

# Automation PC 910

## User's manual

Version: **1.40 (October 2016)**  
Model no.: **MAAPC900-ENG**

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| 3 Glossary.....   | 417        |



# Chapter 1 • General information

## 1 Manual history

| Version          | Date       | Change   |
|------------------|------------|--|
| 0.10 Preliminary | 2012-06-12 | <ul style="list-style-type: none"> <li>First version</li> </ul>  |
| 1.00             | 2012-11-26 | <ul style="list-style-type: none"> <li>Updated chapter 4 "Software" on page 224.</li> <li>Updated chapter 7 "Maintenance and servicing" on page 388.</li> <li>Updated "Appendix A" on page 416.</li> <li>Modified "Organization of safety notices" on page 17. Updated descriptions for cautions and warnings.</li> <li>Revised terminology in German edition.</li> <li>Updated the following sections in chapter "Technical data": "Temperature specifications" on page 28, "Block diagrams" on page 48, "Humidity specifications" on page 36.</li> <li>Updated the following sections in chapter "Installation": "Mounting orientations" on page 204, "Spacing for air circulation" on page 206, "Grounding concept" on page 208.</li> <li>Updated CPU boards 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-05, 5PC900.TS77-06, 5PC900.TS77-07 and 5PC900.TS77-08 in sections "QM77 CPU boards" on page 92 and "HM76 CPU boards" on page 94.</li> <li>Updated the following drives: "5AC901.CSSD-00" on page 116, "5AC901.CSSD-01" on page 118, "5AC901.CSSD-02" on page 120, "5AC901.CCFA-00" on page 148.</li> <li>Updated the following interface options: "5AC901.ICAN-00" on page 161, "5AC901.IHDA-00" on page 164, "5AC901.ISRM-00" on page 166.</li> <li>Updated section "Monitor/Panel options" on page 178.</li> <li>Updated heat sink 5AC901.HS01-00, see "5AC901.HS0x-00" on page 105.</li> <li>Modified section "System components / Configuration" on page 24.</li> <li>Updated bus units 5AC901.BX01-01 and 5AC901.BX02-01, see "Bus units" on page 102.</li> <li>Updated "CFast cards" on page 338.</li> <li>Updated USB media drive, see "5MD900.USB2-02" on page 354.</li> </ul> |
| 1.05             | 2013-03-19 | <ul style="list-style-type: none"> <li>Updated the following sections in chapter 2 "Technical data": "Monitor/Panel option" on page 68, "Slide-in slot 1" on page 72, "Uninterruptible power supply (UPS)" on page 186.</li> <li>Updated the following drives: "5AC901.CHDD-01" on page 111, "5MMHDD.0500-00" on page 113, "5AC901.CHDD-99" on page 149.</li> <li>Updated the service life of the battery, see "Battery" on page 71.</li> <li>Updated sections "BIOS options" on page 224 and "Upgrade information" on page 293 in chapter 4 "Software".</li> <li>Updated sections "Replacing the battery" on page 388, "Installing PCI/PCIe cards" on page 403 and "Connecting an external device to the mainboard" on page 411 in 7 "Maintenance and servicing".</li> <li>Modified tables "Umgebungstemperatur mit Lüfter" on page and "Umgebungstemperatur ohne Lüfter" on page .</li> <li>Updated "Internal supply cable" on page 384.</li> </ul>  |
| 1.10             | 2013-06-12 | <ul style="list-style-type: none"> <li>Updated system unit "5PC910.SX05-00" on page 86.</li> <li>Updated fan kit "5AC901.FA05-00" on page 108.</li> <li>Updated front covers 5AC901.FF01-01, 5AC901.FF02-01, 5AC901.FF05-00 and 5AC901.FF05-01 on page 201.</li> <li>Updated slide-in compact drive "5AC901.CSSD-03" on page 122.</li> <li>Updated replacement SSDs "5MMSSD.0060-00" on page 133, "5MMSSD.0060-01" on page 135 and "5MMSSD.0180-00" on page 141.</li> <li>Updated slide-in drives "5AC901.SDVW-00" on page 150 and "5AC901.SSCA-00" on page 153.</li> <li>Updated bus units 5AC901.BX05-00, 5AC901.BX05-01 and 5AC901.BX05-02 on page 102.</li> <li>Updated PCI RAID system "5ACPCI.RAIC-06" on page 154.</li> <li>Updated the replacement fan kits on page 385.</li> <li>Updated section "Slide-in slot 2" on page 73.</li> <li>Updated chapter 5 "Standards and certifications" on page 330.</li> <li>Updated section "Configuring a SATA RAID set using the internal RAID controller" on page 218.</li> <li>Updated sections "Slide-in 1 features" on page 248 and "Slide-in 2 features" on page 250 in BIOS.</li> <li>Revised section "Installing and connecting the UPS battery unit" on page 406.</li> <li>Revised section "Power management" on page 37.</li> <li>Modified Fig. 156 "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 292.</li> <li>Updated the BIOS version to V1.13, see "BIOS options" on page 224.</li> </ul>   |

Table 1: Manual history

| Version | Date       | Change   |
|---------|------------|--|
| 1.05    | 2013-07-30 | <ul style="list-style-type: none"> <li>Updated section "Fan control" on page 35.</li> <li>Updated UPS cable 5CAUPS.0010-01, see "5CAUPS.xxxx-01" on page 199.</li> <li>Updated B&amp;R USB flash drive 5MMUSB.4096-01, see "USB flash drives" on page 352.</li> <li>Updated slide-in compact drive "5AC901.CSSD-04" on page 125.</li> <li>Updated replacement SSD "5MMSSD.0128-01" on page 138.</li> <li>Updated UPS IF option "5AC901.IUPS-01" on page 189 and UPS battery unit "5AC901.BUPS-01" on page 195.</li> <li>Updated replacement disk tray "5AC901.FRAME-00" on page 360.</li> <li>Updated tightening torque of locating screws in section "Cables" on page 361.</li> <li>Updated 5AC901.BX02-02 and 5AC901.BX05-03 in section "Bus units" on page 102.</li> <li>Updated sections "B&amp;R Automation Device Interface (ADI) Development Kit" on page 322 and "B&amp;R Automation Device Interface (ADI) .NET SDK" on page 324.</li> <li>Updated HM76 CPU boards 5PC900.TS77-09 and 5PC900.TS77-10 in section "5PC900.TS77-0x" on page 94.</li> </ul>   |
| 1.20    | 2014-04-14 | <ul style="list-style-type: none"> <li>Revised sections "IF option 1 slot" on page 67 and "IF option 2 slot" on page 67.</li> <li>Updated following section in "Windows 7": "Installing on the internal RAID controller (QM77)" on page 308.</li> <li>Updated following section in "Windows XP Professional": "Installing on the internal RAID controller (QM77) or in AHCI mode" on page 313.</li> <li>Updated information about the discontinuation of support for the operating system "Windows XP Professional" on page 312.</li> <li>Revised section "Automation Runtime" on page 316.</li> <li>Updated "GL", "cULus HazLoc Class 1 Division 2" and "GOST-R" certification to the technical data for several individual components.</li> <li>Updated sections "GOST-R" on page 331 and "DNV GL certification (Det Norske Veritas Germanischer Lloyd)" on page 332 in chapter 5 "Standards and certifications".</li> <li>Updated the BIOS version to V1.15, see "BIOS options" on page 224.</li> <li>Updated front covers 5AC901.FF01-02, 5AC901.FF02-02 and 5AC901.FF05-02 on page 201.</li> <li>Updated monitor/panel option "5AC901.LSD3-00" on page 183.</li> <li>Updated ready relay IF option "5AC901.IRDY-00" on page 172.</li> <li>Updated slide-in compact drive "5AC901.CSSD-05" on page 128.</li> <li>Updated replacement SSD "5MMSSD.0256-00" on page 143.</li> <li>Corrected technical data for ambient temperature and humidity for the following drives: "5AC901.CSSD-03" on page 122, "5AC901.CSSD-04" on page 125, "5MMSSD.0060-01" on page 135, "5MMSSD.0128-01", "5MMSSD.0256-00" on page 143.</li> <li>Updated "Line filter" on page 386.</li> <li>Updated SDL3 cables "5CASD3.xxxx-00" on page 377.</li> <li>Updated service life diagram for the "5AC901.BUPS-00" and "5AC901.BUPS-01" battery units.</li> </ul> |
| 1.21    | 2014-05-27 | <ul style="list-style-type: none"> <li>Corrected technical data for bus units with PCI Express slots – PCIe standard and bus speed, see "Technical data" on page 104.</li> <li>Corrected Fig. 156 "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 292.</li> <li>Documented new revision of CFast cards, see "CFast cards" on page 338.</li> </ul>  |
| 1.22    | 2014-08-25 | <ul style="list-style-type: none"> <li>Corrected Fig. X "Leistungskalkulation APC 1 Slot" on page , Fig. X "Leistungskalkulation APC 2 Slot" on page and Tab. 17 "5-slot APC variant - Power calculation table" on page 44.</li> <li>Corrected Fig. 5 "Voltage supply for system units" on page 37.</li> </ul>   |
| 1.25    | 2015-02-11 | <ul style="list-style-type: none"> <li>Updated 5AC901.ISIO-00 interface option, see "Interface options" on page 157.</li> <li>Updated "Windows Embedded 8.1 Industry Pro" on page 303.</li> <li>Updated Fig. X "Revision der Einzelkomponenten mit GL-Zulassung" on page and Fig. X "GL-Zertifikat Nr. 61 601 - 13 HH" on page .</li> <li>Updated section "Mounting orientation - Floor-mounted" on page 205.</li> <li>Updated section "Known problems / Issues" on page 223.</li> <li>Updated the BIOS version to V1.19, see "BIOS options" on page 224.</li> <li>Updated section "Automation Runtime" on page 316.</li> <li>Updated 5CFAST.032G-10, 5CFAST.064G-10 and 5CFAST.128G-10 CFast cards, see "CFast cards" on page 338.</li> <li>Updated section "Fan control" on page 35.</li> </ul>  |
| 1.30    | 2015-09-30 | <ul style="list-style-type: none"> <li>Updated terminal block 0TB2104.8000 for ready relay, see "0TB2104.8000" on page 336.</li> <li>Updated SDL cable 5CASDL.0008-00, see "SDL cables" on page 364.</li> <li>Updated "B&amp;R KCF Editor".</li> <li>Updated "HMI Service Center" on page 329 (5SWUTI.0001-000).</li> <li>Documented new revision of bus unit 5AC901.BX02-02, see "Bus units" on page 102.</li> <li>Updated figure "Grounding concept" on page 208.</li> <li>Revised section "SDL3 - LED status indicators" on page 185.</li> <li>Updated section "B&amp;R Automation Device Interface (ADI) - Control Center" on page 320.</li> <li>Updated "Humidity specifications" on page 36.</li> <li>Updated MTCX controller, see "Maintenance Controller Extended (MTCX)" on page 416.</li> <li>Updated section "DNV GL certification (Det Norske Veritas Germanischer Lloyd)" on page 332.</li> <li>Updated Debian 8 section, see "Debian (GNU/Linux)" on page 318.</li> <li>Updated POWERLINK IF option "5AC901.IPLK-00" on page 168.</li> <li>Revised overview of "Windows Embedded 8.1 Industry Pro", "Windows 7" and "Windows Embedded Standard 7".</li> </ul>  |

Table 1: Manual history

| Version | Date       | Change  |
|---------|------------|---|
| 1.31    | 2015-11-12 | <ul style="list-style-type: none"> <li>Updated slide-in compact drive "5AC901.CSSD-06" on page 131.</li> <li>Updated replacement SSD "5MMSSD.0512-00" on page 146.</li> <li>Updated OTG1000.02 Technology Guard (HID), see "Automation Runtime" on page 316.</li> <li>Updated slide-in compact drive "5AC901.CHDD-99" on page 149.</li> </ul>   |
| 1.32    | 2016-01-28 | <ul style="list-style-type: none"> <li>Updated the BIOS version to V1.23, see "BIOS options" on page 224.</li> <li>Correct PCI slot assignment n "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 292.</li> </ul>  |
| 1.35    | 2016-04-14 | <ul style="list-style-type: none"> <li>Renamed SO-DIMM 1 and SO-DIMM 2 to CPU board sensor 3 and CPU board sensor 4, see "Temperature sensor locations" on page 34.</li> <li>Updated "Humidity specifications" on page 36.</li> <li>Updated drives "5AC901.CHDD-01" on page 111 and "5MMHDD.0500-00" on page 113.</li> <li>Documented new revisions of drives "5AC901.CSSD-03", "5AC901.CSSD-04", "5AC901.CSSD-05", "5MMSSD.0060-01", "5MMSSD.0128-01" and "5MMSSD.0256-00".</li> <li>Updated "Windows 10 IoT Enterprise 2015 LTSB" on page 300.</li> <li>Updated section "General instructions for performing temperature testing" on page 209 in chapter 3 "Installation".</li> <li>Updated PCI RAID controller "5ACPCI.RAIC-06" on page 154.</li> <li>Updated SDL3 cable 5CASD3.0030-00, see "SDL3 cables" on page 377.</li> <li>Updated section "Power supply +24 VDC" on page 60.</li> </ul> |
| 1.36    | 2016-08-02 | <ul style="list-style-type: none"> <li>Updated "Device interfaces - Overview" on page 58.</li> <li>Documented new covers 5AC901.FF01-03, 5AC901.FF02-03 and 5AC901.FF05-03 on page 201.</li> <li>Updated Ethernet interface option "5AC901.IETH-00" on page 176.</li> <li>Updated PCIe plug-in card "5ACPCE.ETH1-00" on page 347.</li> <li>Updated chapter 5 "Standards and certifications" as well as "EAC" on page 331, "KC" on page 331 and "RCM" on page 332.</li> <li>Updated section 3.13 "Uninterruptible power supply (UPS)".</li> <li>Corrected I/O address and IRQ of IF option 1 (COM E) and IF option 2 (COM F) on page 158.</li> </ul>   |
| 1.40    | 2016-10-05 | <ul style="list-style-type: none"> <li>Updated PCIe plug-in card "5ACPCE.ETH4-00" on page 350.</li> <li>Documented new CPU boards 5PC900.TS17-00, 5PC900.TS17-01 and 5PC900.TS17-02 on page 96.</li> <li>Updated main memory "5MMDDR.xxxx-04" on page 101.</li> <li>Updated data in sections "Temperature specifications", "Power management" and "Block diagrams" as well as operating systems 300.</li> <li>Updated section "CFast cards" on page 338.</li> </ul>   |

Table 1: Manual history

## 2 [Safety](#) guidelines

### 2.1 Intended use

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

### 2.2 Protection against electrostatic discharge

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

#### 2.2.1 Packaging

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

#### 2.2.2 Guidelines for proper [ESD](#) handling

##### Electrical components with a housing

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

##### Electrical components without a housing

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

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

##### Individual components

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

### 2.3 Policies and procedures

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

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

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

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

## 2.4 Transport and storage

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

## 2.5 Installation

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

## 2.6 Operation

### 2.6.1 Protection against touching electrical parts

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

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

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

### 2.6.2 Environmental conditions - Dust, moisture, corrosive gases

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

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

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

### 2.6.3 Viruses and dangerous programs

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

## 2.7 Environmentally friendly disposal

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

### 2.7.1 Separation of materials

It is necessary to separate different materials so the [device can](#) undergo an environmentally friendly recycling process.

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

Disposal must comply with applicable legal regulations.

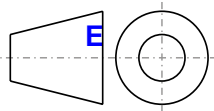
### 3 Organization of safety notices

Safety notices in this manual are organized as follows:

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

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

### 4 Guidelines



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

All dimensions are specified in mm.

Unless otherwise specified, the following general tolerances apply:

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

Table 3: Range of nominal sizes



## 5 Overview

| Model number        | Short description   | Page |
|---------------------|---|------|
| <b>Accessories</b>  |   |      |
| 0TB103.9            | Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm <sup>2</sup>   | 334  |
| 0TB103.91           | Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm <sup>2</sup>  | 334  |
| 5AC804.MFLT-00      | Line filter   | 386  |
| 5AC901.FI01-00      | APC910 air filter - For 1-slot APC910 - 1 pieces  | 385  |
| 5AC901.FI02-00      | APC910 air filter - For 2-slot APC910 - 1 pieces  | 385  |
| 5AC901.FI05-00      | APC910 air filter - For 5-slot APC910 - 1 pieces  | 385  |
| 5AC901.FRAME-00     | APC910 slide-in compact tray  | 360  |
| 5ACPCE.ETH1-00      | PCIe carte - 1x ETH 10/100/1000 - For APC910/PPC900   | 347  |
| 5ACPCE.ETH4-00      | PCIe card - 4-port ETH 10/100/1000 - For APC910/PPC900  | 350  |
| 5CAMSC.0001-00      | Internal supply cable   | 384  |
| 5SWUTI.0001-000     | HMI Service Center USB Flash Drive - Hardware diagnostics software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC51x/PP500 - For Automation Panel 800/900  | 329  |
| <b>Batteries</b>    |   |      |
| 0AC201.91           | Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect cells against short circuits. For emergency information, call RENATA SA at + 41 61 319 28 27 | 337  |
| 4A0006.00-000       | Lithium battery, 3 V / 950 mAh, button cell   | 337  |
| <b>Buseinheiten</b> |   |      |
| 5AC901.BX01-00      | APC910 1-slot bus - 1 PCI   | 103  |
| 5AC901.BX01-01      | APC910 1-slot bus - 1 PCI Express x8  | 103  |
| 5AC901.BX02-00      | APC910 2-slot bus - 2 PCI   | 103  |
| 5AC901.BX02-01      | APC910 2-slot bus - 1 PCI - 1 PCI Express x8  | 103  |
| 5AC901.BX02-02      | APC910 2-slot bus - 2 PCI Express x4  | 103  |
| 5AC901.BX05-00      | APC910 5-slot bus - 5 PCI   | 103  |
| 5AC901.BX05-01      | APC910 5-slot bus - 4 PCI - 1 PCI Express x8  | 103  |
| 5AC901.BX05-02      | APC910 5-slot bus - 2 PCI - 1 PCI Express x8 - 2 PCI Express x1   | 103  |
| 5AC901.BX05-03      | APC910 5-slot bus - 2 PCI Express x4 - 3 PCI Express x1   | 103  |
| <b>CFast cards</b>  |   |      |
| 5CFAST.016G-00      | CFast card, 16 GB SLC   | 340  |
| 5CFAST.032G-00      | CFast card, 32 GB SLC   | 340  |
| 5CFAST.032G-10      | CFast card, 32 GB MLC   | 344  |
| 5CFAST.064G-10      | CFast card, 64 GB MLC   | 344  |
| 5CFAST.128G-10      | CFast card, 128 GB MLC  | 344  |
| 5CFAST.2048-00      | CFast card, 2 GB SLC  | 340  |
| 5CFAST.4096-00      | CFast card, 4 GB SLC  | 340  |
| 5CFAST.8192-00      | CFast card, 8 GB SLC  | 340  |
| <b>CPU boards</b>   |   |      |
| 5PC900.TS17-00      | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - Chipset QM170 - For APC910   | 96   |
| 5PC900.TS17-01      | CPU board Intel Core i3 6100E 2.7 GHz - Dual core - Chipset HM170 - For APC910  | 98   |
| 5PC900.TS17-02      | CPU board Intel Celeron G3900E 2.4 GHz - Dual core - Chipset HM170 - For APC910   | 98   |
| 5PC900.TS77-00      | CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910  | 92   |
| 5PC900.TS77-01      | CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910  | 92   |
| 5PC900.TS77-02      | CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910  | 92   |
| 5PC900.TS77-03      | CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910  | 92   |
| 5PC900.TS77-04      | CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910  | 92   |
| 5PC900.TS77-05      | CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910  | 92   |
| 5PC900.TS77-06      | CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910  | 92   |
| 5PC900.TS77-07      | CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910  | 94   |
| 5PC900.TS77-08      | CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910  | 94   |
| 5PC900.TS77-09      | CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910   | 94   |
| 5PC900.TS77-10      | CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910  | 94   |
| <b>DVI cables</b>   |   |      |
| 5CADVI.0018-00      | DVI-D cable - 1.8 m   | 361  |
| 5CADVI.0050-00      | DVI-D cable - 5 m   | 361  |
| 5CADVI.0100-00      | DVI-D cable - 10 m  | 361  |
| <b>Debian 8</b>     |   |      |
| 5SWLIN.0540-MUL     | Debian 8 - 32-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device  | 318  |
| 5SWLIN.0640-MUL     | Debian 8 - 64-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device  | 318  |
| 5SWLIN.0649-MUL     | Debian 8 - 64-bit - Multilingual - APC910 chipset QM170/HM170 - Installation (without Recovery DVD) - Only available with a new device  | 318  |
| <b>Drives</b>       |   |      |
| 5AC901.CCFA-00      | CFast adapter - For slide-in compact slot   | 148  |
| 5AC901.CHDD-00      | 250 GB hard disk - Slide-in compact - SATA  | 109  |
| 5AC901.CHDD-01      | 500 GB hard disk - Slide-in compact - SATA  | 111  |
| 5AC901.CHDD-99      | Slide-in compact kit  | 149  |
| 5AC901.CSSD-00      | 32 GB SSD SLC - Slide-in compact - SATA   | 116  |
| 5AC901.CSSD-01      | 60 GB SSD MLC - Slide-in compact - SATA   | 118  |
| 5AC901.CSSD-02      | 180 GB SSD MLC - Slide-in compact - SATA  | 120  |
| 5AC901.CSSD-03      | 60 GB SSD MLC - Slide-in compact - SATA   | 122  |
| 5AC901.CSSD-04      | 128 GB SSD MLC - Slide-in compact - SATA  | 125  |



| Model number                    | Short description   | Page |
|---------------------------------|---|------|
| 5AC901.CSSD-05                  | 256 GB SSD MLC - Slide-in compact - Toshiba - SATA                                  | 128  |
| 5AC901.CSSD-06                  | 512 GB SSD MLC - Slide-in compact - Toshiba - SATA                                  | 131  |
| 5AC901.SDVW-00                  | DVD drive - DVD-R/RW/DVD+R/RW - Slide-in  | 150  |
| 5AC901.SSCA-00                  | Slide-in compact adapter - For slide-in compact drives                              | 153  |
| 5ACPCI.RAIC-06                  | PCI RAID System 2x 500 GB - SATA  | 154  |
| 5MMHDD.0500-00                  | 500 GB hard disk - SATA   | 113  |
| 5MMSSD.0060-00                  | 60 GB SSD MLC - Intel - SATA  | 133  |
| 5MMSSD.0060-01                  | 60 GB SSD MLC - Intel - SATA  | 135  |
| 5MMSSD.0128-01                  | 128 GB SSD MLC - Toshiba - SATA   | 138  |
| 5MMSSD.0180-00                  | 180 GB SSD MLC - Intel - SATA   | 141  |
| 5MMSSD.0256-00                  | 256 GB SSD MLC - Toshiba - SATA   | 143  |
| 5MMSSD.0512-00                  | 512 GB SSD MLC - Toshiba - SATA   | 146  |
| <b>Fan kit</b>                  |   |      |
| 5AC901.FA01-00                  | APC910 fan kit - For 5PC910.SX01-00   | 106  |
| 5AC901.FA02-00                  | APC910 fan kit - For 5PC910.SX02-00   | 107  |
| 5AC901.FA05-00                  | APC910 fan kit - For 5PC910.SX05-00 system unit                                     | 108  |
| <b>Front cover</b>              |   |      |
| 5AC901.FF01-00                  | Front cover for 1-slot APC910 - Orange  | 201  |
| 5AC901.FF01-01                  | Front cover for 1-slot APC910 - Dark gray   | 201  |
| 5AC901.FF01-02                  | Front cover for 1-slot APC910 - Dark gray - Without logo                            | 201  |
| 5AC901.FF01-03                  | Front cover for 1-slot APC910 - Orange - Without logo                               | 201  |
| 5AC901.FF02-00                  | Front cover for 2-slot APC910 - Orange  | 201  |
| 5AC901.FF02-01                  | Front cover for 2-slot APC910 - Dark gray   | 201  |
| 5AC901.FF02-02                  | Front cover for 2-slot APC910 - Dark gray - Without logo                            | 201  |
| 5AC901.FF02-03                  | Front cover for 2-slot APC910 - Orange - Without logo                               | 201  |
| 5AC901.FF05-00                  | Front cover for 5-slot APC910 - Orange  | 201  |
| 5AC901.FF05-01                  | Front cover for 5-slot APC910 - Dark gray   | 201  |
| 5AC901.FF05-02                  | Front cover for 5-slot APC910 - Dark gray - Without logo                            | 201  |
| 5AC901.FF05-03                  | Front cover for 5-slot APC910 - Orange - Without logo                               | 201  |
| <b>Heat sink</b>                |   |      |
| 5AC901.HS00-00                  | APC910 heat sink, active  | 105  |
| 5AC901.HS00-01                  | APC910 active heat sink QM170/HM170   | 105  |
| 5AC901.HS01-00                  | APC910 heat sink, passive   | 105  |
| 5AC901.HS01-01                  | APC910 passive heat sink QM170/HM170  | 105  |
| <b>Interface options</b>        |   |      |
| 5AC901.I485-00                  | Interface card - 1x RS232/422/485 interface - For APC910/PPC900                     | 157  |
| 5AC901.ICAN-00                  | Interface card - 1x CAN interface - For APC910/PPC900                               | 161  |
| 5AC901.IETH-00                  | Interface card - 1x ETH 10/100/1000 - For APC910/PPC900                             | 176  |
| 5AC901.IHDA-00                  | Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900  | 164  |
| 5AC901.IPLK-00                  | Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900             | 168  |
| 5AC901.IRDY-00                  | Interface card - Ready relay - For APC910/PPC900                                    | 172  |
| 5AC901.ISIO-00                  | Interface card - System I/O - For APC910/PPC900                                     | 174  |
| 5AC901.ISRM-00                  | Interface cards - 2 MB SRAM - For APC910/PPC900                                     | 166  |
| <b>Main memory</b>              |   |      |
| 5MMDDR.016G-04                  | SO-DIMM DDR4, 16384 MB  | 101  |
| 5MMDDR.1024-03                  | SO-DIMM DDR3, 1024 MB   | 100  |
| 5MMDDR.2048-03                  | SO-DIMM DDR3, 2048 MB   | 100  |
| 5MMDDR.4096-03                  | SO-DIMM DDR3, 4096 MB   | 100  |
| 5MMDDR.4096-04                  | SO-DIMM DDR4, 4096 MB   | 101  |
| 5MMDDR.8192-03                  | SO-DIMM DDR3, 8192 MB   | 100  |
| 5MMDDR.8192-04                  | SO-DIMM DDR4, 8192 MB   | 101  |
| <b>Monitor/Panel options</b>    |   |      |
| 5AC901.LDPO-00                  | DisplayPort transmitter   | 178  |
| 5AC901.LSD3-00                  | SDL3 transmitter  | 183  |
| 5AC901.LSDL-00                  | SDL/DVI transmitter   | 180  |
| <b>RS232 cables</b>             |   |      |
| 9A0014.02                       | RS232 extension cable for remote operation of display unit with touch screen, 1.8 m | 382  |
| 9A0014.05                       | RS232 extension cable for remote operation of display unit with touch screen, 5 m   | 382  |
| 9A0014.10                       | RS232 extension cable for remote operation of display unit with touch screen, 10 m  | 382  |
| <b>SDL cable 45° connectors</b> |   |      |
| 5CASDL.0018-01                  | SDL cable - 45 degree connector - 1.8 m   | 367  |
| 5CASDL.0050-01                  | SDL cable - 45 degree connector - 5 m   | 367  |
| 5CASDL.0100-01                  | SDL cable - 45 degree connector - 10 m  | 367  |
| 5CASDL.0150-01                  | SDL cable - 45 degree connector - 15 m  | 367  |
| <b>SDL cables</b>               |   |      |
| 5CASDL.0008-00                  | SDL cable - 0.8 m   | 364  |
| 5CASDL.0018-00                  | SDL cable - 1.8 m   | 364  |
| 5CASDL.0050-00                  | SDL cable - 5 m   | 364  |
| 5CASDL.0100-00                  | SDL cable - 10 m  | 364  |
| 5CASDL.0150-00                  | SDL cable - 15 m  | 364  |
| 5CASDL.0200-00                  | SDL cable - 20 m  | 364  |
| 5CASDL.0250-00                  | SDL cable - 25 m  | 364  |
| 5CASDL.0300-00                  | SDL cable - 30 m  | 364  |

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|---|--|------|
| <b>SDL flex cables</b>                            |  |      |
| 5CASDL.0018-03                                    | SDL flex cable - 1.8 m   | 370  |
| 5CASDL.0050-03                                    | SDL flex cable - 5 m   | 370  |
| 5CASDL.0100-03                                    | SDL flex cable - 10 m  | 370  |
| 5CASDL.0150-03                                    | SDL flex cable - 15 m  | 370  |
| 5CASDL.0200-03                                    | SDL flex cable - 20 m  | 370  |
| 5CASDL.0250-03                                    | SDL flex cable - 25 m  | 370  |
| 5CASDL.0300-03                                    | SDL flex cable - 30 m  | 370  |
| 5CASDL.0300-13                                    | SDL flex cable with extender - 30 m  | 373  |
| 5CASDL.0400-13                                    | SDL flex cable with extender - 40 m  | 373  |
| 5CASDL.0430-13                                    | SDL flex cable with extender - 43 m  | 373  |
| <b>SDL3 cables</b>                                |  |      |
| 5CASD3.0030-00                                    | SDL3 cable - 3 m   | 377  |
| 5CASD3.0050-00                                    | SDL3 cable - 5 m   | 377  |
| 5CASD3.0100-00                                    | SDL3 cable - 10 m  | 377  |
| 5CASD3.0150-00                                    | SDL3 cable - 15 m  | 377  |
| 5CASD3.0200-00                                    | SDL3 cable - 20 m  | 377  |
| 5CASD3.0300-00                                    | SDL3 cable - 30 m  | 377  |
| 5CASD3.0500-00                                    | SDL3 cable - 50 m  | 377  |
| 5CASD3.1000-00                                    | SDL3 cable - 100 m   | 377  |
| <b>System units</b>                               |  |      |
| 5PC910.SX01-00                                    | 1-slot APC910 system unit  | 74   |
| 5PC910.SX02-00                                    | 2-slot APC910 system unit  | 80   |
| 5PC910.SX05-00                                    | 5-slot APC910 system unit  | 86   |
| <b>Technology Guard</b>                           |  |      |
| 0TG1000.01  | Technology Guard (MSD) is provided in USB device class MSD (mass storage device)   | 316  |
| 0TG1000.02  | Technology Guard (HID) is provided in USB device class HID (human interface device). Automation Runtime supports HIDs in version D4.09 and later.            | 316  |
| 1TG4600.10-5                                      | Automation Runtime Windows, TG license   | 316  |
| 1TG4601.06-5                                      | Automation Runtime Embedded, TG license  | 316  |
| <b>Terminal blocks</b>                            |  |      |
| 0TB2104.8000                                      | Connector 24 VDC - 4-pin female - Screw clamps 2.5 mm <sup>2</sup>   | 336  |
| <b>USB accessories</b>                            |  |      |
| 5A5003.03   | Front cover for drives - 5A5003.02 - 5MD900.USB2   | 358  |
| 5MD900.USB2-02                                    | USB 2.0 drive combination - DVD-R/RW, DVD+R/RW - CompactFlash slot   | 354  |
| 5MMUSB.2048-01                                    | USB 2.0 flash drive 2048 MB B&R  | 352  |
| 5MMUSB.4096-01                                    | USB 2.0 flash drive 4096 MB B&R  | 352  |
| <b>USB cables</b>                                 |  |      |
| 5CAUSB.0018-00                                    | USB 2.0 connection cable - Type A - Type B connector - 1.8 m   | 380  |
| 5CAUSB.0050-00                                    | USB 2.0 connection cable - Type A - Type B connector - 5 m   | 380  |
| <b>Uninterruptible power supplies</b>             |  |      |
| 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.0030-01                                    | UPS cable - 3 m - For 5AC901.IUPS-xx   | 199  |
| <b>Windows 10 IoT Enterprise</b>                  |  |      |
| 5SWW10.0240-MUL                                   | Windows 10 IoT Enterprise 2015 LTSC - 64-bit - Multilingual - APC910 QM77/HM76 chipset - License (without Recovery DVD) - Only available with a new device   | 300  |
| 5SWW10.0249-MUL                                   | Windows 10 IoT Enterprise 2015 LTSC - 64-bit - Multilingual - APC910 chipset QM170/HM170 - License (without Recovery DVD) - Only available with a new device | 300  |
| <b>Windows 7 Professional/Ultimate</b>            |  |      |
| 5SWWI7.1100-ENG                                   | Windows 7 Professional SP1 - 32-bit - English - DVD  | 306  |
| 5SWWI7.1100-GER                                   | Windows 7 Professional SP1 - 32-bit - German - DVD   | 306  |
| 5SWWI7.1200-ENG                                   | Windows 7 Professional SP1 - 64-bit - English - DVD  | 306  |
| 5SWWI7.1200-GER                                   | Windows 7 Professional SP1 - 64-bit - German - DVD   | 306  |
| 5SWWI7.1300-MUL                                   | Windows 7 Ultimate SP1 - 32-bit - Multilingual - DVD   | 306  |
| 5SWWI7.1400-MUL                                   | Windows 7 Ultimate SP1 - 64-bit - Multilingual - DVD   | 306  |
| <b>Windows Embedded 8.1 Industry Professional</b> |  |      |
| 5SWWI8.0340-MUL                                   | Windows Embedded 8.1 Industry Pro - 32-bit - Multilingual - For APC910 QM77/HM76 - License   | 303  |
| 5SWWI8.0440-MUL                                   | Windows Embedded 8.1 Industry Pro - 64-bit - Multilingual - For APC910 QM77/HM76 - License   | 303  |
| <b>Windows Embedded Standard 2009</b>             |  |      |
| 5SWWXP.0740-ENG                                   | Windows Embedded Standard 2009 - English - For PPC900 with QM77/HM76 chipset - License   | 314  |
| <b>Windows Embedded Standard 7</b>                |  |      |
| 5SWWI7.1540-ENG                                   | Windows Embedded Standard 7 SP1 - 32-bit - English - For APC910 with QM77/HM76 chipset - License   | 309  |
| 5SWWI7.1640-ENG                                   | Windows Embedded Standard 7 SP1 - 64-bit - English - For APC910 with QM77/HM76 chipset - License   | 309  |
| 5SWWI7.1740-MUL                                   | Windows Embedded Standard 7 Premium SP1 - 32-bit - Multilingual - For APC910 with QM77/HM76 chipset - License  | 309  |
| 5SWWI7.1840-MUL                                   | Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with QM77/HM76 chipset - License  | 309  |
| 5SWWI7.1849-MUL                                   | Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with chipset QM170/HM170 - License  | 309  |

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|                 | <b>Windows XP Professional</b>                  |      |
| 5SWWXP.0600-ENG | Windows XP Professional SP3 - English - CD      | 312  |
| 5SWWXP.0600-GER | Windows XP Professional SP3 - German - CD       | 312  |
| 5SWWXP.0600-MUL | Windows XP Professional SP3 - Multilingual - CD | 312  |

## Chapter 2 • Technical data

### 1 Introduction

#### 1.1 Intel Core i-series processors for the most demanding tasks

The APC910 is based on the latest Intel Core i-series technology and offers maximum performance for demanding tasks such as those that involve vision systems. The proven standard design of the Automation PCs has been retained while adding many new details to keep up with the advancements being made on the PC market. Robust design for use in industrial applications around the world and long-term series availability continue to define the Automation PC series, a trend now being continued by the APC910.



#### 1.2 Maximum performance

The APC910 has the latest Intel Core i-series technology at its heart. By further reducing the structural size of the chip and implementing a new microprocessor architecture that now integrates graphics directly into the CPU, Intel has been able to improve performance by leaps and bounds over their first Core i-series generation and Core 2 Duo systems. The rest of the PC infrastructure has also been streamlined for maximum computing performance and optimal data throughput. The APC910 now has a serial ATA-based CFast card to replace the previously used CompactFlash. And just like the APC810, hard disks and solid-state drives are connected to the PC system via the high-speed SATA interface. These devices are also well-equipped when it comes to interface options. Two Gigabit Ethernet ports, USB interfaces and onboard as well as modular serial interfaces round off the extensive capabilities of the APC910.

#### 1.3 Availability and reliability for many productive years

Automation PCs are built for continuous operation over a period of many years. This starts with the robust welded housing that shields the electronics from the external environment, easily withstanding rough conditions. The industrial-grade coating can endure even the most aggressive environments so that even a well-seasoned Automation PC might be mistaken for new. Components have also been selected to provide many years of reliable service. These components have been designed specifically for use in industrial environments, can withstand high ambient temperatures and enjoy guaranteed long-term availability. In addition, Automation PC generations are produced in excess of 10 years – quite the exception in the otherwise fast-paced PC sector and a significant advantage for

the user. The third generation of **Automation** PCs, represented by the APC910, proves once again that innovation and product continuity are not incompatible goals. From the ease of connecting cables to the interfaces on top of the **device** to the location of mounting holes, many details have stayed the same. For the many thousands of panels in the field – whether customized or in the standard design – there is always the proven SDL **interface** for easily connecting the PC to its display.

## 1.4 Features

- Latest processor technology - Intel Core i-series (Generation 3 - Ivy Bridge and Generation 6 - Skylake)
- Up to 16 **GB** main memory (dual-channel memory support) for QM77/HM76
- Up to 32 **GB** main memory (dual-channel memory support) for QM170/HM170
- 1 CFast slot<sup>1)</sup>
- 1, 2 or 5 card slots (for PCI / PCI Express (PCIe) cards)
- SATA drives (slide-in and slide-in compact slots)
- 4x **USB** 3.0, 1x **USB** 2.0
- 2x **Ethernet** 10/100/1000 Mbit interfaces
- 1x **RS232 interface**, **modem-compatible**
- Connections for a wide range of display devices to the monitor/panel and DisplayPort interfaces
- 24 VDC supply voltage
- Fanless operation<sup>2)</sup>
- **BIOS** (AMI)
- Real-time clock (RTC, battery-backed)
- Wide range of **interface** options
- Wide range of monitor/panel options

<sup>1)</sup> A CFast adapter allows multiple CFast cards to be used. This depends on the respective system unit.

<sup>2)</sup> Depends on the **device** configuration and ambient temperature.

## 1.5 System components / Configuration

The APC910 system [can](#) be assembled to meet individual requirements and operating conditions. The following components are required for operation:

- System unit
- Bus unit
- [CPU](#) board
- Heat sink
- Fan kit<sup>3)</sup>
- Main memory
- Drive (mass storage [device](#) such as CFast card or hard disk) for the operating system
- Operating system

### 1.5.1 Configuration - Base system

System units [can](#) be operated with or without a fan kit. This choice plays a role in determining the various types of heat sinks to be used.

Using a fan kit allows for operation at higher ambient temperatures. More information [can](#) be found in section "[Maximum ambient temperature](#)" on page 29.

<sup>3)</sup> A fan kit is only mandatory when using heat sink 5AC901.HS00-00 and 5AC901.HS00-01. If a fan kit is not used, it is important to consider the more limited ambient temperature specifications (see "[Maximum ambient temperature](#)" on page 29).

## Configuration with a fan kit
















| Configuration - Base system with a fan kit (active)                                 |  |   |   |
|---|--|---|---|
| System unit   | Select 1   |   |   |
| A system unit consists of a housing and mainboard.                                  | <br>5PC910.SX01-00  | <br>5PC910.SX02-00 | <br>5PC910.SX05-00 |
| Bus unit  | Select 1   |   |   |
|    | 5AC901.BX01-00<br>5AC901.BX01-01   | 5AC901.BX02-00<br>5AC901.BX02-01<br>5AC901.BX02-02  | 5AC901.BX05-00<br>5AC901.BX05-01<br>5AC901.BX05-02<br>5AC901.BX05-03                                  |
| CPU board / Heat sink / Fan kit / Main memory                                       |  |   |   |
| CPU board   | Select 1   |   |   |
|    | <b>QM77 CPU boards</b><br>5PC900.TS77-00<br>5PC900.TS77-01<br>5PC900.TS77-02<br>5PC900.TS77-03<br>5PC900.TS77-04<br>5PC900.TS77-05<br>5PC900.TS77-06 | <b>HM76 CPU boards</b><br>5PC900.TS77-07<br>5PC900.TS77-08<br>5PC900.TS77-09<br>5PC900.TS77-10      | <b>QM170 CPU boards</b><br>5PC900.TS17-00<br>5PC900.TS17-01<br>5PC900.TS17-02                         |
| Heat sink   | Select 1   |   |   |
|    | 5AC901.HS00-00 (5PC900.TS77-0x)<br>5AC901.HS00-01 (5PC900.TS17-0x)   |   |   |
| Fan kit   | Select 1   |   |   |
|  | 5AC901.FA01-00   | 5AC901.FA02-00  | 5AC901.FA05-00  |
| Main memory   | Select 1 or 2  |   |   |
|  | <b>QM77/HM76 CPU boards</b><br>5MMDDR.1024-03<br>5MMDDR.2048-03<br>5MMDDR.4096-03<br>5MMDDR.8192-03  | <b>QM170/HM170 CPU boards</b><br>5MMDDR.4096-04<br>5MMDDR.8192-04<br>5MMDDR.016G-04                 |   |

Figure 1: Configuration - Base system with a fan kit

## Configuration without a fan kit

| Configuration - Base system without a fan kit (passive)                             |  |   |   |
|---|--|---|---|
| System unit   | Select 1   |   |   |
| A system unit consists of a housing and mainboard.                                  | <br>5PC910.SX01-00                                | <br>5PC910.SX02-00 | <br>5PC910.SX05-00 |
| Bus unit  | Select 1   |   |   |
|    | 5AC901.BX01-00<br>5AC901.BX01-01   | 5AC901.BX02-00<br>5AC901.BX02-01<br>5AC901.BX02-02  | 5AC901.BX05-00<br>5AC901.BX05-01<br>5AC901.BX05-02<br>5AC901.BX05-03                                  |
| CPU board - Heat sink - Main memory   |  |   |   |
| CPU board   | Select 1   |   |   |
|    | <b>QM77 CPU boards</b><br>5PC900.TS77-01<br>5PC900.TS77-02<br>5PC900.TS77-03<br>5PC900.TS77-04<br>5PC900.TS77-05<br>5PC900.TS77-06 | <b>HM76 CPU boards</b><br>5PC900.TS77-07<br>5PC900.TS77-08<br>5PC900.TS77-09<br>5PC900.TS77-10      | <b>HM170 CPU boards</b><br>5PC900.TS17-01<br>5PC900.TS17-02   |
| Heat sink   | Select 1   |   |   |
|    | 5AC901.HS01-00 (5PC900.TS77-0x)<br>5AC901.HS01-01 (5PC900.TS17-0x)   |   |   |
| Main memory   | Select 1 or 2  |   |   |
|  | <b>QM77/HM76 CPU boards</b><br>5MMDDR.1024-03<br>5MMDDR.2048-03<br>5MMDDR.4096-03<br>5MMDDR.8192-03                                | <b>QM170/HM170 CPU boards</b><br>5MMDDR.4096-04<br>5MMDDR.8192-04<br>5MMDDR.016G-04                 |   |

1) Main memory frequency of 5PC900.TS77-0x CPU boards limited to 1067 MHz when operating without a fan kit.






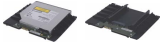











2) When operated without a fan kit

- CPU board 5PC900.TS17-01 is limited to a maximum CPU frequency of 1900 MHz.
- CPU board 5PC900.TS17-02 is limited to a maximum CPU frequency of 1700 MHz.

Figure 2: Configuration - Base system without a fan kit



## 1.5.2 Accessory and software configuration

| Accessory and software configuration  |  |   |  |
|---|--|---|--|
| System unit   | Select 1   |   |  |
| A system unit consists of a housing and mainboard.                                  | <br>5PC910.SX01-00  | <br>5PC910.SX02-00   | <br>5PC910.SX05-00  |
| Front covers  | Select 1   |   |  |
|    | 5AC901.FF01-00<br>5AC901.FF01-01<br>5AC901.FF01-02<br>5AC901.FF01-03   | 5AC901.FF02-00<br>5AC901.FF02-01<br>5AC901.FF02-02<br>5AC901.FF02-03  | 5AC901.FF05-00<br>5AC901.FF05-01<br>5AC901.FF05-02<br>5AC901.FF05-03   |
| Slide-in compact drives   | Select 1   |   |  |
|    | 5AC901.CHDD-01<br>5AC901.CSSD-03<br>5AC901.CSSD-04   | 5AC901.CSSD-05<br>5AC901.CSSD-06<br>5AC901.CCFA-00  |  |
| Slide-in drives   |  | Select max. 1   | Select max. 2  |
|    |   |   | 5AC901.SDVW-00<br>5AC901.SSCA-00   |
| RAID system   | Select 1   |   |  |
|    | 5ACPCI.RAIC-06 (uses 1 PCI slot)<br>5MMHDD.0500-00   |   |  |
| IF options  | Select max. 2 <sup>2)</sup>  |   |  |
|    | 5AC901.I485-00<br>5AC901.ICAN-00   | 5AC901.IHDA-00<br>5AC901.IRDY-00<br>5AC901.IPLK-00  | 5AC901.ISIO-00<br>5AC901.ISRM-00<br>5AC901.IETH-00   |
| Monitor/Panel options   |  | Select 1  |  |
|   |    |   | 5AC901.LDPO-00<br>5AC901.LSDL-00<br>5AC901.LSD3-00   |
| UPS   | Select 1 of each   |   |  |
|  | <b>UPS module</b><br>5AC901.IUPS-00<br>5AC901.IUPS-01  | + <b>Battery unit</b><br>+ 5AC901.BUPS-00<br>+ 5AC901.BUPS-01   | + <b>UPS cable</b><br>5CAUPS.0005-01<br>5CAUPS.0010-01<br>5CAUPS.0030-01   |
| CFast cards   | Select 1   |   |  |
|  | 5CFAST.2048-00<br>5CFAST.4096-00<br>5CFAST.8192-00   | 5CFAST.016G-00<br>5CFAST.032G-00  | 5CFAST.032G-10<br>5CFAST.064G-10<br>5CFAST.128G-10   |
| PCIe-Karten   | Select 1 <sup>4)</sup>   |   |  |
|  | 5ACPCI.ETH1-00<br>5ACPCI.ETH4-00   |   |  |
| USB accessories   | Select 1   |   |  |
|  | 5MMUSB.2048-01<br>5MMUSB.4096-01   |   |  |
| Terminal blocks   | Select 1   |   |  |
|  | <b>Power connectors</b><br>0TB103.9<br>0TB103.91   |   |  |
| Operating systems   | Select 1 <sup>5)</sup>   |   |  |
|  | <b>Windows 7</b><br>5SWWI7.1100-ENG<br>5SWWI7.1100-GER<br>5SWWI7.1300-MUL<br>5SWWI7.1200-ENG<br>5SWWI7.1200-GER<br>5SWWI7.1400-MUL<br><br><b>Windows Embedded 8.1 Industry</b><br>5SWWI8.0340-MUL<br>5SWWI8.0440-MUL | <b>Windows Embedded Standard 7</b><br>5SWWI7.1540-ENG<br>5SWWI7.1640-ENG<br>5SWWI7.1740-MUL<br>5SWWI7.1840-MUL<br>5SWWI7.1849-MUL<br><br><b>Windows Embedded Standard 2009</b><br>5SWWXP.0740-ENG<br><br><b>Debian 8 (GNU/Linux)</b><br>5SWLIN.0540-MUL<br>5SWLIN.0640-MUL<br>5SWLIN.0649-MUL | <b>Automation Runtime</b><br>0TG1000.01<br>0TG1000.02<br>1TG4600.10-5<br>1TG4601.06-5<br><br><b>Windows XP</b><br>5SWWXP.0600-ENG<br>5SWWXP.0600-GER<br>5SWWXP.0600-MUL<br><br><b>Windows 10</b><br>5SWW10.0240-MUL<br>5SWW10.0249-MUL |

1) The front cover is not included with the system unit and must be ordered separately.

2) Certain limitations must be taken into account when using IF options. For more information, please refer to the section "Device interfaces" in Chapter 2 "Technical data".

3) This UPS module can only be operated in the IF option 1 slot.

4) Required = PCIe bus

Only the following 64-bit operating systems are supported by 5PC900.TS17-0x CPU boards:

Windows 7

Windows 10 IoT Enterprise 2015 LTSC

Windows Embedded Standard 7

Debian 8

Figure 3: Accessory and software configuration

## 2 Complete system

### 2.1 Temperature specifications

CPU boards [can](#) be combined with various other components such as drives, main memory, additional plug-in cards, etc. depending on the system unit and fan kit. 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 reached in typical applications, e.g. those in Microsoft Windows. Testing and evaluation must be performed on-site by the user (temperatures [can](#) be read in BIOS or using the B&R [Control Center](#)).

#### Information regarding worst-case conditions of QM77/HM76 CPU boards

- Thermal Analysis Tool (TAT V4.3) from Intel for simulating a 100% processor load
- BurnInTest tool (BurnInTest V4.0 Pro from Passmark [Software](#)) for simulating a 100% load on the [interface](#) via loopback adapters (serial interfaces, slide-in drives, [USB](#) interfaces, audio outputs)
- Maximum system expansion and power consumption

#### Information regarding worst-case conditions of QM170/HM170 CPU boards

- Thermal Analysis Tool (TAT V5) from Intel for simulating a 100% processor load
- BurnInTest tool (BurnInTest V6.0 Pro from PassMark [Software](#)) for simulating a 100% load on the [interface](#) via loopback adapters (serial interfaces, slide-in drives, [USB](#) interfaces, audio outputs)
- Maximum system expansion and power consumption

## 2.1.1 Maximum ambient temperature

### Operation with a fan kit on QM77/HM76 CPU boards

#### Information:

The 5AC901.HS00-00 heat sink must be used when operating the Automation PC 910 with a fan kit.

All specifications apply to non-condensing operation.

|   |                              | Operation with a fan kit and 5AC901.HS00-00 heat sink |                                |                                |                                |                                |                                |                                |                              |                              |                               |                                | Location of sensor(s)  |
|---|------------------------------|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|------------------------------|------------------------------|-------------------------------|--------------------------------|------------------------|
|   |                              | i7<br>3615QE<br>5PC900.TS77-00                        | i7<br>3612QE<br>5PC900.TS77-01 | i7<br>3555LE<br>5PC900.TS77-02 | i7<br>3517UE<br>5PC900.TS77-03 | i5<br>3610ME<br>5PC900.TS77-04 | i3<br>3120ME<br>5PC900.TS77-05 | i3<br>3217UE<br>5PC900.TS77-06 | CM<br>847E<br>5PC900.TS77-07 | CM<br>827E<br>5PC900.TS77-08 | CM<br>1020E<br>5PC900.TS77-09 | CM<br>1047UE<br>5PC900.TS77-10 |                        |
| All temperature values in degrees Celsius (°C) at 500 m above sea level.<br><br>The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level). |                              | 50  | 55                             | 55                             | 55                             | 55                             | 55                             | 55                             | 55                           | 55                           | 55                            | 55                             | Location of sensor(s)  |
| Maximum ambient temperature   |                              |   |                                |                                |                                |                                |                                |                                |                              |                              |                               |                                |                        |
| What else can also be operated at the max. ambient temperature, or are there any limits?  |                              |   |                                |                                |                                |                                |                                |                                |                              |                              |                               |                                |                        |
| System units  | 5PC910.SX01-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              | Power supply           |
|   | 5PC910.SX02-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5PC910.SX05-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
| Main memory   | 5MMDDR.1024-03               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              | -                      |
|   | 5MMDDR.2048-03               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5MMDDR.4096-03               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5MMDDR.8192-03               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
| Slide-in compact Drives   | 5AC901.CHDD-00               | ✓   | 50                             | 50                             | 50                             | 50                             | 50                             | 50                             | 50                           | 50                           | 50                            | 50                             | Slide-in compact drive |
|   | 5AC901.CHDD-01               | ✓   | 50                             | 50                             | 50                             | 50                             | 50                             | 50                             | 50                           | 50                           | 50                            | 50                             |                        |
|   | 5AC901.CSSD-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.CSSD-01               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.CSSD-02               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.CSSD-03               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.CSSD-04               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.CSSD-05               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.CSSD-06               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
| Slide-in drives   | 5AC901.CCFA-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              | Slide-in drive         |
|   | 5AC901.SDVW-00               | 40  | 40                             | 40                             | 40                             | 40                             | 40                             | 40                             | 40                           | 40                           | 40                            | 40                             |                        |
|   | 5AC901.SSCA-00 <sup>1)</sup> | -   | -                              | -                              | -                              | -                              | -                              | -                              | -                            | -                            | -                             | -                              |                        |
| RAID system   | 5ACPCI.RAIC-06               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              | -                      |
| Interface options   | 5AC901.I485-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              | Interface option       |
|   | 5AC901.ICAN-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.IHDA-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.ISRM-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.IPLK-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.IRDY-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.ISIO-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.IUPS-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.IUPS-01               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.IETH-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
| Monitor/Panel Options   | 5AC901.LDPO-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              | Monitor/Panel option   |
|   | 5AC901.LSDL-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
|   | 5AC901.LSD3-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
| CFast cards   | 5CFAST.xxxx-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              | -                      |
|   | 5CFAST.xxxx-10               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |
| PCIe cards  | 5ACPCE.ETH1-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              | -                      |
|   | 5ACPCE.ETH4-00               | ✓   | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                              | ✓                            | ✓                            | ✓                             | ✓                              |                        |

1) The max. temperature depends on the slide-in compact drive being used.

Table 4: Ambient temperature with a fan kit

# Operation without a fan kit on QM77/HM76 CPU boards

## Information:

The 5PC900.TS77-00 CPU board cannot be operated without a fan kit.

The 5AC901.HS01-00 heat sink must be used when operating the Automation PC 910 without a fan kit.

All specifications apply to non-condensing operation.

|   |                              | Operation without a fan kit and with 5AC901.HS01-00 heat sink |                |                |                |                |                |                |                |                |                |                | Location of sensor(s)  |
|---|------------------------------|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------------|
|   |                              | i7 3615QE   | i7 3612QE      | i7 3555LE      | i7 3517UE      | i5 3610ME      | i3 3120ME      | i3 3217UE      | CM 847E        | CM 827E        | CM 1020E       | CM 1047UE      |                        |
| All temperature values in degrees Celsius (°C) at 500 m above sea level.  |                              | 5PC900.TS77-00  | 5PC900.TS77-01 | 5PC900.TS77-02 | 5PC900.TS77-03 | 5PC900.TS77-04 | 5PC900.TS77-05 | 5PC900.TS77-06 | 5PC900.TS77-07 | 5PC900.TS77-08 | 5PC900.TS77-09 | 5PC900.TS77-10 |                        |
| The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level). |                              |   |                |                |                |                |                |                |                |                |                |                |                        |
| Maximum ambient temperature   |                              | -   | 35             | 40             | 50             | 35             | 35             | 50             | 50             | 50             | 35             | 50             |                        |
| What else can also be operated at the max. ambient temperature, or are there any limits?                              |                              |   |                |                |                |                |                |                |                |                |                |                |                        |
| System units  | 5PC910.SX01-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | Power supply           |
|   | 5PC910.SX02-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5PC910.SX05-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
| Main memory   | 5MMDDR.1024-03               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | -                      |
|   | 5MMDDR.2048-03               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5MMDDR.4096-03               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5MMDDR.8192-03               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5MMDDR.16384-03              | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
| Slide-in compact Drives   | 5AC901.CHDD-00               | -   | ✓              | ✓              | 45             | ✓              | ✓              | 45             | 45             | 45             | ✓              | 45             | Slide-in compact drive |
|   | 5AC901.CHDD-01               | -   | ✓              | ✓              | 45             | ✓              | ✓              | 45             | 45             | 45             | ✓              | 45             |                        |
|   | 5AC901.CSSD-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.CSSD-01               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.CSSD-02               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.CSSD-03               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.CSSD-04               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.CSSD-05               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.CSSD-06               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
| Slide-in drives   | 5AC901.CCFA-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | Slide-in drive         |
|   | 5AC901.SDVW-00               | -   | 25             | 25             | 25             | 25             | 25             | 25             | 25             | 25             | 25             | 25             |                        |
| RAID system   | 5AC901.SSCA-00 <sup>1)</sup> | -   | -              | -              | -              | -              | -              | -              | -              | -              | -              | -              | -                      |
|   | 5ACPCI.RAIC-06               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
| Interface options   | 5AC901.I485-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | Interface option       |
|   | 5AC901.ICAN-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.IHDA-00               | -   | ✓              | ✓              | 40             | ✓              | ✓              | 40             | 40             | 40             | ✓              | 40             |                        |
|   | 5AC901.ISRM-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.IPLK-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.IRDY-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.ISIO-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.IUPS-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.IUPS-01               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
| Monitor/Panel Options   | 5AC901.IETH-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | Monitor/Panel option   |
|   | 5AC901.LDPO-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
|   | 5AC901.LSDL-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
| CFast cards   | 5AC901.LSD3-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | -                      |
|   | 5CFAST.xxxx-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
| PCIe cards  | 5CFAST.xxxx-10               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | -                      |
|   | 5ACPCE.ETH1-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |
| PCIe cards  | 5ACPCE.ETH4-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | -                      |
|   | 5ACPCE.ETH4-00               | -   | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              | ✓              |                        |

1) The max. temperature depends on the slide-in compact drive being used.

Table 5: Ambient temperature without a fan kit

## Operation with a fan kit on QM170/HM170 CPU boards

**Information:**

The 5AC901.HS00-01 heat sink must be used when operating the Automation PC 910 with a fan kit.

All specifications apply to non-condensing operation.

|   |                              | Operation with a fan kit and heat sink 5AC901.HS00-01 |                            |                          | Location of sensor(s)  |
|---|------------------------------|---|----------------------------|--------------------------|------------------------|
|   |                              | i5 6440EQ<br>5PC900.TS17-00                           | i3 6100E<br>5PC900.TS17-01 | G3900E<br>5PC900.TS17-02 |                        |
| All temperature values in degrees Celsius (°C) at 500 m above sea level.  |                              |   |                            |                          |                        |
| The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level). |                              |   |                            |                          |                        |
| Maximum ambient temperature   |                              | 50  | 55                         | 60                       |                        |
| What else can also be operated at the max. ambient temperature, or are there any limits?                              |                              |   |                            |                          |                        |
| System units  | 5PC910.SX01-00               | ✓   | ✓                          | ✓                        | Power supply           |
|   | 5PC910.SX02-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5PC910.SX05-00               | ✓   | ✓                          | ✓                        |                        |
| Main memory   | 5MMDDR.4096-04               | ✓   | ✓                          | ✓                        | -                      |
|   | 5MMDDR.8192-04               | ✓   | ✓                          | ✓                        |                        |
|   | 5MMDDR.016G-04               | ✓   | ✓                          | ✓                        |                        |
| Slide-in compact Drives   | 5AC901.CHDD-00               | ✓   | 50                         | 50                       | Slide-in compact drive |
|   | 5AC901.CHDD-01               | ✓   | 50                         | 50                       |                        |
|   | 5AC901.CSSD-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-01               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-02               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-03               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-04               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-05               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-06               | ✓   | ✓                          | ✓                        |                        |
| Slide-in drives   | 5AC901.SDVW-00               | 40  | 40                         | 40                       | Slide-in drive         |
|   | 5AC901.SSCA-00 <sup>1)</sup> | -   | -                          | -                        |                        |
| RAID system   | 5ACPCI.RAIC-06               | ✓   | ✓                          | ✓                        | -                      |
| Interface options   | 5AC901.I485-00               | ✓   | ✓                          | ✓                        | Interface option       |
|   | 5AC901.ICAN-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.IHDA-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.ISRM-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.IPLK-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.IRDY-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.ISIO-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.IUPS-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.IUPS-01               | ✓   | ✓                          | ✓                        |                        |
| Monitor/Panel Options   | 5AC901.IETH-00               | ✓   | ✓                          | ✓                        | Monitor/Panel option   |
|   | 5AC901.LDPO-00               | ✓   | ✓                          | ✓                        |                        |
|   | 5AC901.LSDL-00               | ✓   | ✓                          | ✓                        |                        |
| CFast cards   | 5CFast.xxxx-00               | ✓   | ✓                          | ✓                        | -                      |
|   | 5CFast.xxxx-10               | ✓   | ✓                          | ✓                        |                        |
| PCIe cards  | 5ACPCE.ETH1-00               | ✓   | ✓                          | ✓                        | -                      |
|   | 5ACPCE.ETH4-00               | ✓   | ✓                          | ✓                        |                        |

1) The max. temperature depends on the slide-in compact drive being used.

Table 6: Ambient temperature with a fan kit

## Operation without a fan kit on QM170/HM170 CPU boards

### Information:

CPU board 5PC900.TS17-00 cannot be operated without a fan kit.

Heat sink 5AC901.HS01-01 must be used when operating the Automation PC 910 without a fan kit.

All specifications apply to non-condensing operation.

|   |                              | Operation without a fan kit and with heat sink 5AC901.HS01-01 |                            |                          | Location of sensor(s)  |
|---|------------------------------|---|----------------------------|--------------------------|------------------------|
|   |                              | i5 6440EQ<br>5PC900.TS17-00                                   | i3 6100E<br>5PC900.TS17-01 | G3900E<br>5PC900.TS17-02 |                        |
|   |                              | -   | 45                         | 55                       |                        |
| All temperature values in degrees Celsius (°C) at 500 m above sea level.  |                              |   |                            |                          |                        |
| The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level). |                              |   |                            |                          |                        |
| Maximum ambient temperature   |                              | -   | 45                         | 55                       |                        |
| What else can also be operated at the max. ambient temperature, or are there any limits?                              |                              |   |                            |                          |                        |
| System units  | 5PC910.SX01-00               | -   | ✓                          | ✓                        | Power supply           |
|   | 5PC910.SX02-00               | -   | ✓                          | ✓                        |                        |
|   | 5PC910.SX05-00               | -   | ✓                          | ✓                        |                        |
| Main memory   | 5MMDDR.4096-04               | -   | ✓                          | ✓                        | -                      |
|   | 5MMDDR.8192-04               | -   | ✓                          | ✓                        |                        |
|   | 5MMDDR.016G-04               | -   | ✓                          | ✓                        |                        |
| Slide-in compact Drives   | 5AC901.CHDD-00               | -   | ✓                          | 45                       | Slide-in compact drive |
|   | 5AC901.CHDD-01               | -   | ✓                          | 45                       |                        |
|   | 5AC901.CSSD-00               | -   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-01               | -   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-02               | -   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-03               | -   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-04               | -   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-05               | -   | ✓                          | ✓                        |                        |
|   | 5AC901.CSSD-06               | -   | ✓                          | ✓                        |                        |
|   | 5AC901.CCFA-00               | -   | ✓                          | ✓                        |                        |
| Slide-in drives   | 5AC901.SDVW-00               | -   | 25                         | 25                       | Slide-in drive         |
|   | 5AC901.SSCA-00 <sup>1)</sup> | -   | -                          | -                        |                        |
| RAID system   | 5ACPCI.RAIC-06               | -   | ✓                          | ✓                        | -                      |
| Interface options   | 5AC901.I485-00               | -   | ✓                          | ✓                        | Interface option       |
|   | 5AC901.ICAN-00               | -   | ✓                          | ✓                        |                        |
|   | 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               | -   | ✓                          | ✓                        |                        |
| Monitor/Panel Options   | 5AC901.LDPO-00               | -   | ✓                          | ✓                        | Monitor/Panel option   |
|   | 5AC901.LSDL-00               | -   | ✓                          | ✓                        |                        |
|   | 5AC901.LSD3-00               | -   | ✓                          | ✓                        |                        |
| CFast cards   | 5CFAST.xxxx-00               | -   | ✓                          | ✓                        | -                      |
|   | 5CFAST.xxxx-10               | -   | ✓                          | ✓                        |                        |
| PCIe cards  | 5ACPCE.ETH1-00               | -   | ✓                          | ✓                        | -                      |
|   | 5ACPCE.ETH4-00               | -   | ✓                          | ✓                        |                        |

1) The max. temperature depends on the slide-in compact drive being used.

Table 7: Ambient temperature without a fan kit

### 2.1.1.1 How to determine the maximum ambient temperature

1. Select the [CPU](#) board (operation with or without a fan kit).
2. The "Maximum ambient temperature" row shows the maximum ambient temperature for the complete system, including the respective [CPU](#) board.

#### Information:

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

3. Incorporating additional drives, main memory, [interface](#) options, etc. [can](#) change the temperature limits of an APC910 system.

If there is a "✓" next to the component, it [can](#) be used at the maximum ambient temperature of the complete system without problems.

If there is a specific temperature next to the component, for example "45", then the ambient temperature of the complete APC910 system is not permitted to exceed this temperature.

### 2.1.2 Minimum ambient temperature

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

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

### 2.1.3 Temperature monitoring

Sensors monitor temperature values at various locations in the APC910 [device](#). The location of these temperature sensors is illustrated in [Fig. 4 "Temperature sensor locations" on page 34](#). The values listed in [Tab. 8 "Temperature sensor locations" on page 34](#) represent the defined maximum temperature for this measurement point. An alarm is not triggered if this temperature is exceeded. These temperatures [can](#) be read in [BIOS](#) or approved Microsoft Windows operating systems using the B&R [Control](#) Center.

In addition, the hard disks for APC910 systems available from B&R are equipped with S.M.A.R.T., or Self-Monitoring, Analysis and Reporting Technology. This makes it possible to read various parameters such as temperature using [software](#) (e.g. [HDD](#) Thermometer, a freeware program) on approved Microsoft operating systems.



## 2.1.4 Temperature sensor positions

Sensors indicate temperature values at various locations in the APC910. These temperatures<sup>4)</sup> can be read in BIOS (Advanced - OEM features - System board features / CPU board features - Temperature values) or Microsoft Windows operating systems using the B&R Control Center<sup>5)</sup>.

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

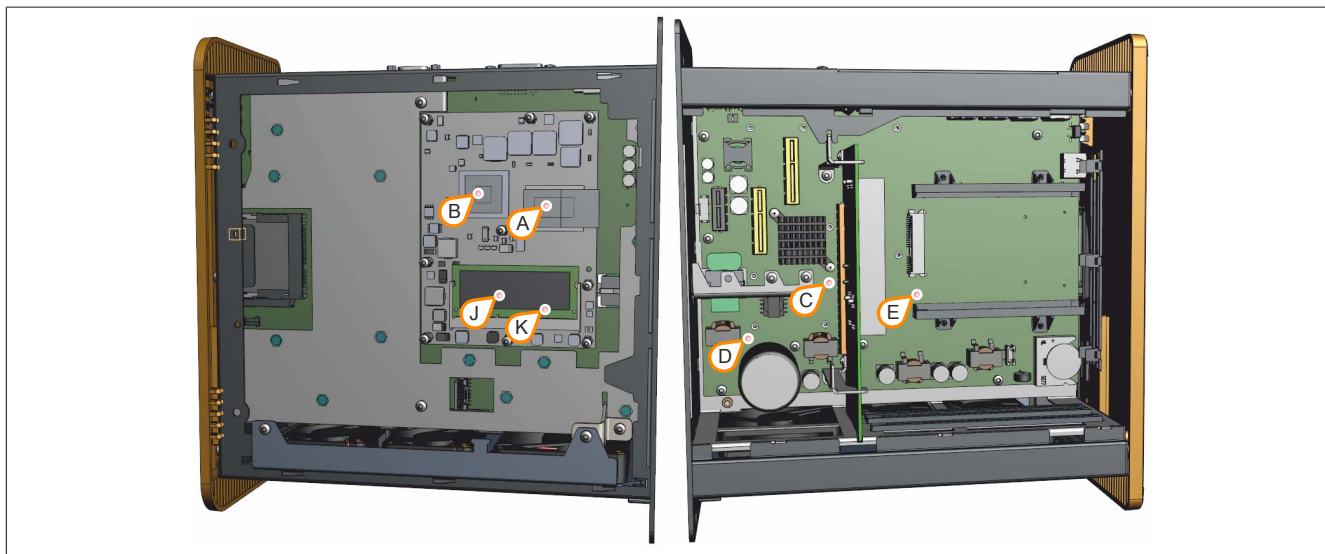


Figure 4: Temperature sensor locations

| ADI sensors          | Position | Measurement point for          | Measurement   | Max. specified                      |
|----------------------|----------|--------------------------------|---|-------------------------------------|
| CPU board Sensor 2   | A        | CPU                            | Temperature of the processor (sensor integrated in the processor)                       | 95°C                                |
| CPU board Sensor 1   | B        | Board controller               | Temperature of the board controller (sensor integrated on the CPU board)                | 95°C                                |
| System unit Sensor 3 | C        | Main memory                    | Temperature of the main memory area (sensor integrated on the mainboard)                | 75°C                                |
| System unit Sensor 1 | D        | Board power supply             | Temperature of the board power supply (sensor on the mainboard)                         | 90°C                                |
| System unit Sensor 2 | E        | Slide-in compact               | Temperature of the slide-in compact drive area (sensor on the mainboard)                | Depends on the drive                |
| Slide-in drive 1     | F        | Slide-in drive 1               | Temperature of slide-in drive 1 (sensor integrated in the slide-in slot)                | Depends on the drive                |
| Slide-in drive 2     | G        | Slide-in drive 2               | Temperature of slide-in drive 2 (sensor integrated in the slide-in slot)                | Depends on the drive                |
| -                    | H        | Interface option <sup>1)</sup> | Temperature of the interface option (sensor integrated on the interface option)         | Depends on the interface option     |
| Display Link Sensor  | I        | Monitor/Panel option           | Temperature of the monitor/panel option (sensor integrated on the monitor/panel option) | Depends on the monitor/panel option |
| CPU board Sensor 3   | J        | SO-DIMM 1 <sup>2)</sup>        | Temperature of main memory 1 (sensor integrated on main memory 1).                      | 85°C                                |
| CPU board Sensor 4   | K        | SO-DIMM 2 <sup>2)</sup>        | Temperature of main memory 2 (sensor integrated on main memory 2).                      | 85°C                                |

Table 8: Temperature sensor locations

- 1) A temperature sensor is currently not integrated in the interface options.
- 2) A valid temperature is only provided if the module is connected and equipped with a temperature sensor. Otherwise, the value 0 is output in the ADI Control Center and BIOS; an alarm is also output in the ADI Control Center.

<sup>4)</sup> Measured temperatures approximate the immediate ambient temperature but may also be influenced by neighboring components.

<sup>5)</sup> The ADI driver that includes the B&R Control Center is available in the Downloads section of the B&R website ([www.br-automation.com](http://www.br-automation.com)).



## 2.1.5 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        | CPU                            | 65°C   | 81°C   |
| B        | Board controller               | 65°C   | 81°C   |
| C        | Main memory                    | 60°C   | 76°C   |
| D        | Board power supply             | 70°C   | 86°C   |
| E        | Slide-in compact               | 60°C   | 76°C   |
| F        | Slide-in drive 1               | 5AC901.SDVW-00: 44°C, 5AC901.SSCA-00: 55°C                       | 5AC901.SDVW-00: 60°C, 5AC901.SSCA-00: 71°C                       |
| G        | Slide-in drive 2               | 5AC901.SDVW-00: 44°C, 5AC901.SSCA-00: 55°C                       | 5AC901.SDVW-00: 60°C, 5AC901.SSCA-00: 71°C                       |
| H        | Interface option <sup>1)</sup> | -  | -  |
| I        | Monitor/Panel option           | 5AC901.LDPO-00: 60°C, 5AC901.LSDL-00: 60°C, 5AC901.LSD3-00: 60°C | 5AC901.LDPO-00: 76°C, 5AC901.LSDL-00: 76°C, 5AC901.LSD3-00: 76°C |
| J        | SO-DIMM 1                      | 60°C   | 76°C   |
| K        | SO-DIMM 2                      | 60°C   | 76°C   |

Table 9: 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).

## 2.2 Humidity specifications

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

| Component                  |                                | Operation | Storage             | Transport           |
|----------------------------|--------------------------------|-----------|---------------------|---------------------|
| System units (all models)  |                                | 5 to 90%  | 5 to 95%            | 5 to 95%            |
| QM77/HM76 CPU boards       |                                | 10 to 90% | 5 to 95%            | 5 to 95%            |
| QM170/HM170 CPU boards     |                                | 10 to 90% | 5 to 95%            | 5 to 95%            |
| Main memory for CPU boards |                                | 10 to 90% | 5 to 95%            | 5 to 95%            |
| Slide-in compact drives    | 5AC901.CHDD-00                 | 5 to 95%  | 5 to 95%            | 5 to 95%            |
|                            | 5AC901.CHDD-01                 | 8 to 90%  | 5 to 95%            | 5 to 95%            |
|                            | 5AC901.CSSD-00                 | 5 to 95%  | 5 to 95%            | 5 to 95%            |
|                            | 5AC901.CSSD-01                 | 5 to 95%  | 5 to 95%            | 5 to 95%            |
|                            | 5AC901.CSSD-02                 | 5 to 95%  | 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%            |
| Slide-in drives            | 5AC901.SDVW-00                 | 8 to 80%  | 5 to 95%            | 5 to 95%            |
|                            | 5AC901.SDVW-01                 | 8 to 80%  | 5 to 95%            | 5 to 95%            |
| RAID system                |                                | 8 to 90%  | 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.IETH-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%            |
|                            | 5AC901.IUPS-00                 | 5 to 90%  | 5 to 95%            | 5 to 95%            |
|                            | 5AC901.IUPS-01                 | 5 to 90%  | 5 to 95%            | 5 to 95%            |
| Monitor/Panel options      | 5AC901.LDPO-00                 | 5 to 90%  | 5 to 95%            | 5 to 95%            |
|                            | 5AC901.LSDL-00                 | 5 to 90%  | 5 to 95%            | 5 to 95%            |
|                            | 5AC901.LSD3-00                 | 5 to 90%  | 5 to 95%            | 5 to 95%            |
| Accessories                | 5MMUSB.2048-01 USB flash drive | 10 to 90% | 5 to 90%            | 5 to 90%            |
|                            | 5MMUSB.4096-01 USB flash drive | 10 to 90% | 5 to 90%            | 5 to 90%            |
|                            | 5CFAST.xxxx-00 CFast cards     | Max. 85%  | Max. 85%            | Max. 85%            |
|                            | 5CFAST.xxxx-10 CFast cards     | 10 to 95% | 10 to 95%           | 10 to 95%           |
|                            | 5MD900.USB2-02 USB media drive | 20 to 80% | 5 to 90% / 5 to 95% | 5 to 90% / 5 to 95% |
|                            | PCIe card 5ACPCE.ETH1-00       | 5 to 90%  | 5 to 95%            | 5 to 95%            |
|                            | PCIe card 5ACPCE.ETH4-00       | 5 to 90%  | 5 to 95%            | 5 to 95%            |

Table 10: Overview of humidity specifications for individual components

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

## 2.3 Power management

### 2.3.1 Power supply - Block diagram

The following block diagram illustrates the simplified structure of the APC910 voltage supply for system units.

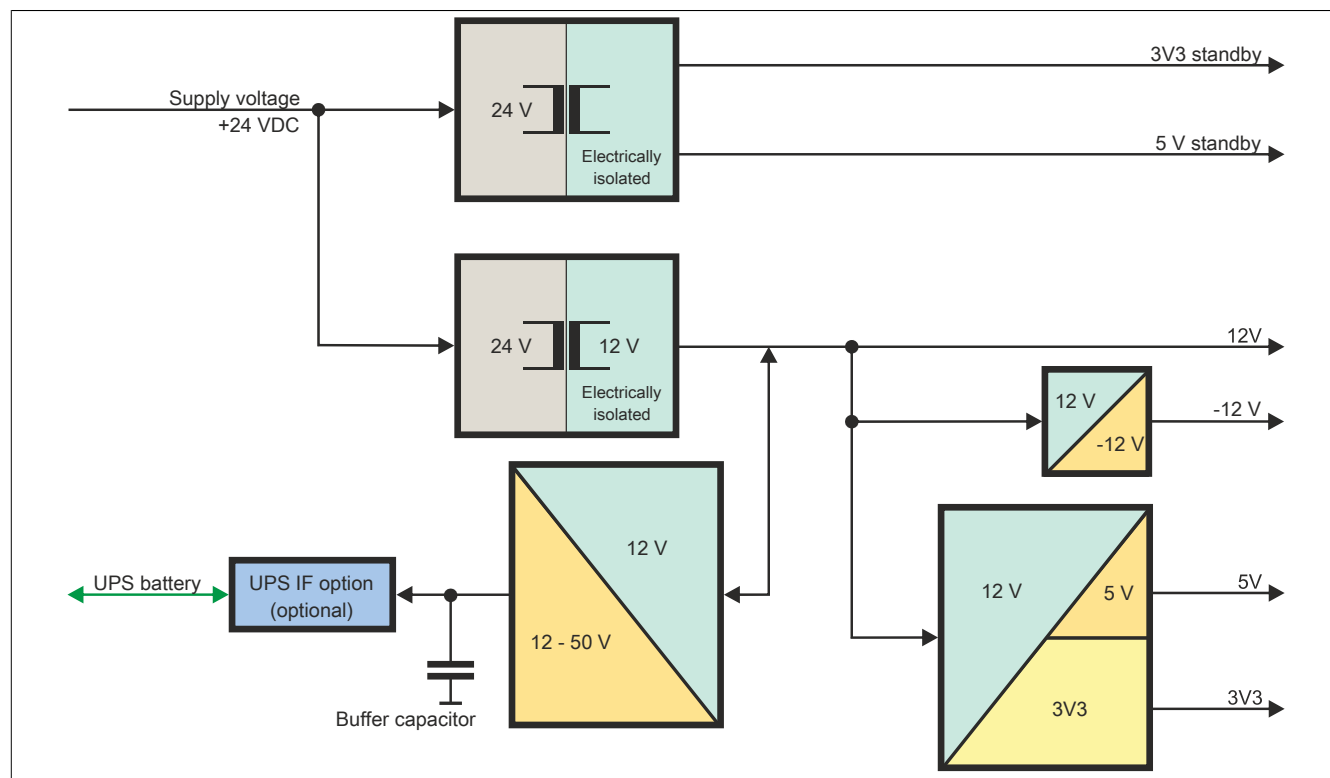


Figure 5: Voltage supply for system units

## 2.3.2 Power calculation with 5PC910.SX01-00

### Information:

The power supply's maximum total power of 130 watts must not be exceeded.

| Information:   |  | CPU board  |                |                |                |                |                |                |                | Current system |                             |  |
|--|--|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------------------|--|
|  |  | 5PC900.TS77-00   | 5PC900.TS77-01 | 5PC900.TS77-02 | 5PC900.TS77-03 | 5PC900.TS77-04 | 5PC900.TS77-05 | 5PC900.TS77-06 | 5PC900.TS77-07 | 5PC900.TS77-08 | Enter values in this column |  |
| All values are specified in <b>watts</b> .<br>The values specified for the <b>producers</b> are maximum values. The values for the <b>consumers</b> are average maximum values, but not peak values. |  | Total power supply power (maximum)   |                |                |                |                |                |                |                |                | 130                         |  |
| Total power supply +12 V   | Maximum possible   |  |                |                |                |                |                |                |                | 130            |                             |  |
|  | CPU board, permanent consumers   | 53   | 43             | 33             | 25             | 43             | 43             | 25             | 25             | 25             |                             |  |
|  | 1024 MB RAM, each 2 W, max. 2 pcs.   |  |                |                |                |                |                |                |                |                |                             |  |
|  | 2048 MB RAM, each 2.5 W, max. 2 pcs.   |  |                |                |                |                |                |                |                |                |                             |  |
|  | 4096 MB RAM, each 3 W, max. 2 pcs.   |  |                |                |                |                |                |                |                |                |                             |  |
|  | 8192 MB RAM, each 3.5 W, max. 2 pcs.   |  |                |                |                |                |                |                |                |                |                             |  |
|  | Fan kit, optional  | 3  | 3              | 3              | 3              | 3              | 3              | 3              | 3              | 3              |                             |  |
|  | External consumers, optional   | 10   | 10             | 10             | 10             | 10             | 10             | 10             | 10             | 10             |                             |  |
|  | Power consumption of PCI cards, optional<br>(max. 3 W without fan kit, max. 6 W with fan kit) <sup>1)</sup>      |  |                |                |                |                |                |                |                |                |                             |  |
|  | Power consumption of PCIe x8 cards, optional<br>(max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup> |  |                |                |                |                |                |                |                |                |                             |  |
|  | Consumers $\Sigma$   |  |                |                |                |                |                |                |                |                |                             |  |
|  | Maximum possible at +5V  |  |                |                |                |                |                |                |                | 45             |                             |  |
|  | +5 V   | Slide-in compact (HDD / SSD)   | 4              | 4              | 4              | 4              | 4              | 4              | 4              | 4              | 4                           |  |
|  |  | 5x USB peripherals, each max. 5 W  |                |                |                |                |                |                |                |                |                             |  |
|  |  | Interface option, optional <sup>2)</sup> , max. 2 connections  |                |                |                |                |                |                |                |                |                             |  |
|  |  | External consumers, optional   | 5              | 5              | 5              | 5              | 5              | 5              | 5              | 5              | 5                           |  |
|  |  | Power consumption of PCI cards, optional<br>(max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup> |                |                |                |                |                |                |                |                |                             |  |
| Maximum possible at -12V   |  |  |                |                |                |                |                |                | 1.2            |                |                             |  |
| -12 V  |  | Power consumption of PCI cards, optional<br>(max. 1.2 W with or without fan kit) <sup>1)</sup>               |                |                |                |                |                |                |                |                |                             |  |
|  | Consumers -12 V $\Sigma$   |  |                |                |                |                |                |                |                |                |                             |  |
| Consumers +5 V $\Sigma$  |  |  |                |                |                |                |                |                |                |                |                             |  |
| 3V3  | Maximum possible at 3V3  |  |                |                |                |                |                |                |                | 30             |                             |  |
|  | System unit, permanent consumers   | 5  | 5              | 5              | 5              | 5              | 5              | 5              | 5              | 5              |                             |  |
|  | CFast card   | 1  | 1              | 1              | 1              | 1              | 1              | 1              | 1              | 1              |                             |  |
|  | Interface option, optional <sup>2)</sup>   |  |                |                |                |                |                |                |                |                |                             |  |
|  | Power consumption of PCI cards, optional<br>(max. 3 W without fan kit, max. 15 W with fan kit) <sup>1)</sup>     |  |                |                |                |                |                |                |                |                |                             |  |
|  | Power consumption of PCIe x8 cards, optional<br>(max. 3 W without fan kit, max. 10 W with fan kit) <sup>1)</sup> |  |                |                |                |                |                |                |                |                |                             |  |
|  | Consumers 3V3 $\Sigma$   |  |                |                |                |                |                |                |                |                |                             |  |
| Total power supply, permanent consumers $\Sigma$   |  |  |                |                |                |                |                |                |                |                |                             |  |

1) The total performance of one PCI/PCIe card per PCI slot (= sum of the power consumption for each voltage range) may not exceed the limits stated for operation with or without a fan kit.

2) Power ratings for the interface options can be found in the table below.

Table 11: Power calculation table - 1-slot APC variant

| Information:  |   | QM170/HM170 CPU board   |                         |                         |                         |                         | Current system              |    |
|---|---|---|-------------------------|-------------------------|-------------------------|-------------------------|-----------------------------|----|
|   |   | 5PC900.TS17-00  | 5PC900.TS17-01<br>@2700 | 5PC900.TS17-01<br>@1900 | 5PC900.TS17-02<br>@2400 | 5PC900.TS17-02<br>@1700 | Enter values in this column |    |
| All values in <b>watts</b><br>The values for the <b>suppliers</b> are maximum values. The values for the <b>consumers</b> are average maximum values but not peak values. |   | Total power supply power (maximum)  |                         |                         |                         |                         | 130                         |    |
| Total power supply +12 V  | Maximum possible  |   |                         |                         |                         |                         | 130                         |    |
|   | CPU board, permanent consumers  | 63  | 43                      | 27                      | 38                      | 25                      |                             |    |
|   | 4096 MB RAM, each 2.5 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |    |
|   | 8192 MB RAM, each 3 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |    |
|   | 16 GB RAM, each 3.5 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |    |
|   | Fan kit, optional   | 3   | 3                       | 3                       | 3                       | 3                       |                             |    |
|   | UPS IF option 5AC901.IUPS-00 during operation, optional   | 30  | 30                      | 30                      | 30                      | 30                      |                             |    |
|   | UPS IF option 5AC901.IUPS-01 during operation, optional   | 25  | 25                      | 25                      | 25                      | 25                      |                             |    |
|   | External consumers, optional  | 10  | 10                      | 10                      | 10                      | 10                      |                             |    |
|   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 6 W with fan kit) <sup>1)</sup>      |   |                         |                         |                         |                         |                             |    |
|   | PCIe x8 card power rating, optional<br>(max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup> |   |                         |                         |                         |                         |                             |    |
|   | Maximum possible at -12 V   |   |                         |                         |                         |                         | 1.2                         |    |
|   | -12 V   | PCI card power rating, optional<br>(max. 1.2 W with or without fan kit) <sup>1)</sup>                   |                         |                         |                         |                         |                             |    |
|   |   | Consumers -12 V ∑   |                         |                         |                         |                         |                             |    |
|   |   | Consumers ∑   |                         |                         |                         |                         |                             |    |
|   | +5 V  | Maximum possible at +5 V  |                         |                         |                         |                         |                             | 45 |
|   |   | Slide-in compact (HDD / SSD)  | 4                       | 4                       | 4                       | 4                       | 4                           |    |
|   |   | 5x USB peripherals, each max. 5 W   |                         |                         |                         |                         |                             |    |
|   |   | Interface option, optional <sup>2)</sup> , max. 2 connections   |                         |                         |                         |                         |                             |    |
|   |   | External consumers, optional  | 5                       | 5                       | 5                       | 5                       | 5                           |    |
|   |   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup>     |                         |                         |                         |                         |                             |    |
|   |   | Consumers +5 V ∑  |                         |                         |                         |                         |                             |    |
|   | 3V3   | Maximum possible at 3V3   |                         |                         |                         |                         |                             | 30 |
|   |   | System unit, permanent consumers  | 5                       | 5                       | 5                       | 5                       | 5                           |    |
|   |   | CFast card  | 1                       | 1                       | 1                       | 1                       | 1                           |    |
|   |   | Interface option, optional <sup>2)</sup>  |                         |                         |                         |                         |                             |    |
|   |   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 15 W with fan kit) <sup>1)</sup>     |                         |                         |                         |                         |                             |    |
|   |   | PCIe x8 card power rating, optional<br>(max. 3 W without fan kit, max. 10 W with fan kit) <sup>1)</sup> |                         |                         |                         |                         |                             |    |
|   |   | Consumers 3V3 ∑   |                         |                         |                         |                         |                             |    |
| Total power supply, consumers ∑   |   |   |                         |                         |                         |                         |                             |    |

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

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

Table 12: 1-slot APC variant - Power calculation table

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  | 3V3   | 12 V  | Power consumption<br>Total |
|-----------------------------|---------------------------|-------|-------|-------|----------------------------|
| <b>Interface option</b>     |                           |       |       |       |                            |
| RS232/RS422/RS485 IF option | 5AC901.I485-00            | 1 W   | -     | -     | 1 W                        |
| CAN IF option               | 5AC901.ICAN-00            | 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                        |
| <b>Monitor/Panel option</b> |                           |       |       |       |                            |
| DisplayPort transmitter     | 5AC901.LDPO-00            | -     | 0.2 W | -     | 0.2 W                      |
| SDL/DVI transmitter         | 5AC901.LSDL-00            | -     | 1 W   | -     | 1 W                        |

Table 13: Interface and monitor/panel options - Power rating table

| Component             | Model number   | +5 V  | 3V3   | 12 V | Power consumption<br>Total |
|-----------------------|----------------|-------|-------|------|----------------------------|
| SDL3 transmitter      | 5AC901.LSD3-00 | 2.2 W | 1.8 W | -    | 4 W                        |
| <b>PCIe cards</b>     |                |       |       |      |                            |
| PCIe x1 Ethernet card | 5ACPCE.ETH1-00 | -     | 1 W   | -    | 1 W                        |
| PCIe x4 Ethernet card | 5ACPCE.ETH4-00 | -     | 4 W   | -    | 4 W                        |

Table 13: [Interface](#) and monitor/panel options - Power rating table

## 2.3.3 Power calculation with 5PC910.SX02-00

**Information:**

The power supply's maximum total power of 130 watts must not be exceeded.

| Information:   |   | CPU board   |                |                |                |                |                |                |                | Current system |                             |
|--|---|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------------------|
|  |   | 5PC900.TS77-00  | 5PC900.TS77-01 | 5PC900.TS77-02 | 5PC900.TS77-03 | 5PC900.TS77-04 | 5PC900.TS77-05 | 5PC900.TS77-06 | 5PC900.TS77-07 | 5PC900.TS77-08 | Enter values in this column |
| All values are specified in <b>watts</b> .<br>The values specified for the <b>producers</b> are maximum values. The values for the <b>consumers</b> are average maximum values, but not peak values. |   | Total power supply power (maximum)  |                |                |                |                |                |                |                |                | 130                         |
| Total power supply +12 V   | Maximum possible  |   |                |                |                |                |                |                |                | 130            |                             |
|  | CPU board, permanent consumers  | 53  | 43             | 33             | 25             | 43             | 43             | 25             | 25             | 25             |                             |
|  | 1024 MB RAM, each 2 W, max. 2 pcs.  |   |                |                |                |                |                |                |                |                |                             |
|  | 2048 MB RAM, each 2.5 W, max. 2 pcs.  |   |                |                |                |                |                |                |                |                |                             |
|  | 4096 MB RAM, each 3 W, max. 2 pcs.  |   |                |                |                |                |                |                |                |                |                             |
|  | 8192 MB RAM, each 3.5 W, max. 2 pcs.  |   |                |                |                |                |                |                |                |                |                             |
|  | Fan kit, optional   | 3   | 3              | 3              | 3              | 3              | 3              | 3              | 3              | 3              |                             |
|  | External consumers, optional  | 10  | 10             | 10             | 10             | 10             | 10             | 10             | 10             | 10             |                             |
|  | Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 6 W with fan kit) <sup>1)</sup>      |   |                |                |                |                |                |                |                |                |                             |
|  | Power consumption of PCIe x8 cards, optional (max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup> |   |                |                |                |                |                |                |                |                |                             |
| Consumers Σ  |   |   |                |                |                |                |                |                |                |                |                             |
| +5 V   | Maximum possible at +5V   |   |                |                |                |                |                |                |                | 45             |                             |
|  | Slide-in compact (HDD / SSD)  | 4   | 4              | 4              | 4              | 4              | 4              | 4              | 4              | 4              |                             |
|  | Slide-in (DVD / ...)  | 4   | 4              | 4              | 4              | 4              | 4              | 4              | 4              | 4              |                             |
|  | 5x USB peripherals, each max. 5 W   |   |                |                |                |                |                |                |                |                |                             |
|  | Interface option, optional <sup>2)</sup> , max. 2 connections   |   |                |                |                |                |                |                |                |                |                             |
|  | Monitor/Panel option, optional <sup>2)</sup>  |   |                |                |                |                |                |                |                |                |                             |
|  | External consumers, optional  | 5   | 5              | 5              | 5              | 5              | 5              | 5              | 5              | 5              |                             |
|  | Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup>     |   |                |                |                |                |                |                |                |                |                             |
|  | Maximum possible at -12V  |   |                |                |                |                |                |                |                | 1.2            |                             |
|  | -12 V   | Power consumption of PCI cards, optional (max. 1.2 W with or without fan kit) <sup>1)</sup> |                |                |                |                |                |                |                |                |                             |
| Consumers -12 V Σ  |   |   |                |                |                |                |                |                |                |                |                             |
| Consumers +5 V Σ   |   |   |                |                |                |                |                |                |                |                |                             |
| 3V3  | Maximum possible at 3V3   |   |                |                |                |                |                |                |                | 30             |                             |
|  | System unit, permanent consumers  | 5   | 5              | 5              | 5              | 5              | 5              | 5              | 5              | 5              |                             |
|  | CFast card  | 1   | 1              | 1              | 1              | 1              | 1              | 1              | 1              | 1              |                             |
|  | Interface option, optional <sup>2)</sup>  |   |                |                |                |                |                |                |                |                |                             |
|  | Monitor/Panel option, optional <sup>2)</sup>  |   |                |                |                |                |                |                |                |                |                             |
|  | Power consumption of PCI cards, optional (max. 3 W without fan kit, max. 15 W with fan kit) <sup>1)</sup>     |   |                |                |                |                |                |                |                |                |                             |
|  | Power consumption of PCIe x8 cards, optional (max. 3 W without fan kit, max. 10 W with fan kit) <sup>1)</sup> |   |                |                |                |                |                |                |                |                |                             |
|  | Consumers 3V3 Σ   |   |                |                |                |                |                |                |                |                |                             |
| Total power supply, permanent consumers Σ  |   |   |                |                |                |                |                |                |                |                |                             |

1) The total performance of one PCI/PCIe card per PCI slot (= sum of the power consumption for each voltage range) may not exceed the limits stated for operation with or without a fan kit.

2) Power ratings for the interface and monitor/panel options can be found in the table below.

Table 14: Power calculation table - 2-slot APC variant

| Information:  |   | QM170/HM170 CPU board   |                         |                         |                         |                         | Current system              |     |
|---|---|---|-------------------------|-------------------------|-------------------------|-------------------------|-----------------------------|-----|
|   |   | 5PC900.TS17-00  | 5PC900.TS17-01<br>@2700 | 5PC900.TS17-01<br>@1900 | 5PC900.TS17-02<br>@2400 | 5PC900.TS17-02<br>@1700 | Enter values in this column |     |
| All values in <b>watts</b><br>The values for the <b>suppliers</b> are maximum values. The values for the <b>consumers</b> are average maximum values but not peak values. |   | Total power supply power (maximum)  |                         |                         |                         |                         | 130                         |     |
| Total power supply +12 V  | Maximum possible  |   |                         |                         |                         |                         | 130                         |     |
|   | CPU board, permanent consumers  | 63  | 43                      | 27                      | 38                      | 25                      |                             |     |
|   | 4096 MB RAM, each 2.5 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |     |
|   | 8192 MB RAM, each 3 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |     |
|   | 16 GB RAM, each 3.5 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |     |
|   | Fan kit, optional   | 3   | 3                       | 3                       | 3                       | 3                       |                             |     |
|   | UPS IF option 5AC901.IUPS-00 during operation, optional   | 30  | 30                      | 30                      | 30                      | 30                      |                             |     |
|   | UPS IF option 5AC901.IUPS-01 during operation, optional   | 25  | 25                      | 25                      | 25                      | 25                      |                             |     |
|   | External consumers, optional  | 10  | 10                      | 10                      | 10                      | 10                      |                             |     |
|   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 6 W with fan kit) <sup>1)</sup>      |   |                         |                         |                         |                         |                             |     |
|   | PCIe x8 card power rating, optional<br>(max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup> |   |                         |                         |                         |                         |                             |     |
|   | -12 V   | Maximum possible at -12 V   |                         |                         |                         |                         |                             | 1.2 |
|   |   | PCI card power rating, optional<br>(max. 1.2 W with or without fan kit) <sup>1)</sup>                   |                         |                         |                         |                         |                             |     |
|   |   | Consumers -12 V ∑   |                         |                         |                         |                         |                             |     |
|   | Consumers ∑   |   |                         |                         |                         |                         |                             |     |
|   | +5 V  | Maximum possible at +5 V  |                         |                         |                         |                         |                             | 45  |
|   |   | Slide-in compact (HDD / SSD)  | 4                       | 4                       | 4                       | 4                       | 4                           |     |
|   |   | Slide-in (DVD / ...)  | 4                       | 4                       | 4                       | 4                       | 4                           |     |
|   |   | 5x USB peripherals, each max. 5 W   |                         |                         |                         |                         |                             |     |
|   |   | Interface option, optional <sup>2)</sup> , max. 2 connections   |                         |                         |                         |                         |                             |     |
|   |   | Monitor/Panel option, optional <sup>2)</sup>  |                         |                         |                         |                         |                             |     |
|   |   | External consumers, optional  | 5                       | 5                       | 5                       | 5                       | 5                           |     |
|   |   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup>     |                         |                         |                         |                         |                             |     |
|   |   | Consumers +5 V ∑  |                         |                         |                         |                         |                             |     |
|   | 3V3   | Maximum possible at 3V3   |                         |                         |                         |                         |                             | 30  |
|   |   | System unit, permanent consumers  | 5                       | 5                       | 5                       | 5                       | 5                           |     |
|   |   | CFast card  | 1                       | 1                       | 1                       | 1                       | 1                           |     |
|   |   | Interface option, optional <sup>2)</sup>  |                         |                         |                         |                         |                             |     |
|   |   | Monitor/Panel option, optional <sup>2)</sup>  |                         |                         |                         |                         |                             |     |
|   |   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 15 W with fan kit) <sup>1)</sup>     |                         |                         |                         |                         |                             |     |
|   |   | PCIe x8 card power rating, optional<br>(max. 3 W without fan kit, max. 10 W with fan kit) <sup>1)</sup> |                         |                         |                         |                         |                             |     |
| Consumers 3V3 ∑   |   |   |                         |                         |                         |                         |                             |     |
| Total power supply, consumers ∑   |   |   |                         |                         |                         |                         |                             |     |

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

2) Power ratings for [interface](#) and monitor/panel options are listed in the table below.

Table 15: 2-slot [APC](#) variant - Power calculation table

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  | 3V3   | 12 V  | Power consumption<br>Total |
|-----------------------------|---------------------------|-------|-------|-------|----------------------------|
| <b>Interface option</b>     |                           |       |       |       |                            |
| RS232/RS422/RS485 IF option | 5AC901.I485-00            | 1 W   | -     | -     | 1 W                        |
| CAN IF option               | 5AC901.ICAN-00            | 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                        |
| <b>Monitor/Panel option</b> |                           |       |       |       |                            |
| DisplayPort transmitter     | 5AC901.LDPO-00            | -     | 0.2 W | -     | 0.2 W                      |
| SDL/DVI transmitter         | 5AC901.LSDL-00            | -     | 1 W   | -     | 1 W                        |

Table 16: [Interface](#) and monitor/panel options - Power rating table



| Component             | Model number   | +5 V  | 3V3   | 12 V | Power consumption<br>Total |
|-----------------------|----------------|-------|-------|------|----------------------------|
| SDL3 transmitter      | 5AC901.LSD3-00 | 2.2 W | 1.8 W | -    | 4 W                        |
| <b>PCIe cards</b>     |                |       |       |      |                            |
| PCIe x1 Ethernet card | 5ACPCE.ETH1-00 | -     | 1 W   | -    | 1 W                        |
| PCIe x4 Ethernet card | 5ACPCE.ETH4-00 | -     | 4 W   | -    | 4 W                        |

Table 16: [Interface](#) and monitor/panel options - Power rating table

### 2.3.4 Power calculation with 5PC910.SX05-00

#### Information:

The power supply's maximum total power of 130 watts must not be exceeded.

| Information:  |  | QM77/HM76 CPU board  |                              |                         |                |                |                |                |                |                |                | Current system |                             |    |
|---|--|--|------------------------------|-------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------------------|----|
| All values in <b>watts</b><br>The values for the <b>suppliers</b> are maximum values. The values for the <b>consumers</b> are average maximum values but not peak values. |  | 5PC900.TS77-00   | 5PC900.TS77-01               | 5PC900.TS77-02          | 5PC900.TS77-03 | 5PC900.TS77-04 | 5PC900.TS77-05 | 5PC900.TS77-06 | 5PC900.TS77-07 | 5PC900.TS77-08 | 5PC900.TS77-09 | 5PC900.TS77-10 | Enter values in this column |    |
| Total power supply power (maximum)  |  |  |                              |                         |                |                |                |                |                |                |                |                | 130                         |    |
| Total power supply +12 V  | -12 V  | Maximum possible   |                              |                         |                |                |                |                |                |                |                |                | 130                         |    |
|   |  | CPU board, permanent consumers   | 53                           | 43                      | 33             | 25             | 43             | 43             | 25             | 25             | 43             | 25             |                             |    |
|   |  | 1024 MB RAM, each 2 W, max. 2 pcs.   |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   |  | 2048 MB RAM, each 2.5 W, max. 2 pcs.   |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   |  | 4096 MB RAM, each 3 W, max. 2 pcs.   |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   |  | 8192 MB RAM, each 3.5 W, max. 2 pcs.   |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   |  | Fan kit, optional  | 5                            | 5                       | 5              | 5              | 5              | 5              | 5              | 5              | 5              | 5              |                             |    |
|   |  | UPS IF option 5AC901.IUPS-00 during operation, optional  | 30                           | 30                      | 30             | 30             | 30             | 30             | 30             | 30             | 30             | 30             |                             |    |
|   |  | UPS IF option 5AC901.IUPS-01 during operation, optional  | 25                           | 25                      | 25             | 25             | 25             | 25             | 25             | 25             | 25             | 25             |                             |    |
|   |  | External consumers, optional   | 10                           | 10                      | 10             | 10             | 10             | 10             | 10             | 10             | 10             | 10             |                             |    |
|   |  | PCI card power rating, optional (max. 3 W without fan kit, max. 6 W with fan kit) <sup>1)</sup>      |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   |  | PCIe x8 card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup> |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   | Maximum possible at -12 V  |  |                              |                         |                |                |                |                |                |                |                | 1.2            |                             |    |
|   | PCI card power rating, optional (max. 1.2 W with or without fan kit) <sup>1)</sup>                   |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   | Consumers -12 V ∑  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   | Consumers ∑  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   | +5 V   | +5 V   | Maximum possible at +5 V     |                         |                |                |                |                |                |                |                |                |                             | 45 |
|   |  |  | Slide-in compact (HDD / SSD) | 4                       | 4              | 4              | 4              | 4              | 4              | 4              | 4              | 4              | 4                           |    |
| Slide-in (DVD / ...)  |  |  | 4                            | 4                       | 4              | 4              | 4              | 4              | 4              | 4              | 4              | 4              |                             |    |
| 5x USB peripherals, each max. 5 W   |  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
| Interface option, optional <sup>2)</sup> , max. 2 connections   |  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
| Monitor/Panel option, optional <sup>2)</sup>  |  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
| External consumers, optional  |  |  | 5                            | 5                       | 5              | 5              | 5              | 5              | 5              | 5              | 5              | 5              |                             |    |
| PCI card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup>  |  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
| Consumers +5 V ∑  |  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
| 3V3   |  |  | 3V3                          | Maximum possible at 3V3 |                |                |                |                |                |                |                |                |                             |    |
|   | System unit, permanent consumers   | 5  |                              | 5                       | 5              | 5              | 5              | 5              | 5              | 5              | 5              | 5              |                             |    |
|   | CFast card   | 1  |                              | 1                       | 1              | 1              | 1              | 1              | 1              | 1              | 1              | 1              |                             |    |
|   | Interface option, optional <sup>2)</sup>   |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   | Monitor/Panel option, optional <sup>2)</sup>   |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   | PCI card power rating, optional (max. 3 W without fan kit, max. 15 W with fan kit) <sup>1)</sup>     |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
|   | PCIe x8 card power rating, optional (max. 3 W without fan kit, max. 10 W with fan kit) <sup>1)</sup> |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
| Consumers 3V3 ∑   |  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |
| Total power supply, consumers ∑   |  |  |                              |                         |                |                |                |                |                |                |                |                |                             |    |

1) The total performance of one PCI/PCIe card per slot (= sum of the power consumption for each voltage range) is not permitted to exceed the limits stated for operation with or without a fan kit.

2) Power ratings for interface and monitor/panel options are listed in the table below.

Table 17: 5-slot APC variant - Power calculation table

| Information:<br>All values in <b>watts</b><br>The values for the <b>suppliers</b> are maximum values. The values for the <b>consumers</b> are average maximum values but not peak values. |   | QM170/HM170 CPU board   |                         |                         |                         |                         | Current system              |     |
|---|---|---|-------------------------|-------------------------|-------------------------|-------------------------|-----------------------------|-----|
|   |   | 5PC900.TS77-00  | 5PC900.TS17-01<br>@2700 | 5PC900.TS17-01<br>@1900 | 5PC900.TS17-02<br>@2400 | 5PC900.TS17-02<br>@1700 | Enter values in this column |     |
|   |   | Total power supply power (maximum)  |                         |                         |                         |                         | 130                         |     |
| Total power supply +12 V  | Maximum possible  |   |                         |                         |                         |                         | 130                         |     |
|   | CPU board, permanent consumers  | 63  | 43                      | 27                      | 38                      | 25                      |                             |     |
|   | 4096 MB RAM, each 2.5 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |     |
|   | 8192 MB RAM, each 3 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |     |
|   | 16 GB RAM, each 3.5 W, max. 2 pcs.  |   |                         |                         |                         |                         |                             |     |
|   | Fan kit, optional   | 5   | 5                       | 5                       | 5                       | 5                       |                             |     |
|   | UPS IF option 5AC901.IUPS-00 during operation, optional   | 30  | 30                      | 30                      | 30                      | 30                      |                             |     |
|   | UPS IF option 5AC901.IUPS-01 during operation, optional   | 25  | 25                      | 25                      | 25                      | 25                      |                             |     |
|   | External consumers, optional  | 10  | 10                      | 10                      | 10                      | 10                      |                             |     |
|   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 6 W with fan kit) <sup>1)</sup>      |   |                         |                         |                         |                         |                             |     |
|   | PCIe x8 card power rating, optional<br>(max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup> |   |                         |                         |                         |                         |                             |     |
|   | -12 V   | Maximum possible at -12 V   |                         |                         |                         |                         |                             | 1.2 |
|   |   | PCI card power rating, optional<br>(max. 1.2 W with or without fan kit) <sup>1)</sup>                   |                         |                         |                         |                         |                             |     |
|   |   | Consumers -12 V ∑   |                         |                         |                         |                         |                             |     |
|   |   | Consumers ∑   |                         |                         |                         |                         |                             |     |
|   | +5 V  | Maximum possible at +5 V  |                         |                         |                         |                         |                             | 45  |
|   |   | Slide-in compact (HDD / SSD)  | 4                       | 4                       | 4                       | 4                       | 4                           |     |
|   |   | Slide-in (DVD / ...)  | 4                       | 4                       | 4                       | 4                       | 4                           |     |
|   |   | 5x USB peripherals, each max. 5 W   |                         |                         |                         |                         |                             |     |
|   |   | Interface option, optional <sup>2)</sup> , max. 2 connections   |                         |                         |                         |                         |                             |     |
|   |   | Monitor/Panel option, optional <sup>2)</sup>  |                         |                         |                         |                         |                             |     |
|   |   | External consumers, optional  | 5                       | 5                       | 5                       | 5                       | 5                           |     |
|   |   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 20 W with fan kit) <sup>1)</sup>     |                         |                         |                         |                         |                             |     |
|   |   | Consumers +5 V ∑  |                         |                         |                         |                         |                             |     |
|   | 3V3   | Maximum possible at 3V3   |                         |                         |                         |                         |                             | 30  |
|   |   | System unit, permanent consumers  | 5                       | 5                       | 5                       | 5                       | 5                           |     |
|   |   | CFast card  | 1                       | 1                       | 1                       | 1                       | 1                           |     |
|   |   | Interface option, optional <sup>2)</sup>  |                         |                         |                         |                         |                             |     |
|   |   | Monitor/Panel option, optional <sup>2)</sup>  |                         |                         |                         |                         |                             |     |
|   |   | PCI card power rating, optional<br>(max. 3 W without fan kit, max. 15 W with fan kit) <sup>1)</sup>     |                         |                         |                         |                         |                             |     |
|   |   | PCIe x8 card power rating, optional<br>(max. 3 W without fan kit, max. 10 W with fan kit) <sup>1)</sup> |                         |                         |                         |                         |                             |     |
|   |   | Consumers 3V3 ∑   |                         |                         |                         |                         |                             |     |
| Total power supply, consumers ∑   |   |   |                         |                         |                         |                         |                             |     |

1) The total performance of one PCI/PCIe card per slot (= sum of the power consumption for each voltage range) is not permitted to exceed the limits stated for operation with or without a fan kit.

2) Power ratings for **interface** and monitor/panel options are listed in the table below.

Table 18: 5-slot **APC** variant - Power calculation table

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  | 3V3   | 12 V  | Power consumption<br>Total |
|-----------------------------|---------------------------|-------|-------|-------|----------------------------|
| <b>Interface option</b>     |                           |       |       |       |                            |
| RS232/RS422/RS485 IF option | 5AC901.I485-00            | 1 W   | -     | -     | 1 W                        |
| CAN IF option               | 5AC901.ICAN-00            | 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                        |
| <b>Monitor/Panel option</b> |                           |       |       |       |                            |
| DisplayPort transmitter     | 5AC901.LDPO-00            | -     | 0.2 W | -     | 0.2 W                      |
| SDL/DVI transmitter         | 5AC901.LSDL-00            | -     | 1 W   | -     | 1 W                        |

Table 19: **Interface** and monitor/panel options - Power rating table

| Component             | Model number   | +5 V  | 3V3   | 12 V | Power consumption<br>Total |
|-----------------------|----------------|-------|-------|------|----------------------------|
| SDL3 transmitter      | 5AC901.LSD3-00 | 2.2 W | 1.8 W | -    | 4 W                        |
| <b>PCIe cards</b>     |                |       |       |      |                            |
| PCIe x1 Ethernet card | 5ACPCE.ETH1-00 | -     | 1 W   | -    | 1 W                        |
| PCIe x4 Ethernet card | 5ACPCE.ETH4-00 | -     | 4 W   | -    | 4 W                        |

Table 19: [Interface](#) and monitor/panel options - Power rating table

## 2.4 Serial number sticker

A unique serial number sticker 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 (model number, name, revision, serial number, delivery date and duration of warranty).

A sticker with detailed information about the installed components **can** also be found on the back of the mounting plate.

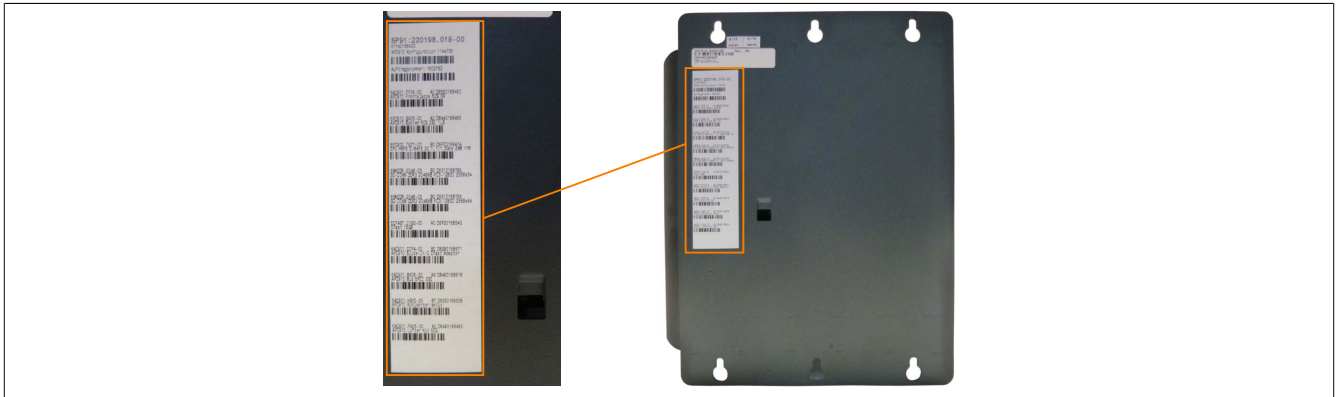


Figure 6: Serial number sticker (back)

The serial number represents all of the individual components built into the system (serial number, model number, revision, delivery date and duration of warranty). This information **can** also be found on the B&R website by entering the serial number of the complete system in the search field tab (after selecting the "Serial number" option) at the top of the website ([www.br-automation.com](http://www.br-automation.com)). The search provides a detailed list of installed components.

Enter serial number e.g. D6DA0168430

Switch to the option "Serial number"

List of installed components shown after searching for a serial number

| SERIAL      | MATERIAL           | REVISION | LIEFERUNG | GEWÄHRLEISTUNGSSENDE |
|-------------|--------------------|----------|-----------|----------------------|
| D88D0168423 | 5P91.220198.001-00 | A0       | *N/V      | *N/A                 |
| AB240174146 | 5MMDDR.2048-02     | C0       | *N/V      | *N/A                 |
| AB240174147 | 5MMDDR.2048-02     | C0       | *N/V      | *N/A                 |
| D6E50168438 | 5AC901.HS00-00     | A0       | *N/V      | *N/A                 |
| D6DD0168447 | 5AC901.BX01-01     | A0       | *N/V      | *N/A                 |
| D6F80168425 | 5PC900.TS77-03     | A0       | *N/V      | *N/A                 |
| D6DA0168430 | 5PC910.SX01-00     | A0       | *N/V      | *N/A                 |
| D7540168426 | 5AC901.CHDD-00     | A0       | *N/V      | *N/A                 |

Figure 7: Searching for a serial number on the B&R website

## 2.5 Block diagrams

The following block diagrams illustrate the simplified structure of system units with a CPU board in relation to the various bus units.

### 2.5.1 5PC910.SX01-00 system unit + 5AC901.BX01-00 bus unit

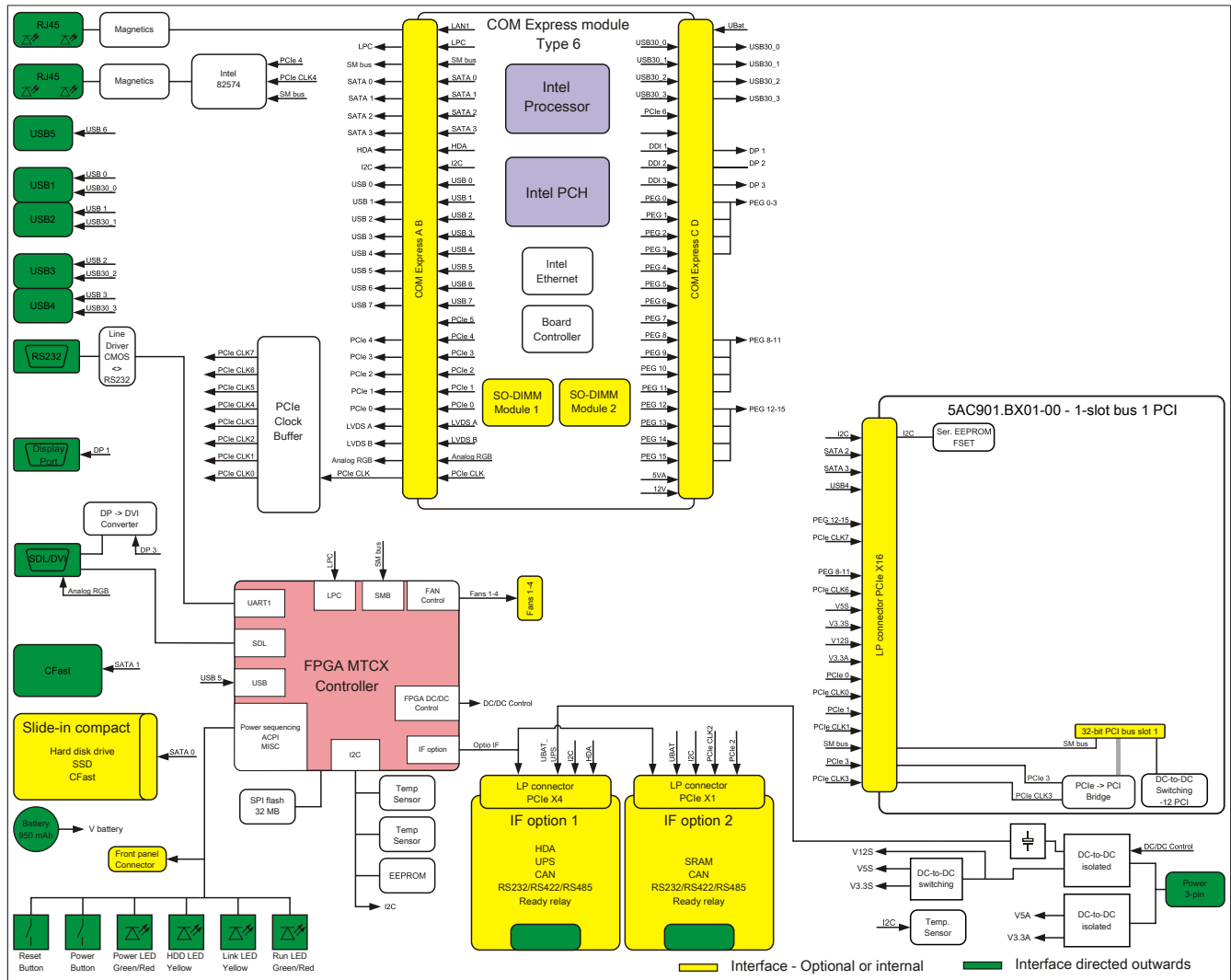


Figure 8: 5PC910.SX01-00 system unit + 5AC901.BX01-00 bus unit - Block diagram

## 2.5.2 5PC910.SX01-00 system unit + 5AC901.BX01-01 bus unit

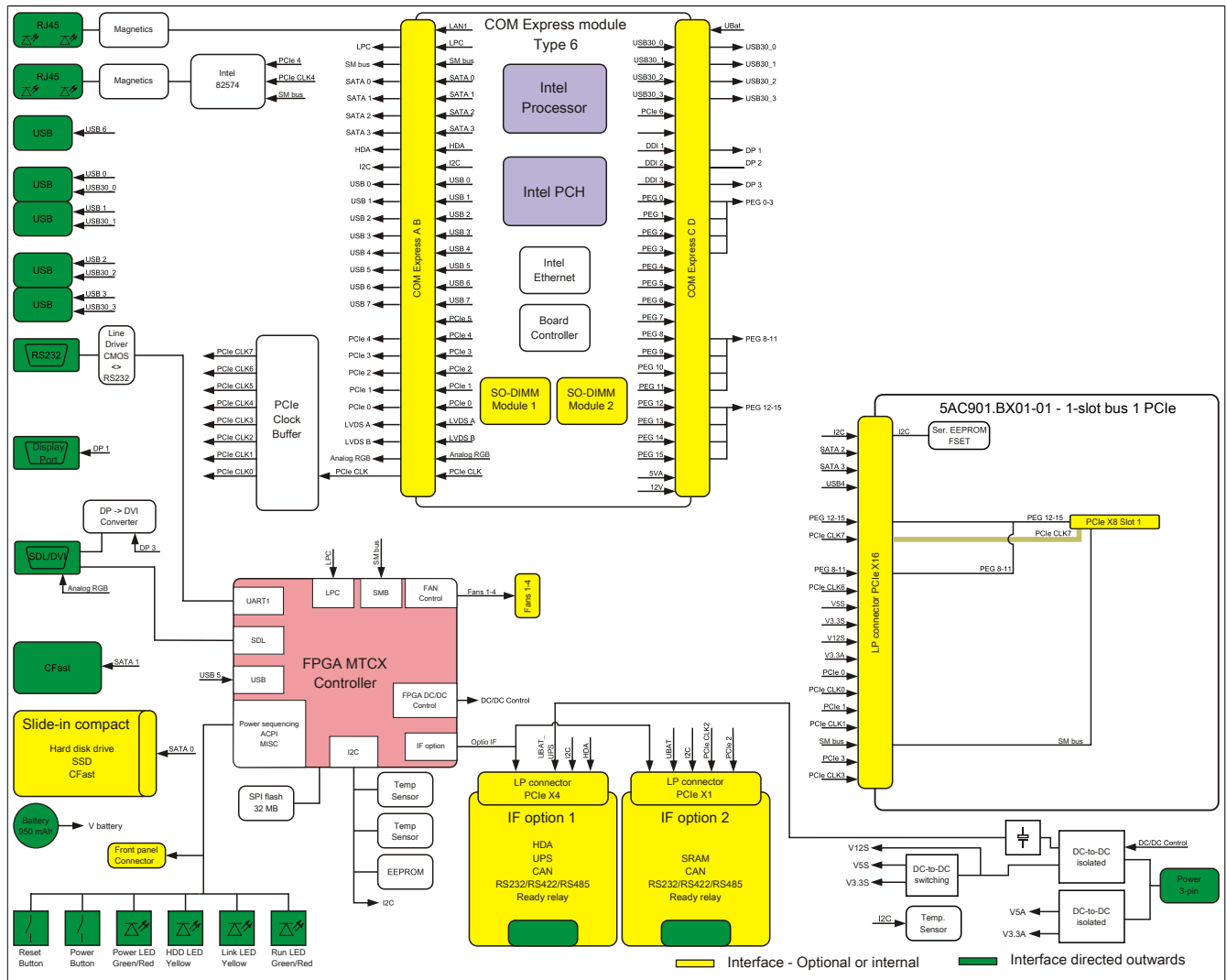


Figure 9: 5PC910.SX01-00 system unit + 5AC901.BX01-01 bus unit - Block diagram

### 2.5.3 5PC910.SX02-00 system unit + 5AC901.BX02-00 bus unit

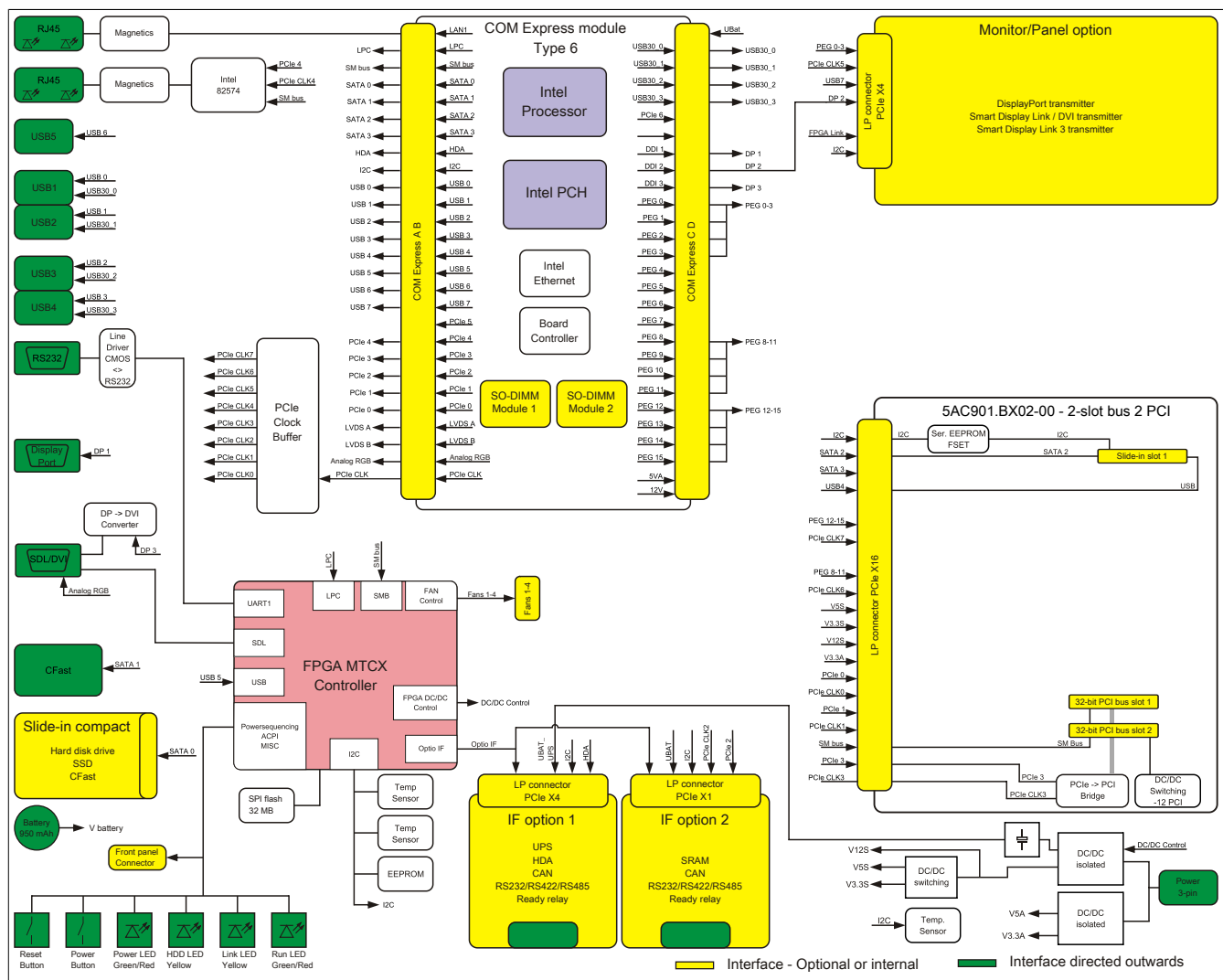


Figure 10: 5PC910.SX02-00 system unit + 5AC901.BX02-00 bus unit - Block diagram



#### 2.5.4 5PC910.SX02-00 system unit + 5AC901.BX02-01 bus unit

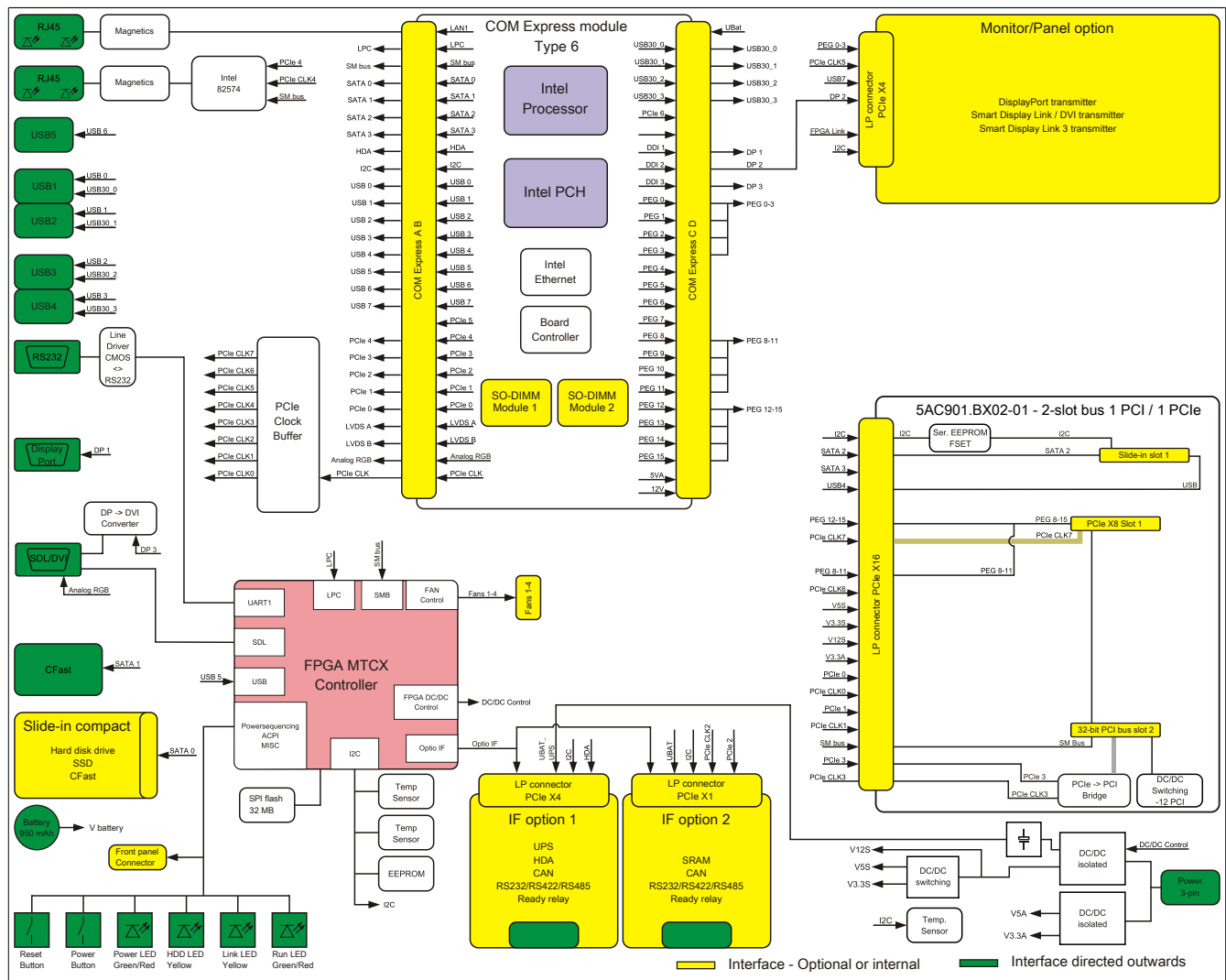


Figure 11: 5PC910.SX02-00 system unit + 5AC901.BX02-01 bus unit - Block diagram

### 2.5.5 5PC910.SX02-00 system unit + 5AC901.BX02-02 bus unit

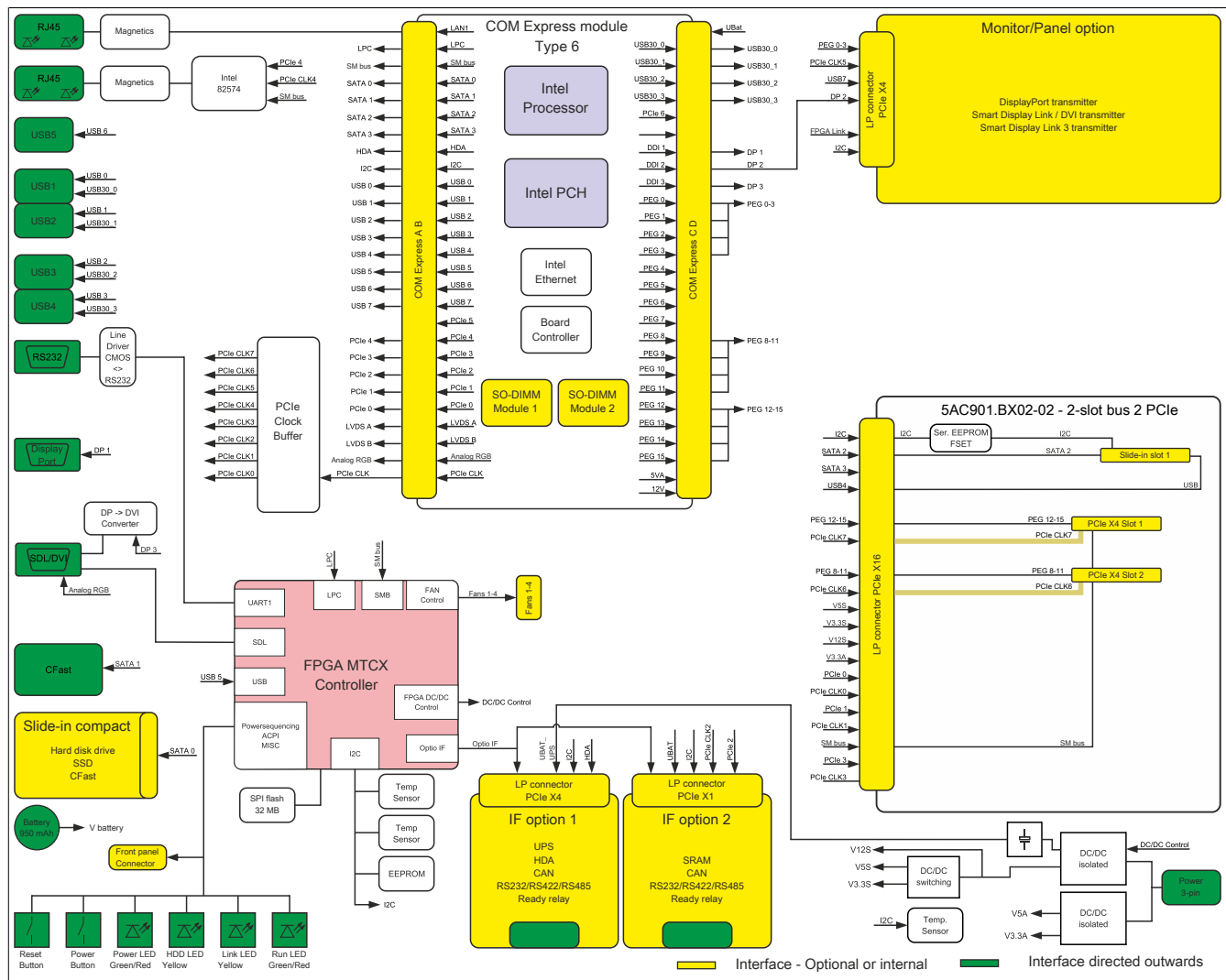


Figure 12: 5PC910.SX02-00 system unit + 5AC901.BX02-02 bus unit - Block diagram

### 2.5.6 5PC910.SX05-00 system unit + 5AC901.BX05-00 bus unit

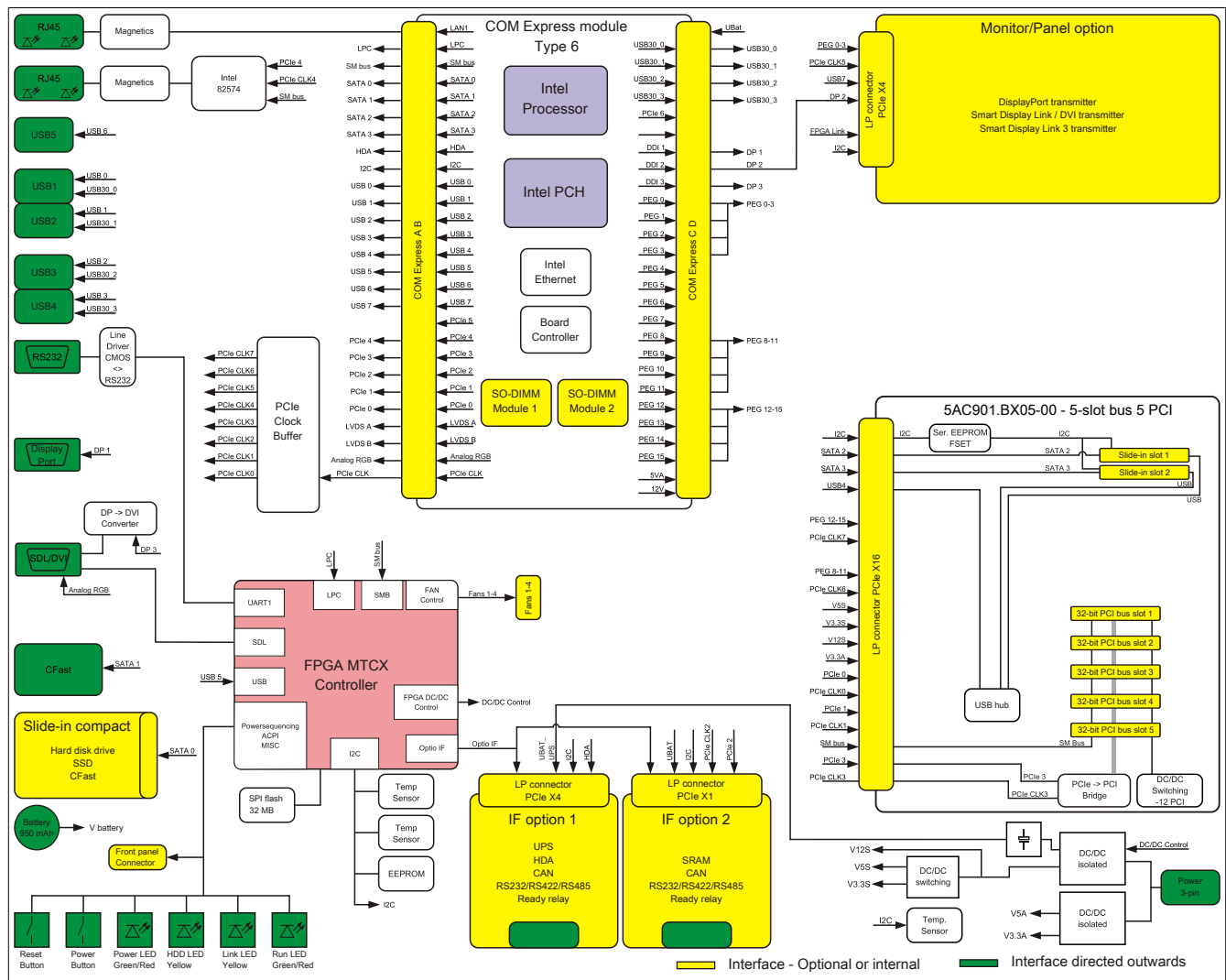


Figure 13: 5PC910.SX05-00 system unit + 5AC901.BX05-00 bus unit - Block diagram

## 2.5.7 5PC910.SX05-00 system unit + 5AC901.BX05-01 bus unit

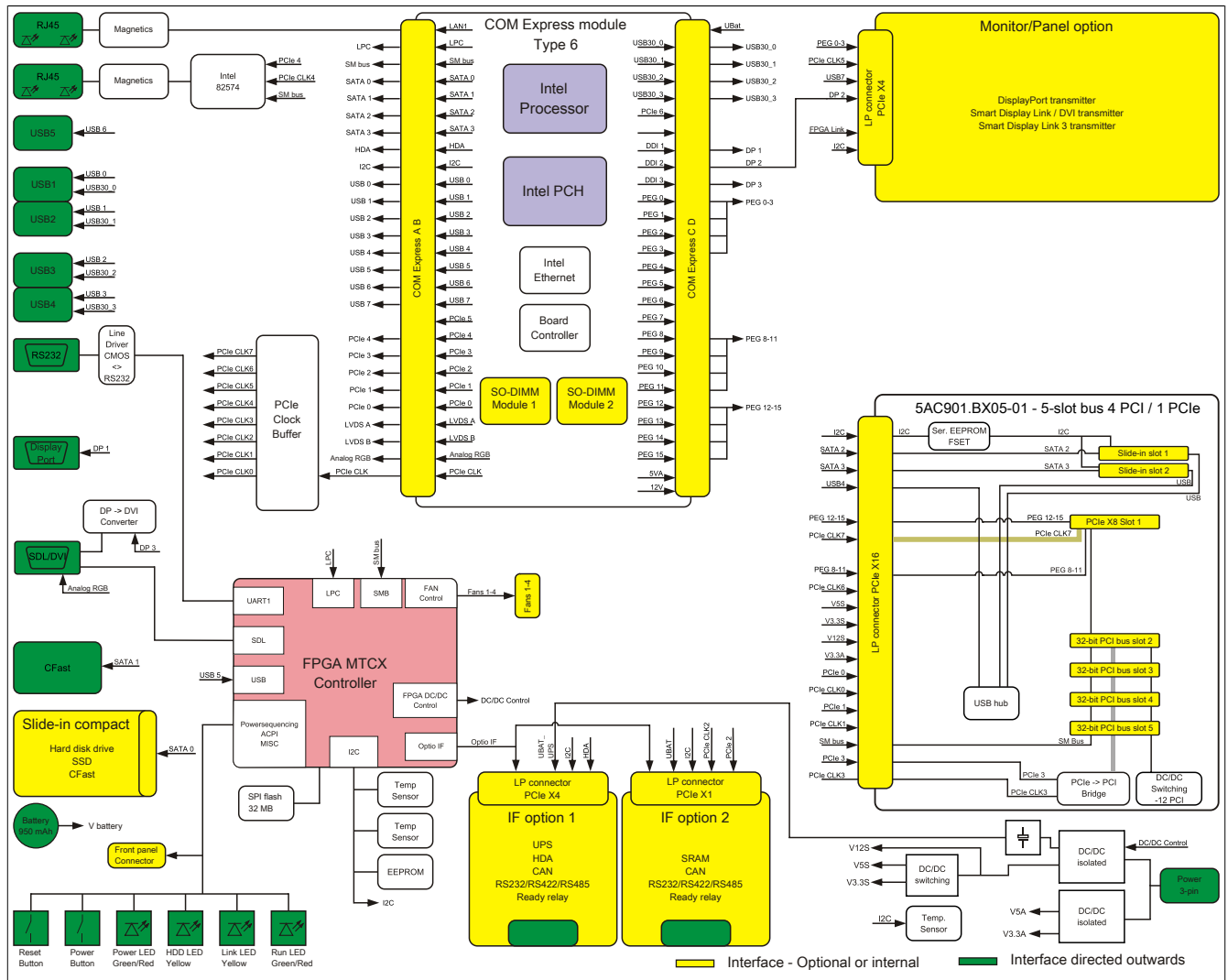


Figure 14: 5PC910.SX05-00 system unit + 5AC901.BX05-01 bus unit - Block diagram

### 2.5.8 5PC910.SX05-00 system unit + 5AC901.BX05-02 bus unit

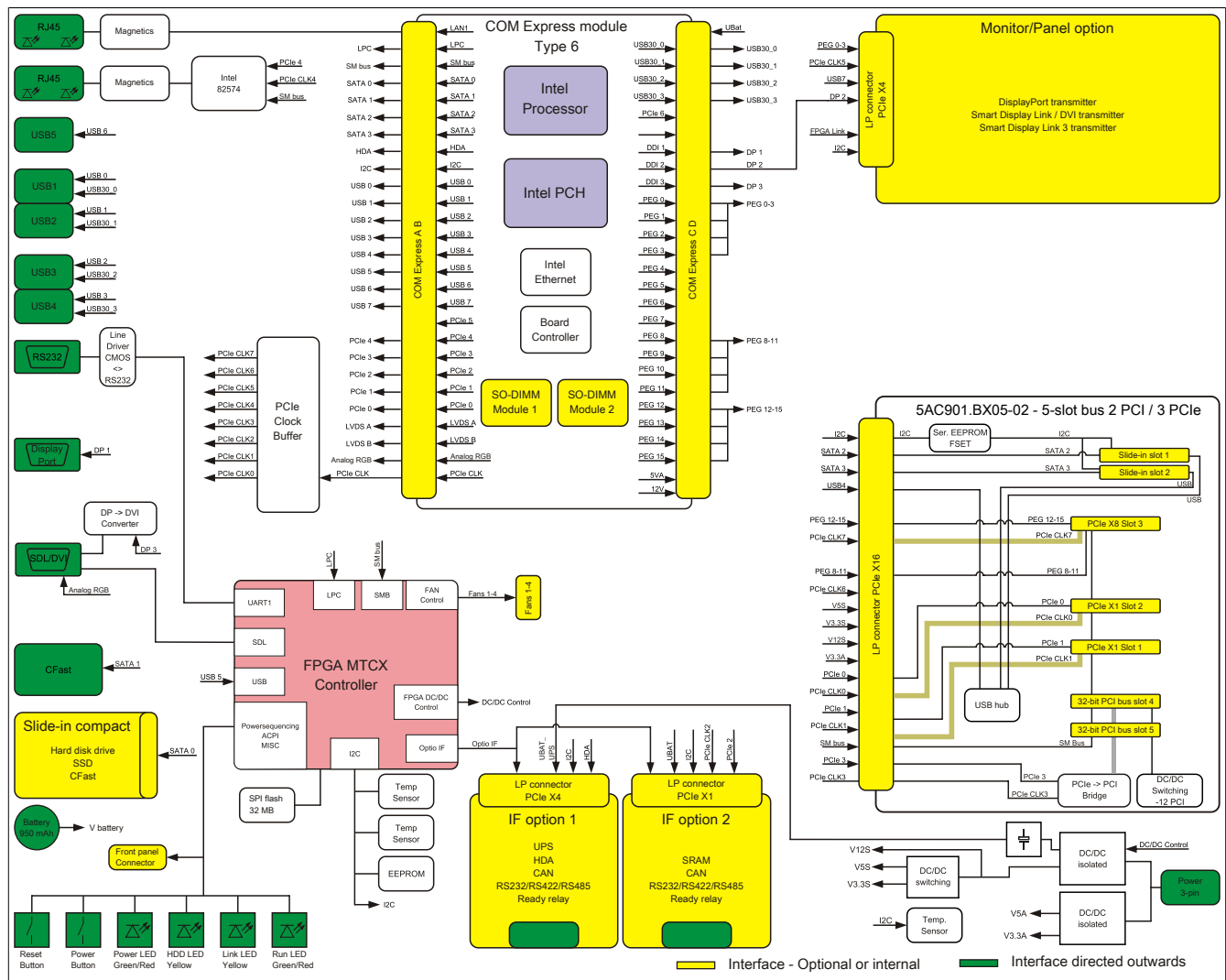


Figure 15: 5PC910.SX05-00 system unit + 5AC901.BX05-02 bus unit - Block diagram

## 2.5.9 5PC910.SX05-00 system unit + 5AC901.BX05-03 bus unit

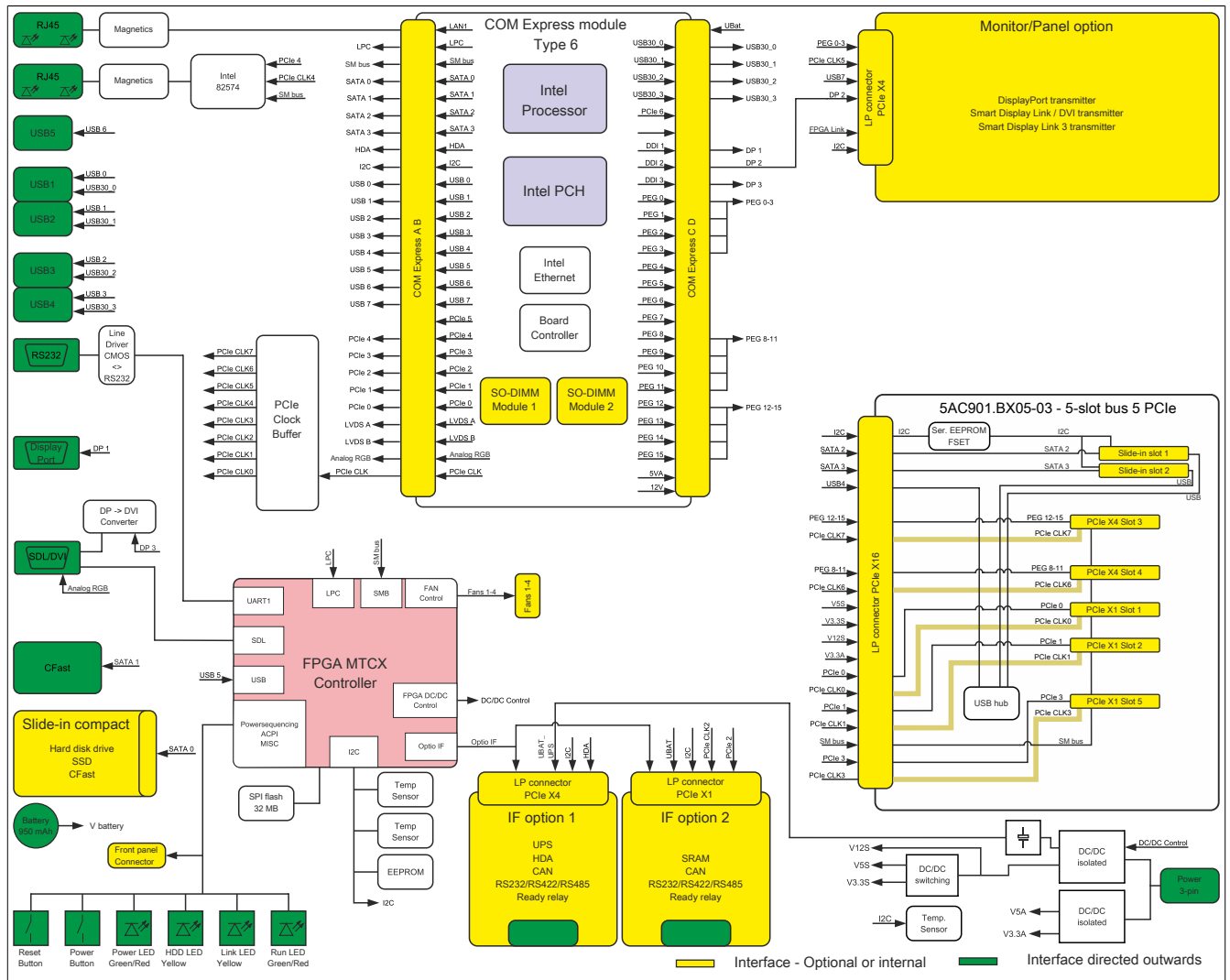


Figure 16: 5PC910.SX05-00 system unit + 5AC901.BX05-03 bus unit - Block diagram

## 2.5.10 Monitor/Panel options

### DisplayPort transmitter

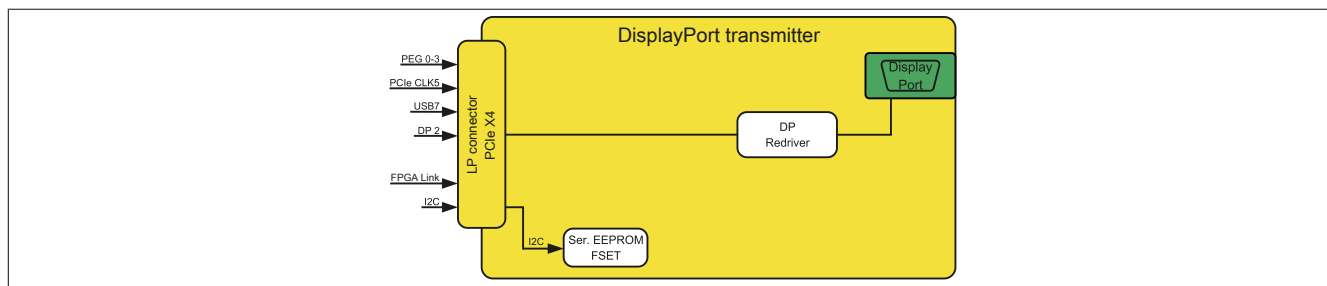


Figure 17: 5AC901.LDPO-00 DisplayPort transmitter - Block diagram

### SDL/DVI transmitter

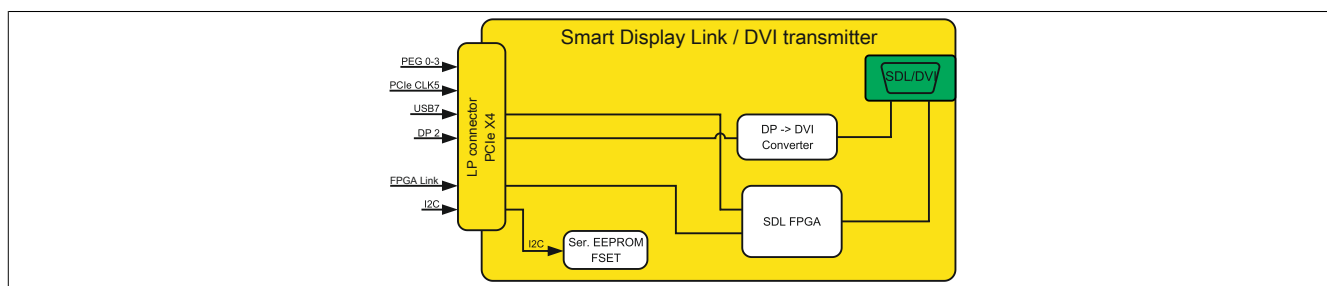


Figure 18: 5AC901.LSDL-00 Smart Display Link / DVI transmitter - Block diagram

### SDL3 transmitter

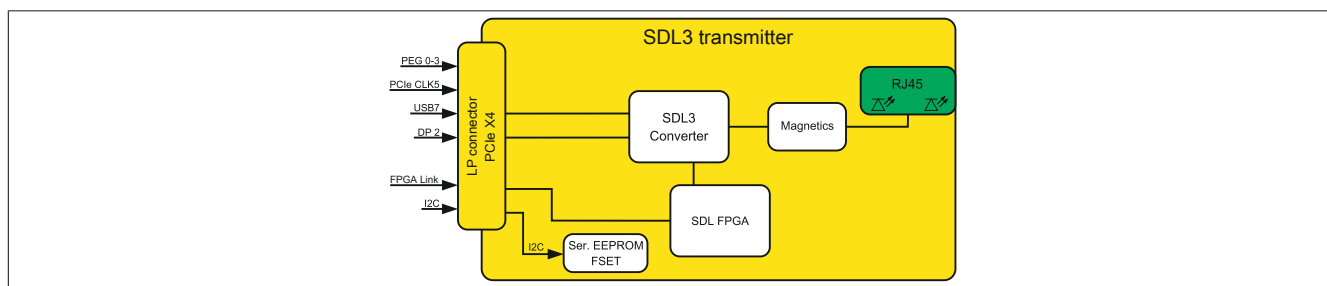


Figure 19: 5AC901.LSD3-00 Smart Display Link 3 transmitter - Block diagram

## 2.6 Device interfaces and slots

### 2.6.1 Device interfaces - Overview

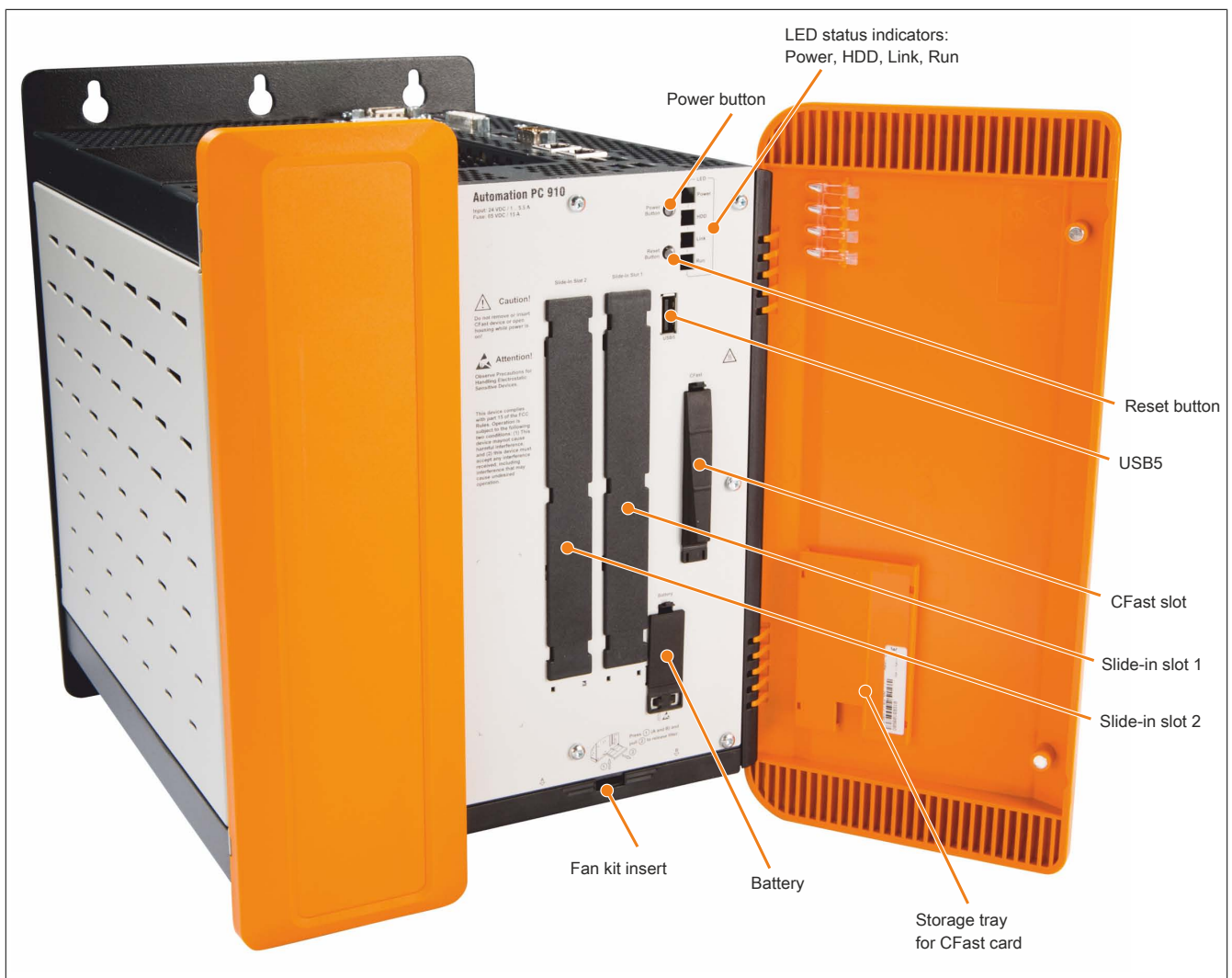
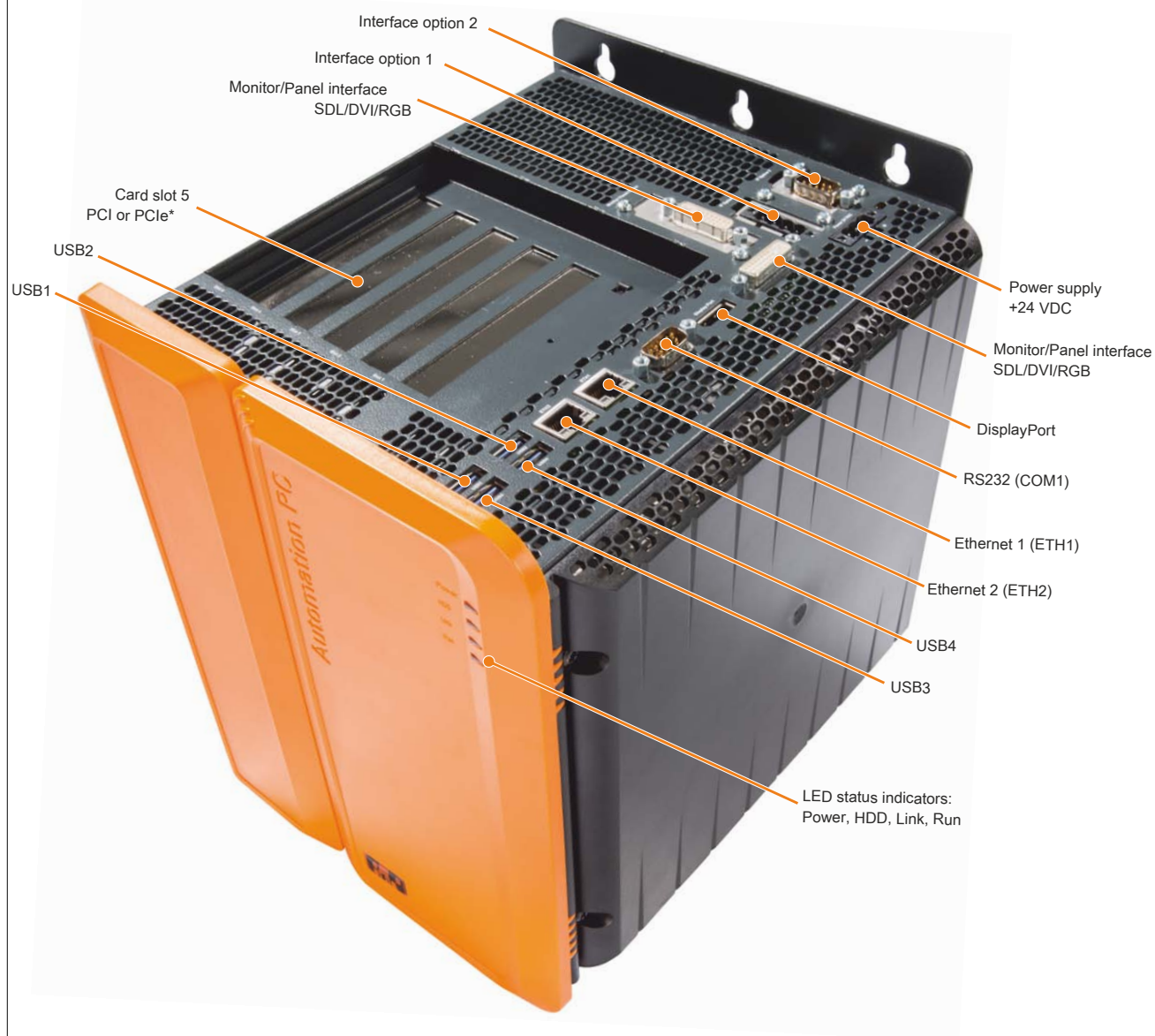


Figure 20: Device interfaces - Overview (front)





\* Depends on the bus unit used

Figure 21: Device interfaces - Overview (top)

## 2.6.2 Power supply +24 VDC

### Danger!

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

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

The pinout is listed in the following table and printed on the housing. The supply voltage is protected internally by a soldered fuse (15 A, fast-acting) to prevent damage to the **device** in the event of an overload (fuse replacement necessary) or if the voltage supply is connected incorrectly (reverse polarity protection -> fuse replacement not necessary). The **device** must be returned to B&R for repairs if the fuse is blown in the event of an error.

| Power supply                       |  |
|------------------------------------|--|
| Protected against reverse polarity |  |
| Pin                                | Description  |
| 1                                  | +  |
| 2                                  | Functional <a href="#">ground</a>                        |
| 3                                  | -  |
| Model number                       | Short description  |
|                                    | Terminal blocks  |
| 0TB103.9                           | Male connector 24 V 5.08 3-pin screw clamps              |
| 0TB103.91                          | Male connector 24 V 5.08 3-pin cage clamp terminal block |
|                                    |  |

3-pin male power supply connector

Power supply  
+24 VDC




Table 20: 24 VDC voltage supply connection

| Electrical characteristics                         |  |
|--|--|
| Nominal voltage                                    | 24 VDC $\pm 25\%$ , SELV <sup>1)</sup> |
| Nominal current                                    | 3 A                                    |
| Overvoltage category in accordance with EN 61131-2 | II                                     |
| Inrush current                                     | Typ. 6 A; max. 10 A for <300 $\mu$ s   |
| Electrical isolation                               | Yes                                    |
| Uninterruptible power supply                       | No                                     |

1) EN 60950 requirements must be observed.

### 2.6.2.1 Grounding

### Caution!

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

The **ground** connection is located on the bottom of the APC910 system.



Figure 22: Ground connection

The M4 self-locking nut must be used, for example, to fasten a copper strip to a central grounding point in the **control** cabinet or system where the APC910 is installed. The largest possible conductor cross section should be used (at least 2.5 mm<sup>2</sup>).

### 2.6.3 COM1 serial interface

| COM1 serial interface <sup>1)</sup> |   |
|-------------------------------------|---|
|                                     | RS232   |
| Type                                | RS232, modem-capable, not electrically isolated |
| UART                                | 16550-compatible, 16-byte FIFO                  |
| Transfer rate                       | Max. 115 kbit/s                                 |
| Bus length                          | Max. 15 m                                       |
| Pin                                 | Assignment                                      |
| 1                                   | DCD   |
| 2                                   | RXD   |
| 3                                   | TXD   |
| 4                                   | DTR   |
| 5                                   | GND   |
| 6                                   | DSR   |
| 7                                   | RTS   |
| 8                                   | CTS   |
| 9                                   | RI  |

9-pin, male, DSUB connector

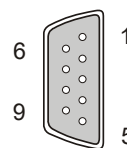


Table 21: COM1 - Pinout

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

## 2.6.4 Panel/Monitor interface

| Panel/Monitor interface - SDL (Smart Display Link) / DVI / RGB  |   |
|---|---|
| The following overview lists the video signals available on the monitor/panel output. For details, see the technical data for the CPU board being used. |   |
| CPU board   | Video signals with all system unit variants |
| 5PC900.TS77-00  | SDL, DVI, RGB                               |
| 5PC900.TS77-01  | SDL, DVI, RGB                               |
| 5PC900.TS77-02  | SDL, DVI, RGB                               |
| 5PC900.TS77-03  | SDL, DVI, RGB                               |
| 5PC900.TS77-04  | SDL, DVI, RGB                               |
| 5PC900.TS77-05  | SDL, DVI, RGB                               |
| 5PC900.TS77-06  | SDL, DVI, RGB                               |
| 5PC900.TS77-07  | SDL, DVI, RGB                               |
| 5PC900.TS77-08  | SDL, DVI, RGB                               |
| 5PC900.TS77-09  | SDL, DVI, RGB                               |
| 5PC900.TS77-10  | SDL, DVI, RGB                               |

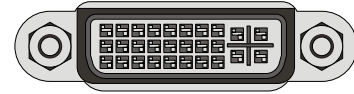


Table 22: Panel/Monitor interface - SDL, DVI, RGB

### 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.

### 2.6.4.1 USB communication in SDL and DVI mode

### Information:

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

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

### 2.6.4.2 Pinout

| Pin | Assignment                | Description                                 | Pin | Assignment                | Description                     |
|-----|---------------------------|---|-----|---------------------------|---------------------------------|
| 1   | TMDS data 2-              | DVI lane 2 (negative)                       | 16  | HPD                       | Hot plug detect                 |
| 2   | TMDS data 2+              | DVI lane 2 (positive)                       | 17  | TMDS data 0-              | DVI lane 0 (negative)           |
| 3   | TMDS data 2/4 SHIELD      | Shield for data pair 2 and 4                | 18  | TMDS data 0+              | DVI lane 0 (positive)           |
| 4   | SDL-                      | SDL lane (negative)                         | 19  | TMDS Data 0/ XUSB1 SHIELD | Shield for data pair 0 and USB1 |
| 5   | SDL+                      | SDL lane (positive)                         | 20  | XUSB1-                    | USB lane 1 (negative)           |
| 6   | DDC clock                 | DDC-based control signal (clock)            | 21  | XUSB1+                    | USB lane 1 (positive)           |
| 7   | DDC data                  | DDC-based control signal (data)             | 22  | TMDS clock shield         | Shield for clock pair           |
| 8   | 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 (negative) HDMI clock (positive) | C1  | ANALOG RED                | Analog red                      |
| 11  | TMDS DATA 1/ XUSB0 SHIELD | Shield for data pair 1 and USB0             | C2  | ANALOG GREEN              | Analog green                    |

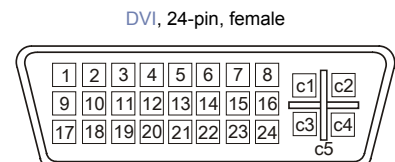


Table 23: DVI interface - Pinout

| Pin | Assignment                                | Description           | Pin | Assignment       | Description                                   |
|-----|---|-----------------------|-----|------------------|---|
| 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 <sup>1)</sup>                  | +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                |     |                  |   |

Table 23: DVI interface - Pinout

1) Protected internally by a multifuse.

### 2.6.4.3 Cable lengths and resolutions for SDL transmission

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

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

Table 24: Cable lengths and resolutions for SDL transmission

### 2.6.4.4 Cable lengths and resolutions for DVI transmission

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

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

Table 25: Cable lengths and resolutions for DVI transmission

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

## 2.6.5 DisplayPort interface

| DisplayPort   |   |
|---|---|
| The following overview lists the video signals available on the DisplayPort output. For details, see the technical data for the CPU board being used. |   |
| CPU board   | Video signals with all system unit variants |
| 5PC900.TS77-00  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-01  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-02  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-03  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-04  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-05  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-06  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-07  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-08  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-09  | DisplayPort, DVI, HDMI                      |
| 5PC900.TS77-10  | DisplayPort, DVI, HDMI                      |

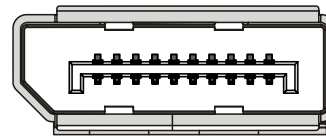


Table 26: DisplayPort

### Information:

The hardware and graphics drivers of approved operating systems support the hot plugging of display devices to the DisplayPort interface for service purposes. The DisplayPort connector is specified for 10,000 connection cycles.

#### 2.6.5.1 DisplayPort - Pinout

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

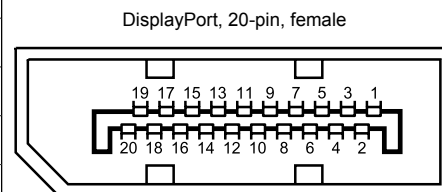


Table 27: DisplayPort - Pinout

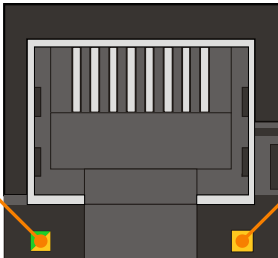
## 2.6.6 Ethernet 1 interface (ETH1)

This Ethernet controller is integrated in the CPU board and connected to external devices via the system unit.

| Ethernet 1 interface (ETH1 <sup>1)</sup> ) |   |   |
|--|---|---|
| Controller                                 | Intel 82579 for 5PC900.TS77-0x<br>Intel i219 for 5PC900.TS17-0x |   |
| Cabling                                    | S/STP (Cat 5e)  |   |
| Transfer rate                              | 10/100/1000 Mbit/s <sup>2)</sup>                                |   |
| Cable length                               | Max. 100 m (min. Cat5e)   |   |
| <b>Speed LED</b>                           | <b>On</b>   | <b>Off</b>                                      |
| Green                                      | 100 Mbit/s  | 10 Mbit/s <sup>3)</sup>                         |
| Orange                                     | 1000 Mbit/s   | -   |
| <b>Link LED</b>                            | <b>On</b>   | <b>Off</b>                                      |
| Orange                                     | Link (Ethernet network connection available)                    | Activity (blinking - data transfer in progress) |

RJ45, female

1



Speed LED

Link LED

Table 28: Ethernet interface (ETH1)

- 1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
- 2) Switching takes place automatically.
- 3) The 10 Mbit/s transfer speed / connection only exists if the Link LED is also lit at the same time.

### Driver support

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

### Information:

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

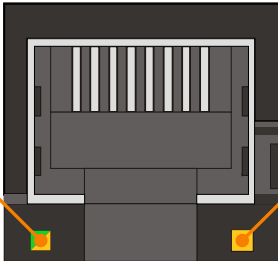
## 2.6.7 Ethernet 2 interface (ETH2)

This Ethernet controller is integrated in the mainboard and connected to external devices via the system unit.

| Ethernet 2 interface (ETH2 <sup>1)</sup> ) |  |   |  |
|--|--|---|--|
| Controller                                 | Intel® 82574L                                |   |  |
| Cabling                                    | S/STP (Cat 5e)                               |   |  |
| Transfer rate                              | 10/100/1000 Mbit/s <sup>2)</sup>             |   |  |
| Cable length                               | Max. 100 m (min. Cat5e)                      |   |  |
| <b>Speed LED</b>                           | <b>On</b>                                    | <b>Off</b>                                      |  |
| Green                                      | 100 Mbit/s                                   | 10 Mbit/s <sup>3)</sup>                         |  |
| Orange                                     | 1000 Mbit/s                                  | -   |  |
| <b>Link LED</b>                            | <b>On</b>                                    | <b>Off</b>                                      |  |
| Orange                                     | Link (Ethernet network connection available) | Activity (blinking - data transfer in progress) |  |

RJ45, female

1



Speed LED

Link LED

Table 29: Ethernet interface (ETH2)

- 1) The interfaces, etc. available on the device or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
- 2) Switching takes place automatically.
- 3) The 10 Mbit/s transfer speed / connection only exists if the Link LED is also lit at the same time.

### Driver support

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

### Information:

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



## 2.6.8 USB interfaces

The APC910 comes equipped with a USB 3.0 (Universal Serial Bus) host controller with multiple USB interfaces, 5 of which are accessible externally for the user. The 4 USB interfaces (USB1-4) on the top are USB 3.0 ports. The USB interface on the front (USB5) is a USB 2.0 interface.

### Warning!

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

### Caution!

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

## USB1, USB2, USB3, USB4

4 USB 3.0 interfaces are provided on the top of the APC910.

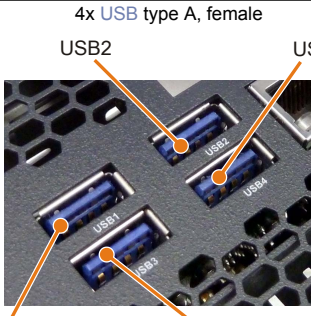
| Universal Serial Bus (USB1, USB2, USB3, USB4) <sup>1)</sup> |  |  |
|---|--|---|
| Type  | USB 2.0 / 3.0  |   |
| Design  | Type A   |   |
| Transfer rate   | Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s) |   |
| Current load <sup>2)</sup><br>USB1, USB2<br>USB3, USB4      | Max. 1 A<br>Max. 1 A   |   |
| Cable length<br>USB 2.0<br>USB 3.0                          | Max. 5 m (without hub)<br>Max. 3 m (without hub)   |   |

Table 30: USB1, USB2, USB3, USB4 interface

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

## USB5

A USB 2.0 interface is provided on the APC910 behind the front cover.

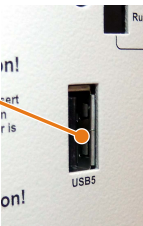
| Universal Serial Bus (USB5) <sup>1)</sup> |   |  |
|---|---|---|
| Type                                      | USB 2.0   |   |
| Design                                    | Type A  |   |
| Transfer rate                             | Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s) |   |
| Current load <sup>2)</sup><br>USB5        | Max. 1 A  |   |
| Cable length                              | Max. 5 m (without hub)  |   |

Table 31: USB5 interface

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



## 2.6.9 IF option 1 slot

Automation PC 910 system units include 2 slots for **interface** options.

The following table lists the **interface** options that **can** be used in the IF option 1 slot.

| IF option 1 slot               |  |  |
|--------------------------------|--|--|
| Model number                   | Short description  |  |
|                                | <b>Interface option</b>  |  |
| 5AC901.I485-00 <sup>1)</sup>   | Interface card - 1x RS232/422/458 interface - For APC910/PPC900                    |  |
| 5AC901.ICAN-00 <sup>1)2)</sup> | Interface card - 1x CAN interface - For APC910/PPC900                              |  |
| 5AC901.IHDA-00                 | Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900 |  |
| 5AC901.IRDY-00                 | Interface card - Ready relay - For APC910/PPC900                                   |  |
| 5AC901.IUPS-00 <sup>3)</sup>   | UPS - For 4.5 Ah battery   |  |
| 5AC901.IUPS-01 <sup>4)</sup>   | UPS - For 2.2 Ah battery   |  |
| 5AC901.ISIO-00                 | Interface card - System I/O - For APC910/PPC900                                    |  |

Table 32: IF option 1 slot

- 1) If IF options 5AC901.I485-00 and 5AC901.ICAN-00 are used simultaneously, the 5AC901.ICAN-00 should be installed in the IF option 1 slot and the 5AC901.I485-00 should be installed in the IF option 2 slot.
- 2) It is not possible to operate two 5AC901.ICAN **interface** options (in the IF option 1 and IF option 2 slots) at the same time.
- 3) The 5AC901.IUPS-00 **UPS** IF option is only permitted to be operated with the 5AC901.BUPS-00 battery unit!
- 4) The 5AC901.IUPS-01 **UPS** IF option is only permitted to be operated with the 5AC901.BUPS-01 battery unit!

### Information:

For information about installing or replacing an **interface** option, please refer to section "**Installing interface options**" on page 391.

## 2.6.10 IF option 2 slot

Automation PC 910 system units include 2 slots for **interface** options.

The following table lists the **interface** options that **can** be used in the IF option 2 slot.

| IF option 2 slot               |   |  |
|--------------------------------|---|--|
| Model number                   | Short description   |  |
|                                | <b>Interface option</b>   |  |
| 5AC901.I485-00 <sup>1)</sup>   | Interface card - 1x RS232/422/458 interface - For APC910/PPC900         |  |
| 5AC901.ICAN-00 <sup>1)2)</sup> | Interface card - 1x CAN interface - For APC910/PPC900                   |  |
| 5AC901.IETH-00                 | Interface card - Ethernet 10/100/1000 - For APC910/PPC900               |  |
| 5AC901.IPLK-00                 | Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900 |  |
| 5AC901.ISRM-00                 | Interface cards - 2 MB SRAM - For APC910/PPC900                         |  |
| 5AC901.IRDY-00                 | Interface card - Ready relay - For APC910/PPC900                        |  |
| 5AC901.ISIO-00                 | Interface card - System I/O - For APC910/PPC900                         |  |

Table 33: IF option 2 slot

- 1) If IF options 5AC901.I485-00 and 5AC901.ICAN-00 are used simultaneously, the 5AC901.ICAN-00 should be installed in the IF option 1 slot and the 5AC901.I485-00 should be installed in the IF option 2 slot.
- 2) It is not possible to operate two 5AC901.ICAN **interface** options (in the IF option 1 and IF option 2 slots) at the same time.

### Information:

For information about installing or replacing an **interface** option, please refer to section "**Installing interface options**" on page 391.

2.6.11 Monitor/Panel option

2-slot (5PC910.SX02-00) and 5-slot (5PC910.SX05-00) APC910 variants allow a third graphics line to be set up. There are a variety of monitor/panel options available for this.


| Monitor/Panel option  |  |  |
|-----------------------|--|---|
| Model number          | Short description                                    |   |
| Monitor/Panel options |  |   |
| 5AC901.LDPO-00        | DisplayPort transmitter                              |   |
| 5AC901.LSDL-00        | Smart Display Link / <a href="#">DVI</a> transmitter |   |
| 5AC901.LSD3-00        | SDL3 transmitter                                     |   |
|                       |  |   |

Table 34: Monitor/Panel option

Information:

For information about installing or replacing a monitor/panel option, please refer to the section "Installing monitor/panel options" on page 394.

2.6.12 Card slot (PCI/PCIe)

Standard PCI 2.2 half-size cards or PCI Express (PCIe) half-size cards can be installed depending on the type of bus unit. They must not exceed the following dimensions.



Figure 23: Standard half-size 32-bit PCI card - Dimensions

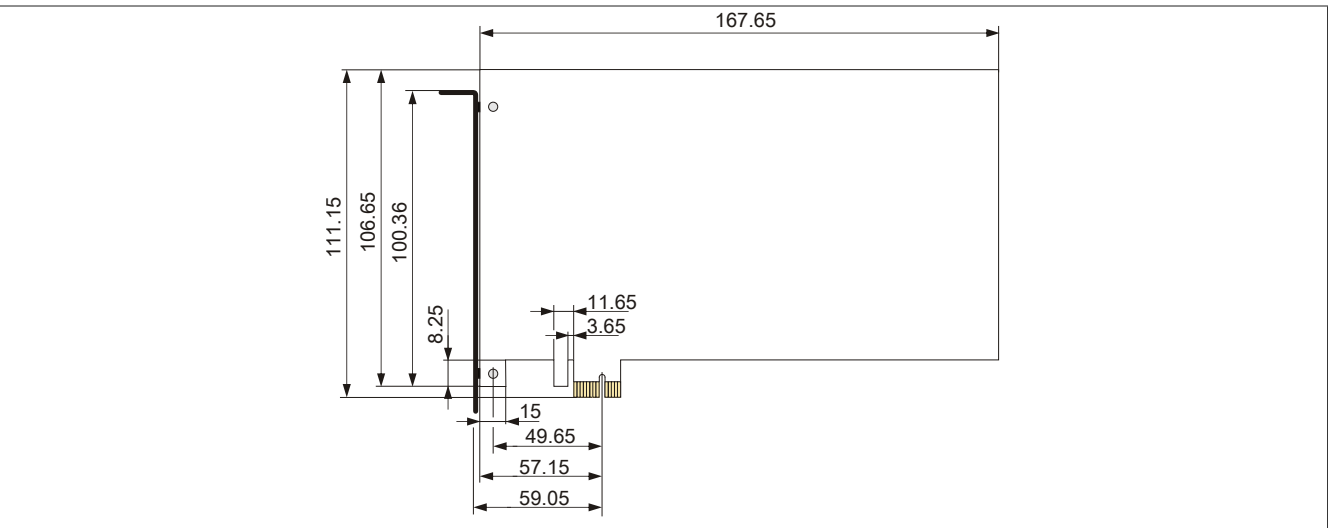


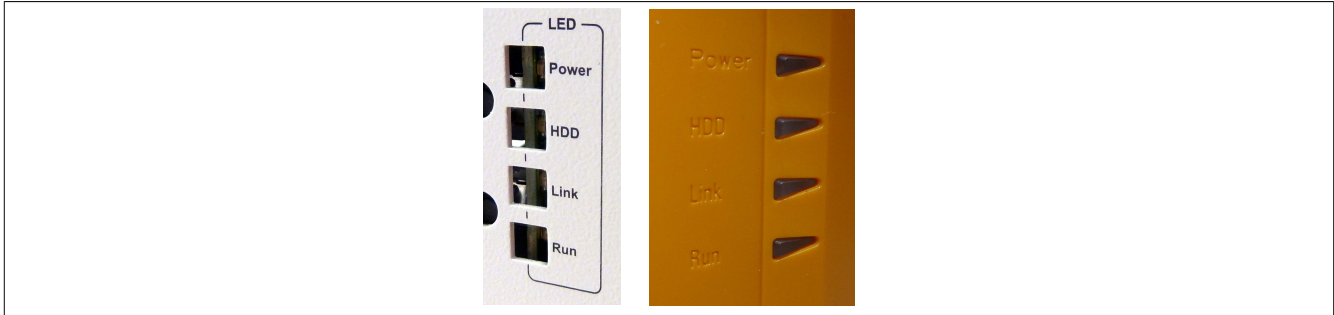
Figure 24: Standard half-size PCIe card - Dimensions

Information:

For information about installing or replacing a PCI/PCIe card, please refer to section "Installing PCI/PCIe cards" on page 403.

### 2.6.13 LED status indicators

LED status indicators are located on the front of the system unit.



The following timing is used for the LED status indicators:

Block size: 250 ms

Repeat interval: 500 ms, 2 boxes thus represent one interval

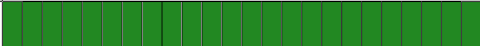















| LED    | Color  | Status   | Function   | LED status indicators  |
|--------|--|--|--|--|
| Power  | Green  | On   | Voltage supply OK  |    |
|        |  | Blinking   | Device booted, battery status "BAD"  |    |
|        |  |  | <div>Information:</div> <div>For more information, see "Battery" on page 71.</div>   |  |
|        | Red  | On   | System in standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk)   |    |
|        |  | Blinking   | MTCX running, battery status "BAD". System in 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 OK, voltage supply OK   |  |
|        |  |  | 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)  |  |
|        |  |  | Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status BAD, voltage supply OK  |  |
|        |  |  | 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) |  |
|        |  |  | <div>Information:</div> <div>An update must be performed again.</div>  |  |
| Yellow | On   | Voltage supply not OK, system operating from UPS |    |  |
| HDD    | Yellow   | On   | Indicates drive access (HDD, CFast)  |  |
| Link   | Yellow   | On   | Indicates an active SDL connection on the male panel connector   |  |
|        |  | Blinking   | Indicates that an active SDL connection has been interrupted by a loss of power to the display unit  |  |
|        | <div>Information:</div> <div>Check the voltage supply / power connector of the connected display unit.</div> |  |  |  |
| Run    | Green  | Blinking   | Automation Runtime booting<br>Controlled by Automation Runtime (ARemb and ARwin)   |  |
|        | Green  | On   | Application running<br>Controlled by Automation Runtime (ARemb and ARwin)  |  |
|        | Red  | On   | Application in service mode<br>Controlled by Automation Runtime (ARemb and ARwin)  |  |
|        |  | Blinking   | Indicates a licensing violation  |  |

Table 35: LED status indicators - Data

2.6.14 Power button

The power button provides a wide range of ATX power supply functions.

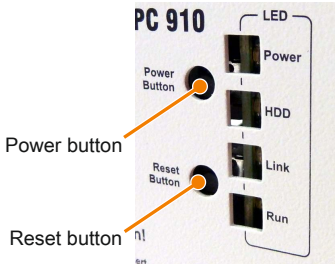
| Power button  |  |
|---|--|
| <p>The power button <b>can</b> be pressed with a pointed <b>object</b> (e.g. paper clip or tip of a pen).</p> <p>The power button acts like the on/off <b>switch</b> on a normal desktop PC with an ATX power supply:</p> <p><b>Press and release ...</b> Switches on the APC910 or shuts down the operating system and switches off the APC910</p> <p><b>Press and hold ...</b> Switches off the ATX power supply without shutting down the APC910 (<b>data could be lost!</b>)</p> <p>Pressing the power button does not reset the <b>MTCX</b> processor.</p> |  |

Table 36: Power button

2.6.15 Reset button

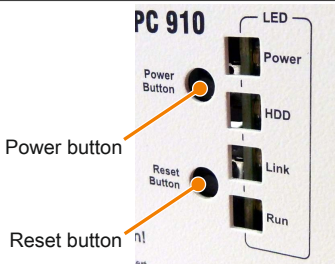
| Reset button  |  |
|---|--|
| <p>The reset button <b>can</b> be pressed with a pointed <b>object</b> (e.g. paper clip or tip of a pen).</p> <p>Pushing the reset button triggers a hardware and PCI reset. The APC910 is restarted (cold restart).</p> <p>Pressing the reset button does not reset the <b>MTCX</b> processor.</p> |  |

Table 37: Reset button

Warning!

A system reset **can** result in lost data!

## 2.6.16 Battery

The lithium battery (3 V, 950 mAh) buffers the internal real-time clock (RTC). It is located behind the black cover on the front of the **device**. The battery's buffer time is at least 4 years (at 50°C, 8.5 µA for the components being supplied and a self-discharge of 40%). If an **SRAM interface** option has been installed, this lifespan is reduced to 2½ years. The battery has a limited service life and should be replaced regularly (after the specified service life at the latest).

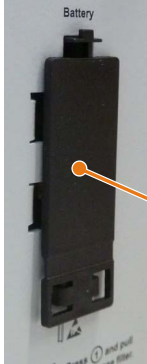
| Battery       |   |  |
|---------------|---|---|
| Battery       |   |   |
| Type          | Renata 950 mAh  |   |
| Removable     | Yes, accessible from the outside                      |   |
| Service life  | 4 years <sup>1)</sup>                                 |   |
| Model number  | Short description                                     |   |
|               | <b>Batteries</b>                                      |   |
| 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    |   |
|               |   |   |

Table 38: Battery

1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an **SRAM interface** option has been 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 <b>firmware</b> 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. |

Table 39: Battery status

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.

## 2.6.17 CFast slot

The APC910 offers an easy-to-access CFast slot behind its front cover so that a CFast card **can** be used as removable media 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).


| CFast slot     |                        |  |
|----------------|------------------------|---|
| Connection     | SATA 1                 |   |
| Model number   | Short description      |   |
|                | <b>CFast cards</b>     |   |
| 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 card, 32 GB MLC  |   |
| 5CFAST.064G-10 | CFast card, 64 GB MLC  |   |
| 5CFAST.128G-10 | CFast card, 128 GB MLC |   |

Table 40: CFast slot

## Warning!

Power must be disconnected before inserting or removing the CFast card.

## 2.6.18 Slide-in compact slot

The slide-in compact slot is connected to the chipset internally via SATA 0 with SATA III design (SATA 6 Gbit/s).

| Slide-in compact slot |  |
|-----------------------|--|
| Connection            | SATA 0                                     |
| Model number          | Short description                          |
| Drives                |  |
| 5AC901.CHDD-00        | 250 GB hard disk - Slide-in compact - SATA |
| 5AC901.CHDD-01        | 500 GB hard disk - Slide-in compact - SATA |
| 5AC901.CSSD-00        | 32 GB SSD (SLC) - Slide-in compact - SATA  |
| 5AC901.CSSD-01        | 60 GB SSD (MLC) - Slide-in compact - SATA  |
| 5AC901.CSSD-02        | 180 GB SSD (MLC) - 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 - SATA |
| 5AC901.CSSD-06        | 512 GB SSD (MLC) - Slide-in compact - SATA |
| 5AC901.CCFA-00        | CFAst adapter - For slide-in compact slot  |

Table 41: Slide-in compact slot

### Information:

The slide-in compact slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in compact drive, please refer to the section ["Installing and exchanging slide-in compact drives" on page 397](#).

## 2.6.19 Slide-in slot 1

Slide-in slot 1 is available on the 2-slot system unit (5PC910.SX02-00) and 5-slot system unit (5PC910.SX05-00). It is connected to the chipset internally via SATA 2 and USB 0 with SATA II design (SATA 3 Gbit/s).

| Slide-in slot 1 |  |
|-----------------|--|
| 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 |
|                 |  |

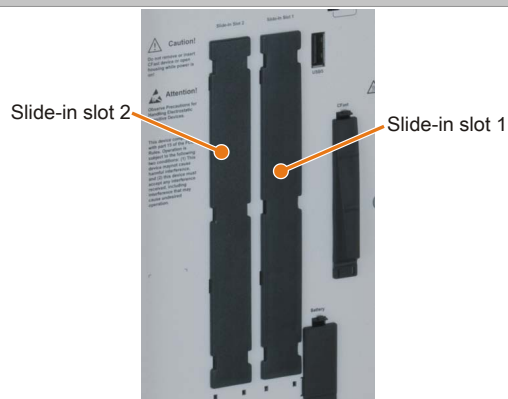


Table 42: Slide-in slot 1


### Information:

The slide-in slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in drive, please refer to the section ["Installing and exchanging slide-in drives" on page 400](#).

## 2.6.20 Slide-in slot 2

Slide-in slot 2 is only available on the 5-slot system unit (5PC910.SX05-00). It is connected to the chipset internally via SATA 3 and [USB 0](#) with SATA II design (SATA 3 Gbit/s).

| Slide-in slot 2 |  |
|-----------------|--|
| Connection      | SATA 3 and <a href="#">USB</a>                         |
| 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 |
|                 |  |



Slide-in slot 2

Slide-in slot 1

Table 43: Slide-in slot 2

### Information:

The slide-in slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in drive, please refer to the section ["Installing and exchanging slide-in drives" on page 400](#).



### 3 Individual components

#### 3.1 System units

The system unit unites all of the individual components into one compact [device](#). It consists of a housing and an integrated mainboard. Interfaces are easily accessible either on top of the [device](#) or behind the orange cover on the front. System units have either 1, 2 or 5 card slots.

The front cover is not included with the system unit and must be ordered separately, see "[Front covers](#)" on page 201.

##### 3.1.1 5PC910.SX01-00

###### 3.1.1.1 General information

- Slot for a bus unit with 1 PCI or 1 PCIe slot
- Insert for 1 slide-in compact drive
- Insert for 2 [interface](#) options
- SDL/DVI/Monitor and DisplayPort interfaces
- CFast slot

###### 3.1.1.2 Order data


| Model number   | Short description   | Figure   |
|----------------|---|--|
|                | <b>System units</b>   |  |
| 5PC910.SX01-00 | 1-slot APC910 system unit   |  |
|                | <b>Required accessories</b>   |  |
|                | <b>Accessories</b>  |  |
| 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                                      |  |
|                | <b>Bus units</b>  |  |
| 5AC901.BX01-00 | APC910 1-slot bus - 1 PCI   |  |
| 5AC901.BX01-01 | APC910 1-slot bus - 1 PCI Express x8  |  |
|                | <b>CPU boards</b>   |  |
| 5PC900.TS17-00 | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - Chipset QM170 - For APC910                           |  |
| 5PC900.TS17-01 | CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910  |  |
| 5PC900.TS17-02 | CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.6 GHz passive - For APC910 |  |
| 5PC900.TS77-00 | CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910                            |  |
| 5PC900.TS77-01 | CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910                            |  |
| 5PC900.TS77-02 | CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910                            |  |
| 5PC900.TS77-03 | CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910                            |  |
| 5PC900.TS77-04 | CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910                            |  |
| 5PC900.TS77-05 | CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910                            |  |
| 5PC900.TS77-06 | CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910                            |  |
| 5PC900.TS77-07 | CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910                              |  |
| 5PC900.TS77-08 | CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910                            |  |
| 5PC900.TS77-09 | CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910                             |  |
| 5PC900.TS77-10 | CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910                            |  |
|                | <b>Heat sink</b>  |  |
| 5AC901.HS00-00 | APC910 heat sink, active  |  |
| 5AC901.HS00-01 | APC910 active heat sink QM170/HM170   |  |
| 5AC901.HS01-00 | APC910 heat sink, passive   |  |
| 5AC901.HS01-01 | APC910 passive heat sink QM170/HM170  |  |
|                | <b>Main memory</b>  |  |
| 5MMDDR.016G-04 | SO-DIMM DDR4, 16384 MB  |  |
| 5MMDDR.1024-03 | SO-DIMM DDR3, 1024 MB   |  |

Table 44: 5PC910.SX01-00 - Order data



| Model number   | Short description  | Figure |
|----------------|--|--------|
| 5MMDDR.2048-03 | SO-DIMM DDR3, 2048 MB  |        |
| 5MMDDR.4096-03 | SO-DIMM DDR3, 4096 MB  |        |
| 5MMDDR.4096-04 | SO-DIMM DDR4, 4096 MB  |        |
| 5MMDDR.8192-03 | SO-DIMM DDR3, 8192 MB  |        |
| 5MMDDR.8192-04 | SO-DIMM DDR4, 8192 MB  |        |
|                | 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-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                                 |        |
|                | Fan kit  |        |
| 5AC901.FA01-00 | APC910 fan kit - For 5PC910.SX01-00  |        |
|                | Front cover  |        |
| 5AC901.FF01-00 | Front cover for 1-slot APC910 - Orange   |        |
| 5AC901.FF01-01 | Front cover for 1-slot APC910 - Dark gray  |        |
| 5AC901.FF01-02 | Front cover for 1-slot APC910 - Dark gray - Without logo                           |        |
| 5AC901.FF01-03 | Front cover for 1-slot APC910 - Orange - Without logo                              |        |
|                | Interface options  |        |
| 5AC901.I485-00 | Interface card - 1x RS232/422/485 interface - For APC910/PPC900                    |        |
| 5AC901.ICAN-00 | Interface card - 1x CAN interface - For APC910/PPC900                              |        |
| 5AC901.IETH-00 | Interface card - 1x ETH 10/100/1000 - For APC910/PPC900                            |        |
| 5AC901.IHDA-00 | Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900 |        |
| 5AC901.IPLK-00 | Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900            |        |
| 5AC901.IRDY-00 | Interface card - Ready relay - For APC910/PPC900                                   |        |
| 5AC901.ISIO-00 | Interface card - System I/O - For APC910/PPC900                                    |        |
| 5AC901.ISRM-00 | Interface cards - 2 MB SRAM - For APC910/PPC900                                    |        |
|                | Uninterruptible power supplies   |        |
| 5AC901.IUPS-00 | UPS - For 4.5 Ah battery   |        |
| 5AC901.IUPS-01 | UPS - For 2.2 Ah battery   |        |

Table 44: 5PC910.SX01-00 - Order data

### 3.1.1.3 Technical data

| Model number               | 5PC910.SX01-00  |
|----------------------------|---|
| <b>General information</b> |   |
| Cooling                    | Passive via heat sink and optionally supported with an active fan kit   |
| LED status indicators      | Power, HDD, Link, Run   |
| B&R ID code                | 0xD6DA  |
| Battery                    |   |
| Type                       | Renata 950 mAh  |
| Service life               | 4 years <sup>1)</sup>   |
| Removable                  | Yes, accessible behind the front cover  |
| Design                     | Lithium ion   |
| Power button               | Yes   |
| Reset button               | Yes   |
| Buzzer                     | Yes   |
| Certification              |   |
| CE                         | Yes   |
| UL                         | cULus E115267   |
| DNV GL                     | Industrial Control Equipment<br>Temperature: B (0 - 55°C)<br>Humidity: B (up to 100%)<br>Vibration: A (0.7g)<br>EMC: B (Bridge and open deck) <sup>2)</sup> |
| GOST-R                     | Yes   |
| <b>Controller</b>          |   |
| Boot loader                | BIOS  |
| Real-time clock            |   |
| Battery-backed             | Yes   |
| Power failure logic        |   |
| Controller                 | MTCX <sup>3)</sup>  |
| Buffer time                | 10 ms   |
| Graphics                   |   |
| Controller                 | Depends on the CPU board being used   |
| Memory                     |   |
| Type                       | Depends on the CPU board being used   |
| Memory size                | Depends on the CPU board being used   |

Table 45: 5PC910.SX01-00 - Technical data

| Model number                                       | 5PC910.SX01-00   |
|--|--|
| Interfaces   |  |
| <b>COM1</b>  |  |
| Type   | RS232, modem-capable, not electrically isolated  |
| Design   | 9-pin, male, DSUB connector  |
| UART   | 16550-compatible, 16-byte FIFO   |
| Max. baud rate                                     | 115 kbit/s   |
| <b>CFast slot</b>                                  |  |
| Quantity   | 1  |
| Type   | SATA III (SATA 60 Gbit/s)  |
| <b>USB</b>   |  |
| Quantity   | 5  |
| Type   | 4x USB 3.0 (top)<br>1x USB 2.0 (front)   |
| Design   | Type A   |
| Transfer rate                                      | Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s) <sup>4)</sup> |
| Current-carrying capacity                          | Max. 1 A per connection  |
| <b>Ethernet</b>                                    |  |
| Quantity   | 2  |
| Design   | Shielded RJ45  |
| Transfer rate                                      | 10/100/1000 Mbit/s   |
| Max. baud rate                                     | 1 Gbit/s   |
| <b>DisplayPort</b>                                 |  |
| Quantity   | 1  |
| Version  | Depends on the CPU board being used  |
| <b>Monitor/Panel interface</b>                     |  |
| Design   | DVI-I  |
| Type   | SDL/DVI/Monitor  |
| Inserts  |  |
| <b>PCI/PCIe slots</b>                              |  |
| Quantity   | 1 PCI slot or 1 PCIe slot <sup>5)</sup>  |
| <b>Slide-in drives</b>                             |  |
| Quantity   | -  |
| <b>Slide-in compact drives</b>                     |  |
| Quantity   | 1  |
| Type   | SATA III (SATA 60 Gbit/s)  |
| Interface option                                   | 2  |
| Monitor/Panel option                               | No   |
| Add-on UPS slot                                    | Yes <sup>6)</sup>  |
| Insert for fan kit                                 | Yes  |
| Electrical characteristics                         |  |
| Nominal voltage                                    | 24 VDC ±25%, SELV <sup>7)</sup>  |
| Nominal current                                    | Max. 5.5 A <sup>8)</sup>   |
| Inrush current                                     | Max. 60 A for <300 µs  |
| Overvoltage category in accordance with EN 61131-2 | II   |
| Electrical isolation                               | Yes  |
| Operating conditions                               |  |
| EN 60529 protection                                | IP20 <sup>9)</sup>   |
| Environmental conditions                           |  |
| <b>Temperature</b>                                 |  |
| Operation  | Component-dependent <sup>10)</sup>   |
| Storage  | -20 to 60°C  |
| Transport  | -20 to 60°C  |
| <b>Relative humidity</b>                           |  |
| Operation  | Component-dependent  |
| Storage  | Component-dependent  |
| Transport  | Component-dependent  |
| <b>Vibration <sup>11)</sup></b>                    |  |
| 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  |
| <b>Shock <sup>11)</sup></b>                        |  |
| Operation  | 15 g, 11 ms  |
| Storage  | 30 g, 6 ms   |
| Transport  | 30 g, 6 ms   |
| <b>Elevation</b>                                   |  |
| Operation  | -300 to 3000 m above sea level <sup>12)</sup>  |
| Mechanical characteristics                         |  |
| <b>Housing <sup>13)</sup></b>                      |  |
| Material   | Galvanized plate, plastic  |
| Coating  | Anthracite gray  |

Table 45: 5PC910.SX01-00 - Technical data

| Model number | 5PC910.SX01-00 |
|--------------|----------------|
| Dimensions   |                |
| Width        | 91 mm          |
| Height       | 270 mm         |
| Depth        | 254.75 mm      |
| Weight       | 2050 g         |

Table 45: 5PC910.SX01-00 - Technical data

- 1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an [interface](#) option with [SRAM](#) or [POWERLINK](#) has been installed, the service life is 2½ years.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) Maintenance [Controller](#) Extended.
- 4) The SuperSpeed transfer rate (5 Gbit/s) is only possible with [USB 3.0](#).
- 5) The PCI and PCIe slots available depend on the 5AC901.BX01-00 and 5AC901.BX01-01 bus unit being used.
- 6) This [UPS](#) module [can](#) only be operated in the IF option 1 slot.
- 7) [EN 60950](#) requirements must be observed; see section "+24 VDC power supply" in the user's manual.
- 8) Maximum current consumption (24 V / 130 W). This [can](#) vary depending on the configuration (see "Power calculation" section). The inrush current must also be taken into consideration when selecting the power supply.
- 9) Only when all [interface](#) covers and the front cover are closed.
- 10) Detailed information [can](#) be found in the temperature tables in the user's manual.
- 11) Maximum values unless specified otherwise by another individual component. Vibration testing is performed in accordance with [EN 60068-2-6](#). Shock testing is performed in accordance with [EN 60068-2-27](#).
- 12) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
- 13) There may be visible deviations in the color and surface appearance depending on the [process](#) or batch.

### 3.1.1.4 Dimensions

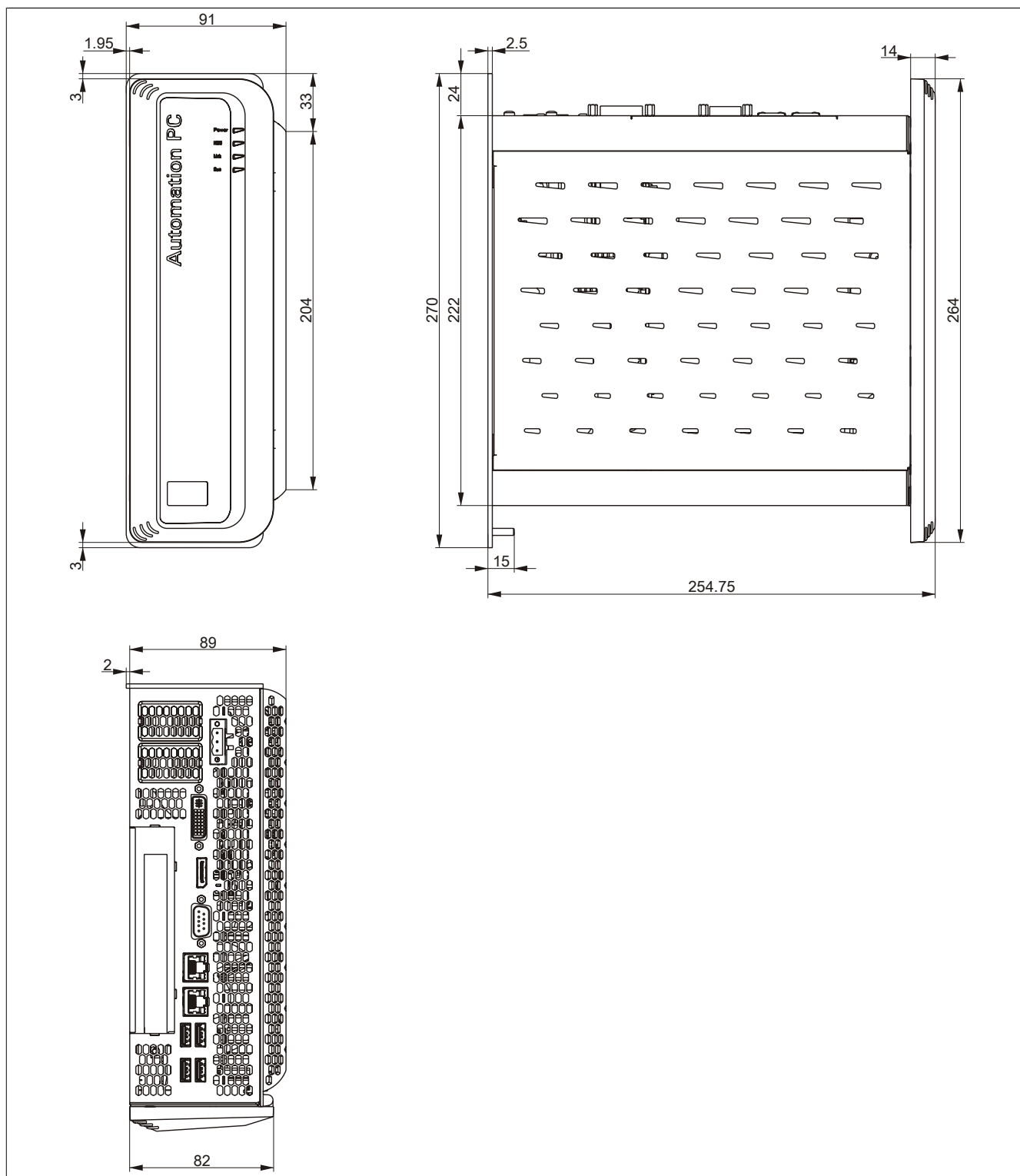


Figure 25: 5PC910.SX01-00 - Dimensions

### 3.1.1.5 Drilling template

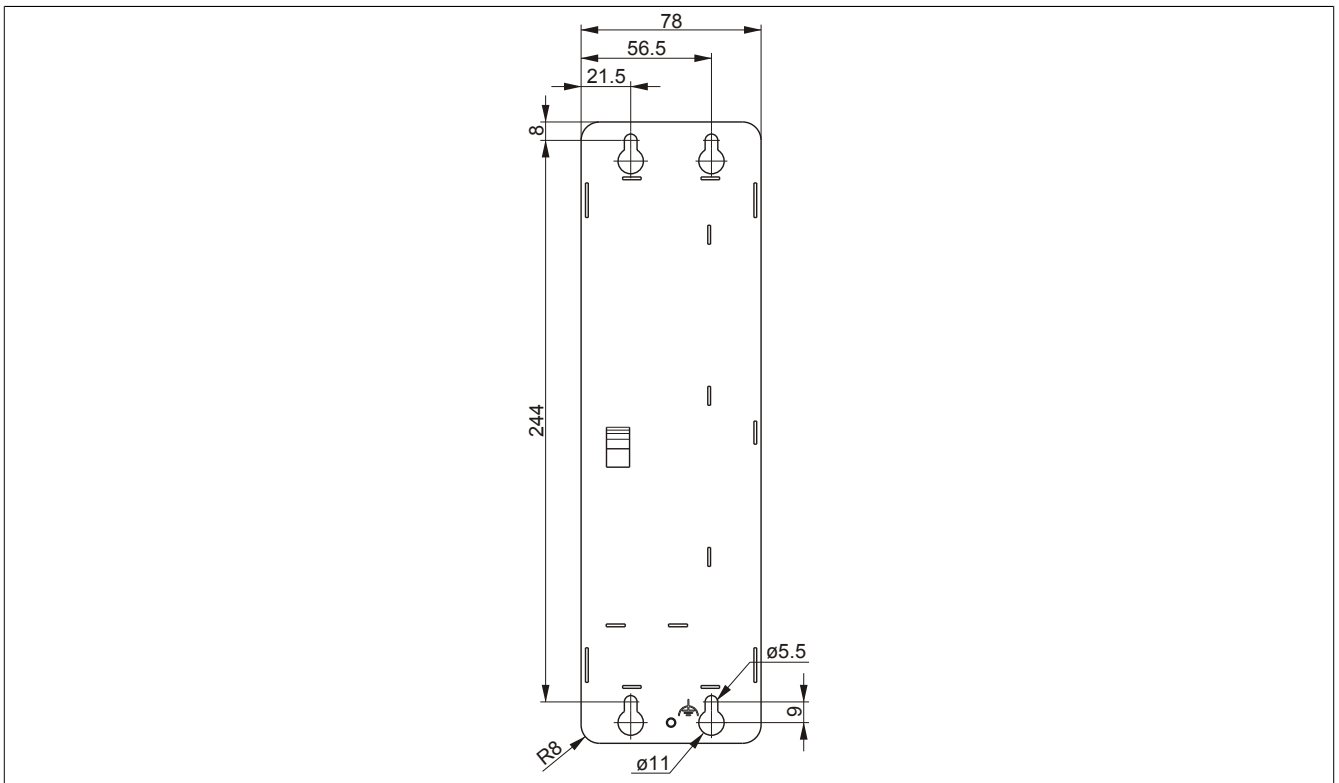


Figure 26: 5PC910.SX01-00 - Drilling template

### 3.1.2 5PC910.SX02-00

#### 3.1.2.1 General information

- Slot for a bus unit with 2 PCI slots or 1 PCI and 1 PCIe slots
- Insert for 1 slide-in compact drive and 1 slide-in drive
- Insert for 2 [interface](#) options
- SDL/DVI/Monitor and DisplayPort interfaces
- Insert for monitor/panel option
- CFast slot

#### 3.1.2.2 Order data


| Model number   | Short description   | Figure  |
|----------------|---|---|
|                | <b>System units</b>   |  |
| 5PC910.SX02-00 | 2-slot APC910 system unit   |   |
|                | <b>Required accessories</b>   |   |
|                | <b>Accessories</b>  |   |
| 0TB103.9       | Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm <sup>2</sup>                         |   |
| 0TB103.91      | Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm <sup>2</sup>                          |   |
|                | <b>Bus units</b>  |   |
| 5AC901.BX02-00 | APC910 2-slot bus - 2 PCI   |   |
| 5AC901.BX02-01 | APC910 2-slot bus - 1 PCI - 1 PCI Express x8  |   |
| 5AC901.BX02-02 | APC910 2-slot bus - 2 PCI Express x4  |   |
|                | <b>CPU boards</b>   |   |
| 5PC900.TS17-00 | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - Chipset QM170 - For APC910                           |   |
| 5PC900.TS17-01 | CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910  |   |
| 5PC900.TS17-02 | CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.6 GHz passive - For APC910 |   |
| 5PC900.TS77-00 | CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-01 | CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-02 | CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-03 | CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-04 | CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-05 | CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-06 | CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-07 | CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910                              |   |
| 5PC900.TS77-08 | CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910                            |   |
| 5PC900.TS77-09 | CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910                             |   |
| 5PC900.TS77-10 | CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910                            |   |
|                | <b>Heat sink</b>  |   |
| 5AC901.HS00-00 | APC910 heat sink, active  |   |
| 5AC901.HS00-01 | APC910 active heat sink QM170/HM170   |   |
| 5AC901.HS01-00 | APC910 heat sink, passive   |   |
| 5AC901.HS01-01 | APC910 passive heat sink QM170/HM170  |   |
|                | <b>Main memory</b>  |   |
| 5MMDDR.016G-04 | SO-DIMM DDR4, 16384 MB  |   |
| 5MMDDR.1024-03 | SO-DIMM DDR3, 1024 MB   |   |
| 5MMDDR.2048-03 | SO-DIMM DDR3, 2048 MB   |   |
| 5MMDDR.4096-03 | SO-DIMM DDR3, 4096 MB   |   |
| 5MMDDR.4096-04 | SO-DIMM DDR4, 4096 MB   |   |
| 5MMDDR.8192-03 | SO-DIMM DDR3, 8192 MB   |   |
| 5MMDDR.8192-04 | SO-DIMM DDR4, 8192 MB   |   |
|                | <b>Optional accessories</b>   |   |
|                | <b>Drives</b>   |   |
| 5AC901.CCFA-00 | CFast adapter - For slide-in compact slot   |   |
| 5AC901.CHDD-01 | 500 GB hard disk - Slide-in compact - SATA  |   |
| 5AC901.CSSD-04 | 128 GB SSD MLC - Slide-in compact - SATA  |   |

Table 46: 5PC910.SX02-00 - Order data

| Model number   | Short description  | Figure |
|----------------|--|--------|
| 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.SDVW-00 | DVD drive - DVD-R/RW DVD+R/RW - Slide-in   |        |
| 5AC901.SSCA-00 | Slide-in compact adapter - For slide-in compact drives                             |        |
|                | Fan kit  |        |
| 5AC901.FA02-00 | APC910 fan kit - For 5PC910.SX02-00  |        |
|                | Front cover  |        |
| 5AC901.FF02-00 | Front cover for 2-slot APC910 - Orange   |        |
| 5AC901.FF02-01 | Front cover for 2-slot APC910 - Dark gray  |        |
| 5AC901.FF02-02 | Front cover for 2-slot APC910 - Dark gray - Without logo                           |        |
| 5AC901.FF02-03 | Front cover for 2-slot APC910 - Orange - Without logo                              |        |
|                | Interface options  |        |
| 5AC901.I485-00 | Interface card - 1x RS232/422/485 interface - For APC910/PPC900                    |        |
| 5AC901.ICAN-00 | Interface card - 1x CAN interface - For APC910/PPC900                              |        |
| 5AC901.IETH-00 | Interface card - 1x ETH 10/100/1000 - For APC910/PPC900                            |        |
| 5AC901.IHDA-00 | Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900 |        |
| 5AC901.IPLK-00 | Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900            |        |
| 5AC901.IRDY-00 | Interface card - Ready relay - For APC910/PPC900                                   |        |
| 5AC901.ISIO-00 | Interface card - System I/O - For APC910/PPC900                                    |        |
| 5AC901.ISRM-00 | Interface cards - 2 MB SRAM - For APC910/PPC900                                    |        |
|                | Monitor/Panel options  |        |
| 5AC901.LDPO-00 | DisplayPort transmitter  |        |
| 5AC901.LSD3-00 | SDL3 transmitter   |        |
| 5AC901.LSDL-00 | SDL/DVI transmitter  |        |
|                | Uninterruptible power supplies   |        |
| 5AC901.IUPS-00 | UPS - For 4.5 Ah battery   |        |
| 5AC901.IUPS-01 | UPS - For 2.2 Ah battery   |        |

Table 46: 5PC910.SX02-00 - Order data

### 3.1.2.3 Technical data

| Model number               | 5PC910.SX02-00  |
|----------------------------|---|
| <b>General information</b> |   |
| Cooling                    | Passive via heat sink and optionally supported with an active fan kit   |
| LED status indicators      | Power, HDD, Link, Run   |
| B&R ID code                | 0xD6DB  |
| Battery                    |   |
| Type                       | Renata 950 mAh  |
| Service life               | 4 years <sup>1)</sup>   |
| Removable                  | Yes, accessible behind the front cover  |
| Design                     | Lithium ion   |
| Power button               | Yes   |
| Reset button               | Yes   |
| Buzzer                     | Yes   |
| Certification              |   |
| CE                         | Yes   |
| UL                         | cULus E115267   |
| DNV GL                     | Industrial Control Equipment  |
| GOST-R                     | Temperature: B (0 - 55°C)<br>Humidity: B (up to 100%)<br>Vibration: A (0.7g)<br>EMC: B (Bridge and open deck) <sup>2)</sup> |
| <b>Controller</b>          |   |
| Boot loader                | BIOS  |
| Real-time clock            |   |
| Battery-backed             | Yes   |
| Power failure logic        |   |
| Controller                 | MTCX <sup>3)</sup>  |
| Buffer time                | 10 ms   |
| Graphics                   |   |
| Controller                 | Depends on the CPU board being used   |
| Memory                     |   |
| Type                       | Depends on the CPU board being used   |
| Memory size                | Depends on the CPU board being used   |

Table 47: 5PC910.SX02-00 - Technical data

| Model number                                       | 5PC910.SX02-00   |
|--|--|
| Interfaces   |  |
| <b>COM1</b>  |  |
| Type   | RS232, modem-capable, not electrically isolated  |
| Design   | 9-pin, male, DSUB connector  |
| UART   | 16550-compatible, 16-byte FIFO   |
| Max. baud rate                                     | 115 kbit/s   |
| <b>CFast slot</b>                                  |  |
| Quantity   | 1  |
| Type   | SATA III (SATA 60 Gbit/s)  |
| <b>USB</b>   |  |
| Quantity   | 5  |
| Type   | 4x USB 3.0 (top)<br>1x USB 2.0 (front)   |
| Design   | Type A   |
| Transfer rate                                      | Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s) <sup>4)</sup> |
| Current-carrying capacity                          | Max. 1 A per connection  |
| <b>Ethernet</b>                                    |  |
| Quantity   | 2  |
| Design   | Shielded RJ45  |
| Transfer rate                                      | 10/100/1000 Mbit/s   |
| Max. baud rate                                     | 1 Gbit/s   |
| <b>DisplayPort</b>                                 |  |
| Quantity   | 1  |
| Version  | Depends on the CPU board being used  |
| <b>Monitor/Panel interface</b>                     |  |
| Design   | DVI-I  |
| Type   | SDL/DVI/Monitor  |
| Inserts  |  |
| <b>PCI/PCle slots</b>                              |  |
| Quantity   | 2 PCI slots or<br>1 PCI slots and 1 PCle slot or<br>2 PCle slots <sup>5)</sup>                               |
| <b>Slide-in drives</b>                             |  |
| Quantity   | 1  |
| Type   | SATA II (SATA 30 Gbit/s)   |
| <b>Slide-in compact drives</b>                     |  |
| Quantity   | 1  |
| Type   | SATA III (SATA 60 Gbit/s)  |
| Interface option                                   | 2  |
| Monitor/Panel option                               | 1  |
| Add-on UPS slot                                    | Yes <sup>6)</sup>  |
| Insert for fan kit                                 | Yes  |
| Electrical characteristics                         |  |
| Nominal voltage                                    | 24 VDC ±25%, SELV <sup>7)</sup>  |
| Nominal current                                    | Max. 5.5 A <sup>8)</sup>   |
| Inrush current                                     | Max. 60 A for <300 µs  |
| Overvoltage category in accordance with EN 61131-2 | II   |
| Electrical isolation                               | Yes  |
| Operating conditions                               |  |
| EN 60529 protection                                | IP20 <sup>9)</sup>   |
| Environmental conditions                           |  |
| <b>Temperature</b>                                 |  |
| Operation  | Component-dependent <sup>10)</sup>   |
| Storage  | -20 to 60°C  |
| Transport  | -20 to 60°C  |
| <b>Relative humidity</b>                           |  |
| Operation  | Component-dependent  |
| Storage  | Component-dependent  |
| Transport  | Component-dependent  |
| <b>Vibration <sup>11)</sup></b>                    |  |
| 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  |
| <b>Shock <sup>11)</sup></b>                        |  |
| Operation  | 15 g, 11 ms  |
| Storage  | 30 g, 6 ms   |
| Transport  | 30 g, 6 ms   |
| <b>Elevation</b>                                   |  |
| Operation  | -300 to 3000 m above sea level <sup>12)</sup>  |

Table 47: 5PC910.SX02-00 - Technical data



| Model number               | 5PC910.SX02-00            |
|----------------------------|---------------------------|
| Mechanical characteristics |                           |
| Housing <sup>13)</sup>     |                           |
| Material                   | Galvanized plate, plastic |
| Coating                    | Anthracite gray           |
| Dimensions                 |                           |
| Width                      | 130 mm                    |
| Height                     | 270 mm                    |
| Depth                      | 254.75 mm                 |
| Weight                     | 2550 g                    |

Table 47: 5PC910.SX02-00 - Technical data

- 1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an [interface](#) option with [SRAM](#) or [POWERLINK](#) has been installed, the service life is 2½ years.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) Maintenance [Controller](#) Extended.
- 4) The SuperSpeed transfer rate (5 Gbit/s) is only possible with [USB 3.0](#).
- 5) The PCI and PCIe slots available depend on the bus unit being used (5AC901.BX02-00, 5AC901.BX02-01 or 5AC901.BX02-02).
- 6) This [UPS](#) module [can](#) only be operated in the IF option 1 slot.
- 7) [EN 60950](#) requirements must be observed; see section "+24 VDC power supply" in the user's manual.
- 8) Maximum current consumption (24 V / 130 W). This [can](#) vary depending on the configuration (see "Power calculation" section). The inrush current must also be taken into consideration when selecting the power supply.
- 9) Only when all [interface](#) covers and the front cover are closed.
- 10) Detailed information [can](#) be found in the temperature tables in the user's manual.
- 11) Maximum values unless specified otherwise by another individual component. Vibration testing is performed in accordance with [EN 60068-2-6](#). Shock testing is performed in accordance with [EN 60068-2-27](#).
- 12) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
- 13) There may be visible deviations in the color and surface appearance depending on the [process](#) or batch.

### 3.1.2.4 Dimensions

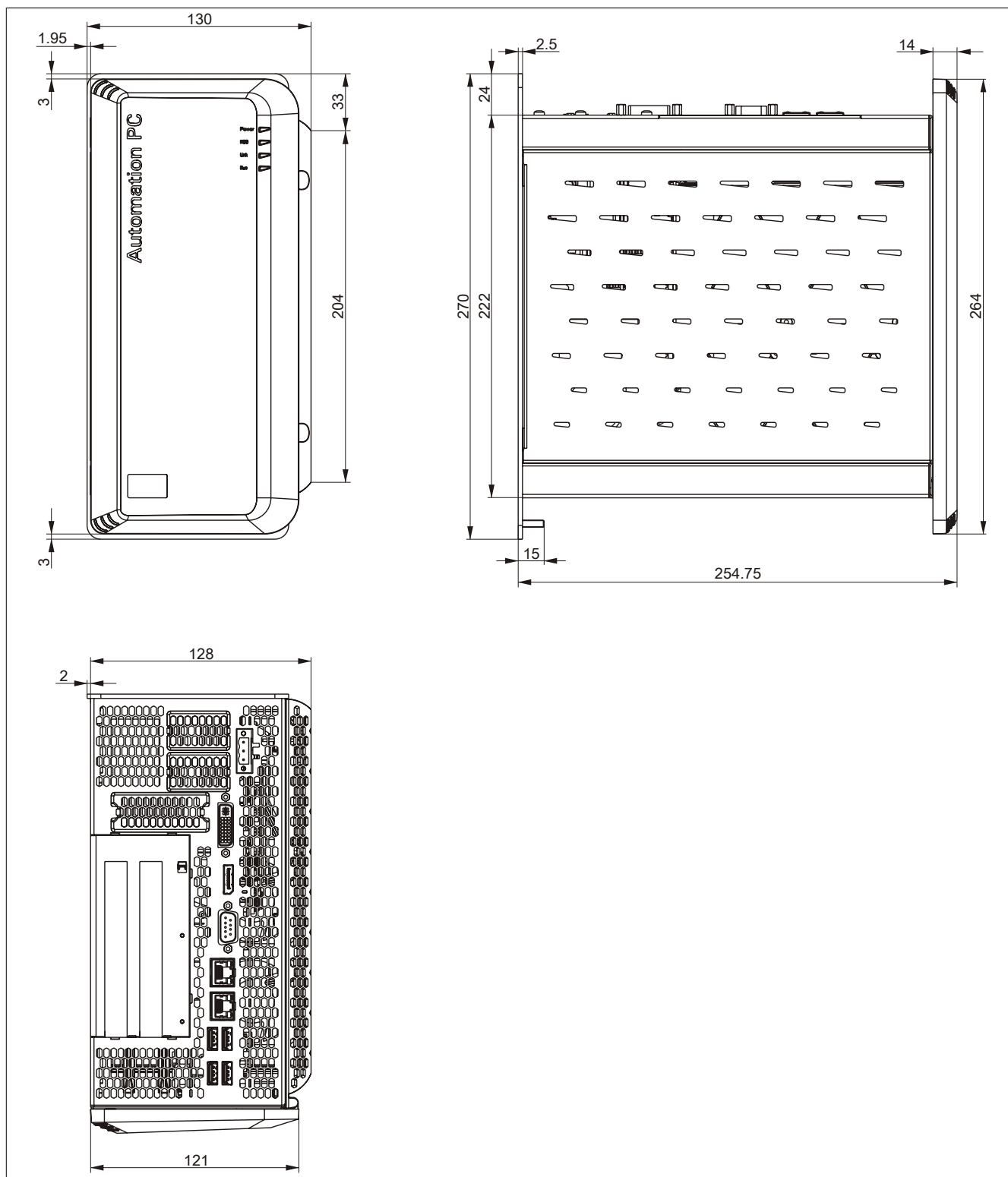


Figure 27: 5PC910.SX02-00 - Dimensions

### 3.1.2.5 Drilling template

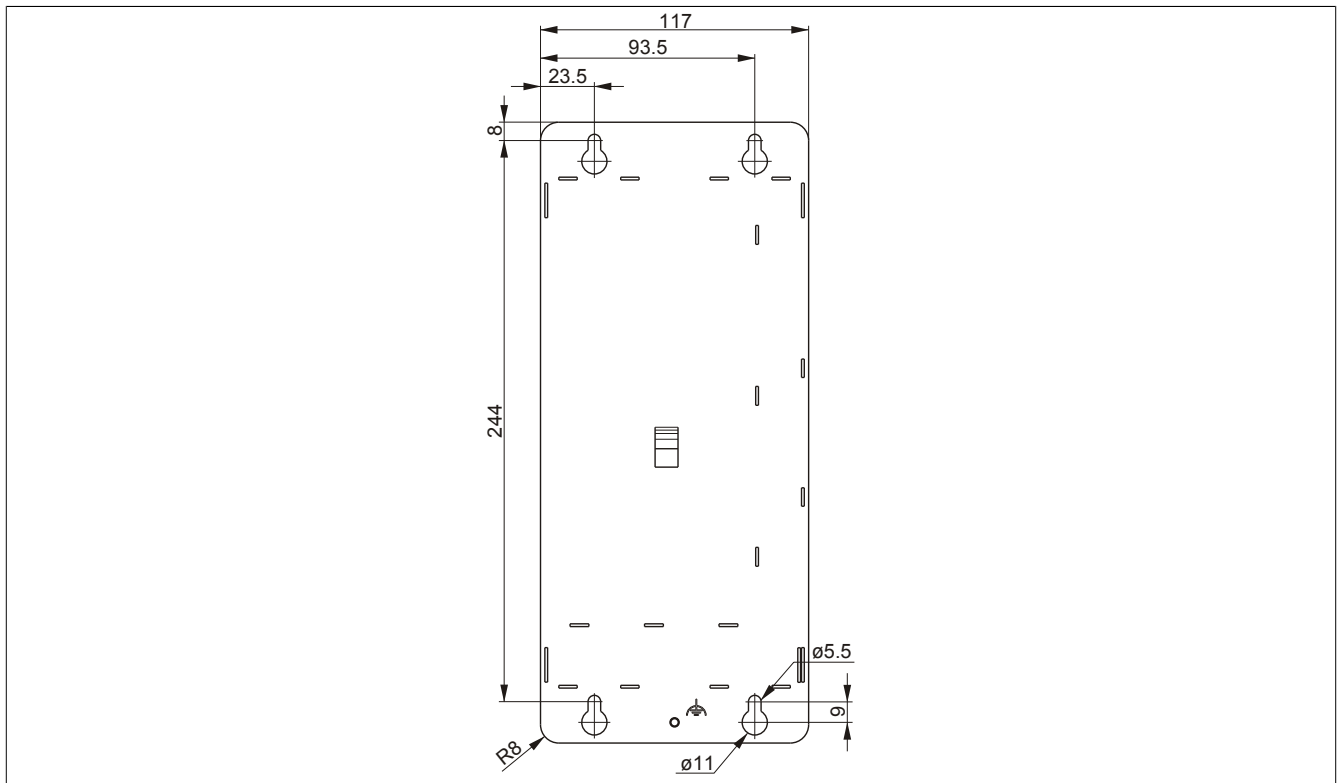


Figure 28: 5PC910.SX02-00 - Drilling template

### 3.1.3 5PC910.SX05-00

#### 3.1.3.1 General information

- Slot for a bus unit with 5 PCI/PCIe slots
- Insert for 1 slide-in compact drive and 2 slide-in drives
- Insert for 2 [interface](#) options
- SDL/DVI/Monitor and DisplayPort interfaces
- Insert for monitor/panel option
- CFast slot

#### 3.1.3.2 Order data

| Model number         | Short description   | Figure  |
|----------------------|---|---|
| System units         |   |  |
| 5PC910.SX05-00       | 5-slot APC910 system unit   |   |
| Required accessories |   |   |
| Accessories          |   |   |
| 0TB103.9             | Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²                                     |   |
| 0TB103.91            | Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²                                      |   |
| Bus units            |   |   |
| 5AC901.BX05-00       | APC910 5-slot bus - 5 PCI   |   |
| 5AC901.BX05-01       | APC910 5-slot bus - 4 PCI - 1 PCI Express x8  |   |
| 5AC901.BX05-02       | APC910 5-slot bus - 2 PCI - 1 PCI Express x8 - 2 PCI Express x1   |   |
| 5AC901.BX05-03       | APC910 5-slot bus - 2 PCI Express x4 - 3 PCI Express x1   |   |
| CPU boards           |   |   |
| 5PC900.TS17-00       | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - Chipset QM170 - For APC910                           |   |
| 5PC900.TS17-01       | CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910  |   |
| 5PC900.TS17-02       | CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.6 GHz passive - For APC910 |   |
| 5PC900.TS77-00       | CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-01       | CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-02       | CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-03       | CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-04       | CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-05       | CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-06       | CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910                            |   |
| 5PC900.TS77-07       | CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910                              |   |
| 5PC900.TS77-08       | CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910                            |   |
| 5PC900.TS77-09       | CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910                             |   |
| 5PC900.TS77-10       | CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910                            |   |
| Heat sink            |   |   |
| 5AC901.HS00-00       | APC910 heat sink, active  |   |
| 5AC901.HS00-01       | APC910 active heat sink QM170/HM170   |   |
| 5AC901.HS01-00       | APC910 heat sink, passive   |   |
| 5AC901.HS01-01       | APC910 passive heat sink QM170/HM170  |   |
| Main memory          |   |   |
| 5MMDDR.016G-04       | SO-DIMM DDR4, 16384 MB  |   |
| 5MMDDR.1024-03       | SO-DIMM DDR3, 1024 MB   |   |
| 5MMDDR.2048-03       | SO-DIMM DDR3, 2048 MB   |   |
| 5MMDDR.4096-03       | SO-DIMM DDR3, 4096 MB   |   |
| 5MMDDR.4096-04       | SO-DIMM DDR4, 4096 MB   |   |
| 5MMDDR.8192-03       | SO-DIMM DDR3, 8192 MB   |   |
| 5MMDDR.8192-04       | SO-DIMM DDR4, 8192 MB   |   |
| Optional accessories |   |   |
| Drives               |   |   |
| 5AC901.CCFA-00       | CFast adapter - For slide-in compact slot   |   |
| 5AC901.CHDD-01       | 500 GB hard disk - Slide-in compact - SATA  |   |

Table 48: 5PC910.SX05-00 - Order data

| Model number   | Short description  | Figure |
|----------------|--|--------|
| 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.SDVW-00 | DVD drive - DVD-R/RW DVD+R/RW - Slide-in   |        |
| 5AC901.SSCA-00 | Slide-in compact adapter - For slide-in compact drives                             |        |
|                | Fan kit  |        |
| 5AC901.FA05-00 | APC910 fan kit - For 5PC910.SX05-00 system unit                                    |        |
|                | Front cover  |        |
| 5AC901.FF05-00 | Front cover for 5-slot APC910 - Orange   |        |
| 5AC901.FF05-01 | Front cover for 5-slot APC910 - Dark gray  |        |
| 5AC901.FF05-02 | Front cover for 5-slot APC910 - Dark gray - Without logo                           |        |
| 5AC901.FF05-03 | Front cover for 5-slot APC910 - Orange - Without logo                              |        |
|                | Interface options  |        |
| 5AC901.I485-00 | Interface card - 1x RS232/422/485 interface - For APC910/PPC900                    |        |
| 5AC901.ICAN-00 | Interface card - 1x CAN interface - For APC910/PPC900                              |        |
| 5AC901.IETH-00 | Interface card - 1x ETH 10/100/1000 - For APC910/PPC900                            |        |
| 5AC901.IHDA-00 | Interface card - 1x audio interface (1x MIC/1x Line In/1x OUT) - For APC910/PPC900 |        |
| 5AC901.IPLK-00 | Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900            |        |
| 5AC901.IRDY-00 | Interface card - Ready relay - For APC910/PPC900                                   |        |
| 5AC901.ISIO-00 | Interface card - System I/O - For APC910/PPC900                                    |        |
| 5AC901.ISRM-00 | Interface cards - 2 MB SRAM - For APC910/PPC900                                    |        |
|                | Monitor/Panel options  |        |
| 5AC901.LDPO-00 | DisplayPort transmitter  |        |
| 5AC901.LSD3-00 | SDL3 transmitter   |        |
| 5AC901.LSDL-00 | SDL/DVI transmitter  |        |
|                | Uninterruptible power supplies   |        |
| 5AC901.IUPS-00 | UPS - For 4.5 Ah battery   |        |
| 5AC901.IUPS-01 | UPS - For 2.2 Ah battery   |        |

Table 48: 5PC910.SX05-00 - Order data

### 3.1.3.3 Technical data

| Model number               | 5PC910.SX05-00  |
|----------------------------|---|
| <b>General information</b> |   |
| Cooling                    | Passive via heat sink and optionally supported with an active fan kit |
| LED status indicators      | Power, HDD, Link, Run   |
| B&R ID code                | 0xD844  |
| Battery                    |   |
| Type                       | Renata 950 mAh  |
| Service life               | 4 years <sup>1)</sup>   |
| Removable                  | Yes, accessible behind the front cover                                |
| Design                     | Lithium ion   |
| Power button               | Yes   |
| Reset button               | Yes   |
| Buzzer                     | Yes   |
| Certification              |   |
| CE                         | Yes   |
| UL                         | cULus E115267<br>Industrial Control Equipment                         |
| GOST-R                     | Yes   |
| <b>Controller</b>          |   |
| Boot loader                | BIOS  |
| Real-time clock            |   |
| Battery-backed             | Yes   |
| Power failure logic        |   |
| Controller                 | MTCX <sup>2)</sup>  |
| Buffer time                | 10 ms   |
| Graphics                   |   |
| Controller                 | Depends on the CPU board being used                                   |
| Memory                     |   |
| Type                       | Depends on the CPU board being used                                   |
| Memory size                | Depends on the CPU board being used                                   |
| <b>Interfaces</b>          |   |
| COM1                       |   |
| Type                       | RS232, modem-capable, not electrically isolated                       |
| Design                     | 9-pin, male, DSUB connector   |
| UART                       | 16550-compatible, 16-byte FIFO  |
| Max. baud rate             | 115 kbit/s  |

Table 49: 5PC910.SX05-00 - Technical data

| Model number                                       | 5PC910.SX05-00  |
|--|---|
| CFAST slot   |   |
| Quantity   | 1   |
| Type   | SATA III (SATA 60 Gbit/s)   |
| USB  |   |
| Quantity   | 5   |
| Type   | 4x USB 3.0 (top)<br>1x USB 2.0 (front)  |
| Design   | Type A  |
| Transfer rate                                      | Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s) <sup>3)</sup>      |
| Current-carrying capacity                          | Max. 1 A per connection   |
| Ethernet   |   |
| Quantity   | 2   |
| Design   | Shielded RJ45   |
| Transfer rate                                      | 10/100/1000 Mbit/s  |
| Max. baud rate                                     | 1 Gbit/s  |
| DisplayPort  |   |
| Quantity   | 1   |
| Version  | Depends on the CPU board being used   |
| Monitor/Panel interface                            |   |
| Design   | DVI-I   |
| Type   | SDL/DVI/Monitor   |
| Inserts  |   |
| PCI/PCIe slots                                     |   |
| Quantity   | 5 PCI slots or<br>4 PCI slots and 1 PCIe slot or<br>2 PCI slots and 3 PCIe slots or<br>5 PCIe slots <sup>4)</sup> |
| Slide-in drives                                    |   |
| Quantity   | 2   |
| Type   | SATA II (SATA 30 Gbit/s)  |
| Slide-in compact drives                            |   |
| Quantity   | 1   |
| Type   | SATA III (SATA 60 Gbit/s)   |
| Interface option                                   | 2   |
| Monitor/Panel option                               | 1   |
| Add-on UPS slot                                    | Yes <sup>5)</sup>   |
| Insert for fan kit                                 | Yes   |
| Electrical characteristics                         |   |
| Nominal voltage                                    | 24 VDC ±25%, SELV <sup>6)</sup>   |
| Nominal current                                    | Max. 5.5 A <sup>7)</sup>  |
| Inrush current                                     | Max. 60 A for <300 µs   |
| Overvoltage category in accordance with EN 61131-2 | II  |
| Electrical isolation                               | Yes   |
| Operating conditions                               |   |
| EN 60529 protection                                | IP20 <sup>8)</sup>  |
| Environmental conditions                           |   |
| Temperature  |   |
| Operation  | Component-dependent <sup>9)</sup>   |
| Storage  | -20 to 60°C   |
| Transport  | -20 to 60°C   |
| Relative humidity                                  |   |
| Operation  | Component-dependent   |
| Storage  | Component-dependent   |
| Transport  | Component-dependent   |
| Vibration <sup>10)</sup>                           |   |
| 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 <sup>10)</sup>                               |   |
| Operation  | 15 g, 11 ms   |
| Storage  | 30 g, 6 ms  |
| Transport  | 30 g, 6 ms  |
| Elevation  |   |
| Operation  | -300 to 3000 m above sea level <sup>11)</sup>   |
| Mechanical characteristics                         |   |
| Housing <sup>12)</sup>                             |   |
| Material   | Galvanized plate, plastic   |
| Coating  | Anthractic gray   |

Table 49: 5PC910.SX05-00 - Technical data

| Model number | 5PC910.SX05-00 |
|--------------|----------------|
| Dimensions   |                |
| Width        | 211 mm         |
| Height       | 270 mm         |
| Depth        | 254.75 mm      |
| Weight       | 2850 g         |

Table 49: 5PC910.SX05-00 - Technical data

- 1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an [interface](#) option with [SRAM](#) or [POWERLINK](#) has been installed, the service life is 2½ years.
- 2) Maintenance [Controller](#) Extended.
- 3) The SuperSpeed transfer rate (5 Gbit/s) is only possible with [USB 3.0](#).
- 4) The PCI and PCIe slots available depend on the bus unit being used (5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02 or 5AC901.BX05-03).
- 5) This [UPS](#) module [can](#) only be operated in the IF option 1 slot.
- 6) [EN 60950](#) requirements must be observed; see section "+24 VDC power supply" in the user's manual.
- 7) Maximum current consumption (24 V / 130 W). This [can](#) vary depending on the configuration (see "Power calculation" section). The inrush current must also be taken into consideration when selecting the power supply.
- 8) Only when all [interface](#) covers and the front cover are closed.
- 9) Detailed information [can](#) be found in the temperature tables in the user's manual.
- 10) Maximum values unless specified otherwise by another individual component. Vibration testing is performed in accordance with [EN 60068-2-6](#). Shock testing is performed in accordance with [EN 60068-2-27](#).
- 11) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
- 12) There may be visible deviations in the color and surface appearance depending on the [process](#) or batch.

### 3.1.3.4 Dimensions

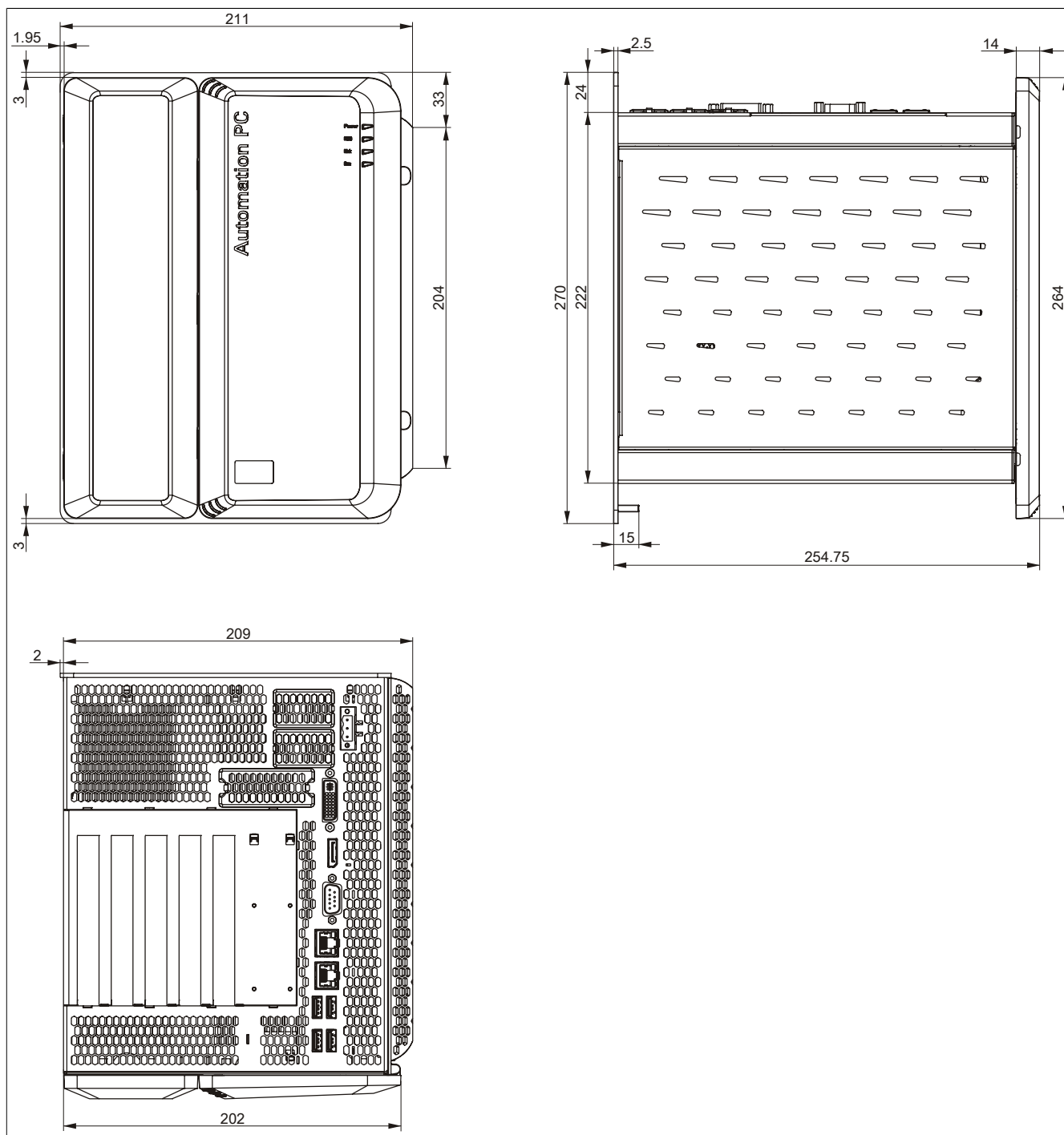


Figure 29: 5PC910.SX05-00 - Dimensions



### 3.1.3.5 Drilling template

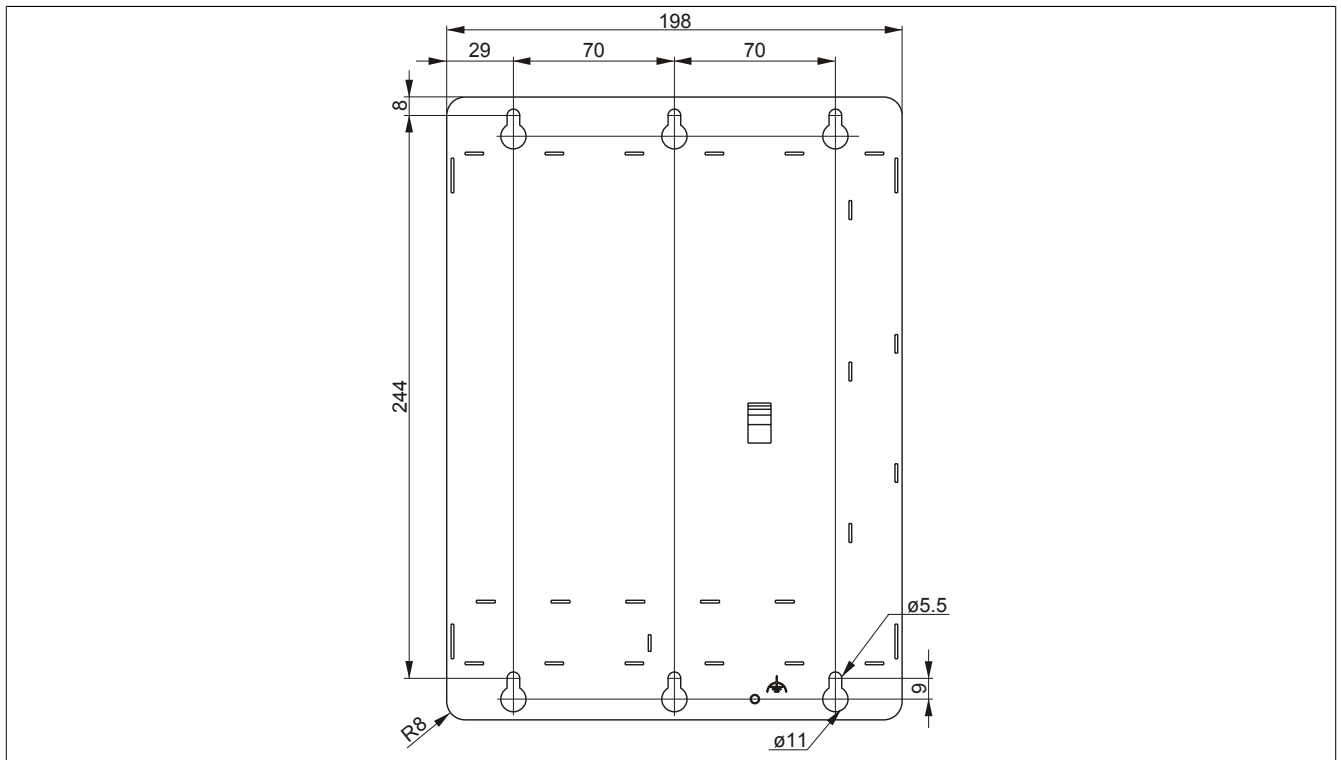


Figure 30: 5PC910.SX05-00 - Drilling template

## 3.2 QM77 CPU boards

### 3.2.1 5PC900.TS77-0x

#### 3.2.1.1 General information

- Intel Core i-series processors
- Intel QM77 chipset
- 2x DDR3 memory slots
- Intel HD Graphics 4000
- AMI BIOS (UEFI)

#### Information:

A fan kit is required when using the 5PC900.TS77-00 CPU board.

#### 3.2.1.2 Order data


| Model number   | Short description  | Figure   |
|----------------|--|--|
|                | <b>CPU boards</b>  |  |
| 5PC900.TS77-00 | CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910 |  |
| 5PC900.TS77-01 | CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910 |  |
| 5PC900.TS77-02 | CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910 |  |
| 5PC900.TS77-03 | CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910 |  |
| 5PC900.TS77-04 | CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910 |  |
| 5PC900.TS77-05 | CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910 |  |
| 5PC900.TS77-06 | CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910 |  |
|                | <b>Required accessories</b>  |  |
|                | <b>Heat sink</b>   |  |
| 5AC901.HS00-00 | APC910 heat sink, active   |  |
| 5AC901.HS01-00 | APC910 heat sink, passive  |  |
|                | <b>Main memory</b>   |  |
| 5MMDDR.1024-03 | SO-DIMM DDR3, 1024 MB  |  |
| 5MMDDR.2048-03 | SO-DIMM DDR3, 2048 MB  |  |
| 5MMDDR.4096-03 | SO-DIMM DDR3, 4096 MB  |  |
| 5MMDDR.8192-03 | SO-DIMM DDR3, 8192 MB  |  |

Table 50: 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-02, 5PC900.TS77-03, 5PC900.TS77-04, 5PC900.TS77-05, 5PC900.TS77-06 - Order data

## 3.2.1.3 Technical data

| Model number                           | 5PC900.<br>TS77-00  | 5PC900.<br>TS77-01      | 5PC900.<br>TS77-02      | 5PC900.<br>TS77-03      | 5PC900.<br>TS77-04  | 5PC900.<br>TS77-05      | 5PC900.<br>TS77-06      |
|--|---|-------------------------|-------------------------|-------------------------|---|-------------------------|-------------------------|
| General information                    |   |                         |                         |                         |   |                         |                         |
| Certification                          |   |                         |                         |                         |   |                         |                         |
| CE                                     | Yes   |                         |                         |                         |   |                         |                         |
| UL                                     | cULus E115267<br>Industrial Control Equipment   |                         |                         |                         |   |                         |                         |
| DNV GL                                 | Temperature:<br>B (0 - 55°C)<br>Humidity:<br>B (up to 100%)<br>Vibration:<br>A (0.7g)<br>EMC: B<br>(Bridge and open deck) <sup>1)</sup> | -                       | -                       | -                       | Temperature:<br>B (0 - 55°C)<br>Humidity:<br>B (up to 100%)<br>Vibration:<br>A (0.7g)<br>EMC: B<br>(Bridge and open deck) <sup>1)</sup> | -                       | -                       |
| GOST-R                                 | Yes   |                         |                         |                         |   |                         |                         |
| Controller                             |   |                         |                         |                         |   |                         |                         |
| Boot loader                            | Embedded AMI BIOS   |                         |                         |                         |   |                         |                         |
| Processor                              |   |                         |                         |                         |   |                         |                         |
| Type                                   | Intel Core<br>i7-3615QE   | Intel Core<br>i7-3612QE | Intel Core<br>i7-3555LE | Intel Core<br>i7-3517UE | Intel Core<br>i5-3610ME   | Intel Core<br>i3-3120ME | Intel Core<br>i3-3217UE |
| Clock frequency                        | 2300 MHz  | 2100 MHz                | 2500 MHz                | 1700 MHz                | 2700 MHz  | 2400 MHz                | 1600 MHz                |
| Number of cores                        | 4   | 4                       | 2                       | 2                       | 2   | 2                       | 2                       |
| Architecture                           | 22 nm   |                         |                         |                         |   |                         |                         |
| Intel Smart Cache                      | 6 MB  | 6 MB                    | 4 MB                    | 4 MB                    | 3 MB  | 3 MB                    | 3 MB                    |
| External bus                           | DMI, 5 GT/s   |                         |                         |                         |   |                         |                         |
| Intel 64 architecture                  | Yes   |                         |                         |                         |   |                         |                         |
| Intel Turbo Boost Technology           | 2.0   | 2.0                     | 2.0                     | 2.0                     | 2.0   | No                      | No                      |
| Intel Hyper-Threading Technology       | Yes   |                         |                         |                         |   |                         |                         |
| Intel Virtualization Technology (VT-x) | Yes   |                         |                         |                         |   |                         |                         |
| Enhanced Intel SpeedStep Technology    | Yes   |                         |                         |                         |   |                         |                         |
| Chipset                                | Intel QM77  |                         |                         |                         |   |                         |                         |
| Real-time clock                        |   |                         |                         |                         |   |                         |                         |
| Precision                              | At 25°C: typ. 12 ppm (1 second) per day <sup>2)</sup>   |                         |                         |                         |   |                         |                         |
| Battery-backed                         | Yes   |                         |                         |                         |   |                         |                         |
| Memory slot                            |   |                         |                         |                         |   |                         |                         |
| Number of memory channels              | 2   |                         |                         |                         |   |                         |                         |
| Type                                   | DDR3  |                         |                         |                         |   |                         |                         |
| Memory size                            | Max. 16 GB  |                         |                         |                         |   |                         |                         |
| Max. memory bandwidth                  | 25.6 GB/s   |                         |                         |                         |   |                         |                         |
| Graphics                               |   |                         |                         |                         |   |                         |                         |
| Controller                             | Intel HD Graphics 4000  |                         |                         |                         |   |                         |                         |
| Max. dynamic graphics frequency        | 1 GHz   | 1 GHz                   | 1 GHz                   | 1 GHz                   | 950 MHz   | 900 MHz                 | 900 MHz                 |
| Color depth                            | Max. 32-bit   |                         |                         |                         |   |                         |                         |
| Resolution                             |   |                         |                         |                         |   |                         |                         |
| DVI                                    | Resolution up to 1920 x 1200 (WUXGA)  |                         |                         |                         |   |                         |                         |
| RGB                                    | 350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)   |                         |                         |                         |   |                         |                         |
| DisplayPort                            | Version 1.1   |                         |                         |                         |   |                         |                         |
| Mass memory management                 | 4x SATA   |                         |                         |                         |   |                         |                         |
| Power management                       | ACPI 4.0 with battery support   |                         |                         |                         |   |                         |                         |

Table 51: 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-02, 5PC900.TS77-03, 5PC900.TS77-04, 5PC900.TS77-05, 5PC900.TS77-06 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification.  
 2) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

### 3.3 HM76 CPU boards

#### 3.3.1 5PC900.TS77-0x

##### 3.3.1.1 General information

- Intel Celeron processors
- Intel HM76 chipset
- 2x DDR3 memory slots
- Intel HD Graphics 2000/2500
- AMI BIOS (UEFI)

##### 3.3.1.2 Order data


| Model number   | Short description  | Figure  |
|----------------|--|---|
|                | <b>CPU boards</b>  |  |
| 5PC900.TS77-07 | CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910   |   |
| 5PC900.TS77-08 | CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910 |   |
| 5PC900.TS77-09 | CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910  |   |
| 5PC900.TS77-10 | CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910 |   |
|                | <b>Required accessories</b>  |   |
|                | <b>Heat sink</b>   |   |
| 5AC901.HS00-00 | APC910 heat sink, active   |   |
| 5AC901.HS01-00 | APC910 heat sink, passive  |   |
|                | <b>Main memory</b>   |   |
| 5MMDDR.1024-03 | SO-DIMM DDR3, 1024 MB  |   |
| 5MMDDR.2048-03 | SO-DIMM DDR3, 2048 MB  |   |
| 5MMDDR.4096-03 | SO-DIMM DDR3, 4096 MB  |   |
| 5MMDDR.8192-03 | SO-DIMM DDR3, 8192 MB  |   |

Table 52: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Order data

##### 3.3.1.3 Technical data

| Model number                           | 5PC900.TS77-07  |                    | 5PC900.TS77-08      | 5PC900.TS77-09  | 5PC900.TS77-10 |
|--|---|--------------------|---------------------|---|----------------|
| General information                    |   |                    |                     |   |                |
| Certification                          | Yes<br>cULus E115267<br>Industrial <b>Control</b> Equipment |                    |                     |   |                |
| CE                                     |   |                    |                     |   |                |
| UL                                     |   |                    |                     |   |                |
| DNV GL                                 | -   | -                  | -                   | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC</b> : <b>B</b> (Bridge and open deck) <sup>1)</sup> |                |
| GOST-R                                 | Yes   |                    |                     |   |                |
| Controller                             |   |                    |                     |   |                |
| Boot loader                            | Embedded AMI <b>BIOS</b>                                    |                    |                     |   |                |
| Processor                              |   |                    |                     |   |                |
| Type                                   | Intel Celeron 847E  | Intel Celeron 827E | Intel Celeron 1020E | Intel Celeron 1047UE  |                |
| Clock frequency                        | 1100 MHz  | 1400 MHz           | 2200 MHz            | 1400 MHz  |                |
| Number of cores                        | 2   | 1                  | 2                   | 2   |                |
| Architecture                           | 32 nm   | 32 nm              | 22 nm               | 22 nm   |                |
| Intel Smart <b>Cache</b>               | 2 <b>MB</b>   | 1.5 <b>MB</b>      | 2 <b>MB</b>         | 2 <b>MB</b>   |                |
| External bus                           | DMI, 5 GT/s   |                    |                     |   |                |
| Intel 64 architecture                  | Yes   |                    |                     |   |                |
| Intel Turbo Boost Technology           | No  |                    |                     |   |                |
| Intel Hyper-Threading Technology       | No  |                    |                     |   |                |
| Intel Virtualization Technology (VT-x) | Yes   |                    |                     |   |                |
| Enhanced Intel SpeedStep Technology    | Yes   |                    |                     |   |                |
| Chipset                                | Intel HM76  |                    |                     |   |                |
| Real-time clock                        |   |                    |                     |   |                |
| Precision                              | At 25°C: typ. 12 ppm (1 second) per day <sup>2)</sup>       |                    |                     |   |                |
| Battery-backed                         | Yes   |                    |                     |   |                |

Table 53: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Technical data

| Model number                    | 5PC900.TS77-07  | 5PC900.TS77-08         | 5PC900.TS77-09         | 5PC900.TS77-10         |
|---------------------------------|---|------------------------|------------------------|------------------------|
| Memory slot                     |   |                        |                        |                        |
| Number of memory channels       | 2   |                        |                        |                        |
| Type                            | DDR3  |                        |                        |                        |
| Memory size                     | Max. 16 GB  |                        |                        |                        |
| Max. memory bandwidth           | 21.3 GB/s   | 21.3 GB/s              | 25.6 GB/s              | 25.6 GB/s              |
| Graphics                        |   |                        |                        |                        |
| Controller                      | Intel HD Graphics 2000                                      | Intel HD Graphics 2000 | Intel HD Graphics 2500 | Intel HD Graphics 2500 |
| Max. dynamic graphics frequency | 800 MHz   | 800 MHz                | 1 GHz                  | 900 MHz                |
| Color depth                     | Max. 32-bit   |                        |                        |                        |
| Resolution                      |   |                        |                        |                        |
| DVI                             | Resolution up to 1920 x 1200 (WUXGA)                        |                        |                        |                        |
| RGB                             | 350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA) |                        |                        |                        |
| DisplayPort                     | Version 1.1   |                        |                        |                        |
| Mass memory management          | 4x SATA   |                        |                        |                        |
| Power management                | ACPI 4.0 with battery support                               |                        |                        |                        |

Table 53: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification.
- 2) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

### 3.4 QM170 CPU boards

#### 3.4.1 5PC900.TS17-00

##### 3.4.1.1 General information

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

#### Information:

A fan kit is required when using CPU board 5PC900.TS17-00.

##### 3.4.1.2 Order data


| Model number   | Short description   | Figure   |
|----------------|---|--|
|                | <b>CPU boards</b>   |  |
| 5PC900.TS17-00 | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - Chipset QM170 - For APC910 |  |
|                | <b>Required accessories</b>   |  |
|                | <b>Heat sink</b>  |  |
| 5AC901.HS00-01 | APC910 active heat sink QM170/HM170   |  |
| 5AC901.HS01-01 | APC910 passive heat sink QM170/HM170  |  |
|                | <b>Main memory</b>  |  |
| 5MMDDR.016G-04 | SO-DIMM DDR4, 16384 MB  |  |
| 5MMDDR.4096-04 | SO-DIMM DDR4, 4096 MB   |  |
| 5MMDDR.8192-04 | SO-DIMM DDR4, 8192 MB   |  |

Table 54: 5PC900.TS17-00 - Order data

##### 3.4.1.3 Technical data

| Model number                           | 5PC900.TS17-00  |
|--|---|
| <b>General information</b>             |   |
| Certification                          |   |
| CE                                     | Yes   |
| UL                                     | cULus E115267<br>Industrial Control Equipment         |
| <b>Controller</b>                      |   |
| Boot loader                            | Embedded AMI BIOS                                     |
| Processor                              |   |
| Type                                   | Intel Core i5-6440EQ                                  |
| Clock frequency                        | 2700 MHz  |
| Number of cores                        | 4   |
| Architecture                           | 14 nm   |
| Intel Smart Cache                      | 6 MB  |
| External bus                           | DMI3, 8 GT/s  |
| Intel 64 architecture                  | Yes   |
| Intel Turbo Boost Technology           | 2.0   |
| Intel Hyper-Threading Technology       | No  |
| Intel Virtualization Technology (VT-x) | Yes   |
| Enhanced Intel SpeedStep Technology    | Yes   |
| Chipset                                | Intel QM170   |
| Real-time clock                        |   |
| Precision                              | At 25°C: typ. 12 ppm (1 second) per day <sup>1)</sup> |
| Battery-backed                         | Yes   |
| Memory slot                            |   |
| Number of memory channels              | 2   |
| Type                                   | DDR4  |
| Memory size                            | Max. 32 GB  |
| Max. memory bandwidth                  | 34.1 GB/s   |

Table 55: 5PC900.TS17-00 - Technical data

| Model number                    | 5PC900.TS17-00  |
|---------------------------------|---|
| Graphics                        |   |
| Controller                      | Intel HD Graphics 530                                       |
| Max. dynamic graphics frequency | 1 GHz   |
| Color depth                     | Max. 32-bit   |
| 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          | 4x SATA   |
| Power management                | ACPI 5.0 with battery support                               |

Table 55: 5PC900.TS17-00 - Technical data

- 1) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

### 3.5 HM170 CPU boards

#### 3.5.1 5PC900.TS17-0x

##### 3.5.1.1 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:

When operated without a fan kit

- CPU board 5PC900.TS17-01 is limited to a maximum CPU frequency of 1900 MHz.
- CPU board 5PC900.TS17-02 is limited to a maximum CPU frequency of 1700 MHz.

##### 3.5.1.2 Order data


| Model number   | Short description   | Figure   |
|----------------|---|--|
|                | <b>CPU boards</b>   |  |
| 5PC900.TS17-01 | CPU board Intel Core i3 6100E 2.7 GHz - Dual core - Chipset HM170 - For APC910  |  |
| 5PC900.TS17-02 | CPU board Intel Celeron G3900E 2.4 GHz - Dual core - Chipset HM170 - For APC910 |  |
|                | <b>Required accessories</b>   |  |
|                | <b>Heat sink</b>  |  |
| 5AC901.HS00-01 | APC910 active heat sink QM170/HM170   |  |
| 5AC901.HS01-01 | APC910 passive heat sink QM170/HM170  |  |
|                | <b>Main memory</b>  |  |
| 5MMDDR.016G-04 | SO-DIMM DDR4, 16384 MB  |  |
| 5MMDDR.4096-04 | SO-DIMM DDR4, 4096 MB   |  |
| 5MMDDR.8192-04 | SO-DIMM DDR4, 8192 MB   |  |

Table 56: 5PC900.TS17-01, 5PC900.TS17-02 - Order data

##### 3.5.1.3 Technical data

| Model number                           | 5PC900.TS17-01  | 5PC900.TS17-02       |
|--|---|----------------------|
| General information                    |   |                      |
| Certification                          |   |                      |
| CE                                     | Yes   | -                    |
| UL                                     | cULus E115267<br>Industrial Control Equipment         |                      |
| Controller                             |   |                      |
| Boot loader                            | Embedded AMI BIOS                                     |                      |
| Processor                              |   |                      |
| Type                                   | Intel Core i3-6100E                                   | Intel Celeron G3900E |
| Clock frequency                        | 2700 MHz  | 2400 MHz             |
| Number of cores                        | 2   |                      |
| Architecture                           | 14 nm   |                      |
| 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 Virtualization Technology (VT-x) | Yes   |                      |
| Enhanced Intel SpeedStep Technology    | Yes   |                      |
| Chipset                                | Intel HM170   |                      |
| Real-time clock                        |   |                      |
| Precision                              | At 25°C: typ. 12 ppm (1 second) per day <sup>1)</sup> |                      |
| Battery-backed                         | Yes   |                      |
| Memory slot                            |   |                      |
| Number of memory channels              | 2   |                      |
| Type                                   | DDR4  |                      |
| Memory size                            | Max. 32 GB  |                      |
| Max. memory bandwidth                  | 34.1 GB/s   |                      |

Table 57: 5PC900.TS17-01, 5PC900.TS17-02 - Technical data



| Model number                    | 5PC900.TS17-01  | 5PC900.TS17-02        |
|---------------------------------|---|-----------------------|
| Graphics                        |   |                       |
| Controller                      | Intel HD Graphics 530                                       | Intel HD Graphics 510 |
| Max. dynamic graphics frequency | 950 MHz   |                       |
| Color depth                     | Max. 32-bit   |                       |
| 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          | 4x SATA   |                       |
| Power management                | ACPI 5.0 with battery support                               |                       |

Table 57: 5PC900.TS17-01, 5PC900.TS17-02 - Technical data

- At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

## 3.6 Main memory

### 3.6.1 5MMDDR.xxxx-03

#### 3.6.1.1 General information

These 204-pin DDR3 main memory modules operate at 1600 MHz and range in size from 1 GB to 8 GB.

If two RAM modules with the same size (e.g. 2 GB) are inserted into the CPU board, then dual-channel memory technology is supported. This technology is not supported if two RAM modules of different sizes (e.g. 2 GB and 4 GB) are inserted.

If two 2 GB modules or one 4 GB module is installed on a 32-bit operating system, only 3 GB of main memory can be used. On a 64-bit operating system, up to 16 GB of main memory can be used.

#### 3.6.1.2 Order data


| Model number   | Short description     | Figure  |
|----------------|-----------------------|---|
|                | <b>Main memory</b>    |  |
| 5MMDDR.1024-03 | SO-DIMM DDR3, 1024 MB |   |
| 5MMDDR.2048-03 | SO-DIMM DDR3, 2048 MB |   |
| 5MMDDR.4096-03 | SO-DIMM DDR3, 4096 MB |   |
| 5MMDDR.8192-03 | SO-DIMM DDR3, 8192 MB |   |

Table 58: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Order data

#### 3.6.1.3 Technical data

| Model number        | 5MMDDR.1024-03   | 5MMDDR.2048-03 | 5MMDDR.4096-03 | 5MMDDR.8192-03  |
|---------------------|--|----------------|----------------|-----------------|
| General information |  |                |                |                 |
| Certification       |  |                |                |                 |
| CE                  | Yes  |                |                |                 |
| UL                  | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |                |                |                 |
| HazLoc              | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup>                   |                |                |                 |
| DNV GL              | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>2)</sup> |                |                |                 |
| GOST-R              | Yes  |                |                |                 |
| Controller          |  |                |                |                 |
| Memory              |  |                |                |                 |
| Type                | SO-DIMM DDR3 <a href="#">SDRAM</a>   |                |                |                 |
| Memory size         | 1 GB   | 2 GB           | 4 GB           | 8 GB            |
| Construction        | 204-pin  |                |                |                 |
| Organization        | 128M x 64-bit  | 256M x 64-bit  | 512M x 64-bit  | 1024M x 64 bits |
| Speed               | DDR3-1600 (PC3-12800)  |                |                |                 |

Table 59: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Technical data

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

### Information:

A main memory module can only be replaced at B&R.

### 3.6.2 5MMDDR.xxxx-04

#### 3.6.2.1 General information

These 260-pin DDR4 main memory modules operate at 2133 MHz and range in size from 4 GB to 16 GB.

If two RAM modules with the same size (e.g. 4 GB) are inserted into the CPU board, then dual-channel memory technology is supported. This technology is not supported if two RAM modules of different sizes (e.g. 4 GB and 8 GB) are inserted.

#### 3.6.2.2 Order data


| Model number   | Short description      | Figure  |
|----------------|------------------------|---|
|                | <b>Main memory</b>     |  |
| 5MMDDR.4096-04 | SO-DIMM DDR4, 4096 MB  |   |
| 5MMDDR.8192-04 | SO-DIMM DDR4, 8192 MB  |   |
| 5MMDDR.016G-04 | SO-DIMM DDR4, 16384 MB |   |

Table 60: 5MMDDR.4096-04, 5MMDDR.8192-04, 5MMDDR.016G-04 - Order data

#### 3.6.2.3 Technical data

| Model number        | 5MDDR.4096-04                                 | 5MDDR.8192-04   | 5MDDR.016G-04   |
|---------------------|---|-----------------|-----------------|
| General information |   |                 |                 |
| Certification       |   |                 |                 |
| CE                  | Yes   |                 |                 |
| UL                  | cULus E115267<br>Industrial Control Equipment |                 |                 |
| Controller          |   |                 |                 |
| Memory              |   |                 |                 |
| Type                | SO-DIMM DDR4 SDRAM                            |                 |                 |
| Memory size         | 4 GB  | 8 GB            | 16 GB           |
| Construction        | 260-pin                                       |                 |                 |
| Organization        | 512M x 64-bits                                | 1024M x 64 bits | 2048M x 64 bits |
| Speed               | DDR4-2133 (PC3-17066)                         |                 |                 |

Table 61: 5MMDDR.4096-04, 5MMDDR.8192-04, 5MMDDR.016G-04 - Technical data

### Information:

A main memory module **can** only be replaced at B&R.

## 3.7 Bus units

### 3.7.1 5AC901.BX0x-0x

#### 3.7.1.1 General information

These bus units are compatible with system units that support PCI and/or PCI Express.

#### 1-slot bus units



Figure 31: 1-slot bus units

#### 2-slot bus units

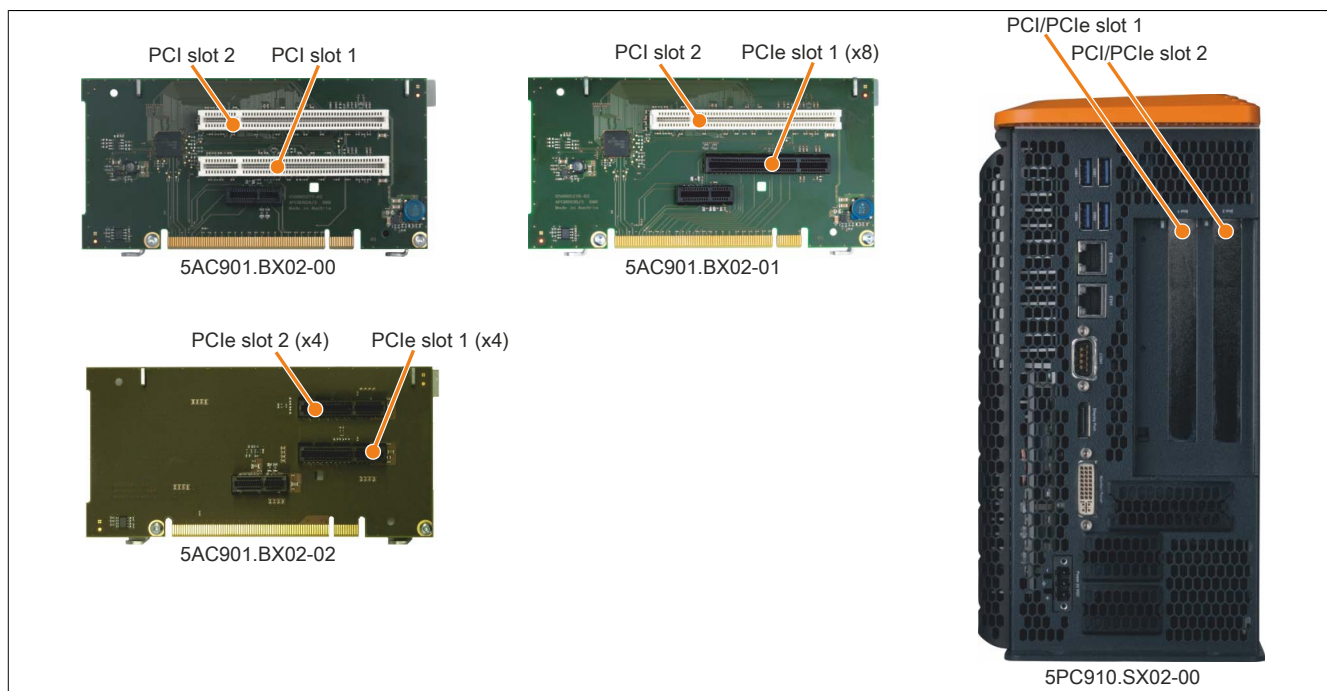


Figure 32: 2-slot bus units

## 5-slot bus units

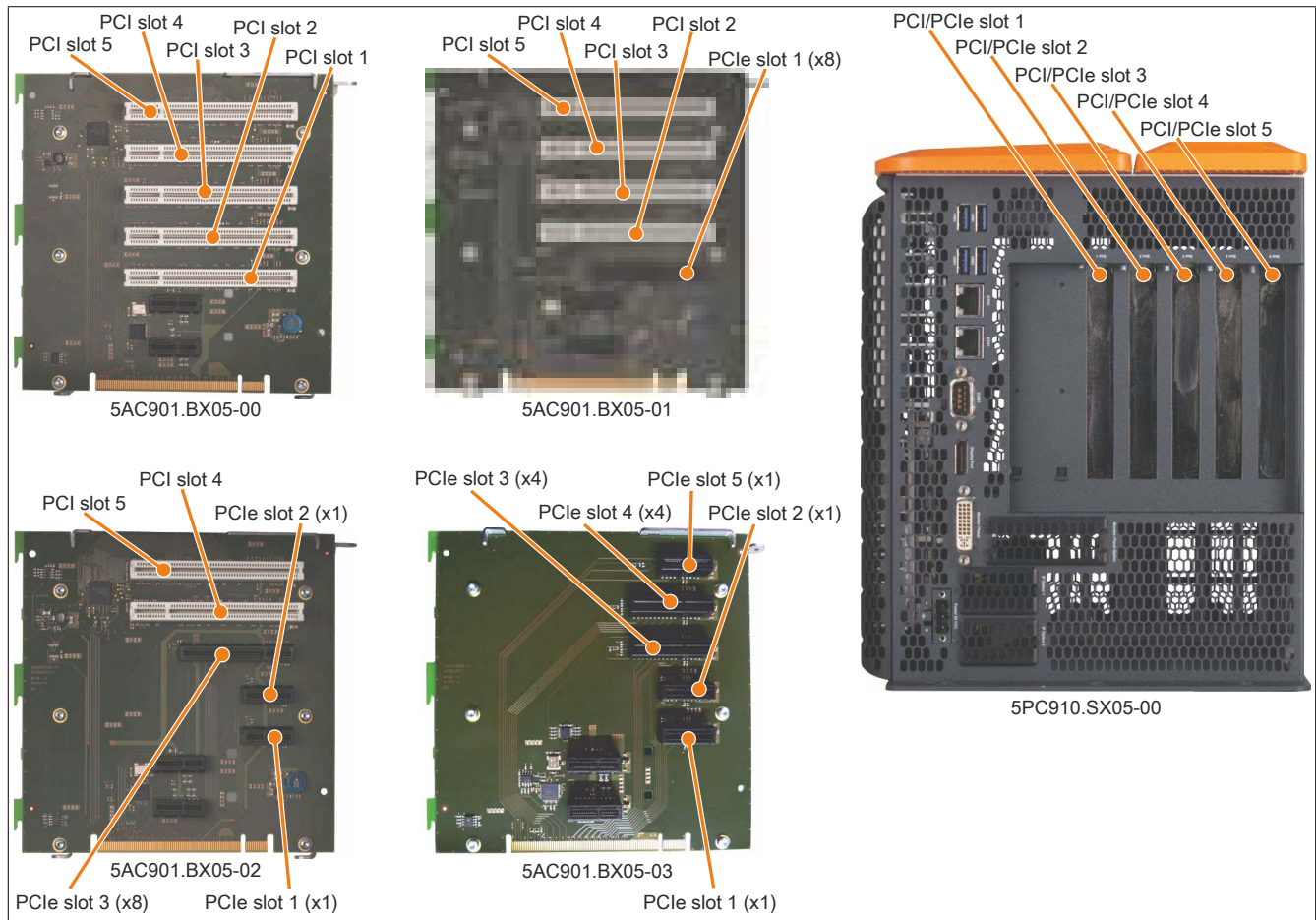


Figure 33: 5-slot bus units

### 3.7.1.2 Order data

| Model number             | Short description   | Figure |
|--------------------------|---|--------|
|                          | <b>Bus units</b>  |        |
| 5AC901.BX01-00           | APC910 1-slot bus - 1 PCI                                       |        |
| 5AC901.BX01-01           | APC910 1-slot bus - 1 PCI Express x8                            |        |
| 5AC901.BX02-00           | APC910 2-slot bus - 2 PCI                                       |        |
| 5AC901.BX02-01           | APC910 2-slot bus - 1 PCI - 1 PCI Express x8                    |        |
| 5AC901.BX02-02 ≤ Rev. C0 | APC910 2-slot bus - 2 PCI Express x4                            |        |
| 5AC901.BX02-02 ≥ Rev. D0 | APC910 2-slot bus - 2 PCI Express x4, open-ended                |        |
| 5AC901.BX05-00           | APC910 5-slot bus - 5 PCI                                       |        |
| 5AC901.BX05-01           | APC910 5-slot bus - 4 PCI - 1 PCI Express x8                    |        |
| 5AC901.BX05-02           | APC910 5-slot bus - 2 PCI - 1 PCI Express x8 - 2 PCI Express x1 |        |
| 5AC901.BX05-03           | APC910 5-slot bus - 2 PCI Express x4 - 3 PCI Express x1         |        |

Table 62: 5AC901.BX01-00, 5AC901.BX01-01, 5AC901.BX02-00, 5AC901.BX02-01, 5AC901.BX02-02, 5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02, 5AC901.BX05-03 - Order data

## 3.7.1.3 Technical data

**Information:**

Up to revision A0, the PCI Express slots on 5AC901.BX01-01 and 5AC901.BX02-01 bus units are equipped with the PCIe x4 standard.

| Model number        | 5AC901.BX01-00  | 5AC901.BX01-01 | 5AC901.BX02-00 | 5AC901.BX02-01 | 5AC901.BX02-02   |
|---------------------|---|----------------|----------------|----------------|------------------|
| General information |   |                |                |                |                  |
| Certification       |   |                |                |                |                  |
| CE                  | Yes   |                |                |                |                  |
| UL                  | cULus E115267<br>Industrial <b>Control</b> Equipment  |                |                |                |                  |
| DNV GL              | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>1)</sup> |                |                |                |                  |
| GOST-R              | Yes   |                |                |                |                  |
| Inserts             |   |                |                |                |                  |
| PCI slots           |   |                |                |                |                  |
| Quantity            | 1   | -              | 2              | 1              | -                |
| Type                | 32-bit  | -              | 32-bit         | 32-bit         | -                |
| Design              | 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                |
| Design              | -   | 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) (2x) |

Table 63: 5AC901.BX01-00, 5AC901.BX01-01, 5AC901.BX02-00, 5AC901.BX02-01, 5AC901.BX02-02 - Technical data

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

| Model number        | 5AC901.BX05-00                                       | 5AC901.BX05-01 | 5AC901.BX05-02                          | 5AC901.BX05-03                          |
|---------------------|--|----------------|---|---|
| General information |  |                |   |   |
| Certification       |  |                |   |   |
| CE                  | Yes  |                |   |   |
| UL                  | cULus E115267<br>Industrial <b>Control</b> Equipment |                |   |   |
| GOST-R              | Yes  |                |   |   |
| Inserts             |  |                |   |   |
| PCI slots           |  |                |   |   |
| Quantity            | 5  | 4              | 2                                       | -                                       |
| Type                | 32-bit   | 32-bit         | 32-bit                                  | -                                       |
| Design              | 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              | 3                                       | 5                                       |
| Design              | -  | 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) (1x);<br>x1 (500 MB/s) (2x) | x4 (2 GB/s) (2x);<br>x1 (500 MB/s) (3x) |

Table 64: 5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02, 5AC901.BX05-03 - Technical data

**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).



### 3.8 Heat sinks

#### 3.8.1 5AC901.HS0x-00

##### 3.8.1.1 General information

The 5AC901.HS00-00 heat sink has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that have fan kits.

The 5AC901.HS01-00 heat sink has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that do not have fan kits.

##### 3.8.1.2 Order data


| Model number   | Short description  | Figure  |
|----------------|--|---|
|                | <b>Heat sink</b>   |  |
| 5AC901.HS00-00 | APC910 heat sink, active   |   |
| 5AC901.HS01-00 | APC910 heat sink, passive  |   |
|                | <b>Required accessories</b>  |   |
|                | <b>CPU boards</b>  |   |
| 5PC900.TS77-00 | CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910 |   |
| 5PC900.TS77-01 | CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910 |   |
| 5PC900.TS77-02 | CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910 |   |
| 5PC900.TS77-03 | CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910 |   |
| 5PC900.TS77-04 | CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910 |   |
| 5PC900.TS77-05 | CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910 |   |
| 5PC900.TS77-06 | CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910 |   |
| 5PC900.TS77-07 | CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910   |   |
| 5PC900.TS77-08 | CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910 |   |
| 5PC900.TS77-09 | CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910  |   |
| 5PC900.TS77-10 | CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910 |   |

Table 65: 5AC901.HS00-00, 5AC901.HS01-00 - Order data

#### 3.8.2 5AC901.HS0x-01

##### 3.8.2.1 General information

Heat sink 5AC901.HS00-01 has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that have fan kits.

Heat sink 5AC901.HS01-01 has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that do not have fan kits.

##### 3.8.2.2 Order data


| Model number   | Short description   | Figure  |
|----------------|---|---|
|                | <b>Heat sink</b>  |  |
| 5AC901.HS00-01 | APC910 active heat sink QM170/HM170   |   |
| 5AC901.HS01-01 | APC910 passive heat sink QM170/HM170  |   |
|                | <b>Required accessories</b>   |   |
|                | <b>CPU boards</b>   |   |
| 5PC900.TS17-00 | CPU board Intel Core i5 6440EQ 2.7 GHz - Quad core - Chipset QM170 - For APC910                           |   |
| 5PC900.TS17-01 | CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910  |   |
| 5PC900.TS17-02 | CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.6 GHz passive - For APC910 |   |
|                |   |   |
|                |   |   |

Table 66: 5AC901.HS00-01, 5AC901.HS01-01 - Order data

### 3.9 Fan kits

#### 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 fan filters" on page 407](#).

#### Information:

For information about installing or replacing a fan kit, please refer to the section ["Replacing fan kits" on page 408](#).

#### 3.9.1 5AC901.FA01-00

##### 3.9.1.1 General information

This fan kit includes 3 fans for improving heat dissipation on 1-slot APC910 system units.

- 3 fans for improved heat dissipation
- Simple installation and removal

##### 3.9.1.2 Order data


| Model number   | Short description  | Figure   |
|----------------|--|--|
|                | <b>Fan kit</b>   |  |
| 5AC901.FA01-00 | APC910 fan kit - For 5PC910.SX01-00                              |  |
|                | <b>Optional accessories</b>                                      |  |
|                | <b>Accessories</b>   |  |
| 5AC901.FI01-00 | APC910 air <a href="#">filter</a> - For 1-slot APC910 - 1 pieces |  |

Table 67: 5AC901.FA01-00 - Order data

##### 3.9.1.3 Technical data

| Model number                      | 5AC901.FA01-00  |
|-----------------------------------|---|
| <b>General information</b>        |   |
| Number of fans                    | 3 (1x 50x50x15, 2x 70x70x15)  |
| Speed                             | Max. 5000 ±10% rpm (50x50x15)<br>Max. 2200 ±250 rpm (70x70x15)  |
| Noise level                       | 33.5 dB(A) (50x50x15)<br>28.3 dB(A) (70x70x15)  |
| Service life                      | 100,000 hours at 40°C (50x50x15)<br>100,000 hours at 40°C (70x70x15)  |
| Certification                     |   |
| CE                                | Yes   |
| UL                                | cULus E115267<br>Industrial <a href="#">Control</a> Equipment   |
| DNV GL                            | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>1)</sup> |
| GOST-R                            | Yes   |
| <b>Mechanical characteristics</b> |   |
| <b>Dimensions</b>                 |   |
| Fan                               |   |
| Width                             | 50 mm<br>70 mm  |
| Height                            | 50 mm<br>70 mm  |
| Depth                             | 15 mm<br>15 mm  |

Table 68: 5AC901.FA01-00 - Technical data

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



### 3.9.2 5AC901.FA02-00

#### 3.9.2.1 General information

This fan kit includes 4 fans for improving heat dissipation on 2-slot APC910 system units.

- 4 fans for improved heat dissipation
- Simple installation and removal

#### 3.9.2.2 Order data


| Model number   | Short description                                | Figure  |
|----------------|--|---|
|                | <b>Fan kit</b>                                   |  |
| 5AC901.FA02-00 | APC910 fan kit - For 5PC910.SX02-00              |   |
|                | <b>Optional accessories</b>                      |   |
|                | <b>Accessories</b>                               |   |
| 5AC901.FI02-00 | APC910 air filter - For 2-slot APC910 - 1 pieces |   |

Table 69: 5AC901.FA02-00 - Order data

#### 3.9.2.3 Technical data

| Model number                      | 5AC901.FA02-00  |
|-----------------------------------|---|
| <b>General information</b>        |   |
| Number of fans                    | 4 (3x 50x50x15, 1x 70x70x15)  |
| Speed                             | Max. 5000 ±10% rpm (50x50x15)<br>Max. 2200 ±250 rpm (70x70x15)  |
| Noise level                       | 33.5 dB(A) (50x50x15)<br>28.3 dB(A) (70x70x15)  |
| Service life                      | 100,000 hours at 40°C (50x50x15)<br>100,000 hours at 40°C (70x70x15)  |
| Certification                     |   |
| CE                                | Yes   |
| UL                                | cULus E115267<br>Industrial Control Equipment   |
| DNV GL                            | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>1)</sup> |
| GOST-R                            | Yes   |
| <b>Mechanical characteristics</b> |   |
| <b>Dimensions</b>                 |   |
| Fan                               |   |
| Width                             | 50 mm<br>70 mm  |
| Height                            | 50 mm<br>70 mm  |
| Depth                             | 15 mm<br>15 mm  |

Table 70: 5AC901.FA02-00 - Technical data

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

### 3.9.3 5AC901.FA05-00

#### 3.9.3.1 General information

This fan kit includes 4 fans for improving heat dissipation on 5-slot APC910 system units.

- 4 fans for improved heat dissipation
- Simple installation and removal

#### 3.9.3.2 Order data


| Model number   | Short description                                | Figure  |
|----------------|--|---|
|                | <b>Fan kit</b>                                   |  |
| 5AC901.FA05-00 | APC910 fan kit - For 5PC910.SX05-00 system unit  |   |
|                | <b>Optional accessories</b>                      |   |
|                | <b>Accessories</b>                               |   |
| 5AC901.FI05-00 | APC910 air filter - For 5-slot APC910 - 1 pieces |   |

Table 71: 5AC901.FA05-00 - Order data

#### 3.9.3.3 Technical data

| Model number                      | 5AC901.FA05-00   |
|-----------------------------------|--|
| <b>General information</b>        |  |
| Number of fans                    | 4 (1x 50x50x15, 3x 70x70x15)   |
| Speed                             | Max. 5000 ±10% rpm (50x50x15)<br>Max. 2200 ±250 rpm (70x70x15)       |
| Noise level                       | 33.5 dB(A) (50x50x15)<br>28.3 dB(A) (70x70x15)                       |
| Service life                      | 100,000 hours at 40°C (50x50x15)<br>100,000 hours at 40°C (70x70x15) |
| Certification                     |  |
| CE                                | Yes  |
| UL                                | cULus E115267  |
| GOST-R                            | Industrial Control Equipment<br>Yes                                  |
| <b>Mechanical characteristics</b> |  |
| <b>Dimensions</b>                 |  |
| Fan                               |  |
| Width                             | 50 mm<br>70 mm   |
| Height                            | 50 mm<br>70 mm   |
| Depth                             | 15 mm<br>15 mm   |

Table 72: 5AC901.FA05-00 - Technical data

## 3.10 Drives

### 3.10.1 5AC901.CHDD-00

#### 3.10.1.1 General information

This 250 GB slide-in compact hard disk is specified for 24-hour operation and can be used in APC910 system units.

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

#### 3.10.1.2 Order data


| Model number   | Short description                          | Figure  |
|----------------|--|---|
|                | <b>Drives</b>                              |   |
| 5AC901.CHDD-00 | 250 GB hard disk - Slide-in compact - SATA |  |

Table 73: 5AC901.CHDD-00 - Order data

#### 3.10.1.3 Technical data

##### Information:

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

| Model number               | 5AC901.CHDD-00   |
|----------------------------|--|
| <b>General information</b> |  |
| Certification              |  |
| 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 <sup>1)</sup> |
| GOST-R                     | Yes  |
| <b>Hard disk drive</b>     |  |
| Capacity                   | 250 GB   |
| Number of heads            | 2  |
| Number of sectors          | 488397168  |
| Bytes per sector           | 512  |
| Cache                      | 8 MB   |
| Speed                      | 5400 rpm ±0.2%   |
| Startup time               | Typ. 3.6 s (from 0 rpm to read access)   |
| MTBF                       | 550,000 POH <sup>2)</sup>  |
| S.M.A.R.T. support         | Yes  |
| Interface                  | SATA   |
| Access time                | 5.6 ms   |
| Supported transfer modes   | SATA 1.0, serial ATA revision 2.6<br>PIO mode 0-4, multiword DMA mode 0-2, UDMA mode 0-6   |
| Data transfer rate         |  |
| Internal                   | Max. 1175 Mbit/s   |
| To/From host               | Max. 150 Mbit/s (SATA I), max. 300 Mbit/s (SATA II)  |
| Positioning time           |  |
| Minimum (track to track)   | 1 ms   |
| Nominal (read only)        | 14 ms  |
| Maximum (read only)        | 30 ms  |

Table 74: 5AC901.CHDD-00 - Technical data

| Model number                    | 5AC901.CHDD-00   |
|---------------------------------|--|
| Environmental conditions        |  |
| Temperature <sup>3)</sup>       |  |
| Operation <sup>4)</sup>         | 0 to 60°C  |
| 24-hour operation <sup>5)</sup> | 0 to 60°C  |
| Storage                         | -40 to 70°C  |
| Transport                       | -40 to 70°C  |
| Relative humidity <sup>6)</sup> |  |
| Operation                       | 5 to 95%, 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                       | 350 g and 2 ms duration, no unrecoverable errors   |
| Storage                         | 800 g and 2 ms duration, no unrecoverable errors<br>800 g and 1 ms duration, no unrecoverable errors<br>600 g and 0.5 ms duration, no unrecoverable errors |
| Transport                       | 800 g and 2 ms duration, no unrecoverable errors<br>800 g and 1 ms duration, no unrecoverable errors<br>600 g and 0.5 ms duration, no unrecoverable errors |
| Elevation                       |  |
| Operation                       | -300 to 3048 m   |
| Storage                         | -300 to 12192 m  |
| Mechanical characteristics      |  |
| Installation                    | Fixed <sup>7)</sup>  |
| Dimensions                      |  |
| Width                           | 13 mm  |
| Height                          | 75 mm  |
| Depth                           | 105 mm   |
| Weight                          | 134 g  |
| Manufacturer information        |  |
| Manufacturer                    | Seagate  |
| Manufacturer's product ID       | ST9250311CS  |

Table 74: 5AC901.CHDD-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) 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 30% per hour.
- 7) Slide-in compact installation.

### 3.10.1.4 Temperature/Humidity diagram

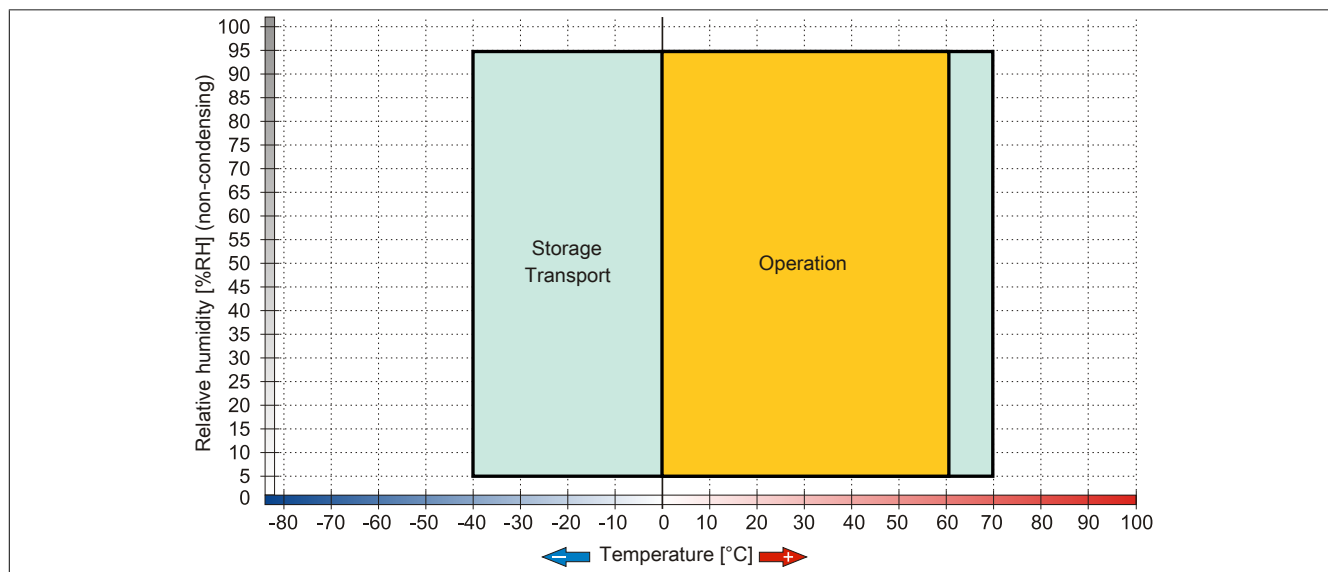


Figure 34: 5AC901.CHDD-00 - Temperature/Humidity diagram

### 3.10.2 5AC901.CHDD-01

#### 3.10.2.1 General information

This 500 GB slide-in compact hard disk is specified for 24-hour operation and 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

#### 3.10.2.2 Order data


| Model number   | Short description                          | Figure  |
|----------------|--|---|
|                | <b>Drives</b>                              |  |
| 5AC901.CHDD-01 | 500 GB hard disk - Slide-in compact - SATA |   |
|                | <b>Optional accessories</b>                |   |
|                | <b>Drives</b>                              |   |
| 5MMHDD.0500-00 | 500 GB hard disk - SATA                    |   |

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

#### 3.10.2.3 Technical data

##### Information:

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

| Model number                    | 5AC901.CHDD-01   |
|---------------------------------|--|
| <b>General information</b>      |  |
| Certification                   |  |
| 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 <sup>1)</sup> |
| GOST-R                          | Yes  |
| <b>Hard disk drive</b>          |  |
| 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 POH <sup>2)</sup>  |
| S.M.A.R.T. support              | Yes  |
| Interface                       | SATA   |
| Access time                     | 5.5 ms   |
| 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 only)             | 11 ms  |
| Maximum (read only)             | 21 ms  |
| <b>Environmental conditions</b> |  |
| Temperature <sup>3)</sup>       |  |
| Operation <sup>4)</sup>         | 0 to 60°C  |
| 24-hour operation <sup>5)</sup> | 0 to 60°C  |
| Storage                         | -40 to 70°C  |
| Transport                       | -40 to 70°C  |

Table 76: 5AC901.CHDD-01 - Technical data

| Model number                      | 5AC901.CHDD-01                                    |
|-----------------------------------|---|
| Relative humidity <sup>6)</sup>   |   |
| 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                                   |
| <b>Mechanical characteristics</b> |   |
| Installation                      | Fixed <sup>7)</sup>                               |
| Dimensions                        |   |
| Width                             | 10 mm   |
| Height                            | 75 mm   |
| Depth                             | 105 mm  |
| Weight                            | 134 g   |
| <b>Manufacturer information</b>   |   |
| Manufacturer                      | Western Digital                                   |
| Manufacturer's product ID         | WD5000LUCT  |

Table 76: 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.

### 3.10.2.4 Temperature/Humidity diagram

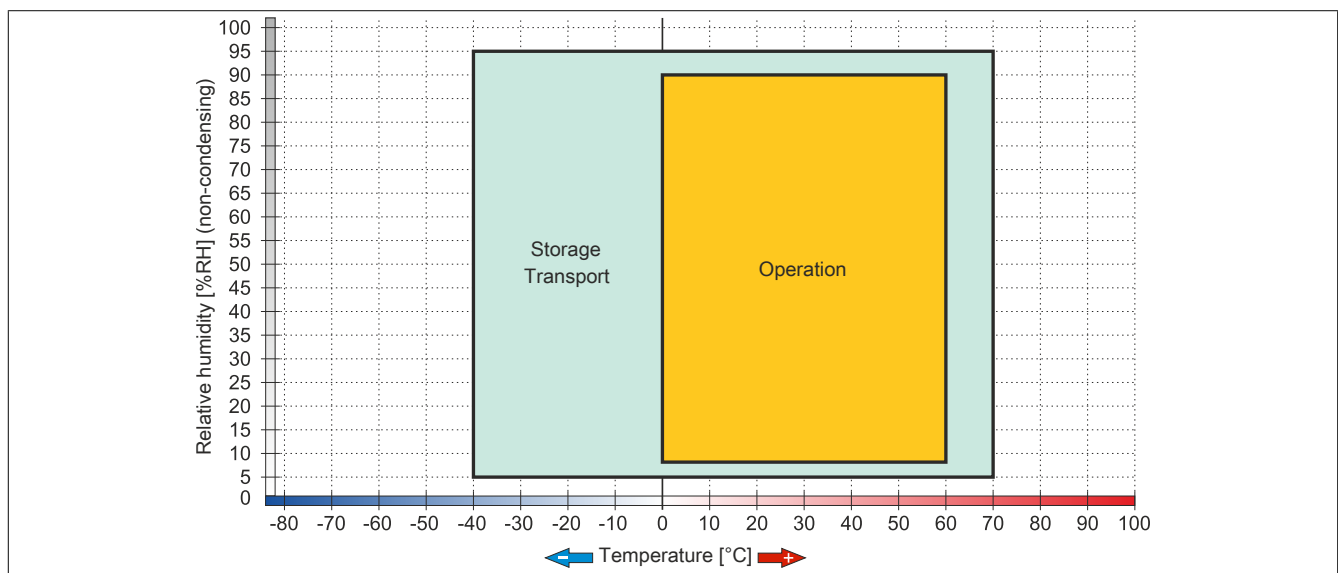


Figure 35: 5AC901.CHDD-01 - Temperature/Humidity diagram

### 3.10.3 5MMHDD.0500-00

#### 3.10.3.1 General information

This 500 GB hard disk can be used as a replacement part or accessory.

- 500 GB hard disk
- Replacement hard disk for a 5AC801.HDDI-04 / 5AC901.CHDD-01 hard disk or a 5ACPCI.RAIC-05 RAID controller
- Accessory for the APC510 (optional hard disk for I/O board)
- Specified for 24-hour operation
- S.M.A.R.T. support

#### 3.10.3.2 Order data


| Model number   | Short description       | Figure  |
|----------------|-------------------------|---|
|                | <b>Drives</b>           |   |
| 5MMHDD.0500-00 | 500 GB hard disk - SATA |  |

Table 77: 5MMHDD.0500-00 - Order data

#### 3.10.3.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number               | 5MMHDD.0500-00  |
|----------------------------|---|
| <b>General information</b> |   |
| Certification              |   |
| 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 <sup>1)</sup> |
| GOST-R                     | Yes   |
| <b>Hard disk drive</b>     |   |
| 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 POH <sup>2)</sup>   |

Table 78: 5MMHDD.0500-00 - Technical data

| Model number                    | 5MMHDD.0500-00                                      |
|---------------------------------|---|
| S.M.A.R.T. support              | Yes   |
| Interface                       | SATA  |
| Access time                     | 5.5 ms  |
| 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 only)             | 11 ms   |
| Maximum (read only)             | 21 ms   |
| Environmental conditions        |   |
| Temperature <sup>3)</sup>       |   |
| Operation <sup>4)</sup>         | 0 to 60°C   |
| 24-hour operation <sup>5)</sup> | 0 to 60°C   |
| Storage                         | -40 to 70°C   |
| Transport                       | -40 to 70°C   |
| Relative humidity <sup>6)</sup> |   |
| 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 characteristics      |   |
| Dimensions                      |   |
| Width                           | 7 mm  |
| Height                          | 69 mm   |
| Depth                           | 100 mm  |
| Weight                          | 100 g   |
| Manufacturer information        |   |
| Manufacturer                    | Western Digital                                     |
| Manufacturer's product ID       | WD5000LUCT  |

Table 78: 5MMHDD.0500-00 - Technical data

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



### 3.10.3.4 Temperature/Humidity diagram

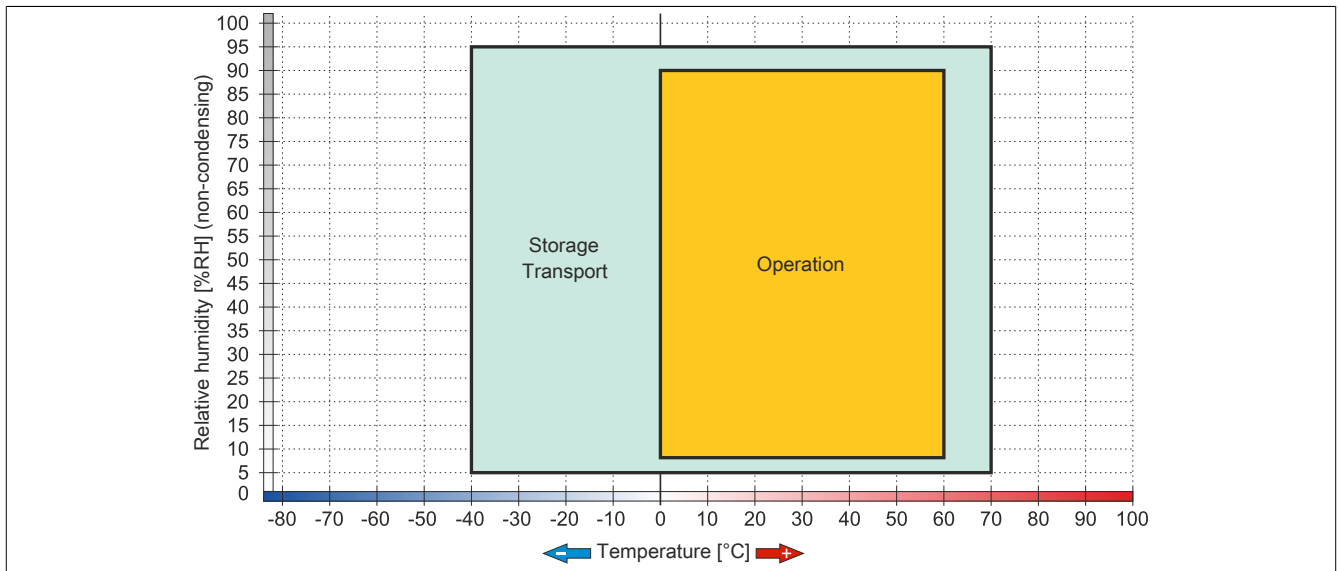


Figure 36: 5MMHDD.0500-00 - Temperature/Humidity diagram

### 3.10.4 5AC901.CSSD-00

#### 3.10.4.1 General information

This 32 GB slide-in compact solid-state drive (SSD) is based on single-level cell (SLC) technology and is SATA 2.6 compatible. The slide-in compact drive can be used in APC910 system units.

- 32 GB solid-state drive
- SLC flash
- S.M.A.R.T. support
- Slide-in compact
- SATA 2.6 compatible

#### 3.10.4.2 Order data


| Model number   | Short description                       | Figure  |
|----------------|---|---|
|                | <b>Drives</b>                           |   |
| 5AC901.CSSD-00 | 32 GB SSD SLC - Slide-in compact - SATA |  |

Table 79: 5AC901.CSSD-00 - Order data

#### 3.10.4.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number               | 5AC901.CSSD-00   |
|----------------------------|--|
| <b>General information</b> |  |
| Certification              |  |
| 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 <sup>1)</sup> |
| GOST-R                     | Yes  |
| <b>Solid-state drive</b>   |  |
| Capacity                   | 32 GB  |
| Data reliability           | <1 unrecoverable error in 10 <sup>16</sup> bit read accesses   |
| MTBF                       | 2,000,000 hours  |
| Power on/off cycles        | 50000  |
| S.M.A.R.T. support         | Yes  |
| Interface                  | SATA   |
| Maintenance                | None   |
| Sequential read            | Max. 250 MB/s  |
| Sequential write           | Max. 195 MB/s  |
| IOPS <sup>2)</sup>         |  |
| 4k read                    | 45000  |
| 4k write                   | 5500   |
| <b>Endurance</b>           |  |
| SLC flash                  | Yes  |
| Guaranteed data volume     |  |
| Guaranteed                 | 700 TB   |
| Results for 5 years        | 350 GB/day   |
| Wear leveling              | Static   |

Table 80: 5AC901.CSSD-00 - Technical data

| Model number                  | 5AC901.CSSD-00  |
|-------------------------------|---|
| Error correction coding (ECC) | Yes   |
| Compatibility                 | SATA revision 2.6 compatible, compatible with SATA 1.5 Gbit/s and 3 Gbit/s interface rates<br>ATA/ATAPI-7<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| Environmental conditions      |   |
| Temperature                   |   |
| Operation                     | 0 to 70°C   |
| Storage                       | -55 to 95°C   |
| Transport                     | -55 to 95°C   |
| Relative humidity             |   |
| Operation                     | 5 to 95%, non-condensing  |
| Storage                       | 5 to 95%, non-condensing  |
| Transport                     | 5 to 95%, non-condensing  |
| Vibration                     |   |
| Operation                     | 5 to 700 Hz: 2.17 g   |
| Storage                       | 5 to 800 Hz: 3.13 g   |
| Transport                     | 5 to 800 Hz: 3.13 g   |
| Shock                         |   |
| Operation                     | 1500 g, 0.5 ms  |
| Storage                       | 1500 g, 0.5 ms  |
| Transport                     | 1500 g, 0.5 ms  |
| Elevation                     |   |
| Operation                     | -300 to 12192 m   |
| Storage                       | -300 to 12192 m   |
| Transport                     | -300 to 12192 m   |
| Mechanical characteristics    |   |
| Installation                  | Fixed <sup>3)</sup>   |
| Dimensions                    |   |
| Width                         | 13 mm   |
| Height                        | 98 mm   |
| Depth                         | 105 mm  |
| Weight                        | 118 g   |
| Manufacturer information      |   |
| Manufacturer                  | Intel   |
| Manufacturer's product ID     | SSDSA2SH032G201   |

Table 80: 5AC901.CSSD-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) IOPS: Random read and write input/output operations per second.
- 3) Slide-in compact installation.

### 3.10.4.4 Temperature/Humidity diagram

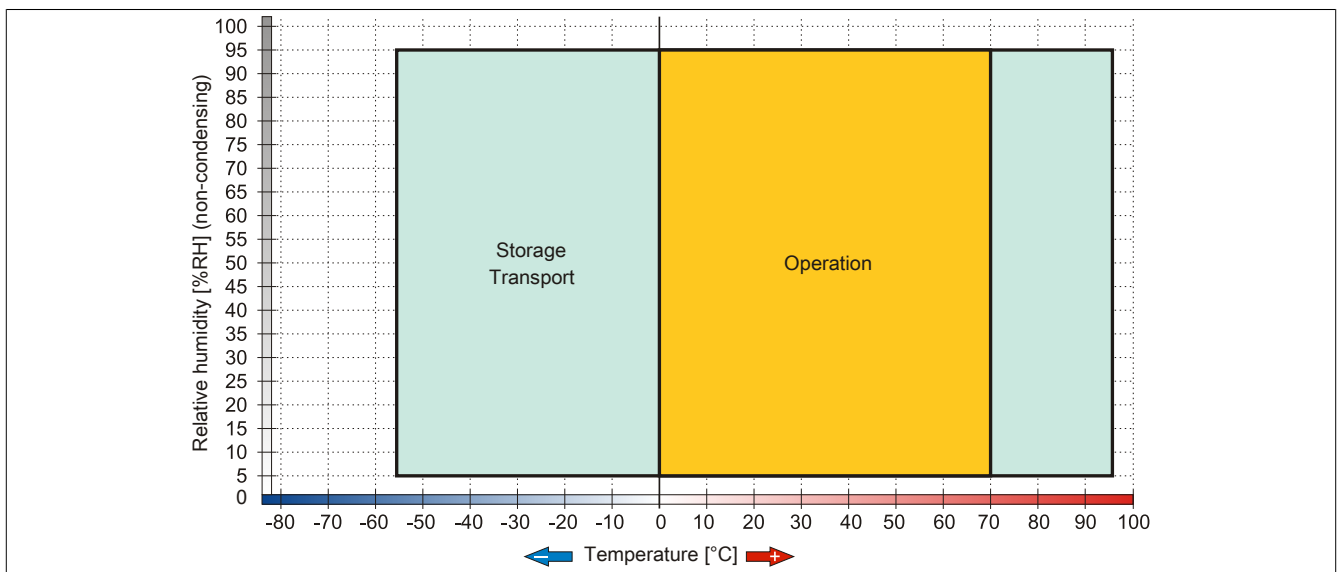


Figure 37: 5AC901.CSSD-00 - Temperature/Humidity diagram

### 3.10.5 5AC901.CSSD-01

#### 3.10.5.1 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 system units.

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

#### 3.10.5.2 Order data


| Model number   | Short description                       | Figure  |
|----------------|---|---|
|                | <b>Drives</b>                           |  |
| 5AC901.CSSD-01 | 60 GB SSD MLC - Slide-in compact - SATA |   |
|                | <b>Optional accessories</b>             |   |
|                | <b>Drives</b>                           |   |
| 5MMSSD.0060-00 | 60 GB SSD MLC - Intel - SATA            |   |

Table 81: 5AC901.CSSD-01 - Order data

#### 3.10.5.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number               | 5AC901.CSSD-01   |
|----------------------------|--|
| <b>General information</b> |  |
| Certification              |  |
| 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 <sup>1)</sup> |
| GOST-R                     | Yes  |
| <b>Solid-state drive</b>   |  |
| Capacity                   | 60 GB  |
| Data reliability           | <1 unrecoverable error in 10 <sup>16</sup> bit read accesses   |
| MTBF                       | 1,200,000 hours  |
| S.M.A.R.T. support         | Yes  |
| Interface                  | SATA   |
| Maintenance                | None   |
| Sequential read            | Max. 550 MB/s, with SATA 6 Gbit/s<br>Max. 280 MB/s, with SATA 3 Gbit/s   |
| Sequential write           | Max. 475 MB/s, with SATA 6 Gbit/s<br>Max. 245 MB/s, with SATA 3 Gbit/s   |
| IOPS <sup>2)</sup>         |  |
| 4k read                    | 15000  |
| 4k write                   |  |
| Typical                    | 23000  |
| Maximum                    | 80000  |
| <b>Endurance</b>           |  |
| MLC flash                  | Yes  |

Table 82: 5AC901.CSSD-01 - Technical data

| Model number               | 5AC901.CSSD-01  |
|----------------------------|---|
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| Environmental conditions   |   |
| Temperature                |   |
| Operation                  | 0 to 70°C   |
| Storage                    | -55 to 95°C   |
| Transport                  | -55 to 95°C   |
| Relative humidity          |   |
| Operation                  | 5 to 95%, non-condensing  |
| Storage                    | 5 to 95%, non-condensing  |
| Transport                  | 5 to 95%, non-condensing  |
| Vibration                  |   |
| Operation                  | 5 to 700 Hz: 2.17 g   |
| Storage                    | 5 to 800 Hz: 3.13 g   |
| Transport                  | 5 to 800 Hz: 3.13 g   |
| Shock                      |   |
| Operation                  | 1500 g, 0.5 ms  |
| Storage                    | 1500 g, 0.5 ms  |
| Transport                  | 1500 g, 0.5 ms  |
| Elevation                  |   |
| Operation                  | -300 to 12192 m   |
| Storage                    | -300 to 12192 m   |
| Transport                  | -300 to 12192 m   |
| Mechanical characteristics |   |
| Installation               | Fixed <sup>3)</sup>   |
| Dimensions                 |   |
| Width                      | 13 mm   |
| Height                     | 98 mm   |
| Depth                      | 105 mm  |
| Weight                     | 118 g   |
| Manufacturer information   |   |
| Manufacturer               | Intel   |
| Manufacturer's product ID  | SSDSC2CW060A3   |

Table 82: 5AC901.CSSD-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) IOPS: Random read and write input/output operations per second.
- 3) Slide-in compact installation.

### 3.10.5.4 Temperature/Humidity diagram

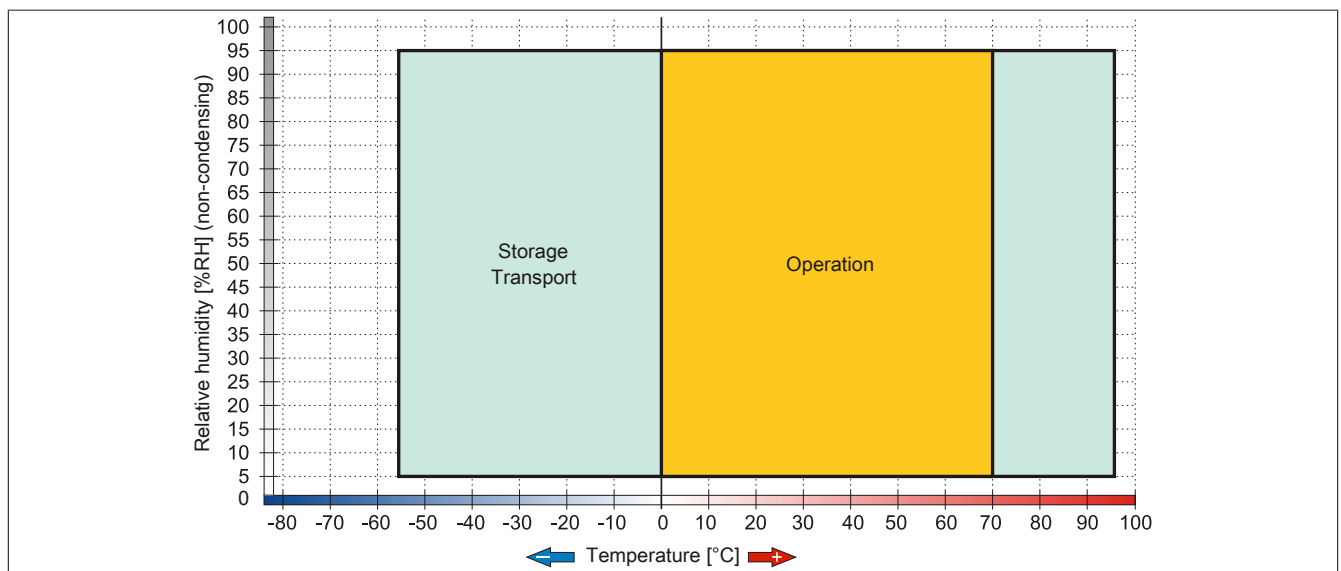


Figure 38: 5AC901.CSSD-01 - Temperature/Humidity diagram

### 3.10.6 5AC901.CSSD-02

#### 3.10.6.1 General information

This 180 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 system units.

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

#### 3.10.6.2 Order data


| Model number   | Short description                        | Figure  |
|----------------|--|---|
|                | <b>Drives</b>                            |  |
| 5AC901.CSSD-02 | 180 GB SSD MLC - Slide-in compact - SATA |   |
|                | <b>Optional accessories</b>              |   |
|                | <b>Drives</b>                            |   |
| 5MMSSD.0180-00 | 180 GB SSD MLC - Intel - SATA            |   |

Table 83: 5AC901.CSSD-02 - Order data

#### 3.10.6.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number               | 5AC901.CSSD-02   |
|----------------------------|--|
| <b>General information</b> |  |
| Certification              |  |
| 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 <sup>1)</sup> |
| GOST-R                     | Yes  |
| <b>Solid-state drive</b>   |  |
| Capacity                   | 180 GB   |
| Data reliability           | <1 unrecoverable error in 10 <sup>16</sup> bit read accesses   |
| MTBF                       | 1,200,000 hours  |
| S.M.A.R.T. support         | Yes  |
| Interface                  | SATA   |
| Maintenance                | None   |
| Sequential read            | Max. 550 MB/s, with SATA 6 Gbit/s<br>Max. 280 MB/s, with SATA 3 Gbit/s   |
| Sequential write           | Max. 520 MB/s, with SATA 6 Gbit/s<br>Max. 260 MB/s, with SATA 3 Gbit/s   |
| IOPS <sup>2)</sup>         |  |
| 4k read                    | 50000  |
| 4k write                   |  |
| Typical                    | 60000  |
| Maximum                    | 80000  |
| <b>Endurance</b>           |  |
| MLC flash                  | Yes  |

Table 84: 5AC901.CSSD-02 - Technical data

| Model number               | 5AC901.CSSD-02  |
|----------------------------|---|
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| Environmental conditions   |   |
| Temperature                |   |
| Operation                  | 0 to 70°C   |
| Storage                    | -55 to 95°C   |
| Transport                  | -55 to 95°C   |
| Relative humidity          |   |
| Operation                  | 5 to 95%, non-condensing  |
| Storage                    | 5 to 95%, non-condensing  |
| Transport                  | 5 to 95%, non-condensing  |
| Vibration                  |   |
| Operation                  | 5 to 700 Hz: 2.17 g   |
| Storage                    | 5 to 800 Hz: 3.13 g   |
| Transport                  | 5 to 800 Hz: 3.13 g   |
| Shock                      |   |
| Operation                  | 1500 g, 0.5 ms  |
| Storage                    | 1500 g, 0.5 ms  |
| Transport                  | 1500 g, 0.5 ms  |
| Elevation                  |   |
| Operation                  | -300 to 12192 m   |
| Storage                    | -300 to 12192 m   |
| Transport                  | -300 to 12192 m   |
| Mechanical characteristics |   |
| Installation               | Fixed <sup>3)</sup>   |
| Dimensions                 |   |
| Width                      | 13 mm   |
| Height                     | 98 mm   |
| Depth                      | 105 mm  |
| Weight                     | 118 g   |
| Manufacturer information   |   |
| Manufacturer               | Intel   |
| Manufacturer's product ID  | SSDSC2CW180A3   |

Table 84: 5AC901.CSSD-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.
- 2) IOPS: Random read and write input/output operations per second.
- 3) Slide-in compact installation.

### 3.10.6.4 Temperature/Humidity diagram

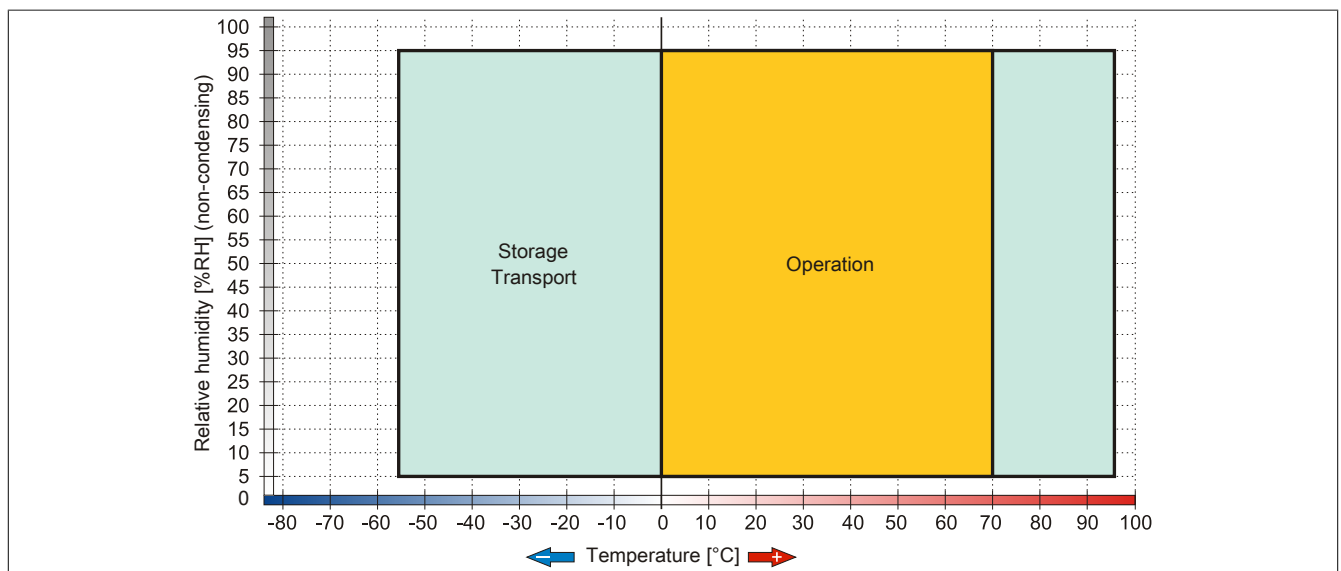


Figure 39: 5AC901.CSSD-02 - Temperature/Humidity diagram

### 3.10.7 5AC901.CSSD-03

#### 3.10.7.1 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
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 3.10.7.2 Order data


| Model number   | Short description                       | Figure  |
|----------------|---|---|
|                | <b>Drives</b>                           |  |
| 5AC901.CSSD-03 | 60 GB SSD MLC - Slide-in compact - SATA |   |
|                | <b>Optional accessories</b>             |   |
|                | <b>Drives</b>                           |   |
| 5MMSSD.0060-01 | 60 GB SSD MLC - Intel - SATA            |   |

Table 85: 5AC901.CSSD-03 - Order data

#### 3.10.7.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number                     | 5AC901.CSSD-03   |    |    |
|----------------------------------|--|----|----|
| Revision                         | C0   | D0 | F0 |
| General information              |  |    |    |
| Certification                    |  |    |    |
| CE                               | Yes  |    |    |
| UL                               | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |    |    |
| HazLoc                           | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup>                   |    |    |
| DNV GL                           | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>2)</sup> |    |    |
| GOST-R                           | Yes  |    |    |
| Solid-state drive                |  |    |    |
| Capacity                         | 60 <a href="#">GB</a>  |    |    |
| Data <a href="#">reliability</a> | <1 unrecoverable error in 10 <sup>15</sup> <a href="#">bit</a> read accesses   |    |    |
| <a href="#">MTBF</a>             | 1,500,000 hours  |    |    |
| S.M.A.R.T. support               | Yes  |    |    |
| <a href="#">Interface</a>        | SATA   |    |    |
| Maintenance                      | None   |    |    |
| Sequential read                  | Max. 510 <a href="#">MB/s</a>  |    |    |
| Sequential write                 | Max. 430 <a href="#">MB/s</a>  |    |    |
| IOPS <sup>3)</sup>               |  |    |    |
| 4k read                          | Max. 50,000 (random)   |    |    |
| 4k write                         | Max. 25,000 (random)   |    |    |

Table 86: 5AC901.CSSD-03, 5AC901.CSSD-03, 5AC901.CSSD-03 - Technical data



| Model number               | 5AC901.CSSD-03  |                          |                      |
|----------------------------|---|--------------------------|----------------------|
| Revision                   | C0  | D0                       | F0                   |
| Endurance                  |   |                          |                      |
| MLC flash                  | Yes   |                          |                      |
| Guaranteed data volume     |   |                          |                      |
| Guaranteed                 | 35 TBW <sup>4)</sup>  |                          | 47 TBW <sup>4)</sup> |
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |                          |                      |
| Environmental 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 12192 m          |                      |
| Storage                    |   | -300 to 12192 m          |                      |
| Transport                  |   | -300 to 12192 m          |                      |
| Mechanical characteristics |   |                          |                      |
| Installation               |   | Fixed <sup>5)</sup>      |                      |
| Dimensions                 |   |                          |                      |
| Width                      |   | 13 mm                    |                      |
| Height                     |   | 98 mm                    |                      |
| Depth                      |   | 105 mm                   |                      |
| Weight                     |   | 118 g                    |                      |
| Manufacturer information   |   |                          |                      |
| Manufacturer               | Toshiba   |                          |                      |
| Manufacturer's product ID  | THNSNH060GBST   | THNSNJ060WCST            | THNSNJ060WCSU        |

Table 86: 5AC901.CSSD-03, 5AC901.CSSD-03, 5AC901.CSSD-03 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) IOPS: Random read and write input/output operations per second.
- 4) TBW: Terabytes written.
- 5) Slide-in compact installation.

### 3.10.7.4 Temperature/Humidity diagram

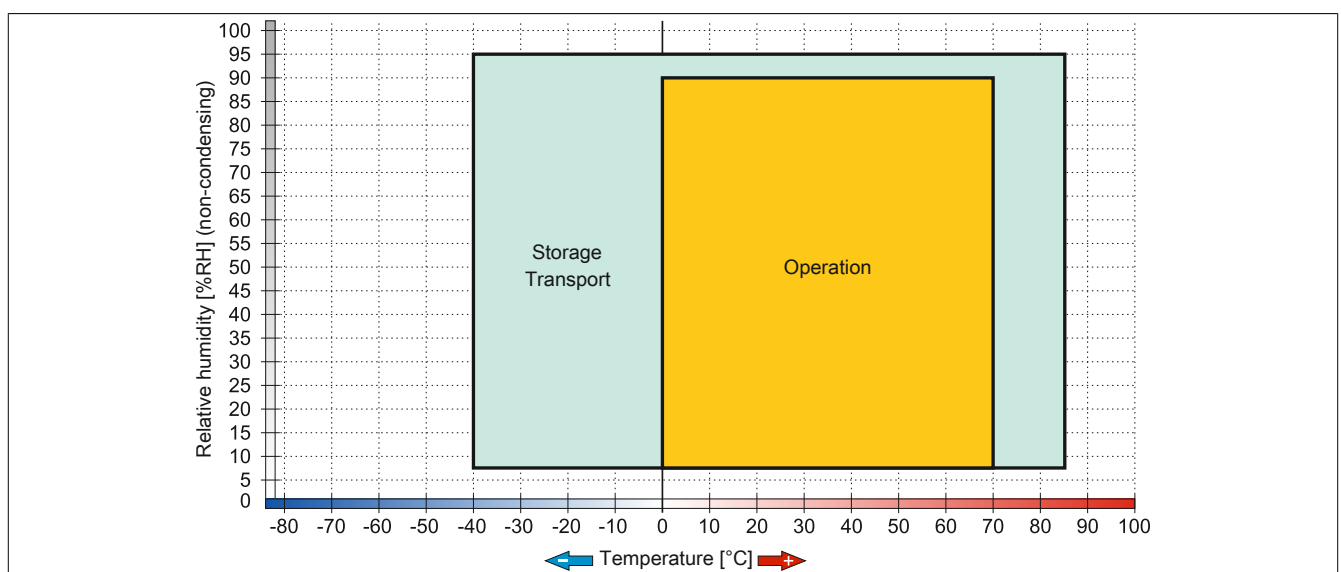


Figure 40: 5AC901.CSSD-03 ≤ Rev. C0 - Temperature/Humidity diagram

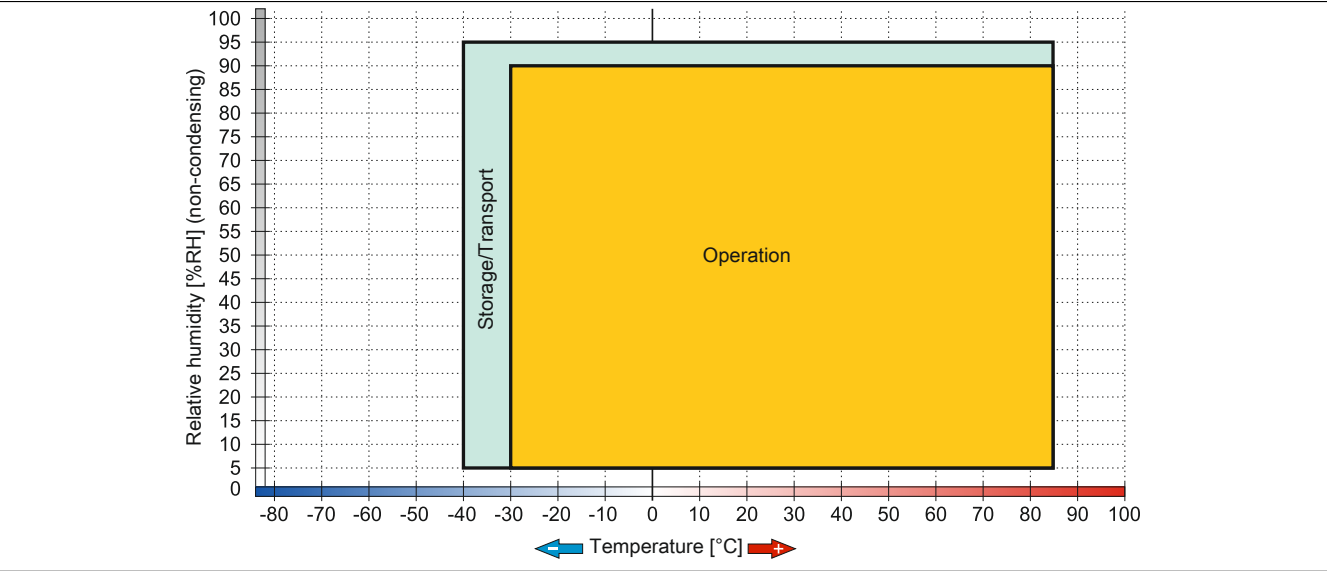


Figure 41: 5AC901.CSSD-03 ≥ Rev. D0 - Temperature/Humidity diagram

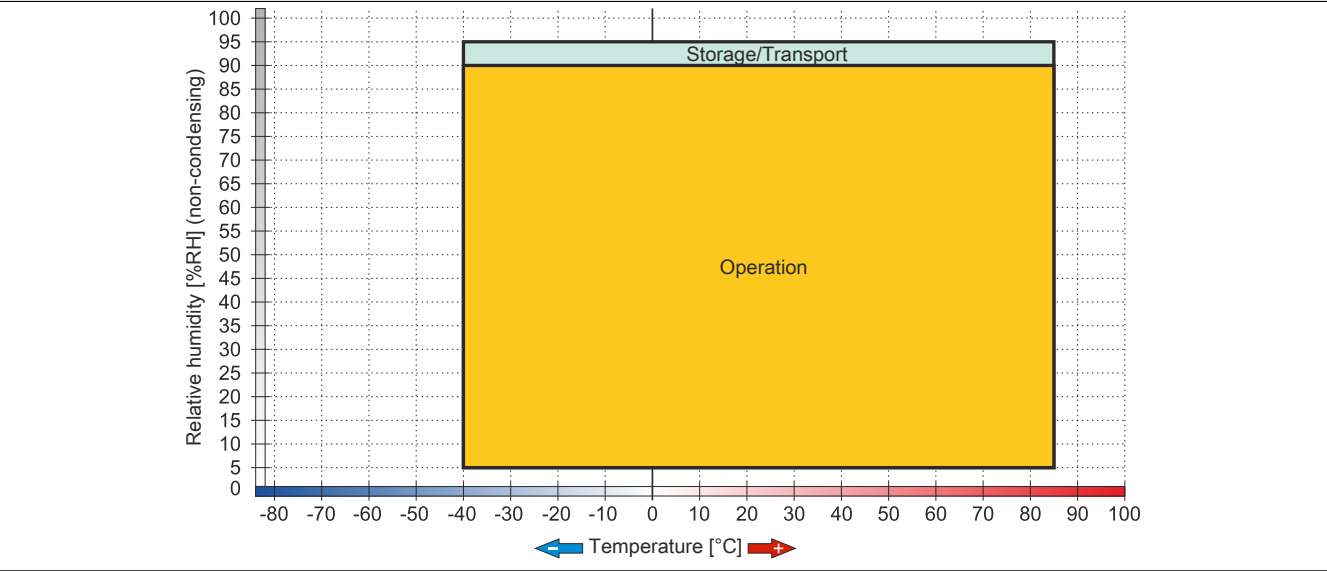


Figure 42: 5AC901.CSSD-03 ≥ Rev. F0 - Temperature/Humidity diagram

### 3.10.8 5AC901.CSSD-04

#### 3.10.8.1 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
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 3.10.8.2 Order data


| Model number   | Short description                        | Figure  |
|----------------|--|---|
|                | <b>Drives</b>                            |  |
| 5AC901.CSSD-04 | 128 GB SSD MLC - Slide-in compact - SATA |   |
|                | <b>Optional accessories</b>              |   |
|                | <b>Drives</b>                            |   |
| 5MMSSD.0128-01 | 128 GB SSD MLC - Toshiba - SATA          |   |

Table 87: 5AC901.CSSD-04 - Order data

#### 3.10.8.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number                     | 5AC901.CSSD-04   |                      |    |    |
|----------------------------------|--|----------------------|----|----|
| Revision                         | C0   | D0                   | E0 | G0 |
| General information              |  |                      |    |    |
| Certification                    |  |                      |    |    |
| CE                               | Yes  |                      |    |    |
| UL                               | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |                      |    |    |
| HazLoc                           | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup>                   |                      |    |    |
| DNV GL                           | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>2)</sup> |                      |    |    |
| GOST-R                           | Yes  |                      |    |    |
| Solid-state drive                |  |                      |    |    |
| Capacity                         | 128 <a href="#">GB</a>   |                      |    |    |
| Data <a href="#">reliability</a> | <1 unrecoverable error in 10 <sup>15</sup> <a href="#">bit</a> read accesses   |                      |    |    |
| <a href="#">MTBF</a>             | 1,500,000 hours  |                      |    |    |
| S.M.A.R.T. support               | Yes  |                      |    |    |
| <a href="#">Interface</a>        | SATA   |                      |    |    |
| Maintenance                      | None   |                      |    |    |
| Sequential read                  | Max. 510 <a href="#">MB/s</a>  |                      |    |    |
| Sequential write                 | Max. 450 <a href="#">MB/s</a>  |                      |    |    |
| IOPS <sup>3)</sup>               |  |                      |    |    |
| 4k read                          | Max. 80,000 (random)   | Max. 85,000 (random) |    |    |
| 4k write                         |  | Max. 35,000 (random) |    |    |

Table 88: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - Technical data

| Model number               | 5AC901.CSSD-04  |                          |               |                       |
|----------------------------|---|--------------------------|---------------|-----------------------|
| Revision                   | C0  | D0                       | E0            | G0                    |
| Endurance                  |   |                          |               |                       |
| MLC flash                  | Yes   |                          |               |                       |
| Guaranteed data volume     |   |                          |               |                       |
| Guaranteed                 | 74 TBW <sup>4)</sup>  |                          |               | 100 TBW <sup>4)</sup> |
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |                          |               |                       |
| Environmental 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 12192 m          |               |                       |
| Storage                    |   | -300 to 12192 m          |               |                       |
| Transport                  |   | -300 to 12192 m          |               |                       |
| Mechanical characteristics |   |                          |               |                       |
| Installation               | Fixed <sup>5)</sup>   |                          |               |                       |
| Dimensions                 |   |                          |               |                       |
| Width                      | 13 mm   |                          |               |                       |
| Height                     | 98 mm   |                          |               |                       |
| Depth                      | 105 mm  |                          |               |                       |
| Weight                     | 118 g   |                          |               |                       |
| Manufacturer information   |   |                          |               |                       |
| Manufacturer               | Toshiba   |                          |               |                       |
| Manufacturer's product ID  | THNSNH128GBST   | THNSNJ128WBST            | THNSNJ128WCST | THNSNJ128WCSU         |

Table 88: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) IOPS: Random read and write input/output operations per second.
- 4) TBW: Terabytes written.
- 5) Slide-in compact installation.

### 3.10.8.4 Temperature/Humidity diagram

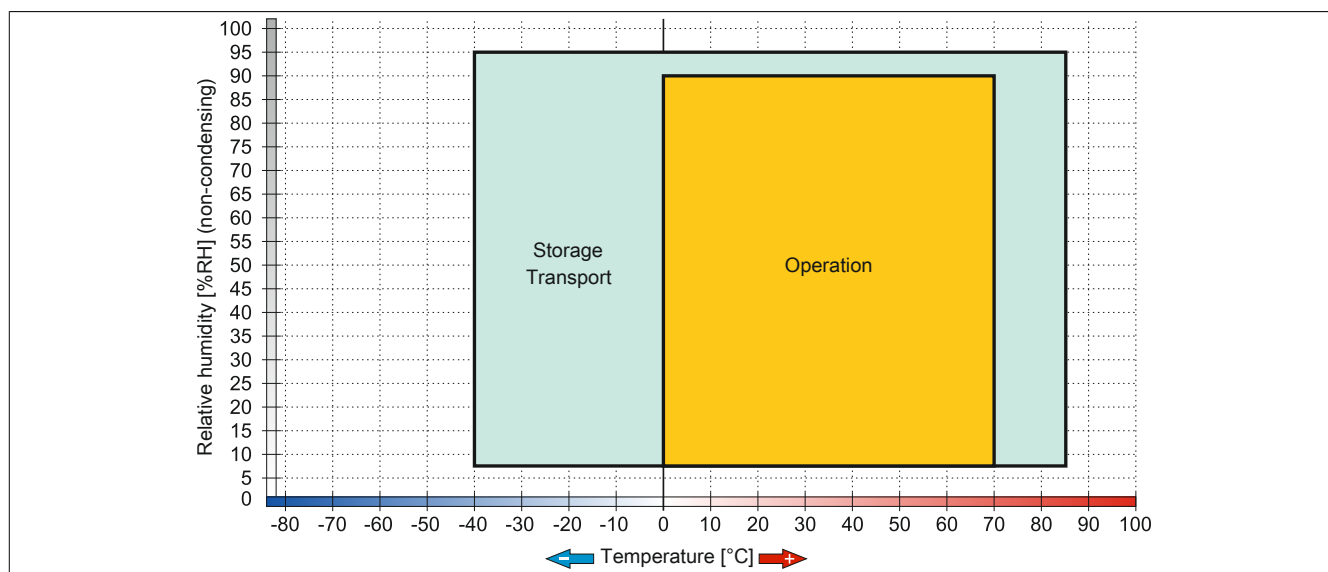


Figure 43: 5AC901.CSSD-04 ≤ Rev. C0 - Temperature/Humidity diagram

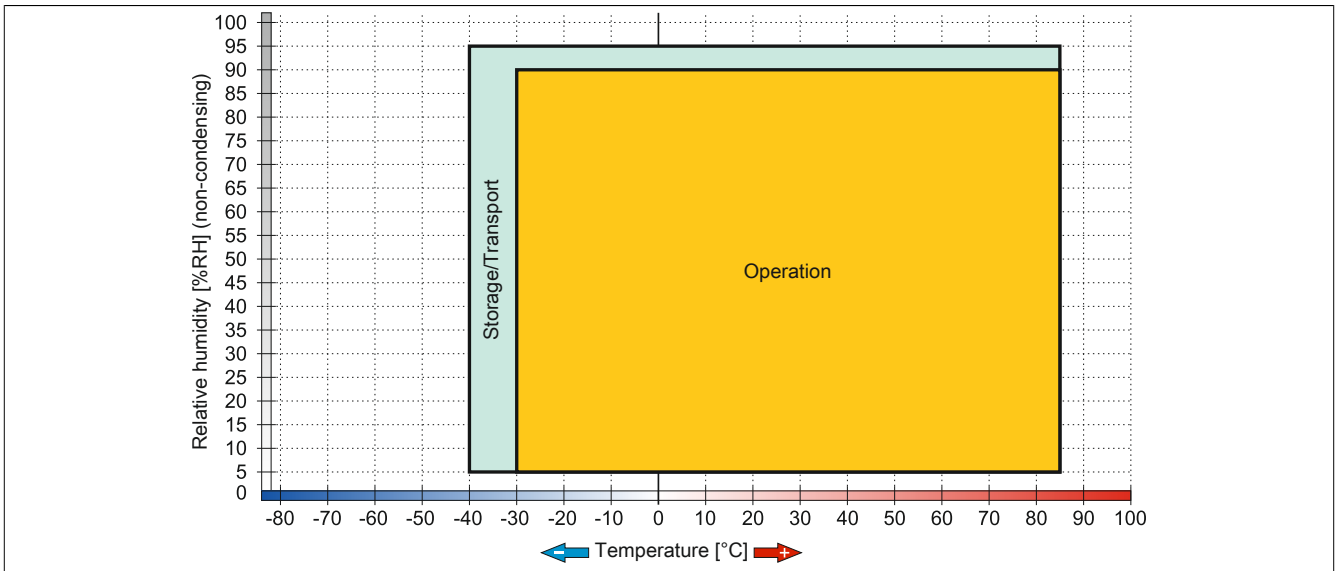


Figure 44: 5AC901.CSSD-04 ≥ Rev. D0 - Temperature/Humidity diagram

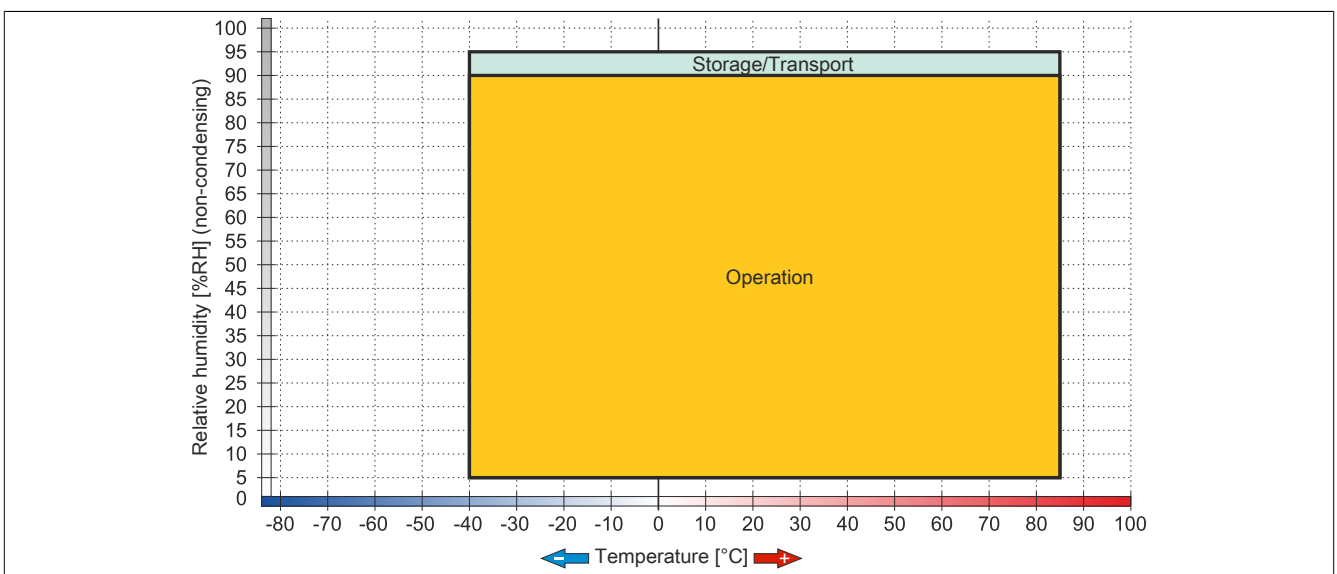


Figure 45: 5AC901.CSSD-04 ≥ Rev. G0 - Temperature/Humidity diagram

### 3.10.9 5AC901.CSSD-05

#### 3.10.9.1 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
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 3.10.9.2 Order data


| Model number   | Short description                                  | Figure  |
|----------------|--|---|
|                | <b>Drives</b>                                      |  |
| 5AC901.CSSD-05 | 256 GB SSD MLC - Slide-in compact - Toshiba - SATA |   |
|                | <b>Optional accessories</b>                        |   |
|                | <b>Drives</b>                                      |   |
| 5MMSSD.0256-00 | 256 GB SSD MLC - Toshiba - SATA                    |   |

Table 89: 5AC901.CSSD-05 - Order data

#### 3.10.9.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number                     | 5AC901.CSSD-05   |    |
|----------------------------------|--|----|
| Revision                         | C0   | E0 |
| General information              |  |    |
| Certification                    |  |    |
| CE                               | Yes  |    |
| UL                               | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |    |
| HazLoc                           | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup>                   |    |
| DNV GL                           | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>2)</sup> |    |
| GOST-R                           | Yes  |    |
| Solid-state drive                |  |    |
| Capacity                         | 256 <a href="#">GB</a>   |    |
| Data <a href="#">reliability</a> | <1 unrecoverable error in 10 <sup>15</sup> <a href="#">bit</a> read accesses   |    |
| <a href="#">MTBF</a>             | 1,500,000 hours  |    |
| S.M.A.R.T. support               | Yes  |    |
| <a href="#">Interface</a>        | SATA   |    |
| Maintenance                      | None   |    |
| Sequential read                  | Max. 510 <a href="#">MB/s</a>  |    |
| Sequential write                 | Max. 460 <a href="#">MB/s</a>  |    |
| IOPS <sup>3)</sup>               |  |    |
| 4k read                          | Max. 90,000 (random)   |    |
| 4k write                         | Max. 35,000 (random)   |    |

Table 90: 5AC901.CSSD-05, 5AC901.CSSD-05 - Technical data

| Model number               | 5AC901.CSSD-05  |                       |
|----------------------------|---|-----------------------|
| Revision                   | C0  | E0                    |
| Endurance                  |   |                       |
| MLC flash                  | Yes   |                       |
| Guaranteed data volume     |   |                       |
| Guaranteed                 | 148 TBW <sup>4)</sup>   | 200 TBW <sup>4)</sup> |
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |                       |
| Environmental 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 12192 m   |                       |
| Storage                    | -300 to 12192 m   |                       |
| Transport                  | -300 to 12192 m   |                       |
| Mechanical characteristics |   |                       |
| Installation               | Fixed <sup>5)</sup>   |                       |
| Dimensions                 |   |                       |
| Width                      | 13 mm   |                       |
| Height                     | 98 mm   |                       |
| Depth                      | 105 mm  |                       |
| Weight                     | 118 g   |                       |
| Manufacturer information   |   |                       |
| Manufacturer               | Toshiba   |                       |
| Manufacturer's product ID  | THNSNJ256WCST   | THNSNJ256WCSU         |

Table 90: 5AC901.CSSD-05, 5AC901.CSSD-05 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) IOPS: Random read and write input/output operations per second.
- 4) TBW: Terabytes written.
- 5) Slide-in compact installation.

### 3.10.9.4 Temperature/Humidity diagram

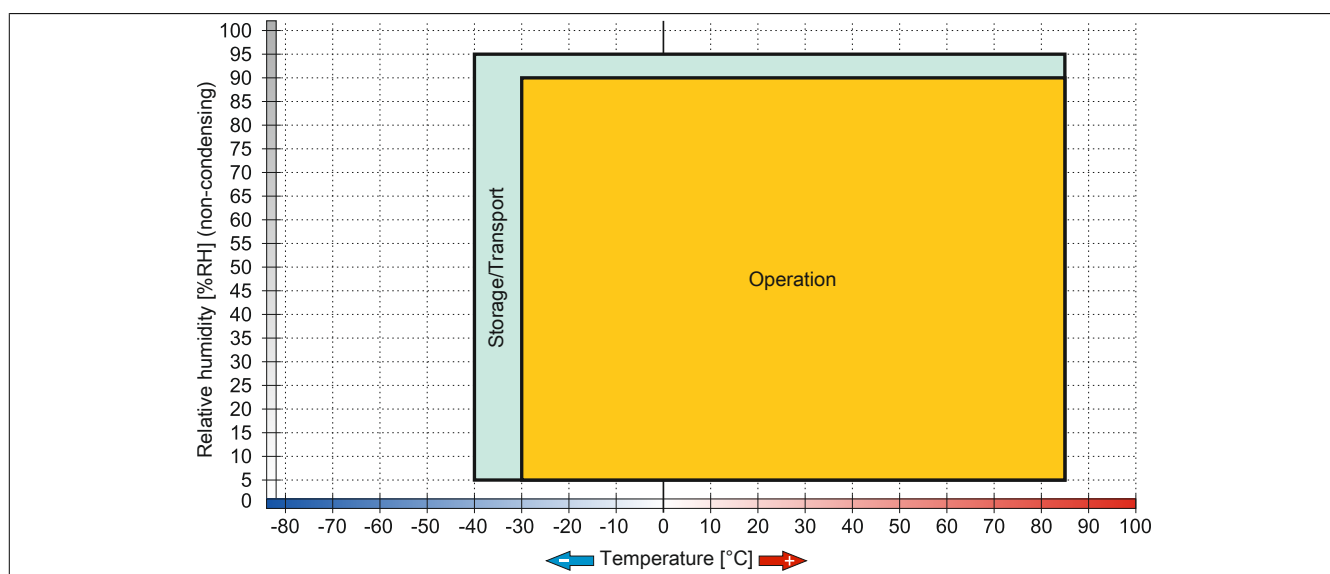


Figure 46: 5AC901.CSSD-05 ≤ Rev. D0 - Temperature/Humidity diagram

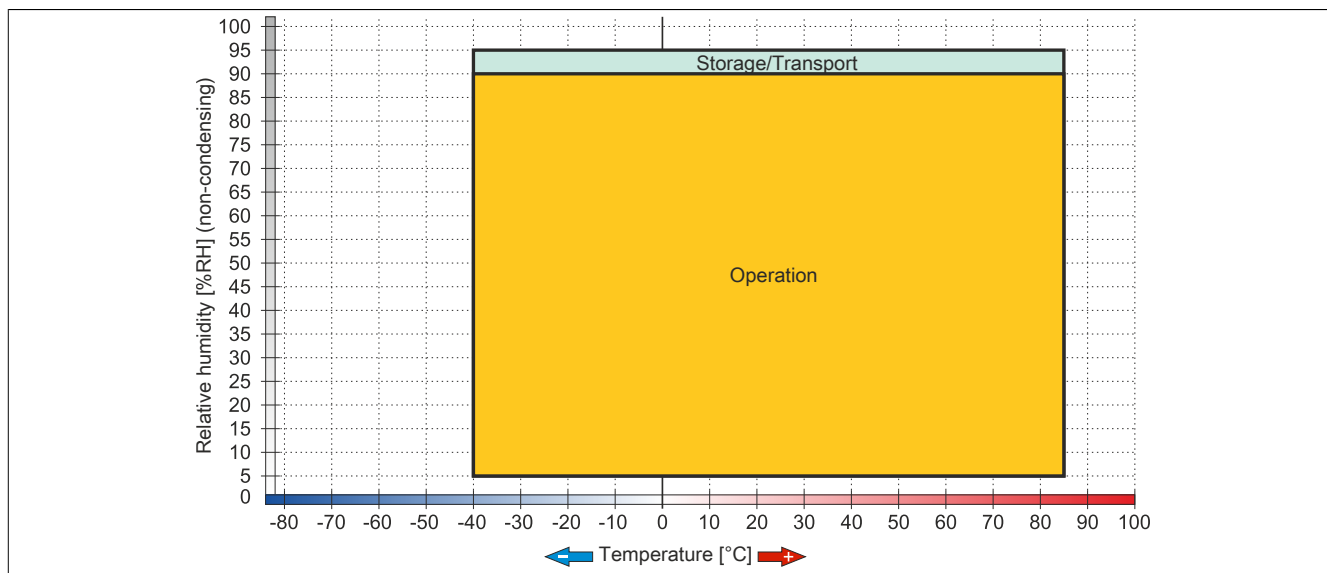


Figure 47: 5AC901.CSSD-05 ≥ Rev. E0 - Temperature/Humidity diagram



### 3.10.10 5AC901.CSSD-06

#### 3.10.10.1 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
- S.M.A.R.T. support
- Slide-in compact
- Compatible with SATA 3.0

#### 3.10.10.2 Order data


| Model number   | Short description                                  | Figure  |
|----------------|--|---|
|                | <b>Drives</b>                                      |  |
| 5AC901.CSSD-06 | 512 GB SSD MLC - Slide-in compact - Toshiba - SATA |   |
|                | <b>Optional accessories</b>                        |   |
|                | <b>Drives</b>                                      |   |
| 5MMSSD.0512-00 | 512 GB SSD MLC - Toshiba - SATA                    |   |

Table 91: 5AC901.CSSD-06 - Order data

#### 3.10.10.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number               | 5AC901.CSSD-06   |
|----------------------------|--|
| <b>General information</b> |  |
| Certification              |  |
| 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 <sup>1)</sup> |
| DNV GL                     | Temperature: B (0 - 55°C)<br>Humidity: B (up to 100%)<br>Vibration: A (0.7g)<br>EMC: B (Bridge and open deck) <sup>2)</sup>            |
| GOST-R                     | Yes  |
| <b>Solid-state drive</b>   |  |
| Capacity                   | 512 GB   |
| Data reliability           | <1 unrecoverable error in 10 <sup>15</sup> bit read accesses   |
| MTBF                       | 1,500,000 hours  |
| S.M.A.R.T. support         | Yes  |
| Interface                  | SATA   |
| Maintenance                | None   |
| Sequential read            | Max. 510 MB/s  |
| Sequential write           | Max. 460 MB/s  |
| IOPS <sup>3)</sup>         |  |
| 4k read                    | Max. 90,000 (random)   |
| 4k write                   | Max. 35,000 (random)   |

Table 92: 5AC901.CSSD-06 - Technical data

| Model number               | 5AC901.CSSD-06  |
|----------------------------|---|
| Endurance                  |   |
| MLC flash                  | Yes   |
| Guaranteed data volume     |   |
| Guaranteed                 | 400 TBW <sup>4)</sup>   |
| Compatibility              | SATA 3.1 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| Environmental 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  |
| Elevation                  |   |
| Operation                  | -300 to 12192 m   |
| Storage                    | -300 to 12192 m   |
| Transport                  | -300 to 12192 m   |
| Mechanical characteristics |   |
| Installation               | Fixed <sup>5)</sup>   |
| Dimensions                 |   |
| Width                      | 13 mm   |
| Height                     | 98 mm   |
| Depth                      | 105 mm  |
| Weight                     | 118 g   |
| Manufacturer information   |   |
| Manufacturer               | Toshiba   |
| Manufacturer's product ID  | THNSNJ512WCSU   |

Table 92: 5AC901.CSSD-06 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) IOPS: Random read and write input/output operations per second.
- 4) TBW: Terabytes written.
- 5) Slide-in compact installation.

### 3.10.10.4 Temperature/Humidity diagram

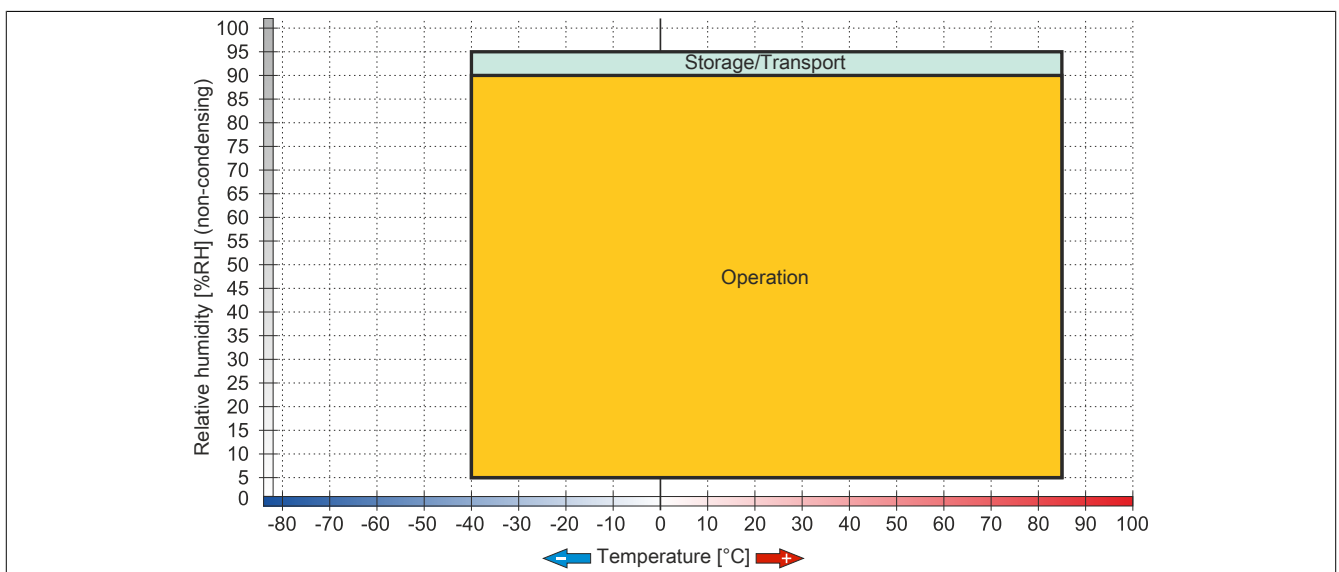


Figure 48: 5AC901.CSSD-06 - Temperature/Humidity diagram

### 3.10.11 5MMSSD.0060-00

#### 3.10.11.1 General information

This 60 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

- Replacement for 5AC801.SSDI-01 or 5AC901.CSSD-01 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

#### 3.10.11.2 Order data


| Model number   | Short description            | Figure  |
|----------------|------------------------------|---|
|                | <b>Drives</b>                |   |
| 5MMSSD.0060-00 | 60 GB SSD MLC - Intel - SATA |  |

Table 93: 5MMSSD.0060-00 - Order data

#### 3.10.11.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a **UPS** is recommended.

##### Information:

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

| Model number               | 5MMSSD.0060-00   |
|----------------------------|--|
| <b>General information</b> |  |
| Certification              |  |
| CE                         | Yes  |
| UL                         | cULus E115267<br>Industrial <b>Control</b> Equipment   |
| HazLoc                     | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD <sup>1)</sup> |
| GOST-R                     | Yes  |
| <b>Solid-state drive</b>   |  |
| Capacity                   | 60 GB  |
| Data reliability           | <1 unrecoverable error in 10 <sup>16</sup> bit read accesses   |
| MTBF                       | 1,200,000 hours  |
| S.M.A.R.T. support         | Yes  |
| Interface                  | SATA   |
| Maintenance                | None   |
| Sequential read            | Max. 550 MB/s, with SATA 6 Gbit/s<br>Max. 280 MB/s, with SATA 3 Gbit/s   |
| Sequential write           | Max. 475 MB/s, with SATA 6 Gbit/s<br>Max. 245 MB/s, with SATA 3 Gbit/s   |
| IOPS <sup>2)</sup>         |  |
| 4k read                    | 15000  |
| 4k write                   |  |
| Typical                    | 23000  |
| Maximum                    | 80000  |
| <b>Endurance</b>           |  |
| MLC flash                  | Yes  |

Table 94: 5MMSSD.0060-00 - Technical data

| Model number               | 5MMSSD.0060-00  |
|----------------------------|---|
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| Environmental conditions   |   |
| Temperature                |   |
| Operation                  | 0 to 70°C   |
| Storage                    | -55 to 95°C   |
| Transport                  | -55 to 95°C   |
| Relative humidity          |   |
| Operation                  | 5 to 95%, non-condensing  |
| Storage                    | 5 to 95%, non-condensing  |
| Transport                  | 5 to 95%, non-condensing  |
| Vibration                  |   |
| Operation                  | 5 to 700 Hz: 2.17 g   |
| Storage                    | 5 to 800 Hz: 3.13 g   |
| Transport                  | 5 to 800 Hz: 3.13 g   |
| Shock                      |   |
| Operation                  | 1500 g, 0.5 ms  |
| Storage                    | 1500 g, 0.5 ms  |
| Transport                  | 1500 g, 0.5 ms  |
| Elevation                  |   |
| Operation                  | -300 to 12192 m   |
| Storage                    | -300 to 12192 m   |
| Transport                  | -300 to 12192 m   |
| Mechanical characteristics |   |
| Dimensions                 |   |
| Width                      | 9.5 mm  |
| Height                     | 69 mm   |
| Depth                      | 100 mm  |
| Weight                     | 78 g  |
| Manufacturer information   |   |
| Manufacturer               | Intel   |
| Manufacturer's product ID  | SSDSC2CW060A3   |

Table 94: 5MMSSD.0060-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) IOPS: Random read and write input/output operations per second.

### 3.10.11.4 Temperature/Humidity diagram

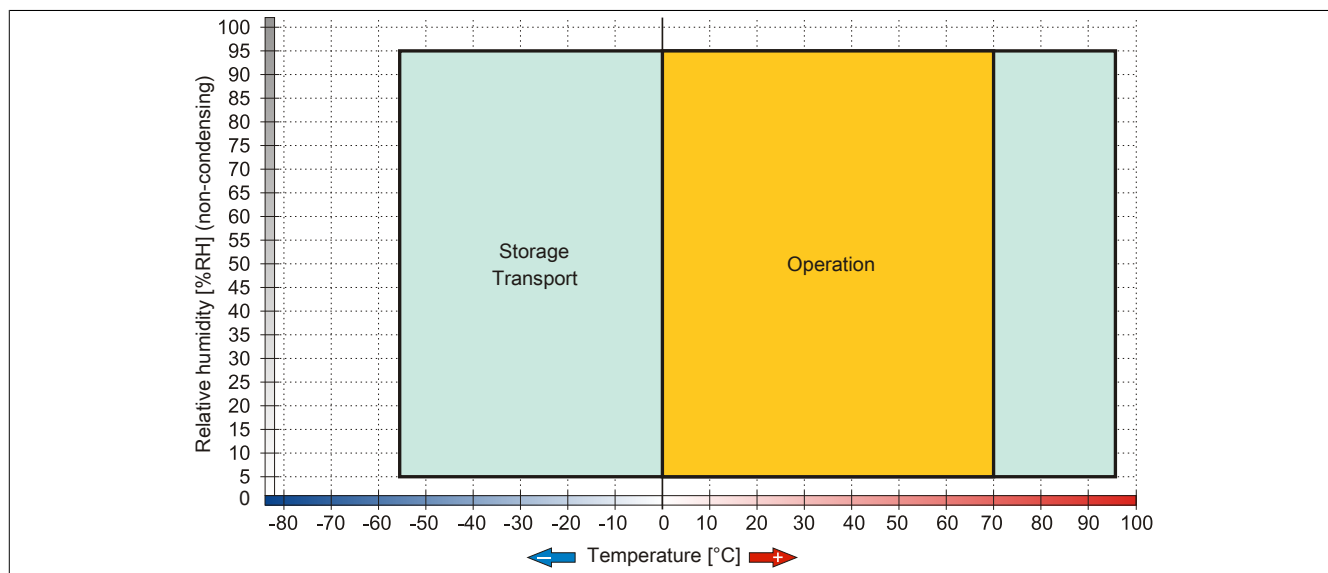


Figure 49: 5MMSSD.0060-00 - Temperature/Humidity diagram

### 3.10.12 5MMSSD.0060-01

#### 3.10.12.1 General information

This 60 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

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

#### 3.10.12.2 Order data


| Model number   | Short description            | Figure  |
|----------------|------------------------------|---|
|                | <b>Drives</b>                |   |
| 5MMSSD.0060-01 | 60 GB SSD MLC - Intel - SATA |  |

Table 95: 5MMSSD.0060-01 - Order data

#### 3.10.12.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a **UPS** is recommended.

##### Information:

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

| Model number               | 5MMSSD.0060-01 |  |                      |
|----------------------------|----------------|--|----------------------|
| Revision                   | C0             | D0   | E0                   |
| <b>General information</b> |                |  |                      |
| Certification              |                |  |                      |
| CE                         |                | Yes  |                      |
| UL                         |                | cULus E115267<br>Industrial <b>Control</b> Equipment   |                      |
| HazLoc                     |                | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD <sup>1)</sup> |                      |
| GOST-R                     |                | Yes  |                      |
| <b>Solid-state drive</b>   |                |  |                      |
| Capacity                   |                | 60 GB  |                      |
| Data reliability           |                | <1 unrecoverable error in 10 <sup>15</sup> bit read accesses   |                      |
| MTBF                       |                | 1,500,000 hours  |                      |
| S.M.A.R.T. support         |                | Yes  |                      |
| Interface                  |                | SATA   |                      |
| Maintenance                |                | None   |                      |
| Sequential read            |                | Max. 510 MB/s  |                      |
| Sequential write           |                | Max. 430 MB/s  |                      |
| IOPS <sup>2)</sup>         |                |  |                      |
| 4k read                    |                | Max. 50,000 (random)   |                      |
| 4k write                   |                | Max. 25,000 (random)   |                      |
| <b>Endurance</b>           |                |  |                      |
| MLC flash                  |                | Yes  |                      |
| Guaranteed data volume     |                |  |                      |
| Guaranteed                 |                | 35 TBW <sup>3)</sup>   | 47 TBW <sup>3)</sup> |
| Compatibility              |                | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ)  |                      |

Table 96: 5MMSSD.0060-01, 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data

| Model number               | 5MMSSD.0060-01           |                          |               |
|----------------------------|--------------------------|--------------------------|---------------|
| Revision                   | C0                       | D0                       | E0            |
| Environmental 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 12192 m          |               |
| Storage                    |                          | -300 to 12192 m          |               |
| Transport                  |                          | -300 to 12192 m          |               |
| Mechanical characteristics |                          |                          |               |
| Dimensions                 |                          |                          |               |
| Width                      | 9.5 mm                   | 7 mm                     |               |
| Height                     |                          | 69 mm                    |               |
| Depth                      |                          | 100 mm                   |               |
| Weight                     |                          | 78 g                     |               |
| Manufacturer information   |                          |                          |               |
| Manufacturer               | Toshiba                  |                          |               |
| Manufacturer's product ID  | THNSNH060GBST            | THNSNJ060WCST            | THNSNJ060WCSU |

Table 96: 5MMSSD.0060-01, 5MMSSD.0060-01, 5MMSSD.0060-01 - 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) IOPS: Random read and write input/output operations per second.
- 3) TBW: Terabytes written.

### 3.10.12.4 Temperature/Humidity diagram

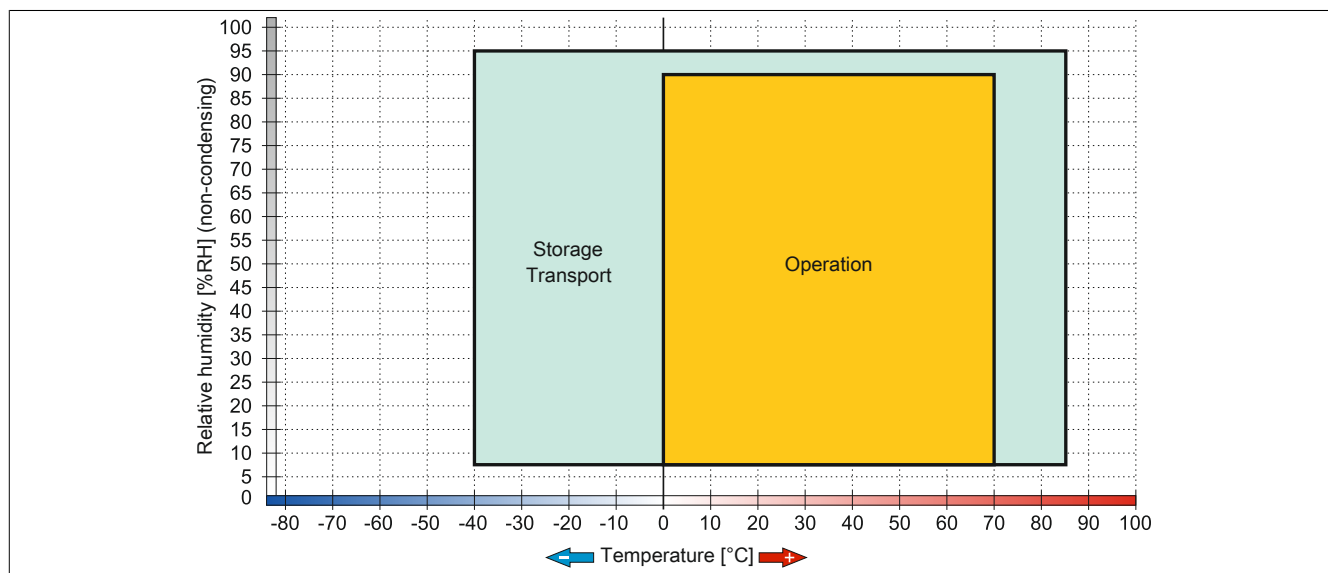


Figure 50: 5MMSSD.0060-01 ≤ Rev. C0 - Temperature/Humidity diagram

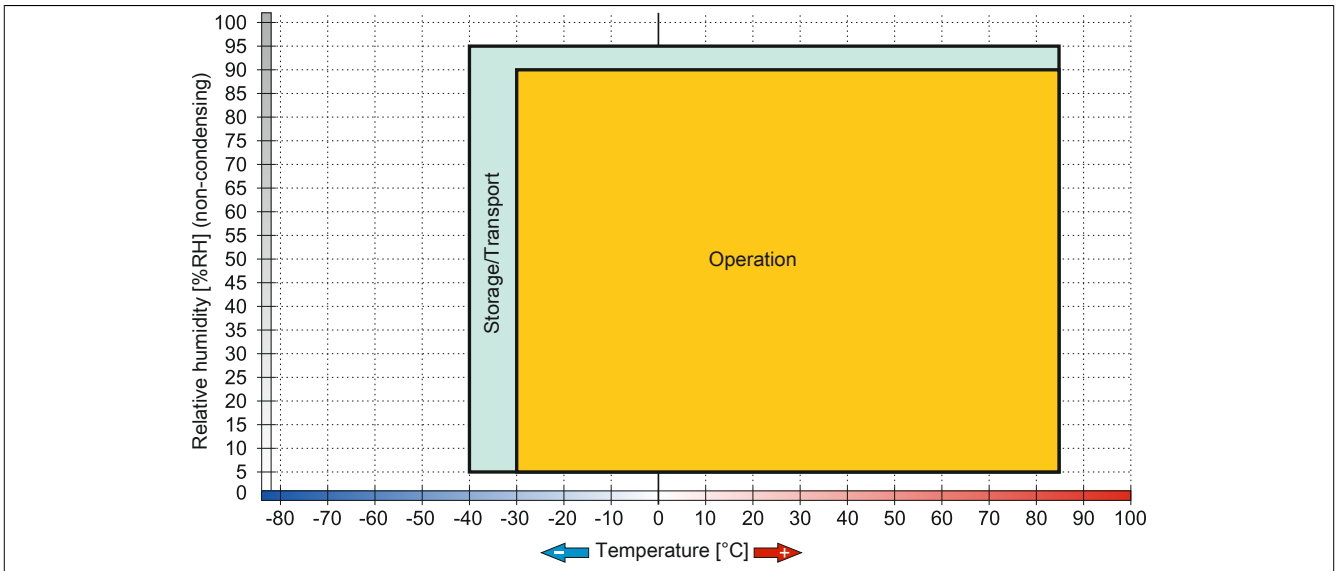


Figure 51: 5MMSSD.0060-01 Rev. D0 - Temperature/Humidity diagram

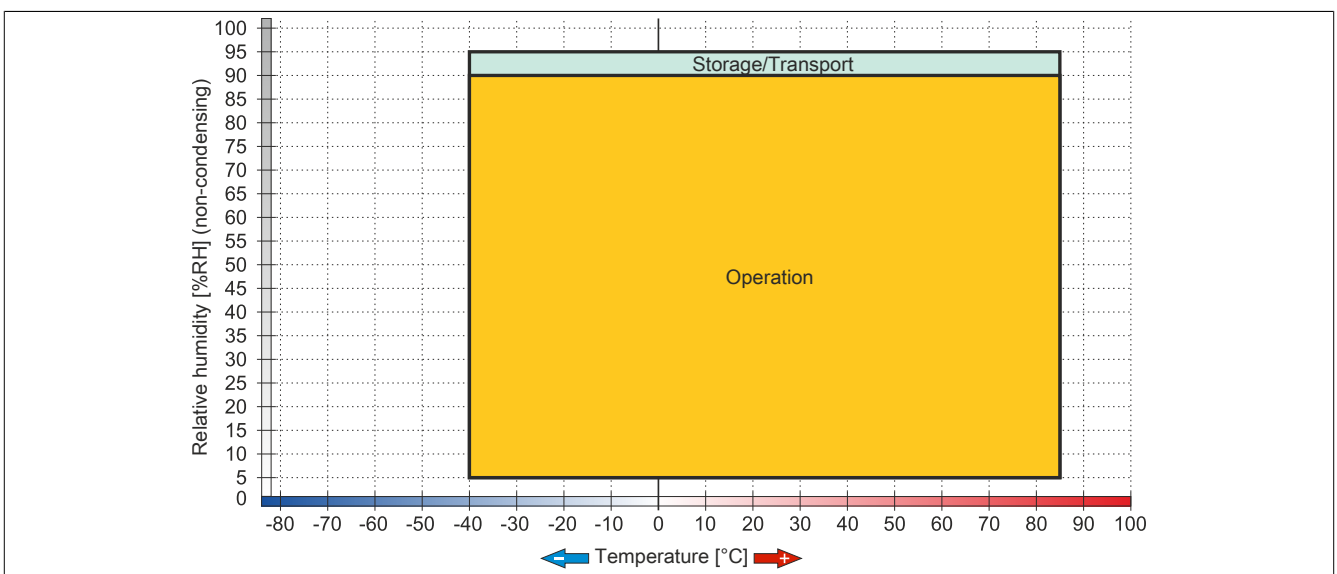


Figure 52: 5MMSSD.0060-01 ≥ Rev. E0 - Temperature/Humidity diagram

### 3.10.13 5MMSSD.0128-01

#### 3.10.13.1 General information

This 128 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

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

#### 3.10.13.2 Order data


| Model number   | Short description               | Figure  |
|----------------|---------------------------------|---|
|                | <b>Drives</b>                   |   |
| 5MMSSD.0128-01 | 128 GB SSD MLC - Toshiba - SATA |  |

Table 97: 5MMSSD.0128-01 - Order data

#### 3.10.13.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a **UPS** is recommended.

##### Information:

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

| Model number                     | 5MMSSD.0128-01 |   |                       |
|----------------------------------|----------------|---|-----------------------|
| Revision                         | C0             | D0  | E0                    |
| General information              |                |   |                       |
| Certification                    |                |   |                       |
| CE                               |                | Yes   |                       |
| UL                               |                | cULus E115267<br>Industrial <a href="#">Control</a> Equipment   |                       |
| HazLoc                           |                | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD <sup>1)</sup> |                       |
| GOST-R                           |                | Yes   |                       |
| Solid-state drive                |                |   |                       |
| Capacity                         |                | 128 <a href="#">GB</a>  |                       |
| Data <a href="#">reliability</a> |                | <1 unrecoverable error in 10 <sup>15</sup> <a href="#">bit</a> read accesses  |                       |
| <a href="#">MTBF</a>             |                | 1,500,000 hours   |                       |
| S.M.A.R.T. support               |                | Yes   |                       |
| <a href="#">Interface</a>        |                | SATA  |                       |
| Maintenance                      |                | None  |                       |
| Sequential read                  |                | Max. 510 <a href="#">MB/s</a>   |                       |
| Sequential write                 |                | Max. 450 <a href="#">MB/s</a>   |                       |
| IOPS <sup>2)</sup>               |                |   |                       |
| 4k read                          |                | Max. 85,000 (random)  |                       |
| 4k write                         |                | Max. 35,000 (random)  |                       |
| Endurance                        |                |   |                       |
| MLC flash                        |                | Yes   |                       |
| Guaranteed data volume           |                |   |                       |
| Guaranteed                       |                | 74 TBW <sup>3)</sup>  | 100 TBW <sup>3)</sup> |

Table 98: 5MMSSD.0128-01, 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data



| Model number               | 5MMSSD.0128-01  |                          |               |
|----------------------------|---|--------------------------|---------------|
| Revision                   | C0  | D0                       | E0            |
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |                          |               |
| Environmental 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 12192 m          |               |
| Storage                    |   | -300 to 12192 m          |               |
| Transport                  |   | -300 to 12192 m          |               |
| Mechanical characteristics |   |                          |               |
| Dimensions                 |   |                          |               |
| Width                      | 9.5 mm  | 7 mm                     |               |
| Height                     |   | 69 mm                    |               |
| Depth                      |   | 100 mm                   |               |
| Weight                     |   | 78 g                     |               |
| Manufacturer information   |   |                          |               |
| Manufacturer               | Toshiba   |                          |               |
| Manufacturer's product ID  | THNSNH128GBST   | THNSNJ128WCST            | THNSNJ128WCSU |

Table 98: 5MMSSD.0128-01, 5MMSSD.0128-01, 5MMSSD.0128-01 - 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) IOPS: Random read and write input/output operations per second.
- 3) TBW: Terabytes written.

### 3.10.13.4 Temperature/Humidity diagram

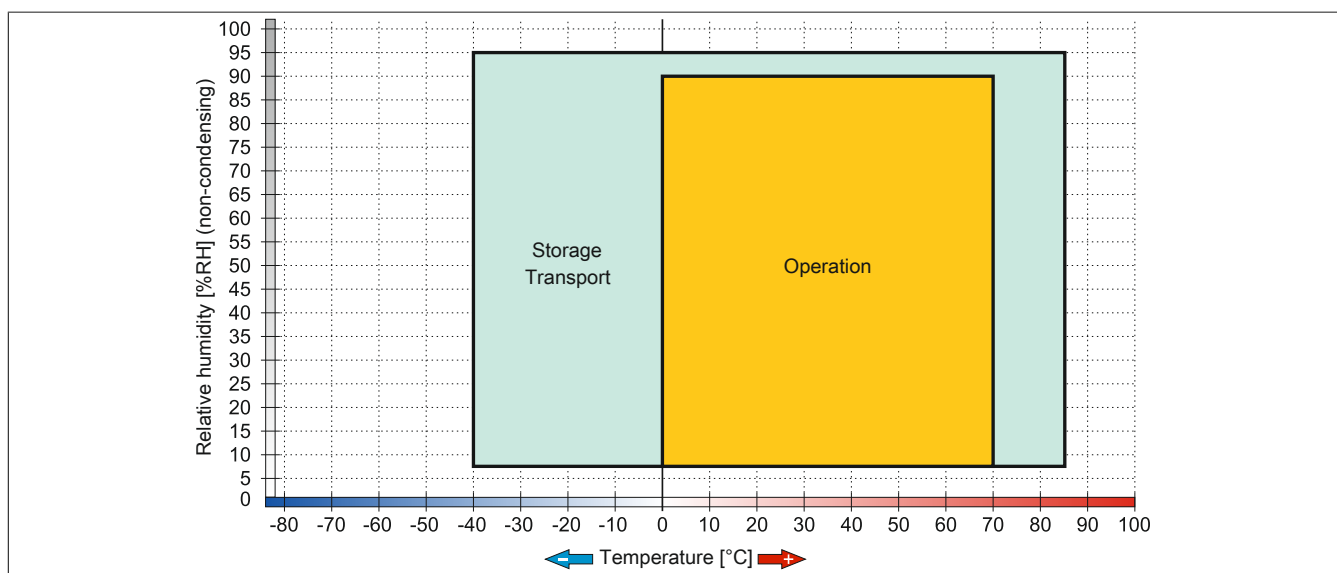


Figure 53: 5MMSSD.0128-01 ≤ Rev. C0 - Temperature/Humidity diagram

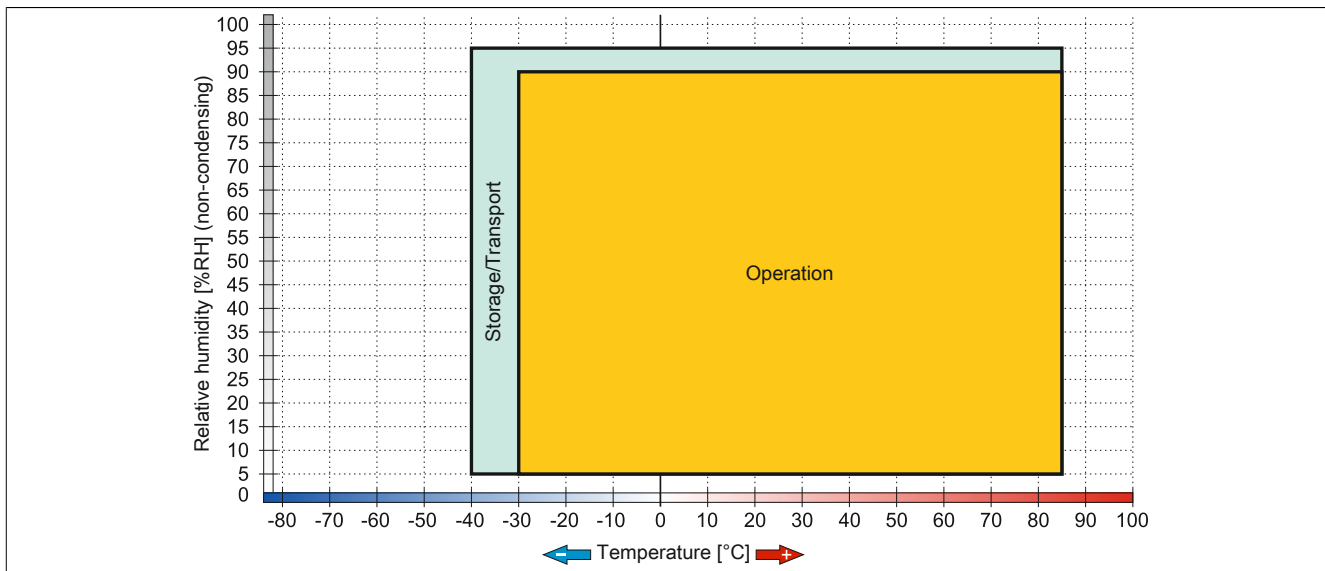


Figure 54: 5MMSSD.0128-01 Rev. D0 - Temperature/Humidity diagram

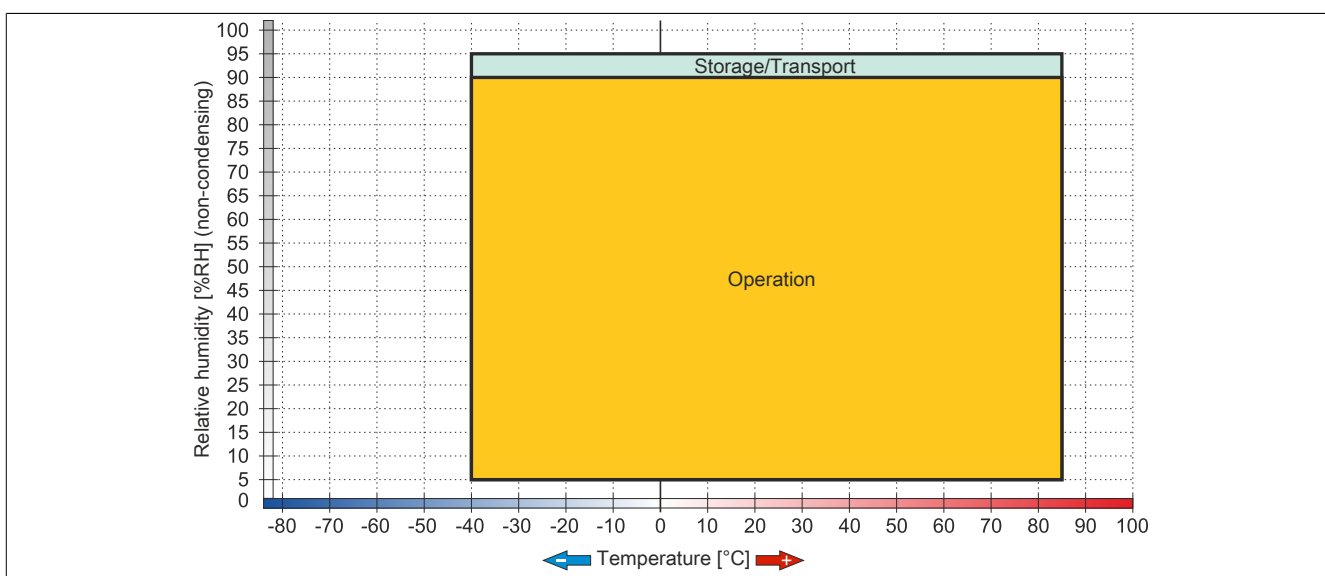


Figure 55: 5MMSSD.0128-01 ≥ Rev. E0 - Temperature/Humidity diagram

### 3.10.14 5MMSSD.0180-00

#### 3.10.14.1 General information

This 180 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

- Replacement for 5AC801.SSDI-02 or 5AC901.CSSD-02 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

#### 3.10.14.2 Order data


| Model number   | Short description             | Figure  |
|----------------|-------------------------------|---|
|                | <b>Drives</b>                 |   |
| 5MMSSD.0180-00 | 180 GB SSD MLC - Intel - SATA |  |

Table 99: 5MMSSD.0180-00 - Order data

#### 3.10.14.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a **UPS** is recommended.

##### Information:

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

| Model number               | 5MMSSD.0180-00   |
|----------------------------|--|
| <b>General information</b> |  |
| Certification              |  |
| CE                         | Yes  |
| UL                         | cULus E115267<br>Industrial <b>Control</b> Equipment   |
| HazLoc                     | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD <sup>1)</sup> |
| GOST-R                     | Yes  |
| <b>Solid-state drive</b>   |  |
| Capacity                   | 180 GB   |
| Data reliability           | <1 unrecoverable error in 10 <sup>16</sup> bit read accesses   |
| MTBF                       | 1,200,000 hours  |
| S.M.A.R.T. support         | Yes  |
| Interface                  | SATA   |
| Maintenance                | None   |
| Sequential read            | Max. 550 MB/s, with SATA 6 Gbit/s<br>Max. 280 MB/s, with SATA 3 Gbit/s   |
| Sequential write           | Max. 520 MB/s, with SATA 6 Gbit/s<br>Max. 260 MB/s, with SATA 3 Gbit/s   |
| IOPS <sup>2)</sup>         |  |
| 4k read                    | 50000  |
| 4k write                   |  |
| Typical                    | 60000  |
| Maximum                    | 80000  |
| <b>Endurance</b>           |  |
| MLC flash                  | Yes  |

Table 100: 5MMSSD.0180-00 - Technical data

| Model number               | 5MMSSD.0180-00  |
|----------------------------|---|
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |
| Environmental conditions   |   |
| Temperature                |   |
| Operation                  | 0 to 70°C   |
| Storage                    | -55 to 95°C   |
| Transport                  | -55 to 95°C   |
| Relative humidity          |   |
| Operation                  | 5 to 95%, non-condensing  |
| Storage                    | 5 to 95%, non-condensing  |
| Transport                  | 5 to 95%, non-condensing  |
| Vibration                  |   |
| Operation                  | 5 to 700 Hz: 2.17 g   |
| Storage                    | 5 to 800 Hz: 3.13 g   |
| Transport                  | 5 to 800 Hz: 3.13 g   |
| Shock                      |   |
| Operation                  | 1500 g, 0.5 ms  |
| Storage                    | 1500 g, 0.5 ms  |
| Transport                  | 1500 g, 0.5 ms  |
| Elevation                  |   |
| Operation                  | -300 to 12192 m   |
| Storage                    | -300 to 12192 m   |
| Transport                  | -300 to 12192 m   |
| Mechanical characteristics |   |
| Dimensions                 |   |
| Width                      | 9.5 mm  |
| Height                     | 69 mm   |
| Depth                      | 100 mm  |
| Weight                     | 78 g  |
| Manufacturer information   |   |
| Manufacturer               | Intel   |
| Manufacturer's product ID  | SSDSC2CW180A3   |

Table 100: 5MMSSD.0180-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) IOPS: Random read and write input/output operations per second.

### 3.10.14.4 Temperature/Humidity diagram

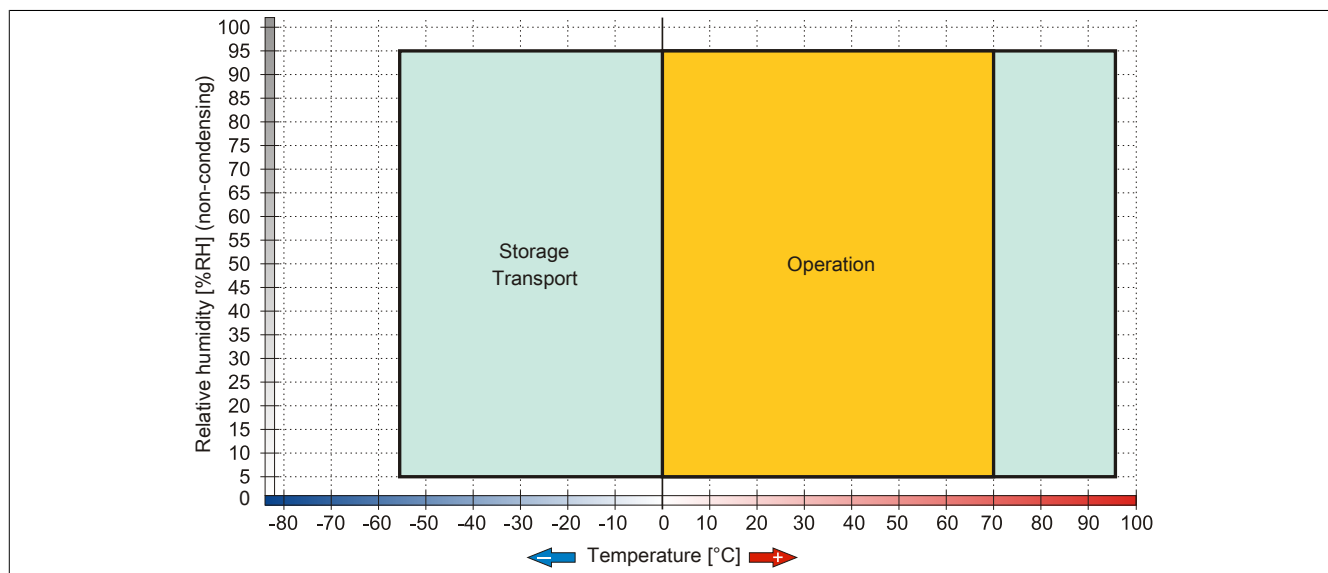


Figure 56: 5MMSSD.0180-00 - Temperature/Humidity diagram

### 3.10.15 5MMSSD.0256-00

#### 3.10.15.1 General information

This 256 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

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

#### 3.10.15.2 Order data


| Model number   | Short description               | Figure  |
|----------------|---------------------------------|---|
|                | <b>Drives</b>                   |   |
| 5MMSSD.0256-00 | 256 GB SSD MLC - Toshiba - SATA |  |

Table 101: 5MMSSD.0256-00 - Order data

#### 3.10.15.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a UPS is recommended.

##### Information:

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

| Model number                     | 5MMSSD.0256-00  |                       |
|----------------------------------|---|-----------------------|
| Revision                         | C0  | D0                    |
| General information              |   |                       |
| Certification                    |   |                       |
| CE                               | Yes   |                       |
| UL                               | cULus E115267<br>Industrial <a href="#">Control</a> Equipment   |                       |
| HazLoc                           | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD <sup>1)</sup> |                       |
| Solid-state drive                |   |                       |
| Capacity                         | 256 <a href="#">GB</a>  |                       |
| Data <a href="#">reliability</a> | <1 unrecoverable error in 10 <sup>15</sup> <a href="#">bit</a> read accesses  |                       |
| <a href="#">MTBF</a>             | 1,500,000 hours   |                       |
| S.M.A.R.T. support               | Yes   |                       |
| <a href="#">Interface</a>        | SATA  |                       |
| Maintenance                      | None  |                       |
| Sequential read                  | Max. 510 <a href="#">MB/s</a>   |                       |
| Sequential write                 | Max. 460 <a href="#">MB/s</a>   |                       |
| IOPS <sup>2)</sup>               |   |                       |
| 4k read                          | Max. 90,000 (random)  |                       |
| 4k write                         | Max. 35,000 (random)  |                       |
| Endurance                        |   |                       |
| MLC flash                        | Yes   |                       |
| Guaranteed data volume           |   |                       |
| Guaranteed                       | 148 TBW <sup>3)</sup>   | 200 TBW <sup>3)</sup> |

Table 102: 5MMSSD.0256-00, 5MMSSD.0256-00 - Technical data

| Model number               | 5MMSSD.0256-00  |               |
|----------------------------|---|---------------|
| Revision                   | C0  | D0            |
| Compatibility              | SATA 3.0 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ) |               |
| Environmental 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 12192 m   |               |
| Storage                    | -300 to 12192 m   |               |
| Transport                  | -300 to 12192 m   |               |
| Mechanical characteristics |   |               |
| Dimensions                 |   |               |
| Width                      | 7 mm  |               |
| Height                     | 69 mm   |               |
| Depth                      | 100 mm  |               |
| Weight                     | 78 g  |               |
| Manufacturer information   |   |               |
| Manufacturer               | Toshiba   |               |
| Manufacturer's product ID  | THNSNJ256WCST   | THNSNJ256WCSU |

Table 102: 5MMSSD.0256-00, 5MMSSD.0256-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) IOPS: Random read and write input/output operations per second.
- 3) TBW: Terabytes written.

### 3.10.15.4 Temperature/Humidity diagram

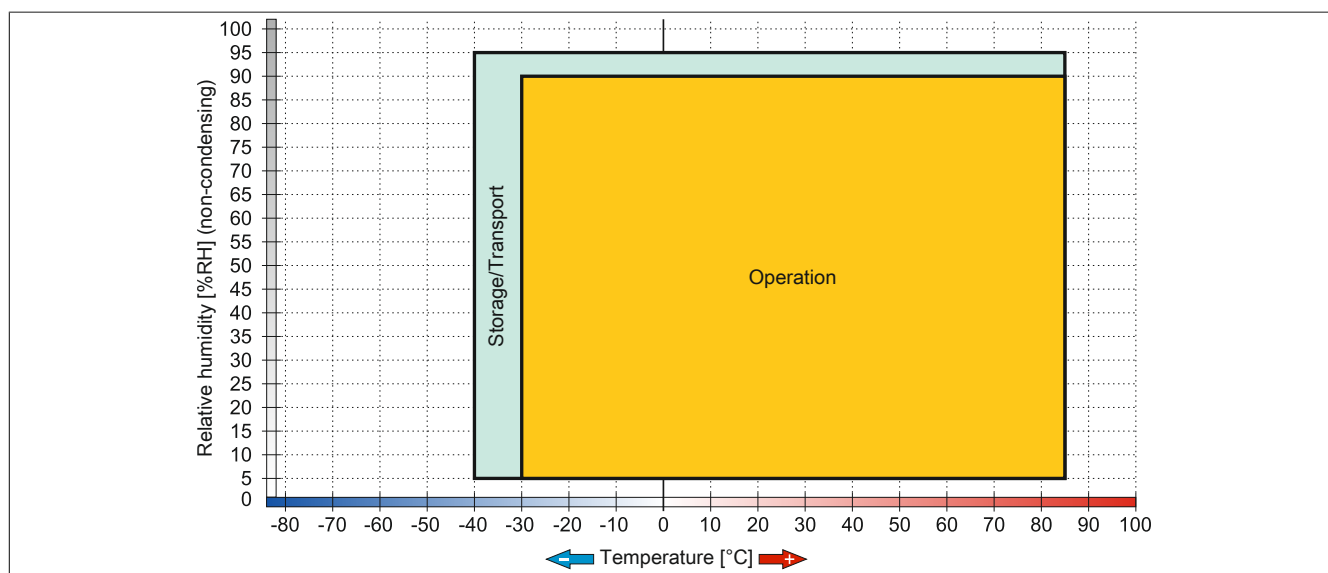


Figure 57: 5MMSSD.0256-00 ≤ C0 - Temperature/Humidity diagram

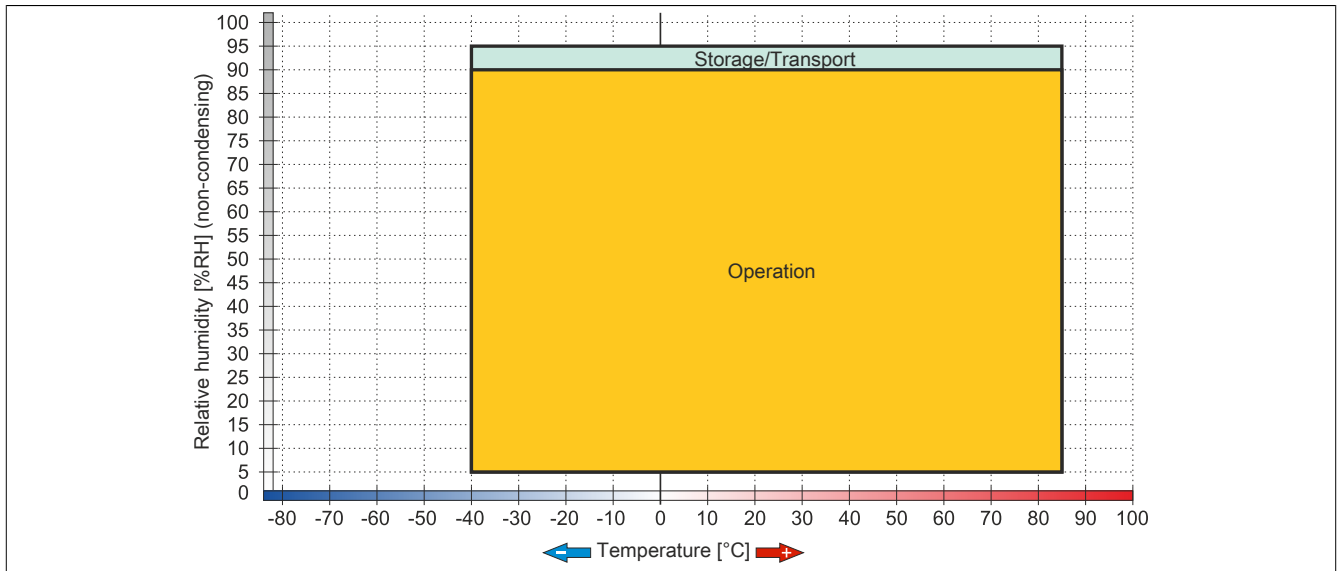


Figure 58: 5MMSSD.0256-00 ≥ D0 - Temperature/Humidity diagram

### 3.10.16 5MMSSD.0512-00

#### 3.10.16.1 General information

This 512 GB slide-in compact solid-state drive (SSD) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

- Replacement drive for 5AC901.CSSD-06 solid-state drive

#### 3.10.16.2 Order data


| Model number   | Short description               | Figure  |
|----------------|---------------------------------|---|
| 5MMSSD.0512-00 | <b>Drives</b>                   |  |
|                | 512 GB SSD MLC - Toshiba - SATA |   |

Table 103: 5MMSSD.0512-00 - Order data

#### 3.10.16.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a **UPS** is recommended.

##### Information:

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

| Model number               | 5MMSSD.0512-00  |
|----------------------------|---|
| <b>General information</b> |   |
| Certification              |   |
| CE                         | Yes   |
| UL                         | cULus E115267<br>Industrial <b>Control</b> Equipment  |
| HazLoc                     | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup> |
| GOST-R                     | Yes   |
| <b>Solid-state drive</b>   |   |
| Capacity                   | 512 GB  |
| Data reliability           | <1 unrecoverable error in 10 <sup>15</sup> bit read accesses  |
| MTBF                       | 1,500,000 hours   |
| S.M.A.R.T. support         | Yes   |
| Interface                  | SATA  |
| Maintenance                | None  |
| Sequential read            | Max. 510 MB/s   |
| Sequential write           | Max. 460 MB/s   |
| IOPS <sup>2)</sup>         |   |
| 4k read                    | Max. 90,000 (random)  |
| 4k write                   | Max. 35,000 (random)  |
| <b>Endurance</b>           |   |
| MLC flash                  | Yes   |
| Guaranteed data volume     |   |
| Guaranteed                 | 400 TBW <sup>3)</sup>   |
| Compatibility              | SATA 3.1 compliant<br>ACS-2<br>SSD Enhanced SMART ATA feature set<br>Native Command Queuing (NCQ)   |

Table 104: 5MMSSD.0512-00 - Technical data



|                                   |                          |
|-----------------------------------|--------------------------|
| <b>Model number</b>               | <b>5MMSSD.0512-00</b>    |
| <b>Environmental conditions</b>   |                          |
| 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           |
| Elevation                         |                          |
| Operation                         | -300 to 12192 m          |
| Storage                           | -300 to 12192 m          |
| Transport                         | -300 to 12192 m          |
| <b>Mechanical characteristics</b> |                          |
| Dimensions                        |                          |
| Width                             | 7 mm                     |
| Height                            | 69 mm                    |
| Depth                             | 100 mm                   |
| Weight                            | 78 g                     |
| <b>Manufacturer information</b>   |                          |
| Manufacturer                      | Toshiba                  |
| Manufacturer's product ID         | THNSNJ512WCSU            |

Table 104: 5MMSSD.0512-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) IOPS: Random read and write input/output operations per second.
- 3) TBW: Terabytes written.

### 3.10.16.4 Temperature/Humidity diagram

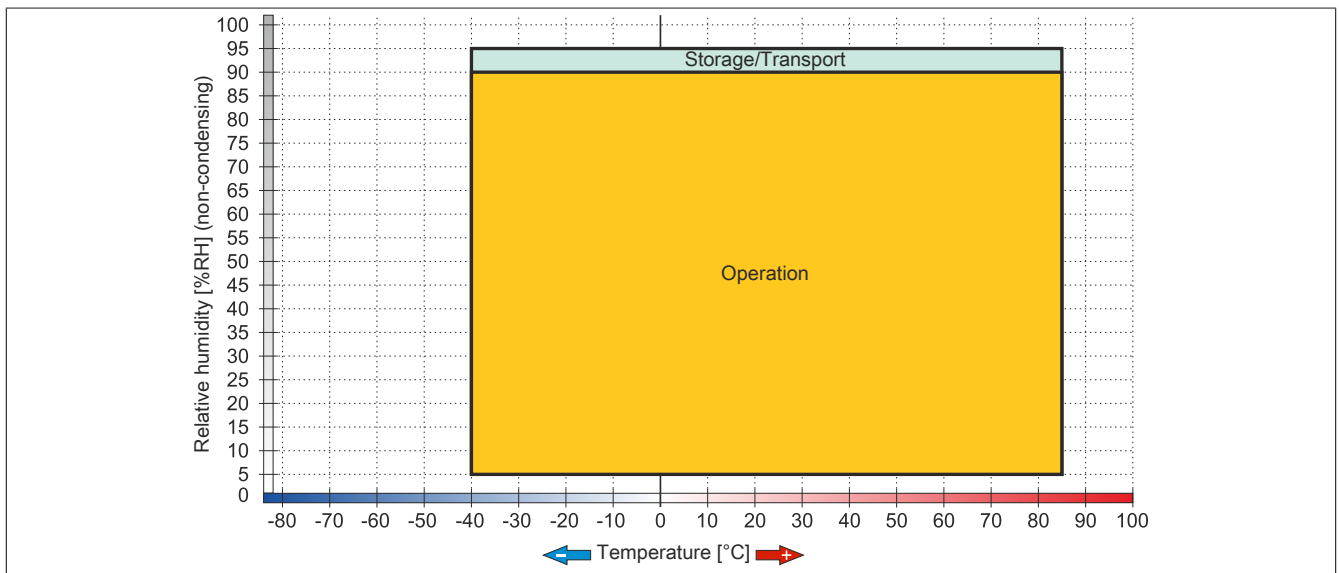


Figure 59: 5MMSSD.0512-00 - Temperature/Humidity diagram

### 3.10.17 5AC901.CCFA-00

#### 3.10.17.1 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

#### 3.10.17.2 Order data


| Model number   | Short description                         | Figure  |
|----------------|---|---|
|                | <b>Drives</b>                             |  |
| 5AC901.CCFA-00 | CFast adapter - For slide-in compact slot |   |
|                | <b>Optional accessories</b>               |   |
|                | <b>CFast cards</b>                        |   |
| 5CFAST.016G-00 | CFast card, 16 GB SLC                     |   |
| 5CFAST.032G-00 | CFast card, 32 GB SLC                     |   |
| 5CFAST.032G-10 | CFast card, 32 GB MLC                     |   |
| 5CFAST.064G-10 | CFast card, 64 GB MLC                     |   |
| 5CFAST.128G-10 | CFast card, 128 GB MLC                    |   |
| 5CFAST.2048-00 | CFast card, 2 GB SLC                      |   |
| 5CFAST.4096-00 | CFast card, 4 GB SLC                      |   |
| 5CFAST.8192-00 | CFast card, 8 GB SLC                      |   |

Table 105: 5AC901.CCFA-00 - Order data

#### 3.10.17.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a **UPS** is recommended.

##### Information:

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

| Model number                    | 5AC901.CCFA-00  |
|---------------------------------|---|
| <b>General information</b>      |   |
| Certification                   |   |
| CE                              | Yes   |
| UL                              | cULus E115267<br>Industrial <b>Control</b> Equipment  |
| HazLoc                          | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup> |
| GOST-R                          | Yes   |
| <b>Interfaces</b>               |   |
| CFast slot                      |   |
| Quantity                        | 1   |
| <b>Environmental conditions</b> |   |
| 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 106: 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.

### 3.10.18 5AC901.CHDD-99

#### 3.10.18.1 General information

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

#### Information:

If this slide-in compact kit is used with components ([HDD/SDD](#)) not approved by B&R, then B&R cannot make any guarantees regarding fit, form or function. In addition, B&R is not able to guarantee that the specifications, norms and certifications applicable to this [device](#) continue to apply.

#### 3.10.18.2 Order data


| Model number   | Short description    | Figure  |
|----------------|----------------------|---|
|                | <b>Drives</b>        |   |
| 5AC901.CHDD-99 | Slide-in compact kit |  |

Table 107: 5AC901.CHDD-99 - Order data

### 3.10.19 5AC901.SDVW-00

#### 3.10.19.1 General information

The DVD-R/RW slide-in drive [can](#) be used in APC910 system units and PPC800 bus units with a slide-in drive slot.

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

#### 3.10.19.2 Order data


| Model number   | Short description                        | Figure  |
|----------------|--|---|
|                | <b>Drives</b>                            |  |
| 5AC901.SDVW-00 | DVD drive - DVD-R/RW DVD+R/RW - Slide-in |   |

Table 108: 5AC901.SDVW-00 - Order data

#### 3.10.19.3 Technical data

##### Information:

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

| Model number               | 5AC901.SDVW-00   |
|----------------------------|--|
| <b>General information</b> |  |
| Certification              |  |
| CE                         | Yes  |
| UL                         | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |
| HazLoc                     | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup>   |
| DNV GL                     | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>2)</sup>   |
| GOST-R                     | Yes  |
| <b>CD / DVD drive</b>      |  |
| Data buffer capacity       | 2 <a href="#">MB</a>   |
| Data transfer rate         | Max. 33.3 <a href="#">MB/s</a>   |
| 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 <a href="#">GB</a> , 2.6 <a href="#">GB</a> )<br>DVD+R, DVD+R (dual layer), DVD+RW |
| Laser class                | Class 1 laser  |
| Service life               | 60000 <a href="#">POH</a> (power-on hours)   |
| <a href="#">Interface</a>  | SATA   |
| Startup time               |  |
| CD                         | Max. 14 seconds (from 0 rpm to read operation)   |
| DVD                        | Max. 15 seconds (from 0 rpm to read operation)   |
| 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,<br>DVD+R, DVD+R (dual layer), DVD+RW, DVD-RAM   |

Table 109: 5AC901.SDVW-00 - Technical data

| Model number                      | 5AC901.SDVW-00   |
|-----------------------------------|--|
| 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 <sup>3)</sup>             | 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              |
| <b>Environmental conditions</b>   |  |
| Temperature <sup>4)</sup>         |  |
| Operation                         | 5 to 55°C <sup>5)</sup>  |
| 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           |
| <b>Mechanical characteristics</b> |  |
| Dimensions                        |  |
| Width                             | 22 mm  |
| Height                            | 172.5 mm   |
| Depth                             | 150 mm   |
| Weight                            | 400 g  |

Table 109: 5AC901.SDVW-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) RAM drivers are not provided by the manufacturer. Support of RAM function by "Nero" burning software (model number 5SWUT1.0000-00) or other burning software packages or drivers from third-party providers.
- 4) Temperature specifications refer to operation at 500 meters. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
- 5) Surface temperature of drive.

### 3.10.19.4 Temperature/Humidity diagram

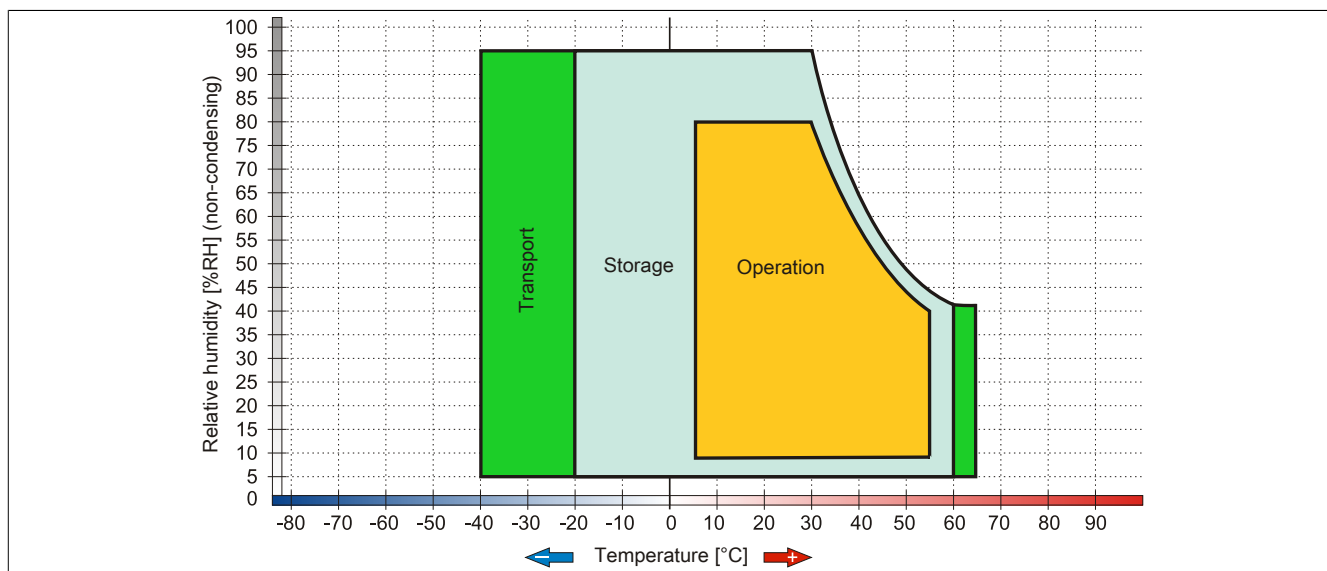


Figure 60: 5AC901.SDVW-00 - Temperature/Humidity diagram

### 3.10.20 5AC901.SSCA-00

#### 3.10.20.1 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

#### 3.10.20.2 Order data


| Model number   | Short description                                      | Figure  |
|----------------|--|---|
|                | <b>Drives</b>  |  |
| 5AC901.SSCA-00 | Slide-in compact adapter - For slide-in compact drives |   |
|                | <b>Optional accessories</b>                            |   |
|                | <b>Drives</b>  |   |
| 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 - 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     |   |

Table 110: 5AC901.SSCA-00 - Order data

#### 3.10.20.3 Technical data

##### Caution!

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

To prevent damage and loss of data, the use of a **UPS** is recommended.

##### Information:

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

| Model number                    | 5AC901.SSCA-00  |
|---------------------------------|---|
| <b>General information</b>      |   |
| Certification                   |   |
| CE                              | Yes   |
| UL                              | cULus E115267<br>Industrial <b>Control</b> Equipment  |
| HazLoc                          | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup>           |
| DNV GL                          | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>2)</sup> |
| GOST-R                          | Yes   |
| <b>Inserts</b>                  |   |
| Slide-in compact drives         | 1   |
| <b>Environmental conditions</b> |   |
| 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  |
| 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 111: 5AC901.SSCA-00 - Technical data

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

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

3.10.21 5ACPCI.RAIC-06

3.10.21.1 General information

This SATA RAID controller supports RAID level 0 and 1 and can be inserted in a PCI slot. The 500 GB hard disks that are used are specified for 24-hour operation (24x7).

- SATA RAID controller
- RAID level 0 (striped) and 1 (mirrored)
- 2x 500 GB SATA hard disks (suitable for 24-hour operation)
- Only requires 1 PCI slot
- Transfer rates up to 150 MB/s

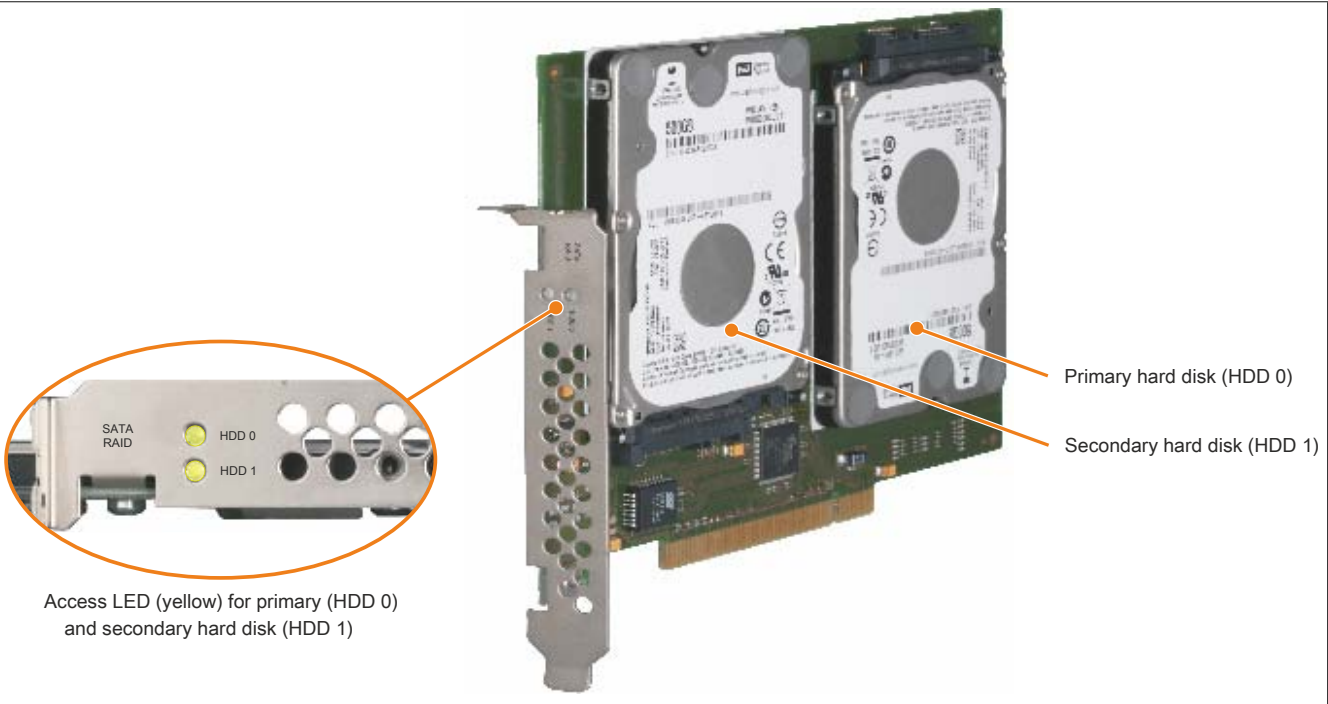


Figure 61: PCI SATA RAID controller

Information:

The PCI SATA RAID controller cannot be used in place of a universal power supply (UPS). If the operating system is not shut down properly, then this will be detected as an error state (with RAID 1 sets) at the next system startup and a complete rebuild is performed. If 500 GB of memory are used, this generally takes approximately 500 minutes (configurable) to complete.

3.10.21.2 Order data

| Model number   | Short description                | Figure |
|----------------|----------------------------------|--------|
|                | <b>Drives</b>                    |        |
| 5ACPCI.RAIC-06 | PCI RAID System 2x 500 GB - SATA |        |
|                | <b>Optional accessories</b>      |        |
|                | <b>Drives</b>                    |        |
| 5MMHDD.0500-00 | 500 GB hard disk - SATA          |        |

Table 112: 5ACPCI.RAIC-06 - Order data



## 3.10.21.3 Technical data

**Information:**

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

|                                      |   |
|--------------------------------------|---|
| <b>Model number</b>                  | <b>5ACPCI.RAIC-06</b>   |
| <b>General information</b>           |   |
| Capacity                             | 2x 500 GB   |
| Number of hard disks                 | 2   |
| Certification                        |   |
| 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 <sup>1)</sup> |
| GOST-R                               | Yes   |
| <b>Controller</b>                    |   |
| Type                                 | Sil 3512 SATA link  |
| Specification                        | Serial ATA 1.0  |
| Data transfer rate                   | Max. 1.5 Gbit/s (150 MB/s)  |
| RAID level                           | Supports RAID 0, 1  |
| BIOS extension ROM requirements      | Approx. 32 kB   |
| <b>Hard disk drive <sup>2)</sup></b> |   |
| 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 POH <sup>3)</sup>   |
| S.M.A.R.T. support                   | Yes   |
| Interface                            | SATA  |
| Access time                          | 5.5 ms  |
| 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 only)                  | 11 ms   |
| Maximum (read only)                  | 21 ms   |
| <b>Environmental conditions</b>      |   |
| Temperature <sup>4)</sup>            |   |
| Operation <sup>5)</sup>              | 0 to 60°C   |
| 24-hour operation <sup>6)</sup>      | 0 to 60°C   |
| Storage                              | -40 to 70°C   |
| Transport                            | -40 to 70°C   |
| Relative humidity <sup>7)</sup>      |   |
| Operation                            | 8 to 90%, non-condensing  |
| Storage                              | 5 to 95%, non-condensing  |
| Transport                            | 5 to 95%, non-condensing  |
| Vibration <sup>8)</sup>              |   |
| Operation (continuous)               | 5 to 500 Hz: 0.125 g, no unrecoverable errors   |
| Operation (occasional)               | 5 to 500 Hz: 0.25 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                            | 200 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   |
| <b>Mechanical characteristics</b>    |   |
| Installation                         | Fixed <sup>9)</sup>   |

Table 113: 5ACPCI.RAIC-06 - Technical data

| Model number              | 5ACPCI.RAIC-06  |
|---------------------------|-----------------|
| Weight                    | 350 g           |
| Manufacturer information  |                 |
| Manufacturer              | Western Digital |
| Manufacturer's product ID | WD5000LUCT      |

Table 113: 5ACPCI.RAIC-06 - 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) Technical data for a hard disk.
- 3) With 8760 POH (power-on hours) per year and 25°C surface temperature.
- 4) 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.
- 5) Standard operation refers to 333 POH (power-on hours) per month.
- 6) 24-hour operation refers to 732 POH (power-on hours) per month.
- 7) Humidity gradient: Maximum 20% per hour.
- 8) Operation in areas prone to vibration and shock can affect performance negatively (reduction of transfer rate).
- 9) PCI slot installation.

### 3.10.21.4 Temperature/Humidity diagram

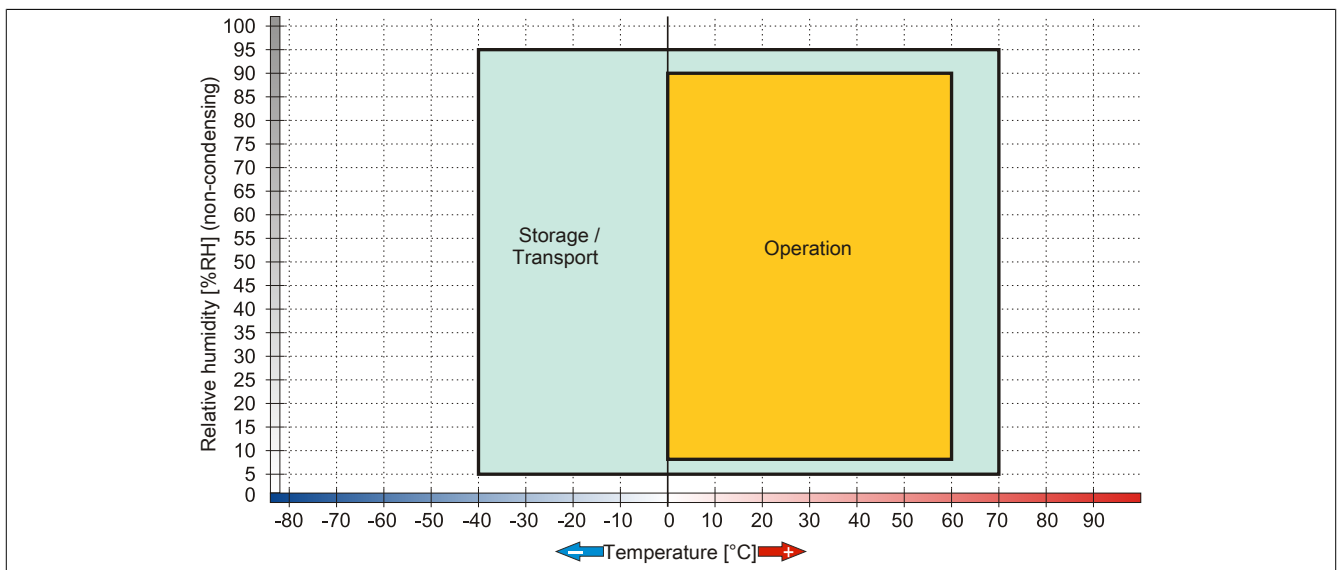


Figure 62: 5ACPCI.RAIC-06 - Temperature/Humidity diagram

### 3.10.21.5 Driver support

Special drivers are necessary for operating the PCI SATA RAID controller. Drivers for supported and approved operating systems are available in the Downloads section of the B&R website ([www.br-automation.com](http://www.br-automation.com)).

.NET-based SATA Raid™ serial ATA RAID management software can also be found on the B&R website.

#### Information:

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

### 3.10.21.6 Configuration

For information about configuring a SATA RAID set, see chapter 3 "Installation", section 5 "Configuring a SATA RAID set" on page 213.

### 3.10.21.7 Replacing a HDD

A hard drive can be easily replaced in the event of an error when using the RAID1 (mirroring) configuration without having to reinstall the system. The 500 GB 5MMHDD.0500-00 SATA HDD is available as a replacement hard disk.

For information about replacing a drive, see "Replacing a PCI SATA RAID hard disk in a RAID 1 set" on page 414.

### 3.11 Interface options

#### Information:

Please note that not every interface option can be installed in interface slots 1 and 2. For more information, see "IF option 1 slot" on page 67 and "IF option 2 slot" on page 67.

#### Information:

For information about installing or replacing an interface option, please refer to the section "Installing interface options" on page 391.

Depending on the IF option being used, it may be necessary to load the default settings in BIOS Setup after replacement or installation (see "Save & Exit" on page 283).

#### 3.11.1 5AC901.I485-00

##### 3.11.1.1 General information

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

- 1x RS232/422/485 interface
- Compatible with the APC910 and PPC900

##### 3.11.1.2 Order data


| Model number   | Short description  | Figure   |
|----------------|--|--|
| 5AC901.I485-00 | Interface options<br>Interface card - 1x RS232/422/485 interface - For APC910/PPC900 |  |

Table 114: 5AC901.I485-00 - Order data

##### 3.11.1.3 Technical data

#### Information:

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

| Model number               | 5AC901.I485-00  |
|----------------------------|---|
| <b>General information</b> |   |
| B&R ID code                | 0xD84A  |
| Certification              |   |
| 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 <sup>1)</sup>                  |
| DNV GL                     | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br>EMC: <b>B</b> (Bridge and open deck) <sup>2)</sup> |
| GOST-R                     | Yes   |

Table 115: 5AC901.I485-00 - Technical data

| Model number               | 5AC901.I485-00                           |
|----------------------------|--|
| Interfaces                 |  |
| COM                        |  |
| Type                       | RS232/RS422/RS485, electrically isolated |
| Design                     | 9-pin, male, DSUB connector              |
| UART                       | 16550-compatible, 16-byte FIFO           |
| Max. baud rate             | 115 kbit/s                               |
| Terminating resistor       | Yes                                      |
| Electrical characteristics |  |
| Power consumption          | 1 W                                      |
| Environmental conditions   |  |
| Temperature                |  |
| Operation                  | 0 to 55°C <sup>3)</sup>                  |
| Storage                    | -20 to 60°C                              |
| Transport                  | -20 to 60°C                              |
| Relative humidity          |  |
| Operation                  | 5 to 90%, non-condensing                 |
| Storage                    | 5 to 95%, non-condensing                 |
| Transport                  | 5 to 95%, non-condensing                 |
| Mechanical characteristics |  |
| Weight                     | Approx. 34 g                             |

Table 115: 5AC901.I485-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) Detailed information can be found in the temperature tables in the user's manual.

### 3.11.1.3.1 Pinout

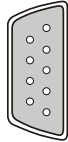
| COM serial interface |   |                |   |
|----------------------|---|----------------|---|
|                      | RS232   | RS422/485      |   |
| Type                 | RS232, not modem-capable, electrically isolated |                |   |
| UART                 | 16550-compatible, 16-byte FIFO                  |                |   |
| Transfer rate        | Max. 115 kbit/s                                 |                |   |
| Bus length           | Max. 15 m                                       | Max. 1200 m    |   |
| Pin                  | RS232 - Pinout                                  | RS422 - Pinout |   |
| 1                    | N/C   | TXD\           | <div> <p>9-pin, male, DSUB connector</p>  </div> |
| 2                    | RXD   | N/C            |   |
| 3                    | TXD   | N/C            |   |
| 4                    | N/C   | TXD            |   |
| 5                    | GND   | GND            |   |
| 6                    | N/C   | RXD\           |   |
| 7                    | RTS   | N/C            |   |
| 8                    | CTS   | N/C            |   |
| 9                    | N/C   | RXD            |   |

Table 116: COM - Pinout

### 3.11.1.3.2 I/O address and IRQ

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

Table 117: I/O address and IRQ

### 3.11.1.3.3 RS232 - Bus length and cable type

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

| Extension | Transfer rate   |
|-----------|-----------------|
| ≤15 m     | Typ. 64 kbit/s  |
| ≤10 m     | Typ. 115 kbit/s |
| ≤5 m      | Typ. 115 kbit/s |

Table 118: RS232 - Bus length and transfer rate

The material used for the cable should have all or most of the following properties in order to achieve an optimal transfer rate.

| RS232 cables         | Property   |
|----------------------|--|
| Signal lines         |  |
| Cable cross section  | 4x 0.16 mm <sup>2</sup> (26 AWG), tinned copper stranded wire      |
| Wire insulation      | PE   |
| Conductor resistance | ≤82 Ω/ km  |
| Stranding            | Wires stranded in pairs  |
| Shield               | Paired shield with aluminum foil                                   |
| Grounding line       |  |
| Cable cross section  | 1x 0.34 mm <sup>2</sup> (22 AWG / 19), tinned copper stranded wire |
| Wire insulation      | PE   |
| Conductor resistance | ≤59 Ω/km   |
| Outer sheathing      |  |
| Material             | PUR mixture  |
| Features             | Halogen-free   |
| Complete shielding   | From tinned copper wires   |

Table 119: RS232 - Cable requirements

### 3.11.1.3.4 RS422 - Bus length and cable type

The RTS line must be switched on to [switch](#) the transmitter to active.

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

| Extension | Transfer rate   |
|-----------|-----------------|
| 1200 m    | Typ. 115 kbit/s |

Table 120: RS422 - Bus length and transfer rate

The material used for the cable should have all or most of the following properties in order to achieve an optimal transfer rate.

| RS422 cable          | Property   |
|----------------------|--|
| Signal lines         |  |
| Cable cross section  | 4x 0.25 mm <sup>2</sup> (24 AWG / 19), tinned copper stranded wire |
| Wire insulation      | PE   |
| Conductor resistance | ≤82 Ω/km   |
| Stranding            | Wires stranded in pairs  |
| Shield               | Paired shield with aluminum foil                                   |
| Grounding line       |  |
| Cable cross section  | 1x 0.34 mm <sup>2</sup> (22 AWG / 19), tinned copper stranded wire |
| Wire insulation      | PE   |
| Conductor resistance | ≤59 Ω/km   |
| Outer sheathing      |  |
| Material             | PUR mixture  |
| Features             | Halogen-free   |
| Complete shielding   | From tinned copper wires   |

Table 121: RS422 - Cable requirements

### 3.11.1.3.5 When operated as an RS485 interface

When operated in this mode, the pins of the RS422 default [interface](#) (1, 4, 6 and 9) must be used. Pins should be connected as shown.

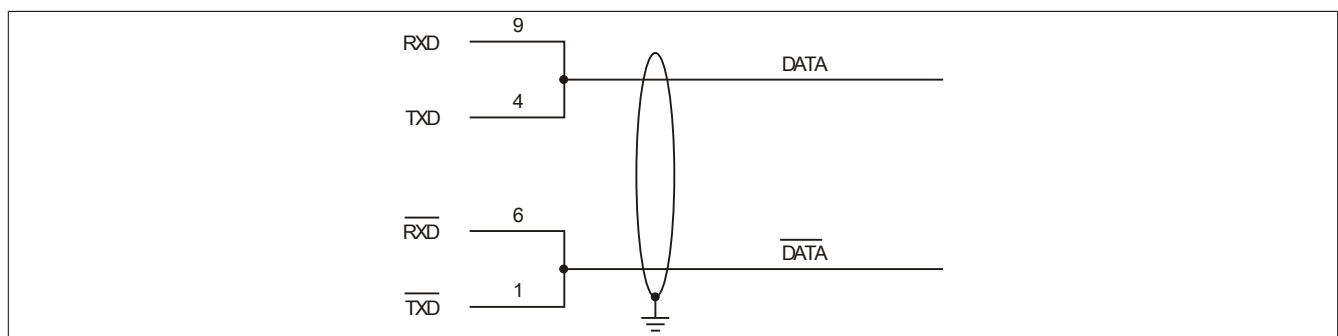


Figure 63: RS232/RS422/RS485 interface - Operation in RS485 mode

The RTS line must be switched by the driver for each transmission or reception; there is no automatic [switch-back](#) mechanism. This cannot be configured in Windows.

The voltage drop resulting from long cable lengths [can](#) lead to greater potential differences between bus stations, which [can](#) hinder communication. This [can](#) be improved by running [ground](#) wire with the others.

### 3.11.1.3.6 RS485 - Bus length and cable type

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

| Extension | Transfer rate   |
|-----------|-----------------|
| 1200 m    | Typ. 115 kbit/s |

Table 122: RS485 - Bus length and transfer rate

The material used for the cable should have all or most of the following properties in order to achieve an optimal transfer rate.

| RS485 cables            | Property   |
|-------------------------|--|
| Signal lines            |  |
| Cable cross section     | 4x 0.25 mm <sup>2</sup> (24 AWG / 19), tinned copper stranded wire |
| Wire insulation         | PE   |
| Conductor resistance    | ≤82 Ω/km   |
| Stranding               | Wires stranded in pairs  |
| Shield                  | Paired shield with aluminum foil                                   |
| Grounding line          |  |
| Cable cross section     | 1x 0.34 mm <sup>2</sup> (22 AWG / 19), tinned copper stranded wire |
| Wire insulation         | PE   |
| Conductor cross section | ≤59 Ω/km   |
| Outer sheathing         |  |
| Material                | PUR mixture  |
| Features                | Halogen-free   |
| Complete shielding      | From tinned copper wires   |

Table 123: RS485 - Cable requirements

### 3.11.1.3.7 Terminating resistor

A terminating resistor for the serial interface is already integrated in the IF option. There is a switch to activate or deactivate the terminating resistor, but the system unit needs to be opened in order to reach it. An active terminating resistor is indicated by a yellow LED.

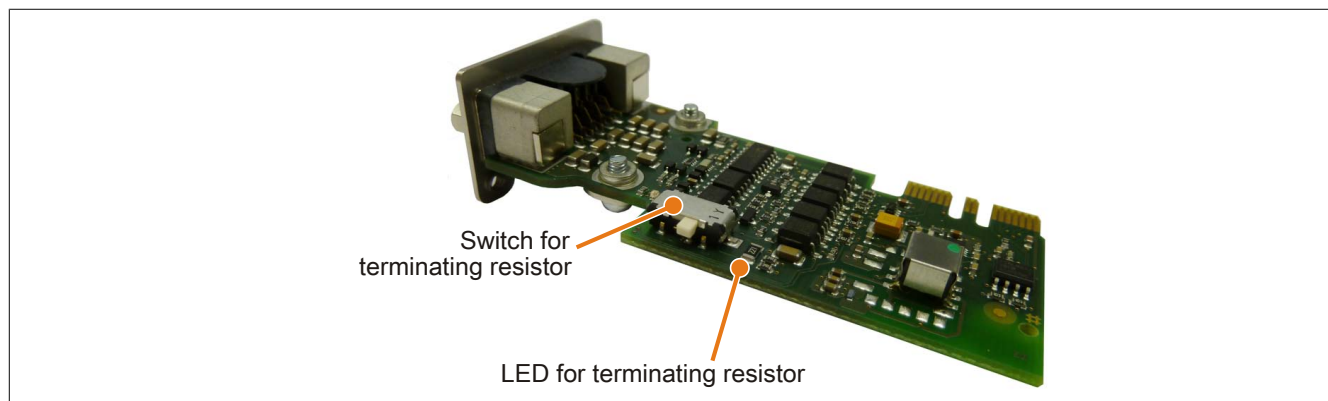


Figure 64: 5AC901.I485-00 - Terminating resistor

### 3.11.2 5AC901.ICAN-00

#### 3.11.2.1 General information

The 5AC901.ICAN-00 [interface](#) option is equipped with a [CAN](#) bus master [interface](#).

- 1x [CAN](#) bus master [interface](#)
- Compatible with the APC910 and PPC900

It is not possible to operate two 5AC901.ICAN [interface](#) options (in the IF option 1 and IF option 2 slots) at the same time.

#### 3.11.2.2 Order data


| Model number   | Short description   | Figure  |
|----------------|---|---|
|                | <a href="#">Interface options</a>   |   |
| 5AC901.ICAN-00 | <a href="#">Interface</a> card - 1x <a href="#">CAN interface</a> - For APC910/PPC900 |  |

Table 124: 5AC901.ICAN-00 - Order data

#### 3.11.2.3 Technical data

##### Information:

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

| Model number                      | 5AC901.ICAN-00   |
|-----------------------------------|--|
| <b>General information</b>        |  |
| B&R ID code                       | 0xD84B   |
| Certification                     |  |
| CE                                | Yes  |
| UL                                | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |
| HazLoc                            | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup>                   |
| DNV GL                            | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>2)</sup> |
| GOST-R                            | Yes  |
| <b>Interfaces</b>                 |  |
| <a href="#">CAN</a>               |  |
| Quantity                          | 1  |
| <a href="#">Controller</a>        | Bosch CC770 (compatible with Intel 82527 <a href="#">CAN controller</a> )  |
| Design                            | DSUB, 9-pin, male, electrically isolated   |
| Transfer rate                     | Max. 1 Mbit/s  |
| Terminating resistor              | Yes  |
| <b>Electrical characteristics</b> |  |
| Power consumption                 | 1 W  |
| <b>Environmental conditions</b>   |  |
| Temperature                       |  |
| Operation                         | 0 to 55°C <sup>3)</sup>  |
| Storage                           | -20 to 60°C  |
| Transport                         | -20 to 60°C  |

Table 125: 5AC901.ICAN-00 - Technical data

| Model 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 characteristics |                          |
| Weight                     | Approx. 33 g             |

Table 125: 5AC901.ICAN-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) Detailed information [can](#) be found in the temperature tables in the user's manual.

### 3.11.2.3.1 - Pinout

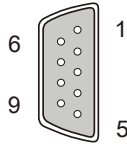
| CAN bus       |                          |  |
|---------------|--------------------------|--|
| Type          | Electrically isolated    | <p>9-pin, male, DSUB connector</p>  |
| Transfer rate | Max. 1 Mbit/s            |  |
| Bus length    | Max. 1000 meters         |  |
| Pin           | Assignment               |  |
| 1             | N/C                      |  |
| 2             | <a href="#">CAN LOW</a>  |  |
| 3             | GND                      |  |
| 4             | N/C                      |  |
| 5             | N/C                      |  |
| 6             | Reserved                 |  |
| 7             | <a href="#">CAN HIGH</a> |  |
| 8             | N/C                      |  |
| 9             | N/C                      |  |

Table 126: 5AC901.ICAN-00 - Pinout

### 3.11.2.3.2 I/O [address](#) and IRQ

| Resource                    | Default setting                          | Function  |
|-----------------------------|--|---|
| I/O <a href="#">address</a> | 384h ( <a href="#">address</a> register) | Defines the register number to access.                                  |
|                             | 385h (data register)                     | Access to the register defined in the <a href="#">address</a> register. |
| IRQ                         | IRQ10                                    | Interrupt   |

Table 127: I/O [address](#) and IRQ

- 1) Resource allocation for the [interface](#) option 1 and 2 slots is the same.

### 3.11.2.3.3 [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 [bit rate](#). In accordance with CiA ([CAN](#) in [Automation](#)), the maximum bus length is 1000 meters.

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

| Extension | Transfer rate   |
|-----------|-----------------|
| ≤1000 m   | Typ. 50 kbit/s  |
| ≤200 m    | Typ. 250 kbit/s |
| ≤100 m    | Typ. 500 kbit/s |
| ≤20 m     | Typ. 1 Mbit/s   |

Table 128: [CAN](#) - Bus length and transfer rate



The material used for the cable should have all or most of the following properties in order to achieve an optimal transfer rate.

| CAN cable            | Property   |
|----------------------|--|
| Signal lines         |  |
| Cable cross section  | 2x 0.25 mm <sup>2</sup> (24 AWG / 19), tinned copper stranded wire |
| Wire insulation      | PE   |
| Conductor resistance | ≤82 Ω/ km  |
| Stranding            | Wires stranded in pairs  |
| Shield               | Paired shield with aluminum foil                                   |
| Grounding line       |  |
| Cable cross section  | 1x 0.34 mm <sup>2</sup> (22 AWG / 19), tinned copper stranded wire |
| Wire insulation      | PE   |
| Conductor resistance | ≤59 Ω/km   |
| Outer sheathing      |  |
| Material             | PUR mixture  |
| Features             | Halogen-free   |
| Complete shielding   | From tinned copper wires   |

Table 129: CAN cable requirements

### 3.11.2.3.4 CAN driver settings

The **baud rate** can be set in **Automation Studio** either with predefined values or with the **bit** timing register. More information on this can be found in **Automation Help**.

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

Table 130: CAN driver settings

### 3.11.2.3.5 Terminating resistor

A terminating resistor for the **CAN interface** is already integrated in the IF option. There is a **switch** to activate or deactivate the terminating resistor, but the system unit needs to be opened in order to reach it. An active terminating resistor is indicated by a yellow **LED**.

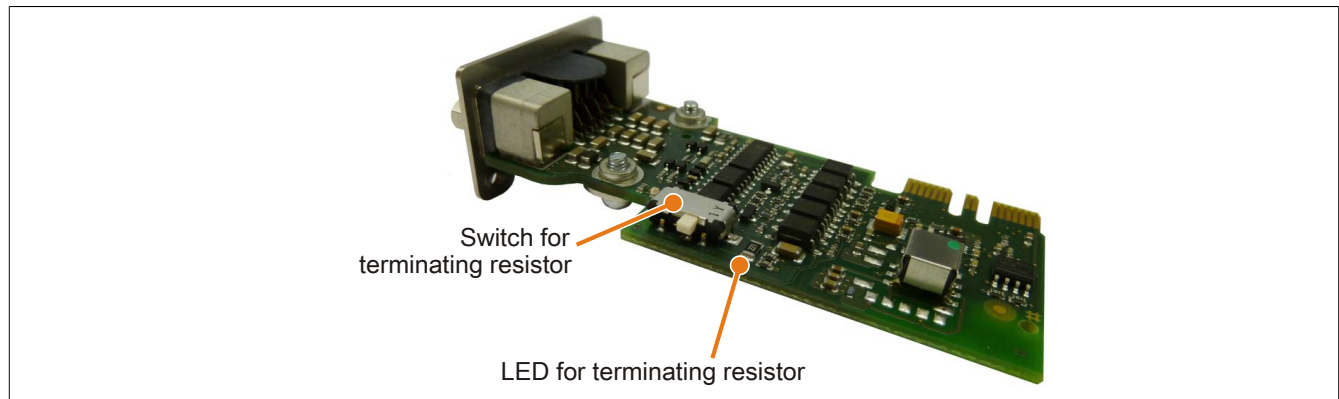


Figure 65: 5AC901.ICAN-00 - Terminating resistor

### 3.11.2.3.6 Drivers

The **CAN** IF option is supported in PVI for Windows XP Professional and Windows Embedded Standard 2009. The 5AC901.ICAN-00 **interface** option is no longer supported by PVI V4.2.5 or Windows **CAN** Driver V3.0 beginning with Windows 7.

### 3.11.3 5AC901.IHDA-00

#### 3.11.3.1 General information

The 5AC901.IHDA-00 **interface** option has an HDA sound chip with externally accessible MIC, Line IN and Line OUT channels.

- 1x MIC
- 1x Line IN
- 1x Line OUT
- Compatible with the APC910 and PPC900

The 5AC901.IHDA-00 **interface** option **can** only be operated in the IF option 1 slot.

#### 3.11.3.2 Order data

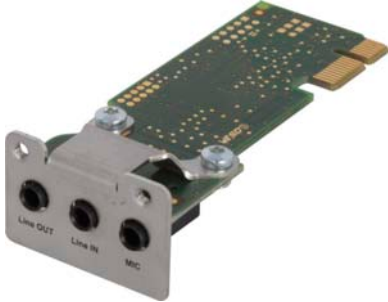
| Model number   | Short description  | Figure  |
|----------------|--|---|
| 5AC901.IHDA-00 | <b>Interface options</b><br>Interface card - 1x audio <b>interface</b> (1x MIC/1x Line In/1x OUT)<br>- For APC910/PPC900 |  |

Table 131: 5AC901.IHDA-00 - Order data

#### 3.11.3.3 Technical data

##### Information:

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

| Model number                      | 5AC901.IHDA-00  |
|-----------------------------------|---|
| <b>General information</b>        |   |
| B&R ID code                       | 0xD84E  |
| Certification                     |   |
| CE                                | Yes   |
| UL                                | cULus E115267<br>Industrial <b>Control</b> Equipment  |
| HazLoc                            | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup>           |
| DNV GL                            | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>2)</sup> |
| GOST-R                            | Yes   |
| <b>Interfaces</b>                 |   |
| Audio                             |   |
| Type                              | HDA sound   |
| <b>Controller</b>                 | Realtek ALC 662   |
| Inputs                            | Microphone, Line IN   |
| Outputs                           | Line OUT  |
| <b>Electrical characteristics</b> |   |
| Power consumption                 | 0.4 W   |
| <b>Environmental conditions</b>   |   |
| Temperature                       |   |
| Operation                         | 0 to 55°C <sup>3)</sup>   |
| Storage                           | -20 to 60°C   |
| Transport                         | -20 to 60°C   |

Table 132: 5AC901.IHDA-00 - Technical data

| Model 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 characteristics |                          |
| Weight                     | Approx. 21 g             |

Table 132: 5AC901.IHDA-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Yes, although applies only if all components installed within the complete system have this certification.
- 3) Detailed information can be found in the temperature tables in the user's manual.

### 3.11.3.3.1 Pinout


| MIC, Line IN, Line OUT |   |  |
|------------------------|---|--|
| Controller             | Realtek ALC 662   | <div> 3.5 mm female connector  </div> |
| MIC                    | Connection of a mono microphone with a 3.5 mm jack                        |  |
| Line IN                | Stereo Line IN signal supplied via a 3.5 mm jack                          |  |
| Line OUT               | Connection of a stereo playback device (e.g. amplifier) via a 3.5 mm jack |  |

Table 133: 5AC901.IHDA-00 - Pinout

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

### Information:

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

### 3.11.4 5AC901.ISRM-00

#### 3.11.4.1 General information

The 5AC901.ISRM-00 [interface](#) option has 2 MB SRAM.

- 2 MB SRAM
- Compatible with the APC910 and PPC900

The 5AC901.ISRM-00 [interface](#) option [can](#) only be operated in the IF option 2 slot.

#### Information:

When writing, reading or accessing the [SRAM](#), "non-aligned accesses" are not supported by the AVLON bus (internal bus in the PCI Express core).

#### 3.11.4.2 Order data


| Model number   | Short description   | Figure  |
|----------------|---|---|
|                | <a href="#">Interface options</a>                               |  |
| 5AC901.ISRM-00 | <a href="#">Interface cards</a> - 2 MB SRAM - For APC910/PPC900 |   |

Table 134: 5AC901.ISRM-00 - Order data

#### 3.11.4.3 Technical data

#### Information:

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

| Model number   | 5AC901.ISRM-00   |
|--|--|
| <b>General information</b>                               |  |
| B&R ID code  | 0xD850   |
| Certification  |  |
| CE   | Yes  |
| UL   | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |
| HazLoc   | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup> |
| GOST-R   | Yes  |
| <b>Controller</b>  |  |
| <b>SRAM</b>  |  |
| Size   | 2 MB   |
| Battery-backed   | Yes  |
| Remanent variables in power <a href="#">failure</a> mode | 256 kB<br>(e.g. for <a href="#">Automation Runtime</a> , see the AS help system)   |
| <b>Electrical characteristics</b>                        |  |
| Power consumption  | 2 W  |
| <b>Environmental conditions</b>                          |  |
| Temperature  |  |
| Operation  | 0 to 55°C <sup>2)</sup>  |
| Storage  | -20 to 60°C  |
| Transport  | -20 to 60°C  |

Table 135: 5AC901.ISRM-00 - Technical data

| Model number               | 5AC901.ISRM-00           |
|----------------------------|--------------------------|
| Relative humidity          |                          |
| Operation                  | 5 to 90%, non-condensing |
| Storage                    | 5 to 95%, non-condensing |
| Transport                  | 5 to 95%, non-condensing |
| Mechanical characteristics |                          |
| Weight                     | Approx. 20 g             |

Table 135: 5AC901.ISRM-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) Detailed information [can](#) be found in the temperature tables in the user's manual.

### 3.11.5 5AC901.IPLK-00

#### 3.11.5.1 General information

The 5AC901.IPLK-00 [interface](#) option is equipped with 1 [POWERLINK interface](#) and 2 MB SRAM.

- 1x [POWERLINK interface](#) managing or controlled node
- 2 MB SRAM
- Compatible with the APC910 and PPC900

The 5AC901.IPLK-00 [interface](#) option [can](#) only be operated in the IF option 2 slot.

#### Information:

When writing, reading or accessing the [SRAM](#), "non-aligned accesses" are not supported by the AVLON bus (internal bus in the PCI Express core).

#### 3.11.5.2 Order data


| Model number   | Short description   | Figure  |
|----------------|---|---|
|                | <a href="#">Interface options</a>   |   |
| 5AC901.IPLK-00 | Interface card - 1x <a href="#">POWERLINK interface</a> - 2 MB SRAM - For APC910/PPC900 |  |

Table 136: 5AC901.IPLK-00 - Order data

#### 3.11.5.3 Technical data

#### Information:

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

| Model number   | 5AC901.IPLK-00   |
|--|--|
| <b>General information</b>                               |  |
| B&R ID code  | 0xE025   |
| Certification  |  |
| CE   | Yes  |
| UL   | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |
| HazLoc   | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup> |
| <b>Controller</b>  |  |
| <b>SRAM</b>  |  |
| Size   | 2 MB   |
| Battery-backed   | Yes  |
| Remanent variables in power <a href="#">failure</a> mode | 256 kB<br>(e.g. for <a href="#">Automation Runtime</a> , see the AS help system)   |
| <b>Interfaces</b>  |  |
| <b>POWERLINK</b>   |  |
| Quantity   | 1  |
| Transmission   | 100BASE-TX   |
| Type   | Type 4 <sup>2)</sup>   |
| Design   | Shielded RJ45  |
| Transfer rate  | 100 Mbit/s   |
| Cable length   | Max. 100 m between two stations (segment length)   |
| <b>Electrical characteristics</b>                        |  |
| Power consumption  | 1.5 W  |
| <b>Environmental conditions</b>                          |  |
| Temperature  |  |
| Operation  | 0 to 55°C <sup>3)</sup>  |
| Storage  | -20 to 60°C  |
| Transport  | -20 to 60°C  |

Table 137: 5AC901.IPLK-00 - Technical data

| Model 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 characteristics |                          |
| Weight                     | Approx. 35 g             |

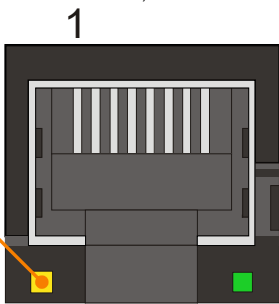
Table 137: 5AC901.IPLK-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 2) More information is available in the [Automation Studio](#) help system (Communication - **POWERLINK** - General information - Hardware - IF / LS).
- 3) Detailed information can be found in the temperature tables in the user's manual.

### 3.11.5.3.1 - Pinout

LEDs are integrated on the [interface](#) option.

| POWERLINK    |                         |        |   |
|--------------|-------------------------|--------|---|
| Cabling      | S/STP (Cat 5e)          |        |   |
| Cable length | Max. 100 m (min. Cat5e) |        |   |
| LED          | Color                   | Status | Function  |
| Link LED     | Yellow                  | On     | Link ( <b>POWERLINK</b> network connection available) |
|              |                         | Off    | Activity (blinking - data transfer in progress)       |



RJ45, female

1

Link LED

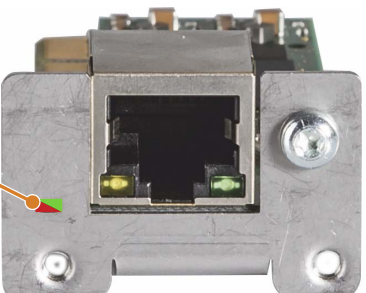
Table 138: 5AC901.IPLK-00 - **POWERLINK** interface

### 3.11.5.3.2 Status/Error LED

The Status/Error LED is a green and red dual LED. The LED status can have different meanings depending on the operating mode.

#### Status/Error LED

| POWERLINK - Status/Error LED |           |        |  |
|------------------------------|-----------|--------|--|
| LED                          | Color     | Status | Function   |
| Status/Error LED             | Green-Red | On     | <b>POWERLINK</b> Status/Error LED, see 3.11.5.3.2 "Status/Error LED" |
|                              |           | Off    | <b>POWERLINK</b> Status/Error LED, see 3.11.5.3.2 "Status/Error LED" |



RJ45, female

Status/Error LED

Table 139: 5AC901.IPLK-00 - **POWERLINK** Status/Error LED

#### Ethernet mode

In this mode, the [interface](#) is operated as an [Ethernet interface](#).

| Green - Status | Description   |
|----------------|---|
| On             | <a href="#">Interface</a> being operated as an <a href="#">Ethernet interface</a> |

Table 140: Status/Error LED - [Ethernet](#) mode

## POWERLINK

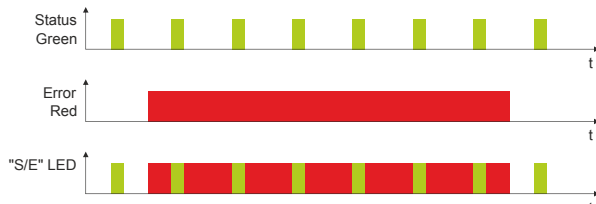
| Red - Error | Description  |
|-------------|--|
| On          | <p>The <a href="#">interface</a> is in an error state (failed <a href="#">Ethernet</a> frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green <a href="#">LED</a> blinks over the red <a href="#">LED</a>:</p> <ul style="list-style-type: none"> <li>BASIC_ETHERNET</li> <li>PRE_OPERATIONAL_1</li> <li>PRE_OPERATIONAL_2</li> <li>READY_TO_OPERATE</li> </ul>  |

Table 141: Status/Error LED - POWERLINK - Error

| Green - Status                                     | Description  |
|--|--|
| Off<br>NOT_ACTIVE                                  | <p><b>State</b><br/>The <a href="#">interface</a> is in the NOT_ACTIVE state or:</p> <ul style="list-style-type: none"> <li>Switched off</li> <li>Starting up</li> <li>Not configured correctly in <a href="#">Automation Studio</a></li> <li>Defective</li> </ul> <p><b>Managing node (MN)</b><br/>The bus is being monitored for <a href="#">POWERLINK</a> frames. If a frame is not received within the configured time window (timeout), the <a href="#">interface</a> switches immediately to PRE_OPERATIONAL_1 mode (single flash). If <a href="#">POWERLINK</a> communication is detected before the time expires, however, then the MN will not be started.</p> <p><b>Controlled node (CN)</b><br/>The bus is being monitored for <a href="#">POWERLINK</a> frames. If a corresponding frame is not received within the defined time frame (timeout), then the module switches immediately to BASIC_ETHERNET mode (flickering). If <a href="#">POWERLINK</a> communication is detected before this time expires, however, the <a href="#">interface</a> switches immediately to PRE_OPERATIONAL_1 mode (single flash).</p> |
| Flickering green (approx. 10 Hz)<br>BASIC_ETHERNET | <p><b>State</b><br/>The <a href="#">interface</a> is in the BASIC_ETHERNET state and being operated as an <a href="#">Ethernet TCP/IP interface</a>.</p> <p><b>Managing node (MN)</b><br/>This state can only be exited by resetting the <a href="#">interface</a>.</p> <p><b>Controlled node (CN)</b><br/>If <a href="#">POWERLINK</a> communication is detected while in this state, the <a href="#">interface</a> switches to the PRE_OPERATIONAL_1 state (single flash).</p>   |
| Single flash (approx. 1 Hz)<br>PRE_OPERATIONAL_1   | <p><b>State</b><br/>The <a href="#">interface</a> is in the PRE_OPERATIONAL_1 state.</p> <p><b>Managing node (MN)</b><br/>The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place.</p> <p><b>Controlled node (CN)</b><br/>The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to the PRE_OPERATIONAL_2 state (double flash). An <a href="#">LED</a> lit red in this state indicates <a href="#">failure</a> of the MN.</p>   |

Table 142: Status/Error LED - POWERLINK - Status



| Green - Status                                   | Description  |
|--|--|
| Double flash (approx. 1 Hz)<br>PRE_OPERATIONAL_2 | <b>State</b><br>The <a href="#">interface</a> is in the PRE_OPERATIONAL_2 state.<br><br><b>Managing node (MN)</b><br>The MN begins cyclic communication (cyclic input data is not yet being evaluated). The CNs are configured in this state.<br><br><b>Controlled node (CN)</b><br>The <a href="#">interface can</a> be configured by the MN in this state. A command then <a href="#">switches</a> the state to READY_TO_OPERATE (triple flash). An <a href="#">LED</a> lit red in this mode indicates <a href="#">failure</a> of the MN.                      |
| Triple flash (approx. 1 Hz)<br>READY_TO_OPERATE  | <b>State</b><br>The <a href="#">interface</a> is in the READY_TO_OPERATE state.<br><br><b>Managing node (MN)</b><br>Cyclic and asynchronous communication is taking place. Any received PDO data is ignored.<br><br><b>Controlled node (CN)</b><br>The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The PDO data being sent corresponds to the PDO mapping. Cyclic data is not yet being evaluated, however. An <a href="#">LED</a> lit red in this mode indicates <a href="#">failure</a> of the MN. |
| On<br>OPERATIONAL                                | <b>State</b><br>The <a href="#">interface</a> is in the OPERATIONAL state. PDO mapping is active and cyclic data is being evaluated.   |
| Blinking (approx. 2.5 Hz)<br>STOPPED             | <b>State</b><br>The <a href="#">interface</a> is in the STOPPED state.<br><br><b>Managing node (MN)</b><br>This status is not possible for the MN.<br><br><b>Controlled node (CN)</b><br>No output data is being produced, and no input data is being received. It is only possible to enter or leave this mode after the MN has given the appropriate command.  |

Table 142: Status/Error LED - POWERLINK - Status

### System stop error codes

Incorrect configuration or defective hardware [can](#) cause a system stop error.

The error code is indicated by the red Error LED using four [switch-on](#) phases. Each [switch-on](#) phase has a duration of either 150 ms or 600 ms. The error code is repeated every 2 seconds.

| Error description   | Error code indicated by red Status LED |   |   |   |       |   |   |   |   |       |
|---|--|---|---|---|-------|---|---|---|---|-------|
| RAM error:<br>The <a href="#">interface</a> is defective and must be replaced.                            | •                                      | • | • | - | Pause | • | • | • | - | Pause |
| Hardware error:<br>The <a href="#">interface</a> or a system component is defective and must be replaced. | -                                      | • | • | - | Pause | - | • | • | - | Pause |

Table 143: System stop error codes

|     |       |                |
|-----|-------|----------------|
| Key | •     | ...150 ms      |
|     | -     | ...600 ms      |
|     | Pause | 2 second delay |

### 3.11.5.3.3 Drivers

The POWERLINK IF option is supported by [Automation Runtime](#) beginning with the following versions:

- AR Upgrade AR H4.10
- [Automation Studio V4.1.x.x](#)

### 3.11.6 5AC901.IRDY-00

#### 3.11.6.1 General information

The 5AC901.IRDY-00 ready relay is switched as soon as the B&R Industrial PC has booted and all internal supply voltages are applied. Additional devices [can](#) also be connected to the ready relay, which are then also switched on when the B&R Industrial PC boots.

- 1 normally closed contact, 1 normally open contact
- Compatible with the APC910 and PPC900

The 0TB2104.8000 terminal block is not included and must be ordered separately.

#### 3.11.6.2 Order data


| Model number   | Short description  | Figure  |
|----------------|--|---|
|                | <b>Interface options</b>   |  |
| 5AC901.IRDY-00 | Interface card - Ready relay - For APC910/PPC900                   |   |
|                | <b>Required accessories</b>  |   |
|                | <b>Terminal blocks</b>   |   |
| 0TB2104.8000   | Connector 24 VDC - 4-pin female - Screw clamps 2.5 mm <sup>2</sup> |   |

Table 144: 5AC901.IRDY-00 - Order data

#### 3.11.6.3 Technical data

##### Information:

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

| Model number                      | 5AC901.IRDY-00   |
|-----------------------------------|--|
| <b>General information</b>        |  |
| B&R ID code                       | 0xD84F   |
| Ready relay                       | Normally open contact and normally closed contact, max. 30 VDC, max. 2 A |
| Certification                     |  |
| CE                                | Yes  |
| UL                                | cULus E115267<br>Industrial <a href="#">Control</a> Equipment            |
| <b>Electrical characteristics</b> |  |
| Power consumption                 | 0.2 W  |
| <b>Environmental conditions</b>   |  |
| Temperature                       |  |
| Operation                         | 0 to 55°C <sup>1)</sup>  |
| 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   |
| <b>Mechanical characteristics</b> |  |
| Weight                            | Approx. 30 g   |

Table 145: 5AC901.IRDY-00 - Technical data

1) Detailed information [can](#) be found in the temperature tables in the user's manual.

### 3.11.6.3.1 Pinout

| Ready relay |            |                         | <p>4-pin male connector</p> |
|-------------|------------|-------------------------|-----------------------------|
| Pin         | Assignment | Description             |                             |
| 1           | NO         | Normally open contact   |                             |
| 2           | COM        | Changeover contact      |                             |
| 3           | NC         | Normally closed contact |                             |
| 4           | -          | Not connected           |                             |
|             |            |                         |                             |

Table 146: 5AC901.IRDY-00 - Pinout

### 3.11.7 5AC901.ISIO-00

#### 3.11.7.1 General information

The ready relay function of the 5AC901.ISIO-00 IF option [can](#) be controlled using the [MTCX](#). Corresponding commands must be issued via the [MTCX](#) to [switch](#) the ready relay.

In addition to the ready relay function, the reset button, power button and power [LED](#) on the APC910 or PPC900 [can](#) be made accessible externally.

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

The maximum cable length for connecting the reset button, power button and power [LED](#) is 2 m.

- Connections for the reset button and power button on the PC
- Connection for the power [LED](#) on the PC
- 1 normally closed contact and 1 normally open contact on the ready relay
- Controlling the ready relay functions using [MTCX](#) commands
- Compatible with the APC910 and PPC900

#### 3.11.7.2 Order data


| Model number   | Short description                               | Figure   |
|----------------|---|--|
|                | <a href="#">Interface options</a>               |  |
| 5AC901.ISIO-00 | Interface card - System I/O - For APC910/PPC900 |  |

Table 147: 5AC901.ISIO-00 - Order data

#### 3.11.7.3 Technical data

##### Information:

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

| Model number                      | 5AC901.ISIO-00   |
|-----------------------------------|--|
| <b>General information</b>        |  |
| B&R ID code                       | 0xE674   |
| Ready relay                       | Normally open contact and normally closed contact, max. 30 VDC, max. 1 A |
| Certification                     |  |
| CE                                | Yes  |
| UL                                | cULus E115267<br>Industrial <a href="#">Control</a> Equipment            |
| <b>Electrical characteristics</b> |  |
| Power consumption                 | 0.5 W  |
| <b>Environmental conditions</b>   |  |
| Temperature                       |  |
| Operation                         | 0 to 55°C <sup>1)</sup>  |
| 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   |
| <b>Mechanical characteristics</b> |  |
| Weight                            | Approx. 30 g   |

Table 148: 5AC901.ISIO-00 - Technical data

1) Detailed information [can](#) be found in the temperature tables in the user's manual.

### 3.11.7.4 Pinout

| Ready relay       |                            | 9-pin female DSUB connector |
|-------------------|----------------------------|-----------------------------|
| Max. cable length | Max. 2 meters              |                             |
| Pin               | Assignment                 |                             |
| 1                 | Output (power) LED - Green |                             |
| 2                 | Output (power) LED - Red   |                             |
| 3                 | GND                        |                             |
| 4                 | Input - Power button       |                             |
| 5                 | Input - Reset button       |                             |
| 6                 | Normally open contact      |                             |
| 7                 | Normally closed contact    |                             |
| 8                 | GND                        |                             |
| 9                 | COM, changeover contact    |                             |

Table 149: 5AC901.ISIO-00 - Pinout

Details about the power LED can be found in section "LED status indicators" on page 69.

Details about the power and reset buttons can be found in section "Power button" on page 70.

### 3.11.7.5 Firmware

In order to guarantee the functionality of the interface option, at least the following firmware version (MTCX) must be installed on the PC:

- Automation PC 910: V1.13
- Panel PC 900: V1.15

This firmware can be downloaded from the B&R website ([www.br-automation.com](http://www.br-automation.com)).

Information about firmware upgrades can be found in section "Firmware upgrade" on page 295.

### 3.11.7.6 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.

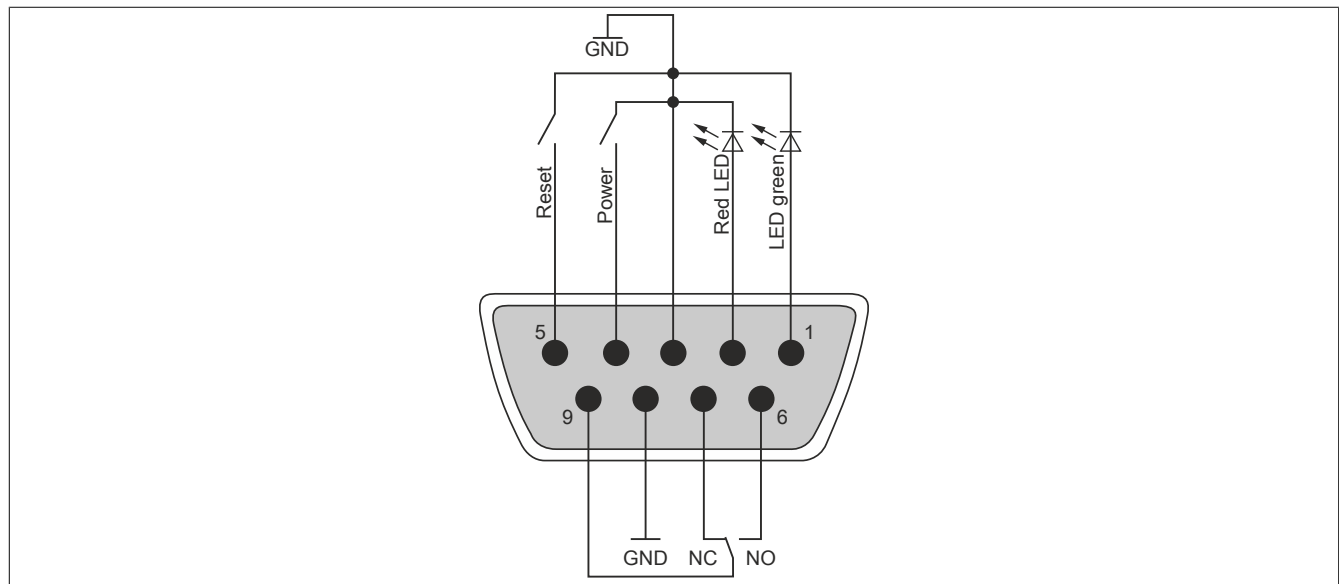


Figure 66: 5AC901.ISIO-00 - Connection example

### 3.11.8 5AC901.IETH-00

#### 3.11.8.1 General information

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

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

Interface option 5AC901.IETH-00 can only be operated in the IF option 2 slot.

#### 3.11.8.2 Order data


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

Table 150: 5AC901.IETH-00 - Order data

#### 3.11.8.3 Technical data

##### Information:

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

| Model number                      | 5AC901.IETH-00                                   |
|-----------------------------------|--|
| <b>General information</b>        |  |
| B&R ID code                       | EC3C   |
| Diagnostics                       |  |
| Data transfer                     | Yes, using LED status indicators                 |
| Certification                     |  |
| UL                                | cULus E115267<br>Industrial Control Equipment    |
| <b>Interfaces</b>                 |  |
| <b>Ethernet</b>                   |  |
| Quantity                          | 1  |
| Controller                        | Intel I210                                       |
| Design                            | Shielded RJ45                                    |
| Transfer rate                     | 10/100/1000 Mbit/s <sup>1)</sup>                 |
| Cable length                      | Max. 100 m between two stations (segment length) |
| <b>Electrical characteristics</b> |  |
| Power consumption                 | 1 W  |
| <b>Environmental conditions</b>   |  |
| <b>Temperature</b>                |  |
| Operation                         | 0 to 55°C  |
| Storage                           | -20 to 60°C                                      |
| Transport                         | -20 to 60°C                                      |
| <b>Relative humidity</b>          |  |
| Operation                         | 5 to 90%, non-condensing                         |
| Storage                           | 5 to 95%, non-condensing                         |
| Transport                         | 5 to 95%, non-condensing                         |
| <b>Mechanical characteristics</b> |  |
| Weight                            | Approx. 35 g                                     |

Table 151: 5AC901.IETH-00 - Technical data

1) Switching takes place automatically.

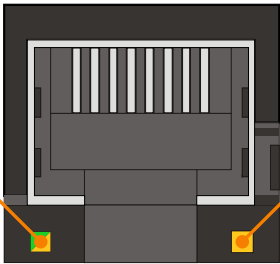
### 3.11.8.3.1 Pinout

LEDs are integrated on the [interface](#) option.

| Ethernet interface (ETH <sup>1</sup> ) |  |   |
|--|--|---|
| Controller                             | Intel I210                                   |   |
| Cabling                                | S/STP (Cat 5e)                               |   |
| Transfer rate                          | 10/100/1000 Mbit/s <sup>2)</sup>             |   |
| Cable length                           | Max. 100 m (min. Cat5e)                      |   |
| <b>Speed LED</b>                       | <b>On</b>                                    | <b>Off</b>                                      |
| Green                                  | 100 Mbit/s                                   | 10 Mbit/s <sup>3)</sup>                         |
| Orange                                 | 1000 Mbit/s                                  | -   |
| <b>Link LED</b>                        | <b>On</b>                                    | <b>Off</b>                                      |
| Orange                                 | Link (Ethernet network connection available) | Activity (blinking - data transfer in progress) |

RJ45, female

1



Speed LED

Link LED

Table 152: 5AC901.IETH-00 - Ethernet interface

- 1) The interfaces, etc. available on the [device](#) or module have been numbered as such for easy identification. This numbering may differ from that used by the particular operating system.
- 2) Switching takes place automatically.
- 3) The 10 Mbit/s transfer speed / connection only exists if the Link LED is also lit at the same time.

### 3.11.8.3.2 Driver support

A special driver is required in order to operate the Intel I210 [Ethernet controller](#). Drivers for approved operating systems are available in the Downloads section of the B&R website [www.br-automation.com](http://www.br-automation.com). Approved operating systems include Windows 7, Windows 10 IoT Enterprise 2015 and B&R Debian 8.

Wake-on-LAN (WoL) and PXE booting are not supported.

#### Information:

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

### 3.12 Monitor/Panel options

#### Information:

Monitor/Panel options **can** only be connected to system units with 2 or 5 PCI/PCIe slots.

#### Information:

For information about installing or replacing a monitor/panel option, please refer to the section "**Installing monitor/panel options**" on page 394.

After replacement or installation, it may be necessary to load the setup defaults in BIOS (see "**Save & Exit**" on page 283).

#### 3.12.1 5AC901.LDPO-00

##### 3.12.1.1 General information

Monitor/Panel option 5AC901.LDPO-00 is equipped with a DisplayPort and USB 2.0 interface.

- DisplayPort interface
- USB 2.0 port
- Installation compatible with APC910

##### 3.12.1.2 Order data


| Model number   | Short description            | Figure   |
|----------------|------------------------------|--|
|                | <b>Monitor/Panel options</b> |  |
| 5AC901.LDPO-00 | DisplayPort transmitter      |  |

Table 153: 5AC901.LDPO-00 - Order data

##### 3.12.1.3 Technical data

#### Information:

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

| Model number                      | 5AC901.LDPO-00  |
|-----------------------------------|---|
| <b>General information</b>        |   |
| B&R ID code                       | 0xD852  |
| Certification                     |   |
| CE                                | Yes   |
| UL                                | cULus E115267   |
| GOST-R                            | Industrial <b>Control</b> Equipment                                     |
|                                   | Yes   |
| <b>Interfaces</b>                 |   |
| <b>USB</b>                        |   |
| Quantity                          | 1   |
| Type                              | USB 2.0   |
| Design                            | Type A  |
| Transfer rate                     | Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s) |
| Current-carrying capacity         | Max. 1 A  |
| <b>DisplayPort</b>                |   |
| Quantity                          | 1   |
| Version                           | Depends on the CPU board being used                                     |
| <b>Electrical characteristics</b> |   |
| Power consumption                 | 0.2 W   |

Table 154: 5AC901.LDPO-00 - Technical data



|                                   |                          |
|-----------------------------------|--------------------------|
| <b>Model number</b>               | <b>5AC901.LDPO-00</b>    |
| <b>Environmental conditions</b>   |                          |
| Temperature                       |                          |
| Operation                         | 0 to 55°C <sup>1)</sup>  |
| 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 |
| <b>Mechanical characteristics</b> |                          |
| Weight                            | Approx. 26 g             |

Table 154: 5AC901.LDPO-00 - Technical data

1) Detailed information can be found in the temperature tables in the user's manual.

### 3.12.1.3.1 DisplayPort interface

| DisplayPort   |   |
|---|---|
| The following overview lists the video signals available on the DisplayPort output. For details, see the technical data for the CPU board being used. |   |
| Monitor/Panel option  | Video signals with all system unit variants |
| 5AC901.LDPO-00  | DisplayPort, DVI, HDMI                      |
|   |   |

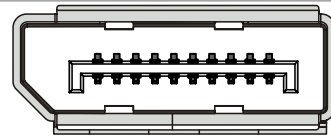


Table 155: DisplayPort interface

## Information:

The hardware and graphics drivers of approved operating systems support the hot plugging of display devices to the DisplayPort interface for service purposes. The DisplayPort connector is specified for 10,000 connection cycles.

### 3.12.1.3.2 DisplayPort - Pinout

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

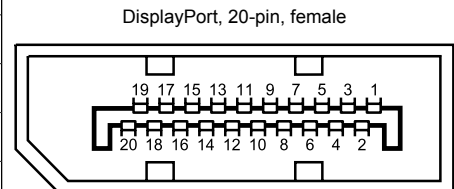


Table 156: DisplayPort - Pinout

### 3.12.2 5AC901.LSDL-00

#### 3.12.2.1 General information

The 5AC901.LSDL-00 monitor/panel option is equipped with a monitor/panel [interface](#) for connecting additional panels via SDL or [DVI](#).

- [SDL/DVI interface](#)
- Installation compatible with APC910

#### 3.12.2.2 Order data


| Model number   | Short description                    | Figure  |
|----------------|--------------------------------------|---|
|                | <b>Monitor/Panel options</b>         |   |
| 5AC901.LSDL-00 | SDL/ <a href="#">DVI</a> transmitter |  |

Table 157: 5AC901.LSDL-00 - Order data

#### 3.12.2.3 Technical data

##### Information:

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

| Model number                            | 5AC901.LSDL-00   |
|---|--|
| <b>General information</b>              |  |
| B&R ID code                             | 0xD853   |
| Certification                           |  |
| CE                                      | Yes  |
| UL                                      | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |
| DNV GL                                  | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>1)</sup> |
| GOST-R                                  | Yes  |
| <b>Interfaces</b>                       |  |
| Monitor/Panel <a href="#">interface</a> |  |
| Design                                  | <a href="#">DVI-D</a>  |
| Type                                    | SDL/ <a href="#">DVI</a>   |
| <b>Electrical characteristics</b>       |  |
| Power consumption                       | 1 W  |
| <b>Environmental conditions</b>         |  |
| Temperature                             |  |
| Operation                               | 0 to 55°C <sup>2)</sup>  |
| 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   |
| <b>Mechanical characteristics</b>       |  |
| Weight                                  | Approx. 45 g   |

Table 158: 5AC901.LSDL-00 - Technical data

- 1) Yes, although applies only if all components installed within the complete system have this certification.
- 2) Detailed information [can](#) be found in the temperature tables in the user's manual.

### 3.12.2.3.1 Monitor/Panel interface

| Monitor/Panel interface - SDL (Smart Display Link) / DVI                              |               |
|---|---------------|
| The following overview lists the video signals available on the monitor/panel output. |               |
| Monitor/Panel option  | Video signals |
| 5AC901.LSDL-00  | SDL, DVI      |

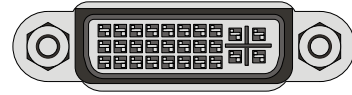


Table 159: Monitor/Panel interface - SDL, DVI

#### Information:

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

#### Information:

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

### 3.12.2.3.2 USB communication in SDL and DVI mode

#### Information:

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

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

### 3.12.2.3.3 Pinout

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

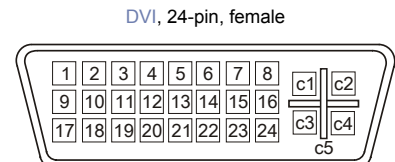


Table 160: DVI interface - Pinout

1) Protected internally by a multifuse.

### 3.12.2.3.4 Cable lengths and resolutions for SDL transmission

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

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

Table 161: Cable lengths and resolutions for SDL transmission

### 3.12.2.3.5 Cable lengths and resolutions for DVI transmission

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

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

Table 162: Cable lengths and resolutions for DVI transmission

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

### 3.12.3 5AC901.LSD3-00

#### 3.12.3.1 General information

The 5AC901.LSD3-00 monitor/panel option is equipped with an SDL3 interface.

- SDL3 interface
- Installation compatible with APC910

##### 3.12.3.1.1 SDL3 mode

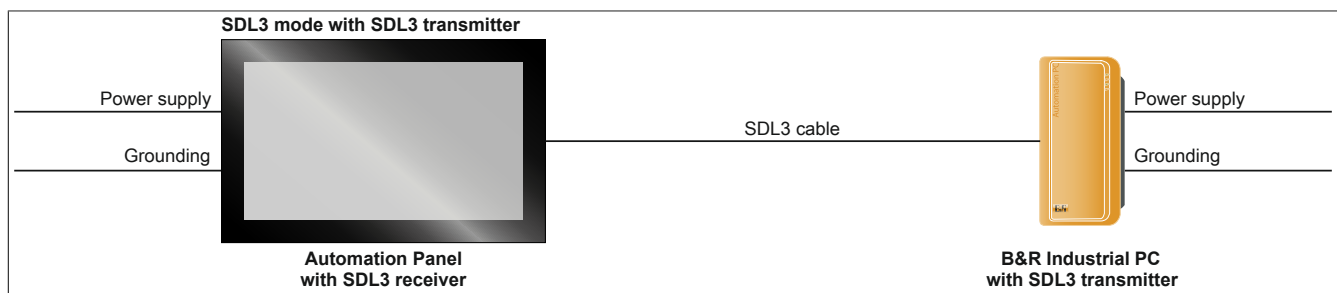
Smart Display Link 3 (SDL3) technology is used to transfer data from all communication channels between a B&R Industrial PC and a panel up to 100 m over a standard Ethernet cable. A male RJ45 connector designed for tight spaces such as feed-throughs and swing arm systems is used to connect to the device.

##### SDL3 mode with SDL3 transmitter

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

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

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



Availability of interfaces on the Automation Panel with SDL3 receiver:

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

Maximum cable length of SDL3: 100 m

##### Prerequisites and requirements

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

#### 3.12.3.2 Order data


| Model number   | Short description            | Figure  |
|----------------|------------------------------|---|
|                | <b>Monitor/Panel options</b> |   |
| 5AC901.LSD3-00 | SDL3 transmitter             |  |

Table 163: 5AC901.LSD3-00 - Order data

#### 3.12.3.3 Technical data

##### Information:

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

|                                   |  |
|-----------------------------------|--|
| <b>Model number</b>               | <b>5AC901.LSD3-00</b>                                |
| <b>General information</b>        |  |
| LED status indicators             | Status, Link   |
| B&R ID code                       | 0xE400   |
| Certification                     |  |
| CE                                | Yes  |
| UL                                | cULus E115267<br>Industrial <b>Control</b> Equipment |
| <b>Interfaces</b>                 |  |
| SDL3 Out                          |  |
| Design                            | Shielded RJ45  |
| Type                              | SDL3   |
| <b>Electrical characteristics</b> |  |
| Power consumption                 | 5 W  |
| <b>Environmental conditions</b>   |  |
| Temperature                       |  |
| Operation                         | 0 to 55°C <sup>1)</sup>                              |
| 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                             |
| <b>Mechanical characteristics</b> |  |
| Weight                            | Approx. 47 g   |

Table 164: 5AC901.LSD3-00 - Technical data

1) Detailed information can be found in the temperature tables in the user's manual.

### 3.12.3.3.1 SDL3 interface

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

| SDL3 interface   |               |
|--|---------------|
| The following overview lists the video signals available on the SDL3 output. |               |
| Monitor/Panel option   | Video signals |
| 5AC901.LSD3-00   | SDL3          |
|  |               |

Female RJ45 connector

1

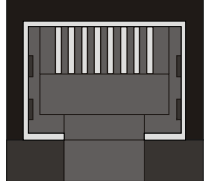


Table 165: SDL3 interface

#### Information:

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

#### Information:

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

### 3.12.3.3.2 Cable lengths and resolutions for SDL3 transmission

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

| SDL3 cable<br>Segment length [m] | Resolution       |                   |                   |                  |                     |                     |                    |
|----------------------------------|------------------|-------------------|-------------------|------------------|---------------------|---------------------|--------------------|
|                                  | VGA<br>640 x 480 | SVGA<br>800 x 600 | XGA<br>1024 x 768 | HD<br>1366 x 768 | SXGA<br>1280 x 1024 | UXGA<br>1600 x 1200 | FHD<br>1920 x 1080 |
| 3                                | 5CASD3.0030-00   | 5CASD3.0030-00    | 5CASD3.0030-00    | 5CASD3.0030-00   | 5CASD3.0030-00      | 5CASD3.0030-00      | 5CASD3.0030-00     |
| 5                                | 5CASD3.0050-00   | 5CASD3.0050-00    | 5CASD3.0050-00    | 5CASD3.0050-00   | 5CASD3.0050-00      | 5CASD3.0050-00      | 5CASD3.0050-00     |
| 10                               | 5CASD3.0100-00   | 5CASD3.0100-00    | 5CASD3.0100-00    | 5CASD3.0100-00   | 5CASD3.0100-00      | 5CASD3.0100-00      | 5CASD3.0100-00     |
| 15                               | 5CASD3.0150-00   | 5CASD3.0150-00    | 5CASD3.0150-00    | 5CASD3.0150-00   | 5CASD3.0150-00      | 5CASD3.0150-00      | 5CASD3.0150-00     |

Table 166: Cable lengths and resolutions for SDL3 transmission

| SDL3 cable<br>Segment length [m] | Resolution       |                   |                   |                  |                     |                     |                    |
|----------------------------------|------------------|-------------------|-------------------|------------------|---------------------|---------------------|--------------------|
|                                  | VGA<br>640 x 480 | SVGA<br>800 x 600 | XGA<br>1024 x 768 | HD<br>1366 x 768 | SXGA<br>1280 x 1024 | UXGA<br>1600 x 1200 | FHD<br>1920 x 1080 |
| 20                               | 5CASD3.0200-00   | 5CASD3.0200-00    | 5CASD3.0200-00    | 5CASD3.0200-00   | 5CASD3.0200-00      | 5CASD3.0200-00      | 5CASD3.0200-00     |
| 30                               | 5CASD3.0300-00   | 5CASD3.0300-00    | 5CASD3.0300-00    | 5CASD3.0300-00   | 5CASD3.0300-00      | 5CASD3.0300-00      | 5CASD3.0300-00     |
| 50                               | 5CASD3.0500-00   | 5CASD3.0500-00    | 5CASD3.0500-00    | 5CASD3.0500-00   | 5CASD3.0500-00      | 5CASD3.0500-00      | 5CASD3.0500-00     |
| 100                              | 5CASD3.1000-00   | 5CASD3.1000-00    | 5CASD3.1000-00    | 5CASD3.1000-00   | 5CASD3.1000-00      | 5CASD3.1000-00      | 5CASD3.1000-00     |

Table 166: Cable lengths and resolutions for SDL3 transmission

### 3.12.3.3.3 SDL3 - LED status indicators

The LEDs are located next to the SDL3 interface.

| SDL3 - LED status indicators |        |          |                                     |
|------------------------------|--------|----------|-------------------------------------|
| LED                          | Color  | Status   | Function                            |
| Link                         | Yellow | On       | Indicates an active SDL3 connection |
|                              |        | Off      | No active SDL3 connection           |
| Status                       | Yellow | On       | SDL3 connection established and OK  |
|                              |        | Blinking | No active SDL3 connection           |

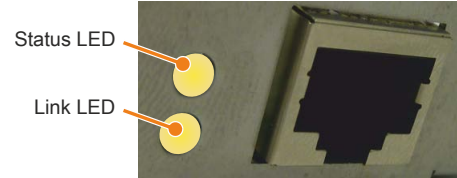


Table 167: SDL3 - LED status indicators

### 3.13 Uninterruptible power supply (UPS)

With an optionally integrated **UPS**, the B&R Industrial PC makes sure that the PC system completes write operations even when a power **failure** occurs. If the **UPS** detects a power **failure**, it **switches** to battery operation immediately without interruption. Any running programs will be properly terminated by the **UPS**. This eliminates the chance of inconsistent data (only works if the **UPS** has already been configured and the drive is enabled).

#### Information:

- An external panel is not buffered by the **UPS** and will shut off when the power fails.
- More detailed information about uninterruptible power supplies **can** be found in the user's manual for the external **UPS**. This **can** be downloaded from the B&R website.

Because the charging circuit is integrated in the housing of the B&R Industrial PC, installation has been simplified to merely attaching the connection cable to the battery unit mounted next to the PC.

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

#### 3.13.1 Requirements

- A suitable system unit
- 5AC901.IUPS-00 or 5AC901.IUPS-01 **UPS** IF option
- Battery unit 5AC901.BUPS-00 or 5AC901.BUPS-01
- **UPS** connection cable 0.5 meters (5CAUPS.0005-01), 1 meter (5CAUPS.0010-01) or 3 meters (5CAUPS.0030-01)
- B&R **UPS** configured in the ADI **Control** Center

#### Warning!

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

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

#### Information:

For information about installation and connecting to the **UPS** IF option, see "**Installing and connecting the UPS battery unit**" on page 406.



### 3.13.2 5AC901.IUPS-00

#### 3.13.2.1 General information

The 5AC901.IUPS-00 **UPS** IF option, together with the 5AC901.BUPS-00 battery unit, allows the B&R Industrial PC to be shut down without any loss of data during a power **failure**.

The 5AC901.IUPS-00 **UPS interface** option **can** only be operated in the IF option 1 slot.

#### Warning!

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

#### Information:

If the system is in standby mode (S5: Soft-off mode or S4: Hibernation mode - 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 completed (e.g. opening the tray of the slide-in DVD drive).

#### 3.13.2.2 Order data


| Model number   | Short description                                   | Figure   |
|----------------|---|--|
|                | <b>Uninterruptible power supplies</b>               |  |
| 5AC901.IUPS-00 | <b>UPS</b> - For 4.5 Ah battery                     |  |
|                | <b>Required accessories</b>                         |  |
|                | <b>Uninterruptible power supplies</b>               |  |
| 5AC901.BUPS-00 | Battery unit 4.5 Ah - For <b>UPS</b> 5AC901.IUPS-00 |  |
| 5CAUPS.0005-01 | <b>UPS</b> cable - 0.5 m - For 5AC901.IUPS-xx       |  |
| 5CAUPS.0010-01 | <b>UPS</b> cable - 1 m - For 5AC901.IUPS-xx         |  |
| 5CAUPS.0030-01 | <b>UPS</b> cable - 3 m - For 5AC901.IUPS-xx         |  |

Table 168: 5AC901.IUPS-00 - Order data

#### 3.13.2.3 Technical data

#### Information:

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

| Model number                      | 5AC901.IUPS-00  |
|-----------------------------------|---|
| <b>General information</b>        |   |
| B&R ID code                       | 0xD851  |
| Certification                     |   |
| CE                                | Yes   |
| UL                                | cULus E115267<br>Industrial <b>Control</b> Equipment  |
| HazLoc                            | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup> |
| GOST-R                            | Yes   |
| <b>Electrical characteristics</b> |   |
| Power consumption                 | Max. 30 W at 1 A  |
| Deep discharge protection         | Yes   |
| Short circuit protection          | Yes <sup>2)</sup>   |
| Battery charging data             |   |
| Charging current                  | Typ. 1 A  |
| <b>Environmental conditions</b>   |   |
| Temperature                       |   |
| Operation                         | 0 to 55°C <sup>3)</sup>   |
| Storage                           | -20 to 60°C   |
| Transport                         | -20 to 60°C   |

Table 169: 5AC901.IUPS-00 - Technical data

| Model 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 characteristics |                          |
| Weight                     | Approx. 28 g             |

Table 169: 5AC901.IUPS-00 - Technical data

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

### 3.13.2.3.1 Pinout

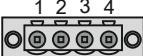
| UPS interface |                                    | 4-pin male connector<br> |
|---------------|------------------------------------|---|
| Pin           | Assignment                         |   |
| 1             | Temperature <a href="#">sensor</a> |   |
| 2             | Temperature <a href="#">sensor</a> |   |
| 3             | -                                  |   |
| 4             | +                                  |   |

Table 170: 5AC901.IUPS-00 / -01 - Pinout

### 3.13.2.4 Installation

This module is installed using the materials included in delivery. For more information regarding installation, see ["Installing interface options" on page 391](#).

### 3.13.3 5AC901.IUPS-01

#### 3.13.3.1 General information

The 5AC901.IUPS-01 **UPS** IF option, together with the 5AC901.BUPS-01 battery unit, allows the B&R Industrial PC to be shut down without any loss of data during a power **failure**.

The 5AC901.IUPS-01 **UPS interface** option **can** only be operated in the IF option 1 slot.

#### Warning!

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

#### Information:

If the system is in standby mode (S5: Soft-off mode or S4: Hibernation mode - 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 completed (e.g. opening the tray of the slide-in DVD drive).

#### 3.13.3.2 Order data


| Model number   | Short description                                   | Figure   |
|----------------|---|--|
|                | <b>Uninterruptible power supplies</b>               |  |
| 5AC901.IUPS-01 | <b>UPS</b> - For 2.2 Ah battery                     |  |
|                | <b>Required accessories</b>                         |  |
|                | <b>Uninterruptible power supplies</b>               |  |
| 5AC901.BUPS-01 | Battery unit 2.2 Ah - For <b>UPS</b> 5AC901.IUPS-01 |  |
| 5CAUPS.0005-01 | <b>UPS</b> cable - 0.5 m - For 5AC901.IUPS-xx       |  |
| 5CAUPS.0010-01 | <b>UPS</b> cable - 1 m - For 5AC901.IUPS-xx         |  |
| 5CAUPS.0030-01 | <b>UPS</b> cable - 3 m - For 5AC901.IUPS-xx         |  |

Table 171: 5AC901.IUPS-01 - Order data

#### 3.13.3.3 Technical data

#### Information:

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

| Model number                      | 5AC901.IUPS-01  |
|-----------------------------------|---|
| <b>General information</b>        |   |
| B&R ID code                       | 0xDF84  |
| Certification                     |   |
| CE                                | Yes   |
| UL                                | cULus E115267<br>Industrial <b>Control</b> Equipment  |
| HazLoc                            | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup> |
| GOST-R                            | Yes   |
| <b>Electrical characteristics</b> |   |
| Power consumption                 | Max. 25 W at 0.9 A  |
| Deep discharge protection         | Yes   |
| Short circuit protection          | Yes <sup>2)</sup>   |
| Battery charging data             |   |
| Charging current                  | Typ. 0.88 A   |
| <b>Environmental conditions</b>   |   |
| Temperature                       |   |
| Operation                         | 0 to 55°C <sup>3)</sup>   |
| Storage                           | -20 to 60°C   |
| Transport                         | -20 to 60°C   |

Table 172: 5AC901.IUPS-01 - Technical data

| Model 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 characteristics |                          |
| Weight                     | Approx. 28 g             |

Table 172: 5AC901.IUPS-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) 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.

### 3.13.3.3.1 Pinout

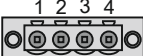
| UPS interface |                                    | 4-pin male connector<br> |
|---------------|------------------------------------|---|
| Pin           | Assignment                         |   |
| 1             | Temperature <a href="#">sensor</a> |   |
| 2             | Temperature <a href="#">sensor</a> |   |
| 3             | -                                  |   |
| 4             | +                                  |   |

Table 173: 5AC901.IUPS-00 / -01 - Pinout

### 3.13.3.4 Installation

This module is installed using the materials included in delivery. For more information regarding installation, see ["Installing interface options" on page 391](#).

### 3.13.4 5AC901.BUPS-00

#### 3.13.4.1 General information

- Battery unit for the 5AC901.IUPS-00 **UPS** IF option
- 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 has a limited service life and should be replaced regularly (after the specified service life at the latest).

### Warning!

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

#### 3.13.4.2 Order data


| Model number   | Short description                                   | Figure  |
|----------------|---|---|
|                | <b>Uninterruptible power supplies</b>               |  |
| 5AC901.BUPS-00 | Battery unit 4.5 Ah - For <b>UPS</b> 5AC901.IUPS-00 |   |
|                | <b>Required accessories</b>                         |   |
|                | <b>Uninterruptible power supplies</b>               |   |
| 5CAUPS.0005-01 | <b>UPS</b> cable - 0.5 m - For 5AC901.IUPS-xx       |   |
| 5CAUPS.0010-01 | <b>UPS</b> cable - 1 m - For 5AC901.IUPS-xx         |   |
| 5CAUPS.0030-01 | <b>UPS</b> cable - 3 m - For 5AC901.IUPS-xx         |   |

Table 174: 5AC901.BUPS-00 - Order data

#### 3.13.4.3 Technical data

| Model number                        | 5AC901.BUPS-00  |
|-------------------------------------|---|
| <b>General information</b>          |   |
| 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 <sup>1)</sup>   |
| Design                              | Single cell   |
| Temperature <b>sensor</b>           | NTC resistance  |
| Maintenance interval during storage | 6-month interval between charges  |
| Certification                       |   |
| CE                                  | Yes   |
| UL                                  | cULus E115267<br>Industrial <b>Control</b> Equipment  |
| HazLoc                              | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>2)</sup> |
| GOST-R                              | Yes   |
| Charge duration when battery low    | Typ. 7 hours  |
| <b>Electrical characteristics</b>   |   |
| Nominal voltage                     | 24 V  |
| Capacity                            | 4.5 Ah  |
| Fuse                                | Yes   |
| Battery charging data               |   |
| Charging current <sup>3)</sup>      | Typ. 1 A  |
| <b>Environmental conditions</b>     |   |
| Temperature                         |   |
| Operation                           | -30 to 60°C <sup>4)</sup>   |
| 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   |

Table 175: 5AC901.BUPS-00 - Technical data

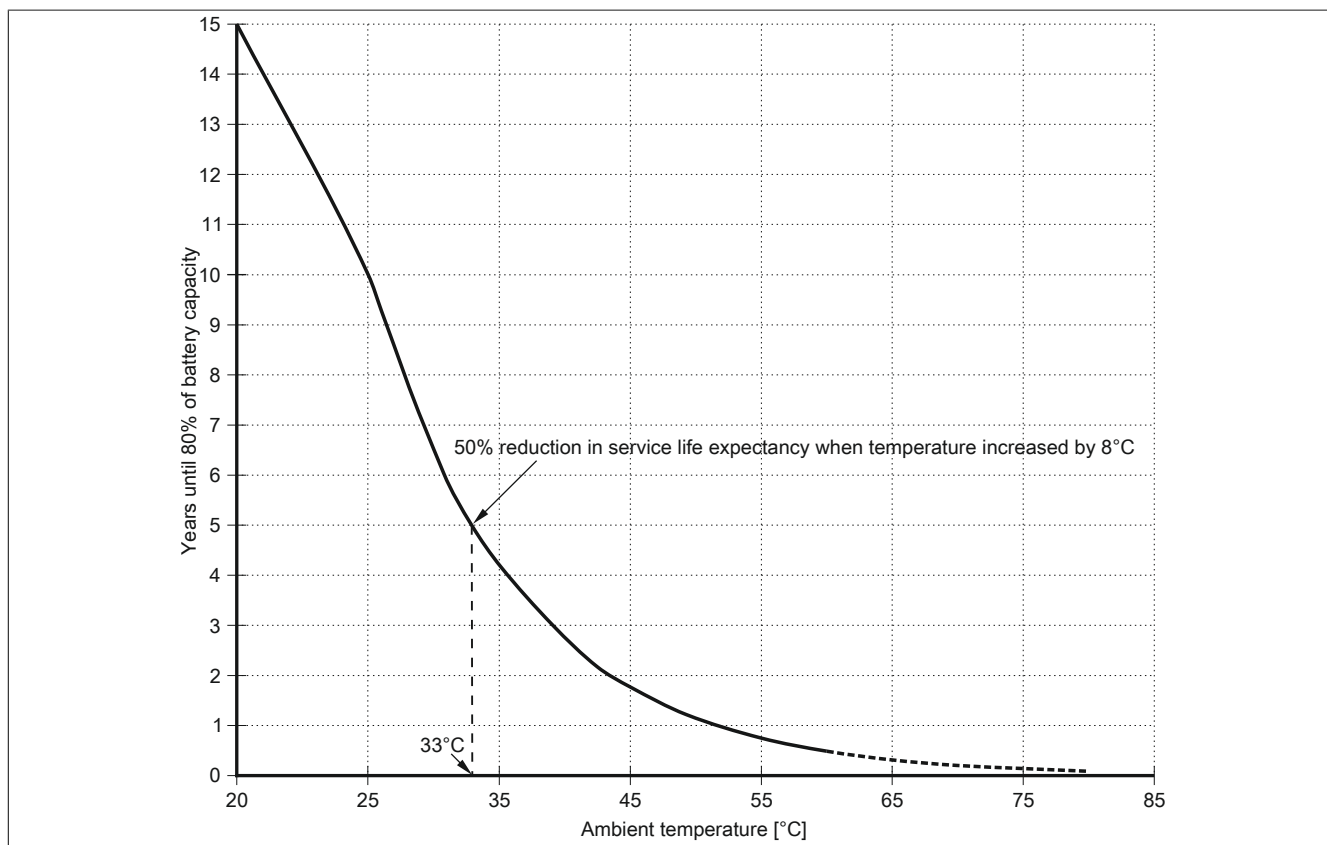
| Model number               | 5AC901.BUPS-00 |
|----------------------------|----------------|
| Mechanical characteristics |                |
| Dimensions                 |                |
| Width                      | 223.2 mm       |
| Height                     | 78.2 mm        |
| Depth                      | 145 mm         |
| Weight                     | Approx. 4600 g |

Table 175: 5AC901.BUPS-00 - Technical data

- 1) Depends on the charging and discharging cycles (up to 80% battery capacity).
- 2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 3) Maximum charging current.
- 4) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

### 3.13.4.4 Service life

The following diagram shows the relationship between ambient temperature and service life.



### 3.13.4.5 Dimensions

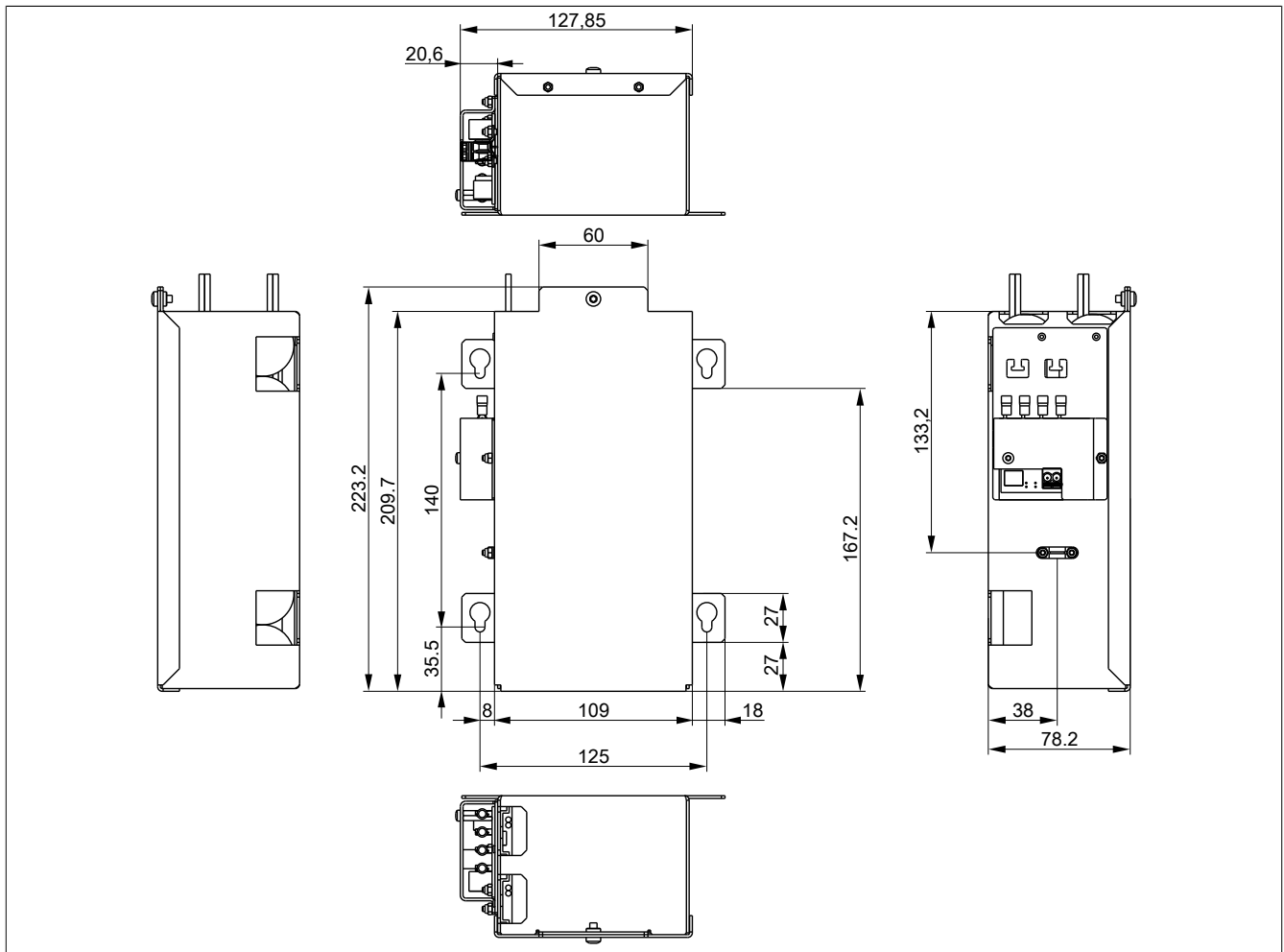


Figure 67: 5AC901.BUPS-00 - Dimensions

### 3.13.4.6 Drilling template

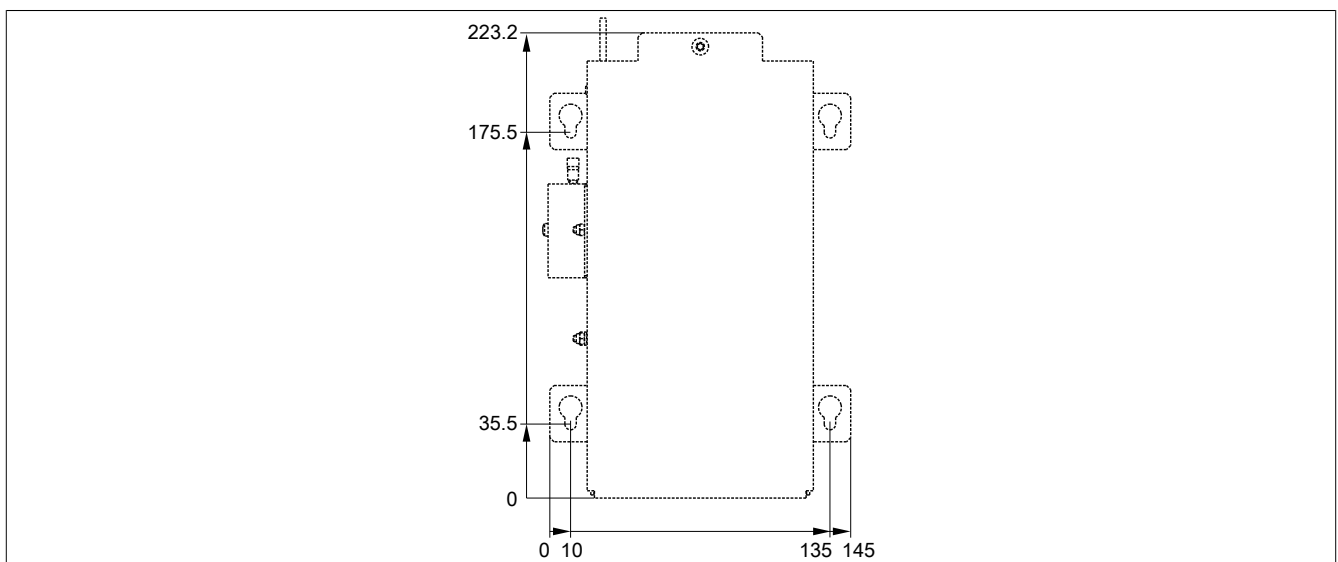


Figure 68: 5AC901.BUPS-00 - Drilling template

### 3.13.4.7 Installation

For information about installation and connecting to the [UPS IF option](#), see "[Installing and connecting the UPS battery unit](#)" on page 406.

### 3.13.4.8 Precautions for handling and use

#### Spills and leaks:

Any further spillage or leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is prohibited. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

#### Waste disposal:

Used 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 testing, larger spills diluted with water must be disposed of in accordance with applicable regulations.

#### Handling and storage:

- Batteries must be kept in cool, dry and well ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Batteries must be protected from adverse weather conditions and separated from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Damage to containers where batteries are stored and transported must be prevented.
- Keep away from fire, sparks and excessive heat.



### 3.13.5 5AC901.BUPS-01

#### 3.13.5.1 General information

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

The battery unit has a limited service life and should be replaced regularly (after the specified service life at the latest).

### Warning!

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

#### 3.13.5.2 Order data


| Model number   | Short description                                   | Figure   |
|----------------|---|--|
|                | <b>Uninterruptible power supplies</b>               |  |
| 5AC901.BUPS-01 | Battery unit 2.2 Ah - For <b>UPS</b> 5AC901.IUPS-01 |  |
|                | <b>Required accessories</b>                         |  |
|                | <b>Uninterruptible power supplies</b>               |  |
| 5CAUPS.0005-01 | <b>UPS</b> cable - 0.5 m - For 5AC901.IUPS-xx       |  |
| 5CAUPS.0010-01 | <b>UPS</b> cable - 1 m - For 5AC901.IUPS-xx         |  |
| 5CAUPS.0030-01 | <b>UPS</b> cable - 3 m - For 5AC901.IUPS-xx         |  |

Table 176: 5AC901.BUPS-01 - Order data

#### 3.13.5.3 Technical data

| Model number                        | 5AC901.BUPS-01  |
|-------------------------------------|---|
| <b>General information</b>          |   |
| Battery                             |   |
| Type                                | Panasonic 12 V 2.2 Ah; two rechargeable batteries connected in series   |
| Service life                        | Up to 5 years at 20°C <sup>1)</sup>   |
| Design                              | Maintenance-free lead acid battery  |
| Temperature <b>sensor</b>           | NTC resistance  |
| Maintenance interval during storage | 6-month interval between charges  |
| Certification                       |   |
| CE                                  | Yes   |
| UL                                  | cULus E115267<br>Industrial <b>Control</b> Equipment  |
| HazLoc                              | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>2)</sup> |
| GOST-R                              | Yes   |
| Charge duration when battery low    | Typ. 5 hours  |
| <b>Electrical characteristics</b>   |   |
| Nominal voltage                     | 24 V  |
| Capacity                            | 2.2 Ah  |
| Fuse                                | Yes   |
| Battery charging data               |   |
| Charging current <sup>3)</sup>      | Typ. 0.88 A   |
| <b>Environmental conditions</b>     |   |
| Temperature                         |   |
| Operation                           | 0 to 40°C <sup>4)</sup>   |
| 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   |

Table 177: 5AC901.BUPS-01 - Technical data

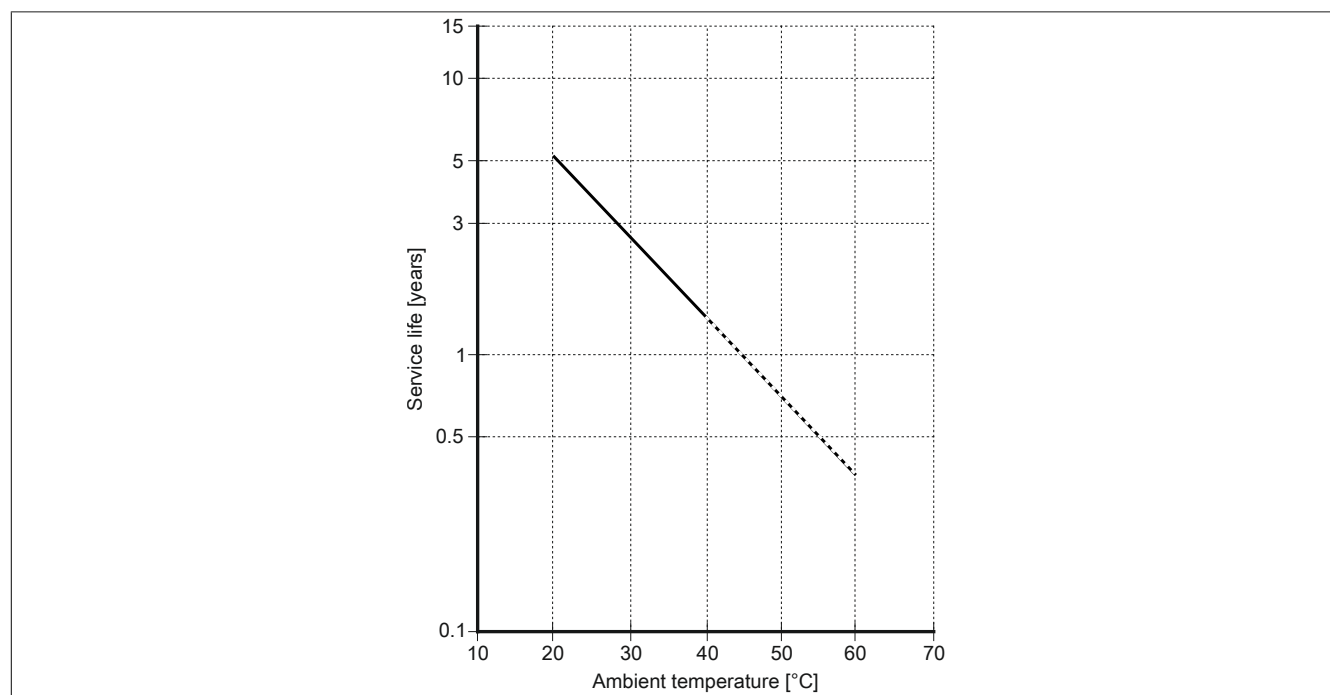
| Model number               | 5AC901.BUPS-01 |
|----------------------------|----------------|
| Elevation                  |                |
| Operation                  | Max. 3000 m    |
| Mechanical characteristics |                |
| Dimensions                 |                |
| Width                      | 188 mm         |
| Height                     | 78 mm          |
| Depth                      | 115 mm         |
| Weight                     | Approx. 2550 g |

Table 177: 5AC901.BUPS-01 - Technical data

- 1) Depends on the charging and discharging cycles.
- 2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 3) Maximum charging current.
- 4) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

### 3.13.5.4 Service life

The following diagram shows the relationship between ambient temperature and service life.



### 3.13.5.5 Dimensions

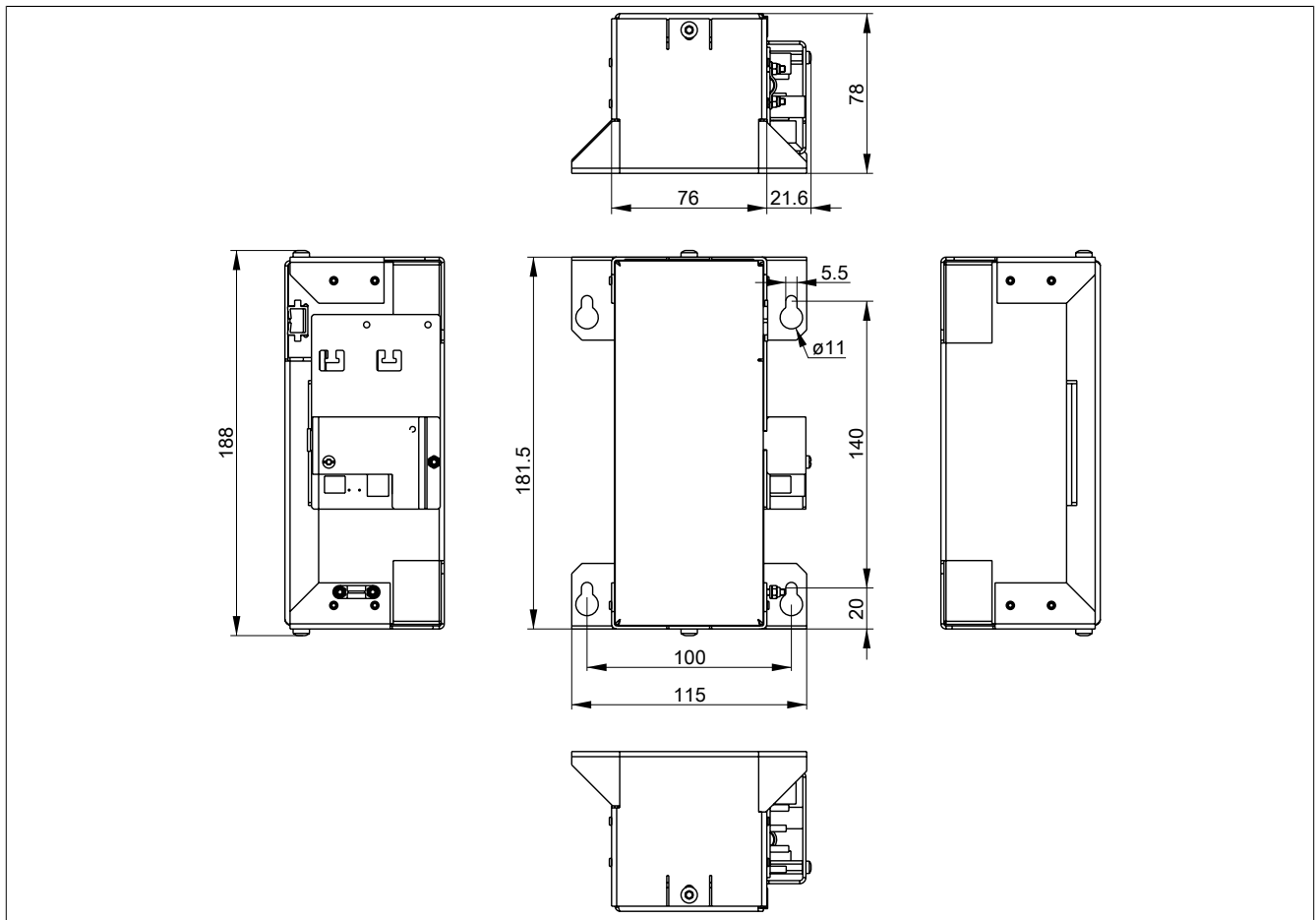


Figure 69: 5AC901.BUPS-01 - Dimensions

### 3.13.5.6 Drilling template

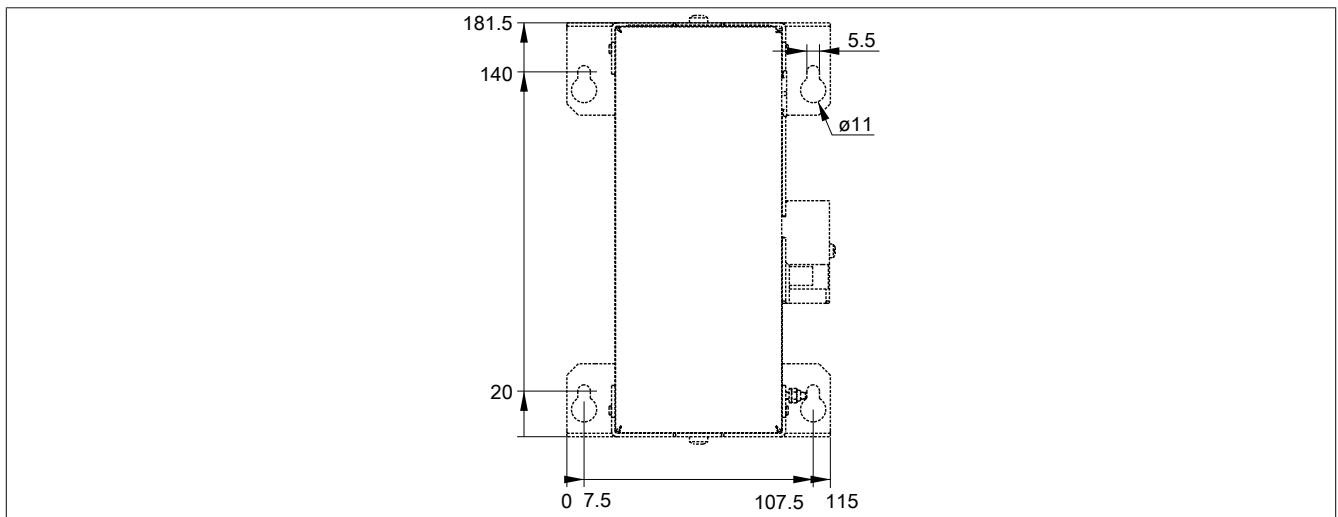


Figure 70: 5AC901.BUPS-01 - Drilling template

### 3.13.5.7 Installation

For information about installation and connecting to the [UPS IF option](#), see "[Installing and connecting the UPS battery unit](#)" on page 406.

### 3.13.5.8 Precautions for handling and use

#### Spills and leaks:

Any further spillage or leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is prohibited. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

#### Waste disposal:

Used 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 testing, larger spills diluted with water must be disposed of in accordance with applicable regulations.

#### Handling and storage:

- Batteries must be kept in cool, dry and well ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Batteries must be protected from adverse weather conditions and separated from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Damage to containers where batteries are stored and transported must be prevented.
- Keep away from fire, sparks and excessive heat.

### 3.13.6 5CAUPS.xxxx-01

#### 3.13.6.1 General information

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

#### 3.13.6.2 Order data


| Model number   | Short description                      | Figure  |
|----------------|--|---|
|                | <b>Uninterruptible power supplies</b>  |  |
| 5CAUPS.0005-01 | UPS cable - 0.5 m - For 5AC901.IUPS-xx |   |
| 5CAUPS.0010-01 | UPS cable - 1 m - For 5AC901.IUPS-xx   |   |
| 5CAUPS.0030-01 | UPS cable - 3 m - For 5AC901.IUPS-xx   |   |

Table 178: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - Order data

#### 3.13.6.3 Technical data

| Model number                      | 5CAUPS.0005-01 | 5CAUPS.0010-01  | 5CAUPS.0030-01 |
|-----------------------------------|----------------|---|----------------|
| <b>General information</b>        |                |   |                |
| Certification                     |                | Yes   |                |
| CE                                |                | cULus E115267   |                |
| UL                                |                | Industrial <b>Control</b> Equipment   |                |
| HazLoc                            |                | cULus HazLoc E180196  |                |
|                                   |                | Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T3C <sup>1)</sup> |                |
| GOST-R                            |                | Yes   |                |
| <b>Cable construction</b>         |                |   |                |
| Wire cross section                |                | 2x 0.5 mm <sup>2</sup> (AWG 20)<br>2x 2.5 mm <sup>2</sup> (AWG 13)  |                |
| Conductor resistance              |                | At 0.5 mm <sup>2</sup> max. 39 Ω/km<br>At 2.5 mm <sup>2</sup> max. 7.98 Ω/km <sup>2)</sup>                            |                |
| Outer sheathing                   |                |   |                |
| Material                          |                | Thermoplastic PVC-based material  |                |
| Color                             |                | Window gray (similar to RAL 7040)   |                |
| <b>Connector</b>                  |                |   |                |
| Type                              |                | Screw clamps, 4-pin <sup>3)</sup>   |                |
| <b>Electrical characteristics</b> |                |   |                |
| 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  |                |
| <b>Environmental conditions</b>   |                |   |                |
| Temperature                       |                |   |                |
| Moving                            |                | -5 to 70°C  |                |
| Static                            |                | -30 to 70°C   |                |
| <b>Mechanical characteristics</b> |                |   |                |
| Dimensions                        |                |   |                |
| Length                            | 0.5 m          | 1 m   | 3 m            |
| Diameter                          |                | 7 mm  |                |
| Bend radius                       |                |   |                |
| Moving                            |                | 10x wire diameter   |                |
| Fixed installation                |                | 5x wire diameter  |                |
| Weight                            | Approx. 55 g   | Approx. 100 g   | Approx. 250 g  |

Table 179: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - 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) 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**
- **Voltage drop**
- **Wire cross section**
- **Sensor lines**

#### **3.13.6.4 Installation**

For information about connecting the cable to the battery unit, please see section "[Installing and connecting the UPS battery unit](#)" on page 406.

## 3.14 Front covers

### 3.14.1 5AC901.FF0x-00

#### 3.14.1.1 General information

The front cover on the APC910 keeps the front-side interfaces free of dust, dirt and other contaminants.

4 different front cover variants are available for the APC910 system units.

#### Information:

**The front cover is not included with the system unit and must be ordered separately.**

#### 3.14.1.2 Order data


| Model number   | Short description  | Figure   |
|----------------|--|--|
|                | <b>Front cover</b>                                       |  |
| 5AC901.FF01-00 | Front cover for 1-slot APC910 - Orange                   |  |
| 5AC901.FF01-01 | Front cover for 1-slot APC910 - Dark gray                |  |
| 5AC901.FF01-02 | Front cover for 1-slot APC910 - Dark gray - Without logo |  |
| 5AC901.FF01-03 | Front cover for 1-slot APC910 - Orange - Without logo    |  |
| 5AC901.FF02-00 | Front cover for 2-slot APC910 - Orange                   |  |
| 5AC901.FF02-01 | Front cover for 2-slot APC910 - Dark gray                |  |
| 5AC901.FF02-02 | Front cover for 2-slot APC910 - Dark gray - Without logo |  |
| 5AC901.FF02-03 | Front cover for 2-slot APC910 - Orange - Without logo    |  |
| 5AC901.FF05-00 | Front cover for 5-slot APC910 - Orange                   |  |
| 5AC901.FF05-01 | Front cover for 5-slot APC910 - Dark gray                |  |
| 5AC901.FF05-02 | Front cover for 5-slot APC910 - Dark gray - Without logo |  |
| 5AC901.FF05-03 | Front cover for 5-slot APC910 - Orange - Without logo    |  |

Table 180: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF01-03, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF02-03, 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02, 5AC901.FF05-03 - Order data

#### 3.14.1.3 Technical data

| Model number               | 5AC901.<br>FF01-00  | 5AC901.<br>FF01-01                          | 5AC901.<br>FF01-02 | 5AC901.<br>FF01-03 | 5AC901.<br>FF02-00  | 5AC901.<br>FF02-01                          | 5AC901.<br>FF02-02 | 5AC901.<br>FF02-03 |
|----------------------------|---|---|--------------------|--------------------|---|---|--------------------|--------------------|
| General information        |   |   |                    |                    |   |   |                    |                    |
| Certification              |   |   |                    |                    |   |   |                    |                    |
| CE                         | Yes   |   |                    |                    |   |   |                    |                    |
| UL                         | cULus E115267<br>Industrial <b>Control</b> Equipment  |   |                    |                    |   |   |                    |                    |
| DNV GL                     | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>1)</sup> |   |                    | -                  | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>1)</sup> |   |                    | -                  |
| GOST-R                     | Yes   |   |                    | -                  | Yes   |   | -                  |                    |
| Mechanical characteristics |   |   |                    |                    |   |   |                    |                    |
| Housing                    |   |   |                    |                    |   |   |                    |                    |
| Front cover                | Orange plas-<br>tic (similar<br>to Pantone<br>144CV)  | Dark gray plastic (similar to Pantone 432C) |                    |                    | Orange plas-<br>tic (similar<br>to Pantone<br>144CV)  | Dark gray plastic (similar to Pantone 432C) |                    |                    |
| Material                   | Plastic   |   |                    |                    |   |   |                    |                    |
| Dimensions                 |   |   |                    |                    |   |   |                    |                    |
| Width                      | 82 mm   |   |                    |                    | 120.9 mm  |   |                    |                    |
| Height                     | 264 mm  |   |                    |                    |   |   |                    |                    |
| Depth                      | 14 mm   |   |                    |                    |   |   |                    |                    |
| Weight                     | Approx. 84 g  |   |                    |                    | Approx. 117 g   |   |                    |                    |

Table 181: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF01-03, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF02-03 - Technical data

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

| Model number                      | 5AC901.FF05-00  | 5AC901.FF05-01                              | 5AC901.FF05-02                              | 5AC901.FF05-03                              |
|-----------------------------------|---|---|---|---|
| <b>General information</b>        |   |   |   |   |
| Certification                     |   |   |   |   |
| CE                                | Yes   |   |   |   |
| UL                                | cULus E115267<br>Industrial <a href="#">Control</a> Equipment |   |   |   |
| GOST-R                            | Yes   | Yes   | -   | -   |
| <b>Mechanical characteristics</b> |   |   |   |   |
| Housing                           |   |   |   |   |
| Front cover                       | Orange plastic (similar to Pantone 144CV)                     | Dark gray plastic (similar to Pantone 432C) | Dark gray plastic (similar to Pantone 432C) | Dark gray plastic (similar to Pantone 432C) |
| Material                          | Plastic   |   |   |   |
| Dimensions                        |   |   |   |   |
| Width                             | 202 mm  |   |   |   |
| Height                            | 264 mm  |   |   |   |
| Depth                             | 14 mm   |   |   |   |
| Weight                            | Approx. 197 g   |   |   |   |

Table 182: 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02, 5AC901.FF05-03 - Technical data



# Chapter 3 • Installation

## 1 Installation

### Danger!

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

Devices are installed using the mounting clip found on the housing. These clips are designed for M5 screws.

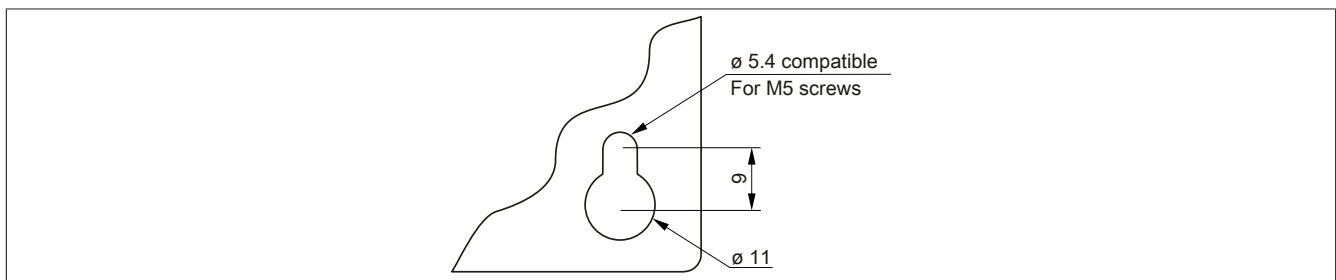


Figure 71: Mounting plates

The exact position of the mounting holes is illustrated in the drilling templates in 2 "Technical data", section "Individual components" on page 74.

### 1.1 Important installation information

- Environmental conditions must be taken into consideration.
- When installed in an enclosure, enough space must be available for air to circulate sufficiently.
- This **device** must be installed on a flat, clean and burr-free surface.
- This **device** is only certified for operation in enclosed rooms.
- This **device** must not be subjected to direct sunlight.
- Ventilation holes must not be covered.
- This **device** must be installed using one of the approved mounting orientations.
- The wall or **control** cabinet must be able to withstand four times the total weight of the **device**.
- The bend radius of connected cables (**DVI**, **SDL**, **USB**, etc.) must not be exceeded.

### 1.2 Procedure

1. Drill the necessary holes in the mounting surface. The exact position of the mounting holes is illustrated in the drilling templates.
2. Mount the B&R Industrial PC using M5 screws.

### 1.3 Mounting orientations

The following diagrams show the approved mounting orientations for the [Automation PC 910](#). The APC910 must be mounted as described in the following sections.

#### 1.3.1 Vertical mounting orientation

APC910 systems with or without a fan kit [can](#) be mounted in this orientation.

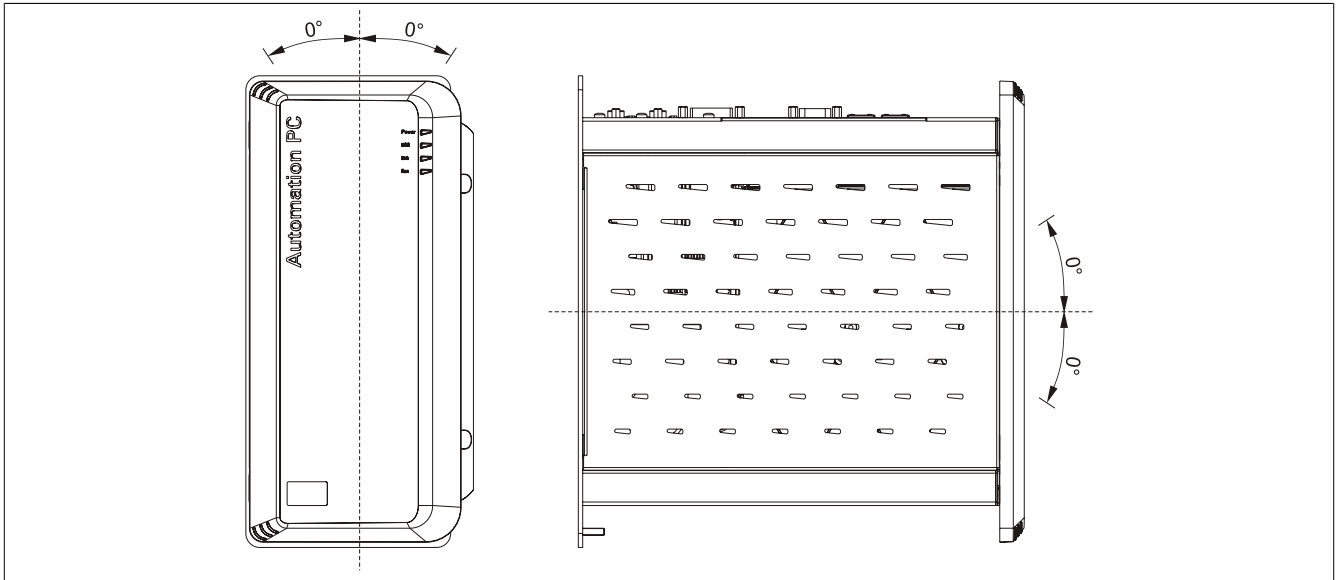


Figure 72: Vertical mounting orientation

In order to facilitate natural air circulation, devices must be mounted according to the spacing indicated in the section ["Spacing for air circulation" on page 206](#).

#### 1.3.2 Horizontal mounting orientation

Operation in the horizontal mounting orientation (heat sink on top) requires the use of a fan kit. The maximum ambient temperature specification must be reduced by 5°C.

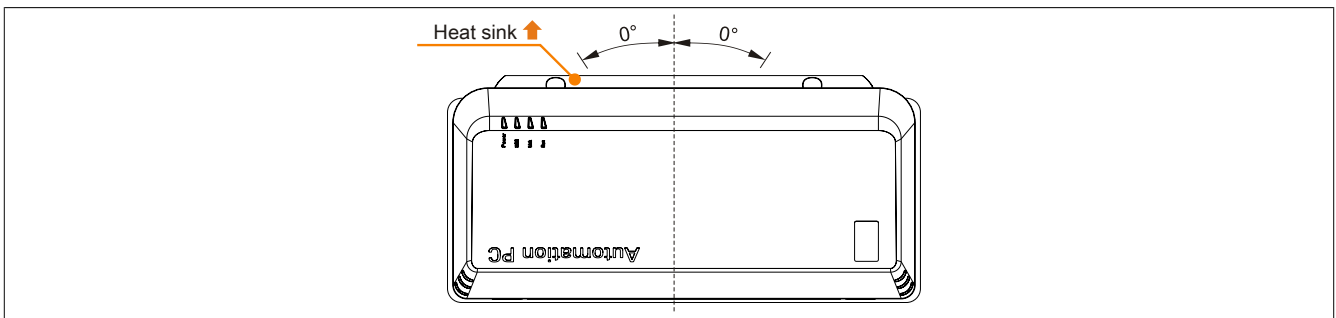


Figure 73: Horizontal mounting orientation

In order to facilitate natural air circulation, devices must be mounted according to the spacing indicated in the section ["Spacing for air circulation" on page 206](#).

### 1.3.3 Mounting orientation - Floor-mounted

Floor-mounted operation (mounting plate mounted to the floor) requires the use of a fan kit. The maximum ambient temperature specification must be reduced by 5°C.

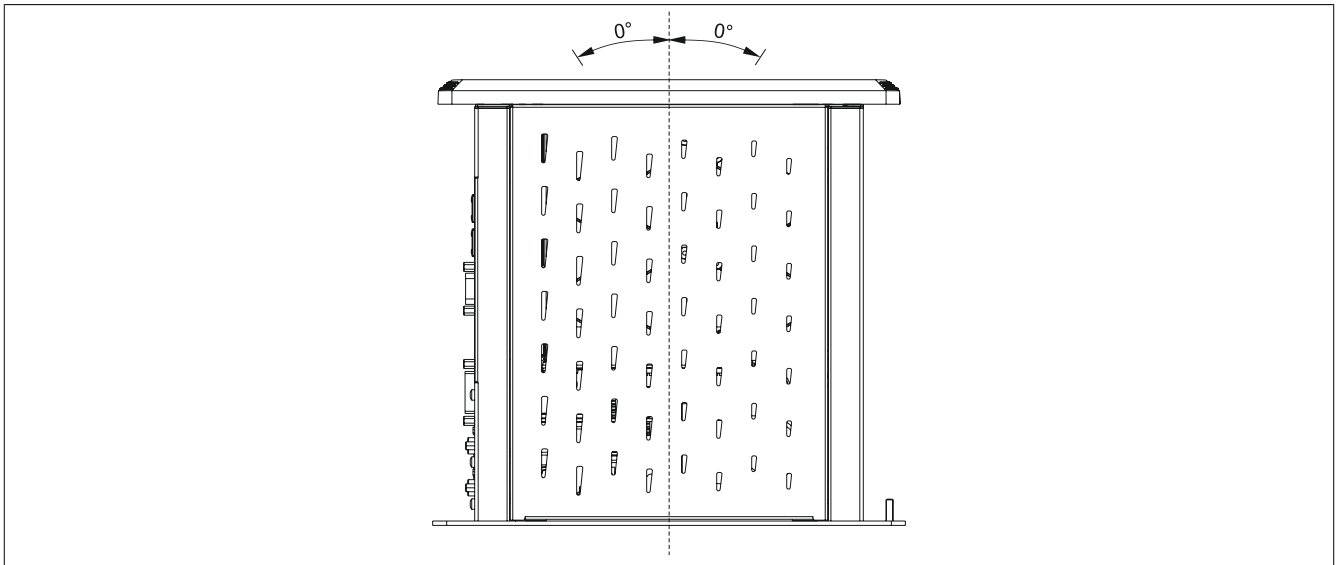


Figure 74: Mounting orientation - Floor-mounted

In order to facilitate natural air circulation, devices must be mounted according to the spacing indicated in the section "[Spacing for air circulation](#)" on page 206.

## 1.4 Spacing for air circulation

In order to guarantee sufficient air circulation, allow the specified amount of space above, below, to the side and behind the **Automation PC 910**. The minimum specified spacing is indicated in the following diagram. This applies to all **Automation PC 910** variants.

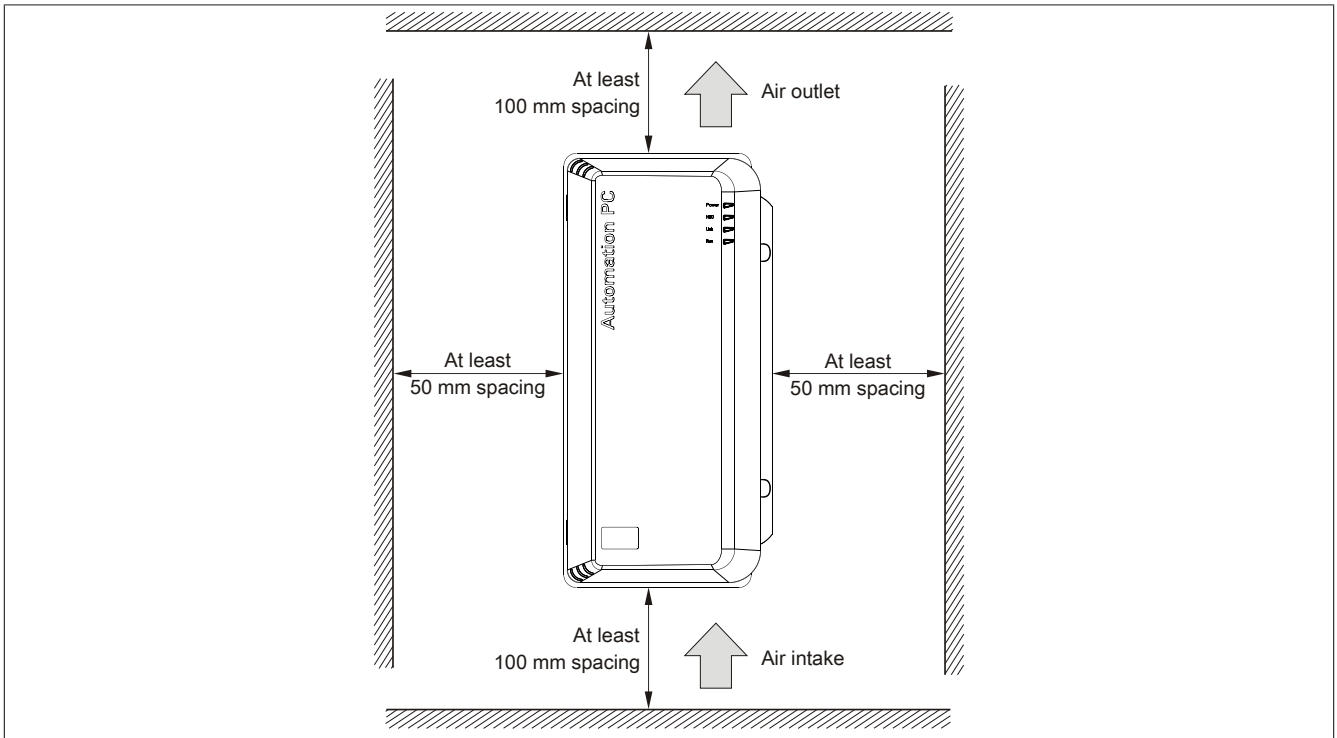


Figure 75: Standard mounting - Spacing

These defined distances are valid for both the vertical and horizontal mounting orientations for the APC910.

### Information:

The spacing specifications for air circulation are based on the worst-case scenario for operation at the maximum specified ambient temperature (see "Temperature specifications" in the chapter "**Technical data**").

If the spacing specifications for air circulation cannot be adhered to, then the maximum specified temperatures for the temperature sensors (see "Temperature sensor positions" in the chapter "**Technical data**") must be monitored by the user and appropriate measures taken if they are exceeded.

## 2 Cable connections

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

### Information:

The maximum torque for the locating screws is 0.5 Nm.

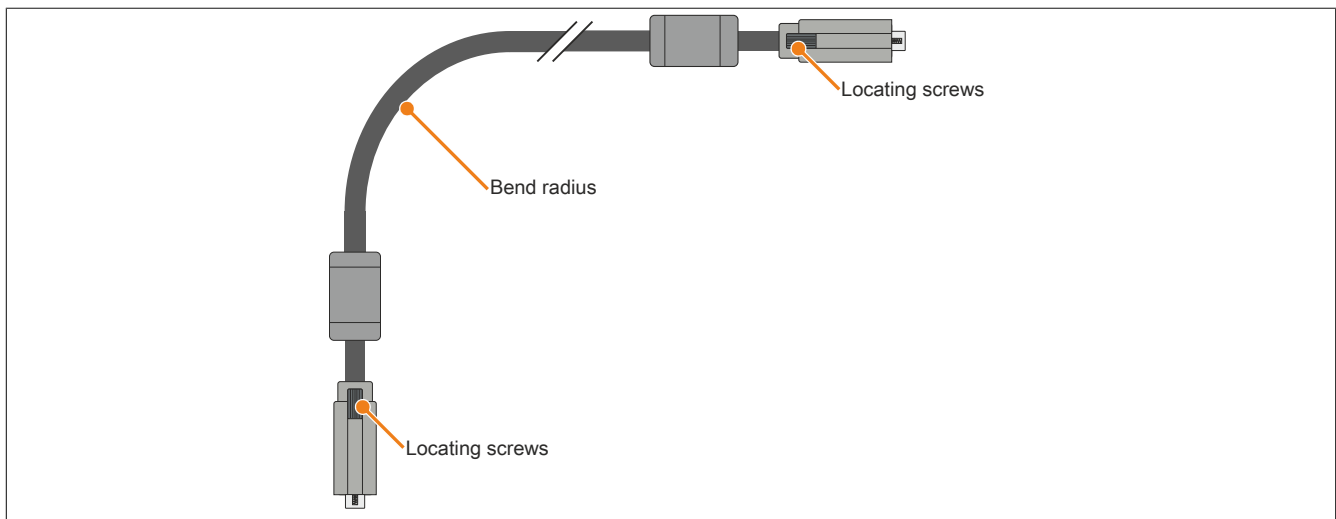


Figure 76: Bend radius - Cable connection

### Information:

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

### 3 Grounding concept

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

This **device** comes equipped with 2 functional **ground** connections:

- Power supply
- **Ground** connection

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

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

Symbol indicating functional **ground** on the B&R **device**: 

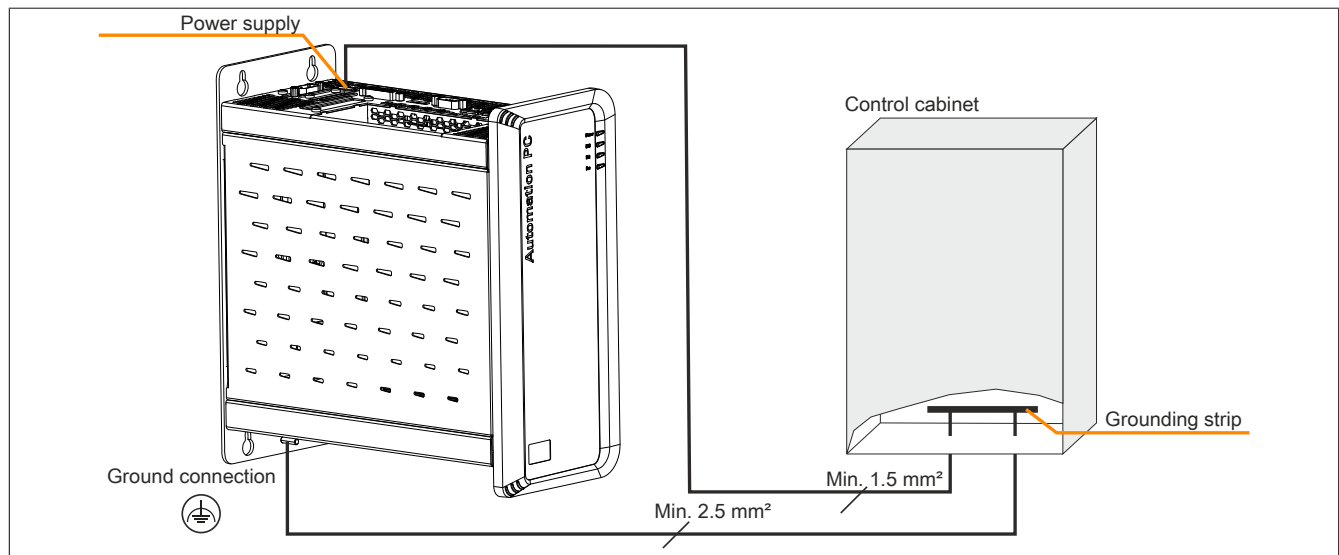


Figure 77: Grounding concept

## 4 General instructions for performing temperature testing

The purpose of these instructions is to explain general procedures for performing application-specific temperature testing on B&R Industrial PCs and **Power Panels**. Nevertheless, these instructions are meant to serve only as guidelines.

### 4.1 Procedure

In order to obtain accurate results, testing conditions should match conditions in the field. This means that for the duration of the temperature tests, the target application should be running, the PC should be installed in the **control** cabinet that will be used, etc.

In addition, a temperature **sensor** should be installed for the **device** being tested to provide live monitoring of the ambient temperature. In order to obtain accurate measurements, this **sensor** should be installed at a distance of 5 to 10 cm from the B&R Industrial PC near the air intake (not near the exhaust).

All B&R Industrial PCs and **Power Panels** are equipped with internal temperature sensors. They are installed at different locations for each **device** family. The number of sensors and temperature limits also vary from series to series.

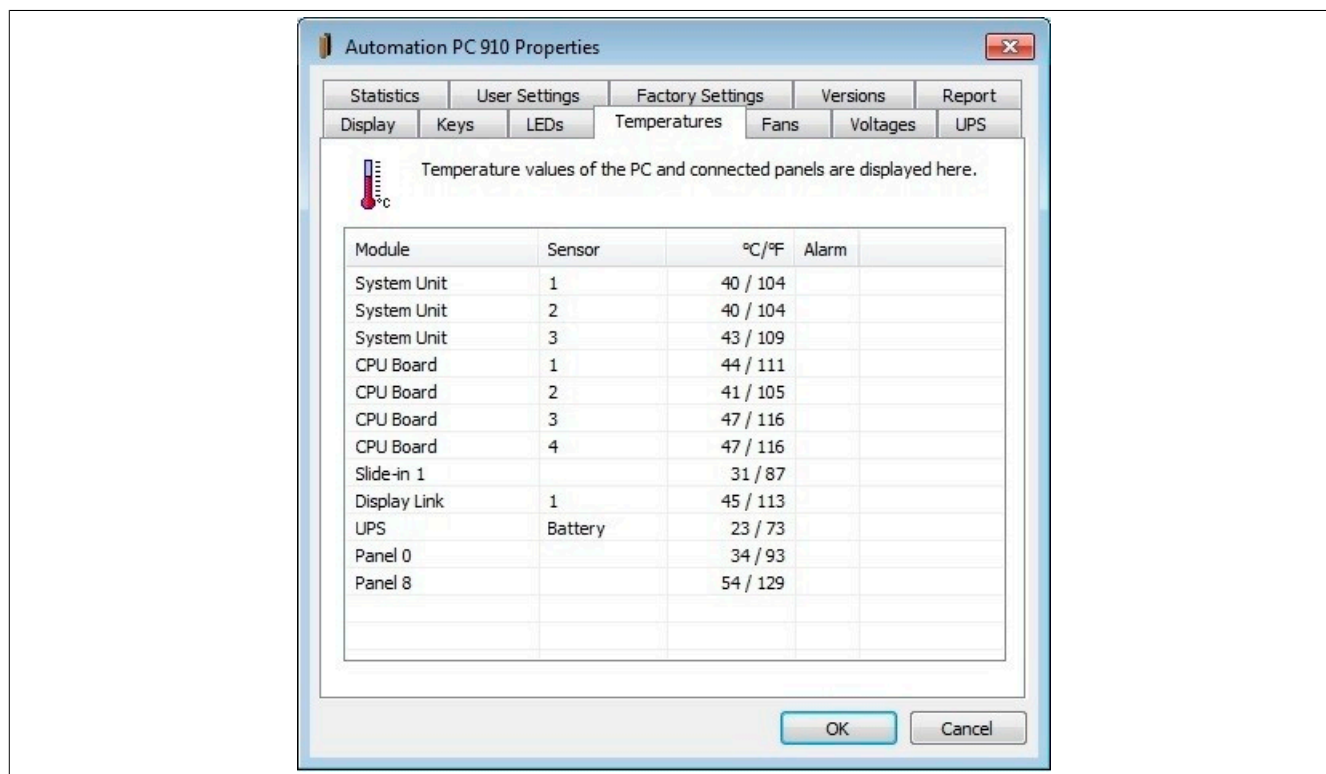
For information about the locations of temperature sensors and maximum specified values, see section "Temperature sensor positions" in 2 "Technical data".

To ensure that the temperature situation is evaluated reliably, a minimum of 8 hours is recommended for testing.

### 4.2 Evaluating temperatures in Windows operating systems

#### 4.2.1 Evaluating with the B&R **Control Center**

The B&R **Control Center** can be used to evaluate temperatures. The temperatures can be viewed on the "Temperatures" tab. The B&R **Control Center** is available at no cost in the Downloads section of the B&R website ([www.br-automation.com](http://www.br-automation.com)). The B&R **Control Center** uses the B&R **Automation Device Interface** (ADI).



A separate application can be developed if it is necessary to collect historical data.

### Information:

**Software** development kits such as the ADI .NET SDK are available on the B&R website ([www.br-automation.com](http://www.br-automation.com)) to develop a separate application.

#### 4.2.2 Evaluating with the BurnInTest tool from Passmark

If a separate application is not developed or used to evaluate the temperature, then B&R recommends using the BurnInTest [software](#) tool from PassMark.

Standard and professional versions of BurnInTest are available. In addition to the [software](#) package, there are also various loopback adapters (serial, parallel, [USB](#), etc.) and test CDs/DVDs available. The exact [software](#) and loopback adapters used will determine the corresponding load that [can](#) be generated on the system and peripheral devices.

#### Information:

**Loopback adapters are also available from PassMark. More information is available at [www.passmark.com](http://www.passmark.com).**

The following screenshots are based on Passmark BurnInTest Pro V6 and a 2-slot APC910 with DVD.

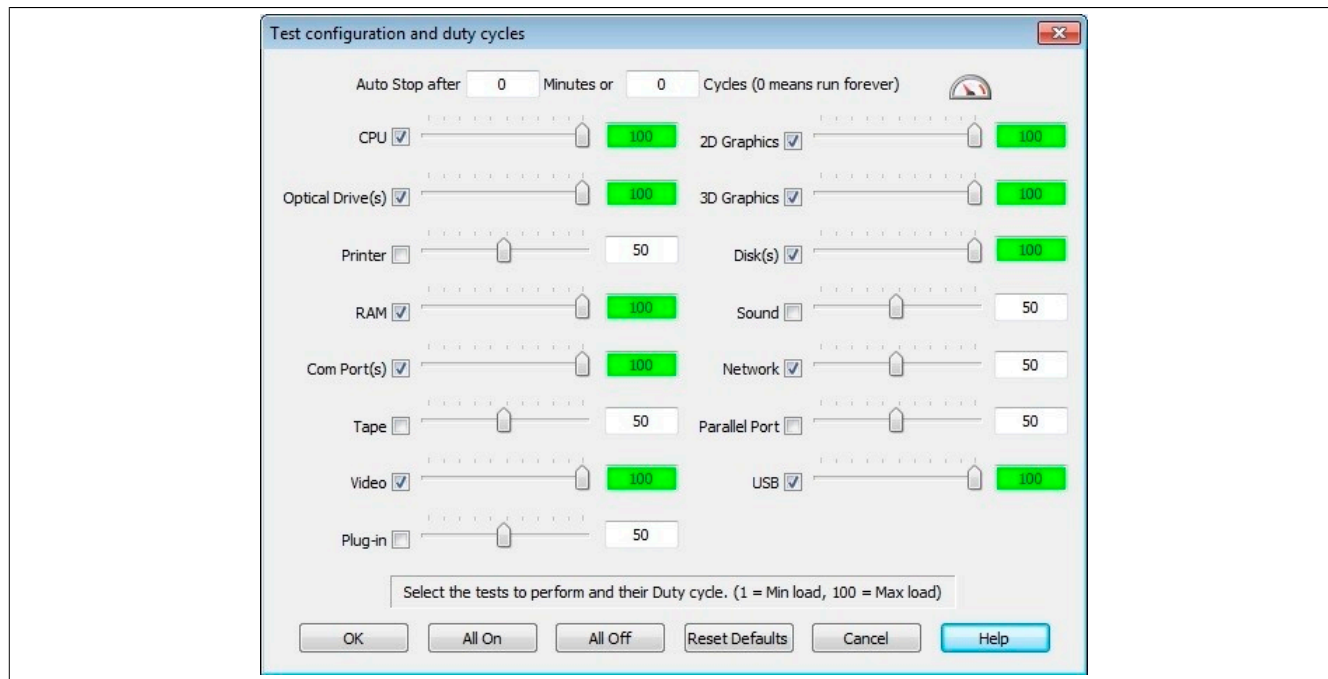


Figure 78: Settings for Passmark BurnInTest Pro V6 and a 2-slot APC910 with DVD



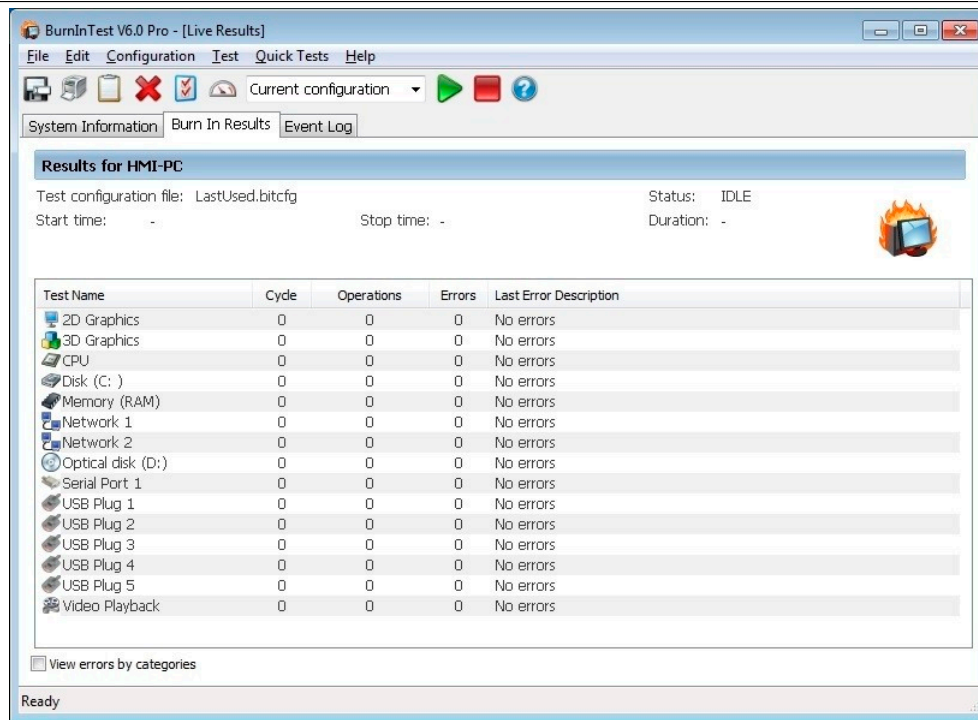


Figure 79: Test overview of a 2-slot APC910 with DVD

The respective test properties may need to be fine-tuned depending on the [availability](#) of a loopback plug and DVDs.

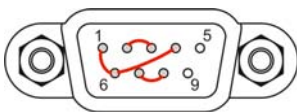
### Information:

**USB flash drives** [can](#) also be used if no **USB** loopback adapters are available. The **USB** flash drives must be detected as formatted drives in Windows. The test **USB** must then be deselected, and the **USB** flash drives must be configured as the testing [device](#) in the disk properties.



### Information:

Serial loopback adapters are relatively easy to create. Simply connect several pins on the serial [inter-](#)  
[face](#) with wires.



## 4.3 Evaluating temperatures in non-Windows operating systems

For applications that do not run in Windows, temperatures [can](#) be evaluated with the help of the B&R implementation guide. In addition to the implementation guide, there are also programs available in MS-DOS.

The implementation guide only describes [device](#)-specific functions, not the main functions of the sample programs.

If code from the sample programs is used, it is important to observe the notes in the implementation guide regarding TODO statements, I/O access functions, etc.

### Information:

Sample programs and implementation guides for all B&R Industrial PCs and **Power Panels** are available at no cost from the B&R website ([www.br-automation.com](http://www.br-automation.com)).

#### 4.4 Evaluating the measurement results

The maximum temperature value recorded by each **sensor** is not permitted to exceed the temperature limits specified in the user's manuals.

If the temperature tests cannot be performed in a climate-controlled chamber, they **can** still be performed in an office environment. However, it is necessary to measure the ambient temperature in this case. Experience at B&R has shown that values measured on passive systems (systems without a fan kit) **can** be projected linearly based on the ambient temperature. In order to be able to project the temperature values for systems with a fan kit, the fans must be running. It is also important to take values such as speed into consideration.

If the temperature tests are performed in a climate-controlled chamber with fans, the fans will cool the devices being tested and distort the results. Measurement results for passive devices are therefore unusable. In order to obtain accurate results in climate-controlled chambers with fans, the fans must be turned off and the **device** must be allowed to run for a sufficient amount of time (several hours) before beginning the test.

## 5 Configuring a SATA RAID set

### Information:

The following [software](#) description is valid for 5ACPCI.RAIC-01, 5ACPCI.RAIC-03, 5ACPCI.RAIC-05 and 5ACPCI.RAIC-06 PCI SATA controllers.

The "RAID Configuration Utility" in BIOS must be started in order to make the necessary settings. After POST, pressing <Ctrl+S> or <F4> opens the RAID BIOS.

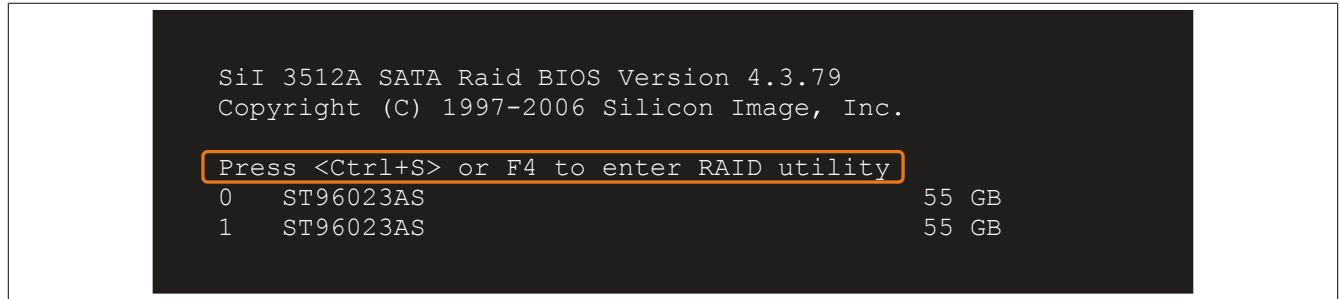


Figure 80: Open the RAID Configuration Utility

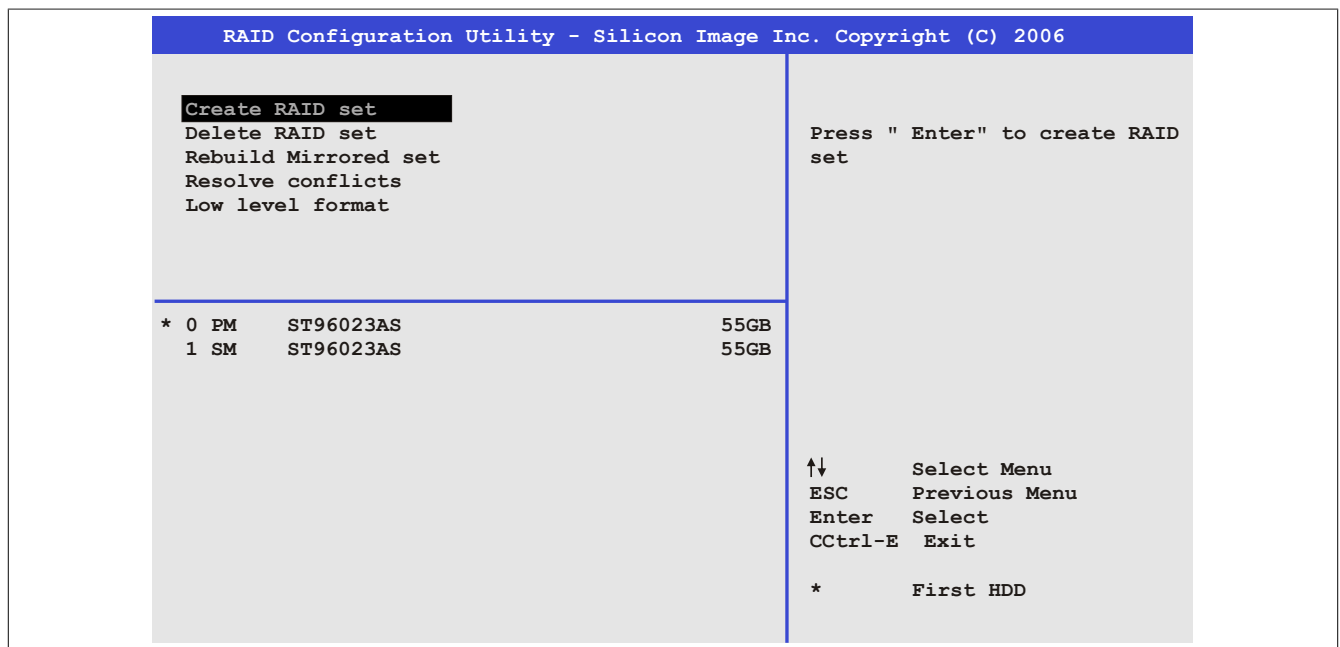


Figure 81: RAID Configuration Utility - Menu

The following keys [can](#) be used once inside BIOS Setup:

| Key      | Function                                   |
|----------|--|
| Cursor ↑ | Moves to the previous item                 |
| Cursor ↓ | Moves to the next item                     |
| Enter    | Selects an item or opens a submenu         |
| ESC      | Returns to the previous menu               |
| Ctrl+E   | Saves any changed settings and exits setup |

Table 183: BIOS-relevant keys in the RAID Configuration Utility

5.1 Create RAID set

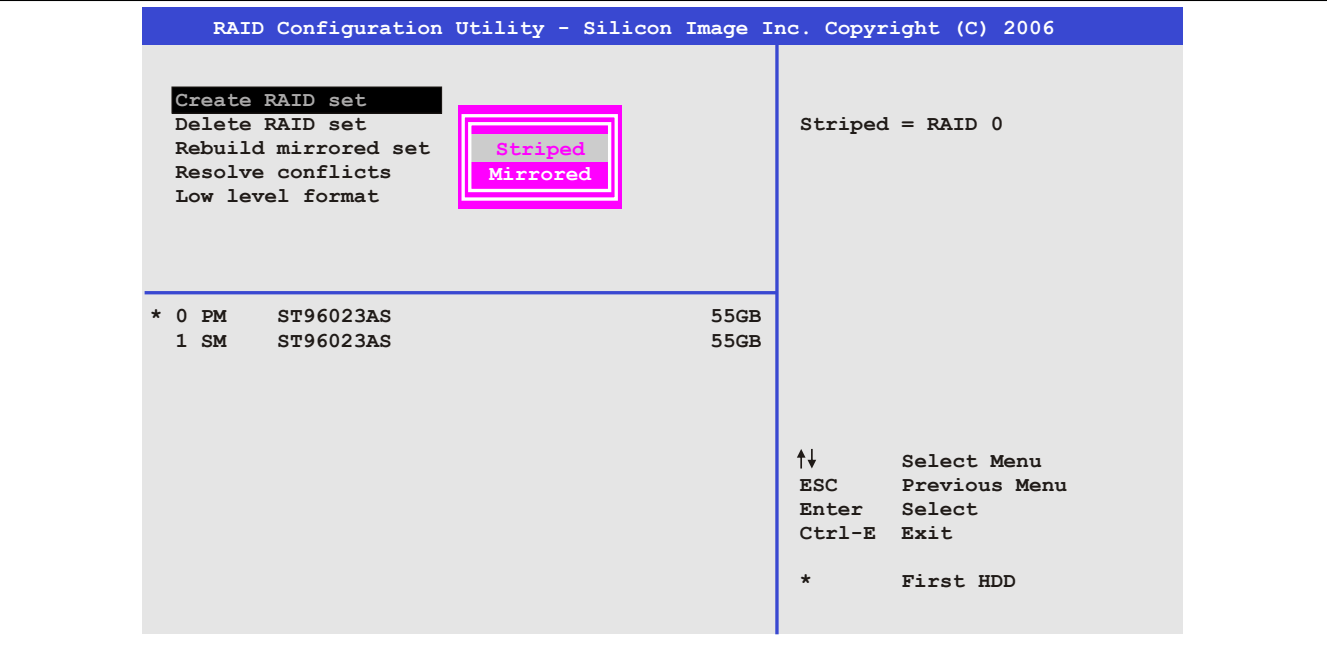


Figure 82: RAID Configuration Utility - Menu

The RAID system can be set up as "Striped" = RAID0 or "Mirrored" = RAID1 using the "Create RAID set" menu option.

5.2 Create RAID set - Striped

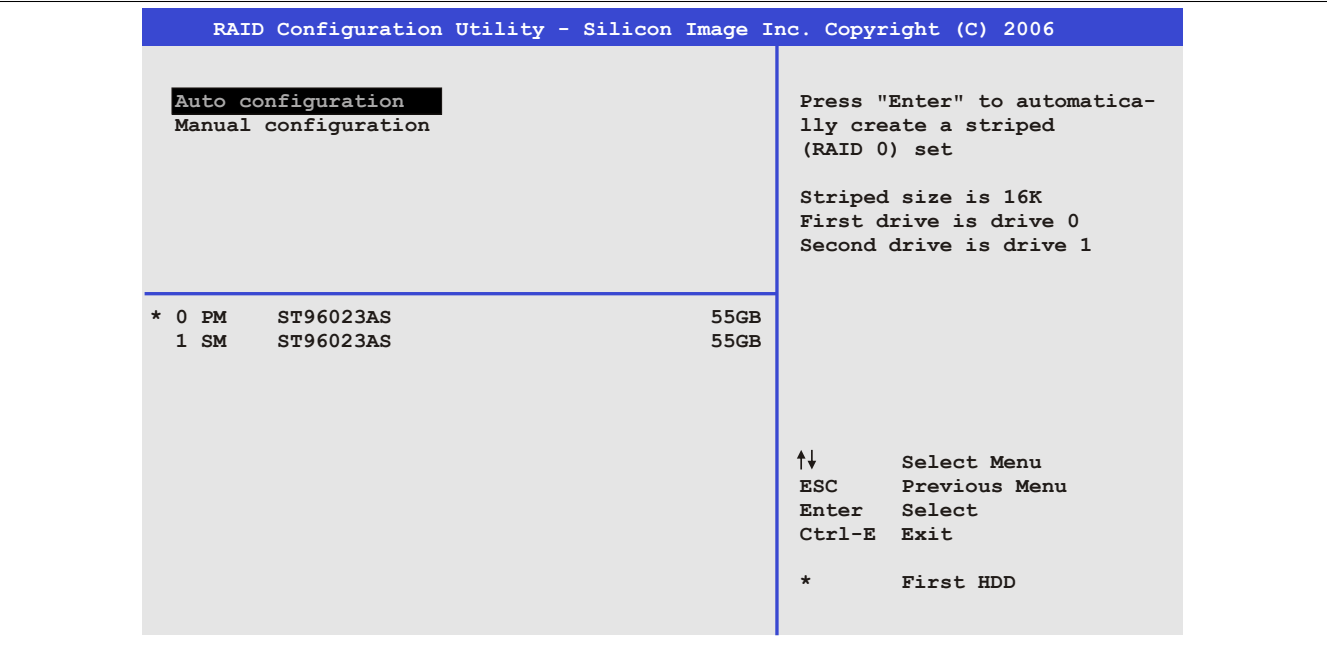


Figure 83: RAID Configuration Utility - Create RAID set - Striped

- "Auto configuration"**  
Auto configuration optimizes all settings.
- "Manual configuration"**  
Allows the first and second HDD to be specified as well as the "Chunk size" (i.e. block size, application-dependent).

### 5.3 Create RAID set - Mirrored

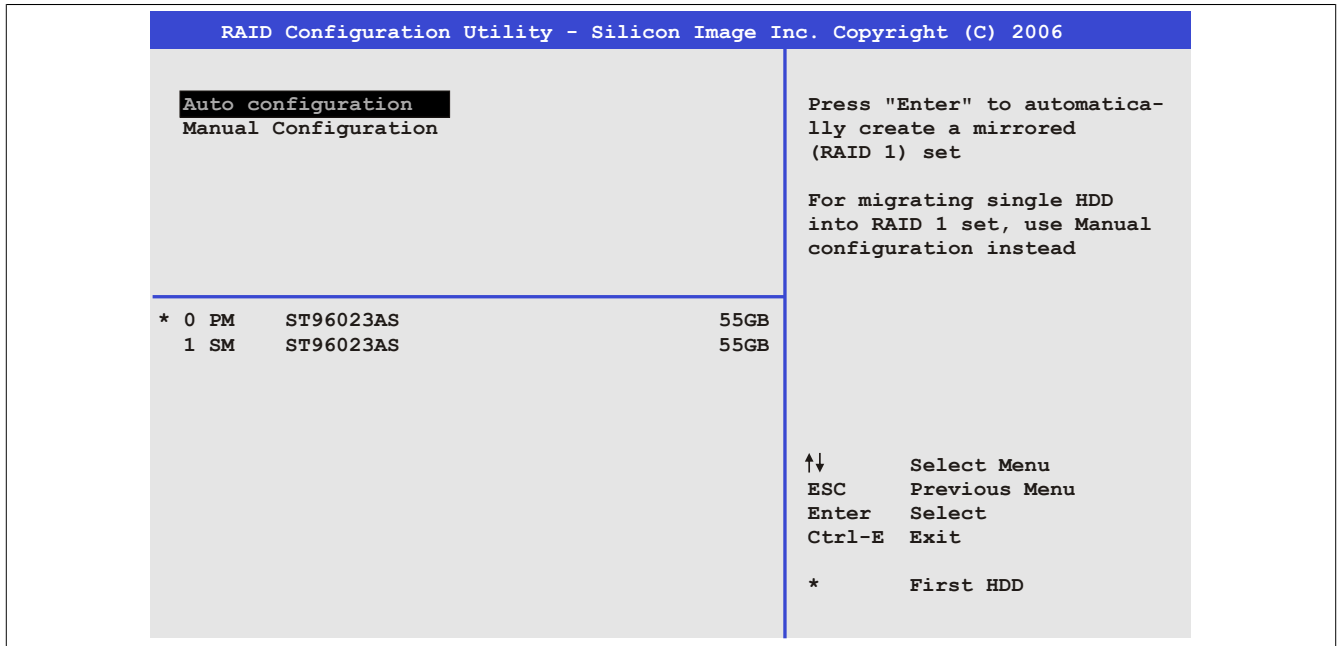


Figure 84: RAID Configuration Utility - Create RAID set - Mirrored

#### "Auto configuration"

Auto configuration optimizes all settings.

#### "Manual configuration"

Allows the "Source" and "Target" HDD to be specified as well as whether a rebuild (mirror) should be performed immediately (takes approx. 50 minutes).

### 5.4 Delete RAID set

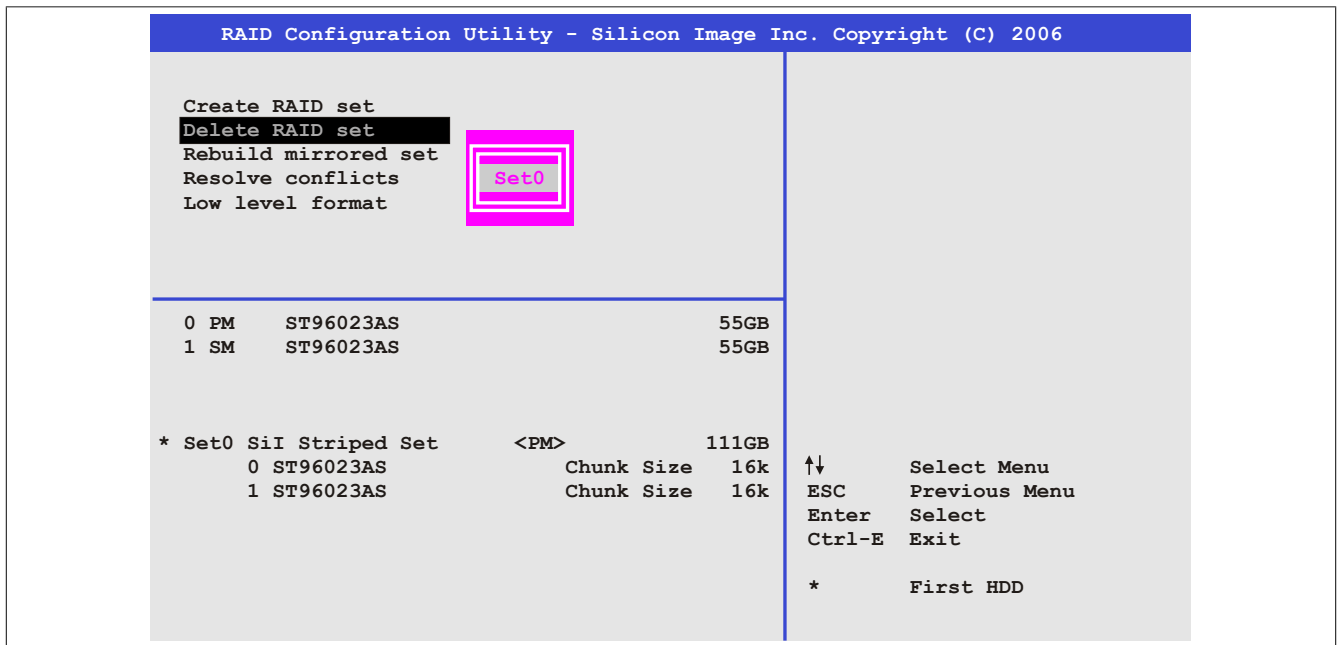


Figure 85: RAID Configuration Utility - Delete RAID set

An existing RAID set can be deleted using the "Delete RAID set" menu option.

5.5 Rebuild mirrored set

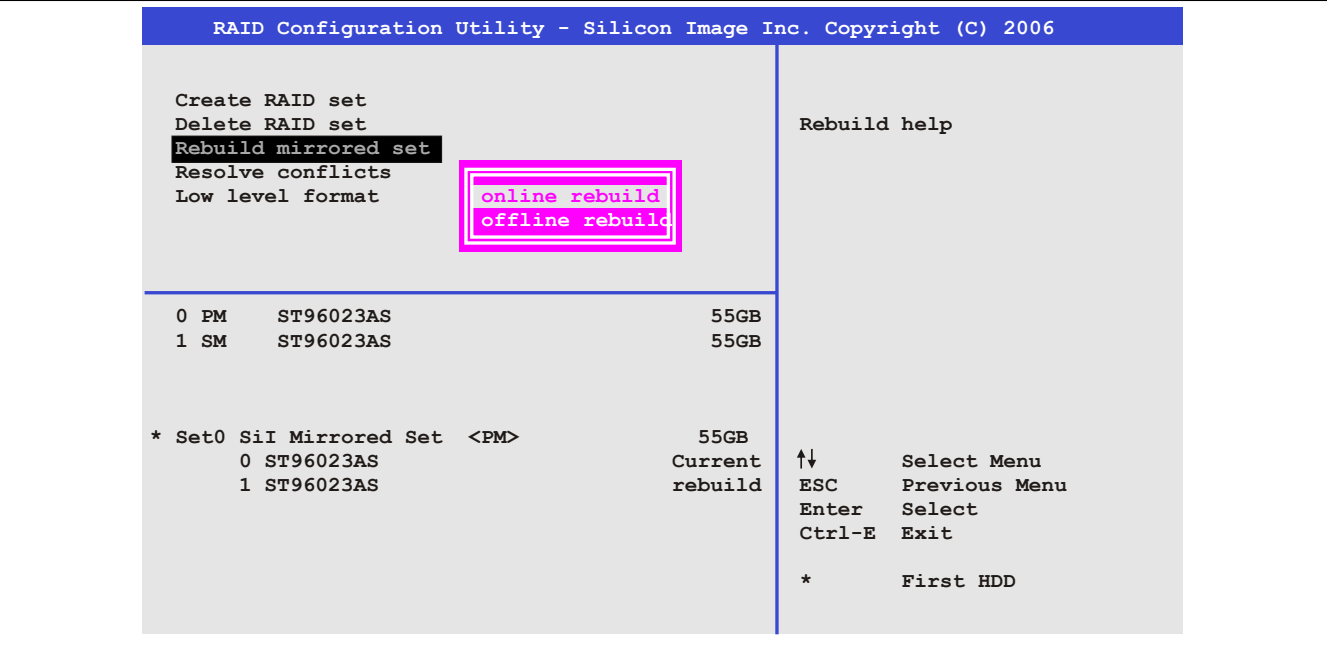


Figure 86: RAID Configuration Utility - Rebuild mirrored set

The "Rebuild mirrored set" menu option can be used to restart a rebuild procedure in a RAID 1 set if an error occurs, if a rebuild procedure was interrupted or if a hard disk was replaced.

If "Online rebuild" is selected, then the rebuild is executed during operation after the system is booted. The installed SATA RAID configuration program may display an event pop-up message: SATA Raid detected a new event before restarting the rebuild. The entire rebuild takes approximately 50 minutes.

If "Offline rebuild" is selected, then a rebuild is performed immediately before the operating system is started (duration depends on the respective memory size).

5.6 Resolve conflicts

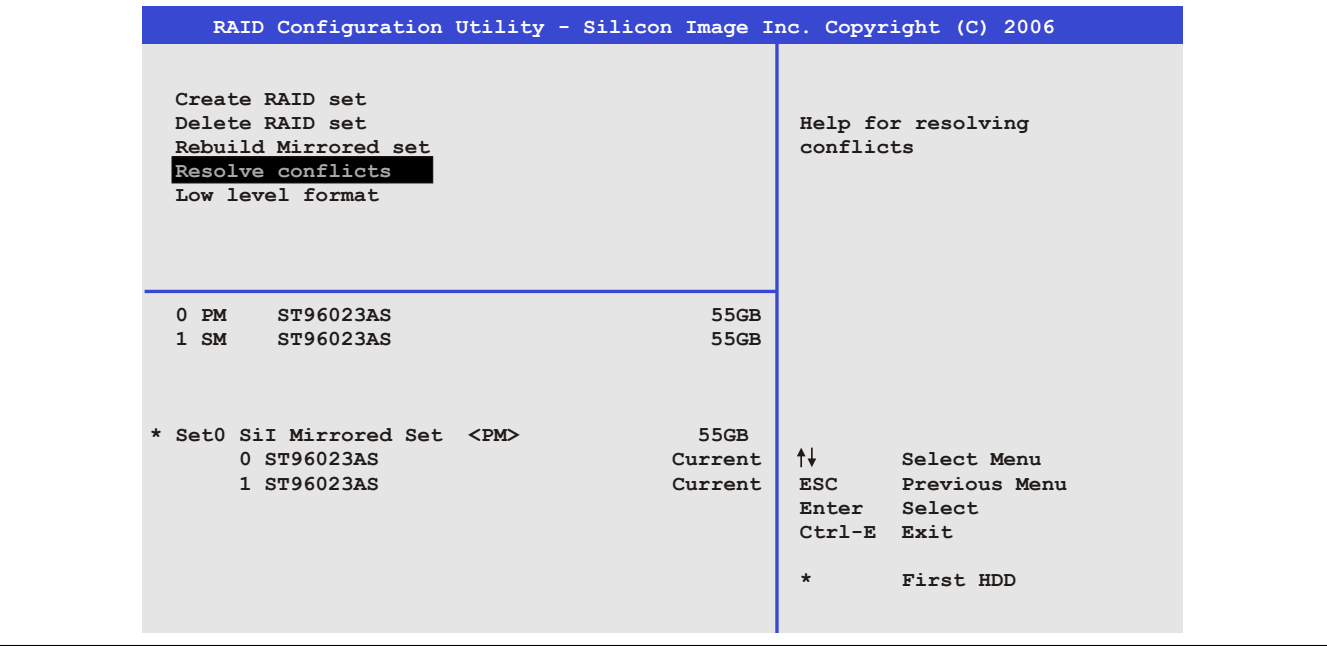


Figure 87: RAID Configuration Utility - Resolve conflicts

Conflicts in a RAID set can be resolved using the "Resolve conflicts" menu option. This function is only available if the status of the hard disk is "Conflict".

5.7 Low level format

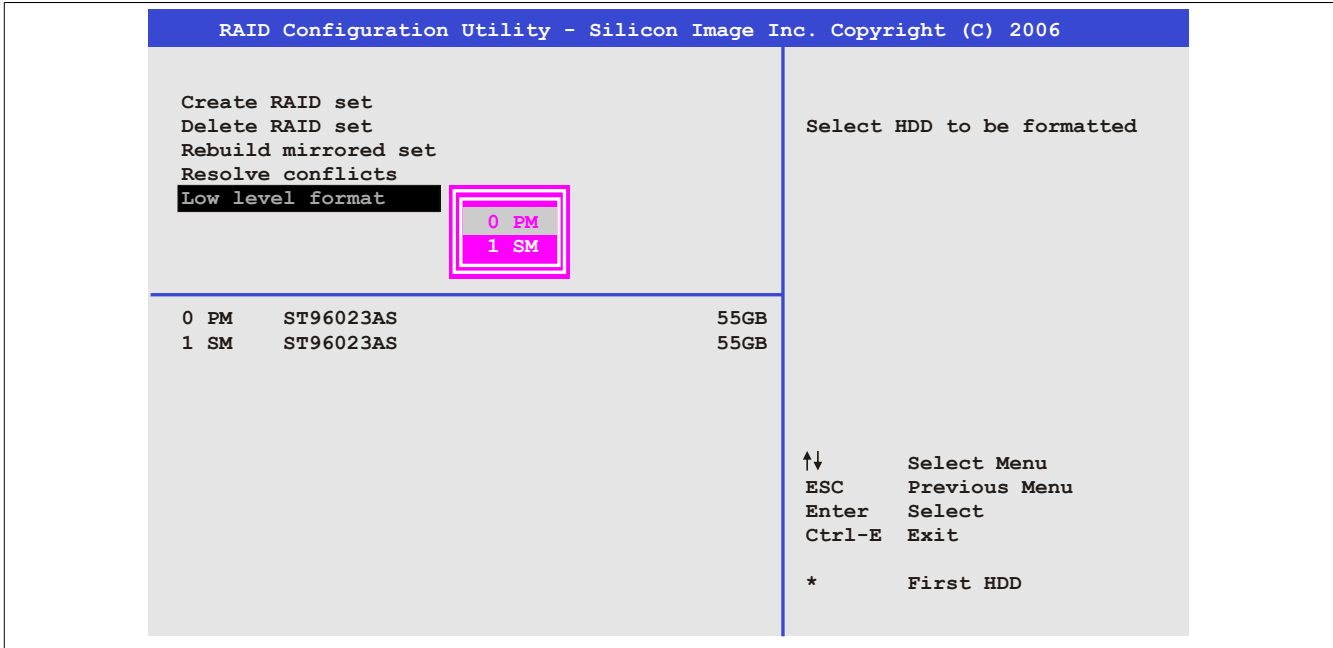


Figure 88: RAID Configuration Utility - Low level format

Individual hard disks can be configured using the "Low level format" menu option. This can only be done if a RAID set is not configured. A low level format of a hard drive takes approx. 40 minutes.

## 6 Configuring a SATA RAID set using the internal RAID controller

The following [software](#) description applies to the internal RAID controller on the QM77 chipset. The HM76 chipset does not provide RAID support.

### Information:

B&R recommends using only drives of the same type in a SATA RAID set (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 consideration when setting up a RAID set with SSDs or CFast cards (with MLC technology).

In order to create a SATA RAID set and get into the "Configuration Utility", *SATA mode selection* must be set to *RAID* in the "Advanced - SATA configuration" menu.

The "Configuration Utility" in BIOS must be started in order to make the necessary settings. After POST, pressing <Ctrl+I> opens 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 89: Configuration Utility - Boot

```
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 90: Configuration Utility - Overview



The following keys can be used once inside BIOS Setup:

| Key      | Function                                   |
|----------|--|
| Cursor ↑ | Moves to the previous item                 |
| Cursor ↓ | Moves to the next item                     |
| Enter    | Selects an item or opens a submenu         |
| ESC      | Returns to the previous menu               |
| Ctrl+E   | Saves any changed settings and exits setup |

Table 184: BIOS-relevant keys in the RAID Configuration Utility

## 6.1 Create RAID volume

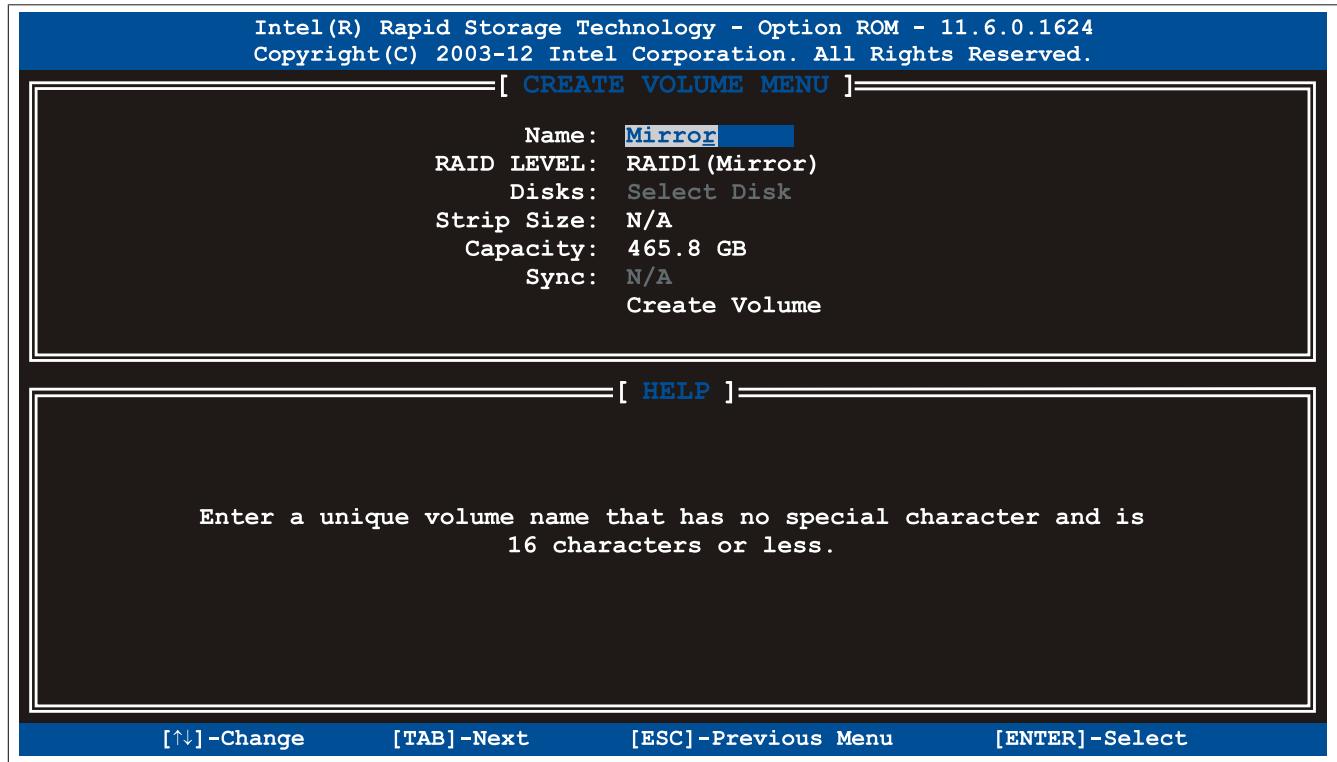


Figure 91: Configuration Utility - Create RAID volume

| Parameter                | Function  | 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 <sup>1)</sup>      | Specifies the installed hard disks as either master or recovery | Master, Recovery                        | Defines the hard disks as master or recovery  |
| Strip size <sup>2)</sup> | 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 <sup>3)</sup>       | 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 185: 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)*.
- 3) This setting is only possible if *RAID level* is set to *Recovery*.

6.2 Delete RAID volume

The "Delete RAID volume" menu option 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.

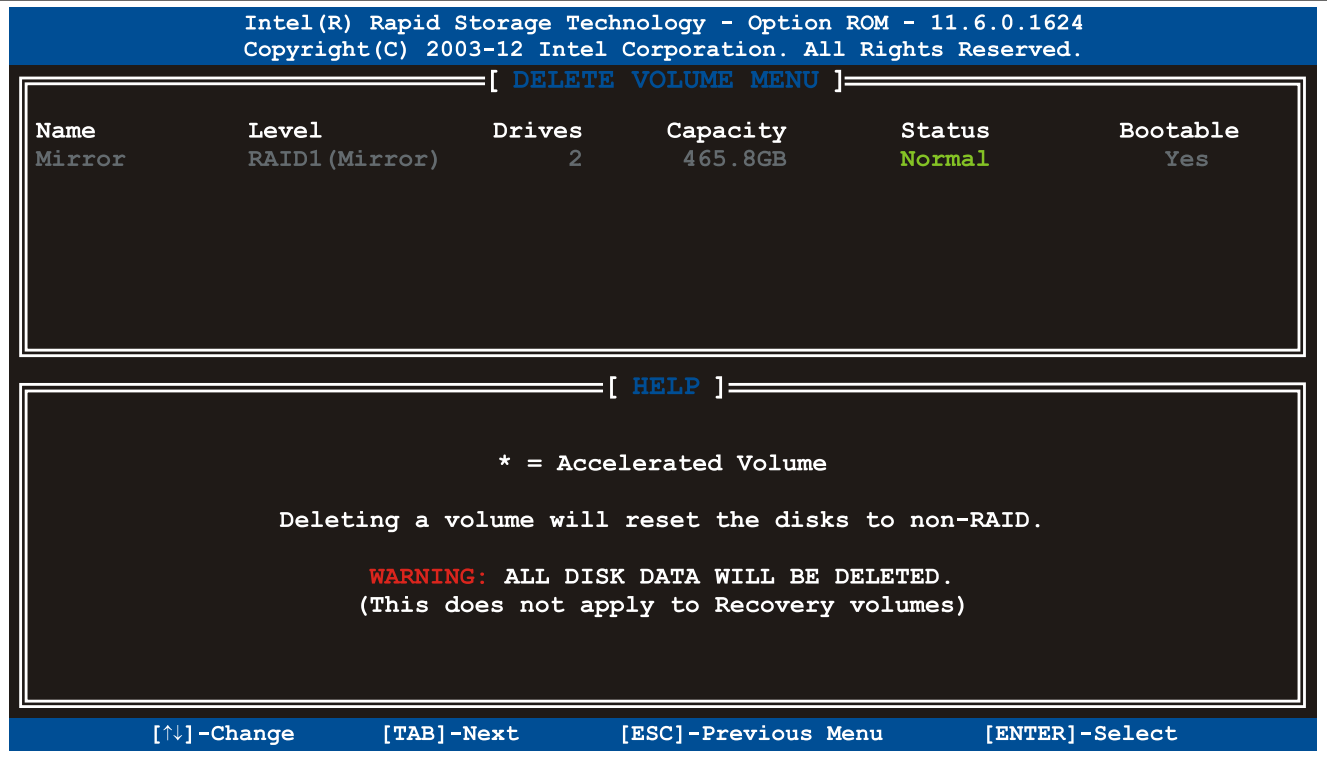


Figure 92: Configuration Utility - Delete RAID volume

### 6.3 Reset disks to non-RAID

An existing RAID set can be deleted using the "Reset disks to non-RAID" option. The RAID to be deleted is selected and then deleted by pressing <SPACE> (<ENTER> to confirm).

#### Information:

Deleting a RAID set also deletes all of the data on the drive.

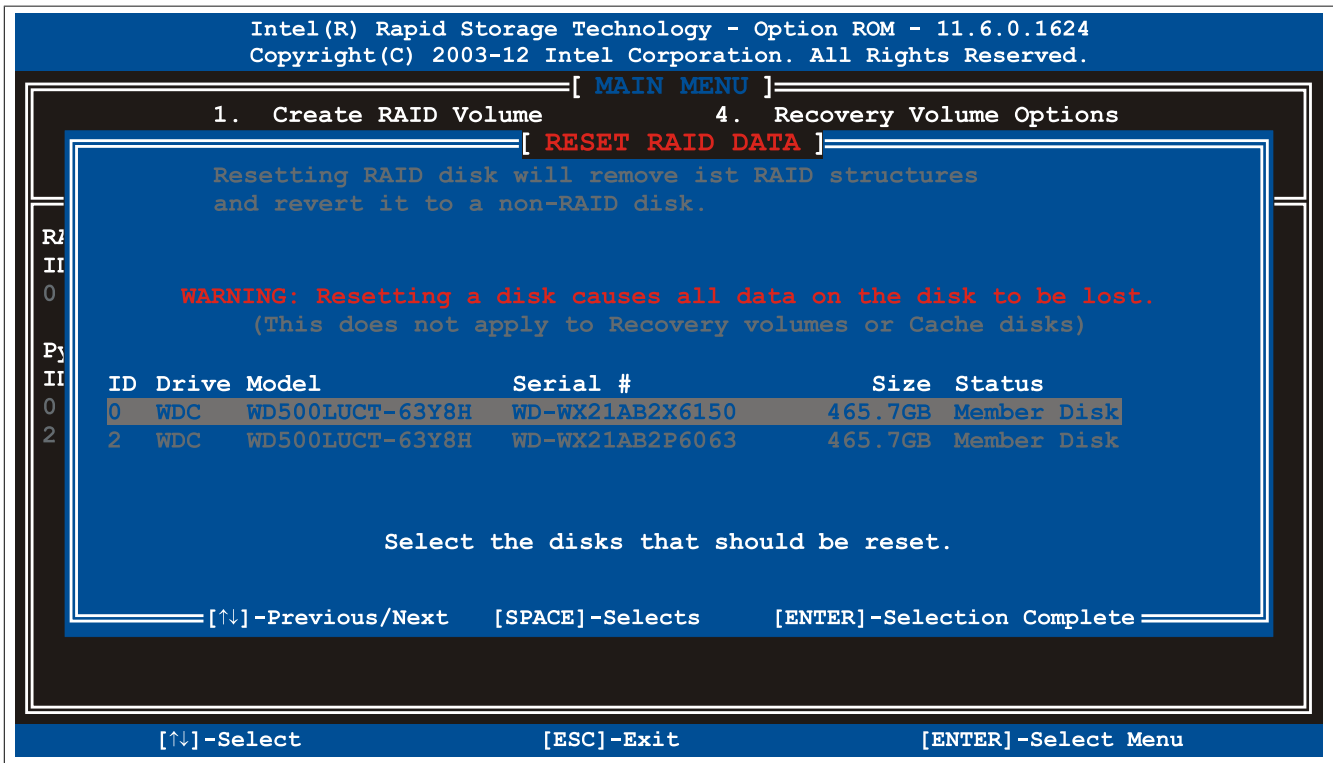


Figure 93: Configuration Utility - Reset disks to non-RAID

## 6.4 Recovery volume options

The "Recovery volume options" menu option [can](#) be used to enable/disable recovery disk and master disk.

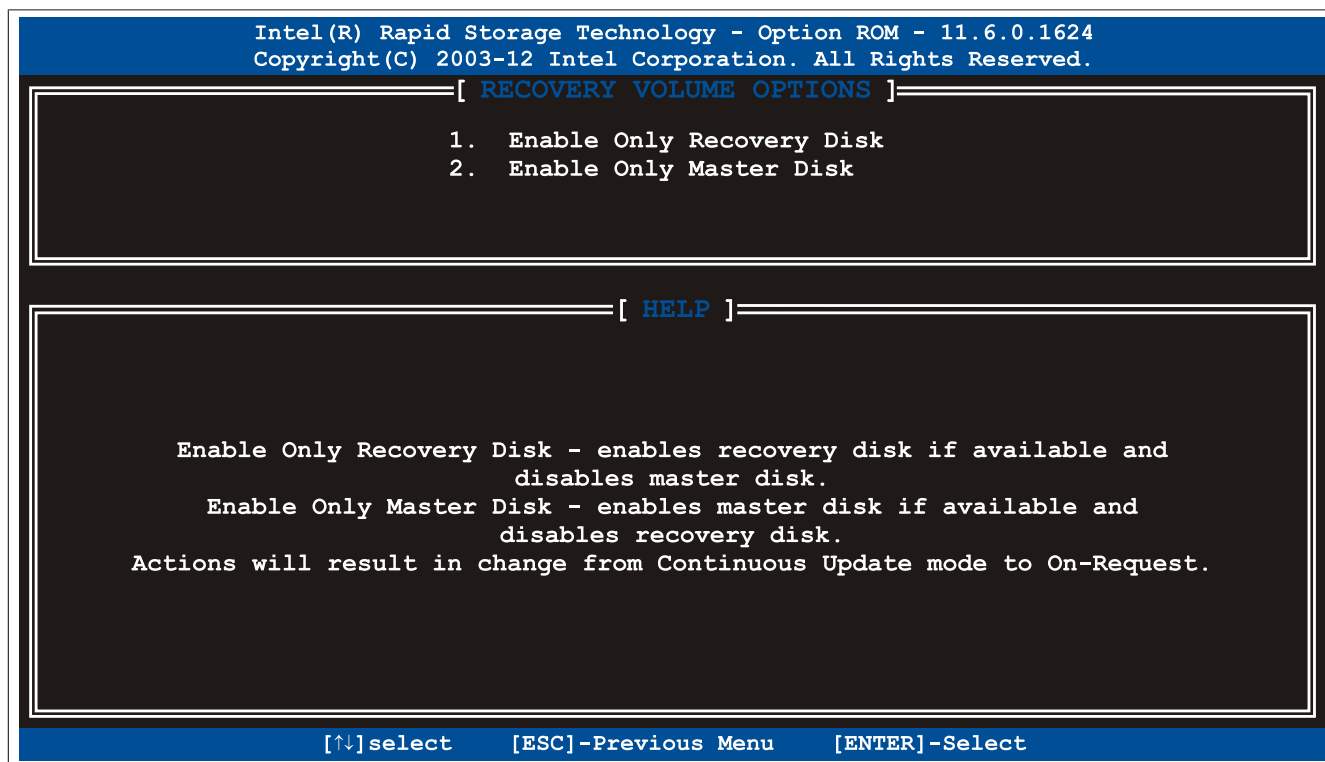


Figure 94: Configuration Utility - Recovery volume options

## 7 Known problems / Issues

- The **CAN** IF option is supported in PVI for Windows XP Professional and Windows Embedded Standard 2009. The 5AC901.ICAN-00 **interface** option is no longer supported by PVI V4.2.5 or Windows **CAN** Driver V3.0 beginning with Windows 7.
- Support for three independent displays is only possible in the following combination:
  - 1x DisplayPort monitor connected directly to the **Automation** PC's DisplayPort **interface**
  - 1x DisplayPort monitor connected via the 5AC901.LDPO-00 monitor/panel option
  - 1x SDL/DVI or RGB connected via the monitor/panel **interface**
- When using a PCI or PCIe RAID **controller**, we recommend disabling ASPM or power management for the respective PCI or PCIe slot.
- The **USB** 2.0 transfer rate is limited to 30 Mbit/s with SDL3.
- The SDL3 transmitter continuously emulates a display using **EDID data** and hot plugging code, which allows **DVI**-compatible operation. For this reason, operating multiple displays may result in incorrect graphic representations. This **can** occur in the following circumstances:
  - No cable connected
  - No connection established between the SDL3 link module and the SDL3 receiver

It is possible to get around these incorrect graphic representations by making suitable settings to **BIOS** or the graphics driver.

- If problems occur with the ETH1 **interface** (connection aborted, slow data transfer, etc.), one possible solution is to disable the EEE feature (Energy Efficient **Ethernet**) in the driver.
- The **Automation** PC 910 onboard DisplayPort **interface** does not work in combination with **CPU** board 5PC900.TS17-0x.

## Chapter 4 • Software

### 1 BIOS options

#### Information:

The following diagrams, BIOS menu items and their descriptions refer to BIOS version 1.23. It is therefore possible that these diagrams and BIOS descriptions will not correspond with the BIOS version actually installed. In addition, the BIOS menu items provided depend on the system configuration.

#### 1.1 General information

BIOS is an acronym for "Basic Input/Output System". It is the most basic standardized interface between the user and the system (hardware). The BIOS system used in this B&R Industrial PC was developed by American Megatrends, Inc.

The BIOS Setup utility can be used to modify basic system configuration settings. These settings are stored in CMOS and EEPROM memory (as a backup).

CMOS data is buffered by a battery (if present) and remains stored on the B&R Industrial PC even when the power is turned off (no 24 VDC supply).

#### 1.2 BIOS Setup and boot procedure

BIOS is activated immediately when switching on the power supply or pressing the power button on the B&R Industrial PC. The system checks if the setup data from EEPROM memory is "OK". If the data is "OK", then it is transferred to CMOS. If the data is "Not OK", then the CMOS data is checked to see whether it is valid. An error message is output if the CMOS data contains errors, and the boot procedure can be continued by pressing <F1>. To prevent an error message from appearing on each restart, launch the BIOS Setup utility by pressing <F2> and resave the settings.

BIOS reads the system configuration information, checks and configures the system with the Power-On Self-Test (POST).

When these "preliminaries" are finished, BIOS looks for an operating system on the available data storage devices (hard drive, floppy drive, etc.). BIOS then launches the operating system and hands over to it the control of system operations.

To enter BIOS Setup, press the <Del> key after the USB controller has been initialized as soon as the following message appears on the screen (during POST): "Press DEL to run SETUP".



Figure 95: Bootscreen

### 1.2.1 BIOS Setup keys

The following keys are enabled during POST:

#### Information:

Key signals from USB keyboards will only be registered after the USB controller has been initialized.

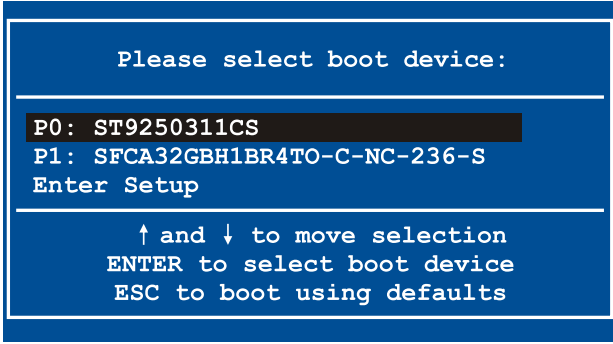
| Keys    | Function  |
|---------|---|
| Del, F2 | Opens the main BIOS Setup screen  |
| F12     | Network boot  |
| F11     | Opens the boot menu. This lists all bootable devices that are connected to the system. Selecting a device with cursor ↑, cursor ↓ and then pressing <ENTER> will boot from that device. |
|         |   |
| <Pause> | Pauses POST. Pressing any other key resumes POST.   |

Table 186: BIOS-relevant keys for POST

The following keys can be used once inside BIOS Setup:

| Key      | Function   |
|----------|--|
| F1       | Opens general help information                                 |
| Cursor ↑ | Moves to the previous item                                     |
| Cursor ↓ | Moves to the next item   |
| Cursor ← | Moves to the previous item                                     |
| Cursor → | Moves to the next item   |
| +/-      | Changes the setting for the selected function                  |
| Enter    | Changes to the selected screen                                 |
| Page ↑   | Changes to the previous page                                   |
| Page ↓   | Changes to the next page                                       |
| Home     | Jumps to the first BIOS menu item or object                    |
| End      | Jumps to the last BIOS menu item or object                     |
| F2 / F3  | Changes the colors of BIOS Setup                               |
| F7       | Resets any changes   |
| F9       | Loads and configures CMOS default values for all BIOS settings |
| F10      | Saves and exits  |
| ESC      | Exits a submenu  |

Table 187: BIOS-relevant keys

### 1.3 Main

The main BIOS Setup screen appears immediately after the <Del> button is pressed during startup.

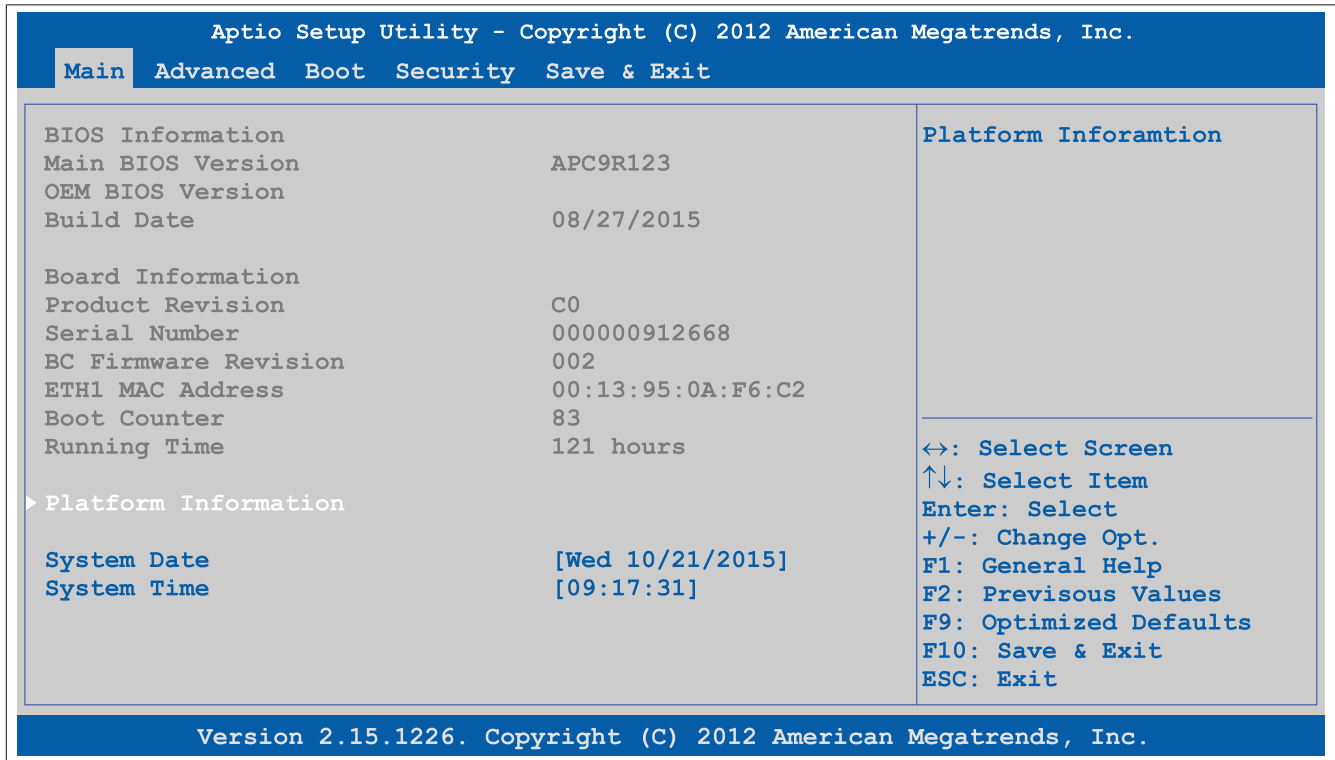


Figure 96: Main

| BIOS setting                | Function  | Configuration options  | Effect   |
|-----------------------------|---|------------------------|--|
| <b>BIOS information</b>     |   |                        |  |
| Main BIOS version           | Displays the BIOS version   | None                   | -  |
| OEM BIOS version            | Displays the OEM BIOS version   | None                   | -  |
| Build date                  | Displays the date the BIOS was created  | None                   | -  |
| <b>Board information</b>    |   |                        |  |
| Product revision            | Displays the hardware revision of the CPU board   | None                   | -  |
| Serial number               | Displays the serial number of the CPU board   | None                   | -  |
| BC firmware revision        | Displays the firmware revision of the CPU board controller  | None                   | -  |
| ETH1 MAC address            | Displays the assigned MAC address for the ETH interface   | None                   | -  |
| Boot counter                | Displays the boot counter; each restart increases the counter by one (max. 16777215)                                | None                   | -  |
| Running time                | Displays the runtime in hours (max. 65535)  | None                   | -  |
| <b>Platform information</b> | Displays information about the chipset, CPU board and main memory   | Enter                  | Opens this submenu<br>See "Platform information" on page 227.    |
| System date                 | The currently configured system date. This is buffered by the CMOS battery when the system is switched off.         | Change the system date | Sets the system date in the format Month:Day:Year (mm:dd:yyyy)   |
| System time                 | The currently configured system time setting. This is buffered by the CMOS battery when the system is switched off. | Change the system time | Sets the system time in the format Hour:Minute:Second (hh:mm:ss) |

Table 188: Main - Configuration options



## 1.3.1 Platform information

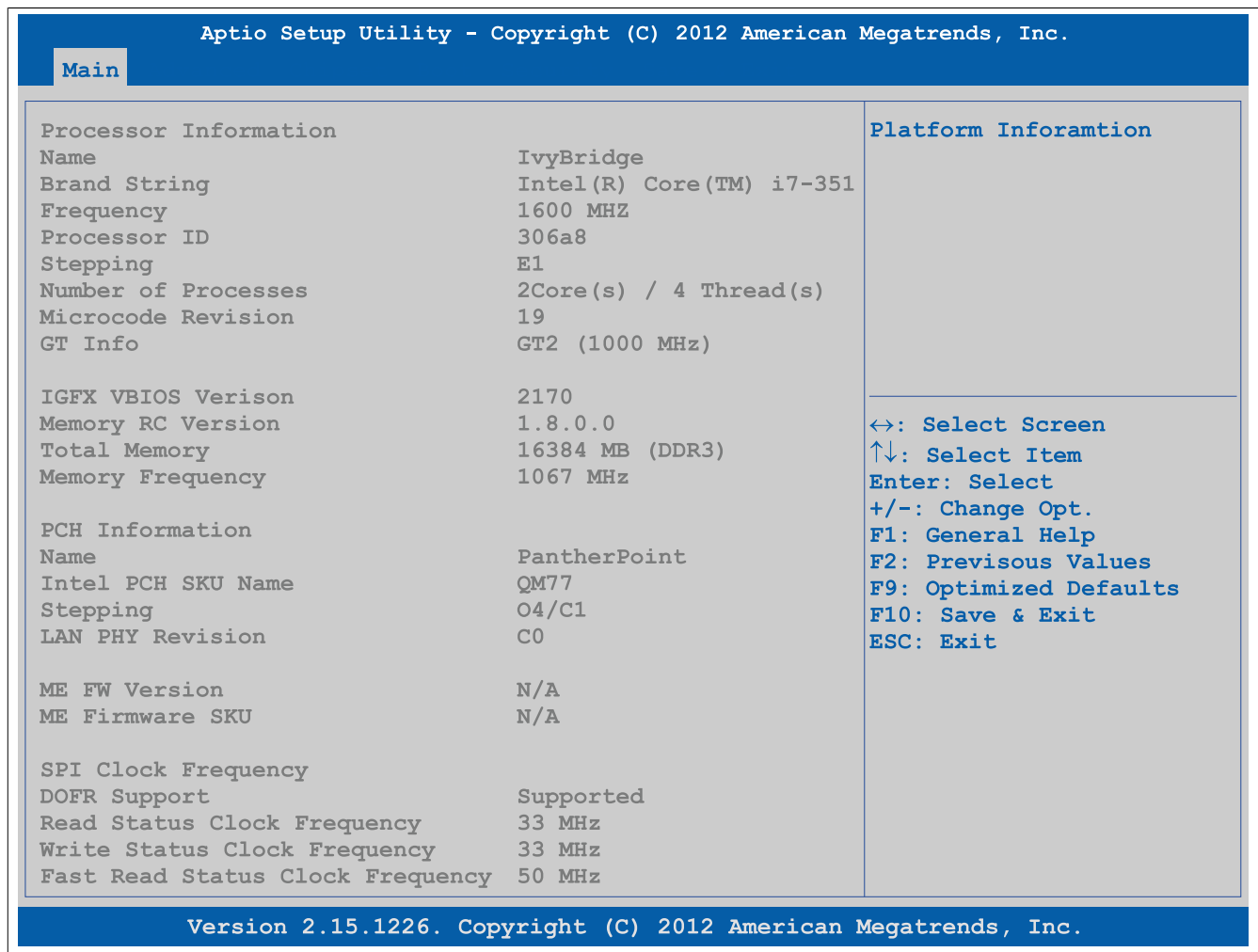


Figure 97: Main - Platform Information

| BIOS setting                     | Function   | Configuration options | Effect |
|----------------------------------|--|-----------------------|--------|
| Processor information            |  |                       |        |
| Name                             | Displays the processor architecture                      | None                  | -      |
| Brand string                     | Displays the processor type                              | None                  | -      |
| Frequency                        | Displays the processor frequency                         | None                  | -      |
| Processor ID                     | Displays the processor ID                                | None                  | -      |
| Stepping                         | Displays the processor stepping version                  | None                  | -      |
| Number of processors             | Displays the number of processor cores/threads           | None                  | -      |
| Microcode revision               | Displays the processor microcode revision                | None                  | -      |
| GT info                          | Displays GT information                                  | None                  | -      |
| IGFX VBIOS version               | Displays the IGFX VBIOS version                          | None                  | -      |
| Memory RC version                | Displays the memory RC version                           | None                  | -      |
| Total memory                     | Displays the system memory size                          | None                  | -      |
| Memory frequency                 | Displays the RAM frequency                               | None                  | -      |
| PCH information                  |  |                       |        |
| Name                             | Displays the platform controller hub                     | None                  | -      |
| Intel PCH SKU name               | Displays the chipset on the CPU board                    | None                  | -      |
| Stepping                         | Displays the chipset stepping version                    | None                  | -      |
| LAN PHY revision                 | Displays the LAN revision                                | None                  | -      |
| ME FW version                    | Displays the Intel management engine firmware version    | None                  | -      |
| ME firmware SKU                  | Displays the Intel management stock-keeping unit version | None                  | -      |
| SPI clock frequency              |  |                       |        |
| DOFR support                     | Displays information about DOFR support                  | None                  | -      |
| Read status clock frequency      | Displays the clock frequency read status                 | None                  | -      |
| Write status clock frequency     | Displays the clock frequency write status                | None                  | -      |
| Fast read status clock frequency | Displays the fast read status clock frequency            | None                  | -      |

Table 189: Main - Platform information - Overview

## 1.4 Advanced

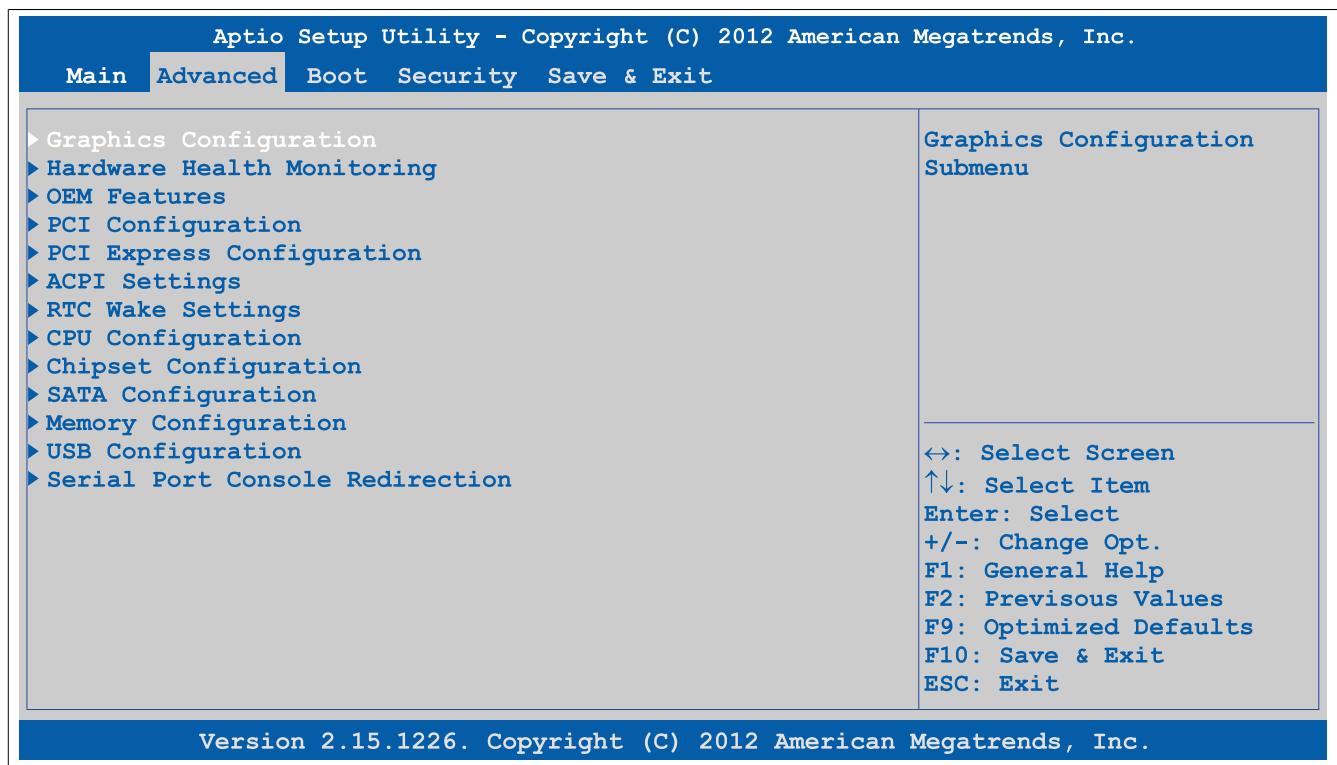


Figure 98: Advanced Übersicht

| BIOS setting                    | Function  | Configuration options | Effect   |
|---------------------------------|---|-----------------------|--|
| Graphics configuration          | Configures graphics settings  | Enter                 | Opens this submenu<br>See "Graphics configuration" on page 229.          |
| Hardware health monitoring      | Displays the current voltage levels as well as the CPU and mainboard temperatures | Enter                 | Opens this submenu<br>See "Hardware health monitoring" on page 231.      |
| OEM features                    | Configures OEM features   | Enter                 | Opens this submenu<br>See "OEM features" on page 232.                    |
| PCI configuration               | Configures PCI devices  | Enter                 | Opens this submenu<br>See "PCI configuration" on page 253.               |
| PCI express configuration       | Configures PCI Express devices  | Enter                 | Opens this submenu<br>See "PCI express configuration" on page 255.       |
| ACPI settings                   | Configures ACPI settings  | Enter                 | Opens this submenu<br>See "ACPI settings" on page 261.                   |
| RTC wake settings               | Configures the start time when switched off                                       | Enter                 | Opens this submenu<br>See "RTC wake settings" on page 262.               |
| CPU configuration               | Configures CPU settings   | Enter                 | Opens this submenu<br>See "CPU configuration" on page 263.               |
| Chipset configuration           | Configures chipset settings   | Enter                 | Opens this submenu<br>See "Chipset configuration" on page 266.           |
| SATA configuration              | Configures SATA settings  | Enter                 | Opens this submenu<br>See "SATA configuration" on page 268.              |
| Memory configuration            | Configures main memory settings   | Enter                 | Opens this submenu<br>See "Memory configuration" on page 271.            |
| USB configuration               | Configures USB settings   | Enter                 | Opens this submenu<br>See "USB configuration" on page 274.               |
| Serial port console redirection | Configures the remote console redirection   | Enter                 | Opens this submenu<br>See "Serial port console redirection" on page 277. |

Table 190: Advanced - Overview

## 1.4.1 Graphics configuration

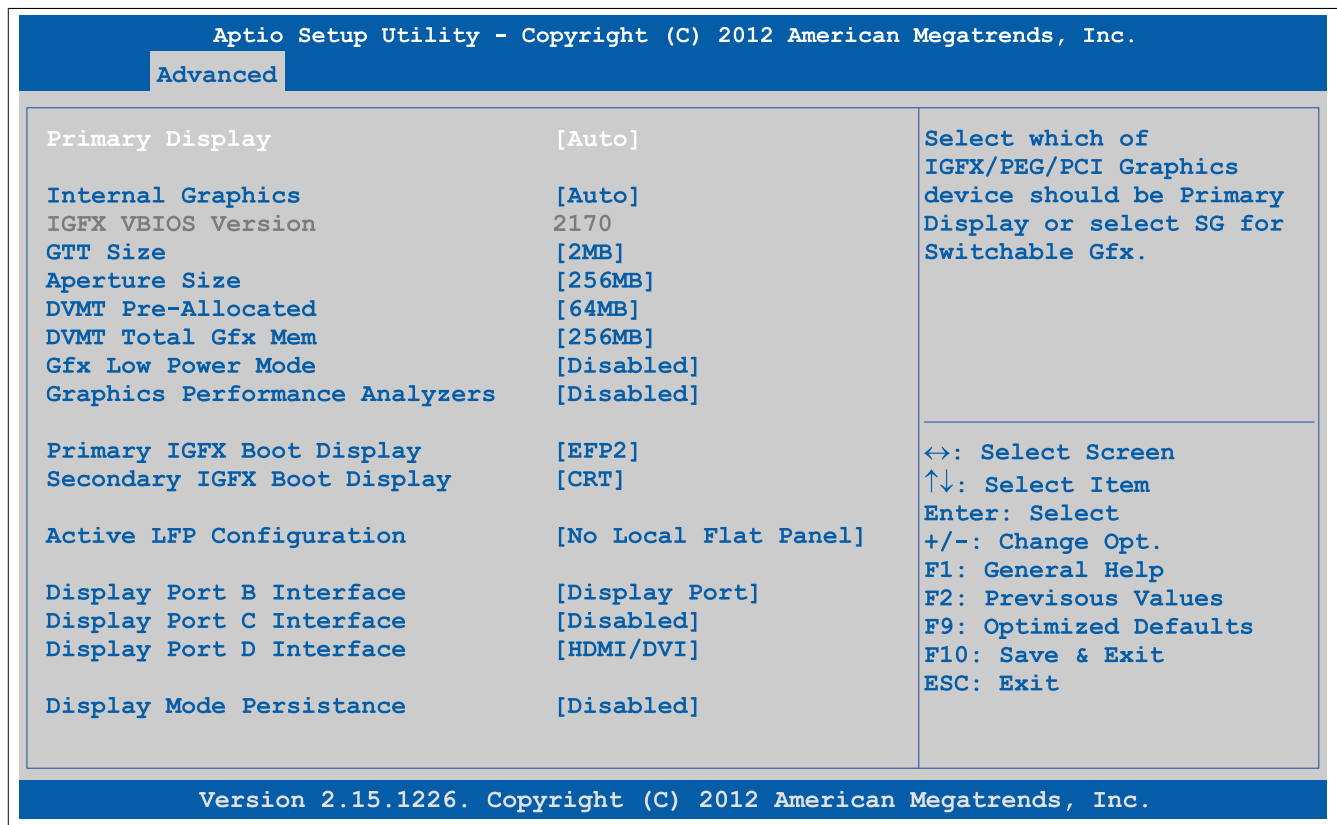


Figure 99: Advanced - Graphics Configuration

| BIOS setting   | Function   | Configuration options   | Effect   |
|--|--|---|--|
| Primary display  | Option for selecting the primary display <a href="#">device</a>  | Auto  | Configures the display <a href="#">device</a> automatically  |
|  |  | IGD   | Uses the internal graphics chip on the <a href="#">CPU</a> board as the display <a href="#">device</a>         |
|  |  | PEG   | Uses an external PCI Express graphics card connected to the x16 PEG port as the display <a href="#">device</a> |
|  |  | PCI   | Uses the graphics chip of a connected graphics card as the display <a href="#">device</a>                      |
| Internal graphics  | Option for configuring the internal graphics chip  | Auto  | Enables the internal graphics chip   |
|  |  | Disabled  | Disables the internal graphics chip  |
|  |  | Enabled   | Enables the internal graphics chip   |
| IGFX VBIOS version   | Displays the IGFX <a href="#">BIOS</a> version   | None  | -  |
| GTT size   | Option for setting the GTT size  | 1 <a href="#">MB</a>  | 1 <a href="#">MB</a> GTT   |
|  |  | 2 <a href="#">MB</a>  | 2 <a href="#">MB</a> GTT   |
| Aperture size  | Option for configuring the maximum amount of <a href="#">RAM</a> made available to the main memory when graphics memory is full  | 128M  | Reserves 128 <a href="#">MB</a>  |
|  |  | 256M  | Reserves 256 <a href="#">MB</a>  |
|  |  | 512M  | Reserves 512 <a href="#">MB</a>  |
| DVMT pre-allocated   | Option for setting the fixed amount of memory used for the internal graphics <a href="#">controller</a>  | 32 <a href="#">MB</a> , 64 <a href="#">MB</a> , 96 <a href="#">MB</a> up to 1024 <a href="#">MB</a> | Defines the fixed graphic memory as a value between 32 and 1024 <a href="#">MB</a>                             |
| DVMT total gfx mem   | Option for setting the amount of memory that <a href="#">can</a> be used for the internal graphics <a href="#">controller</a> . Memory over the permanently assigned graphics memory is assigned dynamically according to the DVMT 5.0 standard. | 128M  | Allocates 128 <a href="#">MB</a> of main memory  |
|  |  | 256M  | Allocates 256 <a href="#">MB</a> of main memory  |
|  |  | MAX   | Allocates the entire main memory   |
| Gfx low power mode   | Option for setting the power saving function for the graphics <a href="#">controller</a>   | Enabled   | Enables low power mode. The graphics <a href="#">con-<br/>troller</a> does not operate at full speed.          |
|  |  | Disabled  | Disables low power mode  |
| <div><div></div><div><div>Information:</div><div>This option <a href="#">can</a> only be used for SFF.</div></div></div> |  |   |  |
| Graphics performance analyzers   | Option for enabling/disabling the Intel graphics performance analyzers   | Enabled   | Enables this function  |
|  |  | Disabled  | Disables this function   |
| Primary IGFX boot display  | Option for defining the primary enabled display <a href="#">device</a> during booting.   | VBIOS default   | Uses the default setting from IGFX <a href="#">BIOS</a>  |
|  |  | <a href="#">CRT</a>   | Uses the <a href="#">CRT</a> (cathode ray tube) channel  |
|  |  | LFP   | Uses the LFP (local flat panel) channel  |
|  |  | EFP   | Uses the EFP (external flat panel) channel   |

Table 191: Advanced - Graphics configuration options

| BIOS setting                | Function   | Configuration options | Effect  |
|-----------------------------|--|-----------------------|---|
|                             | <b>Information:</b><br><br>The numbering of EFP occurs dynamically depending on the DisplayPort interface (B/C/D).   | EFP2                  | Uses the EFP2 (external flat panel 2) channel   |
|                             |  | EFP3                  | Uses the EFP3 (external flat panel 3) channel   |
| Secondary IGFX boot display | Option for defining the secondary enabled panel during POST<br><br><b>Information:</b><br><br>The numbering of EFP occurs dynamically depending on the DisplayPort interface (B/C/D).<br><br><b>Information:</b><br><br>After the BIOS boot screen, nothing more is shown on this display until the graphics driver is reloaded by the operating system. | Disabled              | Disables this function. Only shows POST on one display.   |
|                             |  | CRT                   | Uses the CRT (cathode ray tube) channel   |
|                             |  | LFP                   | Uses the LFP (local flat panel) channel   |
|                             |  | EFP                   | Uses the EFP (external flat panel) channel  |
|                             |  | EFP2                  | Uses the EFP2 (external flat panel 2) channel   |
|                             |  | EFP3                  | Uses the EFP3 (external flat panel 3) channel   |
| Active LFP configuration    | Option for selecting the active LFP (local flat panel) channel<br><br><b>Information:</b><br><br>This option has no effect on the Automation PC 910.   | No local flat panel   | Does not use the LVDS channel   |
|                             |  | Integrated LVDS       | Uses the integrated LVDS channel  |
| Display port B interface    | Option for selecting the display device that is connected to the DisplayPort interface   | Disabled              | Disables the DisplayPort interface  |
|                             |  | DisplayPort           | Configures the DisplayPort interface as a DisplayPort interface   |
|                             |  | HDMI/DVI              | Configures the DisplayPort interface as an HDMI/DVI interface   |
| Display Port C interface    | Option for selecting the display device that is connected to the monitor/panel option  | Disabled              | Disables the monitor/panel option   |
|                             |  | DisplayPort           | Configures the monitor/panel option as a DisplayPort interface  |
|                             |  | HDMI/DVI              | Configures the monitor/panel option as an HDMI/DVI interface  |
| Display Port D interface    | Option for selecting the display device that is connected to the monitor/panel interface   | Disabled              | Disables the monitor/panel interface  |
|                             |  | DisplayPort           | Configures the monitor/panel interface as a DisplayPort interface<br><br><b>Information:</b><br><br>The monitor/panel interface can no longer be used when this setting is selected. This setting is not permitted for the monitor/panel interface! |
|                             |  | HDMI/DVI              | Configures the monitor/panel interface as an HDMI/DVI interface   |
| Display mode persistence    | Display mode persistence means that the operating system remembers and can restore previous display connection configurations. For example, a dual DVI configuration is automatically restored when both DVI monitors are reconnected, even if only one of them was connected and enabled during a previous boot.  | Disabled              | Disables this function  |
|                             |  | Enabled               | Enables this function   |

Table 191: Advanced - Graphics configuration options

## 1.4.2 Hardware health monitoring

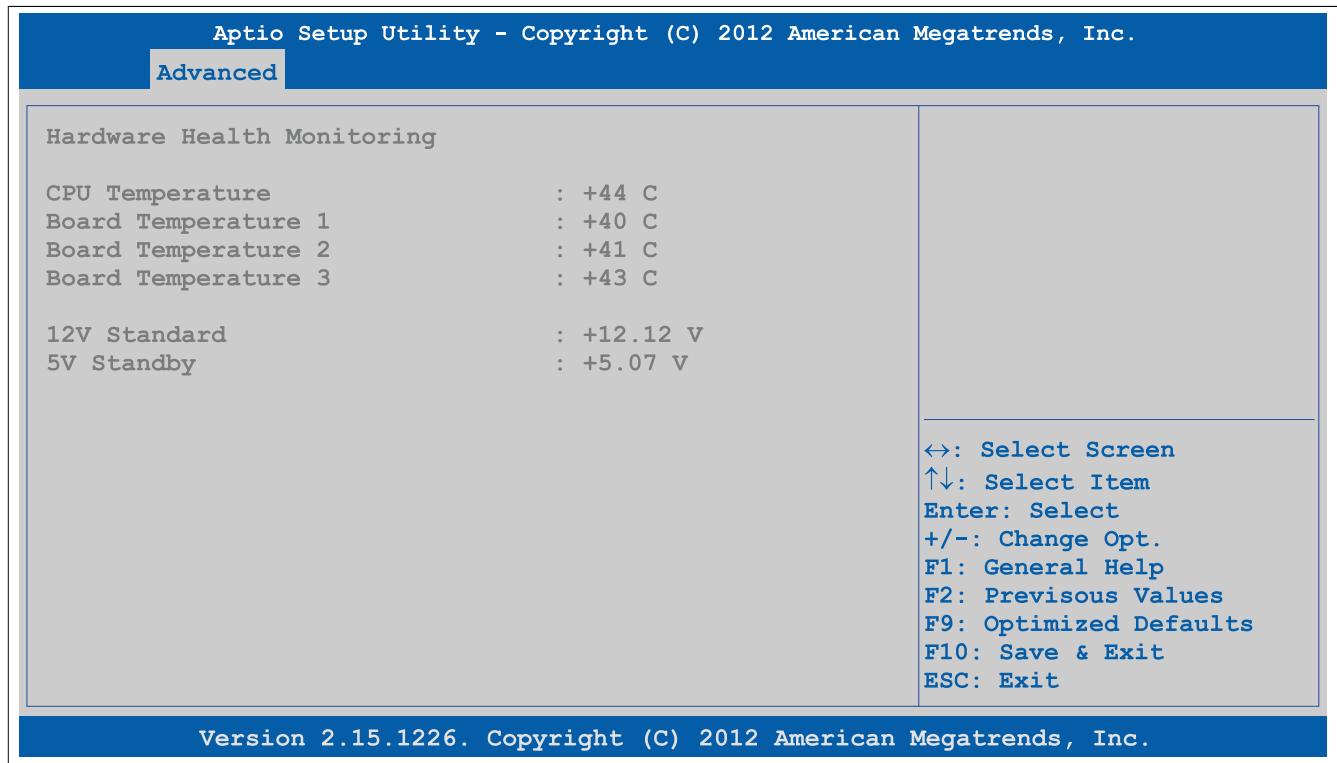


Figure 100: Advanced - Hardware Health Monitoring

| BIOS setting        | Function   | Configuration options | Effect |
|---------------------|--|-----------------------|--------|
| CPU temperature     | Displays the current temperature of the CPU sensor in °C | None                  | -      |
| Board temperature 1 | Displays the current temperature of board sensor 1 in °C | None                  | -      |
| Board temperature 2 | Displays the current temperature of board sensor 2 in °C | None                  | -      |
| Board temperature 3 | Displays the current temperature of board sensor 3 in °C | None                  | -      |
| 12 V (default)      | Displays the current voltage of the 12 volt supply       | None                  | -      |
| 5 V standby         | Displays the current voltage of the 5 volt supply        | None                  | -      |

Table 192: Advanced - Hardware health monitoring

## 1.4.3 OEM features

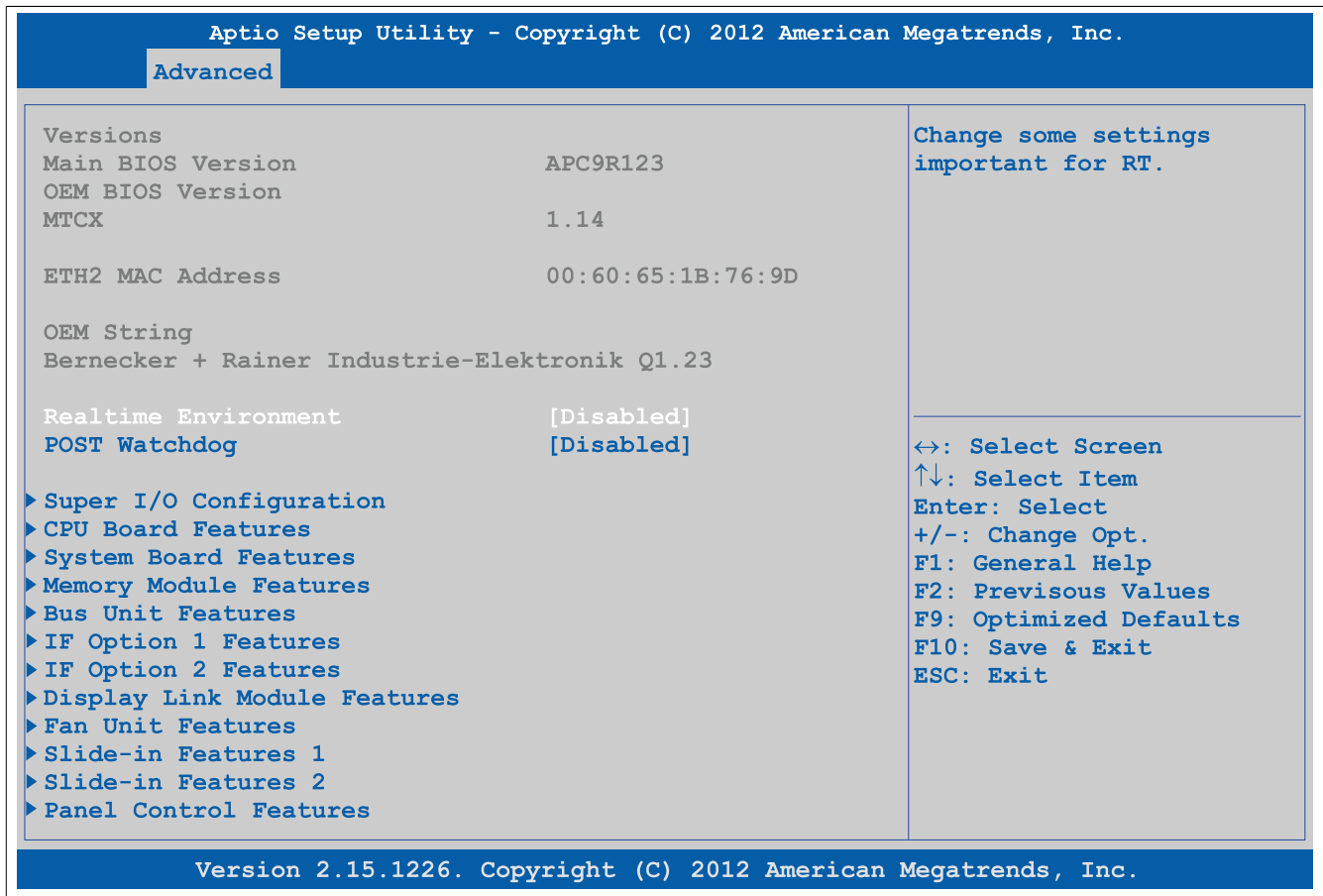


Figure 101: Advanced - OEM Features

| BIOS setting                               | Function   | Configuration options | Effect   |
|--|--|-----------------------|--|
| Main BIOS version                          | Displays the installed B&R BIOS version  | None                  | -  |
| OEM BIOS version                           |  | None                  | -  |
| MTCX                                       | Displays the installed MTCX version  | None                  | -  |
| ETH2 MAC address                           | Displays the assigned MAC address for the ETH2 interface   | None                  | -  |
| Realtime environment                       | Configures settings for real-time operating systems such as ARwin  | Disabled              | Disables this function   |
|  |  | Enabled               | Disables hyper-threading, turbo mode and EIST. Also disables ASPM and the IRQ of root ports 2 and 3. |
| POST watchdog                              | Option for configuring the POST watchdog. This starts at the beginning of POST and stops at the end of POST. | Disabled              | Disables this option   |
|  |  | 30 sec                | Delay time until the POST watchdog is active   |
|  |  | 1 min                 |  |
|  |  | 2 min                 |  |
|  |  | 5 min                 |  |
|  |  | 10 min                |  |
|  |  | 30 min                |  |
| Super I/O configuration                    | Configures special interface settings  | Enter                 | Opens this submenu<br>See "Super I/O configuration" on page 233.                                     |
| CPU board features                         | Displays device-specific information for the CPU board   | Enter                 | Opens this submenu<br>See "CPU board features" on page 234.  |
| System board features                      | Displays device-specific information for the system unit   | Enter                 | Opens this submenu<br>See "System board features" on page 236.                                       |
| Memory module features                     | Displays device-specific information for the main memory   | Enter                 | Opens this submenu<br>See "Memory module features" on page 239.                                      |
| Bus unit features                          | Displays device-specific information for the bus unit  | Enter                 | Opens this submenu<br>See "Bus unit features" on page 240.   |
| IF option 1 features <sup>1)</sup>         | Displays device-specific information for interface option 1  | Enter                 | Opens this submenu<br>See "IF option 1 features" on page 241.  |
| IF option 2 features <sup>1)</sup>         | Displays device-specific information for interface option 2  | Enter                 | Opens this submenu<br>See "IF option 2 features" on page 243.  |
| Display link module features <sup>1)</sup> | Displays device-specific information for the monitor/panel option  | Enter                 | Opens this submenu<br>See "Display link module features" on page 244.                                |

Table 193: Advanced - OEM features screen

| BIOS setting                           | Function  | Configuration options | Effect  |
|--|---|-----------------------|---|
| Fan unit features <sup>2)</sup>        | Displays <a href="#">device</a> -specific information for the fan kit         | Enter                 | Opens this submenu<br>See "Fan unit features" on page 246.      |
| Slide-in features 1 <sup>3)</sup>      | Displays <a href="#">device</a> -specific information for slide-in drive 1    | Enter                 | Opens this submenu<br>See "Slide-in 1 features" on page 248.    |
| Slide-in features 2 <sup>3)</sup>      | Displays <a href="#">device</a> -specific information for slide-in drive 2    | Enter                 | Opens this submenu<br>See "Slide-in 2 features" on page 250.    |
| Panel <a href="#">control</a> features | Displays <a href="#">device</a> -specific information for the connected panel | Enter                 | Opens this submenu<br>See "Panel control features" on page 251. |

Table 193: Advanced - OEM features screen

- 1) This option is only shown if the corresponding option is installed in the system unit.  
2) This option is only shown if a fan kit is installed in the system unit.  
3) This option is only shown if a slide-in drive is installed in the system unit.

### 1.4.3.1 Super I/O configuration

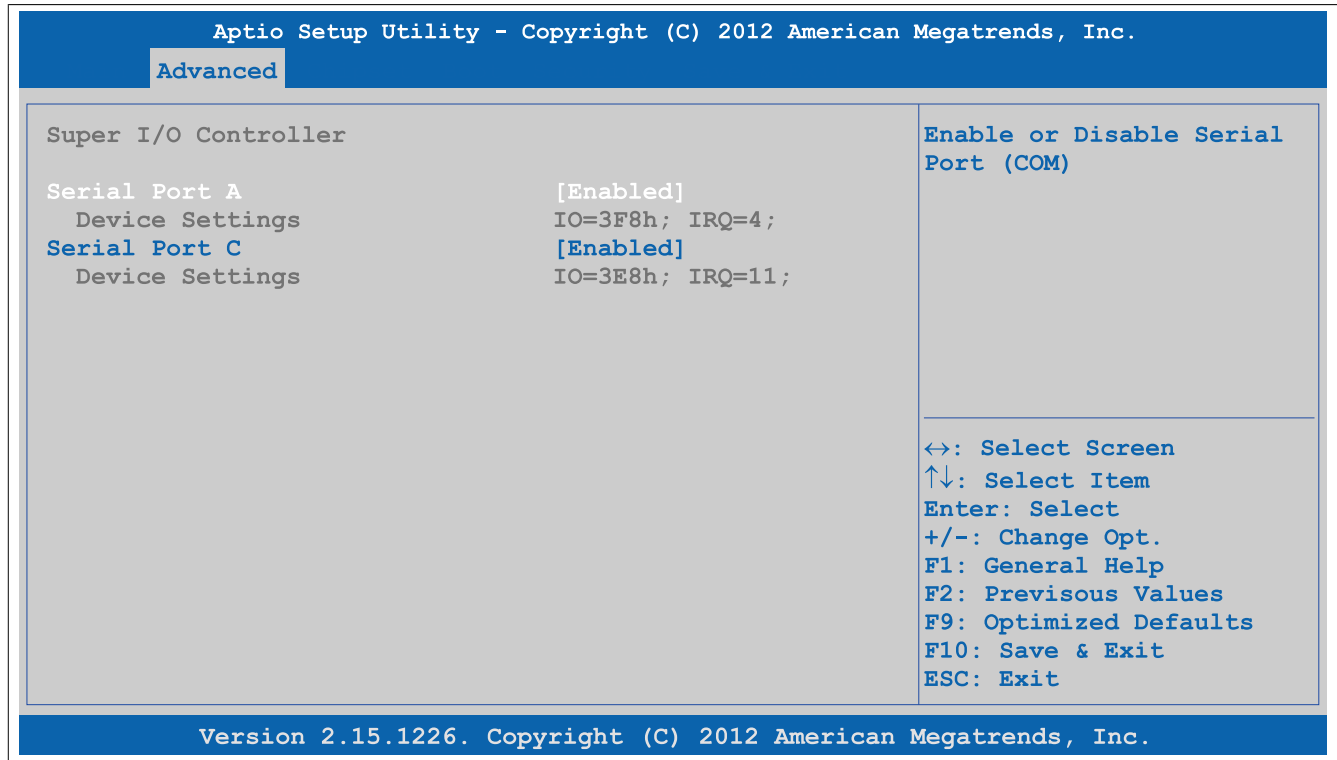


Figure 102: Advanced - OEM Features - Super I/O Configuration

| BIOS setting                 | Function   | Configuration options | Effect                                  |
|------------------------------|--|-----------------------|---|
| Serial port A                | Settings for the <a href="#">COM1</a> serial <a href="#">interface</a>   | Enabled               | Enables this <a href="#">interface</a>  |
|                              |  | Disabled              | Disables this <a href="#">interface</a> |
| Device settings              | Displays the I/O <a href="#">address</a> and interrupt of the <a href="#">COM1</a> <a href="#">interface</a>       | None                  | -                                       |
| Serial port B <sup>1)</sup>  | Setting for the monitor/panel option   | Enabled               | Enables this <a href="#">interface</a>  |
|                              |  | Disabled              | Disables this <a href="#">interface</a> |
| Device settings              | Displays the I/O <a href="#">address</a> and interrupt for the monitor/panel option                                | None                  | -                                       |
| Serial port C                | Setting for the monitor/panel <a href="#">interface</a>  | Enabled               | Enables this <a href="#">interface</a>  |
|                              |  | Disabled              | Disables this <a href="#">interface</a> |
| Device settings              | Displays the I/O <a href="#">address</a> and interrupt for the monitor/panel <a href="#">interface</a>             | None                  | -                                       |
| Serial port E <sup>1)</sup>  | Setting for the <a href="#">RS232</a> IF option in IF option slot 1  | Enabled               | Enables this <a href="#">interface</a>  |
|                              |  | Disabled              | Disables this <a href="#">interface</a> |
| Device settings              | Displays the I/O <a href="#">address</a> and interrupt for the <a href="#">RS232</a> IF option in IF option slot 1 | None                  | -                                       |
| Serial port F <sup>1)</sup>  | Setting for the <a href="#">RS232</a> IF option in IF option slot 2  | Enabled               | Enables this <a href="#">interface</a>  |
|                              |  | Disabled              | Disables this <a href="#">interface</a> |
| Device settings              | Displays the I/O <a href="#">address</a> and interrupt for the <a href="#">RS232</a> IF option in IF option slot 2 | None                  | -                                       |
| CAN controller <sup>1)</sup> | Setting for the <a href="#">CAN</a> IF option  | Enabled               | Enables this <a href="#">interface</a>  |
|                              |  | Disabled              | Disables this <a href="#">interface</a> |
| Device settings              | Displays the I/O <a href="#">address</a> and interrupt for the <a href="#">CAN</a> IF option                       | None                  | -                                       |

Table 194: Advanced - OEM features - Super I/O configuration - Configuration options

- 1) This option is only shown if the corresponding option is installed in the system unit.

1.4.3.2 CPU board features

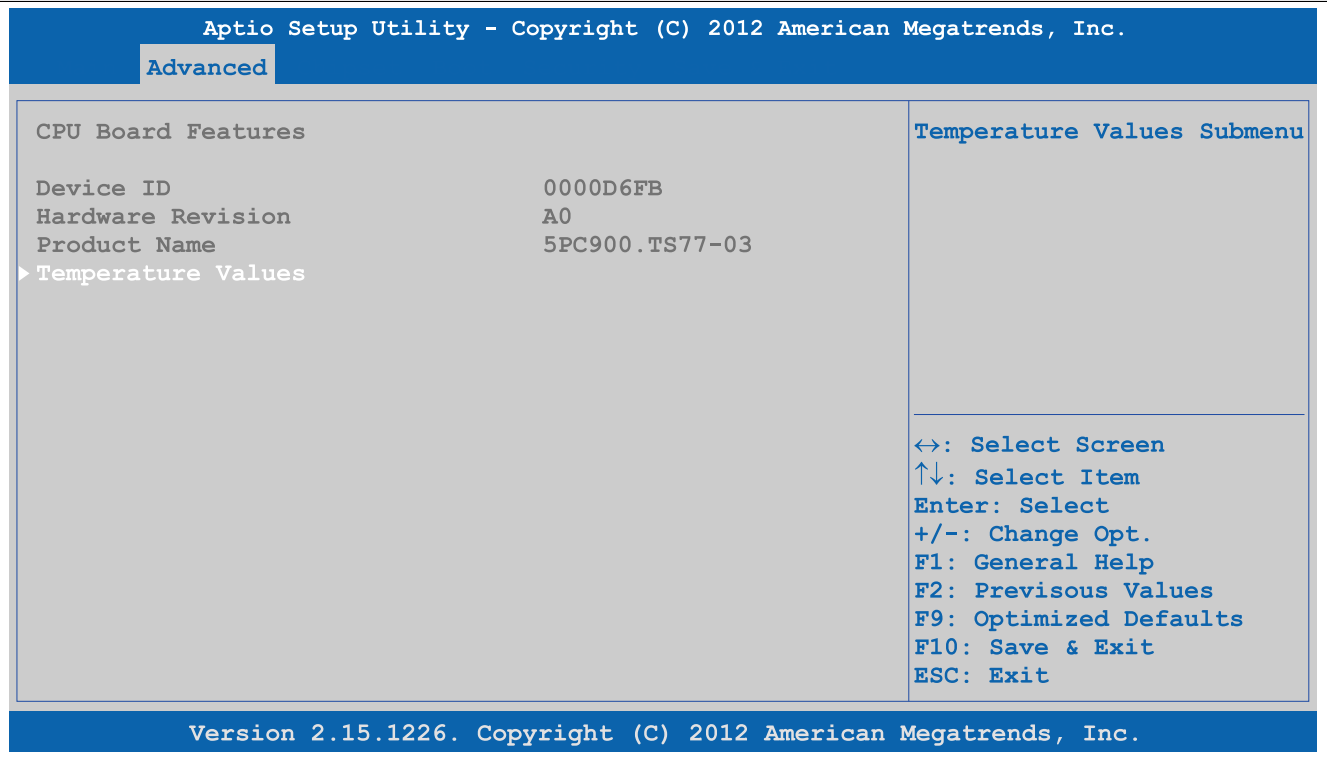


Figure 103: Advanced - OEM Features - CPU Board Features

| BIOS setting       | Function  | Configuration options | Effect  |
|--------------------|---|-----------------------|---|
| Device ID          | Displays the device ID of the CPU board         | None                  | -   |
| Hardware revision  | Displays the hardware revision of the CPU board | None                  | -   |
| Product name       | Displays the B&R model number                   | None                  | -   |
| Temperature values | Displays current temperature values             | Enter                 | Opens this submenu<br>See "Temperature values" on page 235. |

Table 195: Advanced - OEM features - CPU board features



## 1.4.3.2.1 Temperature values

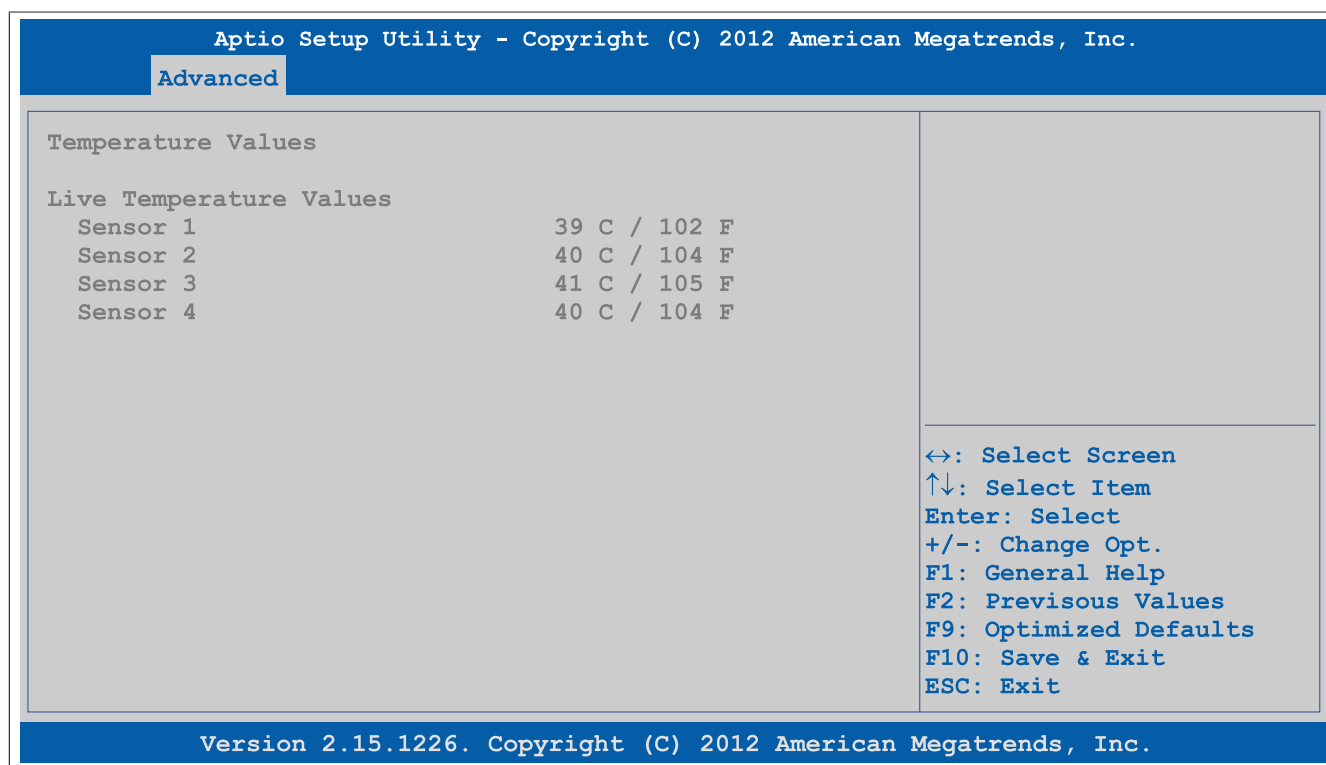


Figure 104: Advanced - OEM Features - CPU Board Features - Temperature Values

| BIOS setting | Function  | Configuration options | Effect |
|--------------|---|-----------------------|--------|
| Sensor 1     | Displays the current temperature of sensor 1 (board controller) in °C and °F        | None                  | -      |
| Sensor 2     | Displays the current temperature of sensor 2 (CPU) in °C and °F                     | None                  | -      |
| Sensor 3     | Displays the current temperature of sensor 3 (SO-DIMM 1) in °C and °F <sup>1)</sup> | None                  | -      |
| Sensor 4     | Displays the current temperature of sensor 4 (SO-DIMM 2) in °C and °F <sup>1)</sup> | None                  | -      |

Table 196: Advanced - OEM features - CPU board features - Temperature values

- 1) A valid temperature is only provided if the module is connected and equipped with a temperature sensor. Otherwise, the value 0 is output in the ADI Control Center and BIOS; an alarm is also output in the ADI Control Center.

## 1.4.3.3 System board features



Figure 105: Advanced - OEM Features - System Board Features

| BIOS setting            | Function   | Configuration options | Effect  |
|-------------------------|--|-----------------------|---|
| Device ID               | Displays the device ID of the system board   | None                  | -   |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.  | None                  | -   |
| Vendor ID               | Displays the vendor ID   | None                  | -   |
| Hardware revision       | Displays the hardware revision of the system board   | None                  | -   |
| Serial number           | Displays the B&R serial number   | None                  | -   |
| Product name            | Displays the B&R model number  | None                  | -   |
| Parent device ID        | Displays the manufacturer number   | None                  | -   |
| Parent compatibility ID | Displays the manufacturer ID   | None                  | -   |
| User serial ID          | Displays the user serial ID. This 8-digit hexadecimal value can be freely specified by the user (e.g. to give the device a unique ID) and can only be changed using the "B&R Control Center" included with the ADI driver. | None                  | -   |
| Statistical values      | Displays statistical values  | Enter                 | Opens this submenu<br>See "Statistical values" on page 237. |
| Temperature values      | Displays current temperature values  | Enter                 | Opens this submenu<br>See "Temperature values" on page 237. |
| Voltage control         | Displays current battery properties  | Enter                 | Opens this submenu<br>See "Voltage values" on page 238.     |

Table 197: Advanced - OEM features - System board features

### 1.4.3.3.1 Statistical values

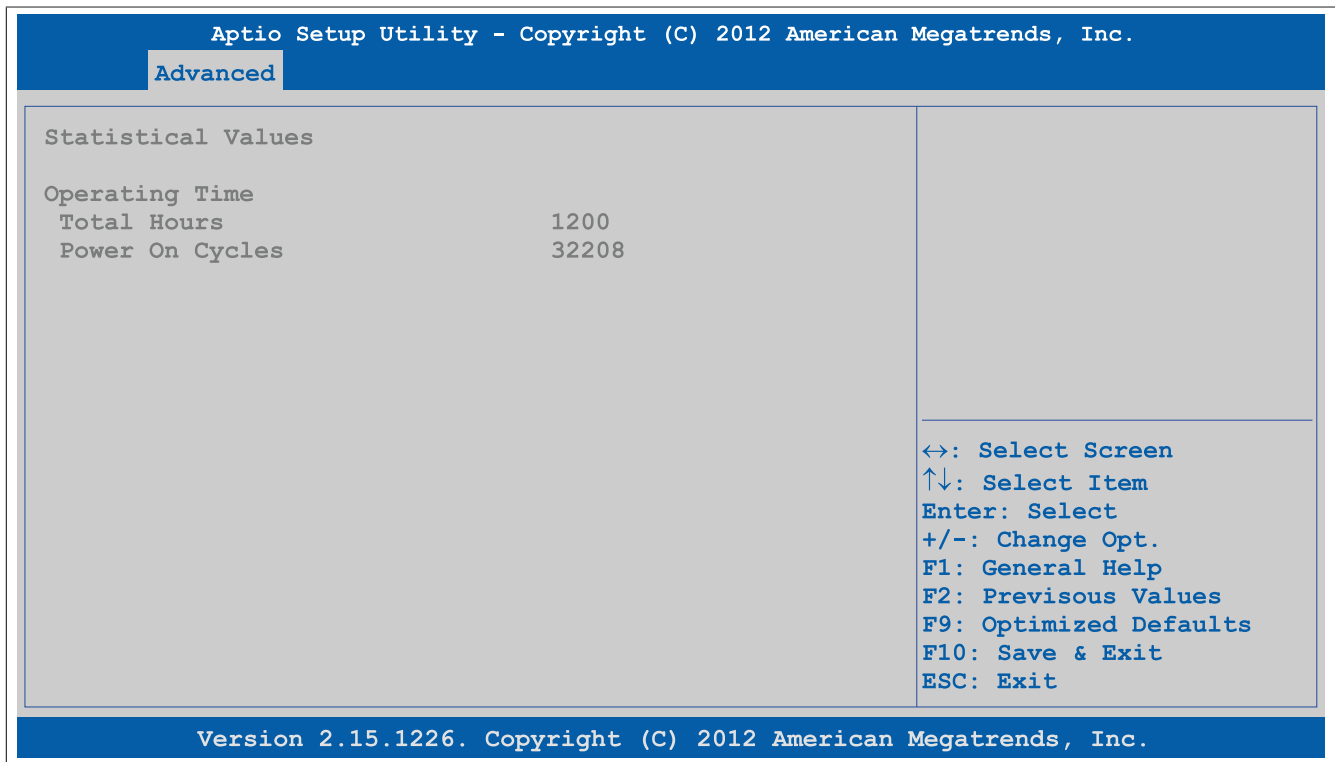


Figure 106: Advanced - OEM Features - System Board Features - Statistical Values

| BIOS setting    | Function   | Configuration options | Effect |
|-----------------|--|-----------------------|--------|
| Total hours     | Displays the runtime in hours  | None                  | -      |
| Power on cycles | Displays the number of power-on cycles. Each restart increases the counter by one. | None                  | -      |

Table 198: Advanced - OEM features - System board features - Statistical values

### 1.4.3.3.2 Temperature values

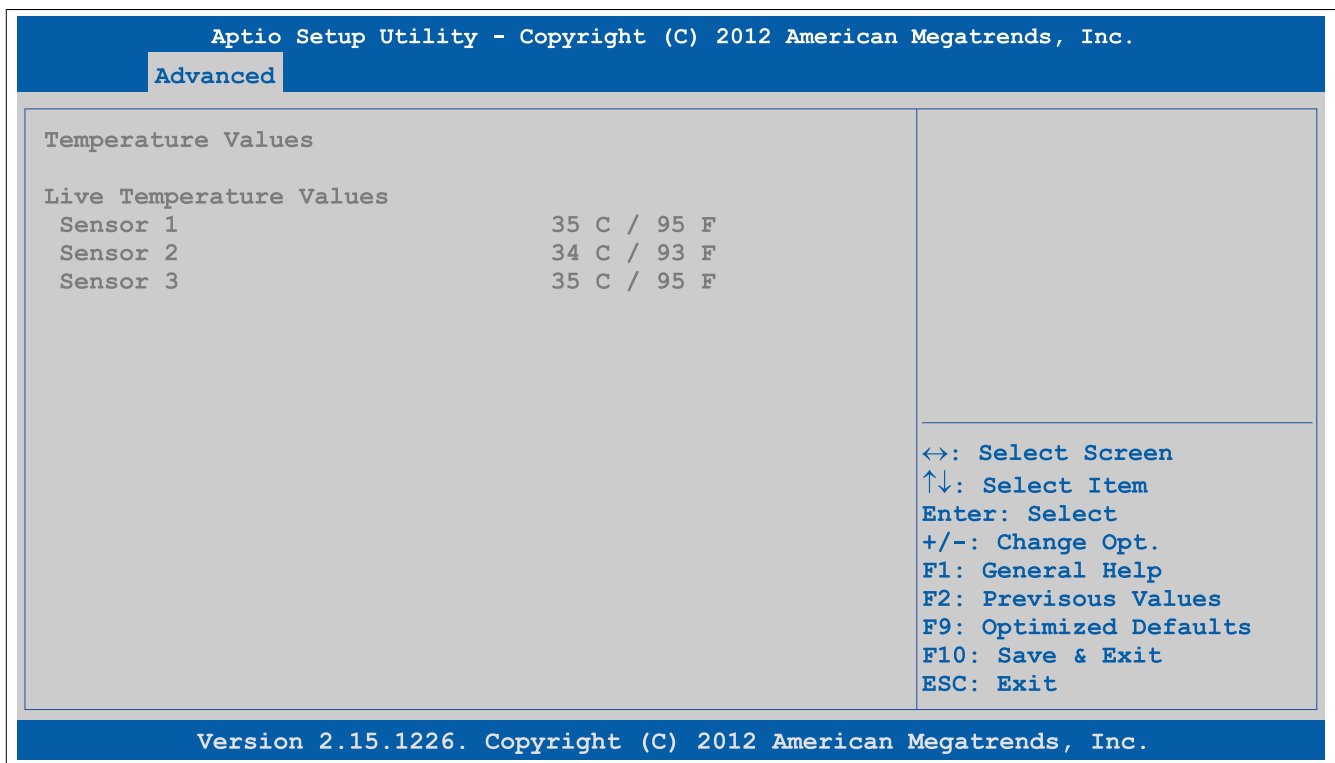


Figure 107: Advanced - OEM Features - System Board Features - Temperature Values

| BIOS setting | Function   | Configuration options | Effect |
|--------------|--|-----------------------|--------|
| Sensor 1     | Displays the current temperature of <a href="#">sensor 1</a> (board power supply) in °C and °F         | None                  | -      |
| Sensor 2     | Displays the current temperature of <a href="#">sensor 2</a> (near slide-in compact slot) in °C and °F | None                  | -      |
| Sensor 3     | Displays the current temperature of <a href="#">sensor 3</a> (near main memory) in °C and °F           | None                  | -      |

Table 199: Advanced - OEM features - System board features - Temperature values

#### 1.4.3.3.3 Voltage values

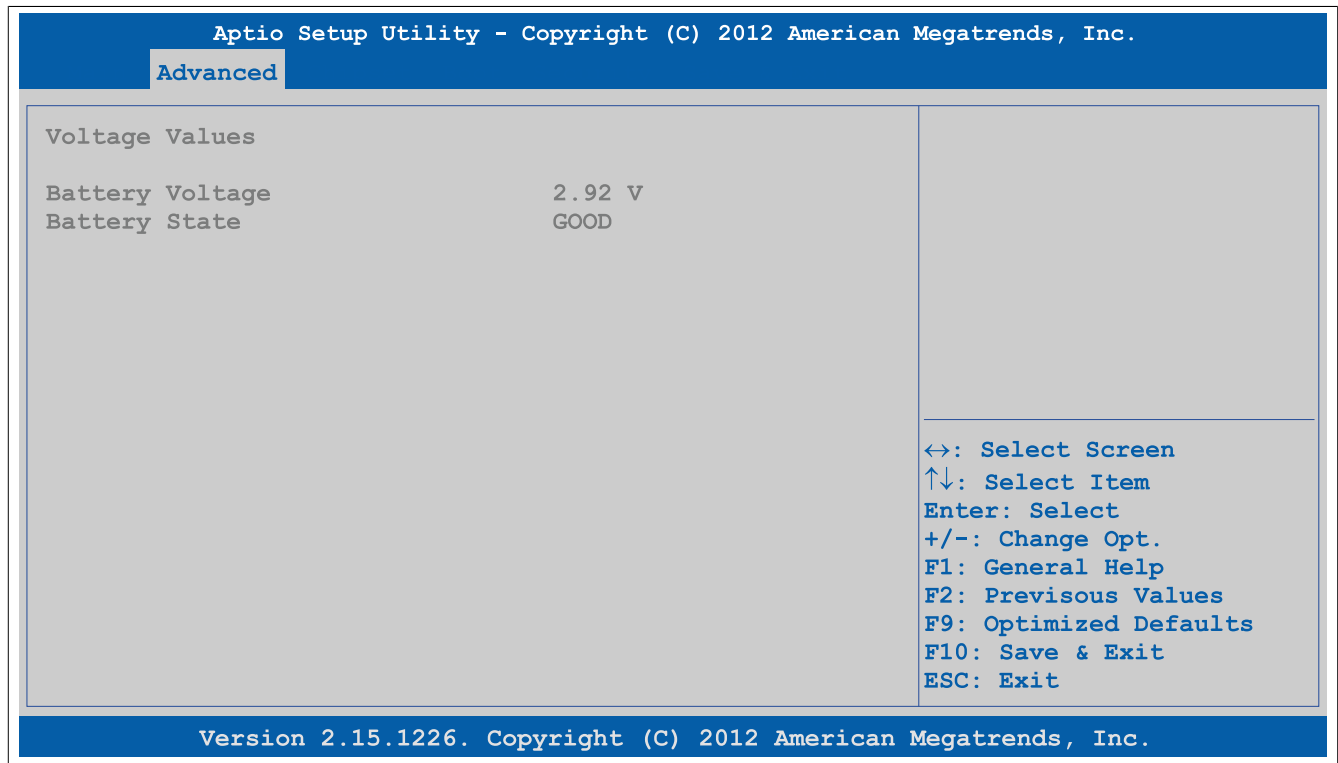


Figure 108: Advanced - OEM Features - System Board Features - Voltage Values

| BIOS setting    | Function                              | Configuration options | Effect |
|-----------------|---------------------------------------|-----------------------|--------|
| Battery voltage | Displays the battery voltage in volts | None                  | -      |
| Battery state   | Displays the status of the battery    | None                  | -      |

Table 200: Advanced - OEM features - System board features - Voltage values

## 1.4.3.4 Memory module features

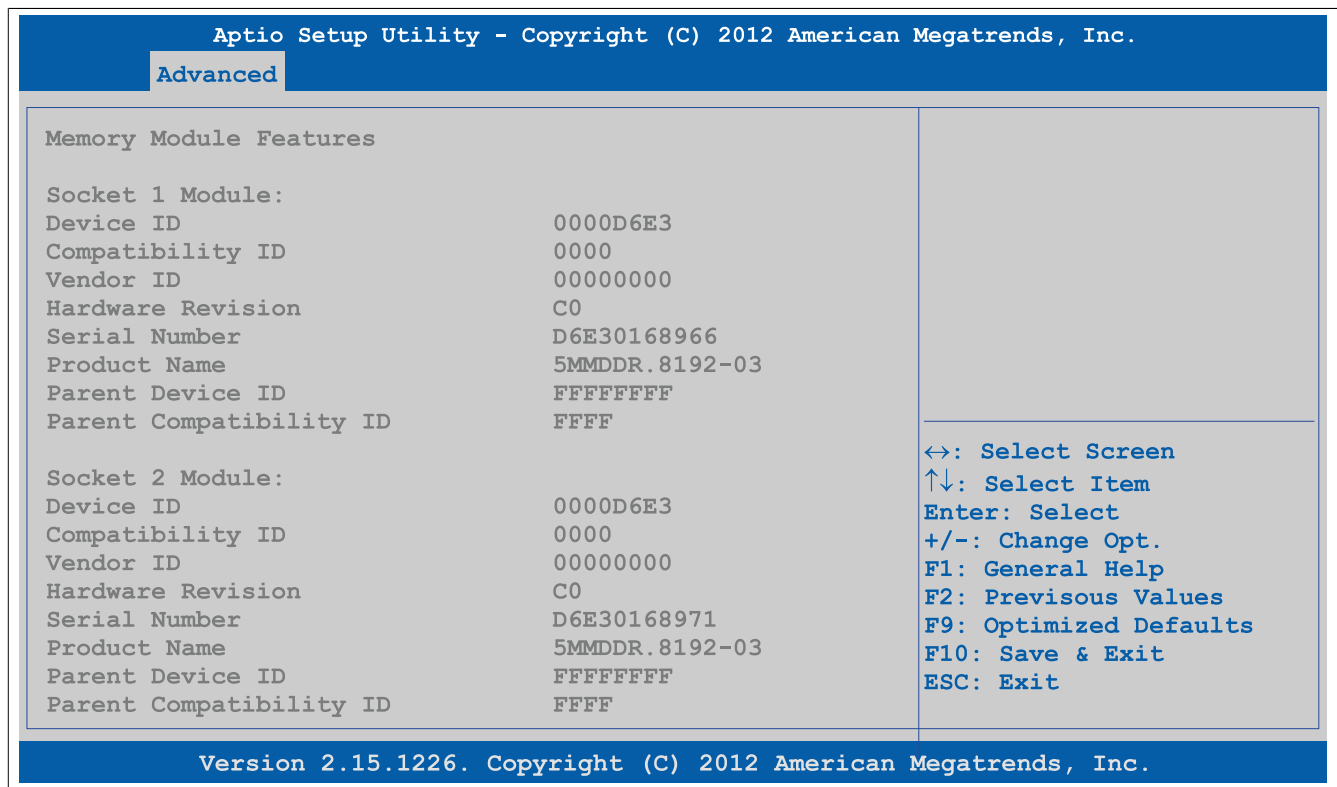


Figure 109: Advanced - OEM Features - Memory Module Features

| BIOS setting            | Function  | Configuration options | Effect |
|-------------------------|---|-----------------------|--------|
| Socket 1 module         |   |                       |        |
| Device ID               | Displays the device ID of the memory module   | None                  | -      |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime. | None                  | -      |
| Vendor ID               | Displays the vendor ID  | None                  | -      |
| Hardware revision       | Displays the hardware revision of the memory module   | None                  | -      |
| Serial number           | Displays the B&R serial number  | None                  | -      |
| Product name            | Displays the B&R model number   | None                  | -      |
| Parent device ID        | Displays the manufacturer number  | None                  | -      |
| Parent compatibility ID | Displays the manufacturer ID  | None                  | -      |
| Socket 2 module         |   |                       |        |
| Device ID               | Displays the device ID of the memory module   | None                  | -      |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime. | None                  | -      |
| Vendor ID               | Displays the vendor ID  | None                  | -      |
| Hardware revision       | Displays the hardware revision of the memory module   | None                  | -      |
| Serial number           | Displays the B&R serial number  | None                  | -      |
| Product name            | Displays the B&R model number   | None                  | -      |
| Parent device ID        | Displays the manufacturer number  | None                  | -      |
| Parent compatibility ID | Displays the manufacturer ID  | None                  | -      |

Table 201: Advanced - OEM features - Memory module features

## 1.4.3.5 Bus unit features



Figure 110: Advanced - OEM Features - Bus Unit Features

| BIOS setting            | Function  | Configuration options | Effect  |
|-------------------------|---|-----------------------|---|
| Device ID               | Displays the device ID of the bus unit  | None                  | -   |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime. | None                  | -   |
| Vendor ID               | Displays the vendor ID  | None                  | -   |
| Hardware revision       | Displays the hardware revision of the bus unit  | None                  | -   |
| Serial number           | Displays the B&R serial number  | None                  | -   |
| Product name            | Displays the B&R model number   | None                  | -   |
| Parent device ID        | Displays the manufacturer number  | None                  | -   |
| Parent compatibility ID | Displays the manufacturer ID  | None                  | -   |
| Statistical values      | Displays statistical values   | Enter                 | Opens this submenu<br>See "Statistical values" on page 241. |

Table 202: Advanced - OEM features - Bus unit features

### 1.4.3.5.1 Statistical values

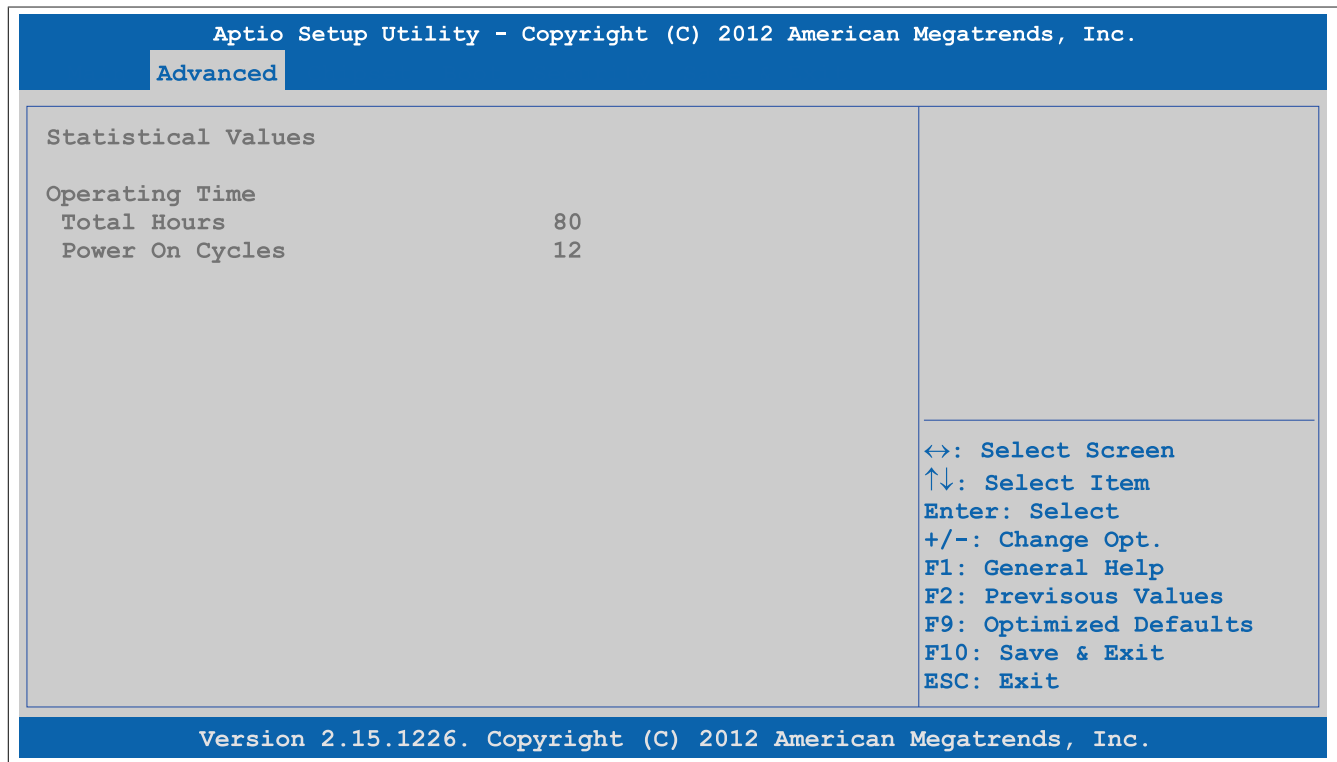


Figure 111: Advanced - OEM Features - Bus Unit Features - Statistical Values

| BIOS setting    | Function   | Configuration options | Effect |
|-----------------|--|-----------------------|--------|
| Total hours     | Displays the runtime in hours  | None                  | -      |
| Power on cycles | Displays the number of power-on cycles. Each restart increases the counter by one. | None                  | -      |

Table 203: Advanced - OEM features - Bus unit features - Statistical values

### 1.4.3.6 IF option 1 features



Figure 112: Advanced - OEM features - IF option 1 features

| BIOS setting            | Function  | Configuration options | Effect  |
|-------------------------|---|-----------------------|---|
| Device ID               | Displays the device ID of IF option 1   | None                  | -   |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime. | None                  | -   |
| Vendor ID               | Displays the vendor ID  | None                  | -   |
| Hardware revision       | Displays the hardware revision of IF option 1   | None                  | -   |
| Serial number           | Displays the B&R serial number  | None                  | -   |
| Product name            | Displays the B&R model number   | None                  | -   |
| Parent device ID        | Displays the manufacturer number  | None                  | -   |
| Parent compatibility ID | Displays the manufacturer ID  | None                  | -   |
| Statistical values      | Displays statistical values   | Enter                 | Opens this submenu<br>See "Statistical values" on page 242. |

Table 204: Advanced - OEM features - IF option 1 features

#### 1.4.3.6.1 Statistical values

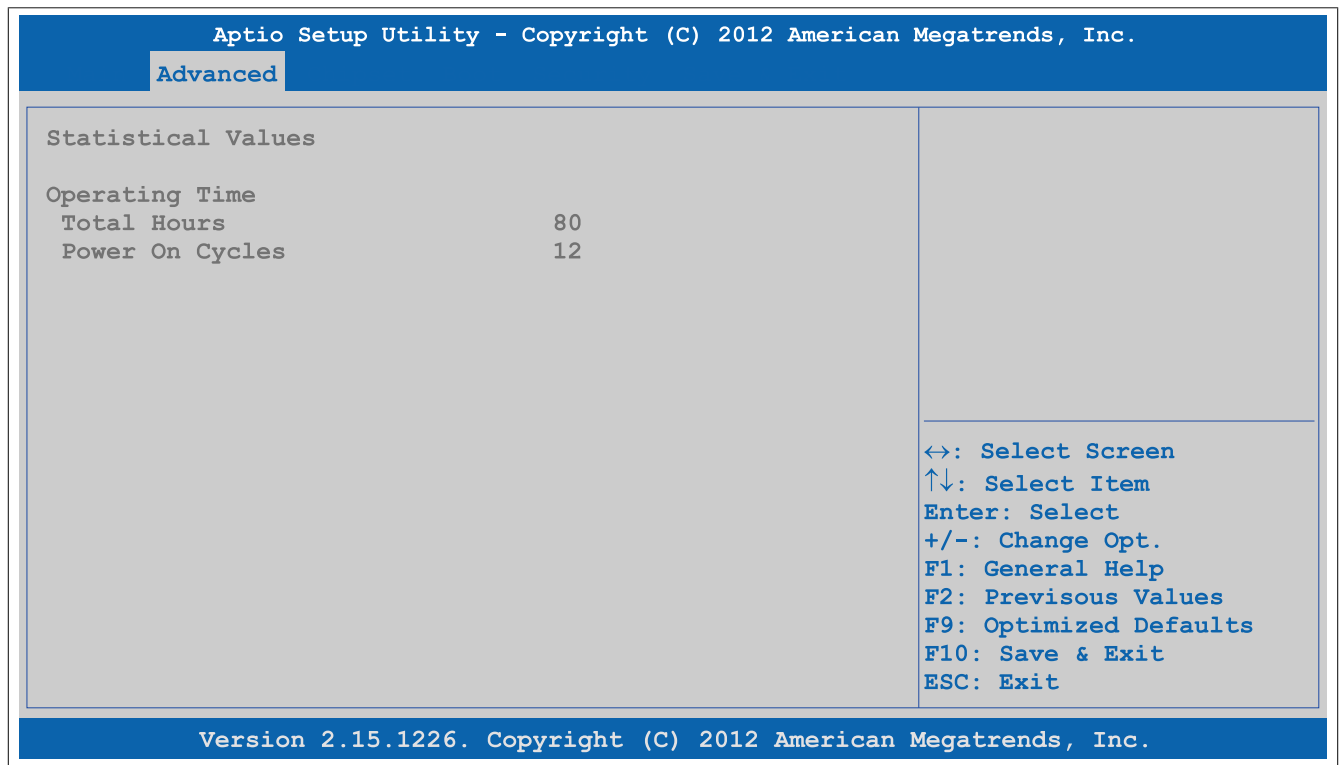


Figure 113: Advanced - OEM features - IF option 1 features - Statistical values

| BIOS setting    | Function   | Configuration options | Effect |
|-----------------|--|-----------------------|--------|
| Total hours     | Displays the runtime in hours  | None                  | -      |
| Power on cycles | Displays the number of power-on cycles. Each restart increases the counter by one. | None                  | -      |

Table 205: Advanced - OEM features - IF option 1 features - Statistical values



## 1.4.3.7 IF option 2 features

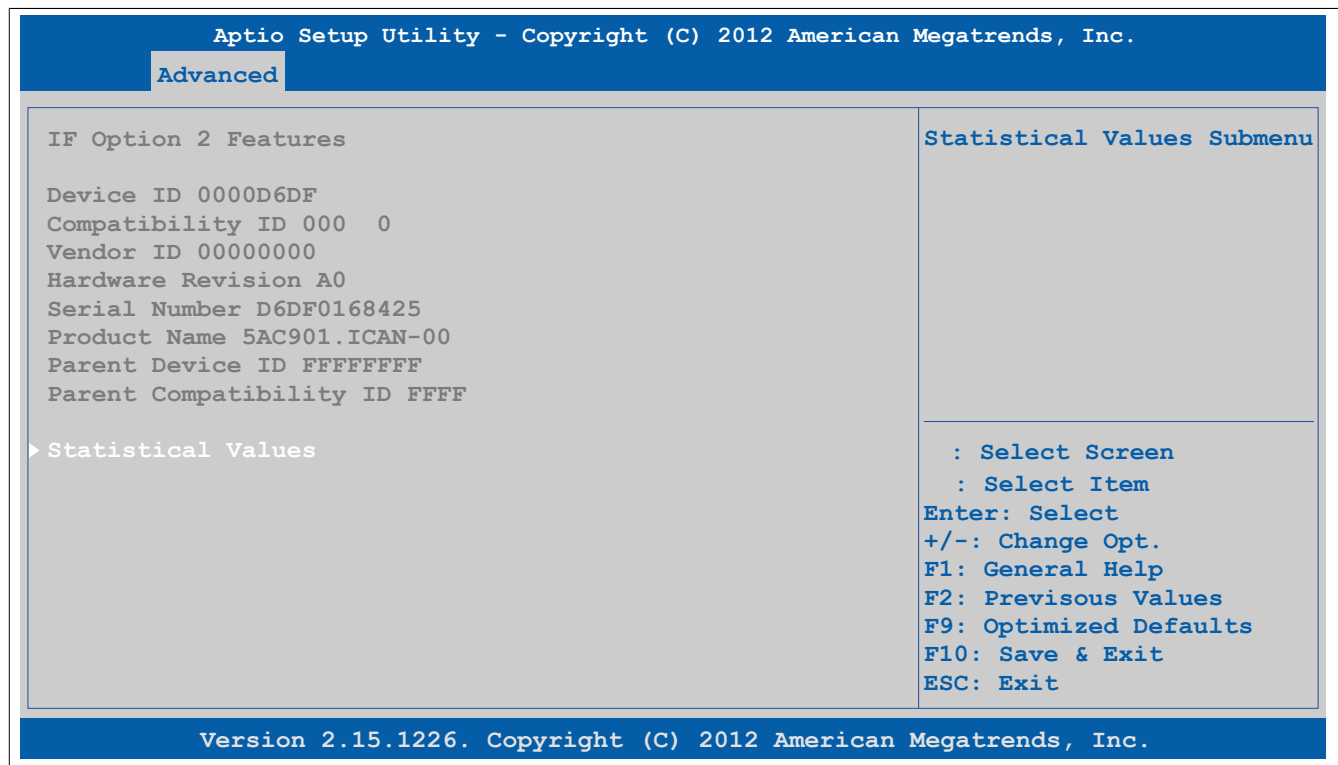


Figure 114: Advanced - OEM features - IF option 2 features

| BIOS setting            | Function  | Configuration options | Effect  |
|-------------------------|---|-----------------------|---|
| Device ID               | Displays the device ID of IF option 2   | None                  | -   |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime. | None                  | -   |
| Vendor ID               | Displays the vendor ID  | None                  | -   |
| Hardware revision       | Displays the hardware revision of IF option 2   | None                  | -   |
| Serial number           | Displays the B&R serial number  | None                  | -   |
| Product name            | Displays the B&R model number   | None                  | -   |
| Parent device ID        | Displays the manufacturer number  | None                  | -   |
| Parent compatibility ID | Displays the manufacturer ID  | None                  | -   |
| Statistical values      | Displays statistical values   | Enter                 | Opens this submenu<br>See "Statistical values" on page 244. |

Table 206: Advanced - OEM features - IF option 2 features

1.4.3.7.1 Statistical values

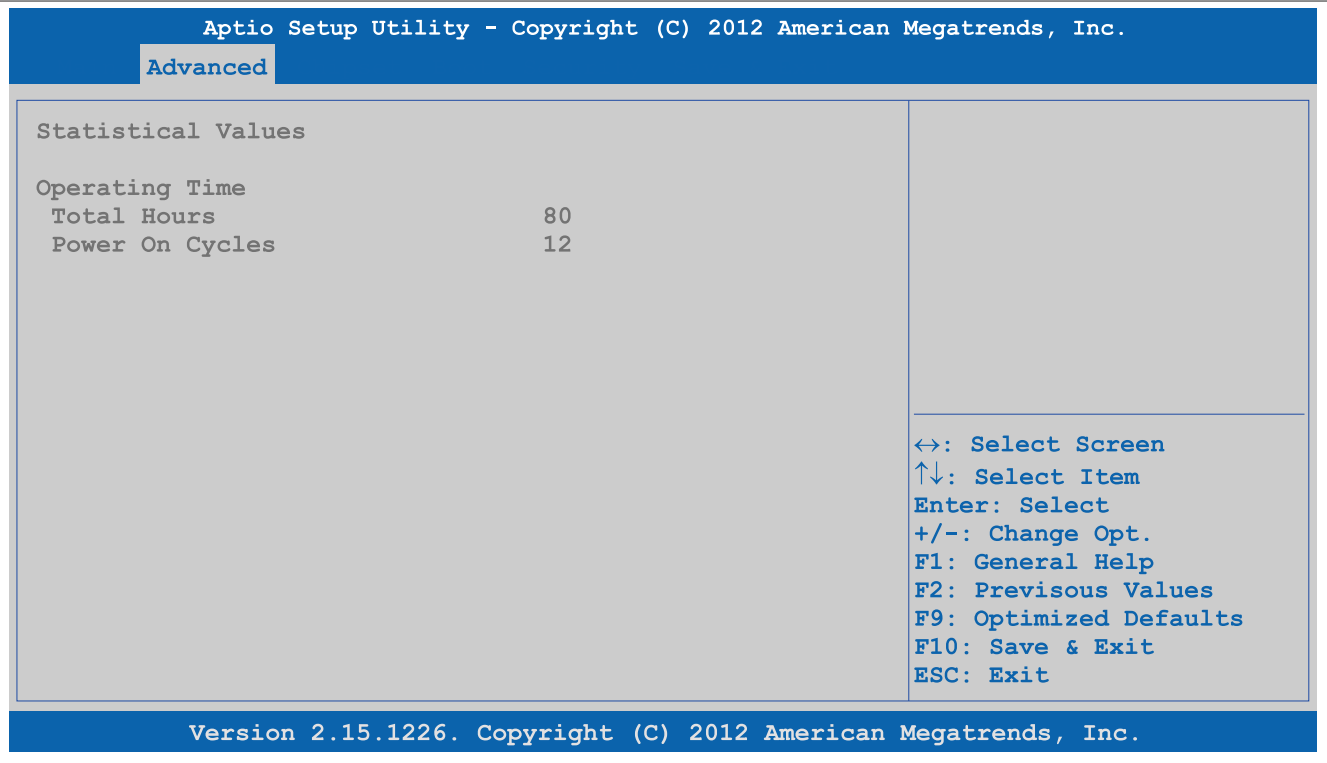


Figure 115: Advanced - OEM features - IF option 2 features - Statistical values

| BIOS setting    | Function   | Configuration options | Effect |
|-----------------|--|-----------------------|--------|
| Total hours     | Displays the runtime in hours  | None                  | -      |
| Power on cycles | Displays the number of power-on cycles. Each restart increases the counter by one. | None                  | -      |

Table 207: Advanced - OEM features - IF option 2 features - Statistical values

1.4.3.8 Display link module features

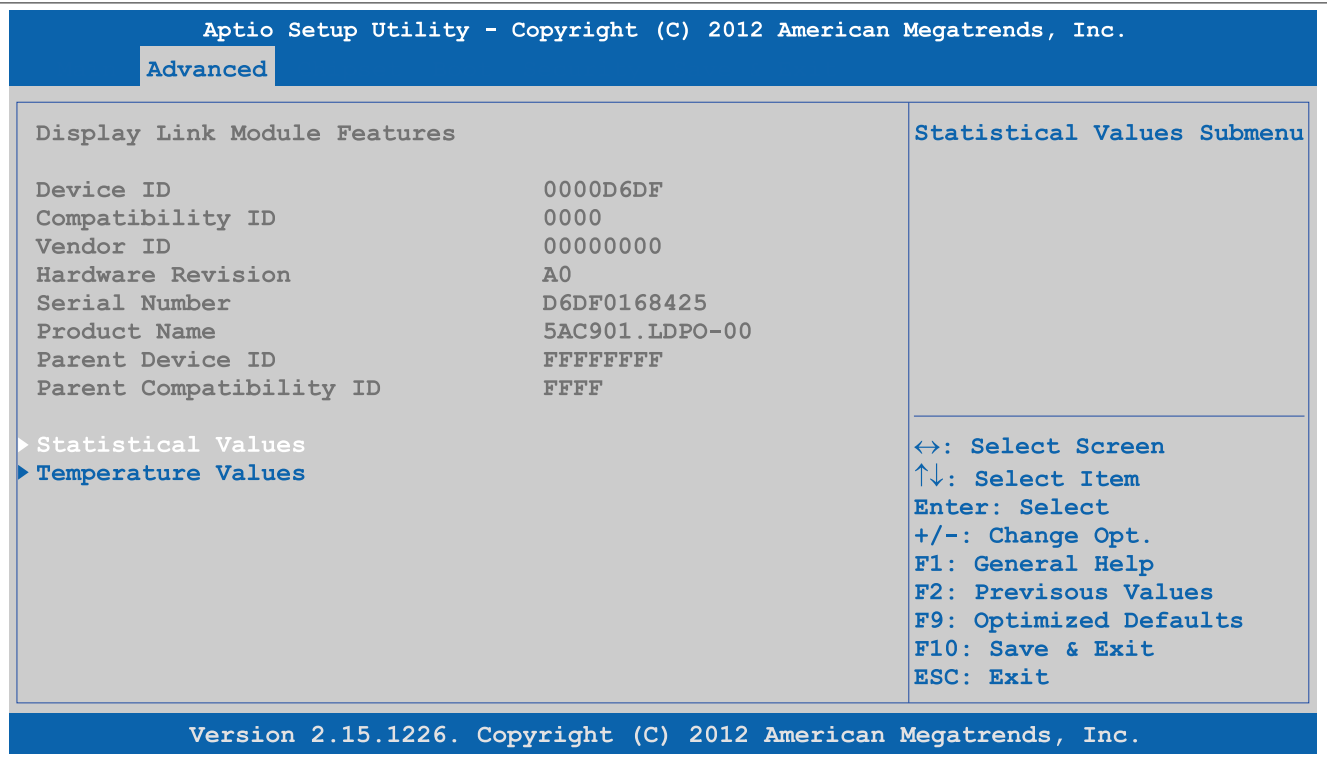
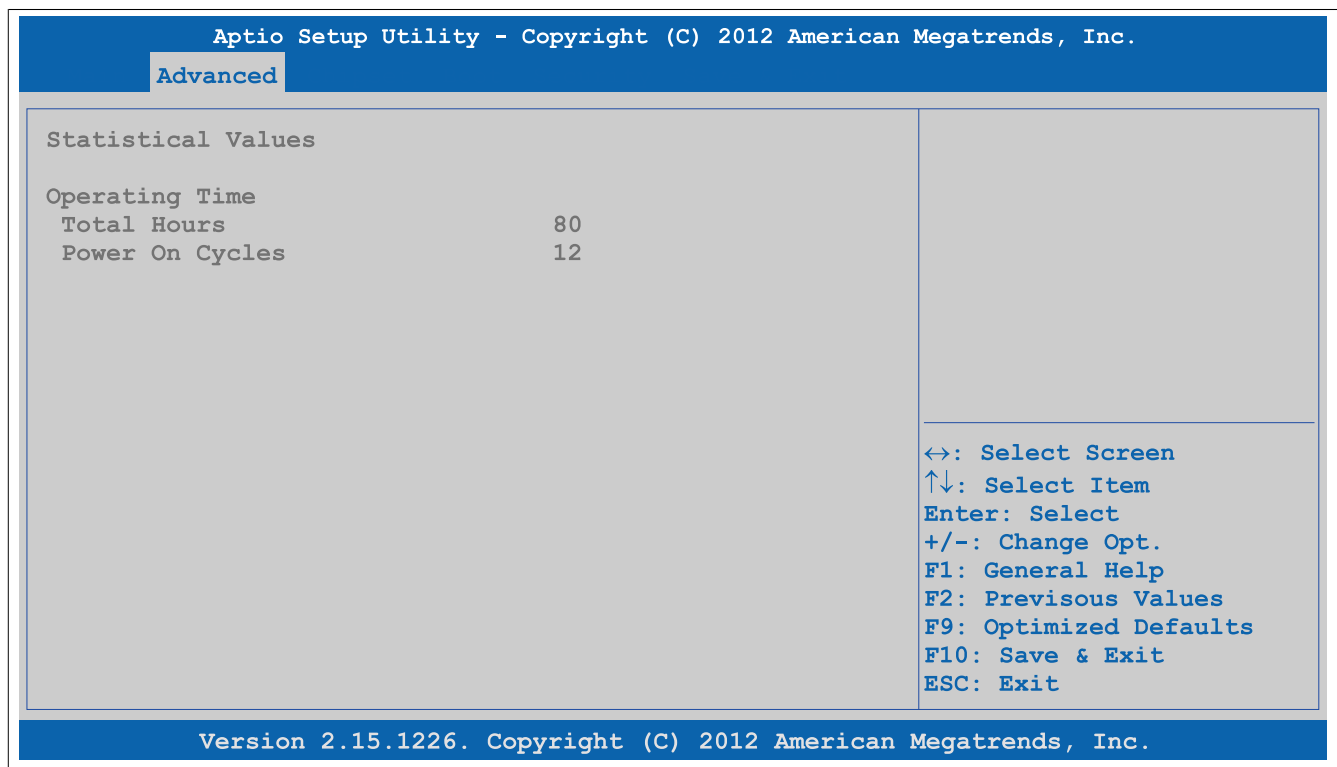


Figure 116: Advanced - OEM features - Display link module features

| BIOS setting                     | Function   | Configuration options | Effect  |
|----------------------------------|--|-----------------------|---|
| Device ID                        | Displays the <a href="#">device</a> ID of the monitor/panel option   | None                  | -   |
| Compatibility ID                 | Displays the version of the <a href="#">device</a> within the same B&R <a href="#">device</a> ID. This ID is needed for <a href="#">Automation Runtime</a> . | None                  | -   |
| Vendor ID                        | Displays the vendor ID   | None                  | -   |
| Hardware revision                | Displays the hardware revision of the monitor/panel option   | None                  | -   |
| Serial number                    | Displays the B&R serial number   | None                  | -   |
| Product name                     | Displays the B&R model number  | None                  | -   |
| Parent <a href="#">device</a> ID | Displays the manufacturer number   | None                  | -   |
| Parent compatibility ID          | Displays the manufacturer ID   | None                  | -   |
| <b>Statistical values</b>        | Displays statistical values  | Enter                 | Opens this submenu<br>See " <a href="#">Statistical values</a> " on page 245. |
| <b>Temperature values</b>        | Displays current temperature values  | Enter                 | Opens this submenu<br>See " <a href="#">Temperature values</a> " on page 246. |

Table 208: Advanced - [OEM](#) features - Display link module features

### 1.4.3.8.1 Statistical values

Figure 117: Advanced - [OEM](#) features - Display link module features - Statistical values

| BIOS setting    | Function   | Configuration options | Effect |
|-----------------|--|-----------------------|--------|
| Total hours     | Displays the runtime in hours  | None                  | -      |
| Power on cycles | Displays the number of power-on cycles. Each restart increases the counter by one. | None                  | -      |

Table 209: Advanced - [OEM](#) features - Display link module features - Statistical values

1.4.3.8.2 Temperature values

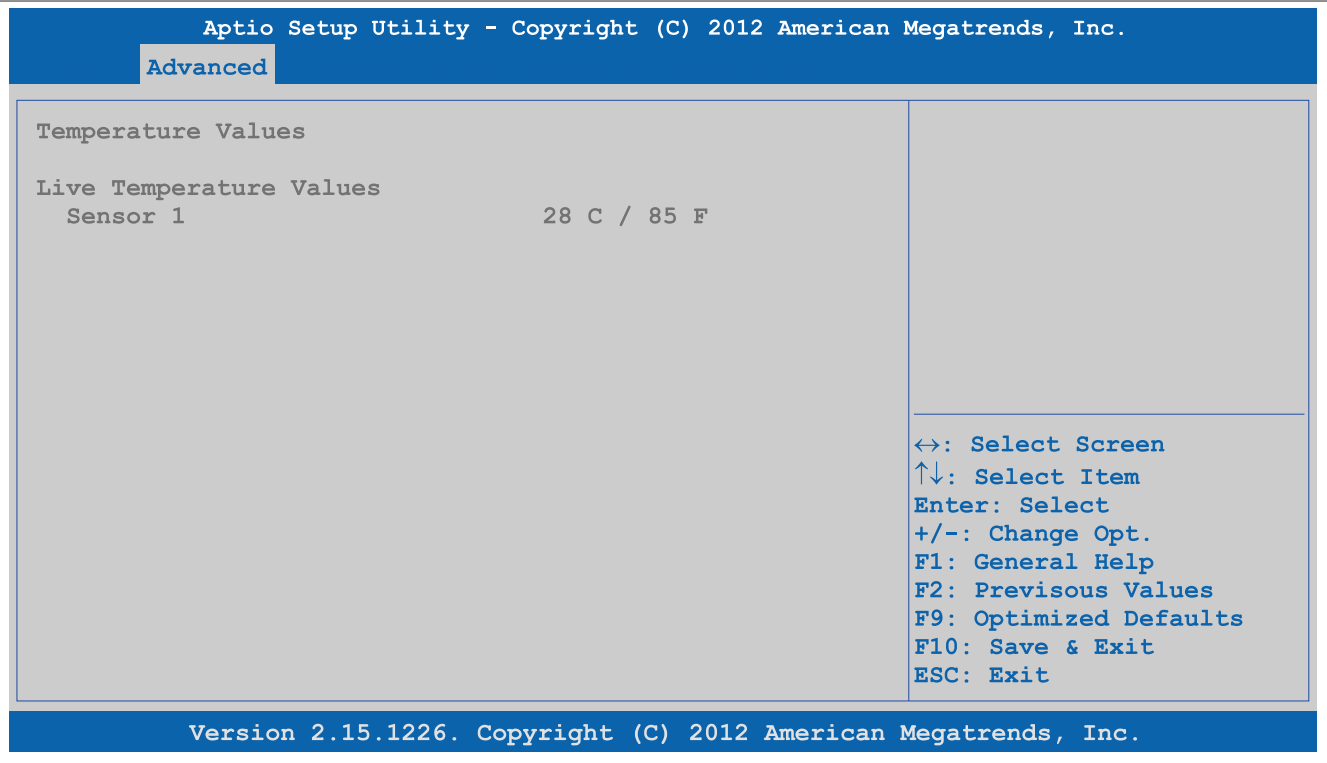


Figure 118: Advanced - OEM features - Display link module features - Temperature values

| BIOS setting | Function   | Configuration options | Effect |
|--------------|--|-----------------------|--------|
| Sensor 1     | Displays the current temperature of sensor 1 (monitor/panel option) in °C and °F | None                  | -      |

Table 210: Advanced - OEM features - Display link module features - Temperature values

1.4.3.9 Fan unit features

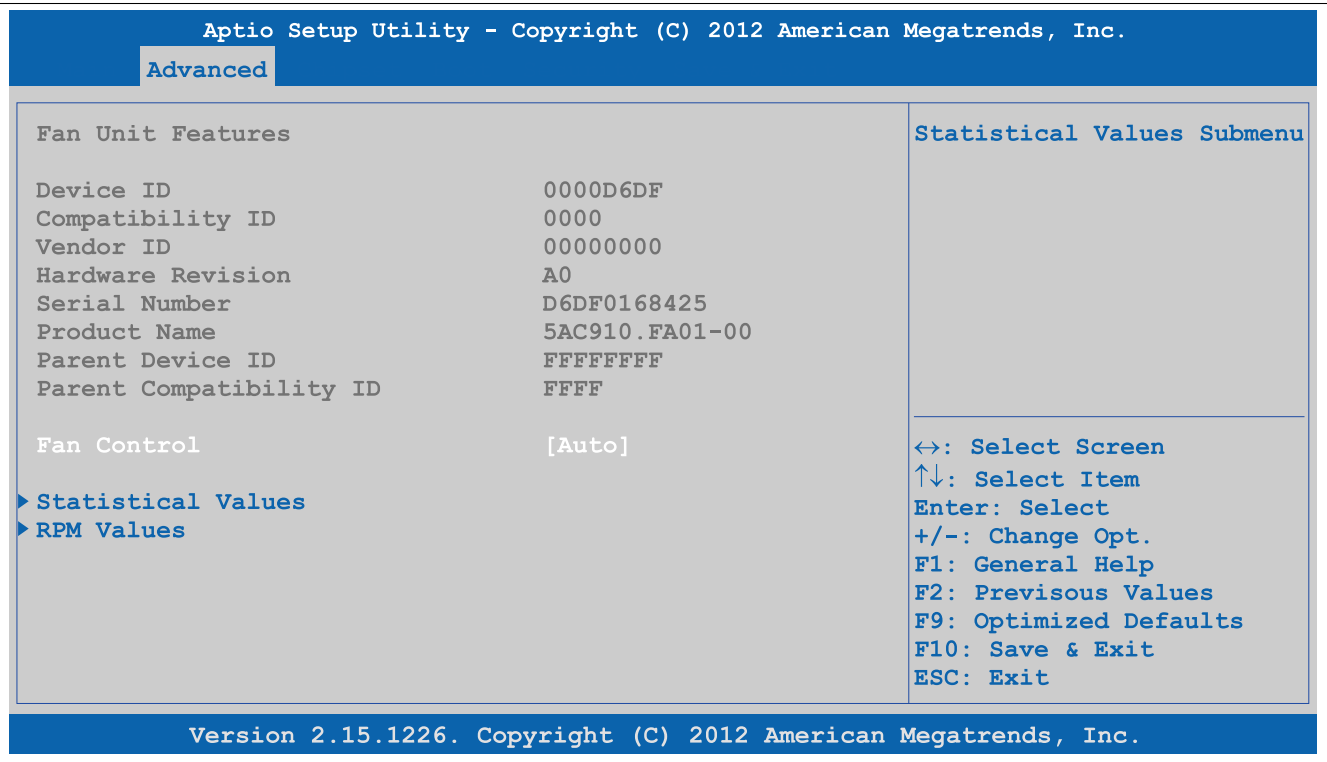


Figure 119: Advanced - OEM features - Fan unit features

| BIOS setting            | Function  | Configuration options | Effect  |
|-------------------------|---|-----------------------|---|
| Device ID               | Displays the device ID of the fan kit   | None                  | -   |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.   | None                  | -   |
| Vendor ID               | Displays the vendor ID  | None                  | -   |
| Hardware revision       | Displays the hardware revision of the fan kit   | None                  | -   |
| Serial number           | Displays the B&R serial number  | None                  | -   |
| Product name            | Displays the B&R model number   | None                  | -   |
| Parent device ID        | Displays the manufacturer number  | None                  | -   |
| Parent compatibility ID | Displays the manufacturer ID  | None                  | -   |
| Fan control             | <b>Information:</b><br><br>It is not possible for a manual fan setting to take effect when starting back up from S3 mode. The setting "Auto" is active. | Auto                  | Automatic fan control   |
|                         |   | Minimum               | Sets the minimum revolution speed. If the temperature increases, however, the fan adjusts its speed automatically to prevent critical temperatures from being exceeded. |
|                         |   | 25%                   | Sets 25% of the maximum revolution speed  |
|                         |   | 50%                   | Sets 50% of the maximum revolution speed  |
|                         |   | 75%                   | Sets 75% of the maximum revolution speed  |
|                         |   | Maximum               | Sets the maximum revolution speed   |
| Statistical values      | Displays statistical values   | Enter                 | Opens this submenu<br>See "Statistical values" on page 247.   |
| RPM values              | Displays the speed (in rpm) of the individual fans in the fan kit   | Enter                 | Opens this submenu<br>See "RPM values" on page 248.   |

Table 211: Advanced - OEM features - Fan unit features

#### 1.4.3.9.1 Statistical values

| Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.   |   |
|--|---|
| Advanced   |   |
| Statistical Values<br><br>Fan 1<br>Total Hours                   80<br>Power On Cycles           12<br><br>Fan 2<br>Total Hours                   80<br>Power On Cycles           12<br><br>Fan 3<br>Total Hours                   80<br>Power On Cycles           12<br><br>Fan 4<br>Total Hours                   80<br>Power On Cycles           12 | ⇐⇒: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F9: Optimized Defaults<br>F10: Save & Exit<br>ESC: Exit |
| Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.  |   |

Figure 120: Advanced - OEM features - Fan unit features - Statistical values

| BIOS setting    | Function   | Configuration options | Effect |
|-----------------|--|-----------------------|--------|
| Total hours     | Displays the runtime in hours  | None                  | -      |
| Power on cycles | Displays the number of power-on cycles. Each restart increases the counter by one. | None                  | -      |

Table 212: Advanced - OEM features - Fan unit features - Statistical values

1.4.3.9.2 RPM values

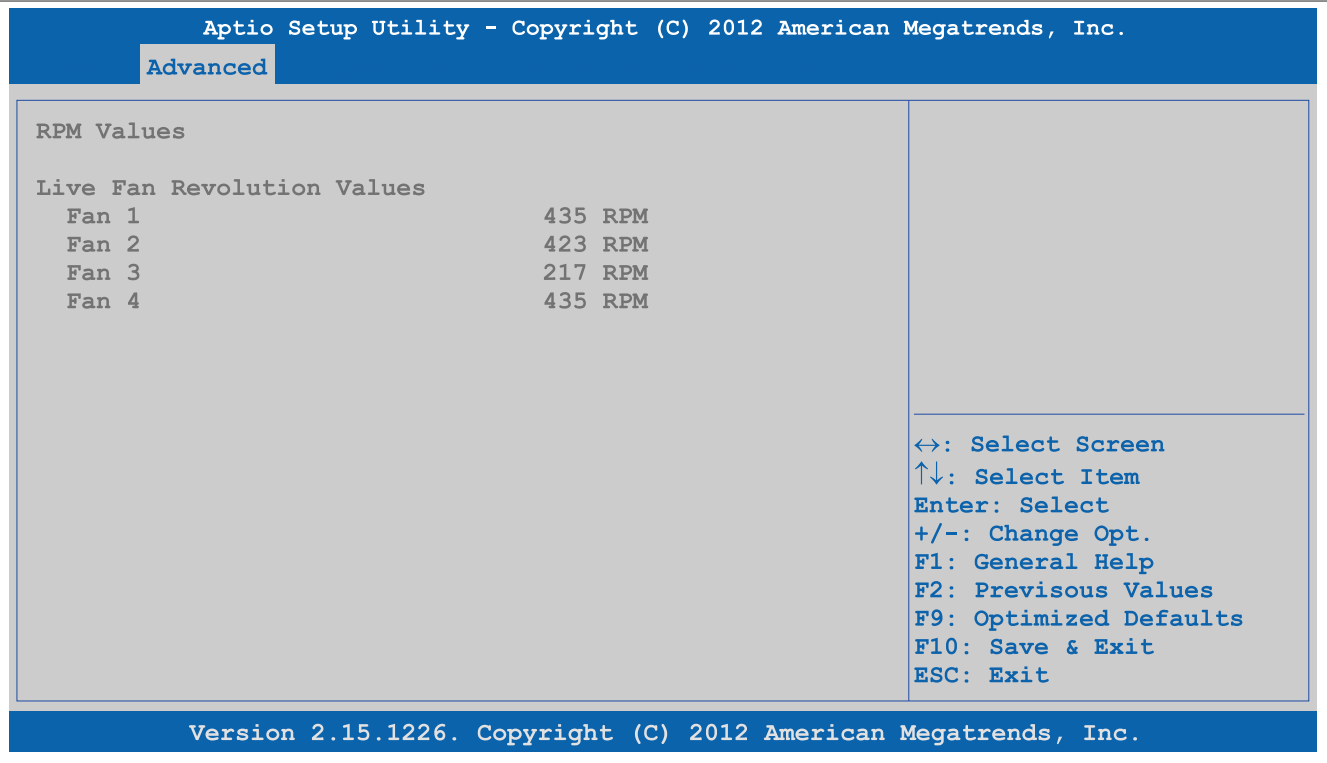


Figure 121: Advanced - OEM features - Fan unit features - RPM values

| BIOS setting | Function                                   | Configuration options | Effect |
|--------------|--|-----------------------|--------|
| Fan 1        | Displays the current speed of fan 1 in rpm | None                  | -      |
| Fan 2        | Displays the current speed of fan 2 in rpm | None                  | -      |
| Fan 3        | Displays the current speed of fan 3 in rpm | None                  | -      |
| Fan 4        | Displays the current speed of fan 4 in rpm | None                  | -      |

Table 213: Advanced - OEM features - Fan unit features - RPM values

1.4.3.10 Slide-in 1 features

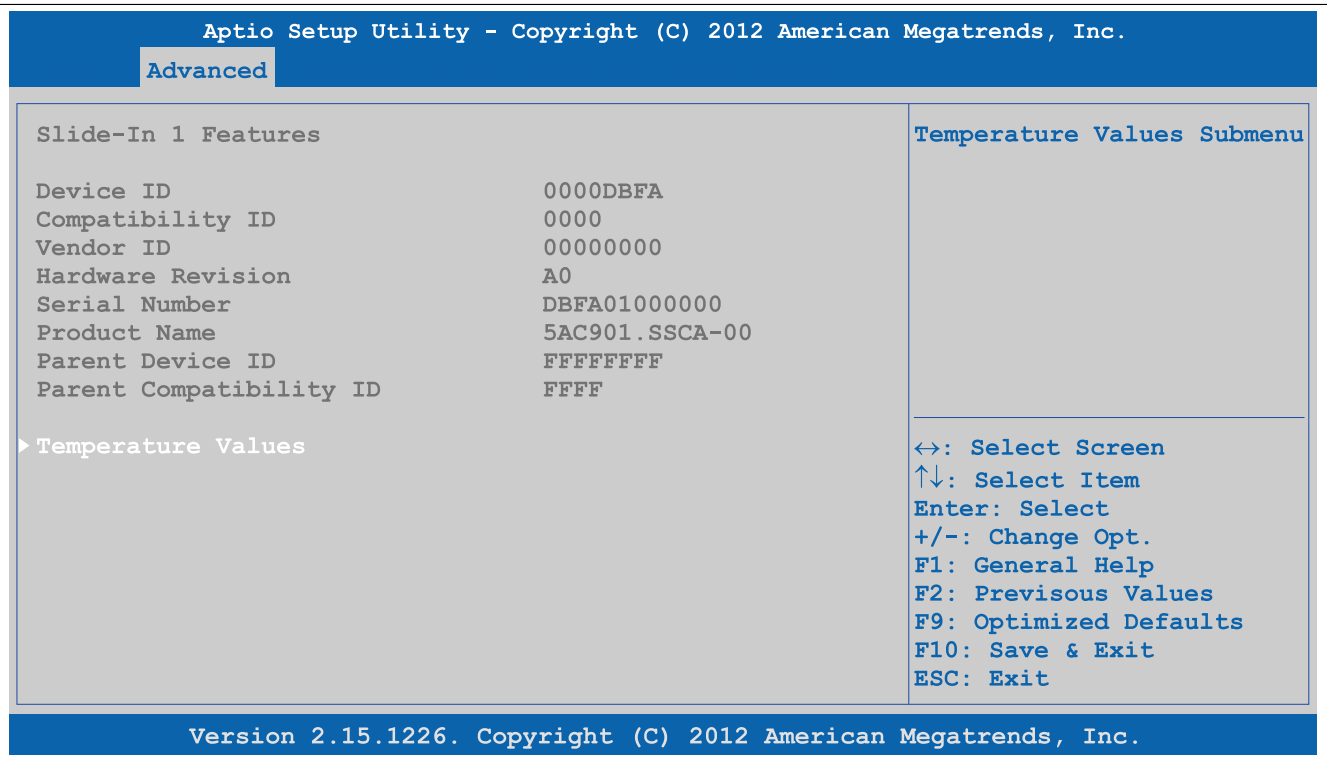


Figure 122: Advanced - OEM features - Slide-in 1 features

| BIOS setting            | Function  | Configuration options | Effect  |
|-------------------------|---|-----------------------|---|
| Device ID               | Displays the device ID of the slide-in 1 drive  | None                  | -   |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime. | None                  | -   |
| Vendor ID               | Displays the vendor ID  | None                  | -   |
| Hardware revision       | Displays the hardware revision of the slide-in drive  | None                  | -   |
| Serial number           | Displays the B&R serial number  | None                  | -   |
| Product name            | Displays the B&R model number   | None                  | -   |
| Parent device ID        | Displays the manufacturer number  | None                  | -   |
| Parent compatibility ID | Displays the manufacturer ID  | None                  | -   |
| Temperature values      | Displays current temperature values   | Enter                 | Opens this submenu<br>See "Temperature values" on page 249. |

Table 214: Advanced - OEM features - Slide-in 1 features

#### 1.4.3.10.1 Temperature values

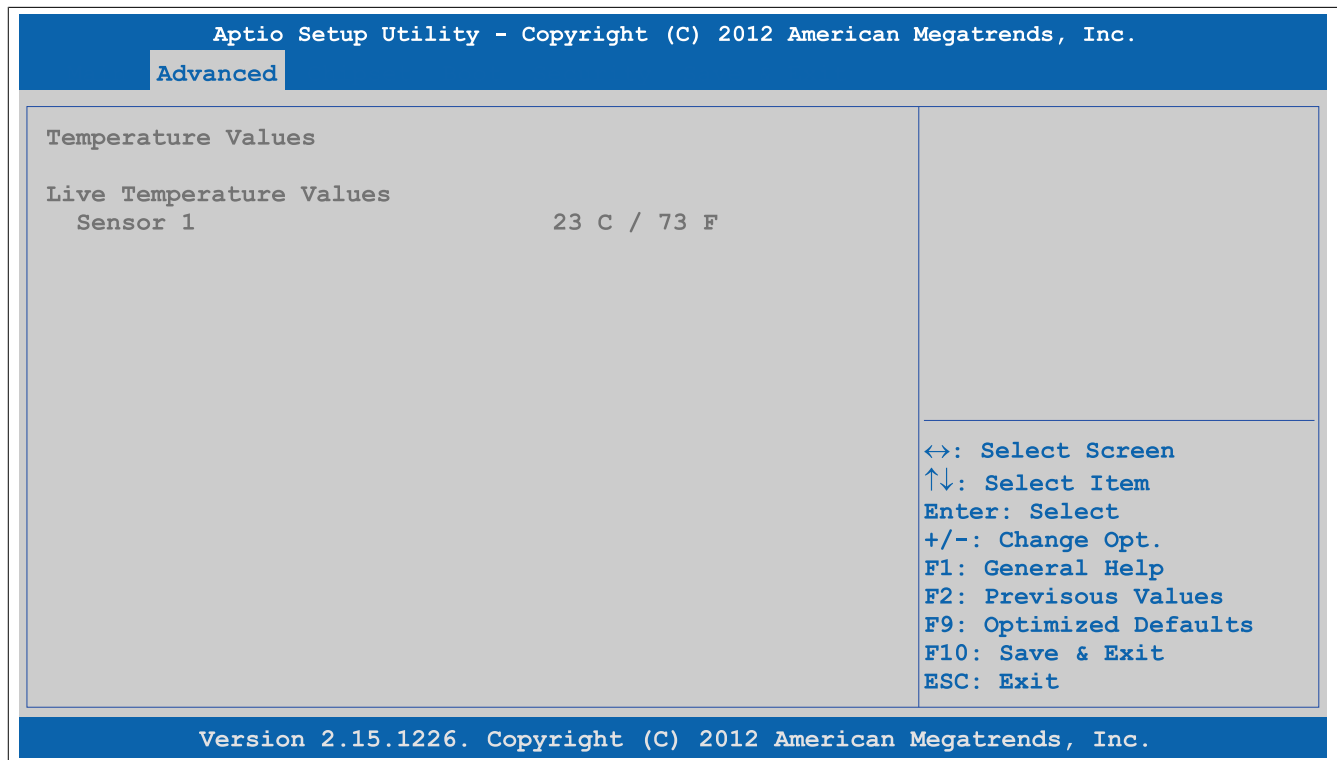


Figure 123: Advanced - OEM features - Slide-in 1 features - Temperature values

| BIOS setting | Function   | Configuration options | Effect |
|--------------|--|-----------------------|--------|
| Sensor 1     | Displays the current temperature of sensor 1 (slide-in 1 drive) in °C and °F | None                  | -      |

Table 215: Advanced - OEM features - Slide-in 1 features - Temperature values

## 1.4.3.11 Slide-in 2 features



Figure 124: Advanced - OEM features - Slide-in 2 features

| BIOS setting            | Function  | Configuration options | Effect  |
|-------------------------|---|-----------------------|---|
| Device ID               | Displays the device ID of the slide-in 2 drive  | None                  | -   |
| Compatibility ID        | Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime. | None                  | -   |
| Vendor ID               | Displays the vendor ID  | None                  | -   |
| Hardware revision       | Displays the hardware revision of slide-in drive 2  | None                  | -   |
| Serial number           | Displays the B&R serial number  | None                  | -   |
| Product name            | Displays the B&R model number   | None                  | -   |
| Parent device ID        | Displays the manufacturer number  | None                  | -   |
| Parent compatibility ID | Displays the manufacturer ID  | None                  | -   |
| Temperature values      | Displays current temperature values   | Enter                 | Opens this submenu<br>See "Temperature values" on page 251. |

Table 216: Advanced - OEM features - Slide-in 2 features



## 1.4.3.11.1 Temperature values



Figure 125: Advanced - OEM features - Slide-in 2 features - Temperature values

| BIOS setting | Function   | Configuration options | Effect |
|--------------|--|-----------------------|--------|
| Sensor 1     | Displays the current temperature of sensor 1 (slide-in 2 drive) in °C and °F | None                  | -      |

Table 217: Advanced - OEM features - Slide-in 2 features - Temperature values

## 1.4.3.12 Panel control features

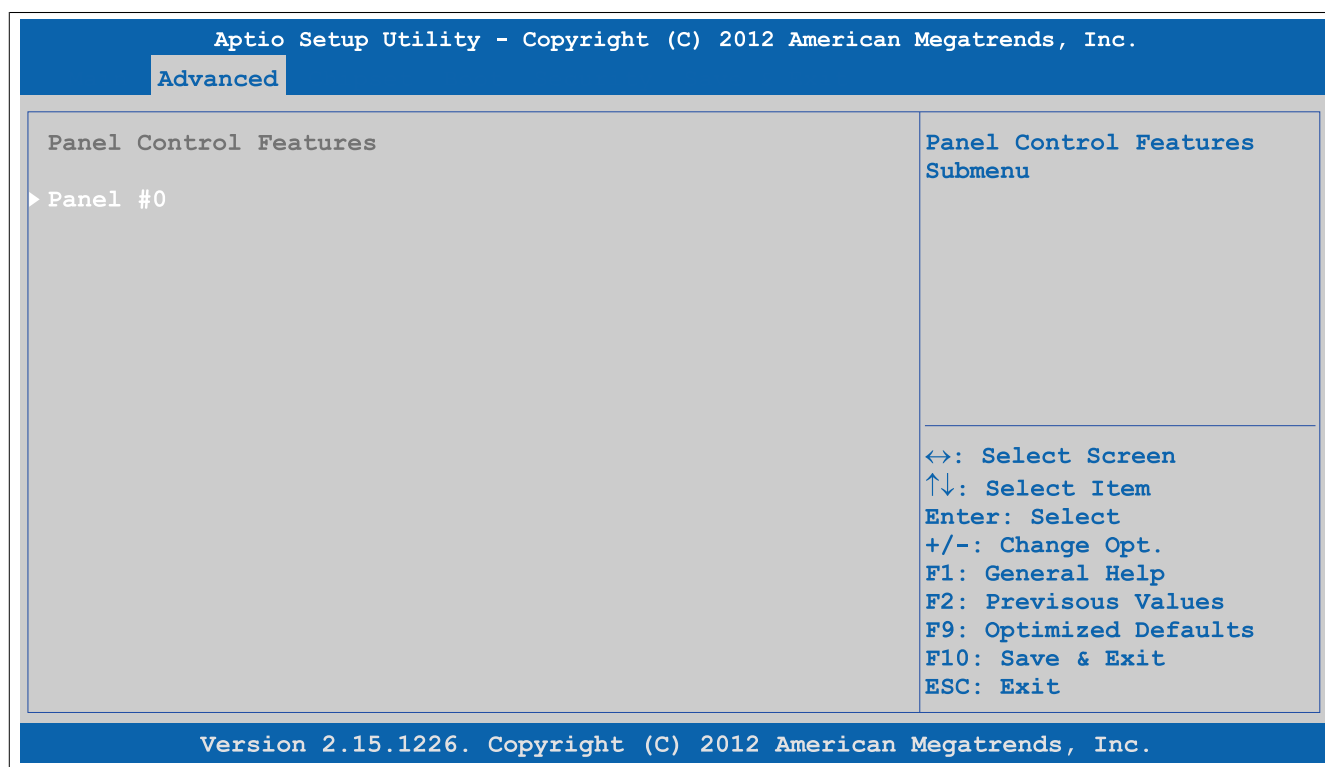


Figure 126: Advanced - OEM Features - Panel Control Features

| BIOS setting | Function   | Configuration options | Effect  |
|--------------|--|-----------------------|---|
| Panel #X     | Displays the panel properties of the connected panel | Enter                 | Opens this submenu<br>See "Panel #X" on page 252. |

Table 218: Advanced - OEM features - Panel control features

## 1.4.3.12.1 Panel #X

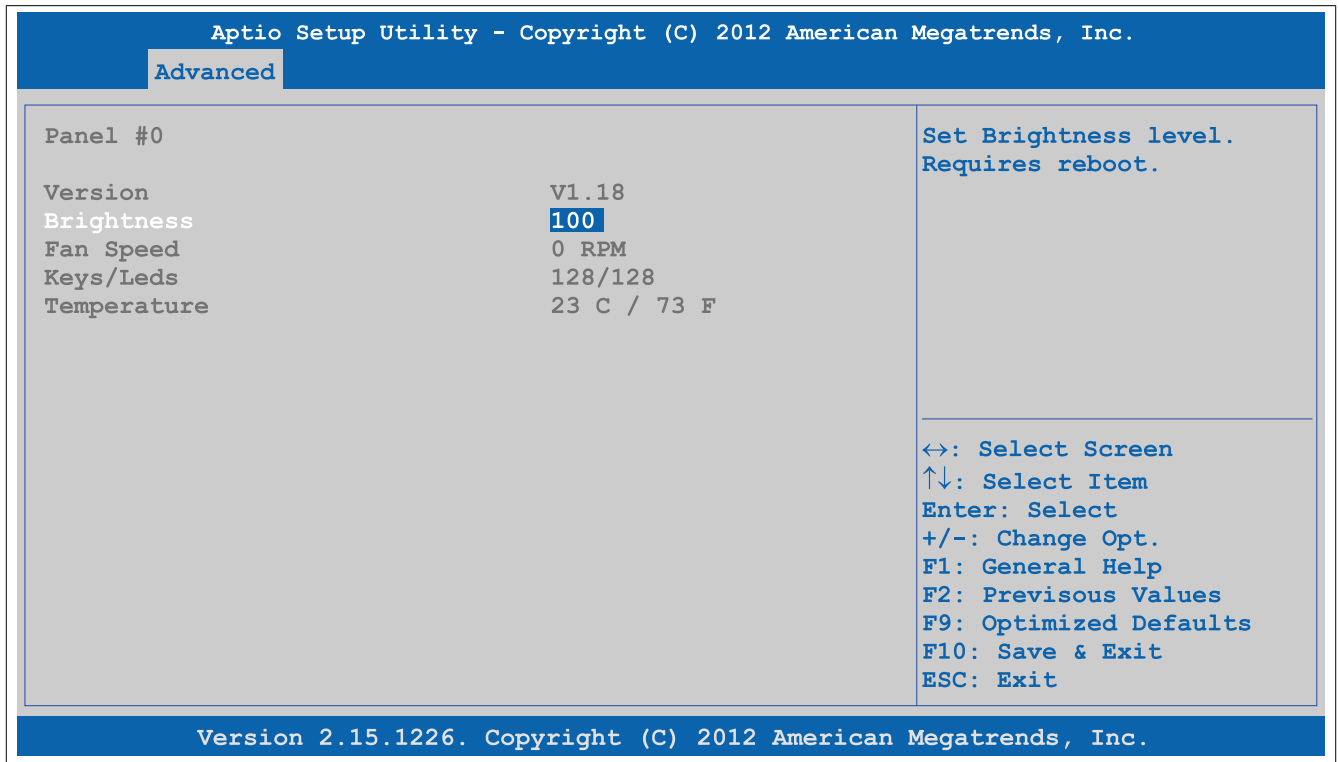


Figure 127: Advanced - OEM Features - Panel Control Features - Panel #x

| BIOS setting | Function   | Configuration options | Effect  |
|--------------|--|-----------------------|---|
| Version      | Displays the firmware version of the SDLR controller | None                  | -   |
| Brightness   | Setting for the brightness of the panel              | 0 to 100              | Sets the brightness (in %) of the selected panel. Settings take effect immediately. |
| Fan speed    | Displays the fan speed of the panel                  | None                  | -   |
| Keys/LEDs    | Displays the available keys and LEDs for the panel   | None                  | -   |
| Temperature  | Displays the temperature of the panel in °C and °F   | None                  | -   |

Table 219: Advanced - OEM features - Panel control features - Panel #X

## 1.4.4 PCI configuration

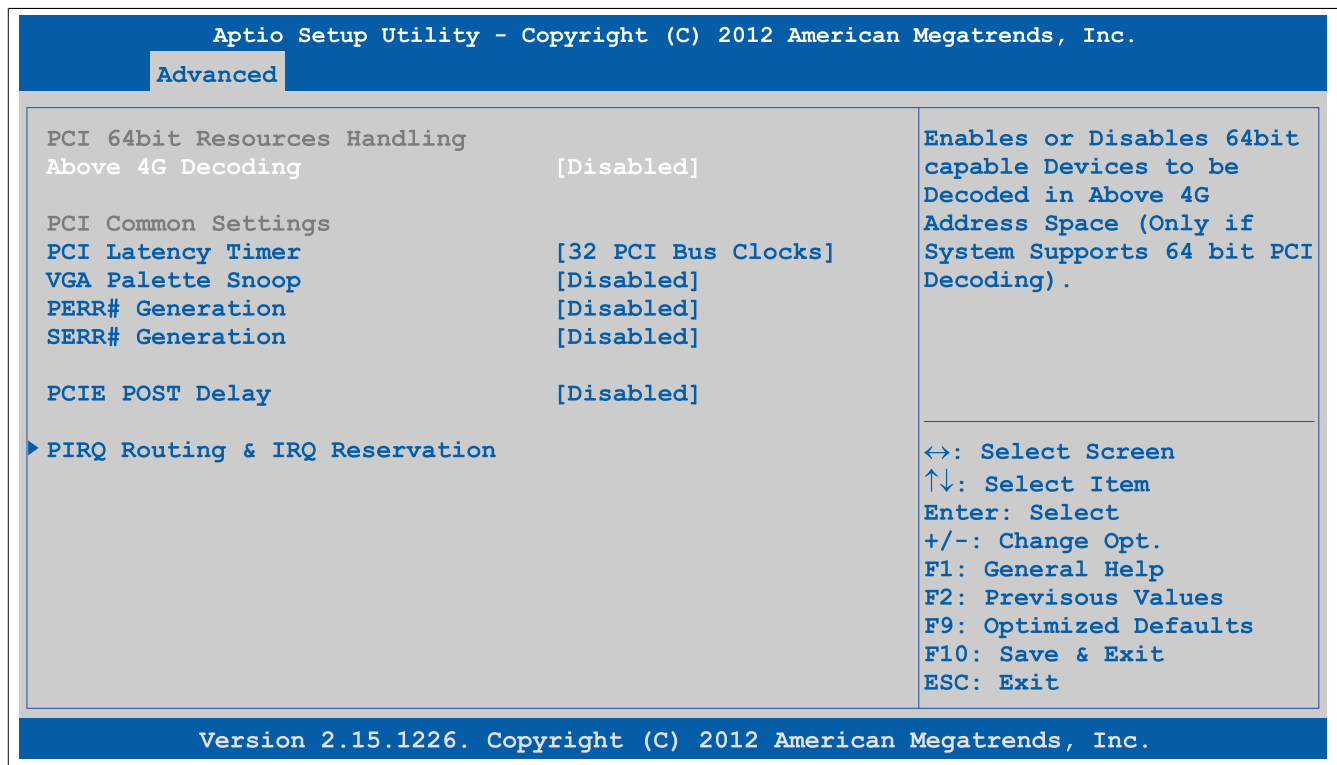


Figure 128: Advanced - PCI Configuration

| BIOS setting                   | Function   | Configuration options                   | Effect  |
|--------------------------------|--|---|---|
| Above 4G decoding              | Option for enabling/disabling 64-bit capable devices to decode them in the address space above 4 GB (only if the system supports 64-bit decoding)            | Disabled                                | Disables this function  |
|                                |  | Enabled                                 | Enables this function   |
| PCI latency timer              | Option for controlling how long (in PCI ticks) one PCI bus card can continue to use the master after another PCI card has requested access                   | 32 PCI bus clocks to 248 PCI bus clocks | Manually sets the value in PCI ticks                                    |
| VGA palette snoop              | Option for supporting graphics cards with 256 colors. This option should only be set to "Enabled" if colors are not displayed correctly.                     | Disabled                                | Disables this function  |
|                                |  | Enabled                                 | Enables this function   |
| PERR# generation               | Option for generating a PERR signal (parity error). This signal indicates a data parity error one cycle after PAR.   | Disabled                                | Disables this function  |
|                                |  | Enabled                                 | Enables this function   |
| SERR# generation               | Option for generating a SERR signal (system error). This signal indicates a data error or other type of system error when executing a special cycle command. | Disabled                                | Disables this function  |
|                                |  | Enabled                                 | Enables this function   |
| PCIE POST delay                | Option for delaying PCIE bus emulation   | Disabled                                | Disables this function  |
|                                |  | 0.1 s                                   | 0.1 s delay before the PCIE bus is scanned                              |
|                                |  | 0.2 s                                   | 0.2 s delay before the PCIE bus is scanned                              |
|                                |  | 0.3 s                                   | 0.3 s delay before the PCIE bus is scanned                              |
|                                |  | 1 s                                     | 1 s delay before the PCIE bus is scanned                                |
|                                |  | 2 s                                     | 2 s delay before the PCIE bus is scanned                                |
|                                |  | 3 s                                     | 3 s delay before the PCIE bus is scanned                                |
|                                |  | 4 s                                     | 4 s delay before the PCIE bus is scanned                                |
|                                |  | 5 s                                     | 5 s delay before the PCIE bus is scanned                                |
| PIRQ routing & IRQ reservation | Configures PIRQ routing  | 10 s                                    | 10 s delay before the PCIE bus is scanned                               |
|                                |  | Enter                                   | Opens this submenu<br>See "PIRQ routing & IRQ reservation" on page 254. |

Table 220: Advanced - PCI configuration - Configuration options

## 1.4.4.1 PIRQ routing &amp; IRQ reservation

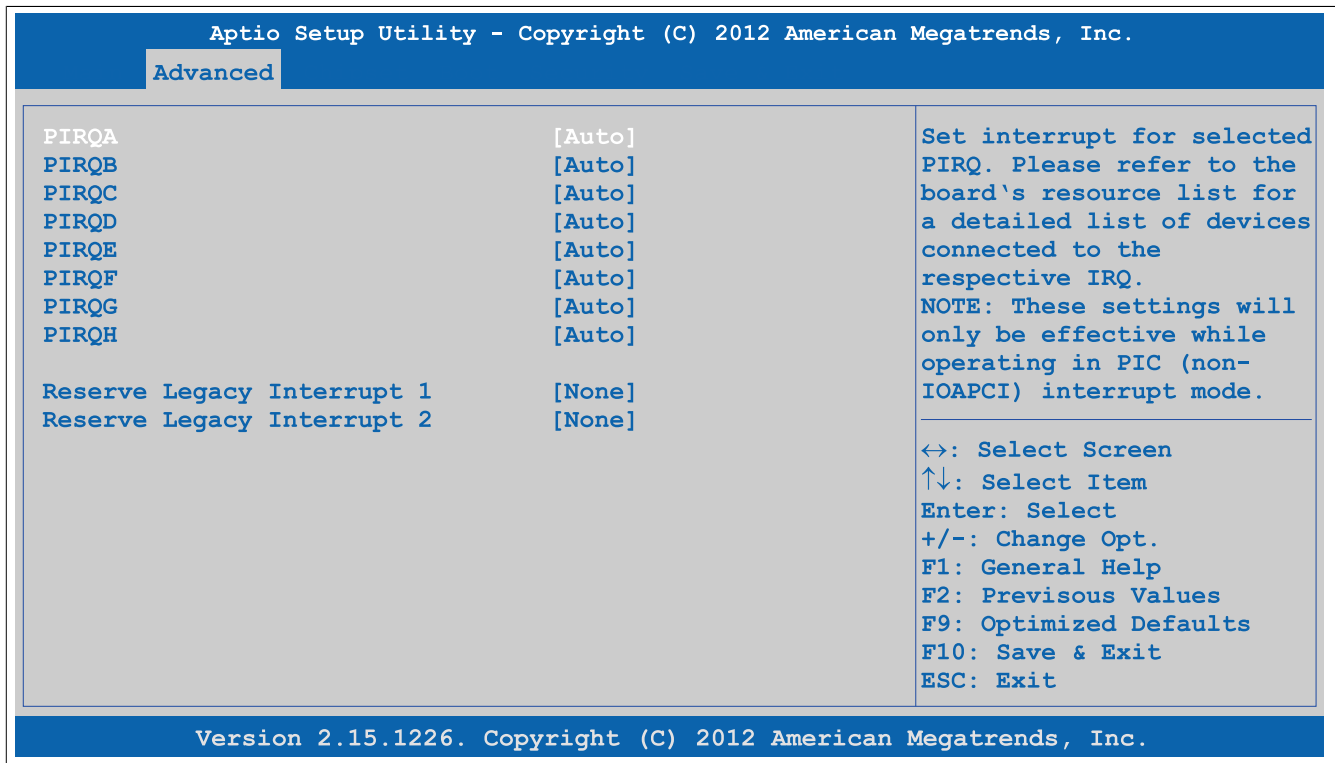


Figure 129: Advanced - PCI Configuration - PIRQ Routing &amp; IRQ Reservation

| BIOS setting               | Function  | Configuration options                              | Effect  |
|----------------------------|---|--|---|
| PIRQA                      | Option for configuring PIRQ A   | Auto   | Automatic assignment by BIOS and the operating system |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Manual assignment                                     |
| PIRQB                      | Option for configuring PIRQ B   | Auto   | Automatic assignment by BIOS and the operating system |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Manual assignment                                     |
| PIRQC                      | Option for configuring PIRQ C   | Auto   | Automatic assignment by BIOS and the operating system |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Manual assignment                                     |
| PIRQD                      | Option for configuring PIRQ D   | Auto   | Automatic assignment by BIOS and the operating system |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Manual assignment                                     |
| PIRQE                      | Option for configuring PIRQ E   | Auto   | Automatic assignment by BIOS and the operating system |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Manual assignment                                     |
| PIRQF                      | Option for configuring PIRQ F   | Auto   | Automatic assignment by BIOS and the operating system |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Manual assignment                                     |
| PIRQG                      | Option for configuring PIRQ G   | Auto   | Automatic assignment by BIOS and the operating system |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Manual assignment                                     |
| PIRQH                      | Option for configuring PIRQ H   | Auto   | Automatic assignment by BIOS and the operating system |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Manual assignment                                     |
| Reserve legacy interrupt 1 | Prevents the interrupt reserved here from being made available to a PCI or PCI Express device | None   | No interrupt assigned                                 |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Reserves IRQx   |
| Reserve legacy interrupt 2 | Prevents the interrupt reserved here from being made available to a PCI or PCI Express device | None   | No interrupt assigned                                 |
|                            |   | IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15 | Reserves IRQx   |

Table 221: Advanced - PCI configuration - PIRQ routing &amp; IRQ reservation - Configuration options

## 1.4.5 PCI express configuration

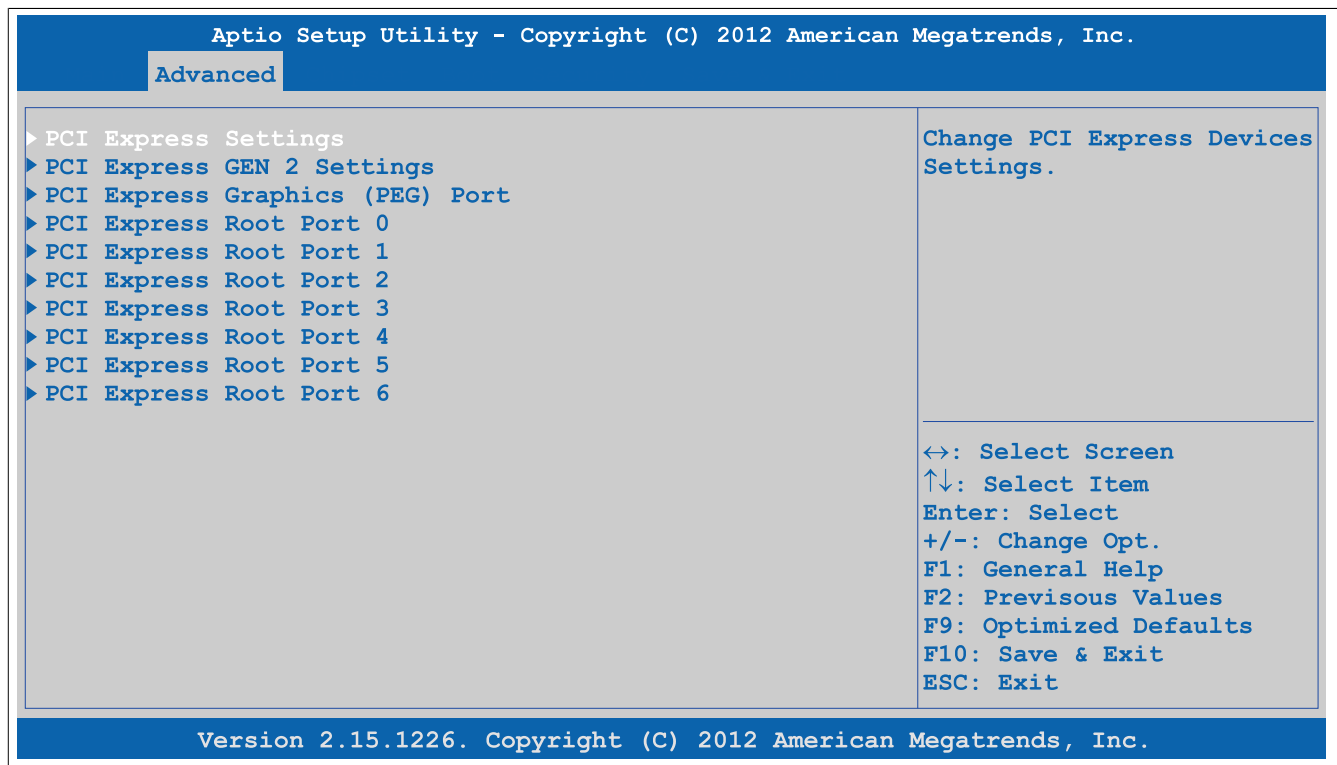


Figure 130: Advanced - PCI Express Configuration

| BIOS setting                    | Function                                  | Configuration options | Effect   |
|---------------------------------|---|-----------------------|--|
| PCI Express settings            | Configures PCI Express settings           | Enter                 | Opens this submenu<br>See "PCI Express settings" on page 256.            |
| PCI Express GEN 2 settings      | Configures PCI Express GEN2 settings      | Enter                 | Opens this submenu<br>See "PCI Express GEN 2 settings" on page 257.      |
| PCI Express graphics (PEG) port | Configures PCI Express graphics settings  | Enter                 | Opens this submenu<br>See "PCI Express graphics (PEG) port" on page 258. |
| PCI Express root port 0         | Configures PCI Express settings on port 0 | Enter                 | Opens this submenu<br>See "PCI Express root port" on page 260.           |
| PCI Express root port 1         | Configures PCI Express settings on port 1 | Enter                 | Opens this submenu<br>See "PCI Express root port" on page 260.           |
| PCI Express root port 2         | Configures PCI Express settings on port 2 | Enter                 | Opens this submenu<br>See "PCI Express root port" on page 260.           |
| PCI Express root port 3         | Configures PCI Express settings on port 3 | Enter                 | Opens this submenu<br>See "PCI Express root port" on page 260.           |
| PCI Express root port 4         | Configures PCI Express settings on port 4 | Enter                 | Opens this submenu<br>See "PCI Express root port" on page 260.           |
| PCI Express root port 5         | Configures PCI Express settings on port 5 | Enter                 | Opens this submenu<br>See "PCI Express root port" on page 260.           |
| PCI Express root port 6         | Configures PCI Express settings on port 6 | Enter                 | Opens this submenu<br>See "PCI Express root port" on page 260.           |

Table 222: Advanced - PCI Express configuration - Menu

## 1.4.5.1 PCI Express settings

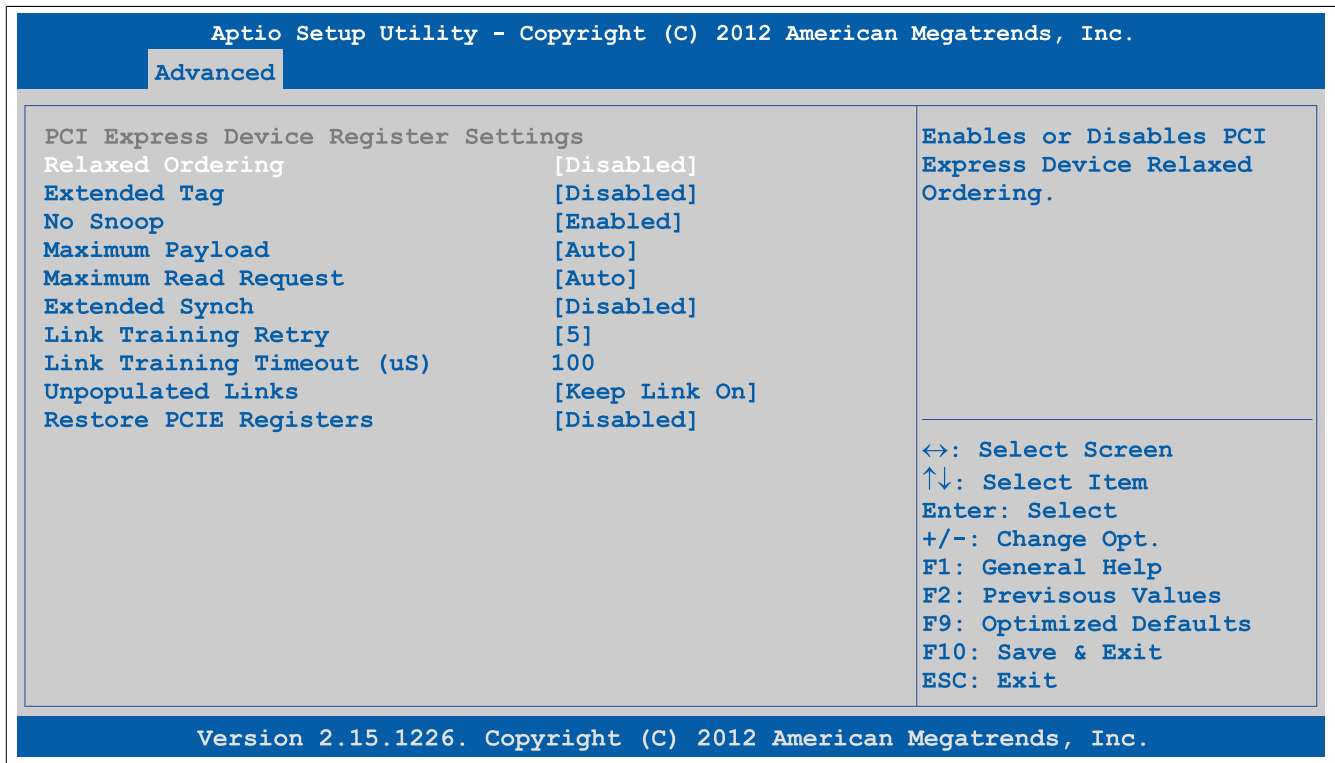


Figure 131: Advanced - PCI Express Configuration - PCI Express Settings

| BIOS setting               | Function  | Configuration options   | Effect  |
|----------------------------|---|-------------------------|---|
| Relaxed ordering           | Option for enabling/disabling relaxed ordering  | Disabled                | Disables this function  |
|                            |   | Enabled                 | Enables this function   |
| Extended tag               | Option for enabling/disabling the extended tag  | Disabled                | Disables this function. Only 5 bits can be used.  |
|                            |   | Enabled                 | Enables this function. Devices with 8 bits in the requester transaction ID field can be used. |
| No snoop                   | Option for enabling/disabling the "No snoop" option   | Disabled                | Disables this function  |
|                            |   | Enabled                 | Enables this function   |
| Maximum payload            | Option for setting the maximum surface packet size for data transfers   | Auto                    | Automatically assigns the packet size   |
|                            |   | 128 bytes to 4096 bytes | Manually assigns the packet size  |
| Maximum read request       | Option for setting the maximum read request   | Auto                    | Automatic assignment  |
|                            |   | 128 bytes to 4096 bytes | Manual assignment   |
| Extended synch             | Option for setting an extended synchronization pattern to improve system performance  | Disabled                | Disables this function  |
|                            |   | Enabled                 | Enables this function   |
| Link training retry        | Option for defining the number of times the software should attempt to reroute a link if the previous training attempt was unsuccessful | Disabled                | Disables this function  |
|                            |   | 2                       | 2 link training attempts  |
|                            |   | 3                       | 3 link training attempts  |
|                            |   | 5                       | 5 link training attempts  |
| Link training timeout (µS) | Option for defining how many microseconds the software waits before the link training bit in the link status register is queried        | 10 to 1000              | Time setting in µs  |
| Unpopulated links          | Option for enabling/disabling PCIe slots where no devices are connected   | Keep link on            | Keeps PCIe slots where no devices are connected enabled                                       |
|                            |   | Disable link            | Disables PCIe slots where no devices are connected to save power                              |
| Restore PCIE registers     | Option for enabling/disabling the restoring of PCIE registers   | Enabled                 | Enables this function   |
|                            |   | Disabled                | Disables this function  |

Table 223: Advanced - PCI Express configuration - PCI Express settings - Configuration options

## 1.4.5.2 PCI Express GEN 2 settings

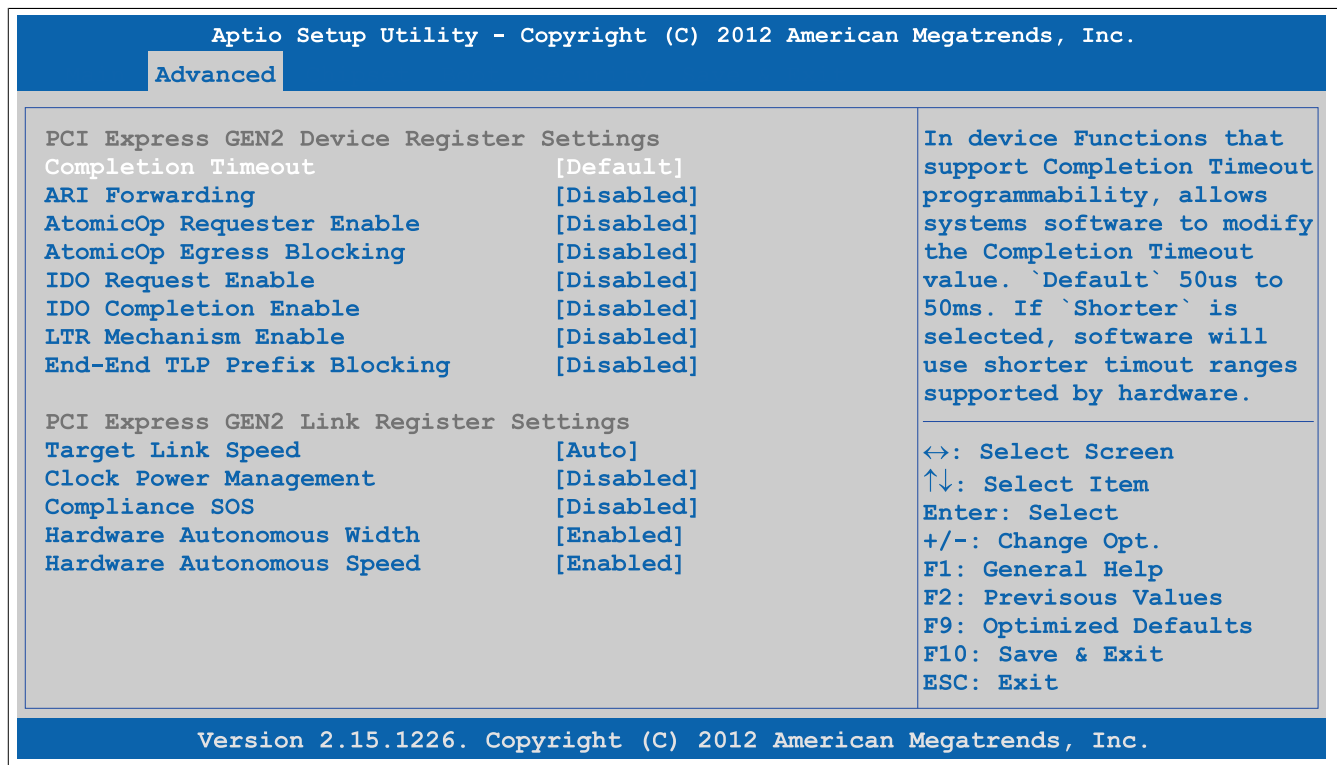


Figure 132: Advanced - PCI Express Configuration - PCI Express GEN 2 Settings

| BIOS setting                | Function  | Configuration options | Effect  |
|-----------------------------|---|-----------------------|---|
| Completion timeout          | Option for allowing software to modify the completion timeout value if supported by device functions  | Default               | Timeout range: 50 $\mu$ s - 50 ms   |
|                             |   | Shorter               | The software uses shorter timeout ranges than are supported by the hardware.  |
|                             |   | Longer                | The software uses longer timeout ranges than are supported by the hardware.   |
|                             |   | Disabled              | Disables this function  |
| ARI forwarding              | If supported by the hardware and set to "Enabled", the downstream port disables its traditional "Device number" field being 0 enforcement when turning a Type1 configuration request into a Type0 configuration request, permitting access to extended functions in an ARI device immediately below the port. | Disabled              | Disables this function  |
|                             |   | Enabled               | Enables this function   |
| AtomicOp requester enable   | Option for enabling/disabling the AtomicOp requester  | Disabled              | Disables this function  |
|                             |   | Enabled               | Enables this function<br>AtomicOp queries are only initiated if the bus master enable bit is set in the command register. |
| AtomicOp egress blocking    | Option for enabling/disabling AtomicOp egress blocking<br><br>If supported by the hardware and set to "Enabled", outbound AtomicOp requests via egress ports will be locked.  | Disabled              | Disables this function  |
|                             |   | Enabled               | Enables this function<br>Blocks outbound AtomicOp requests via the egress port  |
| IDO request enable          | If supported by the hardware and set to "Enabled", this option permits setting the number of ID-based ordering (IDO) bit (Attribute[2]) requests to be initiated.   | Disabled              | Disables this function  |
|                             |   | Enabled               | Enables this function   |
| IDO completion enable       | If supported by the hardware and set to "Enabled", this option permits setting the number of ID-based ordering (IDO) bit (Attribute[2]) requests to be initiated.   | Disabled              | Disables this function  |
|                             |   | Enabled               | Enables this function   |
| LTR mechanism enable        | If supported by the hardware and set to "Enabled", this enables the Latency Tolerance Reporting (LTR) mechanism.  | Disabled              | Disables this function  |
|                             |   | Enabled               | Enables this function   |
| End-End TLP prefix blocking | If supported by the hardware and set to "Enabled", this function will block forwarding of TLPs containing End-End TLP prefixes.   | Disabled              | Disables this function  |
|                             |   | Enabled               | Enables this function   |

Table 224: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options

| BIOS setting              | Function  | Configuration options | Effect  |
|---------------------------|---|-----------------------|---|
| Target link speed         | If supported by the hardware and set to "Force to 2.5 GT/s" for downstream ports, this sets an upper limit on Link operational speed by restricting the values advertised by the upstream component in its training sequences. When "Auto" is selected, hardware-initialized data will be used. | Auto                  | Target link speed is detached by hardware.  |
|                           |   | Force to 2.5 GT/s     | Limits target link speed to 2.5 GT/s  |
|                           |   | Force to 5.0 GT/s     | Limits target link speed to 5 GT/s  |
| Clock power management    | If supported by the hardware and set to "Enabled", the <a href="#">device</a> is permitted to use the CLKREQ# <a href="#">signal</a> for power management of the Link clock in accordance with the <a href="#">protocol</a> defined in the appropriate form factor specification.               | Disabled              | Disables this function  |
|                           |   | Enabled               | Enables this function   |
| Compliance SOS            | If supported by the hardware and set to "Enabled", this will force LTSSM to send SKP ordered sets between sequences when sending compliance patterns or modified compliance patterns.   | Disabled              | Disables this function  |
|                           |   | Enabled               | Enables this function   |
| Hardware autonomous width | If supported by the hardware and set to "Disabled", this will disable the hardware's ability to change link width except width size reduction for the purpose of correcting unstable link operation.  | Disabled              | Disables this function  |
|                           |   | Enabled               | Enables this function   |
| Hardware autonomous speed | If supported by the hardware and set to "Disabled", this will disable the hardware's ability to change link speed except speed size reduction for the purpose of correcting unstable link operation.  | Disabled              | Disables this function<br>The PCIe <a href="#">device</a> can no longer change the link speed except to correct unstable operation. |
|                           |   | Enabled               | Enables this function   |

Table 224: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options

### 1.4.5.3 PCI Express graphics (PEG) port

| Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.  |   |  |
|---|---|--|
| Advanced  |   |  |
| PCI Express Graphics (PEG) Port<br>PEG Root Port Configuration<br>PEG0<br>PEG0 Speed<br>PEG0 ASPM<br>PEG1<br>PEG1 Speed<br>PEG1 ASPM<br>PEG2<br>PEG2 Speed<br>PEG2 ASPM<br><br>Detected Non-compliant Device<br>De-emphasis Control | [Auto]<br>[1 x8 + 2 x4]<br>Not Present<br>[Auto]<br>[Disabled]<br>Not Present<br>[Gen1]<br>[Disabled]<br>Not Present<br>[Auto]<br>[Disabled]<br><br>[Disabled]<br>[-3.5 dB] | Disabled=Disabled internal PEG interface devices and do not detect the devices connected to the PEG port.<br>Enabled=Enable internal PEG interface devices also if no device is detected on PEG port.<br>Auto=Disable internal PEG interface devices<br><br>↔: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F9: Optimized Defaults<br>F10: Save & Exit<br>ESC: Exit |
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Figure 133: Advanced - PCI Express Configuration - PCI Express Graphics (PEG) Port

| BIOS setting                    | Function   | Configuration options | Effect   |
|---------------------------------|--|-----------------------|--|
| PCI Express graphics (PEG) port | Option for configuring the PCI Express graphics port   | Disabled              | Disables internal PEG <a href="#">interface</a> devices. Devices connected to the PEG port are not detected.         |
|                                 |  | Enabled               | Enables internal PEG <a href="#">interface</a> devices even if no <a href="#">device</a> is detected on the PEG port |
|                                 |  | Auto                  | Disables internal PEG <a href="#">interface</a> devices if no <a href="#">device</a> is detected on the PEG port     |
| PEG root port configuration     | Option for selecting the root port configuration on the 16 PCIe channels of the PEG port           | 1 x 16                | Configuration with 1 x 16  |
|                                 |  | 2 x 8                 | Configuration with 2 x 8   |
|                                 |  | 1 x 8 + 2 x 4         | Configuration with 1 x 8 and 2 x 4   |
| PEG0                            | Displays the mode in which the <a href="#">device</a> connected to the PEG0 port is being operated | None                  | -  |

Table 225: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Configuration options



| BIOS setting                 | Function   | Configuration options | Effect  |
|------------------------------|--|-----------------------|---|
| PEG0 speed                   | Option for setting the maximum transfer rate of the PEG0 port                                      | Auto                  | Selects the maximum transfer rate   |
|                              |  | Gen1                  | Maximum transfer rate = 2.5 GT/s  |
|                              |  | Gen2                  | Maximum transfer rate = 5 GT/s  |
|                              |  | Gen3                  | Maximum transfer rate = 8 GT/s  |
| PEG0 ASPM <sup>1)</sup>      | Option for configuring a power saving function for the PEG0 port if it does not require full power | Disabled              | Disables this function  |
|                              |  | Auto                  | Automatic assignment by BIOS and the operating system   |
|                              |  | ASPM L0s              | Enables the L0 energy saving function   |
|                              |  | ASPM L1               | Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher. |
| ASPM L0s <sup>2)</sup>       | Option for configuring the L0 power saving function  | ASPM L0sL1            | Automatic assignment of L0s or L1 power saving function by the PCIe device                                      |
|                              |  | Disabled              | Disables this function  |
|                              |  | Root port only        | Enables the power saving function for the root port   |
|                              |  | Endpoint only         | Enables the power saving function for the endpoint port   |
| Both root and endpoint ports |  |                       | Enables the power saving function for the root and endpoint ports   |
|                              |  |                       |   |
|                              |  |                       |   |
|                              |  |                       |   |
| PEG1                         | Displays the mode in which the device connected to the PEG1 port is being operated                 | None                  | -   |
| PEG1 speed                   | Option for setting the maximum transfer rate for the PEG1 port                                     | Auto                  | Selects the maximum transfer rate   |
|                              |  | Gen1                  | Maximum transfer rate = 2.5 GT/s  |
|                              |  | Gen2                  | Maximum transfer rate = 5 GT/s  |
|                              |  | Gen3                  | Maximum transfer rate = 8 GT/s  |
| PEG1 ASPM <sup>1)</sup>      | Option for configuring a power saving function for the PEG1 port if it does not require full power | Disabled              | Disables this function  |
|                              |  | Auto                  | Automatic assignment by BIOS and the operating system   |
|                              |  | ASPM L0s              | Enables the L0 energy saving function   |
|                              |  | ASPM L1               | Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher. |
| ASPM L0s <sup>3)</sup>       | Option for configuring the L0 power saving function  | ASPM L0sL1            | Automatic assignment of L0s or L1 power saving function by the PCIe device                                      |
|                              |  | Disabled              | Disables this function  |
|                              |  | Root port only        | Enables the power saving function for the root port   |
|                              |  | Endpoint only         | Enables the power saving function for the endpoint port   |
| Both root and endpoint ports |  |                       | Enables the power saving function for the root and endpoint ports   |
|                              |  |                       |   |
|                              |  |                       |   |
|                              |  |                       |   |
| PEG2                         | Displays the mode in which the device connected to the PEG2 port is being operated                 | None                  | -   |
| PEG2 speed                   | Option for setting the maximum transfer rate for the PEG2 port                                     | Auto                  | Selects the maximum transfer rate   |
|                              |  | Gen1                  | Maximum transfer rate = 2.5 GT/s  |
|                              |  | Gen2                  | Maximum transfer rate = 5 GT/s  |
|                              |  | Gen3                  | Maximum transfer rate = 8 GT/s  |
| PEG2 ASPM <sup>1)</sup>      | Option for configuring a power saving function for the PEG2 port if it does not require full power | Disabled              | Disables this function  |
|                              |  | Auto                  | Automatic assignment by BIOS and the operating system   |
|                              |  | ASPM L0s              | Enables the L0 energy saving function   |
|                              |  | ASPM L1               | Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher. |
| ASPM L0s <sup>4)</sup>       | Option for configuring the L0 power saving function  | ASPM L0sL1            | Automatic assignment of L0s or L1 power saving function by the PCIe device                                      |
|                              |  | Disabled              | Disables this function  |
|                              |  | Root port only        | Enables the power saving function for the root port   |
|                              |  | Endpoint only         | Enables the power saving function for the endpoint port   |
| Both root and endpoint ports |  |                       | Enables the power saving function for the root and endpoint ports   |
|                              |  |                       |   |
|                              |  |                       |   |
|                              |  |                       |   |
| Detect non-compliant device  | Option for detecting incompatible PCI Express devices on the PEG port                              | Disabled              | Disables this function  |
|                              |  | Enabled               | Enables this function. Even incompatible PCI Express devices are detected on the PEG port.                      |
| De-emphasis control          | Option for configuring de-emphasis on the PEG port   | -6 dB                 | -6 dB de-emphasis   |
|                              |  | -3.5 dB               | -35 dB de-emphasis  |

Table 225: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Configuration options

- 1) ASPM = Active State Power Management.  
 2) This setting is only possible if PEG0 ASPM is set to ASPM L0s or ASPM L0sL1.  
 3) This setting is only possible if PEG1 ASPM is set to ASPM L0s or ASPM L0sL1.  
 4) This setting is only possible if PEG2 ASPM is set to ASPM L0s or ASPM L0sL1.

## 1.4.5.4 PCI Express root port

**Warning!**

Improper settings **can** cause instability or **device** problems. It is therefore strongly recommended that these settings only be changed by experienced users.

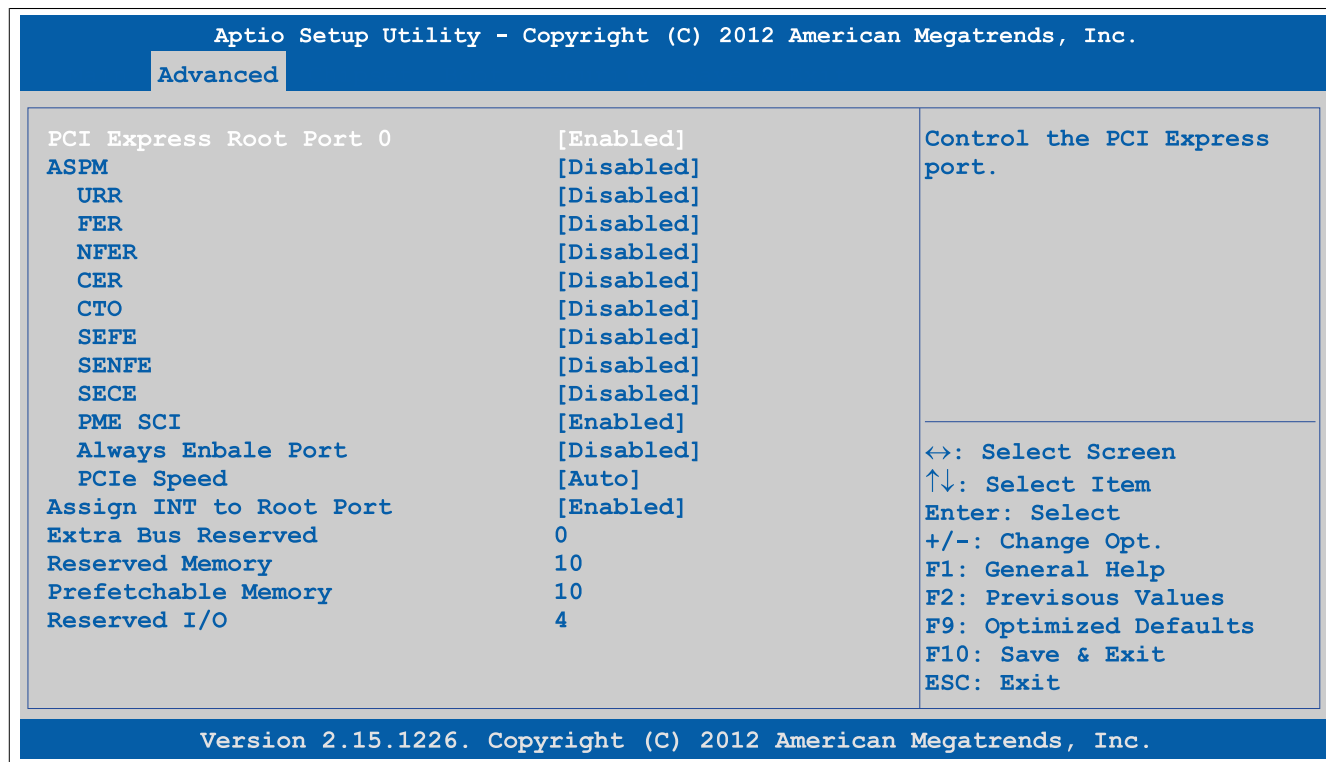


Figure 134: Advanced - PCI Express Configuration - PCI Express Root Port

| BIOS setting            | Function  | Configuration options | Effect  |
|-------------------------|---|-----------------------|---|
| PCI Express root port x | Option for enabling/disabling the PCI Express root port   | Enabled               | Enables PCI Express root port 1   |
|                         |   | Disabled              | Disables PCI Express root port 1 and 2  |
| ASPM                    | <i>Active State Power Management</i><br>Option for configuring a power saving function (L0s/L1) for PCIe devices if they do not require full power  | Disabled              | Disables this function  |
|                         |   | L0s                   | Enables the L0 energy saving function   |
|                         |   | L1                    | Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher. |
|                         |   | L0sL1                 | Automatic assignment of L0s or L1 power saving function by the PCIe device                                      |
|                         |   | Auto                  | Automatic assignment by BIOS and the operating system   |
| URR                     | <i>Unsupported Request (UR) reporting</i><br>Option for reporting unsupported requests. Logging of error messages received by the root port is controlled exclusively by the root control register.                         | Enabled               | Enables this function   |
|                         |   | Disabled              | Disables this function  |
| FER                     | <i>Fatal error reporting</i><br>Option for reporting fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.           | Enabled               | Enables this function   |
|                         |   | Disabled              | Disables this function  |
| NFER                    | <i>Non-fatal error reporting</i><br>Option for reporting non-fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.   | Enabled               | Enables this function   |
|                         |   | Disabled              | Disables this function  |
| CER                     | <i>Correctable error reporting</i><br>Option for reporting non-fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex. | Enabled               | Enables this function   |
|                         |   | Disabled              | Disables this function  |
| CTO                     | <i>PCI Express completion timer T0</i>  | Enabled               | Enables this function   |

Table 226: Advanced - PCI Express configuration - PCI Express root port - Configuration options

| BIOS setting            | Function   | Configuration options | Effect  |
|-------------------------|--|-----------------------|---|
|                         | Option for enabling/disabling the PCI Express completion timer<br><br><b>Information:</b><br><br>This setting should be set to "Enabled" if the system detected an ROB (processor reorder buffer) timeout. | Disabled              | Disables this function  |
| SEFE                    | System error on fatal error<br>Option for generating a system error if a fatal error is reported by a device on the root port or by the root port itself   | Enabled               | Enables this function   |
|                         |  | Disabled              | Disables this function  |
| SENE                    | System error on non-fatal error<br>Option for generating a system error if a non-fatal error is reported by a device on the root port or by the root port itself   | Enabled               | Enables this function   |
|                         |  | Disabled              | Disables this function  |
| SECE                    | System error on correctable error<br>Option for generating a system error if a correctable error is reported by a device on the root port or by the root port itself                                       | Enabled               | Enables this function   |
|                         |  | Disabled              | Disables this function  |
| PME SCI                 | Option for generating an SCI if power management is detected   | Enabled               | Enables this function<br>Enables the root port to generate an SCI if power management is detected |
|                         |  | Disabled              | Disables this function  |
| Always enable port      | Option for keeping the port enabled constantly   | Enabled               | Enables this function   |
|                         |  | Disabled              | Disables this function  |
| PCIe speed              | Option for setting the PCI Express transfer rate   | Auto                  | Automatically sets the transfer rate  |
|                         |  | Gen1                  | Maximum transfer rate = 2.5 GT/s  |
|                         |  | Gen2                  | Maximum transfer rate = 5 GT/s  |
| Assign INT to root port | Option for enabling/disabling the IRQ for the root port  | Disabled              | Disables this function  |
|                         |  | Enabled               | Enables this function   |
| Extra bus reserved      | Option for reserving the extra bus to bridges behind this root bridge  | 0 to 7                |   |
| Reserved memory         | Option for configuring reserved memory for this root bridge  | 0 to 20               |   |
| Prefetchable memory     | Option for configuring prefetchable memory for this root bridge  | 1 to 20               |   |
| Reserved I/O            | Option for configuring a reserved I/O range (4K/8K/12K/16K/20K) for this root bridge   | 4 to 20               |   |

Table 226: Advanced - PCI Express configuration - PCI Express root port - Configuration options

### 1.4.6 ACPI settings

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**Advanced**

|  |  |
|--|--|
| <div style="display: flex; justify-content: space-between;"> <div> <b>ACPI Settings</b><br/>           Enable Hibernation [Enabled]<br/>           ACPI Sleep State [Both S1 and S3 ava...]<br/>           Lock Legacy Resources [Disabled]<br/>           S3 Video Repost [Disabled]         </div> <div>           Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.         </div> </div> |  |
| <div style="display: flex; justify-content: space-between;"> <div>           Critical Trip Point [111 C]         </div> <div>           &lt;=&gt;: Select Screen<br/>           ↑↓: Select Item<br/>           Enter: Select<br/>           +/-: Change Opt.<br/>           F1: General Help<br/>           F2: Previous Values<br/>           F9: Optimized Defaults<br/>           F10: Save &amp; Exit<br/>           ESC: Exit         </div> </div>       |  |

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Figure 135: Advanced - ACPI Settings

| BIOS setting          | Function   | Configuration options                          | Effect   |
|-----------------------|--|--|--|
| Enable hibernation    | Option for enabling/disabling the hibernate function. This <b>can</b> put the operating system into the S4 state. This option may not have any effect on some operating systems. | Disabled                                       | Disables this function   |
|                       |  | Enabled  | Enables this function  |
| ACPI sleep state      | Selects the <b>ACPI</b> status to be used when Suspend mode is enabled   | Suspend disabled                               | Disables this function   |
|                       |  | S1 only ( <b>CPU</b> stop clock)               | Sets S1 as Suspend mode. Only a few functions are disabled and are available again at the touch of a button.                                     |
|                       |  | S3 only (Suspend to <b>RAM</b> )               | Sets S3 as Suspend mode. The current state of the operating system is written to <b>RAM</b> , which is then the only component to receive power. |
|                       |  | Both S1 and S3 available for OS to choose from | Enables S1 and S3. The states <b>can</b> then be selected by the operating system.   |
| Lock legacy resources | Option for configuring whether the operating system is permitted to configure legacy resources   | Disabled                                       | Disables this function   |
|                       |  | Enabled  | Enables this function  |
| S3 video repost       | Option for configuring whether the graphic <b>ROM</b> should be reposted after starting in the S3 status   | Disabled                                       | Disables this function   |
|                       |  | Enabled  | Enables this function  |
| Critical trip point   | Option for configuring a <b>CPU</b> temperature at which the operating system automatically shuts down   | POR  | Sets the critical trip point to 105°C  |
|                       |  | 87 C, 95 C, 103 C, 111 C, 119 C, 127 C         | Temperature setting for the critical trip point. Configurable in increments of 8°C.  |

Table 227: Advanced - **ACPI** settings - Configuration options

### 1.4.7 RTC wake settings

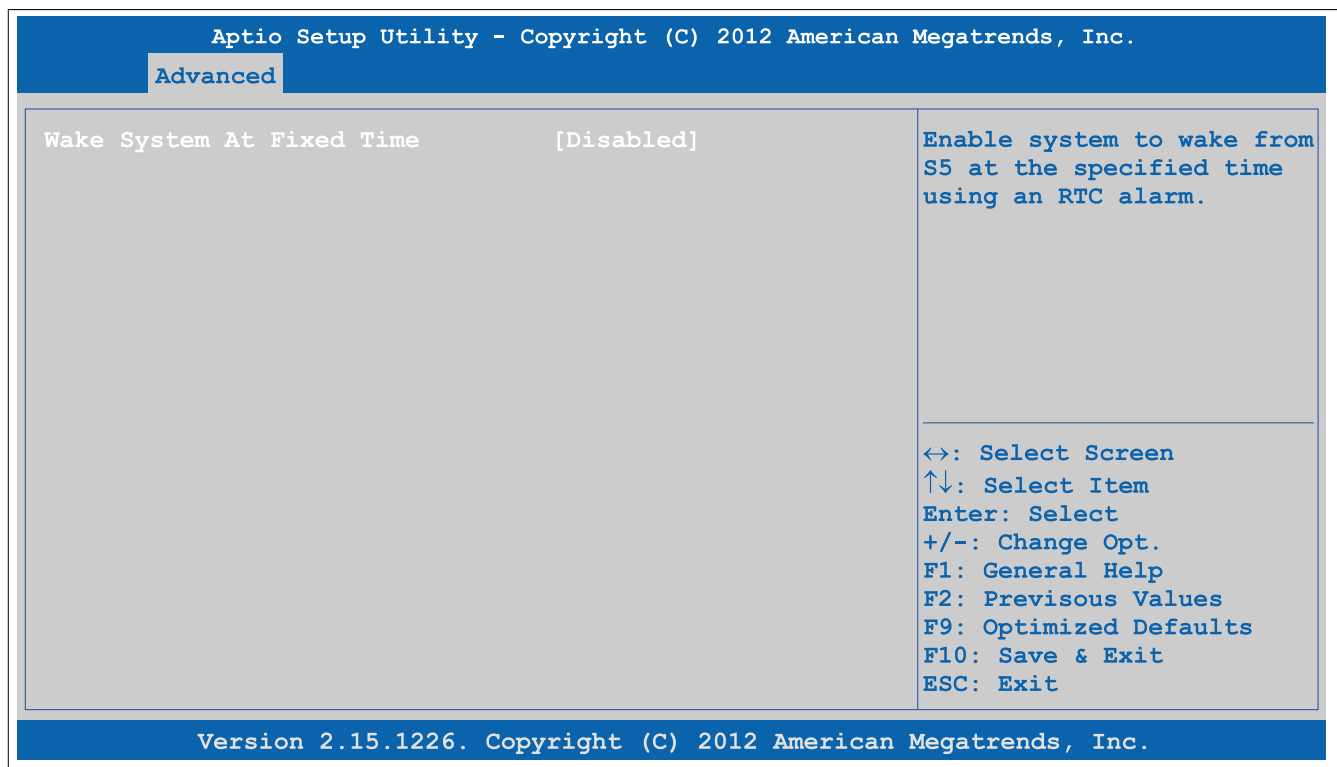


Figure 136: Advanced - RTC Wake Settings

| BIOS setting              | Function  | Configuration options | Effect  |
|---------------------------|---|-----------------------|---|
| Wake system at fixed time | Option for setting the time (to the second) when the system should boot from a switched-off state ( <b>ACPI</b> S5) | Disabled              | Disables this function  |
|                           |   | Enabled               | Enables this function   |
| Wake up hour              | Option for setting the hour   | 0 to 23               | Example: If set to 3, the system will start up at 3 AM. If set to 15, the system will start up at 3 PM. |
| Wake up minute            | Option for setting the minute   | 0 to 59               | Example: If set to 15, the system will start up at minute 15.   |
| Wake up second            | Option for setting the second   | 0 to 59               | Example: If set to 32, the system will start up at second 32.   |

Table 228: Advanced - RTC wake settings - Configuration options

## 1.4.8 CPU configuration

**Information:**

The settings shown may vary depending on the CPU board being used.

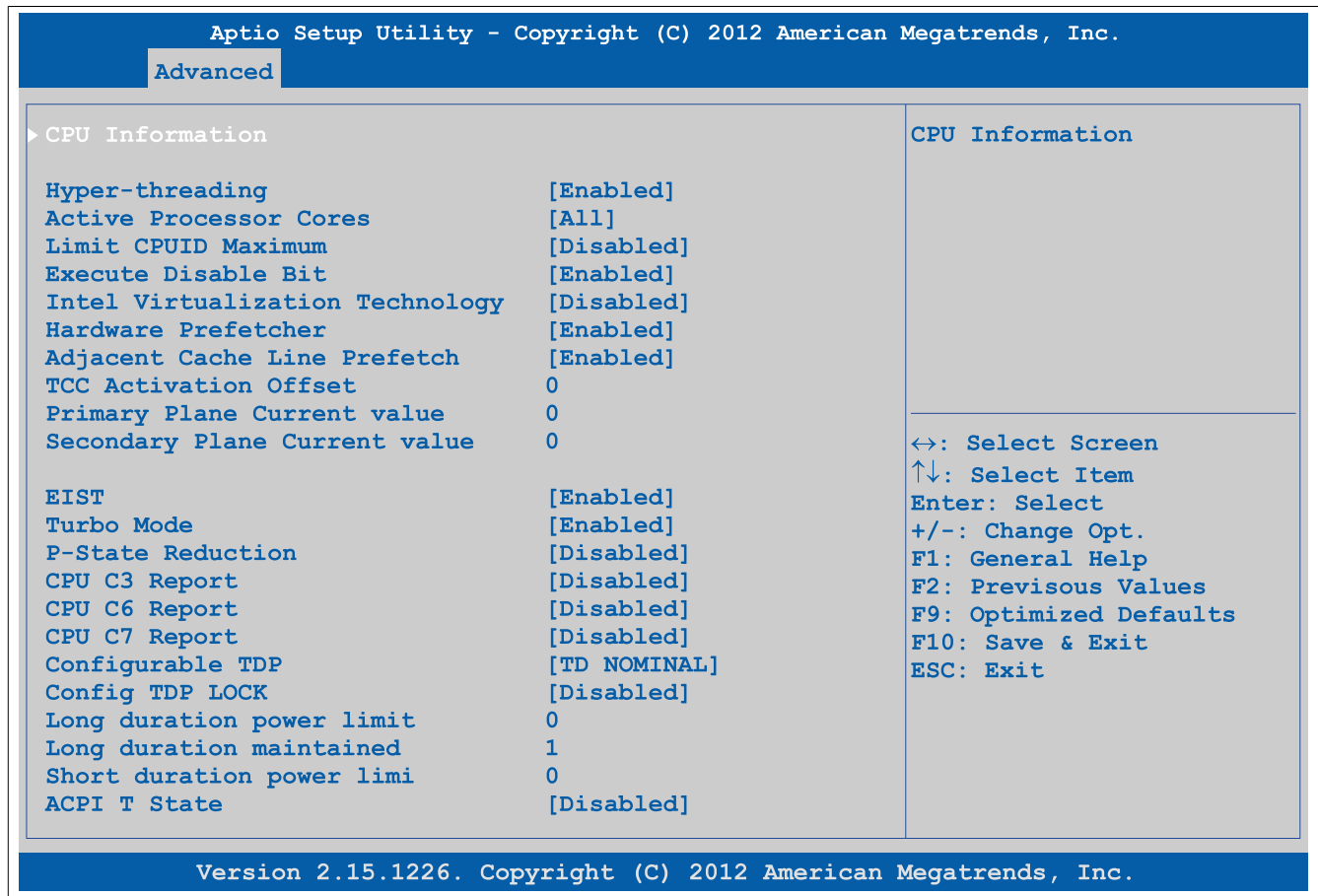


Figure 137: Advanced - CPU Configuration

| BIOS setting                    | Function  | Configuration options | Effect   |
|---------------------------------|---|-----------------------|--|
| <b>CPU information</b>          | Displays CPU properties   | Enter                 | Opens this submenu<br>See "CPU information" on page 265.   |
| Hyper-threading                 | Option for enabling/disabling Intel Hyper-Threading Technology  | Disabled              | Disables this function   |
|                                 |   | Enabled               | Enables this function<br>Each processor core can execute multiple tasks (threads) at the same time. Intel Hyper-Threading Technology increases processor throughput and improves the overall performance of multi-thread software. |
| Active processor cores          | Option for configuring which processor cores are to be used   | All                   | Uses all processor cores   |
|                                 |   | 1                     | Only uses one processor core   |
| Limit CPUID maximum             | Option for limiting the CPUID value. This may be necessary for older operating systems.<br><br><b>Information:</b><br>This option must be set to <b>Disabled</b> when using Windows XP. | Disabled              | The processor returns the current maximum value when the CPUID value is requested.   |
|                                 |   | Enabled               | The processor limits the maximum CPUID value to 03h if necessary if the processor supports a higher value.   |
| Execute disable bit             | Option for enabling/disabling hardware support for prevention of data execution   | Disabled              | Disables this function   |
|                                 |   | Enabled               | Enables this function  |
| Intel virtualization technology | Option for enabling/disabling a virtual machine<br><br><b>Information:</b><br>A restart is required in order to apply changes made to this setting.                                     | Disabled              | Disables this function   |
|                                 |   | Enabled               | Allows a virtual machine to use the additional hardware capacity   |
| Hardware prefetcher             | Option for enabling/disabling the hardware prefetcher   | Disabled              | Disables this function   |
|                                 |   | Enabled               | Enables this function. Data is temporarily stored in cache memory to increase performance.   |

Table 229: Advanced - CPU configuration - Configuration options

| BIOS setting                                 | Function  | Configuration options     | Effect  |
|--|---|---------------------------|---|
| Adjacent <a href="#">cache</a> line prefetch | Option for enabling/disabling the adjacent <a href="#">cache</a> line prefetcher  | Disabled                  | Disables this function  |
|  |   | Enabled                   | Enables this function. Loads the current and next line to <a href="#">cache</a> in order to accelerate the read <a href="#">process</a> |
| TCC <sup>1)</sup> activation offset          | Option for configuring the offset of the thermal <a href="#">control</a> circuit (TCC) at temperatures below the TCC activation temperature   | 0 to 50                   | Sets the offset value   |
| Primary plane current value                  | Option for configuring the maximum current on the primary plane at any single time  | 0 to 255                  | Setting from 0 to 255   |
| Secondary plane current value                | Option for configuring the maximum current on the secondary plane at any single time  | 0 to 255                  | Setting from 0 to 255   |
| EIST   | Option for enabling/disabling Intel® SpeedStep™ technology The processor clock speed is increased or decreased according to the number of calculations that must be made. As a result, the power consumption depends largely on the processor load. | Disabled                  | Disables Intel® SpeedStep™ technology   |
|  |   | Enabled                   | Enables Intel® SpeedStep™ technology The processor speed is regulated by the operating system.  |
| Turbo mode                                   | Option for enabling/disabling Intel® Turbo Boost Technology   | Disabled                  | Disables Intel® Turbo Boost technology  |
|  |   | Enabled                   | Enables Intel® Turbo Boost technology   |
| P state reduction                            | Option for reducing the <a href="#">CPU</a> performance and power usage.  | Disabled                  | Disables this function  |
|  |   | by 1, 2, 3, 4, 5, 6, 7, 8 | The performance is reduced by the set value depending on the <a href="#">CPU</a> used.  |
| <a href="#">CPU</a> C3 report                | Option for enabling/disabling the <a href="#">CPU</a> C3 (ACPI C2) report to the operating system   | Disabled                  | Disables this function. No report is sent to the operating system.  |
|  |   | Enabled                   | Enables this function   |
| <a href="#">CPU</a> C6 report                | Option for enabling/disabling the <a href="#">CPU</a> C6 (ACPI C3) report to the operating system   | Disabled                  | Disables this function. No report is sent to the operating system.  |
|  |   | Enabled                   | Enables this function   |
| <a href="#">CPU</a> C7 report                | Option for enabling/disabling the <a href="#">CPU</a> C7 (ACPI C3) report to the operating system   | Disabled                  | Disables this function. No report is sent to the operating system.  |
|  |   | Enabled                   | Enables this function   |
| Configurable TDP <sup>2)</sup>               | Option for configuring the TDP level  | TDP NOMINAL               | Value remains at the TDP level  |
|  |   | TDP DOWN                  | Value falls below the TDP level, with the <a href="#">CPU</a> running at lower power  |
|  |   | TDP UP                    | Value rises above the TDP level, with the <a href="#">CPU</a> running at higher power   |
|  |   | Disabled                  | Disables this function  |
| Config TDP LOCK                              | Option for locking and configuring the TDP <a href="#">control</a> register   | Disabled                  | Disables this function  |
|  |   | Enabled                   | Enables this function   |
| Long duration power limit                    | Long duration power limit in watts  | 0 to 255                  | Setting from 0 to 255   |
| Long duration maintained                     | Time period during which the "Long duration power" option is enabled  | 0 to 120                  | Setting from 0 to 120   |
| Short duration power limit                   | Short duration power limit in watts   | 0 to 255                  | Setting from 0 to 255   |
| <a href="#">ACPI</a> T state                 | Option for enabling/disabling <a href="#">ACPI</a> T state support.   | Disabled                  | Disables this function  |
|  |   | Enabled                   | Enables this function   |

Table 229: Advanced - [CPU](#) configuration - Configuration options

- 1) TCC = Thermal [control](#) circuit.  
2) TDP = Thermal design power.

## 1.4.8.1 CPU information

**Information:**

The settings shown may vary depending on the CPU board being used.

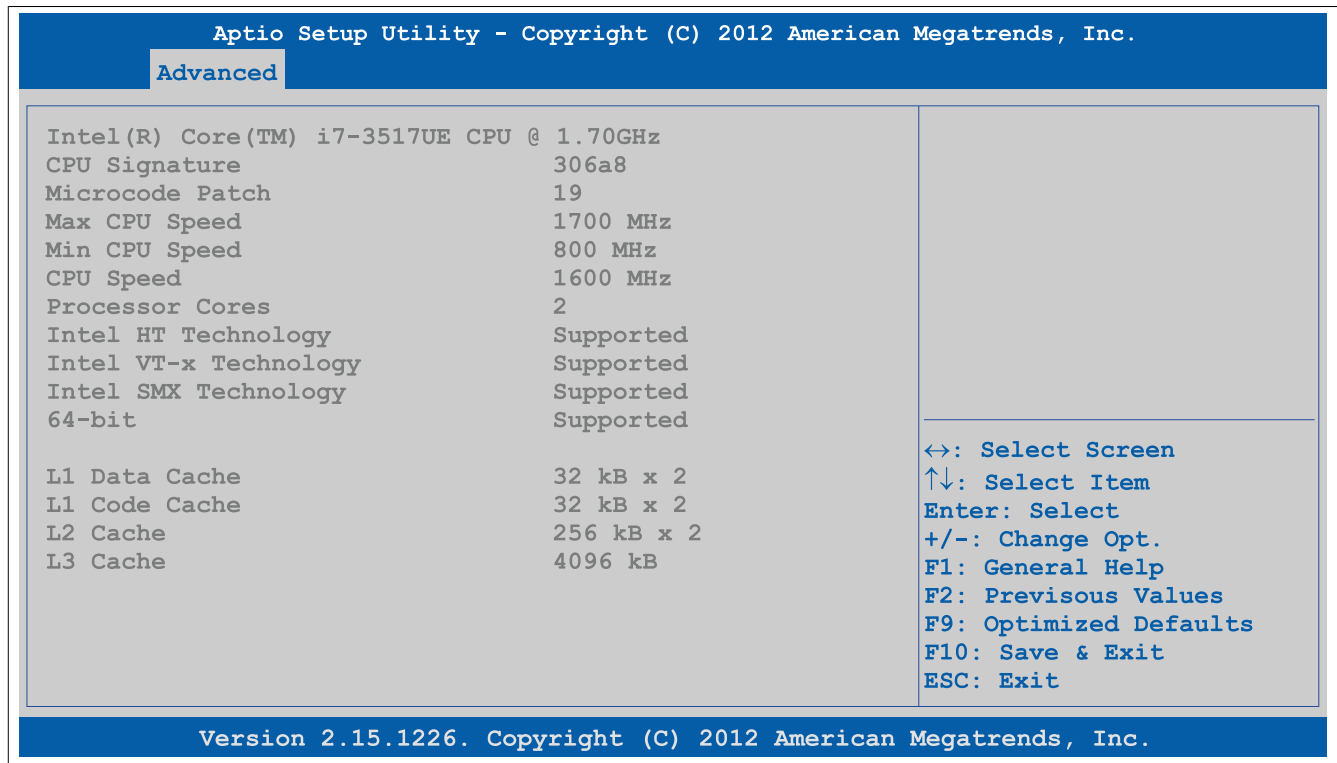


Figure 138: Advanced - CPU Configuration - CPU Information

| BIOS setting          | Function   | Configuration options | Effect |
|-----------------------|--|-----------------------|--------|
| CPU signature         | Displays the CPU ID  | None                  | -      |
| Microcode patch       | Displays the microcode patch ID                                    | None                  | -      |
| Max CPU speed         | Displays the maximum processor frequency                           | None                  | -      |
| Min CPU speed         | Displays the minimum processor frequency                           | None                  | -      |
| CPU speed             | Displays the processor frequency                                   | None                  | -      |
| Processor cores       | Displays the number of processor cores                             | None                  | -      |
| Intel HT technology   | Displays whether the processor supports HT technology              | None                  | -      |
| Intel VT-x technology | Displays whether the processor supports VT-x technology            | None                  | -      |
| Intel SMX technology  | Displays whether the processor supports SMX technology             | None                  | -      |
| 64-bit                | Displays whether the processor supports Intel 64-bit architectures | None                  | -      |
| L1 data cache         | Displays the size of the L1 data cache                             | None                  | -      |
| L1 code cache         | Displays the size of the L1 code cache                             | None                  | -      |
| L2 cache              | Displays the size of the L2 code cache                             | None                  | -      |
| L3 cache              | Displays the size of the L3 cache                                  | None                  | -      |

Table 230: Advanced - CPU configuration - CPU information - Configuration options



## 1.4.9 Chipset configuration

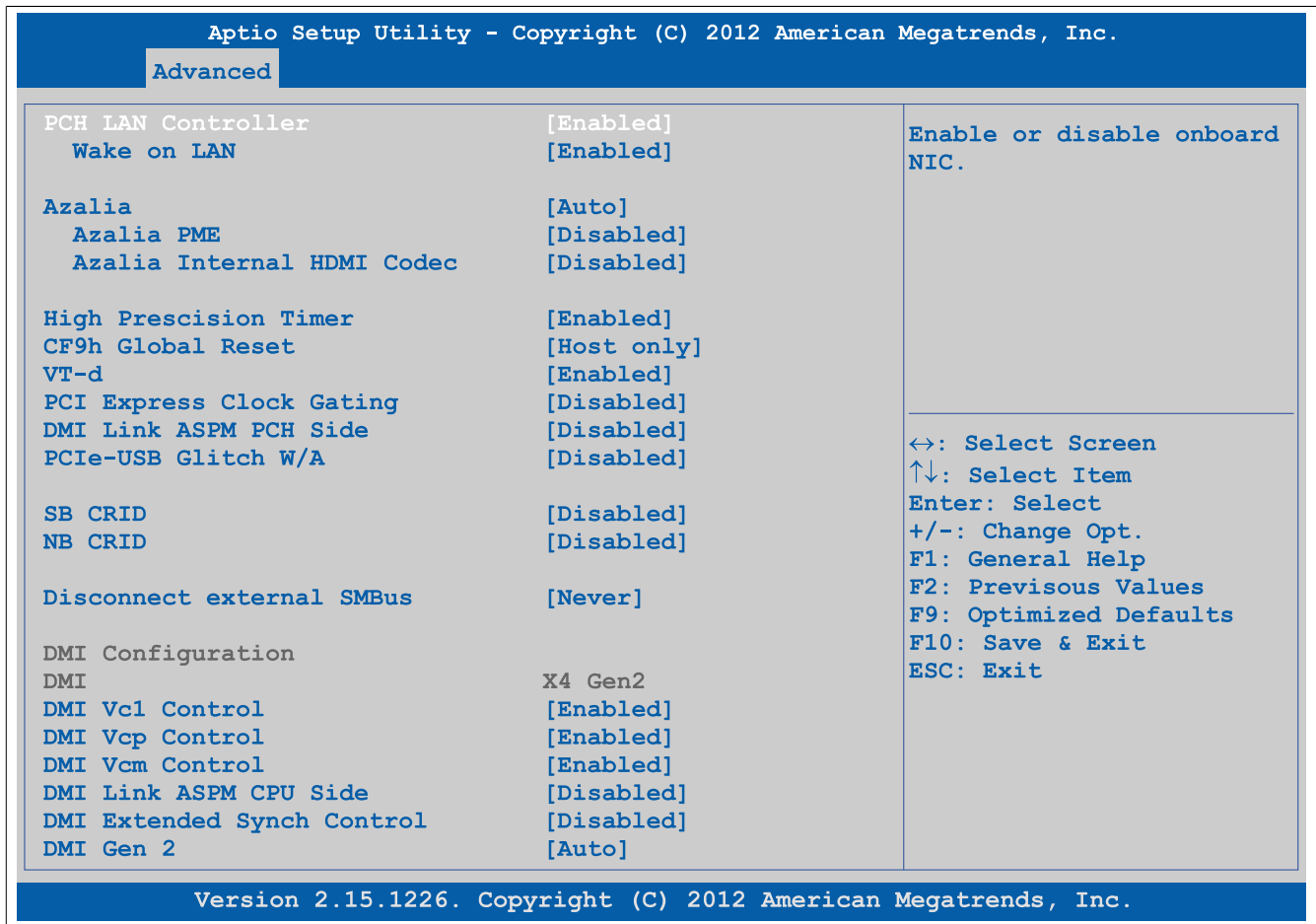


Figure 139: Advanced - Chipset Configuration

| BIOS setting               | Function   | Configuration options | Effect  |
|----------------------------|--|-----------------------|---|
| PCH LAN controller         | Option for turning the onboard LAN controller (ETH1) on and off  | Disabled              | Disables the controller   |
|                            |  | Enabled               | Enables the controller  |
| Wake on LAN                | Option for switching on the system via the on-board LAN controller (ETH1)  | Enabled               | Enables this function. The LAN controller can switch on the system.                       |
|                            |  | Disabled              | Disables this function. The LAN controller cannot switch on the system.                   |
| Azalia                     | Option for enabling/disabling the audio controller   | Disabled              | Disables the audio controller   |
|                            |  | Enabled               | Enables the audio controller  |
|                            |  | Auto                  | Only enables the audio controller if a device is connected                                |
| Azalia PME                 | Option for enabling/disabling power management for the audio controller  | Disabled              | Disables this function  |
|                            |  | Enabled               | Enables this function   |
| Azalia internal HDMI codec | Option for enabling/disabling the internal HDMI codec for Azalia   | Disabled              | Disables audio output   |
|                            |  | Enabled               | Enables audio output  |
| High-precision timer       | The HPET is a timer inside the PC. It is able to trigger an interrupt with a high degree of accuracy, which allows other programs to better synchronize a variety of applications. | Disabled              | Disables this function  |
|                            |  | Enabled               | Enables this function. This function is recommended for multimedia applications.          |
| CF9h global reset          | Option for setting the restart on the CF9h reset register  | Host only             | Chipset only  |
|                            |  | Host+ME               | Chipset and management engine   |
| VT-d                       | Option for enabling/disabling a virtual machine  | Enabled               | Enables this function<br>Allows a virtual machine to use the additional hardware capacity |
|                            | <b>Information:</b><br>A restart is required in order to apply changes made to this setting.   | Disabled              | Disables this function  |
| PCI Express clock gating   | Option for enabling/disabling PCI Express clock gating for each individual root port   | Disabled              | Disables this function  |
|                            |  | Enabled               | Enables this function   |
| DMI link ASPM PCH side     | Option for enabling/disabling active state power management (ASPM) for the DMI link on the PCH side  | Disabled              | Disables this function  |
|                            |  | Enabled               | Enables this function   |
| PCIe USB glitch W/A        | Option for enabling/disabling the PCIe USB glitch if a malfunctioning USB device is connected after the PCIe/PEG port  | Disabled              | Disables this function  |
|                            |  | Enabled               | Enables this function   |

Table 231: Advanced - Chipset configuration - Configuration options



| BIOS setting                      | Function   | Configuration options | Effect  |
|-----------------------------------|--|-----------------------|---|
| SB CRID                           | Option for enabling/disabling the southbridge compatible revision ID                                       | Disabled              | Disables this function  |
|                                   |  | Enabled               | Enables this function   |
| NB CRID                           | Option for enabling/disabling the northbridge compatible revision ID                                       | Disabled              | Disables this function  |
|                                   |  | Enabled               | Enables this function   |
| Disconnect external SMBus         | Option for always/never disconnecting the external SMBus   | Always                | Always allows disconnection of the SMBus  |
|                                   |  | During <b>Post</b>    | Allows disconnection of the SMBus until EOP (end of <b>POST</b> )   |
|                                   |  | Never                 | Never allow disconnection of the SMBus  |
| DMI Configuration                 |  |                       |   |
| DMI                               | Displays the DMI version / generation  | None                  | -   |
| DMI Vc1 <b>control</b>            | Option for enabling/disabling DMI Vc1  | Enabled               | Enables this function   |
|                                   |  | Disabled              | Disables this function  |
| DMI Vcp <b>control</b>            | Option for enabling/disabling DMI Vcp  | Enabled               | Enables this function   |
|                                   |  | Disabled              | Disables this function  |
| DMI Vcm <b>control</b>            | Option for enabling/disabling DMI Vcm  | Enabled               | Enables this function   |
|                                   |  | Disabled              | Disables this function  |
| DMI link ASPM <b>CPU</b> side     | Option for enabling/disabling active state power management (ASPM) for the DMI link on the <b>CPU</b> side | Disabled              | Disables this function  |
|                                   |  | L0s                   | Enables the L0 energy saving function   |
|                                   |  | L1                    | Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher. |
|                                   |  | L0sL1                 | Automatic assignment of L0s or L1 power saving function by the PCIe <b>device</b>                               |
| DMI extended synch <b>control</b> | Option for enabling/disabling DMI extended synchronization   | Enabled               | Enables this function   |
|                                   |  | Disabled              | Disables this function  |
| DMI Gen 2                         | Option for enabling/disabling DMI Gen 2  | Auto                  | Disabled for IVB A0 <b>MB</b> /DT and IVB B0 <b>MB</b> , enabled for other CPUs                                 |
|                                   |  | Enabled               | Enables this function   |
|                                   |  | Disabled              | Disables this function  |

Table 231: Advanced - Chipset configuration - Configuration options

## 1.4.10 SATA configuration

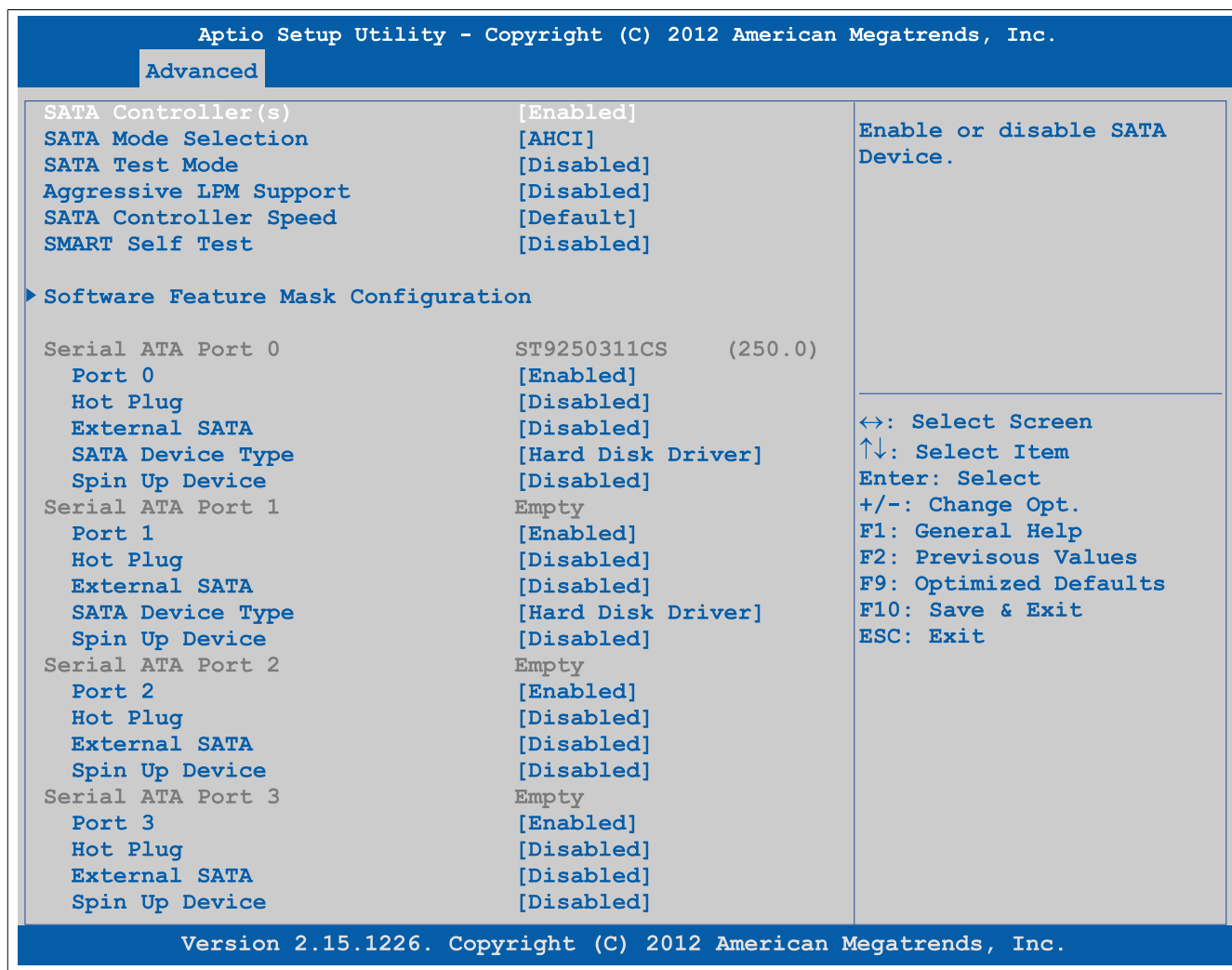


Figure 140: Advanced - SATA Configuration

| BIOS setting                        | Function   | Configuration options | Effect   |
|-------------------------------------|--|-----------------------|--|
| SATA controller(s)                  | Option for configuring SATA support  | Enabled               | Provides support for SATA devices  |
|                                     |  | Disabled              | No support for SATA devices  |
| SATA mode selection                 | Option for configuring supported serial ATA connections  | IDE                   | Uses the serial ATA hard drive as a parallel ATA physical drive. It is not possible to configure the SATA port.  |
|                                     |  | 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.  |
| SATA test mode                      | Option for configuring the test function. This is only used for test measurements.   | Enabled               | Enables this function  |
|                                     |  | Disabled              | Disables this function   |
| Aggressive LPM support              | Aggressive Link Power Management (ALPM) is a power saving method for SATA drives.  | Enabled               | Enables this function  |
|                                     |  | Disabled              | Disables this function   |
| SATA controller speed               | Option for setting the maximum SATA transfer rate. The transfer rate is also dependent on the maximum possible transfer rate of the drive. | Gen1                  | Maximum SATA transfer rate = 1.5 Gbit/s  |
|                                     |  | Gen2                  | Maximum SATA transfer rate = 3.0 Gbit/s  |
|                                     |  | Gen3                  | Maximum SATA transfer rate = 6.0 Gbit/s  |
|                                     |  | Default               | The maximum SATA transfer rate is set by default.  |
| IDE legacy / Native mode selection  | Selects legacy or native mode  | Legacy                | Legacy IDE mode  |
|                                     |  | Native                | Native IDE mode  |
| SMART self test                     | Option for configuring the SMART self-test function on all hard drives   | Enabled               | Enables this function  |
|                                     |  | Disabled              | Disables this function   |
| Software feature mask configuration | Configuration of various drive settings  | Enter                 | Opens this submenu. See "Software feature mask configuration" on page 270.   |

Table 232: Advanced - SATA configuration - Configuration options

| BIOS setting   | Function  | Configuration options | Effect   |
|--|---|-----------------------|--|
| Alternate ID <sup>1)</sup>                               | Option for enabling/disabling a report of the alternate <a href="#">device</a> ID   | Enabled               | Enables this function  |
|  |   | Disabled              | Disables this function   |
| Serial ATA port 0  | Displays the <a href="#">device</a> connected to SATA port 0  | None                  | -  |
| Port 0   | Option for enabling/disabling SATA port 0   | Disabled              | Disables SATA port 0   |
|  |   | Enabled               | Enables SATA port 0  |
| Hot plug   | Option for configuring hot plugging for SATA <a href="#">interface</a> 0  | Disabled              | Disables hot plugging for SATA <a href="#">interface</a> 0   |
|  |   | Enabled               | Enables hot plugging for SATA <a href="#">interface</a> 0. Devices <a href="#">can</a> be connected/disconnected during operation. |
| External SATA  | Option for configuring the external SATA port   | Disabled              | Uses the port externally as eSATA  |
|  |   | Enabled               | Uses the port internally as SATA   |
| Mechanical presence <a href="#">switch</a> <sup>2)</sup> | Option for enabling/disabling the report if this port has a mechanical presence <a href="#">switch</a>                      | Disabled              | Disables this function   |
|  |   | Enabled               | Enables this function  |
| SATA <a href="#">device</a> type                         | Identifies whether a solid state or hard disk drive is connected to the SATA port   | Hard disk drive       | A hard disk is connected to the SATA port.   |
|  |   | Solid-state drive     | A solid-state drive is connected to the SATA port.   |
| Spin up <a href="#">device</a>                           | Option for configuring an initialization sequence for the connected <a href="#">device</a> during startup for the SATA port | Disabled              | Disables this function   |
|  |   | Enabled               | Enables this function  |
| Serial ATA port 1  | Displays the <a href="#">device</a> connected to SATA port 1  | None                  | -  |
| Port 1   | Option for enabling/disabling SATA port 1   | Disabled              | Disables SATA port 1   |
|  |   | Enabled               | Enables SATA port 1  |
| Hot plug   | Option for configuring hot plugging for SATA <a href="#">interface</a> 1  | Disabled              | Disables hot plugging for SATA <a href="#">interface</a> 1   |
|  |   | Enabled               | Enables hot plugging for SATA <a href="#">interface</a> 1. Devices <a href="#">can</a> be connected/disconnected during operation. |
| External SATA  | Option for configuring the external SATA port   | Disabled              | Uses the port externally as eSATA  |
|  |   | Enabled               | Uses the port internally as SATA   |
| Mechanical presence <a href="#">switch</a> <sup>2)</sup> | Option for enabling/disabling the report if this port has a mechanical presence <a href="#">switch</a>                      | Disabled              | Disables this function   |
|  |   | Enabled               | Enables this function  |
| SATA <a href="#">device</a> type                         | Identifies whether a solid state or hard disk drive is connected to the SATA port   | Hard disk drive       | A hard disk is connected to the SATA port.   |
|  |   | Solid-state drive     | A solid-state drive is connected to the SATA port.   |
| Spin up <a href="#">device</a>                           | Option for configuring an initialization sequence for the connected <a href="#">device</a> during startup for the SATA port | Disabled              | Disables this function   |
|  |   | Enabled               | Enables this function  |
| Serial ATA port 2  | Displays the <a href="#">device</a> connected to SATA port 2  | None                  | -  |
| Port 2   | Option for enabling/disabling SATA port 2   | Disabled              | Disables SATA port 2   |
|  |   | Enabled               | Enables SATA port 2  |
| Hot plug   | Option for configuring hot plugging for SATA port 2   | Disabled              | Disables hot plugging for SATA port 2  |
|  |   | Enabled               | Enables hot plugging for SATA <a href="#">interface</a> 2. Devices <a href="#">can</a> be connected/disconnected during operation. |
| External SATA  | Option for configuring the external SATA port   | Disabled              | Uses the port externally as eSATA  |
|  |   | Enabled               | Uses the port internally as SATA   |
| Mechanical presence <a href="#">switch</a> <sup>2)</sup> | Option for enabling/disabling the report if this port has a mechanical presence <a href="#">switch</a>                      | Disabled              | Disables this function   |
|  |   | Enabled               | Enables this function  |
| SATA <a href="#">device</a> type                         | Identifies whether a solid state or hard disk drive is connected to the SATA port   | Hard disk drive       | A hard disk is connected to the SATA port.   |
|  |   | Solid-state drive     | A solid-state drive is connected to the SATA port.   |
| Spin up <a href="#">device</a>                           | Option for configuring an initialization sequence for the connected <a href="#">device</a> during startup for the SATA port | Disabled              | Disables this function   |
|  |   | Enabled               | Enables this function  |
| Serial ATA port 3  | Displays the <a href="#">device</a> connected to SATA port 3  | None                  | -  |
| Port 3   | Option for enabling/disabling SATA port 3   | Disabled              | Disables SATA port 3   |
|  |   | Enabled               | Enables SATA port 3  |
| Hot plug   | Option for configuring hot plugging for SATA port 3   | Disabled              | Disables hot plugging for SATA port 3  |
|  |   | Enabled               | Enables hot plugging for SATA <a href="#">interface</a> 3. Devices <a href="#">can</a> be connected/disconnected during operation. |
| External SATA  | Option for configuring the external SATA port   | Disabled              | Uses the port externally as eSATA  |
|  |   | Enabled               | Uses the port internally as SATA   |
| Mechanical presence <a href="#">switch</a> <sup>2)</sup> | Option for enabling/disabling the report if this port has a mechanical presence <a href="#">switch</a>                      | Disabled              | Disables this function   |
|  |   | Enabled               | Enables this function  |
| SATA <a href="#">device</a> type                         | Identifies whether a solid state or hard disk drive is connected to the SATA port   | Hard disk drive       | A hard disk is connected to the SATA port.   |
|  |   | Solid-state drive     | A solid-state drive is connected to the SATA port.   |
| Spin up <a href="#">device</a>                           | Option for configuring an initialization sequence for the connected <a href="#">device</a> during startup for the SATA port | Disabled              | Disables this function   |
|  |   | Enabled               | Enables this function  |

Table 232: Advanced - SATA configuration - Configuration options

- 1) This setting is only possible if *SATA mode selection* is set to *RAID*.  
2) This setting is only possible if *Hot plug* is set to *Enabled*.

## 1.4.10.1 Software feature mask configuration

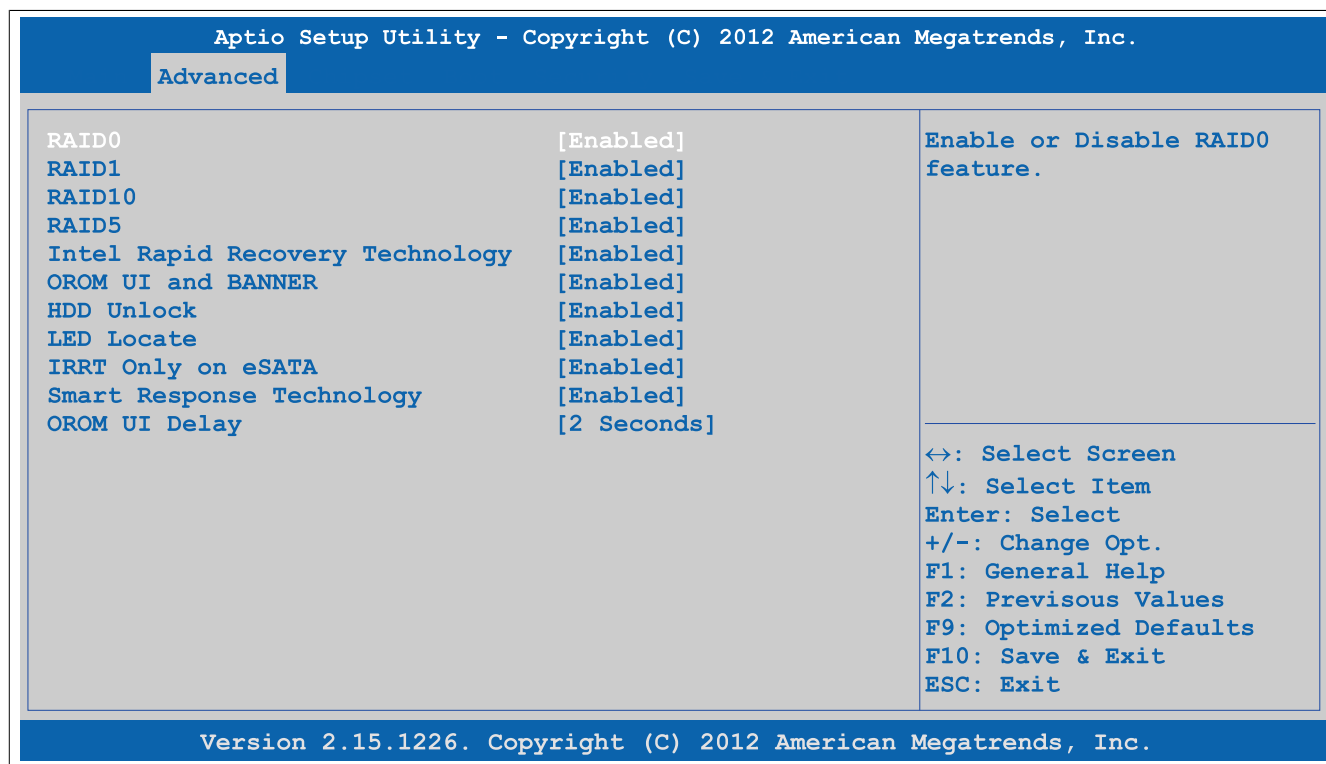


Figure 141: Advanced - SATA Configuration - Software Feature Mask Configuration

| BIOS setting                     | Function  | Configuration options                      | Effect   |
|----------------------------------|---|--|--|
| RAID0                            | Option for enabling/disabling a RAID0 system  | Disabled                                   | Disables this function                               |
|                                  |   | Enabled                                    | Enables this function                                |
| RAID1                            | Option for enabling/disabling a RAID1 system  | Disabled                                   | Disables this function                               |
|                                  |   | Enabled                                    | Enables this function                                |
| RAID10                           | Option for enabling/disabling a RAID10 system   | Disabled                                   | Disables this function                               |
|                                  |   | Enabled                                    | Enables this function                                |
| RAID5                            | Option for enabling/disabling a RAID5 system  | Disabled                                   | Disables this function                               |
|                                  |   | Enabled                                    | Enables this function                                |
| Intel Rapid Recovery technology  | Option for enabling/disabling Intel® Rapid Recovery Technology                          | Disabled                                   | Disables this function                               |
|                                  |   | Enabled                                    | Enables this function                                |
| OROM UI and BANNER               | Option for displaying the OROM UI   | Disabled                                   | Does not display the OROM UI or banner               |
|                                  |   | Enabled                                    | Displays the OROM UI                                 |
| HDD unlock                       | Option for enabling/disabling the HDD password unlock mechanism in the operating system | Disabled                                   | Disables the HDD password unlock mechanism           |
|                                  |   | Enabled                                    | Enables the HDD password unlock mechanism            |
| LED locate                       | Option for displaying the LED/SGPIO when a drive is connected                           | Disabled                                   | Disables this function                               |
|                                  |   | Enabled                                    | Enables an indicator for when a drive is connected   |
| IRRT only on eSATA <sup>1)</sup> | Option for configuring Intel® Rapid Recovery technology                                 | Disabled                                   | Every RAID system can use internal and eSATA drives. |
|                                  |   | Enabled                                    | Only IRRT systems can use internal eSATA drives.     |
| Smart Response technology        | Option for enabling/disabling Intel® Smart Response Technology                          | Disabled                                   | Disables this function                               |
|                                  |   | Enabled                                    | Enables this function                                |
| OROM UI delay                    | Option for displaying the delay time for the OROM UI splash screen                      | 2 seconds, 4 seconds, 6 seconds, 8 seconds | Setting in seconds                                   |

Table 233: Advanced - SATA configuration - Software feature mask configuration - Configuration options

1) IRRT = Intel Rapid Recovery technology.

## 1.4.11 Memory configuration

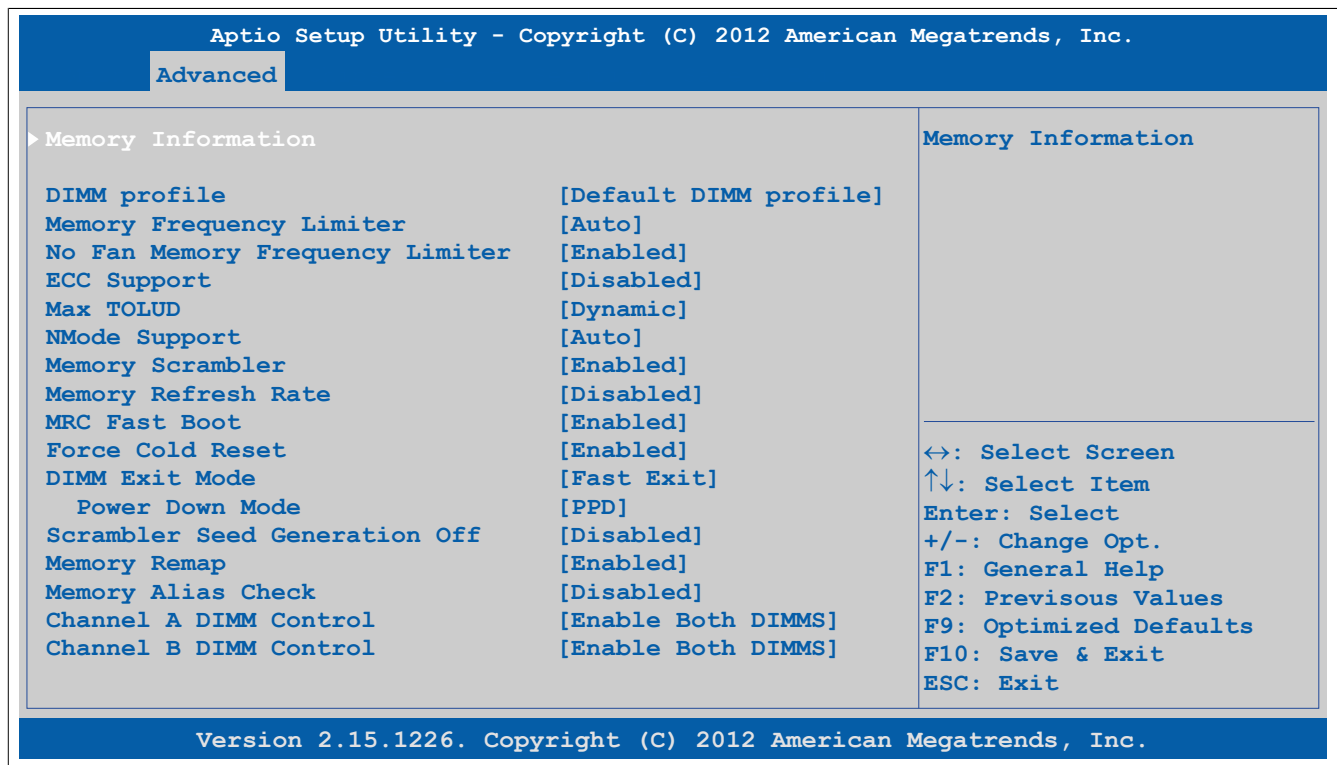


Figure 142: Advanced - Memory Configuration

| BIOS setting                           | Function   | Configuration options   | Effect  |
|--|--|---|---|
| Memory information                     | Displays main memory properties  | Enter   | Opens this submenu<br>See "Memory information" on page 272.                         |
| DIMM profile                           | Option for configuring the main memory timing profile  | Default DIMM profile  | Uses the default profile  |
|  |  | Custom profile  | Uses a user-defined profile   |
|  |  | XMP Profile 1   | Uses XMP profile 1  |
|  |  | XMP profile 2   | Uses XMP profile 2  |
| Custom profile control <sup>1)</sup>   | Configuration of the main memory timing profile  | Enter   | Opens this submenu<br>See "Custom profile control" on page 273.                     |
| Memory frequency limiter <sup>2)</sup> | Option for setting the maximum possible main memory frequency<br><br><b>Information:</b><br><br>If a fan kit is not installed in the device, then the main memory frequency is limited to 1067 MHz when set to "Auto". | Auto  | Automatic configuration   |
|  |  | 1067, 1333, 1600, 1867, 2133, 2400, 2667                                      | Manual configuration  |
| No fan memory frequency limiter        | Option for automatically throttling down the main memory frequency when the system unit has no fan   | Disabled  | Disables this function  |
|  |  | Enabled   | Enables this function   |
| ECC support                            | Option for enabling/disabling main memory ECC support  | Disabled  | Disables this function  |
|  |  | Enabled   | Enables this function   |
| Max TOLUD <sup>3)</sup>                | Option for configuring the maximum "Top of low usable DRAM"  | Dynamic   | Automatically adjusts the TOLUD based on the MMIO length of the graphics controller |
|  |  | 1 GB, 1.25 GB, 1.5 GB, 1.75 GB, 2 GB, 2.25 GB, 2.5 GB, 2.75 GB, 3 GB, 3.25 GB | Manual setting of the TOLUD   |
| NMode support                          | Option for configuring NMode support   | Auto  | Sets automatically  |
|  |  | 1N mode   | Sets 1N mode  |
|  |  | 2N mode   | Sets 2N mode  |
| Memory scrambler                       | Option for enabling/disabling memory scrambler support   | Enabled   | Enables this function   |
|  |  | Disabled  | Disables this function  |
| Memory refresh rate                    | Option for configuring the RAM refresh rate  | Disabled  | Sets automatically  |
|  |  | x1  | Manual setting  |
|  |  | x2  | Manual setting  |
| MRC fast boot                          | Option for enabling/disabling MRC fast booting   | Enabled   | Enables this function   |
|  |  | Disabled  | Disables this function  |
| Force cold reset                       | Option for enabling/disabling force cold resets  | Enabled   | Enables this function   |
|  |  | Disabled  | Disables this function  |
| DIMM exit mode                         | Option for configuring the DIMM exit mode  | Auto  | Sets automatically  |

Table 234: Advanced - Memory configuration - Configuration options

| BIOS setting                  | Function   | Configuration options | Effect                                      |
|-------------------------------|--|-----------------------|---|
|                               |  | Slow exit             | Enables slow exit mode                      |
|                               |  | Fast exit             | Enables fast exit mode                      |
| Power down mode               | Option for setting the power saving function for main memory             | No power down         | No power down                               |
|                               |  | APD                   | Active power down                           |
|                               |  | PPD                   | Precharged power down                       |
|                               |  | APD-PPD               | Active power down - Precharged power down   |
| Scrambler seed generation off | Option for enabling/disabling the scrambler seed generation off function | Enabled               | Enables this function                       |
|                               |  | Disabled              | Disables this function                      |
| Memory remap                  | Option for enabling/disabling memory remapping over 4 GB                 | Enabled               | Enables this function                       |
|                               |  | Disabled              | Disables this function                      |
| Memory alias check            | Option for enabling/disabling the memory alias check function            | Enabled               | Enables this function                       |
|                               |  | Disabled              | Disables this function                      |
| Channel A DIMM control        | Option for configuring main memory channel A                             | Enable both DIMMS     | Enables both channel A main memory modules  |
|                               |  | Disable DIMM0         | Disables channel A DIMM0 main memory        |
|                               |  | Disable DIMM1         | Disables channel A DIMM1 main memory        |
|                               |  | Disable both DIMMS    | Disables both channel A main memory modules |
| Channel B DIMM control        | Option for configuring main memory channel B                             | Enable both DIMMS     | Enables both channel B main memory modules. |
|                               |  | Disable DIMM0         | Disables channel B DIMM0 main memory        |
|                               |  | Disable DIMM1         | Disables channel B DIMM1 main memory        |
|                               |  | Disable both DIMMS    | Disables both channel B main memory modules |

Table 234: Advanced - Memory configuration - Configuration options

- 1) This setting is only shown if *DIMM profile* is set to *Custom profile*.
- 2) This setting is only possible if *No fan memory frequency limiter* is set to *Disabled*.
- 3) TOLUD = Top of low usable DRAM.

#### 1.4.11.1 Memory information

| Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc. |                |  |   |
|--|----------------|--|---|
| Advanced   |                |  |   |
| Memory Information   |                |  |   |
| Memory RC Version  | 1.8.0.0        |  |   |
| Memory Frequency   | 1067 Mhz       |  |   |
| Total Memory   | 4096 MB (DDR3) |  |   |
| DIMM#0   | 2048 MB (DDR3) |  |   |
| DIMM#1   | Not Present    |  |   |
| DIMM#2   | 2048 MB (DDR3) |  |   |
| DIMM#3   | Not Present    |  |   |
| CAS Latency (tCL)  | 7              |  |   |
| Minimum delay time   |                |  |   |
| CAS to RAS (tRCDmin)   | 7              |  |   |
| Row Precharge (tRPmin)   | 7              |  |   |
| Active to Precharge (tRASmin)                                      | 20             |  |   |
| XMP Profile 1  | Not Supported  |  |   |
| XMP Profile 2  | Not Supported  |  |   |
|  |                |  | ⇐⇒: Select Screen<br>↑↓: Select Item<br>Enter: Select<br>+/-: Change Opt.<br>F1: General Help<br>F2: Previous Values<br>F9: Optimized Defaults<br>F10: Save & Exit<br>ESC: Exit |
| Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.    |                |  |   |

Figure 143: Advanced - Memory Configuration - Memory Information

| BIOS setting      | Function  | Configuration options | Effect |
|-------------------|---|-----------------------|--------|
| Memory RC version | Displays the main memory RC version               | None                  | -      |
| Memory frequency  | Displays the main memory frequency                | None                  | -      |
| Total memory      | Displays the total amount of main memory          | None                  | -      |
| DIMM#0            | Displays the amount of main memory in DIMM slot 0 | None                  | -      |
| DIMM#1            | Displays the amount of main memory in DIMM slot 1 | None                  | -      |
| DIMM#2            | Displays the amount of main memory in DIMM slot 2 | None                  | -      |
| DIMM#3            | Displays the amount of main memory in DIMM slot 3 | None                  | -      |
| CAS latency (tCL) | Displays the CAS latency                          | None                  | -      |

Table 235: Advanced - Memory configuration - Memory information

| BIOS setting                  | Function                                      | Configuration options | Effect |
|-------------------------------|---|-----------------------|--------|
| Minimum delay time            |   |                       |        |
| CAS to RAS (tRCDmin)          | Displays the delay time between CAS# and RAS# | None                  | -      |
| Row precharge (tRPmin)        | Displays the row precharge time               | None                  | -      |
| Active to precharge (tRASmin) | Displays the minimum active RAS# time         | None                  | -      |
| XMP Profile 1                 | Displays XMP profile 1                        | None                  | -      |
| XMP profile 2                 | Displays XMP profile 2                        | None                  | -      |

Table 235: Advanced - Memory configuration - Memory information

### 1.4.11.2 Custom profile control

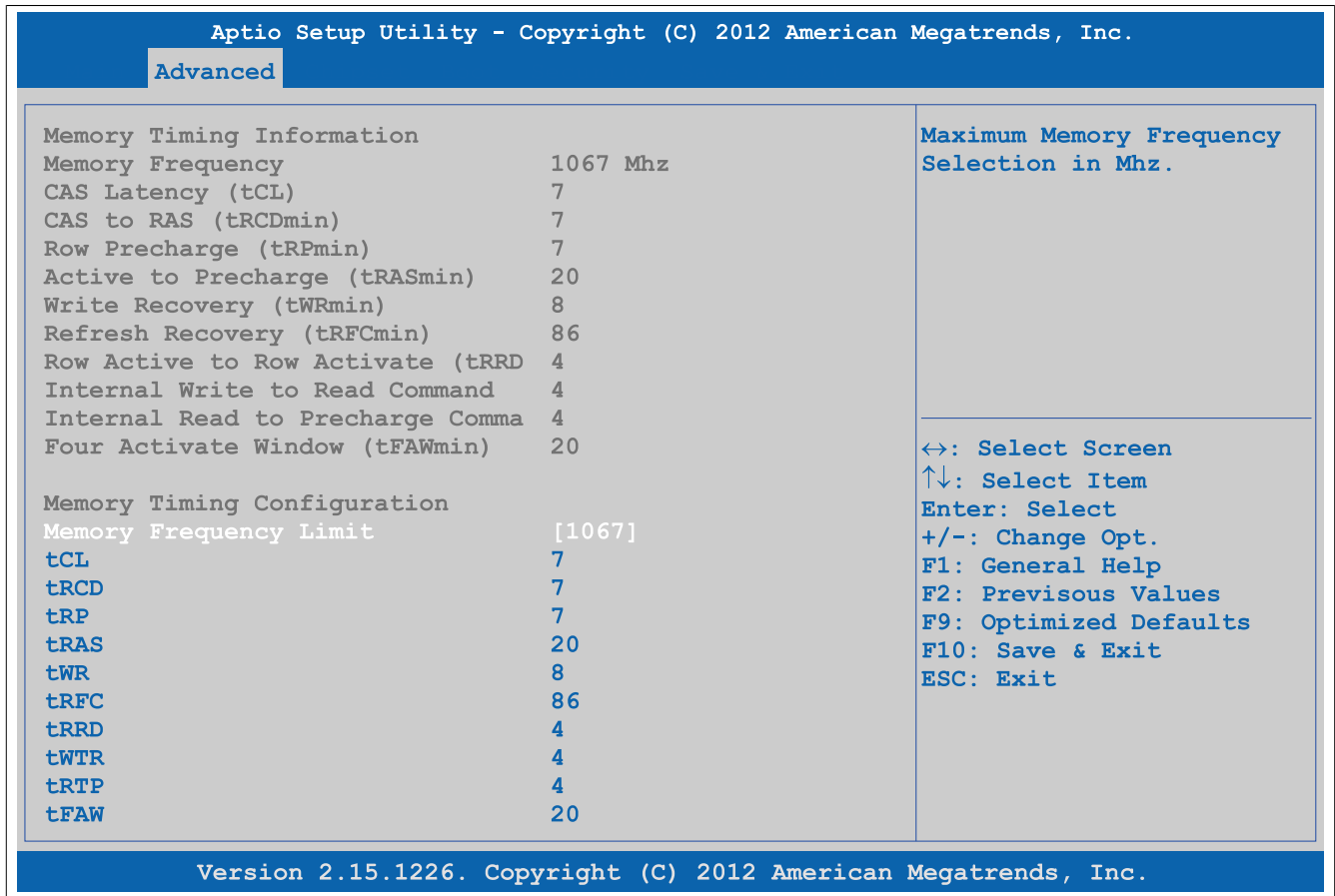


Figure 144: Advanced - Memory Configuration - Custom Profile Control

| BIOS setting             | Function   | Configuration options                    | Effect |
|--------------------------|--|--|--------|
| Memory frequency limiter | Sets the maximum main memory frequency in MHz              | 1067, 1333, 1600, 1867, 2133, 2400, 2667 |        |
| tCL                      | Sets the CAS latency                                       | 4 to 18                                  |        |
| tRCD                     | Sets the minimum "CAS to RAS" time                         | 1 to 38                                  |        |
| tRP                      | Sets the minimum "Row precharge" time                      | 1 to 38                                  |        |
| tRAS                     | Sets the minimum "Active to precharge" time                | 1 to 586                                 |        |
| tWR                      | Sets the minimum "Write recovery" time                     | 1 to 38                                  |        |
| tRFC                     | Sets the minimum "Refresh recovery" time                   | 1 to 9363                                |        |
| tRRD                     | Sets the minimum "Row active to row active" time           | 1 to 38                                  |        |
| tWTR                     | Sets the minimum "Internal write to read command" time     | 1 to 38                                  |        |
| tRTP                     | Sets the minimum "Internal read to precharge command" time | 1 to 38                                  |        |
| tFAW                     | Sets the minimum "Four active window" time                 | 1 to 586                                 |        |

Table 236: Advanced - Memory configuration - Custom profile control - Configuration options



## 1.4.12 USB configuration

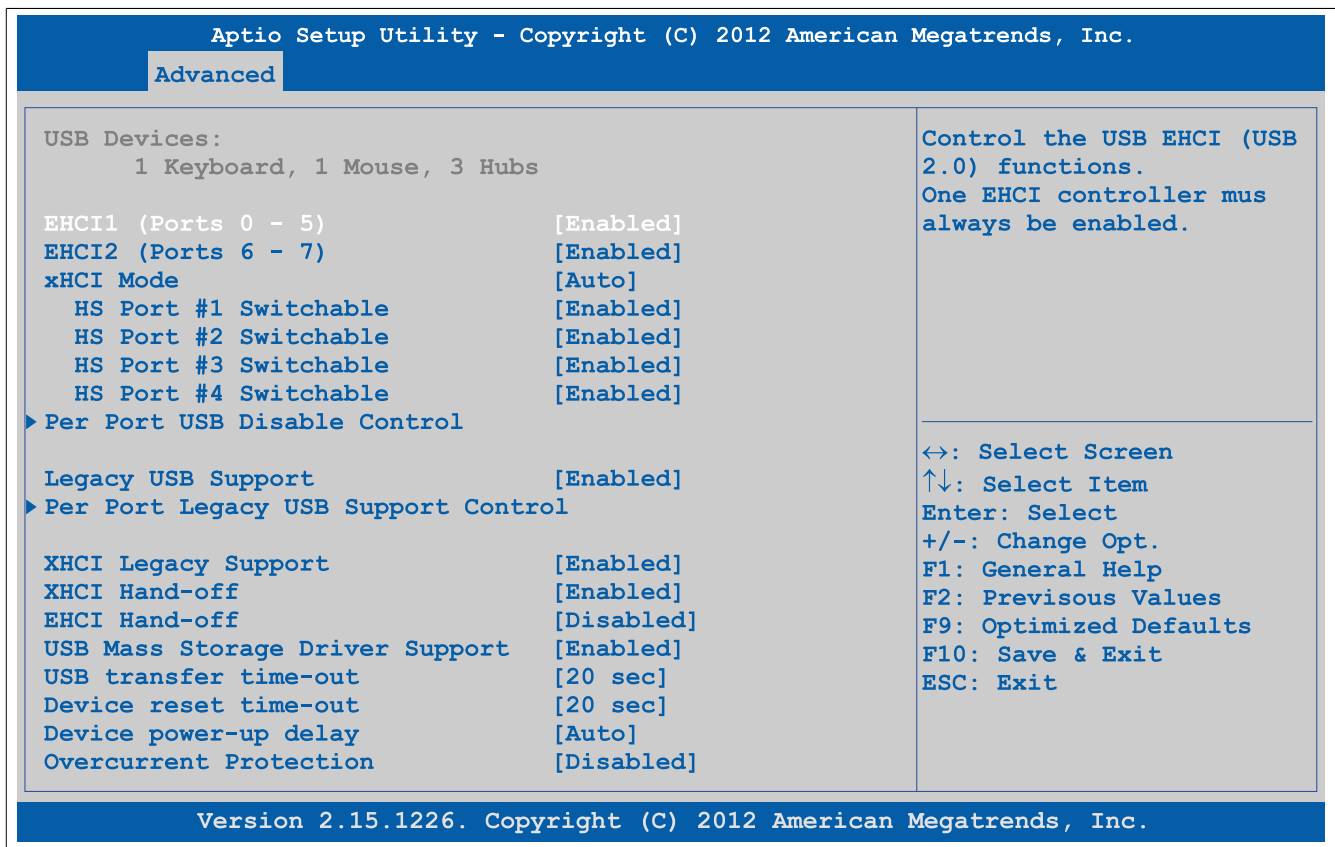


Figure 145: Advanced - USB Configuration

| BIOS setting                 | Function  | Configuration options | Effect  |
|------------------------------|---|-----------------------|---|
| EHCI1 (ports 0-5)            | Sets USB EHCI controller 1 for USB interfaces #0 through #5 (USB1 through USB4 on the system unit, USB on the monitor/panel interface and the bus unit) | Enabled               | Enables EHCI controller 1   |
|                              |   | Disabled              | Disables EHCI controller 1  |
| EHCI2 (ports 6-7)            | Sets USB EHCI controller 1 for USB interfaces #6 through #7 (USB5 on the system unit and USB on the monitor/panel option)                               | Enabled               | Enables EHCI controller 2   |
|                              |   | Disabled              | Disables EHCI controller 2  |
| xHCI mode                    | Option for configuring the xHCI controller  | Smart auto            | USB 3.0 interfaces are not handled as USB 3.0 until after the operating system has started. Until then, they are handled as USB 2.0 interfaces. If the APC910 is rebooted, then the USB 3.0 interfaces are handled as USB 3.0 during booting. |
|                              |   | Auto                  | During the BIOS boot procedure, USB 3.0 interfaces are handled as USB 2.0 interfaces. They are not handled as USB 3.0 interfaces until after the operating system has started and the USB 3.0 driver has been loaded.                         |
|                              |   | Enabled               | Enables the xHCI controller so that USB 3.0 interfaces are always identified as such  |
|                              |   | Disabled              | Disables the xHCI controller. All USB 3.0 interfaces become USB 2.0 interfaces.   |
| HS port #1 switchable        | Option to switch HS port 1 between xHCI and EHCI  | Disabled              | Routes port 1 to EHCI and operates it as USB 2.0  |
|                              |   | Enabled               | Routes port 1 to xHCI and enables the corresponding HS port   |
| HS port #2 switchable        | Option to switch HS port 2 between xHCI and EHCI  | Disabled              | Routes port 2 to EHCI and operates it as USB 2.0  |
|                              |   | Enabled               | Routes port 2 to xHCI and enables the corresponding HS port   |
| HS port #3 switchable        | Option to switch HS port 3 between xHCI and EHCI  | Disabled              | Routes port 3 to EHCI and operates it as USB 2.0  |
|                              |   | Enabled               | Routes port 3 to xHCI and enables the corresponding HS port   |
| HS port #4 switchable        | Option to switch HS port 4 between xHCI and EHCI  | Disabled              | Routes port 4 to EHCI and operates it as USB 2.0  |
|                              |   | Enabled               | Routes port 4 to xHCI and enables the corresponding HS port   |
| Per port USB disable control | Option for enabling/disabling individual USB interfaces   | Enter                 | Opens this submenu<br>See "Per port USB disable control" on page 275.   |

Table 237: Advanced - USB configuration - Configuration options



| BIOS setting                                   | Function   | Configuration options          | Effect  |
|--|--|--------------------------------|---|
| Legacy USB support                             | Option for configuring legacy USB support. USB interfaces do not function during startup. USB support is available again after the operating system has started. A USB keyboard is still recognized during POST. | Enabled                        | Enables this function   |
|  |  | Disabled                       | Disables this function  |
|  |  | Auto                           | Automatic enabling  |
| Per port legacy USB support control            | Option for enabling/disabling legacy USB support for individual USB interfaces   | Enter                          | Opens this submenu<br>See "Per port legacy USB support control" on page 276.  |
| XHCI legacy support                            | Option for enabling/disabling legacy support for the XHCI controller   | Enabled                        | Uses USB 3.0 for all USB 3.0 interfaces   |
|  |  | Disabled                       | Uses USB 2.0 or 1.1 for all USB interfaces  |
| XHCI Hand-off                                  | Option for configuring support for operating systems without a fully automated XHCI function   | Enabled                        | Enables USB 3.0 support   |
|  |  | Disabled                       | Disables this function. On operating systems that do not have a fully automated XHCI function, only USB 2.0 is used with USB devices. |
| EHCI hand-off                                  | Option for configuring support for operating systems without a fully automated EHCI function   | Disabled                       | Disables this function. On operating systems that do not have a fully automated EHCI function, only USB 1.1 is used with USB devices. |
|  |  | Enabled                        | Enables USB 2.0 support   |
| USB mass storage driver support                | Option for enabling/disabling USB mass storage device support  | Enabled                        | Enables this function   |
|  |  | Disabled                       | Disables this function  |
| USB transfer time-out                          | Option for configuring the timeout value for control, bulk and interrupt transfers   | 1 sec, 5 sec, 10 sec, 20 sec   | Value in seconds  |
| Device reset time-out                          | Option for configuring the time that POST waits for USB memory storage devices after the device start command is issued  | 10 sec, 20 sec, 30 sec, 40 sec | Value in seconds  |
| Device power-up delay                          | Option to set the maximum time to wait for a USB device to report to the host controller   | Auto                           | Sets the maximum time automatically. For a root port, 100 ms is set; for a hub port, the data from the hub descriptor is used.        |
|  |  | Manual                         | Allows the maximum time to be entered manually using the "Device power-up delay in seconds" option                                    |
| Device power-up delay in seconds <sup>1)</sup> | Option for setting the device power-up delay time manually   | 1 to 40                        | Value in seconds  |
| Overcurrent protection                         | Option for configuring overcurrent protection for all USB interfaces   | Disabled                       | Disables this function  |
|  |  | Enabled                        | Enables this function   |

Table 237: Advanced - USB configuration - Configuration options

1) This setting is only possible if *Device power-up delay* is set to *Manual*.

#### 1.4.12.1 Per port USB disable control

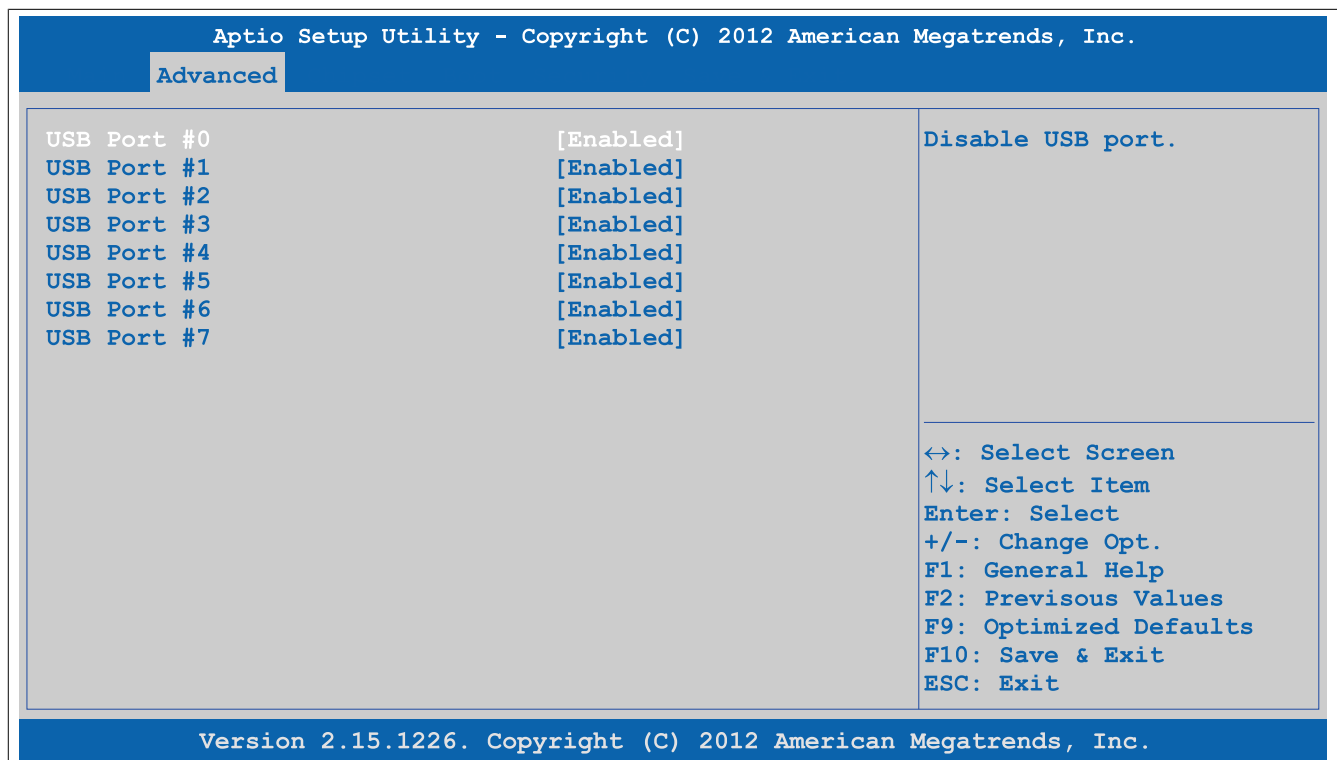


Figure 146: Advanced - USB Configuration - Per Port USB Disable Control

| BIOS setting | Function   | Configuration options | Effect                     |
|--------------|--|-----------------------|----------------------------|
| USB port #0  | Option for enabling/disabling the USB4 port                                    | Disabled              | Disables the USB interface |
|              |  | Enabled               | Enables this USB interface |
| USB port #1  | Option for enabling/disabling the USB2 interface                               | Disabled              | Disables the USB interface |
|              |  | Enabled               | Enables this USB interface |
| USB port #2  | Option for enabling/disabling the USB3 port                                    | Disabled              | Disables the USB interface |
|              |  | Enabled               | Enables this USB interface |
| USB port #3  | Option for enabling/disabling the USB1 interface                               | Disabled              | Disables the USB interface |
|              |  | Enabled               | Enables this USB interface |
| USB port #4  | Option for enabling/disabling the USB interface on the bus unit                | Disabled              | Disables the USB interface |
|              |  | Enabled               | Enables this USB interface |
| USB port #5  | Option for enabling/disabling the USB interface on the monitor/panel interface | Disabled              | Disables the USB interface |
|              |  | Enabled               | Enables this USB interface |
| USB port #6  | Option for enabling/disabling the USB5 port                                    | Disabled              | Disables the USB interface |
|              |  | Enabled               | Enables this USB interface |
| USB port #7  | Option for enabling/disabling the USB interface on the monitor/panel option    | Disabled              | Disables the USB interface |
|              |  | Enabled               | Enables this USB interface |

Table 238: Advanced - USB configuration - Per port USB disable control - Configuration options

#### 1.4.12.2 Per port legacy USB support control

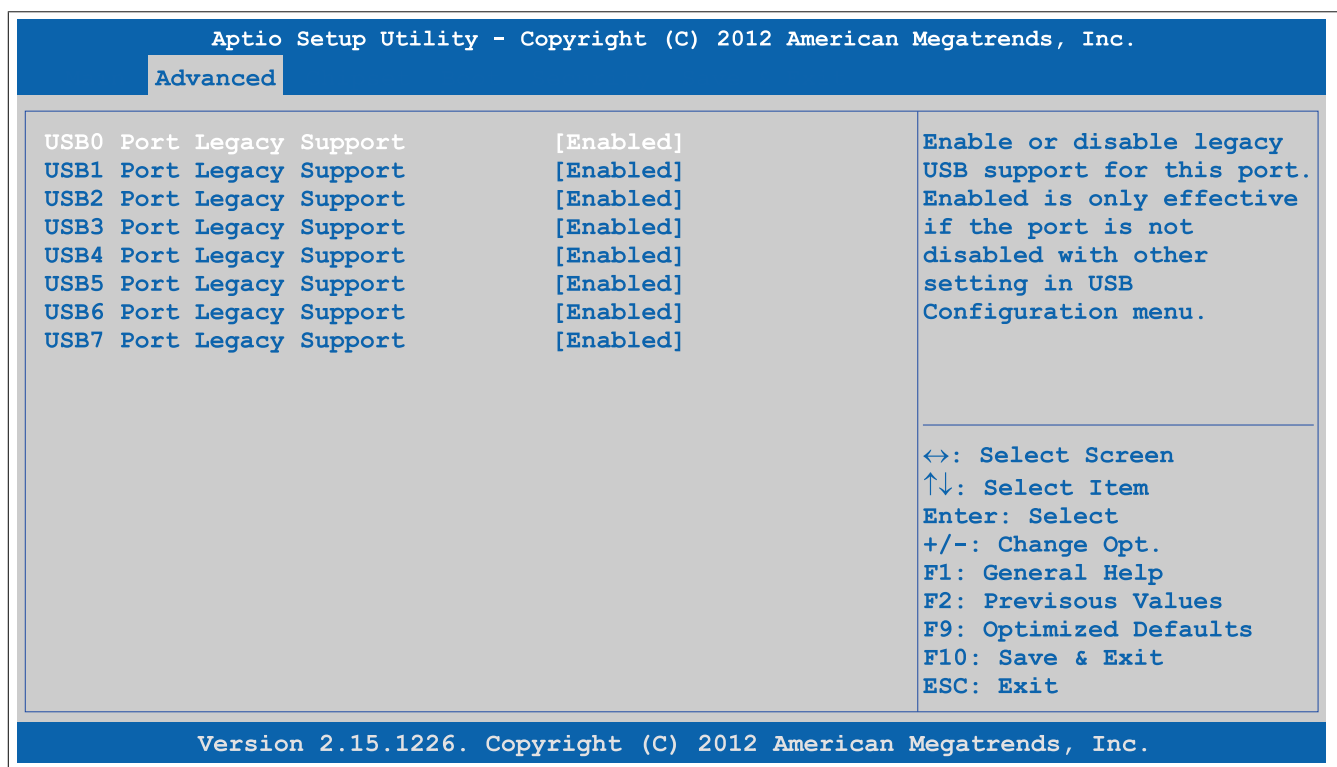


Figure 147: Advanced - USB Configuration - Per Port Legacy USB Support Control

| BIOS setting             | Function  | Configuration options | Effect                     |
|--------------------------|---|-----------------------|----------------------------|
| USB0 port legacy support | Option for enabling/disabling legacy support for the USB4 port                                    | Disabled              | Disables the USB interface |
|                          |   | Enabled               | Enables this USB interface |
| USB1 port legacy support | Option for enabling/disabling legacy support for the USB2 interface                               | Disabled              | Disables the USB interface |
|                          |   | Enabled               | Enables this USB interface |
| USB2 port legacy support | Option for enabling/disabling legacy support for the USB3 port                                    | Disabled              | Disables the USB interface |
|                          |   | Enabled               | Enables this USB interface |
| USB3 port legacy support | Option for enabling/disabling legacy support for the USB1 interface                               | Disabled              | Disables the USB interface |
|                          |   | Enabled               | Enables this USB interface |
| USB4 port legacy support | Option for enabling/disabling legacy support for the USB interface on the bus unit                | Disabled              | Disables the USB interface |
|                          |   | Enabled               | Enables this USB interface |
| USB5 port legacy support | Option for enabling/disabling legacy support for the USB interface on the monitor/panel interface | Disabled              | Disables the USB interface |
|                          |   | Enabled               | Enables this USB interface |
| USB6 port legacy support | Option for enabling/disabling legacy support for the USB5 port                                    | Disabled              | Disables the USB interface |
|                          |   | Enabled               | Enables this USB interface |
| USB7 port legacy support | Option for enabling/disabling legacy support for the USB interface on the monitor/panel option    | Disabled              | Disables the USB interface |
|                          |   | Enabled               | Enables this USB interface |

Table 239: Advanced - USB configuration - Per port legacy USB support control - Configuration options

### 1.4.13 Serial port console redirection

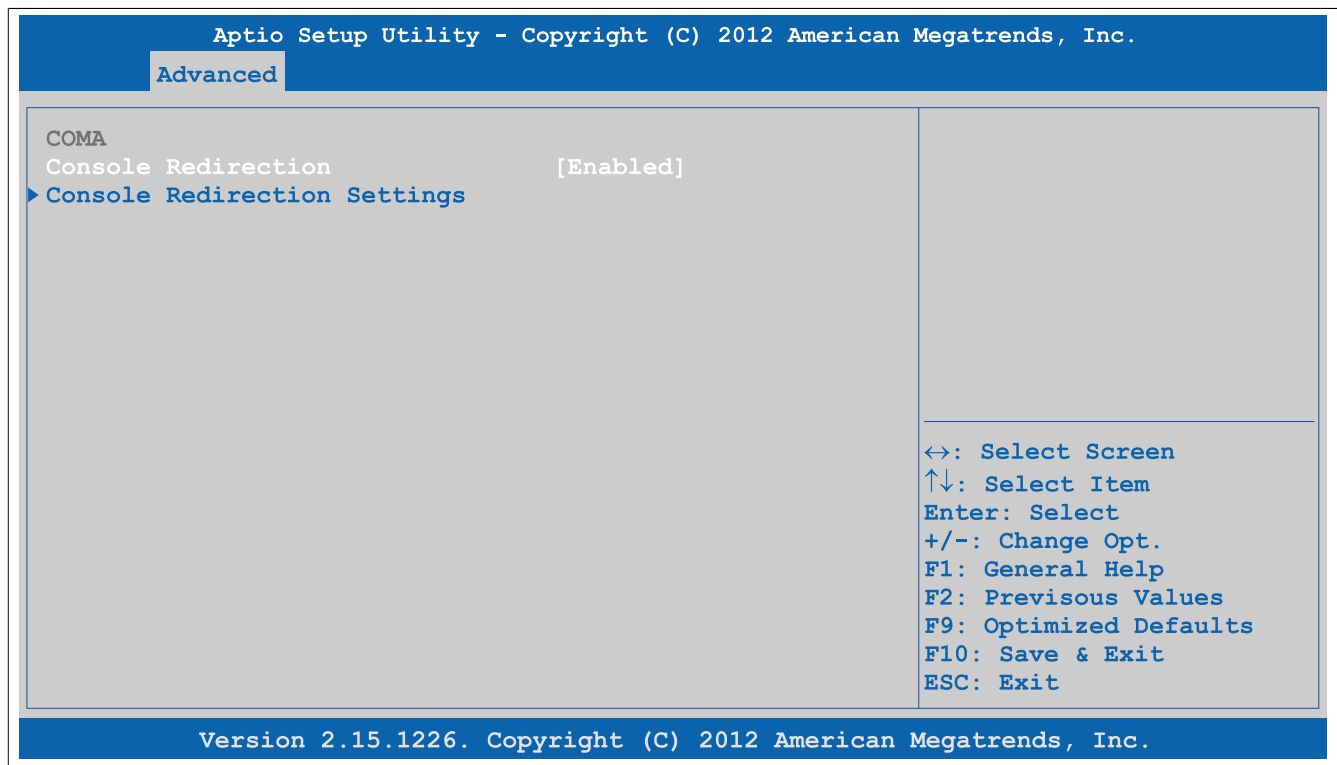


Figure 148: Advanced - Serial Port Console Redirection

| BIOS setting                 | Function  | Configuration options | Effect  |
|------------------------------|---|-----------------------|---|
| Console redirection          | Option for enabling/disabling console redirection | Disabled              | Disables this function  |
|                              |   | Enabled               | Enables this function   |
| Console redirection settings | Configures the remote console                     | Enter                 | Opens this submenu<br>See "Console redirection settings" on page 277. |

Table 240: Advanced - Serial port console redirection - Configuration options

#### 1.4.13.1 Console redirection settings

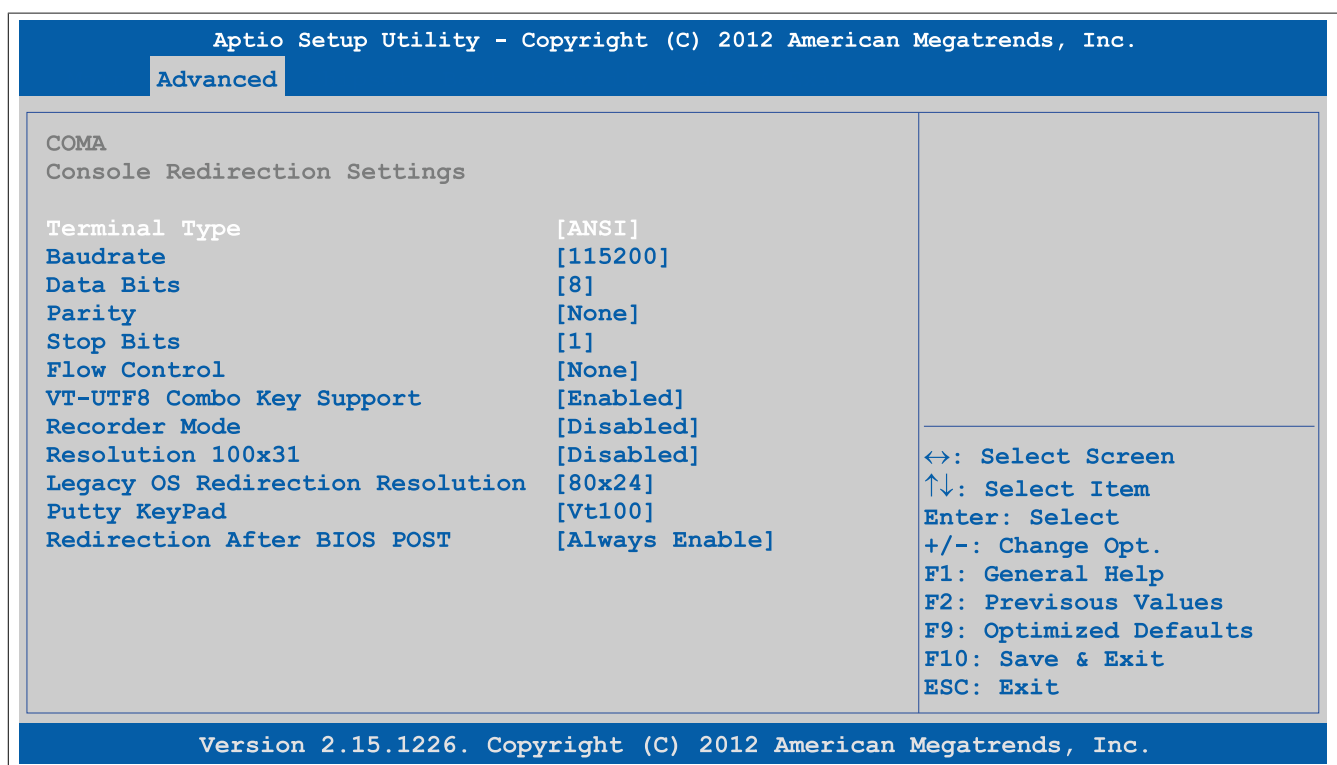


Figure 149: Advanced - Console Redirection - Console Redirection Settings

| BIOS setting                     | Function  | Configuration options                               | Effect  |
|----------------------------------|---|---|---|
| Terminal type                    | Option for configuring keyboard input   | VT100   | Enables the VT100 convention (ASCII character set)  |
|                                  |   | VT100+  | Enables the VT100+ convention (ASCII character set and support for color, function keys, etc)   |
|                                  |   | VT-UTF8   | Enables the VT-UTF8 convention (uses UTF-8 encoding to assign Unicode characters to one or more bytes)  |
|                                  |   | ANSI  | Enables the ANSI convention (extended ASCII character set)  |
| Baud rate                        | Option for setting the transfer rate of the serial interface (bits per second)          | 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 | Enables a transfer rate of x bits   |
| Data bits                        | Option for configuring the character length (data bits) to use for serial communication | 7   | Character length with 7 bits  |
|                                  |   | 8   | Character length with 8 bits  |
| Parity                           | Option for configuring the parity bit to use for serial communication                   | None  | Parity bit not used   |
|                                  |   | Even  | Uses an even number of parity bits  |
|                                  |   | Odd   | Uses an odd number of parity bits   |
|                                  |   | Mark  | Parity bit always 1   |
|                                  |   | Space   | Parity bit always 0   |
| Stop bits                        | Option for configuring the stop bits to use for serial communication                    | 1   | Uses 1 bit as the stop bit  |
|                                  |   | 2   | Uses 2 bits as the stop bit   |
| Flow control                     | Option for configuring the data flow control  | None  | Disables data flow control  |
|                                  |   | Hardware RTS/CTS                                    | Enables hardware handshake  |
| VT-UTF8 combo key support        | Option for enabling/disabling VT-UTF8 combo key support for ANSI and VT100 connections  | Disabled  | Disables this function  |
|                                  |   | Enabled   | Enables this function   |
| Recorder mode                    | Option for enabling/disabling recorder mode   | Disabled  | Disables this function  |
|                                  |   | Enabled   | Enables this function<br>When this setting is used, all control escape sequences are suppressed from the serial redirection output. This may lead to incorrectly formatted screen output but makes automatic storage of the serial console output easier. |
| Resolution 100x31                | Option for enabling/disabling extended terminal resolution                              | Disabled  | Disables this function  |
|                                  |   | Enabled   | Enables this function   |
| Legacy OS redirection resolution | Option for configuring the number of lines and columns for legacy OS redirection        | 80x24   | Resolution of 80x24   |
|                                  |   | 80x25   | Resolution of 80x25   |
| Putty keypad                     | Terminal emulation  | VT100   | VT100 emulation   |
|                                  |   | LINUX   | LINUX emulation   |
|                                  |   | XTERMR6   | XTERMR6 emulation   |
|                                  |   | SCO   | SCO emulation   |
|                                  |   | ESCN  | ESCN emulation  |
|                                  |   | VT400   | VT400 emulation   |
| Redirection After BIOS POST      | Option for configuring redirection after startup  | Always enable                                       | Keeps redirection enabled permanently   |
|                                  |   | Bootloader  | Enables redirection during system startup and when charging   |

Table 241: Advanced - Console redirection - Console redirection settings - Configuration options

## 1.5 Boot

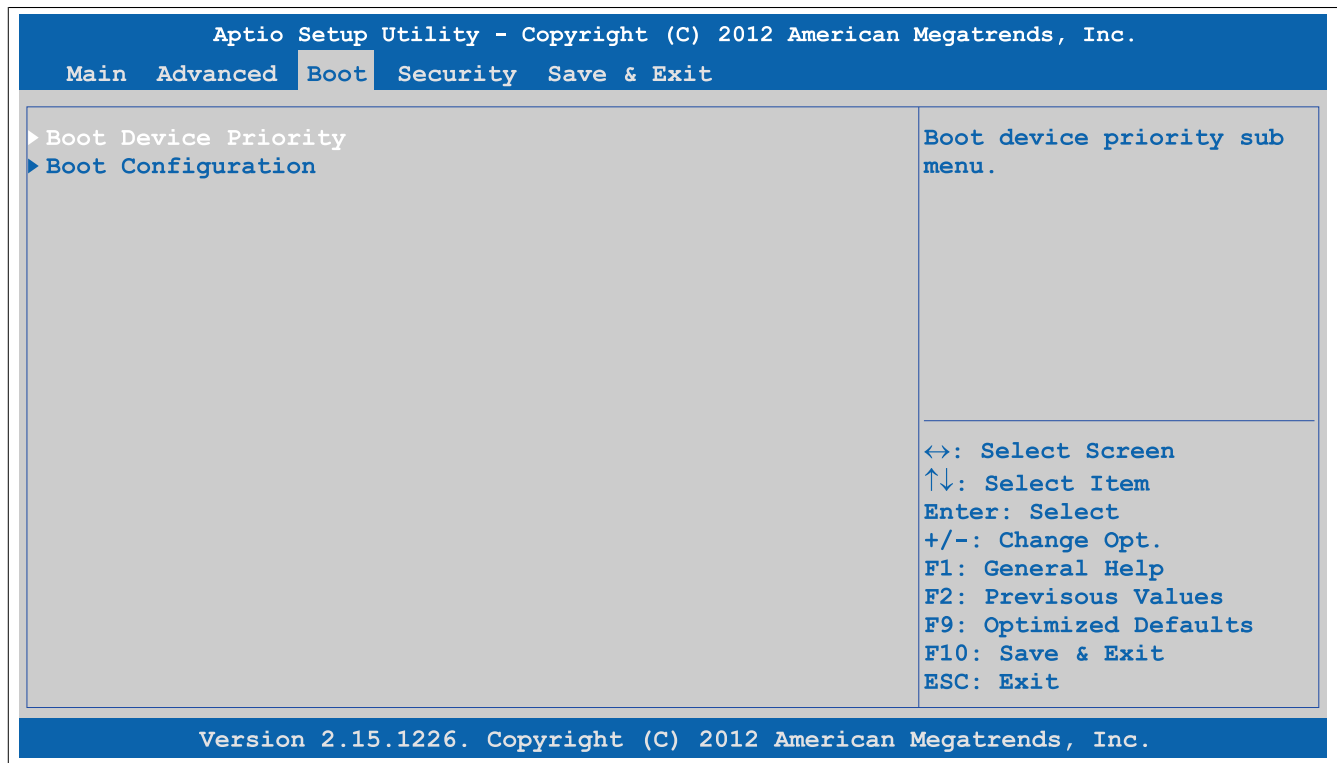


Figure 150: Boot

| BIOS setting         | Function                   | Configuration options | Effect  |
|----------------------|----------------------------|-----------------------|---|
| Boot device priority | Configures the boot order  | Enter                 | Opens this submenu<br>See "Boot device priority" on page 279. |
| Boot configuration   | Configures boot properties | Enter                 | Opens this submenu<br>See "Boot configuration" on page 280.   |

Table 242: Boot - Overview

### 1.5.1 Boot device priority

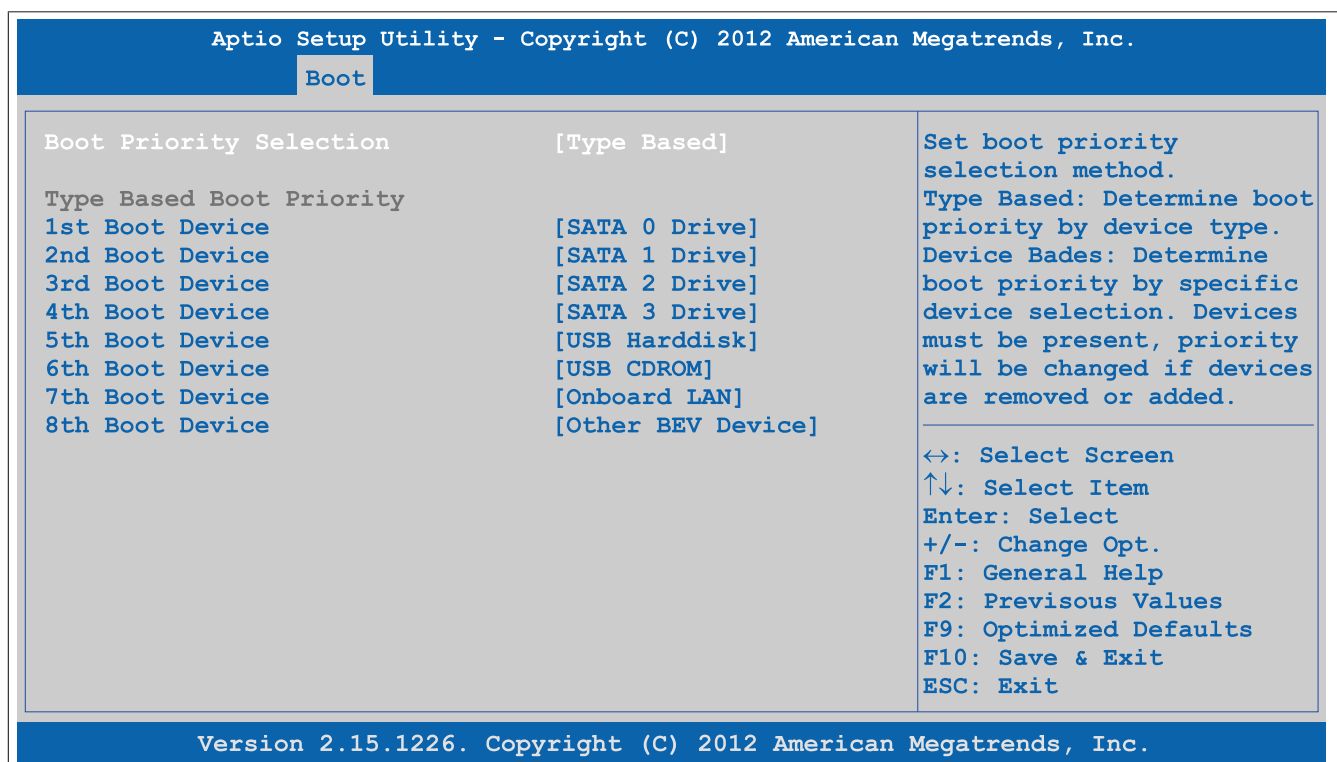


Figure 151: Boot - Boot Device Priority

| BIOS setting            | Function  | Configuration options   | Effect   |
|-------------------------|---|---|--|
| Boot priority selection | Option for determining the method for how drives should be booted | Device based  | Only lists devices that are recognized by the system. The order of devices in this list can be changed.<br><br><b>Information:</b><br>It is only possible to use either "Device based" or "Type based". Using both together is not permitted.                              |
|                         |   | Type based  | The boot sequence of a device type list can be changed. It is also possible to add device types that are not connected to this list.<br><br><b>Information:</b><br>It is only possible to use either "Device based" or "Type based". Using both together is not permitted. |
| 1st boot device         | Option for selecting drives to be used for booting                | Disabled, SATA 0 drive, SATA 1 drive, SATA 2 drive, SATA 3 drive, USB floppy, USB hard disk, USB CDROM, Onboard LAN, External LAN, Other BEV device | Specifies the desired boot sequence  |
| 2nd boot device         |   |   |  |
| 3rd boot device         |   |   |  |
| 4th boot device         |   |   |  |
| 5th boot device         |   |   |  |
| 6th boot device         |   |   |  |
| 7th boot device         |   |   |  |
| 8th boot device         |   |   |  |

Table 243: Boot - Boot device priority - Configuration options

## 1.5.2 Boot configuration

| Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc. |                   |   |
|--|-------------------|---|
| Boot   |                   |   |
| Launch CSM   | [Enabled]         | Controls the execution of UEFI and legacy PXE option ROMs |
| Boot option filter   | [UEFI and Legacy] |   |
| PXE Option ROM Launch Policy                                       | [Do not launch]   |   |
| Storage Option ROM Launch Policy                                   | [Legacy ROM only] |   |
| Video Option ROM Launch Policy                                     | [Legacy ROM only] |   |
| Other PCI device ROM priority                                      | [Legacy OpROM]    |   |
| Option ROM Messages  | [Force BIOS]      |   |
| Boot Logo  | [Auto]            |   |
| Enter Setup If No Boot Device                                      | [No]              |   |
| Setup Prompt Timeout   | 1                 |   |
| Enable Popup Boot Menu   | [Yes]             |   |
| Force POST/Setup VGA Support                                       | [Disabled]        |   |
| Bootup NumLock State   | [On]              |   |
| GateA20 Active   | [Upon Request]    |   |
| INT19 Trap Response  | [Immediate]       |   |
| Power Loss Control   | [Turn On]         |   |
| Fast Boot  | [Disabled]        |   |
|  |                   |   |

↔: Select Screen  
 ↑↓: Select Item  
 Enter: Select  
 +/-: Change Opt.  
 F1: General Help  
 F2: Previous Values  
 F9: Optimized Defaults  
 F10: Save & Exit  
 ESC: Exit

Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.

Figure 152: Boot - Boot Configuration

| BIOS setting       | Function  | Configuration options | Effect                     |
|--------------------|---|-----------------------|----------------------------|
| Launch CSM         | Option for enabling/disabling the CSM module                | Enabled               | Enables this function      |
|                    |   | Disabled              | Disables this function     |
| Boot option filter | Option for controlling which device system should be booted | UEFI and legacy       | Boots from UEFI and legacy |
|                    |   | UEFI only             | Boots from UEFI            |
|                    |   | Legacy only           | Boots from legacy          |

Table 244: Boot - Boot configuration - Configuration options

| BIOS setting                     | Function   | Configuration options | Effect   |
|----------------------------------|--|-----------------------|--|
| PXE Option ROM launch policy     | Option for booting from PXE Option ROM   | Do not launch         | Does not boot from PXE Option ROM  |
|                                  |  | UEFI ROM only         | Boots from UEFI ROM  |
|                                  |  | Legacy ROM only       | Boots from legacy ROM  |
| Storage Option ROM launch policy | Option for booting from Storage Option ROM   | Do not launch         | Does not boot from Storage Option ROM  |
|                                  |  | UEFI ROM only         | Boots from UEFI ROM  |
|                                  |  | Legacy ROM only       | Boots from legacy ROM  |
| Video Option ROM launch policy   | Option for booting from Video Option ROM   | Do not launch         | Does not boot from Video Option ROM  |
|                                  |  | UEFI ROM only         | Boots from UEFI ROM  |
|                                  |  | Legacy ROM only       | Boots from legacy ROM  |
| Other PCI device ROM priority    | Option for configuring which OpROM should be booted if not network, mass storage or video  | UEFI opROM            | Boots from UEFI OpROM  |
|                                  |  | Legacy OpROM          | Boots from legacy OpROM  |
| Option ROM messages              | Option to display Option ROM messages during POST  | Force BIOS            | Displays Option ROM messages during POST   |
|                                  |  | Keep current          | Does not display Option ROM messages during POST   |
| Boot logo                        | Option for configuring the boot logo   | Disabled              | Does not display the boot logo   |
|                                  |  | Enabled               | Displays the boot logo   |
|                                  |  | Auto                  | Displays the boot logo   |
| Enter setup if no boot device    | Option for configuring whether the setup screen is displayed when no bootable drive is connected   | No                    | Does not display the setup screen  |
|                                  |  | Yes                   | Displays the setup screen  |
| Setup prompt timeout             | Option for configuring how long the setup activation key (key for entering BIOS) is displayed  | 1 to 65534            | Displays the setup activation key for x seconds  |
|                                  |  | 65535                 | Displays the setup activation key for an unlimited amount of time  |
| Enable popup boot menu           | Option for enabling/disabling the popup boot menu  | Yes                   | Enables this function. Pressing "F11" during POST allows a boot device to be selected.                                       |
|                                  |  | No                    | Disables this function. It is not possible to select a boot device during POST. Devices will boot in their configured order. |
| Force POST/Setup VGA support     | Option for enabling/disabling 640 x 480 VGA support in BIOS and POST   | Disabled              | Disables this function   |
|                                  |  | Enabled               | Enables this function  |
| Bootup NumLock state             | Option for configuring the numeric keypad when booting the system  | On                    | Enables the numeric keypad   |
|                                  |  | Off                   | Only enables the cursor (movement) functions of the numeric keypad   |
| GateA20 active                   | Option for defining how memory above 1 MB is accessed  | Upon request          | Allows GA20 to be disabled   |
|                                  |  | Always                | Does not disable GA20  |
| INT19 trap response              | Option for configuring the interrupt trap response for the ROM option  | Immediate             | Executes the interrupt trap response immediately   |
|                                  |  | Postponed             | Executes the interrupt trap response during the legacy boot  |
| Power loss control               | Specifies whether the system should be on/off following power loss   | Remain off            | Keeps the PC turned off  |
|                                  |  | Turn on               | Turns on the PC  |
|                                  |  | Last state            | Enables the previous state   |
| Fast boot                        | Option for reducing the boot time by skipping some POST procedures   | Enabled               | Enables this option  |
|                                  |  | Disabled              | Disables this option   |
| SATA support                     | Function for configuring for which option SATA support should be implemented   | Last boot HDD only    | On the last boot of the hard drive   |
|                                  |  | All SATA devices      | For all SATA devices   |
|                                  |  | HDD only              | On the hard drive  |
| VGA support                      | Function for configuring how VGA support should be implemented. If "Auto", legacy OpRom with the legacy OS is installed and the logo will not be displayed during POST. The EFI driver is installed with the EFI OS. | Auto                  | Automatic enabling   |
|                                  |  | EFI driver            | Option handled by EFI driver   |
| USB support                      | Enables/Disables USB support. USB interfaces do not function during startup. USB support is available again after the operating system has started. A USB keyboard is still recognized during POST.                  | Disabled              | Disables this option   |
|                                  |  | Full initial          | Enables the option's complete procedure  |
|                                  |  | Partial initial       | Enables the option's partial procedure   |
| PS2 devices support              | Option for enabling/disabling PS2 device support   | Enabled               | Enables this option  |
|                                  |  | Disabled              | Disables this option   |

Table 244: Boot - Boot configuration - Configuration options

1.6 Security

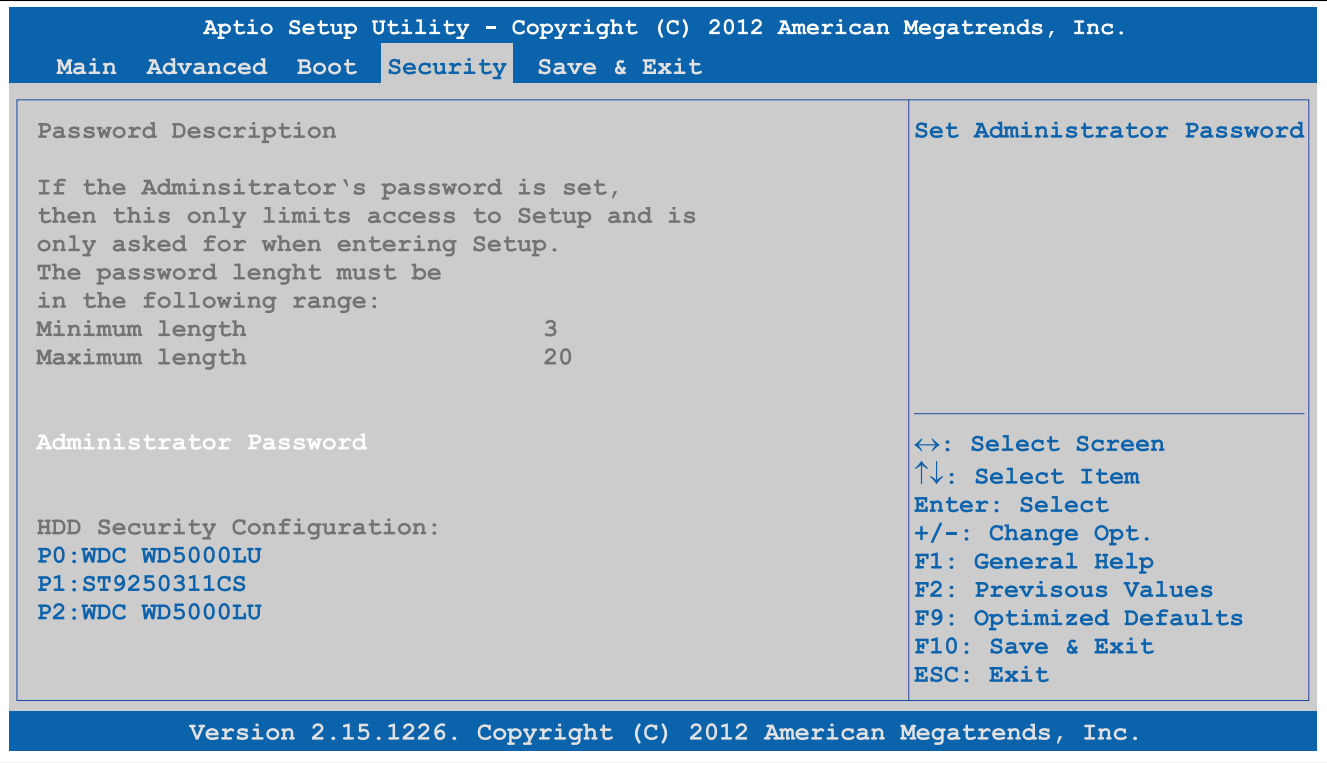


Figure 153: Security

| BIOS setting           | Function  | Configuration options | Effect         |
|------------------------|---|-----------------------|----------------|
| Administrator password | Function for entering/changing the administrator password | Enter                 | Password entry |

Table 245: Security menu - Configuration options

1.6.1 HDD user password

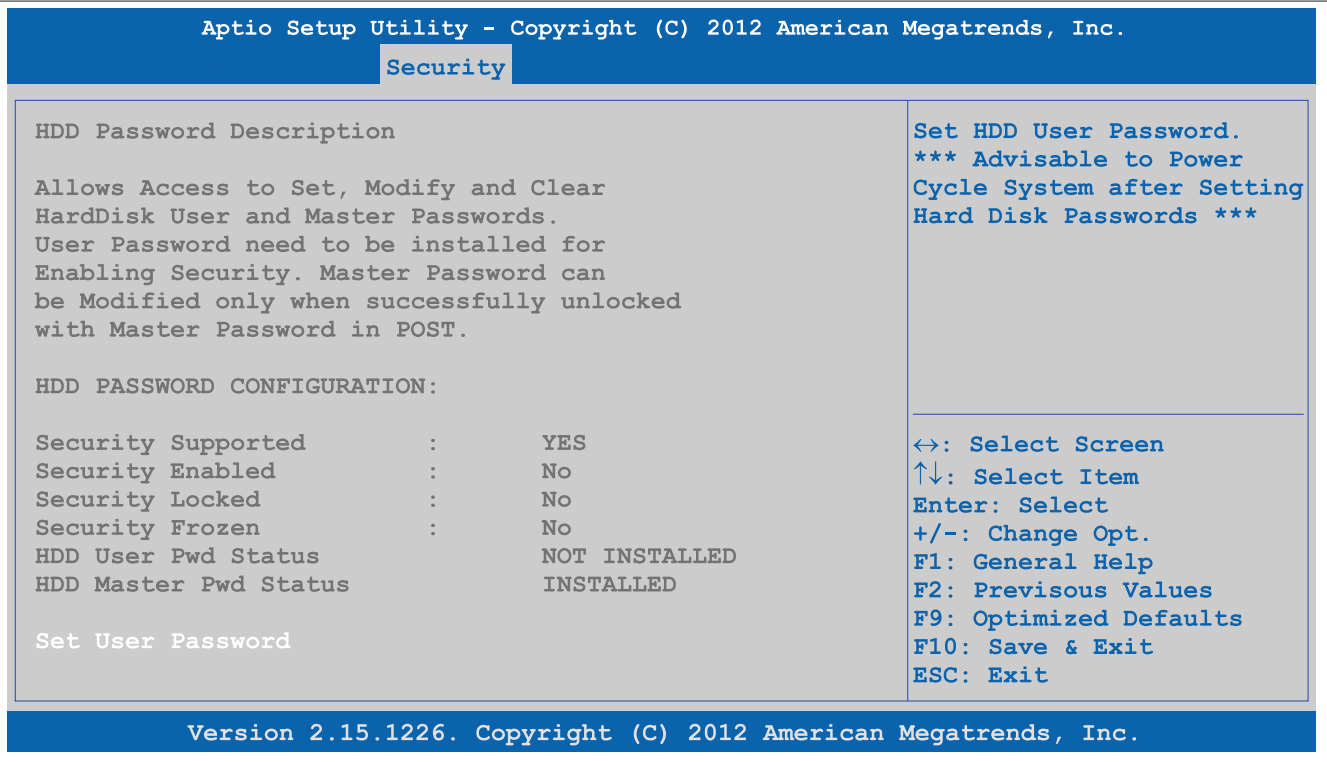


Figure 154: Security - HDD user password



| BIOS setting  | Function  | Configuration options | Effect         |
|---------------|---|-----------------------|----------------|
| User password | Function for entering/changing a user password. | Enter                 | Password entry |

Table 246: Security - HDD user password - Configuration options

## 1.7 Save & Exit

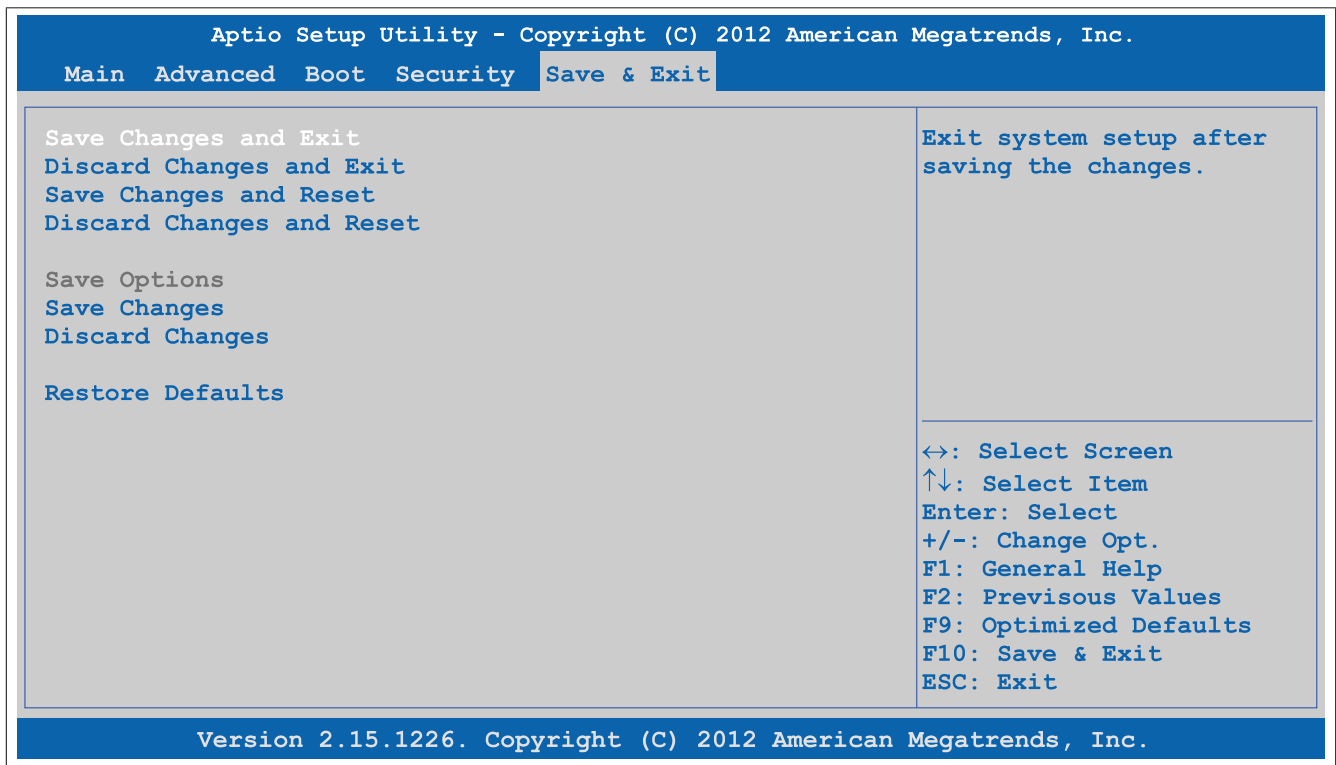


Figure 155: Save &amp; Exit

| BIOS setting              | Function   | Configuration options | Effect |
|---------------------------|--|-----------------------|--------|
| Save changes and exit     | Selecting this option closes BIOS Setup. Selecting this option saves any changes made to CMOS after confirmation.                        | Yes/No                |        |
| Discard changes and exit  | Selecting this option closes BIOS Setup without saving any changes made.   | Yes/No                |        |
| Save changes and reset    | Selecting this option closes BIOS Setup. Selecting this option saves any changes made to CMOS after confirmation and reboots the system. | Yes/No                |        |
| Discard changes and reset | Selecting this option closes BIOS Setup without saving any changes made. The system is then rebooted.                                    | Yes/No                |        |
| Save changes              | Selecting this option saves any changes made to CMOS after confirmation.   | Yes/No                |        |
| Discard changes           | Selecting this option resets any settings that may have been made but forgotten in the meantime (provided they have not yet been saved). | Yes/No                |        |
| Restore defaults          | Selecting this option restores the BIOS default values.  | Yes/No                |        |

Table 247: Save &amp; Exit menu - Configuration options

## 1.8 BIOS default settings

BIOS default settings may vary depending on how the complete system is configured.

If the function "Restore defaults" is selected in the main BIOS Setup menu, or if "Save & Exit" is selected (or F9 is pressed) in the individual setup screens, the following BIOS settings are the optimized values that will be used.

### 1.8.1 Advanced

#### 1.8.1.1 Graphics configuration

| Setting/Option                 | Default profile     | My setting |
|--------------------------------|---------------------|------------|
| Primary display                | Auto                |            |
| Internal graphics              | Auto                |            |
| IGFX VBIOS version             | -                   |            |
| GTT size                       | 2 MB                |            |
| Aperture size                  | 256M                |            |
| DVMT pre-allocated             | 64M                 |            |
| DVMT total gfx mem             | 256M                |            |
| Gfx low power mode             | Disabled            |            |
| Graphics performance analyzers | Disabled            |            |
| Primary IGFX boot display      | EFP2                |            |
| Secondary IGFX boot display    | CRT                 |            |
| Active LFP configuration       | No local flat panel |            |
| Display port B interface       | DisplayPort         |            |
| Display Port C interface       | Disabled            |            |
| Display Port D interface       | HDMI/DVI            |            |
| Display mode persistence       | Disabled            |            |

Table 248: Advanced - Graphics configuration - Overview of profile settings

#### 1.8.1.2 OEM features

| Setting/Option       | Default profile | My setting |
|----------------------|-----------------|------------|
| Main BIOS version    | -               |            |
| OEM BIOS version     | -               |            |
| MTCX                 | -               |            |
| ETH2 MAC address     | -               |            |
| Realtime environment | Disabled        |            |

Table 249: Advanced - OEM features - Overview of profile settings

#### 1.8.1.2.1 Super I/O configuration

| Setting/Option  | Default profile | My setting |
|-----------------|-----------------|------------|
| Serial port A   | Enabled         |            |
| Device settings | -               |            |
| Serial port C   | Enabled         |            |
| Device settings | -               |            |

Table 250: Advanced - OEM features - Super I/O configuration - Overview of profile settings

#### 1.8.1.3 PCI configuration

| Setting/Option                            | Default profile   | My setting |
|---|-------------------|------------|
| Above 4G decoding                         | Disabled          |            |
| PCI latency timer                         | 32 PCI bus clocks |            |
| VGA palette snoop                         | Disabled          |            |
| PERR# generation                          | Disabled          |            |
| SERR# generation                          | Disabled          |            |
| PCIe POST delay                           | Disabled          |            |
| <b>PIRQ routing &amp; IRQ reservation</b> |                   |            |
| PIRQA                                     | Auto              |            |
| PIRQB                                     | Auto              |            |
| PIRQC                                     | Auto              |            |
| PIRQD                                     | Auto              |            |
| PIRQE                                     | Auto              |            |
| PIRQF                                     | Auto              |            |
| PIRQG                                     | Auto              |            |
| PIRQH                                     | Auto              |            |
| Reserve legacy interrupt 1                | None              |            |
| Reserve legacy interrupt 2                | None              |            |

Table 251: Advanced - PCI configuration - Overview of profile settings

### 1.8.1.4 PCI express configuration

#### 1.8.1.4.1 PCI Express settings

| Setting/Option             | Default profile | My setting |
|----------------------------|-----------------|------------|
| Relaxed ordering           | Disabled        |            |
| Extended tag               | Disabled        |            |
| No snoop                   | Enabled         |            |
| Maximum payload            | Auto            |            |
| Maximum read request       | Auto            |            |
| Extended synch             | Disabled        |            |
| Link training retry        | 5               |            |
| Link training timeout (µS) | 100             |            |
| Unpopulated links          | Keep link on    |            |
| Restore PCIE registers     | Disabled        |            |

Table 252: Advanced - PCI Express configuration - PCI Express settings - Overview of profile settings

#### 1.8.1.4.2 PCI Express GEN 2 settings

| Setting/Option              | Default profile | My setting |
|-----------------------------|-----------------|------------|
| Completion timeout          | Default         |            |
| ARI forwarding              | Disabled        |            |
| AtomicOp requester enable   | Disabled        |            |
| AtomicOp egress blocking    | Disabled        |            |
| IDO request enable          | Disabled        |            |
| IDO completion enable       | Disabled        |            |
| LTR mechanism enable        | Disabled        |            |
| End-End TLP prefix blocking | Disabled        |            |
| Target link speed           | Auto            |            |
| Clock power management      | Disabled        |            |
| Compliance SOS              | Disabled        |            |
| Hardware autonomous width   | Enabled         |            |
| Hardware autonomous speed   | Enabled         |            |

Table 253: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Overview of profile settings

#### 1.8.1.4.3 PCI Express graphics (PEG) port

| Setting/Option                  | Default profile | My setting |
|---------------------------------|-----------------|------------|
| PCI Express graphics (PEG) port | Auto            |            |
| PEG root port configuration     | 1 x 8 + 2 x 4   |            |
| PEG0                            | -               |            |
| PEG0 speed                      | Auto            |            |
| PEG0 ASPM                       | Disabled        |            |
| PEG1                            | -               |            |
| PEG1 speed                      | Gen1            |            |
| PEG1 ASPM                       | Disabled        |            |
| PEG2                            | -               |            |
| PEG2 speed                      | Auto            |            |
| PEG2 ASPM                       | Disabled        |            |
| Detect non-compliant device     | Disabled        |            |
| De-emphasis control             | -3.5 dB         |            |

Table 254: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Overview of profile settings

#### 1.8.1.4.4 PCI Express root port

| Setting/Option          | Default profile | My setting |
|-------------------------|-----------------|------------|
| PCI Express root port x | Enabled         |            |
| ASPM                    | Disabled        |            |
| URR                     | Disabled        |            |
| FER                     | Disabled        |            |
| NFER                    | Disabled        |            |
| CER                     | Disabled        |            |
| CT0                     | Disabled        |            |
| SEFE                    | Disabled        |            |
| SENF                    | Disabled        |            |
| SECE                    | Disabled        |            |
| PME SCI                 | Enabled         |            |
| Always enable port      | Disabled        |            |
| PCIe speed              | Auto            |            |
| Assign INT to root port | Enabled         |            |

Table 255: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings

| Setting/Option      | Default profile | My setting |
|---------------------|-----------------|------------|
| Extra bus reserved  | 0               |            |
| Reserved memory     | 10              |            |
| Prefetchable memory | 10              |            |
| Reserved I/O        | 4               |            |

Table 255: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings

### 1.8.1.5 ACPI settings

| Setting/Option        | Default profile                                | My setting |
|-----------------------|--|------------|
| Enable hibernation    | Enabled  |            |
| ACPI sleep state      | Both S1 and S3 available for OS to choose from |            |
| Lock legacy resources | Disabled                                       |            |
| S3 video repost       | Disabled                                       |            |
| Critical trip point   | 111 C  |            |

Table 256: Advanced - ACPI settings - Overview of profile settings

### 1.8.1.6 RTC wake settings

| Setting/Option            | Default profile | My setting |
|---------------------------|-----------------|------------|
| Wake system at fixed time | Disabled        |            |

Table 257: Advanced - RTC wake settings - Overview of profile settings

### 1.8.1.7 CPU configuration

| Setting/Option                  | Default profile | My setting |
|---------------------------------|-----------------|------------|
| Hyper-threading                 | Enabled         |            |
| Active processor cores          | All             |            |
| Limit CPUID maximum             | Disabled        |            |
| Execute disable bit             | Enabled         |            |
| Intel virtualization technology | Disabled        |            |
| Hardware prefetcher             | Enabled         |            |
| Adjacent cache line prefetch    | Enabled         |            |
| TCC activation offset           | 0               |            |
| Primary plane current value     | 0               |            |
| Secondary plane current value   | 0               |            |
| EIST                            | Enabled         |            |
| Turbo mode                      | Enabled         |            |
| P state reduction               | Disabled        |            |
| CPU C3 report                   | Disabled        |            |
| CPU C6 report                   | Disabled        |            |
| CPU C7 report                   | Disabled        |            |
| Configurable TDP                | TDP NOMINAL     |            |
| Config TDP LOCK                 | Disabled        |            |
| Long duration power limit       | 0               |            |
| Long duration maintained        | 1               |            |
| Short duration power limit      | 0               |            |
| ACPI T state                    | Disabled        |            |

Table 258: Advanced - CPU configuration - Overview of profile settings

### 1.8.1.8 Chipset configuration

| Setting/Option             | Default profile | My setting |
|----------------------------|-----------------|------------|
| PCH LAN controller         | Enabled         |            |
| Wake on LAN                | Enabled         |            |
| Azalia                     | Auto            |            |
| Azalia PME                 | Disabled        |            |
| Azalia internal HDMI codec | Disabled        |            |
| High-precision timer       | Enabled         |            |
| CF9h global reset          | Host only       |            |
| VT-d                       | Enabled         |            |
| PCI Express clock gating   | Disabled        |            |
| DMI link ASPM PCH side     | Disabled        |            |
| PCIe USB glitch W/A        | Disabled        |            |
| SB CRID                    | Disabled        |            |
| NB CRID                    | Disabled        |            |
| Disconnect external SMBus  | Never           |            |
| DMI Configuration          | -               |            |
| DMI                        | -               |            |

Table 259: Advanced - Chipset configuration - Overview of profile settings

| Setting/Option                             | Default profile | My setting |
|--|-----------------|------------|
| DMI Vc1 <a href="#">control</a>            | Enabled         |            |
| DMI Vcp <a href="#">control</a>            | Enabled         |            |
| DMI Vcm <a href="#">control</a>            | Enabled         |            |
| DMI link ASPM <a href="#">CPU</a> side     | Disabled        |            |
| DMI extended synch <a href="#">control</a> | Disabled        |            |
| DMI Gen 2                                  | Auto            |            |

Table 259: Advanced - Chipset configuration - Overview of profile settings

### 1.8.1.9 SATA configuration

| Setting/Option                             | Default profile | My setting |
|--|-----------------|------------|
| SATA <a href="#">controller(s)</a>         | Enabled         |            |
| SATA mode selection                        | AHCI            |            |
| SATA test mode                             | Disabled        |            |
| Aggressive LPM support                     | Disabled        |            |
| SATA <a href="#">controller</a> speed      | Default         |            |
| SMART self test                            | Disabled        |            |
| Alternate ID                               | Disabled        |            |
| Serial ATA port 0                          | -               |            |
| Port 0                                     | Enabled         |            |
| Hot plug                                   | Disabled        |            |
| External SATA                              | Disabled        |            |
| SATA <a href="#">device</a> type           | Hard disk drive |            |
| Spin up <a href="#">device</a>             | Disabled        |            |
| Serial ATA port 1                          | -               |            |
| Port 1                                     | Enabled         |            |
| Hot plug                                   | Disabled        |            |
| External SATA                              | Disabled        |            |
| SATA <a href="#">device</a> type           | Hard disk drive |            |
| Spin up <a href="#">device</a>             | Disabled        |            |
| Serial ATA port 2                          | -               |            |
| Port 2                                     | Enabled         |            |
| Hot plug                                   | Disabled        |            |
| External SATA                              | Disabled        |            |
| Spin up <a href="#">device</a>             | Disabled        |            |
| Serial ATA port 3                          | -               |            |
| Port 3                                     | Enabled         |            |
| Hot plug                                   | Disabled        |            |
| External SATA                              | Disabled        |            |
| Spin up <a href="#">device</a>             | Disabled        |            |
| <b>Software feature mask configuration</b> |                 |            |
| RAID0                                      | Enabled         |            |
| RAID1                                      | Enabled         |            |
| RAID10                                     | Enabled         |            |
| RAID5                                      | Enabled         |            |
| Intel Rapid Recovery technology            | Enabled         |            |
| OROM UI and BANNER                         | Enabled         |            |
| <a href="#">HDD</a> unlock                 | Enabled         |            |
| <a href="#">LED</a> locate                 | Enabled         |            |
| IRRT only on eSATA                         | Enabled         |            |
| Smart Response technology                  | Enabled         |            |
| OROM UI delay                              | 2 seconds       |            |

Table 260: Advanced - SATA configuration - Overview of profile settings

### 1.8.1.10 Memory configuration

| Setting/Option                  | Default profile                      | My setting |
|---------------------------------|--------------------------------------|------------|
| <a href="#">DIMM</a> profile    | Default <a href="#">DIMM</a> profile |            |
| Memory frequency limiter        | Auto                                 |            |
| No fan memory frequency limiter | Enabled                              |            |
| ECC support                     | Disabled                             |            |
| Max TOLUD                       | Dynamic                              |            |
| NMode support                   | Auto                                 |            |
| Memory scrambler                | Enabled                              |            |
| Memory refresh rate             | Disabled                             |            |
| MRC fast boot                   | Enabled                              |            |
| Force cold reset                | Enabled                              |            |
| <a href="#">DIMM</a> exit mode  | Fast exit                            |            |
| Power down mode                 | PPD                                  |            |
| Scrambler seed generation off   | Disabled                             |            |

Table 261: Advanced - Memory configuration - Overview of profile settings

| Setting/Option                         | Default profile                   | My setting |
|--|-----------------------------------|------------|
| Memory remap                           | Enabled                           |            |
| Memory alias check                     | Disabled                          |            |
| Channel A <a href="#">DIMM control</a> | Enable both <a href="#">DIMMS</a> |            |
| Channel B <a href="#">DIMM control</a> | Enable both <a href="#">DIMMS</a> |            |

Table 261: Advanced - Memory configuration - Overview of profile settings

### 1.8.1.11 USB configuration

| Setting/Option   | Default profile | My setting |
|--|-----------------|------------|
| EHCI1 (ports 0-5)  | Enabled         |            |
| EHC2 (ports 6-7)   | Enabled         |            |
| xHCI mode  | Auto            |            |
| HS port #1 switchable                                      | Enabled         |            |
| HS port #2 switchable                                      | Enabled         |            |
| HS port #3 switchable                                      | Enabled         |            |
| HS port #4 switchable                                      | Enabled         |            |
| Legacy <a href="#">USB</a> support                         | Enabled         |            |
| XHCI legacy support  | Enabled         |            |
| XHCI Hand-off  | Enabled         |            |
| EHCI hand-off  | Disabled        |            |
| <a href="#">USB</a> mass storage driver support            | Enabled         |            |
| <a href="#">USB</a> transfer time-out                      | 20 sec          |            |
| <a href="#">Device</a> reset time-out                      | 20 sec          |            |
| <a href="#">Device</a> power-up delay                      | Auto            |            |
| Overcurrent protection                                     | Disabled        |            |
| <b>Per port <a href="#">USB</a> disable control</b>        |                 |            |
| <a href="#">USB</a> port #0                                | Enabled         |            |
| <a href="#">USB</a> port #1                                | Enabled         |            |
| <a href="#">USB</a> port #2                                | Enabled         |            |
| <a href="#">USB</a> port #3                                | Enabled         |            |
| <a href="#">USB</a> port #4                                | Enabled         |            |
| <a href="#">USB</a> port #5                                | Enabled         |            |
| <a href="#">USB</a> port #6                                | Enabled         |            |
| <a href="#">USB</a> port #7                                | Enabled         |            |
| <b>Per port legacy <a href="#">USB</a> support control</b> |                 |            |
| USB0 port legacy support                                   | Enabled         |            |
| USB1 port legacy support                                   | Enabled         |            |
| USB2 port legacy support                                   | Enabled         |            |
| USB3 port legacy support                                   | Enabled         |            |
| USB4 port legacy support                                   | Enabled         |            |
| USB5 port legacy support                                   | Enabled         |            |
| USB6 port legacy support                                   | Enabled         |            |
| USB7 port legacy support                                   | Enabled         |            |

Table 262: Advanced - [USB](#) configuration - Overview of profile settings

### 1.8.1.12 Serial port console redirection

| Setting/Option      | Default profile | My setting |
|---------------------|-----------------|------------|
| Console redirection | Disabled        |            |

Table 263: Advanced - Serial port console redirection - Overview of profile settings

## 1.8.2 Boot

### 1.8.2.1 Boot [device](#) priority

| Setting/Option                  | Default profile                  | My setting |
|---------------------------------|----------------------------------|------------|
| Boot priority selection         | Type based                       |            |
| 1st boot <a href="#">device</a> | SATA 0 drive                     |            |
| 2nd boot <a href="#">device</a> | SATA 1 drive                     |            |
| 3rd boot <a href="#">device</a> | SATA 2 drive                     |            |
| 4th boot <a href="#">device</a> | SATA 3 drive                     |            |
| 5th boot <a href="#">device</a> | <a href="#">USB</a> hard disk    |            |
| 6th boot <a href="#">device</a> | <a href="#">USB</a> CDROM        |            |
| 7th boot <a href="#">device</a> | Onboard LAN                      |            |
| 8th boot <a href="#">device</a> | Other BEV <a href="#">device</a> |            |

Table 264: Boot - Boot [device](#) priority - Overview of profile settings

### 1.8.2.2 Boot configuration

| Setting/Option  | Default profile                 | My setting |
|---|---------------------------------|------------|
| Launch CSM  | Enabled                         |            |
| Boot option <a href="#">filter</a>                            | UEFI and legacy                 |            |
| PXE Option <a href="#">ROM</a> launch policy                  | Do not launch                   |            |
| Storage Option <a href="#">ROM</a> launch policy              | Legacy <a href="#">ROM</a> only |            |
| Video Option <a href="#">ROM</a> launch policy                | Legacy <a href="#">ROM</a> only |            |
| Other PCI devices <a href="#">ROM</a> priority                | Legacy OpROM                    |            |
| Option <a href="#">ROM</a> messages                           | Force <a href="#">BIOS</a>      |            |
| Boot logo   | Auto                            |            |
| Enter setup if no boot <a href="#">device</a>                 | No                              |            |
| Force <a href="#">POST</a> /Setup <a href="#">VGA</a> support | Disabled                        |            |
| Setup prompt timeout  | 1                               |            |
| Enable popup boot menu  | Yes                             |            |
| Bootup NumLock state  | On                              |            |
| GateA20 active  | Upon request                    |            |
| INT19 trap response   | Immediate                       |            |
| Power loss <a href="#">control</a>                            | Turn on                         |            |
| Fast boot   | Disabled                        |            |

Table 265: Boot - Boot configuration - Overview of profile settings

## 1.9 Allocation of resources

### 1.9.1 RAM address assignments

| RAM address                      | Address in hexadecimal | Resource                              |
|----------------------------------|------------------------|---------------------------------------|
| (TOM - xxxx) – TOM <sup>1)</sup> | N.A.                   | ACPI reclaim, PCI memory range, video |
| 1024 kB – (TOM - xxxx)           | 100000 - N.A.          | Extended memory                       |
| 869 kB – 1024 kB                 | 0E0000h - 0FFFFFFh     | 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 266: RAM address assignments

1) TOM = Top of memory: max. installed DRAM.

### 1.9.2 I/O address assignments

| I/O address   | Resource                           |
|---------------|------------------------------------|
| 0000h - 00FFh | Motherboard resources              |
| 0170h - 0177h | Secondary IDE channel              |
| 01F0h - 01F7h | Primary IDE channel                |
| 0228h - 022Fh | COM F (IF option 2)                |
| 02E8h - 02EFh | COM E (IF option 1)                |
| 02F8h - 02FFh | COM B (SDL link module)            |
| 0376h - 0376h | Secondary IDE channel command port |
| 0377h - 0377h | Secondary IDE channel status port  |
| 0384h - 0385h | CAN controller                     |
| 03B0h - 03DFh | Video system                       |
| 03E8h - 03EFh | COM C (onboard SDL)                |
| 03F6h - 03F6h | Primary IDE channel command port   |
| 03F7h - 03F7h | Primary IDE channel status port    |
| 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              |
| 4100h - 417Fh | MTCX                               |
| FF00h - FF07h | IDE bus master register            |

Table 267: I/O address assignments

### 1.9.3 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 A (COM1)          |  |   |   | ○ | • | ○ | ○ | ○ |   |   | ○  | ○  | ○  |    |    |    |      |
| ACPI <sup>1)</sup>    |  |   |   |   |   |   |   |   |   | • |    |    |    |    |    |    |      |
| Real-time clock       |  |   |   |   |   |   |   |   | • |   |    |    |    |    |    |    |      |
| Co-processor (FPU)    |  |   |   |   |   |   |   |   |   |   |    |    |    | •  |    |    |      |
| Primary IDE channel   |  |   |   |   |   |   |   |   |   |   |    |    |    |    | •  |    |      |
| Secondary IDE channel |  |   |   |   |   |   |   |   |   |   |    |    |    |    |    | •  |      |
| B&R                   | COM B (monitor/panel option / SDL Link module) |   |   | • | ○ | ○ | ○ | ○ |   |   | ○  | ○  | ○  |    |    |    |      |
|                       | COM C (onboard SDL)                            |   |   | ○ | ○ | ○ | ○ | ○ |   |   | ○  | •  | ○  |    |    |    |      |
|                       | COM E (IF option 1 / I/O board 1)              |   |   | ○ | ○ | ○ | ○ | ○ |   |   | •  | ○  | ○  |    |    |    |      |
|                       | COM F (IF option 2 / I/O board 2)              |   |   | ○ | ○ | ○ | ○ | • |   |   | ○  | ○  | ○  |    |    |    |      |
|                       | CAN  |   |   | ○ | ○ | ○ | ○ | ○ |   |   | •  | ○  | ○  |    |    |    |      |

Table 268: IRQ interrupt assignments in PIC mode

1) Advanced Configuration and Power Interface.

- ... Default setting
- ... Optional setting



### 1.9.4 Interrupt assignments in APIC mode

A total of 23 IRQs are available in APIC (**A**dvanced **P**rogrammable Interrupt **C**ontroller) 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 A (COM1)          |                              |   |   | ○ | • | ○ | ○ | ○ |   |   | ○  | ○  | ○  |    |    |    |    |    |    |    |    |    |    |    |      |
| ACPI <sup>1)</sup>    |                              |   |   |   |   |   |   |   | • | • |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |
| Real-time clock       |                              |   |   |   |   |   |   |   | • |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |
| Co-processor (FPU)    |                              |   |   |   |   |   |   |   |   |   |    |    |    | •  |    |    |    |    |    |    |    |    |    |    |      |
| Primary IDE channel   |                              |   |   |   |   |   |   |   |   |   |    |    |    |    | •  |    |    |    |    |    |    |    |    |    |      |
| Secondary IDE channel |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    | •  |    |    |    |    |    |    |    |    |      |
| B&R                   | COM B (Monitor/Panel option) |   |   | • | ○ | ○ | ○ | ○ |   |   | ○  | ○  | ○  |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | COM C (onboard SDL)          |   |   | ○ | ○ | ○ | ○ | ○ |   |   | ○  | •  | ○  |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | COM E (IF option 1)          |   |   | ○ | ○ | ○ | ○ | ○ |   |   | •  | ○  | ○  |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | COM F (IF option 2)          |   |   | ○ | ○ | ○ | ○ | • |   |   | ○  | ○  | ○  |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | CAN                          |   |   | ○ | ○ | ○ | ○ | ○ |   |   | •  | ○  | ○  |    |    |    |    |    |    |    |    |    |    |    |      |
|                       | POWERLINK (IF option 2)      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    | •  |    |    |    |    |    |      |
| PIRQ A <sup>2)</sup>  |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    | •  |    |    |    |    |    |    |    |    |      |
| PIRQ B <sup>3)</sup>  |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    | •  |    |    |    |    |    |    |    |      |
| PIRQ C <sup>4)</sup>  |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    | •  |    |    |    |    |    |    |      |
| PIRQ D <sup>5)</sup>  |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    | •  |    |    |    |    |    |      |
| PIRQ E <sup>6)</sup>  |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    | •  |    |    |    |    |      |
| PIRQ F <sup>7)</sup>  |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    | •  |    |    |    |      |
| PIRQ G <sup>8)</sup>  |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    | •  |    |    |      |
| PIRQ H <sup>9)</sup>  |                              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    | •  |    |      |

Table 269: IRQ interrupt assignments in APIC mode

- 1) Advanced Configuration and Power Interface.
- 2) PIRQ A: For PCIe; PEG 0/1/2, PCI Express root port 0, [VGA controller](#), PCI Express root port 4 (ETH2).
- 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; EHCI [host controller](#) 2, serial ATA [controller](#) 1, serial ATA [controller](#) 2.
- 8) PIRQ G: For PCIe; Intel High Definition Audio [controller](#), SMBus [controller](#).
- 9) PIRQ H: For PCIe; EHCI [host controller](#) 1, XHCI [host controller](#).

- ... Default setting
- ... Optional setting

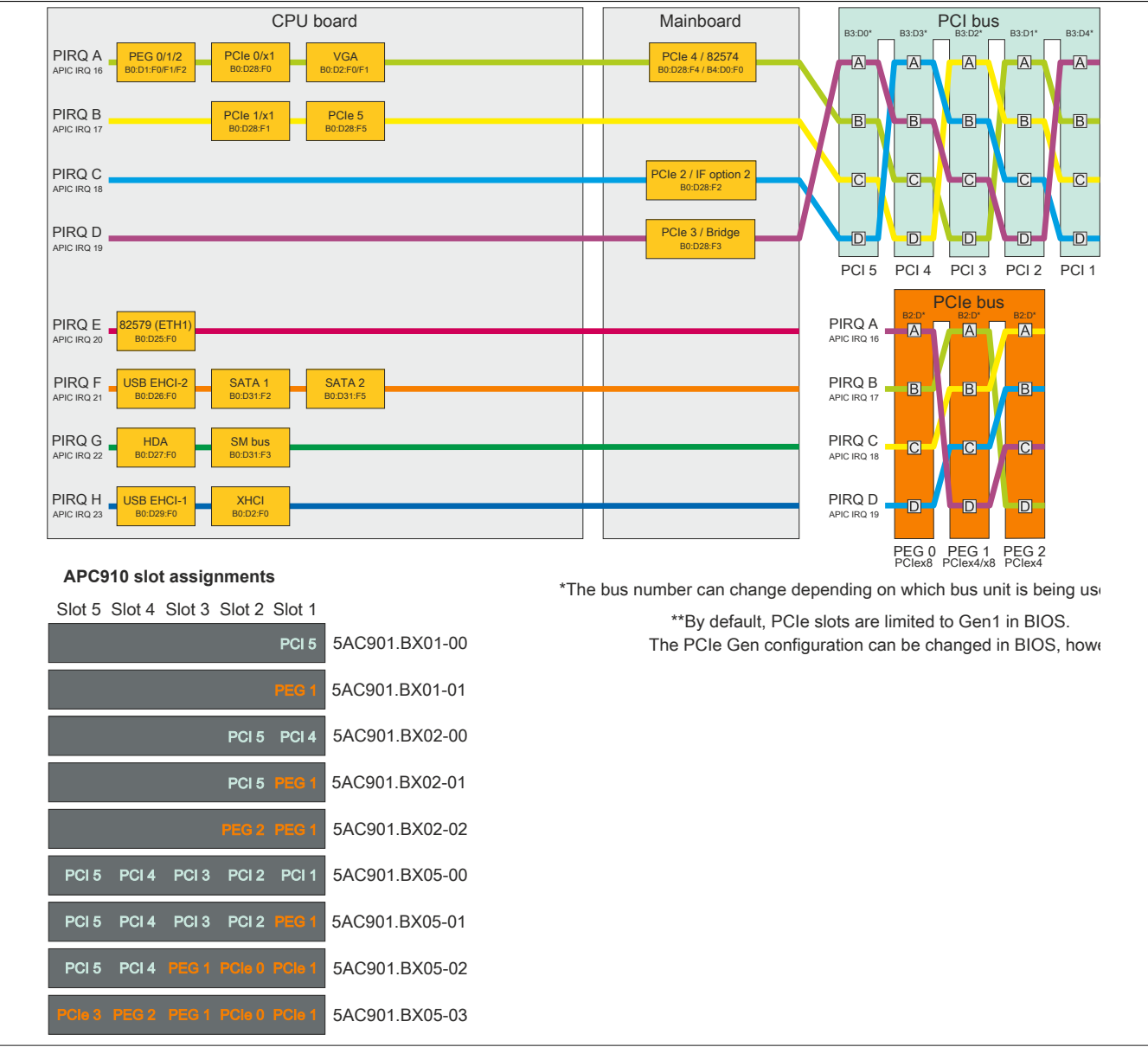


Figure 156: PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards

## 2 Upgrade information

### Warning!

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

### 2.1 BIOS upgrade

An upgrade may be necessary in order to accomplish the following:

- Updating implemented functions or adding newly implemented functions or components to **BIOS** Setup (information about changes **can** be found in the Readme file for the **BIOS** upgrade).

#### 2.1.1 Important information

### Information:

**Customized **BIOS** settings are deleted when upgrading **BIOS**.**

Before starting an upgrade, it helps to determine the various **software** versions.

#### 2.1.1.1 Which **BIOS** version and **firmware** are already installed?

This information **can** be found on the following **BIOS** Setup screen:

- After switching on the APC910, **BIOS** Setup **can** be accessed by pressing <Del>.
- From the "Advanced" menu in **BIOS**, select "OEM features".

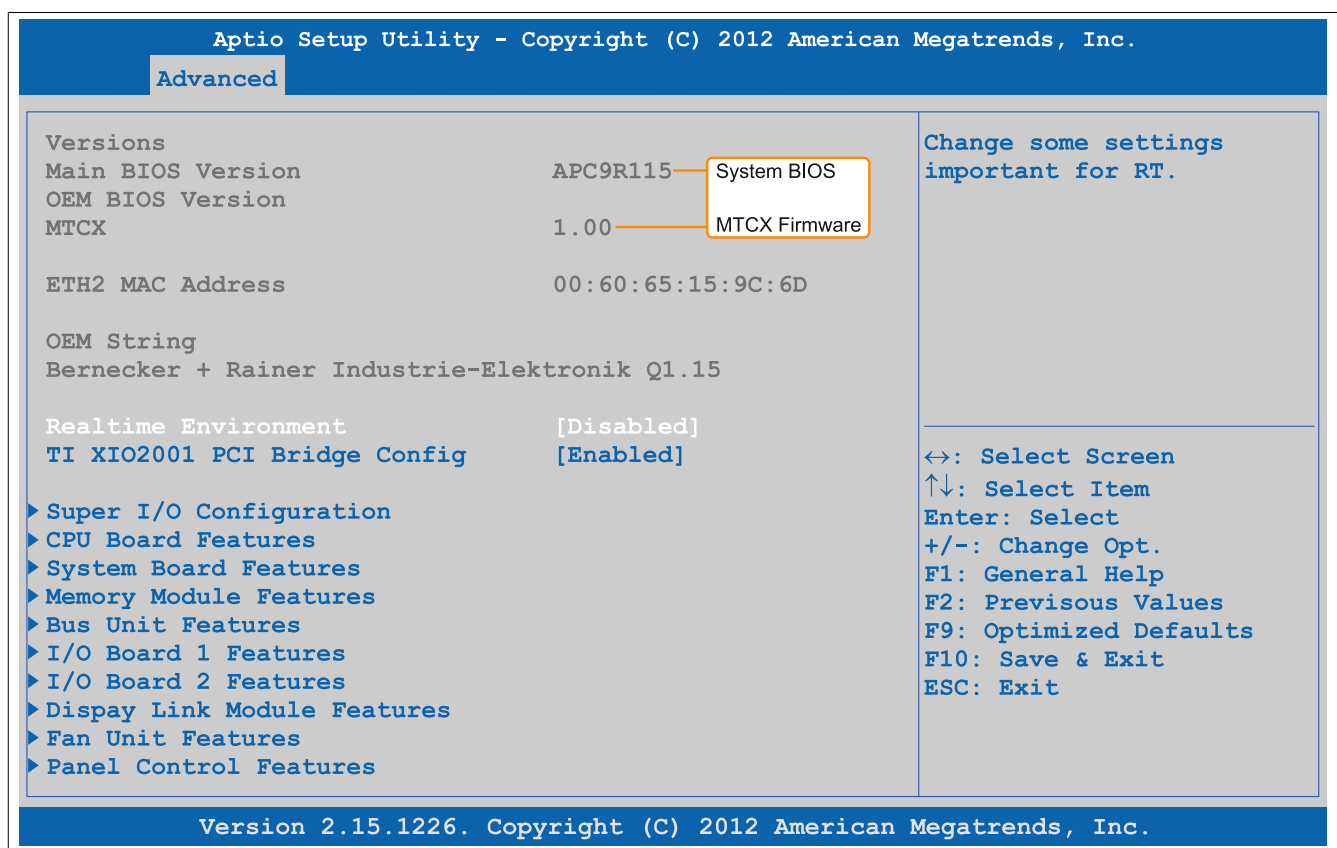


Figure 157: Software version

## 2.1.2 Procedure with MS-DOS

**Caution!**

Do not **switch** off or reset the system during an upgrade under any circumstances!

1. Download the .zip file from the B&R website ([www.br-automation.com](http://www.br-automation.com)).
2. Create bootable media.

**Information:**

In MS-DOS, Win95 and Win98, a blank HD disk **can** be made bootable by typing "sys a:" or "format a: / s" on the command line.

Information about creating a bootable diskette in Windows XP **can** be found on page 296.

Information about creating a **USB** flash drive for a B&R upgrade **can** be found on page 298.

Information about creating a storage **device** for a B&R upgrade **can** be found on page 299.

3. Copy the contents of the .zip file to the bootable media. If the B&R upgrade was already added when creating the bootable media with the B&R Embedded OS Installer, then this step is not necessary.
4. Connect the bootable media to the B&R **device** and reboot.
5. The following boot menu will be shown after startup:

```
1. Upgrade AMI BIOS for APC910/PPC900 (QM77 bzw. HM76)
2. Exit
```

*Option 1:*

Automatically upgrades **BIOS** (default after 5 seconds)

*Option 2:*

Returns to the shell (MS-DOS)

**Information:**

**If a key is not pressed within 5 seconds, then option 1 is automatically carried out to update the industrial PC.**

6. The system must be rebooted after a successful upgrade.
7. Reboot and press <Del> to enter **BIOS** Setup and load the setup defaults, then select "Save changes and exit".

## 2.2 Firmware upgrade

### Caution!

Do not **switch** off or reset the system during an upgrade under any circumstances!

The "Firmware upgrade (MTCX, SDLR, AP830, AP9x3)" software makes it possible to update the firmware for multiple controllers (MTCX, SDLR, AP830, AP9x3) depending on the APC910 system variant.

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

### 2.2.1 Procedure in Windows (B&R Control Center)

1. Download the .zip file from the B&R website ([www.br-automation.com](http://www.br-automation.com)).
2. Open the **Control Center** in the **Control Panel**.
3. Select the **Versions** tab.
4. Under "System unit", click on **Update** for **MTCX**. This brings up the "Open" dialog box.
5. Enter the name of the firmware file or select the file under **Filename**.
6. Click on **Open**. This brings up the "Open" dialog box.

The transfer **can** be canceled by clicking on **Cancel**. **Cancel** is disabled when writing to flash memory.

### Warning!

Do not press any panel keys while the firmware is being transferred! This **can** disrupt the procedure.

Deleting the data in flash memory **can** take several seconds depending on the memory block being used. The progress indicator is not updated during this time.

### Information:

The PC's power supply must be switched off and then switched back on again in order for the new firmware to take effect and the updated version to be displayed. The user is prompted to do this when closing the **Control Center**.

### Information:

For more information about saving and updating firmware, please refer to the help documentation for the **Control Center**.

## 2.3 Creating an MS-DOS boot diskette in Windows XP

1. Insert a blank 1.44 MB HD diskette into the disk drive.
2. Open Windows Explorer.
3. Right-click on the 3½ floppy diskette icon and select "Format".

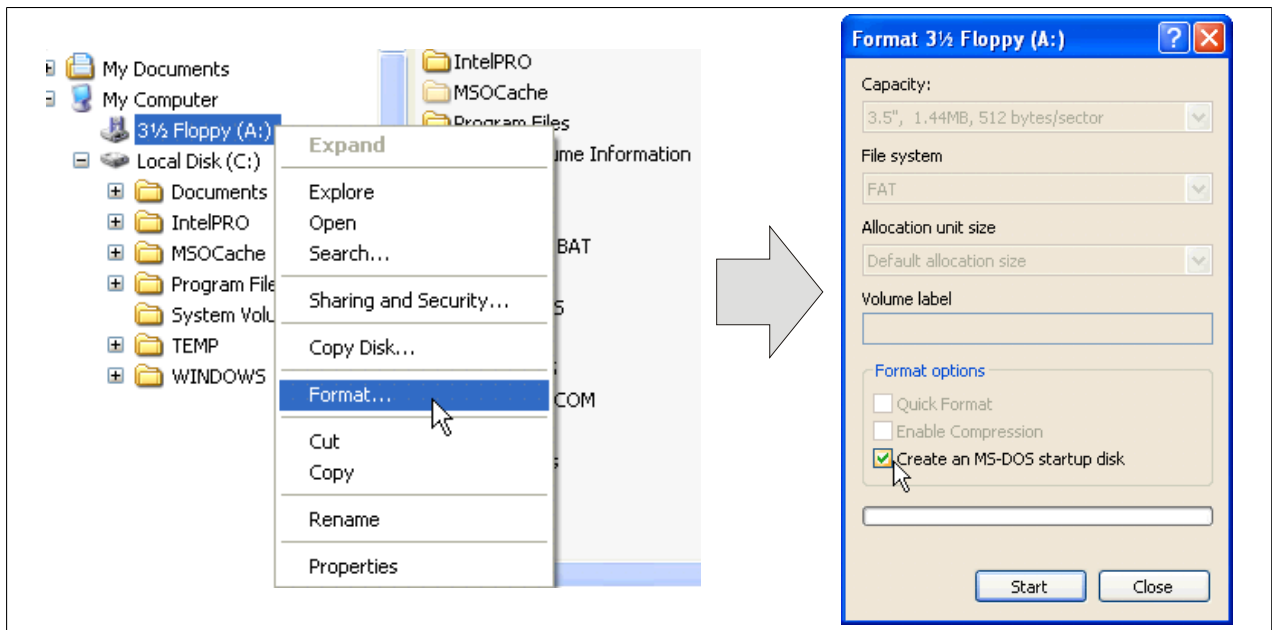


Figure 158: Creating a bootable diskette in Windows XP - Step 1

4. Select the **"Create an MS-DOS startup disk"** option, click on **"Start"** and acknowledge the warning message with "OK".



Figure 159: Creating a bootable diskette in Windows XP - Step 2

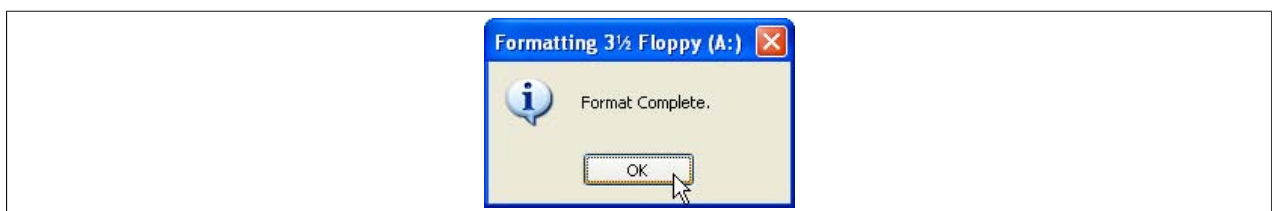


Figure 160: Creating a bootable diskette in Windows XP - Step 3

After creating the startup disk, some of the files must be deleted because of the size of the update.

To do this, all files (hidden system files, etc.) must be visible on the diskette.

In Windows Explorer, go to the "Tools" menu, select "Folder options" and open the "View" tab. Then deselect the option "Hide protected operating system files (Recommended)" (enabled by default) and enable the option "Show hidden files and folders".

| before       |       |                    |                  | after        |        |                    |                    |
|--------------|-------|--------------------|------------------|--------------|--------|--------------------|--------------------|
| Name         | Size  | Type               | Date Modified    | Name         | Size   | Type               | Date Modified      |
| DISPLAY.SYS  | 17 KB | System file        | 6/8/2000 5:00 PM | AUTOEXEC.BAT | 0 KB   | MS-DOS Batch File  | 3/22/2006 10:08 AM |
| EGA2.CPI     | 58 KB | CPI File           | 6/8/2000 5:00 PM | COMMAND.COM  | 91 KB  | MS-DOS Application | 6/8/2000 5:00 PM   |
| EGA3.CPI     | 58 KB | CPI File           | 6/8/2000 5:00 PM | CONFIG.SYS   | 0 KB   | System file        | 3/22/2006 10:08 AM |
| EGA.CPI      | 58 KB | CPI File           | 6/8/2000 5:00 PM | DISPLAY.SYS  | 17 KB  | System file        | 6/8/2000 5:00 PM   |
| KEYB.COM     | 22 KB | MS-DOS Application | 6/8/2000 5:00 PM | EGA2.CPI     | 58 KB  | CPI File           | 6/8/2000 5:00 PM   |
| KEYBOARD.SYS | 34 KB | System file        | 6/8/2000 5:00 PM | EGA3.CPI     | 58 KB  | CPI File           | 6/8/2000 5:00 PM   |
| KEYBRD2.SYS  | 32 KB | System file        | 6/8/2000 5:00 PM | EGA.CPI      | 58 KB  | CPI File           | 6/8/2000 5:00 PM   |
| KEYBRD3.SYS  | 31 KB | System file        | 6/8/2000 5:00 PM | IO.SYS       | 114 KB | System file        | 5/15/2001 6:57 PM  |
| KEYBRD4.SYS  | 13 KB | System file        | 6/8/2000 5:00 PM | KEYB.COM     | 22 KB  | MS-DOS Application | 6/8/2000 5:00 PM   |
| MODE.COM     | 29 KB | MS-DOS Application | 6/8/2000 5:00 PM | KEYBOARD.SYS | 34 KB  | System file        | 6/8/2000 5:00 PM   |
|              |       |                    |                  | KEYBRD2.SYS  | 32 KB  | System file        | 6/8/2000 5:00 PM   |
|              |       |                    |                  | KEYBRD3.SYS  | 31 KB  | System file        | 6/8/2000 5:00 PM   |
|              |       |                    |                  | KEYBRD4.SYS  | 13 KB  | System file        | 6/8/2000 5:00 PM   |
|              |       |                    |                  | MODE.COM     | 29 KB  | MS-DOS Application | 6/8/2000 5:00 PM   |
|              |       |                    |                  | MSDOS.SYS    | 1 KB   | System file        | 4/7/2001 1:40 PM   |

Figure 161: Creating a bootable diskette in Windows XP - Step 4

| Name         | Size   | Type               | Date Modified      |
|--------------|--------|--------------------|--------------------|
| AUTOEXEC.BAT | 0 KB   | MS-DOS Batch File  | 3/22/2006 10:08 AM |
| COMMAND.COM  | 91 KB  | MS-DOS Application | 6/8/2000 5:00 PM   |
| CONFIG.SYS   | 0 KB   | System file        | 3/22/2006 10:08 AM |
| DISPLAY.SYS  | 17 KB  | System file        | 6/8/2000 5:00 PM   |
| EGA2.CPI     | 58 KB  | CPI File           | 6/8/2000 5:00 PM   |
| EGA3.CPI     | 58 KB  | CPI File           | 6/8/2000 5:00 PM   |
| EGA.CPI      | 58 KB  | CPI File           | 6/8/2000 5:00 PM   |
| IO.SYS       | 114 KB | System file        | 5/15/2001 6:57 PM  |
| KEYB.COM     | 22 KB  | MS-DOS Application | 6/8/2000 5:00 PM   |
| KEYBOARD.SYS | 34 KB  | System file        | 6/8/2000 5:00 PM   |
| KEYBRD2.SYS  | 32 KB  | System file        | 6/8/2000 5:00 PM   |
| KEYBRD3.SYS  | 31 KB  | System file        | 6/8/2000 5:00 PM   |
| KEYBRD4.SYS  | 13 KB  | System file        | 6/8/2000 5:00 PM   |
| MODE.COM     | 29 KB  | MS-DOS Application | 6/8/2000 5:00 PM   |
| MSDOS.SYS    | 1 KB   | System file        | 4/7/2001 1:40 PM   |

Figure 162: Creating a bootable diskette in Windows XP - Step 5

Now all files (selected) except Command.com, IO.sys and MSDOS.sys **can** be deleted.

## 2.4 Creating a bootable USB flash drive for B&R upgrade files

When used in connection with a B&R Industrial PC, it is possible to upgrade (e.g. BIOS) from one of the USB flash drives available from B&R. To do this, the USB flash drive must be prepared accordingly. This is done with the B&R Embedded OS Installer, which can be downloaded at no cost from the B&R website ([www.br-automation.com](http://www.br-automation.com)).

### 2.4.1 Requirements

The following is required to create a bootable USB flash drive:

- B&R USB flash drive
- B&R Industrial PC
- USB media drive
- B&R Embedded OS Installer (V3.00 or higher)

### 2.4.2 Procedure

1. Connect the USB flash drive to the PC.
2. If the drive list is not refreshed automatically, update the list using the **Drives > Refresh** command.
3. Select the desired USB flash drive in the drive list.
4. Change to the **Action** tab and select **Install a B&R update to a USB flash drive** as the type of action.
5. Enter the path to the MS-DOS operating system files. If the files are part of a .zip archive, then click on the button **From .zip file**. If the files are stored in a directory on the hard drive, then click on the button **From folder**.
6. In the **B&R upgrade** text box, it is also possible to enter the path to the .zip file for the B&R upgrade disk and select the file.
7. Click on the **Start action** button in the toolbar.

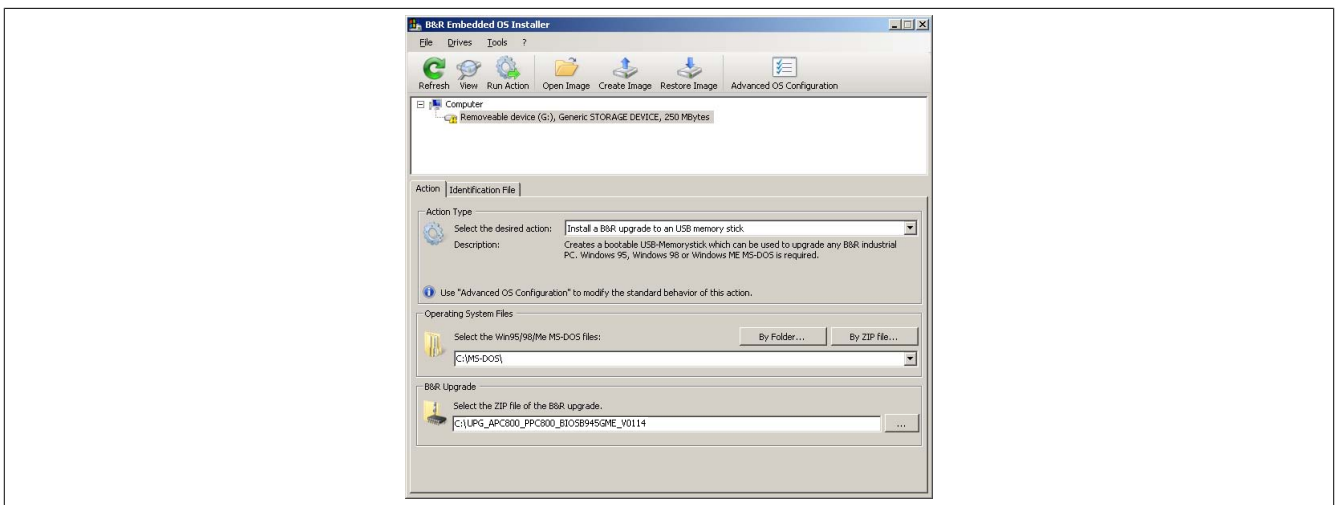


Figure 163: Creating a USB flash drive for B&R upgrade files

### 2.4.3 How to access MS-DOS

Information about creating an MS-DOS boot diskette can be found in section "Creating an MS-DOS boot diskette in Windows XP" on page 296. The files from the diskette are then copied to the hard drive.



## 2.5 Creating a bootable mass storage device for B&R upgrade files

When used in connection with a B&R Industrial PC, it is possible to upgrade (e.g. BIOS) from a mass storage device (e.g. CFast card) available from B&R. To do this, the mass storage device must be prepared accordingly. This is done with the B&R Embedded OS Installer, which can be downloaded at no cost from the B&R website ([www.br-automation.com](http://www.br-automation.com)).

### 2.5.1 Requirements

The following is required to create a bootable mass storage device:

- B&R mass storage device (e.g. CFast card)
- PC with CFast slot
- B&R Embedded OS Installer (V3.00 or higher)

### 2.5.2 Procedure

1. Connect the storage device to the PC.
2. If the drive list is not refreshed automatically, update the list using the **Drives > Refresh** command.
3. Select the desired mass storage device from the list of drives.
4. Change to the **Action** tab and select **Install a B&R update to a mass storage device** as the type of action.
5. Enter the path to the MS-DOS operating system files. If the files are part of a .zip archive, then click on the button **From .zip file**. If the files are stored in a directory on the hard drive, then click on the button **From folder**.
6. In the **B&R upgrade** text box, it is also possible to enter the path to the .zip file for the B&R upgrade disk and select the file.
7. Click on the **Start action** button in the toolbar.

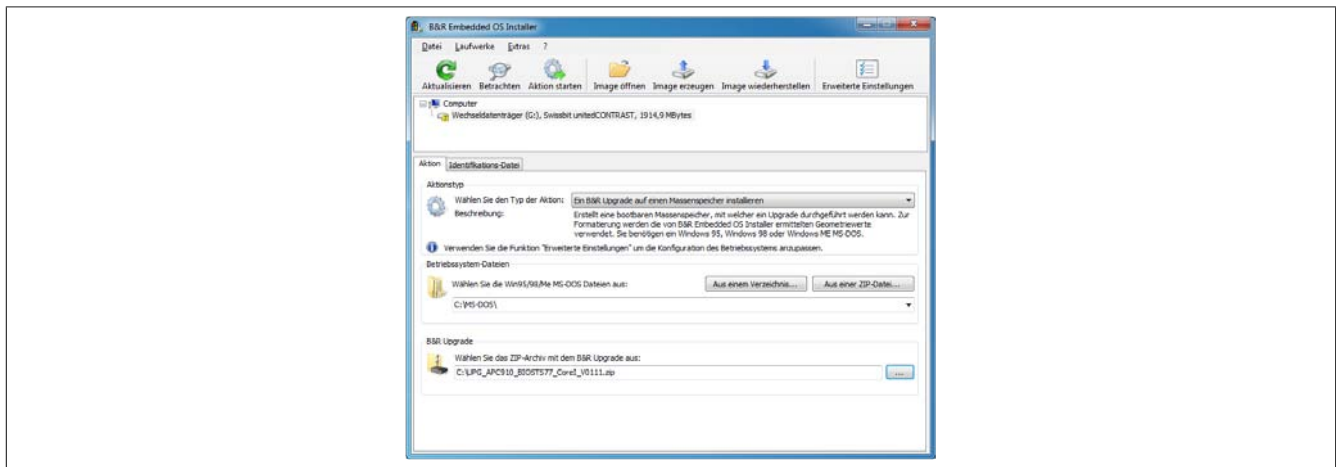


Figure 164: Creating a mass storage device for B&R upgrade files

### 2.5.3 How to access MS-DOS

Information about creating an MS-DOS boot diskette can be found in section "Creating an MS-DOS boot diskette in Windows XP" on page 296. The files from the diskette are then copied to the hard drive.

## 3 Windows 10 IoT Enterprise 2015 LTSC

### 3.1 General information

Windows 10 IoT Enterprise 2015 LTSC is the successor to Windows Embedded 8.1 Industry and based on new Windows 10 technology. This operating system also provides a high degree of protection for industrial applications with additional lockdown functions. Windows 10 IoT Enterprise 2015 LTSC is a version of Windows 10 Enterprise specifically developed for use in industrial applications (Long-Term Servicing Branch).

### 3.2 APC910 - Order data


| Model number    | Short description  | Figure  |
|-----------------|--|---|
|                 | <b>Windows 10 IoT Enterprise</b>   |  |
| 5SWW10.0240-MUL | Windows 10 IoT Enterprise 2015 LTSC - 64-bit - Multilingual - APC910 QM77/HM76 chipset - License (without Recovery DVD) - Only available with a new <a href="#">device</a>   |   |
| 5SWW10.0249-MUL | Windows 10 IoT Enterprise 2015 LTSC - 64-bit - Multilingual - APC910 chipset QM170/HM170 - License (without Recovery DVD) - Only available with a new <a href="#">device</a> |   |
|                 | <b>Optional accessories</b>  |   |
|                 | <b>Windows 10 IoT Enterprise</b>   |   |
| 5SWW10.0200-MUL | Windows 10 IoT Enterprise 2015 LTSC - 64-bit - Multilingual - Recovery DVD   |   |
| 5SWW10.0400-MUL | Windows 10 IoT Enterprise 2015 LTSC - 64-bit - Multilingual DVD  |   |

Table 270: 5SWW10.0240-MUL, 5SWW10.0249-MUL - Order data

### 3.3 Overview

| Model number    | Edition  | Target system | Chipset        | Architecture | Language     | Minimum disk size   | Minimum RAM required |
|-----------------|----------|---------------|----------------|--------------|--------------|---------------------|----------------------|
| 5SWW10.0240-MUL | Embedded | APC910        | QM77<br>HM76   | 64-bit       | Multilingual | 20 GB <sup>1)</sup> | 2 GB <sup>2)</sup>   |
| 5SWW10.0249-MUL | Embedded | APC910        | QM170<br>HM170 | 64-bit       | Multilingual | 20 GB <sup>1)</sup> | 2 GB <sup>3)</sup>   |

- 1) The memory used by additional language packs is not taken into account in the minimum size specified for the disk.
- 2) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 4 GB or more of RAM with 64-bit operating systems.
- 3) The specified amount of memory is the minimum requirement according to Microsoft. B&R recommends using at least 4 GB RAM with 64-bit operating systems, however.

### 3.4 Features with Windows 10 IoT Enterprise 2015 LTSC

The following list of features shows the most important [device](#) functions included in Windows 10 IoT Enterprise 2015 LTSC.

| Function  | Windows 10 IoT Enterprise 2015 LTSC                                       |
|---|---|
| Range of functions in Windows 10 Enterprise 2015 LTSC           | ✓   |
| <a href="#">Internet</a> Explorer 11, including Enterprise Mode | ✓   |
| Multi-touch support   | ✓   |
| Multilingual support  | After installation using language pack DVDs (default language is English) |
| Page file   | Configurable (switched off in image by default by UWF)                    |
| Hibernate file  | Configurable (switched off in image by default)                           |
| System restore  | Configurable (switched off in image by default by UWF)                    |
| SuperFetch  | Configurable (switched off in image by default by UWF)                    |
| File indexing service   | Configurable (switched off in image by default by UWF)                    |
| Fast boot   | Configurable (switched off in image by default by UWF)                    |
| Defragmentation service   | Configurable (switched off in image by default by UWF)                    |
| <b>Additional embedded lockdown functions</b>                   |   |
| Assigned access   | Configurable  |
| AppLocker   | Configurable  |
| Shell launcher  | Configurable  |
| Unified Write <a href="#">Filter</a>                            | ✓   |

Table 271: Features with Windows 10 IoT Enterprise 2015 LTSC.

### 3.5 Installation

B&R preinstalls Windows 10 IoT Enterprise 2015 LTSC on a suitable data storage [device](#) (64-bit: minimum 20 GB). When switched on for the first time, the system runs through the OOBE (Out-of-Box Experience), which allows different settings to be made (e.g. language, region, keyboard layout, computer name, username, etc.).

### 3.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of a driver is still being used, its latest version [can](#) be downloaded and installed from the B&R website ([www.br-automation.com](http://www.br-automation.com)). It is important that Unified Write Filter (UWF) is disabled for this.

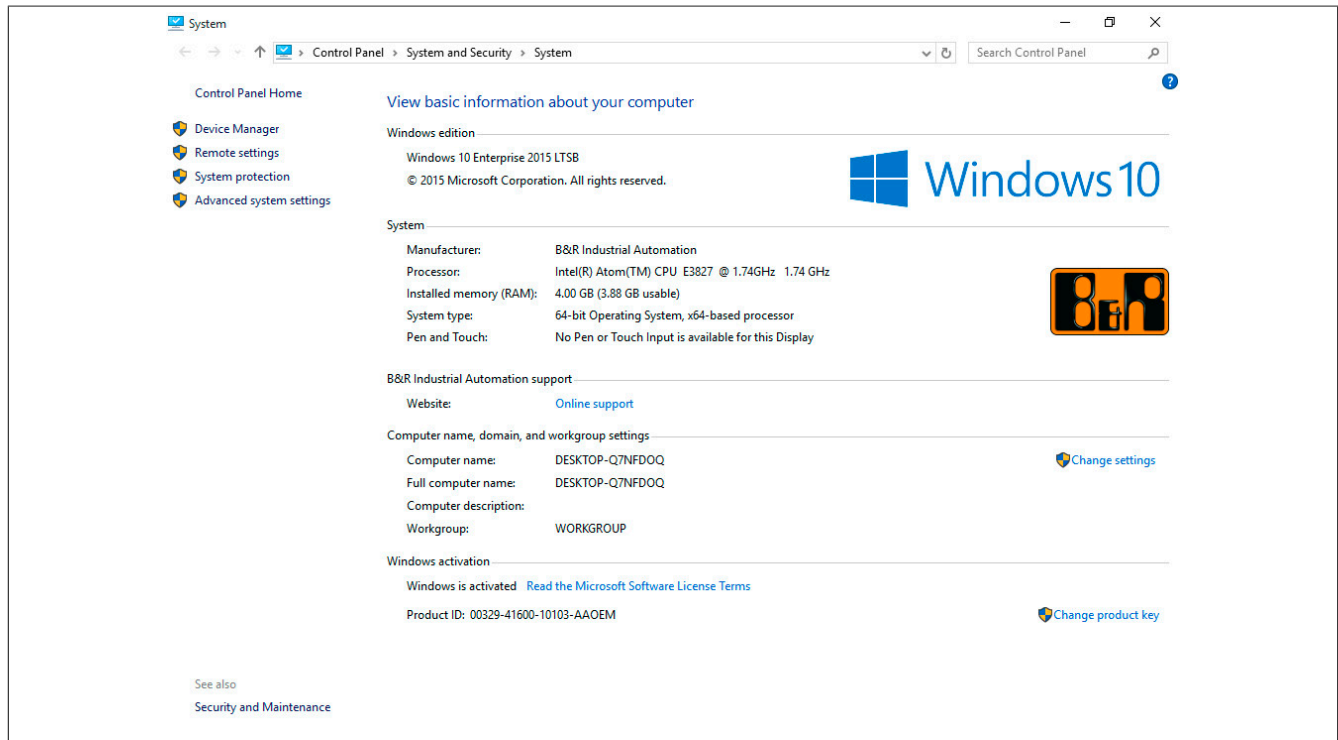
#### Information:

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

### 3.7 Activation

Like its predecessor (Windows Embedded 8.1 Industry Professional), Windows 10 IoT Enterprise 2015 LTSB must also be activated. This has already been done at B&R.

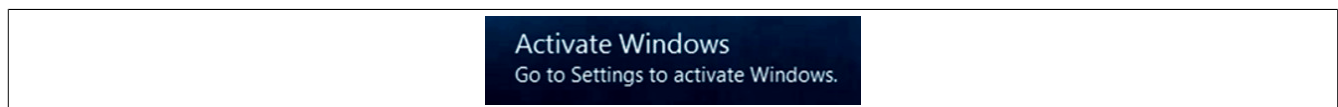
The status of the activation [can](#) be viewed in the [Control Panel](#):



#### Information:

**Activation [can](#) become negated when making changes to hardware (e.g. replacing components in repair situations) and when reinstalling the system (e.g. with the Recovery DVD).**

In this case, a "watermark message" will always be shown on the screen:



Windows 10 IoT Enterprise 2015 LTSB does not carry out any restarts or show any pop-up messages, which means that it is fully functional at all times. Personalization is not possible, however (e.g. setting the desktop background).

The product [can](#) be activated at a later time either over the phone or via the [Internet](#). Instructions for doing so [can](#) be found on in the Windows [Control Panel](#) under "Update & Security > Activation".

#### Information:

**The product key never has to be entered for reactivation.**

### 3.8 Contents of the Recovery DVD

The DVD with model number 5SWW10.0200-MUL is only for recovery purposes.

## Information:

It is only used to carry out the basic installation of Windows 10 Enterprise 2015 LTSC. In contrast to the preinstalled operating system versions, the operating system does not include **device**-specific drivers (network, graphics, ADI, etc.) or optimized settings, nor is it activated! The product **can** be activated at a later time either over the phone or via the **Internet** (see "**Activation**").

### 3.9 Special considerations, limitations

- Unlike the standard Windows 10 Enterprise edition, Windows 10 IoT Enterprise 2015 LTSC does not include Cortana, the Microsoft Edge **browser** or the Microsoft Store.
- The LTSC version is based on Build 10240 of Windows 10 and does not contain any feature updates.

### 3.10 Supported display resolutions

In accordance with Microsoft requirements, Windows 10 IoT Enterprise 2015 LTSC requires **SVGA** resolution (800 x 600) or higher in order to allow unimpeded operation of the Windows user **interface** (including system dialog boxes and apps, etc.). A lower resolution **can** be selected for applications.

## 4 Windows Embedded 8.1 Industry Pro

### 4.1 General information

Windows Embedded 8.1 Industry Pro is an operating system specially tailored to industrial applications. Based on new Windows 8.1 technology, this edition offers full compatibility for applications and drivers while also integrating additional lockdown functions that make industrial PCs more secure.

### 4.2 Order data

| Model number    | Short description  | Figure  |
|-----------------|--|---|
|                 | <b>Windows Embedded 8.1 Industry Professional</b>  |  |
| 5SWWI8.0340-MUL | Windows Embedded 8.1 Industry Pro - 32-bit - Multilingual - For APC910 QM77/HM76 - License |   |
| 5SWWI8.0440-MUL | Windows Embedded 8.1 Industry Pro - 64-bit - Multilingual - For APC910 QM77/HM76 - License |   |
|                 | <b>Optional accessories</b>  |   |
|                 | <b>Windows Embedded 8.1 Industry Professional</b>  |   |
| 5SWWI8.0100-MUL | Windows Embedded 8.1 Industry Pro - 32-bit - Recovery DVD                                  |   |
| 5SWWI8.0200-MUL | Windows Embedded 8.1 Industry Pro - 64-bit - Recovery DVD                                  |   |
| 5SWWI8.0500-MUL | Windows Embedded 8.1 Industry Pro - 32-bit - Language Pack DVD                             |   |
| 5SWWI8.0600-MUL | Windows Embedded 8.1 Industry Pro - 64-bit - Language Pack DVD                             |   |

Table 272: 5SWWI8.0340-MUL, 5SWWI8.0440-MUL - Order data

### 4.3 Overview

| Model number    | Edition  | Target system | Chipset   | Architecture | Language     | Minimum disk size   | Minimum RAM required |
|-----------------|----------|---------------|-----------|--------------|--------------|---------------------|----------------------|
| 5SWWI8.0340-MUL | Embedded | APC910        | QM77 HM76 | 32-bit       | Multilingual | 16 GB <sup>1)</sup> | 1 GB <sup>2)</sup>   |
| 5SWWI8.0440-MUL | Embedded | APC910        | QM77 HM76 | 64-bit       | Multilingual | 20 GB <sup>1)</sup> | 2 GB <sup>3)</sup>   |

1) The memory used by additional language packs is not taken into account in the minimum size specified for the disk.

2) With an active UWF (Unified Write Filter), 2 GB RAM are recommended.

The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 2 GB or more of RAM with 32-bit operating systems.

3) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 4 GB or more of RAM with 64-bit operating systems.

### 4.4 Features with Windows Embedded 8.1 Industry Pro

The following list of features shows the most important device functions included in Windows Embedded 8.1 Industry Pro.

| Function  | Windows Embedded 8.1 Industry Pro   |
|---|---|
| Range of functions in Windows 8.1 Pro           | ✓   |
| Internet Explorer 11, including Enterprise Mode | ✓   |
| Multi-touch support                             | ✓   |
| Multilingual support                            | After installation using language pack DVDs (default language is English) |
| Page file                                       | Configurable (switched off in image by default by UWF)                    |
| Hibernate file                                  | Configurable (switched off in image by default)                           |
| System restore                                  | Configurable (switched off in image by default by UWF)                    |
| SuperFetch                                      | Configurable (switched off in image by default by UWF)                    |
| File indexing service                           | Configurable (switched off in image by default by UWF)                    |
| Fast boot                                       | Configurable (switched off in image by default by UWF)                    |
| Defragmentation service                         | Configurable (switched off in image by default by UWF)                    |
| <b>Additional embedded lockdown functions</b>   |   |
| Assigned access                                 | Configurable  |
| Dialog filter                                   | Configurable  |
| Embedded Lockdown Manager                       | ✓   |
| Keyboard filter                                 | Configurable  |
| Shell launcher                                  | Configurable  |
| Toast Notification Filter                       | Configurable  |
| USB filter                                      | Configurable  |
| Unified Write Filter                            | ✓   |
| Windows 8 Application Launcher                  | Configurable  |
| Gesture filter                                  | Configurable  |

Table 273: Device functions in Windows Embedded 8.1 Industry Pro

## 4.5 Installation

B&R preinstalls Windows Embedded 8.1 Industry Pro on a suitable data storage [device](#) (32-bit: minimum 16 [GB](#), 64-bit: minimum 20 [GB](#)). When switched on for the first time, the system runs through the OOBE (Out-of-Box Experience), which allows different settings to be made (e.g. language, region, keyboard layout, computer name, username, etc.).

### Information:

If the product key is requested during the OOBE, it [can](#) be skipped by pressing "Skip".

## 4.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of a driver is still being used, its latest version [can](#) be downloaded and installed from the B&R website ([www.br-automation.com](http://www.br-automation.com)). It is important that Unified Write [Filter](#) (UWF) is disabled for this.

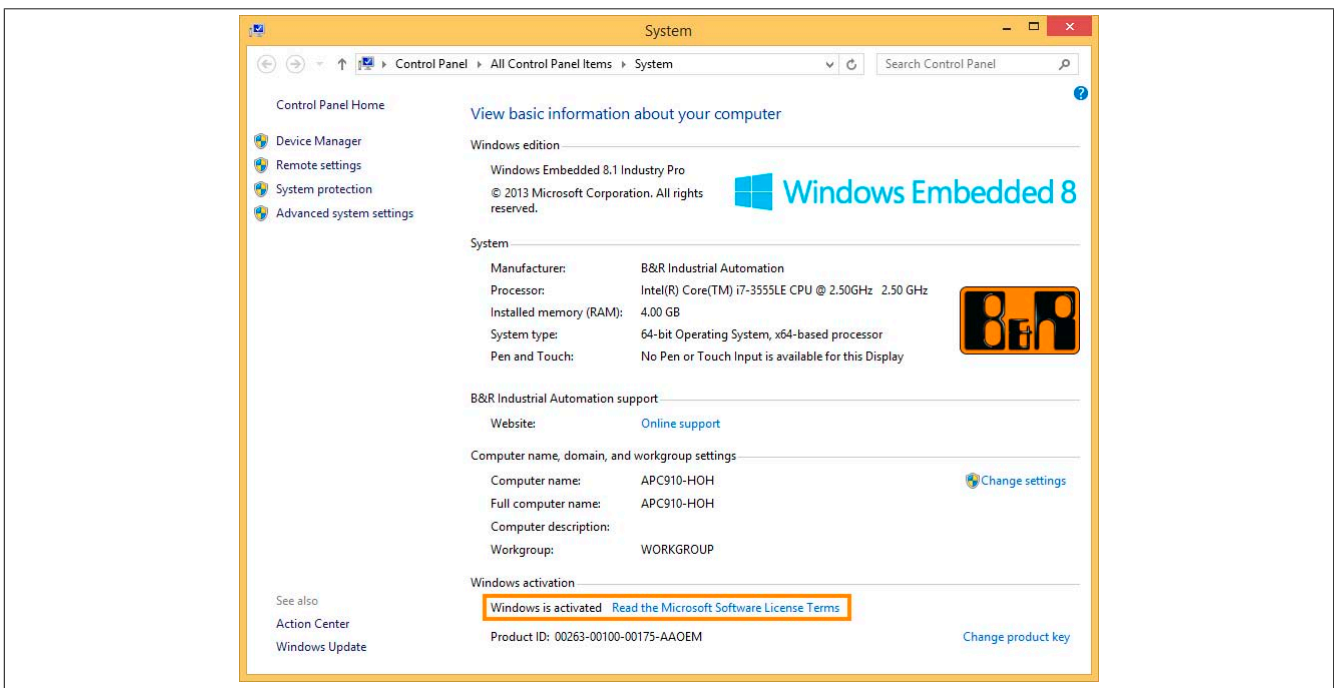
### Information:

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

## 4.7 Activation

In contrast to previous versions – Windows 7 and Windows XP Professional – Windows Embedded 8.1 Industry Pro must be activated. This has already been done at B&R.

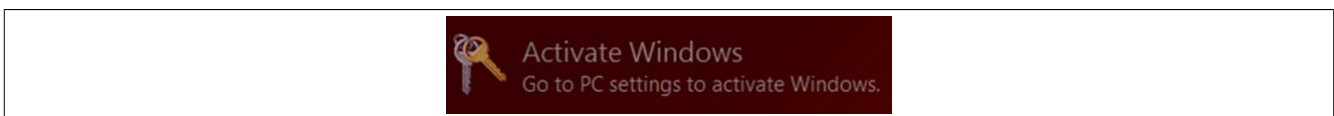
The status of the activation [can](#) be viewed in the [Control Panel](#):



### Information:

Activation [can](#) become negated when making changes to hardware (e.g. replacing components in repair situations) and when reinstalling the system (e.g. with the Recovery DVD).

In this case, a "watermark message" will always be shown on the screen:



Windows Embedded 8.1 Industry Pro does not carry out any restarts or show any pop-up messages, which means that it is fully functional at all times. Personalization is not possible, however (e.g. setting the desktop background).

The product [can](#) be activated at a later time either over the phone or via the [Internet](#). Instructions for doing so [can](#) be found on the Microsoft website.

Activation via direct Internet connection:

[http://msdn.microsoft.com/en-us/library/dn449258\(v=winembedded.82\).aspx](http://msdn.microsoft.com/en-us/library/dn449258(v=winembedded.82).aspx)

Activation over the telephone:

[http://msdn.microsoft.com/en-us/library/dn449379\(v=winembedded.82\).aspx](http://msdn.microsoft.com/en-us/library/dn449379(v=winembedded.82).aspx)

## Information:

The product key never has to be entered for reactivation.

### 4.8 Contents of the Recovery DVD

DVDs with model numbers 5SWWI8.0100-MUL and 5SWWI8.0200-MUL are only for recovery purposes.

## Information:

They are only used to carry out the basic installation of Windows Embedded 8.1 Industry Pro. In contrast to the preinstalled operating system versions, the operating system does not include device-specific drivers (network, graphics, ADI, etc.) or optimized settings, nor is it activated! The product can be activated at a later time either over the phone or via the Internet (see "Activation").

### 4.9 Lockdown features

The lockdown functions in Windows Embedded 8.1 Industry Pro make it possible to individually configure the device while making the system more secure at the same time. They include:

- Unified Write Filter (UWF)  
These features make it possible to configure a data storage device (e.g. CFast) for read-only access, for example, or to allow only certain registry keys to be accessed. As a result, the system always starts with the same configuration after rebooting.
- Dialog filter  
This feature can be used to suppress pop-up windows and dialog boxes. Such dialog boxes can occur, for example, if virus scanners are updated, network connections fail or the Windows Security Center shows warnings. These windows can simply be hidden.
- Keyboard filter  
The keyboard filter allows individual keys or certain keyboard shortcuts to be locked to prevent users from accessing certain functions (e.g. Task Manager).

Additional information about lockdown functions can be found on the Microsoft website at this address:

[http://msdn.microsoft.com/en-us/library/dn449278\(v=winembedded.82\).aspx](http://msdn.microsoft.com/en-us/library/dn449278(v=winembedded.82).aspx)

### 4.10 Supported display resolutions

In accordance with Microsoft requirements, Windows Embedded 8.1 Industry Pro requires XGA resolution (1024 x 768) or higher in order to allow unimpeded operation of the Windows user interface (including system dialog boxes and apps, etc.). A lower resolution can be selected for applications.



## 5 Windows 7

### 5.1 General information

Windows 7 offers a wide range of innovative features and performance improvements. The 64-bit variants also exploit the full power of current PC architectures. Faster switching to sleep mode, quicker restores, less memory usage and high-speed detection of USB devices are just a few of the advantages of Windows 7. Both English and German are available in Windows 7 Professional, while Windows 7 Ultimate supports up to 35 different languages (up to 36 languages in Service Pack 1). Product activation is not necessary on B&R PCs, which is an enormous advantage for simple logistical procedures relating to machine automation.

All Windows operating systems offered by B&R are from the Microsoft Embedded division. This guarantees much longer availability, especially compared to products offered on the consumer market.

### 5.2 Order data


| Model number    | Short description                                    | Figure  |
|-----------------|--|---|
|                 | <b>Windows 7 Professional/Ultimate</b>               |  |
| 5SWWI7.1100-GER | Windows 7 Professional SP1 - 32-bit - German - DVD   |   |
| 5SWWI7.1100-ENG | Windows 7 Professional SP1 - 32-bit - English - DVD  |   |
| 5SWWI7.1200-GER | Windows 7 Professional SP1 - 64-bit - German - DVD   |   |
| 5SWWI7.1200-ENG | Windows 7 Professional SP1 - 64-bit - English - DVD  |   |
| 5SWWI7.1300-MUL | Windows 7 Ultimate SP1 - 32-bit - Multilingual - DVD |   |
| 5SWWI7.1400-MUL | Windows 7 Ultimate SP1 - 64-bit - Multilingual - DVD |   |

Table 274: 5SWWI7.1100-GER, 5SWWI7.1100-ENG, 5SWWI7.1200-GER, 5SWWI7.1200-ENG, 5SWWI7.1300-MUL, 5SWWI7.1400-MUL - Order data



## 5.3 Overview

| Model number    | Edition      | Target sys-tem  | Chipset  | Service pack | Architec-ture | Language     | Minimum hard disk space required | Minimum RAM required |
|-----------------|--------------|---|--|--------------|---------------|--------------|----------------------------------|----------------------|
| 5SWWI7.1100-GER | Professional | APC510<br>APC511<br>APC810<br>APC910<br>APC2100<br>PPC800<br>PPC900<br>PPC2100<br>PP500 | 945GME<br>GM45<br>QM77/HM76<br>NM10<br>US15W<br>Bay Trail                  | SP1          | 32-bit        | German       | 16 GB                            | 1 GB <sup>1)</sup>   |
| 5SWWI7.1100-ENG | Professional | APC510<br>APC511<br>APC810<br>APC910<br>APC2100<br>PPC800<br>PPC900<br>PPC2100<br>PP500 | 945GME<br>GM45<br>QM77/HM76<br>NM10<br>US15W<br>Bay Trail                  | SP1          | 32-bit        | English      | 16 GB                            | 1 GB <sup>1)</sup>   |
| 5SWWI7.1200-GER | Professional | APC810<br>APC910<br>APC2100<br>PPC800<br>PPC900<br>PPC2100                              | 945GME Intel<br>Core2 Duo<br>GM45<br>QM77/HM76<br>QM170/HM170<br>Bay Trail | SP1          | 64-bit        | German       | 20 GB                            | 2 GB <sup>2)</sup>   |
| 5SWWI7.1200-ENG | Professional | APC810<br>APC910<br>APC2100<br>PPC800<br>PPC900<br>PPC2100                              | 945GME Intel<br>Core2 Duo<br>GM45<br>QM77/HM76<br>QM170/HM170<br>Bay Trail | SP1          | 64-bit        | English      | 20 GB                            | 2 GB <sup>2)</sup>   |
| 5SWWI7.1300-MUL | Ultimate     | APC510<br>APC511<br>APC810<br>APC910<br>APC2100<br>PPC800<br>PPC900<br>PPC2100<br>PP500 | 945GME<br>GM45<br>QM77/HM76<br>NM10<br>US15W<br>Bay Trail                  | SP1          | 32-bit        | Multilingual | 16 GB <sup>3)</sup>              | 1 GB <sup>1)</sup>   |
| 5SWWI7.1400-MUL | Ultimate     | APC810<br>APC910<br>APC2100<br>PPC800<br>PPC900<br>PPC2100                              | 945GME Intel<br>Core2 Duo<br>GM45<br>QM77/HM76<br>QM170/HM170<br>Bay Trail | SP1          | 64-bit        | Multilingual | 20 GB <sup>3)</sup>              | 2 GB <sup>2)</sup>   |

Table 275: Windows 7 - Overview

- 1) The specified amount of memory is the minimum requirement according to Microsoft. B&R recommends, however, using 2 GB or more of RAM with 32-bit operating systems.
- 2) The specified amount of memory is the minimum requirement according to Microsoft. B&R recommends using at least 4 GB RAM with 64-bit operating systems, however.
- 3) The memory used by additional language packs is not taken into account in the minimum size of the disk.

## 5.4 Installation

B&R preinstalls the required Windows 7 version on the desired storage device (e.g. CFast card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

### 5.4.1 Installing on the PCI SATA RAID controller - 5ACPCI.RAIC-06

The following steps are necessary to install Windows 7 on the PCI SATA RAID controller:

1. Download the "PCI SATA RAID driver 5ACPCI.RAIC-01, -03, -05, -06" driver for Windows 7 from the B&R website at [www.br-automation.com](http://www.br-automation.com) and copy the data to a folder on a USB flash drive.
2. Boot using the Windows 7 DVD.
3. Follow the installation steps until a page appears asking "Where do you want to install Windows?".
4. Connect the USB flash drive with the RAID drivers into an available USB interface.
5. Click on "Load driver" and navigate to the directory containing the RAID drivers. Then click "Next" to continue.
6. Remove the USB flash drive.
7. The Windows 7 installation can now be performed as usual.

### 5.4.2 Installing on the internal RAID controller (QM77)

The following steps are necessary to install Windows 7 on the internal RAID controller (QM77):

1. Download the "AHCI and RAID driver QM77" driver for Windows 7 from the B&R website at [www.br-automation.com](http://www.br-automation.com) and copy the data to a folder on a USB flash drive.
2. Boot using the Windows 7 DVD.
3. Follow the installation steps until a page appears asking "Where do you want to install Windows?".
4. Connect the USB flash drive with the RAID drivers into an available USB interface.
5. Click on "Load driver" and navigate to the directory containing the RAID drivers. Then click "Next" to continue.
6. Remove the USB flash drive.
7. The Windows 7 installation can now be performed as usual.

### 5.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website ([www.br-automation.com](http://www.br-automation.com)).

#### Information:

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

### 5.6 Special considerations, limitations

- Windows 7 does not contain a Beep.sys file, which means that an audible signal is not sounded when pressing a key, for example.
- There is currently no support for the Windows 7 system rating (although this does not apply to PP500, APC2100, APC510, APC511, APC910, PPC2100 or PPC800 devices with an NM10 chipset).

## 6 Windows Embedded Standard 7

### 6.1 General information

The successor to Windows XP Embedded is Windows Embedded Standard 7. As with previous versions, this embedded operating system offers full system support for B&R Industrial PCs. In addition to new features that are also included in Windows 7 Professional, Windows Embedded Standard 7 includes embedded components such as Enhanced Write Filter, File-Based Write Filter, Registry Filter and USB Boot. Windows Embedded Standard 7 is available in two different versions. The main difference between them has to do with multilingual support. Windows Embedded Standard 7 is only available in a single language, whereas Windows Embedded Standard 7 Premium supports the installation of several languages simultaneously.

With Windows Embedded Standard 7, Microsoft has made substantial improvements in the area of security. The AppLocker program, available in the premium version, can prevent the execution of unknown or potentially undesired applications that are being installed over a network or from drives that are directly connected. A tiered approach allows the differentiation between scripts (.ps1, .bat, .cmd, .vbs and .js), installation files (.msi, .msp) and libraries (.dll, .ocx). AppLocker can also be configured to record undesired activity and display it in the Event Viewer. Windows Embedded Standard 7 is available as both a 32-bit and 64-bit version<sup>6)</sup>, which ensures that even the most demanding applications have the level of support they need.

### 6.2 Order data


| Model number    | Short description   | Figure  |
|-----------------|---|---|
|                 | <b>Windows Embedded Standard 7</b>  |  |
| 5SWWI7.1540-ENG | Windows Embedded Standard 7 SP1 - 32-bit - English - For APC910 with QM77/HM76 chipset - License                |   |
| 5SWWI7.1640-ENG | Windows Embedded Standard 7 SP1 - 64-bit - English - For APC910 with QM77/HM76 chipset - License                |   |
| 5SWWI7.1740-MUL | Windows Embedded Standard 7 Premium SP1 - 32-bit - Multilingual - For APC910 with QM77/HM76 chipset - License   |   |
| 5SWWI7.1840-MUL | Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with QM77/HM76 chipset - License   |   |
| 5SWWI7.1849-MUL | Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with chipset QM170/HM170 - License |   |
|                 | <b>Optional accessories</b>   |   |
|                 | <b>Windows Embedded Standard 7</b>  |   |
| 5SWWI7.1900-MUL | Windows Embedded Standard 7 SP1 - 32-bit - Language Pack DVD  |   |
| 5SWWI7.2000-MUL | Windows Embedded Standard 7 SP1 - 64-bit - Language Pack DVD  |   |

Table 276: 5SWWI7.1540-ENG, 5SWWI7.1640-ENG, 5SWWI7.1740-MUL, 5SWWI7.1840-MUL, 5SWWI7.1849-MUL - Order data

### 6.3 Overview

| Model number    | Edition  | Target system | Chipset     | Service pack | Architecture | Language     | Minimum disk size   | Minimum RAM required |
|-----------------|----------|---------------|-------------|--------------|--------------|--------------|---------------------|----------------------|
| 5SWWI7.1540-ENG | Embedded | APC910        | QM77 HM76   | SP1          | 32-bit       | English      | 16 GB               | 1 GB <sup>1)</sup>   |
| 5SWWI7.1640-ENG | Embedded | APC910        | QM77 HM76   | SP1          | 64-bit       | English      | 16 GB               | 2 GB <sup>2)</sup>   |
| 5SWWI7.1740-MUL | Premium  | APC910        | QM77 HM76   | SP1          | 32-bit       | Multilingual | 16 GB <sup>3)</sup> | 1 GB <sup>1)</sup>   |
| 5SWWI7.1840-MUL | Premium  | APC910        | QM77 HM76   | SP1          | 64-bit       | Multilingual | 16 GB <sup>3)</sup> | 2 GB <sup>2)</sup>   |
| 5SWWI7.1849-MUL | Premium  | APC910        | QM170 HM170 | SP1          | 64-bit       | Multilingual | 16 GB <sup>3)</sup> | 2 GB <sup>4)</sup>   |

- 1) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 2 GB or more of RAM with 32-bit operating systems.
- 2) The specified size is the minimum requirement according to Microsoft. B&R recommends, however, using 4 GB or more of RAM with 64-bit operating systems.
- 3) The memory used by additional language packs is not taken into account in the minimum size of the disk.
- 4) The specified amount of memory is the minimum requirement according to Microsoft. B&R recommends using at least 4 GB RAM with 64-bit operating systems, however.

<sup>6)</sup> 64-bit versions are not supported by all systems.

## 6.4 Features with WES7 (Windows Embedded Standard 7)

The following list of features shows the most important [device](#) functions included in Windows Embedded Standard 7.

| Function  | Windows Embedded Standard 7 | Windows Embedded Standard 7 Premium |
|---|-----------------------------|-------------------------------------|
| Enhanced Write <a href="#">Filter</a> (EWF)                         | ✓                           | ✓                                   |
| File-Based Write <a href="#">Filter</a> (FBWF)                      | ✓                           | ✓                                   |
| Administrator accounts  | ✓                           | ✓                                   |
| User accounts   | Configurable                | Configurable                        |
| Windows Explorer shell  | ✓                           | ✓                                   |
| Registry <a href="#">filter</a>                                     | ✓                           | ✓                                   |
| <a href="#">Internet</a> Explorer 11.0                              | ✓                           | ✓                                   |
| <a href="#">Internet</a> Information Service (IIS) 7.0              | ✓                           | ✓                                   |
| Anti-malware (Windows Defender)                                     | -                           | ✓                                   |
| Add-ons (Snipping Tool, Sticky Notes)                               | -                           | ✓                                   |
| Windows <a href="#">Firewall</a>                                    | ✓                           | ✓                                   |
| .NET Framework 3.5  | ✓                           | ✓                                   |
| 32-bit and 64-bit   | ✓                           | ✓                                   |
| Remote Desktop <a href="#">Protocol</a> 7.0                         | ✓                           | ✓                                   |
| File Compression Utility  | ✓                           | ✓                                   |
| Windows Installer Service   | ✓                           | ✓                                   |
| Windows XP mode   | -                           | -                                   |
| Media Player 12   | ✓                           | ✓                                   |
| DirectX   | ✓                           | ✓                                   |
| Multilingual user <a href="#">interface</a> packs in the same image | -                           | ✓                                   |
| International components and language services                      | ✓                           | ✓                                   |
| Language pack setup   | ✓                           | ✓                                   |
| Windows Update  | Configurable                | Configurable                        |
| Windows PowerShell 2.0  | ✓                           | ✓                                   |
| BitLocker   | -                           | ✓                                   |
| AppLocker   | -                           | ✓                                   |
| Tablet PC support   | -                           | ✓                                   |
| Multi-touch support   | -                           | ✓                                   |
| Boot from <a href="#">USB</a> flash drive                           | ✓                           | ✓                                   |
| Accessories   | ✓                           | ✓                                   |
| Page file   | Configurable                | Configurable                        |
| Number of fonts   | 134                         | 134                                 |

Table 277: [Device](#) functions in Windows Embedded Standard 7

## 6.5 Installation

B&R preinstalls Windows Embedded Standard 7 on a suitable CFast card (32-bit: minimum 16 [GB](#), 64-bit: minimum 16 [GB](#)). The system is then automatically configured when it is switched on for the first time. This procedure takes approximately 30 minutes, with the [device](#) being rebooted a number of times.

### Information:

If Enhanced Write [Filter](#) (EWF) should be used, all mass storage devices should be disconnected from the system during installation or SYSPREP (except for the boot drive). It is also possible to disable additional mass storage devices in [BIOS](#).

## 6.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of a driver is still being used, its latest version [can](#) be downloaded and installed from the B&R website ([www.br-automation.com](http://www.br-automation.com)). It is important that Enhanced Write [Filter](#) (EWF) is disabled for this.

### 6.6.1 Touch screen driver

A touch screen driver will be installed automatically if a touch controller is detected during the Windows Embedded Standard 7 installation. If a touch controller is not detected during Windows Embedded Standard 7 installation or a B&R Automation Panel is connected at a later time, then the touch screen driver needs to be installed manually or the additional touch screen interface must be selected in the touch screen settings in the Windows Control Panel. The driver is available in the Downloads section of the B&R website ([www.br-automation.com](http://www.br-automation.com)). It is important that both Enhanced Write Filter (EWF) and File Based Write Filter (FBWF) are disabled for this.

#### Information:

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

### 6.7 Supported display resolutions

In accordance with Microsoft requirements, Windows Embedded Standard 7 requires XGA resolution (1024 x 768) or higher in order to allow unimpeded operation of the Windows user interface (including system dialog boxes and apps, etc.). A lower resolution can be selected for applications.

## 7 Windows XP Professional

### 7.1 General information

#### Information:

**Discontinuation of support for Windows XP by Microsoft:**

**After April 8th, 2014, Microsoft will no longer be providing any security updates, hotfixes, support (free or paid) or technical resources for Windows XP.**

### 7.2 Order data


| Model number    | Short description                               | Figure  |
|-----------------|---|---|
|                 | <b>Windows XP Professional</b>                  |  |
| 5SWWXP.0600-GER | Windows XP Professional SP3 - German - CD       |   |
| 5SWWXP.0600-ENG | Windows XP Professional SP3 - English - CD      |   |
| 5SWWXP.0600-MUL | Windows XP Professional SP3 - Multilingual - CD |   |

Table 278: 5SWWXP.0600-GER, 5SWWXP.0600-ENG, 5SWWXP.0600-MUL - Order data

### 7.3 Overview

| Model number    | Edition      | Target system   | Chipset                                      | Service pack | Language     | Minimum hard disk space required | Minimum RAM required |
|-----------------|--------------|---|--|--------------|--------------|----------------------------------|----------------------|
| 5SWWXP.0600-GER | Professional | APC510<br>APC511<br>APC620<br>APC810<br>APC820<br>APC910<br>PPC700<br>PPC725<br>PPC800<br>PPC900<br>PP500 | 945GME<br>GM45<br>QM77/HM76<br>NM10<br>US15W | SP3          | German       | ≤2.1 GB                          | 128 MB               |
| 5SWWXP.0600-ENG | Professional | APC510<br>APC511<br>APC620<br>APC810<br>APC820<br>APC910<br>PPC700<br>PPC725<br>PPC800<br>PPC900<br>PP500 | 945GME<br>GM45<br>QM77/HM76<br>NM10<br>US15W | SP3          | English      | ≤2.1 GB                          | 128 MB               |
| 5SWWXP.0600-MUL | Professional | APC510<br>APC511<br>APC620<br>APC810<br>APC820<br>APC910<br>PPC700<br>PPC725<br>PPC800<br>PPC900<br>PP500 | 945GME<br>GM45<br>QM77/HM76<br>NM10<br>US15W | SP3          | Multilingual | ≤2.1 GB                          | 128 MB               |

### 7.4 Installation

B&R preinstalls the required Windows XP Professional version on the desired storage device (e.g. CompactFlash card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

### 7.4.1 Installing on the PCI SATA RAID controller - 5ACPCI.RAIC-06

The following steps are necessary to install Windows XP Professional on a PCI SATA RAID controller:

1. Download the "PCI SATA RAID driver 5ACPCI.RAIC-01, -03, -05, -06" driver for Windows XP from the B&R website at [www.br-automation.com](http://www.br-automation.com) and copy the files to a diskette.
2. Connect the media drive (5MD900.USB2-01 or 5MD900.USB2-02) to the USB interface.
3. Insert the diskette and Windows XP Professional CD in the media drive and boot from the CD.
4. Press the F6 key during installation to install a third-party SCSI or driver.
5. Press the "s" key when asked about installing an additional drive. Insert the diskette into the floppy drive. Press "Enter" and select the driver.
6. Follow the installation instructions.
7. The installer will copy the files to the Windows XP Professional folder and restart the B&R Industrial PC.

#### Information:

- Not all USB FDD drives are supported by the Windows XP installer (see Microsoft KB 916196).
- Depending on the system, the boot order may have to be changed in BIOS.

### 7.4.2 Installing on the internal RAID controller (QM77) or in AHCI mode

The following steps are necessary to install Windows XP Professional on the internal RAID controller (QM77) or in AHCI mode:

1. Download the "AHCI and RAID driver QM77" driver for Windows XP from the B&R website at [www.br-automation.com](http://www.br-automation.com) and copy the files to a diskette.
2. Connect the media drive (5MD900.USB2-01 or 5MD900.USB2-02) to the USB interface.
3. Insert the diskette and Windows XP Professional CD in the media drive and boot from the CD.
4. Press the F6 key during installation to install a third-party SCSI or driver.
5. Press the "s" key when asked about installing an additional drive. Insert the diskette into the floppy drive. Press "Enter" and select the driver.
6. Follow the installation instructions.  
Select "Intel(R) 7 Series Chipset Family SATA AHCI Controller" for AHCI.  
Select "Intel(R) Mobile Express Chipset SATA RAID Controller" RAID.
7. The installer will copy the files to the Windows XP Professional folder and restart the B&R Industrial PC.

If the driver is installed while AHCI is enabled, the following message will appear twice: "Software installation has not passed Windows Logo testing to verify its compatibility with Windows XP. Do you want to continue installing the software?" Select "Yes".

#### Information:

- Not all USB FDD drives are supported by the Windows XP installer (see Microsoft KB 916196).
- Depending on the system, the boot order may have to be changed in BIOS.

## 7.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website ([www.br-automation.com](http://www.br-automation.com)).

#### Information:

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

## 8 Windows Embedded Standard 2009

### 8.1 General information

Windows Embedded Standard 2009 is the modular version of Windows XP Professional. It is used if XP applications should be executed with a minimal operating system size. Together with CompactFlash memory, Windows Embedded Standard 2009 makes it possible to use the Microsoft desktop operating system in harsh environmental conditions. In addition to the familiar features included in Windows XP Professional, Windows Embedded Standard 2009 has been improved with regard to dependability by adding a write [filter](#) for individual memory partitions. By protecting individual partitions such as the boot partition, the PC system [can](#) be started without problems even after an unexpected power [failure](#). B&R offers complete images for industrial PCs, [Power Panel](#) and Mobile Panel devices to make the transition to Windows Embedded Standard 2009 as easy as possible. In addition to Windows Embedded Standard 2009, the standard Windows XP Professional operating system is also available in English, German and a multilingual version.

Windows Embedded Standard 2009 is based on the same binary files as Windows XP Professional with Service Pack 3 and is optimally tailored to the hardware being used. In other words, only the functions and modules required by the respective [device](#) are included. Windows Embedded Standard 2009 is also based on the same reliable code as Windows XP Professional with SP3. It provides industry with leading [reliability](#), security and performance improvements as well as the latest technology for web browsing and extensive [device](#) support.

### 8.2 Order data


| Model number    | Short description  | Figure  |
|-----------------|--|---|
|                 | <b>Windows Embedded Standard 2009</b>  |  |
| 5SWWXP.0740-ENG | Windows Embedded Standard 2009 - English - For PPC900 with QM77/HM76 chipset - License |   |

Table 279: 5SWWXP.0740-ENG - Order data

### 8.3 Overview

| Model number    | Target system | Chipset      | Language | Minimum disk size | Minimum <a href="#">RAM</a> required |
|-----------------|---------------|--------------|----------|-------------------|--------------------------------------|
| 5SWWXP.0740-ENG | APC910        | QM77<br>HM76 | English  | 2 GB              | 256 MB                               |

### 8.4 Features with WES2009 (Windows Embedded Standard 2009)

The following list of features shows the most important [device](#) functions included in Windows Embedded Standard 2009.

| Function   | Included?    |
|--|--------------|
| Enhanced Write <a href="#">Filter</a> (EWF)        | ✓            |
| File-Based Write <a href="#">Filter</a> (FBWF)     | ✓            |
| Page file  | Configurable |
| Administrator accounts                             | ✓            |
| User accounts                                      | Configurable |
| Explorer shell                                     | ✓            |
| Registry <a href="#">filter</a>                    | ✓            |
| <a href="#">Internet</a> Explorer 8.0              | ✓            |
| <a href="#">Internet</a> Information Service (IIS) | -            |
| Terminal service                                   | ✓            |
| Windows <a href="#">Firewall</a>                   | ✓            |
| MSN Explorer                                       | -            |
| Outlook Express                                    | -            |
| Administrative Tools                               | ✓            |
| Remote Desktop                                     | ✓            |
| Remote Assistance                                  | -            |
| .NET Framework                                     | -            |
| ASP.NET  | -            |
| OpenGL support                                     | ✓            |
| Local network bridge                               | ✓            |
| Codepages / User locales / Keyboards               | ✓            |
| Disk Management Service                            | ✓            |
| Windows Installer Service                          | ✓            |
| Class Installer                                    | ✓            |
| CoDevice Installer                                 | ✓            |

Table 280: [Device](#) functions in Windows Embedded Standard 2009



| Function        | Included? |
|-----------------|-----------|
| Media Player 64 | ✓         |
| DirectX 9.0c    | ✓         |
| Accessories     | ✓         |
| Number of fonts | 89        |

Table 280: **Device** functions in Windows Embedded Standard 2009

## 8.5 Installation

Windows Embedded Standard 2009 is already preinstalled on a suitable CFast card by B&R (minimum 1 **GB**). The system is then automatically configured when it is switched on for the first time. This procedure takes approximately 10 minutes, with the **device** being rebooted a number of times.

## 8.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of a driver is still being used, its latest version **can** be downloaded and installed from the B&R website ([www.br-automation.com](http://www.br-automation.com)). It is important that Enhanced Write **Filter** (EWF) is disabled for this.

## 8.7 Supported display resolutions

In accordance with Microsoft requirements, Windows Embedded Standard 2009 requires **SVGA** resolution (800 x 600) or higher in order to allow unimpeded operation of the Windows user **interface** (including system dialog boxes, etc.). A lower resolution **can** be selected for applications.

## 9 Automation Runtime

### 9.1 General information

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

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

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

### 9.2 Order data


| Model number | Short description  | Figure   |
|--------------|--|--|
|              | <b>Technology Guard</b>  |  |
| 0TG1000.01   | Technology Guard (MSD) is provided in USB device class MSD (mass storage device)   |  |
| 0TG1000.02   | Technology Guard (HID) is provided in USB device class HID (human interface device). Automation Runtime supports HID in version D4.09 and later. |  |
| 1TG4600.10-5 | Automation Runtime Windows, TG license   |  |
| 1TG4601.06-5 | Automation Runtime Embedded, TG license  |  |

Table 281: 0TG1000.01, 0TG1000.02, 1TG4600.10-5, 1TG4601.06-5 - Order data

### 9.3 Automation Runtime Windows (ARwin)

#### System requirements

The following software versions (or higher) are required to operate Automation Runtime Windows on an Automation PC 910:

- ARwin upgrade AR A4.02
- Automation Studio V3.0.90.x or V4.0.14.x
- Technology Guard

#### Information:

In order to use Automation Runtime Windows (ARwin), the BIOS setting **Advanced - OEM features - Miscellaneous configuration - Realtime environment** must be set to **Enabled**.

#### Information:

In ARwin 4.06, ADI access is no longer possible from Windows and ARwin at the same time since the ADI interface is blocked by ARwin.

The following components are required in order to be able to access the ADI interface by Windows and ARwin simultaneously:

- ADI driver V2.3 (or higher)
- ARwin I4.06 (or higher)

## 9.4 Automation Runtime Embedded (ARemb)

### System requirements

The following [software](#) versions (or higher) are required to operate [Automation Runtime Embedded](#) on an [Automation PC 910](#):

- ARemb upgrade AR A4.02
- [Automation Studio](#) V3.0.90.x or V4.0.14.x
- Visual Components Runtime (VC) V3.96.0 or V4.05.2
- Technology Guard

PVI Development Setup must be downloaded from the B&R website ([www.br-automation.com](http://www.br-automation.com)) and installed separately!

### Information:

In order to use [Automation Runtime Embedded \(ARemb\)](#), the **BIOS** setting *Advanced - OEM features - Miscellaneous configuration - Realtime environment* must be set to *Enabled*.

## 9.5 Technology Guarding

Technology Guarding is a licensing approach used to safeguard individual [software](#) components. Licenses are stored on a "Technology Guard" (also referred to simply as a dongle), which is connected to an available [USB interface](#) on the target system.

The B&R [software](#) components [Automation Runtime Embedded \(ARemb\)](#), [Automation Runtime Windows \(ARwin\)](#) and [Automation Runtime Embedded Terminal](#) require a license, so a Technology Guard must always be used.

### Information:

Licensing with the Technology Guarding wizard is available in [Automation Studio 4.1](#) and [Automation Runtime 4.08](#) and higher. Earlier versions of [Automation Runtime](#) do not require a Technology Guard.

Additional information about Technology Guarding [can](#) be found in [Automation Help](#).

## 10 Debian (GNU/Linux)

### 10.1 General information

A Linux or GNU/Linux system is an open, Unix-like multiuser operating system based on the Linux kernel and GNU software. Widespread use and commercial applications were made possible starting in 1992 with the licensing of the Linux kernel under the GPL.

The Debian 8 operating system developed by B&R already contains all of the necessary drivers for the devices and can be used immediately without additional work.

Advantages of Debian:

- High degree of stability
- Wide selection of packages

For more information about Debian, visit <http://www.debian.org>.

### 10.2 Order data


| Model number    | Short description  | Figure   |
|-----------------|--|--|
|                 | <b>Debian 8</b>  |  |
| 5SWLIN.0540-MUL | Debian 8 - 32-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device   |  |
| 5SWLIN.0640-MUL | Debian 8 - 64-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device   |  |
| 5SWLIN.0649-MUL | Debian 8 - 64-bit - Multilingual - APC910 chipset QM170/HM170 - Installation (without Recovery DVD) - Only available with a new device |  |
|                 | <b>Optional accessories</b>  |  |
|                 | <b>CFast cards</b>   |  |
| 5CFAST.016G-00  | CFast card, 16 GB SLC  |  |
| 5CFAST.032G-00  | CFast card, 32 GB SLC  |  |
| 5CFAST.032G-10  | CFast card, 32 GB MLC  |  |
| 5CFAST.064G-10  | CFast card, 64 GB MLC  |  |
| 5CFAST.128G-10  | CFast card, 128 GB MLC   |  |
| 5CFAST.4096-00  | CFast card, 4 GB SLC   |  |
| 5CFAST.8192-00  | CFast card, 8 GB SLC   |  |

Table 282: 5SWLIN.0540-MUL, 5SWLIN.0640-MUL, 5SWLIN.0649-MUL - Order data

### 10.3 Overview

| Model number    | Target system | Chipset     | Architecture | Language     | Minimum disk size | Minimum RAM required |
|-----------------|---------------|-------------|--------------|--------------|-------------------|----------------------|
| 5SWLIN.0540-MUL | APC910        | QM77 HM76   | 32-bit       | Multilingual | 4 GB              | 1 GB                 |
| 5SWLIN.0640-MUL | APC910        | QM77 HM76   | 64-bit       | Multilingual | 4 GB              | 1 GB                 |
| 5SWLIN.0649-MUL | APC910        | QM170 HM170 | 64-bit       | Multilingual | 4 GB              | 4 GB                 |

### 10.4 Features

- LXDE desktop
- Touch screen driver
- MTCX driver
- ADI library
- HMI diagnostics tool
- Tool for right-click support via touch screen
- Virtual keyboard

Detailed information about Debian 8 for B&R devices is available in the Downloads section of the B&R website ([www.br-automation.com](http://www.br-automation.com)).

### 10.5 Installation

B&R preinstalls Debian 8 on a desired storage device (e.g. CFast card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

Debian 8 [can](#) also be downloaded from the Debian website (<http://www.debian.org>). The Debian website provides more detailed instructions.

Notes regarding installation on B&R devices are included in a separate document that [can](#) be downloaded from the B&R website ([www.br-automation.com](http://www.br-automation.com)).

Installation packages are also available on the B&R website for the necessary B&R modifications ([www.br-automation.com](http://www.br-automation.com)).

## 10.6 Drivers

All drivers required for operation are preinstalled along with the operating system.

The most current versions of B&R-specific drivers [can](#) be downloaded and installed from the B&R website ([www.br-automation.com](http://www.br-automation.com)).

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

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

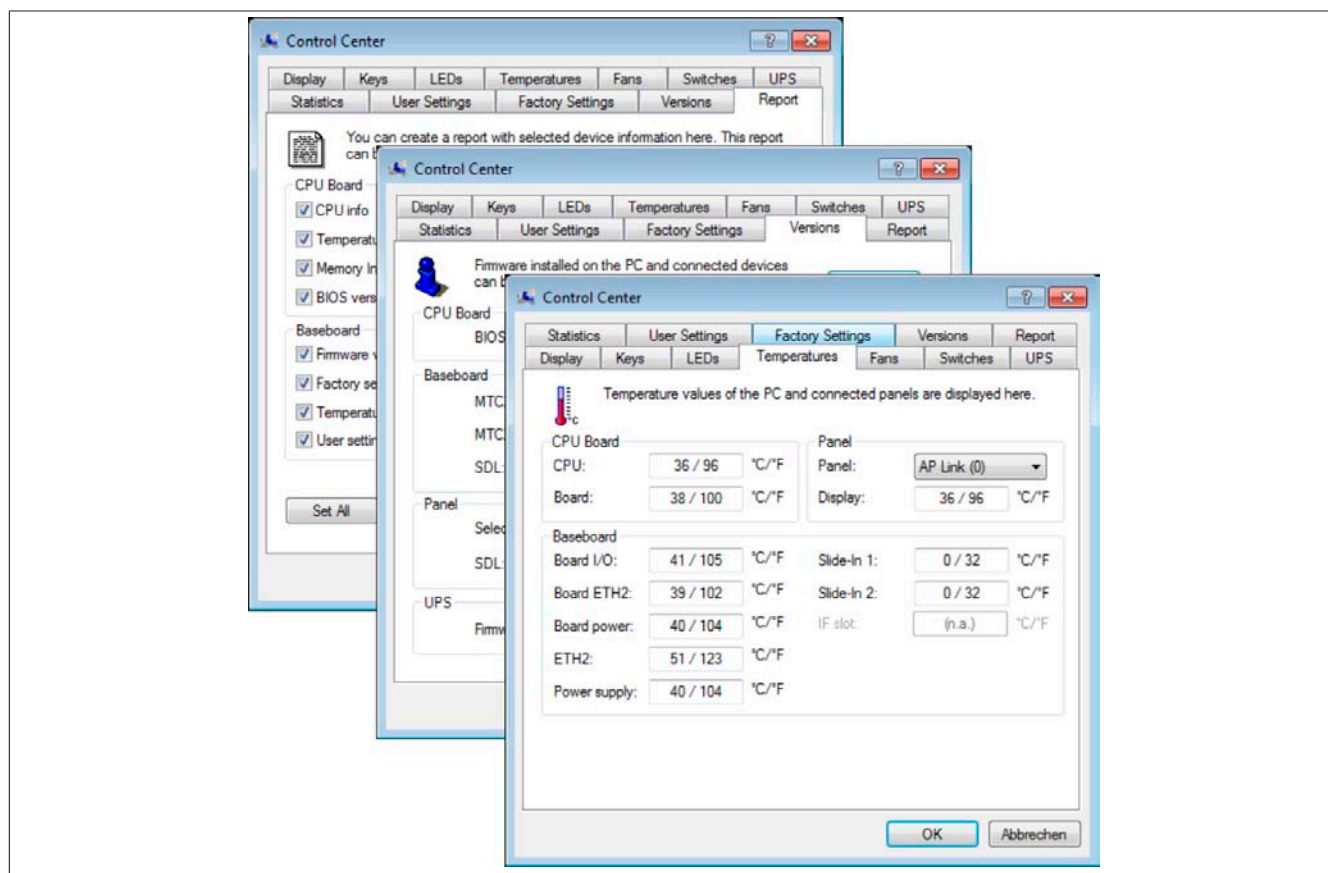


Figure 165: ADI Control Center screenshots - Examples

### Information:

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

### 11.1 Functions

#### Information:

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

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

Supports the following systems:

- Automation Panel 800
- Automation Panel 830
- Automation Panel 900
- Automation Panel 9x3
- Automation Panel 9xD
- Automation Panel 1000
- Automation Panel 5000
- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Mobile Panel 100/200
- Mobile Panel 40/50
- Mobile Panel 7151
- Panel PC 300
- Panel PC 700
- Panel PC 725
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500

## 11.2 Installation

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

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

### Information:

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

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



## 12 B&R Automation Device Interface (ADI) Development Kit

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

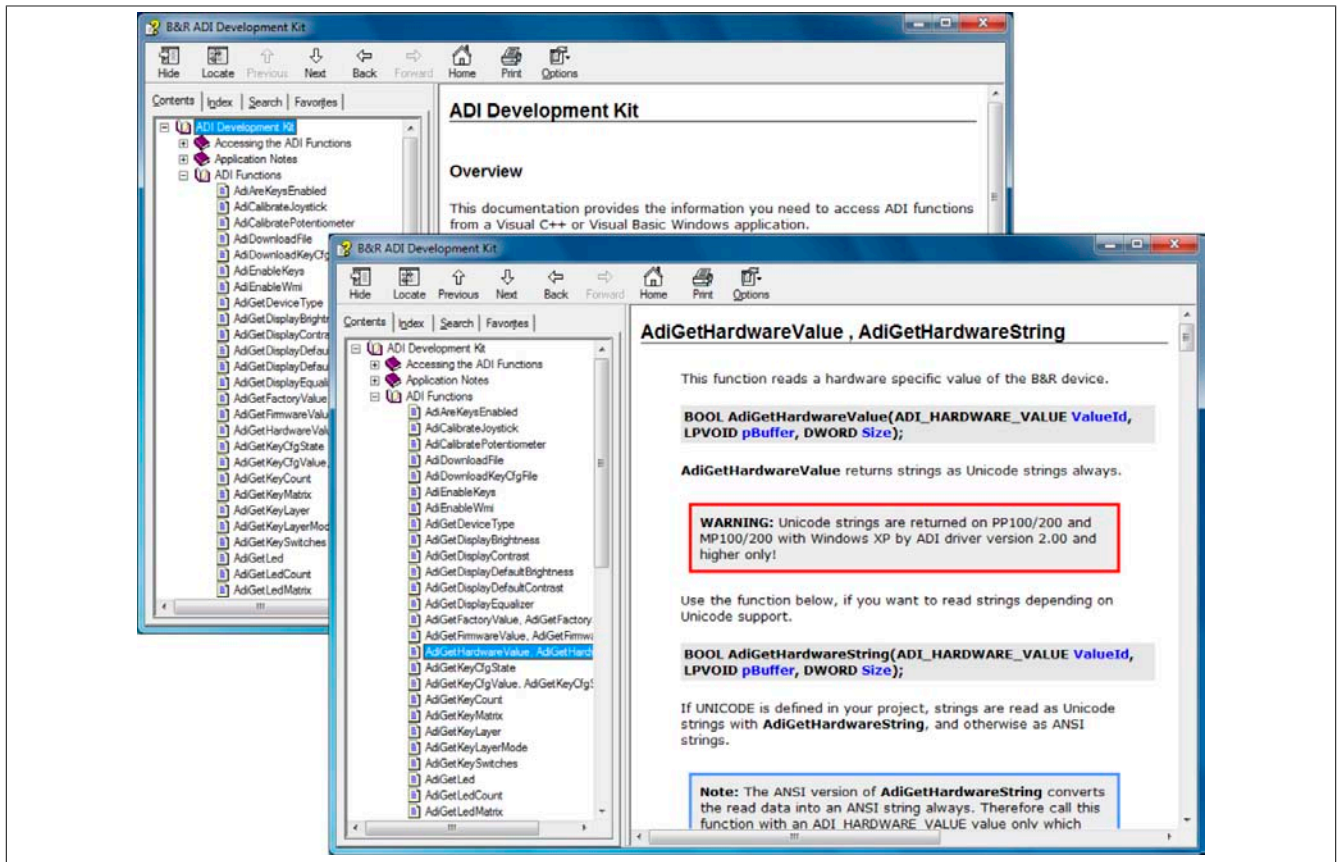


Figure 166: ADI Development Kit Screenshots (Symbolfoto)

### Features:

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

The following systems are supported (version 3.80 and higher):

- Automation Panel 800
- Automation Panel 830
- Automation Panel 900
- Automation Panel 9x3
- Automation Panel 9xD
- Automation Panel 1000
- Automation Panel 5000
- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Automation PC 2100
- Mobile Panel 100/200
- Mobile Panel 40/50
- Mobile Panel 7151



- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500

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

A detailed description of how to use ADI functions [can](#) be found in the help system.

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

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

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

### System requirements

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

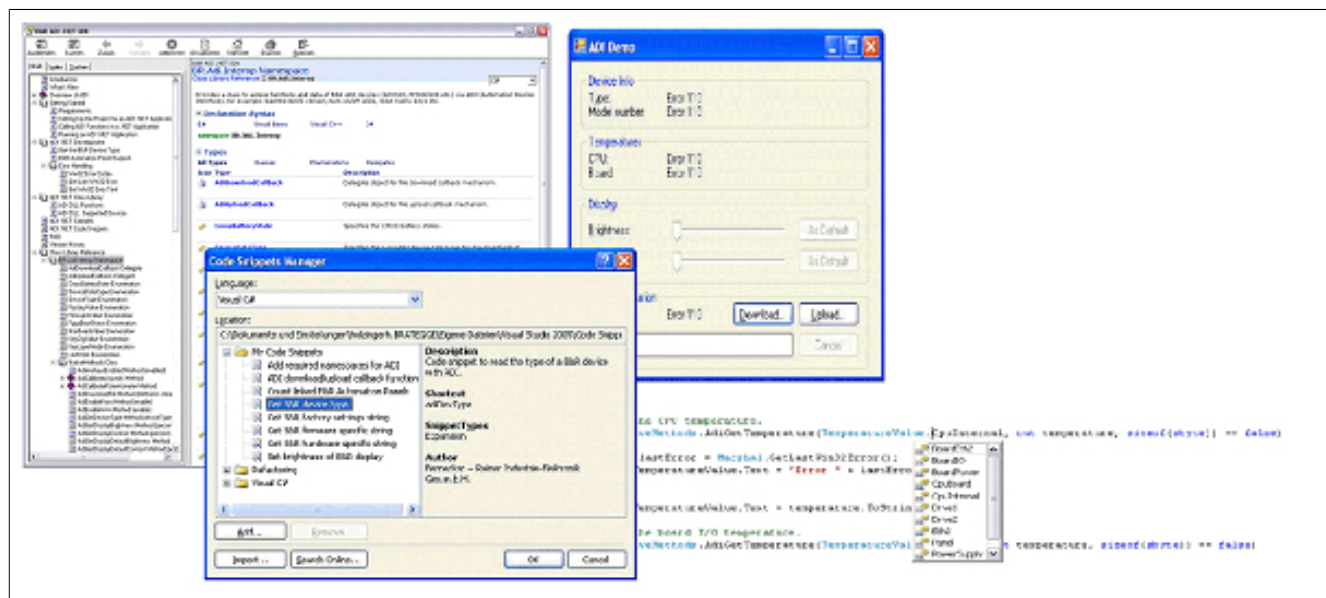


Figure 167: ADI .NET SDK screenshots (sample)

### Features (V2.20 and later):

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

### The following systems are supported (V2.20 and later):

- [Automation Panel 800](#)
- [Automation Panel 830](#)
- [Automation Panel 900](#)
- [Automation Panel 9x3](#)
- [Automation Panel 9xD](#)
- [Automation Panel 1000](#)
- [Automation Panel 5000](#)
- [Automation PC 510](#)
- [Automation PC 511](#)
- [Automation PC 620](#)
- [Automation PC 810](#)
- [Automation PC 820](#)
- [Automation PC 910](#)
- [Automation PC 2100](#)
- [Mobile Panel 100/200](#)
- [Mobile Panel 40/50](#)
- [Mobile Panel 7151](#)

- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Panel PC 2100
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500

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

A detailed description of how to use ADI functions [can](#) be found in the help system.

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

## 14 B&R Key Editor

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

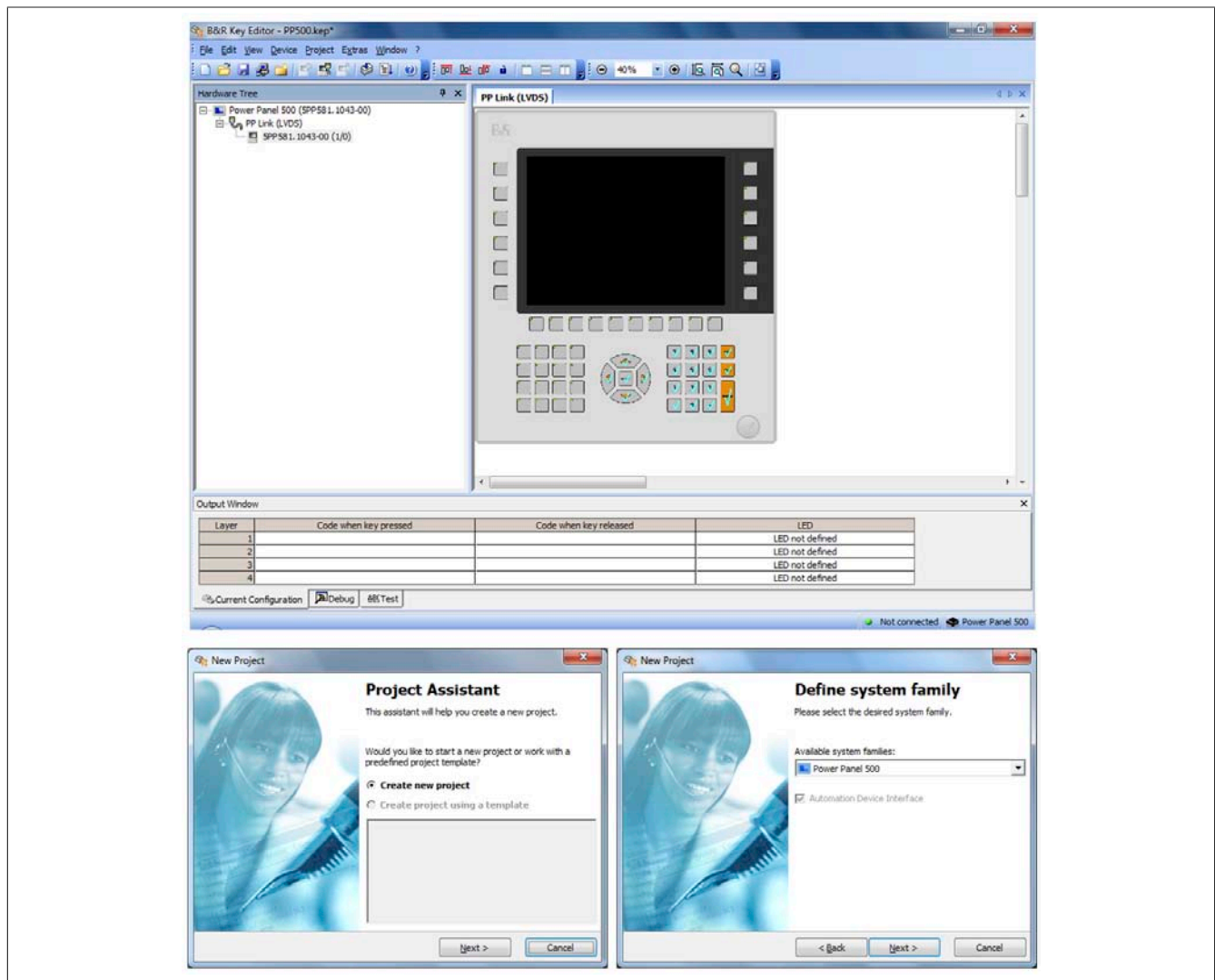


Figure 168: B&R Key Editor screenshots (version 3.60)

### Features:

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

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

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

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

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

## 15 B&R KCF Editor

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

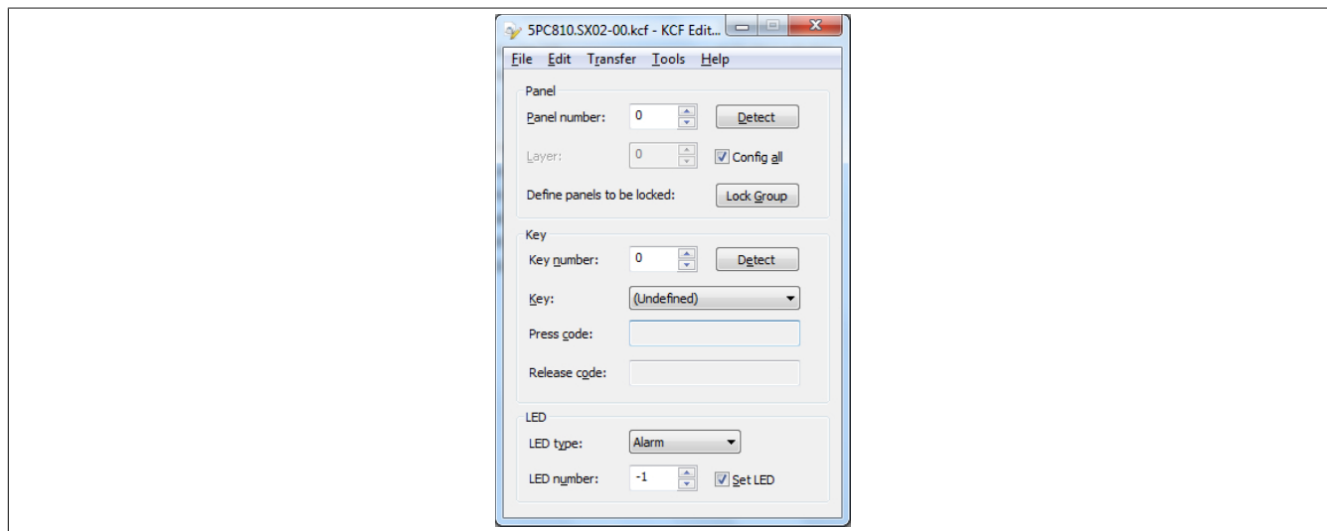


Figure 169: B&R KCF Editor screenshot (version 1.0)

### Features

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

### Additional features when executing the B&R KCF Editor on the target [device](#)<sup>7)</sup>

- Panel and key detection
- [LED](#) test
- Configuration uploads/downloads

### The following systems are supported (version 1.0 and higher)

- [Automation](#) PCs
- Panel PCs
- [Automation](#) Panels
- [Power Panels](#)
- Mobile panels

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

<sup>7)</sup> The ADI driver must be installed on the B&R PC to use these features.

## 16 HMI Service Center

### 16.1 5SWUTI.0001-000

#### 16.1.1 General information

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

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

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

#### 16.1.2 Order data


| Model number    | Short description  | Figure  |
|-----------------|--|---|
|                 | <b>Accessories</b>   |   |
| 5SWUTI.0001-000 | HMI Service Center <a href="#">USB</a> Flash Drive - Hardware diagnostics <a href="#">software</a> - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC51x/PP500 - For <a href="#">Automation</a> Panel 800/900 |  |

Table 283: 5SWUTI.0001-000 - Order data

## Chapter 5 • Standards and certifications

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### 1 Standards and guidelines

#### 1.1 CE mark



Product complies with all applicable directives and their harmonized [EN](#) standards.

#### 1.2 EMC directive

These products meet the requirements of EU directive "[Electromagnetic compatibility](#)2014/30/EU" and are designed for industrial use:

|                                    |   |
|------------------------------------|---|
| <a href="#">EN 61131-2:2007</a>    | Programmable logic controllers - Part 2: Equipment requirements and tests   |
| <a href="#">EN 61000-6 -2:2005</a> | <a href="#">Electromagnetic compatibility (EMC)</a> - Part 6-2: Generic standards - Immunity for industrial environments          |
| <a href="#">EN 61000-6 -4:2007</a> | <a href="#">Electromagnetic compatibility (EMC)</a> - Part 6-4: Generic standards - Emission standard for industrial environments |

#### Information:

Declarations of conformity are available on the B&R website at [Downloads - Certificates - Declarations of conformity](#).



## 2 Certifications

### Danger!

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

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

### Information:

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

#### 2.1 UL certification



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

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

UL certificates are available on the B&R website at [Downloads - Certificates - UL](#).

Ind.Cont.Eq.  
E115267

#### 2.2 GOST-R



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

#### 2.3 EAC



Products with this mark have been tested by an accredited testing laboratory and approved for import to the Eurasian Economic Union (based on EU compliance).

#### 2.4 KC



Products with this mark have been tested by an accredited testing laboratory and approved for import to the Korean market (based on EU compliance).

## 2.5 RCM



Products with this mark have been tested by an accredited testing laboratory and certified by the ACMA. This mark is valid in Australia/Oceania and simplifies the certification of your machines and systems in these areas (based on EU compliance).

## 2.6 DNV GL certification (Det Norske Veritas Germanischer Lloyd)



Products with this mark have been certified by the DNV GL classification society and are suitable for use in maritime environments. DNV GL certificates (type approval) are generally accepted by other classification societies during ship acceptance procedures.

DNV GL in accordance with standard DNVGL-CG-0339 (November 2015)  
IACS E10  
[EN 60945](#) section 1c

These products are suitable for the following DNV GL environmental conditions (DNV GL classes):

|                     |  |
|---------------------|--|
| Temperature         | B  |
| Humidity            | B  |
| Vibration           | A  |
| <a href="#">EMC</a> | B  |
| Enclosure           | Required protection according to the Rules shall be provided upon installation on board. |

### Information:

Line [filter 5AC804.MFLT-00](#) is absolutely mandatory in the supply line when used in a maritime environment. For more information, see section "[Connecting to the end device](#)" on page 387.

The following table lists the revisions from which DNV GL certification applies to individual components.

| Model number   | Description  | DNV GL beginning with rev. |
|----------------|--|----------------------------|
| 5PC910.SX01-00 | 1-slot APC910 system unit  | E0                         |
| 5PC910.SX02-00 | 2-slot APC910 system unit  | G0                         |
| 5AC901.BX01-00 | APC910 1-slot bus - 1 PCI  | D0                         |
| 5AC901.BX01-01 | APC910 1-slot bus - 1 PCI Express x8   | E0                         |
| 5AC901.BX02-00 | APC910 2-slot bus - 2 PCI  | D0                         |
| 5AC901.BX02-01 | APC910 2-slot bus - 1 PCI - 1 PCI Express x8   | E0                         |
| 5AC901.BX02-02 | APC910 2-slot bus - 2 PCI Express x4   | E0                         |
| 5PC900.TS77-00 | <a href="#">CPU</a> board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910   | E0                         |
| 5PC900.TS77-04 | <a href="#">CPU</a> board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910   | D0                         |
| 5PC900.TS77-10 | <a href="#">CPU</a> board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910   | D0                         |
| 5MMDDR.1024-03 | SO-DIMM DDR3, 1024 <a href="#">MB</a>  | D0                         |
| 5MMDDR.2048-03 | SO-DIMM DDR3, 2048 <a href="#">MB</a>  | D0                         |
| 5MMDDR.4096-03 | SO-DIMM DDR3, 4096 <a href="#">MB</a>  | D0                         |
| 5MMDDR.8192-03 | SO-DIMM DDR3, 8192 <a href="#">MB</a>  | D0                         |
| 5AC901.HS00-00 | APC910 heat sink, active   | D0                         |
| 5AC901.FA01-00 | APC910 fan kit - For 5PC910.SX01-00  | D0                         |
| 5AC901.FA02-00 | APC910 fan kit - For 5PC910.SX02-00  | D0                         |
| 5AC901.I485-00 | <a href="#">Interface</a> card - 1x <a href="#">RS232/422/458 interface</a> - For APC910/PPC900  | D0                         |
| 5AC901.ICAN-00 | <a href="#">Interface</a> card - 1x <a href="#">CAN interface</a> - For APC910/PPC900  | D0                         |
| 5AC901.IHDA-00 | <a href="#">Interface</a> card - 1x audio <a href="#">interface</a> (1x MIC/1x Line In/1x OUT) - For APC910/PPC900   | D0                         |
| 5ACPCI.ETH1-01 | PCI <a href="#">Ethernet</a> card 1x 10/100  | D0                         |
| 5ACPCI.ETH3-01 | PCI <a href="#">Ethernet</a> card 3x 10/100  | D0                         |
| 5AC804.MFLT-00 | <a href="#">Line filter</a>  | D0                         |
| 5AC901.CSSD-03 | 60 <a href="#">GB</a> SSD MLC - Slide-in compact - SATA  | E0                         |
| 5AC901.CSSD-04 | 128 <a href="#">GB</a> SSD MLC - Slide-in compact - SATA   | F0                         |
| 5AC901.CSSD-05 | 256 <a href="#">GB</a> SSD MLC - Slide-in compact - Toshiba - SATA   | D0                         |
| 5AC901.SDVW-00 | DVD drive - DVD-R/RW/DVD+R/RW - Slide-in   | D0                         |
| 5AC901.SSCA-00 | Slide-in compact adapter - For slide-in compact drives   | D0                         |
| 5CFAST.2048-00 | CFast card, 2 <a href="#">GB</a> SLC   | D0                         |
| 5CFAST.4096-00 | CFast card, 4 <a href="#">GB</a> SLC   | D0                         |
| 5CFAST.8192-00 | CFast card, 8 <a href="#">GB</a> SLC   | D0                         |
| 5CFAST.016G-00 | CFast card, 16 <a href="#">GB</a> SLC  | D0                         |
| 5CFAST.032G-00 | CFast card, 32 <a href="#">GB</a> SLC  | D0                         |
| 5CFAST.032G-10 | CFast card, 32 <a href="#">GB</a> MLC  | D0                         |
| 5CFAST.064G-10 | CFast card, 64 <a href="#">GB</a> MLC  | D0                         |
| 5CFAST.128G-10 | CFast card, 128 <a href="#">GB</a> MLC   | D0                         |
| 5AC901.FF01-00 | Front cover for 1-slot APC910 - Orange   | D0                         |
| 5AC901.FF01-01 | Front cover for 1-slot APC910 - Dark gray  | D0                         |
| 5AC901.FF01-02 | Front cover for 1-slot APC910 - Dark gray - Without logo   | D0                         |
| 5AC901.FF02-00 | Front cover for 2-slot APC910 - Orange   | D0                         |
| 5AC901.FF02-01 | Front cover for 2-slot APC910 - Dark gray  | D0                         |
| 5AC901.FF02-02 | Front cover for 2-slot APC910 - Dark gray - Without logo   | D0                         |
| 5AC901.LSDL-00 | SDL/ <a href="#">DVI</a> transmitter   | D0                         |
| 5AC900.1000-00 | <a href="#">DVI</a> (male connector) to <a href="#">CRT</a> (female connector) adapter. For connecting a standard monitor to a <a href="#">DVI-I interface</a> . | C0                         |
| 0TB103.91      | Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm <sup>2</sup>   | D0                         |
| 0TB103.9       | Connector 24 VDC - 3-pin female - Screw clamps 3.31 mm <sup>2</sup>  | D0                         |

DNV GL certificates with specifications for permitted environmental conditions are available on the B&R website at [Downloads - Certificates - Maritime - DNV GL](#).

Certificates for compass safe distance are available at [Downloads - Certificates - Maritime - Compass safe distance](#).

## Chapter 6 • Accessories

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

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

### 1 Power connectors

#### 1.1 0TB103.9x

##### 1.1.1 General information

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

##### 1.1.2 Order data


| Model number | Short description   | Figure   |
|--------------|---|--|
|              | <b>Accessories</b>  |  |
| 0TB103.9     | Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm <sup>2</sup> |  |
| 0TB103.91    | Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm <sup>2</sup>  |  |

Table 284: 0TB103.9, 0TB103.91 - Order data

##### 1.1.3 Technical data

#### Information:

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

| Model number              | 0TB103.9   | 0TB103.91                               |
|---------------------------|--|---|
| General information       |  |   |
| Certification             |  |   |
| CE                        | Yes  |   |
| UL                        | cULus E115267<br>Industrial <b>Control</b> Equipment   |   |
| HazLoc                    | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T4 <sup>1)</sup> |   |
| DNV GL                    | Environmental Category C, EMC <sup>12)</sup>   |   |
| DNV GL                    | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck)    |   |
| Terminal block            |  |   |
| Note                      | Protected against vibration by the screw flange<br>Nominal values according to UL  |   |
| Number of pins            | 3 (female)   |   |
| Type of terminal block    | Screw clamp terminal block   | Cage clamp terminal block <sup>3)</sup> |
| Cable type                | Only copper wires (no aluminum wires!)   |   |
| Distance between contacts | 5.08 mm  |   |

Table 285: 0TB103.9, 0TB103.91 - Technical data

| Model number                           | 0TB103.9                     | 0TB103.91                    |
|--|------------------------------|------------------------------|
| Connection cross section               |                              |                              |
| AWG wire                               | 26 to 14 AWG                 | 26 to 12 AWG                 |
| Wire end sleeves with plastic covering | 0.20 to 1.50 mm <sup>2</sup> |                              |
| Solid wires                            | 0.20 to 2.50 mm <sup>2</sup> |                              |
| Fine strand wires                      | 0.20 to 1.50 mm <sup>2</sup> | 0.20 to 2.50 mm <sup>2</sup> |
| With wire end sleeves                  | 0.20 to 1.50 mm <sup>2</sup> |                              |
| Tightening torque                      | 0.4 Nm                       | -                            |
| <b>Electrical characteristics</b>      |                              |                              |
| Nominal voltage                        | 300 V                        |                              |
| Nominal current <sup>4)</sup>          | 10 A / contact               |                              |
| Contact resistance                     | ≤5 mΩ                        |                              |

Table 285: 0TB103.9, 0TB103.91 - Technical data

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

## 2 Terminal block ready relay

### 2.1 0TB2104.8000

#### 2.1.1 General information

The 1-row 4-pin TB2104 terminal block is used for the 5AC901.IRDY-00 ready relay.

#### 2.1.2 Order data


| Model number | Short description  | Figure  |
|--------------|--|---|
|              | <b>Terminal blocks</b>   |  |
| 0TB2104.8000 | Connector 24 VDC - 4-pin female - Screw clamps 2.5 mm <sup>2</sup> |   |

Table 286: 0TB2104.8000 - Order data

#### 2.1.3 Technical data

| Model number                           | 0TB2104.8000  |
|--|---|
| General information                    |   |
| Certification                          |   |
| CE                                     | Yes   |
| UL                                     | cULus E115267<br>Industrial <a href="#">Control</a> Equipment |
| Terminal block                         |   |
| Note                                   | Nominal values according to UL                                |
| Number of pins                         | 4 (female)  |
| Type of terminal block                 | Screw clamps  |
| Cable type                             | Only copper wires (no aluminum wires!)                        |
| Distance between contacts              | 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 strand wires                      | 0.2 to 1.5 mm²  |
| With wire end sleeves                  | 0.2 to 1.5 mm²  |
| Electrical characteristics             |   |
| Nominal voltage                        | 300 V   |
| Nominal current <sup>1)</sup>          | 10 A  |

Table 287: 0TB2104.8000 - Technical data

1) The limit data for each IF option must be taken into consideration.

### 3 Replacement CMOS batteries

#### 3.1 0AC201.91 / 4A0006.00-000

##### 3.1.1 General information

This lithium battery is needed to back BIOS CMOS data and the real-time clock (RTC).

The battery is subject to wear and must be replaced when the battery power is insufficient ("Bad" status).

##### 3.1.2 Order data


| Model number  | Short description   | Figure  |
|---------------|---|---|
|               | <b>Batteries</b>  |   |
| 0AC201.91     | Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect cells against short circuits. For emergency information, call RENATA SA at + 41 61 319 28 27 |  |
| 4A0006.00-000 | Lithium battery, 3 V / 950 mAh, button cell   |   |

Table 288: 0AC201.91, 4A0006.00-000 - Order data

##### 3.1.3 Technical data

#### Warning!

The battery is only permitted to be replaced by a Renata CR2477N battery. The use of another battery may present a risk of fire or explosion.

The battery may explode if handled improperly. Do not recharge, disassemble or dispose of in fire.

#### Information:

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

| Model number               | 0AC201.91                                     | 4A0006.00-000 |
|----------------------------|---|---------------|
| General information        |   |               |
| Storage time               | Max. 3 years at 30°C                          |               |
| Certification              |   |               |
| CE                         | Yes   |               |
| UL                         | cULus E115267<br>Industrial Control Equipment |               |
| Electrical characteristics |   |               |
| Capacity                   | 950 mAh                                       |               |
| Self-discharging           | <1% per year (at 23°C)                        |               |
| Voltage range              | 3 V   |               |
| Environmental conditions   |   |               |
| Temperature                |   |               |
| Storage                    | -20 to 60°C                                   |               |
| Relative humidity          |   |               |
| Operation                  | 0 to 95%                                      |               |
| Storage                    | 0 to 95%                                      |               |
| Transport                  | 0 to 95%                                      |               |

Table 289: 0AC201.91, 4A0006.00-000 - Technical data

## 4 CFast cards

### 4.1 General information

CFast cards are data storage devices that are easy to exchange. Due to their [robustness](#) against environmental influences (e.g. temperature, shock, vibration, etc.), CFast cards are ideal for use as storage media in industrial environments.

CFast cards are a development derived from CompactFlash cards that use the SATA [protocol](#) instead. CFast cards are not compatible with CompactFlash cards.

### 4.2 Basic information

In order to be suited for use in industrial [automation](#), CFast cards must be highly reliable. The following items are very important to achieving the necessary level of [reliability](#):

- The flash technology used
- An efficient [algorithm](#) for maximizing service life
- Good mechanisms for detecting and fixing [errors](#) in the flash memory

#### 4.2.1 Flash technology

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

In addition to a service life that is 10 times longer than MLC flash components, SLC flash components also have write/delete cycles that are 33 times faster, making CFast cards with SLC flash components the preferred choice for industrial environments. These factors are still heavily dependent on the actual application, however, so that no blanket statement [can](#) be made.

Due to increasing cost pressure as well as improved wear level [algorithms](#) and monitoring features (S.M.A.R.T.), MLC flash technology is still widely used in this market.

#### 4.2.2 Wear leveling

Wear leveling is an [algorithm](#) that [can](#) be used to maximize the service life of a CFast card. There are three different [algorithms](#):

- Dynamic wear leveling
- Static wear leveling

The basic idea behind wear leveling is to distribute data over a broad area of blocks or cells on the disk so that the same areas are not deleted and rewritten over and over again.

##### 4.2.2.1 Dynamic wear leveling

Dynamic wear leveling makes it possible to utilize unused flash blocks when writing to a file.

If the disk is 80% full with files, then only 20% [can](#) be used for wear leveling.

The service life of the CFast card is therefore dependent on the amount of unused flash blocks.

##### 4.2.2.2 Static wear leveling

Static wear leveling monitors which data is rarely modified. From time to time, the [controller](#) then moves this data to blocks that have already been used frequently in order to prevent further wear on those cells.

#### 4.2.3 ECC error correction

[Bit errors](#) [can](#) be caused by inactivity or when a certain cell is being operated. Error correction coding (ECC) implemented via hardware or [software](#) [can](#) detect and correct many [errors](#) of this type.

#### 4.2.4 S.M.A.R.T. support

Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) is an industry standard for mass storage devices that has been introduced to monitor important parameters and quickly detect imminent failures. Critical performance and calibration data is monitored and stored in order to help predict the probability of [errors](#).



#### 4.2.5 Calculating the expected service life for an existing application

The following procedure [can](#) be used to better verify whether a CFast card with SLC or MLC technology should be used in a particular application.

- Read the "Average erase count" of the data storage [device](#) via S.M.A.R.T.
- Fully operate the system with the respective data storage [device](#) over a defined period of time (e.g. 1 week).
- Determine the number of erase cycles with "Average erase count".
- Determine the expected service life using the maximum guaranteed write/erase cycles (MLC: 3,000, SLC: 100,000).

Example of an MLC CFast card over the period of a week:

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

#### 4.2.6 Dimensions

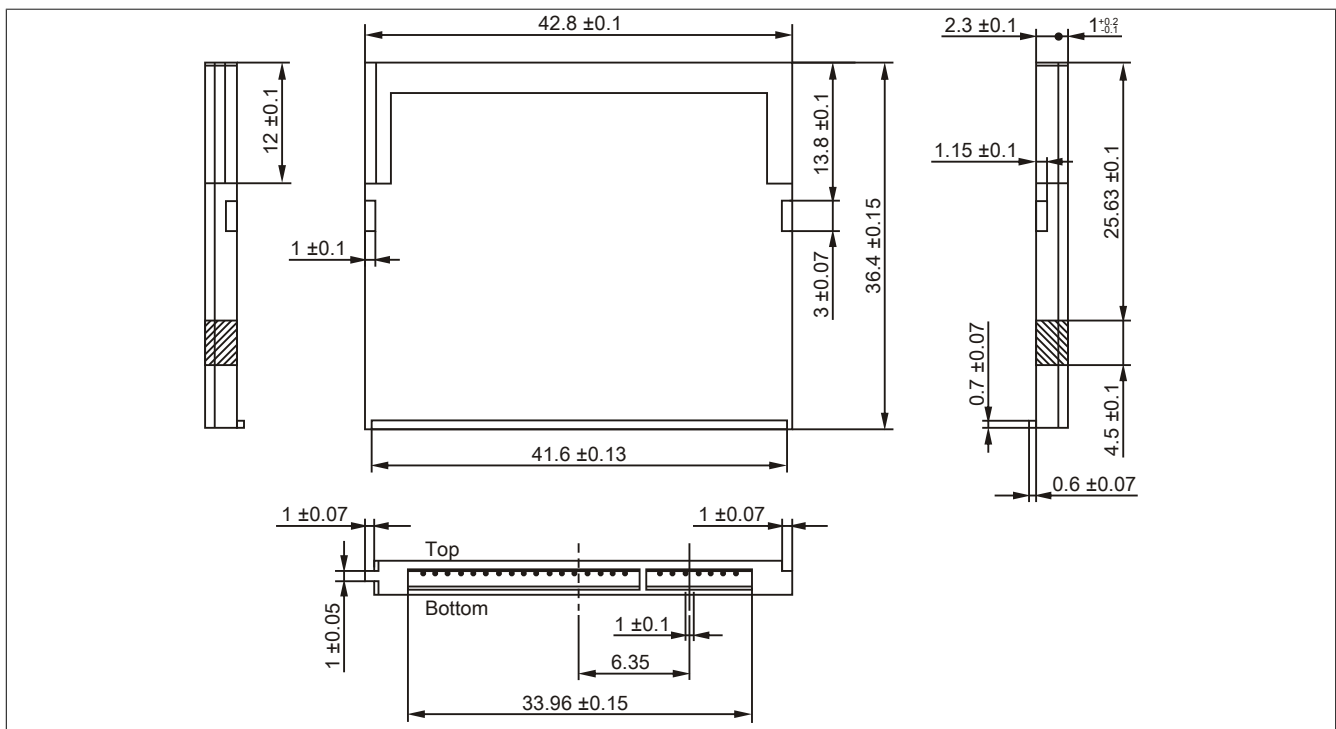


Figure 170: CFast card - Dimensions

### 4.3 5CFAST.xxxx-00

#### 4.3.1 General information

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

#### 4.3.2 Order data


| Model number   | Short description     | Figure  |
|----------------|-----------------------|---|
|                | <b>CFast cards</b>    |  |
| 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 |   |

Table 290: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Order data

#### 4.3.3 Technical data

##### Information:

Due to the changeover to the new **controller**, revision E0 may not be image-compatible to previous revisions when using older cloning tools. This is not the case when using current cloning tools.

##### Information:

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

| Product ID                   | 5CFAST.2048-00<br>≥ Rev. E0                                       | 5CFAST.4096-00<br>≥ Rev. E0 | 5CFAST.8192-00<br>≥ Rev. E0 | 5CFAST.016G-00<br>≥ Rev. E0 | 5CFAST.032G-00<br>≥ Rev. E0 |
|------------------------------|---|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| <b>General information</b>   |   |                             |                             |                             |                             |
| Capacity                     | 2 GB  | 4 GB                        | 8 GB                        | 16 GB                       | 32 GB                       |
| Data retention <sup>1)</sup> | 10 years  |                             |                             |                             |                             |
| Data reliability             | <1 unrecoverable error in 10 <sup>14</sup> bit read accesses      |                             |                             |                             |                             |
| Lifetime monitoring          | Yes   |                             |                             |                             |                             |
| MTBF                         | >2,500,000 hours (at 25°C)  |                             |                             |                             |                             |
| Maintenance                  | None  |                             |                             |                             |                             |
| Supported operating modes    | SATA 2.6, max. PIO Mode 4, Multiword DMA Mode 2, Ultra DMA Mode 6 |                             |                             |                             |                             |
| Sequential read              |   |                             |                             |                             |                             |
| Typical                      |   |                             |                             |                             |                             |
| With 128 kB block size       | 94 MB/s   | 108 MB/s                    | 108 MB/s                    | 108 MB/s                    | 116 MB/s                    |
| With 4 kB block size         | 42 MB/s   | 46 MB/s                     | 46 MB/s                     | 46 MB/s                     | 46 MB/s                     |
| Maximum                      |   |                             |                             |                             |                             |
| With 128 kB block size       | 100 MB/s  | 115 MB/s                    | 115 MB/s                    | 115 MB/s                    | 120 MB/s                    |
| With 4 kB block size         | 42 MB/s   |                             |                             |                             |                             |
| Sequential write             |   |                             |                             |                             |                             |
| Typical                      |   |                             |                             |                             |                             |
| With 128 kB block size       | 57 MB/s   | 86 MB/s                     | 86 MB/s                     | 86 MB/s                     | 111 MB/s                    |
| With 4 kB block size         | 36 MB/s   | 40 MB/s                     | 40 MB/s                     | 40 MB/s                     | 40 MB/s                     |
| Maximum                      |   |                             |                             |                             |                             |
| With 128 kB block size       | 65 MB/s   | 95 MB/s                     | 95 MB/s                     | 95 MB/s                     | 120 MB/s                    |
| With 4 kB block size         | 40 MB/s   | 45 MB/s                     | 45 MB/s                     | 45 MB/s                     | 45 MB/s                     |

Table 291: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

| Product ID   | 5CFAST.2048-00<br>≥ Rev. E0  | 5CFAST.4096-00<br>≥ Rev. E0 | 5CFAST.8192-00<br>≥ Rev. E0 | 5CFAST.016G-00<br>≥ Rev. E0 | 5CFAST.032G-00<br>≥ Rev. E0 |
|--|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Certification  |  |                             |                             |                             |                             |
| CE   | Yes  |                             |                             |                             |                             |
| UL   | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |                             |                             |                             |                             |
| HazLoc   | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T4 <sup>2)</sup>                    |                             |                             |                             |                             |
| DNV GL   | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>3)</sup> |                             |                             |                             |                             |
| GOST-R   | Yes  |                             |                             |                             |                             |
| <b>Endurance<sup>1)</sup></b>                        |  |                             |                             |                             |                             |
| SLC flash  | Yes  |                             |                             |                             |                             |
| Guaranteed data volume                               |  |                             |                             |                             |                             |
| Guaranteed <sup>4)</sup>                             | 185 TBW  | 371 TBW                     | 745 TBW                     | 1468 TBW                    | 2937 TBW                    |
| Clear/Write cycles                                   |  |                             |                             |                             |                             |
| Guaranteed   | 100,000  |                             |                             |                             |                             |
| Wear leveling  | Static   |                             |                             |                             |                             |
| S.M.A.R.T. support                                   | Yes  |                             |                             |                             |                             |
| <b>Support</b>                                       |  |                             |                             |                             |                             |
| Hardware   | APC2100, APC910, PPC2100, PPC900   |                             |                             |                             |                             |
| Operating systems                                    |  |                             |                             |                             |                             |
| Windows 7 32- <a href="#">bit</a>                    | No   | No                          | No                          | Yes                         | Yes                         |
| Windows 7 64- <a href="#">bit</a>                    | No   | No                          | No                          | No                          | Yes                         |
| Windows Embedded Standard 7, 32- <a href="#">bit</a> | No   | No                          | No                          | Yes                         | Yes                         |
| Windows Embedded Standard 7, 64- <a href="#">bit</a> | No   | No                          | No                          | Yes                         | Yes                         |
| Windows XP Professional                              | No   | Yes                         | Yes                         | Yes                         | Yes                         |
| Windows Embedded Standard 2009                       | Yes  |                             |                             |                             |                             |
| <a href="#">Software</a>                             |  |                             |                             |                             |                             |
| PVI Transfer   | ≥V4.0.0.8 (part of PVI Development Setup ≥V3.0.2.3014)   |                             |                             |                             |                             |
| B&R Embedded OS Installer                            | ≥V3.10   | ≥V3.10                      | ≥V3.10                      | ≥V3.20                      | ≥V3.21                      |
| <b>Environmental conditions</b>                      |  |                             |                             |                             |                             |
| Temperature  |  |                             |                             |                             |                             |
| Operation  | -40 to 85°C  |                             |                             |                             |                             |
| Storage  | -50 to 100°C   |                             |                             |                             |                             |
| Transport  | -50 to 100°C   |                             |                             |                             |                             |
| Relative humidity                                    |  |                             |                             |                             |                             |
| Operation  | Max. 85% at 85°C   |                             |                             |                             |                             |
| Storage  | Max. 85% at 85°C   |                             |                             |                             |                             |
| Transport  | Max. 85% at 85°C   |                             |                             |                             |                             |
| Vibration  |  |                             |                             |                             |                             |
| Operation  | 10 to 2000 Hz: 20 g peak   |                             |                             |                             |                             |
| Storage  | 10 to 2000 Hz: 20 g peak   |                             |                             |                             |                             |
| Transport  | 10 to 2000 Hz: 20 g peak   |                             |                             |                             |                             |
| Shock  |  |                             |                             |                             |                             |
| Operation  | 1500 g peak, 0.5 ms  |                             |                             |                             |                             |
| Storage  | 1500 g peak, 0.5 ms  |                             |                             |                             |                             |
| Transport  | 1500 g peak, 0.5 ms  |                             |                             |                             |                             |
| <b>Mechanical characteristics</b>                    |  |                             |                             |                             |                             |
| Dimensions   |  |                             |                             |                             |                             |
| Width  | 42.8 ±0.10 mm  |                             |                             |                             |                             |
| Length   | 36.4 ±0.10 mm  |                             |                             |                             |                             |
| Depth  | 3.6 ±0.10 mm   |                             |                             |                             |                             |
| Weight   | 10 g   |                             |                             |                             |                             |

Table 291: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

- 1) In accordance with JEDEC (JESD47), EOL conditions are not permitted to be reached before 18 months. A higher average of the daily write workload reduces the expected service life and data retention of the data storage [device](#).
- 2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 3) Yes, although applies only if all components installed within the complete system have this certification.
- 4) TBW = Terabytes written.  
Sequential access without a file system.

| Product ID                          | 5CFAST.2048-00<br>≤ Rev. D0   | 5CFAST.4096-00<br>≤ Rev. D0 | 5CFAST.8192-00<br>≤ Rev. D0 | 5CFAST.016G-00<br>≤ Rev. D0 | 5CFAST.032G-00<br>≤ Rev. D0 |
|-------------------------------------|---|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| General information                 |   |                             |                             |                             |                             |
| Capacity                            | 2 GB  | 4 GB                        | 8 GB                        | 16 GB                       | 32 GB                       |
| Data retention <sup>1)</sup>        | 10 years  |                             |                             |                             |                             |
| Data reliability                    | <1 unrecoverable error in 10 <sup>14</sup> bit read accesses  |                             |                             |                             |                             |
| Lifetime monitoring                 | Yes   |                             |                             |                             |                             |
| MTBF                                | >2,500,000 hours (at 25°C)  |                             |                             |                             |                             |
| Maintenance                         | None  |                             |                             |                             |                             |
| Supported operating modes           | SATA 2.6, max. PIO Mode 4, Multiword DMA Mode 2, Ultra DMA Mode 6   |                             |                             |                             |                             |
| Sequential read                     |   |                             |                             |                             |                             |
| Typical                             |   |                             |                             |                             |                             |
| With 128 kB block size              | 56 MB/s   | 107 MB/s                    | 116 MB/s                    | 116 MB/s                    | 116 MB/s                    |
| With 4 kB block size                | 23 MB/s   | 26 MB/s                     | 29 MB/s                     | 29 MB/s                     | 29 MB/s                     |
| Maximum                             |   |                             |                             |                             |                             |
| With 128 kB block size              | 60 MB/s   | 110 MB/s                    | 120 MB/s                    | 120 MB/s                    | 120 MB/s                    |
| With 4 kB block size                | 25 MB/s   | 30 MB/s                     | 35 MB/s                     | 35 MB/s                     | 35 MB/s                     |
| Sequential write                    |   |                             |                             |                             |                             |
| Typical                             |   |                             |                             |                             |                             |
| With 128 kB block size              | 24 MB/s   | 49 MB/s                     | 93 MB/s                     | 93 MB/s                     | 93 MB/s                     |
| With 4 kB block size                | 17 MB/s   | 19 MB/s                     | 21 MB/s                     | 21 MB/s                     | 21 MB/s                     |
| Maximum                             |   |                             |                             |                             |                             |
| With 128 kB block size              | 30 MB/s   | 55 MB/s                     | 100 MB/s                    | 100 MB/s                    | 100 MB/s                    |
| With 4 kB block size                | 20 MB/s   | 25 MB/s                     | 25 MB/s                     | 25 MB/s                     | 25 MB/s                     |
| Certification                       |   |                             |                             |                             |                             |
| CE                                  | Yes   |                             |                             |                             |                             |
| UL                                  | cULus E115267<br>Industrial Control Equipment   |                             |                             |                             |                             |
| HazLoc                              | cULus HazLoc E180196<br>Industrial Control Equipment<br>for Hazardous Locations   |                             |                             |                             |                             |
| DNV GL                              | Class I, Division 2, Groups ABCD, T4 <sup>2)</sup><br>Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br>EMC: <b>B</b> (Bridge and open deck) <sup>3)</sup> |                             |                             |                             |                             |
| GOST-R                              | Yes   |                             |                             |                             |                             |
| Endurance <sup>1)</sup>             |   |                             |                             |                             |                             |
| SLC flash                           | Yes   |                             |                             |                             |                             |
| Guaranteed data volume              |   |                             |                             |                             |                             |
| Guaranteed <sup>4)</sup>            | 185 TBW   | 371 TBW                     | 745 TBW                     | 1468 TBW                    | 2937 TBW                    |
| Clear/Write cycles                  |   |                             |                             |                             |                             |
| Guaranteed                          | 100,000   |                             |                             |                             |                             |
| Wear leveling                       | Static  |                             |                             |                             |                             |
| S.M.A.R.T. support                  | Yes   |                             |                             |                             |                             |
| Support                             |   |                             |                             |                             |                             |
| Hardware                            | APC910, PPC900  |                             |                             |                             |                             |
| Operating systems                   |   |                             |                             |                             |                             |
| Windows 7 32-bit                    | No  | No                          | No                          | Yes                         | Yes                         |
| Windows 7 64-bit                    | No  | No                          | No                          | No                          | Yes                         |
| Windows Embedded Standard 7, 32-bit | No  | No                          | No                          | Yes                         | Yes                         |
| Windows Embedded Standard 7, 64-bit | No  | No                          | No                          | Yes                         | Yes                         |
| Windows XP Professional             | No  | Yes                         | Yes                         | Yes                         | Yes                         |
| Windows Embedded Standard 2009      | Yes   |                             |                             |                             |                             |
| Software                            |   |                             |                             |                             |                             |
| PVI Transfer                        | ≥V4.0.0.8 (part of PVI Development Setup ≥V3.0.2.3014)  |                             |                             |                             |                             |
| B&R Embedded OS Installer           | ≥V3.10  | ≥V3.10                      | ≥V3.10                      | ≥V3.20                      | ≥V3.21                      |
| Environmental conditions            |   |                             |                             |                             |                             |
| Temperature                         |   |                             |                             |                             |                             |
| Operation                           | 0 to 70°C   |                             |                             |                             |                             |
| Storage                             | -50 to 100°C  |                             |                             |                             |                             |
| Transport                           | -50 to 100°C  |                             |                             |                             |                             |
| Relative humidity                   |   |                             |                             |                             |                             |
| Operation                           | Max. 85% at 70°C  |                             |                             |                             |                             |
| Storage                             | Max. 85% at 70°C  |                             |                             |                             |                             |
| Transport                           | Max. 85% at 70°C  |                             |                             |                             |                             |
| Vibration                           |   |                             |                             |                             |                             |
| Operation                           | 10 to 2000 Hz: 20 g peak  |                             |                             |                             |                             |
| Storage                             | 10 to 2000 Hz: 20 g peak  |                             |                             |                             |                             |
| Transport                           | 10 to 2000 Hz: 20 g peak  |                             |                             |                             |                             |

Table 292: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

| Product ID                 | 5CFAST.2048-00<br>≤ Rev. D0 | 5CFAST.4096-00<br>≤ Rev. D0 | 5CFAST.8192-00<br>≤ Rev. D0 | 5CFAST.016G-00<br>≤ Rev. D0 | 5CFAST.032G-00<br>≤ Rev. D0 |
|----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Shock                      |                             |                             |                             |                             |                             |
| Operation                  | 1500 g peak, 0.5 ms         |                             |                             |                             |                             |
| Storage                    | 1500 g peak, 0.5 ms         |                             |                             |                             |                             |
| Transport                  | 1500 g peak, 0.5 ms         |                             |                             |                             |                             |
| Mechanical characteristics |                             |                             |                             |                             |                             |
| Dimensions                 |                             |                             |                             |                             |                             |
| Width                      | 42.8 ±0.10 mm               |                             |                             |                             |                             |
| Length                     | 36.4 ±0.10 mm               |                             |                             |                             |                             |
| Depth                      | 3.6 ±0.10 mm                |                             |                             |                             |                             |
| Weight                     | 10 g                        |                             |                             |                             |                             |

Table 292: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

- 1) In accordance with JEDEC (JESD47), EOL conditions are not permitted to be reached before 18 months. A higher average of the daily write workload reduces the expected service life and data retention of the data storage [device](#).
- 2) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
- 3) Yes, although applies only if all components installed within the complete system have this certification.
- 4) TBW = Terabytes written.  
Sequential access without a file system.

#### 4.3.4 Temperature/Humidity diagram

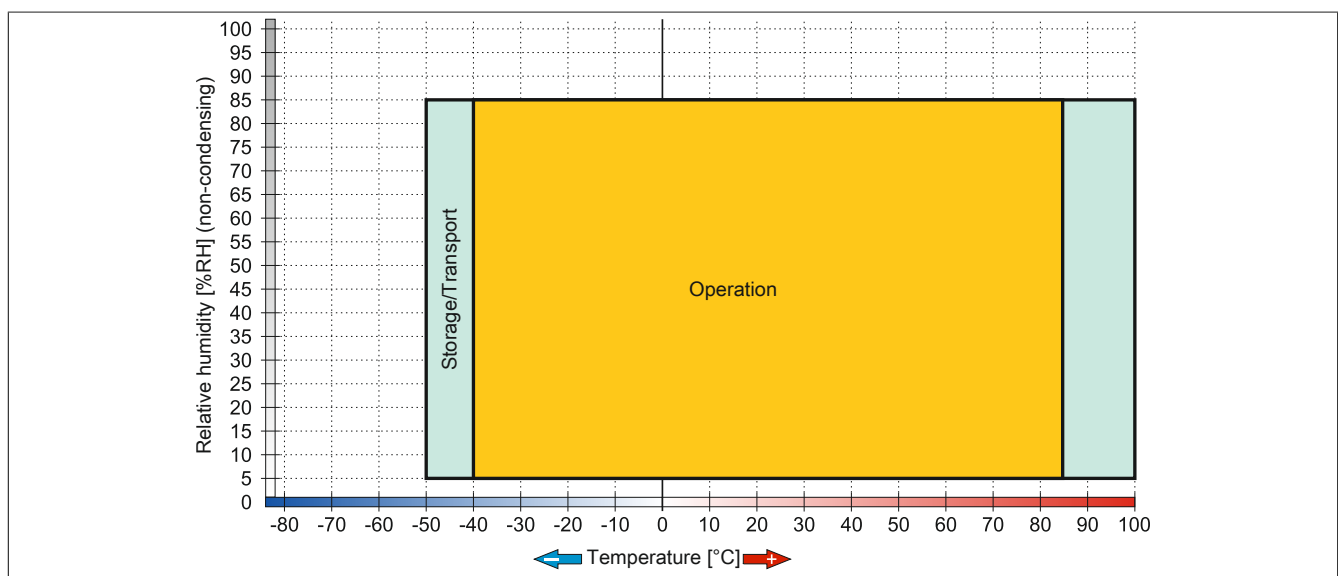


Figure 171: 5CFAST.xxxx-00 ≥ Rev. E0 - Temperature/Humidity diagram

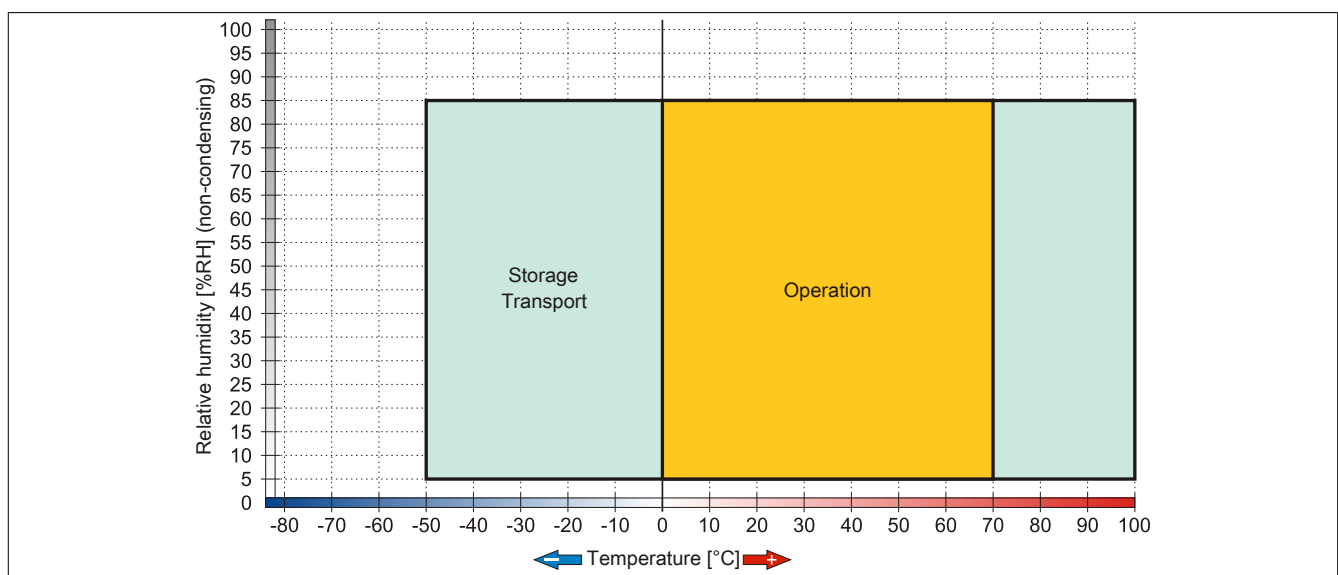


Figure 172: 5CFAST.xxxx-00 ≤ Rev. D0 - Temperature/Humidity diagram

## 4.4 5CFAST.xxxx-10

### 4.4.1 General information

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

### 4.4.2 Order data


| Model number   | Short description      | Figure  |
|----------------|------------------------|---|
|                | <b>CFast cards</b>     |  |
| 5CFAST.032G-10 | CFast card, 32 GB MLC  |   |
| 5CFAST.064G-10 | CFast card, 64 GB MLC  |   |
| 5CFAST.128G-10 | CFast card, 128 GB MLC |   |

Table 293: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Order data

### 4.4.3 Technical data

#### Information:

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

| Model number                  | 5CFAST.032G-10  | 5CFAST.064G-10 | 5CFAST.128G-10 |
|-------------------------------|---|----------------|----------------|
| General information           |   |                |                |
| Capacity                      | 32 GB   | 64 GB          | 128 GB         |
| Data retention <sup>1)</sup>  | 10 years <sup>2)</sup>  |                |                |
| Data reliability              | <1 unrecoverable error in 10 <sup>17</sup> bit read accesses  |                |                |
| Lifetime monitoring           | Yes   |                |                |
| MTBF                          | >3,000,000 hours (at 25°C)  |                |                |
| Maintenance                   | None  |                |                |
| Supported operating modes     | SATA 3, SATA 2, SATA 1  |                |                |
| Sequential read               |   |                |                |
| Maximum                       | 300 MB/s  | 310 MB/s       | 310 MB/s       |
| Sequential write              |   |                |                |
| Maximum                       | 75 MB/s   | 150 MB/s       | 150 MB/s       |
| Certification                 |   |                |                |
| 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 <sup>3)</sup>                   |                |                |
| DNV GL                        | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br>EMC: <b>B</b> (Bridge and open deck) <sup>4)</sup> |                |                |
| Endurance <sup>1)</sup>       |   |                |                |
| MLC flash                     | Yes   |                |                |
| Guaranteed data volume        |   |                |                |
| Guaranteed <sup>5)</sup>      | 86.4 TBW  | 172.8 TBW      | 345.6 TBW      |
| Clear/Write cycles            |   |                |                |
| Guaranteed                    | 3000  |                |                |
| Wear leveling                 | Static  |                |                |
| Error correction coding (ECC) | Yes   |                |                |
| S.M.A.R.T. support            | Yes   |                |                |
| Support                       |   |                |                |
| Hardware                      | APC910, APC2100, PPC900, PPC2100  |                |                |

Table 294: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

| Model number                        | 5CFAST.032G-10      | 5CFAST.064G-10            | 5CFAST.128G-10     |
|-------------------------------------|---------------------|---------------------------|--------------------|
| Operating systems                   |                     |                           |                    |
| Windows 7 32-bit                    |                     | Yes                       |                    |
| Windows 7 64-bit                    |                     | Yes                       |                    |
| Windows Embedded Standard 7, 32-bit |                     | Yes                       |                    |
| Windows Embedded Standard 7, 64-bit |                     | Yes                       |                    |
| Windows XP Professional             |                     | Yes                       |                    |
| Windows Embedded Standard 2009      |                     | Yes                       |                    |
| Software                            |                     |                           |                    |
| PVI Transfer                        | ≥ V4.0.20 or V4.1.5 | ≥ V4.0.20 or V4.1.5       | ≥V4.0.22 or V4.1.6 |
| B&R Embedded OS Installer           |                     | ≥V3.21                    |                    |
| <b>Environmental conditions</b>     |                     |                           |                    |
| 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                           |                     | 7 to 2000 Hz: 20 g peak   |                    |
| Storage                             |                     | 7 to 2000 Hz: 20 g peak   |                    |
| Transport                           |                     | 7 to 2000 Hz: 20 g peak   |                    |
| Shock                               |                     |                           |                    |
| Operation                           |                     | 1500 g peak, 0.5 ms       |                    |
| Storage                             |                     | 1500 g peak, 0.5 ms       |                    |
| Transport                           |                     | 1500 g peak, 0.5 ms       |                    |
| <b>Mechanical characteristics</b>   |                     |                           |                    |
| Dimensions                          |                     |                           |                    |
| Width                               |                     | 42.8 ±0.10 mm             |                    |
| Length                              |                     | 36.4 ±0.10 mm             |                    |
| Depth                               |                     | 3.6 ±0.10 mm              |                    |
| Weight                              |                     | 10 g                      |                    |

Table 294: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

- 1) In accordance with JEDEC (JESD47), EOL conditions are not permitted to be reached before 18 months. A higher average of the daily write workload reduces the expected service life and data retention of the data storage [device](#).
- 2) At 25°C ambient temperature at the start of service life.
- 3) 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) Yes, although applies only if all components installed within the complete system have this certification.
- 5) TBW = Terabytes written.  
Sequential access without a file system.

#### 4.4.4 Temperature/Humidity diagram

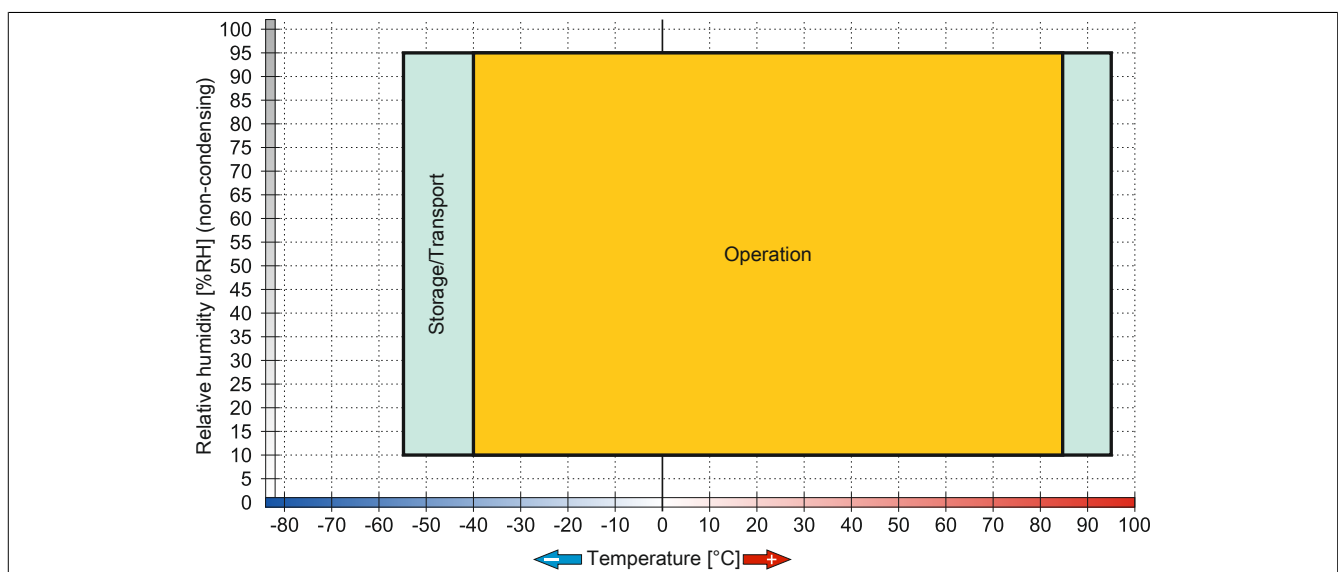


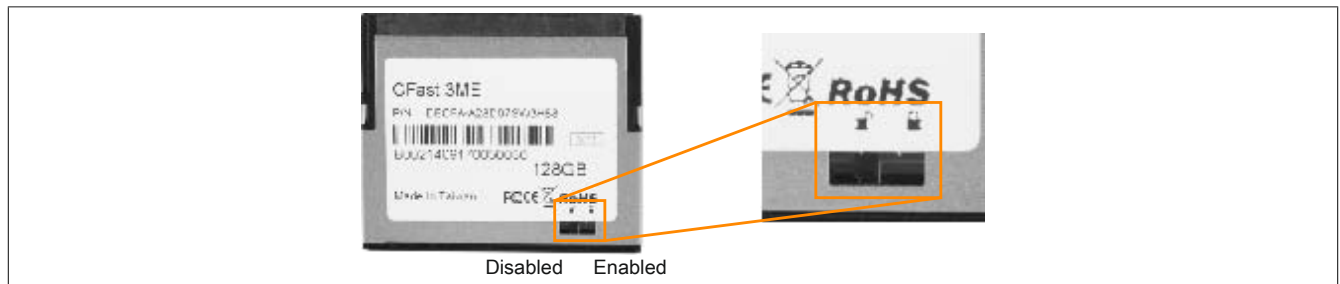
Figure 173: 5CFAST.xxxx-10 - Temperature/Humidity diagram

#### 4.4.5 Write protection

Write protection [can](#) prevent data from being deleted or changed on the CFast card. If write protection is enabled, data [can](#) only be read.

##### Information:

**If an operating system is installed on the CFast card, write protection must be disabled.**





5 PCIe plug-in cards

5.1 5ACPCE.ETH1-00

5.1.1 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 single-width PCI Express slot.

- PCIe x1 Ethernet card
- 1x Ethernet interface (10/100/1000 Mbit/s)



Figure 174: 5ACPCE.ETH1-00 - PCIe Ethernet card 10/100/1000

5.1.2 Order data

| Model number   | Short description                                   | Figure |
|----------------|---|--------|
| Accessories    |   |        |
| 5ACPCE.ETH1-00 | PCIe carte - 1x ETH 10/100/1000 - For APC910/PPC900 |        |

Table 295: 5ACPCE.ETH1-00 - Order data

5.1.3 Technical data

Information:

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

| Model number               | 5ACPCE.ETH1-00                                   |
|----------------------------|--|
| General information        |  |
| B&R ID code                | DBF3   |
| Diagnostics                |  |
| Data transfer              | Yes, using <a href="#">LED</a> status indicators |
| Interfaces                 |  |
| <a href="#">Ethernet</a>   |  |
| Quantity                   | 1  |
| Controller                 | Intel I210                                       |
| Design                     | Shielded RJ45                                    |
| Transfer rate              | 10/100/1000 Mbit/s <sup>1)</sup>                 |
| Cable length               | Max. 100 m between two stations (segment length) |
| Electrical characteristics |  |
| Power consumption          | 1 W  |
| Environmental conditions   |  |
| Temperature                |  |
| Operation                  | 0 to 55°C  |
| Storage                    | -20 to 60°C                                      |
| Transport                  | -20 to 60°C                                      |
| Relative humidity          |  |
| Operation                  | 5 to 90%, non-condensing                         |
| Storage                    | 5 to 95%, non-condensing                         |
| Transport                  | 5 to 95%, non-condensing                         |

Table 296: 5ACPCE.ETH1-00 - Technical data

1) Switching takes place automatically.

### 5.1.3.1 Ethernet interface

| Ethernet connection |   |   |
|---------------------|---|---|
| Controller          | Intel I210  |   |
| Power supply        | PCIe x1 for 3.3 V   |   |
| Cabling             | S/STP (Cat 5e)  |   |
| Transfer rate       | 10/100/1000 Mbit/s <sup>1)</sup>                              |   |
| Cable length        | Max. 100 m (min. Cat5e)                                       |   |
| LED                 | On  | Off   |
| Green               | 100 Mbit/s  | 10 Mbit/s <sup>2)</sup>                         |
| Orange              | Link ( <a href="#">Ethernet</a> network connection available) | Activity (blinking - data transfer in progress) |

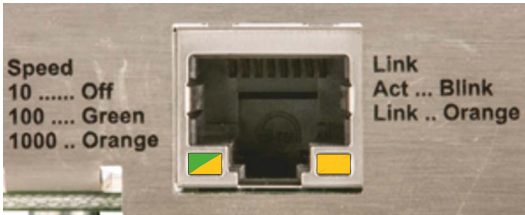


Table 297: 5ACPCE.ETH1-00 - Ethernet interface

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.

### 5.1.4 Driver support

A special driver is required in order to operate the Intel I210 [Ethernet controller](#). Drivers for approved operating systems are available in the Downloads section of the B&R website [www.br-automation.com](http://www.br-automation.com). Approved operating systems include Windows 7, Windows 10 IoT Enterprise 2015 and B&R Debian 8.

Wake-on-LAN (WoL) and PXE booting are not supported.

#### Information:

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

5.1.5 Dimensions

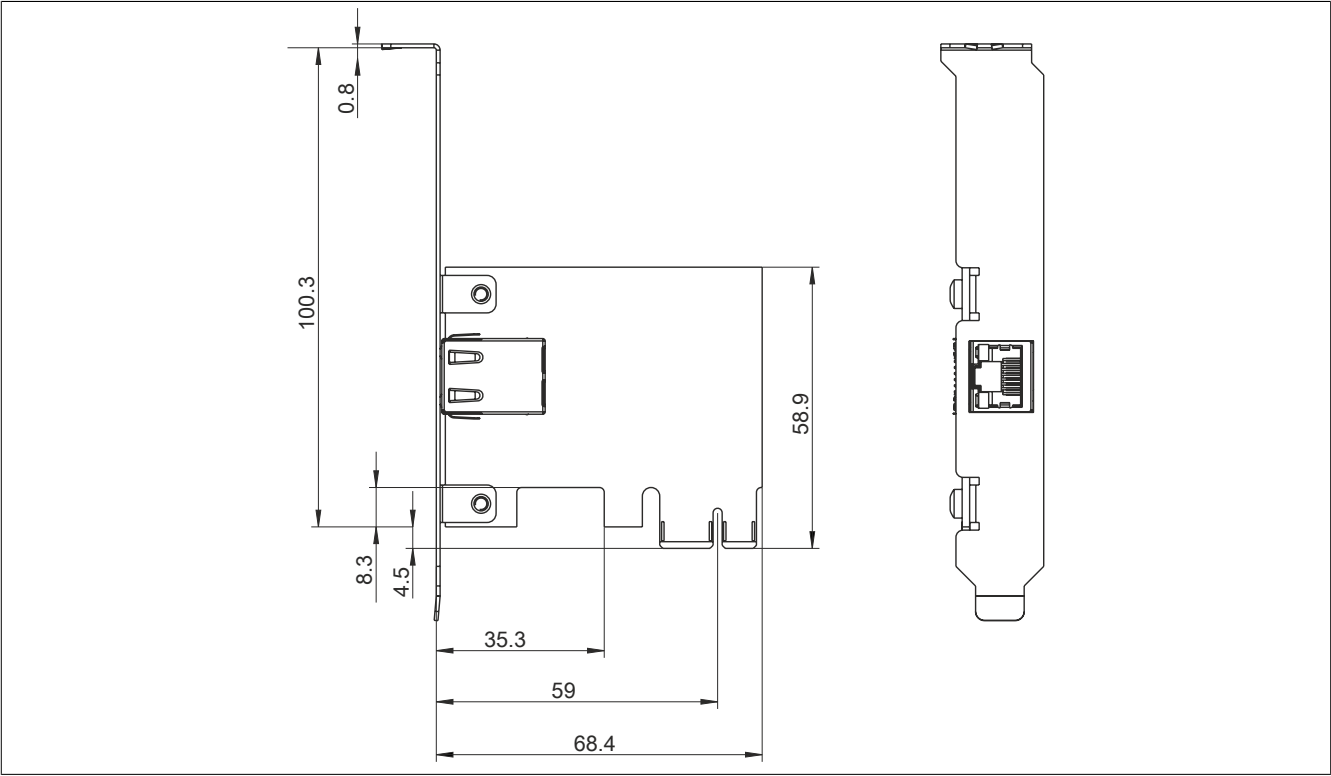


Figure 175: 5ACPCE.ETH1-00 - Dimensions

## 5.2 5ACPCE.ETH4-00

### 5.2.1 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)

### 5.2.2 Order data


| Model number       | Short description                                      | Figure  |
|--------------------|--|---|
| <b>Accessories</b> |  |  |
| 5ACPCE.ETH4-00     | PCIe card - 4-port ETH 10/100/1000 - For APC910/PPC900 |   |

Table 298: 5ACPCE.ETH4-00 - Order data

### 5.2.3 Technical data

#### Information:

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

| Model number                      | 5ACPCE.ETH4-00                                   |
|-----------------------------------|--|
| <b>General information</b>        |  |
| B&R ID code                       | EC3B   |
| Diagnostics                       |  |
| Data transfer                     | Yes, using LED status indicators                 |
| <b>Interfaces</b>                 |  |
| <b>Ethernet</b>                   |  |
| Quantity                          | 4  |
| Controller                        | Intel I350                                       |
| Design                            | Shielded RJ45                                    |
| Transfer rate                     | 10/100/1000 Mbit/s <sup>1)</sup>                 |
| Cable length                      | Max. 100 m between two stations (segment length) |
| <b>Electrical characteristics</b> |  |
| Power consumption                 | 4 W  |
| <b>Environmental conditions</b>   |  |
| <b>Temperature</b>                |  |
| Operation                         | 0 to 55°C  |
| Storage                           | -20 to 60°C                                      |
| Transport                         | -20 to 60°C                                      |
| <b>Relative humidity</b>          |  |
| Operation                         | 5 to 90%, non-condensing                         |
| Storage                           | 5 to 95%, non-condensing                         |
| Transport                         | 5 to 95%, non-condensing                         |

Table 299: 5ACPCE.ETH4-00 - Technical data

1) Switching takes place automatically.

### 5.2.3.1 Ethernet interface

| Ethernet connection |                                  |   |
|---------------------|----------------------------------|---|
| Controller          | Intel I350                       |   |
| Power supply        | PCIe x4 for 3.3 V                |   |
| Cabling             | S/STP (Cat 5e)                   |   |
| Transfer rate       | 10/100/1000 Mbit/s <sup>1)</sup> |   |
| Cable length        | Max. 100 m (min. Cat5e)          |   |
| LED                 | On                               | Off   |
|                     | Green                            | 100 Mbit/s                                      |
|                     | Orange                           | Link (Ethernet network connection available)    |
|                     |                                  | Activity (blinking - data transfer in progress) |

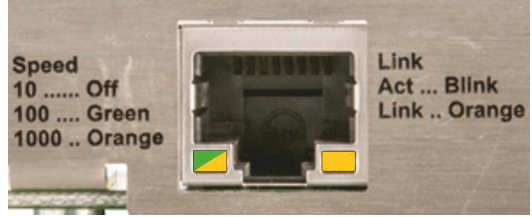


Table 300: 5ACPCE.ETH4-00 - Ethernet interface

- 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.

### 5.2.4 Driver support

A special driver is required in order to operate Intel Ethernet controller I350. Drivers for approved operating systems are available in the Downloads section of the B&R website [www.br-automation.com](http://www.br-automation.com). Approved operating systems include Windows 7, Windows 10 IoT Enterprise 2015 and B&R Debian 8. Wake-on-LAN (WoL) and PXE booting are not supported.

#### Information:

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

### 5.2.5 Dimensions

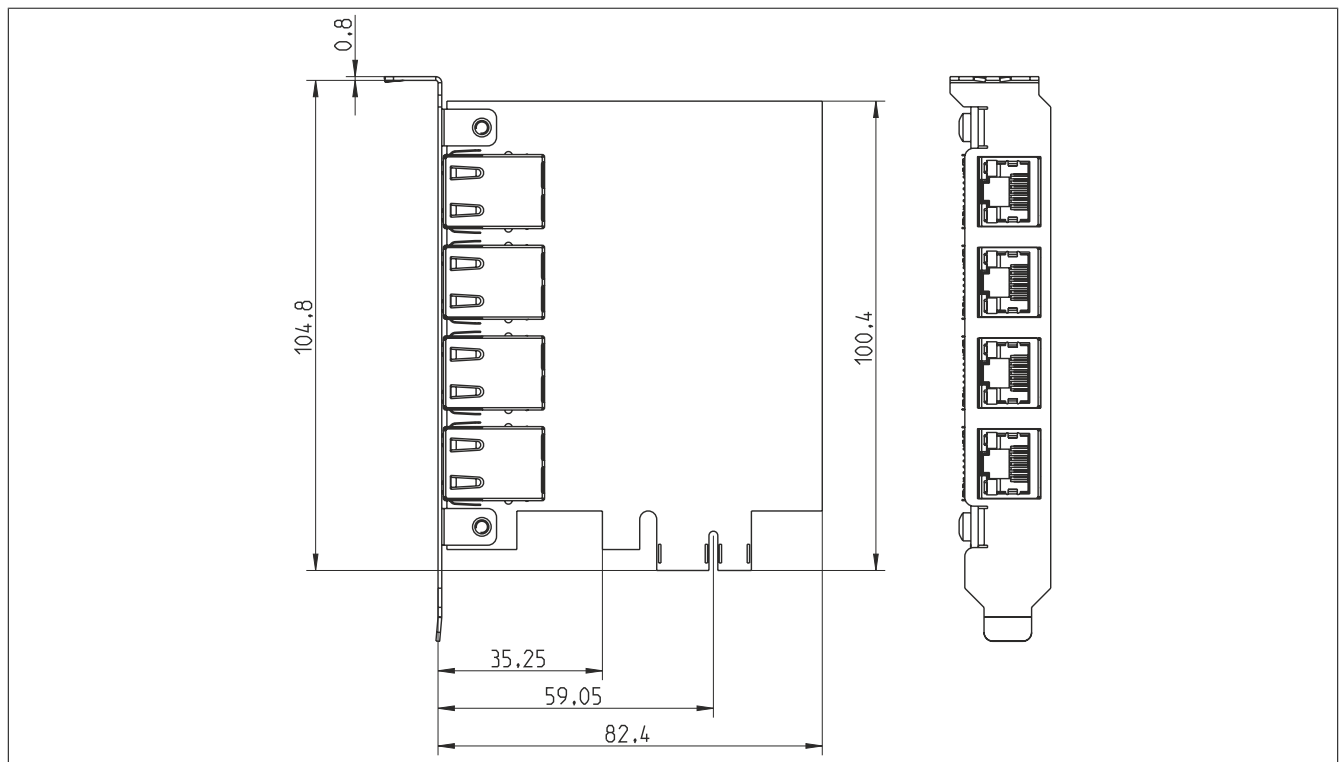


Figure 176: 5ACPCE.ETH4-00 - Dimensions

## 6 USB flash drives

### 6.1 5MMUSB.xxxx-01

#### 6.1.1 General information

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

#### Information:

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

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

#### 6.1.2 Order data


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

Table 301: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

#### 6.1.3 Technical data

| Model number          | 5MMUSB.2048-01  | 5MMUSB.4096-01 |
|-----------------------|---|----------------|
| General information   |   |                |
| Capacity              | 2 GB  | 4 GB           |
| LED status indicators | 1 LED (green) <sup>1)</sup>   |                |
| MTBF                  | >3,000,000 hours  |                |
| Type                  | USB 1.1, USB 2.0  |                |
| Maintenance           | None  |                |
| Default file system   | FAT32   |                |
| Certification         |   |                |
| CE                    | Yes   |                |
| UL                    | Not relevant  |                |
| GOST-R                | Yes   |                |
| Interfaces            |   |                |
| USB                   |   |                |
| Type                  | USB 1.1, USB 2.0  |                |
| Connection            | To any USB type A interface   |                |
| Transfer rate         | Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s) |                |
| Sequential reading    | Full speed max. 1 MB/s,<br>High speed max. 32 MB/s                      |                |
| Sequential writing    | Full speed max. 0.9 MB/s,<br>High speed max. 23 MB/s                    |                |
| Endurance             |   |                |
| SLC flash             | Yes   |                |
| Data retention        | >10 years   |                |
| Data reliability      | <1 unrecoverable error in 10 <sup>14</sup> bit read accesses            |                |
| Connection cycles     | >1500   |                |

Table 302: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

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

Table 302: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

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

### 6.1.4 Temperature/Humidity diagram

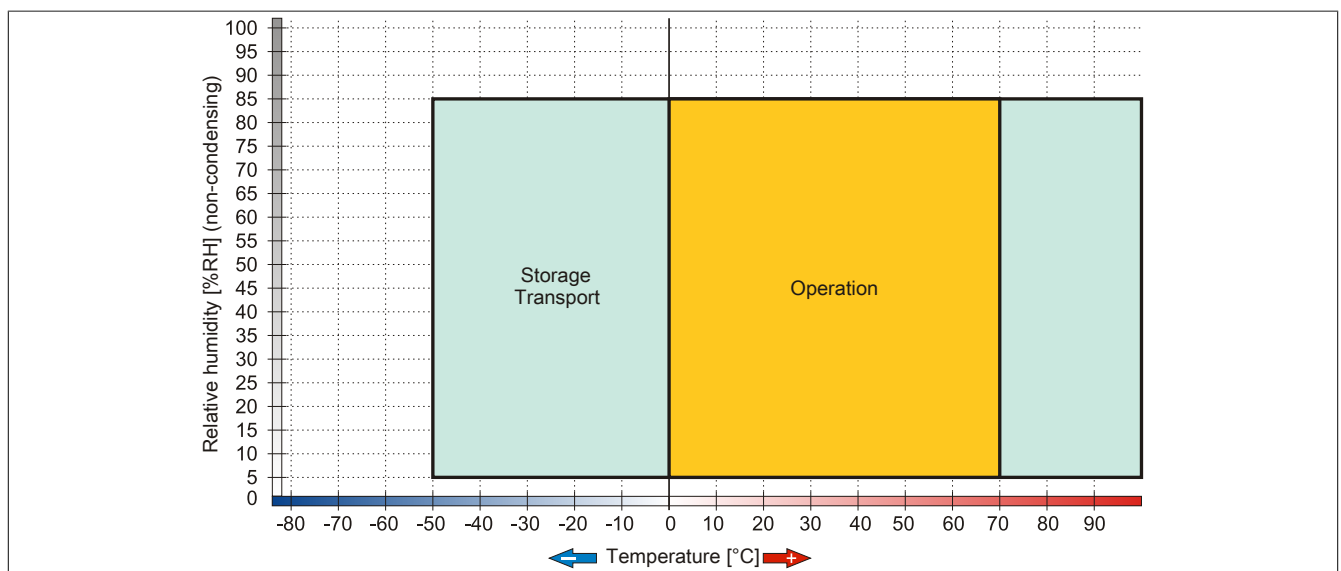


Figure 177: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

## 7 USB media drive

### 7.1 5MD900.USB2-02

#### 7.1.1 General information

The USB media drive is equipped with a DVD-R/RW DVD+R/RW drive, CompactFlash slot and one USB interface on both the front and back. It is connected to a USB interface on the B&R Industrial PC.

- Desktop or cabinet-mounted operation (mounting rail brackets)
- Integrated DVD-R/RW DVD+R/RW drive
- Integrated IDE/ATAPI CompactFlash slot (hot pluggable)
- Integrated USB 2.0 connection
- +24 VDC supply (back)
- USB 2.0 connection (back)
- Optional front cover

#### 7.1.2 Order data


| Model number   | Short description   | Figure  |
|----------------|---|---|
|                | <b>USB accessories</b>  |  |
| 5MD900.USB2-02 | USB 2.0 drive combination - DVD-R/RW, DVD+R/RW - CompactFlash slot                |   |
|                | <b>Required accessories</b>   |   |
|                | <b>Accessories</b>  |   |
| 0TB103.9       | Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm <sup>2</sup> |   |
| 0TB103.91      | Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm <sup>2</sup>  |   |
|                | <b>Other</b>  |   |
| 5SWUT1.0000-00 | OEM Nero CD-RW Software, only available with a CD writer.                         |   |
|                | <b>USB cables</b>   |   |
| 5CAUSB.0018-00 | USB 2.0 connection cable - Type A - Type B connector - 1.8 m                      |   |
| 5CAUSB.0050-00 | USB 2.0 connection cable - Type A - Type B connector - 5 m                        |   |

Table 303: 5MD900.USB2-02 - Order data

#### 7.1.3 Interfaces

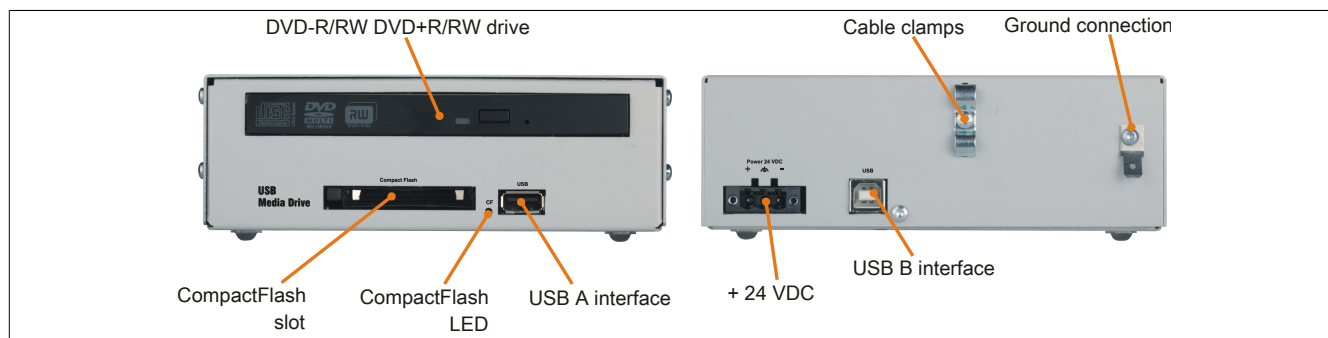


Figure 178: 5MD900.USB2-02 - Interfaces

#### 7.1.4 Technical data

| Model number               | 5MD900.USB2-02  |
|----------------------------|---|
| <b>General information</b> |   |
| Max. cable length          | 5 m (without hub)   |
| Certification              |   |
| CE                         | Yes   |
| UL                         | cULus E115267   |
| GOST-R                     | Industrial Control Equipment                                  |
|                            | Yes   |
| <b>Interfaces</b>          |   |
| CompactFlash slot 1        |   |
| Type                       | Type I  |
| Connection                 | IDE/ATAPI   |
| Activity LED               | Signals read or write access to an inserted CompactFlash card |

Table 304: 5MD900.USB2-02 - Technical data



| Model number                                       | 5MD900.USB2-02   |
|--|--|
| <b>USB</b>   |  |
| Type   | USB 2.0  |
| Design   | Type A front<br>Type B back  |
| Transfer rate                                      | Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)  |
| Current-carrying capacity                          | Max. 500 mA  |
| <b>CD / DVD drive</b>                              |  |
| Data buffer capacity                               | 2 MB   |
| Data transfer rate                                 | Max. 33.3 MB/s   |
| Speed  | Max. 5090 rpm $\pm 1\%$  |
| 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-RW, DVD-Video<br>DVD-RAM (4.7GB, 2.6GB)<br>DVD+R, DVD+R (dual layer), DVD+RW |
| Laser class  | Class 1 laser  |
| Service life                                       | 60000 POH (power-on hours)   |
| <b>Interface</b>                                   |  |
| IDE (ATAPI)  |  |
| Startup time                                       |  |
| CD   | Max. 14 seconds (from 0 rpm to read operation)   |
| DVD  | Max. 15 seconds (from 0 rpm to read operation)   |
| Access time  |  |
| CD   | Typ. 140 ms (24x)  |
| DVD  | Typ. 150 ms (8x)   |
| Readable media                                     |  |
| CD   | CD/CD-ROM (12 cm, 8 cm), CD-R, CD-RW   |
| DVD  | DVD-ROM, DVD-R, DVD-RW, DVD-RAM, DVD+R, DVD+R (dual layer), DVD+RW   |
| Writable media                                     |  |
| CD   | CD-R, CD-RW  |
| DVD  | DVD-R/RW, DVD-RAM (4.7 GB), DVD+R/RW, DVD+R (dual layer)   |
| Read speed   |  |
| CD   | 24x  |
| DVD  | 8x   |
| Write speed  |  |
| CD-R   | 10 to 24x  |
| CD-RW  | 10 to 24x  |
| DVD+R  | 3.3 to 8x  |
| DVD+R (dual layer)                                 | 2.4 to 4x  |
| DVD+RW   | 3.3 to 8x  |
| DVD-R  | 2 to 6x  |
| DVD-R (dual layer)                                 | 2 to 4x  |
| DVD-RAM  | 3 to 5x  |
| DVD-RW   | 2 to 6x  |
| Write methods                                      |  |
| CD   | Disk at once, session at once, packet write, track at once   |
| DVD  | Disk at once, incremental, overwrite, sequential   |
| <b>Electrical characteristics</b>                  |  |
| Nominal voltage                                    | 24 VDC $\pm 25\%$ , SELV <sup>1)</sup>   |
| Overvoltage category in accordance with EN 61131-2 | II   |
| <b>Operating conditions</b>                        |  |
| EN 60529 protection                                | Front: IP65 (only with optional front cover), back: IP20   |
| <b>Environmental conditions</b>                    |  |
| Temperature <sup>2)</sup>                          |  |
| Operation  | 5 to 45°C  |
| Storage  | -20 to 60°C  |
| Transport  | -40 to 60°C  |
| Relative humidity                                  |  |
| Operation  | 20 to 80%  |
| Storage  | 5 to 90%   |
| Transport  | 5 to 95%   |
| Vibration  |  |
| Operation  | 5 to 500 Hz: 0.3 g (2.9 m/s <sup>2</sup> 0-peak)   |
| Storage  | 10 to 100 Hz: 2 g (19.6 m/s <sup>2</sup> 0-peak)   |
| Transport  | 10 to 100 Hz: 2 g (19.6 m/s <sup>2</sup> 0-peak)   |
| Shock  |  |
| Operation  | 5 g, 11 ms   |
| Storage  | 60 g, 11 ms  |
| Transport  | 60 g, 11 ms  |
| Elevation  |  |
| Operation  | Max. 3000 m  |

Table 304: 5MD900.USB2-02 - Technical data

| Model number               | 5MD900.USB2-02                       |
|----------------------------|--------------------------------------|
| Mechanical characteristics |                                      |
| Dimensions                 |                                      |
| Width                      | 156 mm                               |
| Height                     | 52 mm                                |
| Depth                      | 140 mm                               |
| Weight                     | Approx. 1100 g (without front cover) |

Table 304: 5MD900.USB2-02 - Technical data

- 1) EN 60950 requirements must be observed, see section "+24 VDC power supply" in the user's manual.
- 2) Temperature specifications refer to operation at 500 meters. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).

7.1.5 Dimensions

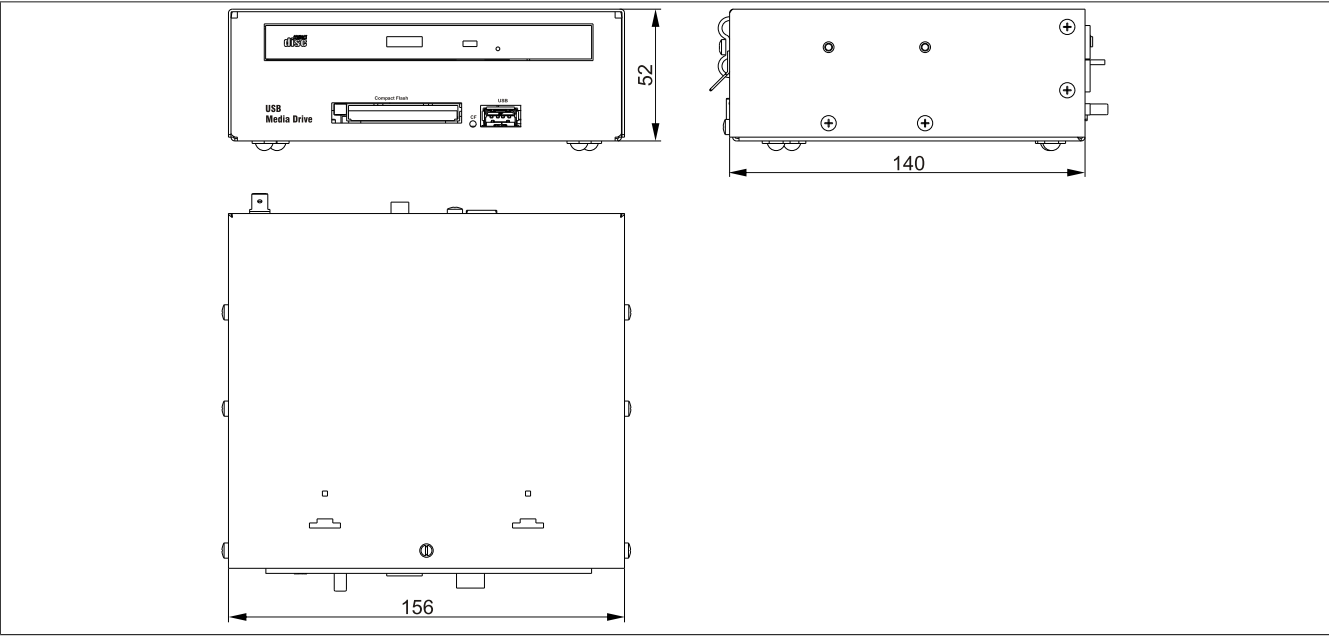


Figure 179: 5MD900.USB2-02 - Dimensions

7.1.6 Dimensions with front cover

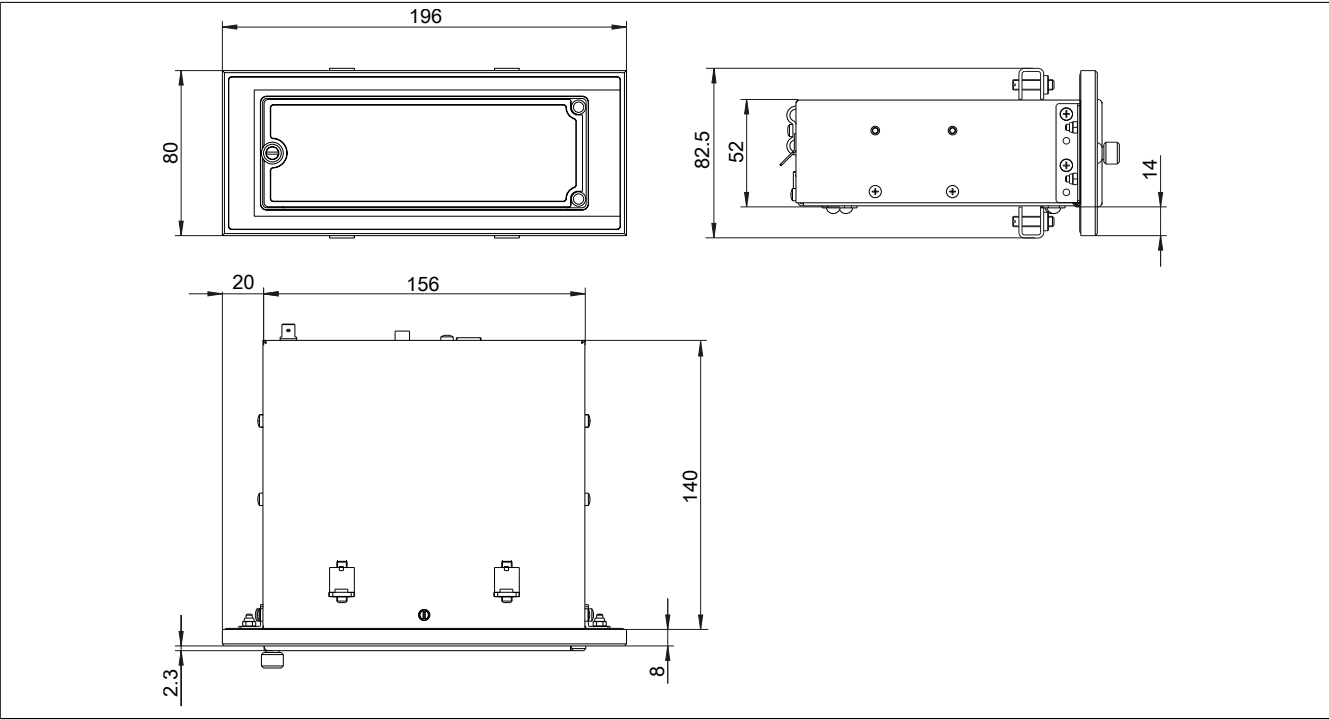


Figure 180: USB media drive with front cover - Dimensions

### 7.1.7 Cutout installation

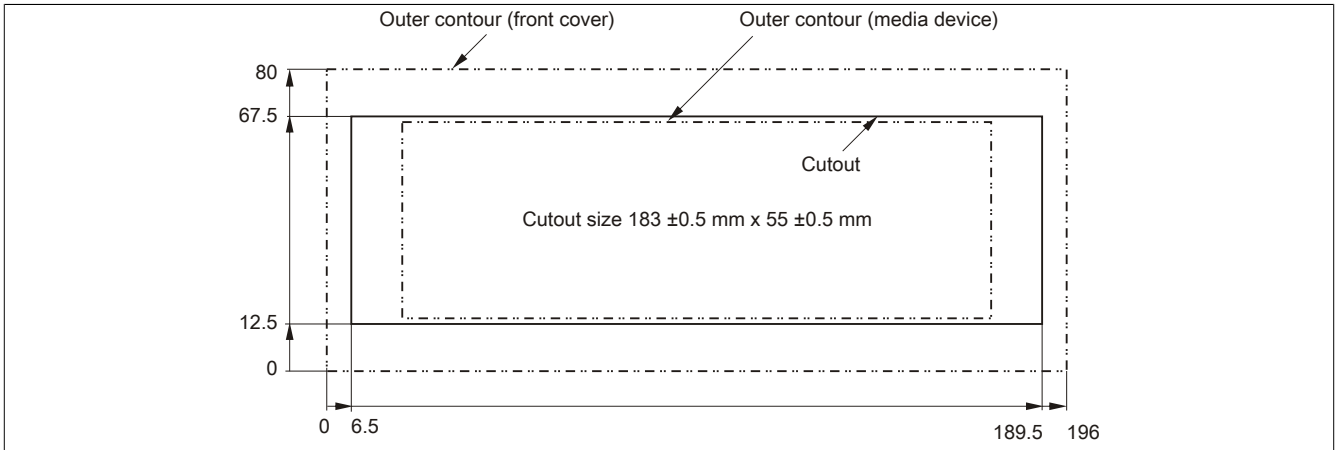


Figure 181: USB media drive with front cover - Installation cutout

### 7.1.8 Content of delivery

| Quantity | Component              |
|----------|------------------------|
| 1        | USB media drive        |
| 2        | Mounting rail brackets |

Table 305: 5MD900.USB2-02 - Content of delivery

### 7.1.9 Installation

The USB media drive can be operated as a desktop device (rubber feet) or cabinet-mounted device (2 mounting rail brackets included).

#### 7.1.9.1 Mounting orientations

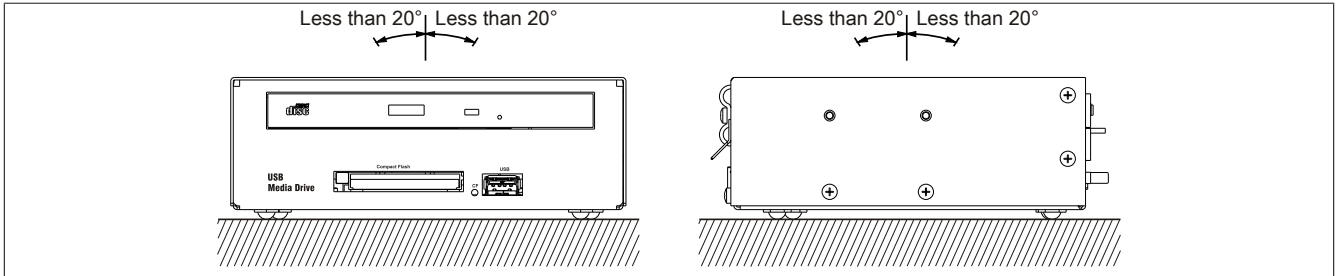


Figure 182: 5MD900.USB2-02 - Mounting orientation

## 7.2 5A5003.03

### 7.2.1 General information

This front cover [can](#) be mounted on the front of the [USB](#) media drive (model number 5MD900.USB2-00, 5MD900.USB2-01 or 5MD900.USB2-02) to protect the [interface](#).

### 7.2.2 Order data


| Model number | Short description                                | Figure  |
|--------------|--|---|
|              | <a href="#">USB accessories</a>                  |  |
| 5A5003.03    | Front cover for drives - 5A5003.02 - 5MD900.USB2 |   |

Table 306: 5A5003.03 - Order data

### 7.2.3 Technical data

| Model number                      | 5A5003.03   |
|-----------------------------------|---|
| <b>General information</b>        |   |
| Certification                     |   |
| CE                                | Yes   |
| UL                                | cULus E115267<br>Industrial <a href="#">Control</a> Equipment |
| GOST-R                            | Yes   |
| <b>Mechanical characteristics</b> |   |
| Front                             |   |
| Panel overlay                     |   |
| Light background                  | Similar to Pantone 427CV                                      |
| Dimensions                        |   |
| Width                             | 196 mm  |
| Height                            | 80 mm   |
| Depth                             | 8 mm  |

Table 307: 5A5003.03 - Technical data

### 7.2.4 Dimensions

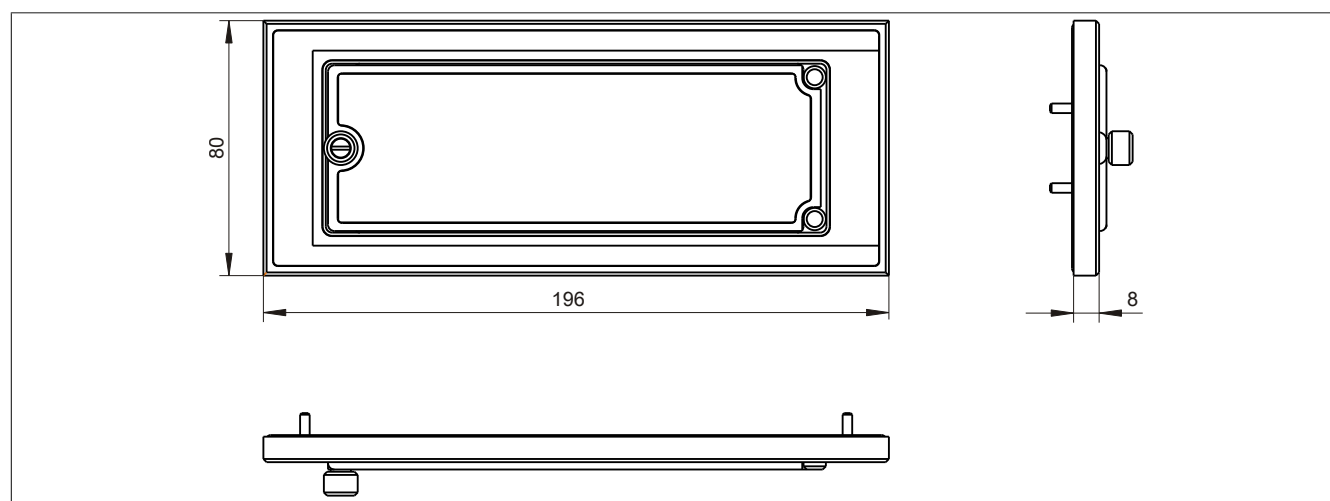


Figure 183: 5A5003.03 - Dimensions

### 7.2.5 Content of delivery

| Quantity | Component   |
|----------|---|
| 1        | Front cover 5A5003.03 for the <a href="#">USB</a> media drive |
| 4        | M3 locknut  |
| 4        | Cover retaining clip  |

Table 308: 5A5003.03 - Content of delivery

## 7.2.6 Installation

The front cover is attached with 2 mounting rail brackets (included with the USB media drive) and 4 M3 locknuts. The 4 retaining clips provided [can](#) be used to mount the USB media drive and front cover as a whole, for example in a [control](#) cabinet door.

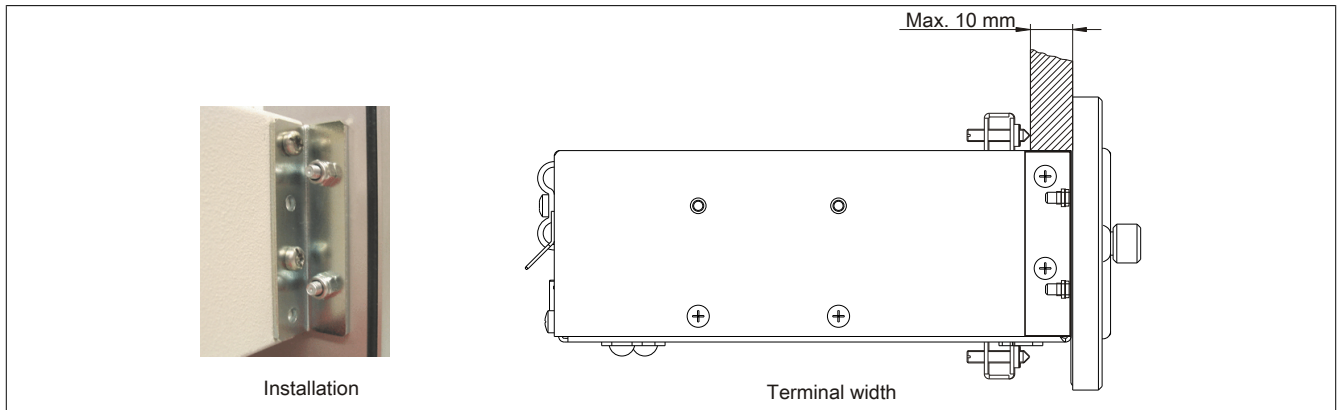


Figure 184: Front cover mounting and installation depth

### 7.2.6.1 Cutout installation

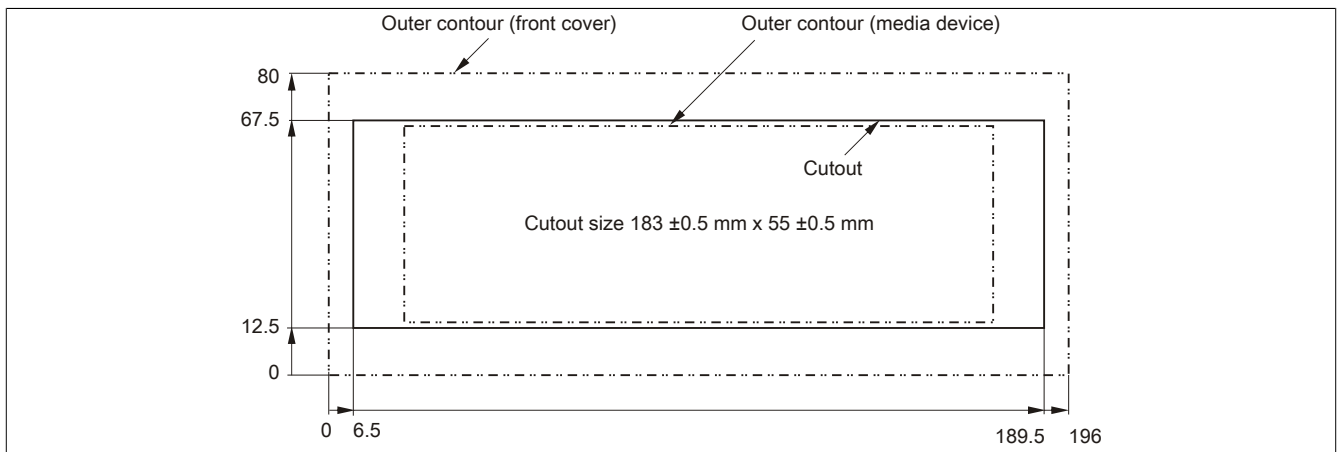


Figure 185: USB media drive with front cover - Installation cutout

## 8 Replacement disk tray

### 8.1 5AC901.FRAM-00

#### 8.1.1 General information

The 5AC901.FRAM-00 replacement disk tray [can](#) be installed on the APC910 in order to exchange a slide-in compact drive as quickly as possible. It [can](#) be used to store the replacement drive.

#### 8.1.2 Order data


| Model number   | Short description            | Figure  |
|----------------|------------------------------|---|
|                | <b>Accessories</b>           |  |
| 5AC901.FRAM-00 | APC910 slide-in compact tray |   |

Table 309: 5AC901.FRAM-00 - Order data

#### 8.1.3 Technical data

| Model number               | 5AC901.FRAM-00 |  |
|----------------------------|----------------|--|
| General information        |                |  |
| Certification              |                |  |
| CE                         | Yes            |  |
| UL                         | Not relevant   |  |
| Mechanical characteristics |                |  |
| Dimensions                 |                |  |
| Width                      | 117 mm         |  |
| Height                     | 105.5 mm       |  |
| Depth                      | 17 mm          |  |

Table 310: 5AC901.FRAM-00 - Technical data

#### 8.1.4 Dimensions

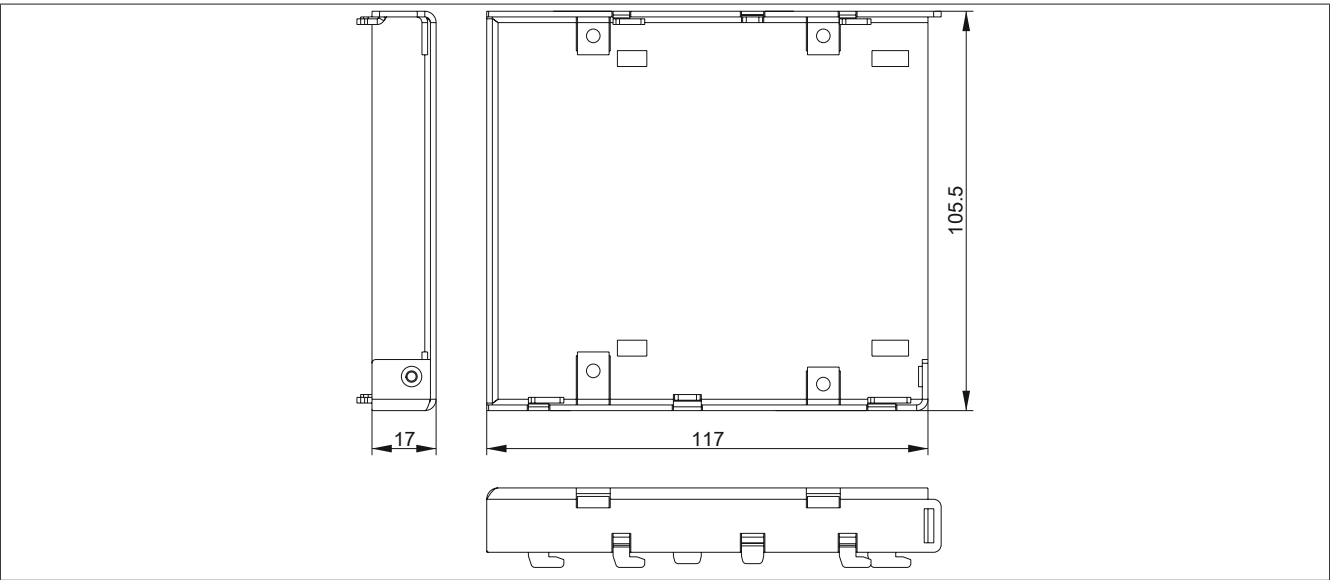


Figure 186: 5AC901.FRAM-00 - Dimensions

## 9 Cables

### 9.1 DVI cables

#### 9.1.1 5CADVI.0xxx-00

##### 9.1.1.1 General information

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

### Caution!

Power must be disconnected before connecting or disconnecting cables.

##### 9.1.1.2 Order data


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

Table 311: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data

##### 9.1.1.3 Technical data

| Model number                     | 5CADVI.0018-00   |  | 5CADVI.0050-00  | 5CADVI.0100-00 |
|----------------------------------|--|--|---|----------------|
| General information              |  |  |   |                |
| Certification                    |  |  |   |                |
| CE                               |  |  | Yes   |                |
| UL                               |  |  | cULus E115267<br>Industrial <b>Control</b> Equipment  |                |
| DNV GL                           |  |  | Environmental Category C, EMC1 <sup>1)</sup>  |                |
| DNV GL                           |  |  | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>1)</sup> |                |
| GOST-R                           |  |  | Yes   |                |
| Cable construction               |  |  |   |                |
| Wire cross section               |  |  | AWG 28  |                |
| Shield                           |  |  | Individual cable pairs, entire cable  |                |
| Complete shielding               |  |  | Tinned copper braiding, optical coverage >86%   |                |
| Outer sheathing                  |  |  |   |                |
| Material                         |  |  | PVC   |                |
| Color                            |  |  | Beige   |                |
| Labeling                         |  |  | AWM STYLE 20276 80°C 30V VW1 <b>DVI</b> DIGITAL SINGLE LINK DER AN  |                |
| Connector                        |  |  |   |                |
| Type                             |  |  | 2x <b>DVI-D</b> (18+1), male  |                |
| Connection cycles                |  |  | 100   |                |
| Locating screw tightening torque |  |  | Max. 0.5 Nm   |                |
| Electrical characteristics       |  |  |   |                |
| Conductor resistance             |  |  | Max. 237 Ω/km   |                |
| Insulation resistance            |  |  | Min. 100 MΩ/km  |                |
| Mechanical characteristics       |  |  |   |                |
| Dimensions                       |  |  |   |                |
| Length                           | 1.8 m ±50 mm   |  | 5 m ±80 mm  | 10 m ±100 mm   |
| Diameter                         |  |  | Max. 8.5 mm   |                |
| Bend radius                      | ≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead) |  |   |                |
| Weight                           | Approx. 260 g  |  | Approx. 460 g   | Approx. 790 g  |

Table 312: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Technical data

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

### 9.1.1.4 Bend radius specifications

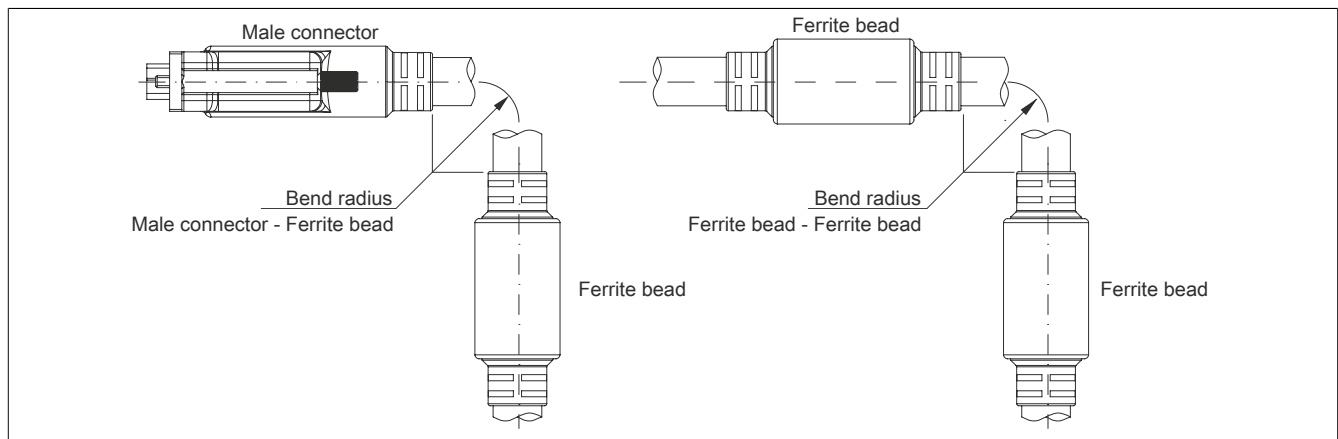


Figure 187: Bend radius specifications

### 9.1.1.5 Dimensions

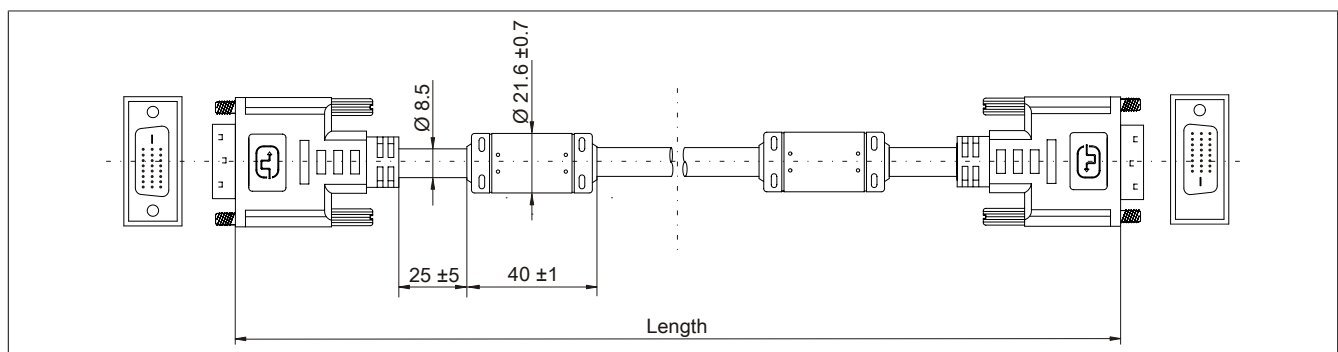


Figure 188: 5CADVI.0xxx-00 - Dimensions



9.1.1.6 Cable pinout

Warning!

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

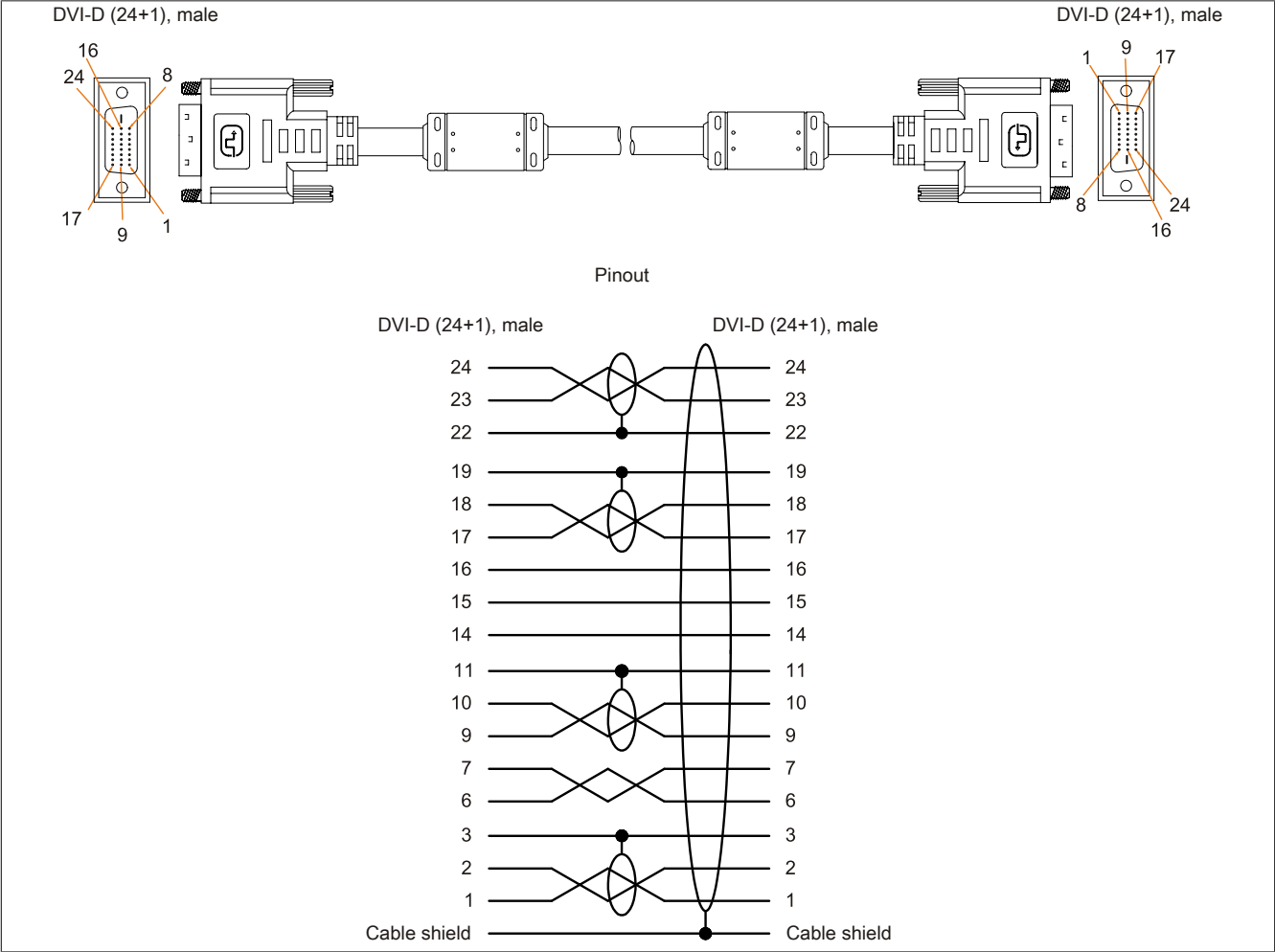


Figure 189: 5CADVI.0xxx-00 - Pinout

## 9.2 SDL cables

### 9.2.1 5CASDL.0xxx-00

#### 9.2.1.1 General information

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

### Caution!

Power must be disconnected before connecting or disconnecting cables.

#### 9.2.1.2 Order data


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

Table 313: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Order data

#### 9.2.1.3 Technical data

| Model number                     | 5CASDL.<br>0008-00   | 5CASDL.<br>0018-00 | 5CASDL.<br>0050-00 | 5CASDL.<br>0100-00 | 5CASDL.<br>0150-00 | 5CASDL.<br>0200-00 | 5CASDL.<br>0250-00 | 5CASDL.<br>0300-00 |
|----------------------------------|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| General information              |  |                    |                    |                    |                    |                    |                    |                    |
| Certification                    |  |                    |                    |                    |                    |                    |                    |                    |
| CE                               | Yes  |                    |                    |                    |                    |                    |                    |                    |
| UL                               | cULus E115267<br>Industrial <a href="#">Control</a> Equipment  |                    |                    |                    |                    |                    |                    |                    |
| HazLoc                           | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T4 <sup>1)</sup>                    |                    |                    |                    |                    | -                  |                    |                    |
| DNV GL                           | Environmental Category C, EMC1 <sup>2)</sup>   |                    |                    |                    |                    |                    |                    |                    |
| DNV GL                           | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><a href="#">EMC</a> : <b>B</b> (Bridge and open deck) <sup>2)</sup> |                    |                    |                    |                    |                    |                    |                    |
| GOST-R                           | -  | Yes                |                    |                    |                    |                    |                    |                    |
| Cable construction               |  |                    |                    |                    |                    |                    |                    |                    |
| Wire cross section               | AWG 28   |                    |                    | AWG 24             |                    |                    |                    |                    |
| Shield                           | Individual cable pairs, entire cable   |                    |                    |                    |                    |                    |                    |                    |
| Complete shielding               | Tinned copper braiding, optical coverage >85%  |                    |                    |                    |                    |                    |                    |                    |
| Outer sheathing                  |  |                    |                    |                    |                    |                    |                    |                    |
| Material                         | PVC  |                    |                    |                    |                    |                    |                    |                    |
| Color                            | Black  |                    |                    |                    |                    |                    |                    |                    |
| Labeling                         | E74020-C (UL) AWM STYLE 20176 80°C 30V VW-1 <a href="#">DVI</a> DIGITAL LINK   |                    |                    |                    |                    |                    |                    |                    |
| Connector                        |  |                    |                    |                    |                    |                    |                    |                    |
| Type                             | 2x <a href="#">DVI-D</a> (24+1), male  |                    |                    |                    |                    |                    |                    |                    |
| Connection cycles                | 100  |                    |                    |                    |                    |                    |                    |                    |
| Contacts                         | Gold-plated  |                    |                    |                    |                    |                    |                    |                    |
| Mechanical protection            | Metal cover with crimped stress relief   |                    |                    |                    |                    |                    |                    |                    |
| Locating screw tightening torque | Max. 0.5 Nm  |                    |                    |                    |                    |                    |                    |                    |
| Electrical characteristics       |  |                    |                    |                    |                    |                    |                    |                    |
| Conductor resistance             |  |                    |                    |                    |                    |                    |                    |                    |
| AWG 24                           | -  |                    |                    | ≤93 Ω/km           |                    |                    |                    |                    |
| AWG 28                           | ≤237 Ω/km  |                    |                    | -                  |                    |                    |                    |                    |
| Insulation resistance            | Min. 10 MΩ/km  |                    |                    |                    |                    |                    |                    |                    |

Table 314: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Technical data

| Model number               | 5CASDL.<br>0008-00  | 5CASDL.<br>0018-00 | 5CASDL.<br>0050-00 | 5CASDL.<br>0100-00              | 5CASDL.<br>0150-00 | 5CASDL.<br>0200-00 | 5CASDL.<br>0250-00 | 5CASDL.<br>0300-00 |
|----------------------------|---|--------------------|--------------------|---------------------------------|--------------------|--------------------|--------------------|--------------------|
| Mechanical characteristics |   |                    |                    |                                 |                    |                    |                    |                    |
| Dimensions                 |   |                    |                    |                                 |                    |                    |                    |                    |
| Length                     | 0.8 m<br>±25 mm   | 1.8 m<br>±30 mm    | 5 m ±30 mm         | 10 m<br>±50 mm                  | 15 m<br>±100 mm    | 20 m<br>±100 mm    | 25 m<br>±100 mm    | 30 m<br>±100 mm    |
| Diameter                   | Typ. 8.6 ±0.2 mm<br>Max. 9 mm   |                    |                    | Typ. 11 ±0.2 mm<br>Max. 11.5 mm |                    |                    |                    |                    |
| Bend radius                | ≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)                                      |                    |                    |                                 |                    |                    |                    |                    |
| Flexibility                | Limited flexibility, valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles/minute) |                    |                    |                                 |                    |                    |                    |                    |
| Weight                     | Approx.<br>206 g  | Approx.<br>300 g   | Approx.<br>580 g   | Approx.<br>1500 g               | Approx.<br>2250 g  | Approx.<br>2880 g  | Approx.<br>4800 g  | Approx.<br>5520 g  |

Table 314: 5CASDL.0008-00, 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Technical data

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

#### 9.2.1.4 Bend radius specifications

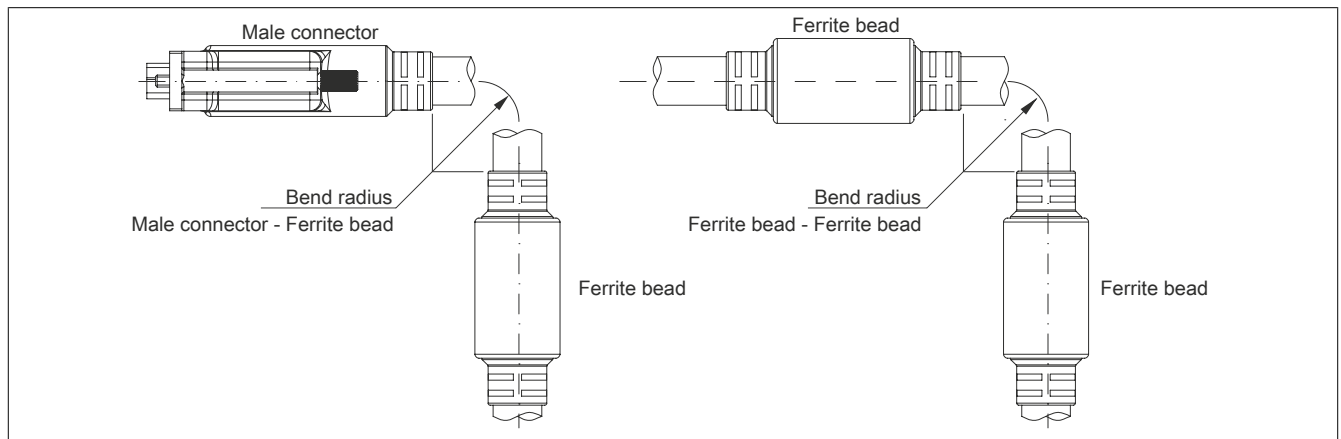


Figure 190: Bend radius specifications

#### 9.2.1.5 Dimensions

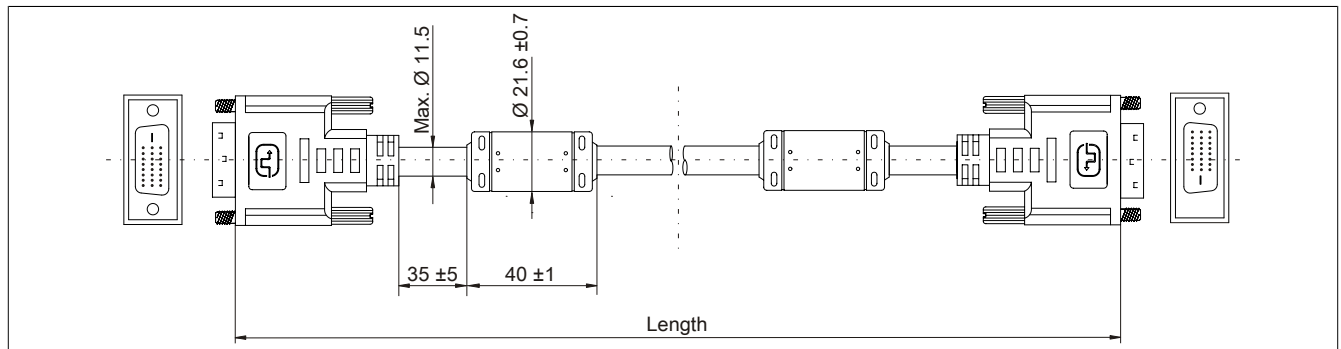


Figure 191: 5CASDL.0xxx-00- Dimensions

## 9.2.1.6 Cable pinout

**Warning!**

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

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

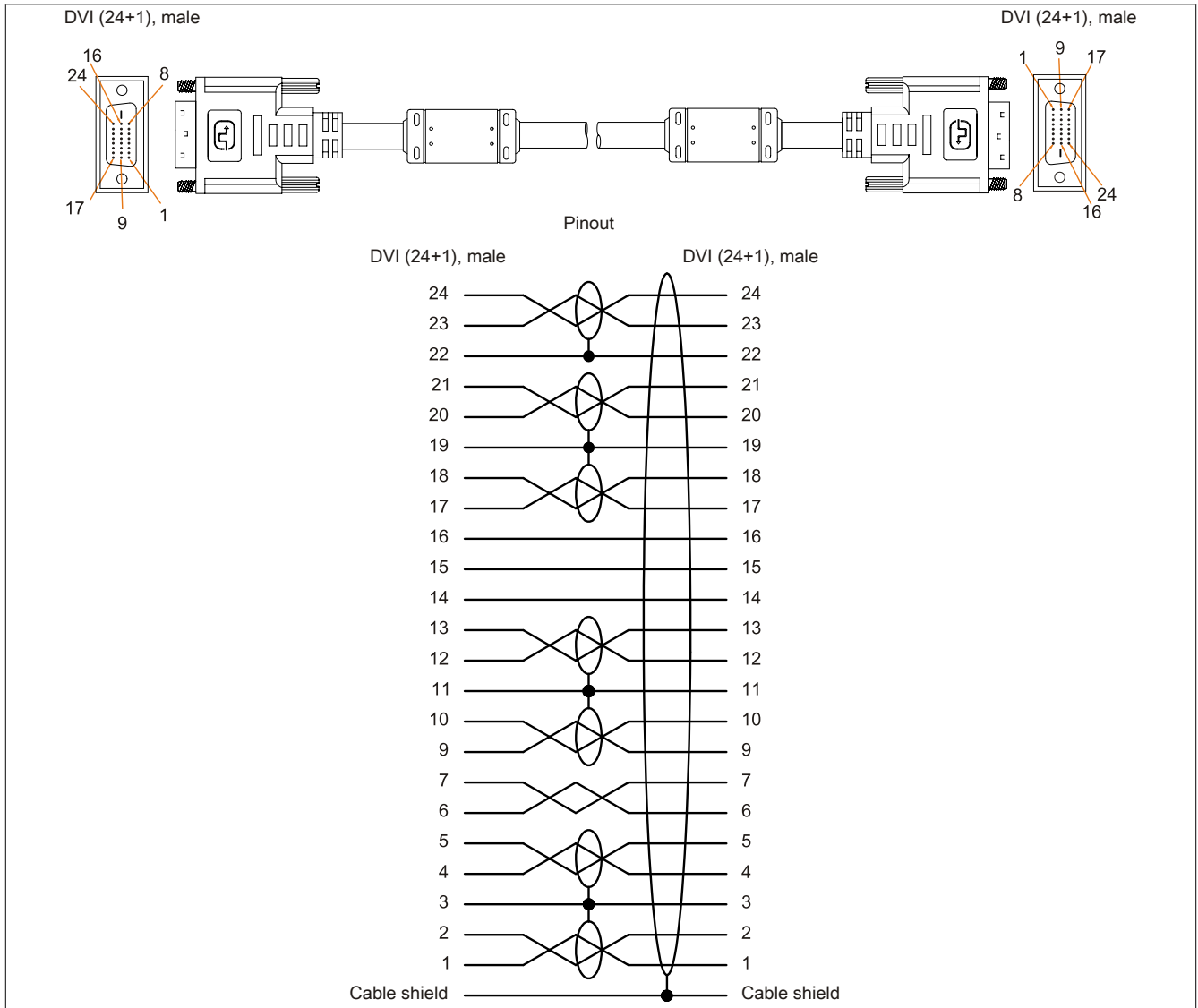


Figure 192: 5CASDL.0xxx-00 - Pinout

## 9.3 SDL cables with 45° male connector

### 9.3.1 5CASDL.0xxx-01

#### 9.3.1.1 General information

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

### Caution!

Power must be disconnected before connecting or disconnecting cables.

#### 9.3.1.2 Order data


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

Table 315: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Order data

#### 9.3.1.3 Technical data

| Model number                     | 5CASDL.0018-01  | 5CASDL.0050-01 | 5CASDL.0100-01 | 5CASDL.0150-01 |
|----------------------------------|---|----------------|----------------|----------------|
| General information              |   |                |                |                |
| Certification                    |   |                |                |                |
| CE                               | Yes   |                |                |                |
| UL                               | cULus E115267<br>Industrial <b>Control</b> Equipment  |                |                |                |
| HazLoc                           | cULus HazLoc E180196<br>Industrial <b>Control</b> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T4 <sup>1)</sup>            |                |                | -              |
| DNV GL                           | Environmental Category C, EMC1 <sup>2)</sup>  |                |                |                |
| DNV GL                           | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>2)</sup> |                |                |                |
| GOST-R                           | Yes   |                |                |                |
| Cable construction               |   |                |                |                |
| Wire cross section               | AWG 28  |                | AWG 24         |                |
| Shield                           | Individual cable pairs, entire cable  |                |                |                |
| Complete shielding               | Tinned copper braiding, optical coverage >85%   |                |                |                |
| Outer sheathing                  |   |                |                |                |
| Material                         | PVC   |                |                |                |
| Color                            | Black   |                |                |                |
| Connector                        |   |                |                |                |
| Type                             | 2x <b>DVI-D</b> (24+1), male  |                |                |                |
| Connection cycles                | 100   |                |                |                |
| Contacts                         | Gold-plated   |                |                |                |
| Mechanical protection            | Metal cover with crimped stress relief  |                |                |                |
| Locating screw tightening torque | Max. 0.5 Nm   |                |                |                |
| Electrical characteristics       |   |                |                |                |
| Conductor resistance             |   |                |                |                |
| AWG 24                           | -   |                | ≤93 Ω/km       |                |
| AWG 28                           | ≤237 Ω/km   |                | -              |                |
| Insulation resistance            | Min. 10 MΩ/km   |                |                |                |
| Mechanical characteristics       |   |                |                |                |
| Dimensions                       |   |                |                |                |
| Length                           | 1.8 m ±30 mm  | 5 m ±50 mm     | 10 m ±100 mm   | 15 m ±100 mm   |
| Diameter                         | Max. 9 mm   |                | Max. 11.5 mm   |                |
| Bend radius                      |   |                |                |                |
| Fixed installation               | ≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)  |                |                |                |
| Flexibility                      | Limited flexibility, valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles/minute)                                 |                |                |                |
| Weight                           | Approx. 300 g   | Approx. 590 g  | Approx. 2800 g | Approx. 2860 g |

Table 316: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

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

### 9.3.1.4 Bend radius specifications

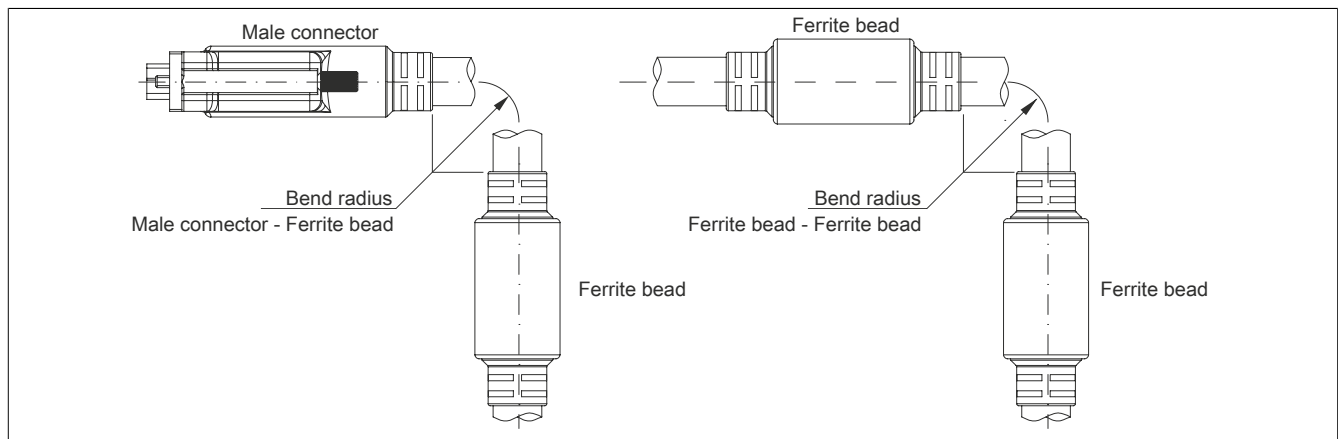


Figure 193: Bend radius specifications

### 9.3.1.5 Dimensions

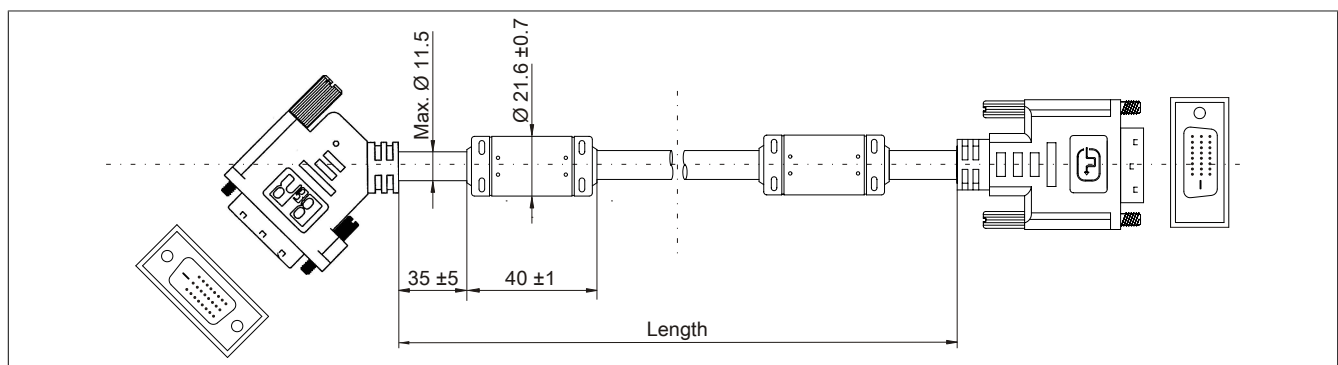


Figure 194: 5CASDL.0xxx-01 - Dimensions

9.3.1.6 Cable pinout

Warning!

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

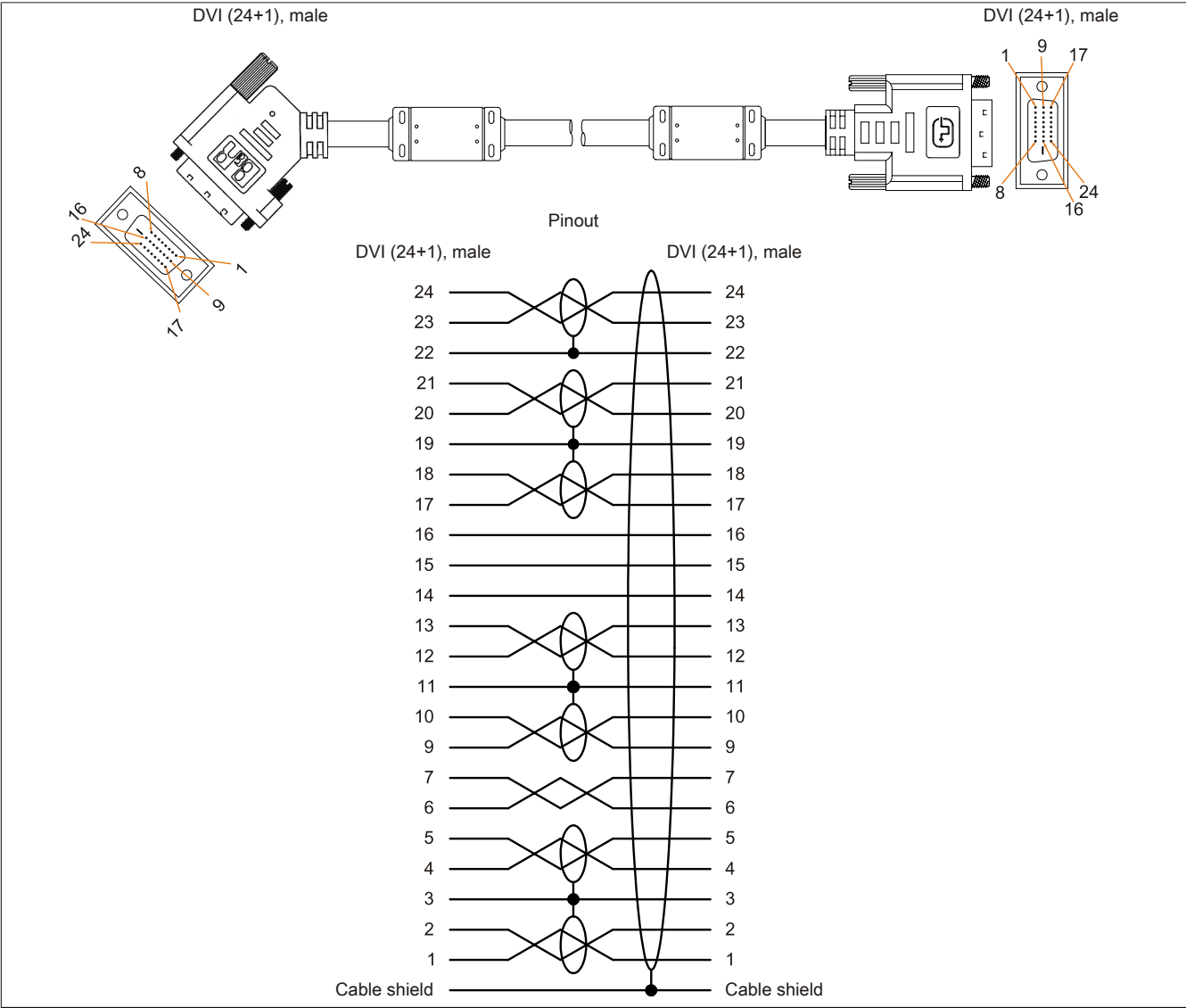


Figure 195: 5CASDL.0xxx-01 - Pinout

## 9.4 SDL flex cables

### 9.4.1 5CASDL.0xxx-03

#### 9.4.1.1 General information

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

### Caution!

Power must be disconnected before connecting or disconnecting cables.

#### 9.4.1.2 Order data


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

Table 317: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Order data

#### 9.4.1.3 Technical data

| Model number                     | 5CASDL.<br>0018-03  | 5CASDL.<br>0050-03 | 5CASDL.<br>0100-03 | 5CASDL.<br>0150-03 | 5CASDL.<br>0200-03 | 5CASDL.<br>0250-03 | 5CASDL.<br>0300-03 |
|----------------------------------|---|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| General information              |   |                    |                    |                    |                    |                    |                    |
| Certification                    |   |                    |                    |                    |                    |                    |                    |
| 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 <sup>1)</sup>                   |                    |                    |                    | -                  |                    |                    |
| DNV GL                           | Environmental Category C, EMC1 <sup>2)</sup>  |                    |                    |                    |                    |                    |                    |
| DNV GL                           | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br>EMC: <b>B</b> (Bridge and open deck) <sup>2)</sup> |                    |                    |                    |                    |                    |                    |
| GOST-R                           | Yes   |                    |                    |                    |                    |                    |                    |
| Cable construction               |   |                    |                    |                    |                    |                    |                    |
| Wire cross section               | AWG 24 (control wires)<br>AWG 26 (DVI, USB, data)   |                    |                    |                    |                    |                    |                    |
| Features                         | Silicone- and halogen-free  |                    |                    |                    |                    |                    |                    |
| Shield                           | Individual cable pairs, entire cable  |                    |                    |                    |                    |                    |                    |
| Complete shielding               | Aluminum-clad foil and tinned copper braiding   |                    |                    |                    |                    |                    |                    |
| Outer sheathing                  |   |                    |                    |                    |                    |                    |                    |
| Material                         | Special semi-glossy TMPU  |                    |                    |                    |                    |                    |                    |
| Color                            | Black   |                    |                    |                    |                    |                    |                    |
| Labeling                         | (B&R) SDL Cable (UL) AWM 20236 80°C 30V E 63216   |                    |                    |                    |                    |                    |                    |
| Connector                        |   |                    |                    |                    |                    |                    |                    |
| Type                             | 2x DVI-D (24+1), male   |                    |                    |                    |                    |                    |                    |
| Connection cycles                | Min. 200  |                    |                    |                    |                    |                    |                    |
| Contacts                         | Gold-plated   |                    |                    |                    |                    |                    |                    |
| Mechanical protection            | Metal cover with crimped stress relief  |                    |                    |                    |                    |                    |                    |
| Locating screw tightening torque | Max. 0.5 Nm   |                    |                    |                    |                    |                    |                    |
| Electrical characteristics       |   |                    |                    |                    |                    |                    |                    |
| Operating voltage                | ≤30 V   |                    |                    |                    |                    |                    |                    |
| Test voltage                     |   |                    |                    |                    |                    |                    |                    |
| Wire/Wire                        | 1 kV  |                    |                    |                    |                    |                    |                    |
| Wire/Shield                      | 0.5 kV  |                    |                    |                    |                    |                    |                    |
| Wave impedance                   | 100 ±10 Ω   |                    |                    |                    |                    |                    |                    |
| Conductor resistance             |   |                    |                    |                    |                    |                    |                    |
| AWG 24                           | ≤95 Ω/km  |                    |                    |                    |                    |                    |                    |
| AWG 26                           | ≤145 Ω/km   |                    |                    |                    |                    |                    |                    |

Table 318: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data



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

Table 318: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data

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

#### 9.4.1.4 Bend radius specifications

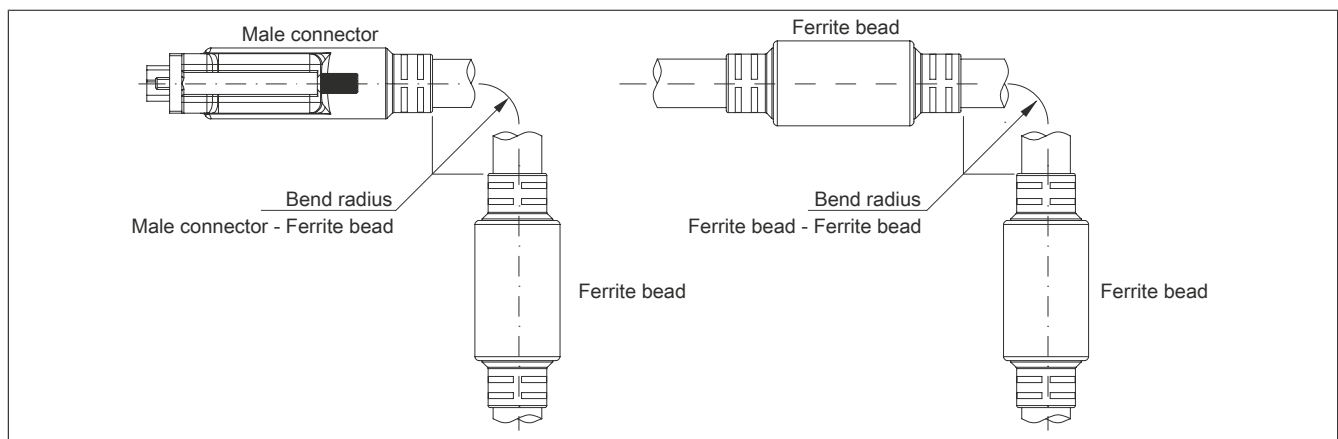


Figure 196: Bend radius specifications

#### 9.4.1.5 Dimensions

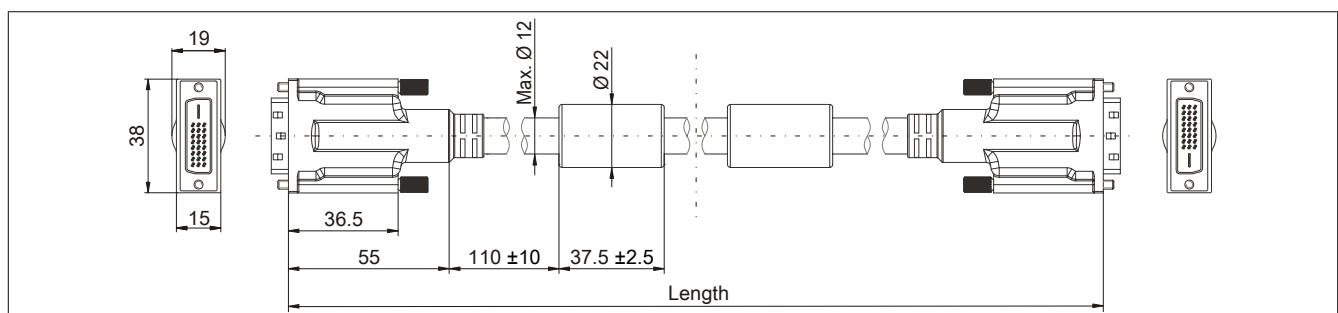


Figure 197: 5CASDL.0xxx-03 - Dimensions

## 9.4.1.6 Design

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

Table 319: 5CASDL.0xxx-03 SDL flex cables - Structure

## 9.4.1.7 Cable pinout

**Warning!**

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

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

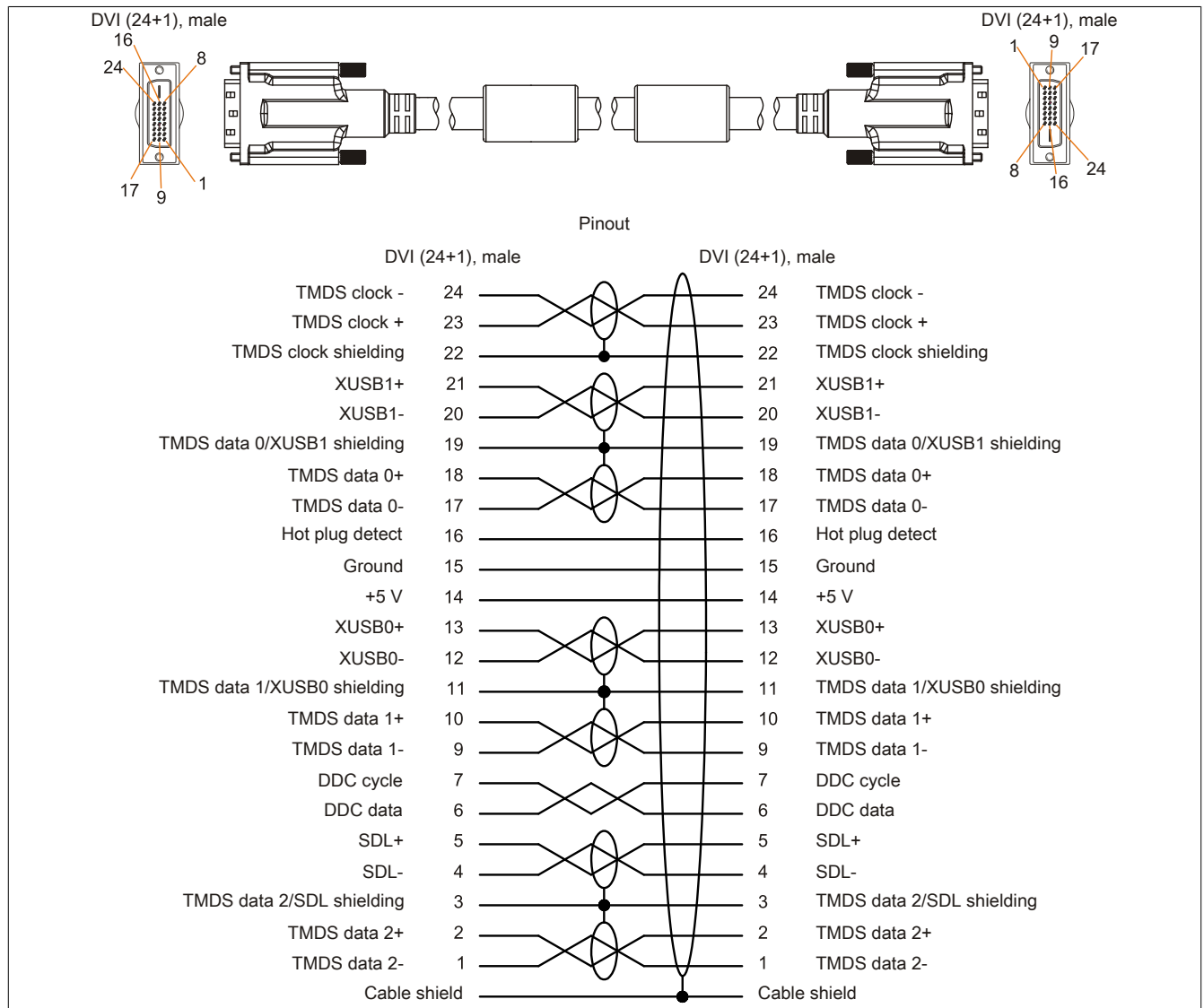


Figure 198: 5CASDL.0xxx-03 - Pinout

## 9.5 SDL flex cables with extender

### 9.5.1 5CASDL.0xx0-13

#### 9.5.1.1 General information

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

### Caution!

Power must be disconnected before connecting or disconnecting cables.

#### 9.5.1.2 Order data


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

Table 320: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Order data

#### 9.5.1.3 Technical data

| Model number                      | 5CASDL.0300-13 | 5CASDL.0400-13  | 5CASDL.0430-13 |
|-----------------------------------|----------------|---|----------------|
| <b>General information</b>        |                |   |                |
| Certification                     |                |   |                |
| CE                                |                | Yes   |                |
| UL                                |                | cULus E115267   |                |
| DNV GL                            |                | Industrial Control Equipment  |                |
| DNV GL                            |                | Environmental Category C, EMC1 <sup>1)</sup>  |                |
| GOST-R                            |                | Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br>EMC: <b>B</b> (Bridge and open deck) <sup>1)</sup> |                |
|                                   |                | Yes   |                |
| <b>Cable construction</b>         |                |   |                |
| Wire cross section                |                | AWG 24 (control wires)<br>AWG 26 (DVI, USB, data)   |                |
| Features                          |                | Silicone- and halogen-free  |                |
| Shield                            |                | Individual cable pairs, entire cable  |                |
| Complete shielding                |                | Aluminum-clad foil and tinned copper braiding   |                |
| Outer sheathing                   |                |   |                |
| Material                          |                | Special semi-glossy TMPU  |                |
| Color                             |                | Black   |                |
| Labeling                          |                | (B&R) SDL cable (UL) AWM 20236 80°C 30V E63216  |                |
| <b>Connector</b>                  |                |   |                |
| Type                              |                | 2x DVI-D (24+1), male   |                |
| Connection cycles                 |                | Min. 200  |                |
| Contacts                          |                | Gold-plated   |                |
| Mechanical protection             |                | Metal cover with crimped stress relief  |                |
| Locating screw tightening torque  |                | Max. 0.5 Nm   |                |
| <b>Electrical characteristics</b> |                |   |                |
| Operating voltage                 |                | ≤30 V   |                |
| Test voltage                      |                |   |                |
| Wire/Wire                         |                | 1 kV  |                |
| Wire/Shield                       |                | 0.5 kV  |                |
| Wave impedance                    |                | 100 ±10 Ω   |                |
| Conductor resistance              |                |   |                |
| AWG 24                            |                | ≤95 Ω/km  |                |
| AWG 26                            |                | ≤145 Ω/km   |                |
| Insulation resistance             |                | >200 MΩ/km  |                |
| <b>Operating conditions</b>       |                |   |                |
| Approbation                       |                | UL AWM 20236 80°C 30 V  |                |
| Flame-retardant                   |                | In accordance with UL758 (cable vertical flame test)  |                |
| Oil and hydrolysis resistance     |                | In accordance with VDE 0282-10  |                |
| <b>Environmental conditions</b>   |                |   |                |
| Temperature                       |                |   |                |
| Storage                           |                | -20 to 60°C   |                |
| Fixed installation                |                | -20 to 60°C   |                |
| Flexible installation             |                | -5 to 60°C  |                |

Table 321: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

| Model number               | 5CASDL.0300-13   | 5CASDL.0400-13 | 5CASDL.0430-13 |
|----------------------------|--|----------------|----------------|
| Mechanical characteristics |  |                |                |
| Dimensions                 |  |                |                |
| Length                     | 30 m ±280 mm   | 40 m ±380 mm   | 43 m ±410 mm   |
| Diameter                   |  | Max. 12 mm     |                |
| Extender box               |  |                |                |
| Width                      |  | 35 mm          |                |
| Length                     |  | 125 mm         |                |
| Height                     |  | 18.5 mm        |                |
| Bend radius                |  |                |                |
| Fixed installation         | ≥6x cable diameter (from male connector - ferrite bead)<br>≥10x cable diameter (from ferrite bead - ferrite bead)    |                |                |
| Flexible installation      | ≥15x cable diameter (from ferrite bead - ferrite bead)   |                |                |
| Flexibility                | Flexible, valid for ferrite bead - ferrite bead (tested<br>300,000 cycles with 15x cable diameter, 4800 cycles/hour) |                |                |
| Drag chain data            |  |                |                |
| Flex cycles                | 300,000  |                |                |
| Speed                      | 4800 cycles/hour   |                |                |
| Bend radius                | 180 mm, 15x cable diameter   |                |                |
| Hub                        | 460 mm   |                |                |
| Weight                     | Approx. 5430 g   | Approx. 7200 g | Approx. 7790 g |
| Tension                    |  |                |                |
| During operation           | ≤50 N  |                |                |
| During installation        | ≤400 N   |                |                |

Table 321: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

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

#### 9.5.1.4 Bend radius specifications

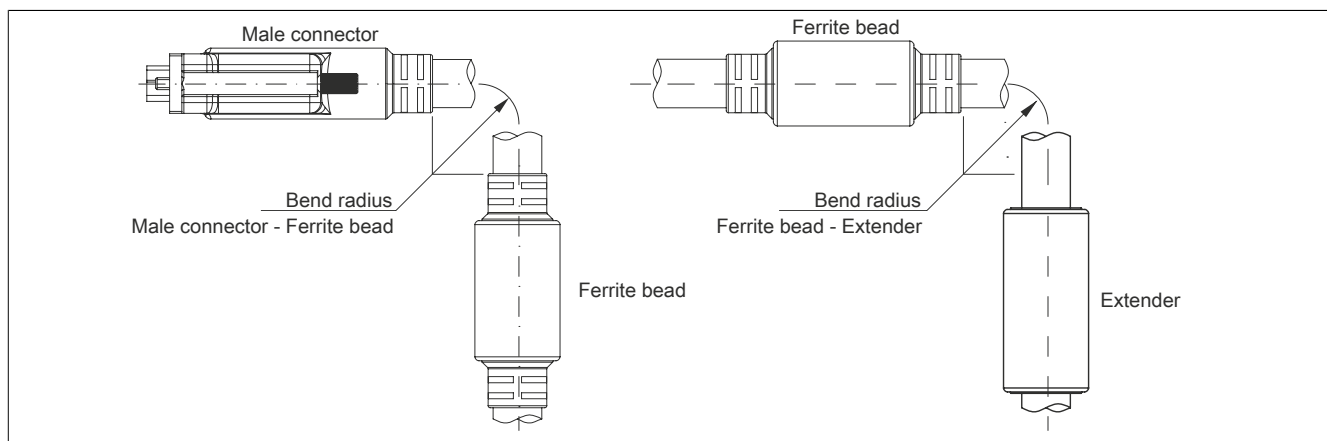


Figure 199: Bend radius specification with extender

#### 9.5.1.5 Dimensions

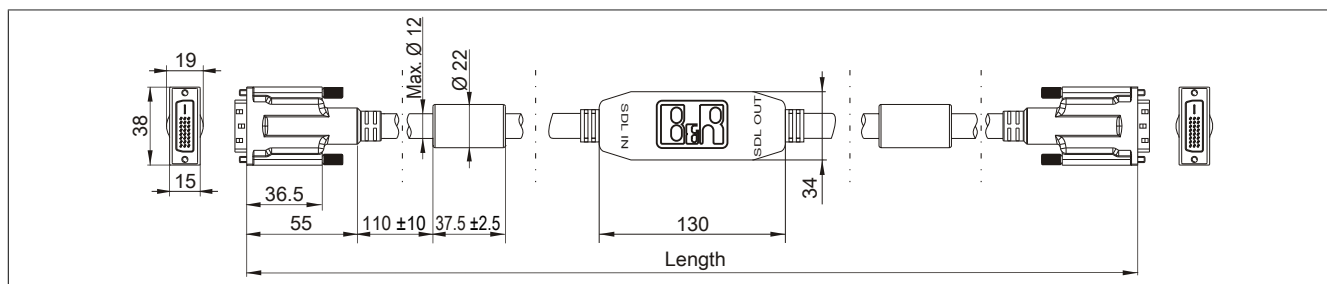


Figure 200: 5CASDL.0xx0-13 - Dimensions

9.5.1.6 Cable pinout

Warning!

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

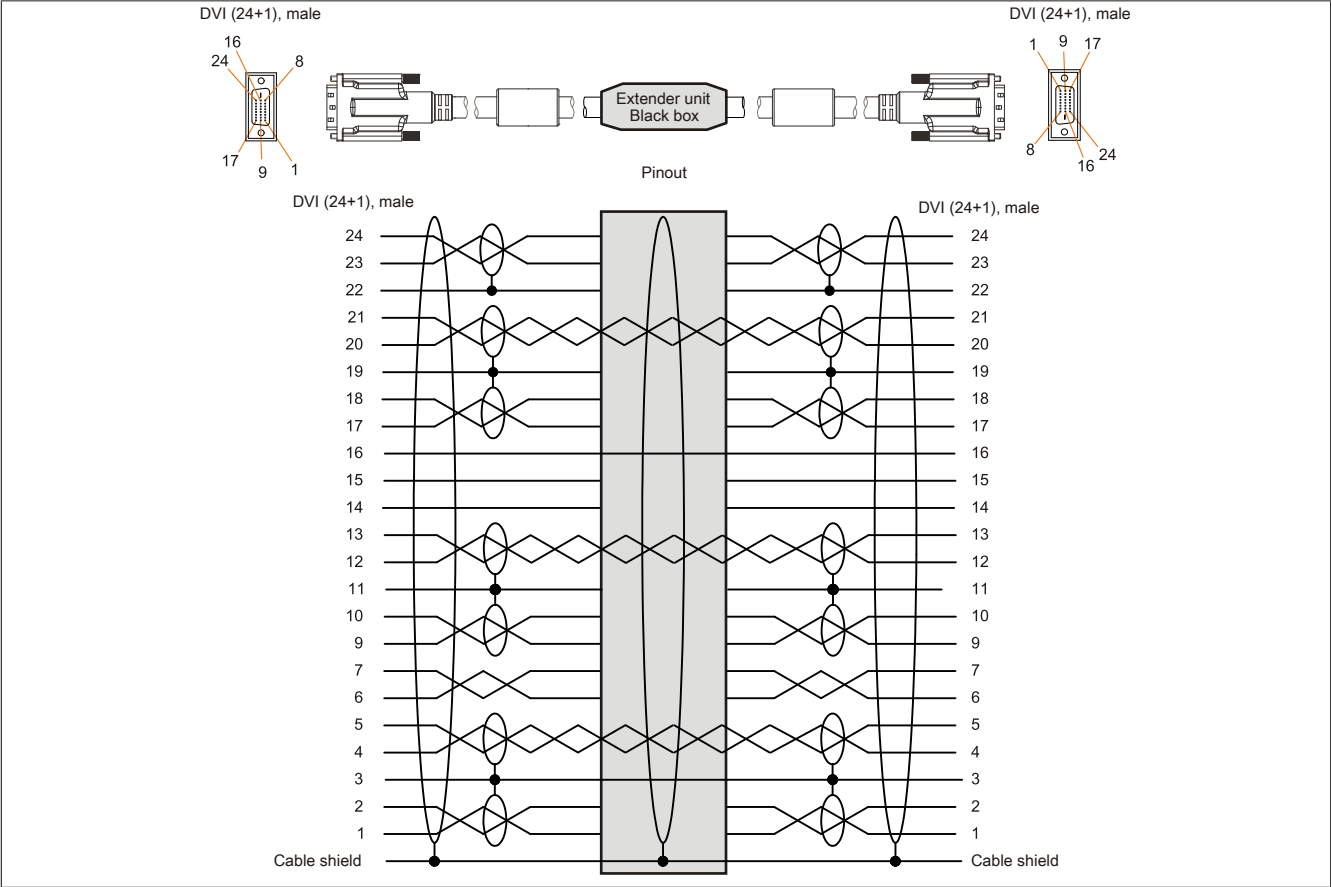


Figure 201: 5CASDL.0xx0-13 - Pinout

### 9.5.1.7 Cable connection

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

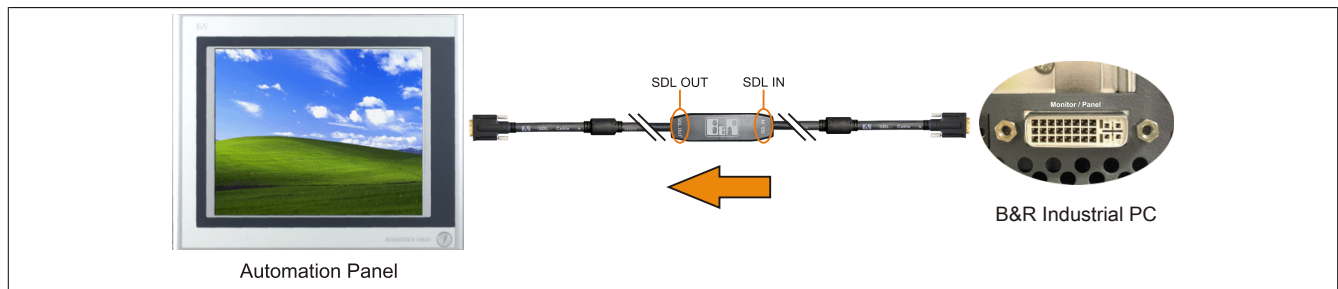


Figure 202: Example of the **signal** direction for an SDL flex cable with extender

## 9.6 SDL3 cables

### 9.6.1 5CASD3.xxxx-00

#### 9.6.1.1 General information

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

### Caution!

Power must be disconnected before connecting or disconnecting cables.

#### 9.6.1.2 Order data


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

Table 322: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Order data

#### 9.6.1.3 Technical data

| Model number                             | 5CASD3.<br>0030-00  | 5CASD3.<br>0050-00 | 5CASD3.<br>0100-00 | 5CASD3.<br>0150-00 | 5CASD3.<br>0200-00 | 5CASD3.<br>0300-00  | 5CASD3.<br>0500-00 | 5CASD3.<br>1000-00 |
|--|---|--------------------|--------------------|--------------------|--------------------|---|--------------------|--------------------|
| General information                      |   |                    |                    |                    |                    |   |                    |                    |
| Certification                            |   |                    |                    |                    |                    |   |                    |                    |
| CE                                       | Yes   |                    |                    |                    |                    |   |                    |                    |
| UL                                       | cULus E115267<br>Industrial <a href="#">Control</a> Equipment   |                    |                    |                    |                    |   |                    |                    |
| HazLoc                                   | cULus HazLoc E180196<br>Industrial <a href="#">Control</a> Equipment<br>for Hazardous Locations<br>Class I, Division 2, Groups ABCD, T4 <sup>1)</sup> |                    |                    |                    |                    |   |                    |                    |
| Cable construction                       |   |                    |                    |                    |                    |   |                    |                    |
| Wire cross section                       | 4x 2x 26/7 AWG  |                    |                    |                    |                    | 4x 2x 23/1 AWG  |                    |                    |
| Features                                 | Flame-resistant, halogen-free, lead-free  |                    |                    |                    |                    |   |                    |                    |
| Outer sheathing                          |   |                    |                    |                    |                    |   |                    |                    |
| Material                                 | Polyurethane (PUR)  |                    |                    |                    |                    |   |                    |                    |
| Color                                    | Yellow, RAL 1021  |                    |                    |                    |                    |   |                    |                    |
| Labeling                                 | HARTING INDUSTRIAL CABLE S/ <a href="#">FTP</a> CAT 6A PUR 4x 2x 26/7 AWG   |                    |                    |                    |                    | HARTING INDUSTRIAL INSTALLATION CABLE S/ <a href="#">FTP</a> CAT 7 PUR 4x 2x 23/1 AWG   |                    |                    |
| Lines                                    |   |                    |                    |                    |                    |   |                    |                    |
| Wire insulation                          | Polyethylene (PE)   |                    |                    |                    |                    |   |                    |                    |
| Wire colors                              | Green/White-green, orange/white-orange, blue/white-blue, brown/white-brown  |                    |                    |                    |                    |   |                    |                    |
| Shield                                   | Aluminum foil and braided wire shield made of tinned copper wires   |                    |                    |                    |                    |   |                    |                    |
| Type                                     | Unprotected copper wire, 4x 2x 26/7 AWG   |                    |                    |                    |                    | Unprotected copper wire, 4x 2x 23/1 AWG   |                    |                    |
| Connector                                |   |                    |                    |                    |                    |   |                    |                    |
| Type                                     | 2x RJ45, male   |                    |                    |                    |                    |   |                    |                    |
| Connection cycles                        | Min. 750  |                    |                    |                    |                    |   |                    |                    |
| Contacts                                 | 8   |                    |                    |                    |                    |   |                    |                    |
| Electrical characteristics <sup>2)</sup> |   |                    |                    |                    |                    |   |                    |                    |
| Operating voltage                        | ≤100 V  |                    |                    |                    |                    | ≤125 V  |                    |                    |
| Conductor resistance                     | ≤290 Ω/km   |                    |                    |                    |                    | ≤75 Ω/km  |                    |                    |
| Wave impedance                           | 100 ±5 Ω (at 100 MHz)   |                    |                    |                    |                    |   |                    |                    |
| Transfer properties                      | Category 6A / Class EA up to 500 MHz in accordance with <a href="#">ISO/IEC 11801 (EN 50173-1)</a> , <a href="#">ISO/IEC 24702 (EN 50173-3)</a>       |                    |                    |                    |                    | Category 7 / Class F up to 600 MHz in accordance with <a href="#">ISO/IEC 11801 (EN 50173-1)</a> , <a href="#">ISO/IEC 24702 (EN 50173-3)</a> |                    |                    |
| Insulation resistance                    | ≥500 MΩ/km  |                    |                    |                    |                    | ≥5 GΩ/km  |                    |                    |
| Operating conditions                     |   |                    |                    |                    |                    |   |                    |                    |
| Flame-retardant                          | <a href="#">IEC 60332-1-2</a>   |                    |                    |                    |                    |   |                    |                    |
| Oil and hydrolysis resistance            | <a href="#">EN 60811-2-1 (90°C / 7x24 h)</a>  |                    |                    |                    |                    |   |                    |                    |

Table 323: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

| Model number               | 5CASD3.<br>0030-00                 | 5CASD3.<br>0050-00 | 5CASD3.<br>0100-00 | 5CASD3.<br>0150-00 | 5CASD3.<br>0200-00 | 5CASD3.<br>0300-00 | 5CASD3.<br>0500-00 | 5CASD3.<br>1000-00 |
|----------------------------|------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| EN 60529 protection        |                                    |                    |                    |                    |                    |                    |                    |                    |
| Cables                     | IP20                               |                    |                    |                    |                    |                    |                    |                    |
| RJ45 connector             | IP20, only when connected properly |                    |                    |                    |                    |                    |                    |                    |
| Environmental conditions   |                                    |                    |                    |                    |                    |                    |                    |                    |
| Temperature                |                                    |                    |                    |                    |                    |                    |                    |                    |
| Storage                    | -40 to 70°C                        |                    |                    |                    |                    |                    |                    |                    |
| Fixed installation         | -40 to 70°C                        |                    |                    |                    |                    |                    |                    |                    |
| Flexible installation      | -40 to 70°C                        |                    |                    |                    |                    | -10 to 50°C        |                    |                    |
| Mechanical characteristics |                                    |                    |                    |                    |                    |                    |                    |                    |
| Dimensions                 |                                    |                    |                    |                    |                    |                    |                    |                    |
| Length                     | 3 m                                | 5 m                | 10 m               | 15 m               | 20 m               | 30 m               | 50 m               | 100 m              |
| Diameter                   | 6.7 mm                             |                    |                    |                    |                    | 8.3 mm             |                    |                    |
| Bend radius                |                                    |                    |                    |                    |                    |                    |                    |                    |
| Fixed installation         | ≥5x diameter                       |                    |                    |                    |                    | ≥4x diameter       |                    |                    |
| Flexible installation      | ≥10x diameter                      |                    |                    |                    |                    | ≥8x diameter       |                    |                    |
| Weight                     | 250 g                              | 500 g              | 700 g              | 950 g              | 2150 g             | 3500 g             | 6950 g             |                    |
| Tension                    |                                    |                    |                    |                    |                    |                    |                    |                    |
| During operation           | ≤70 N                              |                    |                    |                    |                    | ≤110 N             |                    |                    |
| During installation        | ≤70 N                              |                    |                    |                    |                    | ≤110 N             |                    |                    |

Table 323: 5CASD3.0030-00, 5CASD3.0050-00, 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

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

#### 9.6.1.4 Bend radius specifications

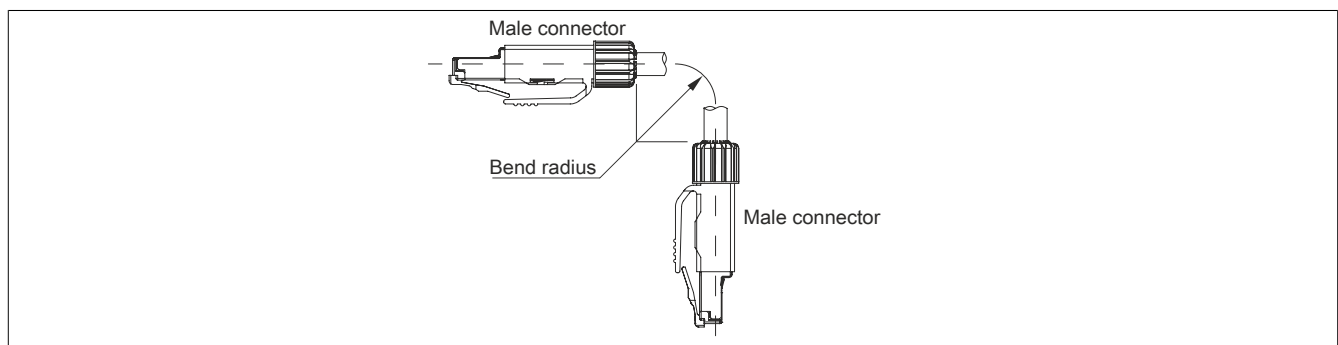


Figure 203: SDL3 - Bend radius specifications

#### 9.6.1.5 Dimensions

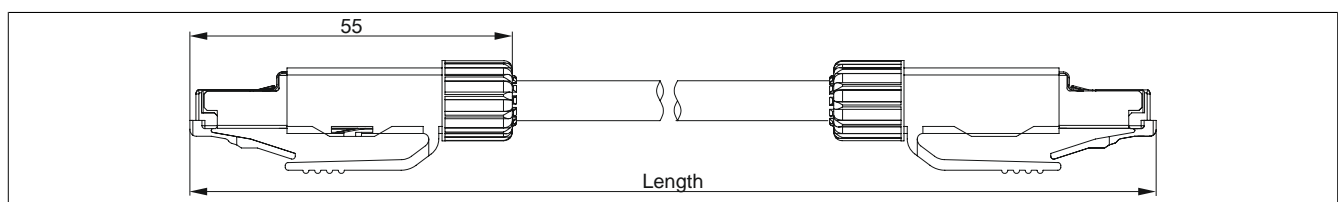


Figure 204: 5CASD3.xxxx-00 - Dimensions



9.6.1.6 Cable pinout

Warning!

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

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

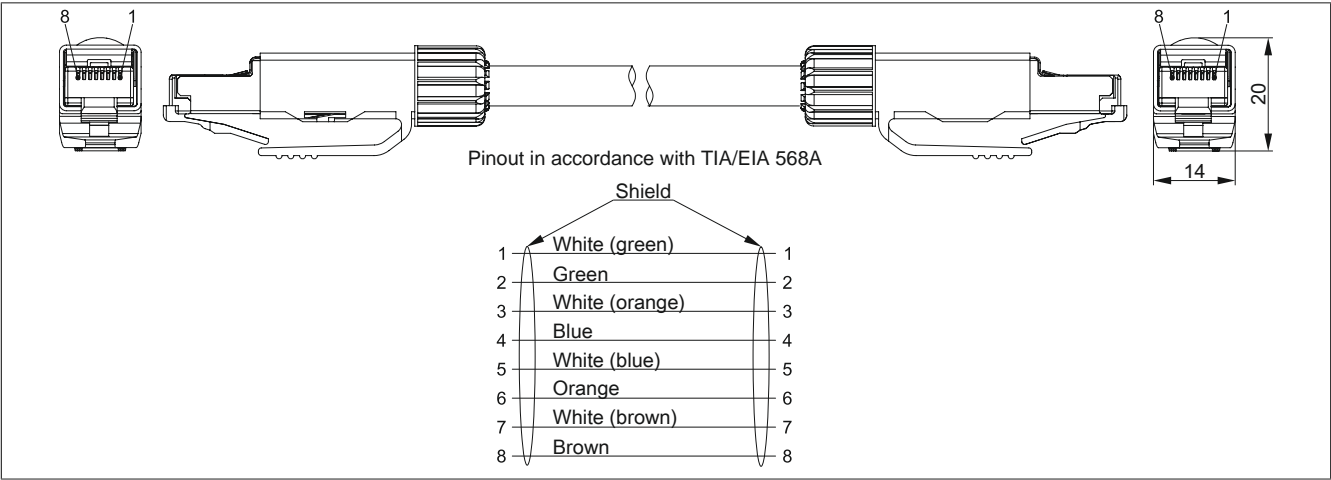


Figure 205: 5CASD3.xxxx-00 - Pinout

9.6.1.7 Cabling

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

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

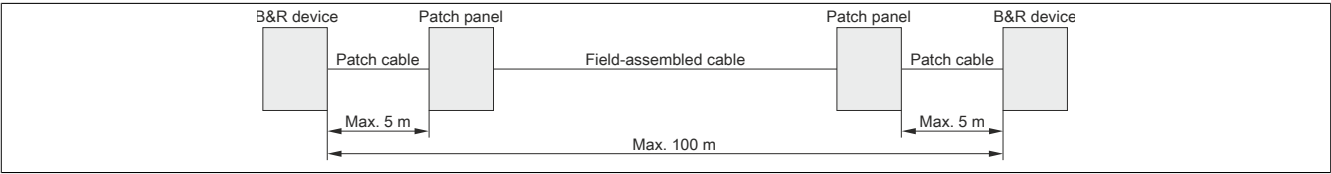


Figure 206: Cabling with a field-assembled cable

## 9.7 USB cables

### 9.7.1 5CAUSB.00xx-00

#### 9.7.1.1 General information

USB cables are designed to achieve USB 2.0 transfer speeds.

#### 9.7.1.2 Order data


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

Table 324: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data

#### 9.7.1.3 Technical data

| Model number               | 5CAUSB.0018-00  |  | 5CAUSB.0050-00 |  |            |  |
|----------------------------|---|--|----------------|--|------------|--|
| General information        |   |  |                |  |            |  |
| Certification              | Yes<br>cULus E115267<br>Industrial <b>Control</b> Equipment<br>Environmental Category C, EMC <sup>1)</sup><br>Temperature: <b>B</b> (0 - 55°C)<br>Humidity: <b>B</b> (up to 100%)<br>Vibration: <b>A</b> (0.7g)<br><b>EMC: B</b> (Bridge and open deck) <sup>1)</sup> |  |                |  |            |  |
| CE                         |   |  |                |  |            |  |
| UL                         |   |  |                |  |            |  |
| DNV GL                     |   |  |                |  |            |  |
| DNV GL                     |   |  |                |  |            |  |
| GOST-R                     | Yes   |  |                |  |            |  |
| Cable construction         |   |  |                |  |            |  |
| Wire cross section         | AWG 24, 28  |  |                |  |            |  |
| Shield                     | Entire cable  |  |                |  |            |  |
| Outer sheathing            | Beige   |  |                |  |            |  |
| Color                      |   |  |                |  |            |  |
| Connector                  |   |  |                |  |            |  |
| Type                       | USB type A male and USB type B male   |  |                |  |            |  |
| Mechanical characteristics |   |  |                |  |            |  |
| Dimensions                 | 1.8 m ±30 mm  |  |                |  | 5 m ±50 mm |  |
| Length                     |   |  |                |  |            |  |
| Diameter                   | Max. 5 mm   |  |                |  |            |  |
| Bend radius                | Min. 100 mm   |  |                |  |            |  |

Table 325: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data

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

#### 9.7.1.4 Cable pinout

### Warning!

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

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

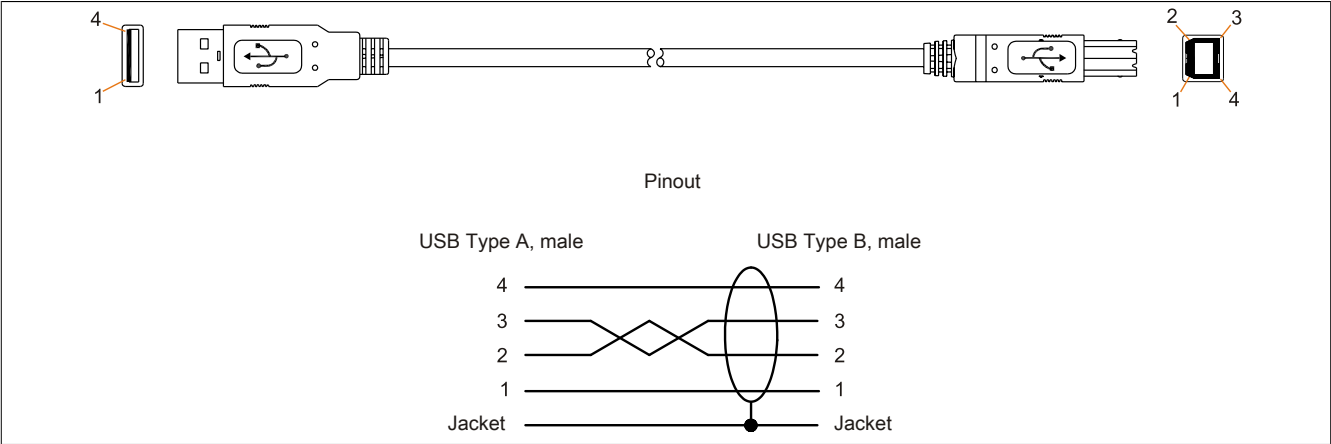


Figure 207: 5CAUSB.00xx-00 USB cables - Pinout

## 9.8 RS232 cables

### 9.8.1 9A0014.xx

#### 9.8.1.1 General information

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

#### 9.8.1.2 Order data


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

Table 326: 9A0014.02, 9A0014.05, 9A0014.10 - Order data

#### 9.8.1.3 Technical data

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

Table 327: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data

9.8.1.4 Cable pinout

Warning!

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

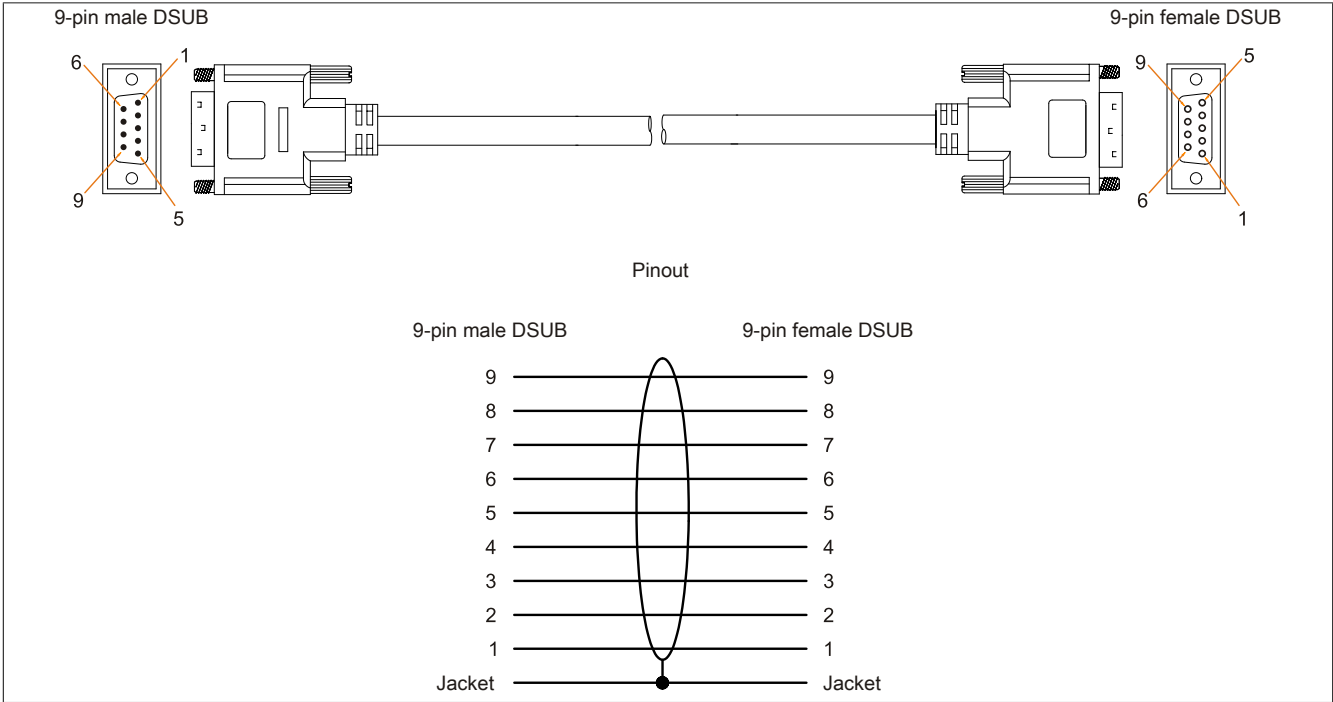


Figure 208: 9A0014.xx RS232 cables - Pinout

## 9.9 Internal supply cable

### 9.9.1 5CAMSC.0001-00

#### 9.9.1.1 General information

This supply cable is used internally, for example to provide power to special PCI cards. It is connected to the mainboard.

### Caution!

Power must be disconnected before connecting or disconnecting cables.

#### 9.9.1.2 Order data


| Model number   | Short description     | Figure  |
|----------------|-----------------------|---|
|                | <b>Accessories</b>    |   |
| 5CAMSC.0001-00 | Internal supply cable |  |

Table 328: 5CAMSC.0001-00 - Order data

#### 9.9.1.3 Technical data

| Model number                      | 5CAMSC.0001-00  |
|-----------------------------------|---|
| <b>General information</b>        |   |
| Certification                     |   |
| CE                                | Yes   |
| GOST-R                            | Yes   |
| <b>Cable construction</b>         |   |
| Wire cross section                | AWG 22  |
| <b>Connector</b>                  |   |
| Type                              | 1x 4-pin male disk drive power connector, 1x 4-pin female connector housing |
| <b>Mechanical characteristics</b> |   |
| Dimensions                        |   |
| Length                            | 100 mm ±5 mm  |
| Flexibility                       | Flexible  |

Table 329: 5CAMSC.0001-00 - Technical data

## 10 Replacement fan

### 10.1 5AC901.FI0x-00

#### 10.1.1 General information

##### Information:

Fan filters are subject to wear and should be checked with appropriate frequency to determine whether the air flow provides sufficient cooling. Replacing or cleaning the fan **filter** is appropriate at that time.

#### 10.1.2 Order data


| Model number       | Short description                                       | Figure  |
|--------------------|---|---|
| <b>Accessories</b> |   |  |
| 5AC901.FI01-00     | APC910 air <b>filter</b> - For 1-slot APC910 - 1 pieces |   |
| 5AC901.FI02-00     | APC910 air <b>filter</b> - For 2-slot APC910 - 1 pieces |   |
| 5AC901.FI05-00     | APC910 air <b>filter</b> - For 5-slot APC910 - 1 pieces |   |

Table 330: 5AC901.FI01-00, 5AC901.FI02-00, 5AC901.FI05-00 - Order data

## 11 Line filter

### 11.1 5AC804.MFLT-00

#### 11.1.1 General information

The 5AC804.MFLT-00 line filter may be necessary to satisfy requirements regarding conducted disturbances in supply lines in accordance with the 2003 edition of GL EMC1 (Germanischer Lloyd).

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

#### 11.1.2 Order data


| Model number   | Short description          | Figure  |
|----------------|----------------------------|---|
| 5AC804.MFLT-00 | Accessories<br>Line filter |  |

Table 331: 5AC804.MFLT-00 - Order data

#### 11.1.3 Technical data

##### Information:

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

| Model number                                       | 5AC804.MFLT-00  |
|--|---|
| <b>General information</b>                         |   |
| Certification                                      |   |
| 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 <sup>1)</sup> |
| DNV GL   | Environmental Category C, EMC1 <sup>2)</sup>  |
| DNV GL   | Temperature: B (0 - 55°C)<br>Humidity: B (up to 100%)<br>Vibration: A (0.7g)<br>EMC: B (Bridge and open deck) <sup>2)</sup>           |
| GOST-R   | Yes   |
| <b>Terminal block</b>                              |   |
| Connection cross section                           |   |
| With wire end sleeves                              | 1.5 mm <sup>2</sup>   |
| Flexible   | 0.2 to 1.5 mm <sup>2</sup>  |
| Inflexible   | 0.2 to 2.5 mm <sup>2</sup>  |
| <b>Electrical characteristics</b>                  |   |
| Nominal voltage                                    | 24 VDC -25% / +30%, SELV <sup>3)</sup>  |
| Nominal current                                    | 8 A   |
| Overvoltage category in accordance with EN 61131-2 | II  |
| <b>Environmental conditions</b>                    |   |
| Temperature  |   |
| Operation  | -25 to 65°C   |
| Storage  | -25 to 65°C   |
| Transport  | -25 to 65°C   |
| <b>Mechanical characteristics</b>                  |   |
| Housing  |   |
| Material   | Galvanized steel plate  |

Table 332: 5AC804.MFLT-00 - Technical data



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

Table 332: 5AC804.MFLT-00 - Technical data

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

#### 11.1.4 Dimensions

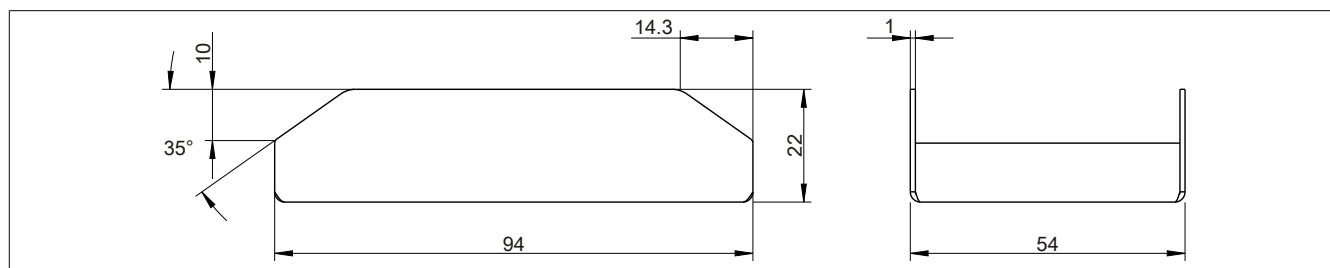


Figure 209: 5AC804.MFLT-00 - Dimensions

#### 11.1.5 Drilling template

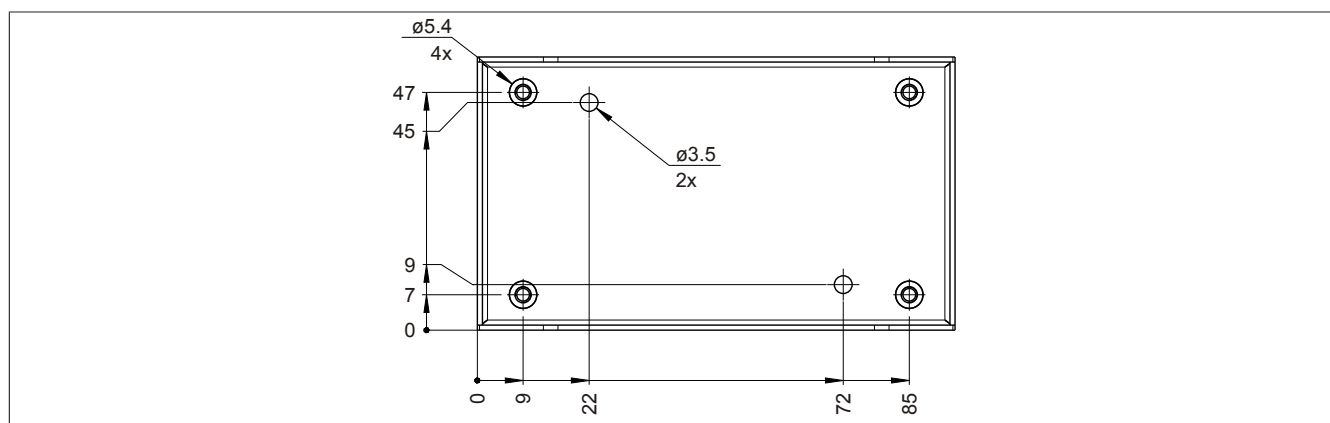


Figure 210: 5AC804.MFLT-00 - Drilling template

#### 11.1.6 Connecting to the end device

The line filter must be connected between the voltage supply and the end device.

The following points must be observed:

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

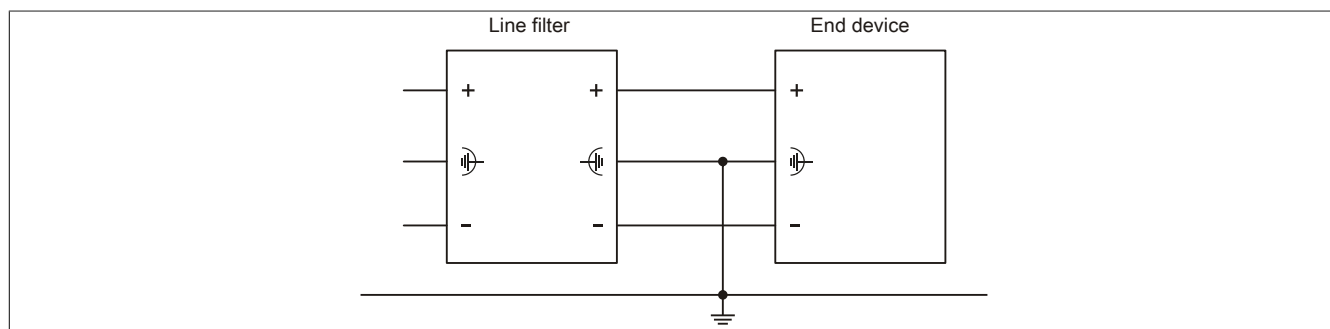


Figure 211: Connection example

## Chapter 7 • Maintenance and servicing

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

### 1 Replacing the battery

The lithium battery buffers the internal real-time clock (RTC) and **CMOS** data.

#### Information:

- The product design allows the battery to be changed with the B&R **device** switched either on or off. In some countries, **safety** regulations do not allow batteries to be changed while the module is switched on.
- Any **BIOS** settings that have been made will remain when the battery is changed with the power turned off (stored in nonvolatile EEPROM). The date and time must be reset later since this data is lost when the battery is changed.
- The battery should only be replaced by qualified personnel.

#### Warning!

The battery is only permitted to be replaced by a Renata CR2477N battery. The use of another battery may present a risk of fire or explosion.

The battery may explode if handled improperly. Do not recharge, disassemble or dispose of in fire.

The following replacement lithium batteries are available: 4A0006.00-000 (1 pc.) and 0AC201.91 (4 pcs.).

#### 1.1 Evaluating the battery status

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 <b>firmware</b> 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. |

Table 333: Battery status

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.

## 1.2 Procedure

- Disconnect the power supply to the B&R Industrial PC.
- Touch the housing or **ground** connection in order to discharge any electrostatic charge from your body.
- Remove the cover from the battery compartment and carefully pull out the battery using the removal strip.
- The battery should not be held by its edges. Insulated tweezers may also be used to insert the battery.

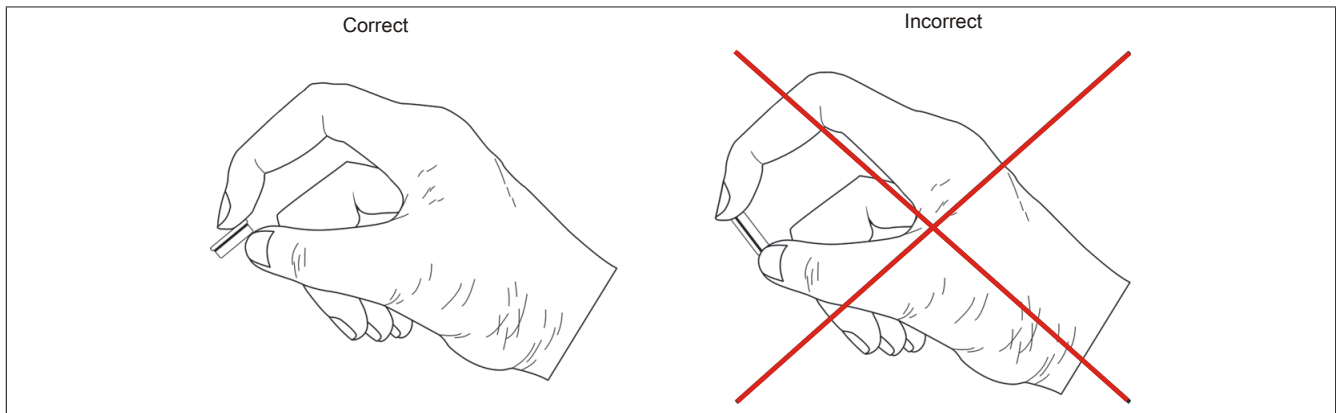


Figure 212: Battery handling

- Insert the new battery with the correct polarity.

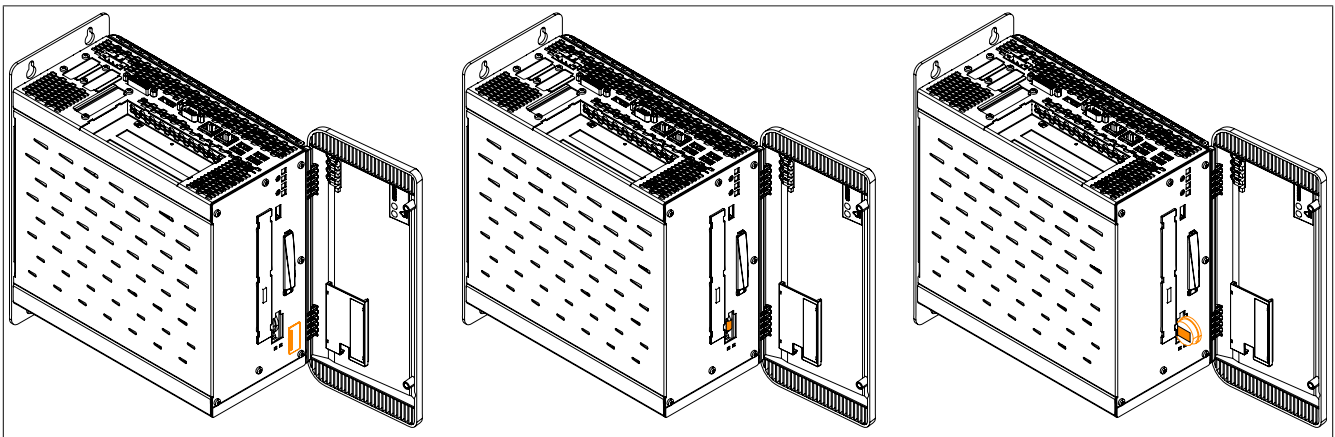


Figure 213: Replacing the battery

- To make the next battery replacement easier, be sure the removal strip is in place when inserting the battery.
- Reconnect the power supply to the B&R Industrial PC (plug in the power cable).
- Reset the date and time in **BIOS**.

### Warning!

**Lithium batteries are considered hazardous waste. Used batteries should be disposed of in accordance with applicable local regulations.**

## 2 Exchanging a CFast card

### Caution!

Power must be turned off before exchanging CFast cards.

Improper use of the ejection lever (e.g. too much force) may damage the ejection mechanism.

The CFast card **can** be exchanged quickly and easily by pressing the ejector (see image) with a pointed **object** such as a pen.

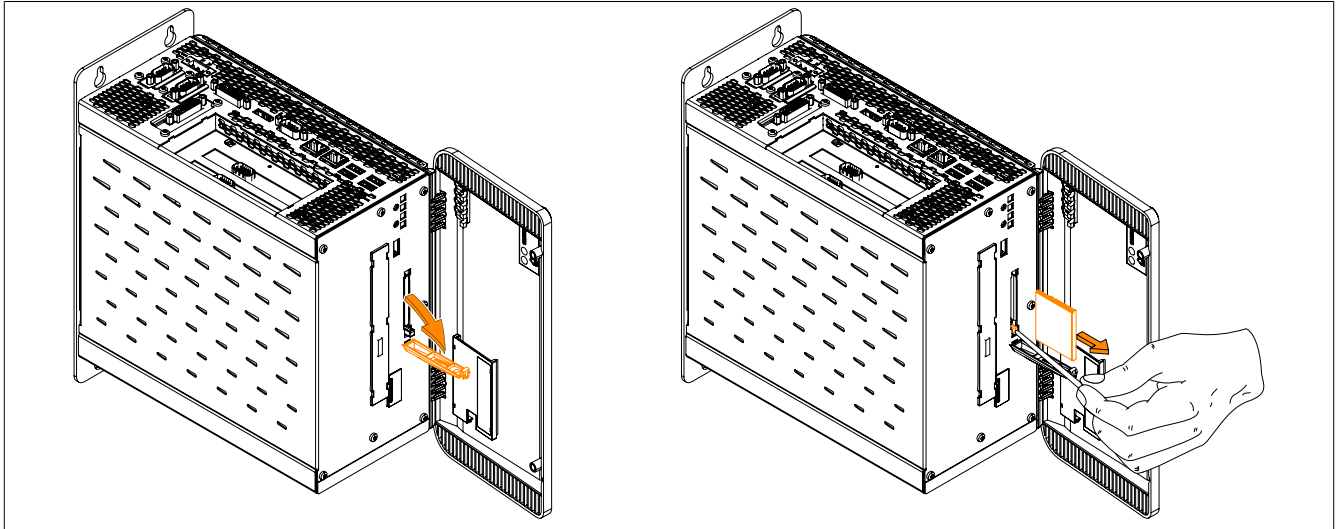


Figure 214: Exchanging a CFast card

### 3 Installing interface options

#### Information:

Please note that not every interface option can be installed in interface slots 1 and 2. For more information, see "IF option 1 slot" on page 67 and "IF option 2 slot" on page 67.

Depending on the IF option being used, it may be necessary to load the default settings in BIOS Setup after replacement or installation (see "Save & Exit" on page 283).

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws can vary depending on the system unit.

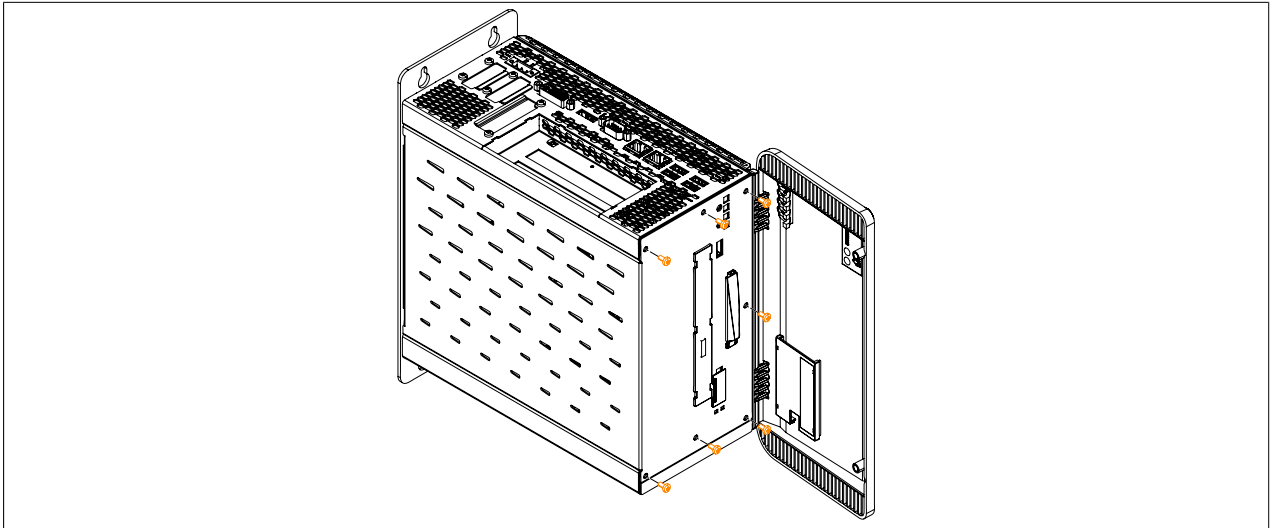


Figure 215: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover can be removed by sliding it first toward the front and then to the side.

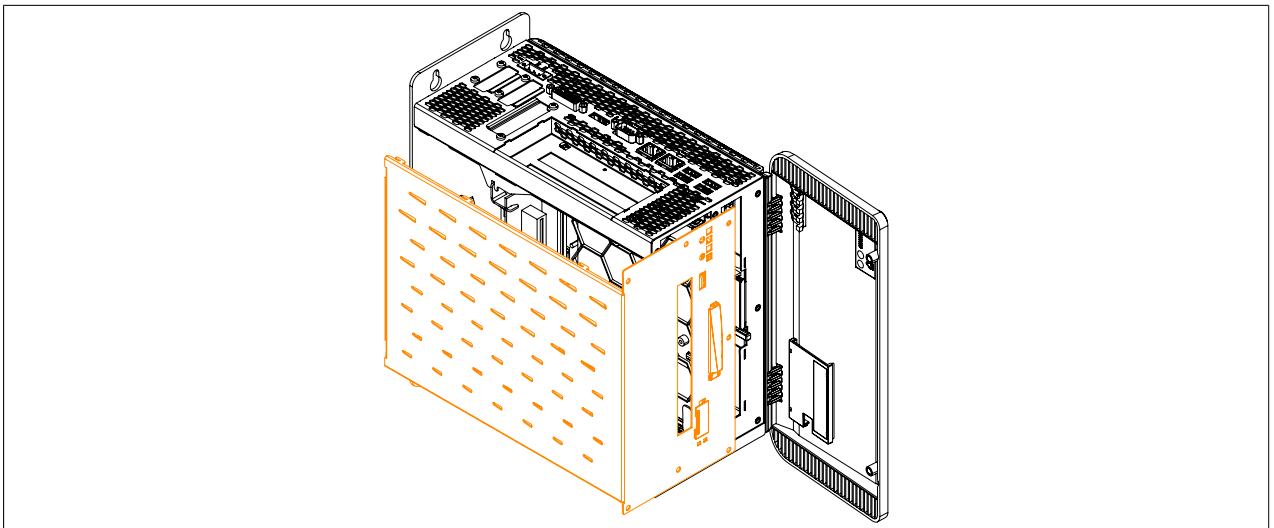


Figure 216: Removing the side cover

5. Remove the plastic slot cover and the marked Torx screws (T10) as well as the metal slot cover.

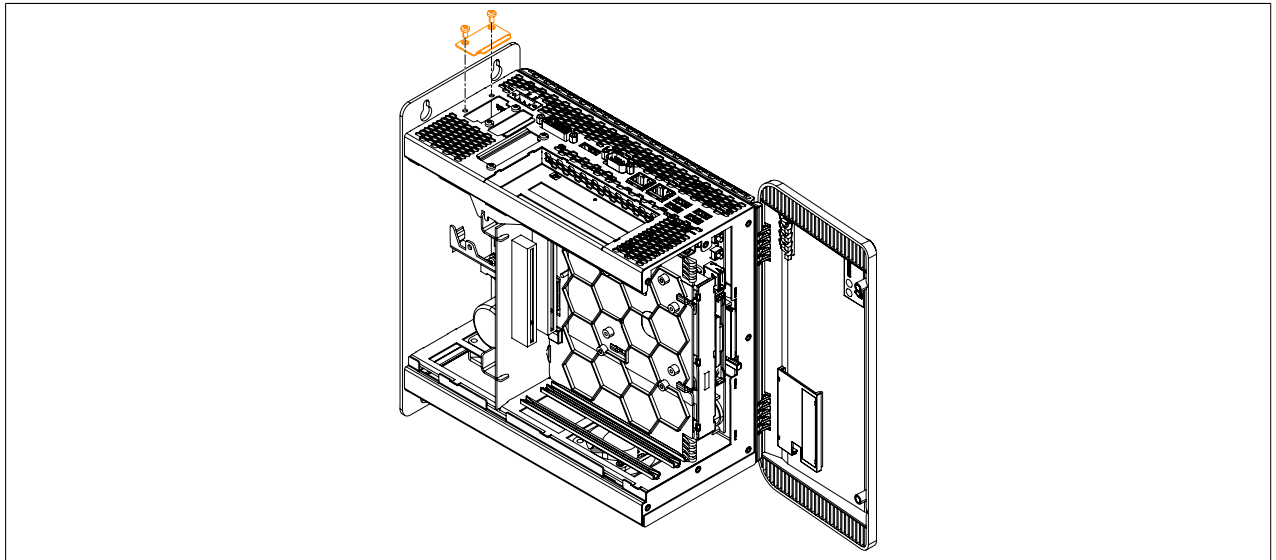


Figure 217: Removing the Torx screws and slot cover

6. Insert the [interface](#) option into the slot.

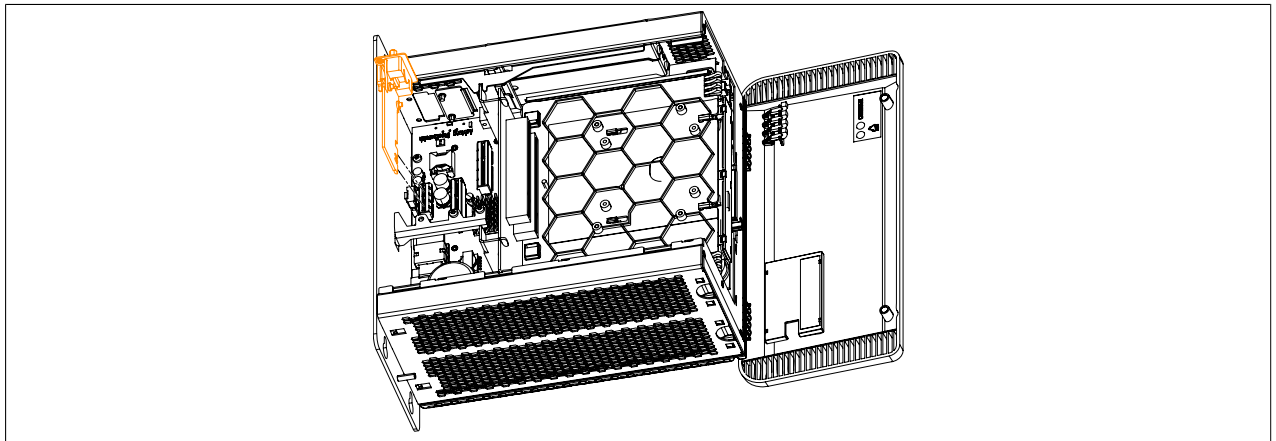


Figure 218: Installing the [interface](#) option

7. Secure the [interface](#) option to the B&R Industrial PC using the Torx screws (T10).

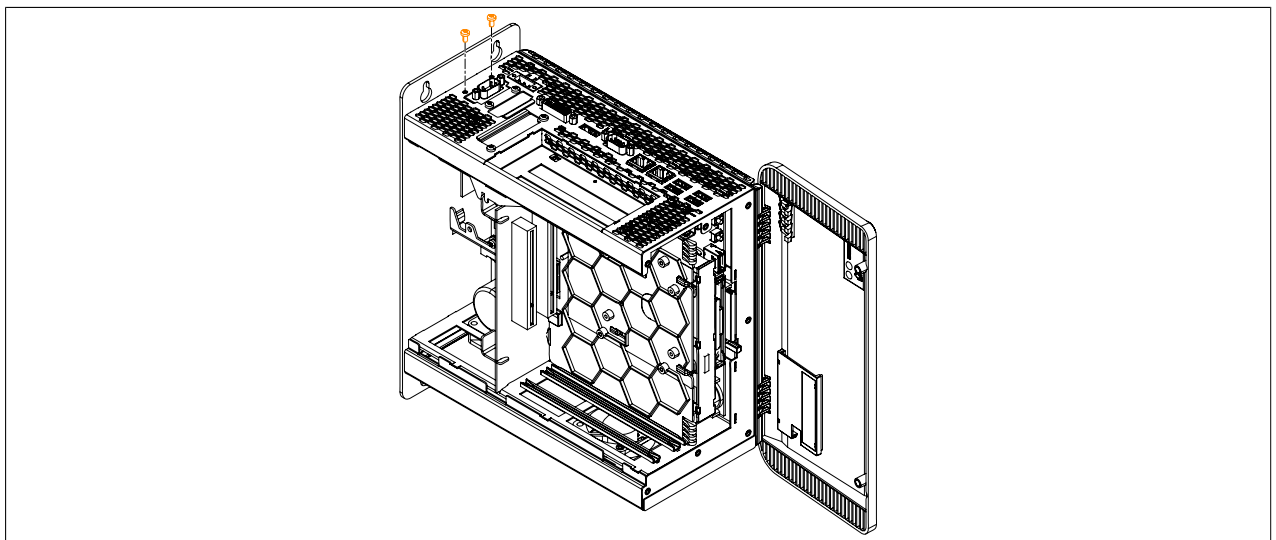


Figure 219: Securing the [interface](#) option

8. Attach the side cover.

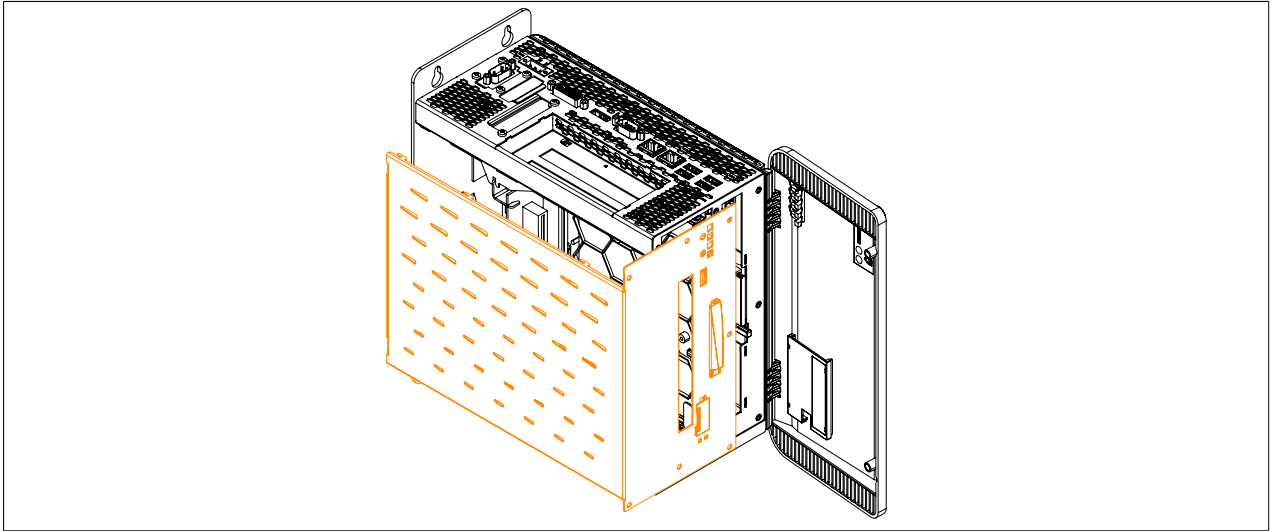


Figure 220: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

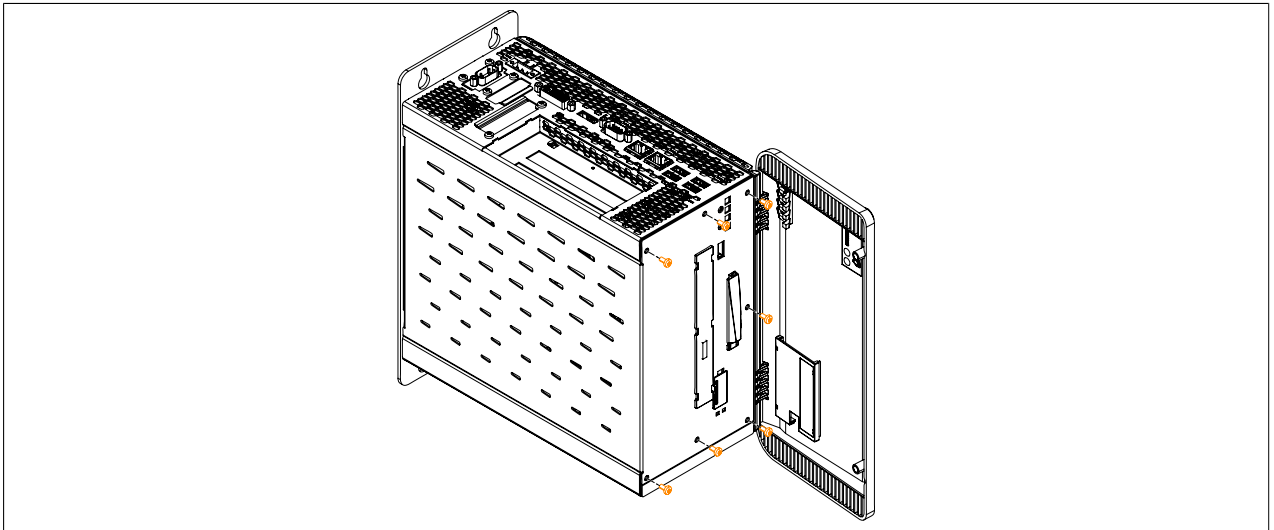


Figure 221: Securing the side cover

10. Once installed successfully, the [interface](#) option must be enabled in [BIOS](#). This is done by launching [BIOS](#) when booting the system, loading the default [BIOS](#) values and then saving the settings. For additional information, see "[Save & Exit](#)" on page 283.

## 4 Installing monitor/panel options

### Information:

After replacement or installation, it may be necessary to load the setup defaults in BIOS (see "Save & Exit" on page 283).

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or **ground** connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws **can** vary depending on the system unit.

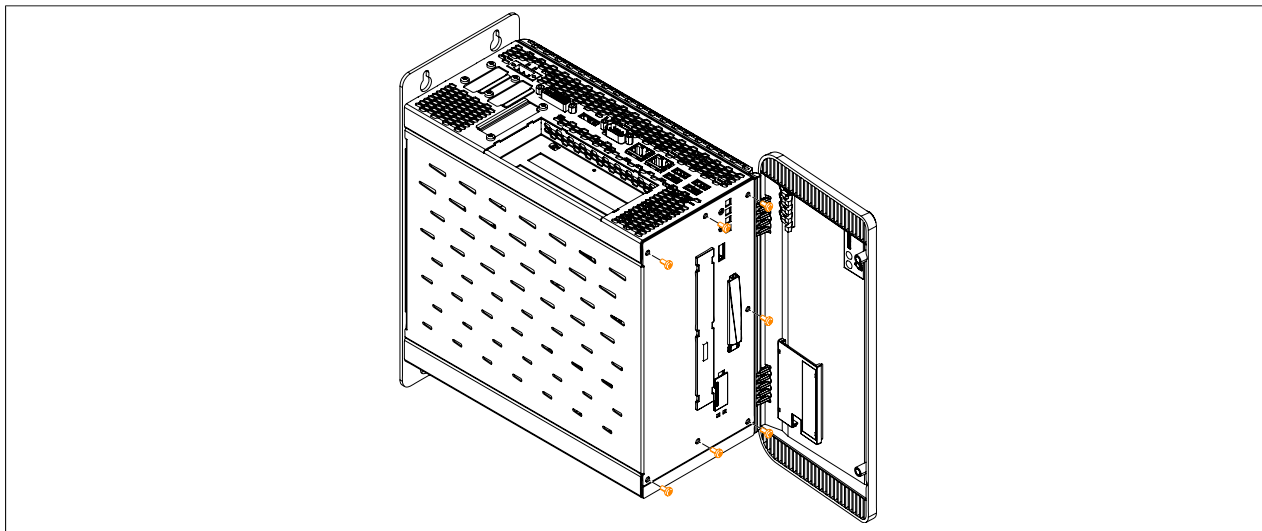


Figure 222: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover **can** be removed by sliding it first toward the front and then to the side.

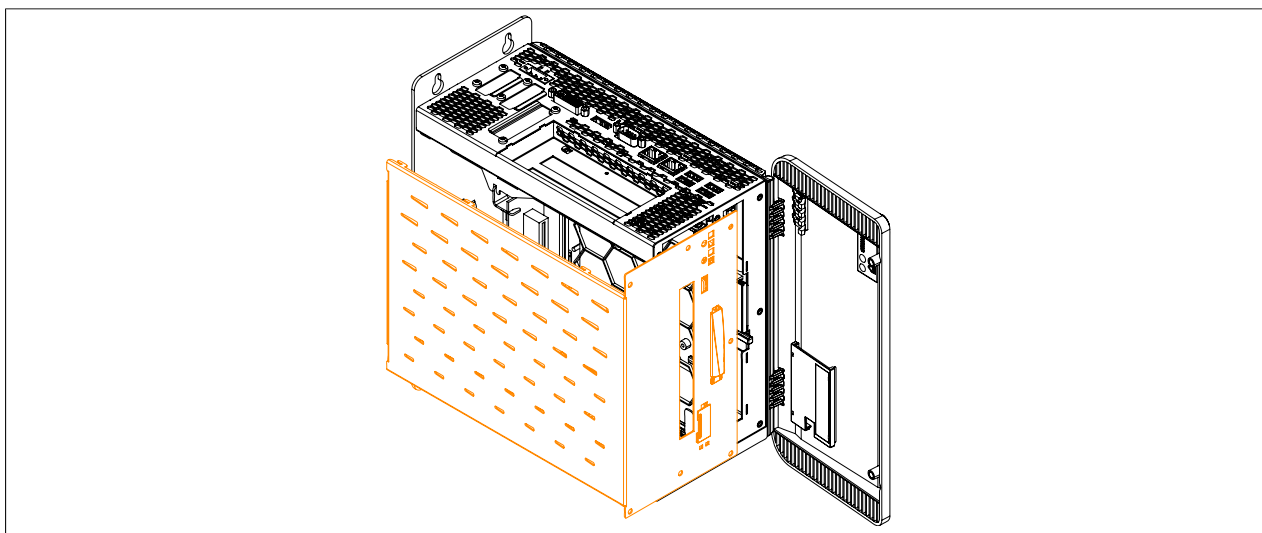


Figure 223: Removing the side cover



5. Remove the plastic slot cover and the marked Torx screws (T10) as well as the metal slot cover.

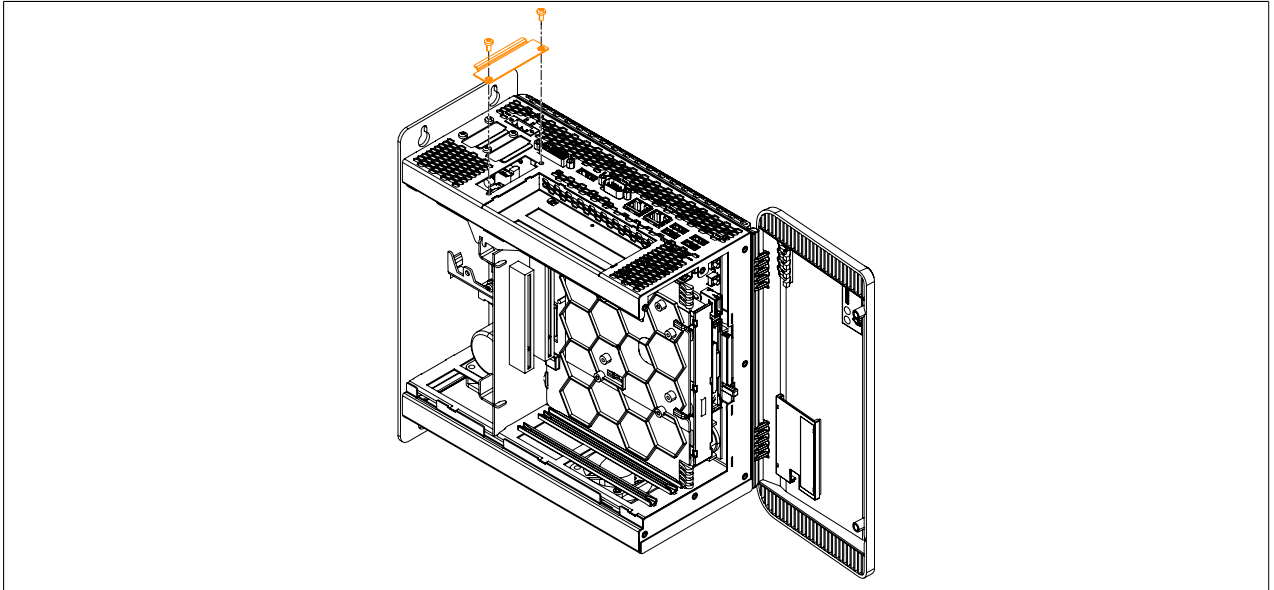


Figure 224: Removing the Torx screws and slot cover

6. Insert the monitor/panel option into the slot.

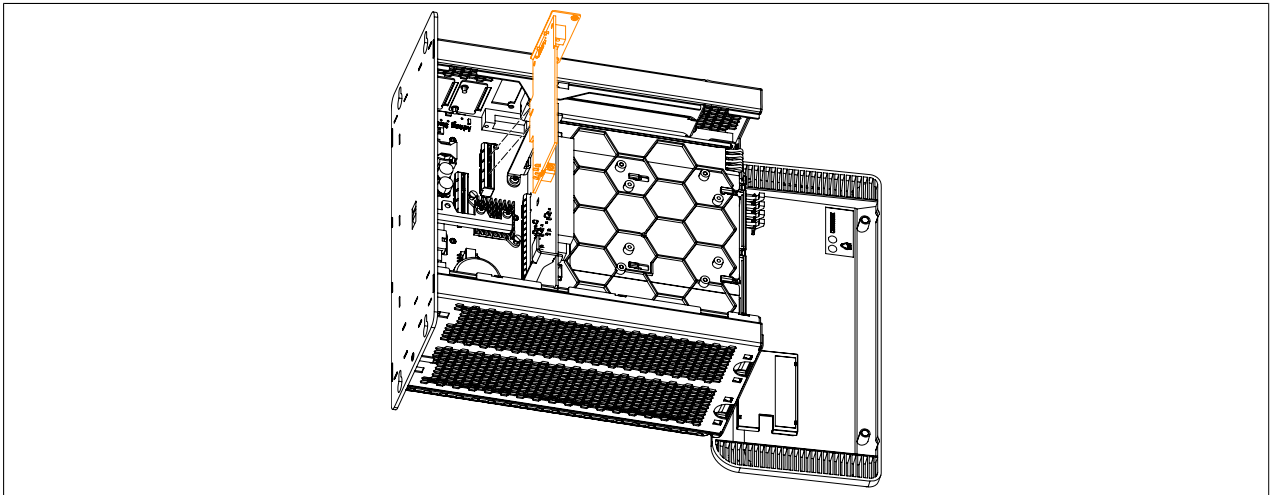


Figure 225: Inserting the monitor/panel option into the APC910

7. Secure the monitor/panel option to the B&R Industrial PC using the Torx screws (T10).

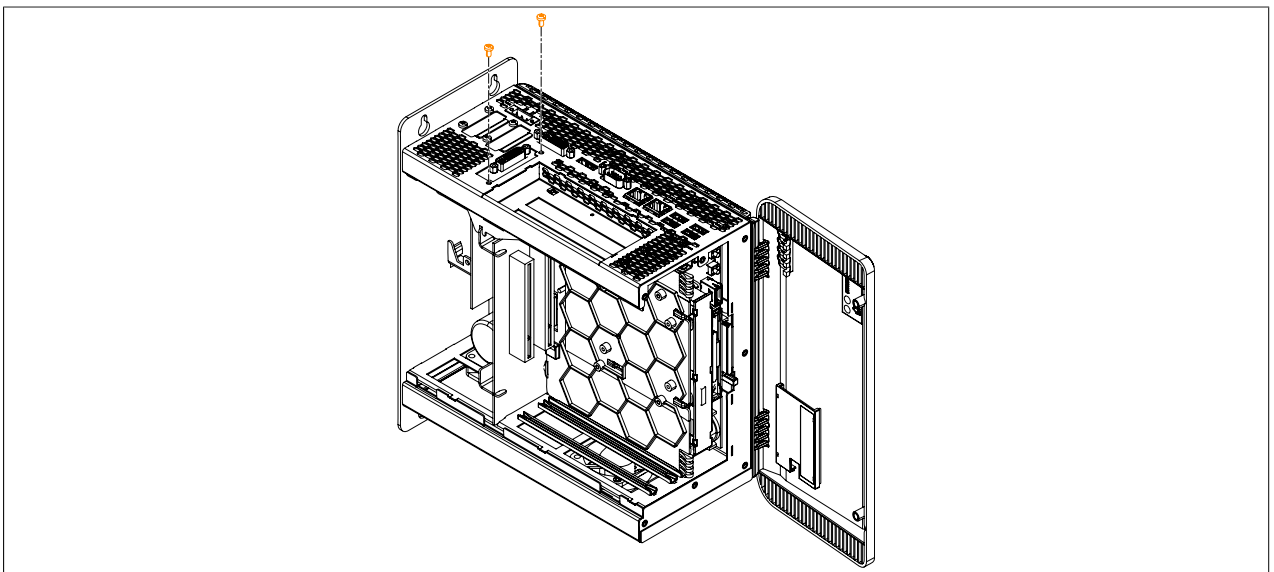


Figure 226: Securing the monitor/panel option using the Torx screws

8. Attach the side cover.

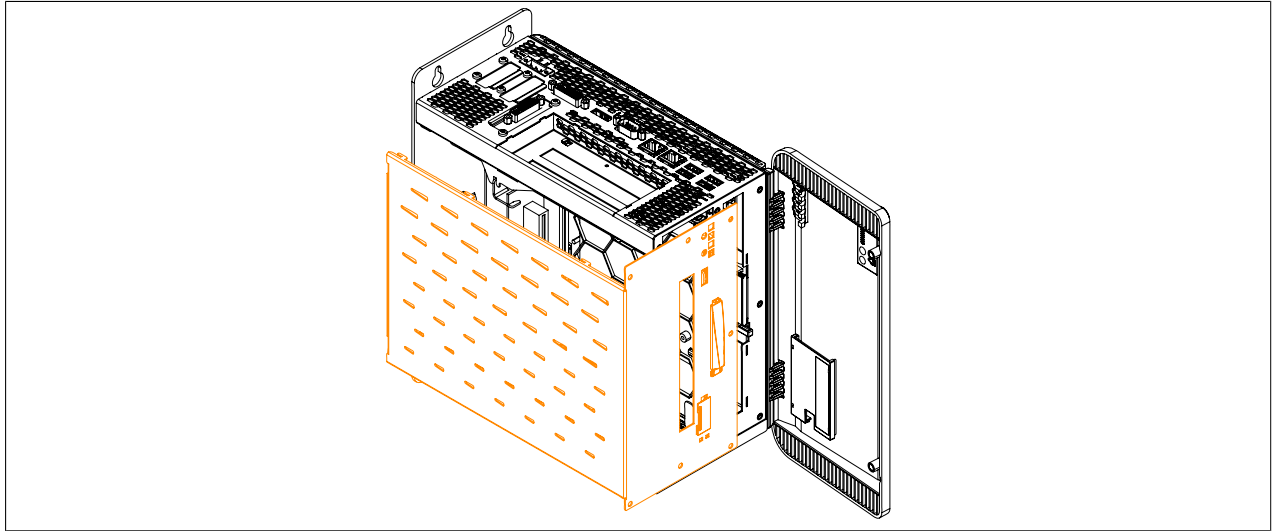


Figure 227: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

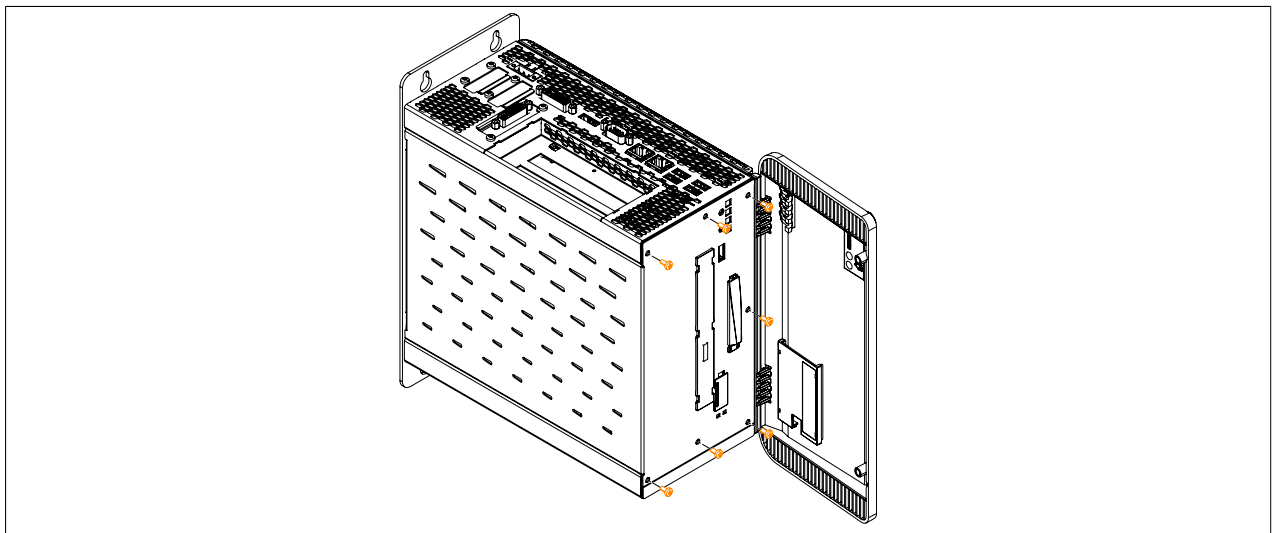


Figure 228: Securing the side cover

10. Once installed successfully, the monitor/panel option must be enabled in [BIOS](#). This is done by launching [BIOS](#) when booting the system, loading the default [BIOS](#) values and then saving the settings. For additional information, see "[Save & Exit](#)" on [page 283](#).

## 5 Installing and exchanging slide-in compact drives

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or **ground** connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws **can** vary depending on the system unit.

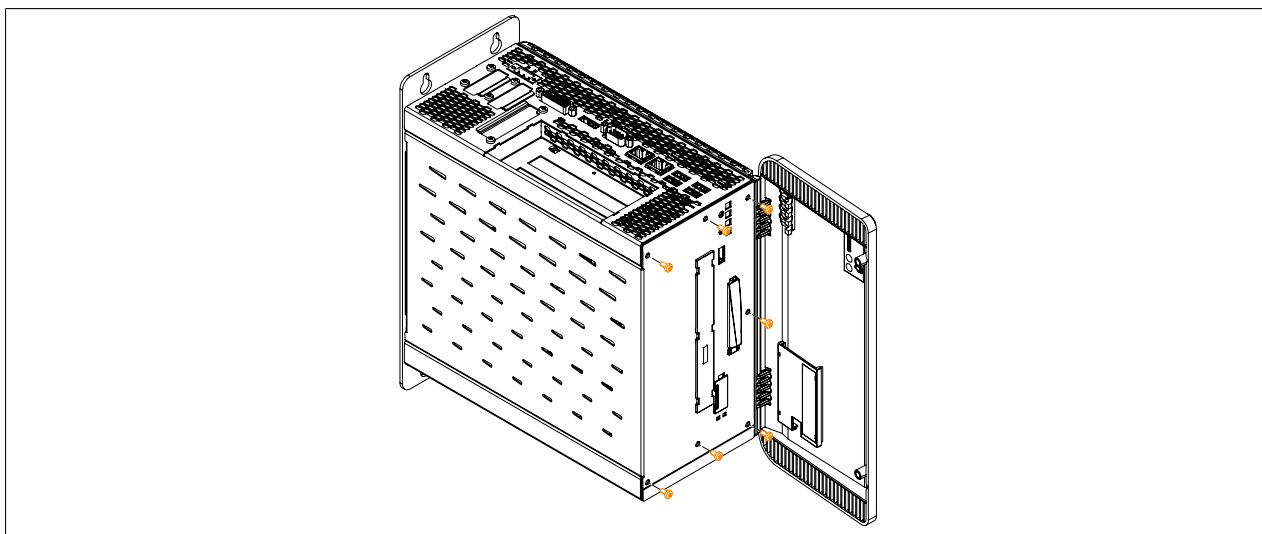


Figure 229: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover **can** be removed by sliding it first toward the front and then to the side.

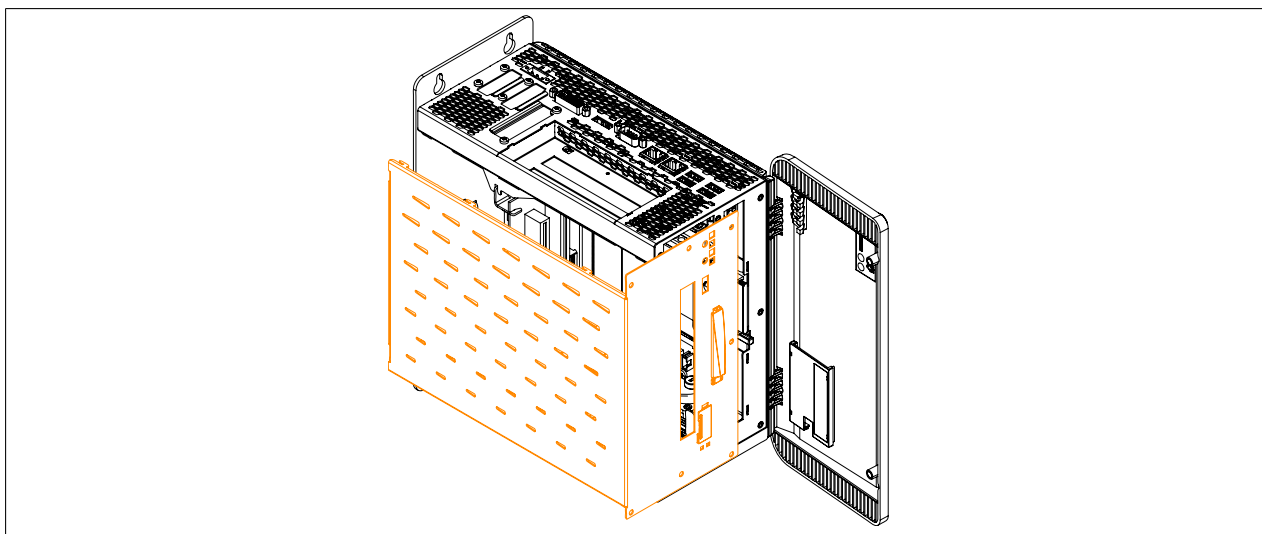


Figure 230: Removing the side cover

5. Free the plastic removal strip fastened to the side of the slide-in compact drive. Remove the slide-in compact drive from the Automation PC 910 by pulling firmly on the removal strip. 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).

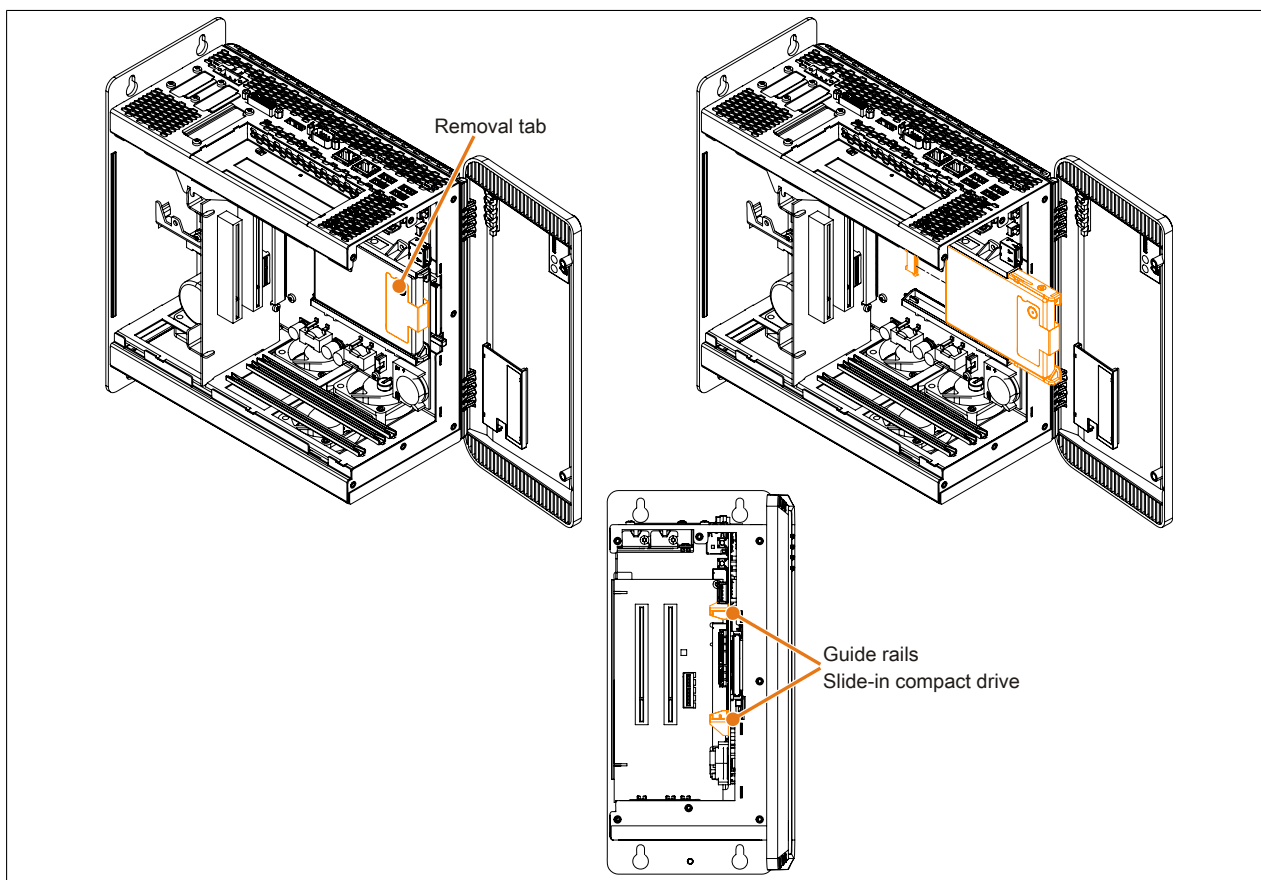


Figure 231: Installing/Exchanging the slide-in compact drive

6. Attach the side cover.

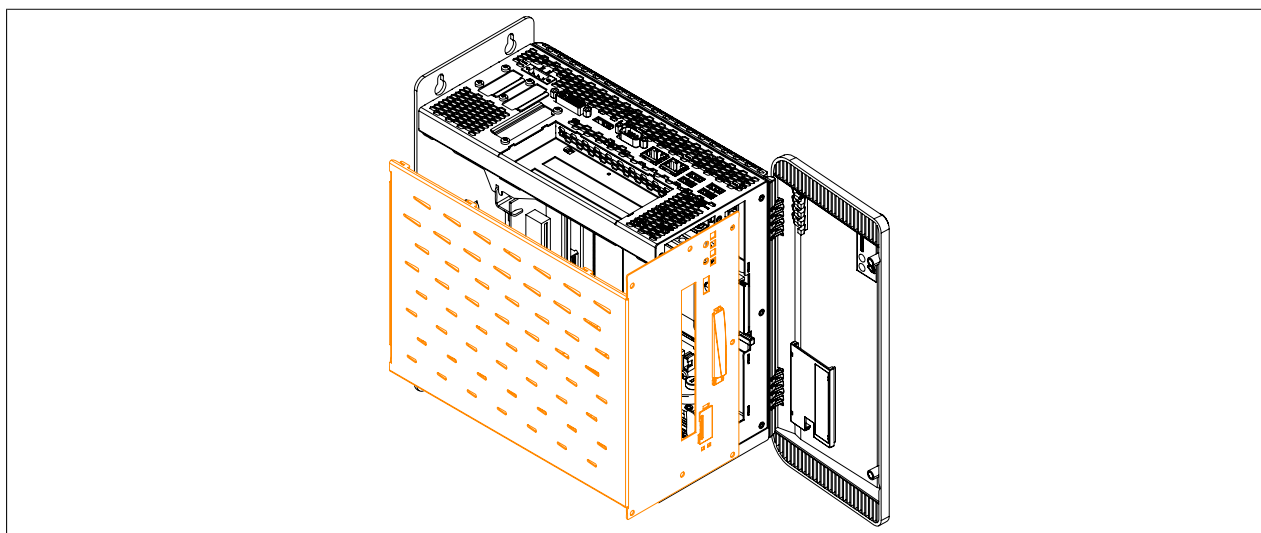


Figure 232: Replacing the side cover

7. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

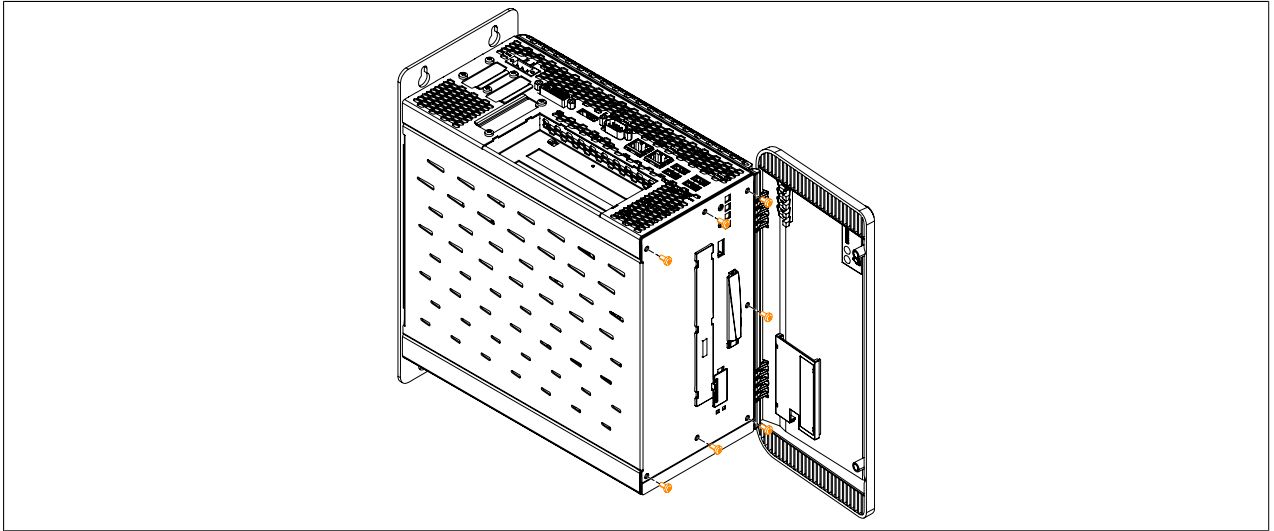


Figure 233: Securing the side cover

## 6 Installing and exchanging slide-in drives

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or **ground** connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws **can** vary depending on the system unit.

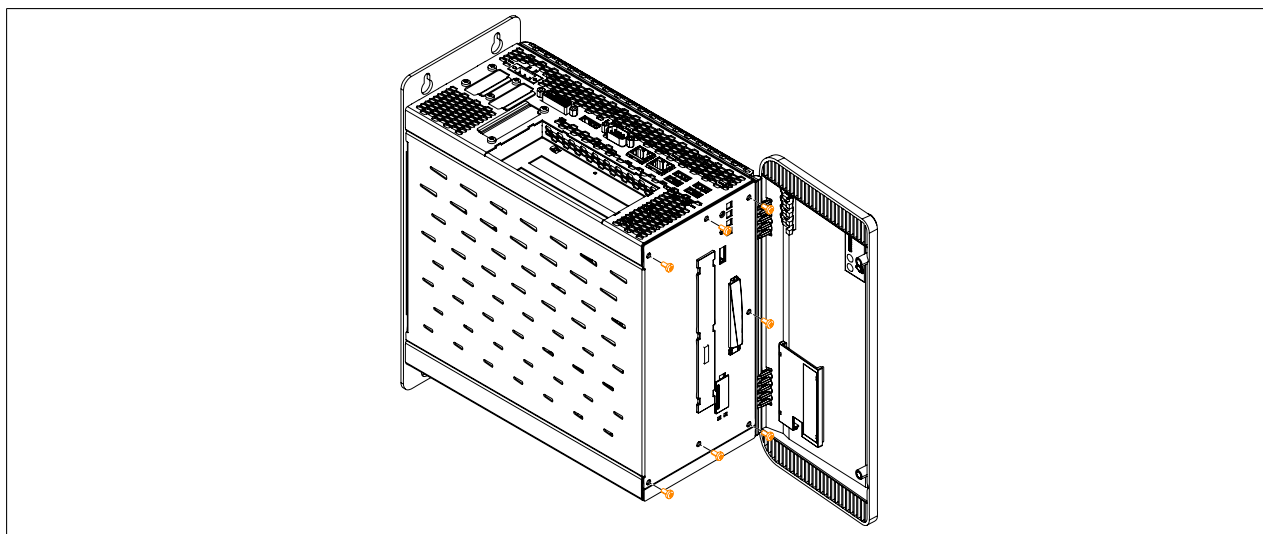


Figure 234: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover **can** be removed by sliding it first toward the front and then to the side.

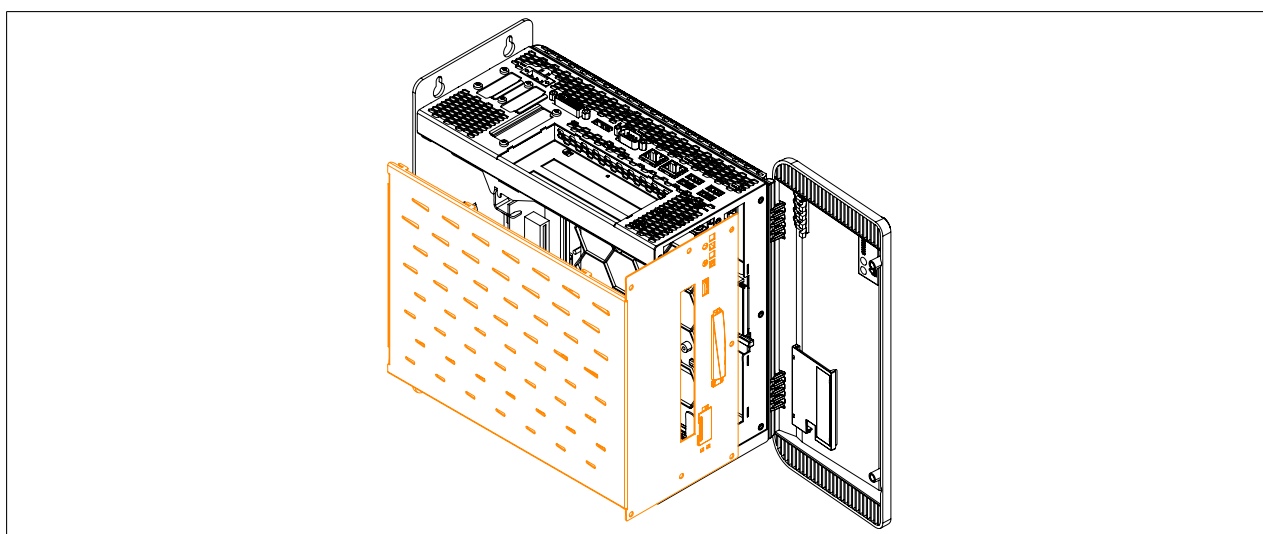


Figure 235: Removing the side cover

5. Install/Exchange the slide-in compact drive. The slide-in compact drive must slide into the guide rails and snap into the connector.

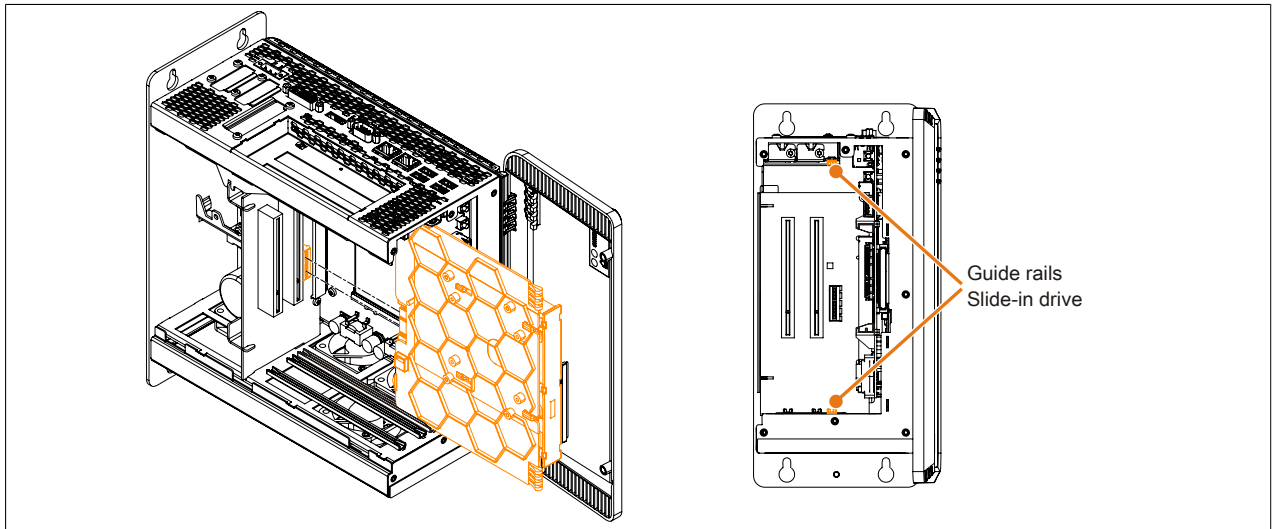


Figure 236: Installing/Exchanging the slide-in drive

6. Attach the side cover.

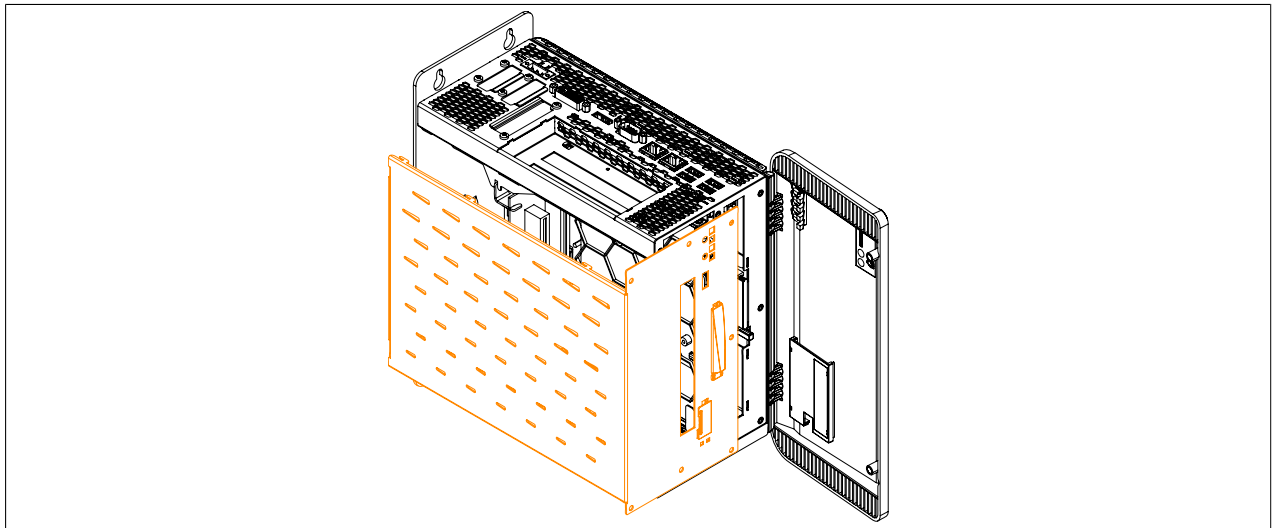


Figure 237: Replacing the side cover

7. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.  
The slide-in slot cover must be installed in order to operate the 5AC901.SSCA-00 slide-in compact adapter.

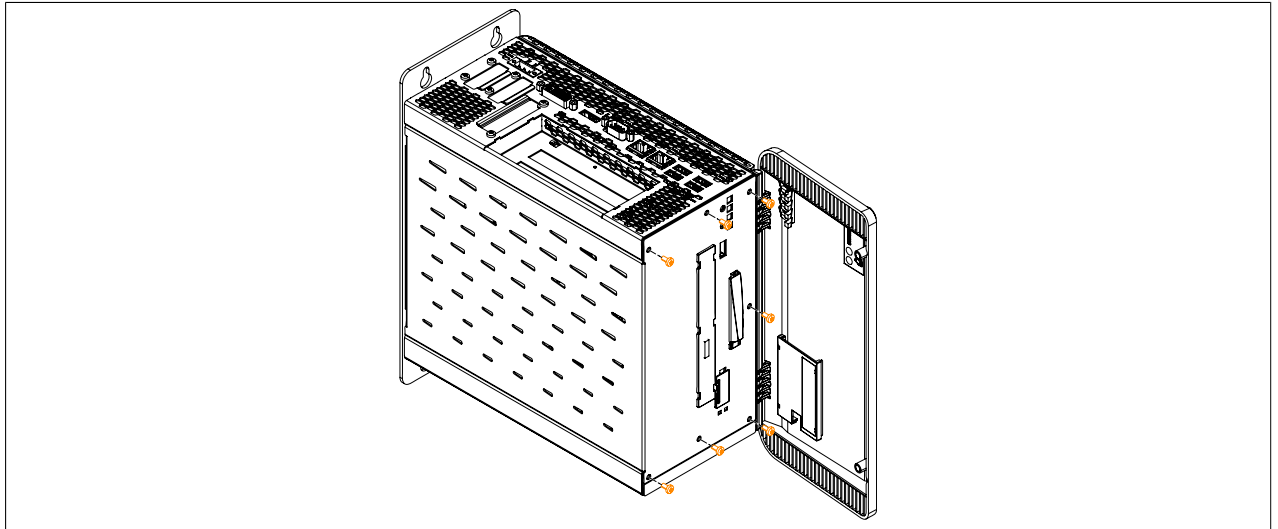


Figure 238: Securing the side cover



## 7 Installing PCI/PCIe cards

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or **ground** connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws **can** vary depending on the system unit.

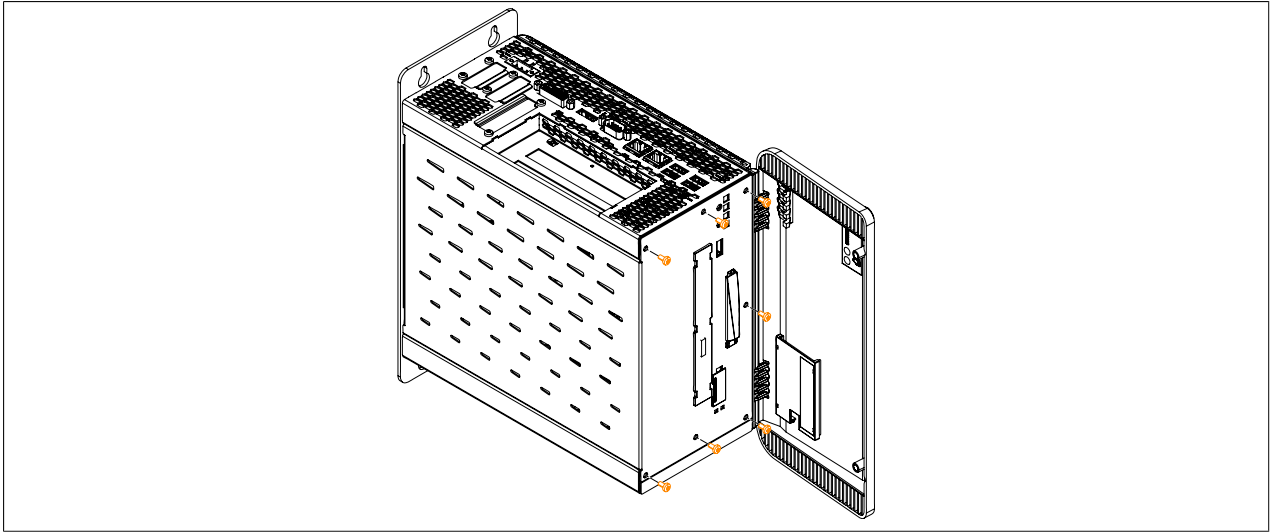


Figure 239: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover **can** be removed by sliding it first toward the front and then to the side.

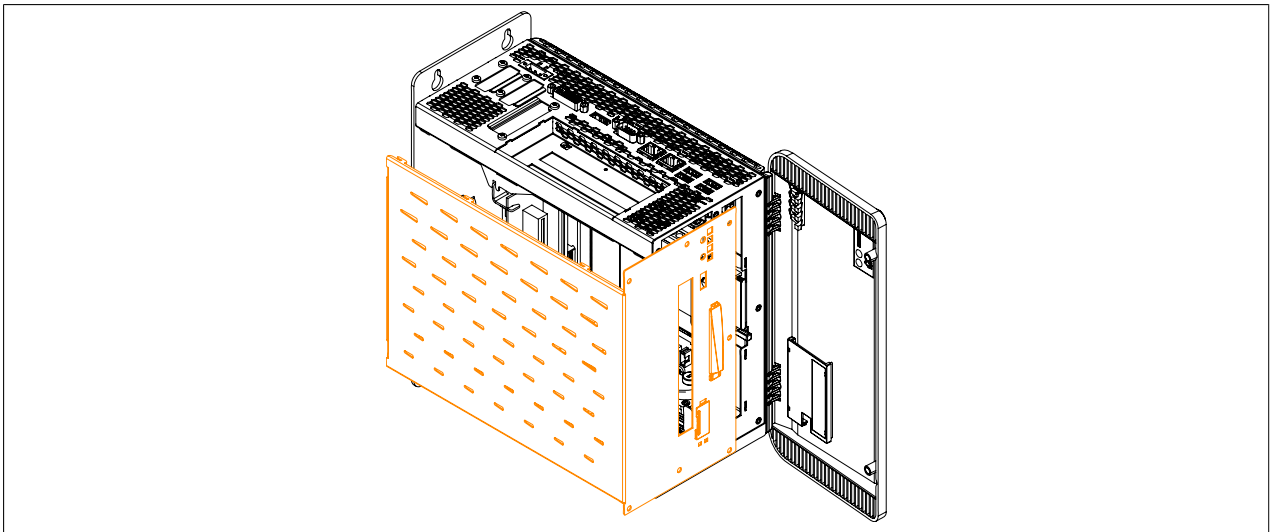


Figure 240: Removing the side cover

5. Remove the PCI slot cover. This is done by first removing the indicated Torx screws (T10) and then removing the cover.

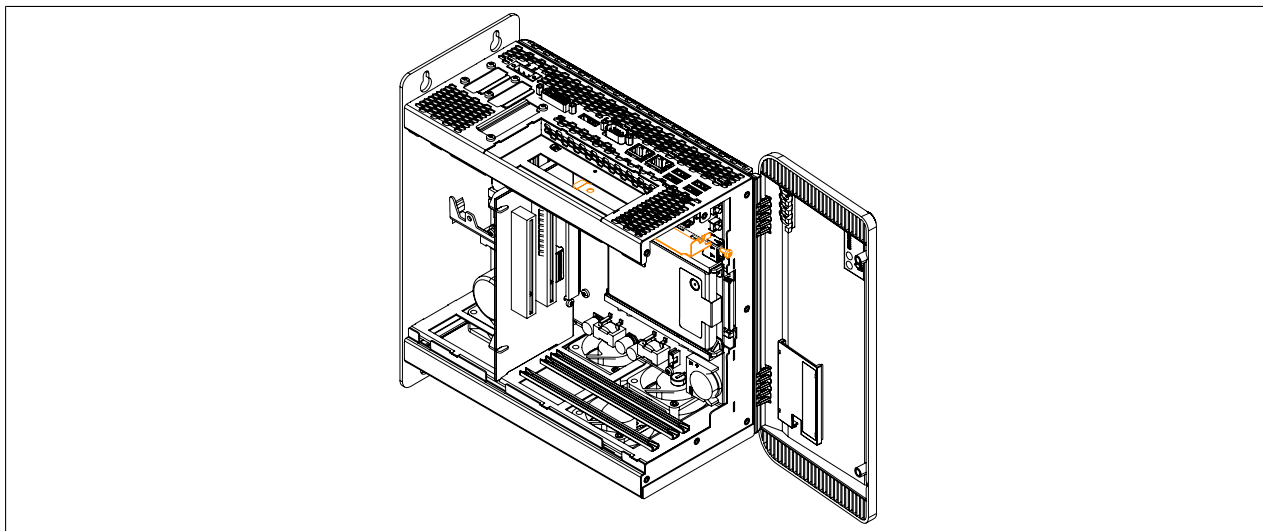


Figure 241: Removing the PCI/PCIe slot cover

6. Install or replace the PCI/PCIe card. Be sure to insert the PCI/PCIe card in the lower black guide rail. Fasten the PCI or PCIe card using the indicated (previously removed) Torx screws (T10).

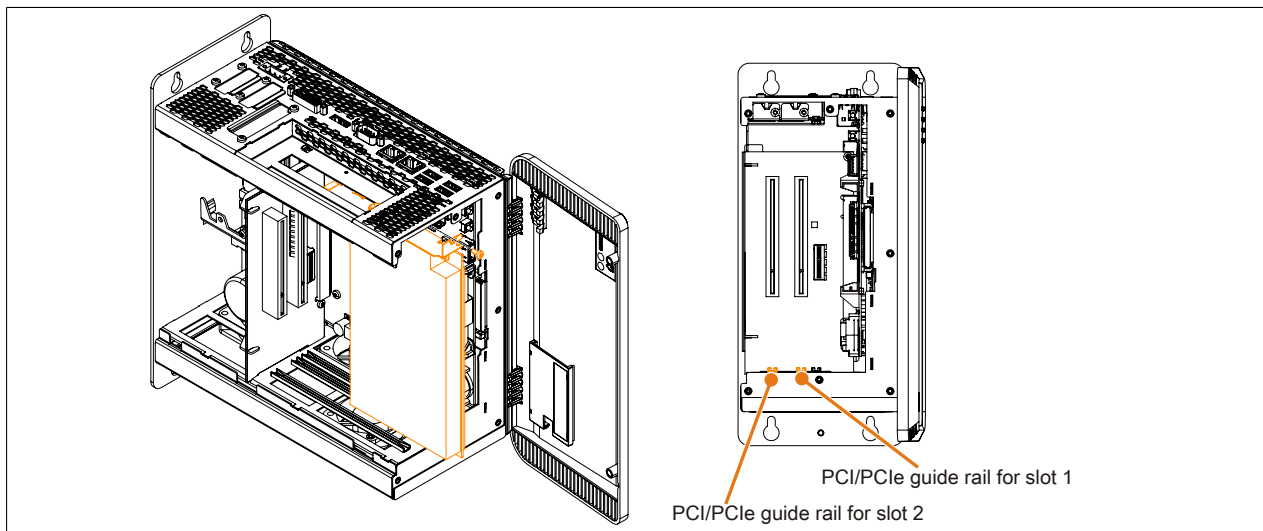


Figure 242: Installing/Replacing the PCI/PCIe card

7. Attach the side cover.

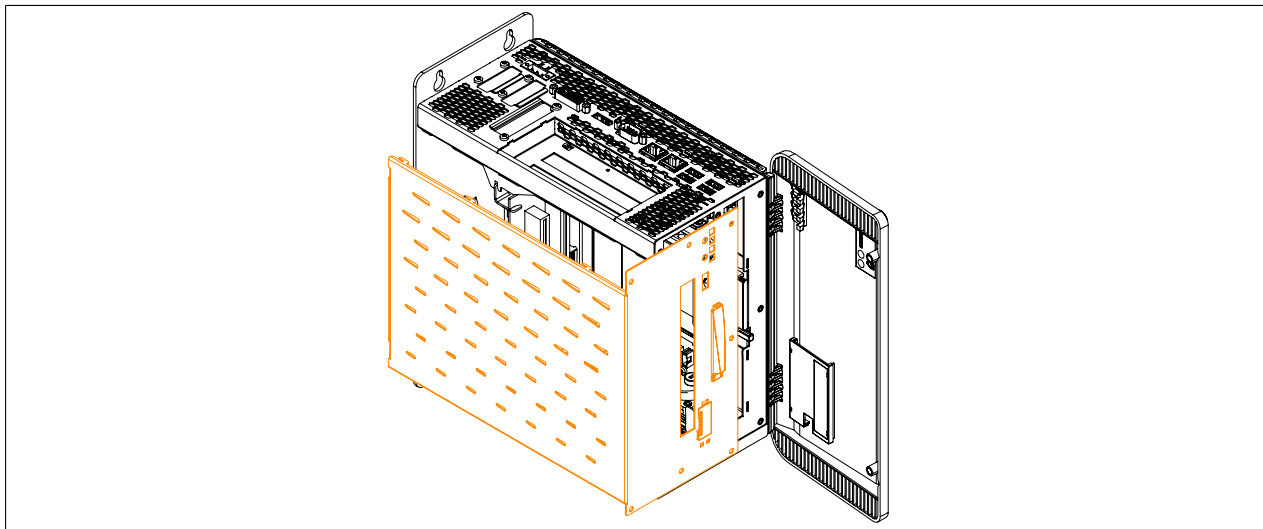


Figure 243: Replacing the side cover

8. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

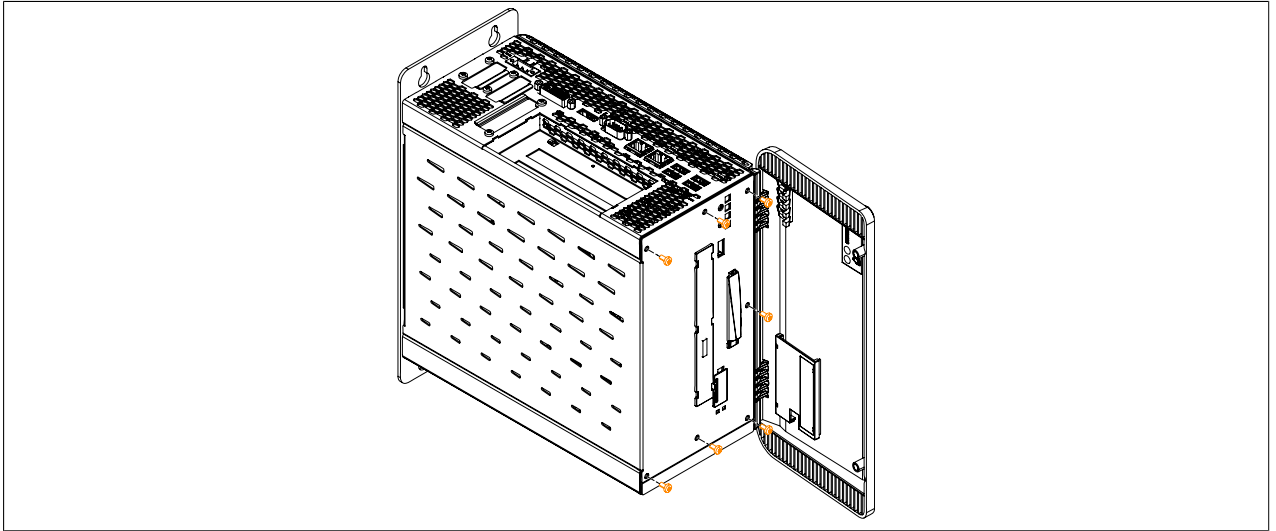


Figure 244: Securing the side cover

## 8 Installing and connecting the UPS battery unit

### Information:

For information about installing the UPS IF option, see "Installing interface options" on page 391.

### Warning!

**Do not open the UPS battery unit!**

1. Disconnect the power supply to the B&R Industrial PC.
2. Install the battery unit. Information about the drilling template [can](#) be found in the technical data of the respective UPS battery unit. Ensure that the distance between the battery unit and the B&R Industrial PC allows them to be connected with the UPS cable (0.5 m, 1 m or 3 m).  
Installation requires 4 M5 screws, 4 washers and 1 screw lock (min. tightening torque 1.3 Nm; screw depth as per applicable DIN regulations and specific application). These are not included in delivery.
3. Connect the UPS cable to the battery unit. When doing so, make sure to connect the red and black wires to the power supply (orange screw clamp). Be sure to use the right terminal block (red wire for +, black wire for -)! Connect the white and brown wires (brown wire for 1, white wire for 2) to the temperature sensor (green screw clamp terminal block).

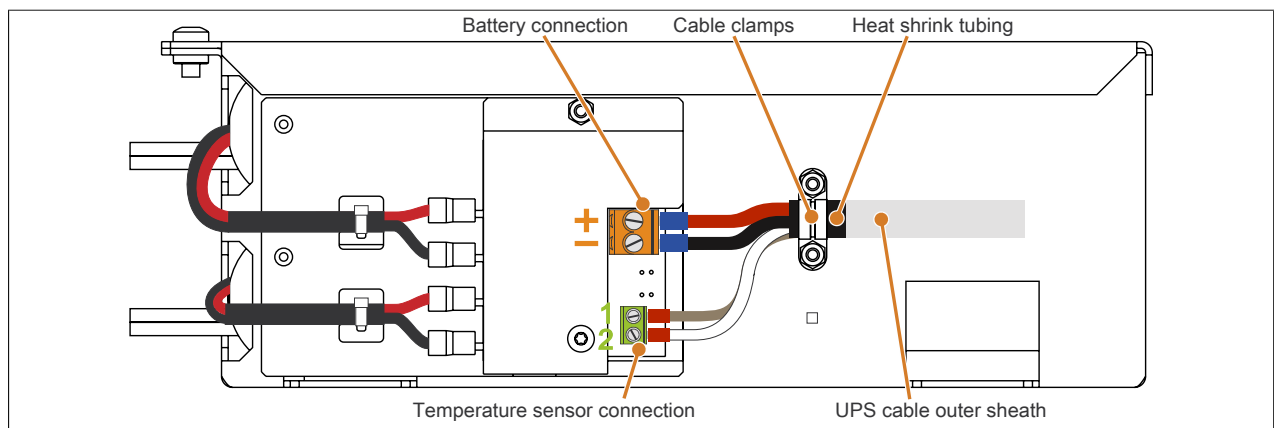


Figure 245: Connecting the UPS cable to the battery

4. Tighten the connected wires in the screw clamps with a screwdriver (max. tightening torque 0.4 Nm).
5. Loosen the two nuts (M3) on the cable clamp and feed the UPS cable through.
6. Fasten the UPS cable using the cable clamp. Tighten the previously removed nuts onto the cable clamp in alternating order (max. tightening torque 0.35 Nm).
7. Connect the 4-pin screw clamp to the UPS IF option and tighten the two screws with a screwdriver (max. tightening torque 0.4 Nm).

## 9 Replacing fan filters

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or **ground** connection in order to discharge any electrostatic charge from your body.
3. Open the front cover.
4. To remove the fan **filter** from the B&R Industrial PC, push up on the locking mechanism while pulling the fan **filter** outward. The number of locking mechanisms may vary depending on the system unit.

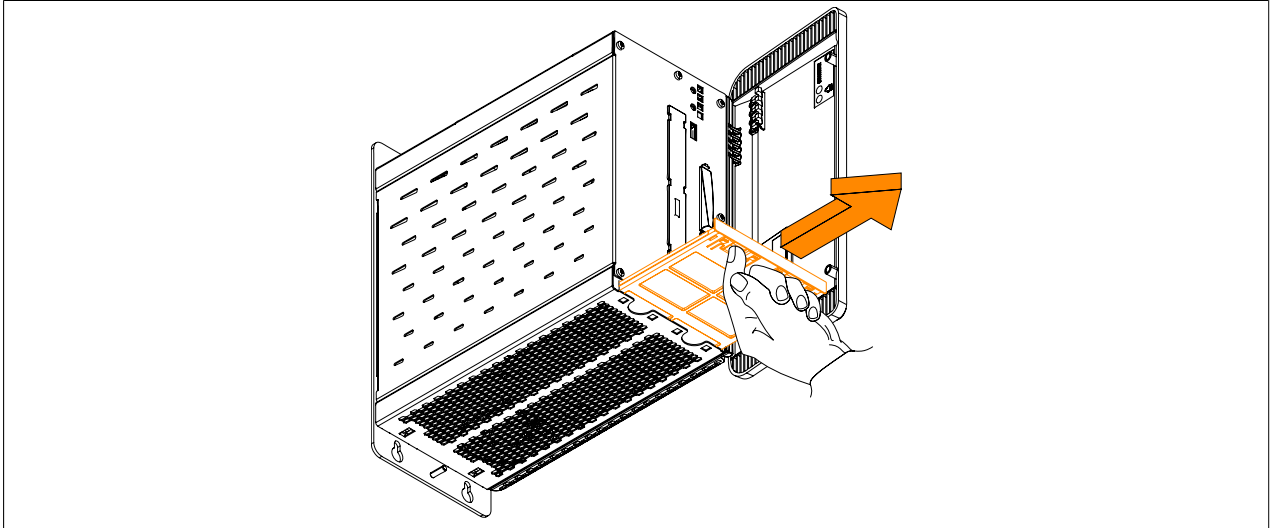


Figure 246: Removing the fan **filter** from the APC910

### Information:

The dust **filter** must be inspected at regular intervals determined by the amount of dust in the operating environment.

## 10 Replacing fan kits

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or **ground** connection in order to discharge any electrostatic charge from your body.
3. Open and remove the front cover.

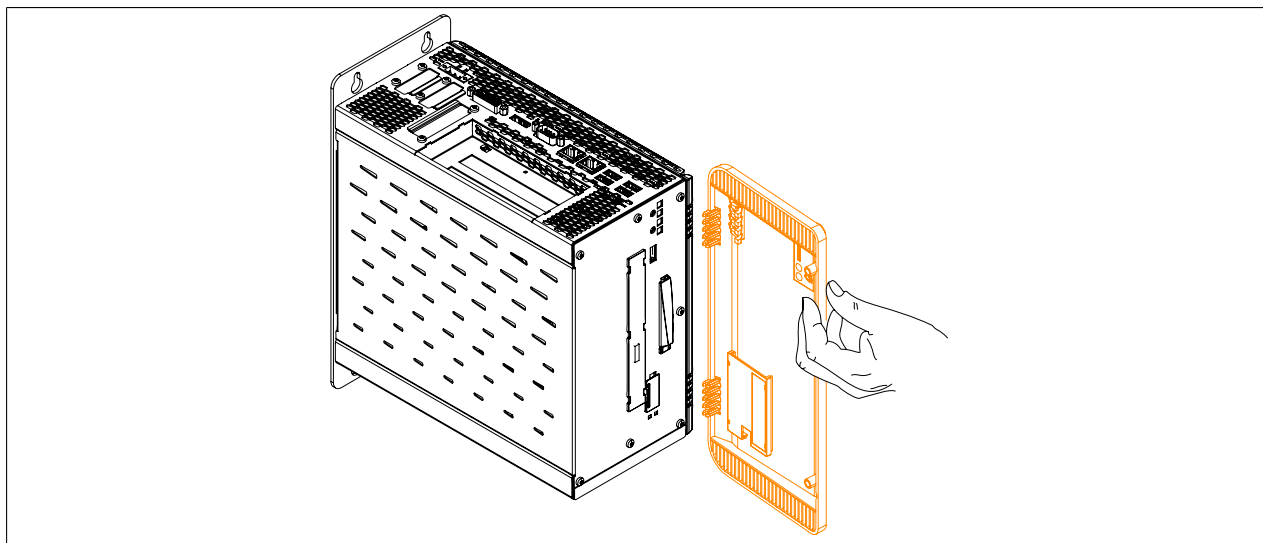


Figure 247: Removing the front cover

4. Remove the heat sink cover. The Torx screws (T15) that are marked in the image must be removed.

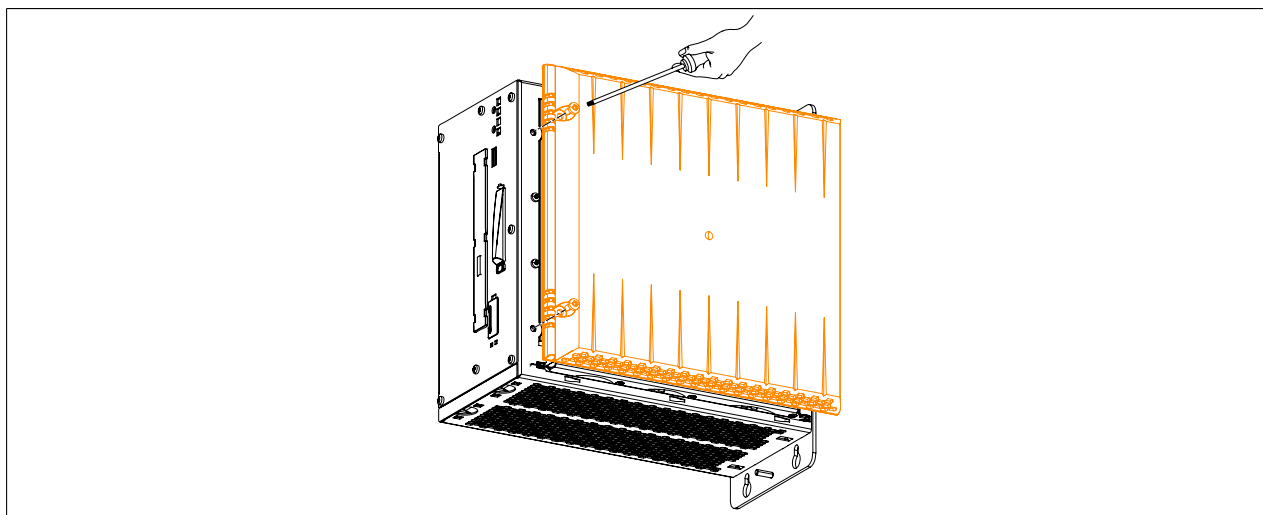


Figure 248: Removing the heat sink cover

- Remove the Torx screws (T10) from the fan kit that are marked in the following image and unplug the fan kit cable from the mainboard.

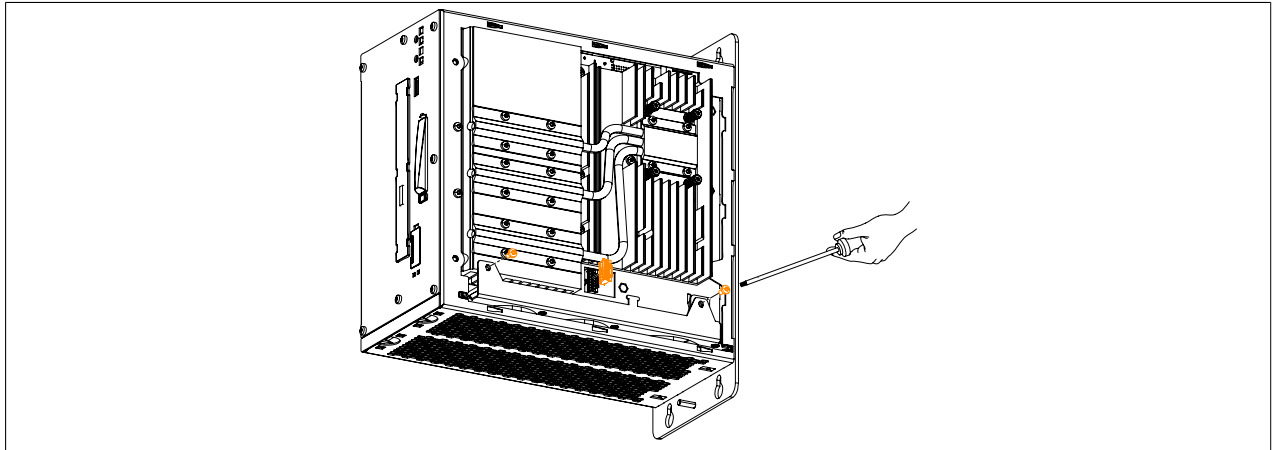


Figure 249: Removing the Torx screws and fan cable

- The fan kit **can** now be removed from the **Automation PC 910**.

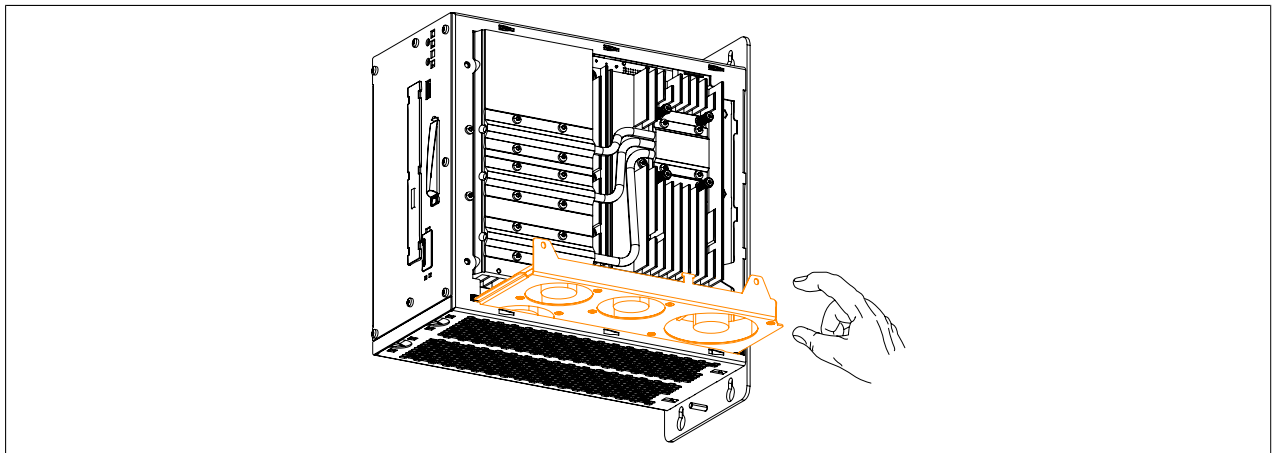


Figure 250: Removing the fan kit from the APC910

- A new fan kit **can** now be installed.
- The **Automation PC 910** **can** now be re-assembled by carrying out these instructions in reverse.
- 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.

- After the fan kit has been programmed, the **BIOS** default values must be loaded and the settings saved. For additional information, see "Save & Exit" on page 283.

### 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 still needs to be programmed.

- 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
- 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



## 11 Connecting an external device to the mainboard

A male connector on the mainboard allows +5 VDC and +12 VDC to be rerouted in order to provide power to special PCI cards, for example.

This voltage [can](#) be accessed using the "Internal supply cable" on [page 384](#). The multi-pin connector is located near the battery and slide-in compact drive.


| Multi-pin connector for external devices |            |               |  |
|--|------------|---------------|--|
| Pin                                      | Assignment | Power         | 4-pin connector, male<br> |
| 1  | +12 VDC    | Max. 10 watts |  |
| 2  | GND        |               |  |
| 3  | GND        | Max. 5 watts  |  |
| 4  | +5 VDC     |               |  |

Table 334: Multi-pin connector on the mainboard - Pinout

Connections are protected with a 1 A multi-fuse.

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or [ground](#) connection in order to discharge any electrostatic charge from your body.
3. Open the front cover. The Torx screws (T10) behind the cover that are marked in the image must then be removed. The number of Torx screws [can](#) vary depending on the system unit.

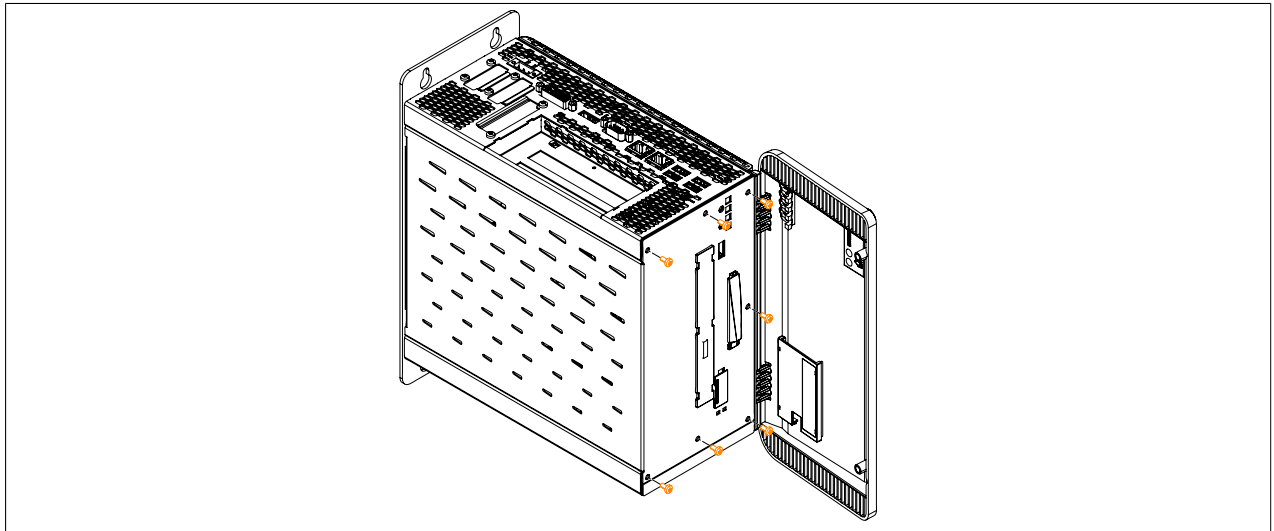


Figure 251: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover [can](#) be removed by sliding it first toward the front and then to the side.

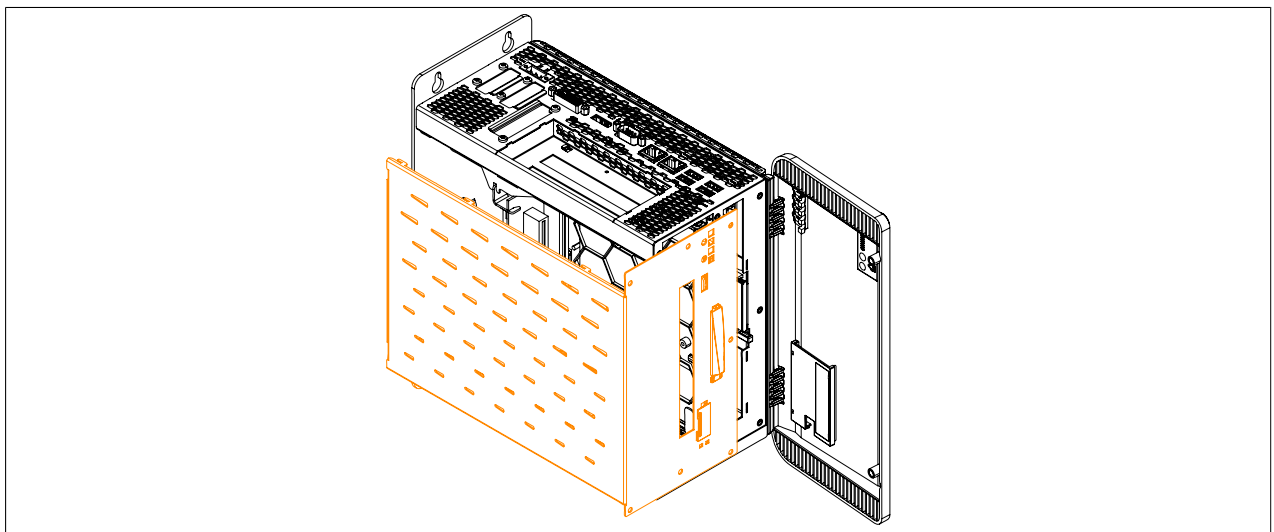


Figure 252: Removing the side cover

5. To access the multi-pin connector for external devices, it may be necessary to first remove any installed slide-in drives.

6. Plug the internal supply cable into the multi-pin connector for external devices on the mainboard. The springs on the supply cable connector must fit into the grooves of the multi-pin connector.

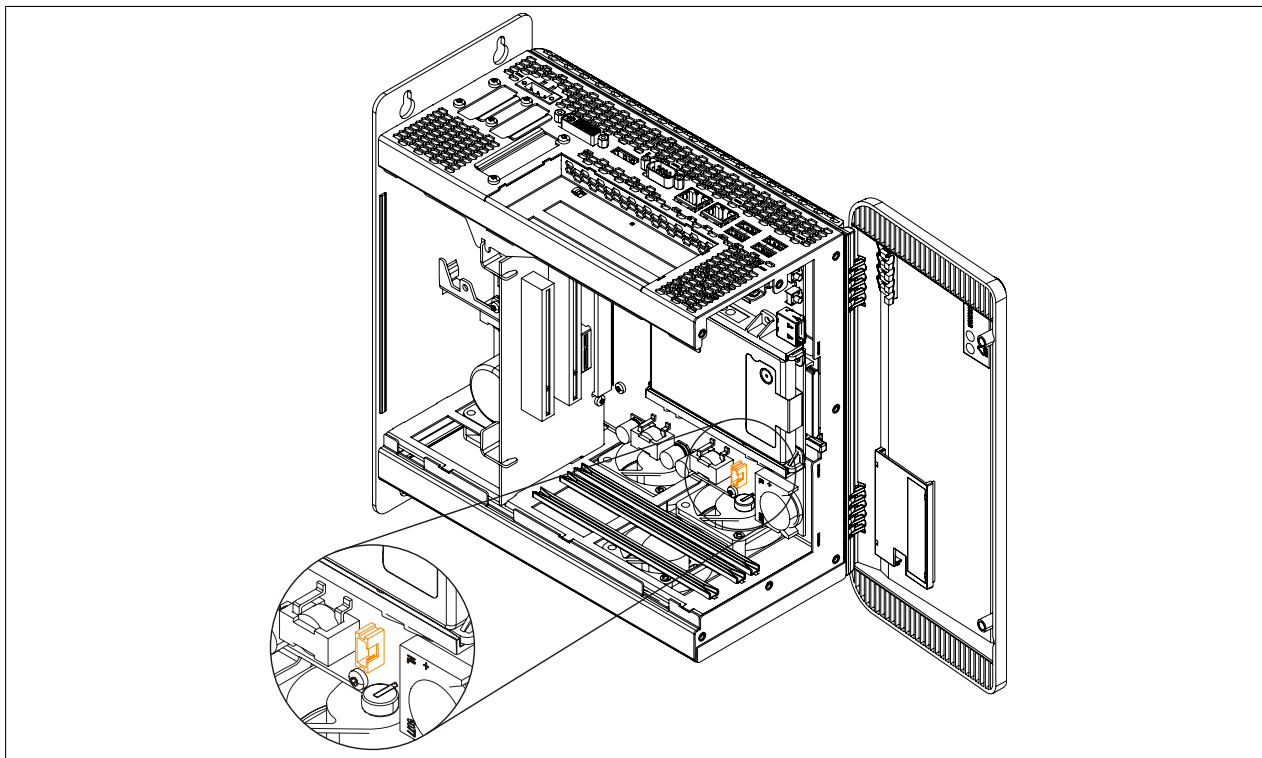


Figure 253: Connector location for external devices

7. Now connect the internal supply cable to the external [device](#) and replace any slide-in drives that were removed earlier.
8. Attach the side cover.

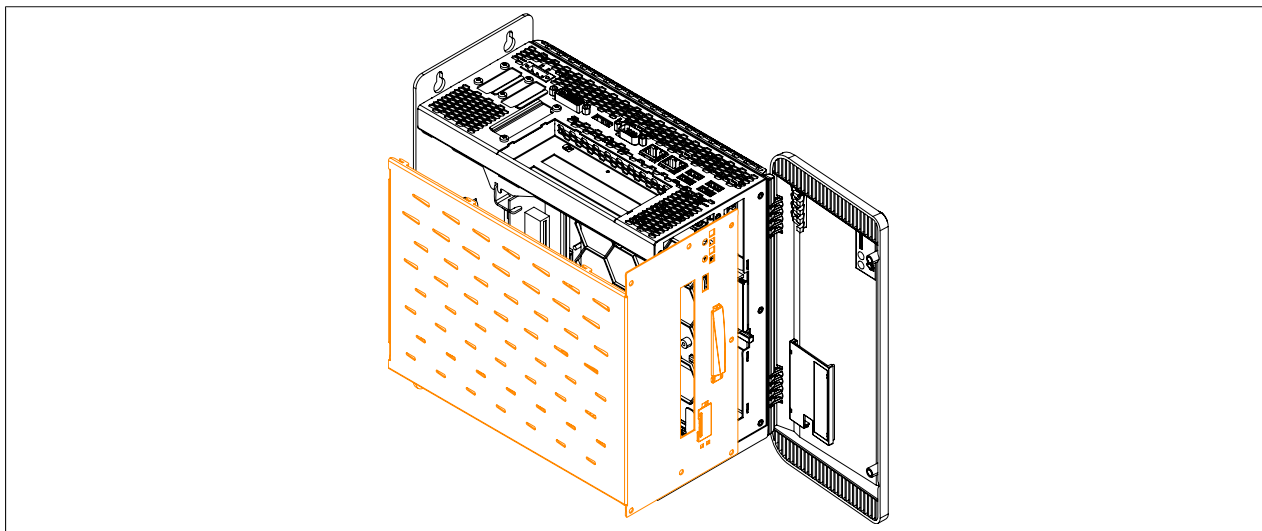


Figure 254: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

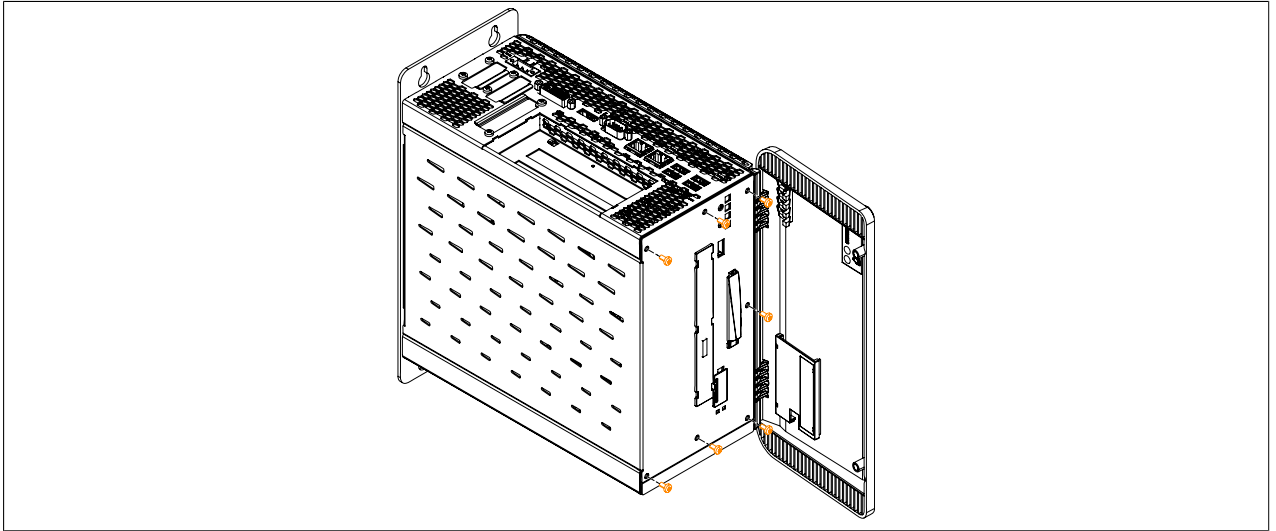


Figure 255: Securing the side cover

## 12 Replacing a PCI SATA RAID hard disk in a RAID 1 set

This example assumes that the secondary hard disk (HDD1) is defective in a RAID 1 configuration. In such a case, the defective hard disk [can](#) be replaced by the replacement drive SATA hard disk.

| Model number of PCI SATA RAID controller | Model number of required replacement SATA HDD | Note             |
|--|---|------------------|
| 5ACPCI.RAIC-01                           | 5ACPCI.RAIC-02                                | 60 GB hard disk  |
| 5ACPCI.RAIC-03                           | 5ACPCI.RAIC-04                                | 160 GB hard disk |
| 5ACPCI.RAIC-05                           | 5MMHDD.0250-00                                | 250 GB hard disk |
| 5ACPCI.RAIC-06                           | 5MMHDD.0500-00                                | 500 GB hard disk |

Table 335: Overview of required replacement SATA HDD for PCI SATA HDD RAID controller

A size 10 Torx screwdriver is needed to replace the hard disk.

### 12.1 Procedure

1. Disconnect the power supply.
2. Touch the housing or [ground](#) connection in order to discharge any electrostatic charge from your body.
3. Remove the side cover.
4. Remove the SATA RAID insert.
5. Loosen the 4 appropriate fastening screws (M3x5).

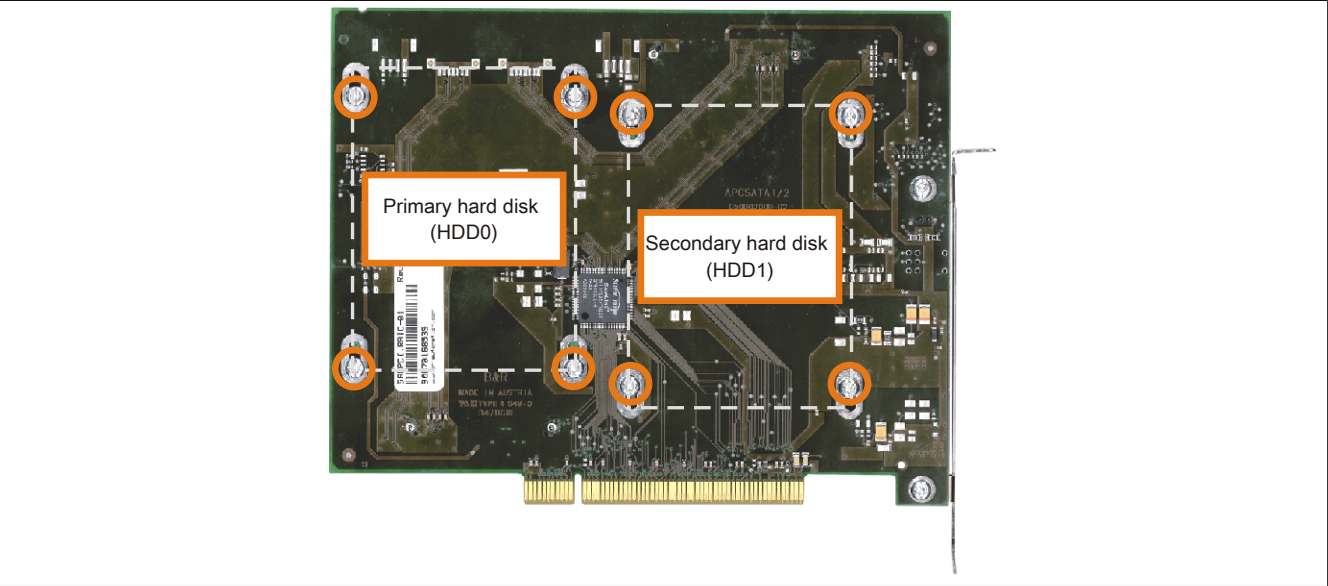


Figure 256: Screw layout on the back of the 5ACPCI.RAIC-03 SATA RAID controller

6. On the front, slide the hard disk down and away ([Exchanging the hard disk](#) - left image).
7. Insert the new hard disk carefully into the connector ([Exchanging the hard disk](#) - right image), being careful to only touch it on the front, not on the top.

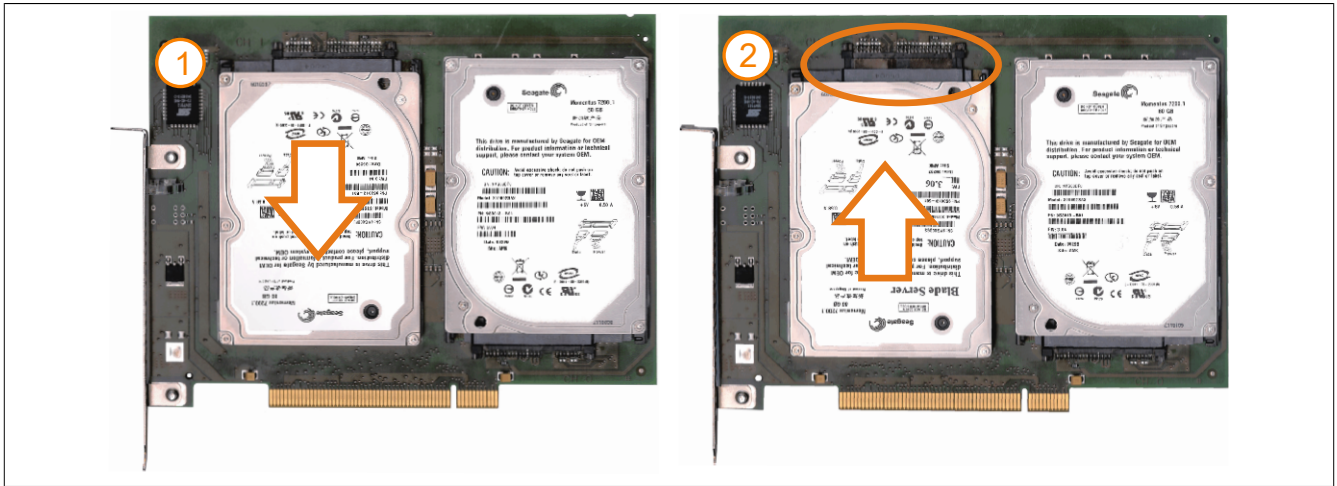


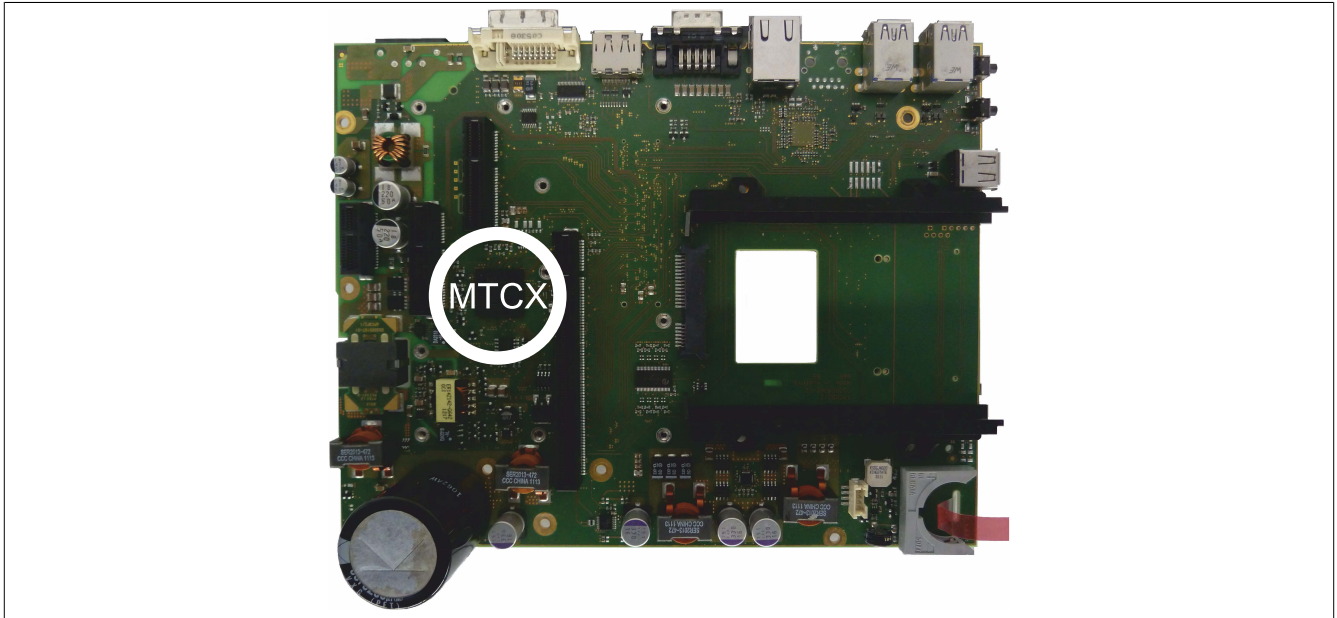
Figure 257: Exchanging the hard disk

8. Re-secure the hard disk using the 4 fastening screws (M3x5) used earlier.
9. Reassemble the device in the reverse order.
10. An error message is output by the RAID BIOS after starting the system: "RAID1 set is in Rebuild status. The rebuild will continue after boot sequence is complete".
11. A rebuild can be performed immediately in SATA RAID BIOS or once the PC has booted - see "Rebuild mirrored set" on page 216.

# Appendix A

## 1 Maintenance Controller Extended (MTCX)

The **MTCX controller** (FPGA processor) is located on the mainboard (part of every system unit) of the APC910 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.

Extended **MTCX** functions are available by upgrading **firmware** <sup>8)</sup>. The version **can** be read in **BIOS** or approved Microsoft Windows operating systems using the B&R **Control** Center.

<sup>8)</sup> Available in the Downloads section of the B&R website ([www.br-automation.com](http://www.br-automation.com)).



## 2 Abbreviations

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

Table 336: Abbreviations in this user's manual

## 3 Glossary

|                                   |   |
|-----------------------------------|---|
| <b>ACPI</b>                       | <i>Advanced Configuration and Power Interface</i> is a configuration interface that enables the operating system to control the power supply for each device connected to the PC. With ACPI, the computer's BIOS is only responsible for the details of communication with the hardware.  |
| <b>Address</b>                    | An address is a character string for identifying a memory location or a memory area, where data is stored and can be retrieved. It is also a symbol (e.g. with numerical controllers) for identifying a function unit for which subsequent geometrical or technological data are determined by the symbol.  |
| <b>Algorithm</b>                  | <p>DIN 19226: Algorithms are a finite series of well-defined regulations. The desired output quantities are created from permitted system input quantities. It describes how something is to be done. A procedure must at least satisfy the following requirements to be valid as an algorithm in a mathematical context.</p> <p><i>Discrete</i> &gt; An algorithm is made up of a finite series of steps.</p> <p><i>Deterministic</i> &gt; Under the same start conditions, an algorithm always creates the same end result.</p> <p><i>Unambiguous</i> &gt; The order of steps in an algorithm is clearly defined.</p> <p><i>Finite</i> &gt; An algorithm ends after a finite number of steps.</p> <p>From a quantity theory perspective, an algorithm is clearly defined by a set of sizes [input, intermediate and output sizes], a set of elementary operations and also by a regulation, which specifies when and in what sequence certain operations should be carried out. From a functional perspective, it transfers a set of input sizes into a set of output sizes. It can be represented in text form in a natural or artificial formal language or using graphic representations [graph, program flow chart, structured chart, Petri Nets etc.].</p> |
| <b>Analog signal</b>              | A signal, whose information parameters can accept any number of values, within specific technical limits. Theoretically, they can have an infinitely high resolution. However, in practice it is limited to a range of only 1 to 104. In addition, long-term storage and allocation causes many size problems. Therefore, digital signals are predominantly used in modern automation technology.   |
| <b>ANSI</b>                       | The <i>American National Standards Institute</i> promotes and manages American industrial standards.  |
| <b>APC</b>                        | <i>Automation PC</i>  |
| <b>Application software</b>       | Software, which is not used for operation by the computer itself, but rather when a computer is used to process a concrete application problem. It sets up the system software and uses this for fulfilling individual tasks. Application software can be accommodated in standard software used by a large number of customers in a wide range of industries. Common examples are Word, Excel, PowerPoint, Paint, Matlab etc. Industrial software tailored to the respective problems of a certain industry and individual software created for solving the particular problems of an individual user.   |
| <b>ASCII</b>                      | <p><i>American Standard Code for Information Interchange</i> is a standard code is used worldwide (numbers, letters, special characters and device controller characters are represented as 7-bit binary combinations). Standard ASCII-characters cover 27 = 128 characters in total. An eighth bit is used as a so-called parity bit for error detection when transferring ASCII files. During even parity checking, this bit is set to 0, when the number of '1s' in the remaining seven bits is an even number. Otherwise, it is set to 1. The expanded ASCII character set does not use parity checking. The highest value bit is used here to switch from the standard character set to the expansion. This allows space for special regional characters e.g. umlauts in the German language.</p> <p><a href="http://www.asciitable.com">www.asciitable.com</a></p>  |
| <b>Automation</b>                 | According to Brockhaus: The application of technical means, using specific programs that (either partially or totally) do not require human intervention to perform operations.   |
| <b>Automation Runtime</b>         | A uniform runtime system for all B&R automation components.   |
| <b>Availability</b>               | [A] The probability that a system will be functioning at a certain point in time. Reliability parameter for repairable systems. The stationary availability is defined using the following formula: $A = 1 / [1 + MDT/MTBF]$ . To achieve the highest possible availability values, it is necessary to perfect all quality assurance measures regarding reliability. However, this procedure has its technical and economical limits for given production conditions. When the automation plan is not sufficient to achieve the required reliability parameters, the principle of error tolerance, which is based on the shortest error detection and reconfiguration times, can allow the availability value to be increased.  |
| <b>B&amp;R Automation Runtime</b> | Windows-based program for creating installation disks to install B&R Automation Runtime™ on the target system.  |
| <b>Baud rate</b>                  | Measurement unit for data transfer speed. It indicates the number of states for a transferred signal per second and is measured using the baud unit of measurement. 1 baud = 1 bit/s or 1 bps   |
| <b>BIOS</b>                       | <i>Basic Input/Output System</i> is abbreviated as BIOS. Core software for computer systems with essential routines for controlling input and output processes on hardware components, for performing tests after system start and for loading the operating system. Although BIOS is used to configure a system's performance, the user does not usually come into contact with it.  |
| <b>Bit</b>                        | A <i>binary digit</i> is the smallest discrete information unit. A bit can have the value 0 or 1.   |
| <b>Bit rate</b>                   | The number of bits that can be transferred within a specified time unit. 1 bit/sec = 1 baud.  |
| <b>Browser</b>                    | A software tool for searching and reading websites. The most famous browsers are Microsoft Internet Explorer and Netscape Navigator.  |
| <b>Byte</b>                       | Data format [1 byte = 8 bits] and a unit for characterizing information amounts and memory capacity. The following units are the commonly used: KB, MB, GB.   |

|                                      |   |
|--------------------------------------|---|
| <b>Cache</b>                         | <i>Background memory</i> , also known as non-addressable memory or fast buffer memory, is used to relieve the fast main memory of a computer. For example, data that should be output to slower components by the working memory (e.g. disk storage, printers) is stored temporarily in cache memory and output from there at an appropriate speed for the target devices.  |
| <b>CAN</b>                           | <i>Controller Area Network</i> is a serial bus system. Structure according to ISO 11898; Bus medium: twisted pair. Good transfer properties in short distances less than 40 m with a 1 Mbit/sec data transfer rate. Maximum number of stations: Theoretically unlimited, but practically limited up to 64. Real-time capable (i.e. defined maximum latency times for messages with high priority). High reliability using error detection, error handling, troubleshooting. Hamming distance.   |
| <b>CE mark</b>                       | It consists of the letters "CE" and indicates conformity to all EU guidelines for the labeled product. It indicates that the individual or corporate body who has performed or attached the label assures that the product conforms to all EU guidelines for complete harmonization. It also indicates that all mandatory conformity evaluation procedures have taken place.  |
| <b>Circuit breaker</b>               | Circuit breaker - Mechanical switching device that can switch on, allow timed operation and switch off currents under certain specified operating conditions; they can also switch on allow timed operation and switch off currents under defined exception conditions e.g. short circuit current. They are available in open and compact designs with manual, magnet, motor or pressurized air drives; in one, two, three or four pole designs; for AC, DC and three-phase current; for low voltage and high voltage applications.   |
| <b>CMOS</b>                          | <i>Battery-powered memory area</i> where fundamental parameters of an IBM (or compatible) personal computer are stored. Information such as the type of hard drive, size of the working memory and the current date and time are required when booting the computer. As the name suggests, the memory is based on CMOS technology standards.  |
| <b>COM</b>                           | A device name used to access serial ports in MS-DOS. The first serial port can be accessed under COM1, the second under COM2, etc. A modem, mouse, or serial printer is typically connected to a serial port.   |
| <b>COM1</b>                          | Device name for the first serial port in a PC system. The input/output area for COM1 is usually found at address 03F8H. Generally, the COM1 port is assigned to IRQ 4. In many systems, an RS232 serial mouse is connected to COM1.   |
| <b>Control</b>                       | Targeted interaction with values in a system that can be influenced. The system being influenced is known as the controlled system and in this case is a device, machine or system in which material and/or energy are subject to one or more possible handling forms, such as extracting, transferring, converting, saving or using as desired.  |
| <b>Controller</b>                    | A device component which allows access to other devices on a computer subsystem. A disk controller, for example, allows access to hard disks and disk drives and is responsible both for physical and logic drive access.   |
| <b>CPU</b>                           | A <i>Central Processing Unit</i> is the processing and control unit of a computer; the unit which interprets and executes commands. Also known as the central processor or microprocessor. A CPU has the capability to load commands, to decode and to execute, as well as to transfer information to and from other resources.   |
| <b>CRT</b>                           | <i>Cathode Ray Tube</i> is abbreviated as CRT. The main component of a television set or a standard computer screen. A cathode ray tube consists of a vacuum tube that contains one or more electron guns. Each electron gun creates a horizontal electron beam that appears on the front of the tube (the screen). The inner surface of the screen is coated with phosphor, which is lit when hit by the electrons. Each of the electron beams move in a line from top to bottom. In order to prevent flickering, the screen content is updated at least 25 times per second. The sharpness of the picture is determined by the number of pixels on the screen.  |
| <b>CTS</b>                           | <i>Clear To Send</i> is abbreviated as CTS. A signal used when transferring serial data from modem to computer, indicating its readiness to send the data. CTS is a hardware signal which is transferred via line number 5 in compliance with the RS-232-C standard.  |
| <b>DCD</b>                           | <i>Data Carrier Detected</i> is a signal used in serial communication that is sent by the modem to the computer it is connected to, indicating that it is ready for transfer.   |
| <b>Device</b>                        | In common usage, the word "device" is a synonym for an apparatus, instrument, piece of equipment, appliance, tool or utensil. This mostly refers to fixed or mobile equipment with relatively small spatial dimensions, with a specific function or special area of use that is generally designated using a preceding word such as in the phrases sporting device, medical device, kitchen device, hearing device, measuring device, control device, automation device, peripheral device etc. Furthermore, there are fixed and mobile large devices, such as those used in the military (tanks, aircraft, ships), medical (MRI scanners), geological (earth drilling equipment, and conveyor bridges) as well as those used in research (e.g. particle accelerator). From a technical standpoint (DIN 40150), devices are made up of components, units and modules. According to regulations regarding electromagnetic compatibility of devices, a device is considered any electrical or electronic apparatus, system, construction or network, which contains electrical or electronic parts. This device definition contradicts guidelines that are well-established and also documented in DIN standards [see above] and widely accepted by engineers, and therefore causes many misunderstandings when using the regulations regarding electromagnetic compatibility of devices. |
| <b>DIMM</b>                          | <i>Double In-line Memory Module</i> consists of one or more RAM chips on a small circuit board that is connected with the motherboard of a computer.  |
| <b>DMA</b>                           | <i>Direct Memory Access</i> is accelerated direct access to a computer's RAM by bypassing the CPU.  |
| <b>DRAM</b>                          | <i>Dynamic Random Access Memory</i> is a form of dynamic RAM consisting of an integrated semiconductor circuit that stores information based on the capacitor principle. Capacitors lose their charge in a relatively short time. Therefore, dynamic RAM circuit boards must contain a logic that allows continual recharging of RAM chips. Since the processor cannot access dynamic RAM while it is being recharged, one or more waiting states can occur when reading or writing data. Although it is slower, dynamic RAM is used more often than static RAM since the simple design of the circuits means that it can store four times more data than static RAM.   |
| <b>DSR</b>                           | <i>Data Set Ready</i> is a signal used in serial data transfer, which is sent by the modem to the computer it is connected to, indicating its readiness for processing. DSR is a hardware signal which is sent via line number 6 in compliance with the RS-232-C standard.  |
| <b>DTR</b>                           | <i>Data Terminal Ready</i> is a signal used in serial data transfer that is sent by the computer to the modem it is connected to, indicating the computer's readiness to accept incoming signals.   |
| <b>DVI</b>                           | <i>Digital Visual Interface</i> is an interface for the digital transfer of video data.   |
| <b>DVI-D</b>                         | Digital only  |
| <b>DVI-I</b>                         | Integrated, i.e. analog and digital   |
| <b>EDID data</b>                     | <i>Extended Display Identification Data</i> > EDID data contains the characteristics of monitors / TFT displays transferred as 128 kB data blocks to the graphics card via the Display Data Channel (DDC). This EDID data can be used to set the graphics card to the monitor properties.   |
| <b>Electromagnetic compatibility</b> | <i>Electromagnetic compatibility</i> > In accordance with EMVG: The ability of a device or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment [IEV 161-01-07])   |
| <b>EMC</b>                           | <i>Electromagnetic Compatibility</i> represents the ability of a device or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment [IEV 161-01-07].   |



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| <b>EN</b>       | <i>European Norm</i> see CENELEC  |
| <b>Errors</b>   | <i>Fault</i> > in accordance with IEC 61508: Abnormal operation, which can reduce or prevent the capability of a functional unit to perform a required function.  |
| <b>ESD</b>      | <i>Electrostatic discharge</i> > Discharge of static electricity. ESD is a process for charge equalization between solid, liquid or gaseous media, which are electrically charged in a different way. It is usually accompanied by a surface, brush, spark discharge or also flashing discharge phenomenon. However, it can also take place via a contact point (excluding line-conducted), and only when the potential difference before the contact does not exceed 330 volts. Sparking can cause flammable gases and vapors or explosive compounds to ignite and through the discharge of currents and fields can damage or destroy electronic components or interfere with the functions of their electronic operating equipment. The first-named effect falls into the jurisdiction of Fire and Explosions Protection and Technical Safety. The second-named area is the responsibility of the protection of Electrostatic Discharge Sensitive components (ESDS) and Electromagnetic Compatibility (EMC). Possible human body discharge from handling switching circuits, circuit boards, control elements, and container surfaces in transport, installation, testing, operating, repairs and service are particularly important issues for people dealing with electronic device technology. The following electrical values should be calculated: Energy content 10 to 30 mJ, electrostatic voltage 0.1 to 20 kV, strength of discharge current up to 30 A (pulse amplitude, current change speed up to 100 A/ns, electrical field strength 1 to 4 kV/m, magnetic field strength up to 15 A/m within centimeters of the discharge). |
| <b>Ethernet</b> | <i>Baseband bus system</i> from RANK XEROX. Originally developed for linking minicomputers in the early 1970s. Ethernet is based on the CSMA/CD access procedure. Coaxial cables and/or twisted pair cables [twisted copper wire pairs] serve as transfer medium. Transfer speeds: 10 Mbps [Ethernet], 100 Mbps [Fast Ethernet] as well as 1 Gbps and 10 Gbps [Gigabit Ethernet], widely growing technology used for networking computers in a LAN, standardized since 1985 [IEEE 802.3 and ISO 8802-3]. Ethernet technology has established itself in office usage. After the enabling the possibility of extremely tough real-time demands and the adaptation of the device technology [bus cable, path fields, connection boxes] to the operating conditions of the industrial world, which are considerably tougher than those in the area of office use, Ethernet is further advancing into the area of automation technology.   |
| <b>Failure</b>  | <i>Failure in accordance with IEC 61508</i> indicates that a functional unit loses the ability to perform a required function. In regards to safety-oriented systems, a distinction is made between dangerous and safe failures. This depends on whether the status of the system failure is considered dangerous or safe. The cause of the failure may be load related or age-related, and therefore a random failure, or related to a flaw inherent in the system. In this case, it is known as a systematic failure.   |
| <b>FDD</b>      | <i>Floppy Disk Drive</i> > Reading device for removable magnetic memory from the early days of PC technology. Due to their sensitivity and moving components, FDDs have been almost completely replaced by CompactFlash memory in modern automation solutions.  |
| <b>Fieldbus</b> | Bus system in the area close to the process, for directly connecting sensors and actuators with own intelligence. On a fieldbus, small amounts of data are transferred between sensors, actuators and control devices in digital form. Transfer must occur as fast as possible (i.e. near real-time). Furthermore, a fixed minimum and maximum response time must be guaranteed. Serial fieldbuses are replacing conventional wiring more and more in modern automation systems. Serial networking of the components saves time during planning and installation. Additionally, the size of control cabinets is reduced and failure and maintenance times are shortened, thereby achieving better system availability. System expansions, changes and updates are easy to implement.  |
| <b>FIFO</b>     | <i>First In First Out</i> > A queuing organization method whereby elements are removed in the same order as they were inserted. The first element inserted is also the first one removed. Such an organization method is typical for a list of documents that are waiting to be printed.  |
| <b>Filter</b>   | In terms of suppression, filters are components used for damping conducted disturbance. Proper application of filters requires that the spectral part of the reference and disturbance variables are different enough from one another. This allows selective damping of disturbance variables without noticeable interference of the reference variables when the filter parameters have been laid out sufficiently. Therefore, the actual damping effect is achieved mostly through voltage division and the resulting filter effect is described using insertion loss. Filters can be used on a source of disturbance to prevent the emission of conducted disturbance and on a noise reduction system to increase the immunity to conducted disturbance. In addition to the most commonly used passive filters, which are made up of passive components, there are also active filters, which contain components that require a power supply. Active filters are widely used as signal filters. They are only used in power supply networks in special cases.   |
| <b>Firewall</b> | <i>Literal meaning: Wall that provides fire protection</i> > A term used for an electronic, hardware and/or software-based security system between two networks, (i.e. Intranet and Internet), which protects the computer or internal company network from unauthorized access from the Internet. Only data for specific, authorized services are allowed to pass through the security barrier at a strictly defined point.  |
| <b>Firmware</b> | Firmware is software used to operate computer-controlled devices that generally stays in the device throughout its lifespan or over a long period of time.<br>Such software includes operating systems for CPUs and application programs for industrial PCs as well as programmable logic controllers (e.g. the software in a washing machine controller). This software is written in read-only memory (ROM, PROM, EPROM) and cannot be easily replaced.   |
| <b>Floppy</b>   | <i>Diskette</i> > A round plastic disk with an iron oxide coating that can store a magnetic field. When the floppy disk is inserted in a disk drive, it rotates so that the different areas (or sectors) of the disk's surface are moved under the read/write head. This allows the magnetic orientation of the particle to be modified and recorded. Orientation in one direction represents binary 1, while the reverse orientation represents binary 0.  |
| <b>FTP</b>      | <i>File Transfer Protocol</i> > Rules for transferring data over a network from one computer to another computer. This protocol is based on TCP/IP, which has established itself as quasi standard for the transfer of data via Ethernet networks. FTP is one of the most used protocols on the Internet. It is defined in RFC 959 in the official regulations for Internet communication.  |
| <b>GB</b>       | <i>Gigabyte</i> > 1 GB = 1024 MB or 1,073,741,824 bytes   |
| <b>Ground</b>   | In the context of electro-technical theory, the term 'ground' is more or less understood as good conductive ground, which does not have any potential differences outside the area of influence or any other electrical phenomena.  |
| <b>HDD</b>      | <i>Hard Disk Drive</i> > Fixed magnetic mass memory with high capacities, e.g. 120 GB.  |

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| <b>Host</b>           | <p><i>Host</i> &gt; On computer systems with multiple CPUs and bus masters, this refers to the device with the arbitration unit and host CPU or the device that has control of the complete system. With regard to the Internet, a constantly available network server is called a host.</p> <p><i>Hot Swap</i> &gt; Changing computer components during operation. There are three different level: basic hot swap, full hot swap and the high availability model. Basic hot swap is the simplest form in which the module to be exchanged is deactivated or the computer configuration is changed using the computer keyboard. Computer specialists are normally needed. With full hot swap, software installed on the components being exchanged handles activation and deactivation. An integrated switch on the front of the component signals the computer that removing the component will start or that inserting the new component is complete. An LED on the front side shows that the component can be removed or that the new component has been inserted. The high availability model is used in computer systems with high availability requirements. Here, the hot swap software does not control each component individually, instead it uses a separate hot swap controller [HSC]. This allows faulty boards to be automatically deactivated and prevents crashes.</p> |
| <b>HTML</b>           | <p><i>Hyper Text Markup Language</i> Programming language with hyper text marks. Language used to write most web pages. It is based on the SGML definition.</p> <p>For detailed information, see<br/> <a href="http://www.w3.org/MarkUp">www.w3.org/MarkUp</a></p>  |
| <b>HTTP</b>           | <p><i>Hyper Text Transfer Protocol</i> &gt; Data transfer protocol for HTML pages and all types of files coupled to them. It is the protocol that the entire WWW is based on. That means, it controls the interaction between web browser and web server. It becomes active with each mouse-click on a hyperlink and ensures that the browser is provided the respective information.</p> <p><a href="http://www.w3c.org/Protocols">www.w3c.org/Protocols</a></p>   |
| <b>Hub</b>            | In this context, a hub is a central connection point in a network with star formed topology, which distributes incoming data packets to all connected end devices [similar to the way a multiple power socket distributes power].   |
| <b>IDE</b>            | <i>Integrated Device Electronics</i> > Interface for mass memory, such as HDDs, in which the controller electronics are found in the drive itself.  |
| <b>IEC</b>            | <p><i>International Electrotechnical Commission</i> &gt; International standards organization that includes all national electro-technical committees. It specifies electro-technical standards worldwide; location: Geneva.</p> <p><a href="http://www.iec.ch">www.iec.ch</a></p>  |
| <b>Interface</b>      | From the hardware point of view, an interface is the connection point between two modules/devices/systems. The units on both sides of the interface are connected by the interface lines so that data, addresses, and control signals can be exchanged. The term interface includes all functional, electrical and constructive conditions [coding, signal level, pinout], which characterize the connection point between the modules, devices or systems. Depending on the type of data transfer, a differentiation is made between parallel [e.g. Centronics, IEEE 488] and serial interfaces [e.g. V.24, TTY, RS232, RS422, RS485], which are set up for different transfer speeds and transfer distances. From the point of view of software, the term interface describes the transfer point between program modules using specified rules for transferring the program data.   |
| <b>Internet</b>       | <p><i>International Network</i> &gt; Worldwide collection of computers and computer networks of various sizes and architectures that work with various operating systems. Information is stored remote computers [servers] that can be accessed by anyone at any time from their computers [clients]. It has developed in steps in recent decades and now is the basis for the worldwide exchange of data, for example via e-mail. It is currently the most popular network in the world with approximately 500 million users.</p> <p><a href="http://www.isoc.org">www.isoc.org</a></p>  |
| <b>IP</b>             | <p><i>Internet Protocol</i> &gt; Protocol [method, procedure] used to transfer data from one computer to another in a network, for example on the Internet or Intranet. Each computer in the network is clearly identified by its IP address. If data is sent from one computer to another, it is broken into small information packets containing the address of the sender and receiver. These packets can reach their destination over the network using different paths and in an order other than the send sequence. Once there, they are put back in the correct order by another protocol, the Transmission Control Protocol [TCP].</p>  |
| <b>ISO</b>            | <p><i>International Organization for Standardization</i> &gt; Worldwide federation of national standardization institutions from over 130 countries. ISO is not an acronym for the name of the organization; it is derived from the Greek word isos, meaning "equal".</p> <p><a href="http://www.iso.ch">www.iso.ch</a></p>   |
| <b>Jitter</b>         | Jitter is a term that describes time deviations of cyclic events. If, for example, an event should take place every 200 $\mu$ s and it actually occurs every 198 to 203 $\mu$ s, then the jitter is 5 $\mu$ s. Jitter has many causes. It originates in the components and transfer media of networks because of noise, crosstalk, electromagnetic interference and many other random occurrences. In automation technology, jitter is a measure of the quality of synchronization and timing.  |
| <b>Latency time</b>   | Synonym for delay time, response time and runtime. For technical purposes, the time a device requires to provide an output reaction after an input arrives or, for example, the time a data packet requires to pass from the sender to the receiver on a network or remains in a network device before being forwarded.   |
| <b>LED</b>            | <i>Light Emitting Diode</i> > Illuminated diodes  |
| <b>Machine</b>        | According to machine regulations, a machine is understood to be an entire collection of interconnected components, with at least one being movable. Along with the mechanical components, the actuator, controller and energy components are also part of a machine. See also Automation Object.  |
| <b>MB</b>             | <i>Megabyte</i> > 1 MB = 220 or 1,048,576 bytes   |
| <b>Microprocessor</b> | Highly integrated circuit with the functionality of a CPU, normally housed on a single chip. It comprises a control unit, arithmetic and logic unit, several registers and a link system for connecting memory and peripheral components. The main performance features are the internal and external data bus and address bus widths, the command set and the clock frequency. Additionally, a choice can be made between CISC and RISC processors. The first commercially available worldwide microprocessor was the Intel 4004. It came on the market in 1971.   |
| <b>Modem</b>          | <i>Modulator/demodulator</i> > Modulation/demodulation device, add-on card, or external device that allows information to be exchanged between computers over the telephone network using digital/analog or analog/digital signal conversion.   |
| <b>Motherboard</b>    | <i>Motherboard</i> > A circuit board that houses the main components of a computer such as the CPU switching circuit, co-processors, RAM, ROM for firmware, interface circuits, and expansion slots for hardware expansions.  |
| <b>MTBF</b>           | <i>Mean Time Between Failures</i> > The mean time between two failures for repairable objects and reliability parameters.   |
| <b>MTCX</b>           | <i>Maintenance Controller Extended</i> > The MTCX is an independent processor system that provides additional functions for a B&R Industrial PC that are not available with a normal PC. The MTC communicates with the B&R Industrial PC via the ISA bus (using a couple register).   |

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| <b>NC</b>                    | <i>Numerical Control</i> > Numerical Control  |
| <b>Nodes</b>                 | Branching point in a network.   |
| <b>Nominal current</b>       | The nominal current is the RMS value for the phase current (current in the motor supply line) when generating the nominal torque at the nominal speed. This is possible for any length of time if the environmental conditions are correct.   |
| <b>Object</b>                | A material thing that can be seen and touched. A person or thing to which a specified action or feeling is directed. In the context of software, it is a self-contained unit that contains specific data [attributes] and functions [operations].   |
| <b>OEM</b>                   | <i>Original Equipment Manufacturer</i> > A company that integrates third-party and in-house manufactured components into their own product range and then distributes these products under its own name.  |
| <b>PCI bus</b>               | <i>Peripheral Component Interconnect Bus</i> > Developed by Intel as an intermediary/local bus for the latest PC generations. It is basically a synchronous bus. The main clock of the CPU is used for synchronization. The PCI bus is microprocessor independent, compatible with 32-bit and 64-bit and supports both 3.3 V and 5 V cards and devices. See also PCI SIG.   |
| <b>PLC</b>                   | <i>Programmable Logic Controller</i> > Computer-based control device that functions using an application program. The application program is relatively easy to create using standardized programming languages [IL, FBD, LAD, AS, ST]. Because of its serial functionality, response times are slower compared to connection-oriented control. Today, PLCs are available in device families with matched modular components for all levels of an automation hierarchy.   |
| <b>POH</b>                   | <i>Power On Hours</i> > see MTBF.   |
| <b>POST</b>                  | <i>Power-On Self Test</i> A set of routines that are stored in ROM on the computer and that test different system components, e.g. RAM, disk drive and the keyboard in order to determine that the connection is operating correctly and ready for operation. POST routines notify the user of problems that occur. This is done using several signal tones or by displaying a message that frequently accompanies a diagnosis value on the standard output or standard error devices (generally the monitor). If the POST runs successfully, control is transferred over to the system's bootstrap loader.   |
| <b>POWERLINK</b>             | see Ethernet POWERLINK<br><a href="http://www.ethernet-powerlink.org">www.ethernet-powerlink.org</a>  |
| <b>Power Panel</b>           | Devices from this B&R product family combine visualization, control and I/O components in one compact device.   |
| <b>Process</b>               | Action, event or procedure in which continuous or discontinuous, quantitative or qualitative changes to parameters or states of a real or virtual object or media being observed take place. Every process has a defined start and a defined end. Depending on what happens during a process or which objects undergo the process, it is possible to differentiate between many types of economic and industrial processes such as value-added processes [production and manufacturing processes], service processes [logistics, maintenance and repair processes], management processes [planning and maneuvering processes], etc. For technological processes, a differentiation is often made between continuous processes, discontinuous processes and charge processes depending on the continuity of the main process activity. |
| <b>Programming languages</b> | Programming languages are artificial languages with strict syntax and semantics, clear symbols and special notation for creating algorithms in an executable computer program. Since the creation of the first functioning program-controlled computer Z3 in 1941, over a thousand programming languages have been developed for various application areas. An overview of the evolution, current state and future of programming languages can be found on the following websites.   |
| <b>Protocol</b>              | Colloquially: 1. Synonym for record or meeting minutes. 2. The original draft of a diplomatic document. In the area of Information technology (IT): Specifications regarding data formats and control procedures for communication between two devices or processes. The protocol can be implemented as hardware or software and mainly includes the following aspects: the type of error detection used, the data compression method (if used) and the way the sender indicates the end of the information sent and the receiver indicates that the information has been received.   |
| <b>RAM</b>                   | <i>Random Access Memory</i> > Memory with random access. Semiconductor memory which can be read or written to by the microprocessor or other hardware components. Memory locations can be accessed in any order. The various ROM memory types do allow random access, but they cannot be written to. The term RAM refers to a more temporary memory that can be written to as well as read.   |
| <b>Reliability</b>           | In a technical context, reliability represents the ability to correctly operate at a continual performance level within defined probability limits and time spans. Characteristic reliability parameters are: A for availability, MTBF of repairable devices, MTTF for non-repairable systems and failure rate for modules or components, which can be used to establish the failure rate.  |
| <b>Robustness</b>            | <i>Robustness</i> > Ability of an object to continue functioning, even if specified conditions are not met. Qualitative term because exact assessment criteria do not exist.  |
| <b>ROM</b>                   | <i>Read Only Memory</i> > Nonvolatile memory. Contents of the memory are stored by the chip manufacturer in final mask step [also called mask-programmed ROM]. It can only be read and constantly remains in the same form.   |
| <b>RS232</b>                 | <i>Recommended Standard Number 232</i> > Oldest and most widespread interface standard, also called a V.24 interface. All signals are referenced to ground making this an imbalanced interface. High level: -3 to -30 V, low level: +3 to +30 V; Cable lengths up to 15 m, transfer rates up to 20 kbit/s. For point-to-point connections between 2 participants.   |
| <b>RS422</b>                 | <i>Recommended Standard Number 422</i> > Interface standard, balanced operation, increased immunity to disturbances. High level: 2 to -6 V, low level: +2 to +6 V; 4-wire connections [inverted/not inverted], cable lengths up to 1200 m, transfer rates up to 10 Mbit/s, 1 sender can carry out simplex communication with up to 10 receivers.  |
| <b>RS485</b>                 | <i>Recommended Standard Number 485</i> > Interface standard upgraded from RS422. High level: 1.5 to -6 V, low level: +1.5 to +6 V; two-wire connection [half-duplex mode] or four-wire connection [full-duplex mode]; permissible cable length up to 1200 m, transfer rates up to 10 Mbit/s. Up to 32 stations (sender/receiver) can be connected to an RS485 bus.  |
| <b>RTS</b>                   | <i>Request To Send</i> > A signal used in serial data transfer for requesting send permission. For example, it is sent from a computer to the modem connected to it. The RTS signal is assigned to pin 4 according to the hardware specifications of the RS-232-C standard.   |
| <b>RXD</b>                   | <i>Receive (RX) Data</i> > A line for transferring serial data received from one device to another, e.g. from a modem to a computer. For connections complying with the RS-232-C standard, the RXD is connected to pin 3 of the plug.   |

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| <b>Safety</b>       | Brockhaus: The absence of danger or the knowledge that an individual or group is protected from potential dangers. When referring to technology, safety is the characteristic of an object [component, device, machine, system] to not present unacceptable dangers to people, equipment or the environment when operated according to specifications. Handling security issues takes place in two ways: Firstly, under the premise that the object will function as it should; secondly, under the premise that the object will not function correctly (complete failure). The first aspect mainly concerns issues of health, working conditions and fire and is regulated by many laws and guidelines. The second aspect is part of technical safety measures that are set up to minimize dangerous situations and risks associated with system failures (at least below an acceptable limiting risk level) based on the probability of a failure and the possible extent of damages. These issues are included in the topic of functional safety. For automation technology, the corresponding standards are IEC 61508 and EN 954-1. As a footnote, there is no such thing as absolute safety without any risks, neither in technology or nature. |
| <b>SDRAM</b>        | <i>Synchronous Dynamic Random Access Memory</i> > A form of dynamic RAM semiconductor modules that can be operated at high clock rates.  |
| <b>Sensor</b>       | Equipment that converts a physical value based on a physical effect into an electrical, pneumatic or hydraulic signal for further processing. Modern sensors have integrated signal preprocessing to prevent disturbances or nonlinearity. In automation technology, sensors are used to get the information required to control a process. For example, determining aggregate and machine states or to collect process data such as temperature, pressure, speed, fill level, flow, distances, angles, etc.   |
| <b>Signal</b>       | Physical value that changes over time, e.g. a voltage or current with a parameter [amplitude, frequency, phase position] that provides concrete information about changes to another physical value. The respective parameter is called an information parameter. For example, an electric tachometer measures the rotational speed of a mechanical shaft, i.e. it is indicated by the amplitude of the tachometer output voltage. In this case, the amplitude of the output voltage is the information parameter providing information about the rotational speed of the machine shaft over time according to the signal definition. It is possible to differentiate between different basic signal types depending on the number of values, availability over time and the number of information parameters. Analog, binary and digital signals are most important for automation technology.  |
| <b>Slot PLC</b>     | PC insert card that has full PLC functionality. On the PC, it is coupled via a DPR with the Process using a fieldbus connection. It is programmed externally or using the host PC.   |
| <b>Software</b>     | SoftPLC; All programs including the respective documentation available for the operation of data processing systems, computer systems and computer-based devices of all types. Software is implemented on hardware as the non-physical functional elements of a computer system. Using the term software when referring to computer programs was initiated in 1958 by mathematician John Tukey, Princeton University. Software can be grouped as system software and application software.   |
| <b>SRAM</b>         | <i>Static Random Access Memory</i> > A high-speed RAM semiconductor type that is mostly used in computers for cache memory. Using a backup battery, the contents of this memory can also be retained during a power failure.   |
| <b>SVGA</b>         | <i>Super Video Graphics Array</i> > Graphics standard with a resolution of at least 800×600 pixels and at least 256 colors.  |
| <b>Switch</b>       | Device, similar to a hub, that takes data packets received in a network and, unlike a hub, does not pass them on to all network nodes, instead only to the respective addressee. Unlike a hub, a switch provides targeted communication within a network that only takes place between sender and receiver. Other network nodes are not involved.  |
| <b>SXGA</b>         | <i>Super Extended Graphics Array</i> > Graphics standard with a screen resolution of 1280 × 1024 pixels (aspect ratio 5:4).  |
| <b>Symbol</b>       | From the point of view of linguistics, a symbol is a "thing" [mark, indicator, etc.] that represents "something else" [in the real or virtual world]. A "symbol" has a defined relationship with the object being referenced, an "icon" has a visual similarity with the object being referenced and an "index" is a reference to a fact or conclusion. For technical terminology [i.e. DIN 44300], characters are symbols that represent certain information [letters, numbers, special characters, etc.].  |
| <b>Task</b>         | Program unit that is assigned a specific priority by the real-time operating system. It contains a complete process can consist of several modules.  |
| <b>Touch screen</b> | Screen with touch sensors for selecting options in a displayed menu using the tip of the finger.   |
| <b>TXD</b>          | <i>Transmit (TX) Data</i> > A line for the transfer of serial data sent from one device to another, e.g. from a computer to a modem. For connections complying with the RS-232-C standard, the TXD is connected to pin 2 of the plug.  |
| <b>UART</b>         | <i>Universal Asynchronous Receiver/Transmitter</i> > Universal Asynchronous Receiver/Transmitter   |
| <b>UDMA</b>         | <i>Ultra Direct Memory Access</i> > A special IDE data transfer mode that allows high data transfer rates for drives. There have been many variations in recent times. UDMA33 mode transfers 33 megabytes per second. UDMA66 mode transfers 66 megabytes per second. UDMA100 mode transfers 100 megabytes per second.  |
| <b>UPS</b>          | <i>Uninterruptible Power Supply</i> > see UPS  |
| <b>USB</b>          | <i>Universal Serial Bus</i> > Cost-effective serial interface for PCs; IBM standard supported by Intel, Compaq and Microsoft and other well-known companies; up to 127 peripheral devices [mouse, keyboard, printer, scanner, digital cameras, modems, CDROM drives, telephones, etc.] can be connected to a single USB interface. The connected devices are also supplied with power via the 4-wire bus cable. The version on the market since 2001 (Version USB 2.0) allows data transfer rates up to 480 Mbps and is therefore also useful for transferring video data and for high-speed disk drives.<br><a href="http://www.usb.org">www.usb.org</a>  |
| <b>UXGA</b>         | <i>Ultra Extended Graphics Array</i> > Generally a screen resolution of 1600×1200 pixels (aspect ratio 4:3, 12:9).   |
| <b>VDE</b>          | <i>The Association for Electrical, Electronic &amp; Information Technologies (Verband der Elektrotechnik Elektronik Informationstechnik e.V.)</i><br><a href="http://www.vde.de">www.vde.de</a>  |
| <b>VGA</b>          | <i>Video Graphics Adapter</i>  |

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| <b>Windows CE</b> | Compact 32-bit operating system with multitasking and multithreading that Microsoft developed especially for the OEM market. It can be ported for various processor types and has a high degree of real-time capability. The development environment uses proven, well-established development tools. It is an open and scalable Windows operating system platform for many different devices. Examples of such devices are handheld PCs, digital wireless receivers, intelligent mobile phones, multimedia consoles, etc. In embedded systems, Windows CE is also an excellent choice for automation technology.   |
| <b>WUXGA</b>      | <i>Wide UXGA</i> > Generally 1920 × 1200 pixels (16:10)   |
| <b>XGA</b>        | <i>eXtended Graphics Array</i> > An expanded standard for graphics controllers and monitors that was introduced by IBM in 1990. This standard supports 640x480 resolution with 65,536 colors or 1024x768 resolution with 256 colors. This standard is generally used in workstation systems.  |
| <b>XML</b>        | <i>eXtensible Markup Language</i> > Extensible markup language . This new language was officially recommended in 1998 by the World Wide Web Consortium W3C as standard for web publishing and document management in client-server environments. Further development of the SGML standard. Unlike SGML documents, XML documents do not require a schema description in the form of a DTD file. XML is already supported completely in the newer versions of many ERP and MES systems. XML is accepted as an industrial standard thanks to its simple notation. Information is represented using the ASCII character set. This makes XML easy to read and transparent, and for the most part, portability of the text form is superior to binary structures.<br><br><a href="http://www.xml.com">www.xml.com</a> |



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