

Automation Panel 9xD

User's manual

Version: **1.10 (October 2015)**
Model no.: **MAAP9xD-ENG**

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Chapter 1 • General information

1 Manual history

Version		
0.10 PRELIMINARY	2014-01-30	<ul style="list-style-type: none"> First version
0.50 PRELIMINARY	2014-04-16	<ul style="list-style-type: none"> Updated display units with operating elements: "5AP99D.185B-0x" on page 54, "5AP99D.215C-0x" on page 57, "5AP99D.215I-0x" on page 60, "5AP99D.240C-0x" on page 63. Updated link module "5DLSD3.1003-00" on page 67. Updated the following sections: "Mounting orientations" on page 23, "Weight specifications" on page 23. Updated section "Cables" on page 115 in chapter 6 "Accessories". Updated section "Components on display units with operating elements" on page 39. Updated "Terminal block for the button/switch interface" on page 112. Updated section "Chemical resistance" on page 130. Updated section "Touch screen" on page 138.
0.51 PRELIMINARY	2014-05-16	<ul style="list-style-type: none"> Updated images of the display units.
1.00	2014-10-21	<ul style="list-style-type: none"> Updated section "SDL3 In LEDs" on page 37. Updated sections "B&R Automation Device Interface (ADI) Development Kit" on page 88 and "B&R Automation Device Interface (ADI) .NET SDK" on page 90. Updated "B&R Key Editor" on page 92. Updated AP99D display units with operating elements. Updated missing specifications for the "Environmental characteristics" on page 24. Updated section "Components on display units with operating elements" on page 39. Revised section "Chemical resistance" on page 130. Updated section "Features" on page 134.
1.05	2015-02-12	<ul style="list-style-type: none"> Updated "Handles" on page 68. Updated section "Installing the handles" on page 76. Updated section "RFID command set" on page 96. Updated section "Certifications" on page 108. Updated temperature/humidity diagrams for "Display units" on page 44. Modified outer diameter of the swing arm shaft from 48 mm to a minimum of 47.5 and a maximum of 48.4 mm, see "Mounting an Automation Panel 9xD" on page 69.
1.10	2015-10-16	<ul style="list-style-type: none"> Documented exact position of key/switch interface, see page 43. Updated the following cables: SDL cables "5CASDL.0xx-00" on page 118, DVI cables "5CAD-VI.0xx-00" on page 121, RS232 cables "9A0014.xx" on page 124, USB cables "5CAUSB.00xx-00" on page 126. Changed wording of "keys" to "buttons" and "display units with keys" to "display units with operating elements". Updated "HMI Service Center" on page 95 (5SWUTI.0001-000). Updated "B&R KCF Editor" on page 94. Updated "B&R Key Editor" on page 92 to version 3.60. Modified section "Protection" on page 27. Updated "RFID read/write transponder unit" on page 134. Updated technical data and temperature humidity diagrams for "Display units" on page 44. Updated SDL3 cable 5CASD3.0050-00, see "SDL3 cables" on page 115. "3M touch screen - Temperature/Humidity diagram" on page 139 updated. Updated section "Power calculation" on page 28. Updated section "Ambient temperature during storage and transport" on page 25.

Table 1: Manual history

2 Safety guidelines

2.1 Intended use

Programmable logic controllers (PLCs), operating/monitoring devices (industrial PCs, Power Panels, Mobile Panels, etc.) and B&R uninterruptible power supplies have been designed, developed and manufactured for conventional use in industrial environments. They were not designed, developed and manufactured for any use involving serious risks or hazards that could lead to death, injury, serious physical damage or loss of any kind without the implementation of exceptionally stringent safety precautions. In particular, such risks and hazards include the use of these devices to monitor nuclear reactions in nuclear power plants, their use in flight control or flight safety systems as well as in the control of mass transportation systems, medical life support systems or weapons systems.

2.2 Protection against electrostatic discharge

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

2.2.1 Packaging

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

2.2.2 Guidelines for proper ESD handling

Electrical components with a housing

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

Electrical components without a housing

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

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

Individual components

- ESD protective measures for individual components are thoroughly integrated at B&R (conductive floors, footwear, arm bands, etc.).
- These increased ESD protective measures for individual components are not necessary for customers handling B&R products.

2.3 Policies and procedures

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

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

All tasks such as the installation, commissioning and servicing of devices are only permitted to be carried out by qualified personnel. Qualified personnel are those familiar with the transport, mounting, installation, commissioning and operation of devices who also have the appropriate qualifications (e.g. IEC 60364). National accident prevention regulations must be observed.

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

2.4 Transport and storage

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

2.5 Installation

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

2.6 Operation

2.6.1 Protection against touching electrical parts

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

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

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

2.6.2 Environmental conditions - Dust, moisture, corrosive gases

The use of operating/monitoring devices (e.g. industrial PCs, Power Panels, Mobile Panels, etc.) and uninterruptible power supplies in very dusty environments should be avoided. Dust collection on the devices can affect functionality and may prevent sufficient cooling, especially in systems with active cooling systems (fans).

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

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

2.6.3 Viruses and dangerous programs

This system is subject to potential risk each time data is exchanged or software is installed from a data medium (e.g. diskette, CD-ROM, USB flash drive, etc.), a network connection or the Internet. The user is responsible for assessing these dangers, implementing preventive measures such as virus protection programs, firewalls, etc. and making sure that software is only obtained from trusted sources.

2.7 Environmentally friendly disposal

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

2.7.1 Separation of materials

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

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

Table 2: Environmentally friendly separation of materials

Disposal must comply with applicable legal regulations.

3 Organization of safety notices

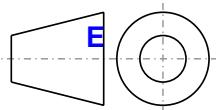
Safety notices in this manual are organized as follows:

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

Table 3: Description of the safety notices used in this documentation

4 Guidelines

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



All dimensions are specified in mm.

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

Table 4: Range of nominal sizes

5 Overview

Product ID	Short description	on page
Accessories		
5SWUTI.0001-000	HMI Service Center USB Flash Drive - Hardware diagnostics software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC51x/PP500 - For Automation Panel 800/900	95
DVI cables		
5CADVI.0018-00	DVI-D cable - 1.8 m	121
5CADVI.0050-00	DVI-D cable - 5 m	121
5CADVI.0100-00	DVI-D cable - 10 m	121
Display units		
5AP92D.1505-00	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	44
5AP92D.1505-01	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	44
5AP92D.1906-00	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	46
5AP92D.1906-01	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	46
5AP93D.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	48
5AP93D.185B-01	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	48
5AP93D.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	50
5AP93D.215C-01	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	50
5AP93D.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	52
5AP93D.240C-01	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	52
5AP99D.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Landscape format - 2 pushbuttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the top	54
5AP99D.185B-01	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 pushbuttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the bottom	54
5AP99D.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 pushbuttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the top	57
5AP99D.215C-01	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 pushbuttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the bottom	57
5AP99D.215I-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Portrait format - 2 pushbuttons - RFID read/write unit - E-stop - Key switch - IP65 protection - For swing arm mounting - Flange on the top	60
5AP99D.215I-01	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Portrait format - 2 pushbuttons - RFID read/write unit - E-stop - Key switch - IP65 protection - For swing arm mounting - Flange on the bottom	60
5AP99D.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 pushbuttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the top	63
5AP99D.240C-01	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 pushbuttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the bottom	63
Handles		
5AC903.HDL0-00	Handles for 5AP92D.1505-00, 5AP92D.1505-01	68
5AC903.HDL0-01	Handles for 5AP92D.1906-00, 5AP92D.1906-01	68
5AC903.HDL0-02	Handles for 5AP93D.185B-00, 5AP93D.185B-01	68
5AC903.HDL0-03	Handles for 5AP93D.215C-00, 5AP93D.215C-01	68
5AC903.HDL0-04	Handles for 5AP93D.240C-00, 5AP93D.240C-01	68
5AC903.HDL0-05	Handles for 5AP99D.185B-00, 5AP99D.185B-01	68
5AC903.HDL0-06	Handles for 5AP99D.215C-00, 5AP99D.215C-01	68
5AC903.HDL0-07	Handles for 5AP99D.215I-00, 5AP99D.215I-01	68
5AC903.HDL0-08	Handles for 5AP99D.240C-00, 5AP99D.240C-01	68
Link modules		
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5DLSDL.1002-00	Automation Panel Link module - SDL/DVI receiver - For Automation Panel 92D/93D/99D	66
RS232 cables		
9A0014.02	RS232 extension cable for remote operation of a display unit with touch screen, 1.8 m	124
9A0014.05	RS232 extension cable for remote operation of a display unit with touch screen, 5 m	124
9A0014.10	RS232 extension cable for remote operation of a display unit with touch screen, 10 m	124
SDL cables		
5CASDL.0008-00	SDL cable - 0.8 m	118
5CASDL.0018-00	SDL cable - 1.8 m	118
5CASDL.0050-00	SDL cable - 5 m	118
5CASDL.0100-00	SDL cable - 10 m	118
5CASDL.0150-00	SDL cable - 15 m	118
5CASDL.0200-00	SDL cable - 20 m	118

Product ID	Short description	on page
5CASDL.0250-00	SDL cable - 25 m	118
5CASDL.0300-00	SDL cable - 30 m	118
SDL3 cables		
5CASD3.0050-00	SDL3 cable - 5 m	115
5CASD3.0100-00	SDL3 cable - 10 m	115
5CASD3.0150-00	SDL3 cable - 15 m	115
5CASD3.0200-00	SDL3 cable - 20 m	115
5CASD3.0300-00	SDL3 cable - 30 m	115
5CASD3.0500-00	SDL3 cable - 50 m	115
5CASD3.1000-00	SDL3 cable - 100 m	115
Terminal blocks		
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm ²	110
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	110
0TB1210.3100	Connector - Female 10-pin - Cage clamp - Protected against vibration by the screw flange	112
USB accessories		
5MMUSB.2048-01	USB 2.0 flash drive, 2048 MB, B&R	113
5MMUSB.4096-01	USB 2.0 flash drive, 4096 MB, B&R	113
USB cables		
5CAUSB.0018-00	USB 2.0 connection cable - Type A - Type B connector - 1.8 m	126
5CAUSB.0050-00	USB 2.0 connection cable - Type A - Type B connector - 5 m	126

Chapter 2 • Technical data

1 Introduction

1.1 About this user's manual

This user's manual contains all relevant information about an operational Automation Panel 9xD swing arm device. This user's manual applies to the modular Automation Panel 9xD product generation. Information about Automation Panel 920, 980, 981 and 982 systems can be found in the Automation Panel 900 user's manual.

1.2 Description of individual modules

1.2.1 Display units

Display units are the basis for every Automation Panel 9xD and Panel PC 2100 swing arm device. They consist of a display, touch screen and housing. A variety of display sizes, touch screen technologies, flange connections (top or bottom) and displays with operating elements are available. These display units can only be operated as a complete system together with a link module (Automation Panel 9xD) or CPU board and system unit (Panel PC 2100 swing arm device).

Single-touch display units start at model number 5AP92D.xxxx-xx, multi-touch display units start at 5AP93D.xxxx-xx and multi-touch display units with operating elements start at 5AP99D.xxxx-xx.



1.2.2 Link modules

Link modules have various graphics interfaces and connections. An operational Automation Panel 9xD is put together by installing a link module onto a display unit. The Automation Panel 9xD is mounted to a swing arm system using the integrated flange.

A link module cannot function without a display unit.



1.3 Structure/Configuration

1.3.1 Automation Panel 9xD - Configuration

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

- Display unit
- Link module

Configuration - Base system						
Display unit	Select 1	Display size	Resolution	Touch screen	Flange	Button
Automation Panel 92D						
	5AP92D.1505-00 5AP92D.1505-01 5AP92D.1906-00 5AP92D.1906-01	15.0" 15.0" 19.0" 19.0"	XGA XGA SXGA SXGA	Single-touch Single-touch Single-touch Single-touch	Top Bottom Top Bottom	No No No No
Automation Panel 93D						
	5AP93D.185B-00 5AP93D.185B-01 5AP93D.215C-00 5AP93D.215C-01 5AP93D.240C-00 5AP93D.240C-01	18.5" 18.5" 21.5" 21.5" 24.0" 24.0"	HD HD FHD FHD FHD FHD	Multi-touch Multi-touch Multi-touch Multi-touch Multi-touch Multi-touch	Top Bottom Top Bottom Top Bottom	No No No No No No
Automation Panel 99D						
	5AP99D.185B-00 5AP99D.185B-01 5AP99D.215C-00 5AP99D.215C-01 5AP99D.215I-00 5AP99D.215I-01 5AP99D.240C-00 5AP99D.240C-01	18.5" 18.5" 21.5" 21.5" 21.5" 21.5" 24.0" 24.0"	HD HD FHD FHD FHD FHD FHD FHD	Multi-touch Multi-touch Multi-touch Multi-touch Multi-touch Multi-touch Multi-touch Multi-touch	Top Bottom Top Bottom Top Bottom Top Bottom	Yes Yes Yes Yes Yes Yes Yes Yes
Link module	Select 1					
		5DLSDL.1002-00 - SDL/DVI receiver 5DLSD3.1003-00 - SDL3 receiver				
Handles ¹⁾	Select 1					
		5AC903.HDL0-00 - For 5AP92D.1505-00/-01 5AC903.HDL0-01 - For 5AP92D.1906-00/-01 5AC903.HDL0-02 - For 5AP93D.185B-00/-01 5AC903.HDL0-03 - For 5AP93D.215C-00/-01 5AC903.HDL0-04 - For 5AP93D.240C-00/-01				
Terminal blocks	Select 1					
		Power connectors 0TB103.9 0TB103.91				

1) Handles are not factory-installed and must be mounted after delivery.

Figure 1: Automation Panel 9xD - Configuration

2 Complete system

2.1 Connection options

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

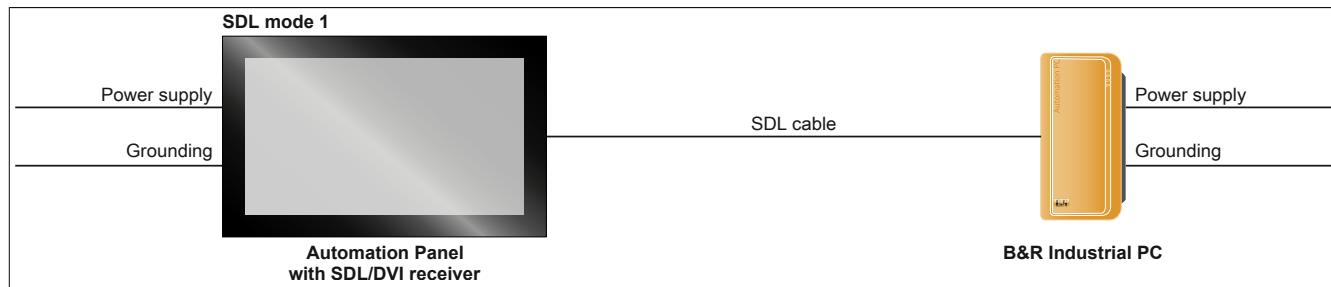
2.1.1 SDL mode

2.1.1.1 SDL mode - Mode 1

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

It is used to transfer not just display data, but touch screen, matrix key, LED, service and diagnostic data as well. The Automation Panel can be installed up to 40 m from the B&R Industrial PC. USB 1.1 is fully integrated in SDL and transferred over this distance as well without requiring any external modules.

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



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

Panel In	✓	USB In	✗	Power supply	✓	Brightness controls	✗
USB1, USB2	✓	USB 1.1	✗	Grounding	✓		

Maximum cable length: 40 m

Prerequisites and requirements

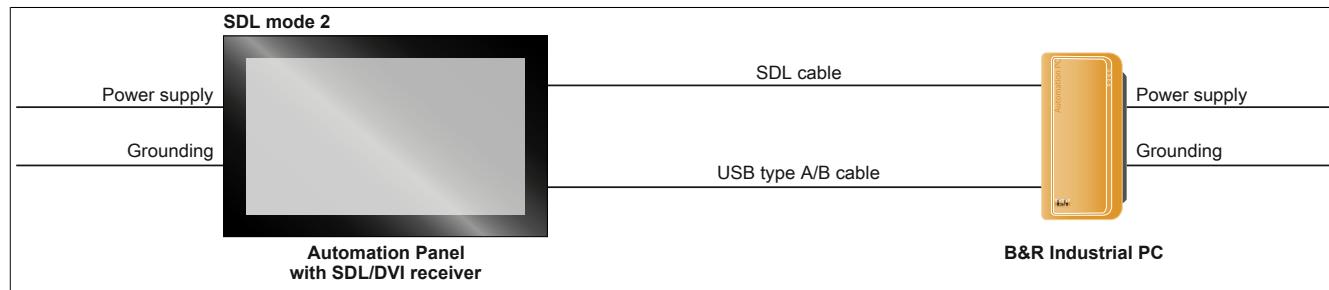
- Automation Panel with SDL/DVI receiver
- B&R Industrial PC with SDL interface
- SDL cable

2.1.1.2 SDL mode - Mode 2

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

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

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



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

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

Maximum cable length: 5 m

Prerequisites and requirements

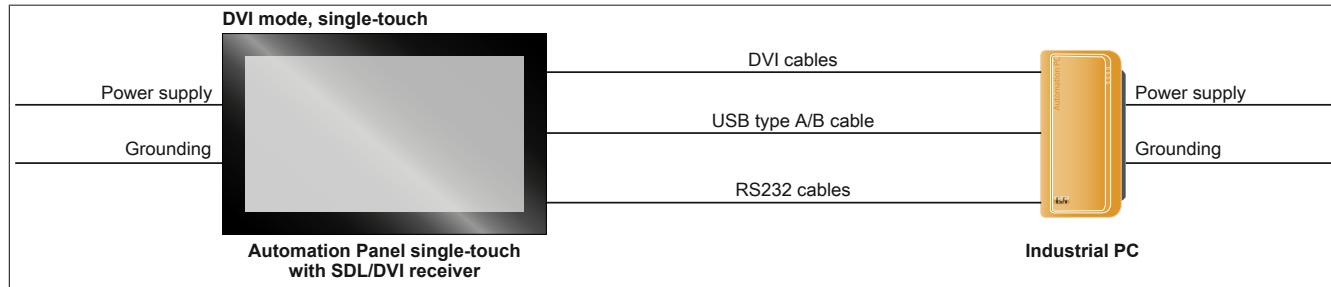
- Automation Panel with SDL/DVI receiver
- B&R Industrial PC with SDL interface
- SDL cable, USB type A/B cable

2.1.2 DVI mode

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

2.1.2.1 DVI mode with single-touch Automation Panel

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



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

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

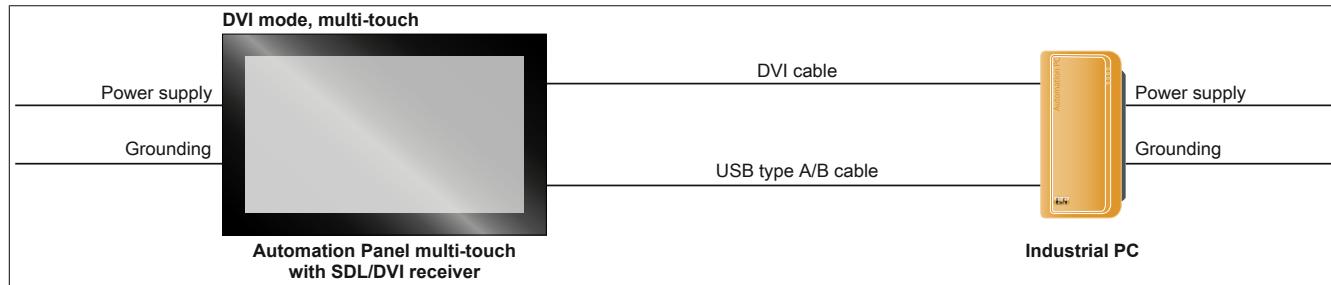
Maximum cable length: 5 m

Prerequisites and requirements

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

2.1.2.2 DVI mode with multi-touch Automation Panel

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



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

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

Maximum cable length: 5 m

Prerequisites and requirements

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

2.1.2.3 Special considerations, limitations

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

2.1.3 SDL3 mode

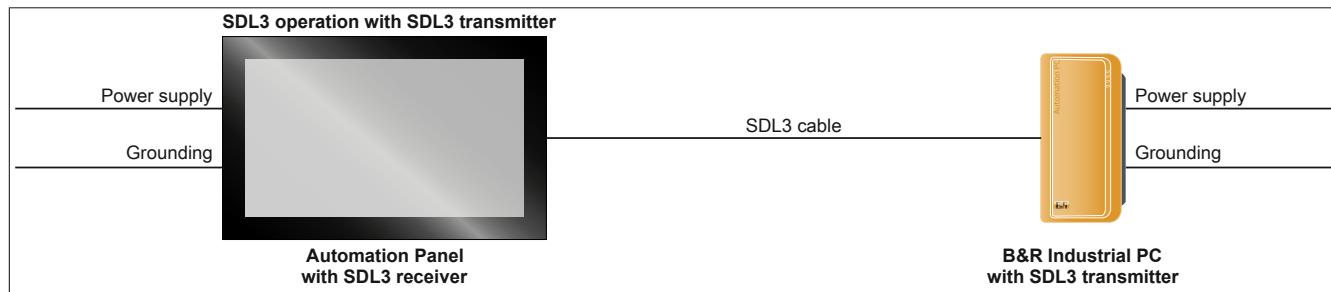
Smart Display Link 3 (SDL3) technology is used to transfer data from all communication channels between a B&R Industrial PC and a panel up to 100 m over a standard Ethernet cable. A male RJ45 connector designed for tight spaces such as feed-throughs and swing arm systems is used to connect to the device.

2.1.3.1 SDL3 mode with SDL3 transmitter

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

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

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



Availability of interfaces on the Automation Panel with SDL3 receiver:

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

Maximum cable length of SDL3: 100 m

Prerequisites and requirements

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

2.1.3.2 Special considerations, limitations

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

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

2.2 Mechanical characteristics

2.2.1 Dimensions

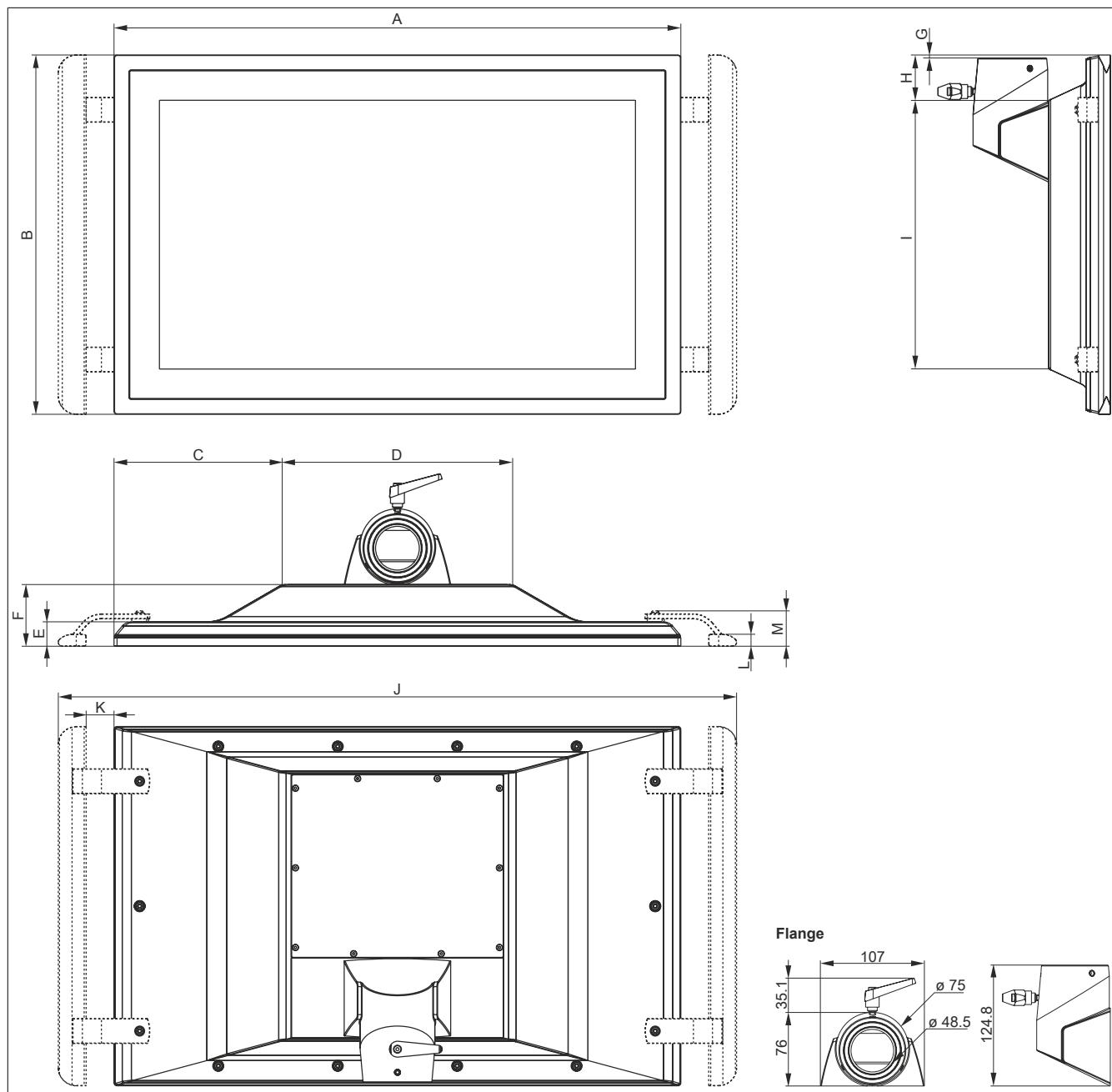


Figure 2: Automation Panel 92D/93D - Bottom/Top connections - Dimensions

All dimensions are specified in mm.

Display type	Model number	A	B	C	D	E	F	G	H	I	J	K	L	M
15.0" single-touch	5AP92D.1505-0x	398	316	81	235.9	24.5	61	-16	25.5	265	517.9	31.95	12	35.5
19.0" single-touch	5AP92D.1906-0x	468	386	116.8	234.4	32.5	63.5	1.6	42.8	300.3	587.9	31.95	12	43.5
18.5" multi-touch	5AP93D.185B-0x	503	323	135.7	231.5	24.5	63	-16	25.5	272	615	28	12	35.5
21.5" multi-touch	5AP93D.215C-0x	569.5	361	169	231.5	24.5	62	3	45.6	269.7	681.5	28	12	35.5
24.0" multi-touch	5AP93D.240C-0x	626.5	392	197.5	231.5	24.5	65	3	38.8	314.4	738.5	28	12	35.5

Table 5: AP92D/93D display units - Dimensions

Information:

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

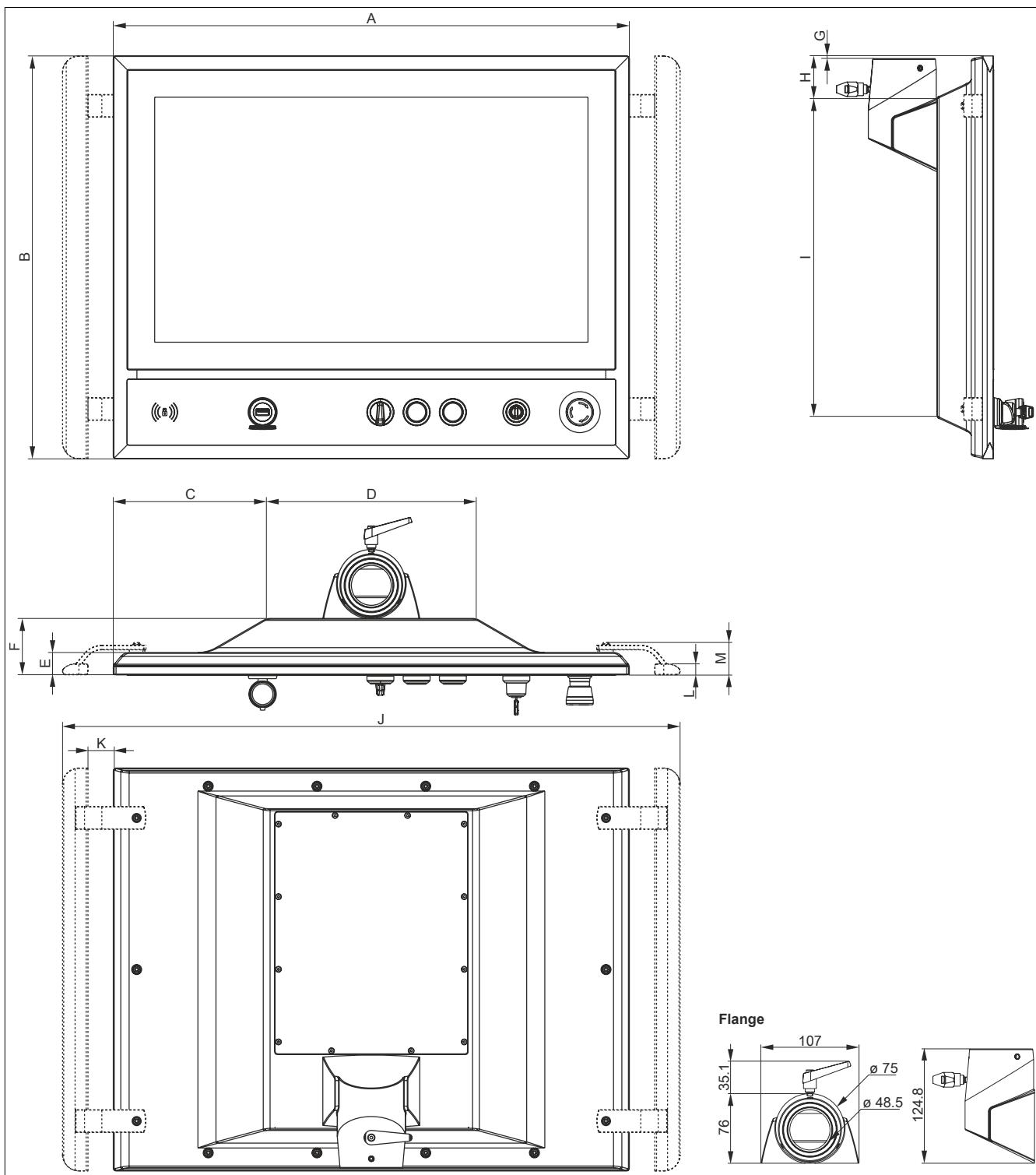


Figure 3: Automation Panel 99D - Bottom/Top connections - Dimensions

All dimensions are specified in mm.

Display type	Model number	A	B	C	D	E	F	G	H	I	J	K	L	M
18.5" multi-touch with operating elements	5AP99D.185B-0x	503	406	135.7	231.5	24.5	63	-16	25.5	355	615	28	12	35.5
21.5" multi-touch with operating elements	5AP99D.215C-0x	569.5	444	169	231.5	24.5	62	3	45.6	352.7	681.5	28	12	35.5
21.5" multi-touch with operating elements	5AP99D.215I-0x	361	652.5	59.2	242.6	24.5	62	94.3	41.6	569.3	477.5	30.25	12	35.5
24.0" multi-touch with operating elements	5AP99D.240C-0x	626.5	475	197.5	231.5	24.5	65	3	38.8	397.4	738.5	28	12	35.5

Table 6: AP99D display units - Dimensions

Information:

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

2.2.2 Mounting orientations

Use the adjustment lever on the flange to set the angle of rotation of the Automation Panel 9xD between +45° and -45°.

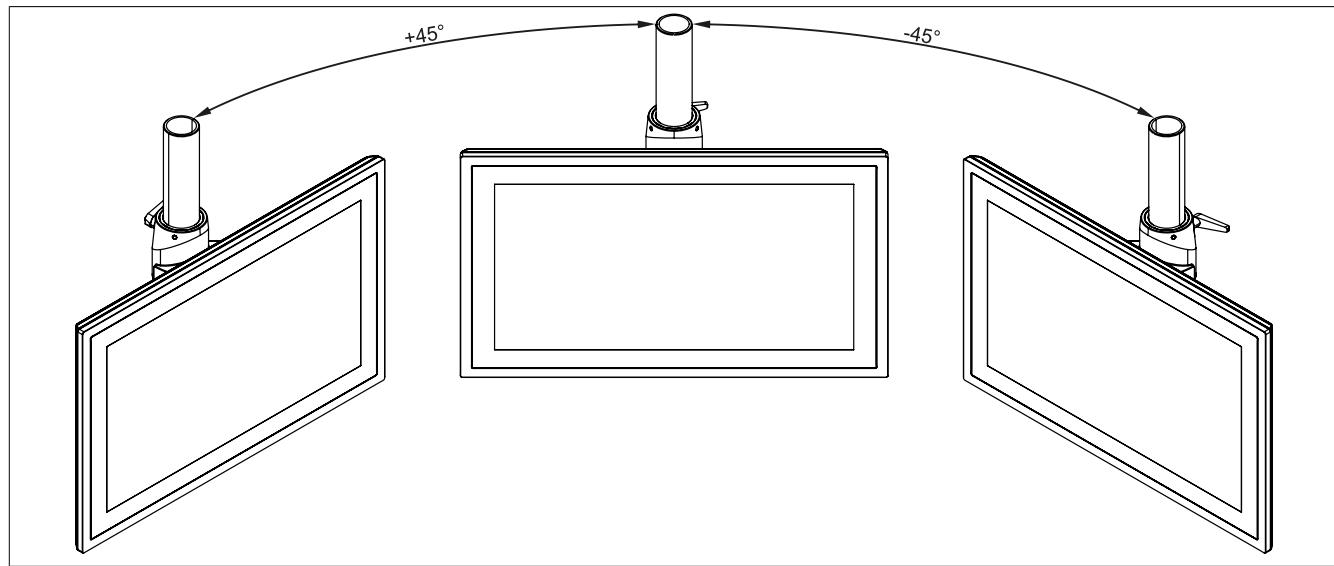


Figure 4: Automation Panel 9xD - Angle of rotation

2.2.3 Weight specifications

All weights are specified in g (grams).

Display type	Model number	Weight
15.0" single-touch	5AP92D.1505-0x	7450
19.0" single-touch	5AP92D.1906-0x	9650
18.5" multi-touch	5AP93D.185B-0x	8800
18.5" multi-touch with operating elements	5AP99D.185B-0x	10850
21.5" multi-touch	5AP93D.215C-0x	9000
21.5" multi-touch with operating elements	5AP99D.215C-0x	11550
21.5" multi-touch with operating elements	5AP99D.215I-0x	11400
24.0" multi-touch	5AP93D.240C-0x	10900
24.0" multi-touch with operating elements	5AP99D.240C-0x	13250

Table 7: Display units - Weight

Link module type	Model number	Weight
SDL/DVI receiver	5DLSDL.1002-00	380
SDL3 receiver	5DLSD3.1003-00	380

Table 8: Automation Panel 9xD - Link modules - Weight

Handles	Model number	Weight
For 5AP92D.1505-xx	5AC903.HDL0-00	600
For 5AP92D.1906-xx	5AC903.HDL0-01	750
For 5AP93D.185B-0x	5AC903.HDL0-02	630
For 5AP93D.215C-0x	5AC903.HDL0-03	700
For 5AP93D.240C-0x	5AC903.HDL0-04	900
For 5AP99D.185B-0x	5AC903.HDL0-05	800
For 5AP99D.215C-0x	5AC903.HDL0-06	850
For 5AP99D.215I-0x	5AC903.HDL0-07	1200
For 5AP99D.240C-0x	5AC903.HDL0-08	880

Table 9: Handles - Weight

2.3 Environmental characteristics

2.3.1 Temperature specifications

Display units and link modules can be combined. The many different configurations possible result in varying maximum ambient temperatures, which can be seen in the following table in this section.

Information:

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

Information regarding worst-case conditions

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

2.3.1.1 Maximum ambient temperature

All specifications are valid for non-condensing operation.

		Link module		Location of sensor(s)	
		SDL/DVI	SDL3		
		SDL1002-00	SDL31003-00		
All temperature values in degrees Celsius (°C) at 500 m above sea level.				Display - See temperature sensor position	
The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).					
Maximum ambient temperature		60	55		
What else can also be operated at the max. ambient temperature, or are there any limits?					
Display units	5AP92D.1505-0x	✓	✓		
	5AP92D.1906-0x	50	50		
	5AP93D.185B-0x	50	50		
	5AP99D.185B-0x	50	50		
	5AP93D.215C-0x	40	40		
	5AP99D.215C-0x	40	40		
	5AP99D.215I-0x	40	40		
	5AP93D.240C-0x	40	40		
	5AP99D.240C-0x	40	40		

Table 10: AP9xD - Ambient temperature

2.3.1.1 How to determine the maximum ambient temperature

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

Information:

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

3. The display unit determines if there are temperature limits.

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

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

2.3.1.2 Minimum ambient temperature during operation

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

2.3.1.3 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. The use of individual components may result in limitations.

Display type	Model number	Storage	Transport
15.0" single-touch	5AP92D.1505-0x	-25 to 80°C	-25 to 80°C
19.0" single-touch	5AP92D.1906-0x	-20 to 60°C	-20 to 60°C
18.5" multi-touch	5AP93D.185B-0x	-10 to 60°C	-10 to 60°C
18.5" multi-touch with operating elements	5AP99D.185B-0x	-10 to 60°C	-10 to 60°C
21.5" multi-touch	5AP93D.215C-0x	-10 to 60°C	-10 to 60°C
21.5" multi-touch with operating elements	5AP99D.215C-0x	-10 to 60°C	-10 to 60°C
21.5" multi-touch with operating elements	5AP99D.215I-0x	-10 to 60°C	-10 to 60°C
24.0" multi-touch	5AP93D.240C-0x	-10 to 60°C	-10 to 60°C
24.0" multi-touch with operating elements	5AP99D.240C-0x	-10 to 60°C	-10 to 60°C

Table 11: AP9xD display units - Ambient temperature during storage and transport

Link module	Model number	Storage	Transport
SDL/DVI receiver	5DLSDL.1002-00	-20 to 60°C	-20 to 60°C
SDL3 receiver	5DLSD3.1003-00	-20 to 60°C	-20 to 60°C

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

2.3.1.4 Temperature monitoring

A sensor in the display monitors the temperature of the AP9xD display unit. The location of the temperature sensor is illustrated in Fig. 5 "Automation Panel 9xD - Temperature sensor position" on page 25. The values listed in Tab. 13 "Temperature sensor position" on page 26 represent the defined maximum temperature for this measurement point. An alarm is not triggered if this temperature is exceeded. These temperatures can be read in BIOS or approved Microsoft Windows operating systems using the B&R Control Center.

2.3.1.5 Temperature sensor positions

These temperatures¹⁾ can be read in BIOS or Microsoft Windows operating systems using the B&R Control Center²⁾.

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



Figure 5: Automation Panel 9xD - Temperature sensor position

¹⁾ The temperature measured approximates the immediate ambient temperature but may also be influenced by neighboring components.

²⁾ The ADI driver that includes the B&R Control Center is available in the Downloads section of the B&R website (www.br-automation.com).

ADI sensors	Position	Measurement point for	Measurement	Max. specified
Panel	A	Display	Temperature of the display (sensor integrated in display unit)	5AP92D.1505-0x: 80°C 5AP92D.1906-0x: 75°C 5AP93D.185B-0x: 70°C 5AP99D.185B-0x: 70°C 5AP93D.215C-0x: 80°C 5AP99D.215C-0x: 75°C 5AP99D.215I-0x: 75°C 5AP93D.240C-0x: 70°C 5AP99D.240C-0x: 70°C

Table 13: Temperature sensor position

2.3.2 Relative humidity

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

Display type	Model number	Operation	Storage	Transport
15.0" single-touch	5AP92D.1505-0x	8 to 90%	8 to 90%	8 to 90%
19.0" single-touch	5AP92D.1906-0x	5 to 90%	5 to 90%	5 to 90%
18.5" multi-touch	5AP93D.185B-0x	5 to 90%	5 to 90%	5 to 90%
18.5" multi-touch with operating elements	5AP99D.185B-0x	5 to 90%	5 to 90%	5 to 90%
21.5" multi-touch	5AP93D.215C-0x	10 to 90%	10 to 90%	10 to 90%
21.5" multi-touch with operating elements	5AP99D.215C-0x	10 to 90%	10 to 90%	10 to 90%
21.5" multi-touch with operating elements	5AP99D.215I-0x	10 to 90%	10 to 90%	10 to 90%
24.0" multi-touch	5AP93D.240C-0x	5 to 90%	5 to 90%	5 to 90%
24.0" multi-touch with operating elements	5AP99D.240C-0x	5 to 90%	5 to 90%	5 to 90%

Table 14: Display units - Humidity

Link module type	Model number	Operation	Storage	Transport
SDL/DVI receiver	5DLSDL.1002-00	5 to 90%	5 to 95%	5 to 95%
SDL3 receiver	5DLSD3.1003-00	5 to 90%	5 to 95%	5 to 95%

Table 15: Link modules - Humidity

The specifications listed correspond to the relative humidity (non-condensing) at an ambient temperature of 30°C. More detailed information about specific temperature-dependent humidity values can be found in the technical data for the individual components.

2.3.3 Vibration

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

	Operation ¹⁾		Storage ^{1 2)}	Transport ^{1 2)}
	Continuous	Periodic		
Automation Panel 9xD	2 to 9 Hz: 1.75 mm amplitude 9 to 200 Hz: 0.5 g	2 to 9 Hz: 3.5 mm amplitude 9 to 200 Hz: 1 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g

Table 16: Vibration

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

2.3.4 Shock

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

	Operation ¹⁾	Storage ^{1 2)}	Transport ^{1 2)}
Automation Panel 9xD	15 g, 11 ms	30 g, 6 ms	30 g, 6 ms

Table 17: Shock

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

2.3.5 Protection

The Automation Panel 9xD is rated IP65 in accordance with EN 60529 on all sides under the following conditions:

- The Automation Panel 9xD is installed correctly (see "Mounting an Automation Panel 9xD" on page 69).
- All covers and components are installed on the interfaces and slots.
- All environmental conditions observed

In accordance with UL 50, "Type 4X indoor use only" also applies to the front of the Automation Panel 92D under the same conditions.

2.4 Electrical characteristics

2.4.1 +24 VDC voltage supply

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

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

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



Table 18: +24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	Max. 3 A
Electrical isolation	Yes
Uninterruptible power supply	No

2.4.2 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.

Link module	Model number	Total power consumption of link module
SDL/DVI receiver	5DLSLD.1002-00	Max. 3.6 W without USB consumers Max. 8.6 W with USB consumers
SDL3 receiver	5DLSD3.1003-00	Max. 8.1 W without USB consumers Max. 13.1 W with USB consumers

Table 19: Link modules - Power calculation

The following specifications are maximum values without additional consumers (USB devices, etc.).

Display type	Model number	+5 V	3V3	+12 V	Power consumption Total
15.0" single-touch	5AP92D.1505-0x	-	2.10 W	8.90 W	11 W
19.0" single-touch	5AP92D.1906-0x	8.00 W	-	22.40 W	30.40 W
18.5" multi-touch	5AP93D.185B-0x	6.10 W	-	10.80 W	16.90 W
18.5" multi-touch Operating elements	5AP99D.185B-0x	6.60 W	-	10.80 W	17.40 W
21.5" multi-touch	5AP93D.215C-0x	7.40 W	-	18.30 W	25.70 W
21.5" multi-touch Operating elements	5AP99D.215C-0x	7.90 W	-	18.30 W	26.20 W
21.5" multi-touch Operating elements	5AP99D.215I-0x	7.80 W	-	18.30 W	26.10 W
24.0" multi-touch	5AP93D.240C-0x	6.35 W	-	24.00 W	30.35 W
24.0" multi-touch Operating elements	5AP99D.240C-0x	6.85 W	-	24.00 W	30.85 W

Table 20: Display units - Power calculation

Example:

15" display unit 5AP92D.1505-00	2.10 W + 8.90 W =	11 W
SDL/DVI receiver 5DLSLD.1002-00	8.6 W (with USB consumers)	8.60 W
	Total max.:	19.60 W

2.4.3 Block diagrams

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

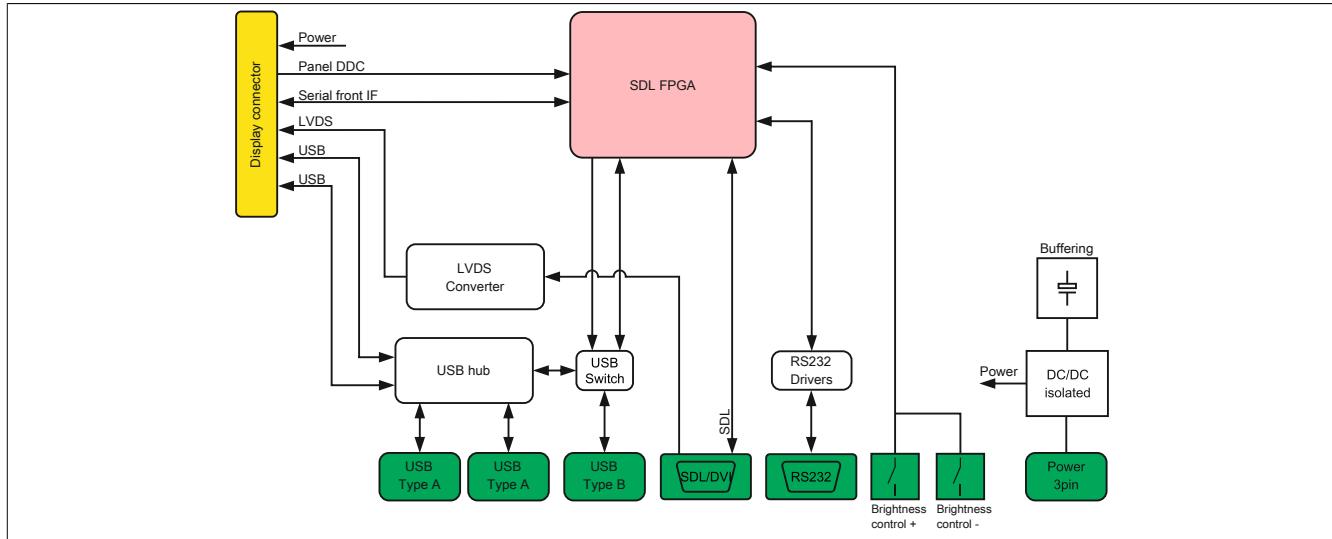


Figure 6: SDL/DVI receiver link module - Block diagram

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

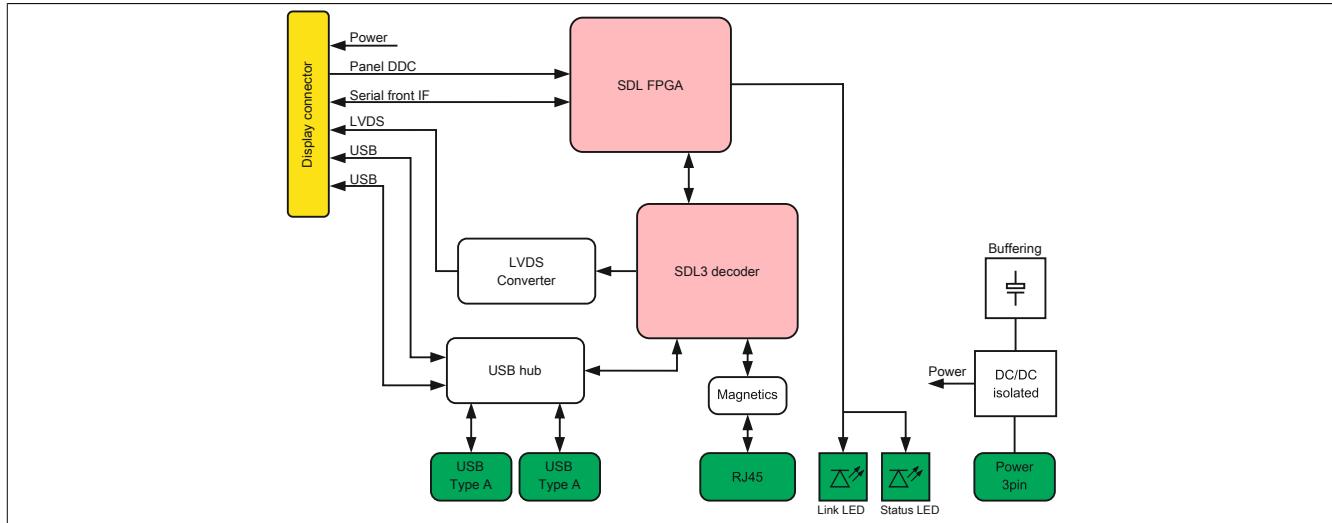


Figure 7: SDL3 receiver link module - Block diagram

2.5 5DLSDL.1002-00 SDL/DVI receiver - Device interfaces

2.5.1 Overview

SDL/DVI receiver interfaces are located on the back of the Automation Panel 9xD. To access, the interface cover on the back must be removed first (see "Removing the interface cover" on page 72).

Information about SDL/DVI mode can be found in sections "SDL mode" on page 16 and "DVI mode" on page 18.

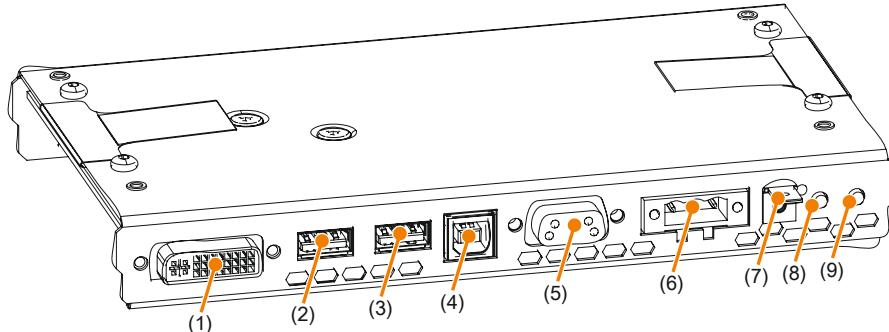


Figure 8: Overview of interfaces - SDL/DVI receiver link module

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

2.5.2 +24 VDC voltage supply

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

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

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



Table 21: +24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	Max. 3 A
Electrical isolation	Yes
Uninterruptible power supply	No

2.5.2.1 Grounding

Caution!

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

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



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

2.5.3 Panel In interface

The Panel In interface can be used for SDL or DVI transfer. For more information, see "SDL mode" on page 16 and "DVI mode" on page 18.

Panel In interface - SDL (Smart Display Link) / DVI	
The following overview lists the video signals available on the panel input. For additional details, see the technical data for the link module or display unit being used.	
Link module	Video signals
5DLSDL.1002-00	SDL, DVI



Table 22: Panel In interface - SDL, DVI

Information:

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

Information:

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

2.5.3.1 Pinout

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

DVI, 24-pin, female

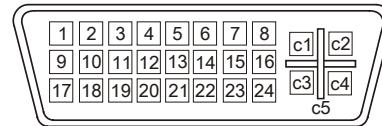


Table 23: DVI interface - Pinout

2.5.3.2 USB communication in SDL and DVI mode

Information:

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

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

2.5.4 USB interfaces

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

Warning!

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

Caution!

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

USB1, USB2

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

Information:

On AP99D systems (display units with operating elements), the USB2 interface is not available for the user. With AP99D ≤ Rev. A0, it is taken up by the RFID transponder; with AP99D ≥ Rev. A2, it is used for the front USB interface. If the USB cable is unplugged, the RFID transponder or front USB interface is disabled.

Depending on the transfer method (SDL or DVI mode), the transfer rate of the USB1 and USB2 interfaces may be limited. Possible transfer methods are listed in the section "Connection options" on page 16.

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

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



Table 24: USB1/USB2 interface

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

2) Each USB interface is protected by a shared, maintenance-free "USB current-limiting circuit breaker" (total max. 1 A).

2.5.5 USB In interface

The USB In interface is a USB 2.0 type B interface that is used to transfer USB data. It must be connected to the USB interface on the output device (e.g. B&R Industrial PC) when using DVI mode or SDL operating mode 2 as the transfer method. Possible transfer methods are listed in the section "Connection options" on page 16.

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

USB In interface ¹⁾	
Type	USB 2.0
Design	Type B
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load ²⁾	Max. 500 mA
Cable length	Max. 5 m (without hub)



Table 25: USB In interface

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

2.5.6 COM serial interface

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

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

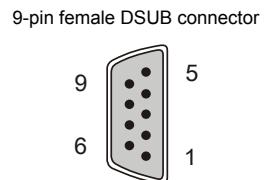
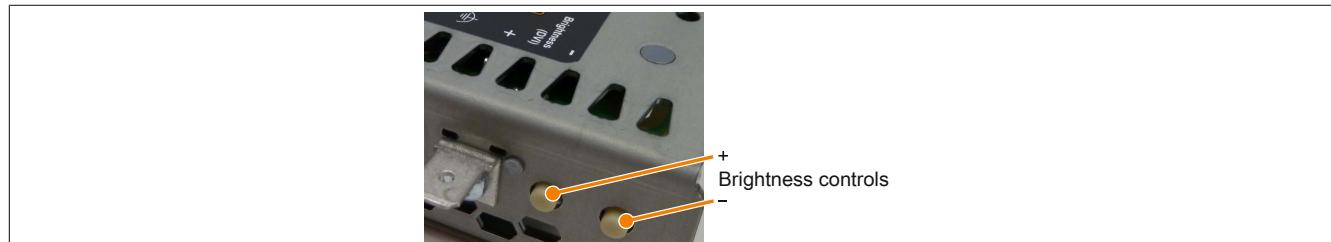


Table 26: COM - Pinout

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

2.5.7 Brightness controls

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



2.6 5DLSD3.1003-00 SDL3 receiver - Device interfaces

2.6.1 Overview

SDL3 receiver interfaces are located on the back of the Automation Panel 9xD. To access, the interface cover on the back must be removed first (see "Removing the interface cover" on page 72).

Information about SDL3 mode can be found in section "SDL3 mode" on page 19.

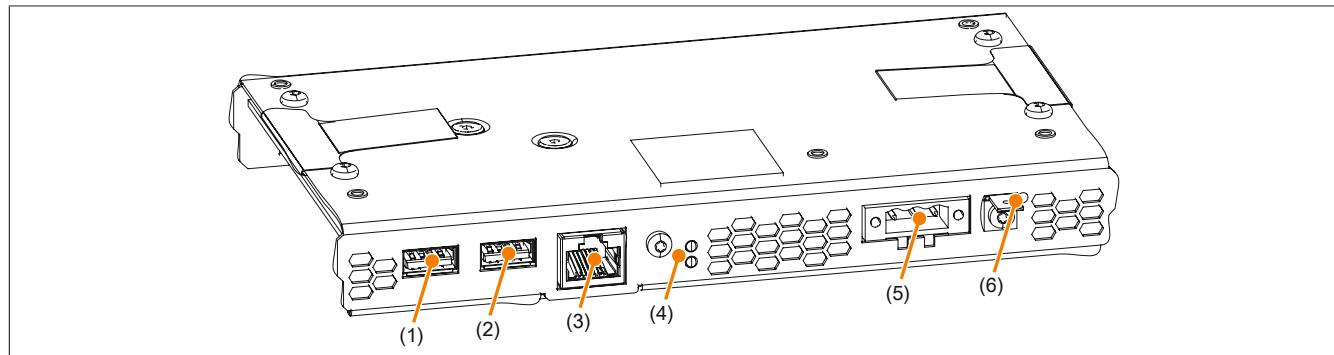


Figure 9: Overview of interfaces - SDL3 receiver link module

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

2.6.2 +24 VDC voltage supply

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

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

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

3-pin male power supply connector
+24 VDC power supply

Table 27: +24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	Max. 3 A
Electrical isolation	Yes
Uninterruptible power supply	No

2.6.3 Grounding

Caution!

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

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



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

2.6.4 SDL3 In interface

The SDL3 In interface is a female RJ45 connector and operated with SDL3 transmission technology. For more information, see section "SDL3 mode" on page 19.

SDL3 In interface - SDL3	
The following overview lists the video signals available on the panel input. For additional details, see the technical data for the link module or display unit being used.	
Link module	Video signals
5DLSD3.1003-00	SDL3

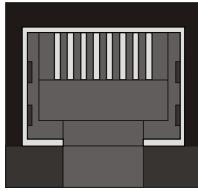


Table 28: SDL3 In interface

Information:

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

Information:

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

2.6.4.1 Cable lengths and resolutions for SDL3 transmission

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

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

Table 29: Cable lengths and resolutions for SDL3 transmission

2.6.4.2 SDL3 In LEDs

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

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



Table 30: SDL3 In LEDs

2.6.5 USB interfaces

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

Warning!

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

Caution!

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

USB1, USB2

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

Information:

On AP99D systems (display units with operating elements), the USB2 interface is not available for the user. With AP99D ≤ Rev. A0, it is taken up by the RFID transponder; with AP99D ≥ Rev. A2, it is used for the front USB interface. If the USB cable is unplugged, the RFID transponder or front USB interface is disabled.

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

2x USB type A, female

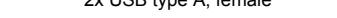


Table 31: USB1/USB2 interface

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

2.7 Components on display units with operating elements

Devices with operating elements come equipped with the following interfaces, buttons and switches on the front:

- RFID read/write transponder unit
- USB interface
- Selector switch (landscape AP99D only)
- Green and red pushbuttons
- Key switch
- E-stop

The button/switch interface is located inside the Automation Panel. To access, the interface cover on the back must be removed first (see "Removing the interface cover" on page 72).



Figure 10: Display unit with operating elements (AP99D) - Front view

2.7.1 Button/Switching element

Button / Switch / Transponder	Element	Switching element
RFID read/write transponder unit	"RFID read/write transponder unit" on page 134	-
Selector switch	"Selector switch RAFIX 22 FS+, 1.30.272.102/2200" on page 135	"Switching element RAFIX 22 FS universal, 1.20.126.005/0000" on page 135
Green pushbutton	"Pushbutton RAFIX 22 FS+, 1.30.270.021/2500" on page 134	"Switching element RAFIX 22 FS universal, 1.20.126.005/0000" on page 135
Red pushbutton	"Pushbutton RAFIX 22 FS+, 1.30.270.021/2300" on page 134	"Switching element RAFIX 22 FS universal, 1.20.126.005/0000" on page 135
Key switch	"Key switch RAFIX 22 FS+, 1.30.255.222/0000" on page 135	"Switching element RAFIX 22 FS universal, 1.20.126.005/0000" on page 135
E-stop	"E-stop RAFIX 22 FS+ "Plus 1", 1.30.273.502/0300" on page 135	"Switching element RAFIX 22 FS+ PCB gold, 1.20.126.414/0000" on page 137

2.7.1.1 Button, switch and LED configuration

Each button and LED can be individually configured and adapted directly to the application. Various B&R tools are available for this:

- B&R Key Editor, B&R KCF Editor or B&R Control Center for Windows operating systems
- Visual Components for Automation Runtime

Buttons and LEDs from each display unit are processed by the matrix controller in a bit string of 128 bits each.

The positions of buttons and LEDs in the matrix are shown as hardware numbers. These hardware numbers can be read directly from the target system using the B&R Key Editor, B&R KCF Editor or B&R Control Center.

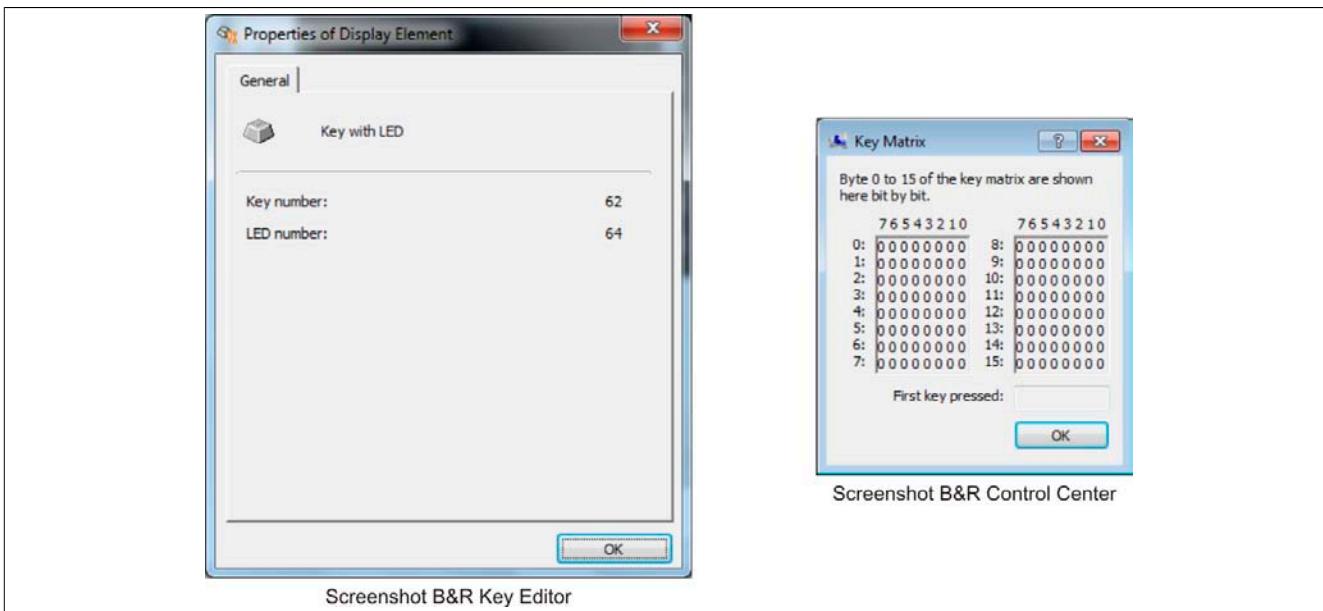


Figure 11: Hardware numbers in the B&R Key Editor and B&R Control Center

The images below show the positions of buttons and LEDs in the matrix. This information is indicated as follows.

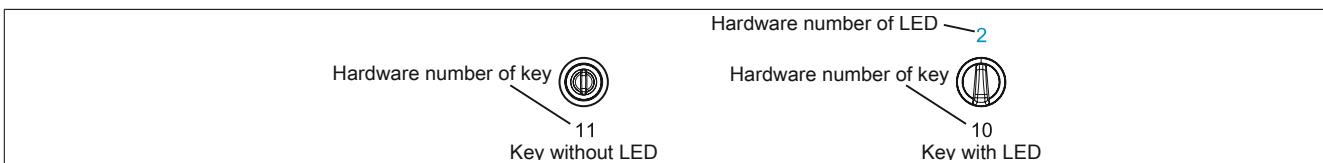


Figure 12: Display - Keys and LEDs

The configuration below applies to the following display units:

- 5AP99D.185B-00 / -01
- 5AP99D.215C-00 / -01
- 5AP99D.240C-00 / -01

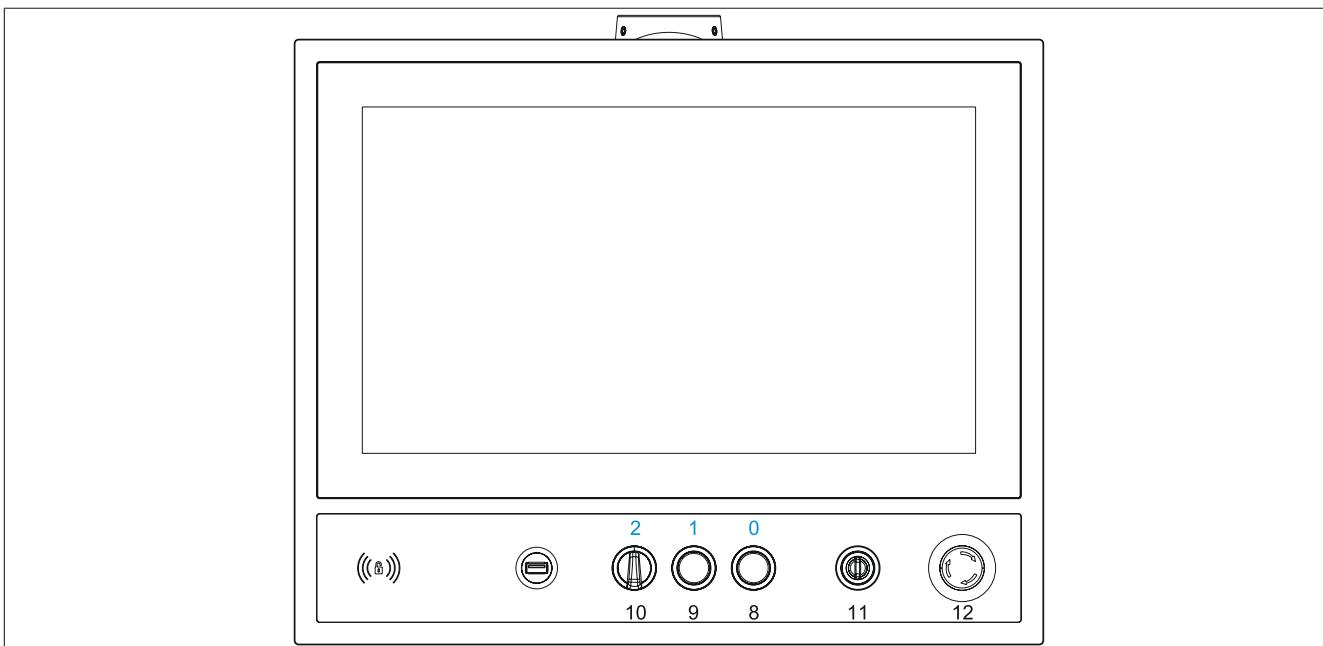


Figure 13: AP99D (landscape) - Button, switch and LED configuration

The configuration below applies to the following display unit:

- 5AP99D.215I-00 / -01

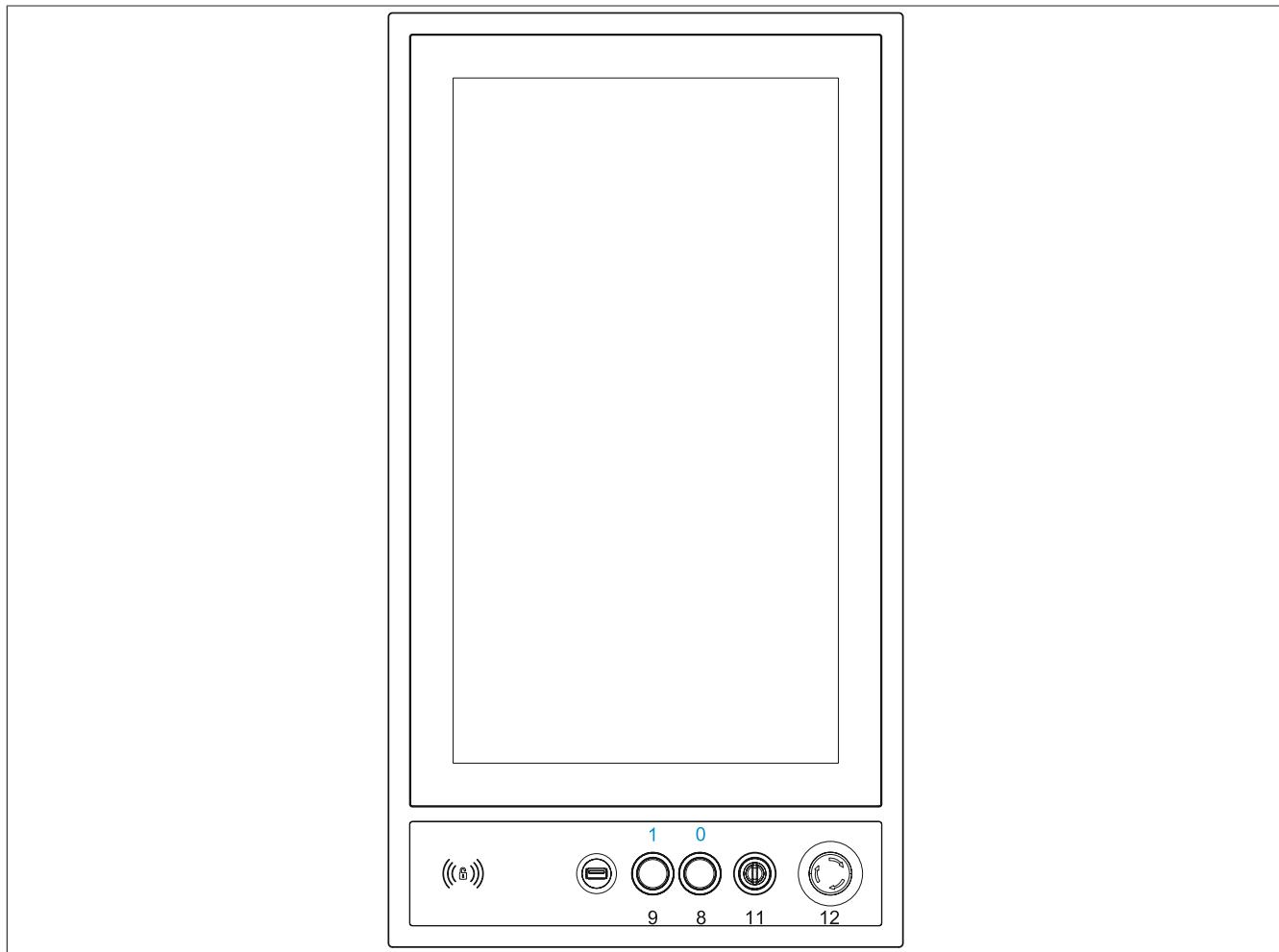


Figure 14: AP99D (portrait) - Button, switch and LED configuration

2.7.2 USB interface

Display units with operating elements are equipped with a USB 2.0 interface on the front. This is equipped with a protective cover.

Caution!

IP65 protection is only possible if this USB protective cover is fitted correctly.

Warning!

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

Caution!

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

Front USB

The front USB interface is available to the user for service purposes.

Information:

With display units ≥ Rev. A2, the front USB interface on the link module occupies the USB2 interface. If the USB cable is unplugged, the front USB interface is disabled as well.

Depending on the transfer method (SDL or DVI mode), the transfer rate of the USB1 and USB2 interfaces may be limited. Possible transfer methods are listed in the section "Connection options" on page 16.

Transfer method	USB type	Max. cable length
SDL mode 1	USB 1.1	40 m
SDL mode 2	USB 2.0	5 m
DVI mode, single-touch	USB 2.0	5 m
DVI mode, multi-touch	USB 2.0	5 m
SDL3 mode	USB 2.0	100 m

Universal Serial Bus (front USB) ¹⁾	
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s) ²⁾
Current load ³⁾ Front USB	Max. 500 mA
Cable length USB 2.0	Max. 4 m (without hub)

1x USB type A, female

USB

Protective cover

Table 32: Front USB interface

- 1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
- 2) In SDL3 mode: Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (30 Mbit/s)
- 3) Each USB interface is protected by a maintenance-free "USB current-limiting circuit breaker" (max. 500 mA).

2.7.3 Button/Switch interface

The button/switch interface can be used to externally wire the buttons and switching elements. It is located inside the AP99D. To access, the interface cover on the back must be removed first, see "Removing the interface cover" on page 72. The terminal block required here must be ordered separately.

Button/Switch interface			
Pin	Name	Button/Switch	Contact
1	T_Green	Green pushbutton	(normally open contact)
2	T_Select	Selector switch	(normally open contact)
3	T_Key	Key switch	(normally open contact)
4	T_Red	Red pushbutton	(normally open contact)
5	V_Button		Reference potential for pins 1-4
6	V_Button		Reference potential for pins 1-4
7	NH21	E-stop	Normally closed contact pair 2 - Emergency stop
8	NH22	E-stop	Normally closed contact pair 2 - Emergency stop
9	NH11	E-stop	Normally closed contact pair 1 - Emergency stop
10	NH12	E-stop	Normally closed contact pair 1 - Emergency stop
Model number		Short description	
		Required accessories	
		Terminal blocks	
OTB1210.3100		Connector, 10-pin female, cage clamps, protected against vibration by the screw flange	

Table 33: Button/Switch interface - Pinout

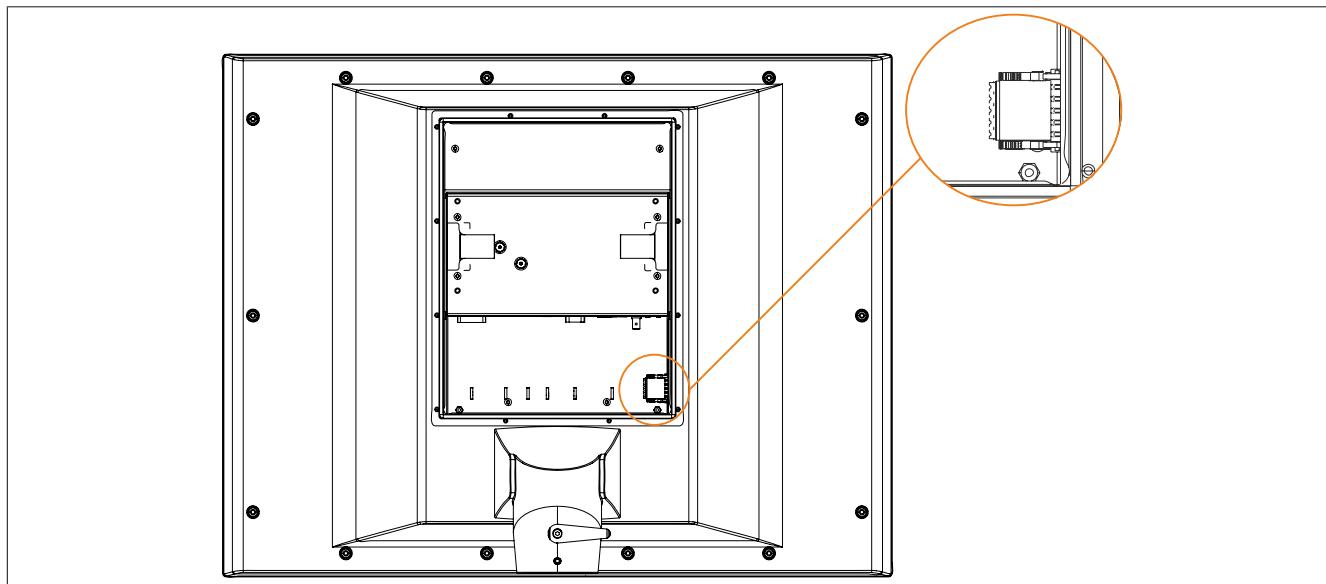
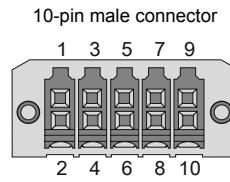


Figure 15: Button/Switch interface

2.7.4 RFID read/write transponder unit

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

The following transponder tags can be used with this RFID transponder:

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

3 Individual components

3.1 Display units

3.1.1 5AP92D.1505-0x

3.1.1.1 General information

- 15.0" TFT XGA color display
- Single-touch (analog resistive)
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.1.2 Order data

Model number	Short description	Figure
5AP92D.1505-00	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	
5AP92D.1505-01	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 34: 5AP92D.1505-00, 5AP92D.1505-01 - Order data

3.1.1.3 Technical data

Product ID	5AP92D.1505-00	5AP92D.1505-01
General information		
B&R ID code	0xE386	0xE387
Certification		
CE	Yes	
cULus	Yes	
Display		
Type	Color TFT	
Display size	15.0"	
Colors	16.2 million	
Resolution	XGA, 1024 x 768 pixels	
Contrast	700:1	
Viewing angles		
Horizontal	Direction R = 80° / Direction L = 80°	
Vertical	Direction U = 70° / Direction D = 70°	
Backlight		
Type	LED	
Brightness (dimmable)	Typ. 20 to 400 cd/m²	
Half-brightness time ¹⁾	50,000 h	
Touch screen ²⁾		
Type	AMT	
Technology	Analog, resistive	
Controller	B&R, serial, 12-bit	
Transmittance	81% ±3%	
Operating conditions		
EN 60529 protection	IP65 ³⁾	
UL 50 protection	Front: Type 4X indoor use only	
Mechanical characteristics		
Housing		
Material	Aluminum, painted	
Coating	White aluminum	
Front		
Frame	Aluminum, painted	
Panel overlay		
Material	Polyester	
Dark gray border around display	RAL 7024	
Flange output	Top	Bottom

Table 35: 5AP92D.1505-00, 5AP92D.1505-01 - Technical data

Product ID	5AP92D.1505-00	5AP92D.1505-01
Dimensions		
Width		398 mm
Height		316 mm
Weight		7450 g

Table 35: 5AP92D.1505-00, 5AP92D.1505-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
- 2) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
- 3) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.1.4 Dimensions

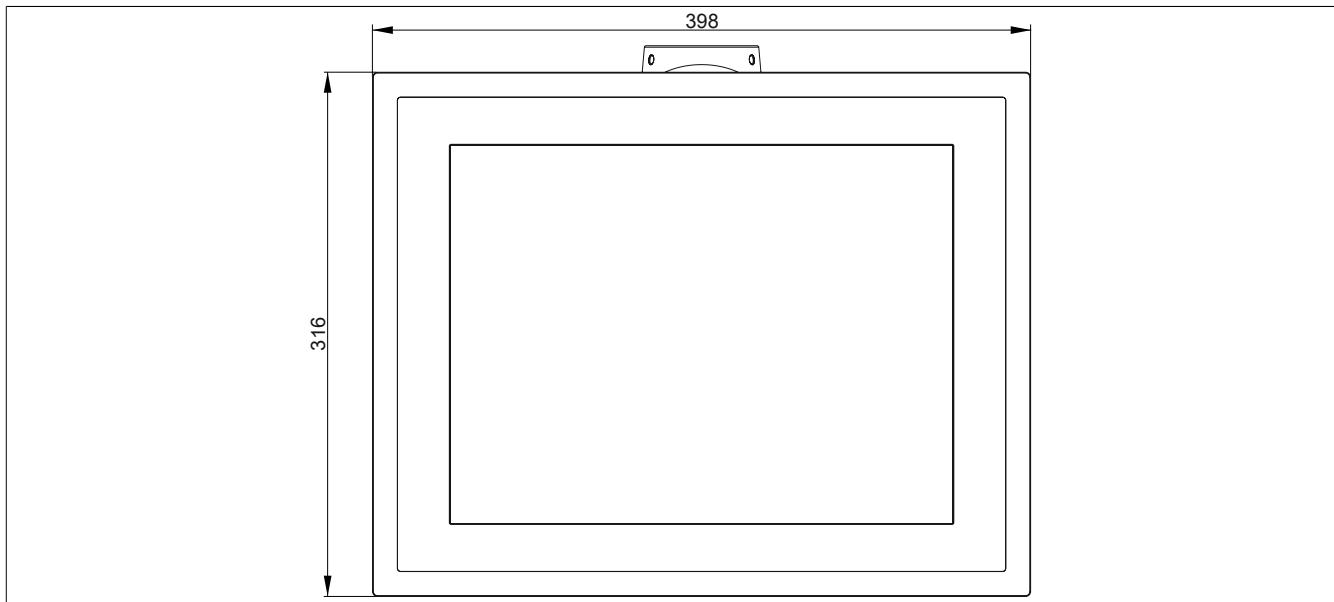


Figure 16: 5AP92D.1505-0x - Dimensions

3.1.1.5 Temperature/Humidity diagram

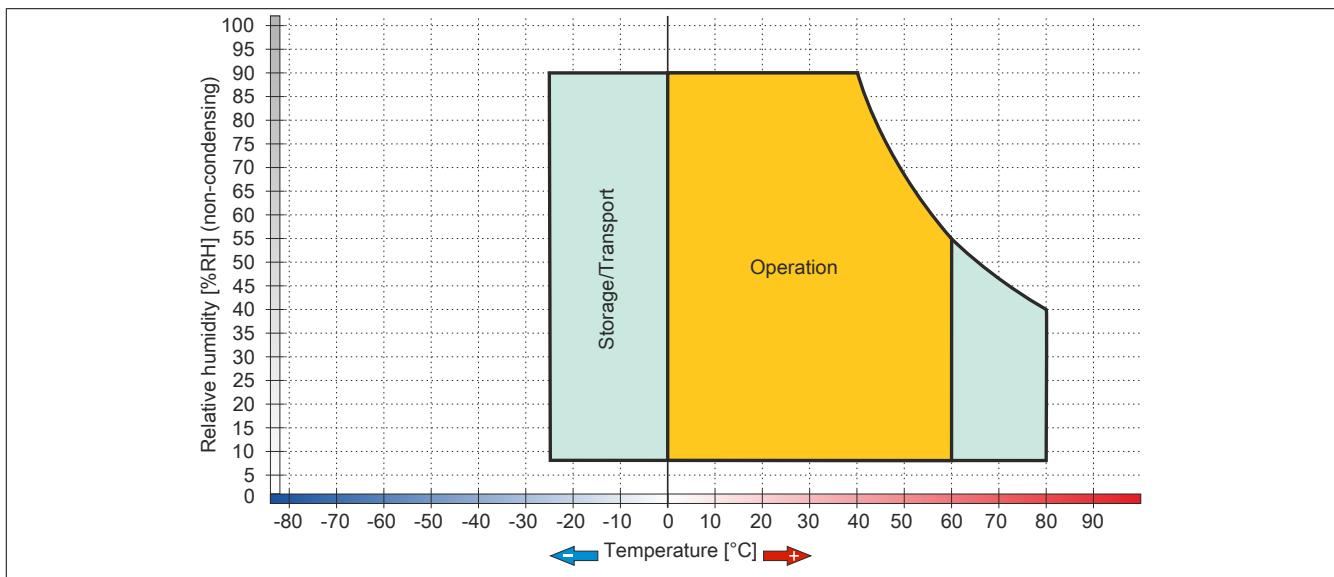


Figure 17: 5AP92D.1505-0x - Temperature/Humidity diagram

3.1.2 5AP92D.1906-0x

3.1.2.1 General information

- 19.0" TFT SXGA color display
- Single-touch (analog resistive)
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.2.2 Order data

Model number	Short description	Figure
Display units		
5AP92D.1906-00	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	
5AP92D.1906-01	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 36: 5AP92D.1906-00, 5AP92D.1906-01 - Order data

3.1.2.3 Technical data

Product ID	5AP92D.1906-00	5AP92D.1906-01
General information		
B&R ID code	0xE388	0xE389
Certification CE cULus		Yes Yes
Display		
Type	Color TFT	
Display size	19.0"	
Colors	16.7 million	
Resolution	SXGA, 1280 × 1024 pixels	
Contrast	2000:1	
Viewing angles Horizontal Vertical	Direction R = 89° / Direction L = 89° Direction U = 89° / Direction D = 89°	
Backlight Type Brightness (dimmable) Half-brightness time ¹⁾	LED Typ. 30 to 300 cd/m ² 50,000 h	
Touch screen ²⁾ Type Technology Controller Transmittance	AMT Analog, resistive B&R, serial, 12-bit 81% ±3%	
Operating conditions		
EN 60529 protection	IP65 ³⁾	
UL 50 protection	Front: Type 4X indoor use only	
Mechanical characteristics		
Housing Material Coating	Aluminum, painted White aluminum	
Front Frame Panel overlay Material Dark gray border around display	Aluminum, painted Polyester RAL 7024	
Flange output	Top	Bottom

Table 37: 5AP92D.1906-00, 5AP92D.1906-01 - Technical data

Product ID	5AP92D.1906-00	5AP92D.1906-01
Dimensions		
Width		468 mm
Height		386 mm
Weight		9650 g

Table 37: 5AP92D.1906-00, 5AP92D.1906-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
- 2) Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website.
- 3) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.2.4 Dimensions

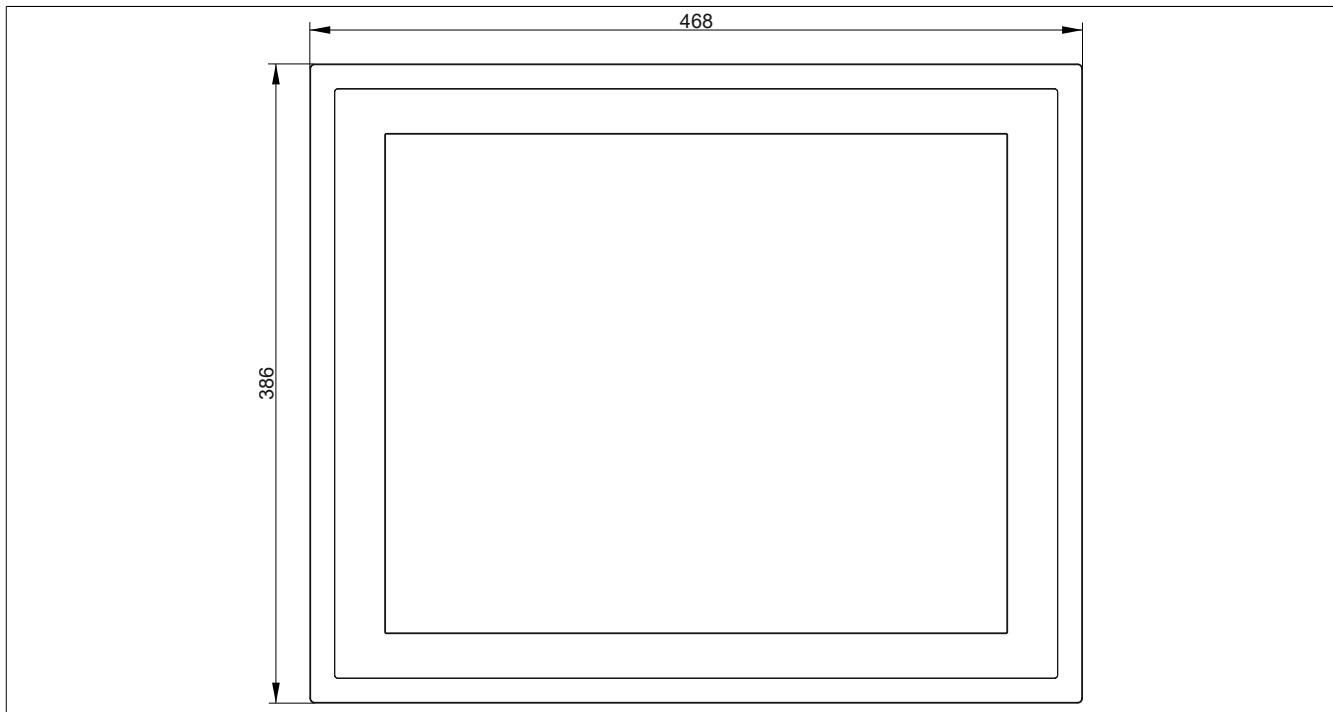


Figure 18: 5AP92D.1906-0x - Dimensions

3.1.2.5 Temperature/Humidity diagram

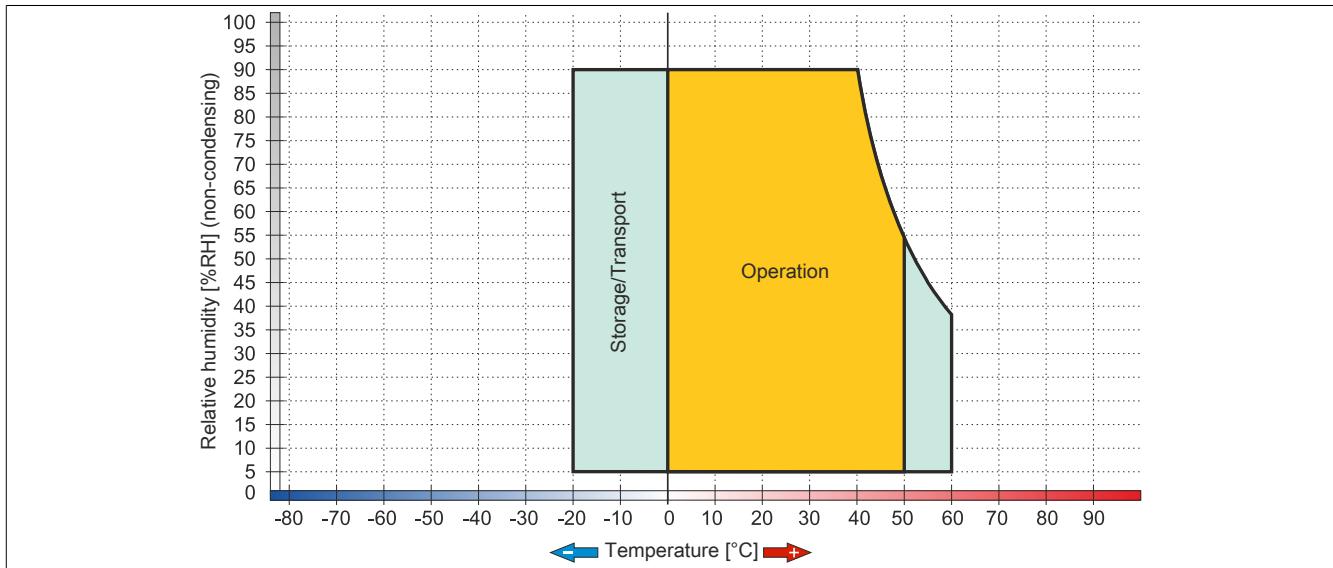


Figure 19: 5AP92D.1906-0x - Temperature/Humidity diagram

3.1.3 5AP93D.185B-0x

3.1.3.1 General information

- 18.5" TFT HD color display
- Multi-touch (PCT)
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.3.2 Order data

Model number	Short description	Figure
Display units		
5AP93D.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	
5AP93D.185B-01	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 38: 5AP93D.185B-00, 5AP93D.185B-01 - Order data

3.1.3.3 Technical data

Product ID	5AP93D.185B-00	5AP93D.185B-01
General information		
B&R ID code	0xE38A	0xE38B
Certification cULus		Yes
Display		
Type	Color TFT	
Display size	18.5"	
Colors	16.7 million	
Resolution	HD, 1366 × 768 pixels	
Contrast	1000:1	
Viewing angles Horizontal Vertical	Direction R = 85° / Direction L = 85° Direction U = 80° / Direction D = 80°	
Backlight Type Brightness (dimmable) Half-brightness time ¹⁾	LED Typ. 15 to 300 cd/m ² 50,000 h	
Touch screen Type Technology Controller Transmittance	3M Projected capacitive touch (PCT) 3M 88% ±2%	
Operating conditions		
EN 60529 protection	IP65 ²⁾	
Mechanical characteristics		
Housing Material Coating	Coated aluminum White aluminum	Aluminum, painted
Front Frame Design	Coated aluminum Black	Aluminum, painted
Flange output	Top	Bottom
Dimensions Width Height	503 mm 323 mm	
Weight	8800 g	

Table 39: 5AP93D.185B-00, 5AP93D.185B-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
 2) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.3.4 Dimensions

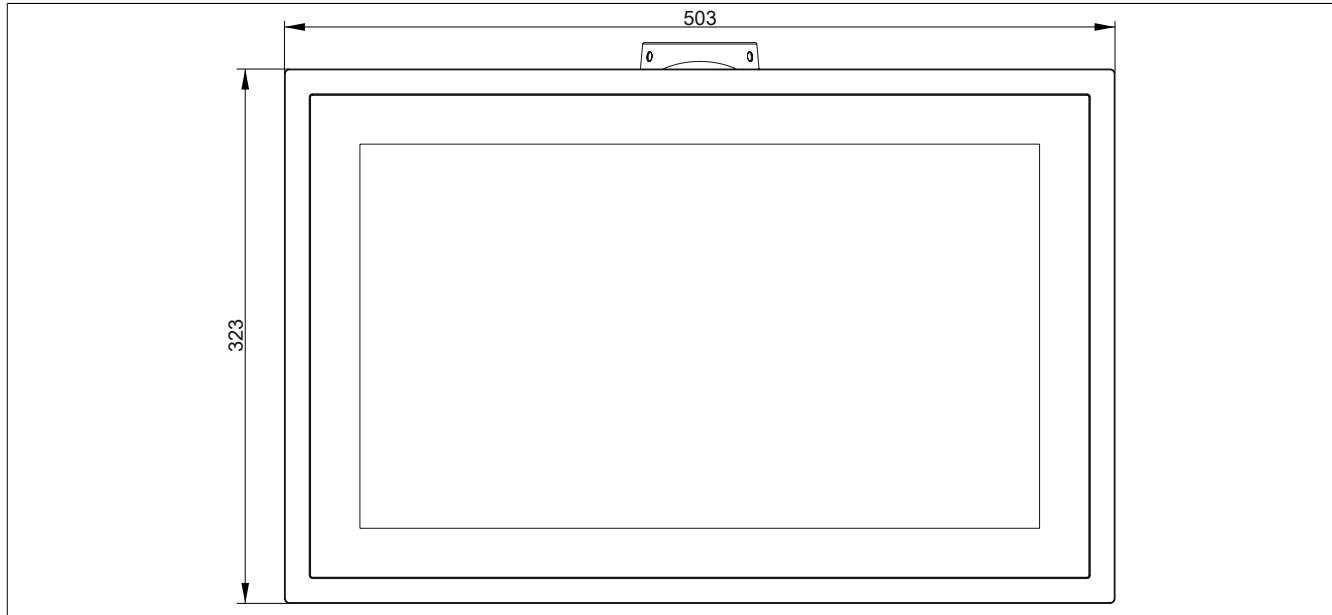


Figure 20: 5AP93D.185B-0x - Dimensions

3.1.3.5 Temperature/Humidity diagram

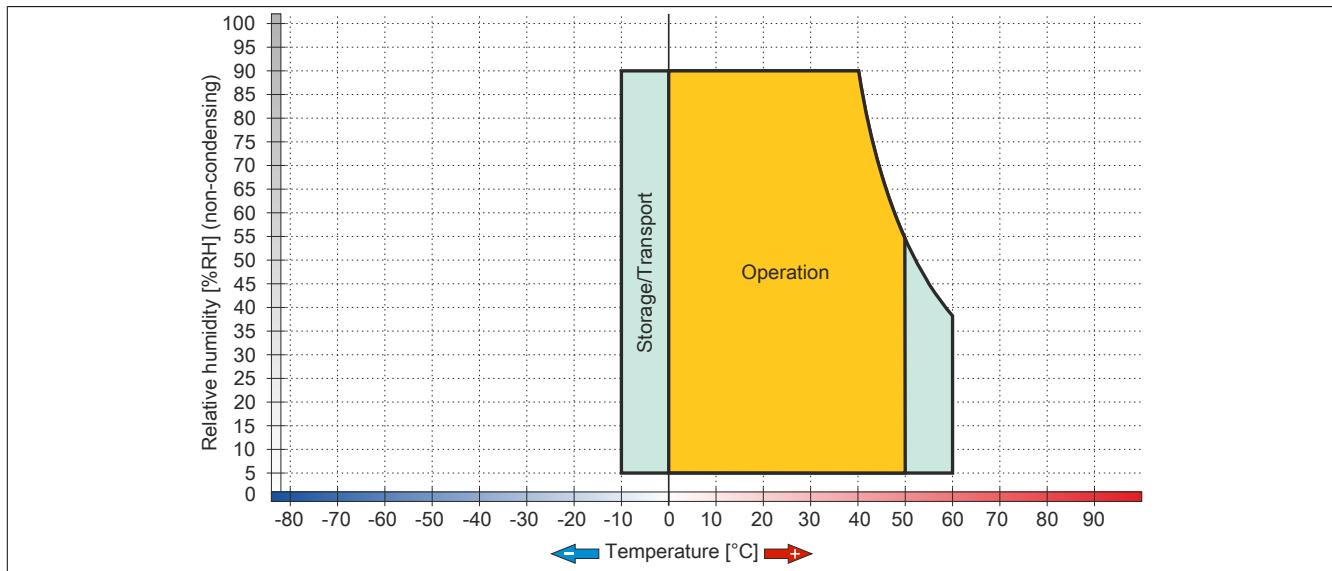


Figure 21: 5AP93D.185B-0x - Temperature/Humidity diagram

3.1.4 5AP93D.215C-0x

3.1.4.1 General information

- 21.5" TFT FHD color display
- Multi-touch (PCT)
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.4.2 Order data

Model number	Short description	Figure
Display units		
5AP93D.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	
5AP93D.215C-01	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 40: 5AP93D.215C-00, 5AP93D.215C-01 - Order data

3.1.4.3 Technical data

Product ID	5AP93D.215C-00	5AP93D.215C-01
General information		
B&R ID code	0xE2B7	0xE3A2
Certification cULus		Yes
Display		
Type	Color TFT	
Display size	21.5"	
Colors	16.7 million	
Resolution	FHD, 1920 × 1080 pixels	
Contrast	1000:1	
Viewing angles Horizontal Vertical		Direction R = 89° / Direction L = 89° Direction U = 89° / Direction D = 89°
Backlight Type Brightness (dimmable) Half-brightness time ¹⁾		LED Typ. 12.5 to 250 cd/m ² 30,000 h
Touch screen Type Technology Controller Transmittance		3M Projected capacitive touch (PCT) 3M 88% ±2%
Operating conditions		
EN 60529 protection		IP65 ²⁾
Mechanical characteristics		
Housing Material Coating		Aluminum, painted White aluminum
Front Frame Design		Aluminum, painted Black
Flange output	Top	Bottom
Dimensions Width Height		569.5 mm 361 mm
Weight		9000 g

Table 41: 5AP93D.215C-00, 5AP93D.215C-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
 2) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.4.4 Dimensions

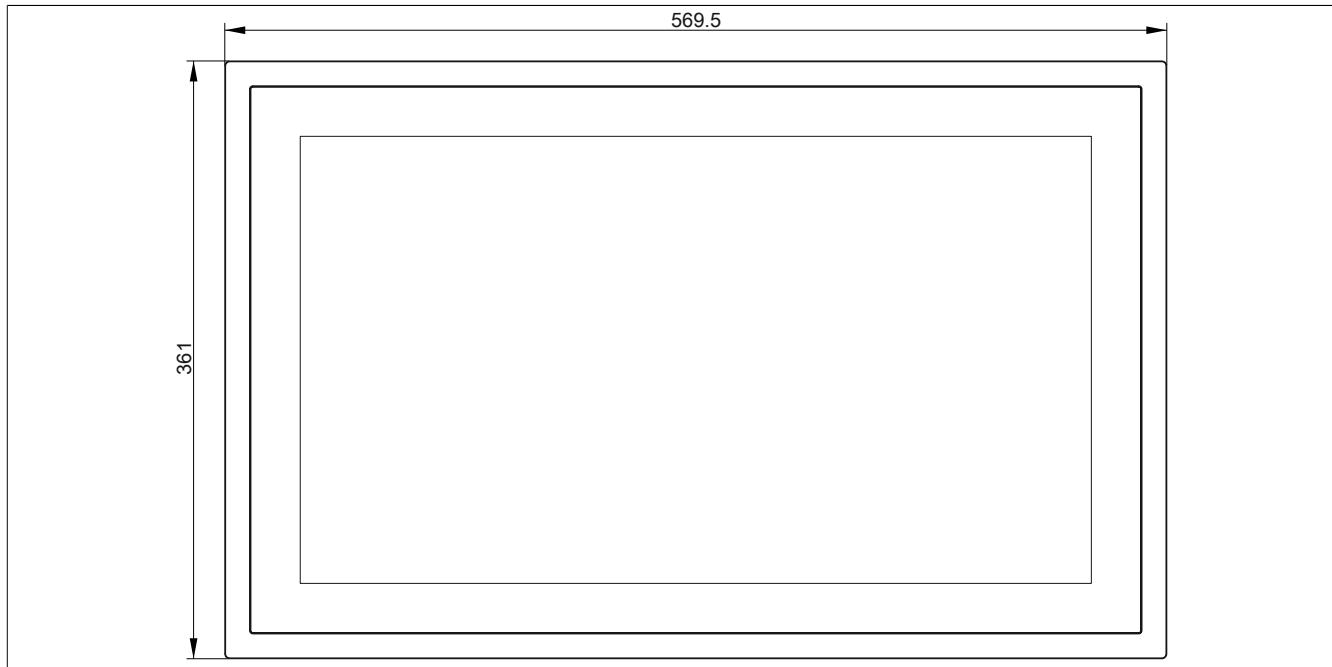


Figure 22: 5AP93D.215C-0x - Dimensions

3.1.4.5 Temperature/Humidity diagram

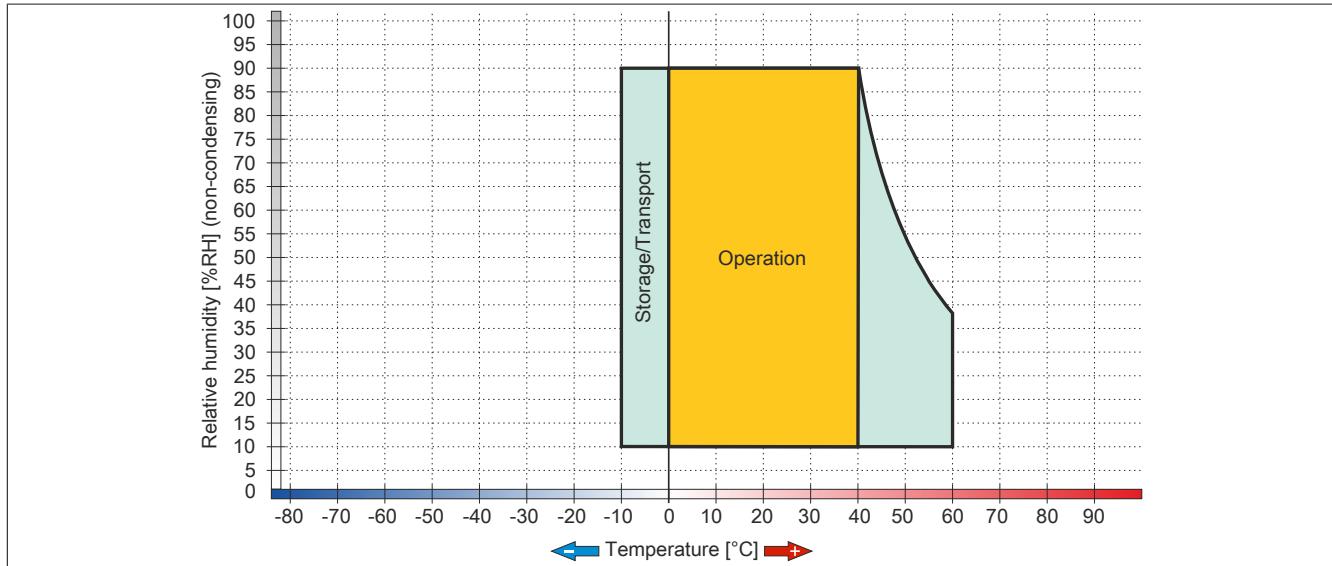


Figure 23: 5AP93D.215C-0x - Temperature/Humidity diagram

3.1.5 5AP93D.240C-0x

3.1.5.1 General information

- 24.0" TFT FHD color display
- Multi-touch (PCT)
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.5.2 Order data

Model number	Short description	Figure
	Display units	
5AP93D.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the top	
5AP93D.240C-01	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 42: 5AP93D.240C-00, 5AP93D.240C-01 - Order data

3.1.5.3 Technical data

Product ID	5AP93D.240C-00	5AP93D.240C-01
General information		
B&R ID code	0xE3A7	0xE3A8
Certification cULus		Yes
Display		
Type	Color TFT	
Display size	24.0"	
Colors	16.7 million	
Resolution	FHD, 1920 × 1080 pixels	
Contrast	5000:1	
Viewing angles Horizontal Vertical		Direction R = 89° / Direction L = 89° Direction U = 89° / Direction D = 89°
Backlight Type Brightness (dimmable) Half-brightness time ¹⁾		LED Typ. 30 to 300 cd/m ² 50,000 h
Touch screen Type Technology Controller Transmittance		3M Projected capacitive touch (PCT) 3M 88% ±2%
Operating conditions		
EN 60529 protection		IP65 ²⁾
Mechanical characteristics		
Housing Material Coating		Aluminum, painted White aluminum
Front Frame Design		Aluminum, painted Black
Flange output	Top	Bottom
Dimensions Width Height		626.5 mm 392 mm
Weight		10900 g

Table 43: 5AP93D.240C-00, 5AP93D.240C-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
 2) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.5.4 Dimensions



Figure 24: 5AP93D.240C-0x - Dimensions

3.1.5.5 Temperature/Humidity diagram

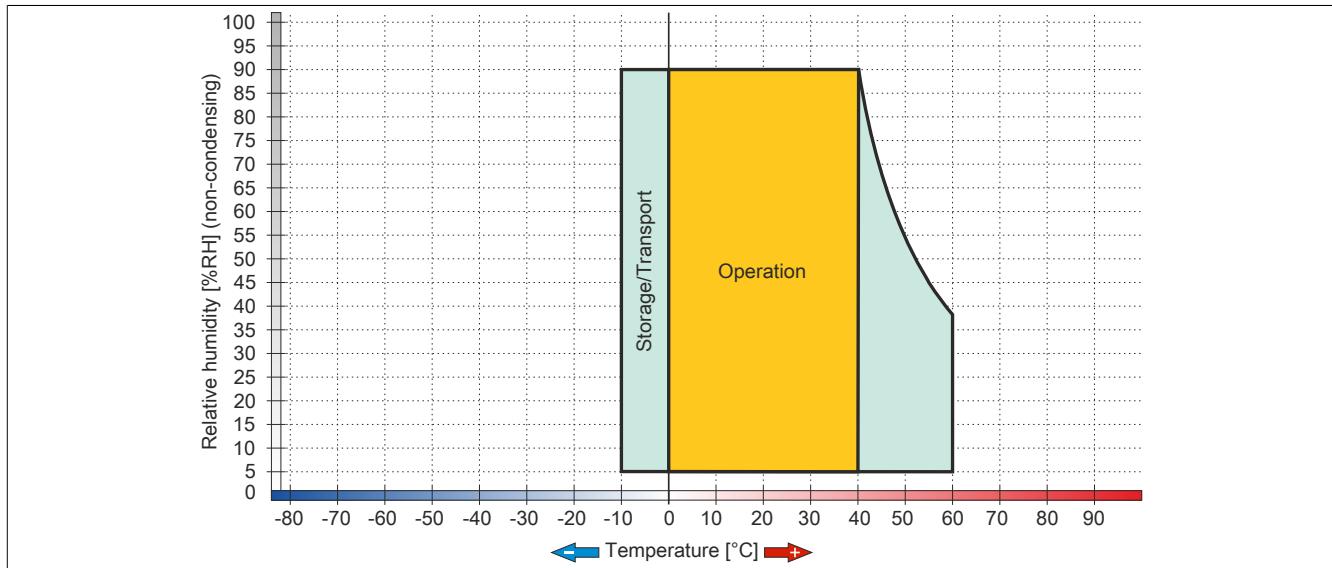


Figure 25: 5AP93D.240C-0x - Temperature/Humidity diagram

3.1.6 5AP99D.185B-0x

3.1.6.1 General information

- 18.5" TFT HD color display
- Multi-touch (PCT)
- Front USB interface
- Pushbuttons, selector switch, key switch, emergency stop
- RFID read/write unit
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.6.2 Order data

Model number	Short description	Figure
Display units		
5AP99D.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Landscape format - 2 pushbuttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the top	
5AP99D.185B-01	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 pushbuttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 44: 5AP99D.185B-00, 5AP99D.185B-01 - Order data

3.1.6.3 Technical data

Product ID	5AP99D.185B-00	5AP99D.185B-01
General information		
B&R ID code	0xE38C	0xE3A1
Interfaces		
USB		
Quantity	1	
Type	USB 2.0	
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current load	Max. 500 mA	
RFID read/write transponder unit		
Type	For I-Code SLI transponder, amplitude modulation and MIFARE Classic	
Frequency	13.56 MHz	
Standard	ISO 15693, MIFARE Classic	
Read/Write range in air	Approx. 1 cm	
Display		
Type	Color TFT	
Display size	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	
Half-brightness time ¹⁾	50,000 h	
Touch screen		
Type	3M	
Technology	Projected capacitive touch (PCT)	
Controller	3M	
Transmittance	88% ±2%	
Features ²⁾		
Pushbuttons		
Quantity	2 (green, red)	
Type	RAFIX 22 FS+, 1.30.270.021/2500 (green), 1.30.270.021/2300 (red)	
Contact element	Momentary	

Table 45: 5AP99D.185B-00, 5AP99D.185B-01 - Technical data

Product ID	5AP99D.185B-00	5AP99D.185B-01
Selector switches		
Quantity	1	
Type	RAFIX 22 FS+, 1.30.272.102/2200	
Contact element	Maintained	
Key switches		
Quantity	1	
Type	RAFIX 22 FS 1.30.255.222/0000	
Contact element	Maintained	
E-stop		
Quantity	1	
Type	RAFIX 22 FS+, Plus 1, 1.30.273.502/0300	
Contact element	Maintained	
Operating conditions		
EN 60529 protection	IP65 ³⁾	
Mechanical characteristics		
Housing		
Material	Coated aluminum	Aluminum, painted
Coating	White aluminum	
Front		
Frame	Coated aluminum	Aluminum, painted
Design	Black	
Flange output	Top	Bottom
Dimensions		
Width	503 mm	
Height	406 mm	
Weight	10850 g	

Table 45: 5AP99D.185B-00, 5AP99D.185B-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
 2) Additional information about operating and connections elements can be found in the user's manual in "Appendix A", section "Equipment".
 3) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.6.4 Dimensions

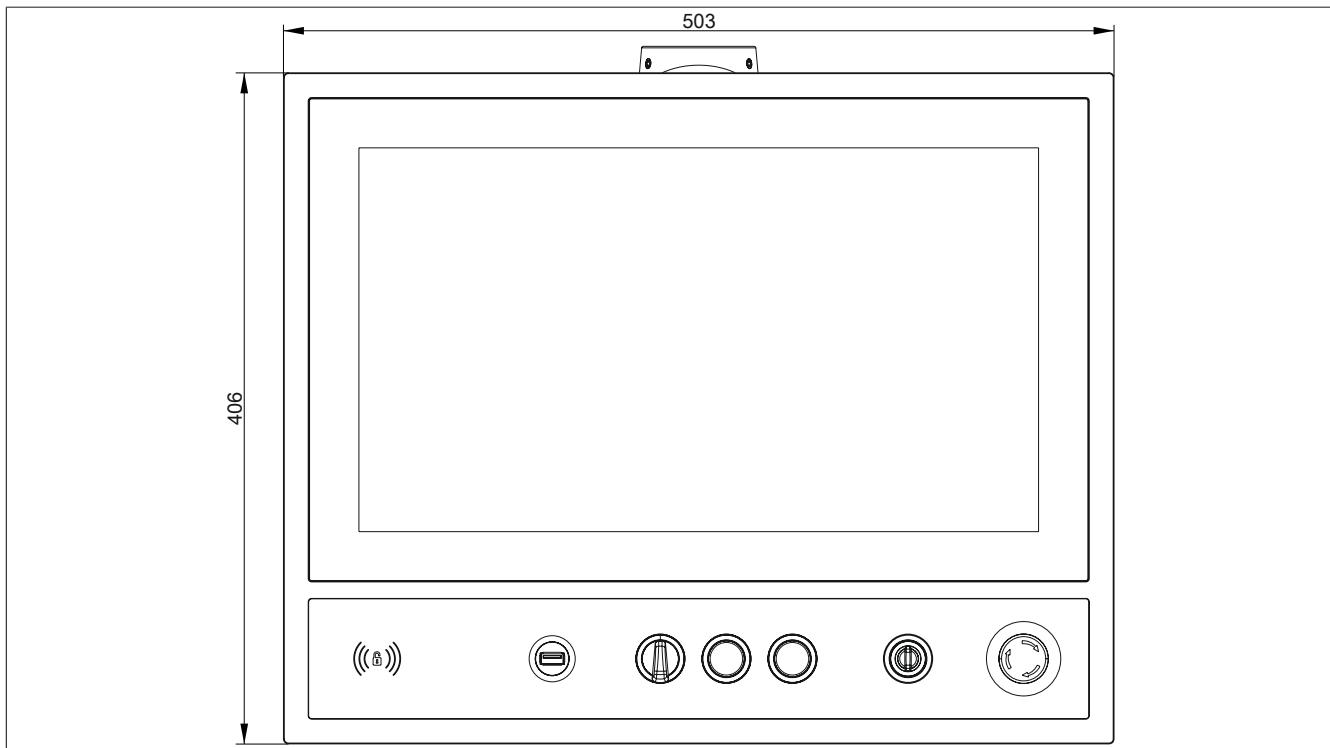


Figure 26: 5AP99D.185B-0x - Dimensions

3.1.6.5 Temperature/Humidity diagram



Figure 27: 5AP99D.185B-0x - Temperature/Humidity diagram

3.1.7 5AP99D.215C-0x

3.1.7.1 General information

- 21.5" TFT FHD color display
- Multi-touch (PCT)
- Front USB interface
- Pushbuttons, selector switch, key switch, emergency stop
- RFID read/write unit
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.7.2 Order data

Model number	Short description	Figure
Display units		
5AP99D.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 push-buttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the top	
5AP99D.215C-01	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 push-buttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 46: 5AP99D.215C-00, 5AP99D.215C-01 - Order data

3.1.7.3 Technical data

Product ID	5AP99D.215C-00	5AP99D.215C-01
General information		
B&R ID code	0xE3A3	0xE3A4
Interfaces		
USB	1 USB 2.0 Type A Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s) Max. 500 mA	
RFID read/write transponder unit	Type Frequency Standard Read/Write range in air For I-Code SLI transponder, amplitude modulation and MIFARE Classic 13.56 MHz ISO 15693, MIFARE Classic Approx. 1 cm	
Display		
Type	Color TFT	
Display size	21.5"	
Colors	16.7 million	
Resolution	FHD, 1920 × 1080 pixels	
Contrast	1000:1	
Viewing angles	Horizontal Vertical Direction R = 89° / Direction L = 89° Direction U = 89° / Direction D = 89°	
Backlight	Type Brightness (dimmable) Half-brightness time ¹⁾ LED Typ. 12.5 to 250 cd/m ² 30,000 h	
Touch screen	Type Technology Controller Transmittance Projected capacitive touch (PCT) 3M 88% ±2%	
Features ²⁾		
Pushbuttons	Quantity Type Contact element 2 (green, red) RAFIX 22 FS+, 1.30.270.021/2500 (green), 1.30.270.021/2300 (red) Momentary	

Table 47: 5AP99D.215C-00, 5AP99D.215C-01 - Technical data

Product ID	5AP99D.215C-00	5AP99D.215C-01
Selector switches		
Quantity	1	
Type	RAFIX 22 FS+, 1.30.272.102/2200	
Contact element	Maintained	
Key switches		
Quantity	1	
Type	RAFIX 22 FS 1.30.255.222/0000	
Contact element	Maintained	
E-stop		
Quantity	1	
Type	RAFIX 22 FS+, Plus 1, 1.30.273.502/0300	
Contact element	Maintained	
Operating conditions		
EN 60529 protection	IP65 ³⁾	
Mechanical characteristics		
Housing		
Material	Aluminum, painted	
Coating	White aluminum	
Front		
Frame	Aluminum, painted	
Design	Black	
Flange output	Top	Bottom
Dimensions		
Width	569.5 mm	
Height	444 mm	
Weight	11550 g	

Table 47: 5AP99D.215C-00, 5AP99D.215C-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
 2) Additional information about operating and connections elements can be found in the user's manual in "Appendix A", section "Equipment".
 3) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.7.4 Dimensions

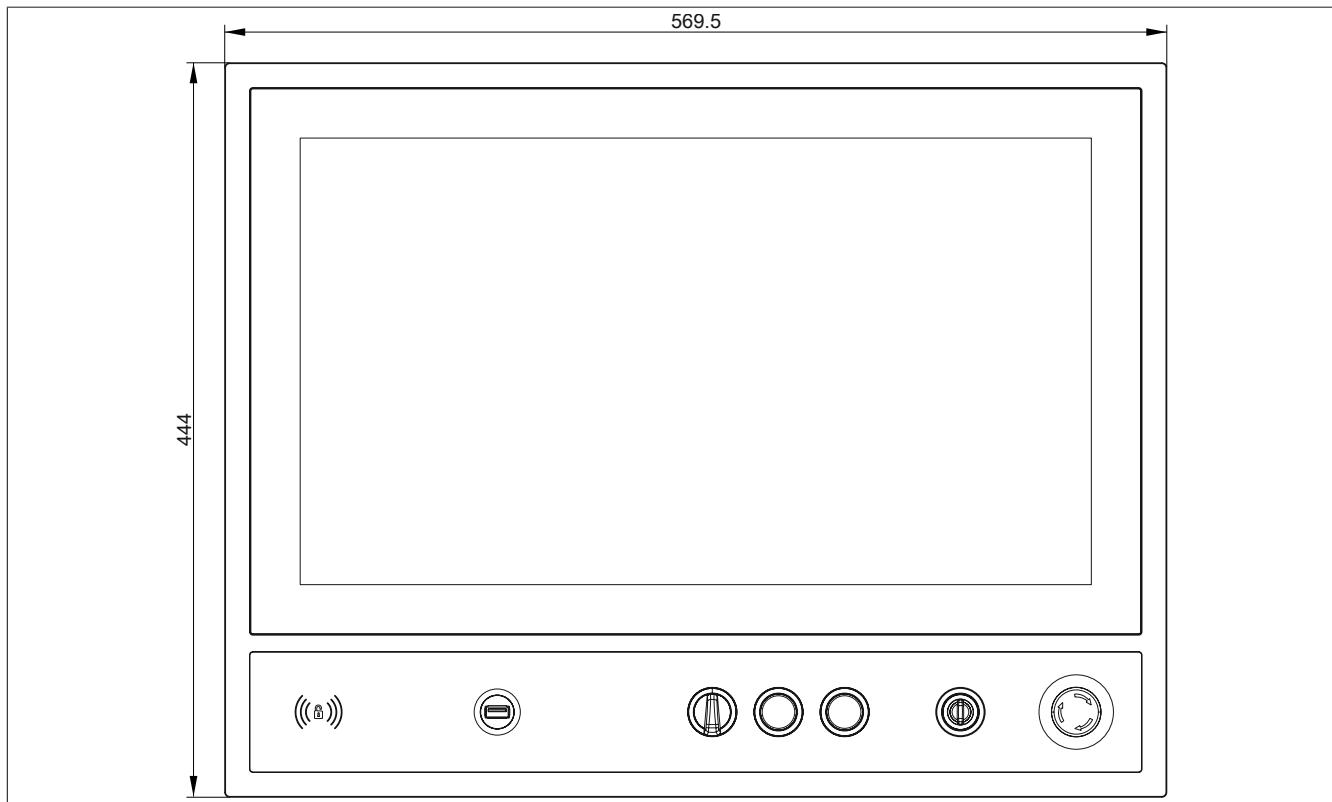


Figure 28: 5AP99D.215C-0x - Dimensions

3.1.7.5 Temperature/Humidity diagram

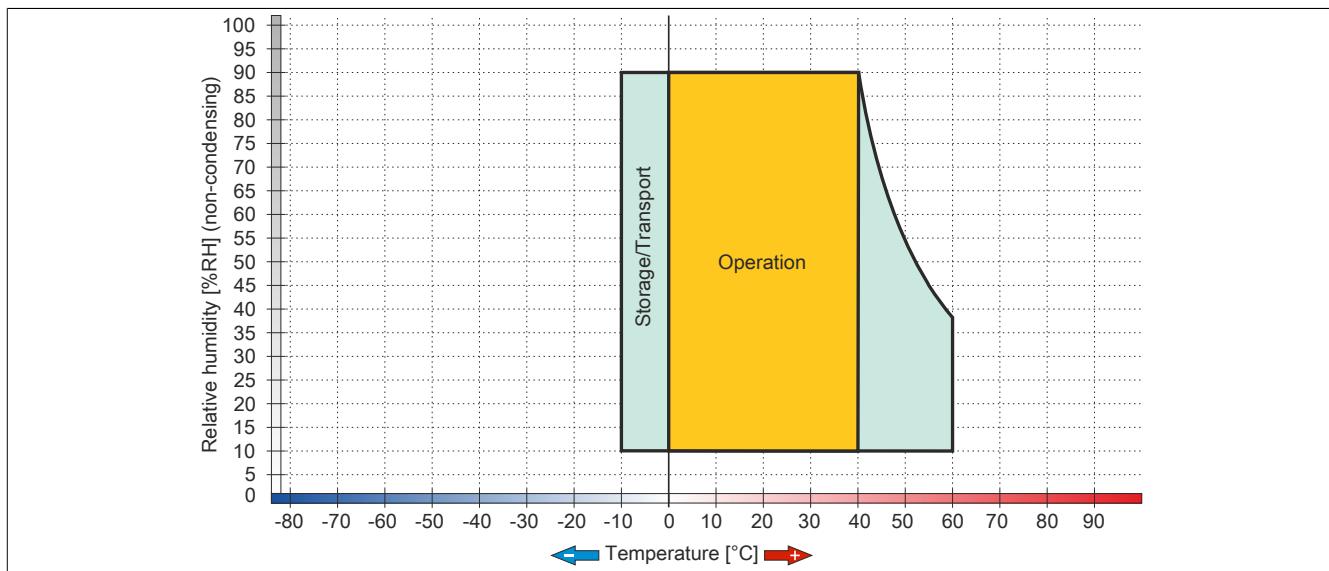


Figure 29: 5AP99D.215C-0x - Temperature/Humidity diagram

3.1.8 5AP99D.215I-0x

3.1.8.1 General information

- 21.5" TFT FHD color display
- Multi-touch (PCT)
- Front USB interface
- Pushbuttons, key switch, emergency stop
- RFID read/write unit
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.8.2 Order data

Model number	Short description	Figure
Display units		
5AP99D.215I-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Portrait format - 2 pushbuttons - RFID read/write unit - E-stop - Key switch - IP65 protection - For swing arm mounting - Flange on the top	
5AP99D.215I-01	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Portrait format - 2 pushbuttons - RFID read/write unit - E-stop - Key switch - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 48: 5AP99D.215I-00, 5AP99D.215I-01 - Order data

3.1.8.3 Technical data

Product ID	5AP99D.215I-00	5AP99D.215I-01
General information		
B&R ID code	0xE3A5	0xE3A6
Interfaces		
USB		
Quantity	1	
Type	USB 2.0	
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current load	Max. 500 mA	
RFID read/write transponder unit		
Type	For I-Code SLI transponder, amplitude modulation and MIFARE Classic	
Frequency	13.56 MHz	
Standard	ISO 15693, MIFARE Classic	
Read/Write range in air	Approx. 1 cm	
Display		
Type	Color TFT	
Display size	21.5"	
Colors	16.7 million	
Resolution	FHD, 1920 × 1080 pixels	
Contrast	1000:1	
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		
Type	3M	
Technology	Projected capacitive touch (PCT)	
Controller	3M	
Transmittance	88% ±2%	

Table 49: 5AP99D.215I-00, 5AP99D.215I-01 - Technical data

Product ID	5AP99D.215I-00	5AP99D.215I-01
Features²⁾		
Pushbuttons		
Quantity	2 (green, red)	
Type	RAFIX 22 FS+, 1.30.270.021/2500 (green), 1.30.270.021/2300 (red)	
Contact element	Momentary	
Key switches		1
Quantity	RAFIX 22 FS 1.30.255.222/0000	
Type	Maintained	
Contact element		
E-stop		1
Quantity	RAFIX 22 FS+, Plus 1, 1.30.273.502/0300	
Type	Maintained	
Contact element		
Operating conditions		
EN 60529 protection	IP65 ³⁾	
Mechanical characteristics		
Housing		
Material	Aluminum, painted	
Coating	White aluminum	
Front		
Frame	Aluminum, painted	
Design	Black	
Flange output	Top	Bottom
Dimensions		
Width	361 mm	
Height	652.5 mm	
Weight	11400 g	

Table 49: 5AP99D.215I-00, 5AP99D.215I-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
 2) Additional information about operating and connections elements can be found in the user's manual in "Appendix A", section "Equipment".
 3) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.8.4 Dimensions

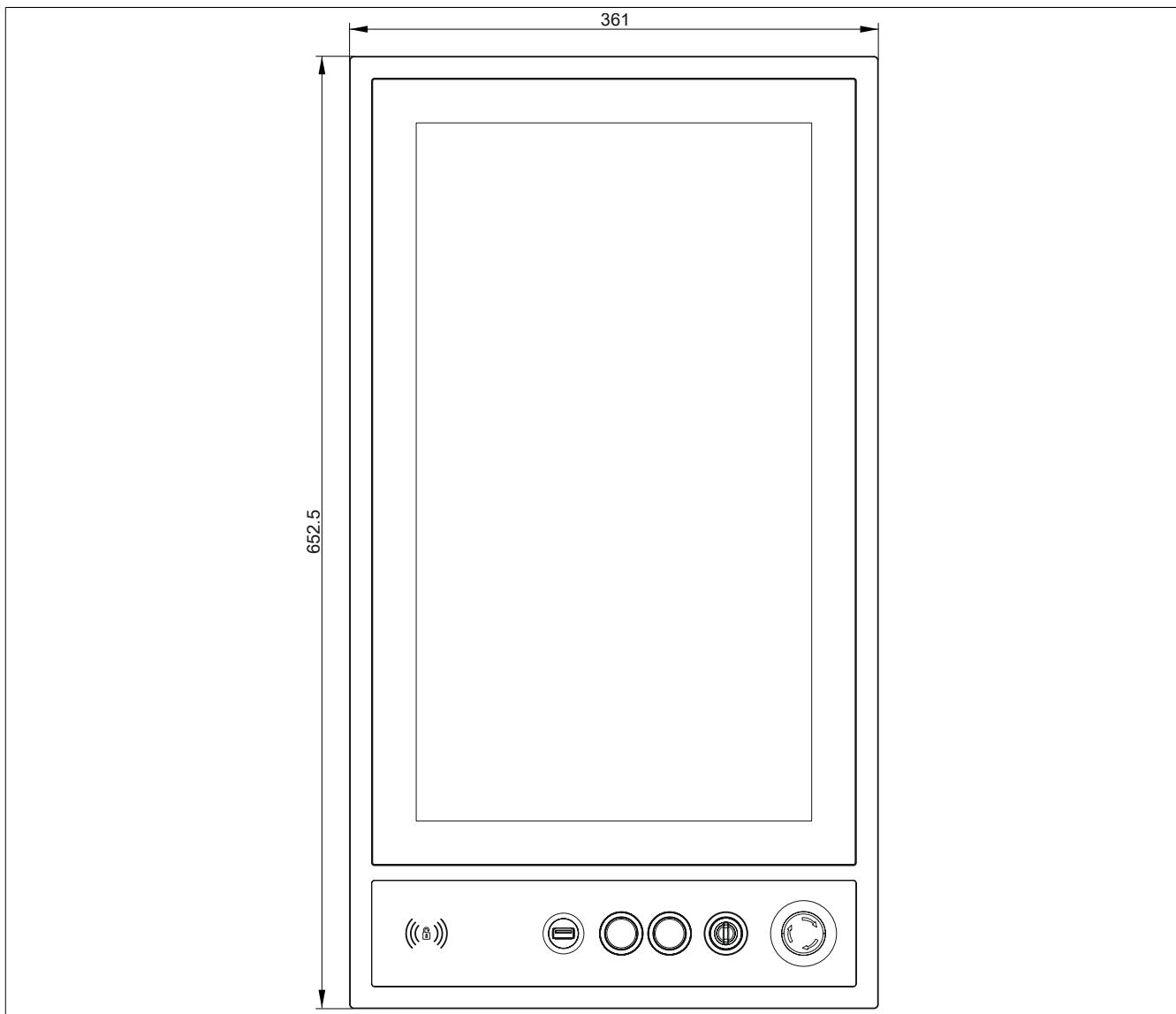


Figure 30: 5AP99D.215I-0x - Dimensions

3.1.8.5 Temperature/Humidity diagram

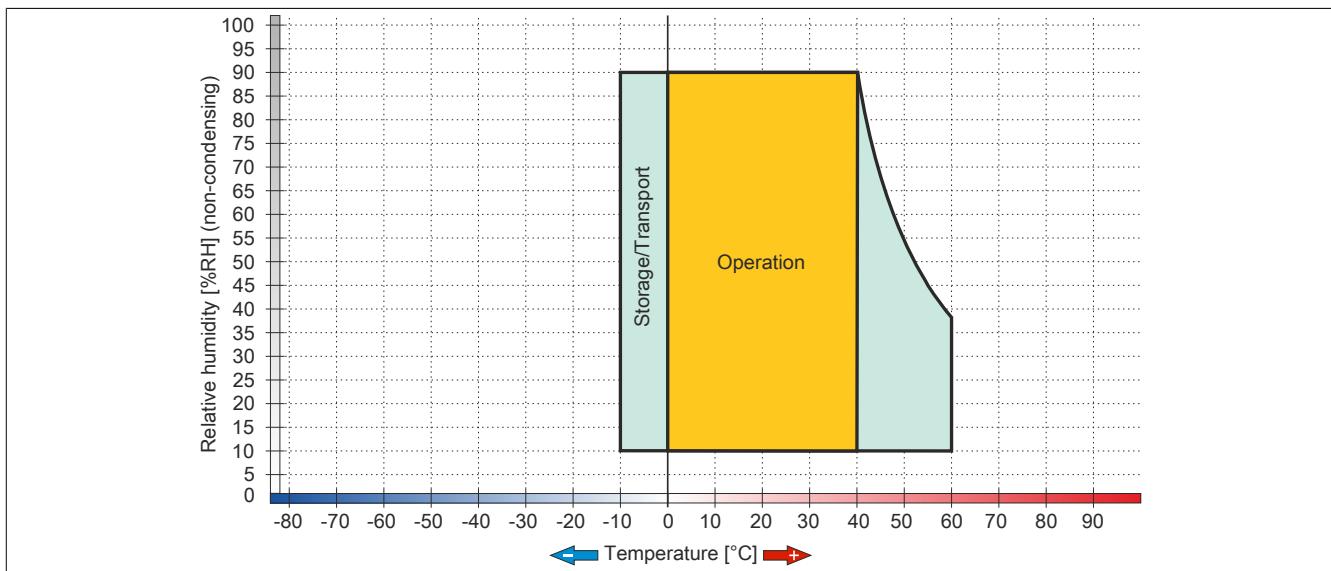


Figure 31: 5AP99D.215I-0x - Temperature/Humidity diagram

3.1.9 5AP99D.240C-0x

3.1.9.1 General information

- 24.0" TFT FHD color display
- Multi-touch (PCT)
- Front USB interface
- Pushbuttons, selector switch, key switch, emergency stop
- RFID read/write unit
- Flexible hanging or standing swing arm installation
- IP65 protection

3.1.9.2 Order data

Model number	Short description	Figure
Display units		
5AP99D.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 push-buttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the top	
5AP99D.240C-01	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (4:9) - Multi-touch (projected capacitive) - Landscape format - 2 push-buttons - RFID read/write unit - E-stop - Selector switch - Key switch - IP65 protection - For swing arm mounting - Flange on the bottom	

Table 50: 5AP99D.240C-00, 5AP99D.240C-01 - Order data

3.1.9.3 Technical data

Product ID	5AP99D.240C-00	5AP99D.240C-01
General information		
B&R ID code	0xE3A9	0xE3AA
Interfaces		
USB		
Quantity	1	
Type	USB 2.0	
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current load	Max. 500 mA	
RFID read/write transponder unit		
Type	For I-Code SLI transponder, amplitude modulation and MIFARE Classic	
Frequency	13.56 MHz	
Standard	ISO 15693, MIFARE Classic	
Read/Write range in air	Approx. 1 cm	
Display		
Type	Color TFT	
Display size	24.0"	
Colors	16.7 million	
Resolution	FHD, 1920 x 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		
Type	3M	
Technology	Projected capacitive touch (PCT)	
Controller	3M	
Transmittance	88% ±2%	
Features ²⁾		
Pushbuttons		
Quantity	2 (green, red)	
Type	RAFIX 22 FS+, 1.30.270.021/2500 (green), 1.30.270.021/2300 (red)	
Contact element	Momentary	

Table 51: 5AP99D.240C-00, 5AP99D.240C-01 - Technical data

Product ID	5AP99D.240C-00	5AP99D.240C-01
Selector switches		
Quantity	1	
Type	RAFIX 22 FS+, 1.30.272.102/2200	
Contact element	Maintained	
Key switches		
Quantity	1	
Type	RAFIX 22 FS 1.30.255.222/0000	
Contact element	Maintained	
E-stop		
Quantity	1	
Type	RAFIX 22 FS+, Plus 1, 1.30.273.502/0300	
Contact element	Maintained	
Operating conditions		
EN 60529 protection	IP65 ³⁾	
Mechanical characteristics		
Housing		
Material	Aluminum, painted	
Coating	White aluminum	
Front		
Frame	Aluminum, painted	
Design	Black	
Flange output	Top	Bottom
Dimensions		
Width	626.5 mm	
Height	475 mm	
Weight	13250 g	

Table 51: 5AP99D.240C-00, 5AP99D.240C-01 - Technical data

- 1) At an ambient temperature of 25°C. Reducing the brightness by 50% can result in an approximately 50% increase in the half-brightness time.
 2) Additional information about operating and connections elements can be found in the user's manual in "Appendix A", section "Equipment".
 3) Only when all covers are installed and the device is properly mounted on a swing arm.

3.1.9.4 Dimensions

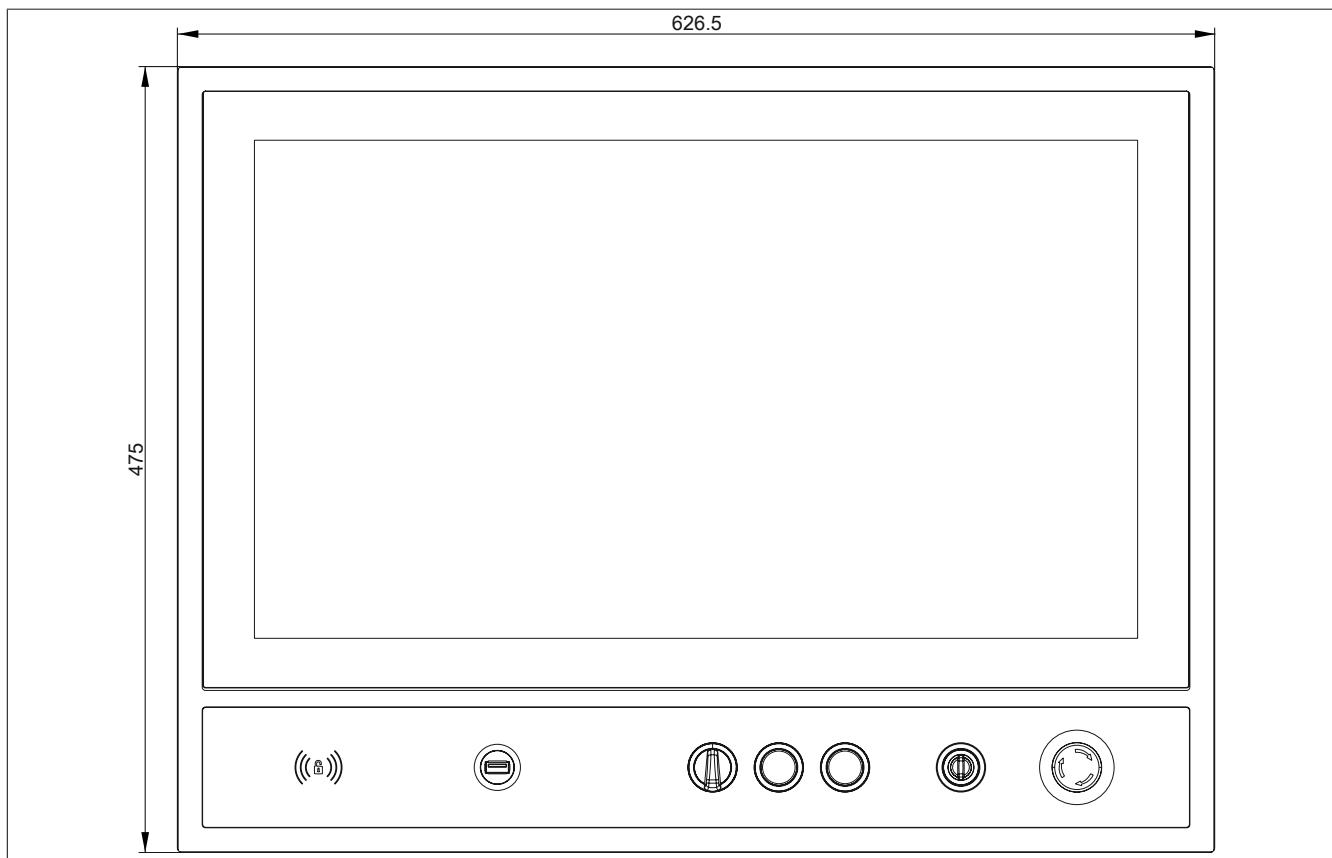


Figure 32: 5AP99D.240C-0x - Dimensions

3.1.9.5 Temperature/Humidity diagram

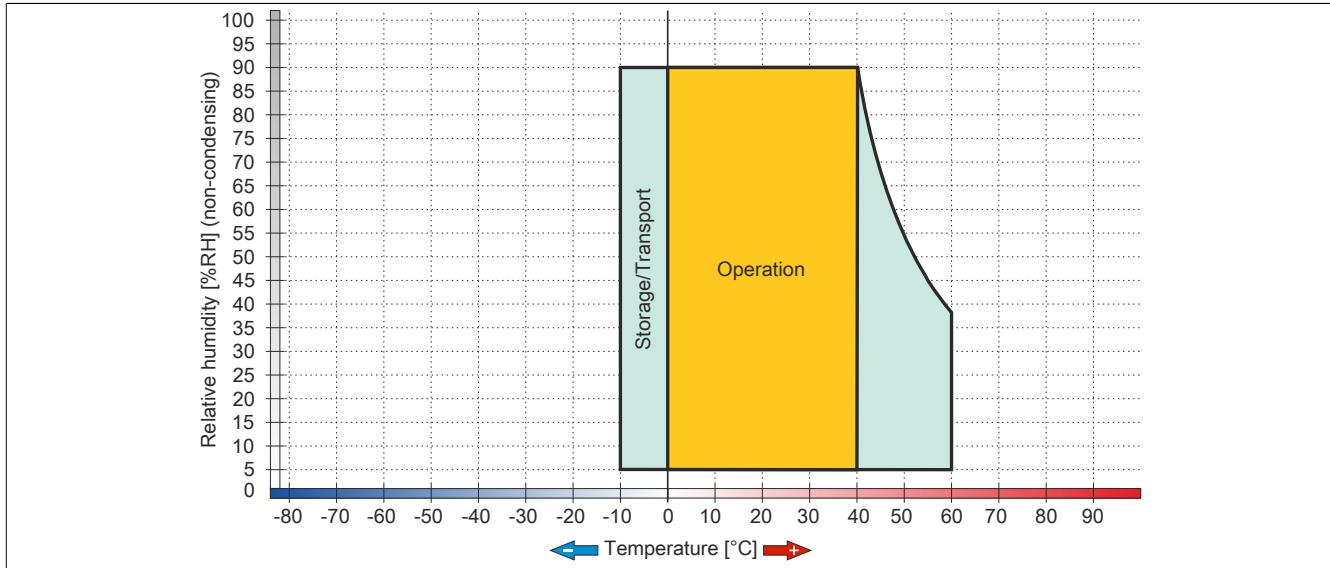


Figure 33: 5AP99D.240C-0x - Temperature/Humidity diagram

3.2 Link modules

3.2.1 5DLSLD.1002-00

3.2.1.1 General information

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

3.2.1.2 Order data

Model number	Short description	Figure
	Link modules	
5DLSLD.1002-00	Automation Panel Link module - SDL/DVI receiver - For Automation Panel 92D/93D/99D	
	Required accessories	
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamps 3.31 mm ²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	

Table 52: 5DLSLD.1002-00 - Order data

3.2.1.3 Technical data

Product ID	5DLSLD.1002-00
General information	
B&R ID code	0xE3B3
Brightness buttons	Yes ¹⁾
Certification cULus	Yes
Interfaces	
COM Type Design UART Max. baud rate	RS232, modem-capable, not electrically isolated 9-pin female DSUB connector 16550-compatible, 16-byte FIFO 115 kbit/s
USB Quantity Type Design Transfer rate Current load	3 (2x Type A; 1x Type B) USB 2.0 ²⁾ 2x type A 1x type B Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s) Total max. 1 A ³⁾
Panel In Design Type	Female DVI-D connector SDL/DVI
Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	Max. 3 A
Electrical isolation	Yes
Mechanical characteristics	
Weight	380 g

Table 53: 5DLSLD.1002-00 - Technical data

1) The brightness controls can be used to configure the brightness of the backlight on the Automation Panel 9x3 in DVI mode.

2) In "SDL mode 1", USB 1.1 transfer rates are the highest possible.

3) For the 2 USB type A female connectors.

3.2.2 5DLSD3.1003-00

3.2.2.1 General information

- Link module for Automation Panel 9xD systems
- 1x SDL3 In interface
- 2x USB 2.0 type A

3.2.2.2 Order data

Model number	Short description	Figure
Link modules		
5DLSD3.1003-00	Automation Panel Link module - SDL3 receiver - For Automation Panel 92D/93D/99D	
Required accessories		
Terminal blocks		
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamps 3.31 mm ²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	
Optional accessories		
SDL3 cables		
5CASD3.0050-00	SDL3 cable - 5 m	
5CASD3.0100-00	SDL3 cable - 10 m	
5CASD3.0150-00	SDL3 cable - 15 m	
5CASD3.0200-00	SDL3 cable - 20 m	
5CASD3.0300-00	SDL3 cable - 30 m	
5CASD3.0500-00	SDL3 cable - 50 m	
5CASD3.1000-00	SDL3 cable - 100 m	



Table 54: 5DLSD3.1003-00 - Order data

3.2.2.3 Technical data

Product ID	5DLSD3.1003-00	
General information		
LED status indicators	Status, Link	
B&R ID code	0xE3FE	
Certification		
cULus	Yes	
Interfaces		
USB		
Quantity	2	
Type	USB 2.0	
Design	2x type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (30 Mbit/s)	
Current load	Total max. 1 A	
SDL3 In		
Design	Shielded female RJ45 connector	
Type	SDL3	
Electrical characteristics		
Nominal voltage	24 VDC ±25%	
Nominal current	Max. 3 A	
Electrical isolation	Yes	
Mechanical characteristics		
Weight	380 g	

Table 55: 5DLSD3.1003-00 - Technical data

3.3 Handles

3.3.1 5AC903.HDL0-0x

3.3.1.1 General information

Handles can be installed on the side of the Automation Panel 9xD to improve its ergonomic properties and ease of use.

Handles are not factory-installed and must be mounted after delivery. For more information regarding installation, see the section "Installing the handles" on page 76.

3.3.1.2 Order data

Model number	Short description	Figure
Handles		
5AC903.HDL0-00	Handles for 5AP92D.1505-00, 5AP92D.1505-01	
5AC903.HDL0-01	Handles for 5AP92D.1906-00, 5AP92D.1906-01	
5AC903.HDL0-02	Handles for 5AP93D.185B-00, 5AP93D.185B-01	
5AC903.HDL0-03	Handles for 5AP93D.215C-00, 5AP93D.215C-01	
5AC903.HDL0-04	Handles for 5AP93D.240C-00, 5AP93D.240C-01	
5AC903.HDL0-05	Handles for 5AP99D.185B-00, 5AP99D.185B-01	
5AC903.HDL0-06	Handles for 5AP99D.215C-00, 5AP99D.215C-01	
5AC903.HDL0-07	Handles for 5AP99D.215I-00, 5AP99D.215I-01	
5AC903.HDL0-08	Handles for 5AP99D.240C-00, 5AP99D.240C-01	

Table 56: 5AC903.HDL0-00, 5AC903.HDL0-01, 5AC903.HDL0-02, 5AC903.HDL0-03, 5AC903.HDL0-04, 5AC903.HDL0-05, 5AC903.HDL0-06, 5AC903.HDL0-07, 5AC903.HDL0-08 - Order data

3.3.1.3 Technical data

Product ID	5AC903. HDL0-00	5AC903. HDL0-01	5AC903. HDL0-02	5AC903. HDL0-03	5AC903. HDL0-04	5AC903. HDL0-05	5AC903. HDL0-06	5AC903. HDL0-07	5AC903. HDL0-08
General information									
Certification					Yes				
CE					Yes				
cULus									
Mechanical characteristics									
Material				Coated aluminum		Aluminum, painted			Coated aluminum
Dimensions									
Height	316 mm	386 mm	323 mm	361 mm	392 mm	406 mm	444 mm	652.5 mm	475 mm
Weight	600 g	750 g	630 g	700 g	900 g	800 g	850 g	1200 g	880 g

Table 57: 5AC903.HDL0-00, 5AC903.HDL0-01, 5AC903.HDL0-02, 5AC903.HDL0-03, 5AC903.HDL0-04, 5AC903.HDL0-05, 5AC903.HDL0-06, 5AC903.HDL0-07, 5AC903.HDL0-08 - Technical data

3.3.1.4 Content of delivery

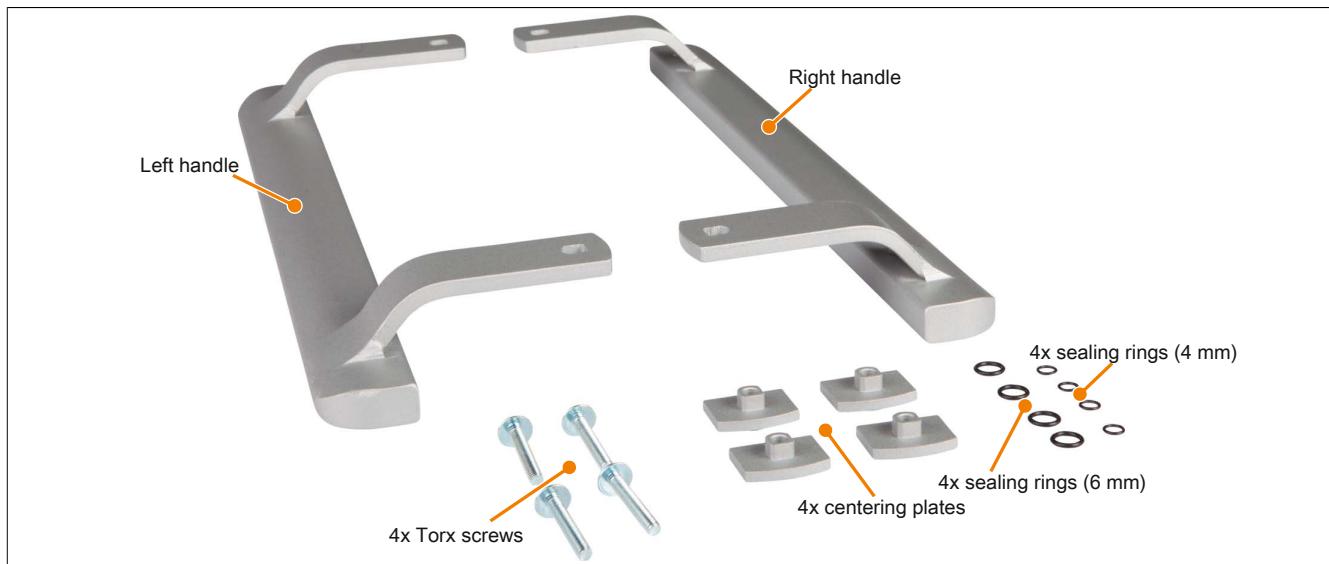


Figure 34: 5AC903.HDL0-0x - Content of delivery

Chapter 3 • Installation

1 Installation

Danger!

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

1.1 Mounting an Automation Panel 9xD

The Automation Panel 9xD is mounted to the swing arm system using an integrated flange.

Installation notes

- Environmental conditions must be taken into consideration.
- This device is only certified for operation in enclosed rooms.
- This device must not be subjected to direct sunlight.
- This device must be installed using one of the approved mounting orientations.
- The swing arm system must be able to hold four times the total weight of the device.
- The flex radius of connected cables (DVI, SDL, USB, etc.) must not be exceeded.
- This device should be mounted in a position that minimizes glare on the screen.
- This device should be mounted in a position and orientation that make viewing as easy as possible for the operator.

Information:

Before installing the Automation Panel 9xD on a swing arm system, ensure that the sealing ring is installed on the AP9xD device's flange.

The swing arm shaft must have an outer diameter of 47.5 to 48.4. The end of the swing arm shaft that connects with the flange must be beveled at a 45° angle and deburred.

Procedure

- The sealing ring must be placed in the groove of the compression ring.

Slide the rotary swivel and compression ring onto the swing arm shaft and fasten them using the 3 M4 headless screws (hex key, size 2) with a tightening torque of 1.5 Nm. Make sure that the rings are installed so that the rotary swivel (with catch) is inserted into the flange first. The distance from the bottom edge of the swing arm shaft and the bottom edge of the rotary swivel must be $21.5 \text{ mm} \pm 0.5 \text{ mm}$ (corresponds to a distance of $19 \text{ mm} \pm 0.5 \text{ mm}$ from the bottom edge of the swing arm shaft to the swivel catch). There must be no space between the two rings.

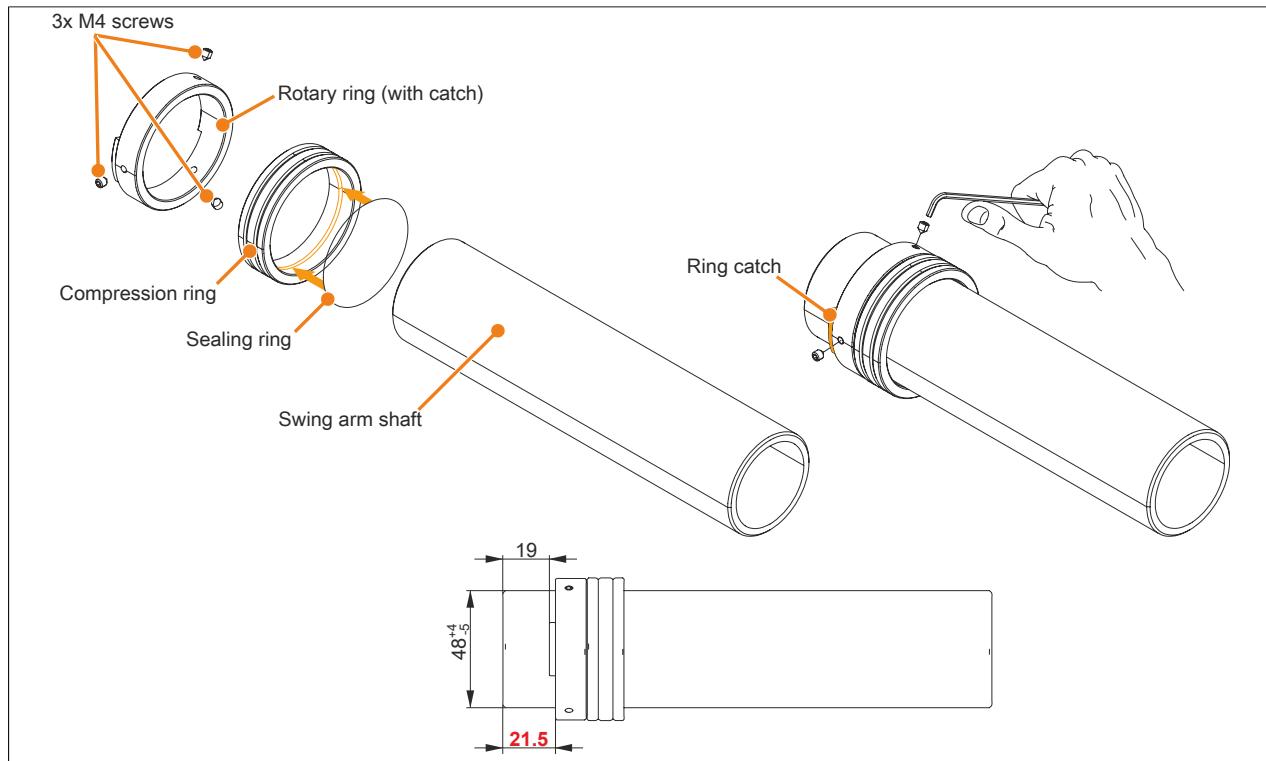


Figure 35: Installing the rings on the swing arm shaft

Warning!

The distance between the bottom edge of the swing arm shaft and the bottom edge of the rotary swivel must be $21.5 \text{ mm} \pm 0.5 \text{ mm}$. If this measurement is not observed, then the Automation Panel 9xD will not be sufficiently stable.

- Feed the necessary cables through the swing arm shaft. The type of cables that must be used depends on the type of connection. For more information, see the section "Connection options" on page 16.

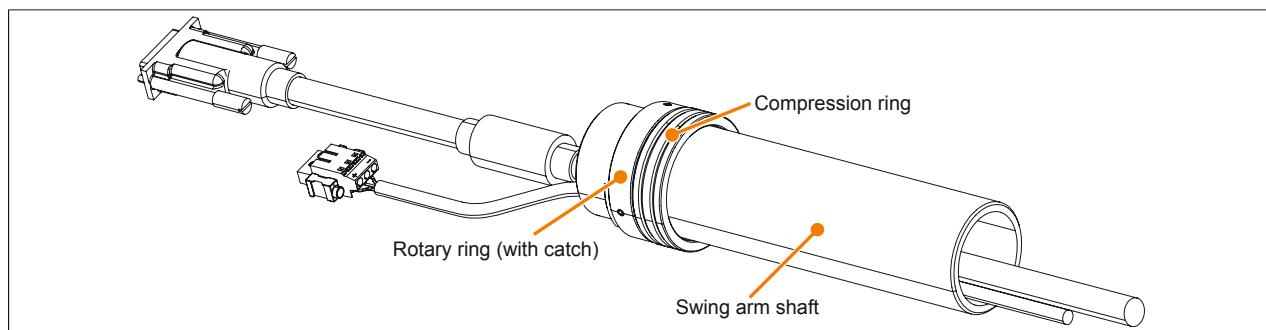


Figure 36: Feeding cables through the swing arm shaft

3. Connect the Automation Panel 9xD to the swing arm system. The catch on the lower ring must fit perfectly into the filed part of the flange. The Automation Panel 9xD has been installed correctly if the upper ring is flush with the flange. Fasten the assembly to the swing arm shaft using the 3 M6 headless screws (hex key, size 3) with a tightening torque of 5 Nm.

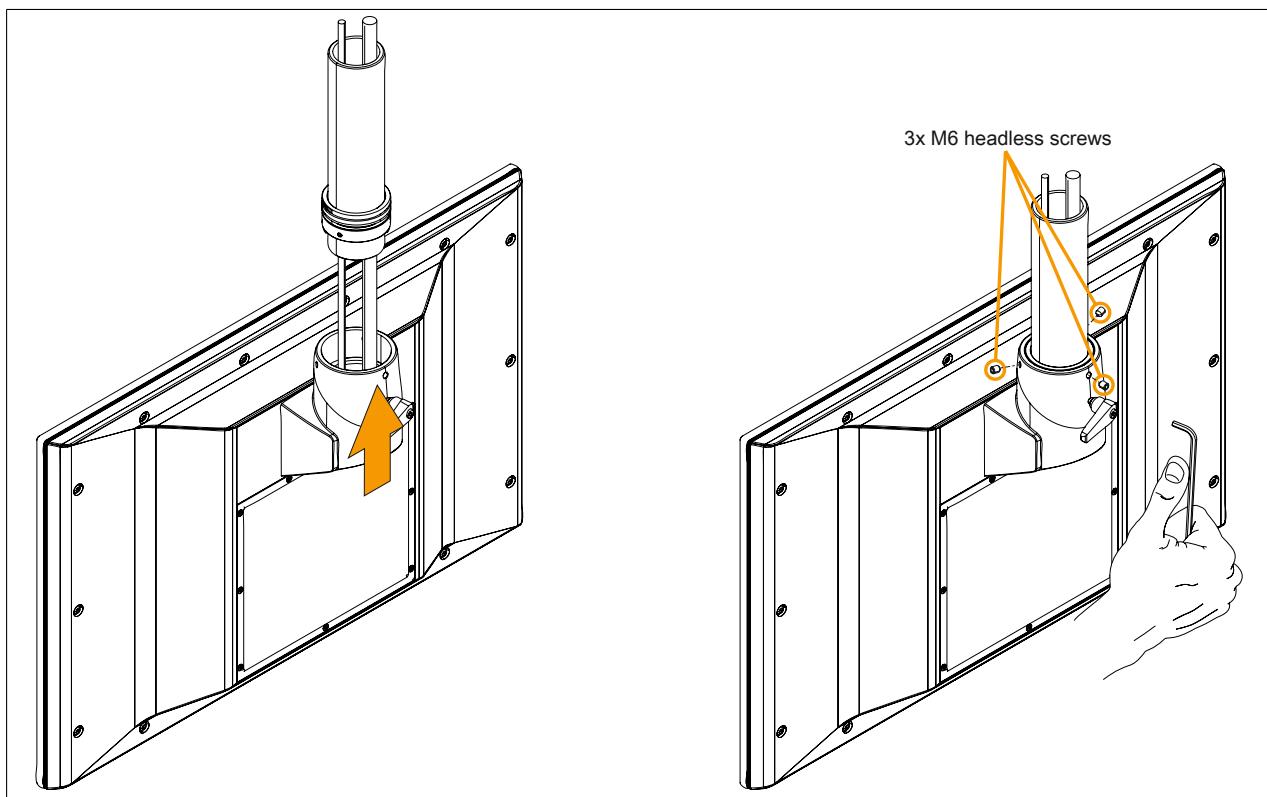


Figure 37: Installing the Automation Panel 9xD

1.2 Removing the interface cover

1. Disconnect the power supply to the Automation Panel (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Discharge any electrostatic charge on the ground connection.
3. Remove the interface cover from the Automation Panel 9xD by removing the 9 to 12 Torx screws (T10).

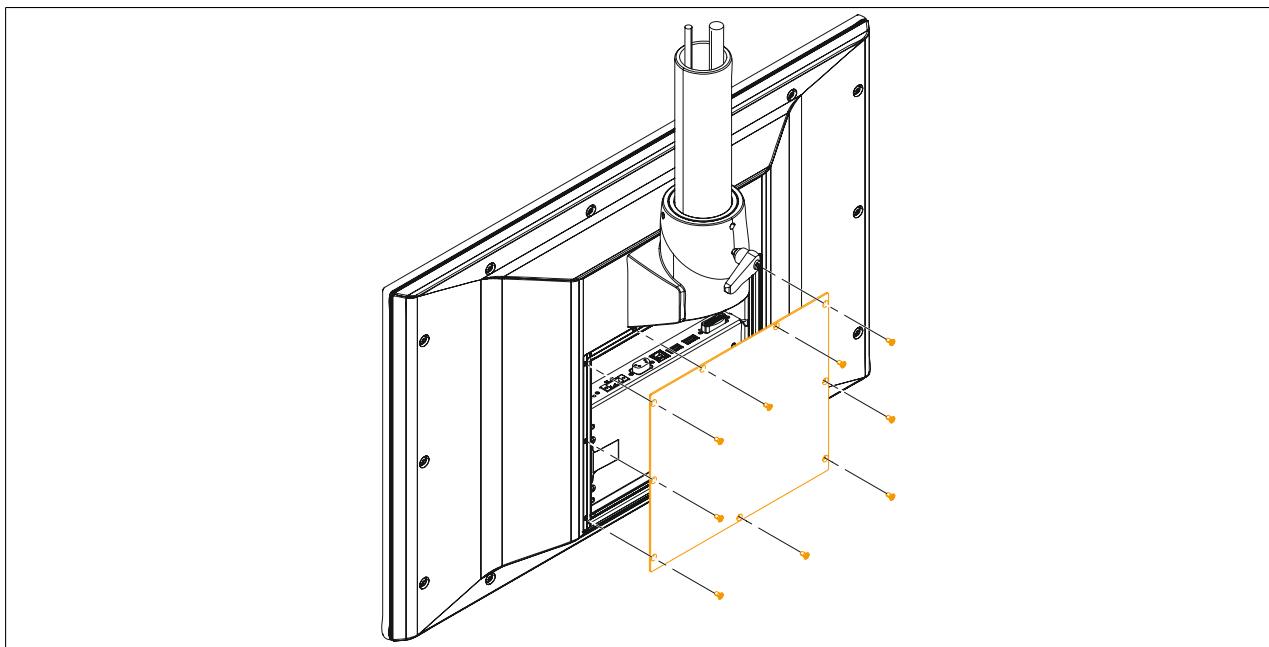


Figure 38: Removing the interface cover

4. Replace the interface cover on the Automation Panel 9xD using the 9 to 12 Torx screws (T10) removed earlier (0.6 Nm tightening torque). The interface cover must be installed correctly to ensure IP65 protection.

1.3 Connecting the cables

The necessary cables must be selected depending on the type of connection being used. For more information, see the section "Connection options" on page 16. Please observe the information in the section "Connecting the cables" on page 73 before connecting the cables.

1. Remove the interface cover from the Automation Panel 9xD by removing the 9 to 12 Torx screws (T10).

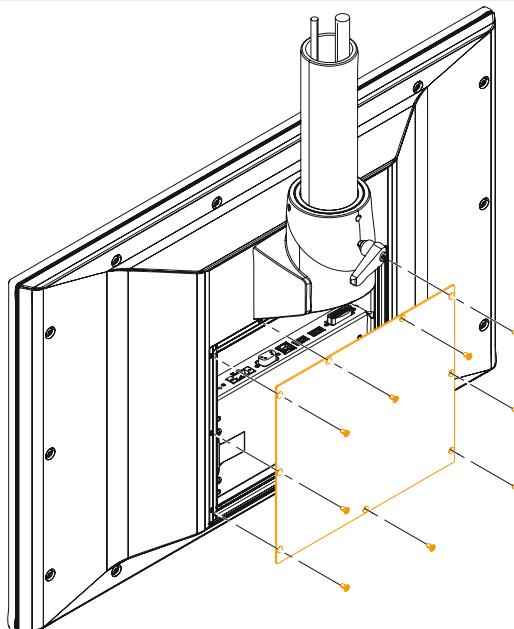


Figure 39: Removing the interface cover

2. Connect the necessary cables to the interfaces and tighten the locating screws.

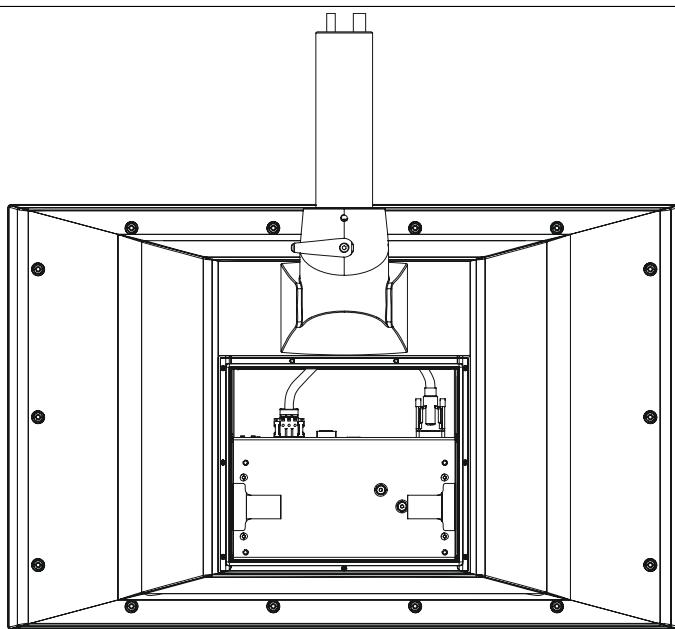


Figure 40: Connecting the cables

3. Make sure the seal is positioned correctly.
4. Replace the interface cover on the Automation Panel 9xD using the Torx screws (T10) removed earlier (0.6 Nm tightening torque). The interface cover must be installed correctly to ensure IP65 protection.

1.4 Replacing link modules

1. Disconnect the power supply to the Automation Panel (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Discharge any electrostatic charge on the ground connection.
3. Remove the interface cover from the Automation Panel 9xD by removing the 9 to 12 Torx screws (T10).

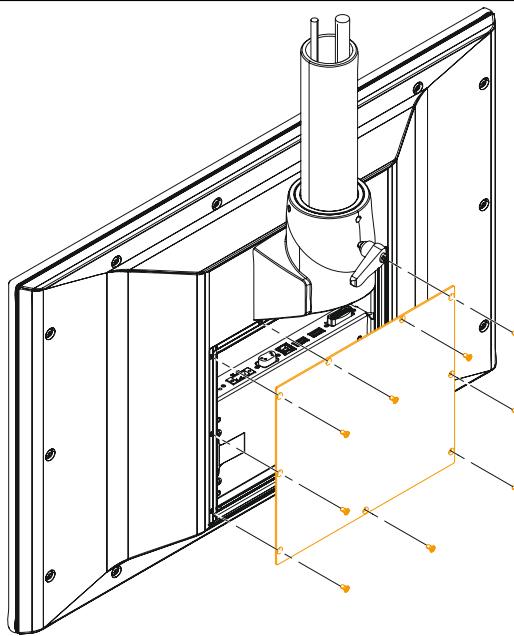


Figure 41: Removing the interface cover

4. Disconnect all connected cables.
5. Disconnect the Automation Panel from the swing arm system by following the steps provided under item 3 in the section "Mounting an Automation Panel 9xD" on page 69 in reverse order.
6. Place the Automation Panel on a clean, flat surface.
7. Remove the Torx screws (T10) indicated in the following image.

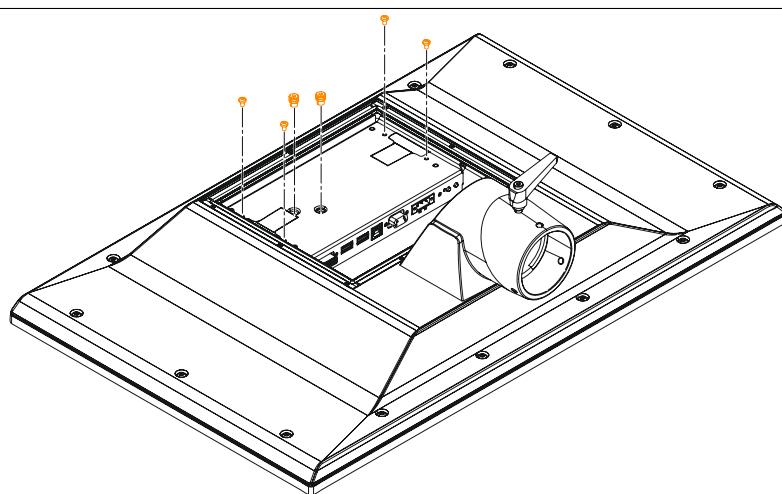


Figure 42: Removing the Torx screws

8. Pull firmly and evenly on the removal strip to remove the link module.

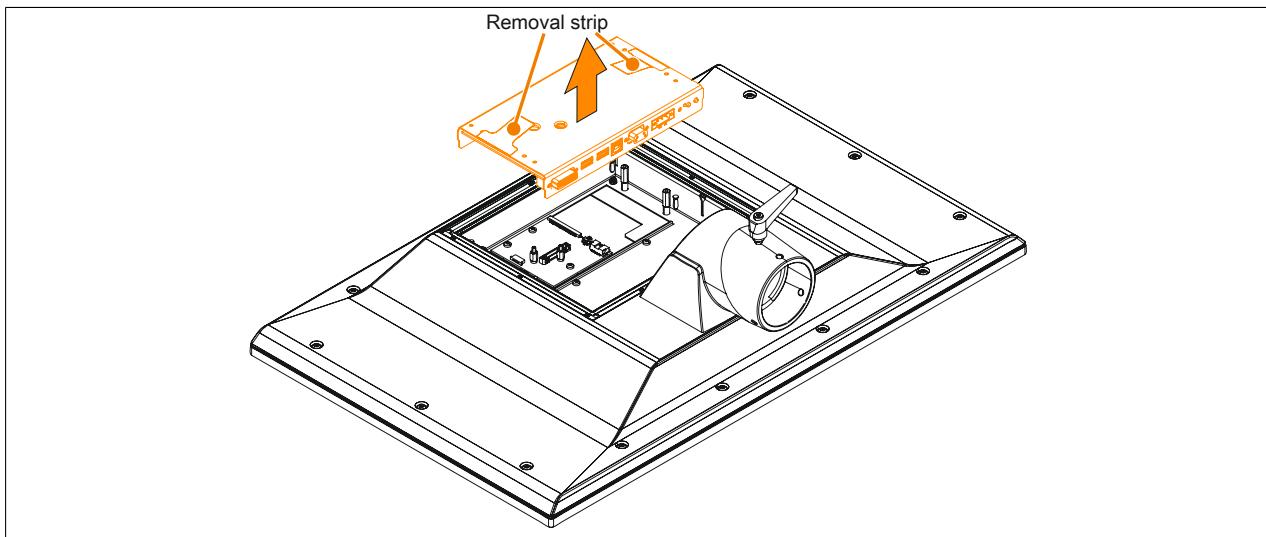


Figure 43: Removing the link module

9. The link module can now be replaced by following these steps in reverse order. The maximum tightening torque of the Torx screws (T10) is 0.5 Nm.
10. Replace the interface cover on the Automation Panel 9xD using the 9 to 12 Torx screws (T10) removed earlier (0.6 Nm tightening torque). The interface cover must be installed correctly to ensure IP65 protection.

1.5 Installing the handles

1. Disconnect the power supply to the Automation Panel (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Discharge any electrostatic charge on the ground connection.
3. Remove the interface cover from the Automation Panel 9xD by removing the 9 to 12 Torx screws (T10).

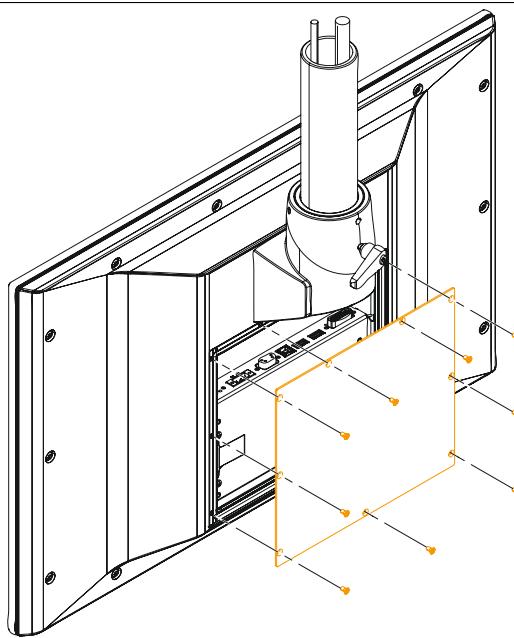


Figure 44: Removing the interface cover

4. Disconnect all connected cables.
5. Disconnect the Automation Panel from the swing arm system by following the steps provided under item 3 in the section "Mounting an Automation Panel 9xD" on page 69 in reverse order.
6. Place the Automation Panel on a clean, flat surface.
7. Remove the Torx screws (T20) indicated in the following image.

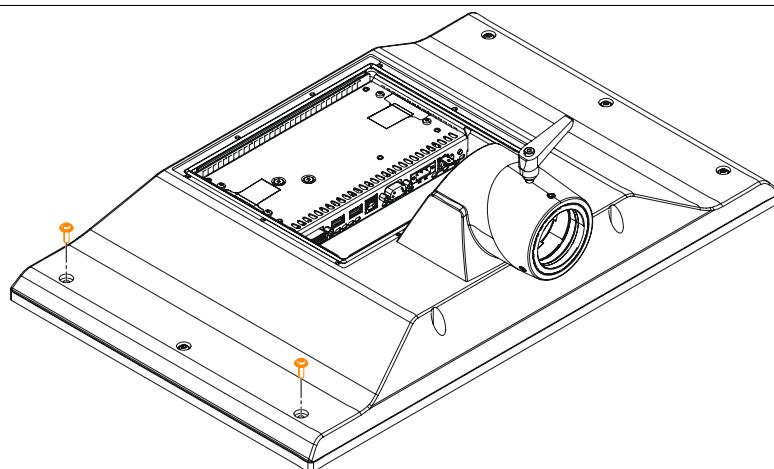


Figure 45: Removing the Torx screws

8. Place a large sealing ring (①, 6 mm) in each of the mounting holes.
9. Insert the two centering plates (②) into the handle (③). The rounded sides must be lined up.
10. Place each Torx screw (⑤) through a small sealing ring (④, 4 mm).
11. Insert the handle (③) with the mounted centering plates (②) in the mounting holes.
12. Insert the Torx screws (⑤, T20) through the previously mounted components and tighten with a max. tightening torque of 1.27 Nm.

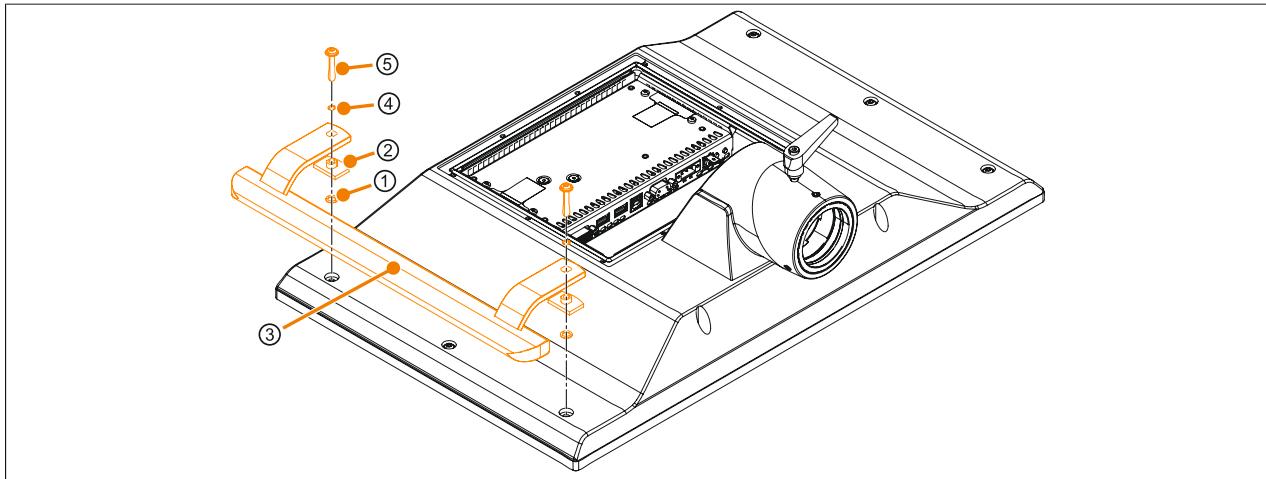


Figure 46: Installing the handles

2 Connecting to the power mains

Danger!

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

2.1 Installing the DC power cable

Danger!

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

2.1.1 Wiring

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

Installing the 0TB103.9 screw clamp terminal block

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

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

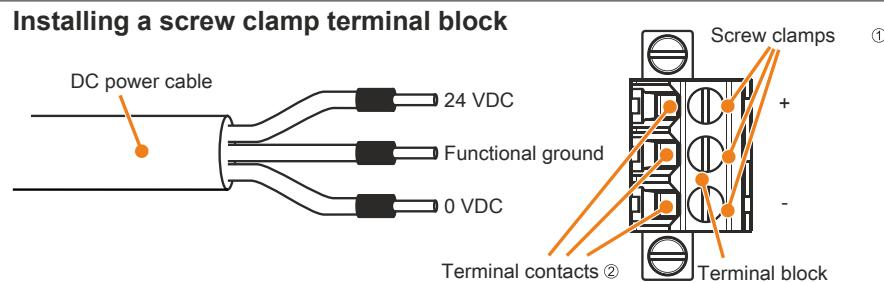


Figure 47: Installing a screw clamp terminal block

Installing the 0TB103.91 cage clamp terminal block

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

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

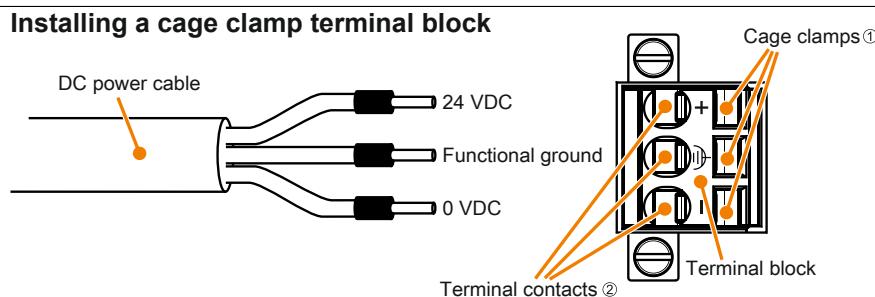


Figure 48: Installing a cage clamp terminal block

2.2 Connecting the power supply to a B&R device

Danger!

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

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

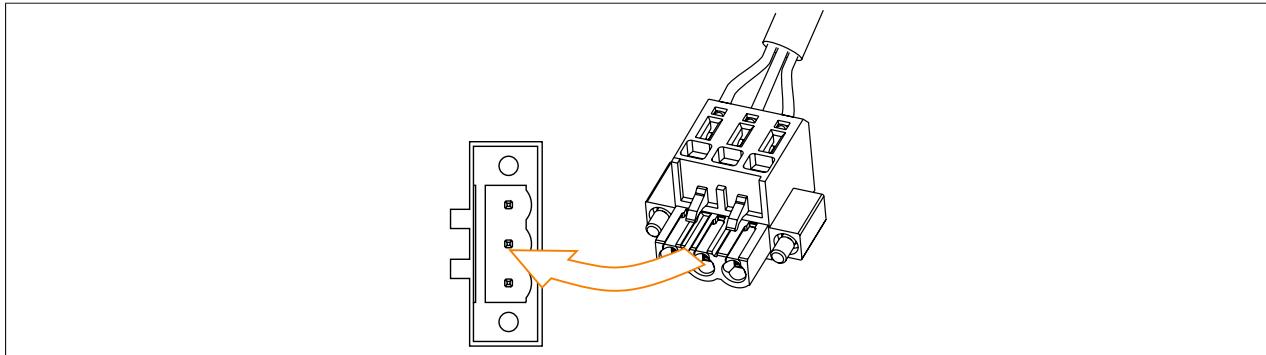


Figure 49: Connecting the power supply connector to a B&R device

2.3 Functional ground - Grounding concept

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

This device comes equipped with two functional ground connections:

- Power supply
- Ground connection

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

- The device must be connected to the central grounding point in the control cabinet using the shortest route possible.
- A cable with a minimum cross section of 2.5 mm^2 per connection should be used. If a cable with wire end sleeves is connected to the 0TB103.9 or 0TB103.91 terminal block, then a cable with maximum 1.5 mm^2 per connection is possible.
- Note the line shielding concept. All data cables connected to the device must be shielded.

Symbol indicating functional ground on the B&R device: 

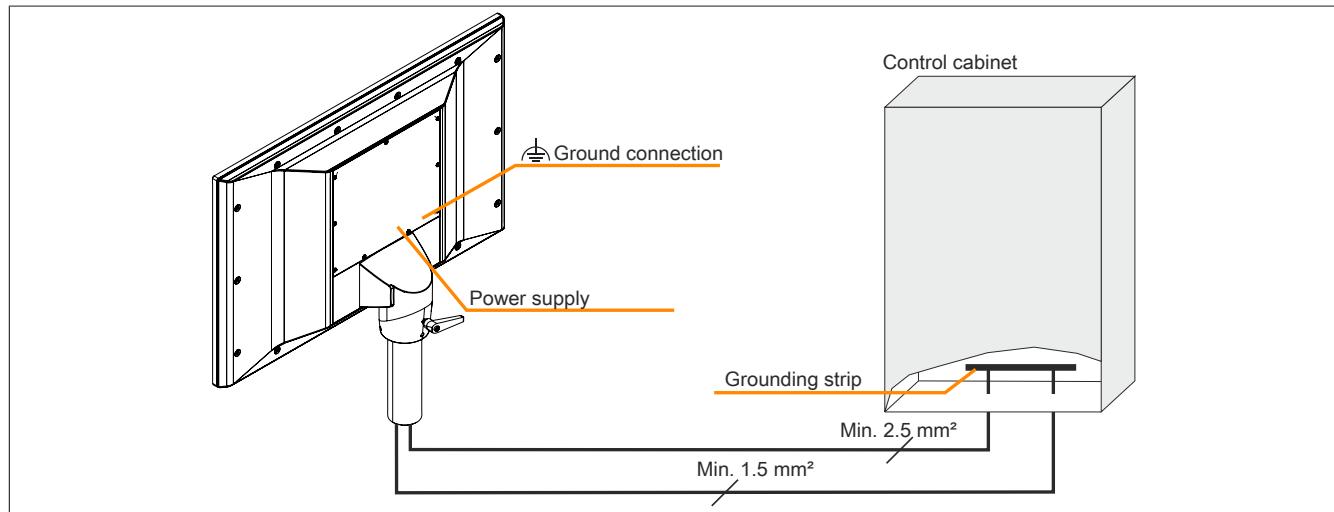


Figure 50: Automation Panel 9xD - Grounding concept

3 Cable connections

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

Information:

The maximum torque for the locating screws is 0.5 Nm.

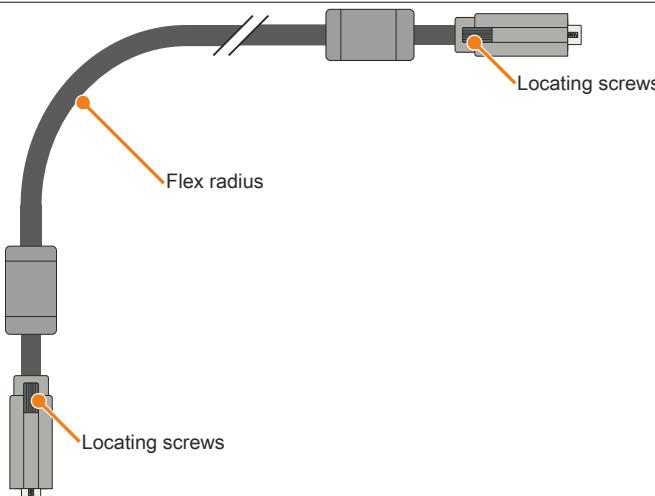


Figure 51: Flex radius - Cable connection

Information:

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

4 Switching on the device for the first time

4.1 General information before switching on the device

Checklist

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

- Have the installation notes as specified in "Installation" on page 69 been observed.
- Have the permitted environmental conditions been taken into consideration for the device?
- Is the power supply connected correctly, and have the associated values been checked?
- Is the ground cable connected correctly to the ground connection?
- The device must be put into operation first before additional hardware is installed.

Caution!

Before the device is put into operation, it must first be acclimated to room temperature! It should not be immediately subjected to thermal radiation.

If transported at low temperatures or if there are large temperature fluctuations, the device must not be subjected to any type of moisture.

Prerequisites and requirements

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

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

4.2 Switching on the Automation Panel

Procedure

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

5 Touch screen calibration

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

5.1 Single-touch (analog resistive)

5.1.1 Windows Embedded 8.1 Industry Pro

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

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

5.1.2 Windows 7 Professional / Ultimate

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

5.1.3 Windows Embedded Standard 7 Embedded / Premium

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

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

5.1.4 Windows XP Professional

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

5.1.5 Windows Embedded Standard 2009

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

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

5.2 Multi-touch (projected capacitive - PCT)

5.2.1 Windows Embedded 8.1 Industry Pro

Microsoft multi-touch drivers are installed when Windows Embedded 8.1 Industry Pro is installed on the device. Once the installation of Windows Embedded 8.1 Industry Pro has completed, the device can be operated immediately.

5.2.2 Windows 7 Professional / Ultimate

Microsoft multi-touch drivers are installed when Windows 7 is installed on the device. Once the installation of Windows 7 has completed, the device can be operated immediately.

5.2.3 Windows Embedded Standard 7 Premium

Microsoft multi-touch drivers are installed when Windows Embedded Standard 7 Premium is installed on the device. Once the installation of Windows Embedded Standard 7 Premium has completed, the device can be operated immediately.

6 Adjusting the display brightness

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

6.1 Adjusting in SDL/SDL3 mode

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

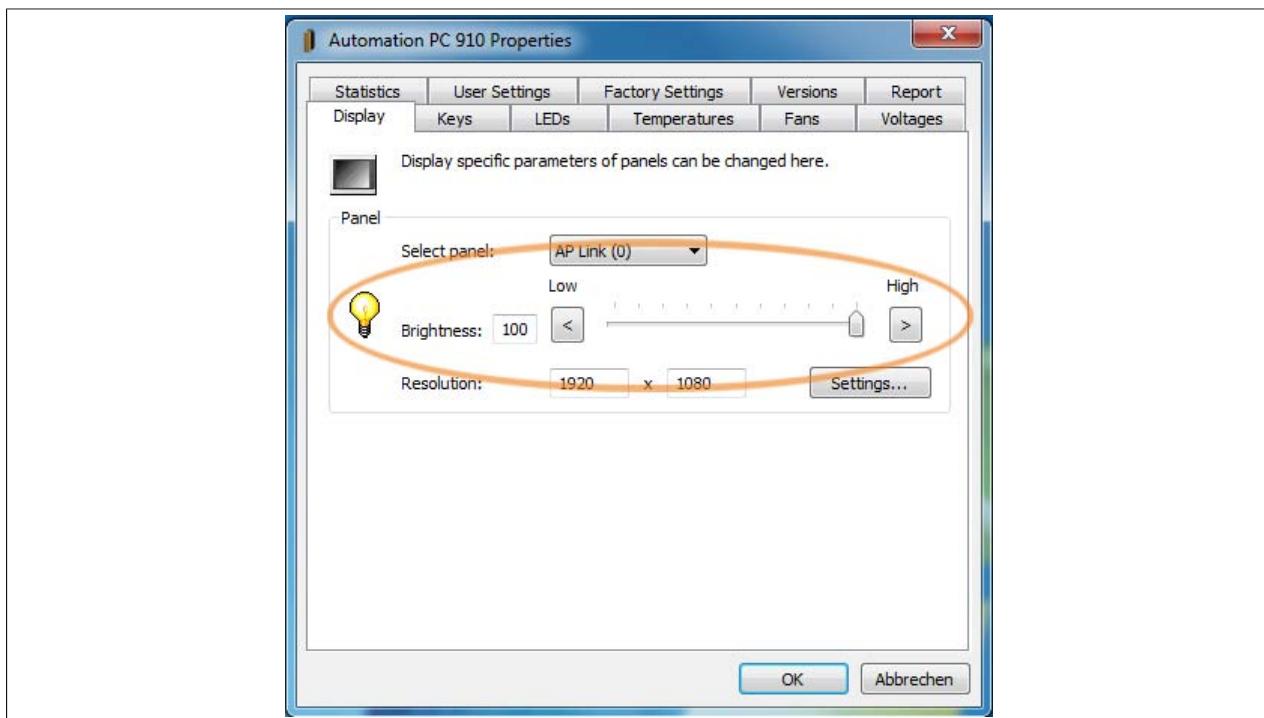


Figure 52: Adjusting the display brightness

Information:

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

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

6.2 Adjusting in DVI mode

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

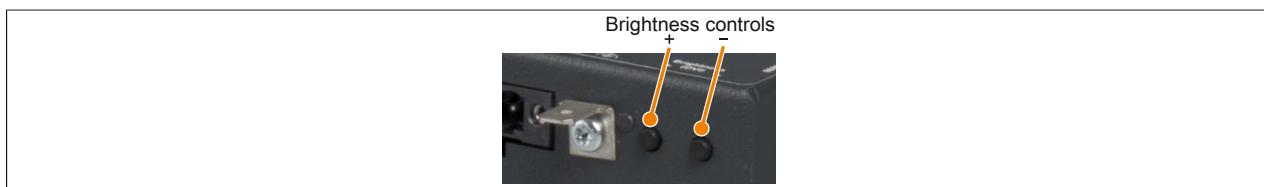


Figure 53: Brightness controls

Chapter 4 • Software

1 Upgrade information

Warning!

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

1.1 Firmware upgrade

The Automation Panel firmware can be updated by updating the firmware of the B&R Industrial PC to which the panel is connected.

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

2 Automation Runtime

2.1 General information

An integral component of Automation Studio is the Automation Runtime real-time operating system. This real-time operating system is the software kernel that allows applications to run on a target system.

- Guaranteed highest possible performance for 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
- Deterministic behavior guaranteed by cyclic system
- Configurable jitter tolerance in all task classes
- Supports all major programming languages such as IEC 61131-3 and C
- Extensive function library conforming to IEC 61131-3 as well as the expanded B&R Automation library
- Integrated into Automation NET. Access to all networks and bus systems via function calls or the Automation Studio™ configuration

B&R Automation Runtime is fully embedded in the corresponding target system (the hardware where Automation Runtime is installed). It allows application programs to access I/O systems (e.g. via the fieldbus) and other devices (interfaces, networks, etc.).

2.2 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 from this version exclusively for 5AP923* single-touch display units.
- 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 display units 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 display units with Rev. ≤ B7 and Rev. ≥ B8.
- Visual Components Runtime (VC) V4.05.5

Information:

Exact information regarding model numbers and Automation Runtime Windows (ARwin) support can be found in the respective user's manual of the B&R Industrial PC being used. This is available in the Downloads section of the B&R website (www.br-automation.com).

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

The ADI (Automation Device Interface) enables access to specific functions on B&R devices. Settings for devices can be read and configured using the B&R Control Center applet in the Control Panel.

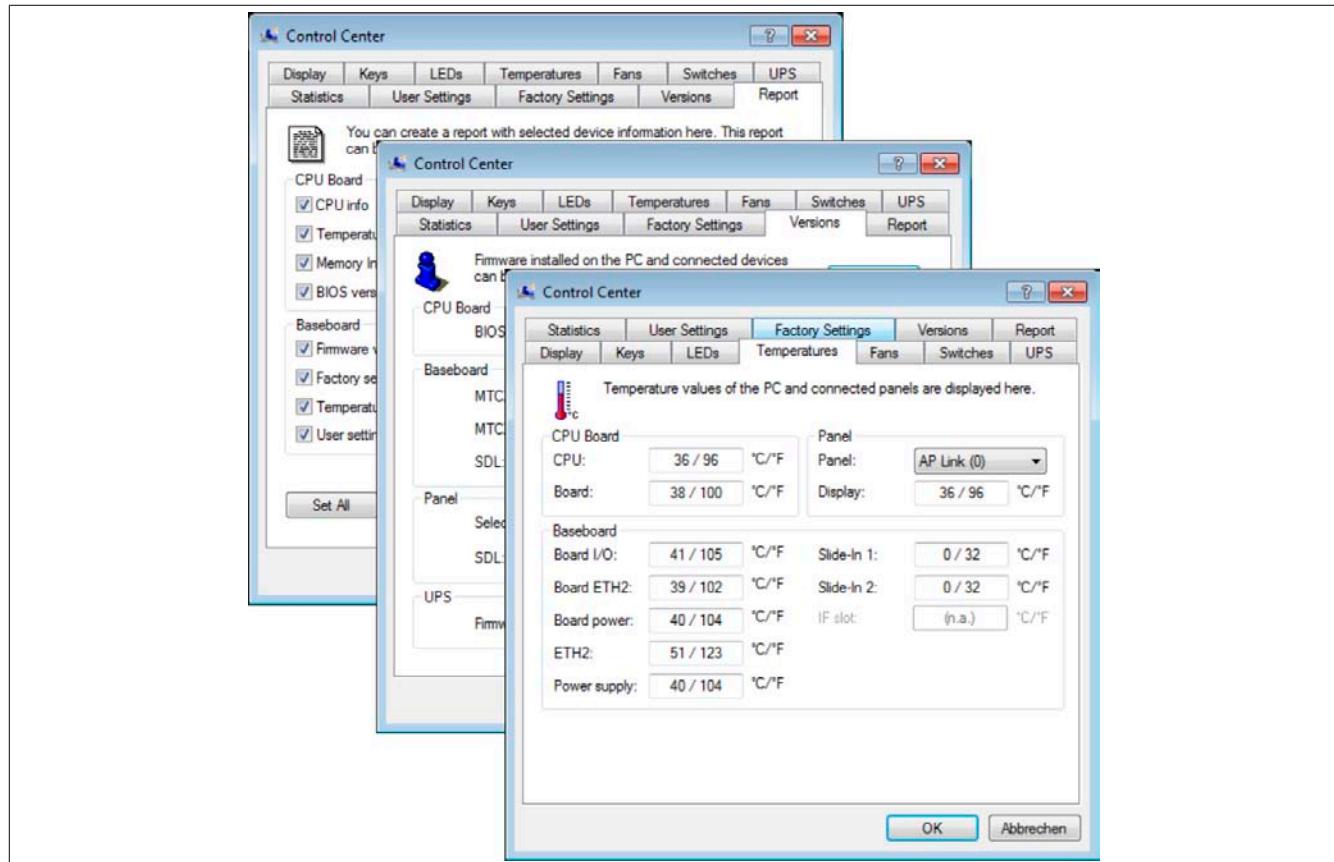


Figure 54: ADI Control Center screenshots - Examples

Information:

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

3.1 Functions

Information:

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

- Changing display-specific parameters
- Reading device-specific keys
- Updating the key configuration
- Enabling device-specific LEDs on a membrane keypad or keys
- Reading and calibrating control devices (e.g. key switches, handwheels, joysticks, potentiometers)
- Reading temperatures, fan speeds, statistical data and switch settings
- Reading operating hours (power-on hours)

- Reading user and factory settings
- Reading software versions
- Updating and backing up BIOS and firmware
- Creating reports about the current system (support assistance)
- Setting the SDL equalizer value when adjusting SDL cables
- Changing the user serial ID

Supports the following systems:

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Panel PC 300
- Panel PC 700
- Panel PC 725
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200
- Connected Automation Panel 800
- Connected Automation Panel 900
- Connected Automation Panel 1000

3.2 Installation

A detailed description of the Control Center can be found in the integrated help system. The B&R Automation Device Interface (ADI) driver (also includes the Control Center) is available at no charge in the Downloads section of the B&R website (www.br-automation.com).

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

Information:

The ADI driver is already included in B&R images of embedded operating systems.

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

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

This software can be used to access B&R Automation Device Interface (ADI) functions directly from Windows applications created in one of the following development environments:

- Microsoft Visual C++ 6.0
- Microsoft Visual Basic 6.0
- Microsoft Embedded Visual C++ 4.0
- Microsoft Visual Studio 2008 (or newer)

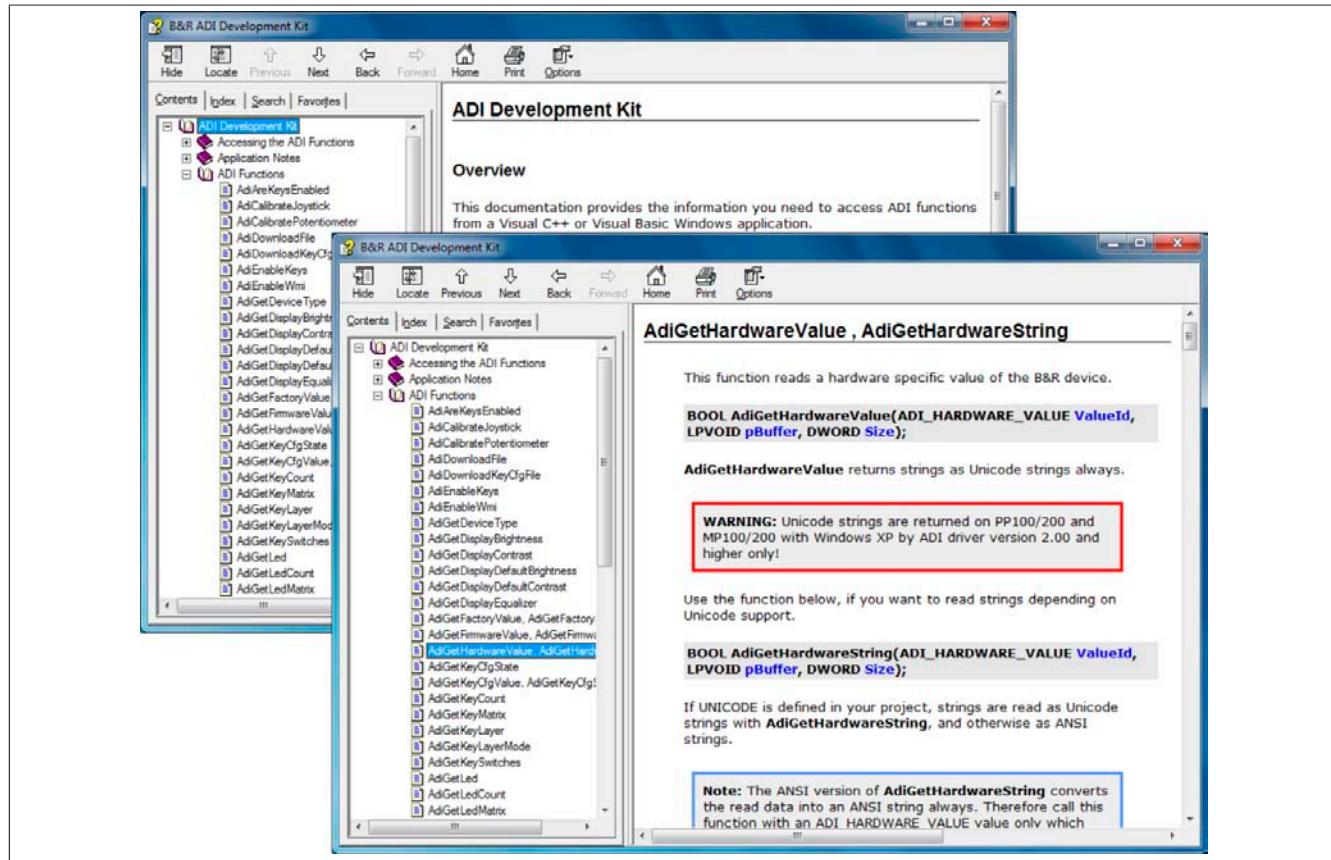


Figure 55: ADI Development Kit Screenshots (Version 3.70)

Features:

- One Microsoft Visual Basic module with ADI function declarations
- Header files and import libraries for Microsoft Visual C++
- Help files for Visual Basic and Visual C++
- Sample projects for Visual Basic and Visual C++
- ADI DLL (for application testing if no ADI driver is installed)

The following systems are supported (version 3.70 and higher):

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100

- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200

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

A detailed description of how to use ADI functions can be found in the help system.

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

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

This software can be used to access B&R Automation Device Interface (ADI) functions directly from .NET applications created using Microsoft Visual Studio 2005 or later.

Supported programming languages:

- Visual Basic
- Visual C++
- Visual C#

System requirements

- Development system: PC with Windows XP or Windows 7 and
 - Microsoft Visual Studio 2005 (or newer)
 - Microsoft .NET Framework 2.0 and/or Microsoft .NET Compact Framework 2.0 (or newer)

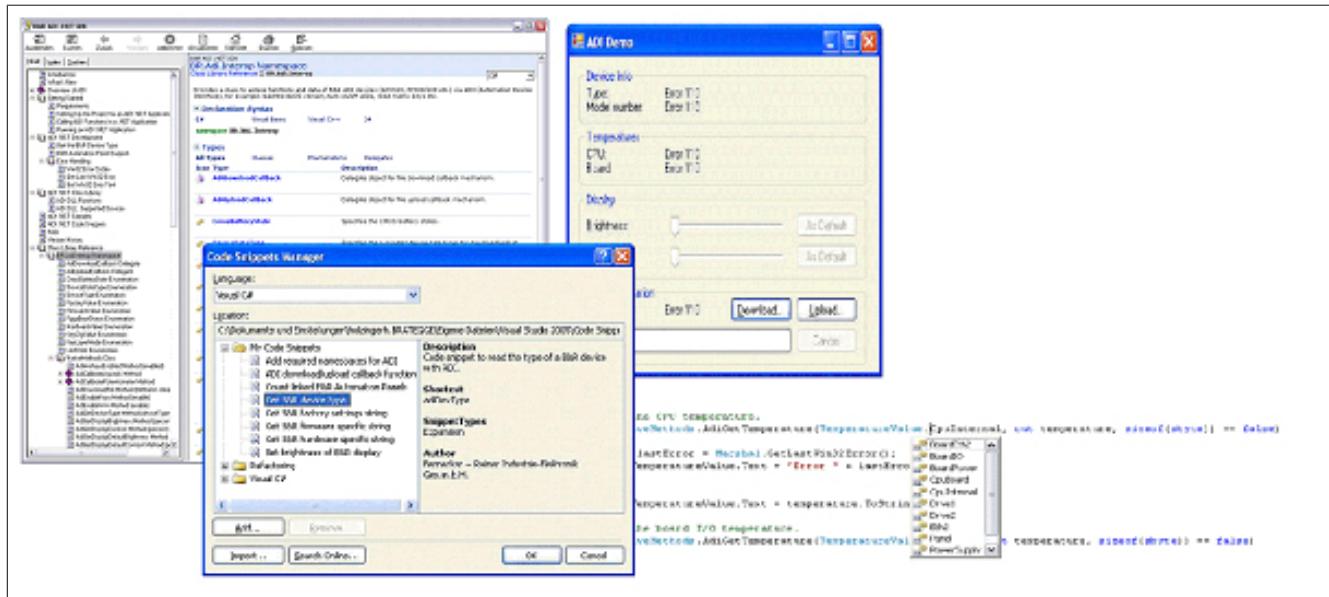


Figure 56: ADI .NET SDK screenshots (version 2.10)

Features (version 2.10 and higher)

- ADI .NET class library
- Help files in HTML Help 1.0 format (.chm), MS Help 2.0 format (.HxS) and MS Help Viewer format (.MSHC) (help documentation is in English only)
- Sample projects and code snippets for Visual Basic, Visual C++ and Visual C#
- ADI DLL (for application testing if no ADI driver is installed)

The following systems are supported (version 2.10 and higher):

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400

- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200

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

A detailed description of how to use ADI functions can be found in the help system.

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

6 B&R Key Editor

On display devices, it is often necessary to adapt the function keys and LEDs directly to the application software being used. The B&R Key Editor makes it quick and easy to implement a unique configuration for the application.

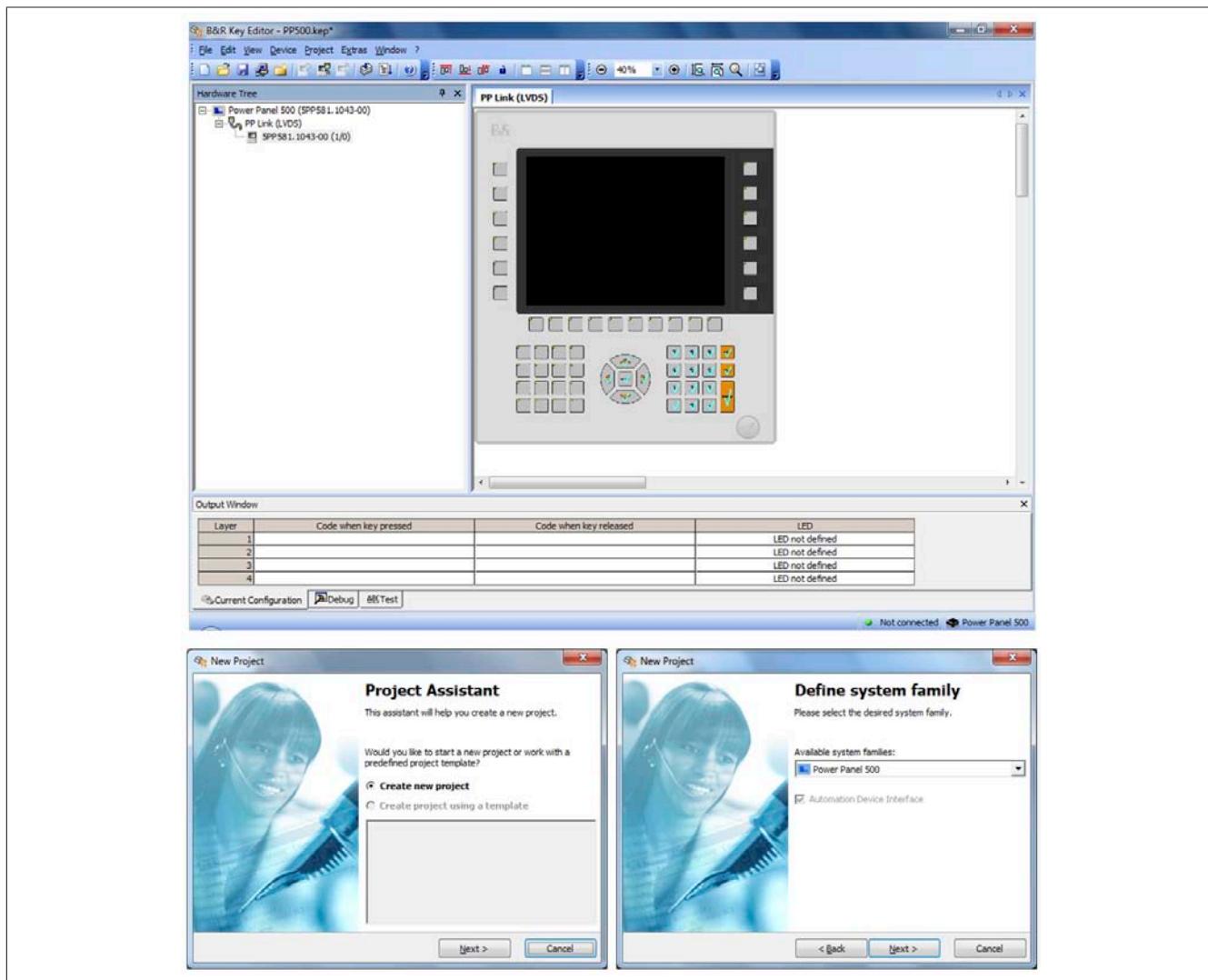


Figure 57: B&R Key Editor screenshots (version 3.60)

Features:

- Configuration of normal keyboard keys (A, B, C, etc.)
- Keyboard shortcuts (CTRL+C, SHIFT+DEL, etc.) using only one key
- Special key functions (change brightness, etc.)
- Assignment of functions to LEDs (HDD access, power, etc.)
- 4 assignments possible per key (using layers)
- Configuration of the panel locking time when multiple Automation Panel 900 devices are connected to Automation PC and Panel PC devices.

The following systems are supported (version 3.60 and higher):

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Automation Panel 800
- Automation Panel 830

- Automation Panel 900
- Automation Panel 9x3
- Automation Panel 9xD
- Automation Panel 1000
- IPC2000, IPC2001, IPC2002
- IPC5000, IPC5600
- IPC5000C, IPC5600C
- Mobile Panel 40/50
- Mobile Panel 100/200
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500

A detailed guide for configuring keys and LEDs as well as installing the key configuration on the target system can be found in the B&R Key Editor's help system. The B&R Key Editor is available in the Downloads section of the B&R website (www.br-automation.com).

7 B&R KCF Editor

The B&R KCF Editor can be used as a simple alternative to the B&R Key Editor. This tool allows function keys and LEDs to be adapted to the application software as needed. Unlike the B&R Key Editor, this program is operated from a simple Windows dialog box instead of graphically on the display. This makes it possible to use the B&R KCF Editor for devices that are not yet supported by the B&R Key Editor. The B&R KCF Editor is a portable application and can be launched on the target device without prior installation (directly from a USB flash drive, for example). An installed ADI driver is required to use the software's full range of functions.

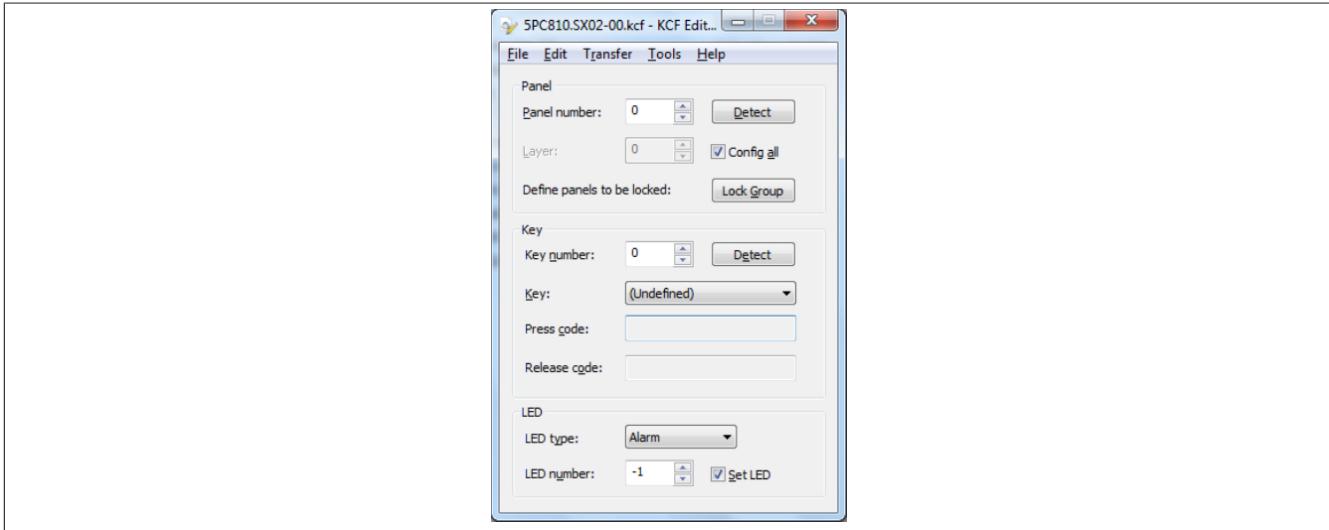


Figure 58: B&R KCF Editor screenshot (version 1.0)

Features

- Configuration of normal keyboard keys (A, B, C, etc.)
- Special key functions (change brightness, etc.)
- Assignment of functions to LEDs (HDD access, power, etc.)
- 4 assignments possible per key (using layers)
- Configuration of the panel locking time when multiple Automation Panel devices are connected to B&R PCs
- Configuration export/import (.ini files)
- Possible to save configuration as a report (text file)

Additional features when executing the B&R KCF Editor on the target device³⁾

- Panel and key detection
- LED test
- Configuration uploads/downloads

The following systems are supported (version 1.0 and higher)

- Automation PCs
- Panel PCs
- Automation Panels
- Power Panels
- Mobile panels

A detailed guide for configuring keys and LEDs can be found in the B&R KCF Editor user's manual. The B&R KCF Editor and its user's manual are available at no cost in the Downloads section of the B&R website (www.br-automation.com).

³⁾ The ADI driver must be installed on the B&R PC to use these features.

8 HMI Service Center

8.1 5SWUTI.0001-000

8.1.1 General information

The HMI Service Center is a software tool used to test B&R Industrial PCs and Automation Panels. These tests cover many different aspects, including COM interfaces, network connectivity, SRAM, etc.

The test system consists of a USB flash drive with an installed Windows PE 5.1 operating system and the HMI Service Center.

Details regarding the HMI Service Center are available in the HMI Service Center user's manual. This can be downloaded from the B&R website (www.br-automation.com).

8.1.2 Order data

Model number	Short description	Figure
	Accessories	
5SWUTI.0001-000	HMI Service Center USB Flash Drive - Hardware diagnostics software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC51x/PP500 - For Automation Panel 800/900	 Perfection in Automation www.br-automation.com

Table 58: 5SWUTI.0001-000 - Order data

9 RFID command set

9.1 General information

The transponder reads and writes MIFARE and ISO 15693 tags. The corresponding commands and parameters are valid depending on the tag being used. When a tag comes within range of the antenna, the PiccSelect message and serial number of the tag are output. When the tag is removed, the PiccRemove message and serial number of the tag are output.

```
*****
***** SW_ResetSTART *****
** Mifare **
** B&R Automation **
** S/W Rev. 0.7 **
**ENTER 'helpme' for information**
*****
PiccSelect: 3B7CF4E0
PiccRemove: 3B7CF4E0
```

An executed command appears as follows:

1. "Command syntax" command
2. The executed command in plain text
3. Response

read,a,ff ff ff ff ff ff,5

"read" command: Data in block 5 in HEX=00

Error messages are constructed as follows:

"Error: <ErrorNumber> (error syntax)"

There is a difference between operating errors and RFID stack error messages. See the section "Error messages and numbers" on page 104.

9.2 MIFARE configuration

9.2.1 Getting started

The driver for the USB communication device class (CDC) must be installed before you can use the transponder.

Information:

Supported operating systems:

- ARemb (using AsUsB.Lib)

9.2.1.1 Port settings

Configure the following port settings in your terminal program:

Bits per second: 115200

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

9.2.1.2 Authentication

The keys needed for authentication can be stored either in EEPROM or temporarily in the transponder. Alternatively, the authentication keys can be transferred with the command.

The Key_EEPROM, Key_TEMP and Key_CMD commands are used to set the storage location or to send the authentication keys.

The following commands are used to store the authentication key in the transponder.

MIFARE commands - Authentication key storage					
Command	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Store_key_eeprom	"A" or "B"	Sector for key in reader's EEPROM	6-byte key	--	--
Store_key_temp	6-byte key	--	--	--	--

Table 59: MIFARE commands - Authentication key storage

Example:

```
store_key_eeprom,a,0,ff ff ff ff ff ff
```

"store_key_eeprom" command: The key is written to EEPROM sector 0.

Default key (when tags are delivered): 0xFF FF FF FF FF FF

Up to 16 keys (0 to 15) can be stored in EEPROM for each key (A and B).

9.2.2 Access rights and memory organization

The tag is divided into 16 sectors of 4 blocks each. Each block contains 16 bytes. The 4th block in each sector contains the keys and access rights for the respective sector (sector trailer). Access rights can be assigned individually to each block. Each sector can be assigned one of two different keys (A or B).

These keys and access rights must be stored in a defined format (according to the MIFARE specification). To change these access rights, the proper format of the "write" command must be used to write to the respective sector trailer.

This documentation will not go into further detail with regard to memory organization and access right of tags. For more information, please see data sheet "[MIFARE standard card IC MF1 IC S50 functional specification](#)".

9.2.3 Value block

A block can be used as a value block. A value block is a signed 4-byte value. With each command (read, increment, decrement, restore), the tag automatically increments/decrements the value without requiring the value to be read. In order to use a block as a value block, it must adhere to a defined format.

This documentation will not go into further detail with regard to the value blocks of tags. For more information, please see data sheet "[MIFARE standard card IC MF1 IC S50 functional specification](#)".

9.2.4 Access rights

There are various options for parameter 2 depending on the configuration.

MIFARE access rights (parameter 2)				
Config	Key_CMD	Key_EEPROM	Key_TEMP	
Parameter 2	6-byte key	Sector for key in reader's EEPROM	Uses the temporarily stored key: Dummy value (0-63)	

Table 60: MIFARE access rights (parameter 2)

"A" = Authentication with key A, "B" = Authentication with key B

Sector = 0 to 63

Source and target block = 0 to 254 (depends on type: 0 to 63 for MIFARE 1K, 0 to 254 for MIFARE 4K; for "Decrement", "Increment" and "Restore", the source block must be a value block)

Data and key = 00 to FF (no leading "0x", bytes can optionally be separated by a space)

Value = 4 bytes including sign bit

All commands and parameters are in ASCII. Data is in 00h hex format.

MIFARE access rights (5-byte parameters)

Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Block (typically 3 - sector trailer)	Access rights for block 0 (data block)	Access rights for block 1 (data block)	Access rights for block 2 (data block)	Access rights for block 3 (sector trailer)

Table 61: MIFARE access rights (5-byte parameters)

MIFARE access rights - Parameters 2, 3 and 4 (data blocks)

Value	Read	Write	Increment	Decrement / Transfer / Restore	Comment
	A / B	A / B	A / B	A / B	
0x00	A / B	A / B	-	-	Full access with every key (default factory setting)
0x01	A / B	B	-	-	
0x02	A / B	-	-	-	
0x03	A / B	B	B	A / B	Value block
0x04	A / B	-	-	A / B	Value block
0x05	B	-	-	-	
0x06	B	B	-	-	
0x07	-	-	-	-	No access

Table 62: MIFARE access rights - Parameters 2, 3 and 4 (data blocks)

If key B is read in the corresponding sector trailer, it cannot be used for authentication (all of the yellow rows in the table above).

Consequences: If the reader attempts to authenticate a block in a sector with key B (access conditions marked in yellow), the tag will refuse all subsequent memory access following authentication.

MIFARE access rights - Parameter 5 (sector trailer)

Value	Key A		Access bits		Key B		Comment
	Read	Write	Read	Write	Read	Write	
0x00	-	A	A	-	A	A	Key B can be read.
0x01	-	B	A / B	-	-	B	
0x02	-	-	A	-	A	-	Key B can be read.
0x03	-	-	A / B	-	-	-	No access
0x04	-	A	A	A	A	A	Key B can be read (factory default).
0x05	-	-	A / B	B	-	-	
0x06	-	B	A / B	B	-	B	
0x07	-	-	A / B	-	-	-	No access

Table 63: MIFARE access rights - Parameter 5 (sector trailer)

The rows marked in yellow are access conditions where key B can be read and used for data.

9.2.5 General commands

Command	Description	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Info_On	Outputs command confirmation	--	--	--	--	--
Info_Off	Does not output command confirmation (default)	--	--	--	--	--
Show_Config	Displays current settings	--	--	--	--	--
Show_Revision	Displays software and hardware revision information	--	--	--	--	--
Show_Status	Displays the RFID stack error	--	--	--	--	--

Table 64: General commands

Command	Description	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Show_SN	Displays the active tag number	--	--	--	--	--
Show_Key	Displays the active key	--	--	--	--	--
Echo_On	Displays an input echo for the output	--	--	--	--	--
Echo_Off	Suppresses the input echo for the output (default)	--	--	--	--	--
Startup	Displays the startup message	--	--	--	--	--
Life	Life command --> Returns OK	--	--	--	--	--
Helpme	Displays a list of all commands	--	--	--	--	--

Table 64: General commands

9.2.6 Update commands

Command	Description	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Restart	Restarts the reader	--	--	--	--	--
Firmware_Update	Switches the µC to X-modem update mode	--	--	--	--	--
Firmware_Upgrade	Switches the µC to USB mass memory update mode	--	--	--	--	--
Firmware_Info	Displays information about the current firmware	--	--	--	--	--

Table 65: Update commands

9.2.7 MIFARE commands

Command	Description	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Read	Reads a 16-byte block from PICC	"A" or "B"	See table "Access rights" (parameter 2).	Source block	--	--
Read_Blocks	Reads the specified range of blocks from PICC	"A" or "B"	See table "Access rights" (parameter 2).	Starting block	Ending block	--
Write	Writes a 16-byte block to PICC	"A" or "B"	See table "Access rights" (parameter 2).	Destination block	16-byte data in hex 00h	--
Decr	Takes the value of the source value block, subtracts the specified value and writes the result to the destination block	"A" or "B"	See table "Access rights" (parameter 2).	Source block	Destination block	Value
Incr	Takes the value of the source value block, adds the specified value and writes the result to the destination block	"A" or "B"	See table "Access rights" (parameter 2).	Source block	Destination block	Value
Restore	Copies a value block	"A" or "B"	See table "Access rights" (parameter 2).	Source block	Destination block	--
InitZero	Initializes a value block with the value 0	"A" or "B"	See table "Access rights" (parameter 2).	Destination block	--	--
Store_Key_EEPROM	Stores a 6-byte key in EEPROM	"A" or "B"	Sector for key in reader's EEPROM	6-byte key		
Store_Key_Temp	Stores a 6-byte key in the µC temporarily until switched off	6-byte key	--	--	--	--
Connect	Connects manually to a specific tag	4-byte SNr	--	--	--	--
Disconnect	Automatically restores a connection to the best tag	--	--	--	--	--
Key_CMD	Sends a key directly with each command (default)	--	--	--	--	--
Key_EEPROM	Uses the key from EEPROM	--	--	--	--	--
Key_TEMP	Uses the temporary key	--	--	--	--	--

Table 66: MIFARE commands

9.2.8 MIFARE commands - Examples

Writing data to block 5 with key A from the reader's EEPROM sector 0:

```
write,a,0,5,0123456789ABCDEF0123456789ABCDEF
```

Response:

```
Command write ->
Data in sector 1 Block 5 written=0123456789ABCDEF0123456789ABCDEF
```

Reading from block 5 with key A from the reader's EEPROM sector 0:

read,a,0,5

Response:

```
Command read ->
Data in block 5 in HEX=0123456789ABCDEF0123456789ABCDEF
```

Initializing block 8 with key A from EEPROM sector 0 as a VALUE block

Initzero,a,0,8

Response:

```
Command initzero ->
Data in sector 2 Block 8 written=00000000FFFFFFFFFF0000000000FF00FF
```

Incrementing block 8 by 2 with key A from sector 0 of the reader's EEPROM:

Incr,a,0,8,8,2

Response:

```
Command incr ->
Block 008 successful by 000000002 incremented and written to block 008
```

Querying from block 5 with a key in the command

read,a,ff ff ff ff ff ff,5

Response:

```
Command read ->
Data in Block 5 in HEX=FFFF0000000000000000000000000000
```

Connecting manually to a specific tag

connect,0b a1 78 98

Response:

```
Command connect ->
*****INFO*****
Key_mode = Key_eeprom
Info_text = Info_on
Tag_connected = Manual_mode
Tag_sn = 0BA17898
*****END_OF_INFO*****
```

Reading blocks 0 to 3

read_blocks,a,0,0,3

Response:

```
Command read_blocks ->
Data in block 0 in HEX=3B7CF4E05388040046B9949745302809
Data in block 1 in HEX=000000000000000000000000000000000000
Data in block 2 in HEX=000000000000000000000000000000000000
Data in block 3 in HEX=000000000000FF078069FFFFFFFFFF
```

9.3 ISO 15693 configuration

9.3.1 Getting started

The driver for the USB communication device class (CDC) must be installed before you can use the transponder.

Information:

Supported operating systems:

- ARemb (using AsUsB.Lib)

9.3.1.1 Port settings

Configure the following port settings in your terminal program:

Bits per second: 115200

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

9.3.2 General commands

Command	Description	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Info_On	Outputs command confirmation	--	--	--	--	--
Info_Off	Does not output command confirmation (default)	--	--	--	--	--
Show_Config	Displays current settings	--	--	--	--	--
Show_Revision	Displays software and hardware revision information	--	--	--	--	--
Show_Status	Displays the RFID stack error	--	--	--	--	--
Show_SN	Displays the active tag number	--	--	--	--	--
Show_Key	Displays the active key	--	--	--	--	--
Echo_On	Displays an input echo for the output	--	--	--	--	--
Echo_Off	Suppresses the input echo for the output (default)	--	--	--	--	--
Startup	Displays the startup message	--	--	--	--	--
Life	Life command --> Returns OK	--	--	--	--	--
Helpme	Displays a list of all commands	--	--	--	--	--

Table 67: General commands

9.3.3 Update commands

Command	Description	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Restart	Restarts the reader	--	--	--	--	--
Firmware_Update	Switches the µC to X-modem update mode	--	--	--	--	--
Firmware_Upgrade	Switches the µC to USB mass memory update mode	--	--	--	--	--
Firmware_Info	Displays information about the current firmware	--	--	--	--	--

Table 68: Update commands

9.3.4 ISO 15693 commands

Command	Description	Parameter 1	Parameter 2	Parameter 3	Parameter 4	
Read	Reads a 4-byte block from PICC	Source block	--	--	--	
Read_Blocks	Reads the specified range of blocks from PICC	Starting block	Ending block	--	--	
Write	Writes a 4-byte block to PICC	Destination block	4-byte data in hex 00h	--	--	
Sys_Info	Reads the AFI, DSFID, number of bytes and bytes/block	--	--	--	--	
Security	Displays the write protection status of individual blocks	Starting block	Ending block	--	--	
Set_AFI	Writes the AFI value	1-byte value	--	--	--	
Set_DSFID	Writes the DSFID value	1-byte value	--	--	--	
Lock_Block	Enables write protection for a block	Target block	--	--	--	
Lock_AFI	Sets AFI write protection	--	--	--	--	
Lock_DSFID	Sets DSFID write protection	--	--	--	--	
Connect	Connects manually to a specific tag	8-byte SNr	--	--	--	
Disconnect	Automatically restores a connection to the best tag	--	--	--	--	

Table 69: ISO 15693 commands

Command	Description	Parameter 1	Parameter 2	Parameter 3	Parameter 4
Inventory	Reads the UID and DSFID from the PICC	Flags (flag)	AFI (afi)	Bit length (bitlength)	Mask (mask)
Stay_Quiet	PICC enters quite mode	Serial number (sn)	--	--	--
Reset_To_Ready	PICC exits quiet mode	Serial number (sn)	--	--	--
Reset_Quiet	All PICCs exit quiet mode	--	--	--	--

Table 69: ISO 15693 commands

9.3.5 Memory organization

Source and destination block = 0 to 254 (depends on the tag)

Data and key = 00 to FF (no leading "0x", bytes can optionally be separated by a space)

Value = 1 bytes including sign bit

All commands and parameters are in ASCII. Data is in 00h hex format.

9.3.6 ISO 15693 commands - Examples

Inventory

flags [hex]:

0x02 = High data rate

0x04 = Inventory

0x10 = AFI value is set

0x20 = Single slot

afi [dec]:

AFI value if 0x10 set in the flags

bitlength [dec]:

Bit length of the subsequent UID mask. A maximum bit length of 60 is permitted for 16 slots; a bit length of 64 is permitted for one slot. The length of the subsequent mask is derived from this parameter.

mask [hex]:

UID mask for the inventory command - 1 to 8 bytes. If the bit length is "0", then a byte ("00") must be transmitted.

Inventory - Examples:

```
Inventory,06,0,0,0  \\ Inventory with high data rate, 16 slots, no AFI value
Inventory,16,3,0,0  \\ Inventory with high data rate, 16 slots, AFI value "3"
Inventory,26,0,0,0  \\ Inventory with high data rate, 1 slot, no AFI value
```

Inventory - Response:

```
1-byte DSFID value, 8-byte UID - slot 1
1-byte DSFID value, 8-byte UID - slot 2
...
...
1-byte DSFID value, 8-byte UID - slot 16
```

If 0x20 is set as a flag, then only the entry from slot 1 is valid. All other slots return "0".

Stay_Quiet

sn [hex]: 8-byte UID of tag

The filter for the tag is set, and the tag is disconnected.

Reset_To_Ready

sn [hex]: 8-byte UID of tag

The filter of the tag is reset and reappears with the inventory command.

Reset_Quiet

This command resets ALL filters that were set previously with Stay_Quiet.

9.4 Error messages and numbers

Operating errors

Operating errors		
Value	Name	Description
0	ERR_NONE	No errors (OK)
1	ERR_OTHER	Miscellaneous operating error, unrecognized command
2	ERR_PARAMETER	Incorrect number of parameters
3	ERR_AUTH	Authentication error (A or B)
4	ERR_SECTOR	Invalid range for sector (0-63)
5	ERR_BLOCK_SRC	Invalid range for source block (0-255)
6	ERR_WRITE	No data found for writing
7	ERR_KEY_EE	No key found for writing
8	ERR_KEY_STORE	Could not save key
9	ERR_BLOCK_DST	Invalid range for destination block (0-255)
10	ERR_NO_TAG	No tag in range
11	ERR_BLOCK_NUM	Incorrect values for source/destination blocks
12	ERR_TAG_NUM	Invalid tag number
13	ERR_KEY	Invalid key
14	ERR_REMOTE	X-modem firmware update canceled (not used)
15	ERR_SYNC	X-modem firmware update packet start not found (not used)
16	ERR_RETRY	X-modem firmware update number of retry attempts (not used)
17	ERR_READ	Could not read data
18	ERR_INCDECRES	Error accessing value block
19	ERR_LOCK	Could not lock block
20	ERR_AFI	Error writing AFI value
21	ERR_DSFID	Error writing DSFID value
22	ERR_SYSINFO	Could not read system information
23	ERR_INVENTORY	Could not execute inventory command due to incorrect parameter (value) or internal RFID stack error
24	ERR_STAY QUIET	Could not set specified ISO tag to STAY QUIET (no longer accessible)
25	ERR_RESET2READY	Could not set specified ISO tag to READY (after a preceding STAY QUIET)

Table 70: Operating errors

RFID stack error messages

RFID stack errors can be queried using the "show_status" command. Each error number consists of a high byte (stack components) and a low byte (errors).

RFID stack high byte error messages		
Value	Name	Description
0x00XX	PH_COMP_GENERIC	Generic component code
0x01XX	PH_COMP_BAL	BAL component code
0x02XX	PH_COMP_HAL	HAL component code
0x03XX	PH_COMP_PAL_ISO14443P3A	ISO 14443-3A PAL component code
0x04XX	PH_COMP_PAL_ISO14443P3B	ISO14443-3A PAL component code
0x05XX	PH_COMP_PAL_ISO14443P4A	ISO 14443-4A PAL component code
0x06XX	PH_COMP_PAL_ISO14443P4	ISO 14443-4 PAL component code
0x07XX	PH_COMP_PAL_MIFARE	MIFARE(R) PAL component code
0x08XX	PH_COMP_PAL_FELICA	Open FeliCa PAL component code
0x09XX	PH_COMP_PAL_EPCUID	ICODE EPC/UID PAL component code
0x0AXX	PH_COMP_PAL_SLI15693	ICODE SLI/ISO 15693 PAL component code
0x0BXX	PH_COMP_PAL_I18000P3M3	ISO 18000-3 Mode3 PAL component code
0x0CXX	PH_COMP_PAL_I18092MPI	ISO18092 passive initiator mode PAL component code
0x10XX	PH_COMP_AL_MFC	MIFARE(R) Classic AL component code
0x11XX	PH_COMP_AL_MFUL	MIFARE(R) Ultralight AL component code
0x12XX	PH_COMP_AL_MFP	MIFARE(R) Plus AL component code
0x13XX	PH_COMP_AL_VCA	Virtual Card Architecture AL component code
0x14XX	PH_COMP_AL_FELICA	Open FeliCa AL component code
0x15XX	PH_COMP_AL_I15693	ISO 15693 AL component code
0x16XX	PH_COMP_AL_SLI	ICODE SLI AL component code
0x18XX	PH_COMP_AL_I18000P3M3	ISO 18000-3 Mode3 AL component code
0x19XX	PH_COMP_AL_Mfdf	MIFARE DESFIRE EV1 AL component code
0x1AXX	PH_COMP_AL_P40CMDPRIV	P40 command library AL component code
0x1BXX	PH_COMP_AL_P40CMDPUB	P40 command library AL component code
0x30XX	PH_COMP_DL_AMP	Amplifier DL component code
0x31XX	PH_COMP_DL_THSTRM	Thermostream DL component code
0x32XX	PH_COMP_DL_OSCI	Oscilloscope DL component code
0x33XX	PH_COMP_DL_RDFPGA	Reader FPGA Box DL component code
0x34XX	PH_COMP_DL_MSTAMPOS	Master Amplifier Oscilloscope DL component code
0x35XX	PH_COMP_DL_STEPPER	Stepper DL component code
0xE0XX	PH_COMP_CIDMANAGER	Cid Manager component code

Table 71: RFID stack high byte error messages

RFID stack high byte error messages

Value	Name	Description
0xE1XX	PH_COMP_CRYPTOSYM	CryptoSym component code
0xE2XX	PH_COMP_KEYSTORE	KeyStore component code
0xE3XX	PH_COMP_TOOLS	Tools component code
0xE4XX	PH_COMP_CRYPTORNG	CryptoRng component code
0xEFXX	PH_COMP_LOG	Log component code

Table 71: RFID stack high byte error messages

RFID stack low byte error messages

Value	Name	Description
0XXX00	PH_ERR_SUCCESS	Returned if no error
0XXX71	PH_ERR_SUCCESS_CHAINING	Rx chaining not complete, further action needed
0XXX72	PH_ERR_SUCCESS_INCOMPLETE_BYTE	Incomplete byte received
0XXX01	PH_ERR_IO_TIMEOUT	No reply received, e.g. PICC removal
0XXX02	PH_ERR_INTEGRITY_ERROR	Wrong CRC or parity detected
0XXX03	PH_ERR_COLLISION_ERROR	Collision occurred
0XXX04	PH_ERR_BUFFER_OVERFLOW	Attempt to write beyond buffer size
0XXX05	PH_ERR_FRAMING_ERROR	Invalid frame format
0XXX06	PH_ERR_PROTOCOL_ERROR	Received response violates protocol
0XXX07	PH_ERR_AUTH_ERROR	Authentication error
0XXX08	PH_ERR_READ_WRITE_ERROR	Read or write error in RAM/ROM or flash memory
0XXX09	PH_ERR_TEMPERATURE_ERROR	RC sensors signaling overheating
0XXX0A	PH_ERR_RF_ERROR	Error on RF interface
0XXX0B	PH_ERR_INTERFACE_ERROR	RC communication error
0XXX0C	PH_ERR_LENGTH_ERROR	Length error
0XXX7F	PH_ERR_INTERNAL_ERROR	Internal error
0XXX20	PH_ERR_INVALID_DATA_PARAMS	Invalid data parameters supplied (layer ID check failed)
0XXX21	PH_ERR_INVALID_PARAMETER	Invalid parameter supplied
0XXX22	PH_ERR_PARAMETER_OVERFLOW	Reading/Writing a parameter would produce an overflow
0XXX23	PH_ERR_UNSUPPORTED_PARAMETER	Parameter not supported
0XXX24	PH_ERR_UNSUPPORTED_COMMAND	Command not supported
0XXX25	PH_ERR_USE_CONDITION	Condition of use not satisfied
0XX26	PH_ERR_KEY	Key error

Table 72: RFID stack low byte error messages

9.5 Updating firmware

Firmware can be updated with a terminal program (e.g. RealTerm, Tera Term, etc.). Since HyperTerminal is no longer supported beginning with Windows 7, Tera Term is recommended.

Complete the following steps to update the firmware:

1. Enter the command "firmware_update".
2. Select the firmware update file (e.g. HyperTerminal -> Transfer -> Send file -> Select file).
3. Transmit the file by pressing the button.
4. The update is carried out automatically.
5. The reader then restarts.
6. The information is checked.
7. The update is completed.

This appears as follows in the terminal program:



Figure 59: Terminal view 1

```
**          B&R Automation      **
          S/W Rev. 65535.65535
**ENTER 'Helpme' for information**
*****
|Error:-1 (PiccRequest)
firmware_update
Kommando FIRMWARE_UPDATE ->
FIRMWARE_UPDATE
CCCCCCCCFirmware-Update complete with 27648 Bytes
***
***** Bootloader *****
*****
New Firmware found: S/W Rev. 1.3
Start Firmware copy
Firmware copy finished
Firmware found-> Version 1.3
Info:09.06.2011 12:50:53
**          Mifare      **
**          B&R Automation      **
          S/W Rev. 1.3
**ENTER 'Helpme' for information**
*****
|Error:-1 (PiccRequest)
-
```

Figure 60: Terminal view 2

Chapter 5 • Standards and certifications

1 Standards and guidelines

1.1 CE mark



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

1.2 EMC directive

These devices meet the requirements of EC directive "2004/108/EC Electromagnetic compatibility" and are designed for the following areas:

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

1.3 Low voltage directive

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

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

2 Certifications

Danger!

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

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

Unless otherwise specified, the following certifications apply:

2.1 UL certification



Products with this mark have been tested by Underwriters Laboratories and are listed as "Industrial Control Equipment". This mark is valid for the USA and Canada and simplifies the certification of your machines and systems in these areas.

Underwriters Laboratories (UL) in accordance with the UL508 standard - 17th Edition Canadian (CSA) standard in accordance with C22.2 No. 142-M1987

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2.2 FCC and IC

B&R products satisfy EMC requirements for operation in the USA and Canada and are compliant with FCC and IC regulations. Corresponding "Radio Frequency Interference Statements" for the USA and Canada:

USA:
Federal Communications Commission (FCC)

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canada:
Industry Canada (IC)

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

If products are also equipped with an RFID read/write unit, it must be approved for operation in the USA and Canada. These types of products are identified by a sticker with "Contains FCC ID:" and "Contains IC ID:" on the RFID read/write unit. In addition to the additional sticker for products with an RFID read/write unit, the requirements below also apply.

Information:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Information:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

Chapter 6 • Accessories

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

All components listed in this manual have been subjected to extensive system and compatibility testing and are approved for use. B&R can make no guarantee regarding the functionality of non-approved accessories.

1 Power connectors

1.1 0TB103.9x

1.1.1 General information

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

1.1.2 Order data

Model number	Short description	Figure
Terminal blocks		
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm ²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	

Table 73: 0TB103.9, 0TB103.91 - Order data

1.1.3 Technical data

Information:

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

Product ID	0TB103.9	0TB103.91
General information		
Certification		
CE	Yes	
cULus	Yes	
cULus HazLoc Class 1 Division 2	Yes ¹⁾	
GL	Yes ²⁾	
Terminal block		
Note	Protected against vibration by the screw flange Nominal values according to UL	
Number of pins	3 (female)	
Type of terminal clamp	Screw clamp terminal block	Cage clamp terminal block ³⁾
Cable type	Only copper wires (no aluminum wires!)	
Distance between contacts	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 mm ²	
Solid wires	0.20 to 2.50 mm ²	
Fine strand wires	0.20 to 1.50 mm ²	0.20 to 2.50 mm ²
With wire end sleeves	0.20 to 1.50 mm ²	
Tightening torque	0.4 Nm	-

Table 74: 0TB103.9, 0TB103.91 - Technical data

Product ID	0TB103.9	0TB103.91
Electrical characteristics		
Nominal voltage	300 V	
Nominal current ⁴⁾	10 A / contact	
Contact resistance	≤5 mΩ	

Table 74: 0TB103.9, 0TB103.91 - Technical data

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

2 Terminal block for the button/switch interface

2.1 0TB1210.3100

2.1.1 General information

This 2-row, 10-pin TB1210 terminal block is used to connect to the button/switch interface of the Automation Panel 9xD as well as to the interfaces on various interface options.

2.1.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB1210.3100	Connector - Female 10-pin - Cage clamp - Protected against vibration by the screw flange	

Table 75: 0TB1210.3100 - Order data

2.1.3 Technical data

Product ID	0TB1210.3100
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes ¹⁾
Terminal block	
Note	Nominal values according to UL
Number of pins	10 (female)
Type of terminal clamp	PUSH IN cage clamp terminal block connector
Cable type	Only copper wires (no aluminum wires!)
Distance between contacts	3.5 mm
Connection cross section	
AWG wire	26 to 16 AWG
Wire end sleeves with plastic covering	0.14 to 1 mm ²
Solid wires	0.14 to 1.5 mm ²
Fine strand wires	0.14 to 1.5 mm ²
With wire end sleeves	0.14 to 1.5 mm ²
Electrical characteristics	
Nominal voltage	300 V
Nominal current ²⁾	10 A

Table 76: 0TB1210.3100 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) The limit data for each I/O module must be taken into consideration.

3 USB flash drives

3.1 5MMUSB.xxxx-01

3.1.1 General information

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

Information:

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

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

3.1.2 Order data

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

Table 77: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

3.1.3 Technical data

Product ID	5MMUSB.2048-01	5MMUSB.4096-01
General information		
Capacity	2 GB	4 GB
LED status indicators	1 LED (green) ¹⁾	
MTBF	>3,000,000 hours	
Type	USB 1.1, USB 2.0	
Maintenance	None	
Default file system	FAT16	FAT32
Certification		
CE	Yes	
GOST-R	Yes	
Interfaces		
USB		
Type	USB 1.1, USB 2.0	
Connection	To any USB type A interface	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Sequential reading	Full speed max. 1 MB/s, High speed max. 32 MB/s	
Sequential writing	Full speed max. 0.9 MB/s, High speed max. 23 MB/s	
Endurance		
SLC flash	Yes	
Data retention	>10 years	
Data reliability	<1 unrecoverable error in 10 ¹⁴ bit read accesses	
Connection cycles	>1,500	
Support		
Operating systems		
Windows 7	Yes	
Windows XP Professional	Yes	
Windows XP Embedded	Yes	
Windows ME	Yes	
Windows 2000	Yes	
Windows CE 5.0	Yes	
Windows CE 4.2	Yes	

Table 78: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Product ID	5MMUSB.2048-01	5MMUSB.4096-01
Electrical characteristics		
Current consumption	Max. 500 µA sleep mode, max. 120 mA read/write	
Environmental conditions		
Temperature Operation	0 to 70°C	
Storage	-50 to 100°C	
Transport	-50 to 100°C	
Relative humidity Operation	85%, non-condensing	
Storage	85%, non-condensing	
Transport	85%, non-condensing	
Vibration Operation	20 to 2000 Hz: 20 g (peak)	
Storage	20 to 2000 Hz: 20 g (peak)	
Transport	20 to 2000 Hz: 20 g (peak)	
Shock Operation	Max. 1500 g (peak)	
Storage	Max. 1500 g (peak)	
Transport	Max. 1500 g (peak)	
Elevation Operation	Max. 3048 m	
Storage	Max. 12192 m	
Transport	Max. 12192 m	
Mechanical characteristics		
Dimensions Width	17.97 mm	
Length	67.85 mm	
Height	8.35 mm	

Table 78: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

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

3.1.4 Temperature/Humidity diagram

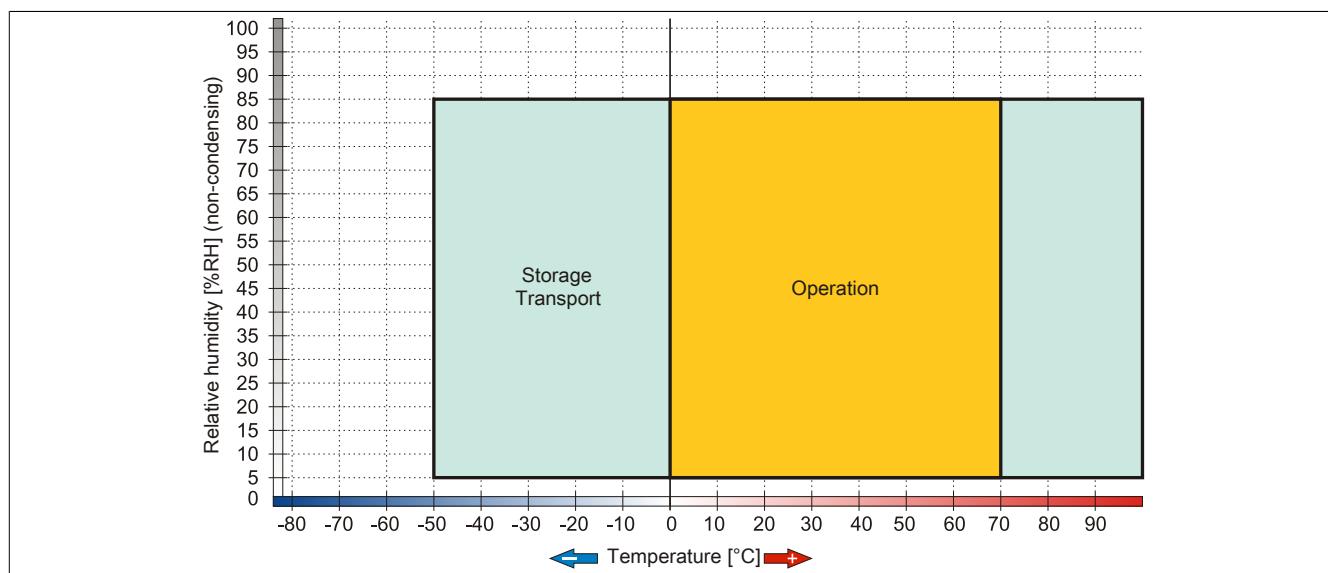


Figure 61: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

4 Cables

4.1 SDL3 cables

4.1.1 5CASD3.xxxx-00

4.1.1.1 General information

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

Caution!

Power must be disconnected before connecting or disconnecting cables.

4.1.1.2 Order data

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

Table 79: 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00,
5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Order data

4.1.1.3 Technical data

Product ID	5CASD3.0050-00	5CASD3.0100-00	5CASD3.0150-00	5CASD3.0200-00	5CASD3.0300-00	5CASD3.0500-00	5CASD3.1000-00
General information							
Certification					Yes		
CE					Yes		
cULus							
Cable construction							
Wire cross section		4x 2x 26/7 AWG			4x 2x 23/1 AWG		
Features					Flame-resistant, halogen-free, lead-free		
Outer sheathing							
Material				Polyurethane (PUR)			
Color				Yellow, RAL 1021			
Labeling			HARTING INDUSTRIAL CABLE S/FTP CAT 6A PUR 4x 2x 26/7 AWG			HARTING INDUSTRIAL INSTALLATION CABLE S/FTP CAT 7 PUR 4x 2x 23/1 AWG	
Lines							
Wire insulation				Polyethylene (PE)			
Wire colors		Green/White-green, orange/white-orange, blue/white-blue, brown/white-brown			Green/white-green, orange/white-orange, blue/white-blue, brown/white-brown	Green/White-green, orange/white-orange, blue/white-blue, brown/white-brown	
Shield				Aluminum foil and braided wire shield made of tinned copper wires			
Type			Unprotected copper wire, 4x 2x 26/7 AWG		Unprotected copper wire, 4x 2x 23/1 AWG		
Connector							
Type				2x RJ45, male			
Connection cycles				Min. 750			
Contacts				8			
Electrical characteristics¹⁾							
Operating voltage			≤100 V		≤125 V		
Conductor resistance			≤290 Ω/km		≤75 Ω/km		
Wave impedance			100 ±5 Ω (at 100 MHz)				
Transfer properties		Category 6A / Class EA up to 500 MHz in accordance with ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)			Category 7 / Class F up to 600 MHz in accordance with ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)		
Insulation resistance			≥ 500 MΩ/km		≥ 5 GΩ/km		
Operating conditions							
Flame-retardant				IEC 60332-1-2			
Oil and hydrolysis resistance				EN 60811-2-1 (90°C / 7x24 h)			

Table 80: 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00,
5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

Product ID	5CASD3. 0050-00	5CASD3. 0100-00	5CASD3. 0150-00	5CASD3. 0200-00	5CASD3. 0300-00	5CASD3. 0500-00	5CASD3. 1000-00
EN 60529 protection Cables RJ45 connector				IP20	IP20, only when connected properly		
Environmental conditions							
Temperature							
Storage				-40 to 70°C			
Fixed installation				-40 to 70°C			
Flexible installation		-40 to 70°C				-10 to 50°C	
Mechanical characteristics							
Dimensions							
Length	5 m		10 m		15 m		20 m
Diameter			6.7 mm				8.3 mm
Flex radius							
Fixed installation			≥5x diameter				≥4x diameter
Flexible installation			≥10x diameter				≥8x diameter
Weight	250 g		500 g		700 g		950 g
Tension			≤70 N				≤110 N
During operation			≤70 N				≤110 N
During installation							

Table 80: 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00,
5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

1) At an ambient temperature of 20°C.

4.1.1.4 Flex radius specifications

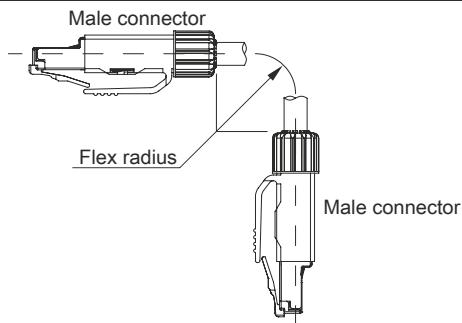


Figure 62: SDL3 - Flex radius specifications

4.1.1.5 Dimensions

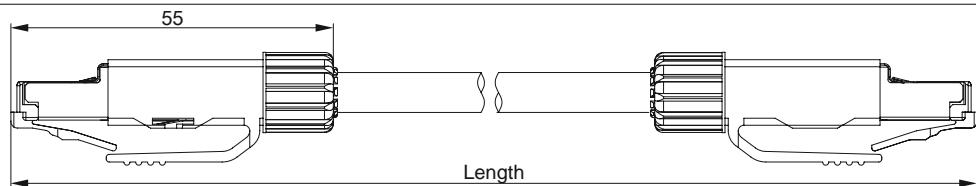


Figure 63: 5CASD3.xxxx-00 - Dimensions

4.1.1.6 Cable pinout

Warning!

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

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

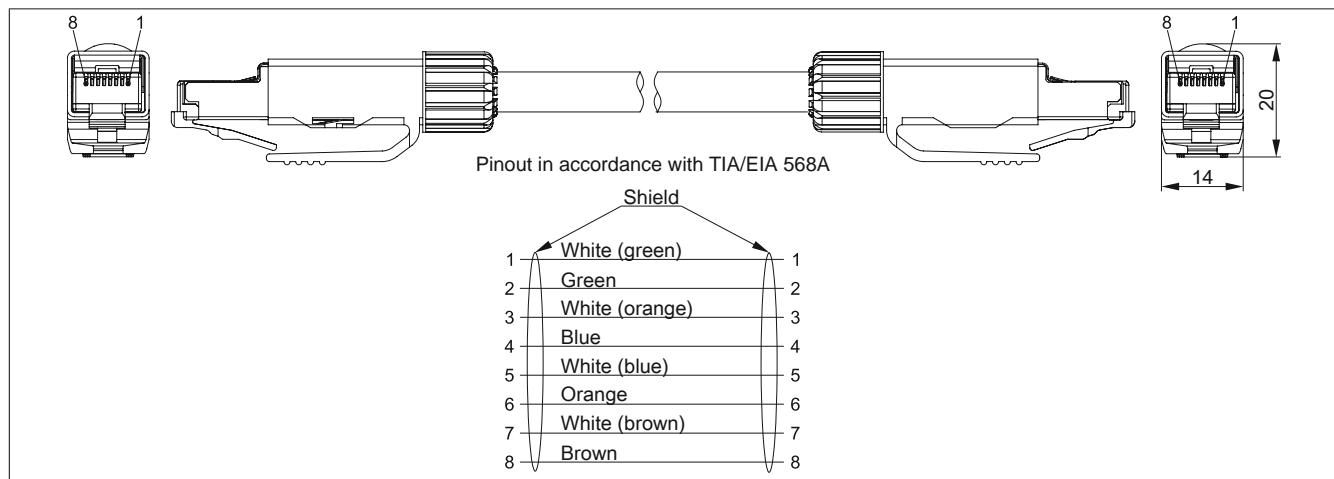


Figure 64: 5C ASD3.xxxx-00 - Pinout

4.1.1.7 Cabling

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

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

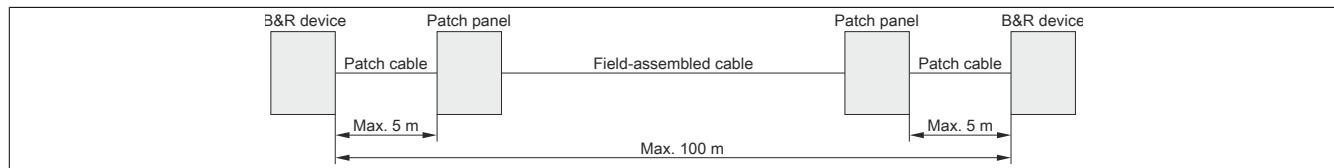


Figure 65: Cabling with a field-assembled cable

4.2 SDL cables

4.2.1 5CASDL.0xxx-00

4.2.1.1 General information

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

Caution!

Power must be disconnected before connecting or disconnecting cables.

4.2.1.2 Order data

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

Table 81: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Order data

4.2.1.3 Technical data

Product ID	5CASDL.0008-00	5CASDL.0018-00	5CASDL.0050-00	5CASDL.0100-00	5CASDL.0150-00	5CASDL.0200-00	5CASDL.0250-00	5CASDL.0300-00					
General information													
Certification					Yes								
CE					Yes								
cULus													
GOST-R	-				Yes								
GL					Yes ¹⁾								
Cable construction													
Wire cross section	AWG 28			AWG 24									
Shield	Individual cable pairs, entire cable												
Complete shielding	Tinned copper braiding, optical coverage >85%												
Outer sheathing													
Material	PVC												
Color	Black												
Labeling	E74020-C (UL) AWM STYLE 20176 80°C 30V VW-1 DVI DIGITAL LINK												
Connector													
Type	2x DVI-D (24+1), male												
Connection cycles	100												
Contacts	Gold-plated												
Mechanical protection	Metal cover with crimped stress relief												
Locating screw tightening torque	Max. 0.5 Nm												
Electrical characteristics													
Conductor resistance													
AWG 24	-												
AWG 28	$\leq 237 \Omega/\text{km}$												
Insulation resistance	Min. 10 MΩ/km												
Mechanical characteristics													
Dimensions													
Length	0.8 m ±25 mm	1.8 m ±30 mm	5 m ±30 mm	10 m ±50 mm	15 m ±100 mm	20 m ±100 mm	25 m ±100 mm	30 m ±100 mm					
Diameter	Typ. 8.6 ±0.2 mm Max. 9 mm												
Flex radius	$\geq 5 \times$ cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)												
Flexibility	Limited flexibility, valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles/minute)												
Weight	Approx. 206 g	Approx. 300 g	Approx. 580 g	Approx. 1500 g	Approx. 2250 g	Approx. 2880 g	Approx. 4800 g	Approx. 5520 g					

Table 82: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Technical data

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

4.2.1.4 Flex radius specifications

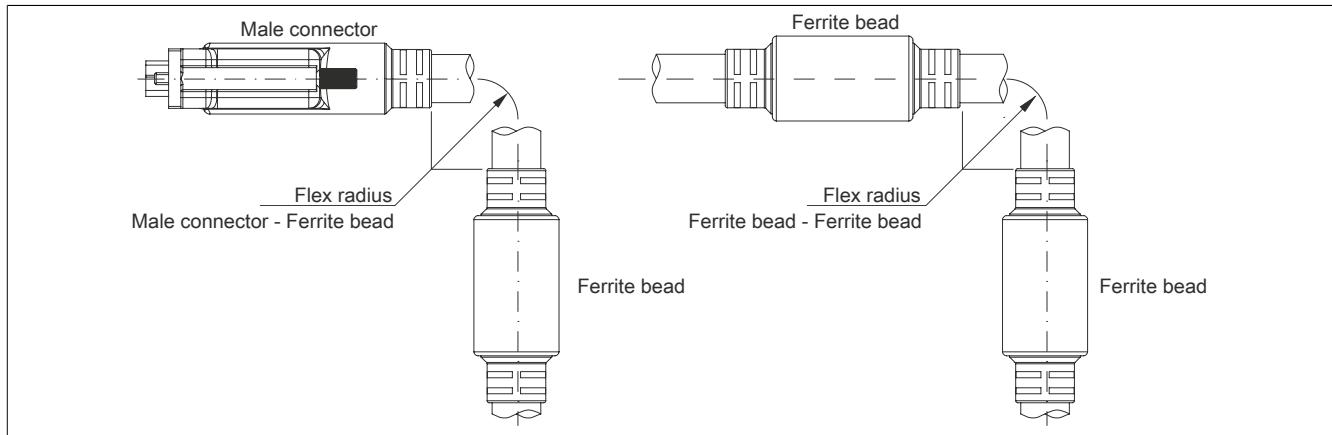


Figure 66: Flex radius specifications

4.2.1.5 Dimensions

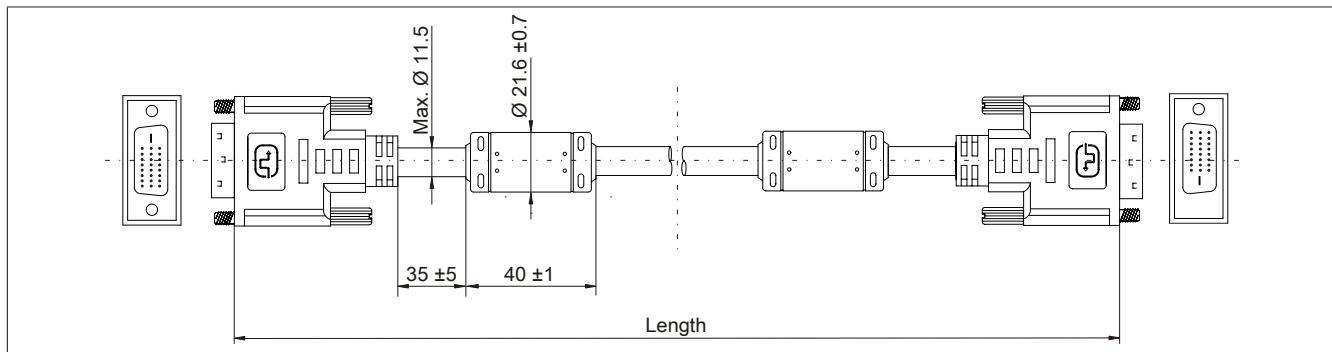


Figure 67: 5CSDL.0xxx-00- Dimensions

4.2.1.6 Cable pinout

Warning!

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

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

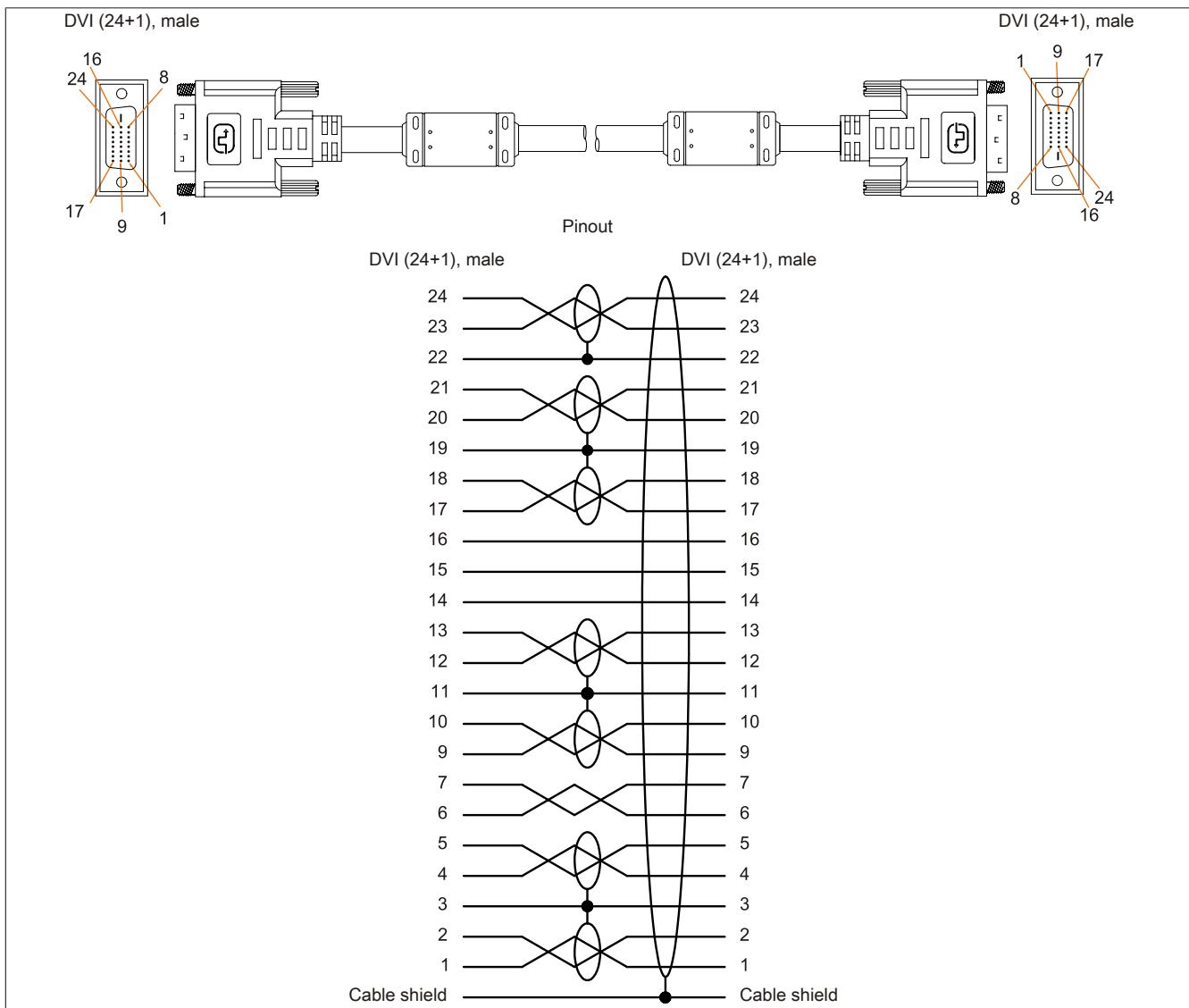


Figure 68: 5CASDL.0xxx-00 - Pinout

4.3 DVI cables

4.3.1 5CADVI.0xxx-00

4.3.1.1 General information

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

Caution!

Power must be disconnected before connecting or disconnecting cables.

4.3.1.2 Order data

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

Table 83: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data

4.3.1.3 Technical data

Product ID	5CADVI.0018-00	5CADVI.0050-00	5CADVI.0100-00
General information			
Certification			
CE		Yes	
cULus		Yes	
GOST-R		Yes	
GL		Yes ¹⁾	
Cable construction			
Wire cross section		AWG 28	
Shield		Individual cable pairs, entire cable	
Complete shielding		Tinned copper braiding, optical coverage >86%	
Outer sheathing			
Material		PVC	
Color		Beige	
Labeling		AWM STYLE 20276 80°C 30V VW1 DVI DIGITAL SINGLE LINK DER AN	
Connector			
Type		2x DVI-D (18+1), male	
Connection cycles		100	
Locating screw tightening torque		Max. 0.5 Nm	
Electrical characteristics			
Conductor resistance		Max. 237 Ω/km	
Insulation resistance		Min. 100 MΩ/km	
Mechanical characteristics			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter		Max. 8.5 mm	
Flex radius	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)		
Weight	Approx. 260 g	Approx. 460 g	Approx. 790 g

Table 84: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Technical data

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

4.3.1.4 Flex radius specifications

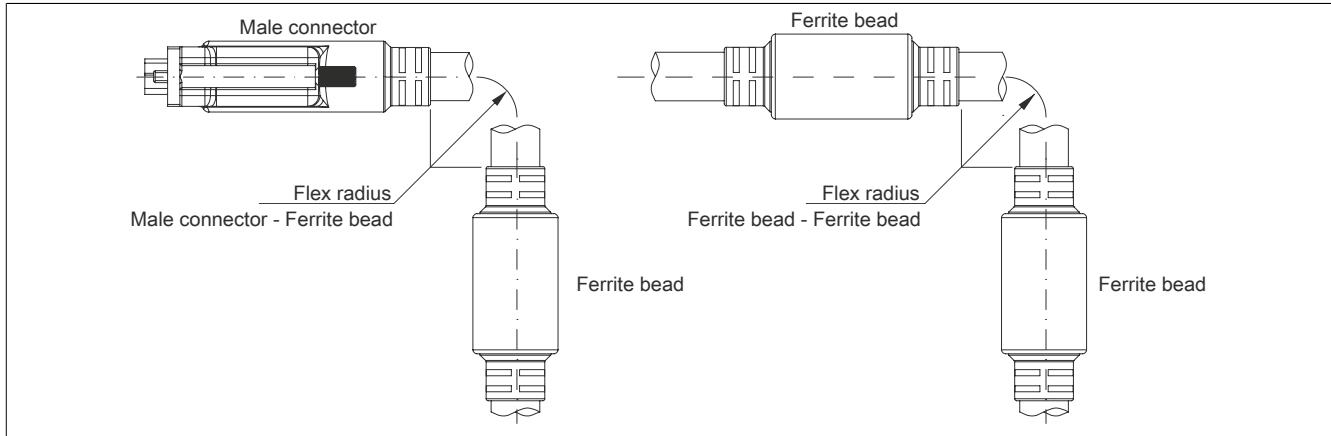


Figure 69: Flex radius specifications

4.3.1.5 Dimensions

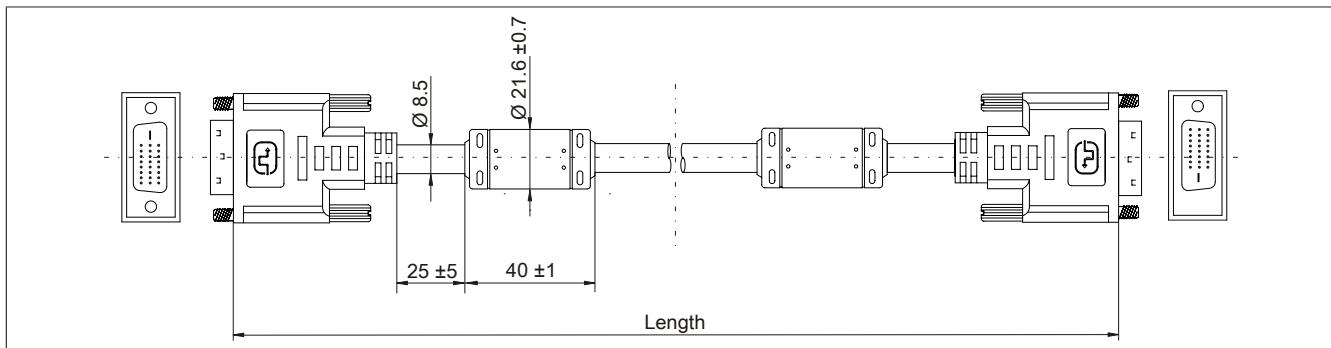


Figure 70: 5CADVI.0xxx-00 - Dimensions

4.3.1.6 Cable pinout

Warning!

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

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

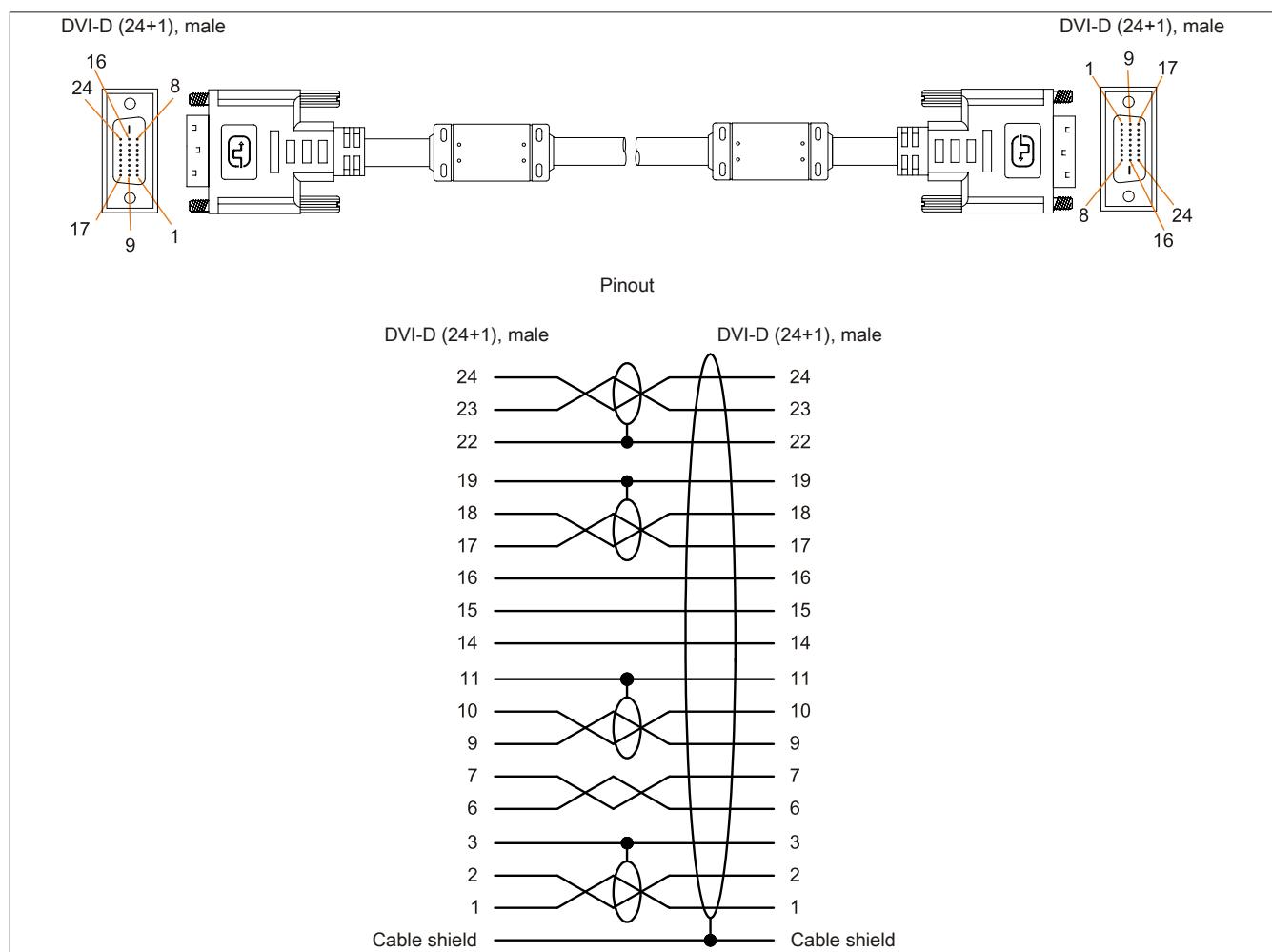


Figure 71: 5CADVI.0xxx-00 - Pinout

4.4 RS232 cables

4.4.1 9A0014.xx

4.4.1.1 General information

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

4.4.1.2 Order data

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

Table 85: 9A0014.02, 9A0014.05, 9A0014.10 - Order data

4.4.1.3 Technical data

Product ID	9A0014.02	9A0014.05	9A0014.10
General information			
Certification			
CE		Yes	
GOST-R	-		Yes
Cable construction			
Wire cross section		AWG 26	
Shield		Entire cable	
Outer sheathing			
Color		Beige	
Connector			
Type		9-pin male/female DSUB connector	
Locating screw tightening torque		Max. 0.5 Nm	
Mechanical characteristics			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter		Max. 5 mm	
Flex radius		Min. 70 mm	

Table 86: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data

4.4.1.4 Cable pinout

Warning!

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

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

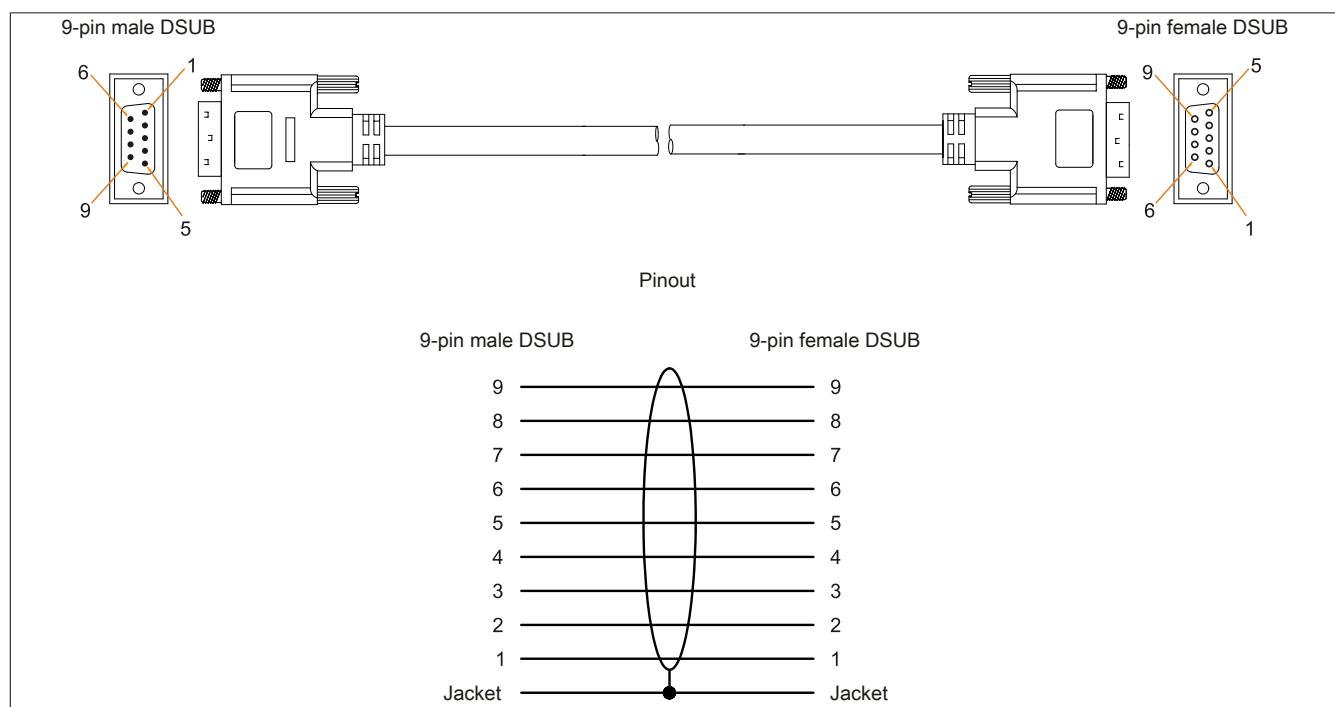


Figure 72: 9A0014.xx RS232 cables - Pinout

4.5 USB cables

4.5.1 5CAUSB.00xx-00

4.5.1.1 General information

USB cables are designed to achieve USB 2.0 transfer speeds.

4.5.1.2 Order data

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

Table 87: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data

4.5.1.3 Technical data

Product ID	5CAUSB.0018-00	5CAUSB.0050-00
General information		
Certification		
CE	Yes	
cULus	Yes	
GOST-R	Yes	
GL	Yes	
Cable construction		
Wire cross section	AWG 24, 28	
Shield	Entire cable	
Outer sheathing Color	Beige	
Connector		
Type	USB type A male and USB type B male	
Mechanical characteristics		
Dimensions		
Length	1.8 m ±30 mm	5 m ±50 mm
Diameter	Max. 5 mm	
Flex radius	Min. 100 mm	

Table 88: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data

4.5.1.4 Cable pinout

Warning!

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

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

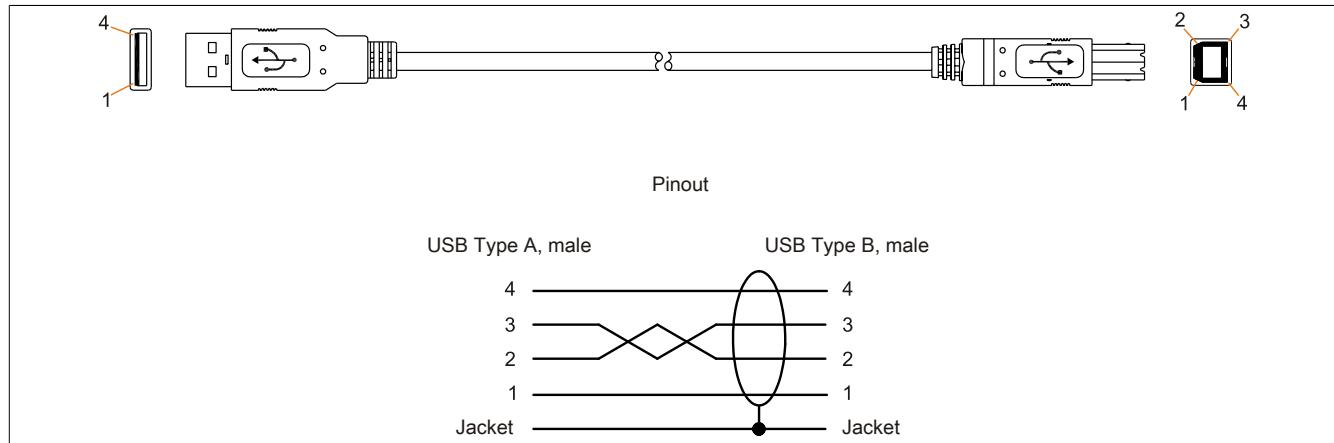


Figure 73: 5CAUSB.00xx-00 USB cables - Pinout

Chapter 7 • Maintenance and service

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

1 Cleaning

Danger!

This device must be switched off before cleaning in order to prevent unintended functions from being triggered when handling the touch screen or pressing keys.

This device should be cleaned with a moist cloth. The cloth should be moistened with water and detergent, a screen cleaning agent or alcohol (ethanol). The cleaning agent should be applied to the cloth beforehand, not sprayed directly on the device! Aggressive solvents, chemicals, scouring agents, pressurized air or steam jets should never be used.

Information:

Displays with a touch screen should be cleaned regularly.

2 Tips for extending the service life of the display

2.1 Backlight

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

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

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

2.2 Screen burn-in

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

There are basically two types:

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

2.2.1 What causes screen burn-in?

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

2.2.2 How can screen burn-in be avoided?

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

3 Pixel errors

Information:

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

Appendix A

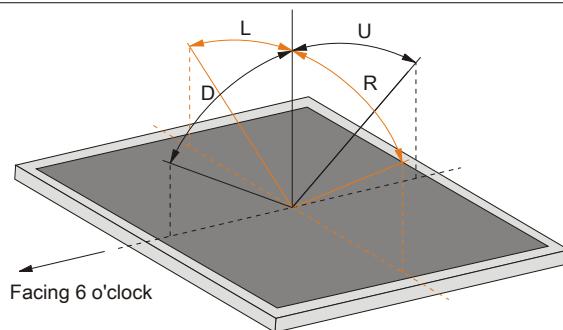
1 Abbreviations

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

Table 89: Abbreviations in this user's manual

2 Viewing angles

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



3 Chemical resistance

Single-touch display units feature the Autotex panel overlay starting with the following revision number:

- 5AP92D.1505-00 and 5AP92D.1505-01 ≥ Revision B0
- 5AP92D.1906-00 and 5AP92D.1906-01 ≥ Revision B0

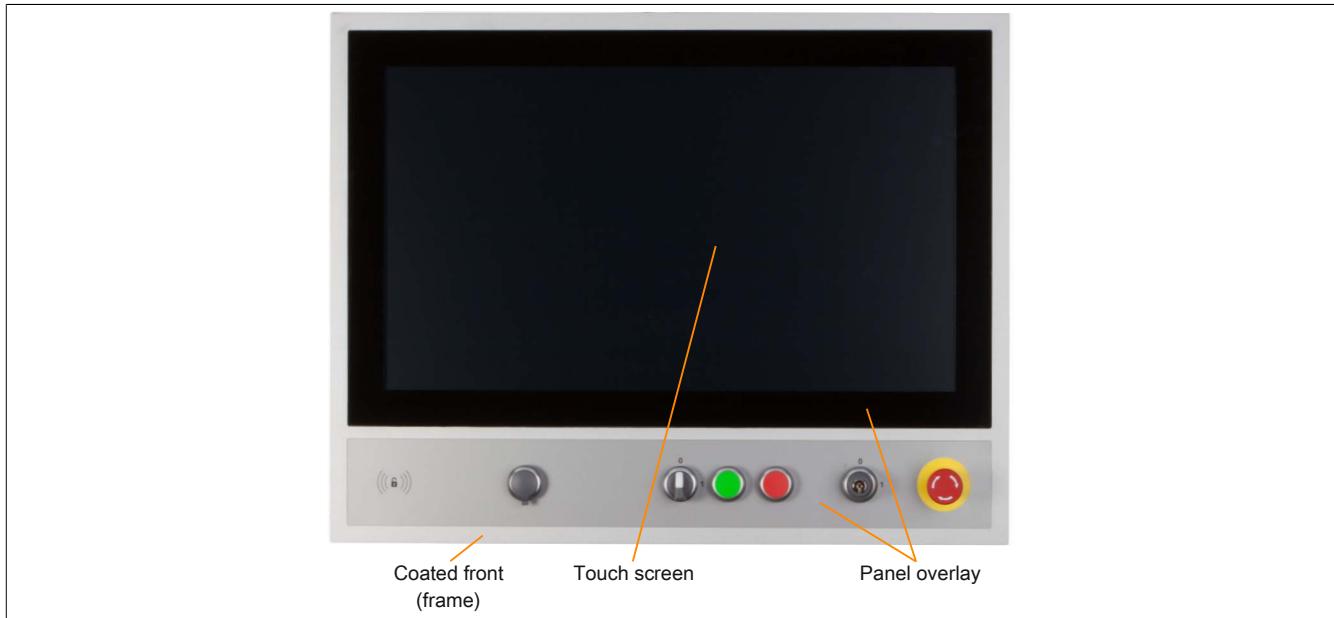


Figure 74: Single-touch display unit with Autotex panel overlay

Single-touch display units < Revision B0 featured the aluminum panel overlay.

Multi-touch display units feature an edge-to-edge glass surface.

3.1 Autotex panel overlay (polyester)

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

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

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

3.2 Aluminum panel overlay

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

- Acetaldehyde
- Acetone
- Acetonitrile
- Alkali carbonate
- Alkane
- Formic acid <50%
- Ammonia <40%
- Amyl acetate
- Gasoline
- Bichromate
- Brake fluid
- Castor oil
- Hydrochloric acid <36%
- Cyclohexanol
- Cyclohexanone
- Decon
- Diacetone alcohol
- Diesel
- Diethyl ether
- Diethyl phthalate
- Dimethylbenzene
- Dioxan
- Dowandol
- DRM/PM
- Iron chloride
- Iron chloride (FeCl₂)
- Iron chloride (FeCl₃)
- Acetic acid <50%
- Butyl acetate
- Ethanol
- Ether
- Ethyl acetate
- 2-Butoxyethanol
- Aviation fuel
- Formaldehyde 37 to 42%
- Transmission fluid
- 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

3.3 Coated aluminum front

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

- Formic acid <50%
- Ammonia <40%
- Brake fluid
- Hydrochloric acid <10%
- Diesel
- Acetic acid <50%
- Transmission fluid
- 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

3.4 Touch screen

AMT touch screen (single-touch)

Unless otherwise specified, the AMT touch screen is resistant to exposure to the following chemicals for a 1-hour period (at 25°C) with no visible signs of damage:

- Acetone
- Ammonia-based glass cleaner
- Beer
- Unleaded gasoline
- Chemical cleaning agents
- Hydrochloric acid <6%
- Coca-Cola
- Diesel
- Dimethylbenzene
- Vinegar
- Ethanol
- Antifreeze
- Transmission fluid
- Household cleaning agents
- Hexane
- n-hexane
- Isopropanol
- Coffee
- Methylbenzene
- Methylene chloride
- Methyl ethyl ketone
- Mineral spirits
- Motor oil
- Nitric acid <70%
- Salt solution <5% tea
- Turpentine
- Grease
- Sulphuric acid <40%
- Cooking oil

3M touch screen (multi-touch)

Unless otherwise specified, the 3M touch screen conforms to ASTM D 1308-02 and ASTM F 1598-95. This means it is resistant to exposure to the following chemicals for a 24-hour period with no visible signs of damage:

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

4 Features

4.1 RFID read/write transponder unit

RFID read/write transponder unit	
Vendor ID	0x1FC9
Frequency	13.56 MHz
Transponder read/write unit	For I-Code SLI transponder, amplitude modulation and MIFARE Classic
Quantity	1
Standard	ISO 15693, MIFARE Classic
Read/Write range in air	Approx. 1 cm
Supply voltage	5 VDC +20% (via USB)
Evaluation	Via USB



Table 90: RFID read/write transponder unit

The following transponder tags can be used with this RFID transponder:

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

4.2 Pushbutton RAFIX 22 FS+, 1.30.270.021/2300

Pushbutton /2300	
Manufacturer	RAFI
Type	RAFIX 22 FS+
Manufacturer number	1.30.270.021/2300
Quantity	1
Illumination	Red
Contact function	Momentary
Lifespan	1,000,000
B10 value	1,300,000



Table 91: Pushbutton /2300

4.3 Pushbutton RAFIX 22 FS+, 1.30.270.021/2500

Pushbutton /2500	
Manufacturer	RAFI
Type	RAFIX 22 FS+
Manufacturer number	1.30.270.021/2500
Quantity	1
Illumination	Green
Contact function	Momentary
Lifespan	1,000,000
B10 value	1,300,000



Table 92: Pushbutton /2500

4.4 Selector switch RAFIX 22 FS+, 1.30.272.102/2200

Selector switch 1.30.272.102/2200	
Manufacturer	RAFI
Type	RAFIX 22 FS+
Manufacturer number	1.30.272.102/2200
Quantity	1
Illumination	White
Contact function	Maintained
Angle of rotation	1 x 90°, L form
Lifespan	300,000
B10 value	400,000



Table 93: Selector switch 1.30.272.102/2200

4.5 Key switch RAFIX 22 FS+, 1.30.255.222/0000

Key switch 1.30.255.222/0000	
Manufacturer	RAFI
Type	RAFIX 22 FS+
Manufacturer number	1.30.255.222/0000
Quantity	1
Contact function	Maintained
Number of possible closings	500
Angle of rotation	1 x 90°, L form
Key removal position	0+1
Lifespan	50,000 maintained / 30,000 key removal switching cycles
B10 value	65,000 maintained / 40,000 key removal switching cycles



Table 94: Key switch 1.30.255.222/0000

4.6 E-stop RAFIX 22 FS+ "Plus 1", 1.30.273.502/0300

E-stop 1.30.273.502/0300	
Manufacturer	RAFI
Type	RAFIX 22 FS+ E-stop button "Plus 1"
Manufacturer number	1.30.273.502/0300
Quantity	1
Contact function	Maintained
Resetting	By rotating to the right
Service life	50,000
B10 value	65,000



Table 95: E-stop 1.30.273.502/0300

4.7 Switching element RAFIX 22 FS universal, 1.20.126.005/0000

The switching element is used for the pushbuttons, the selector switch and the key switch.

Switching element 1.20.126.005/0000	
Manufacturer	RAFI
Type	RAFIX 22 FS+ - universal, 2 S
Manufacturer number	1.20.126.005/0000
Quantity	1
Contact system	Self-cleaning bridge contact
Contacts	2 normally open contacts
Normally closed contact positive opening operation in accordance with IEC 947-5-1	Yes
Lifespan	1,000,000 at 10 mA / 24 VDC
B10 value	1,300,000
Min. AC/DC operating voltage	5 V



Table 96: Switching element 1.20.126.005/0000

Switching element 1.20.126.005/0000	
Max. AC/DC operating voltage	35 V
Min. AC/DC operating current	1 mA
Max. AC/DC operating current	100 mA
Max. switching capacity	250 mW

Table 96: Switching element 1.20.126.005/0000

4.8 Switching element RAFIX 22 FS+ PCB gold, 1.20.126.414/0000

The switching element is used for the E-stop.

Switching element 1.20.126.414/0000	
Manufacturer	RAFI
Type	RAFIX 22 FS+ - PCB gold, E-stop "Plus 1"
Manufacturer number	1.20.126.414/0000
Quantity	1
Contact system	Self-cleaning bridge contact
Contacts	2 normally closed contacts + 1 alarm contact*
Normally closed contact positive separating operation in accordance with IEC 60947-5-1	Yes
Lifespan	50,000 at 10 mA / 24 VDC
B10 value	65,000
Min. AC/DC operating voltage	5 V
Max. AC/DC operating voltage	35 V
Min. AC/DC operating current	1 mA
Max. AC/DC operating current	100 mA
Max. switching capacity	250 mW



Table 97: Switching element 1.20.126.414/0000

5 Touch screen

5.1 5-wire AMT touch screen (single-touch)

5.1.1 Technical data

Information:

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

Product ID	5-wire AMT touch screen
General information	
Certification	
CE	Yes
c-UL-us	Yes
Manufacturer	AMT
Technology	Analog, resistive
Release pressure	<1 N
Light permeability	81% ±3%
Environmental 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
Operating conditions	
Service life	36 million touch operations at the same position (release pressure: 250 g, interval: 2x per second)
Activation	Finger, pointer, credit card, glove
Drivers	Touch screen drivers for approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Table 98: 5-wire AMT touch screen - Technical data

5.1.2 Temperature/Humidity diagram

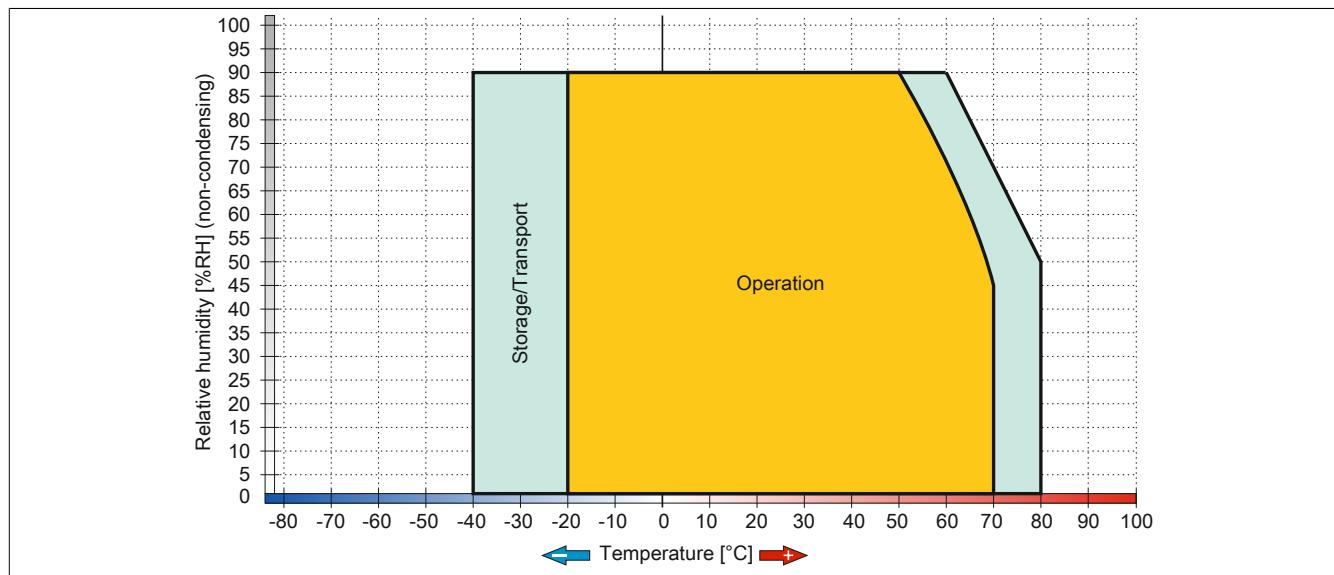


Figure 75: 5-wire AMT touch screen - Temperature/Humidity diagram

5.2 3M touch screen (multi-touch)

5.2.1 Technical data

Information:

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

Product ID	3M touch screen
General information	
Certification CE	Yes
Manufacturer	3M
Technology	Projected capacitive touch (PCT)
Light permeability	88 ±2%
Environmental 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
Operating conditions	
Activation	Finger, thin glove, 3M Smart Pen

Table 99: 3M touch screen - Technical data

5.2.2 Temperature/Humidity diagram

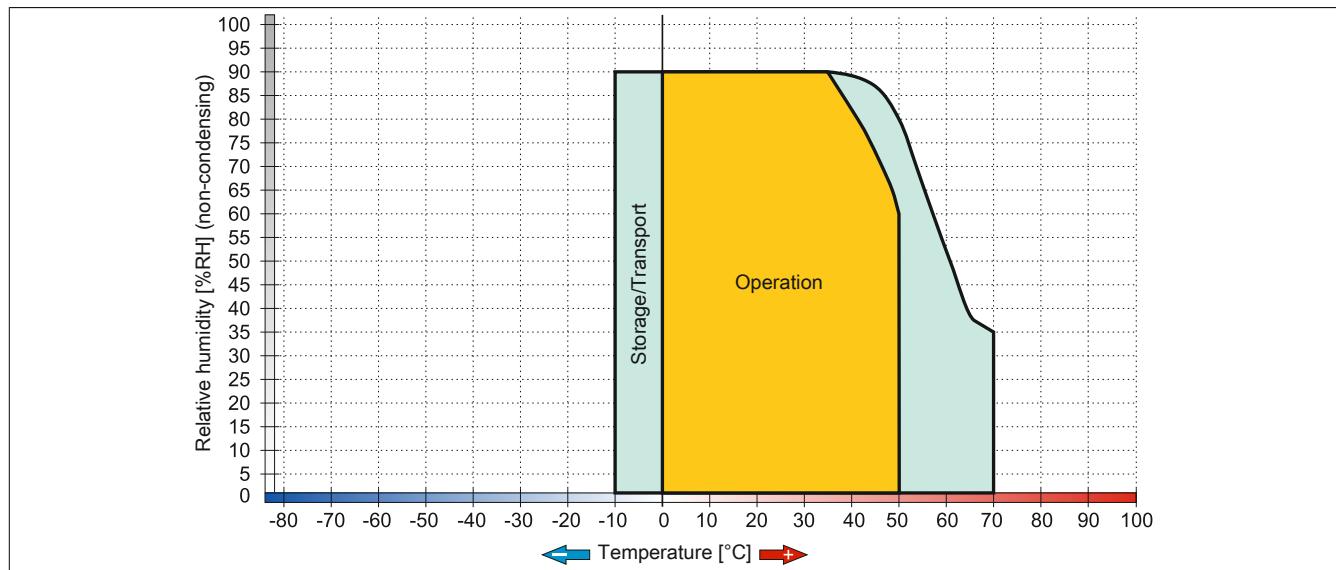


Figure 76: 3M touch screen - Temperature/Humidity diagram

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