Automation Panel 900

User's Manual

Version: **1.70 (March 2008)**

Model number: **MAAP900-ENG**

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Chapter 1 • General information

Information:

B&R does its best to keep the printed versions of its user's manuals as current as possible. However, 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	- Model numbers added - Keypad devices - Legend strip templates
1.2 Preliminary	31.01.2006	- 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	- 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 212 added. - "Example connections with an Automation PC 620" on page 183 added. - "Glossary" on page 281 added. - "USB flash drive" on page 251 added. - "SDL flex cable 5CASDL.0xxx-03" on page 159 and "SDL flex cable with extender 5CASDL.0x00-13" on page 168 added. - Chapter "Service and maintenance" on page 255 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	- 2 GB 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 267 added. - "Mounting compatibilities" on page 270 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	Changes / new features - 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 163 changed, structure of SDL cable 5CASDL.0xxx-03 removed.
1.60	31.10.2007	- 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 238 added. - USB flash drive 5MMUSB.0256-00 and USB flash drive 5MMUSB.1024-00 cancelled. - Section "USB flash drive" on page 251 updated. - Diagram 142 "Example of the signal direction for the SDL cable with extender - APC620" on page 171 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 burn-in effect added. - Information on touch calibration added.
1.70	26.03.2008	- Vibration / shock data revised - Cable descriptions revised. - Ambient temperature derating information depending on elevation 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!

- 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.

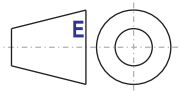
3. Organization of safety notices

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

5. Model numbers

5.1 Automation Panel 10.4" VGA

Model number	Description	Comment
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	Comment
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	Comment
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	Comment
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	Comment
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	Comment
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	Comment
5DLDVI.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
5DLSDL.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 146
5DLSDL.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	Comment
5CADVI.0018-00	**DVI-D cable 1.8 m / single** Single cable, DVI-D/m:DVI-D/m; length: 1.8m	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 for a fixed type of layout; length: 1.8 m	See page 153
5CASDL.0018-01	**SDL cable 1.8 m 45°** SDL cable for fixed type of layout with one-sided 45° plug; length: 1.8 m	See page 156
5CASDL.0018-03	**1.8 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 1.8 m	See page 159
5CASDL.0050-00	**SDL cable 5 m** SDL cable for a fixed type of layout; length: 5 m	See page 153
5CASDL.0050-01	**SDL cable 5 m 45°** SDL cable for fixed type of layout with one-sided 45° plug; length: 5 m	See page 156
5CASDL.0050-03	**5 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 5 m	See page 159
5CASDL.0100-00	**SDL cable 10 m** SDL cable for a fixed type of layout; length: 10 m	See page 153
5CASDL.0100-01	**SDL cable 10 m 45°** SDL cable for fixed type of layout with one-sided 45° plug; length: 10 m	See page 156
5CASDL.0100-03	**10 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 10 m	See page 159
5CASDL.0150-00	**SDL cable 15 m** SDL cable for a fixed type of layout; length: 15 m	See page 153

Table 10: Model numbers - Cables

Model number	Description	Comment
5CASDL.0150-01	**SDL cable 15 m 45°** SDL cable for fixed type of layout with one-sided 45° plug; length: 15 m	See page 156
5CASDL.0150-03	**15 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 15 m	See page 159
5CASDL.0200-00	**SDL cable 20 m** SDL cable for a fixed type of layout; length: 20 m	See page 153
5CASDL.0200-03	**20 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 20 m	See page 159
5CASDL.0250-00	**SDL cable 25 m** SDL cable for a fixed type of layout; length: 25 m	See page 153
5CASDL.0250-03	**25 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 25 m	See page 159
5CASDL.0300-00	**SDL cable 30 m** SDL cable for a fixed type of layout; length: 30 m	See page 153
5CASDL.0300-03	**30 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 30 m	See page 159
5CASDL.0300-10	**30 m SDL cable with extender** SDL cable with extender for a fixed type of layout; length 30 m	Cancelled since 12/2006 Replaced by 5CASDL.0300-13
5CASDL.0300-13	**30 m SDL flex cable with extender** SDL cable with extender for fixed and flexible type of layout; length: 30 m	See page 168
5CASDL.0400-10	**40 m SDL cable with extender** SDL cable with extender for a fixed type of layout; length 40 m	Cancelled since 12/2006 Replaced by 5CASDL.0400-13
5CASDL.0400-13	**40 m SDL flex cable with extender** SDL cable with extender for fixed and flexible type of layout; length: 40 m	See page 168
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 174
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 174
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 174
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 176
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 176

Table 10: Model numbers - Cables (cont.)

5.9 Accessories

Model number	Description	Comment
0TB103.8	**Plug/N 24V 5.08 3-pin screw clamps** Accessory terminal block, 3-pin, screw clamp, 2.5 mm², protection against vibration with the screw flange	See page 242
0TB103.9	**Plug 24V 5.08 3-pin screw clamps** 24 VDC 3-pin connector, female. Screw clamps, 2.5 mm², protected against vibration by the screw flange	See page 243
0TB103.91	**Plug 24V 5.08 3-pin cage clamps** 24 VDC 3-pin connector, female. Cage clamps, 2.5 mm², protected against vibration by the screw flange	See page 243
5AC900.104X-03	**Legend strip template 10.4"** for Automation Panel 5AP951.1043-01 and 5A981.1043-01, for 1 device.	See page 245
5AC900.104X-04	**Legend strip template 10.4"** for Automation Panel 5AP952.1043-01 and 5A982.1043-01, for 1 device.	See page 245
5AC900.104X-05	**Legend strip template 10.4"** for Automation Panel 5AP980.1043-01, for 3 devices.	See page 245
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 245
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 247
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 248
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 251

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 unit and an Automation Panel Link insert card. Put together, these two components make up the complete display unit.

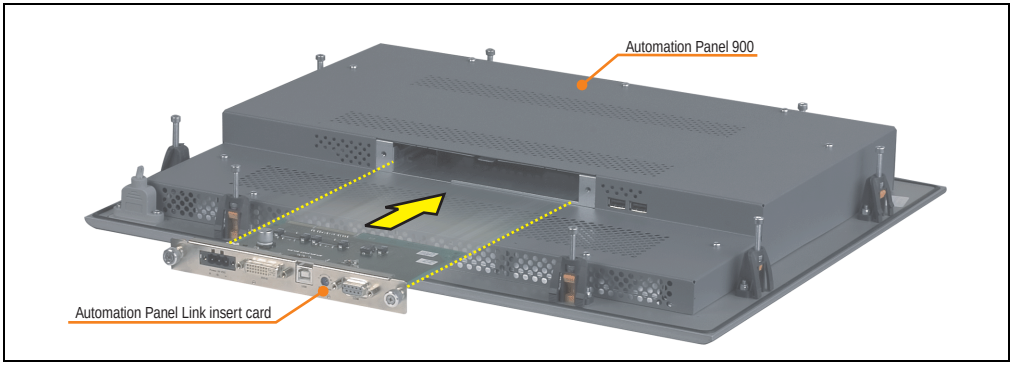


Figure 2: Automation Panel and Automation Panel Link insert card

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.).

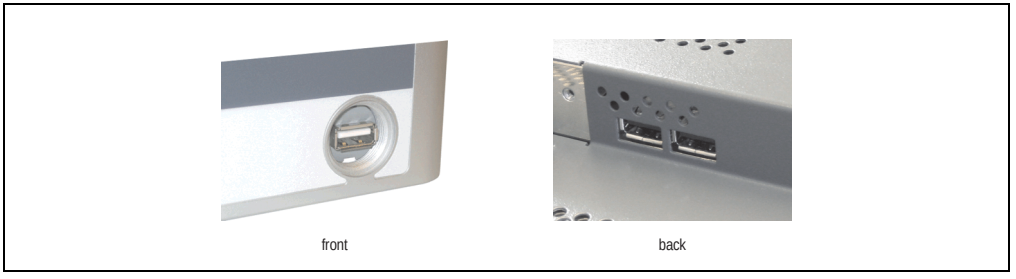


Figure 3: Automation Panel USB connections (front side - back side)

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 "Commissioning", Section 2 "Mounting orientation" on page 181).

Information:

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

	Automation Panel Link insert cards		
Automation Panel 900 without Rittal housing	**0°**	**to -45° display above**	**to +45° display below**
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 + Rittal housing	**0°**	**to -45° display above**	**to +45° display below**
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

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%
5DLDVI.1000-01	5 - 95%	5 - 95%
5DLSDL.1000-00	5 - 95%	5 - 95%
5DLSDL.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
5DLDVI.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

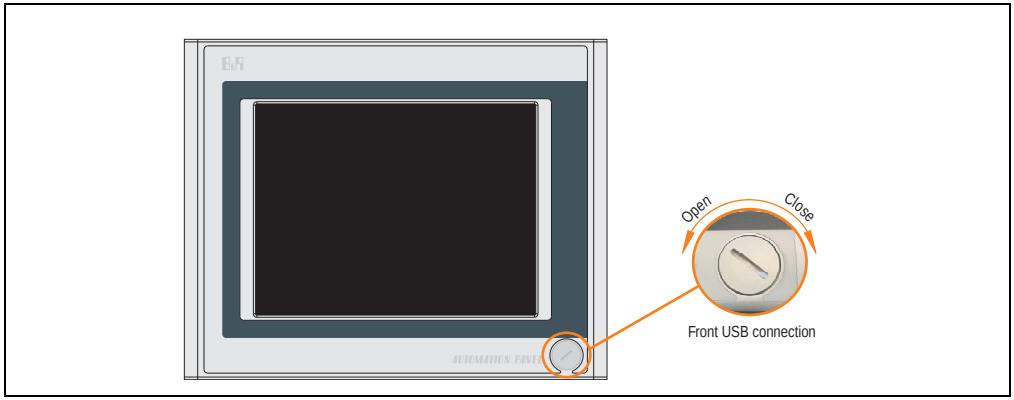


Figure 4: Front view - 5AP920.1043-01

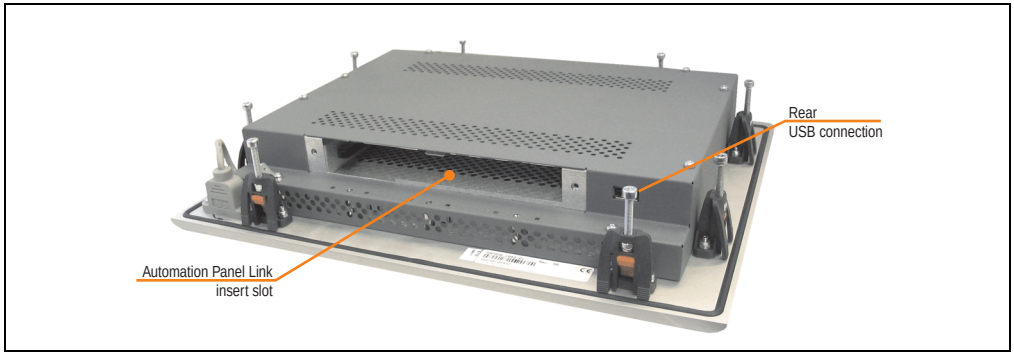


Figure 5: Rear view - 5AP920.1043-01

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 267) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 10.4 in (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

Mechanical characteristics	5AP920.1043-01
Outer dimensions Width Height Depth	 323 mm 260 mm 55 mm
Housing Paint	Metal Similar to Pantone 432CV[5)]
Weight	Approx. 2,9 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	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[6)]

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.
6) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

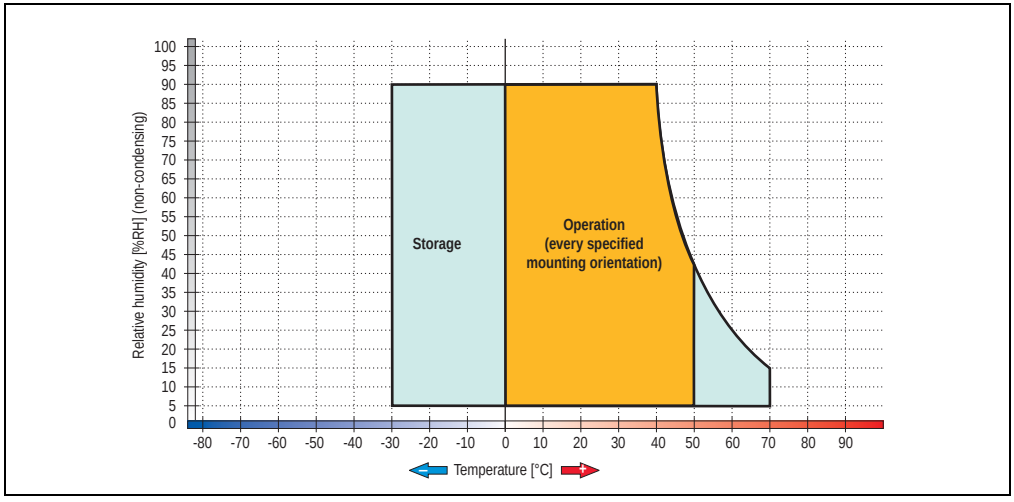


Figure 6: Temperature humidity diagram - 5AP920.1043-01

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

Dimensions

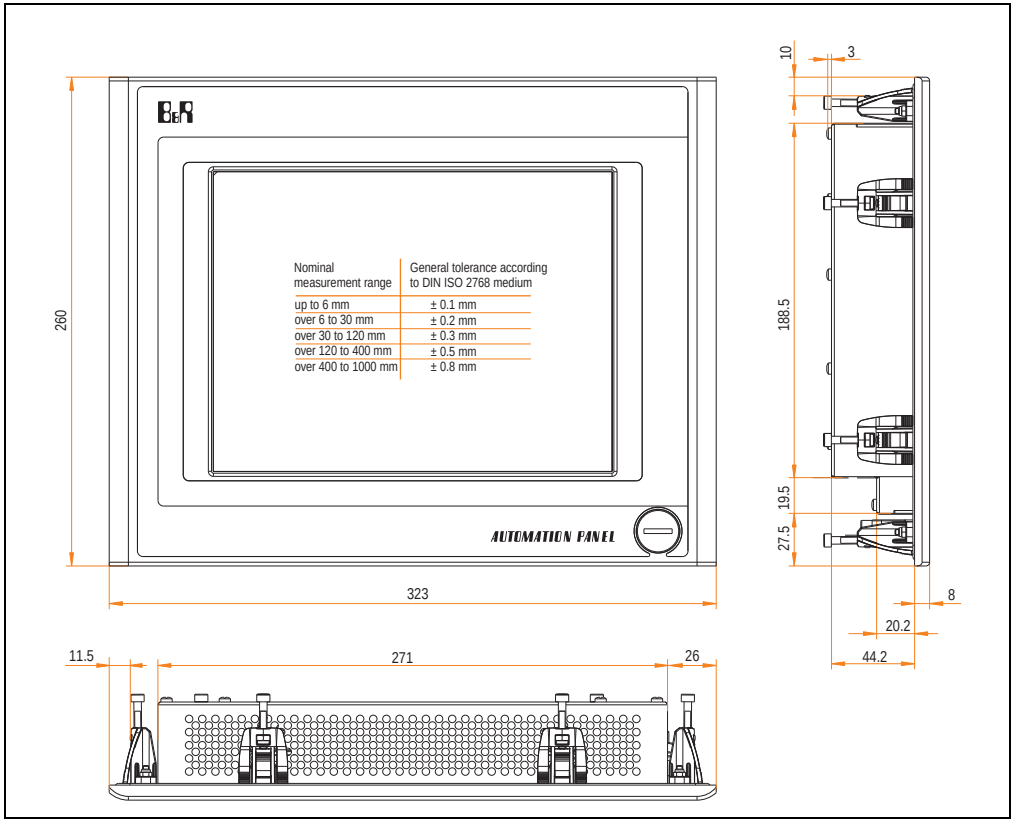


Figure 7: Dimensions 5AP920.1043-01

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.

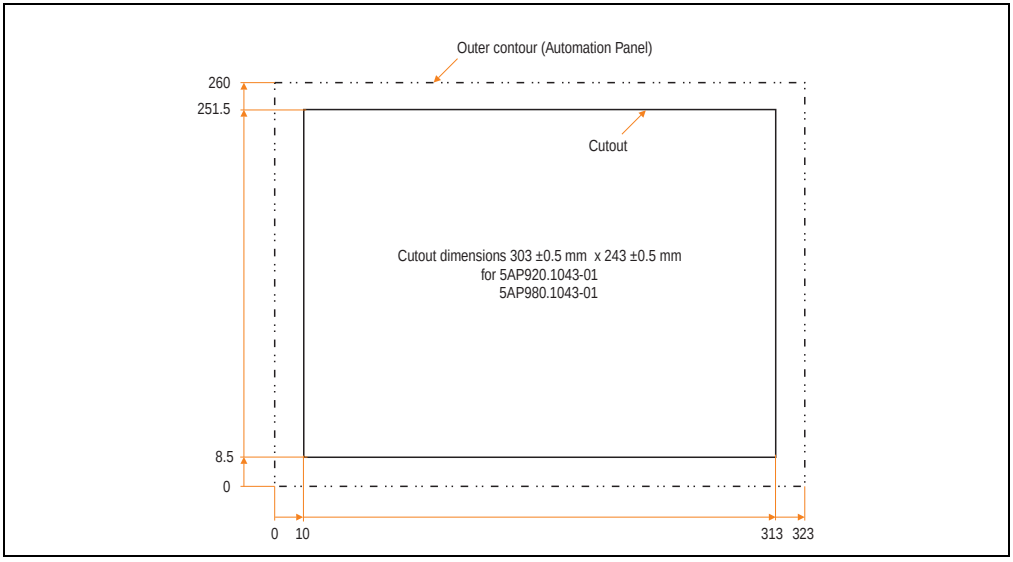


Figure 8: Cutout installation - 5AP920.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

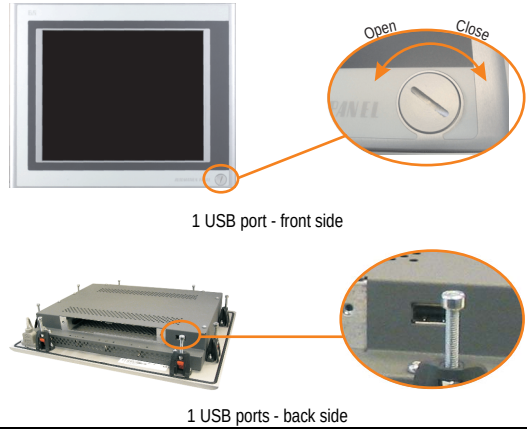


Figure 9: USB connections

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 Automation Panel housing.

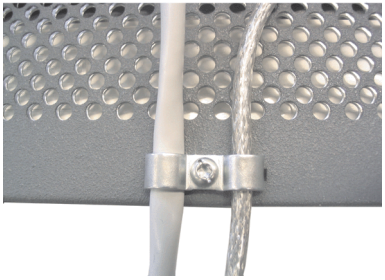


Figure 10: Mounting the cable clamps

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).

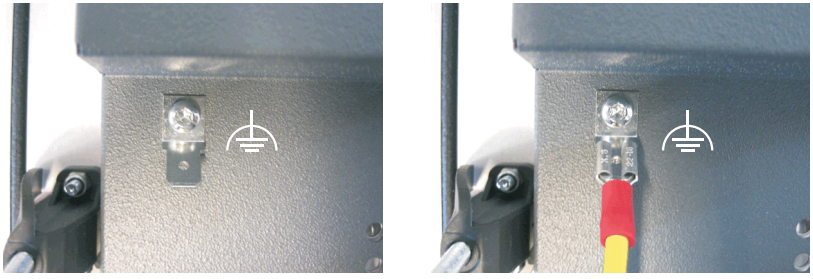


Figure 11: Functional grounding clip

3.1.2 Automation Panel 5AP951.1043-01

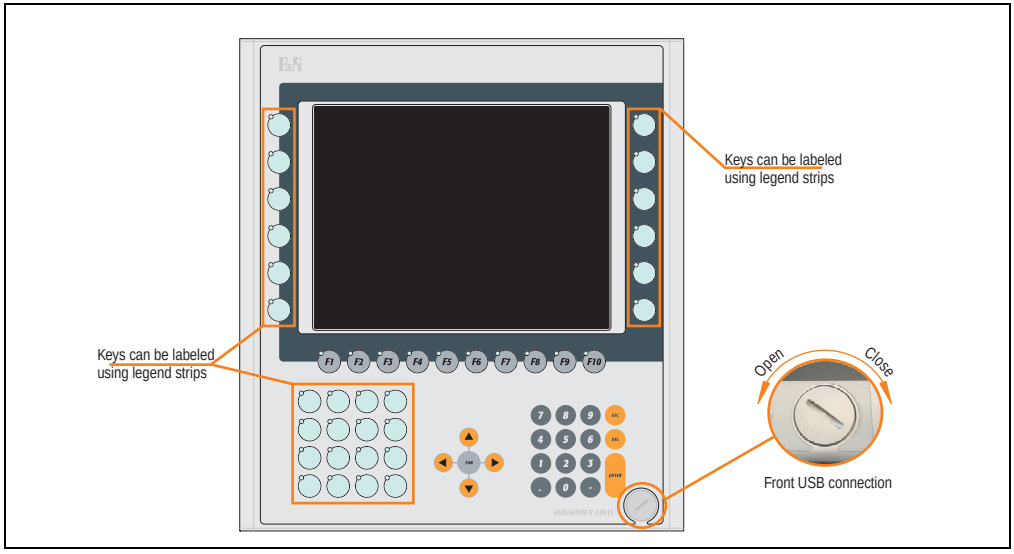


Figure 12: Front view - 5AP951.1043-01

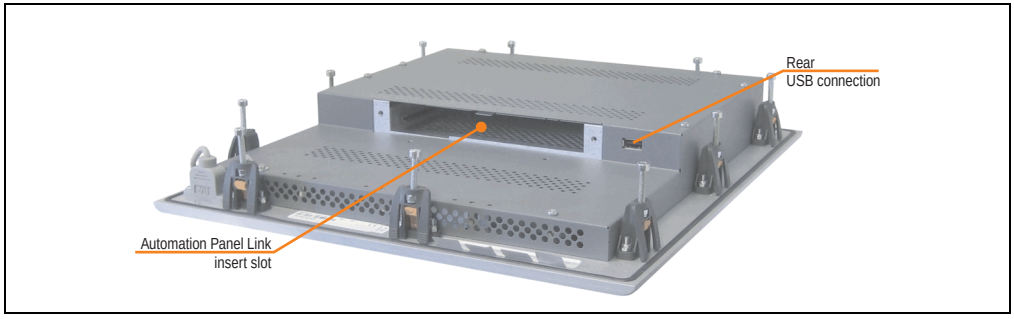


Figure 13: Rear view - 5AP951.1043-01

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 267) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 10.4 in (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 Design Membrane Dark gray border around display Light background Orange keys Dark gray keys Legend strips (gray) Gasket	 Aluminum, naturally anodized[5)] Gray[5)] 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
Housing Paint	Metal Similar to Pantone 432CV[5)]
Weight	Approx. 3.6 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 95%, non-condensing T > 40°C: < 95%, non-condensing
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[6)]

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.

6) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

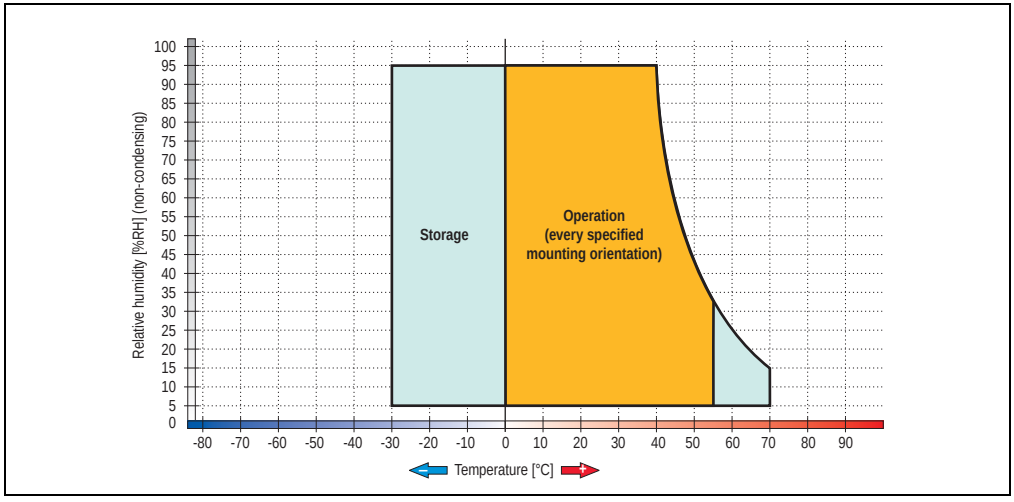


Figure 14: Temperature humidity diagram - 5AP951.1043-01

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

Dimensions

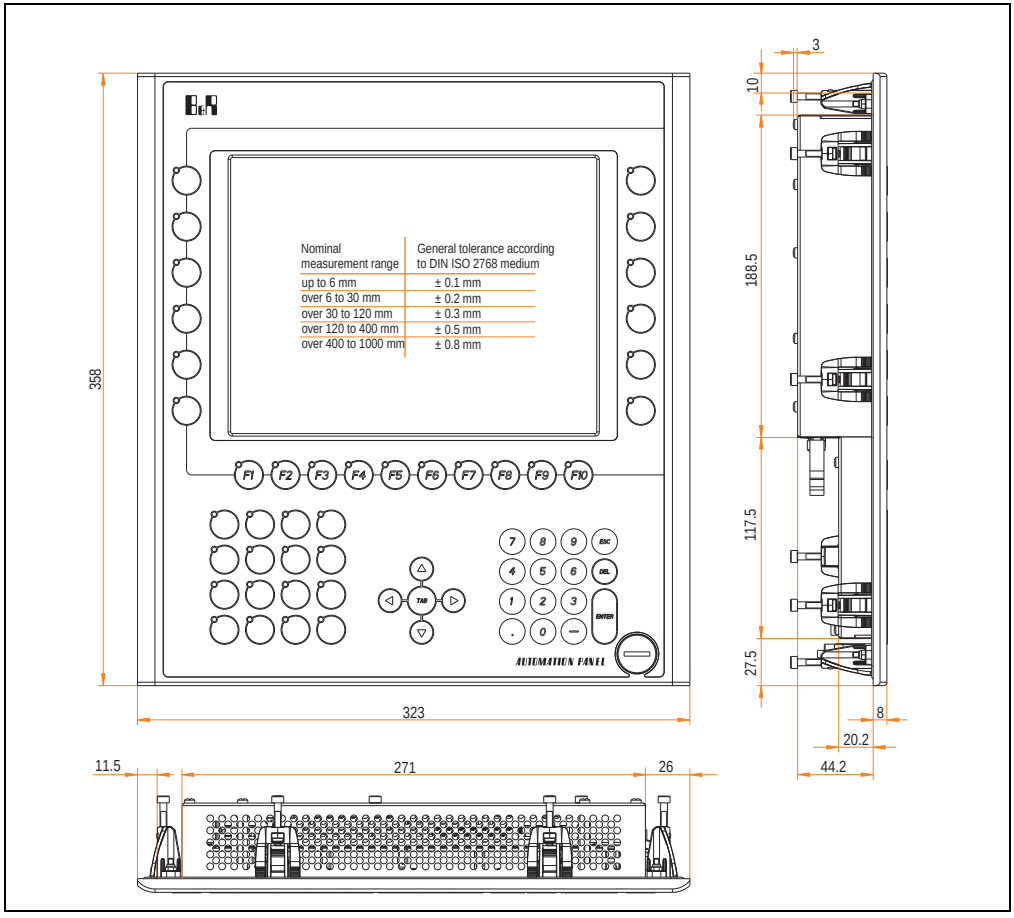


Figure 15: Dimensions 5AP951.1043-01

Contents of delivery

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

Amount	Component
1	Automation Panel 951 TFT VGA 10.4in 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.

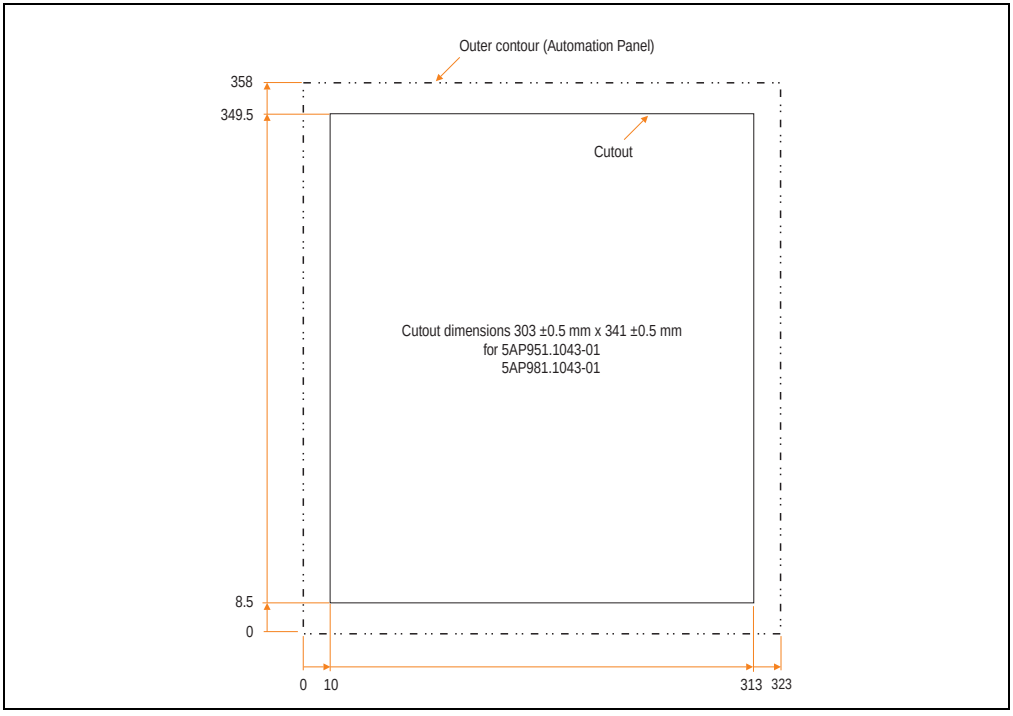


Figure 16: Cutout installation - 5AP951.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

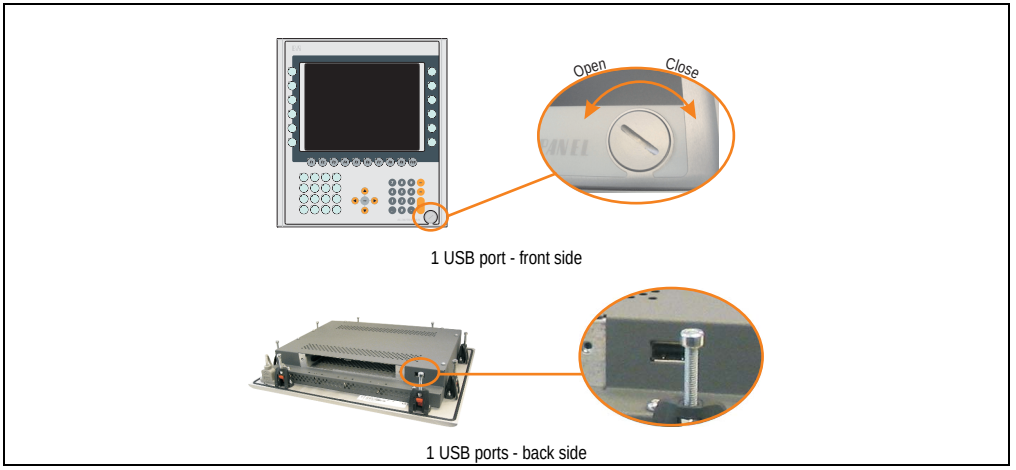


Figure 17: USB connections

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 Automation Panel housing.

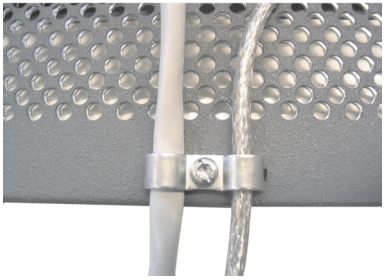


Figure 18: Mounting the cable clamps

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).

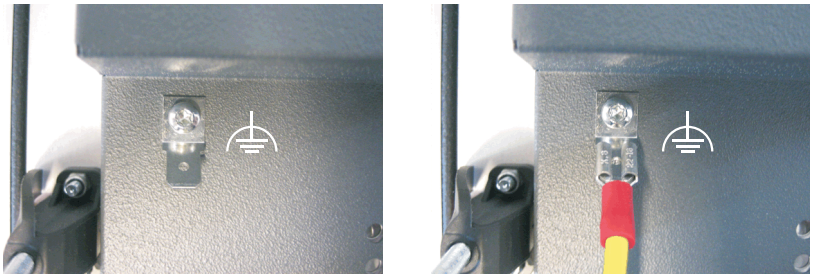


Figure 19: Functional grounding clip

3.1.3 Automation Panel 5AP952.1043-01

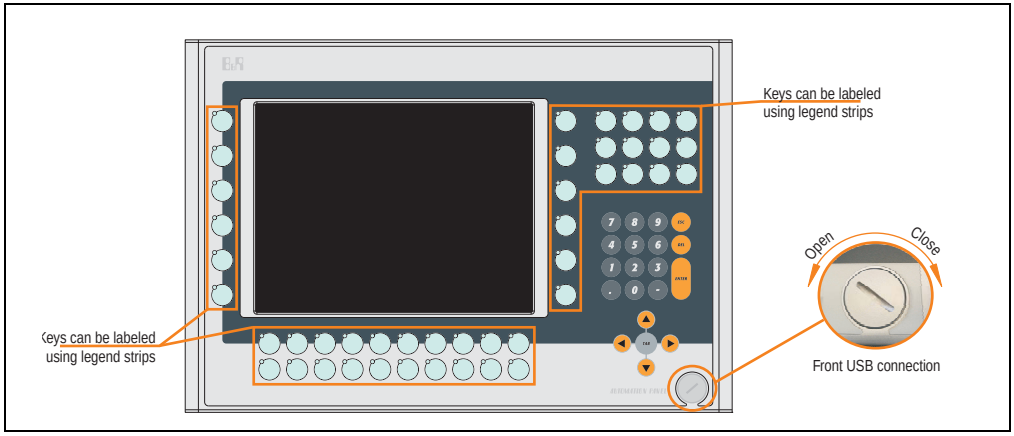


Figure 20: Front view - 5AP952.1043-01

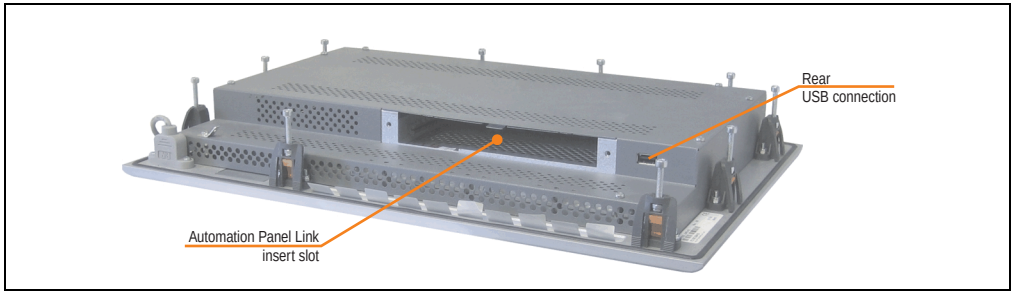


Figure 21: Rear view - 5AP952.1043-01

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 267) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 10.4 in (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 Design Membrane Dark gray border around display Light background Orange keys Dark gray keys Legend strips (gray) Gasket	 Aluminum, naturally anodized[5)] Gray[5)] 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
Housing Paint	Metal Similar to Pantone 432CV[5)]
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 95%, non-condensing T > 40°C: < 95%, non-condensing
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[6)]

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.

6) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

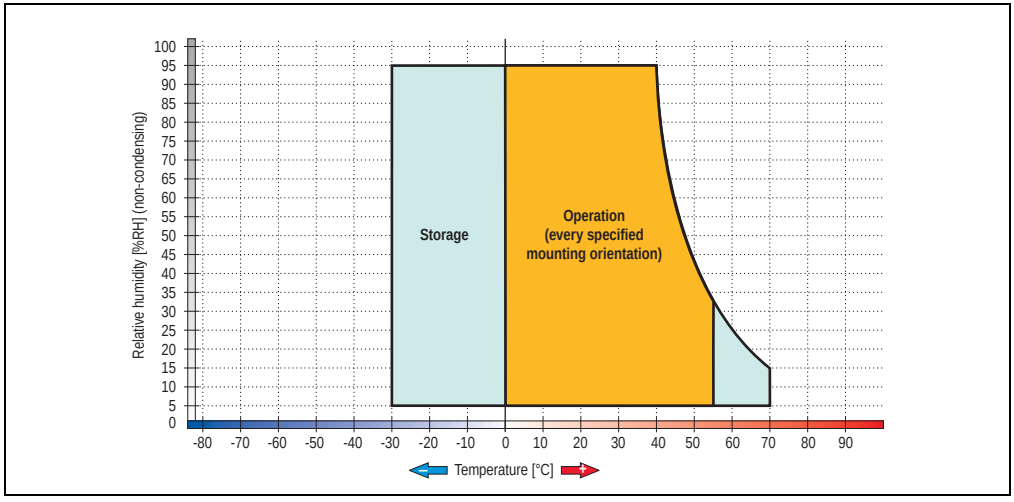


Figure 22: Temperature humidity diagram - 5AP952.1043-01

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

Dimensions

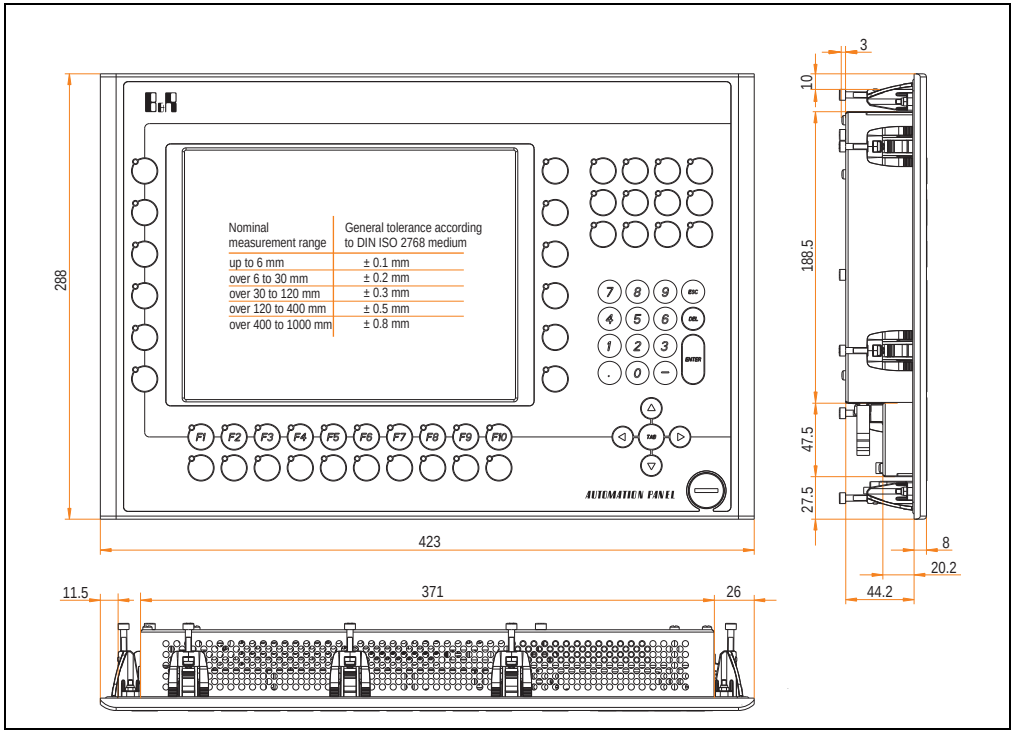


Figure 23: Dimensions 5AP952.1043-01

Contents of delivery

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

Amount	Component
1	Automation Panel 952 TFT VGA 10.4in 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.

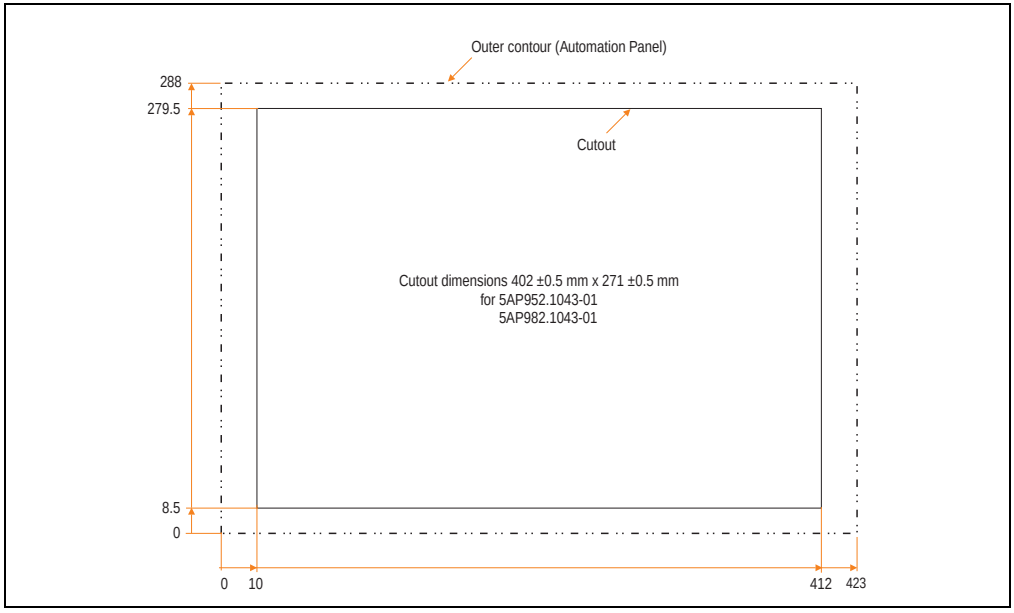


Figure 24: Cutout installation - 5AP952.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

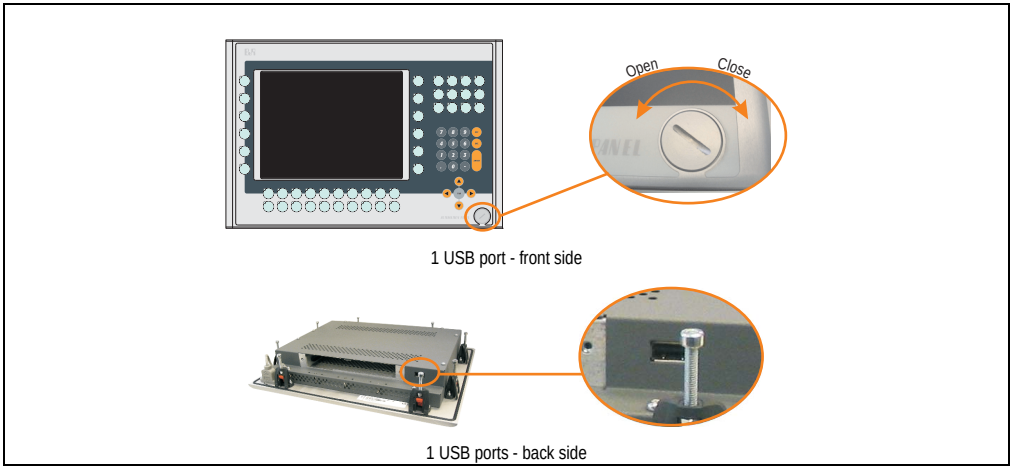


Figure 25: USB connections

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.

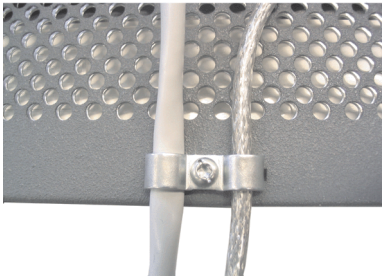


Figure 26: Mounting the cable clamps

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).

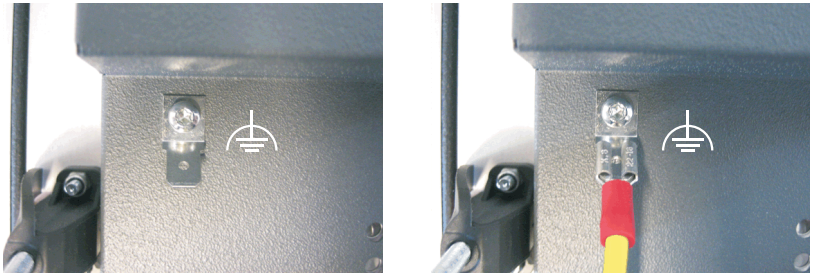


Figure 27: Functional grounding clip

3.1.4 Automation Panel 5AP980.1043-01

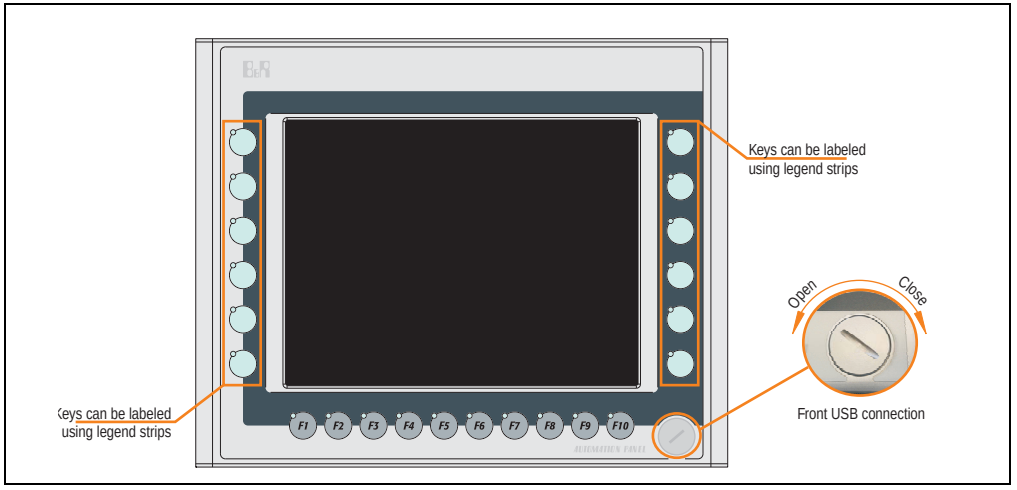


Figure 28: Front view - 5AP980.1043-01

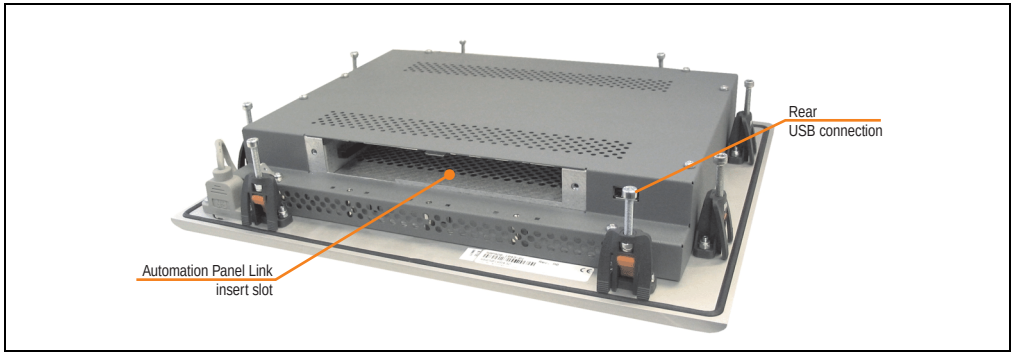


Figure 29: Rear view - 5AP980.1043-01

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 267) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 10.4 in (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	 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 Height Depth	 323 mm 260 mm 55 mm
Housing Paint	Metal Similar to Pantone 432CV[6)]
Weight	Approx. 2.9 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	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[7)]

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.

7) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

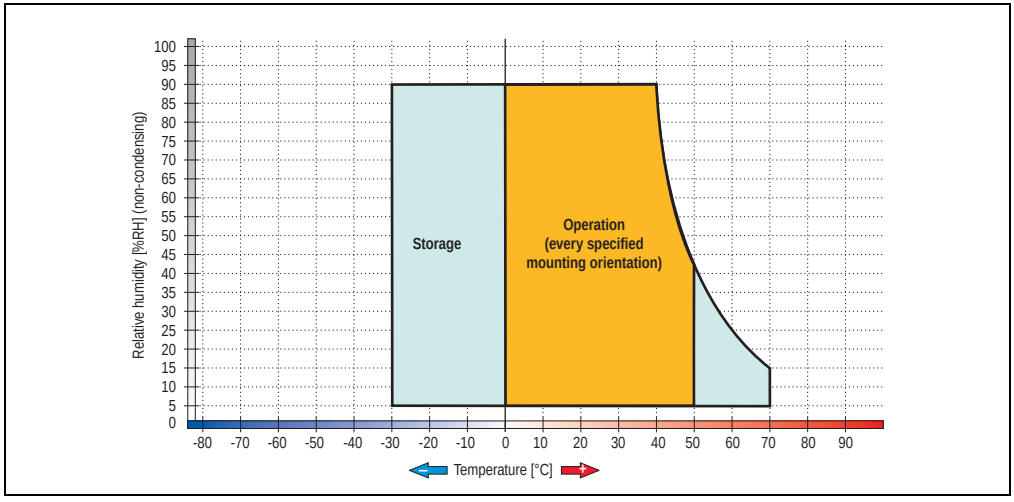


Figure 30: Temperature humidity diagram - 5AP980.1043-01

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

Dimensions

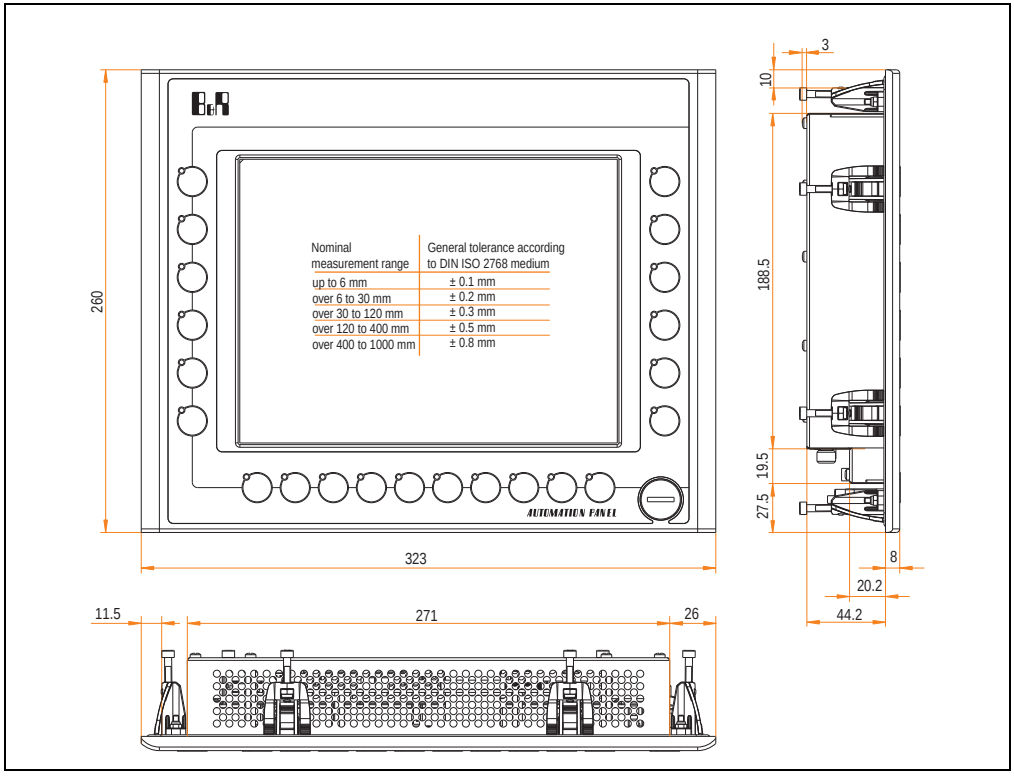


Figure 31: Dimensions 5AP980.1043-01

Contents of delivery

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

Amount	Component
1	Automation Panel 980 TFT VGA 10.4in 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.

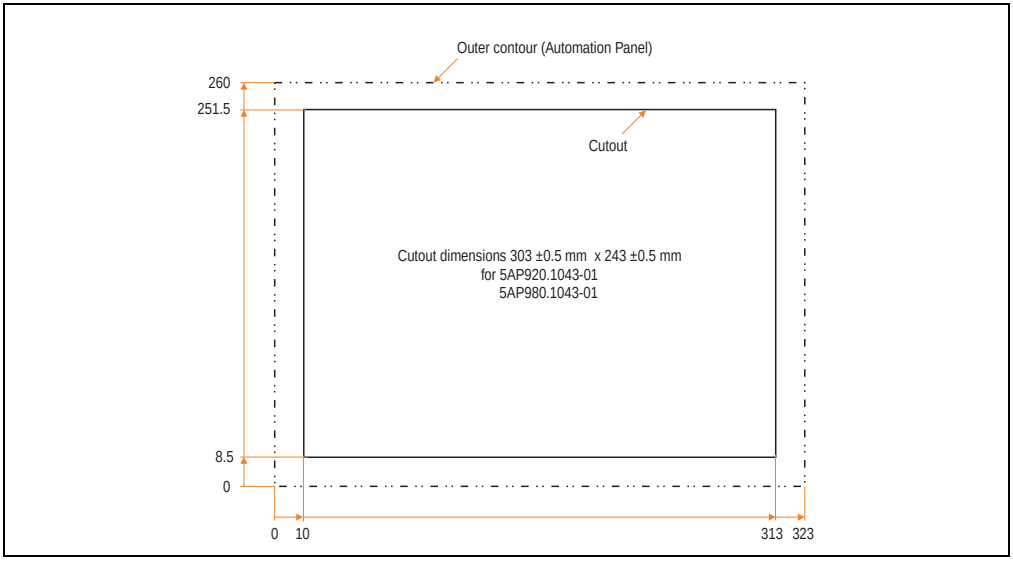


Figure 32: Cutout installation - 5AP980.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

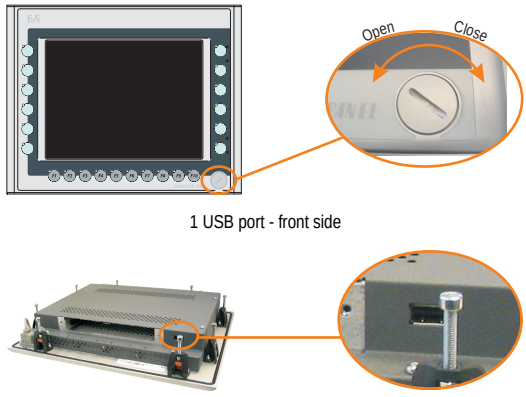


Figure 33: USB connections

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.

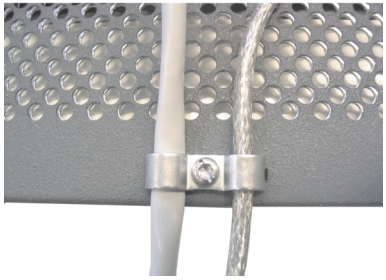


Figure 34: Mounting the cable clamps

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).

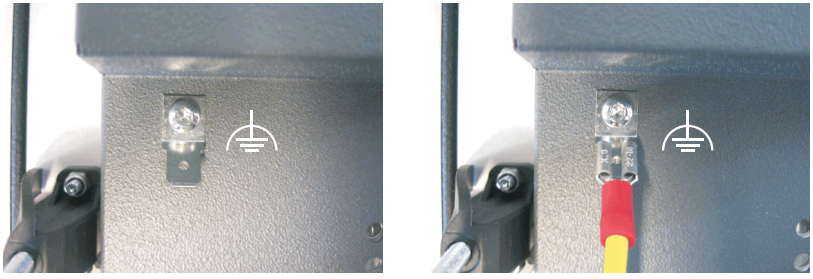


Figure 35: Functional grounding clip

3.1.5 Automation Panel 5AP981.1043-01

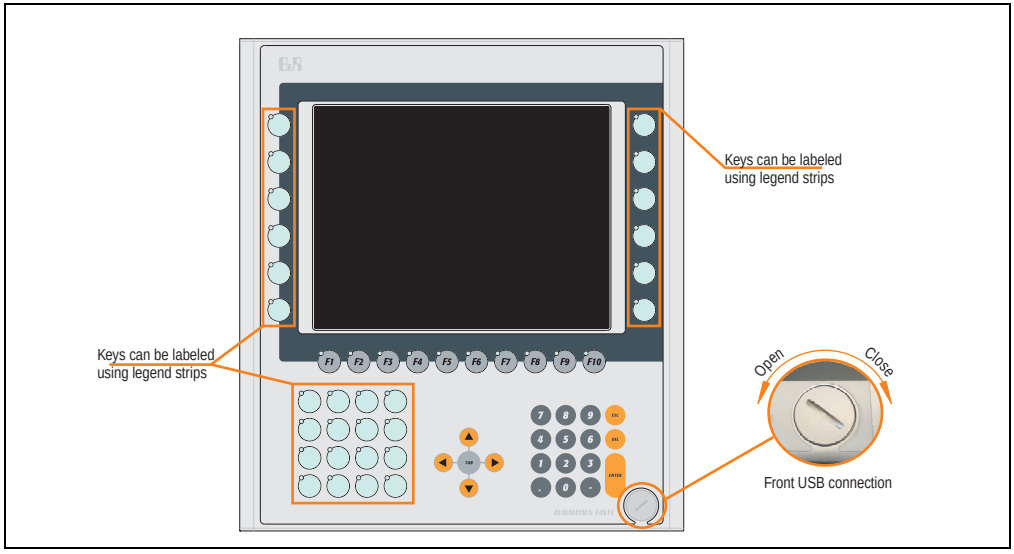


Figure 36: Front view - 5AP981.1043-01

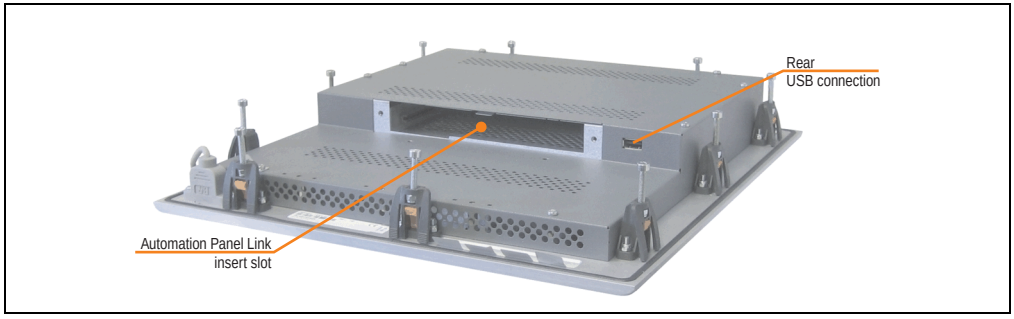


Figure 37: Rear view - 5AP981.1043-01

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 267) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 10.4 in (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 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[5)]
Weight	Approx. 3.6 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	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0,5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[7)]

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.

7) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

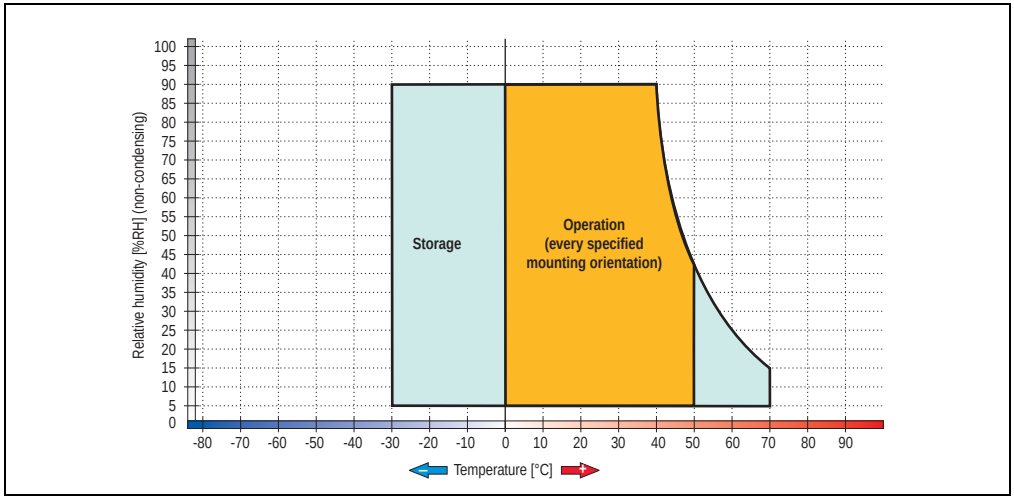


Figure 38: Temperature humidity diagram - 5AP981.1043-01

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

Dimensions

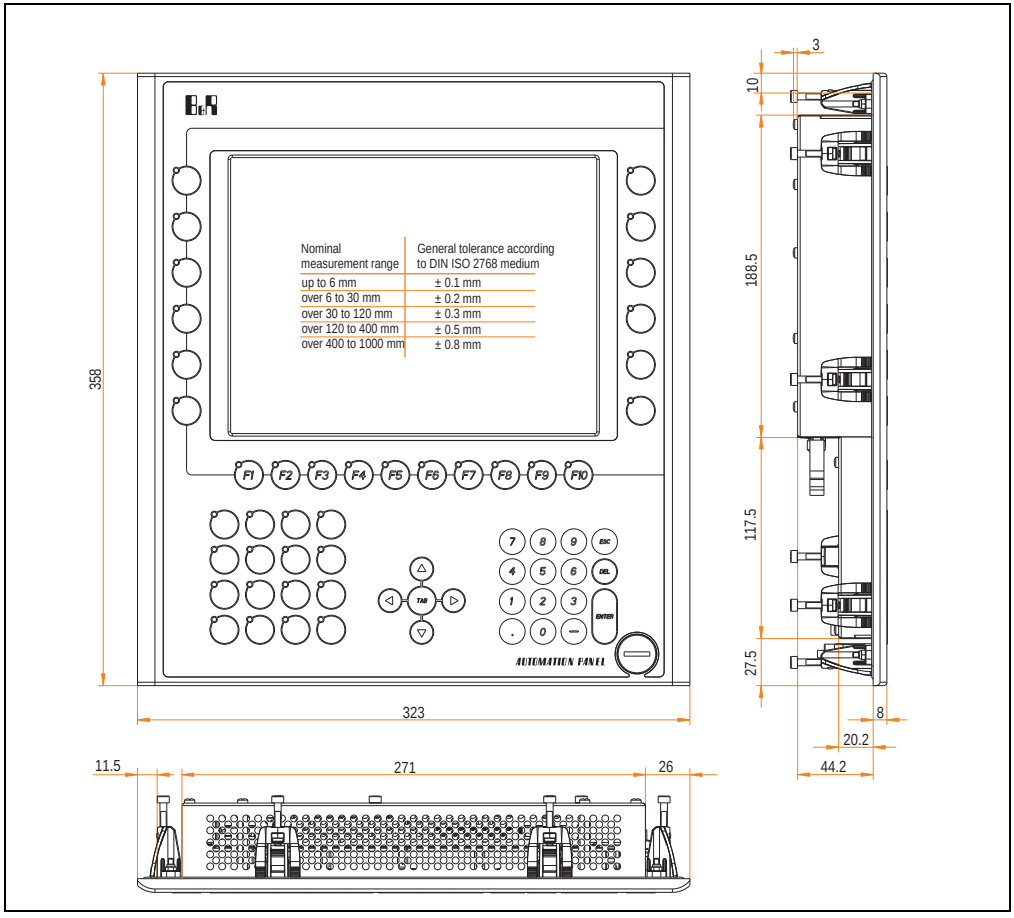


Figure 39: Dimensions 5AP981.1043-01

Contents of delivery

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

Amount	Component
1	Automation Panel 981 TFT VGA 10.4in 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.

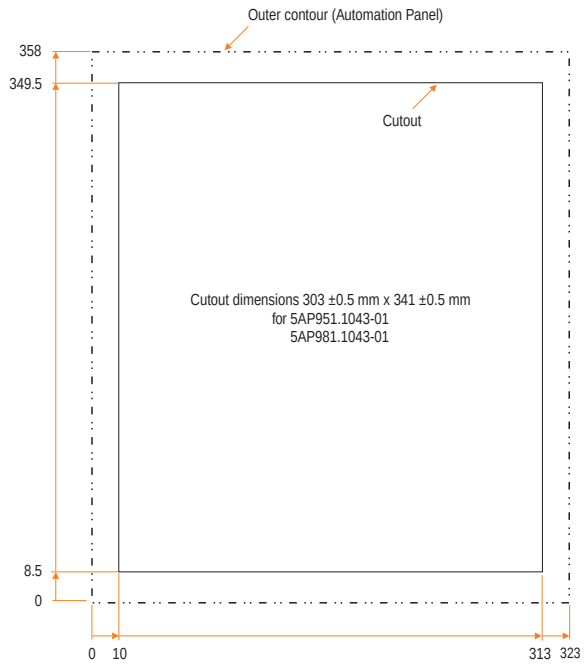


Figure 40: Cutout installation - 5AP981.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

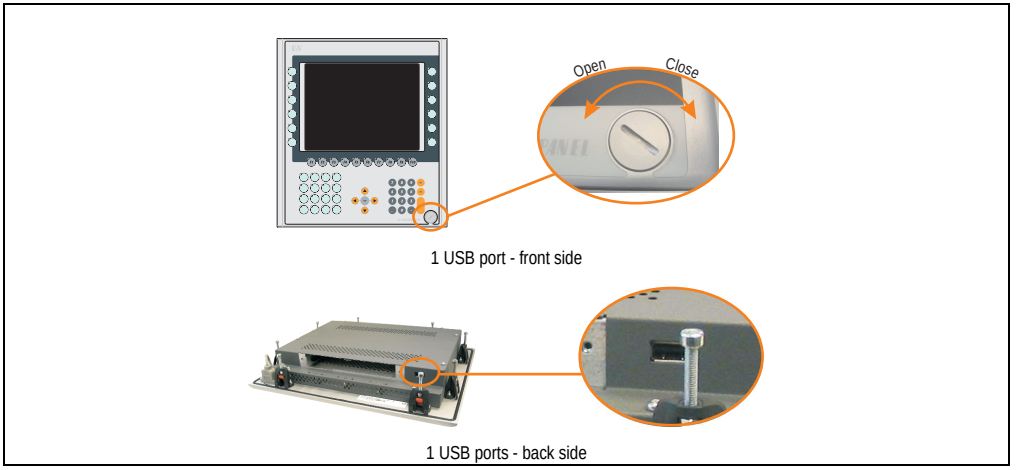


Figure 41: USB connections

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.

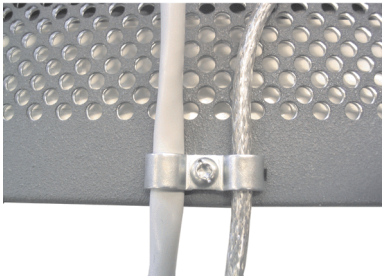


Figure 42: Mounting the cable clamps

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).

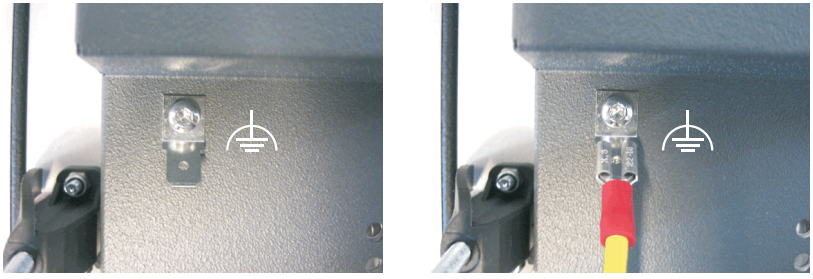


Figure 43: Functional grounding clip

3.1.6 Automation Panel 5AP982.1043-01

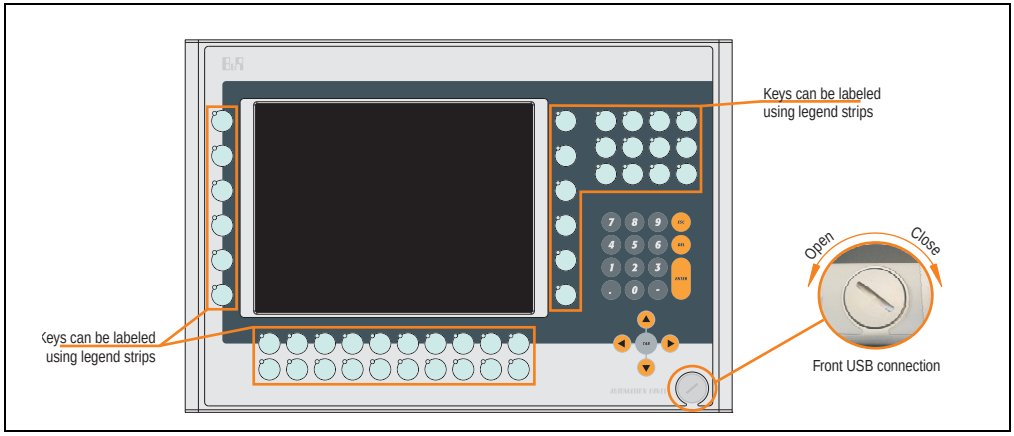


Figure 44: Front view - 5AP982.1043-01

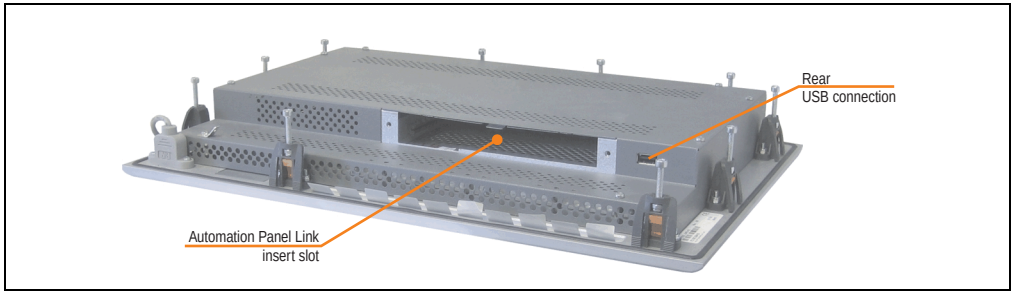


Figure 45: Rear view - 5AP982.1043-01

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 267) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT 10.4 in (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	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[7)]

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.

7) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

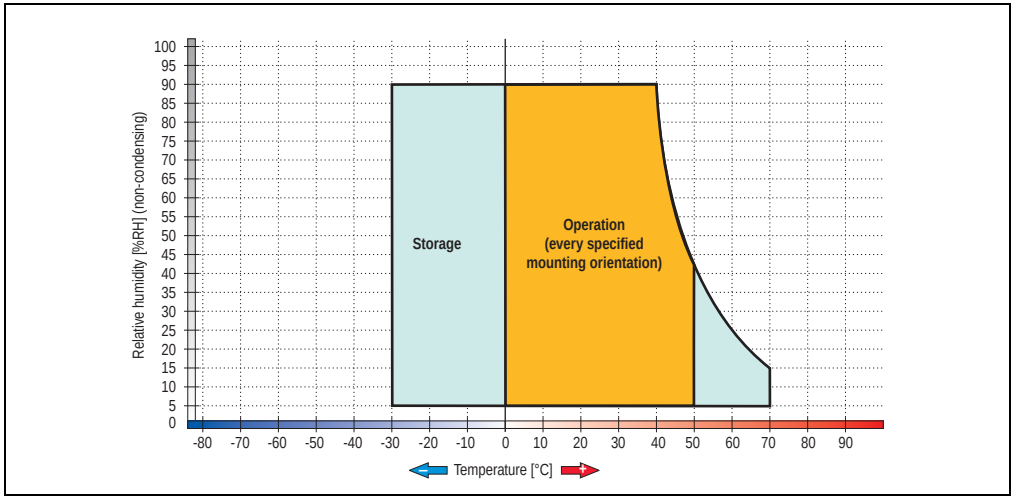


Figure 46: Temperature humidity diagram - 5AP982.1043-01

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

Dimensions

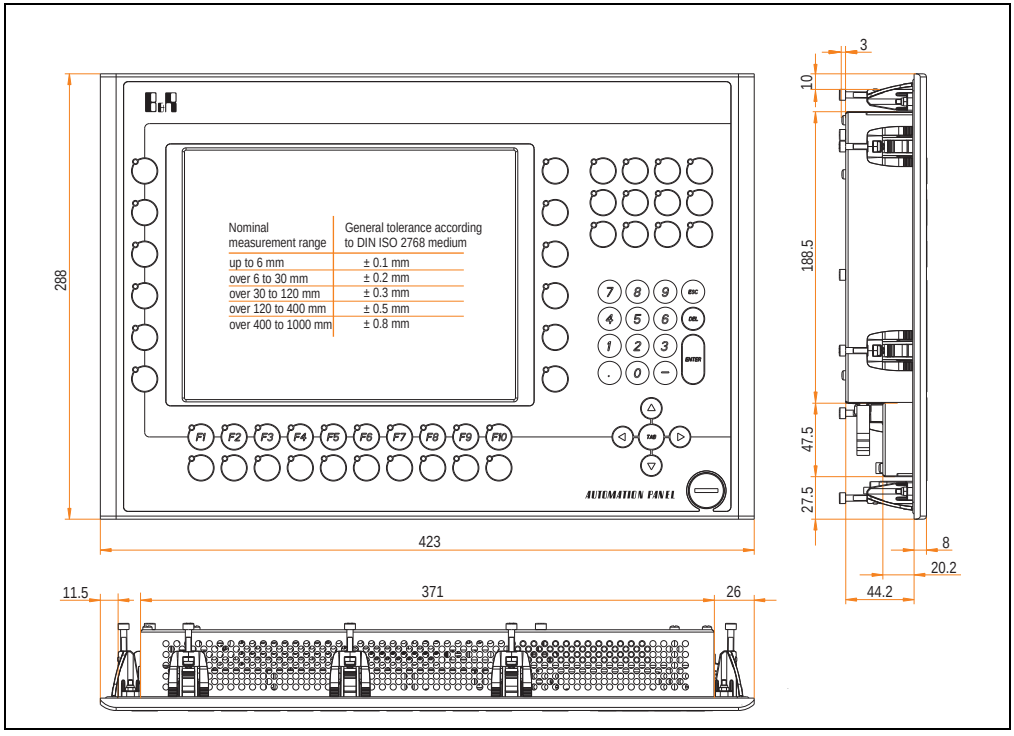


Figure 47: Dimensions 5AP982.1043-01

Contents of delivery

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

Amount	Component
1	Automation Panel 982 TFT VGA 10.4in 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.

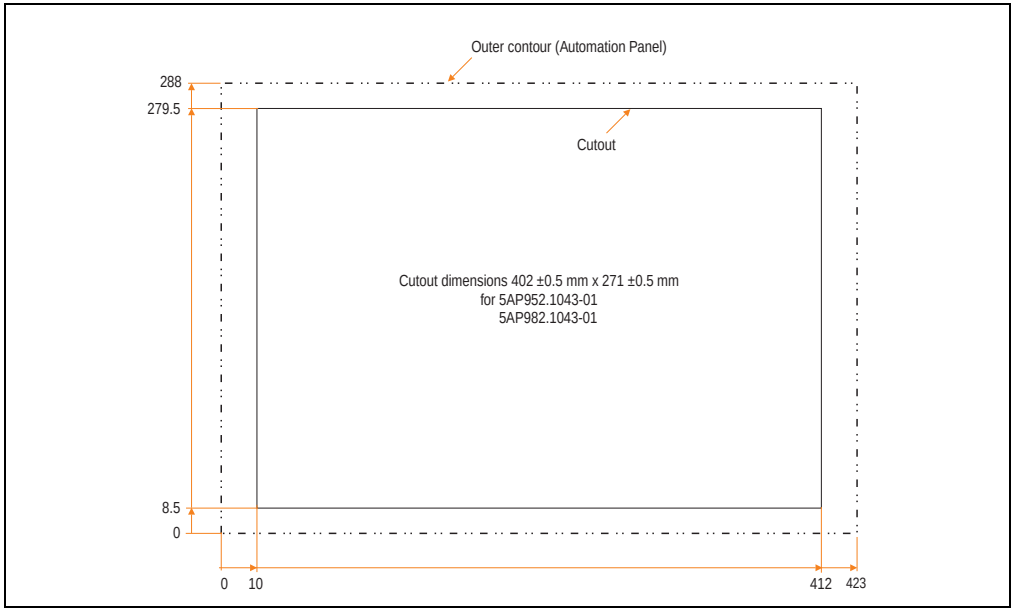


Figure 48: Cutout installation - 5AP982.1043-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

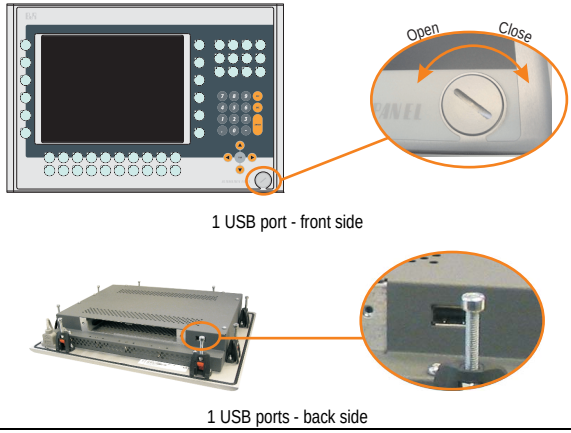


Figure 49: USB connections

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.

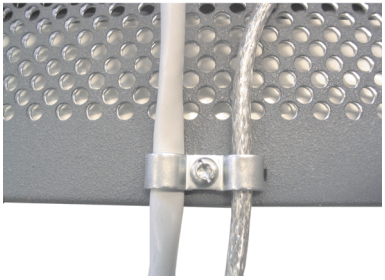


Figure 50: Mounting the cable clamps

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).

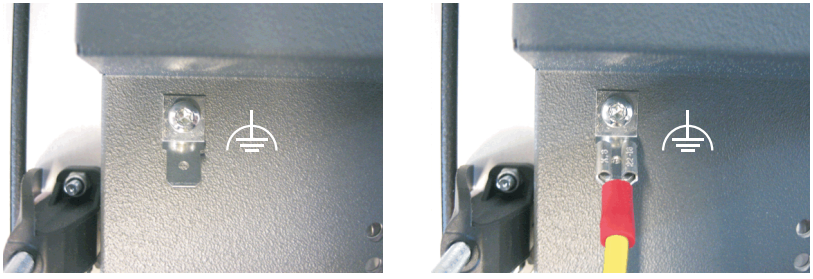


Figure 51: Functional grounding clip

3.2 Automation Panel 12.1" SVGA

3.2.1 Automation Panel 5AP920.1214-01

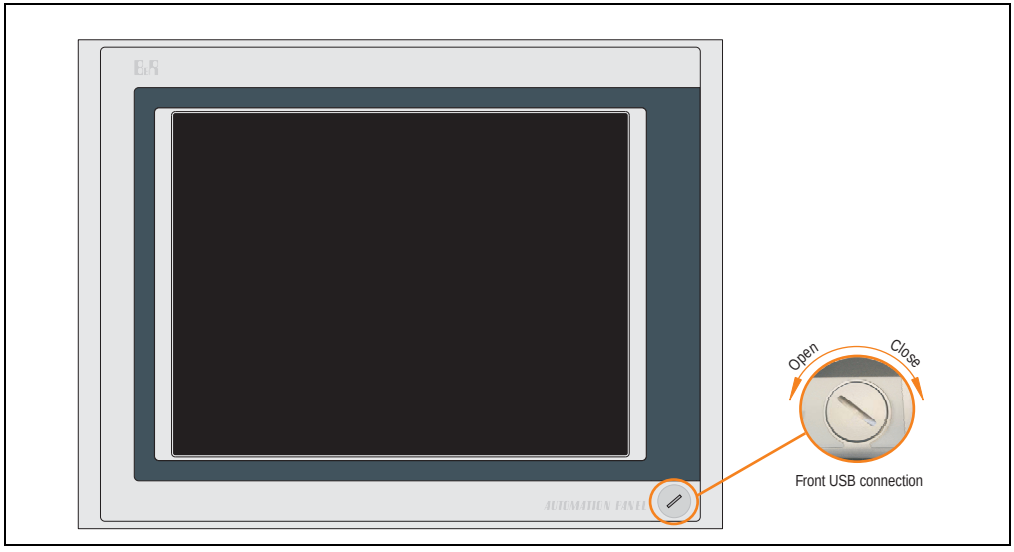


Figure 52: Front view - 5AP920.1214-01

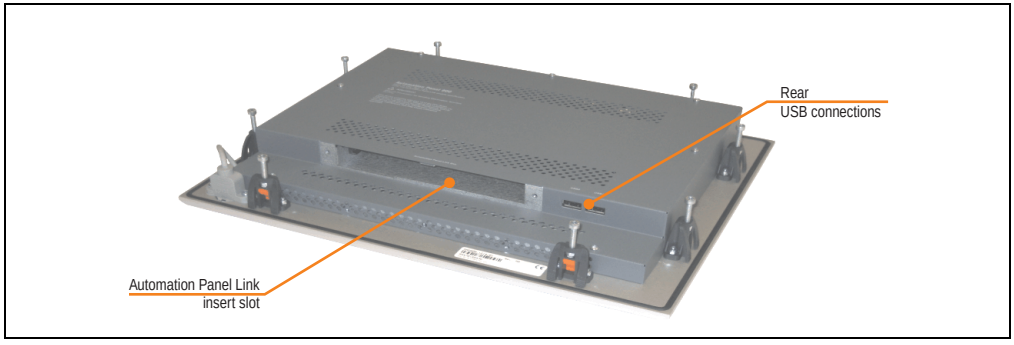


Figure 53: Rear view - 5AP920.1214-01

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 267) 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 Height Depth	 362 mm 284 mm 54 mm
Housing Paint	Metal Similar to Pantone 432CV[5)]
Weight	Approx. 3.4 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	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[6)]

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.

6) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

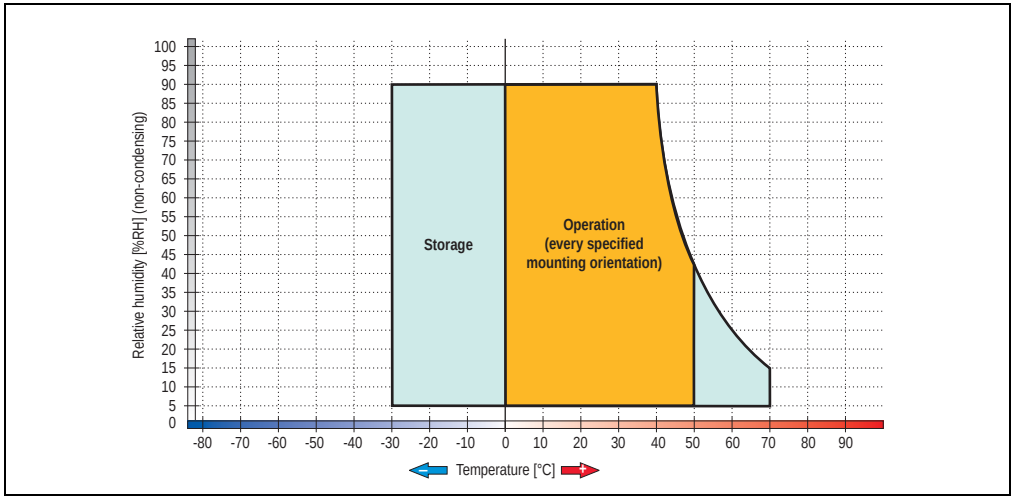


Figure 54: Temperature humidity diagram - 5AP920.1214-01

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

Dimensions

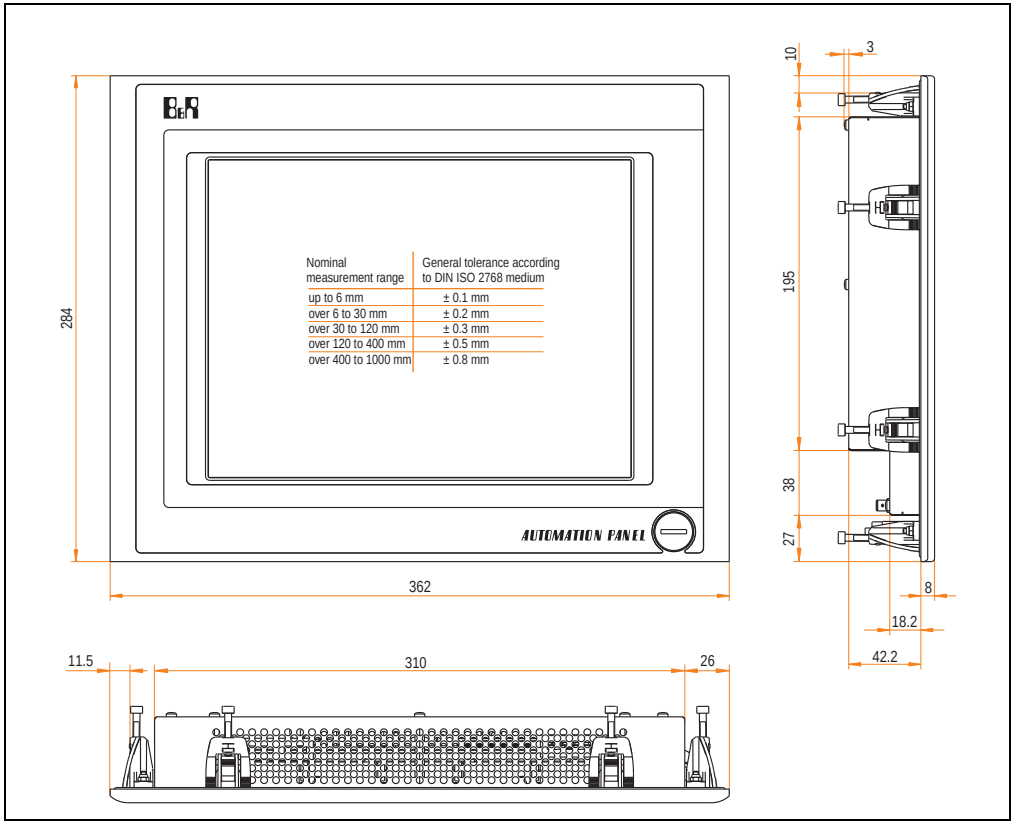


Figure 55: Dimensions - 5AP920.1214-01

Contents of delivery

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

Amount	Component
1	Automation Panel 920 TFT XGA 15in 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.

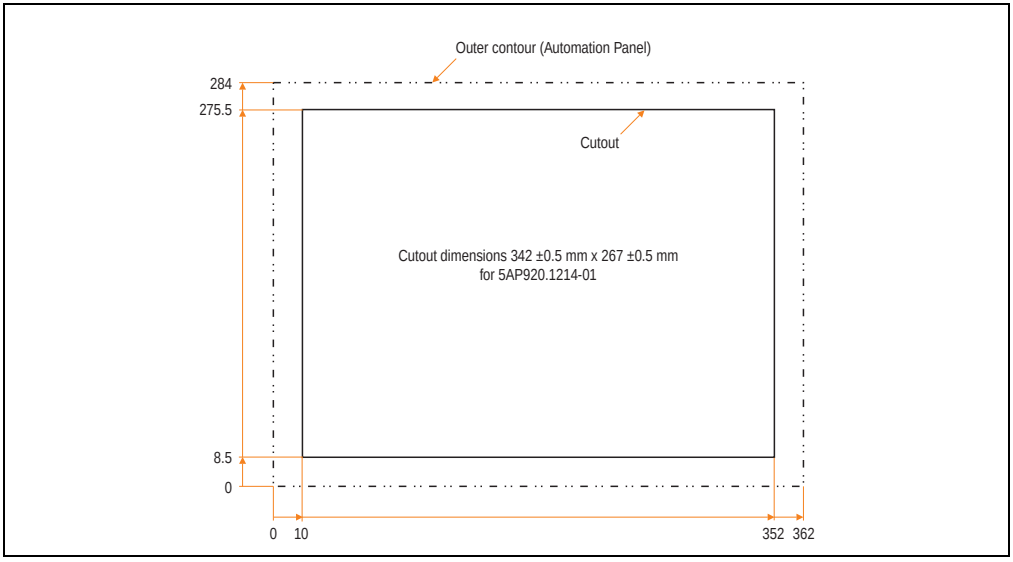


Figure 56: Cutout installation - 5AP920.1214-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

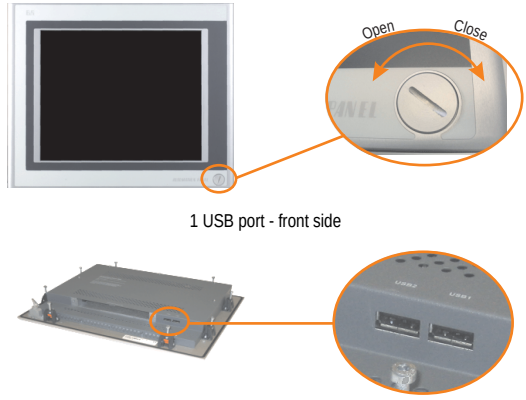


Figure 57: USB connections

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.

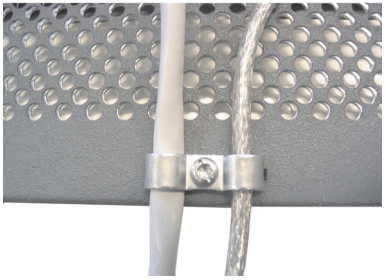


Figure 58: Mounting the cable clamps

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).

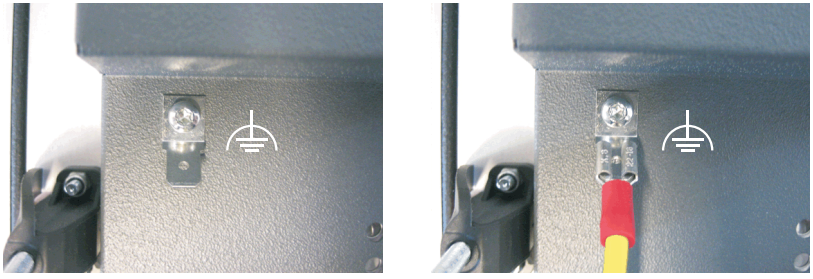


Figure 59: Functional grounding clip

3.3 Automation Panel 15" XGA

3.3.1 Automation Panel 5AP920.1505-01

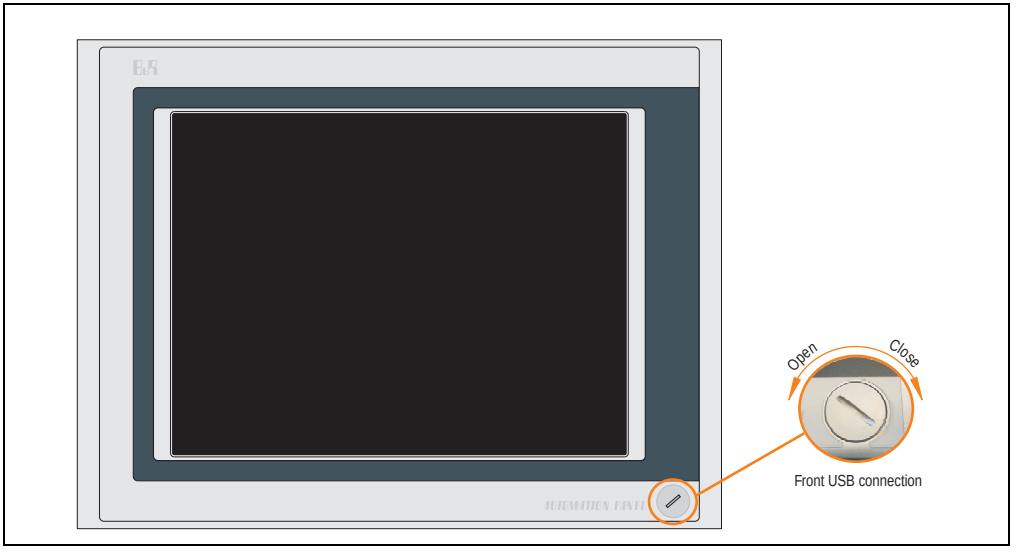


Figure 60: Front view - 5AP920.1505-01

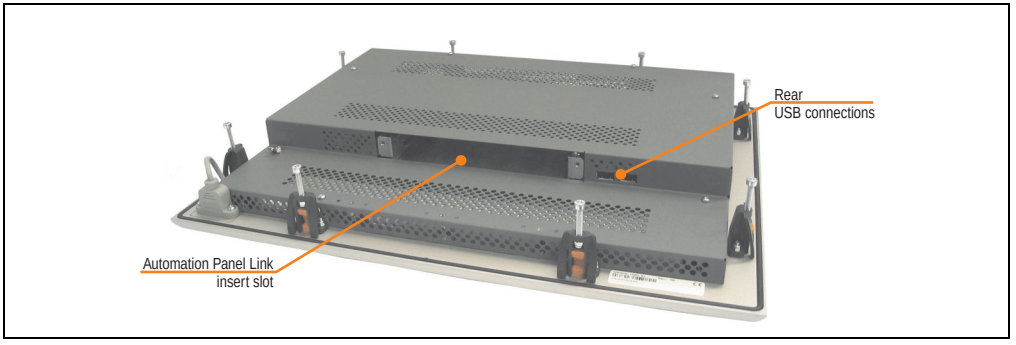


Figure 61: Rear view - 5AP920.1505-01

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 267) 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° Direction U / direction D = 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

Mechanical characteristics	5AP920.1505-01
Outer dimensions Width Height Depth	 435 mm 330 mm 54 mm
Housing Paint	Metal Similar to Pantone 432CV[5)]
Weight	Approx. 5.1 kg
Environmental characteristics	
Ambient temperature Operation Storage Transport	 See "Ambient temperatures" on page 27 -25°C .. +60°C -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) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[6)]

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.

6) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

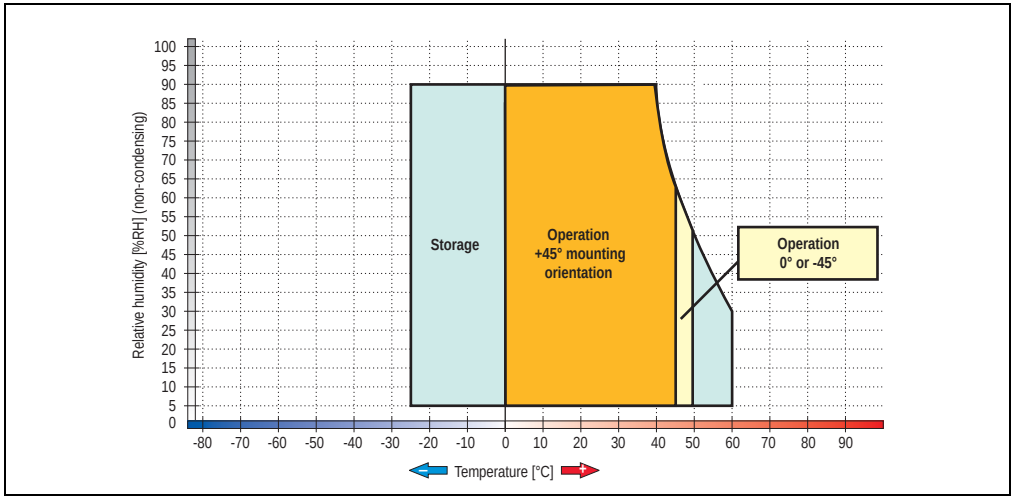


Figure 62: Temperature humidity diagram - 5AP920.1505-01

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

Dimensions

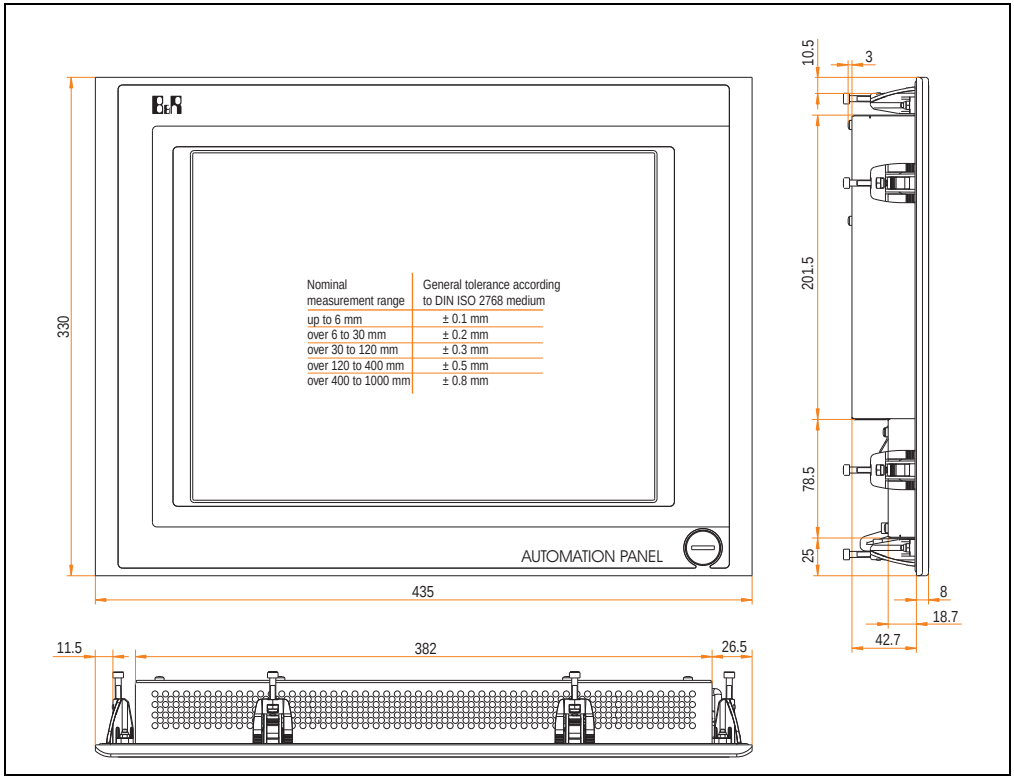


Figure 63: Dimensions 5AP920.1505-01

Contents of delivery

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

Amount	Component
1	Automation Panel 920 TFT XGA 15in 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.

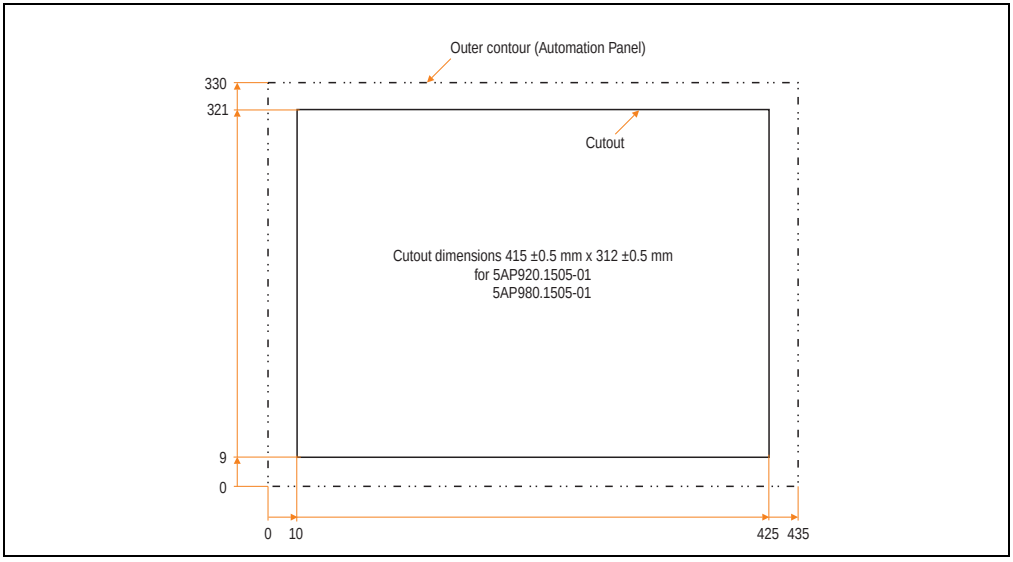


Figure 64: Cutout installation - 5AP920.1505-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

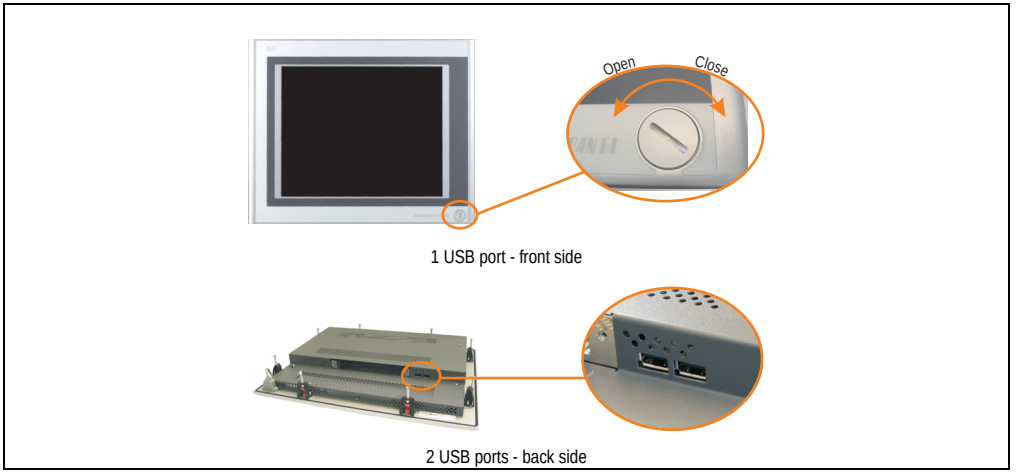


Figure 65: USB connections

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.

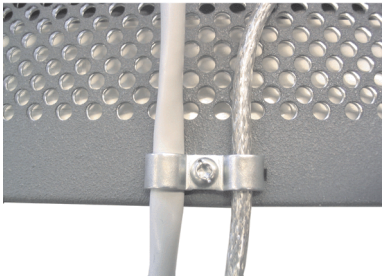


Figure 66: Mounting the cable clamps

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).

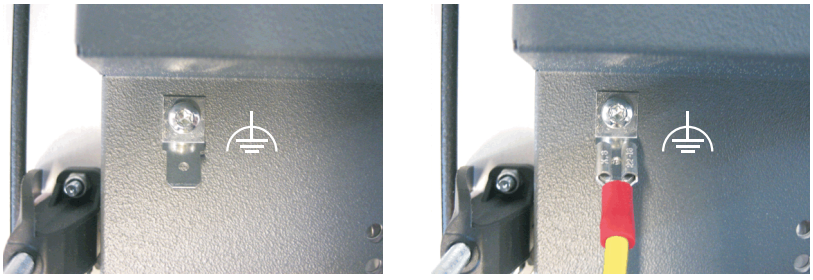


Figure 67: Functional grounding clip

3.3.2 Automation Panel 5AP951.1505-01

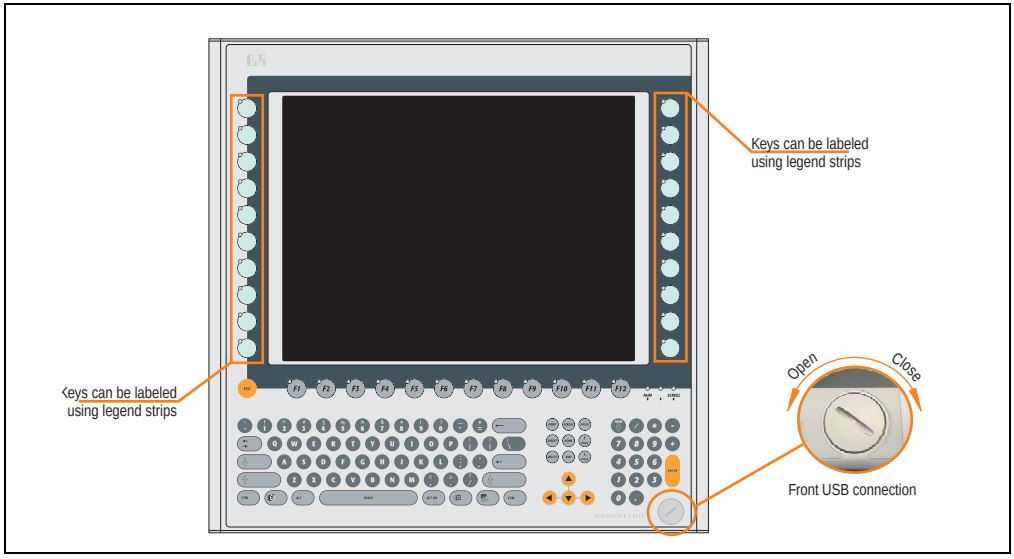


Figure 68: Front view - 5AP951.1505-01

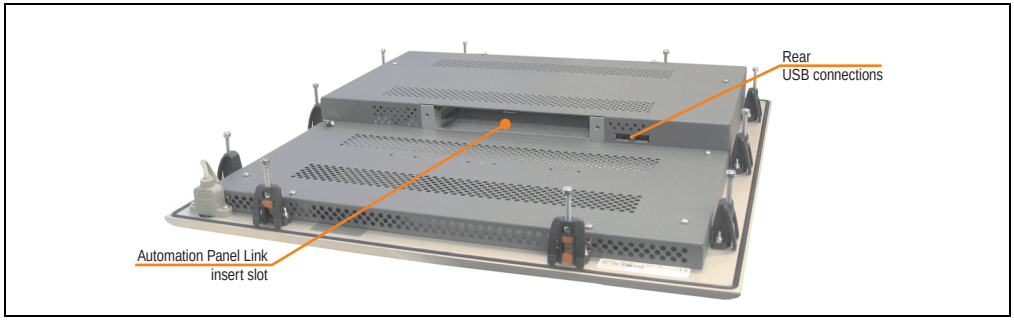


Figure 69: Rear view - 5AP951.1505-01

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 267) 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° Direction U / direction D = 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 Height Depth	 435 mm 430 mm 54 mm
Housing Paint	Metal Similar to Pantone 432CV[5)]
Weight	Approx. 5.9 kg
Environmental characteristics	
Ambient temperature Operation Storage Transport	 See "Ambient temperatures" on page 27 -25°C .. +60°C -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) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[6)]

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.

6) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

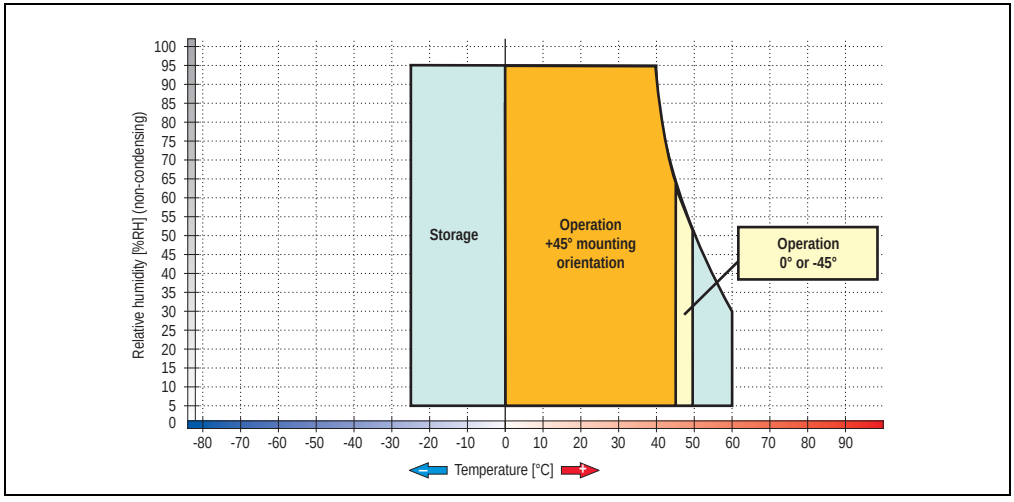


Figure 70: Temperature humidity diagram - 5AP951.1505-01

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

Dimensions

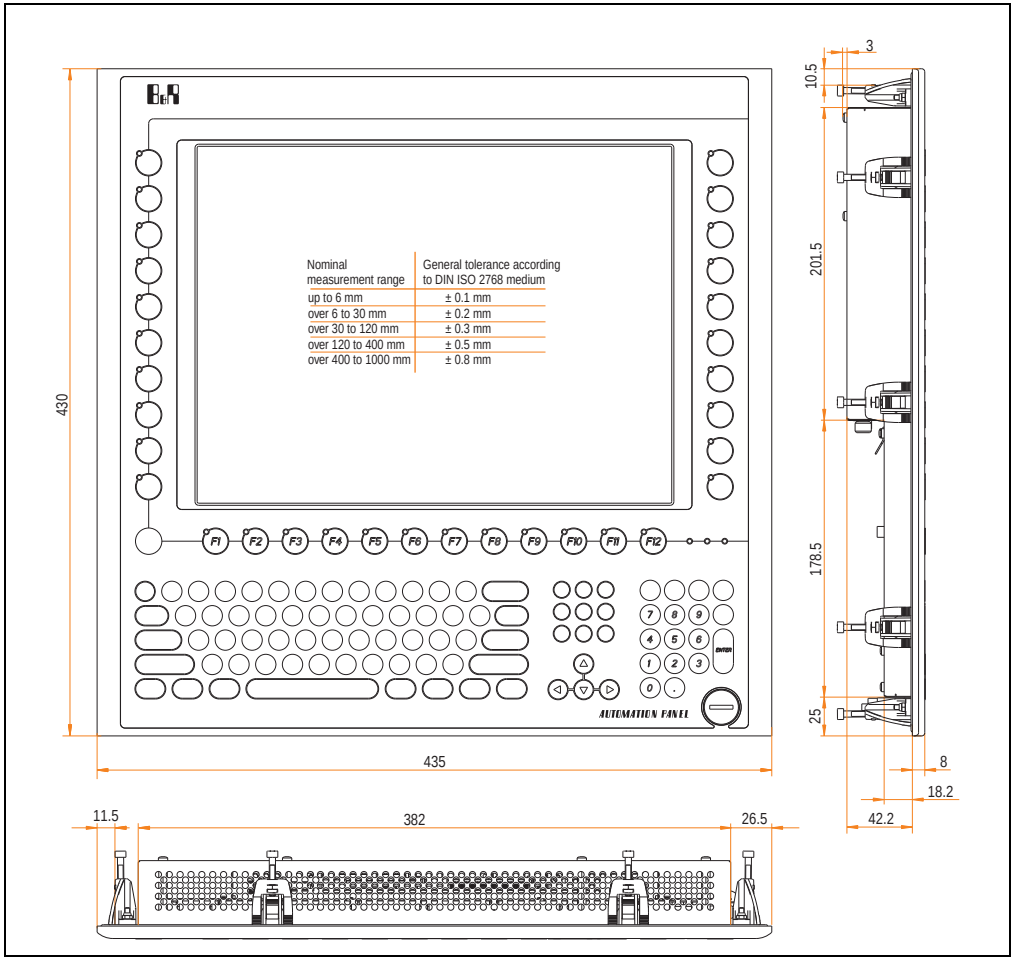


Figure 71: Dimensions 5AP951.1505-01

Contents of delivery

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

Amount	Component
1	Automation Panel 951 TFT VGA 15in 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.

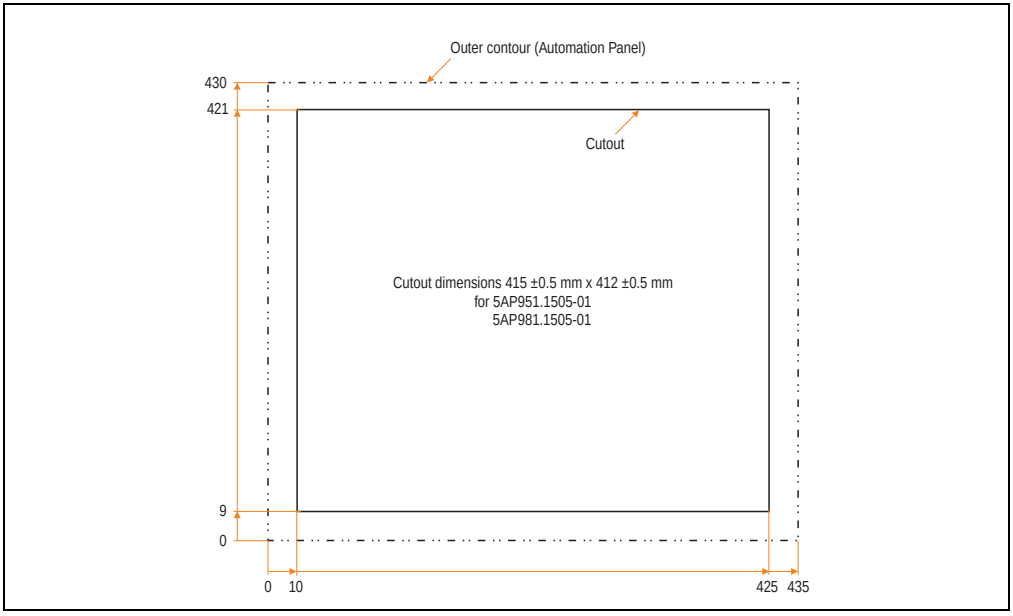


Figure 72: Cutout installation - 5AP951.1505-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

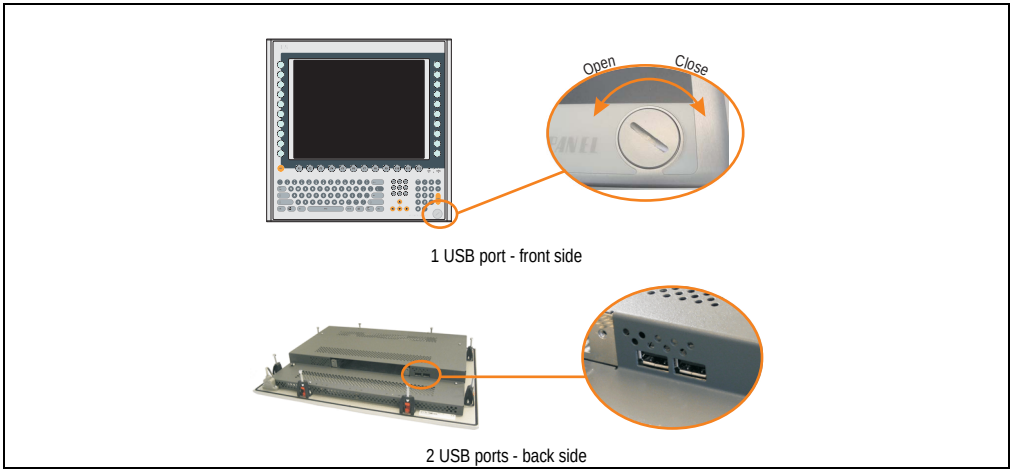


Figure 73: USB connections

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.

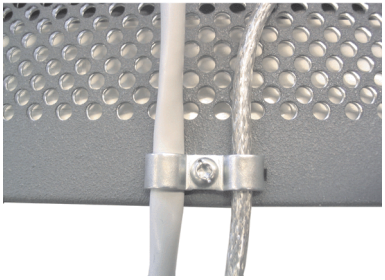


Figure 74: Mounting the cable clamps

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).

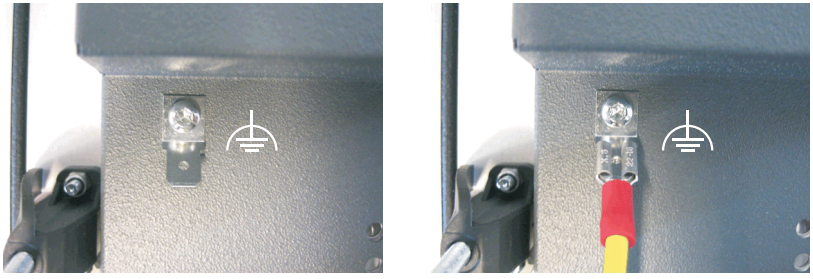


Figure 75: Functional grounding clip

3.3.3 Automation Panel 5AP980.1505-01

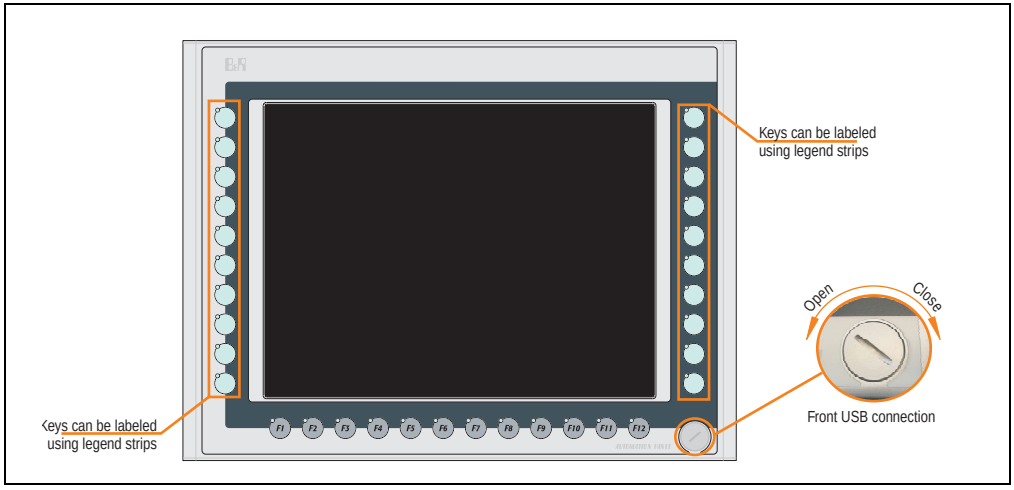


Figure 76: Front view - 5AP980.1505-01

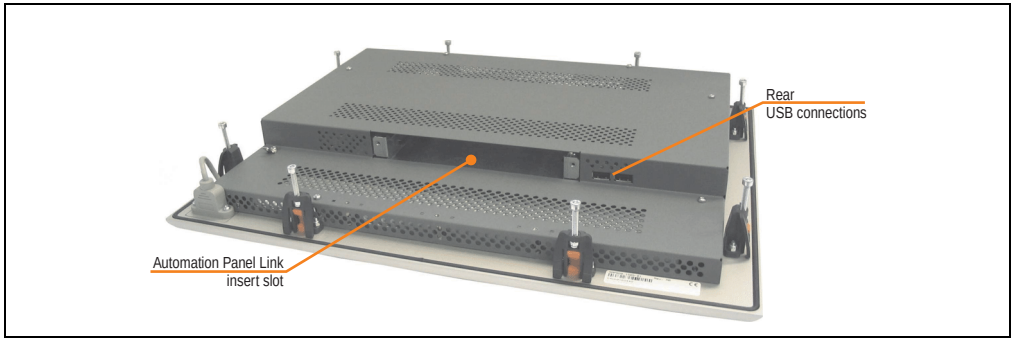


Figure 77: Rear view - 5AP980.1505-01

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 267) 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° Direction U / direction D = 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

Mechanical characteristics	5AP980.1505-01
Outer dimensions Width Height Depth	 435 mm 330 mm 54 mm
Housing Paint	Metal Similar to Pantone 432CV[6)]
Weight	Approx. 5.1 kg
Environmental characteristics	
Ambient temperature Operation Storage Transport	 See "Ambient temperatures" on page 27 -25°C .. +60°C -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) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[7)]

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.

7) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

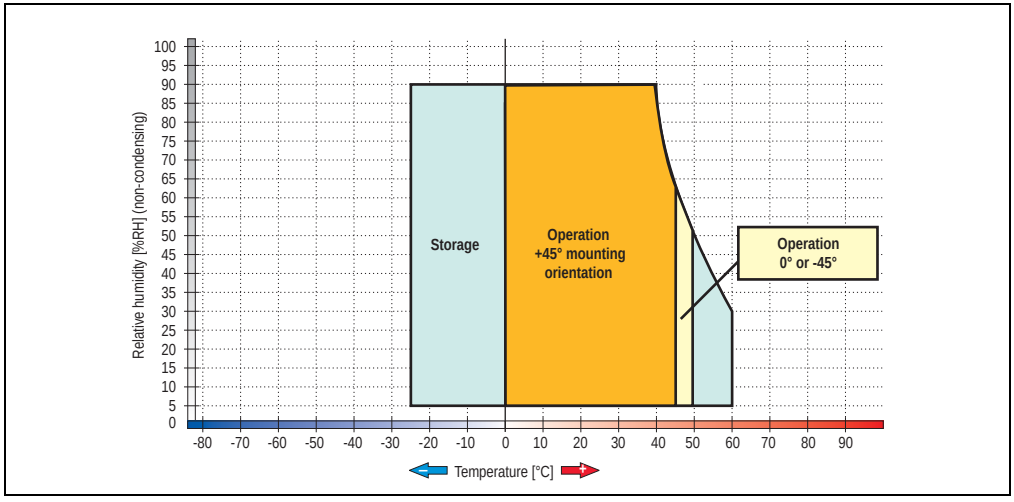


Figure 78: Temperature humidity diagram - 5AP980.1505-01

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

Dimensions

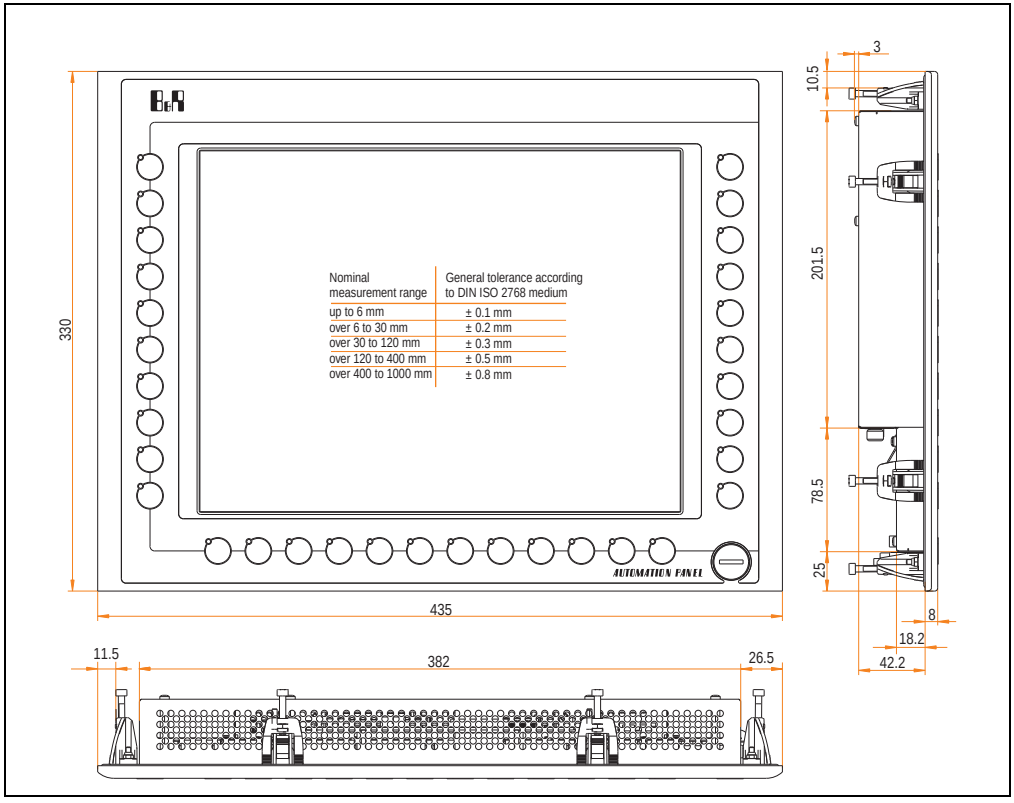


Figure 79: Dimensions 5AP980.1505-01

Contents of delivery

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

Amount	Component
1	Automation Panel 980 TFT XGA 15in 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.

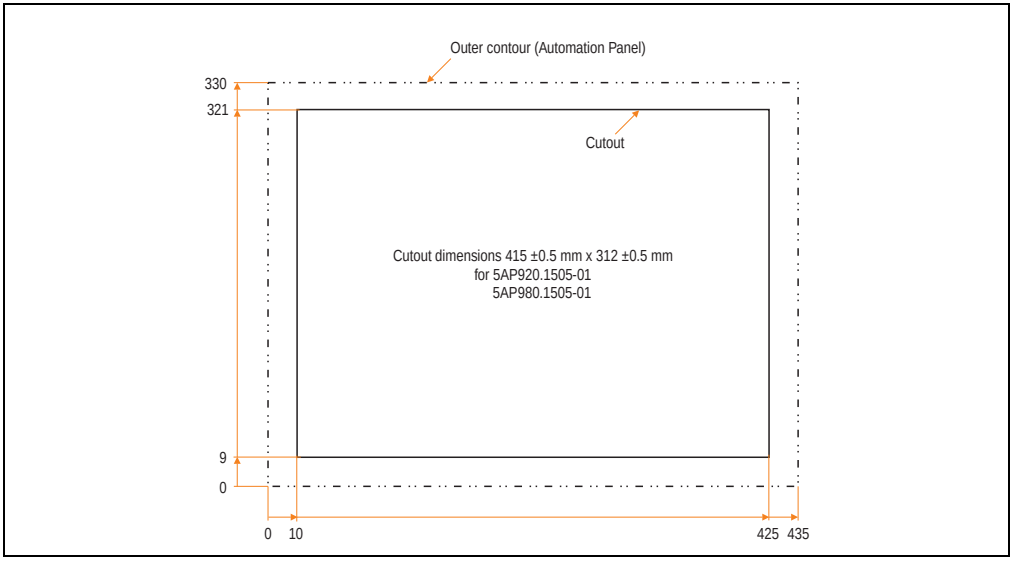


Figure 80: Cutout installation - 5AP980.1505-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

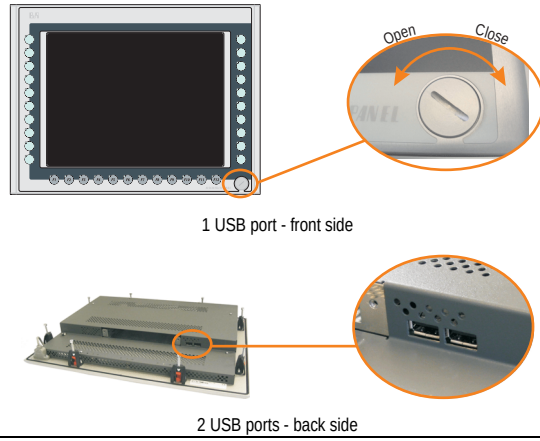


Figure 81: USB connections

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.

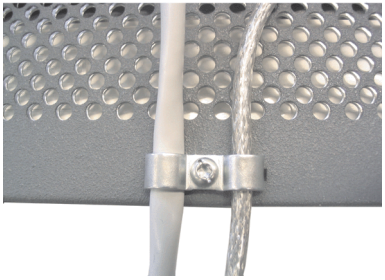


Figure 82: Mounting the cable clamps

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).

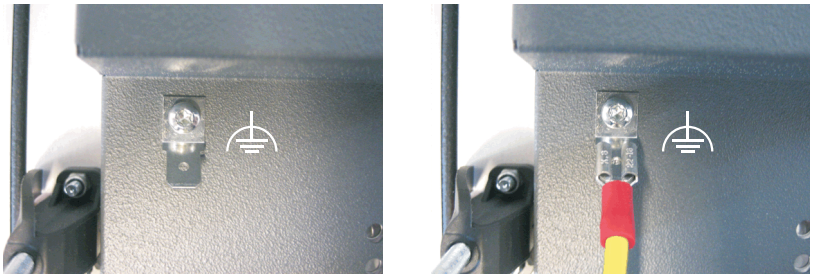


Figure 83: Functional grounding clip

3.3.4 Automation Panel 5AP981.1505-01

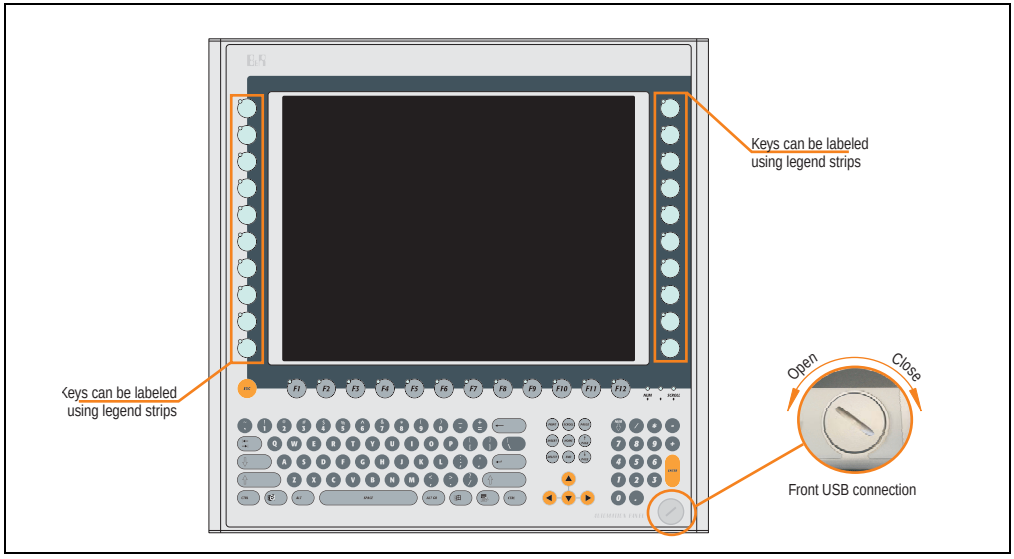


Figure 84: Front view - 5AP981.1505-01

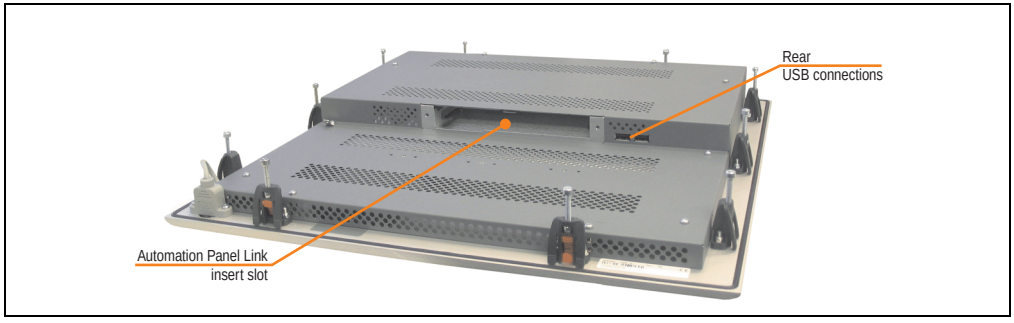


Figure 85: Rear view - 5AP981.1505-01

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 267) 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° Direction U / direction D = 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

Mechanical characteristics	5AP981.1505-01
Outer dimensions Width Height Depth	 435 mm 430 mm 54 mm
Housing Paint	Metal Similar to Pantone 432CV[6)]
Weight	Approx. 5.9 kg
Environmental characteristics	
Ambient temperature Operation Storage Transport	 See "Ambient temperatures" on page 27 -25°C .. +60°C -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) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[7)]

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.

7) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

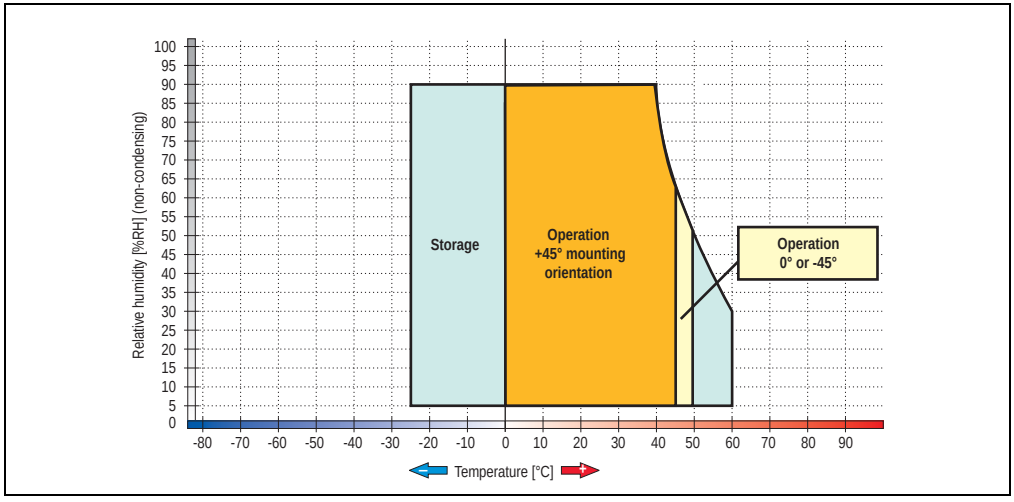


Figure 86: Temperature humidity diagram - 5AP981.1505-01

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

Dimensions

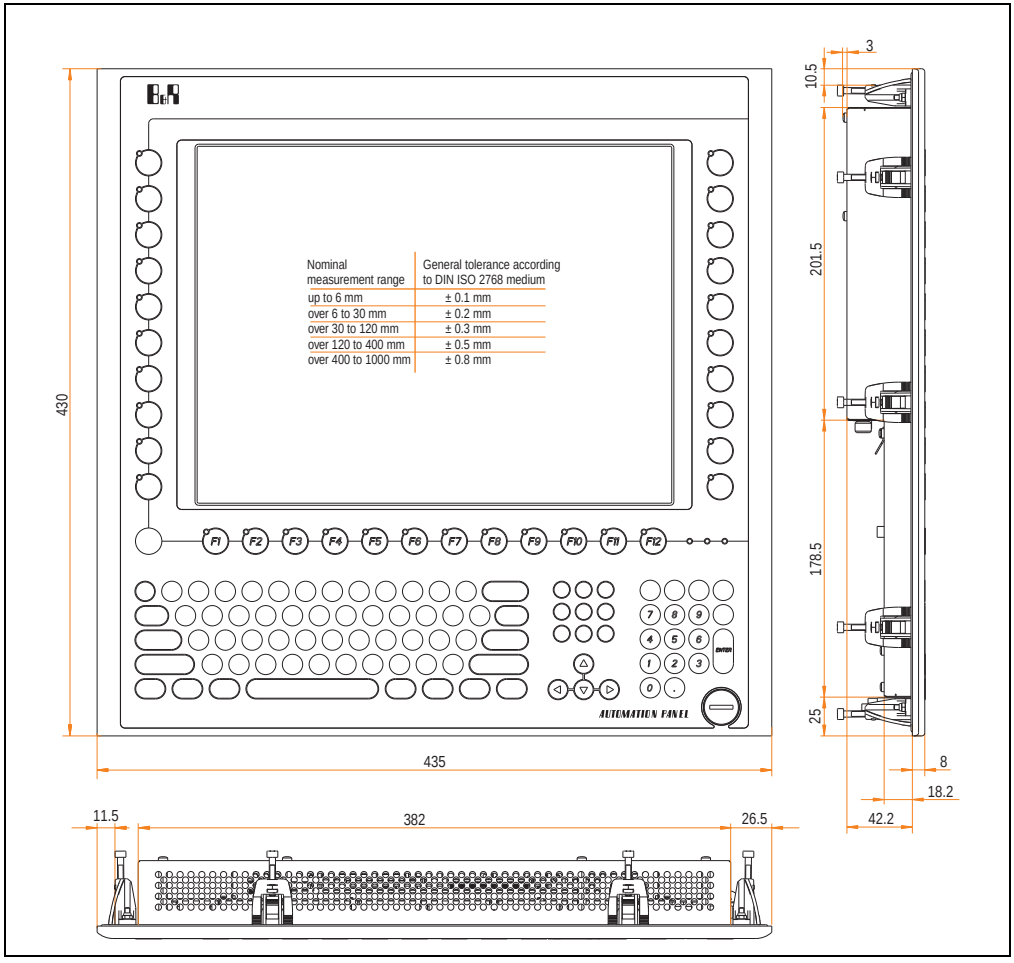


Figure 87: Dimensions 5AP981.1505-01

Contents of delivery

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

Amount	Component
1	Automation Panel 981 TFT VGA 15in 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.

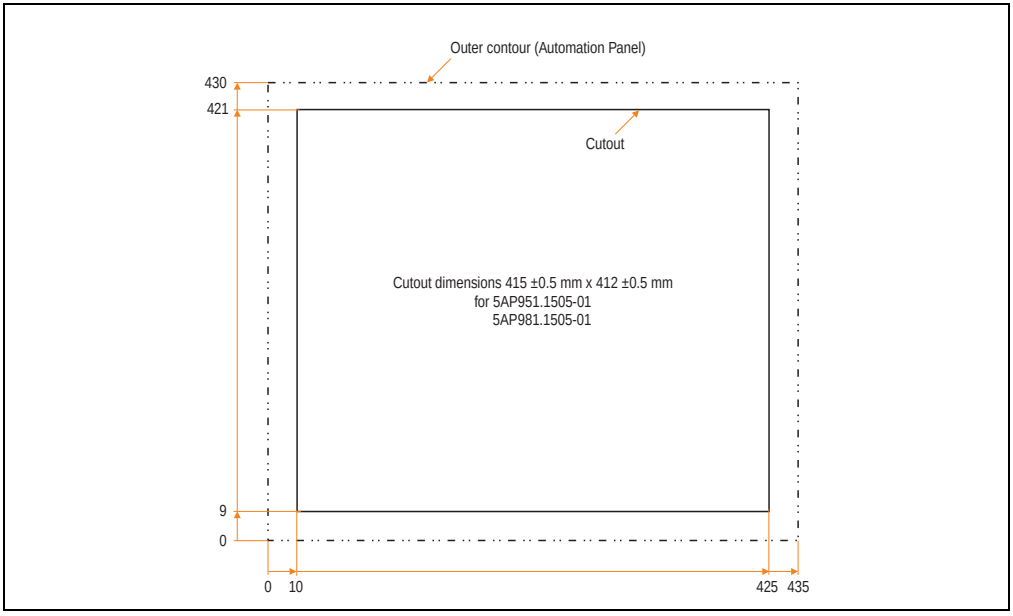


Figure 88: Cutout installation - 5AP981.1505-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

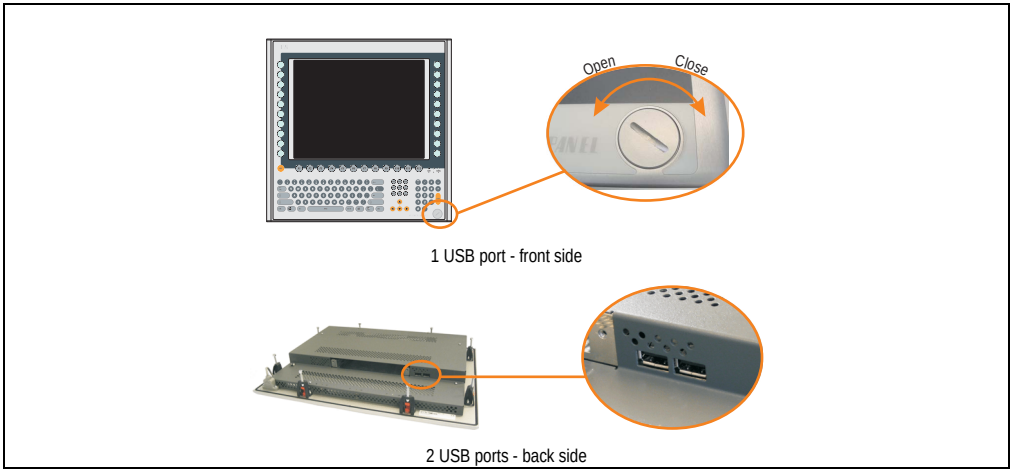


Figure 89: USB connections

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.

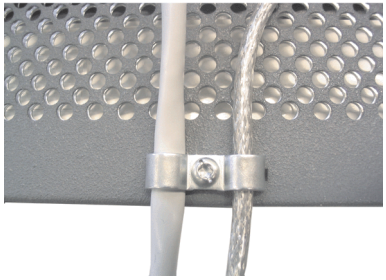


Figure 90: Mounting the cable clamps

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).

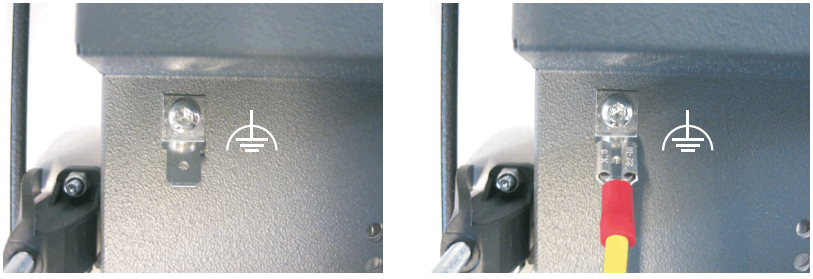


Figure 91: Functional grounding clip

3.4 Automation Panel 17" SXGA

3.4.1 Automation Panel 5AP920.1706-01

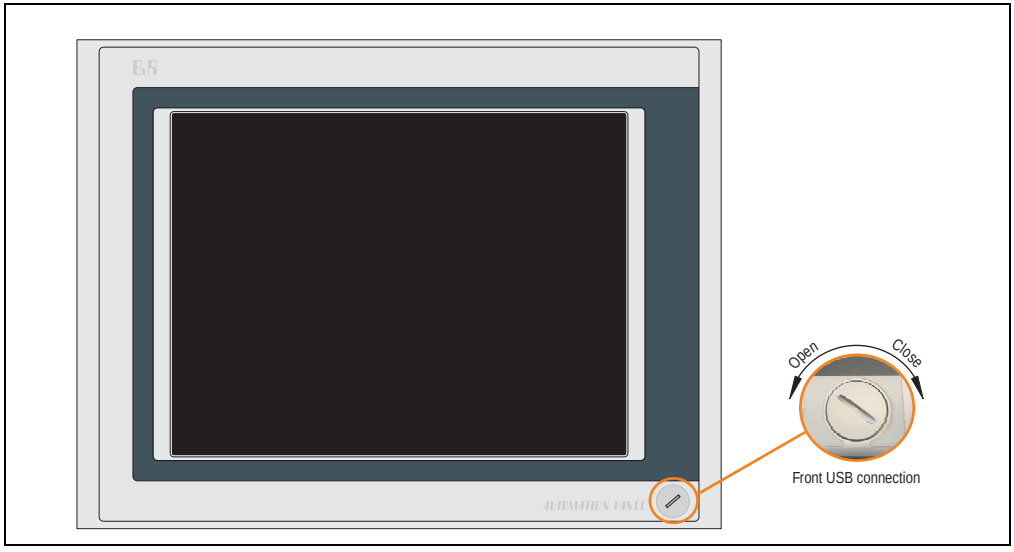


Figure 92: Front view - 5AP920.1706-01

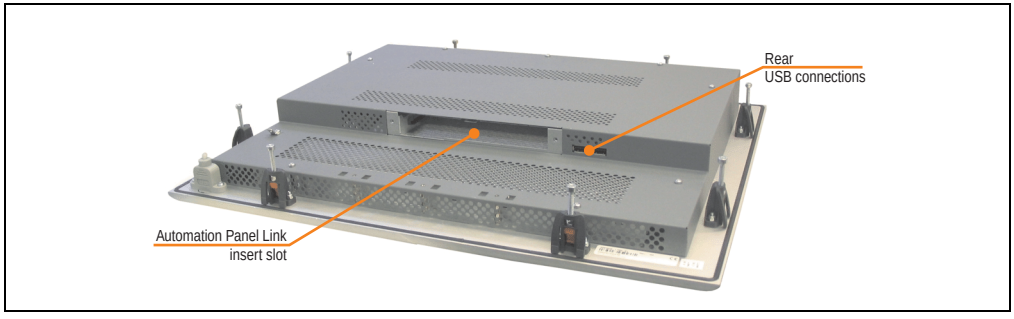


Figure 93: Rear view - 5AP920.1706-01

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 267) 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/m² 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

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	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g	
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms	
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[7)]	

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.
7) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

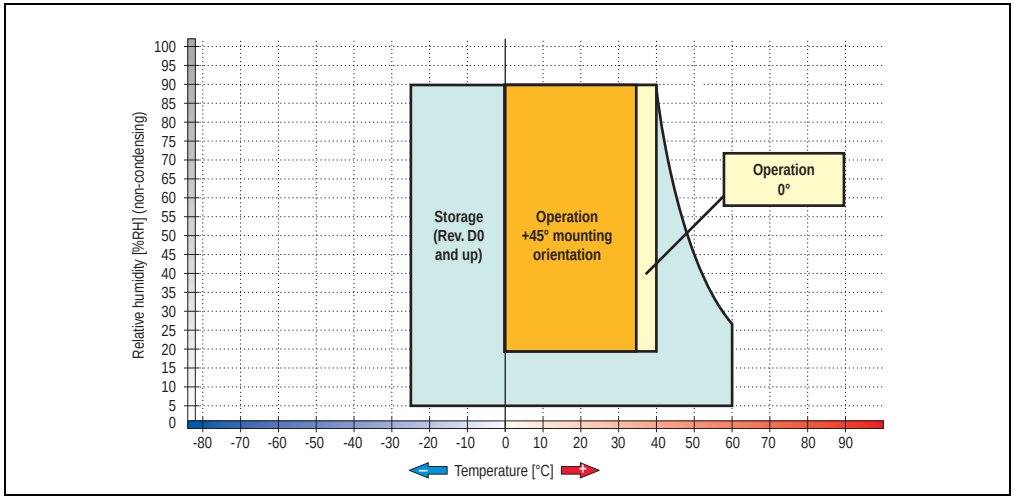


Figure 94: Temperature humidity diagram - 5AP920.1706-01

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

Dimensions

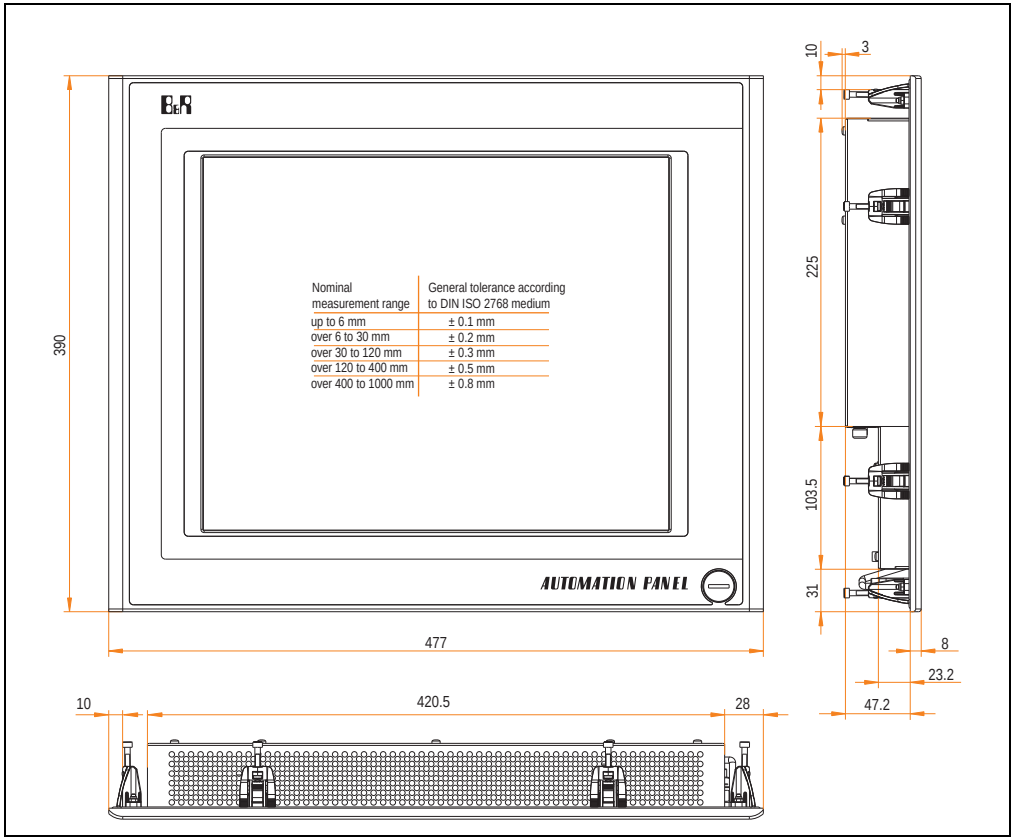


Figure 95: Dimensions 5AP920.1706-01

Contents of delivery

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

Amount	Component
1	Automation Panel 920 TFT SXGA 17in 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.

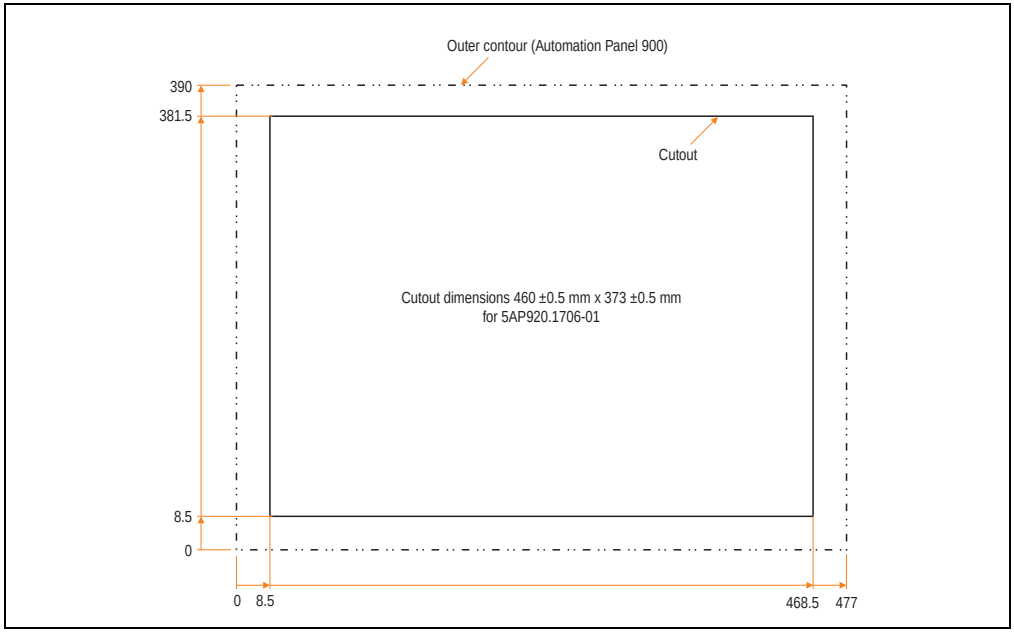


Figure 96: Cutout installation - 5AP920.1706-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

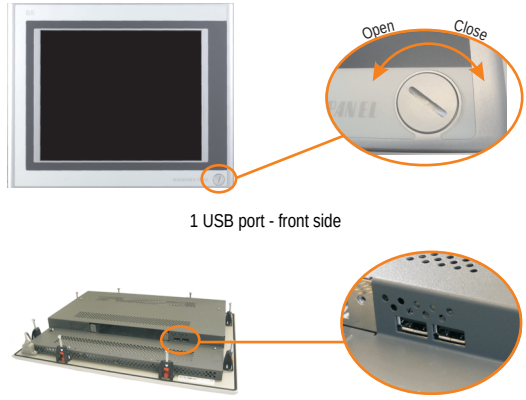


Figure 97: USB connections

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.

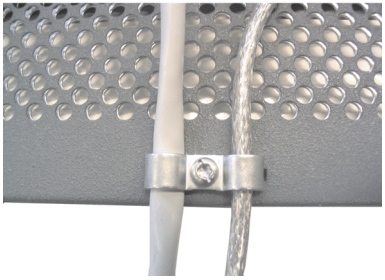


Figure 98: Mounting the cable clamps

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).

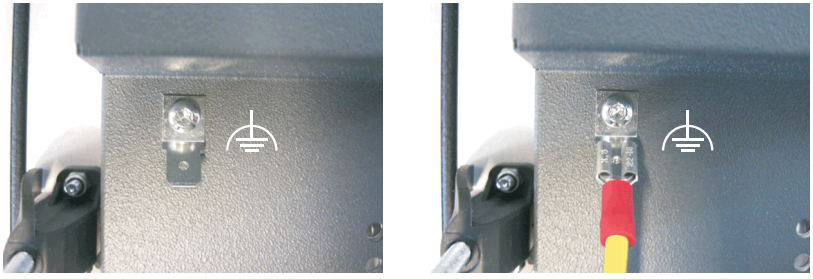


Figure 99: Functional grounding clip

3.5 Automation Panel 19" SXGA

3.5.1 Automation Panel 5AP920.1906-01

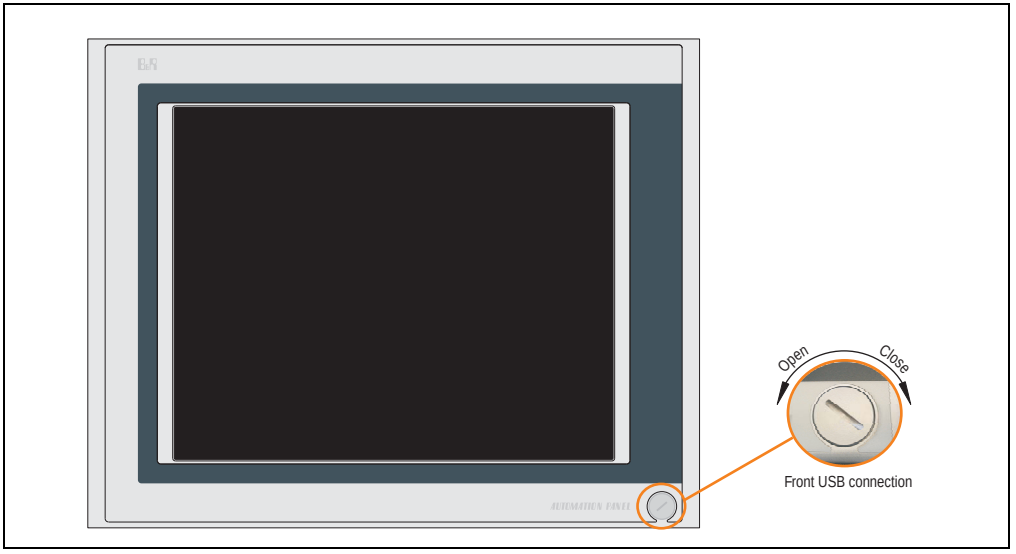


Figure 100: Front view - 5AP920.1906-01

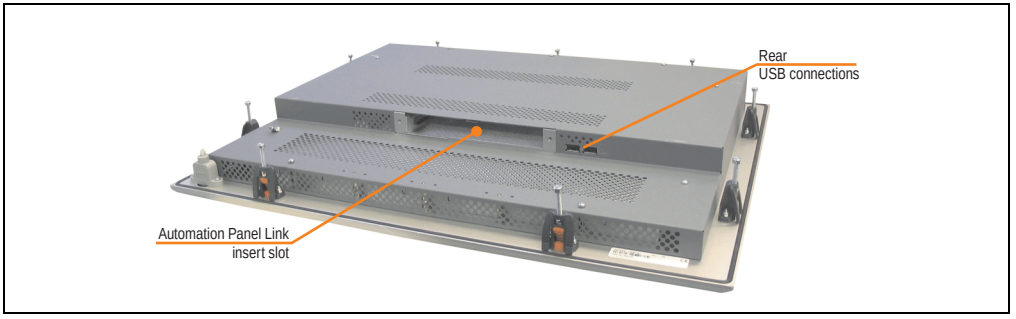


Figure 101: Rear view - 5AP920.1906-01

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 267) 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/m² 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

Mechanical characteristics		
Outer dimensions Width Height Depth	 527 mm 421 mm 62 mm	
Housing Paint	Metal Similar to Pantone 432CV[5)]	
Weight	Approx. 8.1 kg	
Environmental characteristics	**5AP920.1906-01 < Rev. D0**	**5AP920.1906-01 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	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g	
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms	
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[6)]	

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.
6) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

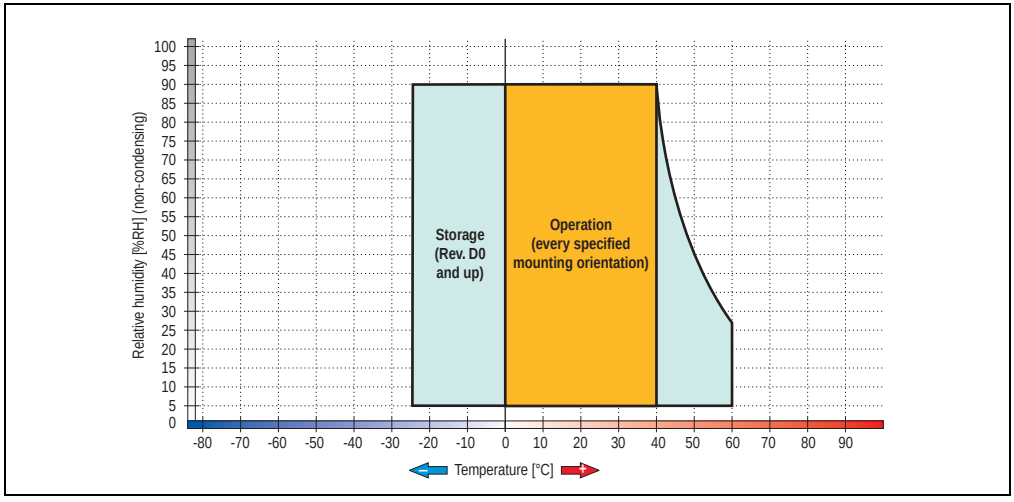


Figure 102: Temperature humidity diagram - 5AP920.1906-01

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

Dimensions

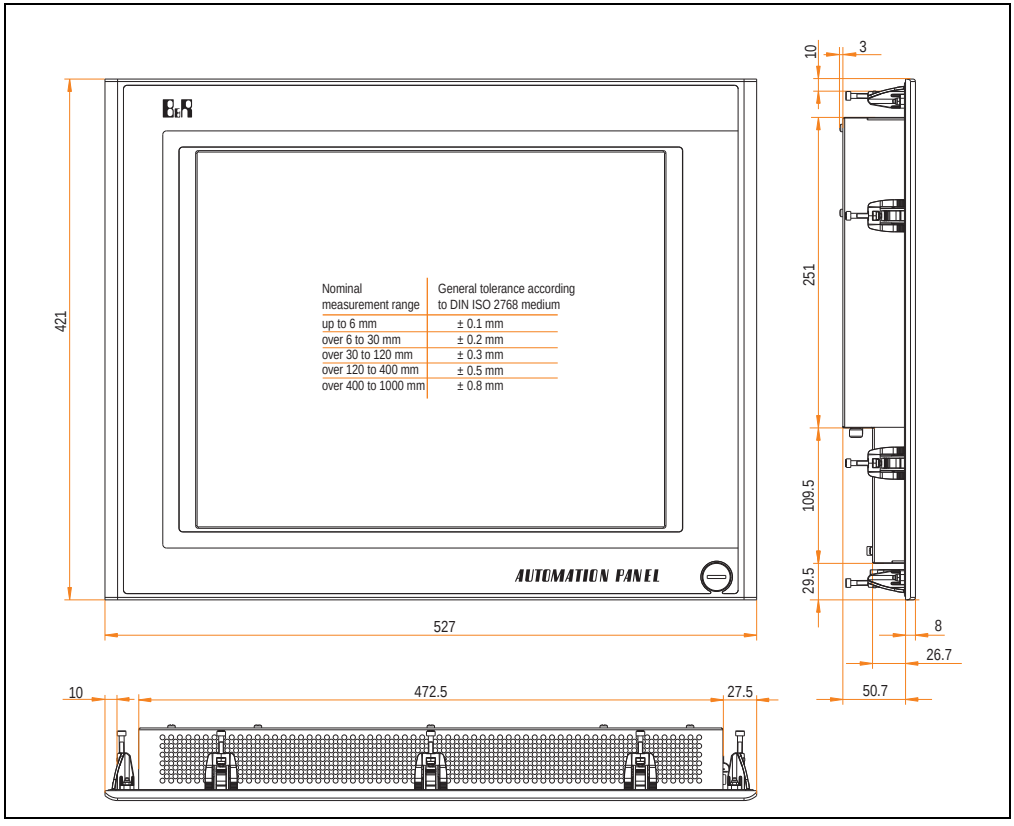


Figure 103: Dimensions 5AP920.1906-01

Contents of delivery

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

Amount	Component
1	Automation Panel 920 TFT SXGA 19in 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.

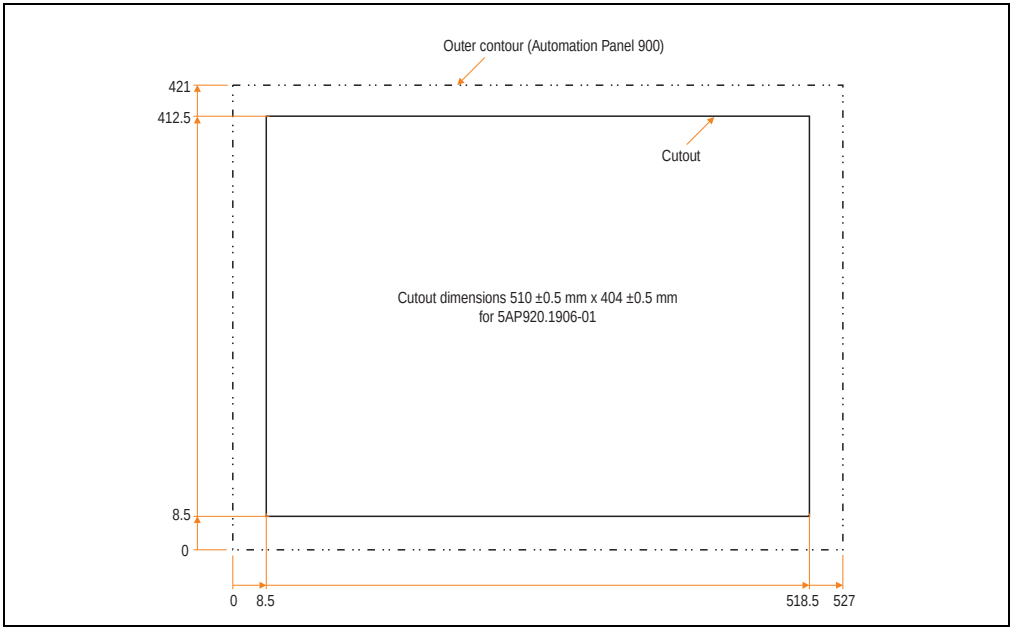


Figure 104: Cutout installation - 5AP920.1906-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

USB connections

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

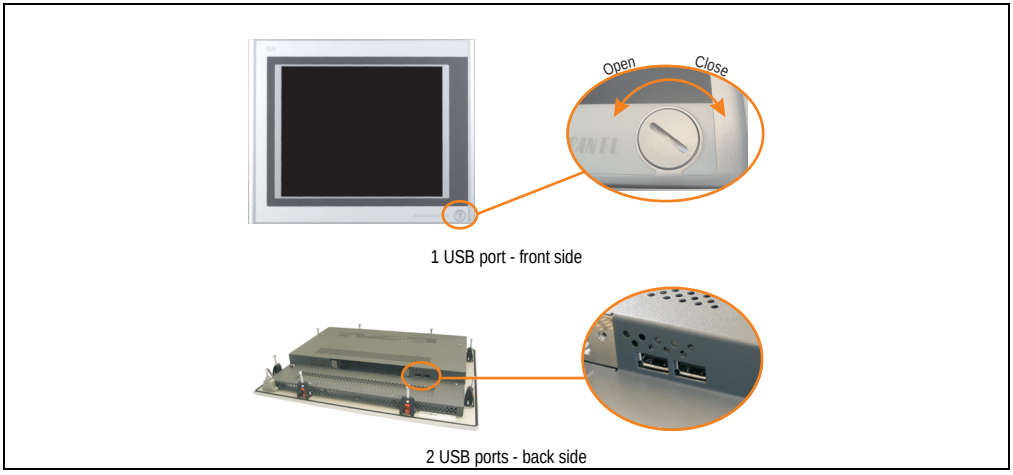


Figure 105: USB connections

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.

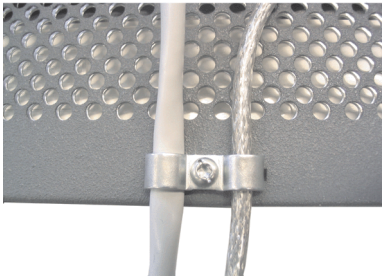


Figure 106: Mounting the cable clamps

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).

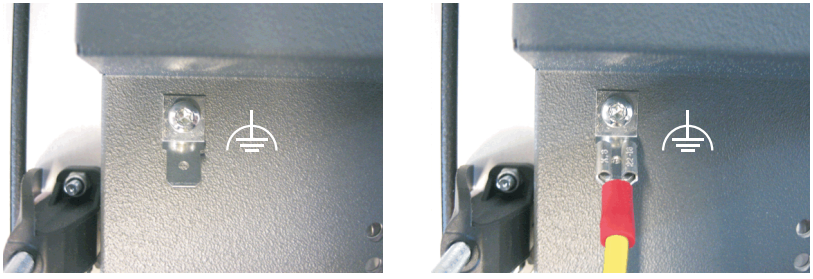


Figure 107: Functional grounding clip

3.6 Automation Panel 21.3" UXGA

3.6.1 Automation Panel 5AP920.2138-01

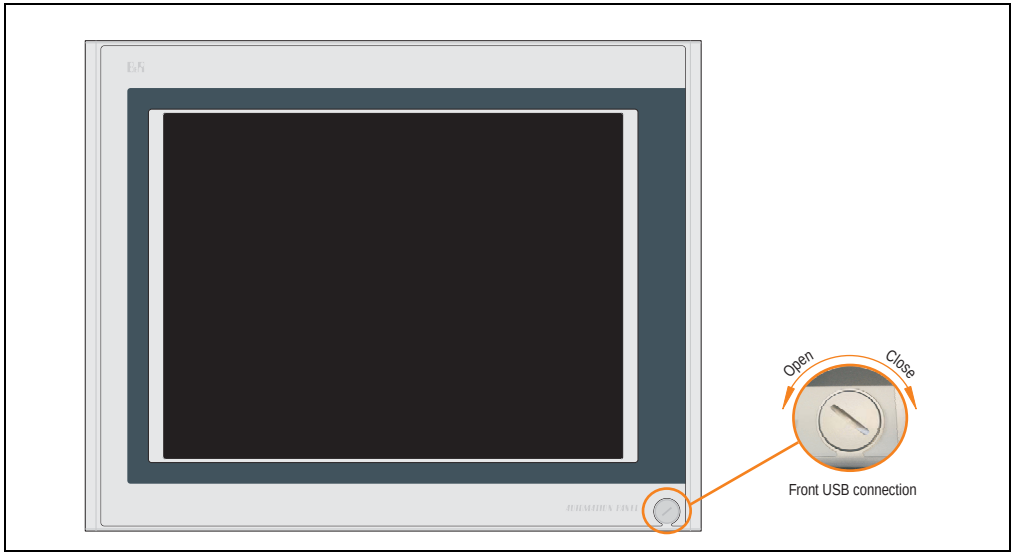


Figure 108: Front view - 5AP920.2138-01

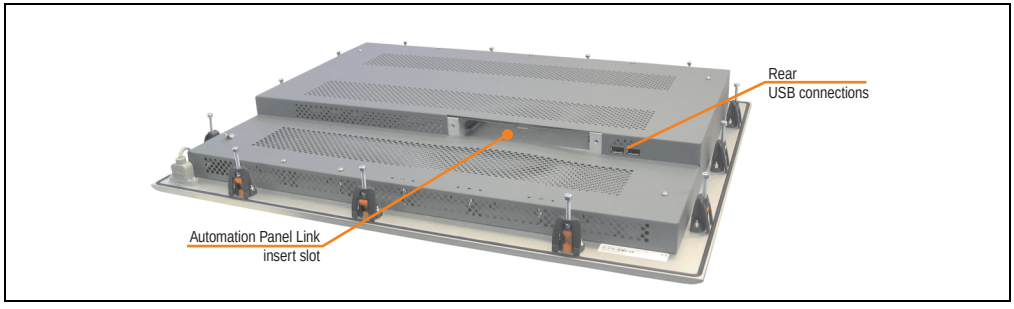


Figure 109: Rear view - 5AP920.2138-01

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 267) 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° Direction U / direction D = 60° 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 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

Mechanical characteristics	5AP920.2138-01
Outer dimensions Width Height Depth	 583 mm 464 mm 64 mm
Housing Paint	Metal Similar to Pantone 432CV[5)]
Weight	Approx. 11 kg
Environmental characteristics	
Ambient temperature Operation Storage Transport	 See "Ambient temperatures" on page 27 -20°C .. +60°C -20°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 T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: .5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
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[6)]

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.
6) Derating the maximum ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Temperature humidity diagram - Operation and storage

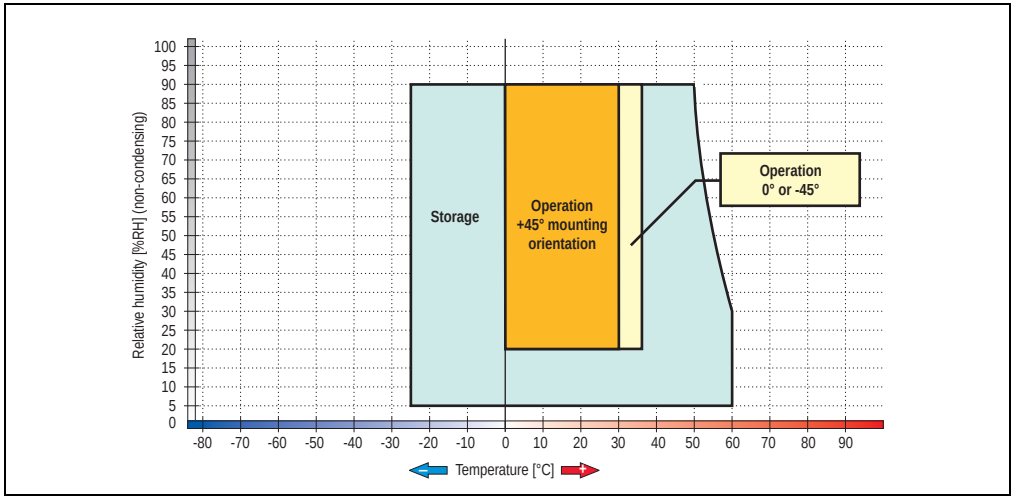


Figure 110: Temperature humidity diagram - 5AP920.2138-01

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

Dimensions

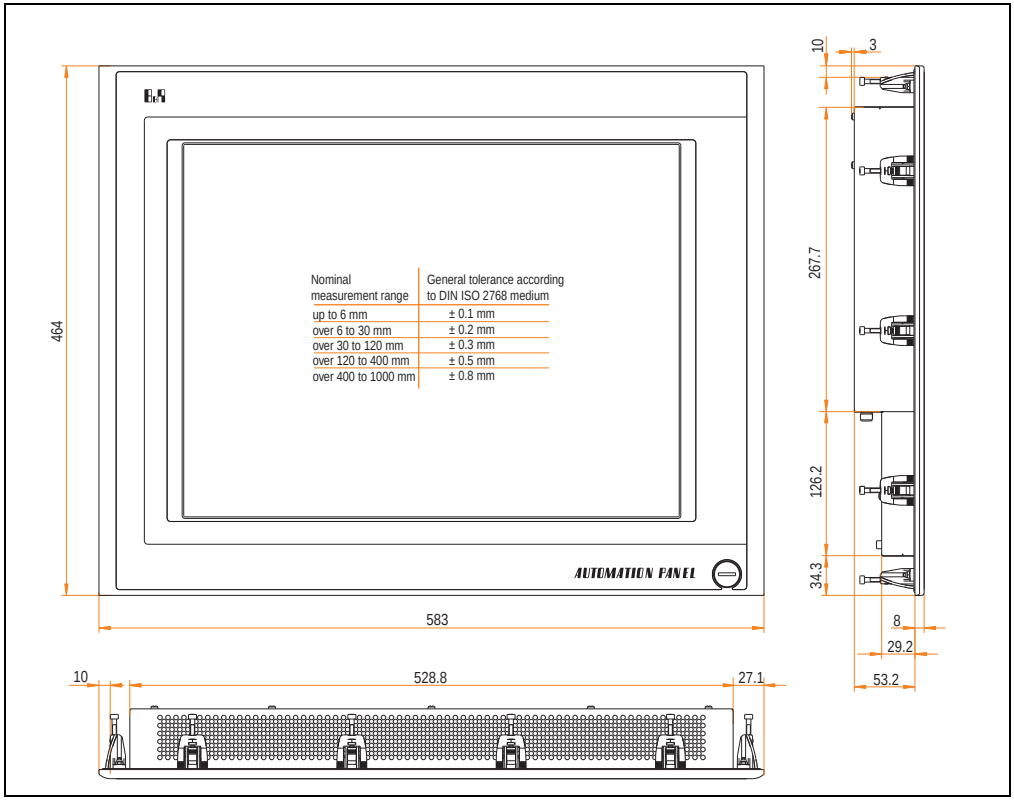


Figure 111: Dimensions 5AP920.2138-01

Contents of delivery

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

Amount	Component
1	Automation Panel 920 TFT SXGA 21.3in 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.

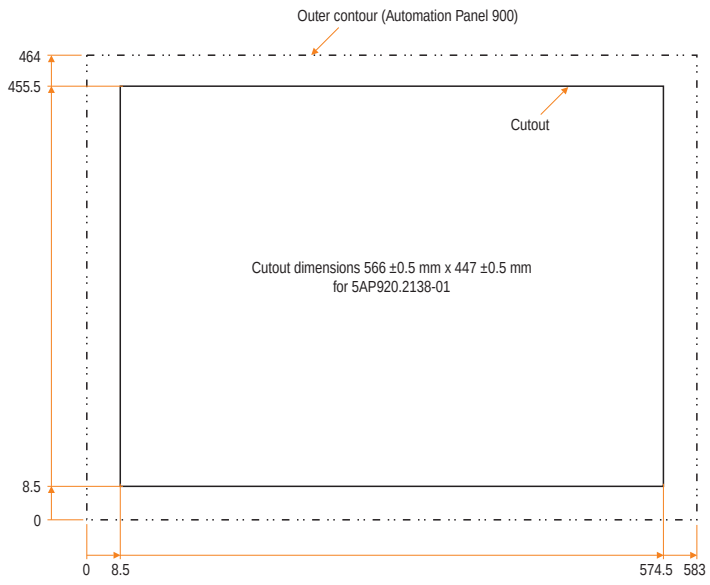


Figure 112: Cutout installation - 5AP920.2138-01

For further information regarding installation and mounting orientation, see Chapter 3 "Commissioning" starting on page 179.

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.

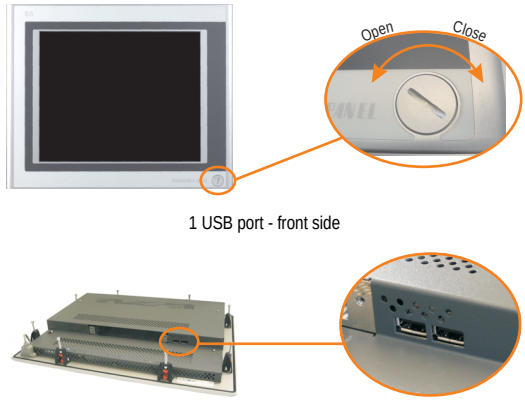


Figure 113: USB connections

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.

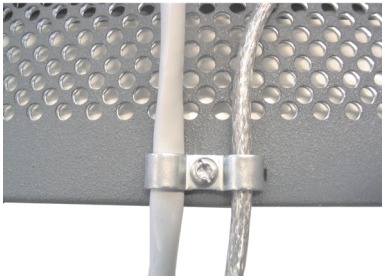


Figure 114: Mounting the cable clamps

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).

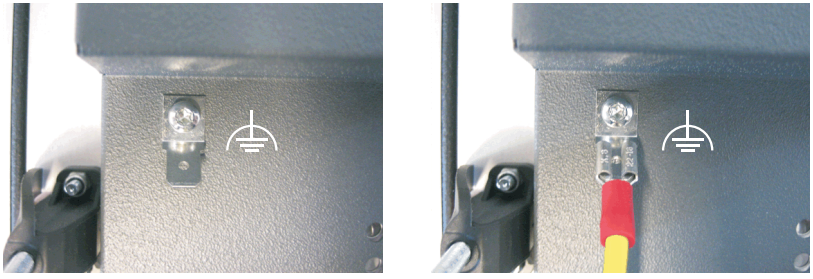


Figure 115: Functional grounding clip

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).

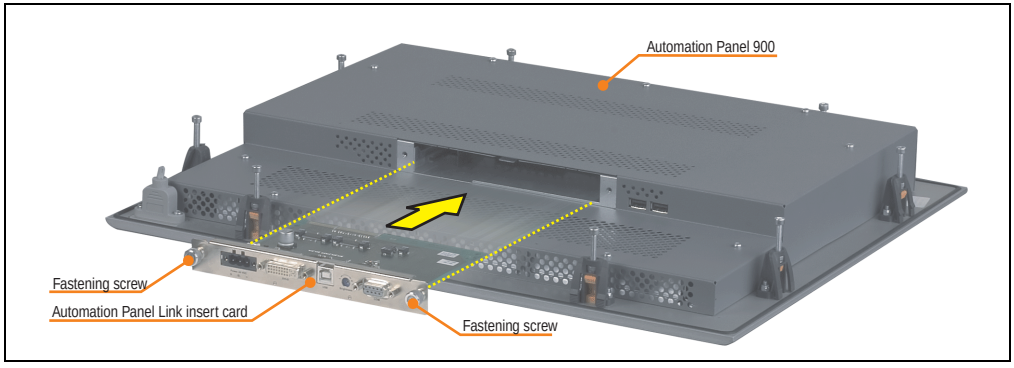


Figure 116: Automation Panel and Automation Panel Link insert card

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

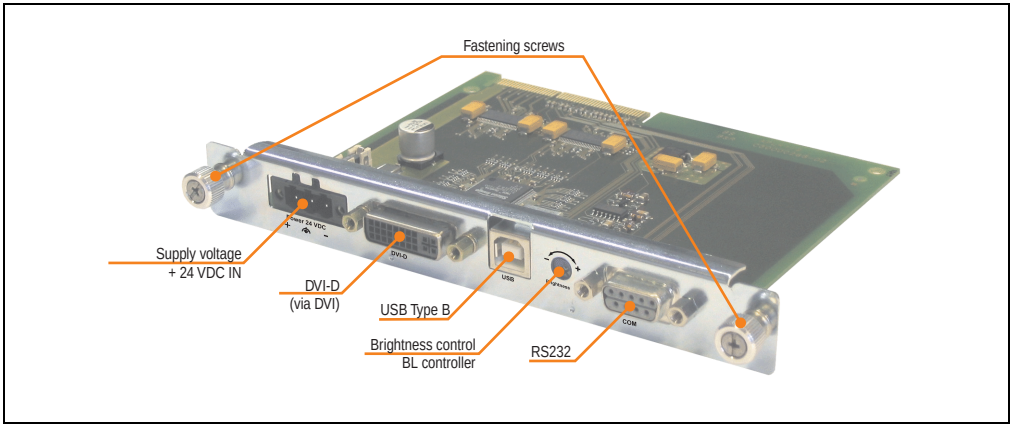


Figure 117: Components - 5DLDVI.1000-01

Technical data

Features	5DLDVI.1000-01
Power supply Rated voltage Rated current[1)] Power consumption	 24 VDC ± 25% Max. 4.2 A Typically 3 W
Fastening screws Maximum fastening torque	2 .5 Nm

Table 43: Technical data – 5DLDVI.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 information", section5.8 "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 5.8 "Cables", 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.).

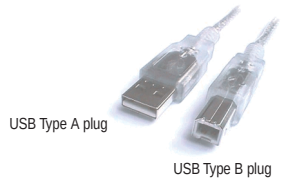


Figure 118: Comparison of USB type A-B connectors

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.

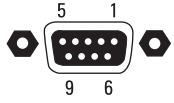
Pin assignments - serial interface		
RS232 interface Not electrically isolated Up to 115 kBaud		9-pin DSUB socket 
Pin	**Assignment**	
1	n.c.	
2	RXD	
3	TXD	
4	n.c.	
5	GND	
6	DSR	
7	RTS	
8	CTS	
9	n.c.	

Table 44: Pin assignments - RS232

B&R offers RS232 cables up to a length of 10 meters (see chapter 1 "General information", 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).

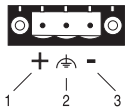
Pin assignments - supply voltage		
Pin	Assignment	
1	+	
2	Ground (safety extra low voltage)	
3	-	

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 184

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

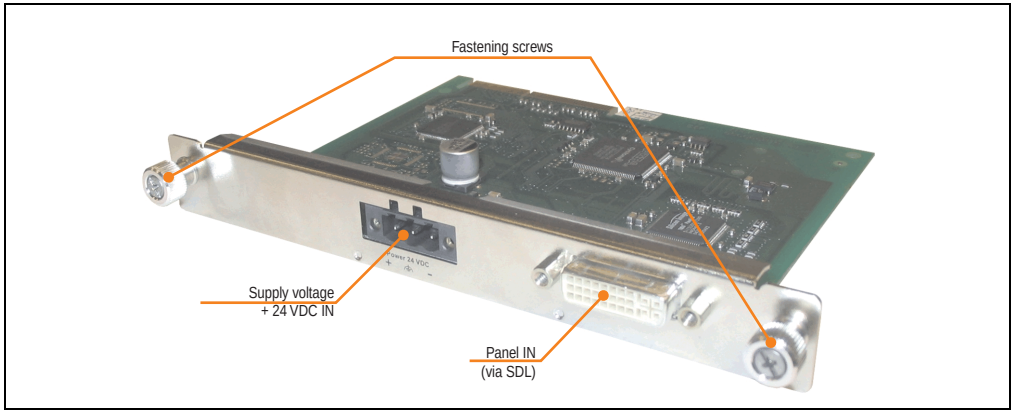


Figure 119: Components - 5DLSDL.1000-00

Technical data

Features	5DLSDL.1000-00
Power supply Rated voltage[1)] Power consumption	24 VDC ± 25% Max. 4.2 A Typically 3 W
Fastening screws Maximum fastening torque	2 .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	-

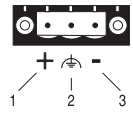


Table 47: Pin assignments - supply voltage

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 information", section5.8 "Cables" on page 21.

Example configurations

Example configuration with an Automation PC 620 - see section:

- "One Automation Panel via SDL (onboard)" on page 187
- "One Automation Panel via SDL (AP Link)" on page 195

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

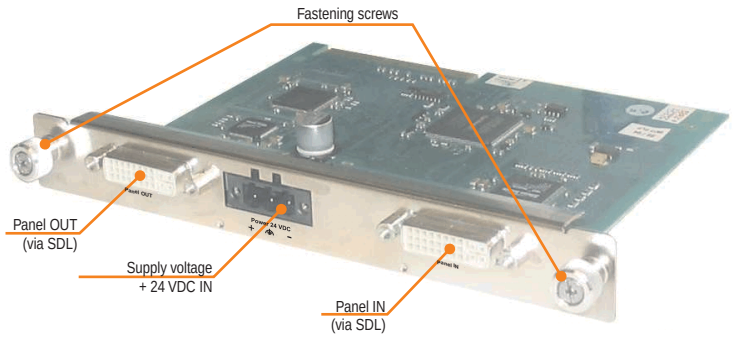


Figure 120: Components - 5DLSDL.1000-01

Technical data

Features	5DLSDL.1000-01
Power supply Rated voltage Rated current[1)] Power consumption	 24 VDC ± 25% Max. 4.2 A Typically 3 W
Fastening screws Maximum fastening torque	2 .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).

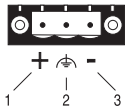
Pin assignments - supply voltage		
Pin	Assignment	
1	+	
2	Ground (safety extra low voltage)	
3	-	

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 information", section5.8 "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 information", section5.8 "Cables" on page 21.

Example configurations

Example configuration with an Automation PC 620 - see section:

- "Four Automation Panels via SDL (onboard)" on page 191
- "Four Automation Panels via SDL (AP Link)" on page 199
- "Two Automation Panels via SDL (onboard) and SDL (AP Link)" on page 203
- "Eight Automation Panels via SDL (onboard) and SDL (AP Link)" on page 207

3.8 Cables

3.8.1 DVI cable 5CADVI.0xxx-00

The DVI cables 5CADVI.0xxx-00 are designed for fixed installation.

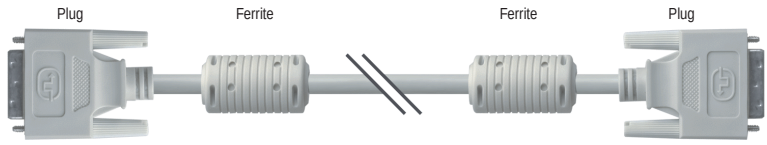


Figure 121: DVI extension cable - 5CADVI.0xxx-00 (similar)

Caution!

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

Order data

Model number	Description	Comment
5CADVI.0018-00	**DVI-D cable 1.8 m / single** Single cable, DVI-D/m:DVI-D/m; length: 1.8m	
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 Tolerance	1.8 m ±30 mm	5 m ±50 mm	10 m ±100 mm
Cable diameter Maximum	8.5 mm		
Shielding	Individual cable pairs and entire cable		
Connector type Connection cycles	2x DVI-D (18+1), male 100		
Wire cross section	AWG 28		
Line resistance	Max. 237Ω/km		
Insulation resistance	Min. 100 MΩ/km		
Flexibility	limited flexibility; valid for ferrite magnet - ferrite magnet (tested 100 cycles with 5 x cable diameter, 20 cycles / minute)		
Flex radius fixed installation	See figure "Flex radius specification" on page 151 ≥ 5 x cable diameter (plug - ferrite magnet and ferrite magnet - ferrite magnet)		
Weight	Approx. 300 g	Approx. 590 g	Approx. 2100 g

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

Flex radius specification

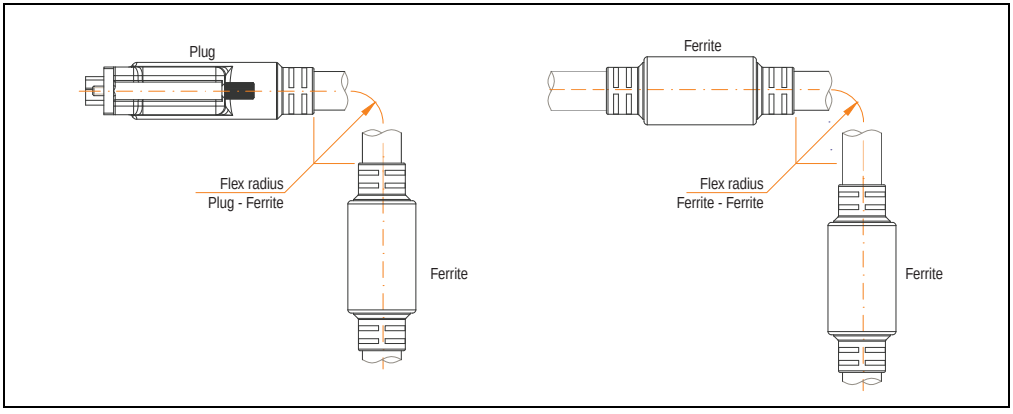


Figure 122: Flex radius specification

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.

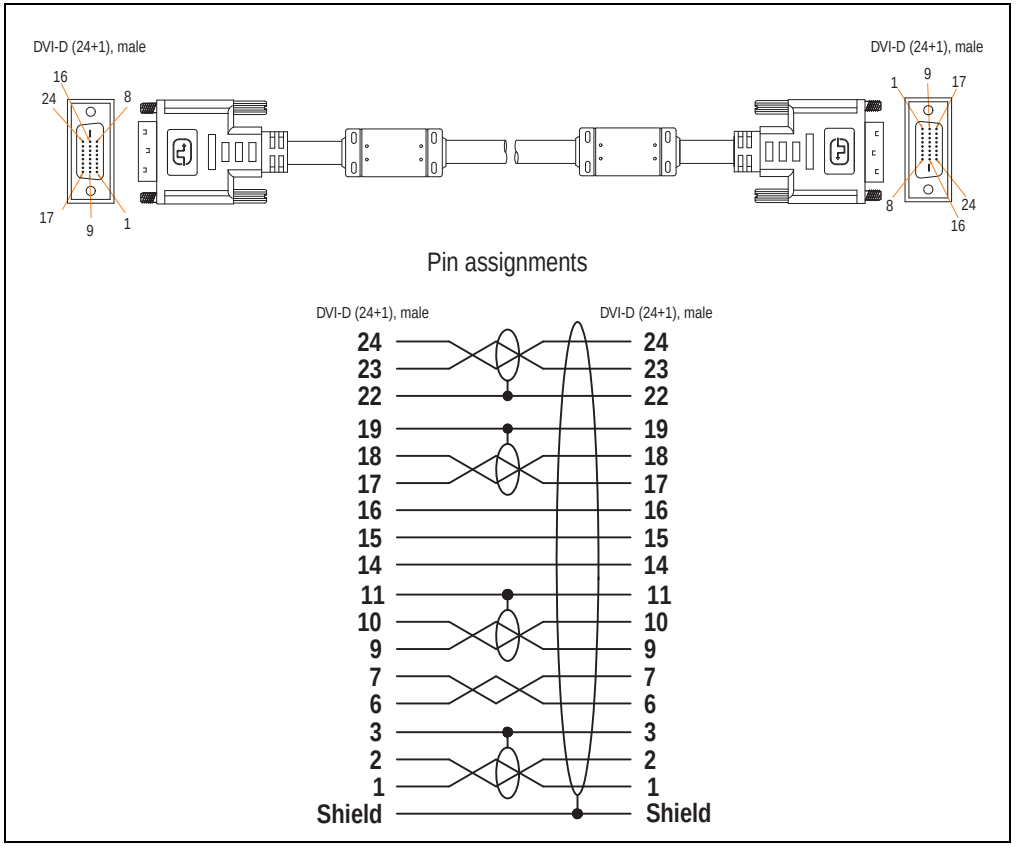


Figure 123: Pin assignments - DVI cable

3.8.2 SDL cable 5CASDL.0xxx-00

The SDL cables 5CASDL.0xxx-00 are designed for fixed installation. Use of the SDL flex cable 5CASDL.0xxx-03 is required for a flexible installation (e.g. in swing arm systems).

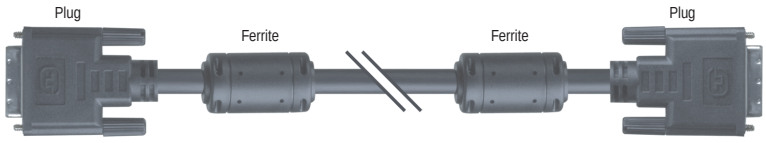


Figure 124: SDL cable 5CASDL.0xxx-00 (similar)

Caution!

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

Order data

Model number	Description	Comment
5CASDL.0018-00	**SDL cable 1.8 m** SDL cable for a fixed type of layout; length: 1.8 m	
5CASDL.0050-00	**SDL cable 5 m** SDL cable for a fixed type of layout; length: 5 m	
5CASDL.0100-00	**SDL cable 10 m** SDL cable for a fixed type of layout; length: 10 m	
5CASDL.0150-00	**SDL cable 15 m** SDL cable for a fixed type of layout; length: 15 m	
5CASDL.0200-00	**SDL cable 20 m** SDL cable for a fixed type of layout; length: 20 m	
5CASDL.0250-00	**SDL cable 25 m** SDL cable for a fixed type of layout; length: 25 m	
5CASDL.0300-00	**SDL cable 30 m** SDL cable for a fixed type of layout; length: 30 m	

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 Tolerance	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
Cable 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 Connection cycles	2x DVI-D (24+1), male 100						
Wire cross section	AWG 28		AWG 24				
Line resistance	Max. 237Ω/km		Max. 93Ω/km				
Insulation resistance	Min. 10 MΩ/km						
Flexibility	limited flexibility; valid for ferrite magnet - ferrite magnet (tested 100 cycles with 5 x cable diameter, 20 cycles / minute)						
Flex radius fixed installation	See figure "Flex radius specification" on page 154 ≥ 5 x cable diameter (plug - ferrite magnet and ferrite magnet - ferrite magnet)						
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

3.8.3 Flex radius specification

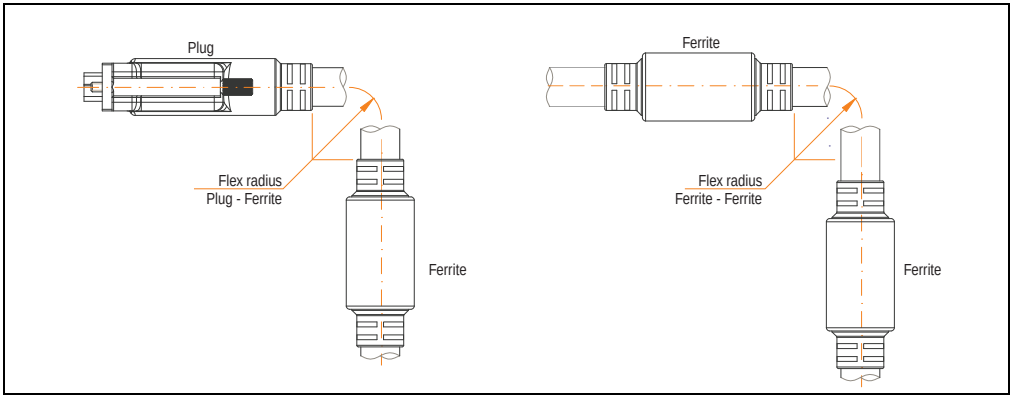


Figure 125: Flex radius specification

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.

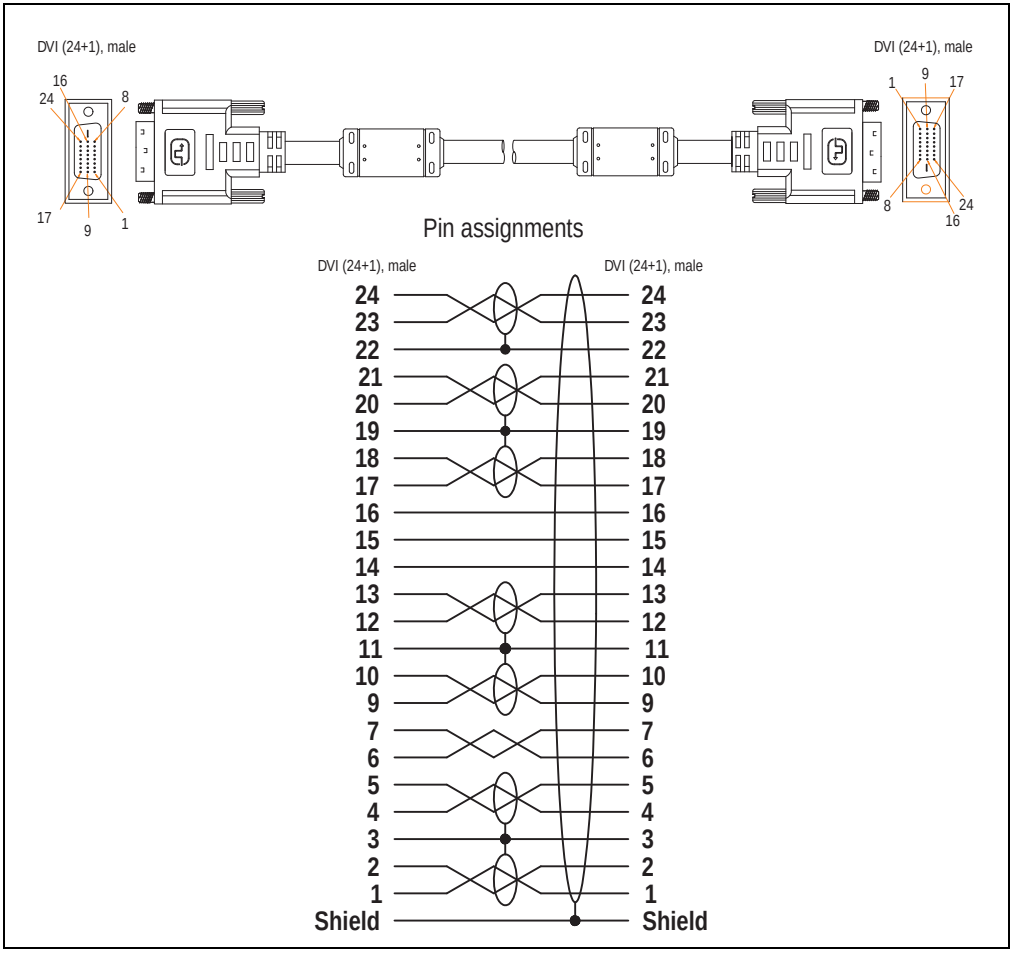


Figure 126: Pin assignments - SDL cable 5CASDL.0xxx-00

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

The SDL cables 5CASDL.0xxx-01 are designed for fixed installation.

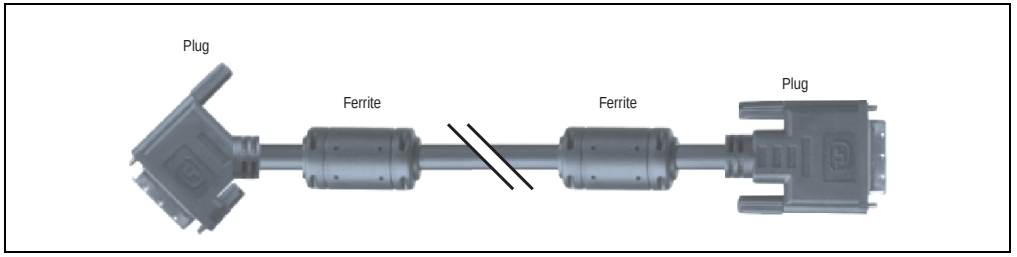


Figure 127: SDL cable with 45° plug (similar)

Caution!

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

Order data

Model number	Description	Comment
5CASDL.0018-01	**SDL cable 1.8 m 45°** SDL cable for fixed type of layout with one-sided 45° plug; length: 1.8 m	
5CASDL.0050-01	**SDL cable 5 m 45°** SDL cable for fixed type of layout with one-sided 45° plug; length: 5 m	
5CASDL.0100-01	**SDL cable 10 m 45°** SDL cable for fixed type of layout with one-sided 45° plug; length: 10 m	
5CASDL.0150-01	**SDL cable 15 m 45°** SDL cable for fixed type of layout with one-sided 45° plug; length: 15 m	

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 Tolerance	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm	15 m ±120 mm
Cable diameter Maximum	9 mm		11.5 mm	
Shielding	Individual cable pairs and entire cable			
Connector type Connection cycles	2x DVI-D (24+1), male 100			
Wire cross section	AWG 28		AWG 24	
Line resistance	Max. 237Ω/km		Max. 93Ω/km	
Insulation resistance	Min. 10 MΩ/km			
Flexibility	limited flexibility; valid for ferrite magnet - ferrite magnet (tested 100 cycles with 5 x cable diameter, 20 cycles / minute)			
Flex radius fixed installation	See figure "Flex radius specification" on page 157 ≥ 5 x cable diameter (plug - ferrite magnet and ferrite magnet - ferrite magnet)			
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

3.8.5 Flex radius specification

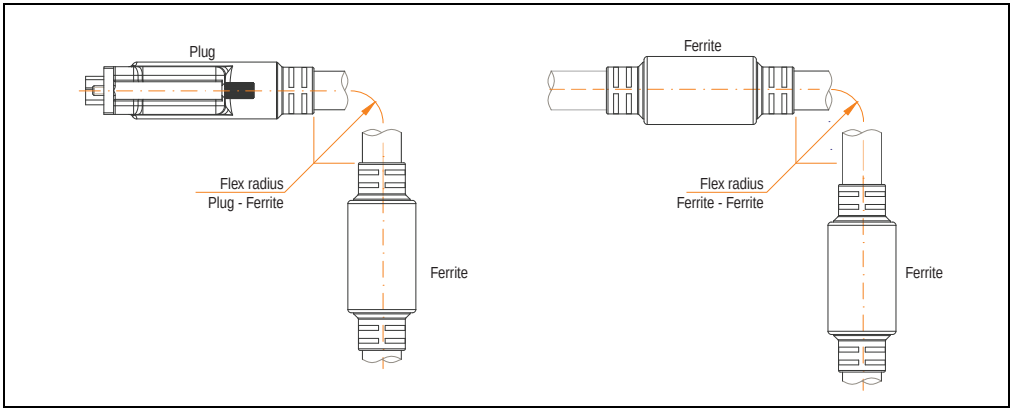


Figure 128: Flex radius specification

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.

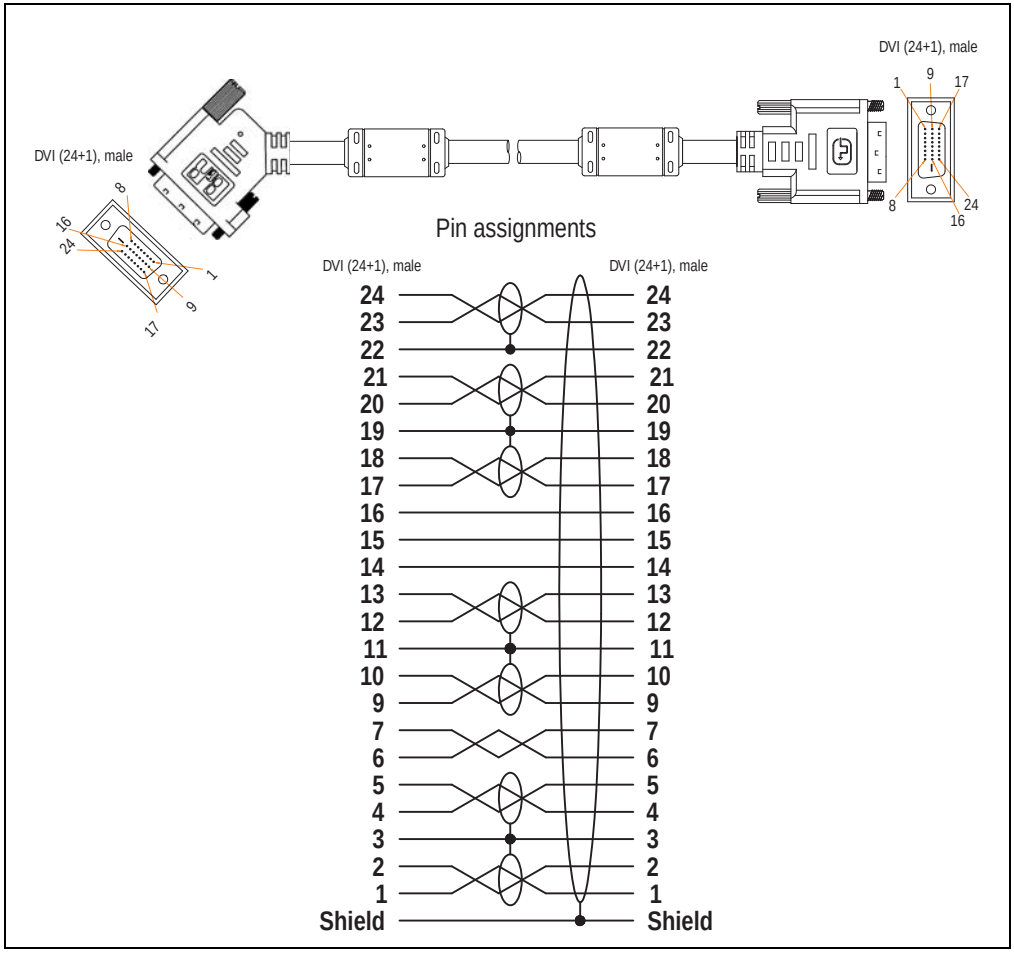


Figure 129: Pin assignments - SDL cable with 45° plug 5CASDL.0xxx-01

3.8.6 SDL flex cable 5CASDL.0xxx-03

The SDL flex cables 5CASDL.0xxx-03 are designed for both fixed and flexible installations (e.g. in swing arm systems).

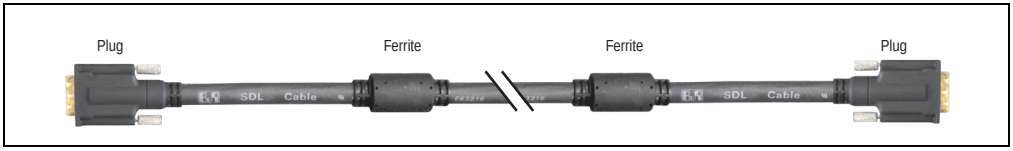


Figure 130: SDL cable 5CASDL.0xxx-03 (similar)

Caution!

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

Order data

Model number	Description	Comment
5CASDL.0018-03	**1.8 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 1.8 m	
5CASDL.0050-03	**5 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 5 m	
5CASDL.0100-03	**10 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 10 m	
5CASDL.0150-03	**15 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 15 m	
5CASDL.0200-03	**20 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 20 m	
5CASDL.0250-03	**25 m flex SDL cable** SDL cable for fixed and flexible type of layout; length: 25 m	
5CASDL.0300-03	**30 m flex SDL cable** SDL cable for fixed and flexible type of layout; 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 Tolerance	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
Cable diameter Maximum	12 mm						
Shielding	Individual cable pairs and entire cable						
Connector type Connection cycles Contacts Mechanical protection	2x DVI-D (24+1), male Min. 200 Gold plated Metal cover with crimped stress relief						
Max. tension During installation During operation	≤ 400 N ≤ 50 N						
Materials Cable shielding Color	RoHS compliant Aluminum foil clad + tinned copper mesh Black (similar to RAL 9005)						
Flexibility	flexible; valid for ferrite magnet - ferrite magnet (tested 300000 cycles with 15 x cable diameter, 4800 cycles / hour)						
Flex radius fixed installation flexible installation	See figure "Flex radius specification" on page 161 ≥ 6 x cable diameter (from plug - ferrite magnet) ≥ 10 x cable diameter (from ferrite magnet - ferrite magnet) ≥ 15 x cable diameter (from ferrite magnet - ferrite magnet)						
Weight	Approx. 450 g	Approx. 1000 g	Approx. 2000 g	Approx. 3000 g	Approx. 4000 g	Approx. 5000 g	Approx. 6000 g
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} .5 kV_{eff}						
Operating voltage	≤ 30 V						
Environmental characteristics							
Temperature resistance Fixed installation Moving Storage	-20°C .. +80°C -5°C .. +60°C -20°C .. +80°C						
Standards and certifications							
Torsion load	100000 cycles (tested angle of rotation: ± 85°; speed: 50 cycles / minute)						

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

Standards and certifications	5CASDL.0018-03	5CASDL.0050-03	5CASDL.0100-03	5CASDL.0150-03	5CASDL.0200-03	5CASDL.0250-03	5CASDL.0300-03
Cable drag chain	300000 cycles Tested flex radius: 180 mm;15 x cable diameter; hub: 460 mm; speed: 4800 cycles / hour						
Approbation	UL AWM 20236 80°C 30 V						
Oil and hydrolysis resistance	According to VDE 0282-10						

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

Flex radius specification

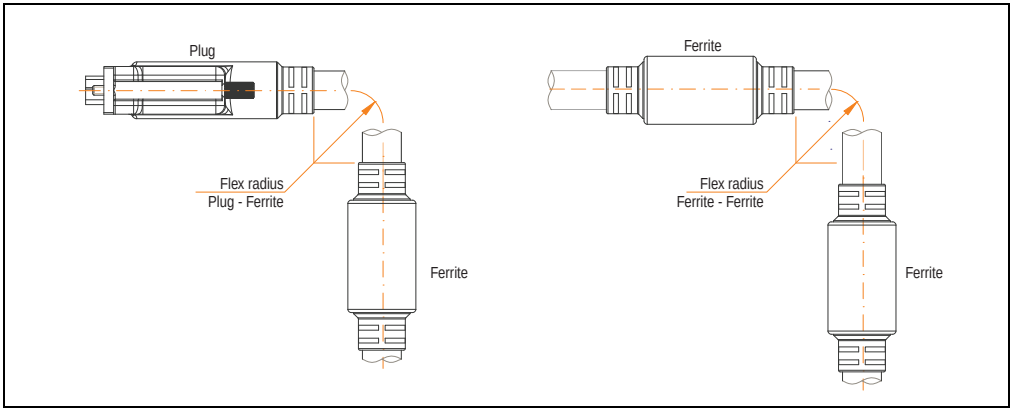


Figure 131: Flex radius specification

Dimensions

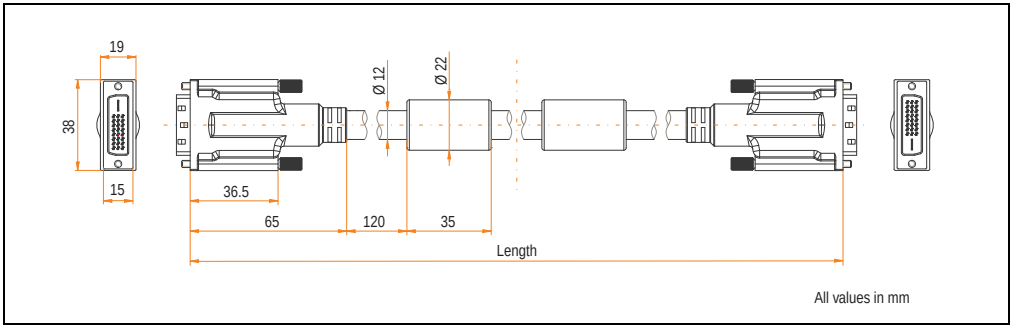


Figure 132: Dimensions - SDL cable 5CASDL.0xxx-03

Construction

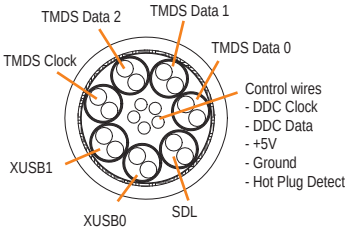
Element	Assignment	Cross section	
DVI	TMDS data 0	26 AWG	 Schematic display
	TMDS data 1	26 AWG	
	TMDS data 2	26 AWG	
	TMDS cycle	26 AWG	
USB	XUSB0	26 AWG	
	XUSB1	26 AWG	
Data	SDL	26 AWG	
Control wires	DDC cycle	24 AWG	
	DDC data	24 AWG	
	+ 5 V	24 AWG	
	mass	24 AWG	
	Hot Plug detect	24 AWG	

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.

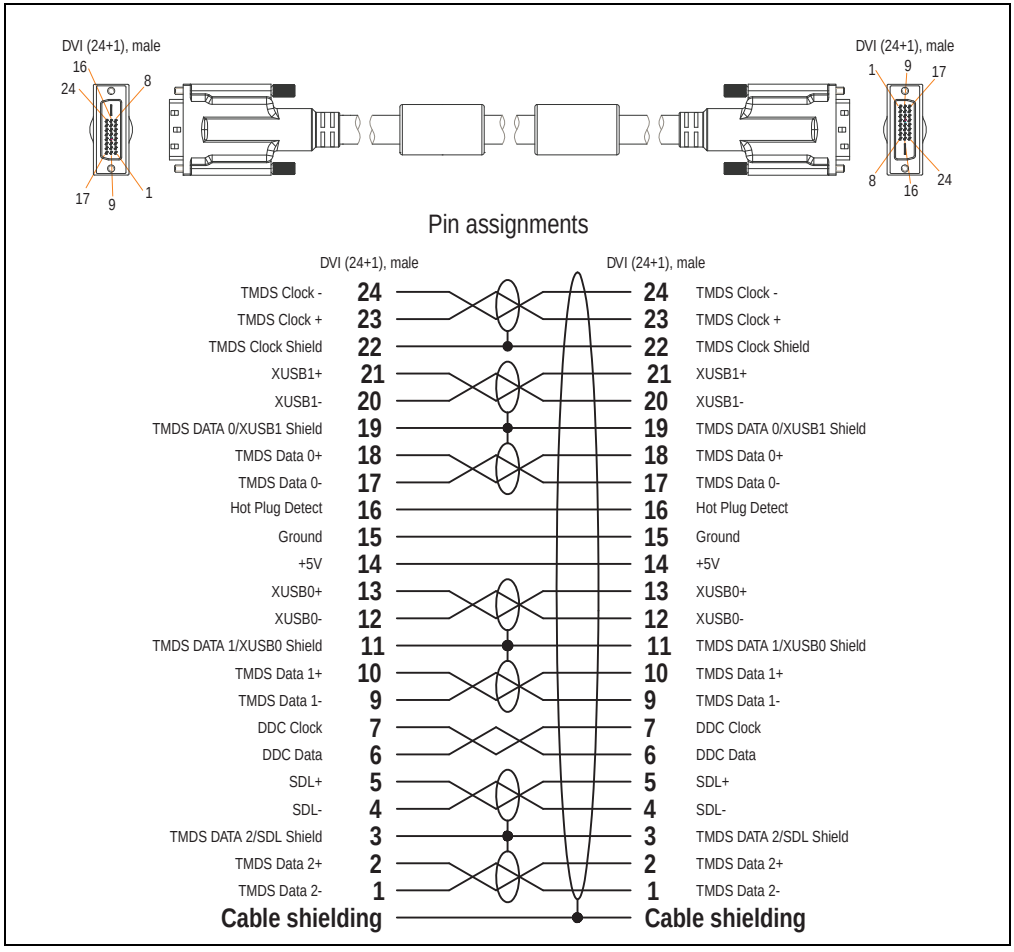


Figure 133: Pin assignments - SDL cable 5CASDL.0xxx-03

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

The SDL cables (with extender) 5CASDL.0xxx-10 are designed for fixed installation. Use of the SDL flex cable (with extender) 5CASDL.0x00-13 is required for a flexible installation (e.g. in swing arm systems).

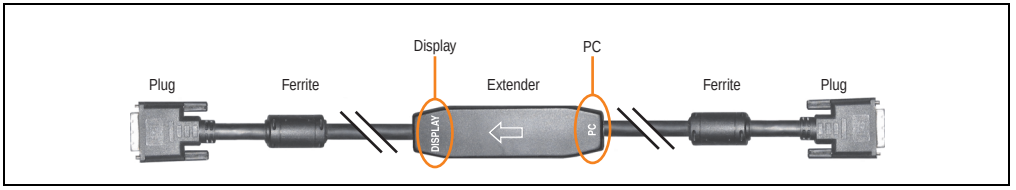


Figure 134: SDL cable with extender - 5CASDL.0x00-10 (similar)

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	Comment
5CASDL.0300-10	**30 m SDL cable with extender** SDL cable with extender for a fixed type of layout; length 30 m	*Cancelled since 01/2007*
5CASDL.0400-10	**40 m SDL cable with extender** SDL cable with extender for a fixed type of layout; length 40 m	*Cancelled since 01/2007*

Table 62: Model numbers - SDL cable with extender

Technical data

Features	5CASDL.0300-10	5CASDL.0400-10
Length Tolerance	30 m ±200 mm	40 m ±200 mm
Dimensions of extender box	Height 18.5 mm, width 35 mm, length 125 mm	
Cable diameter Maximum	11.5 mm	
Shielding	Individual cable pairs and entire cable	
Connector type Connection cycles	2x DVI-D (24+1), male 100	
Wire cross section	AWG 24	
Line resistance	Max. 93Ω/km	
Insulation resistance	Min. 10 MΩ/km	

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

Features	5CASDL.0300-10	5CASDL.0400-10
Flexibility	limited flexibility; valid for ferrite magnet - ferrite magnet (tested 100 cycles with 5 x cable diameter, 20 cycles / minute)	
Flex radius fixed installation	See figure "Flex radius specification" on page 165 ≥ 5 x cable diameter (from plug - ferrite magnet and ferrite magnet - extender)	
Weight	Approx. 6100 g	Approx. 8100 g

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

Flex radius specification

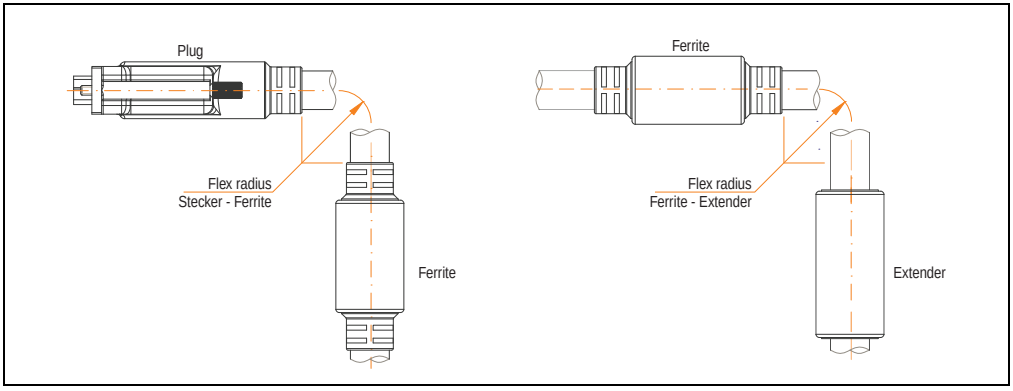


Figure 135: Flex radius specification

Cable connection

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

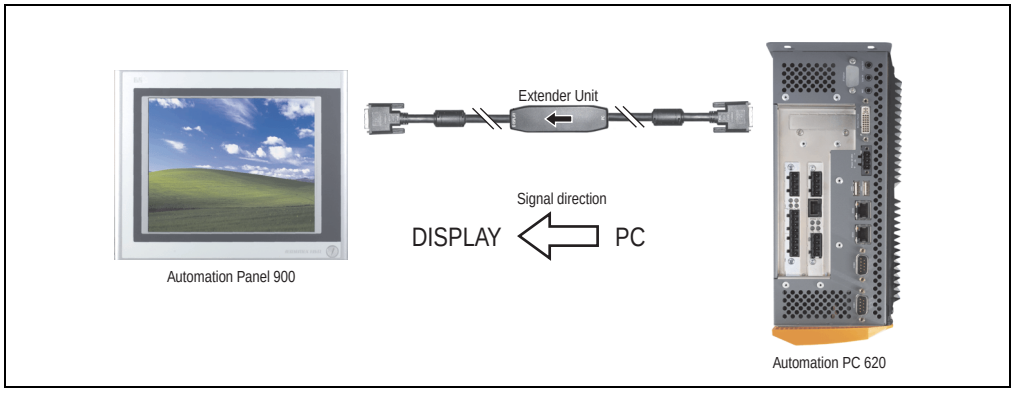


Figure 136: Example of the signal direction for the SDL cable with extender - APC620

Contents of delivery

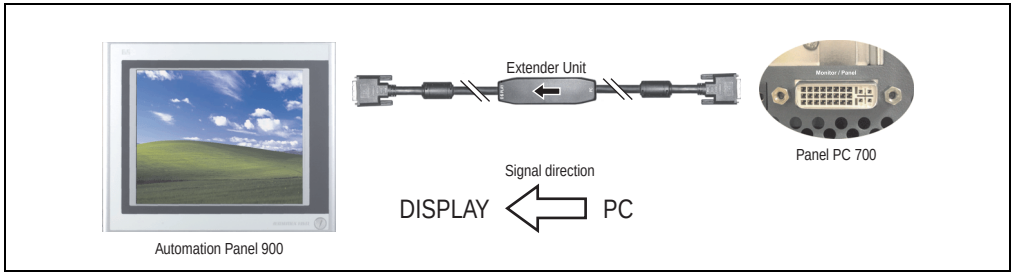


Figure 137: Example of the signal direction for the SDL cable with extender - PPC700

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.

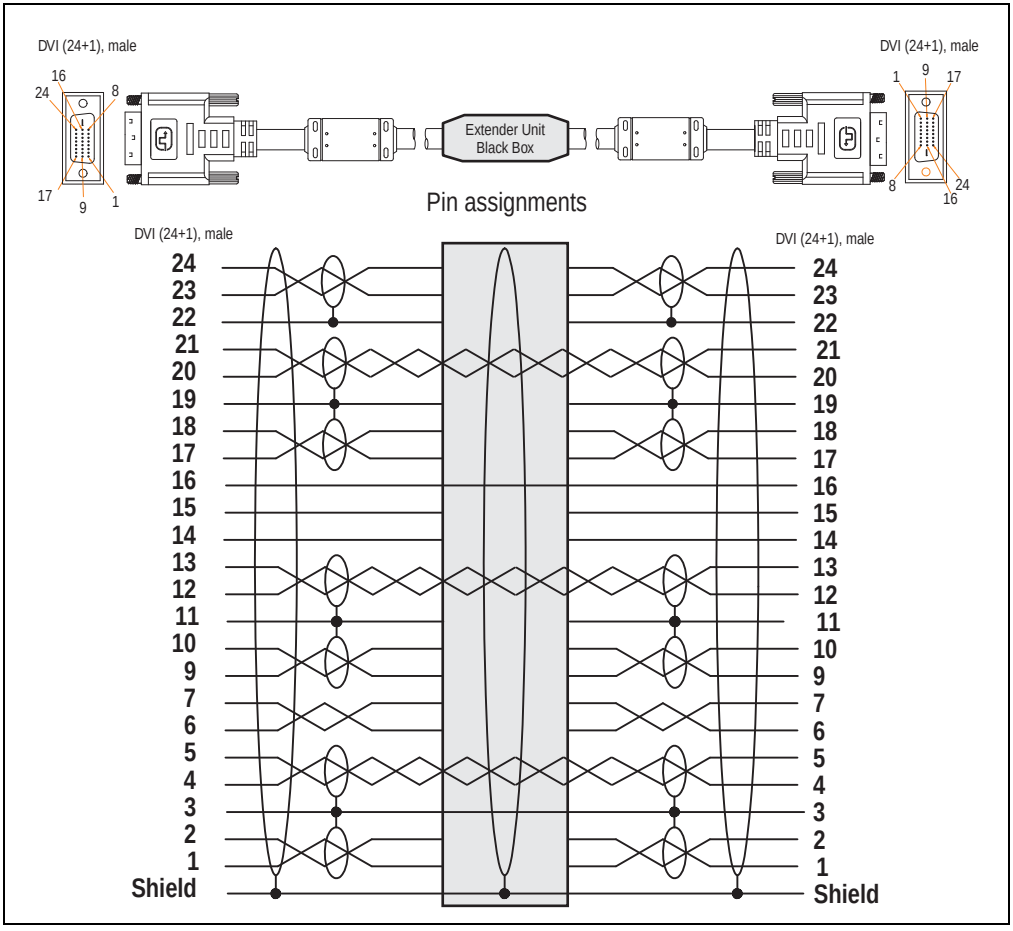


Figure 138: Pin assignments - SDL cable with extender 5CASDL.0x00-10

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

The SDL flex cables (with extender) 5CASDL.0x00-13 are designed for both fixed and flexible installations (e.g. in swing arm systems).

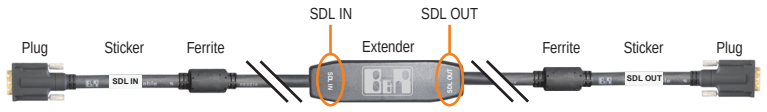


Figure 139: SDL cable with extender - 5CASDL.0x00-13

Caution!

SDL cables with extender can only be plugged in and unplugged when the device is turned off. The correct direction of connection (SDL IN, SDL OUT) for the wiring is illustrated on the middle of the extender and between the ferrite magnet and plug (with a sticker).

Order data

Model number	Description	Comment
5CASDL.0300-13	**30 m SDL flex cable with extender** SDL cable with extender for fixed and flexible type of layout; length: 30 m	
5CASDL.0400-13	**40 m SDL flex cable with extender** SDL cable with extender for fixed and flexible type of layout; length: 40 m	

Table 65: Model numbers - SDL cable with extender

Technical data

Features	5CASDL.0300-13	5CASDL.0400-13
Length Tolerance	30 m ±200 mm	40 m ±200 mm
Dimensions of extender box	Height 18.5 mm, width 35 mm, length 125 mm	
Cable diameter Maximum	12 mm	
Shielding	Individual cable pairs and entire cable	
Connector type Connection cycles Contacts Mechanical protection	2x DVI-D (24+1), male Min. 200 Gold plated Metal cover with crimped stress relief	
Max. tension During installation During operation	≤ 400 N ≤ 50 N	

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

Features	5CASDL.0300-13	5CASDL.0400-13
Materials Cable shielding Color	RoHS compliant Aluminum foil clad + tinned copper mesh Black (similar to RAL 9005)	
Flexibility	flexible; valid for ferrite magnet - ferrite magnet (tested 300000 cycles with 15 x cable diameter, 4800 cycles / hour)	
Flex radius fixed installation flexible installation	See figure "Flex radius specification" on page 170 ≥ 6 x cable diameter (from plug - ferrite magnet) ≥ 10 x cable diameter (from ferrite magnet - extender) ≥ 15 x cable diameter (from ferrite magnet - ferrite magnet)	
Weight	Approx. 6200 g	Approx. 8000 g
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} .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 (tested angle of rotation: ± 85°; speed: 50 cycles / minute)	
Cable drag chain	300000 cycles Tested flex radius: 180 mm;15 x cable diameter; hub: 460 mm; speed: 4800 cycles / hour	
Approbation	UL AWM 20236 80°C 30 V	
Oil and hydrolysis resistance	According to VDE 0282-10	

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

Flex radius specification

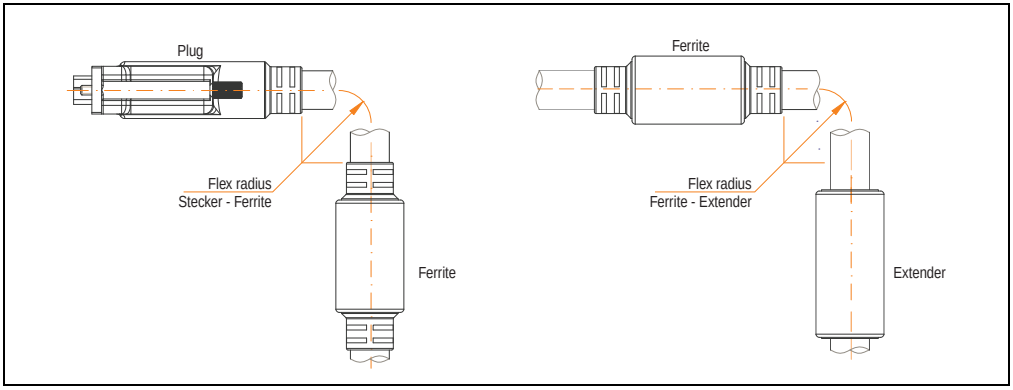


Figure 140: Flex radius specification

Dimensions

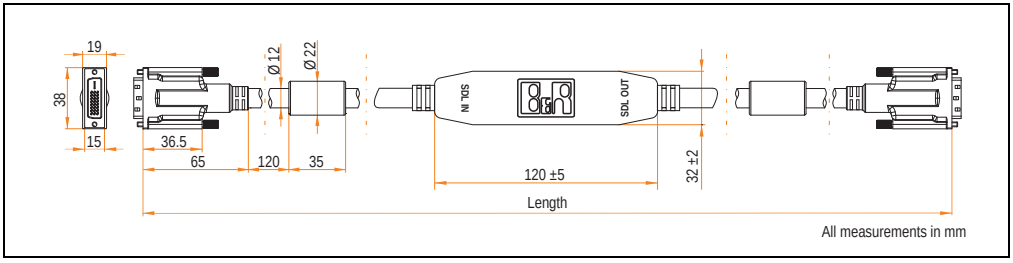


Figure 141: Dimensions - SDL flex cable with extender 5CASDL.0x00-13

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 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 or Panel PC 700 (monitor/panel output) or Panel OUT of an AP900 AP Link card.
- The "SDL OUT" end should be connected to the display unit (e.g. Automation Panel 900) via the Automation Panel Link insert card (Panel IN).

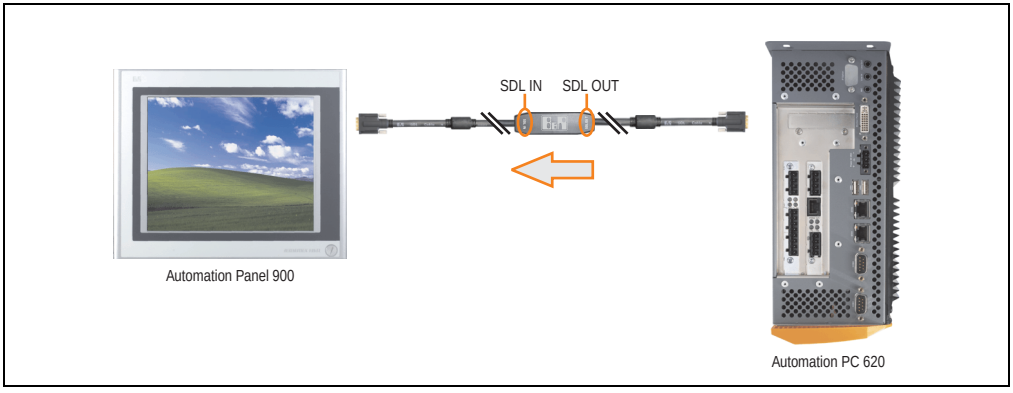


Figure 142: Example of the signal direction for the SDL cable with extender - APC620

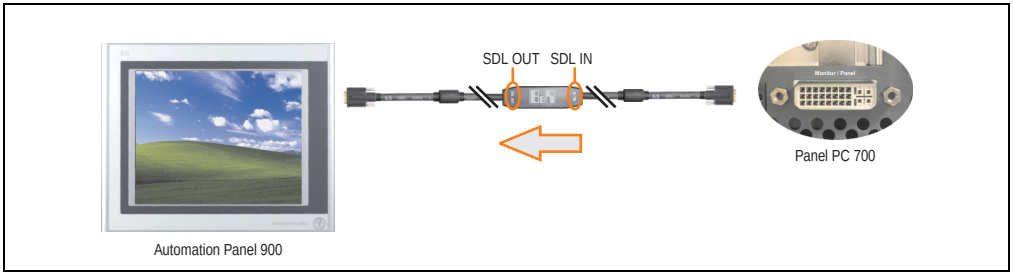


Figure 143: Example of the signal direction for the SDL cable with extender - PPC700

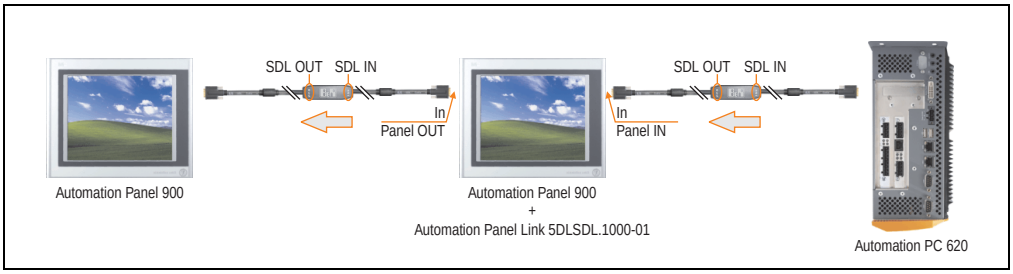


Figure 144: Example of the signal direction display - SDL flex cable with extender

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.

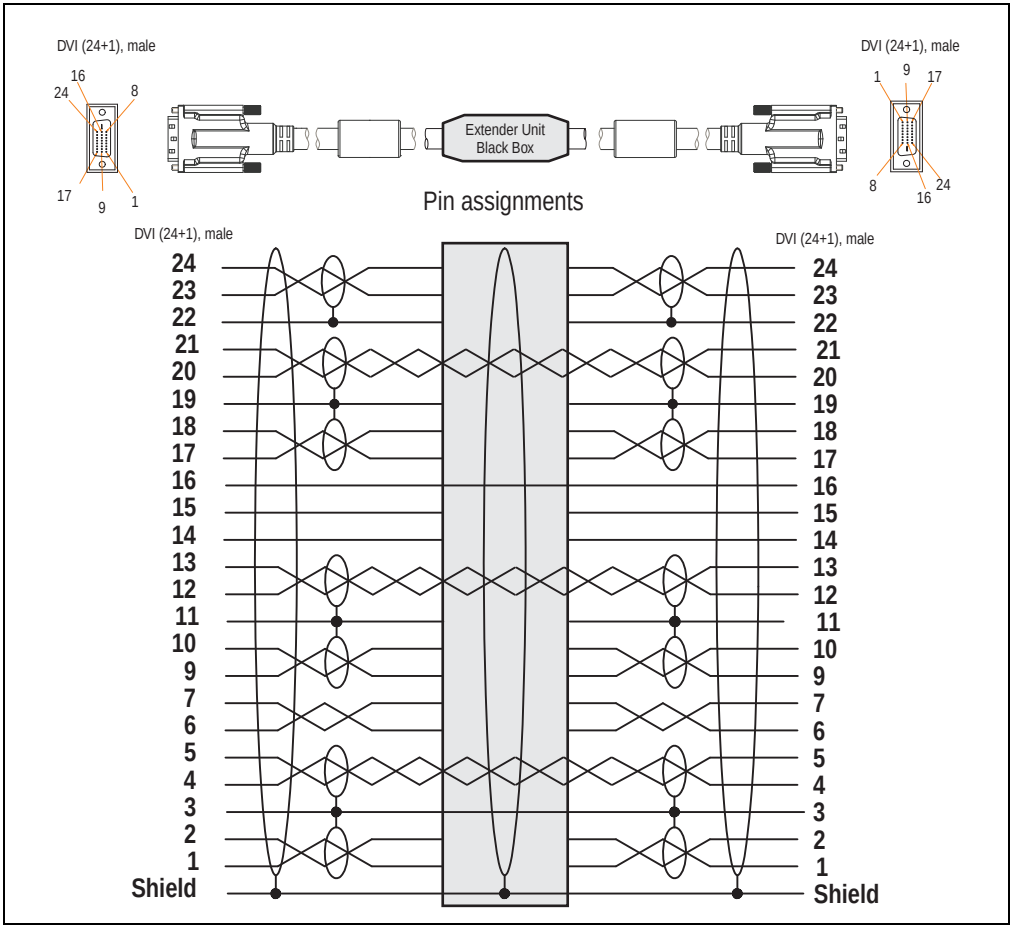


Figure 145: Pin assignments - SDL cable with extender 5CASDL.0x00-13

3.8.9 RS232 cable 9A0014.xx

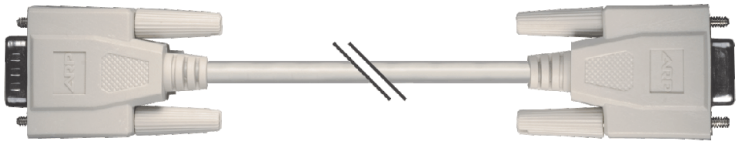


Figure 146: RS232 extension cable (similar)

Order data

Model number	Description	Comment
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.

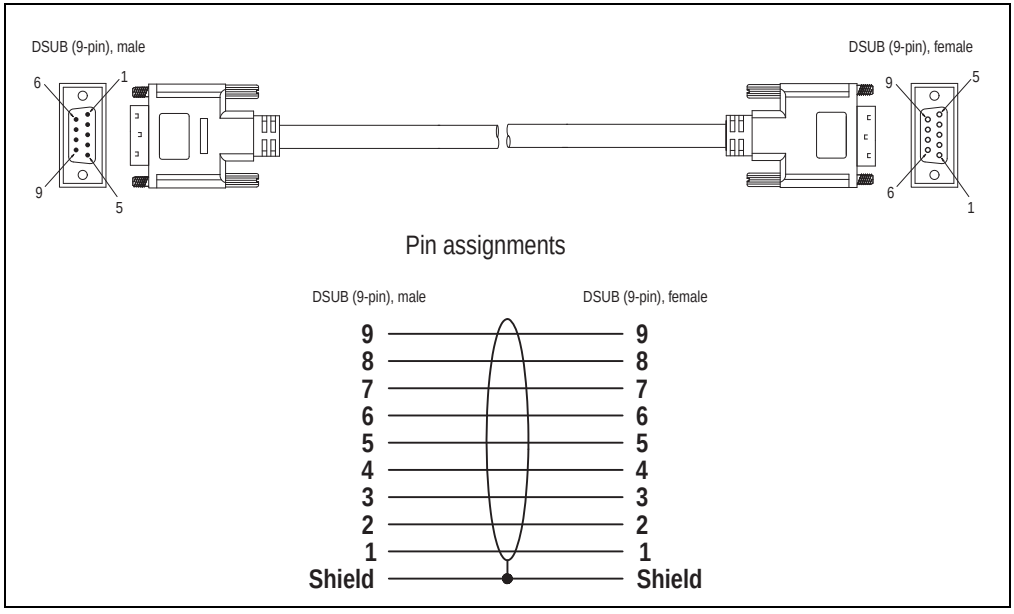


Figure 147: Pin assignments - RS232 cable

3.8.10 USB cable 5CAUSB.00xx-00

Figure 148: USB extension cable (similar)

Order data

Model number	Description	Comment
5CAUSB.0018-00	**USB 2.0 cable, A/m:B/m 1.8 m** USB 2.0 connection cable; plug 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; plug 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.

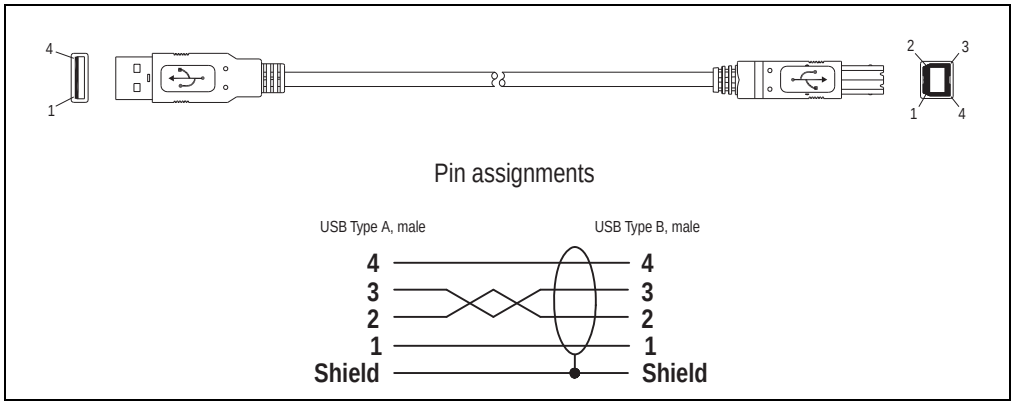


Figure 149: Pin assignments - USB cable

Chapter 3 • Commissioning

1. Installation guidelines

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).

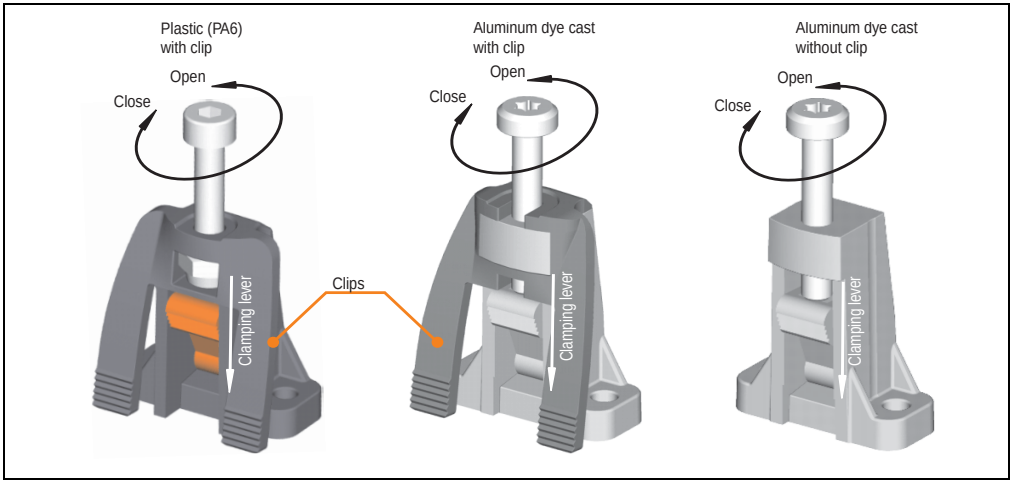


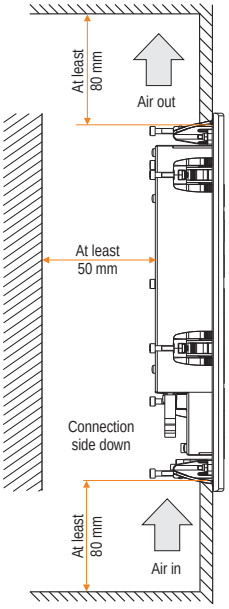
Figure 150: Clamps

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.

Side view



Rear view

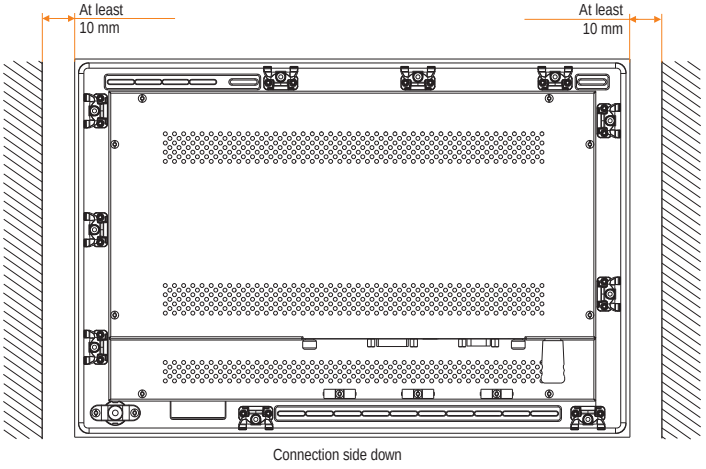


Figure 151: Space for air circulation

2. Mounting orientation

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

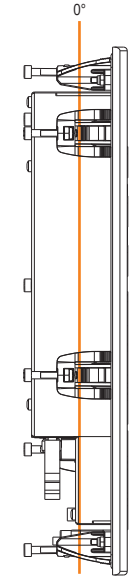
Mounting orientation 0°
 Connection side down

Table 73: Mounting orientation 0°

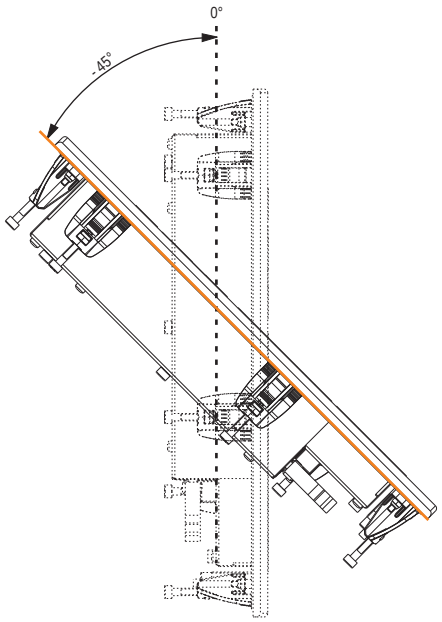
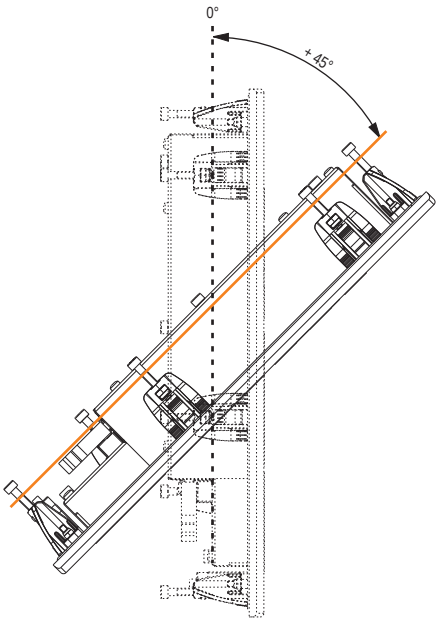
Mounting orientation up to - 45°	Mounting orientation up to + 45°
 Connection side down	 Connection side down

Table 74: Mounting orientations - 45° and +45°.

Warning!

Because of the changed thermal properties with some mounting orientations, e.g. +/- 45°, 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).

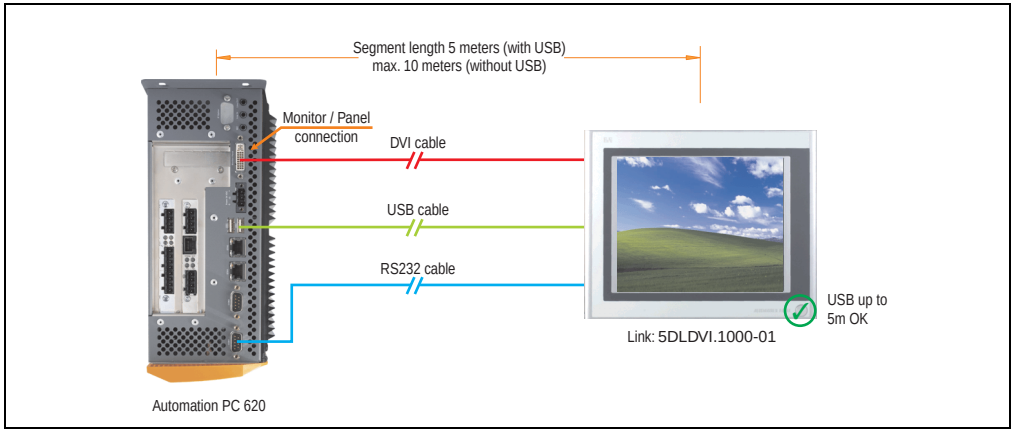


Figure 152: Configuration - One Automation Panel via DVI (onboard)

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	Comment
5DLDVI.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 und 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).

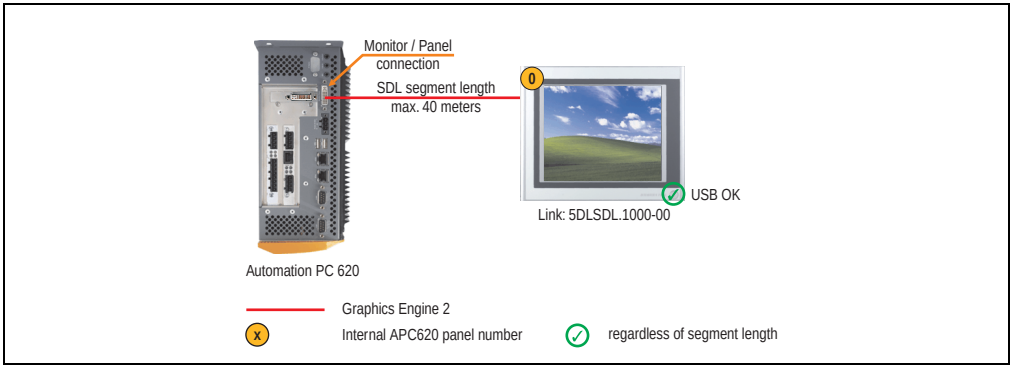


Figure 153: Configuration - One Automation Panel via SDL (onboard)

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	Comment
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 189
2) See table 84 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 189

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	Comment
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**	**Comment**
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	Comment
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**	**Comment**
5DLSDL.1000-00	AP Link SDL receiver	Rev. D0	
5DLSDL.1000-01	AP Link SDL transceiver	Rev. D0	
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	Comment
5PC600.SX02-00	System 2 PCI, 1 disk drive slot, 1 AP Link slot	Rev. D0	
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).

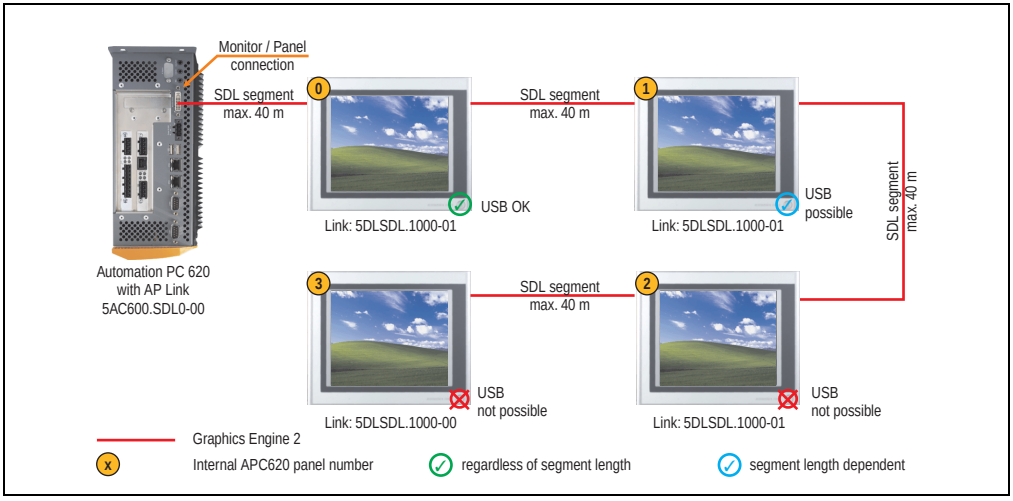


Figure 154: Configuration - Four Automation Panel 900 units via SDL (onboard)

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	Comment
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

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	Resolution				
Segment length [m]	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 193

2) See table 90 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 194

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	Comment
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**	**Comment**
5DLSDL.1000-00	AP Link SDL receiver	Rev. B0	
5DLSDL.1000-01	AP Link SDL transceiver	Rev. B0	

Table 89: 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	Comment
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**	**Comment**
5DLSDL.1000-00	AP Link SDL receiver	Rev. D0	
5DLSDL.1000-01	AP Link SDL transceiver	Rev. D0	
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	
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).

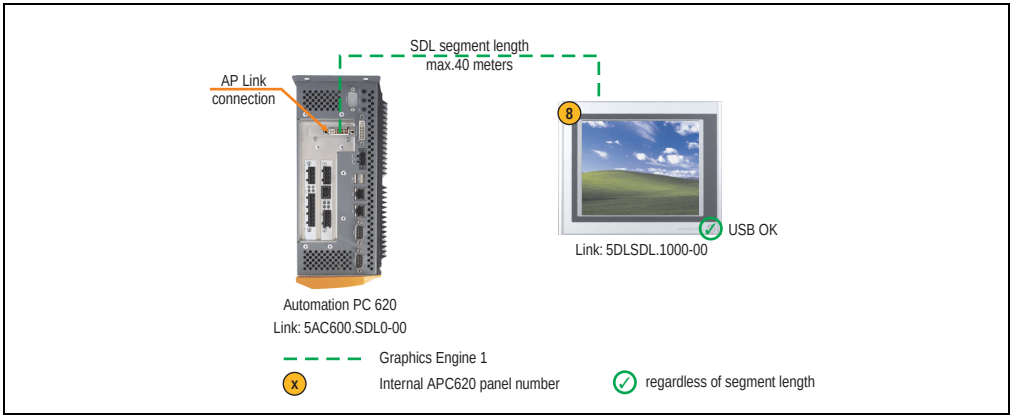


Figure 155: Configuration - One Automation Panel 900 via SDL (AP Link)

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	Comment
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	Resolution				
Segment length [m]	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 197

2) See table 96 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 197

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	Comment
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**	**Comment**
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	Comment
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**	**Comment**
5DLSDL.1000-00	AP Link SDL receiver	Rev. D0	
5DLSDL.1000-01	AP Link SDL transceiver	Rev. D0	

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

Firmware	Name	Version	Comment
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	
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).

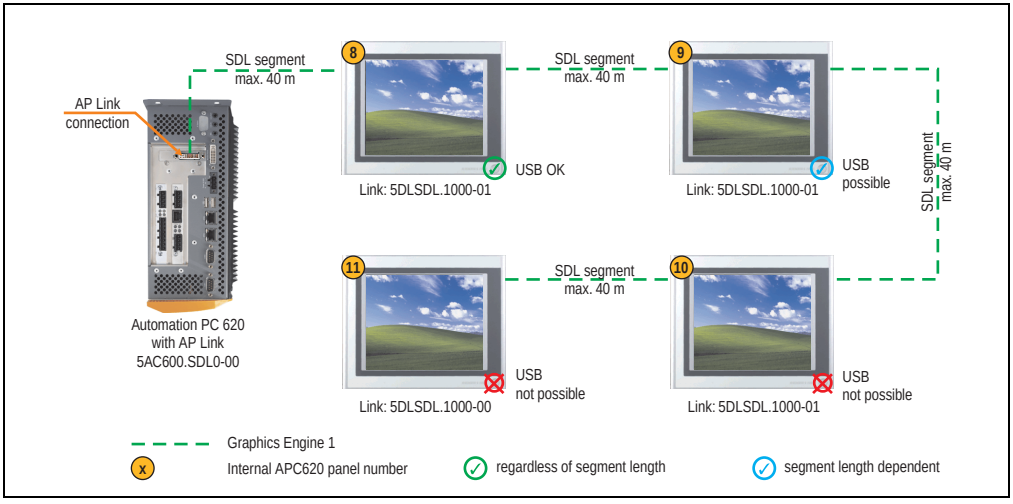


Figure 156: Configuration - Four Automation Panel 900 units via SDL (AP Link) on one line

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	Comment
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	Resolution				
Segment length [m]	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 201

2) See table 102 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 202

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	Comment
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**	**Comment**
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:

Firmware	Name	Version	Comment
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**	**Comment**
5DLSDL.1000-00	AP Link SDL receiver	Rev. D0	
5DLSDL.1000-01	AP Link SDL transceiver	Rev. D0	
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	
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.

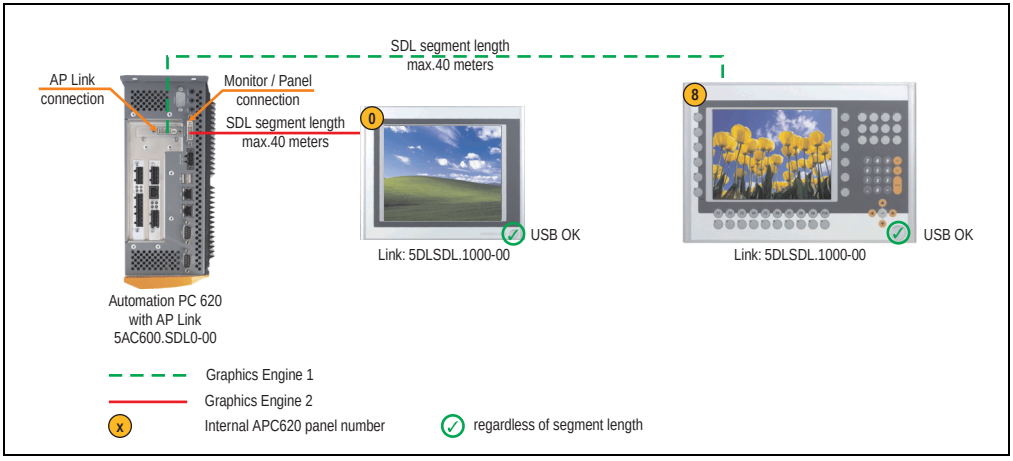


Figure 157: Configuration - Two Automation Panels via SDL (onboard) and SDL (AP Link)

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	Comment
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	Resolution				
Segment length [m]	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 205

2) See table 108 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 205

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	Comment
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**	**Comment**
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	Comment
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**	**Comment**
5DLSDL.1000-00	AP Link SDL receiver	Rev. D0	
5DLSDL.1000-01	AP Link SDL transceiver	Rev. D0	

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

Firmware	Name	Version	Comment
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	
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).

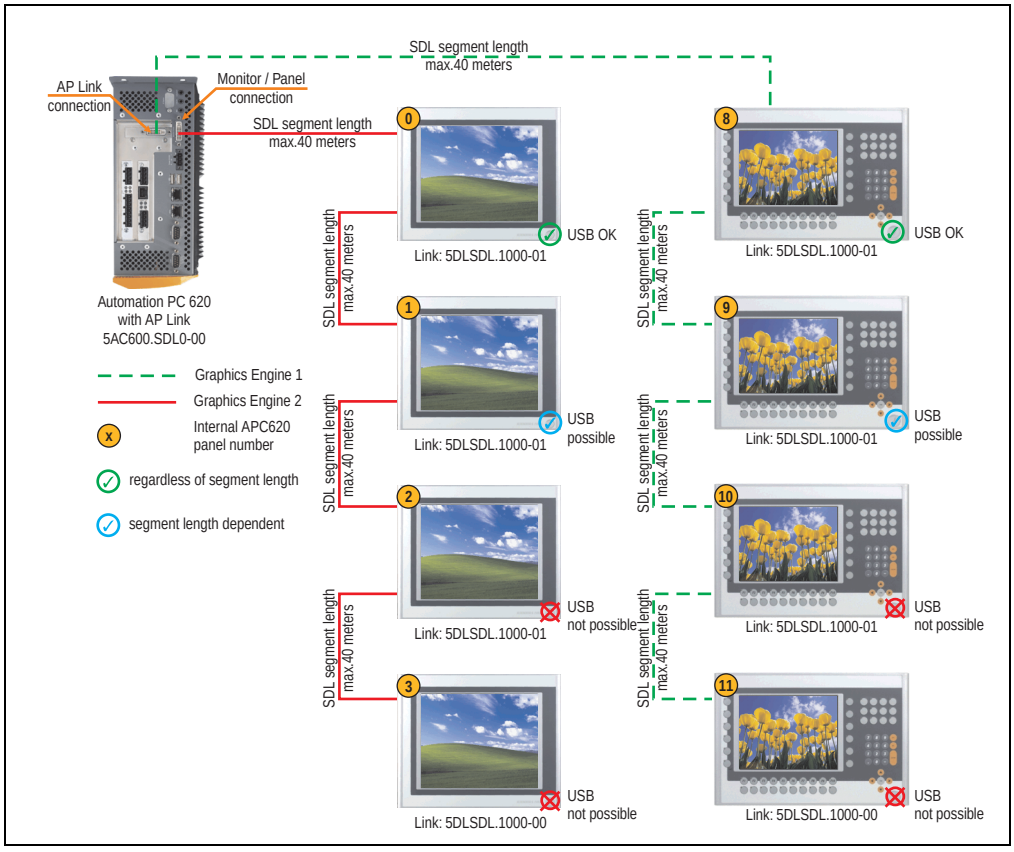


Figure 158: Configuration - Eight Automation Panels via SDL (onboard) and SDL (AP Link)

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	Comment
5DLSDL.1000-00	**Automation Panel Link SDL receiver**	For Automation Panel 900 2 pieces required
5DLSDL.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 210

2) See table 114 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)" on page 210

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	Comment
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**	**Comment**
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	Comment
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**	**Comment**
5DLSDL.1000-00	AP Link SDL receiver	Rev. D0	
5DLSDL.1000-01	AP Link SDL transceiver	Rev. D0	
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	
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.

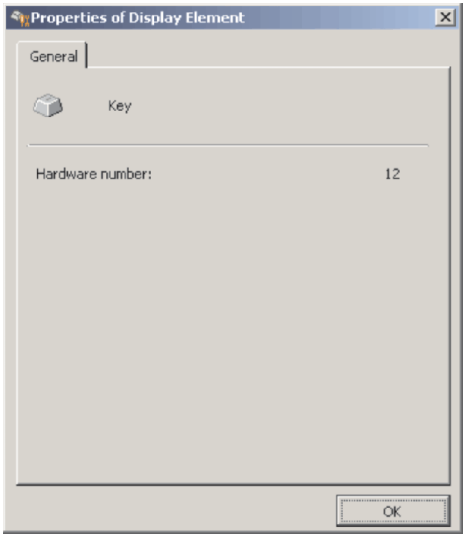
4. Key and LED configurations

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

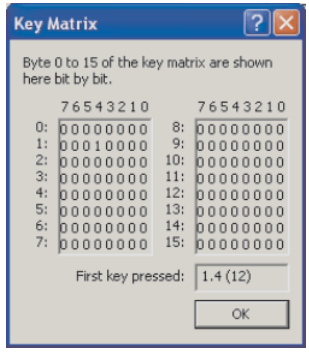
- B&R Key Editor for Windows operating systems
- Visual Components for Automation Runtime

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.



Screenshot B&R Key Editor



Screenshot B&R Control Center

Figure 159: 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.

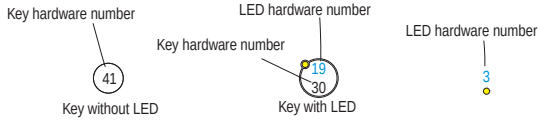


Figure 160: Display - Keys and LEDs in the matrix

4.1 Automation Panel 10.4" VGA

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

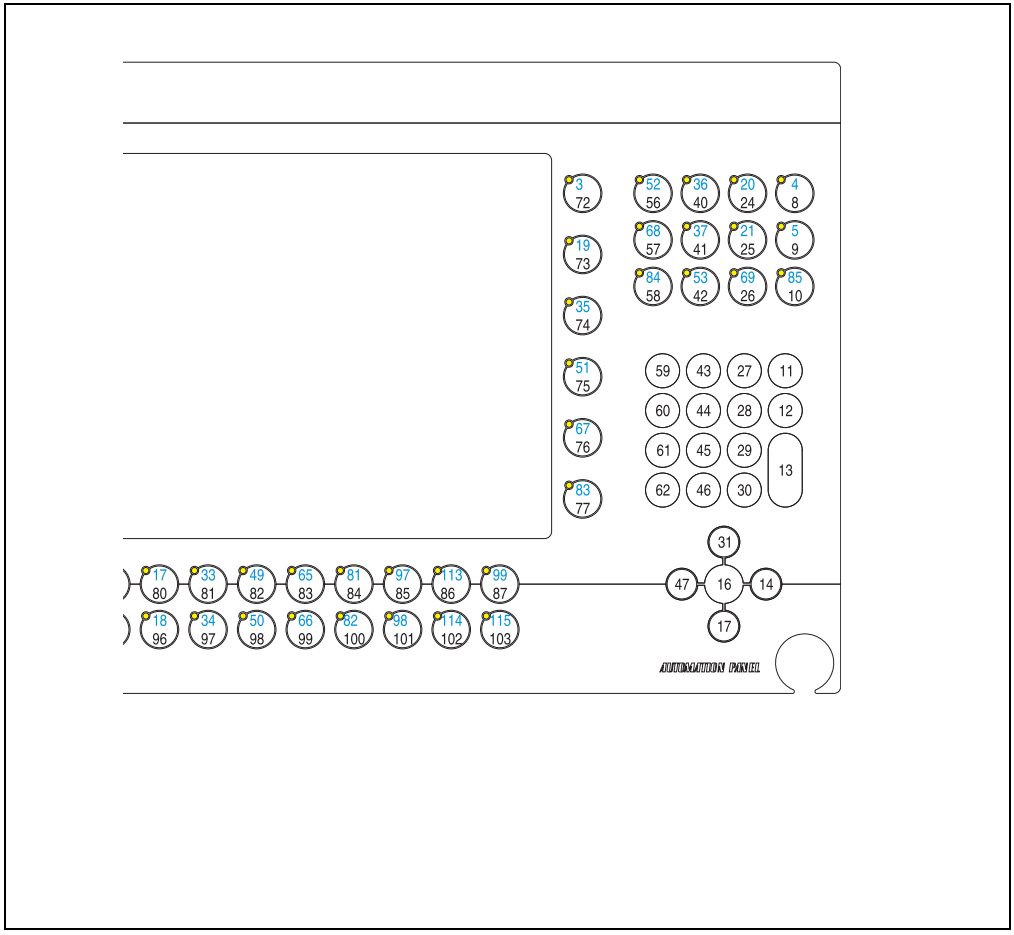


Figure 161: Hardware numbers - 5AP951.1043-01 / 5AP981.1043-01

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

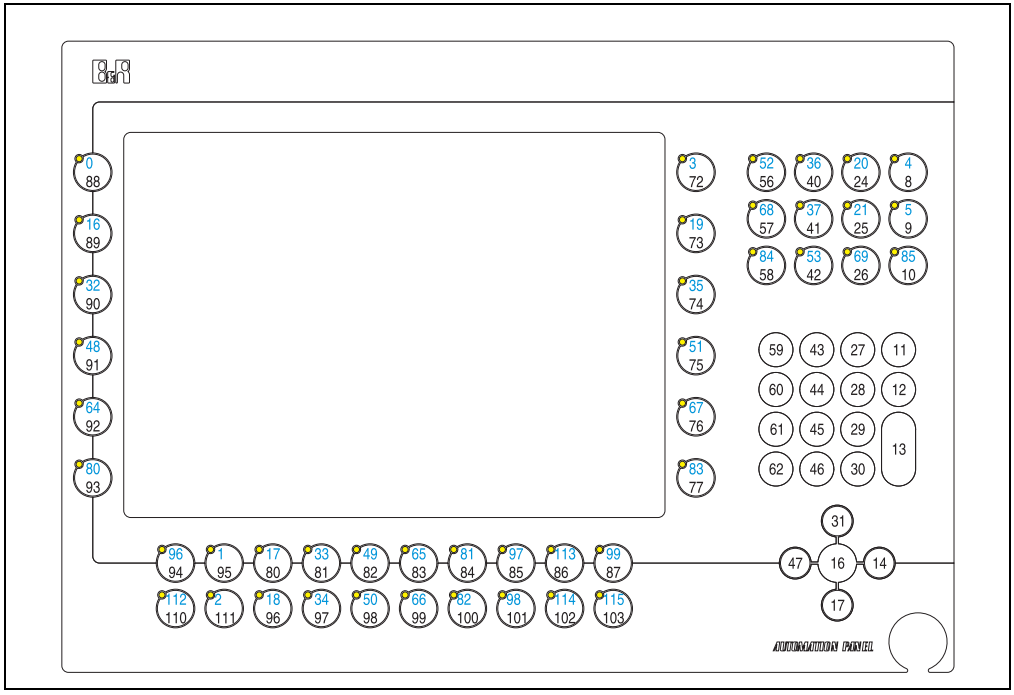


Figure 162: Hardware numbers - 5AP952.1043-01 / 5AP982.1043-01

4.1.3 Automation Panel 5AP980.1043-01

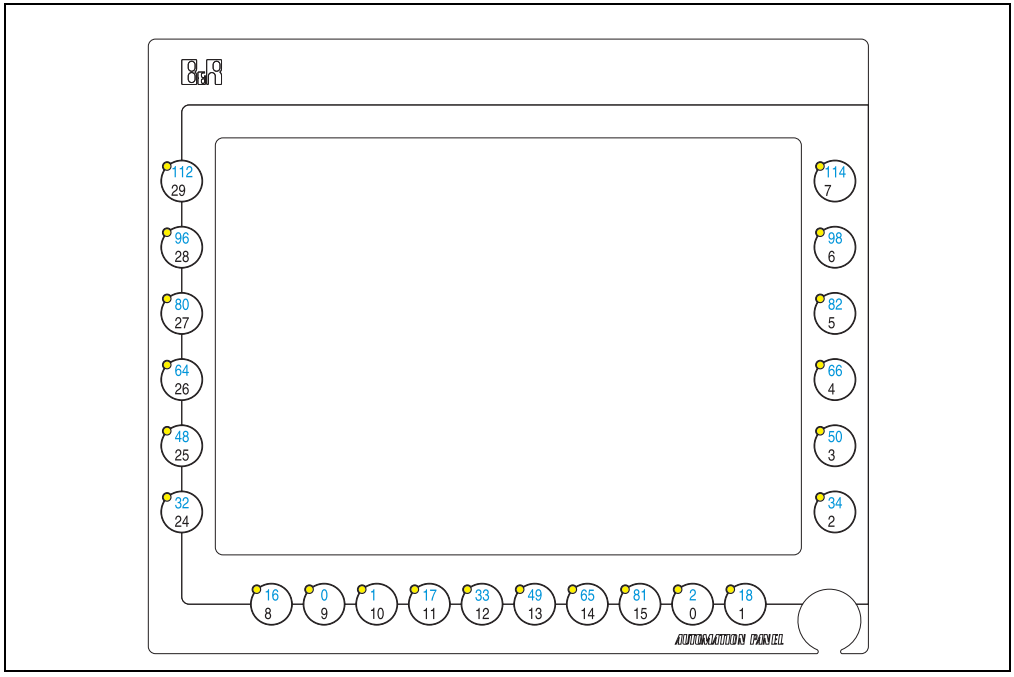


Figure 163: Hardware numbers - 5AP980.1043-01

4.2 Automation Panel 15" XGA

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

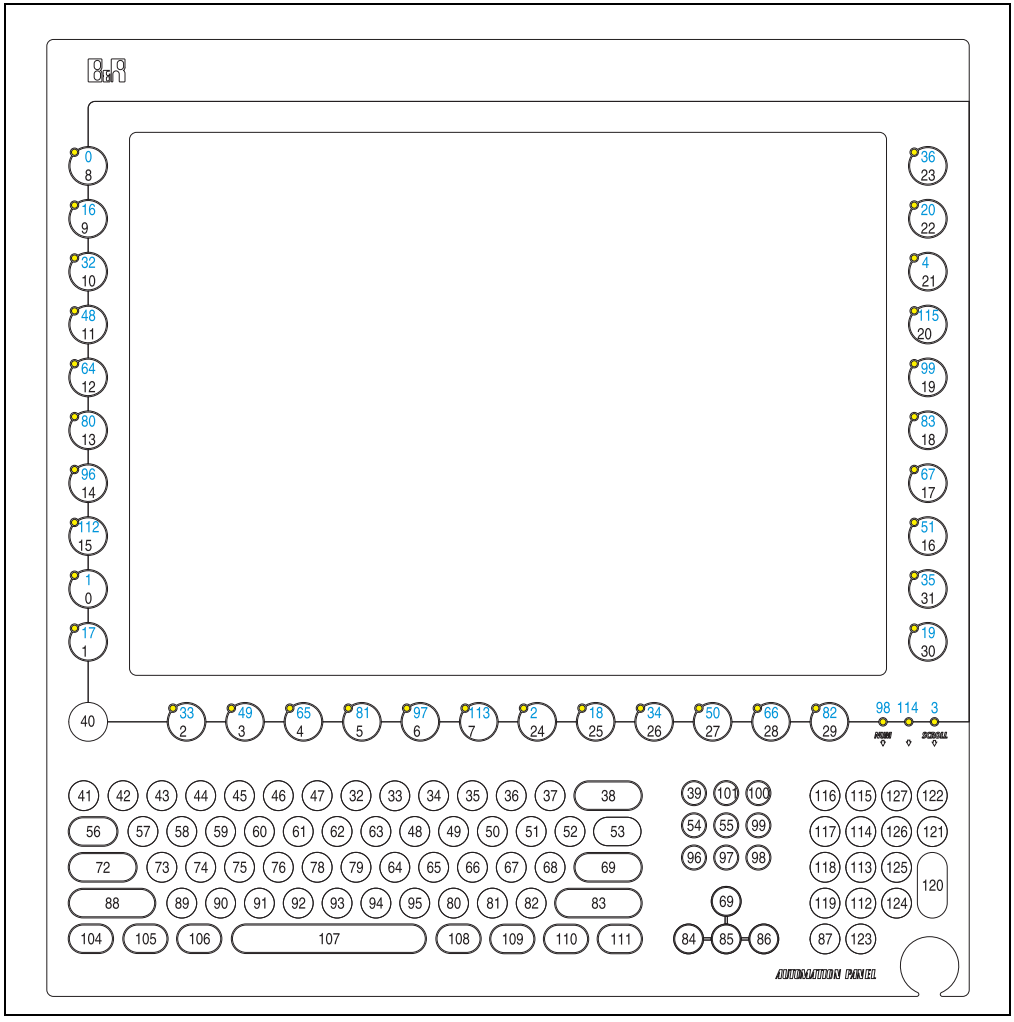


Figure 164: Hardware numbers - 5AP951.1505-01 / 5AP981.1505-01

4.2.2 Automation Panel 5AP980.1505-01

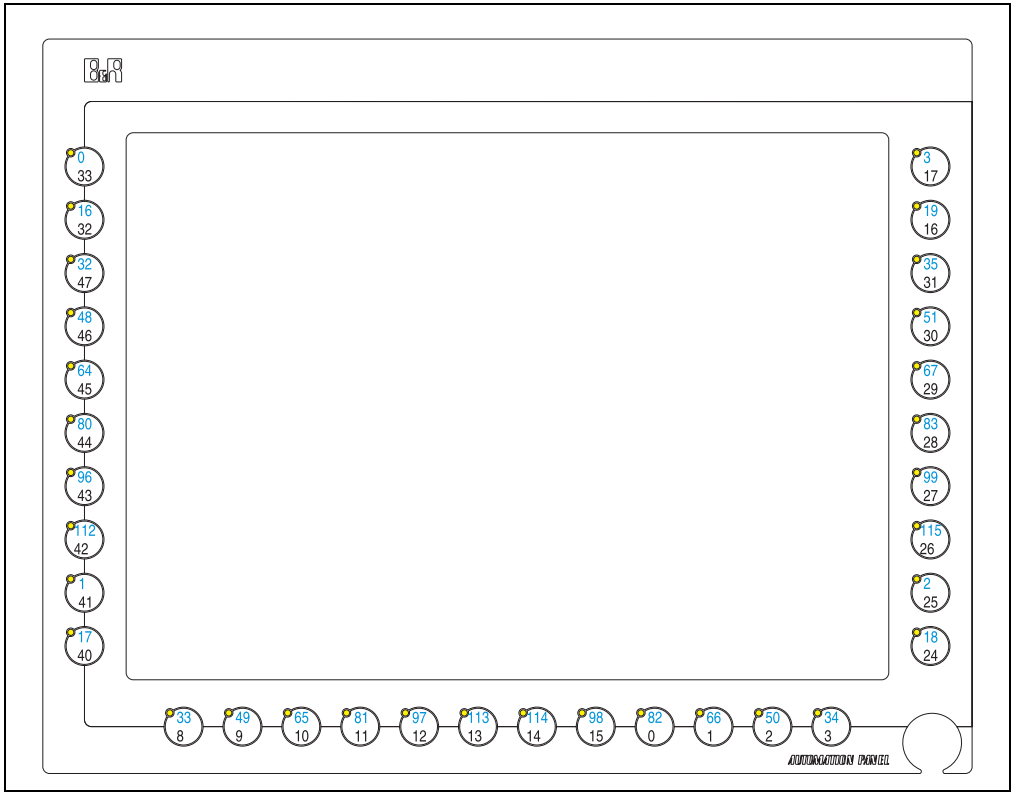


Figure 165: Hardware numbers - 5AP980.1505-01

5. Touch screen calibration:

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

Regardless of this, the touch screen 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. The corresponding drivers can be downloaded from the download area on the B&R homepage (**www.br-automation.com**). The touch screen should be calibrated while installing the driver.

5.2 Windows CE

Windows CE starts the touch screen 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. The corresponding drivers can be downloaded from the download area on the B&R homepage (**www.br-automation.com**). The touch screen should be calibrated while installing the driver.

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 68068-2-2	Environmental testing - part 2: Tests; test B: Dry heat
EN 60068-2-3	Environmental testing - part 2: Tests; test and guidance: Damp heat, constant
EN 60068-2-6	Environmental testing - part 2: Tests; test: Vibration (sinusoidal)
EN 60068-2-14	Environmental testing - part 2: Tests; test N: Change of temperature
EN 60068-2-27	Environmental testing - part 2: Tests; test and guidance: Shock
EN 60068-2-30	Environmental testing - part 2: Tests; test and guidance: Damp heat, cyclic
EN 60068-2-31	Environmental testing - part 2: Tests; test: Drop and topple, primarily for equipment-type specimens
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

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

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, not packaged					
	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, not packaged		

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 µs 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

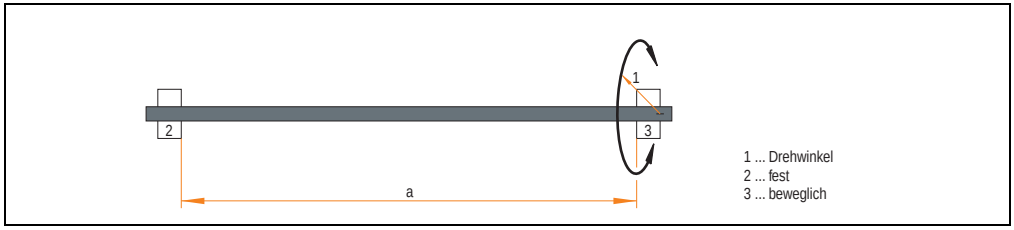


Figure 166: Test structure - torsion

10.1.2 Test conditions

- Distance a: 450 mm
- Rotation angle: ± 85°
- 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

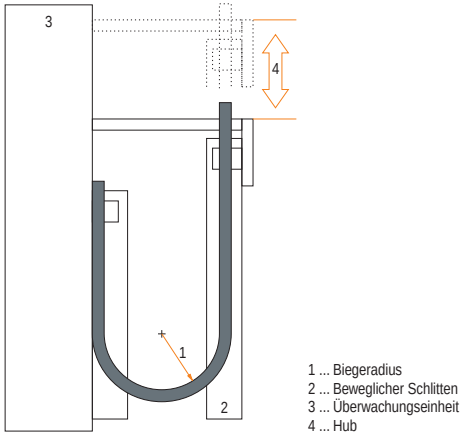


Figure 167: Test structure - cable drag chain

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	Comment
0TB103.8	**Plug/N 24V 5.08 3-pin screw clamps** Accessory terminal block, 3-pin, screw clamp, 2.5 mm², 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 mm², 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 mm², 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	≤ 5 mΩ
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 mm² - 3.31 mm²
Cable type	Copper wires only (no aluminum wires!)

Table 158: Technical data - 0TB103.8

3. TB103 3-pin supply voltage connector

3.1 General information

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)	0TB103.9
0TB103.91	Plug for the 24 V supply voltage (cage clamps)	0TB103.91

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	≤ 5 mΩ	
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 mm² - 3.31 mm²	
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).

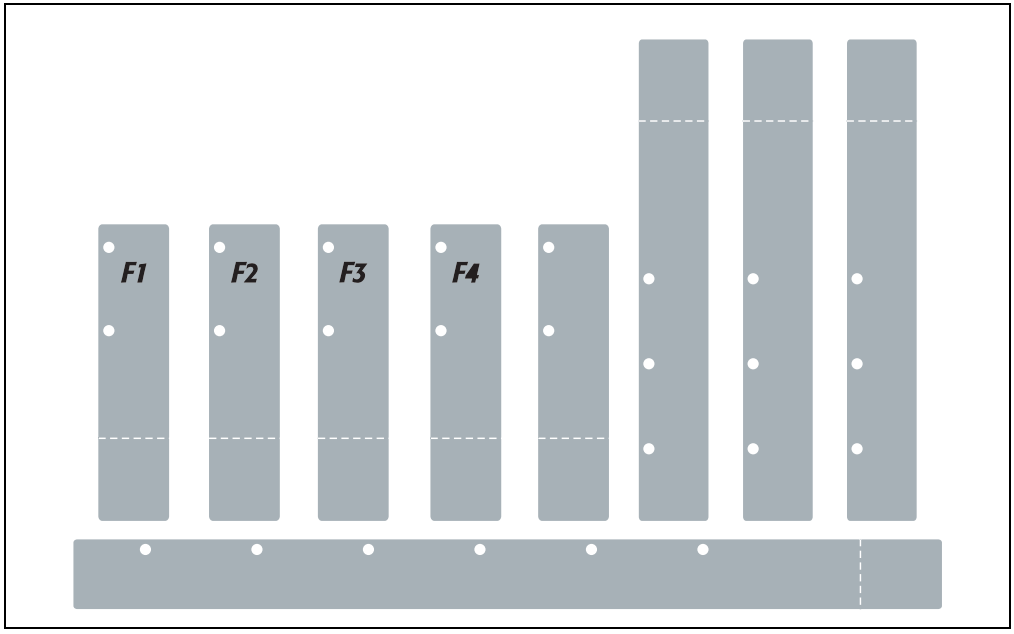


Figure 168: Legend strip templates

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

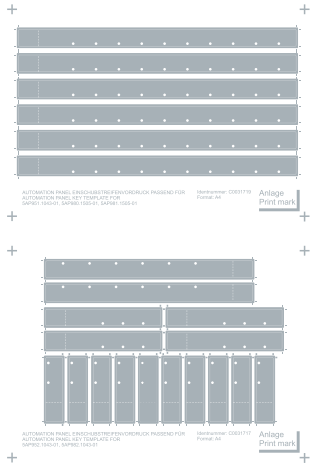
Model number	Description	Figure
5AC900.104X-03	**Legend strip template 10.4"** Legend strip templates for Automation Panels 5AP951.1043-01 and 5A981.1043-01. For 1 device.	Examples of legend strip templates 
5AC900.104X-04	**Legend strip template 10.4"** Legend strip templates for Automation Panels 5AP952.1043-01 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

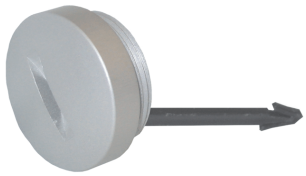
Model number	Description	Figure
5AC900.1200-00	**USB interface cover (cannot be lost)** Front side USB interface cover (cannot be lost) for Automation Panel 900 and Panel PC 700 devices.	

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).

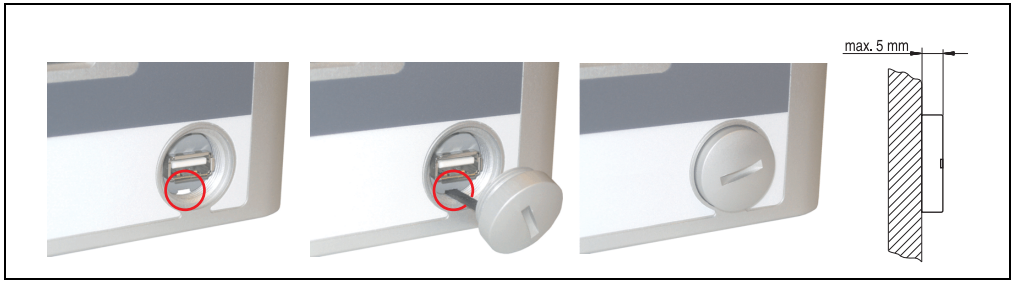


Figure 169: Front side USB interface cover - installation

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

Model number	Short description	Comment
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, the following measures 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

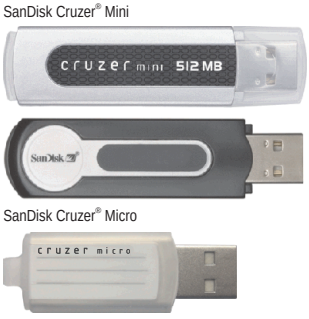
Model number	Description	Figure
5MMUSB.0256-00	USB flash drive 256 MB SanDisk Cruzer Mini	
5MMUSB.0512-00	USB flash drive 512 MB SanDisk Cruzer Mini up to Rev. E0 or Cruzer Micro starting with Rev. E0	
5MMUSB.1024-00	USB flash drive 1 GB SanDisk Cruzer Mini up to Rev. C0 or Cruzer Micro starting with 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 / Cruzer Micro	1 LED (green), signals data transfer (send and receive)			
Power supply Current requirements Cruzer Mini / Cruzer Micro	Via the USB port 650 µA sleep mode, 150 mA read/write			
Interface Cruzer Mini / Cruzer Micro Type Transfer rate Sequential reading Sequential writing Connection	USB specification 2.0 high speed device, mass storage class, USB-IF and WHQL certified USB 1.1 and 2.0-compatible Up to 480 Mbit (high speed) Max. 8.7 MB/second Max. 1.7 MB/second To each USB type A interface			
MTBF (at 25°C) Cruzer Mini / Cruzer Micro	100000 hours			
Data retention Cruzer Mini / Cruzer Micro	10 years			
Maintenance Cruzer Mini / Cruzer Micro	None			
Operating system support Cruzer Mini Cruzer Micro	Windows CE 4.1, CE 4.2, 98SE[1)] , ME, 2000, XP, Mac OS 9.1.x and Mac OS X 10.1.2 Windows CE 4.2, CE 5.0, ME, 2000, XP and Mac OS 9.1.x+, OS X v10.1.2+			
Mechanical characteristics				
Dimensions Height - Cruzer Mini / Cruzer Micro Width - Cruzer Mini / Cruzer Micro Depth - Cruzer Mini / Cruzer Micro	62 mm / 52.2 mm 19 mm / 19 mm 11 mm / 7.9 mm			
Environmental characteristics				
Environmental temperature Cruzer Mini / Cruzer Micro Operation Storage Transport	0°C .. +45°C -20°C .. +60°C -20°C .. +60°C			
Humidity Cruzer Mini / Cruzer Micro Operation Storage Transport	10% .. 90%, non-condensing 5% .. 90%, non-condensing 5% .. 90%, non-condensing			
Vibration Cruzer Mini / Cruzer Micro Operation Storage Transport	At 10 - 500 Hz: 2 g (19.6 m/s^2 0 peak), oscillation rate 1/minute At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute			

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

Features	5MMUSB.0256-00	5MMUSB.0512-00	5MMUSB.1024-00	5MMUSB.2048-00
Shock Cruzer Mini / Cruzer Micro Operation Storage Transport	 Max. 40 g (392 m/s^2 0-peak) and 11 ms length Max. 80 g (784 m/s^2 0-peak) and 11 ms length Max. 80 g (784 m/s^2 0-peak) and 11 ms length			
Altitude Cruzer Mini / Cruzer Micro Operation Storage Transport	 3048 meters 12192 meters 12192 meters			

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

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

7.3.1 Temperature humidity diagram - Operation and storage

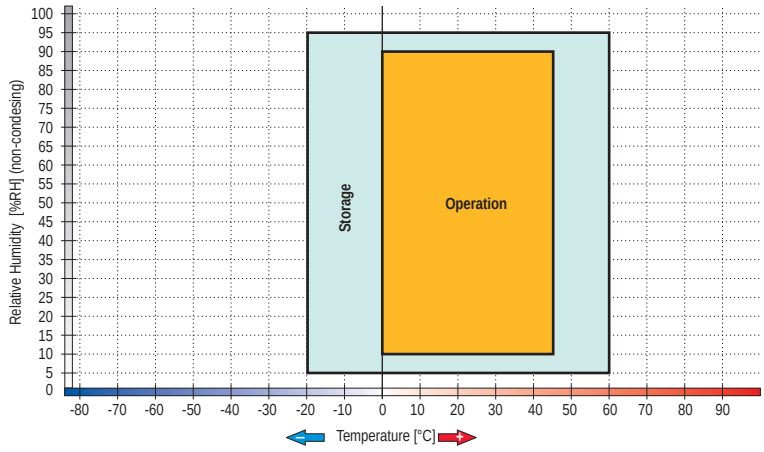


Figure 171: Temperature humidity diagram - USB flash drive - 5MMUSB.xxxx-00

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 covers 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

Burn-in 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 information

The fluorescent lights 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 lights can be exchanged in the 10.4", 12.1", and 15" Automation Panel 900 devices.
They cannot be exchanged in the 17" and 19" Automation Panel 900 devices.

Warning!

To avoid damaging the fluorescent lights 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 small flat-nose pliers. Don't pull on the cables, as this can break the tubes.

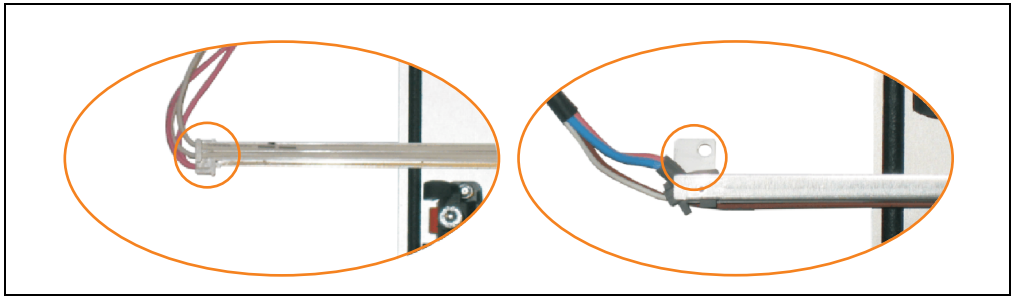


Figure 172: Warning - Exchanging the fluorescent tubes

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).

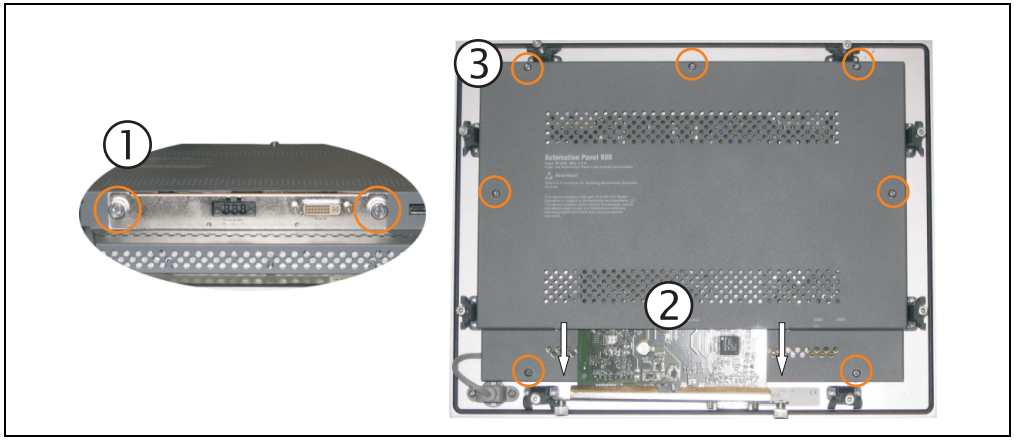


Figure 173: Remove the cover

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).

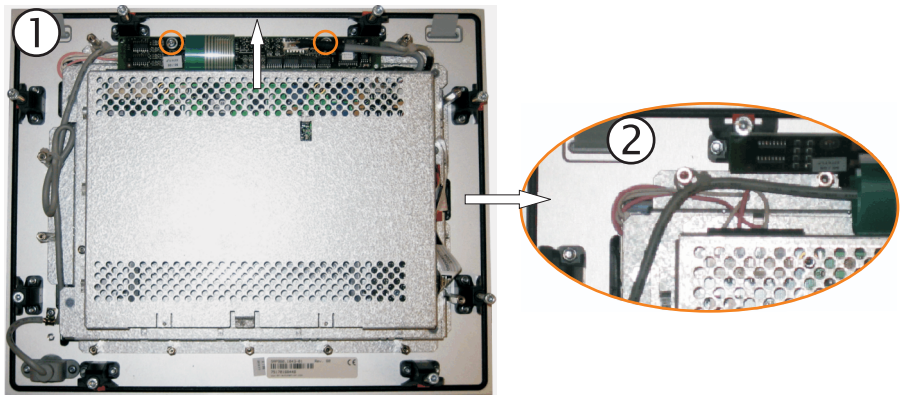


Figure 174: 10.4" Automation Panel - unscrew and unplug

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

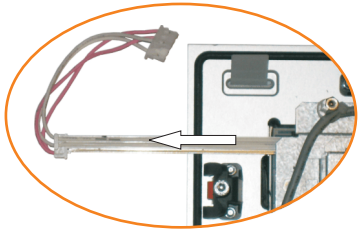


Figure 175: 10.4" Automation Panel - exchange fluorescent tube

3.2.2 Procedure for 12.1" Automation Panel

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

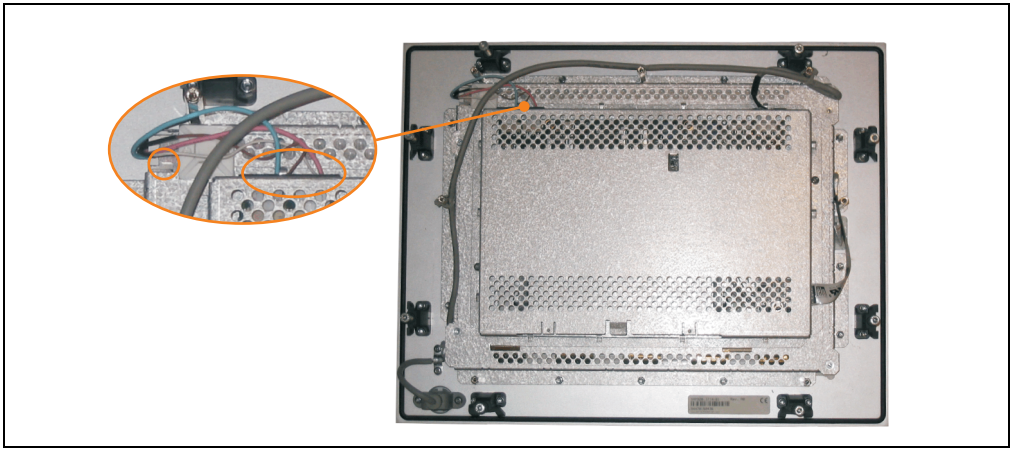


Figure 176: 12.1" Automation Panel - unscrew and unplug

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

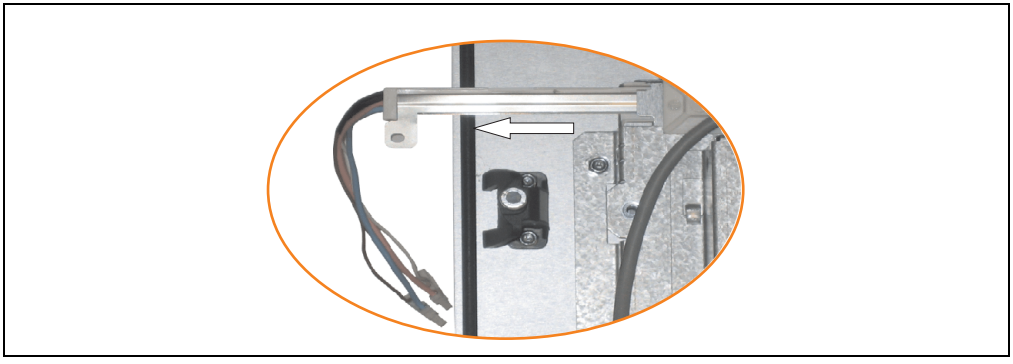


Figure 177: 12.1" Automation Panel - exchange fluorescent tube

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.

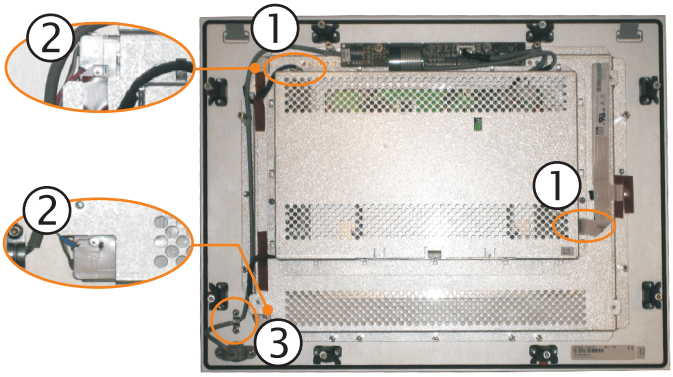


Figure 178: 15" Automation Panel - unscrew and unplug

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).

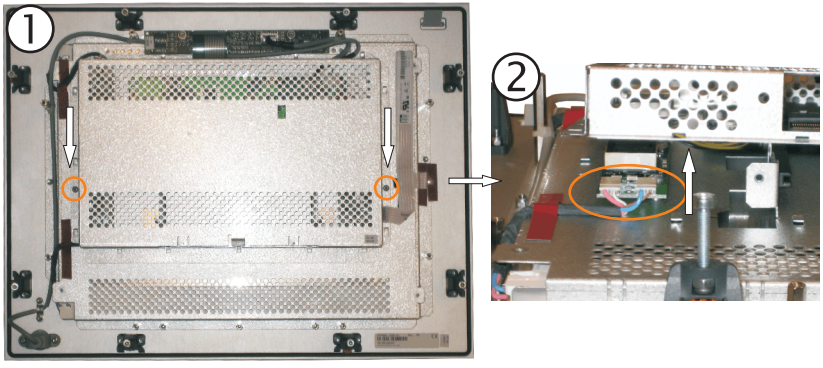


Figure 179: 15" Automation Panel - remove cover and unplug

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

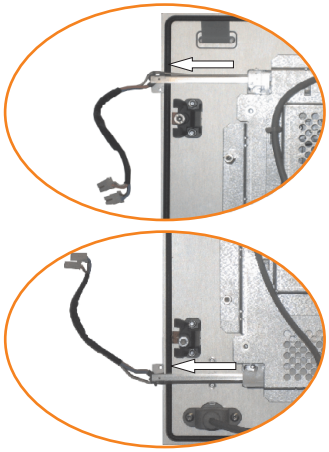


Figure 180: 15" Automation Panel - exchange fluorescent tubes

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 inches (2.032 mm) Maximum error in all directions 0.180 inches (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

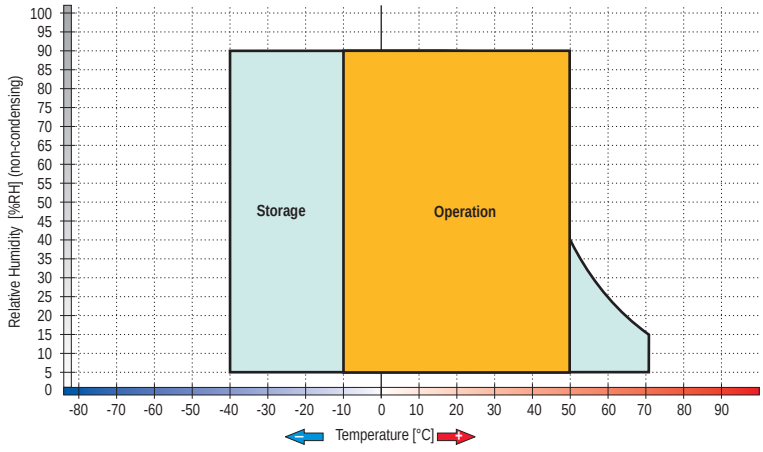


Figure 181: Temperature humidity diagram - Elo Accu touch screen

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% Trichloracetic acid <50% Sulphuric acid <10%	Sodium hypochlorite <20% Hydrogen peroxide <25% Potassium carbonate Washing agents Fabric conditioner Ferric chloride Ferrous chloride (FeCl2) Ferrous chloride (FeCl3) Dibutyl phthalate Dioctyl phthalate Sodium carbonate
Ammonia <40% Caustic soda <40% Potassium hydroxide Alkali carbonate Bichromate Potassium Acetonitrile Sodium bisulphate	Cutting oil Diesel oil Linseed oil Paraffin oil Blown castor oil Silicon oil Turpentine oil substitute Universal brake fluid Aviation fuel Petrol Water Sea water Decon	

Table 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.

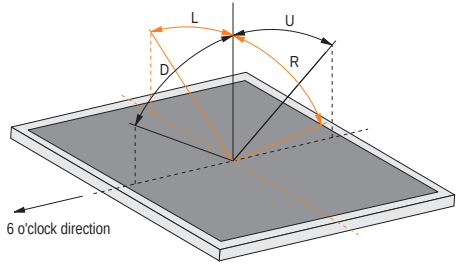


Figure 182: Viewing angles

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.

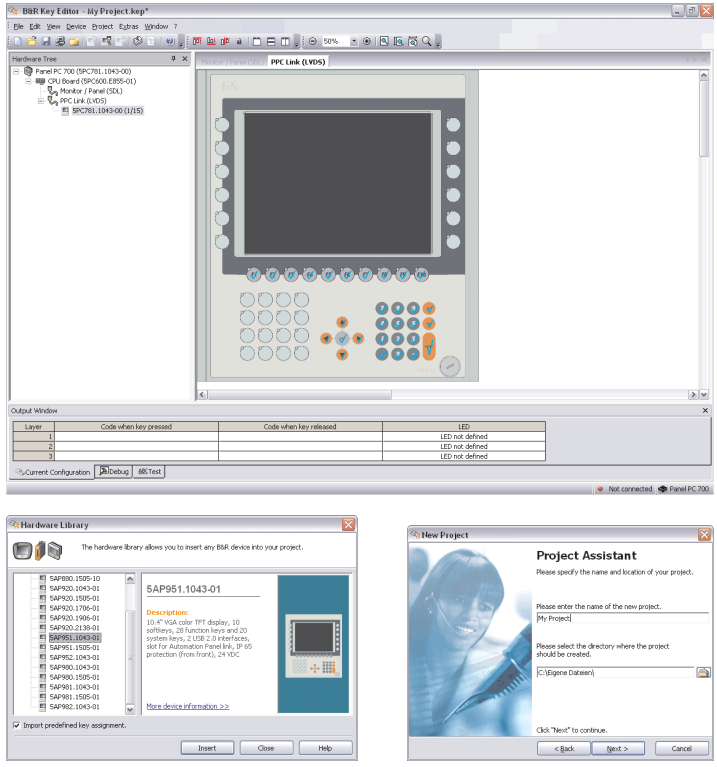


Figure 183: B&R Key Editor screenshots (Version 2.10)

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 272.

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

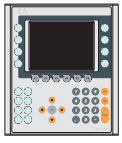
Quantity	Format	Image	Compatible	PP100/200	PP300/400	AP900	PPC700
5,7“	Horizontal1		Outer dimensions	■	■	-	-
			Installation dimensions	●	●	-	-
	Horizontal2		Outer dimensions	■	■	-	-
			Installation dimensions	●	●	-	-
	Vertical1		Outer dimensions	■	■	-	-
			Installation dimensions	●	●	-	-

Table 170: Device compatibility overview

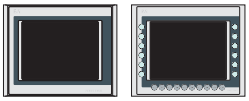
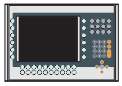
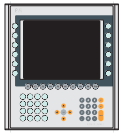
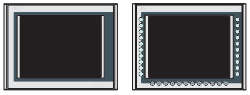
Quantity	Format	Image	Compatible	PP100/200	PP300/400	AP900	PPC700
10.4“	Horizontal1		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	●	●
	Horizontal2		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	▲	▲
	Vertical1		Outer dimensions	■	■	■	■
			Installation dimensions	●	●	▲	▲
12.1“	Horizontal1		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

Quantity	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.

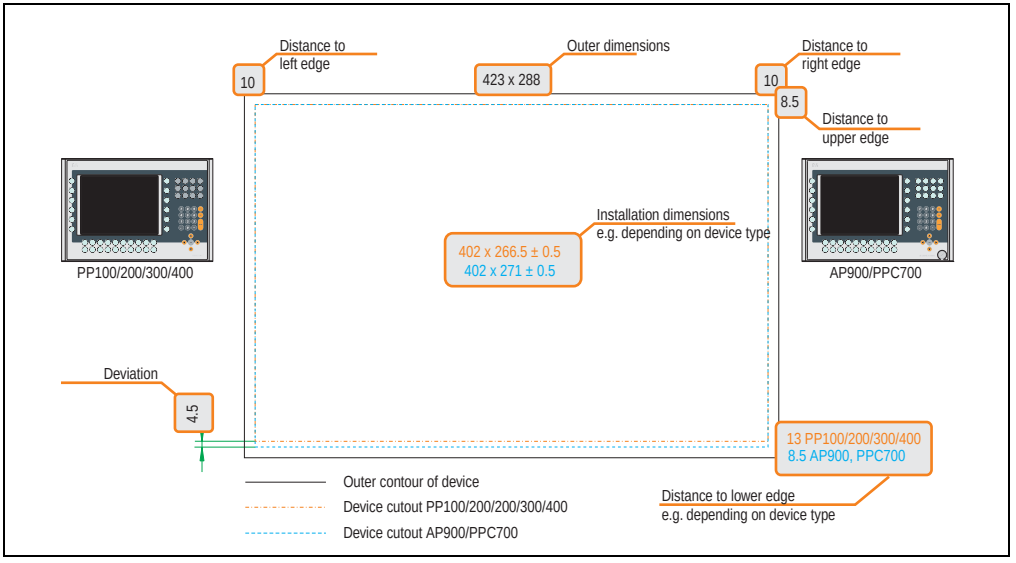


Figure 184: Compatibility details - figure structure

6.2.1 5.7" devices

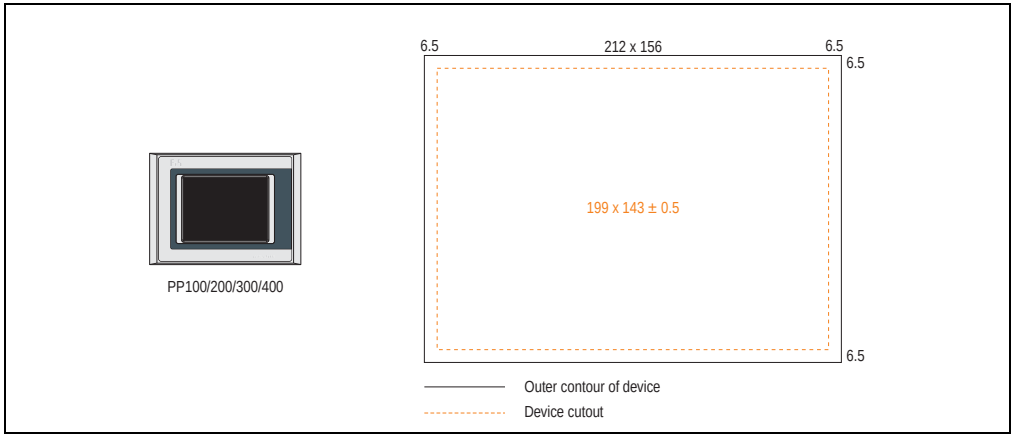


Figure 185: Mounting compatibility - 5.7" device format - Horizontal1

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

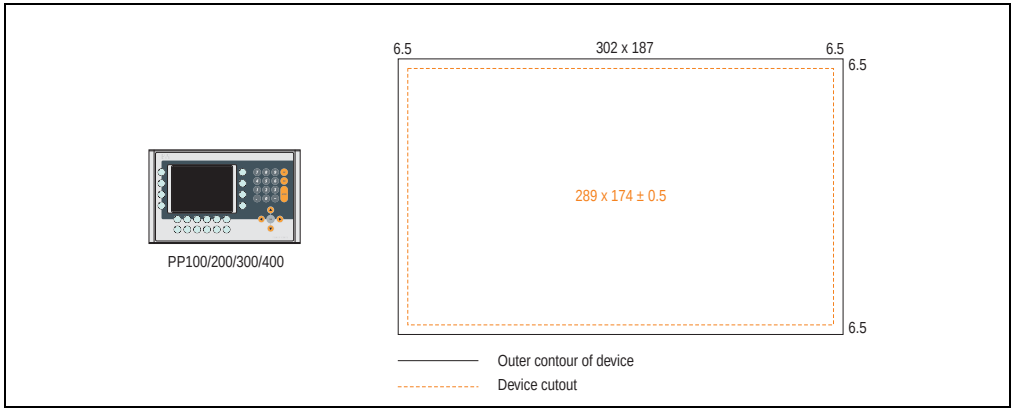


Figure 186: Mounting compatibility - 5.7" device format - Horizontal2

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

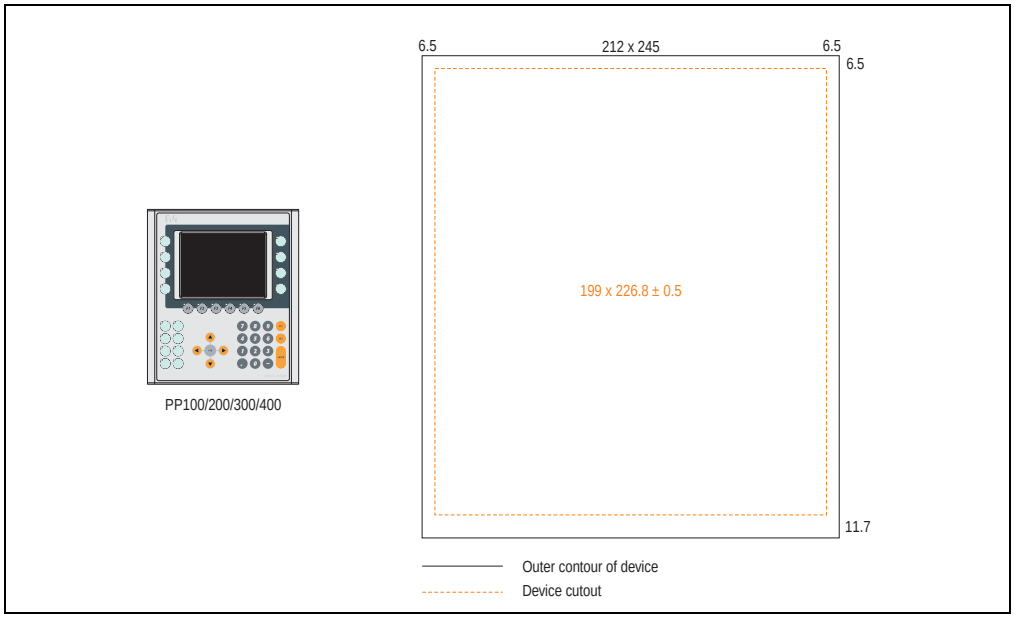


Figure 187: Mounting compatibility - 5.7" device format - Vertical1

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

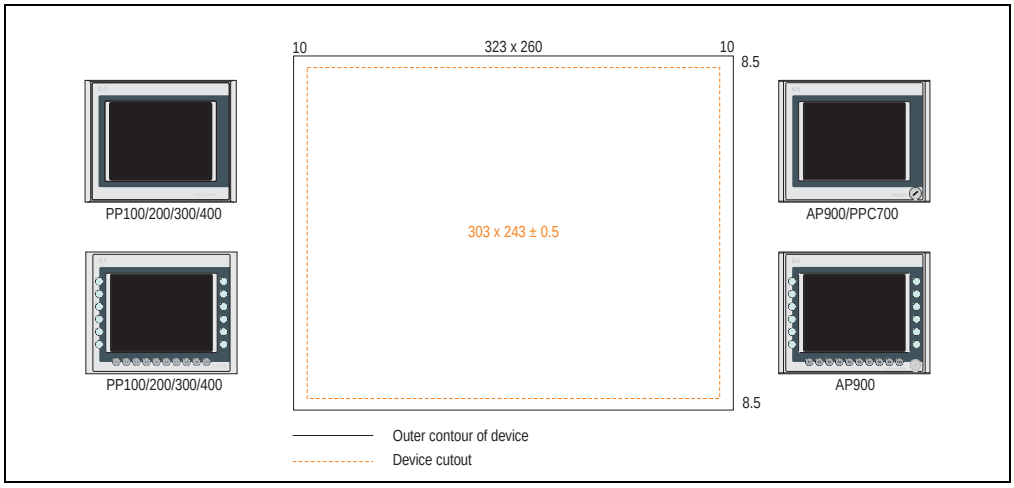


Figure 188: Mounting compatibility - 10.4" device format - Horizontal1

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.

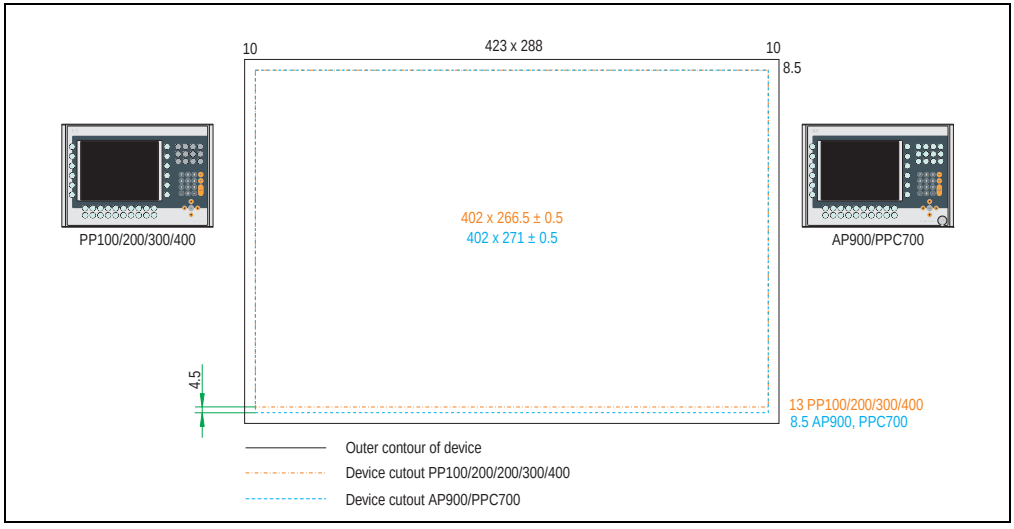


Figure 189: Mounting compatibility - 10.4" device format - Horizontal2

10.4" Power Panel 100/200 and Power Panel 300/400 are 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 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).

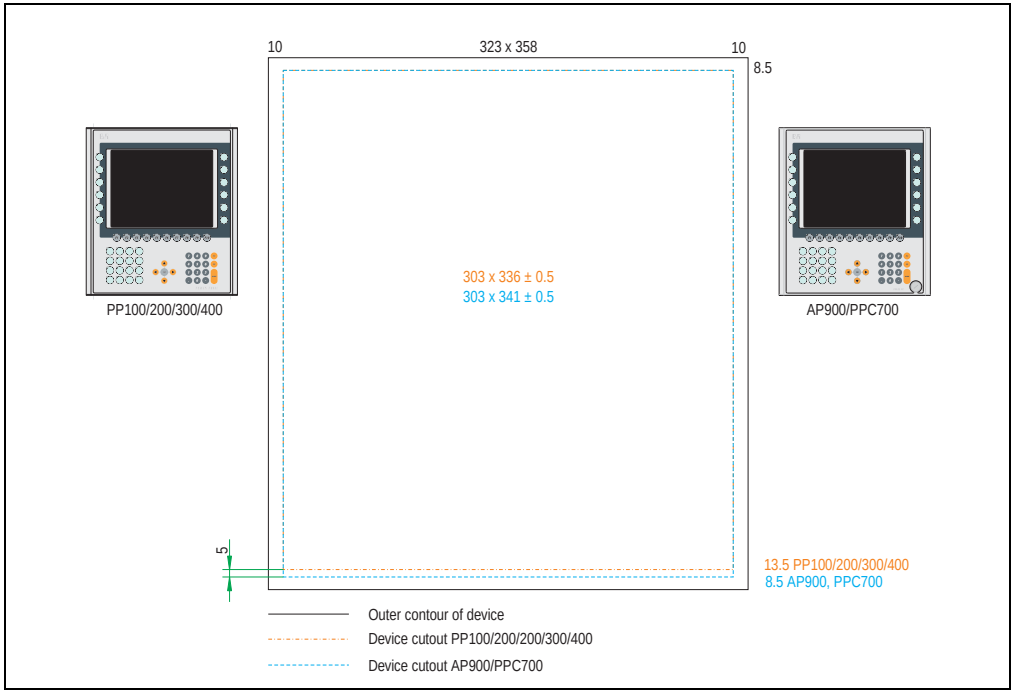


Figure 190: Mounting compatibility - 10.4" device format - Vertical1

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 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

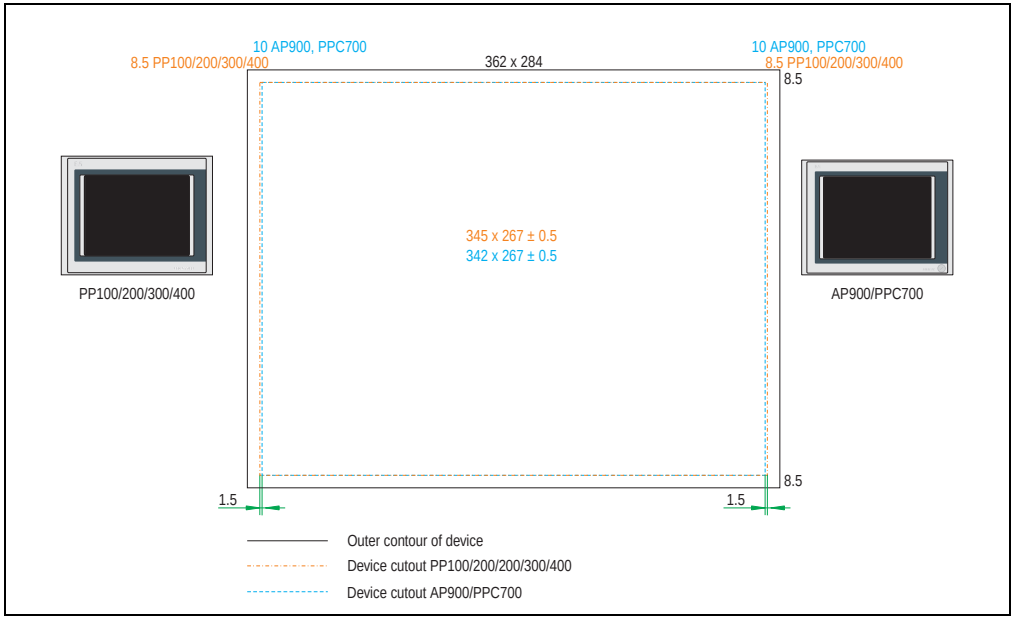


Figure 191: Mounting compatibility - 12.1" device format - Horizontal1

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 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

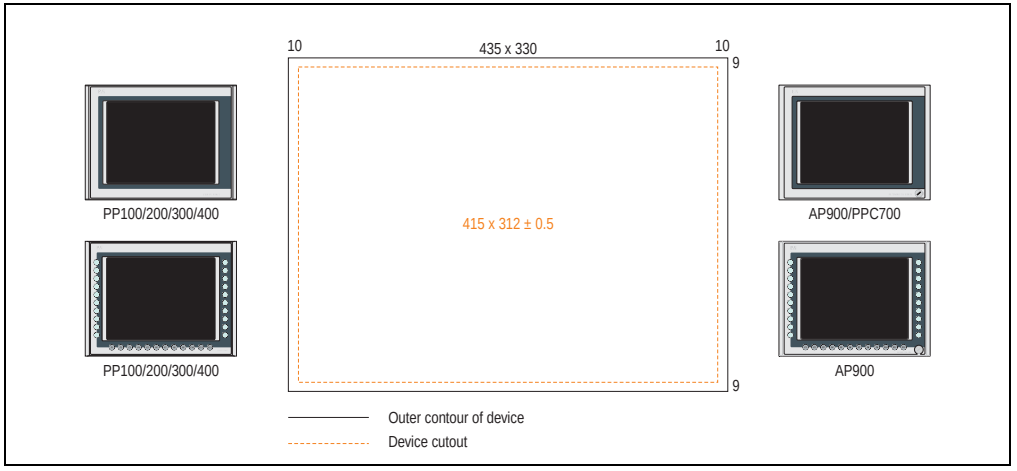


Figure 192: Mounting compatibility - 15" device format - Horizontal1

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

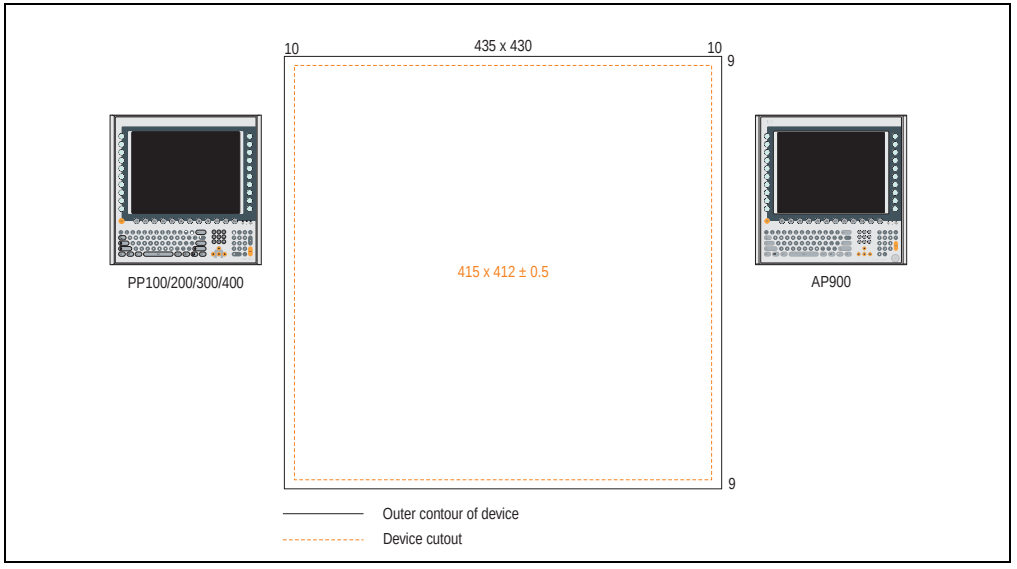


Figure 193: Mounting compatibility - 15" device format - Vertical1

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

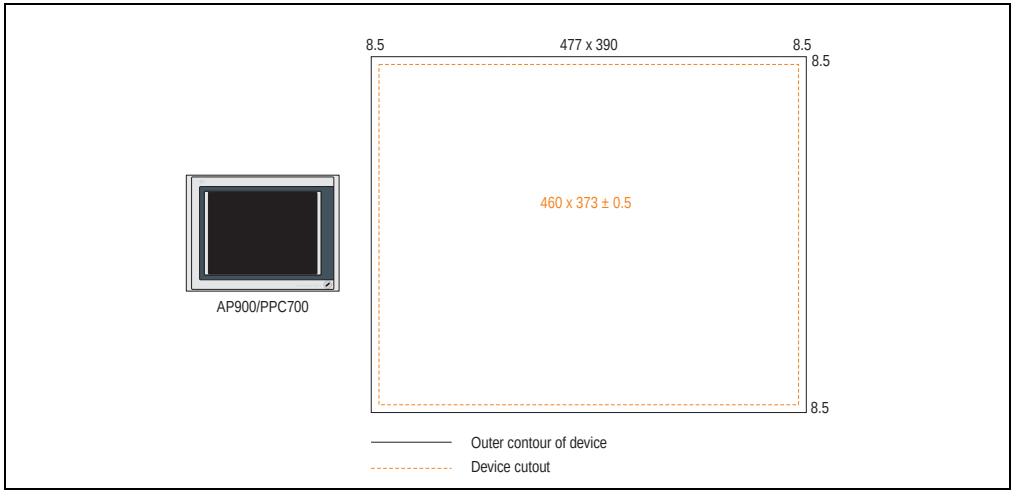


Figure 194: Mounting compatibility - 17" device format - Horizontal1

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

6.2.6 19" devices

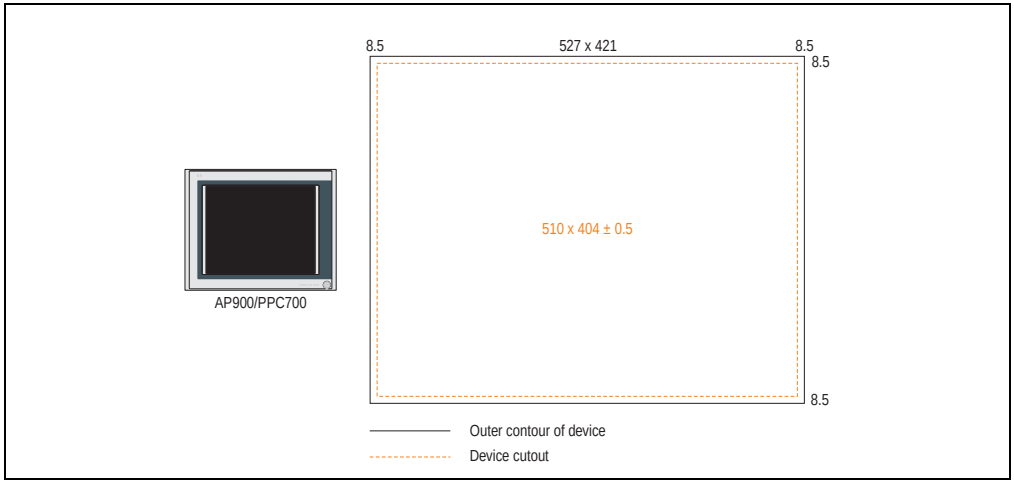


Figure 195: Mounting compatibility - 19" device format - Horizontal1

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

6.2.7 21.3" devices

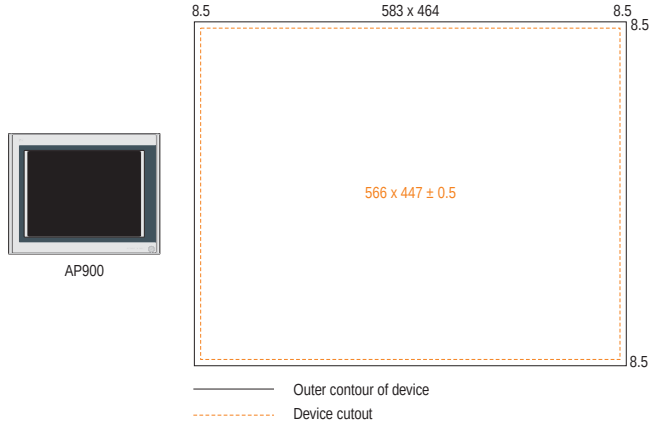


Figure 196: Mounting compatibility - 21.3" format - Horizontal1

7. Glossary

A

APC

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

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

An abbreviation for "**D**ata **S**et **R**eady". 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 "**D**ata **T**erminal **R**eady". 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 »**D**igital **V**isual **I**nterface« 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 "**E**xtended **D**isplay **I**dentification **D**ata". 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**lectro**m**agnetic **C**ompatibility". The ability of a device or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment [IEV 161-01-07].

F

FIFO

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

MTC

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

MTCX

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

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 "**P**ower **O**n **H**ours". See MTBF.

R

RS232

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

RXD

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

S

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 »**S**uper **V**ideo **G**raphics **A**rray«; 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**) **D**ata". A line for the transfer of serial data sent from one device to another, e.g. from a computer to a modem. For connections complying with the RS-232-C standard, the TXD is connected to pin 2 of the plug.

U

USB

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

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**X**tended **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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