Automation Panel 1000 - Hygienic design

User's manual

Version: **1.40 (November 2017)**

Model no.: **Automation Panel 1000 - Hygienic design**

1 General information

Information:

This user's manual is not intended for end customers! It is the responsibility of the machine manufacturer or system provider to provide the safety guidelines relevant to end customers in the operating instructions for the end customer in the respective local language.

1.1 Manual history

Version	Date	Change
1.00	2015-08-13	• First version
1.10	2016-04-08	• Adding the temperature data
1.20	2016-12-05	• Chapter 3: Changed mounting an Automation Panel 1000 with retaining clips.
1.30	2017-05-08	• Updated user's manual.
1.40	2017-11-13	Updated book. • Updated chapter "Individual components".

1.2 Safety guidelines

1.2.1 Intended use

Programmable logic controllers (PLCs), operating/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 industrial environments. 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, their use in flight control or flight safety systems as well as in the control of mass transportation systems, medical life support systems or weapons systems.

1.2.2 Protection against electrostatic discharge

Electrical components that can be damaged by electrostatic discharge (ESD) must be handled accordingly.

1.2.2.1 Packaging

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

1.2.2.2 Guidelines for proper ESD handling

Electrical components with a housing

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

Electrical components without a housing

The following points apply in addition to the points listed under "Electrical components with a housing":

- Any persons handling electrical components or devices with installed electrical components must be grounded.
- Components are only permitted to be touched on their narrow sides or front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.). Metallic surfaces are not suitable storage surfaces!
- Components should not be subjected to electrostatic discharge (e.g. through the use of charged plastics).
- Ensure a minimum distance of 10 cm from monitors and TV sets.
- Measuring instruments and equipment must be grounded.
- Probes on potential-free measuring instruments 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.).
- These increased ESD protective measures for individual components are not necessary for customers handling B&R products.

1.2.3 Policies and procedures

Electronic devices are never completely failsafe. If the programmable control system, operating/monitoring device or uninterruptible power supply fails, the user is responsible for ensuring that other connected devices, e.g. motors, are brought to a secure state.

When using programmable logic controllers or operating/monitoring devices as control systems together with a soft PLC (e.g. B&R Automation Runtime or comparable product) or slot PLC (e.g. B&R LS251 or comparable product), safety precautions relevant to industrial control systems (e.g. the provision of safety devices such as emergency stop, 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 the installation, commissioning and servicing of devices are only permitted to be carried out by qualified personnel. Qualified personnel are those familiar with the transport, mounting, installation, commissioning and operation of devices who also have the appropriate qualifications (e.g. IEC 60364). National accident prevention regulations must be observed.
The safety notices, information on connection conditions (nameplate and documentation) and limit values specified in the technical data are to be read carefully before installation and commissioning and must always be observed.

1.2.4 Transport and storage

During transport and storage, devices must be protected against undue stress (mechanical loads, temperature, moisture, corrosive atmospheres, etc.).

1.2.5 Installation

- These devices are not ready for use upon delivery and must be installed and wired according to the specifications in this documentation in order for the EMC limit values to apply.
- Installation must be performed according to this documentation using suitable equipment and tools.
- Devices are only permitted to be installed by qualified personnel without voltage applied. Before installation, voltage to the control cabinet must be switched off and prevented from being switched on again.
- General safety guidelines and national accident prevention regulations must be observed.
- Electrical installation must be carried out in accordance with applicable guidelines (e.g. line cross sections, fuses, protective ground connections).

1.2.6 Operation

1.2.6.1 Protection against touching electrical parts

To operate programmable logic controllers, operating/monitoring devices and uninterruptible power supplies, certain components must carry dangerous voltage levels over 42 VDC. Touching one of these parts can result in a life-threatening electric shock. This could lead to death, severe injury or damage to property.

Before turning on the programmable logic controller, operating/monitoring devices or uninterruptible power supply, the housing must be properly grounded (PE rail). Ground connections must be established even when testing or operating the operating/monitoring device or uninterruptible power supply for a short time!

Before switching on the device, all parts that carry voltage must be securely covered. During operation, all covers must remain closed.

1.2.6.2 Environmental conditions - Dust, moisture, corrosive gases

The use of operating/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 can affect functionality and may prevent sufficient cooling, especially in systems with active cooling systems (fans).

The presence of corrosive gases can also lead to malfunctions. When combined with high temperature and humidity, corrosive gases – e.g. with sulfur, nitrogen and chlorine components – can induce chemical reactions that can damage electronic components very quickly. Signs of the presence of corrosive gases are blackened copper surfaces and cable ends on existing equipment.

For operation in dusty or moist conditions, correctly installed (e.g. cutout installations) operating/monitoring devices like the Automation Panel or Power Panel are protected on the front. The back of all devices must be protected from dust and moisture and cleaned at suitable intervals.

1.2.6.3 Viruses and dangerous programs

This system is subject to potential risk 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 preventive measures such as virus protection programs, firewalls, etc. and making sure that software is only obtained from trusted sources.

1.2.7 Environmentally friendly disposal

All B&R programmable controllers, operating/monitoring devices and uninterruptible power supplies are designed to inflict as little harm as possible on the environment.

1.2.7.1 Separation of materials

It is necessary to separate different materials so the device can undergo an environmentally friendly recycling process.

Component	Disposal
Programmable logic controllers Operating/Monitoring devices Uninterruptible power supply Batteries and rechargeable batteries Cables	Electronics recycling
Cardboard box / Paper packaging	Cardboard box / Paper recycling
Plastic packaging	Plastic recycling

Table 1: Environmentally friendly disposal

Disposal must comply with applicable legal regulations.

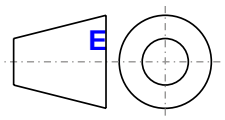
1.3 Organization of safety notices

Safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding these safety guidelines and notices can be life-threatening.
Warning!	Disregarding these safety guidelines and notices can result in severe injury or substantial damage to property.
Caution!	Disregarding these safety guidelines and notices can result in injury or damage to property.
Information:	This information is important for preventing errors.

Table 2: Description of the safety notices used in this documentation

1.4 Guidelines



European dimension standards apply to all dimension diagrams in this document.

All dimensions are specified in mm.

Unless otherwise specified, the following general tolerances apply:

Range of nominal sizes	General tolerance according to DIN ISO 2768 (medium)
Up to 6 mm	±0.1 mm
For 6 to 30 mm	±0.2 mm
For 30 to 120 mm	±0.3 mm
For 120 to 400 mm	±0.5 mm
For 400 to 1000 mm	±0.8 mm

Table 3: Range of nominal sizes

1.5 Overview

Model number	Short description	Page
	Accessories	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	72
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	72
	DVI cables	
5CADVI.0018-00	DVI-D cable - 1.8 m	78
5CADVI.0050-00	DVI-D cable - 5 m	78
5CADVI.0100-00	DVI-D cable - 10 m	78
	Link modules	
5DLSD3.1001-00	Automation Panel link module - SDL3 receiver - For Automation Panel 923/933/1000 - For Automation Panel 5000	49
5DLSDL.1001-00	Automation Panel link module - SDL/DVI receiver - For Automation Panel 923/933/1000 - For Automation Panel 5000	47
	Panels	
5AP1120.0702-I00	- Automation Panel 7.0" WVGA TFT - 800 x 480 pixels (16:10) - Single-touch (resistive), with fully integrated touch screen, without dirt-collecting edge - Non-rusting stainless steel front - Control cabinet installation - Landscape format - For PPC2100 / link modules - Compatible with 5PP520.0702-B00	39
5AP1125.1043-I00	- Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive), with fully integrated touch screen, without dirt-collecting edge - Non-rusting stainless steel front - Control cabinet installation - Landscape format - 13.56 MHz read/write transponder unit - For PPC900 / PPC2100 / link modules - Compatible with 5PP520.1043-B00/5PP520.1043-B10	41
5AP1125.1044-I00	- Automation Panel 10.4" SVGA TFT - 800 x 600 pixels (4:3) - Single-touch (analog resistive), with fully integrated touch screen, without dirt-collecting edge - Non-rusting stainless steel front - Control cabinet installation - Landscape format - 13.56 MHz read/write transponder unit - For PPC900 / PPC2100 / link modules - Compatible with 5PP520.1043-B00/5PP520.1043-B10	43
5AP1125.1505-I00	- Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive), with fully integrated touch screen, without dirt-collecting edge - Non-rusting stainless steel front - Control cabinet installation - Landscape format - 13.56 MHz read/write transponder unit - For PPC900 / PPC2100 / link modules - Compatible with 5PP520.1505-B00/5PP520.1505-B10	45
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of display unit with touch screen, 1.8 m	99
9A0014.05	RS232 extension cable for remote operation of display unit with touch screen, 5 m	99
9A0014.10	RS232 extension cable for remote operation of display unit with touch screen, 10 m	99
	SDL cable 45° connectors	
5CASDL.0018-01	SDL cable - 45 degree connector - 1.8 m	84
5CASDL.0050-01	SDL cable - 45 degree connector - 5 m	84
5CASDL.0100-01	SDL cable - 45 degree connector - 10 m	84
5CASDL.0150-01	SDL cable - 45 degree connector - 15 m	84
	SDL cables	
5CASDL.0008-00	SDL cable - 0.8 m	81
5CASDL.0018-00	SDL cable - 1.8 m	81
5CASDL.0050-00	SDL cable - 5 m	81
5CASDL.0100-00	SDL cable - 10 m	81
5CASDL.0150-00	SDL cable - 15 m	81
5CASDL.0200-00	SDL cable - 20 m	81
5CASDL.0250-00	SDL cable - 25 m	81
5CASDL.0300-00	SDL cable - 30 m	81
	SDL flex cables	
5CASDL.0018-03	SDL flex cable - 1.8 m	87
5CASDL.0050-03	SDL flex cable - 5 m	87
5CASDL.0100-03	SDL flex cable - 10 m	87
5CASDL.0150-03	SDL flex cable - 15 m	87
5CASDL.0200-03	SDL flex cable - 20 m	87
5CASDL.0250-03	SDL flex cable - 25 m	87
5CASDL.0300-03	SDL flex cable - 30 m	87
5CASDL.0300-13	SDL flex cable with extender - 30 m	91
5CASDL.0400-13	SDL flex cable with extender - 40 m	91
5CASDL.0430-13	SDL flex cable with extender - 43 m	91
	SDL3 cables	
5CASD3.0030-00	SDL3 cable - 3 m	94
5CASD3.0050-00	SDL3 cable - 5 m	94
5CASD3.0100-00	SDL3 cable - 10 m	94
5CASD3.0150-00	SDL3 cable - 15 m	94
5CASD3.0200-00	SDL3 cable - 20 m	94
5CASD3.0300-00	SDL3 cable - 30 m	94
5CASD3.0500-00	SDL3 cable - 50 m	94
5CASD3.1000-00	SDL3 cable - 100 m	94
	USB accessories	
5MMUSB.032G-02	USB 3.0 flash drive 32 GB MLC	76
5MMUSB.2048-01	USB 2.0 flash drive 2048 MB B&R	74
5MMUSB.4096-01	USB 2.0 flash drive 4096 MB B&R	74
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable - Type A - Type B connector - 1.8 m	97
5CAUSB.0050-00	USB 2.0 connection cable - Type A - Type B connector - 5 m	97

2 Technical data

2.1 Introduction

2.1.1 About this user's manual

This user's manual contains all relevant information about an operational Automation Panel 1000 cabinet-mounted device.

This user's manual applies to the modular Automation Panel 1000 product generation. Information about Automation Panel 920, 980, 981 and 982 systems can be found in the Automation Panel 900 user's manual. Information about Automation Panel 9x3 systems can be found in the Automation Panel 9x3 user's manual.

2.1.2 Description of individual modules

2.1.2.1 AP1000 display units

AP1000 display units form the basis for the Automation Panel 1000, Panel PC 900 and Panel PC 2100 system families. A wide selection of different display sizes and display units with touch screen and RFID are available. These display units can only be operated as a complete system together with a link module (Automation Panel 1000) or CPU board and system unit (Panel PC 900, Panel PC 2100).

2.1.2.2 Link modules

Link modules have various graphics interfaces and connections. An Automation Panel 9x3 or Automation Panel 1000 is put together by installing a link module onto a display unit. Automation Panel systems are mounted using a retaining frame.

A link module cannot be operated without a display unit.

2.1.3 System components / Configuration

Automation Panel 1000, Panel PC 900 and Panel PC 2100 systems can be assembled to meet individual requirements and operating conditions. Automation Panel 1000, Panel PC 900 and Panel PC 2100 systems are flexible so that an Automation Panel can be converted to a Panel PC, or vice versa.

2.1.3.1 Configuration

The following individual components are required for operation as an Automation Panel 1000:

- Display unit
- Link module
- Terminal block
- Pressure frame

Configuration - Base system					
Display unit	Select 1				
		**Display size**	**Resolution**	**Touch screen**	**RFID**
	Display unit 1120				
	5AP1120.0702-I00	7"	WVGA	Single-touch	No
	Display unit 1125				
	5AP1125.1043-I00	10.4"	VGA	Single-touch	Yes
	5AP1125.1044-I00	10.4"	SVGA	Single-touch	Yes
	5AP1125.1505-I00	15"	XGA	Single-touch	Yes
Link module	Select 1				
	5DLSDL.1001-00 SDL/DVI Receiver 5DLSD3.1001-00 SDL3 receiver				
Terminal blocks	Select 1				
	**Power connectors** 0TB103.9 0TB103.91				

2.2 Complete system

2.2.1 Connection options

The Automation Panel can be connected to a B&R Industrial PC via SDL, DVI or SDL3. The connection options listed below provide an overview of the operating modes as well as possible limitations.

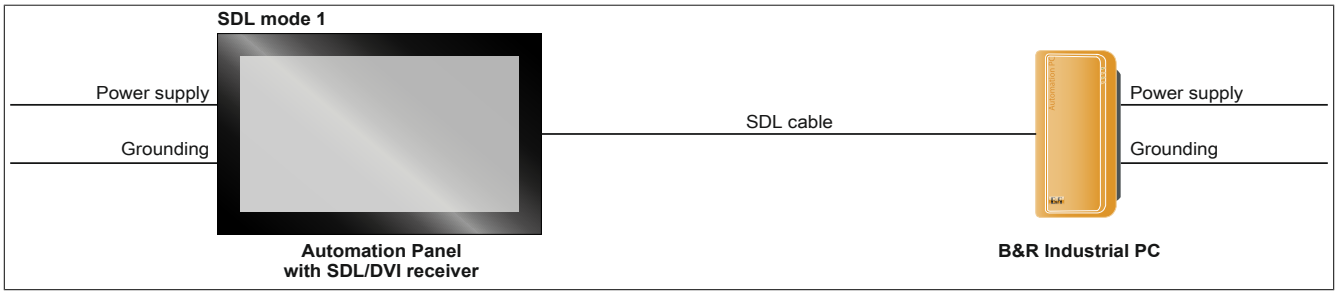
2.2.1.1 SDL mode

2.2.1.1.1 SDL mode - Mode 1

SDL mode 1 allows all communication between the Automation Panel and B&R Industrial PC to be handled using a single SDL cable.

It is used to transfer not just display data, but touch screen, matrix key, LED, service and diagnostic data as well. The Automation Panel can be installed up to form the B&R Industrial PC. USB 1.1 is fully integrated in SDL and also transferred over this distance without requiring any external modules.

The display's brightness can be configured using the ADI Control Center, for example.



Availability of interfaces on the Automation Panel with SDL/DVI receiver:

Panel In	✓	USB In	x	Power supply	✓	Brightness controls	x
USB1, USB2	✓ USB 1.1	COM touch interface	x	Grounding	✓		

Prerequisites and requirements

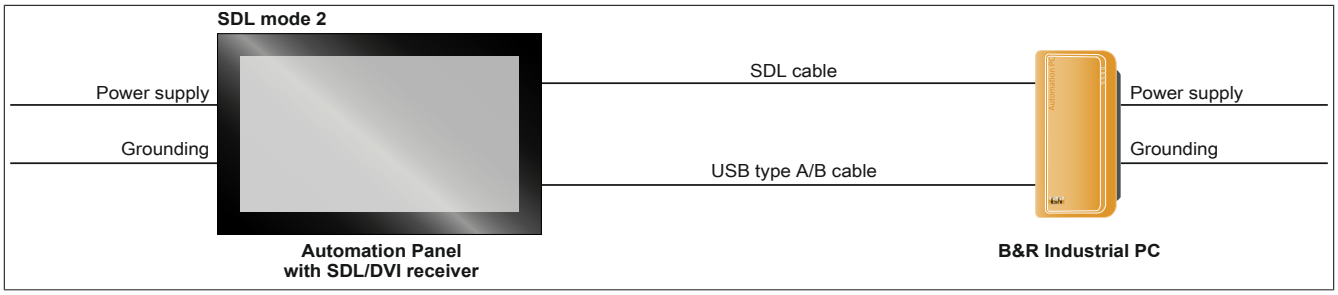
- Automation Panel with SDL/DVI receiver
- B&R Industrial PC with SDL interface
- SDL cable

2.2.1.1.2 SDL mode - Mode 2

In SDL mode 2, communication between the Automation Panel and the B&R Industrial PC is handled using an SDL cable connected to the Panel In interface and a USB type A/B cable connected to the USB In interface.

In addition to display data, the SDL cable is used to transfer resistive touch screen, matrix key and service/diagnostic data. Data from multi-touch touch screens is transferred over the USB type A/B cable. The Automation Panel can be installed up to 5 m (USB specification) from the B&R Industrial PC. USB 2.0 data can be transferred over the USB type A/B cable for this distance without requiring any external modules.

The display's brightness can be configured using the ADI Control Center, for example.



Availability of interfaces on the Automation Panel with SDL/DVI receiver:

Panel In	✓	USB In	✓ USB 2.0	Power supply	✓	Brightness controls	x
USB1, USB2	✓ USB 2.0	COM touch interface	x	Grounding	✓		

Maximum cable length: 5 m

Requirements

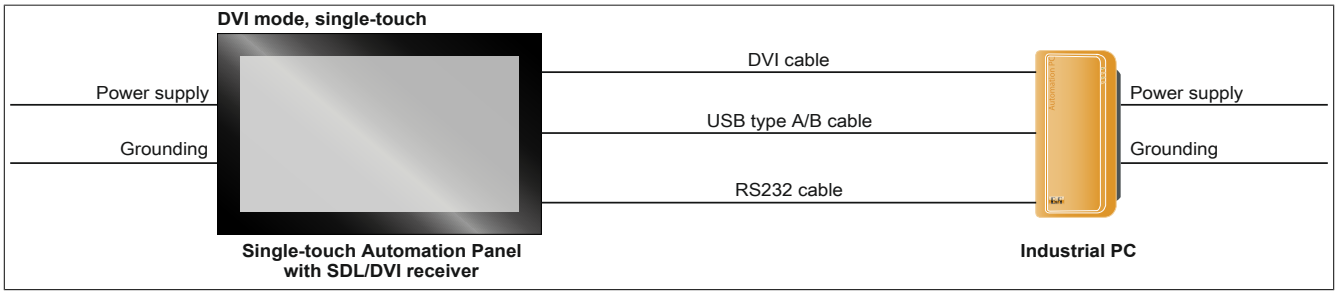
- Automation Panel with SDL/DVI receiver
- B&R Industrial PC with SDL interface
- SDL cable, USB type A/B cable

2.2.1.2 DVI mode

In DVI mode, the signals needed to operate the Automation Panel are each transferred over a separate cable. The brightness of the display can be configured using the brightness buttons.

2.2.1.2.1 DVI mode with single-touch Automation Panel

If an Automation Panel with resistive touch screen (single-touch) is operated in DVI mode, then a DVI cable, USB type A/B cable and RS232 cable must be connected.



Availability of interfaces on the Automation Panel with SDL/DVI receiver:

Panel In	✓	USB In	✓ USB 2.0	Power supply	✓	Brightness controls	✓
USB1, USB2	✓ USB 2.0	COM touch interface	✓	Grounding	✓		

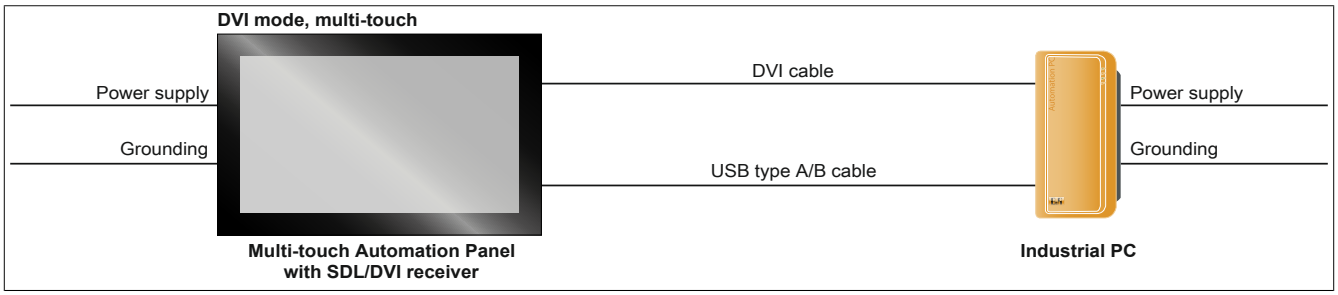
Maximum cable length: 5 m

Requirements

- Automation Panel with SDL/DVI receiver
- B&R Industrial PC with DVI interface
- DVI cable, USB type A/B cable, RS232 cable

2.2.1.2.2 DVI mode with multi-touch Automation Panel

If an Automation Panel with PCT touch screen (multi-touch) is operated in DVI mode, then a DVI cable and USB type A/B cable must be connected.



Availability of interfaces on the Automation Panel with SDL/DVI receiver:

Panel In	✓	USB In	✓ USB 2.0	Power supply	✓	Brightness controls	✓
USB1, USB2	✓ USB 2.0	COM touch interface	x	Grounding	✓		

Maximum cable length: 5 m

Requirements

- Automation Panel with SDL/DVI receiver
- B&R Industrial PC with DVI interface
- DVI cable, USB type A/B cable

2.2.1.2.3 General limitations / Special considerations

- Key and LED data is not transferred.
- Data from operating elements is not transferred.
- Service and diagnostic data is not transferred.
- Maximum cable length is limited to 5 m.

2.2.1.3 SDL3 mode

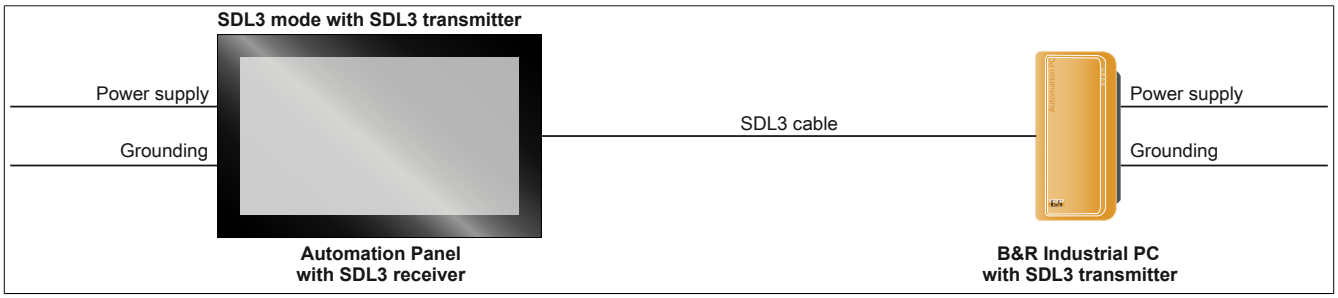
Smart Display Link 3 (SDL3) technology is used to transfer data from all communication channels between a B&R Industrial PC and a panel up to 100 m over a standard Ethernet cable. A male RJ45 connector designed for tight spaces such as feed-throughs and swing arm systems is used to connect to the device.

2.2.1.3.1 SDL3 mode with SDL3 transmitter

SDL3 mode with an SDL3 transmitter in the B&R Industrial PC allows all communication between the Automation Panel and the PC to be handled using a single SDL3 cable.

It is used to transfer not just display data, but touch screen, matrix key, LED, service and diagnostic data as well. The Automation Panel can be installed up to 100 m from the B&R Industrial PC. USB 2.0 is fully integrated in SDL3 and also transferred over this distance without the need for external modules.

The display's brightness can be configured using the ADI Control Center.



Availability of interfaces on the Automation Panel with SDL3 receiver:

SDL3 interface	✓	USB1, USB2	✓ USB 2.0	Power supply	✓	Grounding	✓

Maximum cable length of SDL3: 100 m

Requirements

- Automation Panel with SDL3 receiver
- B&R Industrial PC with SDL3 interface
- SDL3 cable

2.2.1.3.2 General limitations / Special considerations

- The USB 2.0 transfer rate is limited to 30 Mbit/s with SDL3.
- The SDL3 transmitter continuously emulates a display using EDID data and hot plugging code, which allows DVI-compatible operation. This can lead to improperly displayed images during operation with multiple displays. In Windows, a connected panel is detected by the graphics driver even in the following situations:
  - No cable is connected.
  - A connection has not yet been established between the SDL3 link module and the SDL3 transmitter.

  It is possible to correct these improperly displayed images by configuring BIOS or the graphics driver accordingly.

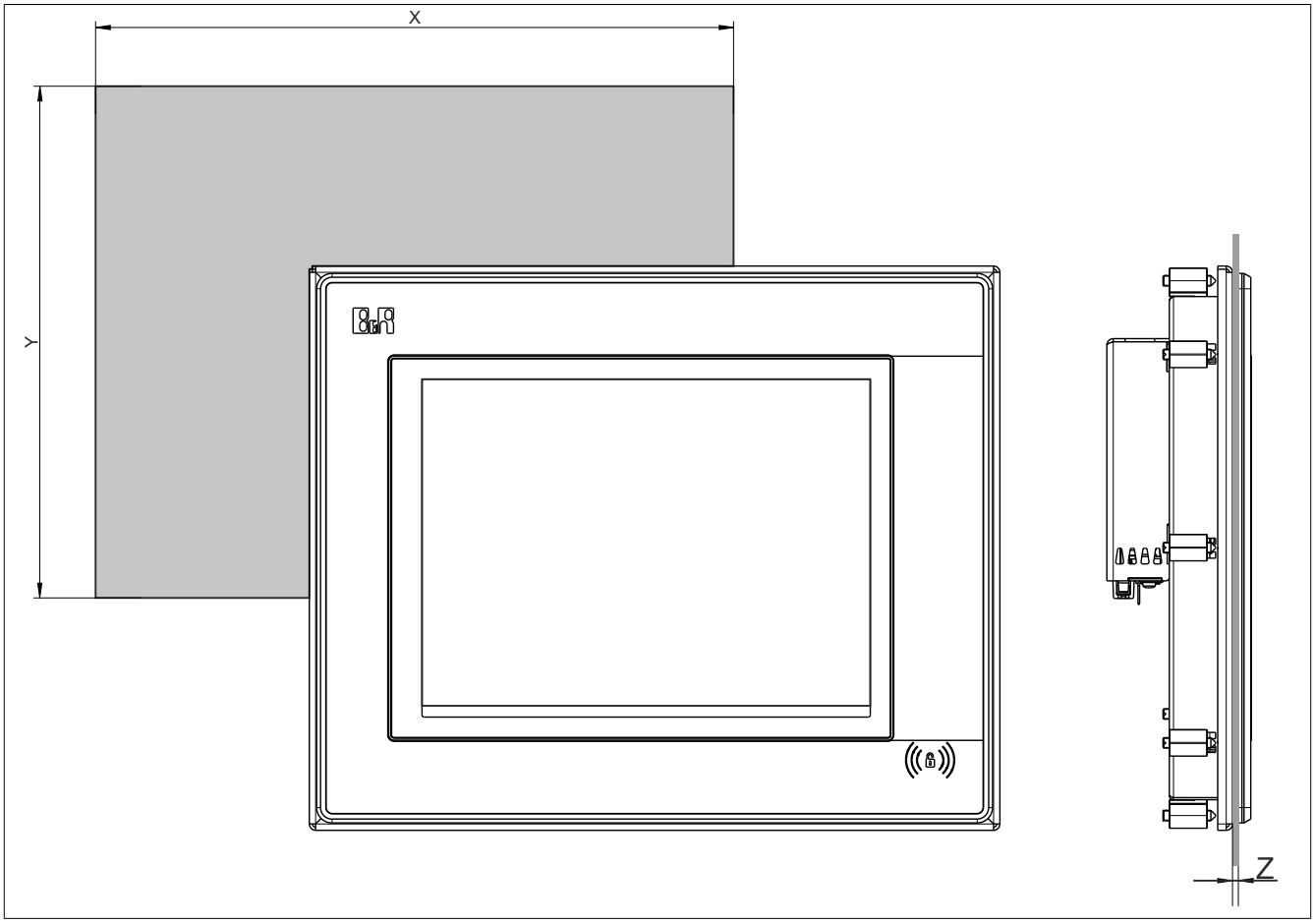
2.2.2 Mechanical characteristics

2.2.2.1 Installation diagrams

Information:

When installing the Automation Panel 1000, be sure to leave sufficient space for air circulation as well as additional space for operation and maintenance of the device.

Installation diagrams



All dimensions are specified in mm.

The cutout tolerance values are +0 mm / -0.5 mm.

Display type	Model number	X	Y	Z min	Z max	Number of retaining clips	
7" single-touch	5AP1120.0702-I00	199	143	1	8	9	
10.4" single-touch	5AP1125.1043-I00	303	243	1	10	14	
10.4" single-touch	5AP1125.1044-I00	303	243	1	10	14	
15" single-touch	5AP1125.1505-I00	415	313	2	10	18	

Table 4: AP1000 display units with retaining clips - Installation diagrams

The "Z" measurement indicates the thickness of the wall or control cabinet panel.

A 2.5 mm hex socket screwdriver is needed to tighten and loosen the screws on the retaining clips. The maximum tightening torque for the retaining clips is 1 Nm.

2.2.2.2 Spacing for air circulation

In order to guarantee sufficient air circulation, allow the specified amount of space above, below, to the side and behind the device. The minimum specified spacing is indicated in the following diagram. This applies to all variants.

Information:

The following image and table provide a thermal examination of the complete system. If additional space is needed to operate or maintain the device, this must be taken into consideration during installation.

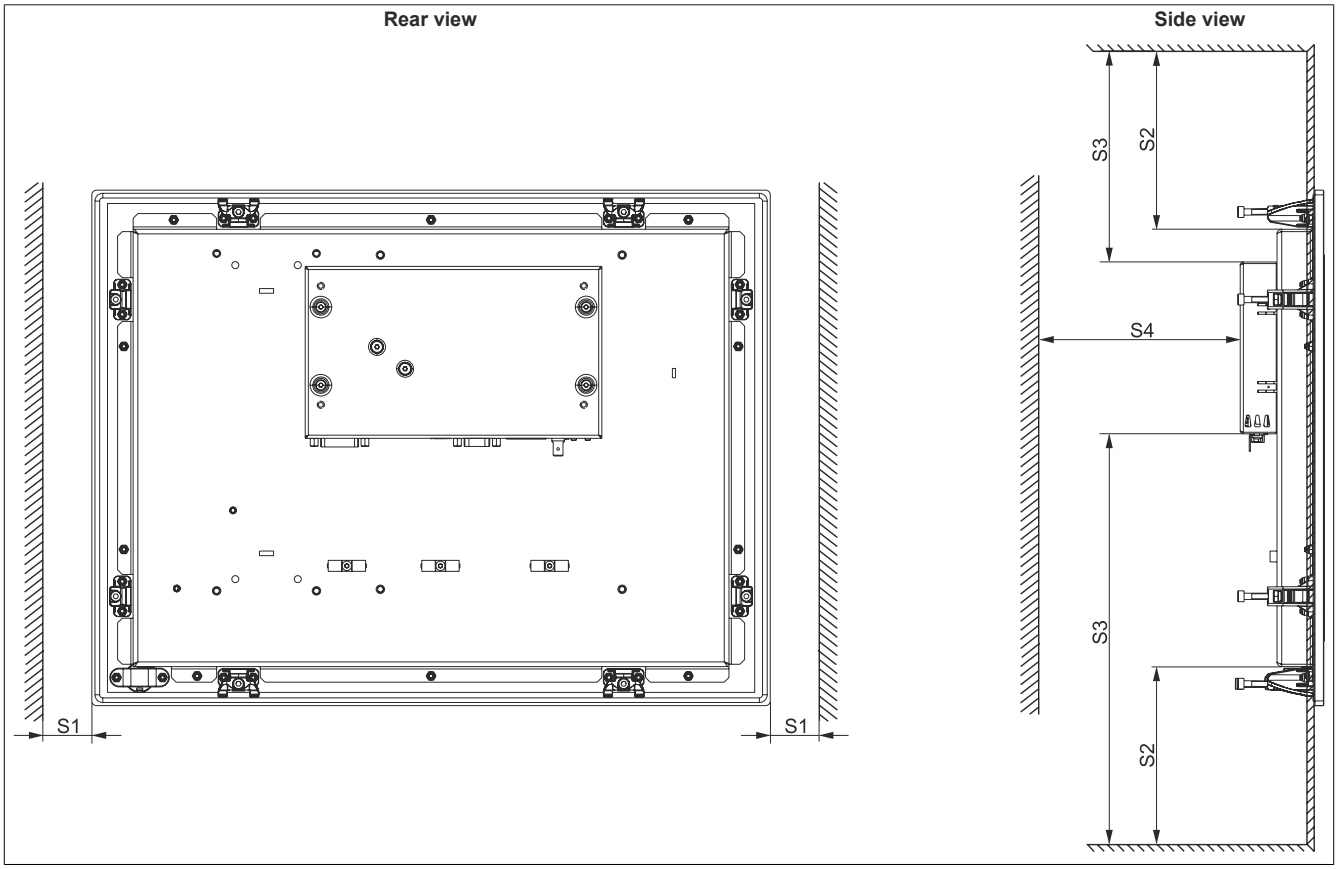


Figure 1: Automation Panel 1000 - Spacing for air circulation

S1: ≥10 mm

S2: ≥80 mm

S3: ≥50 mm

S4: ≥50 mm

Caution!

The spacing specifications for air circulation are based on the worst-case scenario for operation at the maximum specified ambient temperature. The maximum specified ambient temperature must not be exceeded!

If the spacing specifications for air circulation cannot be observed, then the maximum specified temperatures for the temperature sensors (see "Temperature sensor locations" on page 24) must be monitored by the user and appropriate measures taken if they are exceeded.

2.2.2.3 Mounting orientations

The following diagrams show the approved mounting orientations for the Automation Panel 1000. The AP1000 must be mounted as illustrated and described below.

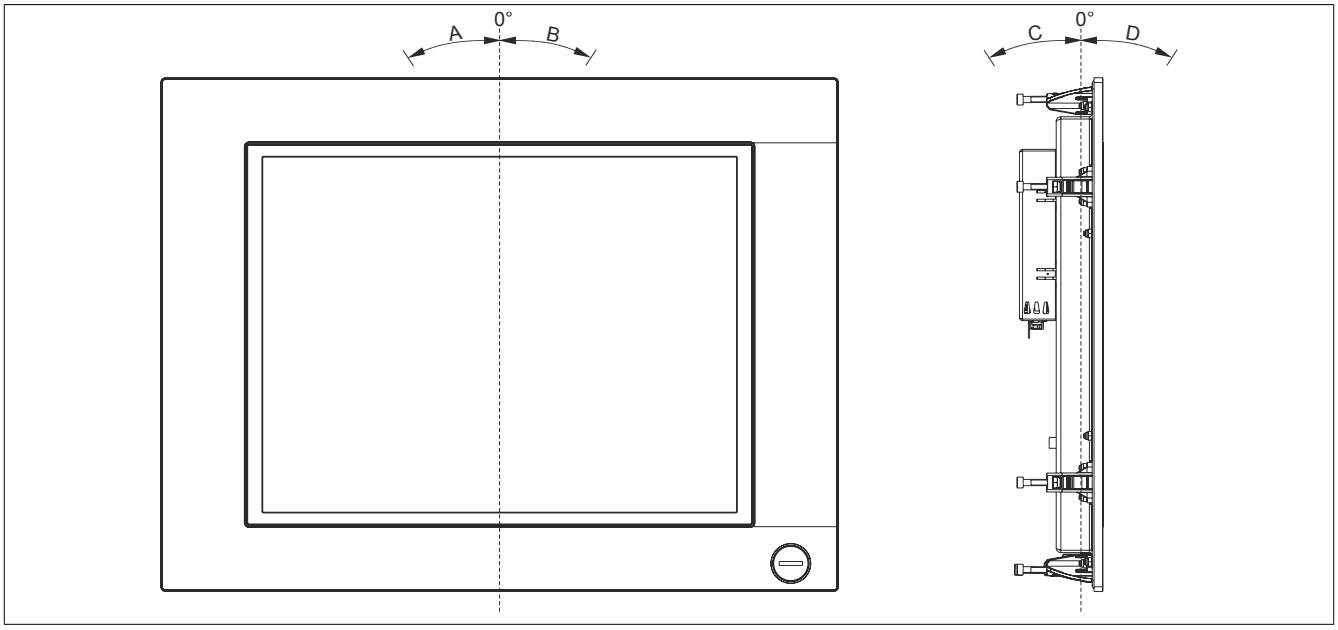


Figure 2: Automation Panel 1000 - Mounting orientation

If "✓" is marked for the installed component, it can be used at the maximum ambient temperature (see Maximum ambient temperature) of the complete system without problems.

If there is a specific temperature for the display unit in a particular mounting orientation, for example "55", then the ambient temperature is not permitted to exceed this temperature.

Mounting orientations for the Automation Panel 1000 with SDL/DVI receiver

		All temperature values in degrees Celsius (°C) at 500 m above sea level.	Display unit			
			5AP1120.0702-I00	5AP1125.1043-I00	5AP1125.1044-I00	5AP1125.1505-I00
Mounting orientation	0°	0°	✓	✓	✓	✓
	A	-1° to -90° (counterclockwise)	✓	✓	✓	✓
	B	+1° to +90° (clockwise)	✓	✓	✓	✓
	C, D	±180° (interfaces on top)	✓	✓	✓	✓
	C	-1° to -45°	✓	✓	✓	✓
	D	+1° to +90° (display facing down)	✓	✓	✓	✓

Table 5: Automation Panel 1000 with SDL/DVI receiver - Mounting orientations

Mounting orientations for the Automation Panel 1000 with SDL3 receiver

		All temperature values in degrees Celsius (°C) at 500 m above sea level.	Display unit			
			5AP1120.0702-I00	5AP1120.1043-I00	5AP1125.1044-I00	5AP1120.1505-I00
Mounting orientation	0°	0°	✓	✓	✓	✓
	A	-1° to -90° (counterclockwise)	✓	✓	✓	✓
	B	+1° to +90° (clockwise)	✓	✓	✓	✓
	C, D	±180° (interfaces on top)	✓	✓	✓	✓
	C	-1° to -45°	✓	✓	✓	✓
	D	+1° to +90° (display facing down)	55	55	55	55

Table 6: Automation Panel 1000 with SDL3 receiver - Mounting orientations

2.2.2.4 Weight specifications

All weights are specified in g (grams).

Display type	Model number	Weight	
7.0" single-touch	5AP1120.0702-I00	1900	
10.4" single-touch	5AP1125.1043-I00	4100	
10.4" single-touch	5AP1125.1044-I00	4300	
15.0" single-touch	5AP1125.1505-I00	6900	

Table 7: AP1000 display units - Weight

Link module type	Model number	Weight
SDL/DVI receiver	5DLSDL.1001-00	538
SDL3 receiver	5DLSD3.1001-00	527

Table 8: Link modules - Weight

2.2.3 Environmental characteristics

2.2.3.1 Temperature specifications

Various panels can be combined with various link modules. The many different configurations possible result in varying maximum ambient temperatures, which can be seen in the following table in this section.

Information:

The maximum specified ambient temperatures for operation were determined under worst-case conditions. Experience has shown that higher ambient temperatures can be reached in typical applications, e.g. those in Microsoft Windows. Testing and evaluation must be performed on-site by the user (temperatures can be read in BIOS or using the B&R Control Center, for example).

Information regarding worst-case conditions

- BurnInTest tool (BurnInTest V4.0 Pro from Passmark Software) for simulating a 100% load on the interface via loopback adapters (serial interface, USB interfaces)
- Maximum system expansion and power consumption

2.2.3.1.1 Maximum ambient temperature

All specifications are valid for non-condensing operation.

	All temperature values in degrees Celsius (°C) at 500 m above sea level. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).	Link module		
		SDL/DVI	SDL3	
		5DLSDL.1001-00	5DLSD3.1001-00	Location of sensor(s)
	Maximum ambient temperature	**60**	**60**	
	What else can also be operated at the max. ambient temperature, or are there any limits?			
Display units	5AP1120.0702-I00	✓	✓	Display - See Temperature sensor position
	5AP1125.1043-I00	✓	✓	
	5AP1125.1044-I00	✓	✓	
	5AP1125.1505-I00	✓	✓	

1) The maximum ambient temperature for the 5DLSD3.1001-00 SDL3 link module < Rev. A5 with the corresponding display unit is reduced by 5°C.

Table 9: Maximum ambient temperature during operation

2.2.3.1.2 Minimum ambient temperature during operation

All specifications are valid for non-condensing operation.

	All temperature values in degrees Celsius (°C) at 500 m above sea level. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).	Link module SDL/DVI 5DLSDL.1001-00	Link module SDL3 5DLSD3.1001-00	Location of sensor(s)
	Minimum ambient temperature	**0°C**	**0°C**	
	What else can also be operated at the min. ambient temperature, or are there any limits?			
Display units	5AP1120.0702-I00	✓	✓	Display - See Temperature sensor position
	5AP1125.1043-I00	✓	✓	
	5AP1125.1044-I00	✓	✓	
	5AP1125.1505-I00	✓	✓	

Table 10: Minimum ambient temperature during operation

2.2.3.1.3 How to determine the maximum ambient temperature

1. Select the link module.
2. The "Maximum ambient temperature" row shows the maximum ambient temperature for the complete system, including the respective link module.

> **Information:**
>
> **Maximum temperature data is for operation at 500 meters. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).**

3. The panel determines if there are temperature limits.

If "✓" is marked for the installed component, it can be used at the maximum ambient temperature of the complete system without problems.

If there is a specific temperature next to the component, for example "45", then the ambient temperature of the complete system is not permitted to exceed this temperature.

2.2.3.1.4 Ambient temperature during storage and transport

The following table provides an overview of the minimum and maximum ambient temperatures for storing and transporting the complete system. The use of individual components may result in limitations.

Display type	Model number	Storage	Transport
12.1" single-touch	5AP923.1215-00	-25 to 80°C	-25 to 80°C
15.0" single-touch	5AP923.1505-00	-25 to 80°C	-25 to 80°C
19.0" single-touch	5AP923.1906-00 ≤ D0	-20 to 60°C	-20 to 60°C
19.0" single-touch	5AP923.1906-00 ≥ E0	-25 to 70°C	-25 to 70°C
15.6" multi-touch	5AP933.156B-00 ≤ C0	-10 to 60°C	-10 to 60°C
15.6" multi-touch	5AP933.156B-00 ≥ D0	-25 to 70°C	-25 to 70°C
18.5" multi-touch	5AP933.185B-00 ≤ C0	-10 to 60°C	-10 to 60°C
18.5" multi-touch	5AP933.185B-00 ≥ D0	-20 to 60°C	-20 to 60°C
21.5" multi-touch	5AP933.215C-00 ≤ C0	-10 to 60°C	-10 to 60°C
21.5" multi-touch	5AP933.215C-00 ≥ D0	-20 to 60°C	-20 to 60°C
24.0" multi-touch	5AP933.240C-00 ≤ C0	-10 to 60°C	-10 to 60°C
24.0" multi-touch	5AP933.240C-00 ≥ D0	-30 to 70°C	-30 to 70°C

Table 11: AP9x3 panels - Ambient temperature during storage and transport

Link module	Model number	Storage	Transport
SDL/DVI receiver	5DLSDL.1001-00	-20 to 60°C	-20 to 60°C
SDL3 receiver	5DLSD3.1001-00	-20 to 60°C	-20 to 60°C

Table 12: Link modules - Ambient temperature during storage and transport

2.2.3.1.5 Temperature monitoring

A sensor in the display monitors the temperature of the AP1000 display unit. The location of the temperature sensor is illustrated in 2.2.3.1.6 "Temperature sensor locations" on page 24. The values listed in 2.2.3.1.6 "Temperature sensor locations" on page 24represent the defined maximum temperature for this measurement point. An alarm is not triggered if this temperature is exceeded. These temperatures can be read in BIOS or approved Microsoft Windows operating systems using the B&R Control Center.

2.2.3.1.6 Temperature sensor locations

These temperatures[1)] can be read in BIOS or Microsoft Windows operating systems using the B&R Control Center[2)].

For applications that do not run in Windows, temperatures can be evaluated using the B&R implementation guide. In addition to the implementation guide, there are also programs available in MS-DOS.

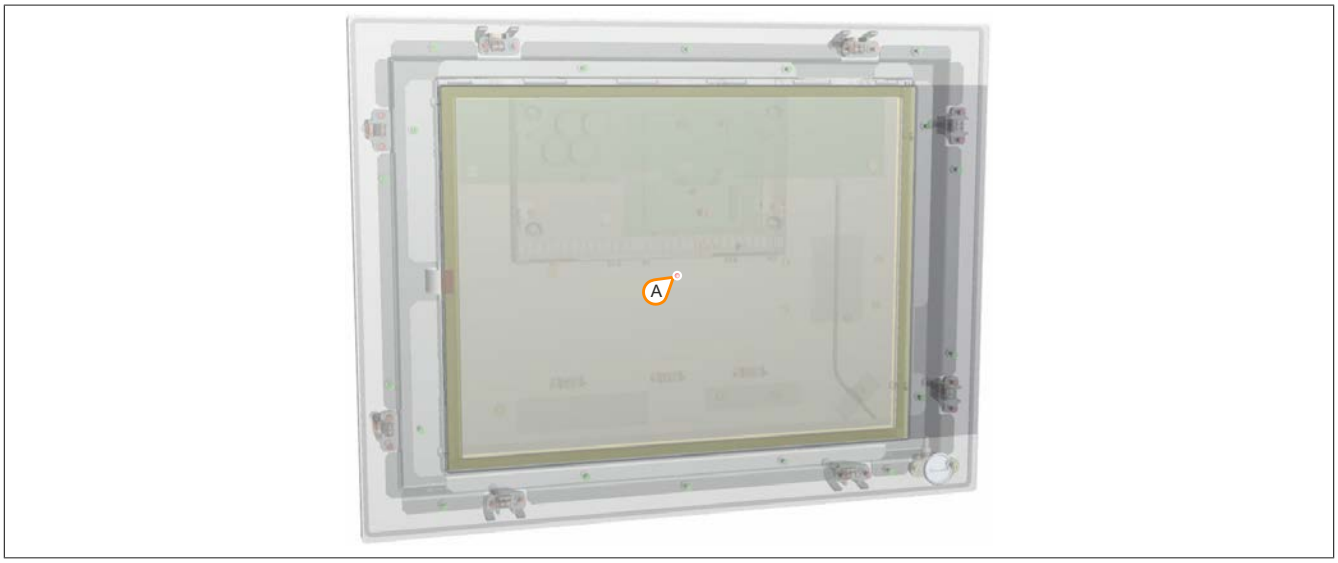


Figure 3: Automation Panel 1000 - Temperature sensor position

ADI sensors	Position	Measurement point for	Measurement	Max. specified
Panel	A	Display	Temperature of the display (sensor integrated in display unit)	5AP1120.0702-I00: 85°C 5AP1125.1043-I00: 90°C 5AP1125.1044-I00: 90°C 5AP1125.1505-I00: 90°C

Table 13: Temperature sensor position

1) The temperature measured approximates the immediate ambient temperature but may also be influenced by neighboring components.
2) The ADI driver that includes the B&R Control Center is available in the Downloads section of the B&R website (www.br-automation.com).

2.2.3.2 Humidity

The following table lists the minimum and maximum relative humidity values for the individual components that are relevant for the humidity limitations of a complete system. The lowest and highest common values are always used when establishing these limits.

Display type	Model number	Operation	Storage/Transport	
7.0" single-touch	5AP1120.0702-I00	20 to 90%	10 to 90%	
10.4" single-touch	5AP1125.1043-I00	5 to 90%	5 to 90%	
10.4" single-touch	5AP1125.1044-I00	5 to 90%	5 to 90%	
15.0" single-touch	5AP1125.1505-I00	8 to 90%	8 to 90%	

Table 14: AP1000 display units - Humidity

Link module type	Model number	Operation	Storage	Transport
SDL/DVI receiver	5DLSDL.1001-00	5 to 90%	5 to 95%	5 to 95%
SDL3 receiver	5DLSD3.1001-00	5 to 90%	5 to 95%	5 to 95%

Table 15: Link modules - Humidity

The specifications listed correspond to the relative humidity at an ambient temperature of 30°C. For more detailed information about specific temperature-dependent humidity values, see the technical data for the individual components.

2.2.3.3 Vibration

The following table provides an overview of the maximum vibration specifications of the complete system. The use of individual components may result in limitations.

	Operation[1)]		Storage[1)2)]	Transport[1)2)]
	Continuous	Periodic		
Automation Panel 1000	2 to 9 Hz: 1.75 mm amplitude 9 to 200 Hz: 0.5 g	2 to 9 Hz: 3.5 mm amplitude 9 to 200 Hz: 1 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g

Table 16: Vibration

1) Testing is performed in accordance with EN 60068-2-6.
2) This value applies to a device in its original packaging.

2.2.3.4 Shock

The following table provides an overview of the maximum shock specifications of the complete system. The use of individual components may result in limitations.

	Operation[1)]	Storage[1)2)]	Transport[1)2)]
Automation Panel 1000	15 g, 11 ms	30 g, 6 ms	30 g, 6 ms

Table 17: Shock

1) Testing is performed in accordance with EN 60068-2-27.
2) This value applies to a device in its original packaging.

2.2.3.5 Protection

In accordance with EN 60529, the Automation Panel 1000 has IP69K protection on the front and IP20 protection on the back under the following conditions:

- Correct installation of the Automation Panel 1000
- All covers and components are installed on the interfaces and slots.
- All environmental conditions are observed.

2.2.4 Electrical characteristics

2.2.4.1 +24 VDC power supply

> **Danger!**
>
> **This device is only permitted to by supplied by a SELV / PELV power supply or with safety extra-low voltage (SELV) in accordance with EN 60950.**

The 3-pin male connector required for connecting the power supply is not included in delivery. It can be ordered from B&R using model number 0TB103.9 (screw clamp terminal block) or 0TB103.91 (cage clamp terminal block).

The pinout is listed in the following table. The supply voltage is protected internally by a soldered fuse (10 A, fast-acting) to prevent damage to the device in the event of an overload (fuse replacement necessary) or if the voltage supply is connected incorrectly (reverse polarity protection -> fuse replacement not necessary). The device must be returned to B&R for repairs if the fuse is blown in the event of error.

+24 VDC power supply		
Protected against reverse polarity		3-pin male power supply connector +24 VDC power supply 
Pin	**Description**	
1	+	
2	Functional ground	
3	-	
Model number	**Short description**	
	Terminal blocks	
0TB103.9	Male connector 24 V 5.08 3-pin screw clamp terminal block	
0TB103.91	Male connector 24 V 5.08 3-pin cage clamp terminal block	

Table 18: +24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%, SELV[1)]
Nominal current	Max. 3 A
Overvoltage category in accordance with EN 61131-2	II
Electrical isolation	Yes
Uninterruptible power supply	No

1) EN 60950 requirements must be observed.

2.2.4.2 Power calculation

In order to calculate the total power of the Automation Panel, the power rating of the display being used (see "Link modules - Power calculation") must be added to the power rating of the link module being used.

Link module	Model number	Total power consumption of link module
SDL/DVI receiver	5DLSDL.1001-00	Max. 3.6 W without USB consumers Max. 8.6 W with USB consumers
SDL3 receiver	5DLSD3.1001-00	Max. 8.1 W without USB consumers Max. 13.1 W with USB consumers

Table 19: Link modules - Power calculation

Display type	Model number	+5 V	3V3	+12 V
7.0" single-touch	5AP1120.0702-I00	TBD	TBD	TBD
10.4" single-touch	5AP1125.1043-I00	TBD	TBD	TBD
10.4" single-touch	5AP1125.1044-I00	TBD	TBD	TBD
15.0" single-touch	5AP1125.1505-I00	TBD	TBD	TBD

Table 20: AP1000 display units - Power calculation

2.2.4.3 Block diagrams

The following block diagram shows the simplified structure of the 5DLSDL.1001-00 SDL/DVI receiver link module.

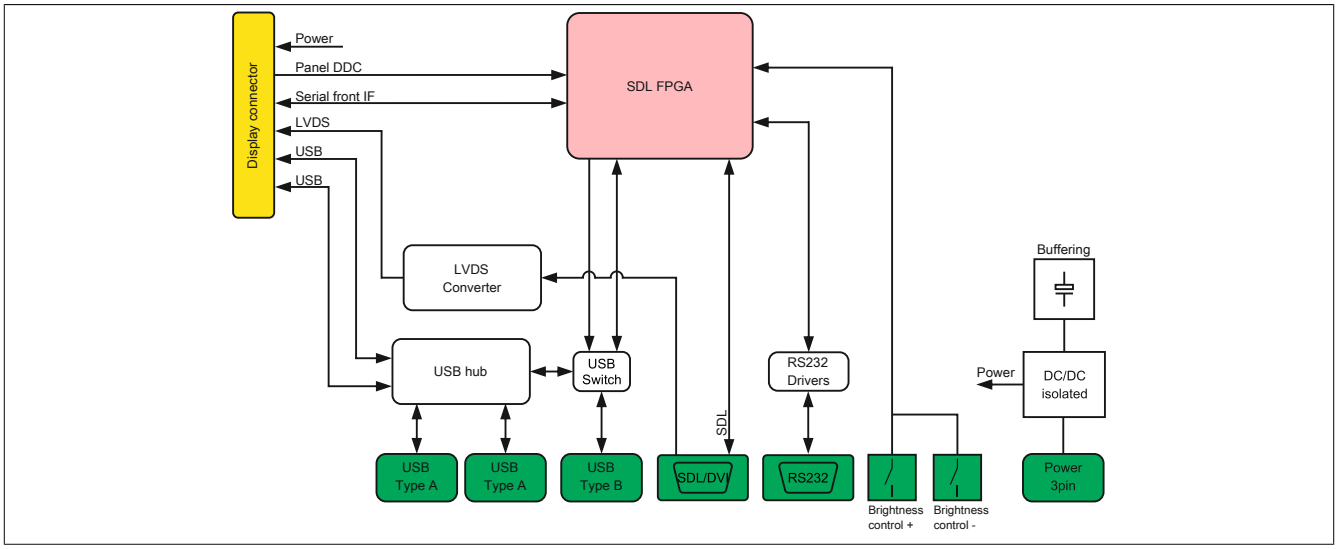


Figure 4: SDL/DVI receiver link module - Block diagram

The following block diagram shows the simplified structure of the 5DLSD3.1001-00 SDL3 receiver link module.

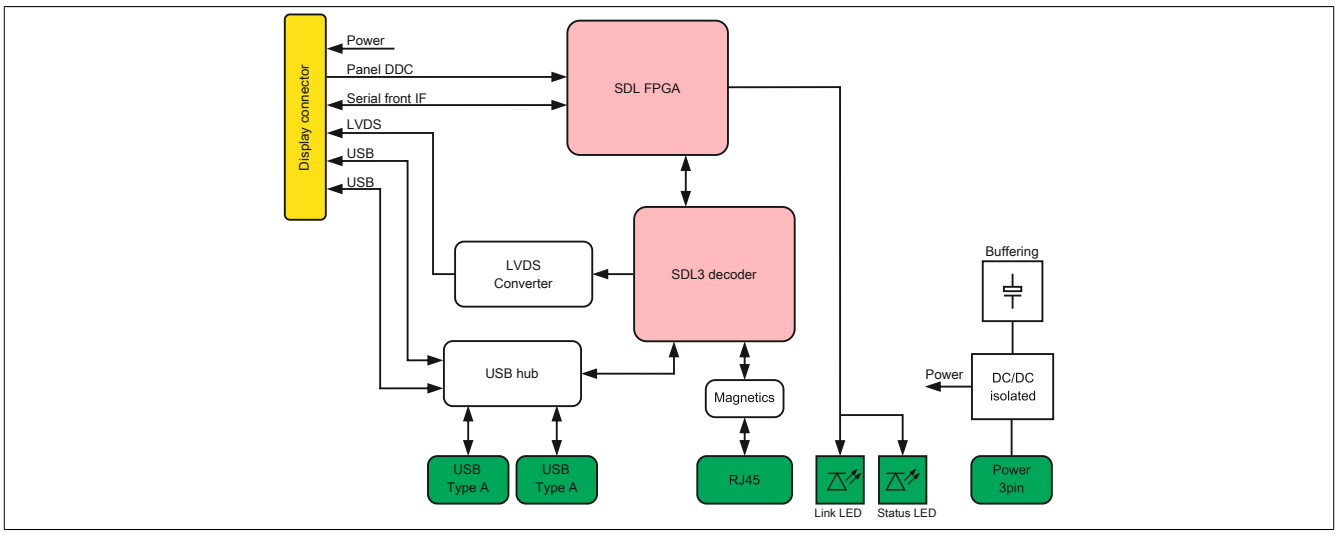


Figure 5: SDL3 receiver link module - Block diagram

2.2.5 SDL/DVI receiver - 5DLSDL.1001-00 device interfaces

2.2.5.1 Overview

SDL/DVI receiver interfaces are located on the back of the Automation Panel 1000.

Information about SDL/DVI mode can be found in sections "SDL mode" on page 14 and "DVI mode" on page 15.

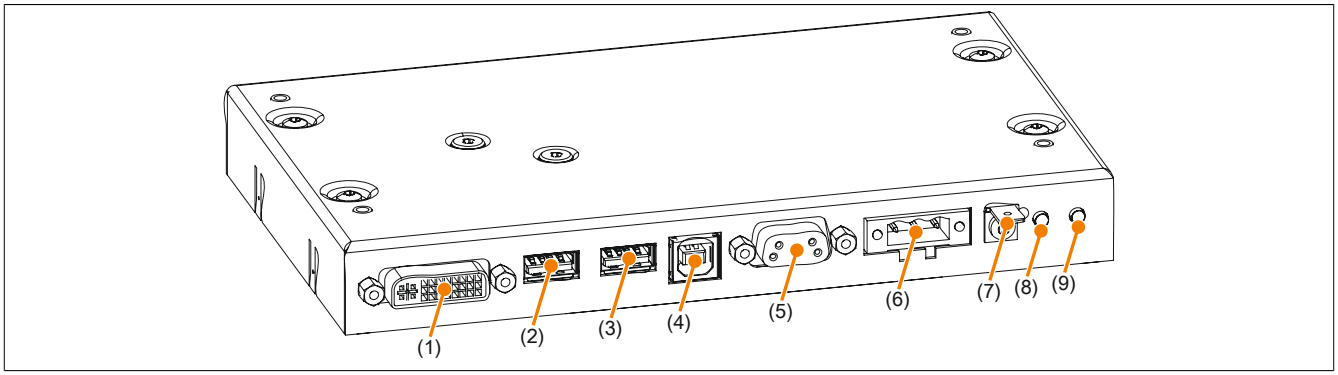


Figure 6: Overview of interfaces - SDL/DVI receiver link module

No.	Type of interface		No.	Type of interface	
1	Panel In SDL/DVI	"Panel In interface"	6	24 VDC power	"+24 VDC power supply"
2	USB1	"USB interfaces"	7	Grounding	"Grounding"
3	USB2	"USB interfaces"	8	Brightness (DVI) +	"Brightness controls"
4	USB In	"USB In interface"	9	Brightness (DVI) -	"Brightness controls"
5	COM	"COM serial interface"			

2.2.5.2 +24 VDC power supply

Danger!

This device is only permitted to by supplied by a SELV / PELV power supply or with safety extra-low voltage (SELV) in accordance with EN 60950.

The 3-pin male connector required for connecting the power supply is not included in delivery. It can be ordered from B&R using model number 0TB103.9 (screw clamp terminal block) or 0TB103.91 (cage clamp terminal block).

The pinout is listed in the following table. The supply voltage is protected internally by a soldered fuse (10 A, fast-acting) to prevent damage to the device in the event of an overload (fuse replacement necessary) or if the voltage supply is connected incorrectly (reverse polarity protection -> fuse replacement not necessary). The device must be returned to B&R for repairs if the fuse is blown in the event of error.

+24 VDC power supply		3-pin male power supply connector +24 VDC power supply 
Protected against reverse polarity		
Pin	**Description**	
1	+	
2	Functional ground	
3	-	
Model number	**Short description**	
	Terminal blocks	
0TB103.9	Male connector 24 V 5.08 3-pin screw clamp terminal block	
0TB103.91	Male connector 24 V 5.08 3-pin cage clamp terminal block	

Table 21: +24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%, SELV[1)]
Nominal current	Max. 3 A
Overvoltage category in accordance with EN 61131-2	II
Electrical isolation	Yes
Uninterruptible power supply	No

1) EN 60950 requirements must be observed.

2.2.5.2.1 Grounding

Caution!

Functional ground (pin 2 of power supply and ground connection) must be kept as short as possible and connected to the largest possible wire cross section at the central grounding point (e.g. the control cabinet or system).

The ground connection is located next to the power supply for the link module.

Grounding

Figure 7: Ground connection

The ground connection must be used, for example, to fasten a copper strip to a central grounding point in the control cabinet or system where the device is installed. The largest possible conductor cross section should be used (at least 2.5 mm²).

2.2.5.3 Panel In interface

The Panel In interface can be used for SDL or DVI transfer. For more information, see "SDL mode" on page 14 and "DVI mode" on page 15.

Panel In interface - SDL (Smart Display Link) / DVI	
The following overview lists the video signals available on the panel input. For additional details, see the technical data for the link module or panel being used.	

Link module	Video signals
5DLSDL.1001-00	SDL, DVI

Table 22: Panel In interface - SDL, DVI

Information:

The hardware and graphics drivers of approved operating systems support the hot plugging of display devices to the Panel In interface for service purposes. The panel connector is specified for max. 100 connection cycles.

Information:

If a display device with touch screen is connected to the Panel In interface and then disconnected again during operation (hot plugging), it may be necessary to recalibrate the touch screen.

2.2.5.3.1 Pinout

Pin	Assignment	Description	Pin	Assignment	Description
1	TMDS data 2-	DVI lane 2 (negative)	16	HPD	Hot plug detect
2	TMDS data 2+	DVI lane 2 (positive)	17	TMDS data 0-	DVI lane 0 (negative)
3	TMDS data 2/4 SHIELD	Shield for data pair 2 and 4	18	TMDS data 0+	DVI lane 0 (positive)
4	SDL-	SDL lane (negative)	19	TMDS Data 0/ XUSB1 SHIELD	Shield for data pair 0 and USB1
5	SDL+	SDL lane (positive)	20	XUSB1-	USB lane 1 (negative)
6	DDC clock	DDC-based control signal (clock)	21	XUSB1+	USB lane 1 (positive)
7	DDC data	DDC-based control signal (data)	22	TMDS clock shield	Shield for clock pair
8	N/C	Not connected	23	TMDS clock+	DVI clock (positive)
9	TMDS data 1-	DVI lane 1 (negative)	24	TMDS clock -	DVI clock (negative)
10	TMDS DATA 1+	DVI lane 1 (negative) HDMI clock (positive)	C1	N/C	Not connected
11	TMDS DATA 1/ XUSB0 SHIELD	Shield for data pair 1 and USB0	C2	N/C	Not connected
12	XUSB0-	USB lane 0 (negative)	C3	N/C	Not connected
13	XUSB0+	USB lane 0 (positive)	C4	N/C	Not connected
14	+5 V power	+5 V power supply	C5	N/C	Not connected
15	Ground (return for +5 V, HSync and VSync)	Ground			

DVI, 24-pin, female

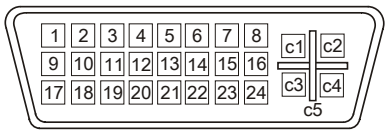


Table 23: DVI interface - Pinout

2.2.5.3.2 USB communication in SDL and DVI mode

Information:

The USB transfer rate is limited to USB 1.1 in SDL mode.

In DVI mode, the maximum USB transfer rate is determined by the USB interface and USB hub on the industrial PC.

2.2.5.3.3 Cable lengths and resolutions for SDL transmission

The following table lists the relationship between segment lengths and maximum resolution depending on the SDL cable being used:

SDL cable	Resolution						
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	HD 1366 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200	FHD 1920 x 1080
0.8	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00	5CASDL.0008-00
1.8	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03	5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03
5	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
10	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03	5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03
15	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03	- - -	- - 5CASDL.0150-03
20	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	5CASDL.0200-00 5CASDL.0200-03	- -	- 5CASDL.0200-03
25	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	5CASDL.0250-00 5CASDL.0250-03	- -	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	- 5CASDL.0300-13	- 5CASDL.0300-13	- 5CASDL.0300-13	- -	- 5CASDL.0300-13
40	5CASDL.0400-13	5CASDL.0400-13	5CASDL.0400-13	5CASDL.0400-13	5CASDL.0400-13	-	5CASDL.0400-13

Table 24: Cable lengths and resolutions for SDL transmission

2.2.5.3.4 Cable lengths and resolutions for DVI transmission

The following table lists the relationship between segment lengths and maximum resolution depending on the DVI cable being used:

DVI cable	Resolution						
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	HD 1366 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200	FHD 1920 x 1080
1.8	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00	5CADVI.0018-00
5	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00	5CADVI.0050-00

Table 25: Cable lengths and resolutions for DVI transmission

The maximum cable length for DVI transfer is limited to 5 m due to the USB specification.

2.2.5.4 USB interfaces

The link module is equipped with a USB 2.0 (Universal Serial Bus) host controller with multiple USB interfaces, 2 of which are accessible externally for the user.

Warning!

Peripheral USB devices can be connected to the USB interfaces on this device. Due to the large number of USB devices available on the market, B&R cannot guarantee their performance. All USB devices provided by B&R are guaranteed to function properly.

Caution!

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

USB1, USB2

The USB1 and USB2 interfaces are available for the user to connect USB devices.

Depending on the transfer method (SDL or DVI mode), the transfer rate of the USB1 and USB2 interfaces may be limited. Possible transfer methods are listed in section "Connection options" on page 13.

Transfer method	USB type	Max. cable length
SDL mode 1	USB 1.1	40 m
SDL mode 2	USB 2.0	5 m
DVI mode, single-touch	USB 2.0	5 m
DVI mode, multi-touch	USB 2.0	5 m

Universal Serial Bus (USB1, USB2)[1]		
Type	USB 2.0	2x USB type A, female
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current load[2] USB1, USB2	Total max. 1 A	
Cable length USB 2.0	Max. 5 m (without hub)	

Table 26: USB1/USB2 interface

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
2) Each USB interface is protected by a shared, maintenance-free "USB current-limiting circuit breaker" (total max. 1 A).

2.2.5.5 USB In interface

The USB In interface is a USB 2.0 type B interface that is used to transfer USB data. It must be connected to the USB interface on the output device (e.g. B&R Industrial PC) when using DVI mode or SDL operating mode 2 as the transfer method. Possible transfer methods are listed in section "Connection options" on page 13.

If the interface is connected to an output device (B&R Industrial PC), then USB 2.0 transfer rates are possible on the USB1 and USB2 interfaces.

USB In interface[1]		
Type	USB 2.0	1x USB type B, female
Design	Type B	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current-carrying capacity[2]	Max. 500 mA	
Cable length	Max. 5 m (without hub)	

Table 27: USB In interface

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
2) Each USB interface is protected by a maintenance-free "USB current-limiting circuit breaker" (max. 500 mA).

2.2.5.6 COM serial interface

The serial interface is only available for use with single-touch displays in DVI mode. It is used to transfer data from the resistive touch screen and must be connected to a serial interface on the output device.

COM serial interface[1]	
	RS232
Type	RS232, modem-capable, not electrically isolated
UART	16550-compatible, 16-byte FIFO
Transfer rate	Max. 115 kbit/s
Bus length	Max. 15 m
Pin	**Assignment**
1	N/C
2	RXD
3	TXD
4	N/C
5	GND
6	N/C
7	RTS
8	CTS
9	N/C

9-pin female DSUB connector

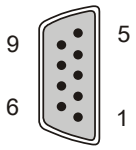


Table 28: COM - Pinout

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.

2.2.5.7 Brightness controls

The brightness controls can be used to configure the brightness of the backlight on the Automation Panel in DVI mode. These buttons have no effect in SDL mode; in this case, the brightness can be configured in the B&R Control Center, for example.

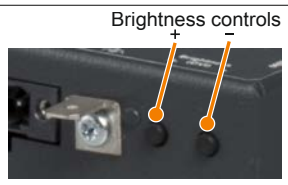


Figure 8: Brightness controls

2.2.6 5DLSD3.1001-00 SDL3 receiver - Device interfaces

2.2.6.1 Overview

SDL3 receiver interfaces are located on the back of the Automation Panel 1000.

Information about SDL3 mode can be found in section "SDL3 mode" on page 16.

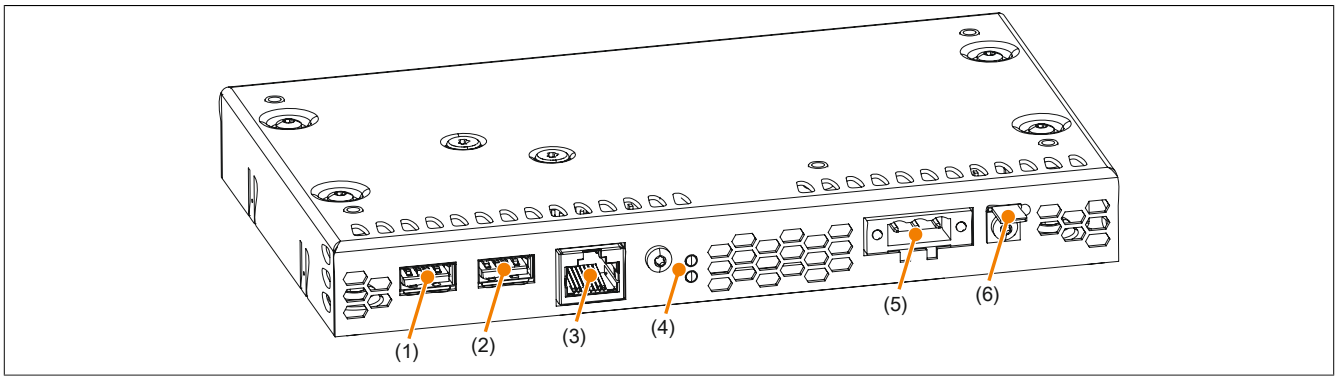


Figure 9: Overview of interfaces - SDL3 receiver link module

No.	Type of interface		No.	Type of interface	
1	USB1	"USB interfaces"	4	SDL3 In LEDs	"SDL3 In LEDs"
2	USB2	"USB interfaces"	5	24 VDC power	"+24 VDC power supply"
3	SDL3 In	"SDL3 In interface"	6	Grounding	"Grounding"

2.2.6.2 +24 VDC power supply

Danger!

This device is only permitted to by supplied by a SELV / PELV power supply or with safety extra-low voltage (SELV) in accordance with EN 60950.

The 3-pin male connector required for connecting the power supply is not included in delivery. It can be ordered from B&R using model number 0TB103.9 (screw clamp terminal block) or 0TB103.91 (cage clamp terminal block).

The pinout is listed in the following table. The supply voltage is protected internally by a soldered fuse (10 A, fast-acting) to prevent damage to the device in the event of an overload (fuse replacement necessary) or if the voltage supply is connected incorrectly (reverse polarity protection -> fuse replacement not necessary). The device must be returned to B&R for repairs if the fuse is blown in the event of error.

+24 VDC power supply		3-pin male power supply connector +24 VDC power supply 
Protected against reverse polarity		
Pin	**Description**	
1	+	
2	Functional ground	
3	-	
Model number	**Short description**	
	Terminal blocks	
0TB103.9	Male connector 24 V 5.08 3-pin screw clamp terminal block	
0TB103.91	Male connector 24 V 5.08 3-pin cage clamp terminal block	

Table 29: +24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%, SELV[1)]
Nominal current	Max. 3 A
Overvoltage category in accordance with EN 61131-2	II
Electrical isolation	Yes
Uninterruptible power supply	No

1) EN 60950 requirements must be observed.

2.2.6.3 Grounding

Caution!

Functional ground (pin 2 of power supply and ground connection) must be kept as short as possible and connected to the largest possible wire cross section at the central grounding point (e.g. the control cabinet or system).

The ground connection is located next to the power supply for the link module.

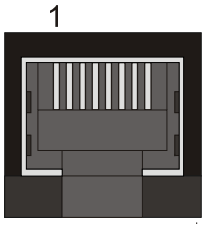
Grounding

Figure 10: Ground connection

The ground connection must be used, for example, to fasten a copper strip to a central grounding point in the control cabinet or system where the device is installed. The largest possible conductor cross section should be used (at least 2.5 mm²).

2.2.6.4 SDL3 In interface

The SDL3 In interface is a female RJ45 connector and operated with SDL3 transmission technology. For more information, see section "SDL3 mode" on page 16.

SDL3 In interface - SDL3	
The following overview lists the video signals available on the panel input. For additional details, see the technical data for the link module or panel being used.	Female RJ45 connector 

Link module	Video signals
5DLSD3.1001-00	SDL3

Table 30: SDL3 In interface

Information:

The hardware and graphics drivers of approved operating systems support the hot plugging of display devices to the SDL3 In interface for service purposes. The female RJ45 connector is specified for 500 connection cycles.

Information:

If a display device with touch screen is connected to the SDL3 In interface and then disconnected again during operation (hot plugging), it may be necessary to recalibrate the touch screen.

2.2.6.4.1 Cable lengths and resolutions for SDL3 transmission

The following table lists the relationship between segment lengths and maximum resolution depending on the SDL3 cable being used:

SDL3 cable	Resolution						
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	HD 1366 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200	FHD 1920 x 1080
3	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00	5CASD3.0030-00
5	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00	5CASD3.0050-00
10	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00
15	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00
20	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00
30	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00
50	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00
100	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00

Table 31: Cable lengths and resolutions for SDL3 transmission

2.2.6.5 SDL3 In LEDs

The SDL3 In LEDs are located next to the SDL3 In interface.

SDL3 In LEDs			
LED	**Color**	**Status**	**Function**
Link	Yellow	On	Indicates an active SDL3 connection
		Off	No active SDL3 connection
Status	Yellow	On	SDL3 connection established and OK
		Off	No active SDL3 connection
		Blinking	Indicates the SDL3 connection is OK, but a firmware image is corrupt

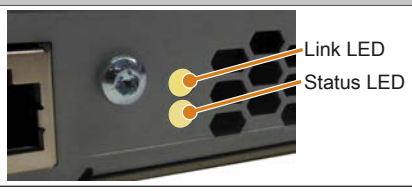


Table 32: SDL3 In LEDs

2.2.6.6 USB interfaces

The link module is equipped with a USB 2.0 (Universal Serial Bus) host controller with multiple USB interfaces, 2 of which are accessible externally for the user.

Warning!

Peripheral USB devices can be connected to the USB interfaces on this device. Due to the large number of USB devices available on the market, B&R cannot guarantee their performance. All USB devices provided by B&R are guaranteed to function properly.

Caution!

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

USB1, USB2

The USB1 and USB2 interfaces are available for the user to connect USB devices.

Universal Serial Bus (USB1, USB2)[1]		
Type	USB 2.0	2x USB type A, female
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (30 Mbit/s)	
Current load[2] USB1, USB2	Total max. 1 A	
Cable length USB 2.0	Max. 5 m (without hub)	

Table 33: USB1/USB2 interface

1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
2) Each USB interface is protected by a shared, maintenance-free "USB current-limiting circuit breaker" (total max. 1 A).

2.2.7 Layout of AP1000 display units

A wide selection of different display sizes and display units with touch screen and RFID read/write unit are available. The following table provides an overview of the display units and their features.

Display type	Model number	Touch screen	RFID read/ write unit	
7.0" single-touch	5AP1120.0702-I00	Single-touch	No	
10.4" single-touch	5AP1125.1043-I00	Single-touch	Yes	
10.4" single-touch	5AP1125.1044-I00	Single-touch	Yes	
15.0" single-touch	5AP1125.1505-I00	Single-touch	Yes	

2.2.7.1 RFID read/write unit

The RFID read/write unit is located on the front of the display unit and can be used to read MIFARE and ISO 15693 tags.

The following transponder tags can be used with this RFID read/write unit:

Model number	Short description
5A9010.43	Transponder tag, black housing, read/write, SLI, 1 kbit, 13.56 MHz
5A9010.44	Transponder tag, white housing, read/write, SLI, 1 kbit, 13.56 MHz
5A9010.45	Transponder tag, yellow housing, read/write, SLI, 1 kbit, 13.56 MHz
5A9010.46	Transponder tag, red housing, read/write, SLI, 1 kbit, 13.56 MHz
5A9010.47	Transponder tag, green housing, read/write, SLI, 1 kbit, 13.56 MHz
5A9010.48	Transponder tag, blue housing, read/write, SLI, 1 kbit, 13.56 MHz
5A9020.43	Transponder tag, black housing, MIFARE Classic, 1 kB, 13.56 MHz read/write
5A9020.44	Transponder tag, white housing, MIFARE Classic, 1 kB, 13.56 MHz read/write
5A9020.45	Transponder tag, yellow housing, MIFARE Classic, 1 kB, 13.56 MHz read/write
5A9020.46	Transponder tag, red housing, MIFARE Classic, 1 kB, 13.56 MHz read/write
5A9020.47	Transponder tag, green housing, MIFARE Classic, 1 kB, 13.56 MHz read/write
5A9020.48	Transponder tag, blue housing, MIFARE Classic, 1 kB, 13.56 MHz read/write

Information:

The tag must be help ca. 0.5 cm from the front of the device for the RFID read/write unit to function properly (ISO 15693 and ISO 14443). Placing flush may cause a temporary loss of communication.

Information:

For more information about the RFID read/write unit, please refer to the technical description for the 5E9020.29 device.

2.3 Individual components

2.3.1 Panels

2.3.1.1 5AP1120.0702-I00

2.3.1.1.1 General information

- AP923 electronics
- 7" color TFT display, WVGA
- Analog resistive touch screen (without dirt-collecting edges)
- Hygienic design
- IP69K stainless steel front

2.3.1.1.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.0702-I00	- Automation Panel 7.0" WVGA TFT - 800 x 480 pixels (16:10) - Single-touch (resistive), with fully integrated touch screen, without dirt-collecting edge - Non-rusting stainless steel front - Control cabinet installation - Landscape format - For PPC2100 / link modules - Compatible with 5PP520.0702-B00	

Table 34: 5AP1120.0702-I00 - Order data

2.3.1.1.3 Technical data

Model number	5AP1120.0702-I00
General information	
B&R ID code	0xE88F
Certification	
CE	Yes
Display	
Type	Color TFT
Display size	7.0"
Colors	16 million
Resolution	WVGA, 800 x 480 pixels
Contrast	600:1
Viewing angles	
Horizontal	Direction R = 70° / Direction L = 70°
Vertical	Direction U = 60° / Direction D = 60°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 80 to 500 cd/m²
Half-brightness time [1)]	50,000 h
Touch screen [2)]	
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
Suitable for hygienic applications	Yes
EN 60529 protection	Front: IP69K Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front [3)]	
Frame	Stainless steel 1.4301
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	Silicone rubber

Table 35: 5AP1120.0702-I00 - Technical data

Model number	5AP1120.0702-I00
Dimensions	
Width	217 mm
Height	161 mm
Weight	1,600 g

Table 35: 5AP1120.0702-I00 - Technical data

1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
2) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
3) There may be visible deviations in the color and surface appearance depending on the process or batch.

2.3.1.1.4 Dimensions

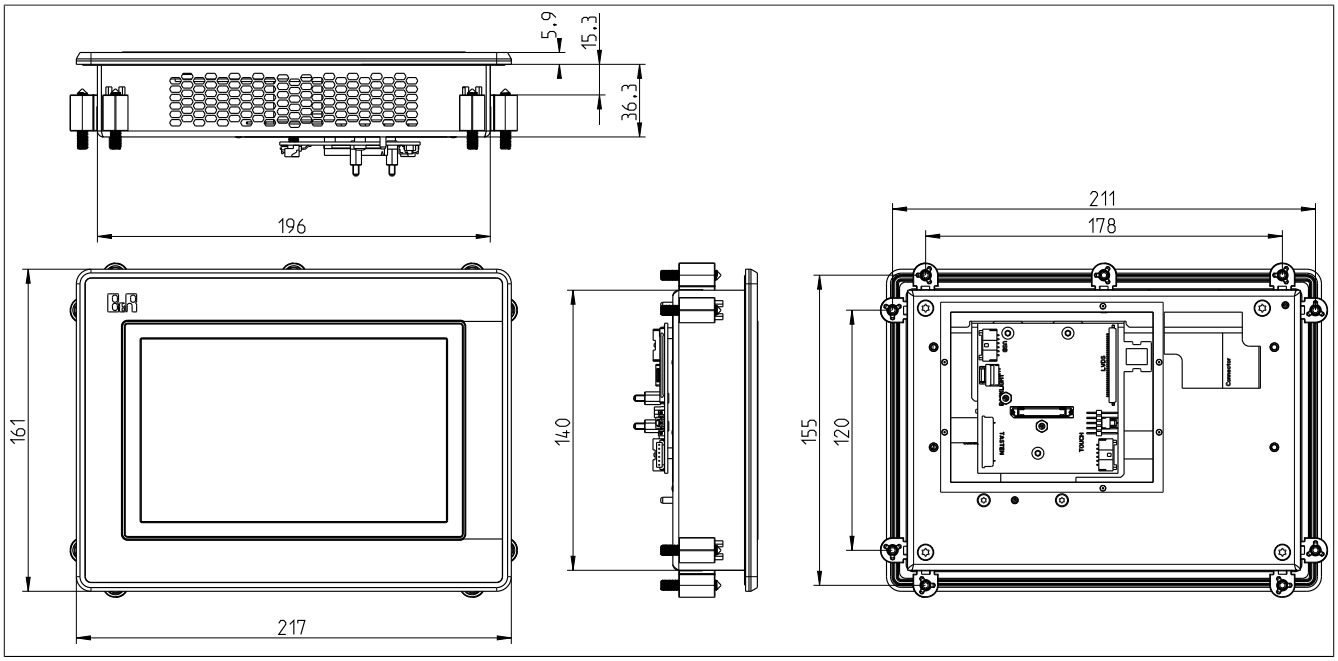


Figure 11: 5AP1120.0702-I00 - Dimensions

Information:

2D and 3D drawings (in DXF and STEP format) can be downloaded from the B&R website (www.br-automation.com).

2.3.1.2 5AP1125.1043-I00

2.3.1.2.1 General information

- AP923 electronics
- 10.4" color TFT display, VGA
- Analog resistive touch screen (without dirt-collecting edges)
- Hygienic design
- IP69K stainless steel front
- RFID read/write transponder unit

2.3.1.2.2 Order data

Model number	Short description	Figure
	Panels	
5AP1125.1043-I00	- Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive), with fully integrated touch screen, without dirt-collecting edge - Non-rusting stainless steel front - Control cabinet installation - Landscape format - 13.56 MHz read/write transponder unit - For PPC900 / PPC2100 / link modules - Compatible with 5PP520.1043-B00/5PP520.1043-B10	

Table 36: 5AP1125.1043-I00 - Order data

2.3.1.2.3 Technical data

Model number	5AP1125.1043-I00
General information	
B&R ID code	0xE890
Certification	
CE	Yes
Interfaces	
RFID read/write transponder unit	
Type	For I-Code SLI transponder, amplitude modulation and MIFARE Classic
Frequency	13.56 MHz
Read/Write range in air	Approx. 1 to 3 cm
Display	
Type	Color TFT
Display size	10.4"
Colors	16.2 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [1]	70,000 h
Touch screen [2]	
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
Suitable for hygienic applications	Yes
EN 60529 protection	Front: IP69K Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only

Table 37: 5AP1125.1043-I00 - Technical data

Model number	5AP1125.1043-I00
Mechanical characteristics	
Front [3]	
Frame	Stainless steel 1.4301
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	Silicone rubber
Dimensions	
Width	321 mm
Height	261 mm
Weight	4100 g

Table 37: 5AP1125.1043-I00 - Technical data

1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
2) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
3) There may be visible deviations in the color and surface appearance depending on the process or batch.

2.3.1.2.4 Dimensions

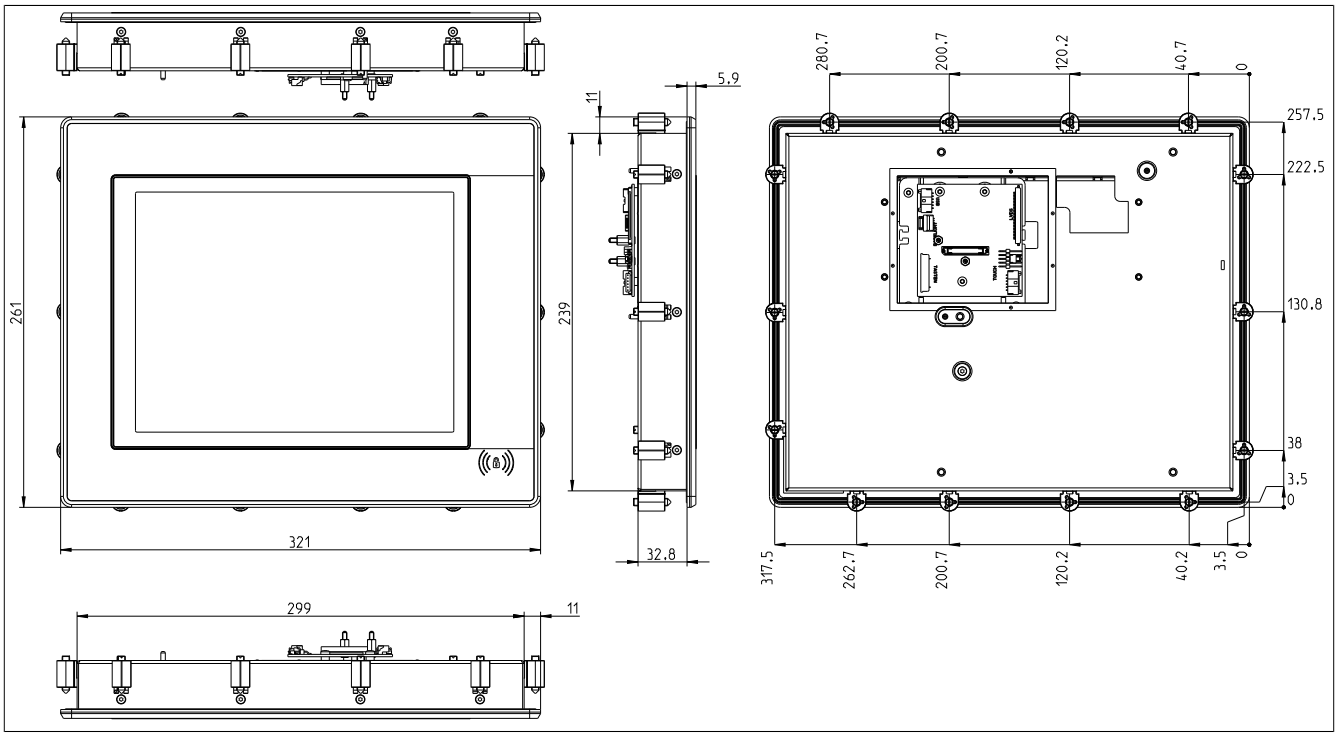


Figure 12: 5AP1125.1043-I00 - Dimensions

Information:

2D and 3D drawings (in DXF and STEP format) can be downloaded from the B&R website (www.br-automation.com).

2.3.1.3 5AP1125.1044-I00

2.3.1.3.1 General information

- AP923 electronics
- 10.4" color TFT display, SVGA
- Analog resistive touch screen (without dirt-collecting edges)
- Hygienic design
- IP69K stainless steel front
- RFID read/write transponder unit

2.3.1.3.2 Order data

Model number	Short description	Figure
	Panels	
5AP1125.1044-I00	- Automation Panel 10.4" SVGA TFT - 800 x 600 pixels (4:3) - Single-touch (analog resistive), with fully integrated touch screen, without dirt-collecting edge - Non-rusting stainless steel front - Control cabinet installation - Landscape format - 13.56 MHz read/write transponder unit - For PPC900 / PPC2100 / link modules - Compatible with 5PP520.1043-B00/5PP520.1043-B10	

Table 38: 5AP1125.1044-I00 - Order data

2.3.1.3.3 Technical data

Model number	5AP1125.1044-I00
General information	
B&R ID code	0xE891
Certification	
CE	Yes
Interfaces	
RFID read/write transponder unit	
Type	For I-Code SLI transponder, amplitude modulation and MIFARE Classic
Frequency	13.56 MHz
Read/Write range in air	Approx. 1 to 3 cm
Display	
Type	Color TFT
Display size	10.4"
Colors	16.2 million
Resolution	SVGA, 800 x 600 pixels
Contrast	800:1
Viewing angles	
Horizontal	Direction R / Direction L = 85°
Vertical	Direction U / Direction D = 85°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [1)]	50,000 h
Touch screen [2)]	
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
Suitable for hygienic applications	Yes
EN 60529 protection	Front: IP69K Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only

Table 39: 5AP1125.1044-I00 - Technical data

Model number	5AP1125.1044-I00
Mechanical characteristics	
Front [3]	
Frame	Stainless steel 1.4301
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	Silicone rubber
Dimensions	
Width	321 mm
Height	261 mm
Weight	4300 g

Table 39: 5AP1125.1044-I00 - Technical data

1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
2) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
3) There may be visible deviations in the color and surface appearance depending on the process or batch.

2.3.1.3.4 Dimensions

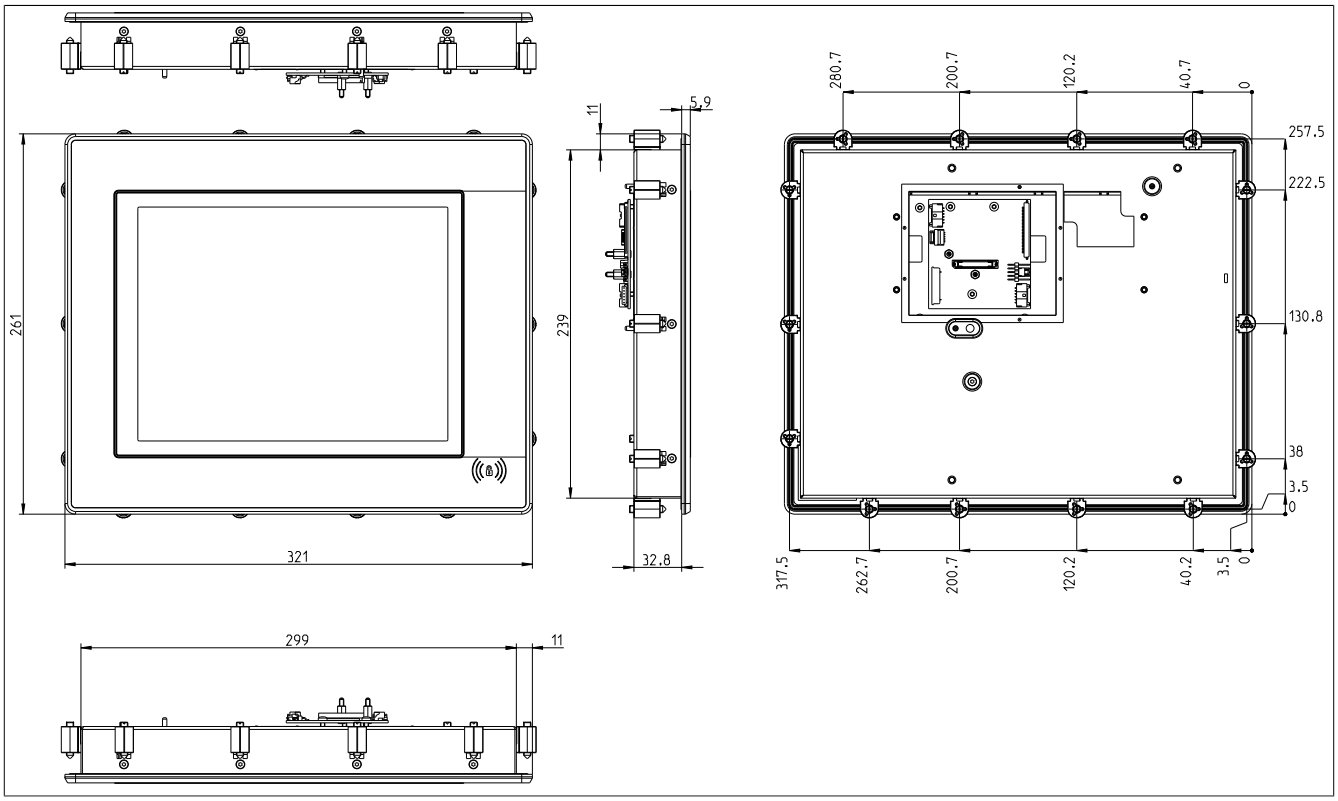


Figure 13: 5AP1125.1044-I00 - Dimensions

Information:

2D and 3D drawings (in DXF and STEP format) can be downloaded from the B&R website (www.br-automation.com).

2.3.1.4 5AP1125.1505-I00

2.3.1.4.1 General information

- AP923 electronics
- 15.5" color TFT display, XGA
- Analog resistive touch screen (without dirt-collecting edges)
- Hygienic design
- IP69K stainless steel front
- RFID read/write transponder unit

2.3.1.4.2 Order data

Model number	Short description	Figure
	Panels	
5AP1125.1505-I00	- Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive), with fully integrated touch screen, without dirt-collecting edge - Non-rusting stainless steel front - Control cabinet installation - Landscape format - 13.56 MHz read/write transponder unit - For PPC900 / PPC2100 / link modules - Compatible with 5PP520.1505-B00/5PP520.1505-B10	

Table 40: 5AP1125.1505-I00 - Order data

2.3.1.4.3 Technical data

Model number	5AP1125.1505-I00
General information	
B&R ID code	0xE892
Certification	
CE	Yes
Interfaces	
RFID read/write transponder unit	
Type	For I-Code SLI transponder, amplitude modulation and MIFARE Classic
Frequency	13.56 MHz
Read/Write range in air	Approx. 1 to 3 cm
Display	
Type	Color TFT
Display size	15.0"
Colors	16.2 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 70° / Direction D = 70°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 20 to 400 cd/m²
Half-brightness time [1]	50,000 h
Touch screen [2]	
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ±3%
Operating conditions	
EN 60529 protection	Front: IP69K Back: IP20 (only with installed link module or installed system unit)
UL 50 protection	Front: Type 4X indoor use only
Mechanical characteristics	
Front [3]	
Frame	Stainless steel 1.4301
Panel overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	Silicone rubber

Table 41: 5AP1125.1505-I00 - Technical data

Model number	5AP1125.1505-I00
Dimensions	
Width	433 mm
Height	331 mm
Weight	6,900 g

Table 41: 5AP1125.1505-I00 - Technical data

1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
2) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
3) There may be visible deviations in the color and surface appearance depending on the process or batch.

2.3.1.4.4 Dimensions

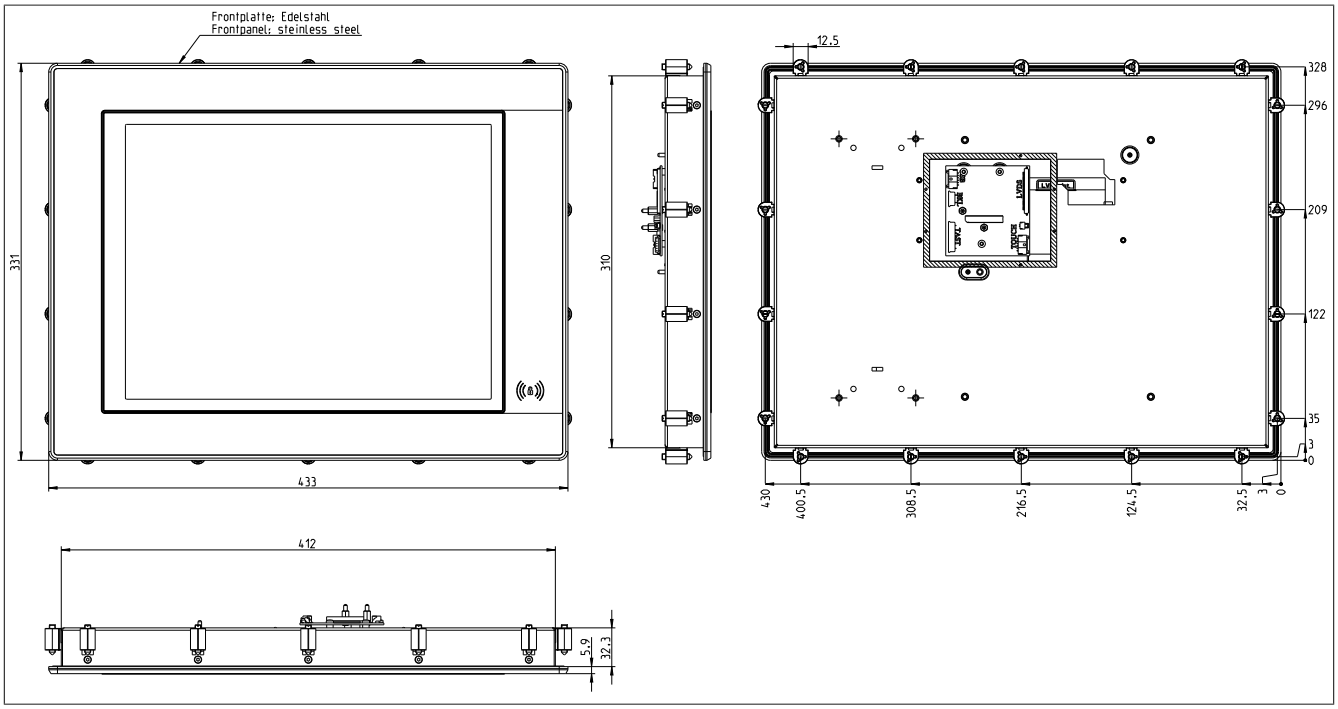


Figure 14: 5AP1125.1505-I00 - Dimensions

Information:

2D and 3D drawings (in DXF and STEP format) can be downloaded from the B&R website (www.br-automation.com).

2.3.2 Link modules

2.3.2.1 5DLSDL.1001-00

2.3.2.1.1 General information

- Link module for Automation Panel 9x3/1000/5000
- 1x SDL/DVI Panel In interface
- 2x USB 2.0 type A
- 1x USB In (USB type B)
- 1x RS232 interface
- Display brightness buttons

2.3.2.1.2 Order data

Model number	Short description	Figure
	Link modules	
5DLSDL.1001-00	Automation Panel link module - SDL/DVI receiver - For Automation Panel 923/933/1000 - For Automation Panel 5000	
	Required accessories	
	Accessories	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	

Table 42: 5DLSDL.1001-00 - Order data

2.3.2.1.3 Technical data

Information:

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

Model number	5DLSDL.1001-00
General information	
B&R ID code	0xE1A4
Brightness buttons	Yes [1]
Certification	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[2]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)
GOST-R	Yes
Interfaces	
COM	
Type	RS232, modem-capable, not electrically isolated
Design	9-pin female DSUB connector
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s
USB	
Quantity	3 (2x Type A; 1x Type B)
Type	USB 2.0 [3]
Design	2x type A 1x type B
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current-carrying capacity	Total max. 1 A [4]
Panel In	
Design	DVI-D
Type	SDL/DVI
Electrical characteristics	
Nominal voltage	24 VDC ±25%, SELV [5]

Table 43: 5DLSDL.1001-00 - Technical data

Model number	5DLSDL.1001-00
Nominal current	Max. 3 A
Overvoltage category per EN 61131-2	II
Electrical isolation	Yes
Operating conditions	
EN 61131 pollution degree	Pollution degree 2
Mechanical characteristics	
Dimensions	
Width	190 mm
Height	110 mm
Depth	23.6 mm
Weight	538 g

Table 43: 5DLSDL.1001-00 - Technical data

1) The brightness controls can be used to configure the brightness of the backlight on the Automation Panel in DVI mode.
2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
3) In "SDL mode 1", USB 1.1 transfer rates are the highest possible.
4) For the 2 USB type A female connectors.
5) EN 60950 requirements must be observed; see section "+24 VDC power supply" in the user's manual.

2.3.2.2 5DLSD3.1001-00

2.3.2.2.1 General information

- Link module for Automation Panel 9x3/1000/5000
- 1x SDL3 Panel In interface
- 2x USB 2.0 type A

2.3.2.2.2 Order data

Model number	Short description	Figure
	Link modules	
5DLSD3.1001-00	Automation Panel link module - SDL3 receiver - For Automation Panel 923/933/1000 - For Automation Panel 5000	
	Required accessories	
	Accessories	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	
	Optional accessories	
	SDL3 cables	
5CASD3.0030-00	SDL3 cable - 3 m	
5CASD3.0050-00	SDL3 cable - 5 m	
5CASD3.0100-00	SDL3 cable - 10 m	
5CASD3.0150-00	SDL3 cable - 15 m	
5CASD3.0200-00	SDL3 cable - 20 m	
5CASD3.0300-00	SDL3 cable - 30 m	
5CASD3.0500-00	SDL3 cable - 50 m	
5CASD3.1000-00	SDL3 cable - 100 m	

Table 44: 5DLSD3.1001-00 - Order data

2.3.2.2.3 Technical data

Information:

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

Model number	5DLSD3.1001-00
General information	
LED status indicators	Status, Link
B&R ID code	0xE3FC
Certification	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	2
Type	USB 2.0
Design	2x type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (30 Mbit/s)
Current-carrying capacity	Total max. 1 A
SDL3 In	
Design	Shielded RJ45
Type	SDL3
Electrical characteristics	
Nominal voltage	24 VDC ±25%, SELV [2)]
Nominal current	Max. 3 A
Overvoltage category per EN 61131-2	II
Electrical isolation	Yes
Operating conditions	
EN 61131 pollution degree	Pollution degree 2

Table 45: 5DLSD3.1001-00 - Technical data

Model number	5DLSD3.1001-00
Mechanical characteristics	
Dimensions	
Width	190 mm
Height	110 mm
Depth	23.6 mm
Weight	527 g

Table 45: 5DLSD3.1001-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) EN 60950 requirements must be observed, see section "+24 VDC power supply" in the user's manual.

3 Commissioning

3.1 Installation

Danger!

- **All supplied power must be disconnected before removing device covers or components or installing/removing accessories, hardware or cables.**
- **The power cable must be disconnected from the device and from the voltage supply.**
- **All covers, components, accessories, hardware and cables must be installed or connected before the device can be connected to the power supply and turned on.**

3.1.1 Important information concerning installation/commissioning

- Checking the delivery
  - When receiving the delivery, check the packaging for any visible transport damage.
  - Any visible transport damage must be documented and reported immediately, or the damage must be confirmed by the shipping/delivery company.
  - Keep the original packaging in the event that goods must be reshipped.

    #### Information:

    If a device is transported or stored without packaging, it is unprotected against all environmental factors such as impacts, vibration, pressure, humidity, etc. Damaged packaging indicates that environmental conditions have already heavily affected and possibly damaged the device.

    This can result in malfunctions on the device, machine or manufacturing system.
  - Check the packaging contents and any ordered accessories for completeness and damage.
  - If the packaging contents are incomplete, damaged or do not match your order, your local sales office or B&R headquarters must be informed immediately.

    #### Danger!

    A damaged device will operate unpredictably. The unintentional installation or operation of a damaged device must be prevented. The damaged device must be marked as such, removed from the productive environment and sent immediately for repairs.
- The environmental conditions must be observed, see see "Environmental characteristics".

  #### Caution!

  Before the device is put into operation, it must first be acclimated to room temperature! Subjecting it to thermal radiation is not permitted. If transported at low temperatures or if there are large temperature fluctuations, the device is not permitted to be subjected to any type of moisture. Moisture can cause short circuits in the electrical circuits and damages the device.
- The permissible mounting orientation must be observed when installing the device, see see "Mounting orientations".

> **Caution!**
>
> **When installed at an angle, the convection of air through the device is reduced, which decreases the maximum permissible ambient temperature for operation. If sufficient external cooling is present when the device is installed at an angle, the limit of the maximum permissible ambient temperature must be checked in each case. Otherwise, the device can become damaged and the certifications and warranty for the device nullified.**

- This device is only certified for operation in enclosed rooms.
- This device is not permitted to be subjected to direct sunlight.
- Ventilation holes are not permitted to be covered.
- When installed in an enclosed housing, sufficient space for air circulation must be present, see 2.2.2.2 "Spacing for air circulation".

> **Information:**
>
> **If additional space is needed to operate or service the device, this must be taken into account during installation.**

- The device must be installed on a flat, clean and burr-free surface. The IP ratings of the device are only ensured if the following requirements for the surface / installation cutout are met:
  - Permissible deviation from the evenness on the installation cutout: ≤0.5 mm.
  - Permissible surface roughness in the area of the mounting seal: ≤120 µm (Rz 120).
- It is important to ensure that the wall or control cabinet can withstand four times the total weight of the device. If necessary, the interior of the installation cutout must be reinforced in order to strengthen the installation surface. The IP ratings of the device are only ensured if the following requirements for the installation surface / installation cutout are met:
  - Material thickness of installation cutout: min. 2 mm

> **Caution!**
>
> **In the event of insufficient load-carrying capacity of the installation surface, inadequate mounting or improper mounting materials, the device may fall and become damaged.**

- The device is not permitted to be positioned next to other heat sources that could cause overheating.
- When connecting cables (DVI, SDL, USB, etc.), the bend radius must be taken into account.
- The device must be installed in a position that minimizes glare on the screen.
- The device must be installed such that viewing is optimized for the user.
- Loss of seal

> **Caution!**
>
> - **The gasket must be inspected before initial installation, subsequent installation as well as at regular intervals appropriate to the requirements of the operating environment.**
> - **Replace the entire device if inspection reveals visible scratches, cracks, collected dirt or excessive wear.**
> - **Do not unnecessarily stretch the gasket.**
> - **Avoid contact between the gasket and the corners and edges of the frame.**
> - **It is important to ensure that the gasket is completely inserted into the installation notch.**
> - **The housing components must be fastened using the specified tightening torque.**
>
> **Failure to follow these instructions can result in damage to property.**

3.1.2 Mounting an Automation Panel 1000 with retaining clips

The Automation Panel 1000 is mounted in the cutout using retaining clips. The number of retaining clips depends on the display unit.

The following Automation Panel 1000 systems are mounted using retaining clips:

- 5AP1120.0702-I00
- 5AP1125.1043-I00
- 5AP1125.1044-I00
- 5AP1125.1505-I00

The thickness of the wall or cabinet plate must be between 2 mm and 6 mm.

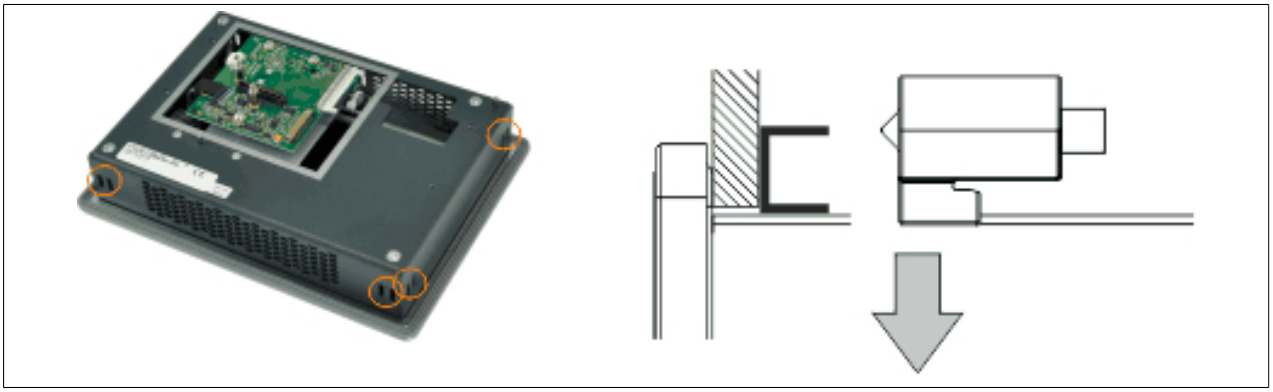
A large flat-blade screwdriver is needed to tighten and loosen the screws. The maximum tightening torque for the retaining clips is 0.5 Nm.

Devices must be installed on a flat, clean and burr-free surface; uneven areas can cause damage to the display when the screws are tightened or the intrusion of dust and water.

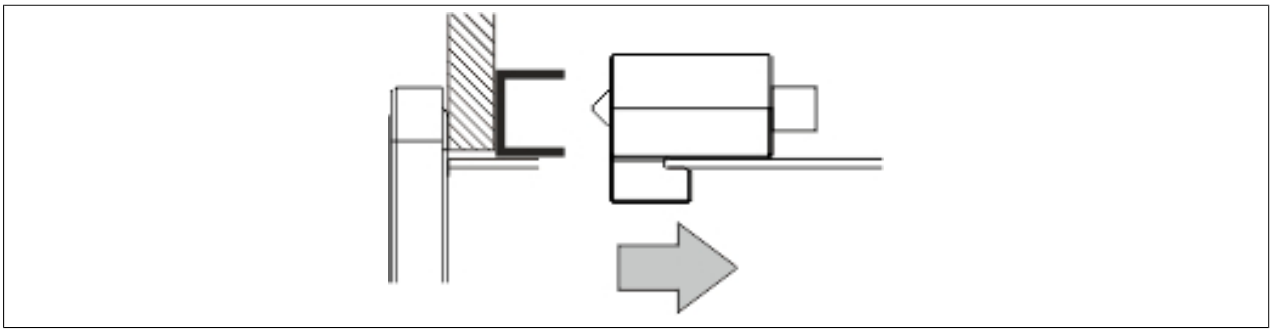
Procedure

1. Insert the device into the front side of the smooth, flat installation cutout. The dimensions for the cutout can be found in the individual Panels.
2. Place the pressure frame (included in delivery) on the B&R device.

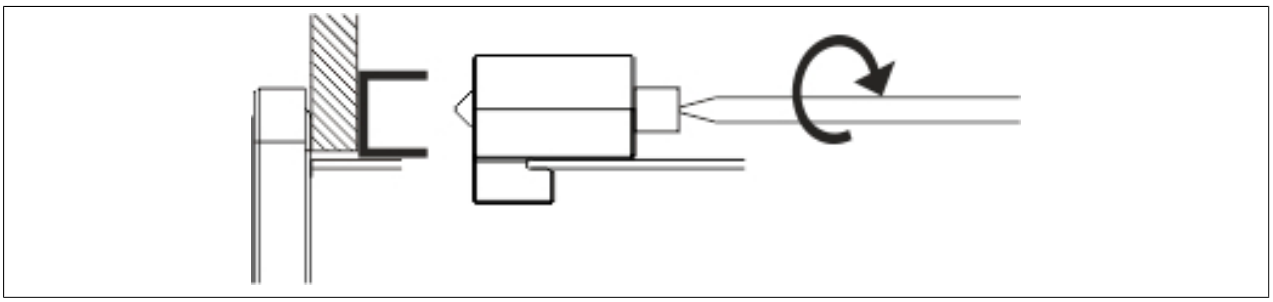
3. Install the retaining clips on the device. This is done by inserting the clips into the openings on the sides of the device (indicated by the orange circles). The number of retaining clips may vary depending on the display unit. The exact number can be found in the individual Panels.



4. Slide the retaining clips all the way to the back of the openings.



5. Now fasten the retaining clips to the wall or control cabinet by tightening the screws with a flat-blade screwdriver. The tightening torque should be approximately 0.5 Nm.



Information:

The retaining clips are designed to clamp material thicknesses up to 6 mm, but mounting using a retaining frame is specified for material thicknesses up to 3 mm.

3.1.3 Replacing link modules

1. Disconnect the power supply to the Automation Panel (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Discharge any electrostatic charge on the ground connection.
3. Remove the Automation Panel from the control cabinet by following the installation steps in reverse order.
4. Place the Automation Panel on a clean, flat surface.
5. Remove the Torx screws (T10) indicated in the following image.

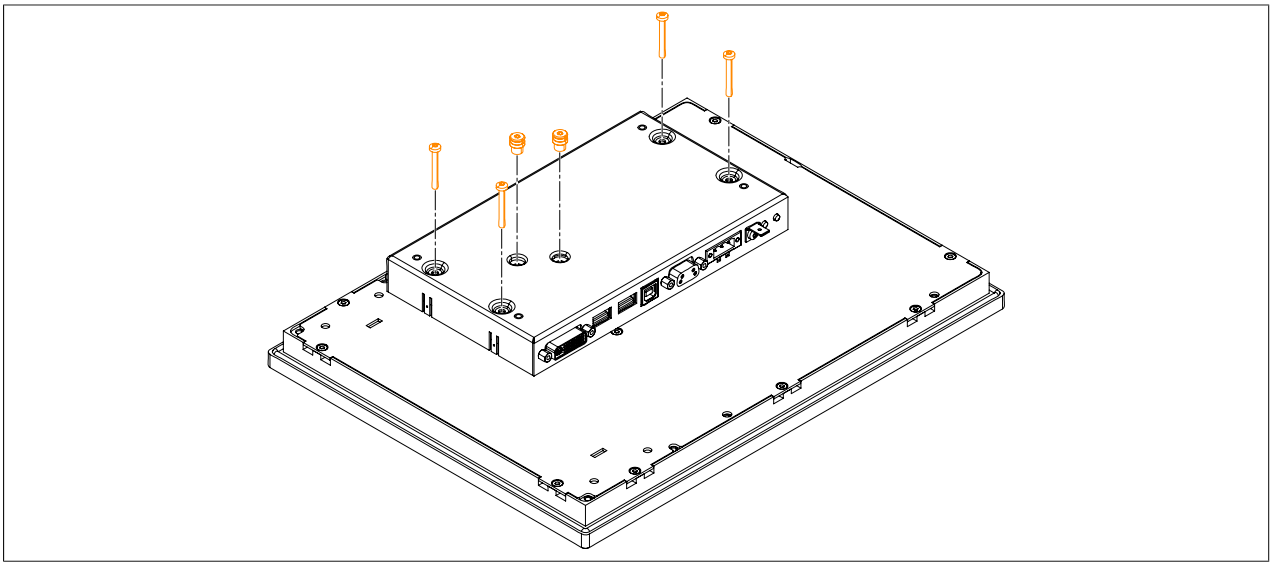


Figure 15: Removing the Torx screws

6. The link module can now be removed by pulling it straight up.

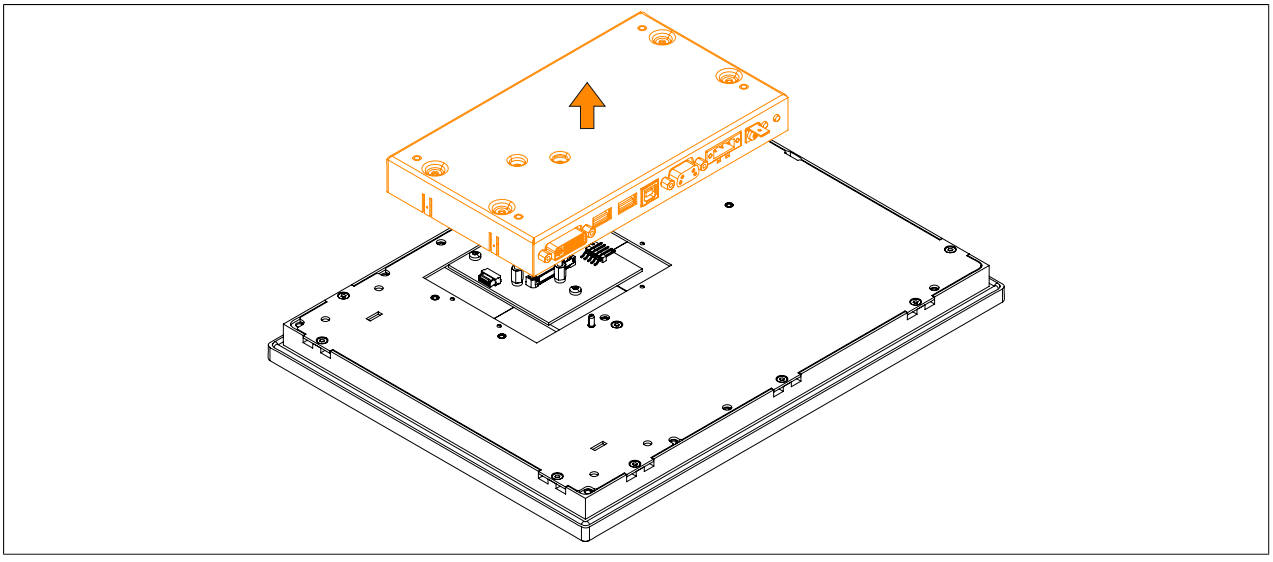


Figure 16: Removing the link module

7. The link module can now be replaced by following these steps in reverse order. The maximum tightening torque of the Torx screws (T10) is 0.5 Nm.

3.2 Connecting to the power grid

Danger!

- **All supplied power must be disconnected before removing device covers or components or installing/removing accessories, hardware or cables.**
- **The power cable must be disconnected from the device and from the voltage supply.**
- **All covers, components, accessories, hardware and cables must be installed or connected before the device can be connected to the power supply and turned on.**

3.2.1 Installing the DC power cable

Danger!

All supplied power to the B&R industrial PC must be completely disconnected. Before connecting the DC power cable, it is important to make absolutely sure that it has been disconnected from the power source (e.g. power supply).

3.2.1.1 Wiring

The DC power cable must be secured in the terminal block (power connector) as shown in the image. Wires with a cross section of 0.75 mm² to 1.5 mm² and wire end sleeves must be used.

Installing the 0TB103.9 screw clamp terminal block

Insert the wires with the wire end sleeves into the terminal contacts ② as shown in the image and tighten the screw clamps ① with a screwdriver (max. torque of 0.4 Nm).

Please note the pinout of the power supply connector on the device!

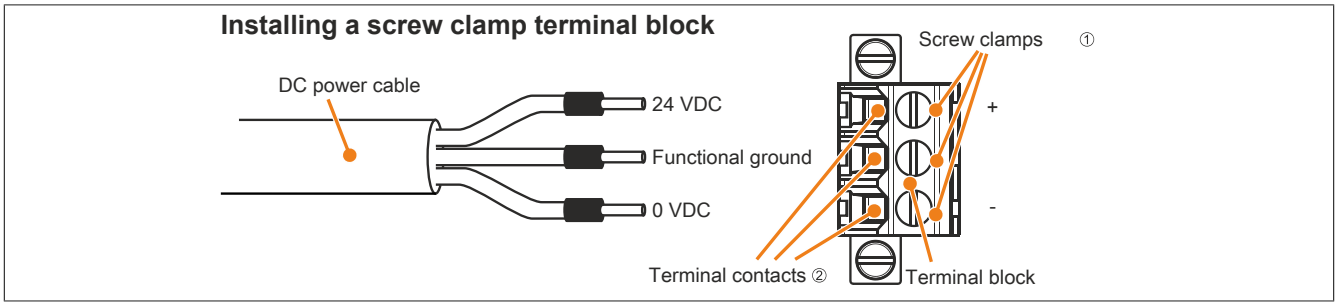


Figure 17: Installing a screw clamp terminal block

Installing the 0TB103.91 cage clamp terminal block

Insert a screwdriver into the cage clamp terminal ① and fasten the wires with wire end sleeves in the terminal contacts ② as shown in the image below. Close the terminal contact by removing the screwdriver.

Please note the pinout of the power supply connector on the device!

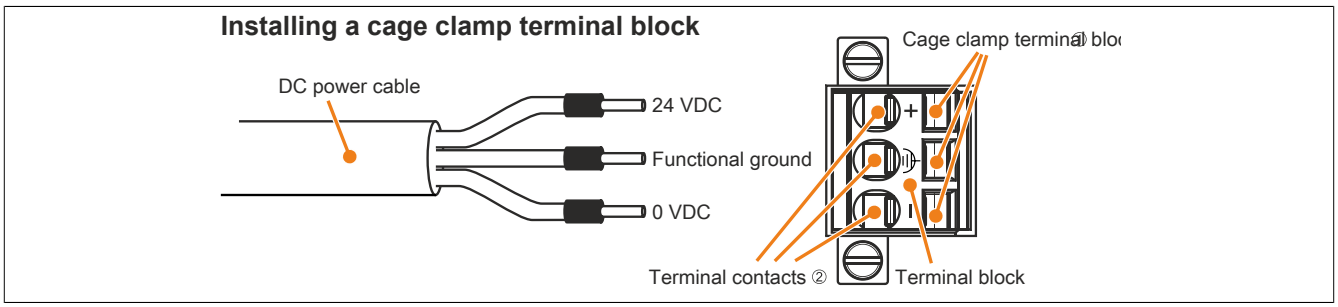


Figure 18: Installing a cage clamp terminal block

3.2.2 Connecting the power supply to a B&R device

Danger!

The voltage supply to the B&R device must be completely disconnected. Before connecting the power cable, it is important to make absolutely sure that it has been disconnected from the power source (e.g. power supply).

1. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
2. Connect the power supply connector to the B&R device and tighten the fastening screws (max. tightening torque 0.5 Nm).

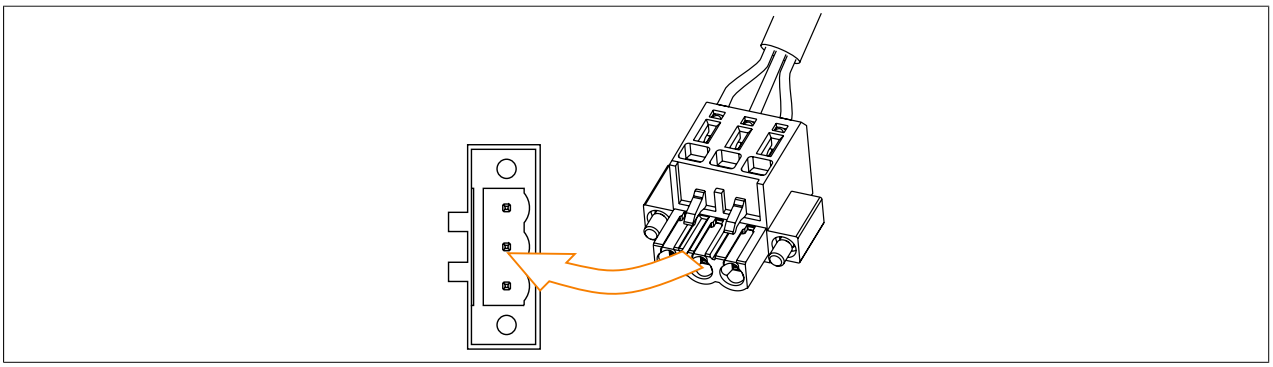


Figure 19: Connecting the power supply connector to a B&R device

3.2.3 Functional ground - Grounding concept

Functional ground is a current path of low impedance between electrical circuits and ground. It is used, for example, to improve immunity to disturbances and not necessarily as a protective measure. It therefore serves only to deflect disturbances, not to provide any kind of protection against electric shock.

This device comes equipped with 2 functional ground connections:

- Power supply
- Ground connection

To guarantee safe conductance of electric disturbances, the following points must be observed:

- The device must be connected to the central grounding point in the control cabinet using the shortest route possible.
- A cable with a minimum cross section of 2.5 mm² per connection should be used. If a cable with wire end sleeves is connected to the 0TB103.9 or 0TB103.91 terminal block, then a cable with maximum 1.5 mm² per connection is possible.
- Note the line shielding concept. All data cables connected to the device must be shielded.

Symbol indicating functional ground on the B&R device: 

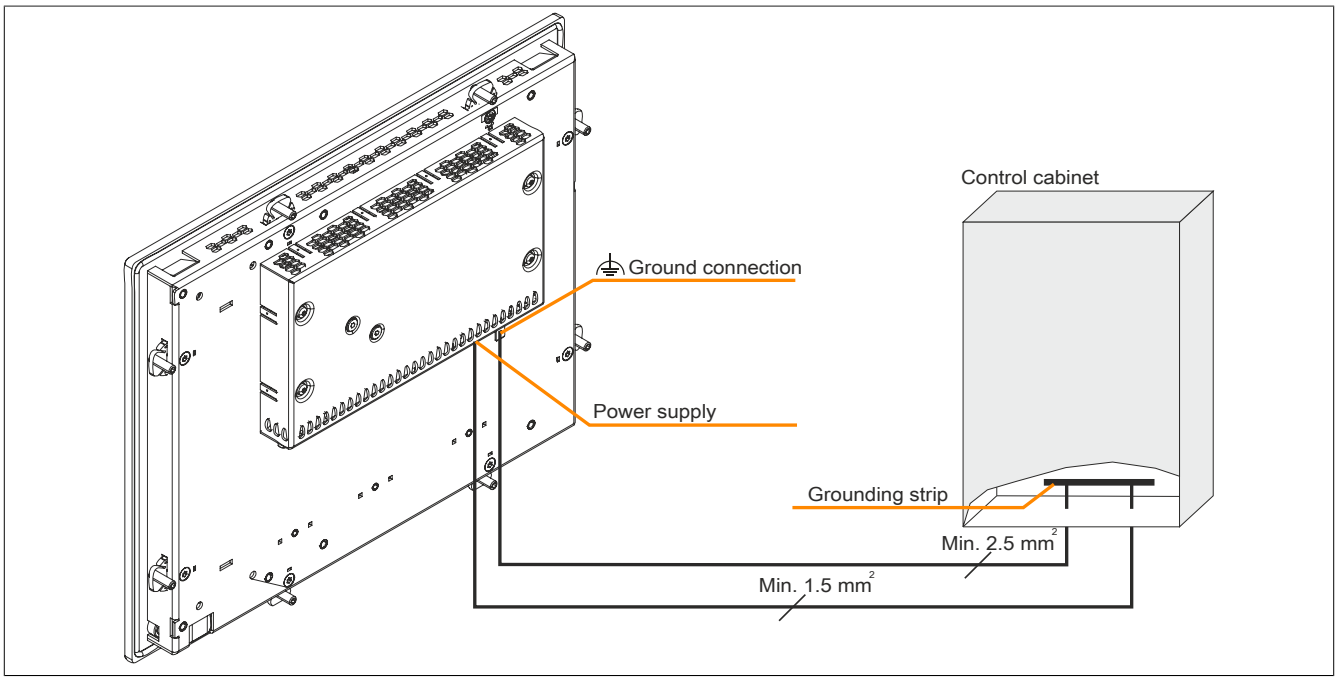


Figure 20: Automation Panel 1000 - Grounding concept

3.3 Cable connections

Bend radius specifications must be taken into account when installing or connecting cables.

Information:

The maximum tightening torque for the locating screws is 0.5 Nm.

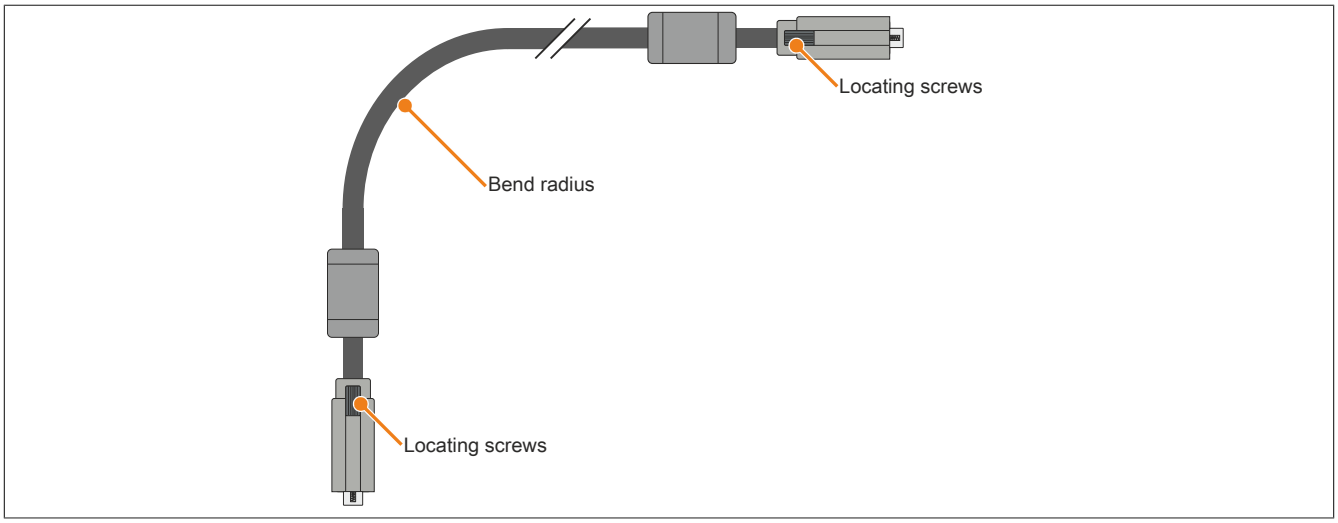


Figure 21: Bend radius - Cable connection

Information:

The specified bend radius is listed in the technical data for the respective cable.

3.4 Switching on the device for the first time

3.4.1 General information before switching on the device

Checklist

The following items must be checked before the device is put into operation for the first time:

- Have the installation notes as specified in "Installation" on page 51 been observed?
- Have the permissible environmental conditions been taken into consideration for the device?
- Is the power supply connected correctly, and have the associated values been checked?
- Is the ground cable connected correctly to the ground connection?
- The device must be put into operation first before additional hardware is installed.

> **Caution!**
>
> **Before the device is put into operation, it must first be acclimated to room temperature! Subjecting it to thermal radiation is not permitted.**
>
> **If transported at low temperatures or if there are large temperature fluctuations, the device is not permitted to be subjected to any type of moisture.**

Requirements

The following requirements must be fulfilled before the device is switched on for the first time:

- The protective film has been removed from the panel.
- The functional ground connections must be kept as short as possible and connected to the central grounding point using the largest possible wire cross section.
- All connection cables must be connected correctly.
- A USB keyboard and USB mouse are connected (optional).
- An Automation PC or Panel PC is connected (via DVI, SDL or SDL3).

3.4.2 Switching on the Automation Panel

Procedure

1. Connect and switch on the voltage supply (e.g. power supply).
2. The device is operational.

3.5 Touch screen calibration

B&R touch screen devices are equipped with a B&R touch controller that supports hardware calibration. As a result, devices are pre-calibrated when delivered. This is an advantageous feature when replacing devices of the same model or type since it avoids having to recalibrate the new device. Nevertheless, calibrating the device is still recommended in order to achieve the best results and to better adapt the touch screen to the user's preferences.

3.5.1 Single-touch (analog resistive)

3.5.1.1 Windows Embedded 8.1 Industry Pro

After starting Windows Embedded 8.1 Industry Pro on the Panel PC for the first time, the corresponding touch screen driver is installed automatically.

On all other devices, the touch screen driver must be installed in order to operate the touch screen. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

3.5.1.2 Windows 7 Professional / Ultimate

After installing Windows 7 on the device, the touch screen driver must be installed in order to operate the touch screen. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

3.5.1.3 Windows Embedded Standard 7 Embedded / Premium

A touch screen driver will be installed automatically if a touch controller is detected during the Windows Embedded Standard 7 installation.

The touch screen driver must be installed manually if a touch controller was not detected when installing Windows Embedded Standard 7 or if an Automation Panel has been connected after installation. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

3.5.1.4 Windows XP Professional

After installing Windows XP Professional on the device, the touch screen driver must be installed in order to operate the touch screen. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

3.5.1.5 Windows Embedded Standard 2009

After starting Windows Embedded Standard 2009 on the Panel PC or Power Panel for the first time (first boot agent), the corresponding touch screen driver is installed automatically.

On all other devices, the touch screen driver must be installed in order to operate the touch screen. The necessary driver is available in the Downloads section of the B&R website (www.br-automation.com).

3.6 Adjusting the display brightness

In SDL or SDL3 mode, the brightness of the display can be configured using the Control Center on the connected B&R Industrial PC, for example. In DVI mode, the brightness can only be controlled using the two brightness controls provided on the SDL/DVI receiver.

3.6.1 Adjusting in SDL/SDL3 mode

1. Open the **Control Center** in the Control Panel.
2. Select the **Display** tab.
3. Select the Automation Panel from the list.
4. Set the desired brightness using the slider control.

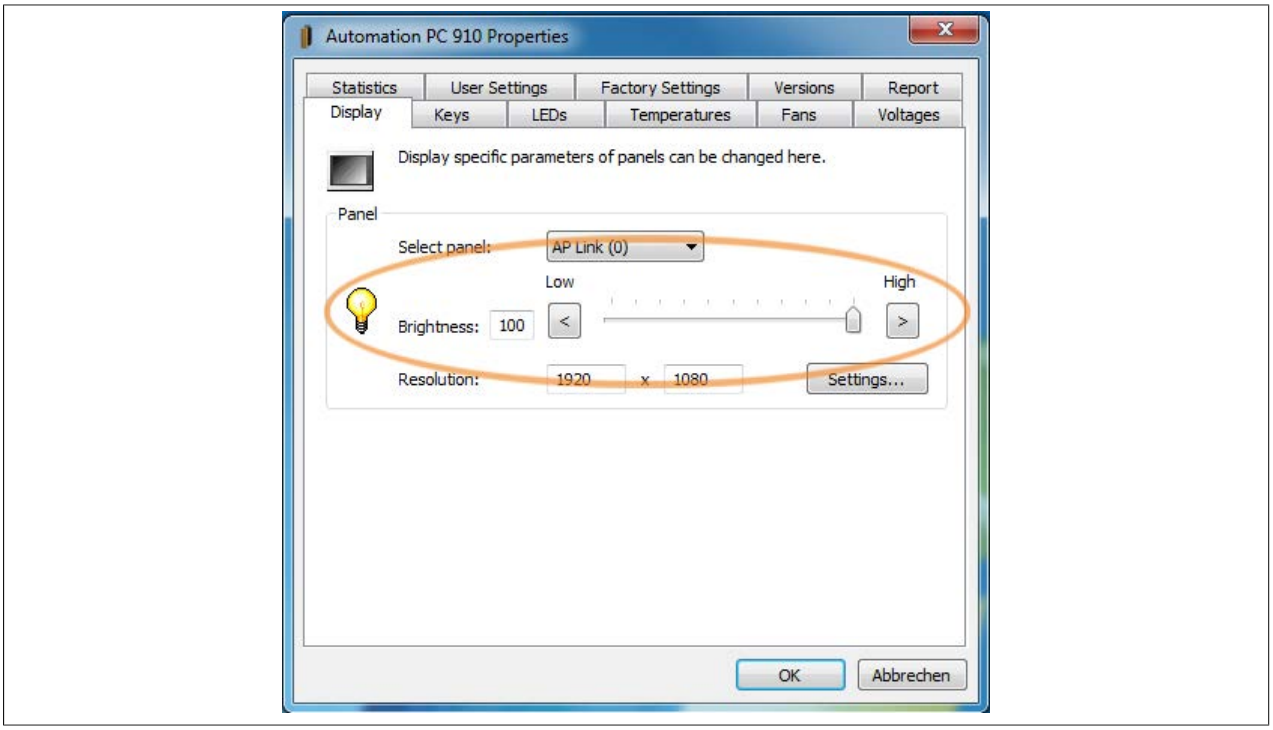


Figure 22: Adjusting the display brightness

Information:

Changes to these settings are displayed online but are only applied by the system (and applied during the next restart) if the Control Center is closed with *OK*.

The configured brightness is separate from the value configured in BIOS Setup, i.e. the value in BIOS is used until Windows boots. The value from BIOS is only applied the first time the Control Center is launched.

3.6.2 Adjusting in DVI mode

1. Use the two brightness controls on the SDL/DVI receiver to set the brightness.

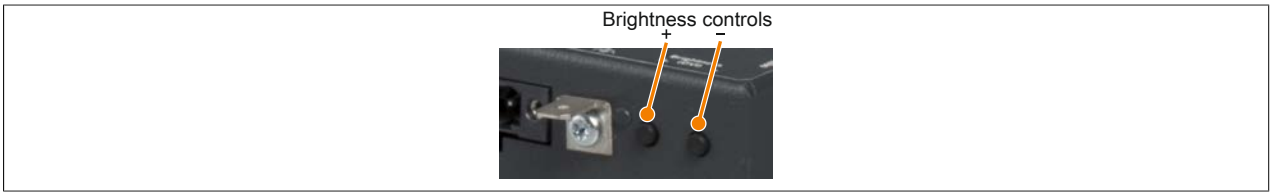


Figure 23: Brightness controls

4 Software

4.1 Upgrade information

Warning!

The BIOS and firmware on B&R devices must be kept current. New versions can be downloaded from the B&R website (www.br-automation.com).

4.1.1 Upgrading the firmware on the Automation Panel

The "Firmware upgrade (Automation Panel, SDL3 Converter)" software makes it possible to update the firmware for multiple controllers (SDLR, SDL3R, SDL3 Converter) depending on how the system is designed.

The latest firmware upgrade is available in the Downloads section of the B&R website (www.br-automation.com).

Caution!

The PC is not permitted to be switched off or reset while performing an update!

4.2 B&R Automation Device Interface (ADI) - Control Center

The ADI (Automation Device Interface) enables access to specific functions on B&R devices. In Windows, the settings for these devices can be viewed and modified using the B&R Control Center applet in the Control Panel.

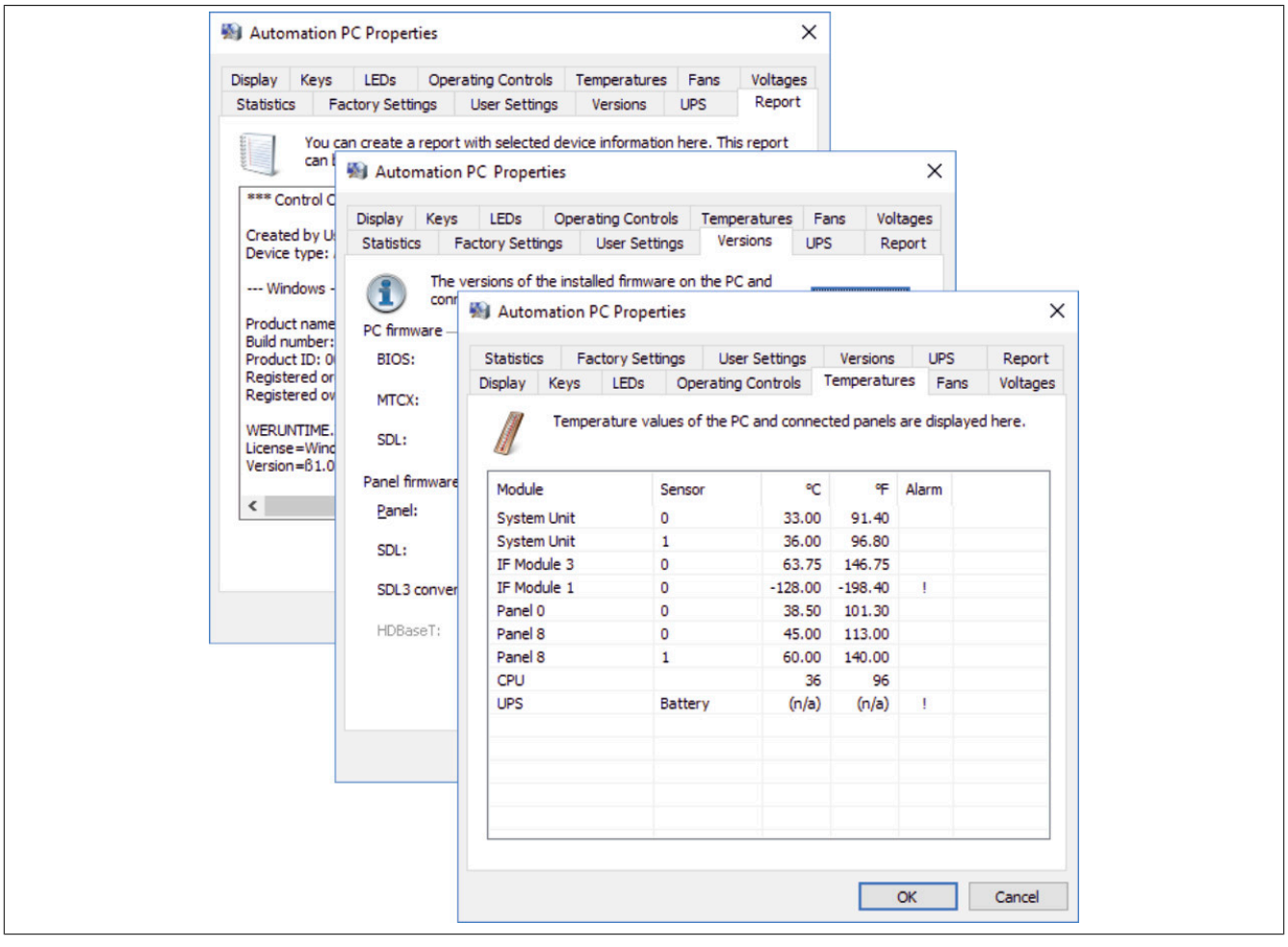


Figure 24: ADI Control Center screenshots - Examples

Information:

The temperature and voltage values (e.g. CPU temperature, core voltage, battery voltage) shown in the corresponding ADI window represent uncalibrated values for informational purposes. They cannot be used to draw any conclusions about hardware alarms or error conditions. The hardware components used have automatic diagnostic functions that can be applied in the event of error.

4.2.1 Functions

Information:

The functions provided by the Automation Device Interface (ADI) - Control Center vary according to the device series.

- Changing display-specific parameters
- Reading device-specific keys
- Updating the key configuration
- Enabling device-specific LEDs on a membrane keypad or keys
- Reading and calibrating control devices (e.g. key switches, handwheels, joysticks, potentiometers)
- Reading temperatures, fan speeds, statistical data and switch settings
- Reading operating hours (power-on hours)
- Reading user and factory settings
- Reading software versions
- Updating and backing up BIOS and firmware
- Creating reports about the current system (support assistance)
- Setting the SDL equalizer value when adjusting SDL cables
- Changing the user serial ID

Supports the following systems:

- Automation Panel 800
- Automation Panel 830
- Automation Panel 900
- Automation Panel 9x3
- Automation Panel 9xD
- Automation Panel 1000
- Automation Panel 5000
- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Automation PC 3100
- Mobile Panel 100/200
- Mobile Panel 40/50
- Mobile Panel 7100
- Panel PC 300
- Panel PC 700
- Panel PC 725
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Panel PC 3100
- Power Panel 100/200

- Power Panel 300/400
- Power Panel 500

4.2.2 Installation

For a detailed description of the Control Center, see Automation Help or the user documentation (depends on the version). The B&R Automation Device Interface (ADI) driver (also includes the Control Center) and user documentation are available at no charge in the Downloads section of the B&R website (www.br-automation.com).

1. Download and unzip the .zip archive.
2. Close all applications.
3. Run the Setup.exe file (e.g. double-click on it in Explorer).

Information:

The ADI driver is included in most B&R Windows operating systems, or it can also be installed at a later time.

If a more current ADI driver version exists (see the Downloads section of the B&R website), it can be installed later. It is important that Enhanced Write Filter (EWF) is disabled for this.

4.3 B&R Automation Device Interface (ADI) Development Kit

This software can be used to access B&R Automation Device Interface (ADI) functions directly from Windows applications created in Microsoft Visual Studio, for example.

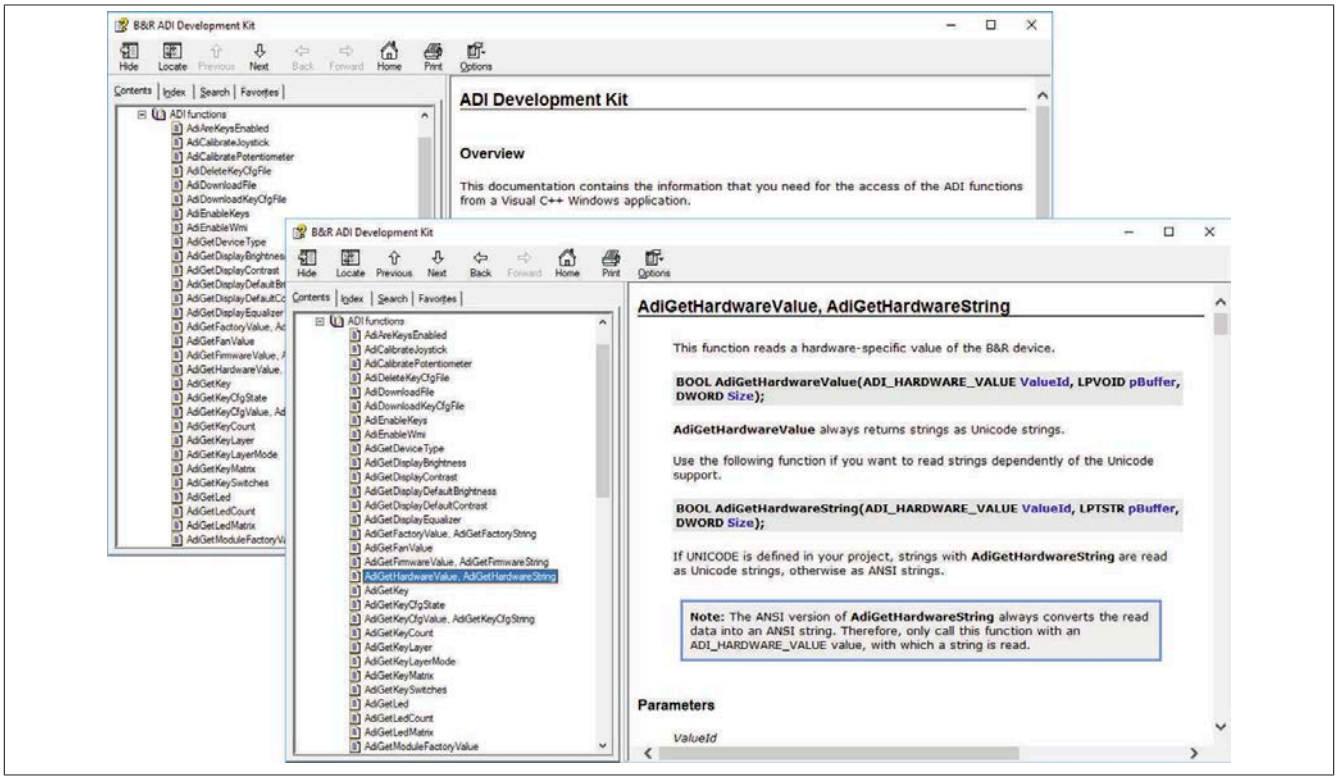


Figure 25: ADI Development Kit Screenshots (Symbolfoto)

Features:

- Header files and import libraries
- Help files
- Sample projects
- ADI DLL (for application testing if no ADI driver is installed)

The following systems are supported (V4.00 and later):

- Automation Panel 800
- Automation Panel 830 (supported up to V3.90)
- Automation Panel 900
- Automation Panel 9x3
- Automation Panel 9xD
- Automation Panel 1000
- Automation Panel 5000
- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Automation PC 3100
- Mobile Panel 100/200 (supported up to V3.80)
- Mobile Panel 40/50
- Mobile Panel 7100
- Panel PC 300
- Panel PC 700

- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Panel PC 3100
- Power Panel 100/200 (supported up to V3.80)
- Power Panel 300/400
- Power Panel 500

The ADI driver installed on the stated product series must be suitable for that device. The ADI driver is already included in B&R images of embedded operating systems.

For a detailed description of how to use ADI functions, see Automation Help.

The B&R Automation Device Interface (ADI) development kit is available at no cost in the Downloads section of the B&R website (www.br-automation.com).

4.4 B&R Automation Device Interface (ADI) .NET SDK

This software can be used to access B&R Automation Device Interface (ADI) functions directly from .NET applications created using Microsoft Visual Studio 2010 or later.

System requirements:

- Development system: PC with Windows 7 or later and
  - Microsoft Visual Studio 2010 (and later)
  - Microsoft .NET Framework 3.5 (and later)

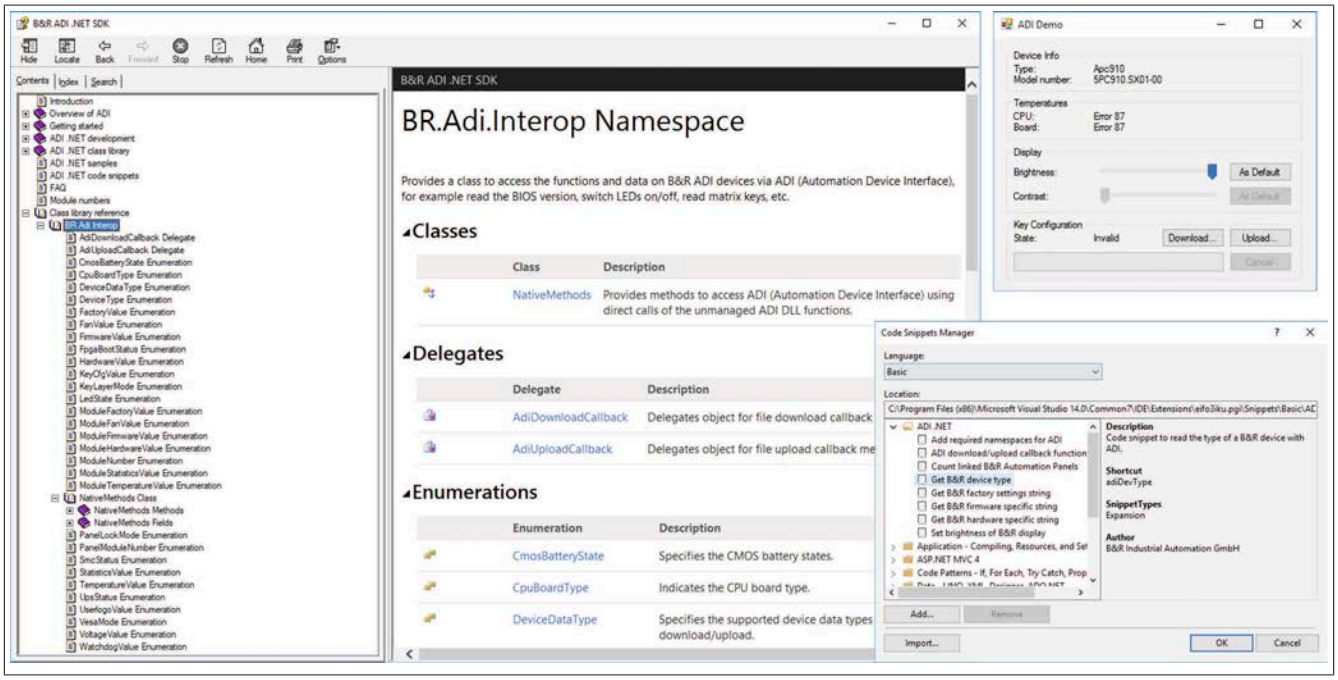


Figure 26: ADI .NET SDK screenshots (sample)

Features:

- ADI .NET class library for NET 3.5 and .NET 4.0.
- Help files in HTML Help 1.0 format (.chm file) and MS Help Viewer format (.mshc file). (help documentation is in English only)
- Sample projects and code snippets.
- ADI DLL (for application testing if no ADI driver is installed).

The following systems are supported (V2.40 and later):

- Automation Panel 800
- Automation Panel 830 (supported up to V2.30)
- Automation Panel 900
- Automation Panel 9x3
- Automation Panel 9xD
- Automation Panel 1000
- Automation Panel 5000
- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Automation PC 3100
- Mobile Panel 100/200 (supported up to V2.20)

- Mobile Panel 40/50
- Mobile Panel 7100
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Panel PC 3100
- Power Panel 100/200 (supported up to V2.20)
- Power Panel 300/400
- Power Panel 500

The ADI driver installed on the stated product series must be suitable for that device. The ADI driver is already included in B&R images of embedded operating systems.

For a detailed description of how to use ADI functions, see Automation Help.

The ADI .NET SDK is available in the Downloads section of the B&R website (www.br-automation.com).

5 Standards and certifications

5.1 Standards and guidelines

5.1.1 CE marking

Product complies with all applicable directives and their harmonized EN standards.

5.1.2 EMC directive

These products meet the requirements of EU directive "Electromagnetic compatibility2014/30/EU" and are designed for industrial use:

EN 61131-2:2007	Programmable logic controllers - Part 2: Equipment requirements and tests
EN 61000-6 -2:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6 -4:2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

Information:

Declarations of conformity are available on the B&R website at Downloads - Certificates - Declarations of conformity.

5.1.3 Low voltage directive

These devices satisfy the requirements of EC directive "2006/95/EC Low voltage directive" and are designed for the following areas:

EN 61131-2:2007	Programmable logic controllers - Part 2: Equipment requirements and tests
EN 60204-1:2006 + A1:2009	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

The low voltage directive applies to equipment that can be used with a nominal voltage between 50 and 1000 VAC and between 75 and 1500 VDC.

5.2 Certifications

Danger!

A complete system can only receive certification if ALL of the individual components it includes have the applicable certifications. If an individual component is being used that DOES NOT have an applicable certification, then the complete system WILL NOT receive certification.

Products and services from B&R comply with applicable standards. This includes 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 are committed to ensuring the reliability of our products in an industrial environment.

Information:

Applicable certifications for respective products are available on the website, section "Certifications" of the technical data in the user's manual or in associated certificates.

5.2.1 UL certification

Products with this marking have been tested by Underwriters Laboratories and are listed as "industrial control equipment". This mark is valid for the USA and Canada and simplifies the certification of your machines and systems in these regions.

Underwriters Laboratories (UL) in accordance with the UL508 standard
Canadian (CSA) standard in accordance with C22.2 No. 142-M1987

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

Ind.Cont.Eq.
E115267

5.2.2 GOST-R

Products with this mark have been tested by an accredited testing laboratory and are permitted for import to the Russian Federation (based on CE compliance).

6 Accessories

The following accessories have successfully completed functional testing at B&R and can be used with this device. Nevertheless, it is important to observe any limitations that may apply to the complete system when operated with other individual components. When operating the complete system, all individual specifications for the components must be observed.

All components listed in this manual have been subjected to extensive system and compatibility testing and are approved for use accordingly. B&R cannot guarantee the functionality of non-approved accessories.

6.1 Power connectors

6.1.1 0TB103.9x

6.1.1.1 General information

This 1-row, 3-pin 0TB103 terminal block is used to connect the power supply.

6.1.1.2 Order data

Model number	Short description	Figure
	Accessories	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	

Table 46: 0TB103.9, 0TB103.91 - Order data

6.1.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	0TB103.9	0TB103.91
General information		
Certification		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]	
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)	
Terminal block		
Note	Protected against vibration by the screw flange Nominal values per UL	
Number of pins	3 (female)	
Type of terminal block	Screw clamp terminal block	Cage clamp terminal block [2)]
Cable type	Only copper wires (no aluminum wires!)	
Distance between contacts	5.08 mm	

Table 47: 0TB103.9, 0TB103.91 - Technical data

Model number	0TB103.9	0TB103.91
Connection cross section		
AWG wire	26 to 14 AWG	26 to 12 AWG
Wire end sleeves with plastic covering	0.20 to 1.50 mm²	
Solid wires	0.20 to 2.50 mm²	
Fine strand wires	0.20 to 1.50 mm²	0.20 to 2.50 mm²
With wire end sleeves	0.20 to 1.50 mm²	
Tightening torque	0.4 Nm	-
Electrical characteristics		
Nominal voltage	300 V	
Nominal current 3)	10 A / contact	
Contact resistance	≤5 mΩ	
Operating conditions		
Degree of pollution in accordance with EN 61131	Pollution degree 2	

Table 47: 0TB103.9, 0TB103.91 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Cage clamp terminal blocks cannot be used side-by-side.
3) The limit data for each I/O module must be taken into consideration.

6.2 USB flash drives

6.2.1 5MMUSB.xxxx-01

6.2.1.1 General information

USB flash drives are data storage devices that are easy to exchange. Because of their high-speed data transfer (USB 2.0), USB flash drives are ideal for use as portable data storage. Without requiring additional drivers ("hot plugging", except in the case of Windows 98SE), the USB flash drive can immediately act as an additional drive for reading or writing data.

Information:

Due to the large number of USB flash drives available on the market as well as their short product lifecycle, we reserve the right to supply alternative products at any time. The following measures may therefore be necessary in order to boot from these flash drives as well:

- **The flash drive must be reformatted or in some cases even repartitioned (set active partition).**
- **The flash drive must be the first bootable device in the BIOS boot order; alternatively, the IDE controllers can be disabled in BIOS. This can be avoided in most cases if the "fdisk /mbr" command is additionally executed on the USB flash drive.**

6.2.1.2 Order data

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

Table 48: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

6.2.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	5MMUSB.2048-01	5MMUSB.4096-01
General information		
Capacity	2 GB	4 GB
LED status indicators	1 LED (green) [1)]	
MTBF	>3,000,000 hours	
Type	USB 1.1, USB 2.0	
Maintenance	None	
Default file system	FAT32	
Certification		
CE	Yes	
GOST-R	Yes	
Interfaces		
USB		
Type	USB 1.1, USB 2.0	
Connection	To any USB type A interface	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Sequential reading	Full speed max. 1 MB/s, High speed max. 32 MB/s	
Sequential writing	Full speed max. 0.9 MB/s, High speed max. 23 MB/s	
Endurance		
SLC flash	Yes	
Data retention	>10 years	
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses	
Connection cycles	>1500	

Table 49: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Model number	5MMUSB.2048-01	5MMUSB.4096-01
Support		
Operating systems		
Windows 7	Yes	
Windows XP Professional	Yes	
Windows XP Embedded	Yes	
Windows ME	Yes	
Windows 2000	Yes	
Windows CE 5.0	Yes	
Windows CE 4.2	Yes	
Electrical characteristics		
Current consumption	Max. 500 µA sleep mode, max. 120 mA read/write	
Environmental conditions		
Temperature		
Operation	0 to 70°C	
Storage	-50 to 100°C	
Transport	-50 to 100°C	
Relative humidity		
Operation	85%, non-condensing	
Storage	85%, non-condensing	
Transport	85%, non-condensing	
Vibration		
Operation	20 to 2000 Hz: 20 g (peak)	
Storage	20 to 2000 Hz: 20 g (peak)	
Transport	20 to 2000 Hz: 20 g (peak)	
Shock		
Operation	Max. 1500 g (peak)	
Storage	Max. 1500 g (peak)	
Transport	Max. 1500 g (peak)	
Elevation		
Operation	Max. 3048 m	
Storage	Max. 12192 m	
Transport	Max. 12192 m	
Mechanical characteristics		
Dimensions		
Width	17.97 mm	
Length	67.85 mm	
Height	8.35 mm	

Table 49: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

1) Indicates data being transferred (sending and receiving).

6.2.1.4 Temperature/Humidity diagram

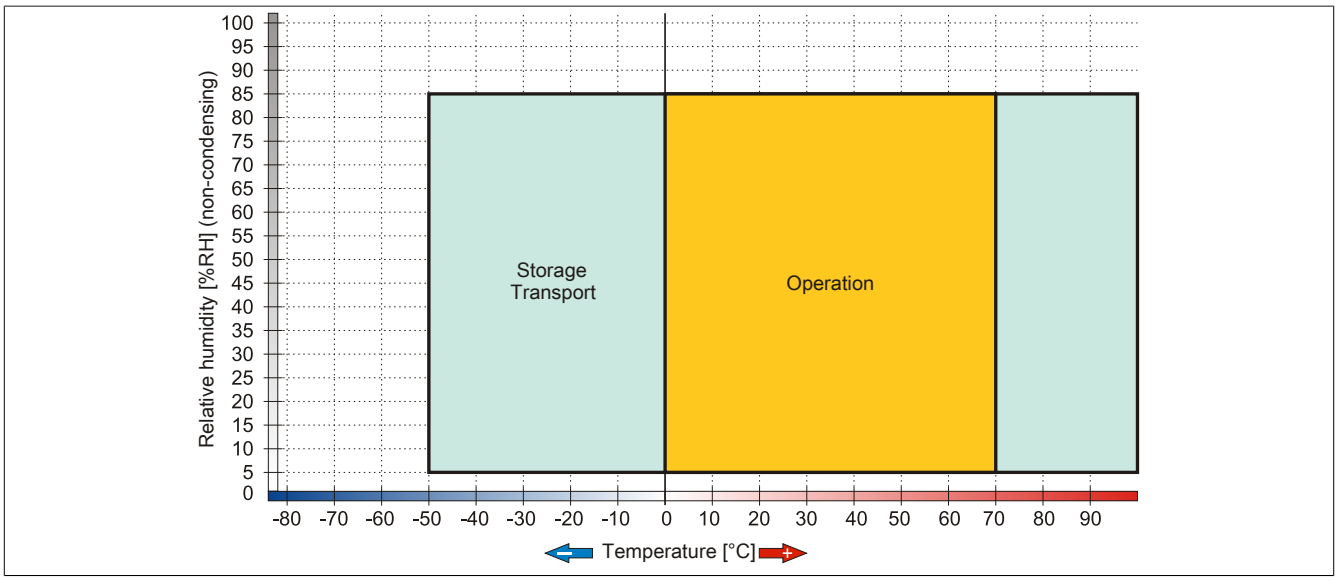


Figure 27: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

6.2.2 5MMUSB.032G-02

6.2.2.1 General information

USB flash drives are data storage devices that are easy to exchange. Because of their high-speed data transfer (USB 3.0), USB flash drives are ideal for use as portable data storage. Without requiring additional drivers ("hot plugging", except in the case of Windows 98SE), the USB flash drive can immediately act as an additional drive for reading or writing data. USB 3.0 (XHCI) will be supported starting with Windows 7 (USB 3.0 driver required).

Information:

Due to the large number of USB flash drives available on the market as well as their short product lifecycle, we reserve the right to supply alternative products at any time. The following measures may therefore be necessary in order to boot from these flash drives as well:

- **The flash drive must be reformatted or in some cases even repartitioned (set active partition).**
- **The flash drive must be the first bootable device in the BIOS boot order; alternatively, the IDE controllers can be disabled in BIOS. This can be avoided in most cases if the "fdisk /mbr" command is additionally executed on the USB flash drive.**

6.2.2.2 Order data

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

Table 50: 5MMUSB.032G-02 - Order data

6.2.2.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	5MMUSB.032G-02
General information	
Capacity	32 GB
LED status indicators	1 LED (green) [1)]
MTBF	>3,000,000 hours
Type	USB 2.0, USB 3.0
Maintenance	None
Certification	
CE	Yes
Interfaces	
USB	
Type	USB 2.0, USB 3.0
Connection	To any USB type A interface
Transfer rate	High Speed (480 MBit/s) to Super Speed (4 GBit/s)
Sequential reading	USB 3.0 max. 100 MB/s
Sequential writing	USB 3.0 max. 50 MB/s
Endurance	
MLC flash	Yes
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses
Connection cycles	>1500
Electrical characteristics	
Current consumption	Max. 500 mA sleep mode, max. 120 mA read, max. 141 mA write
Environmental conditions	
Temperature	
Operation	0 to 70°C
Storage	-55 to 95°C
Transport	-55 to 95°C

Table 51: 5MMUSB.032G-02 - Technical data

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

Table 51: 5MMUSB.032G-02 - Technical data

1) Indicates data being transferred (sending and receiving).

6.2.2.4 Temperature/Humidity diagram

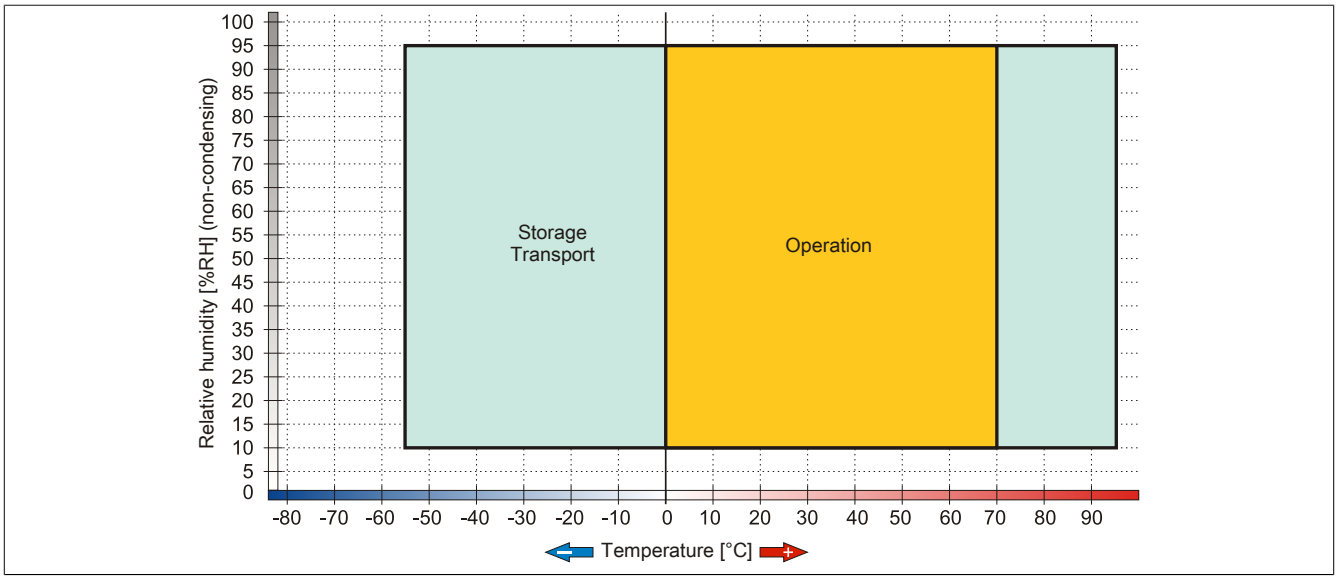


Figure 28: 5MMUSB.032G-02 - Temperature/Humidity diagram

6.3 Cables

6.3.1 DVI cables

6.3.1.1 5CADVI.0xxx-00

6.3.1.1.1 General information

5CADVI.0xxx-00 DVI cables are designed for use in inflexible applications.

> **Caution!**
>
> **The cable is only permitted to be connected or disconnected when power is not applied.**

6.3.1.1.2 Order data

Model number	Short description	Figure
	DVI cables	
5CADVI.0018-00	DVI-D cable - 1.8 m	
5CADVI.0050-00	DVI-D cable - 5 m	
5CADVI.0100-00	DVI-D cable - 10 m	

Table 52: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data

6.3.1.1.3 Technical data

> **Information:**
>
> **The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.**

Model number	5CADVI.0018-00	5CADVI.0050-00	5CADVI.0100-00
General information			
Certification			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[1)]		
GOST-R	Yes		
Cable construction			
Wire cross section	28 AWG		
Shield	Individual cable pairs, entire cable		
Complete shielding	Tinned copper braiding, optical coverage >86%		
Outer sheathing			
Material	PVC		
Color	Beige		
Labeling	AWM STYLE 20276 80°C 30V VW1 DVI DIGITAL SINGLE LINK DER AN		
Connector			
Type	2x DVI-D (18+1), male		
Connection cycles	100		
Locating screw tightening torque	Max. 0.5 Nm		
Electrical characteristics			
Conductor resistance	Max. 237 Ω/km		
Insulation resistance	Min. 100 MΩ/km		
Operating conditions			
Degree of pollution in accordance with EN 61131	Pollution degree 2		
Mechanical characteristics			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter	Max. 8.5 mm		
Bend radius	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)		
Weight	Approx. 260 g	Approx. 460 g	Approx. 790 g

Table 53: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

6.3.1.1.4 Bend radius specifications

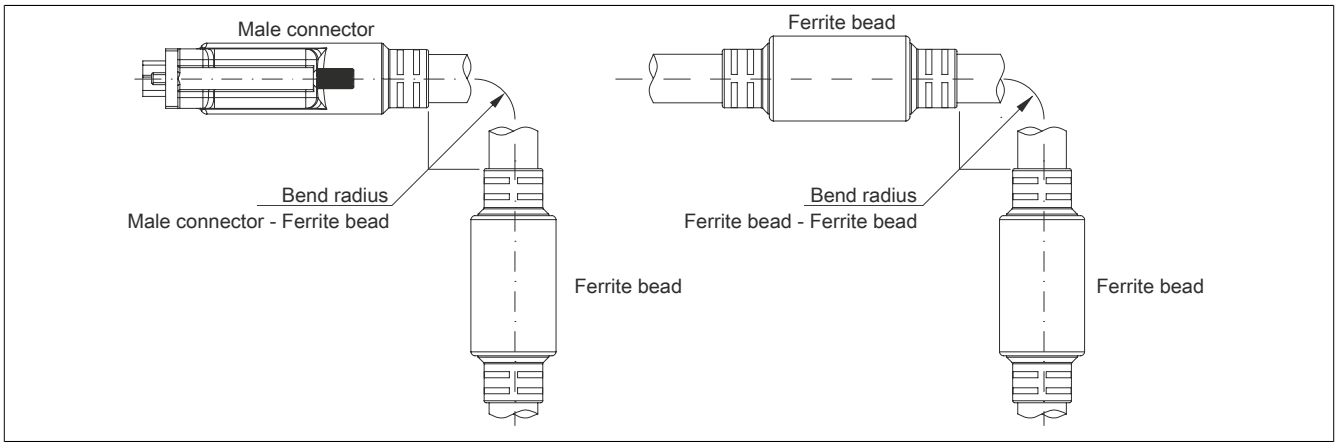


Figure 29: Bend radius specifications

6.3.1.1.5 Dimensions

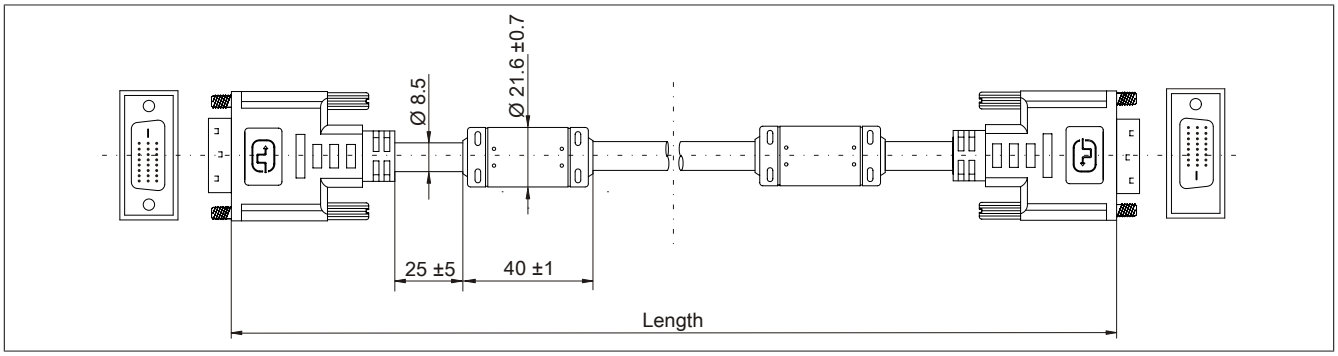


Figure 30: 5CADVI.0xxx-00 - Dimensions

6.3.1.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

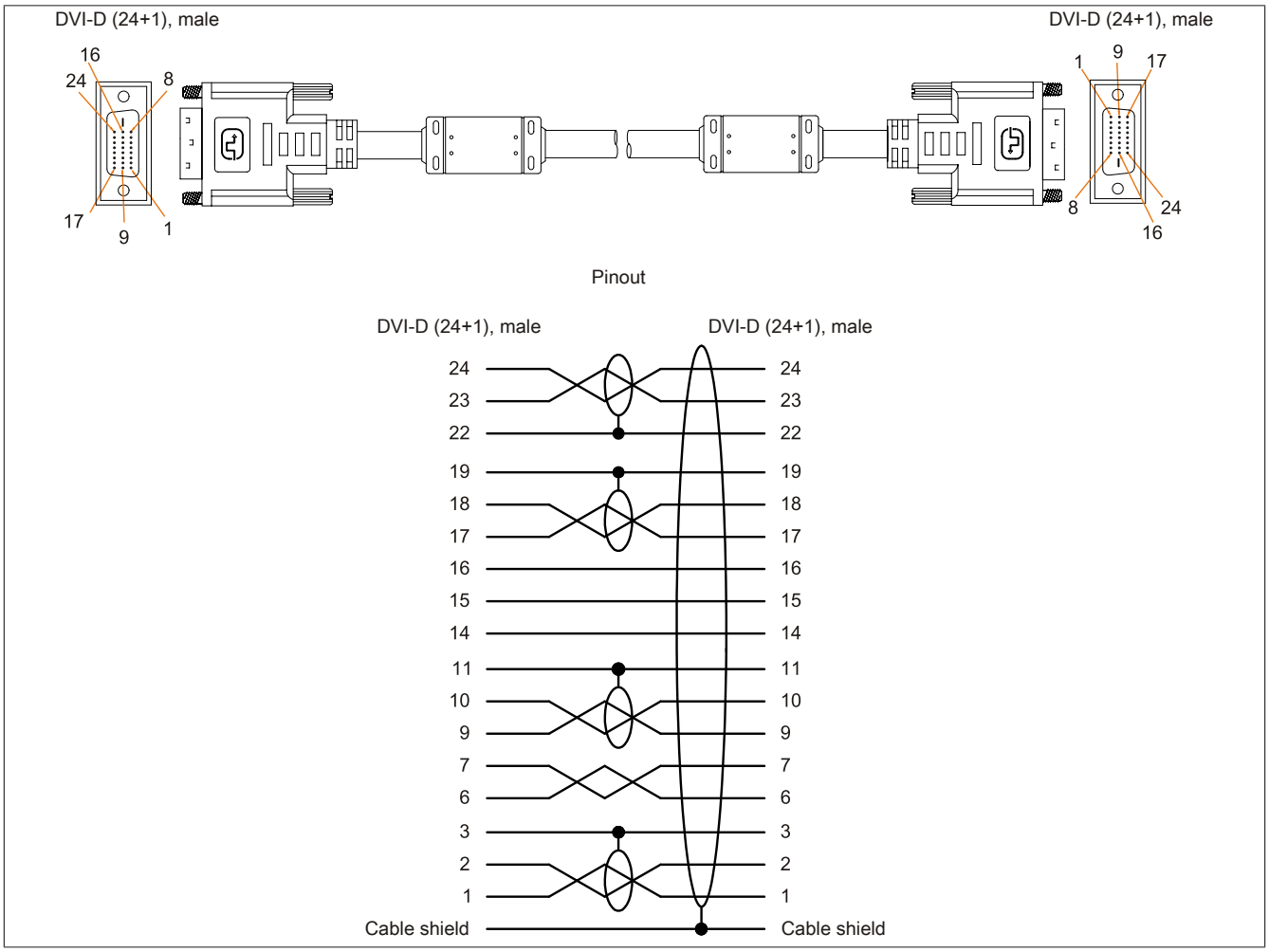


Figure 31: 5CADVI.0xxx-00 - Pinout

6.3.2 SDL cables

6.3.2.1 5CASDL.0xxx-00

6.3.2.1.1 General information

5CASDL.0xxx-00 SDL cables are designed for use in inflexible applications. 5CASDL.0xxx-03 SDL flex cables are required for flexible applications (e.g. swing arm systems).

Caution!

The cable is only permitted to be connected or disconnected when power is not applied.

6.3.2.1.2 Order data

Model number	Short description	Figure
	SDL cables	
5CASDL.0008-00	SDL cable - 0.8 m	
5CASDL.0018-00	SDL cable - 1.8 m	
5CASDL.0050-00	SDL cable - 5 m	
5CASDL.0100-00	SDL cable - 10 m	
5CASDL.0150-00	SDL cable - 15 m	
5CASDL.0200-00	SDL cable - 20 m	
5CASDL.0250-00	SDL cable - 25 m	
5CASDL.0300-00	SDL cable - 30 m	

Table 54: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Order data

6.3.2.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	5CASDL. 0008-00	5CASDL. 0018-00	5CASDL. 0050-00	5CASDL. 0100-00	5CASDL. 0150-00	5CASDL. 0200-00	5CASDL. 0250-00	5CASDL. 0300-00
General information								
Certification								
CE	Yes							
UL	cULus E115267 Industrial control equipment							
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]					cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4		
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]							
GOST-R	-	Yes						
Cable construction								
Wire cross section	28 AWG			24 AWG				
Shield	Individual cable pairs, entire cable							
Complete shielding	Tinned copper braiding, optical coverage >85%							
Outer sheathing								
Material	PVC							
Color	Black							
Labeling	E74020-C (UL) AWM STYLE 20176 80°C 30V VW-1 DVI DIGITAL LINK							
Connector								
Type	2x DVI-D (24+1), male							
Connection cycles	100							
Contacts	Gold-plated							
Mechanical protection	Metal cover with crimped strain relief							
Locating screw tightening torque	Max. 0.5 Nm							
Electrical characteristics								
Conductor resistance								
24 AWG	-			≤93 Ω/km				
28 AWG	≤237 Ω/km			-				

Table 55: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Technical data

Model number	5CASDL. 0008-00	5CASDL. 0018-00	5CASDL. 0050-00	5CASDL. 0100-00	5CASDL. 0150-00	5CASDL. 0200-00	5CASDL. 0250-00	5CASDL. 0300-00
Insulation resistance	Min. 10 MΩ/km							
Operating conditions								
Degree of pollution in accordance with EN 61131	Pollution degree 2							
Mechanical characteristics								
Dimensions								
Length	0.8 m ±25 mm	1.8 m ±30 mm	5 m ±30 mm	10 m ±50 mm	15 m ±100 mm	20 m ±100 mm	25 m ±100 mm	30 m ±100 mm
Diameter	Typ. 8.6 ±0.2 mm Max. 9 mm			Typ. 11 ±0.2 mm Max. 11.5 mm				
Bend radius	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)							
Flexibility	Limited flexibility, valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles/minute)							
Weight	Approx. 206 g	Approx. 300 g	Approx. 580 g	Approx. 1500 g	Approx. 2250 g	Approx. 2880 g	Approx. 4800 g	Approx. 5520 g

Table 55: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.

6.3.2.1.4 Bend radius specifications

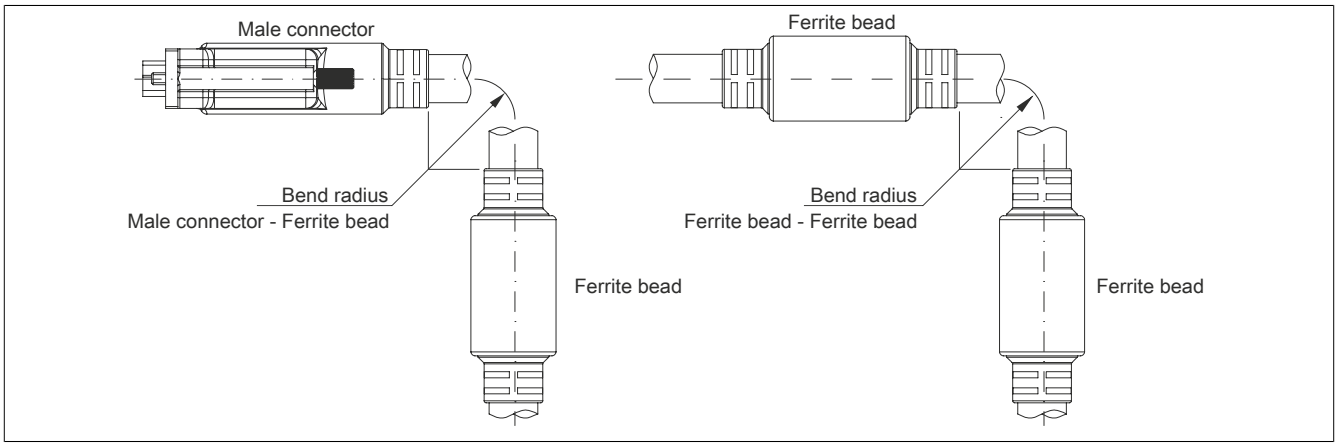


Figure 32: Bend radius specifications

6.3.2.1.5 Dimensions

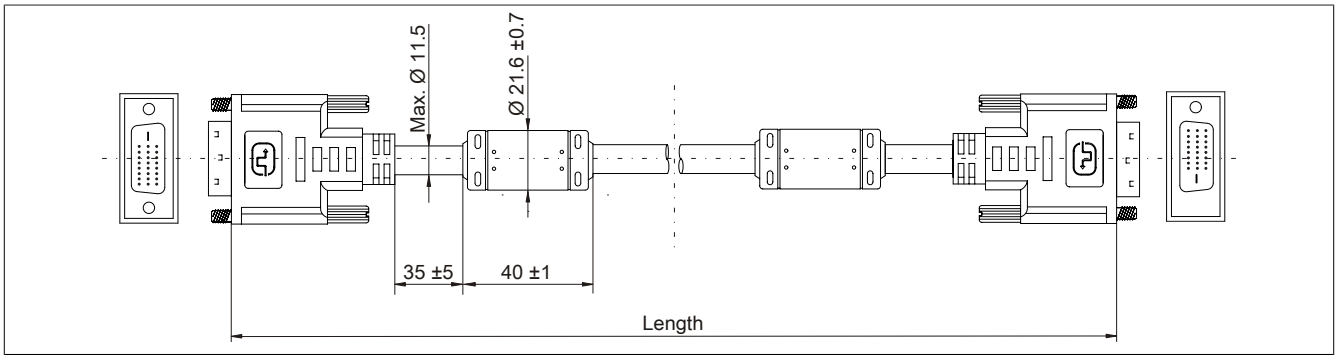


Figure 33: 5CASDL.0xxx-00- Dimensions

6.3.2.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

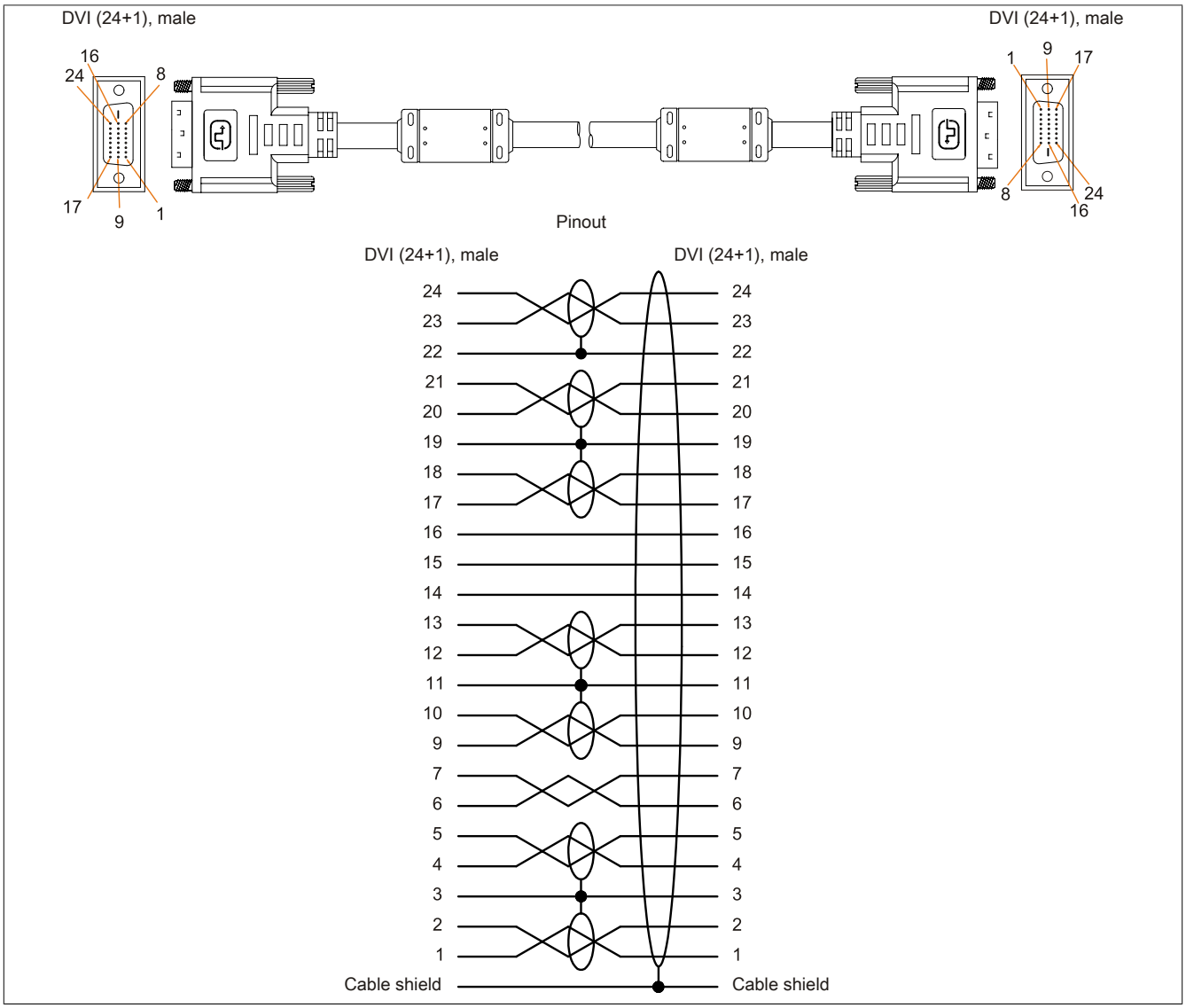


Figure 34: 5CASDL.0xxx-00 - Pinout

6.3.3 SDL cables with 45° male connector

6.3.3.1 5CASDL.0xxx-01

6.3.3.1.1 General information

5CASDL.0xxx-01 SDL cables with 45° connector are designed for use in inflexible applications.

Caution!

The cable is only permitted to be connected or disconnected when power is not applied.

6.3.3.1.2 Order data

Model number	Short description	Figure
	SDL cable 45° connectors	
5CASDL.0018-01	SDL cable - 45 degree connector - 1.8 m	
5CASDL.0050-01	SDL cable - 45 degree connector - 5 m	
5CASDL.0100-01	SDL cable - 45 degree connector - 10 m	
5CASDL.0150-01	SDL cable - 45 degree connector - 15 m	

Table 56: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Order data

6.3.3.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	5CASDL.0018-01	5CASDL.0050-01	5CASDL.0100-01	5CASDL.0150-01
General information				
Certification				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]			cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]			
GOST-R	Yes			
Cable construction				
Wire cross section	28 AWG		24 AWG	
Shield	Individual cable pairs, entire cable			
Complete shielding	Tinned copper braiding, optical coverage >85%			
Outer sheathing				
Material	PVC			
Color	Black			
Connector				
Type	2x DVI-D (24+1), male			
Connection cycles	100			
Contacts	Gold-plated			
Mechanical protection	Metal cover with crimped strain relief			
Locating screw tightening torque	Max. 0.5 Nm			
Electrical characteristics				
Conductor resistance				
24 AWG	-		≤93 Ω/km	
28 AWG	≤237 Ω/km		-	
Insulation resistance	Min. 10 MΩ/km			
Operating conditions				
Degree of pollution in accordance with EN 61131	Pollution degree 2			
Mechanical characteristics				
Dimensions				
Length	1.8 m ±30 mm	5 m ±50 mm	10 m ±100 mm	15 m ±100 mm
Diameter	Max. 9 mm		Max. 11.5 mm	

Table 57: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

Model number	5CASDL.0018-01	5CASDL.0050-01	5CASDL.0100-01	5CASDL.0150-01
Bend radius				
Fixed installation	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)			
Flexibility	Limited flexibility, valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles/minute)			
Weight	Approx. 300 g	Approx. 590 g	Approx. 2800 g	Approx. 2860 g

Table 57: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.

6.3.3.1.4 Bend radius specifications

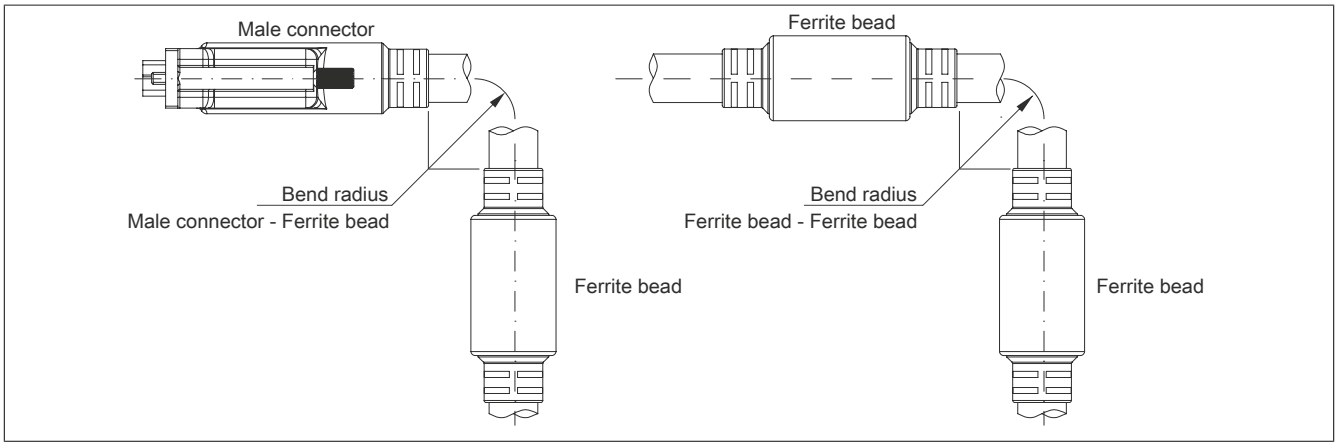


Figure 35: Bend radius specifications

6.3.3.1.5 Dimensions

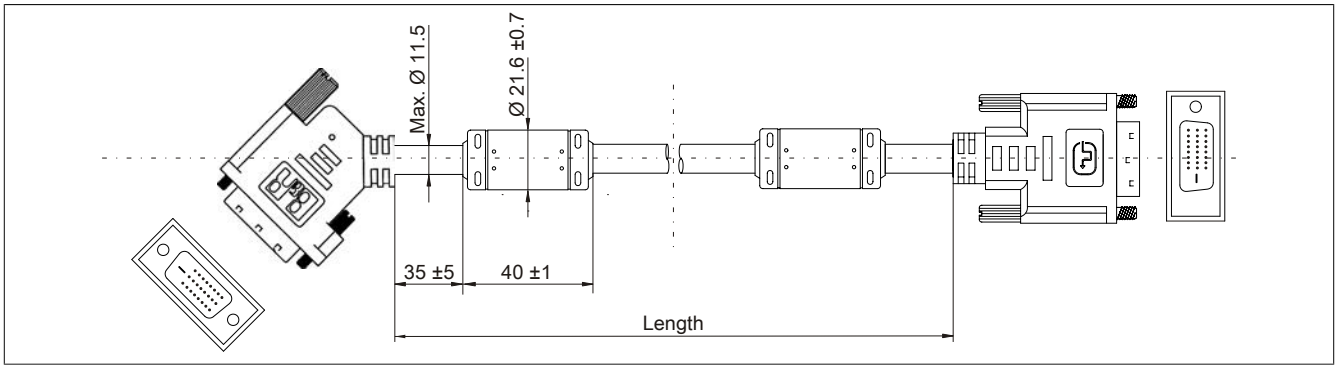


Figure 36: 5CASDL.0xxx-01 - Dimensions

6.3.3.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

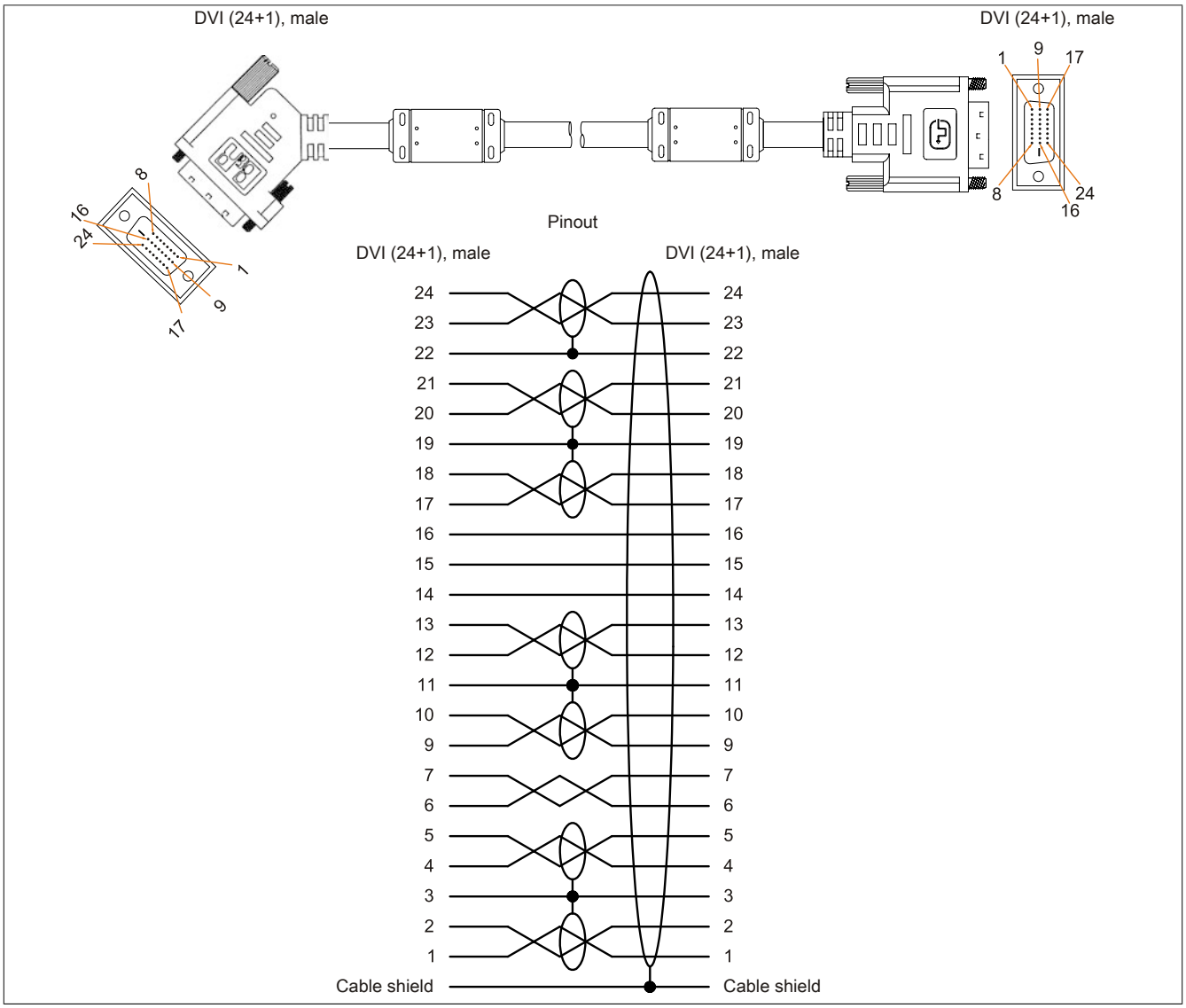


Figure 37: 5CASDL.0xxx-01 - Pinout

6.3.4 SDL flex cables

6.3.4.1 5CASDL.0xxx-03

6.3.4.1.1 General information

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

Caution!

The cable is only permitted to be connected or disconnected when power is not applied.

6.3.4.1.2 Order data

Model number	Short description	Figure
	SDL flex cables	
5CASDL.0018-03	SDL flex cable - 1.8 m	
5CASDL.0050-03	SDL flex cable - 5 m	
5CASDL.0100-03	SDL flex cable - 10 m	
5CASDL.0150-03	SDL flex cable - 15 m	
5CASDL.0200-03	SDL flex cable - 20 m	
5CASDL.0250-03	SDL flex cable - 25 m	
5CASDL.0300-03	SDL flex cable - 30 m	

Table 58: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Order data

6.3.4.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	5CASDL. 0018-03	5CASDL. 0050-03	5CASDL. 0100-03	5CASDL. 0150-03	5CASDL. 0200-03	5CASDL. 0250-03	5CASDL. 0300-03
General information							
Certification							
CE	Yes						
UL	cULus E115267 Industrial control equipment						
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]			cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4			
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]						
GOST-R	Yes						
Cable construction							
Wire cross section	24 AWG (control wires) 26 AWG (DVI, USB, data)						
Features	Silicone- and halogen-free						
Shield	Individual cable pairs, entire cable						
Complete shielding	Aluminum-clad foil and tinned copper braiding						
Outer sheathing							
Material	Special semi-glossy TMPU						
Color	Black						
Labeling	(B&R) SDL Cable (UL) AWM 20236 80°C 30V E 63216						
Connector							
Type	2x DVI-D (24+1), male						
Connection cycles	Min. 200						
Contacts	Gold-plated						
Mechanical protection	Metal cover with crimped strain relief						
Locating screw tightening torque	Max. 0.5 Nm						
Electrical characteristics							
Operating voltage	≤30 V						

Table 59: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data

Model number	5CASDL. 0018-03	5CASDL. 0050-03	5CASDL. 0100-03	5CASDL. 0150-03	5CASDL. 0200-03	5CASDL. 0250-03	5CASDL. 0300-03
Test voltage							
Wire/Wire	1 kV						
Wire/Shield	0.5 kV						
Wave impedance	100 ±10 Ω						
Conductor resistance							
24 AWG	≤95 Ω/km						
26 AWG	≤145 Ω/km						
Insulation resistance	>200 MΩ/km						
Operating conditions							
Degree of pollution in accordance with EN 61131	Pollution degree 2						
Approbation	UL AWM 20236 80°C 30 V						
Flame-retardant	In accordance with UL758 (cable vertical flame test)						
Oil and hydrolysis resistance	In accordance with VDE 0282-10						
Environmental conditions							
Temperature							
Storage	-20 to 80°C						
Fixed installation	-20 to 80°C						
Flexible installation	-5 to 60°C						
Mechanical characteristics							
Dimensions							
Length	1.8 m ±20 mm	5 m ±45 mm	10 m ±90 mm	15 m ±135 mm	20 m ±180 mm	25 m ±225 mm	30 m ±270 mm
Diameter	Max. 12 mm						
Bend radius							
Fixed installation	≥3.5x cable diameter						
Flexible installation	≥15x cable diameter (from ferrite bead - ferrite bead)						
Flexibility	Flexible, valid for ferrite bead - ferrite bead (tested 300,000 cycles with 15x cable diameter, 4800 cycles/hour)						
Drag chain data							
Flex cycles	300,000						
Speed	4800 cycles/hour						
Bend radius	180 mm, 15x cable diameter						
Hub	460 mm						
Weight	Approx. 460 g	Approx. 1020 g	Approx. 1940 g	Approx. 2840 g	Approx. 3740 g	Approx. 4560 g	Approx. 5590 g
Tension							
During operation	≤50 N						
During installation	≤400 N						

Table 59: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed within the complete system have this certification.

6.3.4.1.4 Bend radius specifications

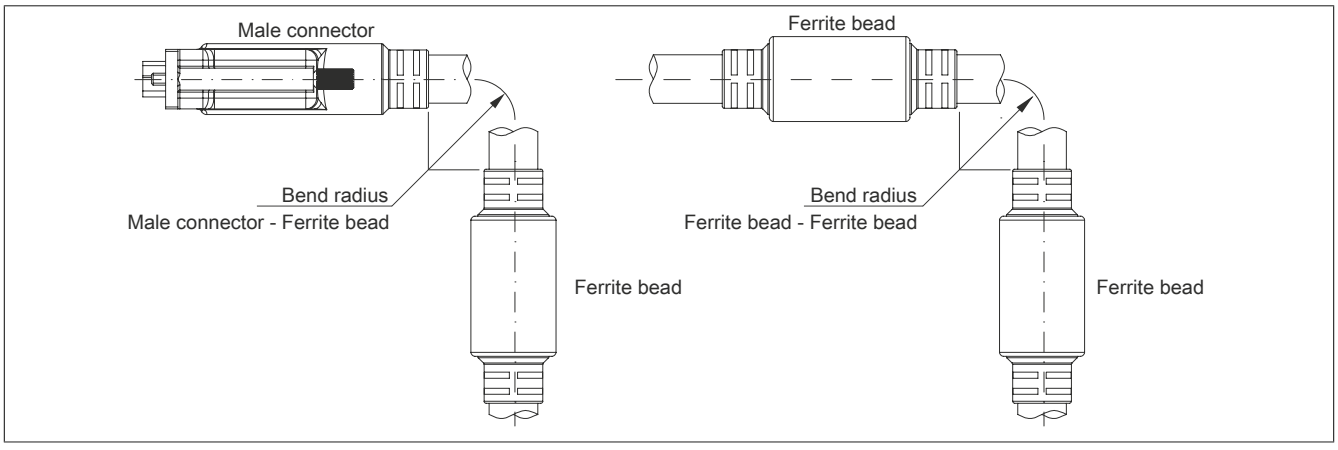


Figure 38: Bend radius specifications

6.3.4.1.5 Dimensions

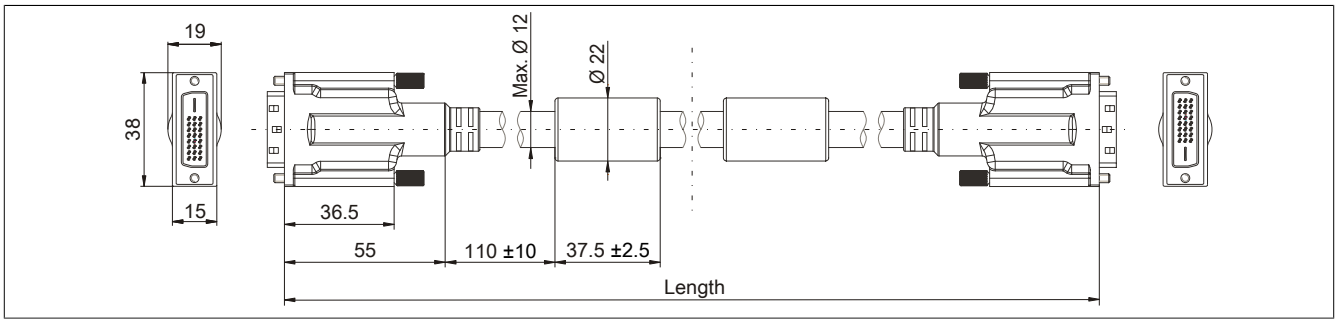


Figure 39: 5CASDL.0xxx-03 - Dimensions

6.3.4.1.6 Design

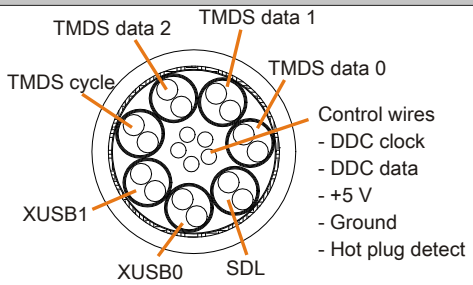
Element	Assignment	Cross section	
DVI	TMDS data 0	26 AWG	
	TMDS data 1	26 AWG	
	TMDS data 2	26 AWG	
	TMDS cycle	26 AWG	
USB	XUSB0	26 AWG	
	XUSB1	26 AWG	
Data	SDL	26 AWG	
Control wires	DDC cycle	24 AWG	
	DDC data	24 AWG	
	+5 V	24 AWG	
	Ground	24 AWG	
	Hot plug detect	24 AWG	

Table 60: 5CASDL.0xxx-03 SDL flex cables - Structure

6.3.4.1.7 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

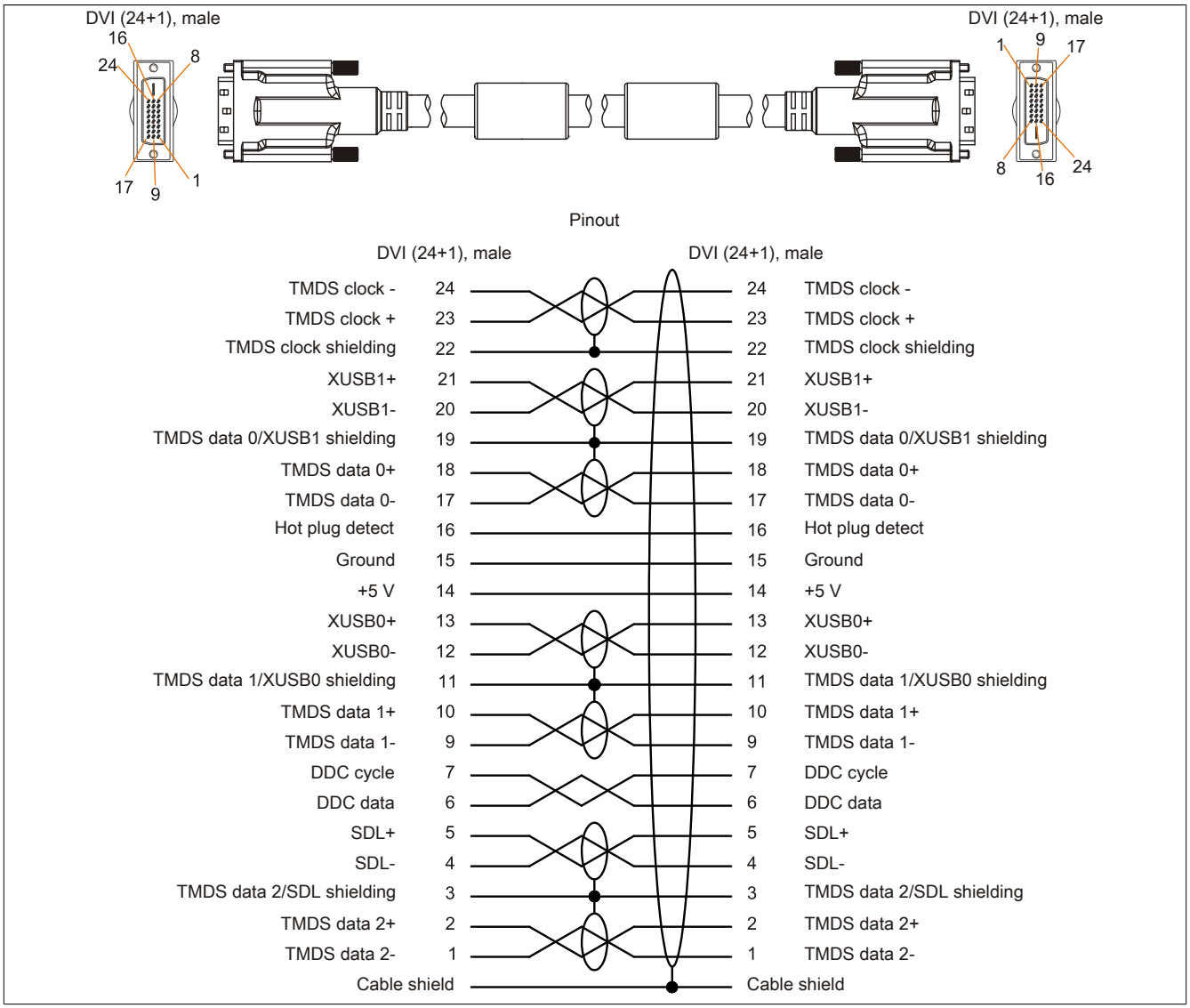


Figure 40: 5CASDL.0xxx-03 - Pinout

6.3.5 SDL flex cables with extender

6.3.5.1 5CASDL.0xx0-13

6.3.5.1.1 General information

5CASDL.0xx0-13 SDL flex cables with an extender are designed for use in both inflexible and flexible applications (e.g. swing arm systems).

Caution!

The cable is only permitted to be connected or disconnected when power is not applied.

6.3.5.1.2 Order data

Model number	Short description	Figure
	SDL flex cables	
5CASDL.0300-13	SDL flex cable with extender - 30 m	
5CASDL.0400-13	SDL flex cable with extender - 40 m	
5CASDL.0430-13	SDL flex cable with extender - 43 m	

Table 61: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Order data

6.3.5.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
General information			
Certification			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4		
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[1)]		
GOST-R	Yes		
Cable construction			
Wire cross section	24 AWG (control wires) 26 AWG (DVI, USB, data)		
Features	Silicone- and halogen-free		
Shield	Individual cable pairs, entire cable		
Complete shielding	Aluminum-clad foil and tinned copper braiding		
Outer sheathing			
Material	Special semi-glossy TMPU		
Color	Black		
Labeling	(B&R) SDL cable (UL) AWM 20236 80°C 30V E63216		
Connector			
Type	2x DVI-D (24+1), male		
Connection cycles	Min. 200		
Contacts	Gold-plated		
Mechanical protection	Metal cover with crimped strain relief		
Locating screw tightening torque	Max. 0.5 Nm		
Electrical characteristics			
Operating voltage	≤30 V		
Test voltage			
Wire/Wire	1 kV		
Wire/Shield	0.5 kV		
Wave impedance	100 ±10 Ω		
Conductor resistance			
24 AWG	≤95 Ω/km		
26 AWG	≤145 Ω/km		
Insulation resistance	>200 MΩ/km		

Table 62: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

Model number	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
Operating conditions			
EN 61131 pollution degree		Pollution degree 2	
Approbation		UL AWM 20236 80°C 30 V	
Flame-retardant		In accordance with UL758 (cable vertical flame test)	
Oil and hydrolysis resistance		In accordance with VDE 0282-10	
Environmental conditions			
Temperature			
Storage		-20 to 60°C	
Fixed installation		-20 to 60°C	
Flexible installation		-5 to 60°C	
Mechanical characteristics			
Dimensions			
Length	30 m ±280 mm	40 m ±380 mm	43 m ±410 mm
Diameter		Max. 12 mm	
Extender box			
Width		35 mm	
Length		125 mm	
Height		18.5 mm	
Bend radius			
Fixed installation		≥6x cable diameter (from male connector - ferrite bead) ≥10x cable diameter (from ferrite bead - ferrite bead)	
Flexible installation		≥15x cable diameter (from ferrite bead - ferrite bead)	
Flexibility		Flexible, valid for ferrite bead - ferrite bead (tested 300,000 cycles with 15x cable diameter, 4800 cycles/hour)	
Drag chain data			
Flex cycles		300,000	
Speed		4800 cycles/hour	
Bend radius		180 mm, 15x cable diameter	
Hub		460 mm	
Weight	Approx. 5430 g	Approx. 7200 g	Approx. 7790 g
Tension			
During operation		≤50 N	
During installation		≤400 N	

Table 62: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

6.3.5.1.4 Bend radius specifications

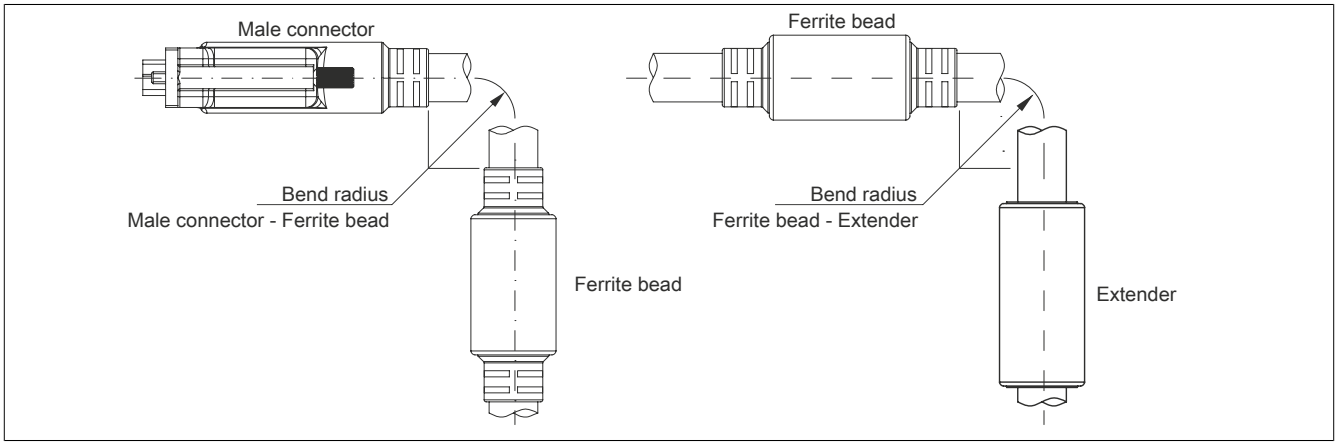


Figure 41: Bend radius specification with extender

6.3.5.1.5 Dimensions

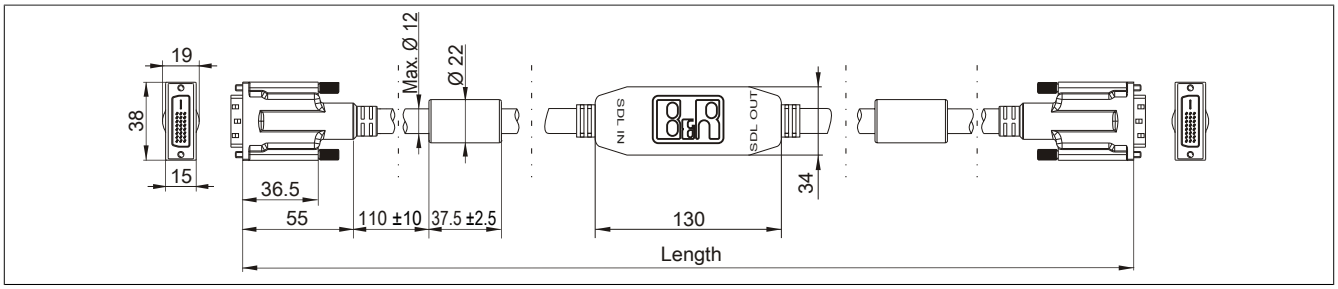


Figure 42: 5CASDL.0xx0-13 - Dimensions

6.3.5.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

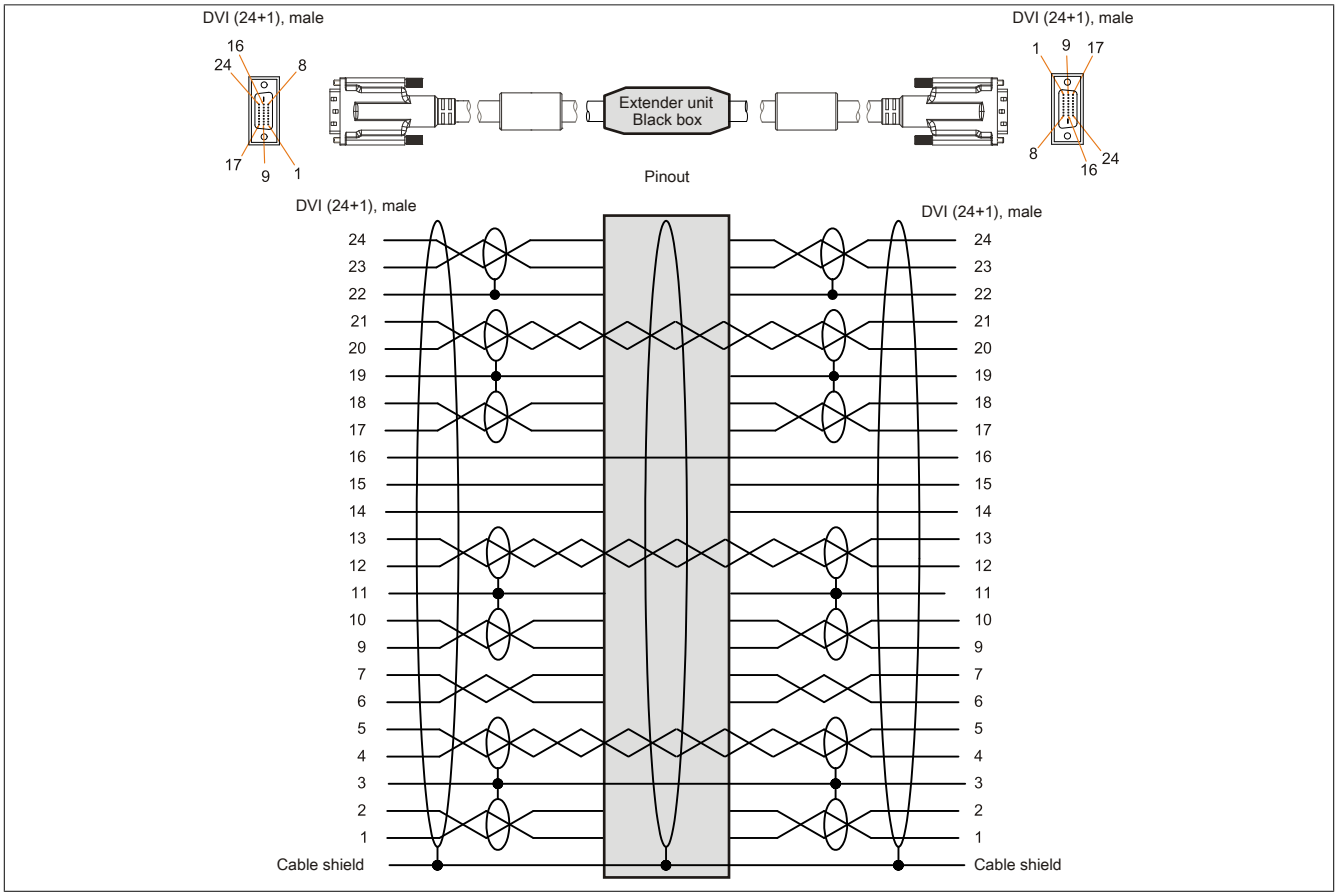


Figure 43: 5CASDL.0xx0-13 - Pinout

6.3.5.1.7 Cable connection

SDL flex cables with an extender must be connected between the B&R Industrial PC and the Automation Panel in the correct direction. The proper signal direction is indicated on the extender.

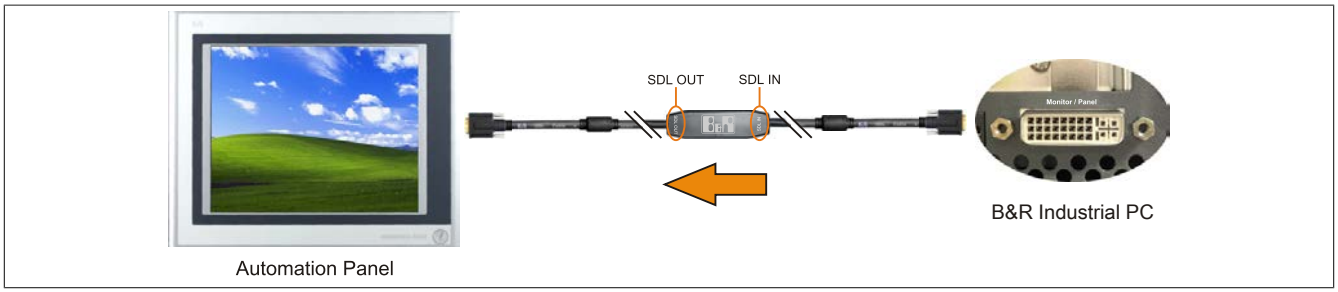


Figure 44: Example of the signal direction for an SDL flex cable with extender

6.3.6 SDL3/SDL4 cables

6.3.6.1 5CASD3.xxxx-00

6.3.6.1.1 General information

5CASD3.xxxx-00 SDL3/SLD4 cables are designed to transfer SDL3/SDL4 data and very easy to install. An RJ45 connector allows these cables to be connected in very narrow spaces, for example in swing arm shafts.

Caution!

The cable is only permitted to be connected or disconnected when power is not applied.

6.3.6.1.2 Order data

Model number	Short description	Figure
	SDL3 cables	
5CASD3.0030-00	SDL3 cable - 3 m	
5CASD3.0050-00	SDL3 cable - 5 m	
5CASD3.0100-00	SDL3 cable - 10 m	
5CASD3.0150-00	SDL3 cable - 15 m	
5CASD3.0200-00	SDL3 cable - 20 m	
5CASD3.0300-00	SDL3 cable - 30 m	
5CASD3.0500-00	SDL3 cable - 50 m	
5CASD3.1000-00	SDL3 cable - 100 m	

Table 63: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Order data

6.3.6.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	5CASD3. 0030-00	5CASD3. 0050-00	5CASD3. 0100-00	5CASD3. 0150-00	5CASD3. 0200-00	5CASD3. 0300-00	5CASD3. 0500-00	5CASD3. 1000-00
General information								
Certification								
CE	Yes							
UL	cULus E115267 Industrial control equipment							
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]							
Cable construction								
Wire cross section	4x 2x 26/7 AWG					4x 2x 23/1 AWG		
Features	Flame-resistant, halogen-free, lead-free							
Outer sheathing								
Material	Polyurethane (PUR)							
Color	Yellow, RAL 1021							
Labeling	HARTING INDUSTRIAL CABLE S/FTP CAT 6A PUR 4x2xAWG26/7					HARTING INDUSTRIAL INSTALLATION CABLE S/FTP CAT 7 PUR 4x 2x 23/1 AWG		
Lines								
Wire insulation	Polyethylene (PE)							
Wire colors	Green/White-green, orange/white-orange, blue/white-blue, brown/white-brown							
Shield	Aluminum foil and braided wire shield made of tinned copper wires							
Type	Unprotected copper wire, 4x 2x 26/7 AWG					Unprotected copper wire, 4x 2x 23/1 AWG		
Connector								
Type	2x RJ45, male							
Connection cycles	Min. 750							
Contacts	8							
Electrical characteristics [2)]								
Operating voltage	≤100 V					≤125 V		
Conductor resistance	≤290 Ω/km					≤75 Ω/km		
Wave impedance	100 ±5 Ω (at 100 MHz)							

Table 64: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

Model number	5CASD3. 0030-00	5CASD3. 0050-00	5CASD3. 0100-00	5CASD3. 0150-00	5CASD3. 0200-00	5CASD3. 0300-00	5CASD3. 0500-00	5CASD3. 1000-00
Transfer properties	Category 6A / Class EA up to 500 MHz in accordance with ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)					Category 7 / Class F up to 600 MHz in accordance with ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)		
Insulation resistance	≥500 MΩ/km					≥5 GΩ/km		
Operating conditions								
EN 61131 pollution degree	Pollution degree 2							
Flame-retardant	IEC 60332-1-2							
Oil and hydrolysis resistance	EN 60811-2-1 (90°C / 7x24 h)							
EN 60529 protection								
Cables	IP20							
RJ45 connector	IP20, only when connected properly							
Environmental conditions								
Temperature								
Storage	-40 to 70°C							
Fixed installation	-40 to 70°C							
Flexible installation	-40 to 70°C					-10 to 50°C		
Mechanical characteristics								
Dimensions								
Length	3 m	5 m	10 m	15 m	20 m	30 m	50 m	100 m
Diameter	6.7 mm					8.3 mm		
Bend radius								
Fixed installation	≥5x diameter					≥4x diameter		
Flexible installation	≥10x diameter					≥8x diameter		
Weight	250 g		500 g	700 g	950 g	2150 g	3500 g	6950 g
Tension								
During operation	≤70 N					≤110 N		
During installation	≤70 N					≤110 N		

Table 64: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) At an ambient temperature of 20°C.

6.3.6.1.4 Bend radius specifications

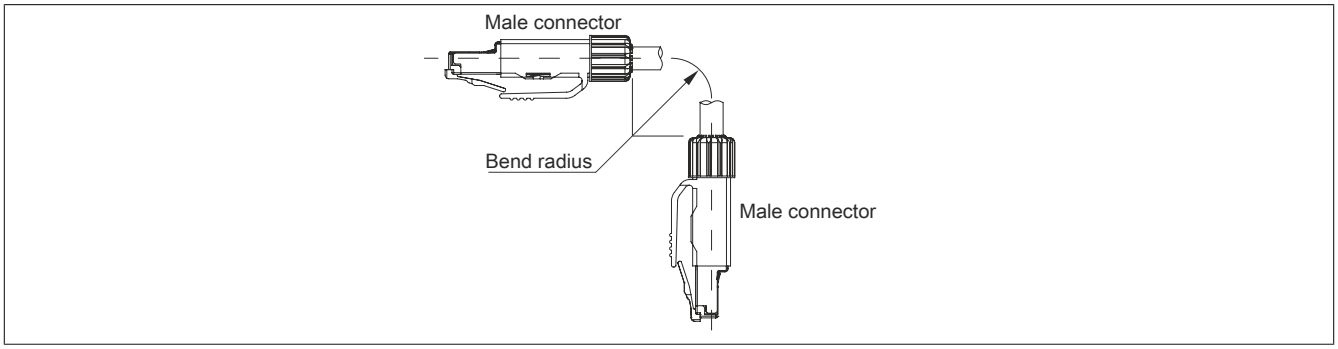


Figure 45: SDL3 - Bend radius specifications

6.3.6.1.5 Dimensions

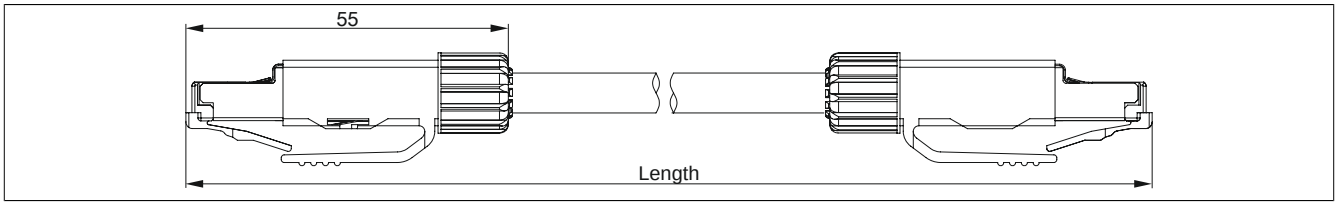


Figure 46: 5CASD3.xxxx-00 - Dimensions

6.3.6.1.6 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

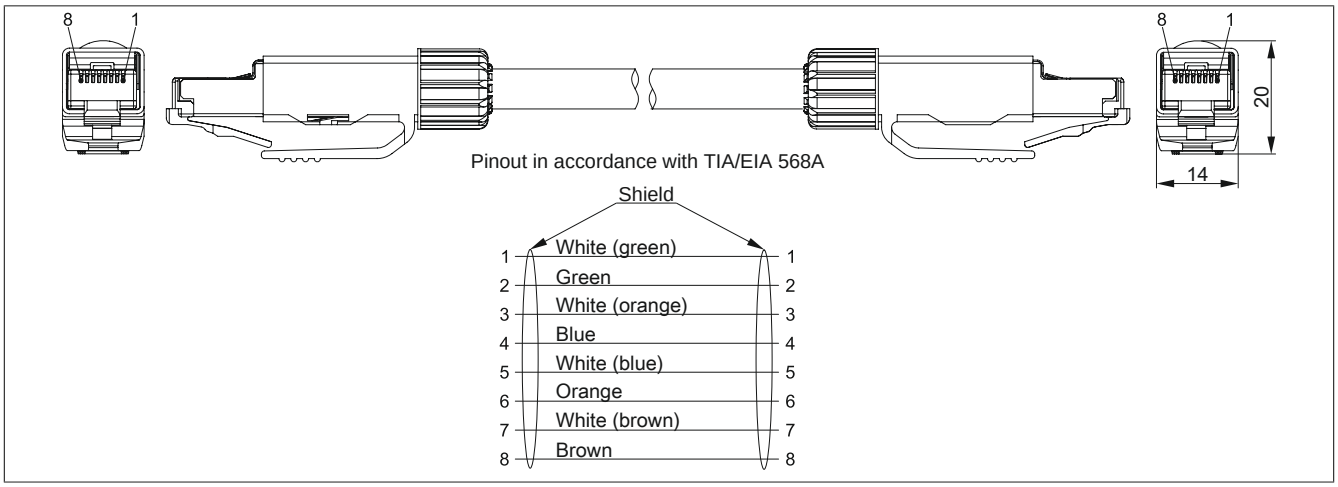


Figure 47: 5CASD3.xxxx-00 - Pinout

6.3.6.1.7 Cabling

The following information and figure apply when using a field-assembled cable that is not directly connected to a B&R device, but to an RJ45 network interface (e.g. patch panel).

Cables must meet category 6a (Cat6a) or category 7 (Cat7) requirements. Exceeding the maximum total length of 100 m is not permitted.

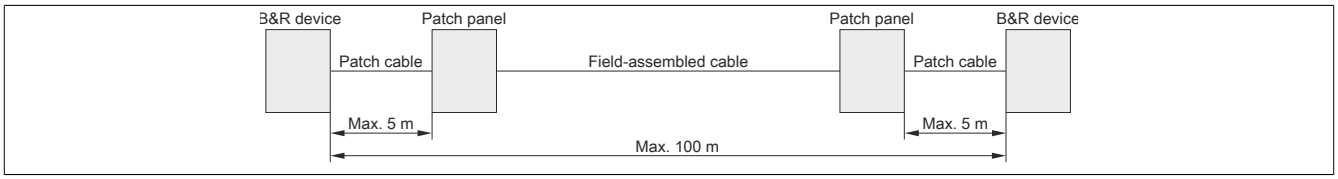


Figure 48: Cabling with a field-assembled cable

6.3.7 USB cables

6.3.7.1 5CAUSB.00xx-00

6.3.7.1.1 General information

USB cables are designed to achieve USB 2.0 transfer speeds.

6.3.7.1.2 Order data

Model number	Short description	Figure
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable - Type A - Type B connector - 1.8 m	
5CAUSB.0050-00	USB 2.0 connection cable - Type A - Type B connector - 5 m	

Table 65: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data

6.3.7.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	5CAUSB.0018-00	5CAUSB.0050-00
General information		
Certification		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[1)]	
GOST-R	Yes	
Cable construction		
Wire cross section	24, 28 AWG	
Shield	Entire cable	
Outer sheathing		
Color	Beige	
Connector		
Type	USB type A male and USB type B male	
Operating conditions		
EN 61131 pollution degree	Pollution degree 2	
Mechanical characteristics		
Dimensions		
Length	1.8 m ±30 mm	5 m ±50 mm
Diameter	Max. 5 mm	
Bend radius	Min. 100 mm	

Table 66: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification.

6.3.7.1.4 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

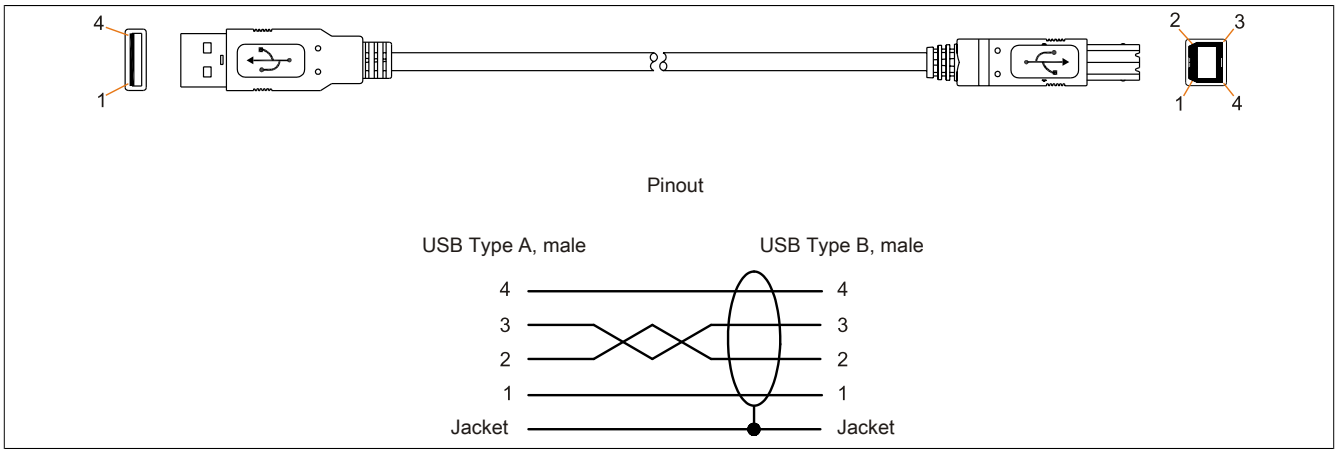


Figure 49: 5CAUSB.00xx-00 USB cables - Pinout

6.3.8 RS232 cables

6.3.8.1 9A0014.xx

6.3.8.1.1 General information

RS232 cables are used as extension cables between two RS232 interfaces.

6.3.8.1.2 Order data

Model number	Short description	Figure
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of display unit with touch screen, 1.8 m	
9A0014.05	RS232 extension cable for remote operation of display unit with touch screen, 5 m	
9A0014.10	RS232 extension cable for remote operation of display unit with touch screen, 10 m	

Table 67: 9A0014.02, 9A0014.05, 9A0014.10 - Order data

6.3.8.1.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate from those specified for the complete system. The data specifications for the complete system take precedence over those of individual components.

Model number	9A0014.02	9A0014.05	9A0014.10
General information			
Certification			
CE		Yes	
GOST-R	-	Yes	
Cable construction			
Wire cross section		26 AWG	
Shield		Entire cable	
Outer sheathing			
Color		Beige	
Connector			
Type		9-pin male/female DSUB connector	
Locating screw tightening torque		Max. 0.5 Nm	
Operating conditions			
Degree of pollution in accordance with EN 61131		Pollution degree 2	
Mechanical characteristics			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter		Max. 5 mm	
Bend radius		Min. 70 mm	

Table 68: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data

6.3.8.1.4 Cable pinout

Warning!

Field-assembled cables must be wired according to these specifications.

If a field-assembled cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

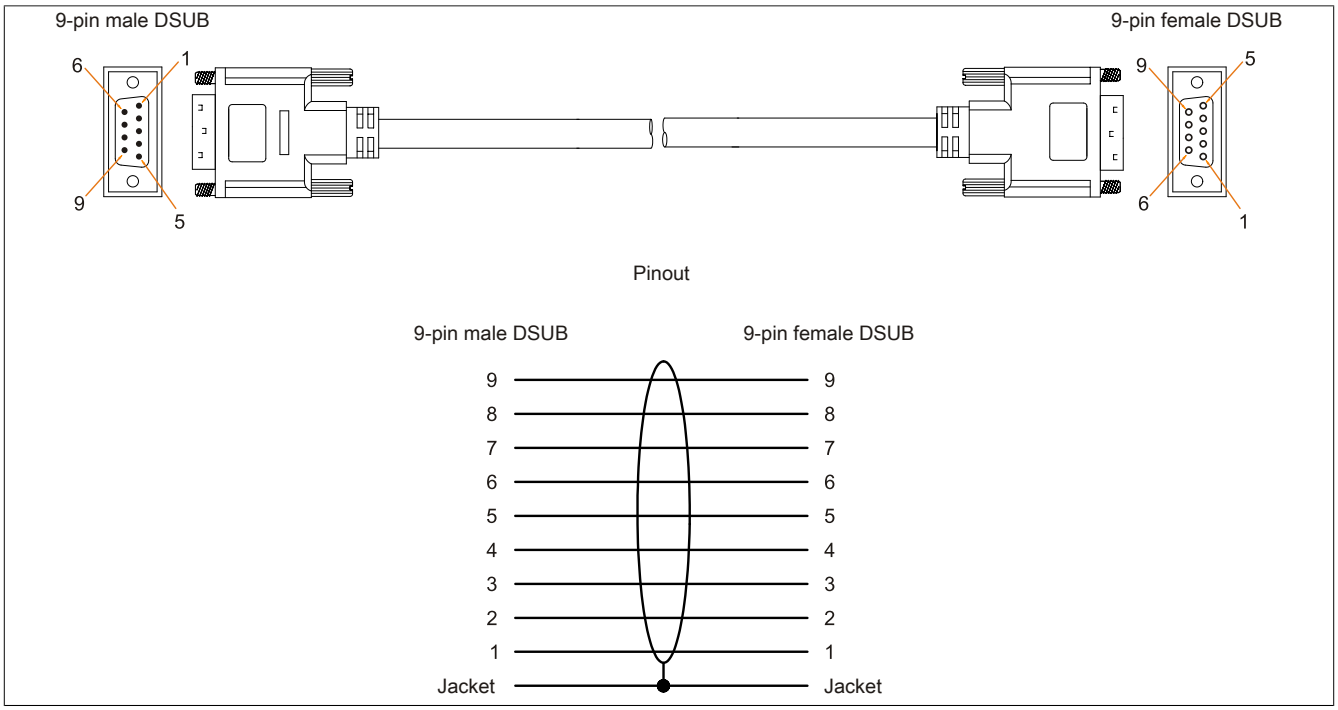


Figure 50: 9A0014.xx RS232 cables - Pinout

7 Maintenance and servicing

This chapter describes servicing / maintenance work that can be carried out by a qualified end user.

7.1 Cleaning

Danger!

The device is only permitted to be cleaned while switched off in order to prevent unintended functions from being triggered when handling the touch screen or pressing keys.

Use a moist cloth to clean this device. Only use water with detergent, a screen cleaning agent or alcohol (ethanol) to moisten the cloth. Apply the cleaning agent to the cloth beforehand; do not spray it directly on the device! Never use aggressive solvents, chemicals, scouring agents, pressurized air or steam jets.

Information:

Displays with a touch screen should be cleaned regularly.

7.2 Tips for extending the service life of the display

7.2.1 Backlight

The service life of the backlight is specified by its "half-brightness time". For example, a specified operating time of 50,000 hours means that the display would still retain 50% of its brightness after this time.

7.2.1.1 How can the service life of the backlight be extended?

- By setting the display brightness to the lowest value that is still comfortable for the eyes
- By using dark images
- By reducing the brightness by 50%, which can result in an approximately 50% increase in the half-brightness time.

7.2.2 Screen burn-in

Image persistence refers to the "burning in" of a static image on a display after being displayed for a prolonged period of time. Nevertheless, static images are not the only cause of screen burn-in. Screen burn-in is also referred to as burn-in effect, image retention, memory effect, memory sticking or ghost image.

There are basically 2 types:

- Area type: This type of screen burn-in is indicated by a dark gray image. The effect will disappear if the display is switched off for a long period of time.
- Line type: This type of screen burn-in can cause lasting damage.

7.2.2.1 What causes screen burn-in?

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

7.2.2.2 How can screen burn-in be avoided?

- By constantly changing between static and dynamic images
- By avoiding excessive brightness differences between foreground and background elements
- By using colors with similar brightness
- By using complementary colors in follow-up images
- By using a screensaver

7.3 Pixel errors

Information:

Displays may contain defective pixels (dead/stuck pixels) that result from the manufacturing process. These flaws are not grounds for reclamation or initiating a warranty claim.

Appendix A

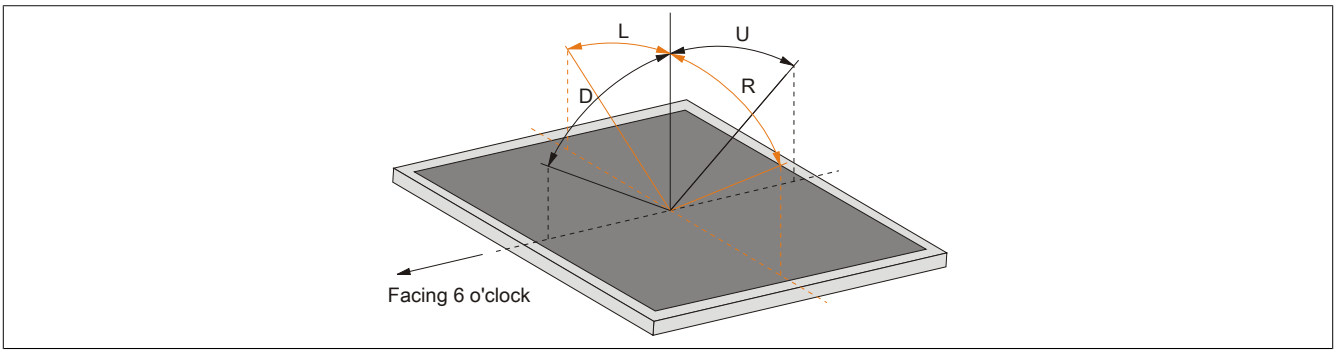
A.1 Abbreviations

Abbreviation	Stands for	Description
NC	Normally closed	Normally closed relay contact.
	Not connected	Used in pinout descriptions if a terminal or pin is not connected to a module.
ND	Not defined	In data tables, this stands for a value that has not been defined. This may be because a cable manufacturer does not provide certain technical data, for example.
NO	Normally open	Normally open relay contact.
TBD	To be defined	Used in technical data tables when certain information is not yet available. The value will be provided later.

Table 69: Abbreviations in this user's manual

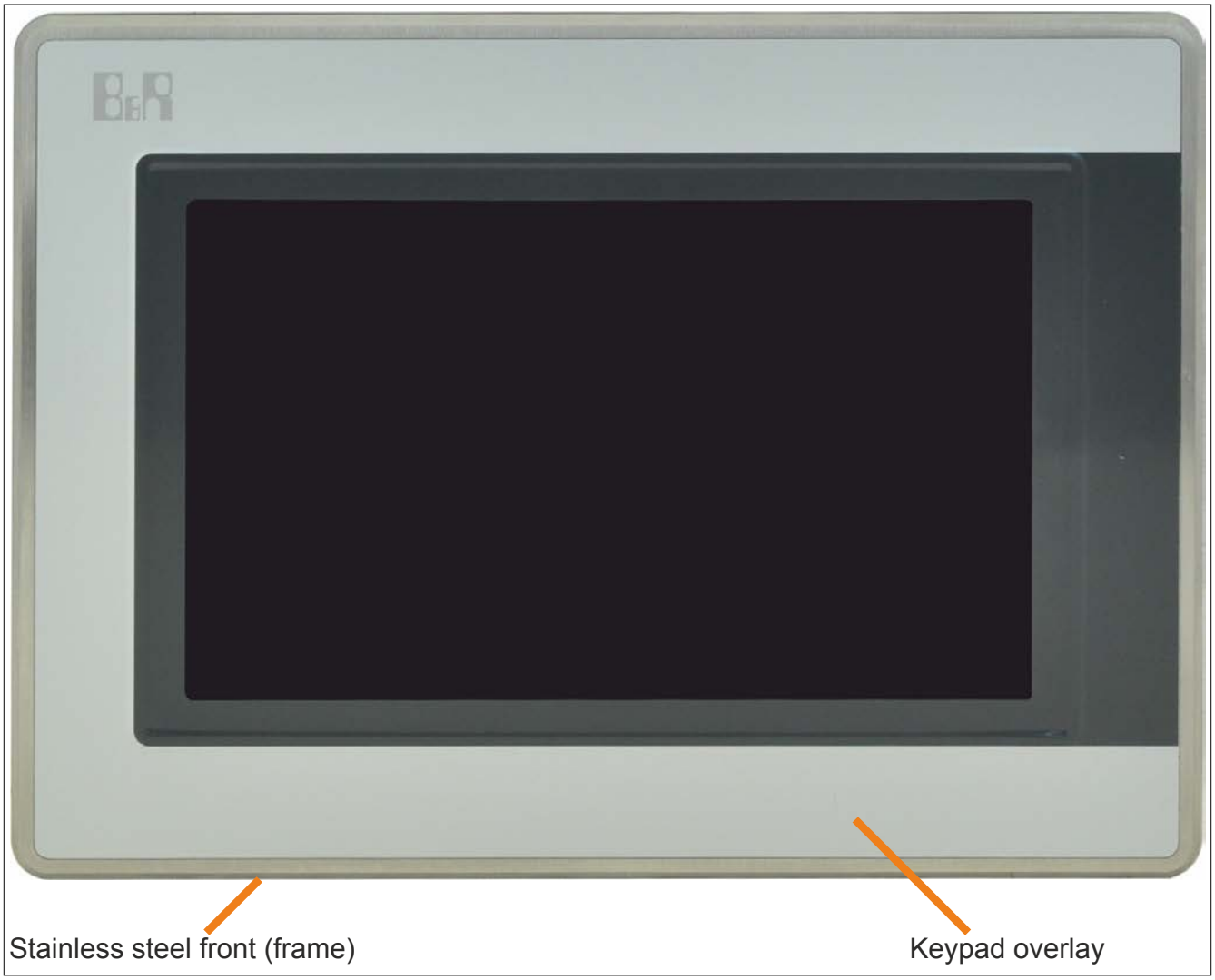
A.2 Viewing angles

Viewing angle specifications (R, L, U, D) for the display types are listed in the technical data for each device.



A.3 Chemical resistance

Display units feature the Autotex panel overlay:



A.3.1 Autotex panel overlay (polyester)

Unless otherwise specified, the panel overlay conforms to DIN 42115 (Part 2). This means it is resistant to exposure to the following chemicals for a 24-hour period with no visible signs of damage:

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

The panel overlay conforms to DIN 42115 Part 2 for exposure to glacial acetic acid for less than one hour without visible damage.

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D

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P

R

S

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W