Automation Panel 9x3

User's manual

Version: **2.10 (August 2024)**
Order no.: **MAAP9x3-ENG**

Translation of the original documentation

Publishing information

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1 Introduction

Information:

B&R makes every effort to keep documents as current as possible. The most current versions are available for download on the B&R website (www.br-automation.com).

1.1 Manual history

Version	Date	Comment[1)]
2.10	August 2024	• Updated "Order number key" on page 15. • Added link module "5DLDPO.1001-00". • Added Windows 10 2021 LTSC. • Added Linux for B&R 12. • Updated section "Touch screen" in appendix C.
2.01	September 2022	Updated document. • Added section "Order number key", see "Order number key" on page 15. • Updated connection options, see "DVI operation" on page 20. • Updated technical data, see section "Individual components" on page 49. • Updated grounding concept of functional ground, see "Grounding concept - Functional ground" on page 78. • Updated section "International and national certifications" on page 101.
2.00	April 2021	Updated document, editorial changes. • Updated safety guidelines, see "General safety guidelines" on page 10. • Updated grounding concept of functional ground, see "Grounding concept - Functional ground" on page 78. • Updated technical data, see section "Individual components" on page 49. • Updated mechanical properties, see "Dimensions" on page 28. • Cables and USB mass storage device are described in their own documentation starting with this version. • Shorted manual history. Updated the following sections: • "General limitations" on page 24
1.26	2018-04-19	• Updated chapter 4 "Technical data". • Updated the following sections: ◦ "Publishing information" on page ◦ "Automation Panel 9x3 - Installation" on page 75 ◦ "General information before switching on the device" on page 80 ◦ "Touch screen calibration" on page ◦ "Display brightness control" on page 83 ◦ "5MMUSB.xxxx-01" on page ◦ "SDL3/SDL4 cables" on page ◦ "Chemical resistance" on page 111 ◦ "DNV certification " on page 102 • Updated the following sections: ◦ "Cybersecurity disclaimer for products" on page 13 ◦ "Third-party updates" on page ◦ "Administrator accounts" on page ◦ "5DLSD4.1001-00 SDL4 receiver - Device interfaces" on page ◦ "5DLSD4.1001-00" on page 71 ◦ "Important information concerning installation/commissioning" on page ◦ "5MMUSB.032G-02" on page
1.25	2017-01-13	• Updated chapter "Standards and certifications". • Updated section "Multi-touch drivers" on page 84. • Updated section "+24 VDC power supply" on page 37. • Updated data in sections "Environmental properties", "Electrical properties" and Touch screen calibration. • Updated technical data, operating conditions and temperature/humidity diagrams for "Panels" on page 49. • Updated SDL cable 5CASD3.0030-00, see SDL3 cables. • Updated Line filter. • Renamed "display units" to "panels". • Updated section Touch screen with Touch screen (multi-touch generation 2) and Touch screen (multi-touch generation 3).

Version	Date	Comment[1)]
1.20	2016-01-13	• Updated section "DNV certification " on page 102 and GL certification for technical data of certain individual components. • Updated "Line filter" on page 99.

1) Editorial corrections are not listed.

1.2 Information about this document

This document is not intended for end customers! The safety guidelines required for end customers must be incorporated into the operating instructions for end customers in the respective national language by the machine manufacturer or system provider.

1.2.1 Organization of notices

Safety notices

Contain **only** information that warns of dangerous functions or situations.

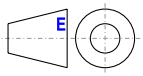
Signal word	Description
Danger!	Failure to observe these safety guidelines and notices will result in death, severe injury or substantial damage to property.
Warning!	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
Caution!	Failure to observe these safety guidelines and notices can result in minor injury or damage to property.
Notice!	Failure to observe these safety guidelines and notices can result in damage to property.

General notices

Contain **useful** information for users and instructions for avoiding malfunctions.

Signal word	Description
Information:	Useful information, application tips and instructions for avoiding malfunctions.

1.2.2 Guidelines



European dimension standards apply to all dimension diagrams.

All dimensions, specifications in dimension diagrams and associated tables are in millimeters [mm].

Unless otherwise specified, the following general tolerances apply:

Nominal dimension range	General tolerance per DIN ISO 2768 medium
Up to 6 mm	±0.1 mm
Over 6 to 30 mm	±0.2 mm
Over 30 to 120 mm	±0.3 mm
Over 120 to 400 mm	±0.5 mm
Over 400 to 1000 mm	±0.8 mm

2 General safety guidelines

2.1 Intended use

In all cases, applicable national and international standards, regulations and safety measures must be taken into account and observed!

The B&R products described in this manual are intended for use in industry and industrial applications.
The intended use includes control, operation, monitoring, drive and HMI tasks as part of automation processes in machines and systems.

B&R products are only permitted to be used in their original condition. Modifications and extensions are only permitted if they are described in this manual.

B&R excludes liability for damage of any kind resulting from the use of B&R products in any intended way.

B&R products have not been designed, developed and manufactured for use that involves fatal risks or hazards that could result in death, injury, serious physical harm or other loss without the assurance of exceptionally stringent safety precautions.

B&R products are explicitly not intended for use in the following applications:

- Monitoring and control of thermonuclear processes
- Weapon systems control
- Flight and traffic control systems for passenger and freight transport
- Health monitoring and life support systems

2.2 Protection against electrostatic discharge

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

2.2.1 Packaging

- **Electrical assemblies with housing:**
  Do not require special ESD packaging but must be handled properly (see "Electrical assemblies with housing").
- **Electrical assemblies without housing:**
  Are protected by ESD-suitable packaging.

2.2.2 Regulations for proper ESD handling

Electrical assemblies with housing

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

Electrical assemblies without housing

The following applies in addition to "Electrical assemblies with housing":

- All persons handling electrical assemblies and devices in which electrical assemblies are installed must be grounded.
- Assemblies are only permitted to be touched on the narrow sides or front plate.
- Always place assemblies on suitable surfaces (ESD packaging, conductive foam, etc.). Metallic surfaces are not suitable surfaces!
- Assemblies must not be subjected to electrostatic discharges (e.g. due to charged plastics).
- A minimum distance of 10 cm from monitors or television sets must be maintained.
- Measuring instruments and devices must be grounded.
- Test probes of floating potential measuring instruments must be discharged briefly on suitable grounded surfaces before measurement.

Individual components

- ESD protective measures for individual components are implemented throughout B&R (conductive floors, shoes, wrist straps, etc.).
- The increased ESD protective measures for individual components are not required for handling B&R products at customer locations.

2.3 Regulations and measures

Electronic devices are generally not failsafe. If the programmable logic controller, operating or control device or uninterruptible power supply fails, the user is responsible for ensuring that connected devices (such as motors) are brought to a safe state.

When using programmable logic controllers as well as when using operating and monitoring devices as control systems in conjunction with a Soft PLC (e.g. B&R Automation Runtime or similar product) or Slot PLC (e.g. B&R LS251 or similar product), the safety measures that apply to industrial controllers (protection by protective equipment such as emergency stops) must be observed in accordance with applicable national and international regulations. This also applies to all other connected devices, such as drives.

All work such as installation, commissioning and servicing are only permitted to be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, installation, assembly, commissioning and operation of the product and have the appropriate qualifications for their job (e.g. IEC 60364). National accident prevention regulations must be observed.
The safety guidelines, information about connection conditions (nameplate and documentation) and limit values specified in the technical data must be read carefully before installation and commissioning and must be strictly observed.

2.4 Transport and storage

During transport and storage, devices must be protected against undue stress (mechanical stress, temperature, humidity, aggressive atmosphere).

2.5 Installation

- The devices are not ready for use and must be installed and wired according to the requirements of this documentation in order to comply with EMC limit values.
- Installation must be carried out according to the documentation using suitable equipment and tools.
- Devices are only permitted to be installed in a voltage-free state and by qualified personnel. The control cabinet must first be disconnected from the power supply and secured against being switched on again.
- General safety regulations and national accident prevention regulations must be observed.
- The electrical installation must be carried out in accordance with relevant regulations (e.g. line cross section, fuse protection, protective ground connection).

2.6 Operation

2.6.1 Protection against contact with electrical parts

In order to operate programmable logic controllers, operating and monitoring devices and uninterruptible power supplies, it is necessary for certain components to carry dangerous voltages over 42 VDC. Touching one of these components can result in a life-threatening electric shock. There is a risk of death, serious injury or damage to property.

Before switching on programmable logic controllers, operating and monitoring devices and uninterruptible power supplies, it must be ensured that the housing is properly connected to ground potential (PE rail). Ground connections must also be made if the operating and monitoring device and uninterruptible power supply are only connected for testing purposes or only operated for a short time!

Before switching on, live parts must be securely covered. All covers must be kept closed during operation.

2.6.2 Ambient conditions - Dust, moisture, aggressive gases

The use of operating and monitoring devices (e.g. industrial PCs, Power Panels, Mobile Panels) and uninterruptible power supplies in dusty environments must be avoided. This can otherwise result in dust deposits that affect the functionality of the device, especially in systems with active cooling (fans), which may no longer ensure sufficient cooling.

The presence of aggressive gases in the environment can also result in malfunctions. In combination with high temperature and relative humidity, aggressive gases – for example with sulfur, nitrogen and chlorine components – trigger chemical processes that can very quickly impair or damage electronic components. Blackened copper surfaces and cable ends in existing installations are indicators of aggressive gases.

When operated in rooms with dust and condensation that can endanger functionality, operating and monitoring devices such as Automation Panels or Power Panels are protected on the front against the ingress of dust and moisture when installed correctly (e.g. cutout installation). The back of all devices must be protected against the ingress of dust and moisture, however, or the dust deposits must be removed at suitable intervals.

2.6.3 Programs, viruses and malicious programs

Any data exchange or installation of software using data storage media (e.g. floppy disk, CD-ROM, USB flash drive) or via networks or the Internet poses a potential threat to the system. It is the direct responsibility of the user to avert these dangers and to take appropriate measures such as virus protection programs and firewalls to protect against them and to use only software from trustworthy sources.

2.7 Cybersecurity disclaimer for products

B&R products communicate via a network interface and were developed for secure connection with internal and, if necessary, other networks such as the Internet.

Information:

In the following, B&R products are referred to as "product" and all types of networks (e.g. internal networks and the Internet) are referred to as "network".

It is the sole responsibility of the customer to establish and continuously ensure a secure connection between the product and the network. In addition, appropriate security measures must be implemented and maintained to protect the product and entire network from any security breaches, unauthorized access, interference, digital intrusion, data leakage and/or theft of data or information.

B&R Industrial Automation GmbH and its subsidiaries are not liable for damages and/or losses in connection with security breaches, unauthorized access, interference, digital intrusion, data leakage and/or theft of data or information.

The aforementioned appropriate security measures include, for example:

- Segmentation of the network (e.g. separation of the IT network from the control network[1)])
- Use of firewalls
- Use of authentication mechanisms
- Encryption of data
- Use of anti-malware software

Before B&R releases products or updates, they are subjected to appropriate functional testing. Independently of this, we recommend that our customers develop their own test processes in order to be able to check the effects of changes in advance. Such changes include, for example:

- Installation of product updates
- Significant system modifications such as configuration changes
- Deployment of updates or patches for third-party software (non-B&R software)
- Hardware replacement

These tests should ensure that implemented security measures remain effective and that systems in the customer's environment behave as expected.

1) The term "control network" refers to computer networks used to connect control systems. The control network can be divided into zones, and there can be several separate control networks within a company or site. The term "control systems" refers to all types of B&R products such as controllers (e.g. X20), HMI systems (e.g. Power Panel T30), process control systems (e.g. APROL) and supporting systems such as engineering workstations with Automation Studio.

3 System overview

3.1 About this user's manual

This user's manual contains all relevant information about an operational Automation Panel 9x3 cabinet-mounted device.

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

3.2 Description of individual modules

3.2.1 AP9x3 panels

AP9x3 panels form the basis for the Automation Panel 9x3, Panel PC 900, Panel PC 2100, Panel PC 2200 and Panel PC 3100 system families. They consist of a display and touch screen. Different display diagonals and touch screen technologies are available. The panels are installed using retaining clips.

Single-touch panels start with order number 5AP923.xxxx-xx; multi-touch panels start with order number 5AP933.xxxx-xx.

The panels can only be operated as a complete system in combination with a link module or Panel PC.

3.2.2 Link modules

Link modules have various graphics interfaces and connections. An Automation Panel is put together by installing a link module onto a panel.

A link module cannot be operated without a panel.

3.3 Design/Configuration

The following individual components are required for operation as an Automation Panel 9x3:

- Panel
- Link module

Configuration						
Panels						Select 1
		Diagonal	**Resolution**	**Touch screen**	**Keys**	**Format**
	**Automation Panel 923**					
	5AP923.1215-00	12.1"	XGA	Single-touch	No	Landscape
	5AP923.1505-00	15.0"	XGA	Single-touch	No	Landscape
	5AP923.1906-00	19.0"	SXGA	Single-touch	No	Landscape
	**Automation Panel 933**					
	5AP933.156B-00	15.6"	HD	Multi-touch	No	Landscape
	5AP933.185B-00	18.5"	HD	Multi-touch	No	Landscape
	5AP933.215C-00	21.5"	FHD	Multi-touch	No	Landscape
	5AP933.240C-00	24.0"	FHD	Multi-touch	No	Landscape
Link modules						Select 1
	5DLDPO.1001-00 DP receiver [1)] 5DLSDL.1001-00 SDL/DVI receiver 5DLSD3.1001-00 SDL3 receiver 5DLSD4.1001-00 SDL4 receiver					
Terminal blocks						Select 1
	**Power supply connectors** 0TB103.9 0TB103.91					

1) Only in conjunction with a multi-touch device.

3.3.1 Order number key

Information:

A current order number key is available on the B&R website for easy identification of the device configuration:

Home > Downloads > Industrial PCs and panels > Automation Panel 9x3

3.4 Overview

Order number	Short description	Page
	Accessories	
0TB103.9	Connector 24 VDC - 3-pin, female - Screw clamp terminal block 3.31 mm²	98
0TB103.91	Connector 24 VDC - 3-pin, female - Cage clamp terminal block 3.31 mm²	98
5AC804.MFLT-00	Line filter	99
5SWUTI.0001-000	HMI Service Center USB flash drive - Hardware diagnostic software - For APC910/PPC900 - For PPC1200 - For APC2100/PPC2100 - For APC2200/PPC2200 - For APC3100/PPC3100 - For APC mobile - For AP800/AP900 - For AP9x3/AP9xD - For AP1000/AP5000	94
	Hypervisor	
1TC4700.00	License for B&R Hypervisor (TC). One license per target system is required. This license is supported starting with version 4.9.	85
	Link modules	
5DLDPO.1001-00	Automation Panel link module - DisplayPort receiver - For Automation Panel 933/1130 - For Automation Panel 5130 - For Automation Panel 5230 (only with 5ACCKP00.xxxx-000)	65
5DLSD3.1001-00	Automation Panel link module - SDL3 receiver - For Automation Panel 923/933/1000 - For Automation Panel 5000	69
5DLSD4.1001-00	Automation Panel link module - SDL4 receiver - For Automation Panel 923/933/1000 - For Automation Panel 5000	71
5DLSDL.1001-00	Automation Panel link module - SDL/DVI receiver - For Automation Panel 923/933/1000 - For Automation Panel 5000	67
	Other	
5ACCRHMI.0006-000	HMI installation tool for control cabinet - 1x torque wrench 0.4 - 2.0 Nm - 1x hex head bit 2.5, length 89 mm - 1x hex head bit 3.0, length 89 mm - 1x hex head bit 5.0, length 89 mm - 1x Torx 10 bit, length 90 mm - 1x Torx 20 bit, length 89 mm	97
	Panels	
5AP923.1215-00	Automation Panel 12.1" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	49
5AP923.1505-00	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	51
5AP923.1906-00	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	53
5AP933.156B-00	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	56
5AP933.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	58
5AP933.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	60
5AP933.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	62
	Runtime	
1TC4601.06-5	License for Automation Runtime Embedded (TC). One license per target system is required. This license is supported starting with version 4.9.	85
	Technology Guard	
0TG1000.01	Technology Guard (MSD)	85
0TG1000.02	Technology Guard (HID)	85
0TGF016.01	Technology Guard (MSD) with integrated flash drive, 16 GB (MLC)	85
1TG4601.06-5	Automation Runtime Embedded, TG license	85
1TG4601.06-T	Automation Runtime Embedded Terminal TG license	85
1TG4700.00	B&R Hypervisor	85

4 Technical data

4.1 Complete system

4.1.1 Connection options

The Automation Panel can be connected to a B&R industrial PC in SDL, DVI, SDL3, SDL4 and DP mode. The connection options described below provide an overview of the operating modes and possible limitations.

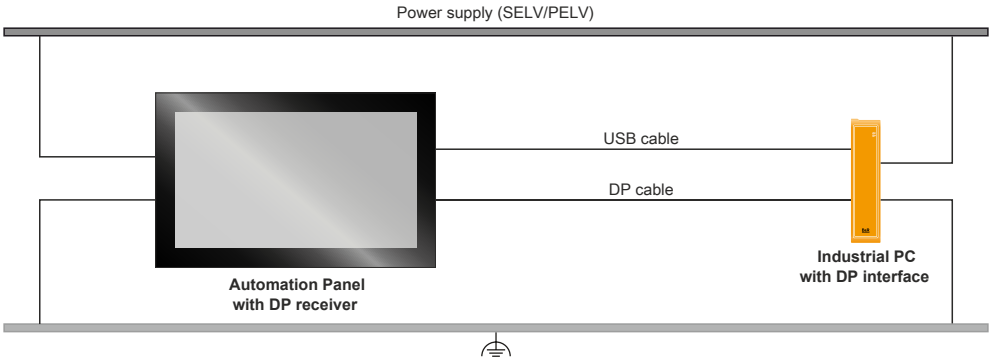
4.1.1.1 DP operation

DisplayPort transfers all communication channels between the B&R industrial PC and monitor/panel via a DisplayPort cable and a USB cable. This means that widely used standard components can be used.

4.1.1.1.1 Automation Panel with DP receiver

The display device can be installed up to 7.5 m away from the B&R industrial PC. USB 2.0 is also transferred over this distance. External adapter modules are not required. A monitor/panel with DP interface or an Automation Panel with DP receiver can be used as a display device.

The brightness of the display can be adjusted via the on-screen display (OSD).



Availability of the interfaces on the Automation Panel with DP receiver:

DP interface (In)	✓	24 VDC power supply	✓
USB	✓ USB 2.0 (up to 2x)	Grounding	✓

Maximum cable length:

- 7.5 m

Requirements

- Automation Panel with DP receiver
- Industrial PC with DP interface (onboard or IF option)
- DP and USB type A/B cable

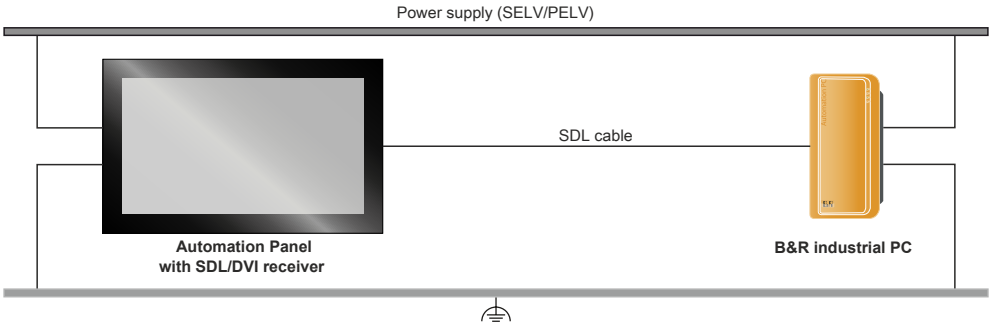
4.1.1.2 SDL operation

4.1.1.2.1 SDL operation without USB cable (mode 1)

With this connection option, all communication between the Automation Panel and B&R industrial PC takes place via a single SDL cable.

In addition to the display data, information from the touch screen, matrix keys, LEDs and service/diagnostic data is transferred. The Automation Panel can be installed up to 40 m away from the B&R industrial PC. USB 1.1 is also transferred over this distance and fully integrated into SDL. External adapter modules are not required.

The brightness of the display can be set via the ADI Control Center, for example.



Availability of the 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 interface for touch screen	x	Grounding	✓		

Maximum cable length: 40 m

Requirements

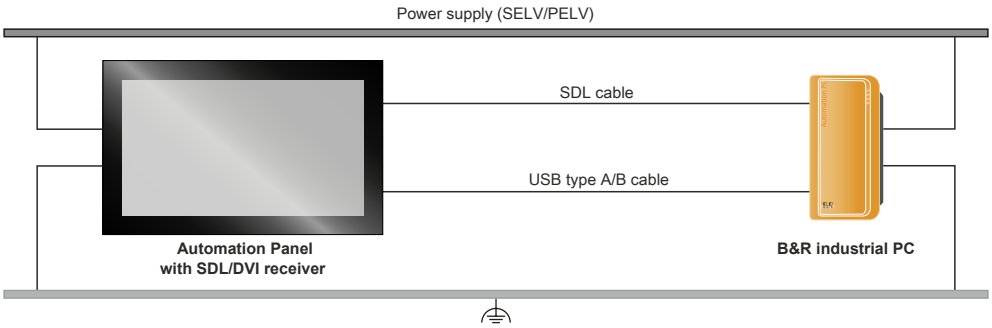
- Automation Panel with SDL/DVI receiver
- B&R industrial PC with SDL interface
- SDL cable

4.1.1.2.2 SDL operation with USB cable (mode 2)

With this connection option, communication between the Automation Panel and B&R industrial PC takes place via an SDL cable that is connected to interface "Panel In" and a USB type A/B cable that is connected to interface "USB In".

Display data as well as information from the resistive touch screen keys, matrix keys, LEDs and service/diagnostic data is transferred via the SDL cable. The touch screen data from the multi-touch screen is transferred via the USB type A/B cable. The Automation Panel can be installed up to 5 m (USB specification) away from the B&R industrial PC. USB 2.0 can be transferred over this distance via the USB type A/B cable. External adapter modules are not required.

The brightness of the display can be set via the ADI Control Center, for example.



Availability of the 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 interface for touch screen	x	Grounding	✓		

Maximum cable length: 5 m

Requirements

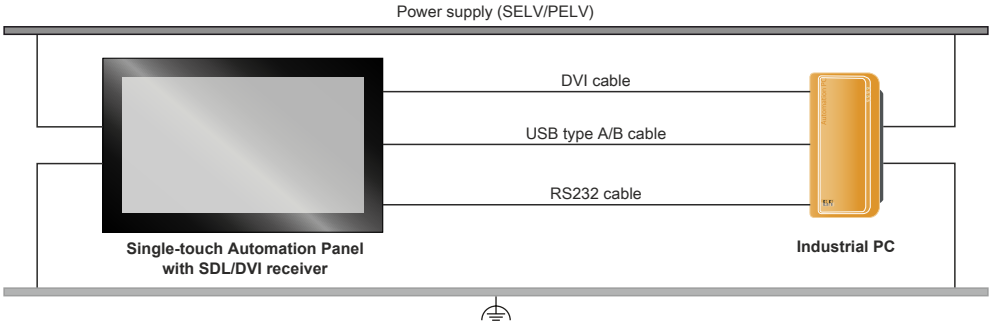
- Automation Panel with SDL/DVI receiver
- B&R industrial PC with SDL interface
- SDL cable, USB type A/B cable

4.1.1.3 DVI operation

In DVI operation, all signals needed to operate the Automation Panel are transferred via a separate cable. The brightness of the display can be set using the brightness buttons.

4.1.1.3.1 DVI operation with single-touch Automation Panel

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



Availability of the 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 interface for touch screen	✓	Grounding	✓		

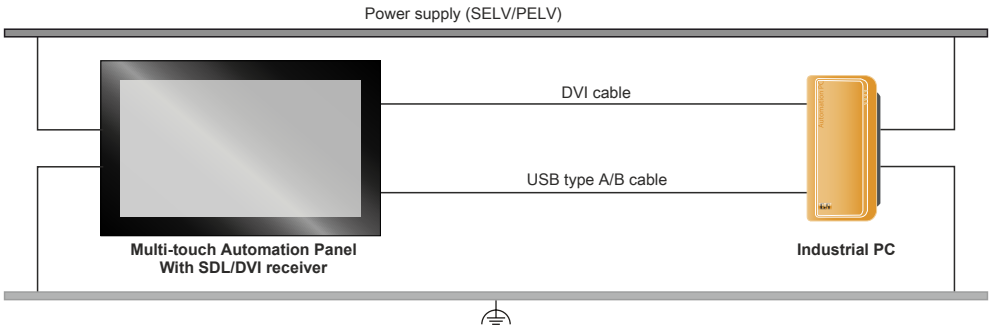
Maximum cable length: 5 m

Requirements

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

4.1.1.3.2 DVI operation with multi-touch Automation Panel

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



Availability of the 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 interface for touch screen	x	Grounding	✓		

Maximum cable length: 5 m

Requirements

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

4.1.1.3.3 General limitations/characteristics

- Key and LED data is not transferred.
- Data from operating elements is not transferred.
- Service and diagnostic data is not transferred.
- The maximum cable length is limited to 5 m.
- Upgrading the firmware of Automation Panels is not possible.

4.1.1.4 SDL3 operation

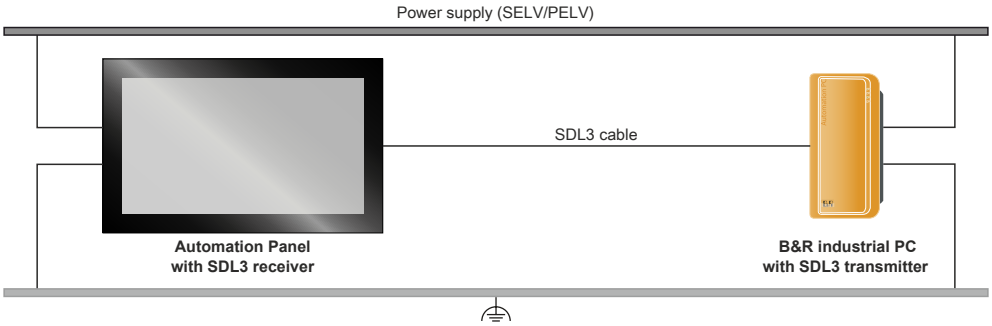
Smart Display Link 3 (SDL3) technology transfers all communication channels between a B&R industrial PC and panel up to 100 m over a standard Ethernet cable (min. Cat 6a). An RJ45 connector is used for the device connection, which is ideal for confined spaces in feed-throughs and swing arm systems.

4.1.1.4.1 SDL3 operation with SDL3 transmitter

In SDL3 operation with an SDL3 transmitter in the B&R industrial PC, all communication between the Automation Panel and B&R industrial PC takes place via a single SDL3 cable.

In addition to the display data, information from the touch screen, matrix keys, LEDs and service/diagnostic data is transferred. The Automation Panel can be installed up to 100 m away from the B&R industrial PC. USB 2.0 is also transferred over this distance and fully integrated into SDL3. External adapter modules are not required.

The brightness of the display can be set via the ADI Control Center.



Availability of interfaces on Automation Panels with an SDL3 receiver:

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

Maximum cable length for SDL3: 100 m

Requirements

- Automation Panel with SDL3 receiver
- B&R industrial PC with SDL3 interface
- SDL3/SDL4 cable

4.1.1.4.2 General limitations/characteristics

- USB 2.0 transfer is limited to 30 Mbit/s with SDL3.
- A display is always emulated by the SDL3 transmitter using EDID data and hot plug detection, so DVI-compatible operation is possible. For this reason, the following behavior may occur during operation with multiple displays. In the operating system, a connected panel is reported by the video driver even in the following situations:
  - No SDL3/SDL4 cable is connected.
  - There is no connection established yet between the SDL3 link module and SDL3 transmitter.

  This behavior can be avoided by appropriate configuration in BIOS or via the graphics driver.

4.1.1.5 SDL4 operation

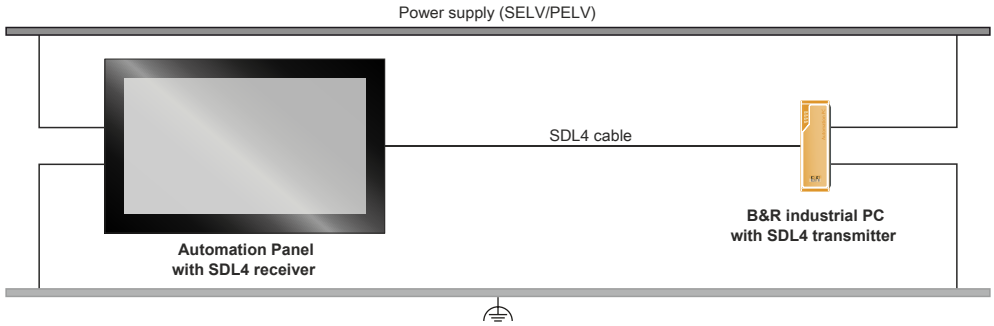
Smart Display Link 4 (SDL4) technology transfers all communication channels between a B&R industrial PC and panel up to 100 m over a standard Ethernet cable (min. Cat 6a). An RJ45 connector is used for the device connection, which is ideal for confined spaces in feed-throughs and swing arm systems.

4.1.1.5.1 SDL4 operation with SDL4 transmitter

In SDL4 operation with an SDL4 transmitter in the B&R industrial PC, all communication between the Automation Panel and B&R industrial PC takes place via a single SDL4 cable.

In addition to the display data, information from the touch screen, matrix keys, LEDs and service/diagnostic data is transferred. The Automation Panel can be installed up to 100 m away from the B&R industrial PC. USB 2.0 is also transferred over this distance and fully integrated into SDL4. External adapter modules are not required.

The brightness of the display can be set via the ADI, for example.



Availability of the interfaces on the Automation Panel with SDL4 receiver:

SDL4 interface	✓	USB1, USB2	✓ USB 2.0	Power supply	✓	Grounding	✓

Maximum cable length for SDL4: 100 m

Requirements

- Automation Panel with SDL4 receiver
- B&R industrial PC with SDL4 interface
- SDL3/SDL4 cable

4.1.1.5.2 General limitations

- USB 2.0 transfer is limited to 150 Mbit/s with SDL4.
- A display is always emulated by the SDL4 transmitter using EDID data and hot plug detection, so DVI-compatible operation is possible. For this reason, the following behavior may occur during operation with multiple displays.
  In the operating system, a connected panel is reported by the video driver even in the following situations:
  - No SDL3/SDL4 cable is connected.
  - There is no connection established yet between the SDL4 link module and SDL4 transmitter.

  This behavior can be avoided by appropriate configuration in BIOS or via the graphics driver.

4.1.1.5.2.1 General limitations

Determining the maximum available endpoints

Single-touch panels

The following limitations apply to single-touch (resistive) panels:

- A maximum of two USB hubs with up to eight ports per hub is supported.
- A maximum of seven additional USB devices can be connected.
- Maximum permissible USB endpoints:

Transfer rate of the devices	Endpoints	
	IN	OUT
High speed	11	12
Full speed / Low speed	12	12

Multi-touch panels

The following limitations apply to multi-touch panels:

- A maximum of two USB hubs with up to eight ports per hub is supported.
- A maximum of six additional USB devices can be connected.
- Maximum permissible USB endpoints:

Transfer rate of the devices	Endpoints	
	IN	OUT
High speed	11	12
Full speed / Low speed	10	11

4.1.2 Electrical properties

4.1.2.1 Power calculation

In order to calculate the total power of the Automation Panel, the power rating of the display being used must be added to the power rating of the link module being used.

> **Information:**
>
> **Unless otherwise specified, the following values are maximum values and additional consumers (e.g. USB devices) are not taken into account.**

Link modules

Type	Order number	Total power consumption of link module
DP receiver	5DLDPO.1001-00	Max. 3.1 W (without USB consumer) Max. 8.1 W (with USB consumer)
SDL/DVI receiver	5DLSDL.1001-00	Max. 3.6 W (without USB consumer) Max. 8.6 W (with USB consumer)
SDL3 receiver	5DLSD3.1001-00	Max. 8.1 W (without USB consumer) Max. 13.1 W (with USB consumer)
SDL4 receiver	5DLSD4.1001-00	Max. 8.1 W (without USB consumer) Max. 13.1 W (with USB consumer)

Panels

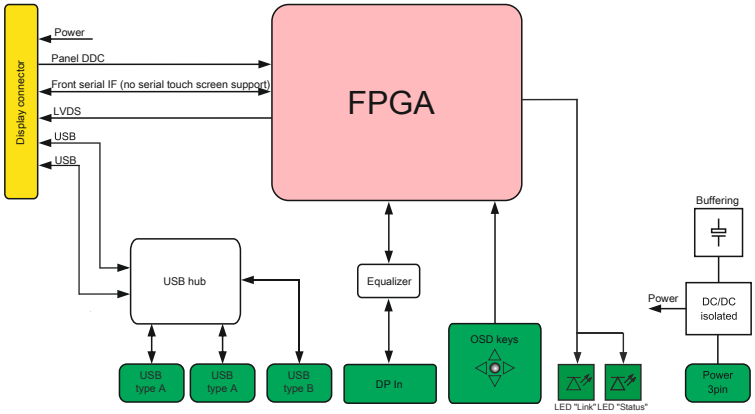
Type	Order number	+5 V	+3.3 V	+12 V	Total power consumption
12.1" single-touch	5AP923.1215-00	-	4.2 W	7.2 W	11.4 W
15.0" single-touch	5AP923.1505-00	-	2.1 W	8.9 W	11 W
19.0" single-touch	5AP923.1906-00 ≤ D0	8 W	-	22.4 W	30.4 W
19.0" single-touch	5AP923.1906-00 ≥ E0	5 W	-	22 W	27 W
15.6" multi-touch	5AP933.156B-00 ≤ C0	3.35 W	-	10.5 W	13.85 W
15.6" multi-touch	5AP933.156B-00 ≥ D0	1.8 W	-	15.6 W	17.4 W
18.5" multi-touch	5AP933.185B-00 ≤ J0	6.1 W	-	10.8 W	16.9 W
18.5" multi-touch	5AP933.185B-00 ≥ K0	3.9 W	-	7.9 W	11.77 W
21.5" multi-touch	5AP933.215C-00 ≤ C0	7.4 W	-	18.3 W	25.7 W
21.5" multi-touch	5AP933.215C-00 ≥ D0	4 W	-	15 W	19 W
24.0" multi-touch	5AP933.240C-00 ≤ C0	6.35 W	-	24 W	30.35 W
24.0" multi-touch	5AP933.240C-00	5 W	-	24.5 W	29.5 W

Example

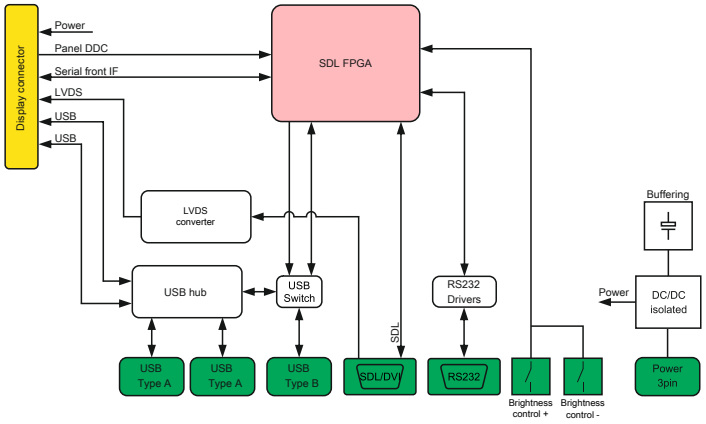
12" panel 5AP923.1215-00	4.2 W + 7.2 W =	11.4 W
5DLSDL.1001-00 SDL/DVI receiver	8.6 W (with USB consumer)	8.6 W
	Total max.:	**20.0 W**

4.1.2.2 Block diagrams

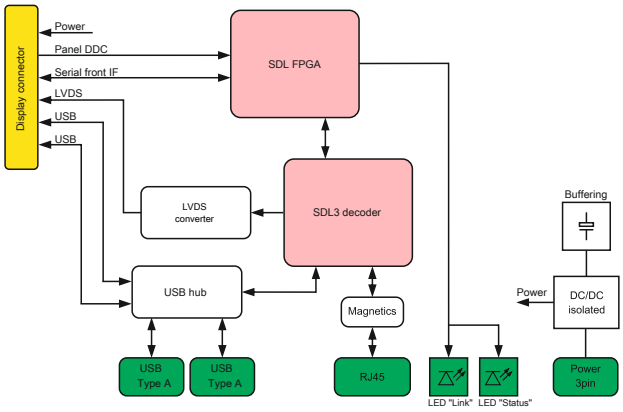
The following block diagram shows the simplified structure of DP receiver link module 5DLDPO.1001-00.



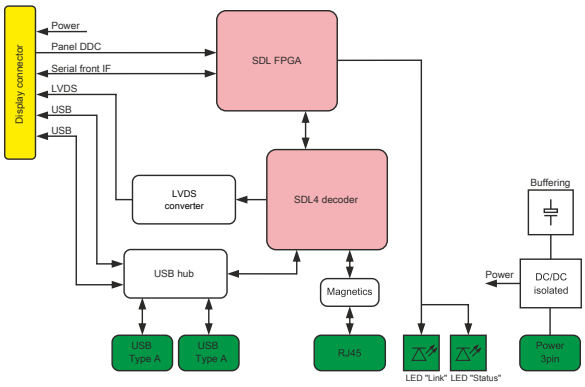
The following block diagram shows the simplified structure of the 5DLSDL.1001-00 SDL/DVI receiver link module.



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



The following block diagram shows the simplified structure of the 55DLSD4.1001-00 SDL4 receiver link module.



4.1.3 Mechanical properties

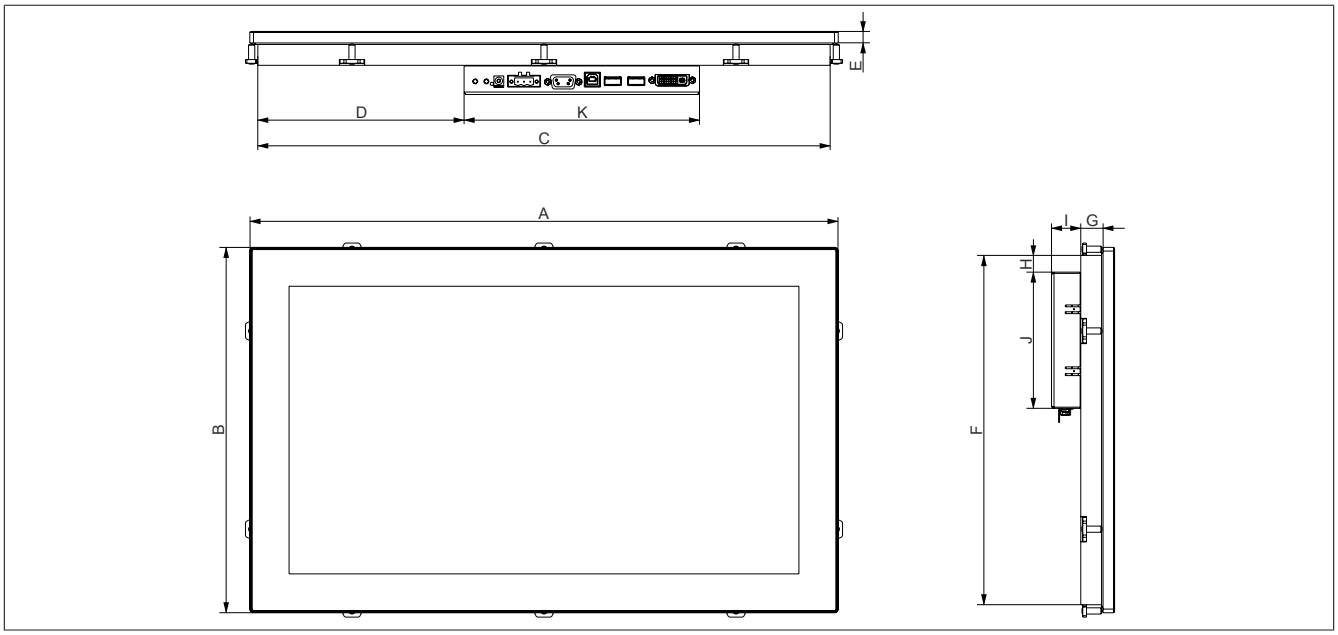
4.1.3.1 Dimensions

Information:

All specifications in dimension diagrams and associated tables are in millimeters [mm].

The following diagrams are symbolic and only meant to illustrate how the dimension tables should be read.

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



Panels										
Type	**Model number**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**Revision**
12.1" single-touch	5AP923.1215-00	315	239	302	48	9	226	13.5	13.5	-
15.0" single-touch	5AP923.1505-00	370	288	357	84.5	9	275	14.5	13.5	
19.0" single-touch	5AP923.1906-00	440	358	427	149	9	345	23	13.5	Up to Rev. E0
								14.5		Rev. F0 and later
15.6" multi-touch	5AP933.156B-00	414	258.5	401	105.5	9	245.5	20	13.5	Up to Rev. C0
								18.0		Rev. D0 and later
18.5" multi-touch	5AP933.185B-00	475	295	462	166.5	9	282	18	13.5	
21.5" multi-touch	5AP933.215C-00	541.5	333	528.5	199.75	9	320	18	13.5	
24.0" multi-touch	5AP933.240C-00	598.5	364	585.5	228.25	9	351	18	13.5	

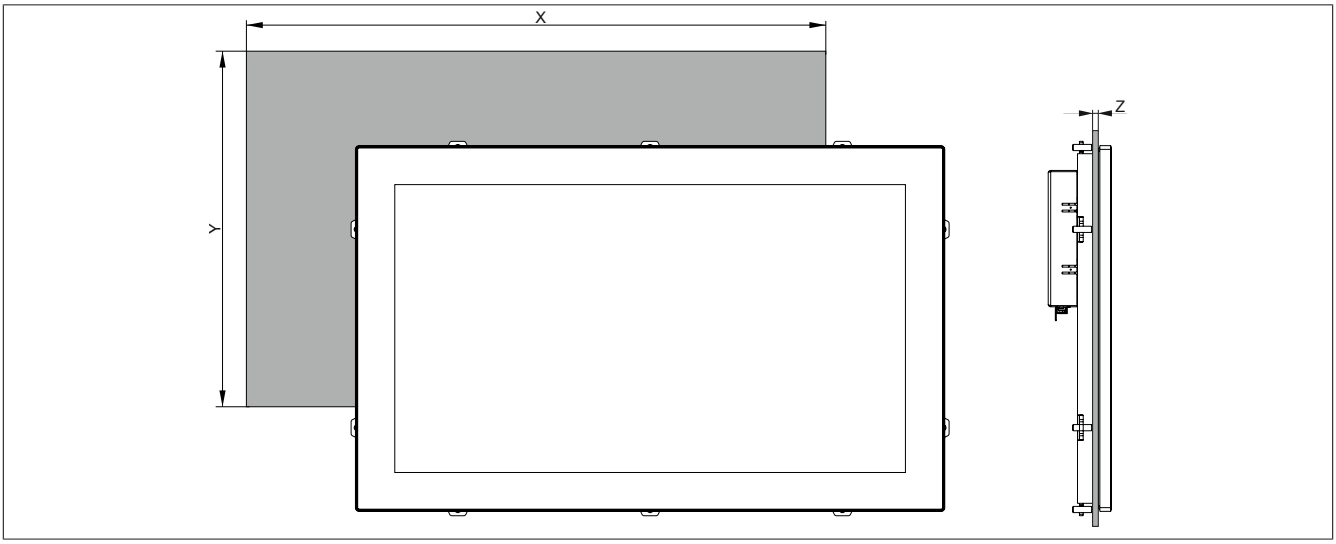
Link module					
Type	**Order number**	**I**	**J**	**K**	**Revision**
Link module	5DLxxx.1001-00	23.6	110	190	-

4.1.3.2 Installation diagrams

Information:

When installing the Automation Panel 9x3, spacing for air circulation and additional free space for operating and servicing the device must be taken into account.

The cutout tolerances are +0 mm / -0.5 mm.



Panels						
Type	**Model number**	**X**	**Y**	**Z min.**	**Z max.**	**Number of retaining clips**
12.1" single-touch	5AP923.1215-00	304	228	1	6	10 pcs.
15.0" single-touch	5AP923.1505-00	359	277	1	6	10 pcs.
19.0" single-touch	5AP923.1906-00	429	347	1	6	12 pcs.
15.6" multi-touch	5AP933.156B-00	403	247.5	1	6	10 pcs.
18.5" multi-touch	5AP933.185B-00	464	284	1	6	10 pcs.
21.5" multi-touch	5AP933.215C-00	530.5	322	1	6	14 pcs.
24.0" multi-touch	5AP933.240C-00	587.5	353	1	6	14 pcs.

Dimension "Z" describes the thickness of the wall or control cabinet plate.

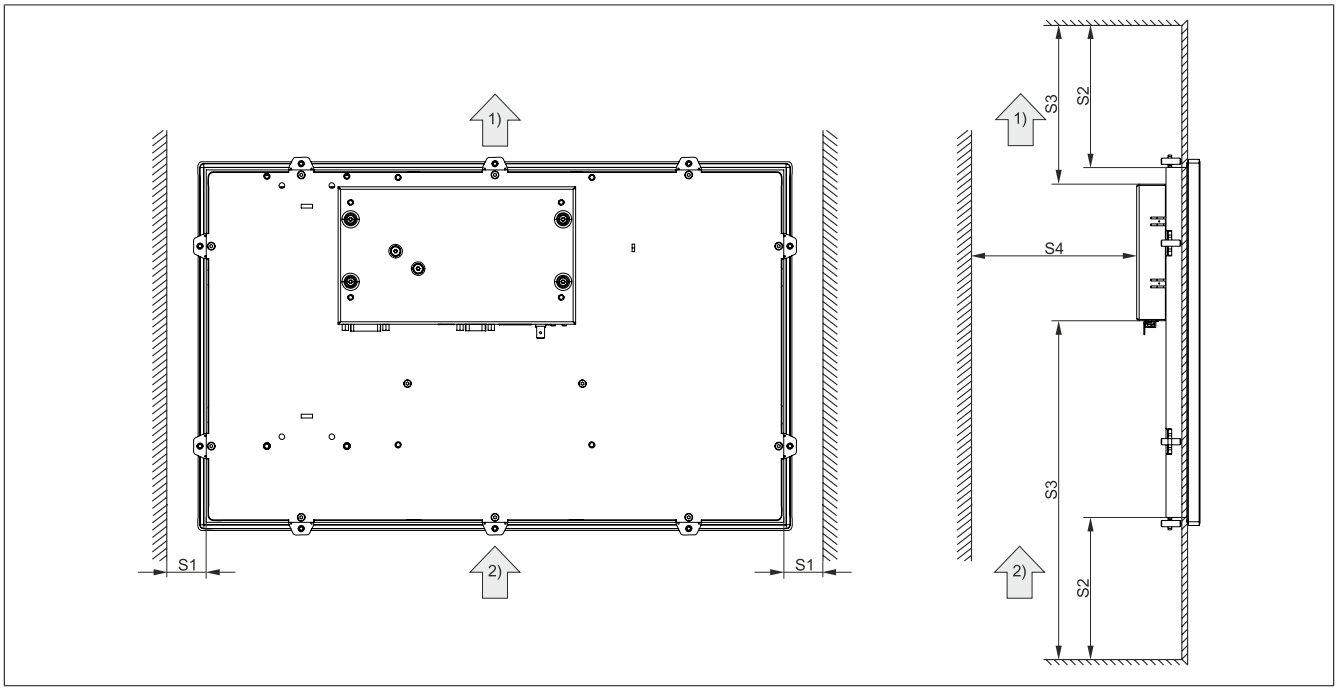
A hex screwdriver is needed to tighten and remove the screw on the retaining clips. The maximum tightening torque of the retaining clips is 1 Nm.

4.1.3.3 Spacing for air circulation

To ensure sufficient air circulation, a specified clearance must be provided above, below, to the side and behind the device. For the minimum specified clearance, see the following diagrams. This is valid for all variants.

Information:

The following figure and table exclusively show the thermal view of the complete system. If additional space is required for operating or servicing the device , this must be taken into account during installation.



Legend			
1)	Air outlet	2)	Air inlet

Name	Dimension	Name	Dimension
S1	≥20	S2	≥50
S3	≥50	S4	≥50

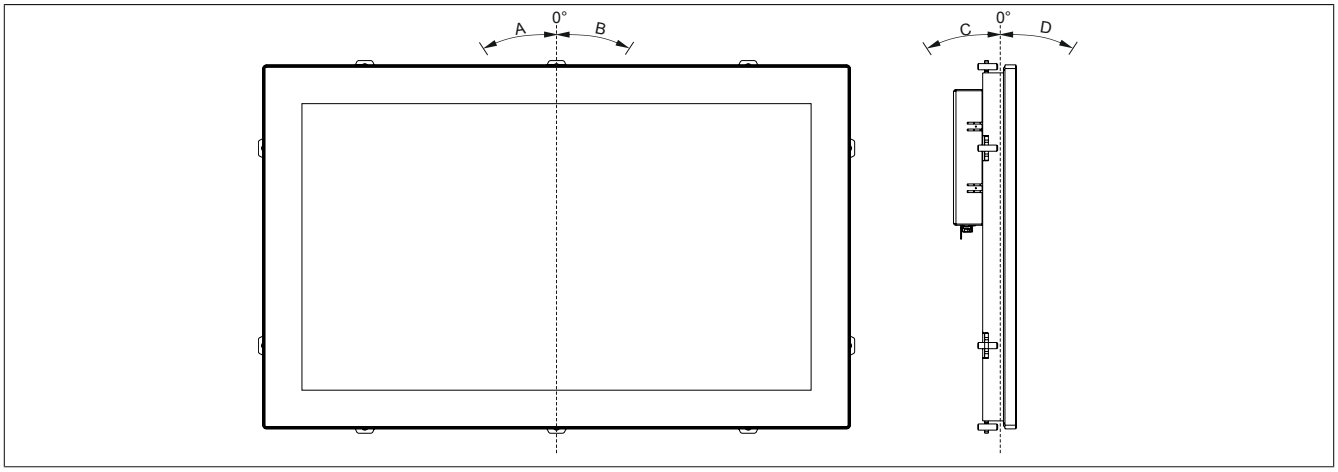
Caution!

The specified spacing for air circulation is based on worst-case operation at the maximum specified ambient temperature. The maximum specified ambient temperature is not permitted to be exceeded!

If the spacing specifications for air circulation cannot be observed, then the maximum specified temperatures for the temperature sensors (see "Temperature sensor positions" on page 34) must be monitored by the user and appropriate measures taken if they are exceeded.

4.1.3.4 Mounting orientations

The following diagram shows the approved mounting orientations for Automation Panel 9x3 devices. An AP9x3 is only permitted to be installed as shown or described below.



Mounting orientation		Ambient temperature limitation
0°	0°	None
A	-1° to -90° (counterclockwise)	None
B	+1° to +90° (clockwise)	None
C, D	±180° (interfaces on top)	None
C	-1° to -45°	None
D	+1° to +90° (display facing down)	None

During installation, it is important to ensure that the spacing specified in section "Spacing for air circulation" on page 30 is observed in order to achieve natural air circulation.

4.1.3.5 Weight specifications

Panels

Panels		
AP9x3	**Order number**	**Weight [g]**
12.1" single-touch	5AP923.1215-00	2200
15.0" single-touch	5AP923.1505-00	3700
19.0" single-touch	5AP923.1906-00	5800
15.6" multi-touch	5AP933.156B-00	3850
18.5" multi-touch	5AP933.185B-00	4850
21.5" multi-touch	5AP933.215C-00	5400
24.0" multi-touch	5AP933.240C-00	7800

Link modules

Type	Model number	Weight [g]
DP receiver	5DLDPO.1001-00	490
SDL/DVI receiver	5DLSDL.1001-00	538
SDL3 receiver	5DLSD3.1001-00	527
SDL4 receiver	5DLSD4.1001-00	525

4.1.4 Environmental properties

4.1.4.1 Temperature specifications

Because it is possible to combine different panels and link modules, the following table provides a component-dependent overview of the maximum ambient temperatures resulting from these combinations.

Information:

The maximum specified ambient temperatures for operation were determined under worst-case conditions. Experience has shown that higher ambient temperatures can be achieved with typical applications in Microsoft Windows, for example. The relevant test and assessment must be carried out individually by the user on site (reading out the temperatures in BIOS or using the ADI Control Center, for example).

Information about worst-case conditions

- BurnInTest V4.0 Pro from PassMark Software for simulating 100% interface utilization using loopback adapters (serial interface, USB interfaces)
- Maximum expansion and power consumption of the system

4.1.4.1.1 Maximum ambient temperature during operation

All temperature specifications in degrees Celsius [°C] at 500 m above sea level, **non-condensing**.		**Maximum ambient temperature with link module**			
The respective ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.		**5DLDPO.1001-00**	**5DLSDL.1001-00** SDL/DVI	**5DLSD3.1001-00** SDL3[1)]	**5DLSD4.1001-00** SDL4
Maximum ambient temperature		**60**	**60**	**60**	**60**
Single-touch	5AP923.1215-00	-	✓	✓	✓
	5AP923.1505-00	-	✓	✓	✓
	5AP923.1906-00 up to Rev. D0	-	50	50	50
	5AP923.1906-00, Rev. E0 or later	-	✓	✓	✓
Multi-touch	5AP933.156B-00 up to Rev. C0	50	50	50	50
	5AP933.156B-00, Rev. D0 or later	✓	✓	55	55
	5AP933.185B-00	50	50	50	50
	5AP933.215C-00 up to Rev. C0	45	45	45	45
	5AP933.215C-00, Rev. D0 or later	50	50	50	50
	5AP933.240C-00 up to Rev. C0	45	45	45	45
	5AP933.240C-00, Rev. D0 or later	50	✓	✓	✓

1) The max. ambient temperature for SDL3 link module 5DLSD3.1001-00 < Rev. A5 with corresponding panel is 5°C lower.

4.1.4.1.1.1 Determining the ambient temperature

1. Select the link module.
2. The rows specify the maximum ambient temperature of the complete system in conjunction with the respective link module.
3. The panel determines if there are temperature limits.
   - ° If the installed component has a "✓" (check mark), it can be operated without any problems at the maximum ambient temperature of the complete system.
   - ° If the installed component has a temperature specification (e.g. "45[°C]"), the ambient temperature of the complete system is not permitted to exceed this value.

4.1.4.1.2 Maximum ambient temperature operation

The minimum ambient temperature for non-condensing operation is 0°C.

4.1.4.1.3 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. Limitations are possible due to individual components.

Panels

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

Link modules

Type	Model number	Storage [°C]	Transport [°C]
DP receiver	5DLDPO.1001-00	-20 to 60	-20 to 60
SDL/DVI receiver	5DLSDL.1001-00	-20 to 60	-20 to 60
SDL3 receiver	5DLSD3.1001-00	-20 to 60	-20 to 60
SDL4 receiver	5DLSD4.1001-00	-20 to 60	-20 to 60

4.1.4.1.4 Temperature monitoring

A sensor in the display monitors the temperature of the AP9x3 panel. For the position of the temperature sensor, see the figure in section "Temperature sensor positions" on page 34. The values specified there represent the defined maximum temperature at this measuring point. If the temperature is exceeded, no alarm is triggered.

These temperatures [2)] can be read in various ways in approved operating systems:

- BIOS
- B&R Control Center
- B&R ADI Development Kit
- B&R ADI .NET SDK
- B&R HMI Service Center
- B&R HMI Diagnose
- Automation Runtime library

[2)] The temperature measured approximates the immediate ambient temperature but may also be influenced by neighboring components.

4.1.4.1.5 Temperature sensor positions

ADI sensors	Position	Measurement point for	Measurement	Max. specified [°C]
Panel	A	Display	Temperature of the display (sensor integrated in panel).	5AP923.1215-00: 90
				5AP923.1505-00: 90
				5AP923.1906-00 ≤ D0: 75 5AP923.1906-00 ≥ E0: 80
				5AP933.156B-00 ≤ C0: 75 5AP933.156B-00 ≥ D0: 80
				5AP933.185B-00: 75
				5AP933.215C-00: 80
				5AP933.240C-00 ≤ C0: 75 5AP933.240C-00 ≥ D0: 80

4.1.4.2 Relative humidity

The following tables show the minimum and maximum relative humidity (at 30°C, non-condensing) of the individual components that are relevant for limiting the humidity of the complete system. The smallest or largest value must always be used for this determination. For more detailed information, see technical data or temperature/humidity diagrams of the individual components.

Panels

Type	Model number	Operation [%]	Storage [%]	Transport [%]
12.1" single-touch	5AP923.1215-00	5 to 90	5 to 90	5 to 90
15.0" single-touch	5AP923.1505-00	8 to 90	8 to 90	8 to 90
19.0" single-touch	5AP923.1906-00	5 to 90	5 to 90	5 to 90
15.6" multi-touch	5AP933.156B-00	5 to 90	5 to 90	5 to 90
18.5" multi-touch	5AP933.185B-00	5 to 90	5 to 90	5 to 90
21.5" multi-touch	5AP933.215C-00 ≤ C0	10 to 90	10 to 90	10 to 90
21.5" multi-touch	5AP933.215C-00 ≥ D0	5 to 90	5 to 90	5 to 90
24.0" multi-touch	5AP933.240C-00	5 to 90	5 to 90	5 to 90

Link modules

Type	Order number	Operation [%]	Storage [%]	Transport [%]
DP receiver	5DLDPO.1001-00	5 to 90	5 to 95	5 to 95
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
SDL4 receiver	5DLSD4.1001-00	5 to 90	5 to 95	5 to 95

4.1.4.3 Vibration and shock

The following table provides an overview of the maximum vibrations and shock values of the complete system. Limitations are possible due to individual components.

Vibration				
	Operation[1)]		Storage[1)3)]	Transport[1)3)]
	Continuous	Periodic		
Automation Panel 9x3	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
Shock				
	Operation[2)]		Storage[2)3)]	Transport[2)3)]
Automation Panel 9x3	15 g, 11 ms		30 g, 6 ms	30 g, 6 ms

1) Testing is performed per EN 60068-2-6.
2) Testing is performed per EN 60068-2-27.
3) The specification refers to a device in its original packaging.

4.1.4.4 Degree of protection

In accordance with EN 60529, the Automation Panel 9x3 has IP65 protection on the front and IP20 protection on the back under the following conditions:

- The Automation Panel 9x3 is installed correctly (see "Automation Panel 9x3 - Installation" on page 75).
- All covers and components are installed on the interfaces and slots.
- All environmental conditions are observed.

The Automation Panel 9x3 additionally has "Type 4X indoor use only" on the front per UL 50 under the same conditions.

4.1.5 Device interfaces

4.1.5.1 Overview

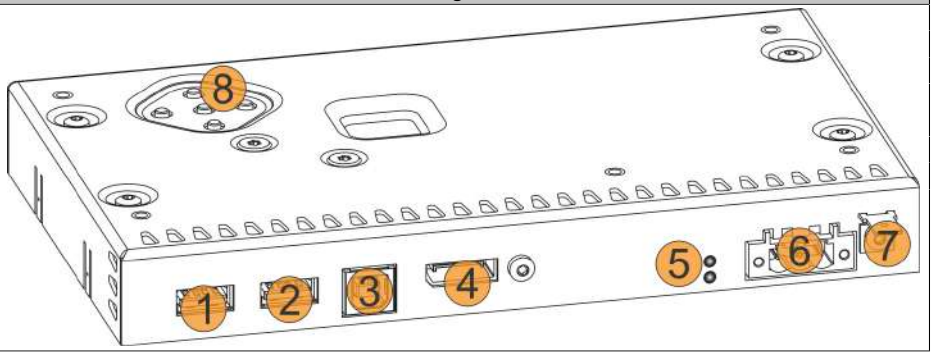
> **Information:**
>
> **The interfaces available on the device or module are numbered for the purpose of clear differentiation. The numbering used by the operating system may deviate, however.**

The receiver interfaces are located on the back of the complete system.

DP receiver 5DLDPO.1001-00

Legend	
1	"USB1 interface"
2	"USB2 interface"
3	"USB In interface"
4	"DP interface"
5	"LED status indicators"
6	"+24 VDC power supply"
7	"Grounding"
8	"OSD control panel"

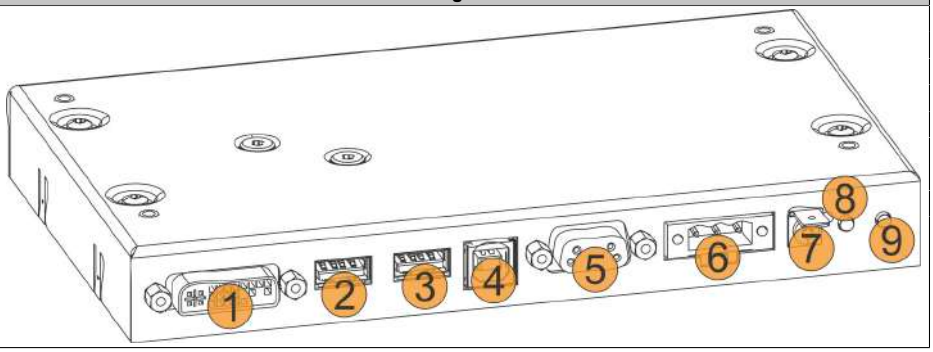
Figure



5DLSDL.1001-00 SDL/DVI receiver

Legend	
1	"Panel In (SDL/DVI)"
2	"USB1 interface"
3	"USB2 interface"
4	"USB In interface"
5	"Serial interface"
6	"+24 VDC power supply"
7	"Grounding"
8	"Brightness control + (DVI)"
9	"Brightness control - (DVI)"

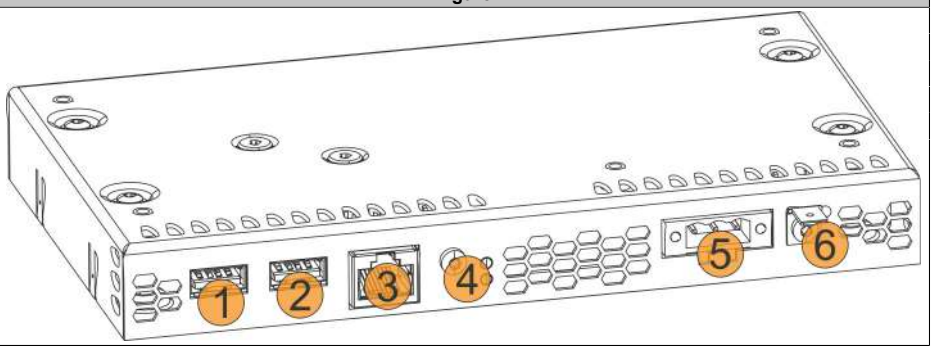
Figure



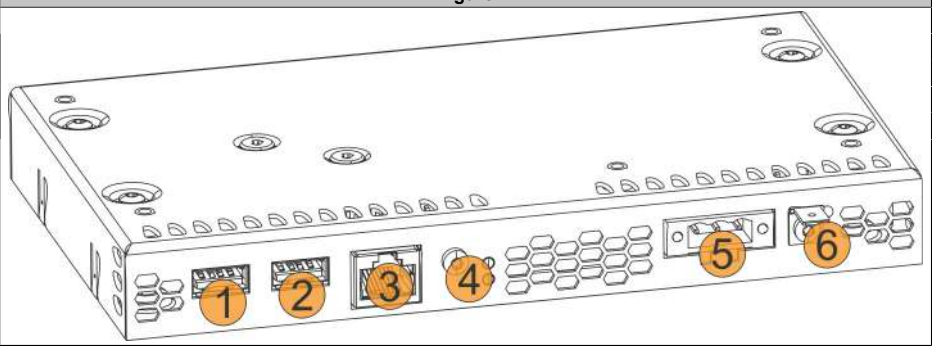
SDL3 receiver 5DLSD3.1001-00

Legend	
1	"USB1 interface"
2	"USB2 interface"
3	"SDL3 In interfaces"
4	"SDL3 In LEDs"
5	"+24 VDC power supply"
6	"Grounding"

Figure



SDL4 receiver 5DLSD4.1001-00

Legend		Figure
1	"USB1 interface"	
2	"USB2 interface"	
3	"SDL4 In interface"	
4	"SDL4 In LEDs"	
5	"+24 VDC power supply"	
6	"Grounding"	

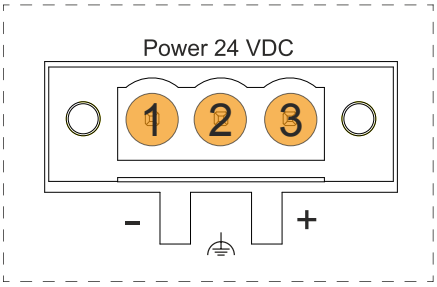
4.1.5.1.1 +24 VDC power supply

Danger!

This device is only permitted to be supplied with a SELV/PELV power supply unit or with safety extra-low voltage (SELV) per IEC 61010-2-201.

The necessary 3-pin connector is not included in delivery; for suitable accessories, see 0TB103.9x.

The device is protected against overload and reverse polarity by a soldered fuse. If the fuse is defective (e.g. due to overload), the device must be sent to B&R for repairs. If the polarity is reversed, it is not necessary to replace the fuse.

Pin	Description	Figure
1	-	
2	Functional ground	
3	+	

- Reverse polarity protection
- 3-pin
- Male

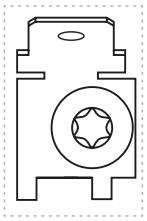
Electrical properties	
Nominal voltage	24 VDC, SELV[1)]
Nominal current	5DLSDx.1001-00: Max. 3 A
	5DLDPO.1001-00: Max. 2.3 A
Operating voltage	24 VDC ±25%
Fuse	5DLSDx.1001-00: 10 A, fast-acting
	5DLDPO.1001-00: 6.3 A, fast-acting
Overvoltage category per EN 61131-2	II
Galvanic isolation	Yes
Uninterruptible power supply	No

1) IEC 61010-2-201 requirements must be observed.

4.1.5.1.2 Grounding

Caution!

The functional ground (power supply pin 2 and ground connection) must be connected to the central grounding point (e.g. control cabinet or system) via the shortest possible path with the lowest possible resistance and with the largest possible wire cross section. This type of grounding is mandatory for proper functionality.

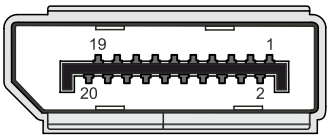


For example, a copper strip must be attached to the ground connection at a central grounding point of the control cabinet or system in which the device is installed. The wire cross section should be as large as possible (at least 2.5 mm²).

4.1.5.1.3 DP receiver (5DLDPO.1001-00)

4.1.5.1.3.1 DisplayPort interface

The DisplayPort interface is 20-pin (female) and can be operated with DisplayPort, DVI or HDMI transmission technologies.



Pin	Pinout	Description	Pin	Pinout	Description
1	DP_LANE3-	DisplayPort lane 3 (negative)	11	GND	Ground
2	GND	Ground	12	DP_LANE0+	DisplayPort lane 0 (positive)
3	DP_LANE3+	DisplayPort lane 3 (positive)	13	CONFIG1	Configuration pin 1 (connected to ground)
4	DP_LANE2-	DisplayPort lane 2 (negative)	14	CONFIG2	Configuration pin 2 (connected to ground)
5	GND	Ground	15	DP_AUX+	Auxiliary channel (positive)
6	DP_LANE2+	DisplayPort lane 2 (positive)	16	GND	Ground
7	DP_LANE1-	DisplayPort lane 1 (negative)	17	DP_AUX-	Auxiliary channel (negative)
8	GND	Ground	18	DP_HPD#	Hot plug detection
9	DP_LANE1+	DisplayPort lane 1 (positive)	19	RETURN	Return for power
10	DP_LANE0-	DisplayPort lane 0 (negative)	20	DP_PWR	Power for connector

Information:

Hot plugging output devices on the interface for service purposes is supported by the hardware and graphic drivers of approved operating systems.

A maximum of 10,000 mating cycles are specified for this interface.

Information:

Cable lengths and resolutions for DP transfer:

The maximum cable length for DP transfer is 7.5 m with a B&R DP cable (regardless of the panel resolution).

4.1.5.1.3.2 USB interfaces

The link module is equipped with a USB 2.0 (Universal Serial Bus) host controller with several USB ports, of which 2 USB interfaces are routed externally and freely available to the user.

Warning!

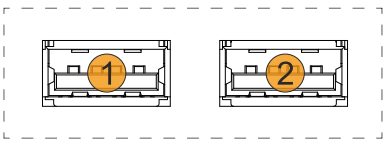
USB peripheral devices can be connected to the USB interfaces. Due to the variety of USB devices available on the market, B&R cannot guarantee their functionality. The functionality of USB devices available from B&R is ensured.

Caution!

Due to the general PC specification, this interface must be handled with the utmost care with regard to EMC, cable routing, etc.

Information:

For using B&R Hypervisor operating mode, see the chapter in B&R Hypervisor.

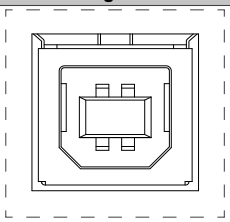
USB1 - 2		
Standard	USB 2.0	
Variant	Type A, female	
Transfer rate	Low speed (1.5 Mbit/s) Full speed (12 Mbit/s) High speed (480 Mbit/s)	
Current-carrying capacity[1)] USB1 (1) USB2 (2)	Total max. 1 A	
Cable length USB 2.0	Max. 5 m (without hub)	

1) The USB interfaces are protected by a shared maintenance-free "USB current-limiting switch" (total max. 1 A).

4.1.5.1.3.3 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 a USB interface on the output device (e.g. B&R industrial PC). For possible transfer methods, see section "Connection options" on page 17.

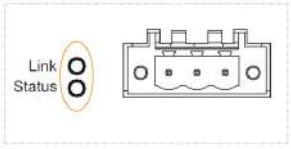
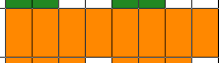
If the interface is connected to an output device (e.g. B&R industrial PC), then USB 2.0 transfer rates are possible on the USB1 and USB2 interfaces.

Description		Figure
Standard	USB 2.0	
Variant	Type B, female	
Transfer rate	Low speed (1.5 Mbit/s) Full speed (12 Mbit/s) High speed (480 Mbit/s)	
Current-carrying capacity[1)]	Max. 500 mA	
Cable length	Max. 7.5 m (without hub)	
-		

1) The USB interface is protected by a maintenance-free "USB current-limiting switch" (max. 500 mA).

4.1.5.1.3.4 LED status indicators

The LEDs are located on the connection side of the DP receiver.

Assignment	LED	Color	Status	Explanation	LED status indicators[1)]
	**Link**	Reserved			
	Status	Green	On	Power LED, image transfer taking place	
			Blinking	Device working but no signal from the PC	
				Hot plugging	
		Yellow	On	Power LED, image transfer taking place, a firmware image is corrupt.	
			Blinking	Device working, no signal from the PC, a firmware image is corrupt.	
				Hot plugging, a firmware image is corrupt.	

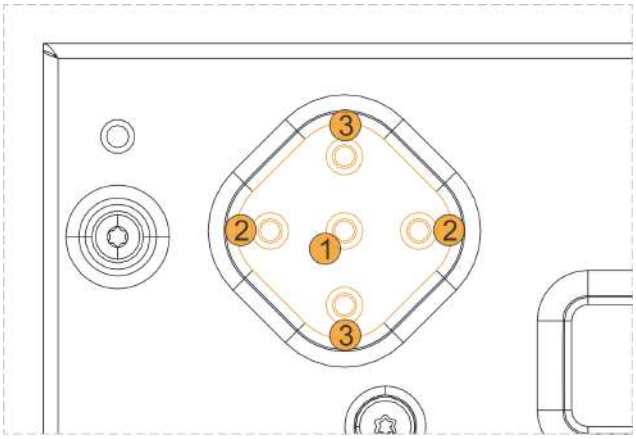
1) Two columns form 1 interval of 500 ms each.

4.1.5.1.3.5 On-screen display (OSD)

The OSD menu is available to display information for service purposes. It is possible to adjust the display brightness during commissioning or maintenance tasks.

OSD control panel

The OSD control panel for menu navigation is located on the back of the DP receiver of the Automation Panel.

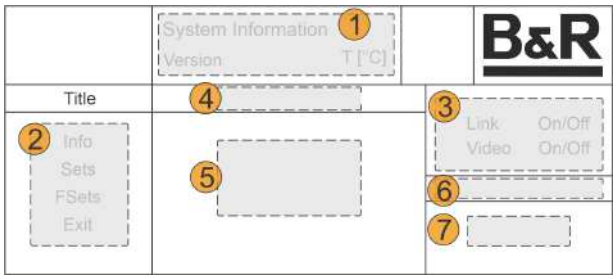


	Key	Option
1	Center menu button	Opens and closes the OSD menu
2	Horizontal cursor keys	Navigates left and right
3	Vertical cursor keys	Navigates up and down

OSD main menu

The OSD menu is not shown as an original screenshot in this documentation, but systematically as a graphic.

The OSD menu is opened using the menu button on the DP receiver.



	Menu	Contents
1	System information	**DisplayPort receiver 5DLDPO.1001-00** • Device revision • Serial number • Installed firmware Temperature measured on the panel in degrees Celsius.
2	Submenu	• Info • Sets • FSets • Exit
3	Status and activity indicator	For information, see LED status indicators.
4	Currently selected submenu	
5	Displays the properties and settings of the submenu	
6	Selected parameter	
7	Change parameters	• Brightness of the display in percent • Backup of modified data • Reset to factory setting

The OSD menu can be navigated using the cursor keys.

Submenu	Contents	Options
Info	CRC (cyclic redundancy check - error detection)	Okay/Fail
	Image	High/Low
	PME	Reserved
	ICT	Reserved
	RecE	Reserved
Sets	Brightness setting of the display	Setting in percent
FSets	Information only	• DP receiver used • Panel used • Reserved
Exit	Closes the OSD menu	Via the menu button
	Saves any changed values	Sets WR to "open", default "locked"
	Reset to factory setting	Sets default to "set", standard "back"

Sets - Brightness setting

In submenu Sets, it is possible to read out the set brightness in % and adjust it to the ambient conditions of the Automation Panel.

1. Open the OSD menu.
2. Select submenu **Sets** using the vertical cursor keys.
3. Press the horizontal cursor key on the control panel until the % value in the parameter field is highlighted in yellow.
4. Use the vertical cursor keys to adjust the brightness.
5. Navigate back to the submenu.
6. Set WR (write protect) to "open" in menu **Exit**.
7. Exit the OSD menu.

Information:

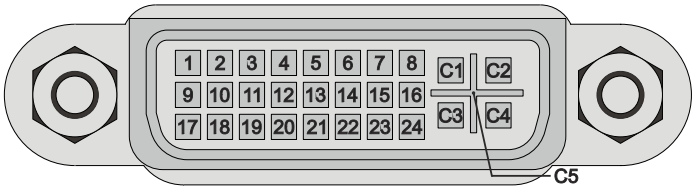
The brightness value is only saved by leaving menu Exit with WR "open" so that the setting is retained even after a power interruption.

4.1.5.1.4 SDL/DVI receiver (5DLSDL.1001-00)

4.1.5.1.4.1 Panel In interface

The interface is designed as a DVI-I connector (female) and can be operated with DVI-D or SDL transmission technology.
For additional information, see sections "SDL operation" on page 18 and "DVI operation" on page 20.

Video signals SDL and DVI are available for the following link modules: 5DLSDL.1001-00. For details, see the technical data for the link module or panel used.



Pin	Pinout	Description	Pin	Pinout	Description
1	TMDS data 2-	DVI lane 2 (negative)	16	HPD	Hot plug detection
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 pairs 2 and 4	18	TMDS data 0+	DVI lane 0 (positive)
4	SDL-	SDL lane (negative)	19	TMDS data 0/XUSB1 SHIELD	Shield of 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 of clock pair
8	Not connected	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 (positive)	C1	Not connected	Not connected
11	TMDS data 1/XUSB0 SHIELD	Shield of data pair 1 and USB0	C2	Not connected	Not connected
12	XUSB0-	USB lane 0 (negative)	C3	Not connected	Not connected
13	XUSB0+	USB lane 0 (positive)	C4	Not connected	Not connected
14	+5 V power[1)]	+5 V power supply	C5	Not connected	Not connected
15	Ground (return for +5 V, HSync and VSync)	Ground	-	-	

1) Protected internally by a multifuse.

Information:

Hot plugging output devices on the interface for service purposes is supported by the hardware and graphic drivers of approved operating systems. Recalibration may be required for touch screen devices.

A maximum of 100 mating cycles are specified for this interface.

It is important to note the following information about the transfer rate:

- In SDL operation without USB type A/B cable, the USB transfer rate is limited to USB 1.1.
- A USB transfer rate of USB 2.0 is possible in DVI or SDL operation with a USB type A/B cable.

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment length and maximum resolution depending on the SDL cable:

SDL cable Segment length [m]	Resolution								
	VGA **640 x 480**	**WVGA** **800 x 480**	**SVGA** **800 x 600**	**XGA** **1024 x 768**	**HD** **1366 x 768**	**WXGA** **1200 x 800**	**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	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	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	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03	5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03
6	5CASDL.0060-00	5CASDL.0060-00	5CASDL.0060-00	5CASDL.0060-00	5CASDL.0060-00	5CASDL.0060-00	5CASDL.0060-00	5CASDL.0060-00	5CASDL.0060-00
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	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.0150-00 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.0200-00 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	5CASDL.0250-00 5CASDL.0250-03	- -	- -	- -	- -
30	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	5CASDL.0300-00 5CASDL.0300-03	- 5CASDL.0300-13	- 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	5CASDL.0400-13	-	5CASDL.0400-13

Cable lengths and resolutions for DVI transfer

The following table shows the relationship between segment length and maximum resolution depending on the DVI cable:

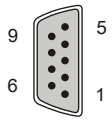
DVI cable Segment length [m]	Resolution									
	VGA **640 x 480**	**WVGA** **800 x 480**	**SVGA** **800 x 600**	**XGA** **1024 x 768**	**HD** **1366 x 768**	**WXGA** **1280 x 800**	**SXGA** **1280 x 1024**	**UXGA** **1600 x 1200**	**FHD** **1920 x 1080**	**WUXGA** **1920 x 1200**
1.8	5CADVI.0018-00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

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

4.1.5.1.4.2 Serial interface

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

COM interface	
	RS232
Type	Modem supported, not galvanically isolated, DSUB, 9-pin, female
UART	16550-compatible, 16-byte FIFO buffer
Transfer rate	Max. 115 kbit/s
Bus length	Max. 15 m
Pin	**Pinout**
1	NC
2	RXD
3	TXD
4	NC
5	GND
6	NC
7	RTS
8	CTS
9	NC



4.1.5.1.4.3 USB interfaces

The link module is equipped with a USB 2.0 (Universal Serial Bus) host controller with several USB ports, of which 2 USB interfaces are routed externally and freely available to the user.

Warning!

USB peripheral devices can be connected to the USB interfaces. Due to the variety of USB devices available on the market, B&R cannot guarantee their functionality. The functionality of USB devices available from B&R is ensured.

Caution!

Due to the general PC specification, this interface must be handled with the utmost care with regard to EMC, cable routing, etc.

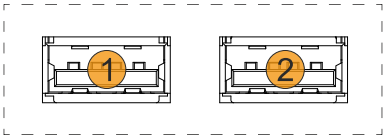
USB1, USB2

Depending on the type of transfer (SDL or DVI operation), there are limitations regarding the transfer rate for interfaces USB1 and USB2. For possible transfer methods, see section "Connection options" on page 17.

Transfer method	USB type	Max. cable length
SDL operation without USB cable	USB 1.1	1)
SDL operation with USB cable	USB 2.0	5 m
Single-touch DVI operation	USB 2.0	5 m
Multi-touch DVI operation	USB 2.0	5 m

1) The max. cable length of depends on the resolution. For more detailed information, see table Cable lengths and resolutions for SDL transfer.

USB1 - 2	
Standard	USB 2.0
Variant	Type A, female
Transfer rate	Low speed (1.5 Mbit/s) Full speed (12 Mbit/s) High speed (480 Mbit/s)
Current-carrying capacity[1)] USB1 (1) USB2 (2)	Total max. 1 A
Cable length USB 2.0	Max. 5 m (without hub)

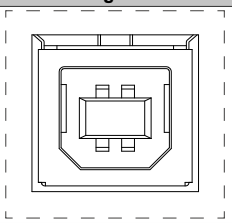


1) The USB interfaces are protected by a shared maintenance-free "USB current-limiting switch" (total max. 1 A).

4.1.5.1.4.4 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 a USB interface on the output device (e.g. B&R industrial PC) if DVI operation or SDL operation with a USB type A/B cable was chosen as the transfer method. For possible transfer methods, see section "Connection options" on page 17.

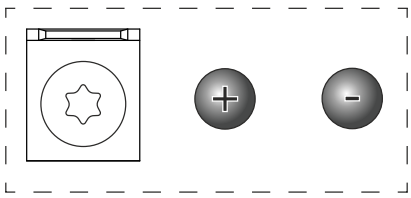
If the interface is connected to an output device (e.g. B&R industrial PC), then USB 2.0 transfer rates are possible on the USB1 and USB2 interfaces.

Description		Figure
Standard	USB 2.0	
Variant	Type B, female	
Transfer rate	Low speed (1.5 Mbit/s) Full speed (12 Mbit/s) High speed (480 Mbit/s)	
Current-carrying capacity[1)]	Max. 500 mA	
Cable length	Max. 5 m (without hub)	
-		

1) The USB interface is protected by a maintenance-free "USB current-limiting switch" (max. 500 mA).

4.1.5.1.4.5 Brightness controls

The brightness controls can be used to set the brightness of the backlight on the Automation Panel in DVI operation. Buttons have no function during SDL operation; the brightness can be set via the B&R Control Center, for example.



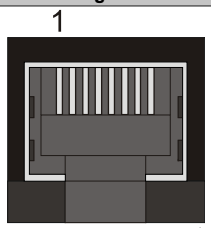
4.1.5.1.5 SDL3 receiver (5DLSD3.1001-00)

4.1.5.1.5.1 SDL3 In interfaces

Information:

For additional information, see section "SDL3 operation" on page 22.

The "SDL3 In" interface is a female RJ45 connector and operated with SDL3 transmission technology.

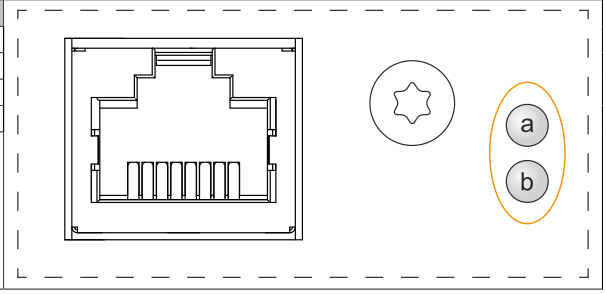
Description		Figure
The following shows an overview of the video signals possible on the panel input. For details, see the technical data for the link module or panel used.		
Variant	RJ45 connector, female	
Link module	**Video signals**	
5DLSD3.1001-00	SDL3	
-		

Information:

Cable lengths and resolutions for SDL3 transfer:

The maximum cable length for SDL3 transfers is 100 m with a B&R SDL3/SDL4 cable (regardless of the panel resolution).

SDL3 In LEDs				
LED	**Color**	**Status**	**Explanation**	
Link (a)	Yellow	On	Indicates an active SDL3 connection.	
		Off	No active SDL3 connection.	
Status (b)	Yellow	On	The SDL3 connection is established and OK.	
		Off	No active SDL3 connection.	
		Blinking	The SDL3 connection is OK, but a firmware image is corrupt.	



Information:

Hot plugging display devices on the SDL3 In interface for service purposes is supported by the hardware and graphics drivers of approved operating systems. The female RJ45 connector is specified for 500 mating 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.

4.1.5.1.5.2 USB interfaces

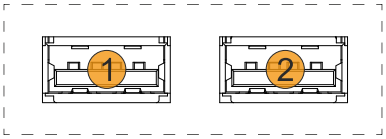
The link module is equipped with a USB 2.0 (Universal Serial Bus) host controller with several USB ports, of which 2 USB interfaces are routed externally and freely available to the user.

Warning!

USB peripheral devices can be connected to the USB interfaces. Due to the variety of USB devices available on the market, B&R cannot guarantee their functionality. The functionality of USB devices available from B&R is ensured.

Caution!

Due to the general PC specification, this interface must be handled with the utmost care with regard to EMC, cable routing, etc.

USB1 - 2		
Standard	USB 2.0	
Variant	Type A, female	
Transfer rate	Low speed (1.5 Mbit/s) Full speed (12 Mbit/s) High speed (30 Mbit/s)	
Current-carrying capacity[1)] USB1 (1) USB2 (2)	Total max. 1 A	
Cable length USB 2.0	Max. 5 m (without hub)	

1) The USB interfaces are protected by a shared maintenance-free "USB current-limiting switch" (total max. 1 A).

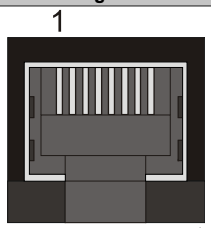
4.1.5.1.6 SDL4 receiver (5DLSD4.1001-00)

4.1.5.1.6.1 SDL4 In interface

Information:

For additional information, see section "SDL4 operation" on page 23.

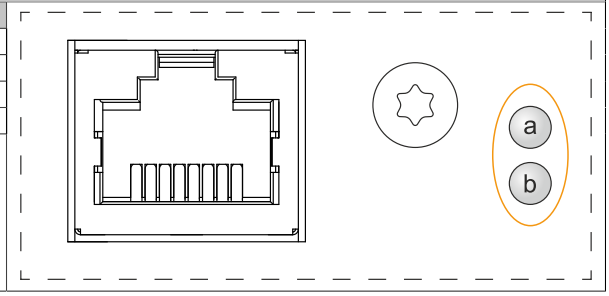
The SDL4 In interface is a female RJ45 connector and operated with SDL4 transmission technology.

Description		Figure
The following shows an overview of the video signals possible on the panel input. For details, see the technical data for the link module or panel used.		
Variant	RJ45 connector, female	
Link module	**Video signals**	
5DLSD4.1001-00	SDL4	
-		

Information:

Cable lengths and resolutions for SDL4 transfer:

The maximum cable length for SDL4 transfer with a B&R SDL3/SDL4 cable is 100 meters (regardless of the resolution of the panel).

SDL4 In LEDs				
LED	**Color**	**Status**	**Explanation**	
Link (a)	Yellow	On	Indicates an active SDL4 connection.	
		Off	No active SDL4 connection.	
Status (b)	Yellow	On	The SDL4 connection is established and OK.	
		Off	No active SDL4 connection.	
		Blinking	The SDL4 connection is OK, but a firmware image is corrupt.	

Information:

Hot plugging display devices on the SDL4 In interface for service purposes is supported by the hardware and graphics drivers of approved operating systems. The female RJ45 connector is specified for 500 mating cycles.

Information:

If a display device with touch screen is connected to the SDL4 In interface and then disconnected again during operation (hot plugging), it may be necessary to recalibrate the touch screen.

4.1.5.1.6.2 USB interfaces

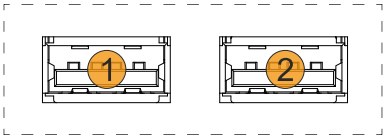
The link module is equipped with a USB 2.0 (Universal Serial Bus) host controller with several USB ports, of which 2 USB interfaces are routed externally and freely available to the user.

Warning!

USB peripheral devices can be connected to the USB interfaces. Due to the variety of USB devices available on the market, B&R cannot guarantee their functionality. The functionality of USB devices available from B&R is ensured.

Caution!

Due to the general PC specification, this interface must be handled with the utmost care with regard to EMC, cable routing, etc.

USB1 - 2		
Standard	USB 2.0	
Variant	Type A, female	
Transfer rate	Low speed (1.5 Mbit/s) Full speed (12 Mbit/s) High speed (150 Mbit/s)	
Current-carrying capacity[1)] USB1 (1) USB2 (2)	Total max. 1 A	
Cable length USB 2.0	Max. 5 m (without hub)	

1) The USB interfaces are protected by a shared maintenance-free "USB current-limiting switch" (total max. 1 A).

4.2 Individual components

4.2.1 Panels

4.2.1.1 5AP923.1215-00

4.2.1.1.1 General information

- Panel for AP9x3, PPC900, PPC2100, PPC2200 or PPC3100
- 12.1" TFT XGA color display
- Single-touch (analog resistive)
- Control cabinet installation

4.2.1.1.2 Order data

Order number	Short description	Figure
	Panels	
5AP923.1215-00	Automation Panel 12.1" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

4.2.1.1.3 Technical data

Information:

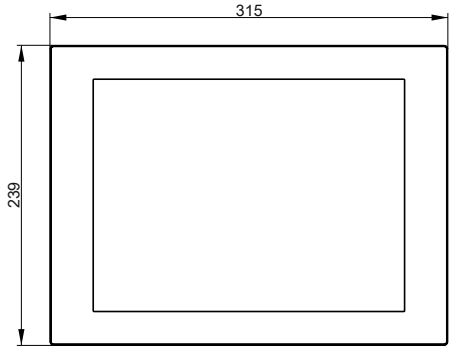
The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5AP923.1215-00
General information	
B&R ID code	0xE1B0
Certifications	
CE	Yes
UKCA	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4
Display	
Type	TFT color
Diagonal	12.1"
Colors	16.7 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Rev. F0 and later: Direction U = 70° / Direction D = 70° Rev. < F0: Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 25 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	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Degree of protection per UL 50	Front: Type 4X indoor use only

Order number	5AP923.1215-00
Mechanical properties	
Front	
Frame	Aluminum, coated
Design	Black
Panel overlay	
Material	Polyester
Light background color	RAL 9006
Dark border color around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	315 mm
Height	239 mm
Weight	2200 g

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

4.2.1.1.4 Dimensions



4.2.1.1.5 Temperature/Humidity diagram

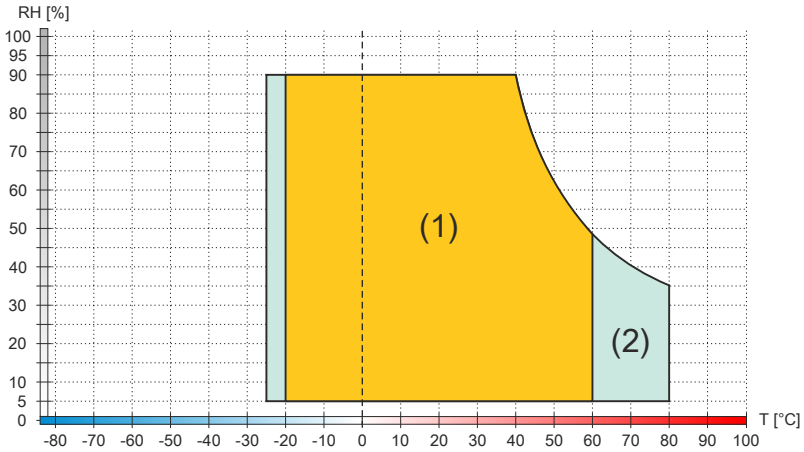


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.2.1.2 5AP923.1505-00

4.2.1.2.1 General information

- Panel for AP9x3, PPC900, PPC2100, PPC2200 or PPC3100
- 15.0" TFT XGA color display
- Single-touch (analog resistive)
- Control cabinet installation

4.2.1.2.2 Order data

Order number	Short description	Figure
	Panels	
5AP923.1505-00	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

4.2.1.2.3 Technical data

Information:

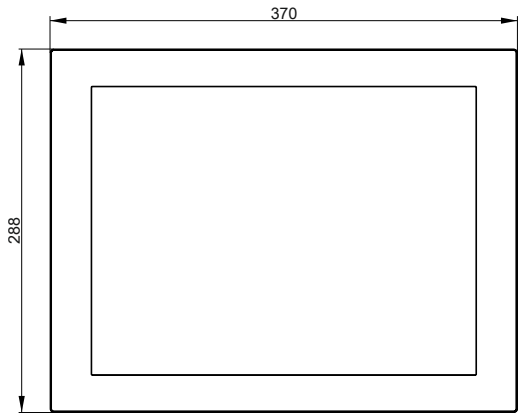
The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5AP923.1505-00
General information	
B&R ID code	0xE169
Certifications	
CE	Yes
UKCA	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	Temperature: **B** (0 to 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)
LR	ENV3
KR	Yes
ABS	Yes
BV	**EC31B** Temperature: 5 - 55°C Vibration: 0.7 g EMC: Bridge and open deck
Display	
Type	TFT color
Diagonal	15.0"
Colors	16.7 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%

Order number	5AP923.1505-00
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Degree of protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front	
Frame	Aluminum, coated
Design	Black
Panel overlay	
Material	Polyester
Light background color	RAL 9006
Dark border color around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	370 mm
Height	288 mm
Weight	3700 g

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

4.2.1.2.4 Dimensions



4.2.1.2.5 Temperature/Humidity diagram

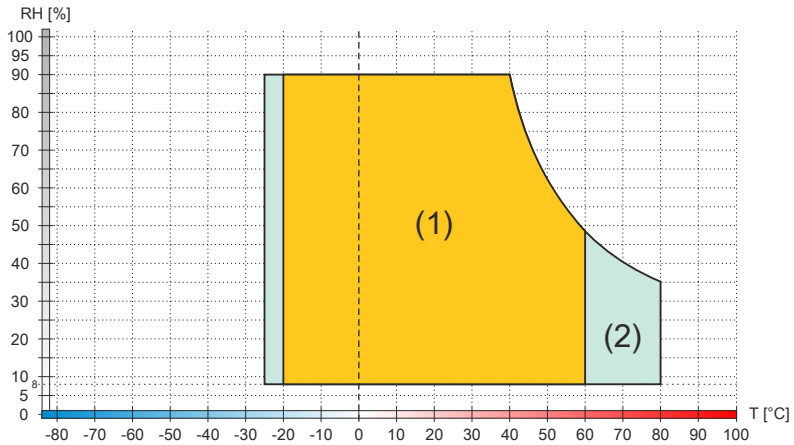


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.2.1.3 5AP923.1906-00

4.2.1.3.1 General information

- Panel for AP9x3, PPC900, PPC2100, PPC2200 or PPC3100
- 19.0" TFT SXGA color display
- Single-touch (analog resistive)
- Control cabinet installation

4.2.1.3.2 Order data

Order number	Short description	Figure
	Panels	
5AP923.1906-00	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

4.2.1.3.3 Technical data

Information:

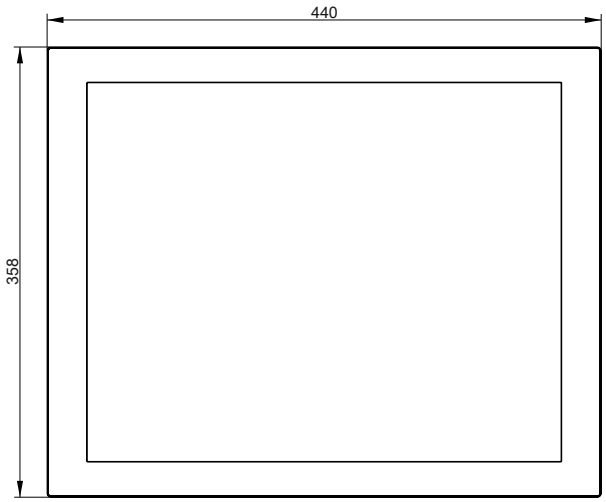
The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5AP923.1906-00	
Revision	**D0**	**E0**
General information		
B&R ID code	0xE1B1	
Certifications		
CE	Yes	
UKCA	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4	
Display		
Type	TFT color	
Diagonal	19.0"	
Colors	16.7 million	
Resolution	SXGA, 1280 × 1024 pixels	
Contrast	2000:1	1500:1
Viewing angles		
Horizontal	Direction R = 89° / Direction L = 89°	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 89° / Direction D = 89°	Direction U = 85° / Direction D = 85°
Backlight		
Type	LED	
Brightness (dimmable)	Typ. 30 to 300 cd/m²	Typ. 35 to 350 cd/m²
Half-brightness time [1]	50,000 h	70,000 h
Touch screen [2]		
Technology	Analog, resistive	
Controller	B&R, serial, 12-bit	
Transmittance	81% ±3%	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)	
Degree of protection per UL 50	Front: Type 4X indoor use only	

Order number	5AP923.1906-00	
Revision	**D0**	**E0**
Mechanical properties		
Front		
Frame	Aluminum, coated	
Design	Black	
Panel overlay		
Material	Polyester	
Light background color	RAL 9006	
Dark border color around display	RAL 7024	
Gasket	3 mm fixed gasket	
Dimensions		
Width	440 mm	
Height	358 mm	
Weight	5800 g	

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

4.2.1.3.4 Dimensions



4.2.1.3.5 Temperature/Humidity diagram

5AP923.1906-00 ≥ Rev. E0

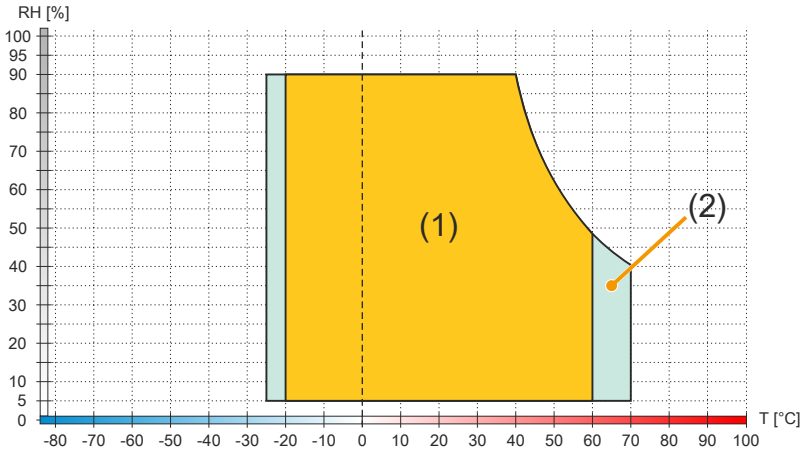


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AP923.1906-00 ≤ Rev. D0

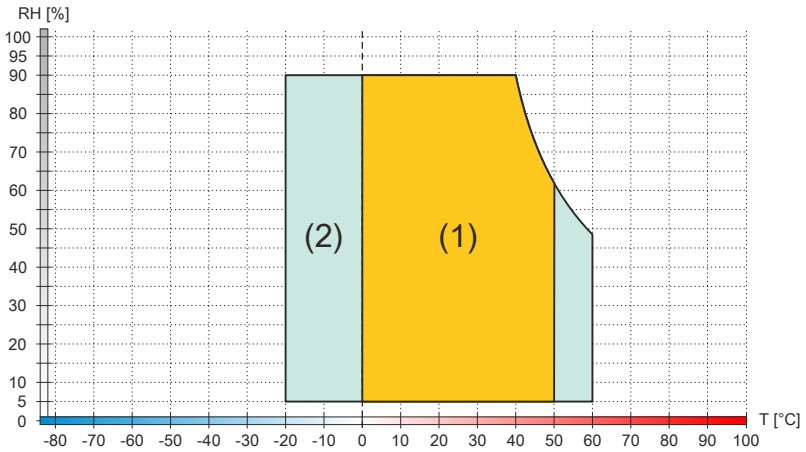


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.2.1.4 5AP933.156B-00

4.2.1.4.1 General information

- Panel for AP9x3, PPC900, PPC2100, PPC2200 or PPC3100
- 15.6" TFT HD color display
- Multi-touch (PCT)
- Control cabinet installation

4.2.1.4.2 Order data

Order number	Short description	Figure
	Panels	
5AP933.156B-00	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

4.2.1.4.3 Technical data

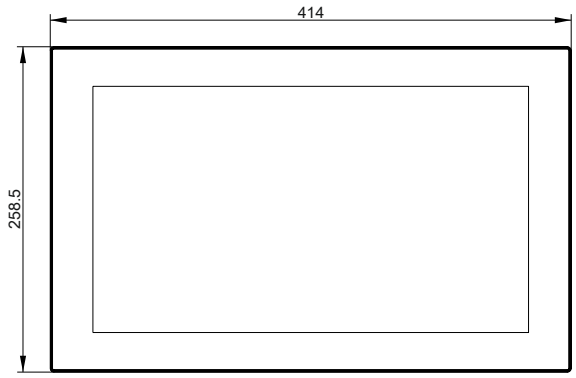
Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5AP933.156B-00	
Revision	**C0**	**D0**
General information		
B&R ID code	0xE16A	
Certifications		
CE	Yes	
UKCA	Yes	
UL	cULus E115267 Industrial control equipment	
Display		
Type	TFT color	
Diagonal	15.6"	
Colors	16.7 million	
Resolution	HD, 1366 × 768 pixels	
Contrast	500:1	1000:1
Viewing angles		
Horizontal	Direction R = 85° / Direction L = 85°	
Vertical	Direction U = 80° / Direction D = 80°	Direction U = 85° / Direction D = 85°
Backlight		
Type	LED	
Brightness (dimmable)	Typ. 15 to 300 cd/m²	Typ. 40 to 400 cd/m²
Half-brightness time [1]	50,000 h	70,000 h
Touch screen [2]		
Technology	Projected capacitive touch (PCT)	
Transmittance	88% ±2%	>90%
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)	
Degree of protection per UL 50	Front: Type 4X indoor use only	
Mechanical properties		
Front		
Frame	Aluminum, coated	
Design	Black	
Gasket	3 mm fixed gasket	
Dimensions		
Width	414 mm	
Height	258.5 mm	
Weight	3850 g	

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) The specifications of the touch screen driver must be taken into account; see section "Multi-touch driver".

4.2.1.4.4 Dimensions



4.2.1.4.5 Temperature/Humidity diagram

5AP933.156B-00 ≥ Rev. D0

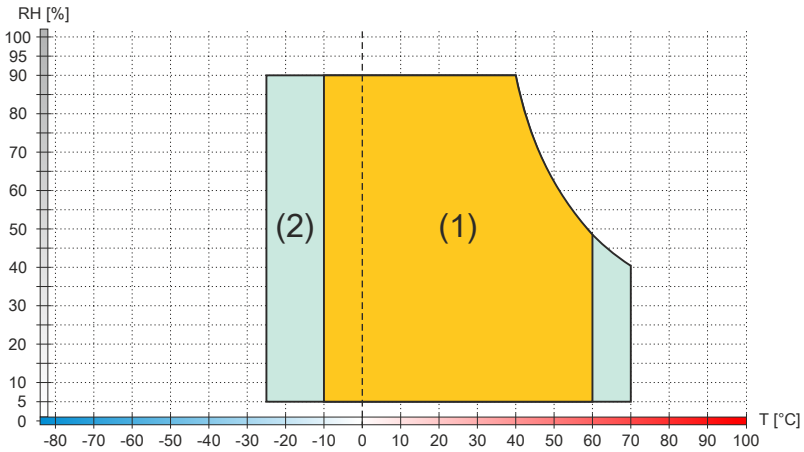


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AP933.156B-00 ≤ Rev. C0

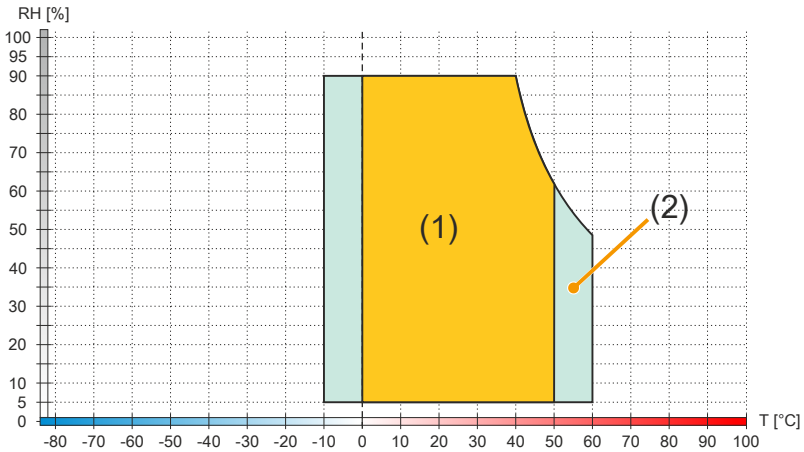


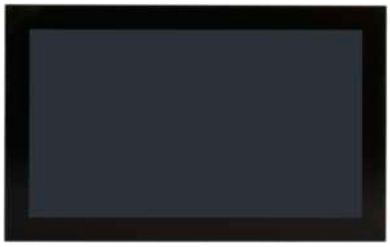
Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.2.1.5 5AP933.185B-00

4.2.1.5.1 General information

- Panel for AP9x3, PPC900, PPC2100, PPC2200 or PPC3100
- 18.5" TFT HD color display
- Multi-touch (PCT)
- Control cabinet installation

4.2.1.5.2 Order data

Order number	Short description	Figure
	Panels	
5AP933.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

4.2.1.5.3 Technical data

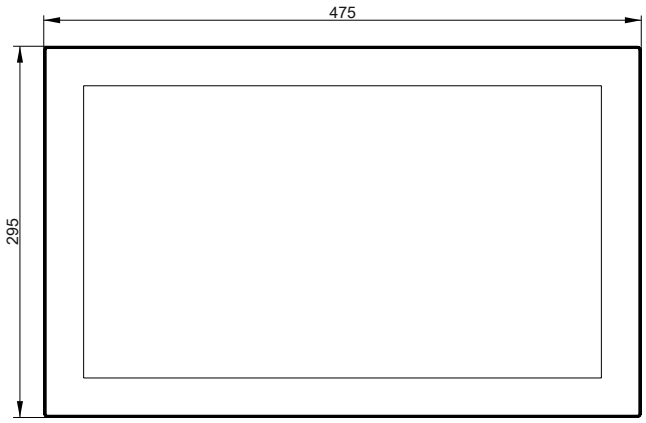
Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5AP933.185B-00		
Revision	**C0**	**D0**	**K0**
General information			
B&R ID code	0xE16B		
Certifications			
CE	Yes		
UKCA	Yes		
UL	cULus E115267 Industrial control equipment		
Display			
Type	TFT color		
Diagonal	18.5"		
Colors	16.7 million		
Resolution	HD, 1366 × 768 pixels		
Contrast	1000:1		
Viewing angles			
Horizontal	Direction R = 85° / Direction L = 85°		
Vertical	Direction U = 80° / Direction D = 80°		
Backlight			
Type	LED		
Brightness (dimmable)	Typ. 15 to 300 cd/m²		Typ. 15 to 450 cd/m²
Half-brightness time [1]	50,000 h		
Touch screen [2]			
Technology	Projected capacitive touch (PCT)		
Transmittance	88% ±2%	>90%	
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)		
Degree of protection per UL 50	Front: Type 4X indoor use only		
Mechanical properties			
Front			
Frame	Aluminum, coated		
Design	Black		
Gasket	3 mm fixed gasket		
Dimensions			
Width	475 mm		
Height	295 mm		
Weight	4850 g		Approx. 4470 g

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) The specifications of the touch screen driver must be taken into account; see section "Multi-touch driver".

4.2.1.5.4 Dimensions



4.2.1.5.5 Temperature/Humidity diagram

5AP933.185B-00 ≥ Rev. D0

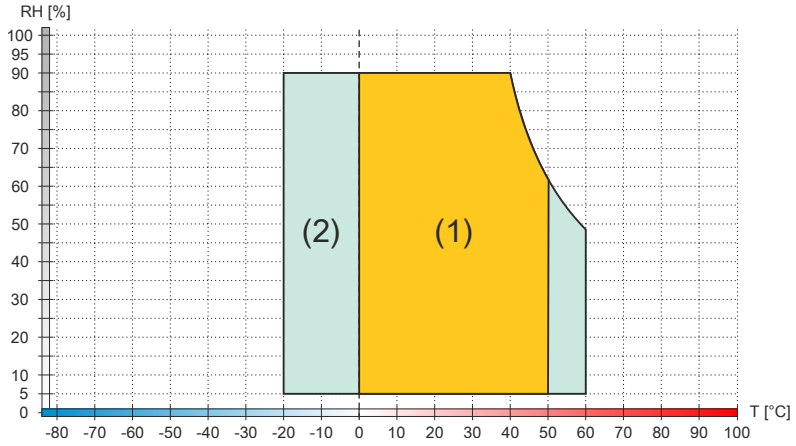


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AP933.185B-00 ≤ Rev. C0

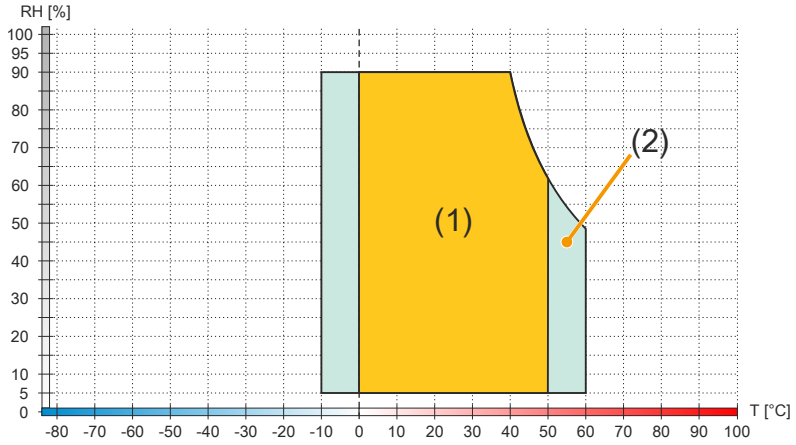


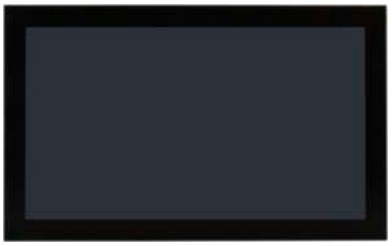
Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.2.1.6 5AP933.215C-00

4.2.1.6.1 General information

- Panel for AP9x3, PPC900, PPC2100, PPC2200 or PPC3100
- 21.5" TFT FHD color display
- Multi-touch (PCT)
- Control cabinet installation

4.2.1.6.2 Order data

Order number	Short description	Figure
	Panels	
5AP933.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

4.2.1.6.3 Technical data

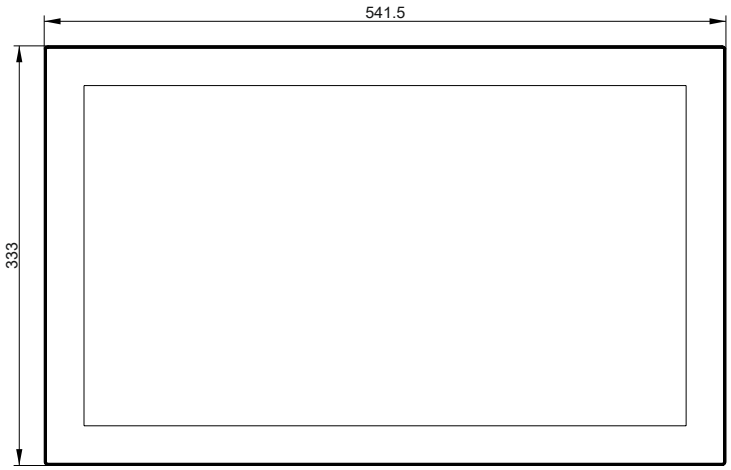
Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5AP933.215C-00	
Revision	**C0**	**D0**
General information		
B&R ID code	0xE16C	
Certifications		
CE	Yes	
UKCA	Yes	
UL	cULus E115267 Industrial control equipment	
Display		
Type	TFT color	
Diagonal	21.5"	
Colors	16.7 million	
Resolution	FHD, 1920 × 1080 pixels	
Contrast	1000:1	5000:1
Viewing angles		
Horizontal	Direction R = 89° / Direction L = 89°	
Vertical	Direction U = 89° / Direction D = 89°	
Backlight		
Type	LED	
Brightness (dimmable)	Typ. 12.5 to 250 cd/m²	
Half-brightness time [1]	30,000 h	
Touch screen [2]		
Technology	Projected capacitive touch (PCT)	
Transmittance	88% ±2%	>90%
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)	
Degree of protection per UL 50	Front: Type 4X indoor use only	
Mechanical properties		
Front		
Frame	Aluminum, coated	
Design	Black	
Gasket	3 mm fixed gasket	
Dimensions		
Width	541.5 mm	
Height	333 mm	
Weight	5400 g	

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) The specifications of the touch screen driver must be taken into account; see section "Multi-touch driver".

4.2.1.6.4 Dimensions



4.2.1.6.5 Temperature/Humidity diagram

5AP933.215C-00 ≥ Rev. D0

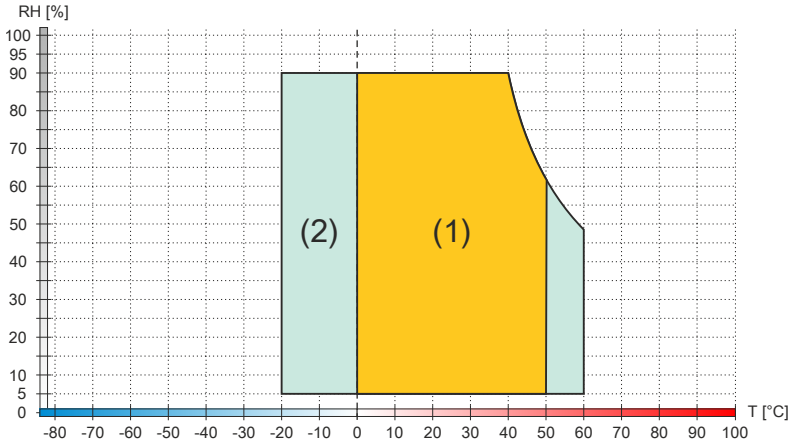


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AP933.215C-00 ≤ Rev. C0

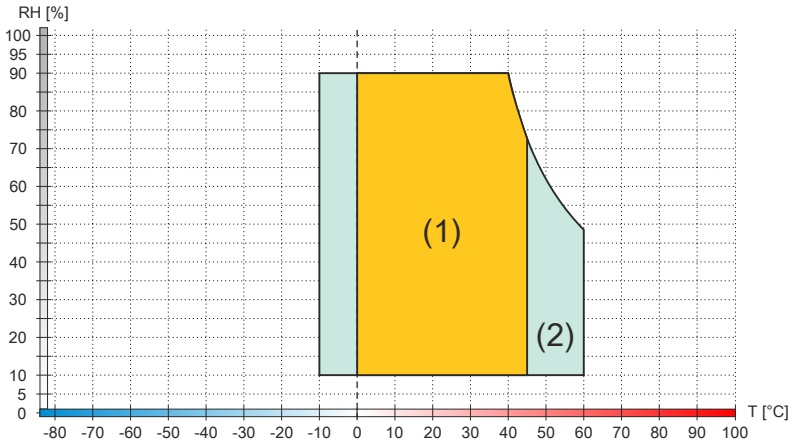


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.2.1.7 5AP933.240C-00

4.2.1.7.1 General information

- Panel for AP9x3, PPC900, PPC2100, PPC2200 or PPC3100
- 24" TFT FHD color display
- Multi-touch (PCT)
- Control cabinet installation

4.2.1.7.2 Order data

Order number	Short description	Figure
	Panels	
5AP933.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

4.2.1.7.3 Technical data

Information:

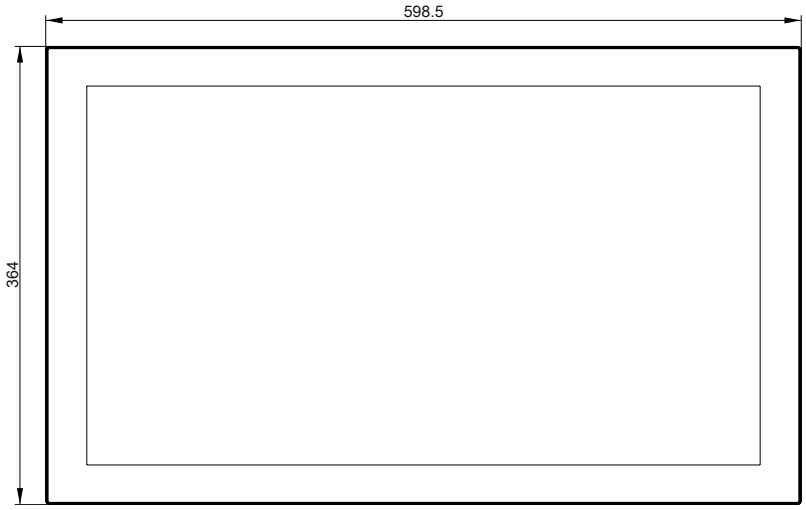
The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5AP933.240C-00	
Revision	**C0**	**D0**
General information		
B&R ID code	0xE1B4	
Certifications		
CE	Yes	
UKCA	Yes	
UL	cULus E115267 Industrial control equipment	
DNV	Temperature: **B** (0 to 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)	
LR	ENV3	
KR	Yes	
ABS	Yes	
BV	**EC31B** Temperature: 5 - 55°C Vibration: 0.7 g EMC: Bridge and open deck	
Display		
Type	TFT color	
Diagonal	24.0"	
Colors	16.7 million	
Resolution	FHD, 1920 × 1080 pixels	
Contrast	5000:1	
Viewing angles		
Horizontal	Direction R = 89° / Direction L = 89°	
Vertical	Direction U = 89° / Direction D = 89°	
Backlight		
Type	LED	
Brightness (dimmable)	Typ. 30 to 300 cd/m²	
Half-brightness time [1]	50,000 h	
Touch screen [2]		
Technology	Projected capacitive touch (PCT)	
Transmittance	88% ±2%	>90%
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)	
Degree of protection per UL 50	Front: Type 4X indoor use only	

Order number	5AP933.240C-00	
Revision	C0	D0
Mechanical properties		
Front		
Frame	Aluminum, coated	
Design	Black	
Gasket	3 mm fixed gasket	
Dimensions		
Width	598.5 mm	
Height	364 mm	
Weight	Approx. 7800 g	

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) The specifications of the touch screen driver must be taken into account; see section "Multi-touch driver".

4.2.1.7.4 Dimensions



4.2.1.7.5 Temperature/Humidity diagram

5AP933.240C-00 ≥ Rev. D0

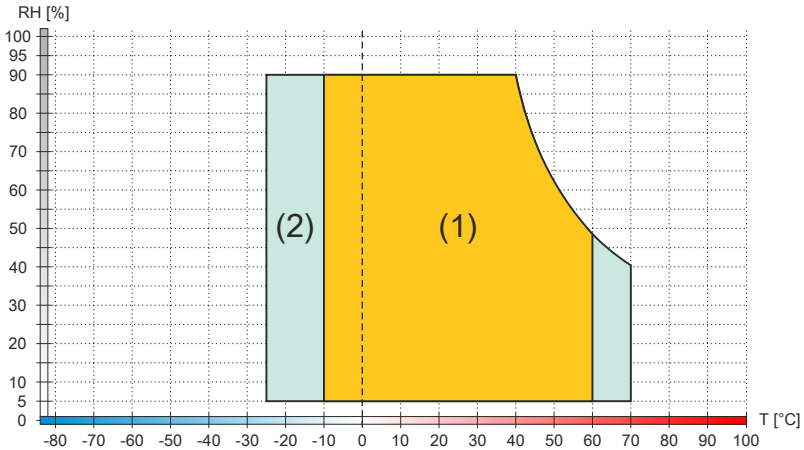


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AP933.240C-00 ≤ Rev. C0

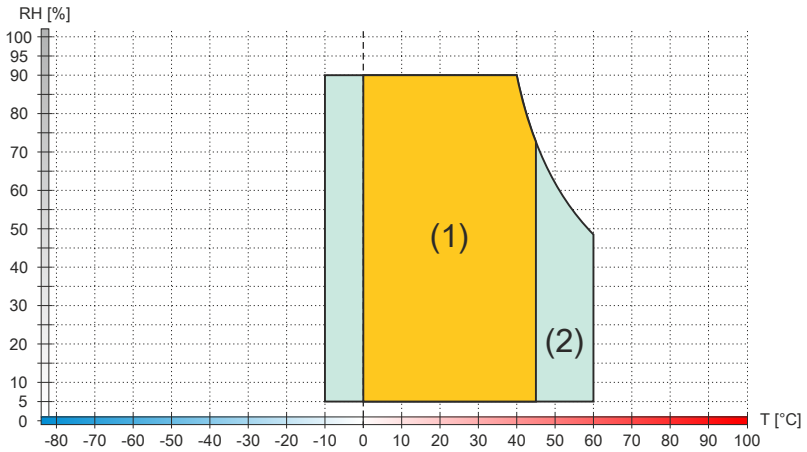


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.2.2 Link modules

4.2.2.1 5DLDPO.1001-00

4.2.2.1.1 General information

- Link module for Automation Panel 933/1130/5130 and 5230 (only with 5ACCKP00.xxxx-000)
- 1x DisplayPort interface
- 1x USB In (USB 2.0 type B)
- 2x USB 2.0 type A
- 1x OSD control panel
- Compatible with the APC910, APC3100 and APC4100

4.2.2.1.2 Order data

Order number	Short description	Figure
	Link modules	
5DLDPO.1001-00	Automation Panel link module - DisplayPort receiver - For Automation Panel 933/1130 - For Automation Panel 5130 - For Automation Panel 5230 (only with 5ACCKP00.xxxx-000)	
	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	
	DisplayPort cables	
5CADPO.0018-00	DisplayPort cable 1.8 m	
5CADPO.0050-00	DisplayPort cable 5 m	
5CADPO.0075-00	DisplayPort cable 7.5 m	
	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	
5CAUSB.0075-00	USB 2.0 connection cable - Type A - type B connector - 7.5 m	

4.2.2.1.3 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5DLDPO.1001-00
General information	
LEDs	Status, Link
B&R ID code	0x2F1A
Certifications	
CE	Yes
UKCA	Yes
UL	In preparation
Interfaces	
USB	
Quantity	3
Type	USB 2.0
Variant	2x type A, 1x type B
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Total max. 1 A [1]
Panel In	
Quantity	1
Variant	DisplayPort
Electrical properties	
Nominal voltage	24 VDC, SELV [2]
Nominal current	Max. 2.3 A
Operating voltage	24 VDC ±25%
Overvoltage category per EN 61131-2	II
Galvanic isolation	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

Order number	5DLDPO.1001-00
Mechanical properties	
Dimensions	
Width	190 mm
Height	110 mm
Depth	23.6 mm
Weight	490 g

1) For the 2 USB type A female connectors.
2) IEC 61010-2-201 requirements must be observed.

4.2.2.2 5DLSDL.1001-00

4.2.2.2.1 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

4.2.2.2.2 Order data

Order 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	

4.2.2.2.3 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5DLSDL.1001-00
General information	
B&R ID code	0xE1A4
Brightness buttons	Yes [1]
Certifications	
CE	Yes
UKCA	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	Temperature: **B** (0 to 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)
LR	ENV3
KR	Yes
ABS	Yes
BV	**EC31B** Temperature: 5 - 55°C Vibration: 0.7 g EMC: Bridge and open deck
Interfaces	
COM	
Type	RS232, modem supported, not galvanically isolated
Variant	DSUB, 9-pin, female
UART	16550-compatible, 16-byte FIFO buffer
Max. baud rate	115 kbit/s
USB	
Quantity	3 (2x Type A; 1x Type B)
Type	USB 2.0 [2]
Variant	2x type A 1x type B
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Total max. 1 A [3]
Panel In	
Variant	DVI-D
Type	SDL/DVI

Order number	5DLSDL.1001-00
Electrical properties	
Nominal voltage	24 VDC, SELV [4]
Nominal current	Max. 3 A
Operating voltage	24 VDC ±25%
Overvoltage category per EN 61131-2	II
Galvanic isolation	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Mechanical properties	
Dimensions	
Width	190 mm
Height	110 mm
Depth	23.6 mm
Weight	538 g

1) The brightness controls can be used to set the brightness of the backlight on the Automation Panel in DVI operation.
2) Max. USB 1.1 is possible in "SDL operation without USB cable".
3) For the 2 USB type A female connectors.
4) IEC 61010-2-201 requirements must be observed.

4.2.2.3 5DLSD3.1001-00

4.2.2.3.1 General information

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

4.2.2.3.2 Order data

Order 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/SDL4/PoE cables	
5CASD3.0010-00	SDL3/SDL4/FT50 cable - 1 m - FT50 including Power over Ethernet	
5CASD3.0030-00	SDL3/SDL4/FT50 cable - 3 m - FT50 including Power over Ethernet	
5CASD3.0050-00	SDL3/SDL4/FT50 cable - 5 m - FT50 including Power over Ethernet	
5CASD3.0070-00	SDL3/SDL4/FT50 cable - 7 m - FT50 including Power over Ethernet	
5CASD3.0100-00	SDL3/SDL4/FT50 cable - 10 m - FT50 including Power over Ethernet	
5CASD3.0150-00	SDL3/SDL4/FT50 cable - 15 m - FT50 including Power over Ethernet	
5CASD3.0200-00	SDL3/SDL4/FT50 cable - 20 m - FT50 including Power over Ethernet	
5CASD3.0300-00	SDL3/SDL4/FT50 cable - 30 m - FT50 including Power over Ethernet	
5CASD3.0500-00	SDL3/SDL4/FT50 cable - 50 m - FT50 including Power over Ethernet	
5CASD3.1000-00	SDL3/SDL4/FT50 cable - 100 m - FT50 including Power over Ethernet	

4.2.2.3.3 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.

Order number	5DLSD3.1001-00
General information	
LEDs	Status, Link
B&R ID code	0xE3FC
Certifications	
CE	Yes
UKCA	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4
Interfaces	
USB	
Quantity	2
Type	USB 2.0
Variant	2x type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (30 Mbit/s)
Current-carrying capacity	Total max. 1 A
SDL3 In	
Variant	RJ45, shielded
Type	SDL3

Order number	5DLSD3.1001-00
Electrical properties	
Nominal voltage	24 VDC, SELV [1)]
Nominal current	Max. 3 A
Operating voltage	24 VDC ±25%
Overvoltage category per EN 61131-2	II
Galvanic isolation	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Mechanical properties	
Dimensions	
Width	190 mm
Height	110 mm
Depth	23.6 mm
Weight	527 g

1) IEC 61010-2-201 requirements must be observed.

4.2.2.4 5DLSD4.1001-00

4.2.2.4.1 General information

- Link module for Automation Panel 9x3/1000/5000
- 1x SDL4 Panel In interface
- 2x USB 2.0 type A

4.2.2.4.2 Order data

Order number	Short description	Figure
	Link modules	
5DLSD4.1001-00	Automation Panel link module - SDL4 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/SDL4/PoE cables	
5CASD3.0010-00	SDL3/SDL4/FT50 cable - 1 m - FT50 including Power over Ethernet	
5CASD3.0030-00	SDL3/SDL4/FT50 cable - 3 m - FT50 including Power over Ethernet	
5CASD3.0050-00	SDL3/SDL4/FT50 cable - 5 m - FT50 including Power over Ethernet	
5CASD3.0070-00	SDL3/SDL4/FT50 cable - 7 m - FT50 including Power over Ethernet	
5CASD3.0100-00	SDL3/SDL4/FT50 cable - 10 m - FT50 including Power over Ethernet	
5CASD3.0150-00	SDL3/SDL4/FT50 cable - 15 m - FT50 including Power over Ethernet	
5CASD3.0200-00	SDL3/SDL4/FT50 cable - 20 m - FT50 including Power over Ethernet	
5CASD3.0300-00	SDL3/SDL4/FT50 cable - 30 m - FT50 including Power over Ethernet	
5CASD3.0500-00	SDL3/SDL4/FT50 cable - 50 m - FT50 including Power over Ethernet	
5CASD3.1000-00	SDL3/SDL4/FT50 cable - 100 m - FT50 including Power over Ethernet	

4.2.2.4.3 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	5DLSD4.1001-00
General information	
LEDs	Status, Link
B&R ID code	0xECE3
Certifications	
CE	Yes
UKCA	Yes
UL	cULus E115267 Industrial control equipment
Interfaces	
USB	
Quantity	2
Type	USB 2.0
Variant	2x type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (150 Mbit/s)
Current-carrying capacity	Total max. 1 A
SDL4 In	
Variant	RJ45, shielded
Type	SDL4
Electrical properties	
Nominal voltage	24 VDC, SELV [1)]
Nominal current	Max. 3 A
Operating voltage	24 VDC ±25%
Overvoltage category per EN 61131-2	II

Order number	5DLSD4.1001-00
Galvanic isolation	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Mechanical properties	
Dimensions	
Width	190 mm
Height	110 mm
Depth	23.6 mm
Weight	525 g

1) IEC 61010-2-201 requirements must be observed.

5 Installation and wiring

5.1 Basic information

Information:

A damaged device has unpredictable properties and states. The unintentional installation or startup of a damaged device must be prevented. The damaged device must be marked as such and made inaccessible, or it must be returned for repairs immediately.

Unpacking

The following activities must be performed before unpacking the device:

- Check the packaging for visible transport damage.
- If transport damage is noticeable, document this immediately and submit a complaint. If possible, have the damage confirmed by the carrier/delivery service.
- Check the contents of the shipment for completeness and damage.
- If the contents of the packaging are incomplete, damaged or do not correspond to the order, the responsible sales office or B&R Headquarters must be informed immediately.
- The information in section "Protection against electrostatic discharge" on page 10 must be observed for unpacked devices and components.
- Keep the original packaging for further transport.

Power supply

The following information is generally applicable and should be observed before performing any work on the device:

- The entire power supply must be disconnected before removing any covers or components from the device and installing or removing any accessories, hardware or cables.
- Remove the power cable from the device and from the power supply.
- All covers and components, accessories, hardware and cables must be installed or secured before the device is connected to the power supply and switched on.

Caution!

Energy regeneration is not permitted and can cause damage or the device to become defective. Built-in or connected peripheral devices (e.g. USB hubs) are not permitted to introduce any voltage into the device.

Installation

Information:

Optional sets are available that contain all necessary tools for installation. For additional information about tool sets, see section "Installation accessories" on page 97.

Before installation

The following activities and limitations must be observed before installing the device.

- Allow sufficient space for installation, operation and maintenance of the device.
- The device must be installed on a flat, clean and burr-free surface.
- The wall or control cabinet panel must be able to support four times the total weight of the device. If necessary, bracing must be attached to reinforce the mounting surface.

Caution!

If the load-bearing capacity of the mounting surface is insufficient, or if the fastening material is inadequate or incorrect, the device may fall and become damaged.

- To avoid overheating, the device is not permitted to be placed near other heat sources.

Information about the device's environment

- Observe the notes and regulations regarding the power supply and functional ground.
- Observer the specified bend radius when connecting cables.
- Ventilation openings are not permitted to be covered or blocked.
- The device is only permitted to be operated in closed rooms and not permitted to be exposed to direct sunlight.
- The climatic ambient conditions and environmental conditions must be taken into account – see "Environmental properties" on page 32.

General installation instructions

- When installing the device, the permissible mounting orientations must be observed - see "Mounting orientations" on page 31.
- The device must be installed in such a way that it can be optimally viewed by the user.
- The device must be installed in such a way that reflections on the screen are avoided as far as possible.
- When installed in a closed housing, there must be sufficient volume for air circulation - see "Spacing for air circulation" on page 30.
- When connecting installed or connected peripherals, follow the instructions in the peripheral device's documentation.

Information about leak tightness

Warning!

Failure to follow instructions can result in damage to property.

- The gasket must be inspected before installation or reinstallation and at regular intervals according to the requirements of the operating environment.
- Replace the entire device if inspection reveals visible scratches, cracks, dirt deposits or excessive wear.
- Do not stretch the gasket unnecessarily.
- It is important to ensure that the gasket is correctly seated all around.
- The housing components must be secured using the specified tightening torque.

Transport and storage

Information:

Condensation may form under certain environmental conditions or rapid climatic changes. For improved acclimatization and to avoid damage, the device must be slowly adapted to the room temperature.

When transporting at low temperatures or in the event of large temperature fluctuations, the collection of moisture in or on the device is not permitted. Moisture can cause short circuits in electrical circuits and damage the device.

If a device is transported or stored without packaging, all environmental influences such as shocks, vibrations, pressure and moisture have an unprotected effect on the device. Damaged packaging indicates that the device has been severely affected by environmental influences and may have been damaged.

This can result in malfunctions of the device, machine or system.

Use of third-party products

If third-party devices or components are used, the relevant manufacturer's documentation must be observed. If limitations or interactions by or with third-party products are possible, this must be taken into account in the application.

5.2 Automation Panel 9x3 - Installation

The Automation Panel 9x3 is installed in the installation cutout using retaining clips. The number of retaining clips depends on the panel used.

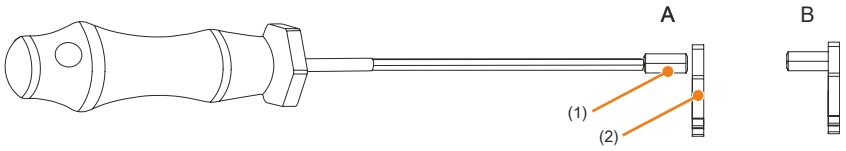
The thickness of the wall or cabinet plate must be between 1 mm and 6 mm.

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.

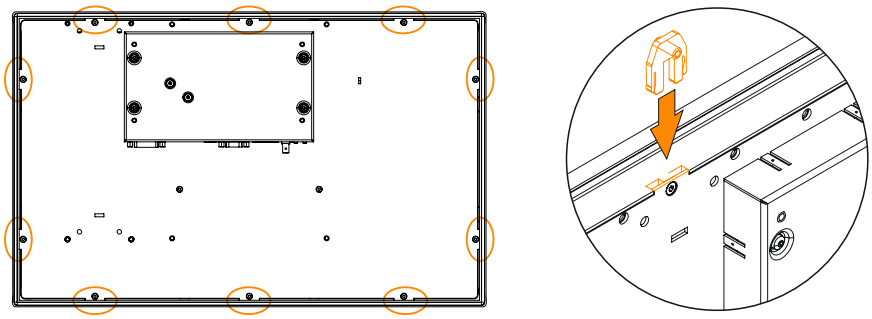
The device must be installed on a flat, clean and burr-free surface since tightening screws on an uneven area can result in damage to the display or the ingress of dust and water.

Procedure

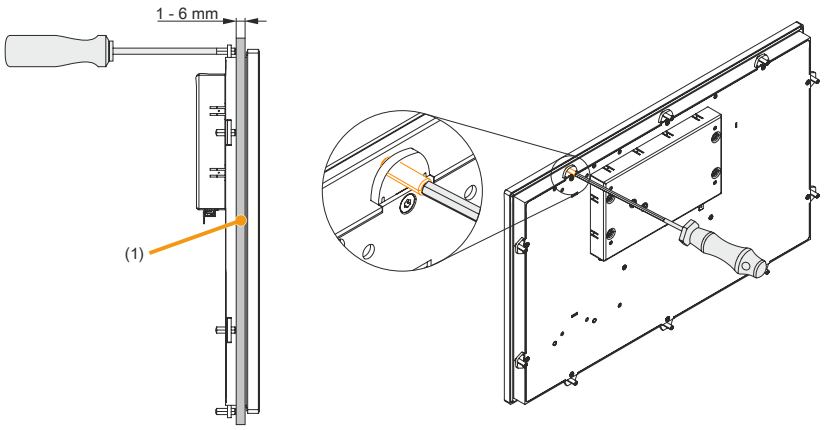
1. Check whether the supplied mounting screws (1) are screwed into the retaining clips (2). If this is not the case, the mounting screws must be screwed into the retaining clips using a 2.5 mm hex screwdriver (view A). The mounting screws are only permitted to be screwed in to the point where they do not project beyond the retaining clip (view B).



2. Insert the device into the front side of the smooth, flat installation cutout. The dimensions for the cutout can be found in section "Installation diagrams" on page 29.
3. Install the retaining clips on the device. To do this, insert all retaining clips into the recesses (marked with orange circles) on the device. The number of retaining clips may vary depending on the panel. For the exact number of retaining clips, see section "Installation diagrams" on page 29.

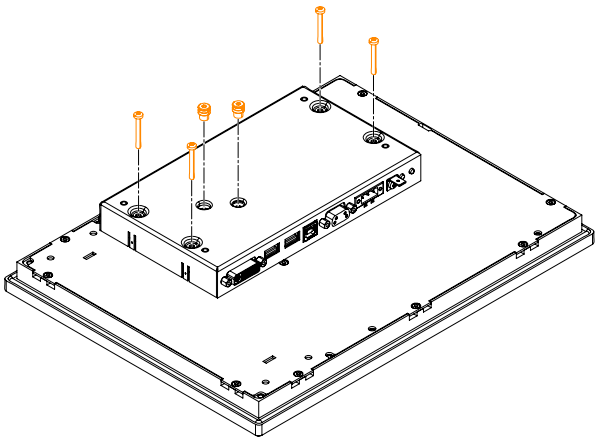


4. Secure the retaining clips to the wall or control cabinet panel (1) by alternately tightening the mounting screws with a 2.5 mm hex screwdriver. The tightening torque for optimal sealing should be max. 1 Nm.

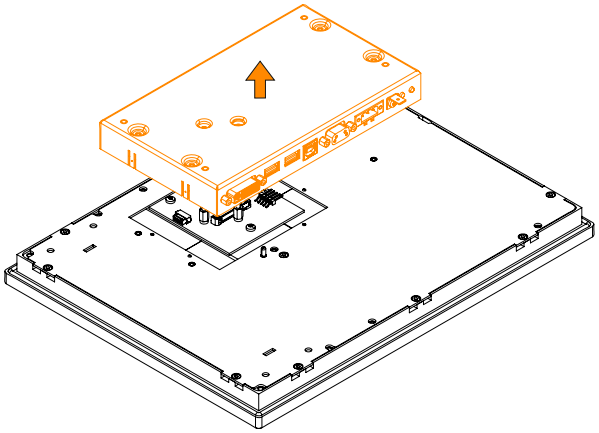


5.3 Switch the link module

1. Disconnect the power supply cable to the Automation Panel (disconnect the power cable). Disconnect from all sources and poles!
2. Carry out electrostatic discharge at 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 figure.



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



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

5.4 Connecting to the power grid

Danger!

- **The entire power supply must be disconnected and electrostatic discharge must take place on the housing or ground connection before removing any covers or components from the device and installing or removing any accessories, hardware or cables.**
- **Remove the power cable from the device and from the power supply.**
- **All covers and components, accessories, hardware and cables must be installed or secured before the device is connected to the power supply and switched on.**

5.4.1 Installing the DC power cable

Danger!

The entire power supply to the B&R industrial PC or B&R Automation Panel must be interrupted. Before connecting the DC power cable, it must be checked whether it has been disconnected from the voltage source (e.g. power supply unit).

5.4.1.1 Wiring

Caution!

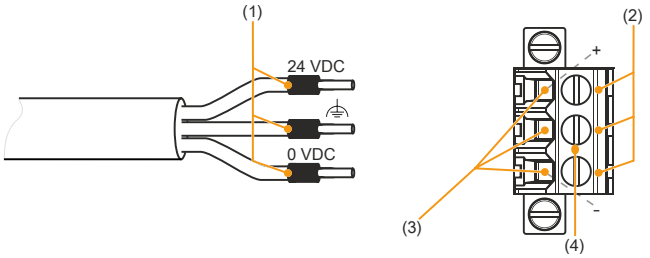
The pinout of the power supply interface must be observed!

Conductors of the power cable	Terminal connection symbol
+24 VDC	+
GND	⏚
0 VDC	-

The DC power cable must be implemented with a wire cross section of 0.75 mm² to 1.5 mm² and wire end sleeves.

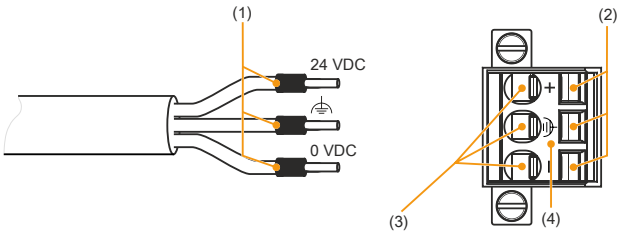
Installing screw clamp terminal block 0TB103.9

Secure the conductors with wire end sleeves ① in the terminal contacts ③ as shown in the figure below and tighten the screw clamp terminals ④ with a screwdriver (max. tightening torque 0.4 Nm). It is important to pay attention to the label on the screw clamp terminal ②.



Installing cage clamp terminal block 0TB103.91

Insert a screwdriver into the cage clamp terminals ② and secure the conductors with wire end sleeves ① in the terminal contacts ③ as shown in the figure below. Close the terminal contact by removing the screwdriver. It is important to pay attention to the label on the cage clamp terminal ④.

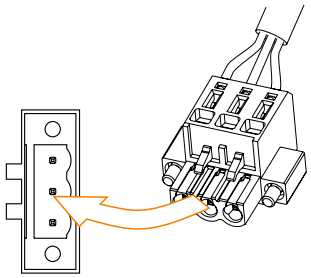


5.4.2 Connecting the power supply to a B&R device

Danger!

The entire power supply to the B&R device must be interrupted. Before connecting the power cable, it must be checked whether it has been disconnected from the voltage source (e.g. power supply unit).

1. Carry out electrostatic discharge on the housing or at the ground connection.
2. Connect the power supply connector to the B&R device and tighten the mounting screws (max. tightening torque 0.5 Nm).



5.4.3 Grounding concept - Functional ground

Functional ground is a low impedance current path between circuits and ground. It is used for equipotential bonding and thus for improving immunity to interference.

Notice!

Functional grounding does not meet the requirements of protective ground!
Suitable measures for electrical safety in the event of operation and faults must be provided separately.

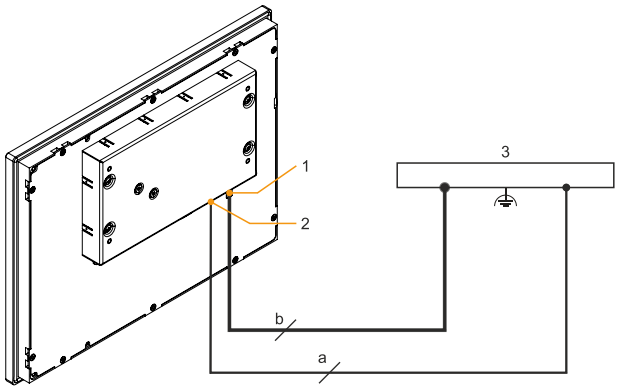
The device is equipped with the following functional ground connections:

- Functional ground connection of the power supply
- Ground connection

The functional ground on the B&R device is marked with the following symbol: ⏚

The following points must be observed to ensure that electrical interference is safely diverted:

- Connect the device to the central grounding point (e.g. the control cabinet or the system) using the shortest possible low-resistance path.
- Cable design with at least 2.5 mm² per connection. If a cable with wire end sleeve is used with terminal block 0TB103.9 or 0TB103.91, a cable with a maximum of 1.5 mm² per connection is possible.
- Observe the shielding concept of the conductors. All data cables connected to the device must be implemented using shielded lines.



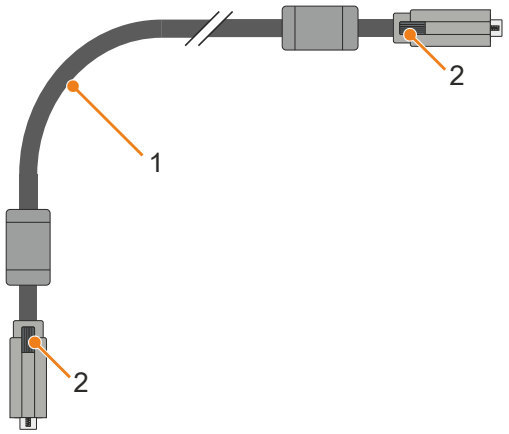
Legend					
1	Ground connection ⏚	2	Power supply connection +24 VDC pin 2	3	Central grounding point
a	At least 1.5 mm²	b	At least 2.5 mm²		-

5.5 Connecting cables

Information:

B&R generally recommends connecting swing arm devices to the Automation PC via SDL4 instead of SDL. The Cat 6 / Cat 7 cables used with SDL4 are much easier to install and connect.

When connecting or installing cables, the bend radius specification must be observed. For this specification, see the technical data of the respective cable.
The maximum tightening torque of the locating screws is 0.5 Nm.



1) Bend radius
2) Locating screws

6 Commissioning

Information:

Condensation may form under certain environmental conditions or rapid climatic changes. For improved acclimatization and to avoid damage, the device must be slowly adapted to the room temperature.

6.1 Switching on the device for the first time

6.1.1 General information before switching on the device

Checklist

Before the device is started up for the first time, the following points must be checked:

- Have the installation instructions been observed as described in "Installation and wiring" on page 73?
- Have the permissible ambient conditions and environmental conditions for the device been taken into account?
- Is the power supply connected correctly and have the values been checked?
- Is the ground cable correctly connected to the ground connection?
- Before installing additional hardware, the device must have been started up.

Caution!

Before the device is started up, it must be gradually adapted to room temperature! Exposure to direct heat radiation is not permitted.

When transporting at low temperatures or in the event of large temperature fluctuations, the collection of moisture in or on the device is not permitted.

Moisture can cause short circuits in electrical circuits and damage the device.

Requirements

The following criteria must be met before switching on the device for the first time:

- The protective film has been removed from the panel.
- The functional ground connections are as short as possible and connected to the central grounding point using the largest possible wire cross section.
- All connection cables are connected correctly.
- A USB keyboard and USB mouse are connected (optional).
- An Automation PC or Panel PC is connected (via DVI, SDL, SDL3 or SDL4).

6.1.2 Switching on the Automation Panel

Procedure

1. Connect the power supply and switch it on.
2. The device is operating.

6.2 Touch screen calibration

B&R panels are hardware-calibrated at the factory. This means that recalibration is not usually necessary.

6.2.1 Single-touch (analog resistive)

Recalibration is generally not necessary, but B&R recommends recalibration in order to achieve the best results and to adapt the touch screen to the user's needs.

6.2.1.1 Windows 10 IoT Enterprise 2019 LTSC

After starting Windows 10 IoT Enterprise 2019 LTSC on a Panel PC for the first time, the appropriate touch screen driver is installed automatically.

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

6.2.1.2 Windows 10 IoT Enterprise 2016 LTSB

After starting Windows 10 IoT Enterprise 2016 LTSB on a Panel PC for the first time, the appropriate touch screen driver is installed automatically.

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

6.2.1.3 Windows 10 IoT Enterprise 2015 LTSB

After starting Windows 10 IoT Enterprise 2015 LTSB on a Panel PC for the first time, the appropriate touch screen driver is installed automatically.

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

6.2.1.4 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 subsequently installed to operate the touch screen. The appropriate driver is available for download in the Downloads section of the B&R website (www.br-automation.com).

6.2.1.5 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 appropriate driver is available for download in the Downloads section of the B&R website (www.br-automation.com).

6.2.1.6 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 screen controller was not detected when installing Windows Embedded Standard 7 or if an Automation Panel has been connected after installation. The appropriate driver is available for download in the Downloads section of the B&R website (www.br-automation.com).

6.2.1.7 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 appropriate driver is available for download in the Downloads section of the B&R website (www.br-automation.com).

6.2.1.8 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 subsequently installed to operate the touch screen. The appropriate driver is available for download in the Downloads section of the B&R website (www.br-automation.com).

6.2.2 Multi-touch (projected capacitive - PCT)

6.2.2.1 Windows 10 IoT Enterprise 2021 LTSC

Microsoft multi-touch drivers are installed on the device during installation of Windows 10 IoT Enterprise 2021 LTSC. After successful installation, the device is immediately ready for operation.

6.2.2.2 Windows 10 IoT Enterprise 2019 LTSC

Microsoft multi-touch drivers are installed on the device during installation of Windows 10 IoT Enterprise 2019 LTSC. After successful installation, the device is immediately ready for operation.

6.2.2.3 Windows 10 IoT Enterprise 2016 LTSB

Microsoft multi-touch drivers are installed on the device during installation of Windows 10 IoT Enterprise 2016 LTSB. After successful installation of Windows 10 IoT Enterprise 2016 LTSB, the device is immediately ready for operation.

6.2.2.4 Windows 10 IoT Enterprise 2015 LTSB

Microsoft multi-touch drivers are installed on the device during installation of Windows 10 IoT Enterprise 2015 LTSB. After successful installation of Windows 10 IoT Enterprise 2015 LTSB, the device is immediately ready for operation.

6.2.2.5 Windows Embedded 8.1 Industry Pro

Microsoft multi-touch drivers are installed on the device during installation of Windows Embedded 8.1 Industry Pro. After successful installation of Windows Embedded 8.1 Industry Pro, the device is immediately ready for operation.

6.2.2.6 Windows 7 Professional / Ultimate

Microsoft multi-touch drivers are installed on the device during installation of Windows 7. After successful installation of Windows 7, the device is immediately ready for operation.

6.2.2.7 Windows Embedded Standard 7 Premium

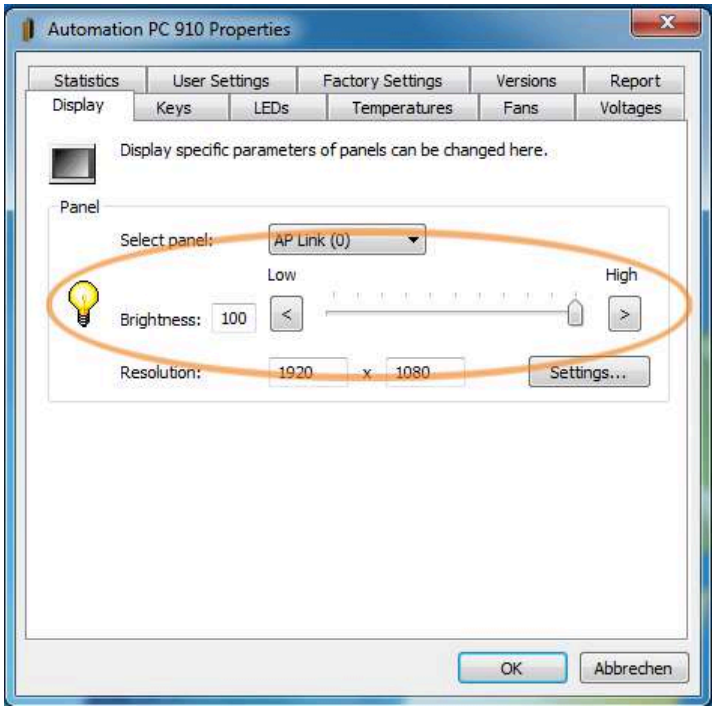
Microsoft multi-touch drivers are installed on the device during installation of Windows Embedded Standard 7 Premium. After successful installation of Windows Embedded Standard 7 Premium, the device is immediately ready for operation.

6.3 Display brightness control

In SDL, SDL3 or SDL4 operation, the brightness of the display can be configured using the B&R Control Center on the connected B&R industrial PC, for example. In DVI operation, the brightness can only be controlled using the two brightness controls provided on the SDL/DVI receiver. In the DP receiver use case, the display brightness can be adjusted via the OSD menu.

6.3.1 Adjusting in SDL / SDL3 / SDL4 mode

1. Open **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.



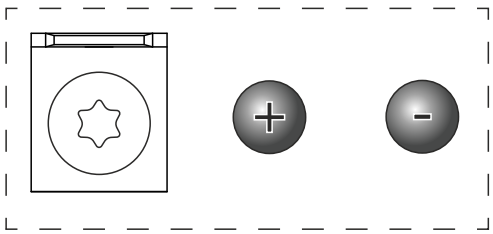
Information:

The changed settings are displayed online but only applied by the system (and used after the next restart) if the Control Center is exited with *OK*.

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

6.3.2 Adjusting in DVI operation

1. Use the two brightness controls on the SDL/DVI receiver to set the brightness (for additional information, see "SDL/DVI receiver (5DLSDL.1001-00)" on page 41).



6.3.3 Adjusting in DP operation

Adjusting the display brightness is described in "Sets - Brightness setting" on page 40.

7 Software

7.1 Upgrade information

Warning!

The BIOS and firmware on B&R devices must always be kept up to date. Current versions can be downloaded from the B&R website (www.br-automation.com).

7.1.1 Automation Panel firmware upgrade

With *Firmware upgrade (Automation Panel, SDL3 Converter, SLD4 converter)*, it is possible to update the firmware of several controllers (SDLR, SDL3R, SDL4R, SDL3 Converter, SDL4 Converter) depending on the variant of the system.

A current firmware upgrade can be downloaded directly from the Downloads section of the B&R website (www.br-automation.com).

Caution!

The Automation Panel is not permitted to be switched off or reset while performing an upgrade!

7.2 Multi-touch drivers

Multi-touch panels are approved as human-interface devices (i.e. multi-touch support from the operating system) for the following operating systems:

- Windows 10 IoT Enterprise 2021 LTSC
- Windows 10 IoT Enterprise 2019 LTSC
- Windows 10 IoT Enterprise 2016 LTSB
- Windows 10 IoT Enterprise 2015 LTSB
- Windows Embedded 8.1 Industry Pro
- Windows 7 Professional/Ultimate
- Windows Embedded Standard 7 Premium
- Linux for B&R 12
- Linux for B&R 10
- Linux for B&R 9
- Linux for B&R 8

No guarantee can be given for multi-touch or single-touch operation, compatibility and functionality for operation with other operating systems and/or individual touch screen drivers.

7.3 Automation software

7.3.1 Licensing

B&R Automation Runtime software components (e.g. Automation Runtime, B&R Hypervisor, mapp Technology) require a license.

It is possible to choose between the following licensing types:

Technology Guarding (TG)

Technology Guarding is license protection used for individual software components. The *Technology Guard* (hardware dongle) serves as the license container; this is connected to an available USB interface on the target system.

> **Information:**
>
> **Licensing via TG is required for Automation Studio V4.1 or later and Automation Runtime V4.08 or later. No TG is necessary in earlier versions.**

Terms and conditions (TC)

No *Technology Guard* is necessary; licensing takes place via a license agreement. Licenses are supplied with the sales receipt. The user is responsible for complying with the license conditions. B&R is protected by the terms of the EULA.

> **Information:**
>
> **Licensing via TC is possible for Automation Studio V4.9 or later as well as Automation Runtime V4.90 or later.**

For detailed information about licensing, see Automation Help (**Automation software / Licensing**).

7.3.2 Order data

Hardware-based licensing (Technology Guard)

Order number	Short description	Figure
	Technology Guard	
0TG1000.01	Technology Guard (MSD)	
0TG1000.02	Technology Guard (HID)	
0TGF016.01	Technology Guard (MSD) with integrated flash drive, 16 GB (MLC)	
1TG4601.06-5	Automation Runtime Embedded, TG license	
1TG4601.06-T	Automation Runtime Embedded Terminal TG license	
1TG4700.00	B&R Hypervisor	

Contract-based licensing (terms and conditions)

Order number	Short description	Figure
	Runtime	
1TC4601.06-5	License for Automation Runtime Embedded (TC). One license per target system is required. This license is supported starting with version 4.9.	
	Hypervisor	
1TC4700.00	License for B&R Hypervisor (TC). One license per target system is required. This license is supported starting with version 4.9.	

7.3.3.1 Support

The following table provides an overview of which Automation Runtime software components are supported by the device.

Target system	B&R Hypervisor	ARemb	ARemb Terminal (TG only)

7.3.4 Automation Runtime

7.3.4.1 General information

The real-time operating system Automation Runtime is an integral part of Automation Studio. This real-time operating system forms the software core for running applications on a target system.

- Guarantees the highest possible performance of the hardware being used
- Runs on all B&R target systems
- Makes the application hardware-independent
- Easy portability of applications between B&R target systems
- Guaranteed determinism through cyclic system
- Configurable jitter tolerance in all task classes
- Support for all relevant programming languages, such as IEC 61131-3 languages and C
- Rich function library per IEC 61131-3 as well as the extended B&R automation library
- Integrated in Automation NET. Access to all networks and bus systems via function calls or by configuration in Automation Studio

B&R Automation Runtime is fully embedded in the corresponding target system (hardware on which Automation Runtime is installed). It thus enables application programs to access I/O systems (also via the fieldbus) and other devices such as interfaces and networks.

7.3.4.2 Minimum versions

7.3.4.2.1 Automation Runtime Embedded (ARemb)

System requirements

The following software versions (or higher) are required to operate Automation Runtime Embedded with an Automation Panel 9x3:

- Automation Studio V4.0.17.x
  - There is support starting with this version exclusively for 5AP923* single-touch panels.
- ARemb upgrade AR I4.06 and Automation Studio V4.0.19.x
  - There is support with single-touch functionality starting with this version for 5AP933* multi-touch panels with Rev. ≤ B7.
- ARemb upgrade AR O4.06, AR E4.09 or AR F4.10 and Automation Studio V4.0.19.x
  - There is support with single-touch functionality starting with this version for 5AP933* multi-touch panels with Rev. ≤ B7 and Rev. ≥ B8.
- Visual Components Runtime (VC) V4.05.5

Information:

For detailed information about order numbers and Automation Runtime Windows (ARwin) support, see the user's manual for the B&R industrial PC being used. All documents are available for download on the B&R website (www.br-automation.com).

Information:

For detailed information, see Automation Help or the B&R website (www.br-automation.com).

7.3.5 B&R Hypervisor

B&R Hypervisor allows multiple operating systems to operate simultaneously on a single device. The operating systems can communicate with each other via a virtual network.

Intelligent distribution of CPU resources

B&R Hypervisor allows Windows or Linux to run simultaneously with Automation Runtime. This makes it possible to combine a controller and HMI PC in one device. With B&R Hypervisor, an industrial PC can also be used as an edge controller. This serves as a controller and simultaneously transmits pre-processed data to higher-level systems in the cloud via OPC UA.

Virtual network

The hypervisor provides a virtual network connection that allows applications to exchange data between operating systems. Similar to an ordinary Ethernet interface, standard network protocols are used. In place of a cable, there is a reserved memory area that is not allocated to either operating system.

Maximum flexibility

The user configures the hypervisor and allocates hardware resources in the B&R Automation Studio software development environment. The system configurations are determined individually. This makes the assignment of resources to the respective operating system flexible. Whereas previous simultaneous solutions were tailored to a specific Windows version, B&R Hypervisor is completely independent of the version of the operating systems used.

System requirements

The following minimum software versions are required to operate B&R Hypervisor on the :

- ARemb upgrade AR
- Automation Studio V4.4

Information:

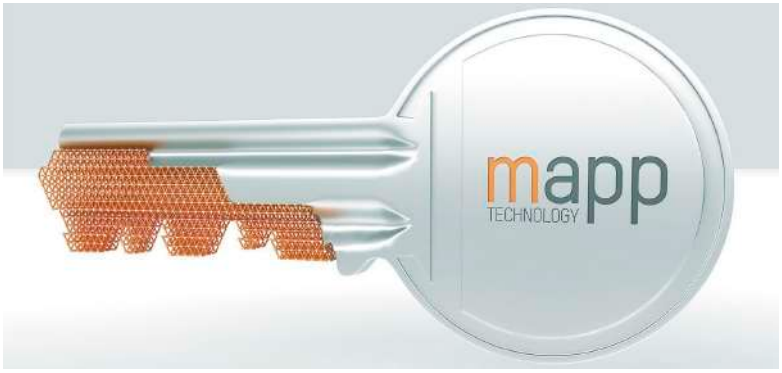
For detailed information, see Automation Help or the B&R website (www.br-automation.com).

7.3.5.1 DP receiver in operation with B&R Hypervisor

When using the DP receiver in a B&R Hypervisor configuration, it is important to note that the assignment to an operating system is made via the USB interface of the connected B&R industrial PC in Automation Studio.[3)] All USB interfaces of the DisplayPort receiver, multi-touch panel and other additional devices are then assigned to the selected operating system.

[3)] Automation Runtime / Method of operation / B&R Hypervisor / Installation and configuration / Configuration in Automation Studio / Adjusting the interface assignment

7.3.6 mapp Technology



mapp Technology is revolutionizing the creation of machine and plant software. "mapps" are as easy to use as smartphone apps. Instead of programming user/role systems, alarm systems or the control of axes line by line, the machine software developer simply configures the finished mapps. Complex algorithms are easy to master. The programmer can concentrate fully on the machine process.

Information:

For detailed information, see Automation Help or the B&R website (www.br-automation.com).

7.4 Automation Device Interface (ADI)

The Automation Device Interface (ADI) enables access to specific functions of B&R devices.

7.4.1 ADI driver (Windows)

> **Information:**
>
> **Basic functionalities and components of the ADI driver are explained below. For more detailed information, the ADI driver user's manual can be downloaded from the B&R website (www.br-automation.com).**

7.4.1.1 Installation

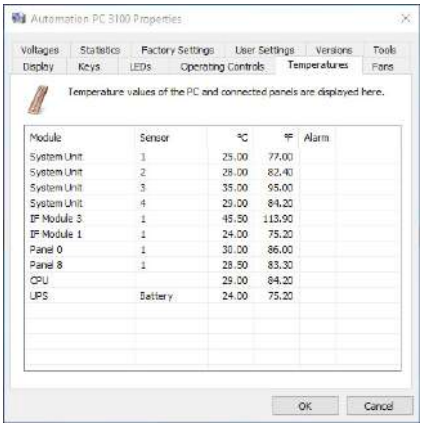
The ADI driver is included in most B&R Windows operating systems or can be installed on request.

The ADI driver (also includes the ADI Control Center) and user documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com). If a more recent version is available, it can be installed later.

> **Information:**
>
> **The *Write filter* must be disabled during installation.**

7.4.1.2 ADI Control Center

The settings of B&R devices can be read out and changed in Windows using the ADI Control Center in the Control Panel. The figure shown is a symbolic image; the representation may vary depending on the device.



> **Information:**
>
> **The displayed temperature and voltage values (e.g. CPU temperature, core voltage, battery voltage) represent uncalibrated information values. No conclusions about possible alarms or hardware malfunctions can be drawn from this. The hardware components used have automatic diagnostic functions in the event of error.**

7.4.1.2.1 Functions

The ADI Control Center offers the following functions, for example:

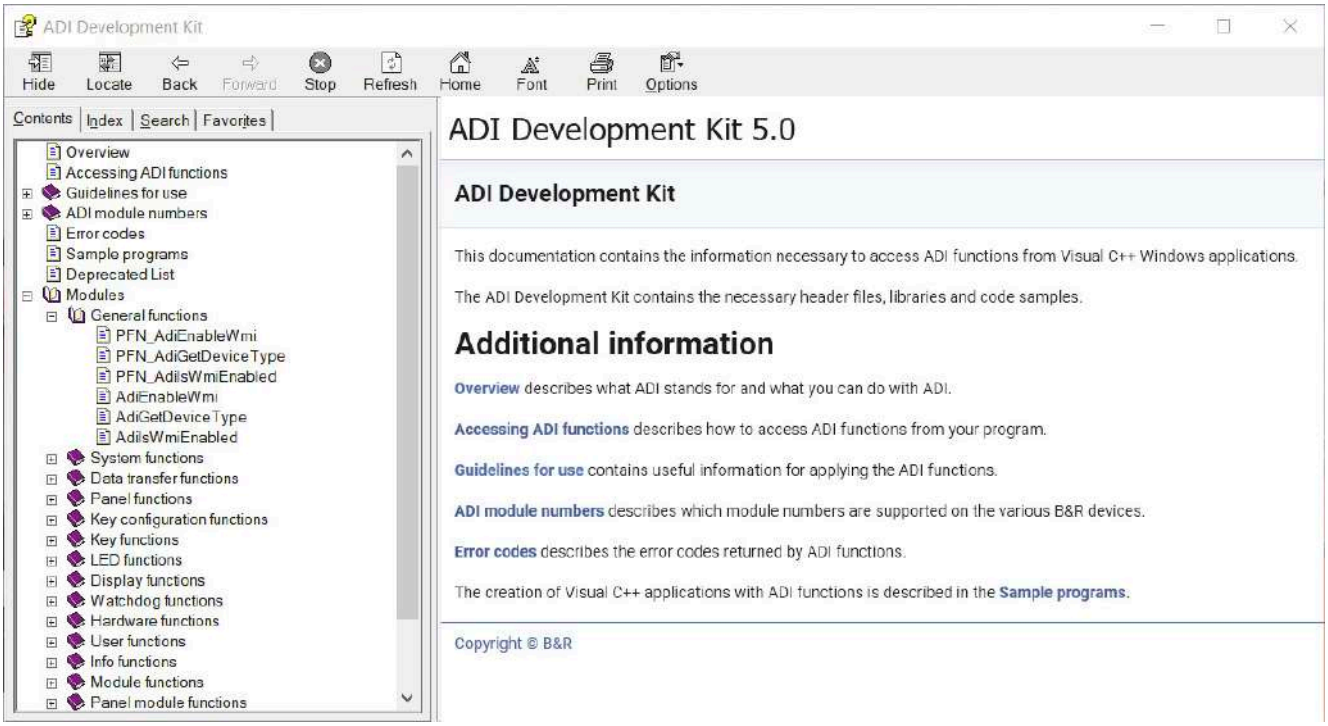
- Changing display-specific parameters
- Reading out device-specific keys
- Updating the key configuration
- Testing keys or device-specific LEDs of a membrane keypad
- Reading out or calibrating control devices (e.g. key switch, handwheel, joystick, potentiometer)
- Reading out temperatures, fan speeds, switch positions and statistical data
- Reading out operating hours (power-on hours)
- Reading user settings and factory settings
- Reading out software versions
- Updating and backing up BIOS and firmware
- Creating reports for the current system (support)
- Setting the SDL equalizer value for the SDL cable adjustment
- Changing the user serial ID

For a detailed description, see the user documentation for the ADI driver.

> **Information:**
>
> **The functions available in the ADI Control Center depend on the device family.**

7.4.2 ADI Development Kit

This software allows *ADI* functions to be accessed from Windows applications created with Microsoft Visual Studio, for example:



Features:

- Header files and import libraries
- Help files
- Example projects
- ADI DLL: For testing applications if no ADI driver is installed.

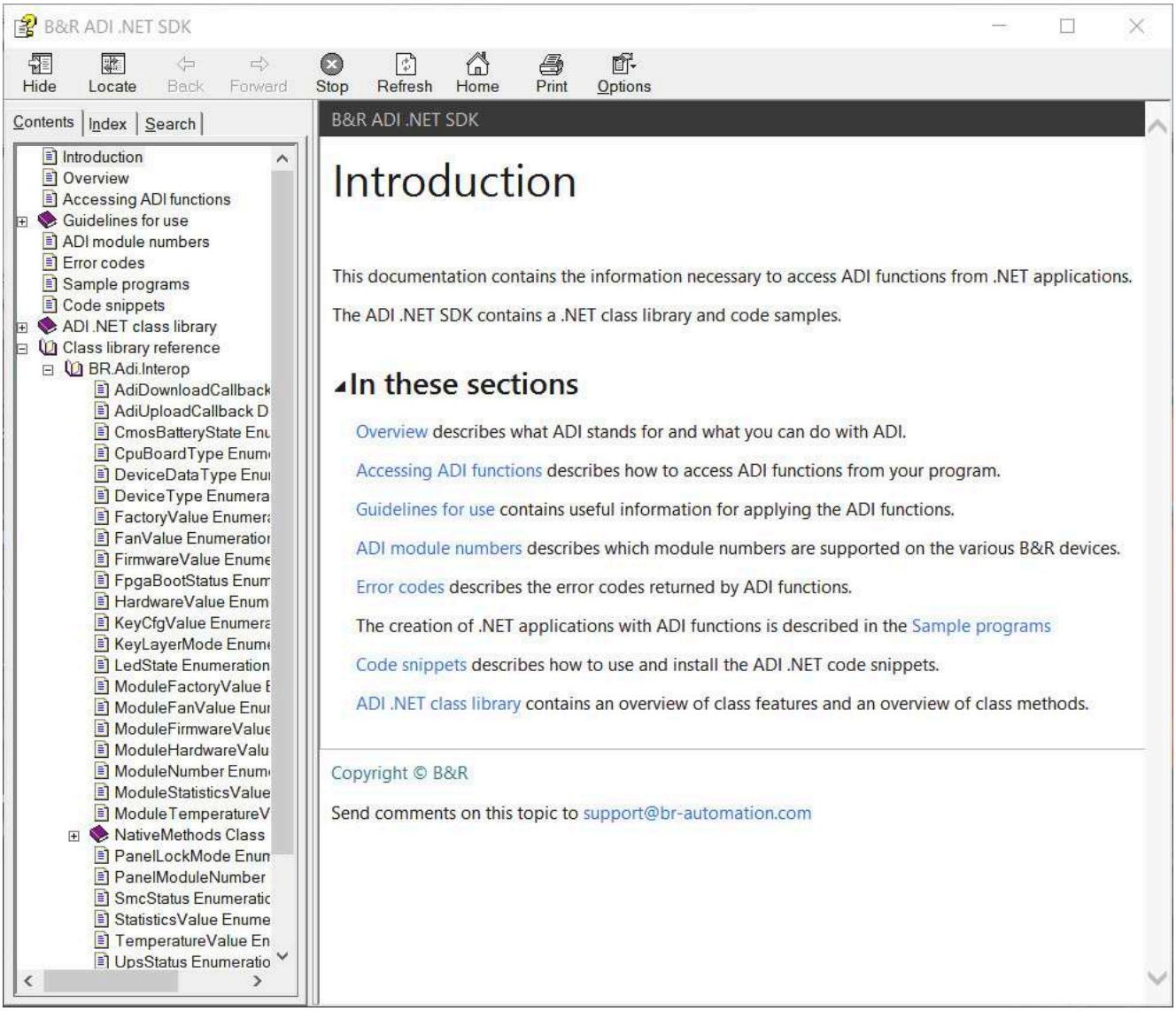
The appropriate ADI driver must be installed for the device. The ADI driver is already included in B&R images of embedded operating systems.

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

The ADI Development Kit can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

7.4.3 ADI .NET SDK

This software allows *ADI* functions to be accessed from .NET applications created with Microsoft Visual Studio.



Features:

- ADI .NET class library
- Help files (in English)
- Sample projects and code snippets
- ADI DLL: For testing applications if no ADI driver is installed.

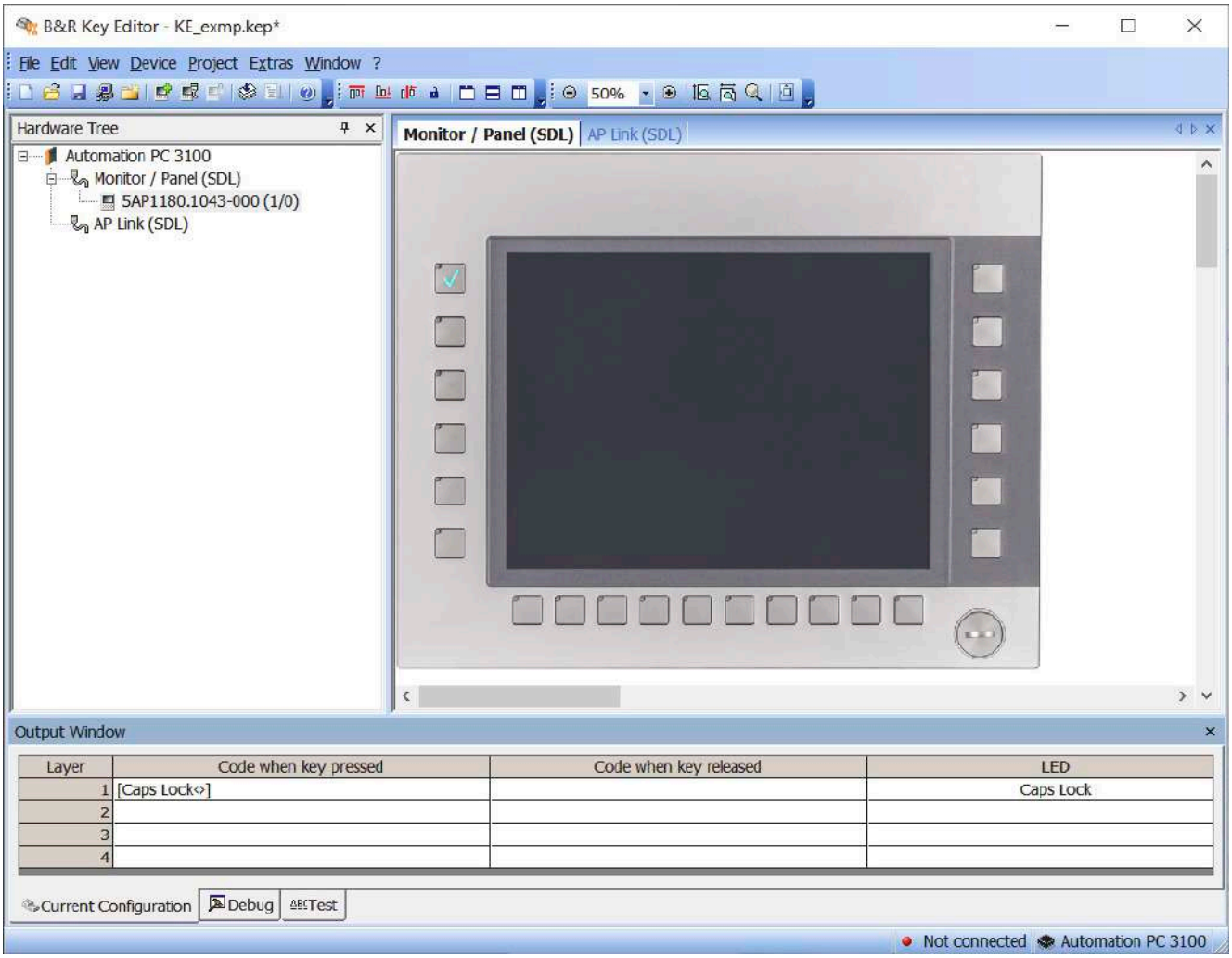
The appropriate ADI driver must be installed for the device. The ADI driver is already included in B&R images of embedded operating systems.

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

The ADI .NET SDK can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

7.5 Key Editor

A frequently occurring requirement for panels is adapting function keys and LEDs to the application software. With the Key Editor, individual adaptation to the application is possible quickly and easily.



Features:

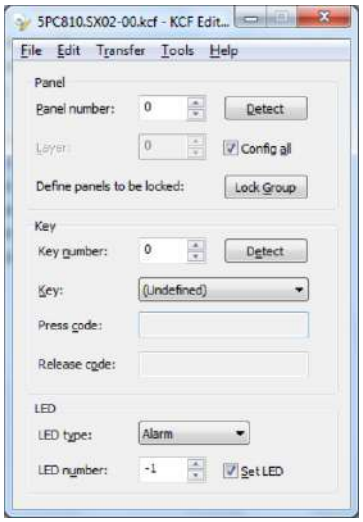
- Configuration of normal keys like on a keyboard (A, B, C, etc.)
- Keyboard shortcuts (CTRL+C, SHIFT+DEL, etc.) on one key
- Special key functions (change brightness, etc.)
- Assignment of LED functions (HDD access, power, etc.)
- 4 assignments possible per key (using layers)
- Configuration of the panel lock time when connecting several Automation Panel devices to Automation PCs and Panel PCs

For detailed instructions about configuring keys and LEDs and installing the key configuration on the target system, see the help documentation for the Key Editor. The Key Editor and help documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

7.6 KCF Editor

The KCF Editor can be used as a simple alternative to the Key Editor. It can also be used to adapt function keys and LEDs to the application software. In contrast to the Key Editor, operation does not take place using a graphical representation of the device, but via a simple Windows dialog box. The KCF Editor can therefore also be used for devices that are not yet supported in the Key Editor. The KCF Editor is a "portable" application and can be started directly from a USB flash drive without installation on the target device, for example.

An installed ADI driver is required for the full range of functions.



Features:

- Configuration of normal keys like on a keyboard (A, B, C, etc.)
- Special key functions (change brightness, etc.)
- Assignment of LED functions (HDD access, power, etc.)
- 4 assignments possible per key (using layers)
- Configuration of the panel lock time when connecting several Automation Panel devices to B&R PCs.
- Export and import of the configuration (via INI files)
- Save configuration as report (text file)

If the KCF Editor is running on the target device and the ADI driver is installed, the following additional features are available:

- Panel and key detection
- LED test
- Download/Upload the configuration

For detailed instructions about configuring keys and LEDs and installing the key configuration on the target system, see the user documentation for the KCF Editor. The KCF Editor and user documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

7.7 HMI Service Center

7.7.1 5SWUTI.0001-000

7.7.1.1 General information

The HMI Service Center is software for testing B&R industrial PCs and Automation Panels. Testing covers different categories such as COM, network and SRAM.

The test system consists of a USB flash drive with installed Windows PE operating system and the HMI Service Center.

For details about the HMI Service Center, see the HMI Service Center user's manual. This can be downloaded at no cost from the B&R website (www.br-automation.com).

7.7.1.2 Order data

Order number	Short description	Figure
	Accessories	
5SWUTI.0001-000	HMI Service Center USB flash drive - Hardware diagnostic software - For APC910/PPC900 - For PPC1200 - For APC2100/PPC2100 - For APC2200/PPC2200 - For APC3100/PPC3100 - For APC mobile - For AP800/AP900 - For AP9x3/AP9xD - For AP1000/AP5000	

8 Maintenance

The following chapter describes the maintenance work that can be carried out by a qualified and trained end user.

Information:

Only components approved by B&R are permitted to be used for maintenance work.

8.1 Cleaning

Danger!

In order to prevent unintentional operation (by touching the touch screen or keys), the device is only permitted to be cleaned when the power is switched off.

- Use a cloth moistened with dishwashing detergent, screen cleaner or alcohol (ethanol) to clean the device.
- The cleaning agent is not permitted to be applied directly to the device.
  Abrasive cleaners, aggressive solvents and chemicals, compressed air or steam cleaners are not permitted to be used.
- When cleaning, areas with adhesive labels and product information should be left out to avoid damage.

Information:

Displays with a touch screen should be cleaned at regular intervals.

8.2 User tips for increasing the service life of the display

8.2.1 Backlight

The service life of the backlight is specified by its "half-brightness time". An operating time of 50,000 hours would mean that the display brightness would still be 50% after this time.

8.2.1.1 Measures to maintain backlight service life

- The display brightness can be set to the lowest level that is comfortable for the user's eyes.
- Bright images should be avoided as far as possible.
- A 50% reduction in brightness can increase the half-brightness time by about 50%.

8.2.2 Image persistence

Image persistence refers to the "burning in" of a static image on a display after being displayed for a long time. It does not only occur with static images, however. Image persistence is also referred to in the technical literature as screen burn-in, image retention, memory effect, memory sticking or ghost image.

There are 2 different types:

- Area type: This type can be seen in a dark gray image. The effect disappears if the display is switched off for a long time.
- Line type: This can result in permanent damage.

8.2.2.1 What causes image persistence?

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

8.2.2.2 How can image persistence be reduced?

- Switch continuously between static and dynamic images.
- Prevent excessive differences in brightness between foreground and background elements.
- Use colors with similar brightness.
- Use complementary colors for subsequent images.
- Use screensavers.

8.3 Pixel errors

Information:

Displays can contain faulty pixels (pixel errors) due to the manufacturing process. They are not grounds for initiating a complaint or warranty claim.

8.4 Repairs/Complaints and replacement parts

Danger!

Unauthorized opening or repair of a device may result in personal injury and/or serious damage to property. Repairs are therefore only permitted to be carried out by authorized qualified personnel at the manufacturer's premises.

To process a repair/complaint, a repair order or complaint must be created via the B&R Material Return Portal on the B&R website (www.br-automation.com).

9 Accessories

The following accessories have undergone functional testing by B&R in connection with the device used and can be operated with this device. Possible limitations regarding operation with individual components other than the complete system must be taken into account, however. All individual specifications of the components must be observed when operating the complete system.

All components listed in this manual have undergone intensive system and compatibility testing and been approved accordingly. B&R cannot assume any functional warranty for accessories that have not been approved.

9.1 Installation accessories

Suitable tool sets can be ordered to easily install B&R industrial PCs and converters.

- Consisting of:

  5ACCRHMI.0006-000

  - 1x torque screwdriver: 0.4 to 2.0 Nm
  - 1x bit set (5 pieces): Hex recess (2.5 mm, 3.0 mm, 5.0 mm), Torx (T10, T20)

9.1.1 Order data

Order number	Short description	Figure
	Other	
5ACCRHMI.0006-000	HMI installation tool for control cabinet - 1x torque wrench 0.4 - 2.0 Nm - 1x hex head bit 2.5, length 89 mm - 1x hex head bit 3.0, length 89 mm - 1x hex head bit 5.0, length 89 mm - 1x Torx 10 bit, length 90 mm - 1x Torx 20 bit, length 89 mm	

9.2 Cables

For additional information about compatible cables, see the B&R website (HMI cable manual).

9.3 USB mass storage device

For additional information about compatible USB mass storage devices, see the B&R website (USB mass storage devices).

9.4 0TB103.9x

9.4.1 General information

One-row 3-pin terminal block 0TB103.9x is used for the power supply.

9.4.2 Order data

Order 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	

9.4.3 Technical data

> **Information:**
>
> **The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an accessory is used.**

Order number	0TB103.9	0TB103.91
General information		
Certifications		
CE	Yes	
UKCA	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	Temperature: **B** (0 to 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)	
LR	ENV3	
KR	Yes	
ABS	Yes	
BV	**EC31B** Temperature: 5 - 55°C Vibration: 0.7 g EMC: Bridge and open deck	
Terminal block		
Note	Protected against vibration by the screw flange Nominal data per UL	
Number of pins	3 (female)	
Type of terminal block	Screw clamp terminal block variant	Cage clamp terminal block variant [1]
Cable type	Only copper wires (no aluminum wires!)	
Pitch	5.08 mm	
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	
Single-wire	0.20 to 2.50 mm²	
Fine-stranded 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 properties		
Nominal voltage	150 V	
Nominal current [2]	13 A / contact	15 A / contact
Contact resistance	≤5 mΩ	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	

1) The cage clamp terminal block cannot be used side by side.
2) The respective limit data of the I/O modules must be taken into account!

9.5 Line filter

9.5.1 5AC804.MFLT-00

9.5.1.1 General information

Line filter 5AC804.MFLT-00 may be necessary to meet maritime requirements regarding conducted interference emissions in power supply line per DNV.

The line filter should be installed as close to the end device as possible; the supply line from the end device to the line filter should be kept as short as possible.

9.5.1.2 Order data

Order number	Short description	Figure
	Accessories	
5AC804.MFLT-00	Line filter	

9.5.1.3 Technical data

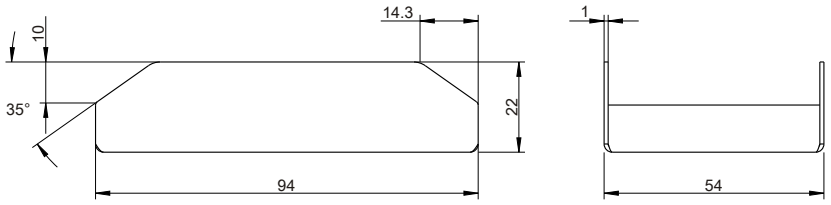
> **Information:**
>
> **The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an accessory is used.**

Order number	5AC804.MFLT-00
General information	
Certifications	
CE	Yes
UKCA	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	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)
LR	ENV3
KR	Yes
ABS	Yes
BV	**EC31B** Temperature: 5 - 55°C Vibration: 0.7 g EMC: Bridge and open deck
EAC	Product family certification
Terminal block	
Connection cross section	
With wire end sleeves	1.5 mm²
Flexible	0.2 to 1.5 mm²
Inflexible	0.2 to 2.5 mm²
Electrical properties	
Nominal voltage	24 VDC (-25% / +30%), SELV [1)]
Nominal current	8 A
Overvoltage category per EN 61131-2	II
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Ambient conditions	
Temperature	
Operation	-25 to 65°C
Storage	-25 to 65°C
Transport	-25 to 65°C
Mechanical properties	
Housing	
Material	Galvanized plate

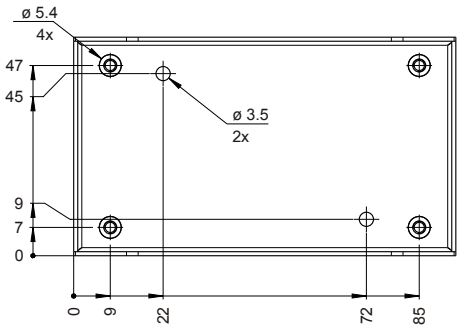
Order number	5AC804.MFLT-00
Dimensions	
Width	54 mm
Length	94 mm
Depth	32.15 mm
Weight	205 g

1) IEC 61010-2-201 requirements must be observed.

9.5.1.4 Dimensions

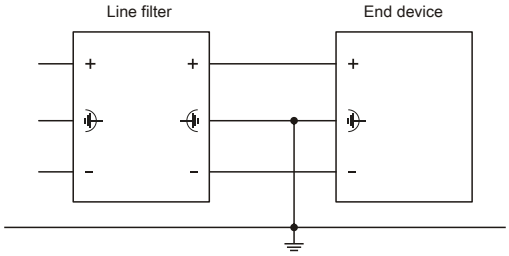


9.5.1.5 Drilling template



9.5.1.6 Connecting to the end device

The line filter must be connected between the power supply and the end device. The following figure shows a connection diagram.



The following points must be observed:

- Use shielded, twisted wires.
- Keep the lines as short as possible (power supply - line filter - end device).
- The line filter must be installed on an uncoated, oil-free metallic surface.

10 International and national certifications

10.1 Directives and declarations

10.1.1 CE marking

All directives applicable to the respective product and their harmonized EN standards are met.

10.1.2 EMC Directive

The products meet the requirements of EU directive "Electromagnetic compatibility 2014/30/EU" and are designed for industrial applications:

EN 61131-2:2007	Programmable 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 under Downloads > Certificates > Declarations of conformity.

10.2 Certifications

Danger!

A complete system can only receive certification if all individual components installed and connected in it have the corresponding certifications. If an individual component is used that does not have the corresponding certification, the complete system will also not be certified.

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

Information:

The certifications valid for the respective product are available on the website and in the user's manual under the technical data in section "Certifications" or in the associated certificates.

10.2.1 UL certification

Products with this mark are tested by Underwriters Laboratories and listed as "industrial control equipment". The mark is valid for the USA and Canada and simplifies the certification of your machines and systems in this economic area.

Underwriters Laboratories (UL) per standard UL 508
Canadian (CSA) standard per C22.2 no. 142-M1987

UL certificates are available on the B&R website under Downloads > Certificates > UL.

Ind. Cont. Eq.
E115267

The device is classified as "open type" for use in the area of "Industrial control equipment" sector per UL 508. The device must therefore be installed in a UL 508-compliant protective housing as a requirement for certification or operation per UL 508.

The front of the device satisfies IP65 (EN 60529) and "Type 4X indoor use only" (UL 50E) requirements.

10.2.2 UKCA

UK Conformity Assessed (UKCA)
All directives applicable to the respective product and their relevant standards are met. Products with this marking are permitted to be imported into Great Britain (England, Wales, Scotland).

Information:

Declarations of conformity are available on the B&R website under Downloads > Certificates > Declarations of conformity.

10.2.3 DNV certification

Products with this certification are certified by the classification society DNV and suitable for the maritime sector. DNV certificates (type approvals) are generally accepted by other classification societies during ship acceptance procedures.
Products used on a ship's bridge must be dimmable using software in accordance with the regulations and guidelines from the respective classification society.

Windows 7 operating systems are only permitted to be used as embedded variants. There are no limitations for all other operating systems approved by B&R.

DNV certificates with specifications for permissible environmental conditions as well as a list of revisions from which the DNV type certification applies to individual devices are available on the B&R website (Downloads > Certificates > Maritime).

Information:

The line filter 5AC804.MFLT-00 in the power supply line is mandatory for use in the maritime environment. For additional information, see section "Connecting to the end device" on page 100.

10.2.4 American Bureau of Shipping (ABS)

Products with this certification are suitable for use in the maritime sector according to the regulations of the classification society American Bureau of Shipping (ABS Rules).

Certificates with specifications for permissible environmental conditions as well as a list of revisions from which the certification applies to individual devices are available on the B&R website (Downloads > Certificates > Maritime).

Information:

The line filter 5AC804.MFLT-00 in the power supply line is mandatory for use in the maritime environment. For additional information, see section "Connecting to the end device" on page 100.

10.2.5 Bureau Veritas (BV)

Products with this certification are suitable for use in the maritime sector according to the regulations of the classification society Bureau Veritas (BV).

Certificates with specifications for permissible environmental conditions as well as a list of revisions from which the certification applies to individual devices are available on the B&R website (Downloads > Certificates > Maritime).

Information:

The line filter 5AC804.MFLT-00 in the power supply line is mandatory for use in the maritime environment. For additional information, see section "Connecting to the end device" on page 100.

10.2.6 Korean Register of Shipping (KR)

Products with this certification are suitable for use in the maritime sector according to the regulations of the classification society Korean Register of Shipping (KR).

Certificates with specifications for permissible environmental conditions are available on the B&R website (Downloads > Certificates > Maritime).

Information:

The line filter 5AC804.MFLT-00 in the power supply line is mandatory for use in the maritime environment. For additional information, see section "Connecting to the end device" on page 100.

10.2.7 Lloyd's Register (LR)

Products with this certification are suitable for use in the maritime sector according to the regulations of the classification society Lloyd's Register (LR).

Certificates with specifications for permissible environmental conditions as well as a list of revisions from which the certification applies to individual devices are available on the B&R website (Downloads > Certificates > Maritime).

Information:

The line filter 5AC804.MFLT-00 in the power supply line is mandatory for use in the maritime environment. For additional information, see section "Connecting to the end device" on page 100.

10.2.8 UL Haz. Loc. certification

Ind. Cont. Eq.
for Haz.Loc.
Cl. I, Div. 2,
Groups ABCD
E180196 (T4)

Products with this mark are tested by Underwriters Laboratories and listed as "industrial control equipment for use in hazardous locations". The mark is valid for the USA and Canada and simplifies the certification of your machines and systems in this economic area.

Underwriters Laboratories (UL) per standard ANSI/ISA 12.12.01
Canadian (CSA) standard per C22.2 no. 213-16

The UL HazLoc certificates are available on the B&R website (Downloads > Certificates > HazLoc).

10.2.8.1 General safety guidelines

AP923 panels with SDL or SDL3 link module that are certified for use in potentially explosive environments and carry the marking above are suitable for use in Class 1, Division 2, Groups A, B, C and D or in nonexplosive environments and correspond to the following standards: UL Std. 508 - 17th Edition, ANSI/ISA 12.12.01:2015, CSA Std. C22.2 No. 213-16.

10.2.8.2 Mounting and installation

Devices with explosion protection are to be used as intended and are only permitted to be operated by knowledgeable and qualified personnel according to these operating instructions and the other information contained in the corresponding user's manual. Operation in any other way endangers the safety and functionality of the devices and the connected systems. The operator is responsible for following all applicable safety and accident prevention regulations, as well as adhering to standards.

Devices must be installed in a suitable protective housing that can only be opened by using a tool. In order to guarantee sufficient air circulation, allow the specified amount of space around the device. Use only in environments with pollution degree 2. The maximum ambient temperature varies depending on the individual components being used, see section "Temperature specifications" on page 32.

The certification marking on the device must be checked before each installation or use of the device in potentially explosive environments. Additional equipment must be suitable for the operating location. Final assembly must be approved by the relevant local authorities. Wiring must follow national regulations and meet all legal requirements.

Devices must remain voltage free until installation work is completed. The tightening torque for power supply terminals is 0.5 Nm. Cables must be suitable for a surface temperature of 75°C. AP923 panels with an SDL or SDL3 link module are only permitted to be operated with 24 VDC.

Unshielded/Ungrounded cables are never permitted to be used in potentially explosive atmospheres. Devices must be securely connected to equipotential bonding. Power supply, communication and accessory cables must be secured to the device or control cabinet. Power supply, communication and accessory cables are not permitted to exert excessive strain on connections. Possible vibrations in the environment must be taken into account.

10.2.8.3 Operation

To switch AP923 panels with SDL or SDL3 link modules on/off in a potentially explosive area, either the switch must be located outside the explosive area or a switch certified for use in potentially explosive areas must be used.

Danger!

Risk of explosion: Accessories are not permitted to be connected or disconnected when the power is switched on unless the area is considered nonhazardous and is free of ignitable concentrations!

Risk of explosion: Replacing components may impair eligibility for Class I, Division 2!

Danger !

Risque d'explosion – Ne pas connecter ou déconnecter un quelconque équipement lorsque le circuit est sous tension, à moins que la zone soit connue comme étant sans risque et sans concentrations inflammables!

Risque d'explosion – Le remplacement de composants peut compromettre l'aptitude au respect de la Classe I, Division 2!

10.2.8.4 Maintenance, breakdowns and disassembly

Devices must be shut down and protected against accidental startup. A voltmeter must be used to verify that the power supply is cut off.

Before removing or installing accessories, components or cables, all power supplies to AP923 panels with SDL or SDL3 link module and power supply must be interrupted. Defective devices must only be replaced by knowledgeable and qualified personnel. Before switching on or connecting the power supply, all covers and system components must be reinstalled and secured.

Danger!

Failure to follow this instruction can result in death, serious bodily injury or damage to property!

Danger !

Le non-respect de ces instructions peut entraîner des blessures graves ou mortelles!

10.2.8.5 USB connection with the SDL or SDL3 link module

10.2.8.5.1 Introduction

The information below describes the use of USB peripheral devices on the front USB interfaces of the B&R SDL or SDL3 link module in hazardous locations Class I, Division 2, Groups A, B, C and D.

Danger!

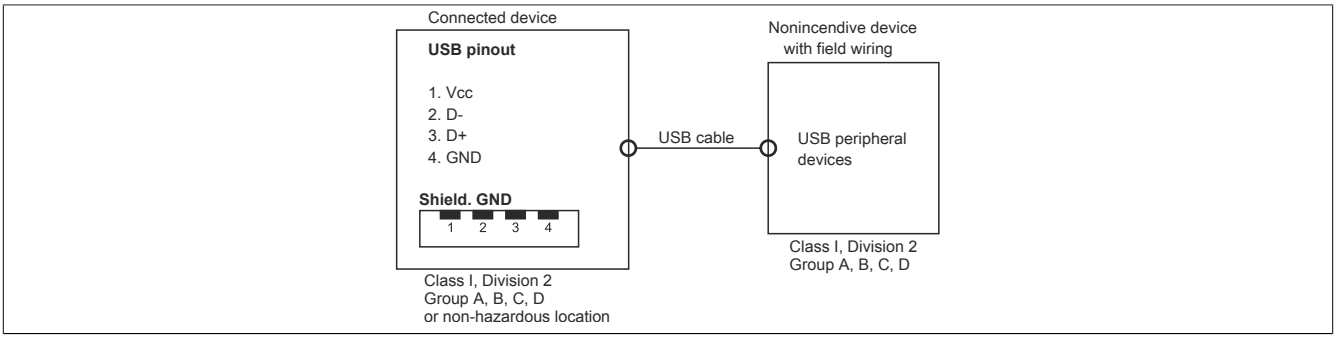
RISK OF EXPLOSION

- **Before installation or use in potentially explosive atmospheres, the explosion protection class of the device must be checked according to ANSI/ISA 12.12.01 and CSA C22.2 N°213.**
- **To switch on/off B&R devices that are installed in potentially explosive atmospheres, at least one of the following conditions must be met:**
  - **A suitable switch installed outside the hazardous area is used.**
  - **A switch certified according to the hazardous location class and division for *tube use* is used.**
- **As long as the electrical circuit is activated, cables or lines are not permitted to be connected or disconnected unless the area is knowingly free of flammable concentrations of vapors, gases and other flammable or combustible materials. This applies to all connections and circuits. This includes power, ground and network connections as well as series and parallel connections.**
- **Unshielded/Ungrounded cables are never permitted to be used in potentially explosive atmospheres.**
- **Only configurations with nonincendive USB devices are permitted to be used.**
- **The doors and openings of housings must always remain closed. This prevents the accumulation of foreign bodies within the workstation.**

Failure to follow this instruction can result in death, serious bodily injury or damage to property!

10.2.8.5.2 Description

Nonincendive devices (keyboards, mouse) are certified for use on the USB interfaces of the B&R SDL or SDL3 link module (connected device) and are permitted to be connected and disconnected during operation. In addition to the nonincendive property, devices that can be connected to the USB interfaces must meet the following criteria.



USB interfaces (USB 2.0):	
Open-circuit voltage [V_{oc}]	5.12 V
Short-circuit current [I_{sc}]	2131 mA
Connected capacity [$_{Ca}$]	20 µF
Connected inductance [$_{La}$]	16.8 µH

Table 32: Nonincendive circuit parameters for the USB interfaces

The unit concept allows the interconnection of nonincendive devices with connected devices with non-specifically tested combinations as a system. For this purpose, the permissible values of V_{oc} (or U_o) and I_{sc} (or I_o) for the connected device must be less than or equal to V_{max} (U_i) and I_{max} (I_i) for the nonincendive device, the permissible values of C_a (C_o) and L_a (L_o) for the connected device must be greater than or equal to C_i + C_{Cable} and L_i + L_{Cable} for the nonincendive device with field wiring.

The nonincendive device with field wiring must meet the following criteria:

B&R device (connected device)	-	Connected, nonincendive device with field wiring (mouse, keyboard)
V_{oc}	≤	V_{max}
I_{sc}	≤	I_{max}
C_a	≥	$C_i + C_{Cable}$
L_a	≥	$L_i + L_{Cable}$

Table 33: Connected, nonincendive device with field wiring

If the electrical parameters of the cable are unknown, the following values can be used:

Where C_{Cable} = 196.85 pF/m (60 pF/ft) if unknown

Where L_{Cable} = 0.656 µH/m (0.20 µH/ft) if unknown

Wiring must be carried out in accordance with national regulations and the requirements of the authorities.

The B&R device must be installed in a suitable protective housing. For installations in Class I, Division 2 hazardous locations, the housing must be capable of withstanding one or more Division 2 wiring methods.

Warning!

- **Replacing components may impair the suitability of the Division 2 hazardous location (classified) under certain circumstances.**
- **As long as the area is knowingly at risk of explosion, the device is not permitted to be switched on or off.**
- **The nonincendive device with field wiring is not permitted to be connected via a parallel connection. This is valid unless the device has received express permission for this.**

The B&R device is suitable for use in Class I, Division 2, Groups A, B, C and D areas. It also provides nonincendive field wiring for devices in Class I, Division 2, Groups A, B, C and D.

11 Environmentally friendly disposal

All programmable logic controllers, operating and monitoring devices and uninterruptible power supplies from B&R are designed to have as little impact on the environment as possible.

11.1 Separation of materials

To ensure that devices can be recycled in an environmentally friendly manner, it is necessary to separate out the different materials.

Component	Disposal
Programmable logic controllers Operating and monitoring devices Uninterruptible power supplies Batteries and rechargeable batteries Cables	Electronics recycling
Paper/Cardboard packaging	Paper/Cardboard recycling
Plastic packaging material	Plastic recycling

Disposal must be carried out in accordance with applicable legal regulations.

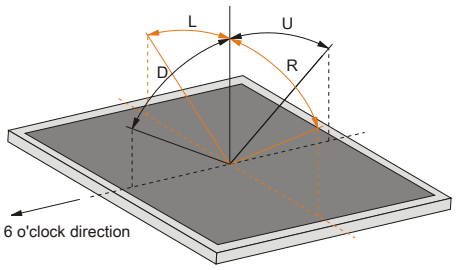
Appendix A Abbreviations

Abbreviations used in the document are explained here.

Abbreviation	Stands for	Description
NC	Normally closed	Stands for a normally closed relay contact.
	Not connected	Used in pinout descriptions if a terminal or pin is not connected on the module side.
ND	Not defined	Stands for an undefined value in technical data tables. This may be because the cable manufacturer has not provided a value for certain technical data.
NO	Normally open	Stands for a normally open relay contact.
TBD	To be defined	Used in technical data tables if there is currently no value for specific technical data. The value will be supplied later.
B_{10D}	-	Number of cycles until 10% of the components fail dangerously (per channel).
MTBF	Mean time between failures	The expected value of the operating time between two consecutive failures.
$MTTF_D$	Mean time to dangerous failure	Mean time to dangerous failure (per channel).
DC	Diagnostic coverage	Degree of diagnostic coverage
PL	Performance level	Discrete level specifying the ability of safety-related devices to perform a safety function under foreseeable conditions.
PFH	Probability of failure per hour	Probability of a failure per hour.
SIL	Safety integrity level	Safety integrity level

Appendix B Viewing angles

For viewing angle specifications (R, L, U, D) of the display types, see the technical data of the individual components.

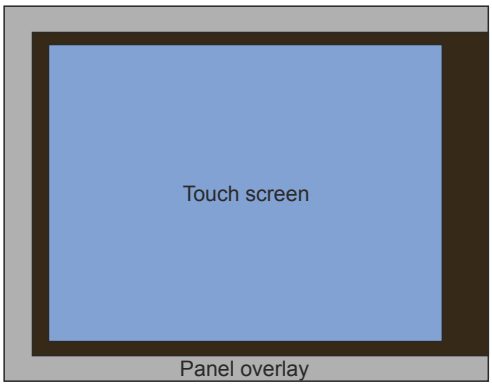


Appendix C Chemical resistance

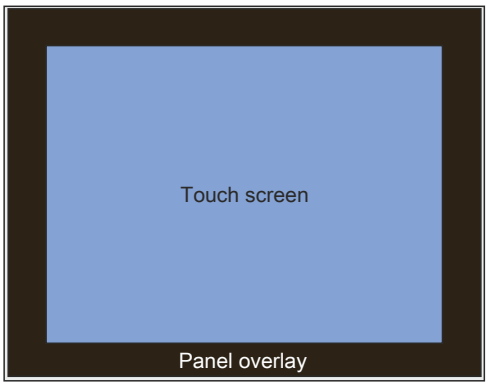
All panels are made of a coated aluminum support frame.

Single-touch panels

- AP1000 single-touch panels are manufactured with an Autotex panel overlay.
- AP9x3 single-touch panels are manufactured with an Autotex panel overlay starting with the following revision:
  - 5AP923.1215-00 ≥ revision B8
  - 5AP923.1505-00 ≥ revision B8
  - 5AP923.1906-00 ≥ revision B8

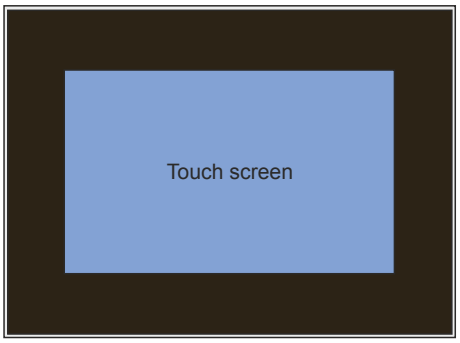


- AP9x3 single-touch panels < revision B8 were manufactured with an aluminum panel overlay.



Multi-touch panels

- AP9x3 and AP1000 multi-touch panels are equipped with a continuous glass surface.



C.1 Autotex panel overlay (polyester)

Unless otherwise specified, the panel overlay is resistant to the following chemicals, materials and substances per DIN 42115 Part 2 when exposed for up to 24 hours without visible changes:

- Acetaldehyde
- Acetone
- Acetonitrile
- Aliphatic hydrocarbons
- Alkali carbonate
- Formic acid <50%
- Ammonia <40%
- Amyl acetate
- Ethanol
- Ether
- Gasoline
- Bichromate
- Potassium
- Cutting oil
- Brake fluid
- Butyl CELLOSOLVE (2-Butoxyethanol)
- Sodium hypochlorite <20%
- Cyclohexanol
- Cyclohexanone
- Decon
- Diacetone alcohol
- Dibutyl phthalate
- Diesel
- Diethyl ether
- Diethyl phthalate
- Dioxan
- Dowandol DRM/PM
- Iron II chloride ($FeCl_2$)
- Iron III chloride ($FeCl_3$)
- Acetic acid <50%
- Butyl acetate
- 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%
- Paraffin oil
- Phosphoric acid <30%
- Blown castor oil
- Nitric acid <10%
- Hydrochloric acid <36%
- Sea water
- Sulphuric acid <10%
- Silicon oil
- Tenside
- Turpentine oil substitute
- Toluene
- Triacetin
- Trichloracetic acid < 50%
- Trichloroethane
- Thinner (white spirit)
- Washing agents
- Water
- Hydrogen peroxide <25%
- Fabric conditioner
- Xylene

Per DIN 42115 Part 2, the panel overlay is resistant to exposure to glacial acetic acid for less than one hour without visible damage.

C.2 Aluminum panel overlay

Unless otherwise specified, the panel overlay is resistant to the following chemicals, materials and substances per DIN 42115 Part 2 when exposed for up to 24 hours without visible changes:

- Acetaldehyde
- Acetone
- Acetonitrile
- Alkali carbonate
- Alkane
- Formic acid <50%
- Ammonia <40%
- Amyl acetate
- Gasoline
- Bichromate
- Brake fluid
- Castor oil
- Hydrogen chloride <36%
- Cyclohexanol
- Cyclohexanone
- Decon
- Diacetone alcohol
- Diesel
- Diethyl ether
- Diethyl phthalate
- Dimethylbenzene
- Dioxan
- Dowandol
- DRM/PM
- Iron chloride
- Iron II chloride (FeCl2)
- Iron III chloride (FeCl3)
- Acetic acid <50%
- Butyl acetate
- Ethanol
- Ether
- Ethyl acetate
- 2-Butoxyethanol (Butyl CELLOSOVLE)
- Aviation fuel
- Formaldehyde 37 to 42%
- Gear oil
- Glycerine
- Glycol
- Isophorone
- Isopropanol
- Potassium
- Potassium carbonate
- Potassium hydroxide
- White spirit
- Linseed oil
- Methanol
- Methylbenzene
- Methyl ethyl ketone
- Methylisobutylketone
- Sodium bisulphate
- Sodium carbonate
- Sodium hydroxide <40%
- Sodium hypochlorite <20%
- Paraffin oil
- Phosphoric acid <30%
- Phthalate
- Nitric acid <10%
- Sea water
- Cutting oil
- Sulphuric acid <10%
- Turpentine oil replacement
- Triacetin
- Trichloracetic acid <50%
- Trichloroethane
- Washing agents
- Water
- Hydrogen peroxide <25%
- Fabric conditioner

The panel overlay is not resistant to the following chemicals:

- Benzyl alcohol
- Dimethyl formamide
- Concentrated mineral acid
- Concentrated caustic solution
- High-pressure steam over 100°C
- Methylene chloride
- Tetrahydrofuran

C.3 Coated aluminum front

Unless otherwise specified, the coated aluminum front is resistant to the following chemicals, materials and substances per DIN 42115 Part 2 when exposed for up to 24 hours without visible changes:

- Formic acid <50%
- Ammonia <40%
- Brake fluid
- Hydrogen chloride <10%
- Diesel
- Acetic acid <50%
- Gear oil
- Lactic acid <10%
- Isopropanol
- Coolant <4%
- Sodium hydroxide <40%
- Petroleum
- Phosphoric acid <25%
- Saline <10%
- Sulphuric acid <25%
- Sidolin
- Skydrol

The coated aluminum front is not resistant to the following chemicals:

- Acetone
- Ethyl acetate

C.4 Touch screen

5-wire touch screen (single-touch)

Unless otherwise specified, the touch screen is resistant to the following chemicals, materials and substances when exposed for up to 1 hour (at 25°C) with no visible changes:

- Acetone
- Beer
- Unleaded gasoline
- Chemical cleaning agents
- Hydrogen chloride <6%
- Coca-Cola
- Diesel
- Dimethylbenzene
- Vinegar
- Ethanol
- Antifreeze
- Gear oil
- Ammonia-based glass cleaner
- Household detergents
- Hexane
- n-hexane
- Isopropanol
- Coffee
- Methylbenzene
- Methylene chloride
- Methyl ethyl ketone
- Mineral spirits
- Motor oil
- Nitric acid <70%
- Saline solution <5%
- Tea
- Turpentine
- Lubricants
- Sulphuric acid <40%
- Cooking oil

Touch screen generation 2 and 3 (multi-touch)

Unless otherwise specified, the touch screen is resistant to the following chemicals, materials and substances per ASTM D 1308-02 and ASTM F 1598-95 when exposed for up to 24 hours without visible changes:

- Acetone
- Ammonia <5%
- Gasoline
- Beer
- Lead
- Brake fluid
- Hydrogen chloride <6%
- Coca-Cola
- Dimethylbenzene
- Ethanol
- Rubber cement
- Isopropanol
- Coffee
- Ink
- Lipstick
- Lysol
- Methylbenzene
- Methyl ethyl ketone
- Naphtha
- Nitric acid <70%
- Lubricants
- Sulphuric acid <40%
- Stamping ink
- Tea
- Trichloroethylene
- Water
- White wine vinegar
- Windex Original

Appendix D Touch screen

D.1 5-wire touch screen (single-touch)

D.1.1 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Note:

Drivers for this touch screen for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

Order number	Touchscreen 5-Draht
General information	
Technology	Analog, resistive
Actuating force	<1 N
Light transmission	80% ±3%
Service life	10,000,000 touch operations at the same position (actuating force: 250 g, interval: 0.25 s)
Operating conditions	
Activation	Finger, stylus, credit card, glove
Ambient conditions	
Temperature	
Operation	-20 to 70°C
Storage	-40 to 80°C
Transport	-40 to 80°C
Relative humidity	
Operation	90% at max. 50°C
Storage	90% RH at max. 60°C for 504 hours
Transport	90% RH at max. 60°C for 504 hours

D.1.2 Temperature/Humidity diagram

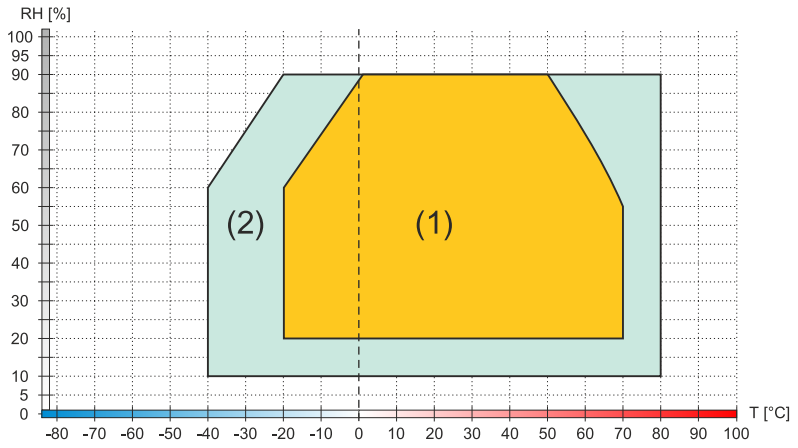


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

D.2 Touch screen (multi-touch generation 2)

D.2.1 General information

Valid for the following products:

- 5AP933.156B-00 with Rev. ≤ C0
- 5AP933.185B-00 with Rev. ≤ C0
- 5AP933.215C-00 with Rev. ≤ C0
- 5AP933.240C-00 with Rev. ≤ C0

D.2.2 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	Touchscreen
General information	
Technology	Projected capacitive touch (PCT)
Light transmission	88 ±2%
Anti-glare coating	Optical/Gloss = 70
Operating conditions	
Activation	Finger, thin glove
Ambient conditions	
Temperature	
Operation	0 to 50°C
Storage	-10 to 70°C
Transport	-10 to 70°C
Relative humidity	
Operation	90% at max. 35°C
Storage	90% at max. 35°C
Transport	90% at max. 35°C

D.2.3 Temperature/Humidity diagram

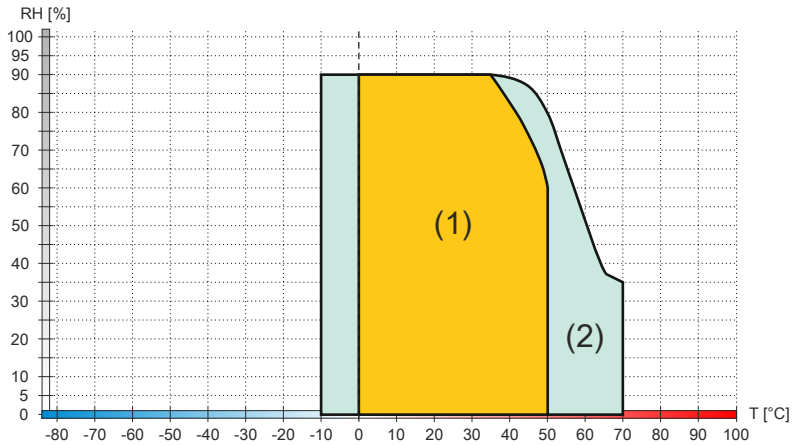


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

D.3 Touch screen (multi-touch generation 3)

D.3.1 General information

Valid for the following products:

- 5AP933.156B-00 with Rev. ≥ D0
- 5AP933.185B-00 with Rev. ≥ D0
- 5AP933.215C-00 with Rev. ≥ D0
- 5AP933.240C-00 with Rev. ≥ D0

D.3.2 Technical data

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which an individual component is used.

Order number	Touchscreen
General information	
Technology	Projected capacitive touch (PCT)
Light transmission	>90%
Anti-glare coating	Optical/Gloss = 80
Operating conditions	
Activation	Finger, thin glove
Ambient conditions	
Temperature	
Operation	-10 to 70°C
Storage	-40 to 70°C
Transport	-40 to 70°C
Relative humidity	
Operation	Up to 90% at max. 35°C, see diagram for > 35°C.
Storage	Up to 90% at max. 35°C, see diagram for > 35°C.
Transport	Up to 90% at max. 35°C, see diagram for > 35°C.

D.3.3 Temperature/Humidity diagram

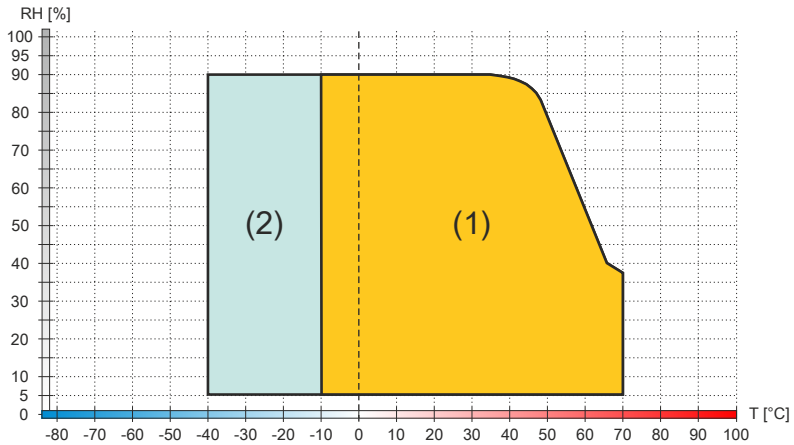


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**