Panel PC 2200 built-in devices

User's manual

Version: **1.05 (December 2018)**
Model no.: **MAPPC2200-ENG**

Translation of the original documentation

1 General information

Information:

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

1.1 Manual history

Version	Date	Change
1.00	November 2018	• First version
1.05	December 2018	Updated document.

1.2 Safety guidelines

1.2.1 Intended use

Programmable logic controllers, operating and monitoring devices (such as industrial PCs, Power Panels, Mobile Panels, etc.) as well as the uninterruptible power supply from B&R have been designed, developed and manufactured for normal use in industry. They have not been designed, developed and manufactured for use that involves fatal risks or hazards that could result in death, injury, serious physical harm or other loss without the assurance of exceptionally stringent safety precautions. In particular, this includes the use of these systems to monitor nuclear reactions in nuclear power plants, flight control systems, air traffic control, the control of mass transport vehicles, medical life support systems and the control of weapon systems.

1.2.2 Protection against electrostatic discharge

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

1.2.2.1 Packaging

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

1.2.2.2 Regulations for proper ESD handling

Electrical assemblies with housing

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

Electrical assemblies without housing

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

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

Individual components

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

1.2.3 Regulations and measures

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

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

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

1.2.4 Transport and storage

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

1.2.5 Installation

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

1.2.6 Operation

1.2.6.1 Protection against contact with electrical parts

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

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

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

1.2.6.2 Ambient conditions - Dust, moisture, aggressive gases

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

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

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

1.2.6.3 Programs, viruses and malicious programs

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

1.2.7 Environmentally friendly disposal

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

1.2.7.1 Separation of materials

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

Component	Disposal
Programmable logic controllers Operating and monitoring devices Uninterruptible power supply Batteries and accumulators Cables	Electronics recycling
Cardboard/Paper packaging	Paper/Cardboard recycling
Plastic packaging material	Plastics recycling

Table 1: Environmentally friendly disposal

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

1.2.8 Security concept

To secure plants, systems, machines and networks against cyber threats, it is required to implement (and continuously maintain) a holistic security concept that is state of the art. B&R products and solutions are only one component of such a concept.

The user is responsible for preventing unauthorized access to plants, systems, machines and networks. Systems, machines and components should only be connected to the corporate network or Internet if and only to the extent necessary and if appropriate protective measures (e.g. use of firewalls and network segmentation) have been taken.

B&R products and solutions are constantly being further developed to make them even more secure. B&R expressly recommends that updates be performed as soon as the corresponding updates are available and that only current product versions be used. Using outdated or no longer supported versions can increase the risk of cyber threats.

1.2.9 Third-party updates

This product includes third-party software (drivers, etc.). B&R only assumes warrants for updates/patches to third-party software if they have been officially released by B&R. Otherwise, updates/patches are performed at your own risk.

1.2.10 Administrator accounts

A user with administrator rights has extensive options for accessing and manipulating the system.

Therefore, make sure that administrator accounts are adequately secured in order to prevent unauthorized changes. To do this, use secure passwords and a standard user account for regular operation. Additional measures such as the use of security policies must be applied as needed.

1.3 Organization of notices

Safety notices

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

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

Table 2: Organization of safety notices

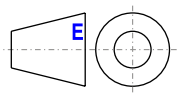
General notices

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

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

Table 3: Organization of general notices

1.4 Guidelines



European dimension standards apply to all dimension diagrams.

All dimensions in mm.

Unless otherwise specified, the following general tolerances apply:

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

Table 4: Nominal dimension ranges

1.5 Overview

Model number	Short description	Page
	Accessories	
5ACCBT01.0000-001	Battery compartment - Dark gray - Includes battery - For APC2200/PPC2200	207
5SWUTI.0001-000	HMI Service Center USB flash drive - Hardware diagnostic software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC2200/PPC2200 - For APC3100/PPC3100 - For APC51x/PP500 - For Automation Panel 800/900 - For Automation Panel 1000/5000	270
	B&R Linux 9	
5SWLIN.0745-MUL	B&R Linux 9 - 64-bit - Multilingual - PPC2200 - Installation (without Recovery DVD) - Only available with a new device	262
	CFast cards	
5CFAST.016G-00	CFast 16 GB SLC	146
5CFAST.032G-00	CFast 32 GB SLC	146
5CFAST.032G-10	CFast 32 GB MLC	150
5CFAST.064G-10	CFast 64 GB MLC	150
5CFAST.128G-10	CFast 128 GB MLC	150
5CFAST.2048-00	CFast 2 GB SLC	146
5CFAST.256G-10	CFast 256 GB MLC	150
5CFAST.4096-00	CFast 4 GB SLC	146
5CFAST.8192-00	CFast 8 GB SLC	146
	Interface options	
5ACCIF01.FPCC-000	Interface card - 2x CAN interfaces - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	153
5ACCIF01.FPCS-000	Interface card - 1x RS485 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	161
5ACCIF01.FPLK-000	Interface card - 1x POWERLINK interface - Integrated 2-port hub - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	168
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	173
5ACCIF01.FPLS-001	Interface card - 1x RS232 interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	178
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	183
5ACCIF01.FPSC-001	Interface card - 1x RS232 interface - 1x CAN interface - 1x X2X Link Interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	190
5ACCIF01.FSS0-000	Interface card - 2x RS422/RS485 interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	197
5ACCIF01.ICAN-000	Interface card - 1x CAN interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	202
5ACCIF03.CETH-000	Interface card - 2x ETH 10/100/1000 interface - For APC2200/PPC2200 - Only available with a new device	205
	Panels	
5AP1120.0573-000	Automation Panel 5.7" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC2100 / PPC2200 / link modules - Compatible with 5PP520.0573-00	89
5AP1120.0702-000	Automation Panel 7" WVGA TFT - 800 x 480 pixels (16:10) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC2100 / PPC2200 / link modules - Compatible with 5PP520.0702-00	95
5AP1120.101E-000	Automation Panel 10.1" WXGA TFT - 1280 x 800 pixels (16:10) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC2100 / PPC3100 / PPC2200 / link modules	99
5AP1120.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP520.1043-00	103
5AP1120.1214-000	Automation Panel 12.1" SVGA TFT - 800 x 600 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP520.1214-00	115
5AP1120.121E-000	Automation Panel 12.1" WXGA TFT - 1280 x 800 pixels (16:10) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC2100 / PPC3100 / PPC2200 / link modules	118
5AP1120.1505-000	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP520.1505-00, 5AP920.1505-01, 5PC720.1505-xx, 5PC820.1505-00	122
5AP1120.156B-000	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	131
5AP1120.1906-000	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5AP920.1906-01, 5PC720.1906-00, 5PC820.1906-00	138
5AP1130.0702-000	Automation Panel 7.0" WVGA TFT - 800 x 480 pixels (16:10) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC2100 / PPC2200 / link modules - Compatible with 5PP520.0702-00	97
5AP1130.101E-000	Automation Panel 10.1" WXGA TFT - 1280 x 800 pixels (16:10) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC2100 / PPC3100 / PPC2200 / link modules	101
5AP1130.121E-000	Automation Panel 12.1" WXGA TFT - 1280 x 800 pixels (16:10) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC2100 / PPC3100 / PPC2200 / link modules	120
5AP1130.156C-000	Automation Panel 15.6" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	133
5AP1130.185C-000	Automation Panel 18.5" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	136
5AP1151.0573-000	Automation Panel 5.7" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Portrait format - 22 function keys and 20 system keys - For PPC2100 / PPC2200 / link modules - Compatible with 5PP551.0573-00	92
5AP1180.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - 22 function keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP580.1043-00, 5AP980.1043-01	106

Model number	Short description	Page
5AP1180.1505-000	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP580.1505-00, 5AP980.1505-01	125
5AP1181.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Portrait format - Front USB - 38 function keys and 20 system keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP581.1043-00, 5AP981.1043-01, 5PC781.1043-00	109
5AP1181.1505-000	Automation Panel 15" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - 32 function keys and 92 system keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP581.1505-000	128
5AP1182.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - 44 function keys and 20 system keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP582.1043-00, 5AP982.1043-01, 5PC782.1043-00	112
5AP923.1215-00	Automation Panel 12.1" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	69
5AP923.1505-00	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	71
5AP923.1906-00	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	74
5AP933.156B-00	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	77
5AP933.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	80
5AP933.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	83
5AP933.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	86
	System units	
5PPC2200.AL02-000	PPC2200 system unit - Intel Atom E3930 1.30 GHz - Dual core - 2 GB SDRAM	141
5PPC2200.AL04-000	PPC2200 system unit - Intel Atom E3930 1.30 GHz - Dual core - 4 GB SDRAM	141
5PPC2200.AL14-000	PPC2200 system unit - Intel Atom E3940 1.60 GHz - Quad core - 4 GB SDRAM	141
5PPC2200.AL18-000	PPC2200 system unit - Intel Atom E3940 1.60 GHz - Quad core - 8 GB SDRAM	141
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	275
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	275
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	276
	USB accessories	
5MMUSB.032G-02	USB 3.0 flash drive 32 GB MLC	280
5MMUSB.2048-01	USB 2.0 flash drive 2048 MB B&R	277
5MMUSB.4096-01	USB 2.0 flash drive 4096 MB B&R	277
	Windows 10 IoT Enterprise	
5SWW10.0545-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Entry - Multilingual - PPC2200 (UEFI boot) - Processor E3930/E3940 - License (without Recovery DVD) - Only available with a new device	259

2 Technical data

2.1 Introduction

2.1.1 Information about this user's manual

This user's manual contains all the necessary information for a functioning Panel PC 2200 built-in device.

2.1.2 Description of individual modules

2.1.2.1 AP9x3 panels

AP9x3 panels form the basis for the Automation Panel 9x3, Panel PC 900, Panel PC 2100, Panel PC 2200 and Panel PC 3100 system families. They consist of a display and touch screen. Different display diagonals and touch screen technologies are available. The panels can only be operated as a complete system in combination with a link module (Automation Panel 9x3) or CPU board and system unit (Panel PC 900, Panel PC 2100, Panel PC 2200, Panel PC 3100). The panels are installed using retaining clips.
Single-touch panels start with model number 5AP923.xxxx-xx; multi-touch panels start with model number 5AP933.xxxx-xx.

2.1.2.2 AP1000 panels

AP1000 panels form the basis for the Automation Panel 1000, Panel PC 900, Panel PC 2100, Panel PC 2200 and Panel PC 3100 system families. Different display diagonals and touch screen technologies as well as panels with touch screen and keys are available. Panels can only be operated as a complete system in combination with a link module (Automation Panel 1000) or CPU board and system unit (Panel PC 900, Panel PC 2100, Panel PC 2200, Panel PC 3100). The panels are installed using retaining clips or clamping blocks.

2.1.2.3 System units

System units consist of the CPU board and an aluminum housing. All interfaces and the main memory of the PPC2200 are integrated on the system units. An interface option and CFast card can also be connected. The main memory modules are permanently installed on the system unit and cannot be replaced.

If a system unit is installed on a panel, this results in a functional Panel PC 2200.

A system unit without a panel is not functional.

2.1.2.3.1 Features

- Intel Atom X processor series (Apollo Lake)
- Up to quad-core CPU performance
- Powerful graphics (Intel HD graphics)
- Compact dimensions
- 2x Gigabit Ethernet
- 2x USB 3.0
- 1x CFast slot
- 1x interface option slot
- Fanless operation
- Real time clock, RTC (battery-backed)
- TPM 2.0 security

2.1.3 Design/Configuration

It is possible to configure the Automation Panel 9x3, Automation Panel 1000 and Panel PC 2200 system individually according to the operating conditions and requirements. The Automation Panel 9x3, Automation Panel 1000 or Panel PC 2200 system is so flexible that an Automation Panel can be converted to a Panel PC or a Panel PC to an Automation Panel.

2.1.3.1 Configuration

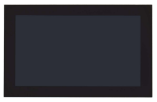
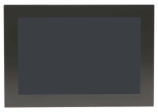
The following individual components are mandatory for operation as a Panel PC 2200:

- Panel
- System unit
- CFast card for the operating system
- Operating system

Base system - Configuration

Panels — Select 1




	Diagonal	Resolution	Touch screen	Keys	Format
923 panels					
5AP923.1215-00	12.1"	XGA	Single-touch	No	Landscape
5AP923.1505-00	15.0"	XGA	Single-touch	No	Landscape
5AP923.1906-00	19.0"	SXGA	Single-touch	No	Landscape
933 panels					
5AP933.156B-00	15.6"	HD	Multi-touch	No	Landscape
5AP933.185B-00	18.5"	HD	Multi-touch	No	Landscape
5AP933.215C-00	21.5"	FHD	Multi-touch	No	Landscape
5AP933.240C-00	24.0"	FHD	Multi-touch	No	Landscape
1120 panels					
5AP1120.0573-000	5.7"	VGA	Single-touch	No	Landscape
5AP1120.0702-000	7.0"	WVGA	Single-touch	No	Landscape
5AP1120.101E-000	10.1"	WXGA	Single-touch	No	Landscape
5AP1120.1043-000	10.4"	VGA	Single-touch	No	Landscape
5AP1120.1214-000	12.1"	SVGA	Single-touch	No	Landscape
5AP1120.121E-000	12.1"	WXGA	Single-touch	No	Landscape
5AP1120.1505-000	15.0"	XGA	Single-touch	No	Landscape
5AP1120.156B-000	15.6"	HD	Single-touch	No	Landscape
5AP1120.1906-000	19.0"	SXGA	Single-touch	No	Landscape
1130 panels					
5AP1130.0702-000	7.0"	WVGA	Multi-touch	No	Landscape
5AP1130.101E-000	10.1"	WXGA	Multi-touch	No	Landscape
5AP1130.121E-000	12.1"	WXGA	Multi-touch	No	Landscape
5AP1130.156C-000	15.6"	FHD	Multi-touch	No	Landscape
5AP1130.185C-000	18.5"	FHD	Multi-touch	No	Landscape
1151 panels					
5AP1151.0573-000	5.7"	VGA	No	Yes	Portrait
1180 panels					
5AP1180.1043-000	10.4"	VGA	Single-touch	Yes	Landscape
5AP1180.1505-000	15.0"	XGA	Single-touch	Yes	Landscape
1181 panels					
5AP1181.1043-000	10.4"	VGA	Single-touch	Yes	Portrait
5AP1181.1505-000	15.0"	XGA	Single-touch	Yes	Landscape
1182 panels					
5AP1182.1043-000	10.4"	VGA	Single-touch	Yes	Landscape

System units — Select 1

System unit	Processor	Processor - Clock frequency	Cores	Main memory type	Main memory size
5PPC2200.AL02-000	Intel Atom x5-E3930	1300 MHz	2	LPDDR4 SDRAM	2 GB
5PPC2200.AL04-000	Intel Atom x5-E3930	1300 MHz	2	LPDDR4 SDRAM	4 GB
5PPC2200.AL14-000	Intel Atom x5-E3940	1600 MHz	4	LPDDR4 SDRAM	4 GB
5PPC2200.AL18-000	Intel Atom x5-E3940	1600 MHz	4	LPDDR4 SDRAM	8 GB

Mass storage devices

CFast cards — Select 1

5CFAST.2048-00 5CFAST.4096-00 5CFAST.8192-00 5CFAST.016G-00 5CFAST.032G-00	5CFAST.032G-10 5CFAST.064G-10 5CFAST.128G-10 5CFAST-256G-10

Interfaces

Battery compartment — Selected automatically[1)]

5ACCBT01.0000-001

Table 5: PPC2200 configuration - Base system

1) The battery compartment is selected automatically.

Accessories and software - Configuration			
Interfaces			
	**Interface options**		Optional, select 1
	5ACCIF01.FPCC-000 5ACCIF01.FPLS-000 5ACCIF01.FPSC-000 5ACCIF01.FPCS-000 5ACCIF01.ICAN-000	5ACCIF01.FPLK-000 5ACCIF01.FPLS-001 5ACCIF01.FPSC-001 5ACCIF03.CETH-000	
Accessories			Optional selection
	5MMUSB.2048-01 5MMUSB.4096-01 5MMUSB.032G-02		
Terminal blocks			Select 1
	**Power supply connectors** 0TB103.9 0TB103.91		
	Terminal block for IF option 0TB1210.3100		
Operating systems			Select 1
Windows 10 Linux	**Windows 10** 5SWW10.0545-MUL	**B&R Linux 9** 5SWLIN.0745-MUL	

Table 6: PPC2200 configuration - Accessories and software

2.2 Complete system

2.2.1 Mechanical properties

2.2.1.1 Dimensions

AP9x3 panels - Dimensions

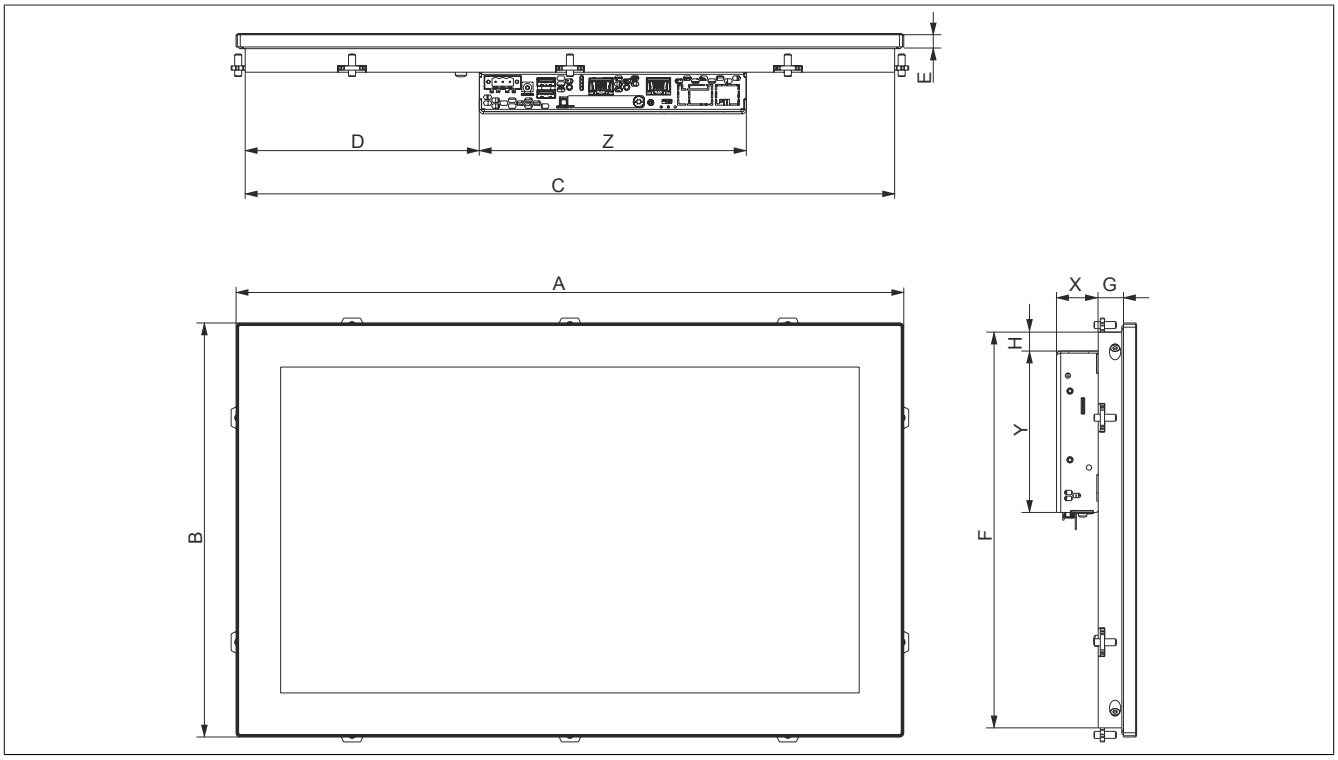


Figure 1: Panel PC 2200 with AP9x3 panels - Dimensions

All dimensions in mm.

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

Table 7: AP9x3 panels - Dimensions

Component	Model number	X	Y	Z
System unit	5PPC2200.ALxx-000	29.7	115	190

Table 8: System units - Dimensions

Information:

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

AP1000 panels with retaining clips - Dimensions

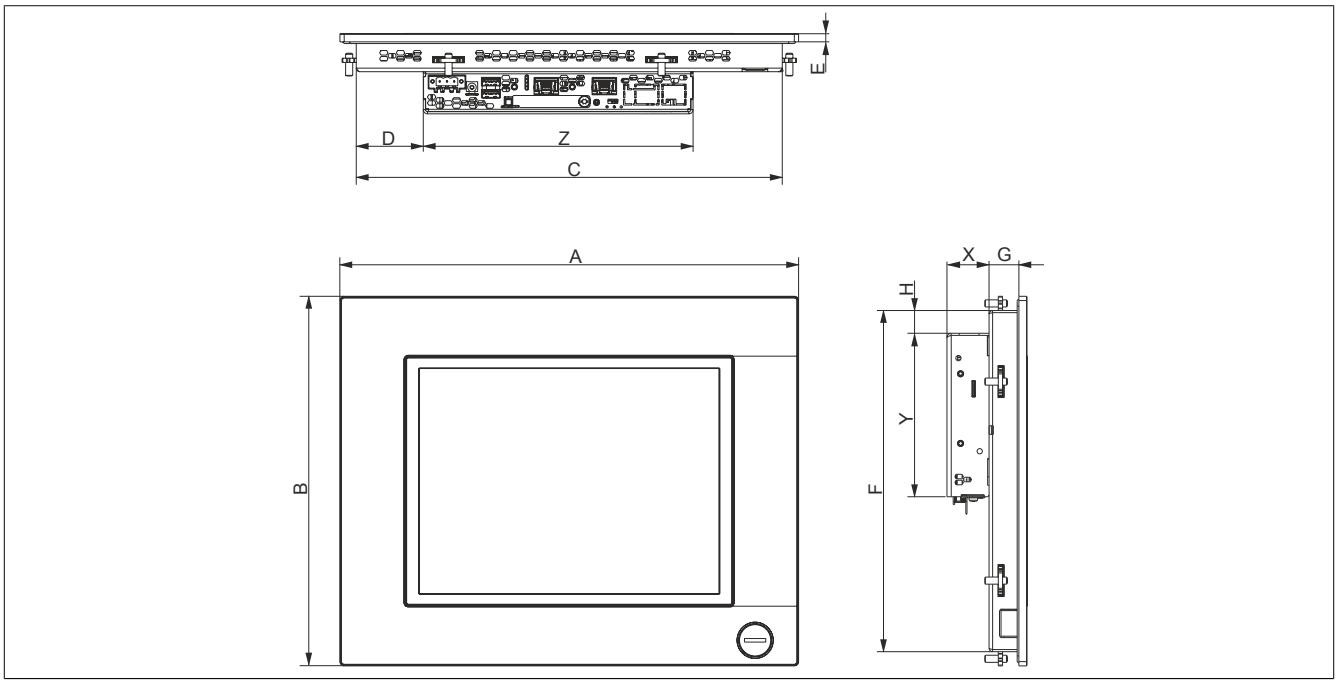


Figure 2: Panel PC 2200 with AP1000 panels with retaining clips - Dimensions

All dimensions in mm.

Display type	Model number	A	B	C	D	E	F	G	H
5.7" single-touch	5AP1120.0573-000	212	156	196	3	5.7	140	19.5	2.5
5.7" keys	5AP1151.0573-000	212	245	196	3	5.7	229	19.5	2.5
7.0" single-touch	5AP1120.0702-000	212	156	196	3	5.7	140	19.5	2.5
7.0" multi-touch	5AP1130.0702-000	209	153	196	3	9	140	20	7.25
10.1" single-touch	5AP1120.101E-000	279	191	266	38	9	178	18	13.5
10.1" multi-touch	5AP1130.101E-000	279	191	266	38	9	178	18	13.5
10.4" single-touch	5AP1120.1043-000	323	260	300	47.2	5.7	240	21	16
10.4" single-touch with keys	5AP1180.1043-000	323	260	300	47.2	5.7	240	21	16
12.1" single-touch	5AP1120.121E-000	324	221.5	311	60.5	9	208.5	18	13.5
12.1" multi-touch	5AP1130.121E-000	324	221.5	311	60.5	9	208.5	18	13.5
15.6" single-touch	5AP1120.156B-000	414	258.5	401	105.5	9	245.5	20	13.5
15.6" multi-touch	5AP1130.156C-000	414	258.5	401	105.5	9	245.5	20	13.5
18.5" multi-touch	5AP1130.185C-000	475	295	462	166.5	9	282	18	13.5

Table 9: AP1000 panels with retaining clips - Dimensions

Component	Model number	X	Y	Z
System unit	5PPC2200.ALxx-000	29.7	115	190

Table 10: System units - Dimensions

Information:

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

AP1000 panels with clamping blocks - Dimensions

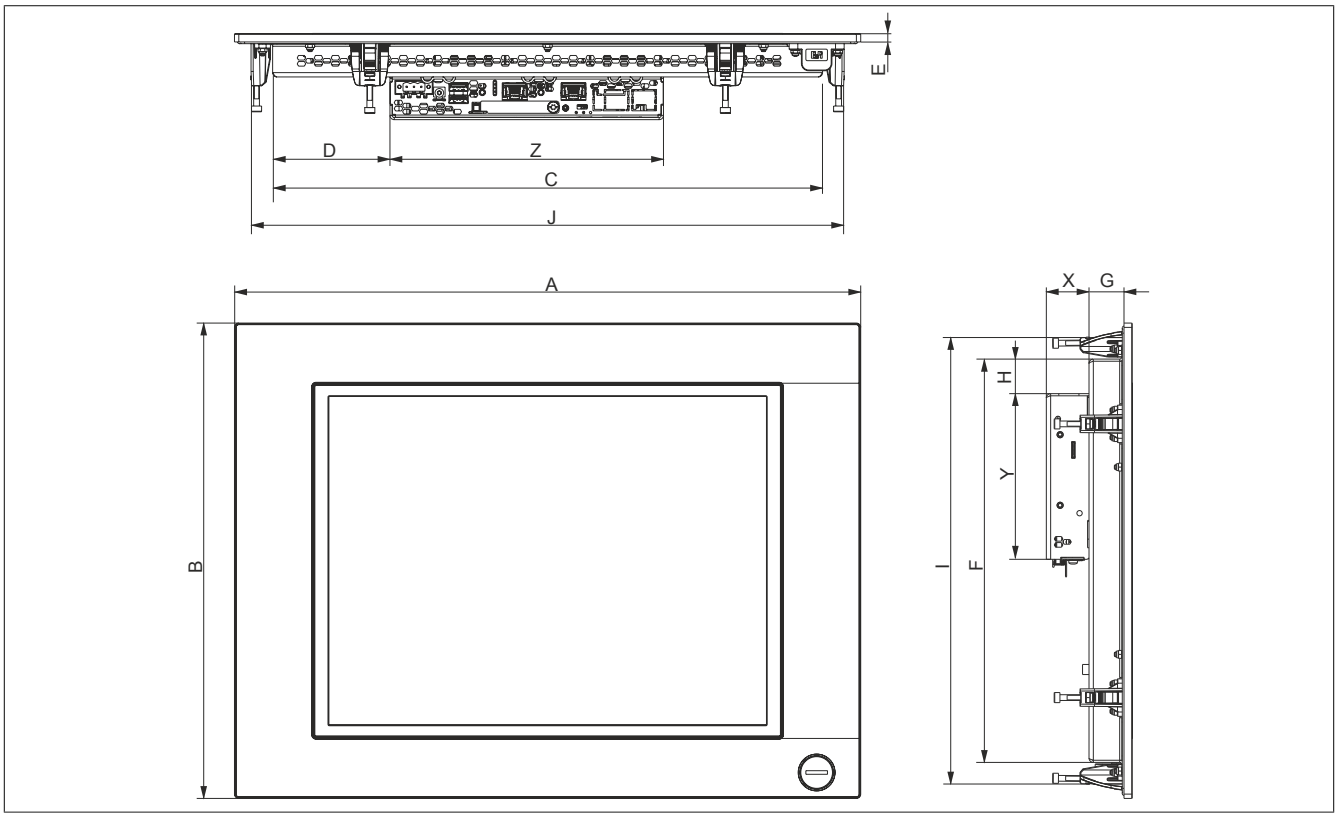


Figure 3: Panel PC 2200 with AP1000 panels with clamping blocks - Dimensions

All dimensions in mm.

Display type	Model number	A	B	C	D	E	F	G	H	I	J
10.4" single-touch with keys	5AP1181.1043-000	323	358	270	70.5	5.7	305	21.3	17.5	338	300
10.4" single-touch with keys	5AP1182.1043-000	423	288	355.5	70.5	5.7	234	21.3	17.5	268	400
12.1" single-touch	5AP1120.1214-000	362	284	309	52.5	5.7	234	20.3	17.5	264	339
15.0" single-touch	5AP1120.1505-000	435	330	382	81.5	5.7	280	24.3	24	310	412
15.0" single-touch with keys	5AP1180.1505-000	435	330	382	81.5	5.7	280	24.3	24	310	412
15.0" single-touch with keys	5AP1181.1505-000	435	430	382	81.5	5.7	380	24.3	24	410	413
19.0" single-touch	5AP1120.1906-000	527	421	445	186.5	5.7	351	23.3	19.3	401	507

Table 11: AP1000 panels with clamping blocks - Dimensions

Component	Model number	X	Y	Z
System unit	5PPC2200.ALxx-000	29.7	115	190

Table 12: System units - Dimensions

Information:

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

2.2.1.2 Installation diagrams

Information:

When installing the Panel PC 2200, spacing for air circulation and additional free space for operating and servicing the device must be taken into account.

AP9x3 panels - Installation diagrams

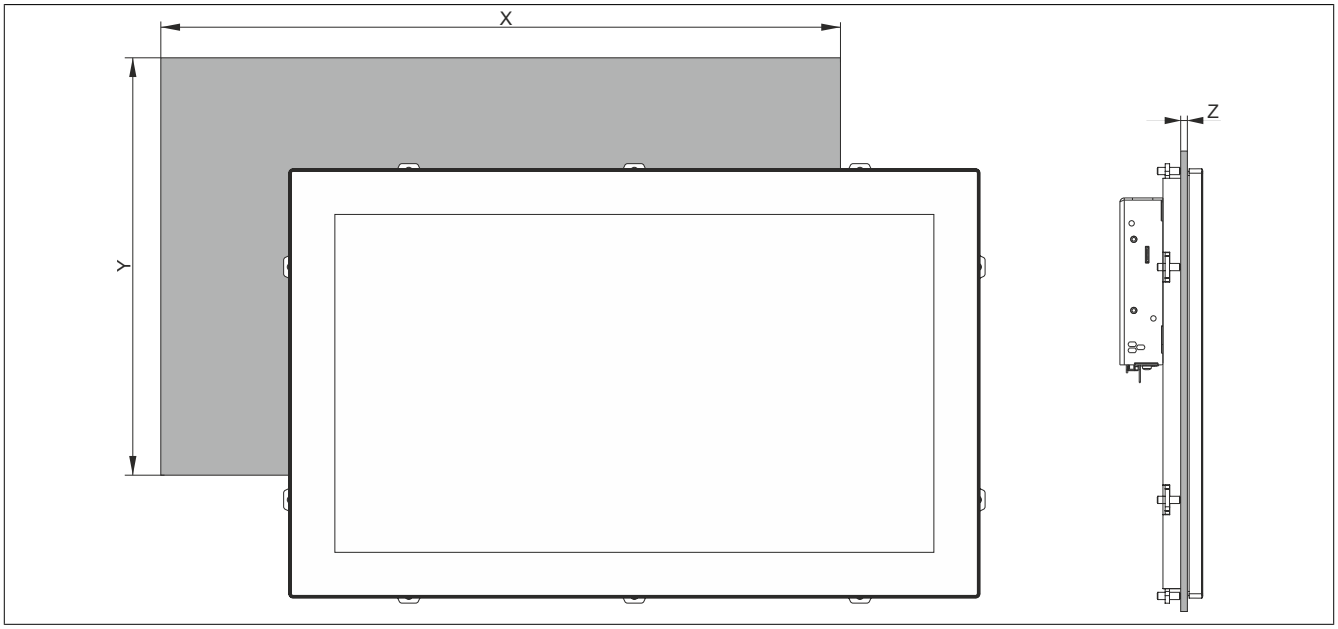


Figure 4: Panel PC 2200 with AP9x3 panels - Installation diagram

All dimensions in mm.

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

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

Table 13: AP9x3 panels - Installation diagrams

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

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

AP1000 panels with retaining clips - Installation diagrams

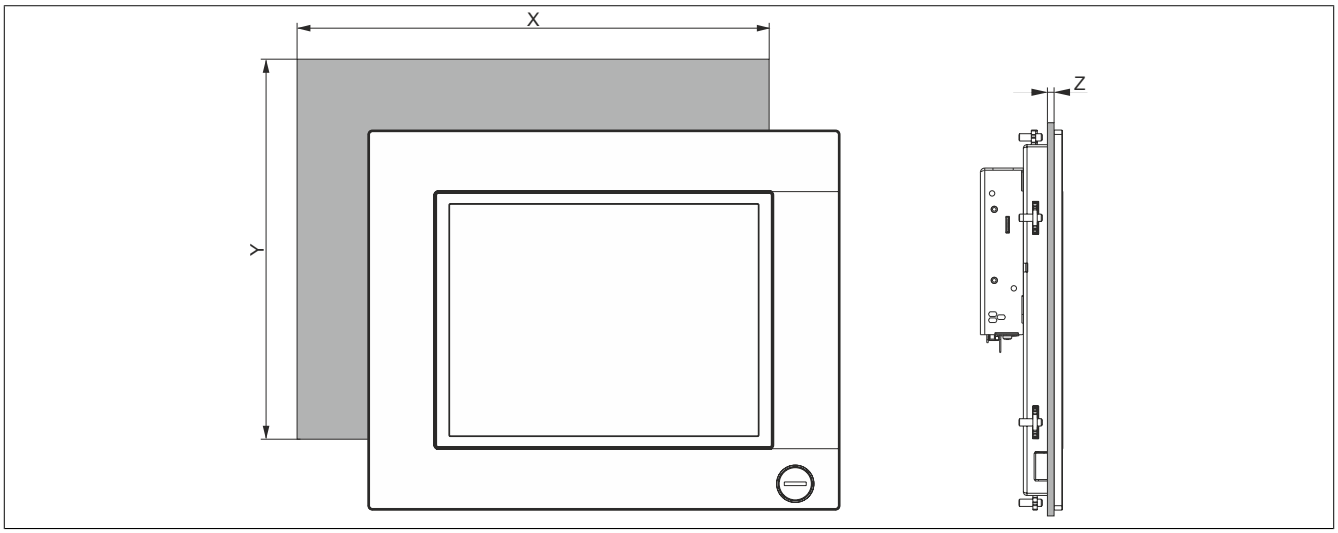


Figure 5: Panel PC 2200 with AP1000 panels with retaining clips - Installation diagram

All dimensions in mm.

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

Display type	Model number	X	Y	Z min.	Z max.	Number of retaining clips
5.7" single-touch	5AP1120.0573-000	199	143	1	8	4
5.7" keys	5AP1151.0573-000	199	232	1	8	6
7.0" single-touch	5AP1120.0702-000	199	143	1	8	4
7.0" multi-touch	5AP1130.0702-000	199	143	1	8	4
10.1" single-touch	5AP1120.101E-000	268	180	1	6	8
10.1" multi-touch	5AP1130.101E-000	268	180	1	6	8
10.4" single-touch	5AP1120.1043-000	303	243	1	10	8
10.4" single-touch with keys	5AP1180.1043-000	303	243	1	10	8
12.1" single-touch	5AP1120.121E-000	313	210.5	1	6	10
12.1" multi-touch	5AP1130.121E-000	313	210.5	1	6	10
15.6" single-touch	5AP1120.156B-000	403	247.5	1	6	10
15.6" multi-touch	5AP1130.156C-000	403	247.5	1	6	10
18.5" multi-touch	5AP1130.185C-000	464	284	1	6	10

Table 14: AP1000 panels with retaining clips - Installation diagrams

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

A 2.5 mm hex screwdriver is needed to tighten and remove the screw on the retaining clips. The maximum tightening torque of the retaining clips is 1 Nm.

Information:

A minimum circumferential distance of 30 mm must be maintained in order to enable installation with retaining clips.

AP1000 panels with clamping blocks - Installation diagrams

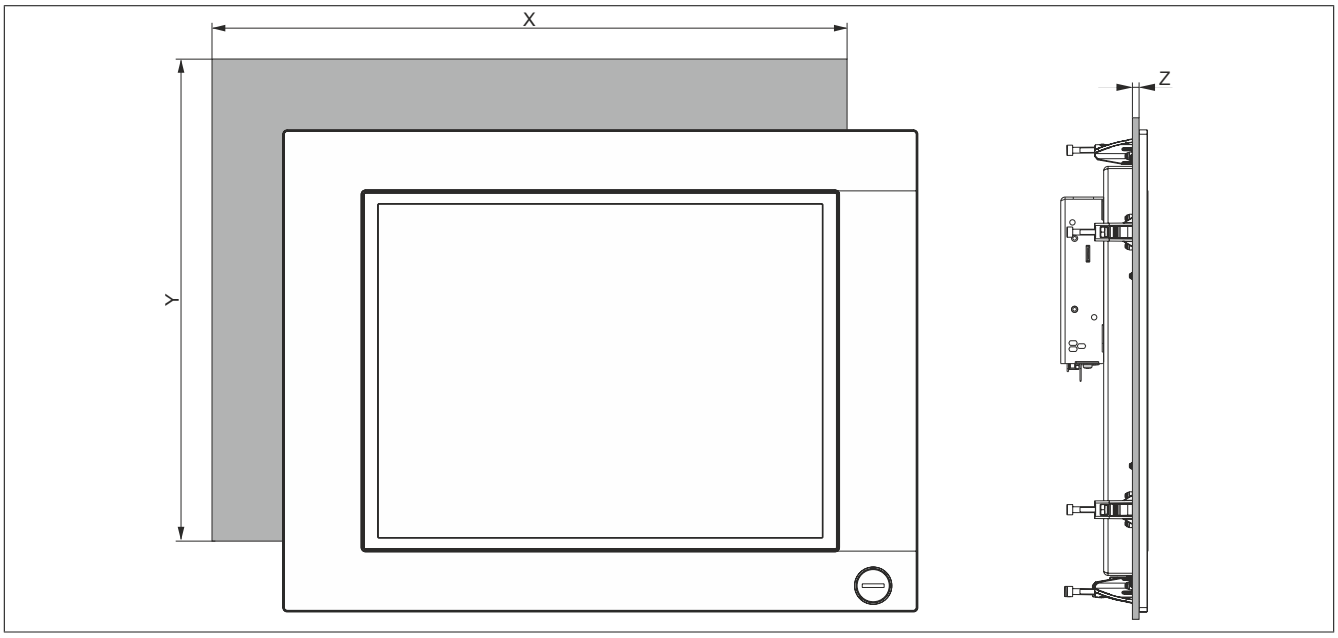


Figure 6: Panel PC 2200 with AP1000 panels with clamping blocks - Installation diagram

All dimensions in mm.

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

Display type	Model number	X	Y	Z min.	Z max.	Number of clamping blocks
10.4" single-touch with keys	5AP1181.1043-000	303	341	2	10	10
10.4" single-touch with keys	5AP1182.1043-000	403	271	2	10	8
12.1" single-touch	5AP1120.1214-000	342	267	2	10	8
15.0" single-touch	5AP1120.1505-000	415	313	2	10	8
15.0" single-touch with keys	5AP1180.1505-000	415	313	2	10	8
15.0" single-touch with keys	5AP1181.1505-000	415	413	2	10	10
19.0" single-touch	5AP1120.1906-000	510	404	2	10	12

Table 15: AP1000 panels with clamping blocks - Installation diagrams

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

A 3 mm hex screwdriver is needed to tighten or remove the screw on the clamping blocks. The maximum tightening torque of the clamping block is 0.5 Nm.

2.2.1.3 Spacing for air circulation

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

Information:

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

The air inlet and air outlet are shown in the following figure. Because the warm air rises from bottom to top, the air inlet is at the bottom.

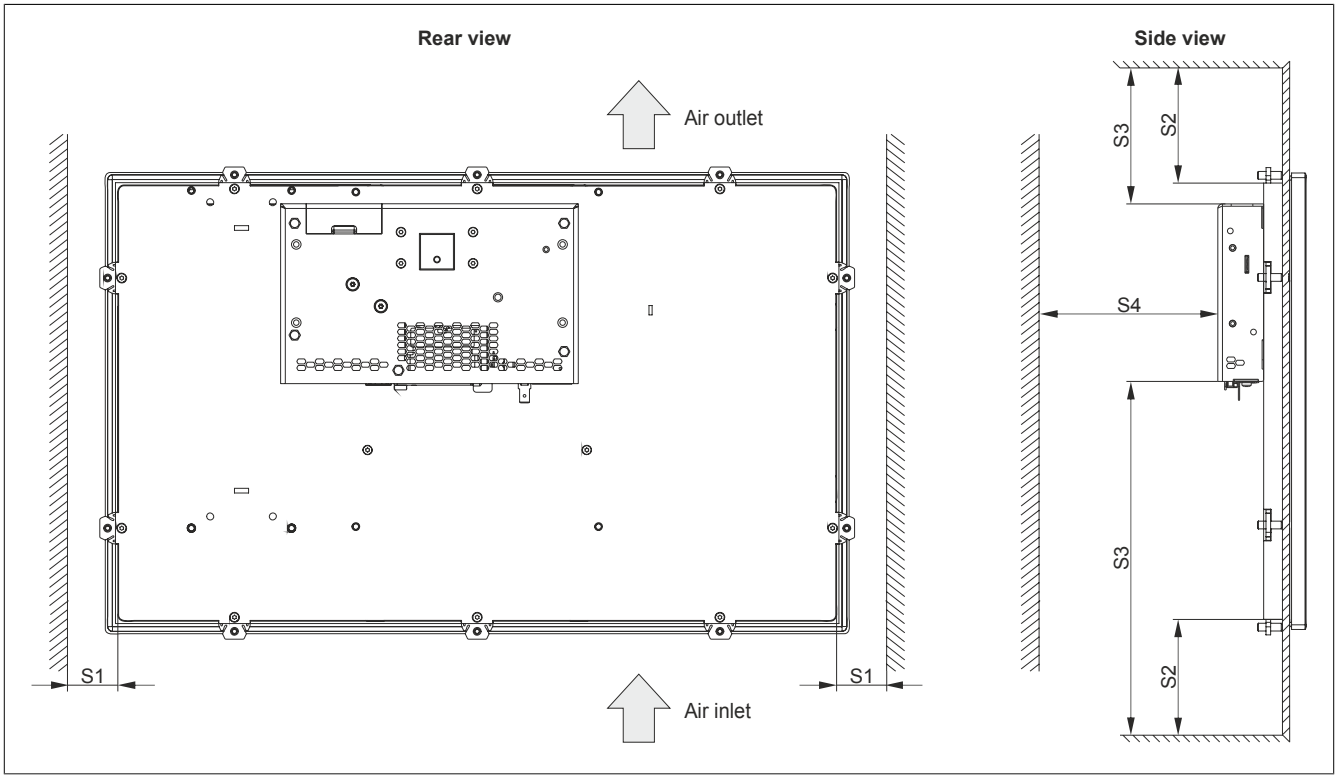


Figure 7: Panel PC 2200 - Spacing for air circulation

S1: ≥20 mm

S2: ≥50 mm

S3: ≥100 mm

S4: ≥50 mm

Caution!

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

If the specified spacing for air circulation cannot be maintained, the maximum specified temperatures of the temperature sensors (see "Temperature sensor positions" on page 33) must be monitored by the user and appropriate measures taken if these values are exceeded.

2.2.1.4 Mounting orientations

The following diagrams show the specified mounting orientations of Panel PC 2200 devices. A PPC2200 is only permitted to be installed as shown or described below.

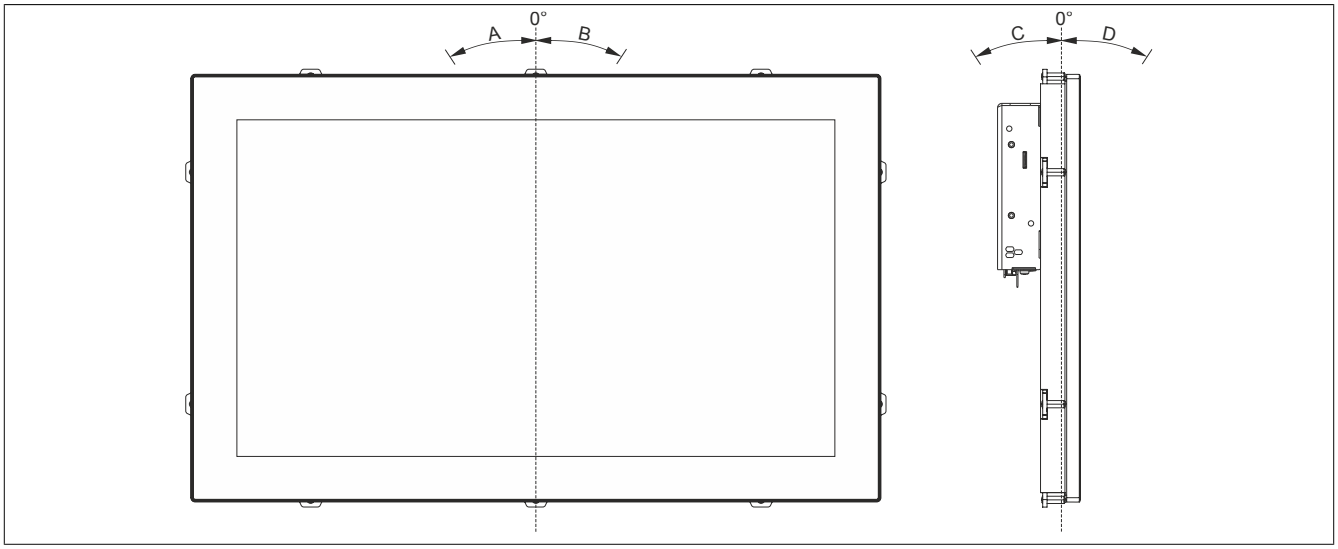


Figure 8: Panel PC 2200 - Mounting orientation

Mounting orientation		Ambient temperature limitation[1)]
0°	0°	None
A	-1° to -90° (counterclockwise)	5°C
B	+1° to +90° (clockwise)	5°C
C, D	±180° (interfaces on top)	None
C	-1° to 90°	5°C
D	+1° to +90° (display facing down)	5°C

Table 16: Mounting orientations during operation

1) The maximum ambient temperature must be reduced by ....

During installation, it is important to make sure that the spacing as described in section "Spacing for air circulation" on page 24 is observed in order to achieve natural air circulation.

2.2.1.5 Weight specifications

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

Table 17: AP9x3 panels - Weight

Display type	Model number	Weight [g]
5.7" single-touch	5AP1120.0573-000	1100
5.7" keys	5AP1151.0573-000	1400
7.0" single-touch	5AP1120.0702-000	900
7.0" multi-touch	5AP1130.0702-000	1200
10.1" single-touch	5AP1120.101E-000	1900
10.1" multi-touch	5AP1130.101E-000	2000
10.4" single-touch	5AP1120.1043-000	2800
10.4" single-touch with keys	5AP1180.1043-000	2800
10.4" single-touch with keys	5AP1181.1043-000	3400
10.4" single-touch with keys	5AP1182.1043-000	3500
12.1" single-touch	5AP1120.1214-000	3200
12.1" single-touch	5AP1120.121E-000	2300
12.1" multi-touch	5AP1130.121E-000	2400
15.0" single-touch	5AP1120.1505-000	5000
15.0" single-touch with keys	5AP1180.1505-000	4900
15.0" single-touch with keys	5AP1181.1505-000	6000
15.6" single-touch	5AP1120.156B-000	4200
15.6" multi-touch	5AP1130.156C-000	3700
18.5" multi-touch	5AP1130.185C-000	4600
19.0" single-touch	5AP1120.1906-000	7300

Table 18: AP1000 panels - Weight

Component	Model number	Weight [g]
System unit	5PPC2200.ALxx-000	577
CFast card	5CFAST.xxxx-00	10
	5CFAST.xxxx-10	10
Interface option	5ACCIF01.FPCC-000	25
	5ACCIF01.FPCS-000	25
	5ACCIF01.FPLK-000	25
	5ACCIF01.FPLS-000	25
	5ACCIF01.FPLS-001	25
	5ACCIF01.FPSC-000	25
	5ACCIF01.FPSC-001	25
	5ACCIF01.FSS0-000	25
	5ACCIF01.ICAN-000	25
	5ACCIF03.CETH-000	25

Table 19: System units, CFast cards, interface options - Weight

2.2.2 Environmental properties

2.2.2.1 Temperature specifications

Because it is possible to combine different system units with different panels, the following tables provide a component-dependent overview of the maximum, minimum and typical possible ambient temperatures resulting from these combinations.

Information:

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

Information about worst-case conditions

- Power Thermal Utility from Intel for simulating 100% processor utilization
- BurnInTest tool (BurnInTest V8.1 Pro by PassMark Software) for simulating 100% interface utilization using loopback adapters (USB interfaces)
- Maximum expansion and power consumption of the system
- 100% display brightness

2.2.2.1.1 Maximum ambient temperature for worst-case operation

All temperature specifications in degrees Celsius (°C) at 500 m above sea level, **non-condensing**		**Maximum worst-case ambient temperature (system unit 5PPC2200.ALxx-000)**			
The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.		**5PPC2200.AL02-000** (E3930 1.3 GHz)	**5PPC2200.AL04-000** (E3930 1.3 GHz)	**5PPC2200.AL14-000** (E3940 1.6 GHz)	**5PPC2200.AL18-000** (E3940 1.6 GHz)
		55	**55**	**50**	**50**
Maximum ambient temperature (accessories)					
AP9x3 panels	5AP923.1215-00	✓	✓	✓	✓
	5AP923.1505-00	✓	✓	✓	✓
	5AP923.1906-00 ≤ D0	50	50	✓	✓
	5AP923.1906-00 ≥ E0	✓	✓	✓	✓
	5AP933.156B-00 ≤ C0	50	50	✓	✓
	5AP933.156B-00 ≥ D0	✓	✓	✓	✓
	5AP933.185B-00	50	50	✓	✓
	5AP933.215C-00 ≤ C0	40	40	40	40
	5AP933.215C-00 ≥ D0	50	50	✓	✓
	5AP933.240C-00 ≤ C0	40	40	40	40
	5AP933.240C-00 ≥ D0	50	50	✓	✓
AP1000 panels	5AP1120.0573-000	✓	✓	✓	✓
	5AP1151.0573-000	✓	✓	✓	✓
	5AP1120.0702-000	✓	✓	✓	✓
	5AP1130.0702-000	✓	✓	✓	✓
	5AP1120.101E-000	50	50	✓	✓
	5AP1130.101E-000	50	50	✓	✓
	5AP1120.1043-000	✓	✓	✓	✓
	5AP1180.1043-000	✓	✓	✓	✓
	5AP1181.1043-000	✓	✓	✓	✓
	5AP1182.1043-000	✓	✓	✓	✓
	5AP1120.1214-000	✓	✓	✓	✓
	5AP1120.121E-000	✓	✓	✓	✓
	5AP1130.121E-000	✓	✓	✓	✓
	5AP1120.1505-000	✓	✓	✓	✓
	5AP1180.1505-000	✓	✓	✓	✓
	5AP1181.1505-000	✓	✓	✓	✓
	5AP1120.156B-000	✓	✓	✓	✓
	5AP1130.156C-000	✓	✓	✓	✓
	5AP1130.185C-000	50	50	✓	✓
	5AP1120.1906-000	✓	✓	✓	✓
CFast card	5CFAST.xxxx-00 ≥ E0	✓	✓	✓	✓
	5CFAST.xxxx-10	✓	✓	✓	✓
Interface option	5ACCIF01.ICAN-000	✓	✓	✓	✓
	5ACCIF01.FPCC-000	50	50	45	45
	5ACCIF01.FPCS-000	50	50	45	45
	5ACCIF01.FPLK-000	50	50	45	45

Table 20: Maximum ambient temperature for worst-case operation

	5ACCIF01.FPLS-000	50	50	45	45
	5ACCIF01.FPLS-001	50	50	45	45
	5ACCIF01.FPSC-000	50	50	45	45
	5ACCIF01.FPSC-001	50	50	45	45
	5ACCIF01.FSS0-000	✓	✓	✓	✓
	5ACCIF03.CETH-000	✓	✓	45	45

Table 20: Maximum ambient temperature for worst-case operation

2.2.2.1.2 Minimum ambient temperature for worst-case operation

All temperature specifications in degrees Celsius (°C) at 500 m above sea level, **non-condensing**		**Minimum worst-case ambient temperature (system unit 5PPC2200.ALxx-000)**			
		5PPC2200.AL02-000 (E3930 1.3 GHz)	**5PPC2200.AL04-000** (E3930 1.3 GHz)	**5PPC2200.AL14-000** (E3940 1.6 GHz)	**5PPC2200.AL18-000** (E3940 1.6 GHz)
		-25	**-25**	**-25**	**-25**
Minimum ambient temperature (accessories)					
AP9x3 panels	5AP923.1215-00	-20	-20	-20	-20
	5AP923.1505-00	-20	-20	-20	-20
	5AP923.1906-00 ≤ D0	0	0	0	0
	5AP923.1906-00 ≥ E0	-20	-20	-20	-20
	5AP933.156B-00 ≤ C0	0	0	0	0
	5AP933.156B-00 ≥ D0	-10	-10	-10	-10
	5AP933.185B-00	0	0	0	0
	5AP933.215C-00 ≤ C0	0	0	0	0
	5AP933.215C-00 ≥ D0	0	0	0	0
	5AP933.240C-00 ≤ C0	0	0	0	0
	5AP933.240C-00 ≥ D0	-10	-10	-10	-10
AP1000 panels	5AP1120.0573-000	-10	-10	-10	-10
	5AP1151.0573-000	0	0	0	0
	5AP1120.0702-000	-20	-20	-20	-20
	5AP1130.0702-000	-10	-10	-10	-10
	5AP1120.101E-000	-20	-20	-20	-20
	5AP1130.101E-000	-10	-10	-10	-10
	5AP1120.1043-000	-20	-20	-20	-20
	5AP1180.1043-000	-20	-20	-20	-20
	5AP1181.1043-000	-20	-20	-20	-20
	5AP1182.1043-000	-20	-20	-20	-20
	5AP1120.1214-000	-20	-20	-20	-20
	5AP1120.121E-000	-20	-20	-20	-20
	5AP1130.121E-000	-10	-10	-10	-10
	5AP1120.1505-000	-20	-20	-20	-20
	5AP1180.1505-000	-20	-20	-20	-20
	5AP1181.1505-000	-20	-20	-20	-20
	5AP1120.156B-000	-20	-20	-20	-20
	5AP1130.156C-000	-10	-10	-10	-10
	5AP1130.185C-000	-10	-10	-10	-10
	5AP1120.1906-000	-20	-20	-20	-20
CFast card	5CFAST.xxxx-00 ≥ E0	✓	✓	✓	✓
	5CFAST.xxxx-10	✓	✓	✓	✓
Interface option	5ACCIF01.ICAN-000	-20	-20	-20	-20
	5ACCIF01.FPCC-000	-20	-20	-20	-20
	5ACCIF01.FPCS-000	-20	-20	-20	-20
	5ACCIF01.FPLK-000	-20	-20	-20	-20
	5ACCIF01.FPLS-000	-20	-20	-20	-20
	5ACCIF01.FPLS-001	-20	-20	-20	-20
	5ACCIF01.FPSC-000	-20	-20	-20	-20
	5ACCIF01.FPSC-001	-20	-20	-20	-20
	5ACCIF01.FSS0-000	-20	-20	-20	-20
	5ACCIF03.CETH-000	-20	-20	-20	-20

Table 21: Minimum ambient temperature for worst-case operation

2.2.2.1.3 Maximum ambient temperature for typical operation

Information about typical conditions

- The total power of all USB interfaces on the system unit is limited to 1 W.
- 2x Gigabit Ethernet.
- No permanent 100% processor utilization and graphics utilization.
- The power consumption of the complete system is limited to 45 W. For the power consumption of individual components, see "Power calculation" on page 37.
- 80% display brightness.

All temperature specifications in degrees Celsius (°C) at 500 m above sea level, **non-condensing**		**Maximum ambient temperature for typical operation (system unit 5PPC2200.ALxx-000)**			
The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.		**5PPC2200.AL02-000** (E3930 1.3 GHz)	**5PPC2200.AL04-000** (E3930 1.3 GHz)	**5PPC2200.AL14-000** (E3940 1.6 GHz)	**5PC2200.AL18-000** (E3940 1.6 GHz)
		60	**60**	**55**	**55**
Maximum ambient temperature for typical operation (accessories)					
AP9x3 panels	5AP923.1215-00	✓	✓	✓	✓
	5AP923.1505-00	✓	✓	✓	✓
	5AP923.1906-00 ≤ D0	50	50	50	50
	5AP923.1906-00 ≥ E0	✓	✓	✓	✓
	5AP933.156B-00 ≤ C0	50	50	50	50
	5AP933.156B-00 ≥ D0	✓	✓	✓	✓
	5AP933.185B-00	50	50	50	50
	5AP933.215C-00 ≤ C0	40	40	40	40
	5AP933.215C-00 ≥ D0	50	50	50	50
	5AP933.240C-00 ≤ C0	40	40	40	40
	5AP933.240C-00 ≥ D0	50	50	50	50
AP1000 panels	5AP1120.0573-000	✓	✓	✓	✓
	5AP1151.0573-000	✓	✓	✓	✓
	5AP1120.0702-000	✓	✓	✓	✓
	5AP1130.0702-000	✓	✓	✓	✓
	5AP1120.101E-000	50	50	50	50
	5AP1130.101E-000	50	50	50	50
	5AP1120.1043-000	✓	✓	✓	✓
	5AP1180.1043-000	✓	✓	✓	✓
	5AP1181.1043-000	✓	✓	✓	✓
	5AP1182.1043-000	✓	✓	✓	✓
	5AP1120.1214-000	✓	✓	✓	✓
	5AP1120.121E-000	55	55	✓	✓
	5AP1130.121E-000	55	55	✓	✓
	5AP1120.1505-000	✓	✓	✓	✓
	5AP1180.1505-000	✓	✓	✓	✓
	5AP1181.1505-000	✓	✓	✓	✓
	5AP1120.156B-000	✓	✓	✓	✓
	5AP1130.156C-000	55	55	✓	✓
	5AP1130.185C-000	55	55	✓	✓
	5AP1120.1906-000	✓	✓	✓	✓
CFast card	5CFAST.xxxx-00 ≥ E0	✓	✓	✓	✓
	5CFAST.xxxx-10	✓	✓	✓	✓
Interface option	5ACCIF01.ICAN-000	✓	✓	✓	✓
	5ACCIF01.FPCC-000	50	50	50	50
	5ACCIF01.FPCS-000	50	50	50	50
	5ACCIF01.FPLK-000	50	50	50	50
	5ACCIF01.FPLS-000	50	50	50	50
	5ACCIF01.FPLS-001	50	50	50	50
	5ACCIF01.FPSC-000	50	50	50	50
	5ACCIF01.FPSC-001	50	50	50	
	5ACCIF01.FSS0-000	✓	✓	✓	✓
	5ACCIF03.CETH-000	✓	✓	50	50

Table 22: Maximum ambient temperature for typical operation

2.2.2.1.4 How are the maximum, minimum and typical ambient temperatures determined?

1. Select the system unit.
2. The columns specify the maximum or minimum temperature in worst-case operation or the maximum temperature in typical operation of the complete system depending on the respective system unit.

> **Information:**
>
> **The maximum and typical temperature specifications correspond to a specification at 500 meters above sea level. The maximum/typical ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.**

3. If interface options and CFast cards are additionally installed in the PPC2200 system, they may result in a temperature limitation.
4. Possible limitations may arise due to the mounting orientation of the Panel PC 2200. For more information, see section "Mounting orientations" on page 25.
5. At typical ambient temperatures, the specifications from "Information about typical conditions" on page 29 must be observed. The relevant test and assessment must be carried out individually by the user on site (reading out the temperatures in BIOS or using the B&R Control Center).

If the installed component has a "✓" (check mark), it can be operated without any problems at the maximum/minimum/typical ambient temperature of the complete system.

If the installed component has a temperature specification, e.g. "45", the ambient temperature of the PPC2200 complete system is not permitted to exceed this value.

2.2.2.1.5 Ambient temperature during storage and transport

The following table provides an overview of the minimum and maximum ambient temperatures for storing and transporting the individual component.

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

Table 23: AP9x3 panels - Ambient temperature during storage and transport

Display type	Model number	Storage	Transport
5.7" single-touch	5AP1120.0573-000	-25 to 80°C	-25 to 80°C
5.7" keys	5AP1151.0573-000	-25 to 70°C	-25 to 70°C
7.0" single-touch	5AP1120.0702-000	-25 to 80°C	-25 to 80°C
7.0" multi-touch	5AP1130.0702-000	-25 to 70°C	-25 to 70°C
10.1" single-touch	5AP1120.101E-000	-25 to 70°C	-25 to 70°C
10.1" multi-touch	5AP1130.101E-000	-25 to 70°C	-25 to 70°C
10.4" single-touch	5AP1120.1043-000	-25 to 80°C	-25 to 80°C
10.4" single-touch with keys	5AP1180.1043-000	-25 to 70°C	-25 to 70°C
10.4" single-touch with keys	5AP1181.1043-000	-25 to 70°C	-25 to 70°C
10.4" single-touch with keys	5AP1182.1043-000	-25 to 70°C	-25 to 70°C
12.1" single-touch	5AP1120.1214-000	-25 to 80°C	-25 to 80°C
12.1" single-touch	5AP1120.121E-000	-25 to 80°C	-25 to 80°C
12.1" multi-touch	5AP1130.121E-000	-25 to 70°C	-25 to 70°C
15.0" single-touch	5AP1120.1505-000	-25 to 80°C	-25 to 80°C
15.0" single-touch with keys	5AP1180.1505-000	-25 to 70°C	-25 to 70°C
15.0" single-touch with keys	5AP1181.1505-000	-25 to 70°C	-25 to 70°C
15.6" single-touch	5AP1120.156B-000	-25 to 70°C	-25 to 70°C
15.6" multi-touch	5AP1130.156C-000	-20 to 70°C	-20 to 70°C
18.5" multi-touch	5AP1130.185C-000	-25 to 70°C	-25 to 70°C
19.0" single-touch	5AP1120.1906-000	-25 to 70°C	-25 to 70°C

Table 24: AP1000 panels - Ambient temperature during storage and transport

Component	Model number	Storage	Transport
System unit	5PPC2200.ALxx-000	-25 to 60°C	-25 to 60°C
CFast card	5CFAST.xxxx-00	-50 to 100°C	-50 to 100°C
	5CFAST.032G-10 ≥ Rev. G0	-40 to 85°C	-40 to 85°C
	5CFAST.064G-10 ≥ Rev. E0	-40 to 85°C	-40 to 85°C
	5CFAST.128G-10 ≥ Rev. E0	-40 to 85°C	-40 to 85°C
	5CFAST.032G-10 ≤ Rev. F0	-55 to 95°C	-55 to 95°C
	5CFAST.064G-10 ≤ Rev. D0	-55 to 95°C	-55 to 95°C
	5CFAST.128G-10 ≤ Rev. D0	-55 to 95°C	-55 to 95°C
	5CFAST.256G-10	-40 to 85°C	-40 to 85°C
Interface option	5ACCIF01.FPCC-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPCS-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPLK-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPLS-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPLS-001	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPSC-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPSC-001	-20 to 60°C	-20 to 60°C
	5ACCIF01.FSS0-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.ICAN-000	-20 to 60°C	-20 to 60°C
	5ACCIF03.CETH-000	-20 to 60°C	-20 to 60°C

Table 25: System units, CFast cards, interface options - Ambient temperature during storage and transport

2.2.2.1.6 Temperature monitoring

Sensors monitor temperature values at various areas in the xPC2200. For the position of temperature sensors, see section "Temperature sensor positions" on page 33. The values specified there represent the defined maximum temperature at this measuring point. If the temperature is exceeded, no alarm is triggered.

Temperatures[1)] can be read out in different ways in approved operating systems:

- BIOS (see "Baseboard" on page 239)
- B&R Control Center[2)]
- B&R ADI Development Kit[2)]
- B&R ADI .NET SDK[2)]
- B&R HMI Service Center[2)]
- B&R HMI Diagnose[2)]
- B&R PVI ADI line[2)]
- B&R ADI SNMP Agent[2)]
- Automation Runtime library[2)]

In addition, the CFast cards available from B&R for xPC2200 systems are equipped with Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T). This means that various parameters, such as temperature, can be read out using software (e.g. HDD Thermometer, freeware) in approved Microsoft Windows or B&R Linux operating systems.

For applications that do not run in approved operating systems, temperatures can be evaluated using the B&R MTCX Development Kit. The MTCX Development Kit also contains executable EFI sample programs.

1) The measured temperature is a guide value for the immediate ambient temperature, but it may have been influenced by neighboring components.

2) Drivers for approved operating systems can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

2.2.2.1.7 Temperature sensor positions

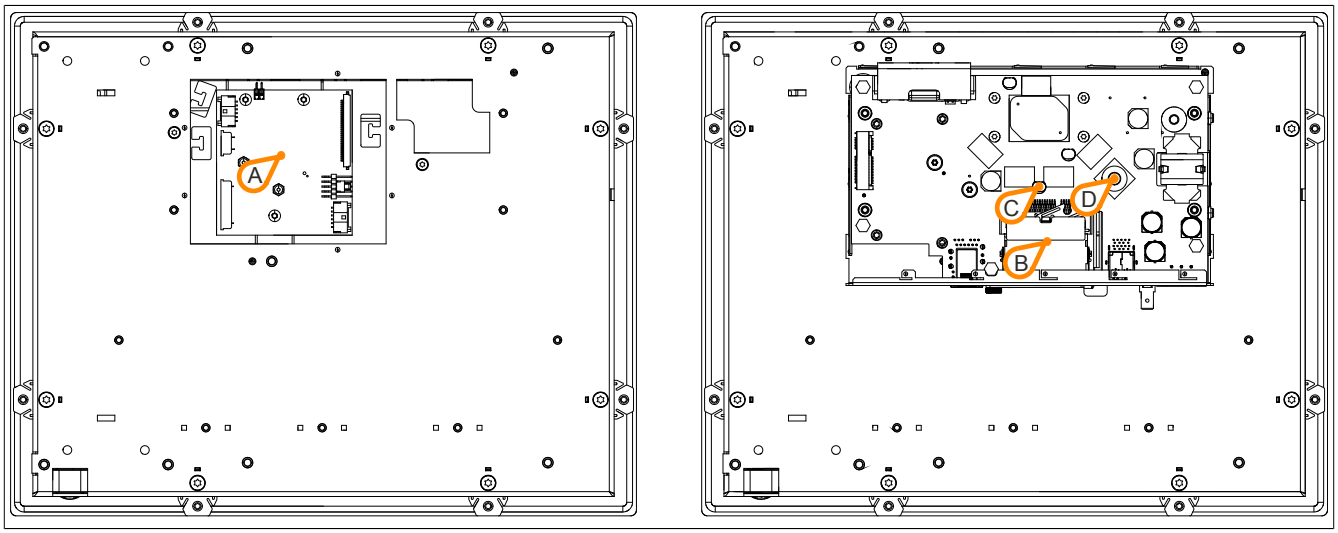


Figure 9: Panel PC 2200 - Temperature sensor positions

ADI sensors	Position	Measuring point for	Measurement	Max. specified
Panel	A	Display	Temperature of the display (sensor integrated on the panel).	5AP923.1215-00: 90°C 5AP923.1505-00: 90°C 5AP923.1906-00 ≤ D0: 75°C 5AP923.1906-00 ≥ E0: 80°C 5AP933.156B-00 ≤ C0: 75°C 5AP933.156B-00 ≥ D0: 80°C 5AP933.185B-00: 75°C 5AP933.215C-00: 80°C 5AP933.240C-00 ≤ C0: 75°C 5AP933.240C-00 ≥ D0: 80°C 5AP1120.0573-000: 80°C 5AP1151.0573-000: 80°C 5AP1120.0702-000: 85°C 5AP1130.0702-000: 85°C 5AP1120.101E-000: 80°C 5AP1130.101E-000: 80°C 5AP1120.1043-000: 90°C 5AP1180.1043-000: 90°C 5AP1181.1043-000: 90°C 5AP1182.1043-000: 90°C 5AP1120.1214-000: 80°C 5AP1120.121E-000: 80°C 5AP1130.121E-000: 80°C 5AP1120.1505-000: 90°C 5AP1180.1505-000: 90°C 5AP1181.1505-000: 90°C 5AP1120.156B-000: 80°C 5AP1130.156C-000: 80°C 5AP1130.185C-000: 80°C 5AP1120.1906-000: 80°C
System unit sensor 1	B	CFast	Temperature of the CFast area (sensor integrated on the CPU board).	95°C
System unit sensor 2	C	Main memory	Temperature of the main memory area (sensor integrated on the CPU board).	95°C
System unit sensor 3	D	MTCX	Temperature of the MTCX area (sensor integrated on the CPU board).	95°C

Table 26: Temperature sensor positions

2.2.2.2 Relative humidity

The following table shows the minimum and maximum relative humidity (non-condensing) of the individual components that are relevant for limiting the humidity of the complete system. Always use the lowest and the highest common value for the determination.

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

Table 27: AP9x3 panels - Relative humidity

Display type	Model number	Operation	Storage	Transport
5.7" single-touch	5AP1120.0573-000 ≤ Rev. D0	5 to 90%	5 to 90%	5 to 90%
5.7" single-touch	5AP1120.0573-000 ≥ Rev. E0	20 to 90%	10 to 90%	10 to 90%
5.7" keys	5AP1151.0573-000 ≤ Rev. D0	5 to 90%	5 to 90%	5 to 90%
5.7" keys	5AP1151.0573-000 ≥ Rev. E0	20 to 90%	10 to 90%	10 to 90%
7.0" single-touch	5AP1120.0702-000	20 to 90%	10 to 90%	10 to 90%
7.0" multi-touch	5AP1130.0702-000	20 to 90%	10 to 90%	10 to 90%
10.1" single-touch	5AP1120.101E-000	20 to 90%	10 to 90%	10 to 90%
10.1" multi-touch	5AP1130.101E-000	20 to 90%	10 to 90%	10 to 90%
10.4" single-touch	5AP1120.1043-000	5 to 90%	5 to 90%	5 to 90%
10.4" single-touch with keys	5AP1180.1043-000	5 to 80%	5 to 90%	5 to 90%
10.4" single-touch with keys	5AP1181.1043-000	5 to 80%	5 to 90%	5 to 90%
10.4" single-touch with keys	5AP1182.1043-000	5 to 80%	5 to 90%	5 to 90%
12.1" single-touch	5AP1120.1214-000	20 to 90%	10 to 90%	10 to 90%
12.1" single-touch	5AP1120.121E-000	5 to 90%	5 to 90%	5 to 90%
12.1" multi-touch	5AP1130.121E-000	5 to 90%	5 to 90%	5 to 90%
15.0" single-touch	5AP1120.1505-000	8 to 90%	8 to 90%	8 to 90%
15.0" single-touch with keys	5AP1180.1505-000	8 to 90%	8 to 90%	8 to 90%
15.0" single-touch with keys	5AP1181.1505-000	8 to 90%	8 to 90%	8 to 90%
15.6" single-touch	5AP1120.156B-000	5 to 90%	5 to 90%	5 to 90%
15.6" multi-touch	5AP1130.156C-000	5 to 90%	5 to 90%	5 to 90%
18.5" multi-touch	5AP1130.185C-000	5 to 90%	5 to 90%	5 to 90%
19.0" single-touch	5AP1120.1906-000	5 to 90%	5 to 90%	5 to 90%

Table 28: AP1000 panels - Relative humidity

All specifications apply to non-condensing operation/storage/transport.

Component	Model number	Operation	Storage	Transport
System unit	5PPC2200.ALxx-000	5 to 90%	5 to 95%	5 to 95%
CFast card	5CFAST.xxxx-00	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.032G-10 ≥ Rev. G0	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.064G-10 ≥ Rev. E0	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.128G-10 ≥ Rev. E0	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.032G-10 ≤ Rev. F0	10 to 95%	10 to 95%	10 to 95%
	5CFAST.064G-10 ≤ Rev. D0	10 to 95%	10 to 95%	10 to 95%
	5CFAST.128G-10 ≤ Rev. D0	10 to 95%	10 to 95%	10 to 95%
	5CFAST.256G-10	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
Interface option	5ACCIF01.FPCC-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPCS-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPLK-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPLS-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPLS-001	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPSC-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPSC-001	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FFS0-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.ICAN-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF03.CETH-000	5 to 90%	5 to 95%	5 to 95%

Table 29: System units, IF options, CFast cards - Relative humidity

The values listed correspond to the relative humidity (non-condensing) at an ambient temperature of 30°C. For more detailed information about the specified relative humidity as a function of temperature, see the technical data or temperature/humidity diagrams of the individual components.

2.2.2.3 Vibration

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

Panel PC	Operation[1]		Storage[1][2]	Transport[1][2]
	Continuous	Periodic		
With CFast card	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 30: Vibration

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

2.2.2.4 Shock

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

Panel PC	Operation[1]	Storage[1][2]	Transport[1][2]
With CFast card	15 g, 11 ms	30 g, 6 ms	30 g, 6 ms

Table 31: Shock

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

2.2.2.5 Degree of protection

Under the following conditions, the Panel PC 2200 offers IP65 protection on the front and IP20 protection on the back per EN 60529:

- Correct installation of the Panel PC 2200 (see "Installation" on page 208)
- Installation of all covers or components on interfaces and slots
- Compliance with all ambient conditions

The Panel PC 2200 with AP9x3 and AP1000 panels additionally has "Type 4X indoor use only" on the front per UL 50 under the same conditions.

2.2.3 Electrical properties

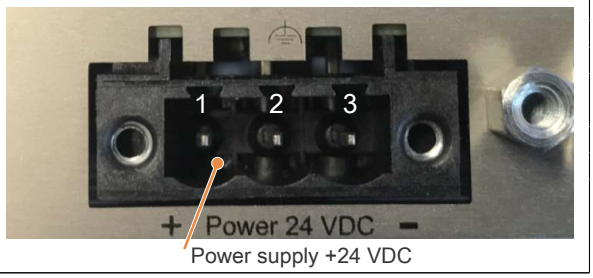
2.2.3.1 +24 VDC power supply

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

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

The pinout is shown in the following table. The supply voltage is protected internally by a soldered fuse (15 A, fast-acting) so that the device is not damaged if the supply voltage is overloaded (fuse must be replaced) or connected incorrectly (reverse polarity protection, fuse replacement not necessary). If the fuse is destroyed during a fault event, the device must be sent to B&R for repairs.

+24 VDC power supply	
Reverse polarity protection	Connector, 3-pin, male
Pin	**Description**
1	+
2	Functional ground
3	-
Model number	**Short description**
	Terminal blocks
0TB103.9	Connector, 24 V, 5.08 3-pin screw clamp terminal block
0TB103.91	Connector, 24 V, 5.08 3-pin cage clamp terminal block



Power supply +24 VDC

Table 32: +24 VDC power supply connection

Electrical properties	
Nominal voltage	24 VDC ±25%, SELV[1)]
Nominal current	Max. 4 A
Overvoltage category per EN 61131-2	II
Inrush current	Typ. 5 A, max. 50 A for <500 µs
Galvanic isolation	Yes
Uninterruptible power supply	No

1) EN 60950 requirements must be observed.

2.2.3.2 Power calculation

In order to calculate the total power of the Panel PC 2200, the power rating of the display used (see AP9x3 panels - Power calculation or AP1000 panels - Power calculation) must be added to the power rating of the system unit; if an interface option or optional CFast card is connected, these power ratings must be added as well.

System unit	Model number	Total power consumption of the system unit
PPC2200 E3930 2C 1.30 GHz	5PPC2200.AL02-000	Max. 15 W without USB 25 W with USB
PPC2200 E3930 2C 1.30 GHz	5PPC2200.AL04-000	Max. 15 W without USB 25 W with USB
PPC2200 E3940 4C 1.60 GHz	5PPC2200.AL14-000	Max. 20 W without USB 30 W with USB
PPC2200 E3940 4C 1.60 GHz	5PPC2200.AL18-000	Max. 20 W without USB 30 W with USB

Table 33: System unit - Power calculation

The following specifications are maximum values without additional consumers (e.g. USB devices).

Display type	Model number	+5 V	3V3	+12 V	Total power consumption
12.1" single-touch	5AP923.1215-00	-	4.2 W	7.2 W	11.4 W
15.0" single-touch	5AP923.1505-00	-	2.1 W	8.9 W	11 W
19.0" single-touch	5AP923.1906-00 ≤ D0	8 W	-	22.4 W	30.4 W
19.0" single-touch	5AP923.1906-00 ≥ E0	5 W	-	22 W	27 W
15.6" multi-touch	5AP933.156B-00 ≤ C0	3.35 W	-	10.5 W	13.85 W
15.6" multi-touch	5AP933.156B-00 ≥ D0	1.8 W	-	15.6 W	17.4 W
18.5" multi-touch	5AP933.185B-00	6.1 W	-	10.8 W	16.9 W
21.5" multi-touch	5AP933.215C-00 ≤ C0	7.4 W	-	18.3 W	25.7 W
21.5" multi-touch	5AP933.215C-00 ≥ D0	4 W	-	15 W	19 W
24.0" multi-touch	5AP933.240C-00 ≤ C0	6.35 W	-	24 W	30.35 W
24.0" multi-touch	5AP933.240C-00 ≥ C0	5 W	-	24.5 W	29.5 W

Table 34: AP9x3 panels - Power calculation

The following specifications are maximum values without additional consumers (e.g. USB devices).

Display type	Model number	+5 V	3V3	+12 V	Total power consumption
5.7" single-touch	5AP1120.0573-000	-	0.7 W	2.5 W	3.2 W
5.7" keys	5AP1151.0573-000	0.5 W	1.3 W	2.5 W	4.3 W
7.0" single-touch	5AP1120.0702-000	-	1.0 W	3.5 W	4.5 W
7.0" multi-touch	5AP1130.0702-000	1.0 W	1.0 W	3.5 W	5.5 W
10.1" single-touch	5AP1120.101E-000	-	1.0 W	5.8 W	6.8 W
10.1" multi-touch	5AP1130.101E-000	1.0 W	1.0 W	5.8 W	7.8 W
10.4" single-touch	5AP1120.1043-000	-	1.3 W	3.6 W	4.9 W
10.4" single-touch with keys	5AP1180.1043-000	0.5 W	1.9 W	3.6 W	6.0 W
10.4" single-touch with keys	5AP1181.1043-000	0.7 W	1.9 W	3.6 W	6.2 W
10.4" single-touch with keys	5AP1182.1043-000	1.0 W	1.9 W	3.6 W	6.5 W
12.1" single-touch	5AP1120.1214-000	-	1.9 W	7.0 W	8.9 W
12.1" single-touch	5AP1120.121E-000	-	2.5 W	7.8 W	10.3 W
12.1" multi-touch	5AP1130.121E-000	1.0 W	2.5 W	7.8 W	11.3 W
15.0" single-touch	5AP1120.1505-000	-	2.1 W	8.9 W	11.0 W
15.0" single-touch with keys	5AP1180.1505-000	0.5 W	2.7 W	8.9 W	12.1 W
15.0" single-touch with keys	5AP1181.1505-000	0.8 W	2.7 W	8.9 W	12.4 W
15.6" single-touch	5AP1120.156B-000	1.8 W	-	15.6 W	17.4 W
15.6" multi-touch	5AP1130.156C-000	6 W	-	18 W	24 W
18.5" multi-touch	5AP1130.185C-000	7 W	-	18.6 W	25.6 W
19.0" single-touch	5AP1120.1906-000	5.0 W	-	22.0 W	27.0 W

Table 35: AP1000 panels - Power calculation

The following specifications are maximum values.

Interface option	Model number	+5 V	3V3	+12 V	Total power consumption
CAN	5ACCIF01.ICAN-000	0.45 W	0.05 W	-	0.5 W
POWERLINK CAN X2X	5ACCIF01.FPCC-000	0.45 W	1.55 W	-	2 W
POWERLINK RS485 CAN	5ACCIF01.FPCS-000	0.75 W	1 W	-	1.75 W
POWERLINK	5ACCIF01.FPLK-000	-	1.75 W	-	1.75 W
POWERLINK RS232	5ACCIF01.FPLS-000	0.5 W	1 W	-	1.5 W
POWERLINK RS232	5ACCIF01.FPLS-001	-	1.5 W	-	1.5 W
POWERLINK RS232 CAN	5ACCIF01.FPSC-000	0.75 W	1 W	-	1.75 W
POWERLINK RS232 CAN X2X	5ACCIF01.FPSC-001	0.6 W	1.4 W	-	2 W
2x RS422/RS485	5ACCIF01.FSS0-000	0.8 W	0.2 W	-	1 W
2x ETH 10/100/1000	5ACCIF03.CETH-000	-	2 W	-	2 W

Table 36: Interface options - Power calculation

The following specifications are maximum values.

CFast cards	Model number	+5 V	3V3	+12 V	Total power consumption
CFast cards with SLC technology	5CFAST.xxxx-00	-	0.7 W read 0.7 W write 0.3 W idle	-	0.7 W read 0.7 W write 0.3 W idle
CFast cards with MLC technology	5CFAST.032G-10 5CFAST.064G-10	-	1.1 W read 1 W write 0.25 W idle	-	1.1 W read 1 W write 0.25 W idle
	5CFAST.128G-10	-	1.1 W read 1.4 W write 0.25 W idle	-	1.1 W read 1.4 W write 0.25 W idle
	5CFAST.256G-10	-	1.2 W read 1.9 W write 0.25 W idle	-	1.2 W read 1.9 W write 0.25 W idle

Table 37: CFast cards - Power calculation

2.2.3.2.1 Calculation example

12" panel 5AP923.1215-00	4.2 W + 7.2 W =	11.4 W
System unit 5PPC2200.AL04-000	25 W (with USB consumers)	25 W
POWERLINK interface option 5ACCIF01.FPLK-000	1.75 W	1.75 W
CFast card 5CFAST.064G-10	1.1 W (read)	1.1 W
	Total max.:	**39.25 W**

Table 38: Power calculation with example configuration

2.2.3.3 Block diagrams

2.2.3.3.1 System units - Block diagram

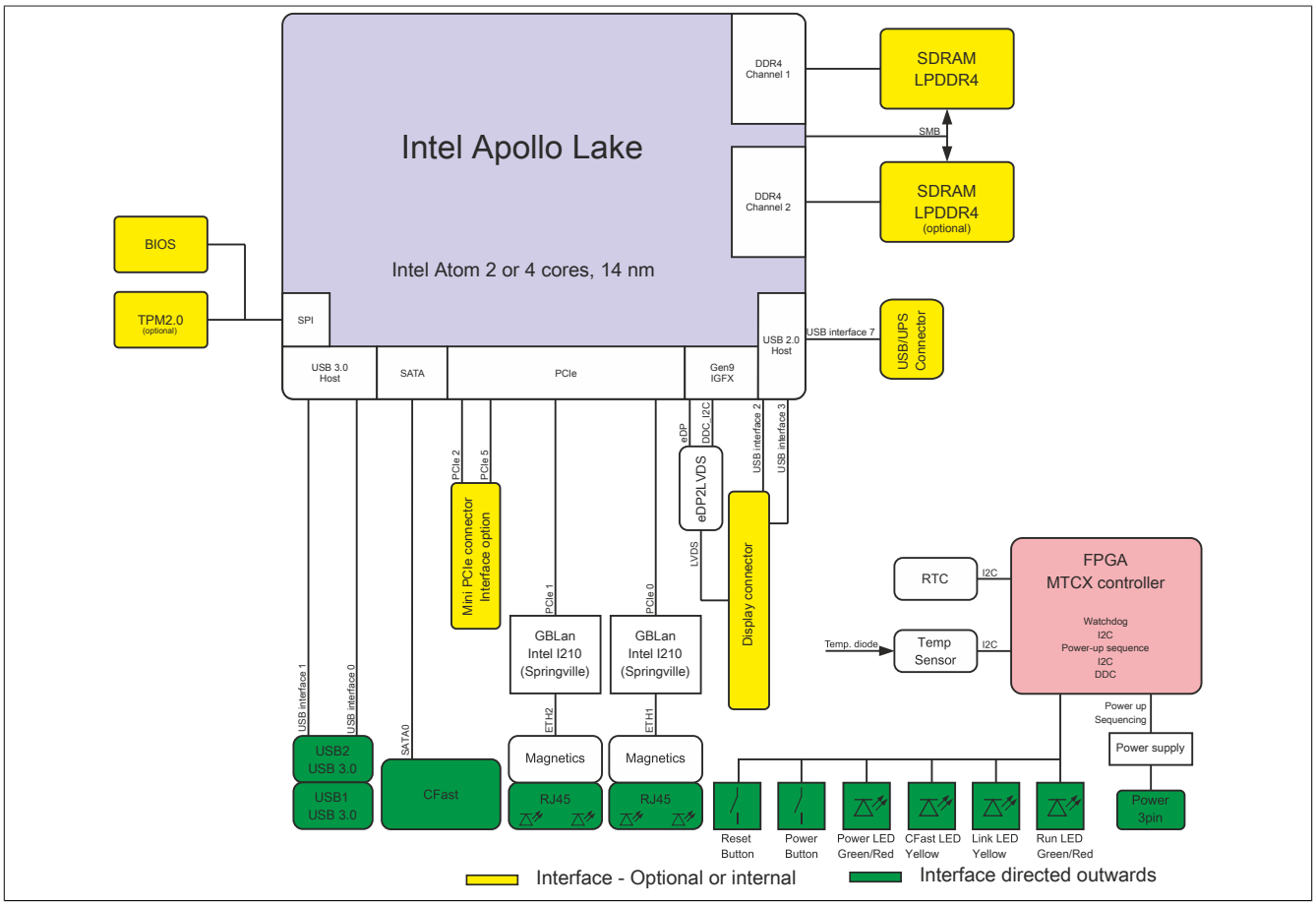


Figure 10: System units (5PPC2200.ALxx-000) - Block diagram

2.2.3.3.2 Interface options - Block diagram

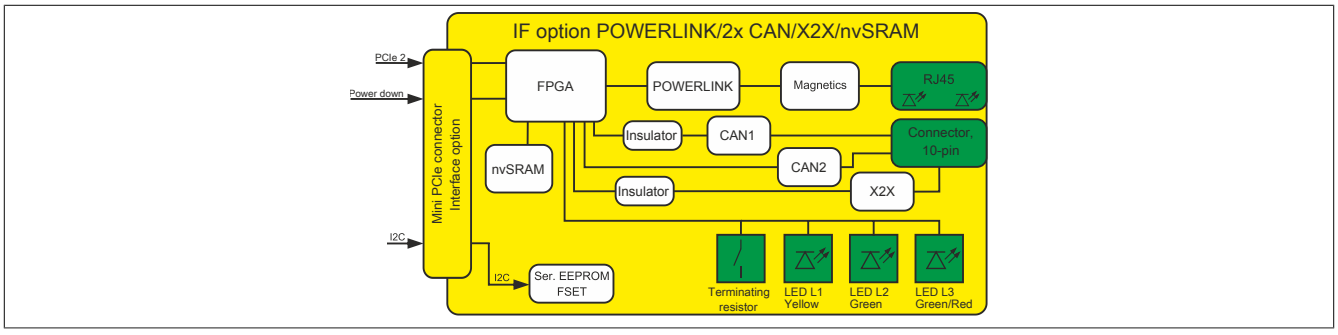


Figure 11: POWERLINK / 2x CAN / X2X / nvSRAM IF option (5ACCIF01.FPCC-000) - Block diagram

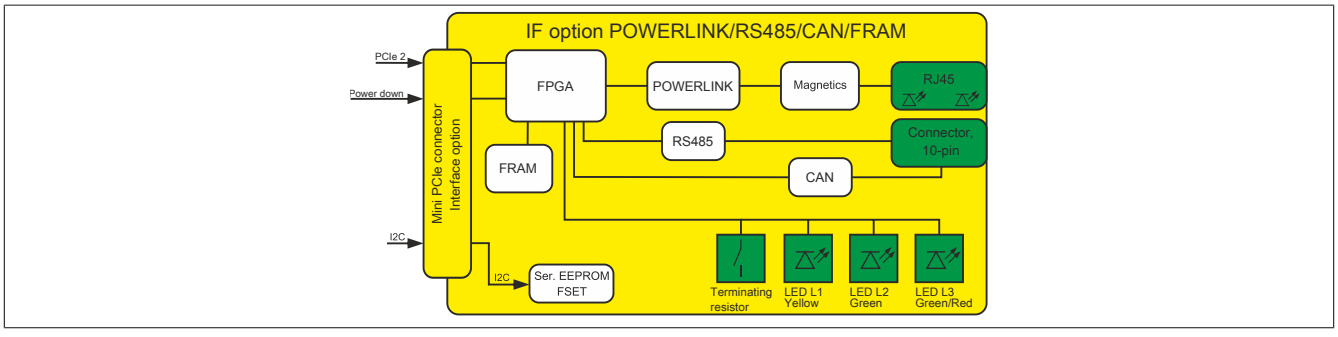


Figure 12: POWERLINK / RS485 / CAN / FRAM IF option (5ACCIF01.FPCS-000) - Block diagram

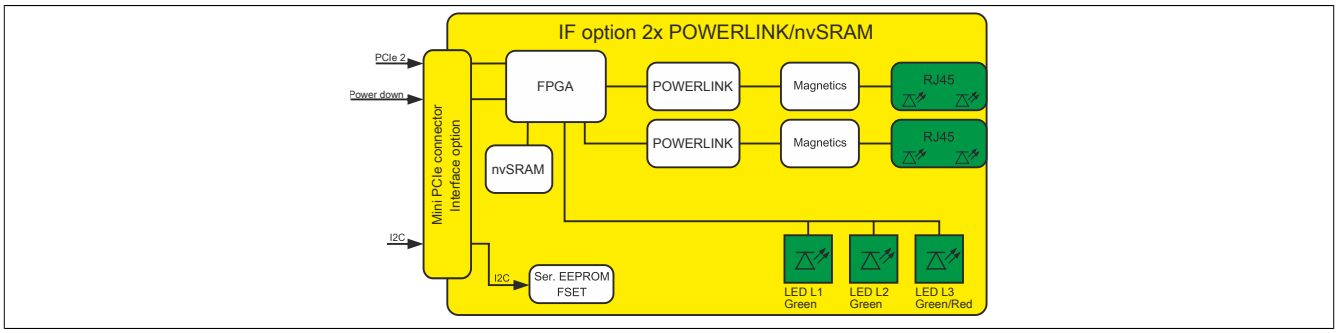


Figure 13: 2x POWERLINK / nvSRAM IF option (5ACCIF01.FPLK-000) - Block diagram

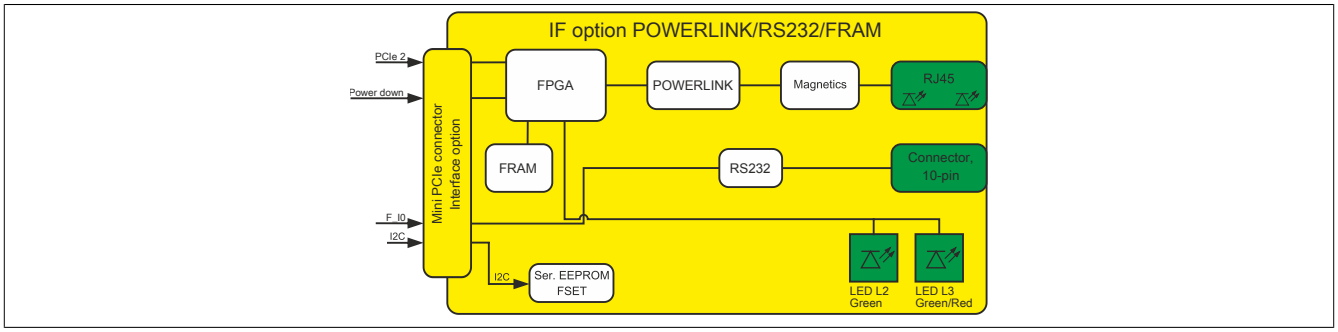


Figure 14: POWERLINK / RS232 / FRAM IF option (5ACCIF01.FPLS-000) - Block diagram

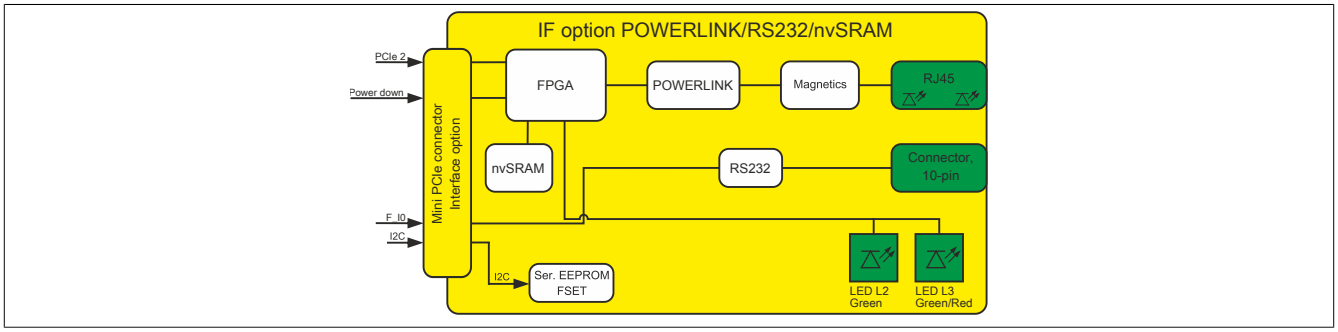


Figure 15: POWERLINK / RS232 / nvSRAM IF option (5ACCIF01.FPLS-001) - Block diagram

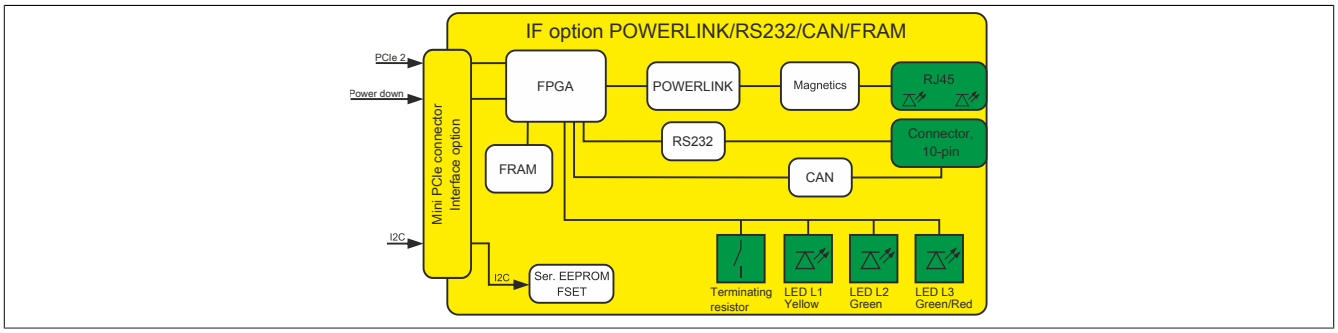


Figure 16: POWERLINK / RS232 / CAN / FRAM IF option (5ACCIF01.FPSC-000) - Block diagram

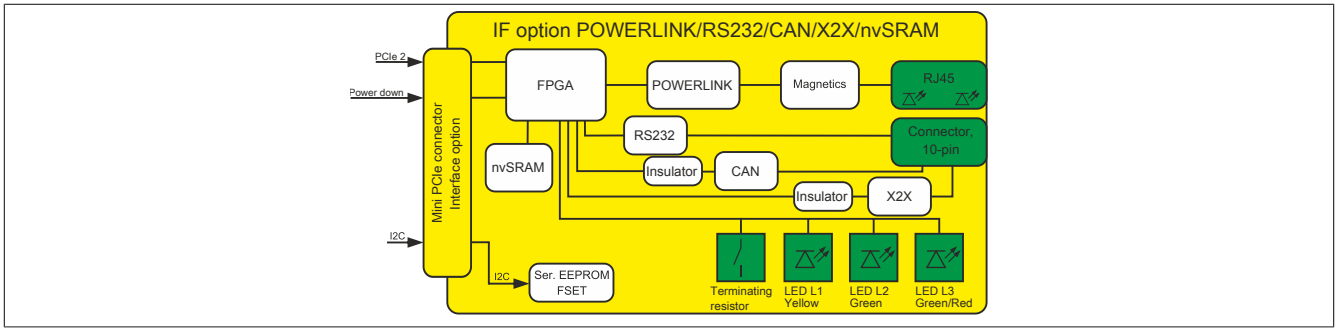


Figure 17: POWERLINK / RS232 / CAN / X2X / nvSRAM IF option (5ACCIF01.FPSC-001) - Block diagram

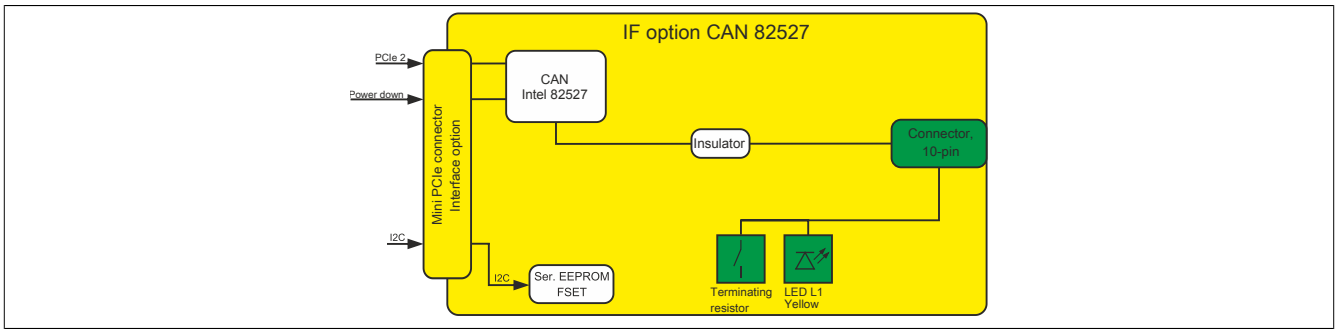


Figure 18: CAN IF option (5ACCIF01.ICAN-000) - Block diagram

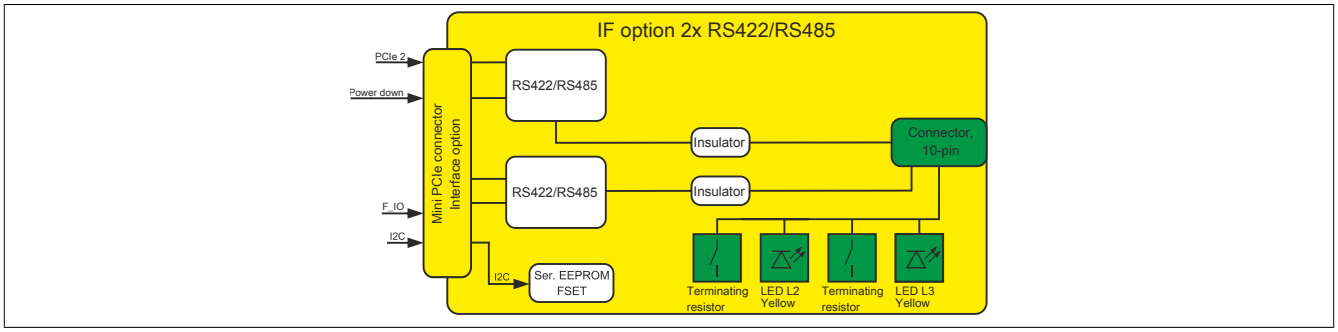


Figure 19: 2x RS422 / RS485 IF option (5ACCIF01.FSS0-000) - Block diagram

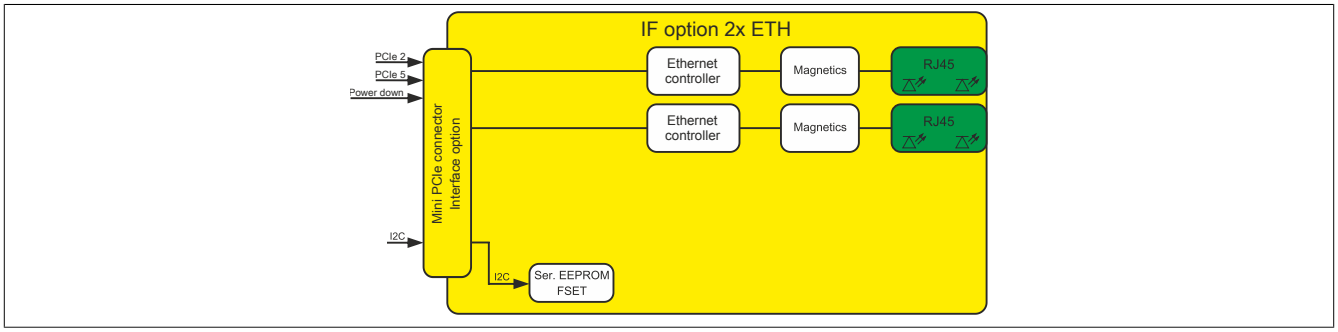


Figure 20: POWERLINK / 2x ETH IF option (5ACCIF03.CETH-000) - Block diagram

2.2.4 Product information

Each B&R device is assigned a device number with a unique serial number and barcode (type 128) to enable unique identification of the device. The product information includes additional data such as product family, power data, certifications, safety notices, license adhesive labels and a field for customer information.

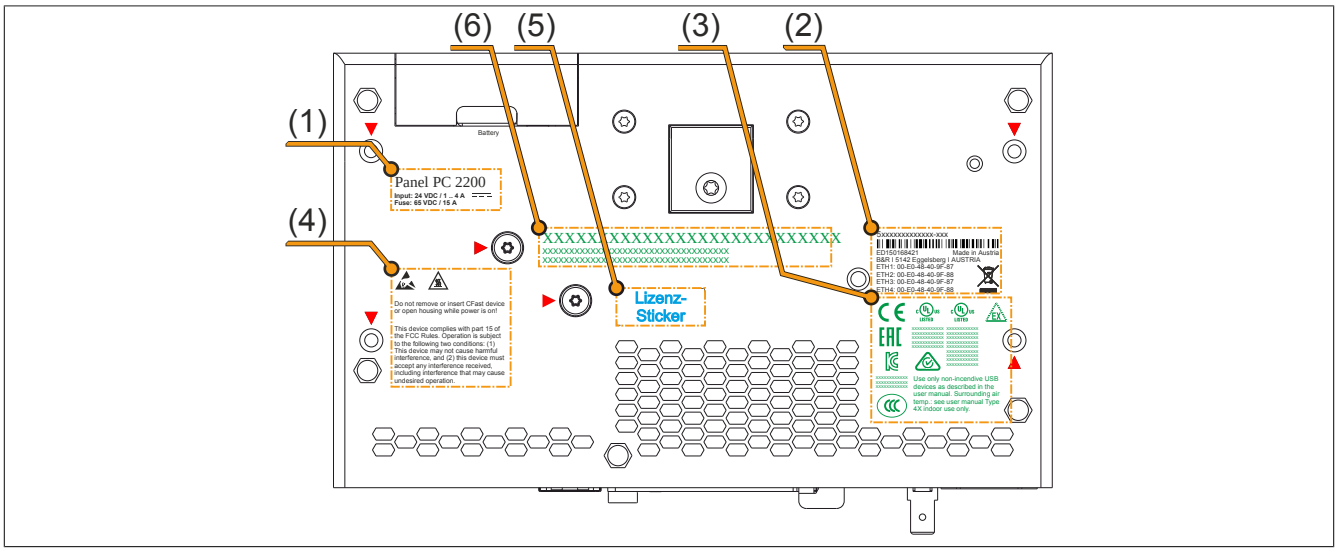


Figure 21: PPC2200 - Product information

No.	Label	Explanation
1	Company logo, product family, power data	Contains the name of the product family, company logo and information about the power data of the device.
2	Identification	Contains the device number with unique serial number and barcode of the device, country of production, company address and MAC addresses of the installed Ethernet interfaces. The number of MAC addresses may vary depending on the configuration.
3	Certifications	Contains all standards and certifications valid for the complete system. These may vary depending on the device configuration.
4	Safety notices	Contains safety notices for the complete system. These may vary depending on the device configuration.
5	License adhesive label	The license adhesive label for operating systems depends on the selected operating system and is not available for all configurations.
6	Customer information	Space for possible customer information. This must be defined already during device configuration. Subsequently changing or adding this customer information is not possible.
▼	Installation markings	These holes are intended for installing/removing the panel PC on the panel.

Table 39: Product information

2.2.4.1 Identification

All components installed in the system (serial number, material number, revision, delivery date and end of warranty) are indicated in the device number. This information can be retrieved from the B&R website (www.br-automation.com) with the device serial number. After the search, a detailed list of the installed components is displayed.

1	The device number is shown here.	
2	The serial number of the device is shown here.	

(symbolic image)

Table 40: Identification

2.2.5 Device interfaces and slots

2.2.5.1 Device interfaces - Overview

The interfaces are located on the bottom of the Panel PC 2200.

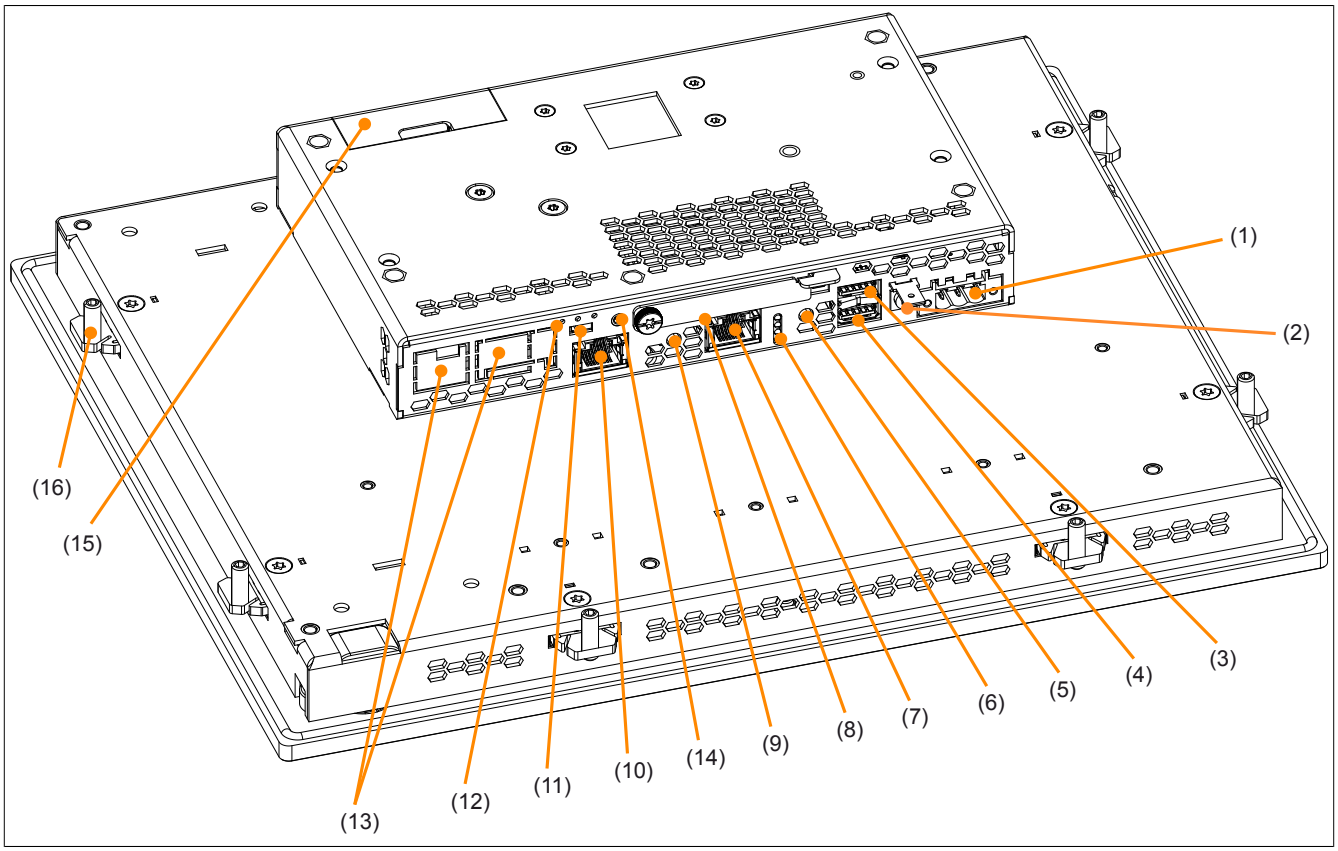


Figure 22: Device interfaces - Overview

No.	Interface name		No.	Interface name	
1	Power 24 VDC	"+24 VDC power supply" on page 44	9	Reset button	"Reset button" on page 48
2	Functional ground connection	"Grounding" on page 44	10	ETH1	"Ethernet 1 interface (ETH1)" on page 45
3	USB2	"USB interfaces" on page 46	11	On/Off	"Terminating resistor" on page 164[1)]
4	USB1	"USB interfaces" on page 46	12	L1, L2, L3	"LED status indicators L2, L3" on page 175 "LED status indicators L1, L2, L3" on page 187[1)]
5	Power button	"Power button" on page 48	13	IF option (configuration-dependent)	"IF option slot" on page 51[1)]
6	Power, CFast, Link, Run	"LED status indicators" on page 49	14	Screw point for cable shield	-
7	ETH2	"Ethernet 2 interface (ETH2)" on page 45	15	Battery compartment	"Battery compartment" on page 50
8	CFast	"CFast slot" on page 47	16	Retaining clip	-

1) Only available with installed interface option.

2.2.5.2 +24 VDC power supply

Danger!

The device is only permitted to be supplied with a SELV/PELV power supply or with safety extra-low voltage (SELV) per EN 60950.

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

The pinout is shown in the following table. The supply voltage is protected internally by a soldered fuse (15 A, fast-acting) so that the device is not damaged if the supply voltage is overloaded (fuse must be replaced) or connected incorrectly (reverse polarity protection, fuse replacement not necessary). If the fuse is destroyed during a fault event, the device must be sent to B&R for repairs.

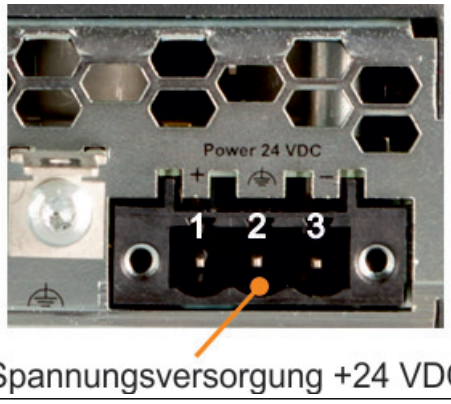
+24 VDC power supply		
	Reverse polarity protection	Power supply connection, 3-pin, male
Pin	**Description**	
1	+	
2	Functional ground	
3	-	
Model number	**Short description**	
	Terminal blocks	
0TB103.9	Connector, 24 V, 5.08 3-pin screw clamp terminal block	
0TB103.91	Connector, 24 V, 5.08 3-pin cage clamp terminal block	

Table 41: +24 VDC power supply connection

Electrical properties	
Nominal voltage	24 VDC ±25%, SELV[1)]
Nominal current	Max. 4 A
Inrush current	Typ. 5 A, max. 50 A for <500 µs
Overvoltage category per EN 61131-2	II
Galvanic isolation	Yes
Uninterruptible power supply	No

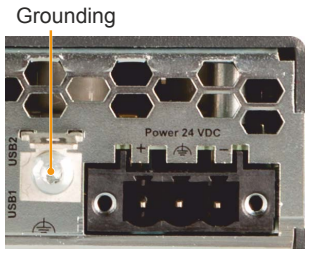
1) EN 60950 requirements must be observed.

2.2.5.2.1 Grounding

Panel PC systems have a ground connection on the interface cover.

Caution!

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



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

2.2.5.3 Ethernet 1 interface (ETH1)

This Ethernet controller is integrated in the system unit and routed externally.

Ethernet 1 interface (ETH1[1])		
Controller	Intel I210	RJ45 connector, female
Wiring	S/STP (Cat 5e)	
Transfer rate	10/100/1000 Mbit/s[2]	
Cable length	Max. 100 m (min. Cat 5e)	
LED "Speed"	**On**	**Off**
Green	100 Mbit/s	10 Mbit/s[3]
Orange (dark)	1000 Mbit/s	-
LED "Link"	**On**	**Off**
Orange (light)	Link (a connection to an Ethernet network exists)	Activity (blinks) (data is being transferred)

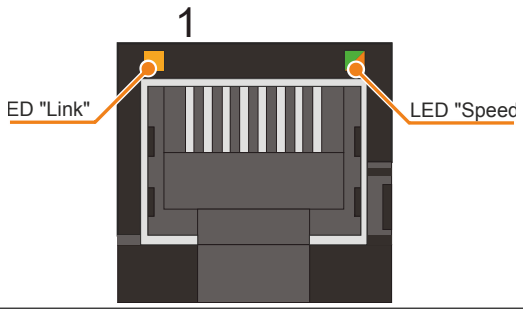


Table 42: Ethernet interface (ETH1)

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) Switching takes place automatically.
3) The 10 Mbit/s transfer rate / connection is only available if LED "Link" is active at the same time.

A special driver is required to operate the Ethernet controller. Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

Information:

Necessary drivers must be downloaded from the B&R website, not from manufacturer websites.

2.2.5.4 Ethernet 2 interface (ETH2)

This Ethernet controller is integrated in the system unit and routed externally.

Ethernet 2 interface (ETH2[1])		
Controller	Intel I210	RJ45 connector, female
Wiring	S/STP (Cat 5e)	
Transfer rate	10/100/1000 Mbit/s[2]	
Cable length	Max. 100 m (min. Cat 5e)	
LED "Speed"	**On**	**Off**
Green	100 Mbit/s	10 Mbit/s[3]
Orange (dark)	1000 Mbit/s	-
LED "Link"	**On**	**Off**
Orange (light)	Link (a connection to an Ethernet network exists)	Activity (blinks) (data is being transferred)

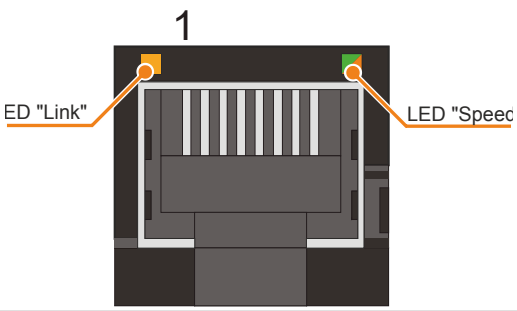


Table 43: Ethernet interface (ETH2)

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) Switching takes place automatically.
3) The 10 Mbit/s transfer rate / connection is only available if LED "Link" is active at the same time.

A special driver is required to operate the Ethernet controller. Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

Information:

Necessary drivers must be downloaded from the B&R website, not from manufacturer websites.

2.2.5.5 USB interfaces

Panel PC devices are equipped with a USB 3.0 (Universal Serial Bus) host controller with several USB ports, of which two USB 3.0 interfaces are routed externally and freely available to the user.

Warning!

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

Caution!

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

Universal Serial Bus (USB1, USB2)[1]		
Type	USB 3.0	2x USB type A, female
Variant	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s) to SuperSpeed (5 Gbit/s)[2]	
Current-carrying capacity[3] USB1, USB2	Max. 1 A	
Cable length USB 3.0 USB 2.0	 Max. 3 m (without hub) Max. 5 m (without hub)	

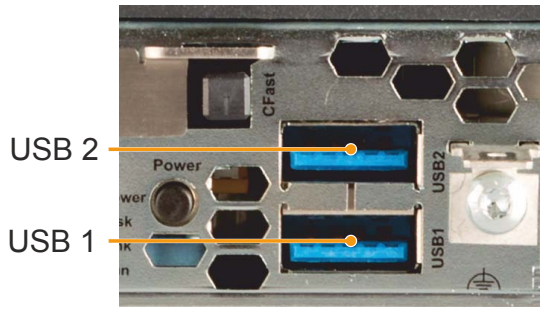


Table 44: USB1, USB2 interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) Compatibility with SuperSpeed depends on the operating system used.
3) The USB interface is protected by a maintenance-free "USB current-limiting switch" (max. 1 A).

2.2.5.6 CFast slot

The Panel PC offers an easily accessible CFast slot so that the CFast card can also be used as a removable storage medium for data transfer or upgrades.

This CFast slot is internally connected to the chipset via SATA 0 and implemented in version SATA III (SATA 6.0 Gbit/s).

Information:

5CFAST.0xxx-00 CFast cards are only permitted to be operated in the xPC2200 starting with revision E0.

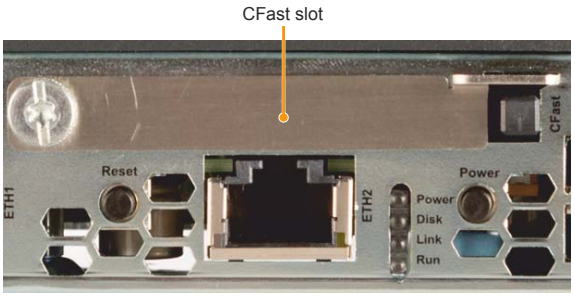
CFast slot		
Connection	SATA 0	
Model number	**Short description**	
	CFast cards	
5CFAST.2048-00	CFast 2 GB SLC	
5CFAST.4096-00	CFast 4 GB SLC	
5CFAST.8192-00	CFast 8 GB SLC	
5CFAST.016G-00	CFast 16 GB SLC	
5CFAST.032G-00	CFast 32 GB SLC	
5CFAST.032G-10	CFast 32 GB MLC	
5CFAST.064G-10	CFast 64 GB MLC	
5CFAST.128G-10	CFast 128 GB MLC	
5CFAST.256G-10	CFast 256 GB MLC	

Table 45: CFast slot

Warning!

The CFast card is only permitted to be connected/disconnected when the power is switched off!

2.2.5.7 Power button

Due to full ATX power supply support, the power button has a wide range of functionalities.

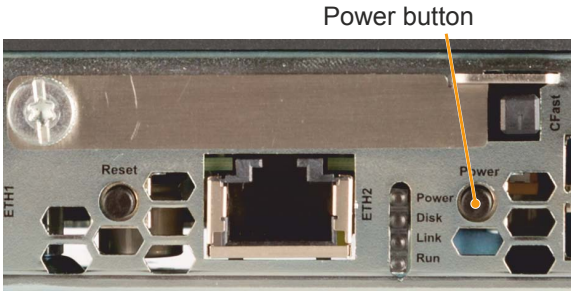
Power button	
The power button can be pressed without any tools. The power button behaves like the power switch on current desktop PCs with an ATX power supply: **Short press** ... Switches on the Panel PC or performs the action configured in the operating system when pressing the power button (shutdown, sleep, etc.) and switches off the Panel PC. **Long press** ... The ATX power supply switches off the Panel PC without shutting it down (**approx. 4 sec. - data loss possible!**). Pressing the power button does not reset the MTCX processor.	

Table 46: Power button

2.2.5.8 Reset button

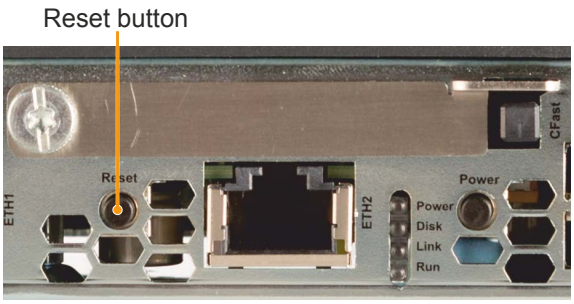
Reset button	
The reset button can be pressed without any tools. Pressing the reset button triggers a hardware and PCI reset. The Panel PC restarts (cold restart - data loss possible!). During a reset, the MTCX processor is not reset.	

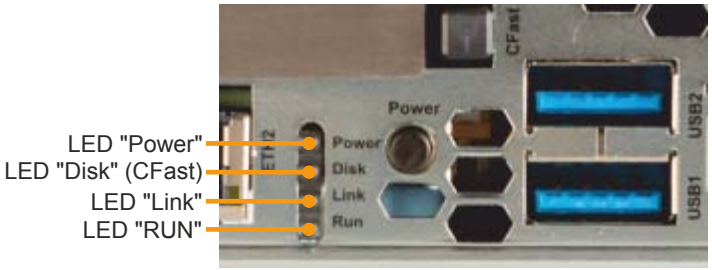
Table 47: Reset button

Warning!

Resetting the system can result in data loss!

2.2.5.9 LED status indicators

The LED status indicators are located between the power button and Ethernet 2 interface.



The following intervals are used for the LED status indicators:
Width of box: 250 ms
Repeat interval: 500 ms. 2 boxes thus correspond to one interval.

LED	Color	Status	Explanation	LED indicator
Power	Green	On	Power supply OK	
		Blinking	The device is started up; the battery state is "BAD".	
			Information: **For additional information, see "Battery compartment".**	
	Red	On	The system is in standby mode (S5: soft-off mode or S4: hibernation/suspend-to-disk mode).	
		Blinking	The MTCX is running; the battery state is "BAD". The system is in standby mode (S5: soft-off mode or S4: hibernation/suspend-to-disk mode).	
	Red-Green	Blinking	Faulty or incomplete BIOS, MTCX or I/O FPGA update, power supply OK	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, power saving (standby) mode (S5: soft-off mode or S4: hibernation/suspend-to-disk mode)	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery state BAD, power supply OK	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery state BAD, power saving (standby) mode (S5: soft-off mode or S4: hibernate/suspend-to-disk mode)	
			Information: **An update must be performed again.**	
Disk (CFast)	Yellow	On	Indicates CFast access.	
Link	Yellow	On	Indicates an active SDL connection on the panel connector.	
		Blinking	An active SDL connection was interrupted due to power loss of the panel.	
			Information: **Check the power supply or power connection of the connected panel.**	
Run	Green	Blinking	Automation Runtime is starting up. Controlled by Automation Runtime (ARemb and ARwin).	
	Green	On	Application running Controlled by Automation Runtime (ARemb and ARwin).	
	Red	On	Application in service mode Controlled by Automation Runtime (ARemb and ARwin).	
	Orange	Blinking	A license violation has occurred.	

Table 48: LED status indicators - Data

2.2.5.10 Battery compartment

The battery compartment consists of the battery holder and the battery.

The lithium battery (3 V, 1000 mAh) ensures backup power to the internal real-time clock (RTC). It is located on the underside of the device behind the gray cover. The self-discharge time of the battery is at least 8 years (at 50°C, 6 µA for the components being supplied). The battery is subject to wear and should be replaced regularly (at least after the specified service life) by changing the battery (see "Changing the battery" on page 286).

Model number	Short description	Figure
	Accessories	
5ACCBT01.0000-001	Battery compartment - Dark gray - Includes battery - For APC2200/PPC2200	

Table 49: Battery compartment

The battery state is determined by the system immediately after the device is switched on and subsequently every 24 hours. During the measurement, the battery is subjected to a brief load (approx. 1 second) and then assessed. The determined battery state is displayed in BIOS (see "Baseboard" on page 239) and the B&R Control Center (ADI driver) but can also be read out in a customer application via the ADI library.

Battery state	Explanation
N/A	The hardware or firmware used is too old and does not support readout.
GOOD	Data retention is ensured.
BAD	As soon as the battery capacity is recognized as BAD (insufficient), the battery compartment must be replaced.

Table 50: Explanation of battery state

As soon as the battery capacity is recognized as insufficient, the battery compartment must be replaced.
To avoid data loss during battery replacement, data is retained by a capacitor for approx. 2 minutes.

2.2.5.11 IF option slot

Panel PC system units have 1 slot for an interface option.

The following table lists the interface options that can be operated in the IF option slot.

IF option IF1, IFx slot		
Model number	**Short description**	
	Interface option	
5ACCIF01.FPCC-000	Interface card - 2x CAN interfaces - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF01.FPCS-000	Interface card - 1x RS485 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF01.FPLK-000	Interface card - 2x POWERLINK interfaces - 512 kB nvSRAM - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF01.FPLS-001	Interface card - 1x RS232 interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF01.FPSC-001	Interface card - 1x RS232 interface - 1x CAN interface - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF01.FSS0-000	Interface card - 2x RS422/RS485 interface - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF01.ICAN-000	Interface card - 1x CAN interface - For APC2100/PPC2100 and APC2200/PPC2200	
5ACCIF03.CETH-000	Interface card - 2x ETH 10/100/1000 interface - For APC2200/PPC2200	

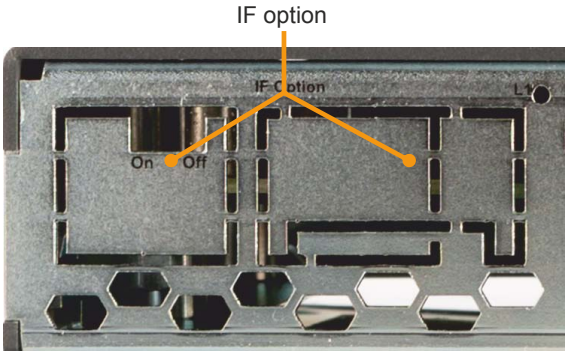


Table 51: IF option

Information:

Interface options can only be installed and replaced at the B&R factory.

2.2.5.12 Trusted Platform Module (TPM)

Depending on the configuration ordered, the system unit may contain a Trusted Platform Module (TPM 2.0). A TPM is a chip that adds important security features to your device, such as improved protection of the PC against unauthorized tampering by third parties. Current operating systems, e.g. Windows 10, support these security functions.

Enabling the Trusted Platform Module

The TPM is disabled by default and can be enabled in BIOS.

1. In submenu "Security" of "Setup utility", set parameter "TPM availability" to "Available".
2. Apply this setting with "Save and exit". The change only takes effect after a reboot, which takes place automatically via "Save and exit".
3. In submenu "Advanced" of "Setup utility", set parameter "Target TPM device" to "dTPM" under "Security configuration".

Using the Trusted Platform Module

The TPM can be used together with "BitLocker" drive encryption in Windows 10, for example. To do this, follow the instructions in the operating system.

> **Information:**
>
> **If the password for data encryption is lost, it is not possible to decrypt the data, e.g. after a BIOS update or TPM firmware update. Access to the encrypted drive is lost. Passwords must be carefully stored and protected from unauthorized access.**

2.2.6 Features of AP1000 panels

Different display diagonals as well as panels with touch screen and keys are available. The following table provides an overview of the panels and their features.

Display type	Model number	Resolution	Touch screen	Function keys	System keys	Front USB interface
5.7" single-touch	5AP1120.0573-000	VGA	Single-touch	No	No	No
5.7" keys	5AP1151.0573-000	VGA	No	Yes	Yes	No
7.0" single-touch	5AP1120.0702-000	WVGA	Single-touch	No	No	No
7.0" multi-touch	5AP1130.0702-000	WVGA	Multi-touch	No	No	No
10.1" single-touch	5AP1120.101E-000	WXGA	Single-touch	No	No	No
10.1" multi-touch	5AP1130.101E-000	WXGA	Multi-touch	No	No	No
10.4" single-touch	5AP1120.1043-000	VGA	Single-touch	No	No	Yes
10.4" single-touch with keys	5AP1180.1043-000	VGA	Single-touch	Yes	No	Yes
10.4" single-touch with keys	5AP1181.1043-000	VGA	Single-touch	Yes	Yes	Yes
10.4" single-touch with keys	5AP1182.1043-000	VGA	Single-touch	Yes	Yes	Yes
12.1" single-touch	5AP1120.1214-000	SVGA	Single-touch	No	No	Yes
12.1" single-touch	5AP1120.121E-000	WXGA	Single-touch	No	No	No
12.1" multi-touch	5AP1130.121E-000	WXGA	Multi-touch	No	No	No
15.0" single-touch	5AP1120.1505-000	XGA	Single-touch	No	No	Yes
15.0" single-touch with keys	5AP1180.1505-000	XGA	Single-touch	Yes	No	Yes
15.0" single-touch with keys	5AP1181.1505-000	XGA	Single-touch	Yes	Yes	Yes
15.6" single-touch	5AP1120.156B-000	HD	Single-touch	No	No	No
15.6" multi-touch	5AP1130.156C-000	FHD	Multi-touch	No	No	No
18.5" multi-touch	5AP1130.185C-000	FHD	Multi-touch	No	No	No
19.0" single-touch	5AP1120.1906-000	SXGA	Single-touch	No	No	Yes

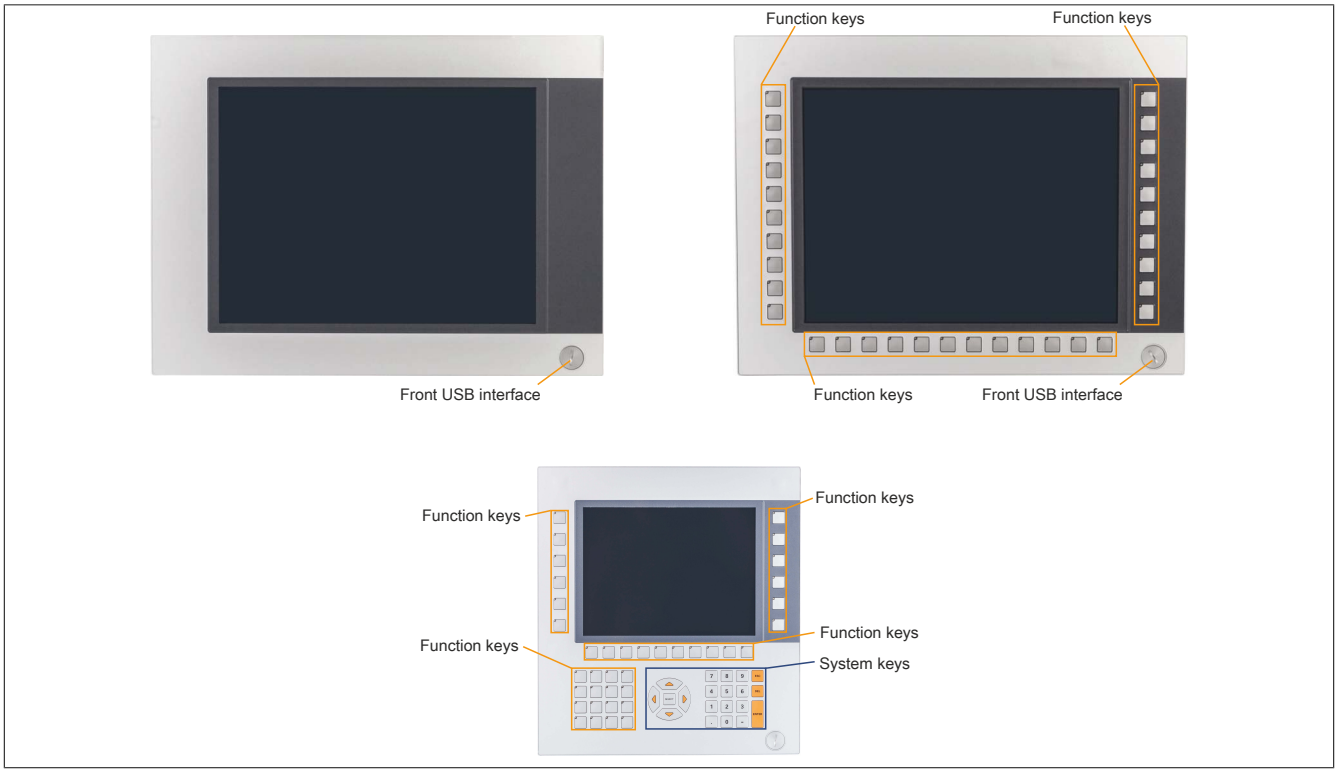


Figure 23: Features of AP1000 panels

2.2.6.1 Slide-in labels

Panels with keys are delivered with inserted, transparent slide-in labels in the function keys. These can be labeled by hand.

It is also possible to download a print template for slide-in labels with individual inscriptions from the B&R website (www.br-automation.com).

The slots provided for slide-in labels are accessible on the rear of the Automation Panel devices.

2.2.6.2 Key and LED configuration

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

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

Keys and LEDs from each device are processed by the matrix controller in a bit string of 128 bits each.

The positions of the keys and LEDs in the matrix are represented as hardware numbers. The hardware numbers can be read directly from the target system using the B&R Key Editor and B&R Control Center, for example.

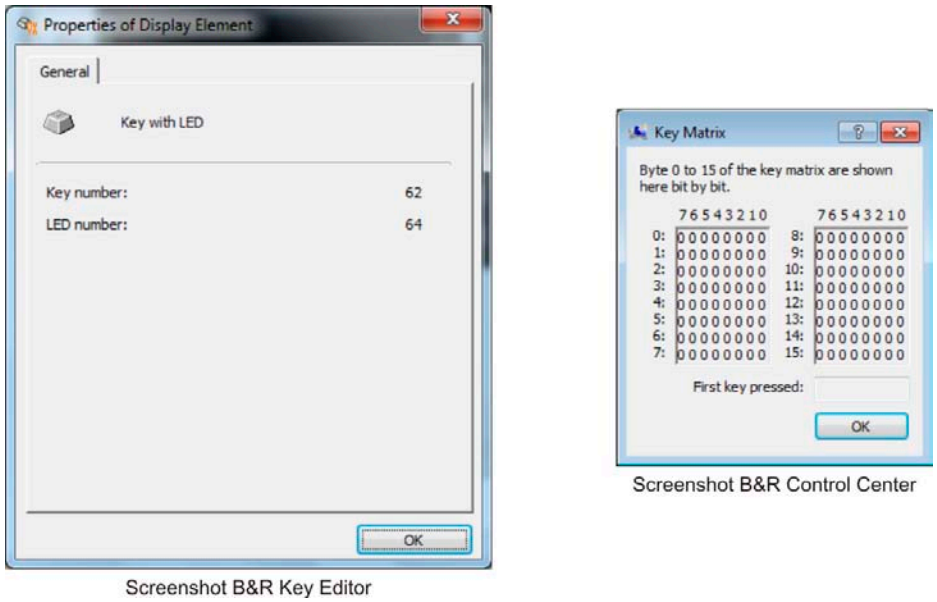


Figure 24: Hardware numbers in the B&R Key Editor and B&R Control Center - Example

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

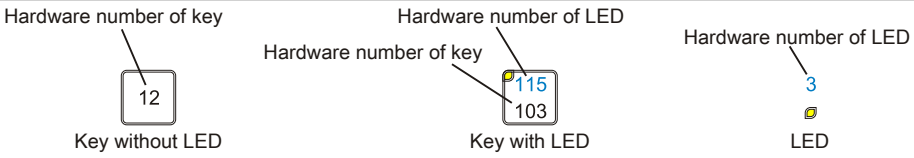


Figure 25: Representation of keys and LEDs

5AP1151.0573-000

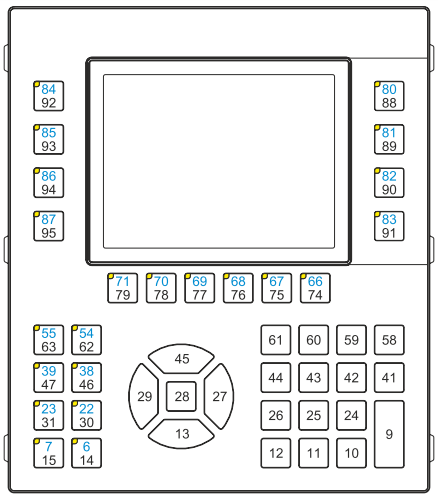


Figure 26: 5AP1151.0573-000 - Key and LED configuration

5AP1180.1043-000

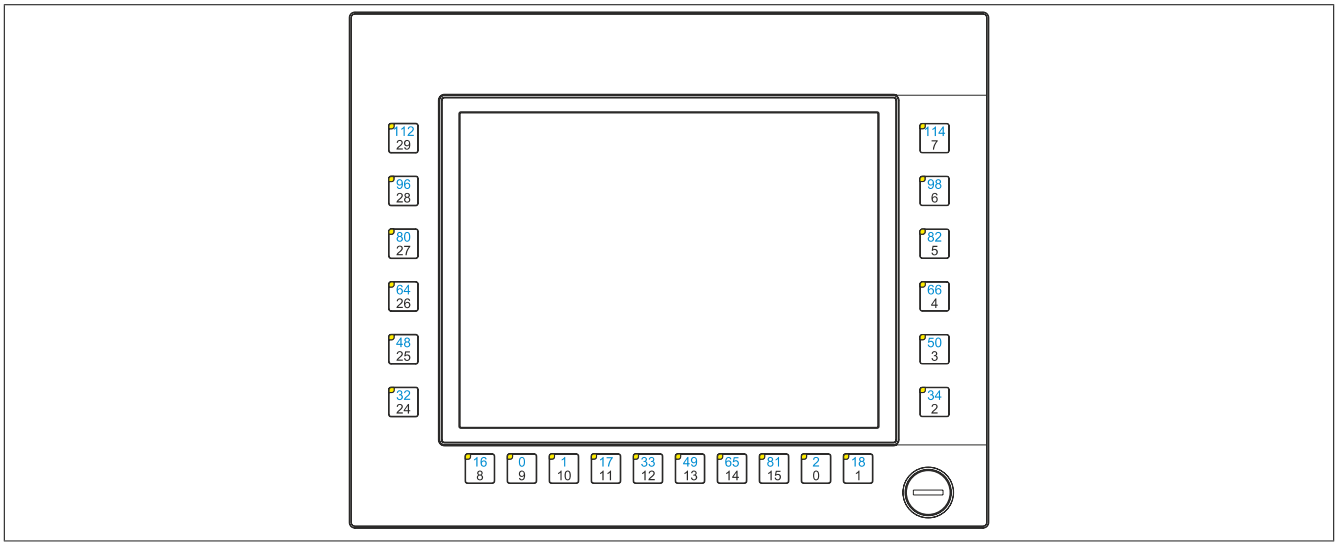


Figure 27: 5AP1180.1043-000 - Key and LED configuration

5AP1181.1043-000

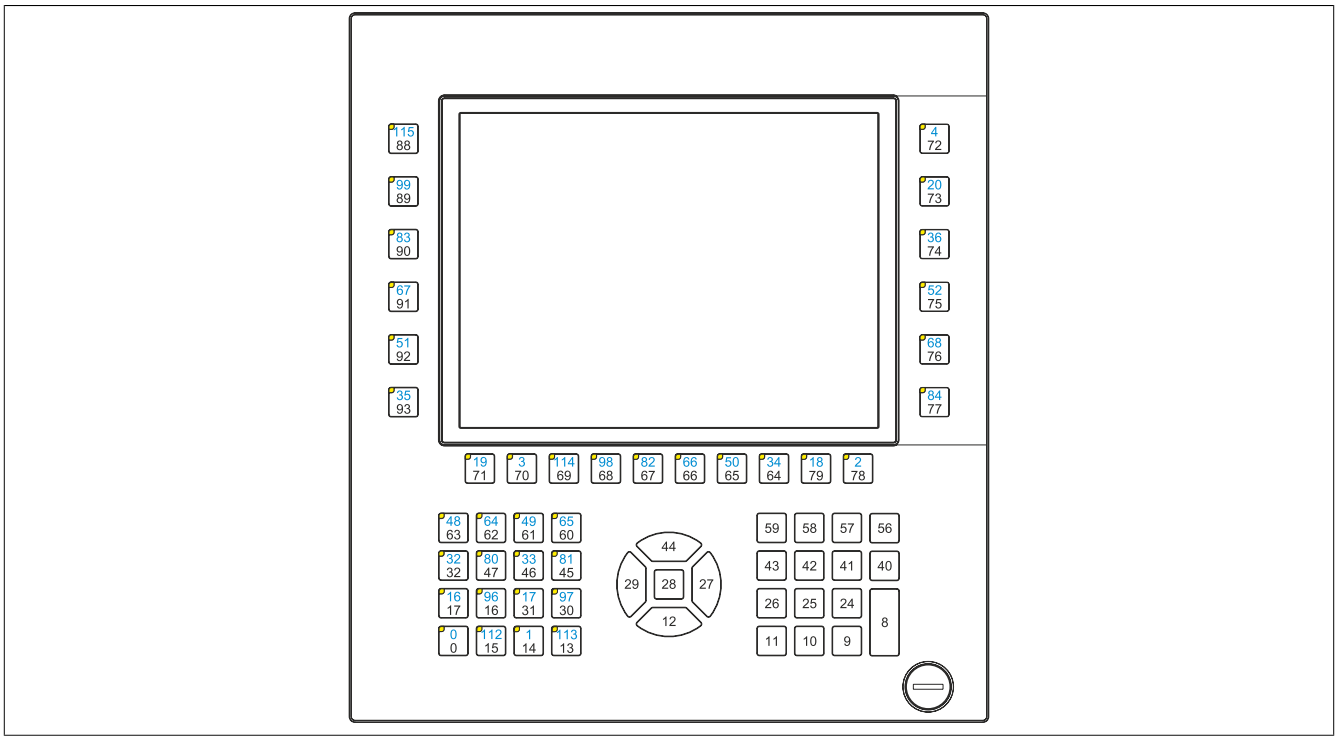


Figure 28: 5AP1181.1043-000 - Key and LED configuration

5AP1182.1043-000

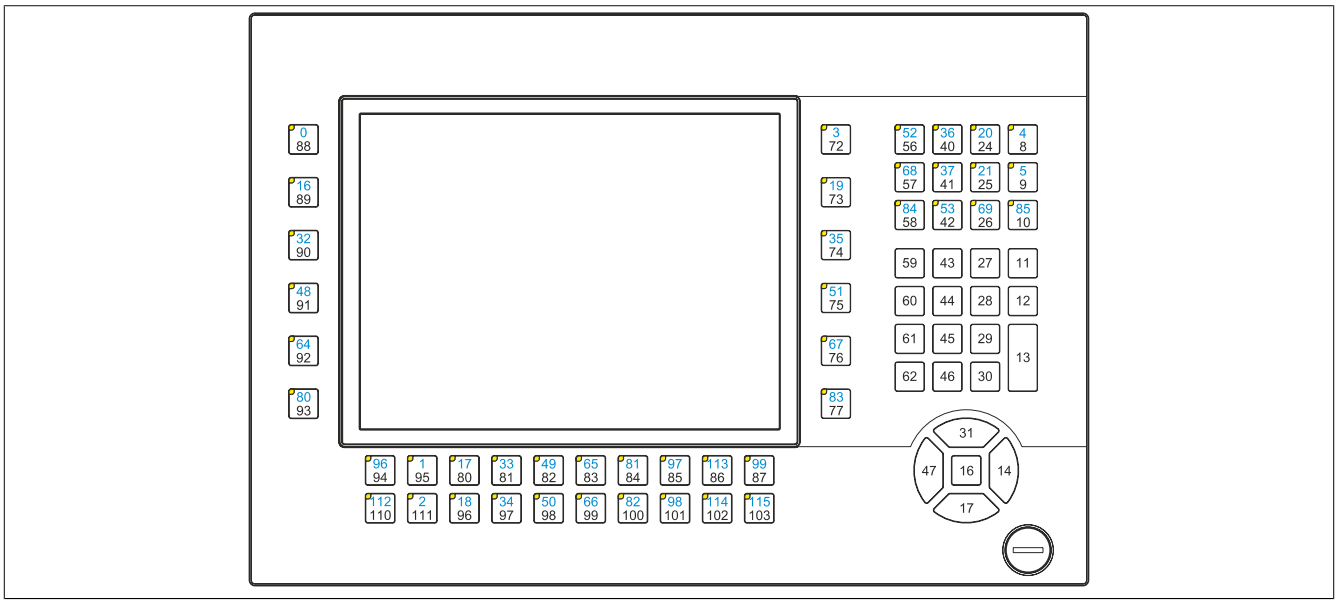


Figure 29: 5AP1182.1043-000 - Key and LED configuration

5AP1180.1505-000

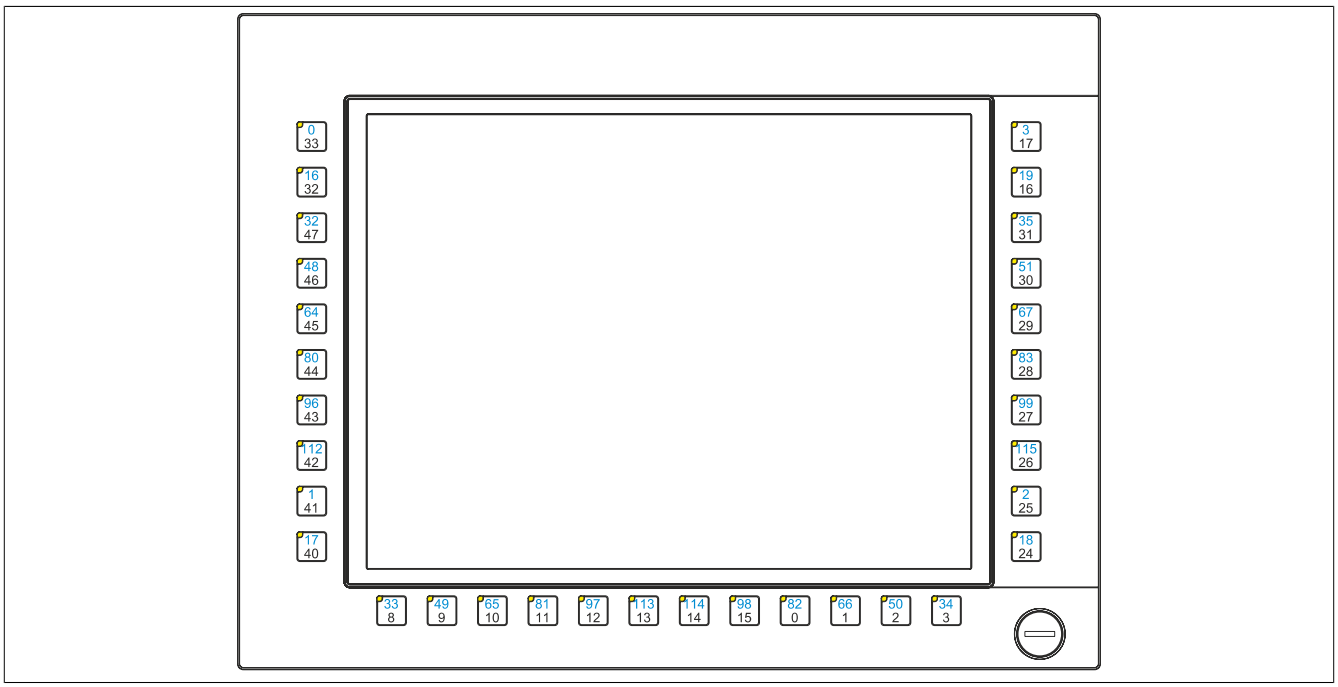


Figure 30: 5AP1180.1505-000 - Key and LED configuration

5AP1181.1505-000

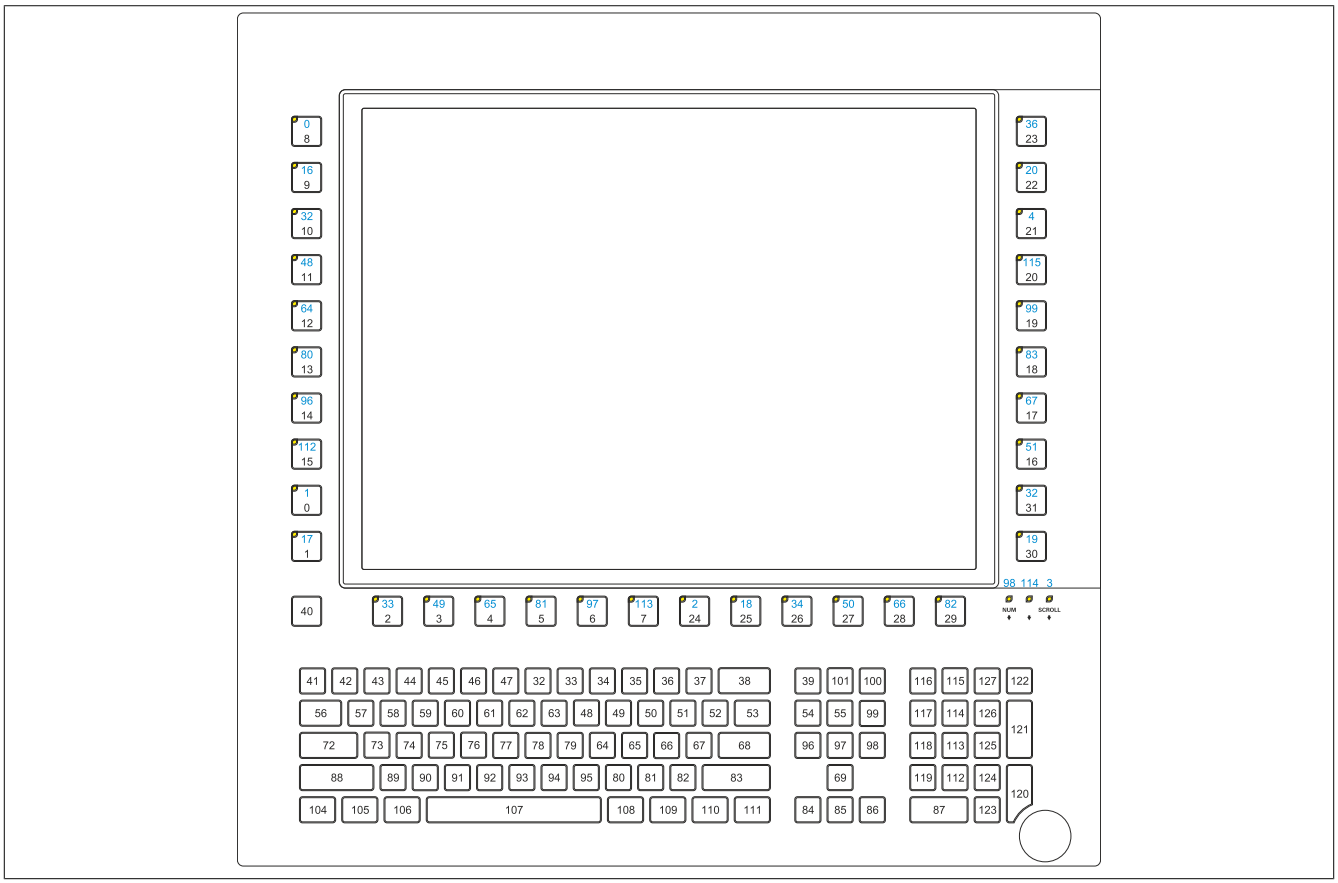


Figure 31: 5AP1181.1505-000 - Key and LED configuration

2.2.6.3 USB interface

AP1000 panels with 10.4", 12.1" (4:3 format only), 15" (4:3 format only) and 19" display diagonals are equipped with a front USB 2.0 interface. This is equipped with a USB interface cover. IP65 protection (front) is only provided if the USB interface cover is correctly installed.

Warning!

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

Caution!

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

Front USB

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

Universal Serial Bus (front USB)[1]		
Type	USB 2.0	1x USB type A, female (sample image)
Variant	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)	
Current-carrying capacity[2] Front USB	Max. 500 mA	
Cable length USB 2.0	Max. 5 m (without hub)	

Table 52: Front USB interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) The USB interface is protected by a maintenance-free "USB current-limiting switch" (max. 500 mA).

2.2.7 Installation compatibility

This section describes the compatibility of the installation dimensions for Power Panel 100/200, Power Panel 300/400, Power Panel 500, Automation Panel 900, Automation Panel 1000, Panel PC 700 and Panel PC 800 devices depending on the respective device diagonals.

The external dimensions of the device types of the respective diagonals are identical.

Information:

Device designation "AP1000" refers to the Automation Panel 1000 as well as to the Panel PC 900, Panel PC 2100, Panel PC 2200 and Panel PC 3100 with an installed AP1000 panel.

The various device types are abbreviated as follows:

Device type	Short form
Power Panel xxx	PPxxx
Panel PC xxxx	PPCxxxx
Automation Panel xxxx	APxxxx

Table 53: Product abbreviations

2.2.7.1 Compatibility overview

The following table gives a brief overview of the PP100/200, PP300/400, PP500, AP900, AP1000, PPC700 and PPC800 devices. For more information, see section "Compatibility details" on page 60.

Information:

The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm. The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

Diagonal	Format		PP100/200	PP300/400	PP500	AP900	AP1000[1)]	PPC700	PPC800
5.7"	Landscape1	Outer dimensions	212 x 156			-	212 x 156	-	
		Installation dimensions	199 x 143			-	199 x 143	-	
	Landscape2	Outer dimensions	302 x 187			-			
		Installation dimensions	289 x 174			-			
	Portrait1	Outer dimensions	212 x 245			-	212 x 245	-	
		Installation dimensions	199 x 226.8		199 x 232	-	199 x 232	-	
7"	Landscape1	Outer dimensions	-		212 x 156	-	212 x 156	-	
		Installation dimensions	-		199 x 143	-	199 x 143	-	
10.4"	Landscape1	Outer dimensions	323 x 260						-
		Installation dimensions	303 x 243						-
	Landscape2	Outer dimensions	423 x 288						-
		Installation dimensions	402 x 266.5		403 x 271	402 x 271	403 x 271	402 x 271	-
	Portrait1	Outer dimensions	323 x 358						-
		Installation dimensions	303 x 336		303 x 341				-
12.1"	Landscape1	Outer dimensions	362 x 284						-
		Installation dimensions	345 x 267		342 x 267				-
15"	Landscape1	Outer dimensions	435 x 330						

Table 54: Overview of device compatibility

Diagonal	Format		PP100/200	PP300/400	PP500	AP900	AP1000[1)]	PPC700	PPC800
		Installation dimensions	415 x 312		415 x 313	415 x 312	415 x 313	415 x 312	
	Portrait1	Outer dimensions	435 x 430				-	435 x 430	-
		Installation dimensions	415 x 412		415 x 413	415 x 412	-	415 x 412	-
17"	Landscape1	Outer dimensions	-			477 x 390	-	477 x 390	-
		Installation dimensions	-			460 x 373	-	460 x 373	-
19"	Landscape1	Outer dimensions	-			527 x 421			
		Installation dimensions	-			510 x 404			
21.3"	Landscape1	Outer dimensions	-			583 x 464	-		
		Installation dimensions	-			566 x 447	-		

Table 54: Overview of device compatibility

1) Device designation "AP1000" refers to the Automation Panel 1000 as well as to Panel PCs installed on AP1000 panels.

2.2.7.2 Compatibility details

2.2.7.2.1 Example

The dimensions (mm) in the subsequent figures have the following meaning.

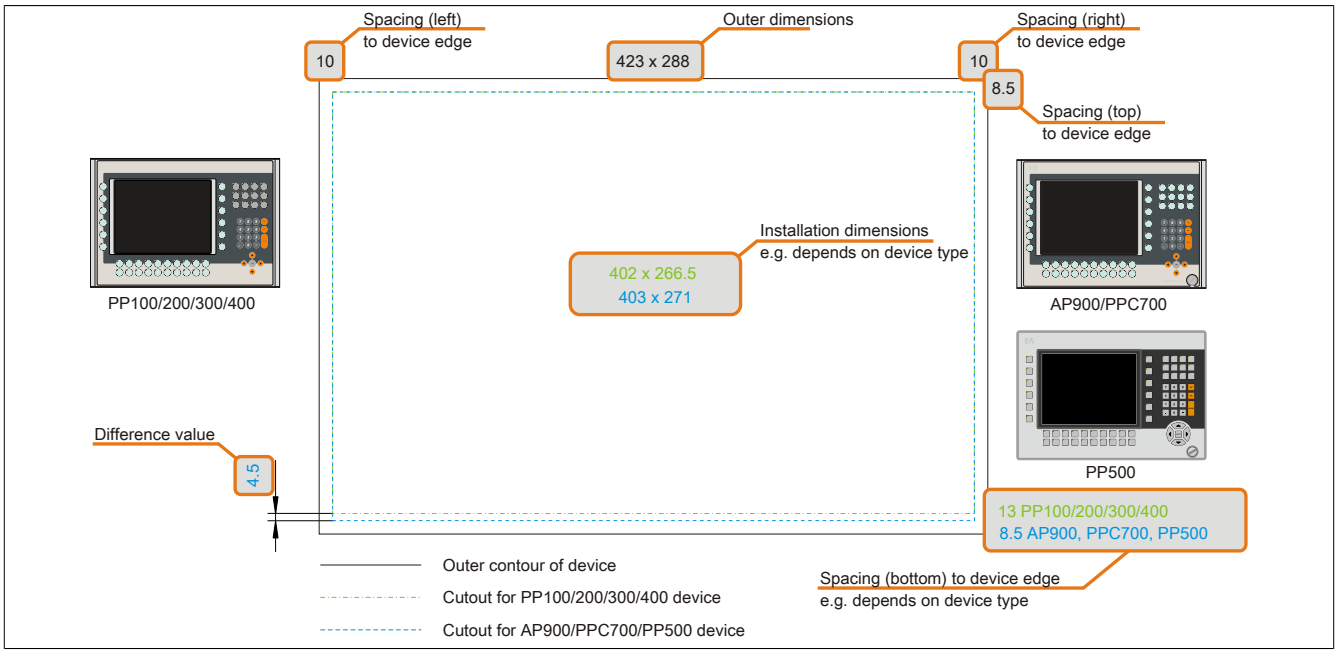


Figure 32: Compatibility details - Figure design

2.2.7.2.2 5.7" devices

The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

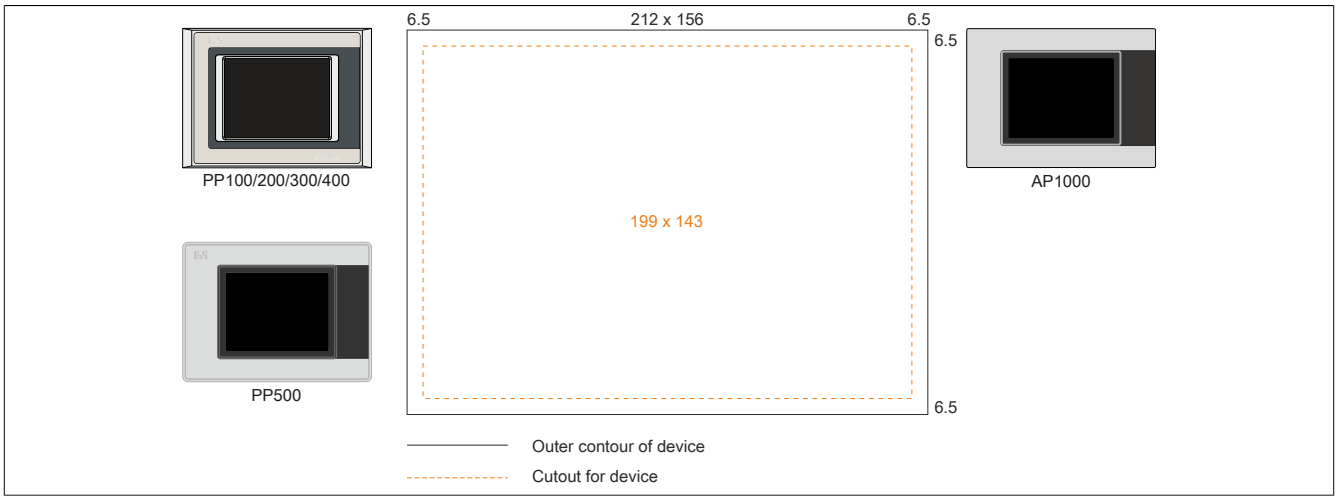


Figure 33: Installation compatibility - 5.7" devices - Landscape1

The 5.7" Automation Panel 1000, Power Panel 500, Power Panel 300/400 and Power Panel 100/200 devices in Landscape1 format are 100% compatible.

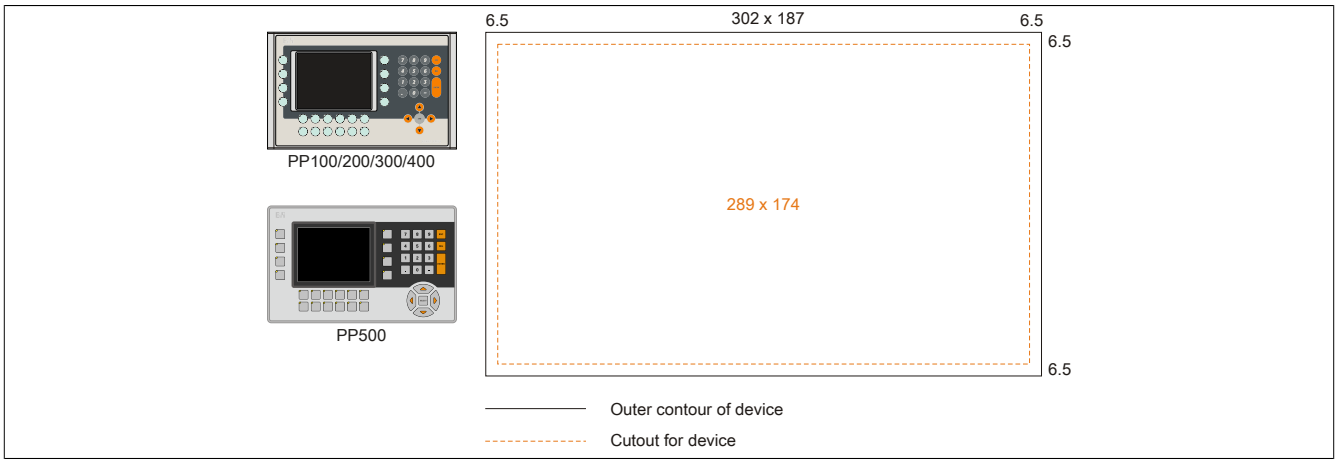


Figure 34: Installation compatibility - 5.7" devices - Landscape2

The 5.7" Power Panel 500, Power Panel 300/400 and Power Panel 100/200 devices in Landscape2 format are 100% compatible.

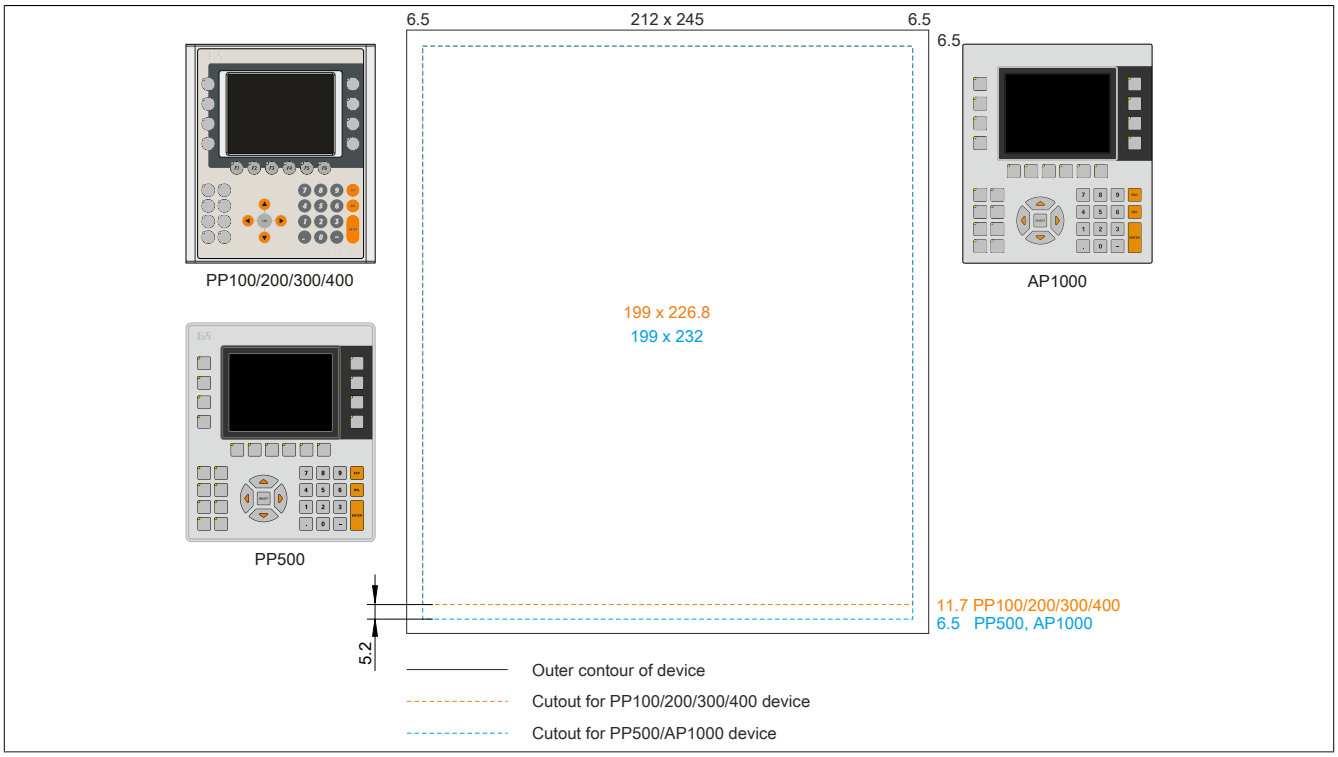


Figure 35: Installation compatibility - 5.7" devices - Portrait1

The 5.7" Automation Panel 1000 and Power Panel 500 are not 100% compatible with Power Panel 300/400 and Power Panel 100/200 devices in Portrait1 format. Automation Panel 1000 and Power Panel 500 devices need a cutout that is 5.2 mm larger (bottom edge).

The larger cutout can be used conditionally for all devices:

- During installation, it is important to ensure that the PP100/200 and PP300/400 devices are positioned and installed as centrally as possible in the cutout. If this is not the case, the retaining clips can no longer grip and impermeability is no longer ensured by the circumferential cord gasket (IP65).

2.2.7.2.3 10.4" devices

The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

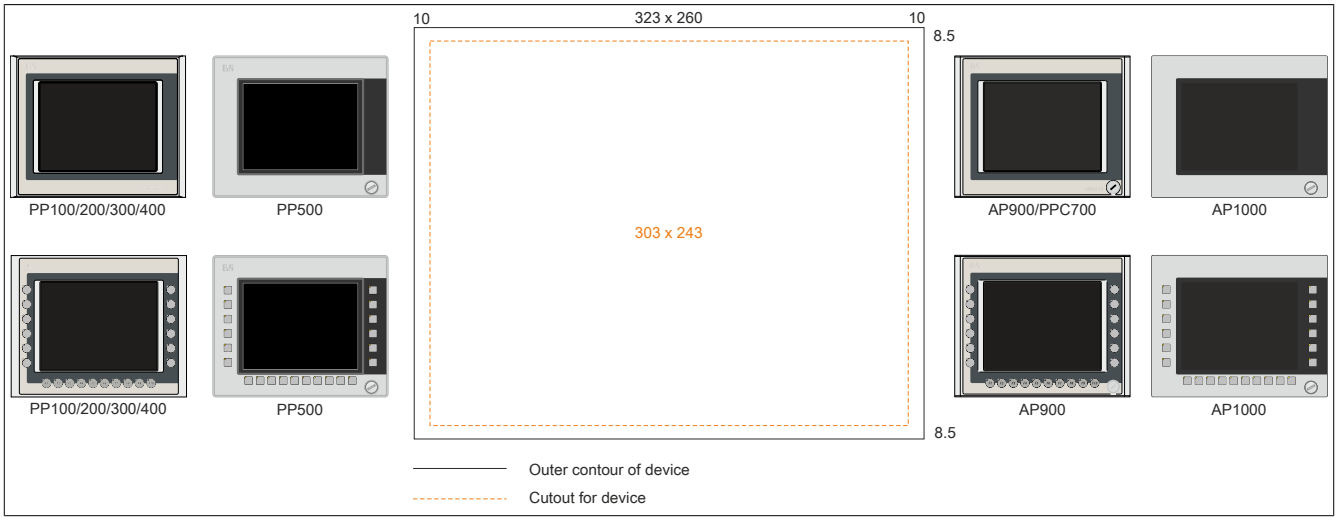


Figure 36: Installation compatibility - 10.4" devices - Landscape1

10.4" Automation Panel 1000, Automation Panel 900, Panel PC 700, Power Panel 500, Power Panel 300/400 and Power Panel 100/200 devices in Landscape1 format are 100% compatible.

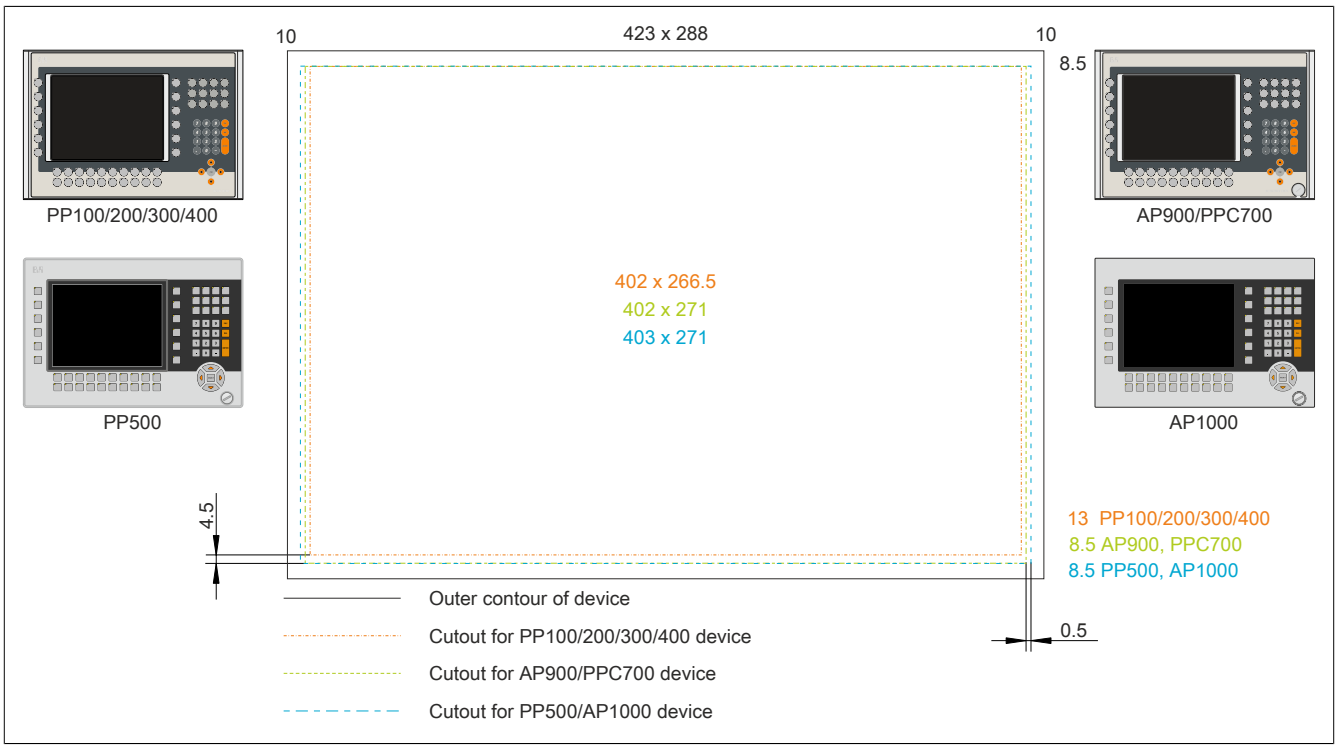


Figure 37: Installation compatibility - 10.4" devices - Landscape2

10.4" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices are not 100% compatible with Power Panel 300/400 or Power Panel 100/200 devices in Landscape2 format. Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices need a cutout that is 4.5 mm larger (bottom edge) and 0.5 mm wider (left and right).

The larger cutout can be used conditionally for all devices:

- During installation, it is important to ensure that the PP100/200 and PP300/400 devices are positioned and installed as centrally as possible in the cutout. If this is not the case, the retaining clips can no longer grip and impermeability is no longer ensured by the circumferential cord gasket (IP65).

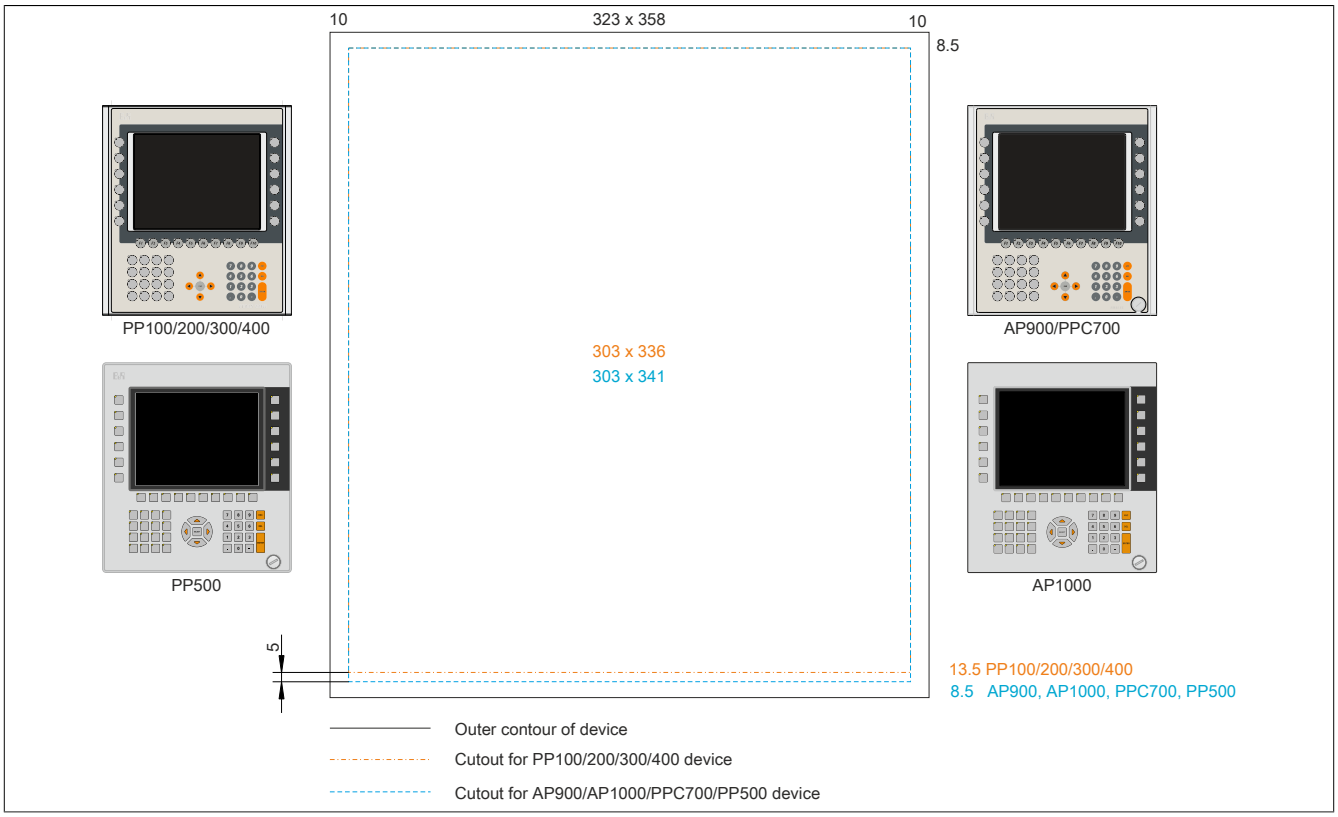


Figure 38: Installation compatibility - 10.4" devices - Portrait1

10.4" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices are not 100% compatible with Power Panel 300/400 or Power Panel 100/200 devices in Portrait1 format. Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices need a cutout that is 5 mm larger (bottom edge).

The larger cutout can be used conditionally for all devices:

- During installation, it is important to ensure that the PP100/200/300/400 devices are positioned and installed as centrally as possible in the cutout. If this is not the case, the retaining clips can no longer grip and impermeability is no longer ensured by the circumferential cord gasket (IP65).

2.2.7.2.4 12.1" devices

The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

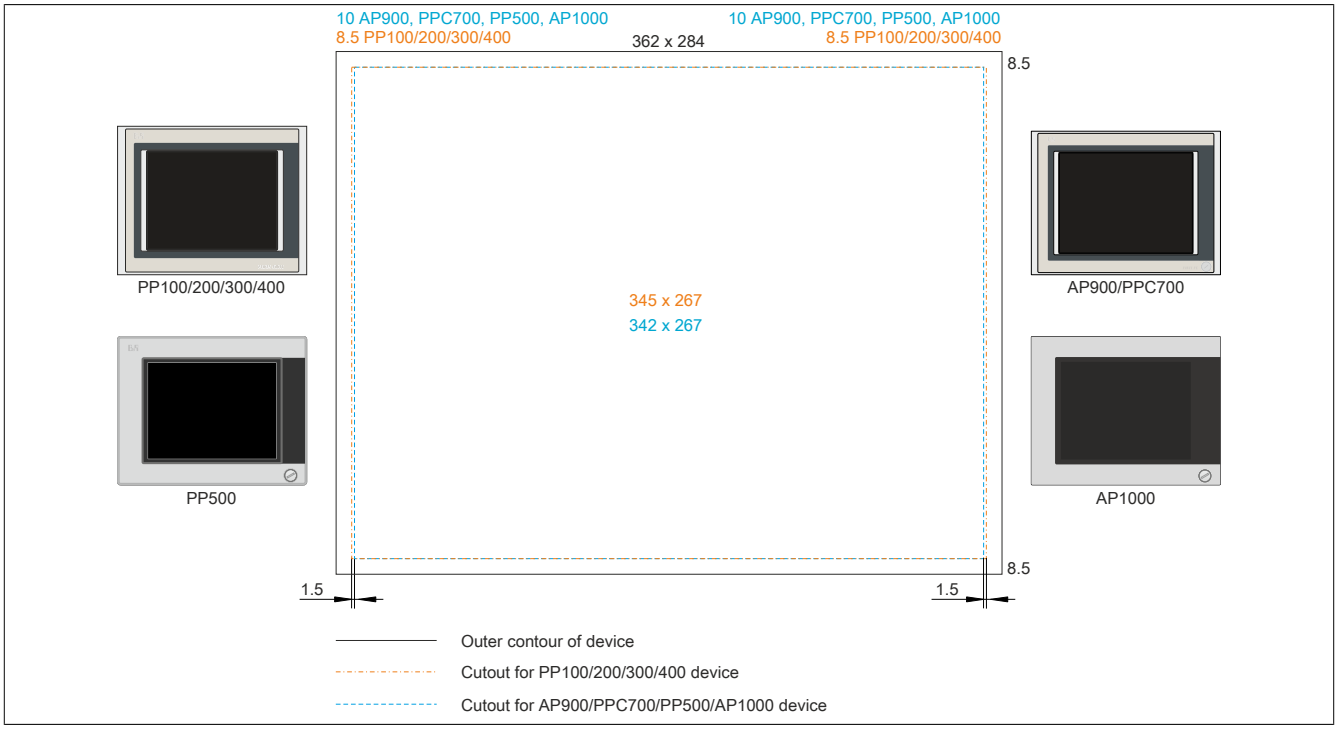


Figure 39: Installation compatibility - 12.1" devices - Landscape1

12.1" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices are not 100% compatible with Power Panel 300/400 or Power Panel 100/200 devices in Landscape1 format. Power Panel 300/400 and Power Panel 100/200 devices need a cutout that is 1.5 mm wider (left and right).

The larger cutout can be used conditionally for all devices:

- During installation, it is important to ensure that the AP1000, AP900, PPC700 and PP500 devices are positioned and installed as centrally as possible in the cutout.

2.2.7.2.5 15" devices

The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

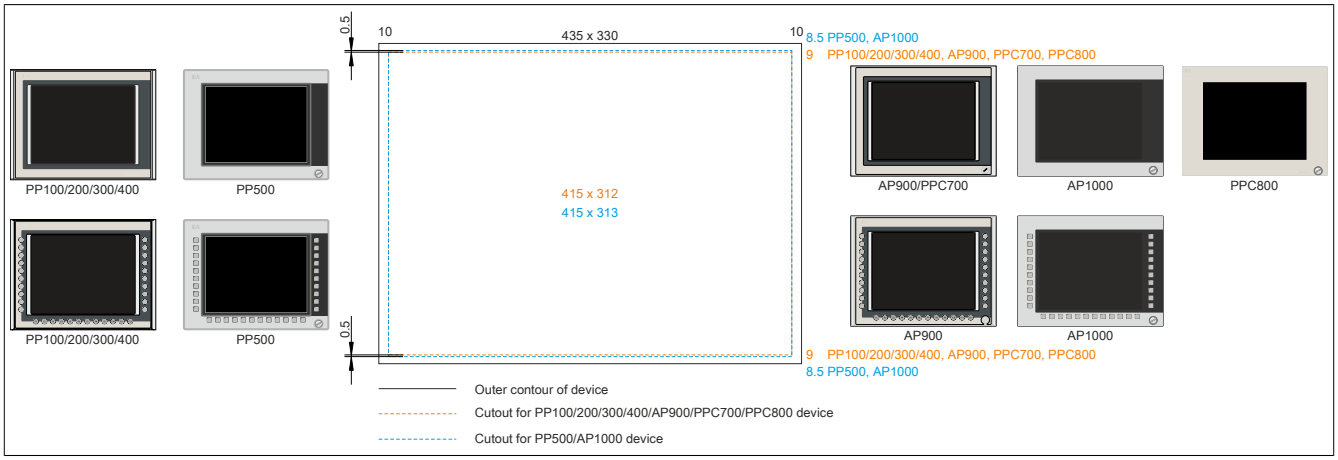


Figure 40: Installation compatibility - 15" devices - Landscape1

15" Automation Panel 1000 and Power Panel 500 devices are not 100% compatible with Power Panel 100/200, Power Panel 300/400, Automation Panel 900, Panel PC 700 and Panel PC 800 devices in Landscape1 format. Automation Panel 1000 and Power Panel 500 devices need a cutout that is 0.5 mm larger (top and bottom edge).

The larger cutout can be used conditionally for all devices:

- During installation, it is important to ensure that the PP100/200, PP300/400, AP900, PPC700 and PPC800 devices are positioned and installed as centrally as possible in the cutout. If this is not the case, the retaining clips can no longer grip and impermeability is no longer ensured by the circumferential cord gasket (IP65).

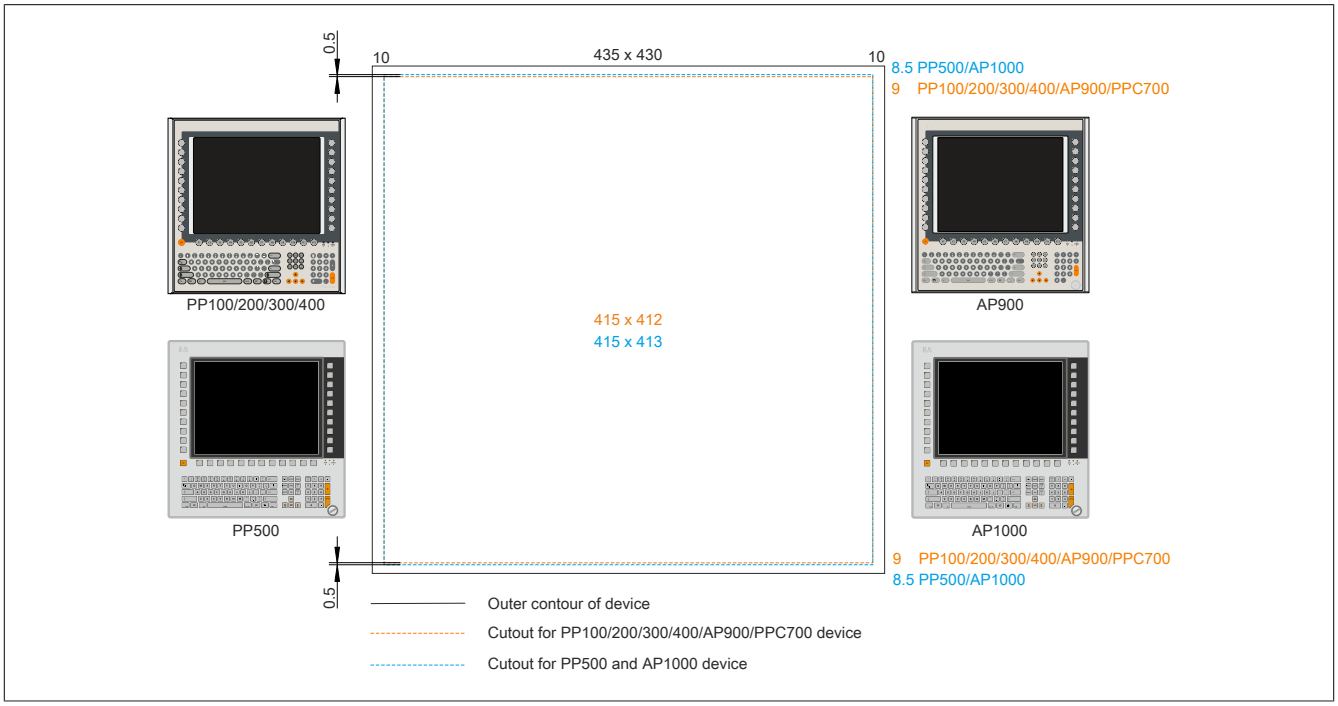


Figure 41: Installation compatibility - 15" devices - Portrait1

15" Automation Panel 1000 and Power Panel 500 devices are not 100% compatible with Power Panel 100/200, Power Panel 300/400, Automation Panel 900 and Panel PC 700 devices in Portrait1 format. Automation Panel 1000 and Power Panel 500 devices need a cutout that is 0.5 mm larger (top and bottom edge).

The larger cutout can be used conditionally for all devices:

- During installation, it is important to ensure that the PP100/200, PP300/400, AP900 and PPC700 devices are positioned and installed as centrally as possible in the cutout. If this is not the case, the retaining clips can no longer grip and impermeability is no longer ensured by the circumferential cord gasket (IP65).

2.2.7.2.6 17" devices

The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

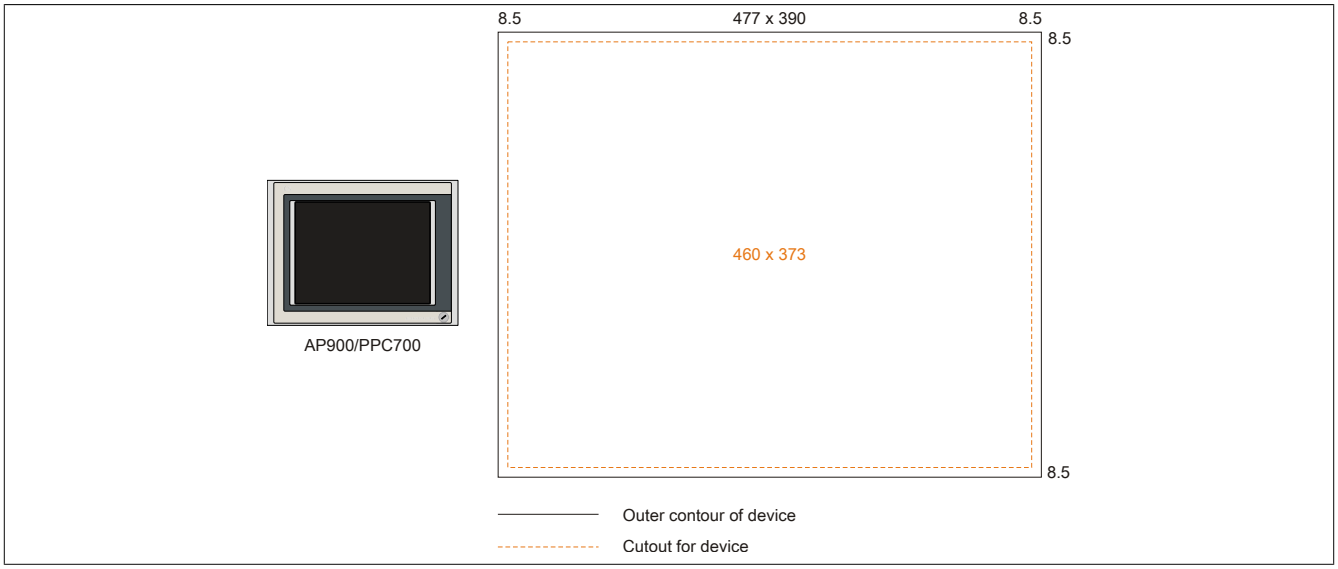


Figure 42: Installation compatibility - 17" devices - Landscape1

The 17" Automation Panel 900 and Panel PC 700 in Landscape1 format are 100% compatible.

2.2.7.2.7 19" devices

The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

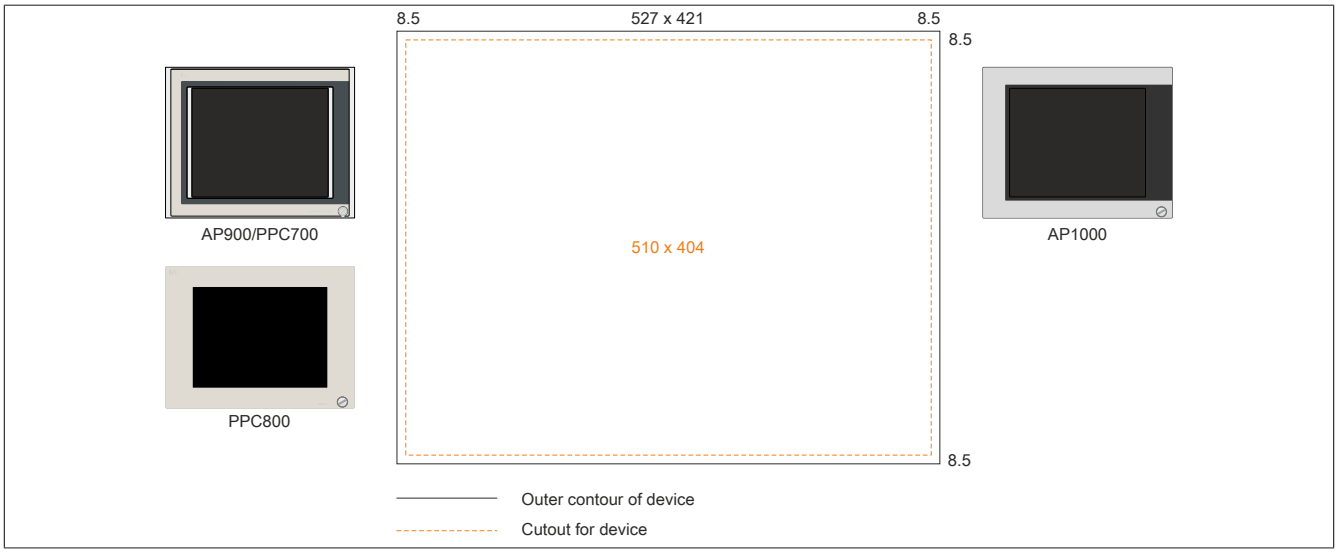


Figure 43: Installation compatibility - 19" devices - Landscape1

The 19" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Panel PC 800 in Landscape1 format are 100% compatible.

2.2.7.2.8 21.3" devices

The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm.
The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

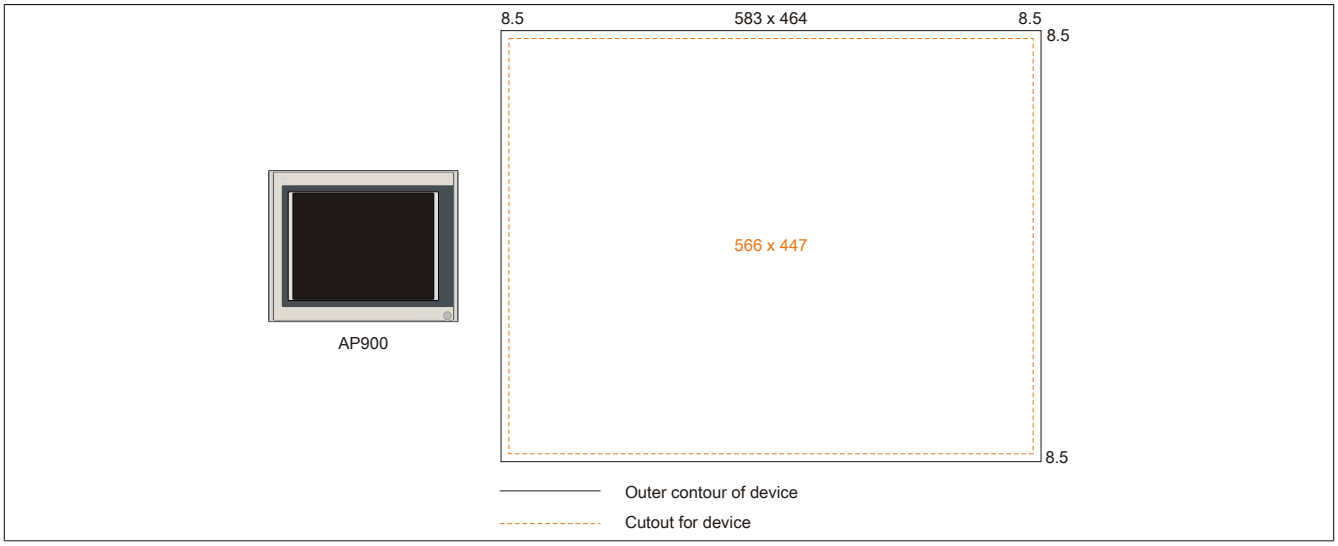


Figure 44: Installation compatibility - 21.3" devices - Landscape1

2.3 Individual components

2.3.1 AP9x3 panels

2.3.1.1 5AP923.1215-00

2.3.1.1.1 General information

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

2.3.1.1.2 Order data

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

Table 55: 5AP923.1215-00 - Order data

2.3.1.1.3 Technical data

Information:

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

Model number	5AP923.1215-00
General information	
B&R ID code	0xE1B0
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 [1)]
Display	
Type	TFT color
Diagonal	12.1"
Colors	16.7 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 25 to 500 cd/m²
Half-brightness time [2)]	50,000 h
Touch screen [3)]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%

Table 56: 5AP923.1215-00 - Technical data

Model number	5AP923.1215-00
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front	
Frame	Aluminum, coated
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	315 mm
Height	239 mm
Weight	2200 g

Table 56: 5AP923.1215-00 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

2.3.1.1.4 Dimensions

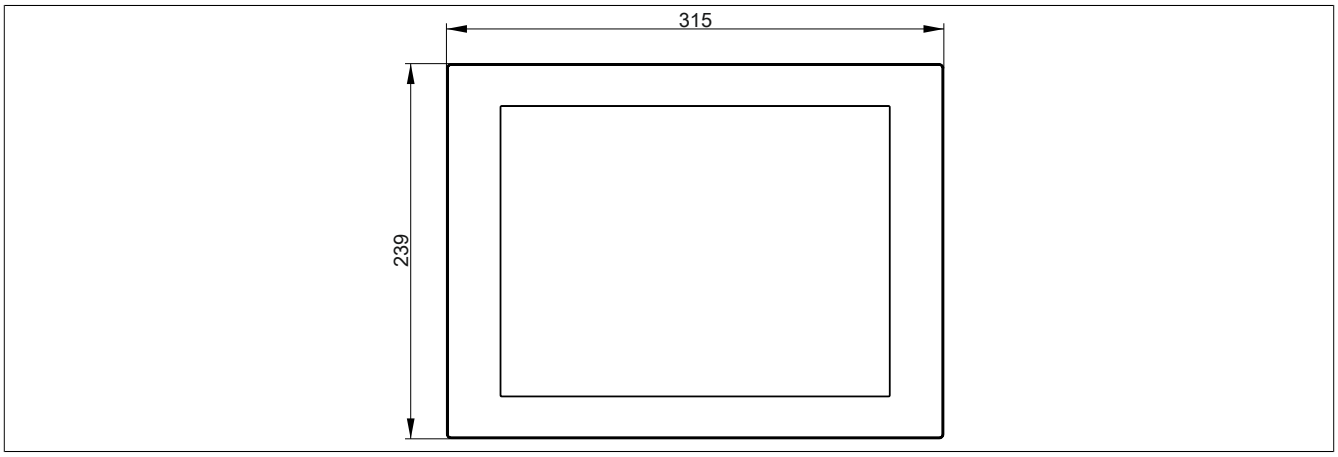


Figure 45: 5AP923.1215-00 - Dimensions

2.3.1.1.5 Temperature/Humidity diagram

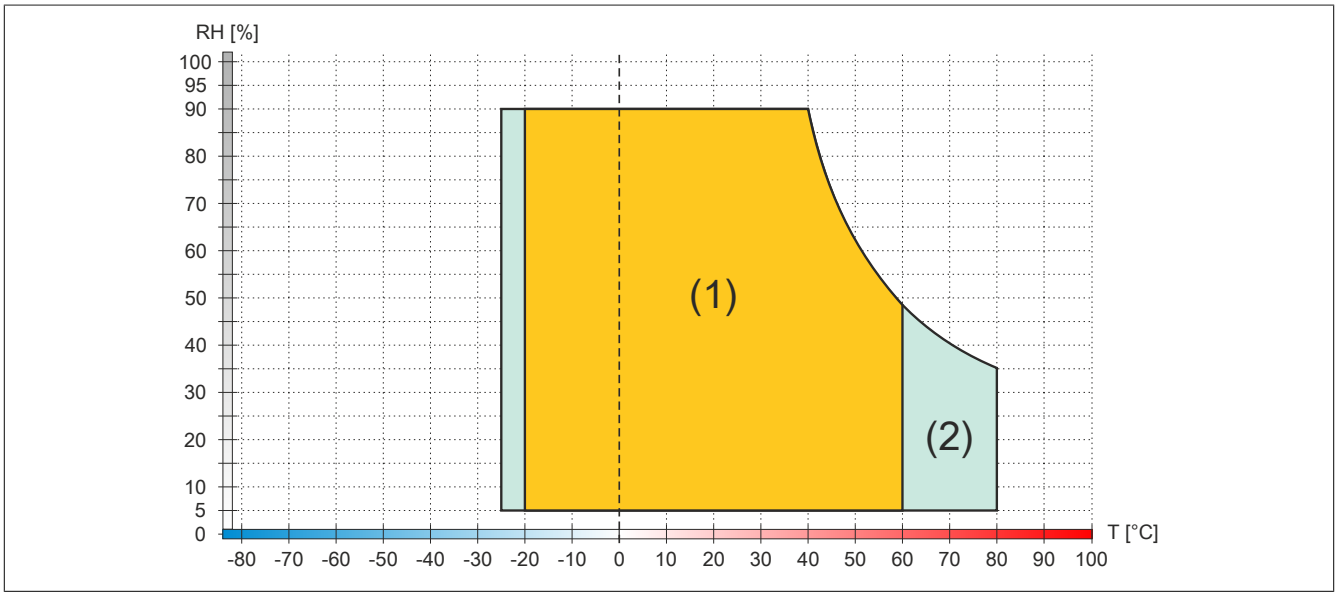


Figure 46: 5AP923.1215-00 - Temperature/Humidity diagram

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

2.3.1.2 5AP923.1505-00

2.3.1.2.1 General information

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

2.3.1.2.2 Order data

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

Table 57: 5AP923.1505-00 - Order data

2.3.1.2.3 Technical data

Information:

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

Model number	5AP923.1505-00
General information	
B&R ID code	0xE169
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]
GOST-R	Yes
Display	
Type	TFT color
Diagonal	15.0"
Colors	16.7 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 70° / Direction D = 70°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 20 to 400 cd/m²
Half-brightness time [3)]	50,000 h
Touch screen [4)]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

Table 58: 5AP923.1505-00 - Technical data

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

Table 58: 5AP923.1505-00 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
4) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

2.3.1.2.4 Dimensions

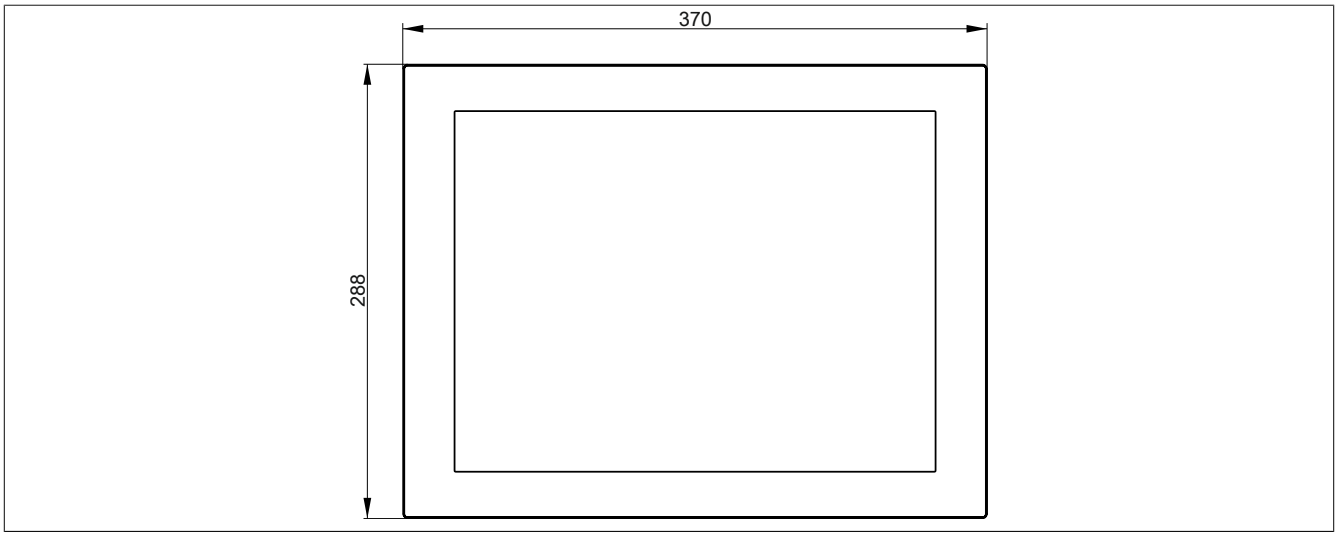


Figure 47: 5AP923.1505-00 - Dimensions

2.3.1.2.5 Temperature/Humidity diagram

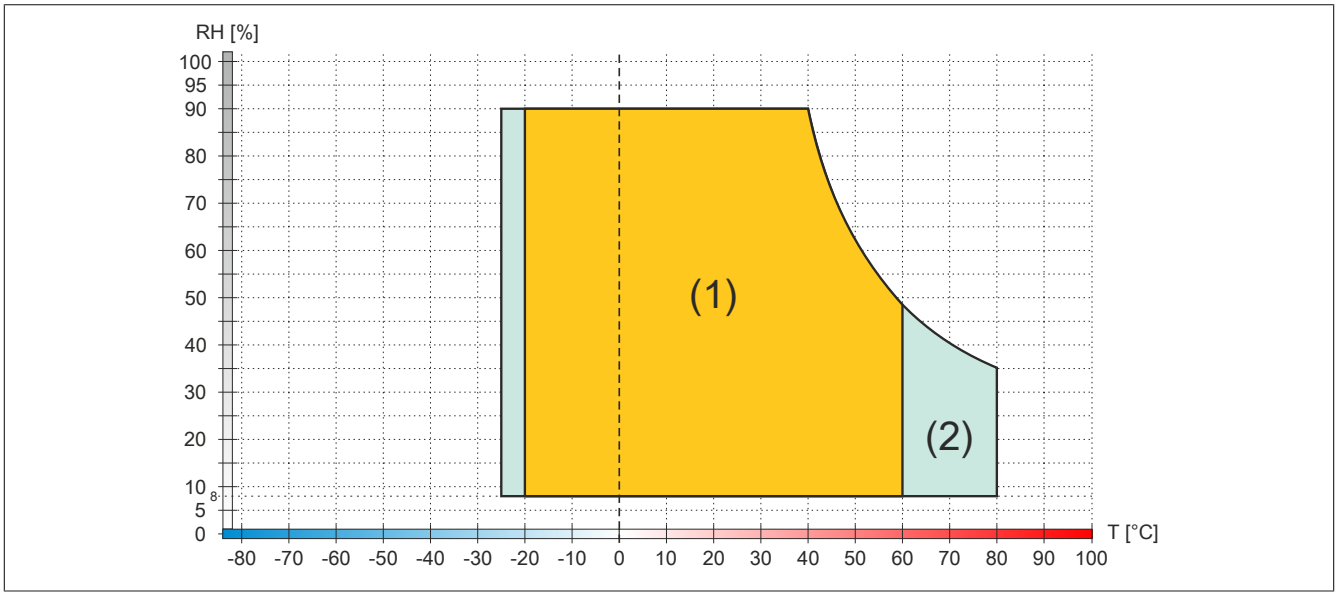


Figure 48: 5AP923.1505-00 - Temperature/Humidity diagram

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

2.3.1.3 5AP923.1906-00

2.3.1.3.1 General information

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

2.3.1.3.2 Order data

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

Table 59: 5AP923.1906-00 - Order data

2.3.1.3.3 Technical data

Information:

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

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

Table 60: 5AP923.1906-00, 5AP923.1906-00 - Technical data

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

Table 60: 5AP923.1906-00, 5AP923.1906-00 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

2.3.1.3.4 Dimensions

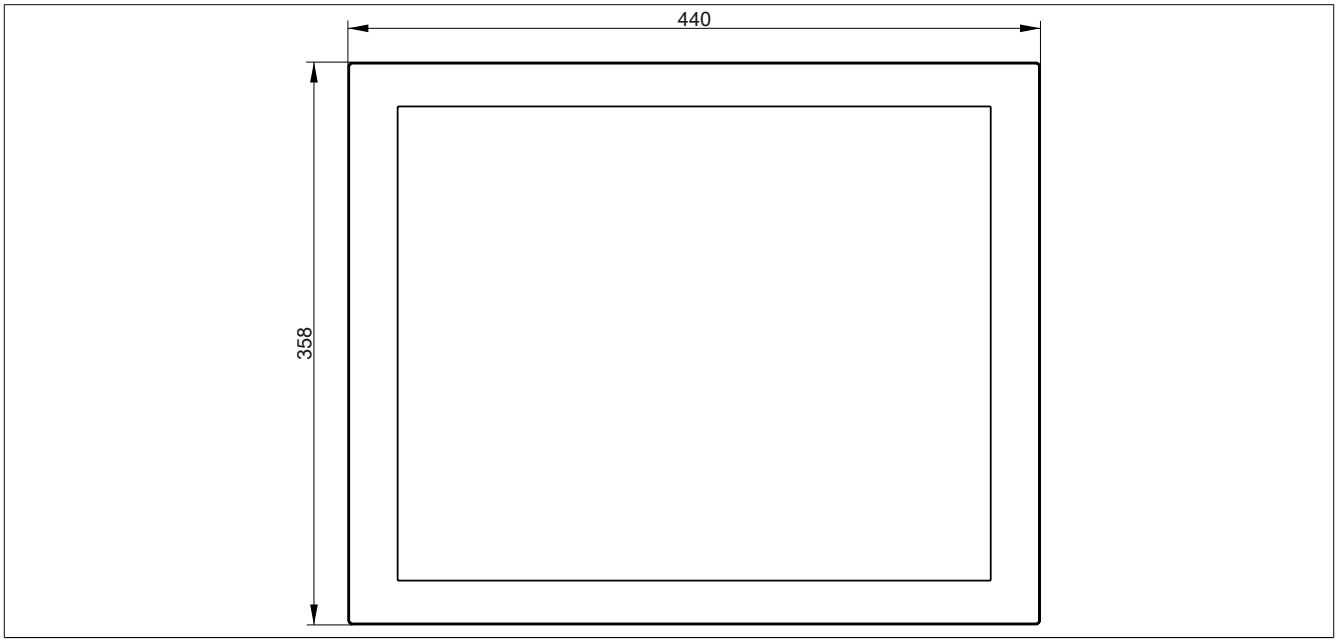


Figure 49: 5AP923.1906-00 - Dimensions

2.3.1.3.5 Temperature/Humidity diagram

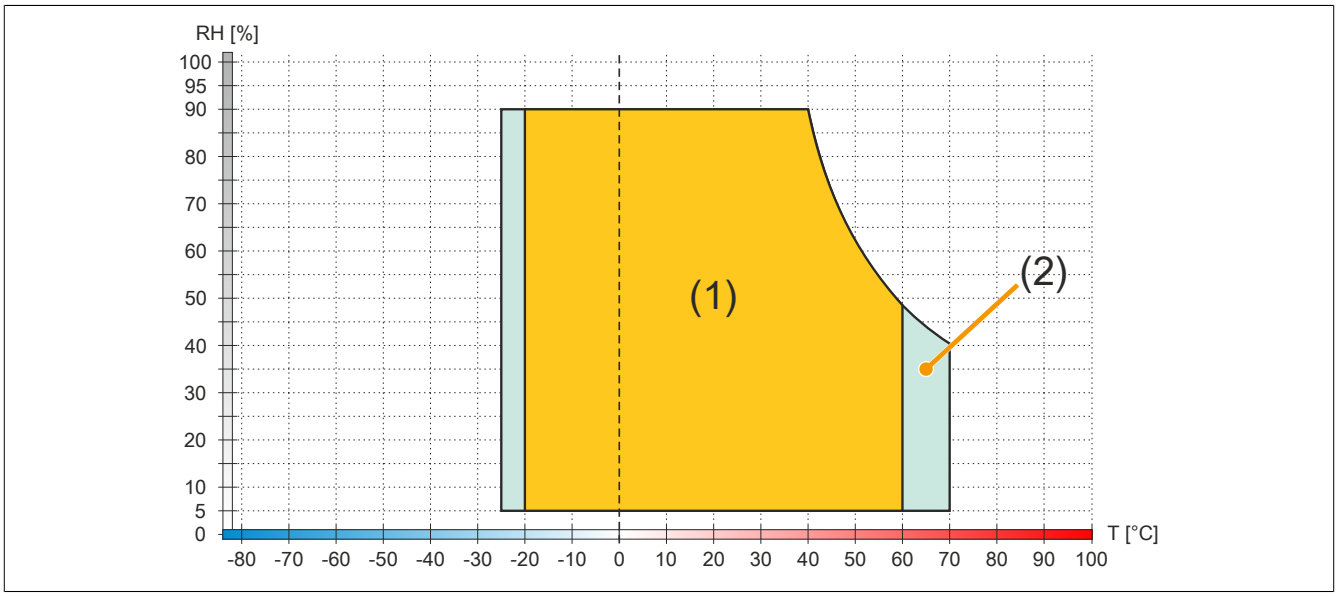


Figure 50: 5AP923.1906-00 ≥ Rev. E0 - Temperature/Humidity diagram

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

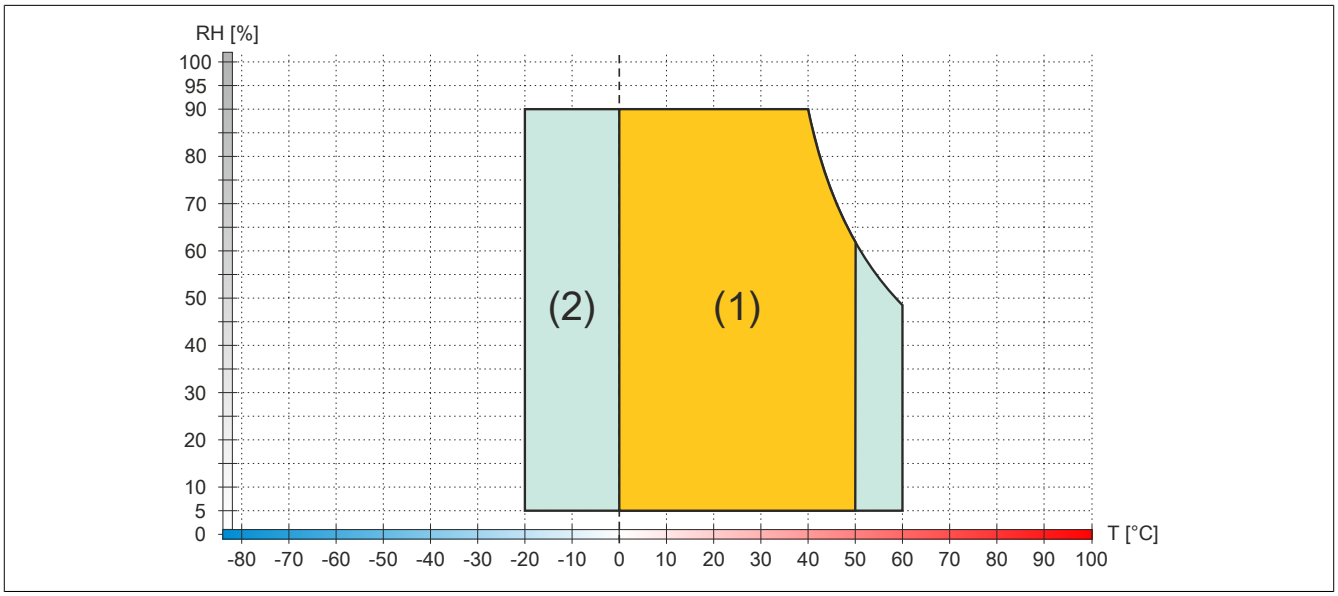


Figure 51: 5AP923.1906-00 ≤ Rev. D0 - Temperature/Humidity diagram

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

2.3.1.4 5AP933.156B-00

2.3.1.4.1 General information

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

2.3.1.4.2 Order data

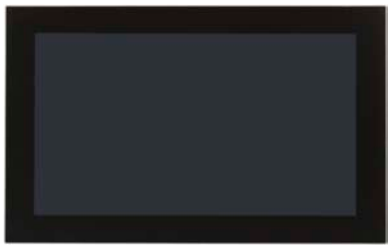
Model number	Short description	Figure
	Panels	
5AP933.156B-00	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

Table 61: 5AP933.156B-00 - Order data

2.3.1.4.3 Technical data

Information:

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

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

Table 62: 5AP933.156B-00, 5AP933.156B-00 - Technical data

Model number	5AP933.156B-00	
Revision	C0	D0
Dimensions		
Width	414 mm	
Height	258.5 mm	
Weight	3850 g	

Table 62: 5AP933.156B-00, 5AP933.156B-00 - Technical data

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section "Multi-touch drivers".

2.3.1.4.4 Dimensions

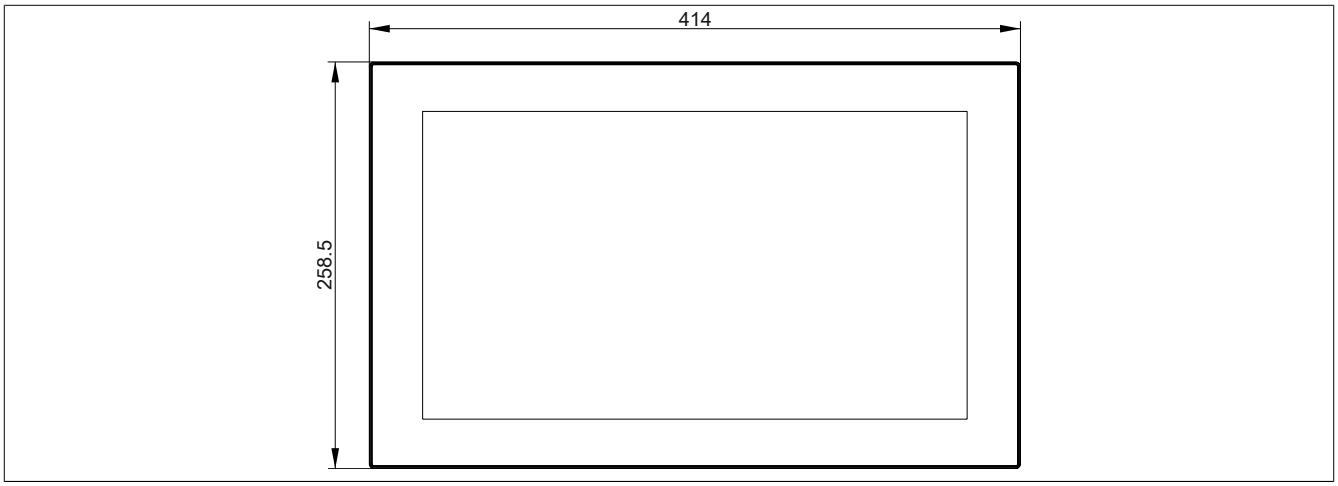


Figure 52: 5AP933.156B-00 - Dimensions

2.3.1.4.5 Temperature/Humidity diagram

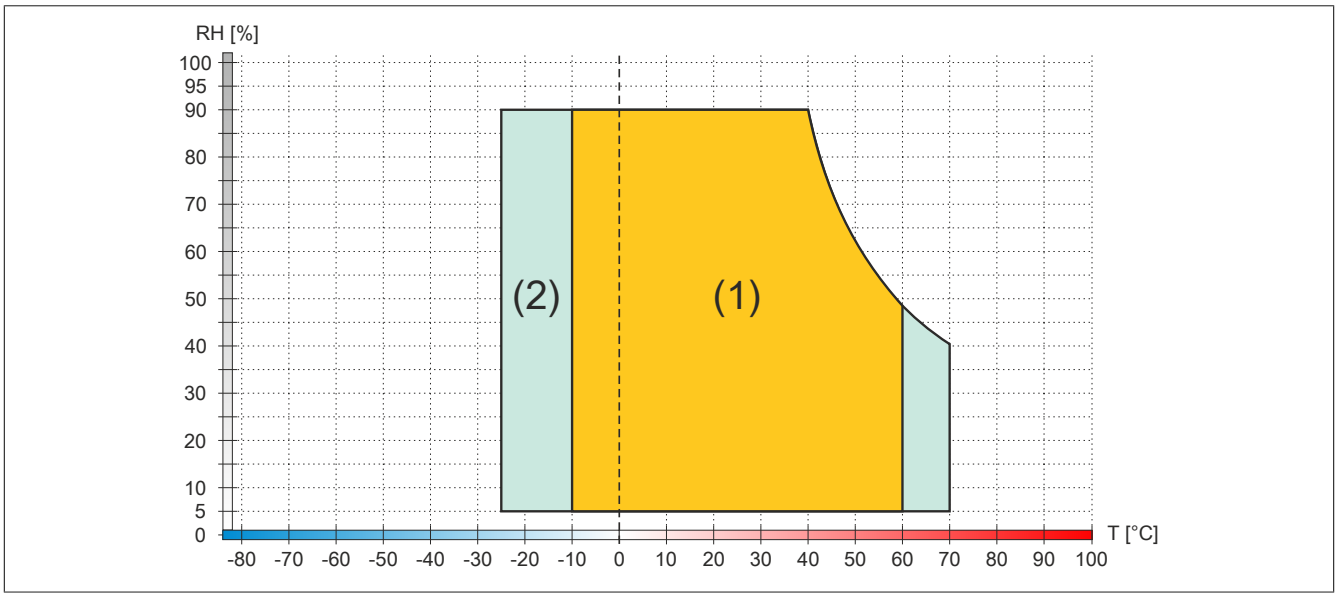


Figure 53: 5AP933.156B-00 ≥ Rev. D0 - Temperature/Humidity diagram

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

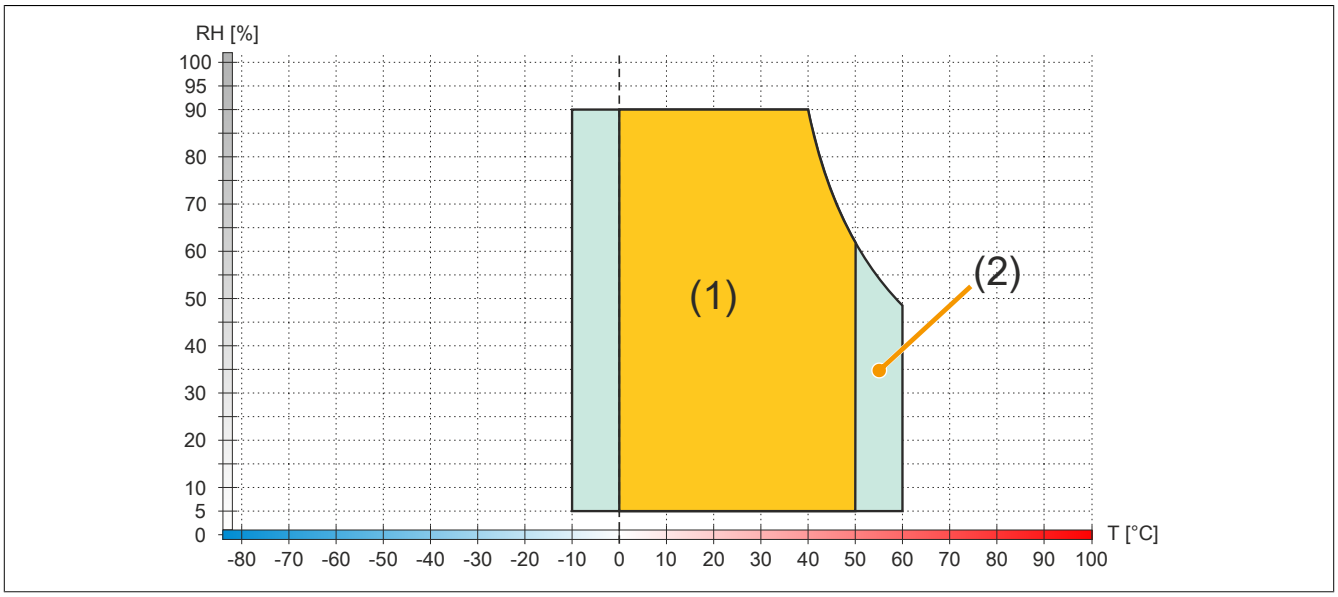


Figure 54: 5AP933.156B-00 ≤ Rev. C0 - Temperature/Humidity diagram

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

2.3.1.5 5AP933.185B-00

2.3.1.5.1 General information

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

2.3.1.5.2 Order data

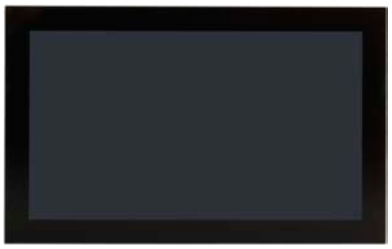
Model number	Short description	Figure
	Panels	
5AP933.185B-00	Automation Panel 18.5" HD TFT - 1366 x 768 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

Table 63: 5AP933.185B-00 - Order data

2.3.1.5.3 Technical data

Information:

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

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

Table 64: 5AP933.185B-00, 5AP933.185B-00 - Technical data

Model number	5AP933.185B-00	
Revision	C0	D0
Dimensions		
Width	475 mm	
Height	295 mm	
Weight	4850 g	

Table 64: 5AP933.185B-00, 5AP933.185B-00 - Technical data

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section "Multi-touch drivers".

2.3.1.5.4 Dimensions

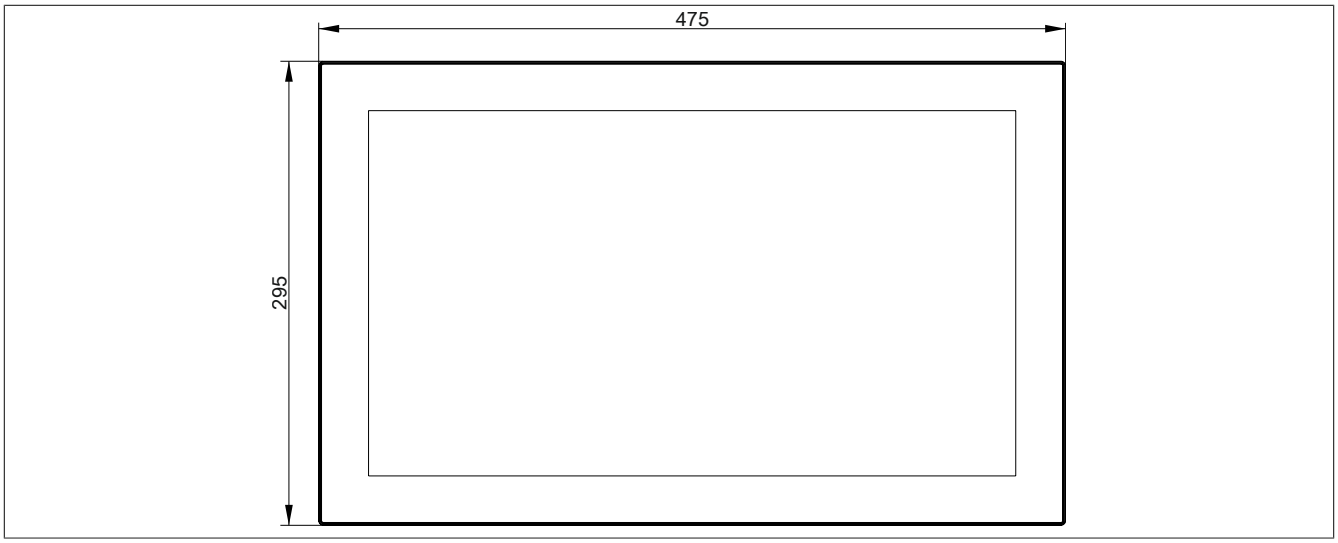


Figure 55: 5AP933.185B-00 - Dimensions

2.3.1.5.5 Temperature/Humidity diagram

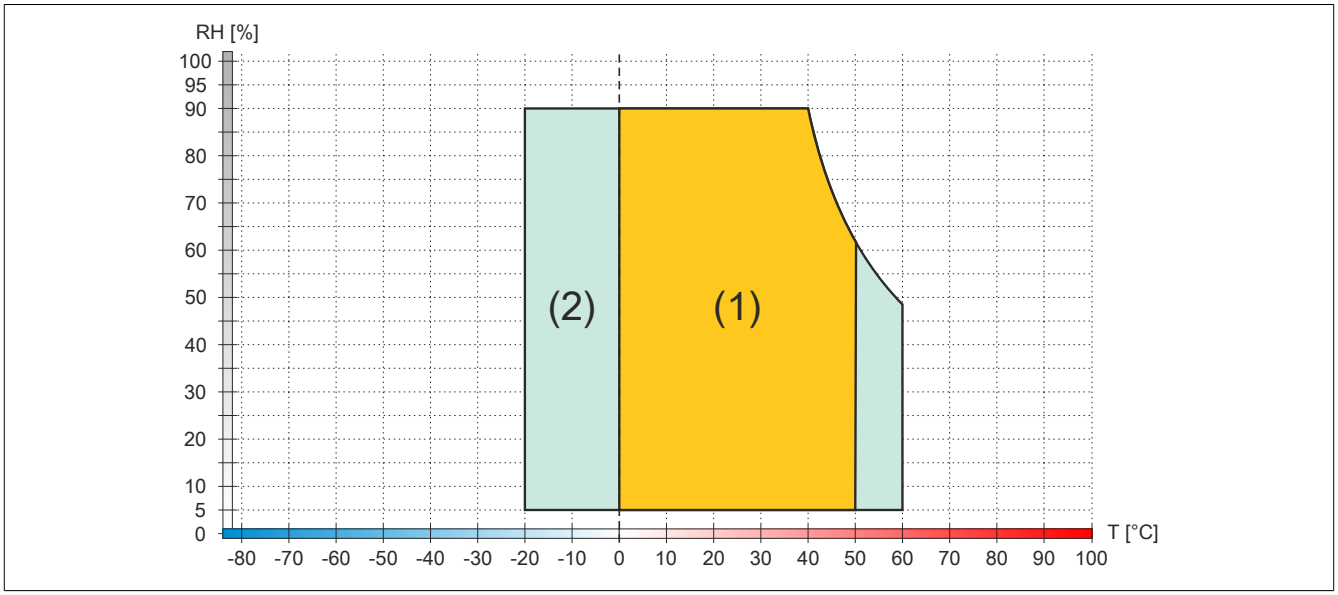


Figure 56: 5AP933.185B-00 ≥ Rev. D0 - Temperature/Humidity diagram

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

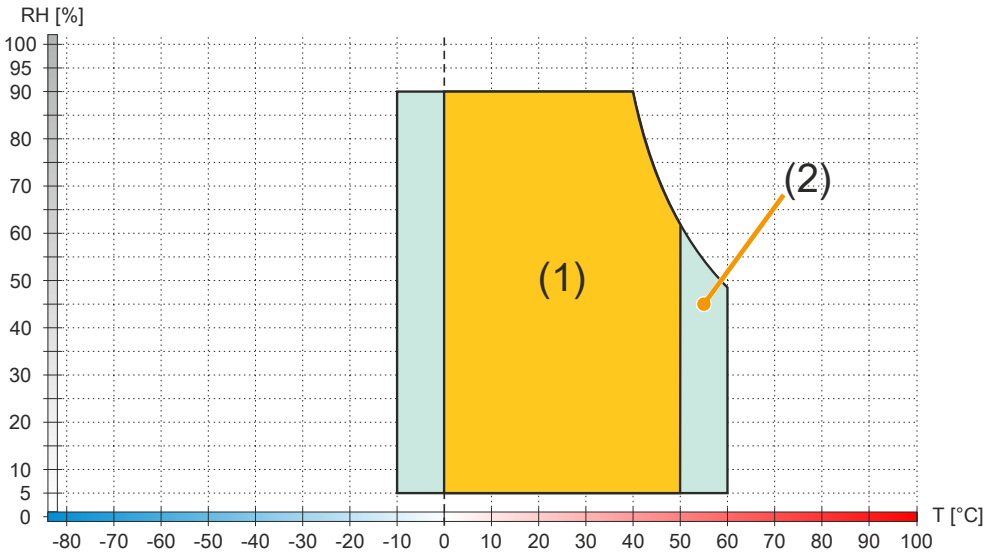


Figure 57: 5AP933.185B-00 ≤ Rev. C0 - Temperature/Humidity diagram

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

2.3.1.6 5AP933.215C-00

2.3.1.6.1 General information

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

2.3.1.6.2 Order data

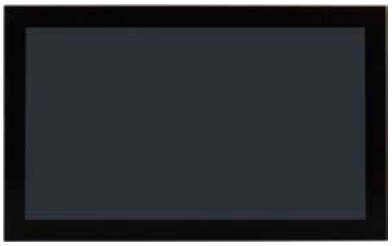
Model number	Short description	Figure
	Panels	
5AP933.215C-00	Automation Panel 21.5" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

Table 65: 5AP933.215C-00 - Order data

2.3.1.6.3 Technical data

Information:

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

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

Table 66: 5AP933.215C-00, 5AP933.215C-00 - Technical data

Model number	5AP933.215C-00	
Revision	C0	D0
Dimensions		
Width	541.5 mm	
Height	333 mm	
Weight	5400 g	

Table 66: 5AP933.215C-00, 5AP933.215C-00 - Technical data

1) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
2) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section "Multi-touch drivers".

2.3.1.6.4 Dimensions

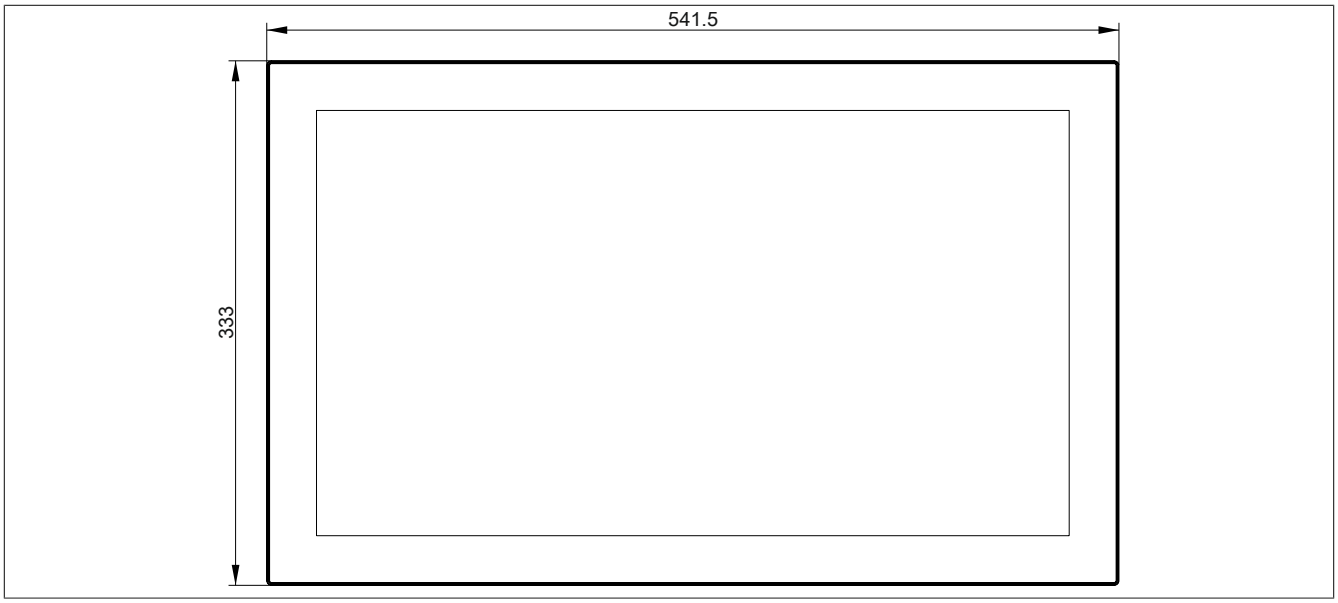


Figure 58: 5AP933.215C-00 - Dimensions

2.3.1.6.5 Temperature/Humidity diagram

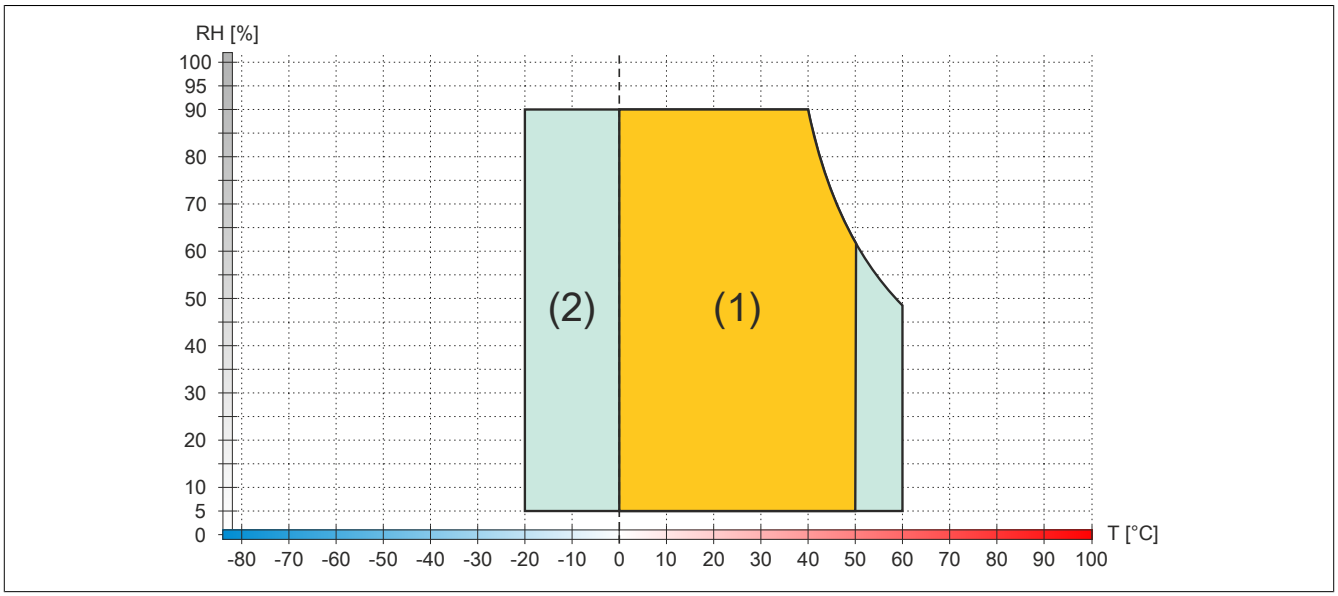


Figure 59: 5AP933.215C-00 ≥ Rev. D0 - Temperature/Humidity diagram

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

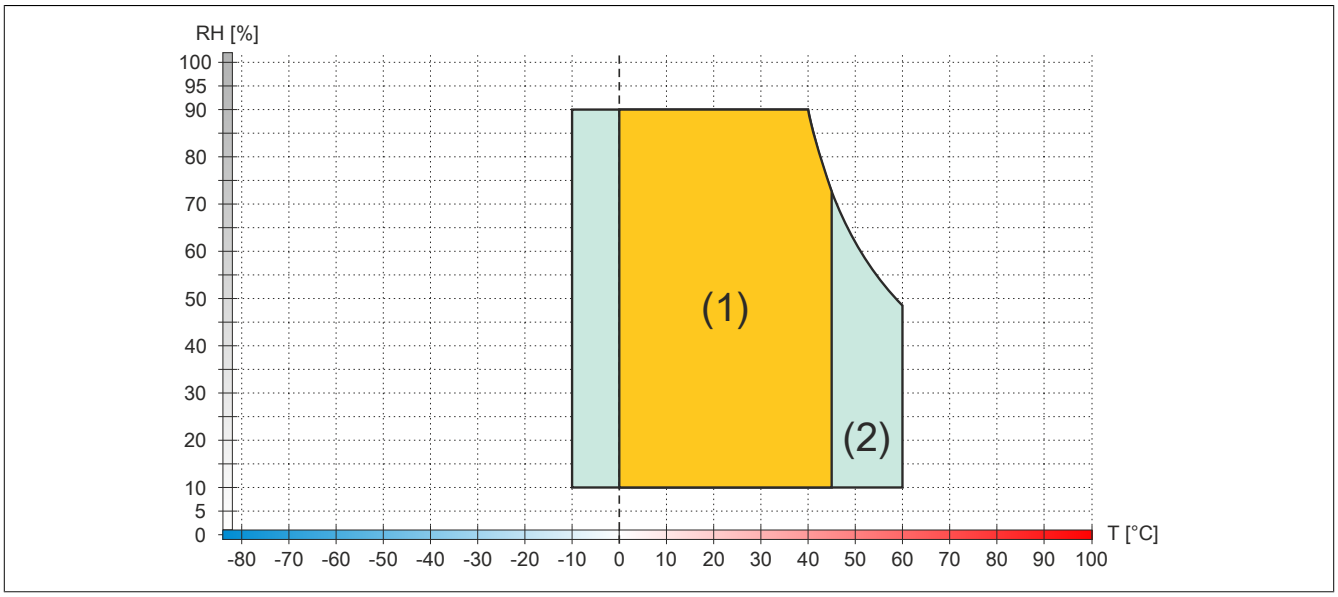


Figure 60: 5AP933.215C-00 ≤ Rev. C0 - Temperature/Humidity diagram

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

2.3.1.7 5AP933.240C-00

2.3.1.7.1 General information

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

2.3.1.7.2 Order data

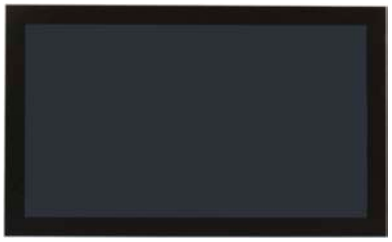
Model number	Short description	Figure
	Panels	
5AP933.240C-00	Automation Panel 24.0" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

Table 67: 5AP933.240C-00 - Order data

2.3.1.7.3 Technical data

Information:

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

Model number	5AP933.240C-00	
Revision	**C0**	**D0**
General information		
B&R ID code	0xE1B4	
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[1)]	
Display		
Type	TFT color	
Diagonal	24.0"	
Colors	16.7 million	
Resolution	FHD, 1920 × 1080 pixels	
Contrast	5000:1	
Viewing angles		
Horizontal	Direction R = 89° / Direction L = 89°	
Vertical	Direction U = 89° / Direction D = 89°	
Backlight		
Type	LED	
Brightness (dimmable)	Typ. 30 to 300 cd/m²	
Half-brightness time [2)]	50,000 h	
Touch screen [3)]		
Type	3M	
Technology	Projected capacitive touch (PCT)	
Controller	3M	
Transmittance	88% ± 2%	>90%
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)	
Protection per UL 50	Front: Type 4X indoor use only	

Table 68: 5AP933.240C-00, 5AP933.240C-00 - Technical data

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

Table 68: 5AP933.240C-00, 5AP933.240C-00 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section "Multi-touch drivers".

2.3.1.7.4 Dimensions

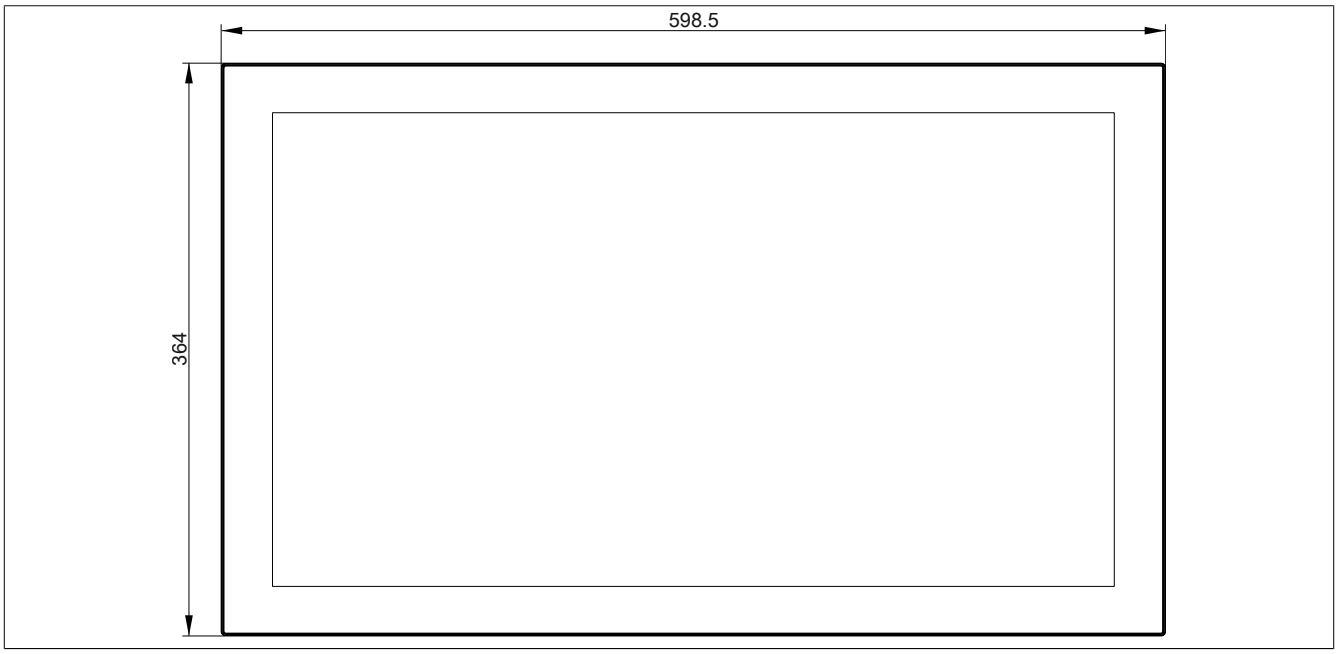


Figure 61: 5AP933.240C-00 - Dimensions

2.3.1.7.5 Temperature/Humidity diagram

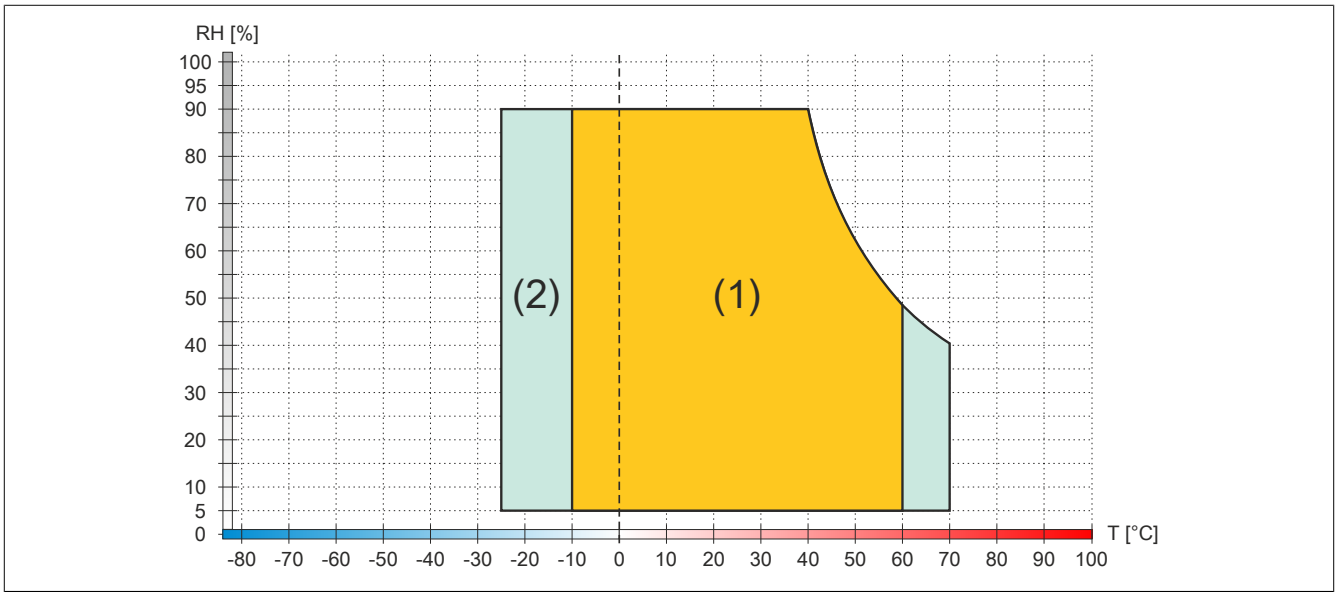


Figure 62: 5AP933.240C-00 ≥ Rev. D0 - Temperature/Humidity diagram

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

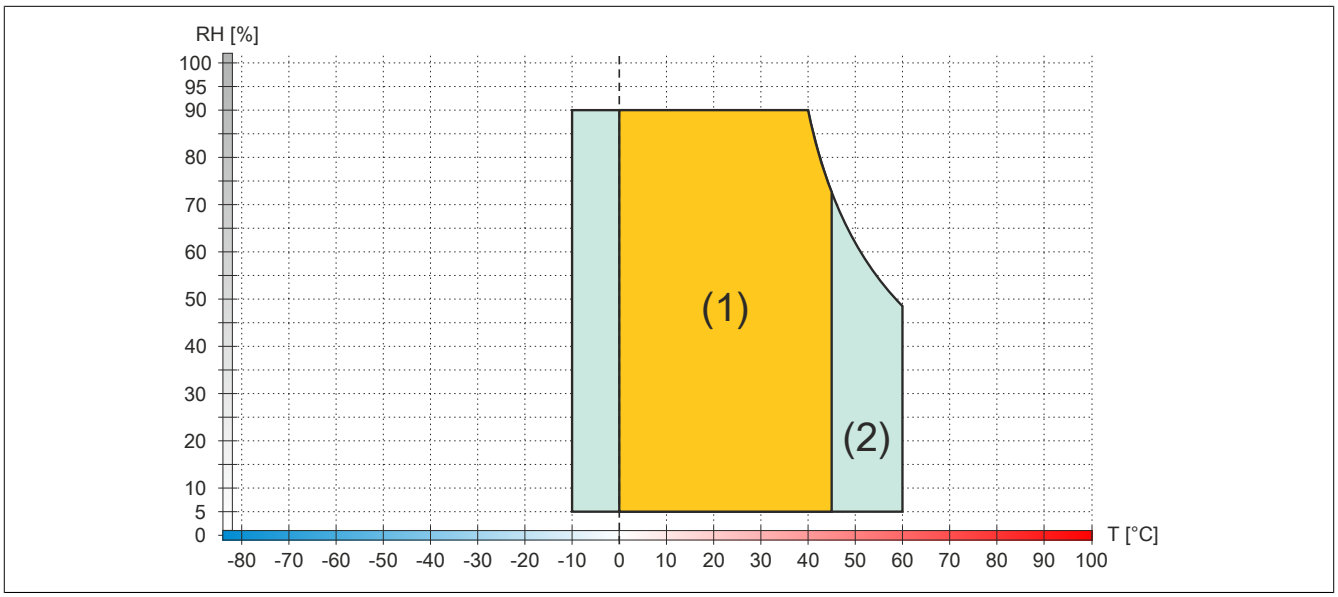


Figure 63: 5AP933.240C-00 ≤ Rev. C0 - Temperature/Humidity diagram

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

2.3.2 AP1000 panels

2.3.2.1 5AP1120.0573-000

2.3.2.1.1 General information

- Panel for AP1000, PPC2100 or PPC2200
- 5.7" TFT VGA color display
- Single-touch (analog resistive)
- Control cabinet installation

2.3.2.1.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.0573-000	Automation Panel 5.7" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC2100 / PPC2200 / link modules - Compatible with 5PP520.0573-00	

Table 69: 5AP1120.0573-000 - Order data

2.3.2.1.3 Technical data

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

Model number	5AP1120.0573-000	
Revision	**D0**	**E0**
General information		
B&R ID code	0xE7AA	
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 [1)]	
Display		
Type	TFT color	
Diagonal	5.7"	
Colors	262,144	
Resolution	VGA, 640 x 480 pixels	
Contrast	850:1	800:1
Viewing angles		
Horizontal	Direction R = 80° / Direction L = 80°	
Vertical	Direction U = 80° / Direction D = 80°	Direction U = 70° / Direction D = 70°
Backlight		
Type	LED	
Brightness (dimmable)	Typ. 20 to 400 cd/m²	Typ. 22.5 to 450 cd/m²
Half-brightness time [2)]	50,000 h	
Touch screen [3)]		
Type	AMT	
Technology	Analog, resistive	
Controller	B&R, serial, 12-bit	
Transmittance	81% ± 3%	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	

Table 70: 5AP1120.0573-000, 5AP1120.0573-000 - Technical data

Model number	5AP1120.0573-000	
Revision	**D0**	**E0**
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)	
Protection per UL 50	Front: Type 4X indoor use only	
Mechanical properties		
Front [4]		
Frame	Aluminum, naturally anodized	
Keypad overlay		
Material	Polyester	
Light background	RAL 9006	
Dark gray border around display	RAL 7024	
Gasket	3 mm fixed gasket	
Dimensions		
Width	212 mm	
Height	156 mm	
Weight	1100 g	

Table 70: 5AP1120.0573-000, 5AP1120.0573-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.1.4 Dimensions

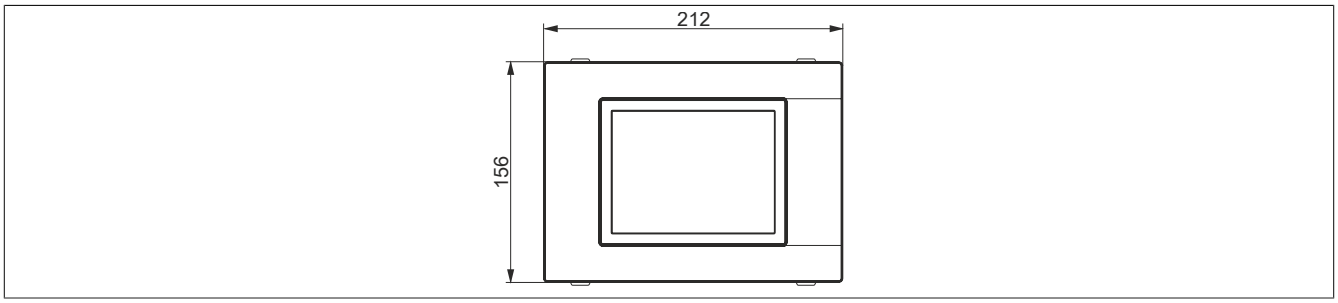


Figure 64: 5AP1120.0573-000 - Dimensions

2.3.2.1.5 Temperature/Humidity diagram

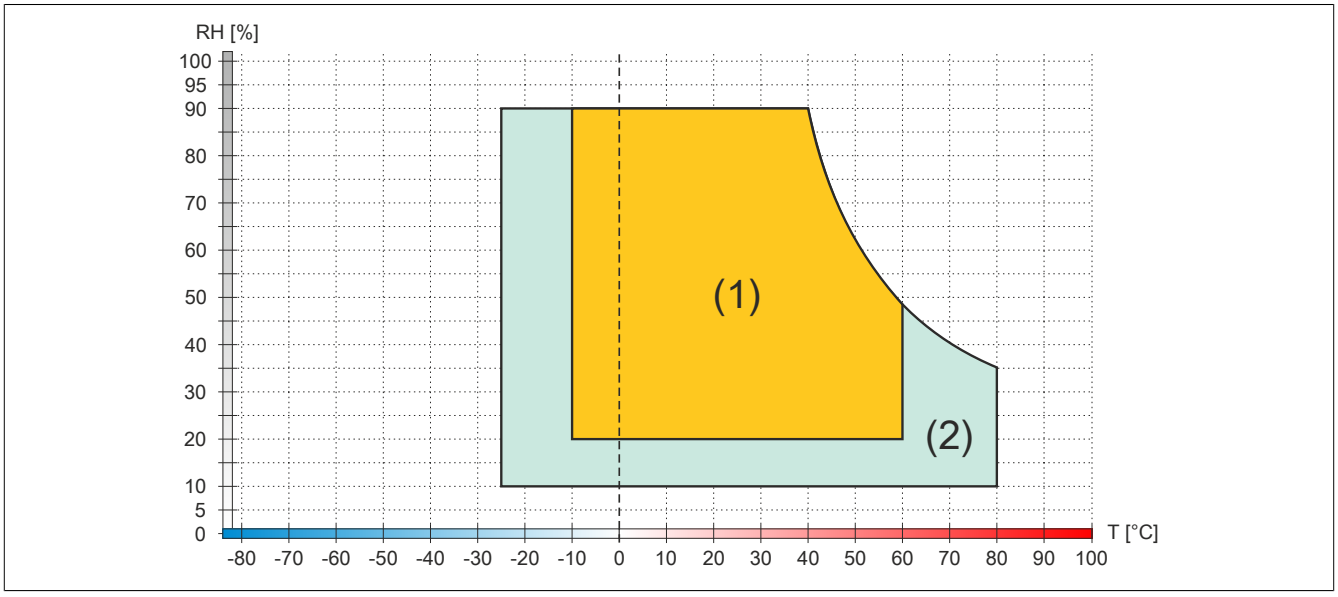


Figure 65: 5AP1120.0573-000 ≥ Rev. E0 - Temperature/Humidity diagram

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

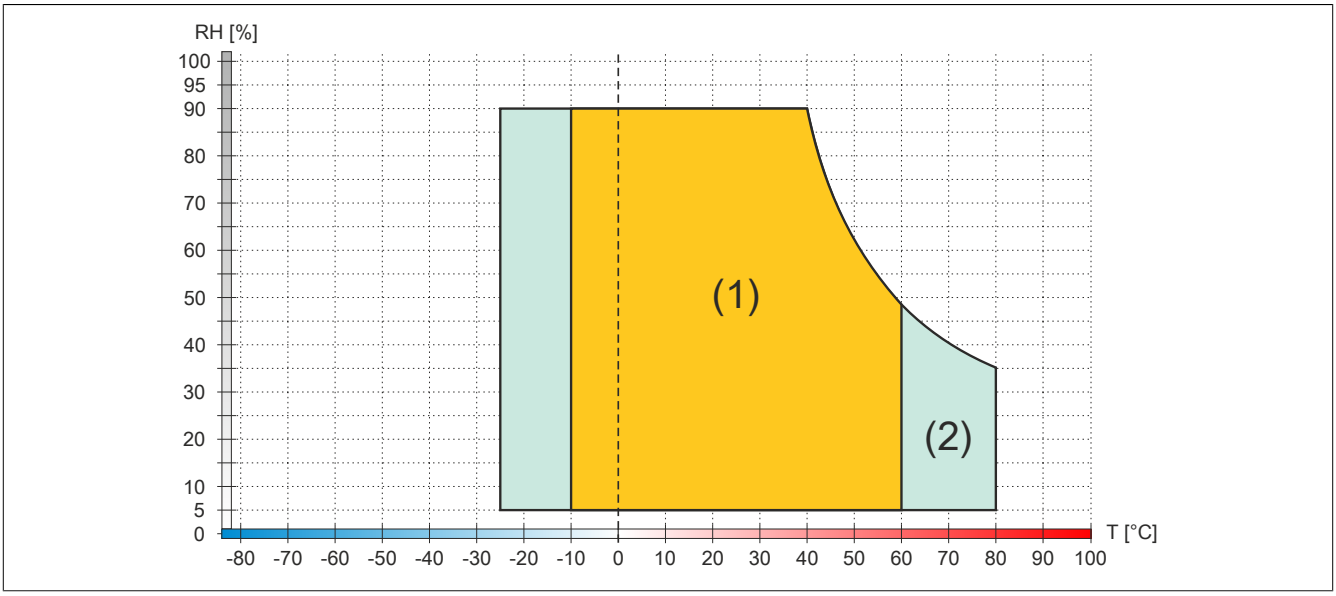


Figure 66: 5AP1120.0573-000 ≤ Rev. D0 - Temperature/Humidity diagram

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

2.3.2.2 5AP1151.0573-000

2.3.2.2.1 General information

- Panel for AP1000, PPC2100 or PPC2200
- 5.7" TFT VGA color display
- 22 function keys and 20 system keys
- Control cabinet installation

2.3.2.2.2 Order data

Model number	Short description	Figure
	Panels	
5AP1151.0573-000	Automation Panel 5.7" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Portrait format - 22 function keys and 20 system keys - For PPC2100 / PPC2200 / link modules - Compatible with 5PP551.0573-00	

Table 71: 5AP1151.0573-000 - Order data

2.3.2.2.3 Technical data

Information:

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

Product ID	5AP1151.0573-000	
Revision	**D0**	**E0**
General information		
B&R ID code	0xE7AB	
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]	
Display		
Type	TFT color	
Diagonal	5.7"	
Colors	262,144	
Resolution	VGA, 640 x 480 pixels	
Contrast	850:1	800:1
Viewing angles		
Horizontal	Direction R = 80° / Direction L = 80°	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°	Direction U = 70° / Direction D = 70°
Backlight		
Type	LED	
Brightness (dimmable)	Typ. 20 to 400 cd/m²	Typ. 22.5 to 450 cd/m²
Half-brightness time[2)]	50,000 h	
Keys		
Function keys	22 with LED (yellow)	
System keys	Numeric keys, cursor block	
Service life	>1,000,000 actuations at 1 ± 0.3 N to 3 ± 0.3 N actuating force	
LED intensity		
Yellow	Typ. 38 mcd	

Table 72: 5AP1151.0573-000, 5AP1151.0573-000 - Technical data

Product ID	5AP1151.0573-000	
Revision	D0	E0
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)	
Degree of protection per UL 50	Front: Type 4X indoor use only	
Mechanical properties		
Front[3)]		
Frame	Aluminum, naturally anodized	
Panel overlay		
Material	Polyester	
Light background color	RAL 9006	
Dark border color around display	RAL 7024	
Gasket	3 mm fixed gasket	
Dimensions		
Width	212 mm	
Height	245 mm	
Weight	1400 g	

Table 72: 5AP1151.0573-000, 5AP1151.0573-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.2.4 Dimensions

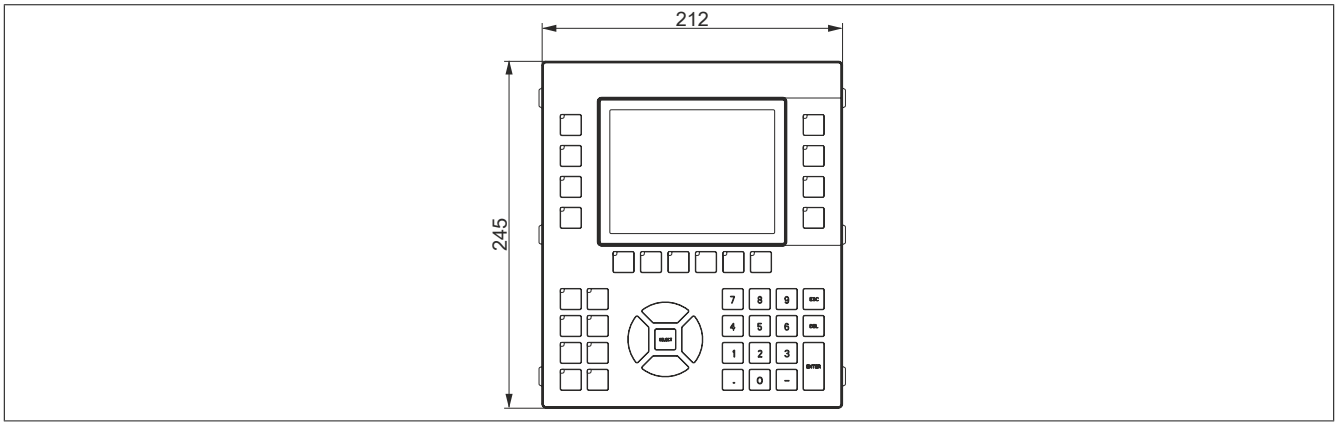


Figure 67: 5AP1151.0573-000 - Dimensions

2.3.2.2.5 Temperature/Humidity diagram

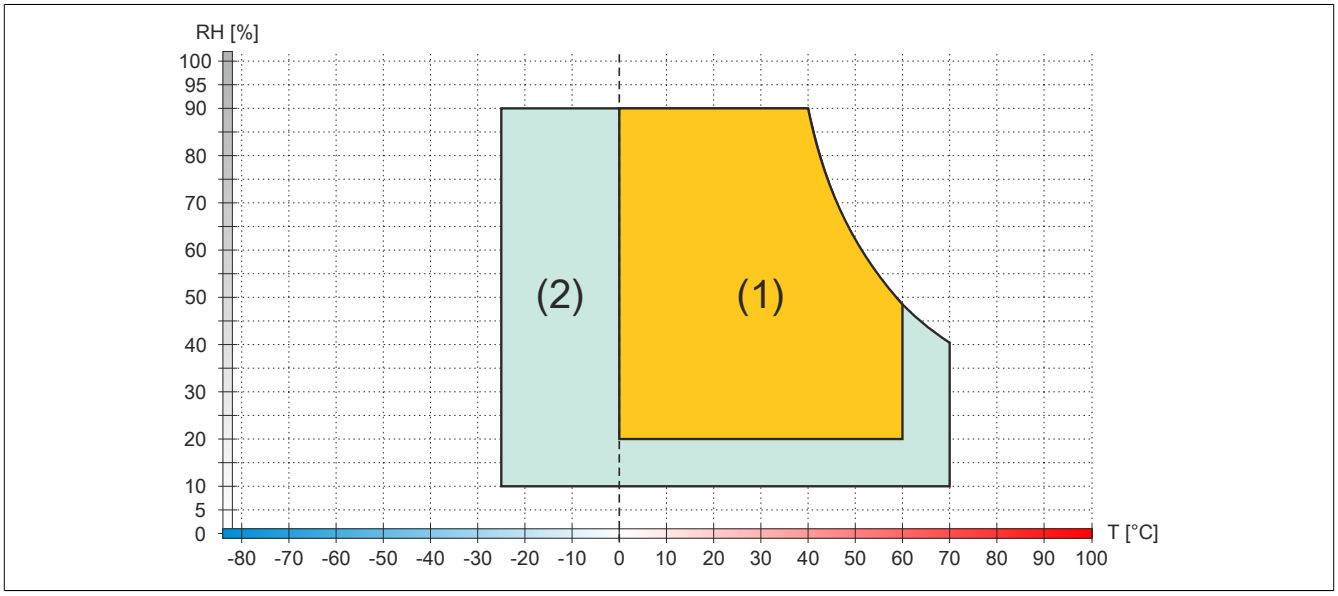


Figure 68: 5AP1151.0573-000 ≥ Rev. E0 - Temperature/Humidity diagram

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

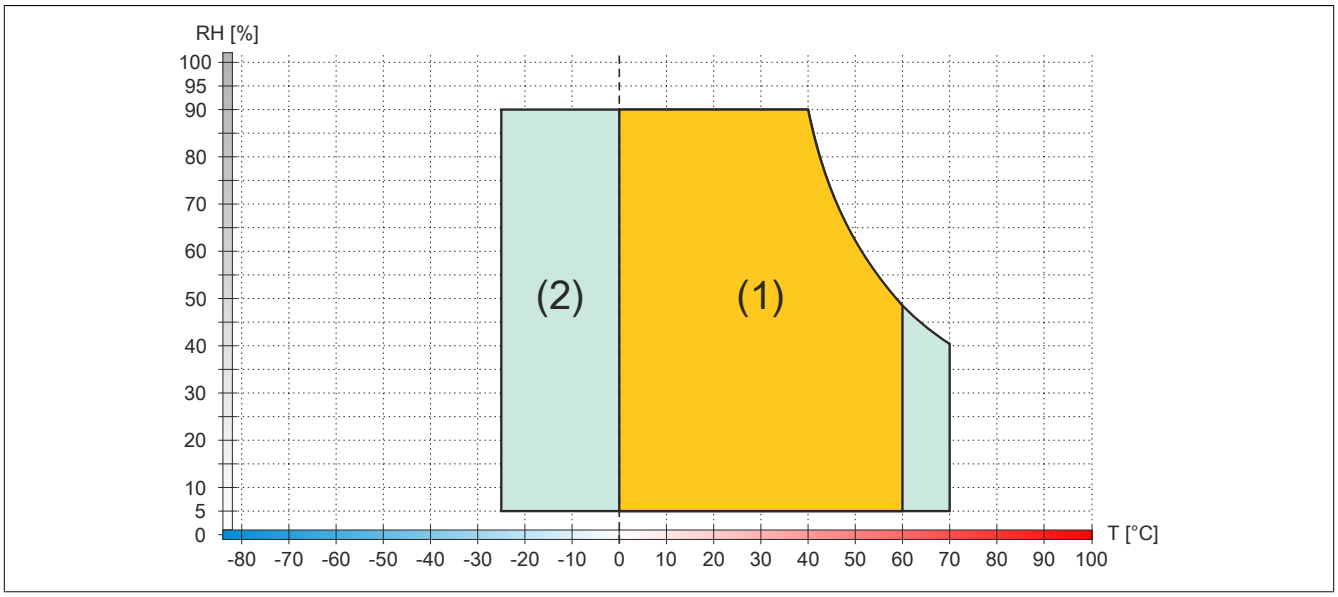


Figure 69: 5AP1151.0573-000 ≤ Rev. D0 - Temperature/Humidity diagram

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

2.3.2.3 5AP1120.0702-000

2.3.2.3.1 General information

- Panel for AP1000, PPC2100 or PPC2200
- 7.0" TFT WVGA color display
- Single-touch (analog resistive)
- Control cabinet installation

2.3.2.3.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.0702-000	Automation Panel 7" WVGA TFT - 800 x 480 pixels (16:10) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC2100 / PPC2200 / link modules - Compatible with 5PP520.0702-00	

Table 73: 5AP1120.0702-000 - Order data

2.3.2.3.3 Technical data

Information:

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

Model number	5AP1120.0702-000
General information	
B&R ID code	0xE7AC
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 [1)]
Display	
Type	TFT color
Diagonal	7.0"
Colors	16.7 million
Resolution	WVGA, 800 x 480 pixels
Contrast	600:1
Viewing angles	
Horizontal	Direction R = 70° / Direction L = 70°
Vertical	Direction U = 60° / Direction D = 60°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 80 to 500 cd/m²
Half-brightness time [2)]	50,000 h
Touch screen [3)]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only

Table 74: 5AP1120.0702-000 - Technical data

Model number	5AP1120.0702-000
Mechanical properties	
Front [4]	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	212 mm
Height	156 mm
Weight	Approx. 900 g

Table 74: 5AP1120.0702-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.3.4 Dimensions

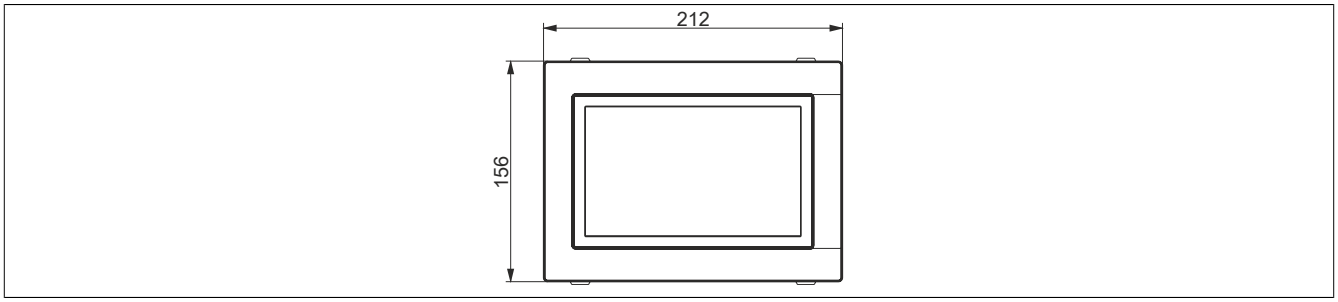


Figure 70: 5AP1120.0702-000 - Dimensions

2.3.2.3.5 Temperature/Humidity diagram

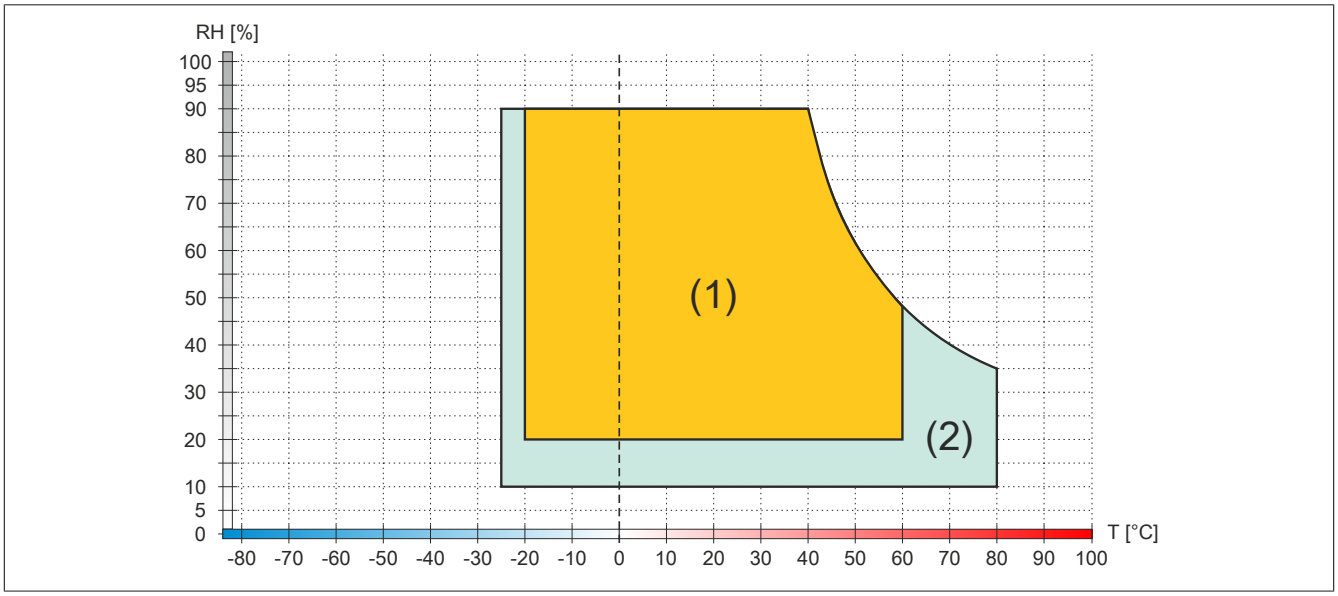


Figure 71: 5AP1120.0702-000 - Temperature/Humidity diagram

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

2.3.2.4 5AP1130.0702-000

2.3.2.4.1 General information

- Panel for AP1000, PPC2100 or PPC2200
- 7.0" TFT WVGA color display
- Multi-touch (projected capacitive)
- Control cabinet installation

2.3.2.4.2 Order data

Model number	Short description	Figure
	Panels	
5AP1130.0702-000	Automation Panel 7.0" WVGA TFT - 800 x 480 pixels (16:10) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC2100 / PPC2200 / link modules - Compatible with 5PP520.0702-00	

Table 75: 5AP1130.0702-000 - Order data

2.3.2.4.3 Technical data

Information:

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

Model number	5AP1130.0702-000
General information	
B&R ID code	0xEB61
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Display	
Type	TFT color
Diagonal	7.0"
Colors	16.7 million
Resolution	WVGA, 800 x 480 pixels
Contrast	600:1
Viewing angles	
Horizontal	Direction R = 70° / Direction L = 70°
Vertical	Direction U = 60° / Direction D = 60°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 80 to 500 cd/m²
Half-brightness time [2)]	50,000 h
Touch screen [3)]	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	See appendix A, section "Touch screen".
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only

Table 76: 5AP1130.0702-000 - Technical data

Model number	5AP1130.0702-000
Mechanical properties	
Front [4]	
Frame	Aluminum, coated
Design	Black
Gasket	3 mm fixed gasket
Dimensions	
Width	209 mm
Height	153 mm
Weight	1200 g

Table 76: 5AP1130.0702-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section 2 "Multi-touch drivers".
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.4.4 Dimensions

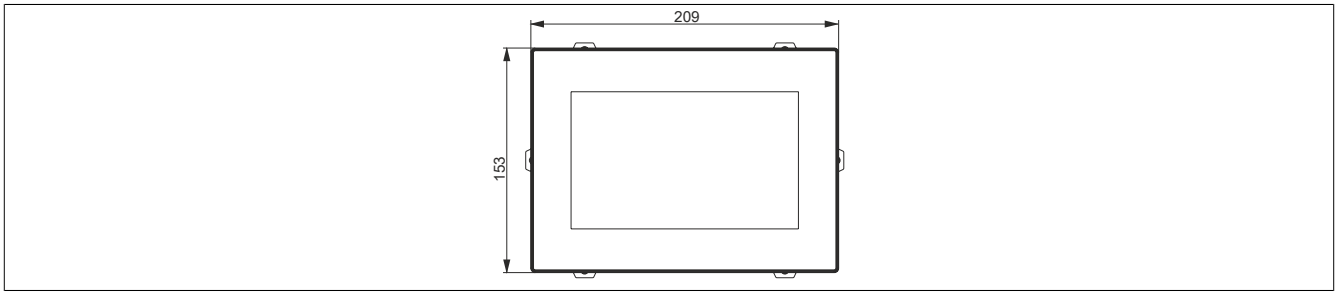


Figure 72: 5AP1130.0702-000 - Dimensions

2.3.2.4.5 Temperature/Humidity diagram

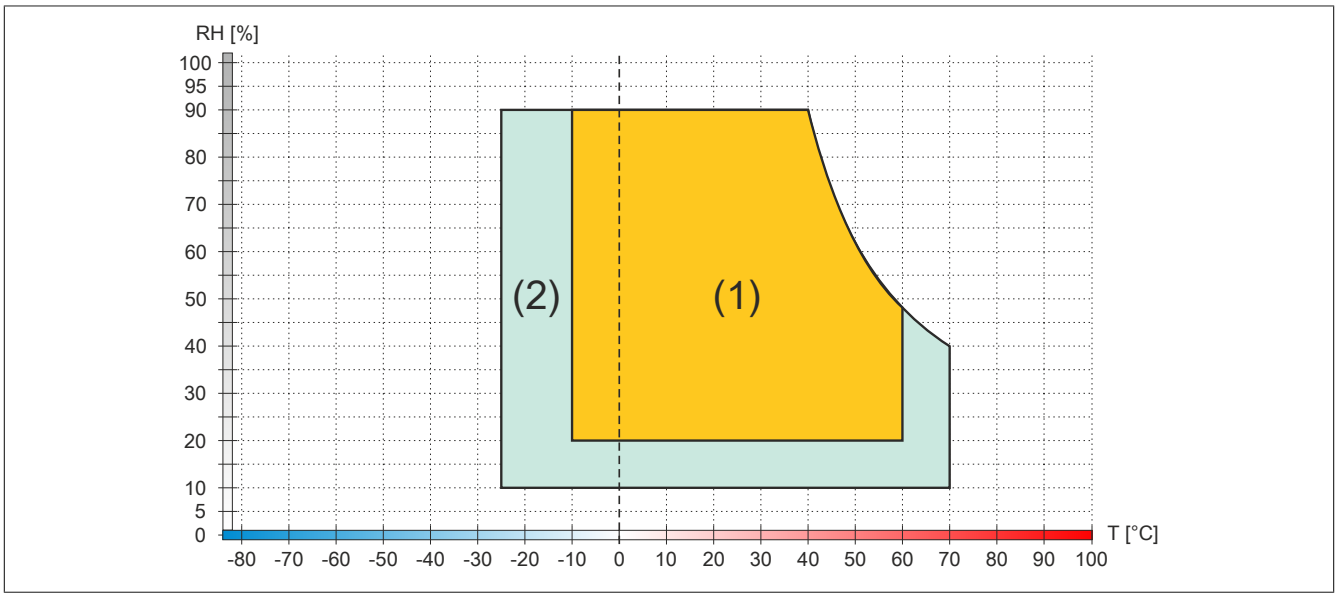


Figure 73: 5AP1130.0702-000 - Temperature/Humidity diagram

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

2.3.2.5 5AP1120.101E-000

2.3.2.5.1 General information

- Panel for AP1000, PPC2100, PPC2200 or PPC3100
- 10.1" TFT WXGA color display
- Single-touch (analog resistive)
- Control cabinet installation

2.3.2.5.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.101E-000	Automation Panel 10.1" WXGA TFT - 1280 x 800 pixels (16:10) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC2100 / PPC3100 / PPC2200 / link modules	

Table 77: 5AP1120.101E-000 - Order data

2.3.2.5.3 Technical data

Information:

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

Model number	5AP1120.101E-000
General information	
B&R ID code	0xE93D
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 [1)]
Display	
Type	TFT color
Diagonal	10.1"
Colors	16.7 million
Resolution	WXGA, 1280 x 800 pixels
Contrast	1000:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 85° / Direction D = 85°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 25 to 500 cd/m²
Half-brightness time [2)]	50,000 h
Touch screen [3)]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only

Table 78: 5AP1120.101E-000 - Technical data

Model number	5AP1120.101E-000
Mechanical properties	
Front [4]	
Frame	Aluminum, coated
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	279 mm
Height	191 mm
Weight	1900 g

Table 78: 5AP1120.101E-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.5.4 Dimensions

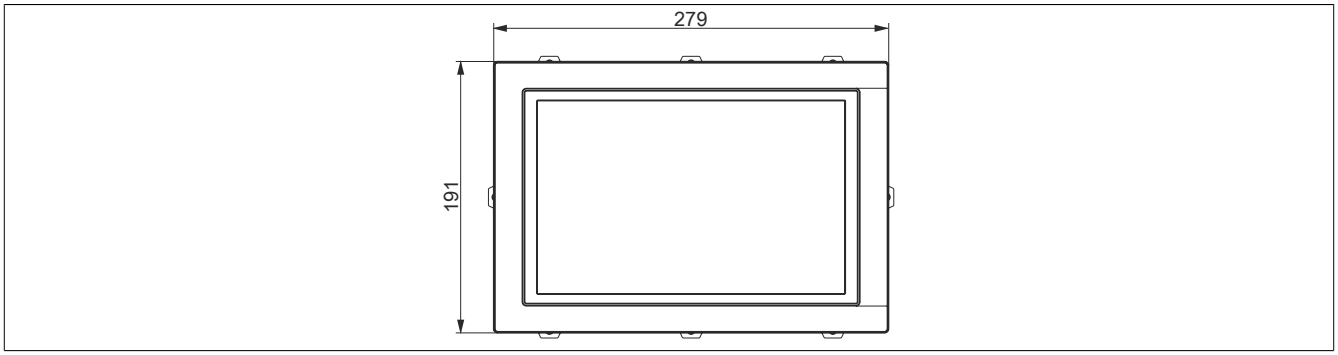


Figure 74: 5AP1120.101E-000 - Dimensions

2.3.2.5.5 Temperature/Humidity diagram

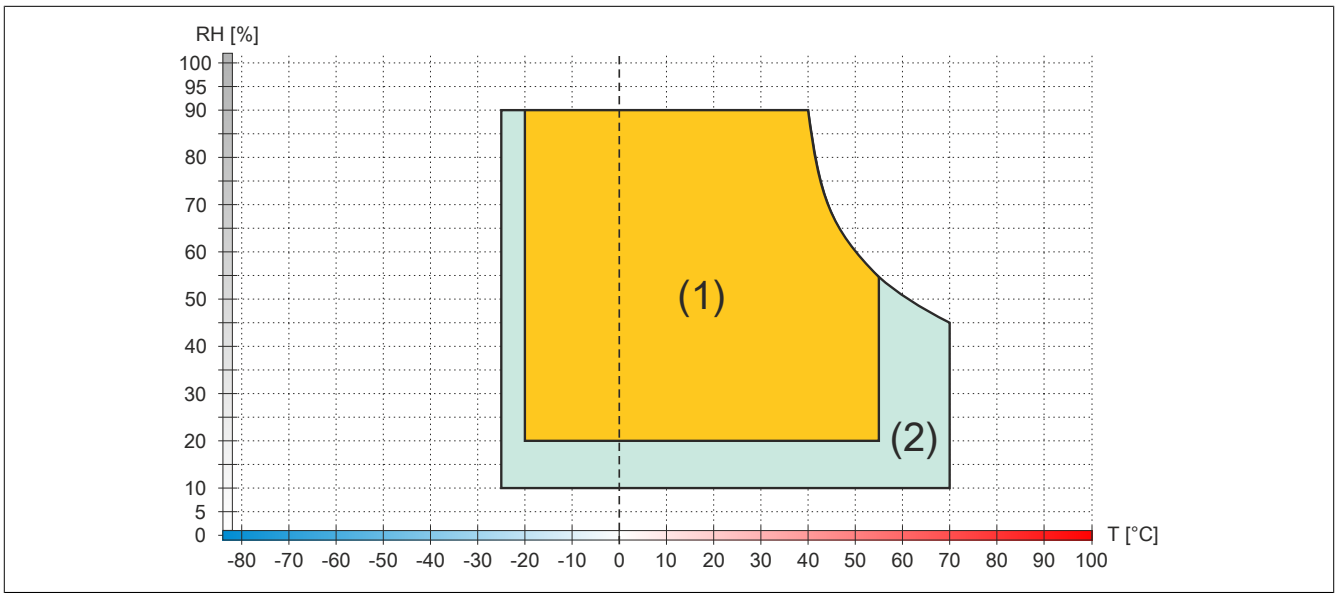


Figure 75: 5AP1120.101E-000 - Temperature/Humidity diagram

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

2.3.2.6 5AP1130.101E-000

2.3.2.6.1 General information

- Panel for AP1000, PPC2100, PPC2200 or PPC3100
- 10.1" TFT WXGA color display
- Multi-touch (projected capacitive)
- Control cabinet installation

2.3.2.6.2 Order data

Model number	Short description	Figure
	Panels	
5AP1130.101E-000	Automation Panel 10.1" WXGA TFT - 1280 x 800 pixels (16:10) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC2100 / PPC3100 / PPC2200 / link modules	

Table 79: 5AP1130.101E-000 - Order data

2.3.2.6.3 Technical data

Information:

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

Model number	5AP1130.101E-000
General information	
B&R ID code	0xEB62
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Display	
Type	TFT color
Diagonal	10.1"
Colors	16.7 million
Resolution	WXGA, 1280 x 800 pixels
Contrast	1000:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 85° / Direction D = 85°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 25 to 500 cd/m²
Half-brightness time [2)]	50,000 h
Touch screen [3)]	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	See appendix A, section "Touch screen".
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only

Table 80: 5AP1130.101E-000 - Technical data

Model number	5AP1130.101E-000
Mechanical properties	
Front [4]	
Frame	Aluminum, coated
Design	Black
Gasket	3 mm fixed gasket
Dimensions	
Width	279 mm
Height	191 mm
Weight	2000 g

Table 80: 5AP1130.101E-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section "Multi-touch drivers".
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.6.4 Dimensions

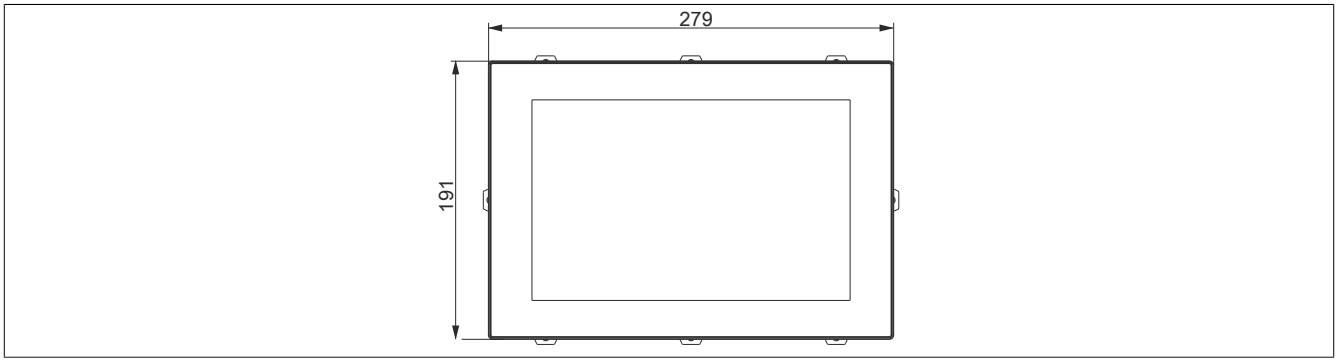


Figure 76: 5AP1130.101E-000 - Dimensions

2.3.2.6.5 Temperature/Humidity diagram

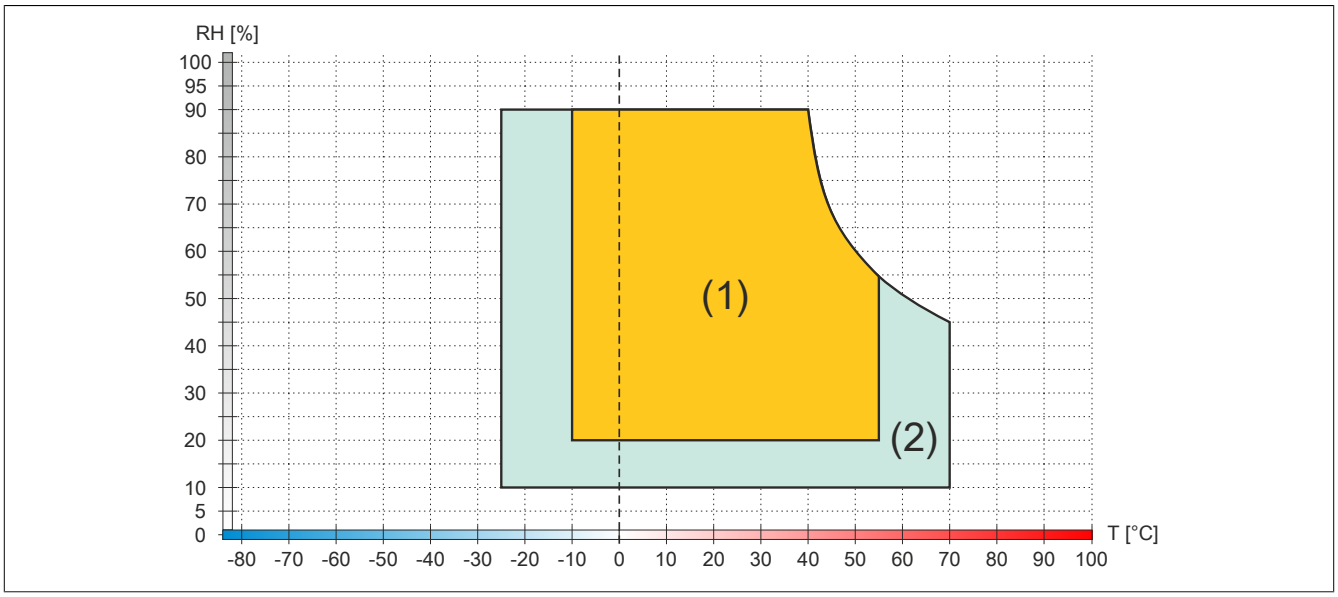


Figure 77: 5AP1130.101E-000 - Temperature/Humidity diagram

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

2.3.2.7 5AP1120.1043-000

2.3.2.7.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 10.4" TFT VGA color display
- Single-touch (analog resistive)
- Front USB interface
- Control cabinet installation

2.3.2.7.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP520.1043-00	

Table 81: 5AP1120.1043-000 - Order data

2.3.2.7.3 Technical data

Information:

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

Model number	5AP1120.1043-000
General information	
B&R ID code	0xE7AD
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	10.4"
Colors	16.7 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2)]	70,000 h

Table 82: 5AP1120.1043-000 - Technical data

Model number	5AP1120.1043-000
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front [4]	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	323 mm
Height	260 mm
Weight	2800 g

Table 82: 5AP1120.1043-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.7.4 Dimensions

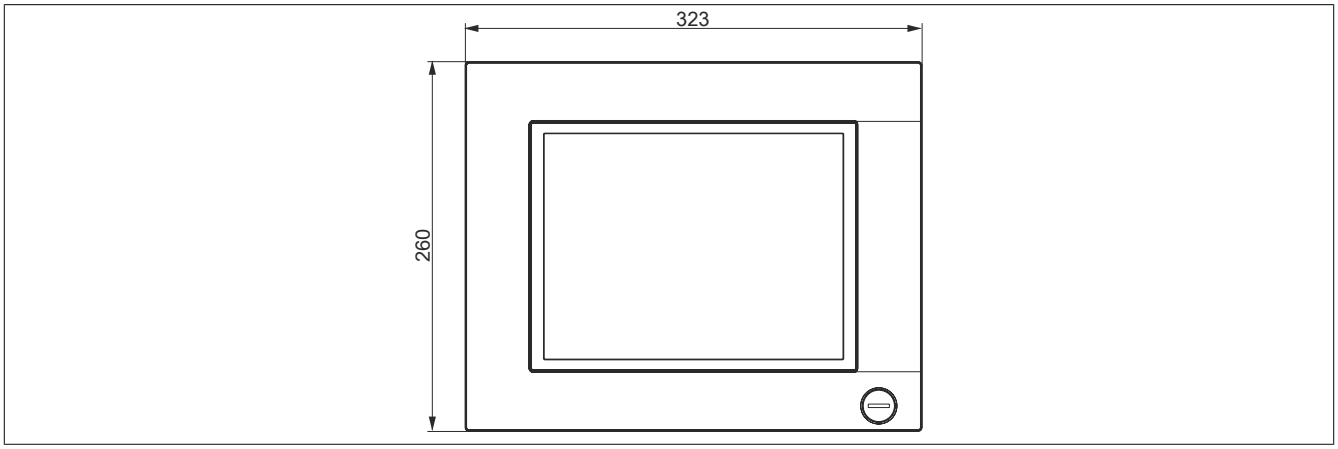


Figure 78: 5AP1120.1043-000 - Dimensions

2.3.2.7.5 Temperature/Humidity diagram

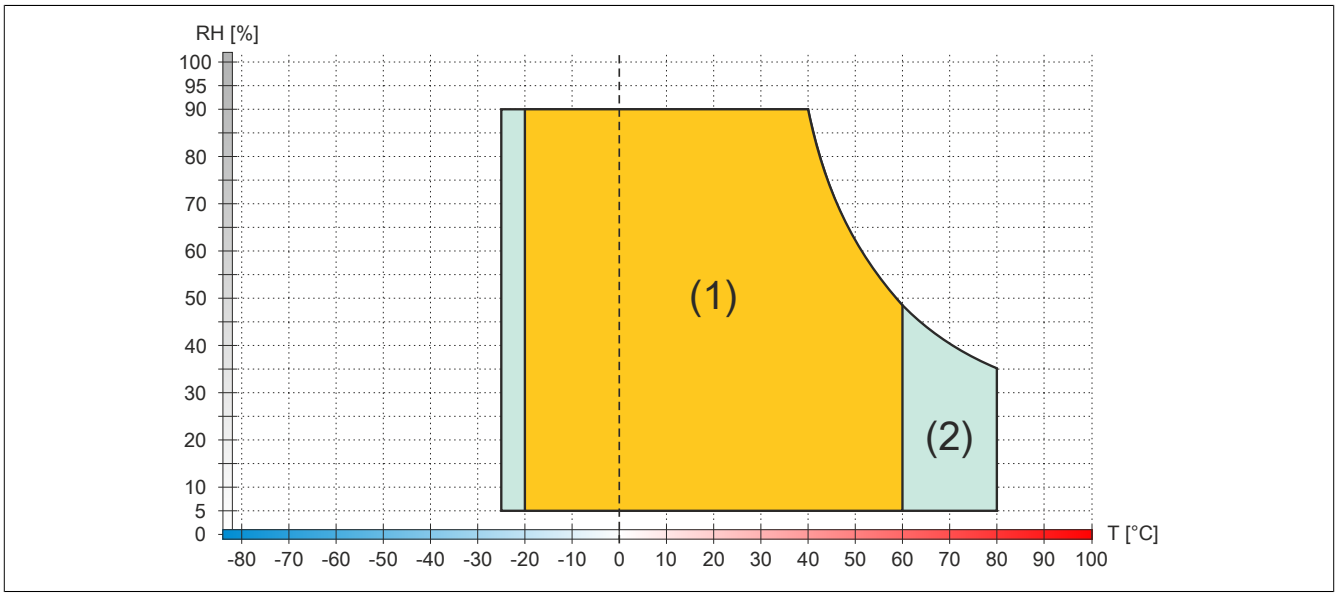


Figure 79: 5AP1120.1043-000 - Temperature/Humidity diagram

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

2.3.2.8 5AP1180.1043-000

2.3.2.8.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 10.4" TFT VGA color display
- Single-touch (analog resistive)
- 22 function keys
- Front USB interface
- Control cabinet installation

2.3.2.8.2 Order data

Model number	Short description	Figure
	Panels	
5AP1180.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - 22 function keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP580.1043-00, 5AP980.1043-01	

Table 83: 5AP1180.1043-000 - Order data

2.3.2.8.3 Technical data

Information:

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

Model number	5AP1180.1043-000
General information	
B&R ID code	0xE7AE
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	10.4"
Colors	16.7 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2)]	70,000 h

Table 84: 5AP1180.1043-000 - Technical data

Model number	5AP1180.1043-000
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Keys	
Function keys	22 with LED (yellow)
System keys	No
Service life	>1,000,000 actuations at 1 ± 0.3 N to 3 ± 0.3 N actuating force
LED brightness	
Yellow	Typ. 38 mcd
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front [4]	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	323 mm
Height	260 mm
Weight	2800 g

Table 84: 5AP1180.1043-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.8.4 Dimensions

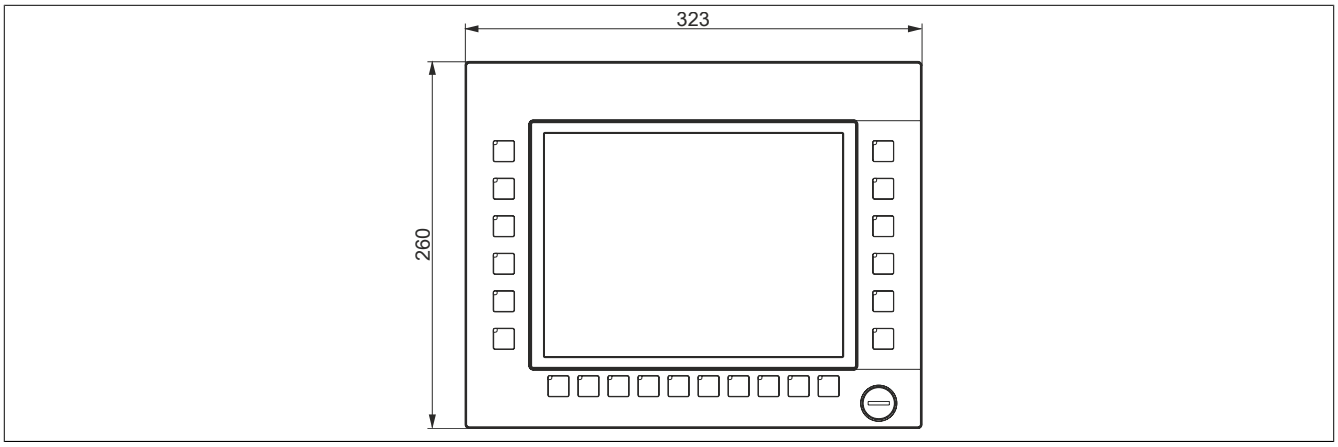


Figure 80: 5AP1180.1043-000 - Dimensions

2.3.2.8.5 Temperature/Humidity diagram

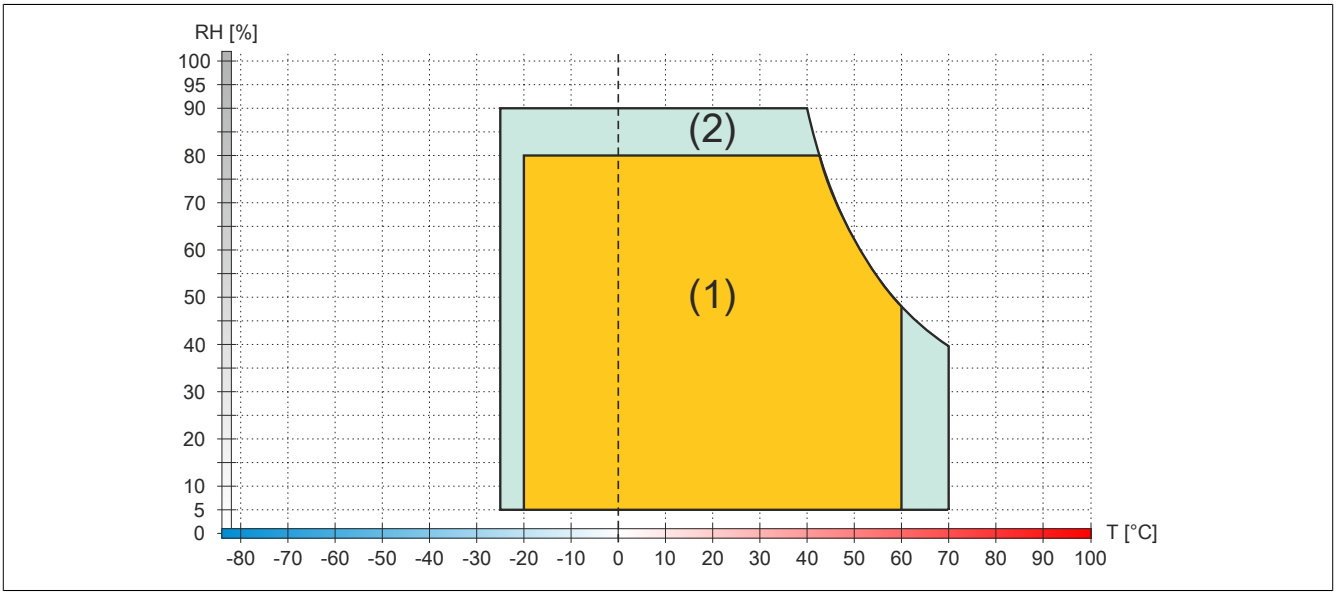


Figure 81: 5AP1180.1043-000 - Temperature/Humidity diagram

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

2.3.2.9 5AP1181.1043-000

2.3.2.9.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 10.4" TFT VGA color display
- Single-touch (analog resistive)
- 38 function keys and 20 system keys
- Front USB interface
- Control cabinet installation

2.3.2.9.2 Order data

Model number	Short description	Figure
	Panels	
5AP1181.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Portrait format - Front USB - 38 function keys and 20 system keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP581.1043-00, 5AP981.1043-01, 5PC781.1043-00	

Table 85: 5AP1181.1043-000 - Order data

2.3.2.9.3 Technical data

Information:

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

Model number	5AP1181.1043-000
General information	
B&R ID code	0xE7AF
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	10.4"
Colors	16.7 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°

Table 86: 5AP1181.1043-000 - Technical data

Model number	5AP1181.1043-000
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time 2)	70,000 h
Touch screen 3)	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Keys	
Function keys	38 with LED (yellow)
System keys	Numeric keys, cursor block
Service life	>1,000,000 actuations at 1 ± 0.3 N to 3 ± 0.3 N actuating force
LED brightness	
Yellow	Typ. 38 mcd
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front 4)	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	323 mm
Height	358 mm
Weight	3400 g

Table 86: 5AP1181.1043-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.9.4 Dimensions

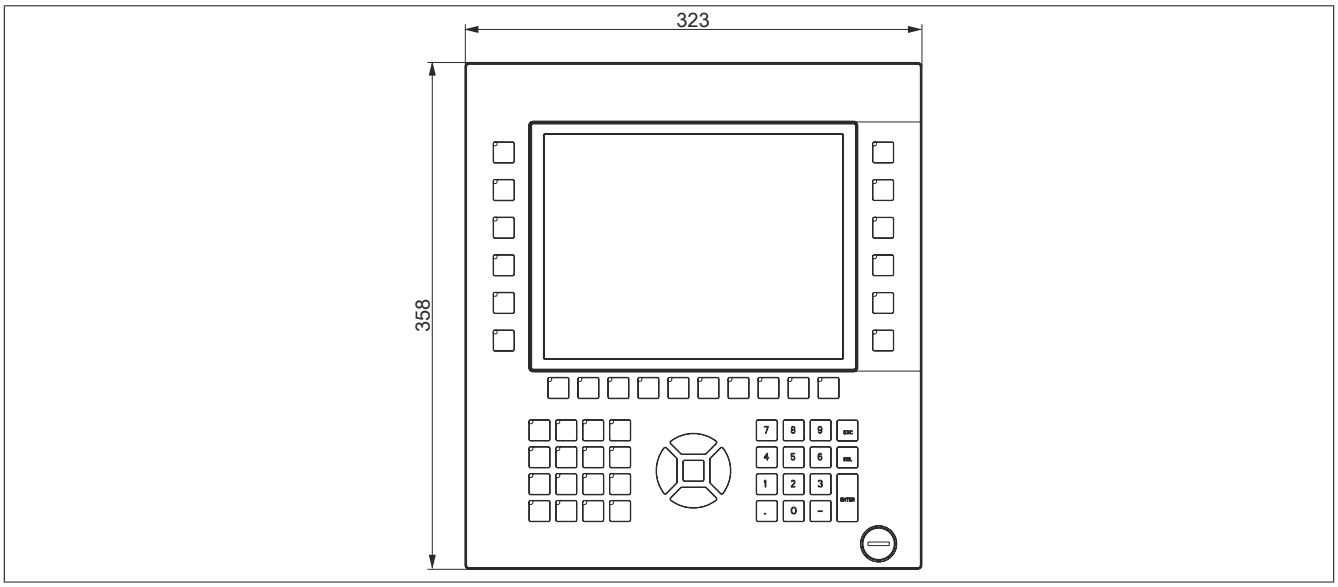


Figure 82: 5AP1181.1043-000 - Dimensions

2.3.2.9.5 Temperature/Humidity diagram

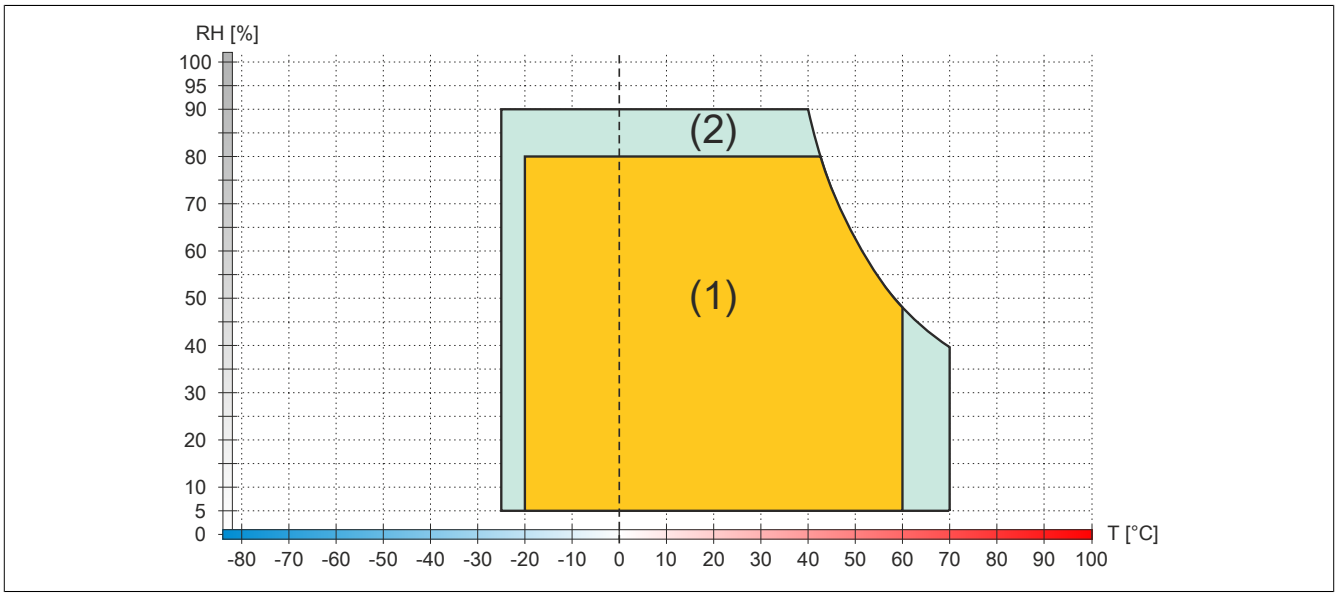


Figure 83: 5AP1181.1043-000 - Temperature/Humidity diagram

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

2.3.2.10 5AP1182.1043-000

2.3.2.10.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 10.4" TFT VGA color display
- Single-touch (analog resistive)
- 44 function keys and 20 system keys
- Front USB interface
- Control cabinet installation

2.3.2.10.2 Order data

Model number	Short description	Figure
	Panels	
5AP1182.1043-000	Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - 44 function keys and 20 system keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP582.1043-00, 5AP982.1043-01, 5PC782.1043-00	

Table 87: 5AP1182.1043-000 - Order data

2.3.2.10.3 Technical data

Information:

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

Model number	5AP1182.1043-000
General information	
B&R ID code	0xE7B0
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	10.4"
Colors	16.7 million
Resolution	VGA, 640 x 480 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 80° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2)]	70,000 h

Table 88: 5AP1182.1043-000 - Technical data

Model number	5AP1182.1043-000
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Keys	
Function keys	44 with LED (yellow)
System keys	Numeric keys, cursor block
Service life	>1,000,000 actuations at 1 ± 0.3 N to 3 ± 0.3 N actuating force
LED brightness	
Yellow	Typ. 38 mcd
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front [4]	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	423 mm
Height	288 mm
Weight	3500 g

Table 88: 5AP1182.1043-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.10.4 Dimensions

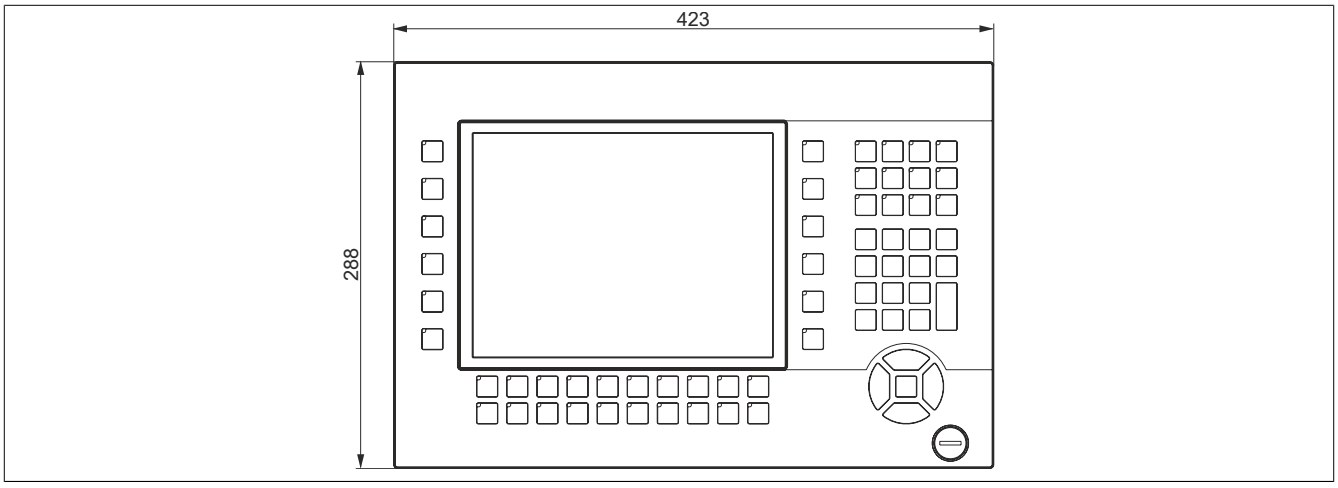


Figure 84: 5AP1182.1043-000 - Dimensions

2.3.2.10.5 Temperature/Humidity diagram

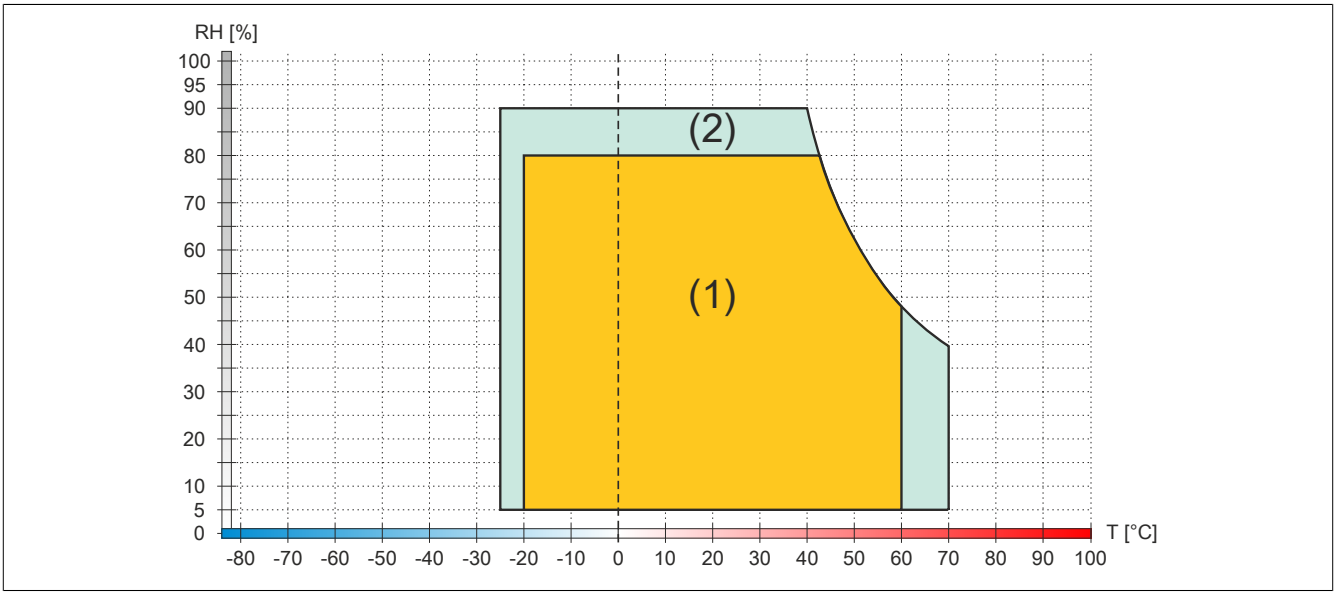


Figure 85: 5AP1182.1043-000 - Temperature/Humidity diagram

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

2.3.2.11 5AP1120.1214-000

2.3.2.11.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 12.1" TFT SVGA color display
- Single-touch (analog resistive)
- Front USB interface
- Control cabinet installation

2.3.2.11.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.1214-000	Automation Panel 12.1" SVGA TFT - 800 x 600 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP520.1214-00	

Table 89: 5AP1120.1214-000 - Order data

2.3.2.11.3 Technical data

Information:

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

Model number	5AP1120.1214-000
General information	
B&R ID code	0xE7BB
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	12.1"
Colors	16.7 million
Resolution	SVGA, 800 x 600 pixels
Contrast	1500:1
Viewing angles	
Horizontal	Direction R = 89° / Direction L = 89°
Vertical	Direction U = 89° / Direction D = 89°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 22.5 to 450 cd/m²
Half-brightness time [2)]	50,000 h

Table 90: 5AP1120.1214-000 - Technical data

Model number	5AP1120.1214-000
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front [4]	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	362 mm
Height	284 mm
Weight	3200 g

Table 90: 5AP1120.1214-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.11.4 Dimensions

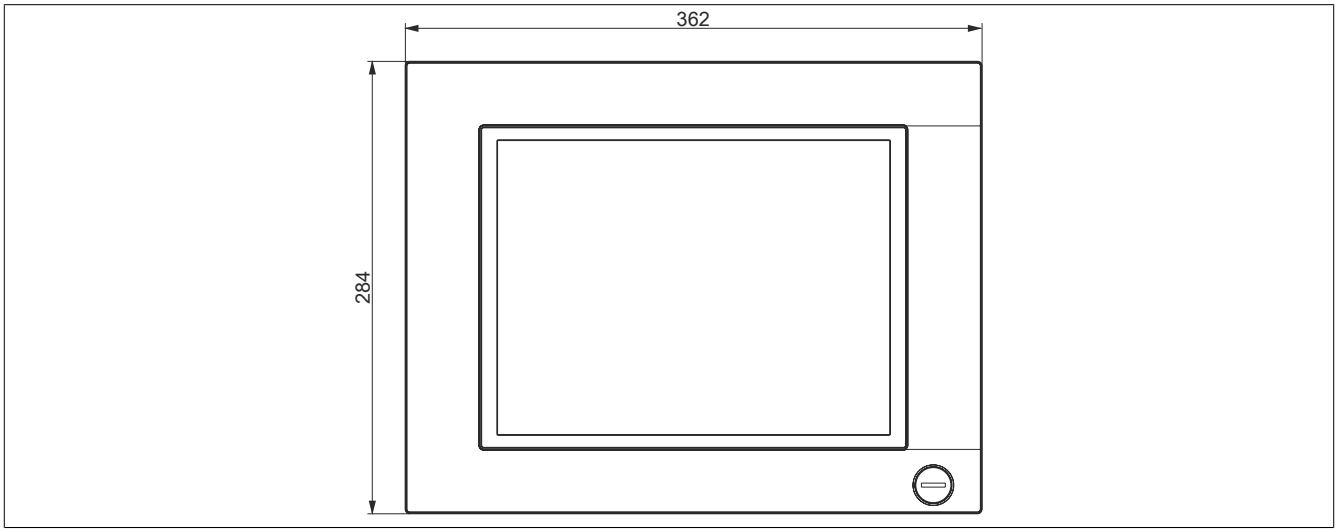


Figure 86: 5AP1120.1214-000 - Dimensions

2.3.2.11.5 Temperature/Humidity diagram

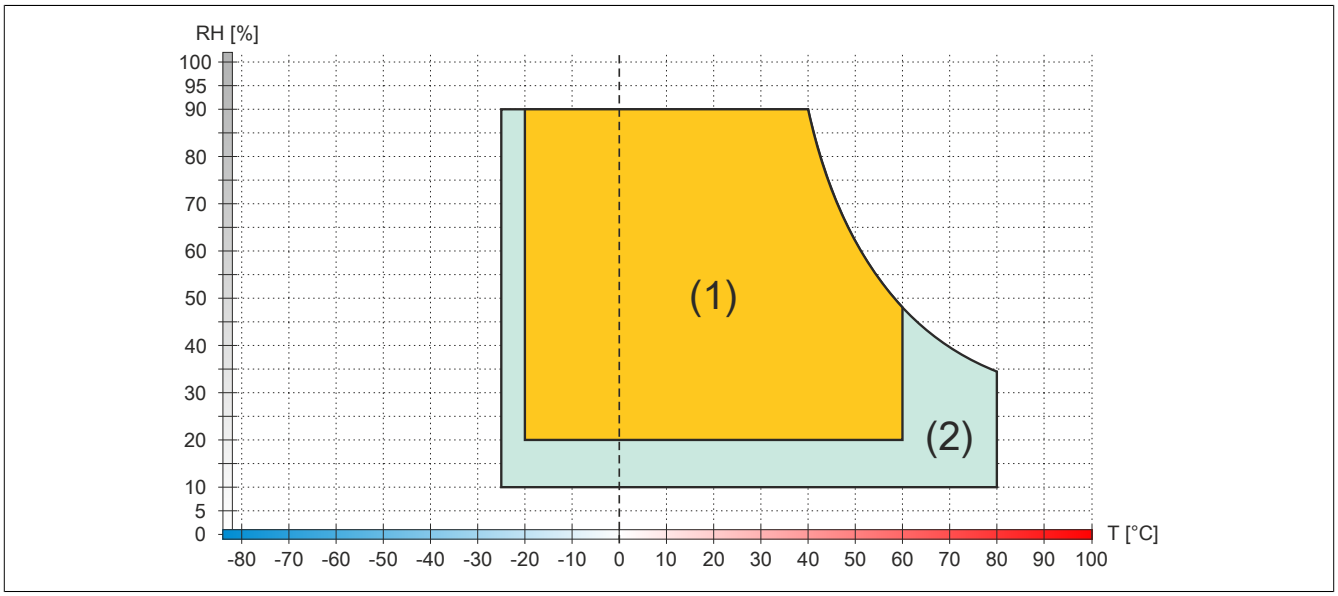


Figure 87: 5AP1120.1214-000 - Temperature/Humidity diagram

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

2.3.2.12 5AP1120.121E-000

2.3.2.12.1 General information

- Panel for AP1000, PPC2100, PPC2200 or PPC3100
- 12.1" TFT WXGA color display
- Single-touch (analog resistive)
- Control cabinet installation

2.3.2.12.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.121E-000	Automation Panel 12.1" WXGA TFT - 1280 x 800 pixels (16:10) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC2100 / PPC3100 / PPC2200 / link modules	

Table 91: 5AP1120.121E-000 - Order data

2.3.2.12.3 Technical data

Information:

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

Model number	5AP1120.121E-000
General information	
B&R ID code	0xE8E4
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Display	
Type	TFT color
Diagonal	12.1"
Colors	16.7 million
Resolution	WXGA, 1280 x 800 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 65° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 40 to 400 cd/m²
Half-brightness time [2)]	50,000 h
Touch screen [3)]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only

Table 92: 5AP1120.121E-000 - Technical data

Model number	5AP1120.121E-000
Mechanical properties	
Front [4]	
Frame	Aluminum, coated
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	324 mm
Height	221.5 mm
Weight	2300 g

Table 92: 5AP1120.121E-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.12.4 Dimensions

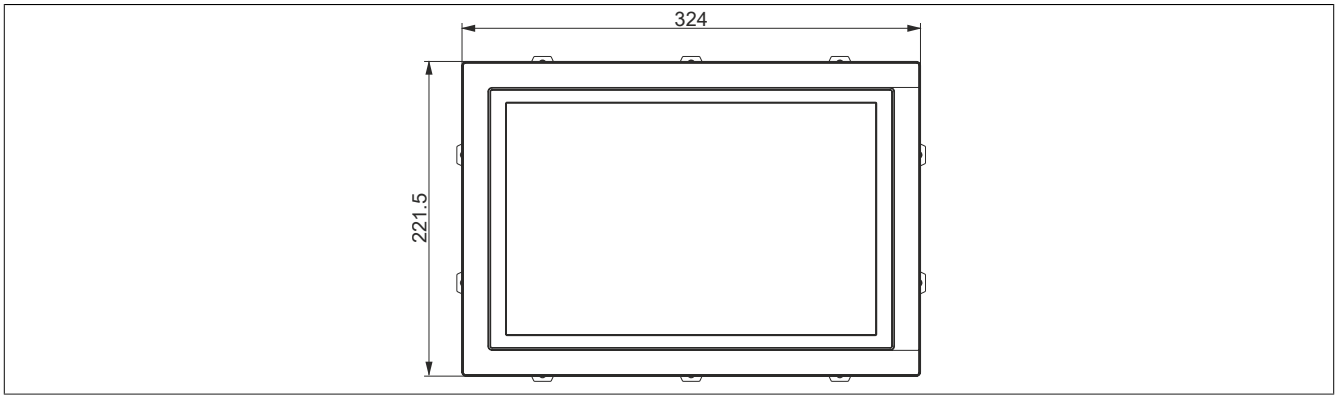


Figure 88: 5AP1120.121E-000 - Dimensions

2.3.2.12.5 Temperature/Humidity diagram

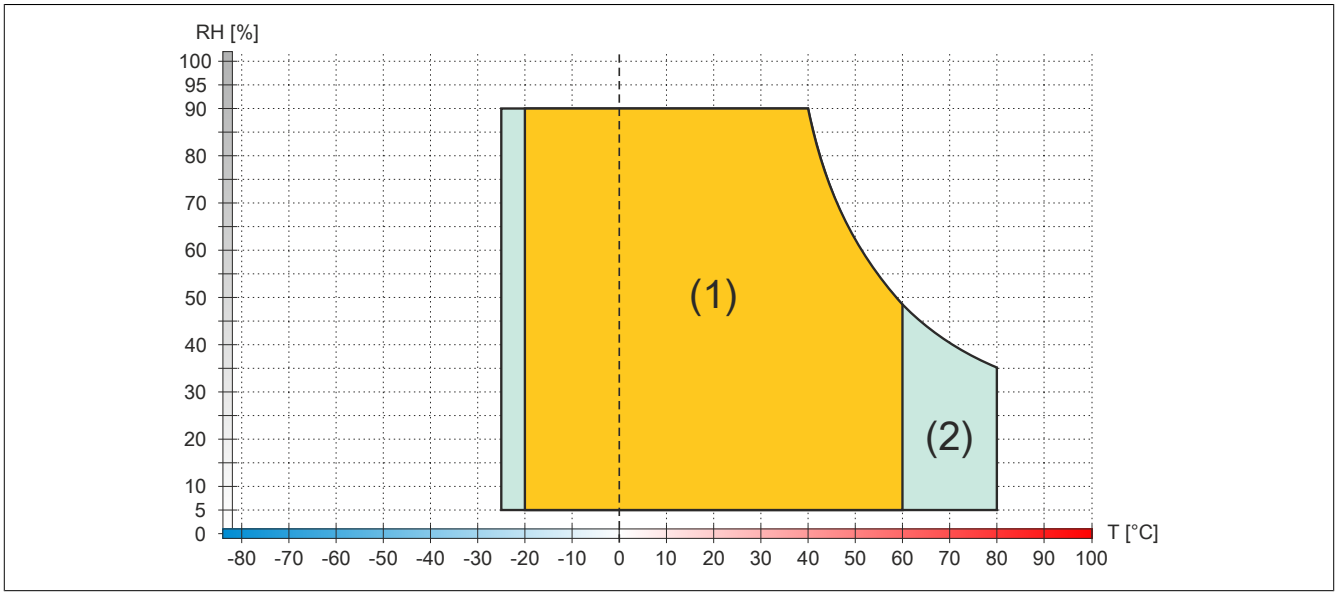


Figure 89: 5AP1120.121E-000 - Temperature/Humidity diagram

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

2.3.2.13 5AP1130.121E-000

2.3.2.13.1 General information

- Panel for AP1000, PPC2100, PPC2200 or PPC3100
- 12.1" TFT WXGA color display
- Multi-touch (projected capacitive)
- Control cabinet installation

2.3.2.13.2 Order data

Model number	Short description	Figure
	Panels	
5AP1130.121E-000	Automation Panel 12.1" WXGA TFT - 1280 x 800 pixels (16:10) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC2100 / PPC3100 / PPC2200 / link modules	

Table 93: 5AP1130.121E-000 - Order data

2.3.2.13.3 Technical data

Information:

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

Model number	5AP1130.121E-000
General information	
B&R ID code	0xEB63
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 [1)]
Display	
Type	TFT color
Diagonal	12.1"
Colors	16.7 million
Resolution	WXGA, 1280 x 800 pixels
Contrast	900:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 65° / Direction D = 80°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 40 to 400 cd/m²
Half-brightness time [2)]	50,000 h
Touch screen [3)]	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	See appendix A, section "Touch screen".
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only

Table 94: 5AP1130.121E-000 - Technical data

Model number	5AP1130.121E-000
Mechanical properties	
Front [4]	
Frame	Aluminum, coated
Design	Black
Gasket	3 mm fixed gasket
Dimensions	
Width	324 mm
Height	221.5 mm
Weight	2400 g

Table 94: 5AP1130.121E-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section "Multi-touch drivers".
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.13.4 Dimensions

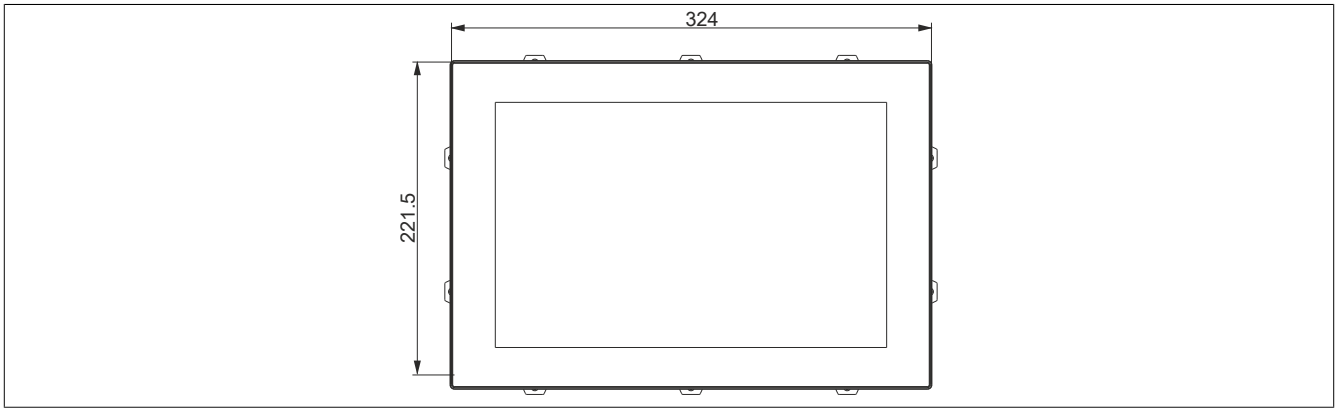


Figure 90: 5AP1130.121E-000 - Dimensions

2.3.2.13.5 Temperature/Humidity diagram

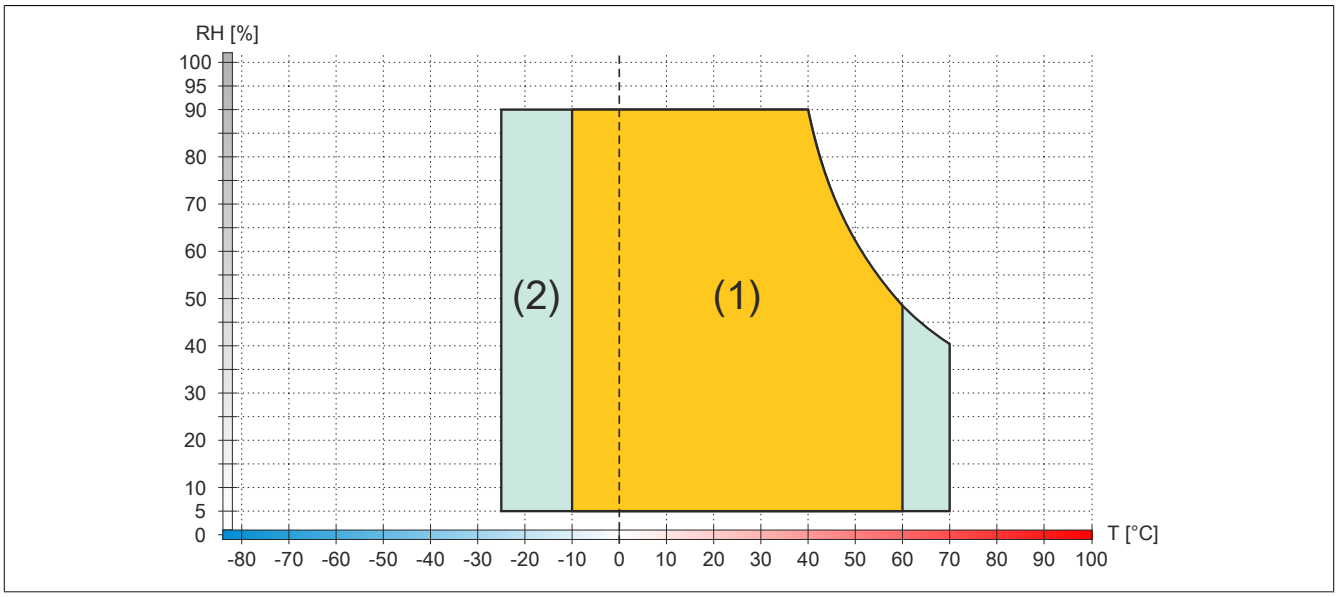


Figure 91: 5AP1130.121E-000 - Temperature/Humidity diagram

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

2.3.2.14 5AP1120.1505-000

2.3.2.14.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 15.0" TFT XGA color display
- Single-touch (analog resistive)
- Front USB interface
- Control cabinet installation

2.3.2.14.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.1505-000	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP520.1505-00, 5AP920.1505-01, 5PC720.1505-xx, 5PC820.1505-00	

Table 95: 5AP1120.1505-000 - Order data

2.3.2.14.3 Technical data

Information:

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

Model number	5AP1120.1505-000
General information	
B&R ID code	0xE7BC
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	15.0"
Colors	16.7 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 70° / Direction D = 70°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 20 to 400 cd/m²
Half-brightness time [2)]	50,000 h

Table 96: 5AP1120.1505-000 - Technical data

Model number	5AP1120.1505-000
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front [4]	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	435 mm
Height	330 mm
Weight	5000 g

Table 96: 5AP1120.1505-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.14.4 Dimensions

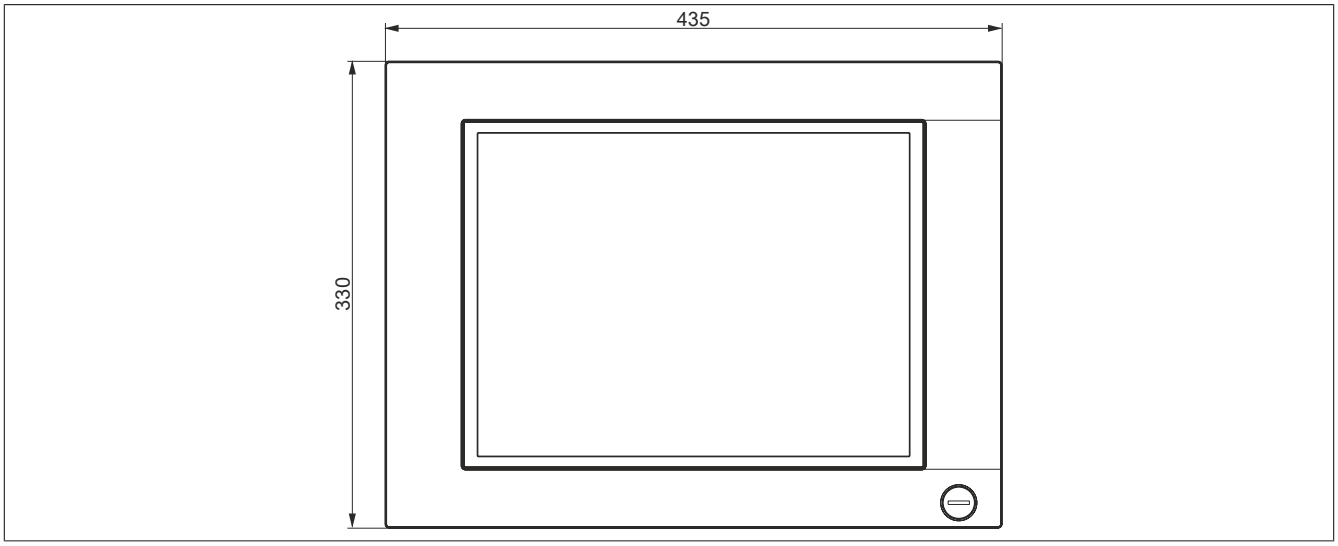


Figure 92: 5AP1120.1505-000 - Dimensions

2.3.2.14.5 Temperature/Humidity diagram

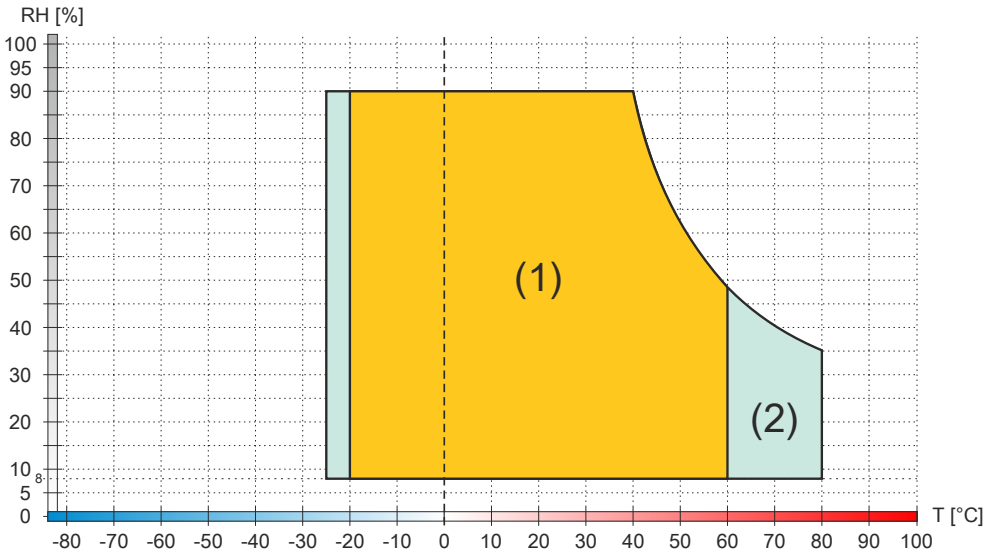


Figure 93: 5AP1120.1505-000 - Temperature/Humidity diagram

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

2.3.2.15 5AP1180.1505-000

2.3.2.15.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 15.0" TFT XGA color display
- Single-touch (analog resistive)
- 32 function keys
- Front USB interface
- Control cabinet installation

2.3.2.15.2 Order data

Model number	Short description	Figure
	Panels	
5AP1180.1505-000	Automation Panel 15.0" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP580.1505-00, 5AP980.1505-01	

Table 97: 5AP1180.1505-000 - Order data

2.3.2.15.3 Technical data

Information:

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

Model number	5AP1180.1505-000
General information	
B&R ID code	0xE7BD
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	15.0"
Colors	16.7 million
Resolution	XGA, 1024 x 768 pixels
Contrast	700:1
Viewing angles	
Horizontal	Direction R = 80° / Direction L = 80°
Vertical	Direction U = 70° / Direction D = 70°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 20 to 400 cd/m²
Half-brightness time [2)]	50,000 h

Table 98: 5AP1180.1505-000 - Technical data

Model number	5AP1180.1505-000
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Keys	
Function keys	32 with LED (yellow)
System keys	No
Service life	>1,000,000 actuations at 1 ± 0.3 N to 3 ± 0.3 N actuating force
LED brightness	
Yellow	Typ. 38 mcd
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front [4]	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	435 mm
Height	330 mm
Weight	4900 g

Table 98: 5AP1180.1505-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.15.4 Dimensions

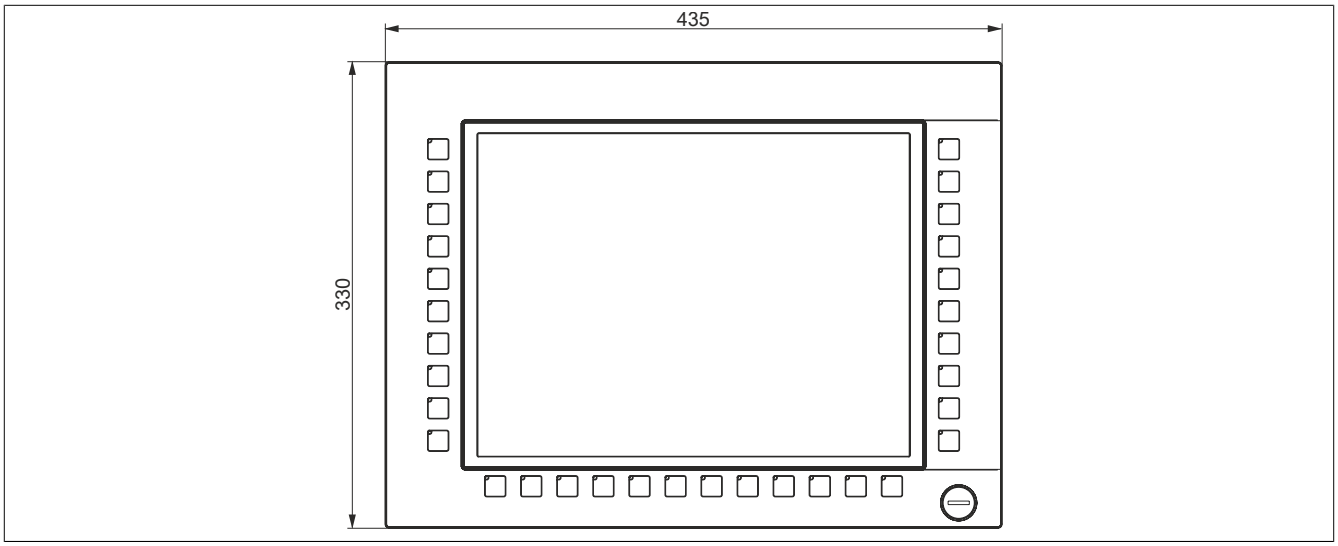


Figure 94: 5AP1180.1505-000 - Dimensions

2.3.2.15.5 Temperature/Humidity diagram

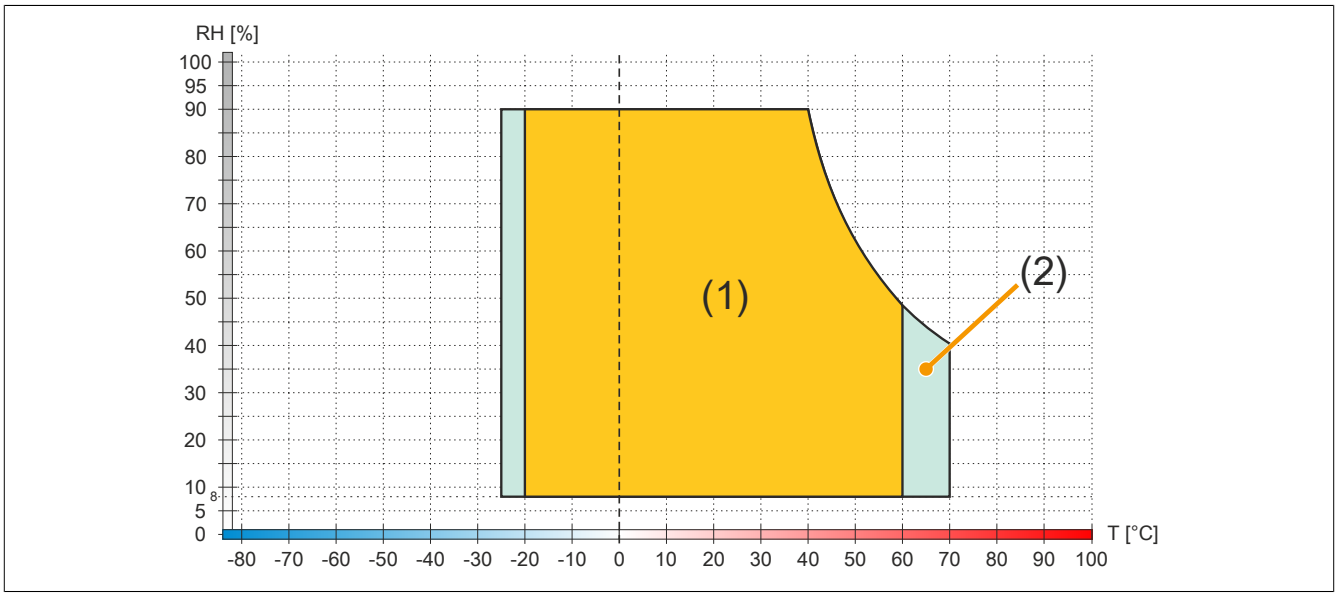


Figure 95: 5AP1180.1505-000 - Temperature/Humidity diagram

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

2.3.2.16 5AP1181.1505-000

2.3.2.16.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 15.0" TFT XGA color display
- Single-touch (analog resistive)
- 32 function keys
- 92 system keys
- Front USB interface
- Control cabinet installation

Information:

This Automation Panel is not approved for DVI operation.

2.3.2.16.2 Order data

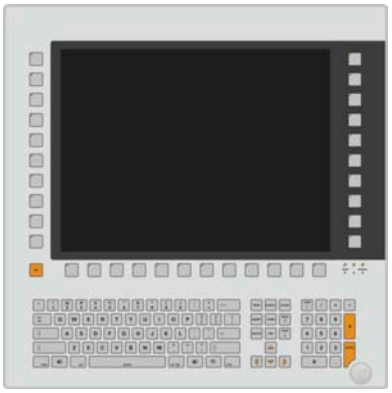
Model number	Short description	Figure
	Panels	
5AP1181.1505-000	Automation Panel 15" XGA TFT - 1024 x 768 pixels (4:3) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - 32 function keys and 92 system keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP581.1505-000	

Table 99: 5AP1181.1505-000 - Order data

2.3.2.16.3 Technical data

Information:

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

Model number	5AP1181.1505-000
General information	
B&R ID code	0xEF61
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	15.0"
Colors	16.7 million
Resolution	XGA, 1024 x 768 pixels

Table 100: 5AP1181.1505-000 - Technical data

Model number	5AP1181.1505-000
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 [2]	50,000 h
Touch screen [3]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Keys	
Function keys	32 with LED (yellow)
System keys	Alphanumeric keys, numeric keys, cursor block
Service life	>1,000,000 actuations at 1 ± 0.3 N to 3 ± 0.3 N actuating force
LED brightness	
Yellow	Typ. 38 mcd
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front [4]	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	435 mm
Height	430 mm
Weight	6000 g

Table 100: 5AP1181.1505-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.16.4 Dimensions

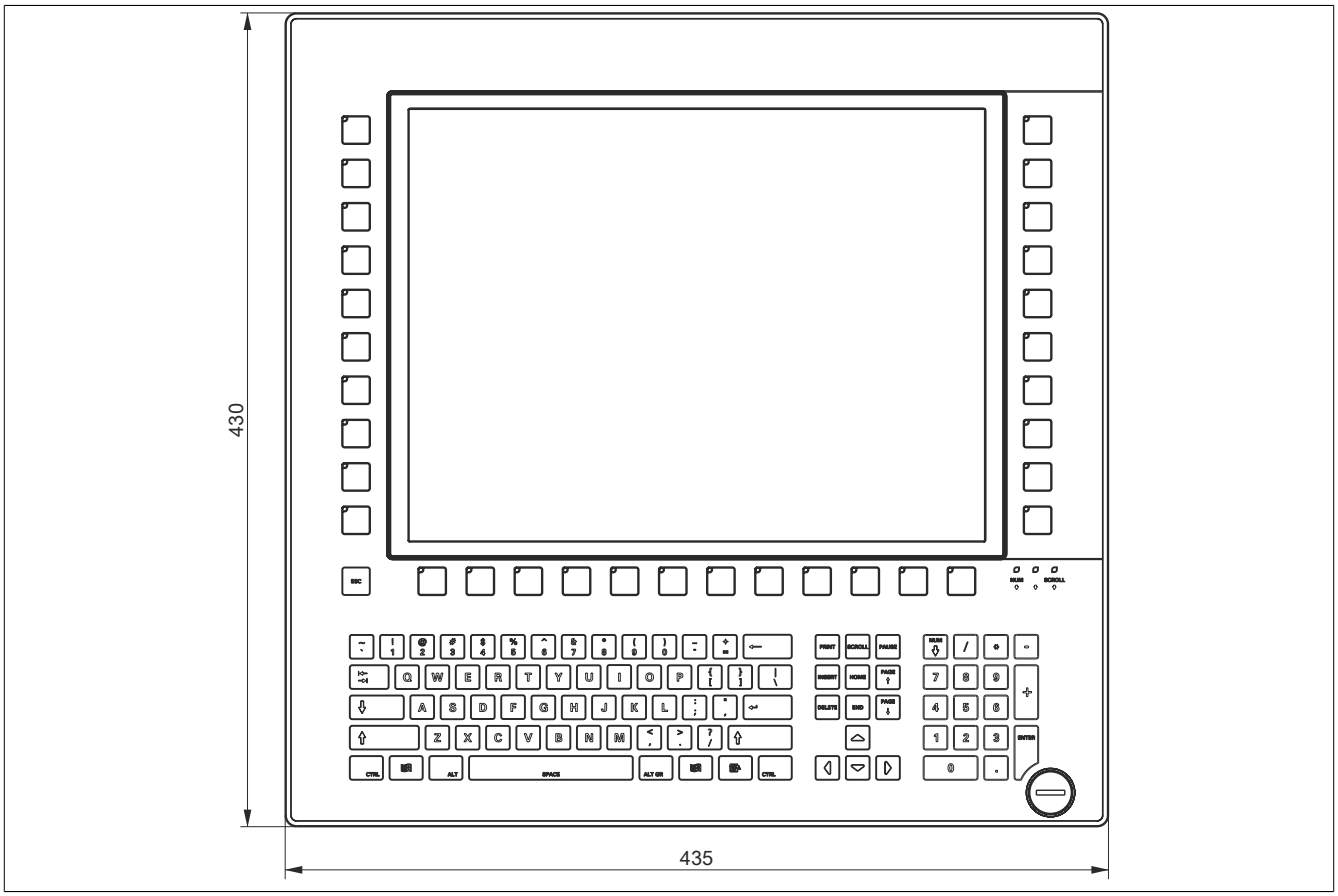


Figure 96: 5AP1181.1505-000 - Dimensions

2.3.2.16.5 Temperature/Humidity diagram

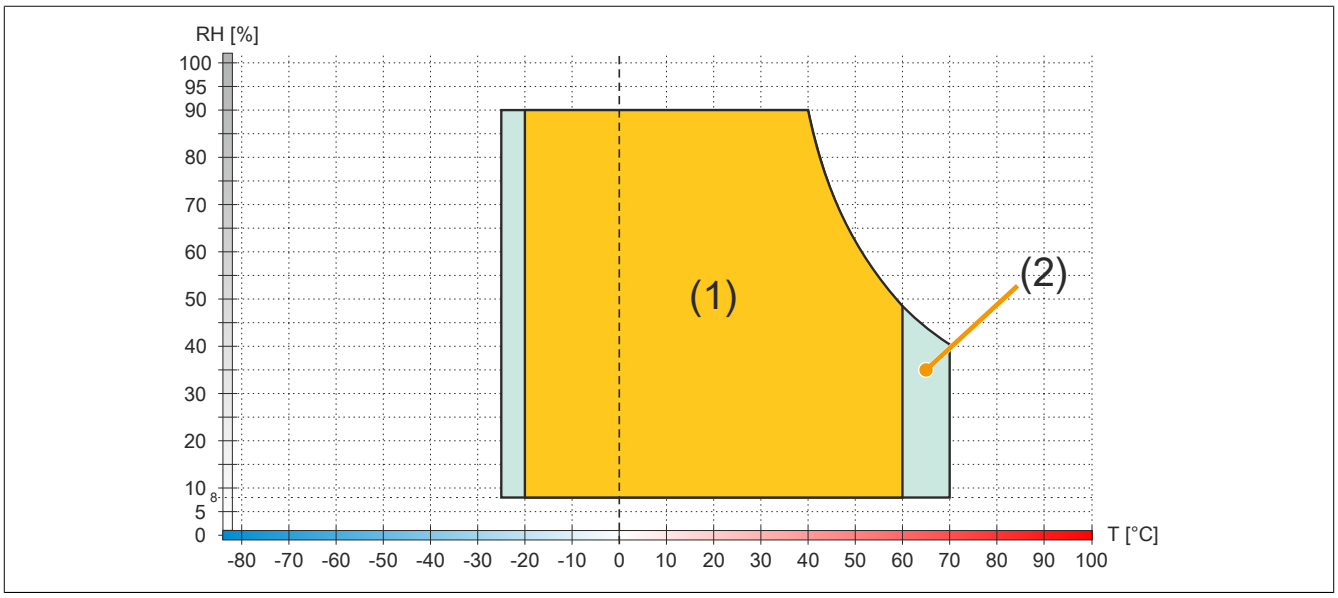


Figure 97: 5AP1181.1505-000 - Temperature/Humidity diagram

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

2.3.2.17 5AP1120.156B-000

2.3.2.17.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 15.6" TFT HD color display
- Single-touch (analog resistive)
- Control cabinet installation

2.3.2.17.2 Order data

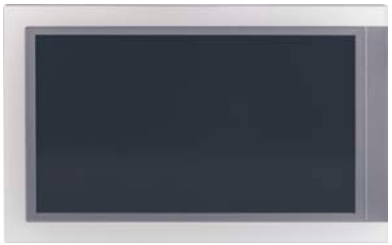
Model number	Short description	Figure
	Panels	
5AP1120.156B-000	Automation Panel 15.6" HD TFT - 1366 x 768 pixels (16:9) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

Table 101: 5AP1120.156B-000 - Order data

2.3.2.17.3 Technical data

Information:

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

Model number	5AP1120.156B-000
General information	
B&R ID code	0xE8E5
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Display	
Type	TFT color
Diagonal	15.6"
Colors	16.7 million
Resolution	HD, 1366 x 768 pixels
Contrast	1000:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 85° / Direction D = 85°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 40 to 400 cd/m²
Half-brightness time [2)]	70,000 h
Touch screen [3)]	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only

Table 102: 5AP1120.156B-000 - Technical data

Model number	5AP1120.156B-000
Mechanical properties	
Front [4]	
Frame	Aluminum, coated
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	414 mm
Height	258.5 mm
Weight	4200 g

Table 102: 5AP1120.156B-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.17.4 Dimensions

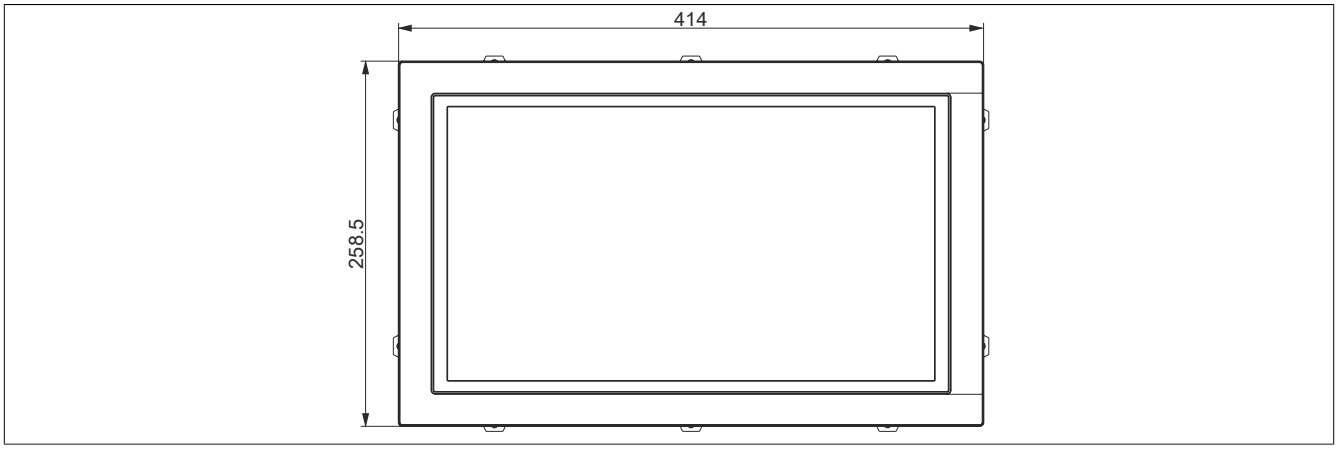


Figure 98: 5AP1120.156B-000 - Dimensions

2.3.2.17.5 Temperature/Humidity diagram

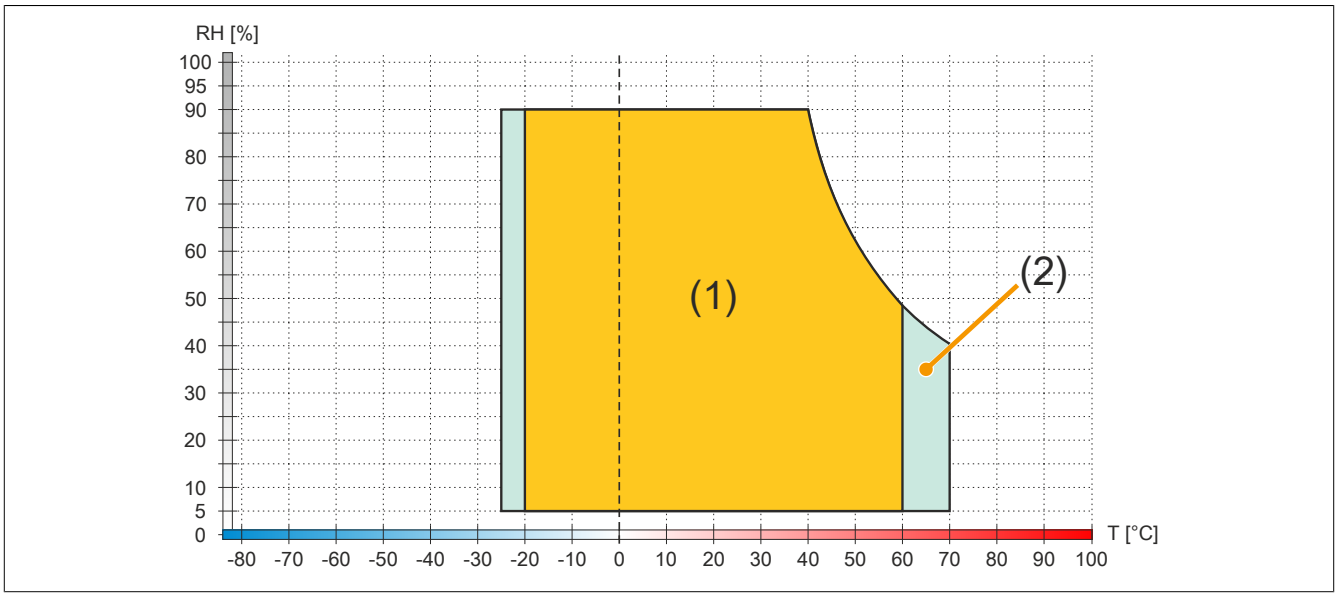


Figure 99: 5AP1120.156B-000 - Temperature/Humidity diagram

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

2.3.2.18 5AP1130.156C-000

2.3.2.18.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 15.6" FHD color display
- Multi-touch (projected capacitive)
- Control cabinet installation

2.3.2.18.2 Order data

Model number	Short description	Figure
	Panels	
5AP1130.156C-000	Automation Panel 15.6" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

Table 103: 5AP1130.156C-000 - Order data

2.3.2.18.3 Technical data

Information:

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

Model number	5AP1130.156C-000
General information	
B&R ID code	0xEC5D
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]
Display	
Type	TFT color
Diagonal	15.6"
Colors	16.7 million
Resolution	FHD, 1920 x 1080 pixels
Contrast	1500:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 85° / Direction D = 85°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 40 to 400 cd/m²
Half-brightness time [3)]	70,000 h
Touch screen [4)]	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	See appendix A, section "Touch screen".

Table 104: 5AP1130.156C-000 - Technical data

Model number	5AP1130.156C-000
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front [5]	
Frame	Aluminum, coated
Design	Black
Gasket	3 mm fixed gasket
Dimensions	
Width	414 mm
Height	258.5 mm
Weight	3700 g

Table 104: 5AP1130.156C-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
4) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section "Multi-touch drivers".
5) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.18.4 Dimensions

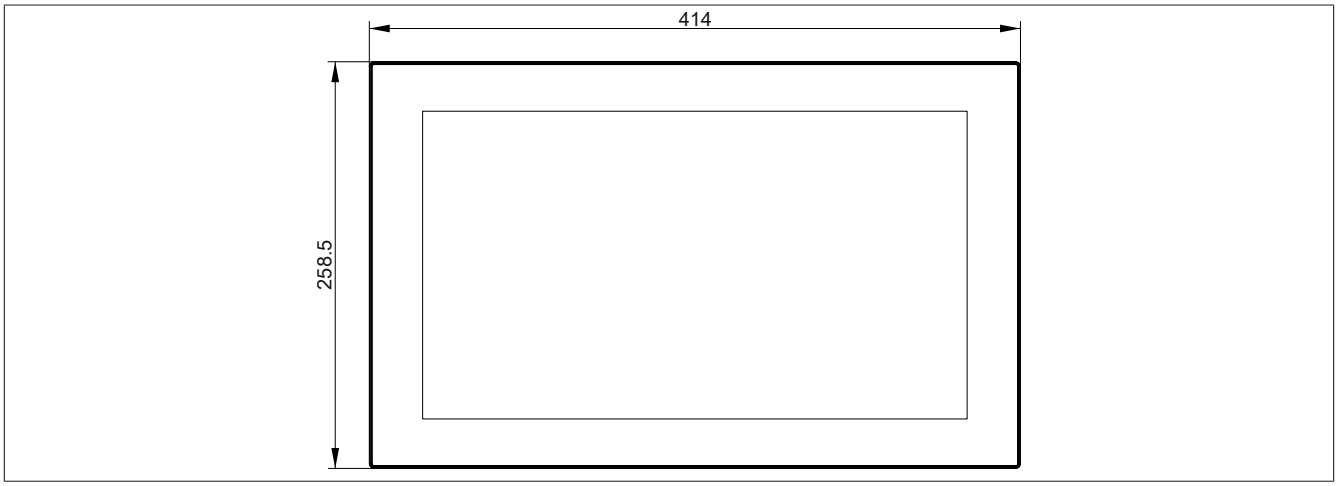


Figure 100: 5AP1130.156C-000 - Dimensions

2.3.2.18.5 Temperature/Humidity diagram

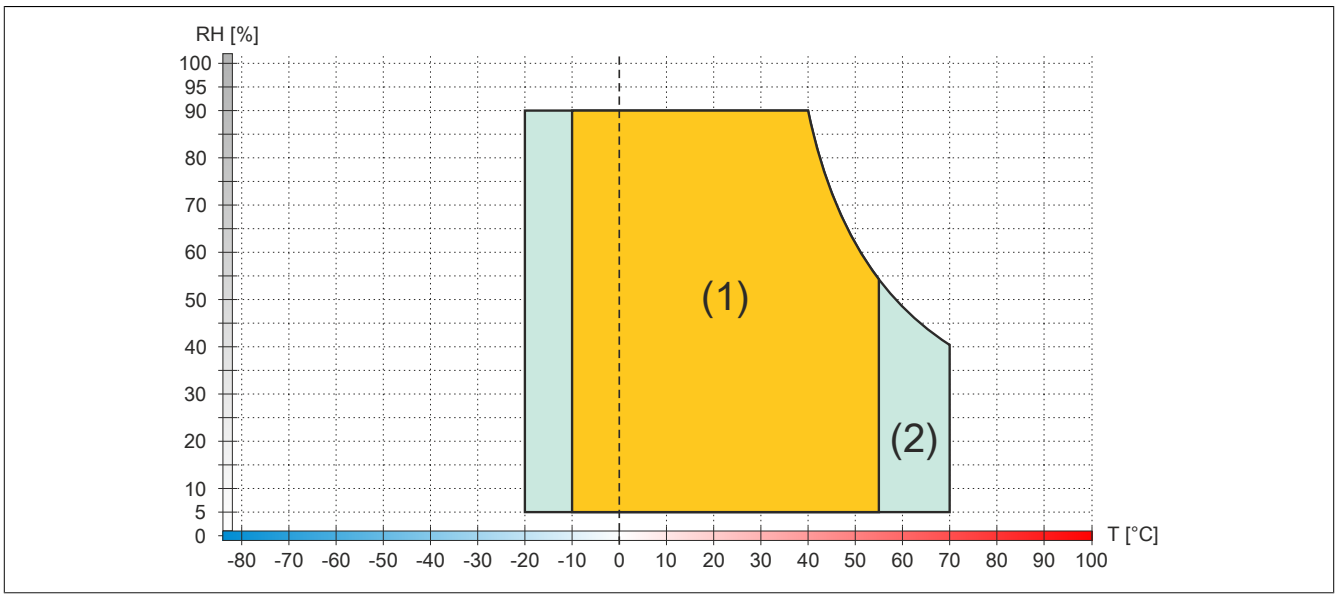


Figure 101: 5AP1130.156C-000 - Temperature/Humidity diagram

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

2.3.2.19 5AP1130.185C-000

2.3.2.19.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 18.5" FHD color display
- Multi-touch (projected capacitive)
- Control cabinet installation

2.3.2.19.2 Order data

Model number	Short description	Figure
	Panels	
5AP1130.185C-000	Automation Panel 18.5" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules	

Table 105: 5AP1130.185C-000 - Order data

2.3.2.19.3 Technical data

Information:

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

Model number	5AP1130.185C-000
General information	
B&R ID code	0xEC5E
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Display	
Type	TFT color
Diagonal	18.5"
Colors	16.7 million
Resolution	FHD, 1920 x 1080 pixels
Contrast	1500:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 85° / Direction D = 85°
Backlight	
Type	LED
Brightness (dimmable)	Typ. 40 to 400 cd/m²
Half-brightness time [2)]	50,000 h
Touch screen [3)]	
Type	3M
Technology	Projected capacitive touch (PCT)
Controller	3M
Transmittance	See appendix A, section "Touch screen".
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only

Table 106: 5AP1130.185C-000 - Technical data

Model number	5AP1130.185C-000
Mechanical properties	
Front [4]	
Frame	Aluminum, coated
Design	Black
Gasket	3 mm fixed gasket
Dimensions	
Width	475 mm
Height	295 mm
Weight	4700 g

Table 106: 5AP1130.185C-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
3) The specifications for the touch screen driver must be taken into account. See chapter 4 "Software", section "Multi-touch drivers".
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.19.4 Dimensions

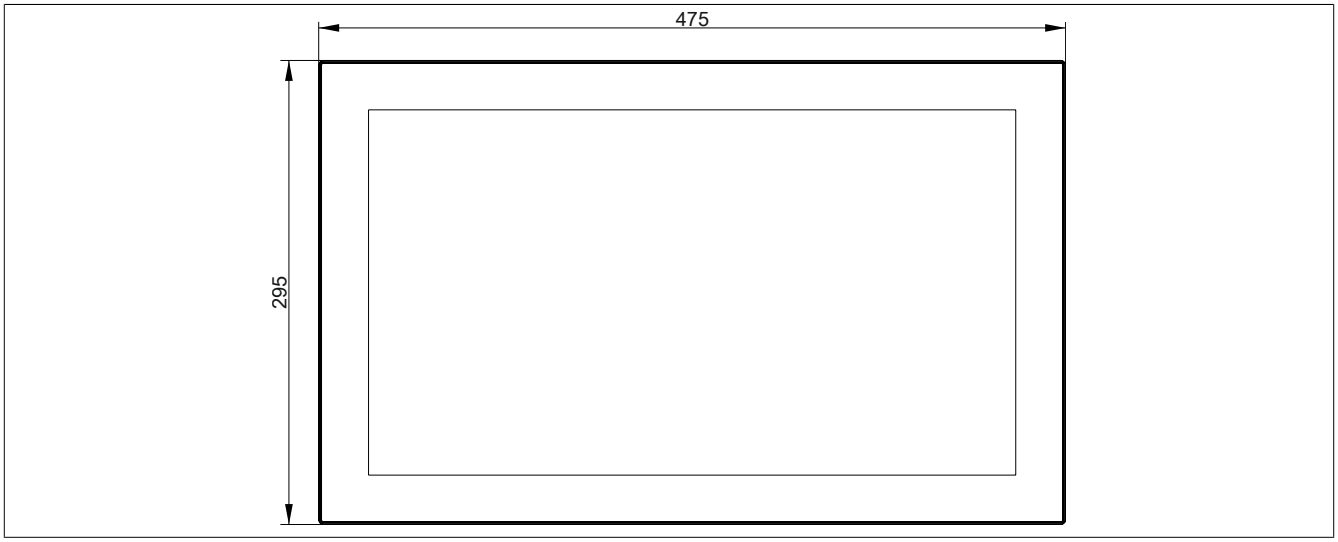


Figure 102: 5AP1130.185C-000 - Dimensions

2.3.2.19.5 Temperature/Humidity diagram

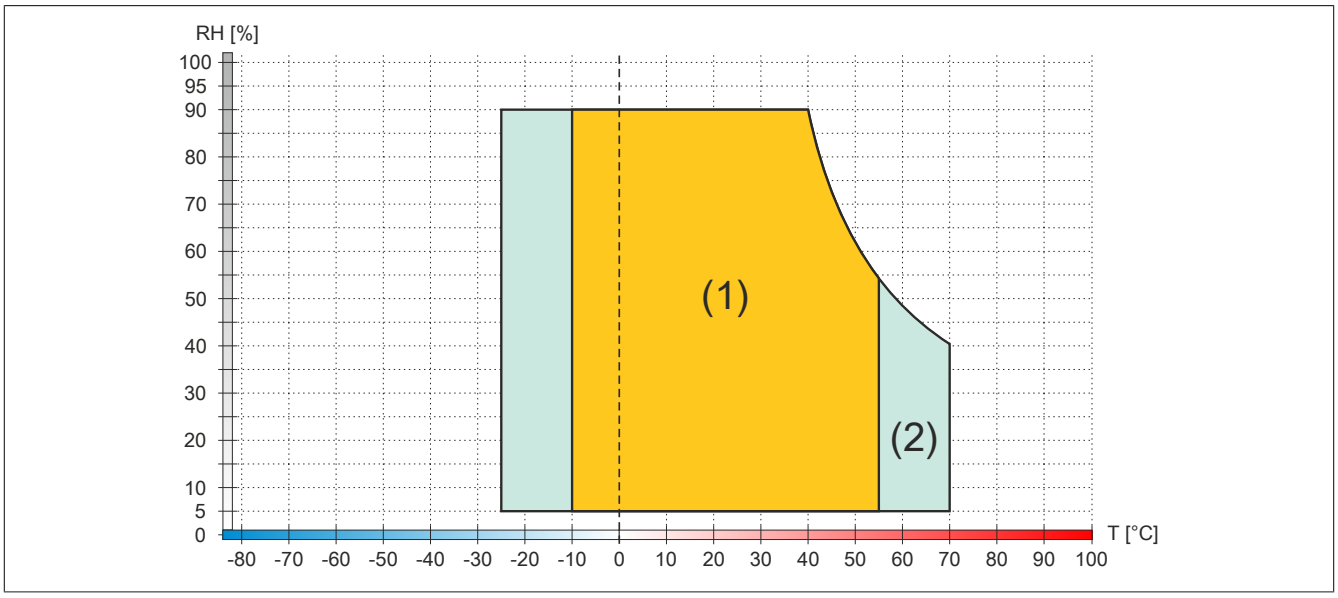


Figure 103: 5AP1130.185C-000 - Temperature/Humidity diagram

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

2.3.2.20 5AP1120.1906-000

2.3.2.20.1 General information

- Panel for AP1000, PPC900, PPC2100, PPC2200 or PPC3100
- 19.0" TFT SXGA color display
- Single-touch (analog resistive)
- Front USB interface
- Control cabinet installation

2.3.2.20.2 Order data

Model number	Short description	Figure
	Panels	
5AP1120.1906-000	Automation Panel 19.0" SXGA TFT - 1280 x 1024 pixels (5:4) - Single-touch (analog resistive) - Control cabinet installation - Landscape format - Front USB - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5AP920.1906-01, 5PC720.1906-00, 5PC820.1906-00	

Table 107: 5AP1120.1906-000 - Order data

2.3.2.20.3 Technical data

Information:

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

Model number	5AP1120.1906-000
General information	
B&R ID code	0xE7BE
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s) to high speed (480 Mbit/s)
Current-carrying capacity	Max. 500 mA
Display	
Type	TFT color
Diagonal	19.0"
Colors	16.2 million
Resolution	SXGA, 1280 x 1024 pixels
Contrast	1500:1
Viewing angles	
Horizontal	Direction R = 85° / Direction L = 85°
Vertical	Direction U = 85° / Direction D = 85°

Table 108: 5AP1120.1906-000 - Technical data

Model number	5AP1120.1906-000
Backlight	
Type	LED
Brightness (dimmable)	Typ. 35 to 350 cd/m²
Half-brightness time 3)	70,000 h
Touch screen 4)	
Type	AMT
Technology	Analog, resistive
Controller	B&R, serial, 12-bit
Transmittance	81% ± 3%
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Front: IP65 Back: IP20 (only with installed link module or installed system unit)
Protection per UL 50	Front: Type 4X indoor use only
Mechanical properties	
Front 5)	
Frame	Aluminum, naturally anodized
Keypad overlay	
Material	Polyester
Light background	RAL 9006
Dark gray border around display	RAL 7024
Gasket	3 mm fixed gasket
Dimensions	
Width	527 mm
Height	421 mm
Weight	7300 g

Table 108: 5AP1120.1906-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) At 25°C ambient temperature. Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.
4) Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).
5) Visual deviations in color and surface quality are possible due to process or batch conditions.

2.3.2.20.4 Dimensions

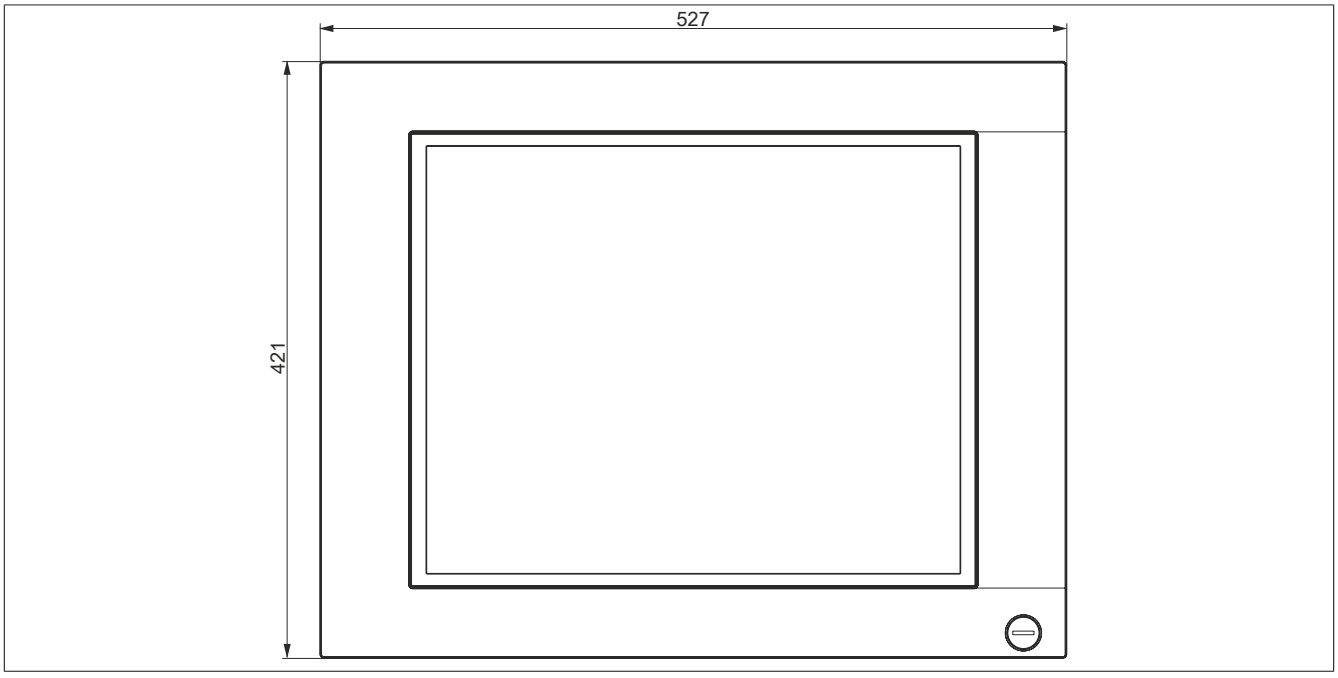


Figure 104: 5AP1120.1906-000 - Dimensions

2.3.2.20.5 Temperature/Humidity diagram

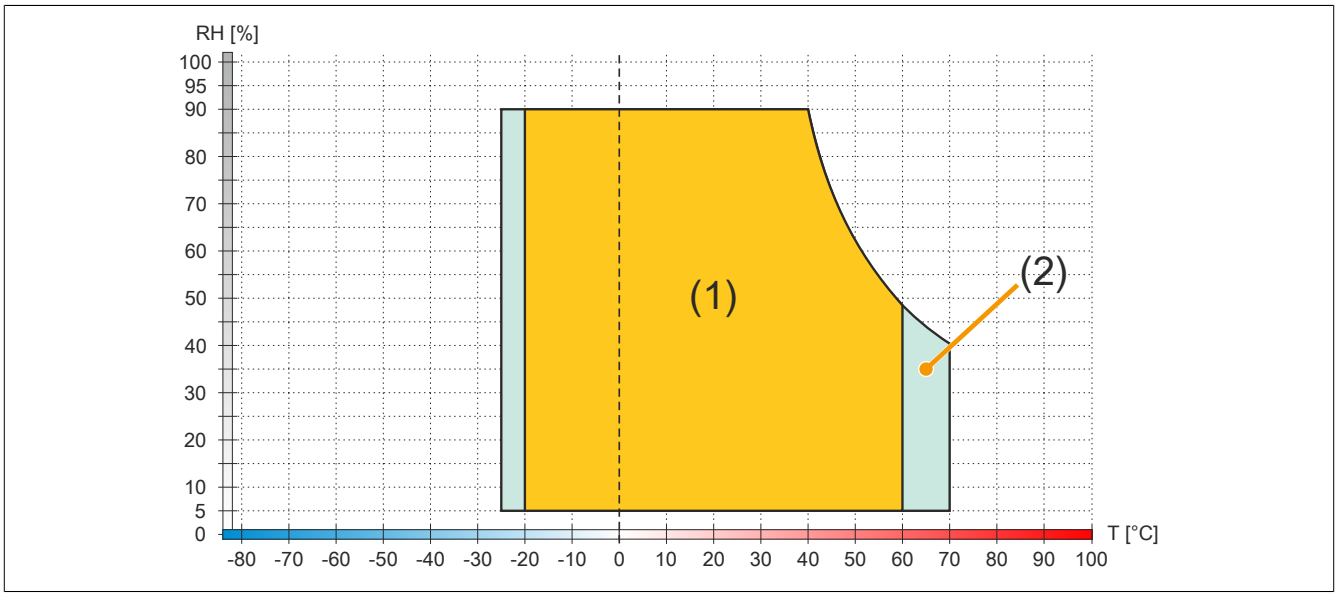


Figure 105: 5AP1120.1906-000 - Temperature/Humidity diagram

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

2.3.3 System units

2.3.3.1 5PPC2200.ALxx-000

2.3.3.1.1 General information

PPC2200 system units consist of a CPU board, housing and mounting plate. It includes all interfaces; in addition, an interface option can be installed. The main memory is permanently soldered to the CPU board and cannot be replaced or upgraded.

- Intel Atom X processor series
- Intel Apollo Lake
- LPDDR4 memory
- Intel HD Graphics
- 1x CFast slot
- Slot for 1 interface option

2.3.3.1.2 Order data

Model number	Short description	Figure
	System units	
5PPC2200.AL02-000	PPC2200 system unit - Intel Atom E3930 1.30 GHz - Dual core - 2 GB SDRAM	
5PPC2200.AL04-000	PPC2200 system unit - Intel Atom E3930 1.30 GHz - Dual core - 4 GB SDRAM	
5PPC2200.AL14-000	PPC2200 system unit - Intel Atom E3940 1.60 GHz - Quad core - 4 GB SDRAM	
5PPC2200.AL18-000	PPC2200 system unit - Intel Atom E3940 1.60 GHz - Quad core - 8 GB SDRAM	
	Required accessories	
	CFast cards	
5CFAST.016G-00	CFast 16 GB SLC	
5CFAST.032G-00	CFast 32 GB SLC	
5CFAST.032G-10	CFast card, 32 GB MLC	
5CFAST.064G-10	CFast 64 GB MLC	
5CFAST.128G-10	CFast 128 GB MLC	
5CFAST.2048-00	CFast card, 2 GB SLC	
5CFAST.256G-10	CFast 256 GB MLC	
5CFAST.4096-00	CFast 4 GB SLC	
5CFAST.8192-00	CFast 8 GB SLC	
	Optional accessories	
	Interface options	
5ACCIF01.FPCC-000	Interface card - 2x CAN interfaces - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPCS-000	Interface card - 1x RS485 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPLK-000	Interface card - 1x POWERLINK interface - Integrated 2-port hub - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPLS-001	Interface card - 1x RS232 interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPSC-001	Interface card - 1x RS232 interface - 1x CAN interface - 1x X2X Link Interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FSS0-000	Interface card - 2x RS422/RS485 interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.ICAN-000	Interface card - 1x CAN interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF03.CETH-000	Interface card - 2x ETH 10/100/1000 interface - For APC2200/PPC2200 - Only available with a new device	

Table 109: 5PPC2200.AL02-000, 5PPC2200.AL04-000, 5PPC2200.AL14-000, 5PPC2200.AL18-000 - Order data

2.3.3.1.3 Technical data

Information:

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

Model number	5PPC2200.AL02-000	5PPC2200.AL04-000	5PPC2200.AL14-000	5PPC2200.AL18-000
General information				
Cooling	Passive via housing			
LED status indicators	Power, CFast, Link, Run			
B&R ID code	0xF0C6	0xF0C7	0xF0C8	0xF0C9
Power button	Yes			
Reset button	Yes			
Buzzer	No			
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
Controller				
Boot loader	UEFI BIOS			
Processor				
Type	Intel Atom x5-E3930		Intel Atom x5-E3940	
Clock frequency	1300 MHz		1600 MHz	
Number of cores	2		4	
Architecture	14 nm			
Thermal design power (TDP)	6.5 W		9.5 W	
L2 cache	2 MB			
Intel 64 architecture	Yes			
Intel Hyper-Threading Technology	No			
Intel vPro Technology	No			
Intel Virtualization Technology (VT-x)	Yes			
Intel Virtualization Technology for Directed I/O (VT-d)	Yes			
Enhanced Intel SpeedStep Technology	Yes			
Chipset	Intel Apollo Lake			
Trusted Platform Module	TPM 2.0			
Real-time clock				
Precision	At 25°C: Typ. 12 ppm (1 second) per day [1]			
Battery-backed	Yes			
Power failure logic				
Controller	MTCX [2]			
Buffer time	10 ms			
Memory				
Type	LPDDR4 SDRAM			
Memory size	2 GB	4 GB		8 GB
Speed	DDR4L-2133			
Memory interface width	Single channel			Dual channel
Removable	No			
Graphics				
Controller	Intel HD Graphics			
Max. dynamic graphics frequency	550 MHz		600 MHz	
Color depth	Max. 32-bit			
DirectX support	12			
OpenGL support	4.3			
Power management	ACPI 5.0			
Interfaces				
CFast slot				
Quantity	1			
Type	SATA III (SATA 60 Gbit/s)			
USB				
Quantity	2			
Type	USB 3.0			
Design	Type A			
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s) to SuperSpeed (5 Gbit/s) [3]			
Current-carrying capacity	Max. 1 A per connection			

Table 110: 5PPC2200.AL02-000, 5PPC2200.AL04-000, 5PPC2200.AL14-000, 5PPC2200.AL18-000 - Technical data

Model number	5PPC2200.AL02-000	5PPC2200.AL04-000	5PPC2200.AL14-000	5PPC2200.AL18-000
Ethernet				
Quantity	2			
Design	RJ45, shielded			
Transfer rate	10/100/1000 Mbit/s			
Max. baud rate	1 Gbit/s			
Inserts				
Interface option [4]	1			
Electrical characteristics				
Nominal voltage	24 VDC ±25%, SELV [5]			
Nominal current	Max. 4 A			
Inrush current	Typ. 5 A, max. 50 A for <500 µs			
Overvoltage category per EN 61131-2	II			
Electrical isolation	Yes			
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			
Degree of protection per EN 60529	Back: IP20 (front: depends on the panel used) [6]			
Environmental conditions				
Elevation				
Operation	Max. 3000 m (component-dependent) [7]			
Mechanical characteristics				
Dimensions				
Width	190 mm			
Height	115 mm			
Depth	29.7 mm			
Weight	577 g			

Table 110: 5PPC2200.AL02-000, 5PPC2200.AL04-000, 5PPC2200.AL14-000, 5PPC2200.AL18-000 - Technical data

1) At max. specified ambient temperature: Typ. 58 ppm (5 seconds) - worst case 220 ppm (19 seconds).
2) Maintenance Controller Extended
3) The SuperSpeed transfer rate (5 Gbit/s) is only possible with USB 3.0.
4) The interface option cannot be replaced.
5) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.
6) Only if all interface covers are installed.
   The degree of protection of the complete system depends on the mounting unit used as well as the panel.
7) The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.

2.3.4 CFast cards

2.3.4.1 General information

CFast cards are easily replaceable storage media. Due to their robustness against and environmental influences (temperature, shock, vibration, etc.), CFast cards offer optimal values for use as storage media in industrial environments.

CFast cards are a further development of CompactFlash cards, but the SATA protocol is used here. CFast cards are not compatible with CompactFlash cards.

2.3.4.2 Basic information

CFast cards used in industrial automation must be extremely reliable. To achieve this, the following points are very important:

- The flash technology used
- An efficient algorithm to maximize service life
- Good mechanisms for detecting and correcting flash memory errors

2.3.4.2.1 Flash technology

CFast cards are currently available with multi-level cell (MLC) and single-level cell (SLC) flash blocks.

SLC flash devices have a service life 10 times longer than MLC flash devices and are characterized above all by 33 times the number of write/erase cycles, which makes CFast cards with SLC flash blocks the preferred choice for industrial applications. These factors are strongly dependent on the application, however, so that no general statement is possible.

Due to increasing cost pressure, improved wear level algorithms and improved monitoring features (S.M.A.R.T.), MLC flash technology is increasingly finding its way into this market.

2.3.4.2.2 Wear leveling

Wear leveling refers to an algorithm that can be used to maximize the service life of a CFast card. A distinction is made between the following algorithms:

- Dynamic wear leveling
- Static wear leveling

The basic idea of wear leveling is that data is distributed over a wide range of blocks or cells on the data storage medium so that the same areas do not always have to be erased and reprogrammed.

2.3.4.2.2.1 Dynamic wear leveling

Dynamic wear leveling offers the possibility to use unused flash blocks when writing to a file.
If the data storage medium is already 80% full of files, only 20% can be used for wear leveling.
The service life of the CFast card therefore depends on the unused flash blocks.

2.3.4.2.2.2 Static wear leveling

Static wear leveling additionally monitors which data is rarely modified. From time to time, the controller moves this data to blocks that have already been programmed frequently to avoid further wear and tear of the cells.

2.3.4.2.3 ECC error correction

Inactivity or operation of a particular cell can cause bit errors. Error-correcting code (ECC) implemented by the hardware or software allows many such errors to be detected and corrected.

2.3.4.2.4 S.M.A.R.T. support

Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) is an industry standard for mass storage devices that has been introduced to monitor key parameters and detect imminent failures at an early stage. Monitoring and storing critical performance and calibration data attempts to predict the probability of error states.

2.3.4.2.5 Calculating the expected service life for an existing application

To better verify whether an SLC or MLC CFast card should be used for an existing application, the following procedure is recommended:

- Read the "Average erase count" of the data storage medium via S.M.A.R.T.
- Fully operate the system with the relevant data storage medium over a defined period of time (e.g. 1 week).
- Determine the used erase cycles via "Average erase count".
- Determine the expected service life based on the maximum guaranteed write/erase cycles (MLC: 3000, SLC: 100,000).

  Example of an MLC CFast card in a one-week period:

  $$\text{Expected service life} = \frac{3000 * 1 \text{ week}}{\text{Completed erase cycles}}$$

2.3.4.2.6 Dimensions

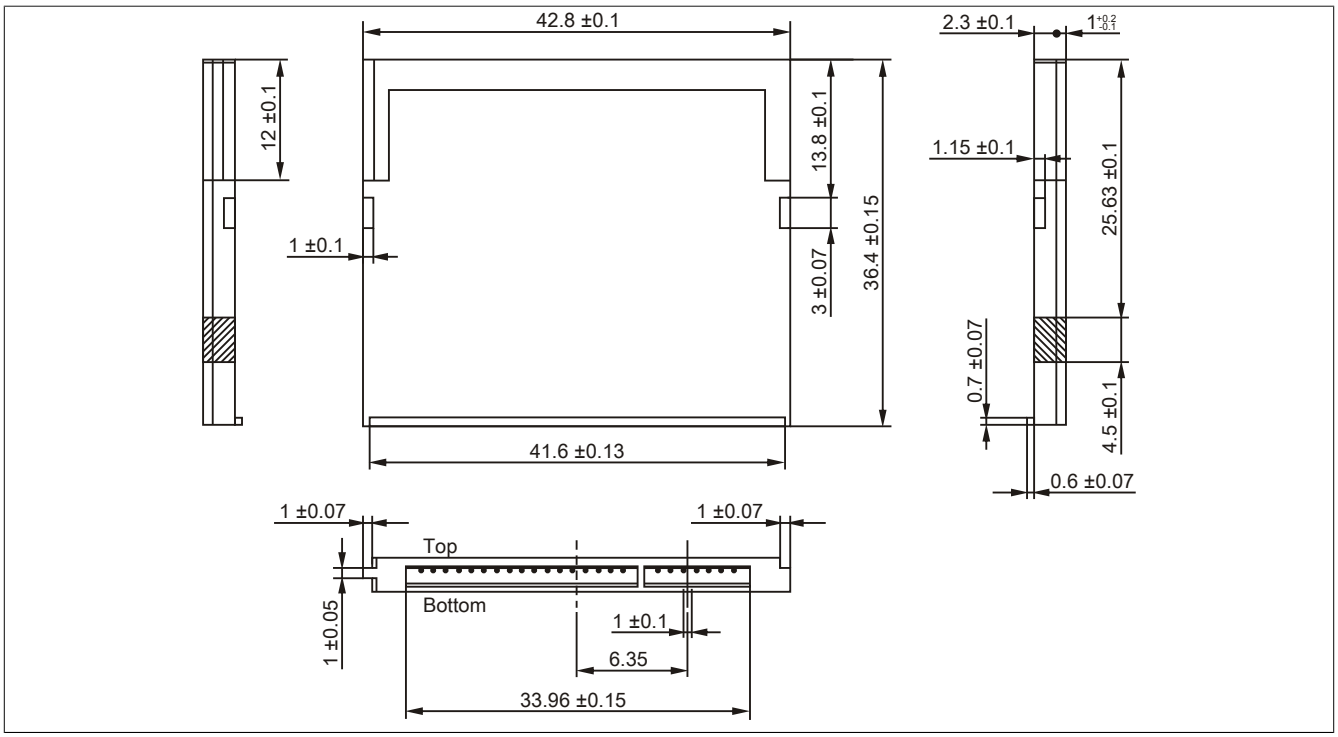


Figure 106: CFast card - Dimensions

2.3.4.3 5CFAST.xxxx-00

2.3.4.3.1 General information

These CFast cards are based on single-level cell (SLC) technology and compatible with SATA 2.6. The dimensions are identical to CompactFlash cards.

2.3.4.3.2 Order data

Model number	Short description	Figure
	CFast cards	
5CFAST.2048-00	CFast 2 GB SLC	
5CFAST.4096-00	CFast 4 GB SLC	
5CFAST.8192-00	CFast 8 GB SLC	
5CFAST.016G-00	CFast 16 GB SLC	
5CFAST.032G-00	CFast 32 GB SLC	

Table 111: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Order data

2.3.4.3.3 Technical data

Caution!

A sudden power failure can lead to data loss! In very rare cases, the mass storage device may also be damaged!

In order to prevent data loss or damage, the use of a UPS is recommended.

Information:

Due to the changeover to the new controller, revision E0 may not be image-compatible with previous revisions when using old cloning tools. With current cloning tools, this behavior usually does not occur.

Information:

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

Model number	5CFAST.2048-00	5CFAST.4096-00	5CFAST.8192-00	5CFAST.016G-00	5CFAST.032G-00
General information					
Capacity	2 GB	4 GB	8 GB	16 GB	32 GB
Data retention [1)]	10 years				
Data reliability	<1 unrecoverable error per 10^{14} bits read				
Lifetime monitoring	Yes				
MTBF	>2,500,000 hours (at 25°C)				
Maintenance	None				
Supported operating modes	SATA 2.6, max. PIO mode 4, Multiword DMA mode 2, Ultra DMA mode 6				
Sequential read					
Typical					
With 128 kB block size	94 MB/s	108 MB/s	108 MB/s	108 MB/s	116 MB/s
With 4 kB block size	42 MB/s	46 MB/s	46 MB/s	46 MB/s	46 MB/s
Maximum					
With 128 kB block size	100 MB/s	115 MB/s	115 MB/s	115 MB/s	120 MB/s
With 4 kB block size	50 MB/s				

Table 112: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

Model number	5CFAST.2048-00	5CFAST.4096-00	5CFAST.8192-00	5CFAST.016G-00	5CFAST.032G-00
Sequential write					
Typical					
With 128 kB block size	57 MB/s	86 MB/s	86 MB/s	86 MB/s	111 MB/s
With 4 kB block size	36 MB/s	40 MB/s	40 MB/s	40 MB/s	40 MB/s
Maximum					
With 128 kB block size	65 MB/s	95 MB/s	95 MB/s	95 MB/s	120 MB/s
With 4 kB block size	40 MB/s	45 MB/s	45 MB/s	45 MB/s	45 MB/s
Certifications					
CE	Yes				
UL	cULus E115267 Industrial control equipment				
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[2)]				
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[3)]				
GOST-R	Yes				
Endurance [1)]					
SLC flash	Yes				
Guaranteed data volume					
Guaranteed [4)]	185 TBW	371 TBW	745 TBW	1468 TBW	2937 TBW
Erase/Write cycles					
Guaranteed	100,000				
Wear leveling	Static				
S.M.A.R.T. support	Yes				
Support					
Hardware	APC3100, APC2200, APC2100, APC910, PPC3100, PPC2200, PPC2100, PPC900				
Operating systems					
Windows 10 IoT Enterprise LTSB 64-bit	No	No	No	No	Yes
Windows Embedded 8.1 Industry Pro 32-bit	No	No	No	Yes	Yes
Windows Embedded 8.1 Industry Pro 64-bit	No	No	No	No	Yes
Windows 7 32-bit	No	No	No	Yes	Yes
Windows 7 64-bit	No	No	No	No	Yes
Windows Embedded Standard 7 32-bit	No	No	No	Yes	Yes
Windows Embedded Standard 7 64-bit	No	No	No	Yes	Yes
Windows XP Professional	No	Yes	Yes	Yes	Yes
Windows Embedded Standard 2009	Yes				
B&R Linux 9	No	Yes	Yes	Yes	Yes
B&R Linux 8	No	Yes	Yes	Yes	Yes
Software					
PVI Transfer	≥V4.0.0.0.8 (part of the PVI Development installer ≥ V3.0.2.3014)				
B&R Embedded OS Installer	≥V3.10	≥V3.10	≥V3.10	≥V3.20	≥V3.21
Environmental conditions					
Temperature					
Operation	-40 to 85°C				
Storage	-50 to 100°C				
Transport	-50 to 100°C				
Relative humidity					
Operation	Max. 85% at 85°C, non-condensing				
Storage	Max. 85% at 85°C, non-condensing				
Transport	Max. 85% at 85°C, non-condensing				
Vibration					
Operation	10 to 2000 Hz: 20 g peak				
Storage	10 to 2000 Hz: 20 g peak				
Transport	10 to 2000 Hz: 20 g peak				
Shock					
Operation	1500 g peak, 0.5 ms				
Storage	1500 g peak, 0.5 ms				
Transport	1500 g peak, 0.5 ms				

Table 112: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

Model number	5CFAST.2048-00	5CFAST.4096-00	5CFAST.8192-00	5CFAST.016G-00	5CFAST.032G-00
Mechanical properties					
Dimensions					
Width	42.8 ± 0.10 mm				
Length	36.4 ± 0.10 mm				
Depth	3.6 ± 0.10 mm				
Weight	10 g				

Table 112: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

1) Per JEDEC (JESD47), EOL conditions are not permitted to be reached before 18 months. A higher average daily write workload reduces the expected service life and data retention of the data storage medium.
2) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
3) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
4) TBW = Terabytes written
Sequential access without file system

2.3.4.3.4 Temperature/Humidity diagram

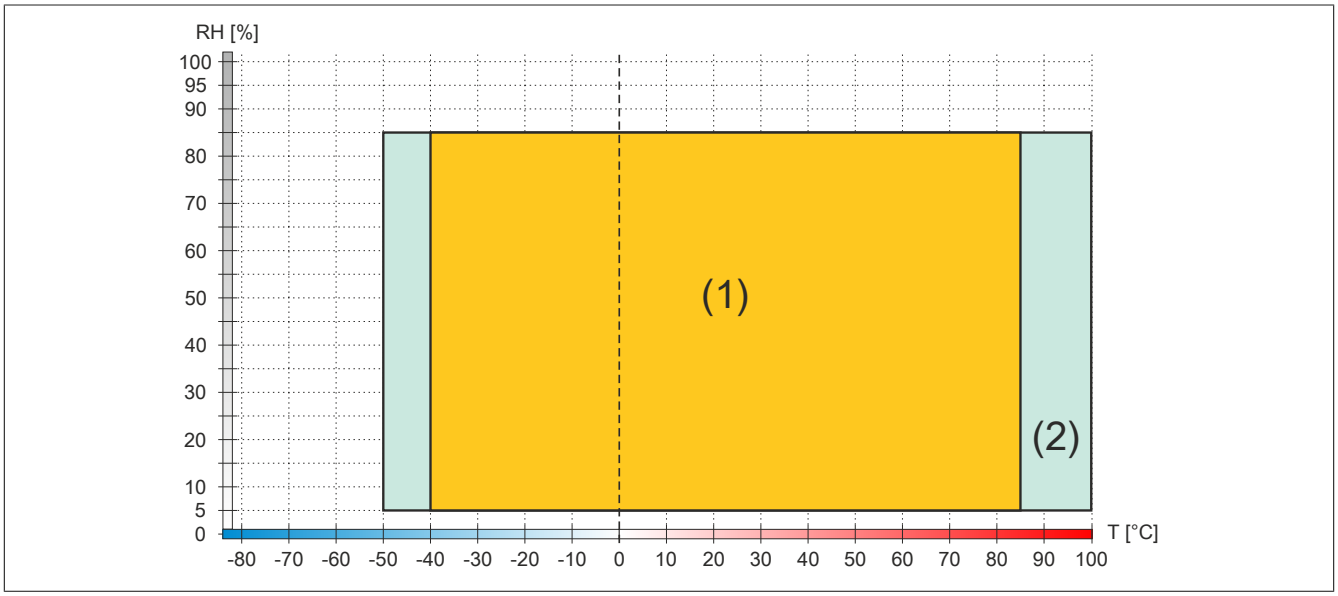


Figure 107: 5CFAST.xxxx-00 - Temperature/Humidity diagram

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

2.3.4.3.5 Dimensions

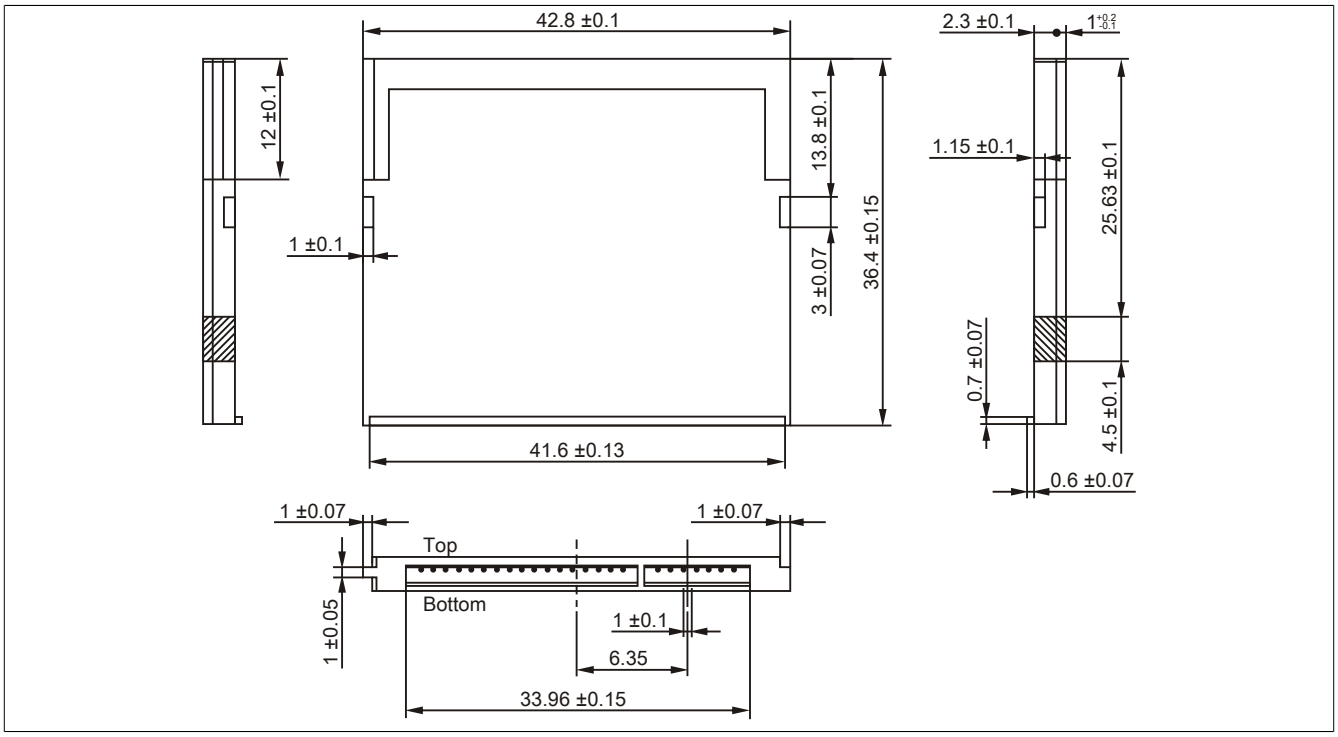


Figure 108: CFast card - Dimensions

2.3.4.4 5CFAST.xxxx-10

2.3.4.4.1 General information

These CFast cards are based on multi-level cell (MLC) technology and compatible with SATA 3. The dimensions are identical to CompactFlash cards.

2.3.4.4.2 Order data

Model number	Short description	Figure
	CFast cards	
5CFAST.032G-10	CFast 32 GB MLC	
5CFAST.064G-10	CFast 64 GB MLC	
5CFAST.128G-10	CFast 128 GB MLC	
5CFAST.256G-10	CFast 256 GB MLC	

Table 113: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Order data

2.3.4.4.3 Technical data

Caution!

A sudden power failure can lead to data loss! In very rare cases, the mass storage device may also be damaged!

In order to prevent data loss or damage, the use of a UPS is recommended.

Information:

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

Model number	5CFAST.032G-10	5CFAST.064G-10	5CFAST.128G-10	5CFAST.256G-10
General information				
Capacity	32 GB	64 GB	128 GB	256 GB
Data retention [1]	10 years [2]			
Data reliability	<1 unrecoverable error per 10^{16} bits read			
Lifetime monitoring	Yes			
MTBF	>2,000,000 hours (at 25°C)			
Maintenance	None			
Supported operating modes	SATA 3, SATA 2, SATA 1			
Sequential read				
Maximum	495 MB/s	500 MB/s		
Sequential write				
Maximum	115 MB/s	100 MB/s	195 MB/s	330 MB/s
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[3]			
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[4]			
Endurance [1]				
MLC flash	Yes			

Table 114: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Technical data

Model number	5CFAST.032G-10	5CFAST.064G-10	5CFAST.128G-10	5CFAST.256G-10
Guaranteed data volume				
Guaranteed [5]	86.4 TBW	172.8 TBW	345.6 TBW	691.2 TBW
Client workload [6]	39.06 TBW	71.02 TBW	104.17 TBW	159.57 TBW
Erase/Write cycles				
Guaranteed	3000			
Wear leveling	Static			
Error correction coding (ECC)	Yes			
S.M.A.R.T. support	Yes			
Support				
Hardware	APC3100, APC2200, APC2100, APC910, PPC3100, PPC2200, PPC2100, PPC900			
Operating systems				
Windows 10 IoT Enterprise LTSB 64-bit	Yes			
Windows Embedded 8.1 Industry Pro 32-bit	Yes			
Windows Embedded 8.1 Industry Pro 64-bit	Yes			
Windows 7 32-bit	Yes			
Windows 7 64-bit	Yes			
Windows Embedded Standard 7 32-bit	Yes			
Windows Embedded Standard 7 64-bit	Yes			
Windows XP Professional	Yes			
Windows Embedded Standard 2009	Yes			
B&R Linux 9	Yes			
B&R Linux 8	Yes			
Software				
PVI Transfer	≥V4.0.20 or V4.1.5		≥V4.0.22 or V4.1.6	
B&R Embedded OS Installer	≥V3.21			
Environmental conditions				
Temperature				
Operation	-40 to 85°C			
Storage	-40 to 85°C			
Transport	-40 to 85°C			
Relative humidity				
Operation	Max. 85% at 85°C, non-condensing			
Storage	Max. 85% at 85°C, non-condensing			
Transport	Max. 85% at 85°C, non-condensing			
Vibration				
Operation	10 to 2000 Hz: 20 g peak			
Storage	10 to 2000 Hz: 20 g peak			
Transport	10 to 2000 Hz: 20 g peak			
Shock				
Operation	1500 g peak, 0.5 ms			
Storage	1500 g peak, 0.5 ms			
Transport	1500 g peak, 0.5 ms			
Mechanical properties				
Dimensions				
Width	42.8 ± 0.10 mm			
Length	36.4 ± 0.10 mm			
Depth	3.6 ± 0.10 mm			
Weight	10 g			

Table 114: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Technical data

1) Per JEDEC (JESD47), EOL conditions are not permitted to be reached before 18 months. A higher average daily write workload reduces the expected service life and data retention of the data storage medium.
2) At 25°C ambient temperature at the start of service life.
3) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
4) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
5) TBW = Terabytes written
Sequential access without file system
6) TBW = Terabytes written
Client workload per standard JEDEC JESD219

2.3.4.4.4 Temperature/Humidity diagram

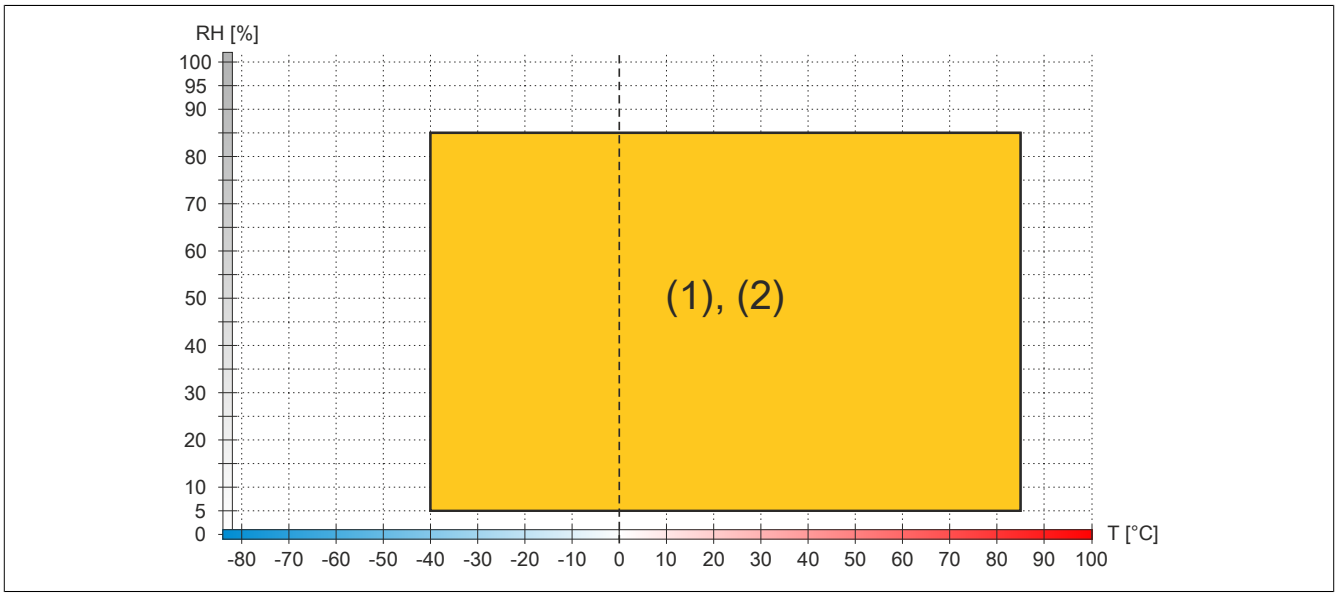


Figure 109: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Temperature/Humidity diagram

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

2.3.5 Interface options

Information:

Interface options can only be installed and replaced at the B&R factory.

2.3.5.1 5ACCIF01.FPCC-000

2.3.5.1.1 General information

Interface option 5ACCIF01.FPCC-000 is equipped with a POWERLINK interface, 2 CAN bus master interfaces and an X2X Link master interface. In addition, 512 kB nvSRAM is installed.

- 1x POWERLINK interface managing or controlled node
- 2x CAN bus master interfaces
- 1x X2X Link master interface
- 512 kB nvSRAM
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

This interface option can only be operated with Automation Runtime.

2.3.5.1.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPCC-000	Interface card - 2x CAN interfaces - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 115: 5ACCIF01.FPCC-000 - Order data

2.3.5.1.3 Technical data

Information:

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

Model number	5ACCIF01.FPCC-000
General information	
LED status indicators	L1, L2, L3
B&R ID code	0xE9BD
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]
Controller	
nvSRAM	
Size	512 kB
Data retention	20 years
Read/Write endurance	Min. 1,000,000
Remanent variables in power failure mode	256 kB (for e.g. Automation Runtime, see Automation Help)

Table 116: 5ACCIF01.FPCC-000 - Technical data

Model number	5ACCIF01.FPCC-000
Interfaces	
POWERLINK	
Quantity	1
Type	Type 4 [3]
Variant	RJ45, shielded
Transfer rate	100 Mbit/s
Transfer	100BASE-TX
Line length	Max. 100 m between two stations (segment length)
CAN	
Quantity	2
Variant	10-pin, male [4]
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be switched on and off with slide switch [5]
X2X	
Type	X2X Link master
Quantity	1
Variant	10-pin, male, galvanically isolated
Electrical characteristics	
Power consumption	2 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical properties	
Weight	25 g

Table 116: 5ACCIF01.FPCC-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) For additional information, see Automation Help (Communication - POWERLINK - General - Hardware - IF / LS).
4) CAN1: Galvanically isolated.
CAN2: Not galvanically isolated
5) The terminating resistor can only be switched on/off for the CAN1 interface.

2.3.5.1.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as "IF option".

POWERLINK[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
LED "Status"	**On**	**Off**	
Green	See status/error LED.		
LED "Link"	**On**	**Off**	
Yellow	Link (a connection to a POWERLINK network exists)	Activity (blinks) (data is being transferred)	

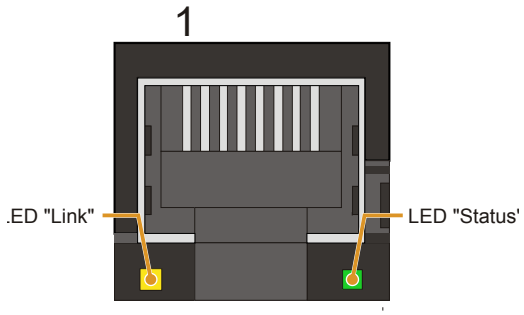


Table 117: 5ACCIF01.FPCC-000 - POWERLINK interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) In Automation Studio / Automation Runtime, this interface is referred to as IF1.

2.3.5.1.3.2 CAN bus 1 interface - Pinout

The CAN bus 1 interface on the system unit is referred to as "IF option".

A terminating resistor can be switched on or off for the CAN bus 1 interface. LED status indicator "L1" indicates whether the terminating resistor is switched on or off.

CAN bus 1[1)2)]	
The electrically isolated CAN bus interface is designed as a female 10-pin connector.	
Transfer rate	Max. 1 Mbit/s
Bus length	Max. 1000 m
Pin	**Pinout**
1	-
2	Shield
3	-
4	-
5	CAN H
6	CAN L
7	CAN GND
8	-
9	-
10	-

10-pin, male

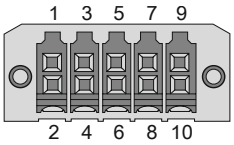


Table 118: 5ACCIF01.FPCC-000 - CAN bus 1 interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF3 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

CAN driver settings

The baud rate can be set either with predefined values or via the bit timing register. For additional information, see Automation Help.

Bit timing register 1	Bit timing register 0	Baud rate
00h	14h	1000 kbit/s
80h or 00h	1Ch	500 kbit/s
81h or 01h	1Ch	250 kbit/s
83h or 03h	1Ch	125 kbit/s
84h or 04h	1Ch	100 kbit/s
89h or 09h	1Ch	50 kbit/s

Table 119: CAN driver settings

CAN1 - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the transfer rate. According to CAN in Automation (CiA), the maximum bus length is 1000 meters.

The following bus lengths are permitted at a maximum permissible oscillator tolerance of 0.121%:

Extension	Transfer rate
≤1000 m	Typ. 50 kbit/s
≤200 m	Typ. 250 kbit/s
≤100 m	Typ. 500 kbit/s
≤15 m[1)]	Typ. 1 Mbit/s

Table 120: CAN1 - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 118 "CAN driver settings". Otherwise, the cable lengths depend on the values in the timing register.

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

CAN cable	Property
Signal line Cable cross section Wire insulation Conductor resistance Stranding Shield	 2x 0.25 mm² (24AWG/19), tinned copper stranded wire PE ≤82 Ω/km Wires stranded in pairs Pair shielding with aluminum foil
Ground conductor Cable cross section Wire insulation Conductor resistance	 1x 0.34 mm² (22AWG/19), tinned copper stranded wire PE ≤59 Ω/km
Outer jacket Material Properties Cable shield	 PUR compound Halogen-free Composed of tinned copper wires

Table 121: CAN cable requirements

Terminating resistor

A terminating resistor is integrated on the interface option. It is located near the ETH1 interface. A switch is used to switch the terminating resistor for the CAN bus 1 interface on and off. LED status indicator "L1" indicates whether the terminating resistor is switched on or off. The terminating resistor cannot be switched on and off for the CAN bus 2 interface.

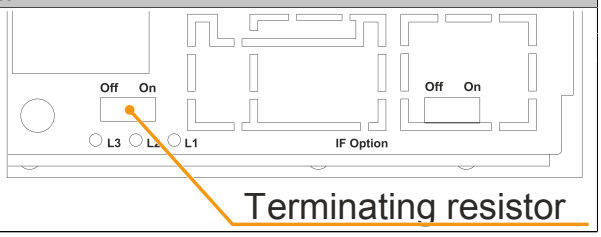
Terminating resistor		
On	The terminating resistor is switched on.	
Off	The terminating resistor is switched off.	

Table 122: Terminating resistor

2.3.5.1.3.3 CAN bus 2 interface - Pinout

The CAN bus 2 interface on the system unit is referred to as "IF option".

The terminating resistor cannot be switched on and off for the CAN bus 2 interface. A terminating resistor must therefore be taken into account during wiring.

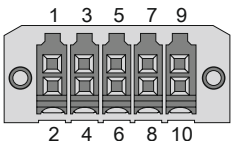
CAN bus 2[1)2)]		
The CAN bus interface is designed as a female 10-pin connector and has no electrical isolation.		10-pin, male 
Transfer rate	Max. 1 Mbit/s	
Bus length	Max. 1000 m	
Pin	**Pinout**	
1	-	
2	Shield	
3	-	
4	-	
5	-	
6	-	
7	-	
8	CAN GND	
9	CAN L	
10	CAN H	

Table 123: 5ACCIF01.FPCC-000 - CAN bus 2 interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF4 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

CAN driver settings

The baud rate can be set either with predefined values or via the bit timing register. For additional information, see Automation Help.

Bit timing register 1	Bit timing register 0	Baud rate
00h	14h	1000 kbit/s
80h or 00h	1Ch	500 kbit/s
81h or 01h	1Ch	250 kbit/s
83h or 03h	1Ch	125 kbit/s
84h or 04h	1Ch	100 kbit/s
89h or 09h	1Ch	50 kbit/s

Table 124: CAN driver settings

CAN2 - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the transfer rate. According to CAN in Automation (CiA), the maximum bus length is 1000 meters.

The following bus lengths are permitted at a maximum permissible oscillator tolerance of 0.121%:

Extension	Transfer rate
≤1000 m	Typ. 50 kbit/s
≤200 m	Typ. 250 kbit/s
≤100 m	Typ. 500 kbit/s
<20 m[1)]	Typ. 1 Mbit/s

Table 125: CAN2 - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 123 "CAN driver settings". Otherwise, the cable lengths depend on the values in the timing register.

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

CAN cable	Property
Signal line	
Cable cross section	2x 0.25 mm² (24AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/km
Stranding	Wires stranded in pairs
Shield	Pair shielding with aluminum foil
Ground conductor	
Cable cross section	1x 0.34 mm² (22AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Cable shield	Composed of tinned copper wires

Table 126: CAN cable requirements

2.3.5.1.3.4 X2X Link master interface - Pinout

The X2X Link master interface on the system unit is referred to as "IF option".

X2X Link master[1)2)]	
The electrically isolated X2X Link master interface is designed as a 10-pin female connector.	
Pin	**Pinout**
1	X2X H
2	Shield
3	X2X L
4	X2X GND
5	-
6	-
7	-
8	-
9	-
10	-

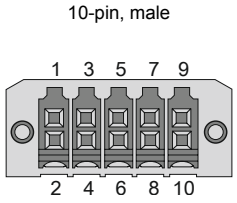


Table 127: 5ACCIF01.FPCC-000 - X2X Link Master interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF2 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

2.3.5.1.3.5 Shielding

For the interfaces on the 10-pin female connector, the shield of the interfaces can be connected to pin "Shield" of the female connector.

In addition, there is a functional ground connection on the interface cover of the system unit and a screw point for cable shields that can also be used for the shielded cables.

2.3.5.1.3.6 LED status indicators L1, L2, L3

The LEDs of the interface option are located near the ETH1 interface.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus 1 terminating resistor is switched on.
		Off	The CAN bus 1 terminating resistor is switched off.
L2	Green	On	POWERLINK link LED A connection to a POWERLINK network exists.
		Blinking	POWERLINK link LED Data is being transferred.
L3	Green-Red	On	POWERLINK status/error LED See "Status/Error LED".
		Off	POWERLINK status/error LED See "Status/Error LED".

Table 128: 5ACCIF01.FPCC-000 - LED status indicators

Status/Error LED

The status/error LED is designed as a green and red dual LED. The LED statuses have a different meaning depending on the operating mode.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Color green - Status	Description
On	The interface is operated as an Ethernet interface.

Table 129: Status/Error LED - Ethernet mode

POWERLINK

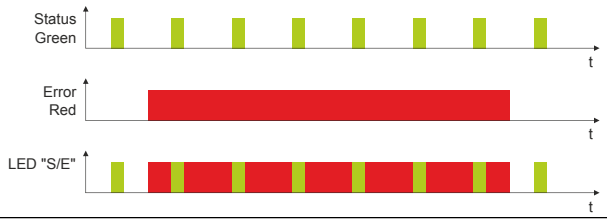
Color red - Error	Description
On	The interface is in an error state (failure of Ethernet frames, accumulation of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 130: Status/Error LED - POWERLINK - Error

Color green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before the time has elapsed, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Green flickering (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** In this state, the module can be configured by the MN. The CN waits for the reception of as SoC frame and then changes to state PRE_OPERATIONAL_2 (double flash). If the red LED lights up in this state, this means that the MN has failed.

Table 131: Status/Error LED - POWERLINK - Status

Color green - Status	Description
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** In this state, the interface can be configured by the MN. Afterwards, a command is used to switch to state READY_TO_OPERATE (triple flash). If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated. If the red LED lights up in this mode, this means that the MN has failed.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible in the MN. **Controlled node (CN)** Output data is not output, and no input data is provided. This mode can only be reached and exited by a corresponding command from the MN.

Table 131: Status/Error LED - POWERLINK - Status

System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by four switch-on phases via the red error LED. The switch-on phases are either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

Error description	Error code indicated by red "Status" LED									
RAM error: The interface is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The interface or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 132: System stop error codes

Legend
- • ...150 ms
- − ...600 ms
- Pause 2 s pause

2.3.5.1.4 Updating the firmware

The firmware is part of Automation Studio. The module is automatically brought up to this level.

To update the firmware contained in Automation Studio, a hardware upgrade must be performed (see "Project management - Workspace - Upgrades" in Automation Help).

2.3.5.2 5ACCIF01.FPCS-000

2.3.5.2.1 General information

Interface option 5ACCIF01.FPCS-000 is equipped with a POWERLINK, RS485 and CAN bus master interface. In addition, 32 kB FRAM is installed.

- 1x POWERLINK interface managing or controlled node
- 1x CAN bus master interface
- 1x RS485 interface
- 32 kB FRAM
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

This interface option can only be operated with Automation Runtime.

2.3.5.2.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPCS-000	Interface card - 1x RS485 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/ APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 133: 5ACCIF01.FPCS-000 - Order data

2.3.5.2.3 Technical data

Information:

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

Model number	5ACCIF01.FPCS-000
General information	
LED status indicators	L1, L2, L3
B&R ID code	0xED7C
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Controller	
FRAM	
Size	32 kB
Data retention	10 years
Read/Write endurance	Min. 10^{12} times/byte
Remanent variables in power failure mode	32 kB (for e.g. Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS485, not galvanically isolated
Variant	10-pin, male
UART	16550-compatible, 16 byte FIFO
Max. baud rate	115 kbit/s
POWERLINK	
Quantity	1
Type	Type 4 [2)]
Variant	RJ45, shielded
Transfer rate	100 Mbit/s
Transfer	100BASE-TX
Line length	Max. 100 m between two stations (segment length)

Table 134: 5ACCIF01.FPCS-000 - Technical data

Model number	5ACCIF01.FPCS-000
CAN	
Quantity	1
Variant	10-pin, male, not galvanically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be switched on and off with slide switch
Electrical characteristics	
Power consumption	1.75 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical properties	
Weight	25 g

Table 134: 5ACCIF01.FPCS-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) For additional information, see Automation Help (Communication - POWERLINK - General - Hardware - IF / LS).

2.3.5.2.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as "IF option".

POWERLINK[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
LED "Status"	**On**	**Off**	
Green	See status/error LED.		
LED "Link"	**On**	**Off**	
Yellow	Link (a connection to a POWERLINK network exists)	Activity (blinks) (data is being transferred)	

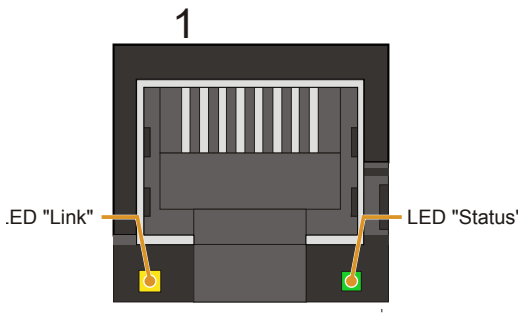


Table 135: 5ACCIF01.FPCS-001 - POWERLINK interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) In Automation Studio / Automation Runtime, this interface is referred to as IF1.

2.3.5.2.3.2 Serial interface COM - Pinout

Serial interface COM on the system unit is referred to as "IF option".

Serial interface COM[1)2)]	
	RS485
Type	RS485, not galvanically isolated
UART	16550-compatible, 16 byte FIFO
Transfer rate	Max. 115 kbit/s
Bus length	Max. 1200 m
Pin	**Pinout**
1	-
2	Shield
3	-
4	-
5	-
6	-

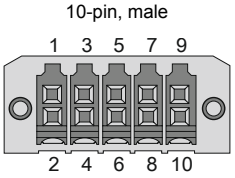


Table 136: 5ACCIF01.FPCS-000 - COM interface

Serial interface COM[1)2)]		
7	-	
8	COM GND	
9	DATA\	
10	DATA	

Table 136: 5ACCIF01.FPCS-000 - COM interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF7 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

The RTS line must be switched by the driver for each transmission or reception; switching back does not take place automatically.

With long cable lengths, the voltage drop can result in greater potential differences between the bus devices, which can hinder communication. This can be improved by running the ground wire with the others.

2.3.5.2.3.3 RS485 - Bus length and cable type

The maximum transfer rate of 115 kbit/s depends on the cable length and type of cable used.

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 137: RS485 - Bus length and transfer rate

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

RS485 cables		Property
Signal line		
	Cable cross section	4x 0.25 mm² (24AWG/19), tinned copper stranded wire
	Wire insulation	PE
	Conductor resistance	≤82 Ω/km
	Stranding	Wires stranded in pairs
	Shield	Pair shielding with aluminum foil
GND		
	Cable cross section	1x 0.34 mm² (22AWG/19), tinned copper stranded wire
	Wire insulation	PE
	Conductor resistance	≤59 Ω/km
Outer jacket		
	Material	PUR compound
	Properties	Halogen-free
	Cable shield	Tinned copper wire

Table 138: RS485 cable requirements

2.3.5.2.3.4 CAN bus interface - Pinout

The CAN bus interface on the system unit is referred to as "IF option".

CAN bus[1)2)]	
The CAN bus interface is designed as a female 10-pin connector and has no electrical isolation.	
Transfer rate	Max. 1 Mbit/s
Bus length	Max. 1000 m
Pin	**Pinout**
1	-
2	Shield
3	-
4	-
5	CAN H
6	CAN L
7	CAN GND
8	-
9	-
10	-

10-pin, male

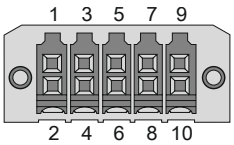


Table 139: 5ACCIF01.FPCS-000 - CAN bus interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF3 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

CAN driver settings

The baud rate can be set either with predefined values or via the bit timing register. For additional information, see Automation Help.

Bit timing register 1	Bit timing register 0	Baud rate
00h	14h	1000 kbit/s
80h or 00h	1Ch	500 kbit/s
81h or 01h	1Ch	250 kbit/s
83h or 03h	1Ch	125 kbit/s
84h or 04h	1Ch	100 kbit/s
89h or 09h	1Ch	50 kbit/s

Table 140: CAN driver settings

CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the transfer rate. According to CAN in Automation (CiA), the maximum bus length is 1000 meters.

The following bus lengths are permitted at a maximum permissible oscillator tolerance of 0.121%:

Extension	Transfer rate
≤1000 m	Typ. 50 kbit/s
≤200 m	Typ. 250 kbit/s
≤100 m	Typ. 500 kbit/s
<20 m[1)]	Typ. 1 Mbit/s

Table 141: CAN - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 139 "CAN driver settings". Otherwise, the cable lengths depend on the values in the timing register.

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

CAN cable	Property
Signal line	
Cable cross section	2x 0.25 mm² (24AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/km
Stranding	Wires stranded in pairs
Shield	Pair shielding with aluminum foil
Ground conductor	
Cable cross section	1x 0.34 mm² (22AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Cable shield	Composed of tinned copper wires

Table 142: CAN cable requirements

Terminating resistor

A terminating resistor is integrated on the interface option. It is located near the ETH1 interface. A switch is used to switch the terminating resistor for the CAN bus interface on and off. LED status indicator "L1" indicates whether the terminating resistor is switched on or off.

Terminating resistor	
On	The terminating resistor is switched on.
Off	The terminating resistor is switched off.

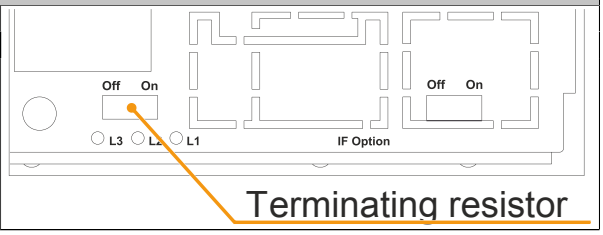


Table 143: Terminating resistor

2.3.5.2.3.5 Shielding

For the interfaces on the 10-pin female connector, the shield of the interfaces can be connected to pin "Shield" of the female connector.

In addition, there is a functional ground connection on the interface cover of the system unit and a screw point for cable shields that can also be used for the shielded cables.

2.3.5.2.3.6 LED status indicators

The LEDs of the interface option are located near the ETH1 interface.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus terminating resistor is switched on.
		Off	The CAN bus terminating resistor is switched off.
L2	Green	On	POWERLINK link LED A connection to a POWERLINK network exists.
		Blinking	POWERLINK link LED Data is being transferred.
L3	Green-Red	On	POWERLINK status/error LED See "Status/Error LED".
		Off	POWERLINK status/error LED See "Status/Error LED".

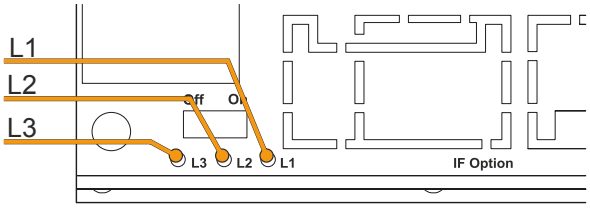


Table 144: 5ACCIF01.FPCS-000 - LED status indicators

Status/Error LED

The status/error LED is designed as a green and red dual LED. The LED statuses have a different meaning depending on the operating mode.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Color green - Status	Description
On	The interface is operated as an Ethernet interface.

Table 145: Status/Error LED - Ethernet mode

POWERLINK

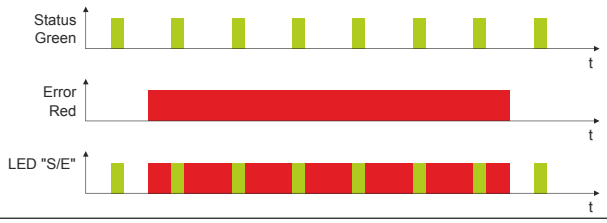
Color red - Error	Description
On	The interface is in an error state (failure of Ethernet frames, accumulation of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 146: Status/Error LED - POWERLINK - Error

Color green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before the time has elapsed, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Green flickering (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** In this state, the module can be configured by the MN. The CN waits for the reception of as SoC frame and then changes to state PRE_OPERATIONAL_2 (double flash). If the red LED lights up in this state, this means that the MN has failed.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** In this state, the interface can be configured by the MN. Afterwards, a command is used to switch to state READY_TO_OPERATE (triple flash). If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated. If the red LED lights up in this mode, this means that the MN has failed.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible in the MN. **Controlled node (CN)** Output data is not output, and no input data is provided. This mode can only be reached and exited by a corresponding command from the MN.

Table 147: Status/Error LED - POWERLINK - Status

System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by four switch-on phases via the red error LED. The switch-on phases are either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

Error description	Error code indicated by red "Status" LED									
RAM error: The interface is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The interface or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 148: System stop error codes

Legend
- • ...150 ms
- − ...600 ms
- Pause 2 s pause

2.3.5.2.4 Updating the firmware

The firmware is part of Automation Studio. The module is automatically brought up to this level.

To update the firmware contained in Automation Studio, a hardware upgrade must be performed (see "Project management - Workspace - Upgrades" in Automation Help).

2.3.5.3 5ACCIF01.FPLK-000

2.3.5.3.1 General information

Interface option 5ACCIF01.FPLK-000 is equipped with 2 female RJ45 connectors; both connectors are connected to an integrated POWERLINK hub. In addition, 512 kB nvSRAM is installed.

With the integrated 2-port hub, a simple tree structure, daisy chain wiring or optional ring redundancy can be easily implemented without additional effort.

With poll-response chaining (PRC), the IF option offers a solution for the highest demands on response time and the shortest cycle times. Especially for central control tasks, poll-response chaining in combination with the B&R control system provides ideal performance.

- 1x POWERLINK interface for real-time communication
- 512 kB nvSRAM
- Integrated hub for economical wiring
- Configurable ring redundancy
- Poll-response chaining
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

This interface option can only be operated with Automation Runtime.

Information:

Ring redundancy in combination with poll-response chaining is not possible at the same time with this IF option.

2.3.5.3.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPLK-000	Interface card - 1x POWERLINK interface - Integrated 2-port hub - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	

Table 149: 5ACCIF01.FPLK-000 - Order data

2.3.5.3.3 Technical data

Information:

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

Model number	5ACCIF01.FPLK-000
General information	
LED status indicators	L1, L2, L3
B&R ID code	0xE9BA
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Controller	
nvSRAM	
Size	512 kB
Data retention	20 years
Read/Write endurance	Min. 1,000,000
Remanent variables in power failure mode	256 kB (for e.g. Automation Runtime, see Automation Help)

Table 150: 5ACCIF01.FPLK-000 - Technical data

Model number	5ACCIF01.FPLK-000
Interfaces	
POWERLINK	
Quantity	1 (integrated 2-port hub)
Transfer	100BASE-TX
Type	Type 4, redundant [2]
Design	RJ45, shielded
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
Electrical characteristics	
Power consumption	1.75 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 150: 5ACCIF01.FPLK-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) For additional information, see Automation Help (Communication - POWERLINK - General - Hardware - IF / LS).

2.3.5.3.3.1 POWERLINK 1 interface - Pinout

The POWERLINK 1 interface on the system unit is referred to as "IF option".

POWERLINK 1[1]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
LED "Status"	**On**	**Off**	
Green	See status/error LED.		
LED "Link"	**On**	**Off**	
Yellow	Link (a connection to a POWERLINK network exists)	Activity (blinks) (data is being transferred)	

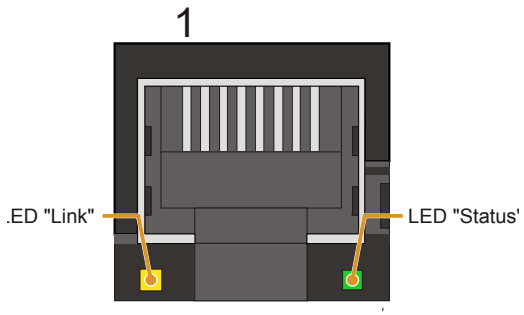


Table 151: 5ACCIF01.FPLK-000 - POWERLINK 1 interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.

2.3.5.3.3.2 POWERLINK 2 interface - Pinout

The POWERLINK 2 interface on the system unit is referred to as "IF option".

POWERLINK 2[1)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
LED "Status"	**On**	**Off**	
Green	See status/error LED.		
LED "Link"	**On**	**Off**	
Yellow	Link (a connection to a POWERLINK network exists)	Activity (blinks) (data is being transferred)	

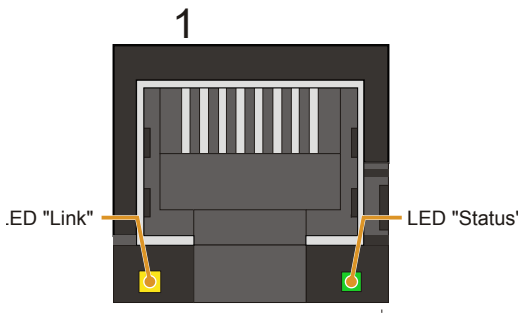


Table 152: 5ACCIF01.FPLK-000 - POWERLINK 2 interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.

2.3.5.3.3.3 LED status indicators L1, L2, L3

The LEDs of the interface option are located near the ETH1 interface.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Green	On	POWERLINK 2 link LED A connection to a POWERLINK network exists.
		Blinking	POWERLINK 2 link LED Data is being transferred.
L2	Green	On	POWERLINK 1 link LED A connection to a POWERLINK network exists.
		Blinking	POWERLINK 1 link LED Data is being transferred.
L3	Green-Red	On	POWERLINK status/error LED See "Status/Error LED".
		Off	POWERLINK status/error LED See "Status/Error LED".

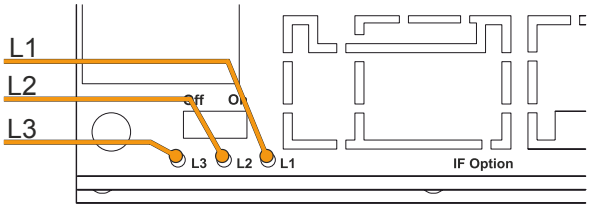


Table 153: 5ACCIF01.FPLK-000 - LED status indicators

Status/Error LED

The status/error LED is designed as a green and red dual LED. The LED statuses have a different meaning depending on the operating mode.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Color green - Status	Description
On	The interface is operated as an Ethernet interface.

Table 154: Status/Error LED - Ethernet mode

POWERLINK

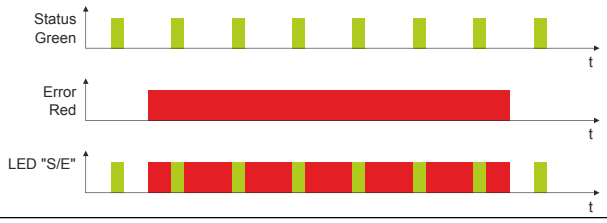
Color red - Error	Description
On	The interface is in an error state (failure of Ethernet frames, accumulation of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 155: Status/Error LED - POWERLINK - Error

Color green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before the time has elapsed, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Green flickering (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** In this state, the module can be configured by the MN. The CN waits for the reception of as SoC frame and then changes to state PRE_OPERATIONAL_2 (double flash). If the red LED lights up in this state, this means that the MN has failed.

Table 156: Status/Error LED - POWERLINK - Status

Color green - Status	Description
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** In this state, the interface can be configured by the MN. Afterwards, a command is used to switch to state READY_TO_OPERATE (triple flash). If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated. If the red LED lights up in this mode, this means that the MN has failed.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible in the MN. **Controlled node (CN)** Output data is not output, and no input data is provided. This mode can only be reached and exited by a corresponding command from the MN.

Table 156: Status/Error LED - POWERLINK - Status

System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by four switch-on phases via the red error LED. The switch-on phases are either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

Error description	Error code indicated by red "Status" LED									
RAM error: The interface is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The interface or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 157: System stop error codes

Legend
- • ...150 ms
- − ...600 ms
- Pause 2 s pause

2.3.5.3.4 Updating the firmware

The firmware is part of Automation Studio. The module is automatically brought up to this level.

To update the firmware contained in Automation Studio, a hardware upgrade must be performed (see "Project management - Workspace - Upgrades" in Automation Help).

2.3.5.4 5ACCIF01.FPLS-000

2.3.5.4.1 General information

Interface option 5ACCIF01.FPLS-000 is equipped with a POWERLINK and RS232 interface. In addition, 32 kB FRAM is installed.

- 1x POWERLINK interface managing or controlled node
- 1x RS232 interface
- 32 kB FRAM
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

2.3.5.4.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 158: 5ACCIF01.FPLS-000 - Order data

2.3.5.4.3 Technical data

Information:

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

Model number	5ACCIF01.FPLS-000
General information	
LED status indicators	L2, L3
B&R ID code	0xE540
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]
Controller	
FRAM	
Size	32 kB
Data retention	10 years
Read/Write endurance	Min. 10^{12} times/byte
Remanent variables in power failure mode	32 kB (for e.g. Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS232, modem supported, not galvanically isolated
Design	10-pin, male
UART	16550-compatible, 16 byte FIFO
Max. baud rate	115 kbit/s
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [3)]
Design	RJ45, shielded
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)

Table 159: 5ACCIF01.FPLS-000 - Technical data

Model number	5ACCIF01.FPLS-000
Electrical characteristics	
Power consumption	1.5 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 159: 5ACCIF01.FPLS-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) For additional information, see Automation Help (Communication - POWERLINK - General - Hardware - IF / LS).

2.3.5.4.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as "IF option".

POWERLINK[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
LED "Status"	**On**	**Off**	
Green	See status/error LED.		
LED "Link"	**On**	**Off**	
Yellow	Link (a connection to a POWERLINK network exists)	Activity (blinks) (data is being transferred)	

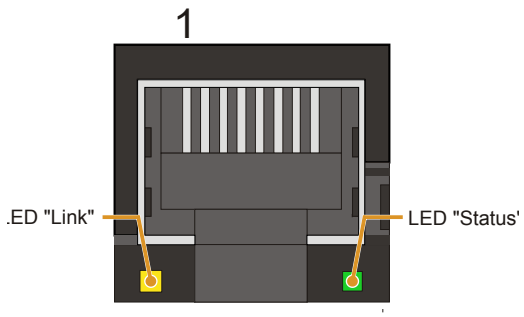


Table 160: 5ACCIF01.FPLS-000 - POWERLINK interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) In Automation Studio / Automation Runtime, this interface is referred to as IF1.

2.3.5.4.3.2 Serial interface COMA - Pinout

Serial interface COMA on the system unit is referred to as "IF option".

Serial interface COMA[1)2)3)]		
	RS232	
Type	RS232, modem supported, not galvanically isolated	
UART	16550-compatible, 16 byte FIFO	
Transfer rate	Max. 115 kbit/s	
Bus length	Max. 15 m	
Pin	**Pinout**	
1	DCD	
2	DSR	
3	RXD	
4	RTS	
5	TXD	
6	CTS	
7	DTR	
8	RI	
9	GND	
10	Shield	

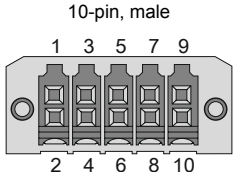


Table 161: 5ACCIF01.FPLS-000 - Interface COMA

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is automatically enabled in BIOS as COMA with default addresses I/O:3F8h and IRQ:4.
3) In Automation Studio / Automation Runtime, this interface is referred to as IF5.

2.3.5.4.3.3 LED status indicators L2, L3

The LEDs of the interface option are located near the ETH1 interface.

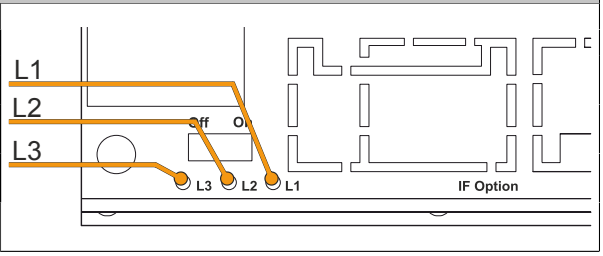
LED status indicators				
LED	**Color**	**Status**	**Explanation**	
L1	NC			
L2	Green	On	POWERLINK link LED A connection to a POWERLINK network exists.	
		Blinking	POWERLINK link LED Data is being transferred.	
L3	Green-Red	On	POWERLINK status/error LED See "Status/Error LED".	
		Off	POWERLINK status/error LED See "Status/Error LED".	

Table 162: 5ACCIF01.FPLS-000 - LED status indicators

Status/Error LED

The status/error LED is designed as a green and red dual LED. The LED statuses have a different meaning depending on the operating mode.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Color green - Status	Description
On	The interface is operated as an Ethernet interface.

Table 163: Status/Error LED - Ethernet mode

POWERLINK

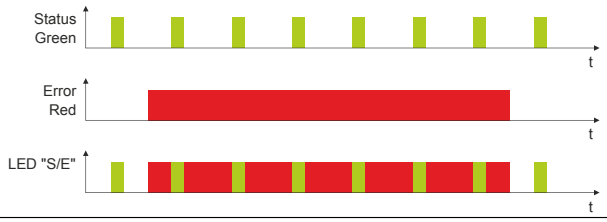
Color red - Error	Description
On	The interface is in an error state (failure of Ethernet frames, accumulation of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 164: Status/Error LED - POWERLINK - Error

Color green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before the time has elapsed, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Green flickering (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** In this state, the module can be configured by the MN. The CN waits for the reception of as SoC frame and then changes to state PRE_OPERATIONAL_2 (double flash). If the red LED lights up in this state, this means that the MN has failed.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** In this state, the interface can be configured by the MN. Afterwards, a command is used to switch to state READY_TO_OPERATE (triple flash). If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated. If the red LED lights up in this mode, this means that the MN has failed.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible in the MN. **Controlled node (CN)** Output data is not output, and no input data is provided. This mode can only be reached and exited by a corresponding command from the MN.

Table 165: Status/Error LED - POWERLINK - Status

System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by four switch-on phases via the red error LED. The switch-on phases are either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

Error description	Error code indicated by red "Status" LED									
RAM error: The interface is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The interface or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 166: System stop error codes

Legend
- • ...150 ms
- − ...600 ms
- Pause 2 s pause

2.3.5.4.3.4 Shielding

For the interfaces on the 10-pin female connector, the shield of the interfaces can be connected to pin "Shield" of the female connector.

In addition, there is a functional ground connection on the interface cover of the system unit and a screw point for cable shields that can also be used for the shielded cables.

2.3.5.4.4 Updating the firmware

The firmware is part of Automation Studio. The module is automatically brought up to this level.

To update the firmware contained in Automation Studio, a hardware upgrade must be performed (see "Project management - Workspace - Upgrades" in Automation Help).

2.3.5.5 5ACCIF01.FPLS-001

2.3.5.5.1 General information

Interface option 5ACCIF01.FPLS-001 is equipped with a POWERLINK and RS232 interface. In addition, 512 kB nvSRAM is installed.

- 1x POWERLINK interface managing or controlled node
- 1x RS232 interface
- 512 kB nvSRAM
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

2.3.5.5.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPLS-001	Interface card - 1x RS232 interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 167: 5ACCIF01.FPLS-001 - Order data

2.3.5.5.3 Technical data

Information:

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

Model number	5ACCIF01.FPLS-001
General information	
LED status indicators	L2, L3
B&R ID code	0xE9B9
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Controller	
nvSRAM	
Size	512 kB
Data retention	20 years
Read/Write endurance	Min. 1,000,000
Remanent variables in power failure mode	256 kB (for e.g. Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS232, modem supported, not galvanically isolated
Design	10-pin, male
UART	16550-compatible, 16 byte FIFO
Max. baud rate	115 kbit/s
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [2)]
Design	RJ45, shielded
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
Electrical characteristics	
Power consumption	1.5 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

Table 168: 5ACCIF01.FPLS-001 - Technical data

Model number	5ACCIF01.FPLS-001
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 168: 5ACCIF01.FPLS-001 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) For additional information, see Automation Help (Communication - POWERLINK - General - Hardware - IF / LS).

2.3.5.5.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as "IF option".

POWERLINK[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
LED "Status"	**On**	**Off**	
Green	See status/error LED.		
LED "Link"	**On**	**Off**	
Yellow	Link (a connection to a POWERLINK network exists)	Activity (blinks) (data is being transferred)	

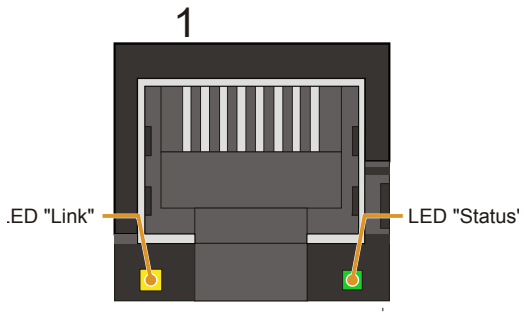


Table 169: 5ACCIF01.FPLS-001 - POWERLINK interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) In Automation Studio / Automation Runtime, this interface is referred to as IF1.

2.3.5.5.3.2 Serial interface COMA - Pinout

Serial interface COMA on the system unit is referred to as "IF option".

Serial interface COMA[1)2)3)]	
	RS232
Type	RS232, modem supported, not galvanically isolated
UART	16550-compatible, 16 byte FIFO
Transfer rate	Max. 115 kbit/s
Bus length	Max. 15 m
Pin	**Pinout**
1	DCD
2	DSR
3	RXD
4	RTS
5	TXD
6	CTS
7	DTR
8	RI
9	GND
10	Shield

10-pin, male

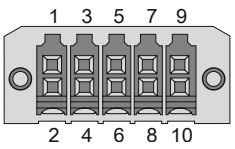


Table 170: 5ACCIF01.FPLS-001 - Interface COMA

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is automatically enabled in BIOS as COMA with default addresses I/O:3F8h and IRQ:4.
3) In Automation Studio / Automation Runtime, this interface is referred to as IF5.

2.3.5.5.3.3 LED status indicators L2, L3

The LEDs of the interface option are located near the ETH1 interface.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	NC		
L2	Green	On	POWERLINK link LED A connection to a POWERLINK network exists.
		Blinking	POWERLINK link LED Data is being transferred.
L3	Green-Red	On	POWERLINK status/error LED See "Status/Error LED".
		Off	POWERLINK status/error LED See "Status/Error LED".

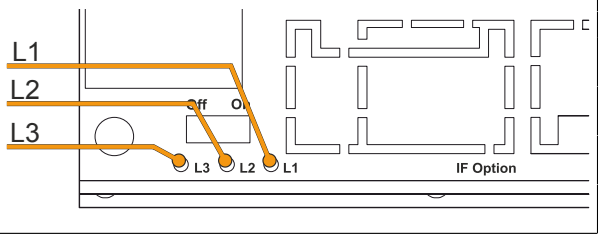


Table 171: 5ACCIF01.FPLS-001 - LED status indicators

Status/Error LED

The status/error LED is designed as a green and red dual LED. The LED statuses have a different meaning depending on the operating mode.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Color green - Status	Description
On	The interface is operated as an Ethernet interface.

Table 172: Status/Error LED - Ethernet mode

POWERLINK

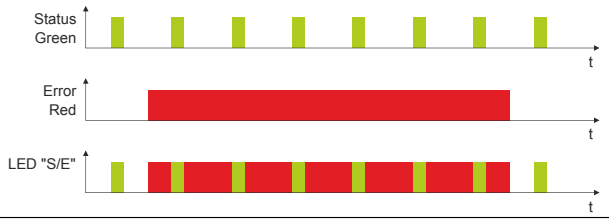
Color red - Error	Description
On	The interface is in an error state (failure of Ethernet frames, accumulation of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 173: Status/Error LED - POWERLINK - Error

Color green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before the time has elapsed, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Green flickering (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** In this state, the module can be configured by the MN. The CN waits for the reception of as SoC frame and then changes to state PRE_OPERATIONAL_2 (double flash). If the red LED lights up in this state, this means that the MN has failed.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** In this state, the interface can be configured by the MN. Afterwards, a command is used to switch to state READY_TO_OPERATE (triple flash). If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated. If the red LED lights up in this mode, this means that the MN has failed.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible in the MN. **Controlled node (CN)** Output data is not output, and no input data is provided. This mode can only be reached and exited by a corresponding command from the MN.

Table 174: Status/Error LED - POWERLINK - Status

System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by four switch-on phases via the red error LED. The switch-on phases are either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

Error description	Error code indicated by red "Status" LED									
RAM error: The interface is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The interface or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 175: System stop error codes

Legend
- • ...150 ms
- − ...600 ms
- Pause 2 s pause

2.3.5.5.3.4 Shielding

For the interfaces on the 10-pin female connector, the shield of the interfaces can be connected to pin "Shield" of the female connector.

In addition, there is a functional ground connection on the interface cover of the system unit and a screw point for cable shields that can also be used for the shielded cables.

2.3.5.5.4 Updating the firmware

The firmware is part of Automation Studio. The module is automatically brought up to this level.

To update the firmware contained in Automation Studio, a hardware upgrade must be performed (see "Project management - Workspace - Upgrades" in Automation Help).

2.3.5.6 5ACCIF01.FPSC-000

2.3.5.6.1 General information

Interface option 5ACCIF01.FPSC-000 is equipped with a POWERLINK, RS232 and CAN bus master interface. In addition, 32 kB FRAM is installed.

- 1x POWERLINK interface managing or controlled node
- 1x CAN bus master interface
- 1x RS232 interface
- 32 kB FRAM
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

This interface option can only be operated with Automation Runtime.

2.3.5.6.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/ APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 176: 5ACCIF01.FPSC-000 - Order data

2.3.5.6.3 Technical data

Information:

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

Model number	5ACCIF01.FPSC-000
General information	
LED status indicators	L1, L2, L3
B&R ID code	0xE53F
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]
Controller	
FRAM	
Size	32 kB
Data retention	10 years
Read/Write endurance	Min. 10^{12} times/byte
Remanent variables in power failure mode	32 kB (for e.g. Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS232, modem not supported, not galvanically isolated
Design	10-pin, male
UART	16550-compatible, 16 byte FIFO
Max. baud rate	115 kbit/s

Table 177: 5ACCIF01.FPSC-000 - Technical data

Model number	5ACCIF01.FPSC-000
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [3]
Design	RJ45, shielded
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
CAN	
Quantity	1
Design	10-pin, male, not galvanically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be switched on and off with slide switch
Electrical characteristics	
Power consumption	1.75 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 177: 5ACCIF01.FPSC-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) For additional information, see Automation Help (Communication - POWERLINK - General - Hardware - IF / LS).

2.3.5.6.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as "IF option".

POWERLINK[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
LED "Status"	**On**	**Off**	
Green	See status/error LED.		
LED "Link"	**On**	**Off**	
Yellow	Link (a connection to a POWERLINK network exists)	Activity (blinks) (data is being transferred)	

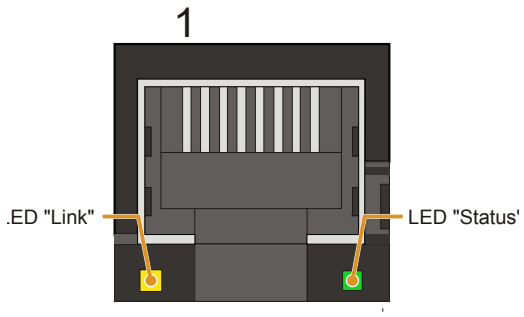


Table 178: 5ACCIF01.FPSC-000 - POWERLINK interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) In Automation Studio / Automation Runtime, this interface is referred to as IF1.

2.3.5.6.3.2 Serial interface COM - Pinout

Serial interface COM on the system unit is referred to as "IF option".

Serial interface COM[1)2)]	
	RS232
Type	RS232, modem not supported, not galvanically isolated
UART	16550-compatible, 16 byte FIFO
Transfer rate	Max. 115 kbit/s
Bus length	Max. 15 m
Pin	**Pinout**
1	-
2	Shield
3	-
4	-
5	-
6	-
7	-
8	COM GND
9	RXD
10	TXD

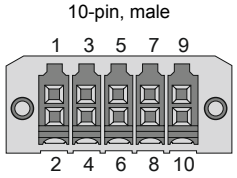


Table 179: 5ACCIF01.FPSC-000 - Interface COM

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF5 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

2.3.5.6.3.3 CAN bus interface - Pinout

The CAN bus interface on the system unit is referred to as "IF option".

CAN bus[1)2)]	
The CAN bus interface is designed as a female 10-pin connector and has no electrical isolation.	
Transfer rate	Max. 1 Mbit/s
Bus length	Max. 1000 m
Pin	**Pinout**
1	-
2	Shield
3	-
4	-
5	CAN H
6	CAN L
7	CAN GND
8	-
9	-
10	-

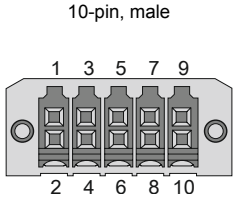


Table 180: 5ACCIF01.FPSC-000 - CAN bus interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF3 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

CAN driver settings

The baud rate can be set either with predefined values or via the bit timing register. For additional information, see Automation Help.

Bit timing register 1	Bit timing register 0	Baud rate
00h	14h	1000 kbit/s
80h or 00h	1Ch	500 kbit/s
81h or 01h	1Ch	250 kbit/s
83h or 03h	1Ch	125 kbit/s
84h or 04h	1Ch	100 kbit/s
89h or 09h	1Ch	50 kbit/s

Table 181: CAN driver settings

CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the transfer rate. According to CAN in Automation (CiA), the maximum bus length is 1000 meters.

The following bus lengths are permitted at a maximum permissible oscillator tolerance of 0.121%:

Extension	Transfer rate
≤1000 m	Typ. 50 kbit/s
≤200 m	Typ. 250 kbit/s
≤100 m	Typ. 500 kbit/s
<20 m[1)]	Typ. 1 Mbit/s

Table 182: CAN - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 180 "CAN driver settings". Otherwise, the cable lengths depend on the values in the timing register.

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

CAN cable	Property
Signal line	
Cable cross section	2x 0.25 mm² (24AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/km
Stranding	Wires stranded in pairs
Shield	Pair shielding with aluminum foil
Ground conductor	
Cable cross section	1x 0.34 mm² (22AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Cable shield	Composed of tinned copper wires

Table 183: CAN cable requirements

Terminating resistor

A terminating resistor is integrated on the interface option. It is located near the ETH1 interface. A switch is used to switch the terminating resistor for the CAN bus interface on and off. LED status indicator "L1" indicates whether the terminating resistor is switched on or off.

Terminating resistor	
On	The terminating resistor is switched on.
Off	The terminating resistor is switched off.

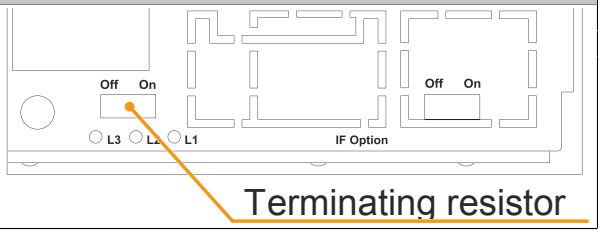


Table 184: Terminating resistor

2.3.5.6.3.4 Shielding

For the interfaces on the 10-pin female connector, the shield of the interfaces can be connected to pin "Shield" of the female connector.

In addition, there is a functional ground connection on the interface cover of the system unit and a screw point for cable shields that can also be used for the shielded cables.

2.3.5.6.3.5 LED status indicators L1, L2, L3

The LEDs of the interface option are located near the ETH1 interface.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus terminating resistor is switched on.
		Off	The CAN bus terminating resistor is switched off.
L2	Green	On	POWERLINK link LED A connection to a POWERLINK network exists.
		Blinking	POWERLINK link LED Data is being transferred.
L3	Green-Red	On	POWERLINK status/error LED See "Status/Error LED".
		Off	POWERLINK status/error LED See "Status/Error LED".

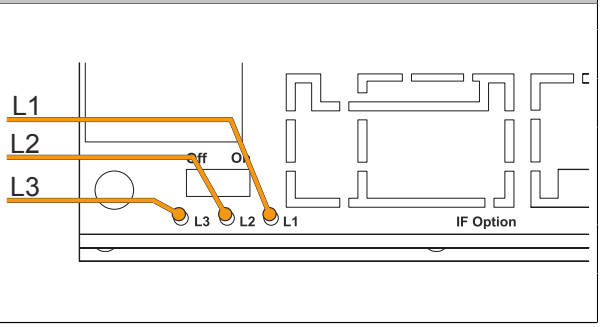


Table 185: 5ACCIF01.FPSC-000 - LED status indicators

Status/Error LED

The status/error LED is designed as a green and red dual LED. The LED statuses have a different meaning depending on the operating mode.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Color green - Status	Description
On	The interface is operated as an Ethernet interface.

Table 186: Status/Error LED - Ethernet mode

POWERLINK

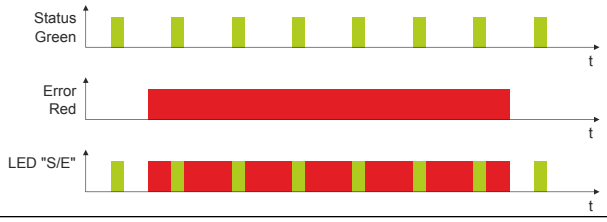
Color red - Error	Description
On	The interface is in an error state (failure of Ethernet frames, accumulation of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 187: Status/Error LED - POWERLINK - Error

Color green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before the time has elapsed, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Green flickering (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** In this state, the module can be configured by the MN. The CN waits for the reception of as SoC frame and then changes to state PRE_OPERATIONAL_2 (double flash). If the red LED lights up in this state, this means that the MN has failed.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** In this state, the interface can be configured by the MN. Afterwards, a command is used to switch to state READY_TO_OPERATE (triple flash). If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated. If the red LED lights up in this mode, this means that the MN has failed.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible in the MN. **Controlled node (CN)** Output data is not output, and no input data is provided. This mode can only be reached and exited by a corresponding command from the MN.

Table 188: Status/Error LED - POWERLINK - Status

System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by four switch-on phases via the red error LED. The switch-on phases are either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

Error description	Error code indicated by red "Status" LED									
RAM error: The interface is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The interface or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 189: System stop error codes

Legend
- • ...150 ms
- − ...600 ms
- Pause 2 s pause

2.3.5.6.4 Updating the firmware

The firmware is part of Automation Studio. The module is automatically brought up to this level.

To update the firmware contained in Automation Studio, a hardware upgrade must be performed (see "Project management - Workspace - Upgrades" in Automation Help).

2.3.5.7 5ACCIF01.FPSC-001

2.3.5.7.1 General information

Interface option 5ACCIF01.FPSC-001 is equipped with a POWERLINK, RS232, CAN bus master and X2X Link master interface. In addition, 512 kB nvSRAM is installed.

- 1x POWERLINK interface managing or controlled node
- 1x CAN bus master interface
- 1x X2X Link master interface
- 1x RS232 interface
- 512 kB nvSRAM
- Compatible with APC2100/PC2100 and APC2200/PPC2200

This interface option can only be operated with Automation Runtime.

2.3.5.7.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPSC-001	Interface card - 1x RS232 interface - 1x CAN interface - 1x X2X Link Interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 190: 5ACCIF01.FPSC-001 - Order data

2.3.5.7.3 Technical data

Information:

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

Model number	5ACCIF01.FPSC-001
General information	
LED status indicators	L1, L2, L3
B&R ID code	0xE9BC
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Controller	
nvSRAM	
Size	512 kB
Data retention	20 years
Read/Write endurance	Min. 1,000,000
Remanent variables in power failure mode	256 kB (for e.g. Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS232, modem not supported, not galvanically isolated
Design	10-pin, male
UART	16550-compatible, 16 byte FIFO
Max. baud rate	115 kbit/s

Table 191: 5ACCIF01.FPSC-001 - Technical data

Model number	5ACCIF01.FPSC-001
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [2]
Design	RJ45, shielded
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
CAN	
Quantity	1
Design	10-pin, male, galvanically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be switched on and off with slide switch
X2X	
Type	X2X Link master
Quantity	1
Design	10-pin, male, galvanically isolated
Electrical characteristics	
Power consumption	2 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 191: 5ACCIF01.FPSC-001 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) For additional information, see Automation Help (Communication - POWERLINK - General - Hardware - IF / LS).

2.3.5.7.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as "IF option".

POWERLINK[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
LED "Status"	**On**	**Off**	
Green	See status/error LED.		
LED "Link"	**On**	**Off**	
Yellow	Link (a connection to a POWERLINK network exists)	Activity (blinks) (data is being transferred)	

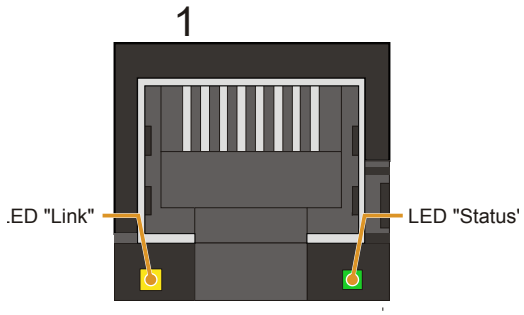


Table 192: 5ACCIF01.FPSC-001 - POWERLINK interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) In Automation Studio / Automation Runtime, this interface is referred to as IF1.

2.3.5.7.3.2 Serial interface COM - Pinout

Serial interface COM on the system unit is referred to as "IF option".

Serial interface COM[1)2)]	
	RS232
Type	RS232, modem not supported, not galvanically isolated
UART	16550-compatible, 16 byte FIFO
Transfer rate	Max. 115 kbit/s
Bus length	Max. 15 m
Pin	**Pinout**
1	-
2	Shield
3	-
4	-
5	-
6	-
7	-
8	COM GND
9	RXD
10	TXD

10-pin, male

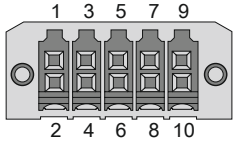


Table 193: 5ACCIF01.FPSC-001 - Interface COM

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF5 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

2.3.5.7.3.3 CAN bus interface - Pinout

The CAN bus interface on the system unit is referred to as "IF option".

CAN bus[1)2)]	
The electrically isolated CAN bus interface is designed as a female 10-pin connector.	
Transfer rate	Max. 1 Mbit/s
Bus length	Max. 1000 m
Pin	**Pinout**
1	-
2	Shield
3	-
4	-
5	CAN H
6	CAN L
7	CAN GND
8	-
9	-
10	-

10-pin, male

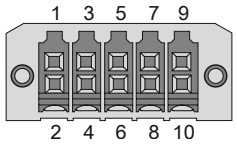


Table 194: 5ACCIF01.FPSC-001 - CAN bus interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF3 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

CAN driver settings

The baud rate can be set either with predefined values or via the bit timing register. For additional information, see Automation Help.

Bit timing register 1	Bit timing register 0	Baud rate
00h	14h	1000 kbit/s
80h or 00h	1Ch	500 kbit/s
81h or 01h	1Ch	250 kbit/s
83h or 03h	1Ch	125 kbit/s
84h or 04h	1Ch	100 kbit/s
89h or 09h	1Ch	50 kbit/s

Table 195: CAN driver settings

CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the transfer rate. According to CAN in Automation (CiA), the maximum bus length is 1000 meters.

The following bus lengths are permitted at a maximum permissible oscillator tolerance of 0.121%:

Extension	Transfer rate
≤1000 m	Typ. 50 kbit/s
≤200 m	Typ. 250 kbit/s
≤100 m	Typ. 500 kbit/s
≤15 m[1)]	Typ. 1 Mbit/s

Table 196: CAN - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 194 "CAN driver settings". Otherwise, the cable lengths depend on the values in the timing register.

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

CAN cable	Property
Signal line	
Cable cross section	2x 0.25 mm² (24AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/km
Stranding	Wires stranded in pairs
Shield	Pair shielding with aluminum foil
Ground conductor	
Cable cross section	1x 0.34 mm² (22AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Cable shield	Composed of tinned copper wires

Table 197: CAN cable requirements

Terminating resistor

A terminating resistor is integrated on the interface option. It is located near the ETH1 interface. A switch is used to switch the terminating resistor for the CAN bus interface on and off. LED status indicator "L1" indicates whether the terminating resistor is switched on or off.

Terminating resistor	
On	The terminating resistor is switched on.
Off	The terminating resistor is switched off.

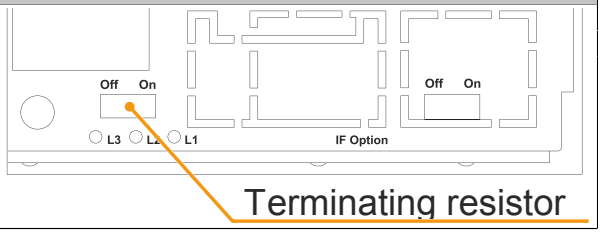


Table 198: Terminating resistor

2.3.5.7.3.4 X2X Link master interface - Pinout

The X2X Link master interface on the system unit is referred to as "IF option".

X2X Link master[1)2)]	
The electrically isolated X2X Link master interface is designed as a 10-pin female connector.	
Pin	**Pinout**
1	X2X H
2	Shield
3	X2X L
4	X2X GND
5	-
6	-
7	-
8	-
9	-
10	-

10-pin, male

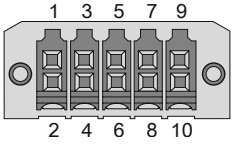


Table 199: 5ACCIF01.FPSC-001 - X2X Link Master interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is displayed as IF2 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not displayed in BIOS.

2.3.5.7.3.5 Shielding

For the interfaces on the 10-pin female connector, the shield of the interfaces can be connected to pin "Shield" of the female connector.

In addition, there is a functional ground connection on the interface cover of the system unit and a screw point for cable shields that can also be used for the shielded cables.

2.3.5.7.3.6 LED status indicators L1, L2, L3

The LEDs of the interface option are located near the ETH1 interface.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus terminating resistor is switched on.
		Off	The CAN bus terminating resistor is switched off.
L2	Green	On	POWERLINK link LED A connection to a POWERLINK network exists.
		Blinking	POWERLINK link LED Data is being transferred.
L3	Green-Red	On	POWERLINK status/error LED See "Status/Error LED".
		Off	POWERLINK status/error LED See "Status/Error LED".

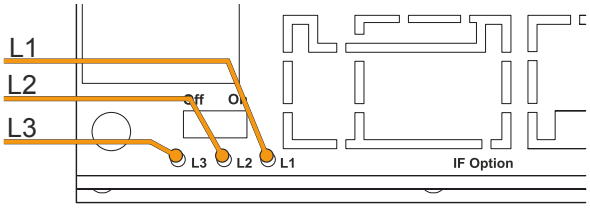


Table 200: 5ACCIF01.FPSC-000 - LED status indicators

Status/Error LED

The status/error LED is designed as a green and red dual LED. The LED statuses have a different meaning depending on the operating mode.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

Color green - Status	Description
On	The interface is operated as an Ethernet interface.

Table 201: Status/Error LED - Ethernet mode

POWERLINK

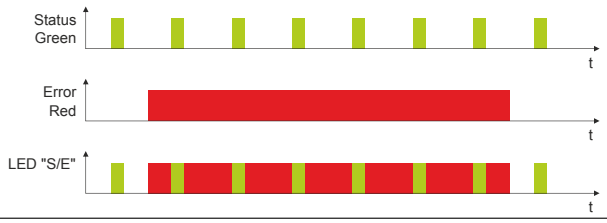
Color red - Error	Description
On	The interface is in an error state (failure of Ethernet frames, accumulation of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 202: Status/Error LED - POWERLINK - Error

Color green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If no corresponding frame is received in the set time window (timeout), the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before the time has elapsed, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Green flickering (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** In this state, the module can be configured by the MN. The CN waits for the reception of as SoC frame and then changes to state PRE_OPERATIONAL_2 (double flash). If the red LED lights up in this state, this means that the MN has failed.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** In this state, the interface can be configured by the MN. Afterwards, a command is used to switch to state READY_TO_OPERATE (triple flash). If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated. If the red LED lights up in this mode, this means that the MN has failed.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible in the MN. **Controlled node (CN)** Output data is not output, and no input data is provided. This mode can only be reached and exited by a corresponding command from the MN.

Table 203: Status/Error LED - POWERLINK - Status

System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by four switch-on phases via the red error LED. The switch-on phases are either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

Error description	Error code indicated by red "Status" LED									
RAM error: The interface is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware error: The interface or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 204: System stop error codes

Legend
- • ...150 ms
- − ...600 ms
- Pause 2 s pause

2.3.5.7.4 Updating the firmware

The firmware is part of Automation Studio. The module is automatically brought up to this level.

To update the firmware contained in Automation Studio, a hardware upgrade must be performed (see "Project management - Workspace - Upgrades" in Automation Help).

2.3.5.8 5ACCIF01.FSS0-000

2.3.5.8.1 General information

Interface option 5ACCIF01.FSS0-000 is equipped with 2 RS422/RS485 interfaces.

- 2x RS422/RS485 interfaces
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

2.3.5.8.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FSS0-000	Interface card - 2x RS422/RS485 interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 205: 5ACCIF01.FSS0-000 - Order data

2.3.5.8.3 Technical data

Information:

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

Model number	5ACCIF01.FSS0-000
General information	
LED status indicators	L2, L3
B&R ID code	0xED7B
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 1)
Interfaces	
COM	
Quantity	2
Type	RS422/RS485, galvanically isolated
Variant	10-pin, male
UART	16550-compatible, 16 byte FIFO
Max. baud rate	115 kbit/s
Terminating resistor	
Type	Can be switched on and off with slide switch
Electrical characteristics	
Power consumption	1 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 60°C 2)
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 206: 5ACCIF01.FSS0-000 - Technical data

Model number	5ACCIF01.FSS0-000
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical properties	
Weight	25 g

Table 206: 5ACCIF01.FSS0-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) For detailed information, see the temperature tables in the user's manual.

2.3.5.8.3.1 Serial interface COM A - Pinout

Serial interface COM A on the system unit is referred to as "IF option".

Serial interface COM A[1)2)3)]	
	RS422/RS485
Type	RS422/RS485, galvanically isolated
UART	16550-compatible, 16 byte FIFO
Transfer rate	Max. 115 kbit/s
Bus length	Max. 1200 m
Pin	**Pinout**
1	-
2	-
3	-
4	-
5	-
6	COM GND
7	TXD
8	TXD\
9	RXD
10	RXD\

10-pin, male

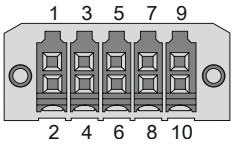


Table 207: 5ACCIF01.FSS0-000 - Interface COM A

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is automatically enabled in BIOS as COM A with default addresses I/O:3F8h and IRQ:4.
3) In Automation Studio / Automation Runtime, this interface is represented as IF7.

Operating COM A as an RS485 interface

The pins of the RS422 default interface (7, 8, 9 and 10) must be used for operation. To do this, connect the pins as shown.

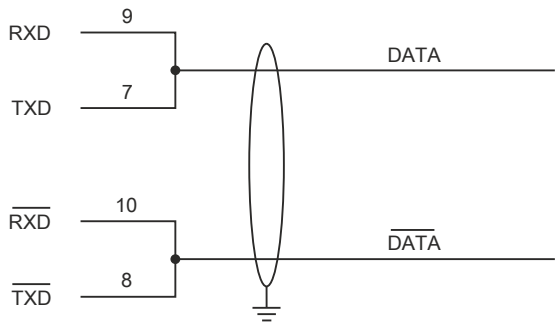


Figure 110: RS232/422/485 interface - COM A operation in RS485 mode

The RTS line must be switched by the driver for each transmission or reception; switching back does not take place automatically.

With long cable lengths, the voltage drop can result in greater potential differences between the bus devices, which can hinder communication. This can be improved by running the ground wire with the others.

2.3.5.8.3.2 Serial interface COM D - Pinout

Serial interface COM D on the system unit is referred to as "IF option".

Serial interface COMD[1)2)3)]	
	RS422/RS485
Type	RS422/RS485, galvanically isolated
UART	16550-compatible, 16 byte FIFO
Transfer rate	Max. 115 kbit/s
Bus length	Max. 1200 m
Pin	**Pinout**
1	RXD
2	RXD\
3	TXD
4	TXD\
5	COM GND
6	-
7	-
8	-
9	-
10	-

10-pin, male

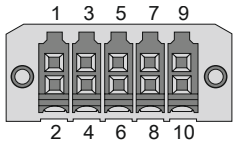


Table 208: 5ACCIF01.FSS0-000 - Interface COM D

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is automatically enabled in BIOS as COM D with default addresses I/O:2E8h and IRQ:5.
3) In Automation Studio / Automation Runtime, this interface is represented as IF8.

Operating COM D as an RS485 interface

The pins of the RS422 default interface (1, 2, 3 and 4) must be used for operation. To do this, connect the pins as shown.

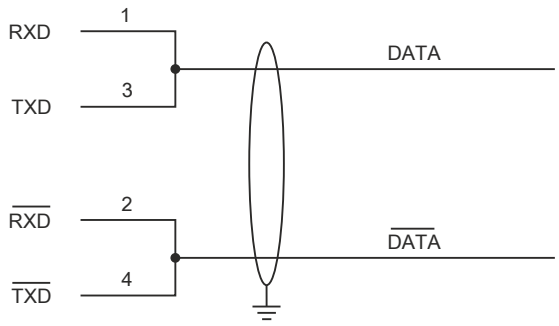


Figure 111: RS232/422/485 interface - COM D operation in RS485 mode

The RTS line must be switched by the driver for each transmission or reception; switching back does not take place automatically.

With long cable lengths, the voltage drop can result in greater potential differences between the bus devices, which can hinder communication. This can be improved by running the ground wire with the others.

2.3.5.8.3.3 RS422 - Bus length and cable type

The RTS line must be switched on to activate the transmitter.

The maximum transfer rate of 115 kbit/s depends on the cable length and type of cable used.

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 209: RS422 - Bus length and transfer rate

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

RS485 cables		Property
Signal line		
	Cable cross section	4x 0.25 mm² (24AWG/19), tinned copper stranded wire
	Wire insulation	PE
	Conductor resistance	≤82 Ω/km
	Stranding	Wires stranded in pairs
	Shield	Pair shielding with aluminum foil
GND		
	Cable cross section	1x 0.34 mm² (22AWG/19), tinned copper stranded wire
	Wire insulation	PE
	Conductor resistance	≤59 Ω/km
Outer jacket		
	Material	PUR compound
	Properties	Halogen-free
	Cable shield	Tinned copper wire

Table 210: RS485 cable requirements

2.3.5.8.3.4 RS485 - Bus length and cable type

The maximum transfer rate of 115 kbit/s depends on the cable length and type of cable used.

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 211: RS485 - Bus length and transfer rate

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

RS485 cables		Property
Signal line		
	Cable cross section	4x 0.25 mm² (24AWG/19), tinned copper stranded wire
	Wire insulation	PE
	Conductor resistance	≤82 Ω/km
	Stranding	Wires stranded in pairs
	Shield	Pair shielding with aluminum foil
GND		
	Cable cross section	1x 0.34 mm² (22AWG/19), tinned copper stranded wire
	Wire insulation	PE
	Conductor resistance	≤59 Ω/km
Outer jacket		
	Material	PUR compound
	Properties	Halogen-free
	Cable shield	Tinned copper wire

Table 212: RS485 cable requirements

2.3.5.8.3.5 Terminating resistor

One terminating resistor per COM is integrated on the interface option; they are located to the left and right of the RS422/RS485 interface. Both can be switched on or off with a switch. LED status indicators L2 and L3 (see "page" on page 201) indicate the state of the assigned terminating resistor.

Terminating resistor	
On	The terminating resistor is switched on.
Off	The terminating resistor is switched off.

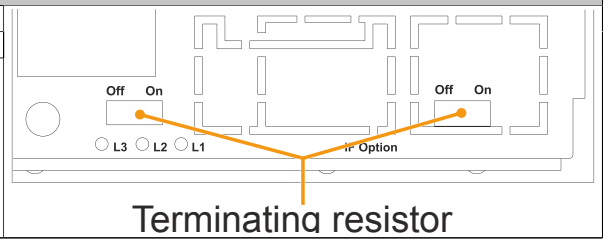


Table 213: Terminating resistor

2.3.5.8.3.6 Shielding

The shields of the cables connected to the female 10-pin connector can be connected to the screw point for cable shields, see "Device interfaces - Overview" on page 43, as an alternative to the functional ground connection of the interface cover of the system unit.

2.3.5.8.3.7 LED status indicators L2, L3

The LEDs of the interface option are located near the ETH1 interface.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	NC		
L2	Yellow	On	The COM D terminating resistor is switched on.
		Off	The COM D terminating resistor is switched off.
L3	Yellow	On	The COM A terminating resistor is switched on.
		Off	The COM A terminating resistor is switched off.

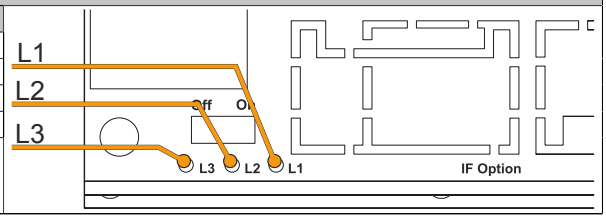


Table 214: 5ACCIF01.FSS0-000 - LED status indicators

2.3.5.9 5ACCIF01.ICAN-000

2.3.5.9.1 General information

Interface option 5ACCIF01.ICAN-000 is equipped with a CAN bus master interface.

- 1x CAN bus master interface
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

2.3.5.9.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.ICAN-000	Interface card - 1x CAN interface - For APC2100/PPC2100/ APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 215: 5ACCIF01.ICAN-000 - Order data

2.3.5.9.3 Technical data

Information:

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

Model number	5ACCIF01.ICAN-000
General information	
LED status indicators	L1
B&R ID code	0xE9BB
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
CAN	
Quantity	1
Controller	Bosch CC770 (compatible with Intel 82527 CAN controller)
Design	10-pin, male, galvanically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be switched on and off with slide switch
Electrical characteristics	
Power consumption	0.5 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 60°C [2)]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 216: 5ACCIF01.ICAN-000 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) For detailed information, see the temperature tables in the user's manual.

2.3.5.9.3.1 CAN bus interface - Pinout

The CAN bus interface on the system unit is referred to as "IF option".

CAN bus[1)2)]	
The electrically isolated CAN bus interface is designed as a female 10-pin connector.	
Transfer rate	Max. 1 Mbit/s
Bus length	Max. 1000 m
Pin	**Pinout**
1	-
2	CAN shield
3	-
4	-
5	CAN H
6	CAN L
7	CAN GND
8	-
9	-
10	-

10-pin, male

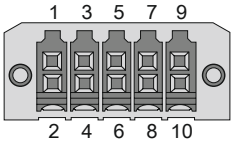


Table 217: 5ACCIF01.ICAN-000 - CAN bus interface

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is automatically enabled in BIOS as CAN with default addresses I/O:384h/385h and IRQ:10.

I/O address and IRQ

Resource	Default setting	Function
I/O address	384h (address register)	Defines the register number to be accessed.
	385h (data register)	Access to the register defined in the address register.
IRQ	IRQ:10	Interrupt

Table 218: I/O address and IRQ

CAN driver setting

The baud rate can be set either with predefined values or via the bit timing register. For additional information, see Automation Help.

Bit timing register 1	Bit timing register 0	Baud rate
00h	14h	1000 kbit/s
80h or 00h	1Ch	500 kbit/s
81h or 01h	1Ch	250 kbit/s
83h or 03h	1Ch	125 kbit/s
84h or 04h	1Ch	100 kbit/s
89h or 09h	1Ch	50 kbit/s

Table 219: CAN driver settings

CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the transfer rate. According to CAN in Automation (CiA), the maximum bus length is 1000 meters.

The following bus lengths are permitted at a maximum permissible oscillator tolerance of 0.121%:

Extension	Transfer rate
≤1000 m	Typ. 50 kbit/s
≤200 m	Typ. 250 kbit/s
≤100 m	Typ. 500 kbit/s
≤20 m	Typ. 1 Mbit/s

Table 220: CAN - Bus length and transfer rate

Preferably, the cable material used should have the following properties or deviate only slightly from them in order to achieve an optimal transfer rate.

CAN cable	Property
Signal line	
Cable cross section	2x 0.25 mm² (24AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/km
Stranding	Wires stranded in pairs
Shield	Pair shielding with aluminum foil
Ground conductor	
Cable cross section	1x 0.34 mm² (22AWG/19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Cable shield	Composed of tinned copper wires

Table 221: CAN cable requirements

Terminating resistor

A terminating resistor is integrated on the interface option. It is located near the ETH1 interface. A switch is used to switch the terminating resistor for the CAN bus interface on and off. LED status indicator "L1" indicates whether the terminating resistor is switched on or off.

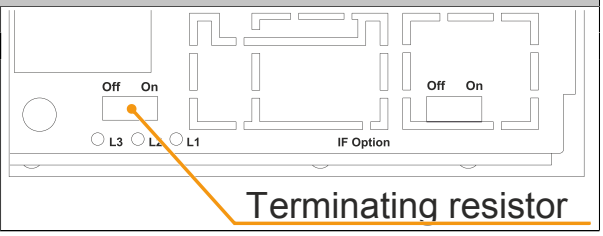
Terminating resistor		
On	The terminating resistor is switched on.	
Off	The terminating resistor is switched off.	

Table 222: Terminating resistor

2.3.5.9.3.2 Shielding

For the interfaces on the 10-pin female connector, the shield of the interfaces can be connected to pin "Shield" of the female connector.

In addition, there is a functional ground connection on the interface cover of the system unit and a screw point for cable shields that can also be used for the shielded cables.

2.3.5.9.3.3 LED status indicator L1

The LEDs of the interface option are located near the ETH1 interface.

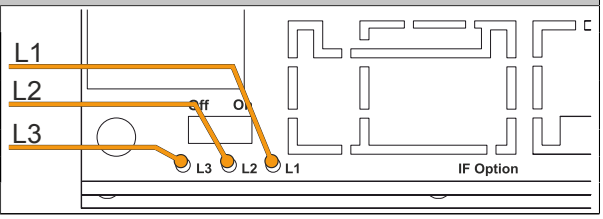
LED status indicator				
LED	Color	Status	Explanation	
L1	Yellow	On	The CAN bus terminating resistor is switched on.	
		Off	The CAN bus terminating resistor is switched off.	
L2	NC			
L3	NC			

Table 223: 5ACCIF01.ICAN-000 - LED status indicator

2.3.5.9.3.4 Drivers

This CAN IF option is supported with Windows 7 and later by PVI V4.2.5 or Windows CAN driver V3.0.

2.3.5.10 5ACCIF03.CETH-000

2.3.5.10.1 General information

Interface option 5ACCIF03.CETH-000 is equipped with 2 10/100/1000BASE-T Ethernet interfaces.

- 2x 10/100/1000BASE-T Ethernet interface
- Compatible with APC2200/PPC2200

2.3.5.10.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF03.CETH-000	Interface card - 2x ETH 10/100/1000 interface - For APC2200/ PPC2200 - Only available with a new device	

Table 224: 5ACCIF03.CETH-000 - Order data

2.3.5.10.3 Technical data

Information:

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

Model number	5ACCIF03.CETH-000
General information	
B&R ID code	F1A8
Diagnostics	
Data transfer	Yes, using LED status indicator
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Interfaces	
Ethernet	
Quantity	2
Controller	Intel I210
Design	RJ45, shielded
Transfer rate	10/100/1000 Mbit/s [1]
Cable length	Max. 100 m between two stations (segment length)
Electrical characteristics	
Power consumption	2 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 60°C [2]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 25 g

Table 225: 5ACCIF03.CETH-000 - Technical data

1) Switching takes place automatically.
2) For detailed information, see the temperature tables in the user's manual.

2.3.5.10.3.1 ETH3 and ETH4 - Pinout

LEDs are integrated on the interface option. The ETH interfaces on the system unit are referred to as IF options.

Ethernet interfaces (ETH[1)])		
Controller	Intel I210	
Wiring	S/STP (Cat 5e)	
Transfer rate	10/100/1000 Mbit/s[2)]	
Cable length	Max. 100 m (min. Cat 5e)	
LED "Speed"	**On**	**Off**
Green	100 Mbit/s	10 Mbit/s[3)]
Orange (dark)	1000 Mbit/s	-
LED "Link"	**On**	**Off**
Orange (light)	Link (a connection to an Ethernet network exists)	Activity (blinks) (data is being transferred)

RJ45, female

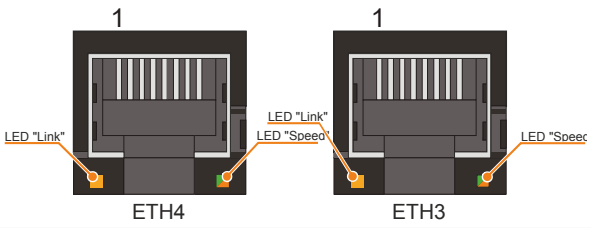


Table 226: 5ACCIF03.CETH-000 - Ethernet interfaces

1) The interfaces, etc. available on the device or module have been numbered for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) Switching takes place automatically.
3) The 10 Mbit/s transfer rate / connection is only available if LED "Link" is active at the same time.

2.3.5.10.3.2 Driver support

A special driver is required to operate Intel Ethernet controller I210. Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com). Approved operating systems are Windows 10 LTSB and B&R Linux.
Wake-on-LAN (WoL) and PXE boot are not supported.

Information:

Necessary drivers must be downloaded from the B&R website, not from manufacturer websites.

2.3.6 Battery compartment

2.3.6.1 5ACCBT01.0000-001

2.3.6.1.1 General information

The lithium battery is needed to retain BIOS CMOS data and to back up the real-time clock (RTC).

The battery is subject to wear and must be replaced if the battery capacity is insufficient (state "Bad").

2.3.6.1.2 Order data

Model number	Short description	Figure
	Accessories	
5ACCBT01.0000-001	Battery compartment - Dark gray - Includes battery - For APC2200/PPC2200	

Table 227: 5ACCBT01.0000-001 - Order data

For the battery compartment replacement part, see "5ACCRPC2.0003-000" on page 282 in section "Replacement parts".

2.3.6.1.3 Technical data

Model number	5ACCBT01.0000-001
General information	
Battery	
Type	Panasonic 1000 mAh
Service life	8 years [1]
Removable	No [2]
Design	Lithium
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-25 to 60°C
Storage	-25 to 60°C
Transport	-25 to 60°C
Relative humidity	
Operation	5 to 90%
Storage	5 to 95%
Transport	5 to 95%
Mechanical characteristics	
Housing	
Material	Gray (similar to Pantone 432C) plastic
Weight	Approx. 13 g

Table 228: 5ACCBT01.0000-001 - Technical data

1) At 50°C, 6 µA for the components being supplied.
2) The battery is permanently installed in the battery compartment and cannot be replaced. The entire battery compartment must always be replaced.

3 Commissioning

3.1 Installation

Danger!

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

3.1.1 Important information for installation/commissioning

- Check the delivery.
  - When accepting the delivery, check the packaging for visible transport damage.
  - If transport damage has occurred, this must be documented immediately and a complaint lodged or confirmed by the shipping/delivery service.
  - Keep the original packaging for further transport.

    #### Information:

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

    This can result in malfunctions of the device, machine or system.
  - Check the contents of the packaging and the optionally ordered accessories for completeness and damage.
  - If the contents of the packaging are incomplete, damaged or do not correspond to your order, you must immediately inform your responsible sales office or B&R Headquarters.

    #### Danger!

    A damaged device has unpredictable properties and states. The unintentional installation or startup of a damaged device must be prevented. The damaged device must be marked as such and made inaccessible, or it must be returned for repairs immediately.
- The climatic and ambient conditions must be taken into account, see "Environmental properties" on page 27.

  #### Caution!

  Before the device is started up, it must be gradually adapted to room temperature! Exposure to direct heat radiation is not permitted. During transport at low temperatures or large temperature fluctuations, the collection of moisture in or on the device is not permitted. Moisture can cause short circuits in electrical circuits and damage the device.
- When installing the device, the permissible mounting orientations must be observed - see "Mounting orientations" on page 25.

> **Caution!**
>
> **Inclined installation reduces the air convection through the device and thus the maximum permissible ambient temperature for operation. If there is sufficient external ventilation in an inclined mounting orientation, the maximum permissible ambient temperature must be checked in each individual case. Failure to do so may result in damage to the equipment and void the certifications and warranty for the device.**

- Requirements regarding standards and certifications of the device must be observed - see "Standards and certifications" on page 271.
- The device is only certified for use in closed rooms.
- The device is not permitted to be exposed to direct sunlight.
- The ventilation holes are not permitted to be covered.
- When installed in a closed housing, there must be sufficient volume for air circulation - see "Spacing for air circulation" on page 24.

> **Information:**
>
> **If additional space is required for operating or servicing the device, this must be taken into account during installation.**

- The device must be installed on a flat, clean and burr-free surface. The specified degrees of protection of the device are only ensured if the following surface / installation cutout / mounting surface requirements are met:
  - Permissible deviation from the evenness on the installation cutout: ≤0.5 mm.
  - Permissible surface roughness in the area of the installation gasket: ≤120 µm (Rz 120).
  - Material thickness of the installation cutout: Min. 1.5 mm steel sheet
- It is important to ensure that the wall or control cabinet plate can support four times the total weight of the device. If necessary, bracing must be attached to the inside of the installation cutout to reinforce the mounting surface.

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

- The device is not permitted to be placed near other heat sources that could cause overheating.
- When connecting cables (DVI, SDL, USB, etc.), the bend radius must be observed.
- When connecting built-in or connected peripherals, follow the instructions in the peripheral device's documentation.

> **Caution!**
>
> **Built-in or connected peripherals, e.g. a USB drive, are not permitted to introduce any voltage into the device. Energy regeneration is generally not permitted and can damage the device.**

- Observe the notes and regulations regarding the power supply and functional ground.
- The device must be installed in such a way that reflections on the screen are avoided as far as possible.
- The device must be installed in such a way that it can be optimally viewed by the user.

- Loss of impermeability

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

3.1.2 Installing a Panel PC with an AP9x3 panel

The Panel PC 2200 with AP9x3 panel is installed in the installation cutout using retaining clips. The number of retaining clips depends on the panel.

The thickness of the wall or control cabinet plate must be at least 1 mm and is not permitted to exceed 6 mm.

A 2.5 mm hex screwdriver is needed to tighten and remove the screw on the retaining clips. The maximum tightening torque of the retaining clips is 1 Nm.

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

Procedure

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

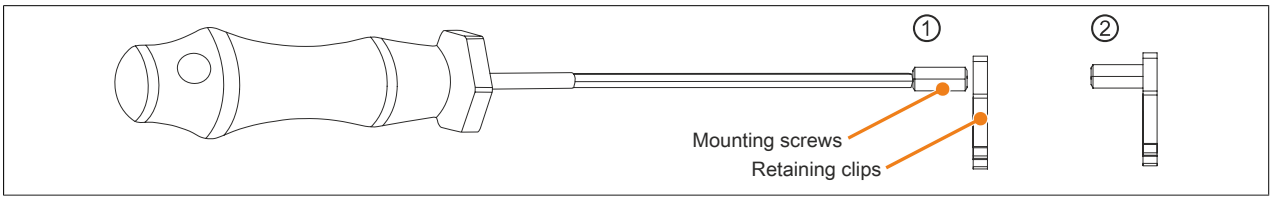


Figure 112: Preparing the retaining clips

2. Insert the device into the front of the prepared, burr-free and flat installation cutout. For the dimensions of the installation cutout, see Fig. 4 "Panel PC 2200 with AP9x3 panels - Installation diagram" on page 21.

3. Install the retaining clips on the device. To do this, insert all retaining clips into the recesses (marked with orange circles) on the device. The number of retaining clips may vary depending on the panel. For the exact number, see Fig. 4 "Panel PC 2200 with AP9x3 panels - Installation diagram" on page 21.

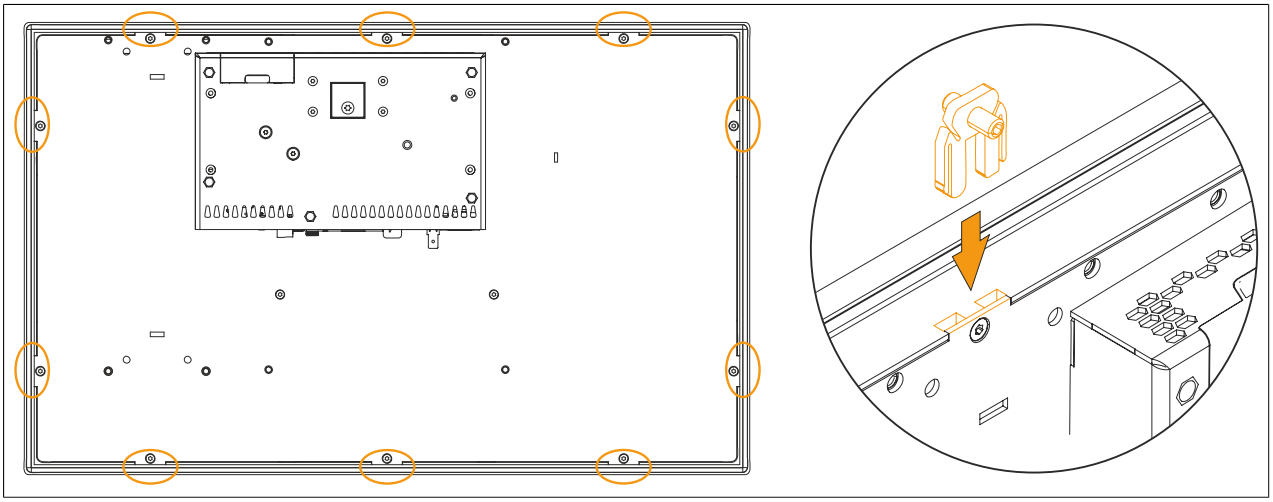


Figure 113: Inserting the retaining clips

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

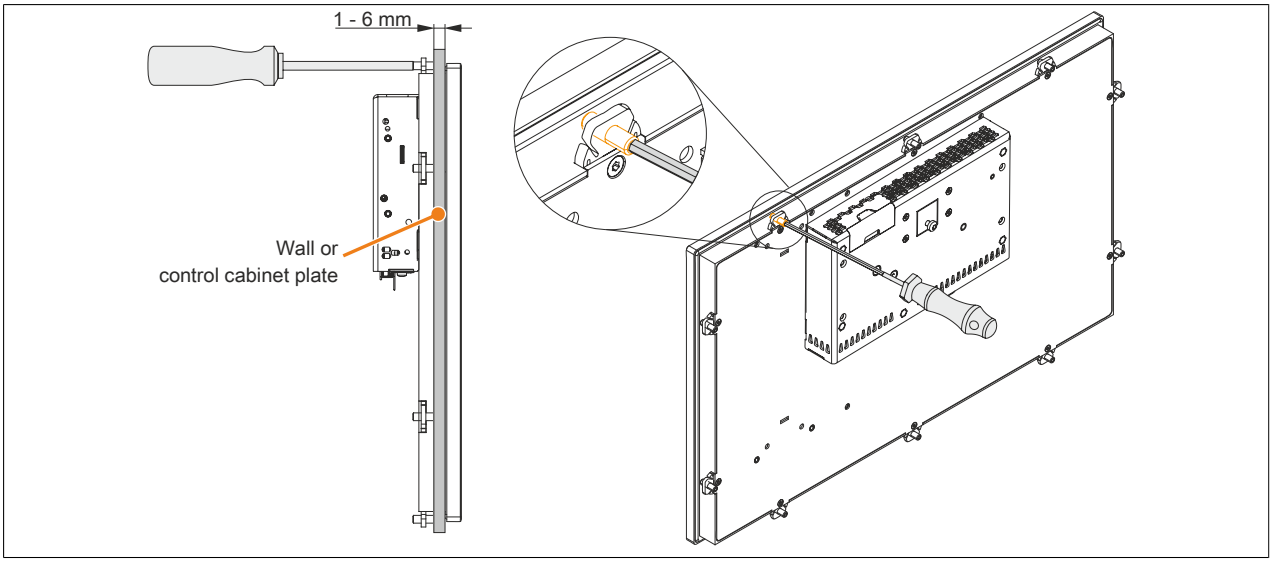


Figure 114: Tightening the retaining clips

3.1.3 Installing the Automation Panel 1000 with retaining clips

The Panel PC 2200 with AP1000 panel is installed in the installation cutout using retaining clips. The number of retaining clips depends on the panel.

The following Automation Panel 1000 panels are installed using retaining clips:

- 5AP1120.0573-000
- 5AP1151.0573-000
- 5AP1120.0702-000
- 5AP1130.0702-000
- 5AP1120.101E-000
- 5AP1130.101E-000
- 5AP1120.1043-000
- 5AP1180.1043-000
- 5AP1120.121E-000
- 5AP1130.121E-000
- 5AP1120.156B-000
- 5AP1130.156C-000
- 5AP1130.185C-000

The thickness of the wall or control cabinet plate must be at least 1 mm and is not permitted to exceed 6 mm.

A 2.5 mm hex screwdriver is needed to tighten and remove the screw on the retaining clips. The maximum tightening torque of the retaining clips is 1 Nm.

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

Procedure

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

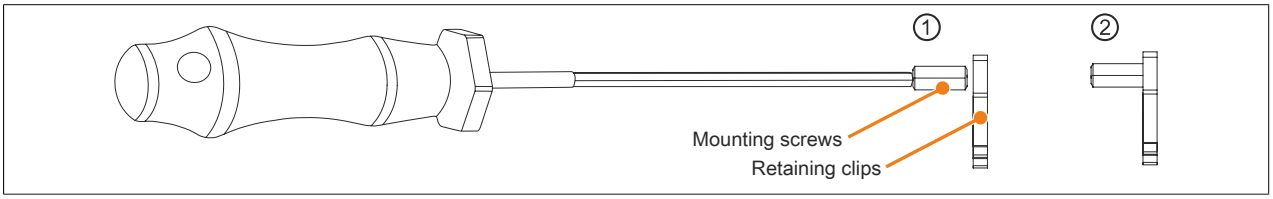


Figure 115: Preparing the retaining clips

2. Insert the device into the front of the prepared, burr-free and flat installation cutout. For the dimensions of the installation cutout, see Fig. 5 "Panel PC 2200 with AP1000 panels with retaining clips - Installation diagram" on page 22.

3. Install the retaining clips on the device. To do this, insert all retaining clips into the recesses (marked with orange circles) on the device. The number of retaining clips may vary depending on the panel. For the exact number, see Tab. 14 "AP1000 panels with retaining clips - Installation diagrams" on page 22.

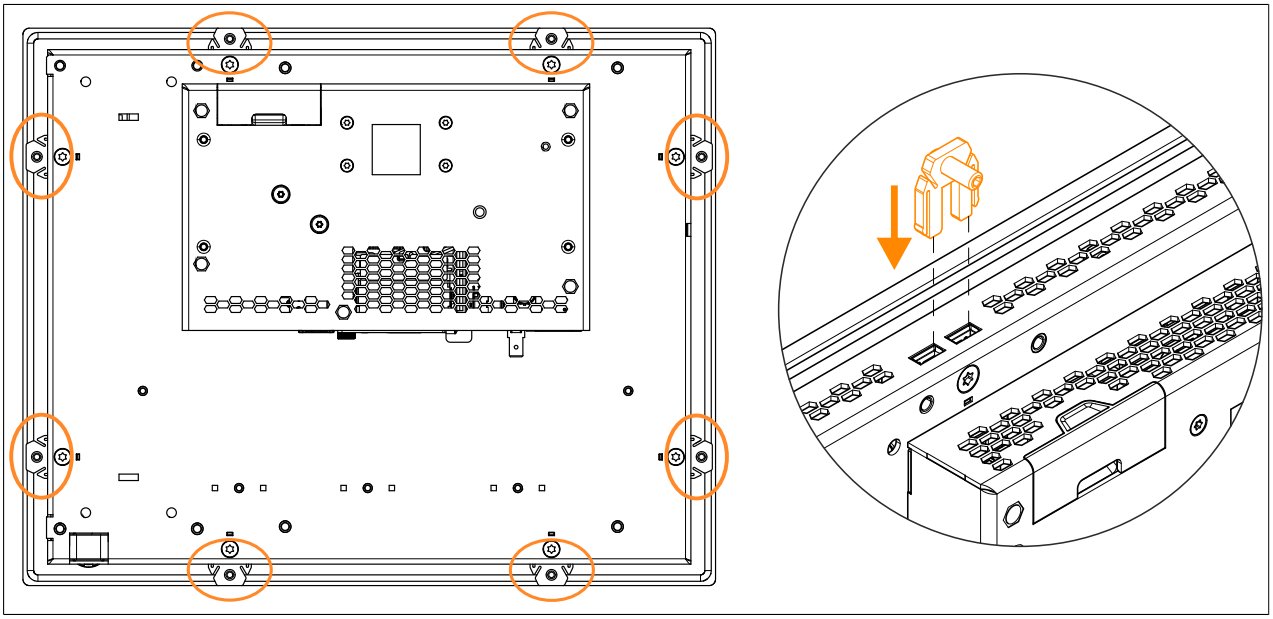


Figure 116: Inserting the retaining clips

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

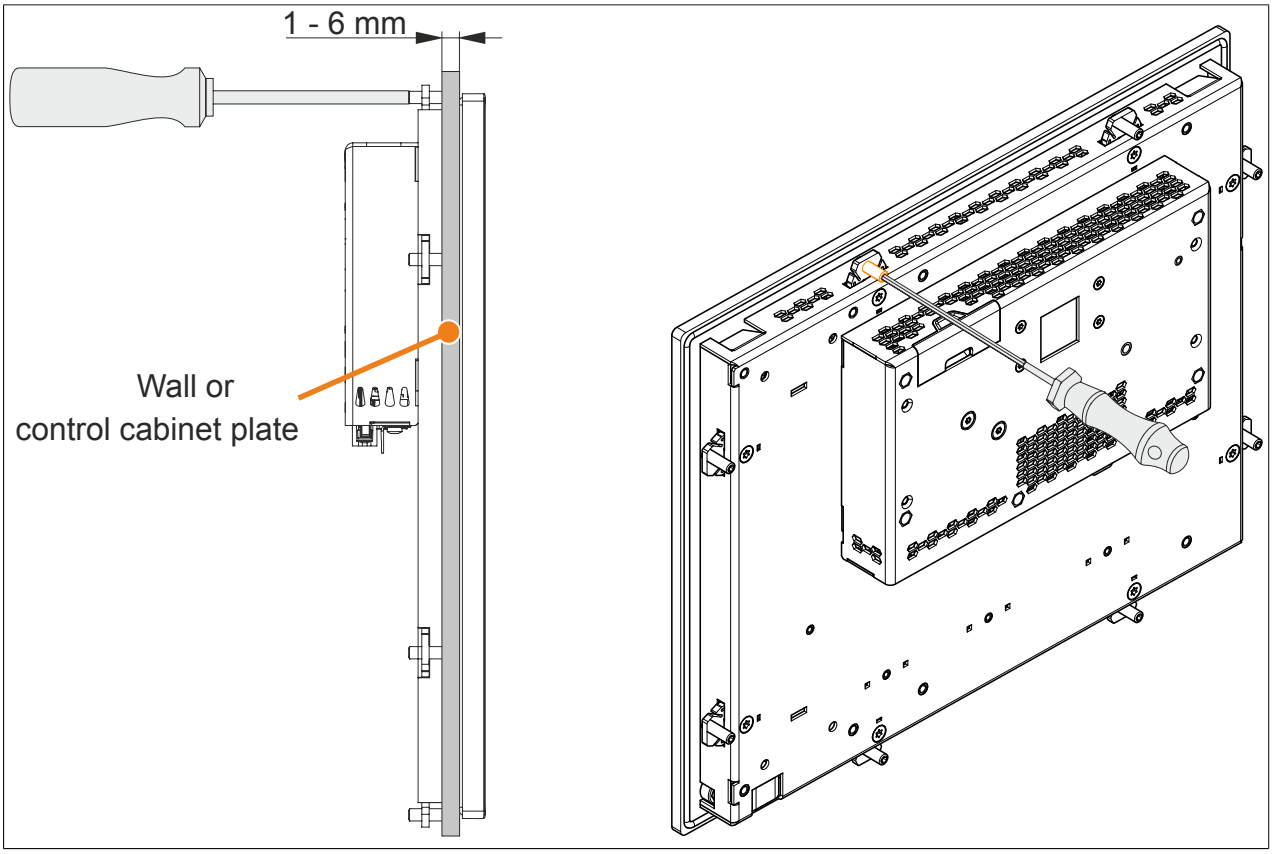


Figure 117: Tightening the retaining clips

3.1.4 Installing the Automation Panel 1000 with clamping blocks

The Panel PC 2200 with AP1000 panel is installed in the installation cutout using clamping blocks. The number of clamping blocks depends on the panel.

The following Automation Panel 1000 panels are installed using clamping blocks:

- 5AP1181.1043-000
- 5AP1182.1043-000
- 5AP1120.1214-000
- 5AP1120.1505-000
- 5AP1180.1505-000
- 5AP1181.1505-000
- 5AP1120.1906-000

The thickness of the wall or control cabinet plate must be at least 2 mm and is not permitted to exceed 10 mm.

A 3 mm hex screwdriver is needed to tighten or remove the screw on the clamping block. The maximum tightening torque of the screw is 0.5 Nm.

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

Procedure

1. Insert the device into the front of the prepared, burr-free and flat installation cutout. For the dimensions of the installation cutout, see Fig. 6 "Panel PC 2200 with AP1000 panels with clamping blocks - Installation diagram" on page 23. The number of clamping blocks may vary depending on the panel. For the exact number, see Tab. 15 "AP1000 panels with clamping blocks - Installation diagrams" on page 23.

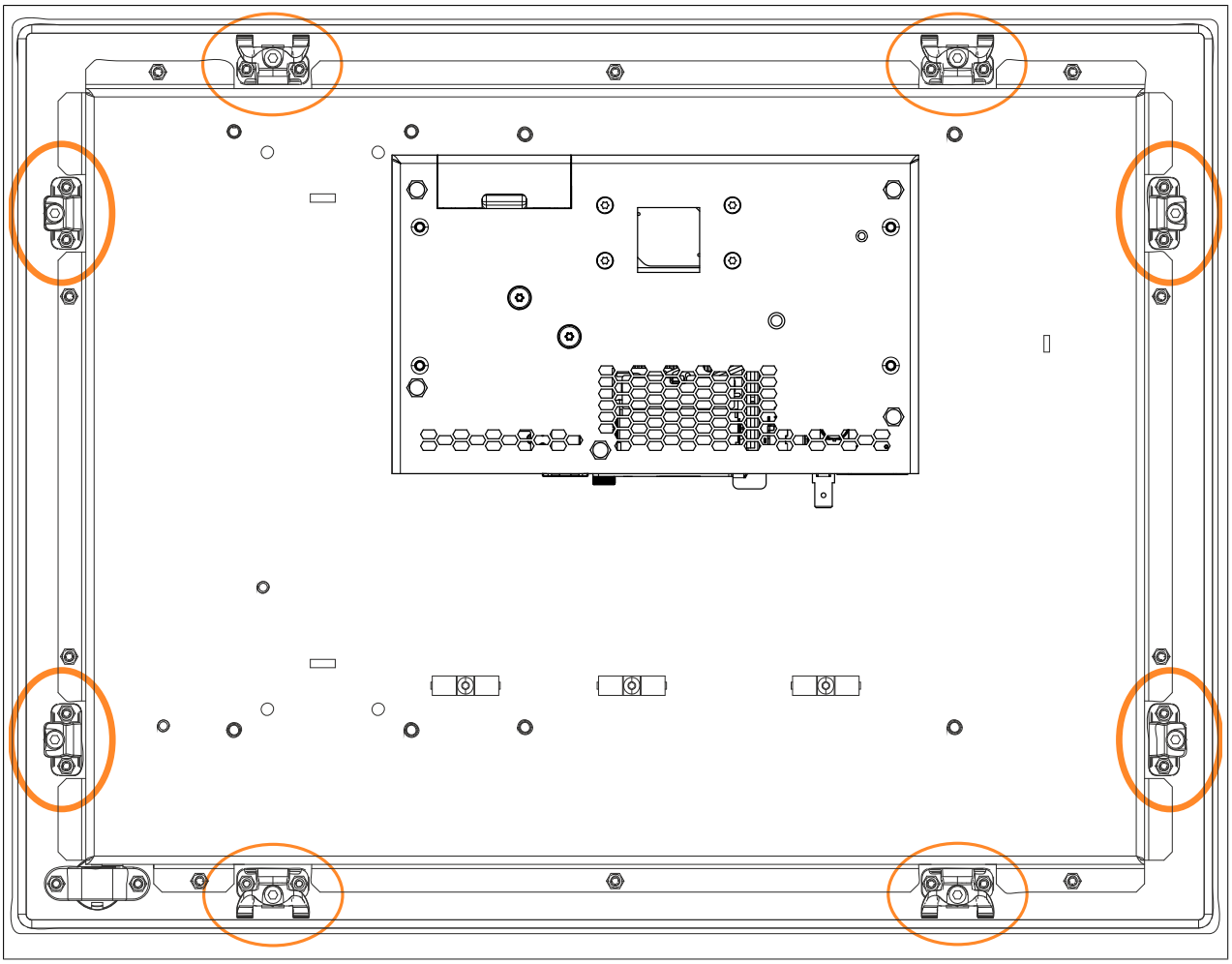


Figure 118: Position of the clamping blocks

2. Secure the clamping blocks to the wall or control cabinet plate by alternately tightening the mounting screws with a 3 mm hex screwdriver. The mounting screws push the clamping lever downwards, which in turn clamps the device to the wall or control cabinet plate. The tightening torque for optimal sealing should be max. 0.5 Nm.

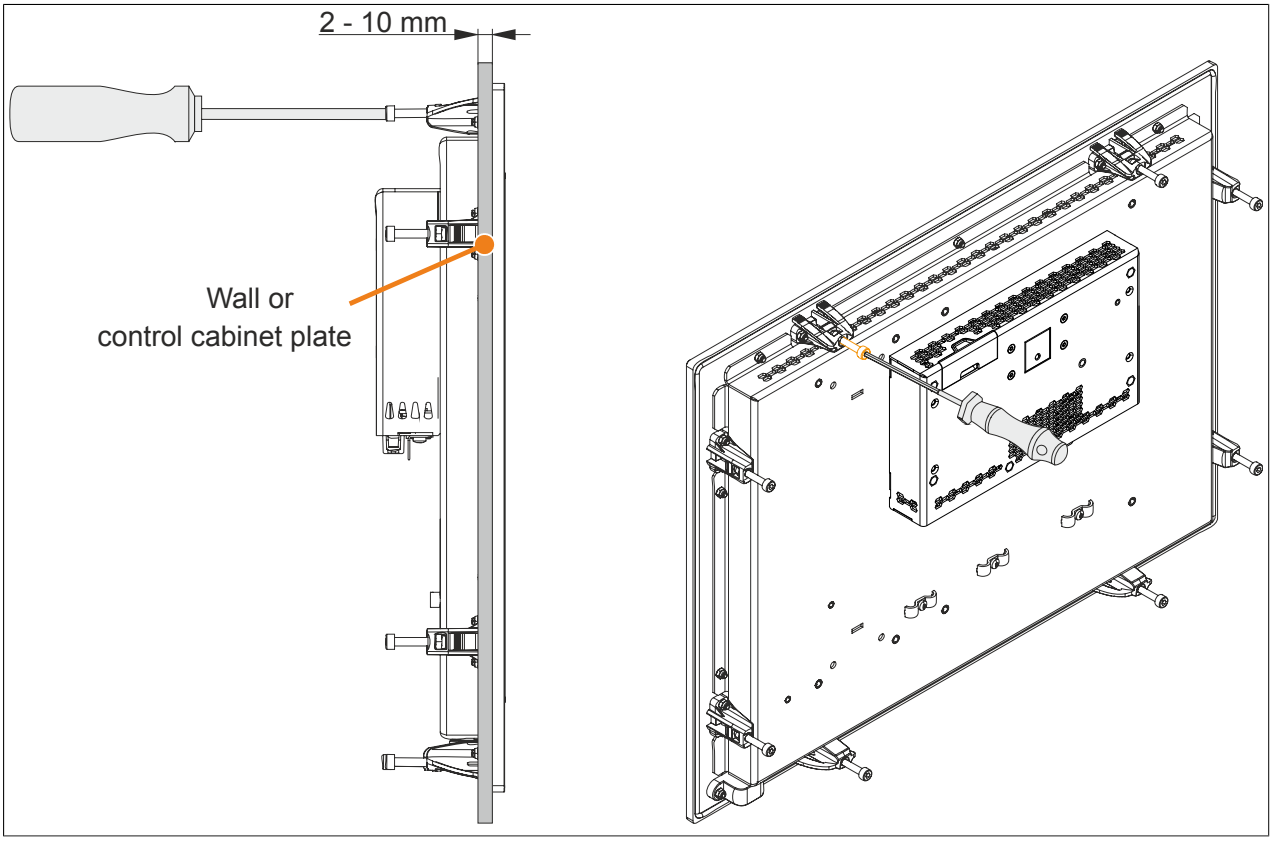


Figure 119: Tightening the clamping blocks

3.1.5 Installation information for separate shipments

Information:

If the Panel PC 2200 is not delivered as a complete system but as a separate shipment, or if individual components are retrofitted, these components must be enabled in BIOS. To do this, launch BIOS during system startup, load the BIOS default values and save the settings. For additional information, see "Exit" on page 253. This is required for the following individual components:

- **System unit**
- **Panel**

3.1.6 Replacing the system unit

1. Disconnect the power supply cable to the Panel PC (disconnect the power cable!). Disconnect from all sources and poles!
2. Carry out electrostatic discharge at the ground connection.
3. Remove the Panel PC from the control cabinet by following the installation steps in reverse order.
4. Place the Panel PC on a clean, flat surface.
5. The Torx screws (T10) marked in the following figure must be removed, see also "Product information - Installation markings" on page 42 .

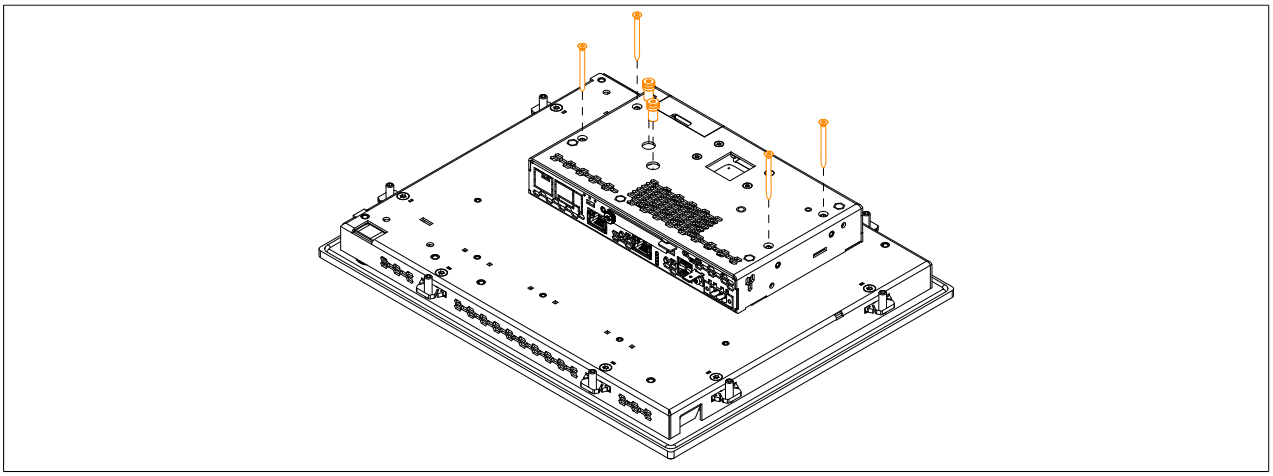


Figure 120: Removing the Torx screws

6. The system unit can now be removed by pulling upwards.

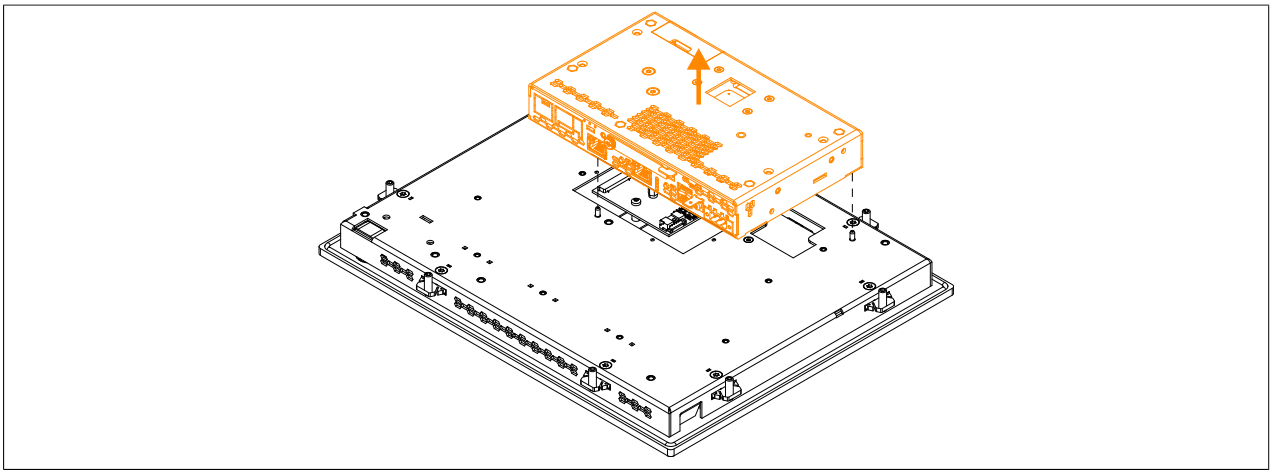


Figure 121: Removing the system unit

7. The system unit can be reinstalled in reverse order. The max. tightening torque of the Torx screws (T10) is 0.5 Nm.
   Only the supplied installation materials are permitted to be used to install the system unit.

3.2 Connecting to the power grid

Danger!

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

3.2.1 Installing the DC power cable

Danger!

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

3.2.1.1 Wiring

Install the DC power cable on the terminal block (power supply connector) as shown in the figure below. Conductors with a cross section of 0.75 mm² to 1.5 mm² and wire end sleeve must be used.

Installing screw clamp terminal block 0TB103.9

Secure the conductors with wire end sleeves in the terminal contacts ② as shown in the figure below and tighten the screw clamp terminals ① with a screwdriver (tightening torque max. 0.4 Nm).

When wiring, pay attention to the pinout of the power supply connection on the device!

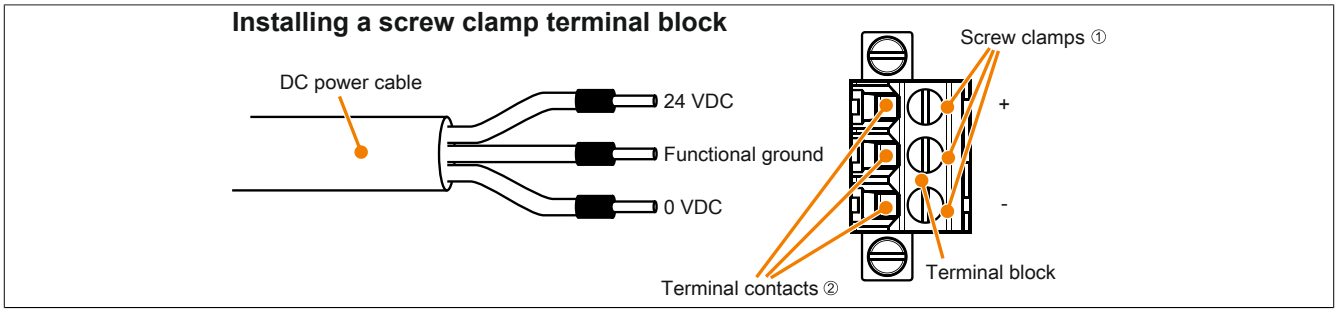


Figure 122: Installing a screw clamp terminal block

Installing cage clamp terminal block 0TB103.91

Insert a screwdriver into the cage clamp terminals ① and secure the conductors with wire end sleeves in the terminal contacts ② as shown in the figure below. Close the terminal contact by removing the screwdriver.

When wiring, pay attention to the pinout of the power supply connection on the device!

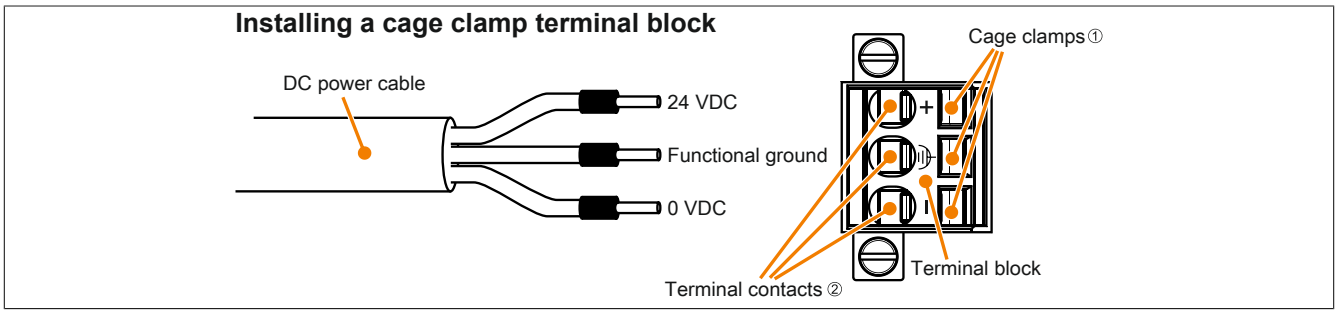


Figure 123: Installing a cage clamp terminal block

3.2.2 Connecting the power supply to a B&R device

Danger!

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

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

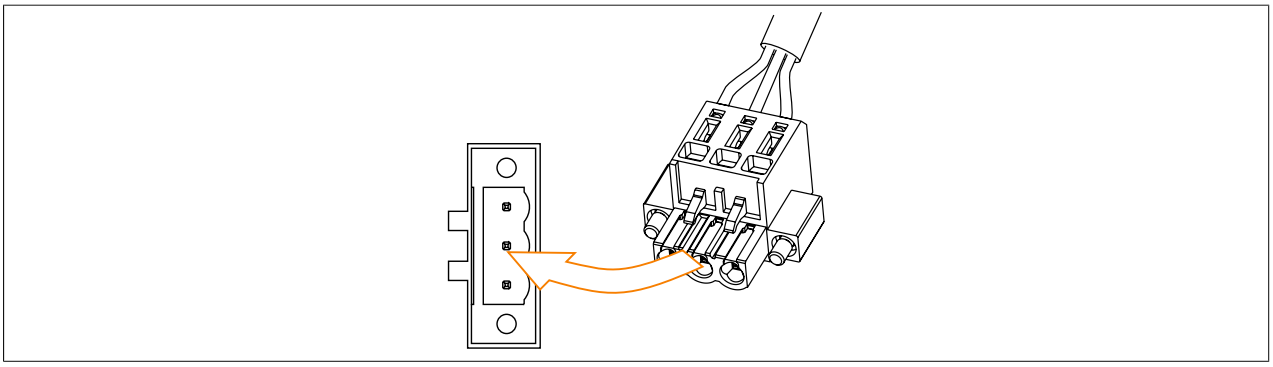


Figure 124: Connecting the power supply connector to a B&R device

3.2.3 Functional ground grounding concept

Functional ground is a current path of low impedance between circuits and ground. It is used to improve immunity to interference, for example, and not as a protective measure. It serves only to divert interference, not to protect against contact with persons.

The device is equipped with 2 functional ground connections:

- Functional ground connection of the power supply
- Ground connection

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

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

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

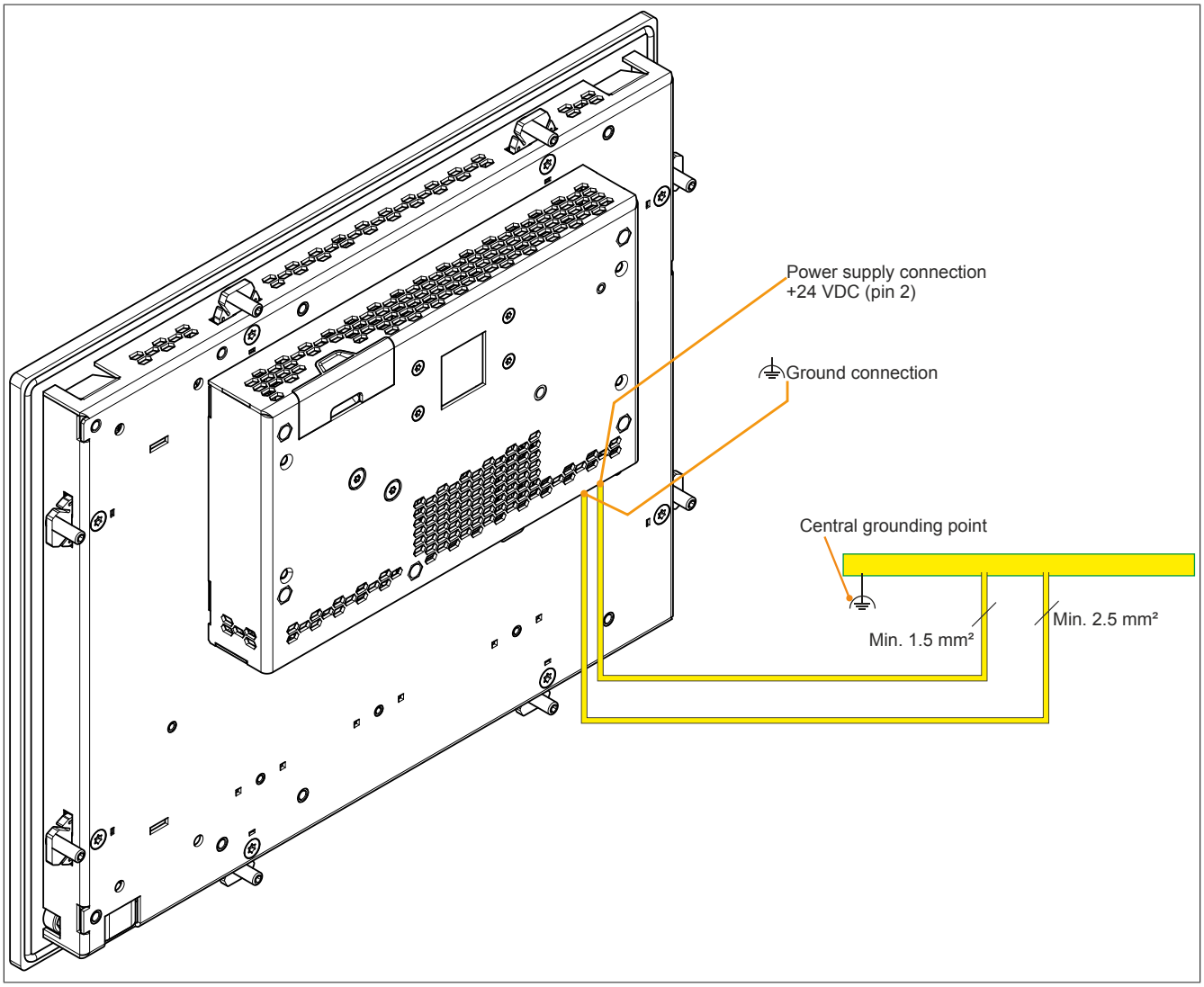


Figure 125: Panel PC 2200 - Grounding concept

3.3 Connecting cables

When connecting or installing cables, the bend radius specification must be observed.

Information:

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

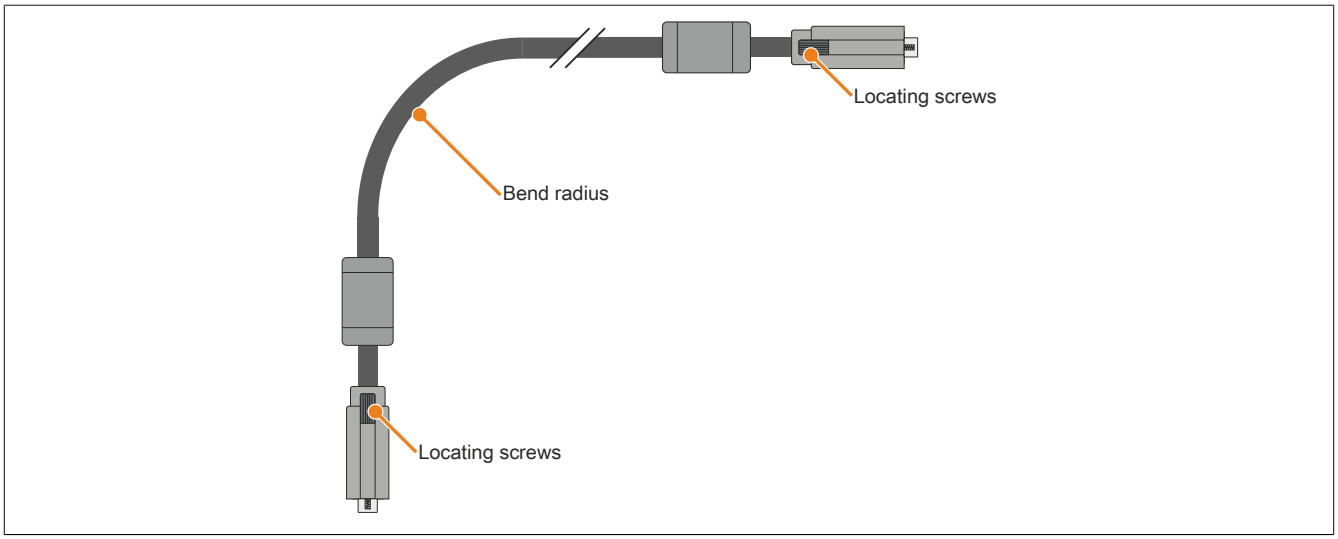


Figure 126: Connecting cables - Bend radius

Information:

For the specified bend radius, see the technical data of the respective cable.

3.4 Switching on the device for the first time

3.4.1 General information before switching on the device

Checklist

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

- Have the installation instructions been observed as described in "Installation" on page 208?
- Have the permissible ambient conditions and environmental conditions for the device been taken into account?
- Is the power supply connected correctly and have the values been checked?
- Is the ground cable correctly connected to the ground connection?
- Before installing additional hardware, the device must have been started up.

> **Caution!**
>
> **Before the device is started up, it must be gradually adapted to room temperature! Exposure to direct heat radiation is not permitted.**
>
> **During transport at low temperatures or large temperature fluctuations, the collection of moisture in or on the device is not permitted.**
>
> **Moisture can cause short circuits in electrical circuits and damage the device.**

Requirements

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

- The functional ground connections are as short as possible and connected to the central grounding point using the largest possible conductor cross section.
- All connection cables are connected correctly.
- A USB keyboard and USB mouse are connected (optional).

3.4.2 Switching on the device

Procedure

1. Connect the power supply and switch it on.
2. The device is operating and boots; LED "Power" lights up.

3.5 General instructions for the temperature test procedure

The purpose of these instructions is to explain the general procedure for application-specific temperature tests with B&R industrial PCs or Power Panels. These instructions are only guidelines, however.

3.5.1 Procedure

In order to obtain accurate results, the test conditions should correspond to conditions in the field. This means that during the temperature tests, the target application should be running, the PC should be installed in the control cabinet housing that will be used later, etc.

In addition, a temperature sensor should be installed for the device being tested in order to continuously monitor the ambient temperature. To obtain correct values, it must be installed at a distance of approx. 5 to 10 cm from the B&R industrial PC near the air intake (not near the exhaust air).

Every B&R industrial PC or Power Panel is equipped with internal temperature sensors. Depending on the device family, these are installed in different positions. The number and temperature limits vary depending on the device family.

For position specifications of the temperature sensors and their maximum specified temperatures, see section .

A minimum test time of 8 hours is recommended for to optimally determine and assess the temperature situation.

3.5.2 Evaluating temperatures in Windows operating systems

3.5.2.1 Evaluating with the B&R Control Center

The B&R Control Center can be used to evaluate temperatures. The temperatures can be viewed in tab "Temperatures". The B&R Control Center can be downloaded at no cost from the B&R website (www.br-automation.com). The B&R Control Center uses the B&R Automation Device Interface (ADI).

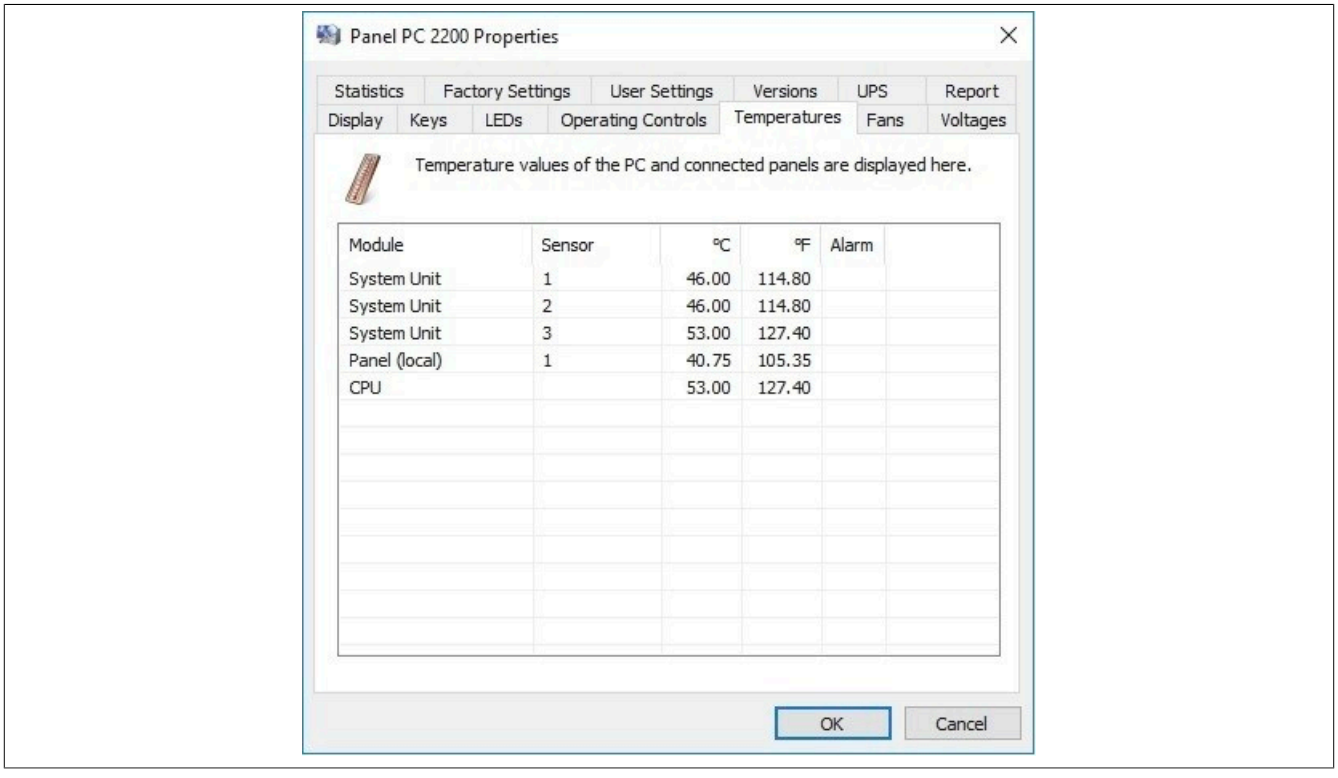


Figure 127: Evaluating with the B&R Control Center using a PPC2200 without IF options

If historical recording of the data is necessary, a separate application can be created.

Information:

To create a separate application, downloads such as the ADI .NET SDK are available from the B&R website (www.br-automation.com).

3.5.2.2 Evaluation with BurnInTest from PassMark

If a separate application is not created or used for temperature evaluation, B&R recommends using the BurnInTest software tool from PassMark.

The BurnInTest software tool is available in standard and professional versions. In addition to the software package, various loopback adapters (serial, parallel, USB, etc.) and test CDs or DVDs are also available. Depending on the expansion level of the software and available loopback adapters, a correspondingly high system and peripheral load can be generated.

Information:

Loopback adapters are also available from PassMark. For more information, see www.passmark.com.

The following screenshots refer to PassMark BurnInTest Pro V8.1 using a PPC2200 without IF options.

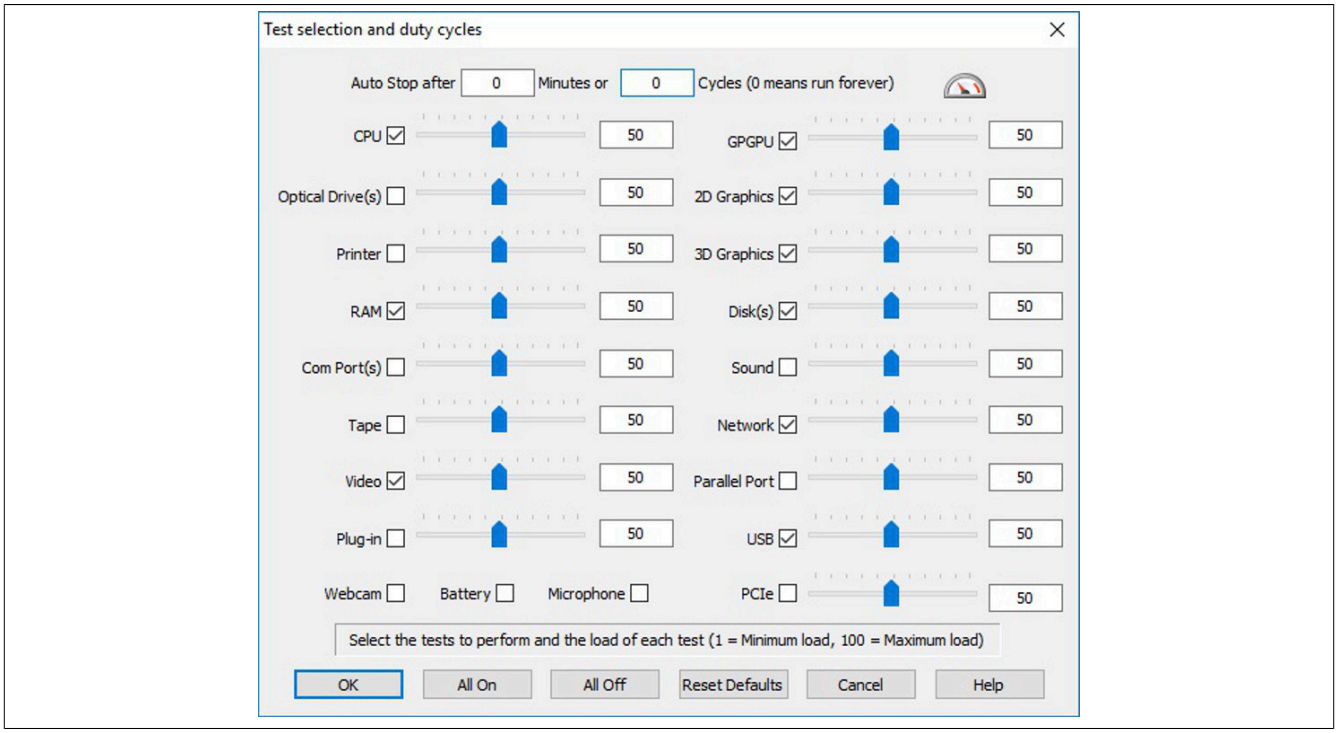


Figure 128: Settings for PassMark BurnInTest Pro V8.1 using a PPC2200 without IF options

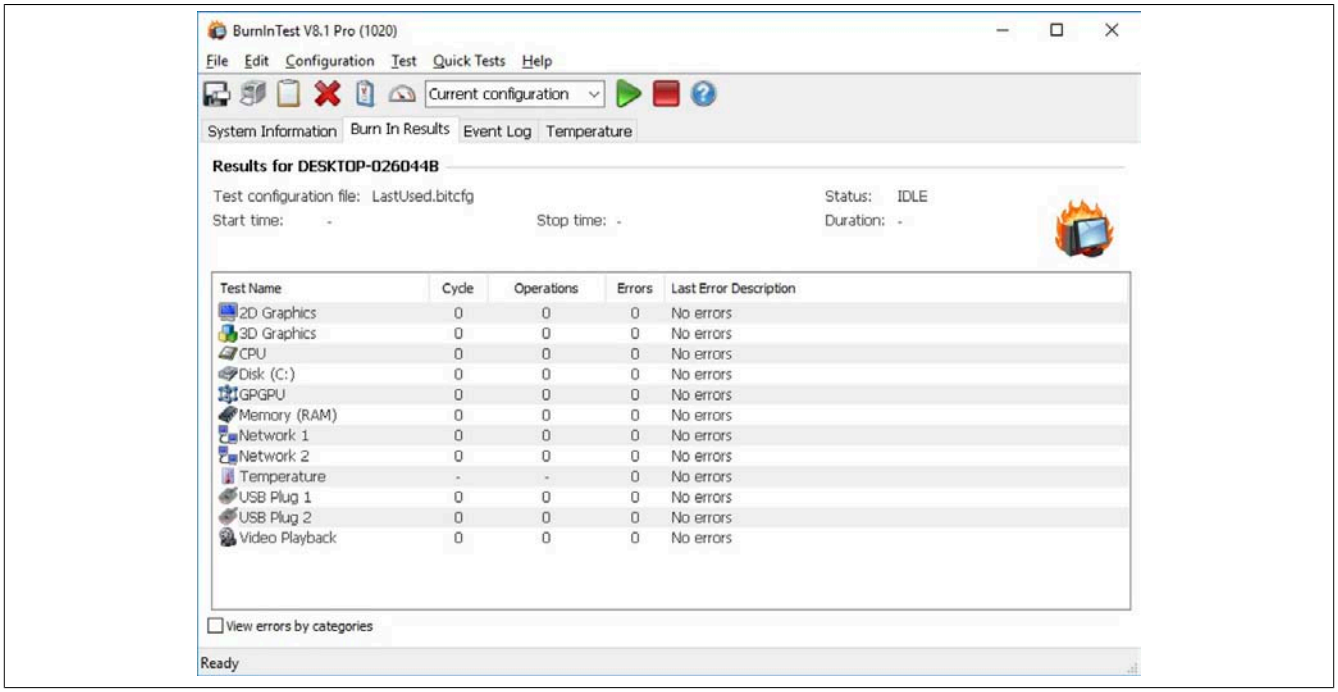


Figure 129: Test overview of a PPC2200 without IF options

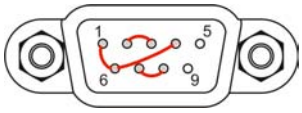
Depending on the availability of the loopback adapters and DVDs, appropriate fine tuning must be carried out in the respective test properties.

Information:

If no USB loopback adapters are available, USB flash drives can also be used. The USB flash drives must be available in Windows as formatted drives. Option "USB" must then be deselected in the test configuration, and the USB flash drives must be configured as test devices in the disk properties.

Information:

Serial loopback adapters can be created relatively easily by yourself. Just connect some pins with wires on the serial interface.



3.5.3 Evaluating temperatures in non-Windows operating systems

For applications that do not run in approved operating systems, temperatures can be evaluated using the B&R MTCX Development Kit. The MTCX Development Kit also contains executable EFI sample programs.

The implementation guide describes only device-specific functions and not the main functions of the sample programs.

If the code from the sample programs is applied, the notes in the implementation guide for the TODO instructions, I/O access functions, etc. must be taken into account!

Information:

For current B&R PC series (APC910 and later), the MTCX Development Kit can be downloaded at no cost from the B&R website (www.br-automation.com).

Sample programs and implementation guides for all other B&R PC series can be downloaded at no cost from the B&R website (www.br-automation.com).

3.5.4 Evaluating the measurement results

The recorded maximum temperature value of each individual sensor is not permitted to exceed the temperature limit specified in the user's manuals.

If the temperature tests cannot be carried out in a climate chamber, they can be carried out in an office environment, for example. It is necessary to record the ambient temperature, however. Based on experience gained at B&R, the measured temperature values can be extrapolated linearly to the ambient temperature for passive systems (systems without a fan kit). In order to also be able to extrapolate the temperature values for systems with a fan kit, the fans must be running. The speed, etc. must also be taken into account.

If the temperature tests are carried out in a controlled climate chamber with a fan, the devices to be tested are cooled by this fan and thus the measurement results are distorted. With passive devices, the measurement results are therefore unusable. In order to be able to carry out temperature tests in climate chambers with fans without distorting the measurement results, however, the fan of the climate chamber must be switched off and a correspondingly long lead time (several hours) must be observed.

3.6 Touch screen calibration

3.6.1 Single-touch (analog resistive)

3.6.1.1 Windows 10 IoT Enterprise 2016 LTSB

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

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

3.6.2 Multi-touch (projected capacitive - PCT)

3.6.2.1 Windows 10 IoT Enterprise 2016 LTSB

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

3.7 Adjusting the display brightness

1. Open the Control Center in the Control Panel.
2. Select tab "Display".
3. Select a panel from the list. Only the local display (PP Link) and connected panels are displayed in the list.
4. Set the desired brightness using the slider.

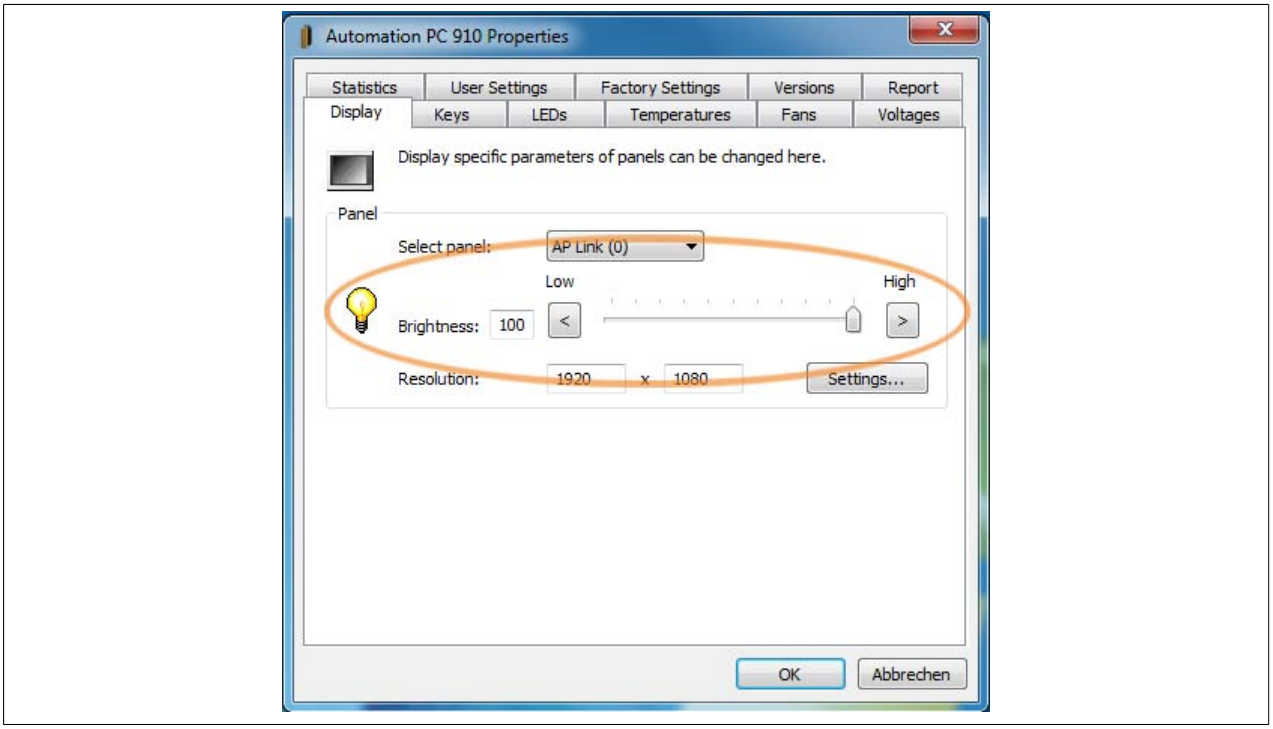


Figure 130: Adjusting the display brightness

Information:

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

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

3.8 Known problems / Characteristics

- If problems occur with the ETH1 or ETH2 interface (connection abort, slow data transfer, etc.), the Energy-Efficient Ethernet feature can be disabled in the driver as a possible solution.

4 Software

4.1 UEFI BIOS options

4.1.1 General information

The Unified Extensible Firmware Interface (UEFI) and its predecessor Extensible Firmware Interface (EFI) establish the basic standardized connection between the user and the system (hardware and firmware), the individual components of a computer and the operating system. This B&R industrial PC uses UEFI BIOS from the Insyde Software corporation.

The UEFI BIOS Setup Utility allows you to modify basic system configuration settings. These settings are stored in a flash block.

Information:

The following BIOS settings are system-optimized. Changes to these settings should only be made by system experts who are aware of the effects of the modification.

4.1.1.1 Adaptation for touch operation

The BIOS used for the APC2200/PPC2200 was developed with touch screen systems in mind. Compared to other or older B&R systems, the user interface, especially buttons and selection fields, is therefore larger. In addition, the setting and configuration options are divided into separate submenu structures.
The APC2200/PPC2200 can still be used with standard displays and operator panels without sacrificing user friendliness, however.

4.1.1.2 Overview of BIOS description

Note:

This description is for the full extent of version 1.00. Depending on the system configuration, BIOS version and BIOS settings, individual parameters or (sub)menus may not be displayed.

For simplification purposes, only setting option "Enter" is explicitly listed below. All settings can also be made via mouse click or touch screen.

These figures are only excerpts from the respective menus. A complete list of all parameters and menus is available in a table in each section.
Depending on the display system used, you can navigate to all menus on the device using the slide bar or mouse and keyboard input.

Variables written in italics (*n*) are used to maintain clarity and to summarize different menus that have the same setting options. When first mentioned, their range of values is defined and, if necessary, further notes are listed. *n* within a certain range of values of a certain BIOS setting is only valid for this parameter. Each combination of "[BIOS parameter]" and "*n*" is defined independently.

Entries outside a specified range of values are not applied.

Note:

Default values are marked bold and italic in column "Input options" in tables.

Submenus are bold in column "BIOS parameter" in tables.

BIOS parameter			Input options	Description
BIOS parameter 1			***Enable(d)***	Disables/Enables BIOS parameter 1
			Disable(d)	
BIOS parameter 1 value			UINT Default: ***42***	Defines the value of BIOS parameter 1 Range: 0 to 65535 Resolution: 3
BIOS parameter 2			-	Displays BIOS parameter 2
	BIOS parameter 2.1		a1	Selects mode of BIOS parameter 2.1
			a2	
			b	
		BIOS subparameter 2.1 value	***Disable(d)***	Disables/Enables BIOS subparameter 2.1
			Enable(d)	
BIOS parameter *n* [1]			***Disable(d)***	Disables BIOS parameter *n* or selects option
			(Various)[2]	
Hardware components			Enter	Opens submenu "Hardware components" on page xyz

Table 229: Main menu - Menu - Submenu(s)

1) The 16 possible parameters are indexed from 0 to 15.
2) Setting option "(Various)" combines different values/modes with different dependencies.

4.1.2 UEFI BIOS setup and start procedure

UEFI BIOS is enabled immediately after switching on the B&R industrial PC. A check takes place as to whether the setup data from the flash block is "OK". If it is OK, the boot process is started. If it is not OK, the setup default settings are loaded and the boot process is continued.

UEFI BIOS reads the system configuration information, checks the system and configures it through the power-on self-test (POST).

UEFI BIOS then searches the data storage media in the system (CFast, USB devices, etc.) for an operating system. UEFI BIOS starts the operating system and transfers to it control over system operations.

To enter UEFI BIOS Setup, the "Esc", "Del" or "F2" key must be pressed after initializing the USB controller as soon as the following message appears on the screen (during POST): "Press ESC / DEL / F2 to enter Setup".

Figure 131: Boot screen

4.1.3 Boot menu

Figure 132: Boot menu

Boot menu option	Description
Continue	Continues the default boot process from the boot menu.
Boot manager	Lists all detected and bootable media. See "Boot manager" on page 233.
Device management	Lists all supported and enabled devices (e.g. RAID and Ethernet). See "Device manager" on page 234.
Boot from file	Selects a bootable file to boot from. Depending on the boot configuration, the files can also be stored on external storage media.
Administer Secure Boot	For a detailed description of this option, see the user documentation from the operating system manufacturer.
Setup utility	Carries out advanced boot configurations. See "Setup utility" on page 235.

Table 230: Boot menu

4.1.4 Boot manager

Figure 133: Boot manager

The boot manager lists all detected and bootable legacy or UEFI media. It is possible to select from which of these media the boot process should be performed.

4.1.5 Device manager

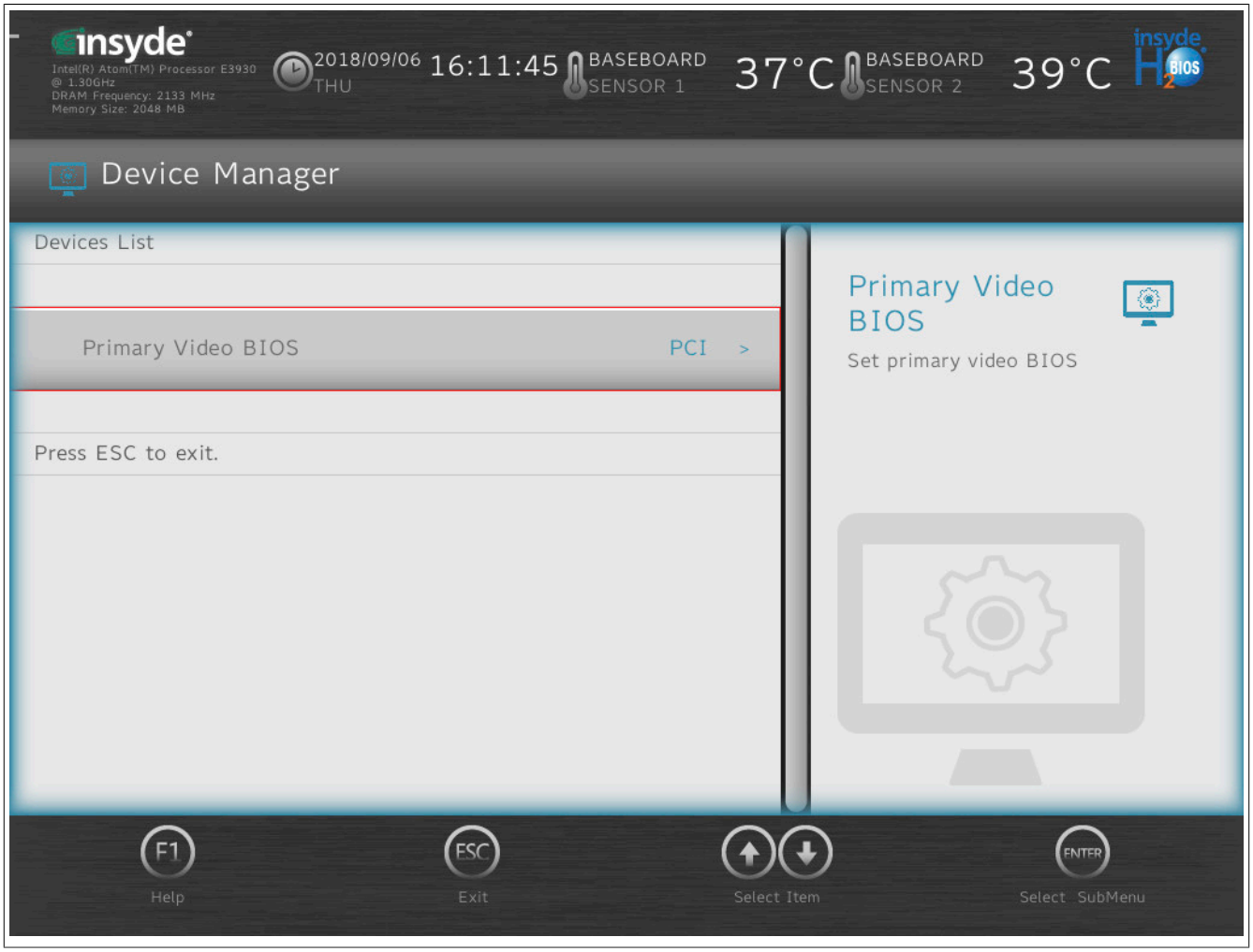


Figure 134: Device manager

The device manager lists all compatible and enabled devices.

BIOS parameter	Setting options	Description
Primary video BIOS	***PCI***	Selects the primary video BIOS
	AGP	

Table 231: Device manager

4.1.6 Setup utility

Settings can be made in boot menu option "Setup utility".

Submenu	Setting options	Description
Main	Enter	Opens submenu "Main" on page 236 Basic system information is displayed and the system time can be set here.
Advanced	Enter	Opens submenu "Advanced" on page 237 Changes to system settings can be made here.
Security	Enter	Opens submenu "Security" on page 247 Changes to the Trusted Platform Module can be made here. Passwords for storage media can be created and managed here.
Power	Enter	Opens submenu "Power" on page 248 Changes that affect the power consumption of the system can be made here.
Boot	Enter	Opens submenu "Boot" on page 250 Changes to the boot modes and boot order can be made here.
Exit	Enter	Opens submenu "Exit" on page 253 Changes can be discarded or saved here. User-specific default values can be saved and loaded here or system-optimized default values from B&R can be restored.

Table 232: Boot menu - Setup utility

4.1.6.1 Main

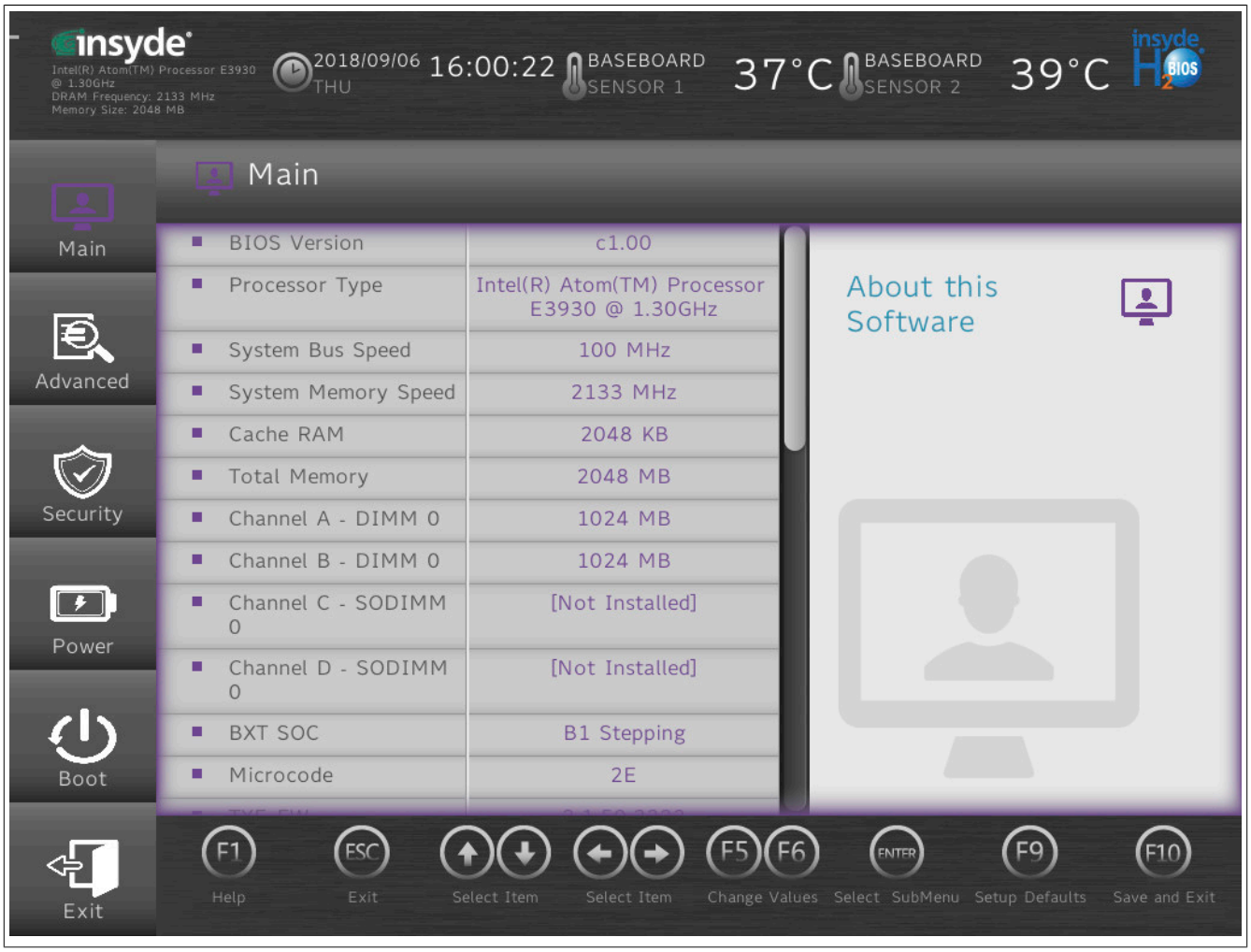


Figure 135: Main

BIOS parameter	Setting options	Description
BIOS version	-	Displays the BIOS version
Processor type	-	Displays the processor type
System bus speed	-	Displays the bus speed
System memory speed	-	Displays the memory speed
Cache RAM	-	Displays the processor cache
Total memory	-	Displays the total memory
Channel A - DIMM 0	-	Displays the amount of memory for channel A
Channel B - DIMM 0	-	Displays the amount of memory for channel B
Channel C - SODIMM 0	-	Displays the amount of memory for channel C
Channel D - SODIMM 0	-	Displays the amount of memory for channel D
BXT SOC	-	Displays SOC stepping
Microcode	-	Displays the microcode revision
TXE FW	-	Displays the TXE version
IGD VBIOS version	-	Displays the VBIOS version of the internal graphics device
System time	INT	Adjusts the system time in the format hh:mm:ss
System date	INT	Adjusts the system date in the format yyyy:mm:dd
About this software	Enter	Displays the copyright disclaimer

Table 233: Main

4.1.6.2 Advanced

Figure 136: Advanced

BIOS parameter	Setting options	Description
OEM features	Enter	Opens submenu "OEM features" on page 238
Graphics configuration	Enter	Opens submenu "Graphics configuration" on page 242
IO configuration	Enter	Opens submenu "IO configuration" on page 243
Security configuration	Enter	Opens submenu "Security configuration" on page 246
ACPI settings	Enter	Opens submenu "ACPI settings" on page 246

Table 234: Advanced

4.1.6.2.1 OEM features

Figure 137: Advanced - OEM features

BIOS parameter	Setting options	Description
BIOS version	-	Displays the BIOS version
MTCX version	-	Displays the MTCX version
Realtime environment	***Disabled***	Disables/Enables the real-time environment This must be enabled for real-time operating systems such as Automation Runtime.
	Enabled	
Automatic firmware update	***Disabled***	Disables/Enables automatic firmware updates for the mainboard, SDL and SDL4 cards
	Enabled	
Super IO	Enter	Opens submenu "Super IO" on page 238
H2OUVE	Enter	Opens submenu "H2OUVE" on page 239
Baseboard	Enter	Opens submenu "Baseboard" on page 239
Interface slot *n* [1)2)]	Enter	Opens submenu "Interface slot n " on page 240
Panel settings	Enter	Opens submenu "Panel settings" on page 240
SSD monitoring service	Enter	Opens submenu "SSD monitoring services" on page 240

Table 235: Advanced - OEM features

1) A total of 2 interface option slots are available. Slot IF option 2 (label: Monitor/Panel) is reserved for graphic interfaces.
2) Unused IF option slots are not displayed.

4.1.6.2.1.1 Super IO

BIOS parameter		Setting options	Description
CAN device		-	Indicates whether a CAN interface (IF option) is installed The CAN interface uses I/O addresses 0x384 - 0x385 and IRQ 10.
COM A		Disable	Disables/Enables COM A (IF option 1)
		Enable	
	Base I/O address	0x2E8	Selects the I/O address for COM A
		0x2F8	
		0x338	
		0x378	
		0x3E8	
		0x3F8	

Table 236: Advanced - OEM features - Super IO

BIOS parameter		Setting options	Description
	Interrupt	IRQ3	Selects the interrupt for COM A
		IRQ4	
		IRQ5	
		IRQ7	
		IRQ11	
COM B		Disable	Disables/Enables COM B (LFP touch screen)
		Enable	
	Base I/O address	0x2E8	Selects the I/O address for COM B
		0x2F8	
		0x338	
		0x378	
		0x3E8	
		0x3F8	
	Interrupt	***IRQ3***	Selects the interrupt for COM B
		IRQ4	
		IRQ5	
		IRQ7	
		IRQ11	
COM C		Disable	Disables/Enables COM C (SDL touch screen option)
		Enable	
	Base I/O address	0x2E8	Selects the I/O address for COM C
		0x2F8	
		0x338	
		0x378	
		0x3E8	
		0x3F8	
	Interrupt	IRQ3	Selects the interrupt for COM C
		IRQ4	
		IRQ5	
		IRQ7	
		IRQ11	
COM D		Disable	Disables/Enables COM D (IF option 1)
		Enable	
	Base I/O address	***0x2E8***	Selects the I/O address for COM D
		0x2F8	
		0x338	
		0x378	
		0x3E8	
		0x3F8	
	Interrupt	IRQ3	Selects the interrupt for COM D
		IRQ4	
		IRQ5	
		IRQ7	
		IRQ11	

Table 236: Advanced - OEM features - Super IO

4.1.6.2.1.2 H2OUVE

BIOS parameter	Setting options	Description
H2OUVE support	***Disabled***	Disables/Enables H2OUVE support
	Enabled	

Table 237: Advanced - OEM features - H2OUVE

4.1.6.2.1.3 Baseboard

BIOS parameter	Setting options	Description
Product name	-	Displays the B&R model number of the mainboard
Serial number	-	Displays the B&R serial number of the mainboard
Device ID	-	Displays the device ID of the mainboard
Vendor ID	-	Displays the vendor ID of the mainboard
Compatibility ID	-	Displays the compatibility ID of the mainboard
HW revision	-	Displays the hardware revision of the mainboard
Parent device ID	-	Displays the parent device ID of the mainboard
Parent comp. ID	-	Displays the parent compatibility of the mainboard
Power on cycles[1)]	-	Displays the power-on cycles of the mainboard
Power on hours	-	Displays the operating time [h] of the mainboard
Battery voltage	-	Displays the battery voltage [V]

Table 238: Advanced - OEM features - Baseboard

BIOS parameter	Setting options	Description
Battery state	-	Displays the battery state
Temperature 1	-	Displays the current temperature at sensor 1 [°C and °F]
Temperature 2	-	Displays the current temperature at sensor 2 [°C and °F]
Temperature 3	-	Displays the current temperature at sensor 3 [°C and °F]

Table 238: Advanced - OEM features - Baseboard

1) Each start/restart increases the value by 1.

4.1.6.2.1.4 Interface slot *n*

A total of 2 interface option slots are available. They are indexed from 1 to 2.

BIOS parameter	Setting options	Description
Product name	-	Displays the B&R model number of IF option *n*
Serial number	-	Displays the B&R serial number of IF option *n*
Device ID	-	Displays the device ID of IF option *n*
Vendor ID	-	Displays the vendor ID of IF option *n*
Compatibility ID	-	Displays the compatibility ID of IF option *n*
HW revision	-	Displays the hardware revision of IF option *n*
FW version[1)]	-	Displays the firmware version of IF option *n*
Parent device ID	-	Displays the parent device ID of IF option *n*
Parent comp. ID	-	Displays the parent compatibility ID of IF option *n*
Power on cycles[2)]	-	Displays the power-on cycles of IF option *n*
Power on hours	-	Displays the operating time [h] of IF option *n*
Temperature *q*[3)]	-	Displays the temperature at sensor *q* [°C and °F]

Table 239: Advanced - OEM features - Interface slot *n*

1) For graphics options only.
2) Each start/restart increases the value by 1.
3) Depending on the IF option card, the number of temperature sensors varies from 0 (parameter not displayed) to 4.

4.1.6.2.1.5 Panel settings

BIOS parameter	Setting options	Description
Panel *n*	Enter	Opens menu "Panel n" on page 240

Table 240: Advanced - OEM features - Panel settings

Panel *n*

The panel of the Panel PC is indexed as panel 15.

BIOS parameter	Setting options	Description
Product name	-	Displays the B&R model number of the panel
Serial number	-	Displays the B&R serial number of the panel
Device ID	-	Displays the device ID of the panel
Vendor ID	-	Displays the vendor ID of the panel
Compatibility ID	-	Displays the panel's compatibility ID
HW revision	-	Displays the hardware revision of the panel
Backlight on cycles[1)]	-	Displays the backlight-on cycles of the panel
Backlight on hours	-	Displays the operating time of the backlight [h] for the panel
Power on cycles[2)]	-	Displays the power-on cycles of the panel
Power on hours	-	Displays the operating time [h] of the panel
Brightness	INT Default: ***100***	Screen brightness of the panel [%]. Range: 0 to 100 Resolution: 1%

Table 241: Advanced - OEM features - Panel settings - Panel *n*

1) Each time the backlight is switched on increases the value by 1.
2) Each start/restart increases the value by 1.

4.1.6.2.1.6 SSD monitoring services

BIOS parameter	Setting options	Description
CFast		
Product name	-	Displays the name of the CFast card
Serial number	-	Displays the manufacturer serial number of the CFast card

Table 242: Advanced - OEM features - SSD monitoring service

BIOS parameter	Setting options	Description
SMART[1] status	-	Displays the S.M.A.R.T. status of the CFast card
WAF[2]	-	Displays the WAF of the CFast card
Average erase count	-	Displays the average number of erase operations on a block of the CFast card
Remaining life	-	Displays the remaining service life of the CFast card [%]

Table 242: Advanced - OEM features - SSD monitoring service

1) Self-Monitoring, Analysis and Reporting Technology
2) Write amplification factor

4.1.6.2.2 Graphics configuration

BIOS parameter	Setting options	Description
Rotate screen	***Disabled***	Disables or selects rotation of the screen content Rotation takes place clockwise.
	90° clockwise	
	270° clockwise	
Integrated graphics device	Disabled	Disables/Enables the integrated graphics device (IGD or GPU)
	Enabled	
RC6 (render standby)	Disabled	Disable/Enables RC6 (render standby) Permits the GPU to go into standby.
	Enabled	
GTT[1] size	2 MB	Selects the GTT size [MB]
	4 MB	
	8 MB	
Aperture size	128 MB	Selects reserved RAM [MB] If the graphics memory is full, the defined amount of memory is made available.
	256 MB	
	512 MB	
DVMT[2] pre-allocated	(Various) Default: ***64M***	Defines the allocated graphics memory (DVMT) [MB] to be used by the IGD. Range: 64M to 512M
DVMT total Gfx mem	128M	Selects the memory size [MB] that can be used by the IDG. MAX uses the entire available main memory.
	256M	
	MAX	
Cd clock frequency	144 MHz	Select highest supported Cd clock frequency [MHz]
	288 MHz	
	384 MHz	
	576 MHz	
	624 MHz	
GT PM support	Disabled	Disables/Enable GT PM support
	Enabled	
PAVP enable	Disabled	Disables/Enables "Force protected audio video path"
	Enabled	
ALS support[3]	Disabled	Disables/Enables ALS support
	Enabled	
Panel scaling	***Auto***	Selects automatic, centered or stretched panel scaling
	Centering	
	Stretching	

Table 243: Advanced - Graphics configuration

1) Graphics translation table (cf. graphics aperture/address remapping table (GART))
2) Dynamic video memory technology
3) Ambient light sensor

4.1.6.2.3 IO configuration

BIOS parameter	Setting options	Description
PCI Express configuration	Enter	Opens submenu "PCI Express configuration" on page 243
SATA configuration	Enter	Opens submenu "SATA configuration" on page 244
USB configuration	Enter	Opens submenu "USB configuration" on page 245
Miscellaneous configuration	Enter	Opens submenu "Miscellaneous configuration" on page 245

Table 244: Advanced - IO configuration

4.1.6.2.3.1 PCI Express configuration

BIOS parameter	Setting options	Description
PCI Express clock gating	Disabled	Disables/Enables PCI Express clock gating for root ports
	Enabled	
Port8xh decode	***Disabled***	Disables/Enables Port8xh decoding
	Enabled	
Peer memory write enable	***Disabled***	Disables/Enables peer memory write enable
	Enabled	
Compliance mode	***Disabled***	Disables/Enables compliance mode
	Enabled	
PCI Express root port 2 (IF1)	Enter	Opens submenu "PCI Express root port n" on page 243[1]
PCI Express root port 3 (ETH1)	Enter	
PCI Express root port 4 (ETH2)	Enter	
PCI Express root port 5 (IF1)	Enter	

Table 245: Advanced - IO configuration - PCI Express configuration

1) Each parameter opens its own menu. Since the included options are the same, schematic menu "PCI Express root port *n*" is described here.

PCI Express root port *n*

BIOS parameter		Setting options		Description
PCI Express root port *n*[1]		***Auto***		Disables/Enables PCI Express root port *n* manually or automatically In mode "Auto", unallocated interfaces are automatically disabled and allocated interfaces are enabled.
		Disabled		
		Enabled		
ASPM		***Auto***		Selects PCIe Active State Power Management manually/automatically or disables it
		Disabled		
		L0sL1		
		L0s		
		L1		
L1 substates		Disabled		Selects or disables L1 substates
		L1.1		
		L1.2		
		L1.1 & L1.2		
	ACS	Disabled		Disables/Enables access control services extended capabilities
		Enabled		
	URR	***Disabled***		Disables/Enables unsupported request reporting Notification of unsupported requests
		Enabled		
	FER	***Disabled***		Disables/Enables fatal error reporting Notification of fatal errors[2]
		Enabled		
	NFER	***Disabled***		Disables/Enables non-fatal error reporting Notification of non-fatal errors[2]
		Enabled		
	CER	***Disabled***		Disable/Enable correctable error reporting Notification of correctable errors[2]
		Enabled		
	CTO	***Disabled***		Disables/Enables PCIe completion timer timeout
		Enabled		
	SEFE	***Disabled***		Disables/Enables system error on fatal error[3]
		Enabled		
	SENFE	***Disabled***		Disables/Enables system error on non-fatal error[3]
		Enabled		
	SECE	***Disabled***		Disables/Enables system error on correctable error[3]
		Enabled		
	PME SCI	Disabled		Disables/Enables system control interrupt on a power management event
		Enabled		
	Hot plug	***Disabled***		Disables/Enables hot plugging
		Enabled		
PCIe speed		***Auto***	-	Selects the PCIe transfer rate [gigatransfers per second (GT/s)] automatically or manually
		Gen1	Gen1: Max. 2.5 GT/s	
		Gen2	Gen2: Max. 5.0 GT/s	
		Gen3	Gen3: Max. 8.0 GT/s	
	Transmitter half swing	***Disabled***		Disables/Enables transmitter half-swing Signals are transferred with a half-swing.
		Enabled		

Table 246: Advanced - PCH-IO configuration - PCI Express root port *n*

BIOS parameter			Setting options	Description
Extra bus reserved			INT Default: ***0***	Defines the extra bus reserved for bridges after this root bridge Range: 0 to 7
Reserved memory			INT Default: ***10***	Defines reserved memory [MB] for this bridge Range: 0 to 20
Reserved I/O			INT Default: ***4***	Defines the reserved I/O range for this bridge Range: 4 to 20 kB Resolution: 4 kB
PCH PCIE LTR			Disabled	Disables/Enables PCIe latency reporting
			Enabled	
	Snoop latency override		***Auto***	Disables the snoop latency override or selects manual or automatic mode
			Disabled	
			Manual	
		Snoop latency value	INT Default: ***60***	Defines the snoop latency value Range: 0 to 1023
		Snoop latency multiplier	1 ns	Defines the snoop latency multiplier value [ns]
			32 ns	
			1024 ns	
			32768 ns	
			1048576 ns	
			33554432 ns	
	Non-snoop latency override		***Auto***	Disables the non-snoop latency override or selects manual or automatic mode
			Disabled	
			Manual	
		Non-snoop latency value	INT Default: ***60***	Defines the non-snoop latency value Range: 0 to 1023
		Non-snoop latency multiplier	1 ns	Defines the non-snoop latency multiplier value [ns]
			32 ns	
			1024 ns	
			32768 ns	
			1048576 ns	
			33554432 ns	
PCIE1 LTR lock			***Disabled***	Disables/Enables the PCIe1 LTR lock function
			Enabled	
PCIe selectable de-emphasis			Disabled	Disables/Enables PCIe selectable de-emphasis
			Enabled	

Table 246: Advanced - PCH-IO configuration - PCI Express root port *n*

1) PCI Express root port *n* must be enabled in order to make further configurations.
2) With a multifunction device, all functions within the device are monitored.
   For the root port, the error occurs within the root complex.
3) Generates a system error if an error of this category is reported by a root port or device on a root port.

4.1.6.2.3.2 SATA configuration

BIOS parameter		Setting options	Description	
Chipset SATA		Disabled	Disables/Enables the SATA controller	
		Enabled		
SATA interface speed		Gen1	Max. 1.5 GB/s	Selects the SATA speed
		Gen2	Max. 3 GB/s	
		Gen3	Max. 6 GB/s	
SATA test mode		***Disabled***	Disables/Enables the test function This is only used for control measurements.	
		Enabled		
Aggressive LPM support		***Disabled***	Disables/Enables Aggressive Link Power Management The host controller can change to a low-power state in the idle phase of the SATA device.	
		Enabled		
	SATA port 0	-	Displays the name and capacity of the SATA device	
	Software preserve	-	Displays support for the software preserve	
	SATA port 0	Disabled	Disables/Enables SATA port 0	
		Enabled		
	SATA Port 0 hot plug capability	***Disabled***	Disables/Enables hot plugging	
		Enabled		
	SATA port 0 DevSlp	***Disabled***	Disables/Enables device sleep	
		Enabled		
	DITO configuration	***Disabled***	Disables/Enables device sleep idle timeout	
		Enabled		
	DITO value	INT Default: ***625***	Defines the DITO value [ms] Range: 0 to 1024	
	DM value	INT Default: ***15***	Defines the DITO multiplier Range: 0 to 15	

Table 247: Advanced - IO configuration - SATA configuration

4.1.6.2.3.3 USB configuration

BIOS parameter		Setting options	Description
USB BIOS support		Disabled	Disables USB support in BIOS or enables USB support (UEFI only) or USB support (UEFI and Legacy Mode)
		Enabled	
		UEFI only	
XHCI disable compliance mode		***False***	Selects XHCI disable compliance mode
		True	
USB port disable override		***Disabled***	Manually disables/enables USB ports or enables all ports Disable this parameter to enable all ports, or enable it to disable/enable each port manually.
		Enabled	
	USB1 3.0 connector	Disabled	Disables/Enables the interface USB1 3.0 connector
		Enabled	
	USB2 3.0 connector	Disabled	Disables/Enables the interface USB2 3.0 connector
		Enabled	
	USB1 2.0 connector	Disabled	Disables/Enables the interface USB1 2.0 connector
		Enabled	
	USB2 2.0 connector	Disabled	Disables/Enables the interface USB2 2.0 connector
		Enabled	
	USB 2.0 USV	Disabled	Disables/Enables the USB 2.0 interface on the UPS
		Enabled	
	USB1 2.0 onboard panel	Disabled	Disables/Enables the USB1 2.0 interface on the onboard panel
		Enabled	
	USB2 2.0 onboard panel	Disabled	Disables/Enables the USB2 2.0 interface on the onboard panel
		Enabled	
	USB 2.0 IF option	Disabled	Disables/Enables the USB 2.0 interface on the IF option
		Enabled	

Table 248: Advanced - IO configuration - USB configuration

4.1.6.2.3.4 Miscellaneous configuration

BIOS parameter	Setting options	Description	
8254 clock gating	***Disabled***	Disables/Enables 8254 clock gating	
	Enabled		
State after G3	S0 state	Working	Selects the state after G3 Defines how to proceed after "mechanical off" (G3). S0/S5 after G3 or restores the state before G3
	S5 state	Soft off	
	Last state	State previous to G3	
BIOS lock	Disabled	Disables/Enables the PCH BIOS lock function The BIOS lock function must enabled activated for SMM[1].	
	Enabled		
RTC lock	Disabled	Disables/Enables lock bytes 0x38h to 0x3Fh of RTC RAM	
	Enabled		
TCO lock	***Disabled***	Disables/Enables the TCO lock	
	Enabled		
Win7 keyboard/mouse support	***Disabled***	Disables/Enables Windows 7 keyboard/mouse support	
	Enabled		
Wake on USB from S5	***Disabled***	Disables/Enables wake on USB from S5	
	Enabled		
Numlock	Off	Disables/Enables the numeric keypad during booting Enables BIOS input via the numeric keypad of a keyboard.	
	On		
Real time option	***RT Disabled***	Disables Intel real-time option or enables it with IDI agent real-time mask bits set (RT enabled, agent IDI1) or not set (RT enabled, agent disabled)	
	RT enabled, agent IDI1		
	RT enabled, agent disabled		
Shell startup script delay	INT Default: ***3***	Defines the shell startup script delay time [s] Range: 0 to 10	

Table 249: Advanced - IO configuration - Miscellaneous configuration

1) System Management Mode

4.1.6.2.4 Security configuration

BIOS parameter	Setting options	Description
TXE[1] FW version	-	Displays the TXE firmware version
TXE FW capabilities	-	Displays the TXE firmware capabilities
TXE FW features	-	Displays the TXE firmware features
TXE FW OEM tag	-	Displays the TXE firmware OEM tag
TXE firmware mode	-	Displays the TXE firmware mode
Target TPM device	***fTPM***	Selects the target TPM device fTPM: Firmware/CPU TPM dTPM: Dedicated/Hardware TPM
	dTPM	

Table 250: Advanced - Security configuration

1) Intel Trusted Execution Engine

4.1.6.2.5 ACPI settings

BIOS parameter	Setting options	Description
ACPI settings	Enter	Opens submenu "ACPI settings" on page 246
FACP - RTC S4 wakeup	Disabled	Disables/Enables S4 wakeup via RTC
	Enabled	
APIC[1] - IO APIC mode	Disabled	Disables/Enables IO APIC mode
	Enabled	

Table 251: Advanced - ACPI settings

1) Advanced Programmable Interrupt Controller

4.1.6.2.5.1 ACPI settings

BIOS parameter	Setting options	Description
Native ASPM[1]	Disabled	Disables native ASPM (BIOS controls ASPM) or enables it (operating system controls ASPM)
	Enabled	
Low power S0 idle capability	Disabled	Disables/Enables low power S0 idle capability
	Enabled	

Table 252: Advanced - ACPI settings - ACPI settings

1) Active State Power Management

4.1.6.3 Security

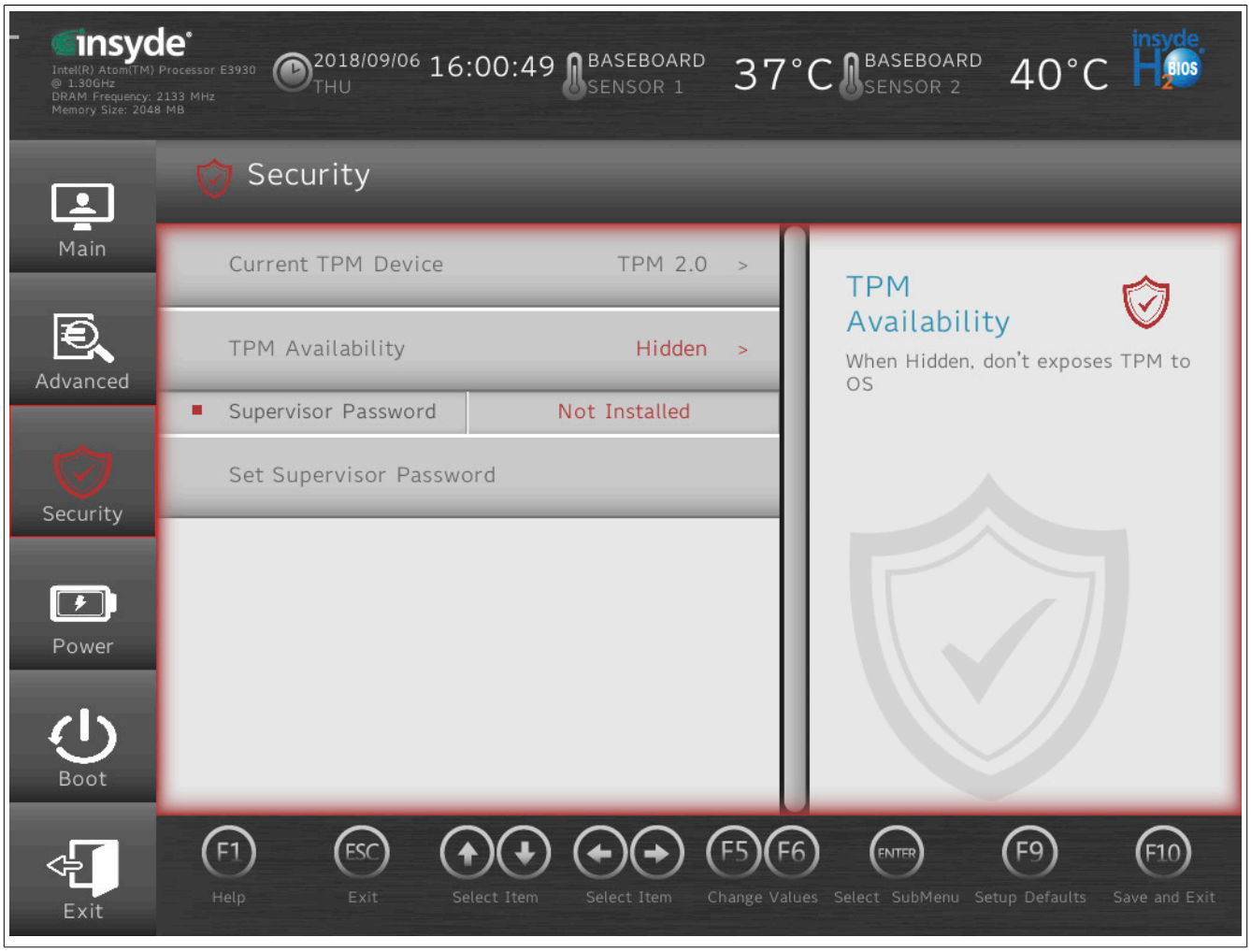


Figure 138: Security

BIOS parameter	Setting options	Description
Current TPM[1] device	-	Displays the current TPM device
TPM active PCR hash algorithm	-	Displays the current PCR hash algorithm
TPM hardware supported hash algorithm	-	Displays the hash algorithms supported by the hardware
TrEE protocol version	***1.0***	Selects the TrEE protocol version
	1.1	
TPM availability	***Hidden***	TPM invisible/visible for the operating system
	Available	
Clear TPM	***Disabled***	Starts clearing TPM by enabling it
	Enabled	
Supervisor password	-	Displays whether a supervisor password has been created
Set supervisor password	String	Sets or changes the supervisor password

Table 253: Security

1) Trusted Platform Module

4.1.6.4 Power

Figure 139: Power

BIOS parameter	Setting options	Description
CPU configuration	Enter	Opens submenu "CPU configuration" on page 248
Wake on PME	***Disabled***	Disables/Enables wake on PME
	Enabled	
Wake on RTC from S5	***Disabled***	Disables wake from S5, daily, on a certain day of the month, after a certain sleep time or by operating system utility The configuration for waking by OS utility must be made in the operating system.
	By every day	
	By day of month	
	By sleep time	
	By OS utility	
Wake from S5 time	Arrow keys and F5/F6 or +/- (numeric keypad)	Defines the time for wake from S5 by every day [hh:mm:ss] [hh] range: 0 to 23 [mm] and [ss] range: 0 to 59
Day of month	INT Default: ***1***	Defines the day of the month for waking from S5 by day of month Range: 1 to 31
Wake from S5 after (seconds)	INT Default: ***5***	Defines the timer for waking from S5 by sleep time [s] Range: 5 to 255

Table 254: Power

4.1.6.4.1 CPU configuration

BIOS parameter	Setting options	Description
VTX-2	Disabled	Disables/Enables VTX-2
	Enabled	
VT-d	***Disabled***	Disables/Enables Intel Virtualization Technology for Directed I/O
	Enabled	
TM1	Disabled	Disables/Enables thermal monitoring 1 The CPU load is reduced by additional idle cycles to control the CPU temperature.
	Enabled	
AES-NI	Disabled	Disables/Enables the Advanced Encryption Standard
	Enabled	
DTS	***Disabled***	Disables/Enables digital thermal sensors

Table 255: Power - CPU configuration

BIOS parameter	Setting options	Description
	Enabled	
Active processor cores	***Disabled***	Disables/Enables active processor cores If this parameter is disabled, all processor cores are used. Enabling makes it possible to configure individual processor cores.
	Enabled	
Core 0	-	This processor core must always be active.
Core 1	Disabled	Disables/Enables processor core 1
	Enabled	
Core 2	Disabled	Disables/Enables processor core 2
	Enabled	
Core 3	Disabled	Disables/Enables processor core 3
	Enabled	
Intel Hyper-Threading Technology	-	Displays whether hyper-threading is supported
Monitor Mwait	***Auto***	Disables/Enables Monitor/Mwait or selects it automatically depending on the operating system and hardware
	Disabled	
	Enabled	
CPU power management	Enter	Opens submenu "CPU power management" on page 249

Table 255: Power - CPU configuration

4.1.6.4.1.1 CPU power management

BIOS parameter		Setting options	Description	
Intel SpeedStep		Disabled	Disables/Enables Intel SpeedStep Enable if more than 2 frequency ranges should be supported.	
		Enabled		
	Boot performance mode	***Max performance***	Selects the performance mode for optimized performance or energy optimization BIOS starts in the selected mode and transfers this configuration to the operating system.	
		Max battery		
	Intel Turbo Boost Technology	Disabled	Disables/Enables Intel Turbo Boost Technology	
		Enabled		
	Power limit 1	-	Displays power limit 1 [W]	
	Power limit 2	-	Displays power limit 2 [W]	
	Power limit 1 enable	Disabled	Disables/Enables power limit 1 (PL1)	
		Enabled		
	Power limit 1 clamp mode	Disabled	Disables/Enables PL1 clamp mode Enabling makes it possible to undershoot the base clock frequency to control the processor core temperature.	
		Enabled		
	Power limit 1 power	***Auto***	Selects the value for PL1 [W] or defines it automatically based on the processor Range: 6 to 25	
		(Various)		
	Power limit 1 time window	***Auto***	Selects the PL1 time window [s] or defines it automatically based on the processor Range: 1 to 128	
		(Various)		
C-states		***Disabled***	Disables/Enables processor C-states	
		Enabled		
	Enhanced C-states	Disabled	Disables/Enables enhanced C-states (C1E) Enabling allows the CPU to switch to the lowest speed if all processor cores change to a C-state.	
		Enabled		
	Max package C state	***S0ix default***	Intel SoC idle standby power states	Selects the max. package C-state
		PC2	Handle QPI/PCIe traffic	
		C0	Executing and not idle	
	Max core C state	***Fused value***	-	Selects limiting for core C-states (CC-states), no limiting or a preset value (fused value)
		Core C10	C9 optimized VR[1] off	
		Core C9	C8 + VR off	
		Core C8	C7 + PCH off	
		Core C7	Deeper power down	
		Core C6	Deep power down	
		Core C1	Halt	
		Unlimited	No limiting for CC-states	
	C-state auto demotion	Disabled	-	Disables/Enables C-state auto demotion Can be used to prevent unnecessary changing of C-states
		C1	Halt	
	C-state un-demotion	Disabled	-	Disables/Enables C-state un-demotion
		C1	Halt	
T-states		***Disabled***	Disables/Enables T-states	
		Enabled		

Table 256: Power - CPU configuration - CPU power management

1) Voltage regulator (module)

4.1.6.5 Boot

Figure 140: Boot

BIOS parameter	Setting options	Description
Boot type	***Dual boot type***	Selects the boot type In dual boot mode, both UEFI and Legacy boot are possible and the CSM[1)] is enabled. In Legacy boot mode, the CSM is enabled. In UEFI boot mode, the CSM is disabled.
	Legacy boot type	
	UEFI boot type	
Quick boot	Disabled	Disables/Enables quick boot If quick boot is enabled, certain tests are not performed so the boot process is faster.
	Enabled	
Quiet boot	Disabled	Disables/Enables booting in text mode
	Enabled	
Network stack	***Disabled***	Disables/Enables the network stack Enabling makes ETH booting possible.
	Enabled	
PXE boot capability	***Disabled***	Disables PXE boot or selects the mode
	UEFI:IPV4	
	UEFI:IPV6	
	UEFI:IPV4/IVP6	
	Legacy	
Power up in standby support	***Disabled***	Disables/Enables power up in standby support
	Enabled	
Add boot options	***Auto***	Selects or changes the mode of arrangement in the boot order for newly added devices. Manual mode is not fully UEFI compatible.
	First	
	Manual	
	Last	
ACPI selection[2)]	Acpi1.0B	Selects the ACPI mode
	Acpi3.0	
	Acpi4.0	
	Acpi5.0	
	Acpi6.0	
	Acpi6.1	
USB boot	Disabled	Disables/Enables USB boot
	Enabled	
EFI device first	Disabled	Disables/Enables EFI device first

Table 257: Boot

BIOS parameter	Setting options	Description
	Enabled	Enable to boot EFI devices before legacy devices. Disable to boot legacy devices before EFI devices.
Timeout	INT Default: ***0***	Delay time until the boot list is processed [s]. Range: 0 to 10
Automatic failover	Disabled	Disables/Enables automatic failover
	Enabled	
EFI	Enter	Opens submenu "EFI" on page 251
Legacy	Enter	Opens submenu "Legacy" on page 252

Table 257: Boot

1) Compatibility support module
2) When changing the ACPI version, make sure that the operating system used is compatible.

4.1.6.5.1 EFI

BIOS parameter	Setting options	Description
EFI	Enter	Opens submenu "EFI" on page 251
1st device	***CFast***	Selects this device as first in the boot order
	eMMC	
	USB device	
	Internal EFI shell	
	ETH1 IPv4	
	ETH1 IPv6	
	ETH2 IPv4	
	ETH2 IPv6	
	USB CD-ROM	
	Other	
	Disabled	
2nd device[1)]	***eMMC***	Selects this device as second in the boot order
3rd device	***USB device***	Selects this device as third in the boot order
4th Device	***Internal EFI shell***	Selects this device as fourth in the boot order
5th device	***ETH1 IPv4***	Selects this device as fifth in the boot order
6th device	***ETH1 IPv6***	Selects this device as sixth in the boot order
7th device	***ETH2 IPv4***	Selects this device as seventh in the boot order
8th device	***ETH2 IPv6***	Selects this device as eighth in the boot order

Table 258: Boot - EFI

1) Starting with the 2nd device, only the respective default values are specified.

4.1.6.5.1.1 EFI

BIOS parameter	Setting options	Description
EFI	Enter, then: ► Keyboard: F5/F6 ► Touch screen: Move items at the gray arrows	Defines the boot order

Table 259: Boot - EFI - EFI

4.1.6.5.2 Legacy

BIOS parameter	Setting options	Description
Normal boot menu	***Normal***	Selects the boot order type
	Advanced	
Boot type order	Enter	Opens submenu "Boot type order" on page 252
Other	Enter	Opens submenu[1)]
Floppy disk	Enter	
Hard disk drive	Enter	Opens submenu "Hard disk drive" on page 252
CD/DVD-ROM drive	Enter	Opens submenu[1)]
USB	Enter	

Table 260: Boot - Legacy

1) These submenus are only available if at least one corresponding device is available.
Their structure corresponds to that of submenu **Hard disk drive**.

4.1.6.5.2.1 Boot type order

BIOS parameter	Setting options	Description
Boot type order	Enter, then: ► Keyboard: F5/ F6 ► Touch screen: Move items at the gray arrows	Defines the boot order

Table 261: Boot - Legacy - Boot type order - Boot type order

4.1.6.5.2.2 Hard disk drive

BIOS parameter	Setting options	Description
Hard disk drive	Enter	Opens submenu "Hard disk drive" on page 252

Table 262: Boot - Legacy - Hard disk drive

Hard disk drive

BIOS parameter	Setting options	Description
Hard disk drive	Enter, then: ► Keyboard: F5/ F6 ► Touch screen: Move items at the gray arrows	Defines the boot order

Table 263: Boot - Legacy - Hard disk drive - Hard disk drive

4.1.6.6 Exit

Figure 141: Exit

BIOS parameter	Setting options	Description
Exit saving changes	Enter	Saves changes and restarts
Save changes without exit	Enter	Saves changes Some settings only take effect after a restart.
Exit discarding changes	Enter	Discards changes and exits
Load optimal defaults	Enter	Loads system-optimized default values
Load custom defaults	Enter	Loads user-specific default values
Save custom defaults	Enter	Saves user-specific default values
Discard changes	Enter	Discards changes

Table 264: Exit

4.2 Upgrade information

> **Warning!**
>
> **The UEFI BIOS and firmware of B&R devices must always be kept up to date. New versions can be downloaded from the B&R website (www.br-automation.com).**

4.2.1 UEFI BIOS upgrade

An upgrade may be necessary for the following reason, for example:

- To update the functions implemented in UEFI BIOS Setup or to add newly implemented functions or components (for information about changes, see the readme file of the UEFI BIOS upgrade).

4.2.1.1 UEFI BIOS - What do I need to know?

> **Information:**
>
> **During a UEFI BIOS upgrade, individually saved setup settings are deleted.**

Before starting an upgrade, it makes sense to determine the different software versions.

4.2.1.1.1 Which UEFI BIOS version and firmware are already installed?

This information is listed on the following UEFI BIOS Setup page:

- After switching on the PC, press "Esc", "Del" or "F2" to enter UEFI BIOS Setup.
- Under UEFI BIOS main menu "Advanced", select submenu "OEM features".

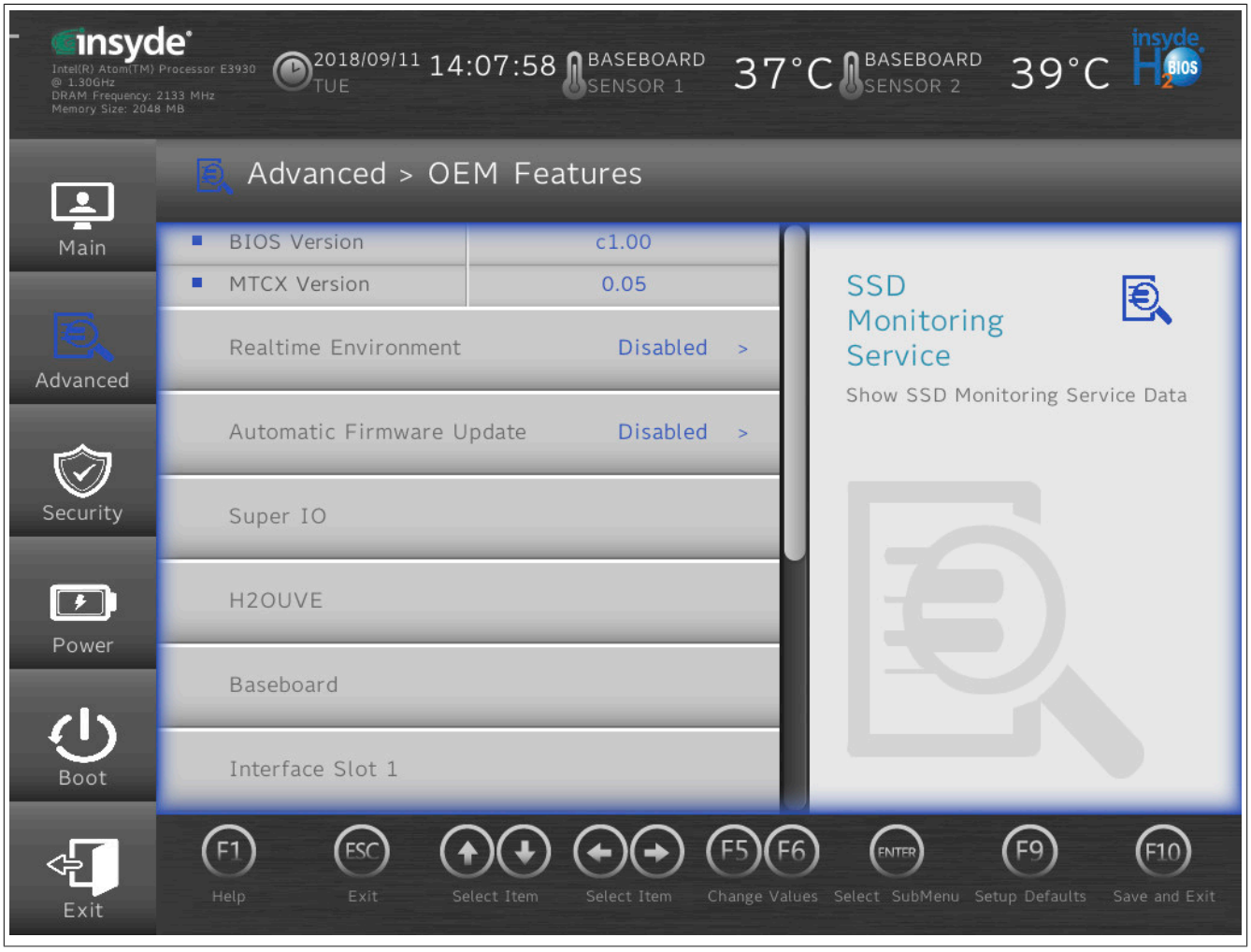


Figure 142: Software version

4.2.1.2 Procedure in the EFI shell

Caution!

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

1. Download the ZIP file from the B&R website (www.br-automation.com).
2. Unzip the ZIP file and copy the files to a USB flash drive formatted in FAT16 or FAT32. Alternatively, a CFast card can also be used.
3. Reboot the PC and select "Internal EFI shell" as the boot device ("Esc", "Del" or "F2" key to open the boot menu).
4. After booting the EFI shell, "startup.nsh" is executed and the UEFI BIOS upgrade is started.

   ## Information:

   With an "Extended" update (e.g. Intel ME firmware), several reboots are necessary.
   The instructions during the update process must be followed until the upgrade installation is completed with the message "BIOS update done".

5. After a successful upgrade, the system must be rebooted.
6. Reboot and press "Esc", "Del" or "F2" key to enter the UEFI BIOS Setup menu and load the setup defaults; then select "Save changes and exit".

4.2.2 Firmware upgrade - Panel PC 2200

With "Firmware upgrade (MTCX)", it is possible to update the firmware depending on the version of the PPC2200 system.

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

Caution!

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

4.2.2.1 Procedure in Windows (B&R Control Center)

1. Download the ZIP file from the B&R website (www.br-automation.com).
2. Open **Control Center** in the Control Panel.
3. Open tab **Versions**.
4. Under **Filename** enter the name of the firmware file or select a file.
5. Click **Open**. Dialog box "Open" opens.

The transfer can be canceled by clicking on **Cancel** in the download dialog box. **Cancel** is disabled while writing to flash memory.

Erasing the data in flash memory can take several seconds depending on the memory module used. During this time, the progress indicator is not updated.

Information:

The power supply to the PC or Automation Panel must be switched off and on again for the new firmware to take effect and the updated version to be displayed. When exiting the Control Center, a corresponding prompt for this is displayed.

Information:

For more detailed information about saving and updating the firmware, see the ADI driver user's manual.

4.2.2.2 Procedure in the EFI shell

1. Download the ZIP file from the B&R website (www.br-automation.com).
2. Unzip the ZIP file and copy the files to a USB flash drive formatted in FAT16 or FAT32. Alternatively, a CFast card can also be used.
3. Reboot the PC and select "Internal shell" as the boot device ("Esc", "Del" or "F2" key to open the boot menu).
4. After booting the EFI shell, "startup.nsh" is executed and the MTCX upgrade is started.
5. After a successful upgrade, a the system must be switched off and on again.

Information:

The power supply to the PC or Automation Panel must be switched off and on again for the new firmware to take effect and the updated version to be displayed.

4.2.2.3 Automatic firmware update

With the APC2200/PPC2200, it is possible to perform firmware updates automatically.

For this, parameter "Automatic firmware update" must be enabled in BIOS (see "Advanced - OEM features" on page 238).

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

Upgrades are provided as a ZIP file and include a readme file that provides additional information.

For automatic upgrades, the upgrade files must be stored off of the root directory of a data storage medium formatted in FAT32 (e.g. CFast card or USB flash drive) in a directory called "XPC2200FWU".

```
UEFI Interactive Shell v2.1
EDK II
UEFI v2.50 (INSYDE Corp., 0x57301018)
Mapping table
      FS0: Alias(s):HD21i0b::BLK1:
          PciRoot(0x0)/Pci(0x15,0x0)/USB(0x8,0x0)/HD(1,MBR,0xC3072E18,0xF0,0x1D63F10)
     BLK0: Alias(s):
          PciRoot(0x0)/Pci(0x15,0x0)/USB(0x8,0x0)
Press ESC in 2 seconds to skip startup.nsh or any other key to continue.
Shell> fs0:
FS0:\> cd XPC2200FWU
FS0:\XPC2200FWU\> dir
Directory of: FS0:\XPC2200FWU\
09/27/2018  14:17 <DIR>         8,192  .
09/27/2018  14:17 <DIR>             0  ..
04/13/2018  11:06           3,145,861  61609_0.fw
04/13/2018  11:06           3,145,861  61610_0.fw
04/13/2018  11:06           3,145,861  61611_0.fw
04/13/2018  11:06           3,145,861  61612_0.fw
04/13/2018  11:06           3,145,861  61638_0.fw
04/13/2018  11:06           3,145,861  61639_0.fw
04/13/2018  11:06           3,145,861  61640_0.fw
04/13/2018  11:06           3,145,861  61641_0.fw
04/12/2018  15:11           3,145,864  62020_0.fp
04/13/2018  11:09               5,925  Liesmich.txt
02/12/2018  15:27             411,264  mtcxsvc.efi
04/13/2018  11:10               1,002  MTCXxPC2200.nsh
04/13/2018  11:10               5,813  Readme.txt
04/13/2018  11:10               1,004  SDLTxPC2200.nsh
04/13/2018  11:10                 913  startup.nsh
08/31/2016  09:16             655,495  59062_0.fp
         16 File(s)  29,394,168 bytes
          2 Dir(s)
FS0:\XPC2200FWU\>
```

Figure 143: View of a suitable data storage medium with firmware upgrade

> **Note:**
>
> **The automatic update only takes place if the installed firmware version differs from the upgrade version.**
> **Automatic downgrades are also possible!**

4.3 Multi-touch drivers

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

Software

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

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

4.4 Windows 10 IoT Enterprise 2016 LTSB

4.4.1 General information

Windows 10 IoT Enterprise 2016 LTSB is the successor to Windows 10 IoT Enterprise 2015 LTSB and based on new Windows 10 technology. The operating system also offers a higher level of protection for industrial applications through additional lockdown functions. Windows 10 IoT Enterprise 2016 LTSB is a special version of Windows 10 Enterprise for industrial use (Long Term Servicing Branch).

4.4.2 Order data

Model number	Short description	Figure
	Windows 10 IoT Enterprise	
5SWW10.0545-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Entry - Multilingual - PPC2200 (UEFI boot) - Processor E3930/E3940 - License (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	Windows 10 IoT Enterprise	
5SWW10.0800-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Language Pack DVD	

Table 265: 5SWW10.0545-MUL - Order data

4.4.3 Overview

Model number	Edition	Target system	Processor	Chipset	Architecture	Language	Minimum size of data storage medium	Minimum size of RAM
5SWW10.0545-MUL	Enterprise LTSB - Entry	PPC2200	x5-E3930 x5-E3940	Apollo Lake	64-bit (UEFI boot)	Multilingual	20 GB [1]	2 GB [2]

1) The specified minimum size of the data storage medium does not take into account the memory requirements of additional language packages.
2) The specified memory size is a minimum requirement according to Microsoft. B&R recommends using 4 GB RAM or more for 64-bit operating systems.

4.4.4 Features

The feature list shows the most important device functions in Windows 10 IoT Enterprise 2016 LTSB.

Function	Windows 10 IoT Enterprise 2016 LTSB
Range of functions in Windows 10 Enterprise	✓
Internet Explorer 11 including Enterprise Mode	✓
Multi-touch support	✓
Multilingual support	Can be installed via Language Pack DVDs (default language is English)
Page file	Configurable (disabled by default in the image by the UWF)
Hibernate file	Configurable (disabled by default in the image)
System restore	Configurable (disabled by default in the image by the UWF)
SuperFetch	Configurable (disabled by default in the image by the UWF)
File indexing service	Configurable (disabled by default in the image by the UWF)
Fast boot	Configurable (disabled by default in the image by the UWF)
Defragmentation service	✓ (Disabled when enabling the UWF)
Additional embedded lockdown functions	
Assigned access	Configurable
AppLocker	Configurable
Shell Launcher	Configurable
Unified Write Filter	✓
Keyboard Filter	Configurable

Table 266: Device functions in Windows 10 IoT Enterprise 2016 LTSB

4.4.5 Installation

Windows 10 IoT Enterprise 2016 LTSB is preinstalled at B&R on a suitable data storage medium (64-bit: at least 20 GB). When switched on for the first time, the system runs through the out-of-box experience (OOBE), which allows different settings to be made (e.g. language, region, keyboard, computer name, username, etc.).

Windows 10 IoT Enterprise 2016 LTSB is installed on the APC2200 and PPC2200 in UEFI mode.

Note that when backing up and restoring the installation, the GPT file system must be supported by the software used.

4.4.6 Drivers

The operating system contains all drivers required for operation. If an older driver version is installed, the latest version can be downloaded and installed from the B&R website (www.br-automation.com). It is important to ensure that "Unified Write Filter (UWF)" is disabled.

Information:

Necessary drivers must be downloaded from the B&R website, not from manufacturer websites.

4.4.7 Activation

Windows 10 IoT Enterprise 2016 LTSB must be activated like its predecessor Windows 10 IoT Enterprise 2015 LTSB. This takes place at B&R.

The activation status can be checked in the Control Panel:

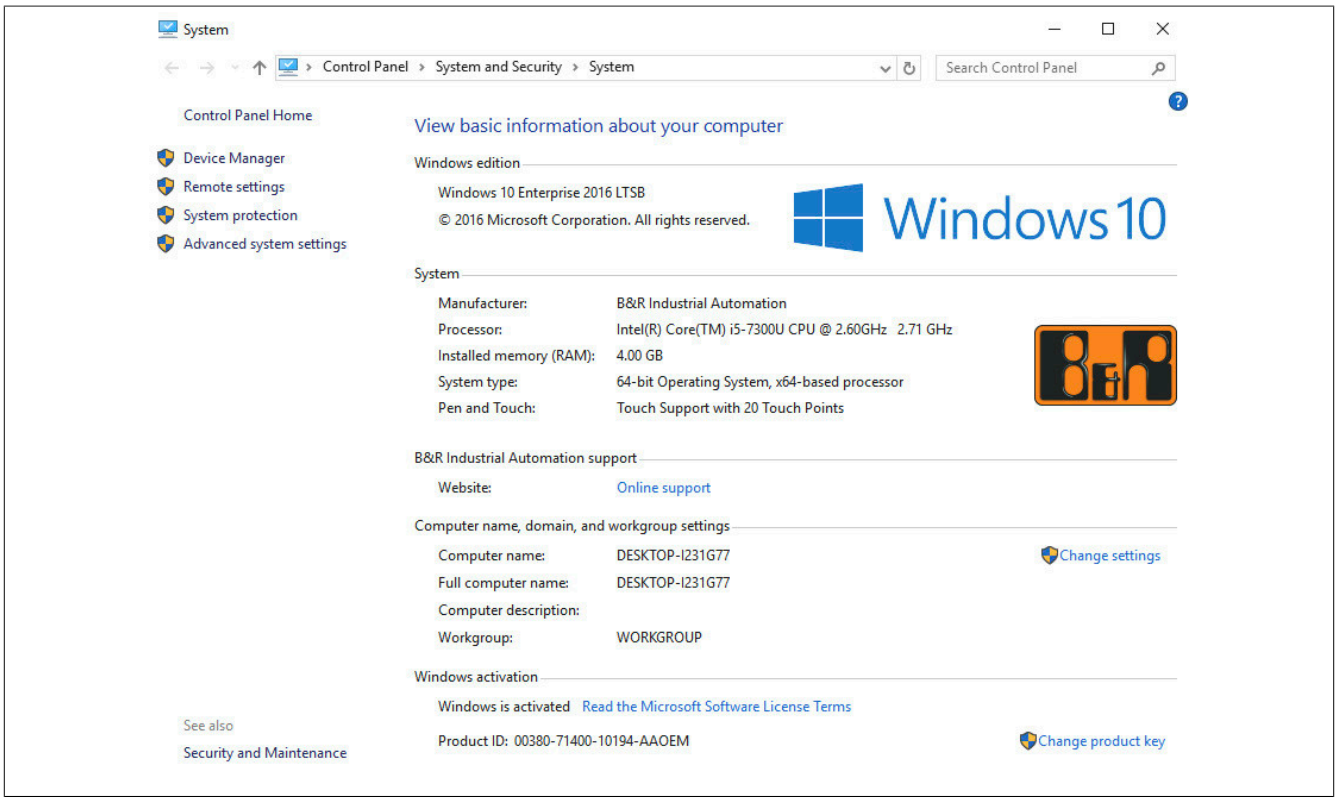


Figure 144: System properties

Activation carried out by B&R is supported by special B&R extensions in the operating system and theoretically not lost when the hardware is changed (e.g. replacement of components in the event of repair) or when the system is reinstalled, unlike Windows 10 IoT Enterprise 2015 LTSB (Microsoft reserves the right to make technical changes without notice).

Information:

It is not required to enter a product key for activation.

4.4.8 Characteristics, limitations

- Unlike a standard Windows 10 Enterprise version, Windows 10 IoT Enterprise 2016 LTSB does not contain Cortana, Microsoft Edge Browser or Microsoft Store, for example.
- The LTSB version is based on build 14393 of Windows 10 and does not receive any feature updates.

The version installed by B&R contains optimized settings for operation in an industrial environment. These are described in detail in a manual for Windows 10 IoT Enterprise 2016 LTSB. This can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com) (login required).

Information:

These settings as well as the features not included in the LTSB version cause different behavior compared to a standard Windows 10 Enterprise installation.

4.4.9 Supported display resolutions

Per Microsoft requirements, Windows 10 IoT Enterprise 2016 LTSB requires SVGA resolution (800 x 600) or higher to enable full operation of the Windows user interface (including system dialog boxes, apps, etc.). A lower resolution can be selected for applications.

4.5 B&R Linux 9 (GNU/Linux)

4.5.1 General information

Linux or GNU/Linux are usually free, UNIX-like multi-user operating systems based on the Linux kernel and fundamentally on GNU software. Wide (also commercial) distribution was made possible starting in 1992 by licensing the Linux kernel under the GPL.

The Linux version created by B&R is based on Debian 9. It already contains all the drivers required for the respective device and can therefore be used immediately without any additional effort.

Advantages of Debian:

- High stability
- Large package selection

For more information about Debian, see http://www.debian.org.

4.5.2 Order data

Model number	Short description	Figure
	B&R Linux 9	
5SWLIN.0745-MUL	B&R Linux 9 - 64-bit - Multilingual - PPC2200 - Installation (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	CFast cards	
5CFAST.016G-00	CFast 16 GB SLC	
5CFAST.032G-00	CFast 32 GB SLC	
5CFAST.032G-10	CFast card, 32 GB MLC	
5CFAST.064G-10	CFast 64 GB MLC	
5CFAST.128G-10	CFast 128 GB MLC	
5CFAST.256G-10	CFast 256 GB MLC	
5CFAST.4096-00	CFast 4 GB SLC	
5CFAST.8192-00	CFast 8 GB SLC	

Table 267: 5SWLIN.0745-MUL - Order data

4.5.3 Overview

Material number	Target system	Chipset	Architecture	Language	Minimum size of data storage medium	Minimum size of RAM
5SWLIN.0745-MUL	PPC2200	Apollo Lake	64-bit	Multilingual	4 GB	2 GB

4.5.4 Features

- LXDE desktop
- Touch screen support
- MTCX driver
- ADI library
- Tool for right-click support via touch screen
- Virtual keyboard

Detailed instructions about B&R Linux 9 for B&R devices can be downloaded from the Downloads section of the B&R website (www.br-automation.com).

4.5.5 Installation

B&R Linux 9 is preinstalled at B&R on the required data storage medium (e.g. CFast card). All necessary drivers (graphics, network, etc.) for operation are also installed.

Debian 9 can also be downloaded and installed from the Debian website (http://www.debian.org). Instructions are also available on the Debian website.

Notes regarding special features of installation on B&R devices are described in a separate document that can be downloaded from the B&R website (www.br-automation.com) (login required).

Installation packages are available for the necessary B&R adjustments; these can also be downloaded from the B&R website (www.br-automation.com) (login required).

4.5.6 Drivers

Current drivers for all approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

Information:

Necessary drivers must be downloaded from the B&R website, not from manufacturer websites.

4.6 B&R Automation Device Interface (ADI) Control Center

The Automation Device Interface (ADI) allows access to specific functions of B&R devices. The settings of these devices can be read out and changed in Windows using the B&R Control Center in the Control Panel.

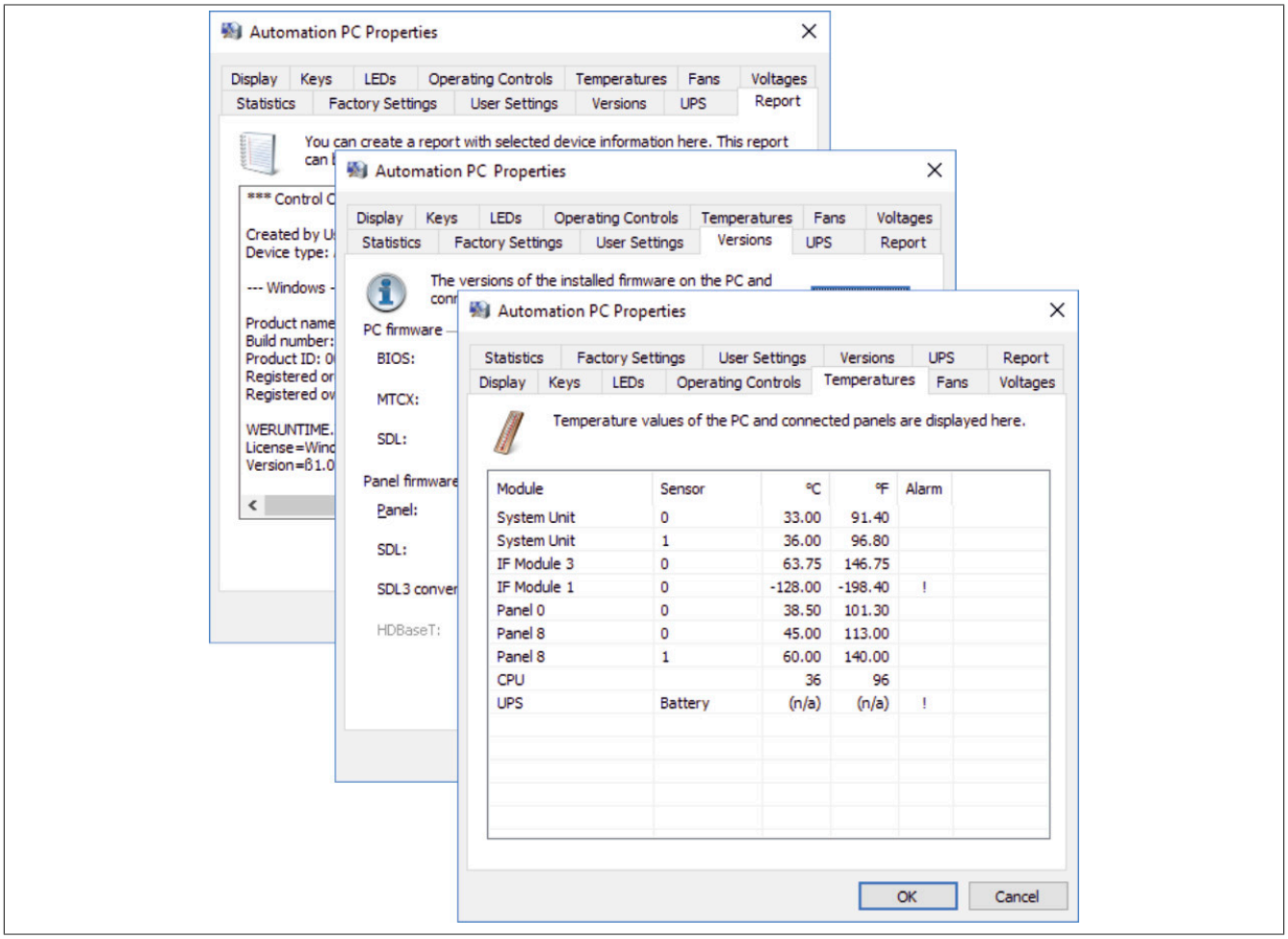


Figure 145: B&R Control Center screenshots - Examples

Information:

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

4.6.1 Functions

Information:

The functions available in the Control Center depend on the device family.

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

- Setting the SDL equalizer value for the SDL cable adjustment
- Changing the user serial ID

Depending on the version, a detailed description of the Control Center is available either in the integrated help documentation or in the user documentation.

4.6.2 Installation

The B&R Automation Device Interface (ADI) driver (also includes the Control Center) and user documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

Information:

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

If a more recent ADI driver version exists (see the Downloads section of the B&R website), it can be installed later. The write filter must be disabled during installation.

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

This software allows functions of the B&R Automation Device Interface (ADI) to be accessed from Windows applications created with Microsoft Visual Studio, for example:

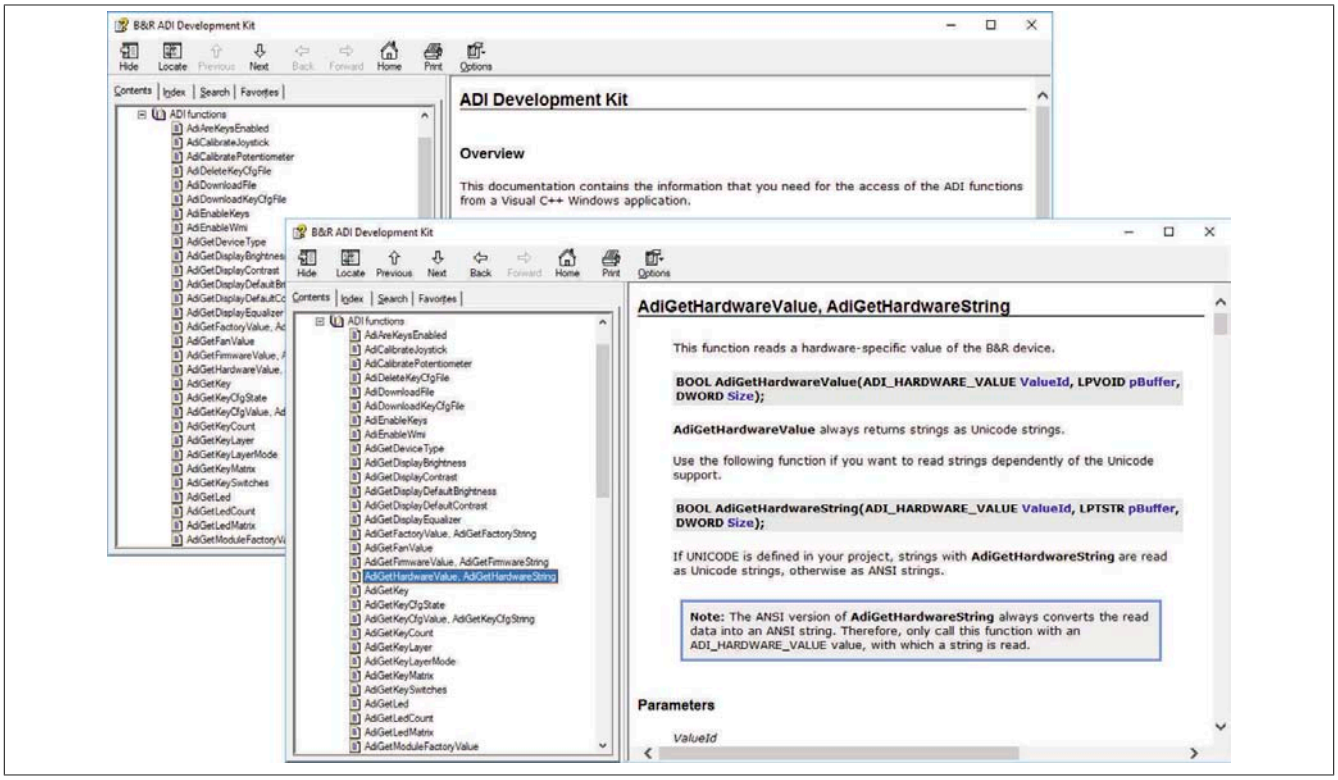


Figure 146: ADI Development Kit screenshots

Features:

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

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

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

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

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

This software allows functions of the B&R Automation Device Interface (ADI) to be accessed from .NET applications created with Microsoft Visual Studio.

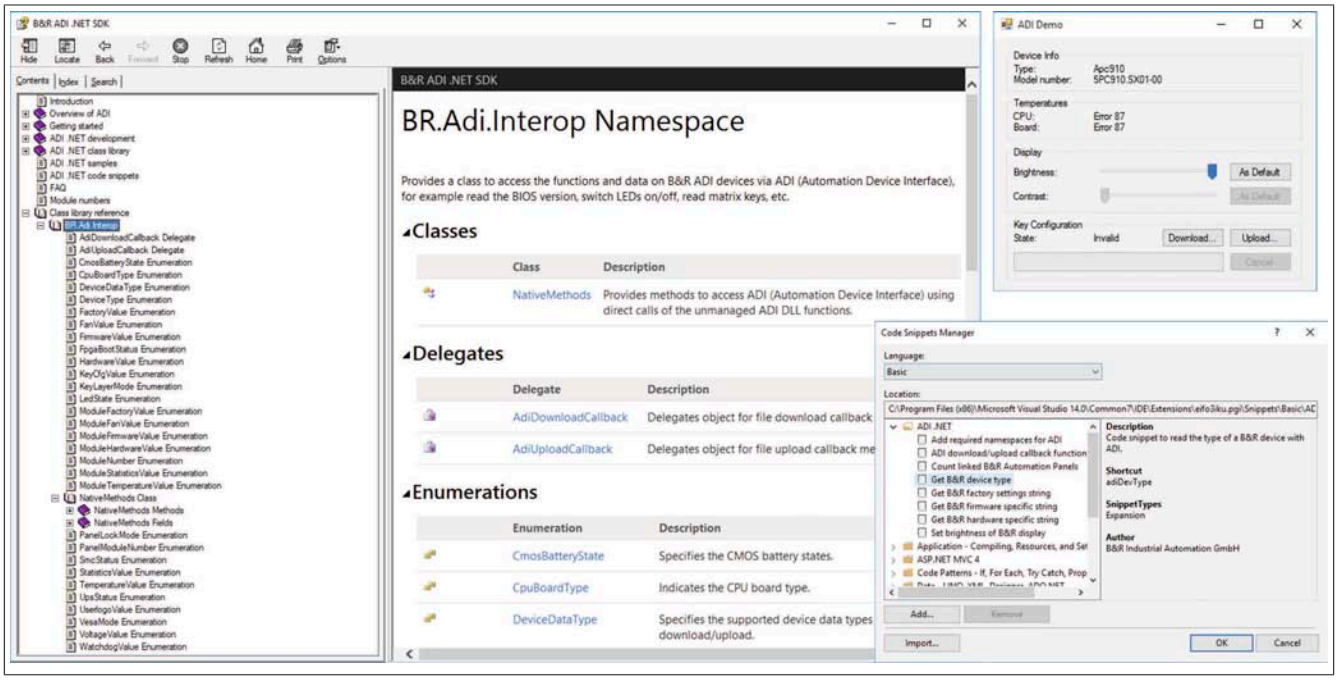


Figure 147: ADI .NET SDK screenshots

Features:

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

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

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

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

4.9 B&R Key Editor

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

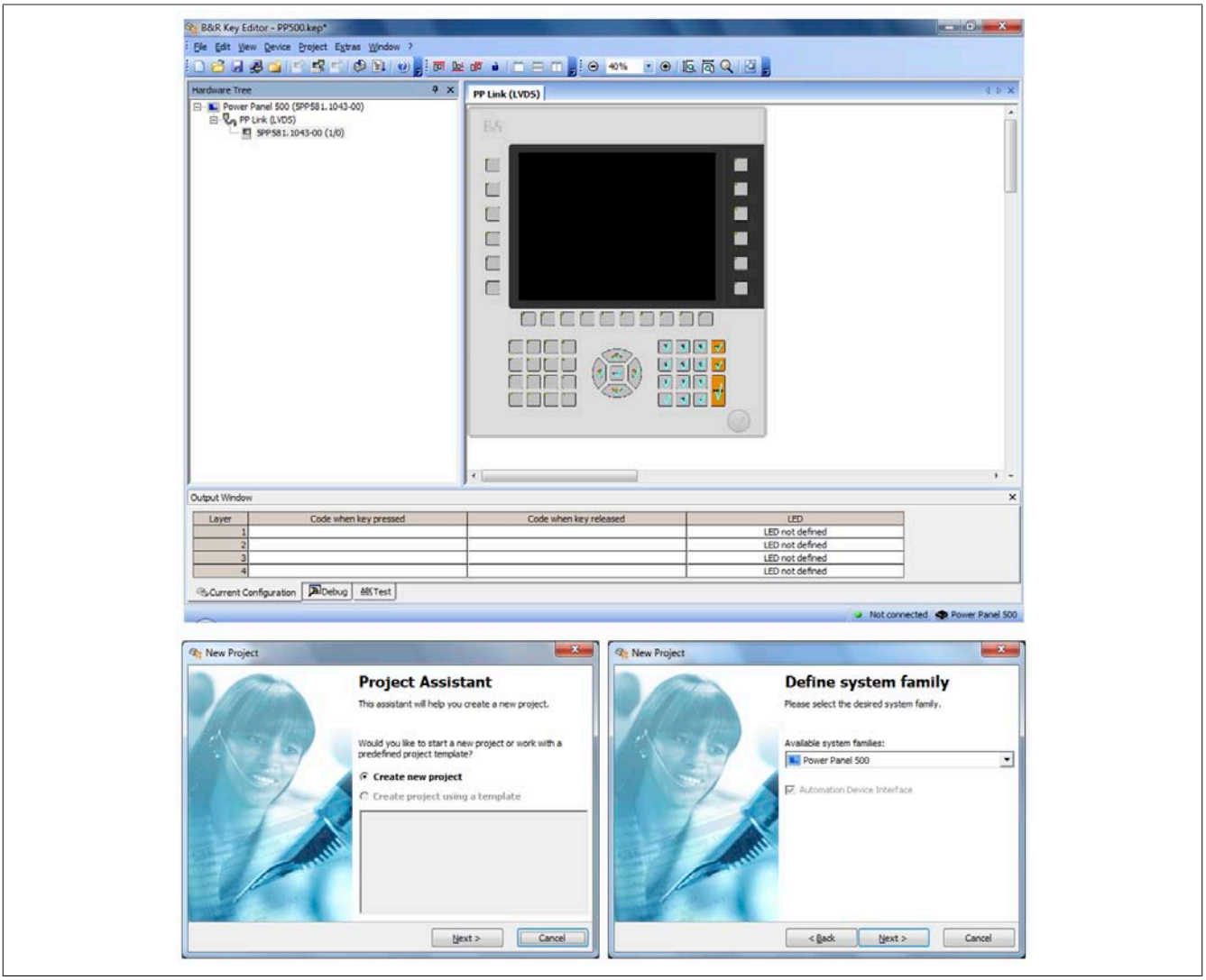


Figure 148: B&R Key Editor screenshots

Features:

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

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

4.10 B&R KCF Editor

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

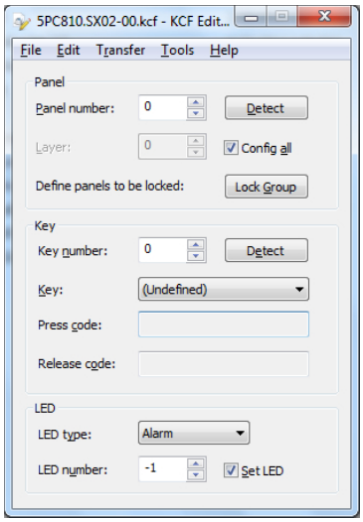


Figure 149: B&R KCF Editor version 1.0 screenshot

Features

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

Additional features if the KCF Editor is executed on the target device[3)]

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

[3)] The ADI driver must be installed on the B&R PC for these features.

4.11 HMI Service Center

4.11.1 5SWUTI.0001-000

4.11.1.1 General information

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

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

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

4.11.1.2 Order data

Model number	Short description	Figure
	Accessories	
5SWUTI.0001-000	HMI Service Center USB flash drive - Hardware diagnostic software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC2200/PPC2200 - For APC3100/PPC3100 - For APC51x/PP500 - For Automation Panel 800/900 - For Automation Panel 1000/5000	

Table 268: 5SWUTI.0001-000 - Order data

5 Standards and certifications

5.1 Directives and declarations

5.1.1 CE marking

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

5.1.2 EMC Directive

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

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

Information:

The declarations of conformity are available on the B&R website under Downloads - Certificates - Declarations of conformity.

5.2 Certifications

Danger!

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

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

Information:

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

5.2.1 UL certification

Ind. Cont. Eq.
E115267

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

Underwriters Laboratories (UL) per standards UL 61010-1 and UL 61010-2-201
Canadian (CSA) standard per C22.2 No. 61010-1-12 and CSA C22.2 No. 61010-2-201:14

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

When using industrial control equipment per UL 61010-1 / UL 61010-2-201, make sure that the device is classified as "open type". The prerequisite for certification or operation per UL 61010-1 / UL 61010-2-201 is therefore the installation of the device in an appropriate protective housing.

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

5.2.2 EAC

Products with this mark are tested by an accredited test laboratory and permitted to be imported into the Eurasian Customs Union (based on EU conformity).

5.2.3 KC

Products with this mark are tested by an accredited test laboratory and permitted to be introduced into the Korean market (based on EU conformity).

5.2.4 RCM

Products with this mark are tested by an accredited test laboratory and certified by the ACMA. The mark is valid for Australia/Oceania and facilitates the certification of your machines and systems in this economic area (based on EU conformity).

6 Accessories

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

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

6.1 General accessories

The following accessories can be ordered for the Automation PC and Panel PC:

- Grounding clip
- Tool set for control cabinet installation (torque wrench with bit set)

6.1.1 Accessories - Order data

Material number	Description
5ACCRHMI.0000-000	REP HMI grounding clip
5ACCRHMI.0006-000	REP HMI installation tool for control cabinet

6.2 Power supply connectors

6.2.1 0TB103.9x

6.2.1.1 General information

1-row 3-pin terminal block 0TB103 is used for the power supply.

6.2.1.2 Order data

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

Table 269: 0TB103.9, 0TB103.91 - Order data

6.2.1.3 Technical data

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

Model number	0TB103.9	0TB103.91
General information		
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]	
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]	
Terminal block		
Note	Protected against vibration by the screw flange Nominal data per UL	
Number of pins	3 (female)	
Type of terminal block	Screw clamp terminal block variant	Cage clamp terminal block variant [3)]
Cable type	Only copper wires (no aluminum wires!)	
Spacing	5.08 mm	
Connection cross section		
AWG wire	26 to 14 AWG	26 to 12 AWG
Wire end sleeves with plastic covering	0.20 to 1.50 mm²	
Solid wires	0.20 to 2.50 mm²	
Fine strand wires	0.20 to 1.50 mm²	0.20 to 2.50 mm²
With wire end sleeves	0.20 to 1.50 mm²	
Tightening torque	0.4 Nm	-
Electrical characteristics		
Nominal voltage	300 V	
Nominal current [4)]	10 A / contact	
Contact resistance	≤5 mΩ	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	

Table 270: 0TB103.9, 0TB103.91 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) The cage clamp terminal block cannot be used side by side.
4) The respective limit data of the I/O modules must be taken into account!

6.3 Terminal block for IF options

6.3.1 0TB1210.3100

6.3.1.1 General information

2-row 10-pin terminal block TB1210 is used to connect to the interfaces of various interface options.

6.3.1.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 271: 0TB1210.3100 - Order data

6.3.1.3 Technical data

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

Model number	0TB1210.3100
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]
Terminal block	
Note	Nominal data per UL
Number of pins	10 (female)
Type of terminal block	Push-in spring connection
Cable type	Only copper wires (no aluminum wires!)
Spacing	3.5 mm
Connection cross section	
AWG wire	26 to 16 AWG
Wire end sleeves with plastic covering	0.14 to 1 mm²
Solid wires	0.14 to 1.5 mm²
Fine strand wires	0.14 to 1.5 mm²
With wire end sleeves	0.14 to 1.5 mm²
Electrical characteristics	
Nominal voltage	300 V
Nominal current [3)]	10 A
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

Table 272: 0TB1210.3100 - Technical data

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) The respective limit data of the I/O modules must be taken into account!

6.4 USB flash drives

6.4.1 5MMUSB.xxxx-01

6.4.1.1 General information

USB flash drives are easily replaceable storage media. Due to the fast data transfer (USB 2.0), USB flash drives offer optimal values for use as portable storage media. Without additional drivers, the USB flash drive immediately reports itself as another drive from which data can be read or to which data can be written (hot plugging).

Information:

Due to the large number of USB flash drives available on the market and their short lifecycles, we reserve the right to supply alternative products. It may therefore be necessary to take the following measures in order to also boot from these USB flash drives:

- **The USB flash drive must be reformatted or, in some cases, repartitioned (set partition as active).**
- **The USB flash drive must be in the first position in the boot order; alternatively, the IDE controllers can be disabled in BIOS. In most cases, this can be avoided by running "fdisk / mbr" on the USB flash drive.**

6.4.1.2 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 273: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

6.4.1.3 Technical data

Information:

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

Model number	5MMUSB.2048-01	5MMUSB.4096-01
General information		
Capacity	2 GB	4 GB
LED status indicators	1 LED (green) [1)]	
MTBF	>3,000,000 hours	
Type	USB 1.1, USB 2.0	
Maintenance	None	
Default file system	FAT32	
Certifications		
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) to 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 per 10^{14} bits read	
Connection cycles	>1500	

Table 274: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Model number	5MMUSB.2048-01	5MMUSB.4096-01
Support		
Operating systems		
Windows 10 IoT Enterprise LTSB 64-bit	Yes	
Windows Embedded 8.1 Industry Pro 32-bit	Yes	
Windows Embedded 8.1 Industry Pro 64-bit	Yes	
Windows 7 32-bit	Yes	
Windows 7 64-bit	Yes	
Windows Embedded Standard 7 32-bit	Yes	
Windows Embedded Standard 7 64-bit	Yes	
Windows XP Professional	Yes	
Windows XP Embedded	Yes	
Windows 2000	Yes	
Windows CE 5.0	Yes	
Windows CE 4.2	Yes	
B&R Linux 8	Yes	
B&R Linux 9	Yes	
Electrical characteristics		
Current consumption	Max. 500 µA in sleep mode, max. 120 mA read/write	
Environmental conditions		
Temperature		
Operation	0 to 70°C [2]	0 to 70°C [2]
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 [2]	Max. 3048 m [2]
Storage	Max. 12192 m	
Transport	Max. 12192 m	
Mechanical properties		
Dimensions		
Width	17.97 mm	
Length	67.85 mm	
Height	8.35 mm	

Table 274: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

1) Signals data transfer (reception and transmission).
2) The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.

6.4.1.4 Temperature/Humidity diagram

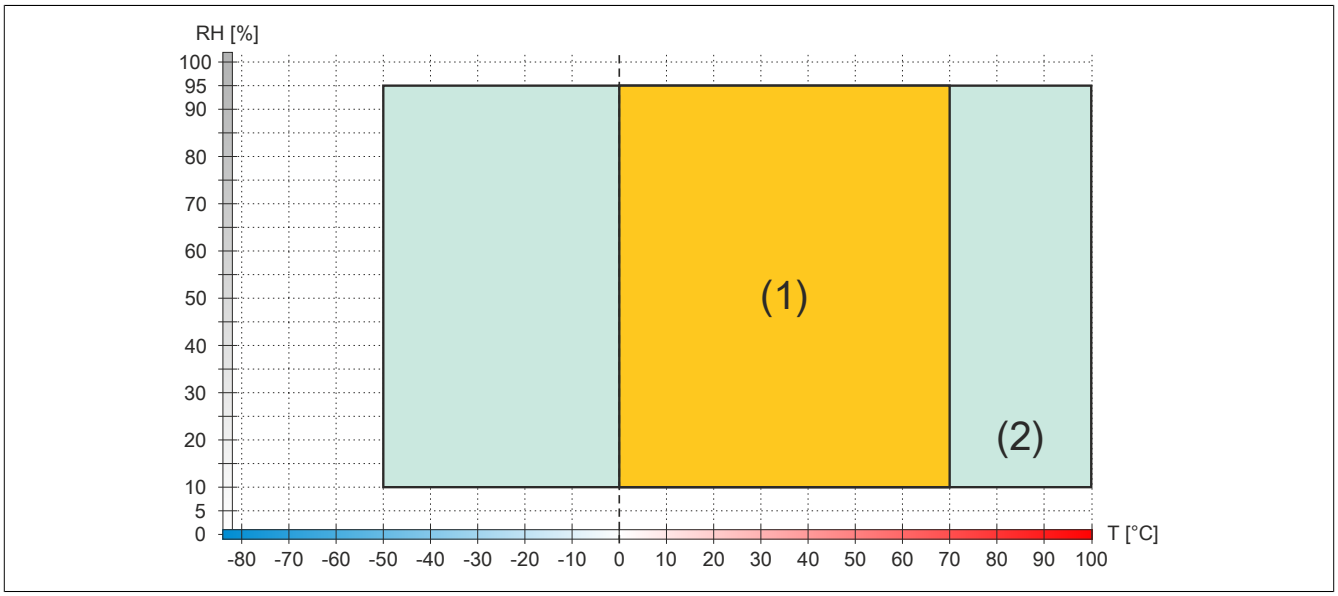


Figure 150: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

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

6.4.2 5MMUSB.032G-02

6.4.2.1 General information

USB flash drives are easily replaceable storage media. Due to the fast data transfer (USB 3.0), USB flash drives offer optimal values for use as portable storage media. Without additional drivers, the USB flash drive immediately reports itself as another drive from which data can be read or to which data can be written (hot plugging). USB 3.0 (XHCI) is supported in Windows 7 and later (USB 3.0 driver required).

Information:

Due to the large number of USB flash drives available on the market and their short lifecycles, we reserve the right to supply alternative products. It may therefore be necessary to take the following measures in order to also boot from these USB flash drives:

- **The USB flash drive must be reformatted or, in some cases, repartitioned (set partition as active).**
- **The USB flash drive must be in the first position in the boot order; alternatively, the IDE controllers can be disabled in BIOS. In most cases, this can be avoided by running "fdisk / mbr" on the USB flash drive.**

6.4.2.2 Order data

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

Table 275: 5MMUSB.032G-02 - Order data

6.4.2.3 Technical data

Information:

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

Model number	5MMUSB.032G-02
General information	
Capacity	32 GB
LED status indicators	1 LED (green) [1]
MTBF	>3,000,000 hours
Type	USB 2.0, USB 3.0
Maintenance	None
Certifications	
CE	Yes
Interfaces	
USB	
Type	USB 2.0, USB 3.0
Connection	To any USB type A interface
Transfer rate	High speed (480 Mbit/s) to SuperSpeed (4 Gbit/s)
Sequential reading	USB 3.0 max. 100 MB/s
Sequential writing	USB 3.0 max. 50 MB/s
Endurance	
MLC flash	Yes
Data reliability	<1 unrecoverable error per 10^{14} bits read
Connection cycles	>1500
Electrical characteristics	
Current consumption	Max. 67 mA in sleep mode, max. 122 mA read, max. 141 mA write
Environmental conditions	
Temperature	
Operation	0 to 70°C [2]
Storage	-55 to 95°C
Transport	-55 to 95°C

Table 276: 5MMUSB.032G-02 - Technical data

Model number	5MMUSB.032G-02
Relative humidity	
Operation	10 to 95%, non-condensing
Storage	10 to 95%, non-condensing
Transport	10 to 95%, non-condensing
Vibration	
Operation	7 to 2000 Hz: 20 g
Storage	7 to 2000 Hz: 20 g
Transport	7 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Elevation	
Operation	Max. 3048 m [2)]
Storage	Max. 12192 m
Transport	Max. 12192 m
Mechanical properties	
Dimensions	
Width	16.58 mm
Length	48.30 mm
Height	7.60 mm
Weight	10 g
Manufacturer information	
Manufacturer	Innodisk
Manufacturer's product ID	DEUA1-32GI61BCH88 (USB Drive 3ME)

Table 276: 5MMUSB.032G-02 - Technical data

1) Signals data transfer (reception and transmission).
2) The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.

6.4.2.4 Temperature/Humidity diagram

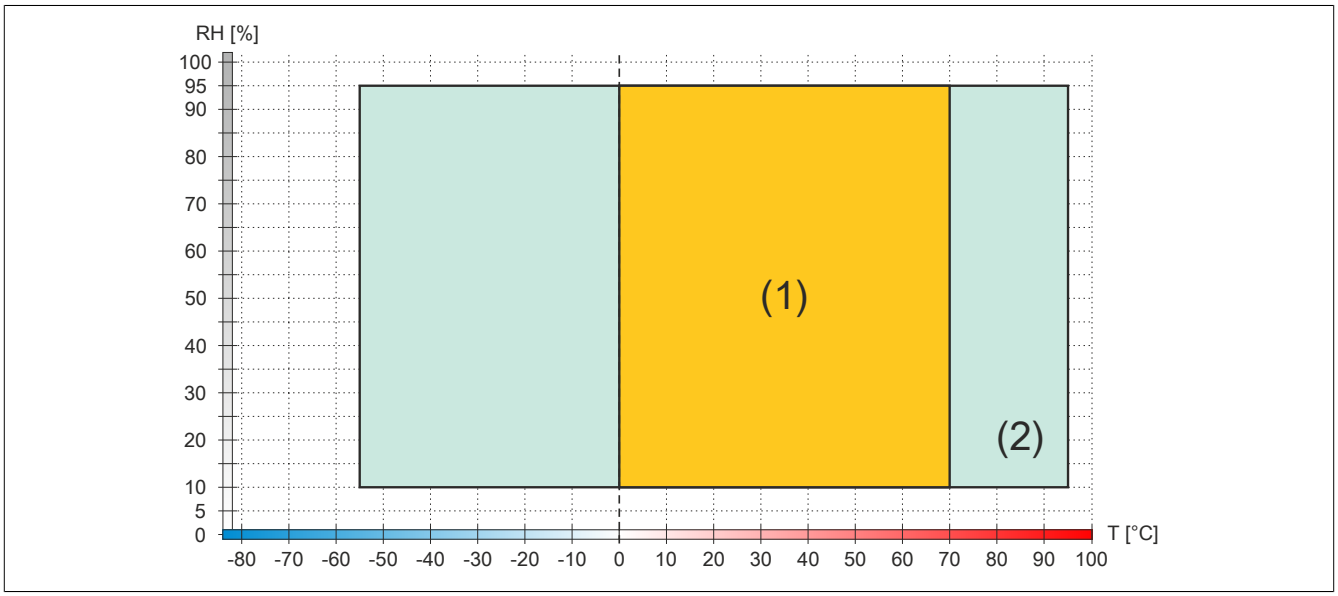


Figure 151: 5MMUSB.032G-02 - Temperature/Humidity diagram

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

6.5 Replacement parts

The following replacement parts can be ordered for the PPC2200:

- Mounting screws for PPC2200
- Slot cover for interfaces
- Cover for CFast slot
- Battery compartment 5ACCRPC2.0003-000
  (corresponds to the variant supplied with the configuration "5ACCBT01.0000-001" on page 207)

6.5.1 Replacement parts - Order data

Material number	Description
5ACCRPC2.0000-000	REP PPC2100/2200 mounting screws
5ACCRPC2.0001-000	REP xPC2100/2200 interface cover
5ACCRPC2.0002-000	REP xPC2200 CFast card cover
5ACCRPC2.0003-000	REP xPC2200 battery compartment

6.5.1.1 5ACCRPC2.0003-000 - Technical data

Model number	5ACCRPC2.0003-000
General information	
Battery	
Type	Panasonic 1000 mAh
Nominal voltage	3 V
Service life	8 years 1)
Removable	No 2)
Variant	Lithium
Certifications	
CE	Yes
UL	Not relevant
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-25 to 60°C
Storage	-25 to 60°C
Transport	-25 to 60°C
Relative humidity	
Operation	5 to 90%
Storage	5 to 95%
Transport	5 to 95%
Mechanical properties	
Housing	
Material	Gray (similar to Pantone 432C) plastic
Weight	Approx. 13 g

Table 277: 5ACCRPC2.0003-000 - Technical data

1) At 50°C, 6 µA for the components being supplied.
2) The battery is permanently installed in the battery compartment and cannot be replaced. The entire battery compartment must always be replaced.

7 Servicing/Maintenance

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

Information:

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

7.1 Cleaning

Danger!

The device is only permitted to be cleaned when it is switched off in order to avoid triggering unintentional functions by touching the touch screen or pressing keys.

Use a damp cloth to clean the device. Use only water with detergent, screen cleaner or alcohol (ethanol) to moisten the cleaning cloth. Apply the cleaning agent to the cloth first; do not spray it directly onto the device! Never use aggressive solvents, chemicals, abrasive cleaners, compressed air or steam cleaners.

Information:

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

7.2 User tips for increasing the service life of the display

7.2.1 Backlight

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

7.2.1.1 How can the service life of backlights be extended?

- Set the display brightness to the lowest value comfortable for the eyes.
- Use dark images.
- Reducing the brightness by 50% can increase the half-brightness time by approximately 50%.

7.2.2 Image persistence

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

There are 2 different types:

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

7.2.2.1 What causes image persistence?

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

7.2.2.2 How can image persistence be reduced?

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

7.3 Pixel errors

Information:

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

7.4 Replacing CFast cards

Caution!

The CFast card is only permitted to be replaced when the power is switched off.

Improper handling of the ejection lever (e.g. applying a large amount of force) can lead to a defect in the ejector mechanism.

1. Disconnect the power supply cable to the B&R industrial PC (disconnect the power cable).
2. Remove the Torx screw (T10) of the cover plate.
3. Remove the cover plate.

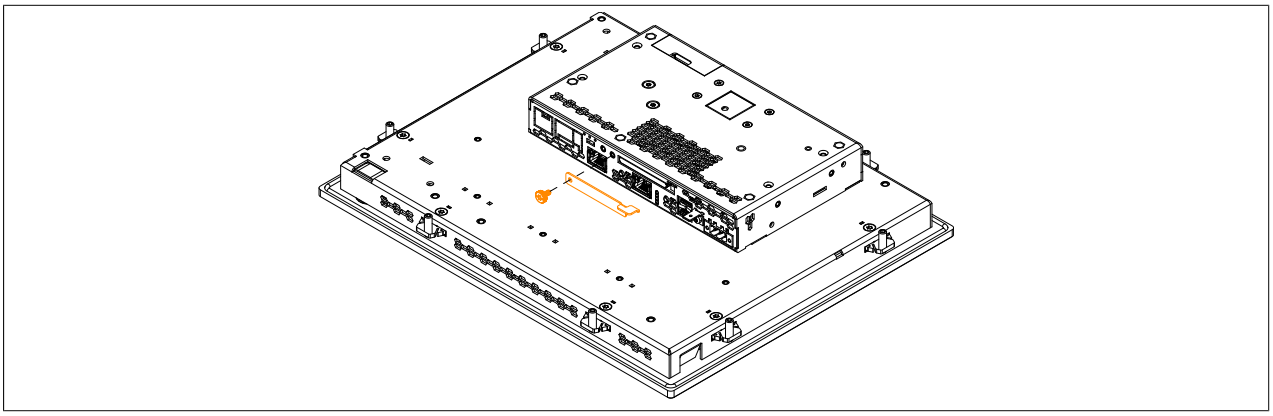


Figure 152: Removing the cover of the CFast slots

4. Press the ejector next to the card slot (see figure below).
   The card is ejected and can be replaced.

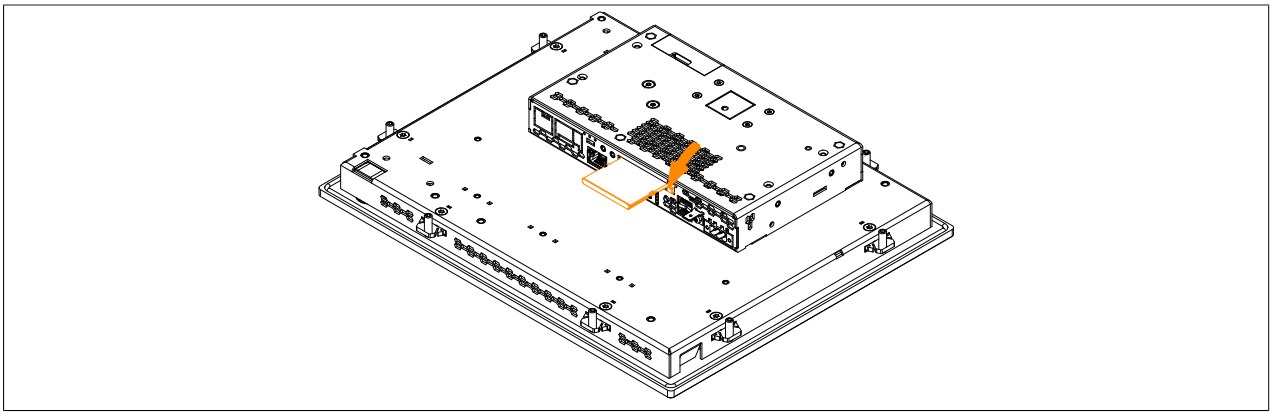


Figure 153: Pressing the ejector and removing the CFast card

7.5 Changing the battery

The following instructions apply to battery compartments 5ACCBT01.0000-001 and 5ACCRPC2.0003-000.

1. Disconnect the power supply cable to the B&R industrial PC (disconnect the power cable).
2. Carry out electrostatic discharge on the housing or at the ground connection.
3. Pull out and remove the battery compartment.

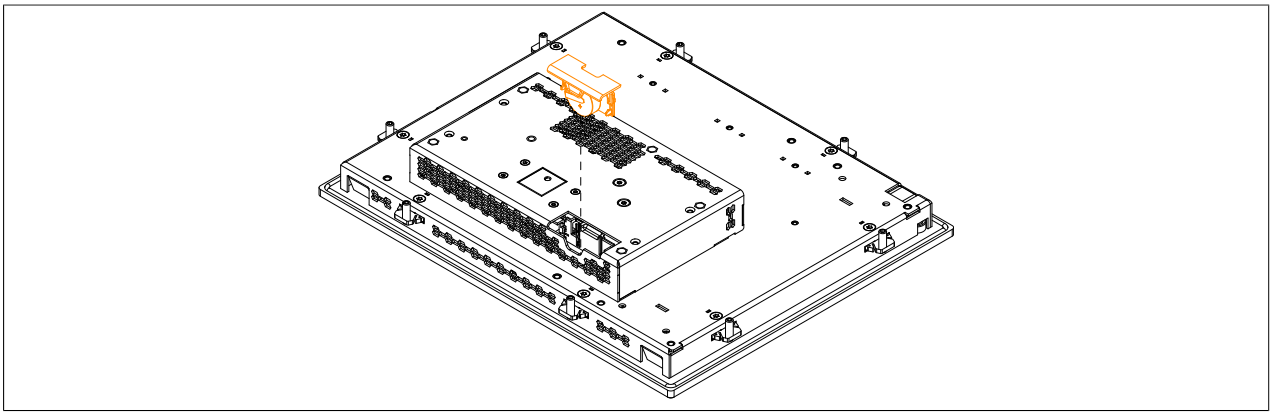


Figure 154: Changing the battery

4. Replace the new battery compartment.
5. Reapply power to the B&R industrial PC (connect the power cable).
6. Reset the date and time.

Warning!

Lithium batteries are hazardous waste. Used batteries must be disposed of in accordance with local regulations.

7.6 Repairs/Complaints and replacement parts

Danger!

Unauthorized opening or repair of the device may result in personal injury and/or serious damage to property. Therefore, do not carry out any repairs yourself. Repairs are only permitted to be carried out by authorized qualified personnel at the manufacturer's premises.

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

Appendix A

A.1 MTCX

The MTCX controller (FPGA processor) is located on the mainboard (part of each system unit) of the APC2200 and PPC2200 device.

Figure 155: MTCX controller - Position

The MTCX is responsible for the following monitoring and control functions:

- Switching on (power OK sequencing) and power failure logic
- Watchdog handling (NMI and reset handling)
- Temperature monitoring
- Fan control
- Handling/Coordination of keys and LEDs (matrix keyboard of B&R panels)
- Advanced desktop operation (buttons, USB forwarding)
- Daisy chain display operation (touch screen, USB forwarding)
- Panel locking mechanism (configurable via the B&R Control Center - ADI driver)
- Backlight control of a connected B&R display
- Calculating statistical data: Power-on cycles, power-on hours and fan hours (resolution: 15 min)
- SDL data transfer (display, matrix keyboard, touch screen, service data, USB)
- LED status indicators (Power, HDD, Link, Run)
- Optimal default BIOS settings are reported to BIOS by the MTCX depending on the existing hardware.

The functions of the MTCX can be extended by upgrading the firmware[4]. The version can be read in BIOS or in approved Microsoft Windows operating systems using the B&R Control Center.

[4] Available for download from the Downloads section of the B&R website (www.br-automation.com).

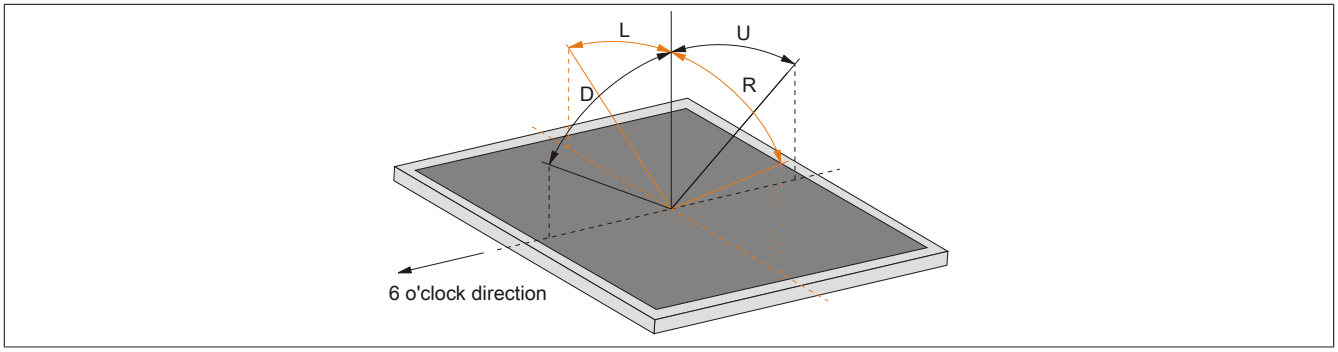
A.2 Abbreviations

Abbreviation	Stands for	Description
NC	Normally closed	Stands for a normally closed relay contact.
	Not connected	Used in pinout descriptions if a terminal or pin is not connected on the module side.
ND	Not defined	Stands for an undefined value in technical data tables. This may be because the cable manufacturer has not provided a value for certain technical data.
NO	Normally open	Stands for a normally open relay contact.
TBD	To be defined	Used in technical data tables if there is currently no value for specific technical data. The value will be supplied later.
MTBF	Mean time between failures	The expected value of the operating time between two consecutive failures.

Table 278: Abbreviations used in this user's manual

A.3 Viewing angles

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



A.4 Chemical resistance

AP1000 single-touch panels are manufactured with the Autotex panel overlay.

AP9x3 single-touch panels are manufactured with the Autotex panel overlay starting with the following revision:

- 5AP923.1215-00 ≥ revision B8
- 5AP923.1505-00 ≥ revision B8
- 5AP923.1906-00 ≥ revision B8

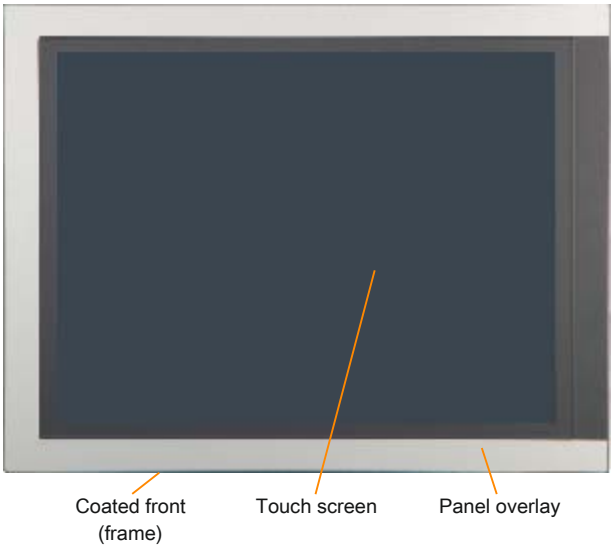


Figure 156: Single-touch panel with Autotex panel overlay

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

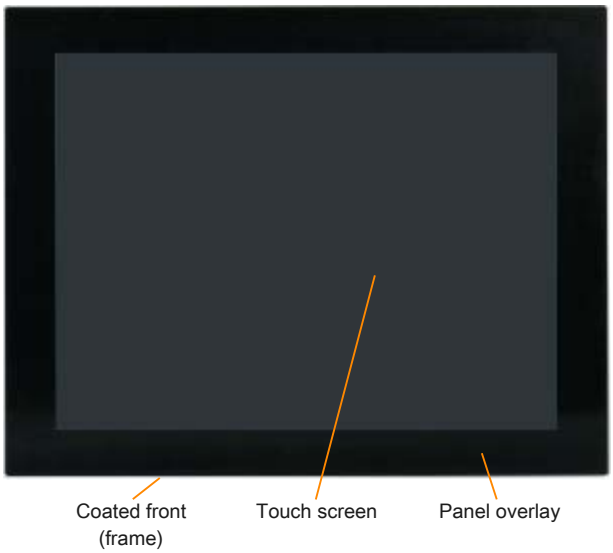


Figure 157: Single-touch panel with aluminum panel overlay

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

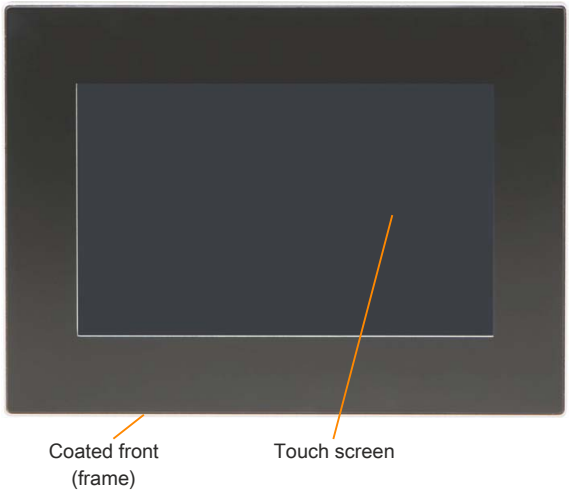


Figure 158: Multi-touch panel with glass surface

A.4.1 Autotex panel overlay (polyester)

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

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

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

A.4.2 Aluminum panel overlay

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

- Acetaldehyde
- Acetone
- Acetonitrile
- Alkali carbonate
- Alkane
- Formic acid < 50%
- Ammonia < 40%
- Amyl acetate
- Gasoline
- Bichromate
- Brake fluid
- Castor oil
- Hydrogen chloride < 36%
- Cyclohexanol
- Cyclohexanone
- Decon
- Diacetone alcohol
- Diesel
- Diethyl ether
- Diethyl phthalate
- Dimethylbenzene
- Dioxan
- Dowandol
- DRM/PM
- Iron chloride
- Iron 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

A.4.3 Coated aluminum front

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

- Formic acid < 50%
- Ammonia < 40%
- Brake fluid
- Hydrogen chloride < 10%
- Diesel
- Acetic acid < 50%
- 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

A.4.4 Touch screen

AMT touch screen (single-touch)

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

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

3M touch screen (multi-touch)

Unless otherwise specified, the 3M touch screen is resistant to the following chemicals per ASTM D 1308-02 and ASTM F 1598-95 when exposed for up to 24 hours without visible changes:

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

A.5 Touch screen

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

A.5.1.1 Technical data

Information:

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

Product ID	5-wire AMT touch screen
General information	
Certifications	
CE	Yes
c-UL-us	Yes
Manufacturer	AMT
Technology	Analog, resistive
Release pressure	<1 N
Light transmission	81% ± 3%
Ambient conditions	
Temperature	
Operation	-20 to 70°C
Storage	-40 to 80°C
Transport	-40 to 80°C
Relative humidity	
Operation	90% at max. 50°C
Storage	90% RH at max. 60°C for 504 hours
Transport	90% RH at max. 60°C for 504 hours
Operating conditions	
Service life	36 million touch operations at the same position (release pressure: 250 g, interval: 2x per second)
Activation	Finger, stylus, credit card, glove
Drivers	Touch screen drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

Table 279: 5-wire AMT touch screen - Technical data

A.5.1.2 Temperature/Humidity diagram

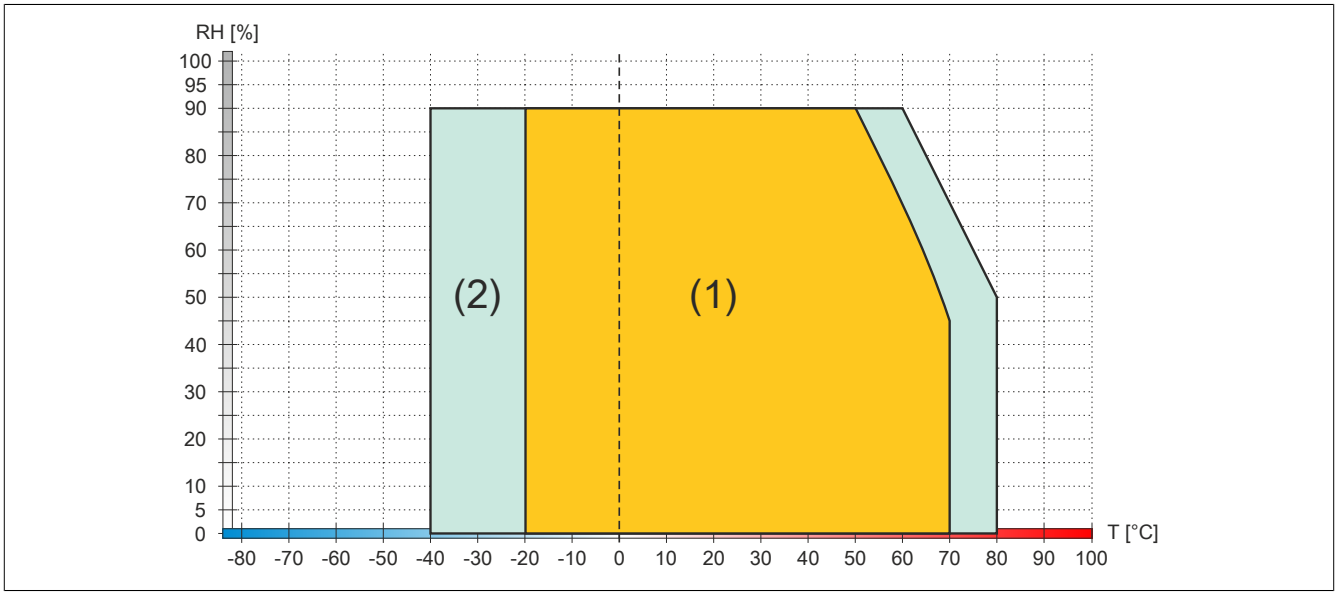


Figure 159: 5-wire AMT touch screen - Temperature/Humidity diagram

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

A.5.2 3M touch screen (multi-touch generation 2)

A.5.2.1 General information

Valid for the following products:

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

A.5.2.2 Technical data

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

Product ID	3M touch screen
General information	
Certifications	
CE	Yes
Manufacturer	3M
Technology	Projected capacitive touch (PCT)
Light transmission	88 ± 2%
Anti-reflective coating	Chemical/Gloss = 70
Ambient conditions	
Temperature	
Operation	0 to 50°C
Storage	-10 to 70°C
Transport	-10 to 70°C
Relative humidity	
Operation	90% at max. 35°C
Storage	90% at max. 35°C
Transport	90% at max. 35°C
Operating conditions	
Activation	Finger, thin glove, 3M Smart Pen

Table 280: 3M touch screen - Technical data

A.5.2.3 Temperature/Humidity diagram

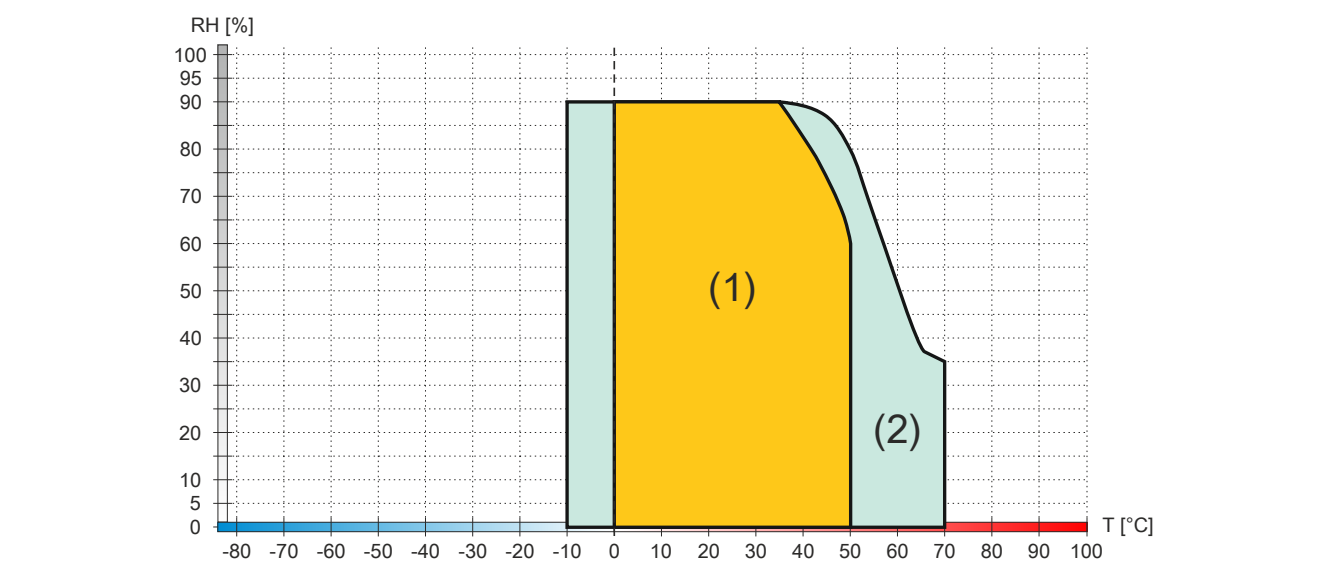


Figure 160: 3M touch screen generation 2 - Temperature/Humidity diagram

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

A.5.3 3M touch screen (multi-touch generation 3)

A.5.3.1 General information

Valid for the following products:

- 5AP1130.0702-000
- 5AP1130.101E-000
- 5AP1130.121E-000
- 5AP1130.156C-000
- 5AP1130.185C-000

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

A.5.3.2 Technical data

Information:

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

Product ID	3M touch screen
General information	
Certifications	
CE	Yes
Manufacturer	3M
Technology	Projected capacitive touch (PCT)
Light transmission	>90%
Anti-reflective coating	Optical/Gloss = 80
Ambient conditions	
Temperature	
Operation	-10 to 70°C
Storage	-40 to 70°C
Transport	-40 to 70°C
Relative humidity	
Operation	Up to 90% at max. 35°C, see diagram for >35°C.
Storage	Up to 90% at max. 35°C, see diagram for >35°C.
Transport	Up to 90% at max. 35°C, see diagram for >35°C.
Operating conditions	
Activation	Finger, thin glove, 3M Smart Pen

Table 281: 3M touch screen - Technical data

A.5.3.3 Temperature/Humidity diagram

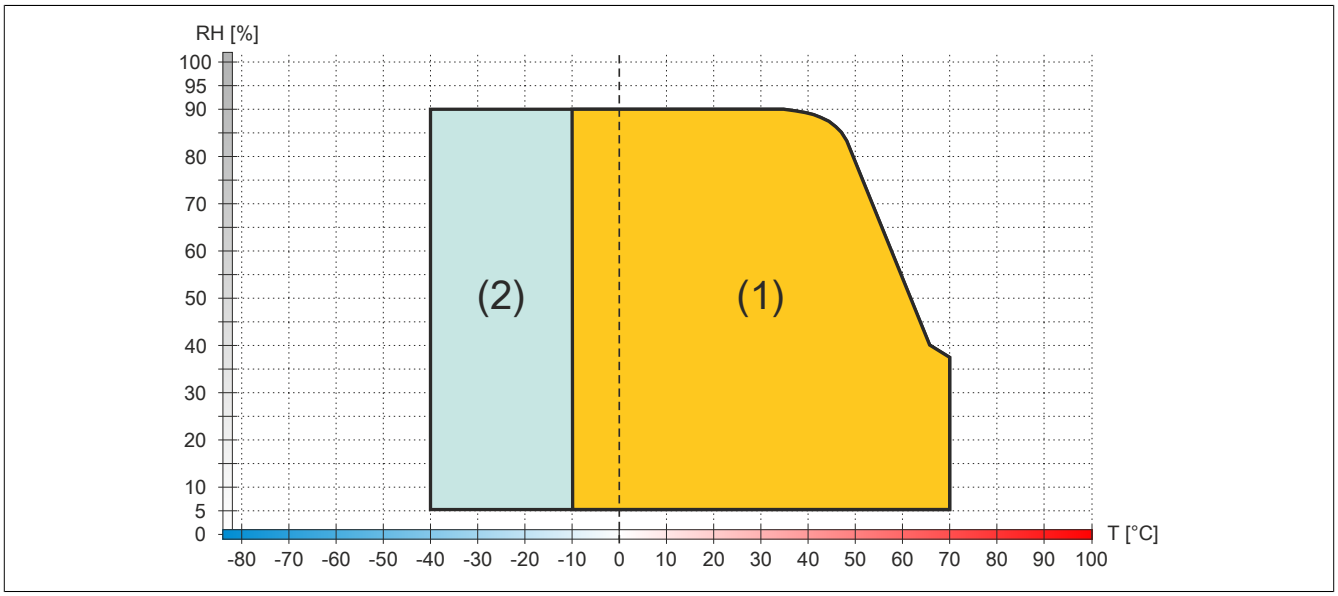


Figure 161: 3M touch screen generation 3 - Temperature/Humidity diagram

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

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