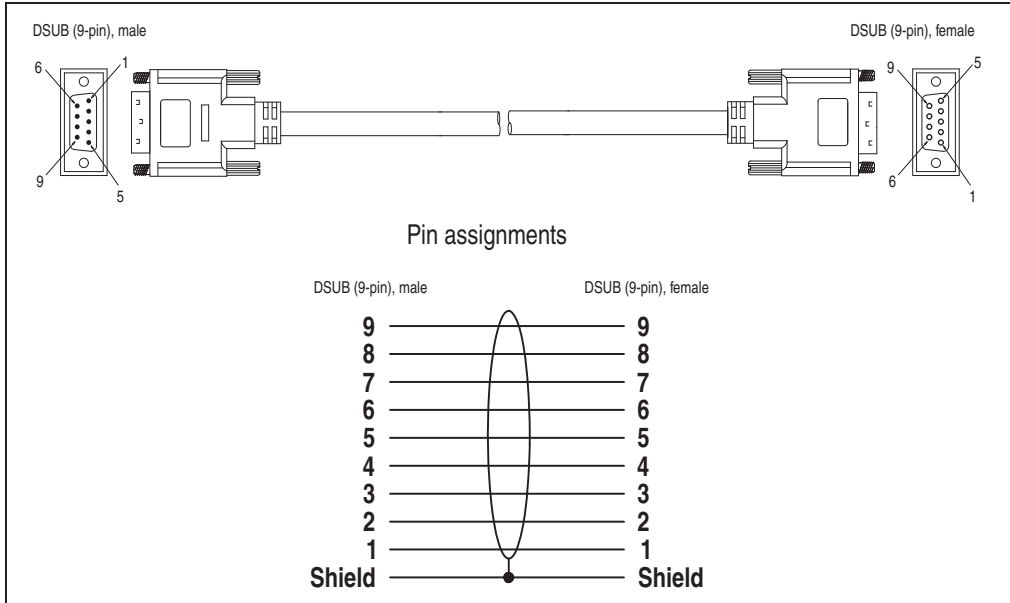


Figure 139: Pin assignments - RS232 cable

3.8.8 USB cable 5CAUSB.00xx-00

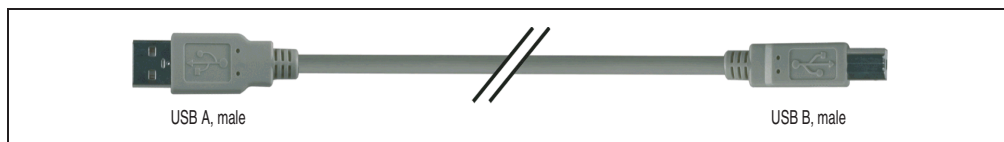


Figure 140: USB extension cable (similar)

Order data

| Model number | Description | Note |
|----------------|---|------|
| 5CAUSB.0018-00 | USB 2.0 cable, A/m:B/m 1.8 m USB 2.0 connection cable, Type A - Type B, length: 1.8 m | |
| 5CAUSB.0050-00 | USB 2.0 cable, A/m:B/m 5 m USB 2.0 connection cable, Type A - Type B, length: 5 m | |

Table 70: Model numbers - USB cables

Technical data

| Features | 5CAUSB.0018-00 | 5CAUSB.0050-00 |
|--------------------|-------------------------------------|----------------|
| Length | 1.8 m ± 30 mm | 5 m ± 50 mm |
| Outer diameter | Max. 5 mm | |
| Shielding | Entire cable | |
| Connector type | USB type A male and USB type B male | |
| Wire cross section | AWG 24, 28 | |
| Flexibility | Flexible | |
| Flex radius | Min. 100 mm | |

Table 71: Technical data - USB cables

Contents of delivery

| Amount | Component |
|--------|-----------------------------|
| 1 | USB cable in desired length |

Table 72: Contents of delivery - USB cable

Cable specifications

The following figure shows the pin assignments for the USB cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The USB cables provided by B&R are guaranteed to function properly.

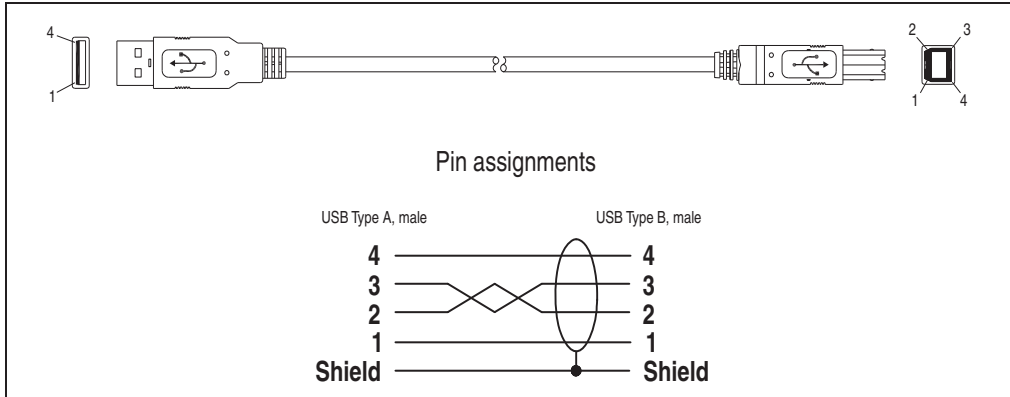


Figure 141: Pin assignments - USB cable

Chapter 3 • Start-up

1. Installation specifications

Automation Panel 900 devices are best installed in a housing cutout using the clamps found on the display units (various types possible).

The cutout dimensions for each of the Automation Panel 900 devices can be found in the technical data (see Chapter 2 "Technical data" starting on page 25).

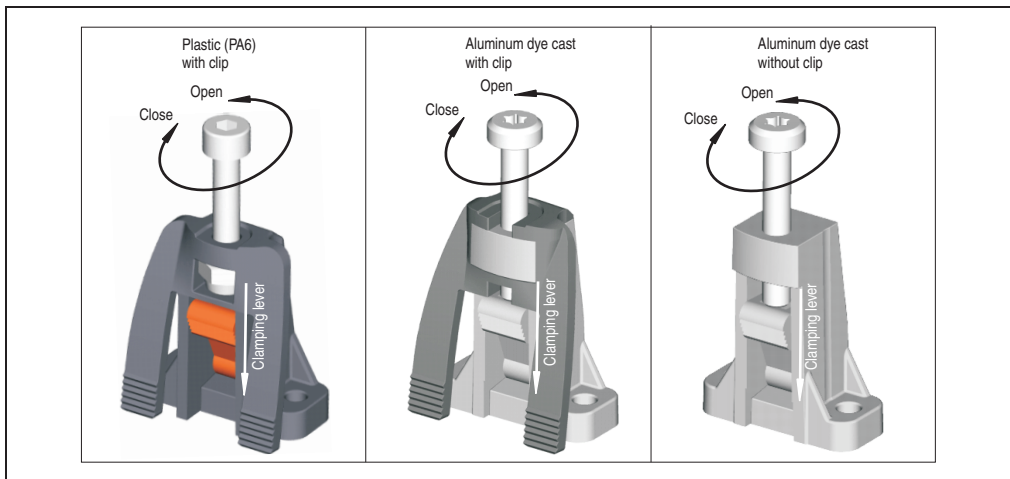


Figure 142: Clamps

The mounting clamps are designed for a max. thickness of 10 mm for the material where the device is being clamped. The minimum thickness is 2 mm.

In order to tighten or loosen the screws, a hex key (size 3) is required for the plastic clamps and a Torx screwdriver (size 20) or a large flat-head screwdriver for the aluminum die casting. The maximum torque when tightening the clamp is 0.5 Nm. An Automation Panel 900 unit must be mounted to a flat surface. Uneven areas can cause damage to the display when the screws are tightened.

In order to guarantee proper air circulation, allow the specified amount of space above, below, to the side and behind the Automation Panel. The minimum specified free space can be found in the diagram below.

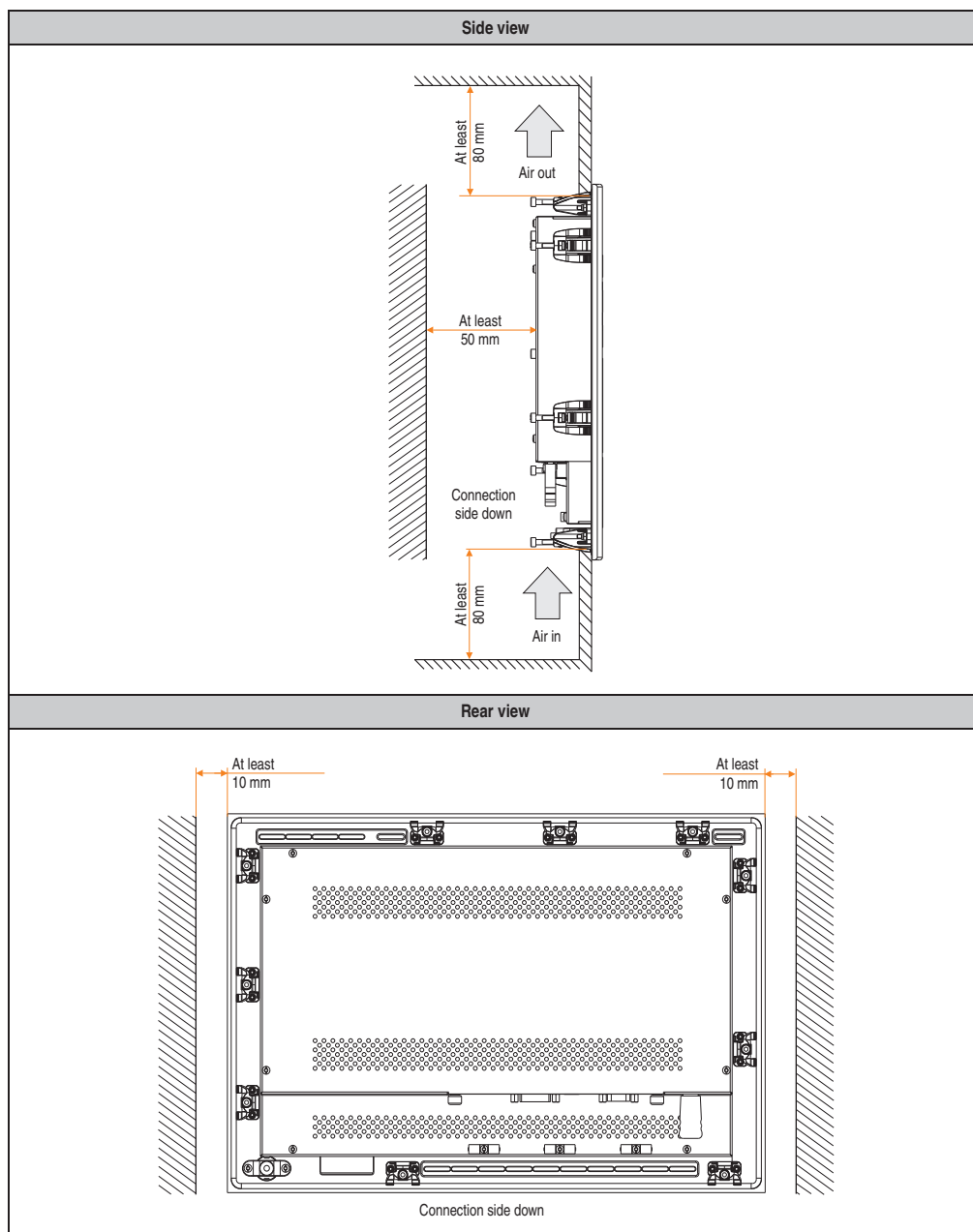


Figure 143: Space for air circulation

2. Mounting orientation

The following diagrams specify the orientations for mounting an Automation Panel device.

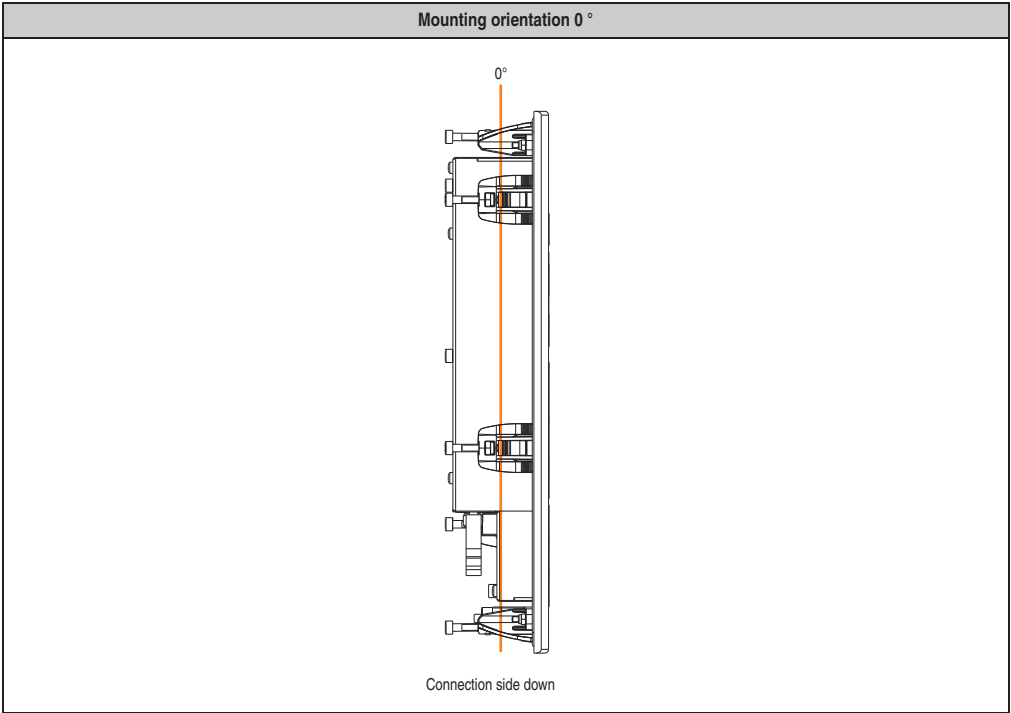


Table 73: Mounting orientation 0 °

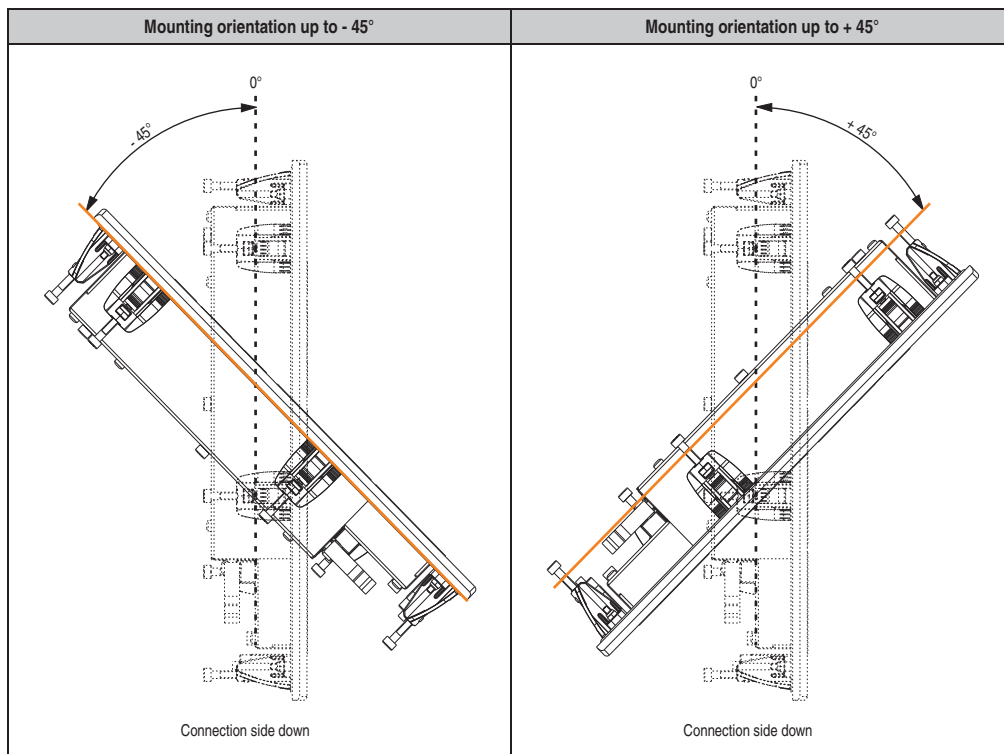


Table 74: Mounting orientations -45° and $+45^\circ$.

Warning!

Because of the changed thermal properties with some mounting orientations, e.g. $\pm 45^\circ$, the maximum ambient temperatures of the Automation Panel 900 specified for 0° mounting orientation cannot be achieved during operation. The limit values that apply in this situation can be found in the technical data for the Automation Panel device.

3. Example connections with an Automation PC 620

The following examples provide an overview of the configuration options for connecting Automation Panel 900 units with the APC620. The following questions will be answered:

- How are Automation Panel 900 devices connected to the monitor / panel output of the APC620, and what needs to be considered?
- How are Automation Panel 900 devices connected to the AP Link output of the APC620, and what needs to be considered?
- How are Automation Panel 900 devices connected simultaneously to the Monitor / Panel output on the optional SDL AP Link of the APC620 and what needs to be considered?
- What are "Display Clone" and "Extended Desktop" modes?
- How many Automation Panel 900 devices can be connected per line?
- How are the connected Automation Panel 900 devices numbered internally?
- Are there limitations to the segment length and if so, what are they?
- What cables and link modules are needed?
- Do BIOS settings have to be changed for a specific configuration?

3.1 One Automation Panel via DVI

An Automation Panel with max. SXGA resolution is connected to the integrated DVI interface (onboard). As an alternative, an office TFT with DVI interface or an analog monitor (using adapter with model no. 5AC900.1000-00) can also be operated. A separate cable is used for touch screen and USB. If USB devices are to be operated on the Automation Panel 900, the maximum distance is 5 meters. USB devices can only be connected directly to the Automation Panel (without hub).

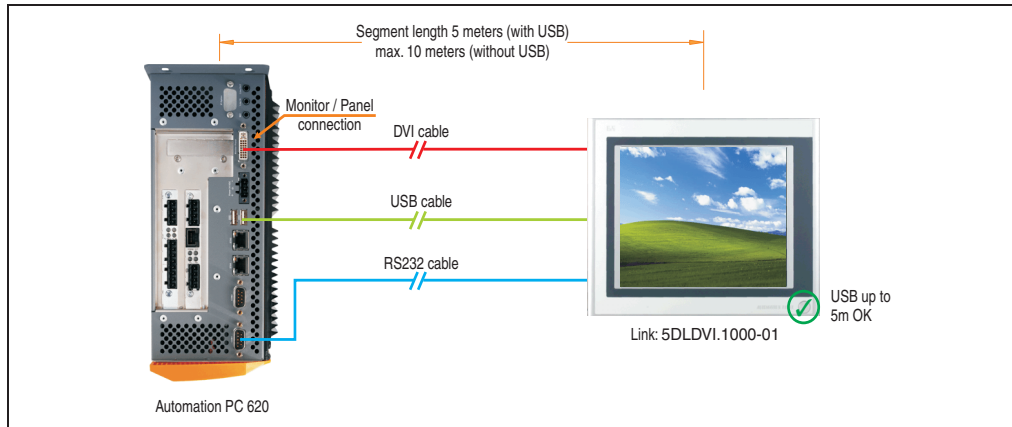


Figure 144: Configuration - One Automation Panel via DVI (onboard)

3.1.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table (e.g. for connecting a non-B&R Automation Panel 900 device).

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-00 5PC600.X855-00 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. SXGA |
| 5PC600.E855-01 5PC600.X855-01 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. SXGA |
| 5PC600.E855-02 5PC600.X855-02 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. SXGA |
| 5PC600.E855-03 5PC600.X855-03 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. SXGA |
| 5PC600.E855-04 5PC600.X855-04 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. SXGA |
| 5PC600.E855-05 5PC600.X855-05 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. SXGA |

Table 75: Possible combinations of system unit and CPU board

3.1.2 Link modules

| Model number | Description | Note |
|-----------------|------------------------------------|--------------------------|
| 5DL DVI.1000-01 | Automation Panel Link DVI receiver | For Automation Panel 900 |

Table 76: Link module for the configuration - One Automation Panel via DVI

3.1.3 Cables

Select one cable each from the 3 required types.

| Model number | Type | Length |
|----------------|--------------|--------------------|
| 5CADVI.0018-00 | DVI | 1.8 m |
| 5CADVI.0050-00 | DVI | 5 m |
| 5CADVI.0100-00 | DVI | 10 m ¹⁾ |
| 9A0014.02 | Touch screen | 1.8 m |
| 9A0014.05 | Touch screen | 5 m |
| 9A0014.10 | Touch screen | 10 m ¹⁾ |
| 5CAUSB.0018-00 | USB | 1.8 m |
| 5CAUSB.0050-00 | USB | 5 m |

Table 77: Cable for DVI configurations

1) USB support is not possible on the Automation Panel 900 because USB is limited to 5 m.

3.1.4 Possible Automation Panel units, resolutions and segment lengths

The following Automation Panel 900 units can be used. In rare cases, the segment length is limited according to the resolution.

| Model number | Diagonal | Resolution | Touch screen | Keys | Max. segment length |
|----------------|----------|------------|--------------|------|--------------------------|
| 5AP920.1043-01 | 10.4" | VGA | ✓ | - | 5 m / 10 m ¹⁾ |
| 5AP920.1214-01 | 12.1" | SVGA | ✓ | - | 5 m / 10 m ¹⁾ |
| 5AP920.1505-01 | 15.0" | XGA | ✓ | - | 5 m / 10 m ¹⁾ |
| 5AP920.1706-01 | 17.0" | SXGA | ✓ | - | 5 m / 10 m ¹⁾ |
| 5AP920.1906-01 | 19.0" | SXGA | ✓ | - | 5 m / 10 m ¹⁾ |

Table 78: Possible Automation Panel units, resolutions und segment lengths

1) USB support is not possible on the Automation Panel 900 because USB is limited to 5 m.

Information:

The DVI transfer mode does not allow reading statistical values on Automation Panel 900 units.

3.1.5 BIOS settings

No special BIOS settings are necessary for operation.

3.1.6 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver.
For detailed information, see the APC620 user's manual.

3.1.7 Windows touch screen driver settings

For detailed information, see the APC620 User's Manual.

3.2 One Automation Panel via SDL (onboard)

An Automation Panel is connected to the integrated SDL interface (onboard) via an SDL cable. USB devices can only be connected directly to the Automation Panel (without hub).

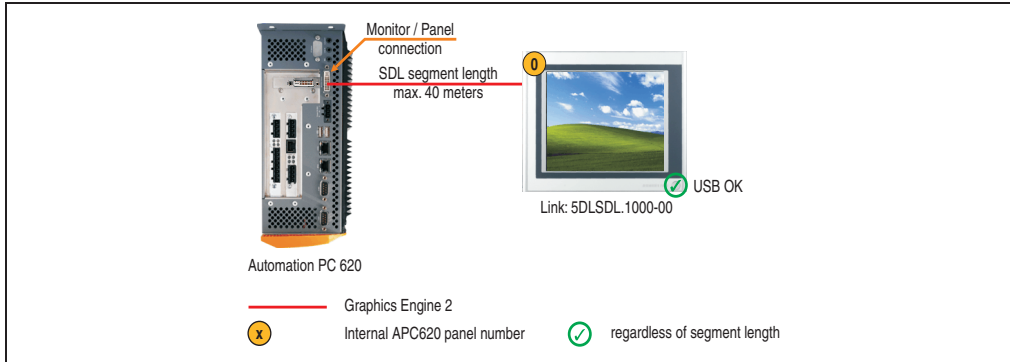


Figure 145: Configuration - One Automation Panel via SDL (onboard)

3.2.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table (e.g. for connecting a non-B&R Automation Panel 900 device).

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-00 5PC600.X855-00 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-01 5PC600.X855-01 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-02 5PC600.X855-02 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-03 5PC600.X855-03 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-04 5PC600.X855-04 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-05 5PC600.X855-05 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |

Table 79: Possible combinations of system unit and CPU board

3.2.2 Link modules

| Model number | Description | Note |
|----------------|------------------------------------|--------------------------|
| 5DLSDL.1000-00 | Automation Panel Link SDL receiver | For Automation Panel 900 |

Table 80: Link module for the configuration - One Automation Panel via SDL

3.2.3 Cables

Select a cable from the following table.

| Model number | Type | Length |
|----------------|--------------------------------|--------|
| 5CASDL.0018-01 | SDL with single-sided 45° plug | 1.8 m |
| 5CASDL.0018-03 | SDL flex without extender | 1.8 m |
| 5CASDL.0050-01 | SDL with single-sided 45° plug | 5 m |
| 5CASDL.0050-03 | SDL flex without extender | 5 m |
| 5CASDL.0100-01 | SDL with single-sided 45° plug | 10 m |
| 5CASDL.0100-03 | SDL flex without extender | 10 m |
| 5CASDL.0150-01 | SDL with single-sided 45° plug | 15 m |
| 5CASDL.0150-03 | SDL flex without extender | 15 m |
| 5CASDL.0200-03 | SDL flex without extender | 20 m |
| 5CASDL.0250-03 | SDL flex without extender | 25 m |
| 5CASDL.0300-03 | SDL flex without extender | 30 m |
| 5CASDL.0300-13 | SDL flex with extender | 30 m |
| 5CASDL.0400-13 | SDL flex with extender | 40 m |

Table 81: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|--|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 1,8 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 |
| 5 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 |
| 10 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 ¹⁾ 5CASDL.0100-03 ¹⁾ |

Table 82: Segment lengths, resolutions and SDL cables

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|--|--|-----------------------------------|--|---------------------|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 15 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 ¹⁾ 5CASDL.0150-03 ¹⁾ | - - |
| 20 | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | - |
| 25 | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | - | - |
| 30 | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-13 ²⁾ - | 5CASDL.0300-13 ²⁾ - | - - |
| 40 | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | - |

Table 82: Segment lengths, resolutions and SDL cables (cont.)

1) See table 83 "Requirements for SDL cable with automatic cable adjustment (equalizer)" on page 185

2) See table 84 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 185

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|----------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. B0 | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. B0 | |

Table 83: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|-------------------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. D0 or higher | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. D0 or higher | |
| 5AC600.SDL0-00 | AP Link SDL transmitter | Rev. B3 | |
| 5PC600.SX01-00 | System 1 PCI | Rev. E0 | |

Table 84: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

| Firmware | Name | Version | Note |
|----------------|--|-------------------|------|
| 5PC600.SX02-00 | System 2 PCI, 1 disk drive slot, 1 AP Link slot | Rev. D0 or higher | |
| 5PC600.SX02-01 | System 2 PCI, 1 disk drive slot | Rev. E0 | |
| 5PC600.SF03-00 | System 3 PCI, 1 disk drive slot, 1 AP Link slot | Rev. A0 | |
| 5PC600.SX05-00 | System 5 PCI, 2 disk drive slots, 1 AP Link slot | Rev. C0 | |
| 5PC600.SX05-01 | System 5 PCI, 2 disk drive slots | Rev. C0 | |

Table 84: Requirements for SDL cable with extender and automatic cable adjustment (equalizer) (cont.)

3.2.4 BIOS settings

No special BIOS settings are necessary for operation.

3.2.5 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver.
For detailed information, see the APC620 User's Manual.

3.2.6 Windows touch screen driver settings

For detailed information, see the APC620 User's Manual.

3.3 Four Automation Panels via SDL (onboard)

An Automation Panel is connected to the integrated SDL interface (onboard) via an SDL cable. Up to three other Automation Panels of the same type are connected to this Automation Panel and operated via SDL. All four panels show the same content (Display Clone).

USB is supported up to a maximum distance (SDL segment 1 + SDL segment 2) of 30 m on the first two panels (front and back side). From a distance of 30 m and longer, USB is only available for the first panel (front and back side). USB devices can only be connected directly to the Automation Panel 900 (without a hub).

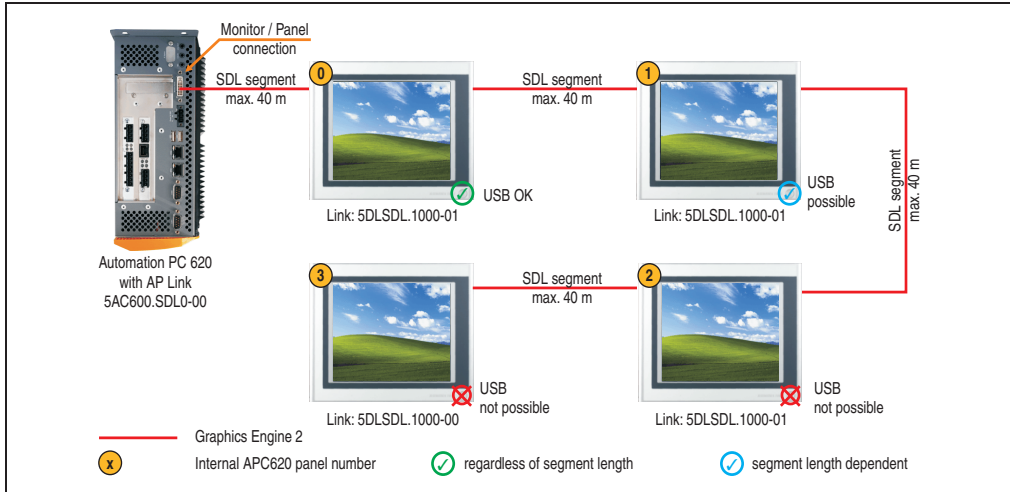


Figure 146: Configuration - Four Automation Panel 900 units via SDL (onboard)

3.3.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table (e.g. for connecting a non-B&R Automation Panel 900 device).

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-00 5PC600.X855-00 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-01 5PC600.X855-01 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-02 5PC600.X855-02 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-03 5PC600.X855-03 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |

Table 85: Possible combinations of system unit and CPU board

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-04 5PC600.X855-04 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |
| 5PC600.E855-05 5PC600.X855-05 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Max. UXGA |

Table 85: Possible combinations of system unit and CPU board (cont.)

3.3.2 Link modules

| Model number | Description | Note |
|---------------|---------------------------------------|---|
| 5DLSL.1000-00 | Automation Panel Link SDL receiver | For Automation Panel 900 |
| 5DLSL.1000-01 | Automation Panel Link SDL transceiver | For Automation Panel 900 3 pieces required |

Table 86: Link modules for the configuration - Four Automation Panels via SDL on one line

3.3.3 Cables

Selection of 4 cables from the following tables.

| Model number | Type | Length |
|----------------|--------------------------------|--------|
| 5CASDL.0018-01 | SDL with single-sided 45° plug | 1.8 m |
| 5CASDL.0018-03 | SDL flex without extender | 1.8 m |
| 5CASDL.0050-01 | SDL with single-sided 45° plug | 5 m |
| 5CASDL.0050-03 | SDL flex without extender | 5 m |
| 5CASDL.0100-01 | SDL with single-sided 45° plug | 10 m |
| 5CASDL.0100-03 | SDL flex without extender | 10 m |
| 5CASDL.0150-01 | SDL with single-sided 45° plug | 15 m |
| 5CASDL.0150-03 | SDL flex without extender | 15 m |
| 5CASDL.0200-03 | SDL flex without extender | 20 m |
| 5CASDL.0250-03 | SDL flex without extender | 25 m |
| 5CASDL.0300-03 | SDL flex without extender | 30 m |
| 5CASDL.0300-13 | SDL flex with extender | 30 m |
| 5CASDL.0400-13 | SDL flex with extender | 40 m |

Table 87: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|--|--|-----------------------------------|--|--|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 1,8 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 |
| 5 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 |
| 10 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 ¹⁾ 5CASDL.0100-03 ¹⁾ |
| 15 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 ¹⁾ 5CASDL.0150-03 ¹⁾ | - - |
| 20 | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | - |
| 25 | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | - | - |
| 30 | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-13 ²⁾ - | 5CASDL.0300-13 ²⁾ - | - - |
| 40 | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | - |

Table 88: Segment lengths, resolutions and SDL cables

1) See table 89 "Requirements for SDL cable with automatic cable adjustment (equalizer)" on page 189

2) See table 90 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 190

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Revision | Note |
|---------------|--|----------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSL.1000-00 | AP Link SDL receiver | Rev. B0 | |
| 5DLSL.1000-01 | AP Link SDL transceiver | Rev. B0 | |

Table 89: Requirements for SDL cable with automatic cable adjustment (equalizer)

Start-up • Example connections with an Automation PC 620

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|-------------------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. D0 or higher | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. D0 or higher | |
| 5AC600.SDL0-00 | AP Link SDL transmitter | Rev. B3 | |
| 5PC600.SX01-00 | System 1 PCI | Rev. E0 | |
| 5PC600.SX02-00 | System 2 PCI, 1 disk drive slot, 1 AP Link slot | Rev. D0 or higher | |
| 5PC600.SX02-01 | System 2 PCI, 1 disk drive slot | Rev. E0 | |
| 5PC600.SF03-00 | System 3 PCI, 1 disk drive slot, 1 AP Link slot | Rev. A0 | |
| 5PC600.SX05-00 | System 5 PCI, 2 disk drive slots, 1 AP Link slot | Rev. C0 | |
| 5PC600.SX05-01 | System 5 PCI, 2 disk drive slots | Rev. C0 | |

Table 90: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

3.3.4 BIOS settings

No special BIOS settings are necessary for operation.

3.3.5 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver. For detailed information, see the APC620 User's Manual.

3.3.6 Windows touch screen driver settings

For detailed information, see the APC620 User's Manual.

3.4 One Automation Panel via SDL (AP Link)

An Automation Panel is connected to the optional SDL transmitter (AP Link) via an SDL cable. USB devices can only be connected directly to the Automation Panel (without hub).

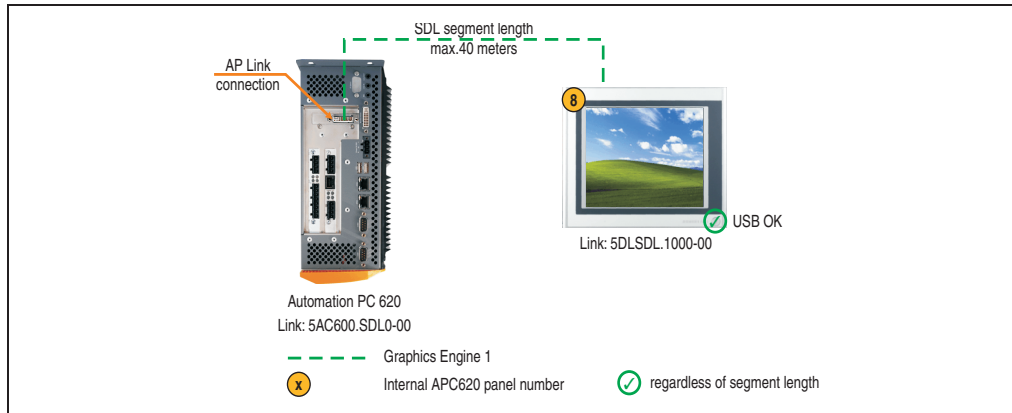


Figure 147: Configuration - One Automation Panel 900 via SDL (AP Link)

3.4.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table (e.g. for connecting a non-B&R Automation Panel 900 device).

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-00 5PC600.X855-00 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-01 5PC600.X855-01 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-02 5PC600.X855-02 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-03 5PC600.X855-03 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-04 5PC600.X855-04 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-05 5PC600.X855-05 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |

Table 91: Possible combinations of system unit and CPU board

3.4.2 Link modules

| Model number | Description | Note |
|----------------|---------------------------------------|--------------------------|
| 5DLSDL.1000-00 | Automation Panel Link SDL receiver | For Automation Panel 900 |
| 5AC600.SDL0-00 | Automation Panel Link SDL transmitter | For Automation PC 620 |

Table 92: Link modules for the configuration - One Automation Panel via SDL (optional)

3.4.3 cables

Select a cable from the following table.

| Model number | Type | Length |
|----------------|--------------------------------|--------|
| 5CASDL.0018-01 | SDL with single-sided 45° plug | 1.8 m |
| 5CASDL.0018-03 | SDL flex without extender | 1.8 m |
| 5CASDL.0050-01 | SDL with single-sided 45° plug | 5 m |
| 5CASDL.0050-03 | SDL flex without extender | 5 m |
| 5CASDL.0100-01 | SDL with single-sided 45° plug | 10 m |
| 5CASDL.0100-03 | SDL flex without extender | 10 m |
| 5CASDL.0150-01 | SDL with single-sided 45° plug | 15 m |
| 5CASDL.0150-03 | SDL flex without extender | 15 m |
| 5CASDL.0200-03 | SDL flex without extender | 20 m |
| 5CASDL.0250-03 | SDL flex without extender | 25 m |
| 5CASDL.0300-03 | SDL flex without extender | 30 m |
| 5CASDL.0300-13 | SDL flex with extender | 30 m |
| 5CASDL.0400-13 | SDL flex with extender | 40 m |

Table 93: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 1,8 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 |
| 5 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 |

Table 94: Segment lengths, resolutions and SDL cables

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|--|--|-----------------------------------|--|--|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 10 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 ¹⁾ 5CASDL.0100-03 ¹⁾ |
| 15 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 ¹⁾ 5CASDL.0150-03 ¹⁾ | - - |
| 20 | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | - |
| 25 | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | - | - |
| 30 | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-13 ²⁾ - | 5CASDL.0300-13 ²⁾ - | - - |
| 40 | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | - |

Table 94: Segment lengths, resolutions and SDL cables (cont.)

1) See table 95 "Requirements for SDL cable with automatic cable adjustment (equalizer)" on page 193

2) See table 96 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 193

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|----------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. B0 | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. B0 | |

Table 95: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|-------------------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. D0 or higher | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. D0 or higher | |

Table 96: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

| Firmware | Name | Version | Note |
|----------------|--|-------------------|------|
| 5AC600.SDL0-00 | AP Link SDL transmitter | Rev. B3 | |
| 5PC600.SX01-00 | System 1 PCI | Rev. E0 | |
| 5PC600.SX02-00 | System 2 PCI, 1 disk drive slot, 1 AP Link slot | Rev. D0 or higher | |
| 5PC600.SX02-01 | System 2 PCI, 1 disk drive slot | Rev. E0 | |
| 5PC600.SF03-00 | System 3 PCI, 1 disk drive slot, 1 AP Link slot | Rev. A0 | |
| 5PC600.SX05-00 | System 5 PCI, 2 disk drive slots, 1 AP Link slot | Rev. C0 | |
| 5PC600.SX05-01 | System 5 PCI, 2 disk drive slots | Rev. C0 | |

Table 96: Requirements for SDL cable with extender and automatic cable adjustment (equalizer) (cont.)

3.4.4 BIOS settings

No special BIOS settings are necessary for operation.

3.4.5 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver. For detailed information, see the APC620 User's Manual.

3.4.6 Windows touch screen driver settings

For detailed information, see the APC620 User's Manual.

3.5 Four Automation Panels via SDL (AP Link)

An Automation Panel is connected to the optional SDL transmitter (AP Link) via an SDL cable. Three other Automation Panels of the same type are connected to this Automation Panel and operated via SDL. All four panels show the same content (Display Clone).

USB is supported up to a maximum distance (SDL segment 1 + SDL segment 2) of 30 m on the first two panels (front and back side). From a distance of 30 m and longer, USB is only available for the first panel (front and back side). USB devices can only be connected directly to the Automation Panel 900 (without a hub).

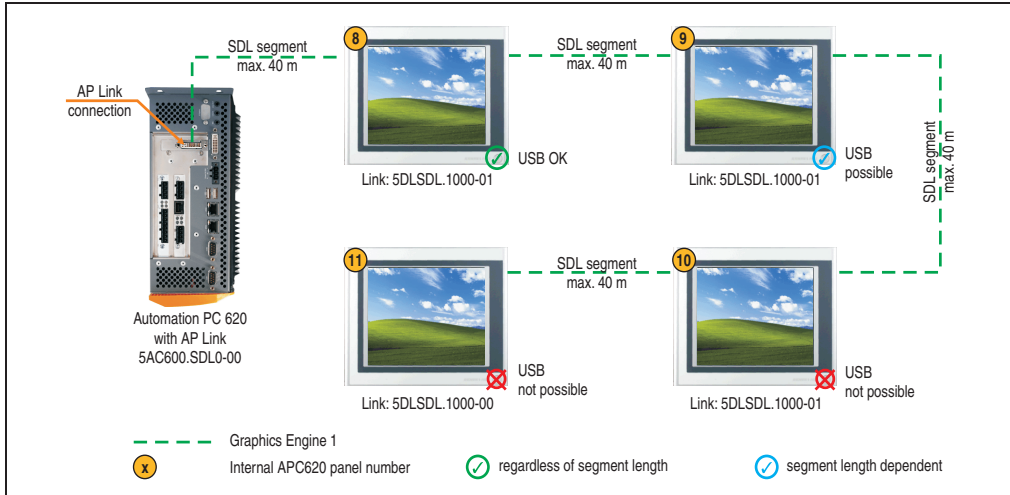


Figure 148: Configuration - Four Automation Panel 900 units via SDL (AP Link) on one line

3.5.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table (e.g. for connecting a non-B&R Automation Panel 900 device).

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-00 5PC600.X855-00 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-01 5PC600.X855-01 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-02 5PC600.X855-02 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |

Table 97: Possible combinations of system unit and CPU board

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-03 5PC600.X855-03 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-04 5PC600.X855-04 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-05 5PC600.X855-05 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |

Table 97: Possible combinations of system unit and CPU board (cont.)

3.5.2 Link modules

| Model number | Description | Note |
|----------------|---------------------------------------|---|
| 5DLSDL.1000-00 | Automation Panel Link SDL receiver | For Automation Panel 900 |
| 5DLSDL.1000-01 | Automation Panel Link SDL transceiver | For Automation Panel 900 3 pieces required |
| 5AC600.SDL0-00 | Automation Panel Link SDL transmitter | For Automation PC 620 |

Table 98: Link modules for the configuration: 4 Automation Panel 900 units via SDL (optional) on 1 line

3.5.3 cables

Selection of 4 cables from the following tables.

| Model number | Type | Length |
|----------------|--------------------------------|--------|
| 5CASDL.0018-01 | SDL with single-sided 45° plug | 1.8 m |
| 5CASDL.0018-03 | SDL flex without extender | 1.8 m |
| 5CASDL.0050-01 | SDL with single-sided 45° plug | 5 m |
| 5CASDL.0050-03 | SDL flex without extender | 5 m |
| 5CASDL.0100-01 | SDL with single-sided 45° plug | 10 m |
| 5CASDL.0100-03 | SDL flex without extender | 10 m |
| 5CASDL.0150-01 | SDL with single-sided 45° plug | 15 m |
| 5CASDL.0150-03 | SDL flex without extender | 15 m |
| 5CASDL.0200-03 | SDL flex without extender | 20 m |
| 5CASDL.0250-03 | SDL flex without extender | 25 m |
| 5CASDL.0300-03 | SDL flex without extender | 30 m |
| 5CASDL.0300-13 | SDL flex with extender | 30 m |
| 5CASDL.0400-13 | SDL flex with extender | 40 m |

Table 99: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|--|--|-----------------------------------|--|--|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 1,8 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 |
| 5 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 |
| 10 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 ¹⁾ 5CASDL.0100-03 ¹⁾ |
| 15 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 ¹⁾ 5CASDL.0150-03 ¹⁾ | - - |
| 20 | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | - |
| 25 | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | - | - |
| 30 | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-13 ²⁾ - | 5CASDL.0300-13 ²⁾ - | - - |
| 40 | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | - |

Table 100: Segment lengths, resolutions and SDL cables

1) See table 101 "Requirements for SDL cable with automatic cable adjustment (equalizer)" on page 197

2) See table 102 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 198

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|----------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. B0 | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. B0 | |

Table 101: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

Start-up • Example connections with an Automation PC 620

| Firmware | Name | Version | Note |
|----------------|--|-------------------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. D0 or higher | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. D0 or higher | |
| 5AC600.SDL0-00 | AP Link SDL transmitter | Rev. B3 | |
| 5PC600.SX01-00 | System 1 PCI | Rev. E0 | |
| 5PC600.SX02-00 | System 2 PCI, 1 disk drive slot, 1 AP Link slot | Rev. D0 or higher | |
| 5PC600.SX02-01 | System 2 PCI, 1 disk drive slot | Rev. E0 | |
| 5PC600.SF03-00 | System 3 PCI, 1 disk drive slot, 1 AP Link slot | Rev. A0 | |
| 5PC600.SX05-00 | System 5 PCI, 2 disk drive slots, 1 AP Link slot | Rev. C0 | |
| 5PC600.SX05-01 | System 5 PCI, 2 disk drive slots | Rev. C0 | |

Table 102: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

3.5.4 BIOS settings

No special BIOS settings are necessary for operation.

3.5.5 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver. For detailed information, see the APC620 User's Manual.

3.5.6 Windows touch screen driver settings

For detailed information, see the APC620 User's Manual.

3.6 Two Automation Panels via SDL (onboard) and SDL (AP Link)

An Automation Panel (max. UXGA) is connected to the integrated SDL interface (onboard) via an SDL cable. A second Automation Panel (max. UXGA) is connected to the optional SDL transmitter (AP Link) via an SDL cable. The Automation Panels show different content (Extended Desktop) and can be different types.

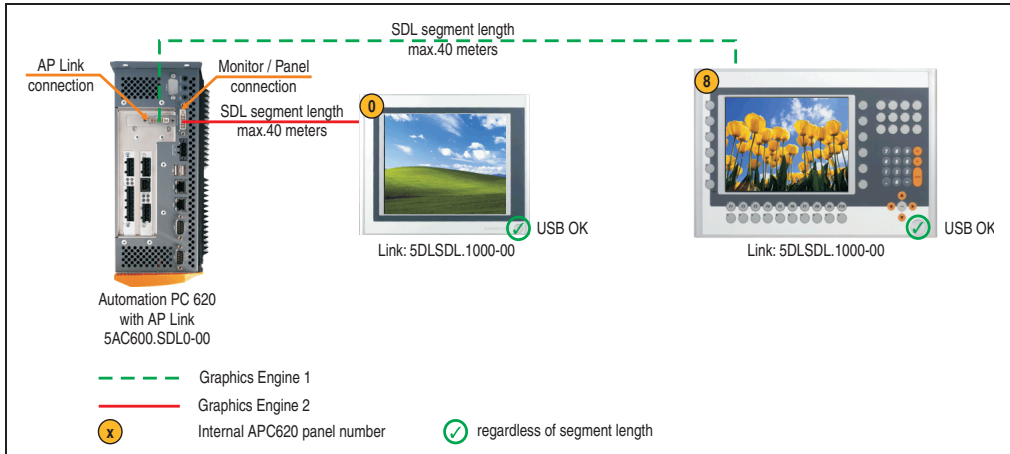


Figure 149: Configuration - Two Automation Panels via SDL (onboard) and SDL (AP Link)

3.6.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table (e.g. for connecting a non-B&R Automation Panel 900 device).

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-00 5PC600.X855-00 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-01 5PC600.X855-01 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-02 5PC600.X855-02 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-03 5PC600.X855-03 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-04 5PC600.X855-04 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-05 5PC600.X855-05 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |

Table 103: Possible combinations of system unit and CPU board

3.6.2 Link modules

| Model number | Description | Note |
|----------------|---------------------------------------|---|
| 5DLSDL.1000-00 | Automation Panel Link SDL receiver | For Automation Panel 900 2 pieces required |
| 5AC600.SDL0-00 | Automation Panel Link SDL transmitter | For Automation PC 620 |

Table 104: Link modules for the configuration - Two Automation Panels via SDL and SDL (optional)

3.6.3 cables

Selection of 2 cables from the following tables.

| Model number | Type | Length |
|----------------|--------------------------------|--------|
| 5CASDL.0018-01 | SDL with single-sided 45° plug | 1.8 m |
| 5CASDL.0018-03 | SDL flex without extender | 1.8 m |
| 5CASDL.0050-01 | SDL with single-sided 45° plug | 5 m |
| 5CASDL.0050-03 | SDL flex without extender | 5 m |
| 5CASDL.0100-01 | SDL with single-sided 45° plug | 10 m |
| 5CASDL.0100-03 | SDL flex without extender | 10 m |
| 5CASDL.0150-01 | SDL with single-sided 45° plug | 15 m |
| 5CASDL.0150-03 | SDL flex without extender | 15 m |
| 5CASDL.0200-03 | SDL flex without extender | 20 m |
| 5CASDL.0250-03 | SDL flex without extender | 25 m |
| 5CASDL.0300-03 | SDL flex without extender | 30 m |
| 5CASDL.0300-13 | SDL flex with extender | 30 m |
| 5CASDL.0400-13 | SDL flex with extender | 40 m |

Table 105: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 1,8 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 |
| 5 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 |

Table 106: Segment lengths, resolutions and SDL cables

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|--|--|-----------------------------------|--|--|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 10 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 ¹⁾ 5CASDL.0100-03 ¹⁾ |
| 15 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 ¹⁾ 5CASDL.0150-03 ¹⁾ | - - |
| 20 | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | - |
| 25 | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | - | - |
| 30 | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-13 ²⁾ - | 5CASDL.0300-13 ²⁾ - | - - |
| 40 | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | - |

Table 106: Segment lengths, resolutions and SDL cables (cont.)

1) See table 107 "Requirements for SDL cable with automatic cable adjustment (equalizer)" on page 201

2) See table 108 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 201

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|----------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. B0 | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. B0 | |

Table 107: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|-------------------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. D0 or higher | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. D0 or higher | |

Table 108: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

| Firmware | Name | Version | Note |
|----------------|--|-------------------|------|
| 5AC600.SDL0-00 | AP Link SDL transmitter | Rev. B3 | |
| 5PC600.SX01-00 | System 1 PCI | Rev. E0 | |
| 5PC600.SX02-00 | System 2 PCI, 1 disk drive slot, 1 AP Link slot | Rev. D0 or higher | |
| 5PC600.SX02-01 | System 2 PCI, 1 disk drive slot | Rev. E0 | |
| 5PC600.SF03-00 | System 3 PCI, 1 disk drive slot, 1 AP Link slot | Rev. A0 | |
| 5PC600.SX05-00 | System 5 PCI, 2 disk drive slots, 1 AP Link slot | Rev. C0 | |
| 5PC600.SX05-01 | System 5 PCI, 2 disk drive slots | Rev. C0 | |

Table 108: Requirements for SDL cable with extender and automatic cable adjustment (equalizer) (cont.)

3.6.4 BIOS settings

No special BIOS settings are necessary for operation.

To operate Automation Panel 900 display units with a touch screen (Extended Desktop or Dual Display Clone), the serial interfaces COM C and COM D must be activated in BIOS (BIOS default setting = disabled).

3.6.5 Windows graphics driver settings

If all connected Automation Panel 900 displays (line 1 + line 2) should display the same content, then "Dual Display Clone" mode must be set in the graphics driver.

If all connected Automation Panel 900 displays (line 1 + line 2) should display the same content, then "Dual Display Clone" mode must be set in the graphics driver.

For detailed information, see the APC620 User's Manual.

3.6.6 Windows touch screen driver settings

For detailed information, see the APC620 User's Manual.

3.7 Eight Automation Panels via SDL (onboard) and SDL (AP Link)

Four Automation Panels (max. UXGA) are connected to the integrated SDL interface (onboard) via SDL. Four additional Automation Panels (max. UXGA) are connected to the optional SDL transmitter (AP Link). The Automation Panels in each line must be the same type. The display content of the two lines is different (Extended Desktop), but the displays in the same line show the same content (Display Clone).

USB is supported up to a maximum distance (SDL segment 1 + SDL segment 2) of 30 m on the first two panels (front and back side). From a distance of 30 m and longer, USB is only available for the first panel on each line. In this case, USB devices can only be connected directly to the Automation Panel 900 (without a hub).

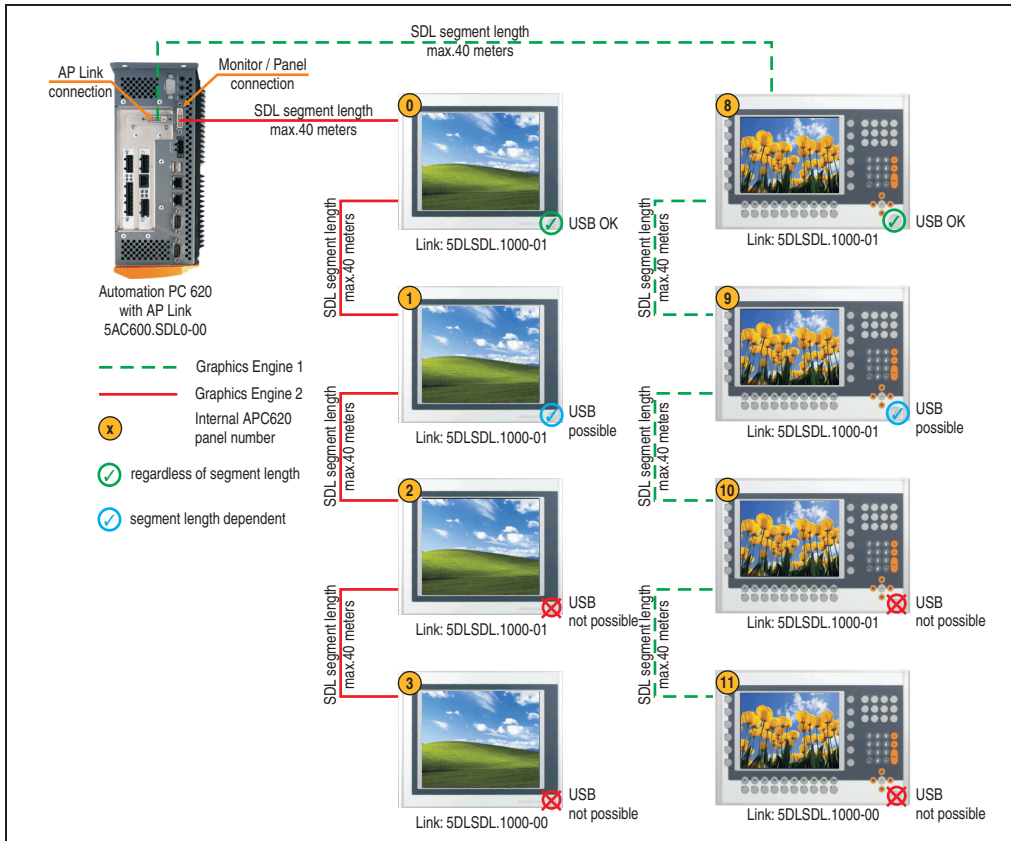


Figure 150: Configuration - Eight Automation Panels via SDL (onboard) and SDL (AP Link)

3.7.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table (e.g. for connecting a non-B&R Automation Panel 900 device).

| CPU board | with system unit | | | | | | Limitation Resolution |
|----------------------------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------------------|
| | 5PC600.SX01-00 | 5PC600.SX02-00 | 5PC600.SX02-01 | 5PC600.SF03-00 | 5PC600.SX05-00 | 5PC600.SX05-01 | |
| 5PC600.E855-00 5PC600.X855-00 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-01 5PC600.X855-01 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-02 5PC600.X855-02 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-03 5PC600.X855-03 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-04 5PC600.X855-04 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |
| 5PC600.E855-05 5PC600.X855-05 | - | ✓ | - | ✓ | ✓ | - | Max. UXGA |

Table 109: Possible combinations of system unit and CPU board

3.7.2 Link modules

| Model number | Description | Note |
|----------------|---------------------------------------|---|
| 5DLSL.1000-00 | Automation Panel Link SDL receiver | For Automation Panel 900 2 pieces required |
| 5DLSL.1000-01 | Automation Panel Link SDL transceiver | For Automation Panel 900 6 pieces required |
| 5AC600.SDL0-00 | Automation Panel Link SDL transmitter | For Automation PC 620 2 pieces required |

Table 110: Link modules for the configuration: Eight Automation Panels via SDL and SDL (optional)

3.7.3 Cables

Selection of 8 cables from the following tables.

| Model number | Type | Length |
|----------------|--------------------------------|--------|
| 5CASDL.0018-01 | SDL with single-sided 45° plug | 1.8 m |
| 5CASDL.0018-03 | SDL flex without extender | 1.8 m |
| 5CASDL.0050-01 | SDL with single-sided 45° plug | 5 m |
| 5CASDL.0050-03 | SDL flex without extender | 5 m |

Table 111: Cables for SDL configurations

| Model number | Type | Length |
|----------------|--------------------------------|--------|
| 5CASDL.0100-01 | SDL with single-sided 45° plug | 10 m |
| 5CASDL.0100-03 | SDL flex without extender | 10 m |
| 5CASDL.0150-01 | SDL with single-sided 45° plug | 15 m |
| 5CASDL.0150-03 | SDL flex without extender | 15 m |
| 5CASDL.0200-03 | SDL flex without extender | 20 m |
| 5CASDL.0250-03 | SDL flex without extender | 25 m |
| 5CASDL.0300-03 | SDL flex without extender | 30 m |
| 5CASDL.0300-13 | SDL flex with extender | 30 m |
| 5CASDL.0400-13 | SDL flex with extender | 40 m |

Table 111: Cables for SDL configurations (cont.)

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

| Cables Segment length [m] | Resolution | | | | |
|------------------------------|--|--|-----------------------------------|--|--|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 |
| 1,8 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-01 5CASDL.0018-03 |
| 5 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-01 5CASDL.0050-03 |
| 10 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-01 ¹⁾ 5CASDL.0100-03 ¹⁾ |
| 15 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-01 ¹⁾ 5CASDL.0150-03 ¹⁾ | - - |
| 20 | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | 5CASDL.0200-03 ¹⁾ | - |
| 25 | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | 5CASDL.0250-03 ¹⁾ | - | - |
| 30 | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-03 ¹⁾ 5CASDL.0300-13 ²⁾ | 5CASDL.0300-13 ²⁾ - | 5CASDL.0300-13 ²⁾ - | - - |
| 40 | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | 5CASDL.0400-13 ²⁾ | - |

Table 112: Segment lengths, resolutions and SDL cables

1) See table 113 "Requirements for SDL cable with automatic cable adjustment (equalizer)" on page 206

2) See table 114 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 206

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

Start-up • Example connections with an Automation PC 620

| Firmware | Name | Version | Note |
|----------------|--|----------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. B0 | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. B0 | |

Table 113: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

| Firmware | Name | Version | Note |
|----------------|--|-------------------|---|
| MTCX FPGA | Firmware on the APC620 | V 01.15 | The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) V01.10 , available in the download area of the B&R homepage. |
| MTCX PX32 | Firmware on the APC620 | v 01.55 | |
| SDLR FPGA | Firmware on the AP Link SDL receiver and transceiver | V 01.04 | |
| SDLT FPGA | Firmware on the AP Link SDL transmitter | V 00.02 | |
| Hardware | Name | Revision | Note |
| 5DLSDL.1000-00 | AP Link SDL receiver | Rev. D0 or higher | |
| 5DLSDL.1000-01 | AP Link SDL transceiver | Rev. D0 or higher | |
| 5AC600.SDL0-00 | AP Link SDL transmitter | Rev. B3 | |
| 5PC600.SX01-00 | System 1 PCI | Rev. E0 | |
| 5PC600.SX02-00 | System 2 PCI, 1 disk drive slot, 1 AP Link slot | Rev. D0 or higher | |
| 5PC600.SX02-01 | System 2 PCI, 1 disk drive slot | Rev. E0 | |
| 5PC600.SF03-00 | System 3 PCI, 1 disk drive slot, 1 AP Link slot | Rev. A0 | |
| 5PC600.SX05-00 | System 5 PCI, 2 disk drive slots, 1 AP Link slot | Rev. C0 | |
| 5PC600.SX05-01 | System 5 PCI, 2 disk drive slots | Rev. C0 | |

Table 114: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

3.7.4 BIOS settings

No special BIOS settings are necessary for operation.

To operate Automation Panel 900 display units with a touch screen (Extended Desktop or Dual Display Clone), the serial interfaces COM C and COM D must be activated in BIOS (BIOS default setting = disabled).

3.7.5 Windows graphics driver settings

If all connected Automation Panel 900 displays (line 1 + line 2) should display the same content, then "Dual Display Clone" mode must be set in the graphics driver.
For detailed information, see the APC620 User's Manual.

3.7.6 Windows touch screen driver settings

For detailed information, see the APC620 User's Manual.

4. 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.

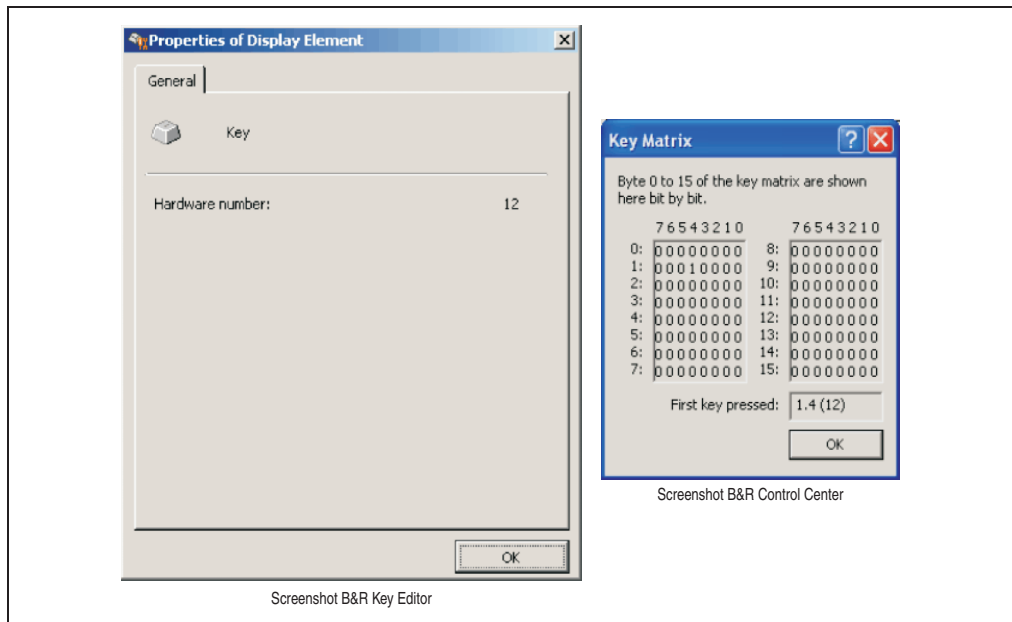


Figure 151: Example - Hardware number in the B&R Key Editor or in the B&R Control Center

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

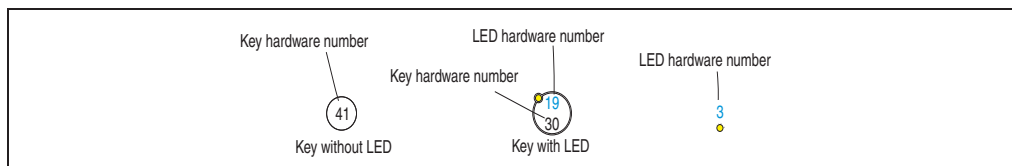


Figure 152: Display - Keys and LEDs in the matrix

4.1 Automation Panel 10.4" VGA

4.1.1 Automation Panel 5AP951.1043-01 / 5AP981.1043-01

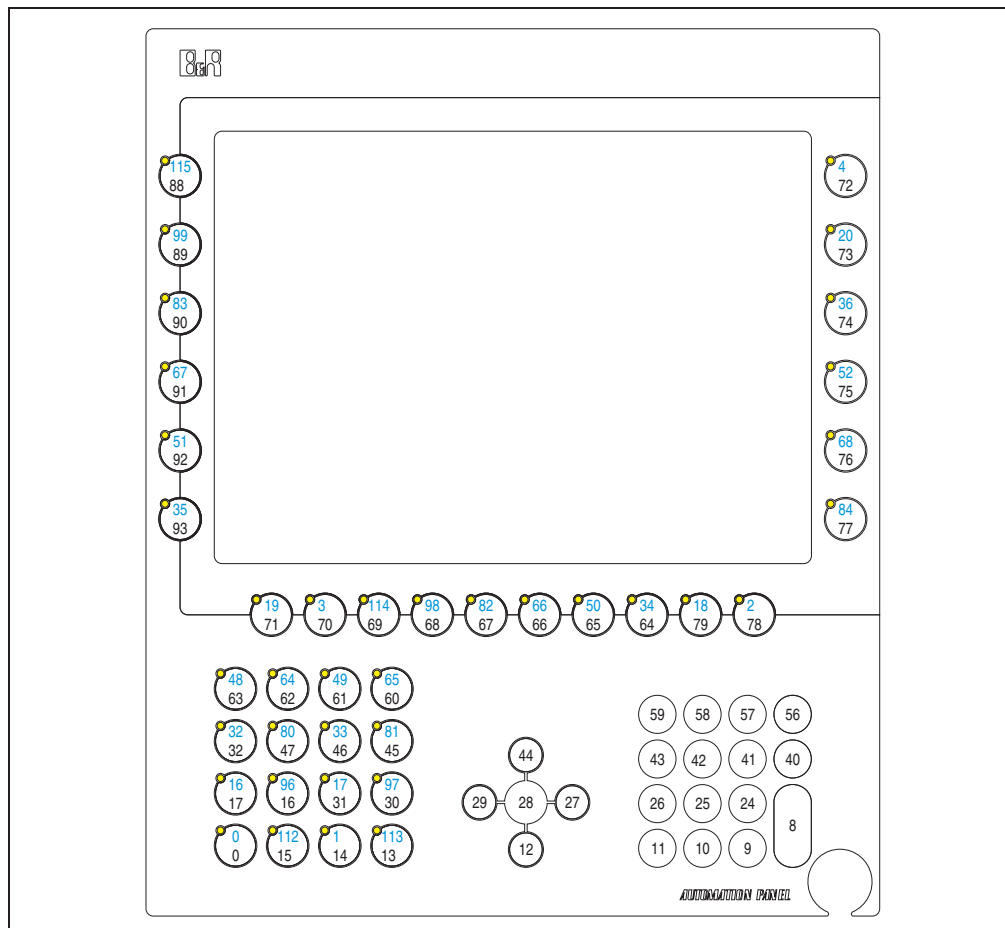


Figure 153: Hardware numbers - 5AP951.1043-01 / 5AP981.1043-01

4.1.2 Automation Panel 5AP952.1043-01 / 5AP982.1043-01

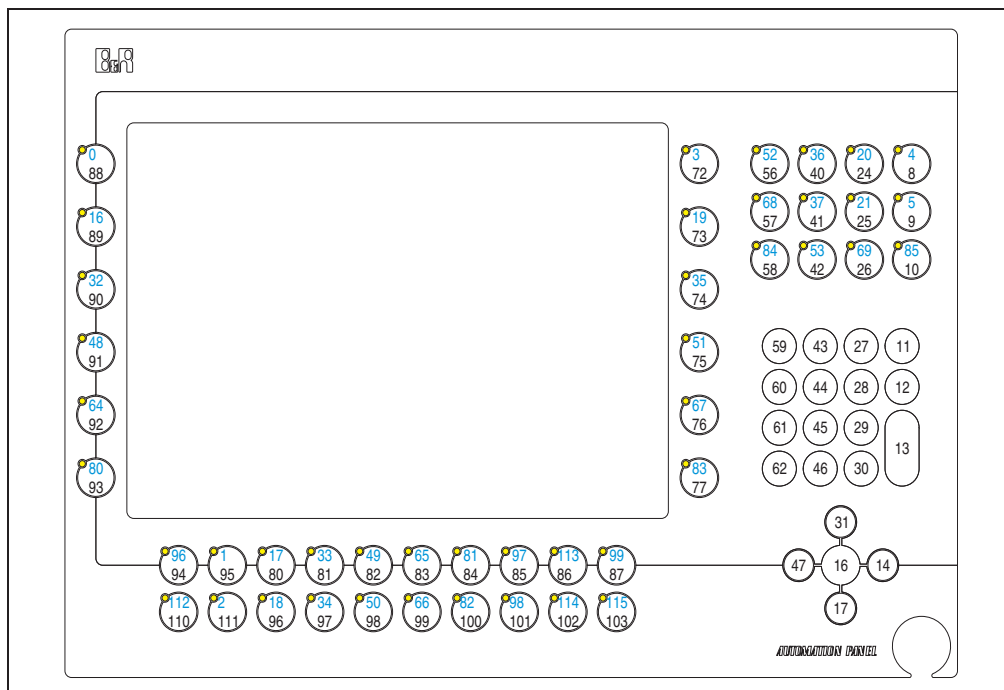


Figure 154: Hardware numbers - 5AP952.1043-01 / 5AP982.1043-01

4.1.3 Automation Panel 5AP980.1043-01

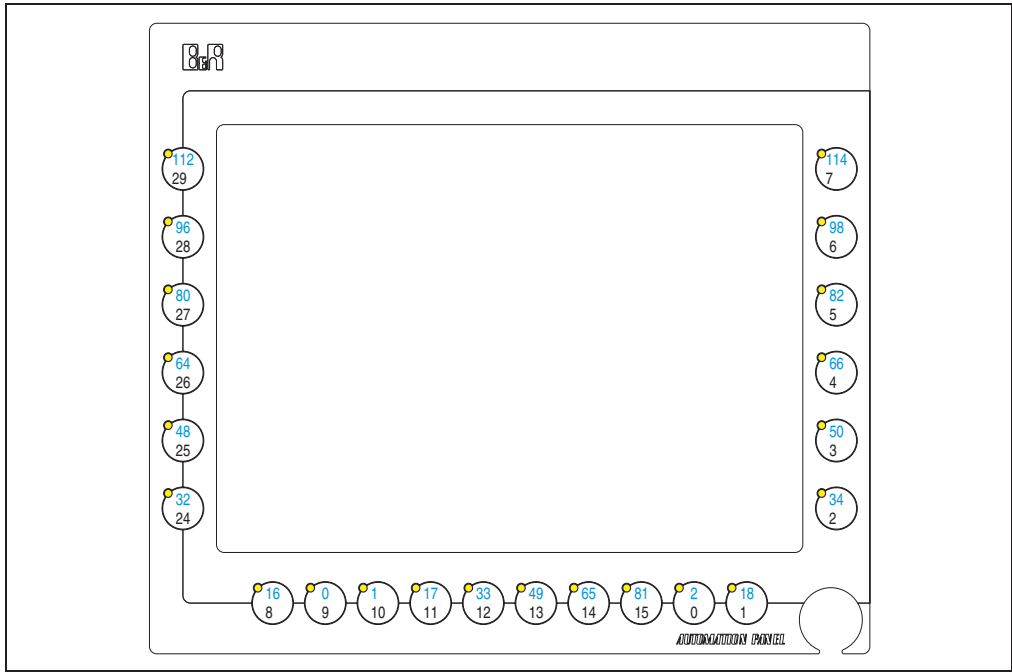


Figure 155: Hardware numbers - 5AP980.1043-01

4.2 Automation Panel 15" XGA

4.2.1 Automation Panel 5AP951.1505-01 / 5AP981.1505-01

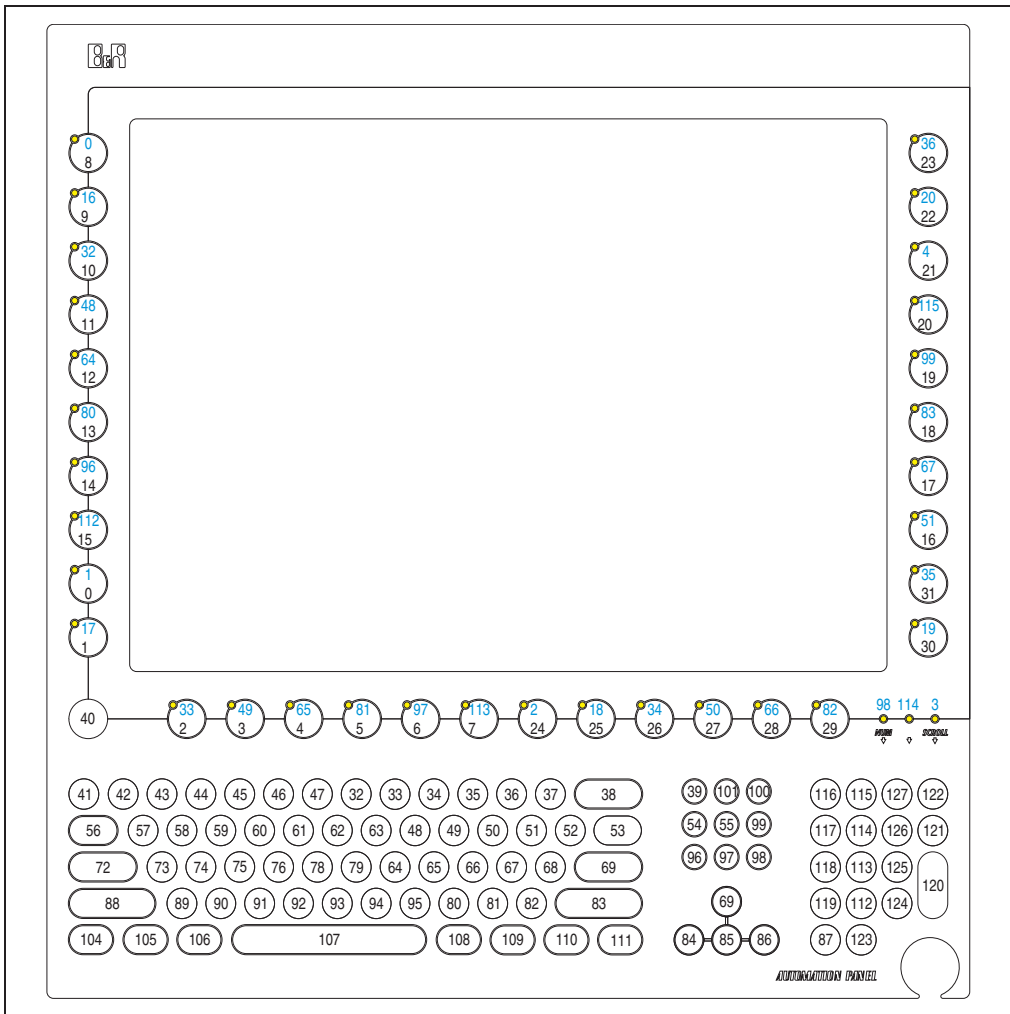


Figure 156: Hardware numbers - 5AP951.1505-01 / 5AP981.1505-01

4.2.2 Automation Panel 5AP980.1505-01

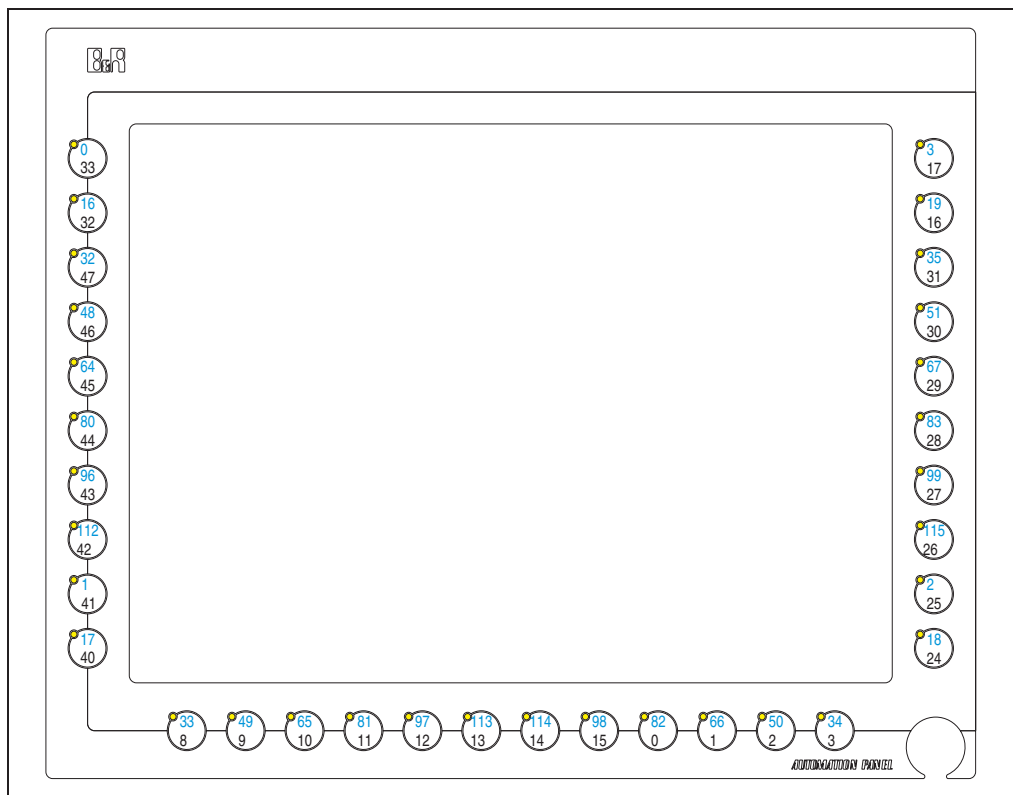


Figure 157: Hardware numbers - 5AP980.1505-01

5. Touch calibration:

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

Regardless of this, the Touch Driver requires calibration following installation.

5.1 Windows XP Professional

After installing Windows XP Professional, the touch screen driver must be installed in the device in order to operate the touch screen. Appropriate drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com). While installing the driver, the touch screen must be calibrated via the Setup.

5.2 Windows CE

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

5.3 Windows XP Embedded

After first starting Windows XP embedded (First Boot Agent), the touch screen driver must be installed in the device in order to operate the touch screen. Appropriate drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com). While installing the driver, the touch screen must be calibrated via the Setup.

5.4 Automation Runtime / Visual Components

The first time the touch screen is used, it must be calibrated once in the customer application for the existing device and project.

Chapter 4 • 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

The Automation Panel 900 units meet the following standards:

| Standard | Description |
|---------------------|---|
| 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 50082-2 | Electromagnetic compatibility (EMC), Generic immunity standard - part 2: Industrial environments (EN 50082-2 has been replaced by EN 61000-6-2) |
| EN 55022 Class B | Electromagnetic compatibility (EMC), radio disturbance characteristics, information technology equipment (ITE devices), limits and methods of measurement |
| EN 55024 | Electromagnetic compatibility (EMC), immunity characteristics, information technology equipment (ITE devices), limits and methods of measurement |
| EN 60060-1 | High-voltage test techniques - part 2: Measuring systems |
| EN 60068-2-1 | Environmental testing - part 2: Tests; test A: Cold |
| EN 60068-2-2 | 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 |
| EN 60068-2-32 | Environmental testing - part 2: Tests; test: Free fall |
| EN 60664-1 | Insulation coordination for equipment within low-voltage systems - part 1: Principles, requirements and tests |
| EN 60721-1 | Classification of environmental conditions - part 1: Environmental parameters and their severities |

Table 115: Overview of standards

Accessories • Overview of standards

| Standard | Description |
|------------------------------|---|
| 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 61000-6-2 (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 61000-6-4 (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 61508-2 | Functional safety of electrical/electronic/programmable electronic safety-related systems - part 2: Requirements for electrical/electronic/programmable electronic safety-related systems |
| UL 508 | Industrial control equipment (UL = Underwriters Laboratories) |
| VDE 0701-1 | Service, modification, and testing of electrical devices - part 1: General requirements |
| 47 CFR | Federal Communications Commission (FCC), 47 CFR Part 15 Subpart B Class A |

Table 115: Overview of standards (cont.)

3. Emission requirements

| Emissions | Test carried out according to | Limits according to |
|---------------------------|-------------------------------|---|
| Network-related emissions | EN 55022 | EN 55022: Information technology equipment (ITE devices), class B (residential areas) |
| | | EN 61000-6-4: Generic standard (industrial areas) |
| | | EN 61131-2: Programmable logic controllers |
| | | 47 CFR Part 15 Subpart B Class A (FCC) |
| Emissions | EN 55022 | EN 55022: Information technology equipment (ITE devices), class B (residential areas) |
| | | EN 61000-6-4: Generic standard (industrial areas) |
| | | EN 61131-2: Programmable logic controllers |
| | | 47 CFR Part 15 Subpart B Class A (FCC) |

Table 116: Overview of limits and testing guidelines for emissions

3.1 Network related emissions

| Test carried out according to EN 55022 | Limits according to EN 55022 class B | | |
|--|---|--|--|
| Power mains connections 150 kHz - 500 kHz | 66 - 56 dB (μV) quasi-peak value 56 - 46 dB (μV) average | | |
| Power mains connections 500 kHz - 5 MHz | 56 dB (μV) quasi-peak value 46 dB (μV) average | | |
| Power mains connections 5 MHz - 30 MHz | 60 dB (μV) quasi-peak value 50 dB (μV) average | | |
| AC mains connections 150 kHz - 500 kHz | - | | |
| AC mains connections 500 kHz - 5 MHz | - | | |
| AC mains connections 5 MHz - 30 MHz | - | | |
| DC power I/O 150 kHz - 500 kHz | - | | |
| DC power I/O 500 kHz - 30 MHz | - | | |

Table 117: Test requirements - Network-related emissions for residential areas

Accessories • Emission requirements

| | | | |
|--|--|--|--|
| Other connections 150 kHz - 500 kHz | 84 - 74 dB (μV) and 40 - 30 dB (μA) quasi-peak value 74 - 64 dB (μV) and 30 - 20 (μA) average | | |
| Other connections 500 kHz - 30 MHz | 74 dB (μV) and 30 dB (μA) quasi-peak value 64 dB (μV) and 20 dB (μA) average | | |

Table 117: Test requirements - Network-related emissions for residential areas (cont.)

| Test carried out according to EN 55022 | Limits according to EN 61000-6-4 | Limits according to EN 61131-2 | Limits according to 47 CFR Part 15 Subpart B class A |
|--|---|---|--|
| 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 | - |
| AC 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 |
| AC 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 |
| Other connections 150 kHz - 500 kHz | - | Only informative for cable lengths > 10 m 40 - 30 dB (μA) quasi-peak value 30 - 20 dB (μA) average | - |
| Other connections 500 kHz - 30 MHz | - | Only informative for cable lengths > 10 m 30 dB (μA) quasi-peak value 20 dB (μA) average | - |

Table 118: Test requirements - Network-related emissions for industrial areas

1) AC network connections only with EN 61131-2

3.2 Emissions, electromagnetic emissions

| Test carried out according to EN 55022 | Limits according to EN 55022 class B | | |
|--|--------------------------------------|--|--|
| 30 MHz - 230 MHz measured at a distance of 10 m | < 30 dB (μV/m) quasi-peak value | | |
| 230 MHz - 1 GHz measured at a distance of 10 m | < 37 dB (μV/m) quasi-peak value | | |

Table 119: : Test requirements - Electromagnetic emissions for residential areas

| Test carried out according to EN 55022 | Limits according to EN 61000-6-4 | Limits according to EN 61131-2 | |
|---|--|------------------------------------|--|
| 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 | |
| 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 | |
| Test carried out | Limits according to 47 CFR Part 15 Subpart B class A | | |
| 30 MHz - 88 MHz measured at a distance of 10 m | < 90 dB (μV/m) quasi-peak value | | |
| 88 MHz - 216 MHz measured at a distance of 10 m | < 150 dB (μV/m) quasi-peak value | | |
| 216 MHz - 960 MHz measured at a distance of 10 m | < 210 dB (μV/m) quasi-peak value | | |
| >960 MHz measured at a distance of 10 m | < 300 dB (μV/m) quasi-peak value | | |

Table 120: : Test requirements - Electromagnetic emissions for industrial areas

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 against 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) |

Table 121: 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 122: 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 123: 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 124: Test requirements - High-speed transient electrical disturbances (burst)

1) For EN 55024 without length limitation.

4.4 Surges

| 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 125: 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 |
| 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 126: Test requirements - Conducted disturbances

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 127: 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%, criteria A | - |

Table 128: Test requirements - Voltage dips, fluctuations, and short-term interruptions

5. Mechanical conditions

| Vibration | Test carried out according to | Limits according to |
|---------------------------------------|-------------------------------|---|
| Vibration operation | EN 60068-2-6 | EN 61131-2: Programmable logic controllers EN 60721-3-3 class 3M4 |
| Vibration during transport (packaged) | EN 60068-2-6 | EN 60721-3-2 class 2M1 EN 60721-3-2 class 2M2 EN 60721-3-2 class 2M3 B&R |
| 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 EN 60721-3-2 class 2M3 B&R |
| Toppling (packaged) | 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 B&R |

Table 129: 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 | | Limits according to EN 60721-3-3 class 3M4 | | |
|--|-----------------------------------|---------------------|---|---------------------|--|
| Vibration operation: Uninterrupted duty with moveable frequency in all 3 axes (x, y, z), 1 octave per minute | 10 sweeps for each axis | | 10 sweeps for each axis | | |
| | Frequency | Limit value | Frequency | Limit value | |
| | 5 - 9 Hz | Amplitude 3.5 mm | 2 - 9 Hz | Amplitude 3 mm | |
| | 9 - 150 Hz | Acceleration 1 g | 9 - 200 Hz | Acceleration 1 g | |

Table 130: Test requirements - Vibration operation

5.2 Vibration during transport (packaged)

| 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 |
| | Limit values according to B&R | | | | | |
| | 10 sweeps per axis, <u>not packaged</u> | | | | | |
| | 2 - 8 Hz | Amplitude 7.5 mm | | | | |
| | 8 - 200 Hz | Acceleration 2 g | | | | |
| | 200 - 500 Hz | Acceleration 4 g | | | | |

Table 131: Test requirements - Vibration during transport (packaged)

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 132: 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 | Limits according to EN 60721-3-2 class 2M3 |
|---|---|---|--|
| 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 | Acceleration 100 g, Length 6 ms, each 3 shocks, packaged |
| | Limits according to B&R | | |
| | Acceleration 30 g, Length 11 ms, each 3 shocks, <u>not packaged</u> | | |

Table 133: 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 134: 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 | | | | | | |
| | Limits according to B&R | | | | | | | |
| | Devices packaged | | | | | | | |
| | Weight | Height | | | | | | |
| | <40 kg | 1 m | | | | | | |

Table 135: 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 136: 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 | 3 hours at max. ambient temperature (min. +40°C) duration approx. 5 hours | 3 hours at max. ambient temperature (min. +40°C) duration approx. 5 hours | |

Table 137: 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 | 16 hours at +70°C for 1 cycle, then 1 hour acclimatization and function testing, duration approximately 17 hours | | |

Table 138: 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 | 16 hours at -40°C for 1 cycle, then 1 hour acclimatization and function testing, duration approximately 17 hours | | |

Table 139: 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 | 3 hours at -40° C and 3 hours at +70° C, 2 cycles, then 2 hours acclimatization and function testing, duration approximately 14 hours | | |

Table 140: 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 | 3 hours at +5° C and 3 hours at 55° C, 5 cycles, temperature gradient 3° C / min, the unit is occasionally supplied with voltage during testing, duration approximately 30 hours | | |
| Closed devices: These are devices whose data sheet specifies a surrounding housing (enclosure) with the corresponding safety precautions | 3 hours at +5° C and 3 hours at +55° C, 5 cycles, temperature gradient 3° C / min, the unit is occasionally supplied with voltage during testing, duration approximately 30 hours | | |

Table 141: 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 | 24 hours at +25° C / +55° C and 97% / 83% RH, 2 cycles, then 2 hours acclimatization, function testing and insulation, duration approximately 50 hours | | |

Table 142: 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) | 48 hours at +40° C and 92.5% RH, then insulation test within 3 hours, duration approximately 49 hours | | |

Table 143: Test requirements - Humid heat, constant (storage)

7. Safety

| Safety | Test carried out according to | Limits according to |
|-----------------------------|-------------------------------|--|
| Ground resistance | EN 61131-2 | |
| | | EN 61131-2: Programmable logic controllers |
| Insulation resistance | | |
| High voltage | EN 60060-1 | EN 61131-2: Programmable logic controllers |
| | | UL 508: Industrial control equipment |
| Residual voltage | EN 61131-2 | |
| | | EN 61131-2: Programmable logic controllers |
| Leakage current | | VDE 0701-1: Service, changes and testing of electrical devices |
| | | B&R |
| 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 144: Overview of limits and testing guidelines for safety

7.1 Ground resistance

| Test carried out according to EN 61131-2 | Limits according to EN 61131-2 | | |
|---|---|--|--|
| Ground resistance: housing (from any metal part to the ground terminal) | Test current 30 A for 2 min, < 0.1 Ohm | | |

Table 145: Test requirements - Ground resistance

7.2 High voltage

| Test carried out according to EN 60060-1 | Limits according to EN 61131-2 ¹⁾ | | | | Limits according to UL 508 | | |
|---|---|---|-----------|-----------|-------------------------------|--------------------------------|--|
| High voltage: Primary circuit to secondary circuit and to protective ground circuit (transformers, coils, varistors, capacitors and components used to protect against over-voltage can be removed before the test) | Input voltage | Test voltage | | | Input voltage | Test voltage | |
| | | 1.2/50 μ s voltage surge peak | AC, 1 min | DC, 1 min | | AC, 1 min | DC, 1 min |
| | 0 - 50 VAC 0 - 60 VDC | 850 V | 510 V | 720 V | ≤50 V | 500 V | 707 V |
| | 50 - 100 VAC 60 - 100 VDC | 1360 V | 740 V | 1050 V | > 50 V | 1000 V + 2 x U _N | (1000 V + 2 x U _N) x 1.414 |
| | 100 - 150 VAC 100 - 150 VDC | 2550 V | 1400 V | 1950 V | | | |
| | 150 - 300 VAC 150 - 300 VDC | 4250 V | 2300 V | 3250 V | | | |
| | 300 - 600 VAC 300 - 600 VDC | 6800 V | 3700 V | 5250 V | | | |
| | 600 - 1000 VAC 600 - 1000 VDC | 10200 V | 5550 V | 7850 V | | | |

Table 146: Test requirements - High voltage

1) See EN 61131-2:2003 page 104, table 59.

7.3 Residual voltage

| Test carried out according to EN 61131-2 | Limits according to EN 61131-2 | | |
|---|---|--|--|
| Residual voltage after switching off | < 60 V after 5 sec (active parts) < 60 V after 1 sec (plug pins) | | |

Table 147: Test requirements - Residual voltage

7.4 Leakage current

| Test carried out | Limits according to VDE 0701-1 | B&R | |
|----------------------------------|-----------------------------------|--------|--|
| Leakage current: Phase to ground | < 3.5 mA | < 1 mA | |

Table 148: Test requirements - Leakage current

7.5 Overload

| Test carried out according to UL 508 | Limits according to EN 61131-2 | Limits according to UL 508 | |
|--------------------------------------|--|--|--|
| Overload of transistor outputs | 50 switches, 1.5 I _N , 1 sec on / 9 sec off | 50 switches, 1.5 I _N , 1 sec on / 9 sec off | |

Table 149: Test requirements - Overload

7.6 Defective component

| Test carried out according to UL 508 | Limits according to EN 61131-2 | Limits according to UL 508 | |
|---|---|---|--|
| Simulation of how components in power supply became defective | Non-flammable surrounding cloth No contact with conductive parts | Non-flammable surrounding cloth No contact with conductive parts | |

Table 150: Test requirements - Defective component

7.7 Voltage range

| Test carried out according to | Limits according to EN 61131-2 | | | |
|-------------------------------|---|-------------------|--|--|
| Supply voltage | Measurement value | Tolerance min/max | | |
| | 24 VDC 48 VDC 125 VDC | -15% +20% | | |
| | 24 VAC 48 VAC 100 VAC 110 VAC 120 VAC 200 VAC 230 VAC 240 VAC 400 VAC | 15% +10% | | |

Table 151: Test requirements - Voltage range

8. Other tests

| Other tests | Test carried out according to | Limits according to |
|---------------------|-------------------------------|---|
| Protection type | - | EN 60529: Degrees of protection provided by enclosures (IP code) |
| Degree of pollution | - | EN 60664-1: Insulation coordination for equipment within low-voltage systems - part 1: Principles, requirements and tests |
| Mounting dimensions | - | B&R |

Table 152: Overview of limits and testing guidelines for other tests

8.1 Protection type

| Test carried out according to | Limits according to EN 60529 | | |
|--|--|--|--|
| Protection of the operating equipment | IP.6 Protection against large solid foreign bodies: dust-proof | | |
| Protection of personnel | IP.6 Protection against touching dangerous parts with conductor | | |
| Protection against water permeation with damaging consequences | IP.5 Protected against sprayed water | | |

Table 153: Test requirements - Protection

8.2 Degree of pollution

| Test carried out according to | Limits according to EN 60664-1 | | |
|-------------------------------|--------------------------------|--|--|
| Definition | Degree of pollution II | | |

Table 154: Test requirements - Degree of pollution

9. International certifications

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



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

Table 155: International certifications

10. SDL flex cable - test description

10.1 Torsion

10.1.1 Structure of the test

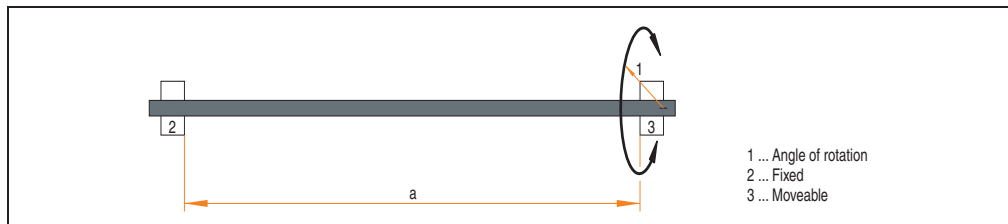


Figure 158: Test structure - Torsion

10.1.2 Test conditions

- Distance a: 450 mm
- Rotation angle: $\pm 85^\circ$
- Speed: 50 cycles / minute
- Special feature: The cable was clamped down twice in the machine.

10.1.3 Individual tests

- Visible pixel errors: At the beginning of the test, the minimum equalizer setting was determined. This is the value between 0-15 at which no more pixel errors are visible. If the equalizer setting is changed due to the mechanical load, this is noted.
- Touch screen for function (with a 21.3" Automation Panel - 5AP920.2138-01)
- USB mouse function
- Hot plug function tested by unplugging the USB plug
- After a test duration of 15000 cycles, the test was ended with a result of "OK".

10.2 Cable drag chain

10.2.1 Structure of the test

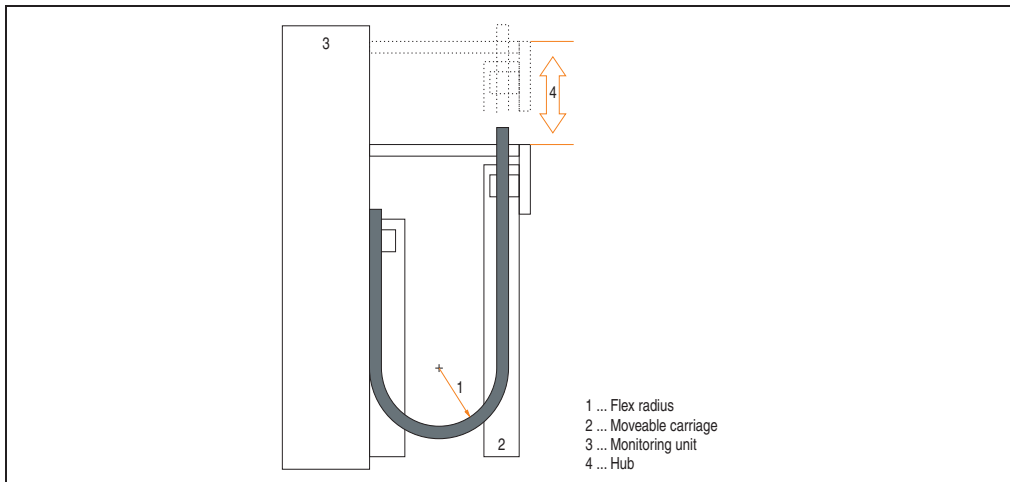


Figure 159: Test structure - Cable drag chain

10.2.2 Test conditions

- Flex radius: 180 mm (= 15 x cable diameter)
- Hub: 460 mm
- Speed: 4800 cycles / hour
- Special feature: The cable was clamped down twice in the machine.

10.2.3 Individual tests:

- Visible pixel errors: At the beginning of the test, the minimum equalizer setting is determined. This is the value between 0-15 at which no more pixel errors are visible. If the equalizer setting is changed due to the mechanical load, this is noted.
- Touch screen for function (with a 21.3" Automation Panel - 5AP920.2138-01)
- USB mouse function
- Hot plug function tested by unplugging the USB plug
- After a test duration of 30000 cycles, the test was ended with a result of "OK".

Chapter 5 • Accessories

1. Overview

| Model number | Product ID | Note |
|----------------|---|---|
| 0TB103.8 | Plug/N 24V 5.08 3-pin screw clamps Accessory terminal block, 3-pin, screw clamp, 2.5 mm ² , protection against vibration with the screw flange | |
| 0TB103.9 | Plug 24V 5.08 3-pin screw clamps 24 VDC 3-pin connector, female. Screw clamps, 2.5 mm ² , protected against vibration by the screw flange | |
| 0TB103.91 | Plug 24V 5.08 3-pin cage clamps 24 VDC 3-pin connector, female. Cage clamps, 2.5 mm ² , protected against vibration by the screw flange | |
| 5AC900.104X-03 | Legend strip template 10.4" for Automation Panel 5AP951.1043-01 and 5A981.1043-01, for 1 device. | |
| 5AC900.104X-04 | Legend strip template 10.4" for Automation Panel 5AP952.1043-01 and 5A982.1043-01, for 1 device. | |
| 5AC900.104X-05 | Legend strip template 10.4" for Automation Panel 5AP980.1043-01, for 3 devices. | |
| 5AC900.150X-01 | Legend strip template 15" for Automation Panel 5AP951.1505-01, 5AP980.1505-01 and 5A981.1505-01, for 4 devices. | |
| 5AC900.1200-00 | USB interface cover (cannot be lost) Front side USB interface cover (cannot be lost) for Automation Panel 900 and Panel PC 700 devices. | |
| 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). | |
| 5MMUSB.0256-00 | USB flash drive 256 MB SanDisk USB 2.0 flash drive 256 MB | Cancelled since 03/2007 Replaced by 5MMUSB.2048-00 |
| 5MMUSB.0512-00 | USB flash drive 512 MB SanDisk USB 2.0 flash drive 512 MB | Cancelled since 07/2007 Replaced by 5MMUSB.2048-00 |
| 5MMUSB.1024-00 | USB flash drive 1 GB SanDisk USB 2.0 flash drive 1 GB | Cancelled since 03/2007 Replaced by 5MMUSB.2048-00 |
| 5MMUSB.2048-00 | USB flash drive 2 GB SanDisk USB 2.0 flash drive 2 GB | |

Table 156: Model numbers - Accessories

2. Plug/N 24V 5.08 3-pin screw clamps

The plug 0TB103.8 is needed if the Automation Panel supply should be connected using the +24 VDC output on the graphics adapter (5GA680.1000-01) in an Automation PC 680.


| Model number | Description | Figure |
|--------------|---|--|
| 0TB103.8 | Plug for the 24 V supply voltage (screw clamps) |  |
| | | |

Table 157: Order data - TB103

2.1 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 | 0TB103.8 |
|--|---|
| Number of pins | 3 |
| Type of terminal | Screw clamps |
| Distance between contacts | 5.08 mm |
| Resistance between contacts | $\leq 5 \text{ m}\Omega$ |
| Nominal voltage according to VDE / UL, CSA | 250 V / 300 V |
| Current load according to VDE / UL, CSA | 14.5 A / 10 A per contact |
| Terminal size | 0.08 mm ² - 3.31 mm ² |
| Cable type | Copper wires only (no aluminum wires!) |

Table 158: Technical data - 0TB103.8

3. TB103 3-pin supply voltage connector

3.1 General

This single row 3-pin terminal block is mainly used to connect the supply voltage.

3.2 Order data



| Model number | Description | Figure |
|--------------|---|--|
| 0TB103.9 | Plug for the 24 V supply voltage (screw clamps) |  <p>0TB103.9</p>  <p>0TB103.91</p> |
| 0TB103.91 | Plug for the 24 V supply voltage (cage clamps) | |

Table 159: Order data - TB103

3.3 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.

| Name | 0TB103.9 | 0TB103.91 |
|--|---|-------------|
| Number of pins | 3 | |
| Type of terminal | Screw clamps | Cage clamps |
| Distance between contacts | 5.08 mm | |
| Resistance between contacts | $\leq 5 \text{ m}\Omega$ | |
| Nominal voltage according to VDE / UL, CSA | 250 V / 300 V | |
| Current load according to VDE / UL, CSA | 14.5 A / 10 A per contact | |
| Terminal size | 0.08 mm ² - 3.31 mm ² | |
| Cable type | Copper wires only (no aluminum wires!) | |

Table 160: Technical data - TB103

4. Legend strip templates

Automation Panel devices with keys are delivered with partially pre-labeled key legend strips (F1, F2, etc.). The key legend strip slots are accessible on the back of the Automation Panel device (above and below).

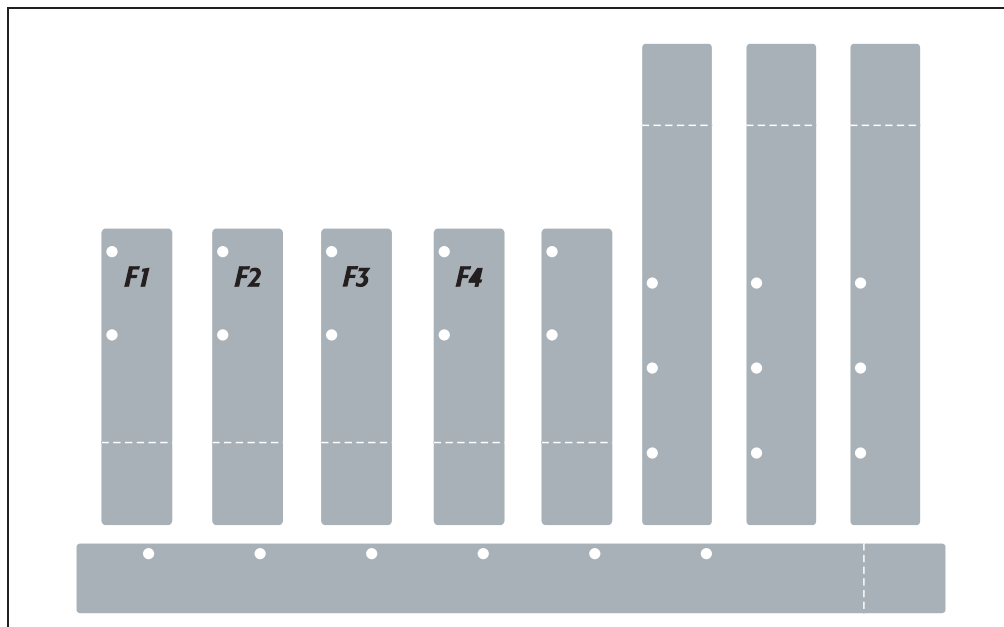


Figure 160: Legend strip templates

Printable legend strips (A4 format) can be ordered from B&R (see table 11 "Model numbers - Accessories" on page 23). They can be printed using a standard laser printer (b/w or color) in a temperature range from -40°C to +125°C. A print template (available for Corel Draw versions 7, 9 and 10) for the respective legend strip template can be downloaded from the B&R homepage at www.br-automation.com. The print templates can also be found on the HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00).

4.1 Order data

| Model number | Description | Figure |
|----------------|---|---|
| 5AC900.104X-03 | Legend strip template 10.4" Legend strip templates for Automation Panels 5AP951.1043-01 and 5A981.1043-01. For 1 device. | <p>Examples of legend strip templates</p> |
| 5AC900.104X-04 | Legend strip template 10.4" Legend strip templates for Automation Panels 5AP952.1043-01 and 5A982.1043-01. For 1 device. | |
| 5AC900.104X-05 | Legend strip template 10.4" Legend strip templates for Automation Panel 5AP980.1043-01. For 3 devices. | |
| 5AC900.150X-01 | Legend strip template 15" Legend strip templates for Automation Panels 5AP951.1505-01, 5AP980.1505-01 and 5A981.1505-01. For 4 devices. | |
| | | |

Table 161: Order data - Legend strip templates

5. USB interface cover (cannot be lost)

Front side USB interface cover (cannot be lost) for Automation Panel 900 and Panel PC 700 devices.

5.1 Order data


| Model number | Description | Figure |
|----------------|---|--|
| 5AC900.1200-00 | USB interface cover (cannot be lost) Front side USB interface cover (cannot be lost) for Automation Panel 900 and Panel PC 700 devices. |  |
| | | |

Table 162: Order data - USB interface cover (cannot be lost)

5.2 Installation

- Remove old cover.
- Feed the USB interface cover through the small opening (see red markings).

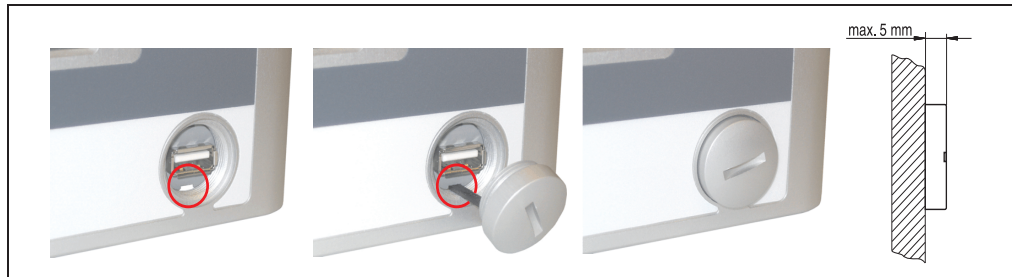


Figure 161: Front side USB interface cover - Installation

- With the cover screwed on, the front side of the display is raised a maximum of 5 mm.

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



Figure 162: 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 163: 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
- CompactFlash lifespan calculation for 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)

7. 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. As a result, it may be necessary (e.g. using the SanDisk Cruzer Micro flash drive with 512 MB) to take the following measures in order to boot from these flash drives:

- 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.

7.1 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.

7.2 Order data

| Model number | Description | Figure |
|----------------|--|---|
| 5MMUSB.0256-00 | USB flash drive 256 MB SanDisk Cruzer Mini | <p>SanDisk Cruzer® Mini</p> <p>SanDisk Cruzer®</p> <p>SanDisk Cruzer® Micro</p> |
| 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 164: Order data - USB flash drives

7.3 Technical data

Information:

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

| Features | 5MMUSB.0256-00 | 5MMUSB.0512-00 | 5MMUSB.1024-00 | 5MMUSB.2048-00 |
|---|---|----------------|----------------|----------------|
| LED Cruzer Mini / Cruzor Micro | 1 LED (green), signals data transfer (send and receive) | | | |
| Power supply Current requirements Cruzor Mini / Cruzor Micro | Via the USB port 650 µA sleep mode, 150 mA read/write | | | |
| Interface Cruzor Mini / Cruzor 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 / Cruzor Micro | 100000 hours | | | |
| Data retention Cruzer Mini / Cruzor Micro | 10 years | | | |
| Maintenance Cruzer Mini / Cruzor 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 - Cruzor Mini / Cruzor Micro Width - Cruzor Mini / Cruzor Micro Depth - Cruzor Mini / Cruzor Micro | 62 mm / 52.2 mm 19 mm / 19 mm 11 mm / 7.9 mm | | | |
| Environmental characteristics | | | | |
| Environmental temperature Cruzor Mini / Cruzor Micro Operation Storage Transport | 0°C .. +45°C -20°C .. +60°C -20°C .. +60°C | | | |
| Humidity Cruzor Mini / Cruzor Micro Operation Storage Transport | 10% .. 90%, non-condensing 5% .. 90%, non-condensing 5% .. 90%, non-condensing | | | |
| Vibration Cruzor Mini / Cruzor 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 165: Technical data - USB flash drive 5MMUSB.xxxx-00

| Features | 5MMUSB.0256-00 | 5MMUSB.0512-00 | 5MMUSB.1024-00 | 5MMUSB.2048-00 |
|--|--|----------------|----------------|----------------|
| Shock Cruiser Mini / Cruiser 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 Cruiser Mini / Cruiser Micro Operation Storage Transport | 3048 meters 12192 meters 12192 meters | | | |

Table 165: Technical data - USB flash drive 5MMUSB.xxxx-00 (cont.)

1) For Win 98SE, a driver can be downloaded from the [SanDisk](http://www.sandisk.com) homepage.

7.3.1 Temperature humidity diagram - Operation and storage

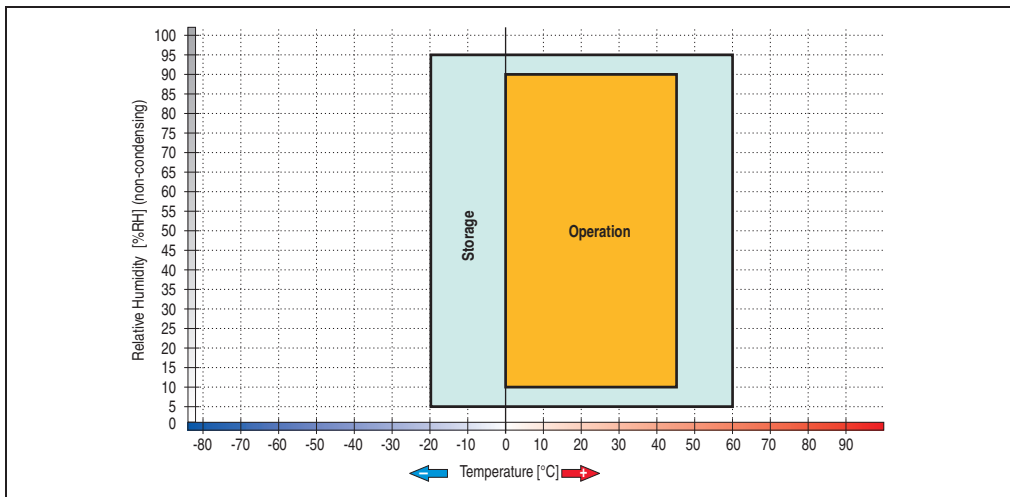


Figure 163: Temperature humidity diagram - USB flash drive - 5MMUSB.xxxx-00

7.4 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 166: 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 cover or strap.

Chapter 6 • Service and maintenance

1. Cleaning

Danger!

Automation Panel 900 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 Automation Panel 900 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 Automation Panel 900 device! Never use aggressive solvents, chemicals, scouring agents, pressurized air or steam jet.

Information:

Displays with touch screens should be cleaned at regular intervals.

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

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

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

2.1 What measures can be taken against this?

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

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

Turning off the background lighting (backlight) does not influence the prevention of the after-image effect.

3. Exchanging the fluorescent tubes

Danger!

The fluorescent tubes may only be exchanged by trained personnel when the Automation Panel 900 device and the entire system are turned off.

3.1 General

The fluorescent tubes in the TFT display are subject to wear. Depending on the number of operating hours (see technical data for the Automation Panel) they must be exchanged after several years.

The fluorescent tubes can be exchanged in the 10.4", 12.1", and 15" Automation Panel 900 devices.

They cannot be exchanged in the 17", 19", and 21.3" Automation Panel 900 devices.

Warning!

To avoid damaging the fluorescent tubes during the exchange, they should be pulled out by grasping them on the plastic frame (10.4" unit) or on the white plate (12.1" and 15" units) using a small flat nose pliers. Don't pull on the cables, as this can break the tubes.

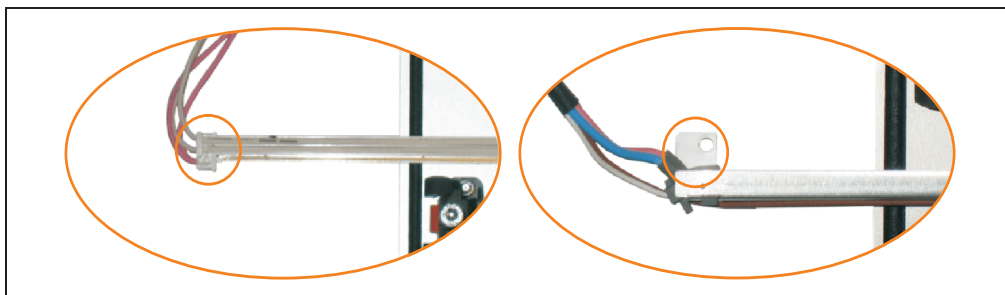


Figure 164: Warning - Exchanging the fluorescent tubes

3.2 Procedure

First step for all units (10.4", 12.1", 15").

Remove the cover. Remove the fastening screws (1) and insert card (2). Loosen the screws on the cover (using Torx screw driver size 10) and remove the cover (3).

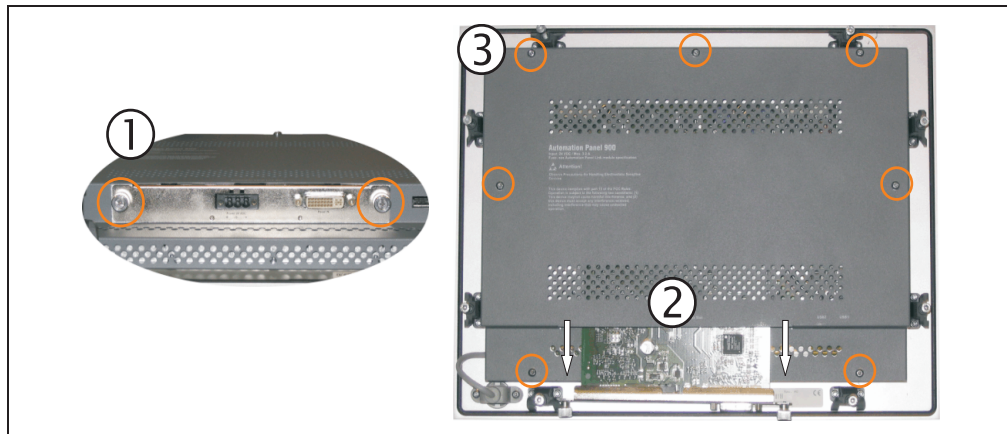


Figure 165: Remove the cover

3.2.1 Procedure for 10.4" Automation Panel

- 1) Using a size 10 Torx screwdriver, remove the screws from the circuit board (1) and tilt it to the side to access the plug for the fluorescent tube. Unplug the fluorescent tube (2).

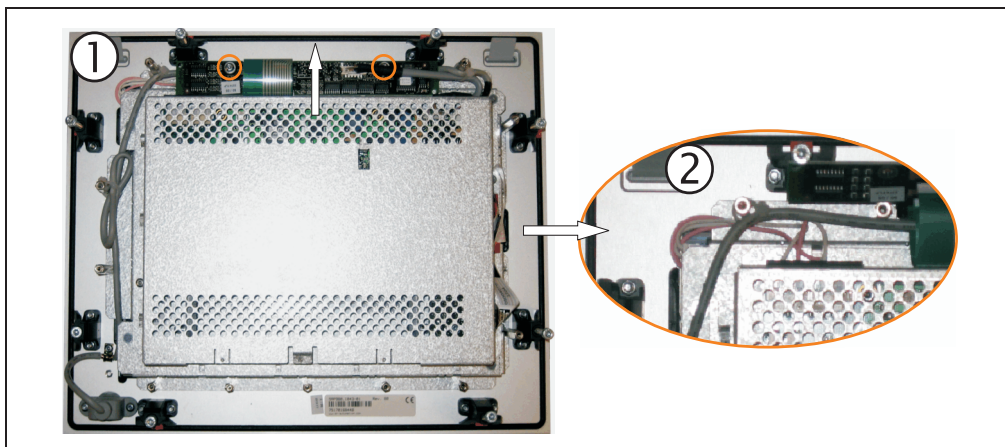


Figure 166: 10.4" Automation Panel - Unscrew and unplug

- 2) Exchange fluorescent tube. To do this, carefully pull the tube out of its holder and replace with a new one.

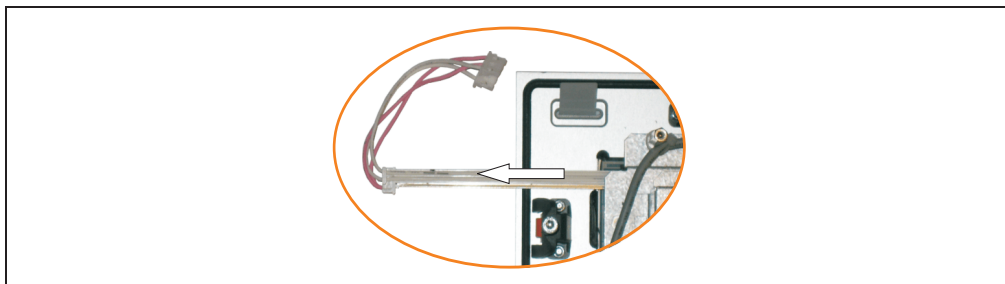


Figure 167: 10.4" Automation Panel - Exchange fluorescent tube

3.2.2 Procedure for 12.1" Automation Panel

- 1) Using a small Phillips screwdriver, remove the screws and unplug the fluorescent tube.

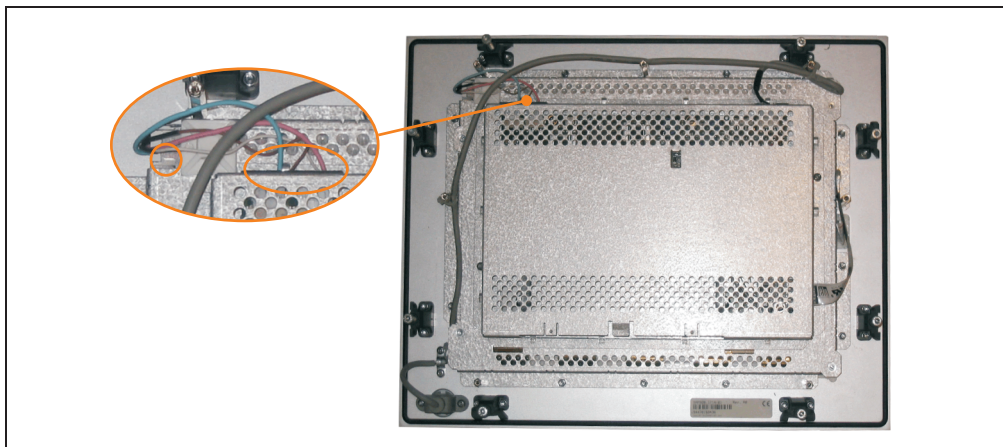


Figure 168: 12.1" Automation Panel - Unscrew and unplug

- 2) Exchange fluorescent tube. To do this, carefully pull the tube out of its holder and replace with a new one.

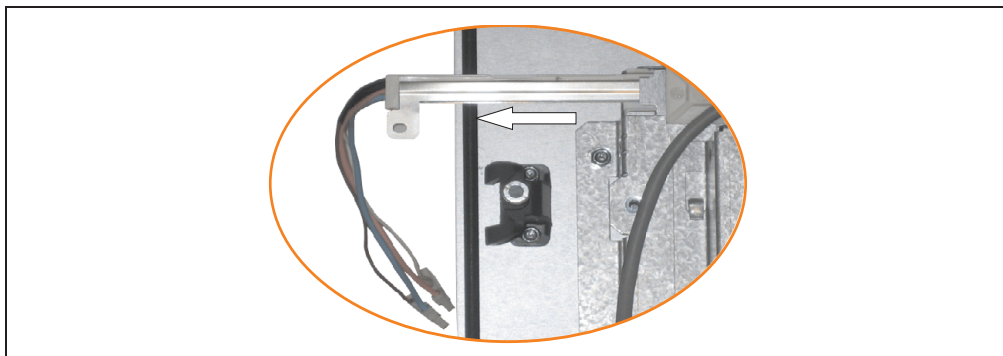


Figure 169: 12.1" Automation Panel - Exchange fluorescent tube

3.2.3 Procedure for 15" Automation Panel

- 1) Unplug the fluorescent tube (1). Using a small Phillips screwdriver, remove the screws (2) from the fluorescent tubes, and using a size 10 Torx screwdriver, remove the ground (3) from the housing.

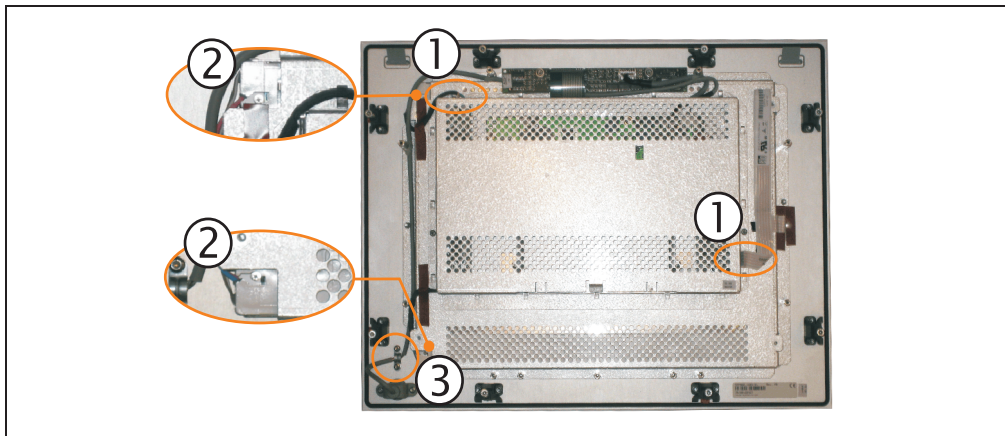


Figure 170: 15" Automation Panel - Unscrew and unplug

- 2) Unplug the second fluorescent tube. Loosen the screws (using a size 10 Torx screw driver) and push the cover up (1), tilt it up and unplug the tube (2).

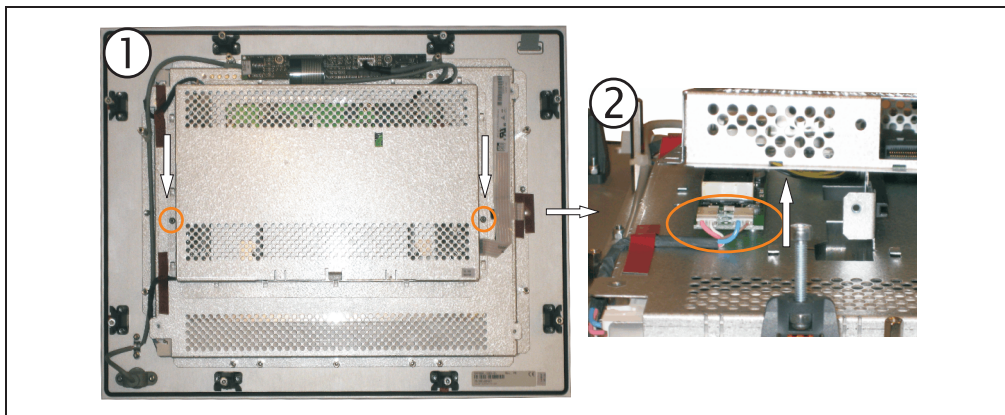


Figure 171: 15" Automation Panel - Remove cover and unplug

- 3) Exchange fluorescent tubes. To do this, carefully pull the tubes out of their holders and replace with new ones.

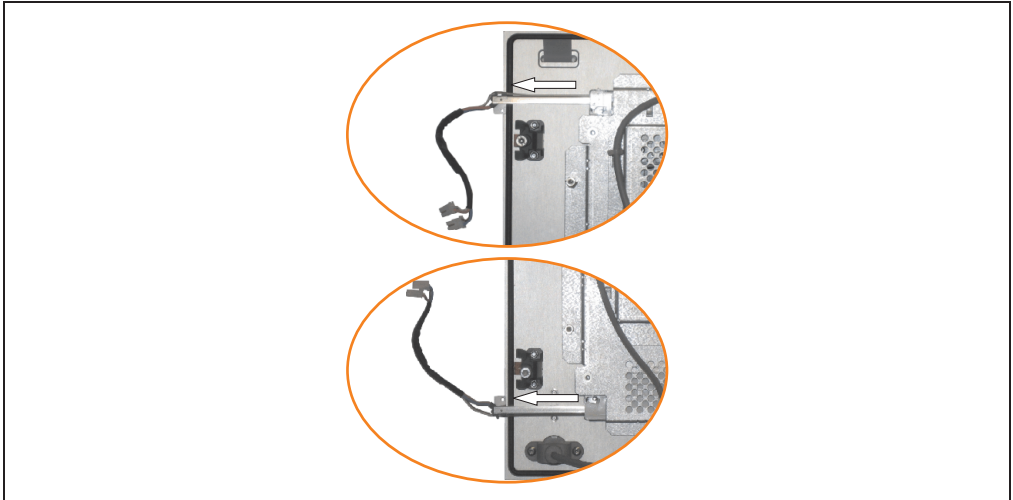


Figure 172: 15" Automation Panel - Exchange fluorescent tubes

Appendix A

1. Touch screen

1.1 Elo Accu Touch

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.

| Elo Accu touch screen | Specifications |
|--|---|
| Manufacturer | Elo |
| Accuracy For < 18" diagonals For > 18" diagonals | Typically < 0.080" (2.032 mm) Maximum error in all directions 0.180" (4.752 mm) Maximum 1% of the diagonal for the active area of the touch screens |
| Response time | < 10 ms |
| Release pressure | < 113 grams |
| Resolution | 4096 x 4096 touch points |
| Light permeability | Up to 80% ±5% |
| Temperature Operation Storage Transport | - 10°C to + 50°C - 40°C to + 71°C - 40°C to + 71°C |
| Relative humidity Operation Storage Transport | Max. 90% at max. 50°C Max. 90% at max. 50°C for 240 hours, non-condensing Max. 90% at max. 50°C for 240 hours, non-condensing |
| Waterproofing | IP65 |
| Lifespan | 35 million contacts on the same point |
| Chemical resistance ¹⁾ | Acetone, ammonia-based glass cleaner, normal food and drinks, hexane, methylene chloride, methyl ethyl ketone, mineral spirits, turpentine, isopropyl alcohol |
| Activation | Finger, pointer, credit card, glove |

Table 167: Technical data - Elo Accu touch screen 5-wire

| Elo Accu touch screen | Specifications |
|-----------------------|--|
| Drivers | Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com). Additionally, they can also be found on the B&R HMI Driver and Utilities DVD (Mod. No. 5SWHMI.0000-00). |

Table 167: Technical data - Elo Accu touch screen 5-wire (cont.)

1) The active area of the touch screen is resistant to these chemicals for a timeframe of one hour at 21°C.

1.1.1 Temperature humidity diagram - Operation and storage

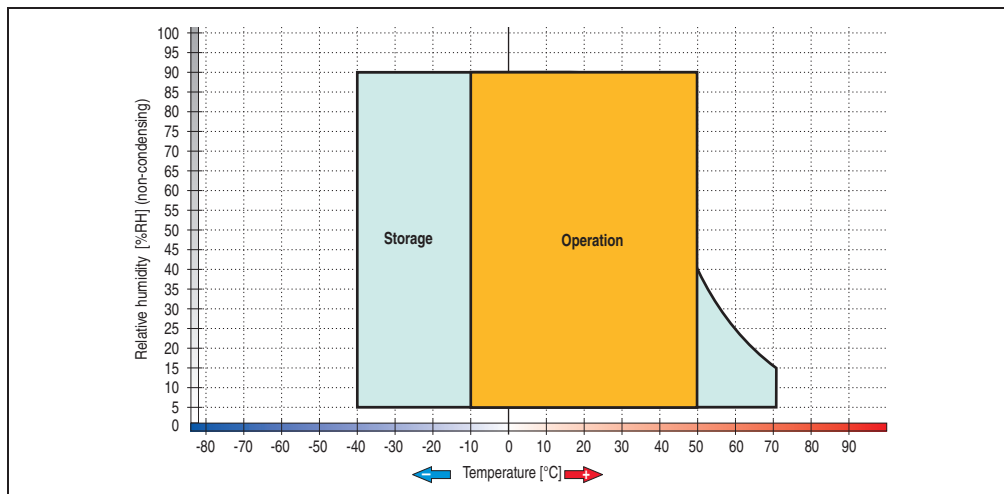


Figure 173: Temperature humidity diagram - Elo Accu touch screen

1.1.2 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, scouring agents, pressurized air or steam jet.

2. Mylar

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:

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.

| | | |
|--|---|--|
| 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% Trichloroacetic acid <50% Sulphuric acid <10% | Sodium hypochlorite <20% Hydrogen peroxide <25% Potassium carbonate Washing agents Fabric conditioner Ferric chloride Ferrous chloride (FeCl ₂) Ferrous chloride (FeCl ₃) 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 168: 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.

3. Filter glass

3.1 Mechanical characteristics

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.

Abrasion-resistant according to DIN 52347

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

3.2 Chemical properties

Durability according to DIN 50021 - CASS

4. Perspectives

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

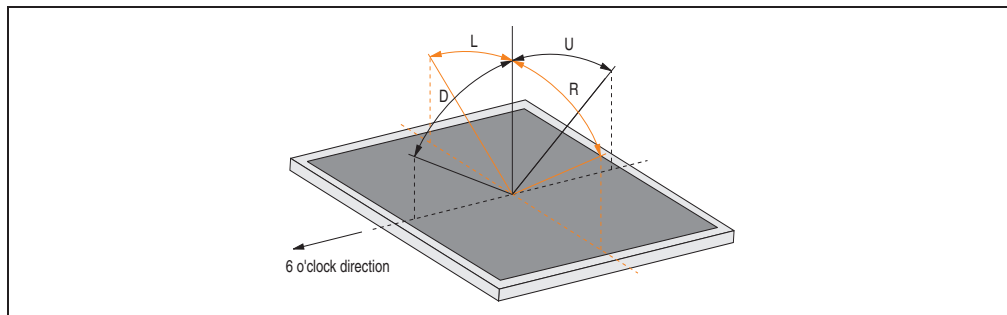


Figure 174: Viewing angles

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.

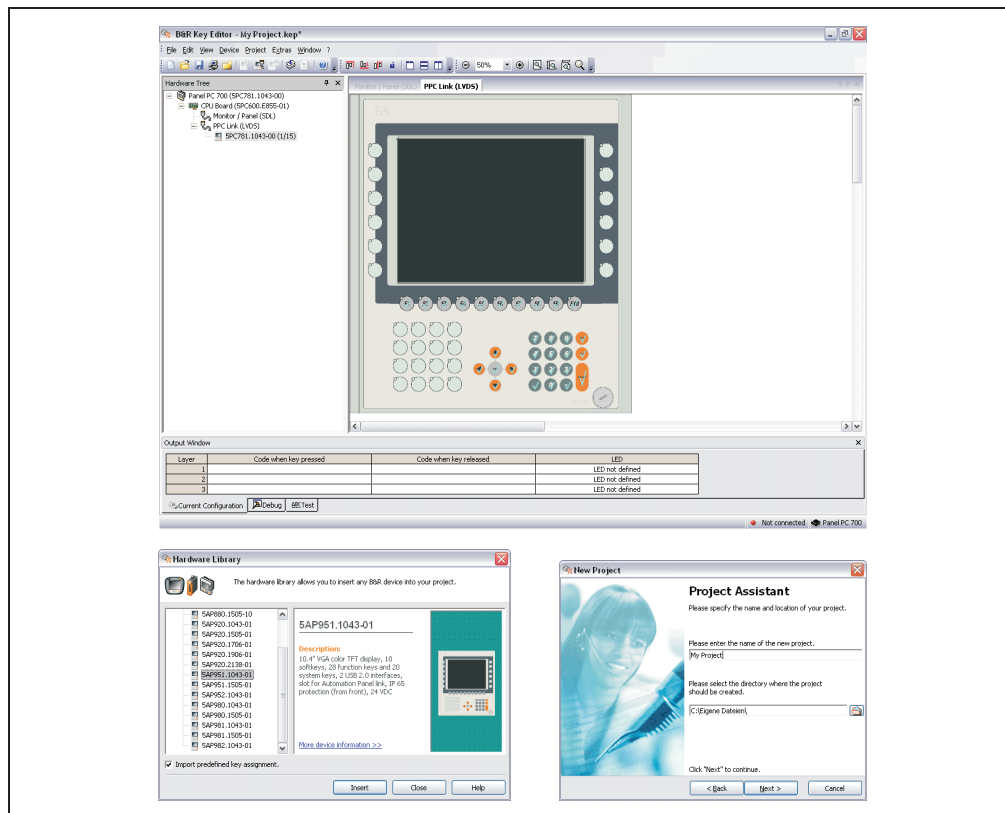


Figure 175: B&R Key Editor screenshots (Version 2.10)

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
- 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. Mounting compatibilities

This section describes the compatibility of the installation dimensions for the Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 units according to the respective device diagonals.

The outer dimensions of the device types are identical for the respective diagonals.
The different device types are abbreviated as follows:

| Device type | Abbreviation |
|----------------------|--------------|
| Power Panel 100/200 | PP100/200 |
| Power Panel 300/400 | PP300/400 |
| Automation Panel 900 | AP900 |
| Panel PC 700 | PPC700 |

Table 169: Product abbreviations

6.1 Compatibility overview

The following table offers a brief overview of the devices PP100/200, PP300/400, AP900 and PPC700. Detailed information can be found in the section "Compatibility details" on page 268.

Compatibility between the device types is represented on each line by matching symbols.



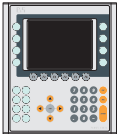
| Size | Format | Image | Compatible | PP100/200 | PP300/400 | AP900 | PPC700 |
|------|-------------|---|-------------------------|-----------|-----------|-------|--------|
| 5.7" | Horizontal1 |  | Outer dimensions | ■ | ■ | - | - |
| | | | Installation dimensions | ● | ● | - | - |
| | Horizontal2 |  | Outer dimensions | ■ | ■ | - | - |
| | | | Installation dimensions | ● | ● | - | - |
| | Vertical1 |  | Outer dimensions | ■ | ■ | - | - |
| | | | Installation dimensions | ● | ● | - | - |

Table 170: Device compatibility overview



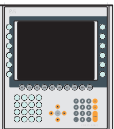

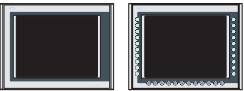


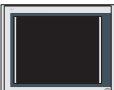
| Size | Format | Image | Compatible | PP100/200 | PP300/400 | AP900 | PPC700 |
|-------|-------------|---|-------------------------|-----------|-----------|-------|--------|
| 10.4" | Horizontal1 |  | Outer dimensions | ■ | ■ | ■ | ■ |
| | | | Installation dimensions | ● | ● | ● | ● |
| | Horizontal2 |  | Outer dimensions | ■ | ■ | ■ | ■ |
| | | | Installation dimensions | ● | ● | ▲ | ▲ |
| | Vertical1 |  | Outer dimensions | ■ | ■ | ■ | ■ |
| | | | Installation dimensions | ● | ● | ▲ | ▲ |
| 12.1" | Horizontal1 |  | Outer dimensions | ■ | ■ | ■ | ■ |
| | | | Installation dimensions | ● | ● | ▲ | ▲ |
| 15" | Horizontal1 |  | Outer dimensions | ■ | ■ | ■ | ■ |
| | | | Installation dimensions | ● | ● | ● | ● |
| | Vertical1 |  | Outer dimensions | ■ | ■ | ■ | ■ |
| | | | Installation dimensions | ● | ● | ● | ● |
| 17" | Horizontal1 |  | Outer dimensions | - | - | ■ | ■ |
| | | | Installation dimensions | - | - | ▲ | ▲ |
| 19" | Horizontal1 |  | Outer dimensions | - | - | ■ | ■ |
| | | | Installation dimensions | - | - | ▲ | - |

Table 170: Device compatibility overview


| Size | Format | Image | Compatible | PP100/200 | PP300/400 | AP900 | PPC700 |
|-------|-------------|---|-------------------------|-----------|-----------|-------|--------|
| 21.3" | Horizontal1 |  | Outer dimensions | - | - | ■ | - |
| | | | Installation dimensions | - | - | ▲ | - |

Table 170: Device compatibility overview

6.2 Compatibility details

The measurement values (all in mm) in the following figures have the following meaning.

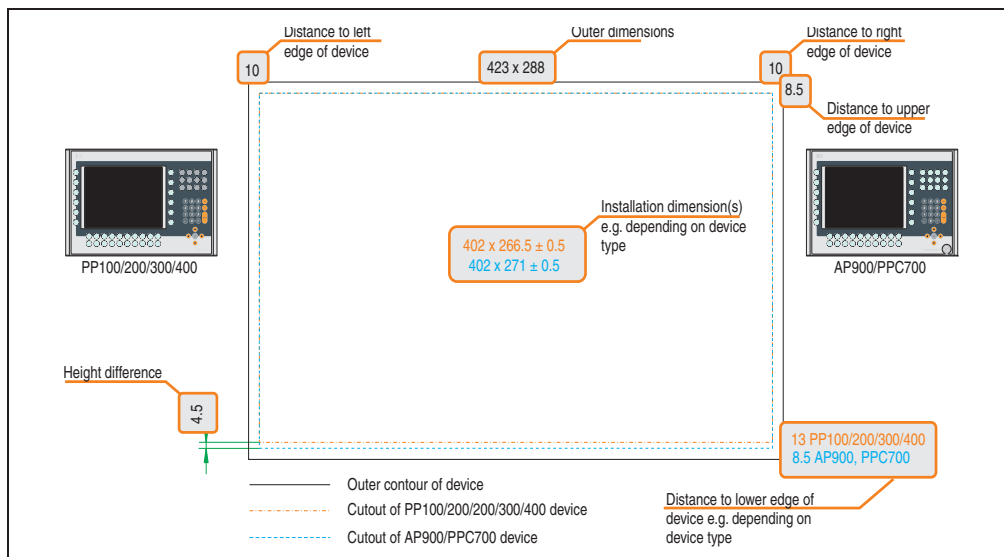


Figure 176: Compatibility details - Figure structure

6.2.1 5.7" devices

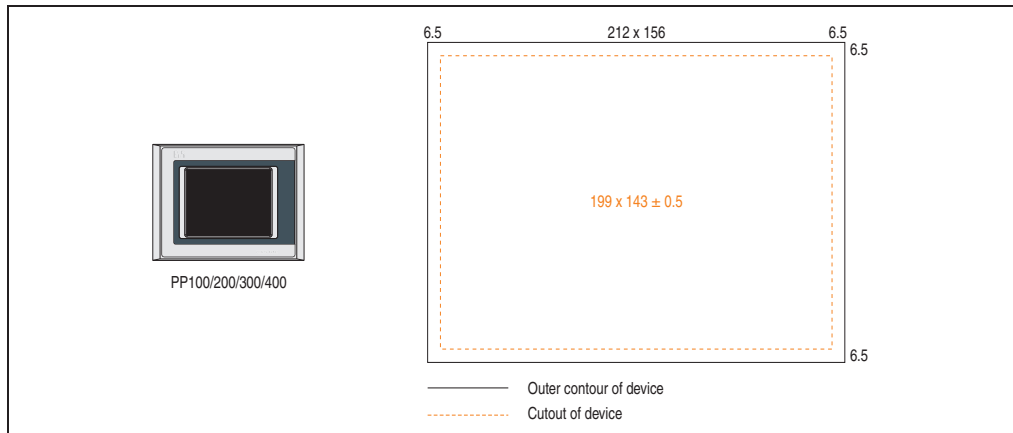


Figure 177: Mounting compatibility - 5.7" device format - Horizontal1

5.7" Power Panel 100/200 and Power Panel 300/400 devices in **Horizontal1** format are 100% mounting compatible.

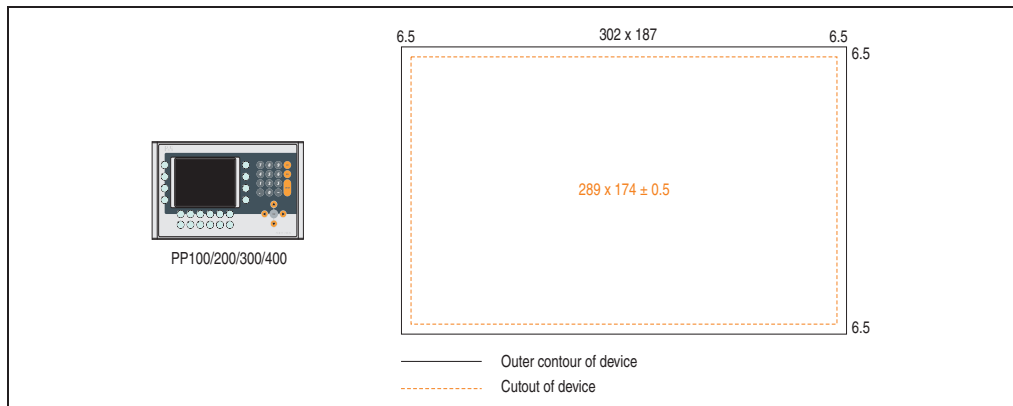


Figure 178: Mounting compatibility - 5.7" device format - horizontal2

5.7" Power Panel 100/200 and Power Panel 300/400 devices in **Vertical1** format are 100% mounting compatible.

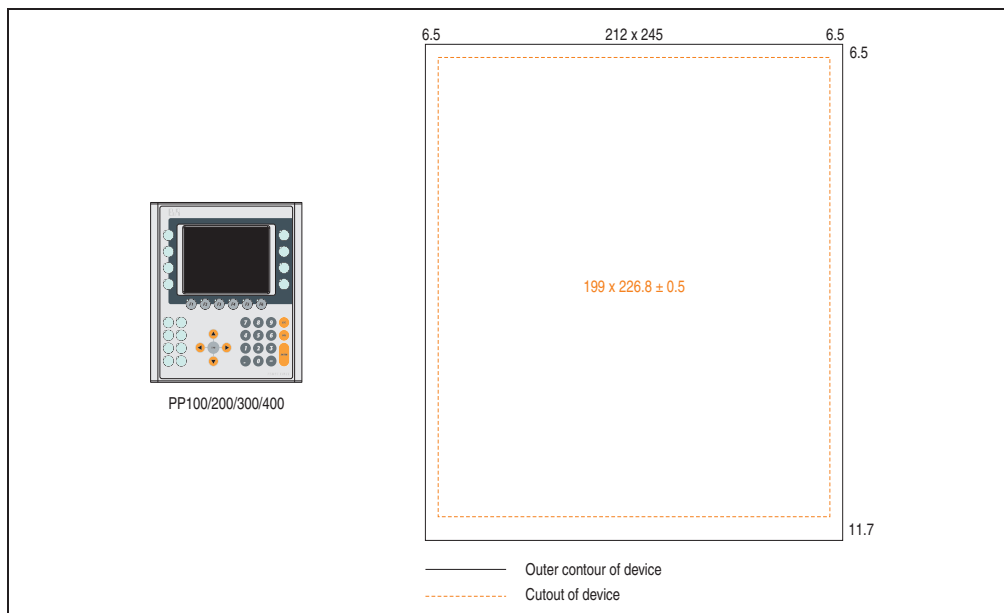


Figure 179: Mounting compatibility - 5.7" device format - Vertical1

5.7" Power Panel 100/200 and Power Panel 300/400 devices in **Vertical1** format are 100% mounting compatible.

6.2.2 10.4" devices

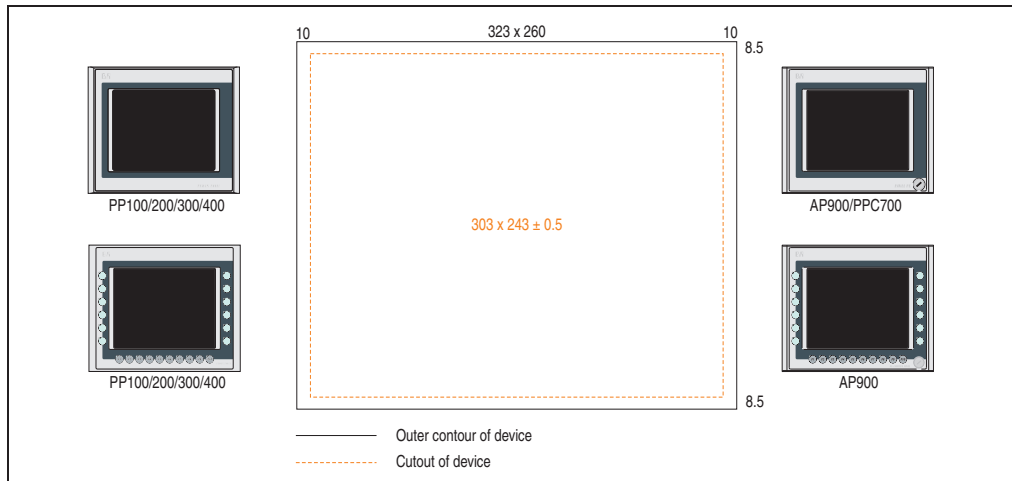


Figure 180: Mounting compatibility - 10.4" device format - Horizontal1

10.4" Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 devices in **Horizontal1** format are 100% mounting compatible.

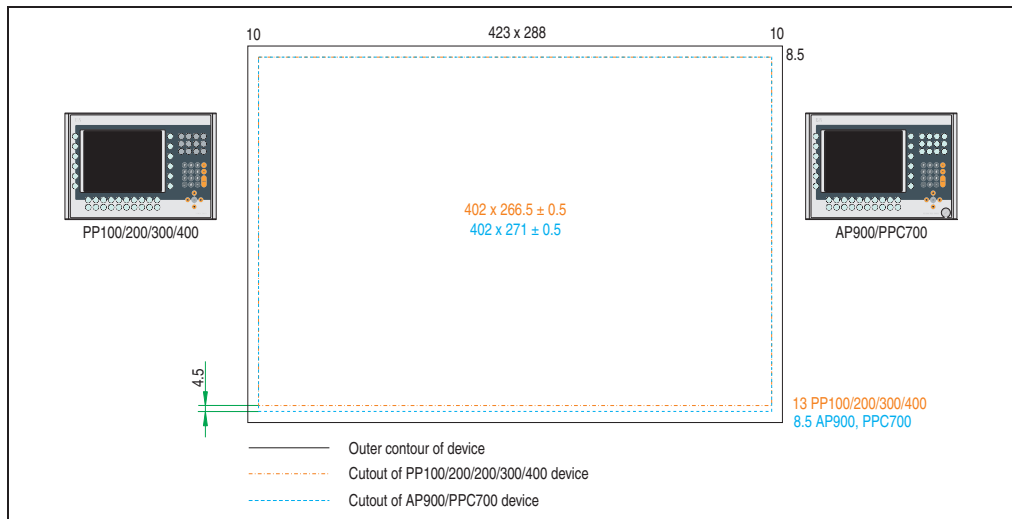


Figure 181: Mounting compatibility - 10.4" device format - horizontal2

10.4" Power Panel 100/200 and Power Panel 300/400 are not 100% mounting compatible with the **Horizontal2** format Automation Panel 900 and Panel PC 700 devices. The Automation Panel 900 and Panel PC 700 devices require a cutout that is 4.5 mm larger vertically (lower edge).

The larger cutout can be conditionally used for all devices:

- When mounting, make sure that the PP100/200/300/400 devices are placed and mounted as close to the center of the cutout as possible. Failure to do so can prevent the retaining clips from holding firmly, which means that a firm seal is no longer guaranteed with the gasket (IP65).

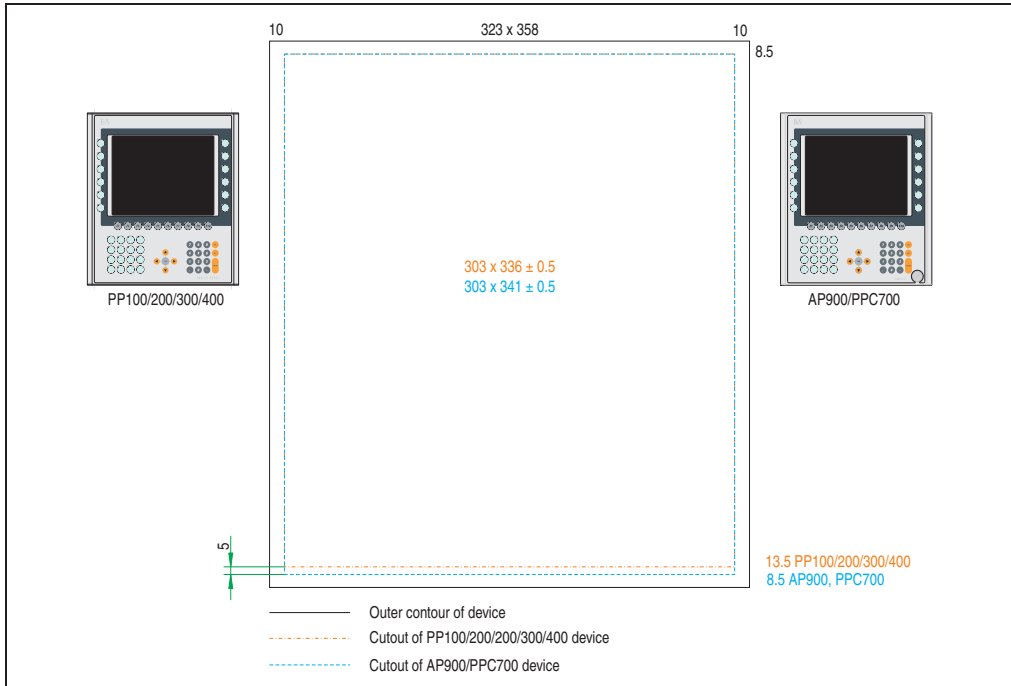


Figure 182: Mounting compatibility - 10.4" device format - Vertical1

10.4" Power Panel 100/200 and Power Panel 300/400 are not 100% mounting compatible with the **Vertical1** format for the Automation Panel 900 and Panel PC 700 devices. The Automation Panel 900 and Panel PC 700 devices require a cutout that is 5 mm larger vertically (lower edge).

The larger cutout can be conditionally used for all devices:

- When mounting, make sure that the PP100/200/300/400 devices are placed and mounted as close to the center of the cutout as possible. Failure to do so can prevent the retaining clips from holding firmly, which means that a firm seal is no longer guaranteed with the gasket (IP65).

6.2.3 12.1" devices

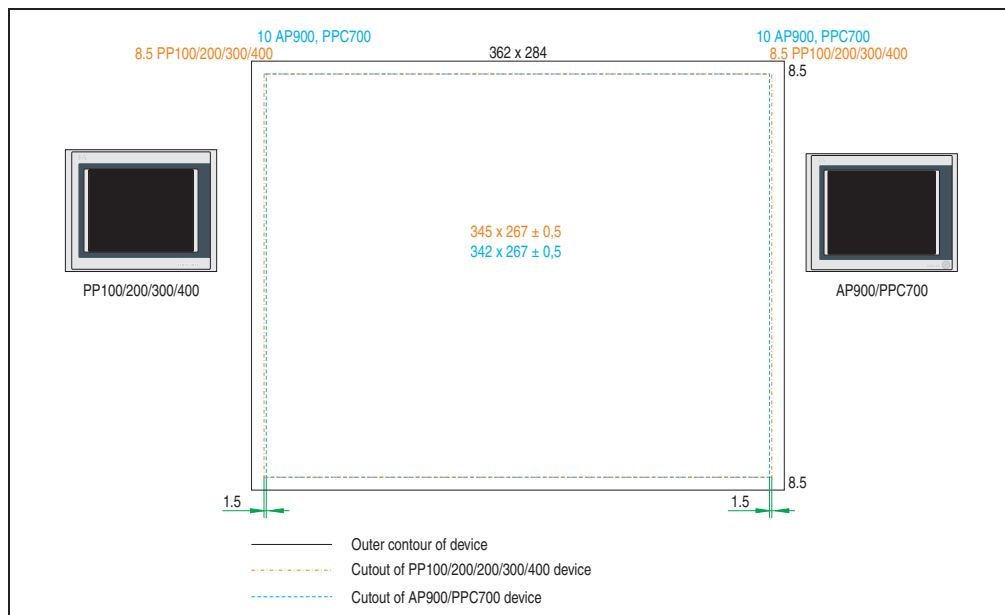


Figure 183: Mounting compatibility - 12.1" device format - Horizontal1

12.1" Power Panel 100/200 and Power Panel 300/400 are *not 100% mounting compatible* with the **Horizontal1** format for the Automation Panel 900 and Panel PC 700 devices. The Power Panel 100/200 and Power Panel 300/400 devices require a cut that is 1.5 mm wider (left and right).

The larger cutout can be conditionally used for all devices:

- When mounting, make sure that the AP900 and PPC700 devices can be placed and mounted as close to the center of the cutout as possible.

6.2.4 15" devices

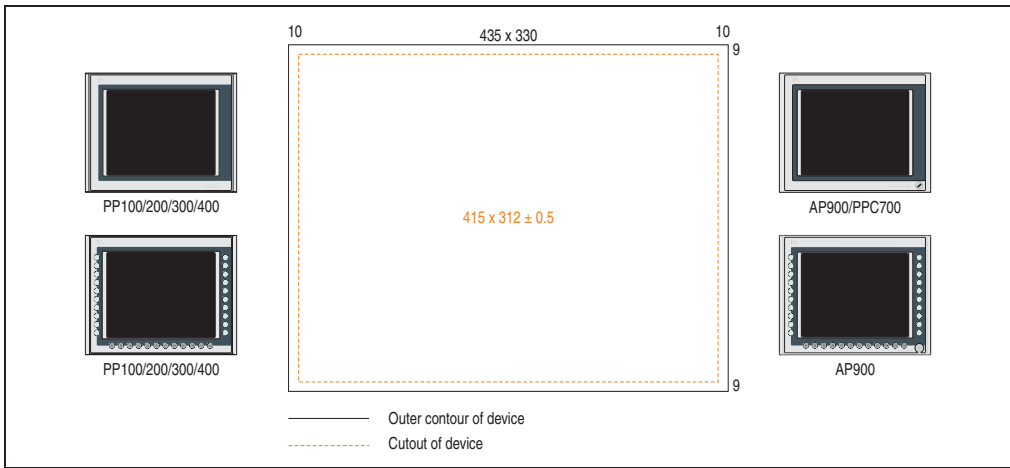


Figure 184: Mounting compatibility - 15" device format - Horizontal1

15" Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 devices in **Horizontal1** format are 100% mounting compatible.

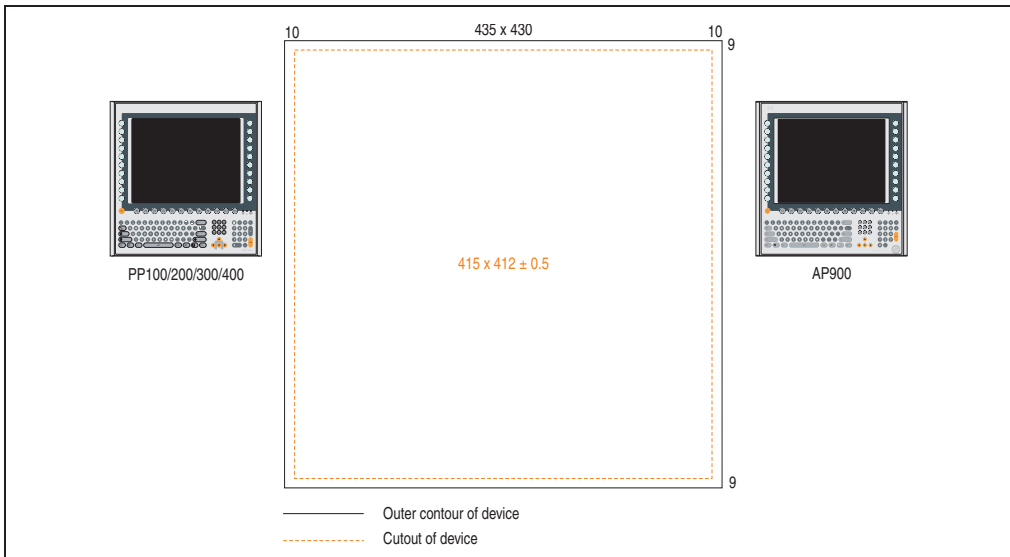


Figure 185: Mounting compatibility - 15" device format - Vertical1

15" Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 devices in **Vertical1** format are 100% mounting compatible.

6.2.5 17" devices

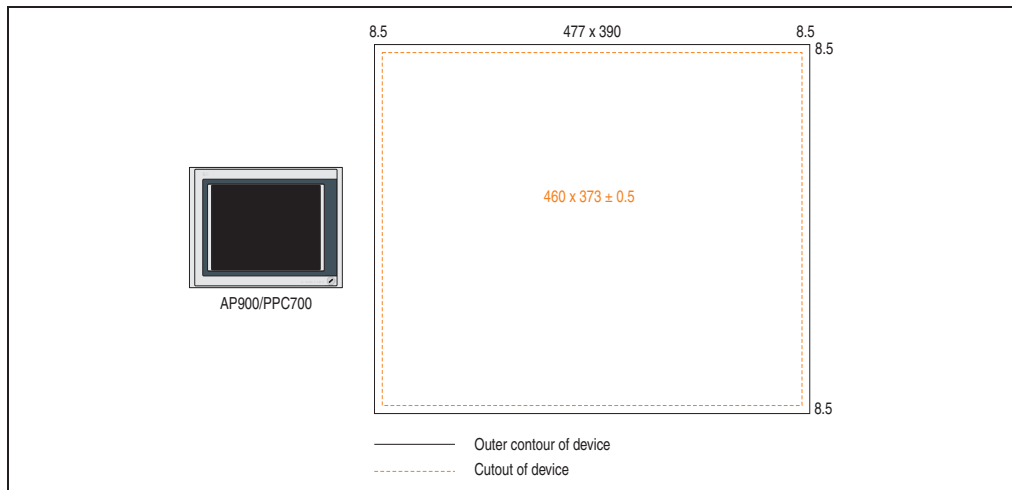


Figure 186: Mounting compatibility - 17" device format - Horizontal1

17" Automation Panel 900 and Panel PC 700 in **Horizontal1** format are 100% mounting compatible.

6.2.6 19" devices

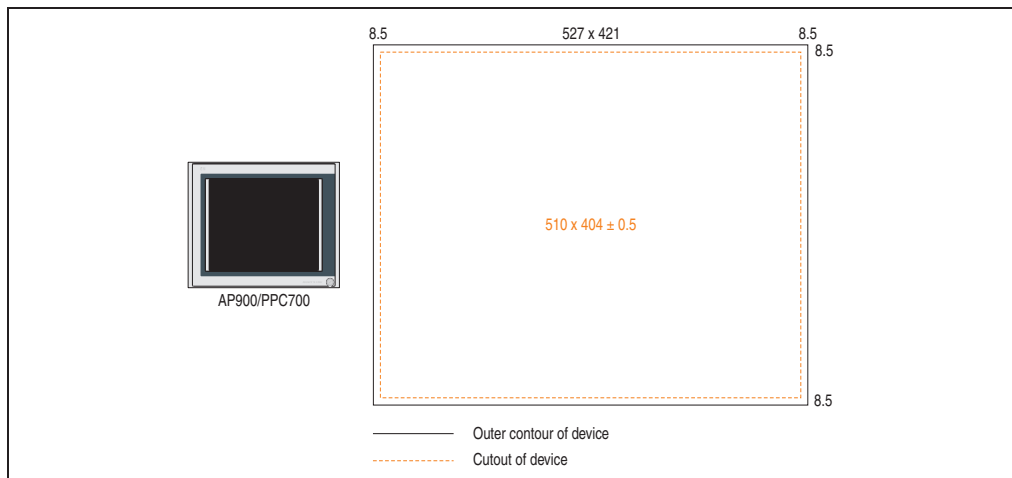


Figure 187: Mounting compatibility - 19" device format - Horizontal1

19" Automation Panel 900 and Panel PC 700 in **Horizontal1** format are 100% mounting compatible.

6.2.7 21.3" devices

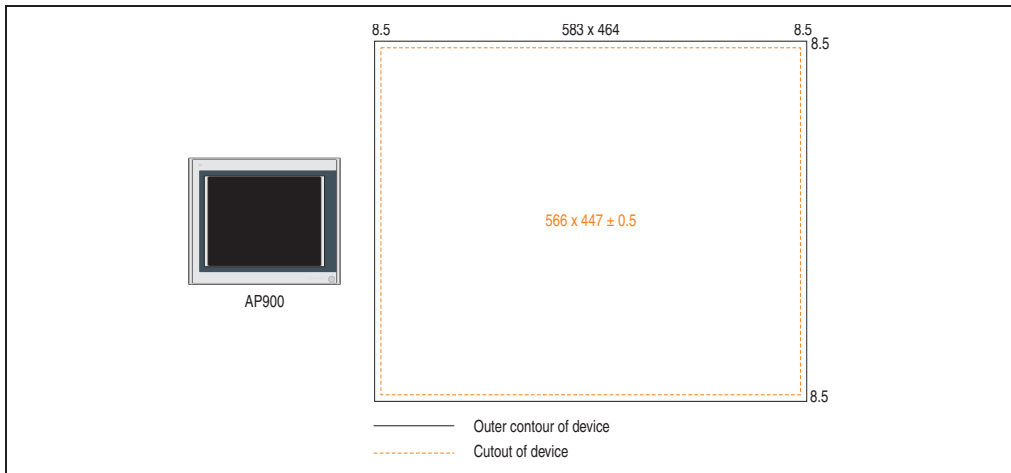


Figure 188: Mounting compatibility - 21.3" format - Horizontal1

7. Glossary

A

APC

Abbreviation for "**A**utomation **P**C".

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.

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.

C

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.

COM

A device name used to access serial ports in MS-DOS. The first serial port can be accessed under COM1, the second under COM2, etc. A modem, mouse, or serial printer is typically connected to a serial port.

D

DCD

An abbreviation for "**D**ata **C**arrier **D**etected". A signal used in serial communication that is sent by the modem to the computer it is connected to, indicating that it is ready for transfer.

DSR

Appendix A • Glossary

An abbreviation for "**Data Set Ready**". A signal used in serial data transfer that is sent by the modem to the computer it is connected to, indicating its readiness for processing. DSR is a hardware signal which is sent via line number 6 in compliance with the RS-232-C standard.

DTR

An abbreviation for "**Data Terminal Ready**". A signal used in serial data transfer that is sent by the computer to the modem it is connected to, indicating the computer's readiness to accept incoming signals.

DVI

Abbreviation for »**Digital Visual Interface**« An interface for the digital transfer of video data.

DVI-A

Analog only

DVI-D

Digital only

DVI-I

Integrated, i.e. analog and digital

E

EDID data

Abbreviation for "**Extended Display Identification Data**". EDID data contains the characteristics of monitors / TFT displays transferred as 128 KB data blocks to the graphics card via the Display Data Channel (DDC). This EDID data can be used to set the graphics card to the monitor properties.

EMC

"**E**lectromagnetic **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].

F

FIFO

An abbreviation for "**F**irst In **F**irst **O**ut". A queuing organization method whereby elements are removed in the same order as they were inserted. The first element inserted is the first one removed. Such an organization method is typical for a list of documents that are waiting to be printed.

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.

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.

L**LCD**

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

LED

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

M**MB**

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

MIPS

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

MTBF

An abbreviation for "**Mean time between failure**". 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 "**Maintenance Controller**". 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 "**MainTenance Controller EXtended**".

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.

POH

An abbreviation for "**Power On Hours**". See MTBF.

R

RS232

Recommended Standard Number 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.

RXD

An abbreviation for "**Receive (RX) Data**". 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

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.

SVGA

Abbreviation for »**Super Video Graphics Array**«; Graphics standard with a resolution of at least 800×600 pixels and at least 256 colors.

SXGA

Abbreviation for Super Extended Graphics Array. Graphics standard with a screen resolution of 1280 × 1024 pixels (aspect ratio 5:4).

T

TFT display

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

Touch screen

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

TXD

An abbreviation for "Transmit (**TX**) Data". 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

USB

An abbreviation for "**Universal Serial Bus**". 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.

UXGA

Abbreviation for »**U**ltra **E**xtended **G**raphics **A**rray« Generally a screen resolution of 1600 × 1200 pixels (aspect ratio 4:3, 12:9).

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.

X

XGA

An abbreviation for "**E**Xtended **G**raphics **A**rray". An expanded standard for graphics controllers and monitors that was introduced by IBM in 1990. This standard supports 640x480 resolution with 65,536 colors or 1024x768 resolution with 256 colors. This standard is generally used in workstation systems.

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