# Panel PC 900 (Skylake)

## User's manual

Version: **1.10 (September 2022)**
Order no.: **MAPPC900S-EN**

**Translation of the original documentation**

# 1 Introduction

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

## 1.1 Manual history

| Version | Date | Change |
|---|---|---|
| 1.10 | September 2022 | Updated the following chapters:<br>• "+24 VDC power supply" on page 51<br>• "Replacing the fan kit" on page 220<br>• "Environmental properties" on page 24<br>• "Mounting orientations" on page 45 |
| 1.00 | April 2021 | • First version |

## 1.2 Information about this document

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

### 1.2.1 Organization of notices

**Safety notices**

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

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

**General notices**

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

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

### 1.2.2 Guidelines
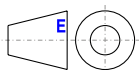
European dimension standards apply to all dimension diagrams.

> **All dimensions in millimeters.**

Unless otherwise specified, the following general tolerances apply:

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

# 2 General safety guidelines

## 2.1 Intended use

In all cases, it is necessary to observe and comply with applicable national and international standards, regulations and safety measures!

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

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

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

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

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

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

## 2.2 Protection against electrostatic discharge

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

### 2.2.1 Packaging

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

### 2.2.2 Regulations for proper ESD handling

**Electrical assemblies with housing**

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

**Electrical assemblies without housing**

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

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

- Measuring instruments and devices must be grounded.
- Test probes of floating potential measuring instruments must be discharged briefly on suitable grounded surfaces before measurement.

**Individual components**

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

## 2.3 Regulations and measures

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

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

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

## 2.4 Transport and storage

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

## 2.5 Installation

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

## 2.6 Operation

### 2.6.1 Protection against contact with electrical parts

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

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

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

### 2.6.2 Ambient conditions - Dust, moisture, aggressive gases

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

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

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

### 2.6.3 Programs, viruses and malicious programs

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

## 2.7 Cybersecurity disclaimer for products

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

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

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

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

The aforementioned appropriate security measures include, for example:

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

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

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

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

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

# 3 System overview

## 3.1 Description of individual modules

### 3.1.1 AP9x3 panels

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

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

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

### 3.1.2 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 screentechnologies as well as panels with touch screen and keys are available.

Panels are installed using retaining clips or clamping blocks.

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

### 3.1.3 CPU board and system unit

In addition to making it possible to insert interface options, slide-in compact drives and CFast cards, the CPU board also includes all of the PPC900's interfaces.

A system unit consists of an anthracite gray housing and heat sink. Both passive variants (without a fan kit) and active variants (with a fan kit) are available.

An operational Panel PC 900 is assembled by installing a CPU board, system unit, main memory and mass storage device on a display unit. Panel PC 900 systems are mounted using retaining clips.

A CPU board and system unit cannot function without a display unit.

## 3.2 Design/Configuration

Automation Panel 9x3, Automation Panel 1000, Panel PC 900, Panel PC 2100, Panel PC 2200 and Panel PC 3100 systems can be assembled to meet individual requirements and operating conditions. Automation Panel 9x3, Panel PC 900, Panel PC 2100, Panel PC 2200 and Panel PC 3100 systems are flexible so that an Automation Panel can be converted to a Panel PC or vice versa.

The following individual components are mandatory for operation as a Panel PC 900:

- Panel
- CPU board
- System unit
- Main memory
- Fan kit[2]
- Drive (mass storage device such as CFast card or hard disk) for the operating system
- Operating system

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[2] The use of a fan kit may be necessary under certain conditions. For additional information, see section "Maximum ambient temperature for worst-case operation" on page 25.

### 3.2.1 Base system - Configuration

Panel PC 900 systems can be operated with or without a fan kit. This choice plays a role in determining the type of housing to be used.

Using a fan kit allows for operation at higher ambient temperatures. For additional information, see section "Maximum ambient temperature for worst-case operation" on page 25.

| 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** | | | | |
| 5AP1120.1043-000 | 10.4" | VGA | Single-touch | No | Landscape |
| 5AP1120.1214-000 | 12.1" | SVGA | 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** | | | | |
| 5AP1130.156C-000 | 15.6" | Full HD | Multi-touch | No | Landscape |
| 5AP1130.156C-001 | 15.6" | Full HD | Multi-touch | No | Landscape |
| 5AP1130.185C-000 | 18.5" | Full HD | Multi-touch | No | Landscape |
| | **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" | FHD | 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 |
| **CPU board** | | | | | Select 1 |
| | **QM170 CPU boards**<br>5PC901.TS17-00[1]<br>5PC901.TS17-01[1]<br>**HM170 CPU boards**[2]<br>5PC901.TS17-02<br>5PC901.TS17-03 | | | | |
| **System unit** | | | | | Select 1 |
| | 5PC911.SX00-00 (system active) | | 5PC911.SX00-01 (system passive) | | |
| **Fan kit** | | | | | Select 1 |
| | 5AC902.FA00-00[1] | | | | |
| **Main memory** | | | | | Select max. 2 |
| | 5MMDDR.4096-04<br>5MMDDR.8192-04<br>5MMDDR.016G-04 | | | | |

1) CPU boards 5PC901.TS17-00 and 5PC901.TS17-01 as well as fan kit 5AC902.FA00-00 can only be operated with system unit 5PC911.SX00-00.
2) The following applies when operated without a fan kit:

- CPU board 5PC901.TS17-02 is limited to a maximum CPU frequency of 1900 MHz.
- CPU board 5PC901.TS17-03 is limited to a maximum CPU frequency of 1700 MHz.

## 3.2.2 Accessories and software - Configuration

| Accessories and software - Configuration | |
|---|---|
| **Power supply unit** | Select 1 |
| 5AC902.PS00-00 | |
| **Slide-in compact drives** | Select 1 |
| 5AC901.CHDD-01        5AC901.CSSD-05<br>5AC901.CSSD-03        5AC901.CSSD-06<br>5AC901.CSSD-04        5AC901.CCFA-00 | |
| **IF options** | Select max. 2[1] |
| 5AC901.I232-00        5AC901.ISRM-00<br>5AC901.I485-00        5AC901.IPLK-00<br>5AC901.ICAN-00        5AC901.IRDY-00<br>5AC901.ICAN-01        5AC901.ISIO-00<br>5AC901.IHDA-00        5AC901.IETH-00 | |
| **UPS** | Select 1 |

**UPS**

| UPS module[2] | + | Battery unit | + | UPS cable |
|---|---|---|---|---|
| 5AC901.IUPS-00<br>5AC901.IUPS-01 | | 5AC901.BUPS-00<br>5AC901.BUPS-01 | | 5CAUPS.0005-01<br>5CAUPS.0010-01<br>5CAUPS.0013-01<br>5CAUPS.0030-01 |

| | |
|---|---|
| **Bus units** | Select 1 |
| 5AC902.BX01-00 (bus 1PCI 1SI)<br>5AC902.BX01-01 (bus 1PCIe.x8 1SI)<br>5AC902.BX02-00 (bus 2PCI 1SI)<br>5AC902.BX02-01 (bus 1PCI 1PCIe.x8 1SI)<br>5AC902.BX02-02 (bus 2PCIe.x4 1SI) | |
| **Slide-in drives** | Select max. 1 |
| 5AC901.SDVW-00<br>5AC901.SSCA-00 | |
| **Fan kit[3]** | Select max. 1 |
| 5AC902.FA0X-00 | |
| **CFast cards** | Select 1 |
| 5CFAST.2048-00        5CFAST.032G-00<br>5CFAST.4096-00        5CFAST.032G-10<br>5CFAST.8192-00        5CFAST.064G-10<br>5CFAST.016G-00        5CFAST.128G-10<br>                  5CFAST.256G-10 | |
| **PCIe cards** | Select 1[4] |
| 5ACPCE.ETH1-00<br>5ACPCE.ETH4-00 | |
| **USB accessories** | Select 1 |
| 5MMUSB.2048-01<br>5MMUSB.4096-01<br>5MMUSB.032G-02<br>5MMUSB.4096-02 | |
| **Terminal blocks** | Select 1 |

| DC power supply connector<br>0TB103.9<br>0TB103.91 | AC power supply connector<br>0TB3103.8000 |
|---|---|

| | |
|---|---|
| **Operating systems** | Select 1 |

| Windows 10 | B&R Linux 10 | Automation Runtime |
|---|---|---|
| 5SWW10.1064-MUL<br>5SWW10.1164-MUL | 5SWLIN.0864-MUL | 0TG1000.01<br>0TG1000.02<br>1TG4601.06-5<br>**B&R Hypervisor**<br>1TG4700.00 |

1)     Certain limitations must be taken into account when using IF options. For additional information, refer to section "Device interfaces" (see "Device interfaces and slots" on page 50).
2)     The UPS module can only be operated in the IF option 1 slot.
3)     If using an active system unit, then a fan kit must be selected for the bus unit.
4)     Required = PCIe bus

## 3.2.3 Configuration options

Panel PC 900 without bus unit:
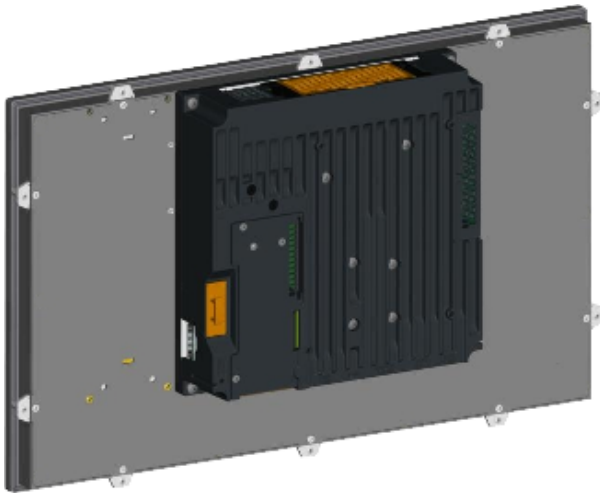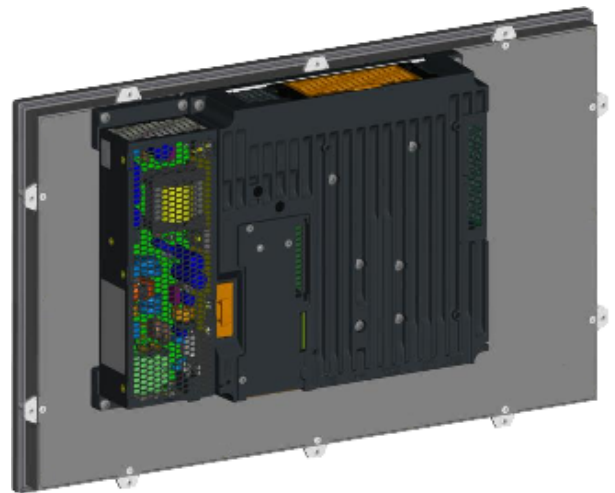


**Panel PC 900**



**Panel PC 900 with power supply**

Figure 1: Panel PC 900 without bus unit

Panel PC 900 with 1-slot bus unit:
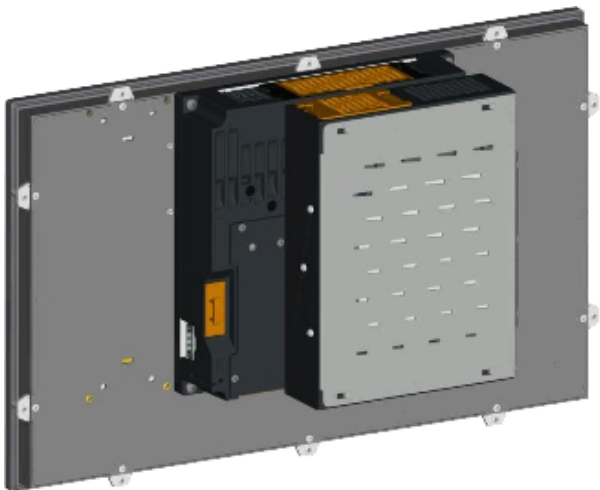


**Panel PC 900 with 1-slot bus unit**
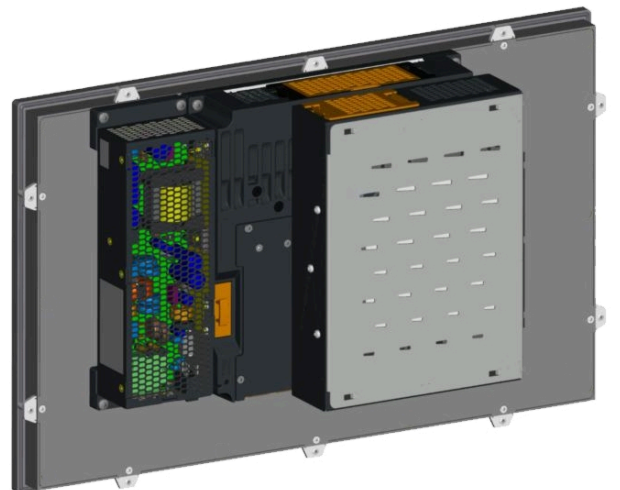


**Panel PC 900 with 1-slot bus unit and power supply**

Figure 2: Panel PC 900 with 1-slot bus unit

Panel PC 900 with 2-slot bus unit:
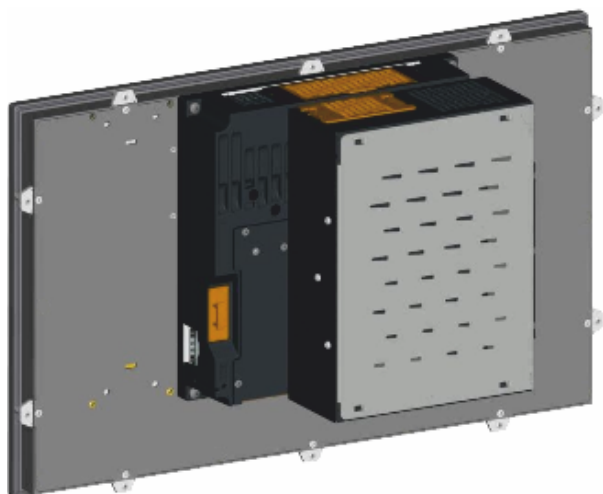


**Panel PC 900 with 2-slot bus unit**
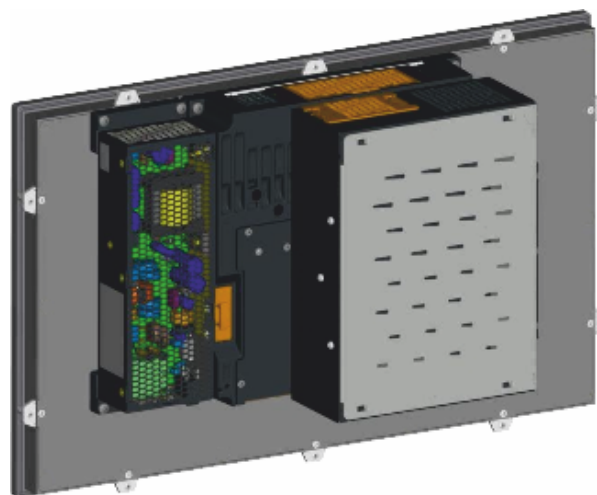
**Panel PC 900 with 2-slot bus unit and power supply**

Figure 3: Panel PC 900 with 2-slot bus unit

## 3.3 Overview

| Order number | Short description | Page |
|---|---|---|
| | **Accessories** | |
| 0TB103.9 | Connector 24 VDC - 3-pin, female - Screw clamp terminal block 3.31 mm² | 314 |
| 0TB103.91 | Connector 24 VDC - 3-pin, female - Cage clamp terminal block 3.31 mm² | 314 |
| | **B&R Linux 10** | |
| 5SWLIN.0864-MUL | B&R Linux 10 - 64-bit - Multilingual - PPC900 chipset QM170/HM170 (UEFI boot) - Installation - Only available with a new device | 295 |
| | **Batteries** | |
| 0AC201.91 | Lithium batteries 4 pcs., 3 V / 950 mAh button cell | 318 |
| 4A0006.00-000 | Lithium battery, 3 V / 950 mAh, button cell | 318 |
| | **Bus units** | |
| 5AC902.BX01-00 | PPC900 bus unit, 1-slot - 1 PCI - 1 slide-in | 126 |
| 5AC902.BX01-01 | PPC900 bus unit, 1-slot - 1 PCI Express x8 - 1 slide-in | 126 |
| 5AC902.BX02-00 | PPC900 bus unit, 2-slot - 2 PCI - 1 slide-in | 126 |
| 5AC902.BX02-01 | PPC900 2-slot bus unit - 1 PCI - 1 PCI Express x8 - 1 slide-in | 126 |
| 5AC902.BX02-02 | PPC900 bus unit, 2-slot - 2 PCI Express x4 - 1 slide-in | 126 |
| | **CPU boards** | |
| 5PC901.TS17-00 | CPU board Intel Core i7 6820EQ 2.8 GHz - Quad core - QM170 chipset - For Panel PC 900 | 116 |
| 5PC901.TS17-01 | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - QM170 chipset - For Panel PC 900 | 116 |
| 5PC901.TS17-02 | CPU board Intel Core i3 6100E - Dual core - HM170 chipset - 2.7 GHz active, 1.9 GHz passive - For Panel PC 900 | 119 |
| 5PC901.TS17-03 | CPU board Intel Celeron G3900E - Dual core - HM170 chipset - 2.4 GHz active, 1.7 GHz passive - For Panel PC 900 | 119 |
| | **Drives** | |
| 5AC901.CCFA-00 | CFast adapter - For slide-in compact slot | 159 |
| 5AC901.CHDD-01 | 500 GB hard disk - Slide-in compact - SATA | 129 |
| 5AC901.CHDD-99 | Slide-in compact kit | 158 |
| 5AC901.CSSD-03 | 60 GB SSD MLC - Slide-in compact - SATA | 132 |
| 5AC901.CSSD-04 | 128 GB SSD MLC - Slide-in compact - Innodisk - SATA | 135 |
| 5AC901.CSSD-05 | 256 GB SSD MLC - Slide-in compact - Innodisk - SATA | 138 |
| 5AC901.CSSD-06 | 512 GB SSD MLC - Slide-in compact - Innodisk - SATA | 141 |
| 5AC901.CSSD-07 | 1 TB SSD MLC - Slide-in compact - Innodisk - SATA | 143 |
| 5AC901.SDVW-00 | DVD drive - DVD-R/RW|DVD+R/RW - Slide-in | 160 |
| 5AC901.SSCA-00 | Slide-in compact adapter - For slide-in compact drives | 163 |
| 5MMSSD.0060-01 | 60 GB SSD MLC - Intel - SATA | 145 |
| 5MMSSD.0128-01 | 128 GB SSD MLC - Innodisk - SATA | 148 |
| 5MMSSD.0256-00 | 256 GB SSD MLC - Innodisk - SATA | 151 |
| 5MMSSD.0512-00 | 512 GB SSD MLC - Innodisk - SATA | 154 |
| 5MMSSD.1024-00 | 1 TB SSD MLC - Innodisk - SATA | 156 |
| | **Fan kit** | |
| 5AC902.FA00-00 | PPC900 fan kit - For system unit 5PC911.SX00-00 | 127 |
| 5AC902.FA0X-00 | PPC900 fan kit - For PPC900 bus unit | 128 |
| | **Hypervisor** | |
| 1TC4700.00 | License for B&R Hypervisor (TC). One license per target system is required. | 296 |
| | **Interface options** | |
| 5AC901.I232-00 | Interface card - 1x RS232 interface - For APC910/PPC900/APC3100/PPC3100 | 165 |
| 5AC901.I485-00 | Interface card - 1x RS232/RS422/RS485 interface - For APC910/PPC900/APC3100/PPC3100 | 167 |
| 5AC901.ICAN-00 | Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100 | 170 |
| 5AC901.ICAN-01 | Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100 | 173 |
| 5AC901.IETH-00 | Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/APC3100/PPC3100 | 184 |
| 5AC901.IHDA-00 | Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100 | 179 |
| 5AC901.IPLK-00 | Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100 | 177 |
| 5AC901.IRDY-00 | Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100 | 181 |
| 5AC901.ISIO-00 | Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100 | 182 |
| 5AC901.ISRM-00 | Interface card - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100 | 175 |
| 5ACPCE.ETH1-00 | PCIe carte - 1x ETH 10/100/1000 - For APC910/PPC900 | 319 |
| 5ACPCE.ETH4-00 | PCIe card - 4-port ETH 10/100/1000 - For APC910/PPC900 | 322 |
| | **Main memory** | |
| 5MMDDR.016G-04 | SO-DIMM DDR4, 16384 MB | 124 |
| 5MMDDR.4096-04 | SO-DIMM DDR4, 4096 MB | 124 |
| 5MMDDR.8192-04 | SO-DIMM DDR4, 8192 MB | 124 |
| | **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 | 86 |
| 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 | 95 |
| 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 | 97 |
| 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 | 104 |

| Order number | Short description | Page |
|---|---|---|
| 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 | 113 |
| 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 | 107 |
| 5AP1130.156C-001 | Automation Panel 15.6" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - Optical bonding - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules | 109 |
| 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 | 111 |
| 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 | 88 |
| 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 - 32 function keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP580.1505-00, 5AP980.1505-01 | 99 |
| 5AP1181.1043-000 | Automation Panel 10.4" VGA TFT - 640 x 480 pixels (4:3) - Single-touch (analog resistive) - Control cabinet in-stallation - 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 | 90 |
| 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 | 101 |
| 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 | 93 |
| 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 | 70 |
| 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 | 72 |
| 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 | 79 |
| 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 | 81 |
| 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 | 83 |
| **Power supply unit** | | |
| 5AC902.PS00-00 | PPC900 power supply 85-264 VAC | 201 |
| **Runtime** | | |
| 1TC4601.06-5 | License for Automation Runtime Embedded (TC). One license per target system is required. | 296 |
| **System units** | | |
| 5PC911.SX00-00 | PPC900 active system unit | 122 |
| 5PC911.SX00-01 | PPC900 passive system unit | 123 |
| **Technology Guard** | | |
| 0TG1000.01 | Technology Guard (MSD) | 296 |
| 0TG1000.02 | Technology Guard (HID) | 296 |
| 0TGF016.01 | Technology Guard (MSD) with integrated flash drive, 16 GB (MLC) | 296 |
| 1TG4601.06-5 | Automation Runtime Embedded, TG license | 296 |
| 1TG4601.06-T | Automation Runtime Embedded Terminal TG license | 296 |
| 1TG4700.00 | B&R Hypervisor | 296 |
| **Terminal blocks** | | |
| 0TB2104.8000 | Connector 24 VDC - 4-pin female - Screw clamp terminal block 2.5 mm² | 317 |
| 0TB3103.8000 | Connector 230 VAC - 3-pin female - Screw clamp terminal block 4 mm² - Protected against vibration by the screw flange | 315 |
| **Uninterruptible power supply** | | |
| 5AC901.BUPS-00 | Battery unit 4.5 Ah - For UPS 5AC901.IUPS-00 | 191 |
| 5AC901.BUPS-01 | Battery unit 2.2 Ah - For UPS 5AC901.IUPS-01 | 195 |
| 5AC901.IUPS-00 | UPS - For 4.5 Ah battery | 187 |
| 5AC901.IUPS-01 | UPS - For 2.2 Ah battery | 189 |
| 5CAUPS.0005-01 | UPS cable - 0.5 m - For 5AC901.IUPS-xx | 199 |
| 5CAUPS.0010-01 | UPS cable - 1 m - For 5AC901.IUPS-xx | 199 |
| 5CAUPS.0013-01 | UPS cable - 1.3 m - For 5AC901.IUPS-xx | 199 |
| 5CAUPS.0030-01 | UPS cable - 3 m - For 5AC901.IUPS-xx | 199 |
| **Windows 10 IoT Enterprise 2019 LTSC** | | |
| 5SWW10.1064-MUL | Windows 10 IoT Enterprise 2019 LTSC - 64-bit - Value - Multilingual - PPC900 chipset QM170/HM170 (UEFI boot) - CPU Celeron/Core i3/Core i5 - License - Only available with a new device | 292 |
| 5SWW10.1164-MUL | Windows 10 IoT Enterprise 2019 LTSC - 64-bit - High End - Multilingual - PPC900 chipset QM170 (UEFI boot) - CPU Core i7 - License - Only available with a new device | 292 |

# 4 Technical data

## 4.1 Complete system

### 4.1.1 Product labels

A unique serial number adhesive label with a barcode (Code 128) is affixed to each B&R device for identification purposes. This serial number represents all of the individual components built into the system (order number, name, revision, serial number, delivery date and duration of warranty).

Depending on the device variant, the position of the adhesive labels may differ from those shown in the figures below.

Three adhesive labels are also included with the Panel PC 900 with detailed information about the installed components. Two of these adhesive labels can be affixed individually.
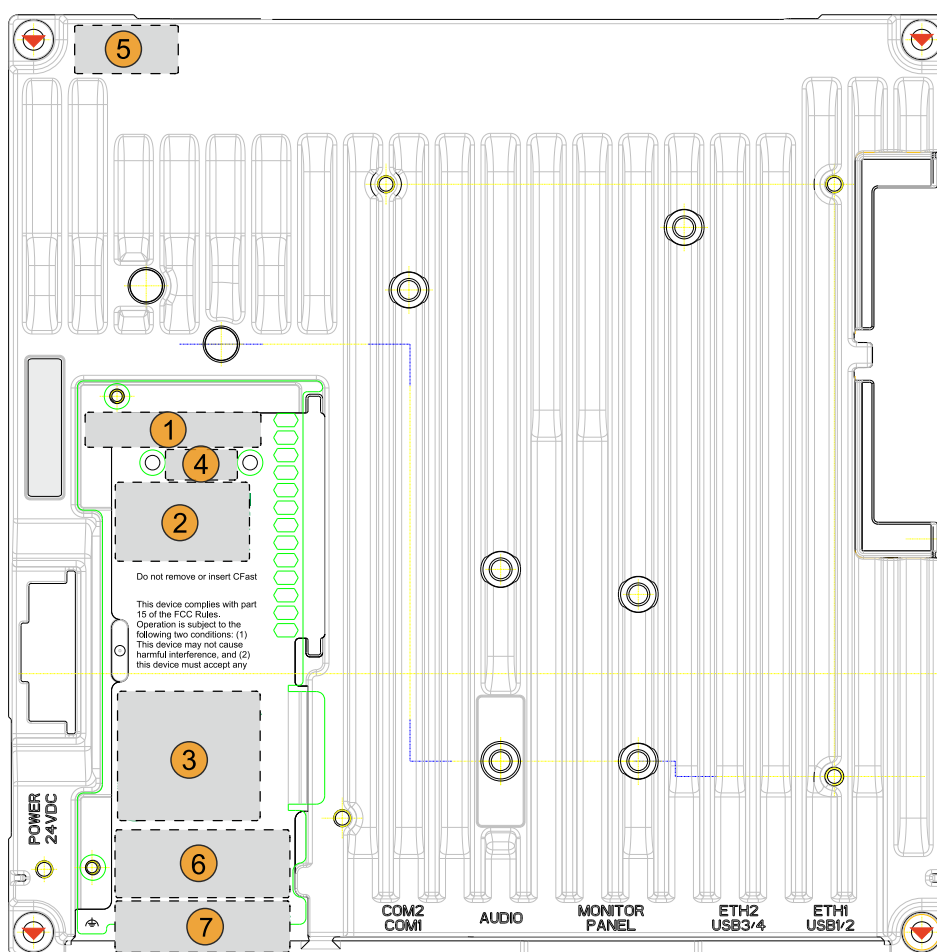


| Position | Description |
|---|---|
| 1 | Specifications for the device family and electrical properties |
| 2 | Device-specific specifications, serial numbers and MAC addresses, see Identification. |
| 3 | Valid test and conformity ID for the product, see section "Technical data" on page 22 |
| 4 | Safety notices, warnings and information about the product |
| 5 | License adhesive label for operating systems (configuration-dependent) |
| 6 | Space for individual customer information (configuration-dependent) |
| 7 | Interfaces on interface options (configuration-dependent) |
| ▼ | These holes are intended for installing/removing the panel PC on the panel. |

**Searching for a serial number on the website**

> # Information:
>
> **Using this function requires logging into the B&R website (www.br-automation.com).**

The serial number represents all of the individual components built into the system (serial number, material number, revision, delivery date and duration of warranty). This information is located on the B&R website. For this, the serial number of the complete system must be entered in the search field on the B&R website (www.br-automation.com). After the search, a detailed list of the installed components is displayed.



Figure 4: Example image

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## 4.1.2 Environmental properties

### 4.1.2.1 Temperature specifications

Depending on the display unit and system unit, CPU boards can be combined with various other components such as drives, main memory, additional plug-in cards, etc. The many different configurations possible result in varying maximum ambient temperatures, which can be seen in the following tables in this section.

> # Information:
>
> **The maximum specified ambient temperatures for operation with and without a fan kit have been determined under worst-case conditions. Experience has shown that higher ambient temperatures can be achieved with typical applications in Microsoft Windows, for example. The relevant test and assessment must be carried out individually by the user on site (reading out the temperatures in BIOS or using the B&R Control Center).**

#### Information regarding worst-case conditions

- Thermal Analysis Tool (TAT V5.0) from Intel for simulating processor utilization (CPU 100%, graphics 100%, memory 100%)
- BurnInTest Pro V8.1 from PassMark Software for simulating 100% interface utilization using loopback adapters (serial interface, slide-in drives, USB interfaces, audio outputs)
- Maximum system expansion and power consumption

### 4.1.2.1.1 Minimum ambient temperature during operation

For systems containing component 5AC901.SDVW-00, the minimum ambient temperature for non-condensing operation is +5°C.

If none of these components are used, then the minimum ambient temperature for non-condensing operation is 0°C.

## 4.1.2.1.2 Maximum ambient temperature for worst-case operation

### Operation with a fan kit

| All temperature specifications in degrees Celsius (°C) at 500 m above sea level, **non-condensing**. | Maximum ambient temperature (system unit 5PC911.SX00-00) | | | |
|---|---|---|---|---|
| The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level. | 5PC901.TS17-00 i7 (6820EQ) | 5PC901.TS17-01 i5 (6440EQ) | 5PC901.TS17-02 i3 (6100E) @2700 MHz | 5PC901.TS17-03 C (G3900E) @2400 MHZ |
| | 50 | 50 | 55 | 60 |
| **AP9x3 panels** | | | | |
| 5AP923.1215-00 | ✓ | ✓ | ✓ | ✓ |
| 5AP923.1505-00 | ✓ | ✓ | ✓ | ✓ |
| 5AP923.1906-00 | 45 | 45 | 45 | 45 |
| 5AP933.156B-00 | ✓ | ✓ | 50 | 50 |
| 5AP933.185B-00 | ✓ | ✓ | 50 | 50 |
| 5AP933.215C-00 | 45 | 45 | 45 | 45 |
| 5AP933.240C-00 | 45 | 45 | 45 | 45 |
| **AP1000 panels** | | | | |
| 5AP1120.1043-000 | ✓ | ✓ | ✓ | ✓ |
| 5AP1180.1043-000 | ✓ | ✓ | ✓ | ✓ |
| 5AP1181.1043-000 | ✓ | ✓ | ✓ | ✓ |
| 5AP1182.1043-000 | ✓ | ✓ | ✓ | ✓ |
| 5AP1120.1214-000 | ✓ | ✓ | ✓ | ✓ |
| 5AP1120.1505-000 | ✓ | ✓ | ✓ | ✓ |
| 5AP1180.1505-000 | ✓ | ✓ | ✓ | ✓ |
| 5AP1181.1505-000 | ✓ | ✓ | ✓ | ✓ |
| 5AP1120.156B-000 | ✓ | ✓ | 50 | 50 |
| 5AP1130.156C-000 | ✓ | ✓ | ✓ | 55 |
| 5AP1130.156C-001 | ✓ | ✓ | ✓ | 55 |
| 5AP1130.185C-000 | ✓ | ✓ | ✓ | 55 |
| 5AP1120.1906-000 | ✓ | ✓ | ✓ | ✓ |
| **Main memory** | | | | |
| 1x 5MMDDR.xxxx-04 inserted[1] | ✓ | ✓ | ✓ | ✓ |
| 2x 5MMDDR.xxxx-04 inserted | ✓ | ✓ | ✓ | ✓ |
| **Slide-in compact drives** | | | | |
| 5AC901.CHDD-01 | ✓ | ✓ | 50 | 50 |
| 5AC901.CSSD-03 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.CSSD-04 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.CSSD-05 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.CSSD-06 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.CCFA-00 | ✓ | ✓ | ✓ | ✓ |
| **Slide-in drives** | | | | |
| 5AC901.SDVW-00 | 40 | 40 | 40 | 40 |
| 5AC901.SSCA-00[2] | ✓ | ✓ | ✓ | ✓ |
| **Interface options** | | | | |
| 5AC901.I232-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.I485-00 | ✓ | ✓ | ✓ | 55 |
| 5AC901.ICAN-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.ICAN-01 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.IHDA-00 | ✓ | ✓ | ✓ | 55 |
| 5AC901.ISRM-00 | ✓ | ✓ | ✓ | 55 |
| 5AC901.IPLK-00 | ✓ | ✓ | ✓ | 55 |
| 5AC901.IRDY-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.ISIO-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.IUPS-00 | ✓ | ✓ | ✓ | 55 |
| 5AC901.IUPS-01 | ✓ | ✓ | ✓ | 55 |
| 5AC901.IETH-00 | ✓ | ✓ | ✓ | 55 |
| **Bus units** | | | | |
| 5AC902.BX01-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC902.BX01-01 | ✓ | ✓ | ✓ | ✓ |
| 5AC902.BX02-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC902.BX02-01 | ✓ | ✓ | ✓ | ✓ |
| 5AC902.BX02-02 | ✓ | ✓ | ✓ | ✓ |
| **Power supply** | | | | |
| 5AC902.PS00-00 | ✓ | ✓ | ✓ | 55 |
| **CFast cards** | | | | |
| 5CFAST.xxxx-00 | ✓ | ✓ | ✓ | ✓ |
| 5CFAST.xxxx-10 | ✓ | ✓ | ✓ | ✓ |
| **PCIe cards** | | | | |
| 5ACPCE.ETH1-00 | ✓ | ✓ | ✓ | 55 |
| 5ACPCE.ETH4-00 | ✓ | ✓ | ✓ | 55 |

1) The main memory module must be connected in RAM slot 2.
2) The max. ambient temperature depends on the slide-in compact drive being used.

## Operation without a fan kit

**▌ Boards 5PC901.TS17-00 and 5PC901.TS17-01 cannot be operated without a fan kit.**

| All temperature specifications in degrees Celsius (°C) at 500 m above sea level, **non-condensing**. | Maximum ambient temperature (system unit 5PC911.SX00-01) | | | |
|---|---|---|---|---|
| The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level. | 5PC901.TS17-00<br>i7 (6820EQ) | 5PC901.TS17-01<br>i5 (6440EQ) | 5PC901.TS17-02<br>i3 (6100E)<br>@1900 MHz | 5PC901.TS17-03<br>C (G3900E)<br>@1700 MHz |
| Up to Rev. C3 | - | - | 45 | 50 |
| Rev. D0 and later | - | - | 45 | 55 |
| **AP9x3 panels** | | | | |
| 5AP923.1215-00 | - | - | ✓ | ✓ |
| 5AP923.1505-00 | - | - | ✓ | ✓ |
| 5AP923.1906-00 | - | - | 40 | 40 |
| 5AP933.156B-00 | - | - | ✓ | ✓ |
| 5AP933.185B-00 | - | - | ✓ | ✓ |
| 5AP933.215C-00 | - | - | 40 | 40 |
| 5AP933.240C-00 | - | - | 40 | 40 |
| **AP1000 panels** | | | | |
| 5AP1120.1043-000 | - | - | ✓ | ✓ |
| 5AP1180.1043-000 | - | - | ✓ | ✓ |
| 5AP1181.1043-000 | - | - | ✓ | ✓ |
| 5AP1182.1043-000 | - | - | ✓ | ✓ |
| 5AP1120.1214-000 | - | - | ✓ | ✓ |
| 5AP1120.1505-000 | - | - | ✓ | ✓ |
| 5AP1180.1505-000 | - | - | ✓ | ✓ |
| 5AP1181.1505-000 | - | - | ✓ | ✓ |
| 5AP1120.156B-000 | - | - | 45 | ✓ |
| 5AP1130.156C-000 | - | - | ✓ | 45 |
| 5AP1130.156C-001 | - | - | ✓ | 45 |
| 5AC1130.185C-000 | - | - | ✓ | 45 |
| 5AP1120.1906-000 | - | - | ✓ | ✓ |
| **Main memory** | | | | |
| 1x 5MMDDR.xxxx-04 inserted[1] | - | - | ✓ | ✓ |
| 2x 5MMDDR.xxxx-04 inserted | - | - | ✓ | ✓ |
| **Slide-in compact drives** | | | | |
| 5AC901.CHDD-01 | - | - | 35[3] | 35[3] |
| 5AC901.CSSD-03 ≤ Rev. D0 | - | - | ✓ | ✓[3] |
| 5AC901.CSSD-03 ≤ Rev. D0 | - | - | ✓ | 40[3] |
| 5AC901.CSSD-04 ≤ Rev. D0 | - | - | ✓ | ✓[3] |
| 5AC901.CSSD-04 ≤ Rev. D0 | - | - | ✓ | 40[3] |
| 5AC901.CSSD-05 | - | - | ✓ | ✓[3] |
| 5AC901.CSSD-06 | - | - | ✓ | ✓[3] |
| 5AC901.CCFA-00 | - | - | ✓ | ✓ |
| **Slide-in drives** | | | | |
| 5AC901.SDVW-00 | - | - | 40 | 40 |
| 5AC901.SSCA-00[2] | - | - | ✓ | ✓ |
| **Interface options** | | | | |
| 5AC901.I232-00 | - | - | ✓ | ✓ |
| 5AC901.I485-00 | - | - | ✓ | ✓ |
| 5AC901.ICAN-00 | - | - | ✓ | ✓ |
| 5AC901.ICAN-01 | - | - | ✓ | ✓ |
| 5AC901.IHDA-00 | - | - | ✓ | 40 |
| 5AC901.ISRM-00 | - | - | ✓ | ✓ |
| 5AC901.IPLK-00 | - | - | ✓ | ✓ |
| 5AC901.IRDY-00 | - | - | ✓ | ✓ |
| 5AC901.ISIO-00 | - | - | ✓ | ✓ |
| 5AC901.IUPS-00 | - | - | ✓ | ✓ |
| 5AC901.IUPS-01 | - | - | ✓ | ✓ |
| 5AC901.IETH-00 | - | - | ✓ | ✓ |
| **Bus units** | | | | |
| 5AC902.BX01-00 | - | - | ✓ | ✓ |
| 5AC902.BX01-01 | - | - | ✓ | ✓ |
| 5AC902.BX02-00 | - | - | ✓ | ✓ |
| 5AC902.BX02-01 | - | - | ✓ | ✓ |
| 5AC902.BX02-02 | - | - | ✓ | ✓ |
| **Power supply** | | | | |
| 5AC902.PS00-00 | - | - | ✓ | ✓ |
| **CFast cards** | | | | |
| 5CFAST.xxxx-00 | - | - | ✓ | ✓ |

| 5CFAST.xxxx-10 | - | - | ✓ | ✓ |
|---|---|---|---|---|
| **PCIe cards** | | | | |
| 5ACPCE.ETH1-00 | - | - | ✓ | ✓ |
| 5ACPCE.ETH4-00 | - | - | ✓ | ✓ |

1)    The main memory module must be connected in RAM slot 2.
2)    The max. ambient temperature depends on the slide-in compact drive being used.
3)    For systems with a total system load >90 W, the max. ambient temperature must be reduced by 5°C.

#### 4.1.2.1.3 Maximum ambient temperature for typical operation

### Information about typical conditions

- BurnInTest 8.1 from PassMark Software for simulating moderate system and interface utilization (2D and 3D graphics, CPU, GPU, RAM, disks C and D, audio test and network on ping station)
- No permanent 100% processor utilization and graphics utilization
- Hardware load: 4x 1 A USB

### Operation with a fan kit

| All temperature specifications in degrees Celsius (°C) at 500 m above sea level, **non-condensing**. | Maximum ambient temperature (system unit 5PC911.SX00-00) | | | |
|---|---|---|---|---|
| The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level. | 5PC901.TS17-00 | 5PC901.TS17-01 | 5PC901.TS17-02 | 5PC901.TS17-03 |
| | i7 (6820EQ) | i5 (6440EQ) | i3 (6100E) @2700 MHz | C (G3900E) @2400 MHZ |
| Rev. D0 and later | 60 | 60 | 65 | 65 |
| **AP9x3 panels** | | | | |
| 5AP923.1215-00 | ✓ | ✓ | 60 | 60 |
| 5AP923.1505-00 | ✓ | ✓ | 60 | 60 |
| 5AP923.1906-00 | 45 | 45 | 45 | 45 |
| 5AP933.156B-00 | 50 | 50 | 50 | 50 |
| 5AP933.185B-00 | 50 | 50 | 50 | 50 |
| 5AP933.215C-00 | 45 | 45 | 45 | 45 |
| 5AP933.240C-00 | 45 | 45 | 45 | 45 |
| **AP1000 panels** | | | | |
| 5AP1120.1043-000 | ✓ | ✓ | 60 | 60 |
| 5AP1180.1043-000 | ✓ | ✓ | 60 | 60 |
| 5AP1181.1043-000 | ✓ | ✓ | 60 | 60 |
| 5AP1182.1043-000 | ✓ | ✓ | 60 | 60 |
| 5AP1120.1214-000 | ✓ | ✓ | 60 | 60 |
| 5AP1120.1505-000 | ✓ | ✓ | 60 | 60 |
| 5AP1180.1505-000 | ✓ | ✓ | 60 | 60 |
| 5AP1181.1505-000 | 60 | 60 | 60 | 60 |
| 5AP1120.156B-000 | 50 | 50 | 50 | 50 |
| 5AP1130.156C-000 | 55 | 55 | 55 | 55 |
| 5AP1130.156C-001 | 55 | 55 | 55 | 55 |
| 5AP1130.185C-000 | 55 | 55 | 55 | 55 |
| 5AP1120.1906-000 | ✓ | ✓ | 60 | 60 |
| **Main memory** | | | | |
| 1x 5MMDDR.xxxx-04 inserted[1] | ✓ | ✓ | ✓ | ✓ |
| 2x 5MMDDR.xxxx-04 inserted | ✓ | ✓ | ✓ | ✓ |
| **Slide-in compact drives** | | | | |
| 5AC901.CHDD-01 | 50 | 50 | 50 | 50 |
| 5AC901.CSSD-03 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.CSSD-04 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.CSSD-05 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.CSSD-06 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.CCFA-00 | ✓ | ✓ | ✓ | ✓ |
| **Slide-in drives** | | | | |
| 5AC901.SDVW-00 | 40 | 40 | 40 | 40 |
| 5AC901.SSCA-00[2] | ✓ | ✓ | ✓ | ✓ |
| **Interface options** | | | | |
| 5AC901.I232-00 | ✓ | ✓ | 60 | 60 |
| 5AC901.I485-00 | 55 | 55 | 55 | 55 |
| 5AC901.ICAN-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.ICAN-01 | ✓ | ✓ | 60 | 60 |
| 5AC901.IHDA-00 | 55 | 55 | 55 | 55 |
| 5AC901.ISRM-00 | 55 | 55 | 55 | 55 |
| 5AC901.IPLK-00 | 55 | 55 | 55 | 55 |
| 5AC901.IRDY-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.ISIO-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC901.IUPS-00 | 55 | 55 | 55 | 55 |
| 5AC901.IUPS-01 | 55 | 55 | 55 | 55 |
| 5AC901.IETH-00 | 55 | 55 | 55 | 55 |
| **Bus units** | | | | |
| 5AC902.BX01-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC902.BX01-01 | ✓ | ✓ | ✓ | ✓ |
| 5AC902.BX02-00 | ✓ | ✓ | ✓ | ✓ |
| 5AC902.BX02-01 | ✓ | ✓ | ✓ | ✓ |
| 5AC902.BX02-02 | ✓ | ✓ | ✓ | ✓ |
| **Power supply unit** | | | | |
| 5AC902.PS00-00 | 55 | 55 | 55 | 55 |
| **CFast cards** | | | | |

| 5CFAST.xxxx-00 | ✓ | ✓ | ✓ | ✓ |
|---|---|---|---|---|
| 5CFAST.xxxx-10 | ✓ | ✓ | ✓ | ✓ |
| **PCIe cards** | | | | |
| 5ACPCE.ETH1-00 | 55 | 55 | 55 | 55 |
| 5ACPCE.ETH4-00 | 55 | 55 | 55 | 55 |

1)    The main memory module must be connected in RAM slot 2.
2)    The max. ambient temperature depends on the slide-in compact drive being used.

**Operation without a fan kit**

█ **Boards 5PC901.TS17-00 and 5PC901.TS17-01 cannot be operated without a fan kit.**

| All temperature specifications in degrees Celsius (°C) at 500 m above sea level, **non-condensing**. | Maximum ambient temperature (system unit 5PC911.SX00-01) | | | |
|---|---|---|---|---|
| The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level. | 5PC901.TS17-00 | 5PC901.TS17-01 | 5PC901.TS17-02 | 5PC901.TS17-03 |
| | i7 (6820EQ) | i5 (6440EQ) | i3 (6100E) @1900 MHz | C (G3900E) @1700 MHz |
| Rev. D0 and later | - | - | 50 | 60 |
| **AP9x3 panels** | | | | |
| 5AP923.1215-00 | - | - | ✓ | ✓ |
| 5AP923.1505-00 | - | - | ✓ | ✓ |
| 5AP923.1906-00 | - | - | ✓ | 40 |
| 5AP933.156B-00 | - | - | ✓ | ✓ |
| 5AP933.185B-00 | - | - | ✓ | ✓ |
| 5AP933.215C-00 | - | - | ✓ | 40 |
| 5AP933.240C-00 | - | - | ✓ | 40 |
| **AP1000 panels** | | | | |
| 5AP1120.1043-000 | - | - | ✓ | ✓ |
| 5AP1180.1043-000 | - | - | ✓ | ✓ |
| 5AP1181.1043-000 | - | - | ✓ | ✓ |
| 5AP1182.1043-000 | - | - | ✓ | ✓ |
| 5AP1120.1214-000 | - | - | ✓ | ✓ |
| 5AP1120.1505-000 | - | - | ✓ | ✓ |
| 5AP1180.1505-000 | - | - | ✓ | ✓ |
| 5AP1181.1505-000 | - | - | ✓ | ✓ |
| 5AP1120.156B-000 | - | - | ✓ | 45 |
| 5AP1130.156C-000 | - | - | ✓ | 55 |
| 5AP1130.156C-001 | - | - | ✓ | 55 |
| 5AP1130.185C-000 | - | - | ✓ | 55 |
| 5AP1120.1906-000 | - | - | ✓ | ✓ |
| **Main memory** | | | | |
| 1x 5MMDDR.xxxx-04 inserted[1] | - | - | ✓ | ✓ |
| 2x 5MMDDR.xxxx-04 inserted | - | - | ✓ | ✓ |
| **Slide-in compact drives** | | | | |
| 5AC901.CHDD-01 | - | - | 35[3] | 35[3] |
| 5AC901.CSSD-03 ≤ Rev. D0 | - | - | ✓ | ✓[3] |
| 5AC901.CSSD-03 ≤ Rev. D0 | - | - | ✓ | 40[3] |
| 5AC901.CSSD-04 ≤ Rev. D0 | - | - | ✓ | ✓[3] |
| 5AC901.CSSD-04 ≤ Rev. D0 | - | - | ✓ | 40[3] |
| 5AC901.CSSD-05 | - | - | ✓ | ✓[3] |
| 5AC901.CSSD-06 | - | - | ✓ | ✓[3] |
| 5AC901.CCFA-00 | - | - | ✓ | ✓ |
| **Slide-in drives** | | | | |
| 5AC901.SDVW-00 | - | - | 40 | 40 |
| 5AC901.SSCA-00[2] | - | - | ✓ | ✓ |
| **Interface options** | | | | |
| 5AP901.I232-00 | - | - | ✓ | 55 |
| 5AC901.I485-00 | - | - | ✓ | ✓ |
| 5AC901.ICAN-00 | - | - | ✓ | ✓ |
| 5AC901.ICAN-01 | - | - | ✓ | 55 |
| 5AC901.IHDA-00 | - | - | 40 | 40 |
| 5AC901.ISRM-00 | - | - | ✓ | ✓ |
| 5AC901.IPLK-00 | - | - | ✓ | ✓ |
| 5AC901.IRDY-00 | - | - | ✓ | ✓ |
| 5AC901.ISIO-00 | - | - | ✓ | ✓ |
| 5AC901.IUPS-00 | - | - | ✓ | ✓ |
| 5AC901.IUPS-01 | - | - | ✓ | ✓ |
| 5AC901.IETH-00 | - | - | ✓ | ✓ |
| **Bus units** | | | | |
| 5AC902.BX01-00 | - | - | ✓ | ✓ |
| 5AC902.BX01-01 | - | - | ✓ | ✓ |
| 5AC902.BX02-00 | - | - | ✓ | ✓ |
| 5AC902.BX02-01 | - | - | ✓ | ✓ |
| 5AC902.BX02-02 | - | - | ✓ | ✓ |
| **Power supply unit** | | | | |
| 5AC902.PS00-00 | - | - | ✓ | 55 |
| **CFast cards** | | | | |
| 5CFAST.xxxx-00 | - | - | ✓ | ✓ |

| 5CFAST.xxxx-10 | - | - | ✓ | ✓ |
|---|---|---|---|---|
| **PCIe cards** | | | | |
| 5ACPCE.ETH1-00 | - | - | ✓ | ✓ |
| 5ACPCE.ETH4-00 | - | - | ✓ | ✓ |

1)    The main memory module must be connected in RAM slot 2.
2)    The max. ambient temperature depends on the slide-in compact drive being used.
3)    For systems with a total system load >90 W, the max. ambient temperature must be reduced by 5°C.

### 4.1.2.1.4 Ambient temperature during storage and transport

The individual components can be transported and stored within the following temperature ranges.

### AP9x3 panels

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

### AP1000 panels

| Type | Model number | Storage [°C] | Transport [°C] |
|---|---|---|---|
| 10.4" single-touch | 5AP1120.1043-000 | -25 to 80 | -25 to 80 |
| 10.4" single-touch with keys | 5AP1180.1043-000 | -25 to 70 | -25 to 70 |
| 10.4" single-touch with keys | 5AP1181.1043-000 | -25 to 70 | -25 to 70 |
| 10.4" single-touch with keys | 5AP1182.1043-000 | -25 to 70 | -25 to 70 |
| 12.1" single-touch | 5AP1120.1214-000 | -25 to 80 | -25 to 80 |
| 15.0" single-touch | 5AP1120.1505-000 | -25 to 80 | -25 to 80 |
| 15.0" single-touch with keys | 5AP1180.1505-000 | -25 to 80 | -25 to 80 |
| 15.0" single-touch with keys | 5AP1181.1505-000 | -25 to 70 | -25 to 70 |
| 15.6" single-touch | 5AP1120.156B-000 | -20 to 60 | -20 to 60 |
| 15.6" multi-touch | 5AP1130.156C-000 | -25 to 80 | -25 to 80 |
| 15.6" multi-touch | 5AP1130.156C-001 | -20 to 70 | -10 to 55 |
| 18.5" multi-touch | 5AP1130.185C-000 | -25 to 80 | -25 to 80 |
| 19.0" single-touch | 5AP1120.1906-000 | -25 to 70 | -25 to 70 |

### Components

| Type | Model number | Storage [°C] | Transport [°C] |
|---|---|---|---|
| CPU boards | 5PC901.TS17-xx | -20 to 60 | -20 to 60 |
| System units | 5PC911.SX00-xx | -20 to 60 | -20 to 60 |
| 1-slot bus units | 5AC902.BX01-xx | -20 to 60 | -20 to 60 |
| 2-slot bus units | 5AC902.BX02-xx | -20 to 60 | -20 to 60 |
| Power supply | 5AC902.PS00-00 | -20 to 60 | -20 to 60 |
| Slide-in compact drives | 5AC901.CHDD-01 | -40 to 70 | -40 to 70 |
| | 5AC901.CSSD-03 ≤ Rev. C0 | -40 to 85 | -40 to 85 |
| | 5AC901.CSSD-03 ≥ Rev. D0 | -40 to 85 | -40 to 85 |
| | 5AC901.CSSD-04 ≤ Rev. C0 | -40 to 85 | -40 to 85 |
| | 5AC901.CSSD-04 ≥ Rev. D0 | -40 to 85 | -40 to 85 |
| | 5AC901.CSSD-05 | -40 to 85 | -40 to 85 |
| | 5AC901.CSSD-06 | -40 to 85 | -40 to 85 |
| | 5AC901.CCFA-00 | -20 to 60 | -20 to 60 |
| Slide-in drives | 5AC901.SDVW-00 | -20 to 60 | -20 to 60 |
| | 5AC901.SSCA-00 | -20 to 60 | -20 to 60 |
| Interface options | 5AC901.I232-00 | -20 to 60 | -20 to 60 |
| | 5AC901.I485-00 | -20 to 60 | -20 to 60 |
| | 5AC901.ICAN-00 | -20 to 60 | -20 to 60 |
| | 5AC901.ICAN-01 | -20 to 60 | -20 to 60 |
| | 5AC901.IETH-00 | -20 to 60 | -20 to 60 |
| | 5AC901.IHDA-00 | -20 to 60 | -20 to 60 |
| | 5AC901.ISRM-00 | -20 to 60 | -20 to 60 |
| | 5AC901.IPLK-00 | -20 to 60 | -20 to 60 |
| | 5AC901.IRDY-00 | -20 to 60 | -20 to 60 |
| | 5AC901.ISIO-00 | -20 to 60 | -20 to 60 |
| CFast cards | 5CFAST.xxxx-00 | -50 to 100 | -50 to 100 |
| | 5CFAST.xxxx-10 | -55 to 95 | -55 to 95 |

| Type | Model number | Storage [°C] | Transport [°C] |
|------|-------------|--------------|----------------|
| PCIe cards | 5ACPCE.ETH1-00 | -20 to 60 | -20 to 60 |
| | 5ACPCE.ETH4-00 | -20 to 60 | -20 to 60 |
| Uninterruptible power supplies | 5AC901.IUPS-00 | -20 to 60 | -20 to 60 |
| | 5AC901.IUPS-01 | -20 to 60 | -20 to 60 |
| | 5AC901.BUPS-00 | -65 to 80 | -65 to 80 |
| | 5AC901.BUPS-01 | -15 to 40 | -15 to 40 |

**4.1.2.1.5 Determining the ambient temperature**

1. Select the system unit.

2. Select the CPU board.

3. The columns specify the maximum temperature of the complete system in connection with the respective CPU board.

> # Information:
>
> **Maximum temperature specifications refer to operation at 500 meters. The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.**

4. If additional drives, interface options, etc. are installed, these components can change the temperature limits of the PPC900 system.

   ° If a "✓" (check mark) is entered for the installed component, it can be operated without any problems.

   ° If the installed component has a temperature specification (e.g. "45[°C]"), the ambient temperature of the complete system is not permitted to exceed this value.

5. Possible limitations may arise due to the mounting orientation of the Panel PC 900. For additional information, see section "Mounting orientations" on page 45.

6. 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). See section .

**4.1.2.1.6 Temperature monitoring**

Sensors monitor temperature values at various areas in the PPC900. For the position of temperature sensors, see Fig. 5 "Panel PC 900 - Temperature sensor positions" on page 34. The values specified in Tab. 1 "Temperature sensor locations" on page 34 represent the defined maximum temperature at this measuring point. If the temperature is exceeded, no alarm is triggered. Temperatures[2] can be read out in different ways in approved operating systems:

- BIOS
- B&R Control Center[3]
- B&R ADI Development Kit[2]
- B&R ADI .NET SDK[2]
- B&R HMI Service Center[2]
- Automation Runtime library[2]

In addition, the hard disks available from B&R for PPC900 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 operating systems.

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[2] The measured temperature is a guide value for the immediate ambient temperature, but it may have been influenced by neighboring components.
[3] Drivers for approved operating systems can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

#### 4.1.2.1.7 Temperature sensor positions

Sensors show temperature values at various areas in the PPC900. These temperatures[4] can be read out in BIOS (menu option Advanced - OEM features - System board features / CPU board features - Temperature values) or Microsoft Windows operating systems using the B&R Control Center[5].
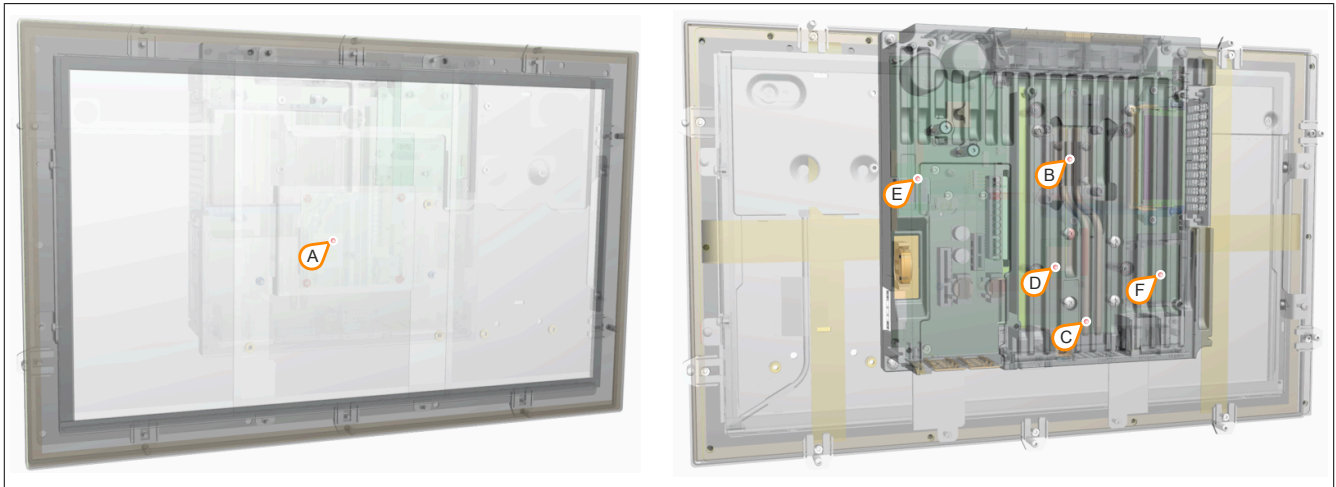


Figure 5: Panel PC 900 - Temperature sensor positions

| ADI sensors | Position | Measurement point for | Measurement | Max. specified |
|---|---|---|---|---|
| Panel | A | Display | Temperature of the display (sensor integrated in display unit) | 5AP923.1215-00: 80°C<br>5AP923.1505-00: 80°C<br>5AP923.1906-00: 75°C<br>5AP933.156B-00: 75°C<br>5AP933.185B-00: 75°C<br>5AP933.215C-00: 80°C<br>5AP933.240C-00: 75°C<br>5AP1120.1043-000: 90°C<br>5AP1180.1043-000: 90°C<br>5AP1181.1043-000: 90°C<br>5AP1182.1043-000: 90°C<br>5AP1120.1214-000: 80°C<br>5AP1120.1505-000: 90°C<br>5AP1180.1505-000: 90°C<br>5AP1181.1505-000: 90°C<br>5AP1120.156B-000: 75°C<br>5AP1130.156C-000: 80°C<br>5AP1130.156C-001: 80°C<br>5AP1130.185C-000: 80°C<br>5AP1120.1906-000: 80°C |
| CPU board | B | CPU | Temperature of the processor (sensor integrated in the processor) | 95°C |
| System unit 1 | C | Board | Temperature of the board (sensor integrated on the CPU board) | 95°C |
| System unit 2 | D | Chipset | Temperature of the chipset area (sensor integrated on the CPU board) | 85°C |
| System unit 3 | E | Board power supply | Temperature of the board power supply area (sensor integrated on the CPU board) | 95°C |
| System unit 4 | F | CFast | Temperature of the CFast area (sensor integrated on the CPU board) | 85°C |
| Slide-in drive | G | Slide-in drive | Temperature of slide-in drive 1 (sensor integrated on the slide-in drive) | Depends on the drive |
| | H | Interface option[1] | Temperature of the interface option (sensor integrated on the interface option) | Depends on the IF option |

Table 1: Temperature sensor locations

1)     A temperature sensor is currently not integrated in the interface options.

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4)   The measured temperature is a guide value for the immediate ambient temperature, but it may have been influenced by neighboring components.
5)   The ADI driver that includes the B&R Control Center can be downloaded at no cost from the Downloads section of the B&R website (www.br-automa-tion.com).

#### 4.1.2.1.8 Fan control

The MTCX constantly monitors the temperature using temperature sensors, which directly determines how the fans are controlled. Their speed depends on the measured temperature. Limit values may depend on the MTCX firmware version being used.

| Position | Measurement point for | Startup temperature | Max. fan speed at: |
|---|---|---|---|
| A | Display | 5AP923.1215-00: 70°C, 5AP923.1505-00: 70°C, 5AP923.1906-00: 70°C, 5AP933.156B-00: 70°C, 5AP933.185B-00: 70°C, 5AP933.215C-00: 70°C, 5AP933.240C-00: 70°C, 5AP1120.1043-000: 70°C, 5AP1180.1043-000: 70°C, 5AP1181.1043-000: 70°C, 5AP1182.1043-000: 70°C, 5AP1120.1214-000: 70°C, 5AP1120.1505-000: 70°C, 5AP1180.1505-000: 70°C, 5AP1181.1505-000: 70°C, 5AP1120.156B-000: 70°C, 5AP1130.156C-000: 70°C, 5AP1130.156C-001: 70°C, 5AP1130.185C-000: 70°C, 5AP1120.1906-000: 70°C | 5AP923.1215-00: 86°C, 5AP923.1505-00: 86°C, 5AP923.1906-00: 86°C, 5AP933.156B-00: 86°C, 5AP933.185B-00: 86°C, 5AP933.215C-00: 86°C, 5AP933.240C-00: 86°C, 5AP1120.1043-000: 86°C, 5AP1180.1043-000: 86°C, 5AP1181.1043-000: 86°C, 5AP1182.1043-000: 86°C, 5AP1120.1214-000: 86°C, 5AP1120.1505-000: 86°C, 5AP1180.1505-000: 86°C, 5AP1181.1505-000: 86°C, 5AP1120.156B-000: 86°C, 5AP1130.156C-000: 86°C; 5AP1130.156C-001: 86°C, 5AP1130.185C-000: 86°C, 5AP1120.1906-000: 86°C |
| B | CPU | 65°C | 81°C |
| C | Board controller | 70°C | 86°C |
| D | Chipset | 70°C | 86°C |
| E | Board power supply | 70°C | 86°C |
| F | CFast | 60°C | 76°C |
| G | Slide-in drive 1 | 5AC901.SDVW-00: 44°C, 5AC901.SSCA-00: 55°C | 5AC901.SDVW-00: 60°C, 5AC901.SSCA-00: 71°C |
| H | Interface option[1] | - | - |

Table 2: Temperature sensor locations

1)     A temperature sensor is currently not integrated in the interface options.

Once the startup temperature is reached, the device is started at the minimum fan speed. The maximum fan speed is reached at a startup temperature of 16°C. The fan speed in this area is controlled depending on the temperature.

Example with slide-in drive 5AC901.SDVW-00: 44°C + 16°C = 60°C --> Maximum fan speed

The fans will only be shut off again if the evaluation temperature is more than 6°C below the switch-on temperature for a period of 4 hours (overshoot time).

### 4.1.2.2 Humidity specifications

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

#### AP9x3 panels

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

#### AP1000 panels

| Type | Model number | Operation [%] | Storage [%] | Transport [%] |
|------|-------------|---------------|-------------|---------------|
| 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 | 8 to 90 | 8 to 90 | 8 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" multi-touch | 5AP1130.156C-000 | 5 to 90 | 5 to 90 | 5 to 90 |
| 15.6" multi-touch | 5AP1130.156C-001 | 5 to 90 | 5 to 90 | 5 to 90 |
| 15.6" single-touch | 5AP1120.156B-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 |

#### Components

| Component | Model number | Operation | Storage | Transport |
|-----------|-------------|-----------|---------|-----------|
| CPU boards | 5PC901.TS77-xx | 10 to 90% | 5 to 95% | 5 to 95% |
| System units | 5PC911.SX00-xx | 5 to 95% | 5 to 95% | 5 to 95% |
| 1-slot bus units | 5AC902.BX01-xx | 5 to 95% | 5 to 95% | 5 to 95% |
| 2-slot bus units | 5AC902.BX02-xx | 5 to 95% | 5 to 95% | 5 to 95% |
| Power supply | 5AC902.PS00-00 | 7 to 90% | 7 to 90% | 7 to 90% |
| Slide-in compact drives | 5AC901.CHDD-01 | 8 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.CSSD-03 ≤ Rev. C0 | 8 to 90% | 8 to 95% | 8 to 95% |
| | 5AC901.CSSD-03 ≥ Rev. D0 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.CSSD-04 ≤ Rev. C0 | 8 to 90% | 8 to 95% | 8 to 95% |
| | 5AC901.CSSD-04 ≥ Rev. D0 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.CSSD-05 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.CSSD-06 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.CCFA-00 | 5 to 95% | 5 to 95% | 5 to 95% |
| Slide-in drives | 5AC901.SDVW-00 | 8 to 80% | 5 to 95% | 5 to 95% |
| Interface options | 5AC901.I485-00 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.ICAN-00 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.IHDA-00 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.ISRM-00 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.IPLK-00 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.IRDY-00 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.ISIO-00 | 5 to 90% | 5 to 95% | 5 to 95% |
| CFast cards | 5CFAST.xxxx-00 | Max. 85% at 85°C | Max. 85% at 85°C | Max. 85% at 85°C |
| | 5CFAST.xxxx-10 | 10 to 95% | 10 to 95% | 10 to 95% |
| Uninterruptible power supplies | 5AC901.IUPS-00 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.IUPS-01 | 5 to 90% | 5 to 95% | 5 to 95% |
| | 5AC901.BUPS-00 | 5 to 95% | 5 to 95% | 5 to 95% |
| | 5AC901.BUPS-01 | 25 to 85% | 25 to 85% | 25 to 85% |

Table 3: CPU boards, system units, bus units and power supply - 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.

### 4.1.2.3 Vibration and shock

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

| Vibration | | | | |
|---|---|---|---|---|
| | Operation[1] | | Storage[1][3] | Transport[1][3] |
| | Continuous | Periodic | | |
| With SSD drives and CFast cards | 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 |
| With hard disk drives | 5 to 200 Hz: 0.25 g | 5 to 200 Hz: 0.5 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 |
| With DVD-R/RW drives | - | 5 to 200 Hz: 0.2 g | 2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g | 2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g |
| Shock | | | | |
| | Operation[2] | | Storage[2][3] | Transport[2][3] |
| With SSD drives and CFast cards | 15 g, 11 ms | | 30 g, 6 ms | 30 g, 6 ms |
| With hard disk drives | 5 g, 11 ms | | 30 g, 6 ms | 30 g, 6 ms |
| With DVD-R/RW drives | 5 g, 11 ms | | 30 g, 6 ms | 30 g, 6 ms |

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

### 4.1.2.4 Degree of protection

Under the following conditions, the Panel PC 900 offers IP65 protection on the front and IP20 protection on the back per EN 60529:

- The Panel PC 900 is installed correctly (see "Installing a Panel PC with an AP9x3 panel" on page 206).
- All covers and components are installed on the interfaces and slots.
- All environmental conditions are being observed.

The Panel PC 900 with AP9x3 and AP1000 panels additionally has "Type 4X indoor use only" on the front per UL 50 under the same conditions.

## 4.1.3 Mechanical properties

### 4.1.3.1 Dimensions

**AP9x3 display units - Dimensions**
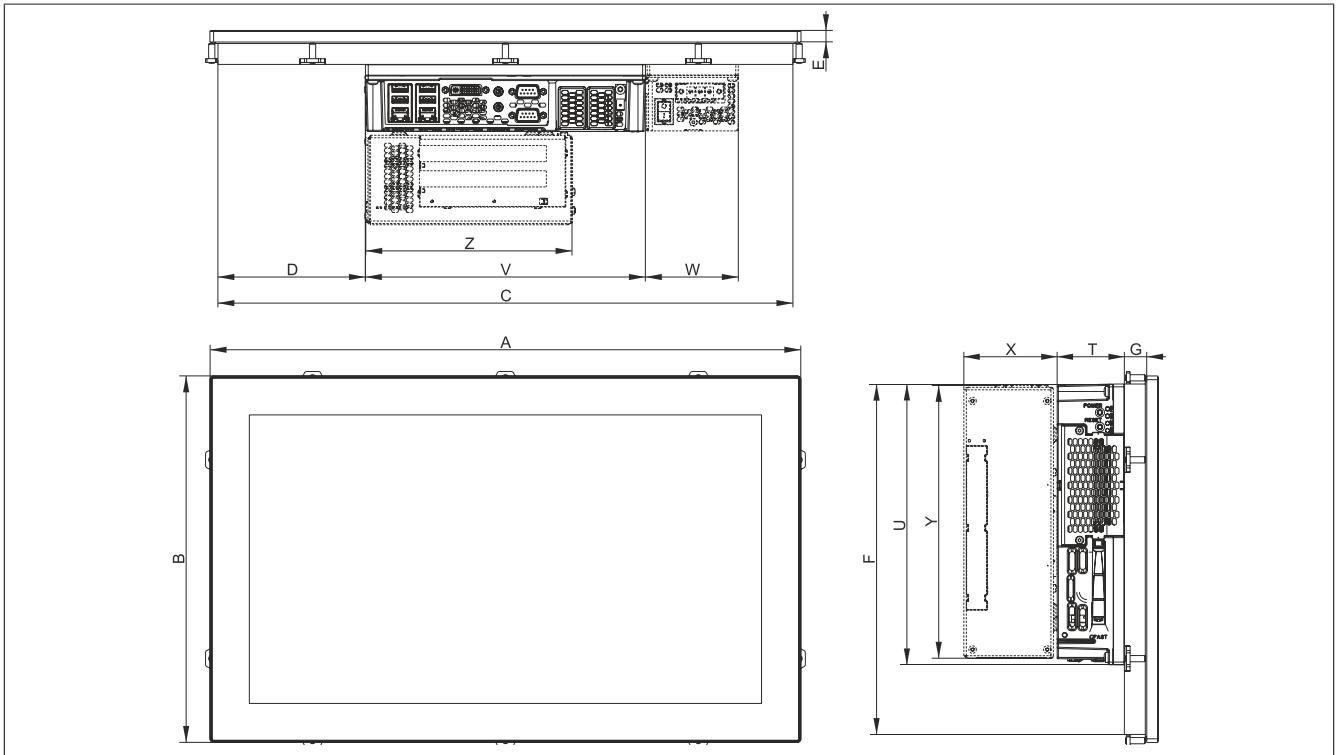


Figure 6: Panel PC 900 with AP9x3 display units - Dimensions

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 | 0 | 9 | 226 | 13.5 | - |
| 15.0" single-touch | 5AP923.1505-00 | 370 | 288 | 357 | 36.5 | 9 | 275 | 14.5 | - |
| 19.0" single-touch | 5AP923.1906-00 | 440 | 358 | 427 | 101 | 9 | 345 | 23 | - |
| 15.6" wide multi-touch | 5AP933.156B-00 | 414 | 258.5 | 401 | 57.5 | 9 | 245.5 | 20 | - |
| 18.5" wide multi-touch | 5AP933.185B-00 | 475 | 295 | 462 | 118.5 | 9 | 282 | 18 | - |
| 21.5" wide multi-touch | 5AP933.215C-00 | 541.5 | 333 | 528.5 | 151.75 | 9 | 320 | 18 | - |
| 24.0" wide multi-touch | 5AP933.240C-00 | 598.5 | 364 | 585.5 | 180.25 | 9 | 351 | 18 | - |

Table 4: AP9x3 panels - Dimensions

| Component | Order number | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|
| CPU board and System unit | 5PC901.TS17-xx & 5PC911.SX00-xx | 54 | 226 | 225 | - | - | - | - |
| 1-slot bus unit | 5AC902.BX01-xx | - | - | - | - | 54.7 | 218 | 164 |
| 2-slot bus unit | 5AC902.BX02-xx | - | - | - | - | 75 | 218 | 164 |
| Power supply | 5AC902.PS00-00 | 53.5 | 225.5 | - | 74.5 | - | - | - |

Table 5: CPU boards, system units, bus units and power supply - Dimensions

## Information:

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

**AP1000 display units with retaining clips - Dimensions**
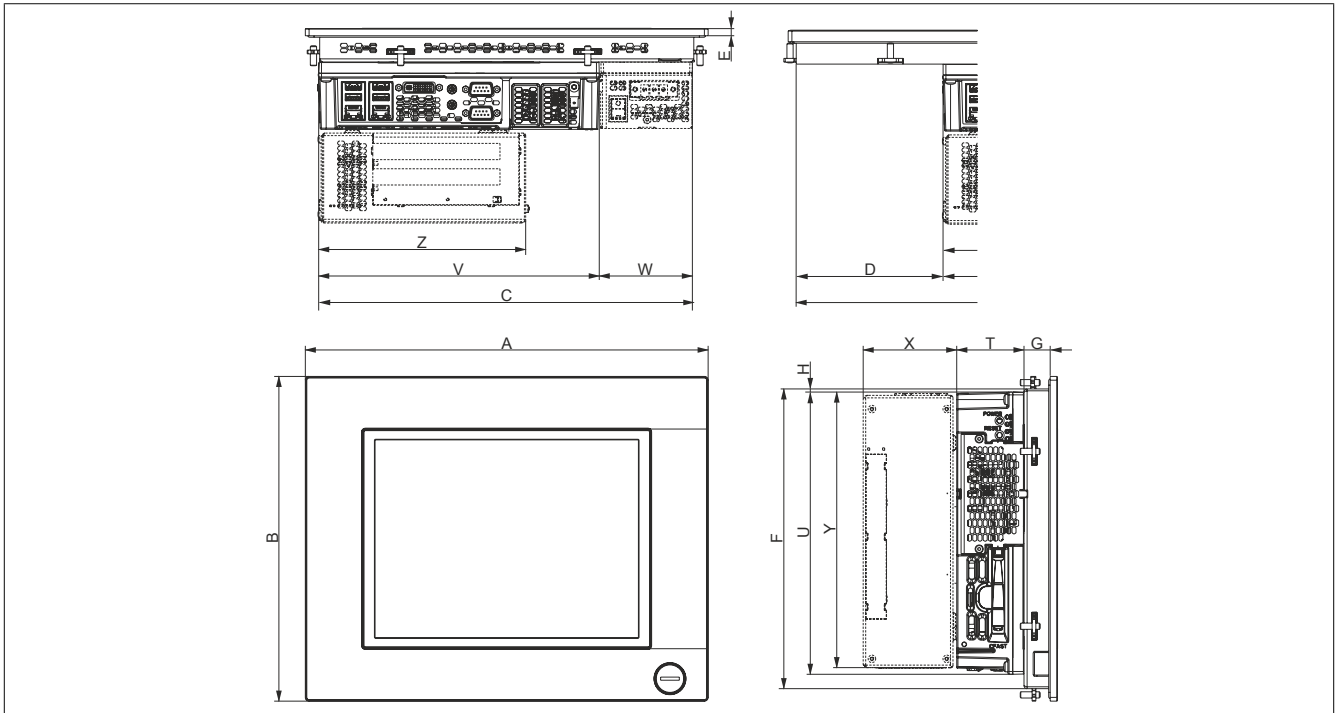


Figure 7: Panel PC 900 with AP1000 display units with retaining clips - Dimensions

All dimensions in mm.

| Display type | Model number | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| 10.4" single-touch | 5AP1120.1043-000 | 323 | 260 | 300 | - | 5.7 | 240 | 21 | 2.5 |
| 10.4" single-touch with keys | 5AP1180.1043-000 | 323 | 260 | 300 | - | 5.7 | 240 | 21 | 2.5 |
| 15.6" single-touch | 5AP1120.156B-000 | 414 | 258.5 | 401 | 57.5 | 9 | 245.5 | 20 | - |
| 15.6" multi-touch | 5AP1130.156C-000 | 414 | 258.5 | 401 | 57.5 | 9 | 245.5 | 20 | 0 |
| 15.6" multi-touch | 5AP1130.156C-001 | 414 | 258.5 | 401 | 57.5 | 9 | 245.5 | 18 | 0 |
| 18.5" multi-touch | 5AP1130.185C-000 | 475 | 295 | 462 | 118.5 | 9 | 282 | 18 | 0 |

Table 6: AP1000 panels with retaining clips - Dimensions

| Component | Order number | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|
| CPU board and System unit | 5PC901.TS17-xx & 5PC911.SX00-xx | 54 | 226 | 225 | - | - | - | - |
| 1-slot bus unit | 5AC902.BX01-xx | - | - | - | - | 54.7 | 218 | 164 |
| 2-slot bus unit | 5AC902.BX02-xx | - | - | - | - | 75 | 218 | 164 |
| Power supply | 5AC902.PS00-00 | 53.5 | 225.5 | - | 74.5 | - | - | - |

Table 7: CPU boards, system units, bus units and power supply - Dimensions

## Information:

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

**AP1000 display units with clamping blocks - Dimensions**
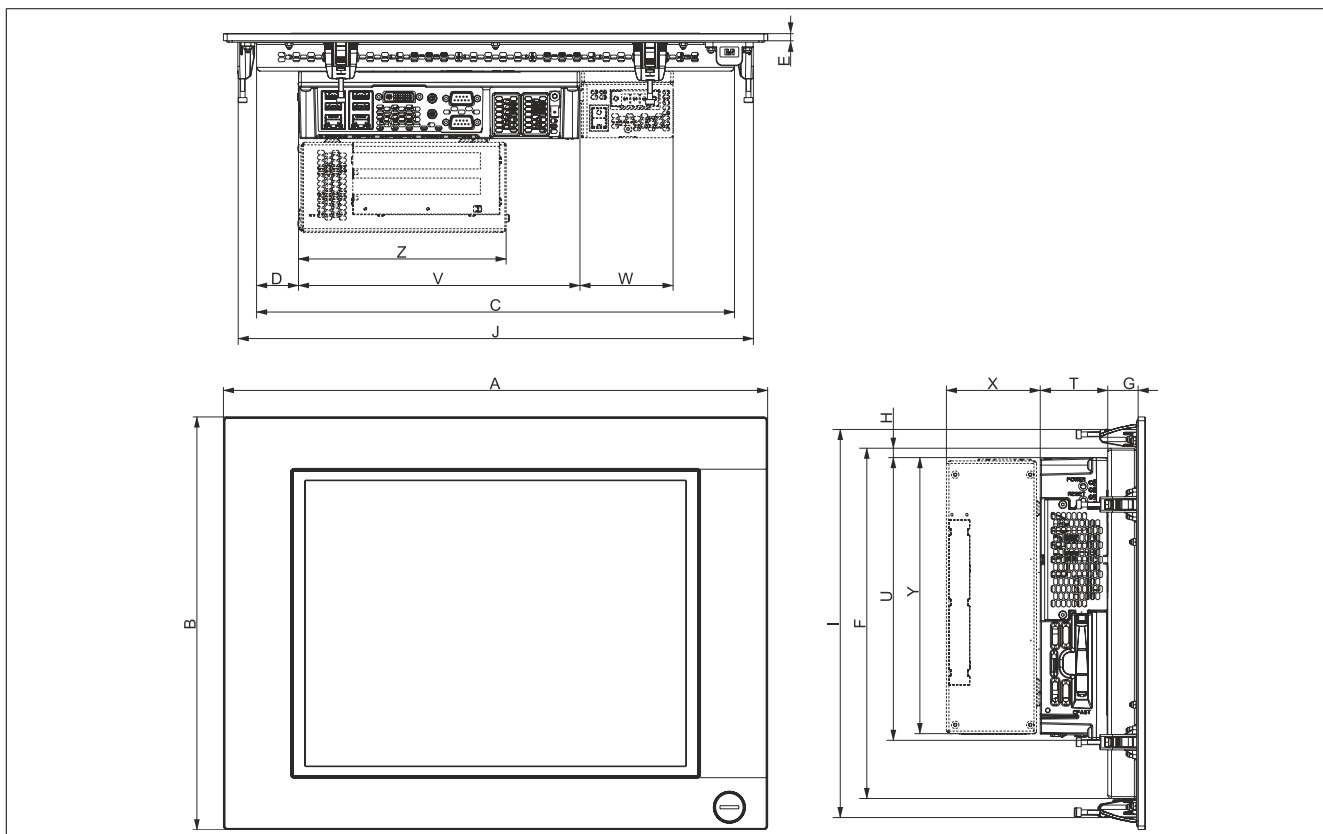


Figure 8: Panel PC 900 with AP1000 display units with clamping blocks - Dimensions

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 | 22.5 | 5.7 | 305 | 21.3 | 4 | 338 | 300 |
| 10.4" single-touch with keys | 5AP1182.1043-000 | 423 | 288 | 355.5 | 22.5 | 5.7 | 234 | 21.3 | 4 | 268 | 400 |
| 12.1" single-touch | 5AP1120.1214-000 | 362 | 284 | 309 | 4.5 | 5.7 | 234 | 20.3 | 4 | 264 | 339 |
| 15.0" single-touch | 5AP1120.1505-000 | 435 | 330 | 382 | 33.5 | 5.7 | 280 | 24.3 | 10.5 | 310 | 412 |
| 15.0" single-touch with keys | 5AP1180.1505-000 | 435 | 330 | 382 | 33.5 | 5.7 | 280 | 24.3 | 10.5 | 310 | 412 |
| 19.0" single-touch | 5AP1120.1906-000 | 527 | 421 | 445 | 138.5 | 5.7 | 351 | 23.3 | 5.8 | 401 | 507 |

Table 8: AP1000 display units with clamping blocks - Dimensions

| Component | Model number | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|
| CPU board and System unit | 5PC901.TS77-xx & 5PC911.SX00-xx | 54 | 226 | 225 | - | - | - | - |
| 1-slot bus unit | 5AC902.BX01-xx | - | - | - | - | 54.7 | 218 | 164 |
| 2-slot bus unit | 5AC902.BX02-xx | - | - | - | - | 75 | 218 | 164 |
| Power supply | 5AC902.PS00-00 | 53.5 | 225.5 | - | 74.5 | - | - | - |

Table 9: CPU boards, system units, bus units and power supply - Dimensions

## Information:

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

**4.1.3.2 Installation diagrams**

> # Information:
>
> **When installing the Panel PC 900, spacing for air circulation and additional free space for operating and servicing the device must be taken into account.**

**AP9x3 panels - Installation diagrams**
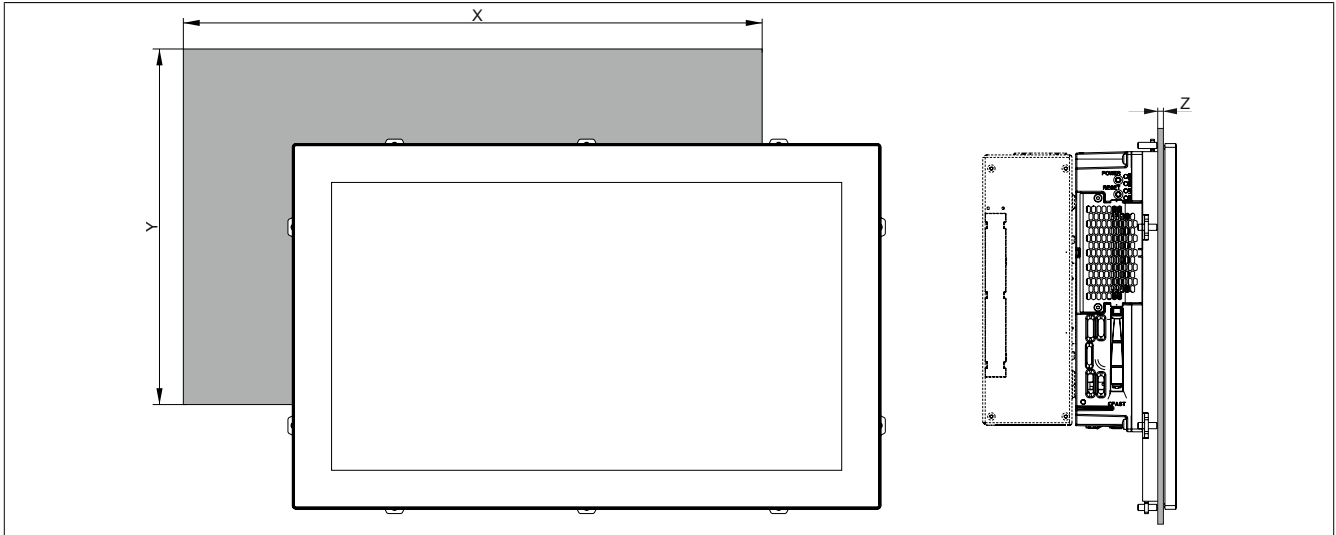


Figure 9: Panel PC 900 with AP9x3 display units - Installation diagram

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

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

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

**AP1000 panels with retaining clips - Installation diagrams**
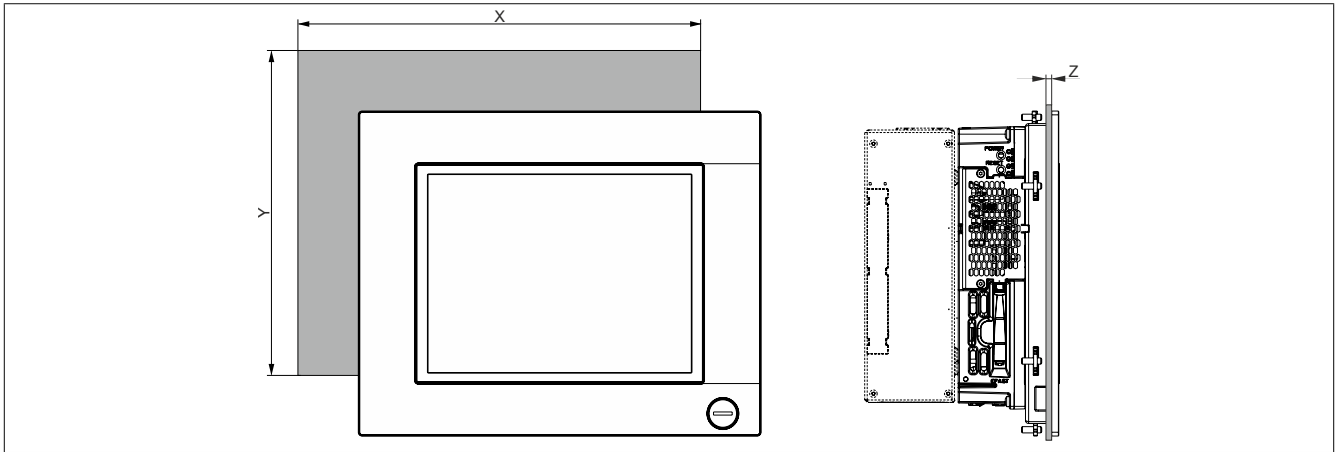


Figure 10: Panel PC 900 with AP1000 display units with retaining clips - Installation diagram

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 |
|---|---|---|---|---|---|---|
| 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 |
| 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 |
| 15.6" multi-touch | 5AP1130.156C-001 | 403 | 247.5 | 1 | 6 | 10 |
| 18.5" multi-touch | 5AP1130.185C-000 | 464 | 284 | 1 | 6 | 10 |

Table 10: AP1000 panels with retaining clips - Installation diagrams

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

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

**AP1000 panels with clamping blocks - Installation diagrams**
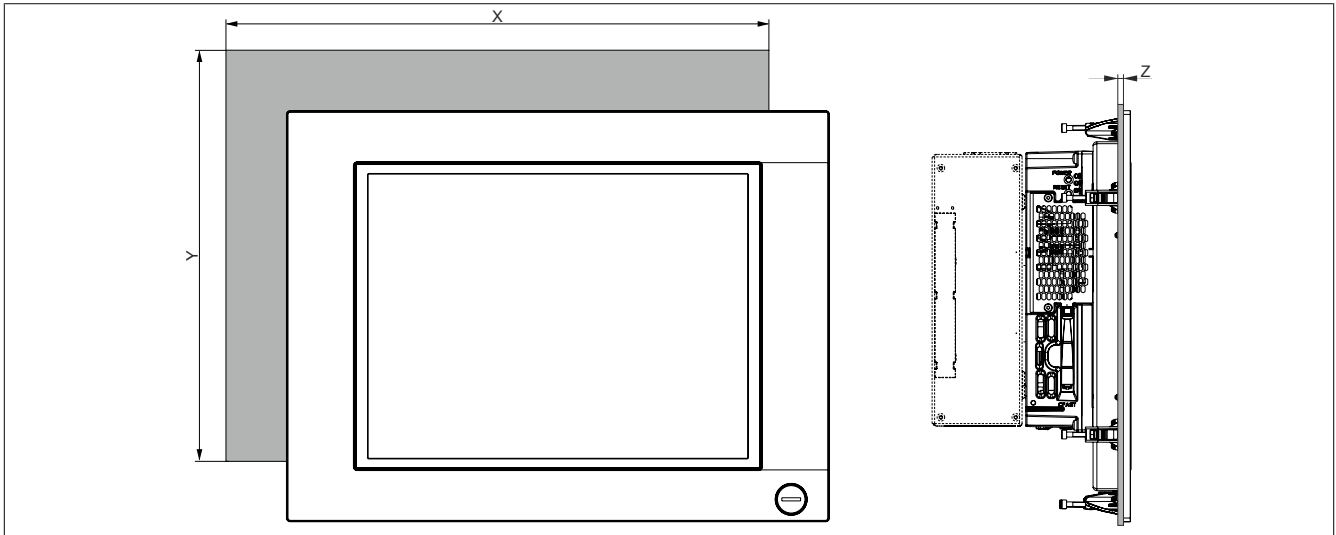


Figure 11: Panel PC 900 with AP1000 display units with retaining clips - Clamping blocks

| Panels | | | | | | |
|---|---|---|---|---|---|---|
| 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 |

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.

### 4.1.3.3 Spacing for air circulation

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

## Information:

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

The air intake and outlet are indicated in the following image for active Panel PCs (i.e. with a fan kit). The air intake on passive Panel PCs (i.e. without a fan kit) is located on the bottom to accommodate the rising warm air.
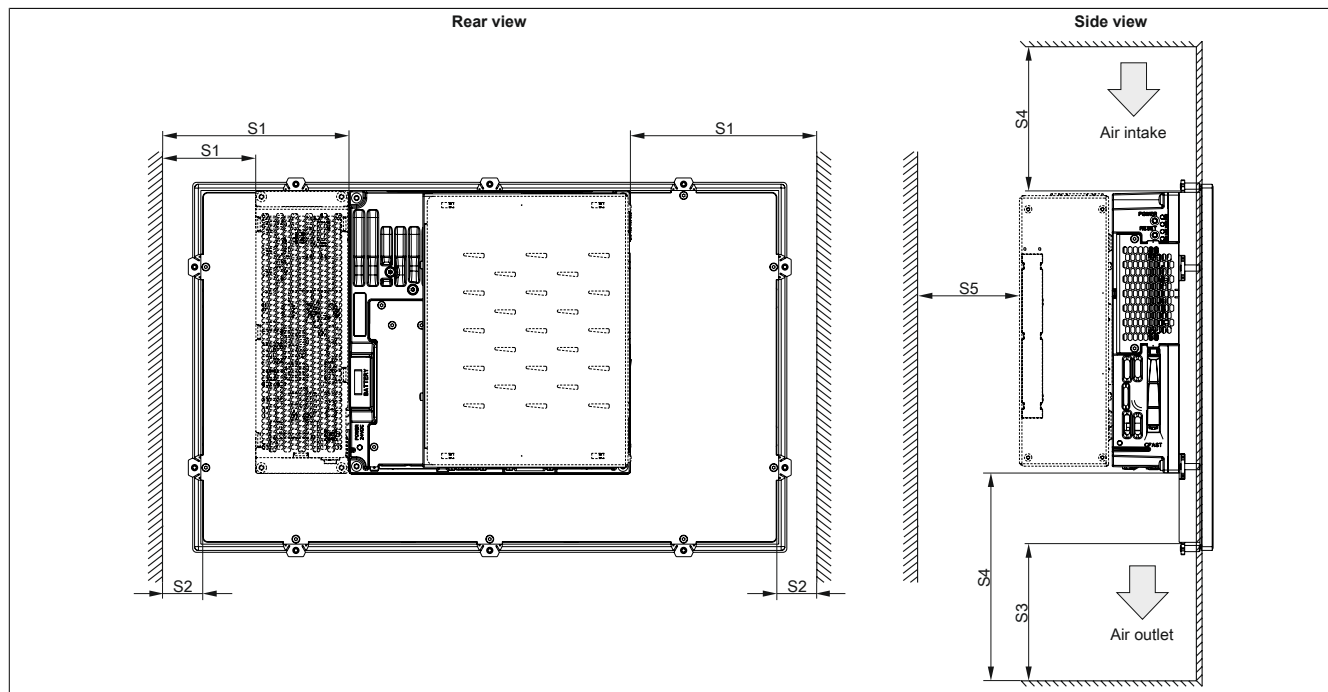


Figure 12: Panel PC 900 - Spacing for air circulation

S1: ≥20 mm

S2: ≥20 mm

S3: ≥50 mm

S4: ≥100 mm

S5: ≥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 spacing specifications for air circulation cannot be observed, then the maximum specified temperatures for the temperature sensors (see "Temperature sensor positions" on page 34) must be monitored by the user and appropriate measures taken if they are exceeded.**

### 4.1.3.4 Mounting orientations

The following diagrams show the specified mounting orientations of Panel PC 900 devices. An PPC900 system is only permitted to be installed as shown or described below.
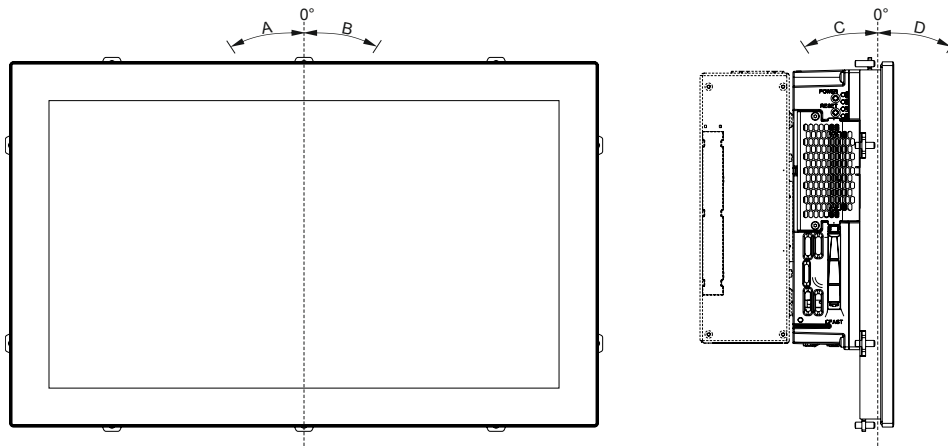


### Mounting orientations when operated without a fan kit

| Mounting orientation | | Derating the ambient temperature[1] |
|---|---|---|
| 0° | 0° | None |
| A | -1° to -90° (counterclockwise) | 5°C |
| B | +1° to +90° (clockwise) | 5°C |
| C, D | ±±180° (interfaces on top) | 5°C |
| C | -1° to -45° | None |
| C | -46° to -90° | Hardware version A2 or later: 10°C<br>Up to hardware version A1: 5°C |
| D | +1° to +90° (display facing down) | 5°C |

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

### Mounting orientations when operated with a fan kit

| Mounting orientation | | Derating the ambient temperature[1] |
|---|---|---|
| 0° | 0° | None |
| A | -1° to -90° (counterclockwise) | None |
| B | +1° to +90° (clockwise) | 5°C |
| C, D | ±±180° (interfaces on top) | None |
| C | -1° to -45° | None |
| C | -46° to -90° | 5°C |
| D | +1° to +90° (display facing down) | 5°C |

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

### Mounting orientations when operated with individual components with limitations

| Mounting orientation | Limitation[1] |
|---|---|
| | **5AC901.SDVW-00** |
| 0° | 0° |
| A | -1° to -30° |
| B | +1° to +30° |
| C | -1° to -5° |
| D | +1° to +30° |

1) The mounting orientation may only be max. ....

In order to facilitate natural air circulation, devices must be mounted according to the spacing indicated in section "Spacing for air circulation" on page 44.

## 4.1.3.5 Weight specifications

All weight values in g (grams).

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

| Display type | Model number | Weight |
|---|---|---|
| 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 |
| 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 |
| 15.6" multi-touch | 5AP1130.156C-001 | 3800 |
| 18.5" multi-touch | 5AP1130.185C-000 | 4700 |
| 19.0" single-touch | 5AP1120.1906-000 | 7300 |

Table 11: AP1000 display units - Weight

| Component | Model number | Weight |
|---|---|---|
| CPU boards | 5PC901.TS17-xx | 450 |
| System units | 5PC911.SX00-00 | 2821 |
| | 5PC911.SX00-01 | 2821 |
| 1-slot bus units | 5AC902.BX01-00 | 1020 |
| | 5AC902.BX01-01 | 1020 |
| 2-slot bus units | 5AC902.BX02-00 | 1220 |
| | 5AC902.BX02-01 | 1220 |
| | 5AC902.BX02-02 | 1220 |
| Power supply | 5AC902.PS00-00 | 580 |
| Fan kits | 5AC902.FA00-00 | 70 |
| | 5AC902.FA0X-00 | 36 |
| Slide-in compact drives | 5AC901.CHDD-01 | 134 |
| | 5AC901.CSSD-03 | 118 |
| | 5AC901.CSSD-04 | 118 |
| | 5AC901.CSSD-05 | 118 |
| | 5AC901.CSSD-06 | 118 |
| | 5AC901.CCFA-00 | 50 |
| Slide-in drives | 5AC901.SDVW-00 | 400 |
| | 5AC901.SSCA-00 | 195 |
| Interface options | 5AC901.I232-00 | 30 |
| | 5AC901.I485-00 | 34 |
| | 5AC901.ICAN-00 | 33 |
| | 5AC901.ICAN-01 | 31 |
| | 5AC901.ISRM-00 | 20 |
| | 5AC901.IPLK-00 | 35 |
| | 5AC901.IHDA-00 | 21 |
| | 5AC901.IRDY-00 | 30 |
| Uninterruptible power supplies | 5AC901.IUPS-00 | 28 |
| | 5AC901.IUPS-01 | 28 |
| | 5AC901.BUPS-00 | 4600 |
| | 5AC901.BUPS-01 | 2550 |

Table 12: CPU boards, system units, bus units and power supply - Weight

### 4.1.4 Electrical properties

#### 4.1.4.1 Power calculation

In order to calculate the total power of the Panel PC, the power rating of the display being used must be entered in the "Display unit, permanent consumer" row of the table below.

## Information:

**The power supply's maximum total power of 130 watts is not permitted to be exceeded.**

| Information:<br><br>All values in **watts**<br>The values for the **suppliers** are maximum values. The values for the **consumers** are average maximum values but not peak values. | | CPU board | | | | | | Current system |
|---|---|---|---|---|---|---|---|---|
| | | i7 6820EQ<br>5PC901.TS17-00 | i5 6440EQ<br>5PC901.TS17-01 | i3 6100E<br>5PC901.TS17-02<br>@2700 MHz | i3 6100E<br>5PC901.TS17-02<br>@1900 MHz | C G3900E<br>5PC901.TS17-03<br>@2400 MHz | C G3900E<br>5PC901.TS17-03<br>@1700 MHz | Enter values in this column |
| Total power supply unit power (maximum) | | | | | | | | 130 |
| Total power supply unit +12 V | +12 V | Maximum possible | | | | | | | 130 |
| | | Panel, permanent consumer[1] | | | | | | | |
| | | CPU board, permanent consumers | 63 | 63 | 43 | 27 | 38 | 25 | |
| | | 4096 MB RAM, each 2.5 W, max. 2 pcs. | | | | | | | |
| | | 8192 MB RAM, each 3 W, max. 2 pcs. | | | | | | | |
| | | 16384 MB RAM, each 3.5 W, max. 2 pcs. | | | | | | | |
| | | Fan kit, optional | 3 | 3 | 3 | 3 | 3 | 3 | |
| | | UPS IF option 5AC901.IUPS-00 during operation, optional | 30 | 30 | 30 | 30 | 30 | 30 | |
| | | UPS IF option 5AC901.IUPS-01 during operation, optional | 25 | 25 | 25 | 25 | 25 | 25 | |
| | | PCI card power rating, optional (max. 3 W without fan kit, max. 6 W with fan kit)[2] | | | | | | | |
| | | PCIe x8 card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit)[2] | | | | | | | |
| | -12 V | Maximum possible at -12 V | | | | | | | 1.2 |
| | | PCI card power rating, optional (max. 1.2 W with or without fan kit)[2] | | | | | | | |
| | | Consumers -12 V ∑ | | | | | | | |
| | | Consumers ∑ | | | | | | | |
| | +5 V | Maximum possible at +5 V | | | | | | | 50 |
| | | Panel, permanent consumer[1] | | | | | | | |
| | | CPU board, permanent consumers | 2 | 2 | 2 | 2 | 2 | 2 | |
| | | Slide-in compact drive (HDD / SSD) | 4 | 4 | 4 | 4 | 4 | 4 | |
| | | Slide-in drive (DVD / ...) | 4 | 4 | 4 | 4 | 4 | 4 | |
| | | 4x USB peripherals, each max. 5 W | | | | | | | |
| | | Interface option, optional[3], max. 2 connections | | | | | | | |
| | | PCI card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit)[2] | | | | | | | |
| | | Consumers +5 V ∑ | | | | | | | |
| | 3V3 | Maximum possible at 3V3 | | | | | | | 33 |
| | | Panel, permanent consumer[1] | | | | | | | |
| | | CPU board, permanent consumers | 5 | 5 | 5 | 5 | 5 | 5 | |
| | | CFast card | 1 | 1 | 1 | 1 | 1 | 1 | |
| | | Interface option, optional[3] | | | | | | | |
| | | PCI card power rating, optional (max. 3 W without fan kit, max. 15 W with fan kit)[2] | | | | | | | |
| | | PCIe x8 card power rating, optional (max. 3 W without fan kit, max. 10 W with fan kit)[2] | | | | | | | |
| | | Consumers 3V3 ∑ | | | | | | | |
| Total power supply unit, consumers ∑ | | | | | | | | |

1) For power ratings of the panels, see the table below.

2) The total power of one PCI/PCIe card per PCI slot (i.e. sum of the power consumption for each voltage range) is not permitted to exceed the max. power rating stated for operation with or without a fan kit.

3) Power ratings for the interface options are listed in the table below.

Table 13: CPU board - Power calculation

In order to accurately determine the total power of the complete system, the values in this table must be entered in the power calculation table depending on the display unit being used.

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

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

| Display type | Model number | +5 V | +3.3 V | +12 V | Power consumption Total |
|---|---|---|---|---|---|
| 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 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 W | 1.9 W | 3.6 W | 6.5 W |
| 12.1" single-touch | 5AP1120.1214-000 | - | 1.9 W | 7 W | 8.9 W |
| 15.0" single-touch | 5AP1120.1505-000 | - | 2.1 W | 8.9 W | 11 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 | 2.5 W | - | 10.5 W | 13 W |
| 15.6" multi-touch | 5AP1130.156C-000 | 6 W | | 18 W | 24 W |
| 15.6" multi-touch | 5AP1130.156C-001 | 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 W | - | 22 W | 27 W |

Table 14: AP1000 display units - Power calculation

In order to accurately determine the total power of the complete system, the values in this table must be entered in the power calculation table if one or more of these options are connected to the system unit.

| Component | Model number | +5 V | +3.3 V | +12 V | Power consumption Total |
|---|---|---|---|---|---|
| **Interface option** | | | | | |
| RS232 IF option | 5AC901.I232-00 | 1 W | - | - | 1 W |
| RS232/RS422/RS485 IF option | 5AC901.I485-00 | 1 W | - | - | 1 W |
| CAN IF option | 5AC901.ICAN-00 | 1 W | - | - | 1 W |
| CAN IF option | 5AC901.ICAN-01 | 1 W | - | - | 1 W |
| Audio IF option | 5AC901.IHDA-00 | 0.2 W | 0.2 W | - | 0.4 W |
| POWERLINK IF option | 5AC901.IPLK-00 | - | 1.5 W | - | 1.5 W |
| SRAM IF option | 5AC901.ISRM-00 | - | 2 W | - | 2 W |
| Ready relay IF option | 5AC901.IRDY-00 | 0.2 W | - | - | 0.2 W |
| System I/O IF option | 5AC901.ISIO-00 | - | 0.5 W | - | 0.5 W |
| UPS IF option | 5AC901.IUPS-00 in standby | - | - | 0.1 W | 0.1 W |
| UPS IF option | 5AC901.IUPS-01 in standby | - | - | 0.1 W | 0.1 W |
| Gigabit Ethernet IF option | 5AC901.IETH-00 | - | 1 W | - | 1 W |
| **PCIe cards** | | | | | |
| PCIe x1 Ethernet card | 5ACPCE.ETH1-00 | - | 1 W | - | 1 W |
| PCIe x4 Ethernet card | 5ACPCE.ETH4-00 | - | 4 W | - | 4 W |

Table 15: Interface options - Power calculation

## 4.1.4.2 Block diagram

The following block diagram shows the simplified structure of the Panel PC 900 complete system without a display unit.
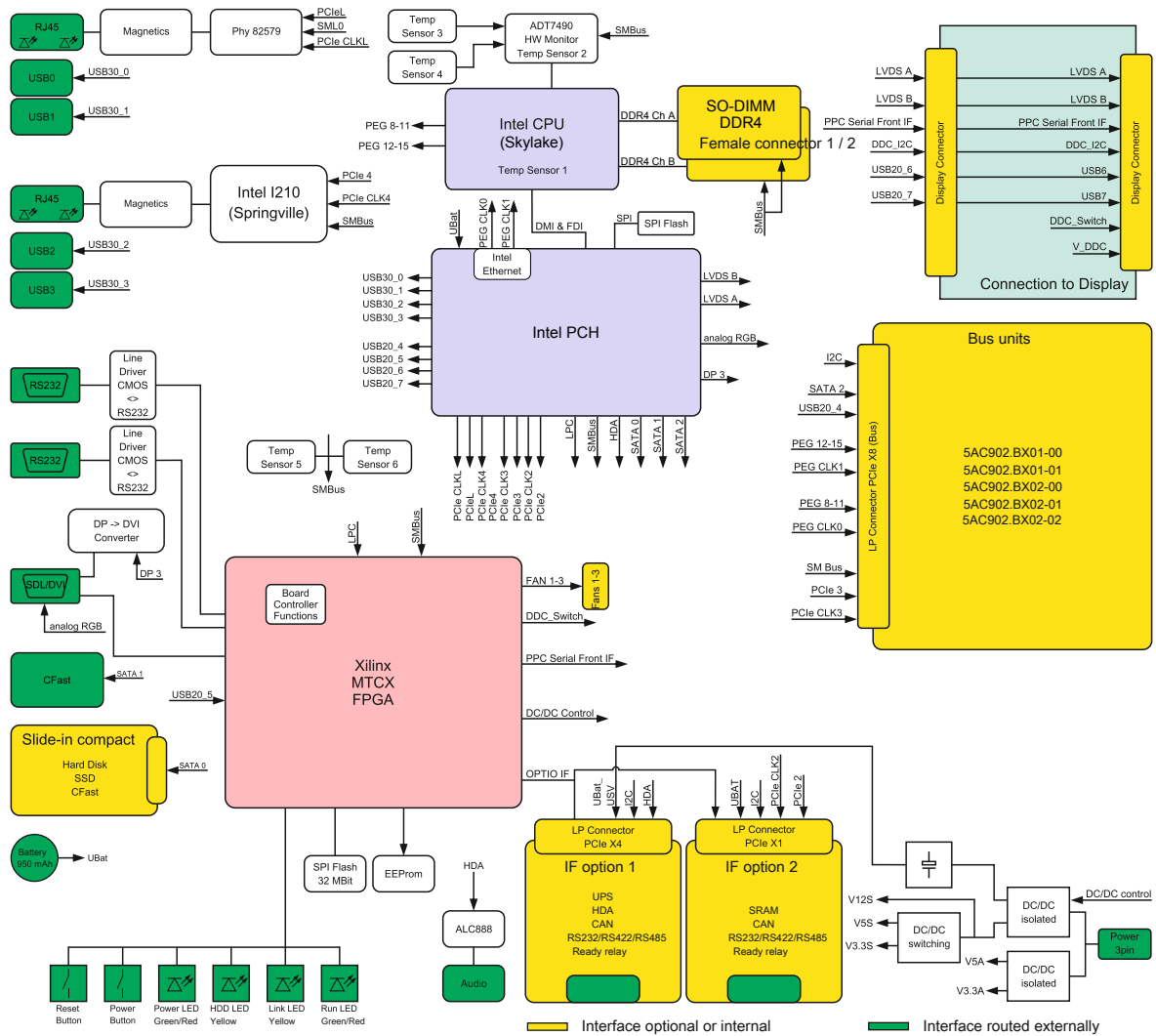
## 4.1.5 Device interfaces and slots

### 4.1.5.1 Overview of device interfaces

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

**For all connections, only connections within a building are permitted, taking into account maximum lengths.**

The following figures shows the interfaces on the Panel PC 900 with an installed bus unit and AC power supply.
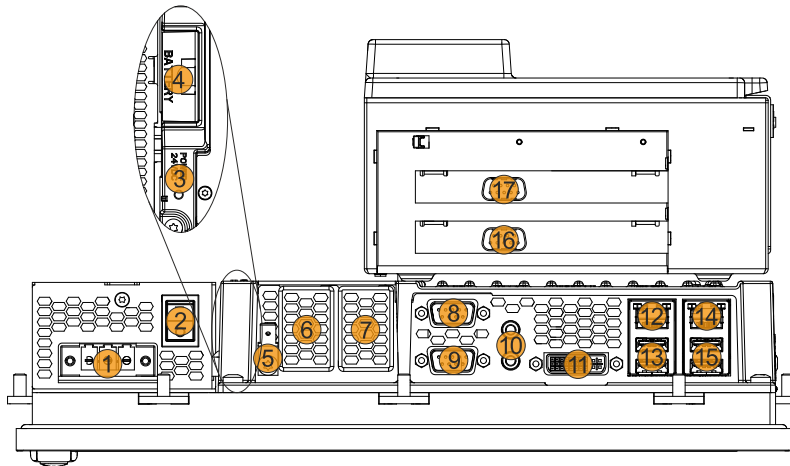


| No. | Type of interface | | No. | Type of interface | |
|-----|-------------------|---|-----|-------------------|---|
| 1 | 230 VAC power | "Optional VAC power supply" | 10 | Audio | "USB interfaces" "Audio" |
| 2 | On/Off switch | "Optional VAC power supply" | 11 | Monitor/Panel | "Panel/Monitor interface" |
| 3 | Power 24 VDC | "+24 VDC power supply" | 12 | ETH2 (Ethernet 2) | "Onboard Ethernet interfaces" |
| 4 | Battery | "Battery" | 13 | USB3 / USB4 | "USB interfaces" |
| 5 | Functional ground connection | Grounding | 14 | ETH1 (Ethernet 1) | "Onboard Ethernet interfaces" |
| 6 | IF option 1 | "IF options" | 15 | USB2 / USB1 | "USB interfaces" |
| 7 | IF option 2 | "IF options" | 16 | Card slot 1 | "Card slot (PCI / PCIe)" |
| 8 | COM 2 | Serial interfaces (COM1 and COM2) | 17 | Card slot 2 | "Card slot (PCI / PCIe)" |
| 9 | COM 1 | Serial interfaces (COM1 and COM2) | | - | |



| No. | Type of interface | | No. | Type of interface | |
|-----|-------------------|---|-----|-------------------|---|
| 1 | CFast | "CFast slot" | 7 | LED "HDD" | "LED status indicators" |
| 2 | Main memory and Slide-in compact drive | "Main memory slots" Slide-in compact slot | 8 | LED "POWER" | "LED status indicators" |
| 3 | Reset button | "Power button / Reset button" | 9 | Slide-in drive on bus unit | "Slide-in slot" |
| 4 | Power button | "Power button / Reset button" | 10 | Fan kit for system unit | |
| 5 | LED "RUN" | "LED status indicators" | 11 | Fan kit for bus unit | |
| 6 | LED "LINK" | "LED status indicators" | | - | |
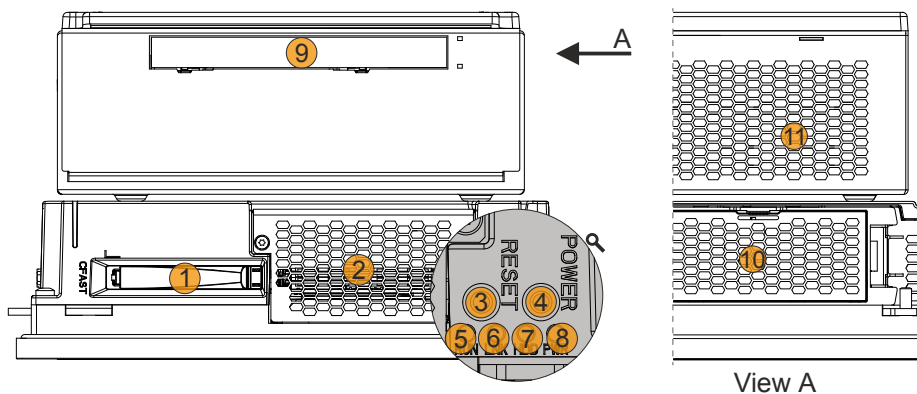
### 4.1.5.2 Power supply

The Panel PC can be operated with 24 VDC or optionally with 100~240 VAC. The 5AC902.PS00-00 power supply is required for AC power.

For information about installing or replacing the power supply, see section "Installing or replacing the AC power supply" on page 212.

> # 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.**
> - **To meet the requirements of UL certification, copper cables must be used that are designed for an operating temperature >90°C.**

#### 4.1.5.2.1 +24 VDC power supply

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

The necessary 3-pin connector is not included in delivery; for suitable accessories, see "0TB103.9x" on page 314.

The device is protected against overload and reverse polarity by a soldered fuse (15 A, fast-acting). If the fuse is defective (e.g. due to overload), the device must be sent to B&R for repairs. If the polarity is reversed, it is not necessary to replace the fuse.

| Pin | Description | Figure |
|---|---|---|
| 1 | + | |
| 2 | Functional ground | |
| 3 | - | |
| • Reverse polarity protection<br>• 3-pin<br>• Male | |  |

| Electrical properties | |
|---|---|
| Operating voltage | 24 VDC ±25% |
| Operating current | Max. 7.4 A |
| Nominal voltage | 24 VDC |
| Nominal current | Max. 5.5 A |
| Inrush current | Max. 60 A for < 300 µs |
| Galvanic isolation | Yes |
| Uninterruptible power supply | Optional, with 5AC901.IUPS-00 or 5AC901.IUPS-01 |

#### 4.1.5.2.1.1 Grounding

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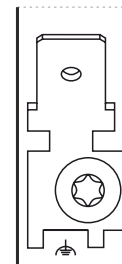


For example, a copper strip must be attached to the ground connection at a central grounding point of the control cabinet or system in which the device is installed. The wire cross section should be as large as possible (at least 2.5 mm²).

### 4.1.5.2.2 Optional VAC power supply

The optional 5AC902.PS00-00 power supply must be installed on the Panel PC in order to operate the Panel PC with AC power.

The 3-pin male connector required for the power supply interface is not included in delivery. It can be ordered from B&R using model number 0TB3103.8000.

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

| Description | | Figure |
|---|---|---|
| **Power supply connection** | | |
| • Reverse polarity protection | | |
| • 3-pin, male | | |
| **Pin** | **Description** | |
| 1 | Protective ground | |
| 2 | L | |
| 3 | N | |
| **Electrical properties** | | |
| Nominal voltage | 100 to 240 VAC | |
| Frequency | 45 to 65 Hz | |
| Nominal current | 1.25 to 2.5 A | |
| Inrush current | <20 A (on cold restart, 100% load and 100 VAC) | |
| Internal fuse | Yes | |
| Uninterruptible power supply | Optional with external UPS | |
| **On/Off switch** | | |
| O | The Panel PC is switched off. | |
| I | The Panel PC is switched on. | |
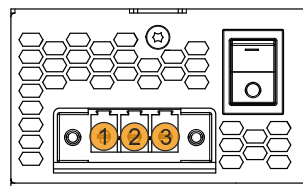
### 4.1.5.3 Serial interfaces (COM1 and COM2)

| Description | | Figure |
|---|---|---|
| **RS232** | | |
| Variant | DSUB, 9-pin, male | |
| Type | Modem supported, not galvanically isolated | |
| UART | 16550-compatible, 16-byte FIFO buffer | |
| Transfer rate | Max. 115 kbit/s | |
| Bus length | Max. 15 m | |
| **Pin** | **Pinout** | |
| 1 | DCD | |
| 2 | RXD | |
| 3 | TXD | |
| 4 | DTR | |
| 5 | GND | |
| 6 | DSR | |
| 7 | RTS | |
| 8 | CTS | |
| 9 | RI | |

#### 4.1.5.4 Panel/Monitor interface

| Panel/Monitor interface - SDL (Smart Display Link) / DVI / RGB | | |
|---|---|---|
| The following overview lists the video signals available on the panel/monitor output. For details, see the technical data for the CPU board being used. | | |
| **CPU board** | **Video signals with all system unit variants** | |
| 5PC901.TS17-00 | SDL, DVI, RGB | |
| 5PC901.TS17-01 | SDL, DVI, RGB | |
| 5PC901.TS17-02 | SDL, DVI, RGB | |
| 5PC901.TS17-03 | SDL, DVI, RGB | |
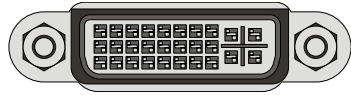
Table 16: Panel/Monitor interface - SDL, DVI, RGB

## Information:

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

## Information:

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

## Information:

**The RGB interface uses an analog signal; the line length depends on the resolution and prevailing environmental conditions. This interface is therefore only recommended for service purposes.**

#### 4.1.5.4.1 USB transfer in SDL and DVI operation

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

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

#### 4.1.5.4.2 Pinout

| Pin | Pinout | Description | Pin | Pinout | Description |
|---|---|---|---|---|---|
| 1 | TMDS data 2- | DVI lane 2 (negative) | 16 | HPD | Hot plug detection |
| 2 | TMDS data 2+ | DVI lane 2 (positive) | 17 | TMDS data 0- | DVI lane 0 (negative) |
| 3 | TMDS data 2/4 SHIELD | Shield for data pairs 2 and 4 | 18 | TMDS data 0+ | DVI lane 0 (positive) |
| 4 | SDL- | SDL lane (negative) | 19 | TMDS data 0/XUSB1 SHIELD | Shield of data pair 0 and USB1 |
| 5 | SDL+ | SDL lane (positive) | 20 | XUSB1- | USB lane 1 (negative) |
| 6 | DDC clock | DDC-based control signal (clock) | 21 | XUSB1+ | USB lane 1 (positive) |
| 7 | DDC data | DDC-based control signal (data) | 22 | TMDS clock shield | Shield of clock pair |
| 8 | ANALOG VERT SYNC | Analog vertical synchronization | 23 | TMDS clock+ | DVI clock (positive) |
| 9 | TMDS data 1- | DVI lane 1 (negative) | 24 | TMDS clock - | DVI clock (negative) |
| 10 | TMDS data 1+ | DVI lane 1 (positive) | C1 | ANALOG RED | Analog red |
| 11 | TMDS data 1/XUSB0 SHIELD | Shield of data pair 1 and USB0 | C2 | ANALOG GREEN | Analog green |
| 12 | XUSB0- | USB lane 0 (negative) | C3 | ANALOG BLUE | Analog blue |
| 13 | XUSB0+ | USB lane 0 (positive) | C4 | ANALOG HORZ SYNC | Analog horizontal synchronization |
| 14 | +5 V power[1] | +5 V power supply | C5 | ANALOG GND | Analog ground (return for R, G and B signals) |
| 15 | Ground (return for +5 V, HSync and VSync) | Ground | - | - | - |

1)     Protected internally by a multifuse.

### 4.1.5.4.3 Cable lengths and resolutions for SDL transfer

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

| SDL cable Segment length [m] | Resolution | | | | | | |
|---|---|---|---|---|---|---|---|
| | VGA 640 x 480 | SVGA 800 x 600 | XGA 1024 x 768 | HD 1366 x 768 | SXGA 1280 x 1024 | UXGA 1600 x 1200 | FHD 1920 x 1080 |
| 0.8 | 5CASDL.0008-00 | 5CASDL.0008-00 | 5CASDL.0008-00 | 5CASDL.0008-00 | 5CASDL.0008-00 | 5CASDL.0008-00 | 5CASDL.0008-00 |
| 1.8 | 5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03 | 5CASDL.0018-00 5CASDL.0018-01 5CASDL.0018-03 |
| 5 | 5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03 | 5CASDL.0050-00 5CASDL.0050-01 5CASDL.0050-03 |
| 6 | 5CASDL.0060-00 | 5CASDL.0060-00 | 5CASDL.0060-00 | 5CASDL.0060-00 | 5CASDL.0060-00 | 5CASDL.0060-00 | 5CASDL.0060-00 |
| 10 | 5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03 | 5CASDL.0100-00 5CASDL.0100-01 5CASDL.0100-03 |
| 15 | 5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03 | 5CASDL.0150-00 5CASDL.0150-01 5CASDL.0150-03 | - - - | - - 5CASDL.0150-03 |
| 20 | 5CASDL.0200-00 5CASDL.0200-03 | 5CASDL.0200-00 5CASDL.0200-03 | 5CASDL.0200-00 5CASDL.0200-03 | 5CASDL.0200-00 5CASDL.0200-03 | 5CASDL.0200-00 5CASDL.0200-03 | - - | - 5CASDL.0200-03 |
| 25 | 5CASDL.0250-00 5CASDL.0250-03 | 5CASDL.0250-00 5CASDL.0250-03 | 5CASDL.0250-00 5CASDL.0250-03 | 5CASDL.0250-00 5CASDL.0250-03 | - - | - - | - - |
| 30 | 5CASDL.0300-00 5CASDL.0300-03 | 5CASDL.0300-00 5CASDL.0300-03 | - 5CASDL.0300-13 | - 5CASDL.0300-13 | - 5CASDL.0300-13 | - - | - 5CASDL.0300-13 |
| 40 | 5CASDL.0400-13 | 5CASDL.0400-13 | 5CASDL.0400-13 | 5CASDL.0400-13 | 5CASDL.0400-13 | - | 5CASDL.0400-13 |

### 4.1.5.4.4 Cable lengths and resolutions for DVI transfer

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

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

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

### 4.1.5.5 Onboard Ethernet interfaces

**ETH1**

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

| Description | | | Image |
|---|---|---|---|
| Variant | RJ45, female | | 1 |
| Controller | Intel I219 | | |
| Cabling | S/STP (Cat 5e) | | |
| Transfer rate | 10/100/1000 Mbit/s[1] | | |
| Cable length | Max. 100 m (min. Cat5e) | | |
| **Speed LED** | **On** | **Off** | |
| Green | 100 Mbit/s | 10 Mbit/s[2] | |
| Orange (light) | 1000 Mbit/s | - | |
| **Link LED** | **On** | **Off** | |
| Orange (light) | Link (Ethernet network connection available) | Activity (blinking - data transfer in progress) | (a)     (b) |

1) Switching takes place automatically.
2) The 10 Mbit/s transfer speed / connection only exists if the Link LED is also lit at the same time.

**ETH2**

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

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

1) Switching takes place automatically.
2) The 10 Mbit/s transfer rate / connection is only available if LED "Link" is active at the same time.

**Driver support**

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) (if required and not already included in the operating system).

> ## Information:
>
> **Necessary drivers must be downloaded from the B&R website, not from manufacturer websites.**

### 4.1.5.6 USB interfaces

The Panel PC comes equipped with a USB 3.0 (Universal Serial Bus) host controller with multiple USB interfaces, 4 of which are accessible externally for the user.

## Warning!

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

## Caution!

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

4 USB 3.0 interfaces are provided on the bottom of the Panel PC.
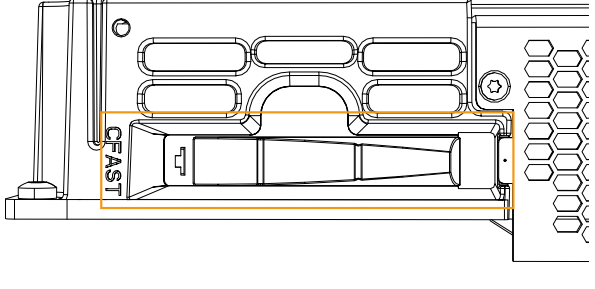
| USB1-4 | | |
|---|---|---|
| **Description** | | **Figure** |
| Type | USB 3.0 | |
| Design | Type A, female | |
| Transfer rate | Low speed (1.5 Mbit/s) Full speed (12 Mbit/s) High speed (480 Mbit/s) SuperSpeed (5 Gbit/s)[1] | |
| Current-carrying capacity[1] | Max. 1 A per USB | |
| Cable length | USB 2.0: Max. 5 m (without hub) USB 3.0: Max. 3 m (without hub) | |
| - | | |

1) Compatibility with SuperSpeed depends on the operating system used.
2) Each USB interface is protected by a maintenance-free "USB current-limiting switch" (max. 1 A).

### 4.1.5.7 CFast slot

The PPC900 offers an easy-to-access CFast slot behind its front cover so that a CFast card can be used as a removable storage medium for transferring data or performing upgrades.

This CFast slot is connected to the chipset internally via SATA 1 with SATA III design (SATA 6 Gbit/s).
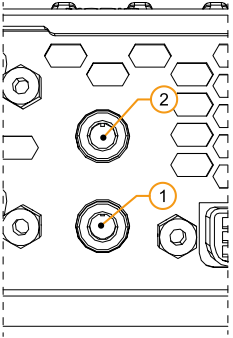
| Description | | Figure |
|---|---|---|
| Connection | SATA 1 | |
| **Model number** | **Short description** | |
| | **CFast cards** | |
| 5CFAST.2048-00 | CFast card, 2 GB SLC | |
| 5CFAST.4096-00 | CFast card, 4 GB SLC | |
| 5CFAST.8192-00 | CFast card, 8 GB SLC | |
| 5CFAST.016G-00 | CFast card, 16 GB SLC | |
| 5CFAST.032G-00 | CFast card, 32 GB SLC | |
| 5CFAST.032G-10 | CFast 32 GB MLC | |
| 5CFAST.064G-10 | CFast 64 GB MLC | |
| 5CFAST.128G-10 | CFast 128 GB MLC | |
| - | | |

## Warning!

**CFast cards are only permitted to be connected and disconnected in a voltage-free state!**

### 4.1.5.8 Audio

The MIC and Line IN inputs use the same female connector (pink). The Line OUT output has its own female connector (green). Connecting a device is detected by the driver so that the user can configure the connections.

| MIC, Line IN, Line OUT | | |
|---|---|---|
| Variant | 3.5 mm female connector | |
| Controller | Realtek RTL888 | |
| MIC (2) | Connection of a mono microphone with a 3.5 mm jack | |
| Line IN (2) | Stereo Line IN signal supplied via a 3.5 mm jack | |
| Line OUT (1) | Connection of a stereo playback device (e.g. amplifier) via a 3.5 mm jack | |

A special driver is required to operate the audio 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.**

### 4.1.5.9 LED status indicators

The LED status indicators are located on the right-hand side of the Panel PC when viewed from the front.

The following timing is used for the LED status indicators:
Block size: 250 ms
Repeat interval: 500 ms, 2 boxes thus represent one interval
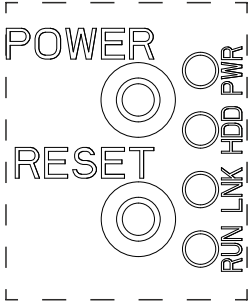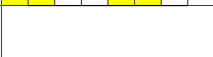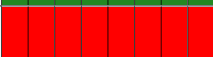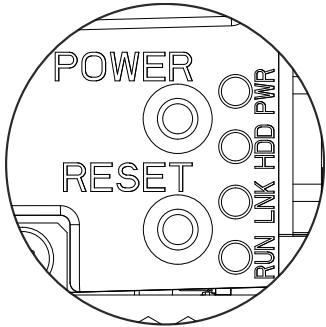
| Assignment | LED | Color | Status | Function | LED status indicators |
|---|---|---|---|---|---|
| | **Power** | Green | On | Voltage supply OK | Green (solid) |
| | | | Blinking | Device booted, battery status "BAD" | Green/off blinking |
| | | | | **Information:** For more information, see "Battery" on page 60. | |
| | | Red | On | System in standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk) | Red (solid) |
| | | | Blinking | MTCX running, battery status "BAD". System in standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk) | Red/off blinking |
| | | Red/Green | Blinking | Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status OK, voltage supply OK | Red/Green blinking |
| | | | | Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status OK, standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk) | Red/Green blinking |
| | | | | Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status BAD, voltage supply OK | Red/Green blinking |
| | | | | Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status BAD, standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk) | Red/Green blinking |
| | | | | **Information:** An update must be performed again. | |
| | | Yellow | On | Voltage supply not OK, system operating from UPS | Yellow (solid) |
| | **HDD** | Yellow | On | Indicates drive access (HDD, CFast) | Yellow (solid) |
| | **Link** | Yellow | On | Indicates an active SDL connection on the male panel connector | Yellow (solid) |
| | | | Blinking | Indicates that an active SDL connection has been interrupted by a loss of power to the display unit | Yellow/off blinking |
| | | | | **Information:** Check the voltage supply / power connector of the connected display unit. | |
| | **Run** | Green | Blinking | Automation Runtime booting Controlled by Automation Runtime (ARemb and AR-win) | Green/off blinking |
| | | Green | On | Application running Controlled by Automation Runtime (ARemb and AR-win) | Green (solid) |
| | | Red | On | Application in service mode Controlled by Automation Runtime (ARemb and AR-win) | Red (solid) |
| | | | Blinking | Indicates a licensing violation | Red/off blinking |

Table 17: LED status indicators - Data

POWER
RESET
RUN LNK HDD PWR

### 4.1.5.10 Power button / Reset button
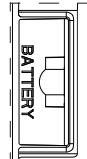
Due to full ATX power supply support, the power button has various functions.

| Description | Figure |
|---|---|
| The power button can be pressed with a pointed object (e.g. tip of a pen).<br><br>The power button behaves like the power switch on current desktop PCs with an ATX power supply:<br>**Short press:** Switches on the Automation PC or performs the action configured in the operating system when pressing the power button (shutdown, sleep, etc.) and switches off the Automation PC.<br>**Long press (approx. 4 seconds):** ATX power supply unit switches off the Automation PC without shutting down.<br>**Data loss possible!**<br><br>Pressing the power button does not reset the MTCX processor. |  |
| The reset button can be pressed with a pointed object (e.g. paper clip or tip of a pen).<br><br>Pressing the reset button triggers a hardware and PCI reset. The APC910 is restarted.<br>**Cold restart - Data loss possible!**<br><br>During a reset, the MTCX processor is not reset.<br><br>## Warning!<br>**Resetting the system can result in data loss!** | |

### 4.1.5.11 Battery

The lithium battery (3 V, 950 mAh) buffers the internal real-time clock (RTC). It is located on the back of the Panel PC. The battery is installed in a battery holder, making it very easy to replace.

The self-discharge time of the battery is at least 4 years (at 50°C, 8.5 µA for the components being supplied and self-discharge of 40%). If an SRAM interface option is installed, the service life is 2½ years. The battery is subject to wear and should be replaced regularly (at least after the specified service life) by changing the battery.

| Description | | Figure |
|---|---|---|
| Battery<br>　Type<br>　Removable<br>　Service life | Renata 950 mAh<br>Yes, accessible from the outside<br>4 years[1] | |
| Model number | Short description | |
| | Batteries | |
| 0AC201.91 | Lithium batteries, 4 pcs., 3 V / 950 mAh, button cell | |
| 4A0006.00-000 | Lithium battery, 1 pc., 3 V / 950 mAh, button cell | |

1)　　At 50°C, 8.5 µA for the components being supplied and self-discharge of 40%. If an SRAM interface option is installed, the service life is 2½ years.
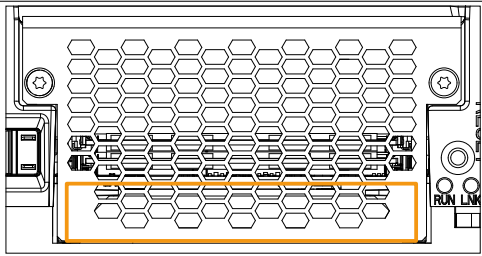
The status of the battery is determined immediately after the device is started and subsequently checked by the system every 24 hours. During this measurement, the battery is subjected to a brief load (approximately 1 second) and then evaluated. Once determined, the battery status is displayed in BIOS (Advanced - OEM features - System board features - Voltage values) and in the B&R Control Center (ADI driver); it can also be read in a customer application using the ADI library.

| Battery status | Function |
|---|---|
| N/A | The hardware or firmware being used is too old and does not support reading the battery status. |
| GOOD | Data buffering is intact. |
| BAD | From the point when battery capacity is recognized as insufficient (BAD), data buffering is intact for approximately another 500 hours. |

From the point when battery capacity is recognized as insufficient, data buffering is intact for approximately another 500 hours. When replacing the battery, data is buffered for approximately 10 minutes by a gold leaf capacitor.

**4.1.5.12 Slide-in compact slot**

The slide-in compact slot is connected to the chipset internally via SATA 0 with SATA III design (SATA 6.0 Gbit/s).

| Description | | Figure |
|---|---|---|
| Connection | SATA 0 | |
| Model number | Short description | |
| | Drives | |
| 5AC901.CHDD-01 | 500 GB hard disk - Slide-in compact - SATA | |
| 5AC901.CSSD-03 | 60 GB SSD MLC - Slide-in compact - SATA | |
| 5AC901.CSSD-04 | 128 GB SSD MLC - Slide-in compact - SATA | |
| 5AC901.CSSD-05 | 256 GB SSD MLC - Slide-in compact - Toshiba - SATA | |
| 5AC901.CSSD-06 | 512 GB SSD MLC - Slide-in compact - Toshiba - SATA | |
| 5AC901.CCFA-00 | CFast adapter - For slide-in compact slot | |

## Information:

**For information about installing or replacing a slide-in compact drive, please refer to the section "Installing or replacing a slide-in compact drive" on page 219.**

**4.1.5.13 Slide-in slot**

The slide-in slot is integrated on the bus unit, meaning that it is only available when the bus unit is installed. It is connected to the chipset internally via SATA 2 and USB with SATA III (SATA 6.0 Gbit/s) design.
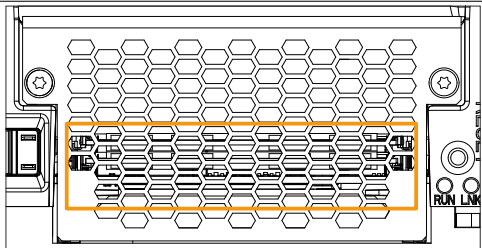
| Description | | Figure |
|---|---|---|
| Connection | SATA 2 and USB | |
| Model number | Short description | |
| | Drives | |
| 5AC901.SDVW-00 | DVD drive - DVD-R/RW\|DVD+R/RW - Slide-in | |
| 5AC901.SSCA-00 | Slide-in compact adapter - For slide-in compact drives | |
| | | |

## Information:

**For information about installing or replacing a slide-in drive, please refer to the section "Installing a slide-in drive" on page 226.**

### 4.1.5.14 Main memory slots

The Panel PC 900 provides 2 slots for DDR4 main memory modules.

| Description | | Figure |
|---|---|---|
| Velocity | DDR4-2133 (PC4-17000) |  |
| Order number | Short description | |
| | Main memory | |
| 5MMDDR.4096-04 | SO-DIMM DDR4, 4096 MB | |
| 5MMDDR.8192-04 | SO-DIMM DDR4, 8192 MB | |
| 5MMDDR.016G-04 | SO-DIMM DDR4, 16 GB | |

## Information:

**For information about replacing or installing a main memory module, see section "Replacing main memory" on page 214.**

## Caution!

**If using only one main memory module, it must be installed in RAM slot 2.**
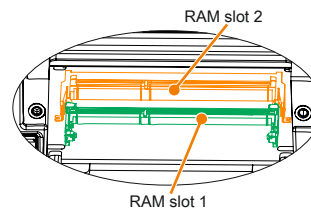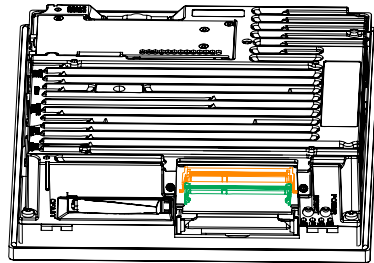
### 4.1.5.15 IF options

PPC900 system units have 2 slots for interface options:

- IF option 1 slot (1)
- IF option 2 slot (2)

**Information:**

**For information about replacing or installing an interface option, see section Installing the interface option.**
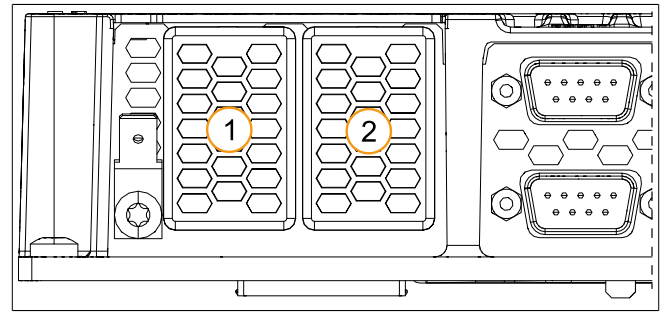
## IF option 1 slot

| Order number | Interface option - Short description |
|---|---|
| 5AC901.I232-00[1) | Interface card - 1x RS232 interface - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.I485-00[1) | Interface card - 1x RS232/422/458 interface - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.ICAN-00[1)2) | Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.ICAN-01[1)2) | Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.IHDA-00 | Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.IRDY-00 | Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.ISIO-00 | Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.IUPS-00[3) | UPS - For 4.5 Ah battery |
| 5AC901.IUPS-01[4) | UPS - For 2.2 Ah battery |

1) If IF options 5AC901.I232-00/5AC901.I485-00 and 5AC901.ICAN are used simultaneously, the 5AC901.ICAN should be installed in the IF option 1 slot and the 5AC901.I232-00/5AC901.I485-00 should be installed in the IF option 2 slot.
2) Simultaneous operation of 2 5AC901.ICAN-xx CAN options in the IF option 1 and IF option 2 slots is not possible.
3) UPS IF option 5AC901.IUPS-00 is only permitted to be operated with battery unit 5AC901.BUPS-00!
4) UPS IF option 5AC901.IUPS-01 is only permitted to be operated with battery unit 5AC901.BUPS-01!

## IF option 2 slot

| Order number | Interface option - Short description |
|---|---|
| 5AC901.I232-00[1) | Interface card - 1x RS232 interface - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.I485-00[1) | Interface card - 1x RS232/422/458 interface - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.ICAN-00[1)2) | Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.ICAN-01[1)2) | Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.IETH-00 | Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.IPLK-00 | Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.ISRM-00 | Interface card - 2 MB RAM - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.IRDY-00 | Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100 |
| 5AC901.ISIO-00 | Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100 |

1) If IF options 5AC901.I232-00/5AC901.I485-00 and 5AC901.ICAN are used simultaneously, the 5AC901.ICAN should be installed in the IF option 1 slot and the 5AC901.I232-00/5AC901.I485-00 should be installed in the IF option 2 slot.
2) Simultaneous operation of 2 5AC901.ICAN-xx CAN options in the IF option 1 and IF option 2 slots is not possible.

**4.1.5.16 Card slot (PCI / PCIe)**

If a bus unit is installed in the Panel PC 900, the bus unit variant being used will determine whether standard PCI 2.2 half-size cards or PCI Express (PCIe) half-size cards can be inserted. They must not exceed the following dimensions.
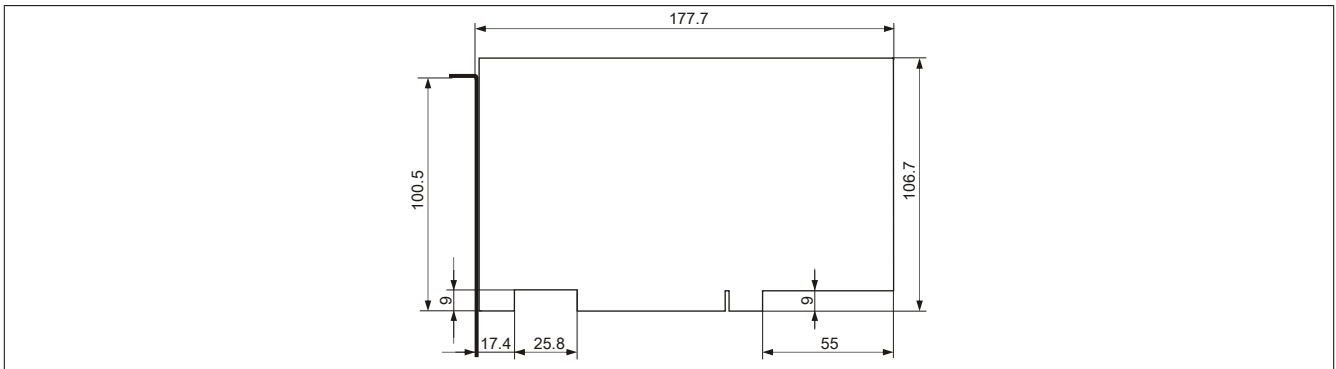


Figure 13: Standard half-size 32-bit PCI card - Dimensions
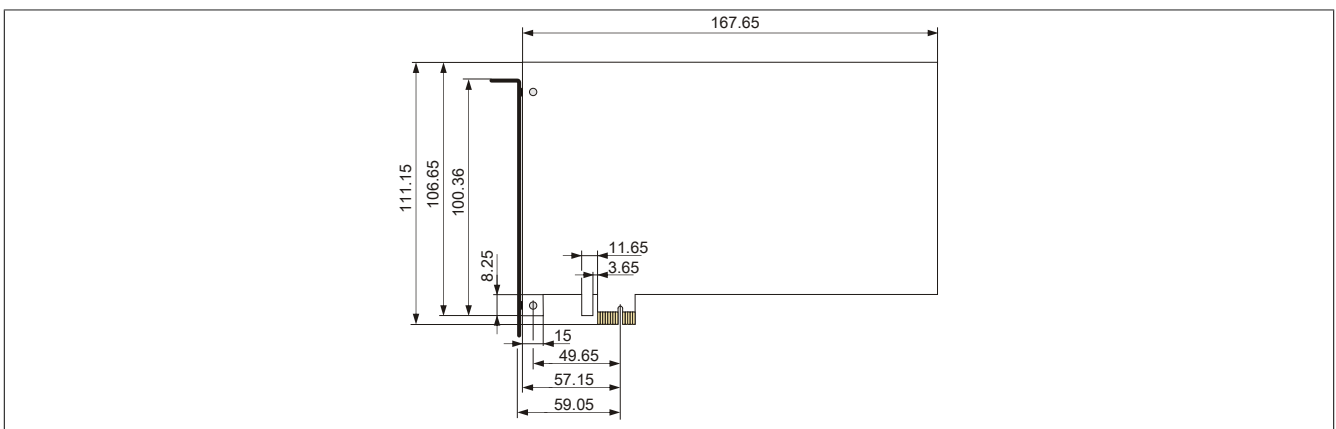


Figure 14: Standard half-size PCIe card - Dimensions

> **Information:**
>
> **For information about installing or replacing a PCI/PCIe card, please refer to section "Installing PCI/ PCIe cards" on page 224.**

## 4.1.6 Layout of AP1000 display units

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

| Display type | Model number | Resolution | Touch screen | Function keys | System keys | Front USB interface |
|---|---|---|---|---|---|---|
| 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 |
| 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 | Full HD | Multi-touch | No | No | No |
| 15.6" multi-touch | 5AP1130.156C-001 | Full HD | Multi-touch | No | No | No |
| 18.5" multi-touch | 5AP1130.185C-000 | Full HD | Multi-touch | No | No | No |
| 19.0" single-touch | 5AP1120.1906-000 | SXGA | Single-touch | No | No | Yes |
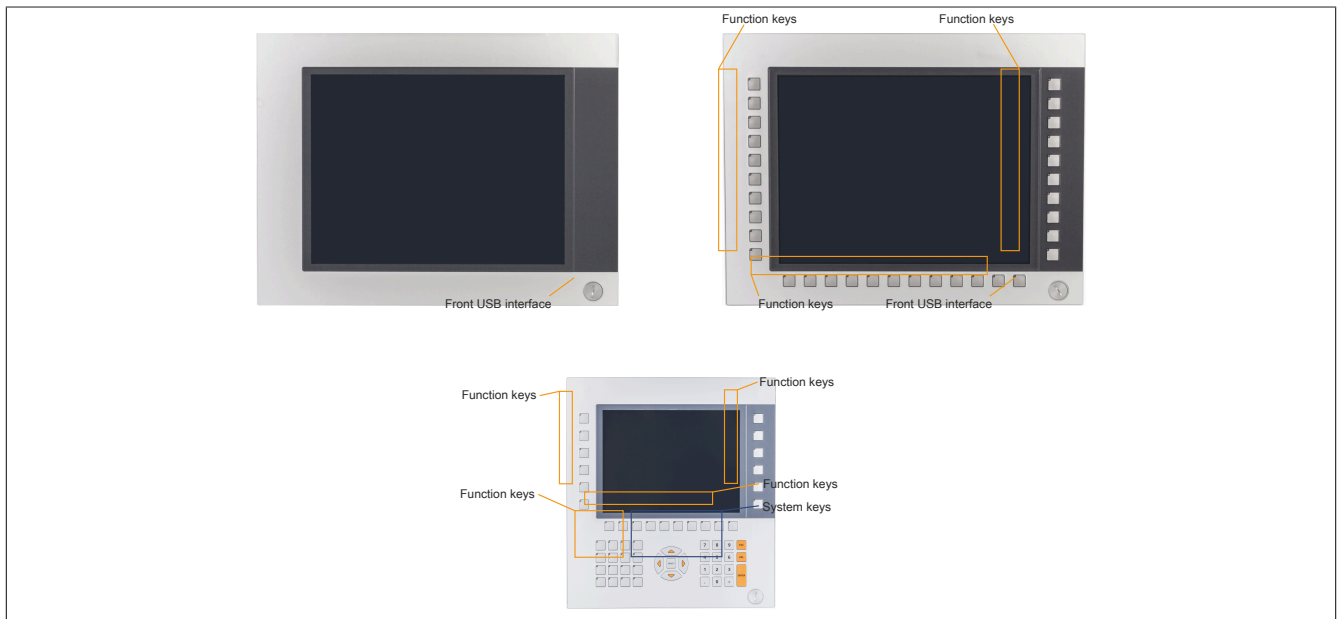


### 4.1.6.1 Slide-in labels

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 template for slide-in labels with individual captions 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.

### 4.1.6.2 Key and LED configuration

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

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

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 displayed as hardware numbers and can be read directly on the target system using B&R tools and the ADI Control Center.
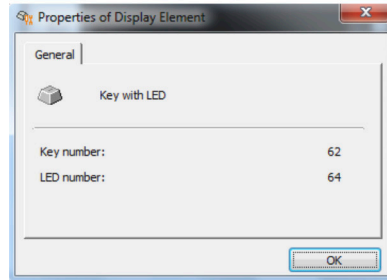


B&R Key Editor
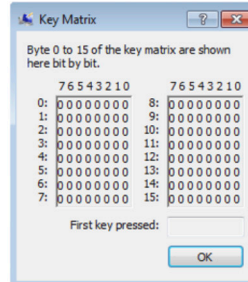


ADI Control Center

### Keys and LEDs in the matrix:

- Hardware numbers of keys are specified in the following with black indexes.
- Hardware numbers of LEDs are specified in the following with blue indexes.

### Illustration examples:
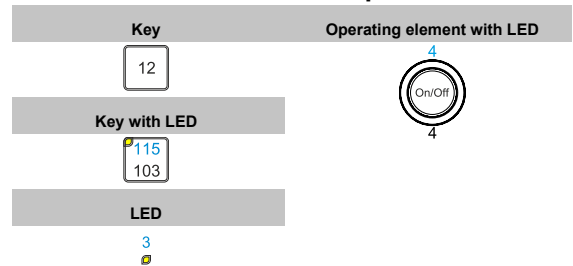


**5AP1180.1043-000**
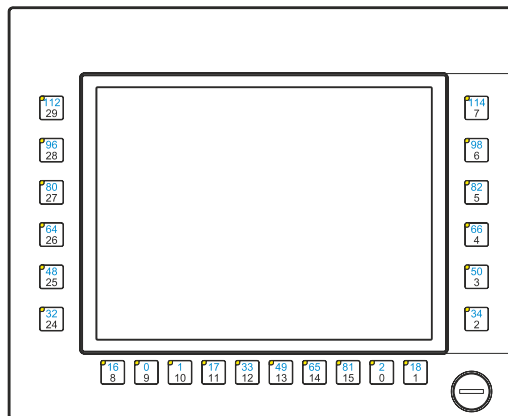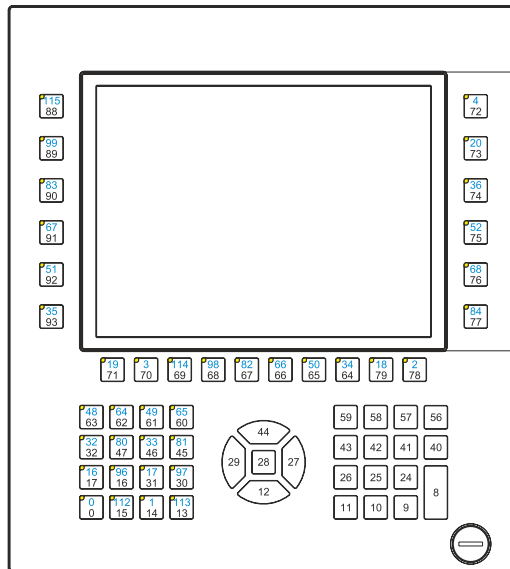
**5AP1181.1043-000**



**5AP1182.1043-000**
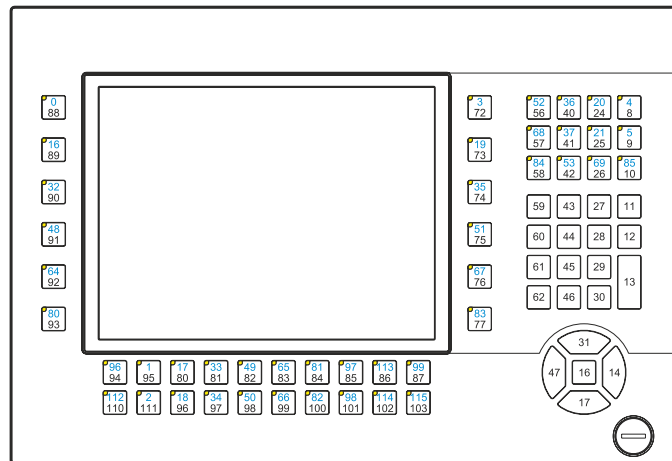


**5AP1180.1505-000**
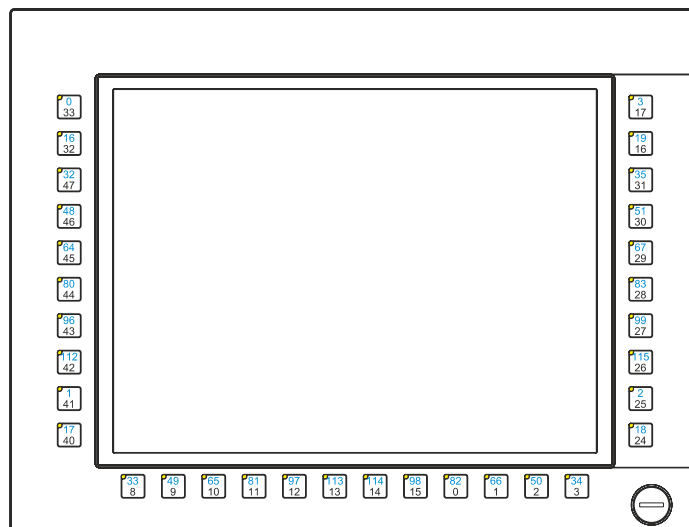
**5AP1181.1505-000**
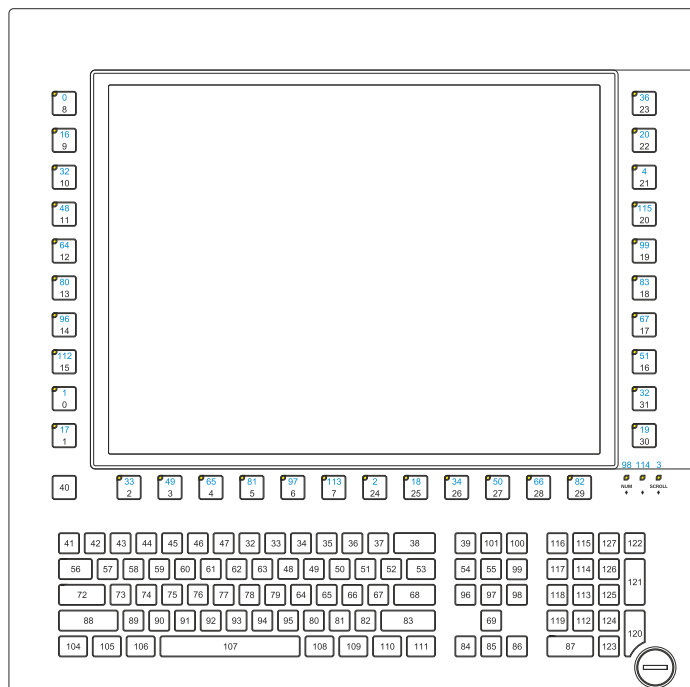
### 4.1.6.3 USB interface

AP1000 panels with 10.4", 12.1" (4:3 format only), 15" and 19" display diagonals are equipped with a USB 2.0 interface on the front. 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 ensured.**
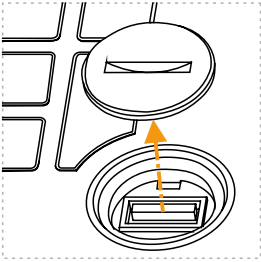
> ## Caution!
>
> **Due to the general PC specification, this interface must be handled with the utmost care with regard to EMC, cable routing, etc.**

### Front USB

The front USB interface is available for service purposes.

| Universal Serial Bus (front USB)[1] | | |
|---|---|---|
| Type | USB 2.0 | 1x 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) | |
| Current-carrying capacity[2] | Max. 0.5 A | |
| Cable length | | |
| USB 2.0 | Max. 5 m (without hub) | |
| - | | |

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. 0.5 A).

## 4.2 Individual components
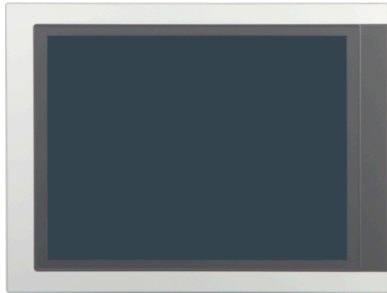
### 4.2.1 AP9x3 panels

#### 4.2.1.1 5AP923.1215-00

##### 4.2.1.1.1 General information

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

##### 4.2.1.1.2 Order data

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

##### 4.2.1.1.3 Technical data

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

| Order number | 5AP923.1215-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xE1B0 |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   EAC | Yes |
| **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] | |
|   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<br>Back: IP20 (only with installed link module or installed system unit) |
| Degree of protection per UL 50 | Front: Type 4X indoor use only |

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

1) 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).

### 4.2.1.1.4 Dimensions



### 4.2.1.1.5 Temperature/Humidity diagram



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

### 4.2.1.2 5AP923.1505-00

#### 4.2.1.2.1 General information

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

#### 4.2.1.2.2 Order data

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

#### 4.2.1.2.3 Technical data

## Information:

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

| Order number | 5AP923.1505-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xE169 |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|    DNV | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|    EAC | 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] | |
|    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<br>Back: IP20 (only with installed link module or installed system unit) |
| Degree of protection per UL 50 | Front: Type 4X indoor use only |

| Order number | 5AP923.1505-00 |
|---|---|
| **Mechanical properties** | |
| Front | |
|   Frame | Aluminum, coated |
|   Panel overlay | |
|     Material | Polyester |
|     Light background color | RAL 9006 |
|     Dark border color around display | RAL 7024 |
|   Gasket | 3 mm fixed gasket |
| Dimensions | |
|   Width | 370 mm |
|   Height | 288 mm |
| Weight | 3700 g |

1) 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 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).

## 4.2.1.2.4 Dimensions
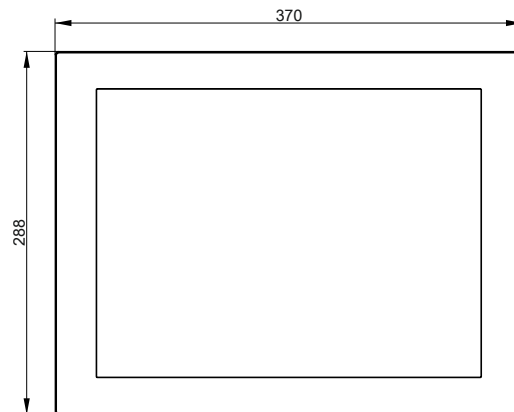


## 4.2.1.2.5 Temperature/Humidity diagram



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

### 4.2.1.3 5AP923.1906-00

#### 4.2.1.3.1 General information

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

#### 4.2.1.3.2 Order data

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

#### 4.2.1.3.3 Technical data

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

| Order number | 5AP923.1906-00 | |
|---|---|---|
| Revision | D0 | E0 |
| **General information** | | |
| B&R ID code | 0xE1B1 | |
| Certifications | | |
|   CE | Yes | |
|   UL | cULus E115267<br>Industrial control equipment | |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] | |
|   EAC | Yes | |
| **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] | | |
|   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<br>Back: IP20 (only with installed link module or installed system unit) | |
| Degree of protection per UL 50 | Front: Type 4X indoor use only | |

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

1) 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).

### 4.2.1.3.4 Dimensions
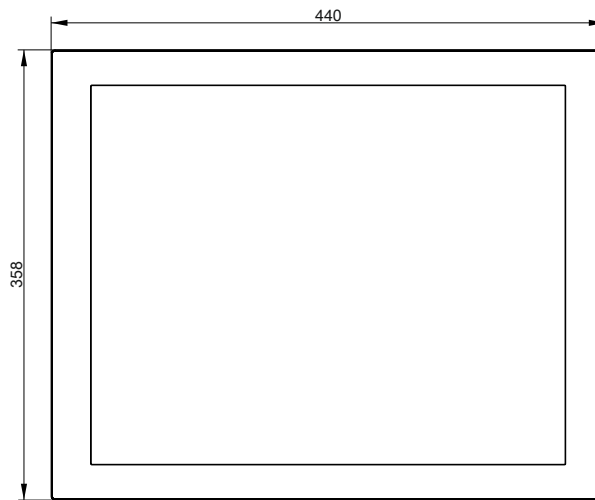


### 4.2.1.3.5 Temperature/Humidity diagram

**5AP923.1906-00 ≥ Rev. E0**



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

**5AP923.1906-00 ≤ Rev. D0**



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

### 4.2.1.4 5AP933.156B-00

#### 4.2.1.4.1 General information

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

#### 4.2.1.4.2 Order data

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

#### 4.2.1.4.3 Technical data

## Information:

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

| Order number | 5AP933.156B-00 | |
|---|---|---|
| Revision | C0 | D0 |
| **General information** | | |
| B&R ID code | 0xE16A | |
| Certifications | | |
|   CE | Yes | |
|   UL | cULus E115267<br>Industrial control equipment | |
|   EAC | 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] | | |
|   Technology | Projected capacitive touch (PCT) | |
|   Transmittance | 88% ±2% | >90% |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| Degree of protection per EN 60529 | Front: IP65<br>Back: IP20 (only with installed link module or installed system unit) | |
| Degree of protection per UL 50 | Front: Type 4X indoor use only | |
| **Mechanical properties** | | |
| Front | | |
|   Frame | Aluminum, coated | |
|   Design | Black | |
|   Gasket | 3 mm fixed gasket | |
| Dimensions | | |
|   Width | 414 mm | |
|   Height | 258.5 mm | |
| Weight | 3850 g | |

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

### 4.2.1.4.4 Dimensions
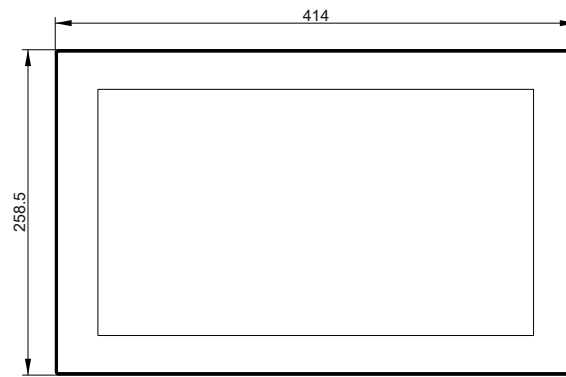


### 4.2.1.4.5 Temperature/Humidity diagram

**5AP933.156B-00 ≥ Rev. D0**
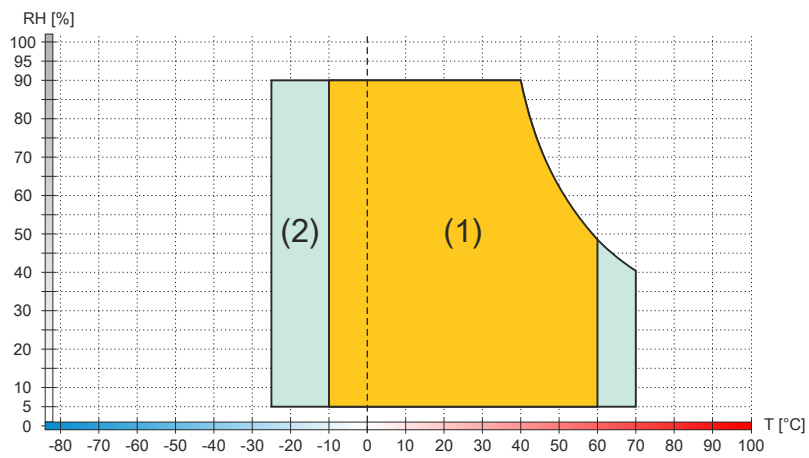


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

**5AP933.156B-00 ≤ Rev. C0**
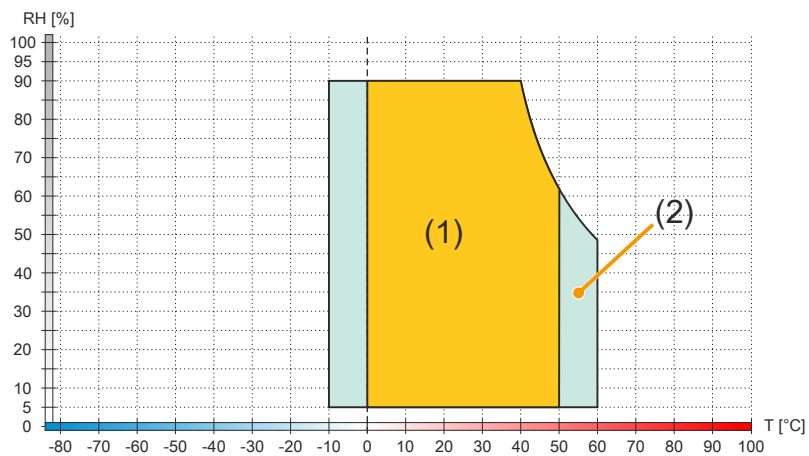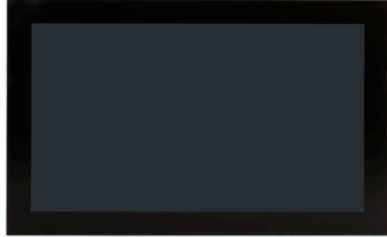


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

## 4.2.1.5 5AP933.185B-00

### 4.2.1.5.1 General information

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

### 4.2.1.5.2 Order data

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

### 4.2.1.5.3 Technical data

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

| Order number | 5AP933.185B-00 | |
|---|---|---|
| Revision | C0 | D0 |
| **General information** | | |
| B&R ID code | 0xE16B | |
| Certifications | | |
|   CE | Yes | |
|   UL | cULus E115267<br>Industrial control equipment | |
|   EAC | 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] | | |
|   Technology | Projected capacitive touch (PCT) | |
|   Transmittance | 88% ±2% | >90% |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| Degree of protection per EN 60529 | Front: IP65<br>Back: IP20 (only with installed link module or installed system unit) | |
| Degree of protection per UL 50 | Front: Type 4X indoor use only | |
| **Mechanical properties** | | |
| Front | | |
|   Frame | Aluminum, coated | |
|   Design | Black | |
|   Gasket | 3 mm fixed gasket | |
| Dimensions | | |
|   Width | 475 mm | |
|   Height | 295 mm | |
| Weight | 4850 g | |

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

#### 4.2.1.5.4 Dimensions
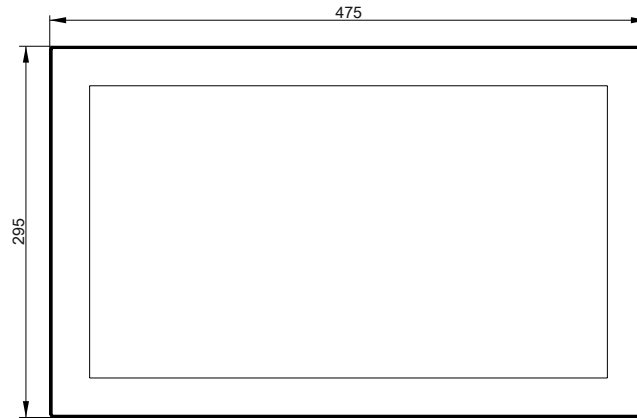


#### 4.2.1.5.5 Temperature/Humidity diagram

**5AP933.185B-00 ≥ Rev. D0**



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

**5AP933.185B-00 ≤ Rev. C0**



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

## 4.2.1.6 5AP933.215C-00

### 4.2.1.6.1 General information

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

### 4.2.1.6.2 Order data

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

### 4.2.1.6.3 Technical data

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

| Order number | 5AP933.215C-00 | |
|---|---|---|
| Revision | C0 | D0 |
| **General information** | | |
| B&R ID code | 0xE16C | |
| Certifications | | |
|   CE | Yes | |
|   UL | cULus E115267 Industrial control equipment | |
|   EAC | 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] | | |
|   Technology | Projected capacitive touch (PCT) | |
|   Transmittance | 88% ±2% | >90% |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| Degree of protection per EN 60529 | Front: IP65 Back: IP20 (only with installed link module or installed system unit) | |
| Degree of protection per UL 50 | Front: Type 4X indoor use only | |
| **Mechanical properties** | | |
| Front | | |
|   Frame | Aluminum, coated | |
|   Design | Black | |
|   Gasket | 3 mm fixed gasket | |
| Dimensions | | |
|   Width | 541.5 mm | |
|   Height | 333 mm | |
| Weight | 5400 g | |

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

## 4.2.1.6.4 Dimensions
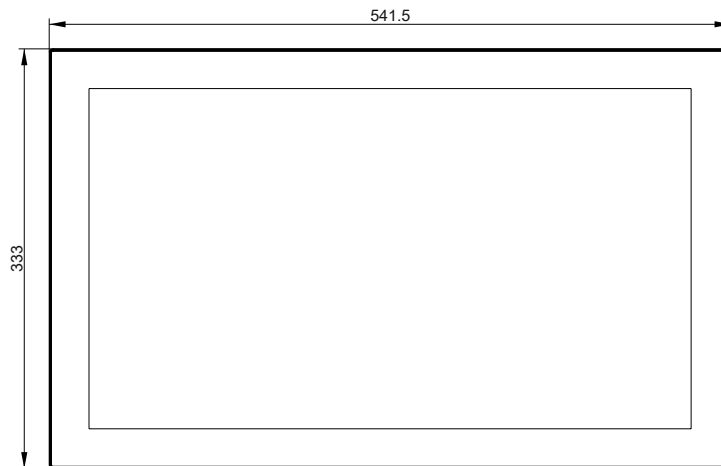


## 4.2.1.6.5 Temperature/Humidity diagram

### 5AP933.215C-00 ≥ Rev. D0



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

### 5AP933.215C-00 ≤ Rev. C0



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

### 4.2.1.7 5AP933.240C-00

#### 4.2.1.7.1 General information

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

#### 4.2.1.7.2 Order data

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

#### 4.2.1.7.3 Technical data

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

| Order number | 5AP933.240C-00 | |
|---|---|---|
| Revision | C0 | D0 |
| **General information** | | |
| B&R ID code | 0xE1B4 | |
| Certifications | | |
|   CE | Yes | |
|   UL | cULus E115267 Industrial control equipment | |
|   DNV | Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck) [1] | |
|   EAC | Yes | |
| **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] | | |
|   Technology | Projected capacitive touch (PCT) | |
|   Transmittance | 88% ±2% | >90% |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| Degree of protection per EN 60529 | Front: IP65 Back: IP20 (only with installed link module or installed system unit) | |
| Degree of protection per UL 50 | Front: Type 4X indoor use only | |
| **Mechanical properties** | | |
| Front | | |
|   Frame | Aluminum, coated | |
|   Design | Black | |
|   Gasket | 3 mm fixed gasket | |

| Order number | 5AP933.240C-00 | |
|---|---|---|
| Revision | C0 | D0 |
| Dimensions | | |
|   Width | 598.5 mm | |
|   Height | 364 mm | |
| Weight | Approx. 7800 g | |

1) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV 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 of the touch screen driver must be taken into account; see section "Multi-touch driver".

### 4.2.1.7.4 Dimensions
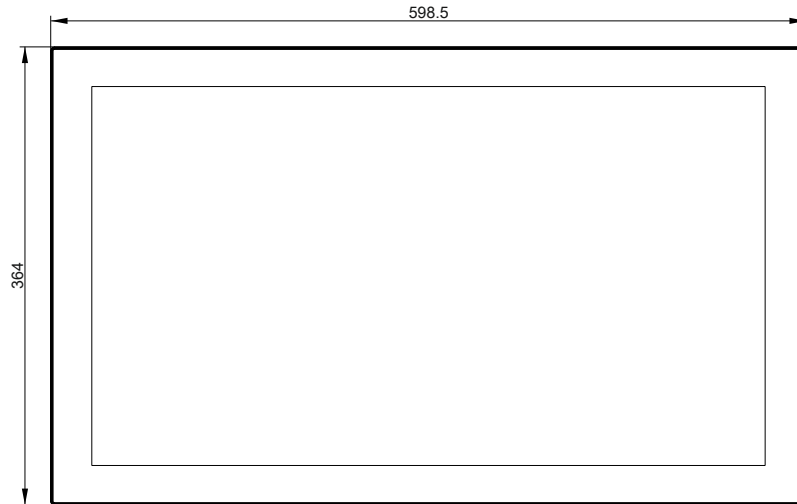


### 4.2.1.7.5 Temperature/Humidity diagram

**5AP933.240C-00 ≥ Rev. D0**



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

**5AP933.240C-00 ≤ Rev. C0**



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

### 4.2.2 AP1000 panels

#### 4.2.2.1 5AP1120.1043-000

##### 4.2.2.1.1 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

##### 4.2.2.1.2 Order data

| Order 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 | |

##### 4.2.2.1.3 Technical data

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

| Order number | 5AP1120.1043-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE7AD |
| Certifications | |
|     CE | Yes |
|     UL | cULus E115267<br>Industrial control equipment |
|     HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|     EAC | Yes |
| **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 |
| Touch screen [3] | |
|     Technology | Analog, resistive |
|     Controller | B&R, serial, 12-bit |
|     Transmittance | 81% ±3% |

| Order number | 5AP1120.1043-000 |
|---|---|
| **Interfaces** | |
| USB | |
|     Quantity | 1 |
|     Type | USB 2.0 |
|     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 | Max. 500 mA |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|     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 | 323 mm |
|     Height | 260 mm |
| Weight | 2800 g |

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.

## 4.2.2.1.4 Dimensions
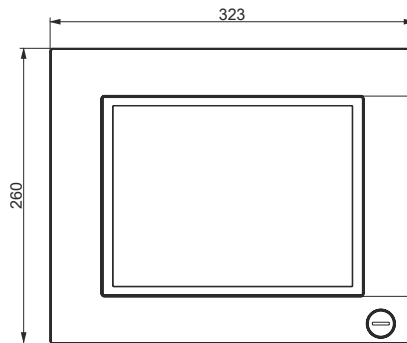


## 4.2.2.1.5 Temperature/Humidity diagram



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

### 4.2.2.2 5AP1180.1043-000

#### 4.2.2.2.1 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

#### 4.2.2.2.2 Order data

| Order 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 |  |

#### 4.2.2.2.3 Technical data

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

| Order number | 5AP1180.1043-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE7AE |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   EAC | Yes |
| **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 |
| Touch screen [3] | |
|   Technology | Analog, resistive |
|   Controller | B&R, serial, 12-bit |
|   Transmittance | 81% ±3% |
| **Interfaces** | |
| USB | |
|   Quantity | 1 |
|   Type | USB 2.0 |
|   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 | Max. 500 mA |

| Order number | 5AP1180.1043-000 |
|---|---|
| **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 luminous intensity | |
|    Yellow | Typ. 38 mcd |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|    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 | 323 mm |
|    Height | 260 mm |
| Weight | 2800 g |

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.

## 4.2.2.2.4 Dimensions



## 4.2.2.2.5 Temperature/Humidity diagram



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

### 4.2.2.3 5AP1181.1043-000

#### 4.2.2.3.1 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

#### 4.2.2.3.2 Order data

| Order 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 |  |

#### 4.2.2.3.3 Technical data

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

| Order number | 5AP1181.1043-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE7AF |
| Certifications | |
| CE | Yes |
| UL | cULus E115267<br>Industrial control equipment |
| HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
| EAC | Yes |
| **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 |
| Touch screen [3] | |
| Technology | Analog, resistive |
| Controller | B&R, serial, 12-bit |
| Transmittance | 81% ±3% |

| Order number | 5AP1181.1043-000 |
|---|---|
| **Interfaces** | |
| USB | |
|     Quantity | 1 |
|     Type | USB 2.0 |
|     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 | Max. 500 mA |
| **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 luminous intensity | |
|     Yellow | Typ. 38 mcd |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|     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 | 323 mm |
|     Height | 358 mm |
| Weight | 3400 g |

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.

## 4.2.2.3.4 Dimensions

## 4.2.2.3.5 Temperature/Humidity diagram
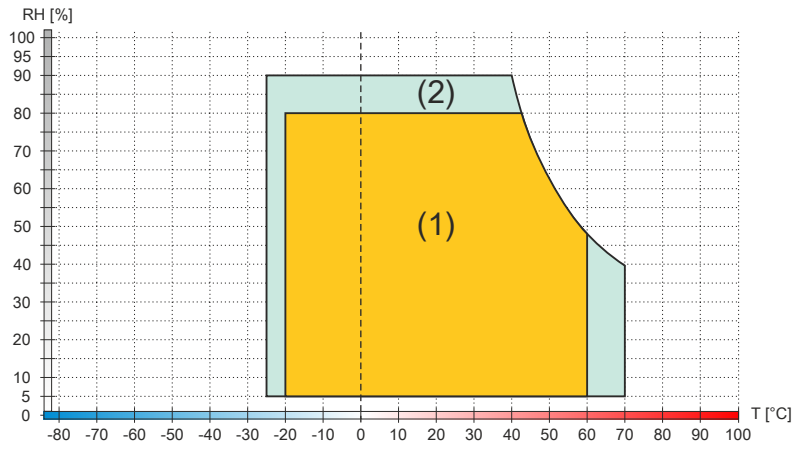


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.2.4 5AP1182.1043-000

#### 4.2.2.4.1 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

#### 4.2.2.4.2 Order data

| Order 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 | |

#### 4.2.2.4.3 Technical data
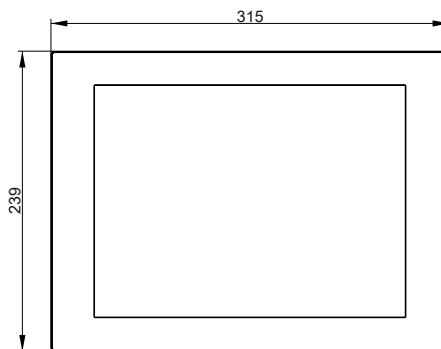
## Information:

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

| Order number | 5AP1182.1043-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE7B0 |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|    EAC | Yes |
| **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 |
| Touch screen [3] | |
|    Technology | Analog, resistive |
|    Controller | B&R, serial, 12-bit |
|    Transmittance | 81% ±3% |
| **Interfaces** | |
| USB | |
|    Quantity | 1 |
|    Type | USB 2.0 |
|    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 | Max. 500 mA |
| **Keys** | |
| Function keys | 44 with LED (yellow) |

| Order number | 5AP1182.1043-000 |
|---|---|
| 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 luminous intensity | |
|   Yellow | Typ. 38 mcd |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|   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 | 423 mm |
|   Height | 288 mm |
| Weight | 3500 g |

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.

## 4.2.2.4.4 Dimensions
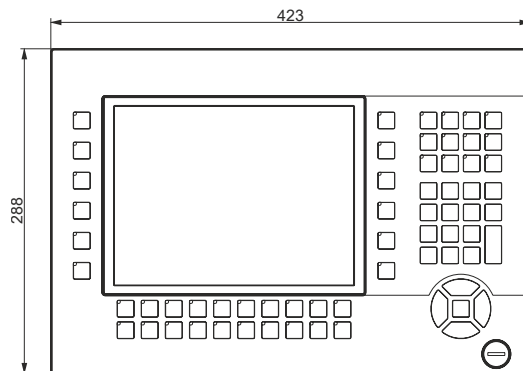


## 4.2.2.4.5 Temperature/Humidity diagram
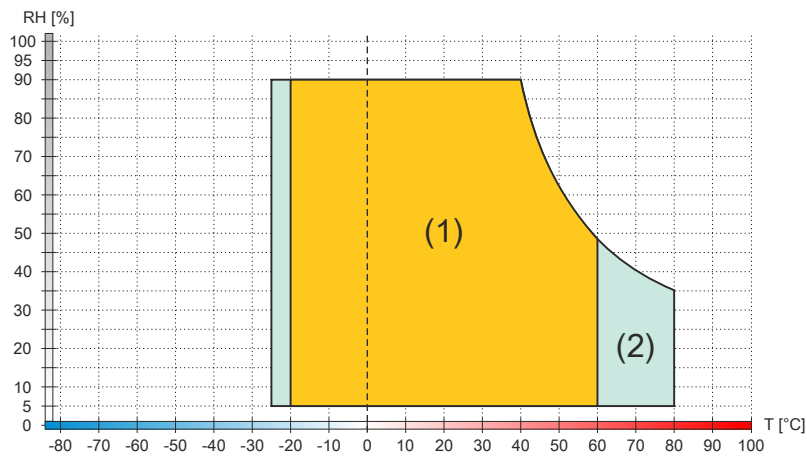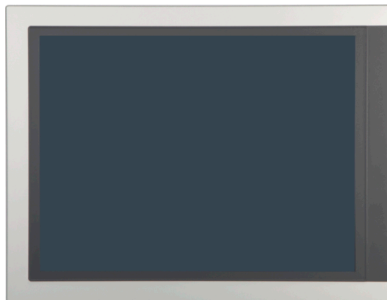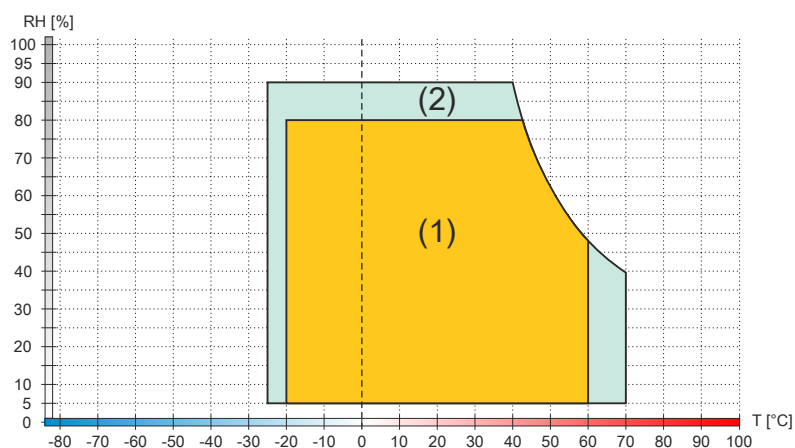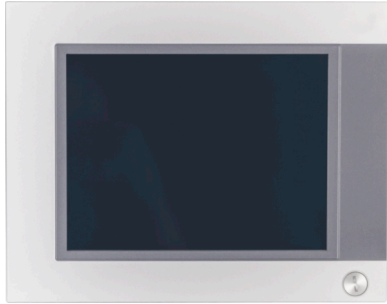


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.2.5 5AP1120.1214-000

#### 4.2.2.5.1 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

#### 4.2.2.5.2 Order data

| Order 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 | |

#### 4.2.2.5.3 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.**

| Order number | 5AP1120.1214-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE7BB |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   EAC | Yes |
| **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 |
| Touch screen [3] | |
|   Technology | Analog, resistive |
|   Controller | B&R, serial, 12-bit |
|   Transmittance | 81% ±3% |
| **Interfaces** | |
| USB | |
|   Quantity | 1 |
|   Type | USB 2.0 |
|   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 | Max. 500 mA |

| Order number | 5AP1120.1214-000 |
|---|---|
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|   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 | 362 mm |
|   Height | 284 mm |
| Weight | 3200 g |

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.

## 4.2.2.5.4 Dimensions
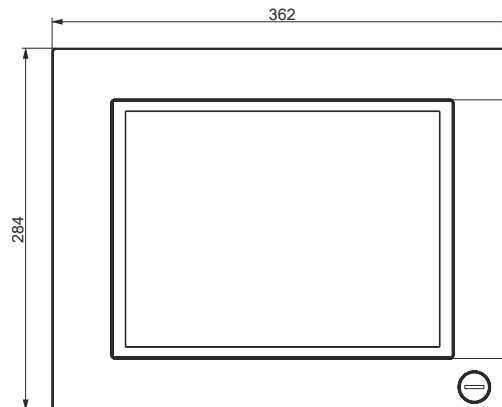


## 4.2.2.5.5 Temperature/Humidity diagram
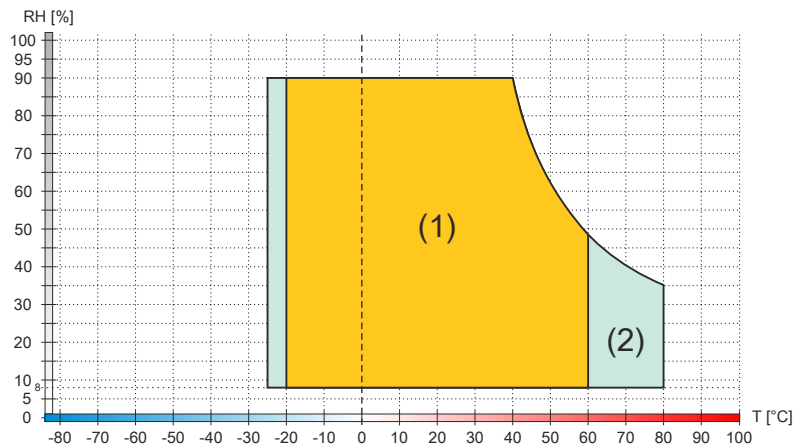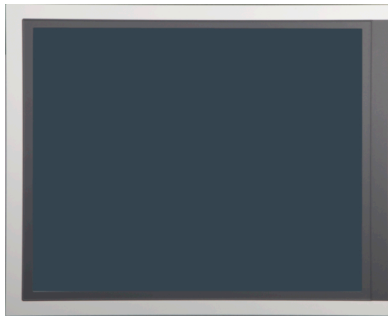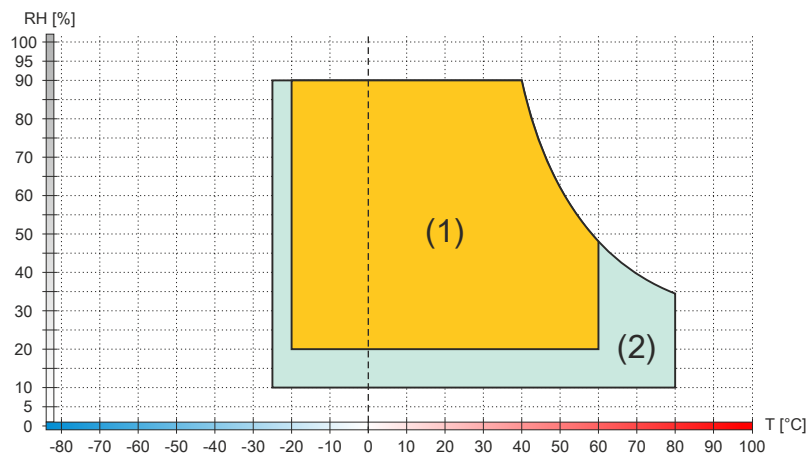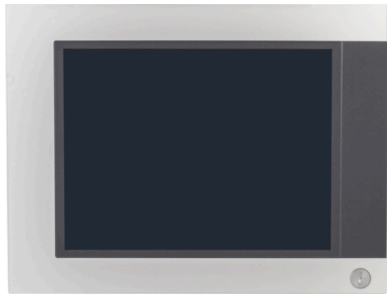


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

## 4.2.2.6 5AP1120.1505-000

### 4.2.2.6.1 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

### 4.2.2.6.2 Order data

| Order 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 | |

### 4.2.2.6.3 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.**

| Order number | 5AP1120.1505-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE7BC |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   EAC | 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 [2] | 50,000 h |
| Touch screen [3] | |
|   Technology | Analog, resistive |
|   Controller | B&R, serial, 12-bit |
|   Transmittance | 81% ±3% |
| **Interfaces** | |
| USB | |
|   Quantity | 1 |
|   Type | USB 2.0 |
|   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 | Max. 500 mA |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |

| Order number | 5AP1120.1505-000 |
|---|---|
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|    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 | 435 mm |
|    Height | 330 mm |
| Weight | 5000 g |

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.

### 4.2.2.6.4 Dimensions
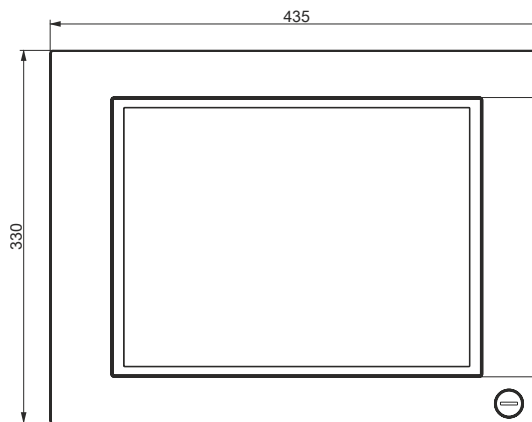


### 4.2.2.6.5 Temperature/Humidity diagram
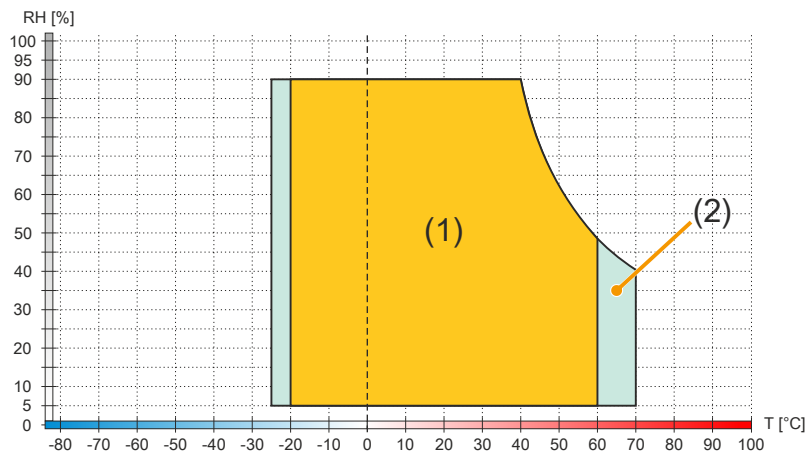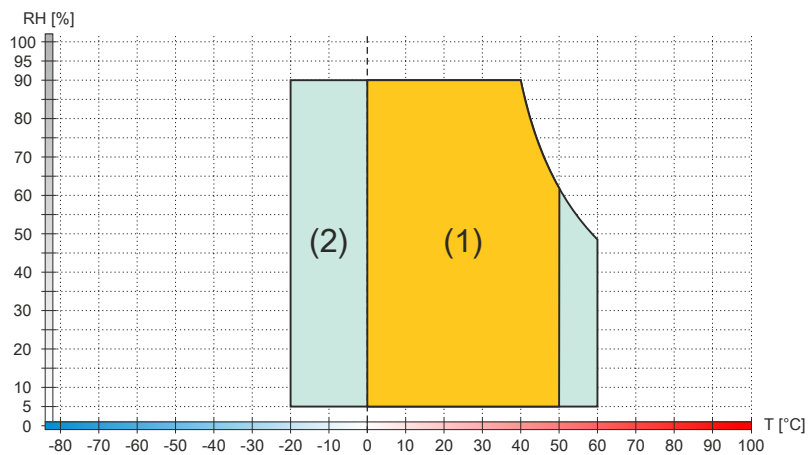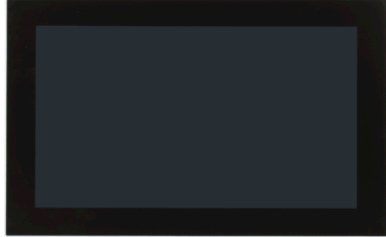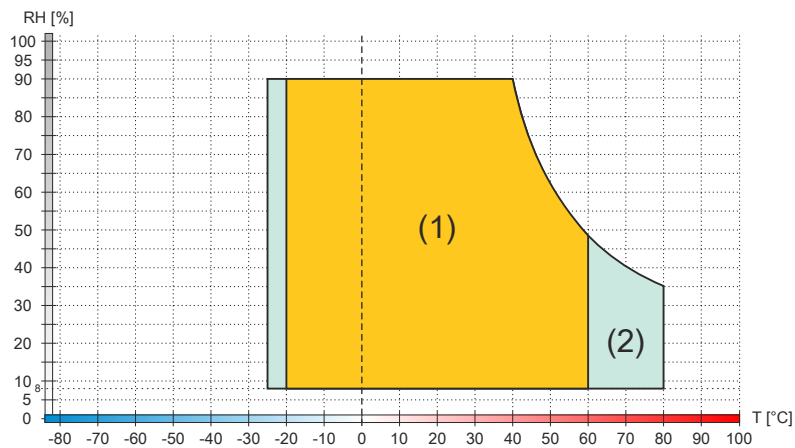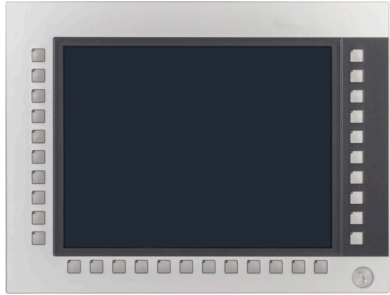


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.2.7 5AP1180.1505-000

#### 4.2.2.7.1 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

#### 4.2.2.7.2 Order data

| Order 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 - 32 function keys - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules - Compatible with 5PP580.1505-00, 5AP980.1505-01 | |

#### 4.2.2.7.3 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.**

| Order number | 5AP1180.1505-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE7BD |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   EAC | 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 [2] | 50,000 h |
| Touch screen [3] | |
|   Technology | Analog, resistive |
|   Controller | B&R, serial, 12-bit |
|   Transmittance | 81% ±3% |
| **Interfaces** | |
| USB | |
|   Quantity | 1 |
|   Type | USB 2.0 |
|   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 | Max. 500 mA |

| Order number | 5AP1180.1505-000 |
|---|---|
| **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 luminous intensity | |
|    Yellow | Typ. 38 mcd |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|    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 | 435 mm |
|    Height | 330 mm |
| Weight | 4900 g |

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.

## 4.2.2.7.4 Dimensions
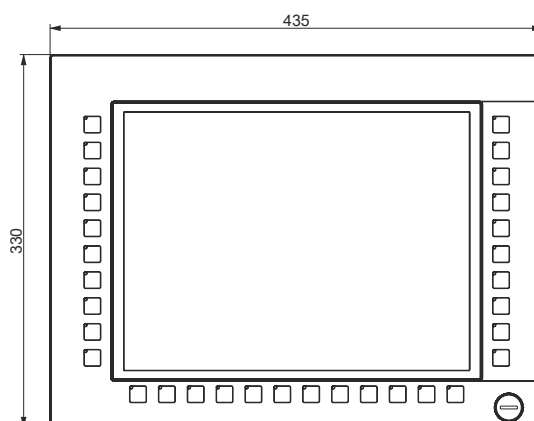


## 4.2.2.7.5 Temperature/Humidity diagram
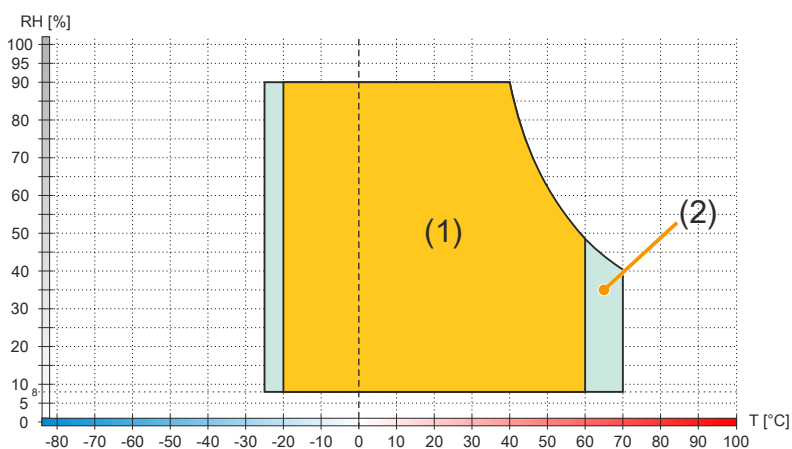


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C | |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** | |

### 4.2.2.8 5AP1181.1505-000
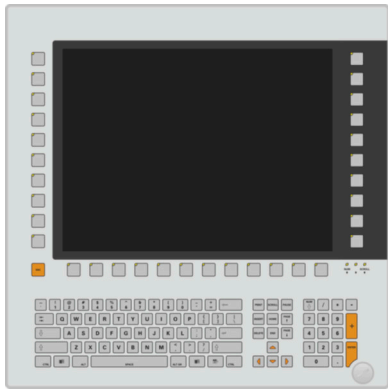
#### 4.2.2.8.1 General information

- 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.**

#### 4.2.2.8.2 Order data

| Order 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 | |

#### 4.2.2.8.3 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.**

| Order number | 5AP1181.1505-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xEF61 |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|    EAC | 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 [2] | 50,000 h |

| Order number | 5AP1181.1505-000 |
|---|---|
| Touch screen [3] | |
|     Technology | Analog, resistive |
|     Controller | B&R, serial, 12-bit |
|     Transmittance | 81% ±3% |
| **Interfaces** | |
| USB | |
|     Quantity | 1 |
|     Type | USB 2.0 |
|     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 | Max. 500 mA |
| **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 luminous intensity | |
|     Yellow | Typ. 38 mcd |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|     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 | 435 mm |
|     Height | 430 mm |
| Weight | 6000 g |

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.

### 4.2.2.8.4 Dimensions
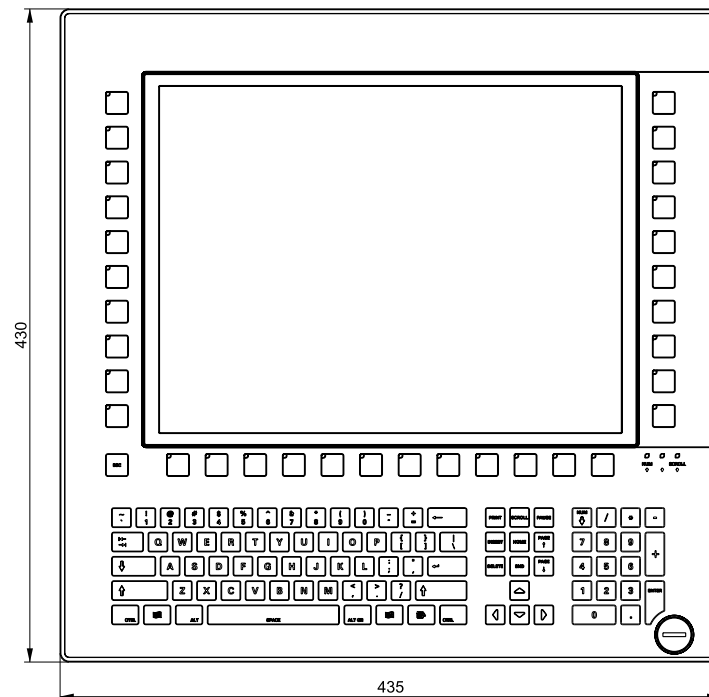
## 4.2.2.8.5 Temperature/Humidity diagram
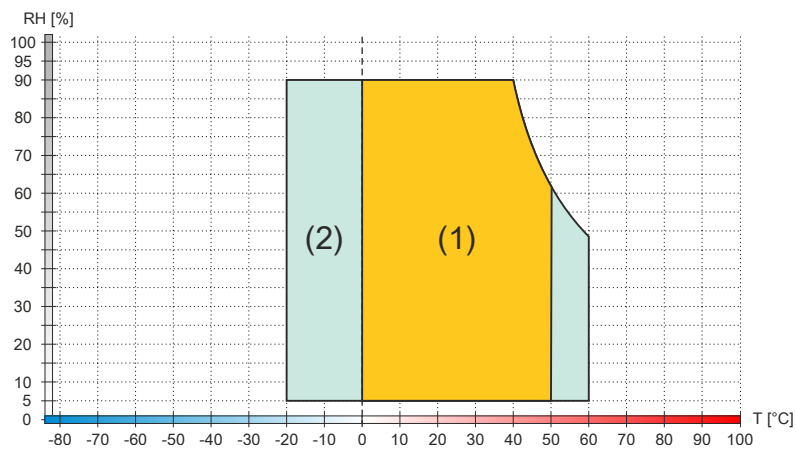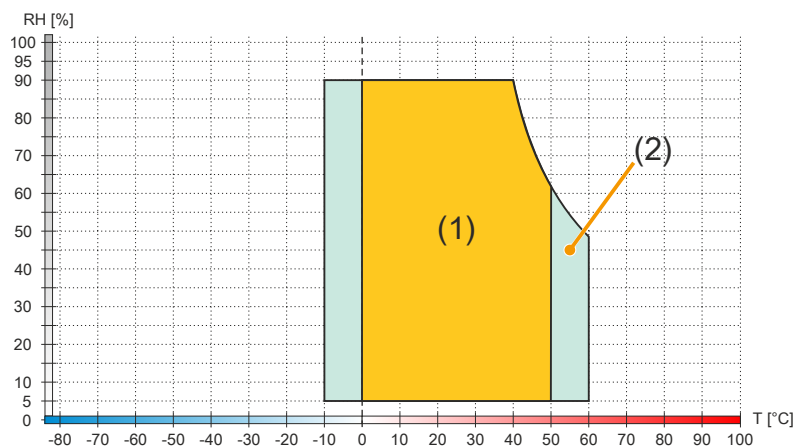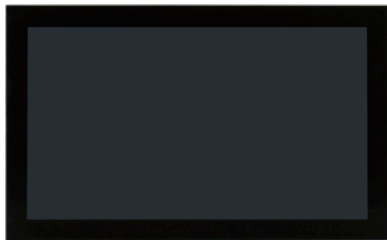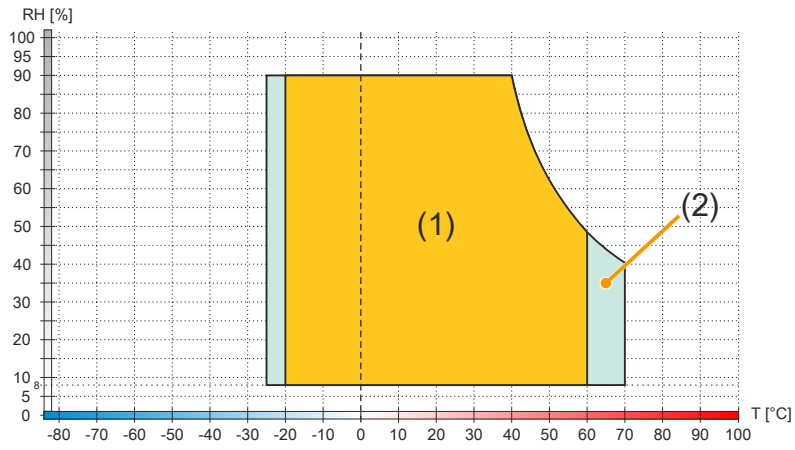


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

## 4.2.2.9 5AP1120.156B-000

### 4.2.2.9.1 General information

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

### 4.2.2.9.2 Order data

| Order 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 | |

### 4.2.2.9.3 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.**

| Order number | 5AP1120.156B-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE8E5 |
| Certifications | |
|     CE | Yes |
|     UL | cULus E115267<br>Industrial control equipment |
|     HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|     EAC | Yes |
| **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] | |
|     Technology | Analog, resistive |
|     Controller | B&R, serial, 12-bit |
|     Transmittance | 81% ±3% |
|     Light transmission | 80 ±3% |
|     Service life | 10,000,000 touch operations at the same position (release pressure: 250 g, interval: 0.25 s) |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>Back: IP20 (only with installed link module or installed system unit) |
| Degree of protection per UL 50 | Front: Type 4X indoor use only |

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

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.

### 4.2.2.9.4 Dimensions
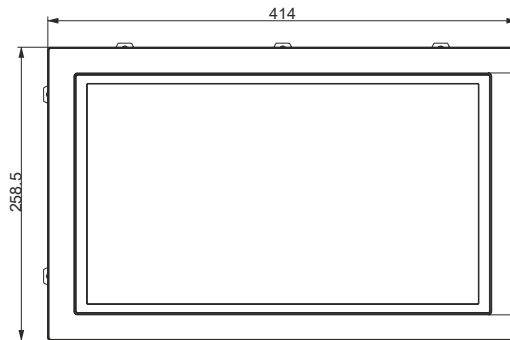


### 4.2.2.9.5 Temperature/Humidity diagram

### Hardware revision H0 and later



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

## Up to hardware revision G0
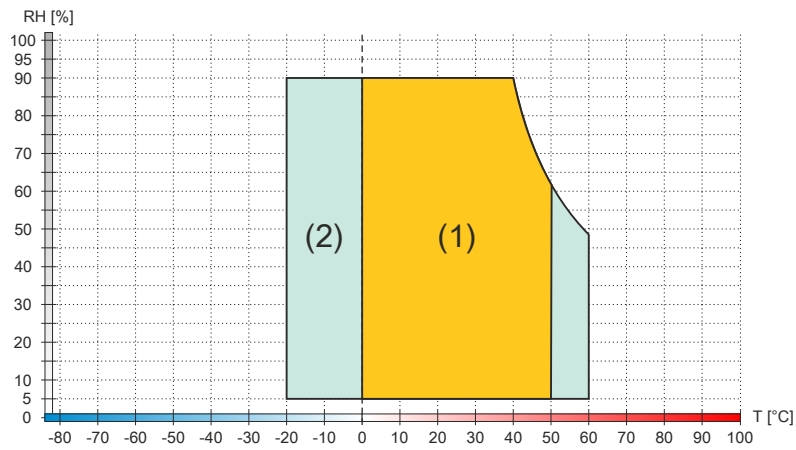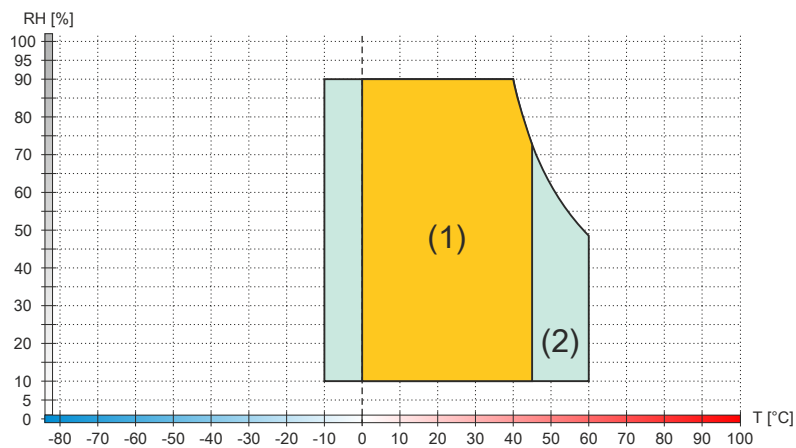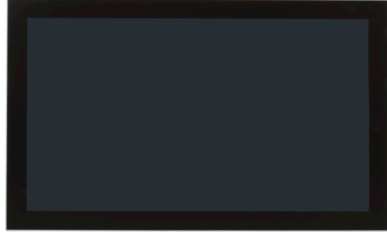


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

Panel PC 900 (Skylake) User's manual V 1.10

## 4.2.2.10 5AP1130.156C-000

### 4.2.2.10.1 General information

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

### 4.2.2.10.2 Order data

| Order 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 | |

### 4.2.2.10.3 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.**

| Order number | 5AP1130.156C-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xEC5D |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|    DNV | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|    EAC | Yes |
| **Display** | |
| Type | TFT color |
| Diagonal | 15.6" |
| Colors | 16.7 million |
| Resolution | FHD, 1920 x 1080 pixels |
| Contrast | 800:1 |
| Viewing angles | |
|    Horizontal | Direction R = 85° / Direction L = 85° |
|    Vertical | Direction U = 85° / Direction D = 85° |
| Backlight | |
|    Type | LED |
|    Brightness (dimmable) | Typ. 40 to 450 cd/m² |
|    Half-brightness time [3] | ≥50,000 h |
| Touch screen [4] | |
|    Technology | Projected capacitive touch (PCT) |
|    Transmittance | See "Appendix A - Touch screen". |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [5] | |
|    Frame | Aluminum, coated |
|    Design | Black |
|    Gasket | 3 mm fixed gasket |

| Order number | 5AP1130.156C-000 |
|---|---|
| Dimensions | |
|   Width | 414 mm |
|   Height | 258.5 mm |
| Weight | 3700 g |

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 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 section "Multi-touch drivers" in chapter 4 "Software".
5) Visual deviations in color and surface quality are possible due to process or batch conditions.

### 4.2.2.10.4 Dimensions
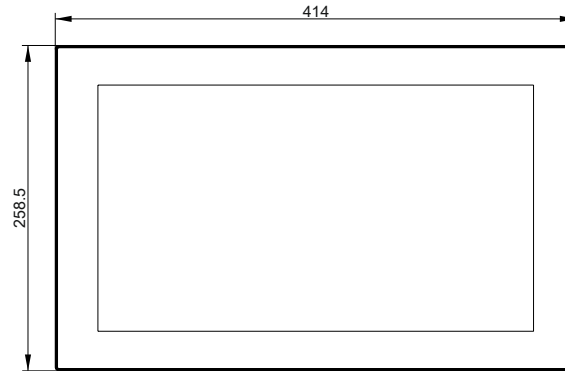


### 4.2.2.10.5 Temperature/Humidity diagram
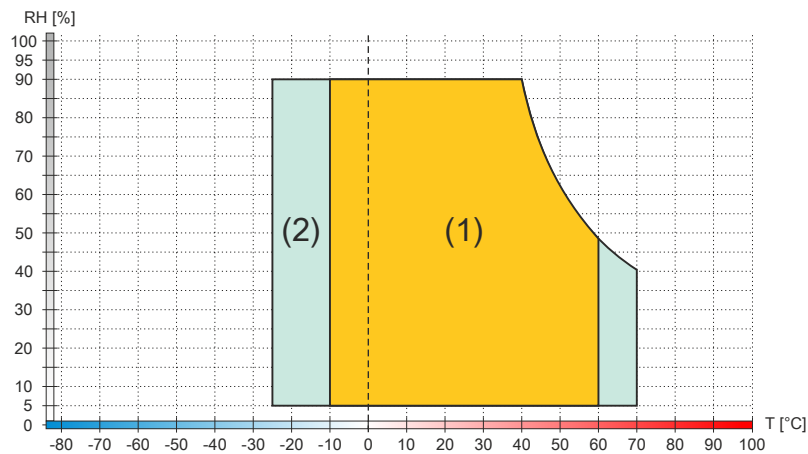


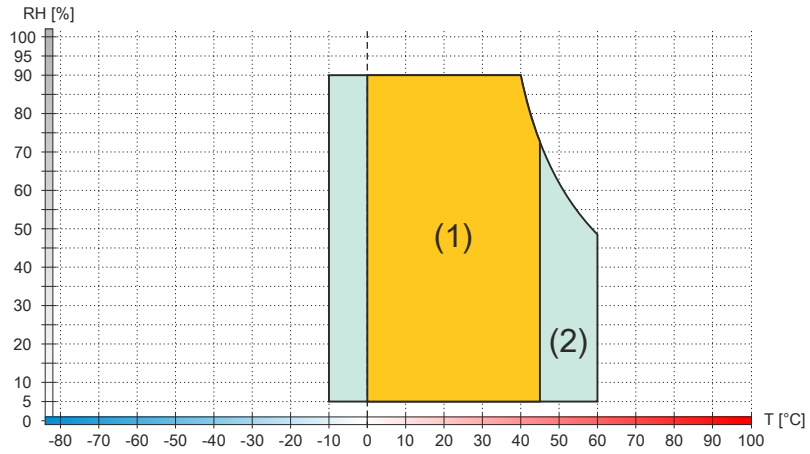| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.2.11 5AP1130.156C-001

#### 4.2.2.11.1 General information

- Panel for AP1000, PPC2100, PPC2200 or PPC3100
- 15.6" TFT WXGA color display
- Multi-touch (projected capacitive)
- Manufactured with optical bonding technology

#### 4.2.2.11.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Panels** | |
| 5AP1130.156C-001 | Automation Panel 15.6" Full HD TFT - 1920 x 1080 pixels (16:9) - Multi-touch (projected capacitive) - Control cabinet installation - Landscape format - Optical bonding - For PPC900/PPC2100/PPC3100/PPC2200 - For link modules | |

#### 4.2.2.11.3 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.**

| Order number | 5AP1130.156C-001 |
|---|---|
| **General information** | |
| B&R ID code | 0x28B5 |
| Certifications | |
|     CE | Yes |
|     UL | cULus E115267<br>Industrial control equipment |
|     HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
| **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 [2] | 70,000 h |
| Touch screen [3] | |
|     Technology | Projected capacitive touch (PCT) |
|     Transmittance | See "Appendix A - Touch screen". |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [4] | |
|     Frame | Aluminum, coated |
|     Design | Black |
|     Gasket | 3 mm fixed gasket |

| Order number | 5AP1130.156C-001 |
|---|---|
| Dimensions | |
| Width | 414 mm |
| Height | 258.5 mm |
| Weight | Approx. 3,800 g |

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 section "Multi-touch drivers" in chapter 4 "Software".
4) Visual deviations in color and surface quality are possible due to process or batch conditions.

### 4.2.2.11.4 Dimensions
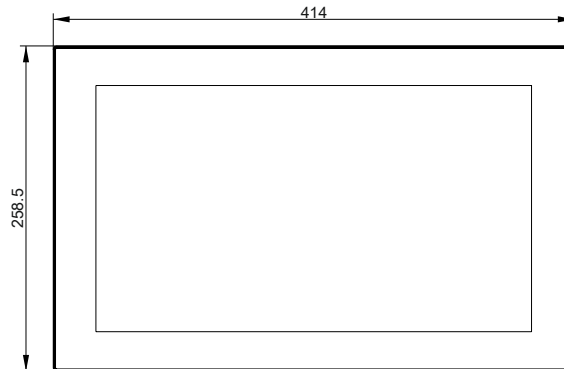


### 4.2.2.11.5 Temperature/Humidity diagram



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

### 4.2.2.12 5AP1130.185C-000

#### 4.2.2.12.1 General information

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

#### 4.2.2.12.2 Order data

| Order 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 | |

#### 4.2.2.12.3 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.**

| Order number | 5AP1130.185C-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xEC5E |
| Certifications | |
| CE | Yes |
| UL | cULus E115267<br>Industrial control equipment |
| HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
| DNV | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
| EAC | Yes |
| **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 [3] | 50,000 h |
| Touch screen [4] | |
| Technology | Projected capacitive touch (PCT) |
| Transmittance | See "Appendix A - Touch screen". |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [5] | |
| Frame | Aluminum, coated |
| Design | Black |
| Gasket | 3 mm fixed gasket |

| Order number | 5AP1130.185C-000 |
|---|---|
| Dimensions | |
|    Width | 475 mm |
|    Height | 295 mm |
| Weight | 4700 g |

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 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 section "Multi-touch drivers" in chapter 4 "Software".
5) Visual deviations in color and surface quality are possible due to process or batch conditions.

### 4.2.2.12.4 Dimensions
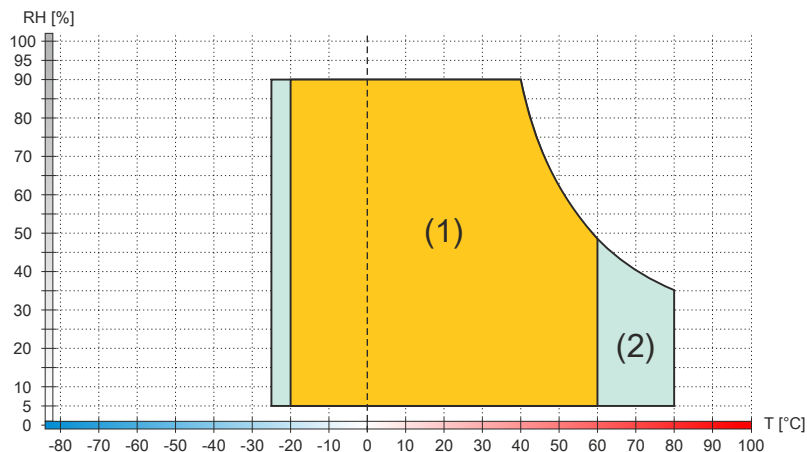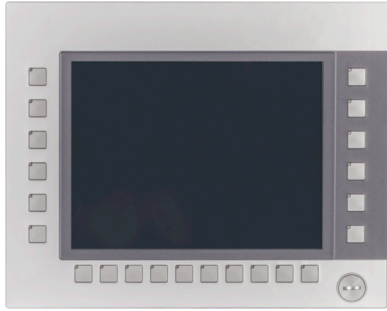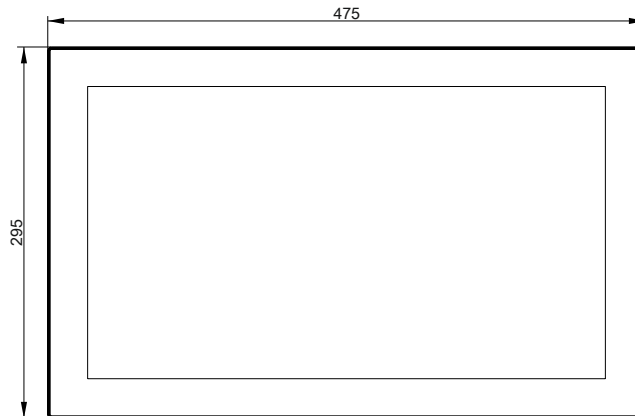


### 4.2.2.12.5 Temperature/Humidity diagram



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

## 4.2.2.13 5AP1120.1906-000

### 4.2.2.13.1 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

### 4.2.2.13.2 Order data

| Order 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 | |

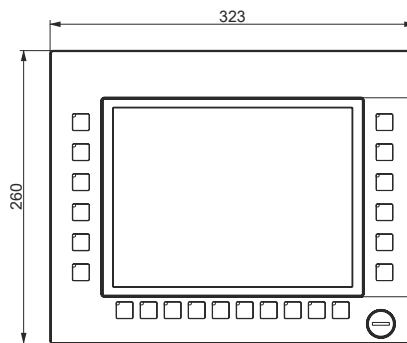### 4.2.2.13.3 Technical data

> # 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.**

| Order number | 5AP1120.1906-000 |
|---|---|
| **General information** | |
| B&R ID code | 0xE7BE |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   DNV | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|   EAC | Yes |
| **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° |
| Backlight | |
|   Type | LED |
|   Brightness (dimmable) | Typ. 35 to 350 cd/m² |
|   Half-brightness time [3] | 70,000 h |
| Touch screen [4] | |
|   Technology | Analog, resistive |
|   Controller | B&R, serial, 12-bit |
|   Transmittance | 81% ±3% |

| Order number | 5AP1120.1906-000 |
|---|---|
| **Interfaces** | |
| USB | |
|    Quantity | 1 |
|    Type | USB 2.0 |
|    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 | Max. 500 mA |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| Degree of protection per EN 60529 | Front: IP65<br>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 [5] | |
|    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 | 527 mm |
|    Height | 421 mm |
| Weight | 7300 g |

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 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.

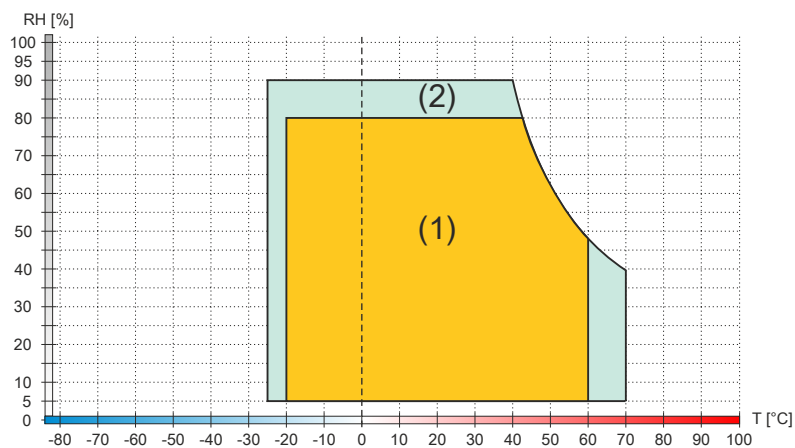## 4.2.2.13.4 Dimensions
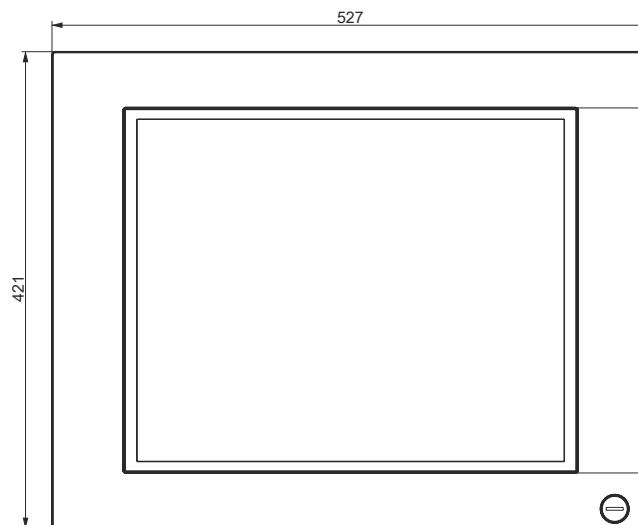
### 4.2.2.13.5 Temperature/Humidity diagram



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

### 4.2.3 QM170 CPU boards

#### 4.2.3.1 5PC901.TS17-00, -01

##### 4.2.3.1.1 General information

- Intel Core i-series processors
- Intel QM170 chipset
- 2x DDR4 memory slots
- Intel Gen 9 HD graphics
- AMI BIOS (UEFI)

> **Information:**
>
> **A fan kit is required when using CPU boards 5PC901.TS17-00 and 5PC901.TS17-01.**

##### 4.2.3.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **CPU boards** | |
| 5PC901.TS17-00 | CPU board Intel Core i7 6820EQ 2.8 GHz - Quad core - QM170 chipset - For Panel PC 900 | |
| 5PC901.TS17-01 | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - QM170 chipset - For Panel PC 900 | |

Table 58: 5PC901.TS17-00, 5PC901.TS17-01 - Order data

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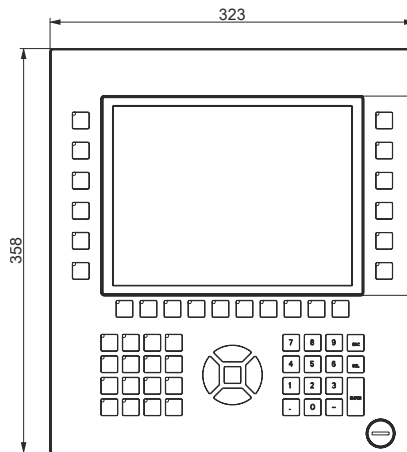
> **Information:**
>
> **The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component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

| Order number | 5PC901.TS17-00 | 5PC901.TS17-01 |
|---|---|---|
| **General information** | | |
| LEDs | Power, HDD, Link, Run | |
| B&R ID code | 0xFC84 | 0xFC85 |
| Cooling | Active via fan kit | |
| Battery | | |
| Type | Renata 950 mAh | |
| Service life | 4 years [1] | |
| Removable | Yes, on the back of the Panel PC | |
| Variant | Lithium ion | |
| Power button | Yes | |
| Reset button | Yes | |
| Buzzer | Yes | |
| Certifications | | |
| CE | Yes | |
| UL | cULus E115267 Industrial control equipment | |
| **Controller** | | |
| Bootloader | Embedded AMI BIOS | |

Table 59: 5PC901.TS17-00, 5PC901.TS17-01 - Technical data

| Order number | 5PC901.TS17-00 | 5PC901.TS17-01 |
|---|---|---|
| Processor | | |
|   Type | Intel Core i7-6820EQ | Intel Core i5-6440EQ |
|   Clock frequency | 2800 MHz | 2700 MHz |
|   Number of cores | 4 | |
|   Architecture | 14 nm | |
|   Thermal design power (TDP) | 45 W | |
|   Intel Smart Cache | 8 MB | 6 MB |
|   External bus | DMI3, 8 GT/s | |
|   Intel 64 architecture | Yes | |
|   Intel Turbo Boost Technology | 2.0 | |
|   Intel Hyper-Threading Technology | Yes | No |
|   Intel vPro Technology | Yes | |
|   Intel Virtualization Technology (VT-x) | Yes | |
|   Intel Virtualization Technology for Directed I/O (VT-d) | Yes | |
|   Enhanced Intel SpeedStep Technology | Yes | |
| Chipset | Intel QM170 | |
| Trusted Platform Module | TPM 2.0 | |
| Real-time clock | | |
|   Accuracy | At 25°C: Typ. 12 ppm (1 second) per day [2] | |
|   Battery-backed | Yes | |
| Power failure logic | | |
|   Controller | MTCX [3] | |
|   Buffer time | 10 ms | |
| Memory slot | | |
|   Number of memory channels | 2 | |
|   Type | DDR4 | |
|   Memory size | Max. 32 GB | |
|   Max. memory bandwidth | 34.1 GB/s | |
| Graphics | | |
|   Controller | Intel HD Graphics 530 | |
|   Max. dynamic graphics frequency | 1 GHz | |
|   Color depth | Max. 32-bit | |
|   DirectX support | 12 | |
|   OpenGL support | 4.4 | |
|   Resolution | | |
|     DVI | Resolution up to 1920 x 1200 (WUXGA) | |
|     RGB | 350 MHz RAMDAC, resolution up to 4096 x 2304 @ 60 Hz (QXGA) | |
|     DisplayPort | Version 1.2, resolution up to 4K | |
| Mass memory management | 3x SATA | |
| Power management | ACPI 5.0 with battery support | |
| **Interfaces** | | |
| COM1 | | |
|   Type | RS232, modem supported, not galvanically isolated | |
|   Variant | DSUB, 9-pin, male | |
|   UART | 16550-compatible, 16-byte FIFO buffer | |
|   Max. baud rate | 115 kbit/s | |
| COM2 | | |
|   Type | RS232, modem supported, not galvanically isolated | |
|   Variant | DSUB, 9-pin, male | |
|   UART | 16550-compatible, 16-byte FIFO buffer | |
|   Max. baud rate | 115 kbit/s | |
| CFast slot | | |
|   Quantity | 1 | |
|   Type | SATA III (SATA 6.0 Gbit/s) | |
| USB | | |
|   Quantity | 4 | |
|   Type | USB 3.0 (on bottom) | |
|   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) [4] | |
|   Current-carrying capacity | Max. 1 A per connection | |
| Ethernet | | |
|   Quantity | 2 | |
|   Variant | RJ45, shielded | |
|   Transfer rate | 10/100/1000 Mbit/s | |
|   Max. baud rate | 1 Gbit/s | |
| Panel/Monitor interface | | |
|   Variant | DVI-I | |
|   Type | SDL/DVI/Monitor | |

Table 59: 5PC901.TS17-00, 5PC901.TS17-01 - Technical data

| Order number | 5PC901.TS17-00 | 5PC901.TS17-01 |
|---|---|---|
| Audio | | |
|    Type | HDA | |
|    Controller | Realtek RTL888 | |
|    Inputs | Microphone, Line In | |
|    Outputs | Line Out | |
| **Slots** | | |
| Slide-in compact drives | | |
|    Quantity | 1 | |
|    Type | SATA III (SATA 6.0 Gbit/s) | |
| Interface option | 2 | |
| Add-on UPS slot | Yes [5] | |
| Slot for fan kit | Yes | |
| **Electrical properties** | | |
| Nominal voltage | 24 VDC, SELV [6] | 24 VDC ±25%, SELV [6] |
| Nominal current | 5.5 A | |
| Operating voltage | 24 VDC (±25%), max. 7.4 A | |
| Inrush current | Max. 60 A for < 300 µs | |
| Overvoltage category per EN 61131-2 | II | |
| Galvanic isolation | Yes | |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| **Ambient conditions** | | |
| Elevation | | |
|    Operation | Max. 3000 m (component-dependent) [7] | |
| **Mechanical properties** | | |
| Housing [8] | | |
|    Material | Aluminum, Light metal die casting | |
|    Coating | Anthracite | |
| Dimensions | | |
|    Width | 225 mm | |
|    Height | 226 mm | |
|    Depth | 54 mm | |
| Weight | Approx. 450 g | |

Table 59: 5PC901.TS17-00, 5PC901.TS17-01 - Technical data

1) At 50°C, 8.5 µA for the components being supplied and self-discharge of 40%. If an SRAM interface option is installed, the service life is 2½ years.
2) At max. specified ambient temperature: Typ. 58 ppm (5 seconds) - worst case 220 ppm (19 seconds).
3) Maintenance Controller Extended
4) The SuperSpeed transfer rate (5 Gbit/s) is only possible with USB 3.0.
5) The UPS module can only be operated in the IF option 1 slot.
6) IEC 61010-2-201 requirements must be observed; see section "+24 VDC power supply" in the user's manual.
7) The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.
8) Visual deviations in color and surface quality are possible due to process or batch conditions.

### 4.2.4 HM170 CPU boards

#### 4.2.4.1 5PC901.TS17-02, -03

##### 4.2.4.1.1 General information

- Intel Celeron and Intel Core i processors
- Intel HM170 chipset
- 2x DDR4 memory slots
- Intel Gen 9 HD graphics
- AMI BIOS (UEFI)

> **Information:**
>
> **The following applies when operated without a fan kit:**
>
> - **CPU board 5PC901.TS17-02 is limited to a maximum CPU frequency of 1900 MHz.**
> - **CPU board 5PC901.TS17-03 is limited to a maximum CPU frequency of 1700 MHz.**

##### 4.2.4.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **CPU boards** | |
| 5PC901.TS17-02 | CPU board Intel Core i3 6100E - Dual core - HM170 chipset - 2.7 GHz active, 1.9 GHz passive - For Panel PC 900 | |
| 5PC901.TS17-03 | CPU board Intel Celeron G3900E - Dual core - HM170 chipset - 2.4 GHz active, 1.7 GHz passive - For Panel PC 900 | |

Table 60: 5PC901.TS17-02, 5PC901.TS17-03 - Order data

##### 4.2.4.1.3 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.**

| Order number | 5PC901.TS17-02 | 5PC901.TS17-03 |
|---|---|---|
| **General information** | | |
| LEDs | Power, HDD, Link, Run | |
| B&R ID code | 0xFC86 | 0xFC87 |
| Cooling | Active via fan kit Passive via heat sink | |
| Battery | | |
|    Type | Renata 950 mAh | |
|    Service life | 4 years [1] | |
|    Removable | Yes, on the back of the Panel PC | |
|    Variant | Lithium ion | |
| Power button | Yes | |
| Reset button | Yes | |
| Buzzer | Yes | |
| Certifications | | |
|    CE | Yes | |
|    UL | In preparation | |
| **Controller** | | |
| Bootloader | Embedded AMI BIOS | |

Table 61: 5PC901.TS17-02, 5PC901.TS17-03 - Technical data

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## Technical data

| Order number | 5PC901.TS17-02 | 5PC901.TS17-03 |
|---|---|---|
| Processor | | |
|   Type | Intel Core i3-6100E | Intel Celeron G3900E |
|   Clock frequency | 2700 MHz | 2400 MHz |
|   Number of cores | 2 | |
|   Architecture | 14 nm | |
|   Thermal design power (TDP) | 35 W | |
|   Intel Smart Cache | 3 MB | 2 MB |
|   External bus | DMI3, 8 GT/s | |
|   Intel 64 architecture | Yes | |
|   Intel Turbo Boost Technology | No | |
|   Intel Hyper-Threading Technology | Yes | 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 HM170 | |
| Trusted Platform Module | TPM 2.0 | |
| Real-time clock | | |
|   Accuracy | At 25°C: Typ. 12 ppm (1 second) per day [2] | |
|   Battery-backed | Yes | |
| Power failure logic | | |
|   Controller | MTCX [3] | |
|   Buffer time | 10 ms | |
| Memory slot | | |
|   Number of memory channels | 2 | |
|   Type | DDR4 | |
|   Memory size | Max. 32 GB | |
|   Max. memory bandwidth | 34.1 GB/s | |
| Graphics | | |
|   Controller | Intel HD Graphics 530 | Intel HD Graphics 510 |
|   Max. dynamic graphics frequency | 950 MHz | |
|   Color depth | Max. 32-bit | |
|   DirectX support | 12 | |
|   OpenGL support | 4.4 | |
|   Resolution | | |
|     DVI | Resolution up to 1920 x 1200 (WUXGA) | |
|     RGB | 350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA) | |
|     DisplayPort | Version 1.2, resolution up to 4K | |
| Mass memory management | 3x SATA | |
| Power management | ACPI 5.0 with battery support | |
| **Interfaces** | | |
| COM1 | | |
|   Type | RS232, modem supported, not galvanically isolated | |
|   Variant | DSUB, 9-pin, male | |
|   UART | 16550-compatible, 16-byte FIFO buffer | |
|   Max. baud rate | 115 kbit/s | |
| COM2 | | |
|   Type | RS232, modem supported, not galvanically isolated | |
|   Variant | DSUB, 9-pin, male | |
|   UART | 16550-compatible, 16-byte FIFO buffer | |
|   Max. baud rate | 115 kbit/s | |
| CFast slot | | |
|   Quantity | 1 | |
|   Type | SATA III (SATA 6.0 Gbit/s) | |
| USB | | |
|   Quantity | 4 | |
|   Type | USB 3.0 (on bottom) | |
|   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) [4] | |
|   Current-carrying capacity | Max. 1 A per connection | |
| Ethernet | | |
|   Quantity | 2 | |
|   Variant | RJ45, shielded | |
|   Transfer rate | 10/100/1000 Mbit/s | |
|   Max. baud rate | 1 Gbit/s | |
| Panel/Monitor interface | | |
|   Variant | DVI-I | |
|   Type | SDL/DVI/Monitor | |

Table 61: 5PC901.TS17-02, 5PC901.TS17-03 - Technical data

                     Panel PC 900 (Skylake) User's manual V 1.10

| Order number | 5PC901.TS17-02 | 5PC901.TS17-03 |
|---|---|---|
| Audio | | |
|     Type | HDA | |
|     Controller | Realtek RTL888 | |
|     Inputs | Microphone, Line In | |
|     Outputs | Line Out | |
| **Slots** | | |
| Slide-in compact drives | | |
|     Quantity | 1 | |
|     Type | SATA III (SATA 6.0 Gbit/s) | |
| Interface option | 2 | |
| Add-on UPS slot | Yes [5] | |
| Slot for fan kit | Yes | |
| **Electrical properties** | | |
| Nominal voltage | 24 VDC ±25%, SELV [6] | |
| Nominal current | 5.5 A | |
| Operating voltage | 24 VDC (±25%), max. 7.4 A | |
| Inrush current | Max. 60 A for < 300 µs | |
| Overvoltage category per EN 61131-2 | II | |
| Galvanic isolation | Yes | |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| **Ambient conditions** | | |
| Elevation | | |
|     Operation | Max. 3000 m (component-dependent) [7] | |
| **Mechanical properties** | | |
| Housing [8] | | |
|     Material | Aluminum, Light metal die casting | |
|     Coating | Anthracite | |
| Dimensions | | |
|     Width | 225 mm | |
|     Height | 226 mm | |
|     Depth | 54 mm | |
| Weight | Approx. 450 g | |

Table 61: 5PC901.TS17-02, 5PC901.TS17-03 - Technical data

1) At 50°C, 8.5 µA for the components being supplied and self-discharge of 40%. If an SRAM interface option is installed, the service life is 2½ years.
2) At max. specified ambient temperature: Typ. 58 ppm (5 seconds) - worst case 220 ppm (19 seconds).
3) Maintenance Controller Extended
4) The SuperSpeed transfer rate (5 Gbit/s) is only possible with USB 3.0.
5) The UPS module can only be operated in the IF option 1 slot.
6) IEC 61010-2-201 requirements must be observed; see section "+24 VDC power supply" in the user's manual.
7) The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.
8) Visual deviations in color and surface quality are possible due to process or batch conditions.

## 4.2.5 System units

### 4.2.5.1 5PC911.SX00-00

#### 4.2.5.1.1 General information

The active Panel PC 900 system unit consists of a housing and heat sink. A fan kit is also required for operation. A CPU board, main memory, IF options, fan kit and slide-in compact drive are installed in the system unit.

The 5AC902.FA00-00 fan kit is not included with the system unit and must be ordered separately.

#### 4.2.5.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | System units | |
| 5PC911.SX00-00 | PPC900 active system unit | |
| | **Required accessories** | |
| 5PC901.TS17-00 | CPU board Intel Core i7 6820EQ 2.8 GHz - Quad core - QM170 chipset - For Panel PC 900 | |
| 5PC901.TS17-01 | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - QM170 chipset - For Panel PC 900 | |
| 5PC901.TS17-02 | CPU board Intel Core i3 6100E 2.7 GHz - Dual core - HM170 chipset - For Panel PC 900 | |
| 5PC901.TS17-03 | CPU board Intel Celeron G3900E 2.4 GHz - Dual core - HM170 chipset - For Panel PC 900 | Figure 15: (symbolic image) |
| 5AC902.FA00-00 | PPC900 fan kit - For system unit 5PC911.SX00-00 | |

Table 62: 5PC911.SX00-00 - Order data

#### 4.2.5.1.3 Technical data

| Order number | 5PC911.SX00-00 |
|---|---|
| **General information** | |
| Cooling | Active via fan kit<br>Passive via heat sink |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
|    EAC | Product family certification |
| **Mechanical properties** | |
| Housing | |
|    Material | Aluminum, Light metal die casting |
|    Coating | Anthracite |
| Dimensions | |
|    Width | 225 mm |
|    Height | 226 mm |
|    Depth | 54 mm |
| Weight | Approx. 2821 g |

Table 63: 5PC911.SX00-00 - Technical data

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

### 4.2.5.2 5PC911.SX00-01

#### 4.2.5.2.1 General information

The passive Panel PC 900 system unit consists of a housing and heat sink. A CPU board, main memory, IF options and slide-in compact drive are installed in the system unit.

#### 4.2.5.2.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | System units | |
| 5PC911.SX00-01 | PPC900 passive system unit | |
| | **Required accessories** | |
| 5PC901.TS17-02 | CPU board Intel Core i3 6100E 2.7 GHz - Dual core - HM170 chipset - For Panel PC 900 | |
| 5PC901.TS17-03 | CPU board Intel Celeron G3900E 2.4 GHz - Dual core - HM170 chipset - For Panel PC 900 | |

Table 64: 5PC911.SX00-01 - Order data

#### 4.2.5.2.3 Technical data

| Order number | 5PC911.SX00-01 |
|---|---|
| **General information** | |
| Cooling | Passive via heat sink |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
|   EAC | Product family certification |
| **Mechanical properties** | |
| Housing | |
|   Material | Aluminum, Light metal die casting |
|   Coating | Anthracite |
| Dimensions | |
|   Width | 225 mm |
|   Height | 226 mm |
|   Depth | 54 mm |
| Weight | Approx. 2821 g |

Table 65: 5PC911.SX00-01 - Technical data

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

## 4.2.6 Main memory
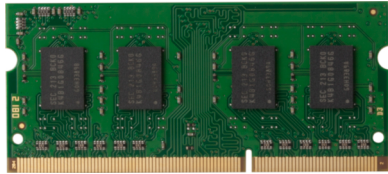
### 4.2.6.1 5MMDDR.xxxx-04

#### 4.2.6.1.1 General information

These 260-pin DDR4 main memory modules operate with a data rate of 2133 MHz and are available in sizes ranging from 4 GB to 16 GB.

If two main memory modules of identical size (e.g. 4 GB) are connected to the CPU board, then dual-channel memory technology is supported. This technology is not supported if two main memory modules of different sizes (e.g. 4 GB and 8 GB) are connected.

#### 4.2.6.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Main memory** | |
| 5MMDDR.4096-04 | SO-DIMM DDR4, 4096 MB | |
| 5MMDDR.8192-04 | SO-DIMM DDR4, 8192 MB | |
| 5MMDDR.016G-04 | SO-DIMM DDR4, 16384 MB | |

#### 4.2.6.1.3 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.**

| Order number | 5MMDDR.4096-04 | 5MMDDR.8192-04 | 5MMDDR.016G-04 |
|---|---|---|---|
| **General information** | | | |
| Certifications | | | |
| CE | Yes | | |
| UKCA | Yes | | |
| UL | cULus E115267 Industrial control equipment | | |
| DNV | Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck) [1] | | |
| LR | ENV3 | | |
| KR | Yes | | |
| ABS | Yes | | |
| BV | **EC31B** Temperature: 5 - 55°C Vibration: 0.7 g EMC: Bridge and open deck | | |
| EAC | Product family certification | | |
| **Controller** | | | |
| Memory | | | |
| Type | SO-DIMM DDR4 SDRAM | | |
| Memory size | 4 GB | 8 GB | 16 GB |
| Construction | 260-pin | | |
| Organization | 512M x 64-bit | 1024M x 64-bit | 2048M x 64-bit |
| Velocity | DDR4-2133 (PC4-17000) | | |
| **Operating conditions** | | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | | |

1) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV certificate for the product family.

### 4.2.7 Bus units

> **Information:**
>
> **For information about installing or replacing a bus unit, please refer to the section "Installing the bus unit" on page 222.**
>
> **When installing or replacing a bus unit, it is also necessary to load the default settings in BIOS Setup (Save & Exit).**

#### 4.2.7.1 5AC902.BX0x-xx

##### 4.2.7.1.1 General information

Bus units consist of a housing and bus. They can be expanded on the Panel PC 900 system unit.

In addition to the availability of different variants with PCI and PCIe slots, every bus unit has a slide-in drive slot and fan kit.

The fan kit is not included in the delivery of the bus unit and must be ordered separately. If an active system unit (5PC911.SX00-00) is being used, then a fan kit must be configured in the bus unit.

**1-slot bus units**
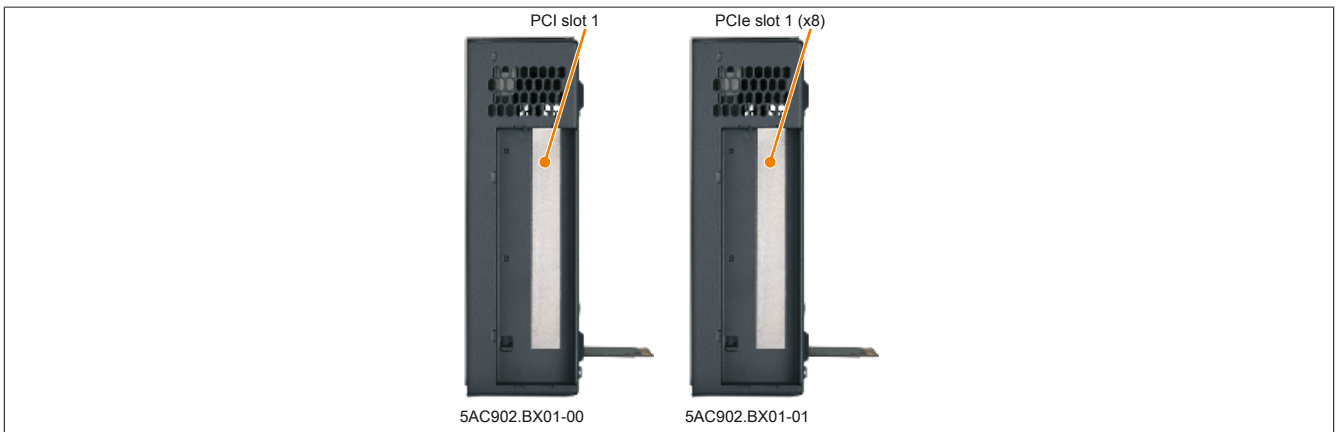


Figure 16: 1-slot bus units

**2-slot bus units**
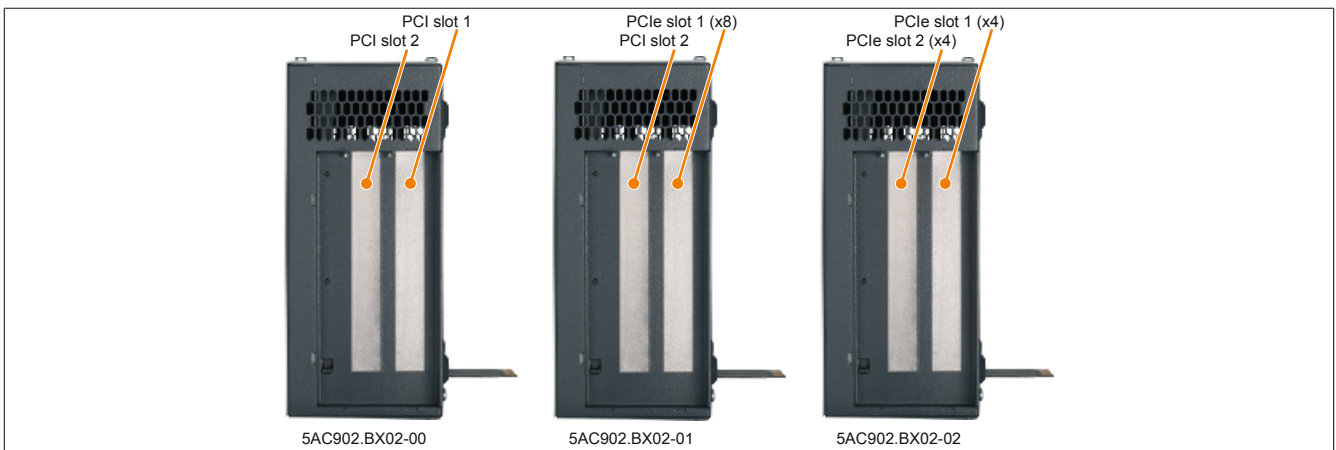


Figure 17: 2-slot bus units

> **Information:**
>
> **Bus unit 5AC902.BX02-02 is supported beginning with firmware version V1.14. Additional information about firmware upgrades can be found in the section "Firmware upgrade" on page 291.**

### 4.2.7.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Bus units** | |
| 5AC902.BX01-00 | PPC900 bus unit, 1-slot - 1 PCI - 1 slide-in | |
| 5AC902.BX01-01 | PPC900 bus unit, 1-slot - 1 PCI Express x8 - 1 slide-in | |
| 5AC902.BX02-00 | PPC900 bus unit, 2-slot - 2 PCI - 1 slide-in | |
| 5AC902.BX02-01 | PPC900 2-slot bus unit - 1 PCI - 1 PCI Express x8 - 1 slide-in | |
| 5AC902.BX02-02 | PPC900 bus unit, 2-slot - 2 PCI Express x4 - 1 slide-in | |
| | **Optional accessories** | |
| | **Fan kit** | |
| 5AC902.FA0X-00 | PPC900 fan kit - For PPC900 bus unit | |

Table 68: 5AC902.BX01-00, 5AC902.BX01-01, 5AC902.BX02-00, 5AC902.BX02-01, 5AC902.BX02-02 - Order data

### 4.2.7.1.3 Technical data

| Order number | 5AC902.BX01-00 | 5AC902.BX01-01 | 5AC902.BX02-00 | 5AC902.BX02-01 | 5AC902.BX02-02 |
|---|---|---|---|---|---|
| **General information** | | | | | |
| Certifications | | | | | |
|   CE | Yes | | | | |
|   UL | cULus E115267<br>Industrial control equipment | | | | |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] | | | | |
|   EAC | Product family certification | | | | |
| **Slots** | | | | | |
| PCI slots | | | | | |
|   Quantity | 1 | - | 2 | 1 | - |
|   Type | 32-bit | - | 32-bit | 32-bit | - |
|   Variant | PCI half-size | - | PCI half-size | PCI half-size | - |
|   Standard | 2.2 | - | 2.2 | 2.2 | - |
|   Bus speed | 33 MHz | - | 33 MHz | 33 MHz | - |
|   PCIe to PCI bridge | Yes | - | Yes | Yes | - |
| PCIe slots | | | | | |
|   Quantity | - | 1 | - | 1 | 2 |
|   Variant | - | PCIe half-size | - | PCIe half-size | PCIe half-size |
|   Standard | - | 2.0 | - | 2.0 | 2.0 |
|   Bus speed | - | x8 (4 GB/s) | - | x8 (4 GB/s) | x4 (2 GB/s) |
| Slide-in drives | 1 | | | | |
| **Mechanical properties** | | | | | |
| Dimensions | | | | | |
|   Width | 164 mm | | | | |
|   Height | 218 mm | | | | |
|   Depth | 54.7 mm | 54.7 mm | 75 mm | 75 mm | 75 mm |
| Weight | Approx. 1020 g | Approx. 1020 g | Approx. 1220 g | Approx. 1220 g | Approx. 1220 g |

Table 69: 5AC902.BX01-00, 5AC902.BX01-01, 5AC902.BX02-00, 5AC902.BX02-01, 5AC902.BX02-02 - Technical data

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

> # Information:
>
> **By default, PCIe slots are limited to Gen1 in BIOS. However, this PCIe Gen setting can be changed in BIOS (Advanced - PCI Express configuration - PCI Express GEN 2 settings).**

### 4.2.8 Fan kit

> **Information:**
>
> **Fan kits are subject to wear and must be checked at appropriate intervals and cleaned or replaced when not functioning properly (e.g. due to dirt and grime). For information about replacing fan filters, please refer to the section "Replacing the fan filter" on page 221.**

> **Information:**
>
> **For information about installing or replacing a fan kit, please refer to the section "Replacing the fan kit" on page 220.**

#### 4.2.8.1 5AC902.FA00-00

##### 4.2.8.1.1 General information

This fan kit includes 2 fans that are installed to improve the heat dissipation of the active 5PC911.SX00-00 PPC900 system unit.

- 2 fans for improved heat dissipation of the system unit
- Simple installation and removal

The 5AC902.FA00-00 fan kit is not included with the system unit and must be ordered separately.

##### 4.2.8.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Fan kit** | |
| 5AC902.FA00-00 | PPC900 fan kit - For system unit 5PC911.SX00-00 | |
| | **Optional accessories** | |
| | **Accessories** | |
| 5AC902.FI00-00 | PPC900 filter kit for system unit | |

Table 70: 5AC902.FA00-00 - Order data

##### 4.2.8.1.3 Technical data

| Order number | 5AC902.FA00-00 |
|---|---|
| **General information** | |
| Number of fans | 2 |
| Speed | Max. 9500 ±10% rpm |
| Noise level | 40.2 dB(A) [1] |
| Service life | 70,000 hours at 40°C |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [2] |
|   EAC | Product family certification |
| **Mechanical properties** | |
| Weight | Approx. 70 g |

Table 71: 5AC902.FA00-00 - Technical data

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

**4.2.8.2 5AC902.FA0X-00**

**4.2.8.2.1 General information**

This fan kit includes a fan that is installed to improve the heat dissipation of a PPC900 bus unit.

- • 1 fan for improved heat dissipation on the bus unit
- • Simple installation and removal

The fan kit is not included in the delivery of the bus unit and must be ordered separately. If an active system unit (5PC911.SX00-00) is being used, then a fan kit must be configured in the bus unit.

**4.2.8.2.2 Order data**

| Order number | Short description | Figure |
|---|---|---|
| | **Fan kit** | |
| 5AC902.FA0X-00 | PPC900 fan kit - For PPC900 bus unit | |
| | **Optional accessories** | |
| | **Accessories** | |
| 5AC902.FI0X-00 | PPC900 filter kit for bus unit | |

Table 72: 5AC902.FA0X-00 - Order data

**4.2.8.2.3 Technical data**

| Order number | 5AC902.FA0X-00 |
|---|---|
| **General information** | |
| Number of fans | 1 |
| Speed | Max. 9500 ±10% rpm |
| Noise level | 40.2 dB(A) [1] |
| Service life | 70,000 hours at 40°C |
| Certifications | |
| CE | Yes |
| UL | cULus E115267<br>Industrial control equipment |
| HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [2] |
| EAC | Product family certification |
| **Mechanical properties** | |
| Weight | Approx. 36 g |

Table 73: 5AC902.FA0X-00 - Technical data

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

### 4.2.9 Drives

> **Information:**
>
> **Current information, such as revision-dependent technical data, is available on the B&R website.**

#### 4.2.9.1 5AC901.CHDD-01

##### 4.2.9.1.1 General information

This 500 GB slide-in compact hard disk is specified for 24-hour operation. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 500 GB hard disk
- Slide-in compact
- Specified for 24-hour operation
- S.M.A.R.T. support

##### 4.2.9.1.2 Order data
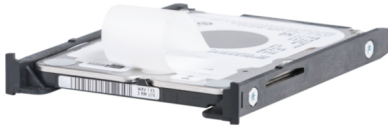
| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5AC901.CHDD-01 | 500 GB hard disk - Slide-in compact - SATA | |
| | **Optional accessories** | |
| | **Drives** | |
| 5MMHDD.0500-00 | 500 GB hard disk - SATA | |

Table 74: 5AC901.CHDD-01 - Order data

##### 4.2.9.1.3 Technical data

> **Caution!**
>
> **A sudden power failure can result in data loss! In very rare cases, the mass storage device may also be damaged!**
>
> **The preventive use of a UPS is therefore 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.**

| Order number | 5AC901.CHDD-01 |
|---|---|
| **General information** | |
| Certifications | |
| CE | Yes |
| UL | cULus E115267<br>Industrial control equipment |
| HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
| EAC | Product family certification |
| **Hard disk** | |
| Capacity | 500 GB |
| Number of heads | 2 |
| Number of sectors | 976,773,168 |
| Bytes per sector | 512 (logical) / 4096 (physical) |
| Cache | 16 MB |
| Speed | 5400 rpm ±0.2% |
| Startup time | Typ. 3.5 s (from 0 rpm to read access) |
| Service life | 5 years |
| MTBF | 1,000,000 hours [2] |
| S.M.A.R.T. support | Yes |
| Interface | SATA |
| Access time | 5.5 ms |

Table 75: 5AC901.CHDD-01 - Technical data

## Technical data

| Order number | 5AC901.CHDD-01 |
|---|---|
| Supported transfer modes | SATA II |
| Data transfer rate | |
|    Internal | Max. 147 MB/s |
|    To/From host | Max. 150 Mbit/s (SATA I), max. 300 Mbit/s (SATA II) |
| Positioning time | |
|    Nominal (read access) | 11 ms |
|    Maximum (read access) | 21 ms |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature [3] | |
|    Operation [4] | 0 to 60°C |
|    24-hour operation [5] | 0 to 60°C |
|    Storage | -40 to 70°C |
|    Transport | -40 to 70°C |
| Relative humidity [6] | |
|    Operation | 8 to 90%, non-condensing |
|    Storage | 5 to 95%, non-condensing |
|    Transport | 5 to 95%, non-condensing |
| Vibration | |
|    Operation (continuous) | 5 to 500 Hz: 0.25 g, no unrecoverable errors |
|    Operation (occasional) | 5 to 500 Hz: 0.5 g, no unrecoverable errors |
|    Storage | 10 to 500 Hz: 5 g, no unrecoverable errors |
|    Transport | 10 to 500 Hz: 5 g, no unrecoverable errors |
| Shock | |
|    Operation | 400 g and 2 ms duration, no unrecoverable errors |
|    Storage | 1000 g and 2 ms duration, no unrecoverable errors |
|    Transport | 1000 g and 2 ms duration, no unrecoverable errors |
| Elevation | |
|    Operation | -305 to 3048 m |
|    Storage | -305 to 12192 m |
| **Mechanical properties** | |
| Installation | Fixed [7] |
| Dimensions | |
|    Width | 10 mm |
|    Height | 75 mm |
|    Depth | 105 mm |
| Weight | 134 g |
| **Vendor information** | |
| Manufacturer | Western Digital |
| Manufacturer's product ID | WD5000LUCT |

Table 75: 5AC901.CHDD-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) With 8760 POH (power-on hours) per year and 25°C surface temperature.
3) Temperature values at an elevation of 305 meters. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature is permitted to increase or decrease by a maximum of 20°C per hour.
4) Standard operation refers to 333 POH (power-on hours) per month.
5) 24-hour operation refers to 732 POH (power-on hours) per month.
6) Humidity gradient: Maximum 20% per hour.
7) Slide-in compact installation.

### 4.2.9.1.4 Temperature/Humidity diagram
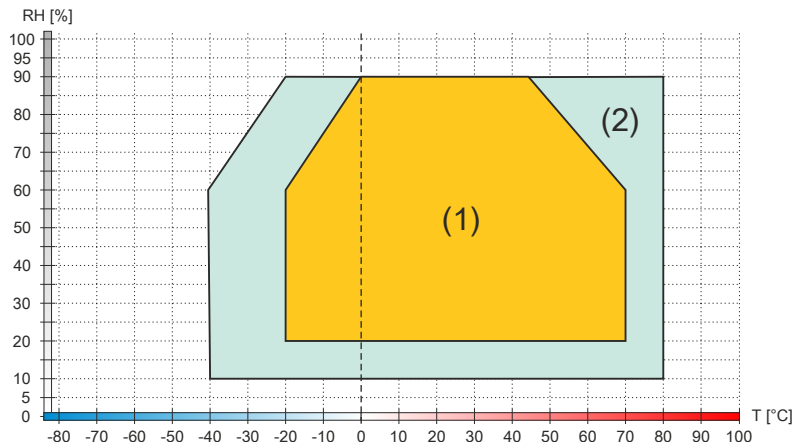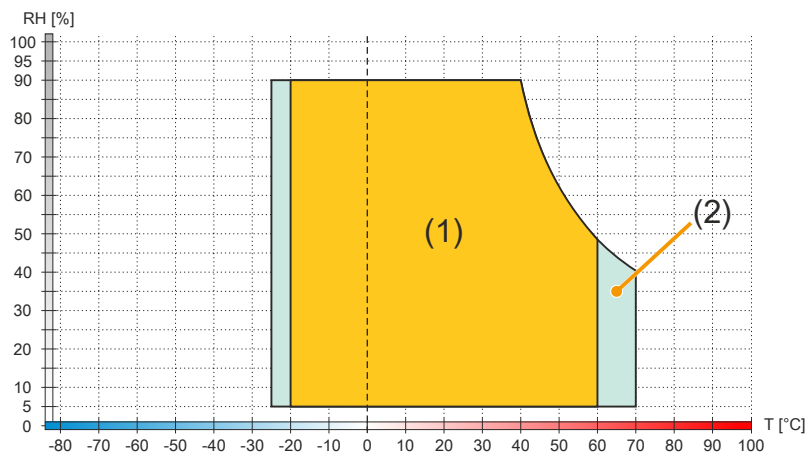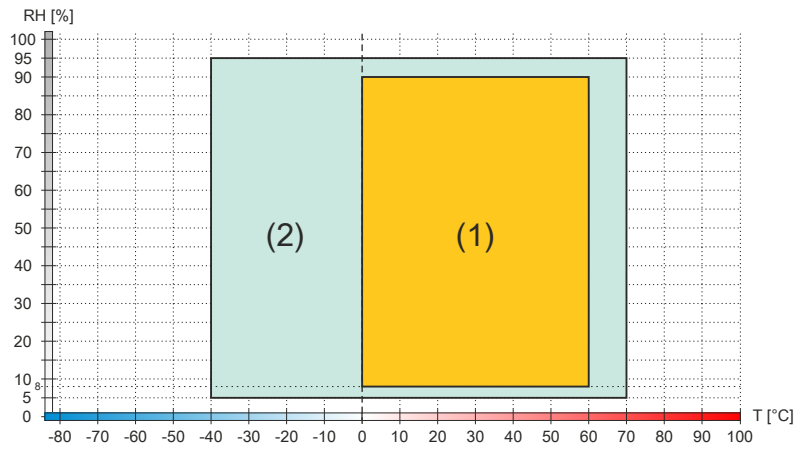


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.2 5AC901.CSSD-03

#### 4.2.9.2.1 General information

This 60 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and is SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 60 GB solid-state drive
- MLC flash memory
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 4.2.9.2.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5AC901.CSSD-03 | 60 GB SSD MLC - Slide-in compact - SATA | |
| | **Optional accessories** | |
| | **Drives** | |
| 5MMSSD.0060-01 | 60 GB SSD MLC - Innodisk - SATA | |

Table 76: 5AC901.CSSD-03 - Order data

#### 4.2.9.2.3 Technical data

> ## Caution!
>
> **A sudden power failure can result in data loss! In very rare cases, the mass storage device may also be damaged!**
>
> **The preventive use of a UPS is therefore 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.**

| Order number | 5AC901.CSSD-03 | | |
|---|---|---|---|
| **Revision** | **C0** | **D0** | **F0** |
| **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, T3C [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] | | |
| EAC | Product family certification | | |
| **Solid-state drive** | | | |
| Capacity | 60 GB | | |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read | | |
| MTBF | Min. 1,500,000 h | | |
| S.M.A.R.T. support | Yes | | |

Table 77: 5AC901.CSSD-03, 5AC901.CSSD-03, 5AC901.CSSD-03 - Technical data

| Order number | 5AC901.CSSD-03 | | |
|---|---|---|---|
| **Revision** | **C0** | **D0** | **F0** |
| Interface | SATA | | |
| Servicing | None | | |
| Continuous reading | Max. 510 MB/s | | |
| Continuous writing | Max. 430 MB/s | | |
| IOPS [3] | | | |
|   4k read | Max. 50,000 (random) | | |
|   4k write | Max. 25,000 (random) | | |
| **Endurance** | | | |
| MLC flash memory | Yes | | |
| Guaranteed data volume | | | |
|   Guaranteed | 35 TBW [4] | | 47 TBW [4] |
| Compatibility | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) | | |
| **Operating conditions** | | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | | |
| **Ambient conditions** | | | |
| Temperature | | | |
|   Operation | 0 to 70°C | -30 to 85 °C | -40 to 85°C |
|   Storage | -40 to 85°C | | |
|   Transport | -40 to 85°C | | |
| Relative humidity | | | |
|   Operation | 8 to 90 %, non-condensing | 5 to 90%, non-condensing | |
|   Storage | 8 to 95%, non-condensing | 5 to 95%, non-condensing | |
|   Transport | 8 to 95%, non-condensing | 5 to 95%, non-condensing | |
| Vibration | | | |
|   Operation | 10 to 2000 Hz: 20 g | | |
|   Storage | 10 to 2000 Hz: 20 g | | |
|   Transport | 10 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 | -300 to 12,192 m | | |
|   Storage | -300 to 12,192 m | | |
|   Transport | -300 to 12,192 m | | |
| **Mechanical properties** | | | |
| Installation | Permanent [5] | | |
| Dimensions | | | |
|   Width | 13 mm | | |
|   Height | 98 mm | | |
|   Depth | 105 mm | | |
| Weight | 118 g | | |
| **Vendor information** | | | |
| Manufacturer | Toshiba | | |
| Manufacturer's product ID | THNSNH060GBST | THNSNJ060WCST | THNSNJ060WCSU |

Table 77: 5AC901.CSSD-03, 5AC901.CSSD-03, 5AC901.CSSD-03 - 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) IOPS: Random read and write input/output operations per second
4) TBW: Terabytes written
5) Slide-in compact installation.

## 4.2.9.2.4 Temperature/Humidity diagram

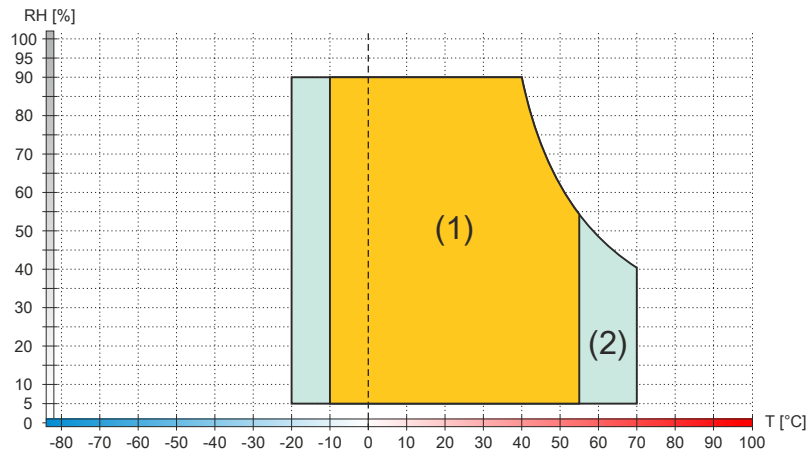### 5AC901.CSSD-03 Rev. F0
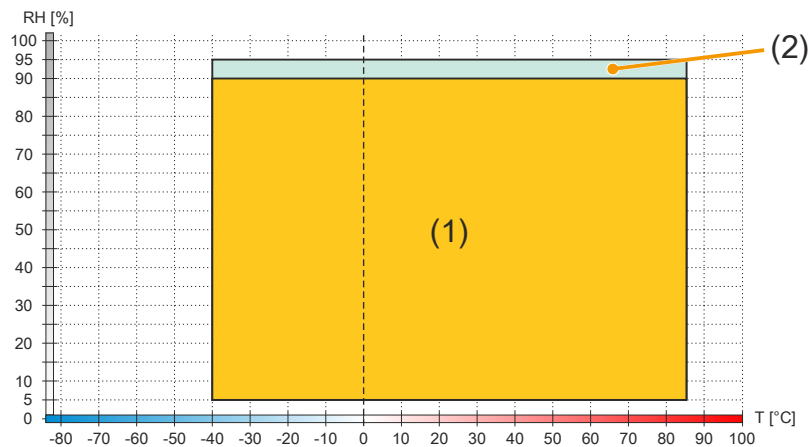


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 5AC901.CSSD-03 ≤ Rev. D0
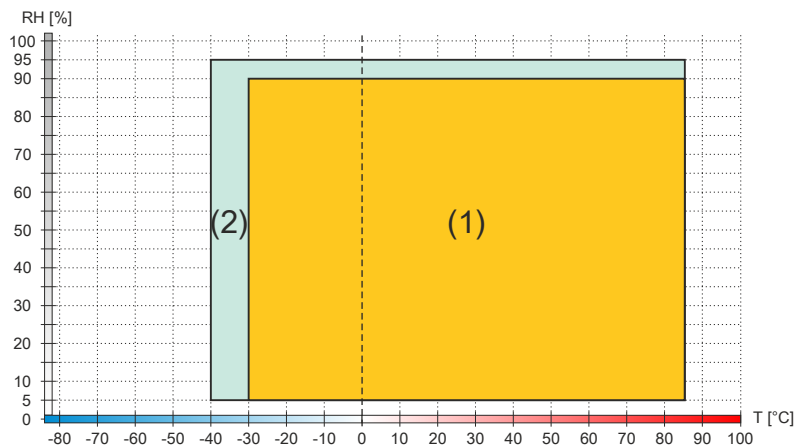


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 5AC901.CSSD-03 ≤ Rev. C0
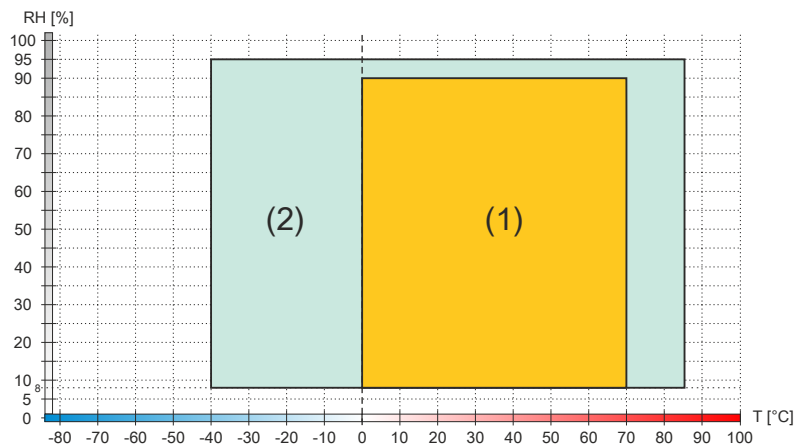


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.3 5AC901.CSSD-04

#### 4.2.9.3.1 General information

This 128 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and is SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 128 GB solid-state drive
- MLC flash memory
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 4.2.9.3.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5AC901.CSSD-04 | 128 GB SSD MLC - Slide-in compact - Innodisk - SATA | |
| | **Optional accessories** | |
| | **Drives** | |
| 5MMSSD.0128-01 | 128 GB SSD MLC - Innodisk - SATA | |

Table 78: 5AC901.CSSD-04 - Order data

#### 4.2.9.3.3 Technical data

## Caution!

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

**The preventive use of a UPS is therefore 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.**

| Order number | 5AC901.CSSD-04 | | | |
|---|---|---|---|---|
| Revision | C0 | D0 | E0 | G0 |
| **General information** | | | | |
| Certifications | | | | |
| CE | Yes | | | |
| UL | cULus E115267<br>Industrial control equipment | | | |
| HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] | | | |
| DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] | | | |
| EAC | Product family certification | | | |
| **Solid-state drive** | | | | |
| Capacity | 128 GB | | | |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read | | | |
| MTBF | Min. 1,500,000 h | | | |
| S.M.A.R.T. support | Yes | | | |

Table 79: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - Technical data

## Technical data

| Order number | 5AC901.CSSD-04 | | | |
|---|---|---|---|---|
| Revision | C0 | D0 | E0 | G0 |
| Interface | SATA | | | |
| Servicing | None | | | |
| Continuous reading | Max. 510 MB/s | | | |
| Continuous writing | Max. 450 MB/s | | | |
| IOPS [3] | | | | |
|     4k read | Max. 80,000 (random) | Max. 85,000 (random) | | |
|     4k write | Max. 35,000 (random) | | | |
| **Endurance** | | | | |
| MLC flash memory | Yes | | | |
| Guaranteed data volume | | | | |
|     Guaranteed | 74 TBW [4] | | | 100 TBW [4] |
| Compatibility | Compliant with SATA revision 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) | | | |
| **Operating conditions** | | | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | | | |
| **Ambient conditions** | | | | |
| Temperature | | | | |
|     Operation | 0 to 70°C | -30 to 85 °C | | -40 to 85°C |
|     Storage | -40 to 85°C | | | |
|     Transport | -40 to 85°C | | | |
| Relative humidity | | | | |
|     Operation | 8 to 90 %, non-condensing | 5 to 90%, non-condensing | | |
|     Storage | 8 to 95%, non-condensing | 5 to 95%, non-condensing | | |
|     Transport | 8 to 95%, non-condensing | 5 to 95%, non-condensing | | |
| Vibration | | | | |
|     Operation | 10 to 2000 Hz: 20 g | | | |
|     Storage | 10 to 2000 Hz: 20 g | | | |
|     Transport | 10 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 | -300 to 12,192 m | | | |
|     Storage | -300 to 12,192 m | | | |
|     Transport | -300 to 12,192 m | | | |
| **Mechanical properties** | | | | |
| Installation | Permanent [5] | | | |
| Dimensions | | | | |
|     Width | 13 mm | | | |
|     Height | 98 mm | | | |
|     Depth | 105 mm | | | |
| Weight | 118 g | | | |
| **Vendor information** | | | | |
| Manufacturer | Toshiba | | | |
| Manufacturer's product ID | THNSNH128GBST | THNSNJ128WBST | THNSNJ128WCST | THNSNJ128WCSU |

Table 79: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - 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) IOPS: Random read and write input/output operations per second
4) TBW: Terabytes written
5) Slide-in compact installation.

## 4.2.9.3.4 Temperature/Humidity diagram

### 5AC901.CSSD-04 Rev. G0
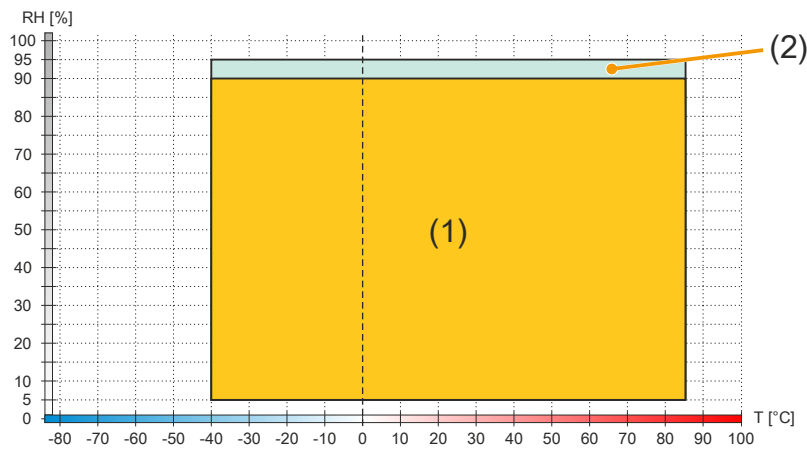


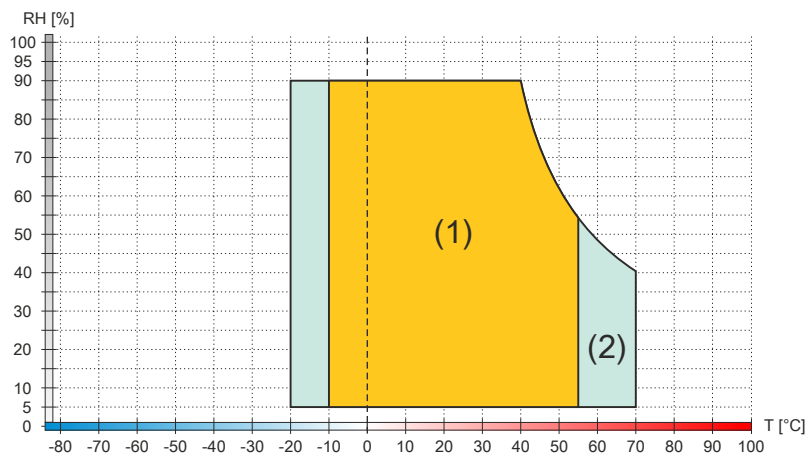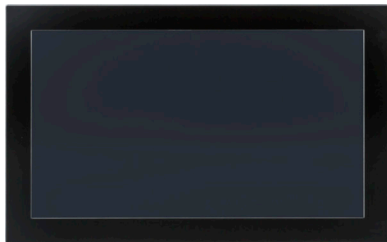| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 5AC901.CSSD-04 ≤ Rev. D0
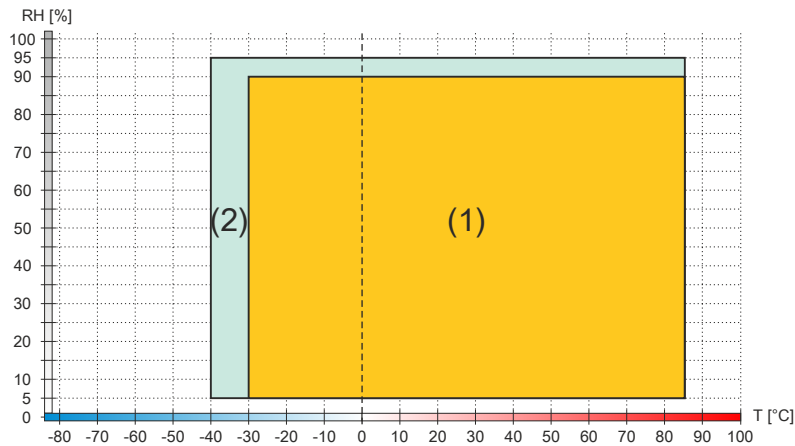


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 5AC901.CSSD-04 ≤ Rev. C0
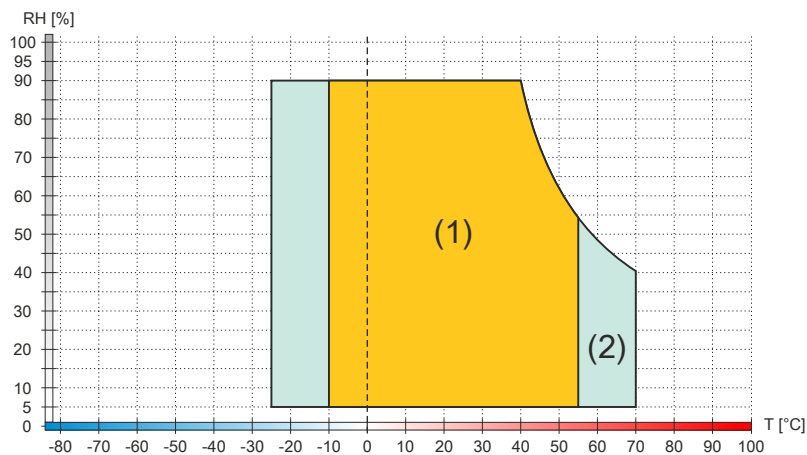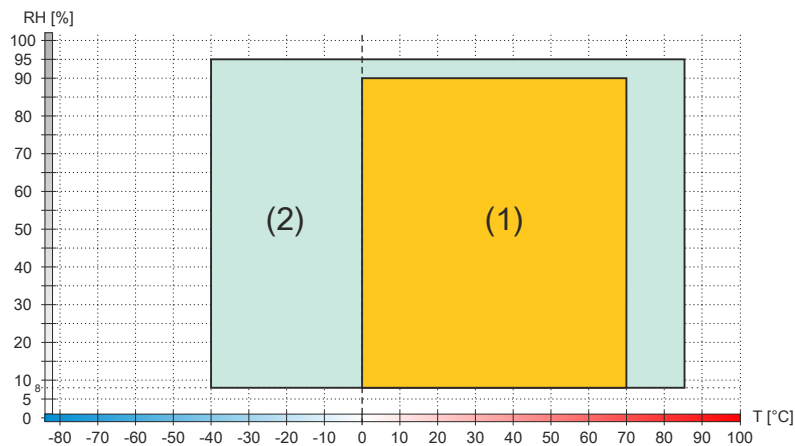


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.4 5AC901.CSSD-05

#### 4.2.9.4.1 General information

This 256 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and is SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 256 GB solid-state drive
- MLC flash memory
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 4.2.9.4.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | Drives | |
| 5AC901.CSSD-05 | 256 GB SSD MLC - Slide-in compact - Innodisk - SATA | |
| | Optional accessories | |
| | Drives | |
| 5MMSSD.0256-00 | 256 GB SSD MLC - Innodisk - SATA | |

Table 80: 5AC901.CSSD-05 - Order data

#### 4.2.9.4.3 Technical data

> **Caution!**
>
> **A sudden power failure can result in data loss! In very rare cases, the mass storage device may also be damaged!**
>
> **The preventive use of a UPS is therefore 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.**

| Order number | 5AC901.CSSD-05 | |
|---|---|---|
| Revision | C0 | E0 |
| **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, T3C [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] | |
| EAC | Product family certification | |
| **Solid-state drive** | | |
| Capacity | 256 GB | |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read | |
| MTBF | Min. 1,500,000 h | |
| S.M.A.R.T. support | Yes | |

Table 81: 5AC901.CSSD-05, 5AC901.CSSD-05 - Technical data

| Order number | 5AC901.CSSD-05 | |
|---|---|---|
| **Revision** | **C0** | **E0** |
| Interface | SATA | |
| Servicing | None | |
| Continuous reading | Max. 510 MB/s | |
| Continuous writing | Max. 460 MB/s | |
| IOPS [3] | | |
|    4k read | Max. 90,000 (random) | |
|    4k write | Max. 35,000 (random) | |
| **Endurance** | | |
| MLC flash memory | Yes | |
| Data volume | | |
|    Theoretical | 768 TBW [4] | |
|    Client workload | 148 TBW [5] | 200 TBW [5] |
| Compatibility | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) | |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| **Ambient conditions** | | |
| Temperature | | |
|    Operation | -30 to 85°C | -40 to 85°C |
|    Storage | -40 to 85°C | |
|    Transport | -40 to 85°C | |
| Relative humidity | | |
|    Operation | 5 to 90%, non-condensing | |
|    Storage | 5 to 95%, non-condensing | |
|    Transport | 5 to 95%, non-condensing | |
| Vibration | | |
|    Operation | 10 to 2000 Hz: 20 g | |
|    Storage | 10 to 2000 Hz: 20 g | |
|    Transport | 10 to 2000 Hz: 20 g | |
| Shock | | |
|    Operation | 1500 g, 0.5 ms | |
|    Storage | 1500 g, 0.5 ms | |
|    Transport | 1500 g, 0.5 ms | |
| **Mechanical properties** | | |
| Installation | Permanent [6] | |
| Dimensions | | |
|    Width | 13 mm | |
|    Height | 98 mm | |
|    Depth | 105 mm | |
| Weight | 118 g | |
| **Vendor information** | | |
| Manufacturer | Toshiba | |
| Manufacturer's product ID | THNSNJ256WCST | THNSNJ256WCSU |

Table 81: 5AC901.CSSD-05, 5AC901.CSSD-05 - 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)    IOPS: Random read and write input/output operations per second
4)    TBW = Terabytes written
5)    Client workload per JEDEC JESD219 standard.
6)    Slide-in compact installation.

## 4.2.9.4.4 Temperature/Humidity diagram

### 5AC901.CSSD-05 ≥ Rev. E0
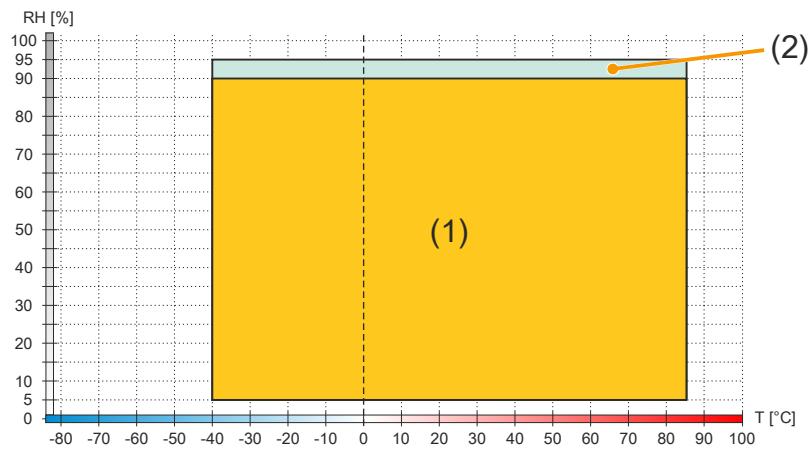


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

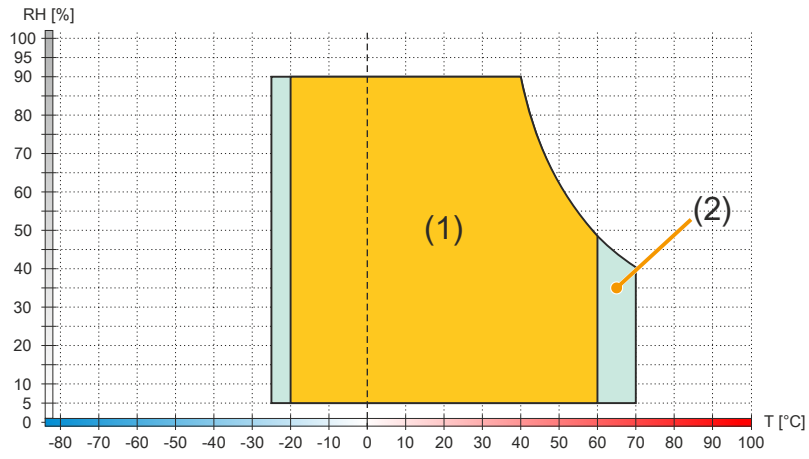### 5AC901.CSSD-05 ≤ Rev. D0
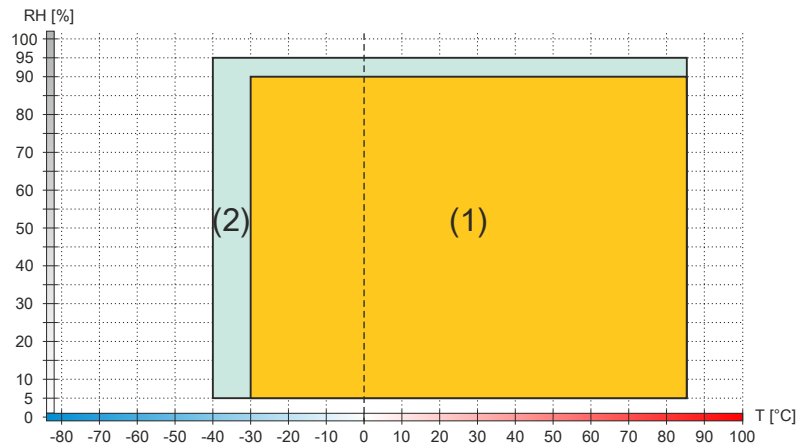


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.5 5AC901.CSSD-06

#### 4.2.9.5.1 General information

This 512 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and is SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 512 GB solid-state drive
- MLC flash memory
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 4.2.9.5.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | Drives | |
| 5AC901.CSSD-06 | 512 GB SSD MLC - Slide-in compact - Innodisk - SATA | |
| | **Optional accessories** | |
| | Drives | |
| 5MMSSD.0512-00 | 512 GB SSD MLC - Innodisk - SATA | |

Figure 18: (symbolic image)

Table 82: 5AC901.CSSD-06 - Order data

#### 4.2.9.5.3 Technical data

## Caution!

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

**The preventive use of a UPS is therefore 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.**

| Order number | 5AC901.CSSD-06 |
|---|---|
| **General information** | |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
|   DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|   EAC | Product family certification |
| **Solid-state drive** | |
| Capacity | 512 GB |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read |
| MTBF | Min. 1,500,000 h |
| S.M.A.R.T. support | Yes |
| Interface | SATA |
| Servicing | None |
| Continuous reading | Max. 510 MB/s |
| Continuous writing | Max. 460 MB/s |
| IOPS [3] | |
|   4k read | Max. 90,000 (random) |
|   4k write | Max. 35,000 (random) |

Table 83: 5AC901.CSSD-06 - Technical data

| Order number | 5AC901.CSSD-06 |
|---|---|
| **Endurance** | |
| MLC flash memory | Yes |
| Data volume | |
|    Theoretical | 1536 TBW [4] |
|    Client workload | 400 TBW [5] |
| Compatibility | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | -40 to 85°C |
|    Storage | -40 to 85°C |
|    Transport | -40 to 85°C |
| Relative humidity | |
|    Operation | 5 to 90%, non-condensing |
|    Storage | 5 to 95%, non-condensing |
|    Transport | 5 to 95%, non-condensing |
| Vibration | |
|    Operation | 10 to 2000 Hz: 20 g |
|    Storage | 10 to 2000 Hz: 20 g |
|    Transport | 10 to 2000 Hz: 20 g |
| Shock | |
|    Operation | 1500 g, 0.5 ms |
|    Storage | 1500 g, 0.5 ms |
|    Transport | 1500 g, 0.5 ms |
| **Mechanical properties** | |
| Installation | Permanent [6] |
| Dimensions | |
|    Width | 13 mm |
|    Height | 98 mm |
|    Depth | 105 mm |
| Weight | 118 g |
| **Vendor information** | |
| Manufacturer | Toshiba |
| Manufacturer's product ID | THNSNJ512WCSU |

Table 83: 5AC901.CSSD-06 - 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) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written
5) Client Workload laut JEDEC JESD219 Standard.
6) Slide-in compact installation.

## 4.2.9.5.4 Temperature/Humidity diagram

### 5AC901.CSSD-06 ≤ Rev. C0
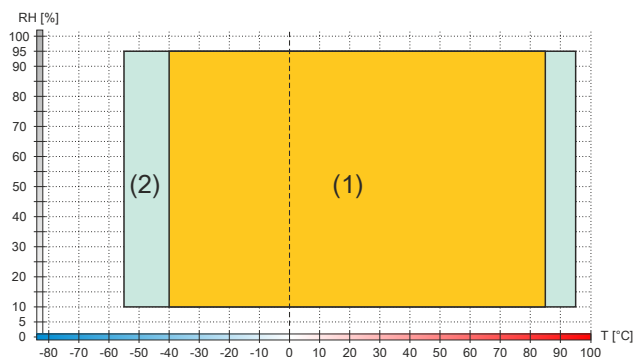


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.6 5AC901.CSSD-07

#### 4.2.9.6.1 General information

This 1 TB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and SATA 3.0 compatible. The slide-in compact drive can be used in APC910 and PPC900 system units.

- 1 TB solid-state drive
- MLC flash memory
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 4.2.9.6.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | Drives | |
| 5AC901.CSSD-07 | 1 TB SSD MLC - Slide-in compact - Innodisk - SATA |  |
| | Optional accessories | |
| | Drives | |
| 5MMSSD.1024-00 | 1 TB SSD MLC - Innodisk - SATA | |

Table 84: 5AC901.CSSD-07 - Order data

#### 4.2.9.6.3 5AC901.CSSD-07 - Technical data

| Order number | 5AC901.CSSD-07 |
|---|---|
| **General information** | |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
|   DNV GL | Temperature: **A** (0 - 45°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **B** (4 g)<br>EMC: **B** (bridge and open deck) [2] |
|   EAC | Product family certification |
| **Solid-state drive** | |
| Capacity | 1024 GB |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read |
| MTBF | Min. 3,000,000 h (at 25°C) |
| S.M.A.R.T. support | Yes |
| Interface | SATA |
| Servicing | None |
| Continuous reading | Max. 520 MB/s |
| Continuous writing | Max. 450 MB/s |
| IOPS [3] | |
|   4k read | Max. 75,000 (random) |
|   4k write | Max. 78,000 (random) |
| **Endurance** | |
| MLC flash memory | Yes |
| Data volume | |
|   Theoretical | 3072 TBW [4] |
|   Client workload | 1172 TBW [5] |
| Compatibility | SATA 3.1 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |

| Order number | 5AC901.CSSD-07 |
|---|---|
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | -40 to 85°C |
|    Storage | -55 to 95°C |
|    Transport | -55 to 95°C |
| Relative humidity | |
|    Operation | 10 to 95%, non-condensing |
|    Storage | 10 to 95%, non-condensing |
|    Transport | 10 to 95%, non-condensing |
| Vibration | |
|    Operation | 10 to 2000 Hz: 20 g |
|    Storage | 10 to 2000 Hz: 20 g |
|    Transport | 10 to 2000 Hz: 20 g |
| Shock | |
|    Operation | 1500 g, 0.5 ms |
|    Storage | 1500 g, 0.5 ms |
|    Transport | 1500 g, 0.5 ms |
| **Mechanical properties** | |
| Installation | Permanent [6] |
| Dimensions | |
|    Width | 13 mm |
|    Height | 98 mm |
|    Depth | 105 mm |
| Weight | Approx. 130 g |
| **Vendor information** | |
| Manufacturer | Innodisk |
| Manufacturer's product ID | 2.5" SATA SSD 3MV2-P 1 TB |

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) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written
5) Client workload per JEDEC JESD219 standard.
6) Slide-in compact installation.

### 4.2.9.6.4 Temperature/Humidity diagram

## 5AC901.CSSD-07 ≤ Rev. C0
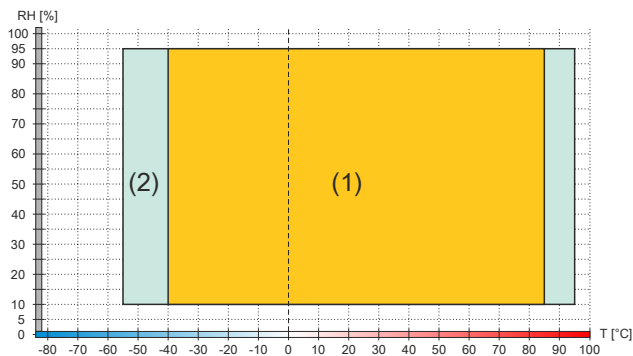


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.7 5MMSSD.0060-01

#### 4.2.9.7.1 General information

This 60 GB solid-state drive (SSD) drive can be used as a replacement part or accessory. The SSD is based on Multi Level Cell (MLC) technology.

- Replacement for 5AC801.SSDI-03 or 5AC901.CSSD-03 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

#### 4.2.9.7.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5MMSSD.0060-01 | 60 GB SSD MLC - Intel - SATA | |

Table 86: 5MMSSD.0060-01 - Order data

#### 4.2.9.7.3 Technical data

> ## Caution!
>
> **A sudden power failure can result in data loss! In very rare cases, the mass storage device may also be damaged!**
>
> **The preventive use of a UPS is therefore 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.**

| Order number | 5MMSSD.0060-01 | | |
|---|---|---|---|
| Revision | C0 | D0 | E0 |
| **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[1] | | |
| **Solid-state drive** | | | |
| Capacity | 60 GB | | |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read | | |
| MTBF | Min. 1,500,000 h | | |
| S.M.A.R.T. support | Yes | | |
| Interface | SATA | | |
| Servicing | None | | |
| Continuous reading | Max. 510 MB/s | | |
| Continuous writing | Max. 430 MB/s | | |
| IOPS [2] | | | |
|   4k read | Max. 50,000 (random) | | |
|   4k write | Max. 25,000 (random) | | |

Table 87: 5MMSSD.0060-01, 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data

| Order number | 5MMSSD.0060-01 | | |
|---|---|---|---|
| **Revision** | **C0** | **D0** | **E0** |
| **Endurance** | | | |
| MLC flash memory | Yes | | |
| Data volume | | | |
| Theoretical | 192 TBW [3] | | |
| Client workload | 35 TBW [4] | | 47 TBW [4] |
| Compatibility | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) | | |
| **Operating conditions** | | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | | |
| **Ambient conditions** | | | |
| Temperature | | | |
| Operation | 0 to 70°C | -30 to 85°C | -40 to 85°C |
| Storage | -40 to 85°C | | |
| Transport | -40 to 85°C | | |
| Relative humidity | | | |
| Operation | 8 to 90%, non-condensing | 5 to 90%, non-condensing | |
| Storage | 8 to 95%, non-condensing | 5 to 95%, non-condensing | |
| Transport | 8 to 95%, non-condensing | 5 to 95%, non-condensing | |
| Vibration | | | |
| Operation | 10 to 2000 Hz: 20 g | | |
| Storage | 10 to 2000 Hz: 20 g | | |
| Transport | 10 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 | -300 to 12,192 m | | |
| Storage | -300 to 12,192 m | | |
| Transport | -300 to 12,192 m | | |
| **Mechanical properties** | | | |
| Dimensions | | | |
| Width | 9.5 mm | 7 mm | |
| Height | 69 mm | | |
| Depth | 100 mm | | |
| Weight | 78 g | | |
| **Vendor information** | | | |
| Manufacturer | Toshiba | | |
| Manufacturer's product ID | THNSNH060GBST | THNSNJ060WCST | THNSNJ060WCSU |

Table 87: 5MMSSD.0060-01, 5MMSSD.0060-01, 5MMSSD.0060-01 - 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) IOPS: Random read and write input/output operations per second
3) TBW = Terabytes written
4) Client workload per JEDEC JESD219 standard.

### 4.2.9.7.4 Temperature/Humidity diagram

**5MMSSD.0060-01 ≤ Rev. C0**
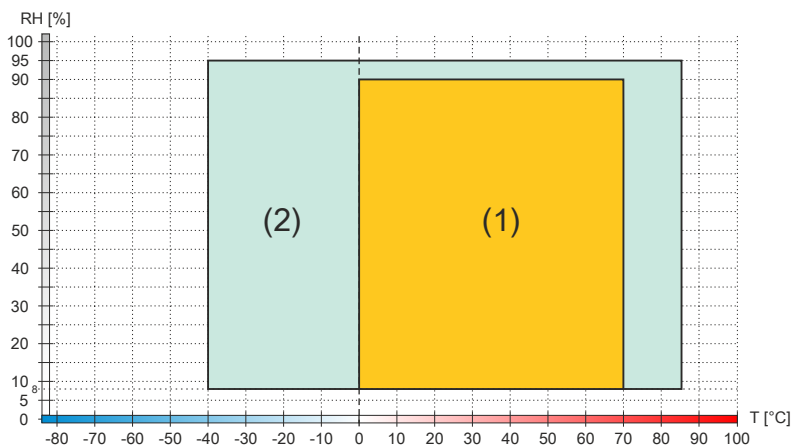


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

**5MMSSD.0060-01 Rev. D0**
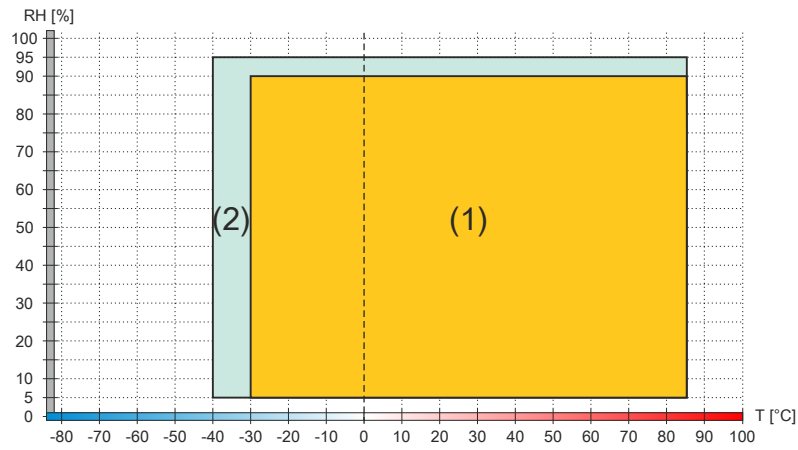


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

**5MMSSD.0060-01 ≥ Rev. E0**
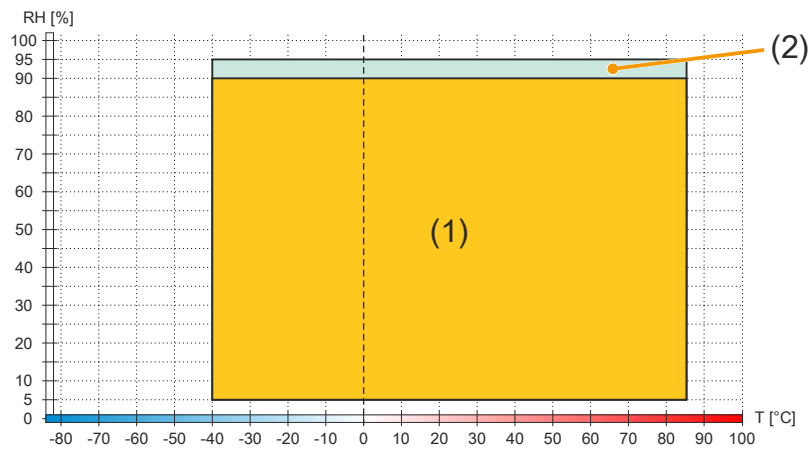


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.8 5MMSSD.0128-01

#### 4.2.9.8.1 General information

This 128 GB solid-state drive (SSD) drive can be used as a replacement part or accessory. The SSD is based on Multi Level Cell (MLC) technology.

- Replacement for 5AC801.SSDI-04 or 5AC901.CSSD-04 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

#### 4.2.9.8.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5MMSSD.0128-01 | 128 GB SSD MLC - Innodisk - SATA | |

Table 88: 5MMSSD.0128-01 - Order data

#### 4.2.9.8.3 Technical data

> ## Caution!
>
> **A sudden power failure can result in data loss! In very rare cases, the mass storage device may also be damaged!**
>
> **The preventive use of a UPS is therefore 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.**

| Order number | 5MMSSD.0128-01 | | |
|---|---|---|---|
| Revision | C0 | D0 | E0 |
| **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[1)] | | |
| **Solid-state drive** | | | |
| Capacity | 128 GB | | |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read | | |
| MTBF | Min. 1,500,000 h | | |
| S.M.A.R.T. support | Yes | | |
| Interface | SATA | | |
| Servicing | None | | |
| Continuous reading | Max. 510 MB/s | | |
| Continuous writing | Max. 450 MB/s | | |
| IOPS [2)] | | | |
|   4k read | Max. 85,000 (random) | | |
|   4k write | Max. 35,000 (random) | | |

Table 89: 5MMSSD.0128-01, 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data

| Order number | 5MMSSD.0128-01 | | |
|---|---|---|---|
| **Revision** | **C0** | **D0** | **E0** |
| **Endurance** | | | |
| MLC flash memory | Yes | | |
| Data volume | | | |
|    Theoretical | 384 TBW [3] | | |
|    Client workload | 74 TBW [4] | | 100 TBW [4] |
| Compatibility | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) | | |
| **Operating conditions** | | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | | |
| **Ambient conditions** | | | |
| Temperature | | | |
|    Operation | 0 to 70°C | -30 to 85°C | -40 to 85°C |
|    Storage | -40 to 85°C | | |
|    Transport | -40 to 85°C | | |
| Relative humidity | | | |
|    Operation | 8 to 90%, non-condensing | 5 to 90%, non-condensing | |
|    Storage | 8 to 95%, non-condensing | 5 to 95%, non-condensing | |
|    Transport | 8 to 95%, non-condensing | 5 to 95%, non-condensing | |
| Vibration | | | |
|    Operation | 10 to 2000 Hz: 20 g | | |
|    Storage | 10 to 2000 Hz: 20 g | | |
|    Transport | 10 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 | -300 to 12,192 m | | |
|    Storage | -300 to 12,192 m | | |
|    Transport | -300 to 12,192 m | | |
| **Mechanical properties** | | | |
| Dimensions | | | |
|    Width | 9.5 mm | 7 mm | |
|    Height | 69 mm | | |
|    Depth | 100 mm | | |
| Weight | 78 g | | |
| **Vendor information** | | | |
| Manufacturer | Toshiba | | |
| Manufacturer's product ID | THNSNH128GBST | THNSNJ128WCST | THNSNJ128WCSU |

Table 89: 5MMSSD.0128-01, 5MMSSD.0128-01, 5MMSSD.0128-01 - 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) IOPS: Random read and write input/output operations per second
3) TBW = Terabytes written
4) Client workload per JEDEC JESD219 standard.

### 4.2.9.8.4 Temperature/Humidity diagram

### 5MMSSD.0128-01 ≤ Rev. C0
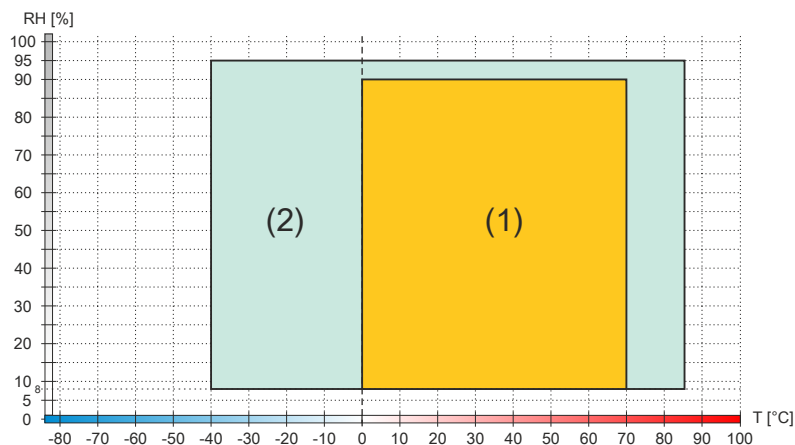


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

## 5MMSSD.0128-01 Rev. D0
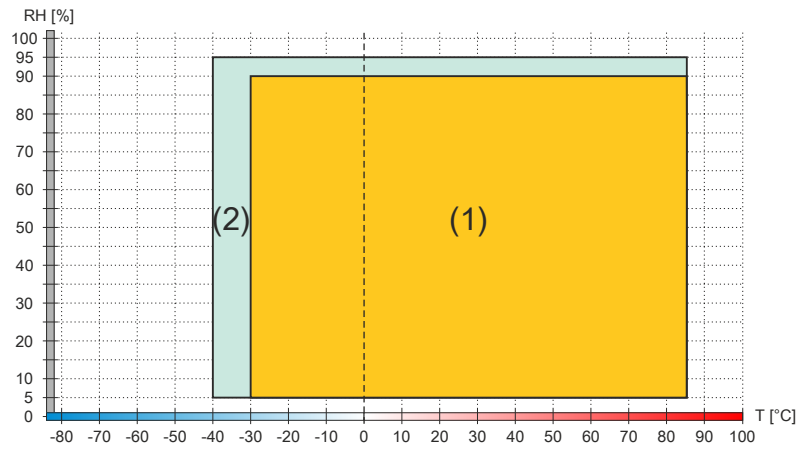


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

## 5MMSSD.0128-01 ≥ Rev. E0
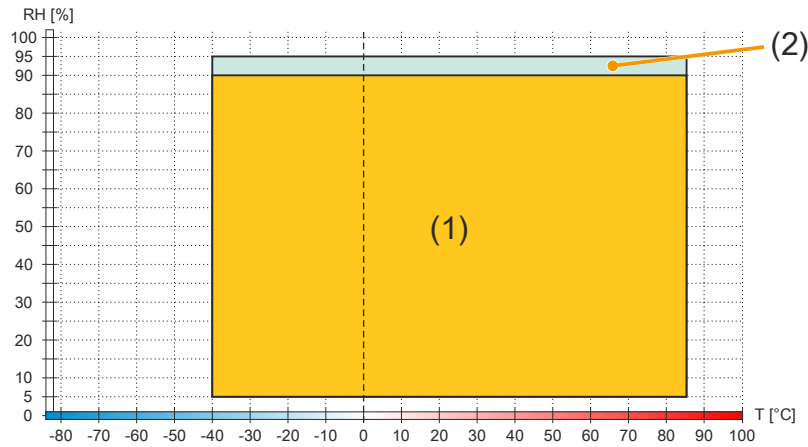


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.9 5MMSSD.0256-00

#### 4.2.9.9.1 General information

This 256 GB solid-state drive (SSD) drive can be used as a replacement part or accessory. The SSD is based on Multi Level Cell (MLC) technology.

- Replacement for 5AC801.SSDI-05 or 5AC901.CSSD-05 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

#### 4.2.9.9.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | Drives | |
| 5MMSSD.0256-00 | 256 GB SSD MLC - Innodisk - SATA | |

Table 90: 5MMSSD.0256-00 - Order data

#### 4.2.9.9.3 Technical data

## Caution!

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

**The preventive use of a UPS is therefore 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.**

| Order number | 5MMSSD.0256-00 | |
|---|---|---|
| Revision | C0 | D0 |
| **General information** | | |
| Certifications | | |
|   CE | Yes | |
|   UL | cULus E115267<br>Industrial control equipment | |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD[1] | |
| **Solid-state drive** | | |
| Capacity | 256 GB | |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read | |
| MTBF | Min. 1,500,000 h | |
| S.M.A.R.T. support | Yes | |
| Interface | SATA | |
| Servicing | None | |
| Continuous reading | Max. 510 MB/s | |
| Continuous writing | Max. 460 MB/s | |
| IOPS [2] | | |
|   4k read | Max. 90,000 (random) | |
|   4k write | Max. 35,000 (random) | |

Table 91: 5MMSSD.0256-00, 5MMSSD.0256-00 - Technical data

| Order number | 5MMSSD.0256-00 | |
|---|---|---|
| Revision | C0 | D0 |
| **Endurance** | | |
| MLC flash memory | Yes | |
| Data volume | | |
|   Theoretical | 768 TBW [3] | |
|   Client workload | 148 TBW [4] | 200 TBW [4] |
| Compatibility | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) | |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| **Ambient conditions** | | |
| Temperature | | |
|   Operation | -30 to 85°C | -40 to 85°C |
|   Storage | -40 to 85°C | |
|   Transport | -40 to 85°C | |
| Relative humidity | | |
|   Operation | 5 to 90%, non-condensing | |
|   Storage | 5 to 95%, non-condensing | |
|   Transport | 5 to 95%, non-condensing | |
| Vibration | | |
|   Operation | 10 to 2000 Hz: 20 g | |
|   Storage | 10 to 2000 Hz: 20 g | |
|   Transport | 10 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 | -300 to 12,192 m | |
|   Storage | -300 to 12,192 m | |
|   Transport | -300 to 12,192 m | |
| **Mechanical properties** | | |
| Dimensions | | |
|   Width | 7 mm | |
|   Height | 69 mm | |
|   Depth | 100 mm | |
| Weight | 78 g | |
| **Vendor information** | | |
| Manufacturer | Toshiba | |
| Manufacturer's product ID | THNSNJ256WCST | THNSNJ256WCSU |

Table 91: 5MMSSD.0256-00, 5MMSSD.0256-00 - 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) IOPS: Random read and write input/output operations per second
3) TBW = Terabytes written
4) Client workload per JEDEC JESD219 standard.

### 4.2.9.9.4 Temperature/Humidity diagram

**5MMSSD.0256-00 ≤ Rev. C0**
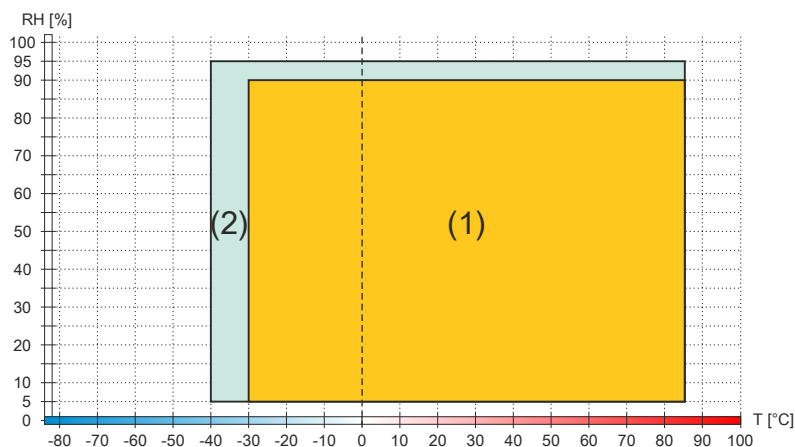


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C | |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** | |

**5MMSSD.0256-00 ≤ Rev. D0**
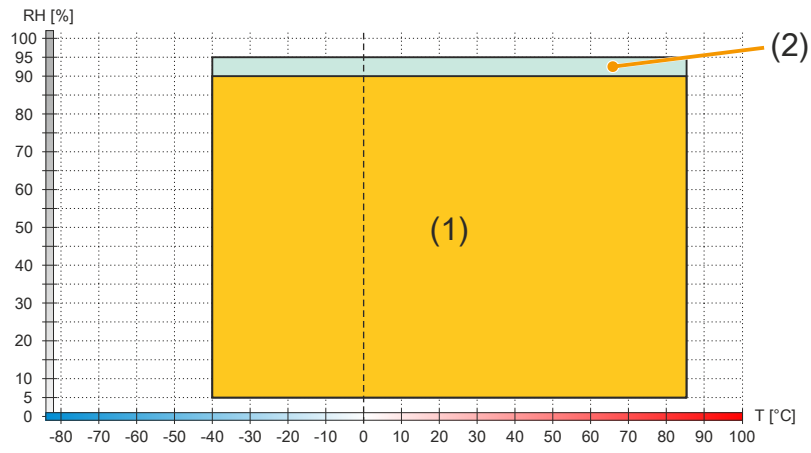


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C | |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** | |

## 4.2.9.10 5MMSSD.0512-00

### 4.2.9.10.1 General information

This 512 GB solid-state drive (SSD) drive can be used as a replacement part or accessory. The SSD is based on Multi Level Cell (MLC) technology.

- Replacement for the SSD drive 5AC901.CSSD-06

### 4.2.9.10.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5MMSSD.0512-00 | 512 GB SSD MLC - Innodisk - SATA | |

Table 92: 5MMSSD.0512-00 - Order data

### 4.2.9.10.3 Technical data up to Rev. C0

| Order number | 5MMSSD.0512-00 |
|---|---|
| **General information** | |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD[1] |
| **Solid-state drive** | |
| Capacity | 512 GB |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read |
| MTBF | Min. 1,500,000 h |
| S.M.A.R.T. support | Yes |
| Interface | SATA |
| Servicing | None |
| Continuous reading | Max. 510 MB/s |
| Continuous writing | Max. 460 MB/s |
| IOPS [2] | |
|   4k read | Max. 90,000 (random) |
|   4k write | Max. 35,000 (random) |
| **Endurance** | |
| MLC flash memory | Yes |
| Data volume | |
|   Theoretical | 1536 TBW [3] |
|   Client workload | 400 TBW [4] |
| Compatibility | SATA 3.1 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|   Operation | -40 to 85°C |
|   Storage | -40 to 85°C |
|   Transport | -40 to 85°C |
| Relative humidity | |
|   Operation | 5 to 90%, non-condensing |
|   Storage | 5 to 95%, non-condensing |
|   Transport | 5 to 95%, non-condensing |

| Order number | 5MMSSD.0512-00 |
|---|---|
| Vibration | |
|     Operation | 10 to 2000 Hz: 20 g |
|     Storage | 10 to 2000 Hz: 20 g |
|     Transport | 10 to 2000 Hz: 20 g |
| Shock | |
|     Operation | 1500 g, 0.5 ms |
|     Storage | 1500 g, 0.5 ms |
|     Transport | 1500 g, 0.5 ms |
| **Mechanical properties** | |
| Dimensions | |
|     Width | 7 mm |
|     Height | 69 mm |
|     Depth | 100 mm |
| Weight | 78 g |
| **Vendor information** | |
| Manufacturer | Toshiba |
| Manufacturer's product ID | THNSNJ512WCSU |

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) IOPS: Random read and write input/output operations per second
3) TBW = Terabytes written
4) Client workload per JEDEC JESD219 standard.

### 4.2.9.10.4 Temperature/Humidity diagram

### 5MMSSD.0512-00 ≤ Rev. C0
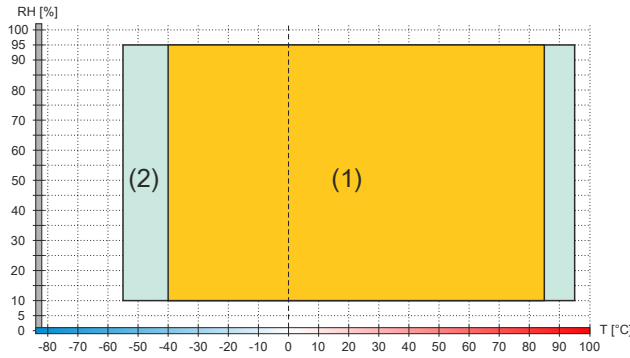


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

### 4.2.9.11 5MMSSD.1024-00

#### 4.2.9.11.1 General information

This 1 TB solid-state drive (SSD) drive can be used as a replacement part. The SSD is based on multi-level cell (MLC) technology.

- Replacement drive for 5AC901.CSSD-C00 SSD drive

#### 4.2.9.11.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5MMSSD.1024-00 | 1 TB SSD MLC - Innodisk - SATA | |

Table 94: 5MMSSD.1024-00 - Order data

#### 4.2.9.11.3 Technical data

## Caution!

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

**The preventive use of a UPS is therefore 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.**

| Order number | 5MMSSD.1024-00 |
|---|---|
| **General information** | |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD[1] |
| **Solid-state drive** | |
| Capacity | 1024 GB |
| Data reliability | Max. 1 unrecoverable error per $10^{15}$ bits read |
| MTBF | Min. 1,500,000 h |
| S.M.A.R.T. support | Yes |
| Interface | SATA |
| Servicing | None |
| Continuous reading | Max. 520 MB/s |
| Continuous writing | Max. 460 MB/s |
| IOPS [2] | |
|   4k read | Max. 75,000 (random) |
|   4k write | Max. 75,000 (random) |
| **Endurance** | |
| MLC flash memory | Yes |

Table 95: 5MMSSD.1024-00 - Technical data

| Order number | 5MMSSD.1024-00 |
|---|---|
| **Data volume** | |
| Theoretical | 3072 TBW [3] |
| Client workload | 1172 TBW [4] |
| Compatibility | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| **Ambient conditions** | |
| Temperature | |
| Operation | 0 to 70°C |
| Storage | -40 to 85°C |
| Transport | -40 to 85°C |
| Relative humidity | |
| Operation | 0 to 95%, non-condensing |
| Storage | 0 to 95%, non-condensing |
| Transport | 0 to 95%, non-condensing |
| Vibration | |
| Operation | 5 to 800 Hz: 5 g |
| Storage | 5 to 800 Hz: 20 g |
| Transport | 5 to 800 Hz: 20 g |
| Shock | |
| Operation | 1500 g, 0.5 ms |
| Storage | 1500 g, 0.5 ms |
| Transport | 1500 g, 0.5 ms |
| Elevation | |
| Operation | -300 to 12,192 m |
| Storage | -300 to 12,192 m |
| Transport | -300 to 12,192 m |
| **Mechanical properties** | |
| Dimensions | |
| Width | 7 mm |
| Height | 69 mm |
| Depth | 100 mm |
| Weight | 58 g |
| **Vendor information** | |
| Manufacturer | Transcend |
| Manufacturer's product ID | TS1TSSD370S |

Table 95: 5MMSSD.1024-00 - 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) IOPS: Random read and write input/output operations per second
3) TBW = Terabytes written
4) Client workload per JEDEC JESD219 standard.

### 4.2.9.11.4 Temperature/Humidity diagram

### 5MMSSD.1024-00 ≤ Rev. C0
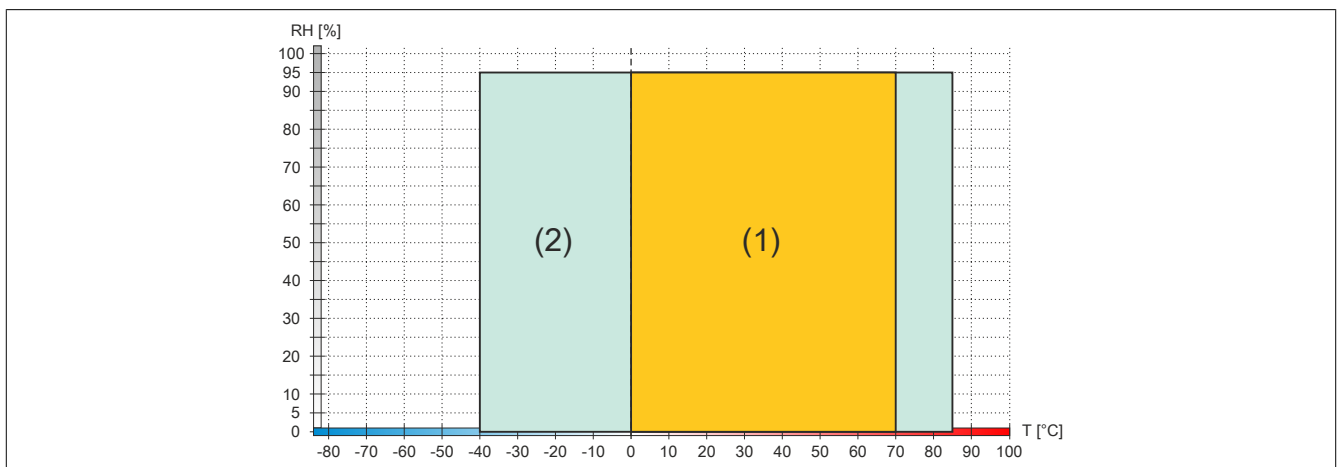


| Diagram legend | | | | |
|---|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

**4.2.9.12 5AC901.CHDD-99**

**4.2.9.12.1 General information**

The slide-in compact kit can be used as a replacement part for the slide-in compact drives (HDD/SSD). It consists of a removal strip, plastic guide rails and the necessary screws.

> **Information:**
>
> **If this slide-in compact kit is used with components not approved by B&R (HDD/SSD), B&R cannot guarantee its fit, form and function. In addition, B&R cannot guarantee compliance with the specifications, standards and certifications applicable to this device.**

**4.2.9.12.2 Order data**

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5AC901.CHDD-99 | Slide-in compact kit | |

Table 96: 5AC901.CHDD-99 - Order data

### 4.2.9.13 5AC901.CCFA-00

#### 4.2.9.13.1 General information

This CFast adapter is a slide-in compact adapter that allows a CFast card to be inserted and operated on a B&R industrial PC. The CFast adapter can be used in APC910 and PPC900 system units.

- CFast slot
- Slide-in compact

#### 4.2.9.13.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5AC901.CCFA-00 | CFast adapter - For slide-in compact slot | |
| | **Optional accessories** | |
| | **CFast cards** | |
| 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.2048-00 | CFast 2 GB SLC | |
| 5CFAST.256G-10 | CFast 256 GB MLC | |
| 5CFAST.4096-00 | CFast 4 GB SLC | |
| 5CFAST.8192-00 | CFast 8 GB SLC | |

Table 97: 5AC901.CCFA-00 - Order data

#### 4.2.9.13.3 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.**

| Order number | 5AC901.CCFA-00 |
|---|---|
| **General information** | |
| Certifications | |
| CE | Yes |
| UL | cULus E115267<br>Industrial control equipment |
| HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
| EAC | Product family certification |
| **Interfaces** | |
| CFast slot | |
| Quantity | 1 |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
| Operation | Depends on the CFast card being used |
| Storage | Depends on the CFast card being used |
| Transport | Depends on the CFast card being used |
| Relative humidity | |
| Operation | Depends on the CFast card being used |
| Storage | Depends on the CFast card being used |
| Transport | Depends on the CFast card being used |

Table 98: 5AC901.CCFA-00 - Technical data

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

### 4.2.9.14 5AC901.SDVW-00

#### 4.2.9.14.1 General information

The DVD-R/RW slide-in drive can be used in APC910 system units and PPC900 bus units with a slide-in drive slot.

- DVD-R/RW, DVD+R/RW drive
- Slide-in

#### 4.2.9.14.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Drives** | |
| 5AC901.SDVW-00 | DVD drive - DVD-R/RW\|DVD+R/RW - Slide-in | |

Table 99: 5AC901.SDVW-00 - Order data

#### 4.2.9.14.3 Technical data

## Caution!

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

**The preventive use of a UPS is therefore 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.**

| Order number | 5AC901.SDVW-00 |
|---|---|
| **General information** | |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
|    DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|    EAC | Product family certification |
| **CD/DVD drive** | |
| Data buffer capacity | 2 MB |
| Data transfer rate | Max. 33.3 MB/s |
| Speed | Max. 5160 rpm ±1% |
| Noise level | Approx. 45 dBA at a distance of 50 cm (full read access) |
| Compatible formats | CD-DA, CD-ROM mode 1/ mode 2<br>CD-ROM XA mode 2 (form 1, form 2)<br>Photo CD (single-/multi-session), Enhanced CD, CD text<br>DVD-ROM, DVD-R, DVD-R (dual layer), DVD-RW, DVD-Video<br>DVD-RAM (4.7 GB, 2.6 GB)<br>DVD+R, DVD+R (dual layer), DVD+RW |
| Laser class | Class 1 laser |
| Service life | 60,000 POH (power-on hours) |
| Interface | SATA |
| Startup time | |
|    CD | Max. 14 seconds (from 0 rpm to read operation) |
|    DVD | Max. 15 seconds (from 0 rpm to read operation) |

Table 100: 5AC901.SDVW-00 - Technical data

| Order number | 5AC901.SDVW-00 |
|---|---|
| Access time | |
|     CD | On average 140 ms (24x) |
|     DVD | On average 150 ms (8x) |
| Readable media | |
|     CD | CD/CD-ROM (12 cm, 8 cm), CD-R, CD-RW |
|     DVD | DVD-ROM, DVD-R, DVD-R (dual layer), DVD-RW. DVD-RAM, DVD+R, DVD+R (dual layer), DVD+RW, DVD-RAM |
| Writable media | |
|     CD | CD-R, CD-RW |
|     DVD | DVD-R/RW, DVD-R (dual layer), DVD-RAM (4.7 GB), DVD+R/RW, DVD+R (dual layer) |
| Read speed | |
|     CD | 24x |
|     DVD | 8x |
| Write speed | |
|     CD-R | 24x, 16x, 10x and 4x |
|     CD-RW | 24x, 16x, 10x and 4x |
|     DVD+R | 8x, 4x and 2.4x |
|     DVD+R (dual layer) | 6x, 4x and 2.4x |
|     DVD+RW | 4x and 2x |
|     DVD-R | 8x, 4x and 2x |
|     DVD-R (dual layer) | 6x, 4x and 2x |
|     DVD-RAM [3] | 5x, 3x and 2x |
|     DVD-RW | 6x, 4x and 2x |
| Write methods | |
|     CD | Disk at once, session at once, packet write, track at once |
|     DVD | Disk at once, incremental, overwrite, sequential, multi-session |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature [4] | |
|     Operation | 5 to 55°C [5] |
|     Storage | -20 to 60°C |
|     Transport | -40 to 65°C |
| Relative humidity | |
|     Operation | 8 to 80%, non-condensing |
|     Storage | 5 to 95%, non-condensing |
|     Transport | 5 to 95%, non-condensing |
| Vibration | |
|     Operation | 5 to 500 Hz: 0.2 g |
|     Storage | 5 to 500 Hz: 2 g |
|     Transport | 5 to 500 Hz: 2 g |
| Shock | |
|     Operation | At max. 5 g and 11 ms duration |
|     Storage | At max. 60 g and 11 ms duration<br>At max. 200 g and 2 ms duration |
|     Transport | At max. 60 g and 11 ms duration<br>At max. 200 g and 2 ms duration |
| **Mechanical properties** | |
| Dimensions | |
|     Width | 22 mm |
|     Height | 172.5 mm |
|     Depth | 150 mm |
| Weight | 400 g |

Table 100: 5AC901.SDVW-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) RAM drivers are not provided by the manufacturer. Support for the RAM function by burning software packages or drivers from third-party suppliers.
4) The temperature specifications correspond to a specification at 500 meters. The max. ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.
5) Surface temperature of drive.

**4.2.9.14.4 Temperature/Humidity diagram**
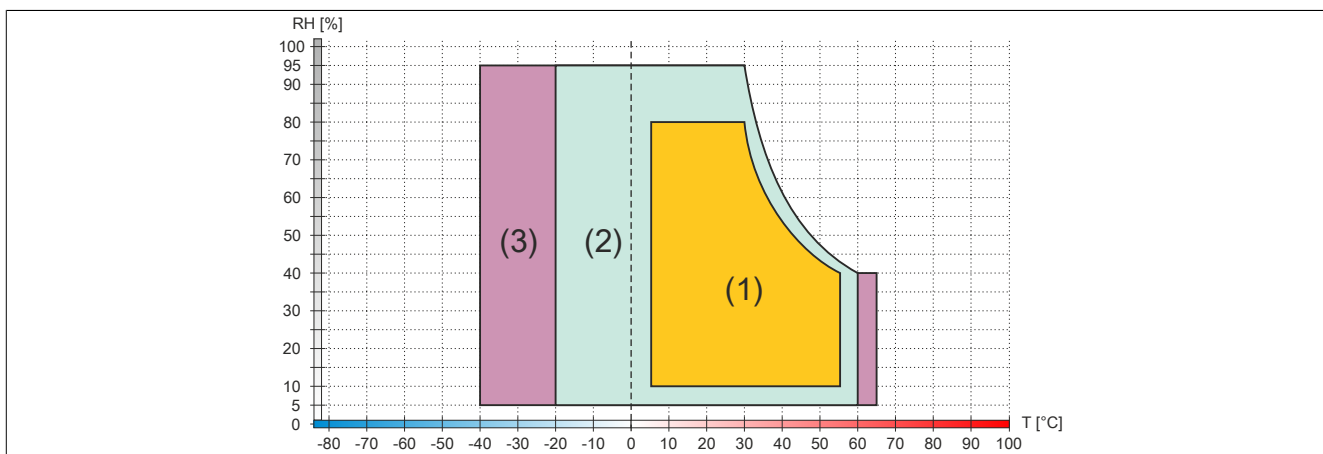


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage | RH [%] | Relative humidity (RH) in percent and **non-condensing** |
| (3) | Transport | | |

### 4.2.9.15 5AC901.SSCA-00

#### 4.2.9.15.1 General information

The slide-in compact adapter is a slide-in adapter that allows a slide-in compact drive to be installed and operated on a B&R industrial PC. The slide-in compact adapter can be used in APC910 system units and PPC900 bus units.

- Slide-in compact slot
- Slide-in

#### 4.2.9.15.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | Drives | |
| 5AC901.SSCA-00 | Slide-in compact adapter - For slide-in compact drives | |
| | Optional accessories | |
| | Drives | |
| 5AC901.CCFA-00 | CFast adapter - For slide-in compact slot | |
| 5AC901.CHDD-01 | 500 GB hard disk - Slide-in compact - SATA | |
| 5AC901.CSSD-00 | 32 GB SSD SLC - Slide-in compact - SATA | |
| 5AC901.CSSD-03 | 60 GB SSD MLC - Slide-in compact - Innodisk - SATA | |
| 5AC901.CSSD-04 | 128 GB SSD MLC - Slide-in compact - Innodisk - SATA | |
| 5AC901.CSSD-05 | 256 GB SSD MLC - Slide-in compact - Innodisk - SATA | |
| 5AC901.CSSD-06 | 512 GB SSD MLC - Slide-in compact - Innodisk - SATA | |
| 5AC901.CSSD-07 | 1 TB SSD MLC - Slide-in compact - Innodisk - SATA | |
| 5AC901.CSSD-C02 | 60 GB SSD MLC - Slide-in compact - SATA - Customized - | |

Table 101: 5AC901.SSCA-00 - Order data

#### 4.2.9.15.3 Technical data

> ## Caution!
>
> **A sudden power failure can result in data loss! In very rare cases, the mass storage device may also be damaged!**
>
> **The preventive use of a UPS is therefore 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.**

| Order number | 5AC901.SSCA-00 |
|---|---|
| **General information** | |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
|   DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|   EAC | Product family certification |
| **Slots** | |
| Slide-in compact drives | 1 |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|   Operation | Depends on the slide-in compact drive being used |
|   Storage | Depends on the slide-in compact drive being used |
|   Transport | Depends on the slide-in compact drive being used |

Table 102: 5AC901.SSCA-00 - Technical data

| Order number | 5AC901.SSCA-00 |
|---|---|
| Relative humidity | |
|     Operation | Depends on the slide-in compact drive being used |
|     Storage | Depends on the slide-in compact drive being used |
|     Transport | Depends on the slide-in compact drive being used |

Table 102: 5AC901.SSCA-00 - Technical data

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

### 4.2.10 Interface options
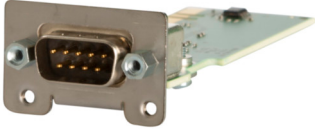
#### 4.2.10.1 5AC901.I232-00

##### 4.2.10.1.1 General information

Interface option 5AC901.I232-00 is equipped with an RS232 interface.

- 1x RS232 interface
- Compatible with APC910/PPC900 and APC3100/PPC3100

##### 4.2.10.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.I232-00 | Interface card - 1x RS232 interface - For APC910/PPC900/ APC3100/PPC3100 | |

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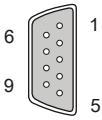
> # Information:
>
> **The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this accessory is installed, for example.**

| Order number | 5AC901.I232-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xF400 |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267 Industrial control equipment |
|   EAC | Product family certification |
| **Interfaces** | |
| COM | |
|   Type | RS232, modem supported, not galvanically isolated |
|   Variant | DSUB, 9-pin, male |
|   UART | 16550-compatible, 16-byte FIFO buffer |
|   Max. baud rate | 115 kbit/s |
| **Electrical properties** | |
| Power consumption | 1 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|   Operation | 0 to 60°C [1] |
|   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 | Approx. 30 g |

1)     For detailed information, see the temperature tables in the user's manual.

### 4.2.10.1.3.1 Pinout

| Serial interface COM[1] | | |
|---|---|---|
| | **RS232** | |
| Variant | DSUB, 9-pin, male | |
| Type | RS232, modem supported | |
| UART | 16550-compatible, 16-byte FIFO buffer | |
| Galvanic isolation | No | |
| Transfer rate | Max. 115 kbit/s | |
| Bus length | Max. 15 m | |
| **Pin** | **Pinout** | |
| 1 | DCD | |
| 2 | RXD | |
| 3 | TXD | |
| 4 | DTR | |
| 5 | GND | |
| 6 | DSR | |
| 7 | RTS | |
| 8 | CTS | |
| 9 | RI | |

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.

### 4.2.10.1.3.2 I/O address and IRQ

When operated in the PPC900:

| Slot | I/O address | IRQ |
|---|---|---|
| IF option 1 (COM E) | 2E8h - 2EFh | 10 |
| IF option 2 (COM F) | 228h - 22Fh | 7 |

### 4.2.10.1.3.3 Cable data

For more detailed information about the transfer rate, bus length or cable requirements for the respective interfaces/buses, see "Cable data" on page 337.

### 4.2.10.2 5AC901.I485-00

#### 4.2.10.2.1 General information

Interface option 5AC901.I485-00 is equipped with an RS232/RS422/RS485 interface. The operating mode (RS232/RS422/RS485) is selected automatically depending on the electrical connection.

- 1x RS232/RS422/RS485 interface
- Compatible with APC910/PPC900 and APC3100/PPC3100

#### 4.2.10.2.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.I485-00 | Interface card - 1x RS232/RS422/RS485 interface - For APC910/PPC900/APC3100/PPC3100 |  |

#### 4.2.10.2.3 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.**

| Order number | 5AC901.I485-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xD84A |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|   EAC | Product family certification |
| **Interfaces** | |
| COM | |
|   Type | RS232/RS422/RS485, galvanically isolated |
|   Variant | DSUB, 9-pin, male |
|   UART | 16550-compatible, 16-byte FIFO buffer |
|   Max. baud rate | 115 kbit/s |
|   Terminating resistor | |
|     Type | Can be switched on and off with slide switch |
|     Default setting | Off |
| **Electrical properties** | |
| Power consumption | 1 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|   Operation | 0 to 55°C [3] |
|   Storage | -20 to 60°C |
|   Transport | -20 to 60°C |

| Order number | 5AC901.I485-00 |
|---|---|
| Relative humidity | |
|     Operation | 5 to 90%, non-condensing |
|     Storage | 5 to 95%, non-condensing |
|     Transport | 5 to 95%, non-condensing |
| **Mechanical properties** | |
| Weight | Approx. 34 g |
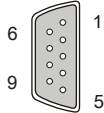
1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) For detailed information, see the temperature tables in the user's manual.

### 4.2.10.2.3.1 Pinout

| Serial interface COM | | | |
|---|---|---|---|
| | **RS232** | **RS422/485** | |
| Variant | DSUB, 9-pin, male | | |
| Type | RS232, not modem supported | | |
| UART | 16550-compatible, 16-byte FIFO buffer | | |
| Galvanic isolation | Yes | | |
| Transfer rate | Max. 115 kbit/s | | |
| Bus length | Max. 15 m | Max. 1200 m | |
| **Pin** | **RS232 - Pinout** | **RS422 - Pinout** | |
| 1 | NC.[1] | TXD\ | |
| 2 | RXD | NC. | |
| 3 | TXD | NC. | |
| 4 | NC. | TXD | |
| 5 | GND | GND | |
| 6 | NC. | RXD\ | |
| 7 | RTS | NC. | |
| 8 | CTS | NC. | |
| 9 | NC. | RXD | |

```
      6  ·····  1
            ·····
      9  ·····  5
```

1) Not connected

### 4.2.10.2.3.2 I/O address and IRQ

When operated in the PPC900:

| Slot | I/O address | IRQ |
|---|---|---|
| IF option 1 (COM E) | 2E8h - 2EFh | 10 |
| IF option 2 (COM F) | 228h - 22Fh | 7 |

### 4.2.10.2.3.3 Cable data

For more detailed information about the transfer rate, bus length or cable requirements for the respective interfaces/buses, see .

#### 4.2.10.2.3.4 Operation as RS485 interface

The pins of the RS422 default interface (1, 4, 6 and 9) must be used for operation. To do this, connect the pins as shown.
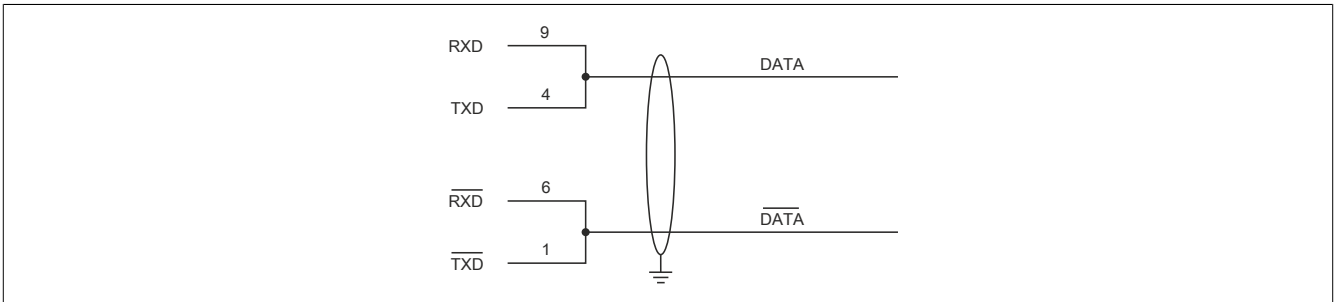


Figure 19: RS232/RS422/RS485 interface - Operation in RS485 mode

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

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.

The cable ends of an RS485 bus should be terminated (at least for longer cable lengths or higher transfer rates). Passive termination can normally be used by connecting the signal lines via a 120 Ω resistor at each of the two bus ends; see "Terminating resistor" for the IF card.

#### 4.2.10.2.3.5 Terminating resistor

A terminating resistor for the serial interface is already integrated in the IF option. This can be switched on or off with a switch (1); it is necessary to open the system unit for this. A switched-on terminating resistor is indicated by a yellow LED (2).
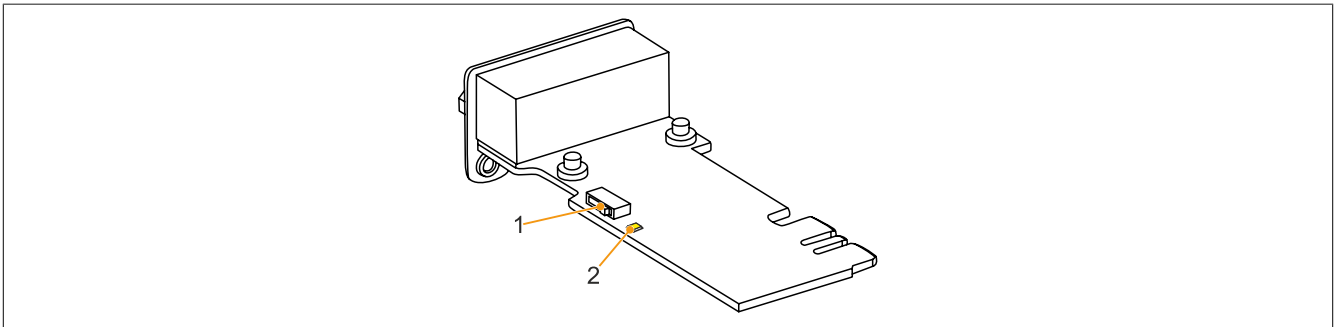
### 4.2.10.3 5AC901.ICAN-00
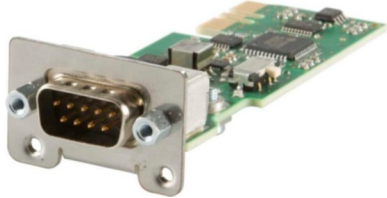
#### 4.2.10.3.1 General information

Interface option 5AC901.ICAN-00 is equipped with a CAN bus master interface.

- 1x CAN bus master interface
- Compatible with APC910/PPC900 and APC3100/PPC3100

Simultaneous operation of 2 interface options with a legacy CAN interface in slots IF option 1 and IF option 2 is not possible.

#### 4.2.10.3.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.ICAN-00 | Interface card - 1x CAN interface - For APC910/PPC900/ APC3100/PPC3100 |  |

#### 4.2.10.3.3 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.**
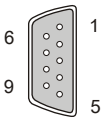
| Order number | 5AC901.ICAN-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xD84B |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|    DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|    EAC | Product family certification |
| **Interfaces** | |
| CAN | |
|    Quantity | 1 |
|    Controller | Bosch CC770 (compatible with Intel 82527 CAN controller) |
|    Variant | DSUB, 9-pin, male, electrically isolated |
|    Transfer rate | Max. 1 Mbit/s |
|    Terminating resistor | |
|      Type | Can be switched on and off with slide switch |
|      Default setting | Off |
| **Electrical properties** | |
| Power consumption | 1 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | 0 to 60°C [3] |
|    Storage | -20 to 60°C |
|    Transport | -20 to 60°C |

| Order number | 5AC901.ICAN-00 |
|---|---|
| Relative humidity | |
|     Operation | 5 to 90%, non-condensing |
|     Storage | 5 to 95%, non-condensing |
|     Transport | 5 to 95%, non-condensing |
| **Mechanical properties** | |
| Weight | Approx. 33 g |

1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, although 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 detailed information, see the temperature tables in the user's manual.

### 4.2.10.3.3.1 Pinout

| CAN bus | | |
|---|---|---|
| Variant | DSUB, 9-pin, male | |
| Galvanic isolation | Yes | |
| Transfer rate | Max. 1 Mbit/s | |
| Bus length | Max. 1000 meters | |
| **Pin** | **Pinout** | |
| 1 | NC.[1] | |
| 2 | CAN LOW | |
| 3 | GND | |
| 4 | NC. | |
| 5 | NC. | |
| 6 | Reserved | |
| 7 | CAN HIGH | |
| 8 | NC. | |
| 9 | NC. | |

1) Not connected

### 4.2.10.3.3.2 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 | IRQ10 | Interrupt |

1) Resource allocation is identical for the interface option 1 and 2 slots.

### 4.2.10.3.3.3 Cable data

For more detailed information about the transfer rate, bus length or cable requirements for the respective interfaces/buses, see .

### 4.2.10.3.3.4 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 |

### 4.2.10.3.3.5 Terminating resistor

A terminating resistor for the CAN interface is already integrated in the IF option. This can be switched on or off with a switch (1); it is necessary to open the system unit for this. A switched-on terminating resistor is indicated by a yellow LED (2).
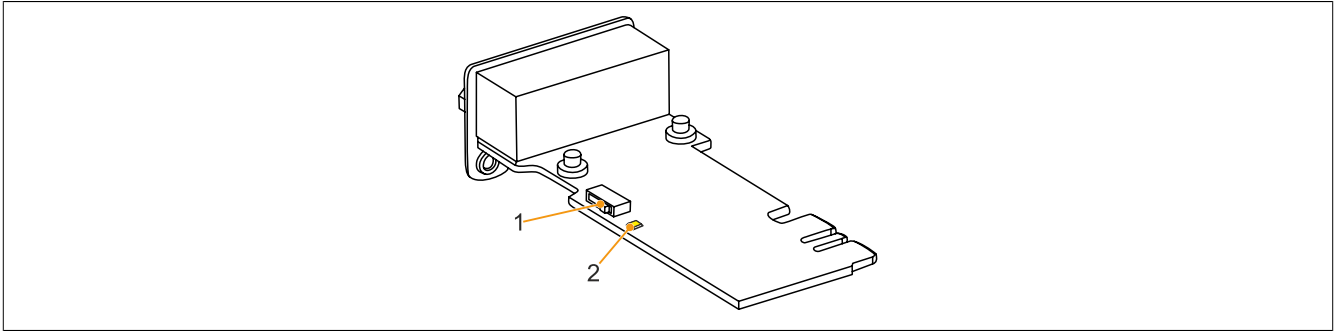
**4.2.10.3.3.6 Drivers**

Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com) (if required and not already included in the operating system).

Approved operating systems:

- Windows 10
- Automation Runtime

### 4.2.10.4 5AC901.ICAN-01
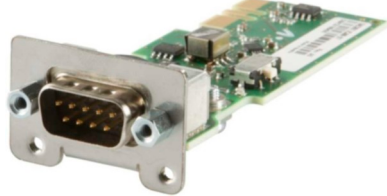
#### 4.2.10.4.1 General information

Interface option 5AC901.ICAN-01 is equipped with a CAN bus master interface.

- 1x CAN bus master interface (SJA1000)
- Compatible with APC910/PPC900 and APC3100/PPC3100

Simultaneous operation of 2 interface options with a legacy CAN interface in slots IF option 1 and IF option 2 is not possible.

#### 4.2.10.4.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.ICAN-01 | Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100 | |

#### 4.2.10.4.3 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.**

| Order number | 5AC901.ICAN-01 |
|---|---|
| **General information** | |
| B&R ID code | 0xD84C |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   EAC | Product family certification |
| **Interfaces** | |
| CAN | |
|   Quantity | 1 |
|   Controller | SJA1000 |
|   Variant | DSUB, 9-pin, male, galvanically isolated |
|   Transfer rate | Max. 1 Mbit/s |
|   Terminating resistor | |
|     Type | Can be switched on and off with slide switch |
|     Default setting | Off |
| **Electrical properties** | |
| Power consumption | 0.5 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient 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 properties** | |
| Weight | Approx. 33 g |

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.

### 4.2.10.4.3.1 Pinout

| CAN bus | |
|---|---|
| Variant | DSUB, 9-pin, male |
| Galvanic isolation | Yes |
| Transfer rate | Max. 1 Mbit/s |
| Bus length | Max. 1000 meters |
| **Pin** | **Pinout** |
| 1 | NC.[1] |
| 2 | CAN LOW |
| 3 | GND |
| 4 | NC. |
| 5 | NC. |
| 6 | Reserved |
| 7 | CAN HIGH |
| 8 | NC. |
| 9 | NC. |

1)    Not connected

### 4.2.10.4.3.2 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 | IRQ10 | Interrupt |

1)    Resource allocation is identical for the interface option 1 and 2 slots.

### 4.2.10.4.3.3 Cable data

For more detailed information about the transfer rate, bus length or cable requirements for the respective interfaces/buses, see .

### 4.2.10.4.3.4 CAN driver settings

The baud rate can be set either with predefined values or via the bit timing register. For additional information, see the technical description of the B&R CAN driver.

| 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 |

### 4.2.10.4.3.5 Terminating resistor

A terminating resistor for the CAN interface is already integrated in the IF option. This can be switched on or off with a switch (1); it is necessary to open the system unit for this. A switched-on terminating resistor is indicated by a yellow LED (2).
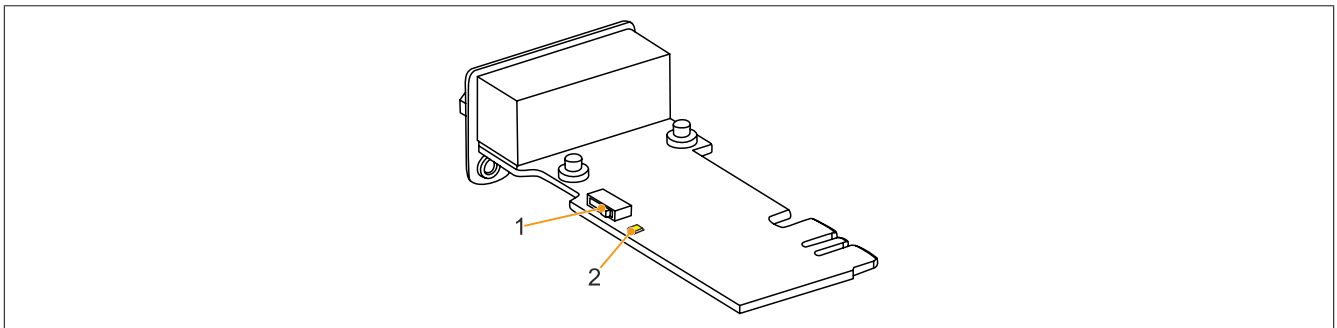
### 4.2.10.4.3.6 Drivers

Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com) (if required and not already included in the operating system).

Approved operating systems:

- Windows 10
- B&R Linux

### 4.2.10.5 5AC901.ISRM-00
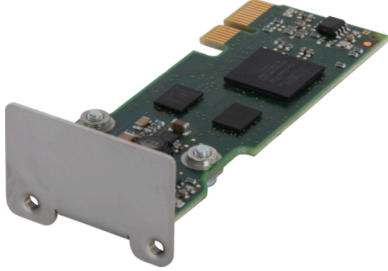
#### 4.2.10.5.1 General information

Interface option 5AC901.ISRM-00 is equipped with 2 MB SRAM.

- 2 MB SRAM
- Compatible with APC910/PPC900 and APC3100/PPC3100

This interface option can only be operated in slot IF option 2.

#### 4.2.10.5.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.ISRM-00 | Interface card - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100 | |

#### 4.2.10.5.3 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.**

| Order number | 5AC901.ISRM-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xD850 |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|   EAC | Product family certification |
| **Controller** | |
| SRAM | |
|   Size | 2 MB |
|   Battery-backed | Yes |
|   Remanent variables in power failure mode | 256 kB (for e.g. Automation Runtime, see Automation Help) |
| **Electrical properties** | |
| Power consumption | 2 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|   Operation | 0 to 55°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 properties** | |
| Weight | Approx. 20 g |

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.

**4.2.10.5.3.1 Drivers**

Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com) (if required and not already included in the operating system).

Approved operating systems:

- Windows 10
- B&R Linux

### 4.2.10.6 5AC901.IPLK-00
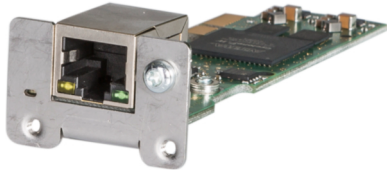
#### 4.2.10.6.1 General information

Interface option 5AC901.IPLK-00 is equipped with 1 POWERLINK interface and 2 MB SRAM.

- 1x POWERLINK interface managing or controlled node
- 2 MB SRAM
- Compatible with APC910/PPC900 and APC3100/PPC3100

This interface option can only be operated in slot IF option 2.

#### 4.2.10.6.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | Interface options | |
| 5AC901.IPLK-00 | Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100 | |

#### 4.2.10.6.3 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.**

| Order number | 5AC901.IPLK-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xE025 |
| Diagnostics | |
|    Data transfer | Yes, using status LED |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267 <br> Industrial control equipment |
|    HazLoc | cULus HazLoc E180196 <br> Industrial control equipment <br> for hazardous locations <br> Class I, Division 2, Groups ABCD, T4 [1] |
|    DNV GL | Temperature: **B** (0 - 55°C) <br> Humidity: **B** (up to 100%) <br> Vibration: **A** (0.7 g) <br> EMC: **B** (bridge and open deck) [2] |
|    EAC | Product family certification |
| **Controller** | |
| SRAM | |
|    Size | 2 MB |
|    Battery-backed | Yes |
|    Remanent variables in power failure mode | 256 kB <br> (e.g. for Automation Runtime, see Automation Help) |
| **Interfaces** | |
| POWERLINK | |
|    Quantity | 1 |
|    Type | Type 4 [3] |
|    Variant | Shielded RJ45 |
|    Transfer rate | 100 Mbit/s |
|    Transfer | 100BASE-TX |
|    Cable length | Max. 100 m between two stations (segment length) |
| **Electrical properties** | |
| Power consumption | 1.5 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | 0 to 55°C [4] |
|    Storage | -20 to 60°C |
|    Transport | -20 to 60°C |

| Order number | 5AC901.IPLK-00 |
|---|---|
| Relative humidity | |
|    Operation | 5 to 90%, non-condensing |
|    Storage | 5 to 95%, non-condensing |
|    Transport | 5 to 95%, non-condensing |
| **Mechanical properties** | |
| Weight | Approx. 35 g |
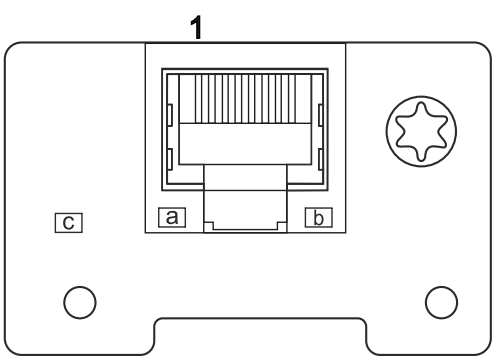
1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) More information is available in the Automation Studio help system (Communication - POWERLINK - General information - Hardware - IF / LS).
4) Detailed information can be found in the temperature tables in the user's manual.

## 4.2.10.6.3.1 Pinout

| POWERLINK | | |
|---|---|---|
| Variant | RJ45, female | |
| Wiring | S/STP (Cat 5e) | |
| Cable length | Max. 100 m (min. Cat 5e) | |
| **LED "Link" (a)** | **On** | **Active** |
| Orange (light) | Link (a connection to a POWERLINK network exists) | Blinking (data being transferred) |
| **(b)** | - | |
| | - | |
| **LED "Status/Error" (c)** | **On** | **Off** |
| Green/Red | POWERLINK status see "LED "S/E" (status/error LED)" on page 334 | |
| | - | |



## POWERLINK commissioning and operation

For a description of the operating modes, status and node numbers of the POWERLINK interface(s), see "LED "S/E" (status/error LED)" on page 334.

### 4.2.10.6.3.2 Driver support and firmware update

The POWERLINK IF option is only supported by Automation Runtime / Automation Studio starting with the following versions:

- AR upgrade AR H4.10
- Automation Studio V4.1.x.x

### 4.2.10.7 5AC901.IHDA-00
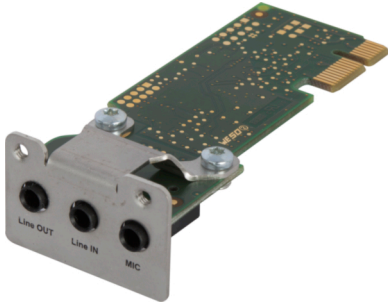
#### 4.2.10.7.1 General information

Interface option 5AC901.IHDA-00 is equipped with an HDA sound chip with externally accessible MIC, Line IN and Line OUT channels.

- 1x MIC
- 1x Line IN
- 1x Line OUT
- Compatible with APC910/PPC900 and APC3100/PPC3100

This interface option can only be operated in slot IF option 1.

#### 4.2.10.7.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.IHDA-00 | Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100 | |

#### 4.2.10.7.3 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.**

| Order number | 5AC901.IHDA-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xD84E |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
|   DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] |
|   EAC | Product family certification |
| **Interfaces** | |
| Audio | |
|   Type | HDA sound |
|   Controller | Realtek ALC 662 |
|   Inputs | Microphone, Line In |
|   Outputs | Line out |
| **Electrical properties** | |
| Power consumption | 0.4 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|   Operation | 0 to 55°C [3] |
|   Storage | -20 to 60°C |
|   Transport | -20 to 60°C |

| Order number | 5AC901.IHDA-00 |
|---|---|
| Relative humidity | |
| Operation | 5 to 90%, non-condensing |
| Storage | 5 to 95%, non-condensing |
| Transport | 5 to 95%, non-condensing |
| **Mechanical properties** | |
| Weight | Approx. 21 g |
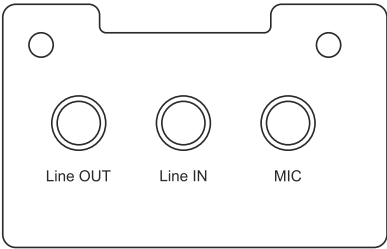
1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) For detailed information, see the temperature tables in the user's manual.

### 4.2.10.7.3.1 Pinout

All interfaces are designed as 3.5-mm jack connections (female).

| MIC, Line IN, Line OUT | | |
|---|---|---|
| Controller | Realtek ALC 662 | |
| **MIC** | Microphone input (mono) | |
| **Line IN** | Input (stereo) | |
| **Line OUT** | Output (stereo) for playback devices (e.g. amplifiers) | |
| - | | |

Line OUT   Line IN   MIC

### 4.2.10.7.3.2 Drivers

A special driver is necessary to operate the audio controller. Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com) (if required and not already included in the operating system).

## Information:

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

### 4.2.10.8 5AC901.IRDY-00
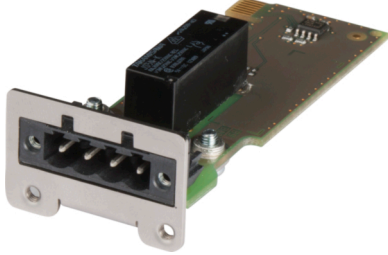
#### 4.2.10.8.1 General information

Ready relay 5AC901.IRDY-00 is switched as soon as the B&R industrial PC has started up and all internal supply voltages are applied. It is possible to connect additional devices to the ready relay; they will also be switched on when the B&R industrial PC starts up.

- 1 normally closed contact, 1 normally open contact
- Compatible with APC910/PPC900 and APC3100/PPC3100

Terminal block 0TB2104.8000 is not included in delivery and must be ordered separately.

#### 4.2.10.8.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.IRDY-00 | Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100 |  |
| | **Required accessories** | |
| | **Terminal blocks** | |
| 0TB2104.8000 | Connector 24 VDC - 4-pin female - Screw clamp terminal block 2.5 mm² | |

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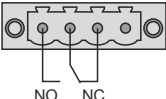
> **Information:**
>
> **The following specified characteristic data, features and limit values are only valid for this accessory and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this accessory is installed, for example.**

| Order number | 5AC901.IRDY-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xD84F |
| Ready relay | Normally open contact and normally closed contact, max. 30 VDC, max. 2 A |
| Certifications | |
|     CE | Yes |
|     UL | cULus E115267<br>Industrial control equipment |
|     EAC | Product family certification |
| **Electrical properties** | |
| Power consumption | 0.2 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|     Operation | 0 to 60°C [1] |
|     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 | Approx. 30 g |

[1] For detailed information, see the temperature tables in the user's manual.

#### 4.2.10.8.3.1 Pinout

| Ready relay | | | Connector, 4-pin, male |
|---|---|---|---|
| **Pin** | **Pinout** | **Description** | |
| 1 | NO | Normally open contact |  |
| 2 | COM | Changeover contact | |
| 3 | NC | Normally closed contact | |
| 4 | - | Not connected | |

### 4.2.10.9 5AC901.ISIO-00

#### 4.2.10.9.1 General information

The ready relay function of IF option 5AC901.ISIO-00 can be controlled using the MTCX. Corresponding commands must be issued by the MTCX in order to switch the ready relay.
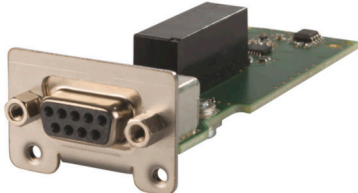
In addition to the ready relay function, the reset and power button as well as the power LED of the APC910/PPC900 or APC3100/PPC3100 can be routed externally.

- Connections for the reset button and power buttons on the PC
- Connection for LED "Power" on the PC
- 1 normally closed contact, 1 normally open contact of the ready relay
- Control of the ready relay functions using MTCX commands
- Compatible with APC910/PPC900 and APC3100/PPC3100

Unlike IF option 5AC901.IRDY-00, ready relay 5AC901.ISIO-00 is not automatically switched on or off if the power supply to the PC is switched on or off.

The maximum cable length for connecting the reset button, power button and LED "Power" is 2 m.

#### 4.2.10.9.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.ISIO-00 | Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100 |  |

#### 4.2.10.9.3 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.**

| Order number | 5AC901.ISIO-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xE674 |
| Ready relay | Normally open contact and normally closed contact, max. 30 VDC, max. 1 A |
| Certifications | |
|   CE | Yes |
|   UKCA | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   DNV | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [1] |
|   LR | ENV3 |
|   ABS | Yes |
|   BV | **EC31B**<br>Temperature: 5 - 55°C<br>Vibration: 0.7 g<br>EMC: Bridge and open deck |
|   EAC | Product family certification |
| **Electrical properties** | |
| Power consumption | 0.5 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|   Operation | 0 to 60°C [2] |
|   Storage | -20 to 60°C |
|   Transport | -20 to 60°C |

| Order number | 5AC901.ISIO-00 |
|---|---|
| Relative humidity | |
|    Operation | 5 to 90%, non-condensing |
|    Storage | 5 to 95%, non-condensing |
|    Transport | 5 to 95%, non-condensing |
| **Mechanical properties** | |
| Weight | Approx. 30 g |
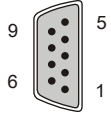
1) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV certificate for the product family.
2) For detailed information, see the temperature tables in the user's manual.

### 4.2.10.9.3.1 Pinout

| Ready relay | | |
|---|---|---|
| Cable length | Max. 2 meters | |
| **Pin** | **Pinout** | |
| 1 | Output LED ("Power") - Green | |
| 2 | Output LED ("Power") - Red | |
| 3 | GND | |
| 4 | Input - Power button | |
| 5 | Input - Reset button | |
| 6 | Relay, normally open contact | |
| 7 | Relay, normally closed contact | |
| 8 | GND | |
| 9 | COM relay, changeover contact | |

DSUB, 9-pin, female

### 4.2.10.9.3.2 Connection example

## Information:

**Series resistors for the LEDs are already installed on the interface option.**

The LED outputs are dimensioned for a typical LED current of 3.5 mA.
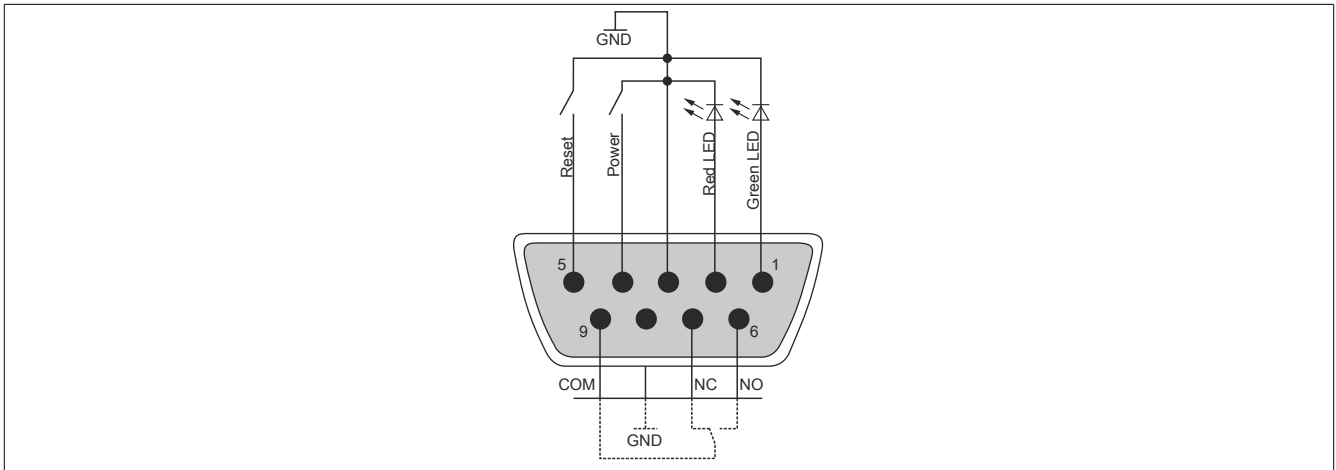
### 4.2.10.10 5AC901.IETH-00
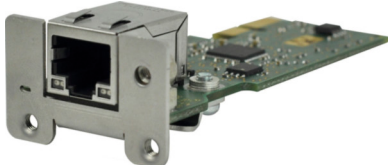
#### 4.2.10.10.1 General information

Interface option 5AC901.IETH-00 is equipped with a 10/100/1000BASE-T Ethernet interface.

- 1x Ethernet interface 10/100/1000BASE-T
- Compatible with APC910/PPC900 and APC3100/PPC3100

This interface option can only be operated in slot IF option 2.

#### 4.2.10.10.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Interface options** | |
| 5AC901.IETH-00 | Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/ APC3100/PPC3100 |  |

#### 4.2.10.10.3 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.**

| Order number | 5AC901.IETH-00 |
|---|---|
| **General information** | |
| B&R ID code | EC3C |
| Diagnostics | |
|    Data transfer | Yes, using status LED |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    DNV GL | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [1] |
|    EAC | Product family certification |
| **Interfaces** | |
| Ethernet | |
|    Quantity | 1 |
|    Controller | Intel I210 |
|    Variant | Shielded RJ45 |
|    Transfer rate | 10/100/1000 Mbit/s [2] |
|    Cable length | Max. 100 m between two stations (segment length) |
| **Electrical properties** | |
| Power consumption | 1 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | 0 to 55°C [3] |
|    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 | Approx. 35 g |

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) Switching takes place automatically.
3) For detailed information, see the temperature tables in the user's manual.

**4.2.10.10.3.1 Pinout**

| Ethernet interface (ETH[1]) | | |
|---|---|---|
| Variant | RJ45, female | |
| 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" (a)** | **On** | **Off** |
| Green | 100 Mbit/s | 10 Mbit/s[3] |
| Orange (light) | 1000 Mbit/s | - |
| **LED "Link" (b)** | **On** | **Active** |
| Orange (light) | Link (a connection to an Ethernet network exists) | Blinking (data being transferred) |

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.

**4.2.10.10.3.2 Driver support**

A special driver is necessary 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) (if required and not already included in the operating system).

Approved operating systems:

- Windows 10
- 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.**

### 4.2.11 Uninterruptible power supply (UPS)

With the optionally integrated UPS, the B&R industrial PC ensures that the PC system can complete write operations even after a power failure occurs. If the UPS detects a power failure, it switches to battery operation immediately without interruption. All running programs are properly exited by the UPS software. The possibility of inconsistent data is eliminated (only works if the UPS has already been configured and the driver is enabled).

## Information:

- **An external panel or monitor is not buffered by the UPS and will fail if a power failure occurs.**

Because the charging circuit is integrated in the housing of the B&R industrial PC, installation has been reduced to simply attaching the connection cable to the battery unit installed next to the PC.

Special emphasis was placed on simplified maintenance when designing the battery unit. Batteries are easily accessible from the front and can be replaced in just a few moments when servicing.

#### 4.2.11.1 Requirements

- A suitable system unit
- UPS IF option 5AC901.IUPS-00 or 5AC901.IUPS-01
- Battery unit 5AC901.BUPS-00 or 5AC901.BUPS-01
- UPS connection cable 5CAUPS.00xx-01
- B&R UPS configured in the ADI Control Center

## Warning!

**Battery unit 5AC901.BUPS-00 is only permitted to be operated with UPS IF option 5AC901.IUPS-00!**

**Battery unit 5AC901.BUPS-01 is only permitted to be operated with UPS IF option 5AC901.IUPS-01!**

### 4.2.11.2 5AC901.IUPS-00

#### 4.2.11.2.1 General information

UPS IF option 5AC901.IUPS-00 used together with battery unit 5AC901.BUPS-00 allows the B&R industrial PC to be switched off properly without data loss during a power failure.

This interface option can only be operated in slot IF option 1.
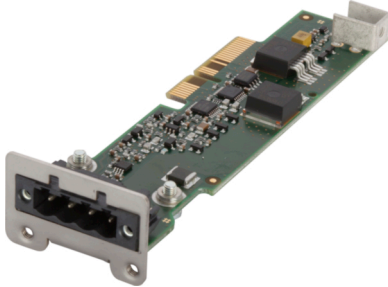
> # Warning!
>
> **UPS IF option 5AC901.IUPS-00 is only permitted to be operated with battery unit 5AC901.BUPS-00!**

> # Information:
>
> **If the system is in power saving mode (S5: soft-off or S4: hibernate/suspend-to-disk), then the internal UPS interface option charges the connected battery unit. The system's internal power supplies are active during this procedure. This allows various actions to be performed (e.g. opening the tray of the built-in slide-in DVD drive).**

#### 4.2.11.2.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Uninterruptible power supply** | |
| 5AC901.IUPS-00 | UPS - For 4.5 Ah battery | |
| | **Required accessories** | |
| | **Uninterruptible power supply** | |
| 5AC901.BUPS-00 | Battery unit 4.5 Ah - For UPS 5AC901.IUPS-00 | |
| 5CAUPS.0005-01 | UPS cable - 0.5 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0010-01 | UPS cable - 1 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0013-01 | UPS cable - 1.3 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0030-01 | UPS cable - 3 m - For 5AC901.IUPS-xx | |

#### 4.2.11.2.3 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.**

| Order number | 5AC901.IUPS-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xD851 |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|    EAC | Product family certification |
| **Electrical properties** | |
| Power consumption | Max. 30 W at 1 A |
| Deep discharge protection | Yes |
| Short-circuit proof | Yes [2] |
| Battery charging data | |
|    Charging current | Typ. 1 A |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | 0 to 55°C [3] |
|    Storage | -20 to 60°C |
|    Transport | -20 to 60°C |

| Order number | 5AC901.IUPS-00 |
|---|---|
| Relative humidity | |
|    Operation | 5 to 90%, non-condensing |
|    Storage | 5 to 95%, non-condensing |
|    Transport | 5 to 95%, non-condensing |
| **Mechanical properties** | |
| Weight | Approx. 28 g |
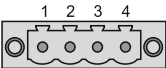
1)    Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2)    The interface option is short-circuit proof. This value does not apply to the connected battery unit.
3)    For detailed information, see the temperature tables in the user's manual.

## 4.2.11.2.3.1 Pinout

| UPS interface | | |
|---|---|---|
| Variant | 4-pin, male | |
| **Pin** | **Pinout** | 1  2  3  4 |
| 1 | Temperature sensor | |
| 2 | Temperature sensor | |
| 3 | - | |
| 4 | + | |

### 4.2.11.2.4 Installation

This module is installed using the materials included in delivery. For additional information regarding installation, see section "Installing the interface option" on page 216.

### 4.2.11.3 5AC901.IUPS-01

#### 4.2.11.3.1 General information

UPS IF option 5AC901.IUPS-01 used together with battery unit 5AC901.BUPS-01 allows the B&R industrial PC to be switched off properly without data loss during a power failure.

This interface option can only be operated in slot IF option 1.
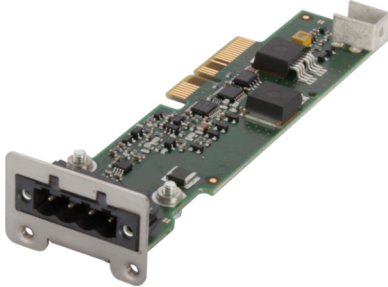
> ## Warning!
>
> **UPS IF option 5AC901.IUPS-01 is only permitted to be operated with battery unit 5AC901.BUPS-01!**

> ## Information:
>
> **If the system is in power saving mode (S5: soft-off or S4: hibernate/suspend-to-disk), then the internal UPS interface option charges the connected battery unit. The system's internal power supplies are active during this procedure. This allows various actions to be performed (e.g. opening the tray of the built-in slide-in DVD drive).**

#### 4.2.11.3.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Uninterruptible power supply** |  |
| 5AC901.IUPS-01 | UPS - For 2.2 Ah battery | |
| | **Required accessories** | |
| | **Uninterruptible power supply** | |
| 5AC901.BUPS-01 | Battery unit 2.2 Ah - For UPS 5AC901.IUPS-01 | |
| 5CAUPS.0005-01 | UPS cable - 0.5 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0010-01 | UPS cable - 1 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0013-01 | UPS cable - 1.3 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0030-01 | UPS cable - 3 m - For 5AC901.IUPS-xx | |

#### 4.2.11.3.3 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.**

| Order number | 5AC901.IUPS-01 |
|---|---|
| **General information** | |
| B&R ID code | 0xDF84 |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] |
|    EAC | Product family certification |
| **Electrical properties** | |
| Power consumption | Max. 25 W at 0.9 A |
| Deep discharge protection | Yes |
| Short-circuit proof | Yes [2] |
| Battery charging data | |
|    Charging current | Typ. 0.88 A |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | 0 to 55°C [3] |
|    Storage | -20 to 60°C |
|    Transport | -20 to 60°C |

| Order number | 5AC901.IUPS-01 |
|---|---|
| Relative humidity | |
|    Operation | 5 to 90%, non-condensing |
|    Storage | 5 to 95%, non-condensing |
|    Transport | 5 to 95%, non-condensing |
| **Mechanical properties** | |
| Weight | Approx. 28 g |
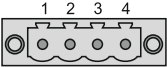
1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) The interface option provides protection against short circuits. This does not apply to the connected battery unit.
3) Detailed information can be found in the temperature tables in the user's manual.

### 4.2.11.3.3.1 Pinout

| UPS interface | | |
|---|---|---|
| Variant | 4-pin, male | |
| **Pin** | **Pinout** | |
| 1 | Temperature sensor | |
| 2 | Temperature sensor | |
| 3 | - | |
| 4 | + | |

### 4.2.11.3.4 Installation

This module is installed using the materials included in delivery. For additional information regarding installation, see section .

### 4.2.11.4 5AC901.BUPS-00

#### 4.2.11.4.1 General information

- Battery unit for UPS IF option 5AC901.IUPS-00
- Single-cell rechargeable battery
- 2 Hawker Cyclon 12 V, 4.5 Ah rechargeable batteries connected in series
- Rated voltage 24 V
- Capacity 4.5 Ah

The battery unit is subject to wear and should be replaced regularly (after the specified service life at the latest).
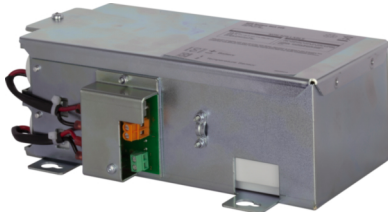
## Warning!

**Battery unit 5AC901.BUPS-00 is only permitted to be operated with UPS IF option 5AC901.IUPS-00!**

## Information:

**If the max. specified temperature limits of the battery unit are overshot or undershot, the temperature alarm of the battery unit is set. Battery backing is no longer provided if the temperature alarm for the battery unit is active. The battery is also no longer charged since this can result in damage to the battery. This temperature alarm is defined with a hysteresis of 5°C, i.e. the temperature alarm is only cleared again if the minimum temperature limit is again overshot by this hysteresis or the maximum temperature limit is again undershot by this hysteresis. The temperature or temperature alarm of the battery unit is not only monitored and checked at runtime, but also when the system is powered on; it can be evaluated using the B&R ADI library.**

#### 4.2.11.4.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Uninterruptible power supply** | |
| 5AC901.BUPS-00 | Battery unit 4.5 Ah - For UPS 5AC901.IUPS-00 | |
| | **Required accessories** | |
| | **Uninterruptible power supply** | |
| 5CAUPS.0005-01 | UPS cable - 0.5 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0010-01 | UPS cable - 1 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0013-01 | UPS cable - 1.3 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0030-01 | UPS cable - 3 m - For 5AC901.IUPS-xx | |

#### 4.2.11.4.3 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.**

| Order number | 5AC901.BUPS-00 |
|---|---|
| **General information** | |
| B&R ID code | 0xD82E |
| Battery | |
|    Type | Hawker Cyclon 12 V, 4.5 Ah, two rechargeable batteries connected in series |
|    Service life | Up to 15 years at 20°C / 10 years at 25°C [1] |
|    Variant | Single cell |
| Temperature sensor | NTC resistance |
| Service interval during storage | Charge 1 time every 6 months |
| Charge duration when battery low | Typ. 7 hours |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [2] |
|    EAC | Product family certification |
| **Electrical properties** | |
| Nominal voltage | 24 V |
| Capacity | 4.5 Ah |

| Order number | 5AC901.BUPS-00 |
|---|---|
| Fuse | Yes |
| Battery charging data | |
|     Charging current [3] | Typ. 1 A |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|     Operation | -30 to 60°C [4] |
|     Storage | -65 to 80°C |
|     Transport | -65 to 80°C |
| Relative humidity | |
|     Operation | 5 to 95%, non-condensing |
|     Storage | 5 to 95%, non-condensing |
|     Transport | 5 to 95%, non-condensing |
| Elevation | |
|     Operation | Max. 3000 m |
| **Mechanical properties** | |
| Dimensions | |
|     Width | 223.2 mm |
|     Height | 78.2 mm |
|     Depth | 145 mm |
| Weight | Approx. 4600 g |

1)    Depends on the charging and discharging cycles (up to 80% battery capacity).
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)    Maximum charging current.
4)    Battery backing is no longer provided if the temperature undershoots the minimum temperature or overshoots the maximum temperature. The battery is also no longer charged since this can result in damage to the battery.

## 4.2.11.4.4 Service life

The following diagram shows the relationship between ambient temperature and service life.
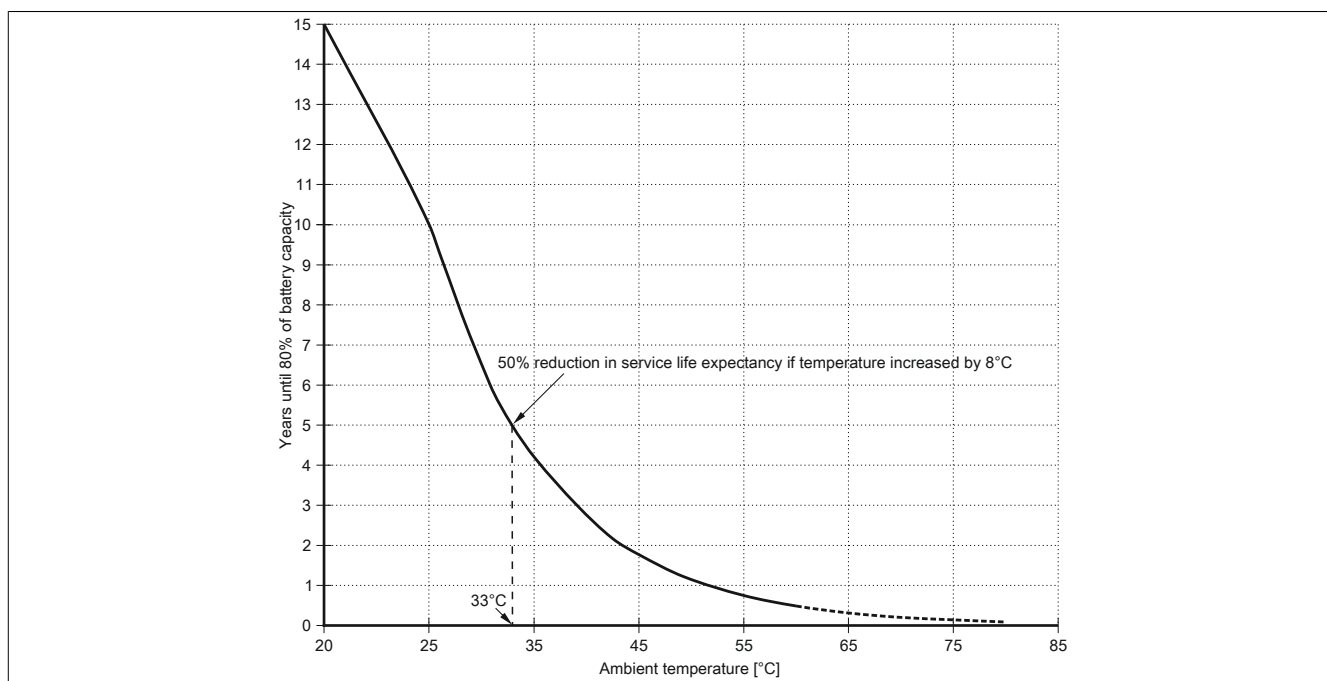
### 4.2.11.4.5 5AC901.BUPS-00 - Dimensions
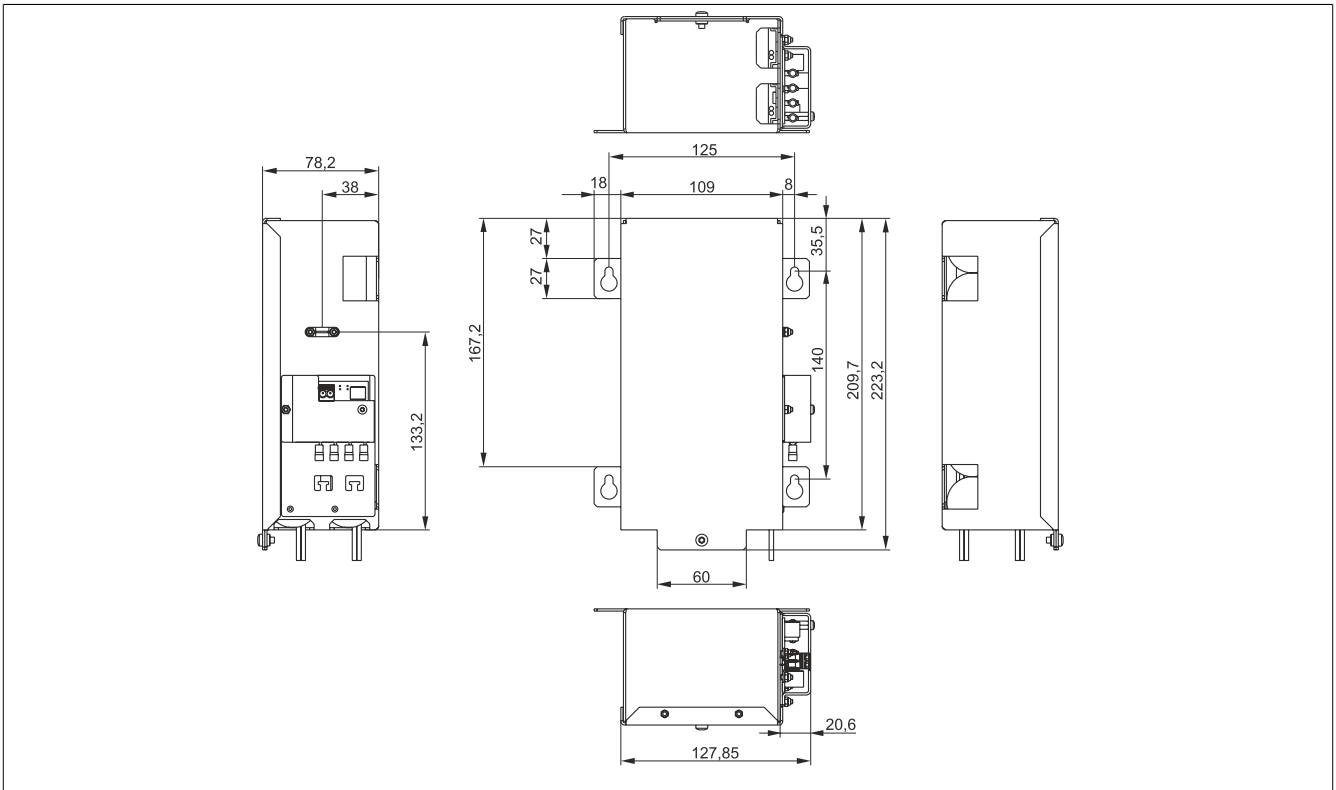


### 4.2.11.4.6 5AC901.BUPS-00 - Drilling template
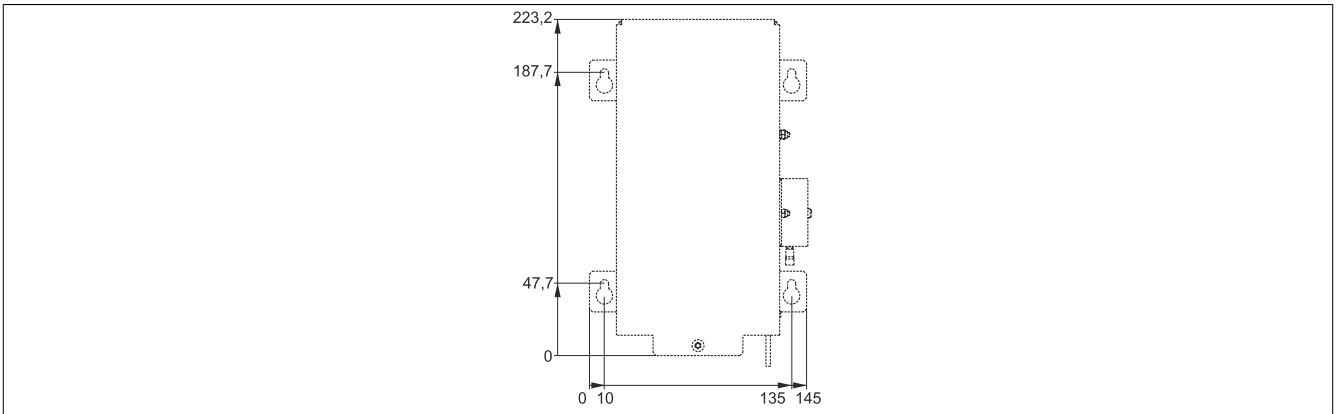


### 4.2.11.4.7 Installation

### 4.2.11.4.8 Precautions for handling and use

**Spills and leaks:**

Further leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is not permitted. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves as well as acid-resistant face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

**Waste disposal:**

Used batteries and rechargeable batteries must be disposed of in an environmentally friendly recycling process.

Neutralized mud must be stored in closed containers and stored / disposed of in accordance with applicable regulations. After neutralization and inspection, larger spills diluted with water must be disposed of in accordance with applicable regulations.

**Handling and storage:**

- Store in cool, dry and well-ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Protect from adverse weather conditions and separate from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Prevent damage to containers in which batteries and rechargeable batteries are stored and transported.
- Keep away from fire, sparks and heat.

### 4.2.11.5 5AC901.BUPS-01

#### 4.2.11.5.1 General information

- Battery unit for UPS IF option 5AC901.IUPS-01
- Maintenance-free lead acid rechargeable battery
- 2x 12 V, 2.2 Ah rechargeable batteries connected in series
- Rated voltage 24 V
- Capacity 2.2 Ah

The battery unit is subject to wear and should be replaced regularly (after the specified service life at the latest).
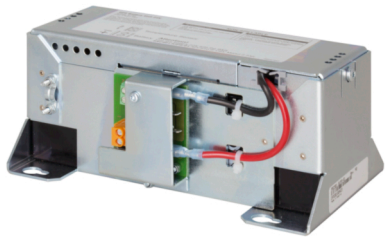
> # Warning!
>
> **Battery unit 5AC901.BUPS-01 is only permitted to be operated with UPS IF option 5AC901.IUPS-01!**

> # Information:
>
> **If the max. specified temperature limits of the battery unit are overshot or undershot, the temperature alarm of the battery unit is set. Battery backing is no longer provided if the temperature alarm for the battery unit is active. The battery is also no longer charged since this can result in damage to the battery. This temperature alarm is defined with a hysteresis of 5°C, i.e. the temperature alarm is only cleared again if the minimum temperature limit is again overshot by this hysteresis or the maximum temperature limit is again undershot by this hysteresis. The temperature or temperature alarm of the battery unit is not only monitored and checked at runtime, but also when the system is powered on; it can be evaluated using the B&R ADI library.**

#### 4.2.11.5.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Uninterruptible power supply** | |
| 5AC901.BUPS-01 | Battery unit 2.2 Ah - For UPS 5AC901.IUPS-01 | |
| | **Required accessories** | |
| | **Uninterruptible power supply** | |
| 5CAUPS.0005-01 | UPS cable - 0.5 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0010-01 | UPS cable - 1 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0013-01 | UPS cable - 1.3 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0030-01 | UPS cable - 3 m - For 5AC901.IUPS-xx | |

#### 4.2.11.5.3 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.**

| Order number | 5AC901.BUPS-01 |
|---|---|
| **General information** | |
| B&R ID code | 0xDF83 |
| Battery | |
|    Type | 12 V, 2.2 Ah, two rechargeable batteries connected in series |
|    Service life | Up to 5 years at 20°C [1] |
|    Variant | Maintenance-free lead acid battery |
| Temperature sensor | NTC resistance |
| Service interval during storage | Charge 1 time every 6 months |
| Charge duration when battery low | Typ. 5 hours |
| 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] |
|    EAC | Product family certification |
| **Electrical properties** | |
| Nominal voltage | 24 V |

| Order number | 5AC901.BUPS-01 |
|---|---|
| Capacity | 2.2 Ah |
| Fuse | Yes |
| Battery charging data | |
|    Charging current [3] | Typ. 0.88 A |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | 0 to 40°C [4] |
|    Storage | -15 to 40°C |
|    Transport | -15 to 40°C |
| Relative humidity | |
|    Operation | 25 to 85%, non-condensing |
|    Storage | 25 to 85%, non-condensing |
|    Transport | 25 to 85%, non-condensing |
| Elevation | |
|    Operation | Max. 3000 m |
| **Mechanical properties** | |
| Dimensions | |
|    Width | 188 mm |
|    Height | 78 mm |
|    Depth | 115 mm |
| Weight | Approx. 2550 g |

1) Depends on the charging and discharging cycles.
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) Maximum charging current.
4) Battery backing is no longer provided if the temperature undershoots the minimum temperature or overshoots the maximum temperature. The battery is also no longer charged since this can result in damage to the battery.

## 4.2.11.5.4 Service life

The following diagram shows the relationship between ambient temperature and service life.
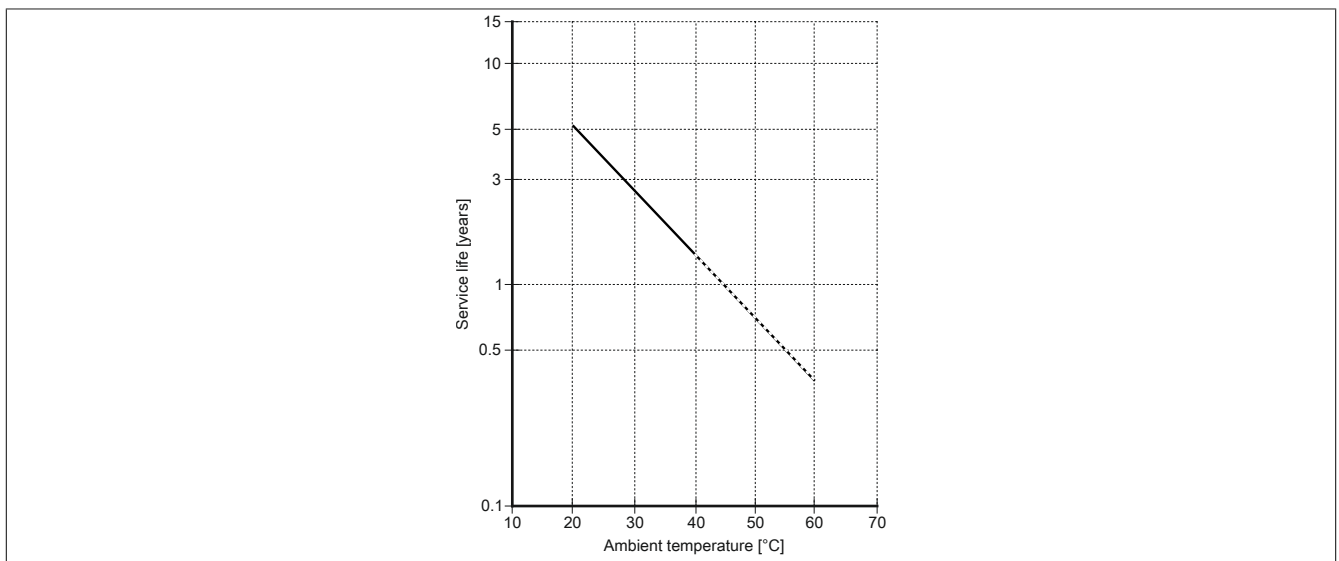
### 4.2.11.5.5 5AC901.BUPS-01 - Dimensions
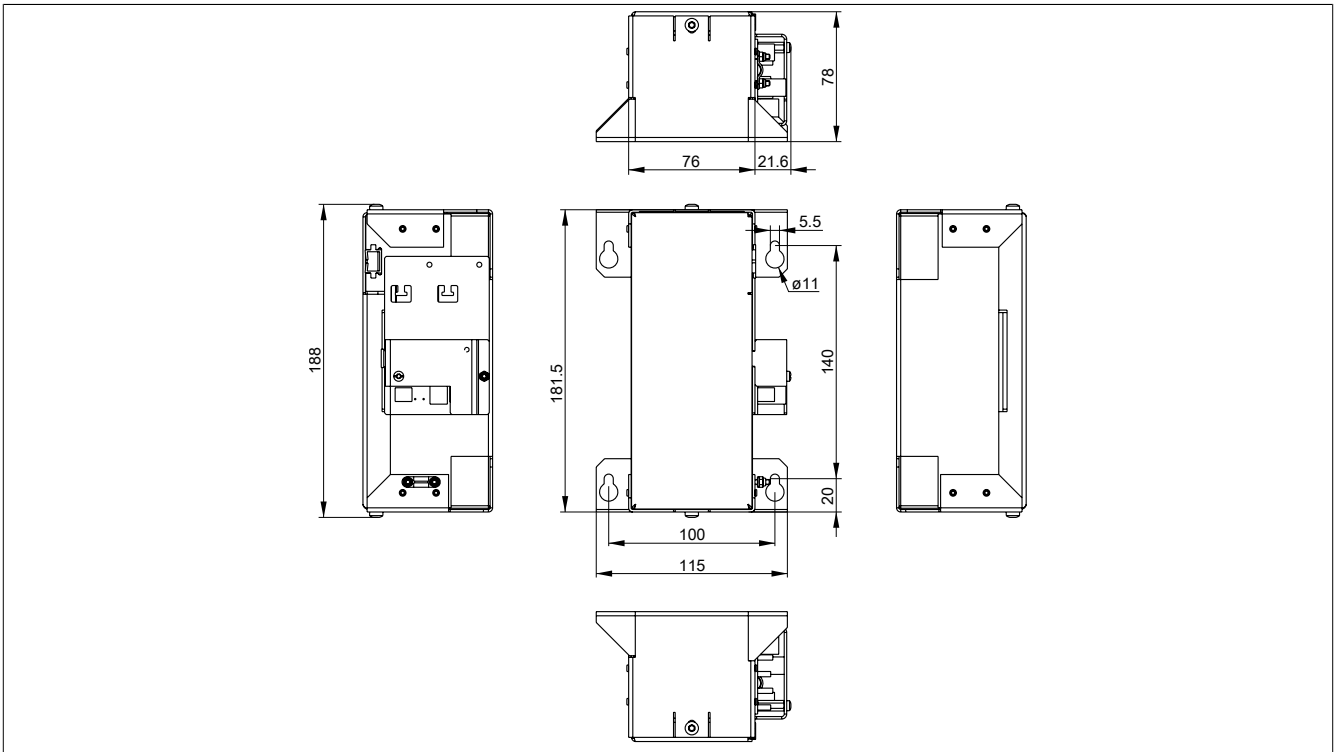


### 4.2.11.5.6 5AC901.BUPS-01 - Drilling template
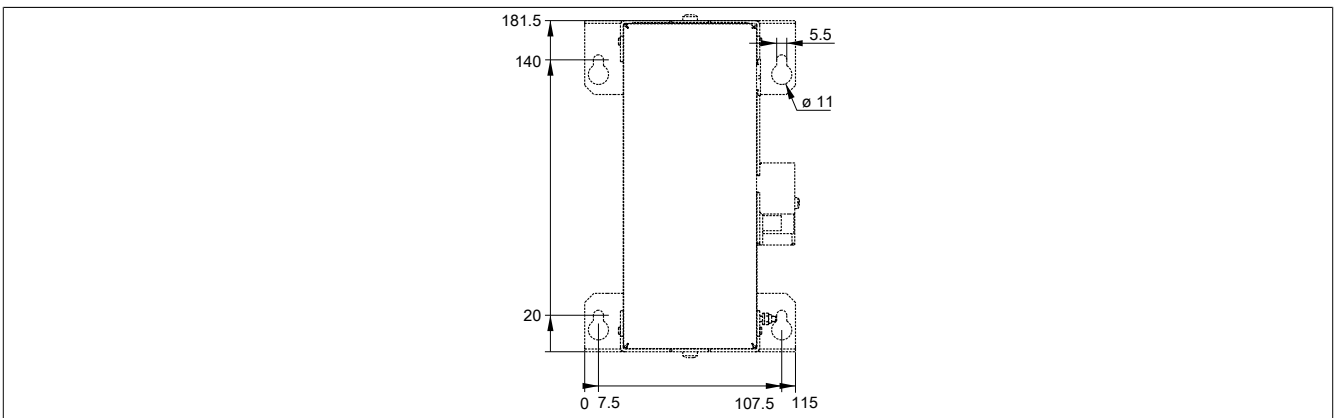


### 4.2.11.5.7 Installation

### 4.2.11.5.8 Precautions for handling and use

**Spills and leaks:**

Further leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is not permitted. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves as well as acid-resistant face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

**Waste disposal:**

Used batteries and rechargeable batteries must be disposed of in an environmentally friendly recycling process.

Neutralized mud must be stored in closed containers and stored / disposed of in accordance with applicable regulations. After neutralization and inspection, larger spills diluted with water must be disposed of in accordance with applicable regulations.

**Handling and storage:**

- Store in cool, dry and well-ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Protect from adverse weather conditions and separate from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Prevent damage to containers in which batteries and rechargeable batteries are stored and transported.
- Keep away from fire, sparks and heat.

### 4.2.11.6 5CAUPS.xxxx-01

#### 4.2.11.6.1 General information

The UPS connection cable establishes the connection between the UPS interface option and battery unit.

#### 4.2.11.6.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Uninterruptible power supply** | |
| 5CAUPS.0005-01 | UPS cable - 0.5 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0010-01 | UPS cable - 1 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0013-01 | UPS cable - 1.3 m - For 5AC901.IUPS-xx | |
| 5CAUPS.0030-01 | UPS cable - 3 m - For 5AC901.IUPS-xx | |

#### 4.2.11.6.3 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.**

| Order number | 5CAUPS.0005-01 | 5CAUPS.0010-01 | 5CAUPS.0013-01 | 5CAUPS.0030-01 |
|---|---|---|---|---|
| **General information** | | | | |
| Certifications | | | | |
|   CE | Yes | | | |
|   UKCA | Yes | | | |
|   UL | cULus E115267 Industrial control equipment | | | |
|   HazLoc | cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 [1] | | | |
| **Cable construction** | | | | |
| Wire cross section | 2x 0.5 mm² (20 AWG) 2x 2.5 mm² (13 AWG) | | | |
| Conductor resistance | At 0.5 mm² max. 39 Ω/km At 2.5 mm² max. 7.98 Ω/km [2] | | | |
| Outer jacket | | | | |
|   Material | Thermoplastic PVC-based material | | | |
|   Color | Window gray (similar to RAL 7040) | | | |
| **Connector** | | | | |
| Type | 4-pin screw clamp terminal block [3] | | | |
| **Electrical properties** | | | | |
| Operating voltage | Max. 30 VDC | | | |
| Peak operating voltage | Typ. 30 VDC | | | |
| Test voltage | | | | |
|   Wire - Wire | 1500 V | | | |
| Current-carrying capacity | 10 A at 20°C | | | |
| **Operating conditions** | | | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | | | |
| **Ambient conditions** | | | | |
| Temperature | | | | |
|   Moving | -5 to 70°C | | | |
|   Static | -30 to 70°C | | | |
| **Mechanical properties** | | | | |
| Dimensions | | | | |
|   Length | 0.5 m | 1 m | 1.3 m | 3 m |
|   Diameter | 7 mm | | | |
| Bend radius | | | | |
|   Moving | 10x wire diameter | | 10x line diameter | 10x wire diameter |
|   Fixed installation | 5x wire diameter | | 5x line diameter | 5x wire diameter |
| Weight | Approx. 55 g | Approx. 100 g | Approx. 130 g | Approx. 250 g |

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 an ambient temperature of 20°C.
3) Tightening torque: Min. 0.4 Nm, max. 0.5 Nm

# Information:

**The maximum length of the UPS connection cable depends on the following:**

- **Power output**
- **Voltage drop**
- **Wire cross section**
- **Sensor line**

**4.2.11.6.4 Installation**

## 4.2.12 Power supply

### 4.2.12.1 5AC902.PS00-00

#### 4.2.12.1.1 General information

This AC power supply for the Panel PC can optionally be expanded to allow operation with 100~240 VAC.

#### 4.2.12.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Power supply unit** | |
| 5AC902.PS00-00 | PPC900 power supply 85-264 VAC | |
| | **Required accessories** | |
| | **Terminal blocks** | |
| 0TB3103.8000 | Connector 230 VAC - 3-pin female - Screw clamp terminal block 4 mm² - Protected against vibration by the screw flange | |

Table 133: 5AC902.PS00-00 - Order data

#### 4.2.12.1.3 Technical data

| Order number | 5AC902.PS00-00 |
|---|---|
| **General information** | |
| Power button | Yes |
| Certifications | |
|   CE | Yes |
|   UL | cULus E115267<br>Industrial control equipment |
|   HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T3C [1] |
|   EAC | Yes |
| **Input** | |
| Nominal input voltage | 100 to 240 VAC |
| Frequency | 45 to 65 Hz |
| Inrush current | <20 A (on cold restart, 100% load and 100 VAC) |
| Power failure bypass | >10 ms (100 VAC and 230 VAC) |
| Internal fuse | Yes |
| **Output** | |
| Nominal voltage | 24 VDC ±10% [2] |
| Output current | |
|   0 to 55°C | 5.5 A [3] |
| **Electrical properties** | |
| Overvoltage category per EN 61131-2 | II |
| **Mechanical properties** | |
| Housing | |
|   Material | Steel sheet |
|   Coating | Anthracite |
| Dimensions | |
|   Width | 73.5 mm |
|   Height | 225.5 mm |
|   Depth | 53.5 mm |
| Weight | 580 g |

Table 134: 5AC902.PS00-00 - 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) IEC 61010-2-201 requirements must be observed; see section "+24 VDC power supply" in the user's manual.
3) At an ambient temperature of 0 to 55°C and nominal voltage.

#### 4.2.12.1.4 Installation

For information about installing this power supply, please refer to the section "Installing or replacing the AC power supply" on page 212.

# 5 Installation and wiring

## 5.1 Installation and wiring

### 5.1.1 Basic information

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

**Unpacking**

The following activities must be performed before unpacking the device:

- Check the packaging for visible transport damage.
- If transport damage is noticeable, document this immediately and submit a complaint. If possible, have the damage confirmed by the carrier/delivery service.
- Check the contents of the shipment for completeness and damage.
- If the contents of the packaging are incomplete, damaged or do not correspond to the order, the responsible sales office or B&R Headquarters must be informed immediately.
- The information in section "Protection against electrostatic discharge" on page 11 must be observed for unpacked devices and components.
- Keep the original packaging for further transport.

**Power supply**

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

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

## Caution!

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

**Installation**

**Before installation**

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

### Caution!

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

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

**Information about the device's environment**
- Observe the notes and regulations regarding the power supply and functional ground.
- Observer the specified bend radius when connecting cables.

- Ventilation openings are not permitted to be covered or blocked.
- The device is only permitted to be operated in closed rooms and not permitted to be exposed to direct sunlight.
- The climatic and ambient conditions must be taken into account – see "Environmental properties" on page 24.

### General installation instructions

- When installing the device, the permissible mounting orientations must be observed – .
- When connecting installed or connected peripherals, follow the instructions in the peripheral device's documentation.

### Transport and storage

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

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

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

### Use of third-party products

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

## 5.1.2 Connecting to the power grid

## Danger!

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

### 5.1.2.1 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 unit).**

### 5.1.2.1.1 Wiring

## Caution!

**The pinout of the power supply interface must be observed!**

The DC power cable must be implemented with a wire cross section of 0.75 mm$^2$ to 1.5 mm$^2$ and wire end sleeves.

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

### Installing screw clamp terminal block 0TB103.9

Secure the conductors with wire end sleeves ① in the terminal contacts ③ as shown in the figure below and tighten the screw clamp terminals ④ with a screwdriver (max. tightening torque 0.4 Nm). It is important to pay attention to the label on the spring clamp terminal ②.
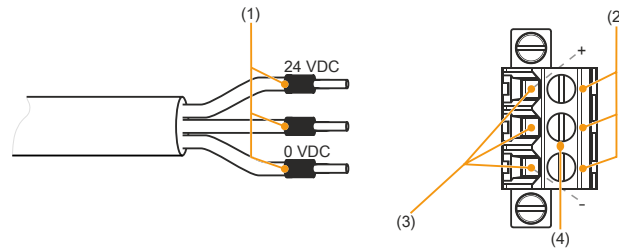
**Installing cage clamp terminal block 0TB103.91**

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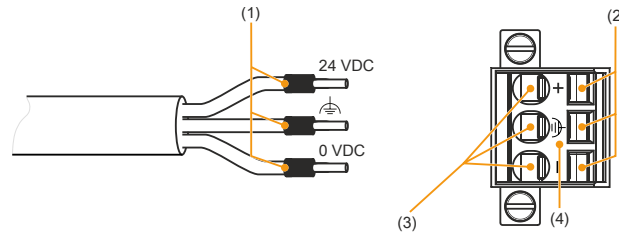


### 5.1.2.2 Connecting the power supply to a B&R device

## 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 unit).**

1. Carry out electrostatic discharge on the housing or at the ground connection.

2. Connect the power supply connector to the B&R device and tighten the mounting screws (max. tightening torque 0.5 Nm).
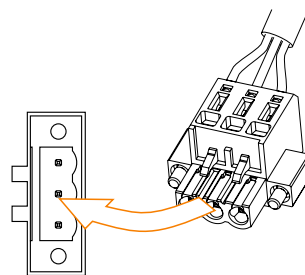


### 5.1.2.3 Grounding concept

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

## Notice!

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

The device is equipped with the following functional ground connections:

- Functional ground connection of the power supply
- Ground connection

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

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

- Connect the device to the central grounding point (e.g. the control cabinet or the system) using the shortest possible low-resistance path.
- Cable design with at least 2.5 mm² per connection. If a cable with wire end sleeve is used 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.
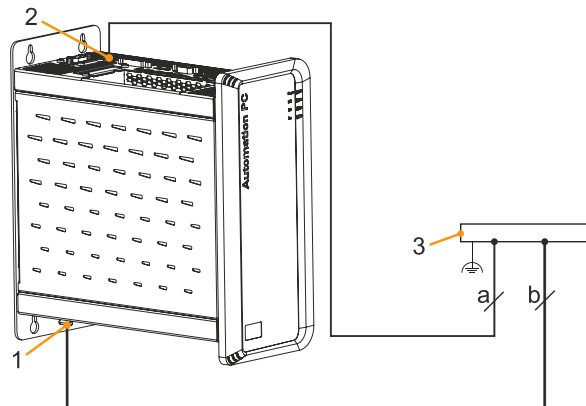


| Legend | | | | | |
|---|---|---|---|---|---|
| 1 | Ground connection ⏚ | 2 | Power supply connection +24 VDC pin 2 | 3 | Central grounding point |
| a | At least 1.5 mm² | b | At least 2.5 mm² | | - |

### 5.1.2.4 Connecting cables

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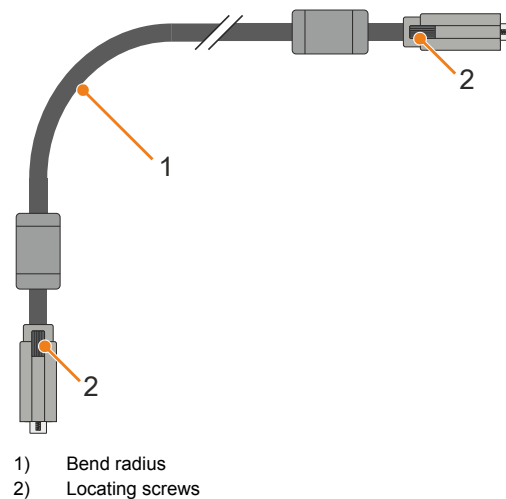


1) Bend radius
2) Locating screws

### 5.1.3 Installing a Panel PC with an AP9x3 panel

The with AP9x3 panel is installed in the installation cutout using retaining clips. The number of retaining clips depends on the panel.

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.

**Required tools:**

- 2.5 mm hex screwdriver

The following AP9x3 panels are installed with retaining clips:

- 5AP923.1215-00
- 5AP923.1505-00
- 5AP923.1906-00

- 5AP933.156B-00
- 5AP933.185B-00
- 5AP933.215C-00
- 5AP933.240C-00

> **Notice!**
>
> **All the included retaining clips and clamping blocks must be used during installation. Failure to do so can result in damage to property due to loss of leak tightness between the device and housing (pollution) or mechanical stress.**

**Procedure**

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



2. Insert the device into the prepared installation cutout (see ).

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.

4. Secure the retaining clips by alternately tightening the mounting screws with a 2.5 mm hex screwdriver (max. tightening torque 1 Nm).

| Thickness of the wall or control cabinet | Minimum | Maximum |
|---|---|---|
| W | See | |

### 5.1.4 Installing the Automation Panel 1000 with retaining clips

The with AP1000 panel is installed in the installation cutout using retaining clips. The number of retaining clips depends on the panel.

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.

**Required tools:**

- 2.5 mm hex screwdriver

The following AP1000 panels are installed with retaining clips:

- 5AP11xx.0573-000
- 5AP11x0.0702-000
- 5AP11x0.101x-000
- 5AP1120.1043-000
- 5AP11x0.121E-0x0
- 5AP11x0.156x-00x
- 5AP1130.185C-000
- 5AP1180.1043-000

> **Notice!**
>
> **All the included retaining clips and clamping blocks must be used during installation. Failure to do so can result in damage to property due to loss of leak tightness between the device and housing (pollution) or mechanical stress.**

**Procedure**

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



2. Insert the device into the prepared installation cutout (see ).

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.

4. Secure the retaining clips by alternately tightening the mounting screws with a 2.5 mm hex screwdriver (max. tightening torque 1 Nm).

| Thickness of the wall or control cabinet | Minimum | Maximum |
|---|---|---|
| W | See | |

### 5.1.5 Installing the Automation Panel 1000 with clamping blocks

The with AP1000 panel is installed in the installation cutout using clamping blocks. The number of clamping blocks depends on the panel.

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.

**Required tools:**

- 3.0 mm hex screwdriver

The following AP1000 panels are installed with clamping blocks:

- 5AP118x.1043-000
- 5AP1120.1214-000
- 5AP1120.1505-000
- 5AP118x.1505-000
- 5AP1120.1906-000

## Notice!

**All the included retaining clips and clamping blocks must be used during installation. Failure to do so can result in damage to property due to loss of leak tightness between the device and housing (pollution) or mechanical stress.**

**Procedure**

1. Insert the device into the prepared installation cutout (see ).

2. Secure the clamping blocks by alternately tightening the mounting screws with a 3 mm hex screwdriver (max. tightening torque 0.5 Nm). The mounting screws push the clamping lever downwards, which in turn secures the device to the wall or control cabinet panel.

| Thickness of the wall or control cabinet | Minimum | Maximum |
|---|---|---|
| W | See | |

### 5.1.6 Installation information for separate shipments

## Information:

**If the Panel PC 900 is not delivered as a complete system but as separate shipments, 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 Save & Exit. This is required for the following individual components:**

- **CPU board and system unit**
- **Interface option**
- **Fan kit**
- **Bus unit**

### 5.1.7 Installing accessories

#### 5.1.7.1 Replacing the CPU board and system unit

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

> ## Information:
>
> **If a bus unit is mounted on the Panel PC, it must be removed first.**

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. Remove the 4 Torx screws (T20) and 2 Torx screws (T10) shown in the following image.
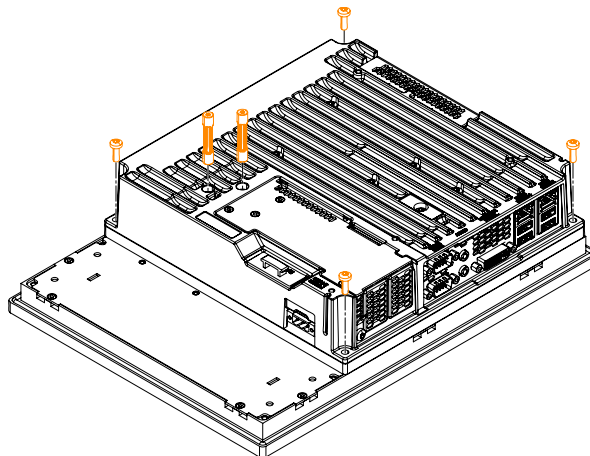


6. Remove the system unit with the installed CPU board.
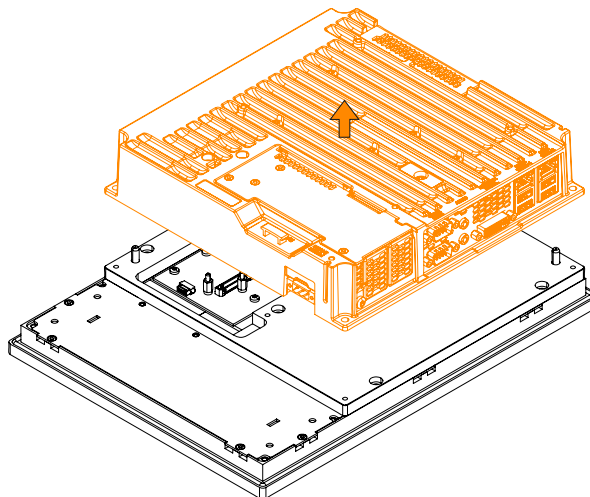


7. A different system unit with a preinstalled CPU board can now be installed on the display unit. Installation takes place in reverse order. The max. tightening torque is 0.5 Nm for the T10 Torx screws and 1.2 Nm for the T20 Torx screws.
   It is very important that the system unit is installed correctly. The connector for the display interface must be carefully connected to the female connector on the display unit.

8. If the Panel PC 900 is converted to an Automation Panel, then the mounting plate must also be removed. To do so, remove the 5 Torx screws (T20) indicated below.
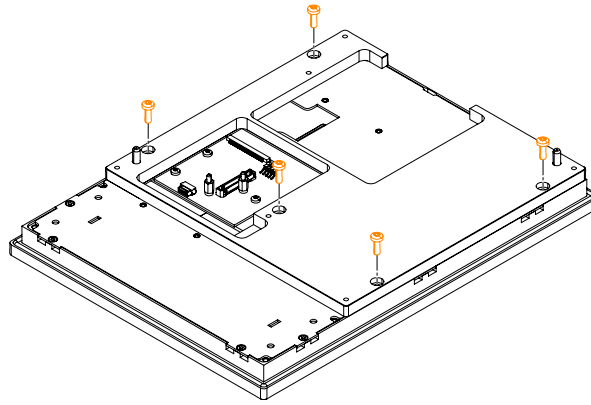


9. Remove the mounting plate from the display unit.
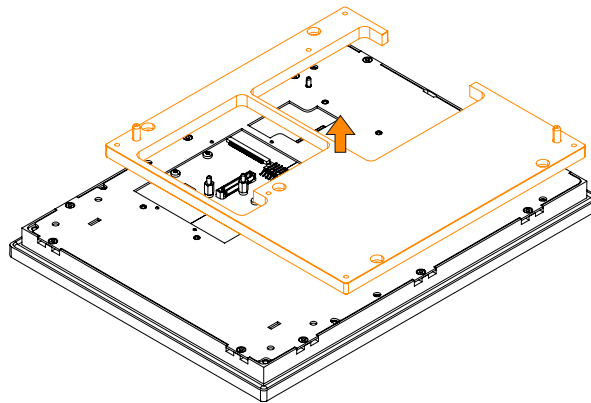


10. The mounting plate is installed by following these instructions in reverse; the max. tightening torque is 1.2 Nm. It is very important that the mounting plate is installed correctly.

### 5.1.7.2 Installing or replacing the AC power supply

1. The on/off switch must be set to position "0" (off). Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

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. Remove the Torx screws (T20) indicated in the following image.
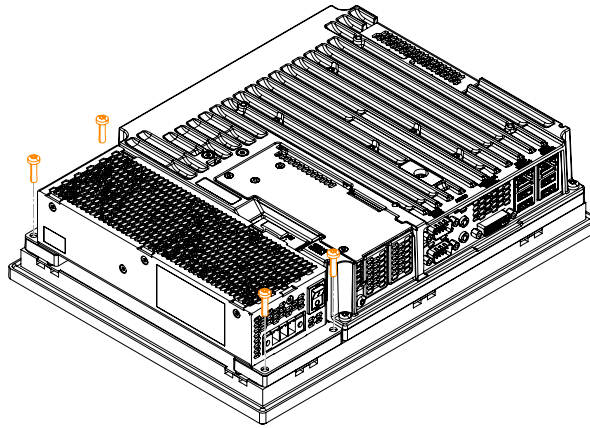
6. The AC power supply can now be removed parallel to the Panel PC in the direction indicated by the arrows in the image below. Exercise caution to prevent damage to the power supply connector.
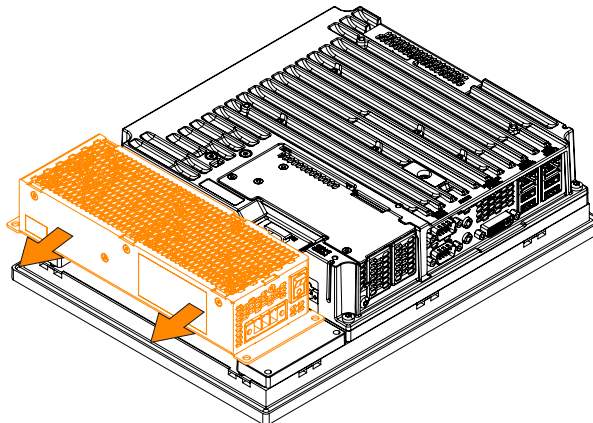
7. If the AC power supply is being installed for the first time (i.e. not a replacement), then both mounting plates must be installed first. To do so, guide the mounting plates into each of the three slots at a slight angle. These mounting plates are included with the AC power supply.
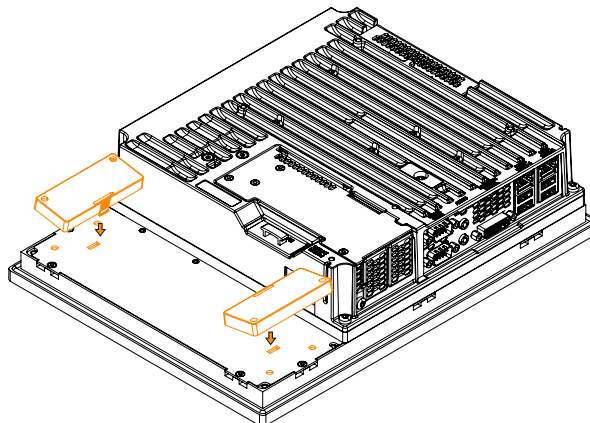
8. To install an AC power supply on the Panel PC, it must be aligned parallel to the Panel PC. Plug the power supply connector into the female connector on the Panel PC.

9. Fasten the AC power supply with the 4 Torx screws (T20) (max. tightening torque 1.2 Nm). It is important that it is aligned parallel to the housing. The power supply connector must click into place in the female connector on the Panel PC. There must not be any pressure or mechanical stress on the connector.
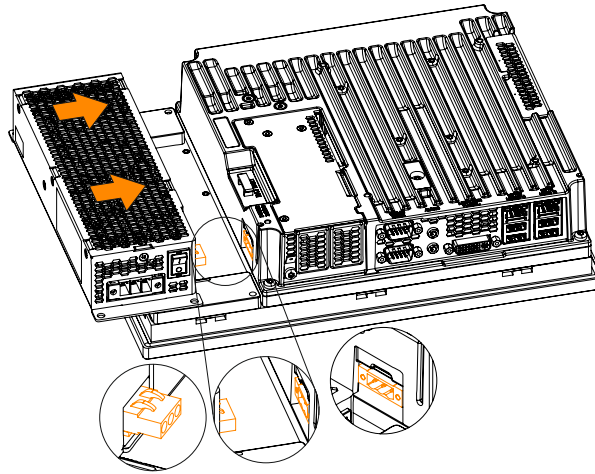


10. The Panel PC can now be installed back in the control cabinet.

**5.1.7.3 Replacing main memory**

> **Information:**
>
> **The Panel PC has 2 slots for main memory modules. Only the following B&R main memory modules are permitted:**

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Discharge any electrostatic charge on the ground connection.

3. Remove the 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. Remove the Torx screws (T10) indicated in the following image.
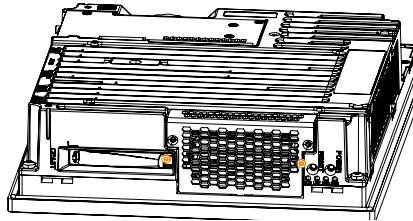
6. Tilt the cover plate forward and remove it by sliding it upward.
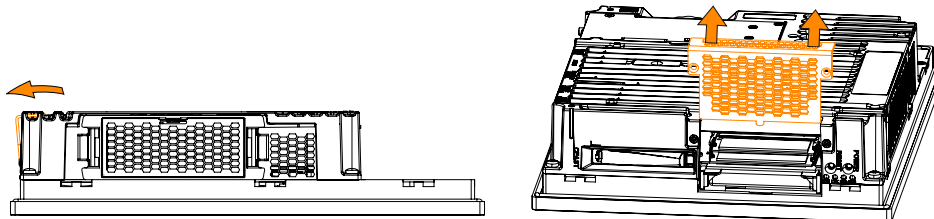
> **Information:**
>
> **The lower main memory module can only be replaced after the top one has been removed.**

7. The main memory modules can now be replaced. This is done by carefully pressing the fastening clamps outward and pull out the main memory module.

8. If inserting a new main memory module, align the notch on the connector side of the memory module with the notch above the slot. The main memory module can then be carefully pressed into the slot until the fastening clamps are engaged.
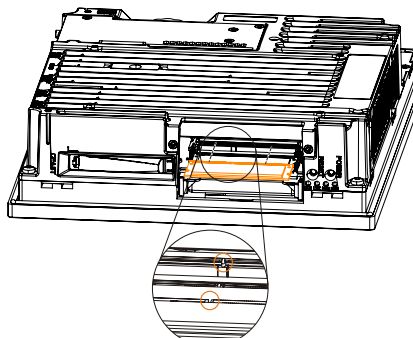
# Caution!

**If using only one main memory module, it must be installed in RAM slot 2.**



RAM slot 2

RAM slot 1
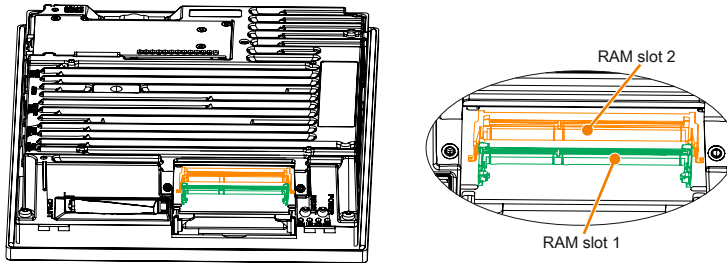
9.  The cover plate can now be replaced by following these steps in reverse order. The maximum tightening torque of the Torx screws (T10) is 0.5 Nm.

10. The Panel PC can now be installed back in the control cabinet.

### 5.1.7.4 Installing the interface option

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

> **Information:**
>
> **If a bus unit is mounted on the Panel PC, it must be removed first.**

3. Remove the Torx screws (T10) indicated by ① in the following image. The Torx screws indicated by ② only need to be removed if an IF option is already mounted.
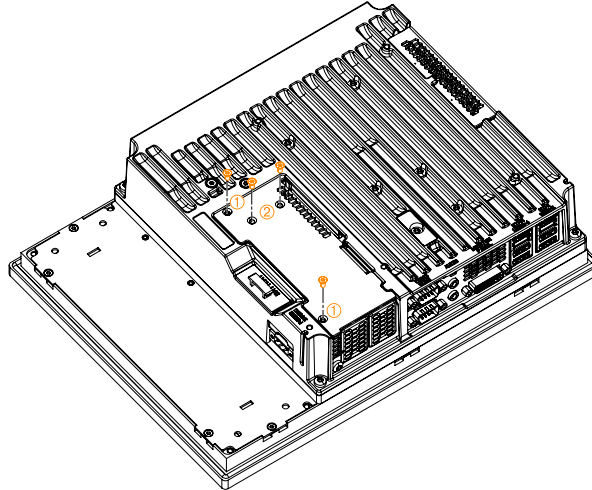


4. Lift the cover plate up and away to remove it.
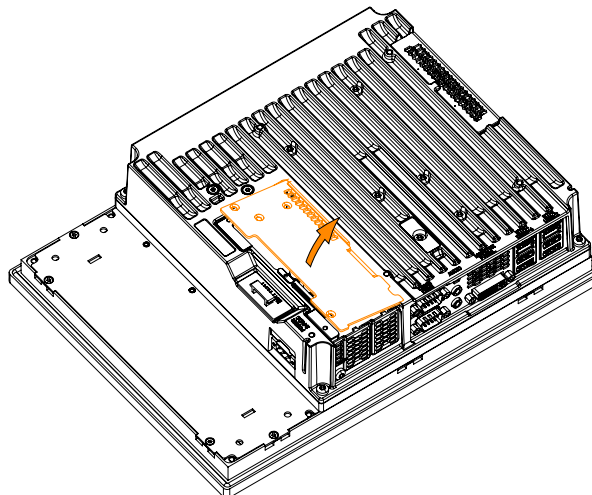
5. Remove the cover plate by sliding it upwards and also remove the installed IF option.
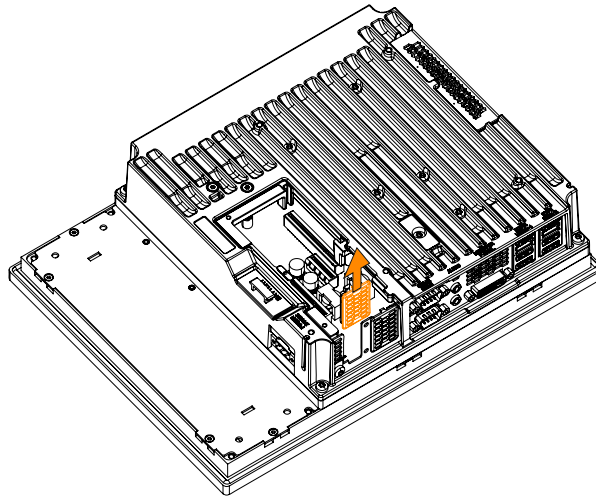
6. Insert the interface option in the slot and fasten it to the Panel PC (max. tightening torque 0.5 Nm) with 2 Torx screws (T10).
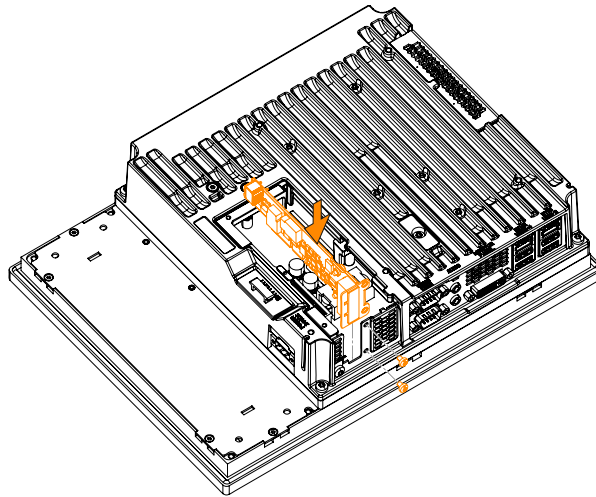
7. Replace the cover plate.
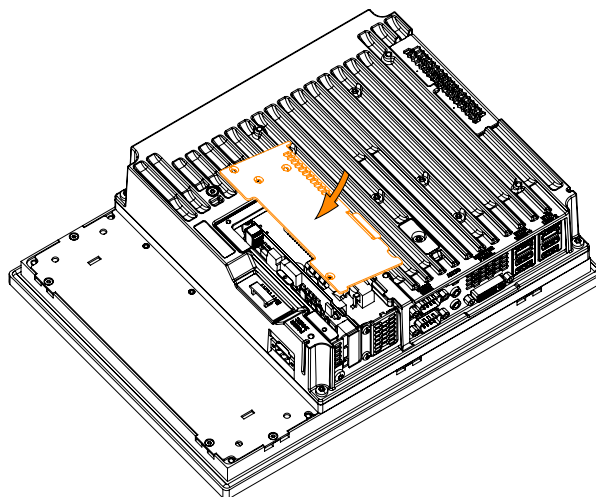
8. Secure the cover plate to the B&R Industrial PC using the same Torx screws (T10) from before. The Torx screws indicated by ② only need to be tightened if an IF option is mounted (max. tightening torque 0.5 Nm).
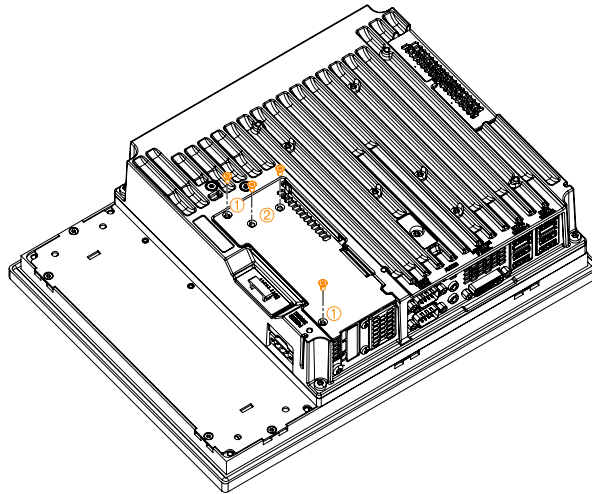


9. Once installed successfully, the interface option must be enabled in BIOS. To do this, launch BIOS during system startup, load the BIOS default values and save the settings. For additional information, see Save & Exit.

**5.1.7.5 Installing or replacing a slide-in compact drive**

> **Information:**
>
> **The slide-in compact drive can only be replaced without removing the PPC from the control cabinet if the wall is less than 5.5 mm thick. Steps 3, 4 and 11 are only necessary if the Panel PC is removed from the cabinet.**

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

3. Place the Panel PC on a clean, flat surface.

4. Remove the Torx screws (T10) indicated in the following image.
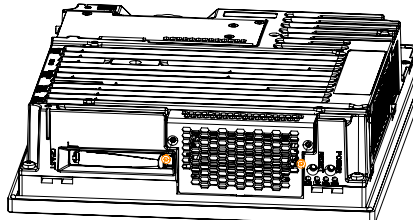


5. Tilt the cover plate forward and remove it by sliding it upward.
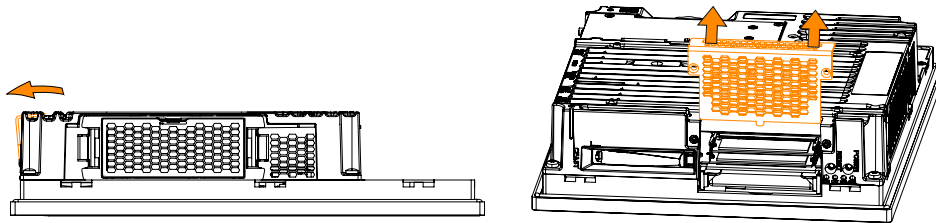


6. Free the plastic removal strip fastened to the side of the slide-in compact drive.
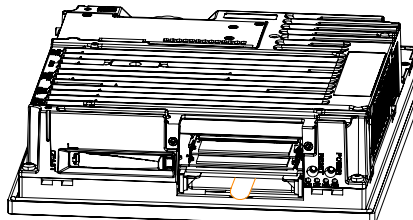


7. Pull firmly on the removal strip to remove the slide-in compact drive.
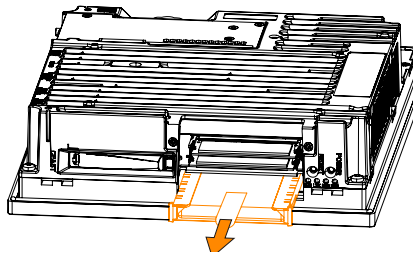


8. When inserting a slide-in compact drive, be sure to align it with the guide rails. Tuck the removal strip back between the drive and the frame (as it was before it was pulled out).

9. The cover plate can now be replaced by following these steps in reverse order.

10. The Panel PC can now be installed back in the control cabinet.

### 5.1.7.6 Replacing the fan kit

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

3. Press in the indicated latching mechanisms (①) while removing the fan kit at the same time (②).
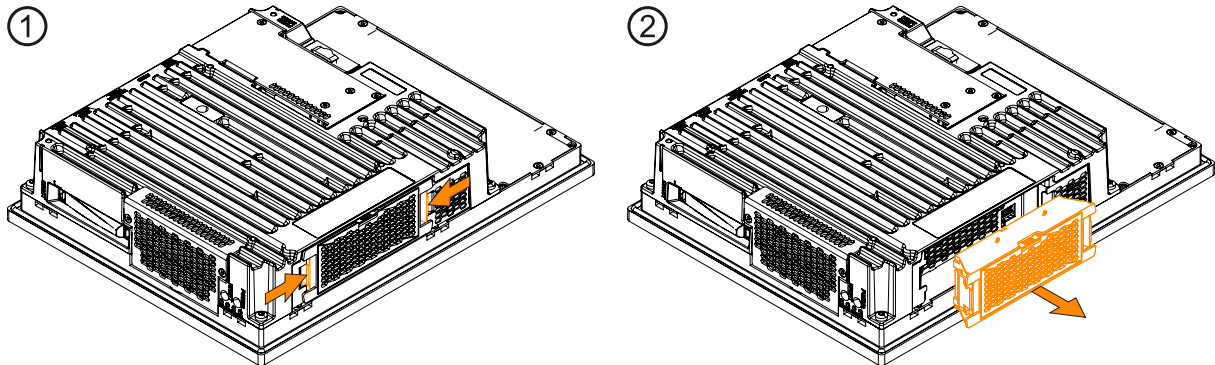


4. A new fan kit can now be installed. Align the fan kit parallel to the Panel PC and press it in until it latches. Make sure the fan kit is inserted so that the connections match up.

5. If a fan kit is being installed for the first time (i.e. fan kit previously not used in device), then it still needs to be programmed. To do so, follow the instructions in the "Programming fan kit data" section.
   If a fan kit has been removed from the device and is not being replaced, then its data must be deleted. To do so, follow the instructions in the "Deleting fan kit data" section.

> **Information:**
>
> **If a fan kit has been replaced, then an incorrect serial number will be displayed. To display the correct serial number, the fan kit data must be deleted and reprogrammed.**

6. After the fan kit has been programmed, the BIOS default values must be loaded and the settings saved. For additional information, see Save & Exit.

#### Programming fan kit data

> **Information:**
>
> **If a fan kit is being installed for the first time (i.e. fan kit previously not used in device), then it must still be programmed. The file needed to program the fan kit (called "fn" in the example below) is available from the B&R headquarters upon request.**

1. Boot the B&R Industrial PC and type the following on the command line:
   `mtxcsvc i fanfset` - Checks whether the fan kit has already been programmed

2. If the fan kit has not yet been programmed, this can be done by typing in the following:
   `mtxcsvc u fanfset "fn"` - The path of the file and filename must be specified in place of "fn".

#### Deleting fan kit data

> **Information:**
>
> **If a fan kit has been removed from the device and is not being replaced, then its data must be deleted.**

1. Boot the B&R Industrial PC and type the following on the command line:
   `mtxcsvc i fanfset` - Checks whether the fan kit has already been programmed

2. Since a fan kit was already installed, its data must be deleted. This is done by typing the following on the command line:
   `mtxcsvc d fanfset` - Deletes the data for the previously installed fan kit

**5.1.7.7 Replacing the fan filter**

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

3. Press down the indicated latching mechanism (①) while pulling out the filter cover (②) at the same time.
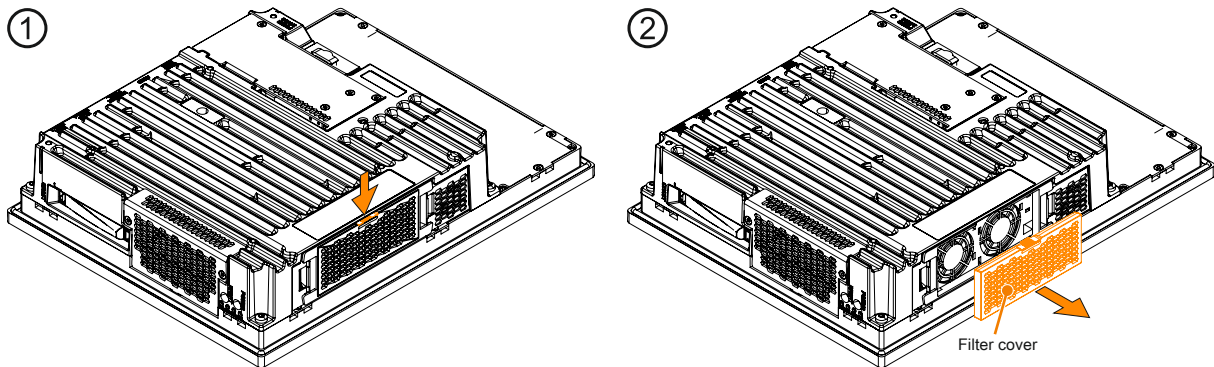


Filter cover

4. Insert the new filter cover into the fan kit by following these instructions in the reverse order.

### 5.1.7.8 Installing the bus unit

## Information:

**Since the 5AC902.BX02-02 bus unit is supported beginning with firmware version V1.14, a firmware upgrade must be carried out before installation. See "Firmware upgrade" on page 291.**

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

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. Remove the 2 or 4 Torx screws (T10). Slide the cover plate forward to remove it.
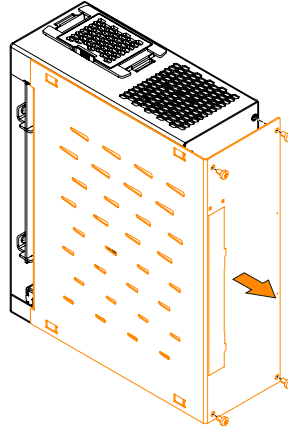


6. Install the bus unit on the system unit using the 4 Torx screws (T20) included in delivery (tightening torque approx. 1.2 Nm).
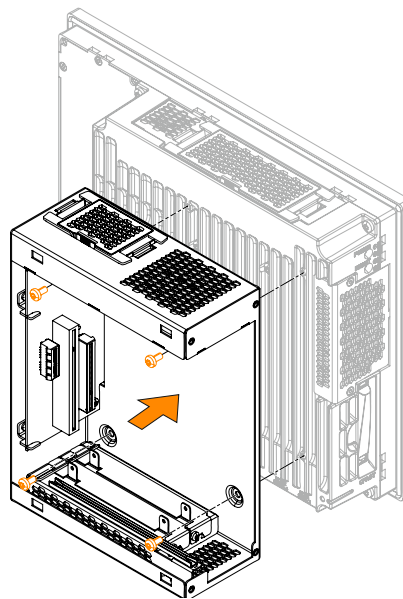
7.  Install the side cover on the bus expansion using the 4 indicated Torx screws (T10) (2 already removed, 2 included in delivery); the tightening torque is approx. 0.5 Nm.
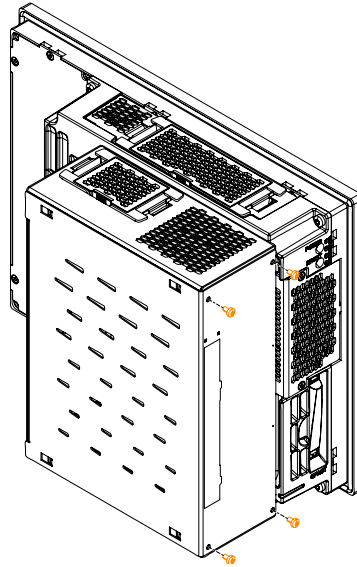


8.  The Panel PC can now be installed back in the control cabinet.

### 5.1.7.9 Installing PCI/PCIe cards

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

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. Remove the Torx screws (T10) indicated in the following image. Slide the cover plate forward to remove it.
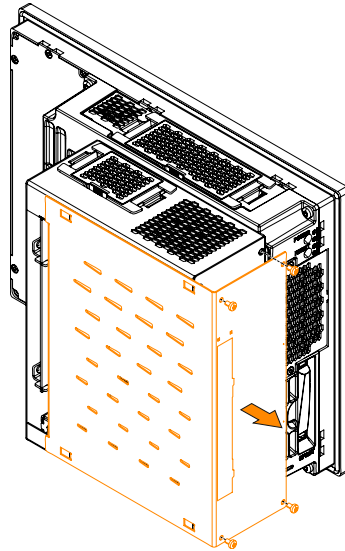
6. Remove the PCI slot cover from the bus unit. This is done by first removing the indicated Torx screws (T10) and then removing the cover.
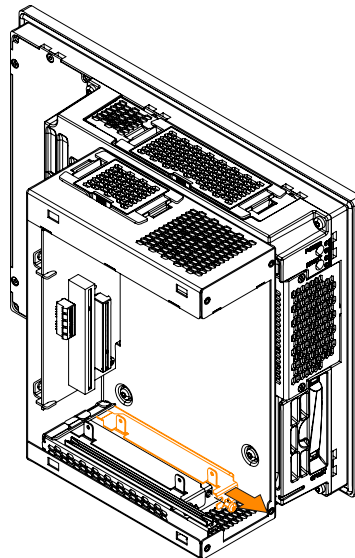
7. Install the PCI or PCIe card in the bus unit. Be sure to insert the PCI or PCIe card in the black guide rail at the top of the bus unit. Fasten the PCI or PCIe card using the indicated Torx screws (T10) removed earlier (max. tightening torque 0.5 Nm).
A description and pinout of the bus units can be found in section "Bus units" on page 125.
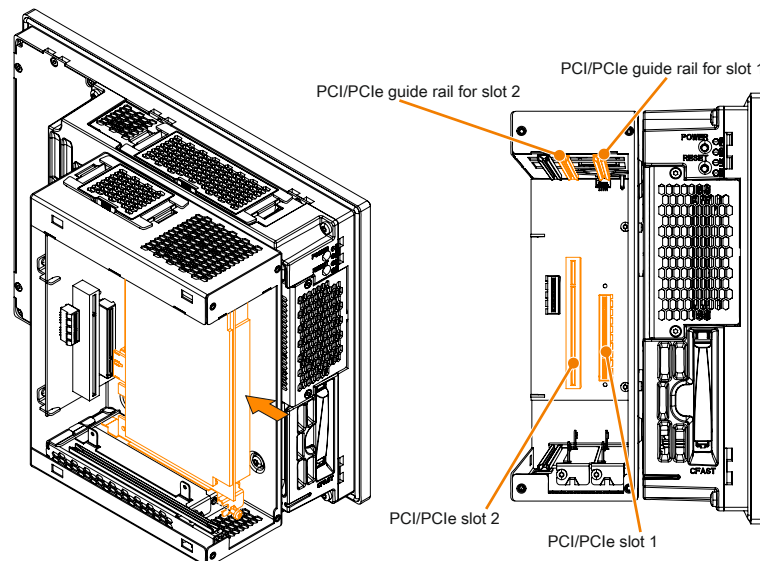


PCI/PCIe guide rail for slot 1
PCI/PCIe guide rail for slot 2
PCI/PCIe slot 2
PCI/PCIe slot 1

8. Install the side cover on the bus unit using the 4 indicated Torx screws (T10); the max. tightening torque is 0.5 Nm.
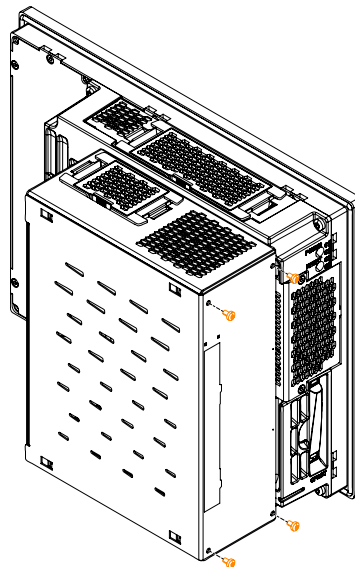
**5.1.7.10 Installing a slide-in drive**

1. Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!

2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.

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. Remove the Torx screws (T10) indicated in the following image. Slide the cover plate forward to remove it.
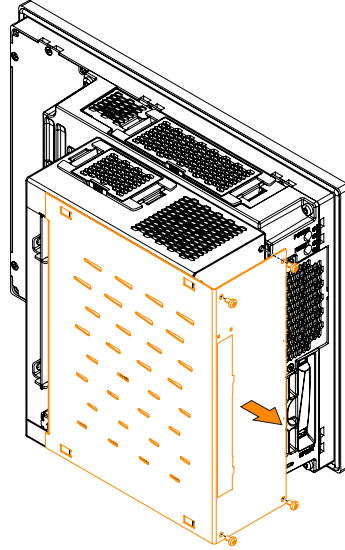


6. Remove the slide-in slot cover from the side cover. This is done by pressing in the 6 indicated snap arms and removing the slot cover.
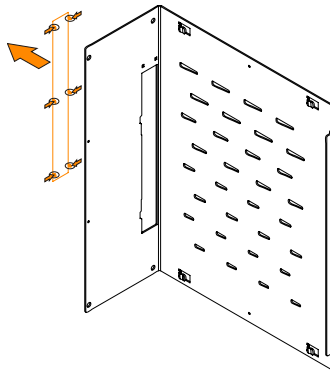
7. Install the slide-in drive in the bus unit. Be sure to insert the slide-in drive in the black guide rails at the top and bottom of the bus unit.
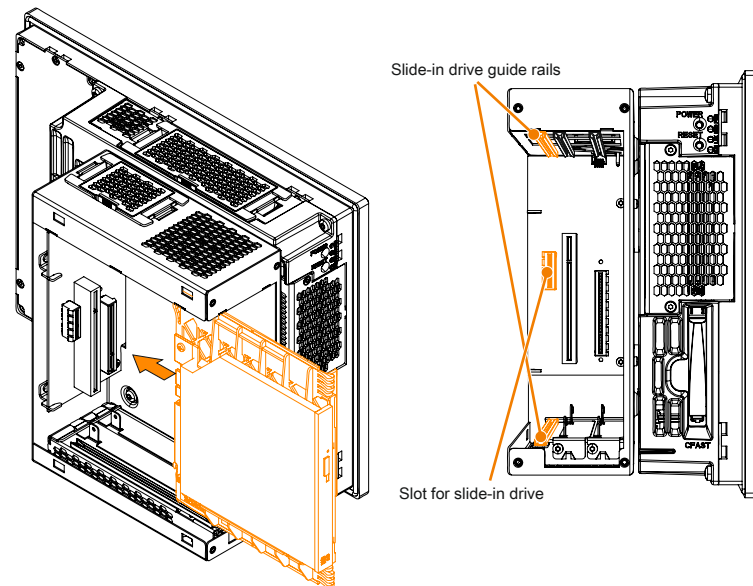


Slide-in drive guide rails

Slot for slide-in drive

8. Install the side cover on the bus unit using the 4 indicated Torx screws (T10); the max. tightening torque is 0.5 Nm.
The slide-in slot cover must be installed in order to operate the 5AC901.SSCA-00 slide-in compact adapter.
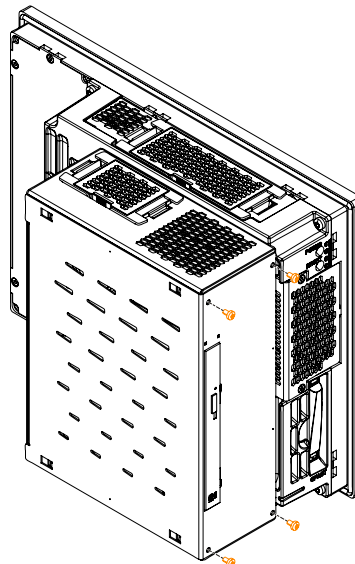


9. The Panel PC can now be installed back in the control cabinet.

**5.1.7.11 Installing and connecting the UPS battery unit**

# Warning!

**Opening the UPS battery unit is not permitted!**

1. Disconnect the power supply cable to the B&R industrial PC.

2. Install the battery unit. For the drilling template, see the technical data for the respective UPS battery unit. The spacing between the battery unit and B&R industrial PC must be selected so that they can be connected together with the UPS cable; note the cable length.
4 M5 screws, 4 flat washers and 1 screw locking washer are needed for installation (min. tightening torque 1.3 Nm, screw-in depth per applicable DIN regulations and the application). These are not included in delivery.

3. Connect the UPS cable to the battery. To do so, connect the red and black wires to the power supply (**orange** screw clamp terminal).
Connect the white and brown wires to the temperature sensor (**green** screw clamp terminal).
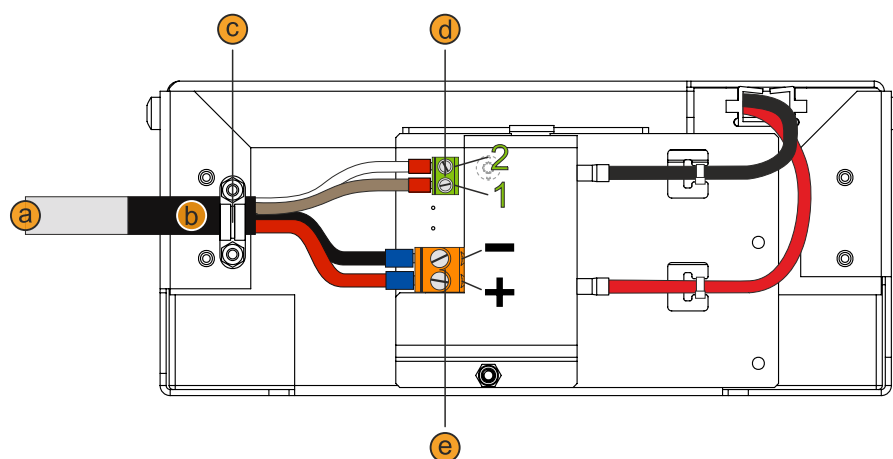


| Legend | | | |
|---|---|---|---|
| a | UPS cable | b | Heat shrink tubing |
| c | Cable clamp | d | Temperature sensor connection |
| e | Battery unit connection | | | |
| Temperature sensor screw clamp terminal (green) | | | |
| 1 | Brown | 2 | White |
| Power supply screw clamp terminal (orange) | | | |
| + | Red | - | Black |

4. Tighten the connected wires to the screw clamp terminals with a screwdriver (max. tightening torque 0.4 Nm).

5. Loosen both nuts (M3) on the cable clamp and feed the UPS cable through.

6. Fasten the UPS cable using the cable clamp. Alternately tighten the previously removed nuts onto the cable clamp (max. tightening torque 0.35 Nm).

7. Connect the 4-pin screw clamp terminal block to the UPS IF option and tighten the two screws with a screwdriver (max. tightening torque 0.4 Nm).

# 6 Commissioning

## 6.1 Switching on the device for the first time

### 6.1.1 General information before switching on the device

**Checklist**

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

- Have the installation instructions been observed as described in "Installation and wiring" on page 202?
- Have the permissible ambient conditions and environmental conditions for the device been taken into account?
- Is the power supply connected correctly and have the values been checked?
- Is the ground cable correctly connected to the ground connection?
- Before installing additional hardware, the device must have been started up.

> ## Caution!
>
> **Before the device is started up, it must be gradually adapted to room temperature! Exposure to direct heat radiation is not permitted.**
>
> **When transporting at low temperatures or in the event of large temperature fluctuations, the collection of moisture in or on the device is not permitted.**
>
> **Moisture can cause short circuits in electrical circuits and damage the device.**

**Requirements**

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

- The functional ground connections are as short as possible and connected to the central grounding point using the largest possible wire cross section.
- All connection cables are connected correctly.
- A USB keyboard and USB mouse are connected (optional).

### 6.1.2 Switching on the device

**Procedure**

1. Connect the power supply and switch it on (e.g. power supply unit).
2. The device is operating and boots; LED *Power* lights up.

## 6.2 Touch screen calibration

B&R touch screen devices are equipped with a B&R touch controller that supports hardware calibration. These devices come already pre-calibrated from the factory. This feature offers great advantages especially for replacement parts since recalibration is usually no longer required when replacing a device (identical model/type). B&R still recommends recalibration for best results and to optimally adapt the touch screen to the needs of the user.

### 6.2.1 Single-touch (analog resistive)

#### 6.2.1.1 Windows 10 IoT Enterprise 2019 LTSC

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

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

### 6.2.2 Multi-touch (projected capacitive - PCT)

#### 6.2.2.1 Windows 10 IoT Enterprise 2019 LTSC

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

## 6.3 Display brightness control

1. Open the ADI 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 (the figure is symbolic).

> **Information:**
>
> **The changed settings are displayed online but only applied by the system (and used after the next restart) if the ADI 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 ADI Control Center is launched.**
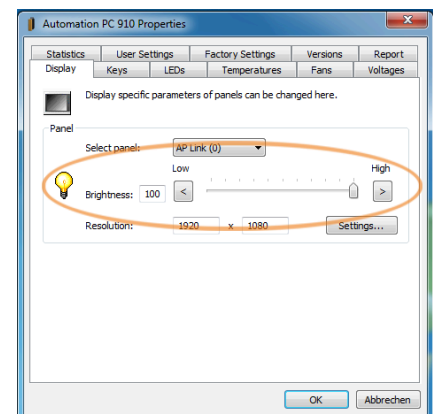
## 6.4 Configuring a SATA RAID volume with the internal RAID controller

Depending on the chipset of the internal RAID controller, either the legacy or the UEFI BIOS boot can be used.

### 6.4.1 Legacy BIOS boot

The following software description applies to the internal RAID controller on the QM77/QM170/HM170/CM236 chipset. The HM76 chipset does not provide RAID support.

> ## Information:
>
> **B&R recommends using only drives of the same type in a SATA RAID volume (hard disk with hard disk in a set, SSD with SSD in a set; CFast with CFast in a set).**

> ## Caution!
>
> **The maximum number of possible write cycles must be taken into account when setting up a RAID volume with SSDs or CFast cards (with MLC technology).**

In order to create a SATA RAID volume and to access setting "Configuration utility", setting *SATA mode selection* must be set to *RAID* in BIOS menu "Advanced - SATA configuration".

The "Configuration utility" in BIOS must be started for the configuration. After POST, press <Ctrl+I> to open the RAID BIOS.

```
Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.


 RAID Volumes:
 ID Name      Level               Strip           Size Status          Bootable
 0  Mirror   RAID1(Mirror)        N/A           465.8GB Normal             Yes

 Pyhsical Devices:
 ID Device  Model       Serial #              Size Type/Status(Vol ID)
 0  WDC      WD500LUCT-6  WD-WX21AB2X6150     465.7GB Member Disk(0)
 2  WDC      WD500LUCT-6  WD-WX21AB2X6150     465.7GB Member Disk(0)

Press <CTRL-I> to enter Configuration Utility..
```

Figure 20:  Configuration Utility - Boot (example)

```
              Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
              Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.
==============[ MAIN MENU ]==============
       1.   Create RAID Volume        4.   Recovery Volume Options
       2.   Delete RAID Volume        5.   Acceleration Options
       3.   Reset Disks to Non-RAID   6.   Exit
===========[ DISK/VOLUME INFORMATION ]===========
 RAID Volumes:
 ID Name      Level               Strip           Size Status          Bootable
 0  Mirror   RAID1(Mirror)        N/A           465.8GB Normal             Yes

 Pyhsical Devices:
 ID Device  Model       Serial #              Size Type/Status(Vol ID)
 0  WDC      WD500LUCT-6  WD-WX21AB2X6150     465.7GB Member Disk(0)
 2  WDC      WD500LUCT-6  WD-WX21AB2P6063     465.7GB Member Disk(0)




       [↑↓]-Select              [ESC]-Exit            [ENTER]-Select Menu
```

Figure 21: Configuration Utility - Overview (example)

The following keys can be used after entering BIOS Setup:

| Key | Function |
|---|---|
| Cursor ↑ | Moves to the previous item. |
| Cursor ↓ | Go to next object. |
| Enter | Selects an item or opens a submenu. |
| ESC | Returns to the previous menu. |
| Ctrl+E | Saves any changed settings and exits setup. |

Table 135: BIOS-relevant keys in the RAID Configuration Utility

### 6.4.1.1 Create RAID volume



```
          Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
             Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.
                        ═[ CREATE VOLUME MENU ]═

                         Name:  Mirror
                   RAID LEVEL:   RAID1(Mirror)
                        Disks:   Select Disk
                   Strip Size:   N/A
                     Capacity:   465.8 GB
                         Sync:   N/A
                                 Create Volume


                            ═[ HELP ]═



              Enter a unique volume name that has no special character and is
                            16 characters or less.




        [↑↓]-Change        [TAB]-Next        [ESC]-Previous Menu        [ENTER]-Select
```

Figure 22: Configuration Utility - Create RAID volume (example)

| Setting | Explanation | Configuration options | Effect |
|---|---|---|---|
| Name | Option for entering the RAID name. | Name with up to 16 characters | Assigns a name to the RAID volume. |
| RAID level | Option for setting the RAID level. | RAID0 (Stripes) | Creates RAID0. |
| | | RAID1 (Mirror) | Creates RAID1. |
| | | Recovery | Creates recovery RAID. |
| Disks[1] | Specifies the installed hard disks as either master or recovery. | Master, Recovery | Defines the hard disks as master or recovery. |
| Strip size[2] | Option for configuring the size of data blocks. | 4 kB, 8 kB, 16 kB, 32 kB, 64 kB, 128 kB | Configures the size of the data block. |
| Capacity | Option for configuring the RAID capacity. | | Configures the memory size of the RAID volume. |
| Sync[1] | Option for configuring RAID synchronization. | N/A | - |
| | | Continuous | Automatically synchronizes the RAID volume. |
| | | On request | Manually synchronizes the RAID volume. |
| Create volume | Creates the RAID volume. | - | Creates the RAID volume. |

Table 136: Configuration Utility - Create RAID volume

1)    This setting is only possible if *RAID level* is set to *Recovery*.
2)    This setting is only possible if *RAID level* is set to *RAID0(Stripe)*.

### 6.4.1.2 Delete RAID volume

Menu option "Delete RAID volume" can be used to format the RAID drive, making it non-RAID. The drive to be deleted is selected and then deleted by pressing <DEL>.

| **Information:**

**This option deletes all data on the drive, including the operating system.**

```
           Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
           Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.
  ===============================[ DELETE VOLUME MENU ]===============================
  Name          Level          Drives      Capacity        Status        Bootable
  Mirror        RAID1(Mirror)     2         465.8GB         Normal          Yes




  ====================================[ HELP ]====================================

                        * = Accelerated Volume

             Deleting a volume will reset the disks to non-RAID.

                  WARNING: ALL DISK DATA WILL BE DELETED.
                  (This does not apply to Recovery volumes)



        [↑↓]-Change       [TAB]-Next        [ESC]-Previous Menu       [ENTER]-Select
```
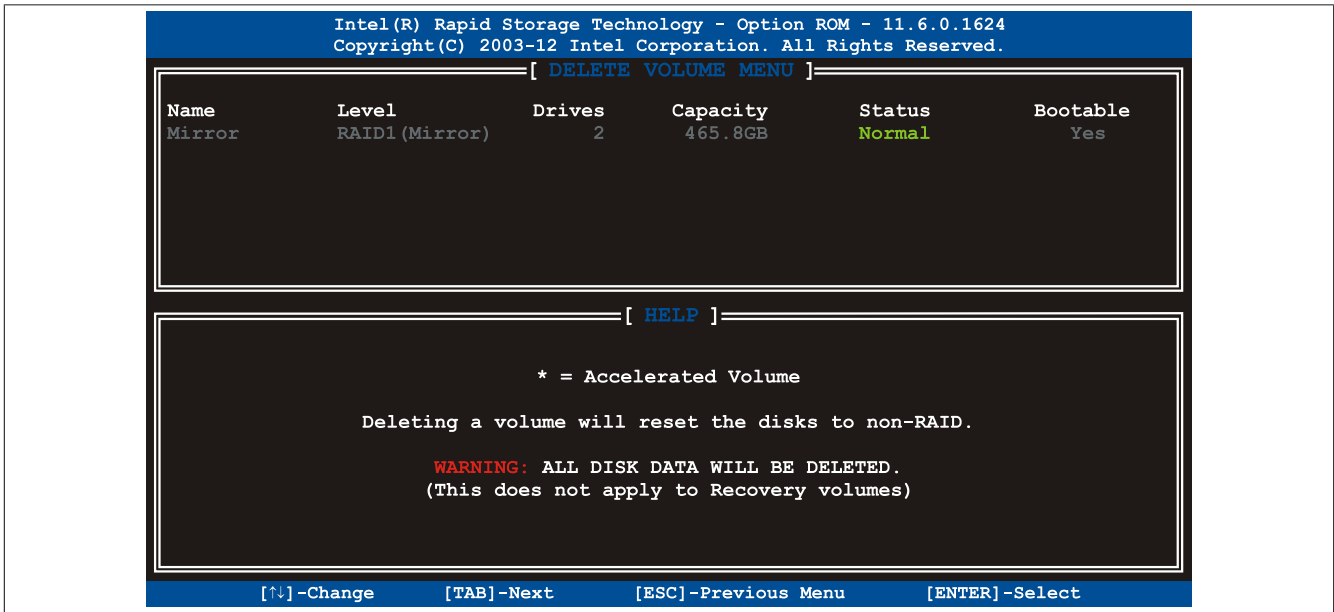
Figure 23: Configuration Utility - Delete RAID volume (example)

### 6.4.1.3 Reset disks to non-RAID

An existing RAID volume can be deleted using option "Reset disks to non-RAID". The RAID to be deleted is selected and then deleted by pressing <SPACE> (<ENTER> to confirm).

| **Information:**

**Deleting a RAID volume also deletes all of the data on the drive.**

```
           Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
           Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.
  ================================[ MAIN MENU ]================================
        1.  Create RAID Volume          4.   Recovery Volume Options
  ============================[ RESET RAID DATA ]============================
          Resetting RAID disk will remove ist RAID structures
          and revert it to a non-RAID disk.


          WARNING: Resetting a disk causes all data on the disk to be lost.
              (This does not apply to Recovery volumes or Cache disks)

     ID Drive Model              Serial #              Size  Status
     0  WDC     WD500LUCT-63Y8H  WD-WX21AB2X6150     465.7GB  Member Disk
     2  WDC     WD500LUCT-63Y8H  WD-WX21AB2P6063     465.7GB  Member Disk


                 Select the disks that should be reset.


        ====[↑↓]-Previous/Next    [SPACE]-Selects    [ENTER]-Selection Complete====



        [↑↓]-Select            [ESC]-Exit           [ENTER]-Select Menu
```

Figure 24: Configuration Utility - Reset disks to non-RAID (example)

## 6.4.1.4 Recovery volume options

Menu option "Recovery volume options" can be used to enable/disable recovery disk and master disk.

```
           Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
           Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.
==================================[ RECOVERY VOLUME OPTIONS ]==================================

                     1.   Enable Only Recovery Disk
                     2.   Enable Only Master Disk




==================================[ HELP ]==================================




        Enable Only Recovery Disk - enables recovery disk if available and
                              disables master disk.
        Enable Only Master Disk - enables master disk if available and
                              disables recovery disk.
        Actions will result in change from Continuous Update mode to On-Request.




              [↑↓]select     [ESC]-Previous Menu     [ENTER]-Select
```

Figure 25: Configuration Utility - Recovery volume options (example)

### 6.4.2 UEFI BIOS boot

The following software description only applies to the internal RAID controller on the TS17 CPU modules.

## Information:

**B&R recommends using only drives of the same type in a SATA RAID volume (hard disk with hard disk in a set, SSD with SSD in a set; CFast with CFast in a set).**

## Caution!

**The maximum number of possible write cycles must be taken into account when setting up a RAID volume with SSDs or CFast cards (with MLC technology).**

To create, configure or maintain a SATA RAID volume in UEFI mode, the BIOS settings indicated in the following figure must be set:
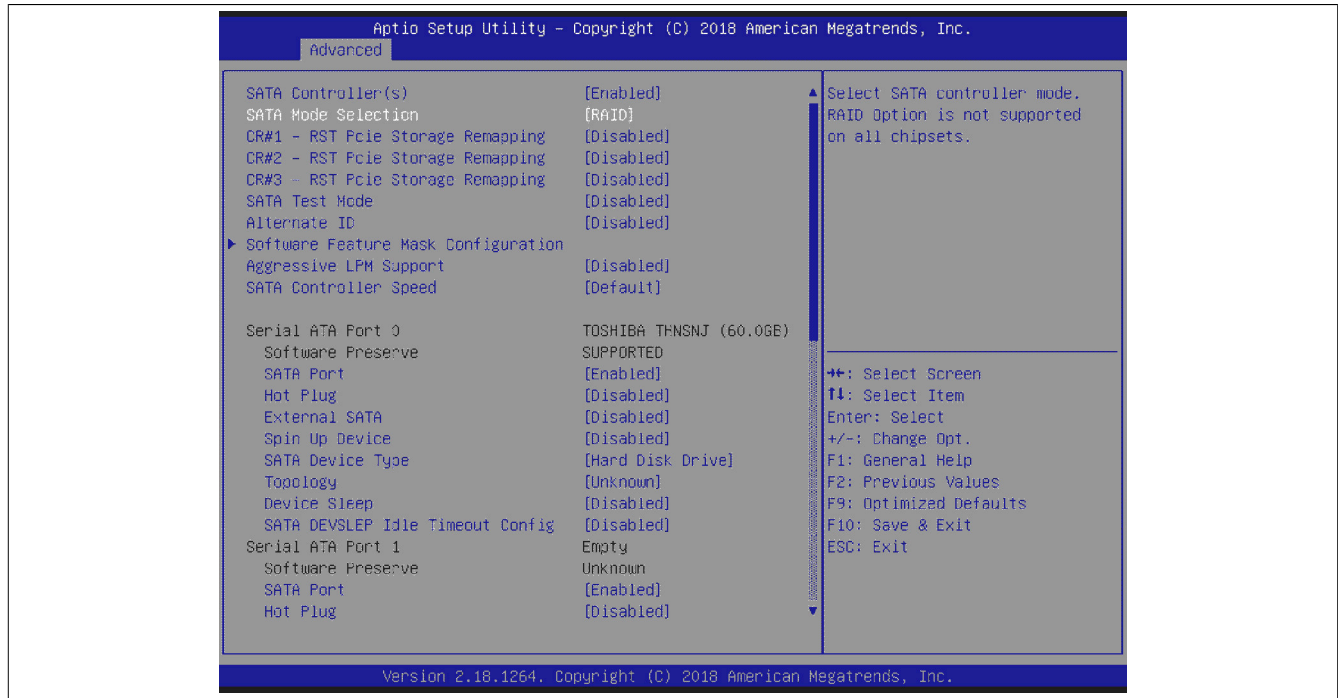


Figure 26: Creating the RAID configuration
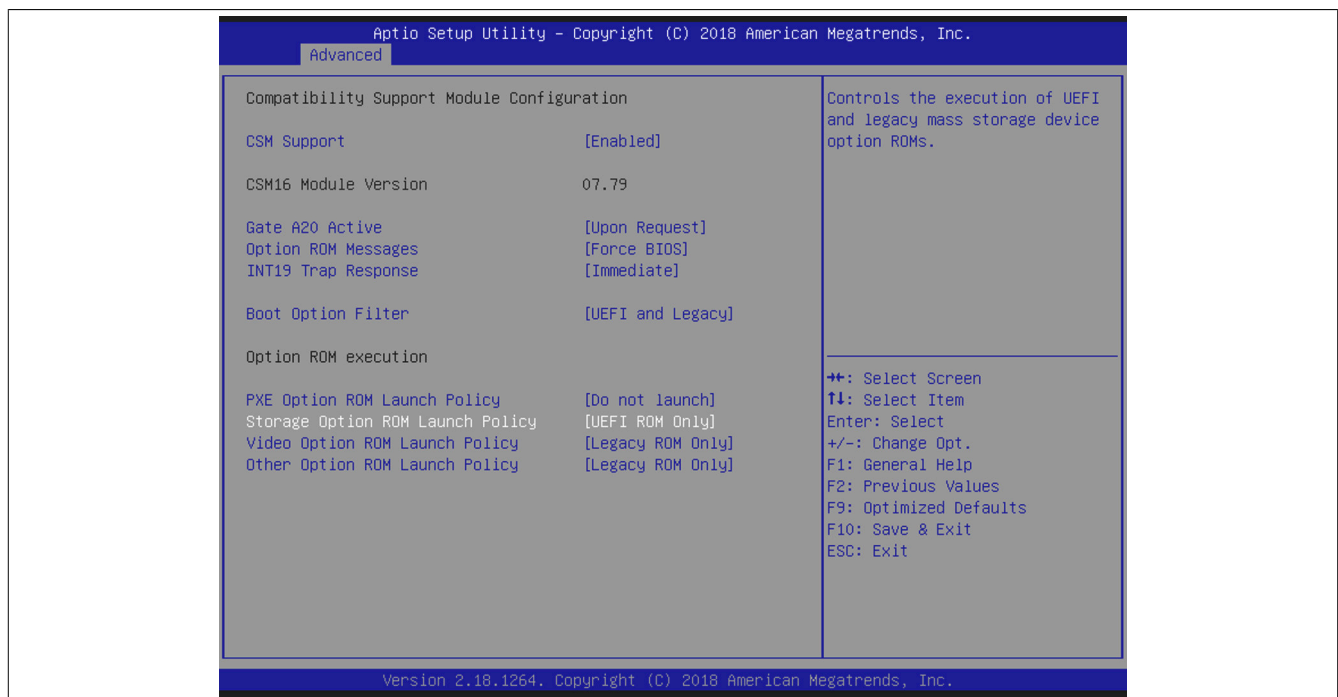


Figure 27: Setting UEFI mode

---

After the BIOS has been configured for RAID in UEFI mode, menu "Intel(R) Rapid Storage Technology" is visible.

```
              Aptio Setup Utility – Copyright (C) 2018 American Megatrends, Inc.
          Main  Advanced  Chipset  Security  Boot  Save & Exit

        ▶ Graphics Configuration                       ▲  This formset allows the user
        ▶ Hardware Health Monitoring                      to manage RAID volumes on the
        ▶ OEM Features                                    Intel(R) RAID Controller
        ▶ Intel(R) Rapid Storage Technology
        ▶ Trusted Computing
        ▶ RTC Wake Settings
        ▶ ACPI Configuration
        ▶ AMT Configuration
        ▶ PCH-FW Configuration
        ▶ SMART Settings
        ▶ Serial Port Console Redirection
        ▶ CPU Configuration
        ▶ Secure Erase                                    →←: Select Screen
        ▶ SATA Configuration                              ↑↓: Select Item
        ▶ Thermal Configuration                           Enter: Select
        ▶ PCI Configuration                               +/–: Change Opt.
        ▶ PCI Express Configuration                       F1: General Help
        ▶ PEG Port Configuration                          F2: Previous Values
        ▶ DMI/OPI Configuration                           F9: Optimized Defaults
        ▶ HD Audio Configuration                          F10: Save & Exit
        ▶ Memory Configuration                            ESC: Exit
        ▶ UEFI Network Stack
        ▶ CSM & Option ROM Control
        ▶ NVMe Configuration                          ▼
        ▶ USB Configuration

              Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

Figure 28: Selecting option "Intel(R) Rapid Storage Technology"

## 6.4.2.1 RAID volume information

```
              Aptio Setup Utility – Copyright (C) 2018 American Megatrends, Inc.
          Advanced

        Intel(R) RST 15.7.0.3054 RAID Driver             Select to see more information
                                                         about the RAID Volume


        RAID Volumes:
        ▶ Volume1, RAID1(Mirror), 55.9GB, Normal




                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/–: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F9: Optimized Defaults
                                                          F10: Save & Exit
                                                          ESC: Exit



              Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

Figure 29: Calling the information
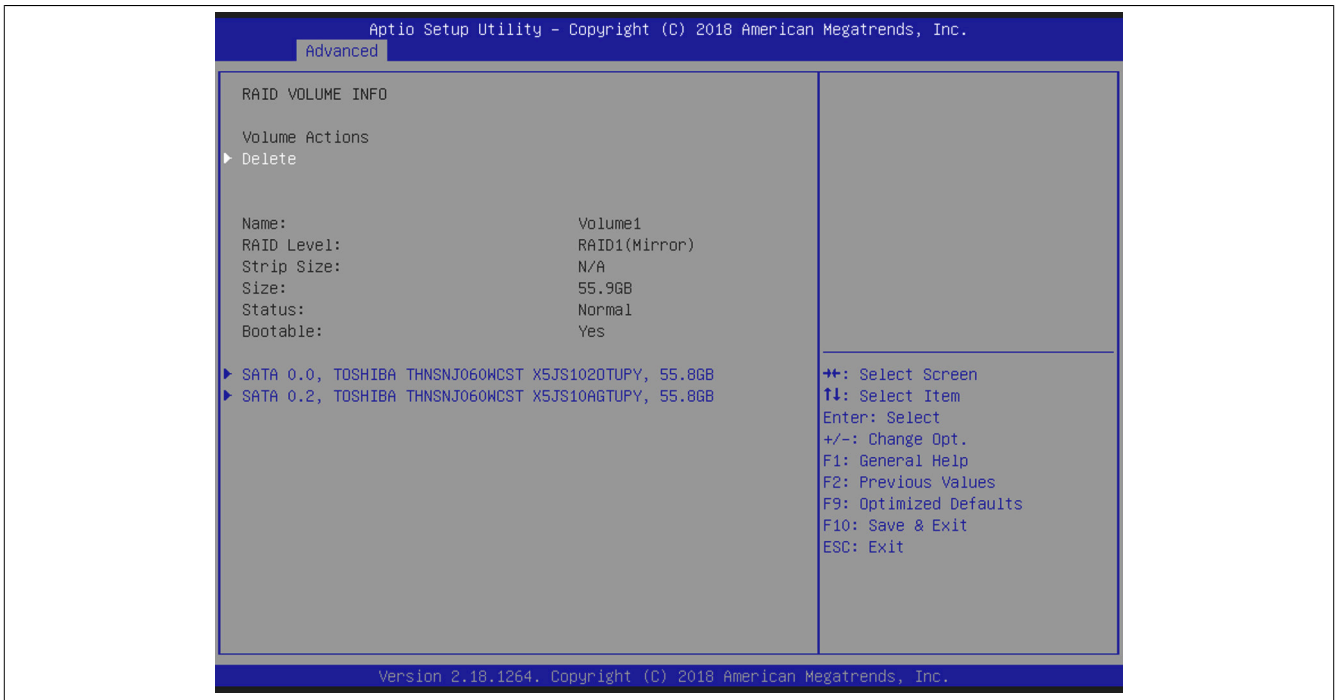
Figure 30: Selecting option "Delete"

### 6.4.2.2 Create RAID volume

Creating a RAID group is done via menu "Create RAID volume". At least two of the available drives must be selected for this.

**Information:**

**Executing this option will delete all data on the selected drives, including the operating system.**
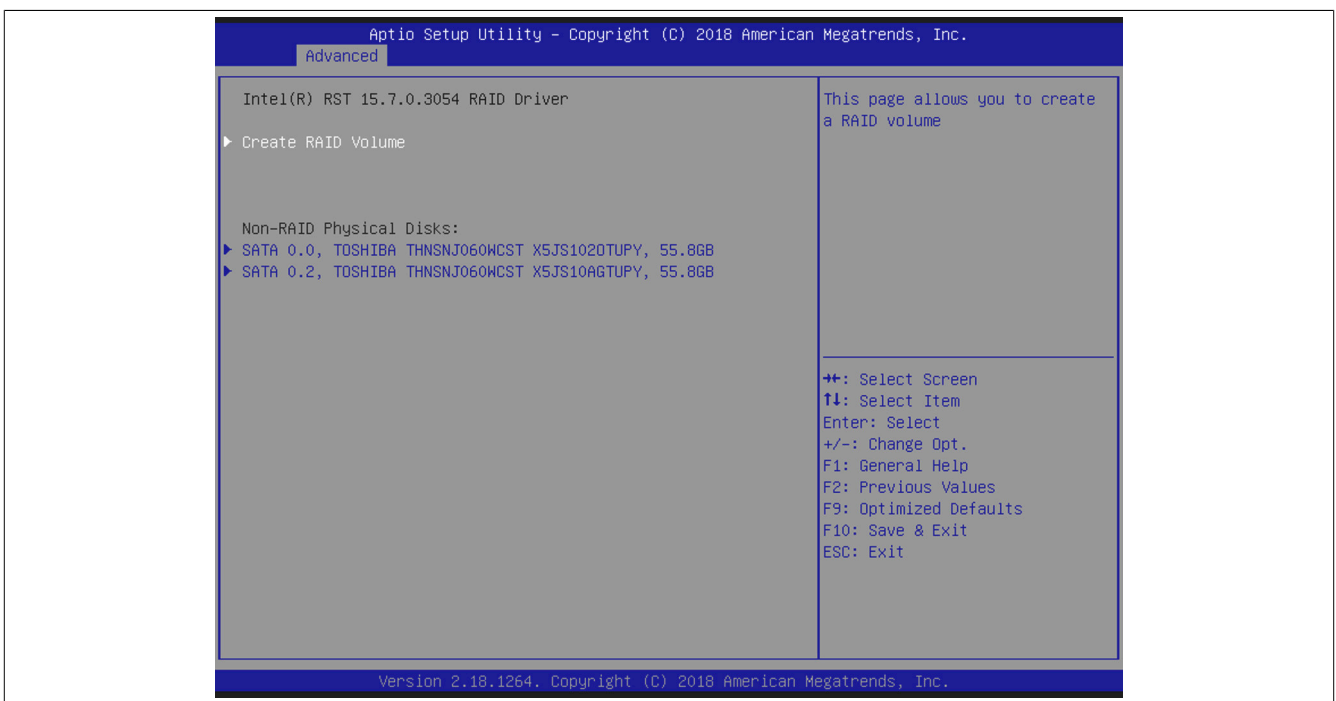


Figure 31: Creating a new RAID volume

```
                    Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
                  Advanced

    Create RAID Volume                                          X - to Select Disk

    Name:                          Volume1
    RAID Level:                    [RAID1(Mirror)]

    Select Disks:
    SATA 0.0, TOSHIBA THNSNJ060WCST       [X]
    X5JS1020TUPY, 55.8GB
    SATA 0.2, TOSHIBA THNSNJ060WCST       [X]
    X5JS10AGTUPY, 55.8GB

    Capacity (MB):                 57239

  ▶ Create Volume                                           ↔: Select Screen
                                                            ↑↓: Select Item
                                                            Enter: Select
                                                            +/-: Change Opt.
                                                            F1: General Help
                                                            F2: Previous Values
                                                            F9: Optimized Defaults
                                                            F10: Save & Exit
                                                            ESC: Exit


                    Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

Figure 32: Configuration of the new RAID volume

| Setting | Explanation | Configuration options | Effect |
|---|---|---|---|
| Name | Option for entering the RAID name. | Name with up to 16 characters | Assigns a name to the RAID volume. |
| RAID level | Option for setting the RAID level. | RAID0 (Stripes) | Creates RAID0. |
| | | RAID1 (Mirror) | Creates RAID1. |
| | | Recovery | Creates recovery RAID. |
| Disks[1] | Specifies the installed hard disks as either master or recovery. | Master, Recovery | Defines the hard disks as master or recovery. |
| Strip size[2] | Option for configuring the size of data blocks. | 4 kB, 8 kB, 16 kB, 32 kB, 64 kB, 128 kB | Configures the size of the data block. |
| Capacity | Option for configuring the RAID capacity. | | Configures the memory size of the RAID volume. |
| Sync[1] | Option for configuring RAID synchronization. | N/A | - |
| | | Continuous | Automatically synchronizes the RAID volume. |
| | | On request | Manually synchronizes the RAID volume. |
| Create volume | Creates the RAID volume. | - | Creates the RAID volume. |

Table 137: Configuration Utility - Create RAID volume

1) This setting is only possible if *RAID level* is set to *Recovery*.
2) This setting is only possible if *RAID level* is set to *RAID0(Stripe)*.

### 6.4.2.3 Delete RAID volume

The RAID drive can be formatted via menu "Delete". The drive to be deleted is selected and then deleted by pressing <DEL>.

## Information:

**This option deletes all data on the drive, including the operating system.**

```
                  Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
              Advanced

      RAID VOLUME INFO

      Volume Actions
    ▶ Delete


      Name:                        Volume1
      RAID Level:                  RAID1(Mirror)
      Strip Size:                  N/A
      Size:                        55.9GB
      Status:                      Normal
      Bootable:                    Yes

    ▶ SATA 0.0, TOSHIBA THNSNJ060WCST X5JS1020TUPY, 55.8GB    ⟷: Select Screen
    ▶ SATA 0.2, TOSHIBA THNSNJ060WCST X5JS10AGTUPY, 55.8GB    ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit



                  Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```
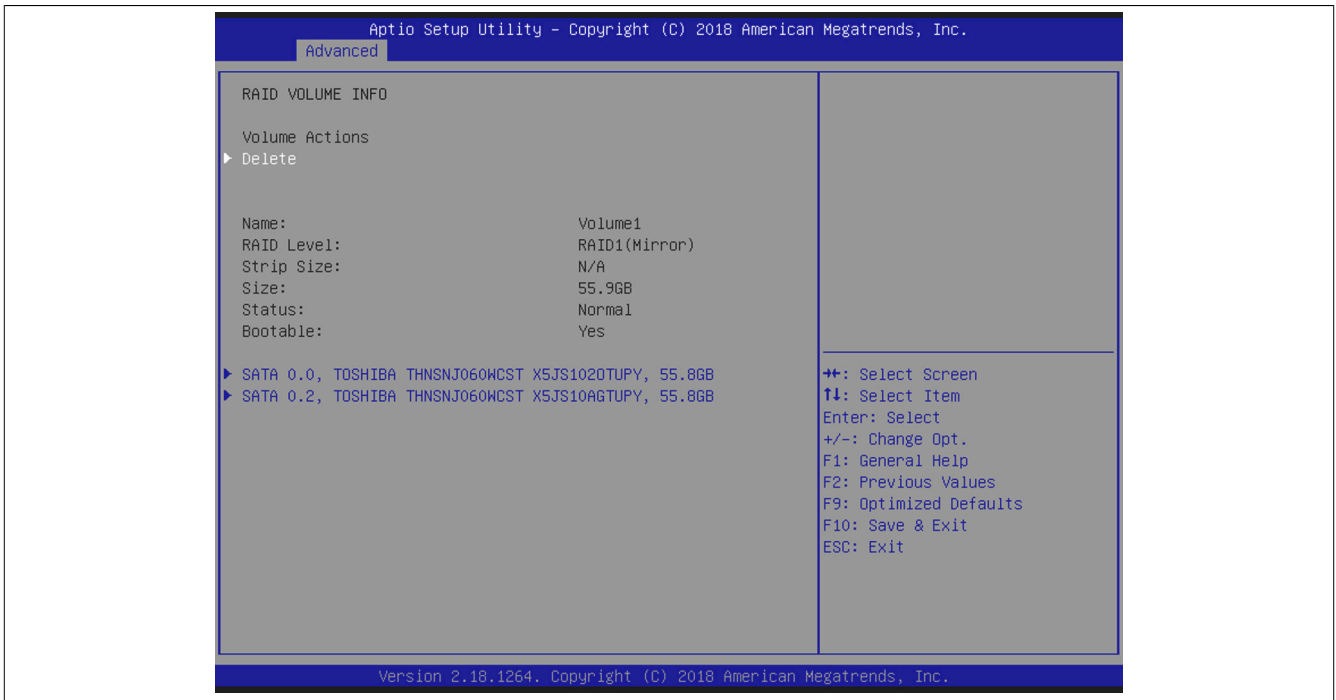
Figure 33: Selecting option "Delete"

```
                  Aptio Setup Utility - Copyright (C) 2018 American Megatrends, Inc.
              Advanced

      Delete                                                Deleting a volume will reset
                                                            the disks to non-RAID.
      Delete the RAID volume?
      ALL DATA ON VOLUME WILL BE LOST!

    ▶ Yes
    ▶ No







                                                              ⟷: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit



                  Version 2.18.1264. Copyright (C) 2018 American Megatrends, Inc.
```

Figure 34: Confirm

### 6.4.2.4 Reset disks to non-RAID

An existing RAID volume can be deleted using menu "Reset to non-RAID". The RAID to be deleted is selected and then deleted by pressing <SPACE> (<ENTER> to confirm).

**Information:**

**Deleting a RAID volume also deletes all of the data on the drive.**
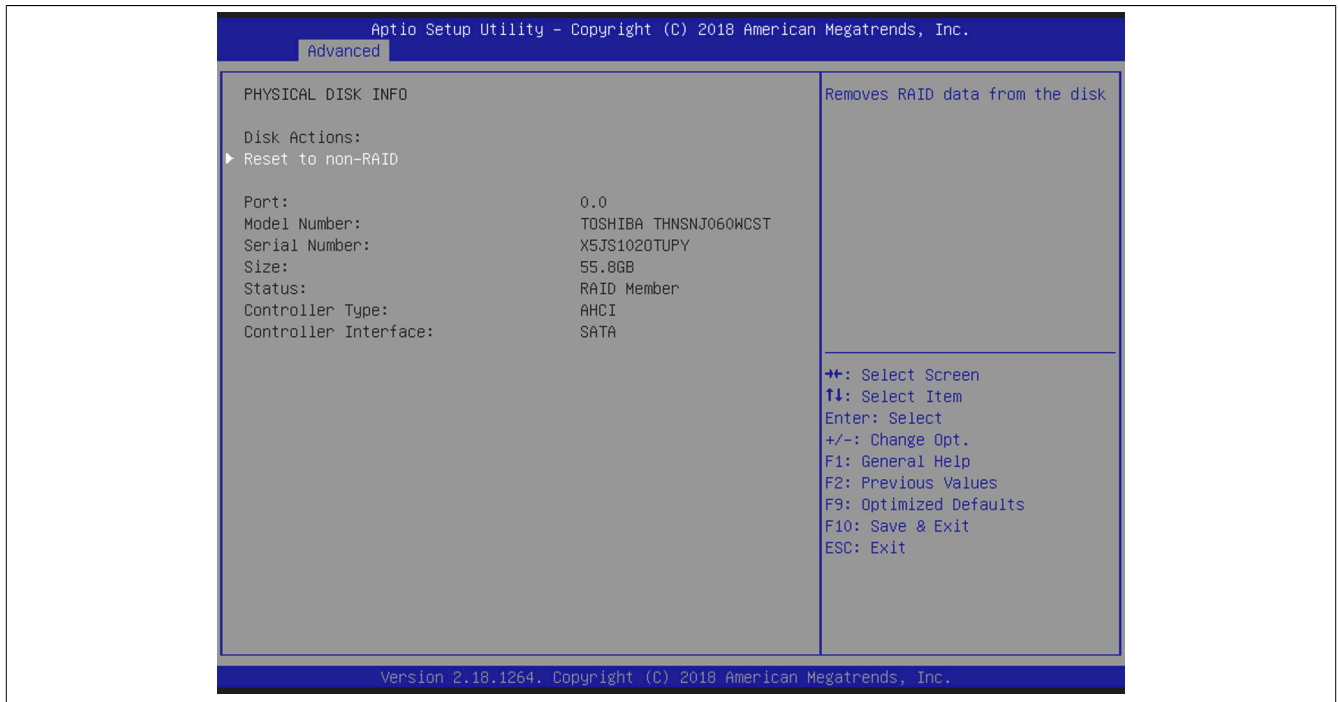
Figure 35: Selecting option "Reset"

# 6.5 Known problems/issues

- When using a PCI or PCIe RAID controller, we recommend disabling ASPM or power management for the respective PCI or PCIe slot.
- If problems occur with the ETH1 and ETH2 interface (connection aborted, slow data transfer, etc.), one possible solution is to disable the EEE feature (Energy Efficient Ethernet) in the driver.
- Under certain circumstances[6], Windows may not recognize a connected PCIe card. In such cases, it is recommended to make the following change in the BIOS:

  In menu **Advanced / PCI Express graphics (PEG) port**, set setting *PCI Express graphics (PEG) port* to **Enabled**.

---

[6]  TS77 chipsets with MTCX 1.20 or 1.24 and BIOS 1.24, 1.27 or 1.30, for example

# 7 Software

## 7.1 BIOS options

### 7.1.1 General information

BIOS is the abbreviation for "Basic Input and Output System". It is the basic standardized connection between user and system (hardware). The BIOS system used in this B&R industrial PC was developed by American Megatrends, Inc.

The BIOS Setup Utility allows to modify basic system configuration settings. These settings are stored in the CMOS and EEPROM (as backup).

CMOS data is nonvolatile and remains stored on the B&R industrial PC for a certain amount of time even when the power is switched off (no 24 VDC power supply).

### 7.1.2 BIOS Setup and start procedure

BIOS is enabled immediately after switching on the power supply of the B&R industrial PC or pressing the power button. A check takes place as to whether the setup data from the EEPROM is "OK". If "OK", the data is transferred to the CMOS. If "not OK", the CMOS data is checked for validity. If the CMOS data is also invalid, an error message is output and the boot procedure can be resumed without problems by pressing the <F1> key. To prevent an error message from appearing on each restart, launch the BIOS Setup utility by pressing <F2> and save the settings again.

BIOS reads the system configuration information, checks the system and configures it through the power-on self-test (POST).

When these "preparations" are completed, BIOS searches the system for an operating system in the available data storage devices (hard disk drive, floppy disk drive, etc.). BIOS starts the operating system and transfers to it control over system operations.

To enter BIOS Setup, key "Del" must be pressed after the USB controller has been initialized as soon as the following message appears on the monitor (during POST): "Press DEL to run setup".

### 7.1.2.1 BIOS Setup buttons

The following keys are enabled during POST:

> **Information:**
>
> **The key signals of the USB keyboard are only accepted after initializing the USB controller.**
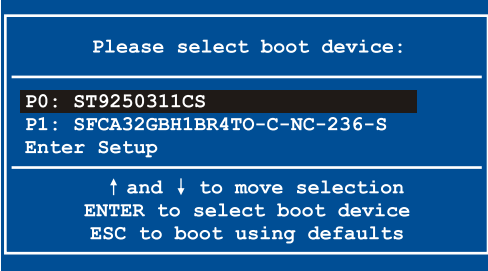
| Keys | Function |
|------|----------|
| Del, F2 | Access to the BIOS Setup menu. |
| F12 | It is possible to boot from the network with F12. |
| F11 | Opens the boot menu. This lists all bootable devices that are connected to the system. Selecting a device with cursor ↑, cursor ↓ and then pressing <ENTER> will boot from that device. <br><br> **Please select boot device:** <br><br> P0: ST9250311CS <br> P1: SFCA32GBH1BR4TO-C-NC-236-S <br> Enter Setup <br><br> ↑ and ↓ to move selection <br> ENTER to select boot device <br> ESC to boot using defaults |
| <Pause> | The POST can be stopped with the <Pause> button. After pressing any other key, the POST continues to run. |

Table 138: BIOS-relevant keys during POST

The following keys can be used after entering BIOS Setup:

| Key | Function |
|-----|----------|
| F1 | General help. |
| Cursor ↑ | Go to previous object. |
| Cursor ↓ | Go to next object. |
| Cursor ← | Go to previous object. |
| Cursor → | Go to next object. |
| +- | Changes the setting of the selected function. |
| Enter | Switches to the selected menu. |
| Page ↑ | Changes to the previous page. |
| Page ↓ | Changes to the next page. |
| Home | Jumps to the first BIOS menu option or object. |
| End | Jumps to the last BIOS menu option or object. |
| F2 / F3 | Changes the colors of BIOS Setup. |
| F7 | Resets the changes. |
| F9 | Loads and sets CMOS default values for all BIOS settings. |
| F10 | Saves and closes. |
| ESC | Exits the submenu. |

Table 139: BIOS-relevant keys in the BIOS menu

### 7.1.3 BIOS TS17

**Information:**

**The following figures, BIOS menu options and descriptions refer to BIOS version 2.10. It is therefore possible that these figures or BIOS descriptions do not correspond to the installed BIOS version. In addition, the BIOS menu options depend on the system configuration.**

**Information:**

**BIOS default settings are bold and italicized in the tables.**

**BIOS menu options and descriptions that are not highlighted either depend on the system configuration or are only displayed depending on other BIOS settings.**

**Information:**

**The set BIOS default values are optimized for the respective system and adapted to the system configuration. Every change to the BIOS default values must be checked by the user. Faulty or invalid BIOS settings can result in malfunctions of the system.**

**7.1.3.1 Main**

The BIOS Setup main menu appears immediately after key "Del" is pressed during system startup.

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  Main  Advanced  Chipset  Security  Boot  Save & Exit

  BIOS Information                                      Platform Information
  Main BIOS Version              APCCR210
  OEM BIOS Version
  Build Date                     12/11/2020

  Board Information
  Product Revision               X.0
  Serial Number                  000005090843

▶ Platform Information

  System Date                    [Wed 03/17/2021]
  System Time                    [10:15:53]
                                                       →←: Select Screen
                                                       ↑↓: Select Item
                                                       Enter: Select
                                                       +/-: Change Opt.
                                                       F1: General Help
                                                       F2: Previous Values
                                                       F9: Optimized Defaults
                                                       F10: Save & Exit
                                                       ESC: Exit

              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.1.1 Platform information**

Path: Main > Platform Information

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  Main

  Intel(R) Core(TM) i3-6100E CPU @ 2.70GHz
  Codename                       Skylake Halo
  Processor Speed                2700 MHz
  Processor Signature            0x506E3
  Stepping                       R0/S0/N0
  Processor Cores                2Core(s) / 4Thread(s)
  Microcode Revision             E2
  Processor Graphics Controller  GT2 (0x191B)
  eDRAM Size                     N/A

  IGD VBIOS Version              1066
  IGD GOP Version                N/A
  Total Memory                    8192 MB
  Memory Frequency                2133 MHz                →←: Select Screen
                                                          ↑↓: Select Item
  PCH Information                                         Enter: Select
  Codename                       SKL PCH-H                +/-: Change Opt.
  PCH SKU                        HM170                    F1: General Help
  Stepping                       D1                       F2: Previous Values
                                                          F9: Optimized Defaults
                                                          F10: Save & Exit
                                                          ESC: Exit

              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

## 7.1.3.2 Advanced

```
                    Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Main  Advanced  Chipset  Security  Boot  Save & Exit

    ▶ CPU Configuration                                          CPU Configuration
    ▶ Thermal Configuration
    ▶ IGD Display Configuration
    ▶ OEM Features
    ▶ Network Stack Configuration
    ▶ Trusted Computing
    ▶ RTC Wake Settings
    ▶ ACPI Settings
    ▶ SMART Settings
    ▶ Serial Port Console Redirection
    ▶ PCI Configuration
    ▶ USB Configuration
    ▶ CSM & Option ROM Control
    ▶ NVMe Configuration
                                                                 ↔: Select Screen
                                                                 ↑↓: Select Item
                                                                 Enter: Select
                                                                 +/-: Change Opt.
                                                                 F1: General Help
                                                                 F2: Previous Values
                                                                 F9: Optimized Defaults
                                                                 F10: Save & Exit
                                                                 ESC: Exit




                    Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.2.1 CPU configuration

> **Information:**
>
> **The settings shown may vary depending on the CPU board being used.**

Path: Advanced > CPU configuration

```
                    Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Advanced

    ▶ Processor Information                                      Processor Information
    ▶ CPU - Power Management Control
      SW Guard Extensions (SGX)         [Disabled]
      CPU Flex Ratio Override           [Disabled]
      Hardware Prefetcher               [Enabled]
      Adjacent Cache Line Prefetch      [Enabled]
      Intel (VMX) Virtualization        [Enabled]
      Technology
      PECI                              [Enabled]
      Active Processor Cores            [All]
      Execute Disable Bit               [Enabled]
      Hyper-Threading                   [Enabled]
      BIST                              [Disabled]
      AP threads Idle Manner            [MWAIT Loop]            ↔: Select Screen
      AP threads Handoff Manner         [MWAIT Loop]            ↑↓: Select Item
      AES                               [Enabled]               Enter: Select
      MachineCheck                      [Enabled]               +/-: Change Opt.
      MonitorMWait                      [Enabled]               F1: General Help
      Current Debug Interface Status     Disabled               F2: Previous Values
      Debug Interface                   [Disabled]              F9: Optimized Defaults
      Debug Interface Lock              [Enabled]               F10: Save & Exit
      Processor trace memory allocation [Disabled]              ESC: Exit




                    Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.2.1.1 Processor information**

┃ # Information:
┃
┃ **The settings shown may vary depending on the CPU board being used.**

Path: Advanced > CPU configuration > Processor information

```
Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  Advanced

Type                            Intel(R) Core(TM)
                                i3-6100E CPU @ 2.70GHz
Processor Signature             0x506E3
Processor Speed                 2700 MHz
L1 Data Cache                   32 KB x 2
L1 Instruction Cache            32 KB x 2
L2 Cache                        256 KB x 2
L3 Cache                        3 MB
L4 Cache                        N/A
VMX                             Supported
SMX/TXT                         Not Supported

                                            →←: Select Screen
                                            ↑↓: Select Item
                                            Enter: Select
                                            +/-: Change Opt.
                                            F1: General Help
                                            F2: Previous Values
                                            F9: Optimized Defaults
                                            F10: Save & Exit
                                            ESC: Exit

       Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.2.1.2 Power management control**

Path: Advanced > CPU configuration > Power management control

```
Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
  Main

CPU - Power Management Control                      Select the performance state
                                                   that the BIOS will set
Boot performance mode          [Max Non-Turbo      starting from reset vector.
                                Performance]
Intel(R) SpeedStep(tm)         [Enabled]
No Fan CPU Speed Limiter       [Enabled]
Race To Halt (RTH)             [Enabled]
Intel(R) Speed Shift Technology [Disabled]
HDC Control                    [Disabled]
▶ View/Configure Turbo Options
C states                       [Disabled]
Thermal Monitor                [Enabled]
Interrupt Redirection Mode     [PAIR with Fixed
Selection                      Priority]          →←: Select Screen
Timed MWAIT                    [Disabled]         ↑↓: Select Item
▶ Custom P-state Table                            Enter: Select
                                                  +/-: Change Opt.
                                                  F1: General Help
                                                  F2: Previous Values
                                                  F9: Optimized Defaults
                                                  F10: Save & Exit
                                                  ESC: Exit

       Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.2.2 Thermal configuration

Path: Advanced > Thermal configuration

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

  Thermal Configuration                                      CPU Thermal Configuration
                                                             options
 ▶ CPU Thermal Configuration
 ▶ Platform Thermal Configuration




                                                             →←: Select Screen
                                                             ↑↓: Select Item
                                                             Enter: Select
                                                             +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F9: Optimized Defaults
                                                             F10: Save & Exit
                                                             ESC: Exit



              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.2.2.1 CPU thermal configuration

Path: Advanced > Thermal configuration > CPU thermal configuration

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

  Cpu Thermal Configuration                                  Disabled: ACPI thermal
                                                             management uses EC reported
  DTS SMM                        [Disabled]                  temperature values.
  Tcc Activation Offset          0                           Enabled: ACPI thermal
  Tcc Offset Time Window         [Disabled]                  management uses DTS SMM
  Tcc Offset Clamp Enable        [Disabled]                  mechanism to obtain CPU
  Tcc Offset Lock Enable         [Disabled]                  temperature values.
  Bi-directional PROCHOT#        [Enabled]                   Out of Spec: ACPI Thermal
  Disable PROCHOT# Output        [Enabled]                   Management uses EC reported
  Disable VR Thermal Alert       [Disabled]                  temperature values and DTS SMM
  PROCHOT Response               [Disabled]                  is used to handle Out of Spec
  PROCHOT Lock                   [Disabled]
  ACPI T-States                  [Disabled]
  PECI Reset                     [Enabled]                   →←: Select Screen
  PECI C10 Reset                 [Disabled]                  ↑↓: Select Item
                                                             Enter: Select
                                                             +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F9: Optimized Defaults
                                                             F10: Save & Exit
                                                             ESC: Exit



              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

## 7.1.3.2.2.2 Platform thermal configuration

Path: Advanced > Thermal configuration > Platform thermal configuration

```
                 Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

   Platform Thermal Configuration                               Enable/Disable PCH Thermal
                                                                Device(D20:F2)
   PCH Thermal Device              [Disabled]
   PCH Temp Read                   [Enabled]
   CPU Energy Read                 [Enabled]
   CPU Temp Read                   [Enabled]
   Alert Enable Lock               [Disabled]




                                                                →←: Select Screen
                                                                ↑↓: Select Item
                                                                Enter: Select
                                                                +/-: Change Opt.
                                                                F1: General Help
                                                                F2: Previous Values
                                                                F9: Optimized Defaults
                                                                F10: Save & Exit
                                                                ESC: Exit



                 Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

## 7.1.3.2.3 IGD display configuration

Path: Advanced > IGD display configuration

```
                 Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced
                                                                Primary IGD display in POST.
   Primary IGD Boot Display Device    [Auto]                    CRT = Analog VGA display port
                                                                LFP = Local Flat Panel
   Active LFP Configuration        [eDP to LVDS Bridge]         EFPx (External Flat Panel) is
   LVDS SSC                        [Disabled]                   a DisplayPort or HDMI/DVI
                                                                display on DDI1, DDI2 or DDI3.
   Digital Display Interface 1     [Disabled]                   Only DDI2 enabled: DDI2->EFP
   Digital Display Interface 2     [Disabled]                   Both DDI1 and DDI2 enabled:
   Digital Display Interface 3     [HDMI/DVI]                   DDI1->EFP, DDI2->EFP2. EFP
   VGA Port                        [Enabled]                    selections are valid only when
                                                                DDI1,2 and/or DDI3 are enabled.
   DisplayPort Spread Spectrum Clock  [Disabled]

 ▶ Display Interface Signal Integrity Settings                  →←: Select Screen
                                                                ↑↓: Select Item
                                                                Enter: Select
                                                                +/-: Change Opt.
                                                                F1: General Help
                                                                F2: Previous Values
                                                                F9: Optimized Defaults
                                                                F10: Save & Exit
                                                                ESC: Exit



                 Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.2.3.1 Display interface signal integrity settings**

> # 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.**

Path: Advanced > IGD display configuration > Display interface signal integrity settings

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
    Advanced

  Display Interface Signal Integrity Settings              This feature specifies the
                                                           Level shifter configuration
  HDMI 1 Level Shifter Config      [ 800mV/2.0dB]          for HDMI.
  HDMI 2 Level Shifter Config      [ 800mV/2.0dB]
  HDMI 3 Level Shifter Config      [ 800mV/2.0dB]

  DisplayPort 1 Trace Length       [Default]
  DisplayPort 2 Trace Length       [Default]
  DisplayPort 3 Trace Length       [Default]

  DDI 0 IBoost                     [Disabled]

  DDI 1 IBoost                     [Disabled]
                                                           →←: Select Screen
  DDI 2 IBoost                     [Disabled]              ↑↓: Select Item
                                                           Enter: Select
  DDI 3 IBoost                     [Disabled]              +/-: Change Opt.
                                                           F1: General Help
  DDI 4 IBoost                     [Disabled]              F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit



            Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.2.4 OEM features

Path: Advanced > OEM features

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
         Advanced

      Main BIOS Version              APCCR210          ▲  Slide-In 1 Features Submenu.
      OEM BIOS Version                                 ▒
      MTCX                           1.31              ▒

      MAC Address                    00:13:95:3A:25:0B
      ETH2 MAC Address               00:13:95:3A:25:0C

      OEM String
      Bernecker + Rainer  Industrie-Elektronik X2.10

      Realtime Environment           [Disabled]
      Hypervisor Environment         [Disabled]
      TI XIO2001 PCI Bridge Config   [Enabled]

    ▶ Super IO                                            →←: Select Screen
    ▶ CPU Board Features                                  ↑↓: Select Item
    ▶ System Board Features                               Enter: Select
    ▶ Memory Module Features                              +/-: Change Opt.
    ▶ Display Board Features                              F1: General Help
    ▶ Bus Unit Features                                   F2: Previous Values
    ▶ IF Option 1 Features                                F9: Optimized Defaults
    ▶ IF Option 2 Features                                F10: Save & Exit
    ▶ Fan Unit Features                                   ESC: Exit
    ▶ Fan Unit Bus Features
    ▶ Slide-In 1 Features                             ▼

            Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

Function of "Realtime environment" and "Hypervisor environment" settings:
This function is supported in Automation Studio 4.7 and later. Starting with this version, it is possible to configure hypervisor operation with or without hyperthreading for the GPOS (if the CPU used supports this).

| Option | Realtime environment (RTE) | Hypervisor environment (HV) | Description |
|---|---|---|---|
| a) | Disabled | Disabled | The default settings are used. |
| b) | Enabled | Disabled | The system has full RTE support. Hyperthreading is disabled. |
| c) | Enabled | Enabled | The system has full RTE and AS support. Hyperthreading is disabled. |
| d) | Disabled | Enabled | The system has RTE and AS support. Hyperthreading is enabled. |

If the complete system has been preconfigured for real-time and/or hypervisor operation, these parameters are system specifications and grayed out. Changes in BIOS Setup are then ineffective since they are overwritten by the system specifications during booting. In this case, configuration changes must be made with in the EFI shell with tool "mtcxsvc.efi", which is part of the firmware upgrades for PPC900 systems (see "Firmware upgrade" on page 291).

**7.1.3.2.4.2 Super I/O configuration**

Path: Advanced > OEM features > Super I/O configuration

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
         Advanced

    Super I/O Controller                                       Enable or disable Serial Port
                                                               (COM).
    Serial Port A                      [Enabled]
      Device Settings                  IO=3F8h; IRQ=4;
    Serial Port B                      [Enabled]
      Device Settings                  IO=2F8h; IRQ=3;
    Serial Port D                      [Enabled]
      Device Settings                  IO=238h; IRQ=6;
    CAN Controller                     Enabled
      Device Settings                  IO=384h IRQ=10


                                                               ↔: Select Screen
                                                               ↑↓: Select Item
                                                               Enter: Select
                                                               +/-: Change Opt.
                                                               F1: General Help
                                                               F2: Previous Values
                                                               F9: Optimized Defaults
                                                               F10: Save & Exit
                                                               ESC: Exit




              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.2.4.3 CPU board features**

Path: Advanced > OEM features > CPU board features

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
         Advanced

    CPU Board Features                                         Temperature Values Submenu.

    Device ID                          0000FC86
    Hardware Revision                  A0
    Product Name                       5PC901.TS17-02
  ▶ Temperature Values




                                                               ↔: Select Screen
                                                               ↑↓: Select Item
                                                               Enter: Select
                                                               +/-: Change Opt.
                                                               F1: General Help
                                                               F2: Previous Values
                                                               F9: Optimized Defaults
                                                               F10: Save & Exit
                                                               ESC: Exit




              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**Temperature values**

Path: Advanced > OEM features > CPU board features > Temperature values

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Advanced

   Temperature Values

   Live Temperature Values
    Sensor 1                            49 C / 120 F


                                                           ++: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit




              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.2.4.4 System board features

Path: Advanced > OEM features > System board features

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Advanced

   System Board Features                                   Statistical Values Submenu.

   Device ID                     0000FC86
   Compatibility ID              0000
   Vendor ID                     00000000
   Hardware Revision             A0
   Serial Number                 FC860168422
   Product Name                  5PC901.TS17-02
   Parent Device ID              FFFFFFFF
   Parent Compatibility ID       FFFF
   User Serial ID                00000001

   ▶ Statistical Values
   ▶ Temperature Values                                    ++: Select Screen
   ▶ Voltage Values                                        ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit




              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

## Statistical values

Path: Advanced > OEM features > System board features > Statistical values

```
            Aptio Setup Utility – Copyright (C) 2020 American Megatrends, Inc.
            Advanced

 Statistical Values

 Operating Time
  Total Hours                    764
  Power On Cycles                1631

                                                   →←: Select Screen
                                                   ↑↓: Select Item
                                                   Enter: Select
                                                   +/–: Change Opt.
                                                   F1: General Help
                                                   F2: Previous Values
                                                   F9: Optimized Defaults
                                                   F10: Save & Exit
                                                   ESC: Exit

            Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

## Temperature values

Path: Advanced > OEM features > System board features > Temperature values

```
            Aptio Setup Utility – Copyright (C) 2020 American Megatrends, Inc.
            Advanced

 Temperature Values

 Live Temperature Values
  Sensor 1                       46 C / 114 F
  Sensor 2                       45 C / 113 F
  Sensor 3                       46 C / 114 F
  Sensor 4                       43 C / 109 F

                                                   →←: Select Screen
                                                   ↑↓: Select Item
                                                   Enter: Select
                                                   +/–: Change Opt.
                                                   F1: General Help
                                                   F2: Previous Values
                                                   F9: Optimized Defaults
                                                   F10: Save & Exit
                                                   ESC: Exit

            Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**Voltage values**

Path: Advanced > OEM features > System board features > Voltage values

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

  Voltage Values

  Battery Voltage                      3.02 V
  Battery State                        GOOD



                                                         →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F9: Optimized Defaults
                                                         F10: Save & Exit
                                                         ESC: Exit



                Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.2.4.5 Memory module features

Path: Advanced > OEM features > Memory module features

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

  Memory Module Features

  Socket 1 Module:
  Serial Number                        6BA7009B
  Product Name                         DDRID-i-DIMM


  Socket 2 Module:
  Serial Number                        395B001B
  Product Name                         DDRID-i-DIMM
                                                         →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F9: Optimized Defaults
                                                         F10: Save & Exit
                                                         ESC: Exit



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```

## 7.1.3.2.4.6 Display board features

Path: Advanced > OEM features > Display link module features

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

  Display Board Features                                      Statistical Values Submenu.

  Device ID                      0000E16A
  Compatibility ID               0000
  Vendor ID                      00000000
  Hardware Revision              H0
  Serial Number                  E16A0172447
  Product Name                   5AP933.156B-00
  Parent Device ID               FFFFFFFF
  Parent Compatibility ID        FFFF

  ▶ Statistical Values
  ▶ Temperature Values                                        →←: Select Screen
                                                              ↑↓: Select Item
  ▶ Panel #15                                                 Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit

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```

### Statistical values

Path: Advanced > OEM features > Display link module features > Statistical values

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

  Statistical Values

  Operating Time
   Total Hours                   5042
   Power On Cycles               1633

                                                              →←: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit

                Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```
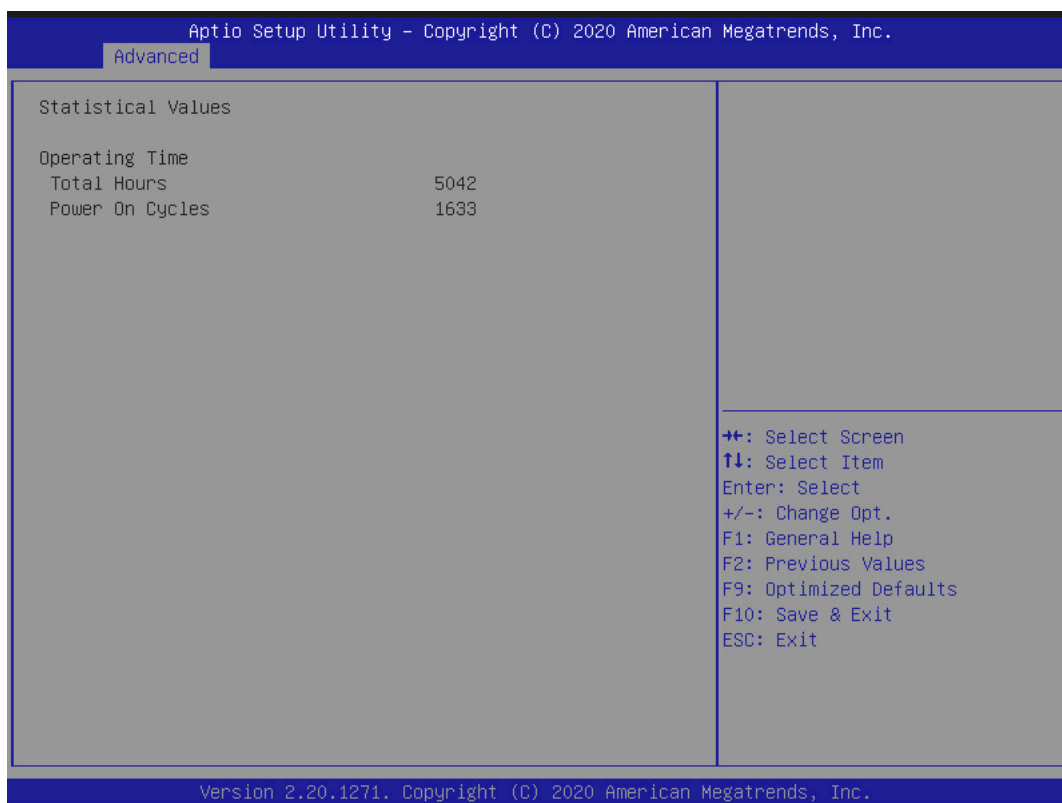
#### Temperature values

Path: Advanced > OEM features > Display link module features > Temperature values

```
        Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
    Advanced

Temperature Values

Live Temperature Values
  Sensor 1                           43 C / 109 F

                                                     →←: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F9: Optimized Defaults
                                                     F10: Save & Exit
                                                     ESC: Exit

        Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```
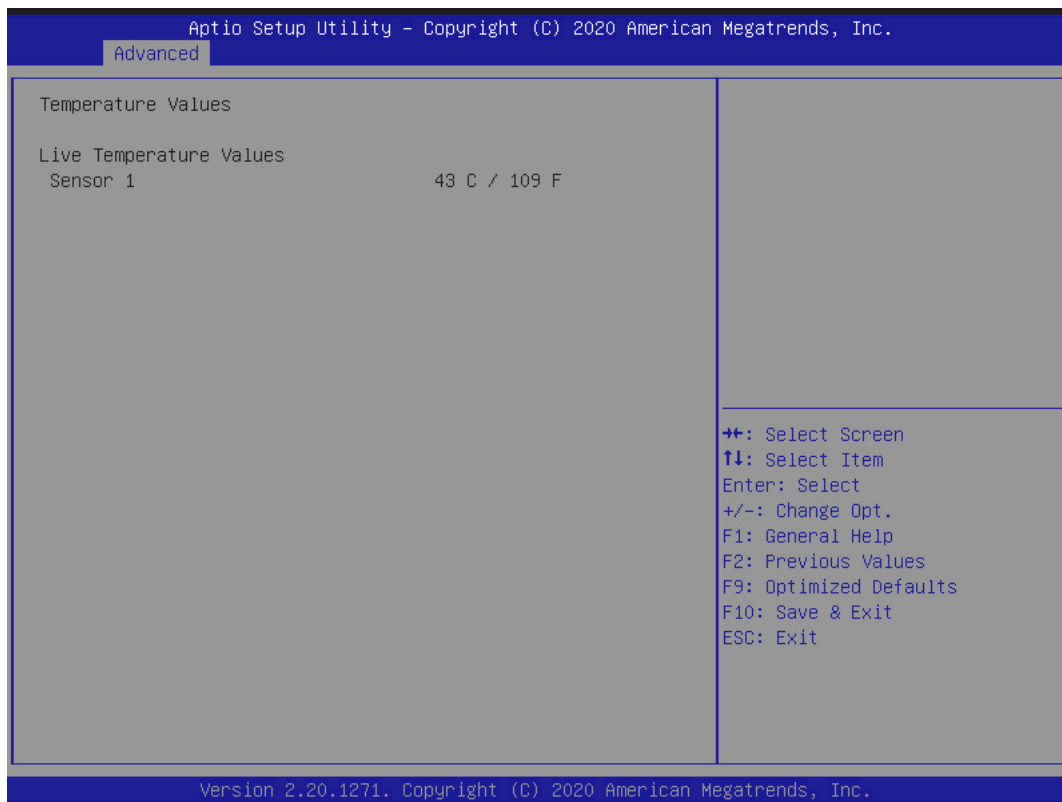
#### Panel #15

Path: Advanced > OEM features > Display board features > Panel #15

```
        Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
    Advanced

Panel #15                                            Set Brightness level. Requires
                                                     reboot.
Version                    V1.00
Brightness                 100
Fan Speed                  0 RPM
Keys/Leds                  0/0
Temperature                0 C / 32 F

                                                     →←: Select Screen
                                                     ↑↓: Select Item
                                                     Enter: Select
                                                     +/-: Change Opt.
                                                     F1: General Help
                                                     F2: Previous Values
                                                     F9: Optimized Defaults
                                                     F10: Save & Exit
                                                     ESC: Exit

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```

### 7.1.3.2.4.7 Bus unit features

Path: Advanced > OEM features > Bus unit features

```
          Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Advanced

  Bus Unit Features                                     Statistical Values Submenu.

  Device ID                       0000DFB1
  Compatibility ID                0000
  Vendor ID                       00000000
  Hardware Revision               C0
  Serial Number                   DFB10168461
  Product Name                    5AC902.BX01-01
  Parent Device ID                FFFFFFFF
  Parent Compatibility ID         FFFF

  ▶ Statistical Values
                                                      ↔: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F9: Optimized Defaults
                                                      F10: Save & Exit
                                                      ESC: Exit

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```

**Statistical values**

Path: Advanced > OEM features > Bus unit features > Statistical values

```
          Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Advanced

  Statistical Values

  Operating Time
   Total Hours                    354
   Power On Cycles                53




                                                      ↔: Select Screen
                                                      ↑↓: Select Item
                                                      Enter: Select
                                                      +/-: Change Opt.
                                                      F1: General Help
                                                      F2: Previous Values
                                                      F9: Optimized Defaults
                                                      F10: Save & Exit
                                                      ESC: Exit

          Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.2.4.8 IF option 1 features**

Path: Advanced > OEM features > IF option 1 features

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Advanced

    IF Option 1 Features                                       Statistical Values Submenu.

    Device ID                        0000D84A
    Compatibility ID                 0000
    Vendor ID                        00000000
    Hardware Revision                D0
    Serial Number                    D84A0171680
    Product Name                     5AC901.I485-00
    Parent Device ID                 FFFFFFFF
    Parent Compatibility ID          FFFF

    ▶ Statistical Values
                                                               ↔: Select Screen
                                                               ↑↓: Select Item
                                                               Enter: Select
                                                               +/-: Change Opt.
                                                               F1: General Help
                                                               F2: Previous Values
                                                               F9: Optimized Defaults
                                                               F10: Save & Exit
                                                               ESC: Exit

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```

**Statistical values**

Path: Advanced > OEM features > IF option 1 features > Statistical values

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Advanced

    Statistical Values

    Operating Time
     Total Hours                     14975
     Power On Cycles                 1651



                                                               ↔: Select Screen
                                                               ↑↓: Select Item
                                                               Enter: Select
                                                               +/-: Change Opt.
                                                               F1: General Help
                                                               F2: Previous Values
                                                               F9: Optimized Defaults
                                                               F10: Save & Exit
                                                               ESC: Exit

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```

**7.1.3.2.4.9 IF option 2 features**

Path: Advanced > OEM features > IF option 2 features

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
     Advanced

   IF Option 2 Features                                         Statistical Values Submenu.

   Device ID                        0000D84B
   Compatibility ID                 0000
   Vendor ID                        00000000
   Hardware Revision                D0
   Serial Number                    D84B0168911
   Product Name                     5AC901.ICAN-00
   Parent Device ID                 FFFFFFFF
   Parent Compatibility ID          FFFF

 ▶ Statistical Values
                                                              →←: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit

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```

**Statistical values**

Path: Advanced > OEM features > IF option 2 features > Statistical values

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
     Advanced

   Statistical Values

   Operating Time
    Total Hours                     958
    Power On Cycles                 1152

                                                              →←: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit

              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.2.4.10 Fan unit features**

Path: Advanced > OEM features > Fan unit features

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

  Fan Unit Features                                        Set fan to fix speed or
                                                           temperature controlled speed.
  Device ID                       0000DFBA
  Compatibility ID                0000
  Vendor ID                       00000000
  Hardware Revision               C0
  Serial Number                   DFBA0168422
  Product Name                    5AC902.FA00-00
  Parent Device ID                FFFFFFFF
  Parent Compatibility ID         FFFF

  Fan Control                     [Auto]

▶ Statistical Values                                       →←: Select Screen
▶ RPM Values                                               ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit




            Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**Statistical values**

Path: Advanced > OEM features > Fan unit features > Statistical values

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

  Statistical Values

  Fan 1
  Total Hours                     6
  Power On Cycles                 2512

  Fan 2
  Total Hours                     6
  Power On Cycles                 2512




                                                           →←: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit




            Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**RPM values**

Path: Advanced > OEM features > Fan unit features > RPM values

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
          Advanced

    RPM Values

    Live Fan Revolution Values
     Fan 1                                    7177 RPM
     Fan 2                                    6915 RPM




                                                        →←: Select Screen
                                                        ↑↓: Select Item
                                                        Enter: Select
                                                        +/-: Change Opt.
                                                        F1: General Help
                                                        F2: Previous Values
                                                        F9: Optimized Defaults
                                                        F10: Save & Exit
                                                        ESC: Exit




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```

### 7.1.3.2.4.11 Fan unit bus features

Path: Advanced > OEM features > Fan unit bus features

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
          Advanced

    Fan Unit Features                                   Set fan to fix speed or
                                                        temperature controlled speed.
    Device ID                      0000DFBB
    Compatibility ID               0000
    Vendor ID                      00000000
    Hardware Revision              C0
    Serial Number                  DFBB0168422
    Product Name                   5AC902.FA0X-00
    Parent Device ID               FFFFFFFF
    Parent Compatibility ID        FFFF

    Fan Control                    [Auto]

  ▶ Statistical Values                                  →←: Select Screen
  ▶ RPM Values                                          ↑↓: Select Item
                                                        Enter: Select
                                                        +/-: Change Opt.
                                                        F1: General Help
                                                        F2: Previous Values
                                                        F9: Optimized Defaults
                                                        F10: Save & Exit
                                                        ESC: Exit




                Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**Statistical values**

Path: Advanced > OEM features > Fan unit bus features > Statistical values

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Advanced

    Statistical Values

      Fan 1
      Total Hours                      1
      Power On Cycles                  4

                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F9: Optimized Defaults
                                                          F10: Save & Exit
                                                          ESC: Exit

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```

**RPM values**

Path: Advanced > OEM features > Fan unit bus features > RPM values

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Advanced

    RPM Values

    Live Fan Revolution Values
      Fan 1                         6855 RPM

                                                          →←: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F9: Optimized Defaults
                                                          F10: Save & Exit
                                                          ESC: Exit

              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.2.4.12 Slide-in 1 features**

Path: Advanced > OEM features > Slide-in 1 features

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Advanced

   Slide-In 1 Features                                         Temperature Values Submenu.

   Device ID                        0000DBFA
   Compatibility ID                 0000
   Vendor ID                        00000000
   Hardware Revision                D0
   Serial Number                    DBFA0172028
   Product Name                     5AC901.SSCA-00
   Parent Device ID                 FFFFFFFF
   Parent Compatibility ID          FFFF

 ▶ Temperature Values

                                                              ↔: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit

              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**Temperature values**

Path: Advanced > OEM features > Slide-in 1 features > Temperature values

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Advanced

   Temperature Values

   Live Temperature Values
    Sensor 1                        25 C / 77 F

                                                              ↔: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit

              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.2.4.13 Panel control features

Path: Advanced > OEM features > Panel control features

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Advanced

   Panel Control Features                                    Panel Control Features Submenu.

 ▶ Panel #0




                                                             →←: Select Screen
                                                             ↑↓: Select Item
                                                             Enter: Select
                                                             +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F9: Optimized Defaults
                                                             F10: Save & Exit
                                                             ESC: Exit



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```

### Panel #x

Path: Advanced > OEM features > Panel control features > Panel #X

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Advanced

   Panel #0                                                  Set Brightness level. Requires
                                                             reboot.
   Version                    V3.15
   Brightness                 100
   Fan Speed                  0 RPM
   Keys/Leds                  128/128
   Temperature                28 C / 82 F




                                                             →←: Select Screen
                                                             ↑↓: Select Item
                                                             Enter: Select
                                                             +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F9: Optimized Defaults
                                                             F10: Save & Exit
                                                             ESC: Exit



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```

### 7.1.3.2.5 Network stack configuration

Path: Advanced > Network stack configuration

```
              Aptio Setup Utility – Copyright (C) 2020 American Megatrends, Inc.
      Advanced

   Network Stack                    [Enabled]                     Enable/Disable UEFI Network
   Ipv4 PXE Support                 [Disabled]                    Stack
   Ipv4 HTTP Support                [Disabled]
   Ipv6 PXE Support                 [Disabled]
   Ipv6 HTTP Support                [Disabled]
   IPSEC Certificate                [Enabled]
   PXE boot wait time               0
   Media detect count               1




                                                                  →←: Select Screen
                                                                  ↑↓: Select Item
                                                                  Enter: Select
                                                                  +/–: Change Opt.
                                                                  F1: General Help
                                                                  F2: Previous Values
                                                                  F9: Optimized Defaults
                                                                  F10: Save & Exit
                                                                  ESC: Exit




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```

### 7.1.3.2.6 Trusted computing

Path: Advanced > Trusted computing

```
              Aptio Setup Utility – Copyright (C) 2020 American Megatrends, Inc.
      Advanced

   TPM 2.0 Device Found                                           Enables or Disables BIOS
   Firmware Version:                5.63                          support for security device.
   Vendor:                          IFX                           O.S. will not show Security
                                                                  Device. TCG EFI protocol and
   Security Device Support          [Enable]                      INT1A interface will not be
   Active PCR banks                 SHA-1,SHA256                  available.
   Available PCR banks              SHA-1,SHA256                  Information: Please check
                                                                  possible country-specific
   SHA-1 PCR Bank                   [Enabled]                     usage restrictions or
   SHA256 PCR Bank                  [Enabled]                     regulations before enabling
                                                                  TPM!
   Pending operation                [None]
   Platform Hierarchy               [Enabled]
   Storage Hierarchy                [Enabled]                     →←: Select Screen
   Endorsement Hierarchy            [Enabled]                     ↑↓: Select Item
   TPM 2.0 UEFI Spec Version        [TCG_2]                       Enter: Select
   Physical Presence Spec Version   [1.3]                         +/–: Change Opt.
   TPM 2.0 InterfaceType            [TIS]                         F1: General Help
   Device Select                    [Auto]                        F2: Previous Values
                                                                  F9: Optimized Defaults
                                                                  F10: Save & Exit
                                                                  ESC: Exit




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```

### 7.1.3.2.7 RTC wake settings

Path: Advanced > RTC wake settings

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Advanced

   RTC Wake Mode                    [Wake from S4 and S5]        Set system wake mode on alarm
                                                                 event. When enabled, system
   Wake up hour                     0                            will wake from the specified
   Wake up minute                   0                            Sx states on the hr::min::sec
   Wake up second                   0                            specified.



                                                                 →←: Select Screen
                                                                 ↑↓: Select Item
                                                                 Enter: Select
                                                                 +/-: Change Opt.
                                                                 F1: General Help
                                                                 F2: Previous Values
                                                                 F9: Optimized Defaults
                                                                 F10: Save & Exit
                                                                 ESC: Exit




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```

### 7.1.3.2.8 ACPI settings

Path: Advanced > ACPI settings

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Advanced

   ACPI Settings                                                 Enables or Disables BIOS ACPI
                                                                 Auto Configuration.
   Enable ACPI Auto Configuration   [Disabled]

   Hibernation Support              [Enabled]
   ACPI Sleep State                 [S3 (Suspend to RAM)]
   Lock Legacy Resources            [Disabled]
   S3 Video Repost                  [Disabled]

   Automatic Critical Trip Point    [Enabled]

   PTID Support                     [Disabled]
   PECI Access Method               [Direct I/O]
   Native PCI Express Support       [Enabled]              →←: Select Screen
     Native ASPM                    [Disabled]             ↑↓: Select Item
                                                           Enter: Select
   Wake System from S5 via RTC      [Disabled]             +/-: Change Opt.
   ACPI Debug                       [Disabled]             F1: General Help
                                                           F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit




                Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.2.9 SMART settings**

Path: Advanced > SMART settings

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

   SMART Settings                                              Run SMART self test on all
                                                              hard disk drives during POST.
   SMART Self Test                    [Disabled]





                                                              →←: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit



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```

**7.1.3.2.10 Serial port console redirection**

Path: Advanced > Serial port console redirection

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

   COMA
   Console Redirection                [Enabled]
 ▶ Console Redirection Settings





                                                              →←: Select Screen
                                                              ↑↓: Select Item
                                                              Enter: Select
                                                              +/-: Change Opt.
                                                              F1: General Help
                                                              F2: Previous Values
                                                              F9: Optimized Defaults
                                                              F10: Save & Exit
                                                              ESC: Exit



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```

#### 7.1.3.2.10.1 Console redirection settings

Path: Advanced > Serial port console redirection > Console redirection settings

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Advanced

  COMA
  Console Redirection Settings

  Terminal Type                      [ANSI]
  Bits per second                    [115200]
  Data Bits                          [8]
  Parity                             [None]
  Stop Bits                          [1]
  Flow Control                       [None]
  VT-UTF8 Combo Key Support          [Enabled]
  Recorder Mode                      [Disabled]
  Resolution 100x31                  [Disabled]
  Putty KeyPad                       [VT100]

                                                    →←: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F9: Optimized Defaults
                                                    F10: Save & Exit
                                                    ESC: Exit



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```

#### 7.1.3.2.11 PCI configuration

Path: Advanced > PCI configuration

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
        Advanced

  PCI Settings                                      Value to be programmed into
  PCI Latency Timer              [32 PCI Bus Clocks] PCI latency timer register.
  PCI-X Latency Timer            [64 PCI Bus Clocks]
  VGA Palette Snoop              [Disabled]
  PERR# Generation               [Disabled]
  SERR# Generation               [Disabled]
  BME DMA Mitigation             [Disabled]

  ▶ PCI Express Settings

  ▶ PCI Express GEN 2 Settings

  ▶ PCI Hot-Plug Settings
                                                    →←: Select Screen
                                                    ↑↓: Select Item
                                                    Enter: Select
                                                    +/-: Change Opt.
                                                    F1: General Help
                                                    F2: Previous Values
                                                    F9: Optimized Defaults
                                                    F10: Save & Exit
                                                    ESC: Exit


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```

### 7.1.3.2.11.1 PCIe device register setting

Path: Advanced > PCI configuration > PCIe device register setting

```
               Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Advanced

  PCI Express Device Register Settings                     Enable or disable PCI Express
  Relaxed Ordering               [Enabled]                device relaxed ordering.
  Extended Tag                   [Disabled]
  No Snoop                       [Enabled]
  Maximum Payload                [Auto]
  Maximum Read Request           [Auto]

  PCI Express Link Register Settings
  ASPM                           [Disabled]
  WARNING: Enabling ASPM may cause some
           PCIe devices to fail
  Extended Synch                 [Disabled]

  Link Training Retry            [5]                        →←: Select Screen
  Link Training Timeout (us)     1000                       ↑↓: Select Item
  Unpopulated Links              [Keep Link On]             Enter: Select
                                                            +/-: Change Opt.
                                                            F1: General Help
                                                            F2: Previous Values
                                                            F9: Optimized Defaults
                                                            F10: Save & Exit
                                                            ESC: Exit

               Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.2.11.2 Gen2 device register setting

Path: Advanced > PCI configuration > Gen2 device register setting

```
               Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Advanced

  PCI Express GEN2 Device Register Settings                In device Functions that
  Completion Timeout             [Default]                 support Completion Timeout
  ARI Forwarding                 [Disabled]                programmability, allows system
  AtomicOp Requester Enable      [Disabled]                software to modify the
  AtomicOp Egress Blocking       [Disabled]                Completion Timeout value.
  IDO Request Enable             [Disabled]                'Default' 50us to 50ms. If
  IDO Completion Enable          [Disabled]                'Shorter' is selected,
  LTR Mechanism Enable           [Disabled]                software will use shorter
  End-End TLP Prefix Blocking    [Disabled]                timeout ranges supported by
                                                           hardware. If 'Longer' is
  PCI Express GEN2 Link Register Settings                  selected, software will use
  Target Link Speed              [Auto]
  Clock Power Management         [Disabled]
  Compliance SOS                 [Disabled]                →←: Select Screen
  Hardware Autonomous Width      [Enabled]                 ↑↓: Select Item
  Hardware Autonomous Speed      [Enabled]                 Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit

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```

### 7.1.3.2.11.3 Advanced - PCI - PCIe setting

Path: Advanced > PCI Configuration > PCI hot-plug settings

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

   PCI Hot-Plug Settings                                    If ENABLED allows BIOS build
                                                            in Hot-Pug support. Use this
   BIOS Hot-Plug Support           [Disabled]               feature if OS does not support
                                                            PCI Express and SHPC hot-plug
                                                            natively.




                                                            →←: Select Screen
                                                            ↑↓: Select Item
                                                            Enter: Select
                                                            +/-: Change Opt.
                                                            F1: General Help
                                                            F2: Previous Values
                                                            F9: Optimized Defaults
                                                            F10: Save & Exit
                                                            ESC: Exit



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```

### 7.1.3.2.12 USB configuration

Path: Advanced > USB configuration

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Advanced

   USB Configuration                                        Overcurrent protection on all
                                                            USB ports
   USB Controllers:
       1 XHCI
   USB Devices:
       1 Drive, 1 Keyboard, 2 Mice, 1 Point, 1 Hub

   Overcurrent Protection          [Disabled]
   USB Driver Beeps                [Disabled]

   Legacy USB Support              [Enabled]
   xHCI Hand-off                   [Enabled]
   USB Mass Storage Driver Support [Enabled]

   USB hardware delays and time-outs:                       →←: Select Screen
   USB Transfer Timeout            [20 sec]                  ↑↓: Select Item
   Device Reset Timeout            [20 sec]                  Enter: Select
   Device Power-up Delay Selection [Auto]                    +/-: Change Opt.
                                                            F1: General Help
   Mass Storage Devices:                                    F2: Previous Values
   SwissbitunitedCONTRAST 2000     [Auto]                   F9: Optimized Defaults
                                                            F10: Save & Exit
                                                            ESC: Exit



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```

### 7.1.3.2.13 CSM configuration

Path: Advanced > CSM configuration

```
                  Aptio Setup Utility – Copyright (C) 2020 American Megatrends, Inc.
          Advanced

 Compatibility Support Module Configuration                 Enable/Disable CSM Support.

 CSM Support                          [Enabled]

 CSM16 Module Version                 07.84

 Gate A20 Active                      [Upon Request]
 Option ROM Messages                  [Force BIOS]
 INT19 Trap Response                  [Immediate]
 HDD Connection Order                 [Adjust]

 Boot Option Filter                   [UEFI and Legacy]

                                                            →←: Select Screen
 Option ROM execution                                       ↑↓: Select Item
                                                            Enter: Select
 PXE Option ROM Launch Policy         [Do not launch]       +/-: Change Opt.
 Storage Option ROM Launch Policy     [Legacy ROM Only]     F1: General Help
 Video Option ROM Launch Policy       [Legacy ROM Only]     F2: Previous Values
 Other Option ROM Launch Policy       [Legacy ROM Only]     F9: Optimized Defaults
                                                            F10: Save & Exit
                                                            ESC: Exit




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```

### 7.1.3.2.14 NVMe configuration

Path: Advanced > NVMe configuration

```
                  Aptio Setup Utility – Copyright (C) 2020 American Megatrends, Inc.
          Advanced

 NVMe Configuration

 No NVME Device Found






                                                            →←: Select Screen
                                                            ↑↓: Select Item
                                                            Enter: Select
                                                            +/-: Change Opt.
                                                            F1: General Help
                                                            F2: Previous Values
                                                            F9: Optimized Defaults
                                                            F10: Save & Exit
                                                            ESC: Exit




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```

**7.1.3.3 Chipset**

```
          Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Main  Advanced  Chipset  Security  Boot  Save & Exit

  ▶ Processor (Integrated Components)          Configuration of the
  ▶ Platform Controller Hub (PCH)              components which are
                                               integrated into the Processor




                                               →←: Select Screen
                                               ↑↓: Select Item
                                               Enter: Select
                                               +/-: Change Opt.
                                               F1: General Help
                                               F2: Previous Values
                                               F9: Optimized Defaults
                                               F10: Save & Exit
                                               ESC: Exit



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```

**7.1.3.3.1 Processor (integrated components)**

Path: Chipset > Processor (integrated components)

```
          Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Chipset

    System Agent (SA) Configuration             Memory configuration parameters

  ▶ Memory Configuration
  ▶ Graphics Configuration
  ▶ DMI Configuration
  ▶ PEG Port Configuration
  ▶ Miscellaneous Configuration




                                               →←: Select Screen
                                               ↑↓: Select Item
                                               Enter: Select
                                               +/-: Change Opt.
                                               F1: General Help
                                               F2: Previous Values
                                               F9: Optimized Defaults
                                               F10: Save & Exit
                                               ESC: Exit



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```

**7.1.3.3.1.1 Memory configuration**

## 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.**

Path: Chipset > Processor (integrated components) > Memory configuration

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Chipset

   Memory Configuration                                    ▲  Enable Or Disable Base Memory
                                                              Test Run on Warm Boot
   Memory RC Version              2.0.0.6
   Memory Frequency                2133 MHz
   Memory Timings (tCL-tRCD-tRP-tRAS)  15-15-15-36

   Channel 0 Slot 0              Populated & Enabled
      Size                       4096 MB (DDR4)
      Number of Ranks            1
      Manufacturer               UnKnown
   Channel 1 Slot 0              Populated & Enabled
      Size                       4096 MB (DDR4)
      Number of Ranks            1
      Manufacturer               UnKnown                      →←: Select Screen
                                                              ↑↓: Select Item
   Memory Test on Warm Boot      [Enabled]                    Enter: Select
   Maximum Memory Frequency      [Auto]                       +/-: Change Opt.
   HOB Buffer Size               [Auto]                       F1: General Help
   ECC Support                   [Enabled]                    F2: Previous Values
   Max TOLUD                     [Dynamic]                    F9: Optimized Defaults
   SA GV                         [Fixed High]                 F10: Save & Exit
   Retrain on Fast Fail          [Enabled]                    ESC: Exit
   Command Tristate              [Enabled]
   BER Support                   [Enabled]
   Enable RH Prevention          [Enabled]                 ▼

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```

### 7.1.3.3.1.2 Graphics configuration

Path: Chipset > Processor (integrated components) > Graphics configuration

```
             Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Chipset

  Graphics Configuration                                     Select which of IGFX/PEG/PCI
                                                             Graphics device should be
  Primary Display                        [Auto]              Primary Display.
▶ External Gfx Card Primary Display Configuration
  Internal Graphics Device               [Auto]
  GTT Size                               [8MB]
  Aperture Size                          [256MB]
  IGD Pre-Allocated Graphics Memory      [32M]
  IGD Total Graphics Memory              [256M]
  Graphics Turbo IMON Current            31
  VDD Enable                             [Enabled]
  PM Support                             [Disabled]
  RC6(Render Standby)                    [Disabled]
  Maximum GT frequency                   [Default Max Frequency]    →←: Select Screen
  PAVP Enable                            [Enabled]            ↑↓: Select Item
  Cdynmax Clamping Enable                [Enabled]            Enter: Select
  Cd Clock Frequency                     [675 Mhz]            +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F9: Optimized Defaults
                                                             F10: Save & Exit
                                                             ESC: Exit



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```

**External Gfx card primary display configuration**

Path: Chipset > Processor (integrated components) > Graphics configuration > External Gfx card primary display configuration

```
             Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
      Chipset

  External Gfx Card Primary Display Configuration            Select PEG0/PEG1/PEG2/PEG3
                                                             Graphics device should be
  Primary PEG                            [Auto]              Primary PEG.
  Primary PCIE                           [Auto]











                                                             →←: Select Screen
                                                             ↑↓: Select Item
                                                             Enter: Select
                                                             +/-: Change Opt.
                                                             F1: General Help
                                                             F2: Previous Values
                                                             F9: Optimized Defaults
                                                             F10: Save & Exit
                                                             ESC: Exit



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```

### 7.1.3.3.1.3 DMI configuration

Path: Chipset > Processor (integrated components) > DMI configuration

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                   Chipset

   DMI Configuration                                              Set DMI Speed Gen1/Gen2/Gen3

   DMI                                 X4  Gen3

   DMI Max Link Speed                  [Auto]
   DMI Vc1 Control                     [Disabled]
   DMI Vcm Control                     [Enabled]
   DMI Link ASPM Processor Side        [Disabled]
   DMI Extended Sync Control           [Disabled]
   DMI De-emphasis Control             [-3.5 dB]

                                                                  →←: Select Screen
                                                                  ↑↓: Select Item
                                                                  Enter: Select
                                                                  +/-: Change Opt.
                                                                  F1: General Help
                                                                  F2: Previous Values
                                                                  F9: Optimized Defaults
                                                                  F10: Save & Exit
                                                                  ESC: Exit

                Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

### 7.1.3.3.1.4 PEG port configuration

Path: Chipset > Processor (integrated components) > PEG port configuration

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                   Chipset

   PEG Port Configuration                                 ▲      Enable or Disable the Root Port

   PEG Port Configuration              [1x8+2x4]

   PEG 0:1:0                           Not Present
     Enable Root Port                  [Auto]
     PEG0 Speed                        [Auto]
     Max Link Width                    [Auto]
     Power Down Unused Lanes           [Auto]
     Gen3 Eq Phase 2                   [Auto]
     Gen3 Eq Phase 3 Method            [Auto]
     PEG0 ASPM                         [Disabled]
     De-emphasis Control               [-3.5 dB]
     OBFF                              [Enabled]           →←: Select Screen
     LTR                               [Enabled]           ↑↓: Select Item
     PEG0 Slot Power Limit Value       75                  Enter: Select
     PEG0 Slot Power Limit Scale       [1.0x]              +/-: Change Opt.
     PEG0 Physical Slot Number         1                   F1: General Help
     PEG0 Max Payload size             [Auto]              F2: Previous Values
   PEG 0:1:1                           Not Present         F9: Optimized Defaults
     Enable Root Port                  [Auto]              F10: Save & Exit
     PEG1 Speed                        [Auto]              ESC: Exit
     Max Link Width                    [Auto]
     Power Down Unused Lanes           [Auto]
     Gen3 Eq Phase 2                   [Auto]       ▼

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```

### 7.1.3.3.1.5 Miscellaneous SA configuration

Path: Chipset > Processor (integrated components) > Miscellaneous SA configuration

```
             Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Chipset

  Miscellaneous SA Configuration                                    VT-d capability

  VT-d                              Supported
  VT-d                              [Enabled]
  Stop Grant Configuration          [Auto]
  CHAP Device (B0:D7:F0)            [Disabled]
  Thermal Device (B0:D4:F0)         [Disabled]
  GMM Device (B0:D8:F0)             [Enabled]
  CRID Support                      [Disabled]
  Above 4GB MMIO BIOS assignment    [Disabled]
  X2APIC Opt Out                    [Disabled]
  eDRAM Mode                        [eDRAM HW Mode]

                                                                →←: Select Screen
                                                                ↑↓: Select Item
                                                                Enter: Select
                                                                +/-: Change Opt.
                                                                F1: General Help
                                                                F2: Previous Values
                                                                F9: Optimized Defaults
                                                                F10: Save & Exit
                                                                ESC: Exit



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```

### 7.1.3.3.2 PCH-IO configuration

Path: Chipset > PCH-IO configuration

```
             Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Chipset

  PCH-IO Configuration                                             PCI Express Configuration
                                                                  settings
  ▶ PCI Express Configuration
  ▶ SATA And RST Configuration
  ▶ USB Configuration
  ▶ HD Audio Configuration
  ▶ Miscellaneous Configuration






                                                                →←: Select Screen
                                                                ↑↓: Select Item
                                                                Enter: Select
                                                                +/-: Change Opt.
                                                                F1: General Help
                                                                F2: Previous Values
                                                                F9: Optimized Defaults
                                                                F10: Save & Exit
                                                                ESC: Exit



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```

#### 7.1.3.3.2.1 PCI Express configuration

Path: Chipset > PCH-IO configuration > PCIe configuration

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Chipset

  PCI Express Configuration                               Enable or disable PCI Express
                                                          clock gating for each root
  PCI Express Clock Gating       [Disabled]               port.
  Legacy IO Low Latency          [Disabled]
  DMI Link ASPM PCH Side         [Disabled]
  PCIE Port assigned to LAN      4
  Port8xh Decode                 [Disabled]
  Peer Memory Write Enable       [Disabled]
  Compliance Test Mode           [Disabled]
  PCIe-USB Glitch W/A            [Disabled]
  PCIe function swap             [Disabled]
▶ PCI Express Gen3 Eq Lanes

▶ PCI Express Port 2                                      →←: Select Screen
▶ PCI Express Port 3                                      ↑↓: Select Item
▶ PCI Express Port 4                                      Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F9: Optimized Defaults
                                                          F10: Save & Exit
                                                          ESC: Exit


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```
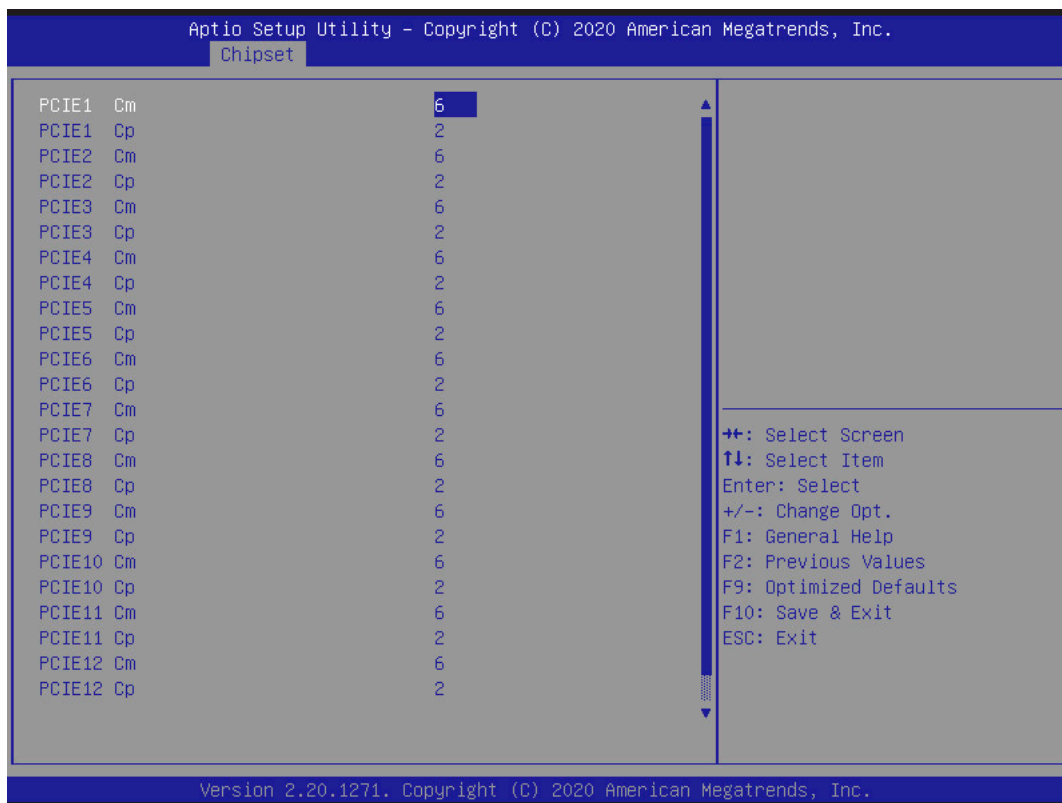
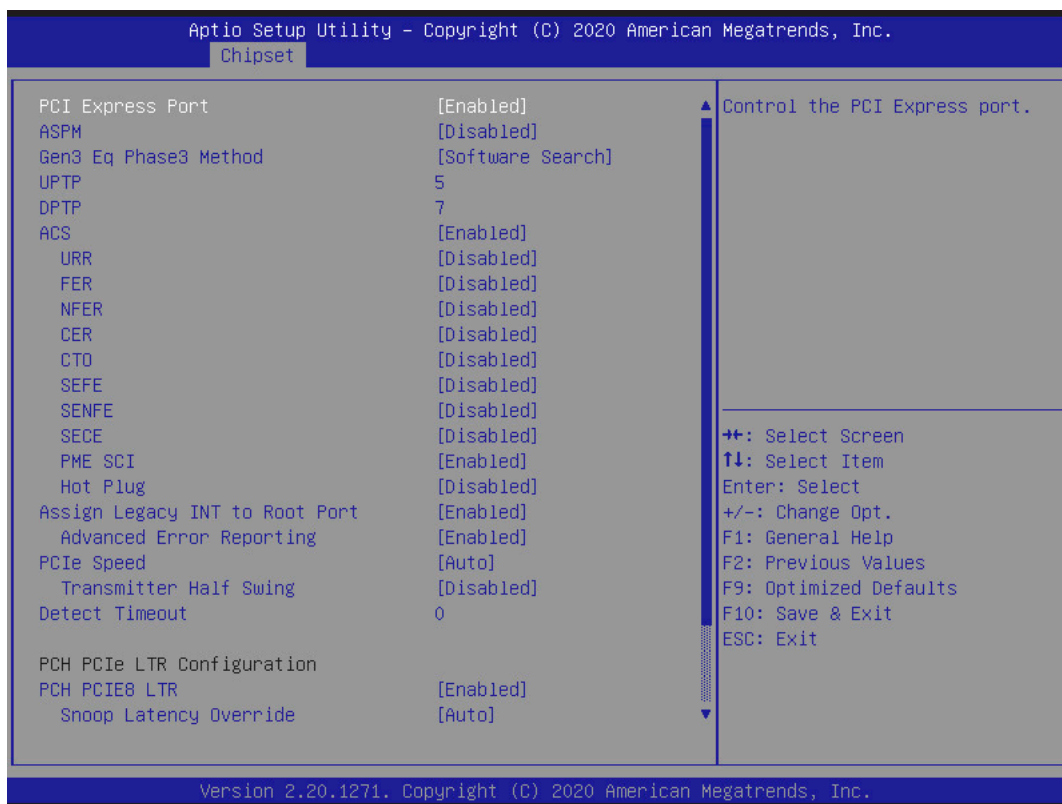**PCI Express Gen3 eq lanes**

> **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.**

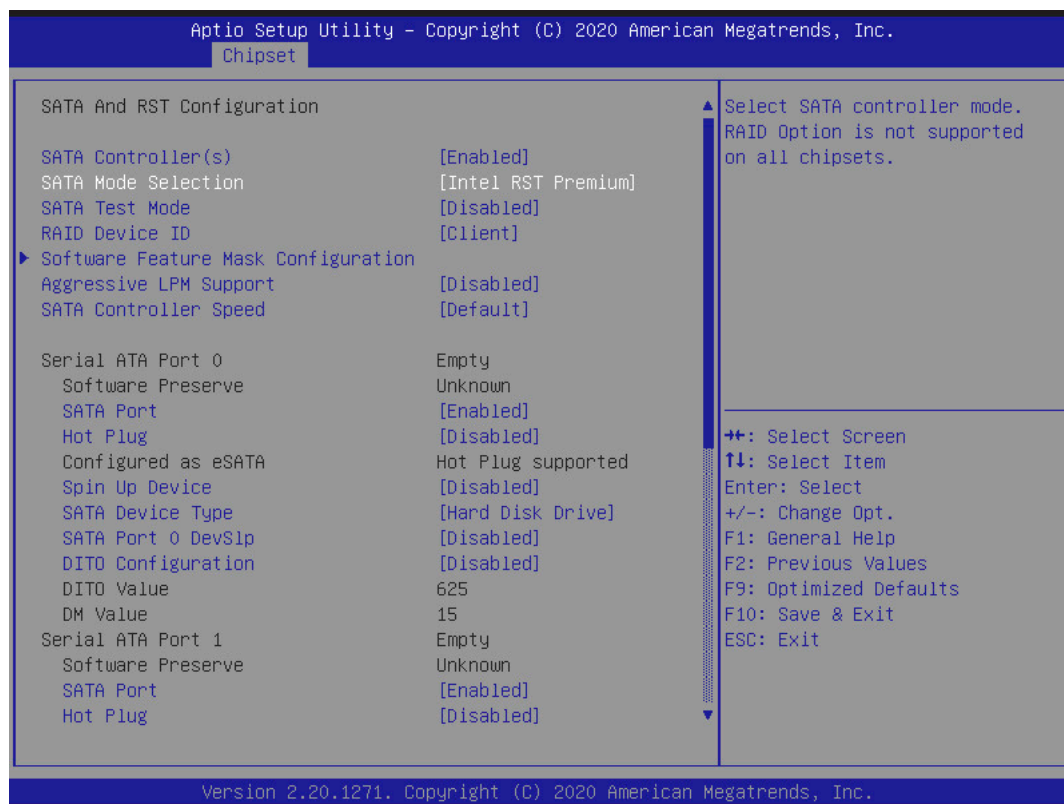Path: Chipset > PCH-IO configuration > PCIe configuration > PCIe Gen3 eq lanes

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                   Chipset

     PCIE1   Cm                          6
     PCIE1   Cp                          2
     PCIE2   Cm                          6
     PCIE2   Cp                          2
     PCIE3   Cm                          6
     PCIE3   Cp                          2
     PCIE4   Cm                          6
     PCIE4   Cp                          2
     PCIE5   Cm                          6
     PCIE5   Cp                          2
     PCIE6   Cm                          6
     PCIE6   Cp                          2
     PCIE7   Cm                          6
     PCIE7   Cp                          2                  →←: Select Screen
     PCIE8   Cm                          6                  ↑↓: Select Item
     PCIE8   Cp                          2                  Enter: Select
     PCIE9   Cm                          6                  +/-: Change Opt.
     PCIE9   Cp                          2                  F1: General Help
     PCIE10  Cm                          6                  F2: Previous Values
     PCIE10  Cp                          2                  F9: Optimized Defaults
     PCIE11  Cm                          6                  F10: Save & Exit
     PCIE11  Cp                          2                  ESC: Exit
     PCIE12  Cm                          6
     PCIE12  Cp                          2

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```

**PCI Express ports**

Path: Chipset > PCH-IO configuration > PCIe configuration > PCIe ports [2-4]

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                   Chipset

     PCI Express Port              [Enabled]          Control the PCI Express port.
     ASPM                          [Disabled]
     Gen3 Eq Phase3 Method         [Software Search]
     UPTP                          5
     DPTP                          7
     ACS                           [Enabled]
        URR                        [Disabled]
        FER                        [Disabled]
        NFER                       [Disabled]
        CER                        [Disabled]
        CTO                        [Disabled]
        SEFE                       [Disabled]
        SENFE                      [Disabled]
        SECE                       [Disabled]          →←: Select Screen
        PME SCI                    [Enabled]           ↑↓: Select Item
        Hot Plug                   [Disabled]          Enter: Select
     Assign Legacy INT to Root Port [Enabled]          +/-: Change Opt.
        Advanced Error Reporting   [Enabled]           F1: General Help
     PCIe Speed                    [Auto]              F2: Previous Values
        Transmitter Half Swing     [Disabled]          F9: Optimized Defaults
     Detect Timeout                0                   F10: Save & Exit
                                                       ESC: Exit
     PCH PCIe LTR Configuration
     PCH PCIE8 LTR                 [Enabled]
        Snoop Latency Override     [Auto]

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```

### 7.1.3.3.2.2 SATA configuration

Path: Chipset > PCH-IO configuration > SATA configuration

```
             Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                    Chipset

   SATA And RST Configuration                            ▲  Select SATA controller mode.
                                                            RAID Option is not supported
   SATA Controller(s)                [Enabled]              on all chipsets.
   SATA Mode Selection               [Intel RST Premium]
   SATA Test Mode                    [Disabled]
   RAID Device ID                    [Client]
 ▶ Software Feature Mask Configuration
   Aggressive LPM Support            [Disabled]
   SATA Controller Speed             [Default]

   Serial ATA Port 0                 Empty
     Software Preserve               Unknown
     SATA Port                       [Enabled]           ◄►: Select Screen
     Hot Plug                        [Disabled]          ↑↓: Select Item
     Configured as eSATA             Hot Plug supported  Enter: Select
     Spin Up Device                  [Disabled]          +/-: Change Opt.
     SATA Device Type                [Hard Disk Drive]   F1: General Help
     SATA Port 0 DevSlp              [Disabled]          F2: Previous Values
     DITO Configuration              [Disabled]          F9: Optimized Defaults
     DITO Value                      625                 F10: Save & Exit
     DM Value                        15                  ESC: Exit
   Serial ATA Port 1                 Empty
     Software Preserve               Unknown
     SATA Port                       [Enabled]
     Hot Plug                        [Disabled]          ▼

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```

The following default settings must be observed:

| BIOS setting | Explanation | Configuration options | Effect |
|---|---|---|---|
| SATA mode selection | Option for configuring supported serial ATA connections. | *AHCI* | The AHCI setting enables the internal memory driver for SATA functions, which increases the storage performance for random read-write access by allowing the drive itself to determine the sequence of commands. |
| | | RAID | RAID 0, 1, 5, 10 or Intel® Matrix Storage technology can be configured here with the serial ATA hard drive. |

**Software feature mask configuration**

Path: Chipset > PCH-IO configuration > SATA configuration > Software feature mask configuration

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Chipset

    Software Feature Mask Configuration                    If enabled, indicates that the
                                                           HDD password unlock in the OS
    HDD Unlock                       [Enabled]             is enabled.
    LED Locate                       [Enabled]
    Use RST Legacy OROM              [Enabled]
    RAID0                            [Enabled]
    RAID1                            [Enabled]
    RAID10                           [Enabled]
    RAID5                            [Enabled]
    Intel Rapid Recovery Technology  [Enabled]
    Option ROM UI and Banner         [Enabled]
    IRRT Only on eSATA               [Enabled]
    Smart Response Technology        [Enabled]
    OROM UI Normal Delay             [2 secs]              →←: Select Screen
    RST Force Form                   [Disabled]            ↑↓: Select Item
    CPU attached storage             [Enabled]             Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit



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```

**7.1.3.3.2.3 USB configuration**

Path: Chipset > USB configuration

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
              Chipset

    USB Configuration                                      Options to disable Compliance
                                                           Mode. Default is FALSE to not
                                                           disable Compliance Mode. Set
    XHCI Disable Compliance Mode     [FALSE]               TRUE to disable Compliance
                                                           Mode.
    xDCI Support                     [Disabled]

    USB Port Disable Override        [Disabled]



                                                           →←: Select Screen
                                                           ↑↓: Select Item
                                                           Enter: Select
                                                           +/-: Change Opt.
                                                           F1: General Help
                                                           F2: Previous Values
                                                           F9: Optimized Defaults
                                                           F10: Save & Exit
                                                           ESC: Exit



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```

**7.1.3.3.2.4 Audio**

Path: Chipset > PCH-IO configuration > HD audio configuration

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                  Chipset

     HD Audio Subsystem Configuration Settings           Control Detection of the
                                                          HD-Audio device.
     HD Audio                          [Auto]             Disabled = HDA will be
      Audio DSP                        [Disabled]         unconditionally disabled
      HDA-Link Codec Select            [Platform Onboard] Enabled = HDA will be
      iDisplay Audio Disconnect        [Disabled]         unconditionally enabled
      PME Enable                       [Disabled]         Auto = HDA will be enabled if
    ▶ HD Audio Advanced Configuration                     present, disabled otherwise.




                                                          ↔: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F9: Optimized Defaults
                                                          F10: Save & Exit
                                                          ESC: Exit



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```

**HD audio advanced configuration**

Path: Chipset > PCH-IO configuration > HD audio configuration > Advanced configuration

```
            Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                  Chipset

     HD Audio Subsystem Advanced Configuration Settings   Selects the ownership of the
                                                          I/O buffer between Intel HD
     I/O Buffer Control:                                  Audio link vs I2S port (for
      I/O Buffer Ownership             [HD-Audio Link]    bilingual codecs).
      I/O Buffer Voltage Select        [3.3V]
     Statically Switchable BCLK Clock
     Frequency Configuration:
      HD Audio Link Frequency          [24 MHz]
      iDisplay Link Frequency          [96 MHz]




                                                          ↔: Select Screen
                                                          ↑↓: Select Item
                                                          Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F9: Optimized Defaults
                                                          F10: Save & Exit
                                                          ESC: Exit



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```

### 7.1.3.3.2.5 Miscellaneous PCH configuration

Path: Chipset > PCH-IO configuration > Miscellaneous PCH configuration

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                Chipset

   Miscellaneous PCH Configuration                        Allows isolating the
                                                          off-module/external SMBus
   Isolate SMBus Segments            [No]                 segment from the on-module
   CF9h Global Reset                 [Host only]          SMBus segment. This can be a
   PCH LAN Controller                [Enabled]            workaround for non spec
     Wake on LAN Enable              [Enabled]            conform external SMBus devices.
   K1 off                            [Enabled]
   Serial IRQ Mode                   [Continuous]
   Port 61h Bit-4 Emulation          [Enabled]
   Port 80h Redirection              [LPC Bus]
   Enhance Port 80h LPC Decoding     [Disabled]
   Compatible Revision ID            [Disabled]
   Enable TCO Timer                  [Disabled]
   PCIe Spread Spectrum Clocking     [Auto]               →←: Select Screen
   Unlock PCH P2SB                   [Disabled]           ↑↓: Select Item
   SPD Write Disable                 [TRUE]               Enter: Select
                                                          +/-: Change Opt.
                                                          F1: General Help
                                                          F2: Previous Values
                                                          F9: Optimized Defaults
                                                          F10: Save & Exit
                                                          ESC: Exit




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```

**7.1.3.4 Security**

```
             Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
       Main  Advanced  Chipset  Security  Boot  Save & Exit

  Password Description                                    Set BIOS Password

  If BIOS password is set, it limits access
  to Setup and is asked for when entering Setup.
  Only if BIOS password and BIOS lock are set,
  BIOS update & write protection can be enabled.
  The password length must be
  in the following range:
  Minimum length                    3
  Maximum length                    20


  BIOS Password

  BIOS Lock                         [Enabled]            →←: Select Screen
  BIOS Update and Write Protection  [Disabled]           ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
  HDD Security Configuration:                            F9: Optimized Defaults
▶ P2:TOSHIBA THNSNJ128WCST                               F10: Save & Exit
                                                         ESC: Exit
▶ Secure Boot Menu



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```

**7.1.3.4.1 Secure Boot**

Path: Security > Secure boot

```
             Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
                             Security

  System Mode                 Setup                      Secure Boot feature is Active
                                                         if Secure Boot is Enabled,
  Secure Boot                 [Disabled]                 Platform Key(PK) is enrolled
                              Not Active                  and the System is in User mode.
                                                         The mode change requires
  Secure Boot Mode            [Custom]                   platform reset
▶ Restore Factory Keys
▶ Reset To Setup Mode

▶ Key Management



                                                         →←: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F9: Optimized Defaults
                                                         F10: Save & Exit
                                                         ESC: Exit



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```

**7.1.3.4.1.1 Key manager**

Path: Security > Secure boot > Key management

```
          Aptio Setup Utility – Copyright (C) 2020 American Megatrends, Inc.
                       Security

   Vendor Keys                       Valid                    Install factory default Secure
                                                              Boot keys after the platform
   Factory Key Provision             [Disabled]               reset and while the System is
 ▶ Restore Factory Keys                                       in Setup mode
 ▶ Reset To Setup Mode
 ▶ Export Secure Boot variables
 ▶ Enroll Efi Image

   Device Guard Ready
 ▶ Remove 'UEFI CA' from DB
 ▶ Restore DB defaults

   Secure Boot variable | Size| Keys| Key Source
 ▶ Platform Key(PK)     |    0|    0| No Keys        →←: Select Screen
 ▶ Key Exchange Keys    |    0|    0| No Keys        ↑↓: Select Item
 ▶ Authorized Signatures|    0|    0| No Keys        Enter: Select
 ▶ Forbidden  Signatures|    0|    0| No Keys        +/-: Change Opt.
 ▶ Authorized TimeStamps|    0|    0| No Keys        F1: General Help
 ▶ OsRecovery Signatures|    0|    0| No Keys        F2: Previous Values
                                                     F9: Optimized Defaults
                                                     F10: Save & Exit
                                                     ESC: Exit



          Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

## 7.1.3.5 Boot

```
                Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
     Main  Advanced  Chipset  Security  Boot  Save & Exit

  Early BIOS POST delay            [Disabled]              ▲  Add a delay at beginning of
                                                              POST.
  Boot Configuration
  Setup Prompt Timeout             1
  Bootup NumLock State             [On]

  Boot Logo                        [Auto]
  Enter Setup If No Boot Device    [No]
  Enable Popup Boot Menu           [Yes]
  Force POST/Setup VGA Support     [No]
  Boot Priority Selection          [Type Based]
  Boot Option Sorting Method       [Legacy Before UEFI]

  Type Based Boot Priority                                 →←: Select Screen
  1st Boot Device                  [BR Hypervisor]         ↑↓: Select Item
  2nd Boot Device                  [SATA 0 Drive]          Enter: Select
  3rd Boot Device                  [SATA 1 Drive]          +/-: Change Opt.
  4th Boot Device                  [SATA 2 Drive]          F1: General Help
  5th Boot Device                  [USB Harddisk]          F2: Previous Values
  6th Boot Device                  [Onboard RAID]          F9: Optimized Defaults
  7th Boot Device                  [Onboard LAN]           F10: Save & Exit
  8th Boot Device                  [Built-in UEFI Shell]   ESC: Exit

  Power Loss Control               [Turn On]
  UEFI Fast Boot                   [Disabled]              ▼

                Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

**7.1.3.6 Save & Exit**

```
              Aptio Setup Utility - Copyright (C) 2020 American Megatrends, Inc.
     Main  Advanced  Chipset  Security  Boot  Save & Exit

    Save Options                                         Exit system setup after saving
    Save Changes and Exit                                the changes.
    Discard Changes and Exit

    Save Changes and Reset
    Discard Changes and Reset

    Save Changes
    Discard Changes

    Default Options
    Restore Defaults
    Save as User Defaults
    Restore User Defaults                                →←: Select Screen
                                                         ↑↓: Select Item
    ▶ Generate Menu Layout File                          Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F9: Optimized Defaults
                                                         F10: Save & Exit
                                                         ESC: Exit




              Version 2.20.1271. Copyright (C) 2020 American Megatrends, Inc.
```

## 7.1.3.7 Allocation of resources

### 7.1.3.7.1 RAM address assignment

| RAM address | Address in hexadecimal | Resource |
|---|---|---|
| (TOM - xxxx) - TOM[1] | N.A. | ACPI reclaim, PCI memory range, video |
| 1024 kB - (TOM - xxxx) | 100000 - N.A. | Extended memory |
| 869 kB - 1024 kB | 0E0000h - 0FFFFFh | Runtime BIOS |
| 768 kB - 896 kB | 0C0000h - 0DFFFFh | Expansion area |
| 640 kB - 768 kB | 0A0000h - 0BFFFFh | Video memory and BIOS |
| 639 kB - 640 kB | 09FC00h - 09FFFFh | Extended BIOS data |
| 0 - 639 kB | 000000h - 09FC00h | Conventional memory |

Table 140: RAM address assignment

1) TOM = Top of memory: Max. installed DRAM.

### 7.1.3.7.2 I/O address assignments

| I/O address | Resource |
|---|---|
| 0000h - 00FFh | Motherboard resources |
| 0228h - 022Fh | COM F (IF option 2) |
| 02E8h - 02EFh | COM E (IF option 1) |
| 02F8h - 02FFh | COM B (COM2) |
| 0384h - 0385h | CAN controller |
| 03B0h - 03DFh | Video system |
| 03E8h - 03EFh | COM C (onboard SDL) |
| 03F8h - 03FFh | COM A (COM1) |
| 0400h - 047Fh | Motherboard resources |
| 0500h - 057Fh | Motherboard resources |
| 0CF8h - 0CFBh | PCI config address register |
| 0CFCh - 0CFFh | PCI config data register |
| 0D00h - FFFFh | PCI / PCI Express bus |
| 4000h - 40FFh | MTCX (SDL4 update). |
| 4100h - 41FFh | MTCX |
| FF00h - FF07h | IDE bus master register |

Table 141: I/O address assignments

### 7.1.3.7.3 Interrupt assignments in PIC mode

| IRQ | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | NONE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System timer | | ● | | | | | | | | | | | | | | | | |
| Keyboard | | | ● | | | | | | | | | | | | | | | |
| IRQ cascade | | | | ● | | | | | | | | | | | | | | |
| COM B (COM2) | | | | | ● | ○ | ○ | ○ | ○ | | | | | | | | | |
| COM A (COM1) | | | | | ○ | ● | ○ | ○ | ○ | | | ○ | ○ | ○ | | | | |
| ACPI[1] | | | | | | | | | | | ● | | | | | | | |
| Real-time clock | | | | | | | | | | ● | | | | | | | | |
| Co-processor (FPU) | | | | | | | | | | | | | | | ● | | | |
| B&R | COM C (onboard SDL) | | | | | ○ | ● | ○ | | | ○ | ○ | ○ | ○ | | | | |
| | COM E (IF option 1 / I/O board 1) | | | | ○ | ○ | ○ | ○ | ○ | | | ● | ○ | ○ | | | | |
| | COM F (IF option 2 / I/O board 2) | | | | ○ | ○ | ○ | ○ | ● | | | ○ | ○ | ○ | | | | |
| | CAN | | | | ○ | ○ | ○ | ○ | ○ | | | ● | ○ | ○ | | | | |

Table 142: IRQ interrupt assignments in PIC mode

1) Advanced Configuration and Power Interface.

● ... Default setting
○ ... Optional setting

### 7.1.3.7.4 Interrupt assignments in APIC mode

A total of 23 IRQs are available in APIC (Advanced Programmable Interrupt Controller) mode. Enabling this option is only effective if done before the Windows operating system is installed.

| IRQ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | NONE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System timer | ● | | | | | | | | | | | | | | | | | | | | | | | | |
| Keyboard | | ● | | | | | | | | | | | | | | | | | | | | | | | |
| IRQ cascade | | | ● | | | | | | | | | | | | | | | | | | | | | | |
| COM B (COM2) | | | | ● | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | | | | |

Table 143: IRQ interrupt assignments in APIC mode

| IRQ | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | NONE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COM A (COM1) | | | | | ○ | ● | ○ | ○ | ○ | | | ○ | ○ | ○ | | | | | | | | | | | | |
| ACPI[1] | | | | | | | | | | | ● | | | | | | | | | | | | | | | |
| Real-time clock | | | | | | | | | | ● | | | | | | | | | | | | | | | | |
| Co-processor (FPU) | | | | | | | | | | | | | | | ● | | | | | | | | | | | |
| B&R | COM C (onboard SDL) | | | | | | | | | | | | | ○ | ● | ○ | | | ○ | ○ | ○ | ○ | ○ | | | |
| | COM E (IF option 1) | | | | ○ | ○ | ○ | ○ | ○ | | | ● | ○ | ○ | | | | | | | | | | | | |
| | COM F (IF option 2) | | | | ○ | ○ | ○ | ○ | ● | | | ○ | ○ | ○ | | | | | | | | | | | | |
| | CAN | | | | ○ | ○ | ○ | ○ | ○ | | | ● | ○ | ○ | | | | | | | | | | | | |
| | POWERLINK (IF option 2) | | | | | | | | | | | | | | | | | | | ● | | | | | | |
| PIRQ A[2] | | | | | | | | | | | | | | | | | | ● | | | | | | | | |
| PIRQ B[3] | | | | | | | | | | | | | | | | | | | ● | | | | | | | |
| PIRQ C[4] | | | | | | | | | | | | | | | | | | | | ● | | | | | | |
| PIRQ D[5] | | | | | | | | | | | | | | | | | | | | | ● | | | | | |
| PIRQ E[6] | | | | | | | | | | | | | | | | | | | | | | ● | | | | |
| PIRQ F[7] | | | | | | | | | | | | | | | | | | | | | | | ● | | | |
| PIRQ G[8] | | | | | | | | | | | | | | | | | | | | | | | | ● | | |
| PIRQ H[9] | | | | | | | | | | | | | | | | | | | | | | | | | ● | |

Table 143: IRQ interrupt assignments in APIC mode

1) **A**dvanced **C**onfiguration and **P**ower **I**nterface.
2) PIRQ A: For PCIe; PEG 0/1/2, PCI Express root port 0, VGA controller, PCI Express root port 4 (ETH2), GMM (Gaussian mixture model).
3) PIRQ B: For PCIe; PCI Express root port 1, PCI Express root port 5.
4) PIRQ C: For PCIe; PCI Express root port 2, SRAM, POWERLINK
5) PIRQ D: For PCIe; PCI Express root port 3, PCIe to PCI bridge.
6) PIRQ E: For PCIe; onboard Gigabit LAN controller (ETH1).
7) PIRQ F: For PCIe, serial ATA controller
8) PIRQ G: For PCIe; Intel High Definition Audio controller, SMBus controller.
9) PIRQ H: For PCIe, XHCI host controller, thermal subsystem

● ... Default setting
○ ... Optional setting
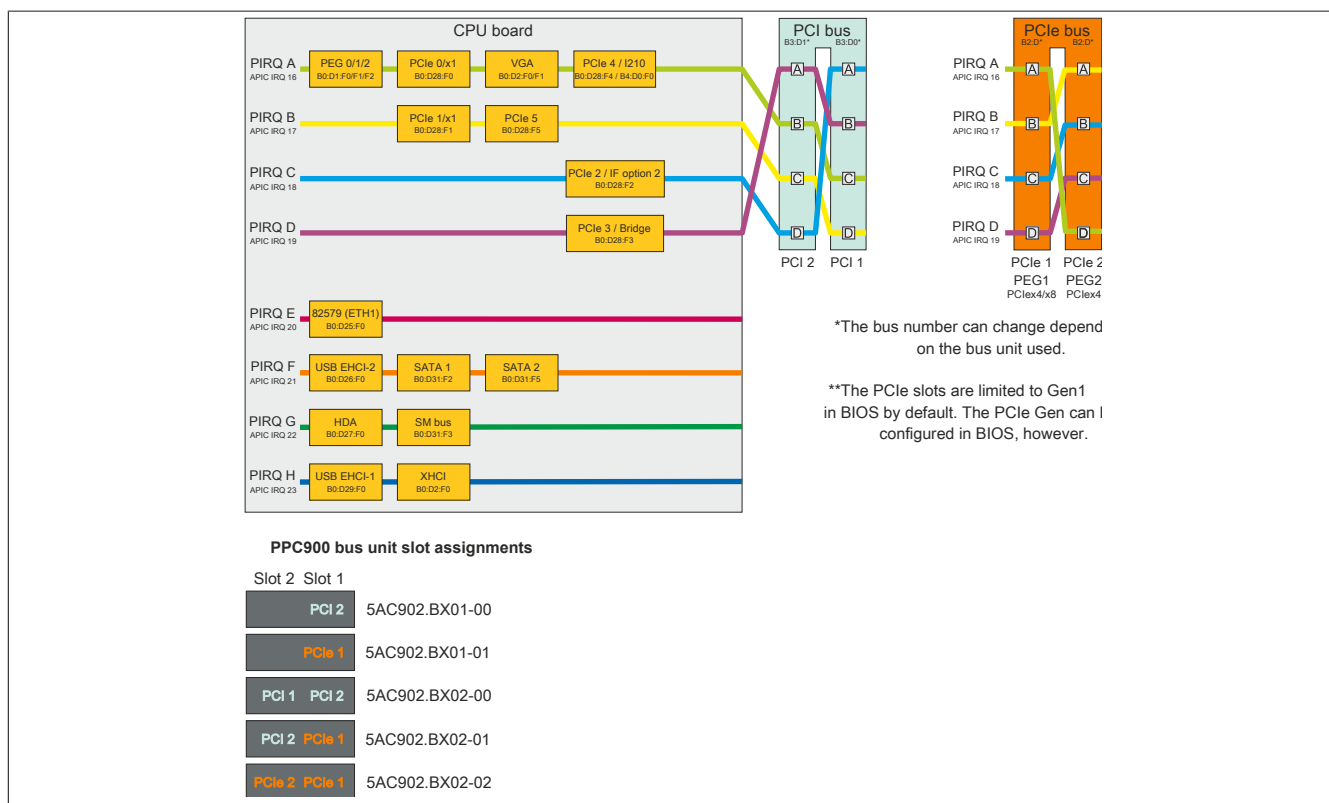


Figure 36: PCI and PCIe routing with enabled QM170/HM170 CPU board

## 7.2 Upgrade information

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

### 7.2.1 BIOS upgrade

An upgrade may be necessary for the following reason, for example:

- To update the functions implemented in BIOS Setup or to add newly implemented functions or components (for information about changes, see the readme file of the BIOS upgrade).

#### 7.2.1.1 Basic information

> # Information:
>
> **During a BIOS upgrade, individually saved BIOS settings are deleted.**

It is helpful to determine the different software versions before starting the upgrade.

##### 7.2.1.1.1 Which BIOS version and firmware are already installed?

This information is listed on the following BIOS Setup page.

- Select "OEM features" from BIOS main menu "Advanced".

#### 7.2.1.2 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 **UEFI: Built-in EFI shell** as boot device (open the BBS boot menu via **[F11]**).
4. After booting the EFI shell, *startup.nsh* is executed and the BIOS upgrade is started.
5. After a successful upgrade, the system must be rebooted.
6. Reboot and press key **[Del]** to enter BIOS Setup and load the setup defaults; then select **Save changes and exit**.

### 7.2.2 Firmware upgrade

## Caution!

**Do not switch off or reset the system during an upgrade under any circumstances!.**

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

#### 7.2.2.1 Procedure in Windows (ADI Control Center)

1. Download the ZIP file from the B&R website (www.br-automation.com).
2. Open the *ADI Control Center* in the Control Panel.
3. Open tab **Versions**.
4. Enter the name of the firmware file or select a file under "Filename".
5. Execute file with **Open**.
6. After a successful upgrade, the system must be switched off and on again for the upgrade to take effect.
   ✓ The upgrade is installed and in effect.

The transfer can be canceled by clicking on **Cancel** in dialog box "Download". This 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:

**For more detailed information about saving and updating the firmware, see the ADI driver user's manual. This is available for download at www.br-automation.com.**

#### 7.2.2.2 Procedure in the EFI shell

## Information:

**Separate update packages are available for the firmware of the PC family and Automation Panels.**

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 **UEFI: Built-In EFI shell** as boot device (open the BBS boot menu with **[F11]**).
4. After booting the EFI shell, *startup.nsh* is executed and the MTCX 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.**

## 7.3 Operating systems

### 7.3.1 Windows 10 IoT Enterprise 2019 LTSC

#### 7.3.1.1 General information

Windows 10 IoT Enterprise 2019 LTSC is a special version of Windows 10 Enterprise for industrial use (Long-Term Servicing Channel) that provides a high level of protection for applications through additional lockdown functions.

**Information:**

**For detailed information, see the user's manual of the operating system. This is available for download on the B&R website (www.br-automation.com).**

#### 7.3.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Windows 10 IoT Enterprise 2019 LTSC** | |
| 5SWW10.1064-MUL | Windows 10 IoT Enterprise 2019 LTSC - 64-bit - Value - Multilingual - PPC900 chipset QM170/HM170 (UEFI boot) - CPU Celeron/Core i3/Core i5 - License - Only available with a new device | |
| 5SWW10.1164-MUL | Windows 10 IoT Enterprise 2019 LTSC - 64-bit - High End - Multilingual - PPC900 chipset QM170 (UEFI boot) - CPU Core i7 - License - Only available with a new device | |

#### 7.3.1.3 Overview

| Order number | 5SWW10.1064-MUL | 5SWW10.1164-MUL |
|---|---|---|
| **Operating system** | | |
| Target systems | | |
|    Industrial PC | PPC900 Skylake | |
|    Processor | Celeron, Core i3, Core i5, Core i7 | Core i5, Core i7 |
|    Chipset | HM170, QM170 | QM170 |
| License class | Value | High End |
| Architecture | 64-bit (UEFI boot) | |
| Language | Multilingual | |
| Minimum size of RAM | 2 GB [1] | |
| Minimum size of data storage medium | 20 GB [2] | |

1) 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.
2) The specified minimum size of the data storage medium does not take into account the memory requirements of additional language packages.

#### 7.3.1.4 Features

Windows 10 IoT Enterprise 2019 LTSC supports the following Microsoft features:

| Features | Windows 10 IoT Enterprise 2019 LTSC |
|---|---|
| Range of functions in Windows 10 Enterprise | ✓ |
| Internet Explorer 11 (including Enterprise Mode) | ✓ |
| Windows Touch | ✓ |
| Multilingual support | With language packs (default: English) |
| Page file | Configurable (default: disabled by UWF) |
| Hibernate file | Configurable (default: disabled) |
| System restore | Configurable (default: disabled by UWF) |
| SuperFetch | |
| File indexing service | |
| Fast boot | |
| Defragmentation service | ✓ (disabled when enabling the UWF) |
| Additional lockdown features (excerpt) | |
| Assigned access | Configurable |
| AppLocker | Configurable |
| Shell Launcher | Configurable |
| Unified Write Filter | ✓ |
| Keyboard Filter | Configurable |

The following are some differences from standard Windows 10 Enterprise:

- Windows 10 IoT Enterprise 2019 LTSC does not include Cortana, the Microsoft Edge browser or the Microsoft Store.
- The LTSC version is based on build 17763 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 the **Windows 10 IoT Enterprise 2019 LTSC working guide**. This contains information about installing languages, enabling lockdown and other features.

## Information:

**These settings, as well as all features not included in the LTSC version, result in different behavior compared to a standard Windows 10 Enterprise installation.**

### 7.3.1.5 Installation

B&R installs and activates Windows 10 IoT Enterprise 2019 LTSC on a suitable data storage medium. After the system has been switched on for the first time, it runs through the out-of-box experience (OOBE), which allows the user to make various settings (e.g. language, region, keyboard, computer name, username).

The operating system is now only installed in UEFI mode.

The data storage medium containing the Windows partition is formatted as a GUID Partition Table (GPT) file system in UEFI mode. For other drives, it is possible to use either the GPT or Master Boot Record (MBR) file format. A GPT drive can have up to 128 partitions.

## Notice!

**It is important to note that when installing in UEFI mode, the GPT file system must be supported by the software being used when backing up and restoring the installation.**

### 7.3.1.6 Drivers

The operating system contains all drivers necessary 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.**

### 7.3.1.7 Activation

Windows 10 IoT Enterprise 2019 LTSC must be activated like its predecessor version. This takes place at B&R. The activation status can be checked in the Control Panel:
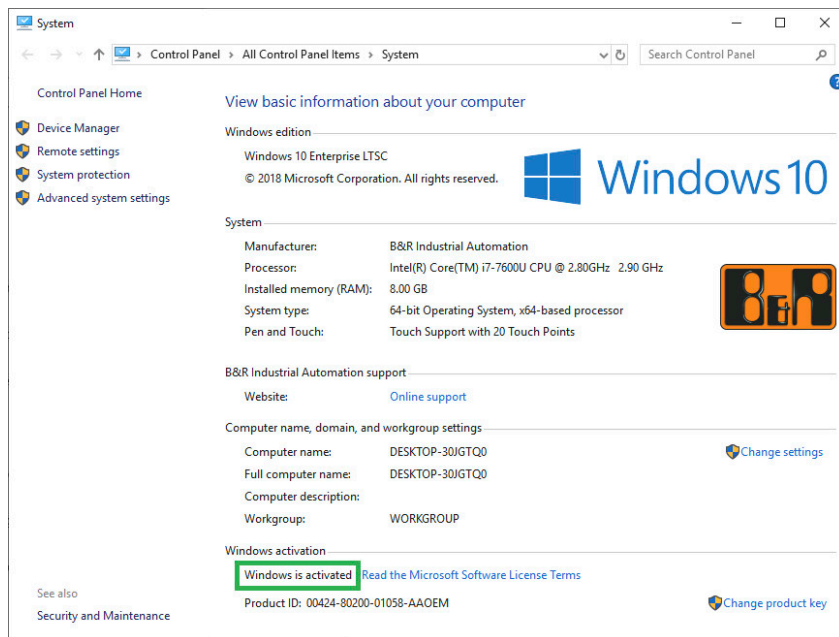


The activation carried out by B&R is supported by special B&R extensions in the operating system and is not lost when the hardware is changed (e.g. replacement of components in the event of repair) or when the system is reinstalled (Microsoft reserves the right to make technical changes without notice).

### 7.3.1.8 Supported display resolutions

Windows requires SVGA resolution (800 x 600) or higher per Microsoft requirements to activate full operation of the Windows interface (e.g. with system dialog boxes). A lower resolution can be selected for applications.

## 7.3.2 B&R Linux 10 (GNU/Linux)

### 7.3.2.1 General information

B&R supports Linux in the form of modified images based on Debian GNU / Linux 10 (codename "buster").

With B&R Linux, B&R offers a variant of Debian optimized for B&R industrial PCs that already includes all B&R-specific modifications and offers the broadest possible basis for various applications.

Reasons for Debian:

- High stability
- Large package selection
- Wide distribution of Debian and various derivatives (e.g. Ubuntu, Linux Mint)

For additional information, see the Debian website (https://www.debian.org/).

**Information:**

**For detailed information, see the user's manual of the operating system. This is available for download on the B&R website (www.br-automation.com).**

### 7.3.2.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **B&R Linux 10** | |
| 5SWLIN.0864-MUL | B&R Linux 10 - 64-bit - Multilingual - PPC900 chipset QM170/HM170 (UEFI boot) - Installation - 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 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.8192-00 | CFast 8 GB SLC | |

### 7.3.2.3 Overview

| Order number | 5SWLIN.0864-MUL |
|---|---|
| **Operating system** | |
| Target systems | |
|     Industrial PC | PPC900 |
|     Chipset | Skylake |
| Architecture | 64-bit (UEFI boot) |
| Language | Multilingual |
| Minimum size of RAM | 2 GB |
| Minimum size of data storage medium | 8 GB |

Table 147: 5SWLIN.0864-MUL - Technical data

### 7.3.2.4 Features

B&R Linux 10 contains a selection of predefined software package groups. Additional packages can be installed later with an existing Internet connection.

Appropriate modifications have been made and certain features provided using custom packages in order to use Debian on B&R Automation Panels and Panel PCs. Most of these packages are already included in B&R Linux and/or available for download on the B&R website (www.br-automation.com).

### 7.3.2.5 Installation

B&R Linux 10 is preinstalled at B&R on the desired data storage medium (e.g. CFast card).

### 7.3.2.6 Drivers

The operating system contains all drivers necessary for operation.

The current version of B&R-specific drivers can be downloaded and installed from the B&R website (www.br-automation.com).

# 7.4 Automation software

## 7.4.1 Licensing

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

It is possible to choose between the following licensing types:

**Technology Guarding (TG)**

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

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

**Terms and conditions (TC)**

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

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

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

## 7.4.2 Order data

**Hardware-based licensing (Technology Guard)**

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

**Contract-based licensing (terms and conditions)**

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

## 7.4.3.1 Support

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

| Target system | B&R Hypervisor | ARemb | ARemb Terminal (TG only) |
|---|---|---|---|
| PPC900SL | Yes | Yes | No |

### 7.4.4 Automation Runtime

#### 7.4.4.1 General information

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

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

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

#### 7.4.4.2 Minimum versions

#### 7.4.4.2.1 Automation Runtime Embedded (ARemb) with QM170/HM170 CPU boards

**System requirements**

The following software versions (or higher) are required to operate Automation Runtime Embedded on a Panel PC 900:

- ARemb upgrade AR A4.90
- Automation Studio V4.9
- Technology Guard

> **Information:**
>
> **In order to use Automation Runtime Embedded (ARemb), BIOS setting *Advanced - OEM features - Realtime environment* must be set to *Enabled* and *Boot - Boot option sorting method* must be set to *UEFI before legacy*.**
>
> **For other important information regarding operation of Automation Runtime, see .**

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

#### 7.4.4.3 Information about Automation Runtime operation

> **Information:**
>
> **The specified <u>thermal design power</u> (TDP) of the CPU may be exceeded if the graphics load and CPU utilization are high at the same time. In real-time applications, this can result in increased jitter and/or higher cycle times.**

If the TDP is exceeded, internal protection mechanisms of the CPU begin limiting the load to the limit of the TDP. This means that either the CPU frequency or the graphic frequency (GPU) will be reduced/controlled. In real-time applications, this can result in increased jitter and/or higher cycle times.

This behavior can be influenced by settings in BIOS. Option *CPU flex ratio override* must be set to *Enabled* in BIOS under *Advanced - CPU configuration*. This displays option *CPU flex ratio settings*. The maximum CPU frequency can be set with this option. The number of cores used can be set using option *Active processor cores*.

In addition, the maximum frequency of the GPU (Gfx) can be limited in BIOS under *Advanced - Graphics configuration* using option *Max. GPU frequency*. Limiting the CPU and/or GPU frequency reduces power consumption and prevents the TDP from being exceeded.

The optimal settings for real-time operation depend on several factors:

1) CPU variant being used:

   ° If CPU C-G3900E is used, no further action (BIOS settings) are necessary. For pure ARemb operation, the limiting of active processor cores can be set to 1 in BIOS; this is otherwise recommended.
   ° If CPU i3-6100E, i5-6440EQ or i7-6820EQ is used, see item 2. ARemb or B&R Hypervisor mode.

2) ARemb or B&R Hypervisor mode:

   ° For pure ARemb operation, the active processor cores must be limited to 1 (see item 4 "Typical use cases for ARemb").
   ° For B&R Hypervisor mode, see item 3. Requirements of the respective application.

3) Requirements of the respective application:

   ° If CPU performance is a priority, then it is recommended to limit the GPU to a minimum. Depending on the CPU variant used, it may also be necessary to limit the CPU frequency somewhat (see item 5 "Typical use cases for B&R Hypervisor").
   ° If GPU performance is a priority, then it is recommended to limit the CPU (minimum CPU frequency = 800 MHz). Depending on the CPU variant used, it may also be necessary to limit the GPU frequency somewhat (see item 5 "Typical use cases for B&R Hypervisor").
   ° If average performance of the CPU and GPU is desired, it is recommended to limit the CPU and GPU to an average value (see item 5 "Typical use cases for B&R Hypervisor").

4) Typical use cases for ARemb:

   ° Limit active processor cores to 1.

5) Typical use cases for B&R Hypervisor:

   ° High CPU performance:

     • i3-6100E with 2600 MHz CPU and 500 MHz GPU frequency.
     • i5-6440EQ with 2400 MHz CPU and 500 MHz GPU frequency.
     • i7-6820EQ with 2500 MHz CPU and 500 MHz GPU frequency.

   ° High GPU performance:

     • i3-6100E with 2000 MHz CPU and maximum GPU frequency.
     • i5-6440EQ with 1900 MHz CPU and maximum GPU frequency.
     • i7-6820EQ with 2100 MHz CPU and maximum GPU frequency.

   ° Mid-level CPU and GPU performance:

     • i3-6100E with 2300 MHz CPU and 800 MHz GPU frequency.
     • i5-6440EQ with 2200 MHz CPU and 800 MHz GPU frequency.
     • i7-6820EQ with 2300 MHz CPU and 800 MHz GPU frequency.

### 7.4.5 B&R Hypervisor

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

**Intelligent distribution of CPU resources**

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

**Virtual network**

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

**Maximum flexibility**

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

**System requirements**

The following minimum software versions are required to operate B&R Hypervisor on the Panel PC 900:

- ARemb upgrade AR A4.90
- Automation Studio V4.9

## Information:

**The following settings must be made in BIOS to operate B&R Hypervisor:**

- *Advanced - OEM features - Realtime environment* **set to Enabled**
- *Advanced - OEM features - Hypervisor environment* **set to Enabled**
- *Boot - Boot option sorting method* **set to "UEFI before legacy"**

**For additional important information regarding operation of Automation Runtime, see Information about Automation Runtime operation.**

## Information:

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

### 7.4.6 mapp Technology
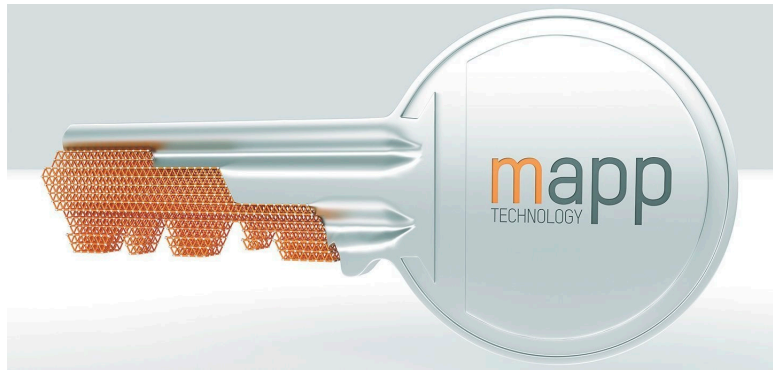


mapp is revolutionizing the creation of software for industrial machinery and equipment. mapp components – mapps for short – are as easy to use as smartphone apps. Rather than write lines and lines of code to build a user management system, alarm system or motion control sequence from the ground up, developers of machine software simply configure the ready-made mapps with a few clicks of the mouse. Complex algorithms are easy to master. Programmers can focus entirely on the machine process.

## Information:

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

## 7.5 Automation Device Interface (ADI)

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

### 7.5.1 ADI driver

#### 7.5.1.1 Installation

The ADI driver is included in B&R Windows operating systems.

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

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

#### 7.5.1.2 ADI Control Center

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

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

#### 7.5.1.2.1 Functions

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

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

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

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

## 7.5.2 ADI Development Kit

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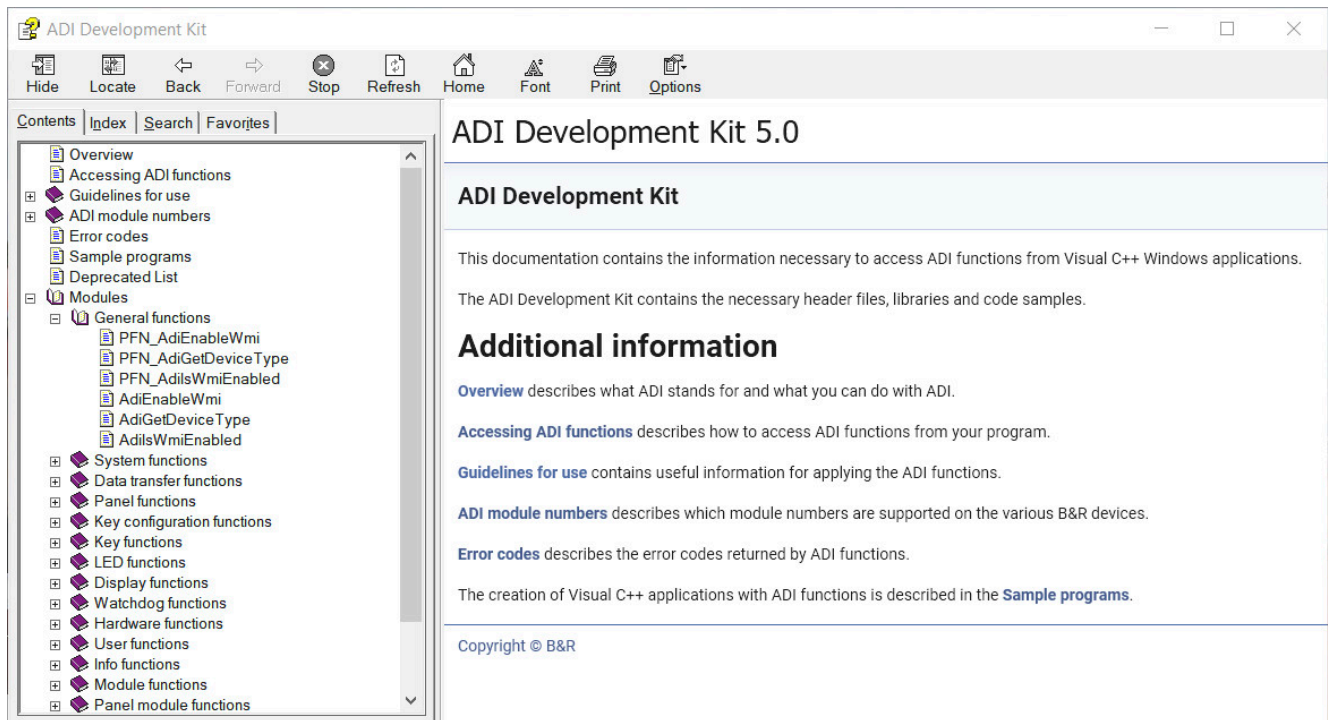


**Features:**

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

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

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

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

### 7.5.3 ADI .NET SDK

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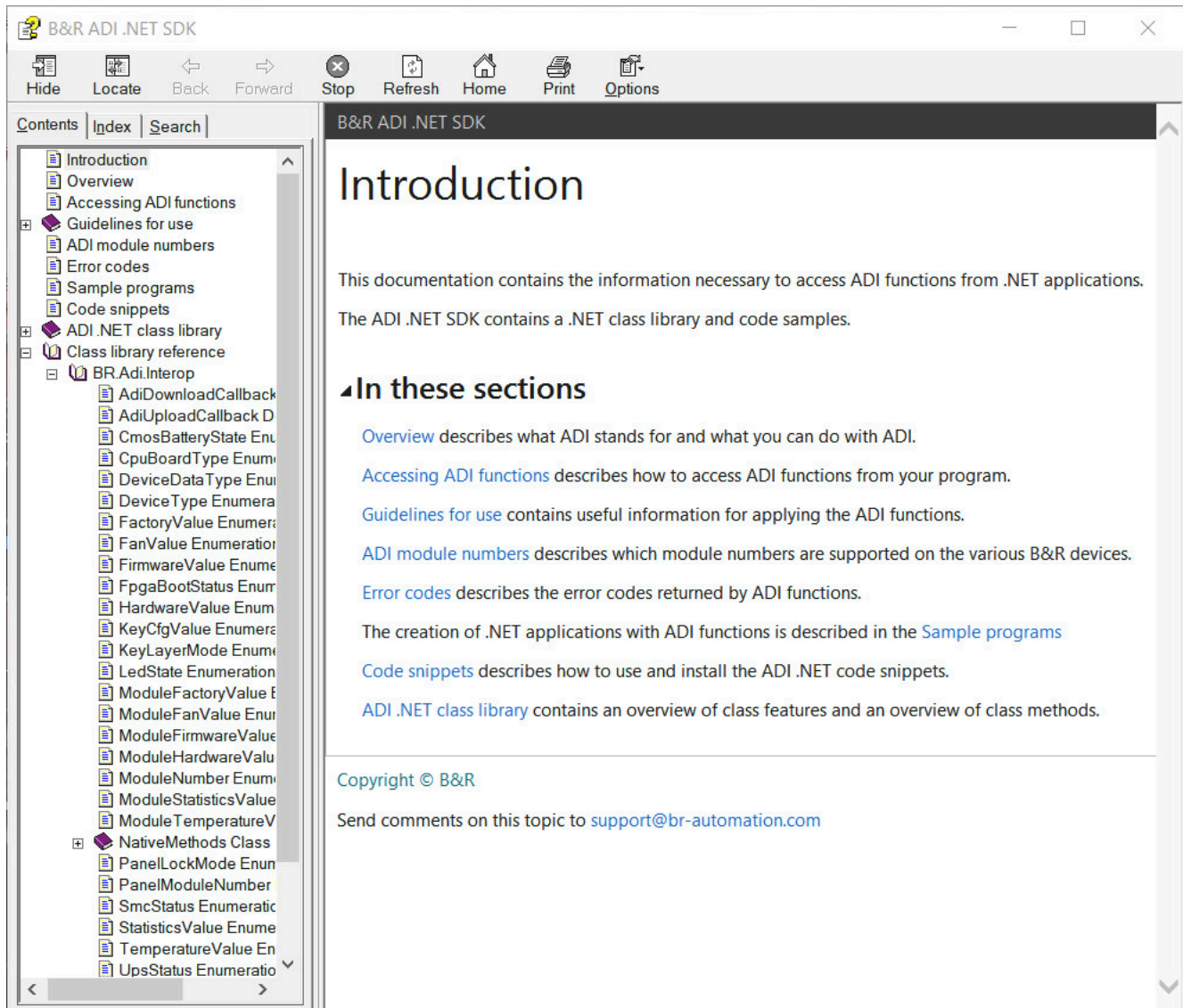


**Features:**

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

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

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

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

## 7.5.4 ADI OPC UA Server

This document contains technical information about B&R Automation Device Interface OPC UA Server (B&R ADI OPC UA Server).

The descriptions and figures refer to B&R ADI OPC UA Server V2.0.0 and later.

ADI OPC UA Server provides the functions and information of the Automation Device Interface (ADI) as OPC UA variables. OPC UA stands for **O**pen **P**latform **C**ommunications **U**nified **A**rchitecture and is an international standard for secure, reliable, manufacturer- and platform-independent information exchange in industrial communication.

OPC UA is based on the client-server principle and, in the case of ADI OPC UA Server, enables temperatures and device information to be read from B&R devices, for example.

Additional information is available on the OPC Foundation (www.opcfoundation.org) website, for example.

The ADI OPC UA Server and user documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

# 7.6 Key Editor

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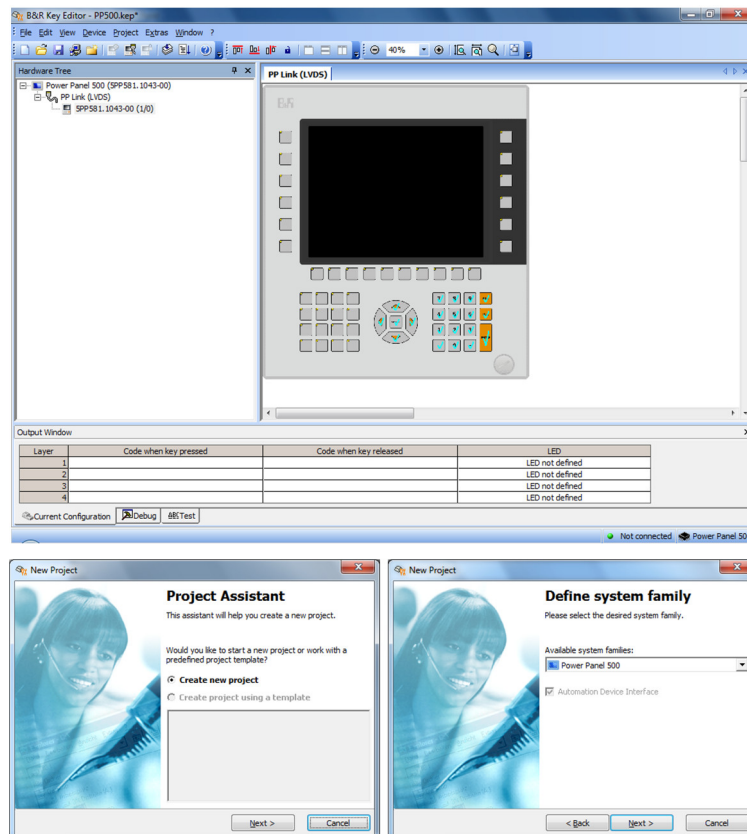


**Features:**

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

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

## 7.7 KCF Editor

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

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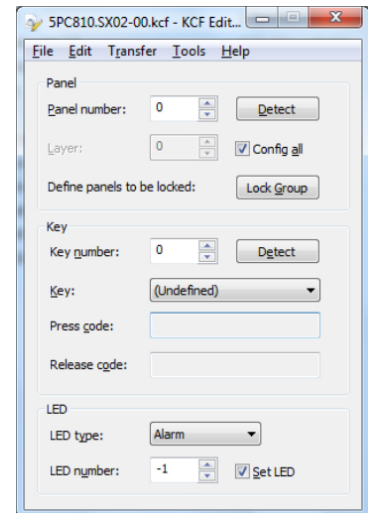
**Features:**

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

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

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

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

# 8 Maintenance

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

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

## 8.1 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.

### 8.1.1 Procedure

In order to obtain meaningful results, the test conditions should correspond to conditions in the field. This means that during the temperature tests, for example, the target application should be running and the PC should be installed in the control cabinet housing that will be used later.

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 inlet (not near the air outlet).

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.

A minimum test time of 8 hours is recommended for to optimally determine and assess the temperature situation.

### 8.1.2 Evaluating temperatures in Windows operating systems

#### 8.1.2.1 Evaluating with the B&R Control Center

The *ADI Control Center* can be used to evaluate temperatures. The temperatures can be viewed in tab **Temperatures**. The ADI Control Center can be downloaded from the B&R website (www.br-automation.com) at no cost and uses the ADI (Automation Device Interface).
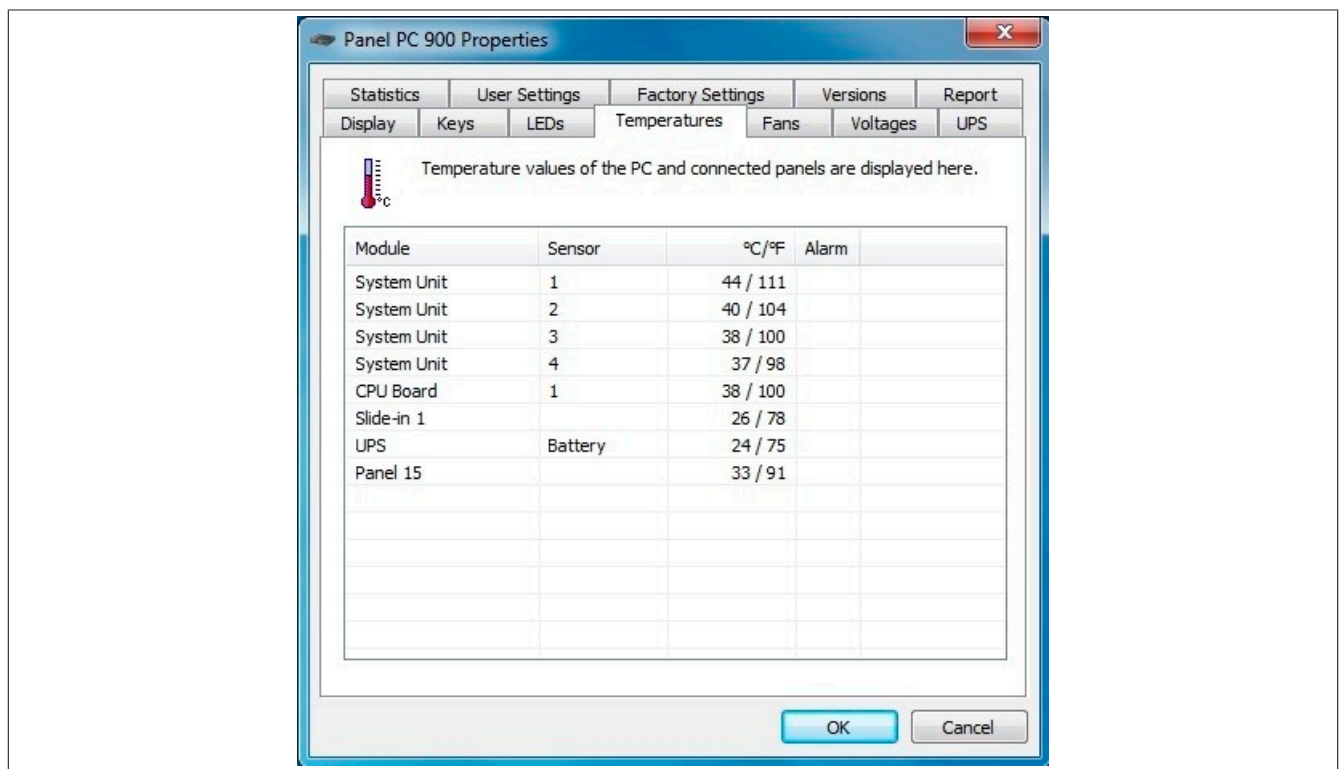
If historical recording of the data is necessary, a separate application can be created.

## Information:

**To create a separate application, downloads such as the ADI .NET SDK are available from the B&R website (www.br-automation.com).**

### 8.1.2.2 Evaluating with the BurnInTest tool 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 additional information, see www.passmark.com.**

The following screenshots are based on Passmark BurnInTest Pro V6 and a 2-slot PPC910 with DVD.
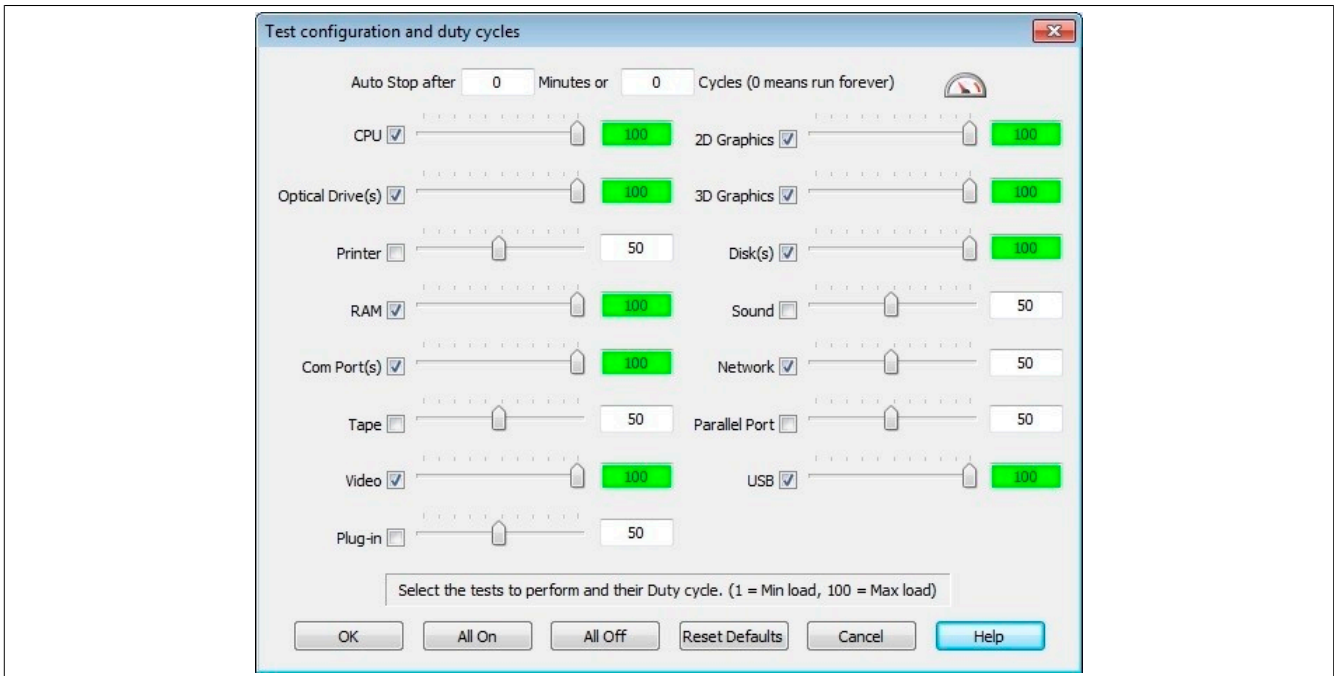


Figure 37: Setting for Passmark BurnInTest Pro V6 and a 2-slot PPC900 with DVD
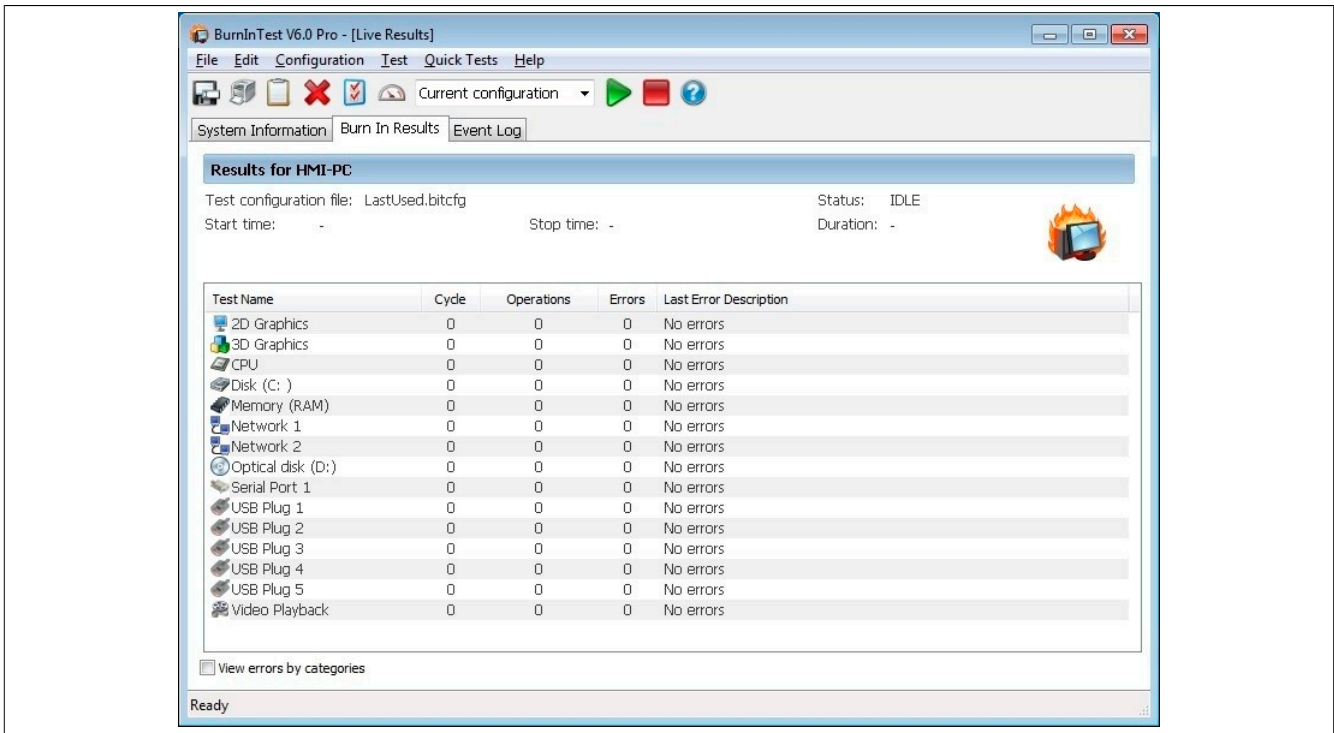
Figure 38: Test overview of a 2-slot PPC900 with DVD

The respective test properties may need to be fine-tuned depending on the availability of a loopback plug and DVDs.

If no USB loopback adapters are available, USB flash drives can also be used. These must be available in Windows as formatted drives. Option **USB** must be deselected under **Test selection and duty cycles**, and **Test this device** must then be selected in the **Disk** settings (**Configuration / Test Preferences / Disk**).



Serial loopback adapters can be easily created by connecting some pins as shown.
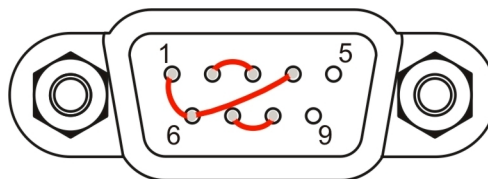


### 8.1.3 Evaluating the measurement results

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.

## 8.2 Changing the battery

> # Warning!
>
> **The battery is only permitted to be replaced with a CR2477N battery. The use of any other battery may present a risk of fire or explosion.**
>
> **The battery can explode if handled improperly. Do not recharge, disassemble or dispose of the battery in fire.**

The lithium battery ensures the retention of the internal real-time clock (RTC) and CMOS data.

The following lithium replacement batteries are available: 4A0006.00-000 (1 pc.) and 0AC201.91 (4 pcs.).

Note the following when changing the battery:

- The product design allows the battery to be changed when the PLC is in a voltage-free state as well as when the B&R device is switched on. In some countries, changing under operating voltage is not permitted, however; local regulations must be observed!
- The battery is only permitted to be changed by qualified personnel.
- When changing the battery in a voltage-free state, any BIOS settings made are retained (stored in voltage-safe EEPROM). The date and time must be set again since this data is lost during the change.

### 8.2.1 Procedure

- Disconnect the power supply to the B&R Industrial PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
- Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
- Pull the battery holder out of the Panel PC (①) and remove the battery (②).
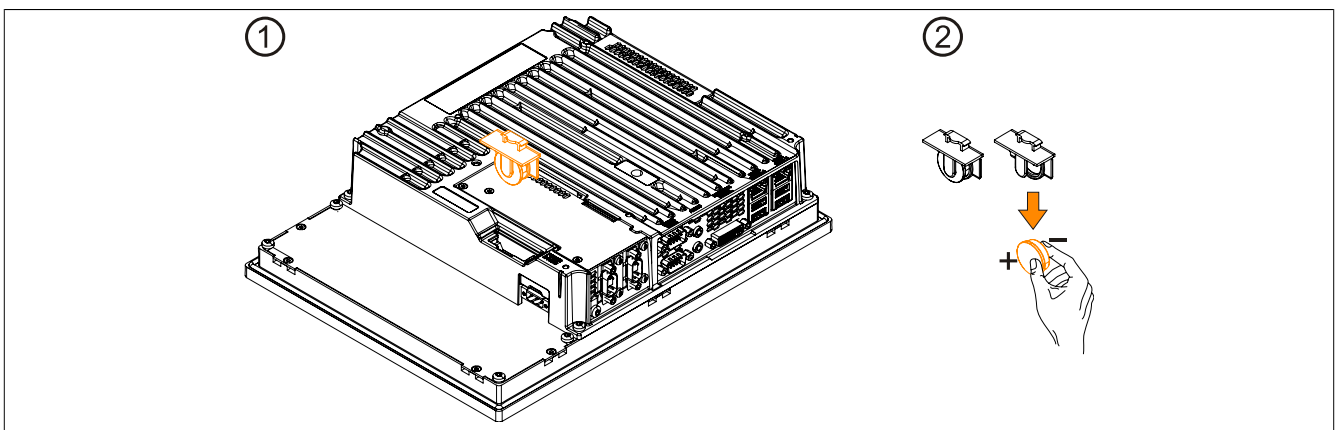


Figure 39: Pull out battery holder and remove battery

1. The battery is not permitted to be held by its edges. Insulated tweezers may also be used to insert the battery.
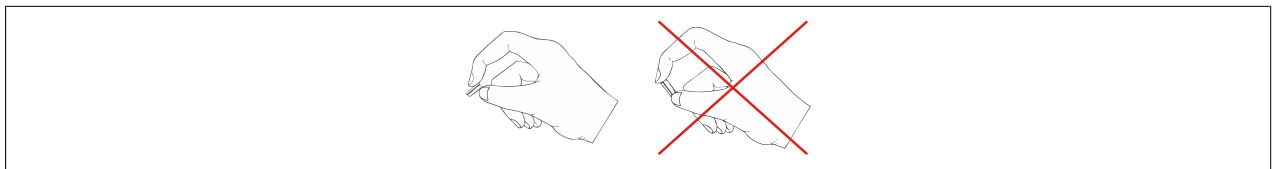


Figure 40: Battery handling

2. Insert the new battery with the correct polarity.

- Insert the battery holder into the Panel PC.
- Reconnect the power supply to the B&R Industrial PC (plug in the power cable).
- Check the date and time in BIOS and correct them if necessary.

> # Warning!
>
> **Lithium batteries are hazardous waste! Used batteries must be disposed of in accordance with local regulations.**

## 8.3 Exchanging a CFast card

> # Caution!
>
> **Power must be turned off before exchanging CFast cards.**

The CFast card can be exchanged quickly and easily using the ejector (see image).
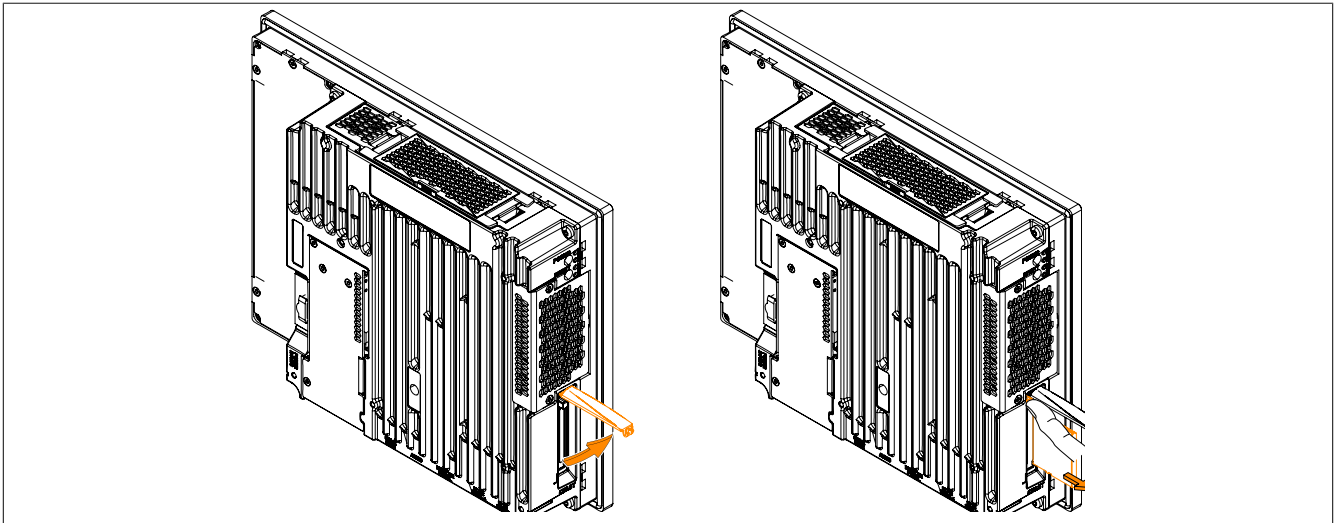


Figure 41: Exchanging a CFast card

## 8.4 Cleaning

## Danger!

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

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

## Information:

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

## 8.5 User tips for increasing the service life of the display

### 8.5.1 Backlight

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

#### 8.5.1.1 Measures to maintain backlight service life

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

### 8.5.2 Image persistence

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

There are 2 different types:

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

#### 8.5.2.1 What causes image persistence?

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

#### 8.5.2.2 How can image persistence be reduced?

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

## 8.6 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.**

# 9 Accessories

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

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

## 9.1 Terminal block power supply

### 9.1.1 0TB103.9x

#### 9.1.1.1 General information

1-row 3-pin terminal block 0TB103 is used for the power supply.

#### 9.1.1.2 Order data

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

#### 9.1.1.3 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.**

| Order number | 0TB103.9 | 0TB103.91 |
|---|---|---|
| **General information** | | |
| Certifications | | |
| CE | Yes | |
| UL | cULus E115267<br>Industrial control equipment | |
| HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD, T4 [1] | |
| DNV | Temperature: **B** (0 - 55°C)<br>Humidity: **B** (up to 100%)<br>Vibration: **A** (0.7 g)<br>EMC: **B** (bridge and open deck) [2] | |
| LR | ENV3 | |
| KR | Yes | |
| ABS | Yes | |
| BV | **EC31B**<br>Temperature: 5 - 55°C<br>Vibration: 0.7 g<br>EMC: Bridge and open deck | |
| EAC | Yes | |
| **Terminal block** | | |
| Note | Protected against vibration by the screw flange<br>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!) | |
| Pitch | 5.08 mm | |

| Order number | 0TB103.9 | 0TB103.91 |
|---|---|---|
| Connection cross section | | |
|     AWG wire | 26 to 14 AWG | 26 to 12 AWG |
|     Wire end sleeves with plastic covering | 0.20 to 1.50 mm² | |
|     Solid wires | 0.20 to 2.50 mm² | |
|     Fine-stranded wires | 0.20 to 1.50 mm² | 0.20 to 2.50 mm² |
|     With wire end sleeves | 0.20 to 1.50 mm² | |
| Tightening torque | 0.4 Nm | - |
| **Electrical properties** | | |
| Nominal voltage | 300 V | |
| Nominal current [4] | 10 A / contact | |
| Contact resistance | ≤5 mΩ | |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |

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 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!

## 9.1.2 0TB3103.8000

### 9.1.2.1 General information

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

### 9.1.2.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Terminal blocks** | |
| 0TB3103.8000 | Connector 230 VAC - 3-pin female - Screw clamp terminal block 4 mm² - Protected against vibration by the screw flange |  |

Table 152: 0TB3103.8000 - Order data

### 9.1.2.3 Technical data

| Order number | 0TB3103.8000 |
|---|---|
| **General information** | |
| Certifications | |
|     CE | Yes |
|     UL | cULus E115267<br>Industrial control equipment |
|     HazLoc | cULus HazLoc E180196<br>Industrial control equipment<br>for hazardous locations<br>Class I, Division 2, Groups ABCD[1] |
|     EAC | Yes |
| **Terminal block** | |
| Note | Protected against vibration by the screw flange |
| Number of pins | 3 (male) |
| Type of terminal block | Screw clamps |
| Pitch | 7.62 mm |
| Connection cross section | |
|     AWG wire | 24 to 10 AWG |
|     Wire end sleeves with plastic covering | 0.25 to 4 mm² |
|     Flexible | 0.2 to 4 mm² |
|     Inflexible | 0.2 to 4 mm² |

Table 153: 0TB3103.8000 - Technical data

| Order number | 0TB3103.8000 |
|---|---|
| Tightening torque | 0.5 to 0.6 Nm |
| **Electrical properties** | |
| Nominal voltage | 400 V |
| Nominal current | 20 A |

Table 153: 0TB3103.8000 - Technical data

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

# 9.2 Terminal block ready relay

## 9.2.1 0TB2104.8000

### 9.2.1.1 General information

This 1-row, 4-pin TB2104 terminal block is used for ready relay 5AC901.IRDY-00.

### 9.2.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Terminal blocks** | |
| 0TB2104.8000 | Connector 24 VDC - 4-pin female - Screw clamp terminal block 2.5 mm² | |

### 9.2.1.3 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.**

| Order number | 0TB2104.8000 |
|---|---|
| **General information** | |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267 Industrial control equipment |
|    EAC | Yes |
| **Terminal block** | |
| Note | Nominal data per UL |
| Number of pins | 4 (female) |
| Type of terminal block | Screw clamp terminal block variant |
| Cable type | Only copper wires (no aluminum wires!) |
| Pitch | 5.08 mm |
| Connection cross section | |
|    AWG wire | 26 to 14 AWG |
|    Wire end sleeves with plastic covering | 0.2 to 1.5 mm² |
|    Solid wires | 0.2 to 2.5 mm² |
|    Fine-stranded wires | 0.2 to 1.5 mm² |
|    With wire end sleeves | 0.2 to 1.5 mm² |
| **Electrical properties** | |
| Nominal voltage | 300 V |
| Nominal current [1] | 10 A |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |

1) The respective limit data of the IF option must be taken into account!

# 9.3 Replacement CMOS batteries

## 9.3.1 0AC201.91 / 4A0006.00-000

### 9.3.1.1 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").

### 9.3.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | **Batteries** | |
| 0AC201.91 | Lithium batteries 4 pcs., 3 V / 950 mAh button cell | |
| 4A0006.00-000 | Lithium battery, 3 V / 950 mAh, button cell | |

### 9.3.1.3 Technical data

## Warning!

**The battery is only permitted to be replaced with a CR2477N battery. The use of any other battery may present a risk of fire or explosion.**

**The battery can explode if handled improperly. Do not recharge, disassemble or dispose of the battery in fire.**

## 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.**

| Order number | 0AC201.91 | 4A0006.00-000 |
|---|---|---|
| **General information** | | |
| Storage time | Max. 3 years at 30°C | |
| Certifications | | |
|   CE | Yes | |
|   UL | cULus E115267<br>Industrial control equipment | |
| **Electrical properties** | | |
| Capacity | 950 mAh | |
| Self-discharge | <1% per year (at 23°C) | |
| Voltage range | 3 V | |
| **Operating conditions** | | |
| Pollution degree per EN 61131-2 | Pollution degree 2 | |
| **Ambient conditions** | | |
| Temperature | | |
|   Storage | -20 to 60°C | |
| Relative humidity | | |
|   Operation | 0 to 95% | |
|   Storage | 0 to 95% | |
|   Transport | 0 to 95% | |

# 9.4 PCIe plug-in cards

## 9.4.1 5ACPCE.ETH1-00

### 9.4.1.1 General information

This PCIe card has a 10/100/1000 Mbit/s network connection and can be used as an additional network interface in a standard PCI Express x1 slot.

- PCIe x1 Ethernet card
- 1x Ethernet interface (10/100/1000 Mbit/s)



Figure 42: 5ACPCE.ETH1-00 - PCIe Ethernet card 10/100/1000

### 9.4.1.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | Interface options | |
| 5ACPCE.ETH1-00 | PCIe carte - 1x ETH 10/100/1000 - For APC910/PPC900 |  |

Table 158: 5ACPCE.ETH1-00 - Order data

### 9.4.1.3 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.**

| Order number | 5ACPCE.ETH1-00 |
|---|---|
| **General information** | |
| B&R ID code | DBF3 |
| Diagnostics | |
|    Data transfer | Yes, using LED status indicators |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    EAC | Product family certification |
| **Interfaces** | |
| Ethernet | |
|    Quantity | 1 |
|    Controller | Intel I210 |
|    Variant | Shielded RJ45 |
|    Transfer rate | 10/100/1000 Mbit/s [1] |
|    Line length | Max. 100 m between two stations (segment length) |
| **Electrical properties** | |
| Power consumption | 1 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | 0 to 55°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 |
| Vibration [3] | |
|    Operation (continuous) | 2 to 9 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g |
|    Operation (occasional) | 2 to 9 Hz: 3.5 mm amplitude / 9 to 200 Hz: 1 g |
|    Storage | 2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g |
|    Transport | 2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g |
| Shock [3] | |
|    Operation | 15 g, 11 ms |
|    Storage | 30 g, 6 ms |
|    Transport | 30 g, 6 ms |
| Elevation | |
|    Operation | -300 to 3000 m above sea level [2] |

Table 159: 5ACPCE.ETH1-00 - Technical data

1)    Switching takes place automatically.
2)    The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.
3)    Vibration testing is performed per EN 60068-2-6. Shock testing is performed per EN 60068-2-27.

### 9.4.1.3.1 Ethernet interface

| **Ethernet connection** | | | |
|---|---|---|---|
| Controller | Intel I210 | | |
| Power supply | PCIe x1 for 3.3 V | | |
| Wiring | S/STP (Cat 5e) | | |
| Transfer rate | 10/100/1000 Mbit/s[1] | | |
| Cable length | Max. 100 m (min. Cat 5e) | | |
| **LED "Speed"** | **On** | **Off** | |
| Green | 100 Mbit/s | 10 Mbit/s[2] | |
| Orange (light) | 1000 Mbit/s | - | |
| **LED "Link"** | **On** | **Off** | |
| Orange (light) | Link (a connection to an Ethernet network exists) | Activity (blinks) (data is being transferred) | |
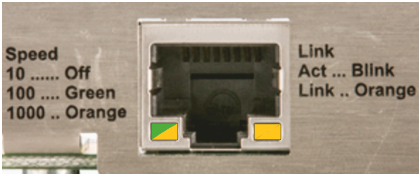
Table 160: 5ACPCE.ETH1-00 - Ethernet interface

1)    Switching takes place automatically.
2)    The 10 Mbit/s transfer rate / connection is only available if LED "Link" is active at the same time.

### 9.4.1.4 Driver support

A special driver is necessary 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) (if required and not already included in the operating system).

Approved operating systems:

- Windows 7
- Windows 10
- 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.**

### 9.4.1.5 Dimensions
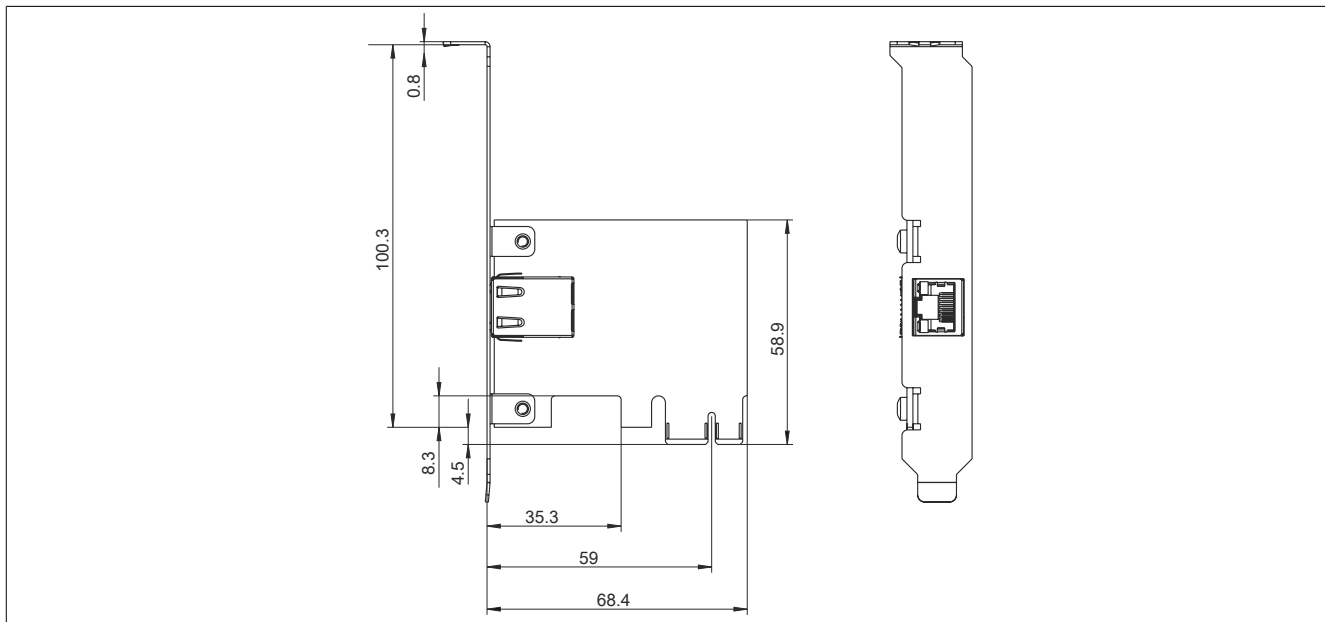


Figure 43: 5ACPCE.ETH1-00 - Dimensions

## 9.4.2 5ACPCE.ETH4-00

### 9.4.2.1 General information

This PCIe card has 4 10/100/1000 Mbit/s network connections and can be used as an additional network interface in a standard PCI Express x4 slot.

- PCIe x4 Ethernet card
- 4x Ethernet interface (10/100/1000 Mbit/s)

### 9.4.2.2 Order data

| Order number | Short description | Figure |
|---|---|---|
| | Interface options | |
| 5ACPCE.ETH4-00 | PCIe card - 4-port ETH 10/100/1000 - For APC910/PPC900 |  |

Table 161: 5ACPCE.ETH4-00 - Order data

### 9.4.2.3 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.**

| Order number | 5ACPCE.ETH4-00 |
|---|---|
| **General information** | |
| B&R ID code | EC3B |
| Diagnostics | |
|    Data transfer | Yes, using LED status indicator |
| Certifications | |
|    CE | Yes |
|    UL | cULus E115267<br>Industrial control equipment |
|    EAC | Product family certification |
| **Interfaces** | |
| Ethernet | |
|    Quantity | 4 |
|    Controller | Intel I350 |
|    Variant | RJ45, shielded |
|    Transfer rate | 10/100/1000 Mbit/s [1] |
|    Line length | Max. 100 m between two stations (segment length) |
| **Electrical properties** | |
| Power consumption | 4 W |
| **Operating conditions** | |
| Pollution degree per EN 61131-2 | Pollution degree 2 |
| **Ambient conditions** | |
| Temperature | |
|    Operation | 0 to 55°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 |

Table 162: 5ACPCE.ETH4-00 - Technical data

| Order number | 5ACPCE.ETH4-00 |
|---|---|
| Vibration [3] | |
|    Operation (continuous) | 2 to 9 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g |
|    Operation (occasional) | 2 to 9 Hz: 3.5 mm amplitude / 9 to 200 Hz: 1 g |
|    Storage | 2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g |
|    Transport | 2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g |
| Shock [3] | |
|    Operation | 15 g, 11 ms |
|    Storage | 30 g, 6 ms |
|    Transport | 30 g, 6 ms |
| Elevation | |
|    Operation | -300 to 3000 m above sea level [2] |

Table 162: 5ACPCE.ETH4-00 - Technical data

1) Switching takes place automatically.
2) The maximum ambient temperature is typically derated 1°C per 1000 meters starting at 500 m above sea level.
3) Vibration testing is performed per EN 60068-2-6. Shock testing is performed per EN 60068-2-27.

### 9.4.2.3.1 Ethernet interface

| Ethernet connection | | | |
|---|---|---|---|
| Controller | Intel I350 | | |
| Power supply | PCIe x4 for 3.3 V | | |
| Wiring | S/STP (Cat 5e) | | |
| Transfer rate | 10/100/1000 Mbit/s[1] | | |
| Cable length | Max. 100 m (min. Cat 5e) | | |
| **LED "Speed"** | **On** | **Off** | |
| Green | 100 Mbit/s | 10 Mbit/s[2] | |
| Orange (light) | 1000 Mbit/s | - | |
| **LED "Link"** | **On** | **Off** | |
| Orange (light) | Link (a connection to an Ethernet network exists) | Activity (blinks) (data is being transferred) | |
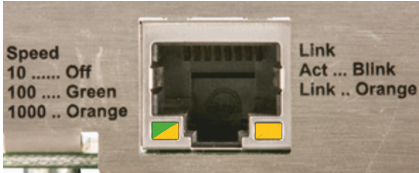
Table 163: 5ACPCE.ETH4-00 - Ethernet interface

1) Switching takes place automatically.
2) The 10 Mbit/s transfer rate / connection is only available if LED "Link" is active at the same time.

### 9.4.2.4 Driver support

A special driver is required in order to operate Intel Ethernet controller I350. Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com) (if required and not already included in the operating system).

Approved operating systems:

- Windows 7
- Windows 10
- 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.**

### 9.4.2.5 Correction of the problem

Under certain circumstances (mainly with older boards with TS77), the PCIe plug-in card 5ACPCE.ETH4-00 may not be recognized by Windows. In this case, proceed as follows:

1. Set the following setting to "**Enabled**" in BIOS:
   **Set Advanced / PCI Express configuration / PCI Express graphics (PEG) port / PCI Express graphics (PEG) port**

**9.4.2.6 Dimensions**
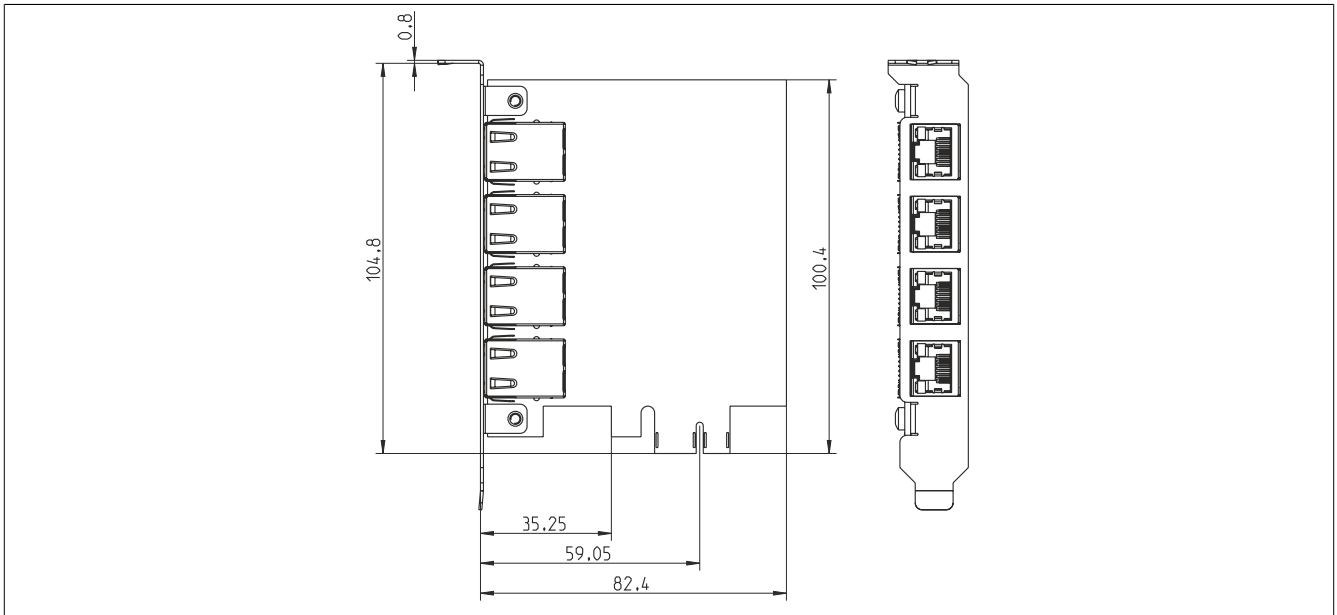


Figure 44: 5ACPCE.ETH4-00 - Dimensions

## 9.5 CFast cards

For detailed information about compatible CFast cards, see the aggregate data sheet for CFast cards on the B&R website.

## 9.6 Cables

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

## 9.7 USB mass storage device

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

# 10 International and national certifications

## 10.1 Directives and declarations

### 10.1.1 CE marking

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

### 10.1.2 EMC Directive

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

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

> **Information:**
>
> **The declarations of conformity are available on the B&R website under Declarations of conformity.**

### 10.1.3 Low voltage directive

The products meet the requirements of EU directive "Low Voltage Directive 2014/35/EU" and are designed for industrial applications:

EN 61131-2:2007          Programmable logic controllers - Part 2: Equipment requirements and tests

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

> **Information:**
>
> **Declarations of conformity are available on the B&R website under Declarations of conformity.**

## 10.2 Certifications

## Danger!

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

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

## Information:

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

### 10.2.1 UL certification

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.

### 10.2.2 GOST-R

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

### 10.2.3 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).

**10.2.4 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).

**10.2.5 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 simplifies the certification of your machines and systems in this economic area (based on EU conformity).

**10.2.6 Certifications for use in potentially explosive environments**

**10.2.6.1 UL Haz. Loc. Certifications**

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

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

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

The UL HazLoc certificates are available on the B&R website under Downloads - Certificates - HazLoc.

Ind.Cont.Eq.
for Haz.Locs.
Cl. I, Div. 2,
Groups ABCD
E180196 (T3C)

**10.2.6.1.1 General safety guidelines**

PPC900 system with AP923 or AP1000 display units that are certified for use in potentially explosive environments and carry the marking above are suitable for use in Class I, Division 2, Groups A, B, C and D as well as non-potentially explosive environments.

Devices with explosion protection are to be used as intended and are only permitted to be operated by knowledgeable and qualified personnel according to these operating instructions and the corresponding PPC900 and AP923 or AP1000 user's manuals. Operation in any other way endangers the safety and functionality of the devices and the connected systems. The operator is responsible for following all applicable safety and accident prevention regulations, as well as adhering to standards.

PPC900 systems with AP923 or AP1000 display units that are certified for use in potentially explosive environments and carry the marking above correspond to the following standards: UL 508 - 17th Edition, ANSI/ISA 12.12.01:2013, CSA C22.2 No. 213-M1987, and CSA C22.2 No. 142-M1987.

### 10.2.6.1.2 Mounting and installation

PPC900 systems with AP923 or AP1000 display units are only permitted to be installed by knowledgeable and qualified personnel in accordance with the PPC900 and AP923 or AP1000 user's manuals. Devices must be installed in a suitable protective housing that can only be opened by using a tool. In order to guarantee sufficient air circulation, allow the specified amount of space around the device. Use only in environments with pollution degree 2. The maximum ambient temperature varies depending on the individual components being used, see section "Temperature specifications" on page 24.

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

Devices must remain voltage-free until installation work is complete. The tightening torque for the power supply terminals is 0.5 Nm. Cables must be able to handle a surface temperature of 75°C. PPC900 systems with AP923 or AP1000 display units are only permitted to operated with 24 VDC.

Unshielded/Ungrounded cables are never permitted to be used in potentially explosive areas. Devices must be securely connected to the potential offset. Power supply, communication and accessory cables must be secured on the device or control cabinet. Power supply, communication and accessory cables are not permitted to exert excessive tensile stress on the interfaces. Possible vibrations in the environment must be taken into account for this.

### 10.2.6.1.3 Operation

To switch PP900 systems with AP923 or AP1000 display units on/off in a potentially explosive area, either the switch must be located outside the explosive area or a switch certified for use in potentially explosive areas must be used.

## Danger!

**Explosion hazard: The accessory is not permitted to be connected or disconnected with voltage applied unless the area is considered nonhazardous and is free of ignitable concentrations!**

**Explosion hazard: Replacing components may impair eligibility for Class I, Division 2!**

**Explosion hazard: Fuses or batteries (Renata CR2477N) are not permitted to be removed or replaced with voltage applied unless the area is considered nonhazardous and is free of ignitable concentrations!**

## Danger !

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

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

**Risque d'explosion – Ne pas retirer ou remplacer les fusibles ou les batteries (Renata CR2477N), sauf si l'alimentation électrique a été déconnectée ou si la zone est connue comme étant sans risque et sans concentrations inflammables!**

With the exception of USB dongle 0TG1000.01 or in line with the requirements set forth in "Control drawing (non-incendive)", USB interfaces are not certified for operation in potentially explosive areas and may only be used for service purposes.

### 10.2.6.1.4 Maintenance, breakdowns and disassembly

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

Before removing or installing accessories, components or cables, all power supplies to PPC900 systems with AP923 or AP1000 display units must be interrupted. Defective devices must only be replaced by knowledgeable and qualified personnel. Before switching on or connecting the power supply, all covers and system components must be reinstalled and secured.

## Danger!

**Nonobservance of these instructions can result in material damage, severe injury or death!**

---

# Danger !

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

### 10.2.6.1.5 USB connection with the Automation Panel 1000

### 10.2.6.1.5.1 Introduction

The information below describes the use of USB peripheral devices on the front USB interface of the B&R Automation Panel 1000 in hazardous locations Class I, Division 2, Groups A, B, C and D.

# Danger!

**RISK OF EXPLOSION**

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

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

### 10.2.6.1.5.2 Description

Nonincendive devices (keyboards, mouse) are certified for use on the front USB interface of the B&R Automation Panel 1000 (connected device) and are permitted to be connected and disconnected during operation. In addition to the nonincendive property, devices that can be connected to the front USB interface must meet the following criteria.
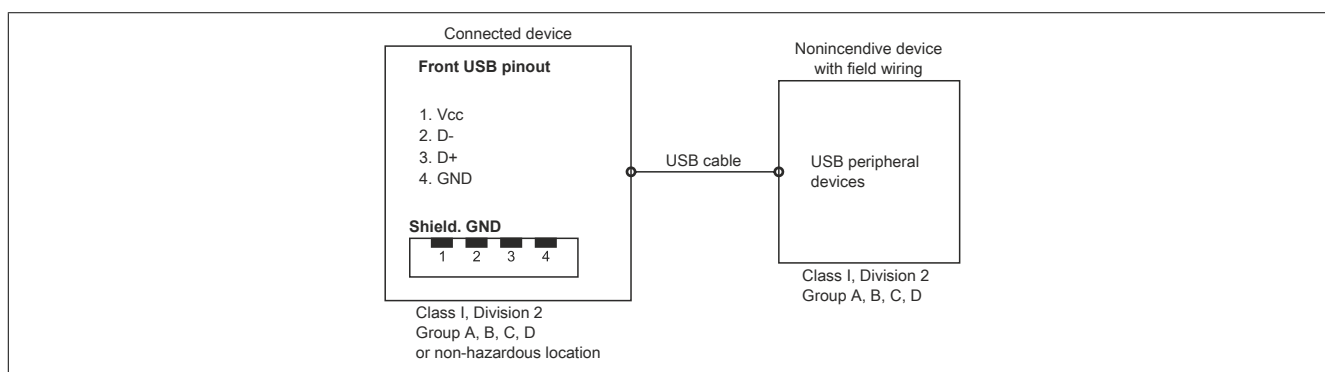


| Front USB interface (USB 2.0): | |
|---|---|
| Open-circuit voltage [$V_{oc}$] | 5.04 V |
| Short-circuit current [$I_{sc}$] | 1170 mA |
| Connected capacity [$C_a$] | 20 µF |
| Connected inductance [$L_a$] | 16.8 µH |

Table 164: Nonincendive electrical circuit parameters for the front USB interface

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

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

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

Table 165: Connected, nonincendive device with field wiring

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

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

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

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

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

## Warning!

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

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

# 11 Environmentally friendly disposal

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

## 11.1 Separation of materials

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

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

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

# Appendix A

## A.1 Maintenance Controller Extended (MTCX)

The MTCX controller (FPGA processor) is located on the mainboard (part of every system unit) of the PPC900 device.
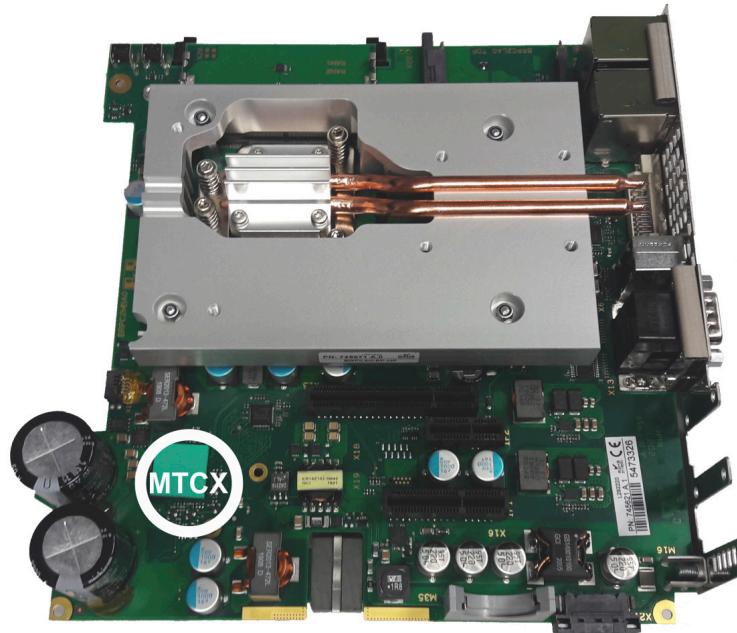


The MTCX is responsible for the following monitoring and control functions:

- Power on (power OK sequencing) and power failure logic
- Watchdog handling (NMI and reset handling)
- Temperature monitoring
- Fan control
- Key and LED handling/coordination (matrix keyboard on B&R display units)
- Advanced desktop operation (keys, USB forwarding)
- Daisy chain display operation (touch screen, USB forwarding)
- Panel locking mechanism (can be configured using B&R Control Center - ADI driver)
- Backlight control for connected B&R displays
- Statistical data recording (power cycles - records every switch-on, power on and fan hour; each quarter hour is counted)
- SDL data transfer (display, matrix keyboard, touch screen, service data, USB)
- LED status indicators (Power, HDD, Link, Run)
- Optimal default BIOS are reported to BIOS by the MTCX based on the actual hardware.

The functions of the MTCX can be extended by upgrading its firmware[7]. The version can be read in BIOS or in approved Microsoft Windows operating systems using the B&R Control Center.

---

[7]  Can be downloaded from the Downloads section of the B&R website (www.br-automation.com).

# A.A POWERLINK

## A.A.1 LED "S/E" (status/error LED)

This LED is a green/red dual LED and indicates the state of the POWERLINK interface. The LED states have a different meaning depending on the operating mode of the POWERLINK interface.

### A.A.1.1 Ethernet mode

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

| LED "S/E" | | |
|---|---|---|
| **Green** | **Red** | **Description** |
| On | Off | The interface is operated as an Ethernet interface. |

Table: LED "S/E": Interface in Ethernet mode

### A.A.1.2 POWERLINK V2 mode

**Error message**

| LED "S/E" | | |
|---|---|---|
| **Green** | **Red** | **Description** |
| Off | On | The interface is in error mode (failed Ethernet frames, increased number of collisions on the network, etc.).<br>Note:<br>Several red blinking signals are displayed immediately after the device is switched on. These are not errors, however. |
| Blinking | On | If an error occurs in the following modes, then the green LED blinks over the red LED:<br><br>• PRE_OPERATIONAL_1<br>• PRE_OPERATIONAL_2<br>• READY_TO_OPERATE<br><br> |

Table: LED "S/E" - Error message (interface in POWERLINK mode)

**Interface status**

| LED "S/E" | | |
|---|---|---|
| **Green** | **Red** | **Description** |
| Off | Off | **Mode:** NOT_ACTIVE<br>The interface is either in mode NOT_ACTIVE or one of the following modes or errors is present:<br><br>• The device is switched off.<br>• The device is in the startup phase.<br>• The interface or device is not configured correctly in Automation Studio.<br>• The interface or device is defective.<br><br>**Managing node (MN)**<br>The network is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1.<br>If POWERLINK communication is detected before the time has elapsed, however, the MN is not started.<br><br>**Controlled node (CN)**<br>The network is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode BASIC_ETHERNET. If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1. |
| Flickering (approx. 10 Hz) | Off | **Mode:** BASIC_ETHERNET<br>The interface is in mode BASIC_ETHERNET. The interface is operated in Ethernet mode.<br><br>**Managing node (MN)**<br>This mode can only be exited by resetting the controller.<br><br>**Controlled node (CN)**<br>If POWERLINK communication is detected during this mode, the interface enters mode PRE_OPERATIONAL_1. |

Table: LED "S/E" - Interface state (interface in POWERLINK mode)

| LED "S/E" | | |
| --- | --- | --- |
| **Green** | **Red** | **Description** |
| Single flash (approx. 1 Hz) | Off | **Mode:** PRE_OPERATIONAL_1<br>The interface is in mode PRE_OPERATIONAL_1.<br><br>**Managing node (MN)**<br>The MN is in "reduced cycle" mode. The CNs are configured in this mode.<br>Cyclic communication is not yet taking place.<br><br>**Controlled node (CN)**<br>The CN can be configured by the MN in this mode. The CN waits until it receives an SoC frame and then switches to mode PRE_OPERATIONAL_2. |
| | On | **Controlled node (CN)**<br>If the red LED lights up in this mode, this means that the MN has failed. |
| Double flash (approx. 1 Hz) | Off | **Mode:** PRE_OPERATIONAL_2<br>The interface is in mode PRE_OPERATIONAL_2.<br><br>**Managing node (MN)**<br>The MN starts cyclic communication (cyclic input data is not yet evaluated).<br>The CNs are configured in this mode.<br><br>**Controlled node (CN)**<br>The CN can be configured by the MN in this mode. A command then switches the mode to READY_TO_OPERATE. |
| | On | **Controlled node (CN)**<br>If the red LED lights up in this mode, this means that the MN has failed. |
| Triple flash (approx. 1 Hz) | Off | **Mode:** READY_TO_OPERATE<br>The interface is in mode READY_TO_OPERATE.<br><br>**Managing node (MN)**<br>Cyclic and asynchronous communication. Received PDO data is ignored.<br><br>**Controlled node (CN)**<br>The configuration of the CN is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated. |
| | On | **Controlled node (CN)**<br>If the red LED lights up in this mode, this means that the MN has failed. |
| On | Off | **Mode:** OPERATIONAL<br>The interface is in mode OPERATIONAL. PDO mapping is active and cyclic data is evaluated. |
| Blinking (approx. 2.5 Hz) | Off | **Mode:** STOPPED<br>The interface is in mode STOPPED.<br><br>**Managing node (MN)**<br>This mode does not occur for the MN.<br><br>**Controlled node (CN)**<br>Output data is not being output, and no input data is being provided. This mode can only be reached and exited by a corresponding command from the MN. |

Table: LED "S/E" - Interface state (interface in POWERLINK mode)

## Blink times
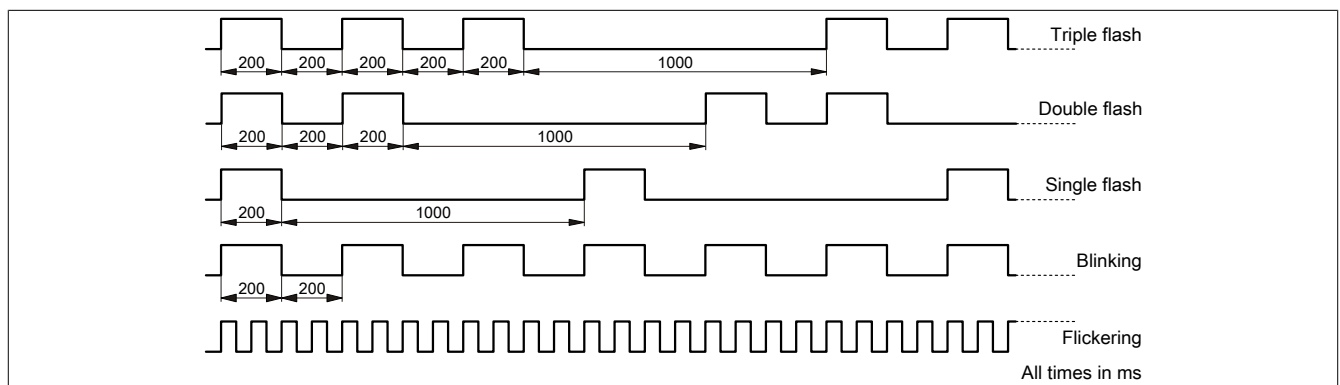
### A.A.1.3 System stop error codes

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

The error code is indicated by LED "S/E" blinking red. The blinking signal of the error code consists of 4 switch-on phases with short (150 ms) or long (600 ms) duration. The error code is repeated every 2 seconds.
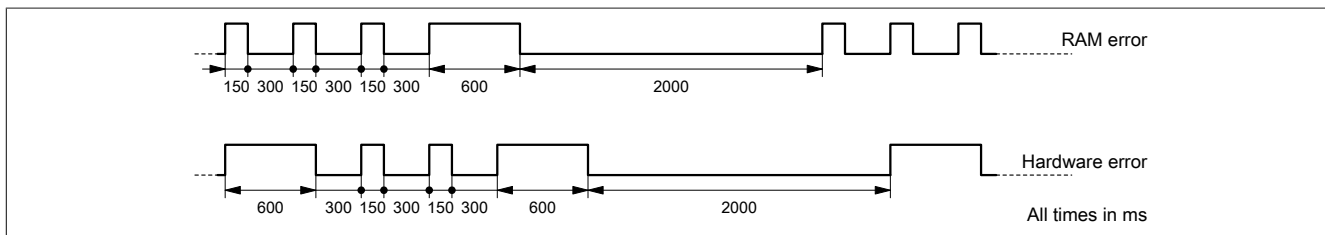


| Error | Error description |
|---|---|
| RAM error | The device is defective and must be replaced. |
| Hardware error | The device or a system component is defective and must be replaced. |

### A.A.1.4 POWERLINK V2

By default, the POWERLINK interface is operated as a managing node (MN). In the managing node, the node number is set to a fixed value of 240.

If the POWERLINK node is operated as a controlled node (CN), a node number from 1 to 239 can be set in the POWERLINK configuration in Automation Studio.

# A.B Cable data

| Signal | | Signal | |
|---|---|---|---|
| RS232 | "RS232 - Bus length and cable type" on page 337 | RS422 | "RS422 - Bus length and cable type" on page 337 |
| RS485 | "RS485 - Bus length and cable type" on page 338 | CAN | "CAN - Bus length and cable type" on page 338 |

## A.B.1 RS232 - Bus length and cable type

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

| Bus length | Transfer rate |
|---|---|
| ≤15 m | Typ. 64 kbit/s |
| ≤10 m | Typ. 115 kbit/s |
| ≤5 m | Typ. 115 kbit/s |

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

| RS232 cables | | Property |
|---|---|---|
| **Signal line** | | |
| | Cable cross section | 4x 0.16 mm² (26 AWG), 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 |

## A.B.2 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.

| Bus length | Transfer rate |
|---|---|
| 1200 m | Typ. 115 kbit/s |

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

| RS422 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 |

## A.B.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.

| Bus length | Transfer rate |
|---|---|
| 1200 m | Typ. 115 kbit/s |

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 |

## A.B.4 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. Per CiA (CAN in Automation), the maximum bus length is 1000 meters.

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

| Bus length[1] | 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 |

1) The specified cable length is only valid with the values specified in "CAN driver settings". Cable lengths otherwise depend on the values in the bit timing register, cable quality and number of nodes.

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 | Twisted-pair wires |
| | 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 |

# A.C Abbreviations

Abbreviations used in the document are explained here.

| Abbreviation | Stands for | Description |
|---|---|---|
| NC | Normally closed | Stands for a normally closed relay contact. |
| | Not connected | Used in pinout descriptions if a terminal or pin is not connected on the module side. |
| ND | Not defined | Stands for an undefined value in technical data tables. This may be because the cable manufacturer has not provided a value for certain technical data. |
| NO | Normally open | Stands for a normally open relay contact. |
| TBD | To be defined | Used in technical data tables if there is currently no value for specific technical data. The value will be supplied later. |
| MTBF | Mean time between failures | The expected value of the operating time between two consecutive failures. |

# A.D Viewing angles

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



6 o'clock direction
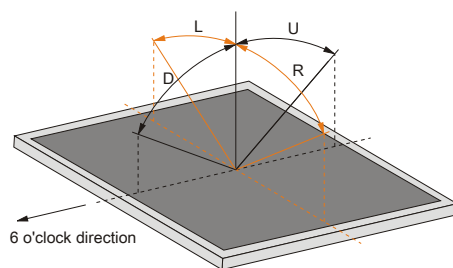
# A.E Chemical resistance

All panels are made of a coated aluminum support frame.

### A.E.1 Autotex panel overlay (polyester)

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

- Acetaldehyde
- Acetone
- Acetonitrile
- Aliphatic hydrocarbons
- Alkali carbonate
- Formic acid <50%
- Ammonia <40%
- Amyl acetate
- Ethanol
- Ether
- Gasoline
- Bichromate
- Potassium
- Cutting oil
- Brake fluid
- Butyl CELLOSOLVE (2-Butoxyethanol)
- Sodium hypochlorite <20%
- Cyclohexanol
- Cyclohexanone
- Decon
- Diacetone alcohol
- Dibutyl phthalate

- Diesel
- Diethyl ether
- Diethyl phthalate
- Dioxan
- Dowandol DRM/PM
- Iron II chloride ($FeCl_2$)
- Iron III chloride ($FeCl_3$)
- Acetic acid <50%
- Butyl acetate
- Ethyl acetate
- Linseed oil
- Aviation fuel
- Formaldehyde 37 to 42%
- Glycerine
- Glycol
- Isophorone
- Isopropanol
- Potassium hydroxide
- Potassium carbonate
- Methanol
- Methylisobutylketone (MIBK)
- Sodium bisulphate

- Sodium carbonate
- Caustic soda <40%
- Paraffin oil
- Phosphoric acid <30%
- Blown castor oil
- Nitric acid <10%
- Hydrochloric acid <36%
- Sea water
- Sulphuric acid <10%
- Silicon oil
- Tenside
- Turpentine oil substitute
- Toluene
- Triacetin
- Trichloracetic acid < 50%
- Trichloroethane
- Thinner (white spirit)
- Washing agents
- Water
- Hydrogen peroxide <25%
- Fabric conditioner
- Xylene

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

## A.E.2 Aluminum panel overlay

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

- Acetaldehyde
- Acetone
- Acetonitrile
- Alkali carbonate
- Alkane
- Formic acid <50%
- Ammonia <40%
- Amyl acetate
- Gasoline
- Bichromate
- Brake fluid
- Castor oil
- Hydrogen chloride <36%
- Cyclohexanol
- Cyclohexanone
- Decon
- Diacetone alcohol
- Diesel
- Diethyl ether
- Diethyl phthalate
- Dimethylbenzene
- Dioxan
- Dowandol

- DRM/PM
- Iron chloride
- Iron II chloride (FeCl2)
- Iron III chloride (FeCl3)
- Acetic acid <50%
- Butyl acetate
- Ethanol
- Ether
- Ethyl acetate
- 2-Butoxyethanol (Butyl CEL-LOSOVLE)
- Aviation fuel
- Formaldehyde 37 to 42%
- Gear oil
- Glycerine
- Glycol
- Isophorone
- Isopropanol
- Potassium
- Potassium carbonate
- Potassium hydroxide
- White spirit
- Linseed oil

- Methanol
- Methylbenzene
- Methyl ethyl ketone
- Methylisobutylketone
- Sodium bisulphate
- Sodium carbonate
- Sodium hydroxide <40%
- Sodium hypochlorite <20%
- Paraffin oil
- Phosphoric acid <30%
- Phthalate
- Nitric acid <10%
- Sea water
- Cutting oil
- Sulphuric acid <10%
- Turpentine oil replacement
- Triacetin
- Trichloracetic acid <50%
- Trichloroethane
- Washing agents
- Water
- Hydrogen peroxide <25%
- Fabric conditioner

The panel overlay is not resistant to the following chemicals:

- Benzyl alcohol
- Dimethyl formamide
- Concentrated mineral acid

- Concentrated caustic solution
- High-pressure steam over 100°C
- Methylene chloride

- Tetrahydrofuran

## A.E.3 Coated aluminum front

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

- Formic acid <50%
- Ammonia <40%
- Brake fluid
- Hydrogen chloride <10%
- Diesel
- Acetic acid <50%

- Gear oil
- Lactic acid <10%
- Isopropanol
- Coolant <4%
- Sodium hydroxide <40%
- Petroleum

- Phosphoric acid <25%
- Saline <10%
- Sulphuric acid <25%
- Sidolin
- Skydrol

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

- Acetone
- Ethyl acetate

## A.E.4 Touch screen

**5-wire touch screen (single-touch)**

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

- Acetone
- Beer
- Unleaded gasoline
- Chemical cleaning agents
- Hydrogen chloride <6%
- Coca-Cola
- Diesel
- Dimethylbenzene
- Vinegar
- Ethanol

- Antifreeze
- Gear oil
- Ammonia-based glass cleaner
- Household detergents
- Hexane
- n-hexane
- Isopropanol
- Coffee
- Methylbenzene
- Methylene chloride

- Methyl ethyl ketone
- Mineral spirits
- Motor oil
- Nitric acid <70%
- Saline solution <5%
- Tea
- Turpentine
- Lubricants
- Sulphuric acid <40%
- Cooking oil

**Touch screen generation 2 and 3 (multi-touch)**

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

- Acetone
- Ammonia <5%
- Gasoline
- Beer
- Lead
- Brake fluid
- Hydrogen chloride <6%
- Coca-Cola
- Dimethylbenzene
- Ethanol

- Rubber cement
- Isopropanol
- Coffee
- Ink
- Lipstick
- Lysol
- Methylbenzene
- Methyl ethyl ketone
- Naphtha
- Nitric acid <70%

- Lubricants
- Sulphuric acid <40%
- Stamping ink
- Tea
- Trichloroethylene
- Water
- White wine vinegar
- Windex Original

# A.F Touch screen

## A.F.1 Touch screen (multi-touch generation 2)

### A.F.1.1 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.F.1.2 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.**

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

### A.F.1.3 Temperature/Humidity diagram
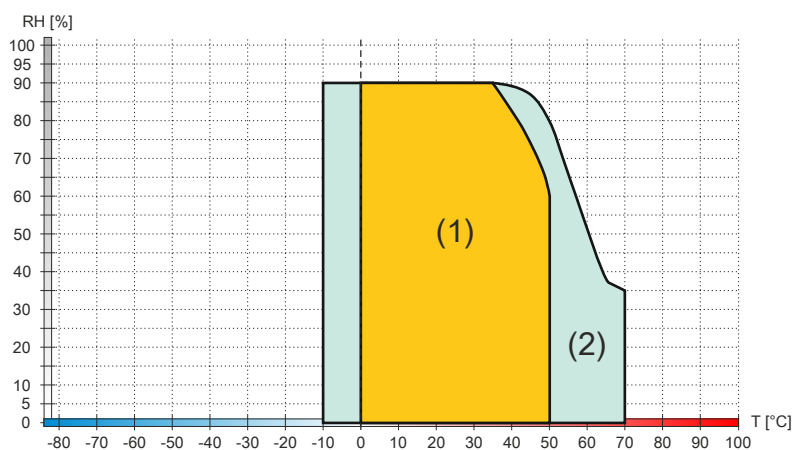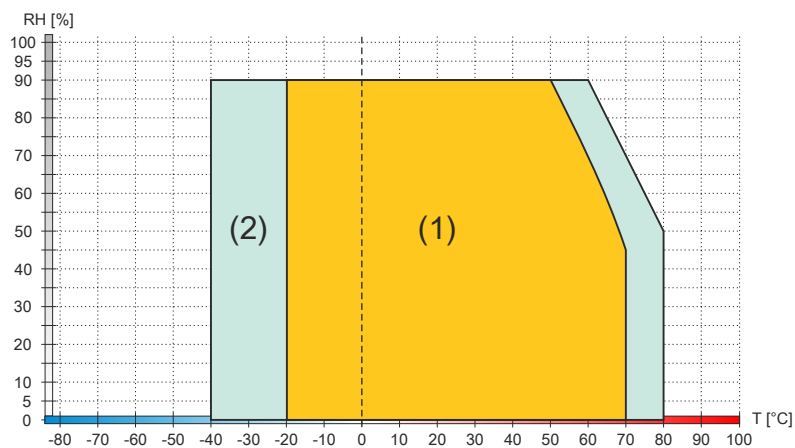


| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

## A.F.2 Touch screen (multi-touch generation 3)

### A.F.2.1 General information

Valid for the following products:

### A.F.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.**

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

### A.F.2.3 Temperature/Humidity diagram
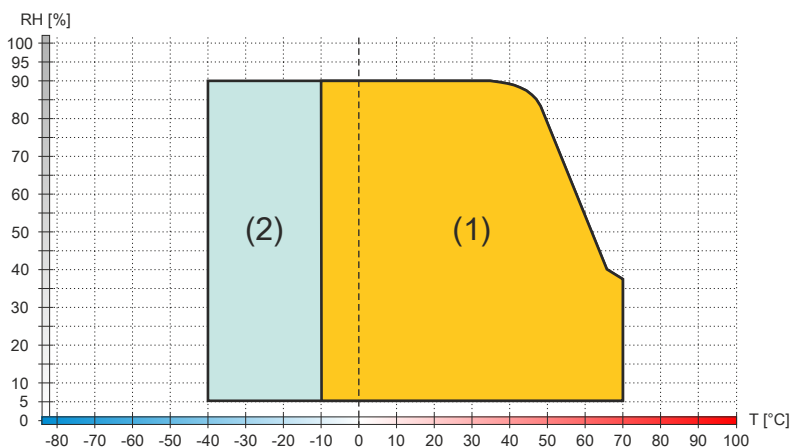
| Diagram legend | | | |
|---|---|---|---|
| (1) | Operation | T [°C] | Temperature in °C |
| (2) | Storage and transport | RH [%] | Relative humidity (RH) in percent and **non-condensing** |

## A.F.3 5-wire touch screen (single-touch)

### A.F.3.1 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.**

**Note:**

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

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

### A.F.3.2 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.G 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 |

### A.G.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 .
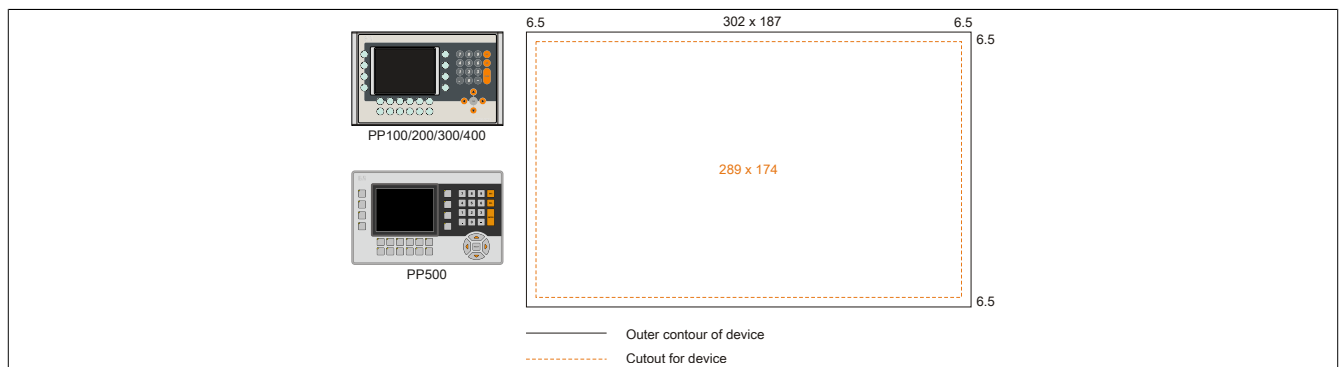
> ## Information:
>
> **The cutout tolerance for the PP100/200, PP300/400, PP500, AP900, PPC700 and PPC800 is ±0.5 mm. The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.**

| Diagonal | Format | | PP100/200 | PP300/400 | PP500 | AP900 | AP1000[1] | PPC700 | PPC800 |
|---|---|---|---|---|---|---|---|---|---|
| **5.7"** | Land-scape1 | Outer dimensions | 212 x 156 | | | - | 212 x 156 | | - |
| | | Installation dimensions | 199 x 143 | | | - | 199 x 143 | | - |
| | Land-scape2 | Outer dimensions | 302 x 187 | | | - | | | |
| | | Installation dimensions | 289 x 174 | | | - | | | |
| | Por-trait1 | Outer dimensions | 212 x 245 | | | - | 212 x 245 | | - |
| | | Installation dimensions | 199 x 226.8 | | 199 x 232 | - | 199 x 232 | | - |
| **7"** | Land-scape1 | Outer dimensions | - | 212 x 156 | | - | 212 x 156 | | - |
| | | Installation dimensions | - | 199 x 143 | | - | 199 x 143 | | - |
| **10.4"** | Land-scape1 | Outer dimensions | 323 x 260 | | | | | | - |
| | | Installation dimensions | 303 x 243 | | | | | | - |
| | Land-scape2 | Outer dimensions | 423 x 288 | | | | | | - |
| | | Installation dimensions | 402 x 266.5 | 403 x 271 | 402 x 271 | 403 x 271 | 402 x 271 | | - |
| | Por-trait1 | Outer dimensions | 323 x 358 | | | | | | - |
| | | Installation dimensions | 303 x 336 | 303 x 341 | | | | | - |
| **12.1"** | Land-scape1 | Outer dimensions | 362 x 284 | | | | | | - |
| | | Installation dimensions | 345 x 267 | 342 x 267 | | | | | - |

| Diagonal | Format | | PP100/200 | PP300/400 | PP500 | AP900 | AP1000¹⁾ | PPC700 | PPC800 |
|---|---|---|---|---|---|---|---|---|---|
| **15"** | Land-scape1 | Outer dimensions | 435 x 330 | | | | | | |
| | | Installation dimensions | 415 x 312 | | 415 x 313 | 415 x 312 | 415 x 313 | 415 x 312 | |
| | Por-trait1 | Outer dimensions | 435 x 430 | | | | - | 435 x 430 | - |
| | | Installation dimensions | 415 x 412 | | 415 x 413 | 415 x 412 | - | 415 x 412 | - |
| **17"** | Land-scape1 | Outer dimensions | - | | | 477 x 390 | - | 477 x 390 | - |
| | | Installation dimensions | - | | | 460 x 373 | - | 460 x 373 | - |
| **19"** | Land-scape1 | Outer dimensions | - | | | 527 x 421 | | | |
| | | Installation dimensions | - | | | 510 x 404 | | | |
| **21.3"** | Land-scape1 | Outer dimensions | - | | | 583 x 464 | - | | |
| | | Installation dimensions | - | | | 566 x 447 | - | | |

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

## A.G.2 Compatibility details

### A.G.2.1 Example

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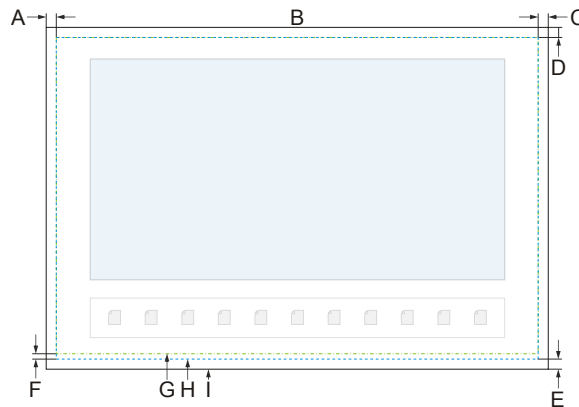


| Diagram legend | | | |
|---|---|---|---|
| A | Spacing (left) to device edge | F | Difference value |
| B | Outer dimensions | G | Installation dimensions/Cutout for PP100/200/300/400 device |
| C | Spacing (right) to device edge | H | Installation dimensions/Cutout AP900/PP500/PPC700 device |
| D | Spacing (top) to device edge | I | Outer contour of device |
| E | Spacing (bottom) to device edge | | |

### A.G.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.

**Installation compatibility - 5.7" devices - Landscape1**
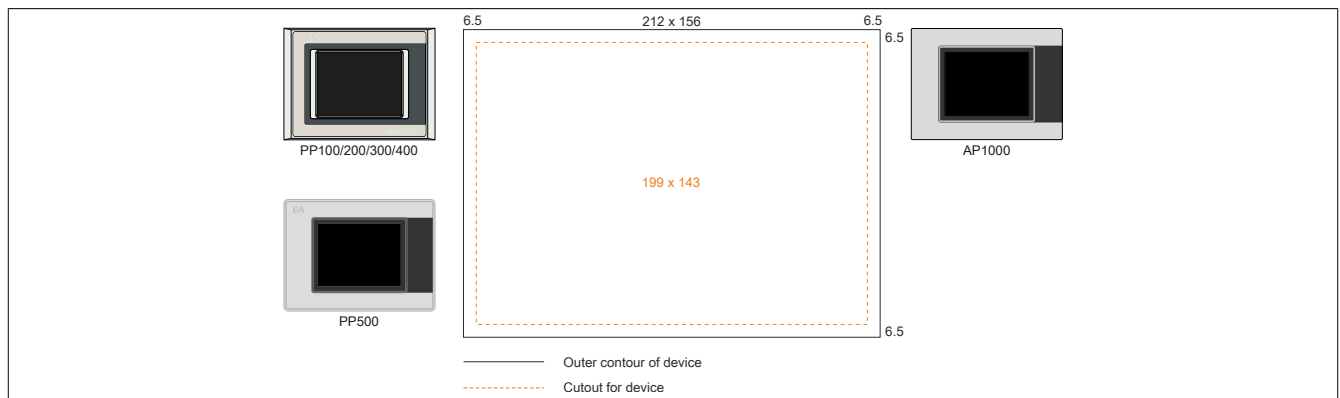


The 5.7" Automation Panel 1000, Power Panel 500, Power Panel 300/400 and Power Panel 100/200 devices in Landscape1 format are 100% compatible.

**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.

**Installation compatibility - 5.7" devices - Portrait1**
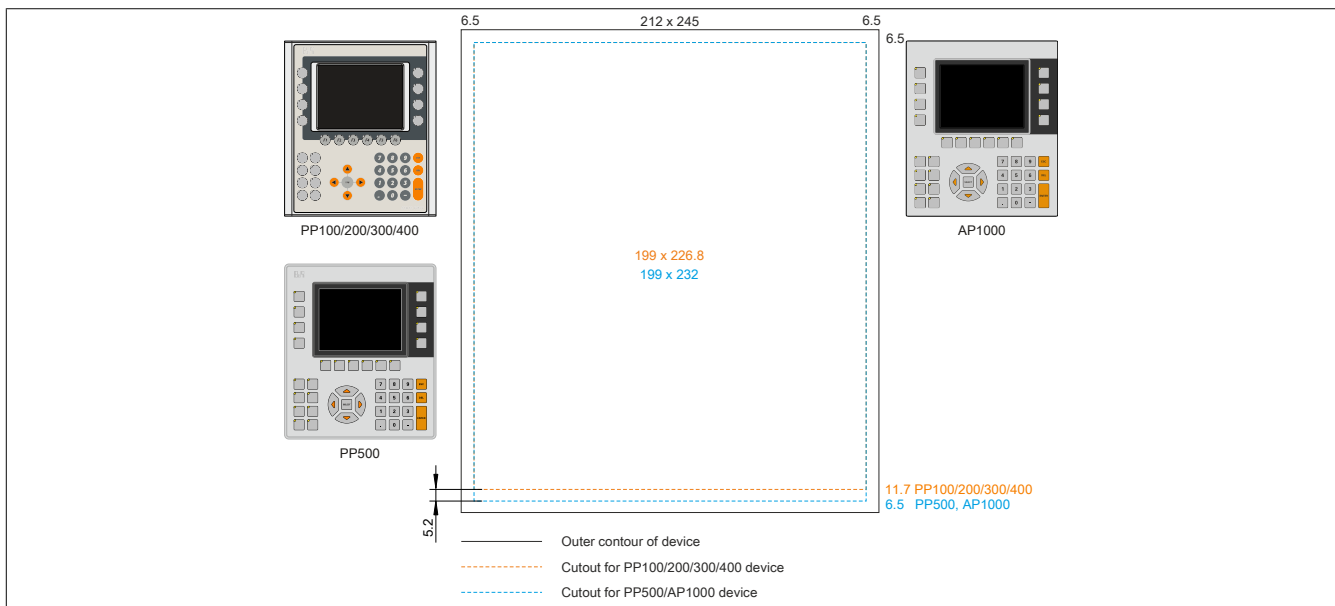


The 5.7" Automation Panel 1000 and Power Panel 500 are not 100% compatible with Power Panel 300/400 and Power Panel 100/200 devices in Portrait1 format. Automation Panel 1000 and Power Panel 500 devices need a cutout that is 5.2 mm larger (bottom edge).

**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).

## A.G.2.3 10.4" devices

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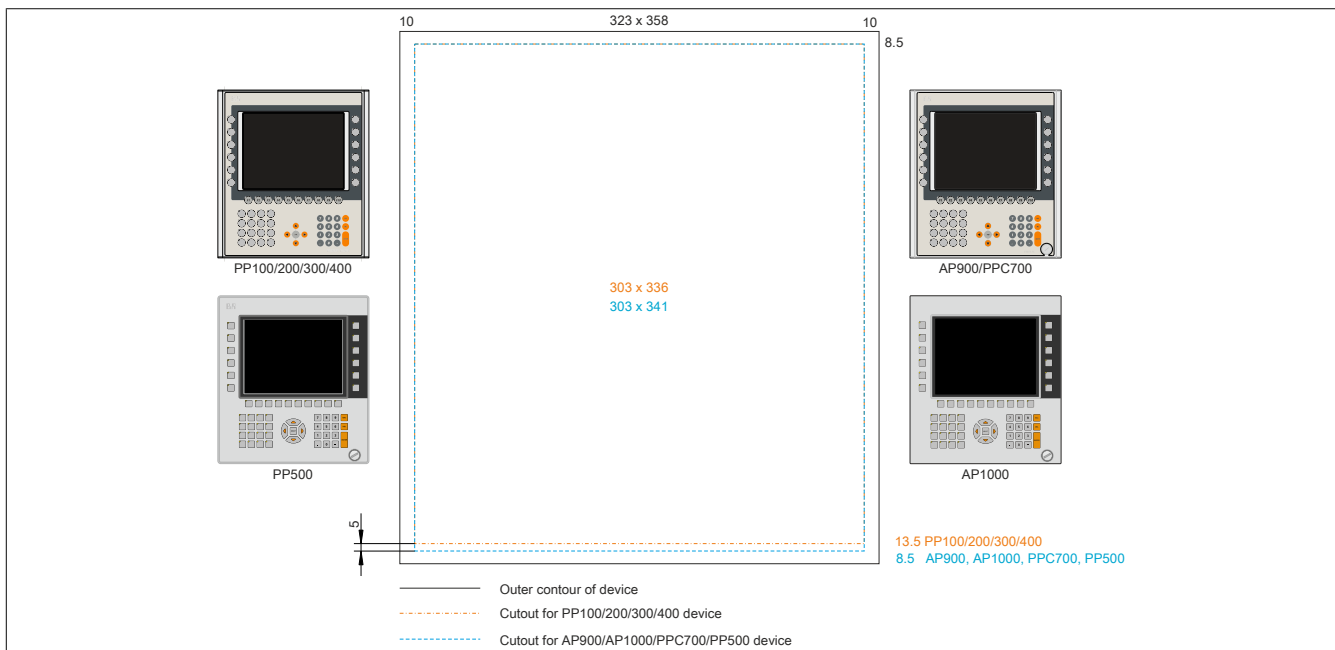The cutout tolerance for the AP1000 is +0 mm / -0.5 mm.

### Installation compatibility - 10.4" devices - Landscape1
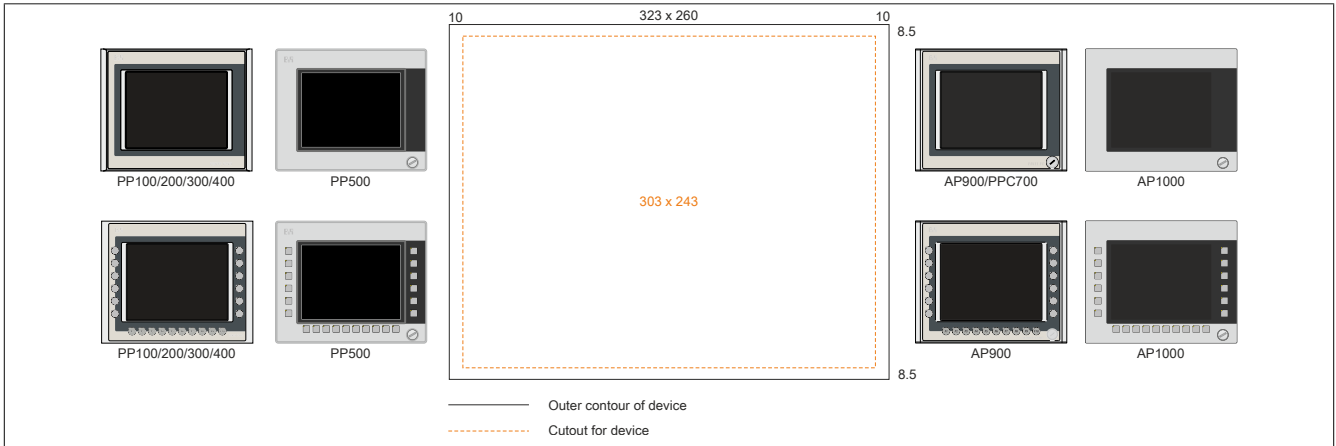


10.4" Automation Panel 1000, Automation Panel 900, Panel PC 700, Power Panel 500, Power Panel 300/400 and Power Panel 100/200 devices in Landscape1 format are 100% compatible.

### Installation compatibility - 10.4" devices - Landscape2
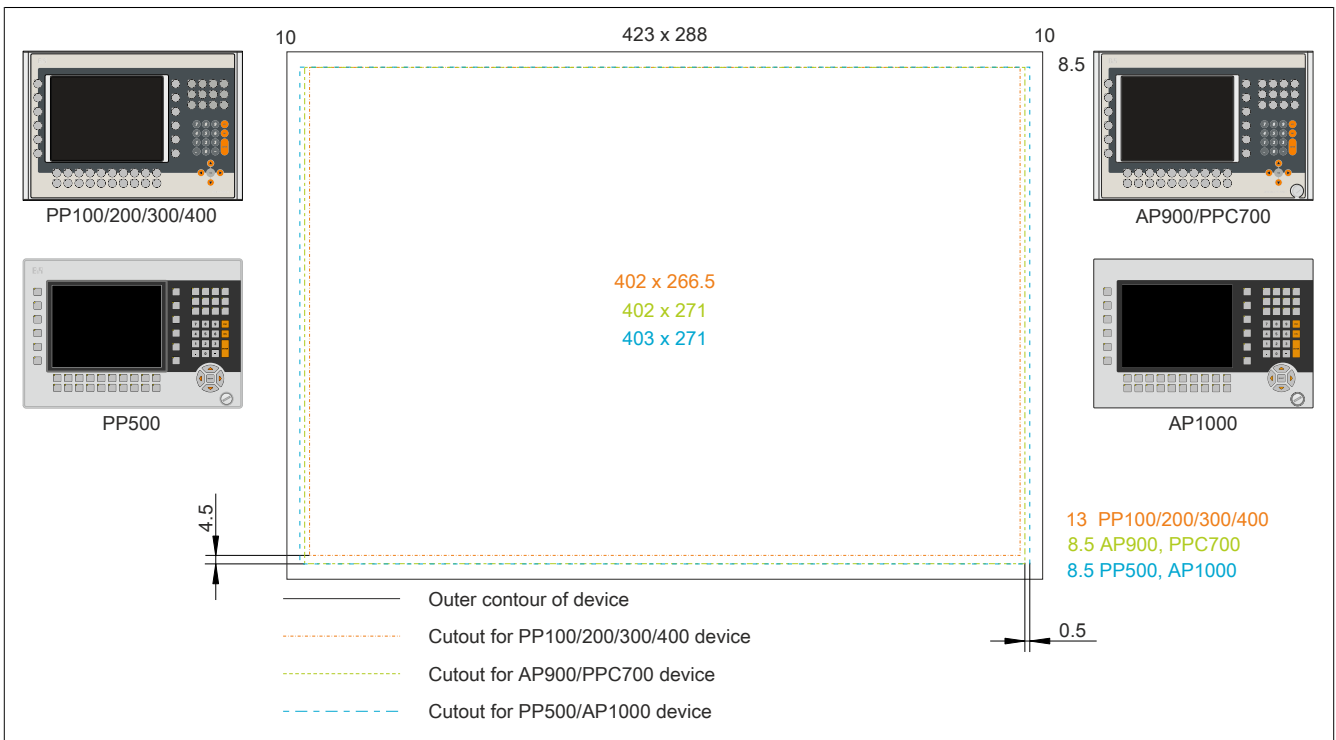


10.4" Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices are not 100% compatible with Power Panel 300/400 or Power Panel 100/200 devices in Landscape2 format. Automation Panel 1000, Automation Panel 900, Panel PC 700 and Power Panel 500 devices need a cutout that is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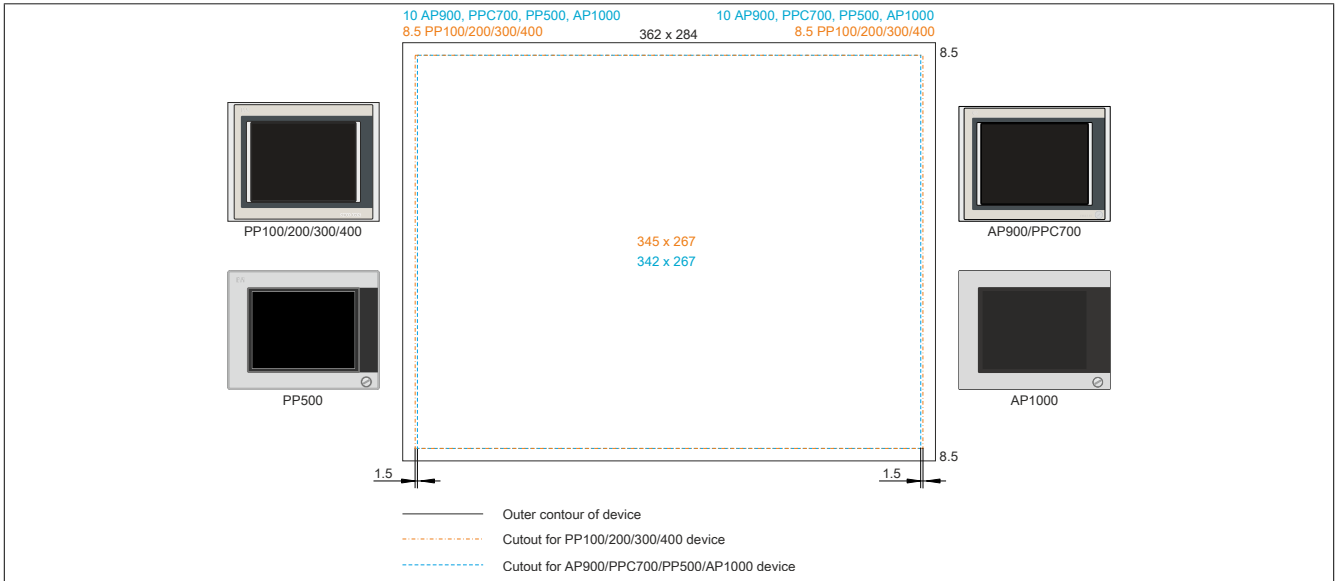
**The larger cutout can be used conditionally for all devices:**

- 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).

**Installation compatibility - 10.4" devices - Portrait1**



Figure 45: 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).
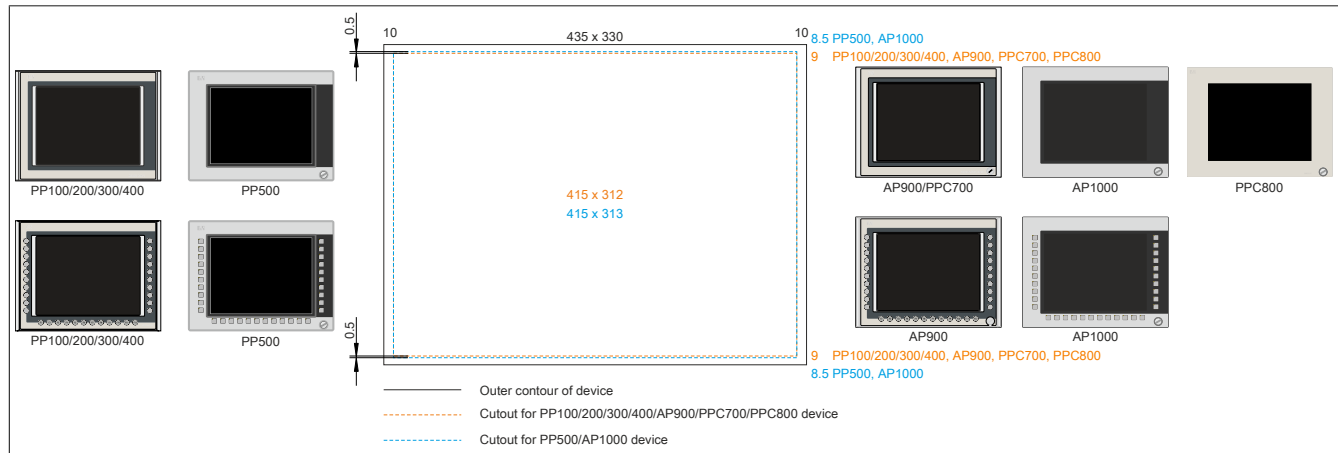
**The larger cutout can be used conditionally for all devices:**

- 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).

**A.G.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.

**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.

## A.G.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.

### Installation compatibility - 15" devices - Landscape1
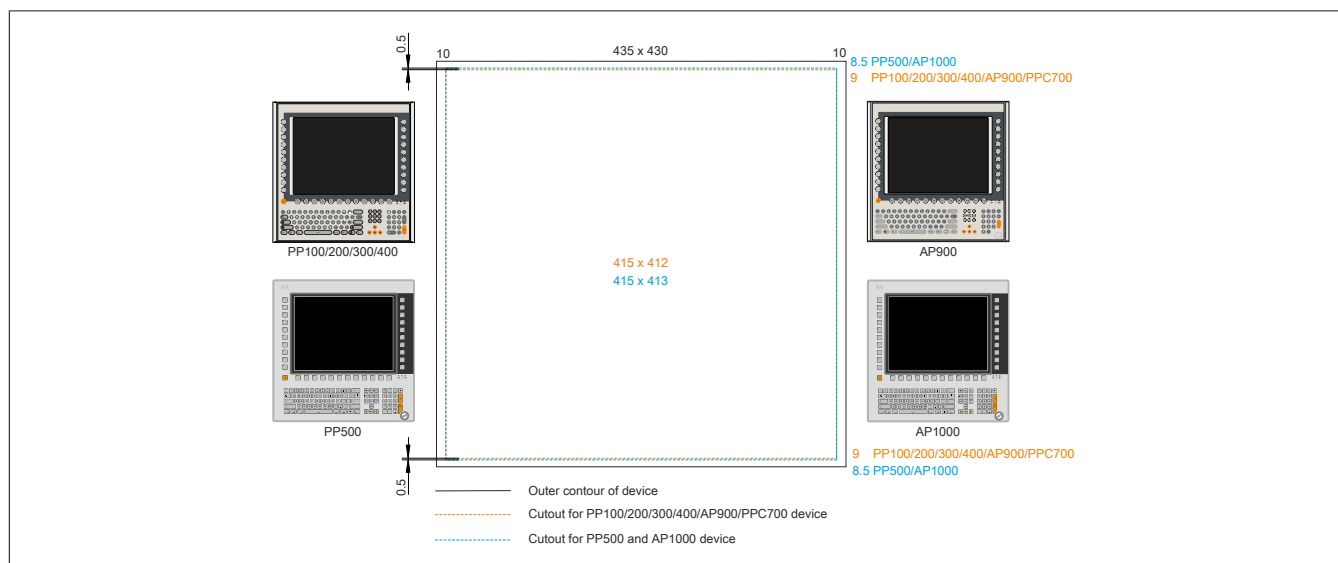


15" Automation Panel 1000 and Power Panel 500 devices are not 100% compatible with Power Panel 100/200, Power Panel 300/400, Automation Panel 900, Panel PC 700 and Panel PC 800 devices in Landscape1 format. Automation Panel 1000 and Power Panel 500 devices need a cutout that is 0.5 mm larger (top and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

### 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).

**A.G.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.

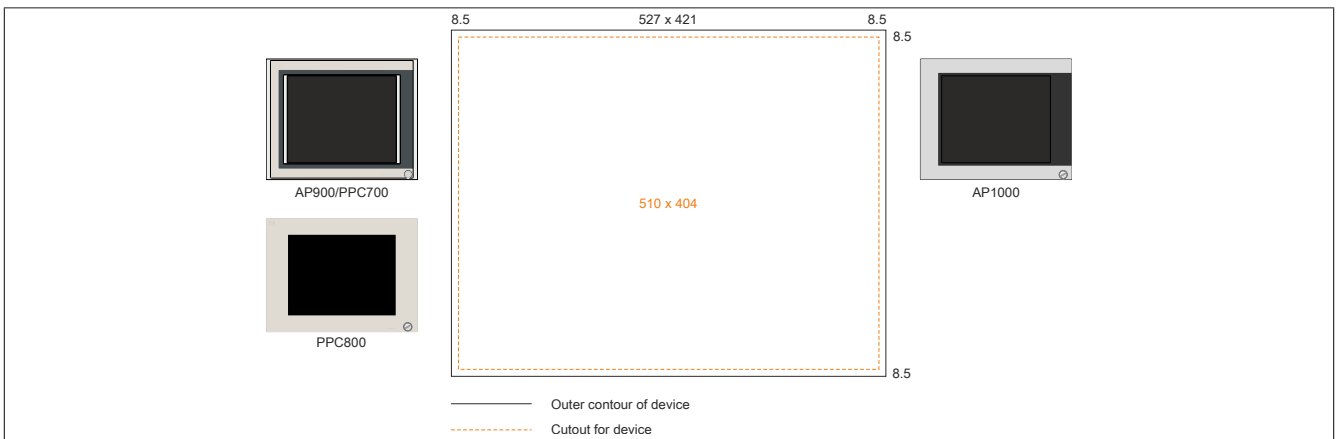**Installation compatibility - 17" devices - Landscape1**
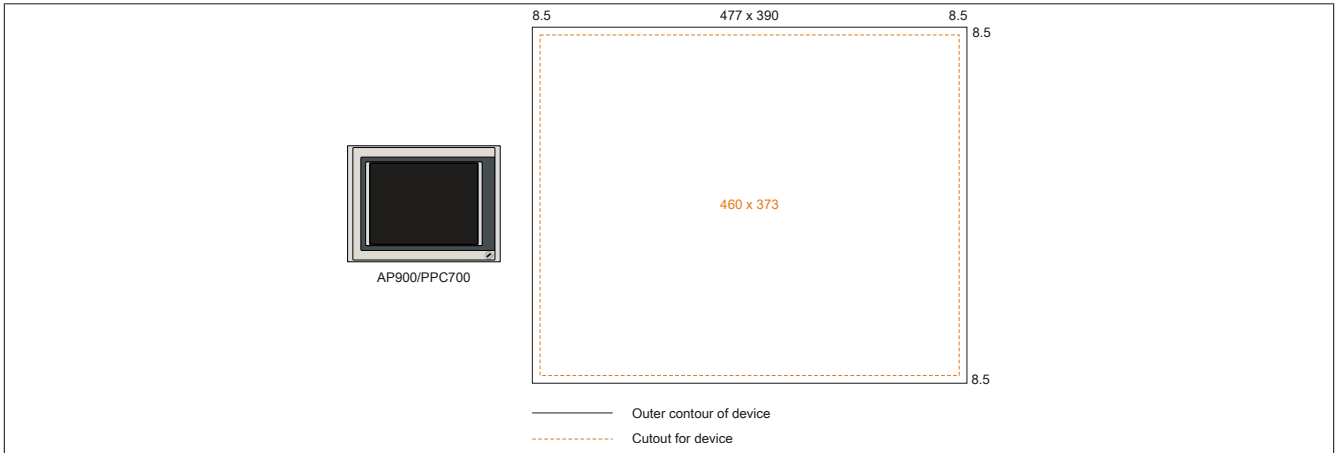


The 17" Automation Panel 900 and Panel PC 700 in Landscape1 format are 100% compatible.

**A.G.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.

**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.

**A.G.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.

**Installation compatibility - 21.3" devices - Landscape1**