Automation PC 2100

User's manual

Version: **1.25 (August 2018)**
Model no.: **MAAPC2100-ENG**

Translation of the original manual

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The place of jurisdiction, in accordance with article 17 of the European Convention on Courts of Jurisdiction and Enforcement, is A-4910

Ried im Innkreis, Austria, commercial register court: Ried im Innkreis, Austria

Commercial register number: FN 111651 v.

The place of fulfillment in accordance with article 5 of the European Convention on Courts of Jurisdiction and Enforcement is A-5142 Eggelsberg, Austria

Austrian DVR no.: 0721301

VATIN: ATU62367156

Chapter 1 • General information

Information:

This document is not intended for end customers! It is the responsibility of the machine manufacturer or system provider to provide the safety guidelines relevant to end customers in the operating instructions for the end customer in the respective local language.

1 Manual history

Version	Date	Change
1.00	2014-12-04	• First version
1.05	2015-02-13	• Updated interface options 5ACCIF01.FPLS-000 and 5ACCIF01.FPSC-000, see "Interface options" on page 69. • Updated terminal block for IF options "0TB1210.3100" on page 219. • "Windows Embedded 8.1 Industry Pro" on page 184 Updated. • Updated 5CFAST.032G-10, 5CFAST.064G-10 and 5CFAST.128G-10 CFast cards, see "CFast cards" on page 52. • Updated section "Allocation of resources" on page 172. • Modified section "Minimum ambient temperature for worst-case operation" on page 32. • Corrected section "LED status indicators" on page 47. • Updated sections "B&R Automation Device Interface (ADI) Control Center" on page 200, "B&R Automation Device Interface (ADI) Development Kit" on page 202, "B&R Automation Device Interface (ADI) .NET SDK" on page 203 and "B&R Key Editor" on page 204.
1.10	2015-10-09	• Updated max. cable length for USB 2.0 in section "USB interfaces" on page 45. • Updated SDL cable 5CASDL.0008-00, see "SDL cables" on page 231. • Updated SDL3 monitor/panel option "5ACCLI01.SDL3-000" on page 67 . • Updated "B&R KCF Editor" on page 205. • Updated "HMI Service Center" on page 206 (5SWUTI.0001-000). • Updated section "Mounting orientations" on page 29. • Updated "SDL3/SDL4 cables" on page 228. • Revised overview of "Windows Embedded 8.1 Industry Pro", "Windows 7" and "Windows Embedded Standard 7". • Updated "Maximum ambient temperature for typical operation" on page 32. • Updated section "Power calculation" on page 37. • Updated "Introduction" on page 18.
1.15	2015-11-26	• Updated interface options "5ACCIF01.FPLS-001" on page 94, "5ACCIF01.FPSC-001" on page 105 and "5ACCIF01.ICAN-000" on page 117. • Updated "Front covers" on page 121. • Updated BIOS to V1.23, see "BIOS options" on page 138. • Updated section "Upgrade information" on page 174. • Updated section about Debian 8, see "Debian (GNU/Linux)" on page . • Updated Technology Guard (HID) 0TG1000.02, see "Automation Runtime" on page 192. • Updated section "DNV GL certification " on page 210 and GL certification for technical data of certain individual components.
1.16	2016-01-19	• Updated interface options "5ACCIF01.FPCC-000" on page 69 and "5ACCIF01.FPLK-000" on page 84. • Updated color of Ethernet connector LEDs, see "Ethernet 1 interface (ETH1)" on page 44 and "Ethernet 2 interface (ETH2)" on page 44.
1.17	2016-03-16	• Updated chapter 5 "Standards and certifications". • "Windows 10 IoT Enterprise 2015 LTSB" on page 181 Updated. • Updated section "General instructions for performing temperature testing" on page 133 in chapter 3 "Commissioning". • Revised section "Temperature specifications" on page 31. • Updated SDL3 cable 5CASD3.0030-00, see "SDL3/SDL4 cables" on page 228. • Updated section "Known problems / Issues" on page 137. • Harmonized RAM specifications in the technical data for "Interface options" on page 69.

Table 1: Manual history

Version	Date	Change
1.20	2016-08-01	• Updated section "+24 VDC power supply" on page 36. • Documented new front covers 5ACCFF00.0001-000, 5ACCFF00.0001-001 and 5ACCFF00.0001-002 on page "Front covers". • Updated 4-port USB hub "5ACCUSB4.0000-000" on page 225. • Updated installation of 4-port USB hub, see "Installing the 4-port USB hub" on page 127. • Updated section "DNV GL certification " on page 210 and DNV GL certification in the technical data of certain individual components. • Documented configuration option for XHCI controller, see "USB configuration" on page 162.
1.21	2016-11-07	• Documented system unit 5APC2100.BY48-000 on page 49. • Documented interface option "5ACCIF01.FPCS-000" on page 77. • Documented new revisions of CFast cards, see "5CFAST.xxxx-10" on page 58.
1.22	2017-12-06	• Documented interface option "5ACCIF01.FSS0-000" on page 112. • Documented CFast card 5CFAST.256G-10, see "5CFAST.xxxx-10" on page 58. • Updated the following sections: ° "B&R Automation Device Interface (ADI) Control Center" on page 200 ° "B&R Automation Device Interface (ADI) Development Kit" on page 202 ° "B&R Automation Device Interface (ADI) .NET SDK" on page 203 ° "B&R Key Editor" on page 204 ° "B&R KCF Editor" on page 205 ° "Windows 10 IoT Enterprise 2016 LTSB" on page 178 ° "Repairs, complaints and replacement parts" on page 253 • Revised section "Installation" on page 123. • Updated the following sections: ° "DNV GL certification " on page 210 ° "UL Haz. Loc. certification" on page 211 ° "5CASDL.0xxx-03" on page 237 ° "5CASDL.0xx0-13" on page 241
1.25	2018-06-15	• Updated the following sections: ° "Safety guidelines" on page 12 ° "Configuration" on page 20 ° "Electrical characteristics" on page 36 ° "Functional ground - Grounding concept" on page 130 ° "Important information concerning installation/commissioning" on page 123 ° "Known problems / Issues" on page 137 ° "Windows 10 IoT Enterprise 2016 LTSB" on page 178 ° "Windows 10 IoT Enterprise 2015 LTSB" on page 181 ° "B&R Linux 8 (GNU/Linux)" on page 196 ° "UL certification" on page 208 ° "Servicing and maintenance" on page 252 ° "USB hub" on page 225 • Updated the following sections: ° "B&R Hypervisor" on page 194 ° "mapp Technology" on page 195 ° "B&R Linux 9 (GNU/Linux)" on page 198

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 uninterruptible power supplies from B&R 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 impairment or loss of any kind without the implementation of exceptionally stringent safety precautions. In particular, this includes the use of these devices to monitor nuclear reactions in nuclear power plants, 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 must always be placed on or stored in a suitable medium (ESD packaging, conductive foam, etc.). Metallic surfaces are not suitable storage surfaces!
- Components must not be subjected to electrostatic discharge (e.g. caused by charged plastics).
- Observe a minimum distance of 10 cm from monitors and television sets.
- Measuring instruments and equipment must be grounded.
- Probe tips of galvanically isolated measuring instruments must be temporarily discharged on suitably grounded surfaces before taking measurements.

Individual components

- ESD protective measures for individual components are thoroughly implemented at B&R (conductive floors, footwear, arm bands, etc.).
- Increased ESD protective measures for individual components are not required for handling B&R products at customer locations.

2.3 Policies and procedures

Electronic devices are never completely failsafe. If the programmable logic controller, operating/monitoring device or uninterruptible power supply fails, the user is responsible for ensuring that other connected devices such as motors are brought to a safe state.

When using programmable logic controllers or operating/monitoring devices as control systems in connection 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. This also applies to 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 to perform these tasks (e.g. IEC 60364). National accident prevention regulations must be observed.
The safety notices, information about connection conditions (nameplate and documentation) and limit values specified in the technical data must be read carefully before installation and commissioning and are to be observed in all cases.

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

- Devices are not ready for use immediately upon delivery. They must be installed and wired according to the requirements of this documentation in order for EMC limit values to be observed.
- Installation must be performed according to this documentation using suitable equipment and tools.
- Devices are only permitted to be installed by qualified personnel and when the power is switched off. 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. wire cross sections, fuses, protective ground connections).

2.6 Operation

2.6.1 Protection against touching electrical parts

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

Before switching on programmable logic controllers, operating/monitoring devices or the uninterruptible power supply, it must be ensured that the housing is properly connected to ground (PE rail). Ground connections must also be established when the operating/monitoring device or uninterruptible power supply is connected for test purposes or only being operated for a short period of time!

Before switching on the device, all voltage-carrying components 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) and uninterruptible power supplies in very dusty environments must be avoided. The collection of dust on devices can affect functionality and may prevent sufficient cooling, especially in systems with active cooling (fans).

The presence of corrosive gases can also result in impaired functionality. In combination 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. The presence of corrosive gases is indicated by blackened copper surfaces and cable ends on existing installations.

When operated in dusty or moist environments that could potentially impair functionality, operating/monitoring devices such as the Automation Panel and Power Panel are protected on the front against the ingress of dust or moisture when installed properly (e.g. cutout installation). The back of all devices must be protected from the ingress of dust and moisture, however; any collected dust must be removed 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 storage device (e.g. diskette, CD-ROM, USB flash drive, etc.), network connection or the Internet. The user is responsible for assessing these risks, implementing preventive measures such as virus protection programs, firewalls, etc. and making sure that software is obtained only from trusted sources.

2.7 Environmentally friendly disposal

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

2.7.1 Separation of materials

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

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

Table 2: Environmentally friendly disposal

Disposal must take place in accordance with applicable legal regulations.

2.8 Security concept

To protect plants, systems, machines and networks against cyber threats, it is necessary to implement (and continuously maintain) an integrated security concept that is state of the art. B&R products and solutions form only one part of such a concept.

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

B&R products and solutions are constantly being developed further to make them even more secure. B&R strongly recommends that updates be performed as soon as the corresponding updates are available and that only the latest product versions are used. Using outdated or unsupported versions can increase the risk of cyber threats.

2.9 Third-party software updates

This product contains third-party software (e.g. drivers, etc.). B&R only assumes warranty for updates/patches to the third-party software if they have been officially released by B&R. Otherwise, updates/patches are undertaken at your own risk.

2.10 Administrator accounts

A user with administrator rights has extensive access and manipulation options available on the system.

Therefore, make sure that your administrator accounts are adequately secured to prevent unauthorized changes. Use secure passwords and a standard user account for regular operation. Further measures such as the use of security guidelines are to be applied as needed.

3 Organization of notices

Safety notices

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

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

Table 3: Organization of safety notices

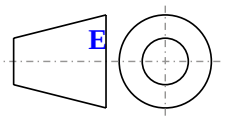
General notices

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

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

Table 4: Organization of general notices

4 Guidelines



European dimension standards apply to all dimension diagrams.

All dimensions are specified in mm.

Unless otherwise specified, the following general tolerances apply:

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

Table 5: Range of nominal sizes

5 Overview

Model number	Short description	Page
	Accessories	
5ACCUSB4.0000-000	USB hub 4x passive - For APC2100/PPC2100	225
5SWUTI.0001-000	HMI Service Center USB flash drive - Hardware diagnostic software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC2200/PPC2200 - For APC3100/PPC3100 - For APC51x/PP500 - For Automation Panel 800/900 - For Automation Panel 1000/5000	206
	B&R Linux 8	
5SWLIN.0542-MUL	B&R Linux 8 - 32-bit - Multilingual - APC2100 chipset Bay Trail - Installation (without Recovery DVD) - Only available with a new device	196
5SWLIN.0642-MUL	B&R Linux 8 - 64-bit - Multilingual - APC2100 chipset Bay Trail - Installation (without Recovery DVD) - Only available with a new device	196
	B&R Linux 9	
5SWLIN.0742-MUL	B&R Linux 9 - 64-bit - Multilingual - APC2100 chipset Bay Trail - Installation (without Recovery DVD) - Only available with a new device	198
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB SLC	54
5CFAST.032G-00	CFast card, 32 GB SLC	54
5CFAST.2048-00	CFast card, 2 GB SLC	54
5CFAST.4096-00	CFast card, 4 GB SLC	54
5CFAST.8192-00	CFast card, 8 GB SLC	54
	CFast-Karten	
5CFAST.032G-10	CFast card, 32 GB MLC ≤Rev. F0	58
5CFAST.064G-10	CFast card, 64 GB MLC ≤Rev. D0	58
5CFAST.128G-10	CFast card, 128 GB MLC ≤Rev. D0	58
5CFAST.256G-10	CFast card, 256 GB MLC	58
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5CADVI.0018-00	DVI-D cable - 1.8 m	245
5CADVI.0050-00	DVI-D cable - 5 m	245
5CADVI.0100-00	DVI-D cable - 10 m	245
	Front covers	
5ACCFF00.0000-000	APC2100 front cover - Orange - With B&R logo	121
5ACCFF00.0000-001	APC2100 front cover - Dark gray - Without logo	121
5ACCFF00.0000-002	APC2100 front cover - Orange - Without logo	121
5ACCFF00.0001-000	APC2100 front cover - Orange - With B&R logo - For USB hub	121
5ACCFF00.0001-001	APC2100 front cover - Dark gray - Without logo - For USB hub	121
5ACCFF00.0001-002	APC2100 front cover - Orange - Without logo - For USB hub	121
	Interface options	
5ACCIF01.FPCC-000	Interface card - 2x CAN interfaces - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	69
5ACCIF01.FPCS-000	Interface card - 1x RS485 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	77
5ACCIF01.FPLK-000	Interface card - 1x POWERLINK interface - Integrated 2-port hub - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	84
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	89
5ACCIF01.FPLS-001	Interface card - 1x RS232 interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	94
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface card - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	99
5ACCIF01.FPSC-001	Interface card - 1x RS232 interface - 1x CAN interface - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	105
5ACCIF01.FSS0-000	Interface card - 2x RS422/485 interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	112
5ACCIF01.ICAN-000	Interface card - 1x CAN interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	117
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5ACCLI01.SDL0-000	Monitor/Panel option - 1x SDL/DVI transmitter - For APC2100/APC2200 - Only available with a new device	64
5ACCLI01.SDL3-000	Monitor/Panel option - 1x SDL3 transmitter - For APC2100 - Only available with a new device	67
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9A0014.02	RS232 extension cable for remote operation of display unit with touch screen, 1.8 m	247
9A0014.05	RS232 extension cable for remote operation of display unit with touch screen, 5 m	247
9A0014.10	RS232 extension cable for remote operation of display unit with touch screen, 10 m	247
	SDL cables	
5CASDL.0008-00	SDL cable - 0.8 m	231
5CASDL.0018-00	SDL cable - 1.8 m	231
5CASDL.0050-00	SDL cable - 5 m	231
5CASDL.0100-00	SDL cable - 10 m	231
5CASDL.0150-00	SDL cable - 15 m	231
5CASDL.0200-00	SDL cable - 20 m	231
5CASDL.0250-00	SDL cable - 25 m	231
5CASDL.0300-00	SDL cable - 30 m	231
	SDL cables 45° connection	
5CASDL.0018-01	SDL cable - 45 degree connector - 1.8 m	234
5CASDL.0050-01	SDL cable - 45 degree connector - 5 m	234
5CASDL.0100-01	SDL cable - 45 degree connector - 10 m	234

Model number	Short description	Page
5CASDL.0150-01	SDL cable - 45 degree connector - 15 m	234
	SDL cables flex	
5CASDL.0018-03	SDL flex cable - 1.8 m	237
5CASDL.0050-03	SDL flex cable - 5 m	237
5CASDL.0100-03	SDL flex cable - 10 m	237
5CASDL.0150-03	SDL flex cable - 15 m	237
5CASDL.0200-03	SDL flex cable - 20 m	237
5CASDL.0250-03	SDL flex cable - 25 m	237
5CASDL.0300-03	SDL flex cable - 30 m	237
5CASDL.0300-13	SDL flex cable with extender - 30 m	241
5CASDL.0400-13	SDL flex cable with extender - 40 m	241
5CASDL.0430-13	SDL flex cable with extender - 43 m	241
	SDL3/SDL4 cables	
5CASD3.0030-00	SDL3/SDL4 cable - 3 m	228
5CASD3.0050-00	SDL3/SDL4 cable - 5 m	228
5CASD3.0100-00	SDL3/SDL4 cable - 10 m	228
5CASD3.0150-00	SDL3/SDL4 cable - 15 m	228
5CASD3.0200-00	SDL3/SDL4 cable - 20 m	228
5CASD3.0300-00	SDL3/SDL4 cable - 30 m	228
5CASD3.0500-00	SDL3/SDL4 cable - 50 m	228
5CASD3.1000-00	SDL3/SDL4 cable - 100 m	228
	System units	
5APC2100.BY01-000	APC2100 system unit - Intel Atom E3815 1.46 GHz - Single core - 1 GB SDRAM	49
5APC2100.BY11-000	APC2100 system unit - Intel Atom E3825 1.33 GHz - Dual core - 1 GB SDRAM	49
5APC2100.BY22-000	APC2100 system unit - Intel Atom E3826 1.46 GHz - Dual core - 2 GB SDRAM	49
5APC2100.BY34-000	APC2100 system unit - Intel Atom E3827 1.75 GHz - Dual core - 4 GB SDRAM	49
5APC2100.BY44-000	APC2100 system unit - Intel Atom E3845 1.91 GHz - Quad core - 4 GB SDRAM	49
5APC2100.BY48-000	APC2100 system unit - Intel Atom E3845 1.91 GHz - Quad core - 8 GB SDRAM	49
	Technology Guard	
0TG1000.01	Technology Guard (MSD)	192
0TG1000.02	Technology Guard (HID)	192
1TG4600.10-5	Automation Runtime Windows, TG license	192
1TG4601.06-5	Automation Runtime Embedded, TG license	192
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	217
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	217
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	219
	USB accessories	
5MMUSB.032G-02	USB 3.0 flash drive 32 GB MLC	223
5MMUSB.2048-01	USB 2.0 flash drive 2048 MB B&R	220
5MMUSB.4096-01	USB 2.0 flash drive 4096 MB B&R	220
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable - Type A - type B connector - 1.8 m	250
5CAUSB.0050-00	USB 2.0 connection cable - Type A - type B connector - 5 m	250
	Windows 10 IoT Enterprise	
5SWW10.0242-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Multilingual - APC2100 Bay Trail chipset - License (without Recovery DVD) - Only available with a new device	181
5SWW10.0542-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Entry - Multilingual - APC2100 with Bay Trail chipset - License (without Recovery DVD) - Only available with a new device	178
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5SWWI7.1100-ENG	Windows 7 Professional SP1 - 32-bit - English - DVD	187
5SWWI7.1100-GER	Windows 7 Professional SP1 - 32-bit - German - DVD	187
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5SWWI7.1400-MUL	Windows 7 Ultimate SP1 - 64-bit - Multilingual - DVD	187
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5SWWI8.0342-MUL	Windows Embedded 8.1 Industry Pro - 32-bit - Multilingual - For APC2100 - License	184
5SWWI8.0442-MUL	Windows Embedded 8.1 Industry Pro - 64-bit - Multilingual - For APC2100 - License	184
	Windows Embedded Standard 7	
5SWWI7.1542-ENG	Windows Embedded Standard 7 SP1 - 32-bit - English - For APC2100 - License	190
5SWWI7.1642-ENG	Windows Embedded Standard 7 SP1 64-bit, English; for APC2100; license.	190
5SWWI7.1742-MUL	Windows Embedded Standard 7 Premium SP1 32-bit, multilingual; for APC2100; license.	190
5SWWI7.1842-MUL	Windows Embedded Standard 7 Premium SP1 64-bit, multilingual; for APC2100; license.	190

Chapter 2 • Technical data

1 Introduction

1.1 About this user's manual

This user's manual contains all relevant information about an operational Automation PC 2100 cabinet-mounted device.

1.2 Maximum performance with compact dimensions

The control cabinet variant of the Automation PC 2100 provides a full-fledged PC system with minimized dimensions. This innovative PC design is based on Intel Bay Trail architecture, whose single-, dual- and even quad-core processor technology represents a milestone for embedded systems – all while offering an optimal price/performance ratio.

1.3 Communication in all directions

All important interfaces are integrated in the Automation PC 2100. This includes 2x Gigabit Ethernet, 1x USB 3.0 and 1x USB 2.0. Interface modules can also be added to take advantage of fieldbus technology such as POWERLINK and CAN. MLC-based CFast cards are available as data storage device that can store up to 60 GB or more.

1.4 Outstanding graphics performance

The graphics engine used by Intel Atom processors is derived from Core i technology and provides powerful processing. This is also the first time that support for DirectX 11 is provided in this segment, opening up even more possibilities for enhanced graphic capabilities in SCADA and other HMI systems. All resolutions and screen sizes up to 24.0" Full HD are supported.

1.5 Features

- Intel Atom E3800 processors (Bay Trail)
- Up to quad-core CPU performance
- Powerful graphics (Intel HD graphics)
- Compact dimensions
- 2x Gigabit Ethernet
- SDL/DVI or SDL3
- 1x USB 3.0, 1x USB 2.0
- 1x CFast slot
- 1x slot for interface options
- Fanless operation

1.6 System components / Configuration

1.6.1 Configuration

The following individual components are required for an operational Automation PC 2100:

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

Configuration		
System units		Select 1
	5ACP2100.BY01-000 5ACP2100.BY11-000 5ACP2100.BY22-000	5ACP2100.BY34-000 5ACP2100.BY44-000 5ACP2100.BY48-000
Front covers		Select 1[1)2)]
	5ACCFF00.0000-000 5ACCFF00.0000-001 5ACCFF00.0000-002	5ACCFF00.0001-000 5ACCFF00.0001-001 5ACCFF00.0001-002
CFast cards		Select 1
	5CFAST.2048-00 5CFAST.4096-00 5CFAST.8192-00 5CFAST.016G-00 5CFAST.032G-00	5CFAST.032G-10 5CFAST.064G-10 5CFAST.0128G-10 5CFAST.256G-10
Monitor/Panel options		Optional, select 1
	5ACCLI01.SDL0-000 5ACCLI01.SDL3-000	
Interface options		Optional, select 1
	5ACCIF01.FPCC-000 5ACCIF01.FPLK-000 5ACCIF01.FSS0-000 5ACCIF01.FPLS-000 5ACCIF01.FPLS-001	5ACCIF01.FPSC-000 5ACCIF01.FPSC-001 5ACCIF01.ICAN-000 5ACCIF01.FPCS-000
USB hub		Optional, select 1
	5ACCUSB4.0000-000	
USB accessories		Select as an option
	5MMUSB.2048-01 5MMUSB.4096-01	
Terminal blocks		Select 1
	**Power supply connectors** 0TB103.9 0TB103.91	**Terminal block IF option** 0TB1210.3100
Operating systems		Select 1
Windows 7 Linux Windows Embedded Standard 7 Windows Embedded 8 Windows 10 Automation Runtime	**Windows 7** 5SWWI7.1100-ENG 5SWWI7.1100-GER 5SWWI7.1300-MUL 5SWWI7.1200-ENG 5SWWI7.1200-GER 5SWWI7.1400-MUL **Windows 10** 5SWW10.0242-MUL 5SWW10.0542-MUL	**Windows Embedded Standard 7** 5SWWI7.1542-ENG 5SWWI7.1642-GER 5SWWI7.1742-MUL 5SWWI7.1842-MUL **Automation Runtime** 0TG1000.01 0TG1000.02 1TG4600.10-5 1TG4600.06-5	**Windows Embedded 8.1 Industry** 5SWWI8.0342-MUL 5SWWI8.0442-MUL **B&R Linux 8 (GNU/Linux)** 5SWLIN.0542-MUL 5SWLIN.0642-MUL **B&R Linux 9 (GNU/Linux)** 5SWLIN.0742-MUL

1) 1) If no front cover is selected during device configuration, then front cover 5ACCFF00.0000-000 (orange with B&R logo) is installed and delivered by default.
2) If a USB hub is selected during device configuration, front cover 5ACCFF00.0001-00x must be used.

System unit	Processor - Type	Processor - Clock frequency	Processor - Cores	Main memory - Type	Main memory - Size
5APC2100.BY01-000	Intel Atom E3815	1460 MHz	1	DDR3 SDRAM	1 GB
5APC2100.BY11-000	Intel Atom E3825	1330 MHz	2	DDR3 SDRAM	1 GB
5APC2100.BY22-000	Intel Atom E3826	1460 MHz	2	DDR3 SDRAM	2 GB
5APC2100.BY34-000	Intel Atom E3827	1750 MHz	2	DDR3 SDRAM	4 GB
5APC2100.BY44-000	Intel Atom E3845	1910 MHz	4	DDR3 SDRAM	4 GB
5APC2100.BY48-000	Intel Atom E3845	1910 MHz	4	DDR3 SDRAM	8 GB

2 Complete system

2.1 Connection options

An Automation Panel can be connected to the Automation PC via DVI, SDL or SDL3 using an optional monitor/panel option. The connection options described below provide an overview of the operating modes as well as possible limitations.

Information:

In its minimum configuration, the APC2100 does not have a way to connect to an external display (e.g. Automation Panel). In order to implement a display, a monitor/panel option must be added to the configuration. This option can only be installed at B&R; it cannot be added later.

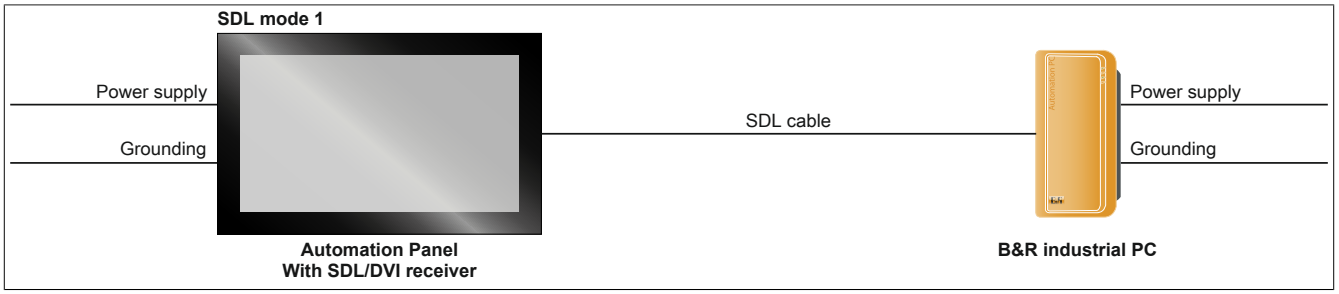
2.1.1 SDL operation

2.1.1.1 SDL operation - Mode 1

In SDL operating mode 1, all communication between the Automation Panel and B&R industrial PC is handled using a single SDL cable.

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

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



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

Panel In	✓	USB In	x	Power supply	✓	Brightness controls	x
USB1, USB2	✓ USB 1.1	COM touch screen interface	x	Grounding	✓		

Maximum cable length: 40 m

Requirements

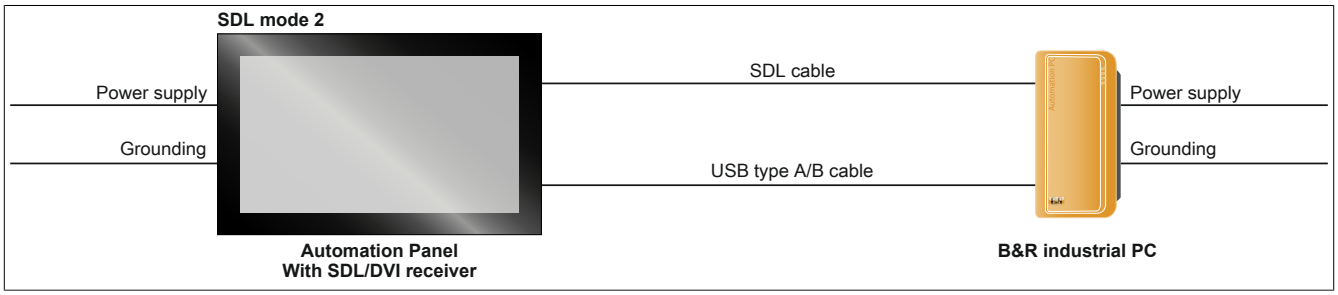
- Automation Panel with SDL/DVI receiver
- B&R industrial PC with SDL interface
- SDL cable

2.1.1.2 SDL operation - Mode 2

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

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

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



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

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

Maximum cable length: 5 m

Requirements

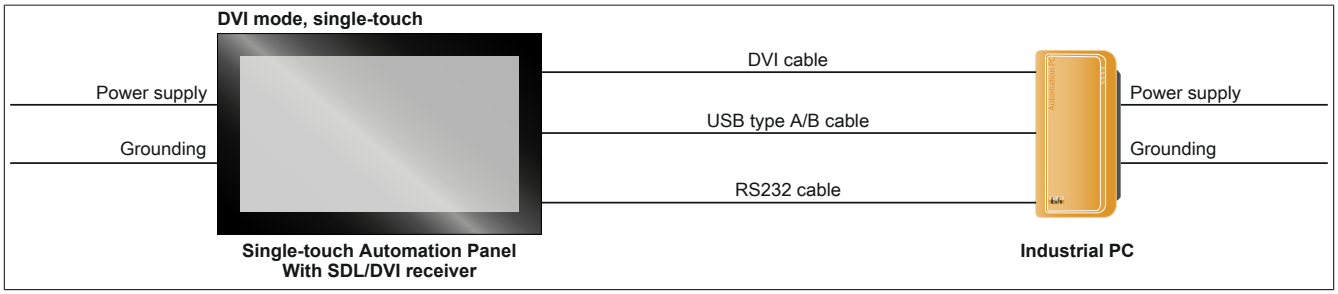
- Automation Panel with SDL/DVI receiver
- B&R industrial PC with SDL interface
- SDL cable, USB type A/B cable

2.1.2 DVI operation

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

2.1.2.1 DVI operation with single-touch Automation Panel

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



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

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

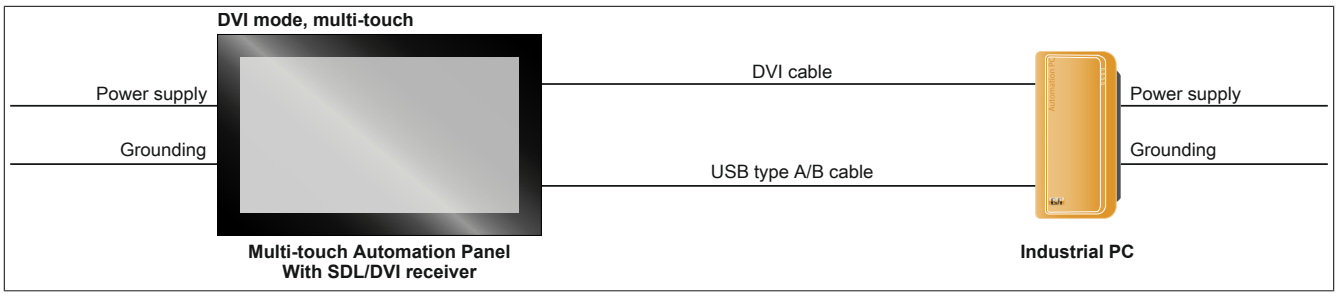
Maximum cable length: 5 m

Requirements

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

2.1.2.2 DVI mode with multi-touch Automation Panel

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



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

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

Maximum cable length: 5 m

Requirements

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

2.1.2.3 General limitations

- Key and LED data is not transferred.
- Service and diagnostic data is not transferred.
- It is not possible to update the firmware of Automation Panels.
- Maximum cable length is limited to 5 m.

2.1.3 SDL3 mode

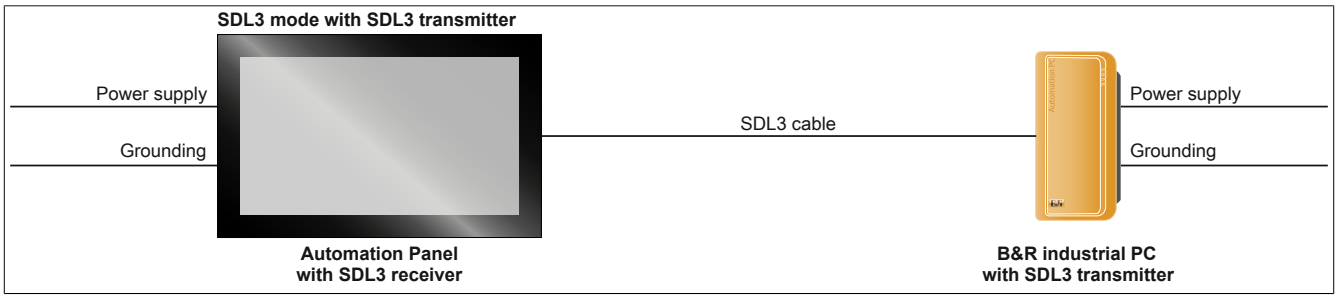
Smart Display Link 3 (SDL3) technology transfers all communication channels between a B&R industrial PC and panel up to 100 m over a standard Ethernet cable (min. Cat 6a). An RJ45 connector ideal for narrow spaces such as feed-throughs and swing arm system is used to connect to the device.

2.1.3.1 SDL3 mode with SDL3 transmitter

In the SDL3 operating mode with an SDL3 transmitter in the B&R industrial PC, all communication between the Automation Panel and B&R industrial PC is handled using a single SDL3 cable.

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

The brightness of the display can be set 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

Requirements

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

2.1.3.2 General limitations / Special considerations

- The USB 2.0 transfer rate is limited to 30 Mbit/s with SDL3.
- The SDL3 transmitter constantly emulates a display using EDID data and hot plugging code; this allows DVI-compatible operation. As a result, improperly displayed images are possible during operation with multiple displays. In Windows, a connected panel is registered by the graphics driver even in the following situations:
  - No cable is connected.
  - A connection has not yet been established between the SDL3 link module and the SDL3 transmitter.

  These improperly displayed images can be circumvented by making suitable configurations in BIOS or via the graphics driver.

2.2 Mechanical properties

2.2.1 Dimensions

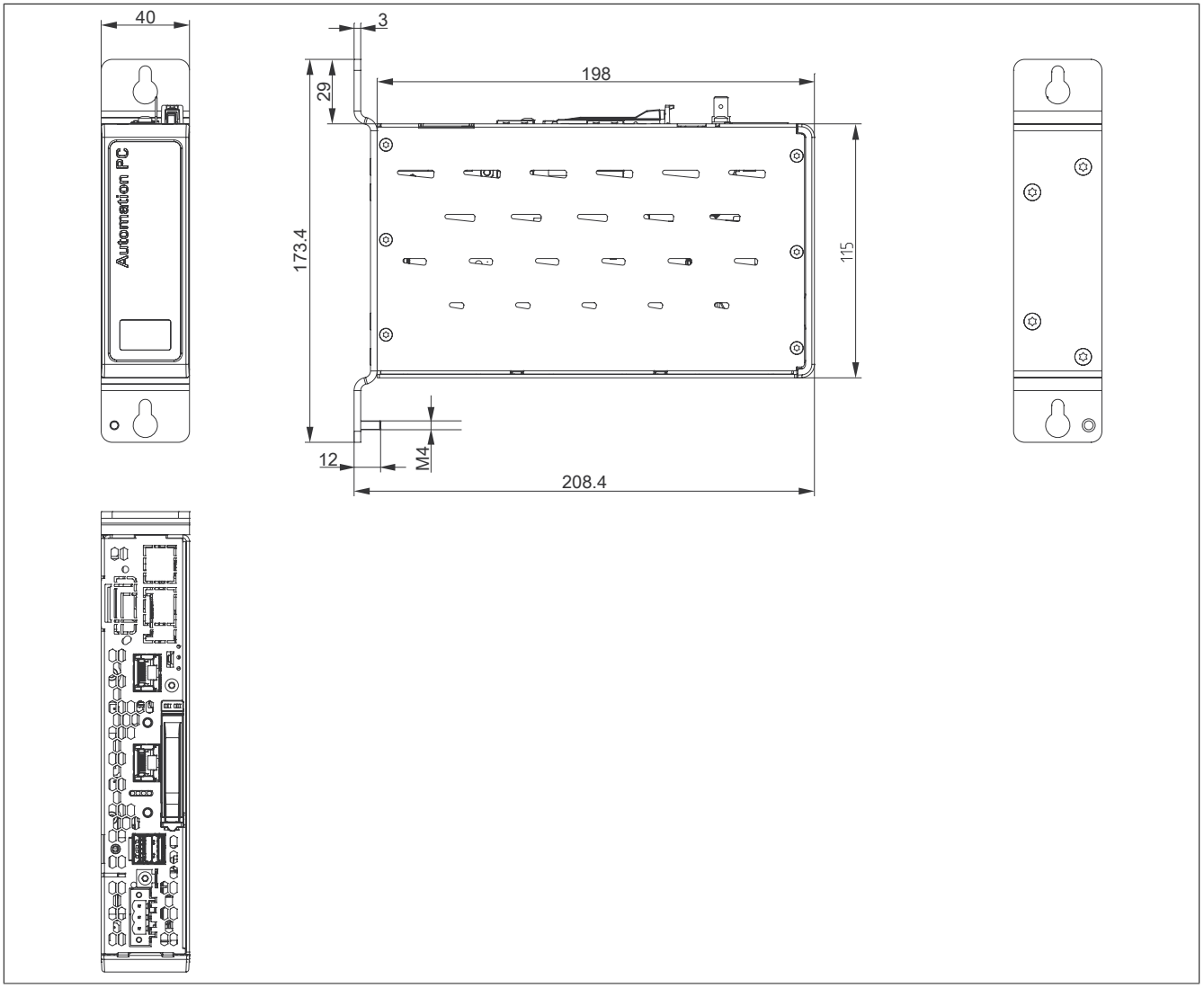


Figure 1: Automation PC 2100 with rear mounting plate (book style) - Dimensions

All dimensions are specified in mm.

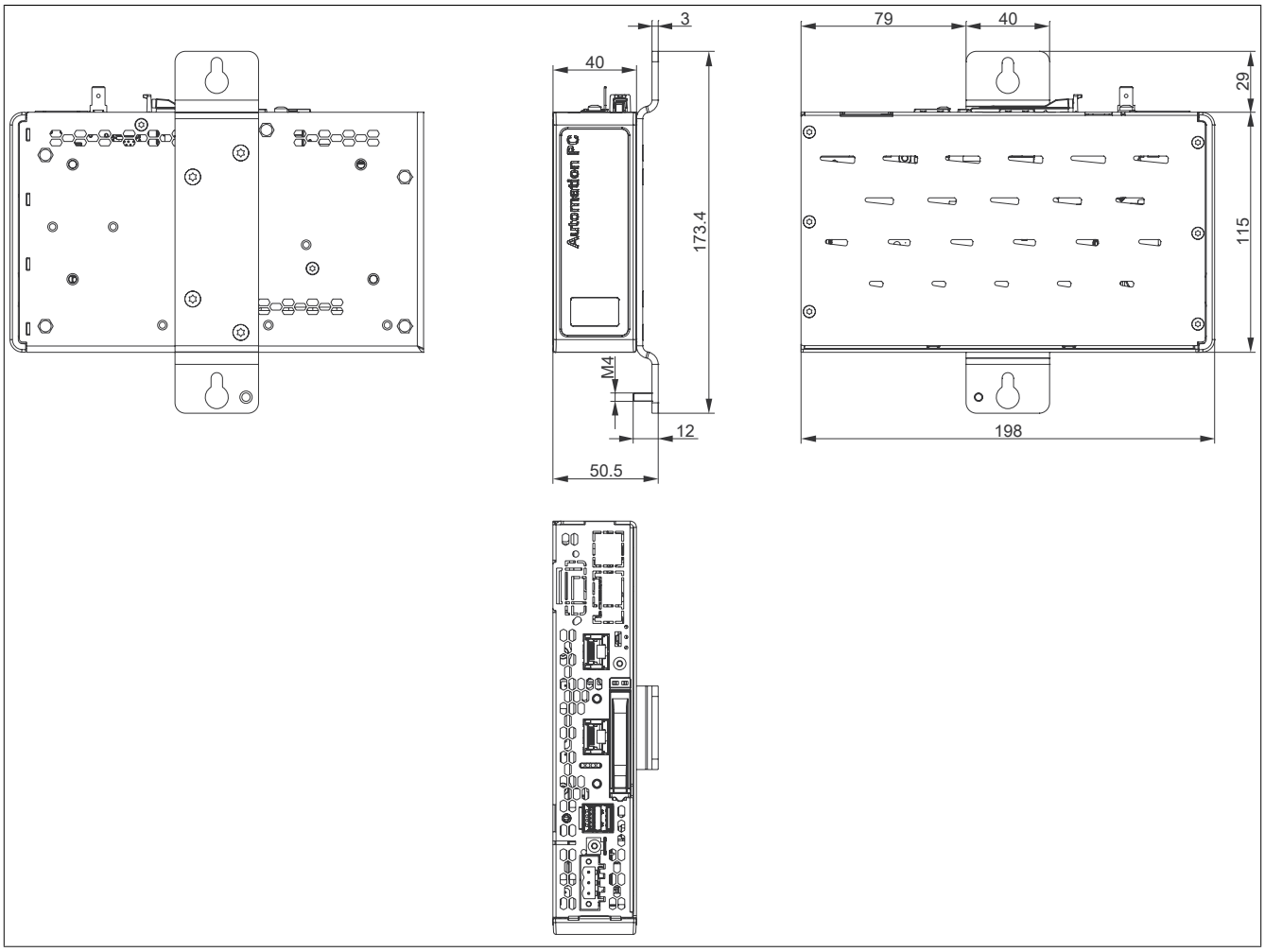


Figure 2: Automation PC 2100 with side mounting plate (box style) - Dimensions

All dimensions are specified in mm.

Information:

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

2.2.2 Drilling template

Information:

When installing the Automation PC 2100, sufficient space for air circulation as well as for operation and servicing of the device must be taken into account.

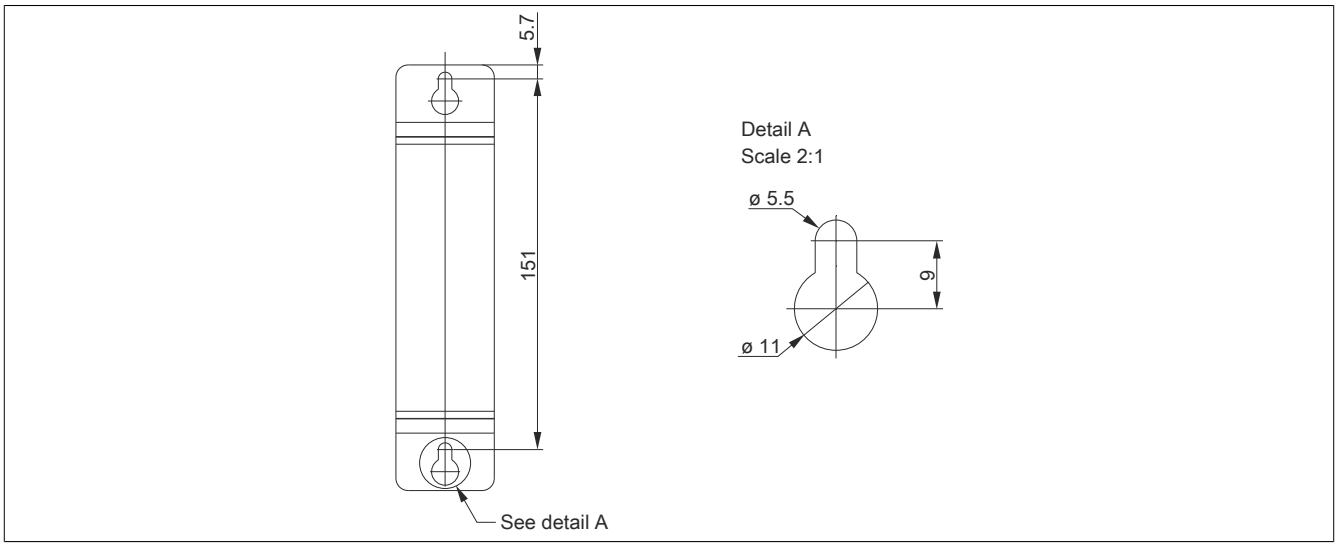


Figure 3: Automation PC 2100 mounting plate - Drilling template

All dimensions are specified in mm.

2.2.3 Spacing for air circulation

In order to ensure sufficient air circulation, the specified clearance values must be observed above, below, to the side and behind the device. For the minimum specified clearance, see the following diagrams. This applies to all variants.

Information:

The following figure and table illustrate the complete system from a thermal point of view. Additional space needed to operate or service the device must be taken into account during installation.

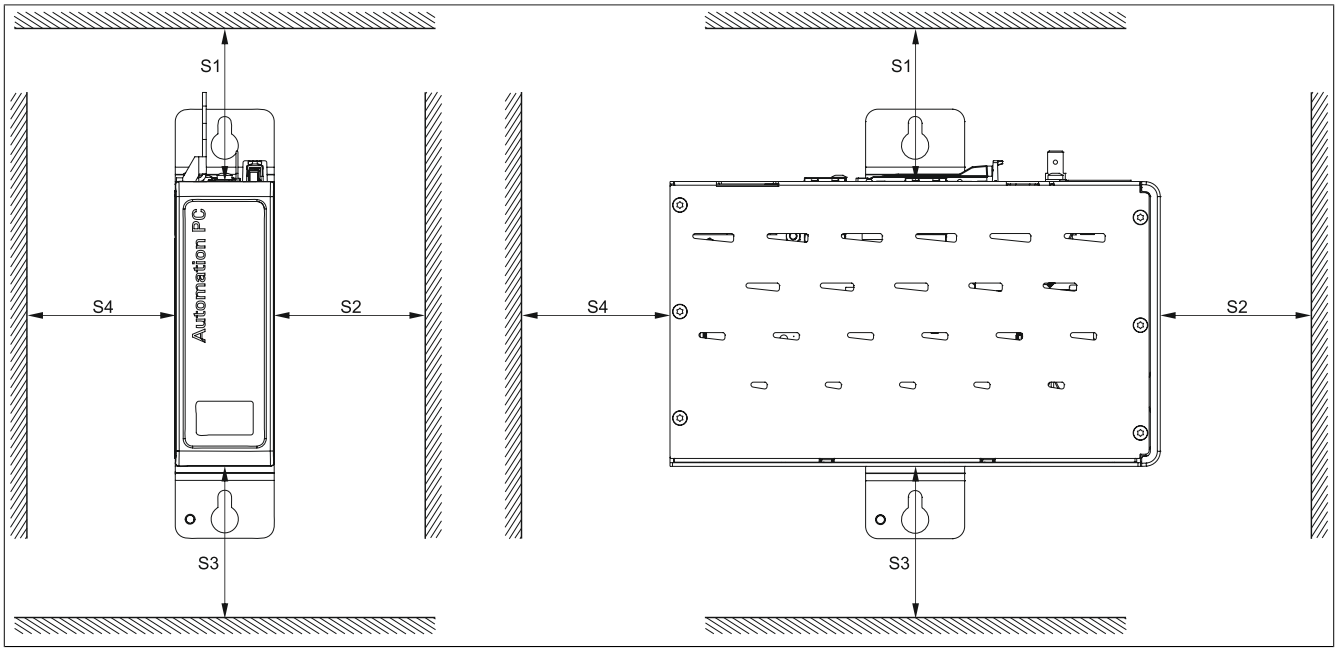


Figure 4: Automation PC 2100 - Spacing for air circulation

S1: ≥100 mm

S2: ≥50 mm

S3: ≥100 mm

S4: ≥50 mm

Caution!

The specified air circulation clearance values are based on worst-case operation at the maximum specified ambient temperature. Exceeding the maximum specified ambient temperature is not permitted!

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

2.2.4 Mounting orientations

Mounting plate on back (book style)

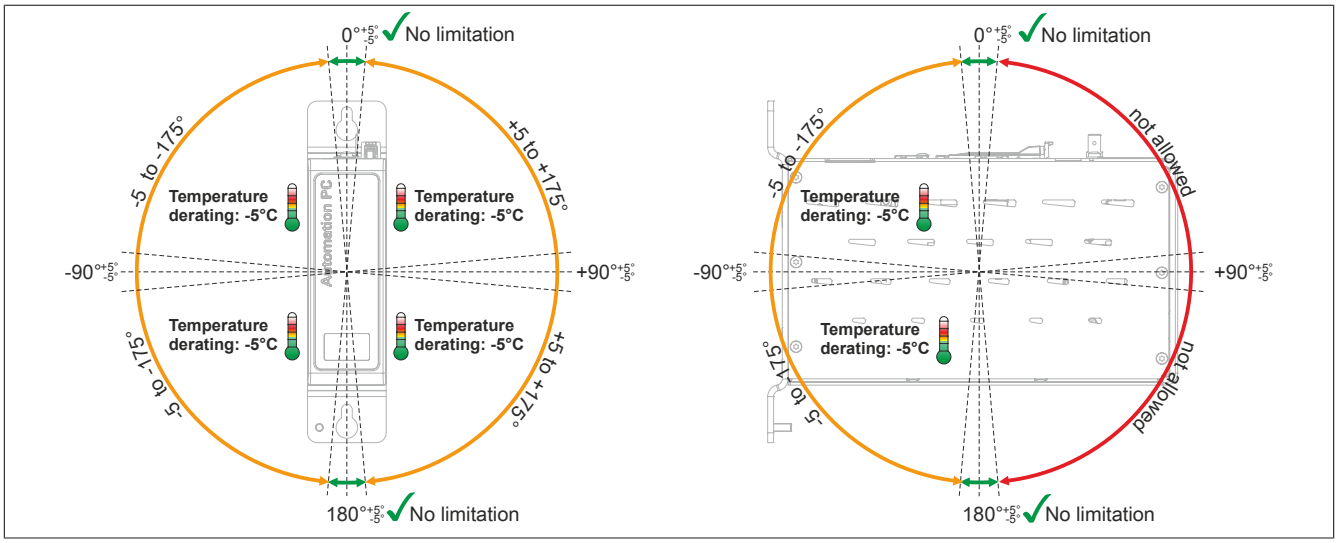


Figure 5: Mounting orientations - Mounting plate on back

To achieve natural air circulation, it is important to ensure that the clearance values specified in section "Spacing for air circulation" on page 28 are observed during installation.

Mounting plate on right side (box style)

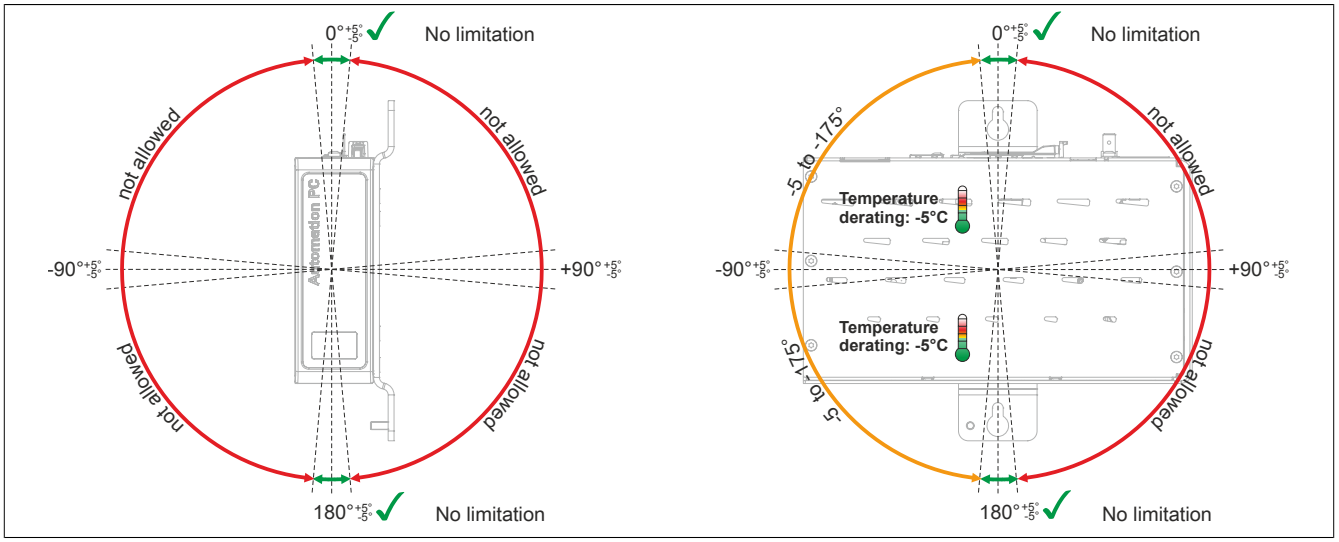


Figure 6: Mounting orientations - Mounting plate on side

To achieve natural air circulation, it is important to ensure that the clearance values specified in section "Spacing for air circulation" on page 28 are observed during installation.

2.2.5 Weight specifications

All weights are specified in g (grams).

Component	Model number	Weight
System unit	5APC2100.BYxx-000	1170
CFast cards	5CFAST.xxxx-00	10
	5CFAST.xxxx-10	10
Monitor/Panel option	5ACCLI01.SDL0-000	20
	5ACCLI01.SDL3-000	20
Interface options	5ACCIF01.FPCC-000	25
	5ACCIF01.FPCS-000	25
	5ACCIF01.FPLK-000	25
	5ACCIF01.FPLS-000	25
	5ACCIF01.FPLS-001	25

Table 6: System units, CFast cards, interface options - Weight

Component	Model number	Weight
	5ACCIF01.FPSC-000	25
	5ACCIF01.FPSC-001	25
	5ACCIF01.FSS0-000	25
	5ACCIF01.ICAN-000	25

Table 6: System units, CFast cards, interface options - Weight

2.3 Environmental characteristics

2.3.1 Temperature specifications

Since the various system units can be combined with a monitor/panel option and interface option, the following tables provide an overview for determining the maximum, minimum and typical ambient temperatures possible based on these components.

Information:

The minimum and maximum specified ambient temperatures have been calculated for operation under worst-case conditions. Experience has shown that higher ambient temperatures can be achieved in typical applications, e.g. in Microsoft Windows. Testing and evaluation in this regard must be performed on-site by the user in each individual case (temperatures can be read in BIOS or using the B&R Control Center, for example).

Information regarding worst-case conditions

- Thermal Analysis Tool (TAT V4.3.4.13.01) from Intel for simulating a 100% processor load
- BurnInTest tool (BurnInTest V7.0 Pro from PassMark Software) for simulating a 100% load on the interface using loopback adapters (USB interfaces)
- Maximum system expansion and power consumption

2.3.1.1 Maximum ambient temperature for worst-case operation

All values apply to non-condensing operation.

	All temperature values in degrees Celsius (°C) at 500 m above sea level, non-condensing The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.	E3815 1.46 GHz 5APC2100.BY01-000	E3825 1.33 GHz 5APC2100.BY11-000	E3826 1.46 GHz 5APC2100.BY22-000	E3827 1.75 GHz 5APC2100.BY34-000	E3845 1.91 GHz 5APC2100.BY44-000	E3845 1.91 GHz 5APC2100.BY48-000
	Maximum ambient temperature for worst-case operation	**55**	**55**	**55**	**50**	**50**	**50**
	What else can also be operated at the max. ambient temperature, or is there a limitation?						
CFast cards	5CFAST.xxxx-00 ≥E0	✓	✓	✓	✓	✓	✓
	5CFAST.xxxx-10	✓	✓	✓	✓	✓	✓
Monitor/Panel options	5ACCLI01.SDL0-000	✓	✓	✓	✓	✓	✓
	5ACCLI01.SDL3-000	50	50	50	✓	45	45
Interface options	5ACCIF01.ICAN-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPCC-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPCS-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLK-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLS-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLS-001	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPSC-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPSC-001	✓	✓	✓	✓	✓	✓
	5ACCIF01.FSS0-000	✓	✓	✓	✓	✓	✓

Table 7: Maximum ambient temperature for worst-case operation

2.3.1.2 Minimum ambient temperature for worst-case operation

All values apply to non-condensing operation.

	All temperature values in degrees Celsius (°C) at 500 m above sea level, non-condensing	E3815 1.46 GHz 5APC2100.BY01-000	E3825 1.33 GHz 5APC2100.BY11-000	E3826 1.46 GHz 5APC2100.BY22-000	E3827 1.75 GHz 5APC2100.BY34-000	E3845 1.91 GHz 5APC2100.BY44-000	E3845 1.91 GHz 5APC2100.BY48-000
	Minimum ambient temperature for worst-case operation	**-20**	**-20**	**-20**	**-20**	**-20**	**-20**
	What else can also be operated at the min. ambient temperature, or is there a limitation?						
CFast cards	5CFAST.xxxx-00 ≥E0	✓	✓	✓	✓	✓	✓
	5CFAST.xxxx-10	✓	✓	✓	✓	✓	✓
Monitor/Panel options	5ACCLI01.SDL0-000[1)]	✓	✓	✓	✓	✓	✓
	5ACCLI01.SDL3-000	0	0	0	0	0	0
Interface options	5ACCIF01.ICAN-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPCC-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPCS-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLK-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLS-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLS-001	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPSC-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPSC-001	✓	✓	✓	✓	✓	✓
	5ACCIF01.FSS0-000	✓	✓	✓	✓	✓	✓

1) RGB mode is possible down to 0°C.

Table 8: Minimum ambient temperature for worst-case operation

2.3.1.3 Maximum ambient temperature for typical operation

Information regarding typical conditions

- The total power of all USB interfaces on the system unit is limited to 1 W.
- 2x Gigabit Ethernet
- No permanent 100% processor load and graphics load
- The power consumption of the entire system is limited to 15 W. For information about the power consumption of individual components, see 2.4.2 "Power calculation".

All values apply to non-condensing operation.

	All temperature values in degrees Celsius (°C) at 500 m above sea level, non-condensing The typical ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.	E3815 1.46 GHz 5APC2100.BY01-000 max. 8 W without USB	E3825 1.33 GHz 5APC2100.BY11-000 max. 8 W without USB	E3826 1.46 GHz 5APC2100.BY22-000 max. 9 W without USB	E3827 1.75 GHz 5APC2100.BY34-000 max. 11 W without USB	E3845 1.91 GHz 5APC2100.BY44-000 max. 13 W without USB	E3845 1.91 GHz 5APC2100.BY48-000 max. 13 W without USB
	Maximum ambient temperature for typical operation	**60**	**60**	**60**	**55**	**55**	**55**
	What else can also be operated at the typ. ambient temperature, or is there a limitation?						
CFast cards	5CFAST.xxxx-00 ≥Rev. E0	55	55	55	✓	✓	✓
	5CFAST.xxxx-10	55	55	55	✓	✓	✓
Monitor/Panel options	5ACCLI01.SDL0-000	✓	✓	✓	✓	✓	✓
	5ACCLI01.SDL3-000	55	55	55	50	50	50
Interface options	5ACCIF01.ICAN-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPCC-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPCS-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLK-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLS-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPLS-001	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPSC-000	✓	✓	✓	✓	✓	✓
	5ACCIF01.FPSC-001	✓	✓	✓	✓	✓	✓
	5ACCIF01.FSS0-000	✓	✓	✓	✓	✓	✓

Table 9: Maximum ambient temperature for typical operation

2.3.1.4 How to determine the maximum, minimum and typical ambient temperatures

1. Select the system unit.
2. Rows "Maximum, minimum ambient temperature for worst-case operation" and "Maximum ambient temperature for typical operation" show the minimum, maximum and typical ambient temperatures for the complete system in connection with the respective system unit.

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

3. If additional monitor/panel options, interface options and CFast cards are installed, these components can change the temperature limits of the APC2100 system.
4. Limitations are possible due to the mounting orientation of the Automation PC 2100. For more information, see section "Mounting orientations".
5. "Information regarding typical conditions" on page 32 must be taken into account for typical ambient temperatures. Testing and evaluation in this regard must be performed on-site by the user in each individual case (temperatures can be read in BIOS or using the B&R Control Center).

If the installed component is marked by a "✓", it can be operated at the minimum/maximum/typical ambient temperature of the complete system without problems.

If a temperature value is specified for the installed component, for example "45", then the ambient temperature of the complete APC2100 system is not permitted to exceed this temperature.

2.3.1.5 Ambient temperature during storage and transport

The following table provides an overview of the minimum and maximum ambient temperatures for storing and transporting the complete system. Limitations are possible through the use of individual components.

Component	Model number	Storage	Transport
System unit	5APC2100.BYxx-000	-20 to 60°C	-20 to 60°C
CFast cards	5CFAST.xxxx-00	-50 to 100°C	-50 to 100°C
	5CFAST.032G-10 ≥Rev. G0	-40 to 85°C	-40 to 85°C
	5CFAST.064G-10 ≥Rev. E0	-40 to 85°C	-40 to 85°C
	5CFAST.128G-10 ≥Rev. E0	-40 to 85°C	-40 to 85°C
	5CFAST.032G-10 ≤Rev. F0	-55 to 95°C	-55 to 95°C
	5CFAST.064G-10 ≤Rev. D0	-55 to 95°C	-55 to 95°C
	5CFAST.128G-10 ≤Rev. D0	-55 to 95°C	-55 to 95°C
Interface options	5ACCIF01.ICAN-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPCC-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPCS-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPLK-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPLS-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPLS-001	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPSC-000	-20 to 60°C	-20 to 60°C
	5ACCIF01.FPSC-001	-20 to 60°C	-20 to 60°C
	5ACCIF01.FSS0-000	-20 to 60°C	-20 to 60°C

Table 10: System units, CFast cards, interface options - Ambient temperature during storage and transport

2.3.1.6 Temperature monitoring

Sensors monitor temperature values at various locations in the APC2100 device. For the position of the temperature sensors, see Fig. 7 "Automation PC 2100 - Position of temperature sensors" on page 34. The specified values in Tab. 11 "Temperature sensor positions" on page 34 represent the defined maximum temperature for this measurement point. An alarm is not triggered if the 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 CFast cards for APC2100 systems available from B&R are equipped with S.M.A.R.T (Self Monitoring, Analysis, and Reporting Technology). This makes it possible to read a wide range of parameters such as temperature using software (e.g. HDD Thermometer, a freeware program) in approved Microsoft operating systems.

2.3.1.7 Temperature sensor positions

Sensors indicate temperature values at various locations in the APC2100. The temperatures [1)] can be read in BIOS (menu option "OEM features" on page 143) or Microsoft Windows operating systems using the B&R Control Center[2)].

For applications that do not run in approved operating systems, temperatures can be evaluated using the MTCX Development Kit. In addition to the MTCX Development Kit, sample programs in EFI are also available.

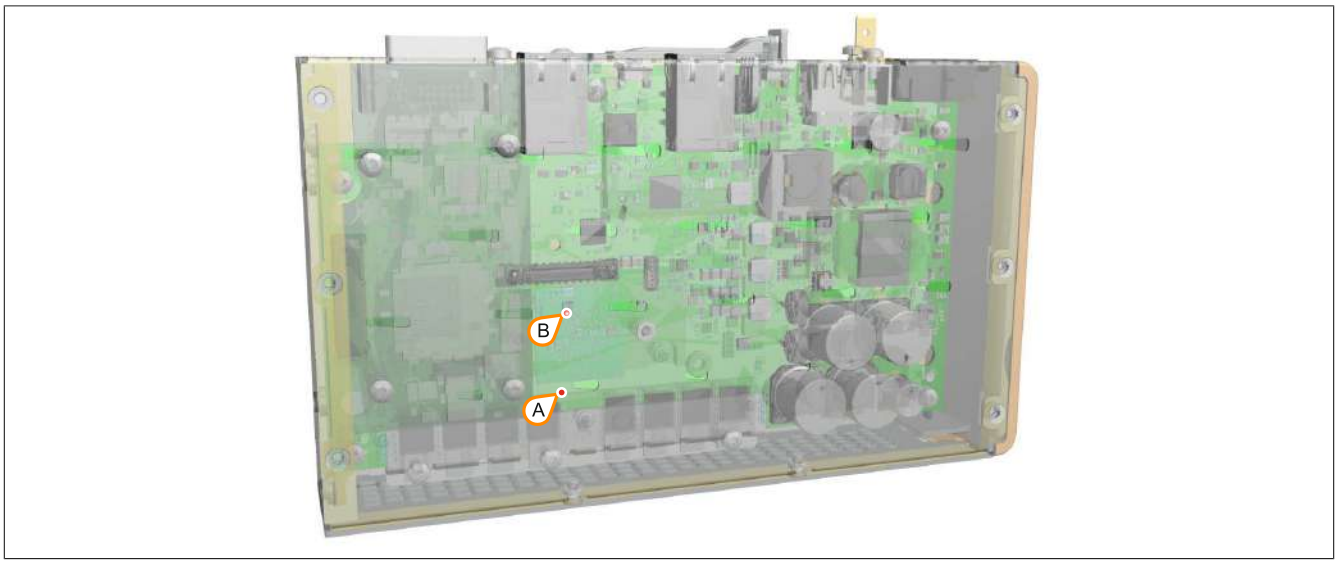


Figure 7: Automation PC 2100 - Position of temperature sensors

ADI sensors	Position	Measurement point for	Measurement	Max. specified
System unit sensor 2	B	CPU	Temperature of the processor area (sensor integrated on the CPU board).	95°C
System unit sensor 1	A	Main memory	Temperature of the main memory area (sensor integrated on the CPU board).	95°C

Table 11: Temperature sensor positions

1) The measured temperature represents an approximate value for the immediate ambient temperature but can also be influenced by neighboring components.
2) The ADI driver that includes the B&R Control Center can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

2.3.2 Humidity

The following table shows the minimum and maximum relative humidity values (non-condensing) of the individual components that are relevant to the humidity limitations of the complete system. The lowest and highest common values are always used for this determination.

Component	Model number	Operation	Storage	Transport
System units	5APC2100.BYxx-000	5 to 90%	5 to 95%	5 to 95%
CFast cards	5CFAST.xxxx-00	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.032G-10 ≥Rev. G0	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.064G-10 ≥Rev. E0	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.128G-10 ≥Rev. E0	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.256G-10	Max. 85% at 85°C	Max. 85% at 85°C	Max. 85% at 85°C
	5CFAST.032G-10 ≤Rev. F0	10 to 95%	10 to 95%	10 to 95%
	5CFAST.064G-10 ≤Rev. D0	10 to 95%	10 to 95%	10 to 95%
	5CFAST.128G-10 ≤Rev. D0	10 to 95%	10 to 95%	10 to 95%
Monitor/Panel option	5ACCLI01.SDL0-000	5 to 90%	5 to 95%	5 to 95%
	5ACCLI01.SDL3-000	5 to 90%	5 to 95%	5 to 95%
Interface options	5ACCIF01.FPCC-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPCS-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPLK-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPLS-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPLS-001	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPSC-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FPSC-001	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.FSS0-000	5 to 90%	5 to 95%	5 to 95%
	5ACCIF01.ICAN-000	5 to 90%	5 to 95%	5 to 95%

Table 12: Humidity - System units, monitor/panel options, IF options, CFast cards

The specifications listed correspond to the relative humidity (non-condensing) at an ambient temperature of 30°C. For more detailed information about specific temperature-dependent humidity values, see the technical data for the individual components.

2.3.3 Vibration

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

Automation PC	Operation[1)]		Storage[1)2)]	Transport[1)2)]
	Continuous	Periodic		
With CFast card	2 to 9 Hz: 1.75 mm amplitude 9 to 200 Hz: 0.5 g	2 to 9 Hz: 3.5 mm amplitude 9 to 200 Hz: 1 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g	2 to 8 Hz: 7.5 mm amplitude 8 to 200 Hz: 2 g 200 to 500 Hz: 4 g

Table 13: Vibration

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

2.3.4 Shock

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

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

Table 14: Shock

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

2.3.5 Protection

The Automation PC 2100 has IP20 protection per EN 60529 under the following conditions:

- The Automation PC 2100 is installed correctly (see "Installation" on page 123).
- All covers or components are installed on the interfaces and slots.
- All environmental conditions are being observed.

2.4 Electrical characteristics

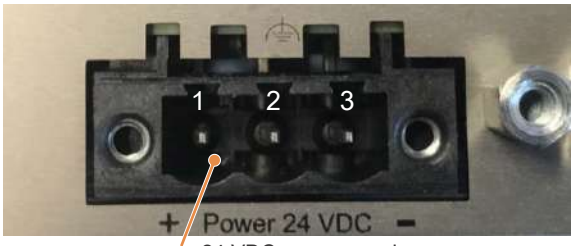
2.4.1 +24 VDC power supply

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

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

For the pinout, see the following table. The supply voltage is protected internally by a soldered fuse (10 A, fast-acting) to prevent damage to the device in the event of 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 destroyed in the event of error.

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



+24 VDC power supply

Table 15: +24 VDC power supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%, SELV[1)]
Nominal current	3 A
Overvoltage category per EN 61131-2	II
Inrush current	Typ. 6 A, max. 10 A for <300 µs
Electrical isolation	Yes
Uninterruptible power supply	No

1) EN 60950 requirements must be observed.

2.4.2 Power calculation

In order to calculate the total power of the Automation PC 2100 device, the power rating of the monitor/panel option being used must be added to the power ratings of the system unit being used and any connected interface options or CFast cards.

System unit	Model number	Total power consumption of system unit
APC2100 E3815 1C 1.46 GHz	5APC2100.BY01-000	Max. 12 W without USB consumers Max. 22 W with USB consumers
APC2100 E3825 2C 1.33 GHz	5APC2100.BY11-000	Max. 13 W without USB consumers Max. 23 W with USB consumers
APC2100 E3826 2C 1.46 GHz	5APC2100.BY22-000	Max. 15 W without USB consumers Max. 25 W with USB consumers
APC2100 E3827 2C 1.75 GHz	5APC2100.BY34-000	Max. 17 W without USB consumers Max. 27 W with USB consumers
APC2100 E3845 4C 1.91 GHz	5APC2100.BY44-000	Max. 19 W without USB consumers Max. 29 W with USB consumers
APC2100 E3845 4C 1.91 GHz	5APC2100.BY48-000	Max. 20 W without USB consumers Max. 30 W with USB consumers

Table 16: System unit - Power calculation

The following values are maximum values:

Monitor/Panel option	Model number	+5 V	3V3	+12 V	Power consumption Total
SDL/DVI transmitter	5ACCLI01.SDL0-000	0.25 W	0.75 W	-	1.00 W
SDL3 transmitter	5ACCLI01.SDL3-000	2.20 W	1.80 W	-	4.00 W

Table 17: Power calculation - Monitor/Panel options

The following values are maximum values:

Interface option	Model number	+5 V	3V3	+12 V	Power consumption Total
CAN	5ACCIF01.ICAN-000	0.45 W	0.05 W	-	0.50 W
POWERLINK CAN X2X	5ACCIF01.FPCC-000	0.45 W	1.55 W	-	2.00 W
POWERLINK RS485 CAN	5ACCIF01.FPCS-000	0.75 W	1.00 W	-	1.75 W
POWERLINK	5ACCIF01.FPLK-000	-	1.75 W	-	1.75 W
POWERLINK RS232	5ACCIF01.FPLS-000	0.50 W	1.00 W	-	1.50 W
POWERLINK RS232	5ACCIF01.FPLS-001	-	1.50 W	-	1.50 W
POWERLINK RS232 CAN	5ACCIF01.FPSC-000	0.75 W	1.00 W	-	1.75 W
POWERLINK RS232 CAN X2X	5ACCIF01.FPSC-001	0.60 W	1.40 W	-	2.00 W
2x RS422/485	5ACCIF01.FSS0-000	0.80 W	0.20 W	-	1.00 W

Table 18: Interface options - Power calculation

The following values are maximum values:

CFast cards	Model number	+5 V	3V3	+12 V	Power consumption Total
CFast cards with SLC technology	5CFAST.xxxx-00	-	0.7 W read 0.7 W write 0.3 W idle	-	0.7 W read 0.7 W write 0.3 W idle
CFast cards with MLC technology	5CFAST.032G-10 ≥ G0 5CFAST.064G-10 ≥ E0	-	1.1 W read 1 W write 0.25 W idle	-	1.1 W read 1 W write 0.25 W idle
	5CFAST.128G-10 ≥ E0	-	1.1 W read 1.4 W write 0.25 W idle	-	1 W read 1.4 W write 0.25 W idle
	5CFAST.032G-10 ≤ F0 5CFAST.064G-10 ≤ D0 5CFAST.128G-10 ≤ D0	-	0.8 W read 1 W write 0.4 W idle	-	0.8 W read 1 W write 0.4 W idle
	5CFAST.256G-10	-	1.2 W read 1.9 W write 0.25 W idle	-	1.2 W read 1.9 W write 0.25 W idle

Table 19: CFast cards - Power calculation

Example

5APC2100.BY11-000 system unit	23 W (with USB consumers)	23 W
Monitor/Panel option 5ACCLI01.SDL0-000	0.25 W + 0.75 W	1 W
5CFAST.xxxx-10 CFast card		1 W
	Total max.:	**25 W**

2.4.3 Block diagrams

2.4.3.1 System units - Block diagram

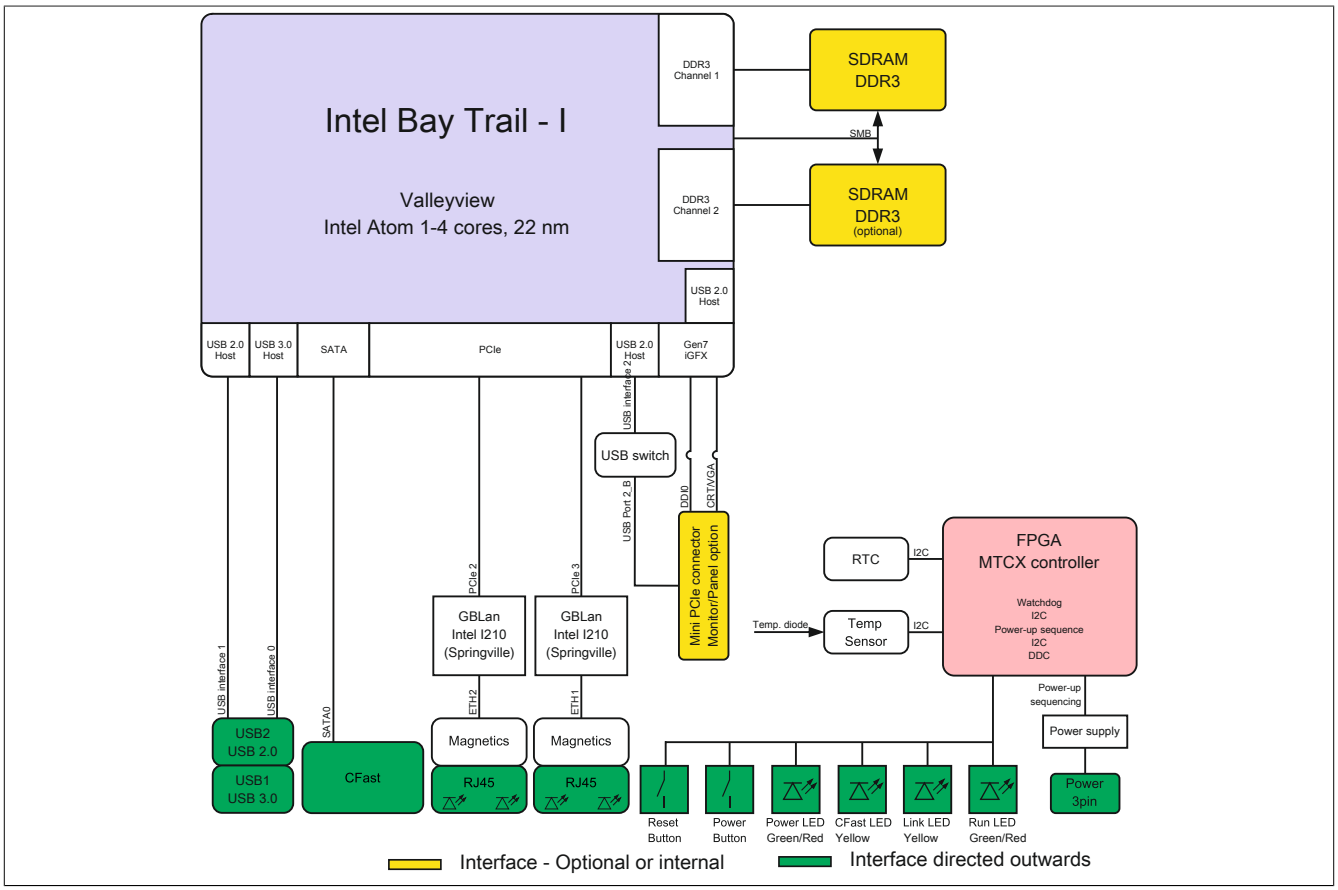


Figure 8: System units (5APC2100.BYxx-000) - Block diagram

2.4.3.2 Monitor/Panel options - Block diagram

SDL/DVI/RGB transmitter

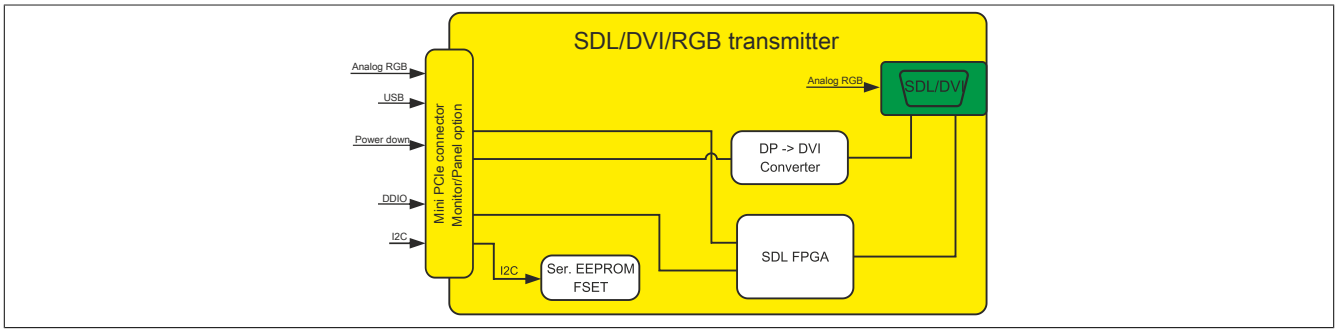


Figure 9: Monitor/Panel option SDL/DVI/RGB (5ACCLI01.SDL0-000) - Block diagram

SDL3 transmitter

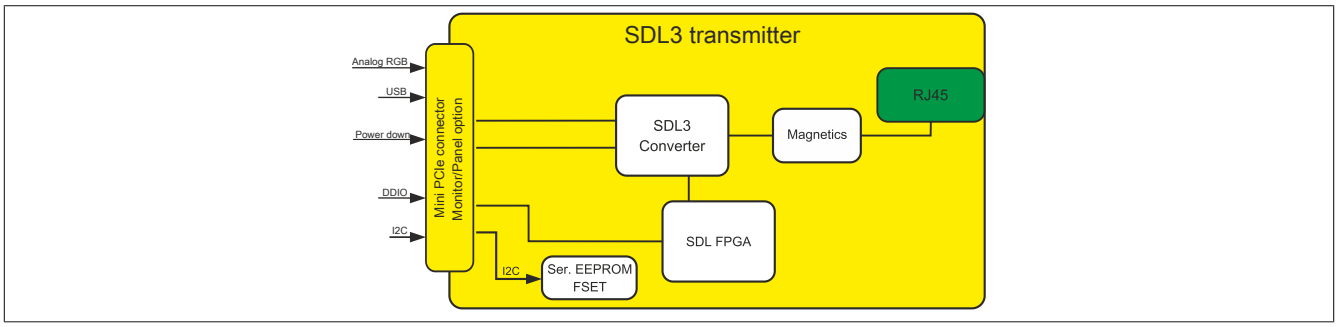


Figure 10: Smart Display Link 3 transmitter (5ACCLI01.SDL3-000) - Block diagram

2.4.3.3 Interface options - Block diagram

POWERLINK / 2x CAN / X2X / nvSRAM

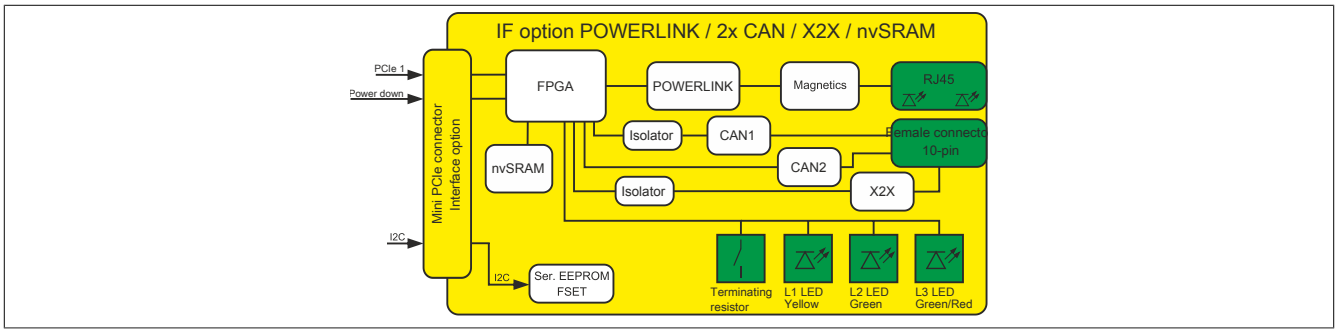


Figure 11: IF option POWERLINK / 2x CAN / X2X / nvSRAM (5ACCIF01.FPCC-000) - Block diagram

POWERLINK/RS485/CAN/FRAM

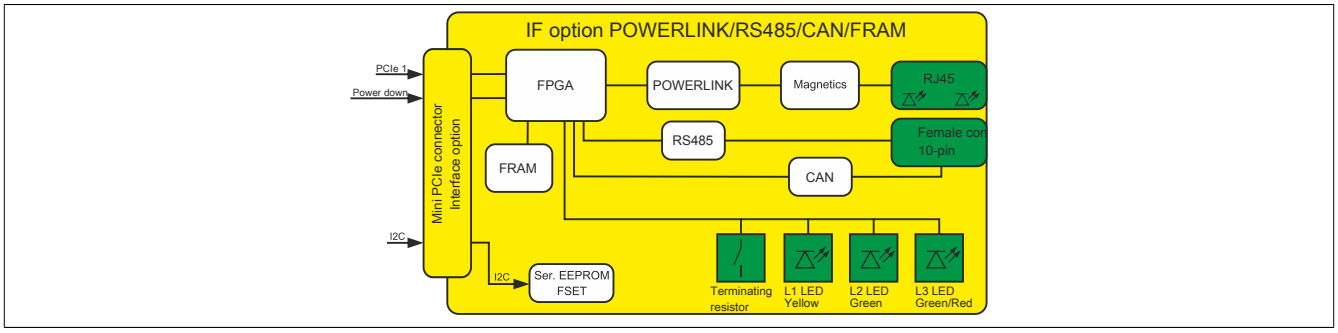


Figure 12: IF option POWERLINK/RS485/CAN/FRAM (5ACCIF01.FPCS-000) - Block diagram

2x POWERLINK / nvSRAM

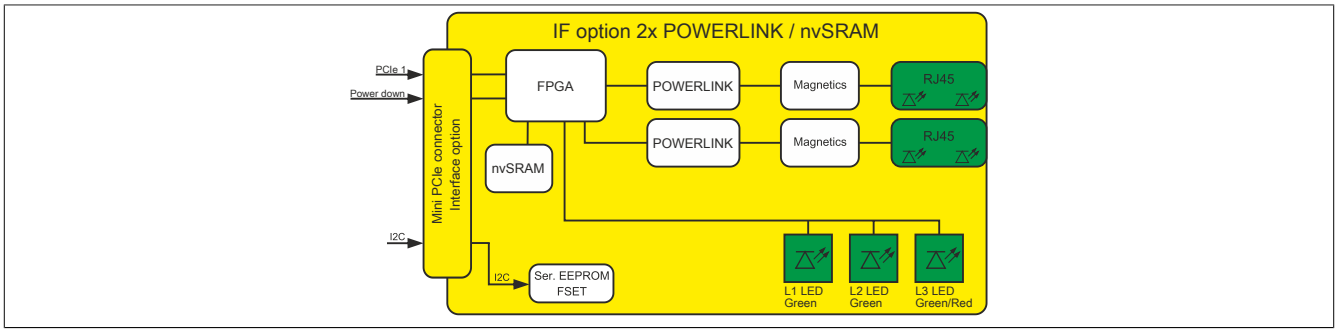


Figure 13: IF option 2x POWERLINK / nvSRAM (5ACCIF01.FPLK-000) - Block diagram

POWERLINK/RS232/FRAM

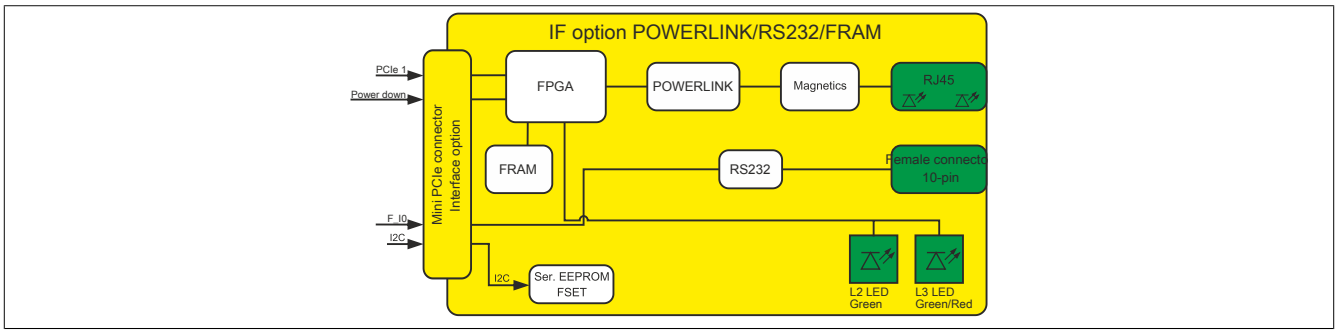


Figure 14: IF option POWERLINK/RS232/FRAM (5ACCIF01.FPLS-000) - Block diagram

POWERLINK/RS232/nvSRAM

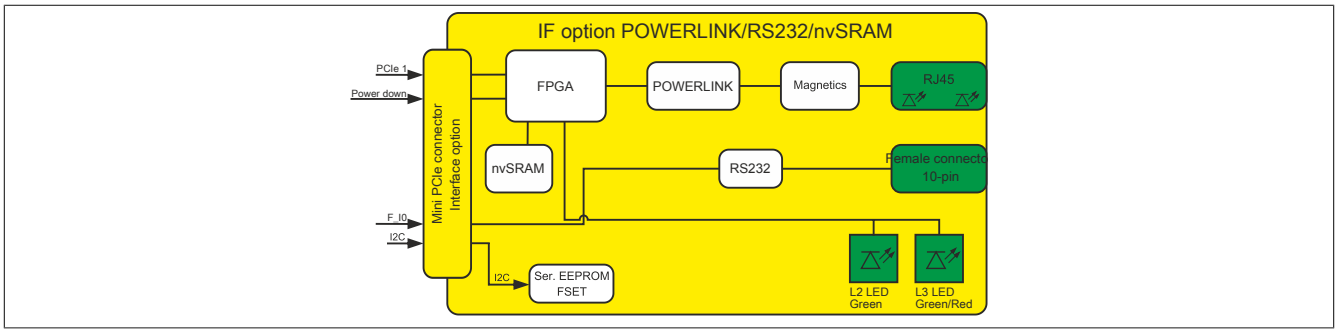


Figure 15: IF option POWERLINK/RS232/nvSRAM (5ACCIF01.FPLS-001) - Block diagram

POWERLINK/RS232/CAN/FRAM

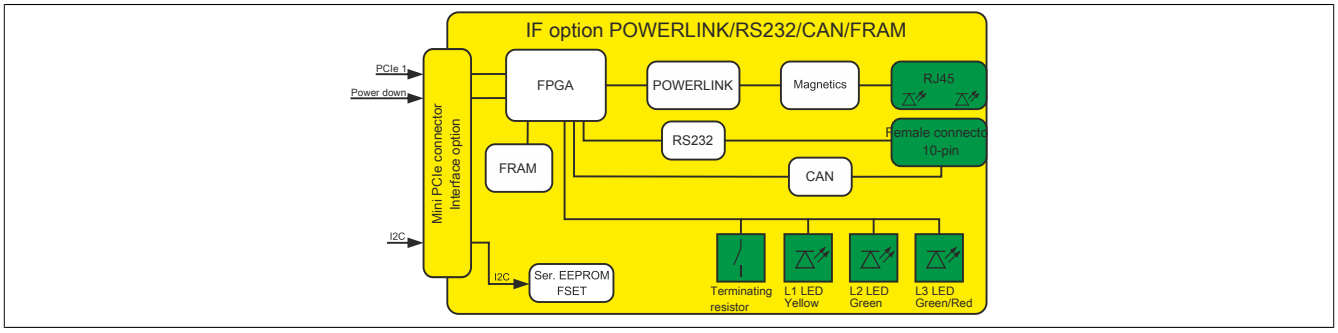


Figure 16: IF option POWERLINK/RS232/CAN/FRAM (5ACCIF01.FPSC-000) - Block diagram

POWERLINK/RS232/CAN/X2X/nvSRAM

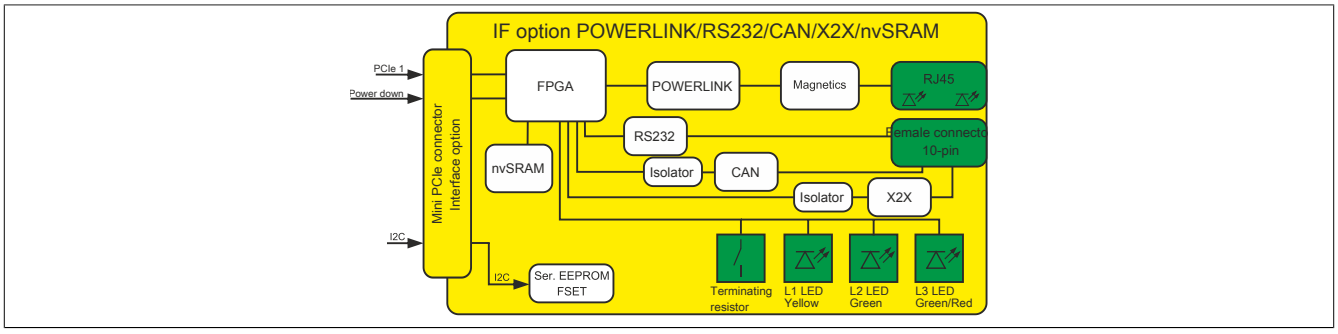


Figure 17: IF option POWERLINK/RS232/CAN/X2X/nvSRAM (5ACCIF01.FPSC-001) - Block diagram

CAN

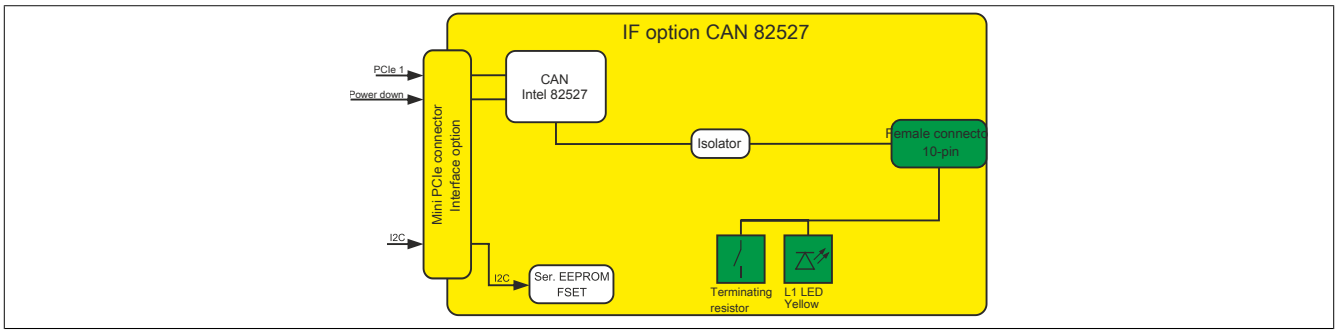


Figure 18: IF option CAN (5ACCIF01.ICAN-000) - Block diagram

2x RS422/RS485

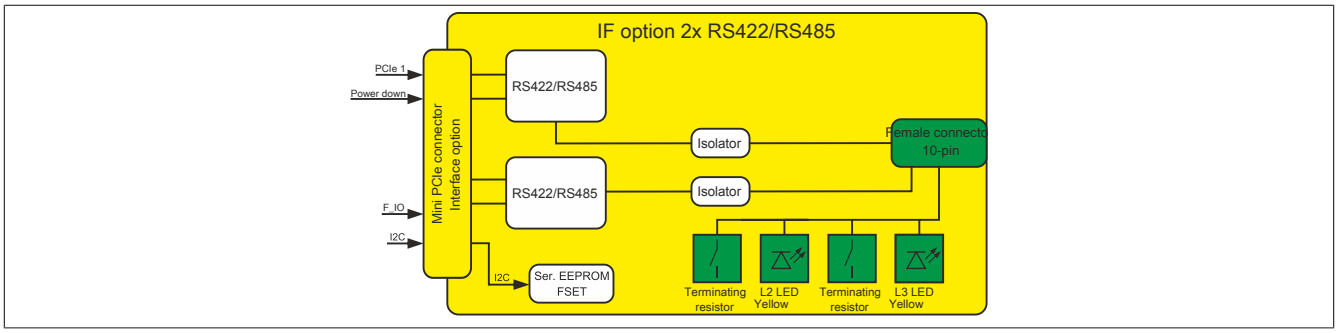


Figure 19: IF option 2x RS422/RS485 (5ACCIF01.FSS0-000) - Block diagram

2.5 Device interfaces and slots

2.5.1 Device interfaces - Overview

Interfaces are located on the top of the Automation PC 2100.

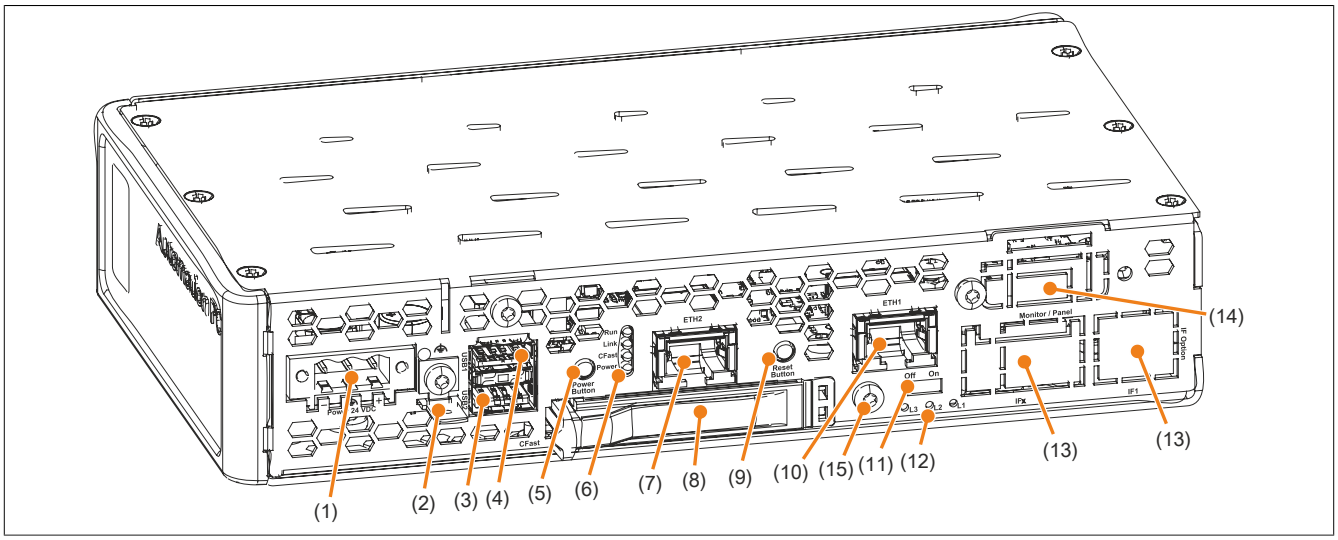


Figure 20: Device interfaces - Overview without an installed interface option

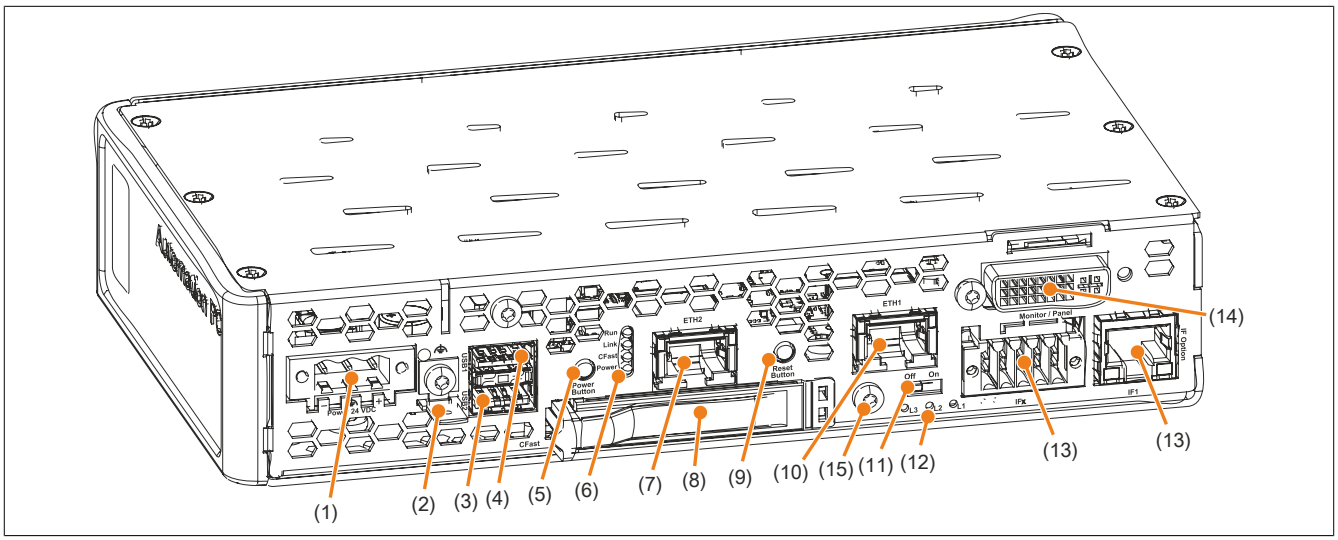


Figure 21: Device interfaces - Overview with an installed interface and monitor/panel option

No.	Type of interface		No.	Type of interface	
1	24 VDC power	"+24 VDC power supply"	9	Reset button	"Reset button"
2	Functional ground connection	"Grounding"	10	ETH1	"Ethernet 1 interface (ETH1)"
3	USB2	"USB interfaces"	11	Off	"Terminating resistor"[1)]
4	USB1	"USB interfaces"	12	L1, L2, L3	"LED status indicators - L2, L3" on page 91 "LED status indicators - L1, L2, L3" on page 102[1)]
5	Power button	"Power button"	13	IF1, IFx IF option	"IF option slot (IF1, IFx)"
6	Power, CFast, Link, Run	"LED status indicators"	14	Monitor/Panel interface	"Monitor/Panel interface"
7	ETH2	"Ethernet 2 interface (ETH2)"	15	Screw connection for cable shield	
8	CFast	"CFast slot"			

1) Only available if interface option installed.

2.5.2 +24 VDC power supply

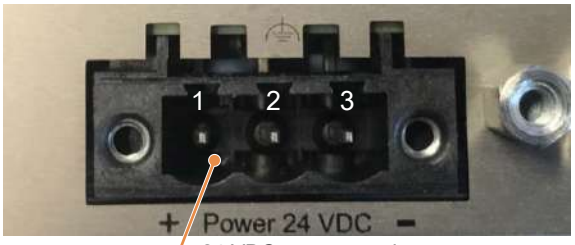
Danger!

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

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

For the pinout, see the following table. The supply voltage is protected internally by a soldered fuse (10 A, fast-acting) to prevent damage to the device in the event of 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 destroyed in the event of error.

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



+24 VDC power supply

Table 20: +24 VDC power supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%, SELV[1)]
Nominal current	Max. 3 A
Overvoltage category per EN 61131-2	II
Inrush current	Typ. 6 A, max. 10 A for <300 µs
Electrical isolation	Yes
Uninterruptible power supply	No

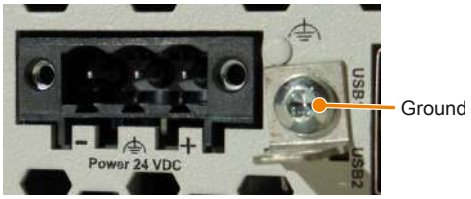
1) EN 60950 requirements must be observed.

2.5.2.1 Grounding

Caution!

Functional ground (pin 2 of power supply and ground connection) must be connected to the central grounding point (e.g. of the control cabinet or system) using the shorted path with the lowest resistance and largest possible wire cross section. This type of grounding is mandatory to ensure the system functions properly.

Automation PC systems are equipped with a ground connection on the interface cover.



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

2.5.3 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[1])			
Controller	Intel I210		RJ45 connector, female
Wiring	S/STP (Cat 5e)		
Transfer rate	10/100/1000 Mbit/s[2]		
Cable length	Max. 100 m (min. Cat 5e)		
LED "Speed"	**On**	**Off**	
Yellow	100 Mbit/s	10 Mbit/s[3]	
Green	1000 Mbit/s	-	
LED "Link"	**On**	**Off**	
Green	Link (indicates connection to an Ethernet network)	Activity (blinks to indicate active data transfer)	

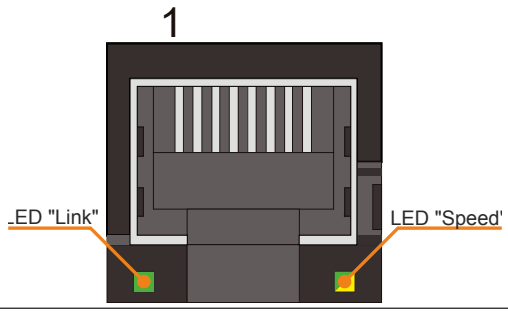


Table 21: Ethernet interface (ETH1)

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) Switching takes place automatically.
3) The 10 Mbit/s transfer rate / connection only exists if LED "Link" 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 for download in the Downloads section of the B&R website (www.br-automation.com).

Information:

Only download necessary drivers from the B&R website, not from vendor websites.

2.5.4 Ethernet 2 interface (ETH2)

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

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

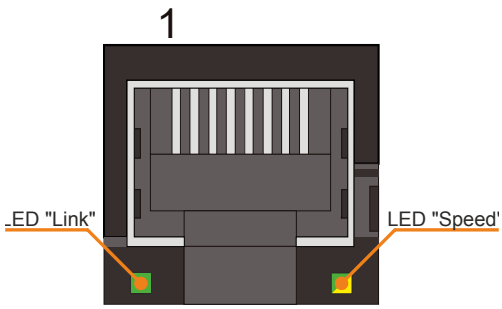


Table 22: Ethernet interface (ETH2)

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) Switching takes place automatically.
3) The 10 Mbit/s transfer rate / connection only exists if LED "Link" 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 for download in the Downloads section of the B&R website (www.br-automation.com).

Information:

Only download necessary drivers from the B&R website, not from vendor websites.

2.5.5 USB interfaces

Automation PC devices are equipped with a USB 3.0 (Universal Serial Bus) host controller with multiple USB interfaces, of which one USB 3.0 and one USB 2.0 interface are externally accessible for the user.

Warning!

Peripheral USB devices can be connected to the USB interfaces. Due to the large number of USB devices available on the market, B&R cannot guarantee their functionality. Functionality is ensured when using the USB devices available from B&R.

Caution!

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

USB1

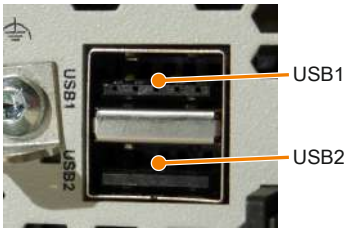
Universal Serial Bus (USB1)[1]		
Type	USB 3.0	1x USB type A, female
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s), SuperSpeed (5 Gbit/s)[2]	
Current-carrying capacity[3] USB1	Max. 1 A	
Cable length USB 2.0 USB 3.0	Max. 5 m (without hub) Max. 3 m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

Table 23: USB1 interface

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) Compatibility with SuperSpeed USB depends on the operating system being used.
3) The USB interface is protected by a maintenance-free "USB current-limiting switch" (max. 1 A).
4) With revisions <B0 for the system units, the max. cable length has been specified at 3 m.

USB2

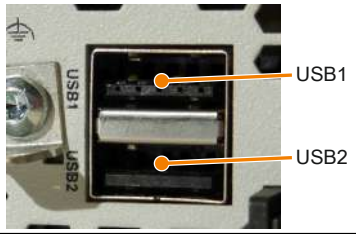
Universal Serial Bus (USB2)[1]		
Type	USB 2.0	1x USB type A, female
Design	Type A	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Current-carrying capacity[2] USB2	Max. 1 A	
Cable length USB 2.0	Max. 5 m (without hub)	

Table 24: USB2 interface

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) The USB interface is protected by a maintenance-free "USB current-limiting switch" (max. 1 A).
3) With revisions <B0 for the system units, the max. cable length has been specified at 3 m.

USB hub interfaces

4-port USB hub 5ACCUSB4.0000-000 provides up to 4 additional USB interfaces for the Automation PC 2100. For more information, see section "USB hub" on page 225.

2.5.6 CFast slot

The Automation PC offers an easy-to-access CFast slot so that a CFast card can also be used as removable media for transferring data or performing upgrades.

This CFast slot is connected to the chipset internally via SATA 0 with SATA II design (SATA 3.0 Gbit/s).

Information:

5CFAST.0xxx-00 CFast cards are only permitted to be operated in the APC2100 with revision E0 or later.

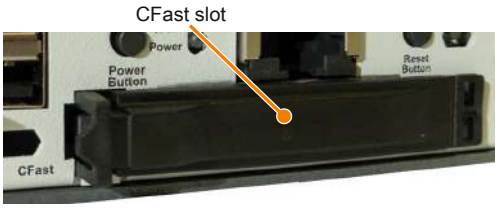
CFast slot		
Connection	SATA 0	
Model number	**Short description**	
	CFast cards	
5CFAST.2048-00	CFast card, 2 GB SLC	
5CFAST.4096-00	CFast card, 4 GB SLC	
5CFAST.8192-00	CFast card, 8 GB SLC	
5CFAST.016G-00	CFast card, 16 GB SLC	
5CFAST.032G-00	CFast card, 32 GB SLC	
5CFAST.032G-10	CFast card, 32 GB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

Table 25: CFast slot

Warning!

The CFast card is only permitted to be connected or disconnected when the power is switched off.

2.5.7 Power button

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

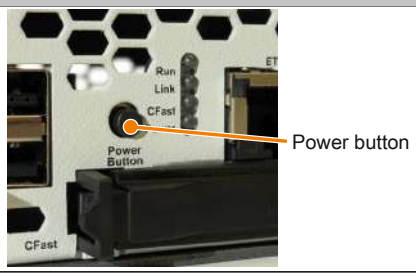
Power button	
The Power button can be operated without any tools. The power button acts like the on/off switch on a normal desktop PC with ATX power supply: **Press and release** ... Switches on the Automation PC or executes the action configured in the operating system when pressing the Power button (shut down, sleep, etc.) and switches off the Automation PC. **Press and hold** ... The ATX power supply switches off the Automation PC without shutting down the operating system (**approx. 4 s - possible data loss!**) Pressing the power button does not reset the MTCX processor.	

Table 26: Power button

2.5.8 Reset button

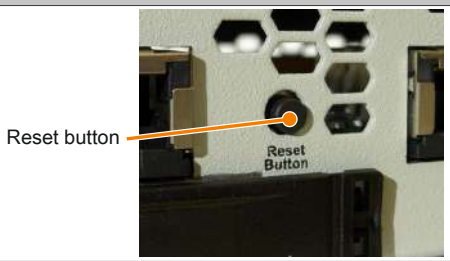
Reset button	
The Reset button can be operated without any tools. Pushing the reset button triggers a hardware and PCI reset. The Automation PC is restarted (cold restart - possible data loss!). Pressing the reset button does not reset the MTCX processor.	

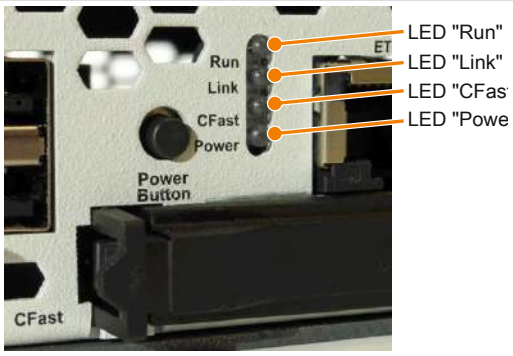
Table 27: Reset button

Warning!

Resetting the system can result in data loss!

2.5.9 LED status indicators

The LED status indicators are located between the ETH2 interface and the power button.



The following intervals are used for the LED status indicators:
Block size: 250 ms
Repeat interval: 500 ms, 2 boxes thus represent one interval

LED	Color	Status	Explanation	LED status indicators
Power	Green	On	Power supply OK	
	Red	On	The system is in standby mode (S5: soft-off mode or S4: hibernation/suspend-to-disk mode).	
	Red/Green	Blinking	Faulty or incomplete BIOS, MTCX or I/O FPGA update, power supply OK	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, standby mode (S5: soft-off mode or S4: hibernation/suspend-to-disk mode)	
CFast	Yellow	On	Indicates CFast access.	
Link	Yellow	On	Indicates an active SDL connection on the male panel connector.	
		Blinking	An active SDL connection was interrupted by a loss of power to the display unit.	
			Information: **The power supply / power connection of the connected display unit must be checked.**	
Run	Green	Blinking	Automation Runtime is starting up. This is controlled by Automation Runtime (AREmb and ARwin).	
	Green	On	Application running This is controlled by Automation Runtime (AREmb and ARwin).	
	Red	On	Application in service mode This is controlled by Automation Runtime (AREmb and ARwin).	
	Orange	Blinking	A license violation exists.	

Table 28: LED status indicators - Data

2.5.10 Monitor/Panel interface

The Automation PC system units do not have a monitor/panel interface. This can be added with various monitor/panel options. It is also possible to choose a configuration without a monitor/panel option.

The following table lists the monitor/panel options that can be used in the interface. For more information, see section "Monitor/Panel options" on page 64.

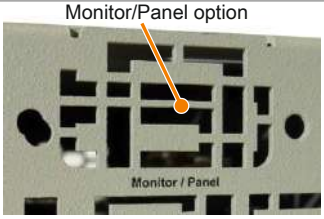
Monitor/Panel interface	
	Monitor/Panel option 
Model number	**Short description**
	Monitor/Panel option
5ACCLI01.SDL0-000	SDL/DVI transmitter for APC2100
5ACCLI01.SDL3-000	SDL3 transmitter - For APC2100

Table 29: Monitor/Panel interface

Information:

Monitor/Panel options can only be installed and replaced by B&R.

2.5.11 IF option slot (IF1, IFx)

The Automation PC system units include 1 slot for an interface option.

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

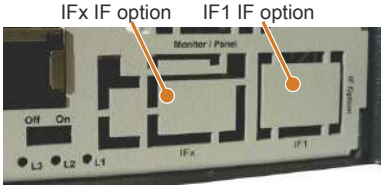
IF option IF1, IFx slot	
	IFx IF option IF1 IF option 
Model number	**Short description**
	Interface option
5ACCIF01.FPCC-000	Interface card - 2x CAN interfaces - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100
5ACCIF01.FPCS-000	Interface card - 1x RS485 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100
5ACCIF01.FPLK-000	Interface card - 2x POWERLINK interfaces - 512 kB nvSRAM - For APC2100/PPC2100
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100
5ACCIF01.FPLS-001	Interface card - 1x RS232 interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100
5ACCIF01.FPSC-001	Interface card - 1x RS232 interface - 1x CAN interface - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100
5ACCIF01.FSS0-000	Interface card - 2x RS422/485 interfaces - For APC2100/PPC2100
5ACCIF01.ICAN-000	Interface card - 1x CAN interface - For APC2100/PPC2100

Table 30: IF1 IF option, IFx slot

Information:

Interface options can only be installed and replaced by B&R.

3 Individual components

3.1 System units

3.1.1 5APC2100.BYxx-000

3.1.1.1 General information

APC2100 system units consist of a CPU board, housing and mounting plate. All interfaces are included, an interface option and monitor/panel can be additionally installed. The main memory is permanently soldered to the CPU board and cannot be replaced or expanded.

- Intel Atom processors
- Intel Bay Trail platform
- DDR3 memory
- Intel HD graphics
- 1 CFast slot
- Insert for 1 monitor/panel option
- Slot for 1 interface option

3.1.1.2 Order data

Model number	Short description	Figure
	System units	
5APC2100.BY01-000	APC2100 system unit - Intel Atom E3815 1.46 GHz - Single core - 1 GB SDRAM	
5APC2100.BY11-000	APC2100 system unit - Intel Atom E3825 1.33 GHz - Dual core - 1 GB SDRAM	
5APC2100.BY22-000	APC2100 system unit - Intel Atom E3826 1.46 GHz - Dual core - 2 GB SDRAM	
5APC2100.BY34-000	APC2100 system unit - Intel Atom E3827 1.75 GHz - Dual core - 4 GB SDRAM	
5APC2100.BY44-000	APC2100 system unit - Intel Atom E3845 1.91 GHz - Quad core - 4 GB SDRAM	
5APC2100.BY48-000	APC2100 system unit - Intel Atom E3845 1.91 GHz - Quad core - 8 GB SDRAM	
	Required accessories	
	CFast cards	
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.256G-10	CFast card, 256 GB MLC	
	Optional accessories	
	Interface options	
5ACCIF01.FPCC-000	Interface card - 2x CAN interfaces - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPCS-000	Interface card - 1x RS485 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPLK-000	Interface card - 1x POWERLINK interface - Integrated 2-port hub - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPLS-001	Interface card - 1x RS232 interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface card - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.FPSC-001	Interface card - 1x RS232 interface - 1x CAN interface - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	

Table 31: 5APC2100.BY01-000, 5APC2100.BY11-000, 5APC2100.BY22-000, 5APC2100.BY34-000, 5APC2100.BY44-000, 5APC2100.BY48-000 - Order data

Model number	Short description	Figure
5ACCIF01.FSS0-000	Interface card - 2x RS422/485 interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
5ACCIF01.ICAN-000	Interface card - 1x CAN interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Monitor/Panel options	
5ACCLI01.SDL0-000	Monitor/Panel option - 1x SDL/DVI transmitter - For APC2100/APC2200 - Only available with a new device	
5ACCLI01.SDL3-000	Monitor/Panel option - 1x SDL3 transmitter - For APC2100 - Only available with a new device	

Table 31: 5APC2100.BY01-000, 5APC2100.BY11-000, 5APC2100.BY22-000, 5APC2100.BY34-000, 5APC2100.BY44-000, 5APC2100.BY48-000 - Order data

3.1.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5APC2100.BY01-000	5APC2100.BY11-000	5APC2100.BY22-000	5APC2100.BY34-000	5APC2100.BY44-000	5APC2100.BY48-000
General information						
Cooling	Passive via housing					
LED status indicators	Power, CFast, Link, Run					
B&R ID code	0xE5C1	0xE5C2	0xE5C3	0xE5C4	0xE5C5	0xED0D
Power button	Yes					
Reset button	Yes					
Buzzer	No					
Certifications						
CE	Yes					
UL	cULus E115267 Industrial control equipment					
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]					
DNV GL	-				Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]	
Controller						
Boot loader	UEFI BIOS					
Processor						
Type	Intel Atom E3815	Intel Atom E3825	Intel Atom E3826	Intel Atom E3827	Intel Atom E3845	
Clock frequency	1460 MHz	1330 MHz	1460 MHz	1750 MHz	1910 MHz	
Number of cores	1	2			4	
Architecture	22 nm					
Thermal design power (TDP)	5 W	6 W	7 W	8 W	10 W	
L2 cache	512 kB	1 MB			2 MB	
Intel 64 architecture	Yes					
Intel Hyper-Threading Technology	No					
Intel vPro Technology	No					
Intel Virtualization Technology (VT-x)	Yes					
Intel Virtualization Technology for Directed I/O (VT-d)	No					
Enhanced Intel SpeedStep Technology	Yes					
Chipset	Intel Bay Trail					
Real-time clock						
Precision	At 25°C: Typ. 12 ppm (1 second) per day [3)]					
Self-discharge time [4)]	Typ. approx 400 h Min. approx. 200 h					
Battery-backed	No					
Power failure logic						
Controller	MTCX [5)]					
Buffer time	10 ms					

Table 32: 5APC2100.BY01-000, 5APC2100.BY11-000, 5APC2100.BY22-000, 5APC2100.BY34-000, 5APC2100.BY44-000, 5APC2100.BY48-000 - Technical data

Model number	5APC2100. BY01-000	5APC2100. BY11-000	5APC2100. BY22-000	5APC2100. BY34-000	5APC2100. BY44-000	5APC2100. BY48-000
Memory						
Type	DDR3 SDRAM					
Memory size	1 GB		2 GB	4 GB		8 GB
Speed	DDR3L-1067			DDR3L-1333		
Memory interface width	Single channel					Dual channel
Removable	No					
Graphics						
Controller	Intel HD graphics					
Max. dynamic graphics frequency	400 MHz	533 MHz	667 MHz	792 MHz		
Color depth	Max. 32-bit					
DirectX support	11					
OpenGL support	4.0					
Power management	ACPI 4.0					
Interfaces						
CFast slot						
Quantity	1					
Type	SATA II (SATA 30 Gbit/s)					
USB						
Quantity	2					
Type	1x USB 3.0 1x USB 2.0					
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) [6]					
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					
Inserts						
Interface option [7]	1					
Monitor/Panel option [8]	1					
Electrical characteristics						
Nominal voltage	24 VDC ±25%, SELV [9]					
Nominal current	Max. 3 A					
Inrush current	Typ. 6 A, max. 10 A for <300 µs					
Overvoltage category per EN 61131-2	II					
Electrical isolation	Yes					
Operating conditions						
Pollution degree per EN 61131-2	Pollution degree 2					
Degree of protection per EN 60529	IP20 [10]					
Environmental conditions						
Elevation						
Operation	Max. 3000 m (component-dependent) [11]					
Mechanical characteristics						
Dimensions [12]						
Width	40 mm					
Height	115 mm					
Depth	198 mm					
Weight	1170 g					

Table 32: 5APC2100.BY01-000, 5APC2100.BY11-000, 5APC2100.BY22-000, 5APC2100.BY34-000, 5APC2100.BY44-000, 5APC2100.BY48-000 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) At max. specified ambient temperature: Typ. 58 ppm (5 seconds), worst-case 220 ppm (19 seconds).
4) To achieve the specified values for the self-discharge time, the product must be supplied with power for min. 8 hours.
5) Maintenance Controller Extended
6) The SuperSpeed transfer rate (5 Gbit/s) is only possible with USB 3.0.
7) The interface option cannot be replaced.
8) The monitor/panel option cannot be replaced.
9) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.
10) Only when all interface covers are installed.
11) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.
12) All dimensions without mounting plate.

3.2 CFast cards

3.2.1 General information

CFast cards are easily exchangeable data storage devices. Due to their robustness against environmental influences (temperature, shock, vibration, etc.), CFast cards are ideal for use as storage media in industrial environments.

CFast cards are a variant of CompactFlash that use the SATA protocol instead. CFast cards are not compatible with CompactFlash cards.

3.2.2 Basic information

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

- The flash technology used
- An efficient algorithm for maximizing service life
- Good mechanisms for detecting and correcting errors in the flash memory

3.2.2.1 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 blocks, SLC flash blocks also have write/erase cycles that are 33 times faster, making CFast cards with SLC flash blocks the preferred choice for industrial environments. These factors are heavily dependent on the actual application, however, so 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 also widely used in this market.

3.2.2.2 Wear leveling

Wear leveling refers to an algorithm that can be used to maximize the service life of a CFast card. Different algorithms are possible:

- Dynamic wear leveling
- Static wear leveling

The basic idea behind wear leveling is that data is distributed over a broad range of blocks or cells on the data storage device so that the same areas are not erased and rewritten over and over again.

3.2.2.2.1 Dynamic wear leveling

Dynamic wear leveling makes it possible to utilize unused flash blocks when writing to a file.
If 80% of the data storage device is already taken up by files, then only 20% can be used for wear leveling.
The service life of the CFast card therefore depends on the unused flash blocks.

3.2.2.2.2 Static wear leveling

Static wear leveling additionally monitors which data is only seldom modified. From time to time, the controller moves this data to blocks that have already been written to frequently in order to prevent further wear on those cells.

3.2.2.3 ECC error correction

Bit errors can result from the inactivity or operation of a certain cell. Error-correcting code (ECC) added by the hardware or software can detect and correct many errors of this type.

3.2.2.4 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 was introduced to monitor important parameters and detect imminent failures. Critical performance and calibration data is monitored and stored in an effort to predict the probability of error states.

3.2.2.5 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 completed erase cycles with "Average erase count".
- Calculate the expected service life using the maximum guaranteed write/erase cycles (MLC: 3000, SLC: 100,000).

Example for an MLC CFast card over the period of a week:

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

3.2.2.6 Dimensions

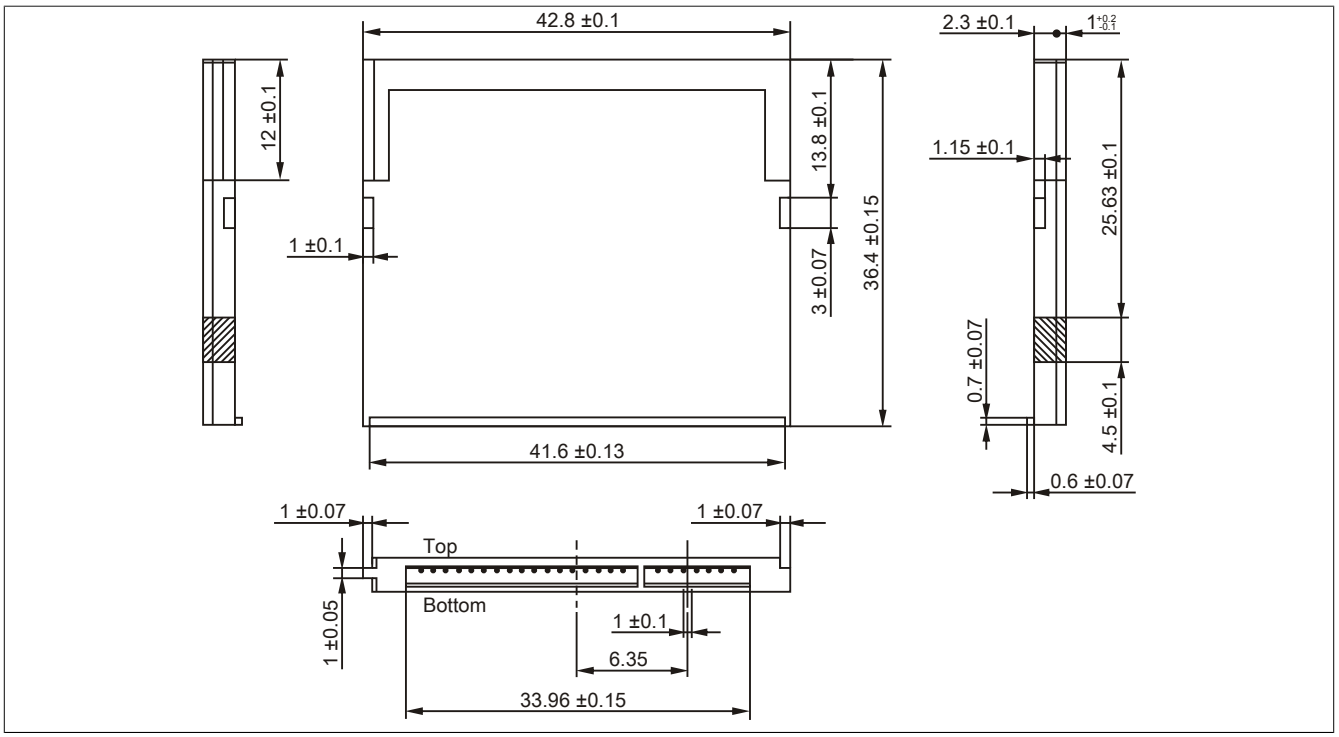


Figure 22: CFast card - Dimensions

3.2.3 5CFAST.xxxx-00

3.2.3.1 General information

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

3.2.3.2 Order data

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

Table 33: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Order data

3.2.3.3 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:

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 generally not the case when using current cloning tools.

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CFAST.2048-00	5CFAST.4096-00	5CFAST.8192-00	5CFAST.016G-00	5CFAST.032G-00
General information					
Capacity	2 GB	4 GB	8 GB	16 GB	32 GB
Data retention [1)]	10 years				
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses	<1 unrecoverable error per 10^{14} bits read	<1 unrecoverable error per 10^{14} bits read	<1 unrecoverable error per 10^{14} bits read	<1 unrecoverable error in 10^{14} 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	SATA 2.6, max. PIO mode 4, Multiword DMA mode 2, Ultra DMA mode 6	SATA 2.6, max. PIO mode 4, Multiword DMA mode 2, Ultra DMA mode 6	SATA 2.6, max. PIO mode 4, Multiword DMA mode 2, Ultra DMA mode 6	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	50 MB/s	50 MB/s	50 MB/s	42 MB/s

Table 34: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

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

Table 34: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

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

Table 34: 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 in the complete system have this certification and the complete system bears the corresponding mark.
4) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
5) TBW = Terabytes written.
Sequential access without a file system.

3.2.3.4 Temperature/Humidity diagram

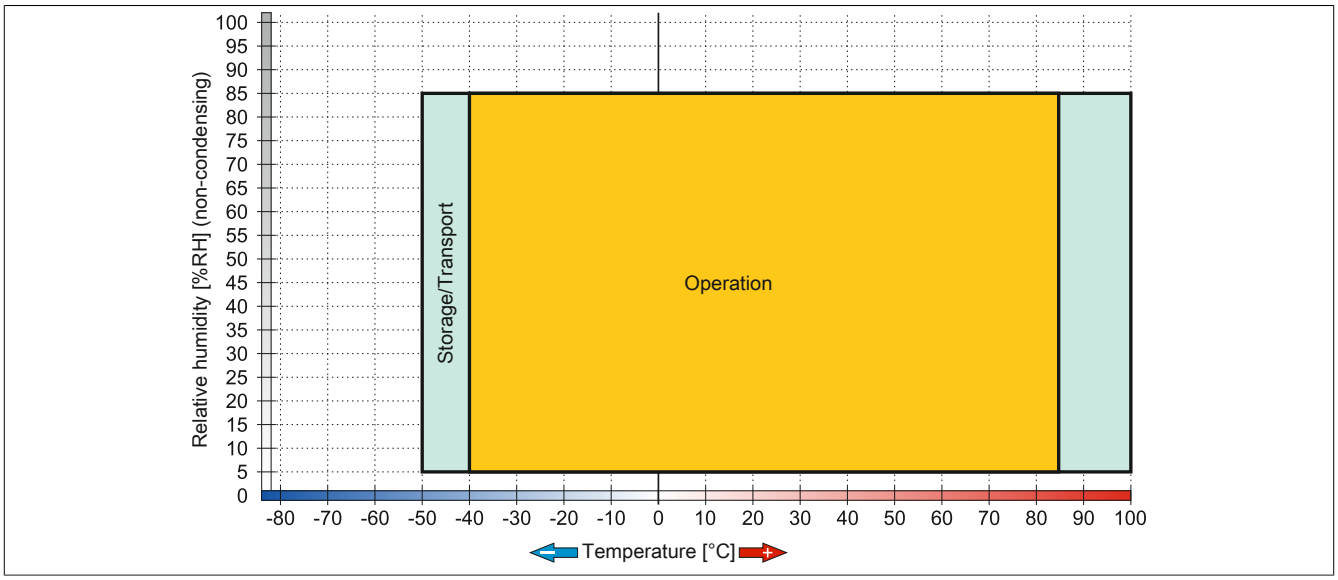


Figure 23: 5CFAST.xxxx-00 - Temperature/Humidity diagram

3.2.3.5 Dimensions

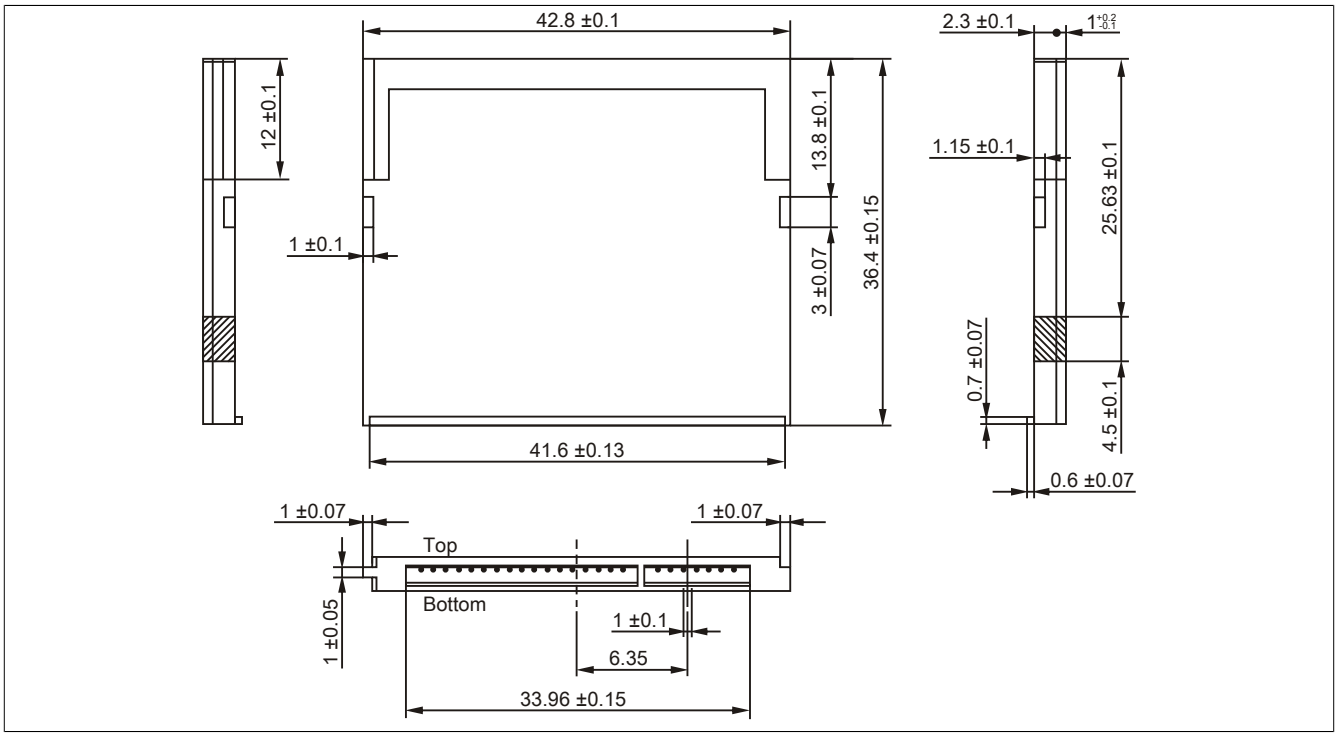


Figure 24: CFast card - Dimensions

3.2.4 5CFAST.xxxx-10

3.2.4.1 General information

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

3.2.4.2 Order data

Model number	Short description	Figure
	CFast cards	
5CFAST.032G-10	CFast 32 GB MLC CFast 32 GB MLC ≥Rev. G0	
5CFAST.064G-10	CFast card, 64 GB MLC ≥Rev. E0	
5CFAST.128G-10	CFast card, 128 GB MLC ≥Rev. E0	
5CFAST.256G-10	CFast card, 256 GB MLC	

Table 35: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Order data

Model number	Short description	Figure
	CFast cards	
5CFAST.032G-10	CFast card, 32 GB MLC ≤Rev. F0	
5CFAST.064G-10	CFast card, 64 GB MLC ≤Rev. D0	
5CFAST.128G-10	CFast card, 128 GB MLC ≤Rev. D0	

Table 36: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Order data

3.2.4.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Product ID	5CFAST.032G-10 ≥Rev. G0	5CFAST.064G-10 ≥Rev. E0	5CFAST.128G-10 ≥Rev. E0	5CFAST.256G-10
General information				
Capacity	32 GB	64 GB	128 GB	256 GB
Data retention[1)]	10 years[2)]			
Data reliability	<1 unrecoverable error per 10^{16} bits read			
Lifetime monitoring	Yes			
MTBF	>2,000,000 hours (at 25°C)			
Maintenance	None			

Table 37: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Technical data

Product ID	5CFAST.032G-10 ≥Rev. G0	5CFAST.064G-10 ≥Rev. E0	5CFAST.128G-10 ≥Rev. E0	5CFAST.256G-10
General information				
Supported operating modes	SATA 3, SATA 2, SATA 1			
Sequential read				
Maximum	495 MB/s	500 MB/s	500 MB/s	500 MB/s
Sequential write				
Maximum	115 MB/s	100 MB/s	195 MB/s	330 MB/s
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[3)]			
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[4)]			
Endurance[1)]				
MLC flash	Yes			
Guaranteed data volume				
Guaranteed[5)]	86.4 TBW	172.8 TBW	345.6 TBW	691.2 TBW
Client workload[6)]	39.06 TBW	71.02 TBW	104.17 TBW	159.57 TBW
Erase/Write cycles				
Guaranteed	3000			
Wear leveling	Static			
Error correction coding (ECC)	Yes			
S.M.A.R.T. support	Yes			
Support				
Hardware	APC3100, APC2200, APC2100, APC910, PPC3100, PPC2200, PPC2100, PPC900			
Operating systems				
Windows 10 IoT Enterprise LTSB 64-bit	Yes			
Windows Embedded 8.1 Industry Pro 32-bit	Yes			
Windows Embedded 8.1 Industry Pro 64-bit	Yes			
Windows 7 32-bit	Yes			
Windows 7 64-bit	Yes			
Windows Embedded Standard 7 32-bit	Yes			
Windows Embedded Standard 7 64-bit	Yes			
Windows XP Professional	Yes			
Windows Embedded Standard 2009	Yes			
B&R Linux 8	Yes			
B&R Linux 9	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	≥V4.0.22 or V4.1.6
B&R Embedded OS Installer	≥V3.21			
Environmental conditions				
Temperature				
Operation	-40 to 85°C			
Storage	-40 to 85°C			
Transport	-40 to 85°C			
Relative humidity				
Operation	Max. 85% at 85°C, non-condensing			
Storage	Max. 85% at 85°C, non-condensing			
Transport	Max. 85% at 85°C, non-condensing			
Vibration				
Operation	10 to 2000 Hz: 20 g peak			
Storage	10 to 2000 Hz: 20 g peak			
Transport	10 to 2000 Hz: 20 g peak			
Shock				
Operation	1500 g peak, 0.5 ms			
Storage	1500 g peak, 0.5 ms			
Transport	1500 g peak, 0.5 ms			

Table 37: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Technical data

Product ID	5CFAST.032G-10 ≥Rev. G0	5CFAST.064G-10 ≥Rev. E0	5CFAST.128G-10 ≥Rev. E0	5CFAST.256G-10
General information				
Mechanical properties				
Dimensions				
Width	42.8 ±0.10 mm			
Length	36.4 ±0.10 mm			
Depth	3.6 ±0.10 mm			
Weight	10 g			

Table 37: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Technical data

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

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Product ID	5CFAST.032G-10 ≤Rev. F0	5CFAST.064G-10 ≤Rev. D0	5CFAST.128G-10 ≤Rev. D0
General information			
Capacity	32 GB	64 GB	128 GB
Data retention[1)]	10 years[2)]		
Data reliability	<1 unrecoverable error per 10^{17} bits read		
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
Certifications			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[3)]		
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[4)]		
Endurance[1)]			
MLC flash	Yes		
Guaranteed data volume			
Guaranteed[5)]	86.4 TBW	172.8 TBW	345.6 TBW
Erase/Write cycles			
Guaranteed	3000		
Wear leveling	Static		
Error correction coding (ECC)	Yes		
S.M.A.R.T. support	Yes		
Support			
Hardware	APC2100, APC910, PPC2100, PPC900		

Table 38: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

Product ID	5CFAST.032G-10 ≤Rev. F0	5CFAST.064G-10 ≤Rev. D0	5CFAST.128G-10 ≤Rev. D0
General information			
Operating systems			
Windows 10 IoT Enterprise LTSB 64-bit		Yes	
Windows Embedded 8.1 Industry Pro 32-bit		Yes	
Windows Embedded 8.1 Industry Pro 64-bit		Yes	
Windows 7 32-bit		Yes	
Windows 7 64-bit		Yes	
Windows Embedded Standard 7 32-bit		Yes	
Windows Embedded Standard 7 64-bit		Yes	
Windows XP Professional		Yes	
Windows Embedded Standard 2009		Yes	
B&R Linux 8		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	
Environmental conditions			
Temperature			
Operation		-40 to 85°C	
Storage		-55 to 95°C	
Transport		-55 to 95°C	
Relative humidity			
Operation		10 to 95%, non-condensing	
Storage		10 to 95%, non-condensing	
Transport		10 to 95%, non-condensing	
Vibration			
Operation		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	
Mechanical properties			
Dimensions			
Width		42.8 ±0.10 mm	
Length		36.4 ±0.10 mm	
Depth		3.6 ±0.10 mm	
Weight		10 g	

Table 38: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

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

3.2.4.4 Temperature/Humidity diagrams

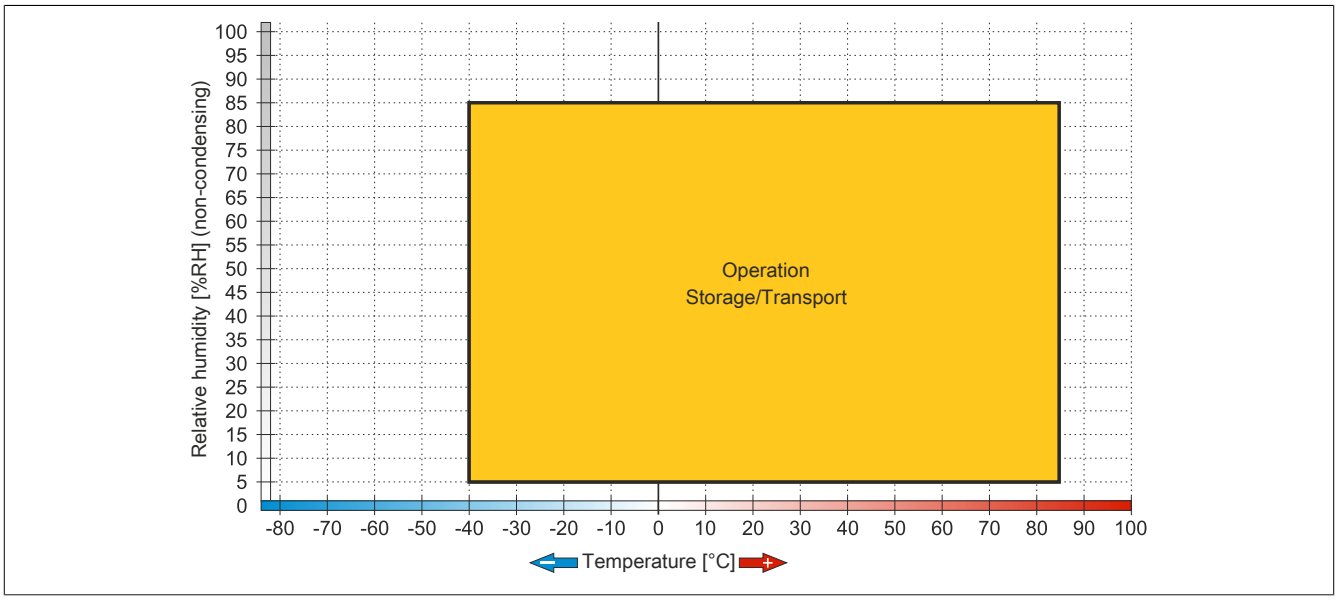


Figure 25: 5CFAST.032G-10 ≥Rev. G0, 5CFAST.064G-10 ≥Rev. E0, 5CFAST.128G-10 ≥Rev. E0, 5CFAST.256G-10 - Temperature/Humidity diagram

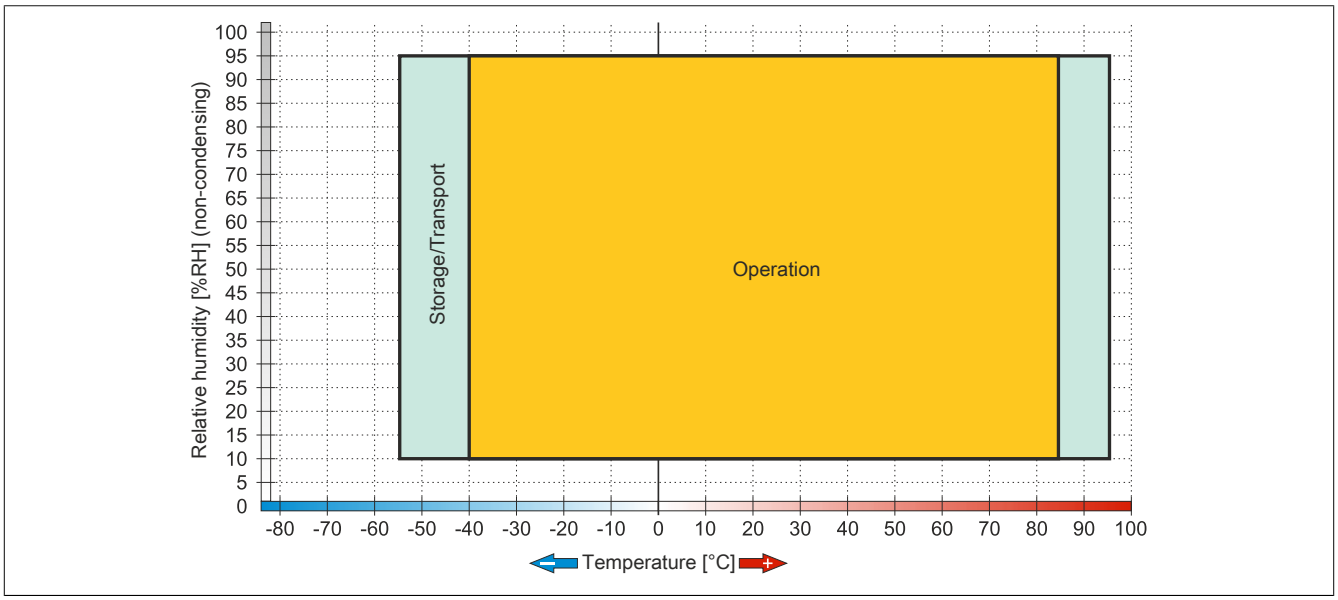


Figure 26: 5CFAST.032G-10 ≤Rev. F0, 5CFAST.064G-10 ≤Rev. D0, 5CFAST.128G-10 ≤Rev. D0 - Temperature/Humidity diagram

3.2.4.5 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.

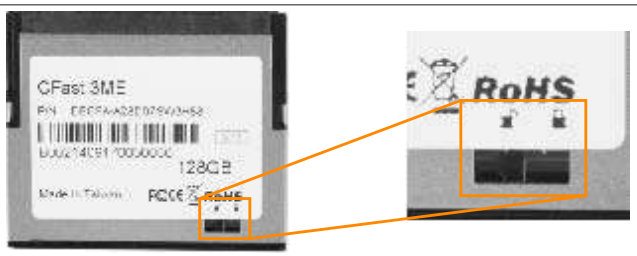


Figure 27: CFast card - Write protection

Write protection is only present on the following CFast cards:

- 5CFAST.032G-10 ≤Rev. F0
- 5CFAST.064G-10 ≤Rev. D0
- 5CFAST.128G-10 ≤Rev. D0

3.3 Monitor/Panel options

Information:

Monitor/Panel options can only be installed and replaced by B&R.

3.3.1 5ACCLI01.SDL0-000

3.3.1.1 General information

The 5ACCLI01.SDL0-000 monitor/panel option is equipped with an interface for connecting additional panels via SDL or DVI.

- SDL/DVI interface
- Compatible with APC2100 and APC2200

3.3.1.2 Order data

Model number	Short description	Figure
	Monitor/Panel options	
5ACCLI01.SDL0-000	Monitor/Panel option - 1x SDL/DVI transmitter - For APC2100/ APC2200 - Only available with a new device	

Table 39: 5ACCLI01.SDL0-000 - Order data

3.3.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCLI01.SDL0-000
General information	
B&R ID code	0xE6B6
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 [1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck) [2)]
Interfaces	
Panel/Monitor interface [3)]	
Design	DVI-I
Type	SDL/DVI/RGB
Electrical characteristics	
Power consumption	1 W
Environmental conditions	
Temperature	
Operation	-20 to 55°C [4)]
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 40: 5ACCLI01.SDL0-000 - Technical data

Model number	5ACCLI01.SDL0-000
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	20 g

Table 40: 5ACCLI01.SDL0-000 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) The APC2200 has no RGB interface, DVI-D variant.
4) For detailed information, see the temperature tables in the user's manual.
DVI and SDL modes are possible down to -20°C; RGB mode is only possible down to 0°C.

3.3.1.3.1 Monitor/Panel interface

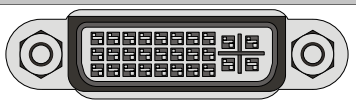
Monitor/Panel interface - SDL (Smart Display Link) / DVI / RGB	
The following overview shows the possible video signals available on the Monitor/Panel input.	
Monitor/Panel option	**Video signals**
5ACCLI01.SDL0-000	SDL, DVI, RGB

Table 41: Monitor/Panel interface - SDL, DVI, RGB

Information:

Hot plugging display devices on the monitor/panel interface for service purposes is supported by the hardware and graphics drivers of approved operating systems. 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.

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.

3.3.1.3.2 USB transfer 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 depends on the USB interface and USB hub on the display device.

3.3.1.3.3 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	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

DVI, 24-pin, female

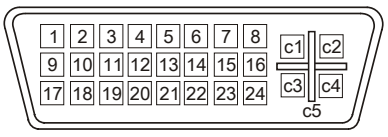


Table 42: DVI interface - Pinout

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 synchro-nization	
14	+5 V power[1)]	+5 V power supply	C5	Analog GND	Analog ground (return for R, G and B signals)	
15	Ground (return for +5 V, HSync and VSync)	Ground				

Table 42: DVI interface - Pinout

1) Protected internally by a multifuse.

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

Table 43: Cable lengths and resolutions for SDL transmission

3.3.1.3.5 Cable lengths and resolutions for DVI transfer

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

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

Table 44: Cable lengths and resolutions for DVI transfer

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

3.3.2 5ACCLI01.SDL3-000

3.3.2.1 General information

The 5ACCLI01.SDL3-000 monitor/panel option is equipped with an SDL3 interface.

- SDL3 interface
- Compatible with the APC2100

3.3.2.2 Order data

Model number	Short description	Figure
	Monitor/Panel options	
5ACCLI01.SDL3-000	Monitor/Panel option - 1x SDL3 transmitter - For APC2100 - Only available with a new device	

Table 45: 5ACCLI01.SDL3-000 - Order data

3.3.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCLI01.SDL3-000
General information	
B&R ID code	0xE6C1
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
SDL3 Out	
Design	Shielded RJ45
Type	SDL3
Electrical characteristics	
Power consumption	4 W
Environmental conditions	
Temperature	
Operation	0 to 50°C [2)]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	20 g

Table 46: 5ACCLI01.SDL3-000 - 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.

3.3.2.3.1 SDL3 interface

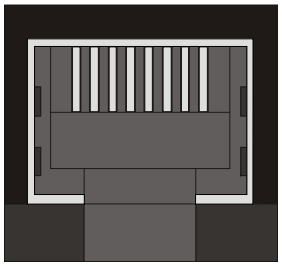
SDL3 interface	
The following overview shows the possible video signals available on the SDL3 output.	1 
Monitor/Panel option	**Video signals**
5ACCLI01.SDL3-000	SDL3

Table 47: SDL3 interface

Information:

Hot plugging display devices on the SDL3 interface for service purposes is supported by the hardware and graphics drivers of approved operating systems. 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.

3.3.2.3.2 Cable lengths and resolutions for SDL3 transfer

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

3.3.2.3.3 SDL3 - LED status indicators

The LEDs are located next to the SDL3 interface.

SDL3 - LED status indicators			
LED	**Color**	**Status**	**Explanation**
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

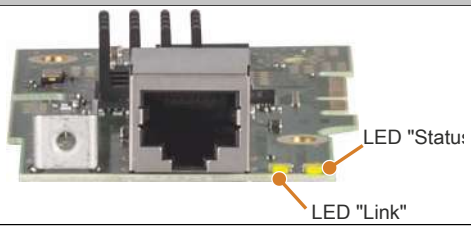


Table 48: SDL3 - LED status indicators

3.3.2.3.4 General limitations / Special considerations

- The USB 2.0 transfer rate is limited to 30 Mbit/s with SDL3.
- The SDL3 transmitter constantly emulates a display using EDID data and hot plugging code; this allows DVI-compatible operation. As a result, improperly displayed images are possible during operation with multiple displays. In Windows, a connected panel is registered by the graphics driver even in the following situations:
  - No cable is connected.
  - A connection has not yet been established between the SDL3 link module and the SDL3 transmitter.

  These improperly displayed images can be circumvented by making suitable configurations in BIOS or via the graphics driver.

3.4 Interface options

Information:

It is important to note that not every interface option can be connected in interface slots IF1 and IFx. For more information, see section "IF option slot (IF1, IFx)" on page 48.

Information:

Interface options can only be installed and replaced by B&R.

3.4.1 5ACCIF01.FPCC-000

3.4.1.1 General information

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

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

This interface option can only be operated with Automation Runtime.

3.4.1.2 Order data

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

Table 49: 5ACCIF01.FPCC-000 - Order data

3.4.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCIF01.FPCC-000
General information	
LED status indicators	L1, L2, L3
B&R ID code	0xE9BD
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]

Table 50: 5ACCIF01.FPCC-000 - Technical data

Model number	5ACCIF01.FPCC-000
Controller	
nvSRAM	
Size	512 kB
Data retention	20 years
Read/Write endurance	Min. 1,000,000
Remanent variables in power failure mode	256 kB (e.g. for Automation Runtime, see Automation Help)
Interfaces	
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [3]
Design	Shielded RJ45
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
CAN	
Quantity	2
Design	10-pin, male [4]
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be enabled or disabled using a slide switch [5]
X2X	
Type	X2X Link master
Quantity	1
Design	10-pin, male, electrically isolated
Electrical characteristics	
Power consumption	2 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 50: 5ACCIF01.FPCC-000 - Technical data

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

3.4.1.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as IF1.

POWERLINK - IF1[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
Status LED	**On**	**Off**	
Green	See Status/Error LED.		
Link LED	**On**	**Off**	
Yellow	Link (POWERLINK network connection available)	Activity (blinks to indicate active data transfer)	

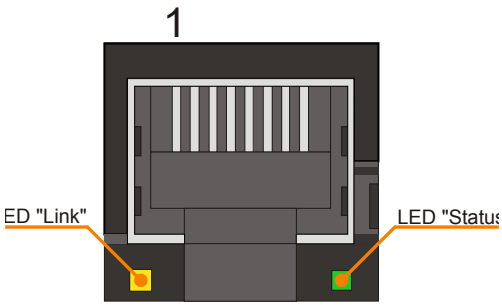


Table 51: 5ACCIF01.FPCC-000 - POWERLINK interface

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

3.4.1.3.2 CAN bus 1 interface - Pinout

The CAN bus 1 interface on the system unit is referred to as IFx.

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

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

10-pin, male

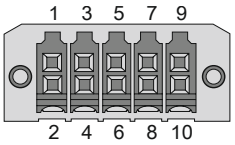


Table 52: 5ACCIF01.FPCC-000 - CAN bus 1 interface

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

CAN driver settings

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

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

Table 53: CAN driver settings

CAN1 - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the 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
≤15 m[1)]	Typ. 1 Mbit/s

Table 54: CAN1 - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 53 "CAN driver settings". Cable lengths additionally depend on the values in the timing register.

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

CAN cable	Property
Signal lines	
Cable cross section	2x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 55: CAN cable requirements

Terminating resistor

A terminating resistor is integrated in the interface option above the ETH1 interface. A switch is used to switch the terminating resistor on or off for the CAN bus 1 interface. The L1 LED status indicator indicates whether the terminating resistor is switched on or off. The terminating resistor cannot be switched on/off for the CAN bus 2 interface.

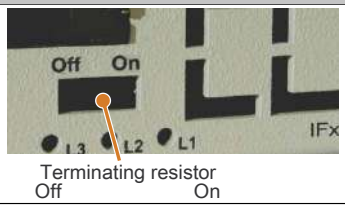
Terminating resistor		
On	The terminating resistor is switched on.	
Off	The terminating resistor is switched off.	

Table 56: Terminating resistor

3.4.1.3.3 CAN bus 2 interface - Pinout

The CAN bus 2 interface on the system unit is referred to as IFx.

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

CAN bus 2 - IFx[1)2)]	
The CAN bus interface is a 10-pin female connector without electrical isolation.	
Transfer rate	Max. 1 Mbit/s
Bus length	Max. 1000 m
Pin	**Assignment**
1	-
2	Shield
3	-
4	-
5	-
6	-
7	-
8	CAN GND
9	CAN L
10	CAN H

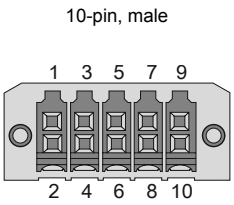


Table 57: 5ACCIF01.FPCC-000 - CAN bus 2 interface

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

CAN driver settings

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

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

Table 58: CAN driver settings

CAN2 - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the 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[1)]	Typ. 1 Mbit/s

Table 59: CAN2 - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 58 "CAN driver settings". Cable lengths additionally depend on the values in the timing register.

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

CAN cable	Property
Signal lines	
Cable cross section	2x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 60: CAN cable requirements

3.4.1.3.4 X2X Link master interface - Pinout

The X2X Link master interface on the system unit is referred to as IFx.

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

10-pin, male

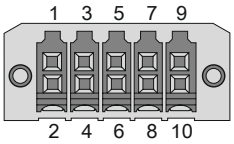


Table 61: 5ACCIF01.FPCC-000 - X2X Link master interface

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

3.4.1.3.5 Shielding

For the interfaces on the 10-pin female connector, the interface shield can be put on pin 2 of the female connector.

A functional ground connection and screw, which can also be used for the cable shields, is located on the interface plate of the system unit.

3.4.1.3.6 LED status indicators - L1, L2, L3

The interface option has 3 integrated LEDs located above the terminating resistor.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus 1 terminating resistor is enabled.
		Off	The CAN bus 1 terminating resistor is disabled.
L2	Green	On	POWERLINK Link LED Indicates a connection to a POWERLINK network.
		Blinking	POWERLINK Link LED Data transfer in progress.
L3	Green-Red	On	POWERLINK Status/Error LED See "LED "Status/Error"".
		Off	POWERLINK Status/Error LED See "LED "Status/Error"".

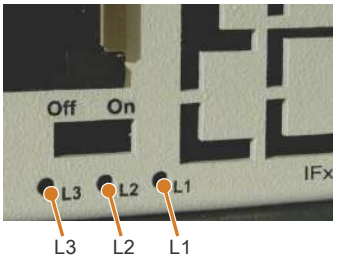


Table 62: 5ACCIF01.FPCC-000 - LED status indicators

LED "Status/Error"

LED "Status/Error" is a green and red dual LED. The LED states have a different meaning depending on the operating mode.

Ethernet mode

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

Green - Status	Description
On	The interface is being operated as an Ethernet interface.

Table 63: LED "Status/Error" - Ethernet mode

POWERLINK

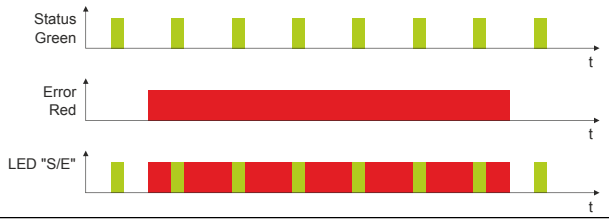
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 64: LED "Status/Error" - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time expires, however, then the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the configured time frame (timeout), then the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Flickering green (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to state PRE_OPERATIONAL_2 (double flash). A solid red LED in this state indicates failure of the MN.

Table 65: LED "Status/Error" - POWERLINK - Status

Green - Status	Description
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** The interface can be configured by the MN in this state. A command then switches the state to READY_TO_OPERATE (triple flash). A solid red LED in this mode indicates failure of the MN.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A solid red LED in this mode indicates failure of the MN.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. The PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible for the MN. **Controlled node (CN)** No output data is output, and no input data is provided. It is only possible to enter or leave this mode by a corresponding command from the MN.

Table 65: LED "Status/Error" - POWERLINK - Status

System stop error codes

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

The error code is indicated by the red "Error" LED and four switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

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

Table 66: System stop error codes

Legend:
- • ...150 ms
- − ...600 ms
- Pause 2-second pause

3.4.1.4 Updating firmware

The firmware is a component of Automation Studio. The module is updated to this version automatically.

To update the firmware included in Automation Studio, the hardware must be upgraded (see "Project management" / "The workspace" / "Upgrades" in Automation Help).

3.4.2 5ACCIF01.FPCS-000

3.4.2.1 General information

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

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

This interface option can only be operated with Automation Runtime.

3.4.2.2 Order data

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

Table 67: 5ACCIF01.FPCS-000 - Order data

3.4.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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

Table 68: 5ACCIF01.FPCS-000 - Technical data

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

Table 68: 5ACCIF01.FPCS-000 - Technical data

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

3.4.2.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as IF1.

POWERLINK - IF1[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
Status LED	**On**	**Off**	
Green	See Status/Error LED.		
Link LED	**On**	**Off**	
Yellow	Link (POWERLINK network connection available)	Activity (blinks to indicate active data transfer)	

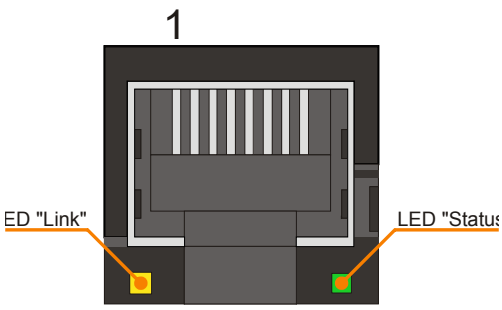


Table 69: 5ACCIF01.FPCS-001 - POWERLINK interface

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

3.4.2.3.2 COM serial interface - Pinout

Serial interface COM is referred to as IFx on the system unit.

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

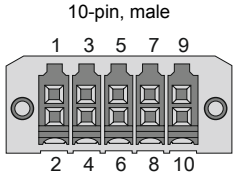


Table 70: 5ACCIF01.FPCS-000 - COM interface

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

Table 70: 5ACCIF01.FPCS-000 - COM interface

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

The RTS line must be switched by the driver for each transmission or reception; there is no automatic switch-back mechanism.

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

3.4.2.3.3 RS485 - Bus length and cable type

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

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 71: RS485 - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

RS485 cables	Property
Signal lines	
Cable cross section	4x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor cross section	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 72: RS485 - Cable requirements

3.4.2.3.4 CAN bus interface - Pinout

The CAN bus interface on the system unit is referred to as IFx.

CAN bus - IFx[1)2)]		
The CAN bus interface is a 10-pin female connector without electrical isolation.		
Transfer rate	Max. 1 Mbit/s	
Bus length	Max. 1000 m	
Pin	**Assignment**	
1	-	
2	Shield	
3	-	
4	-	
5	CAN H	
6	CAN L	
7	CAN GND	
8	-	
9	-	
10	-	

10-pin, male

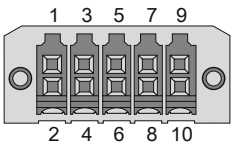


Table 73: 5ACCIF01.FPCS-000 - CAN bus interface

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

CAN driver settings

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

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

Table 74: CAN driver settings

CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the 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[1)]	Typ. 1 Mbit/s

Table 75: CAN - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 74 "CAN driver settings". Cable lengths additionally depend on the values in the timing register.

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

CAN cable	Property
Signal lines	
Cable cross section	2x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 76: CAN cable requirements

Terminating resistor

A terminating resistor is integrated in the interface option above the ETH1 interface. A switch is used to enable or disable the terminating resistor for the CAN bus interface. The L1 LED status indicator indicates whether the terminating resistor is switched on or off.

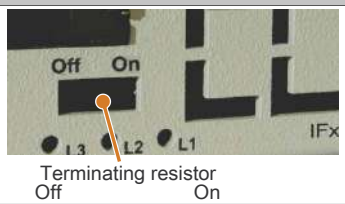
Terminating resistor		
On	The terminating resistor is switched on.	
Off	The terminating resistor is switched off.	

Table 77: Terminating resistor

3.4.2.3.5 Shielding

For the interfaces on the 10-pin female connector, the interface shield can be put on pin 2 of the female connector.

A functional ground connection and screw, which can also be used for the cable shields, is located on the interface plate of the system unit.

3.4.2.3.6 LED status indicators

The interface option has 3 integrated LEDs located above the terminating resistor.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus terminating resistor is enabled.
		Off	The CAN bus terminating resistor is disabled.
L2	Green	On	POWERLINK Link LED Indicates a connection to a POWERLINK network.
		Blinking	POWERLINK Link LED Data transfer in progress.
L3	Green-Red	On	POWERLINK Status/Error LED See "LED "Status/Error"".
		Off	POWERLINK Status/Error LED See "LED "Status/Error"".

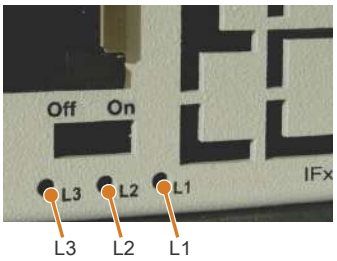


Table 78: 5ACCIF01.FPCS-000 - LED status indicators

LED "Status/Error"

LED "Status/Error" is a green and red dual LED. The LED states have a different meaning depending on the operating mode.

Ethernet mode

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

Green - Status	Description
On	The interface is being operated as an Ethernet interface.

Table 79: LED "Status/Error" - Ethernet mode

POWERLINK

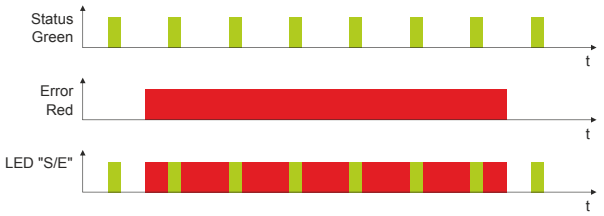
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 80: LED "Status/Error" - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time expires, however, then the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the configured time frame (timeout), then the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Flickering green (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to state PRE_OPERATIONAL_2 (double flash). A solid red LED in this state indicates failure of the MN.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** The interface can be configured by the MN in this state. A command then switches the state to READY_TO_OPERATE (triple flash). A solid red LED in this mode indicates failure of the MN.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A solid red LED in this mode indicates failure of the MN.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. The PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible for the MN. **Controlled node (CN)** No output data is output, and no input data is provided. It is only possible to enter or leave this mode by a corresponding command from the MN.

Table 81: LED "Status/Error" - POWERLINK - Status

System stop error codes

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

The error code is indicated by the red "Error" LED and four switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

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

Table 82: System stop error codes

Legend:

•	...150 ms
−	...600 ms
Pause	2-second pause

3.4.2.4 Updating firmware

The firmware is a component of Automation Studio. The module is updated to this version automatically.

To update the firmware included in Automation Studio, the hardware must be upgraded (see "Project management" / "The workspace" / "Upgrades" in Automation Help).

3.4.3 5ACCIF01.FPLK-000

3.4.3.1 General information

Interface option 5ACCIF01.FPLK-000 is equipped with 2 female RJ45 connectors connected to an integrated POWERLINK hub. 512 kB of nvSRAM is also installed.

The integrated 2-port hub allows for the easiest possible implementation of a simple tree structure, daisy chain wiring or optional ring redundancy without extra effort.

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

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

This interface option can only be operated with Automation Runtime.

Information:

Ring redundancy and simultaneous poll-response chaining operation is not possible with this IF option.

3.4.3.2 Order data

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

Table 83: 5ACCIF01.FPLK-000 - Order data

3.4.3.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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

Table 84: 5ACCIF01.FPLK-000 - Technical data

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

Table 84: 5ACCIF01.FPLK-000 - Technical data

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

3.4.3.3.1 POWERLINK 1 interface - Pinout

The POWERLINK 1 interface on the system unit is referred to as IF1.

POWERLINK 1 - IF1[1]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
Status LED	**On**	**Off**	
Green	See Status/Error LED.		
Link LED	**On**	**Off**	
Yellow	Link (POWERLINK network connection available)	Activity (blinks to indicate active data transfer)	

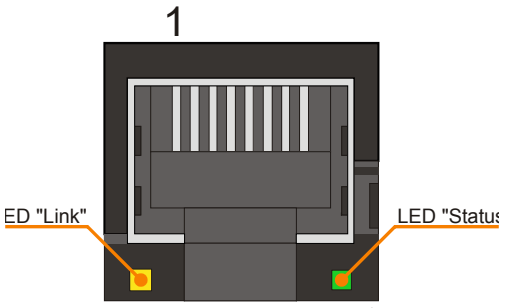


Table 85: 5ACCIF01.FPLK-000 - POWERLINK 1 interface

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

3.4.3.3.2 POWERLINK 2 interface - Pinout

The POWERLINK 2 interface on the system unit is referred to as IFx.

POWERLINK 2 - IFx[1]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
Status LED	**On**	**Off**	
Green	See Status/Error LED.		
Link LED	**On**	**Off**	
Yellow	Link (POWERLINK network connection available)	Activity (blinks to indicate active data transfer)	

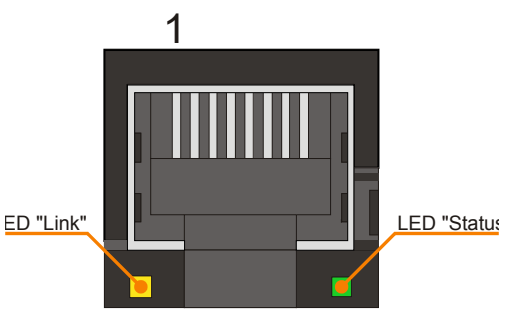


Table 86: 5ACCIF01.FPLK-000 - POWERLINK 2 interface

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

3.4.3.3.3 LED status indicators - L1, L2, L3

3 LEDs are integrated on the interface option.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Green	On	POWERLINK 2 Link LED Indicates a connection to a POWERLINK network.
		Blinking	POWERLINK 2 Link LED Data transfer in progress.
L2	Green	On	POWERLINK 1 Link LED Indicates a connection to a POWERLINK network.
		Blinking	POWERLINK 1 Link LED Data transfer in progress.
L3	Green-Red	On	POWERLINK Status/Error LED See "LED "Status/Error"".
		Off	POWERLINK Status/Error LED See "LED "Status/Error"".

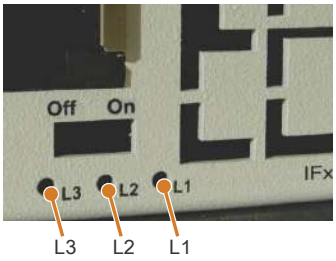


Table 87: 5ACCIF01.FPLK-000 - LED status indicators

LED "Status/Error"

LED "Status/Error" is a green and red dual LED. The LED states have a different meaning depending on the operating mode.

Ethernet mode

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

Green - Status	Description
On	The interface is being operated as an Ethernet interface.

Table 88: LED "Status/Error" - Ethernet mode

POWERLINK

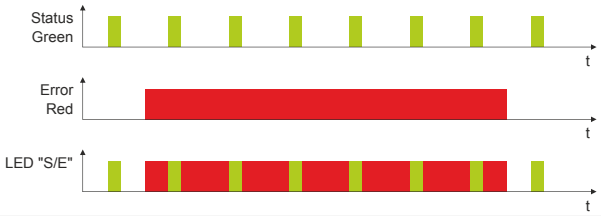
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 89: LED "Status/Error" - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time expires, however, then the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the configured time frame (timeout), then the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Flickering green (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to state PRE_OPERATIONAL_2 (double flash). A solid red LED in this state indicates failure of the MN.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** The interface can be configured by the MN in this state. A command then switches the state to READY_TO_OPERATE (triple flash). A solid red LED in this mode indicates failure of the MN.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A solid red LED in this mode indicates failure of the MN.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. The PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible for the MN. **Controlled node (CN)** No output data is output, and no input data is provided. It is only possible to enter or leave this mode by a corresponding command from the MN.

Table 90: LED "Status/Error" - POWERLINK - Status

System stop error codes

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

The error code is indicated by the red "Error" LED and four switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

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

Table 91: System stop error codes

Legend:
- • ...150 ms
- − ...600 ms
- Pause 2-second pause

3.4.3.4 Updating firmware

The firmware is a component of Automation Studio. The module is updated to this version automatically.

To update the firmware included in Automation Studio, the hardware must be upgraded (see "Project management" / "The workspace" / "Upgrades" in Automation Help).

3.4.4 5ACCIF01.FPLS-000

3.4.4.1 General information

Interface option 5ACCIF01.FPLS-000 is equipped with a POWERLINK and RS232 interface. 32 kB of FRAM is also installed.

- 1x POWERLINK interface managing or controlled node
- 1x RS232 interface
- 32 kB FRAM
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

3.4.4.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 92: 5ACCIF01.FPLS-000 - Order data

3.4.4.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCIF01.FPLS-000
General information	
LED status indicators	L2, L3
B&R ID code	0xE540
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]
Controller	
FRAM	
Size	32 kB
Data retention	10 years
Read/Write endurance	Min. 10^{12} times/byte
Remanent variables in power failure mode	32 kB (e.g. for Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS232, modem supported, not electrically isolated
Design	10-pin, male
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [3)]
Design	Shielded RJ45
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)

Table 93: 5ACCIF01.FPLS-000 - Technical data

Model number	5ACCIF01.FPLS-000
Electrical characteristics	
Power consumption	1.5 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 93: 5ACCIF01.FPLS-000 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) For more information, see Automation Help (Communication - POWERLINK - General information - Hardware - IF / LS).

3.4.4.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as IF1.

POWERLINK - IF1[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
Status LED	**On**	**Off**	
Green	See Status/Error LED.		
Link LED	**On**	**Off**	
Yellow	Link (POWERLINK network connection available)	Activity (blinks to indicate active data transfer)	

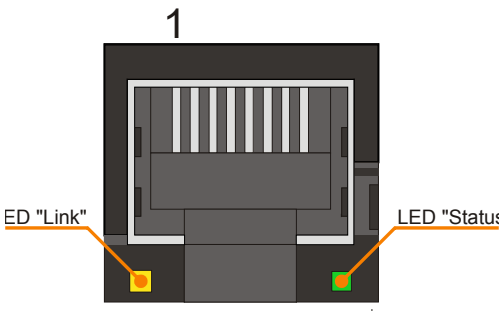


Table 94: 5ACCIF01.FPLS-000 - POWERLINK interface

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

3.4.4.3.2 COMA serial interface - Pinout

Serial interface COMA is referred to as IFx on the system unit.

Serial interfaceCOM A - IFx[1)2)3)]	
	RS232
Type	RS232, modem supported, 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	DSR
3	RXD
4	RTS
5	TXD
6	CTS
7	DTR
8	RI
9	GND
10	GND

10-pin, male

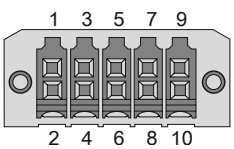


Table 95: 5ACCIF01.FPLS-000 - Interface COMA

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is enabled automatically in BIOS as COMA with default I/O address 3F8h and IRQ 4.
3) This interface is referred to as IF5 in Automation Studio / Automation Runtime.

3.4.4.3.3 LED status indicators - L2, L3

2 LEDs are integrated on the interface option.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	-	-	-
L2	Green	On	POWERLINK Link LED Indicates a connection to a POWERLINK network
		Blinking	POWERLINK Link LED Data transfer in progress
L3	Green-Red	On	POWERLINK Status/Error LED See "LED "Status/Error"".
		Off	POWERLINK Status/Error LED See "LED "Status/Error"".

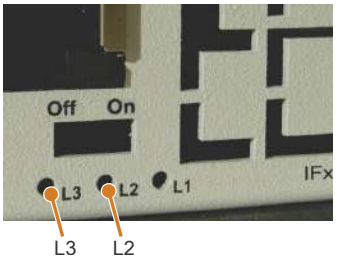


Table 96: 5ACCIF01.FPLS-000 - LED status indicators

LED "Status/Error"

LED "Status/Error" is a green and red dual LED. The LED states have a different meaning depending on the operating mode.

Ethernet mode

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

Green - Status	Description
On	The interface is being operated as an Ethernet interface.

Table 97: LED "Status/Error" - Ethernet mode

POWERLINK

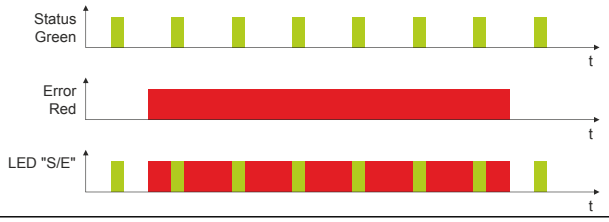
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 98: LED "Status/Error" - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time expires, however, then the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the configured time frame (timeout), then the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Flickering green (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to state PRE_OPERATIONAL_2 (double flash). A solid red LED in this state indicates failure of the MN.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** The interface can be configured by the MN in this state. A command then switches the state to READY_TO_OPERATE (triple flash). A solid red LED in this mode indicates failure of the MN.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A solid red LED in this mode indicates failure of the MN.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. The PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible for the MN. **Controlled node (CN)** No output data is output, and no input data is provided. It is only possible to enter or leave this mode by a corresponding command from the MN.

Table 99: LED "Status/Error" - POWERLINK - Status

System stop error codes

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

The error code is indicated by the red "Error" LED and four switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

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

Table 100: System stop error codes

Legend: • ...150 ms
− ...600 ms
Pause 2-second pause

3.4.4.3.4 Shielding

For the interfaces on the 10-pin female connector, the interface shield can be put on pin 2 of the female connector.

A functional ground connection and screw, which can also be used for the cable shields, is located on the interface plate of the system unit.

3.4.4.4 Updating firmware

The firmware is a component of Automation Studio. The module is updated to this version automatically.

To update the firmware included in Automation Studio, the hardware must be upgraded (see "Project management" / "The workspace" / "Upgrades" in Automation Help).

3.4.5 5ACCIF01.FPLS-001

3.4.5.1 General information

Interface option 5ACCIF01.FPLS-001 is equipped with a POWERLINK and RS232 interface. 512 kB of nvSRAM is also installed.

- 1x POWERLINK interface for managing or controlled node
- 1x RS232 interface
- 512 kB nvSRAM
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

3.4.5.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPLS-001	Interface card - 1x RS232 interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 101: 5ACCIF01.FPLS-001 - Order data

3.4.5.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCIF01.FPLS-001
General information	
LED status indicators	L2, L3
B&R ID code	0xE9B9
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Controller	
nvSRAM	
Size	512 kB
Data retention	20 years
Read/Write endurance	Min. 1,000,000
Remanent variables in power failure mode	256 kB (e.g. for Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS232, modem supported, not electrically isolated
Design	10-pin, male
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [2)]
Design	Shielded RJ45
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
Electrical characteristics	
Power consumption	1.5 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

Table 102: 5ACCIF01.FPLS-001 - Technical data

Model number	5ACCIF01.FPLS-001
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 102: 5ACCIF01.FPLS-001 - Technical data

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

3.4.5.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as IF1.

POWERLINK - IF1[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
Status LED	**On**	**Off**	
Green	See Status/Error LED.		
Link LED	**On**	**Off**	
Yellow	Link (POWERLINK network connection available)	Activity (blinks to indicate active data transfer)	

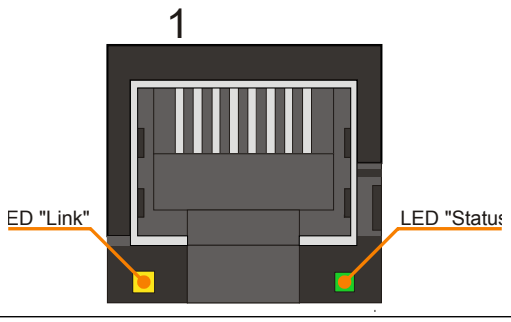


Table 103: 5ACCIF01.FPLS-001 - POWERLINK interface

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

3.4.5.3.2 COMA serial interface - Pinout

Serial interface COMA is referred to as IFx on the system unit.

Serial interfaceCOM A - IFx[1)2)3)]	
	RS232
Type	RS232, modem supported, 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	DSR
3	RXD
4	RTS
5	TXD
6	CTS
7	DTR
8	RI
9	GND
10	GND

10-pin, male

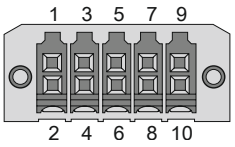


Table 104: 5ACCIF01.FPLS-001 - Interface COMA

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is enabled automatically in BIOS as COMA with default I/O address 3F8h and IRQ 4.
3) This interface is referred to as IF5 in Automation Studio / Automation Runtime.

3.4.5.3.3 LED status indicators - L2, L3

2 LEDs are integrated on the interface option.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	-	-	-
L2	Green	On	POWERLINK Link LED Indicates a connection to a POWERLINK network
		Blinking	POWERLINK Link LED Data transfer in progress
L3	Green-Red	On	POWERLINK Status/Error LED See "LED "Status/Error"".
		Off	POWERLINK Status/Error LED See "LED "Status/Error"".

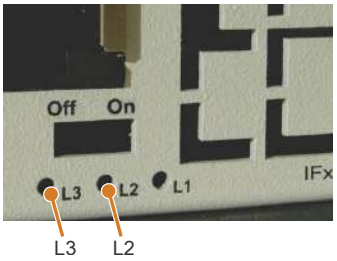


Table 105: 5ACCIF01.FPLS-001 - LED status indicators

LED "Status/Error"

LED "Status/Error" is a green and red dual LED. The LED states have a different meaning depending on the operating mode.

Ethernet mode

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

Green - Status	Description
On	The interface is being operated as an Ethernet interface.

Table 106: LED "Status/Error" - Ethernet mode

POWERLINK

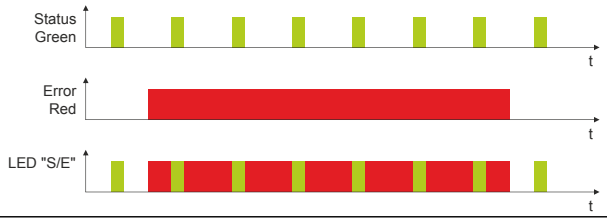
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 107: LED "Status/Error" - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time expires, however, then the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the configured time frame (timeout), then the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Flickering green (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to state PRE_OPERATIONAL_2 (double flash). A solid red LED in this state indicates failure of the MN.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** The interface can be configured by the MN in this state. A command then switches the state to READY_TO_OPERATE (triple flash). A solid red LED in this mode indicates failure of the MN.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A solid red LED in this mode indicates failure of the MN.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. The PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible for the MN. **Controlled node (CN)** No output data is output, and no input data is provided. It is only possible to enter or leave this mode by a corresponding command from the MN.

Table 108: LED "Status/Error" - POWERLINK - Status

System stop error codes

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

The error code is indicated by the red "Error" LED and four switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

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

Table 109: System stop error codes

Legend:
- • ...150 ms
- − ...600 ms
- Pause 2-second pause

3.4.5.3.4 Shielding

For the interfaces on the 10-pin female connector, the interface shield can be put on pin 2 of the female connector.

A functional ground connection and screw, which can also be used for the cable shields, is located on the interface plate of the system unit.

3.4.5.4 Updating firmware

The firmware is a component of Automation Studio. The module is updated to this version automatically.

To update the firmware included in Automation Studio, the hardware must be upgraded (see "Project management" / "The workspace" / "Upgrades" in Automation Help).

3.4.6 5ACCIF01.FPSC-000

3.4.6.1 General information

Interface option 5ACCIF01.FPSC-000 is equipped with a POWERLINK, RS232 and CAN bus master interface. 32 kB of FRAM is also installed.

- 1x POWERLINK interface managing or controlled node
- 1x CAN bus master interface
- 1x RS232 interface
- 32 kB FRAM
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

This interface option can only be operated with Automation Runtime.

3.4.6.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface card - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100/ APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 110: 5ACCIF01.FPSC-000 - Order data

3.4.6.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCIF01.FPSC-000
General information	
LED status indicators	L1, L2, L3
B&R ID code	0xE53F
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]
Controller	
FRAM	
Size	32 kB
Data retention	10 years
Read/Write endurance	Min. 10^{12} times/byte
Remanent variables in power failure mode	32 kB (e.g. for Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS232, not modem-capable, not electrically isolated
Design	10-pin, male
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s

Table 111: 5ACCIF01.FPSC-000 - Technical data

Model number	5ACCIF01.FPSC-000
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [3]
Design	Shielded RJ45
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
CAN	
Quantity	1
Design	10-pin, male, not electrically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be enabled or disabled using a slide switch
Electrical characteristics	
Power consumption	1.75 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 111: 5ACCIF01.FPSC-000 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) For more information, see Automation Help (Communication - POWERLINK - General information - Hardware - IF / LS).

3.4.6.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as IF1.

POWERLINK - IF1[1)2)]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
Status LED	**On**	**Off**	
Green	See Status/Error LED.		
Link LED	**On**	**Off**	
Yellow	Link (POWERLINK network connection available)	Activity (blinks to indicate active data transfer)	

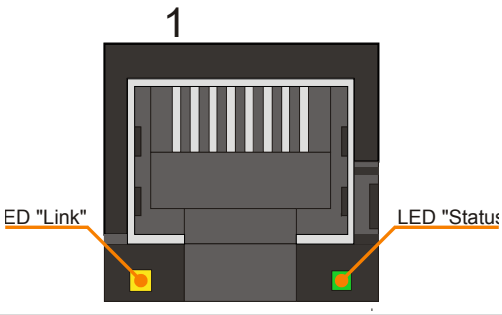


Table 112: 5ACCIF01.FPSC-000 - POWERLINK interface

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

3.4.6.3.2 COM serial interface - Pinout

Serial interface COM is referred to as IFx on the system unit.

Serial interface COM - IFx[1)2)]	
	RS232
Type	RS232, not 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	-
2	Shield
3	-
4	-
5	-
6	-
7	-
8	COM GND
9	RXD
10	TXD

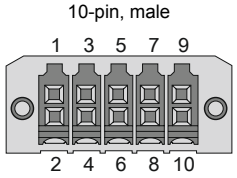


Table 113: 5ACCIF01.FPSC-000 - Interface COM

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is referred to as IF5 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not shown in BIOS.

3.4.6.3.3 CAN bus interface - Pinout

The CAN bus interface on the system unit is referred to as IFx.

CAN bus - IFx[1)2)]	
The CAN bus interface is a 10-pin female connector without electrical isolation.	
Transfer rate	Max. 1 Mbit/s
Bus length	Max. 1000 m
Pin	**Assignment**
1	-
2	Shield
3	-
4	-
5	CAN H
6	CAN L
7	CAN GND
8	-
9	-
10	-

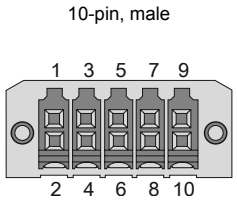


Table 114: 5ACCIF01.FPSC-000 - CAN bus interface

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

CAN driver settings

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

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

Table 115: CAN driver settings

CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the 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[1)]	Typ. 1 Mbit/s

Table 116: CAN - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 115 "CAN driver settings". Cable lengths additionally depend on the values in the timing register.

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

CAN cable	Property
Signal lines	
Cable cross section	2x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 117: CAN cable requirements

Terminating resistor

A terminating resistor is integrated in the interface option above the ETH1 interface. A switch is used to enable or disable the terminating resistor for the CAN bus interface. The L1 LED status indicator indicates whether the terminating resistor is switched on or off.

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

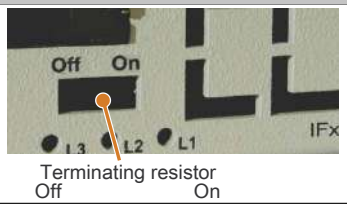


Table 118: Terminating resistor

3.4.6.3.4 Shielding

For the interfaces on the 10-pin female connector, the interface shield can be put on pin 2 of the female connector.

A functional ground connection and screw, which can also be used for the cable shields, is located on the interface plate of the system unit.

3.4.6.3.5 LED status indicators - L1, L2, L3

The interface option has 3 integrated LEDs located above the terminating resistor.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus terminating resistor is enabled.
		Off	The CAN bus terminating resistor is disabled.
L2	Green	On	POWERLINK Link LED Indicates a connection to a POWERLINK network.
		Blinking	POWERLINK Link LED Data transfer in progress.
L3	Green-Red	On	POWERLINK Status/Error LED See "LED "Status/Error"".
		Off	POWERLINK Status/Error LED See "LED "Status/Error"".

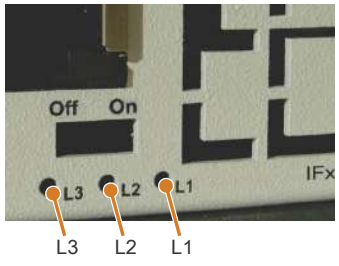


Table 119: 5ACCIF01.FPSC-000 - LED status indicators

LED "Status/Error"

LED "Status/Error" is a green and red dual LED. The LED states have a different meaning depending on the operating mode.

Ethernet mode

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

Green - Status	Description
On	The interface is being operated as an Ethernet interface.

Table 120: LED "Status/Error" - Ethernet mode

POWERLINK

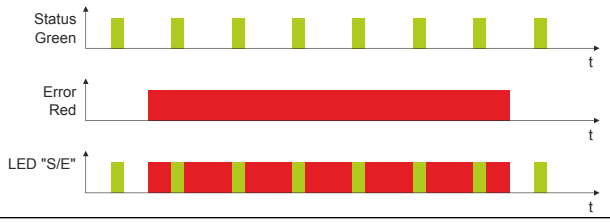
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 121: LED "Status/Error" - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time expires, however, then the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the configured time frame (timeout), then the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Flickering green (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to state PRE_OPERATIONAL_2 (double flash). A solid red LED in this state indicates failure of the MN.

Table 122: LED "Status/Error" - POWERLINK - Status

Green - Status	Description
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** The interface can be configured by the MN in this state. A command then switches the state to READY_TO_OPERATE (triple flash). A solid red LED in this mode indicates failure of the MN.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A solid red LED in this mode indicates failure of the MN.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. The PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible for the MN. **Controlled node (CN)** No output data is output, and no input data is provided. It is only possible to enter or leave this mode by a corresponding command from the MN.

Table 122: LED "Status/Error" - POWERLINK - Status

System stop error codes

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

The error code is indicated by the red "Error" LED and four switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

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

Table 123: System stop error codes

Legend:
- • ...150 ms
- − ...600 ms
- Pause 2-second pause

3.4.6.4 Updating firmware

The firmware is a component of Automation Studio. The module is updated to this version automatically.

To update the firmware included in Automation Studio, the hardware must be upgraded (see "Project management" / "The workspace" / "Upgrades" in Automation Help).

3.4.7 5ACCIF01.FPSC-001

3.4.7.1 General information

Interface option 5ACCIF01.FPSC-001 is equipped with a POWERLINK, RS232, CAN bus master and X2X Link master interface. 512 kB of nvSRAM is also installed.

- 1x POWERLINK interface for managing or controlled node
- 1x CAN bus master interface
- 1x X2X Link master interface
- 1x RS232 interface
- 512 kB nvSRAM
- Compatible with APC2100/PC2100 and APC2200/PPC2200

This interface option can only be operated with Automation Runtime.

3.4.7.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FPSC-001	Interface card - 1x RS232 interface - 1x CAN interface - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 124: 5ACCIF01.FPSC-001 - Order data

3.4.7.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCIF01.FPSC-001
General information	
LED status indicators	L1, L2, L3
B&R ID code	0xE9BC
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Controller	
nvSRAM	
Size	512 kB
Data retention	20 years
Read/Write endurance	Min. 1,000,000
Remanent variables in power failure mode	256 kB (e.g. for Automation Runtime, see Automation Help)
Interfaces	
COM	
Quantity	1
Type	RS232, not modem-capable, not electrically isolated
Design	10-pin, male
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s

Table 125: 5ACCIF01.FPSC-001 - Technical data

Model number	5ACCIF01.FPSC-001
POWERLINK	
Quantity	1
Transfer	100BASE-TX
Type	Type 4 [2]
Design	Shielded RJ45
Transfer rate	100 Mbit/s
Cable length	Max. 100 m between two stations (segment length)
CAN	
Quantity	1
Design	10-pin, male, electrically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be enabled or disabled using a slide switch
X2X	
Type	X2X Link master
Quantity	1
Design	10-pin, male, electrically isolated
Electrical characteristics	
Power consumption	2 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 125: 5ACCIF01.FPSC-001 - Technical data

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

3.4.7.3.1 POWERLINK interface - Pinout

The POWERLINK interface on the system unit is referred to as IF1.

POWERLINK - IF1[1][2]			
Wiring	S/STP (Cat 5e)		RJ45, female
Cable length	Max. 100 m (min. Cat 5e)		
Status LED	**On**	**Off**	
Green	See Status/Error LED.		
Link LED	**On**	**Off**	
Yellow	Link (POWERLINK network connection available)	Activity (blinks to indicate active data transfer)	

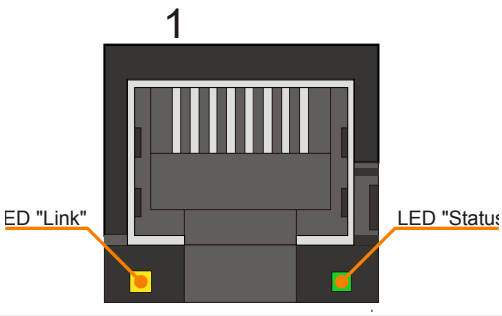


Table 126: 5ACCIF01.FPSC-001 - POWERLINK interface

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

3.4.7.3.2 COM serial interface - Pinout

Serial interface COM is referred to as IFx on the system unit.

Serial interface COM - IFx[1)2)]	
	RS232
Type	RS232, not 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	-
2	Shield
3	-
4	-
5	-
6	-
7	-
8	COM GND
9	RXD
10	TXD

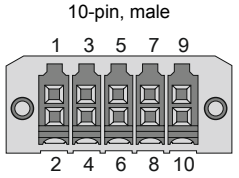


Table 127: 5ACCIF01.FPSC-001 - Interface COM

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface can only be used in Automation Runtime and is referred to as IF5 in Automation Studio / Automation Runtime. It is not a "PC interface" and therefore not shown in BIOS.

3.4.7.3.3 CAN bus interface - Pinout

The CAN bus interface on the system unit is referred to as IFx.

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

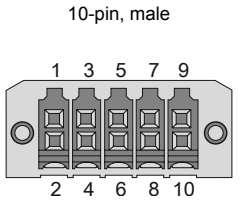


Table 128: 5ACCIF01.FPSC-001 - CAN bus interface

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

CAN driver settings

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

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

Table 129: CAN driver settings

CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the 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
≤15 m[1)]	Typ. 1 Mbit/s

Table 130: CAN - Bus length and transfer rate

1) The specified cable length is only valid with the values specified in Tab. 129 "CAN driver settings". Cable lengths additionally depend on the values in the timing register.

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

CAN cable	Property
Signal lines	
Cable cross section	2x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 131: CAN cable requirements

Terminating resistor

A terminating resistor is integrated in the interface option above the ETH1 interface. A switch is used to enable or disable the terminating resistor for the CAN bus interface. The L1 LED status indicator indicates whether the terminating resistor is switched on or off.

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

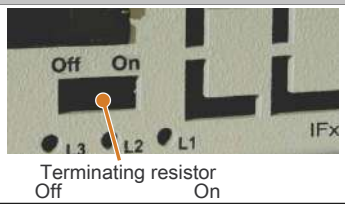


Table 132: Terminating resistor

3.4.7.3.4 X2X Link master interface - Pinout

The X2X Link master interface on the system unit is referred to as IFx.

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

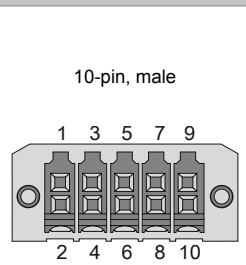


Table 133: 5ACCIF01.FPSC-001 - X2X Link master interface

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

3.4.7.3.5 Shielding

For the interfaces on the 10-pin female connector, the interface shield can be put on pin 2 of the female connector.

A functional ground connection and screw, which can also be used for the cable shields, is located on the interface plate of the system unit.

3.4.7.3.6 LED status indicators - L1, L2, L3

The interface option has 3 integrated LEDs located above the terminating resistor.

LED status indicators			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus terminating resistor is enabled.
		Off	The CAN bus terminating resistor is disabled.
L2	Green	On	POWERLINK Link LED Indicates a connection to a POWERLINK network.
		Blinking	POWERLINK Link LED Data transfer in progress.
L3	Green-Red	On	POWERLINK Status/Error LED See "LED "Status/Error"".
		Off	POWERLINK Status/Error LED See "LED "Status/Error"".

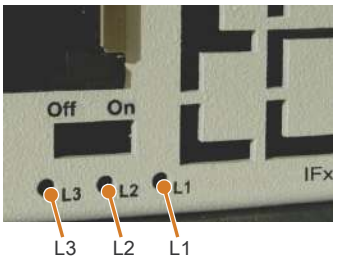


Table 134: 5ACCIF01.FPSC-000 - LED status indicators

LED "Status/Error"

LED "Status/Error" is a green and red dual LED. The LED states have a different meaning depending on the operating mode.

Ethernet mode

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

Green - Status	Description
On	The interface is being operated as an Ethernet interface.

Table 135: LED "Status/Error" - Ethernet mode

POWERLINK

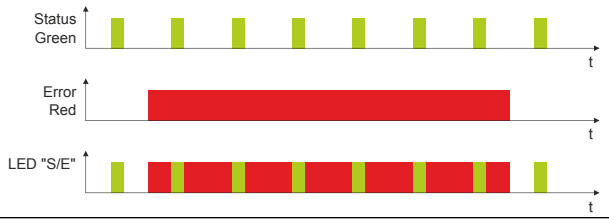
Red - Error	Description
On	The interface is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED: • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table 136: LED "Status/Error" - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	**State** The interface is in state NOT_ACTIVE or: • Switched off • Starting up • Not configured correctly in Automation Studio • Defective **Managing node (MN)** The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time expires, however, then the MN is not started. **Controlled node (CN)** The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the configured time frame (timeout), then the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).
Flickering green (approx. 10 Hz) BASIC_ETHERNET	**State** The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface. **Managing node (MN)** This state can only be exited by resetting the interface. **Controlled node (CN)** If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	**State** The interface is in state PRE_OPERATIONAL_1. **Managing node (MN)** The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place. **Controlled node (CN)** The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to state PRE_OPERATIONAL_2 (double flash). A solid red LED in this state indicates failure of the MN.
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	**State** The interface is in state PRE_OPERATIONAL_2. **Managing node (MN)** The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state. **Controlled node (CN)** The interface can be configured by the MN in this state. A command then switches the state to READY_TO_OPERATE (triple flash). A solid red LED in this mode indicates failure of the MN.
Triple flash (approx. 1 Hz) READY_TO_OPERATE	**State** The interface is in state READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. **Controlled node (CN)** The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A solid red LED in this mode indicates failure of the MN.
On OPERATIONAL	**State** The interface is in state OPERATIONAL. The PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz) STOPPED	**State** The interface is in state STOPPED. **Managing node (MN)** This state is not possible for the MN. **Controlled node (CN)** No output data is output, and no input data is provided. It is only possible to enter or leave this mode by a corresponding command from the MN.

Table 137: LED "Status/Error" - POWERLINK - Status

System stop error codes

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

The error code is indicated by the red "Error" LED and four switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code output is repeated cyclically every 2 seconds.

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

Table 138: System stop error codes

Legend:
- • ...150 ms
- − ...600 ms
- Pause 2-second pause

3.4.7.4 Updating firmware

The firmware is a component of Automation Studio. The module is updated to this version automatically.

To update the firmware included in Automation Studio, the hardware must be upgraded (see "Project management" / "The workspace" / "Upgrades" in Automation Help).

3.4.8 5ACCIF01.FSS0-000

3.4.8.1 General information

Interface option 5ACCIF01.FSS0-000 is equipped with 2 RS422/485 interfaces.

- 2x RS422/485 interfaces
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

3.4.8.2 Order data

Model number	Short description	Figure
	Interface options	
5ACCIF01.FSS0-000	Interface card - 2x RS422/485 interface - For APC2100/PPC2100/APC2200/PPC2200 - Only available with a new device	
	Optional accessories	
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 139: 5ACCIF01.FSS0-000 - Order data

3.4.8.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCIF01.FSS0-000
General information	
LED status indicators	L2, L3
B&R ID code	0xED7B
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
COM	
Quantity	2
Type	RS422/RS485, electrically isolated
Design	10-pin, male
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s
Terminating resistor	
Type	Can be enabled or disabled using a slide switch
Electrical characteristics	
Power consumption	1 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

Table 140: 5ACCIF01.FSS0-000 - Technical data

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

3.4.8.3.1 COMA serial interface - Pinout

Serial interface COMA is referred to as IFx on the system unit.

Serial interfaceCOM A - IFx[1)2)3)]	
	RS422/RS485
Type	RS422/RS485, electrically isolated
UART	16550-compatible, 16-byte FIFO
Transfer rate	Max. 115 kbit/s
Bus length	Max. 1200 m
Pin	**Assignment**
1	-
2	-
3	-
4	-
5	-
6	COM GND
7	TXD
8	TXD\
9	RXD
10	RXD\

10-pin, male

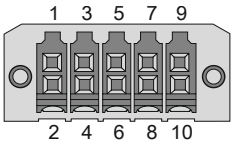


Table 141: 5ACCIF01.FSS0-000 - Interface COMA

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is enabled automatically in BIOS as COMA with default I/O address 3F8h and IRQ 4.
3) This interface is referred to as IF7 in Automation Studio / Automation Runtime.

Operating COMA as an RS485 interface

The pins of the RS422 default interface (7, 8, 9 and 10) must be used to operate in this mode. Pins must be connected as shown.

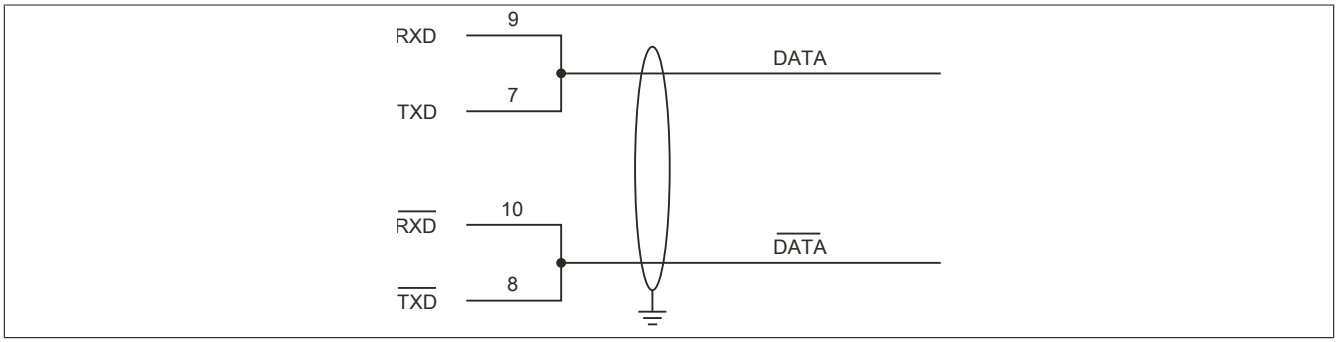


Figure 28: RS232/422/485 interface - COMA operation in RS485 mode

The RTS line must be switched by the driver for each transmission or reception; there is no automatic switch-back mechanism.

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

3.4.8.3.2 COMD serial interface - Pinout

Serial interface COMD is referred to as IFx on the system unit.

Serial interface COMD - IFx[1)2)3)]		
	RS422/RS485	
Type	RS422/RS485, electrically isolated	
UART	16550-compatible, 16-byte FIFO	
Transfer rate	Max. 115 kbit/s	
Bus length	Max. 1200 m	
Pin	**Assignment**	
1	RXD	
2	RXD\	
3	TXD	
4	TXD\	
5	COM GND	
6	-	
7	-	
8	-	
9	-	
10	-	

10-pin, male

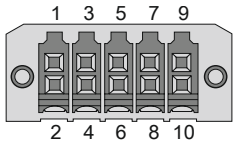


Table 142: 5ACCIF01.FSS0-000 - Interface COMD

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is enabled automatically in BIOS as COMD with default I/O address 2F8h and IRQ 10.
3) This interface is referred to as IF8 in Automation Studio / Automation Runtime.

Operating COMD as an RS485 interface

The pins of the RS422 default interface (1, 2, 3 and 4) must be used for operation. Pins must be connected as shown.

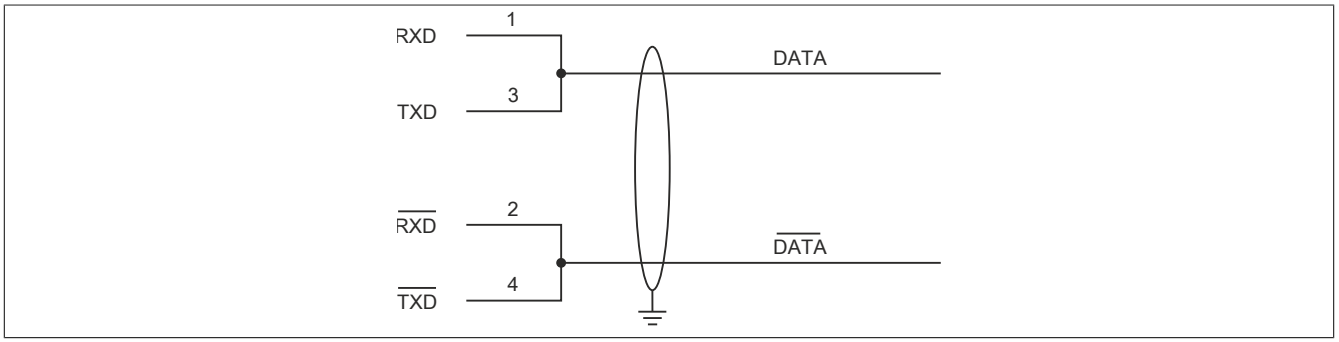


Figure 29: RS232/422/485 interface - COMD operation in RS485 mode

The RTS line must be switched by the driver for each transmission or reception; there is no automatic switch-back mechanism.

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

3.4.8.3.3 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 cable length as well as the type of cable being used.

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 143: RS422 - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

RS422 cable	Property
Signal lines	
Cable cross section	4x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 144: RS422 - Cable requirements

3.4.8.3.4 RS485 - Bus length and cable type

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

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 145: RS485 - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

RS485 cables	Property
Signal lines	
Cable cross section	4x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor cross section	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 146: RS485 - Cable requirements

3.4.8.3.5 Terminating resistor

A terminating resistor is integrated for each COM on the interface option; they are located to the left and right of the IFx connector. The terminating resistor is enabled or disabled using a switch. LED status indicators L2 and L3 indicate whether the terminating resistor is enabled or disabled.

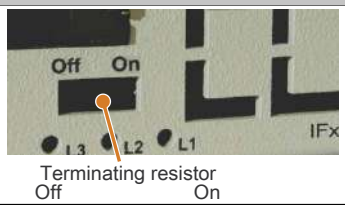
Terminating resistor		
On	The terminating resistor is switched on.	
Off	The terminating resistor is switched off.	

Table 147: Terminating resistor

3.4.8.3.6 Shielding

The shields for the cables connected to the 10-pin female connector can be connected to the screw connection for cable shields (see "Device interfaces - Overview" on page 42) as an alternative to the functional ground connection of the system unit's interface cover.

3.4.8.3.7 LED status indicators L2, L3

LEDs are integrated in the interface option; they are located above the terminating resistor.

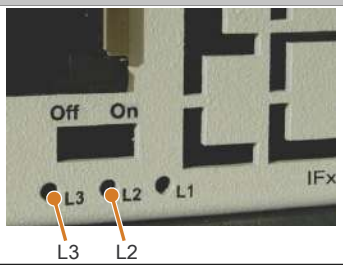
LED status indicators				
LED	**Color**	**Status**	**Explanation**	
L2	Yellow	On	The COM D terminating resistor is enabled.	
		Off	The COM D terminating resistor is disabled.	
L3	Yellow	On	The COM A terminating resistor is enabled.	
		Off	The COM A terminating resistor is disabled.	

Table 148: 5ACCIF01.FSS0-000 - LED status indicators

3.4.8.3.8 Firmware

In order to ensure the functionality of the interface option, the following firmware version (MTCX) or later must be installed on the PC:

- Automation PC 2100: V1.10
- Panel PC 2100: V1.10

The firmware can be downloaded from the B&R website (www.br-automation.com).

For information about firmware upgrades, see section "Upgrading the firmware on the Automation PC 2100" on page 176.

3.4.8.3.9 Hardware

The following minimum hardware revisions are required on the PC to ensure the functionality of the interface option:

- 5APC2100.BY01-000: Rev. H0 or later
- 5APC2100.BY11-000: Rev. G0 or later
- 5APC2100.BY22-000: Rev. H0 or later
- 5APC2100.BY34-000: Rev. H0 or later
- 5APC2100.BY44-000: Rev. H0 or later
- 5APC2100.BY48-000: Rev. D0 or later

3.4.9 5ACCIF01.ICAN-000

3.4.9.1 General information

Interface option 5ACCIF01.ICAN-000 is equipped with a CAN bus master interface.

- 1x CAN bus master interface
- Compatible with APC2100/PPC2100 and APC2200/PPC2200

3.4.9.2 Order data

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

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

3.4.9.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCIF01.ICAN-000
General information	
LED status indicators	L1
B&R ID code	0xE9BB
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
CAN	
Quantity	1
Controller	Bosch CC770 (compatible with Intel 82527 CAN controller)
Design	10-pin, male, electrically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	
Type	Can be enabled or disabled using a slide switch
Electrical characteristics	
Power consumption	0.5 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-20 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	25 g

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

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

3.4.9.3.1 CAN bus interface - Pinout

The CAN bus interface on the system unit is referred to as IFx.

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

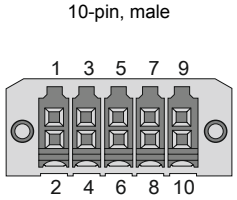


Table 151: 5ACCIF01.ICAN-000 - CAN bus interface

1) The interfaces, etc. available on the device or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
2) This interface (if available) is enabled automatically in BIOS as CAN with default I/O address 384h/385h and IRQ 10.

I/O address and IRQ

Resource	Default setting	Function
I/O address	384h (address register)	Defines the register number that should be accessed.
	385h (data register)	Access to the register defined in the address register.
IRQ	IRQ10	Interrupt

Table 152: I/O address and IRQ

CAN driver settings

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

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

Table 153: CAN driver settings

CAN - Bus length and cable type

The type of cable to be used depends largely on the required bus length and number of nodes. The bus length is determined by the 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 154: CAN - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

CAN cable	Property
Signal lines	
Cable cross section	2x 0.25 mm² (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
Ground line	
Cable cross section	1x 0.34 mm² (22 AWG / 19), tinned copper stranded wire
Wire insulation	PE
Conductor resistance	≤59 Ω/km
Outer jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 155: CAN cable requirements

Terminating resistor

A terminating resistor is integrated in the interface option above the ETH1 interface. A switch is used to enable or disable the terminating resistor for the CAN bus interface. The L1 LED status indicator indicates whether the terminating resistor is switched on or off.

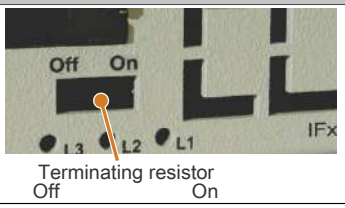
Terminating resistor		
On	The terminating resistor is switched on.	
Off	The terminating resistor is switched off.	

Table 156: Terminating resistor

3.4.9.3.2 Shielding

For the interfaces on the 10-pin female connector, the interface shield can be put on pin 2 of the female connector.

A functional ground connection and screw, which can also be used for the cable shields, is located on the interface plate of the system unit.

3.4.9.3.3 LED status indicator - L1

The interface option has 1 integrated LED located above the terminating resistor.

LED "Status"			
LED	**Color**	**Status**	**Explanation**
L1	Yellow	On	The CAN bus terminating resistor is enabled.
		Off	The CAN bus terminating resistor is disabled.
L2	-	-	-
L3	-	-	-

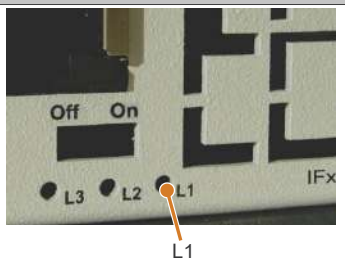


Table 157: 5ACCIF01.ICAN-000 - LED status indicator

3.4.9.3.4 Firmware

In order to ensure the functionality of the interface option, the following firmware version (MTCX) or later must be installed on the PC:

- Automation PC 2100: V1.06
- Panel PC 2100: V1.06

The firmware can be downloaded from the B&R website (www.br-automation.com).

For information about firmware upgrades, see section "Upgrading the firmware on the Automation PC 2100" on page 176.

3.4.9.3.5 Drivers

In Windows 7 and later, the CAN IF option is supported by PVI V4.2.5 or Windows CAN driver V3.0.

3.5 Front covers

3.5.1 5ACCFF00.000x-00x

3.5.1.1 General information

3 front cover variants are available for APC2100 system units. 3 additional variants are available for APC2100 system units with a 4-port USB hub.

Information:

The front cover is part of the complete system and cannot be ordered as an individual component.

1) If no front cover is selected during standard device configuration, then front cover 5ACCFF00.0000-000 (orange APC2100 front cover with B&R logo) is installed and delivered by default.

When configuring a device with a USB hub, 1 of the 3 front covers must be selected (5ACCFF00.0001-000, 5ACCFF00.0001-001 or 5ACCFF00.0001-002).

3.5.1.2 Order data

Model number	Short description	Figure
	Front covers	
5ACCFF00.0000-000	APC2100 front cover - Orange - With B&R logo	
5ACCFF00.0000-001	APC2100 front cover - Dark gray - Without logo	
5ACCFF00.0000-002	APC2100 front cover - Orange - Without logo	
5ACCFF00.0001-000	APC2100 front cover - Orange - With B&R logo - For USB hub	
5ACCFF00.0001-001	APC2100 front cover - Dark gray - Without logo - For USB hub	
5ACCFF00.0001-002	APC2100 front cover - Orange - Without logo - For USB hub	

Table 158: 5ACCFF00.0000-000, 5ACCFF00.0000-001, 5ACCFF00.0000-002, 5ACCFF00.0001-000, 5ACCFF00.0001-001, 5ACCFF00.0001-002 - Order data

3.5.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCFF00.0000-000	5ACCFF00.0000-001	5ACCFF00.0000-002	5ACCFF00.0001-000	5ACCFF00.0001-001	5ACCFF00.0001-002
General information						
Certifications						
CE	Yes					
UL	cULus E115267 Industrial control equipment					
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]					
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]			-		

Table 159: 5ACCFF00.0000-000, 5ACCFF00.0000-001, 5ACCFF00.0000-002, 5ACCFF00.0001-000, 5ACCFF00.0001-001, 5ACCFF00.0001-002 - Technical data

Model number	5ACCFF00.0000-000	5ACCFF00.0000-001	5ACCFF00.0000-002	5ACCFF00.0001-000	5ACCFF00.0001-001	5ACCFF00.0001-002
Mechanical characteristics						
Housing						
Front cover	Orange plastic (similar to Pantone 144CV)	Dark gray plastic (similar to Pantone 432C)	Orange plastic (similar to Pantone 144CV)		Dark gray plastic (similar to Pantone 432C)	Orange plastic (similar to Pantone 144CV)
Logo	B&R logo	-		B&R logo	-	
Material	Plastic					
Weight	Approx. 14 g			Approx. 20 g		

Table 159: 5ACCFF00.0000-000, 5ACCFF00.0000-001, 5ACCFF00.0000-002, 5ACCFF00.0001-000, 5ACCFF00.0001-001, 5ACCFF00.0001-002 - Technical data

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

Chapter 3 • Commissioning

1 Installation

Danger!

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

1.1 Important information concerning installation/commissioning

- Checking the delivery
  - When receiving the delivery, check the packaging for any visible transport damage.
  - Any visible transport damage must be documented and reported immediately, or the damage must be confirmed by the shipping/delivery company.
  - Keep the original packaging in the event that goods must be reshipped.

    #### Information:

    If a device is transported or stored without packaging, it is unprotected against all environmental factors such as impacts, vibration, pressure, moisture, etc. Damaged packaging indicates that environmental conditions have already heavily affected and possibly damaged the device.

    This can result in malfunctions on the device, machine or manufacturing system.
  - Check the packaging contents and any ordered optional accessories for completeness and damage.
  - If the packaging contents are incomplete, damaged or do not match your order, inform your local sales office or B&R headquarters immediately.

    #### Danger!

    A damaged device is subject to unpredictable properties and states. The unintentional installation or operation of a damaged device must be prevented. The damaged device must be marked as such and removed from the productive environment or sent immediately for repairs.
- The environmental conditions must be observed – see "Environmental characteristics".

  #### Caution!

  Before the device is put into service, it must slowly be acclimated to room temperature! Subjecting it to thermal radiation is not permitted. If transported at low temperatures or if there are large temperature fluctuations, the device is not permitted to be subjected to any type of moisture. Moisture can cause short circuits in the electrical circuits and damages the device.
- The permissible mounting orientations when installing the device must be observed, see see "Mounting orientations".

> **Caution!**
>
> **When installed at an angle, the convection of air through the device is reduced, which decreases the maximum permissible ambient temperature for operation. If sufficient external cooling is present when the device is installed at an angle, the limit of the maximum permissible ambient temperature must be checked in each case. Otherwise, the device can become damaged and the certifications and warranty for the device nullified.**

- The requirements for device standards and certifications must be observed, see see "Standards and certifications".
- The device is only certified for operation in enclosed rooms.
- The device is not permitted to be subjected to direct sunlight.
- Ventilation holes are not permitted to be covered.
- When installed in a closed housing, enough space must be available for air to circulate sufficiently, see 2.2.3 "Spacing for air circulation".

> **Information:**
>
> **Additional space needed to operate or service the device must be taken into account during installation.**

- The device must be installed on a flat, clean and burr-free surface.
- It is important to ensure that the wall or control cabinet plate can hold four times the total weight of the device. If necessary, the interior of the installation cutout must be reinforced in order to strengthen the installation surface.

> **Caution!**
>
> **In the event of insufficient load-carrying capacity of the installation surface, inadequate mounting or improper mounting materials, the device may fall and become damaged.**

- The device is not permitted to be positioned next to other heat sources that could cause overheating.
- When connecting cables (DVI, SDL, USB, etc.), the bend radius must be taken into account.
- When connecting built-in or connected peripherals, the instructions in the documentation of the peripheral device must be followed.

> **Caution!**
>
> **Built-in or connected peripherals (e.g. a USB drive) are not permitted to bring any voltage into the device. Energy regeneration is generally not permitted and can damage the device.**

- Instructions and regulations on the power supply and functional ground must be observed.

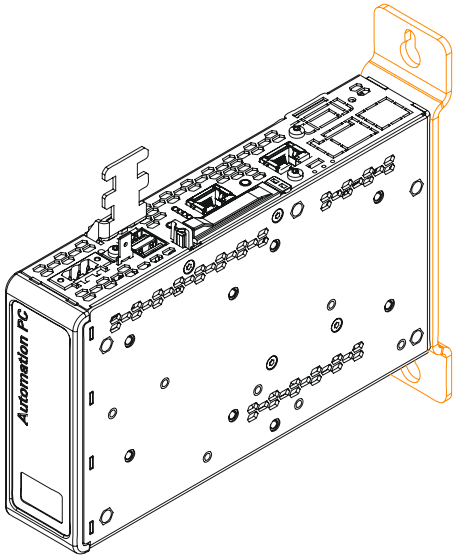
1.2 Installing an Automation PC

The Automation PC 2100 is mounted using two M5 screws, which are not included in delivery.

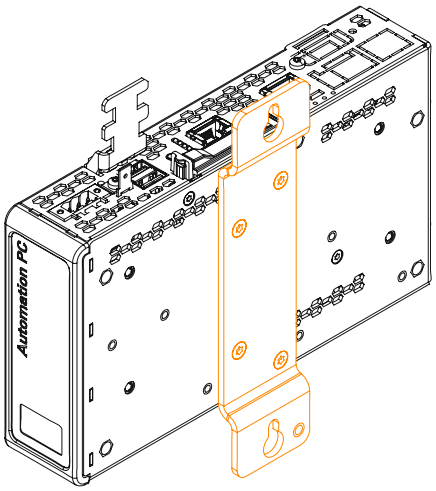
Installation options

The Automation PC 2100 offers two different installation options:

Mounting plate on back (book style)



Mounting plate on right side (box style)



The devices are mounted using the mounting plates provided. The mounting holes are intended for M5 screws.

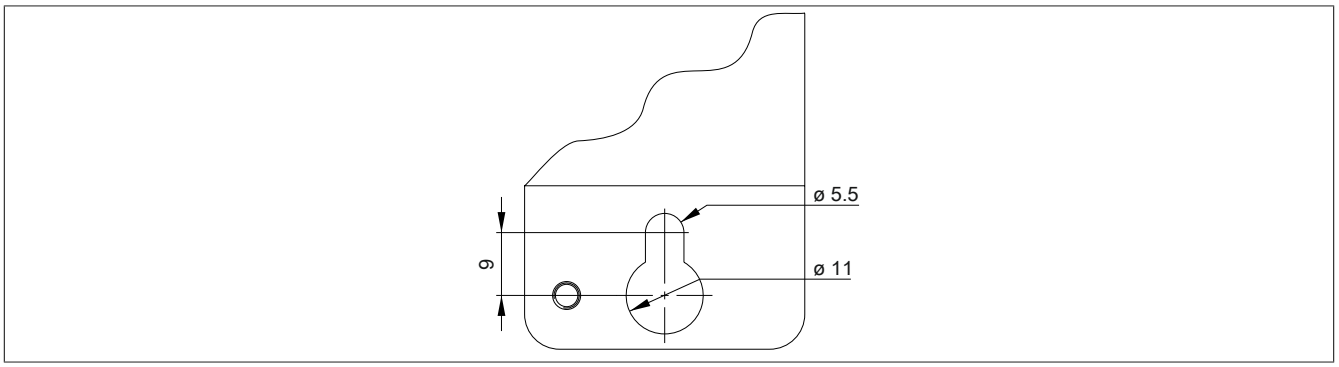


Figure 30: Mounting holes

For the exact position of the mounting holes, see section "Drilling template" on page 27.

Procedure

1. Drill the necessary holes in the mounting surface. For the exact position of the mounting holes, see the drilling templates.
2. Install the B&R industrial PC using M5 screws.

1.3 Repositioning the mounting plate

1. Disconnect the power supply to the Automation PC (disconnect the power cable). Isolate the system from all potential sources of electrical power!
2. Discharge any electrostatic charge on the ground connection.
3. Disconnect all connected cables.
4. Dismount the Automation PC. To do this, remove the M5 screws and take down the Automation PC.
5. Remove the 4 Torx screws (T20) indicated in the following image.

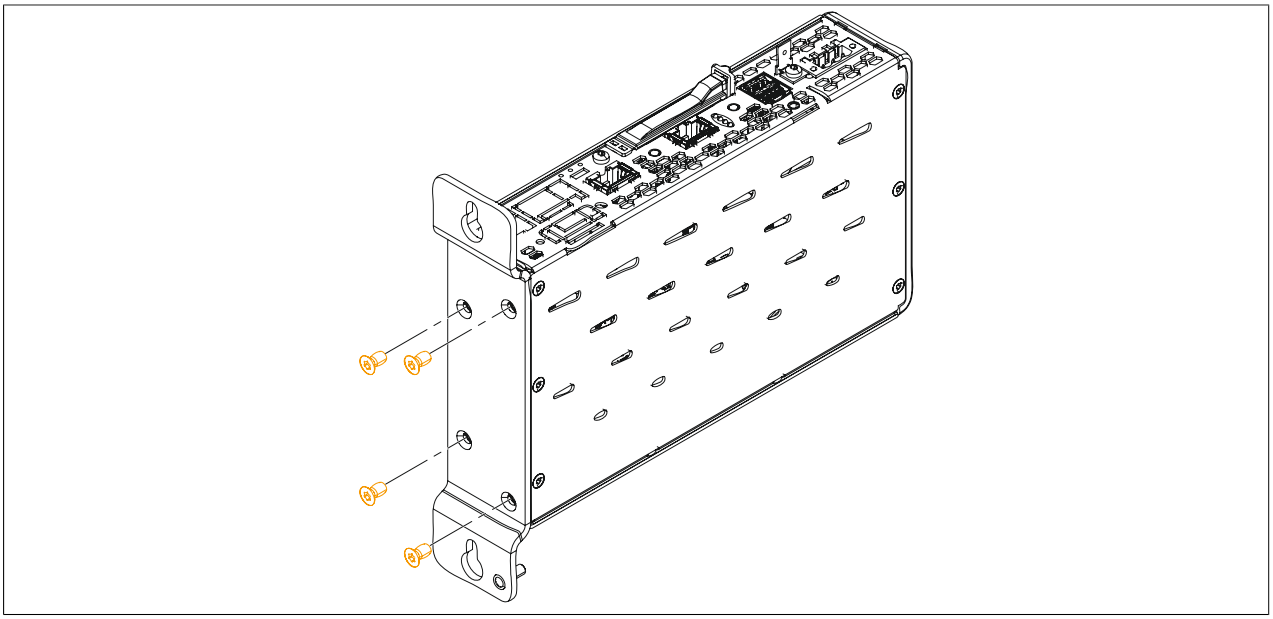


Figure 31: Removing the Torx screws

6. Remove the mounting plate and position it for the other mounting option using the Torx screws (T20) that were previously removed (max. tightening torque 0.5 Nm).

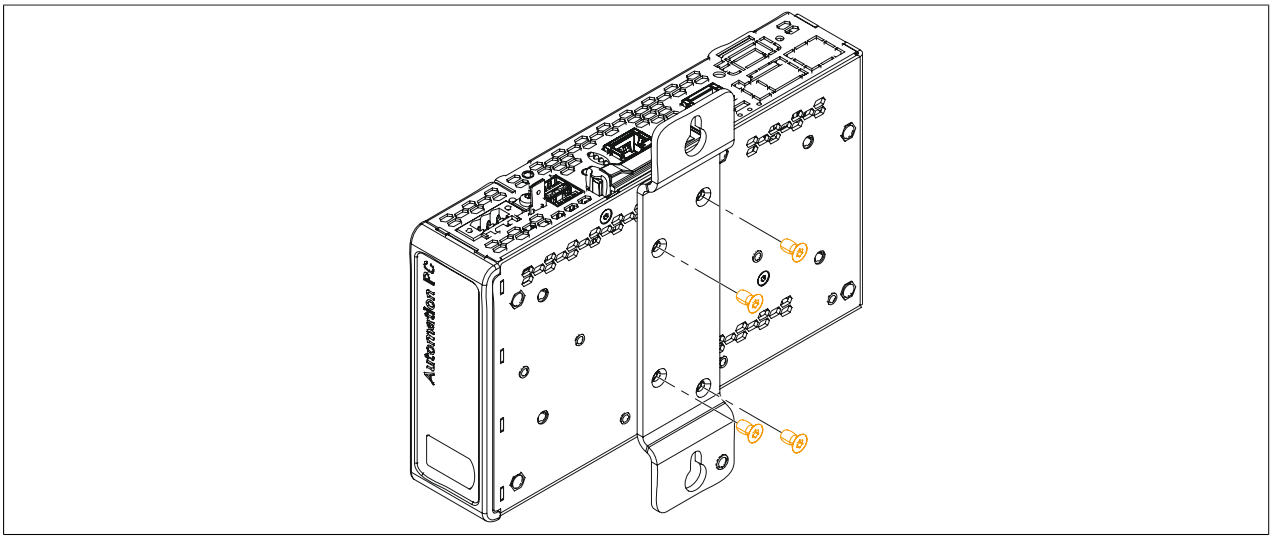


Figure 32: Installing the Torx screws

7. The Automation PC can now be mounted again. Be sure that there is still sufficient space for air circulation. For more information, see "Mechanical properties" on page 25.

1.4 Installing the 4-port USB hub

The USB hub can be installed starting with the following revisions:

- 5APC2100.BY01-000 - Rev. E0 and later
- 5APC2100.BY11-000 - Rev. E0 and later
- 5APC2100.BY22-000 - Rev. E0 and later
- 5APC2100.BY34-000 - Rev. E0 and later
- 5APC2100.BY44-000 - Rev. E0 and later
- 5APC2100.BY48-000 - Rev. A0 and later

One of the following covers must be included in the order in order to ensure correct installation and operation.

- 5ACCFF00.0001-000
- 5ACCFF00.0001-001
- 5ACCFF00.0001-002

1. Screw the 4-port USB hub to the front of the APC2100 using the included Torx screw (T10). Tightening torque 0.55 Nm.
2. Cover 5ACCFF00.0001-00x is installed over the USB hub. Follow the order shown in the image.

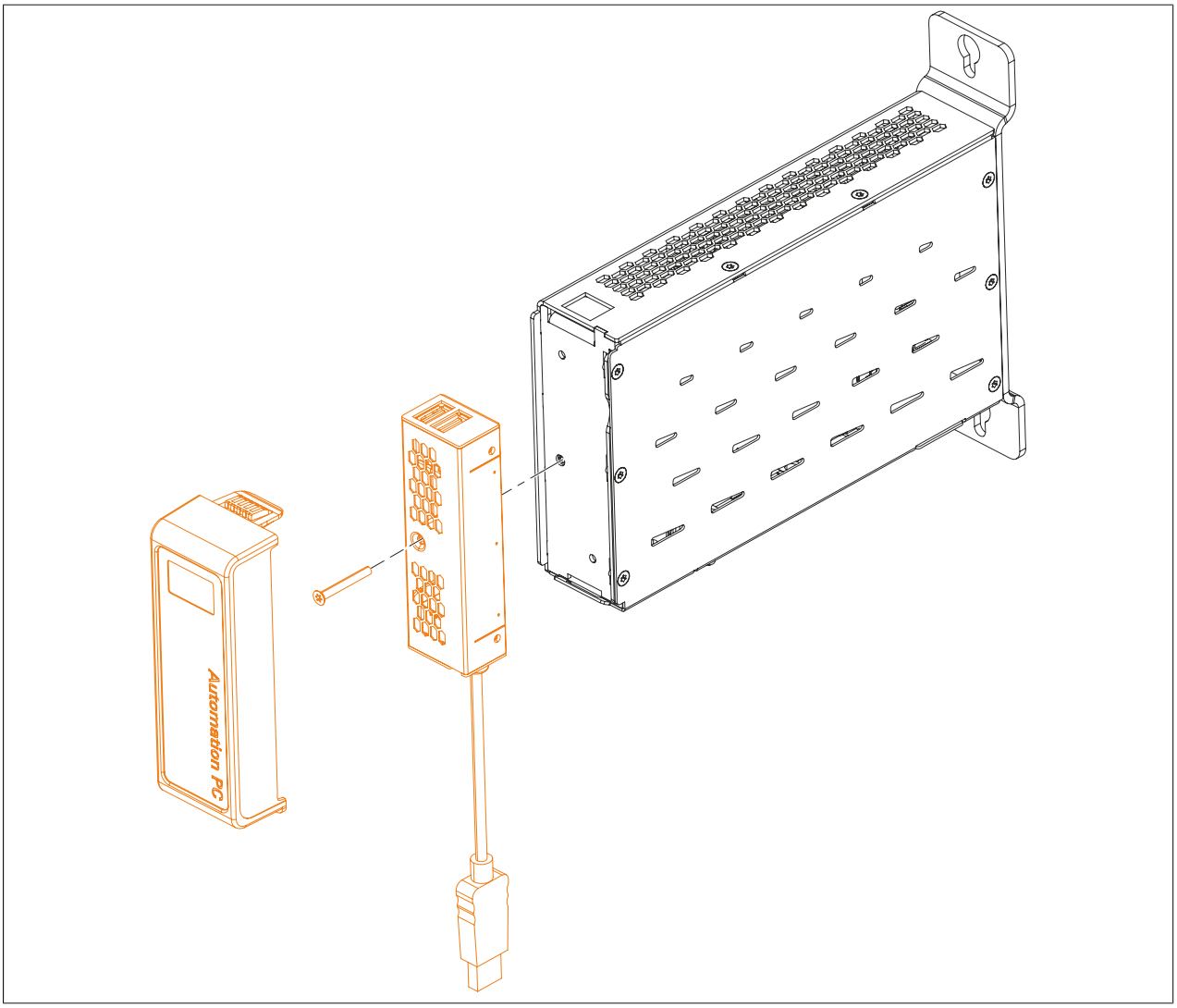


Figure 33: Installing the 4-port USB on the Automation PC

3. Connect the USB cable attached to the USB hub to the USB2 interface on the Automation PC.

2 Connecting to the power grid

Danger!

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

2.1 Installing the DC power cable

Danger!

All power supplies to the B&R industrial PC and B&R Automation Panel must be interrupted. Before connecting the DC power cable, it is necessary to check whether it has been disconnected from the power source (e.g. power supply).

2.1.1 Wiring

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

Installing screw clamp terminal block 0TB103.9

Fasten the wires with wire end sleeves into the terminal contacts ② as shown in the image below and tighten the screw clamp terminals ① with a screwdriver (max. tightening torque 0.4 Nm).

Observe the pinout of the power supply connection on the device during wiring!

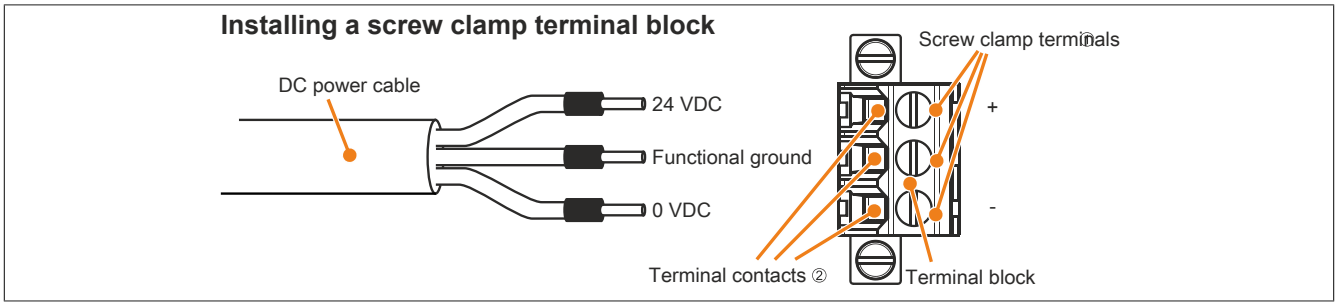


Figure 34: Installing a screw clamp terminal block

Installing cage clamp terminal block 0TB103.91

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

Observe the pinout of the power supply connection on the device during wiring!

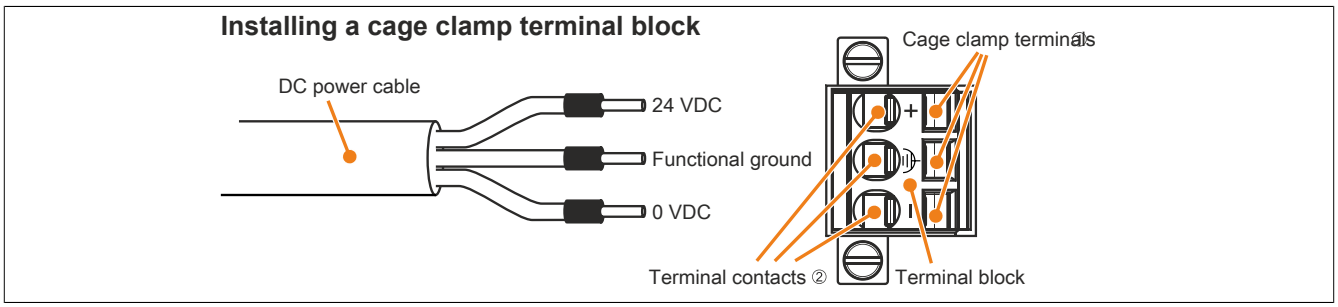


Figure 35: Installing a cage clamp terminal block

2.2 Connecting the power supply to a B&R device

Danger!

The power supply to the B&R device must be completely interrupted. Before connecting the power cable, it is necessary to check whether it has been disconnected from the power source (e.g. power supply).

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

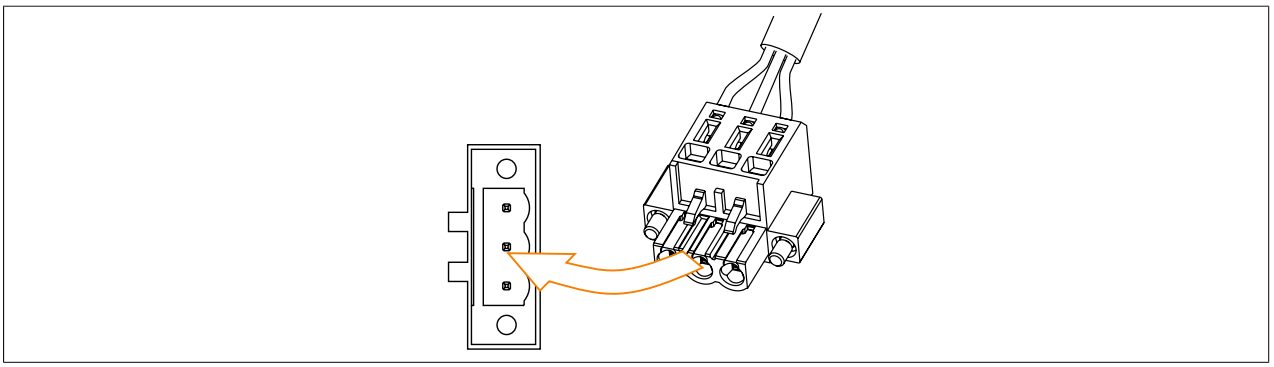


Figure 36: Connecting the power supply connector to a B&R device

2.3 Functional ground - Grounding concept

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

This device comes equipped with 2 functional ground connections:

- Functional ground connection for the power supply
- Ground connection

To ensure the safe conductance of electrical interference, the following points must be observed:

- Connect the device to the central grounding point (e.g. the control cabinet or the system) using the shortest path with the lowest resistance.
- A cable with a minimum cross section of 2.5 mm² per connection must be used. If a cable with wire end sleeves is connected to terminal block 0TB103.9 or 0TB103.91, then a cable with maximum 1.5 mm² per connection is possible.
- Observe the line shielding concept. All data cables connected to the device must be shielded.

The following symbol is used to indicate functional ground on the B&R device: 

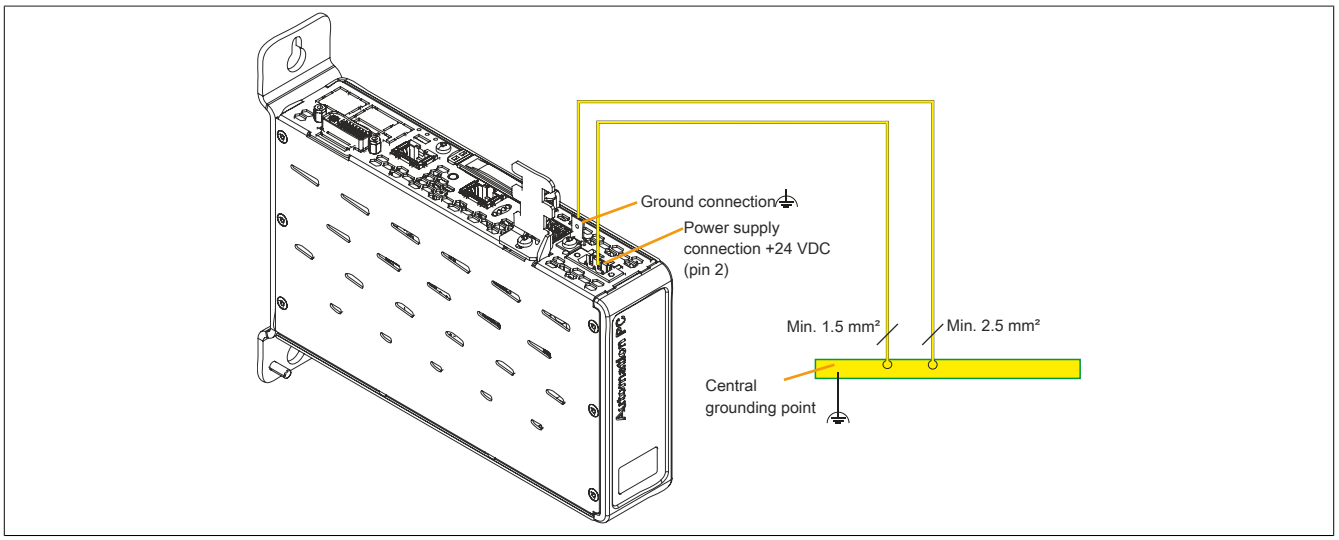


Figure 37: Automation PC 2100 - Grounding concept

3 Cable connections

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

Information:

The maximum tightening torque for the locating screws is 0.5 Nm.

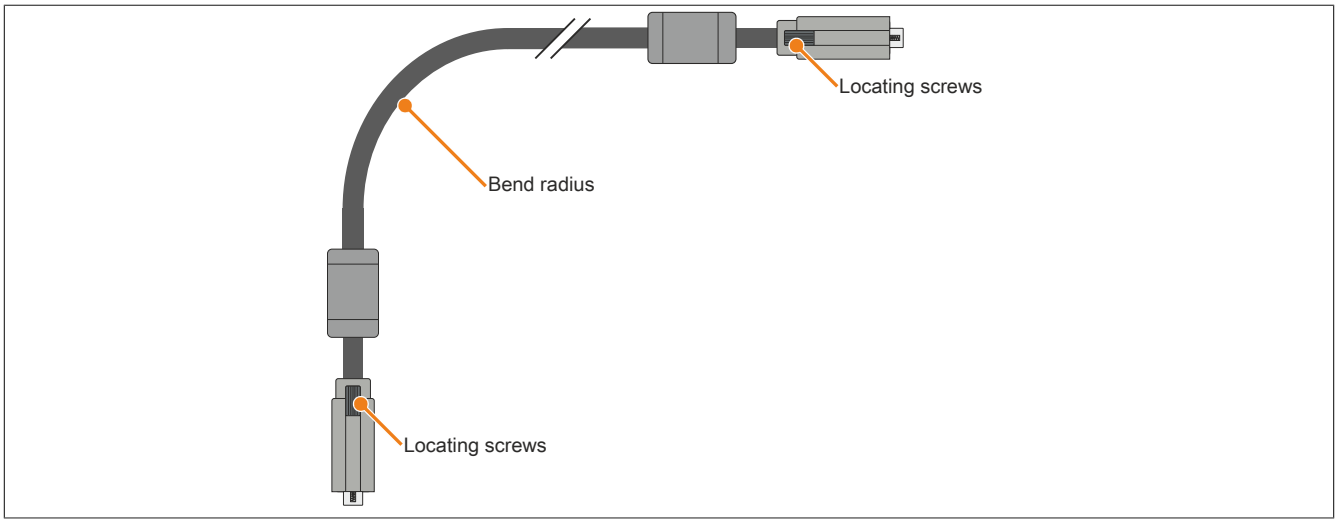


Figure 38: Bend radius - Cable connection

Information:

For the specified bend radius, see the technical data for the respective cable.

4 Switching on the device for the first time

4.1 General information before switching on the device

Checklist

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

- Have the installation notes specified in "Installation" on page 123 been observed?
- Have the permissible environmental conditions for the device been taken into account?
- Is the power supply connected correctly, and have the values been checked?
- Is the ground cable connected correctly to the ground connection?
- The device must first be put into service before additional hardware is installed.

> **Caution!**
>
> **Before the device is put into service, it must slowly be acclimated to room temperature! Subjecting it to thermal radiation is not permitted.**
>
> **If transported at low temperatures or if there are large temperature fluctuations, the device is not permitted to be subjected to any type of moisture.**
>
> **Moisture can cause short circuits in the electrical circuits and damages the device.**

Requirements

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

- The functional ground connections are as short as possible and connected to the central grounding point using the largest possible wire cross section.
- All connection cables are connected correctly.
- A USB keyboard and USB mouse are connected (optional).

4.2 Switching on the device

Procedure

1. Connect and switch on the power supply.
2. The device is in service and booting; LED "Power" is lit.

5 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 or Power Panels. These instructions only represent guidelines, however.

5.1 Procedure

In order to obtain accurate results, test 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 later, etc.

In addition, a temperature sensor should be installed for the device being tested to constantly monitor the ambient temperature. In order to obtain correct values, it should be placed at a distance of approx. 5 to 10 cm from the B&R industrial PC near the air intake (not near the exhaust).

Every B&R industrial PCs and Power Panel is equipped with internal temperature sensors. They are positioned in different locations depending on the device family. Their number as well as the temperature limits also vary depending on the device family.

For information about the location of temperature sensors as well as their maximum specified temperatures, see section "Temperature sensor positions" on page 34.

A minimum testing time of 8 hours is recommended for an optimal determination and assessment of the temperature situation.

5.2 Evaluating temperatures in Windows operating systems

5.2.1 Evaluating with the B&R Control Center

The B&R Control Center can be used to evaluate temperatures. The temperatures can be viewed on the "Temperatures" tab. The B&R Control Center is available for download at no cost in the Downloads section of the B&R website (www.br-automation.com). The B&R Control Center uses the B&R Automation Device Interface (ADI).

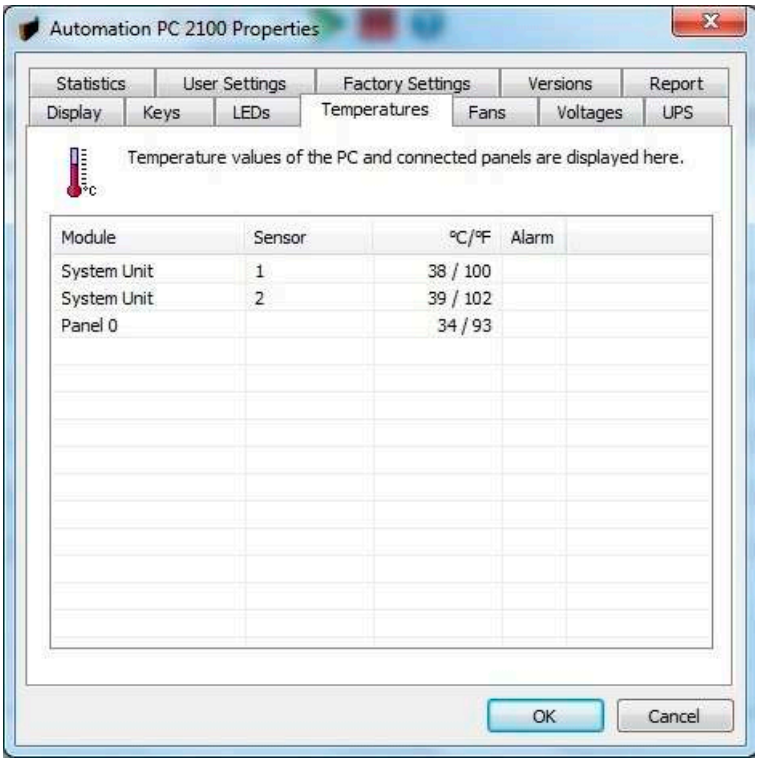


Figure 39: Evaluating with the B&R Control Center using an APC2100 without IF options

A separate application can be developed if it is necessary to collect historical data.

Information:

There are downloads such as the ADI .NET SDK available on the B&R website (www.br-automation.com) that can be used to create a separate application.

5.2.2 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. A corresponding load can be generated on the system and peripheral devices based on the extent of the software and existing loopback adapters.

Information:

Loopback adapters are also available from PassMark. For more information, see www.passmark.com.

The following screenshots are based on PassMark BurnInTest Pro V6 using an APC2100 without IF options.

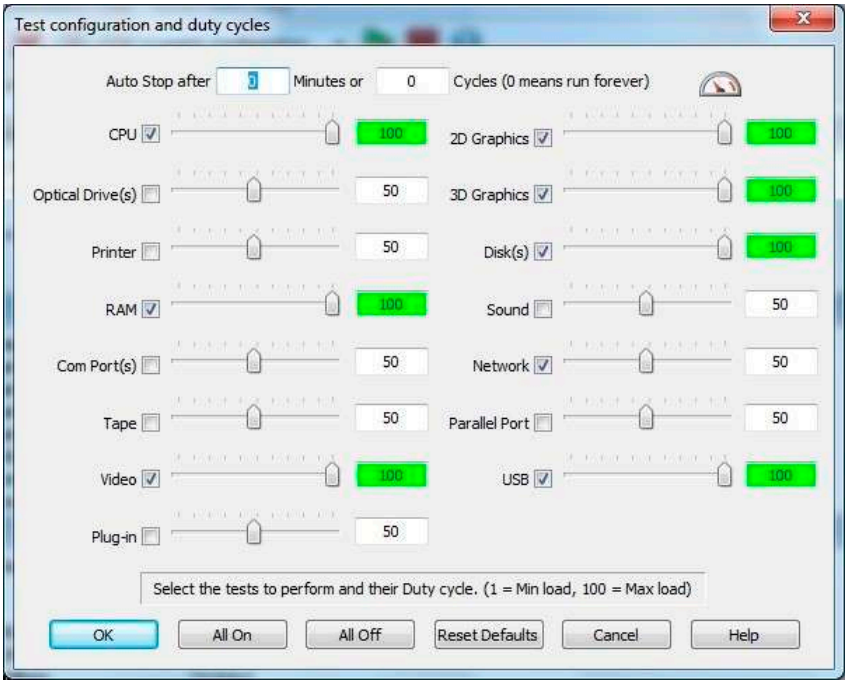


Figure 40: Settings for PassMark BurnInTest Pro V6 using an APC2100 without IF options

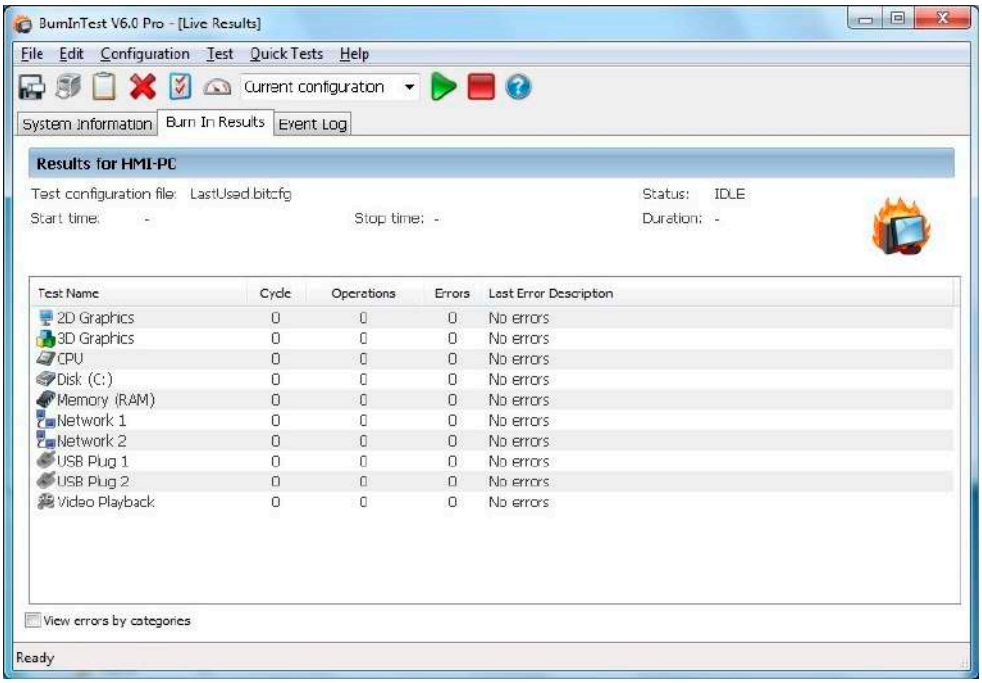


Figure 41: Test overview of an APC2100 without IF options

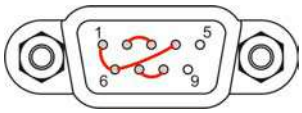
Test properties may need to be fine-tuned depending on the availability of loopback adapters and DVDs.

Information:

USB flash drives can also be used if no USB loopback adapters are available. The USB flash drives must be available in Windows as formatted drives. 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 some pins on the serial interface with wires.



5.3 Evaluating temperatures in non-Windows operating systems

For applications that do not run in Windows, temperatures can be evaluated using the B&R MTCX Development Kit. In addition to the MTCX Development Kit, sample programs in EFI are also available.

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 take into account the notes in the implementation guide regarding TODO comments, I/O access functions, etc.

Information:

For current B&R PC series (starting with the APC910), the MTCX Development Kit can be downloaded at no cost from the B&R website (www.br-automation.com).

Sample programs and implementation guides for all other B&R series can be downloaded free of charge from the B&R website (www.br-automation.com).

5.4 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 chamber, they can be performed in an office environment, for example. It is necessary to measure the ambient temperature in this case, however. Experience at B&R has shown that temperature values measured on passive systems (systems without a fan kit) can be calculated linearly based on the ambient temperature. In order to calculate temperature values for systems with a fan kit, the fans must be running. It is also important to take speed, etc. into account.

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. The measurement results for passive devices are therefore unusable. In order to be able to still perform temperature tests in climate-controlled chambers with fans without distorting the results, the fans in the climate chamber must be switched off and a sufficient amount of time (several hours) observed before beginning the test.

6 Known problems / Issues

- In Windows 7 and later, CAN IF option 5ACCIF01.ICAN-000 is supported by PVI V4.2.5 or Windows CAN driver V3.0.
- The USB 2.0 transfer rate is limited to 30 Mbit/s with SDL3.
- The SDL3 transmitter constantly emulates a display using EDID data and hot plugging code; this 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.
  - A connection has not yet been 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 or ETH2 interface (connection abort, slow data transfer, etc.), one possible solution is to disable the EEE feature (Energy-Efficient Ethernet) in the driver.
- If USB 3.0 should be used, XHCI mode must be set for the following operating systems in the "USB configuration":
  - Windows 10 or Windows 8.1 set to "Enabled"
  - Windows 7 set to "Smart auto"

  If XHCI mode is set to "Smart auto" in Windows 8.1 or Windows 10, then only USB 2.0 is supported. The default value for setting "XHCI mode" is "Smart auto".
- If problems occur during shutdown or rebooting in B&R Linux, disabling the USB 3.0 function is one possible solution. To do this, the XHCI controller must be set to "Disabled" in the BIOS USB configuration.
- In order to slightly improve the real-time behavior (jitter) of Automation Runtime Windows (ARwin) or Automation Runtime Embedded (ARemb) in graphics-intensive applications, set BIOS setting *Advanced - Graphics (IGD) configuration - IGD turbo* to *Disabled*. If BIOS setting *Advanced - Graphics (IGD) configuration - IGD turbo* is set to *Disabled*, the graphics performance of the system is noticeably reduced.

Chapter 4 • Software

1 BIOS options

Information:

The following figures, BIOS menu options and descriptions refer to BIOS version 1.40. 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 Phoenix.

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 nonvolatile and remains stored on the B&R industrial PC for a certain amount of time even when the power is switched off (no 24 VDC power supply). For additional information, see the technical data for the system unit.

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, the "F2" key must be pressed after the USB controller has been initialized as soon as the following message appears on the monitor (during POST): "F2 = Setup".

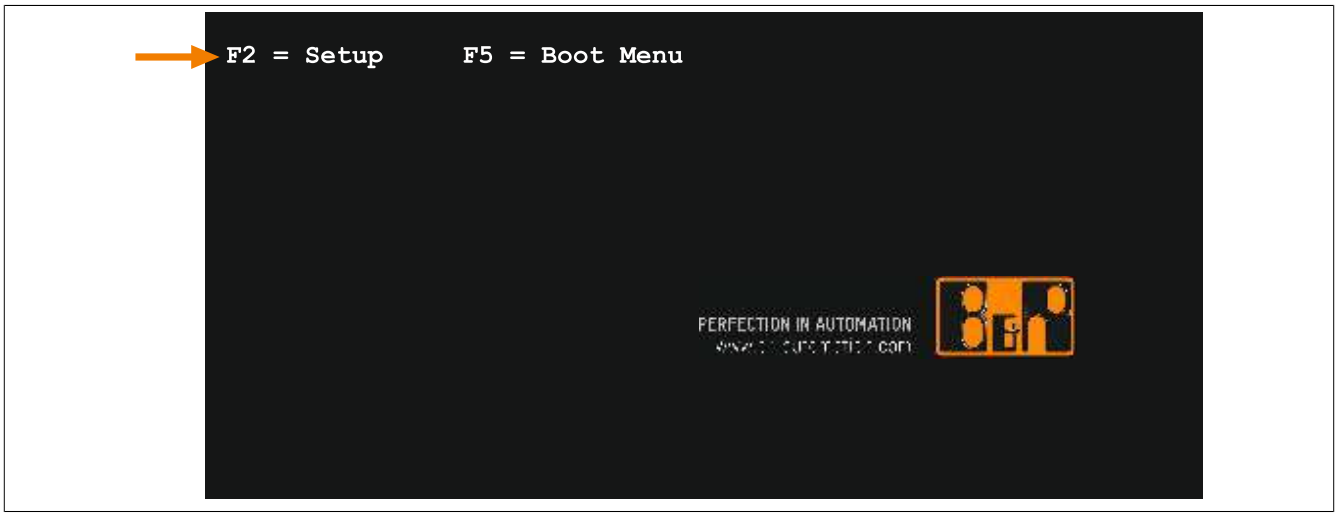


Figure 42: Boot screen

1.3 BIOS default settings

Configuration options in bold typeface represent the default value.

The default settings are the optimized settings that are applied when selecting the "Load setup defaults" function on the BIOS Setup "Exit" screen or pressing <F9> on the individual screens (applies the default settings for the respective screen only).

1.4 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.

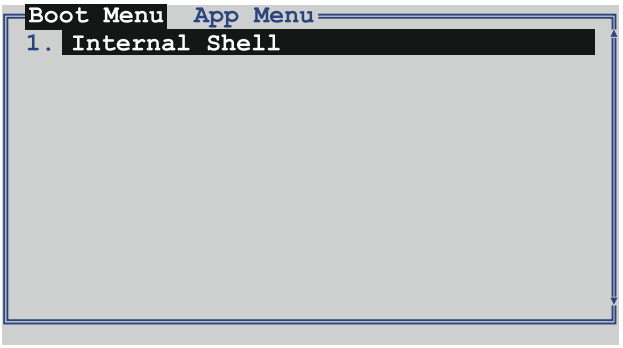
Keys	Function
F2	Opens the main BIOS Setup screen.
F5	Opens the boot menu. This lists all bootable devices that are connected to the system. Selecting a device with cursor ↑, cursor ↓ and then pressing <ENTER> will boot from that device. 
<Pause>	Pauses POST. Pressing any other key resumes POST.

Table 160: 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 ↑	Jumps to the first BIOS menu item or object.
Page ↓	Jumps to the last BIOS menu item or object.
Home	Jumps to the first BIOS menu item or object.
End	Jumps to the last BIOS menu item or object.
F7	Resets any changes.
F9	Loads and configures CMOS default values for all BIOS settings.
F10	Saves and exits.
ESC	Exits a submenu.

Table 161: BIOS-relevant keys

1.5 Main

The main BIOS Setup screen appears immediately after the <F2> button is pressed during startup:

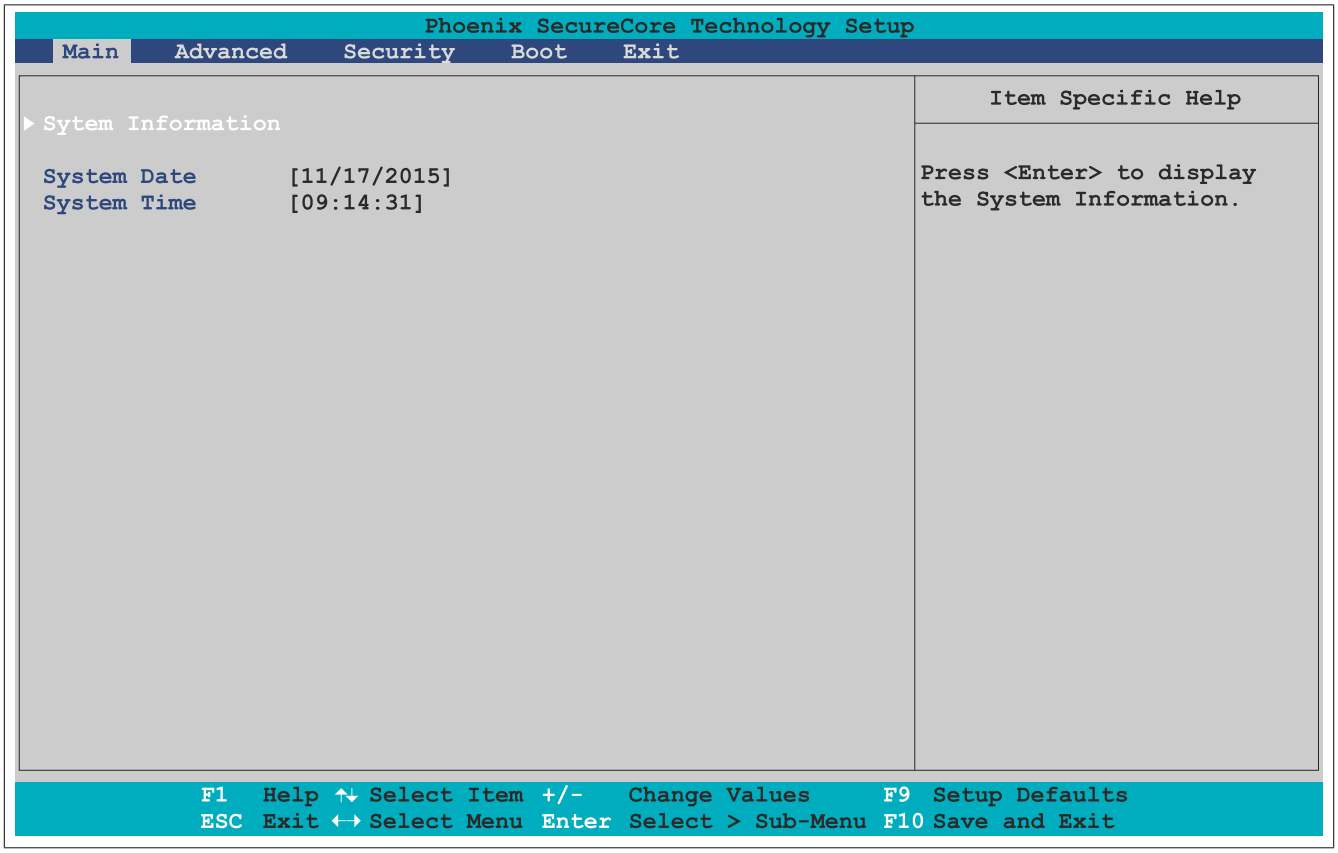


Figure 43: Main

BIOS setting	Explanation	Configuration options	Effect
System information	Displays information about the chipset, CPU board and main memory.	Enter	Opens this submenu See "System information" on page 141.
System date	The currently configured system date. This is retained when the system is switched off. For details, see the technical data for the system unit.	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 retained when the system is switched off. For details, see the technical data for the system unit.	Change the system time	Sets the system time in the format Hour:Minute:Second (hh:mm:ss).

Table 162: Main

1.5.1 System information

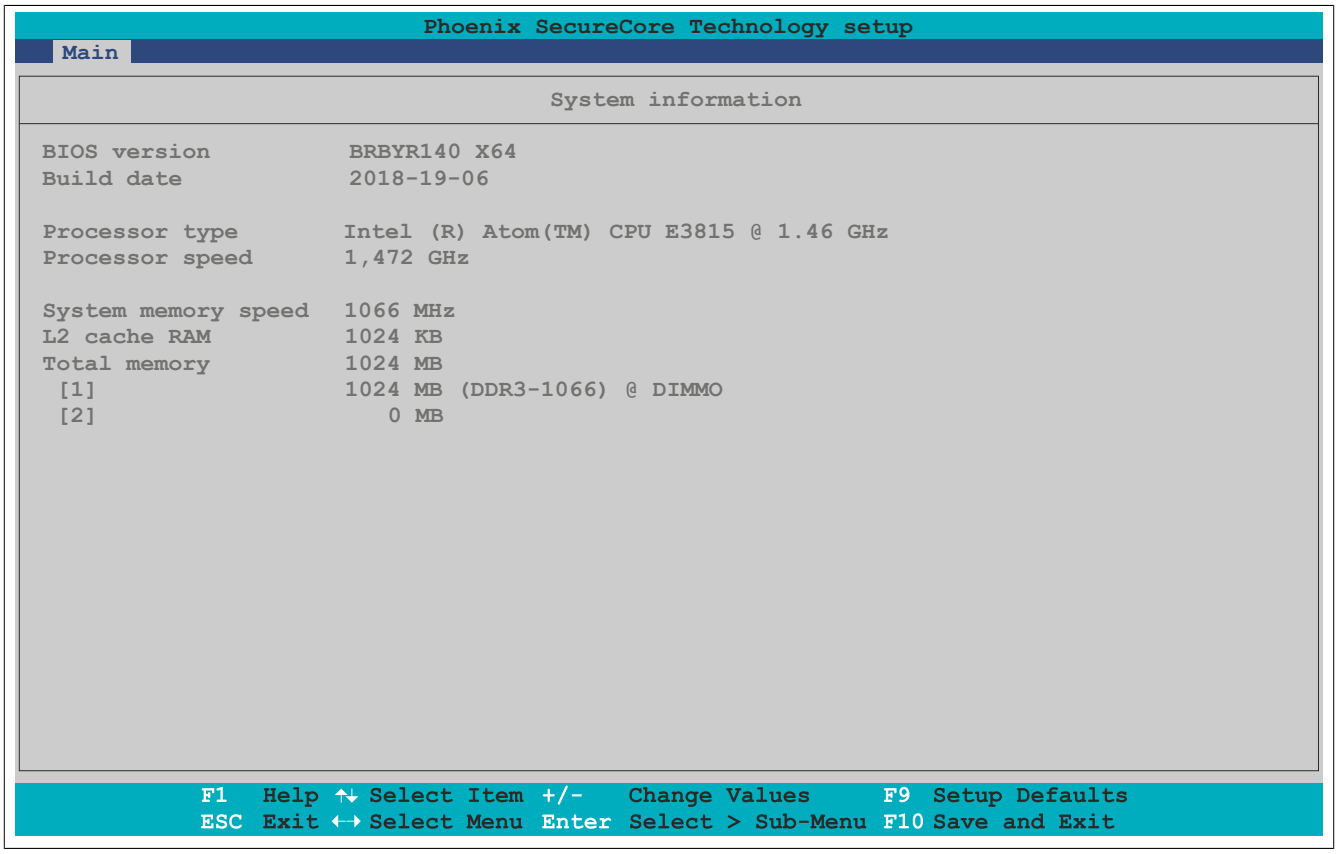


Figure 44: Main - System information

BIOS setting	Explanation	Configuration options	Effect
BIOS version	Displays the BIOS version.	None	-
Build time	Displays the date the BIOS was created.	None	-
Processor type	Displays the processor type.	None	-
Processor speed	Displays the processor frequency.	None	-
System memory speed	Displays the main memory frequency.	None	-
L2 cache RAM	Displays the size of the L2 code cache.	None	-
Total memory	Displays the size of all main memory.	None	-
[1]	Displays the size of the main memory in slot 1.	None	-
[2]	Displays the size of the main memory in slot 2.	None	-

Table 163: Main - System information

1.6 Advanced

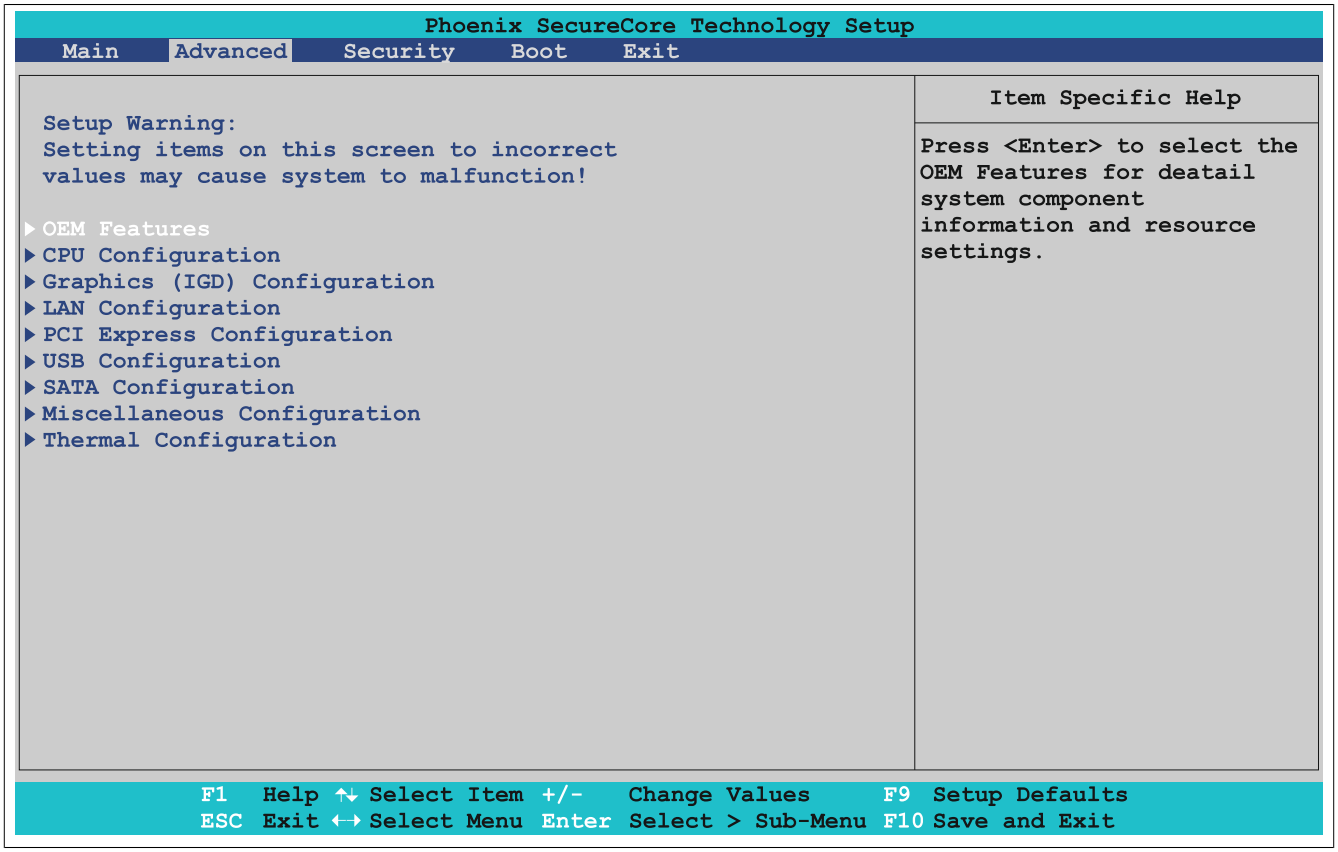


Figure 45: Advanced

BIOS setting	Explanation	Configuration options	Effect
OEM features	Configures OEM features.	Enter	Opens this submenu See "OEM features" on page 143.
CPU configuration	Configures CPU settings.	Enter	Opens this submenu See "CPU configuration" on page 154.
Graphics (IGD) configuration	Graphics settings configuration.	Enter	Opens this submenu See "Graphics (IGD) configuration" on page 156.
LAN configuration	Configures LAN settings.	Enter	Opens this submenu See "LAN" on page 158.
PCI express configuration	Configures PCI Express settings.	Enter	Opens this submenu See "PCI express configuration" on page 160.
USB configuration	Configures USB settings.	Enter	Opens this submenu See "USB configuration" on page 162.
SATA configuration	Configures SATA settings.	Enter	Opens this submenu See "SATA configuration" on page 163.
Miscellaneous configuration	Configures miscellaneous settings.	Enter	Opens this submenu See "Miscellaneous configuration" on page 164.
Thermal configuration	Configures temperature settings.	Enter	Opens this submenu See "Thermal configuration" on page 165.

Table 164: Advanced

1.6.1 OEM features

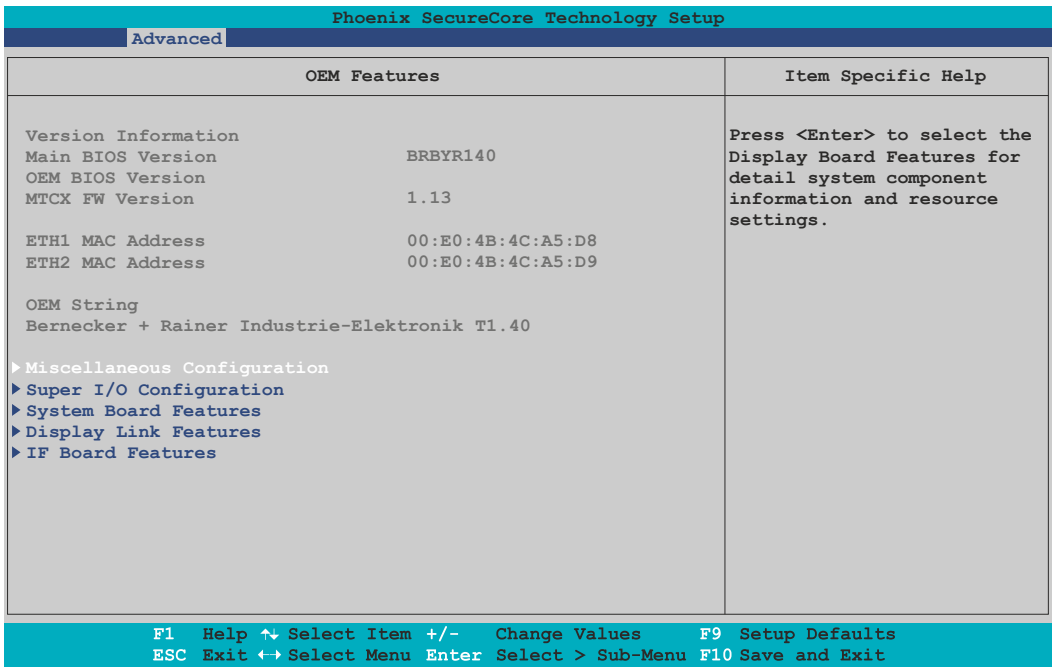


Figure 46: Advanced - OEM features

BIOS setting	Explanation	Configuration options	Effect
Version information		None	-
Main BIOS version	Displays the installed B&R BIOS version.	None	-
OEM BIOS version		None	-
MTCX firmware version	Displays the installed MTCX version.	None	-
ETH1 MAC address	Displays the assigned MAC address for the ETH1 interface.	None	-
ETH2 MAC address	Displays the assigned MAC address for the ETH2 interface.	None	-
OEM string	Displays the OEM string.	None	-
Miscellaneous configuration	Configures miscellaneous settings.	Enter	Opens this submenu See "Miscellaneous configuration" on page 144.
Super I/O configuration	Configures special interface settings.	Enter	Opens this submenu See "Super I/O configuration" on page 145.
System board features	Displays device-specific information for the system unit.	Enter	Opens this submenu See "System board features" on page 146.
Display link features	Displays device-specific information for the connected display	Enter	Opens this submenu See "Display link features" on page 149.
IF board features	Displays device-specific information for the IF option.	Enter	Opens this submenu See "IF board features" on page 152.

Table 165: Advanced - OEM features

1.6.1.1 Miscellaneous configuration

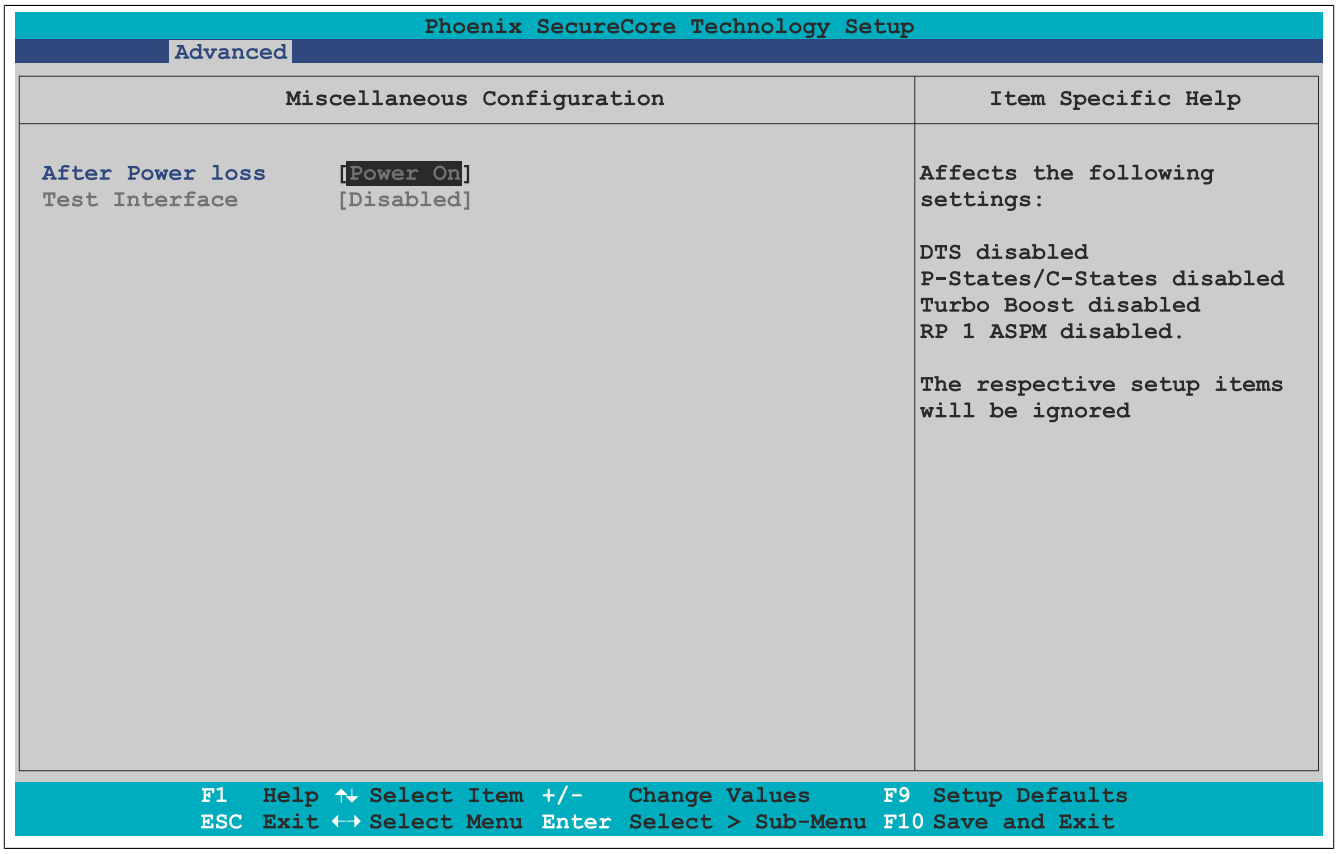


Figure 47: Advanced - OEM features - Miscellaneous configuration

BIOS setting	Explanation	Configuration options	Effect
After power loss	Option for setting the behavior after a power failure.	Stay off	The PC remains switched off on power-on.
		Power on	The PC is restarted on power-on.
Test interface		None	-

Table 166: Advanced - OEM features - Miscellaneous configuration

1.6.1.2 Super I/O configuration

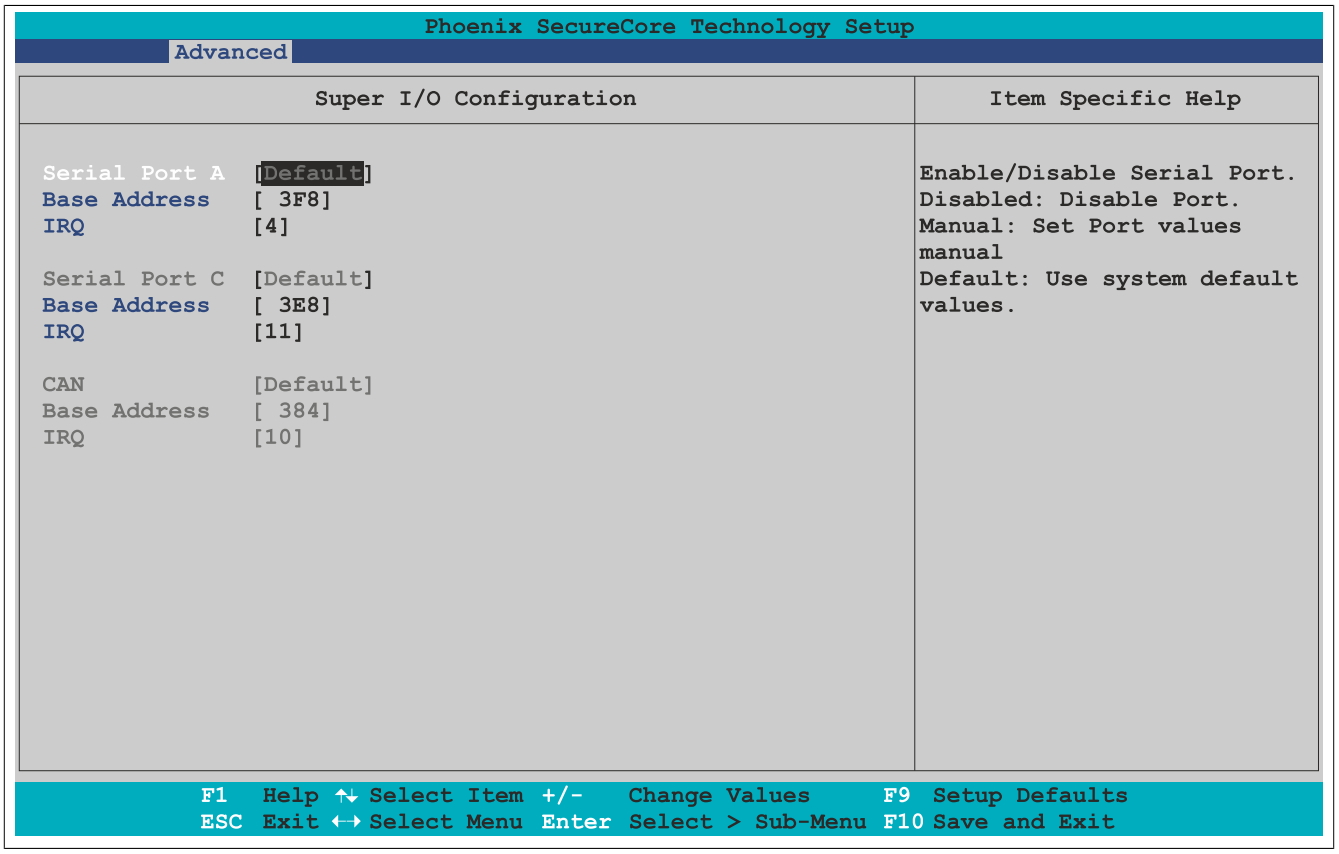


Figure 48: Advanced - OEM features - Super I/O configuration

BIOS setting	Explanation	Configuration options	Effect
Serial port A	Setting for the COM interface on the IF option.	Disabled	Disables this interface.
		Manual	Allows manual settings for "Base address" and "IRQ".
		Default	Uses the default settings.
Base address	Sets and displays the I/O address.	**3F8h**	Default setting
		Any	Allows any I/O address to be entered.
IRQ	Sets and displays the IRQ.	3, **4**, 5, 6, 7, 10, 11, 12, 14, 15	Manual assignment.
Serial port C	SDL or SDL3 Link setting for the resistive touch screen	Disabled	Disables this interface.
		Manual	Allows manual settings for "Base address" and "IRQ".
		Default	Uses the default settings.
Base address	Sets and displays the I/O address.	**3E8h**	Default setting
		Any	Allows any I/O address to be entered.
IRQ	Sets and displays the IRQ.	3, 4, 5, 6, 7, 10, **11**, 12, 14, 15	Manual assignment.
CAN	Setting for the CAN interface on the IF option.	**Default**	Uses the default settings. No other settings are possible.
Base address	Displays the I/O address.	**384h/385h**	Permanently assigned. This setting cannot be modified.
IRQ	Displays IRQ.	**10**	Permanently assigned. This setting cannot be modified.

Table 167: Advanced - OEM features - Super I/O configuration

1.6.1.3 System board features

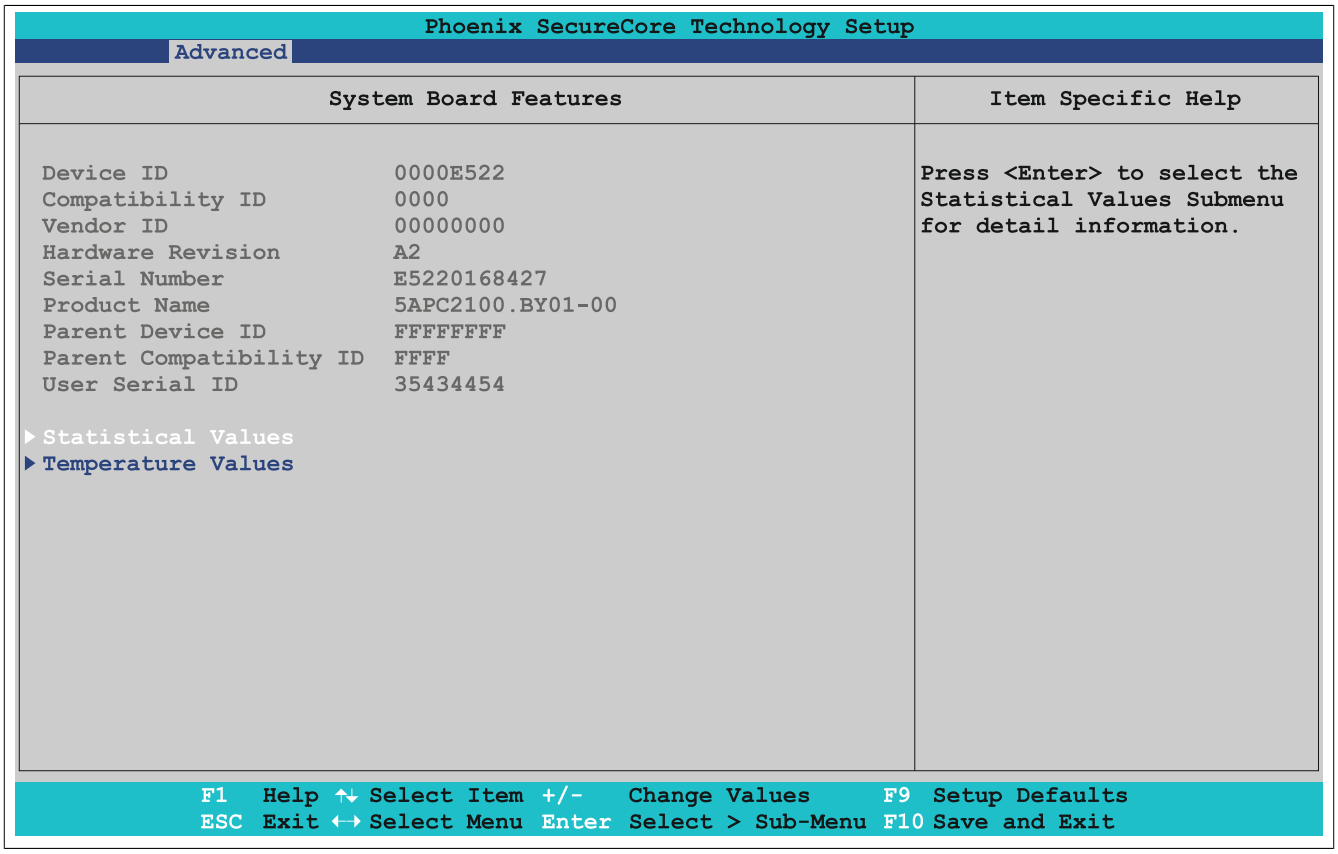


Figure 49: Advanced - OEM features - System board features

BIOS setting	Explanation	Configuration options	Effect
Device ID	Displays the device ID of the system 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 system 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	-
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 See "Statistical values" on page 147.
Temperature values	Displays current temperature values.	Enter	Opens this submenu See "Temperature values" on page 148.

Table 168: Advanced - OEM features - System board features

1.6.1.3.1 Statistical values

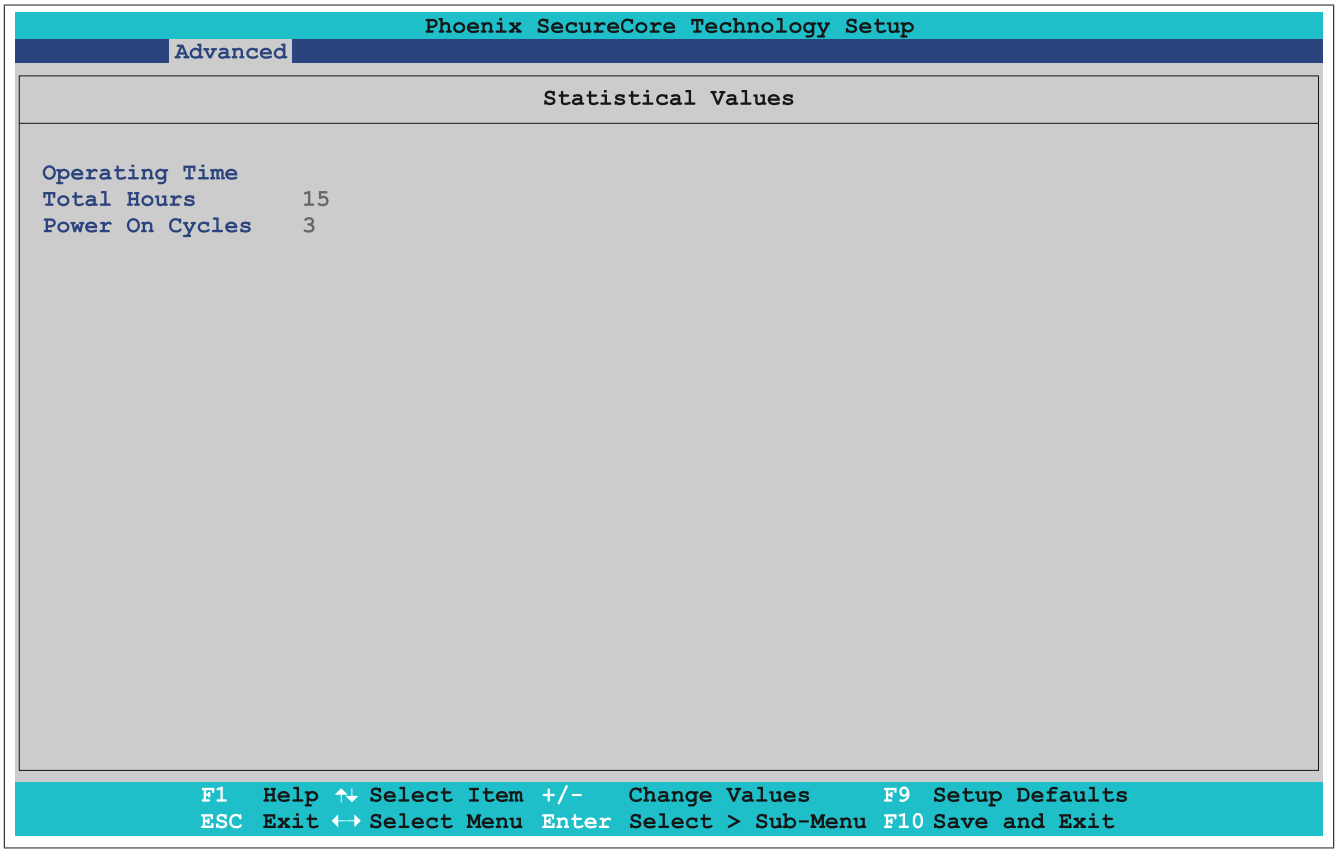


Figure 50: Advanced - OEM features - System board features - Statistical values

BIOS setting	Explanation	Configuration options	Effect
Total hours	Displays the runtime in hours.	None	-
Power on cycles	Displays the number of power cycles. Each restart increases the counter by one.	None	-

Table 169: Advanced - OEM features - System board features - Statistical values

1.6.1.3.2 Temperature values

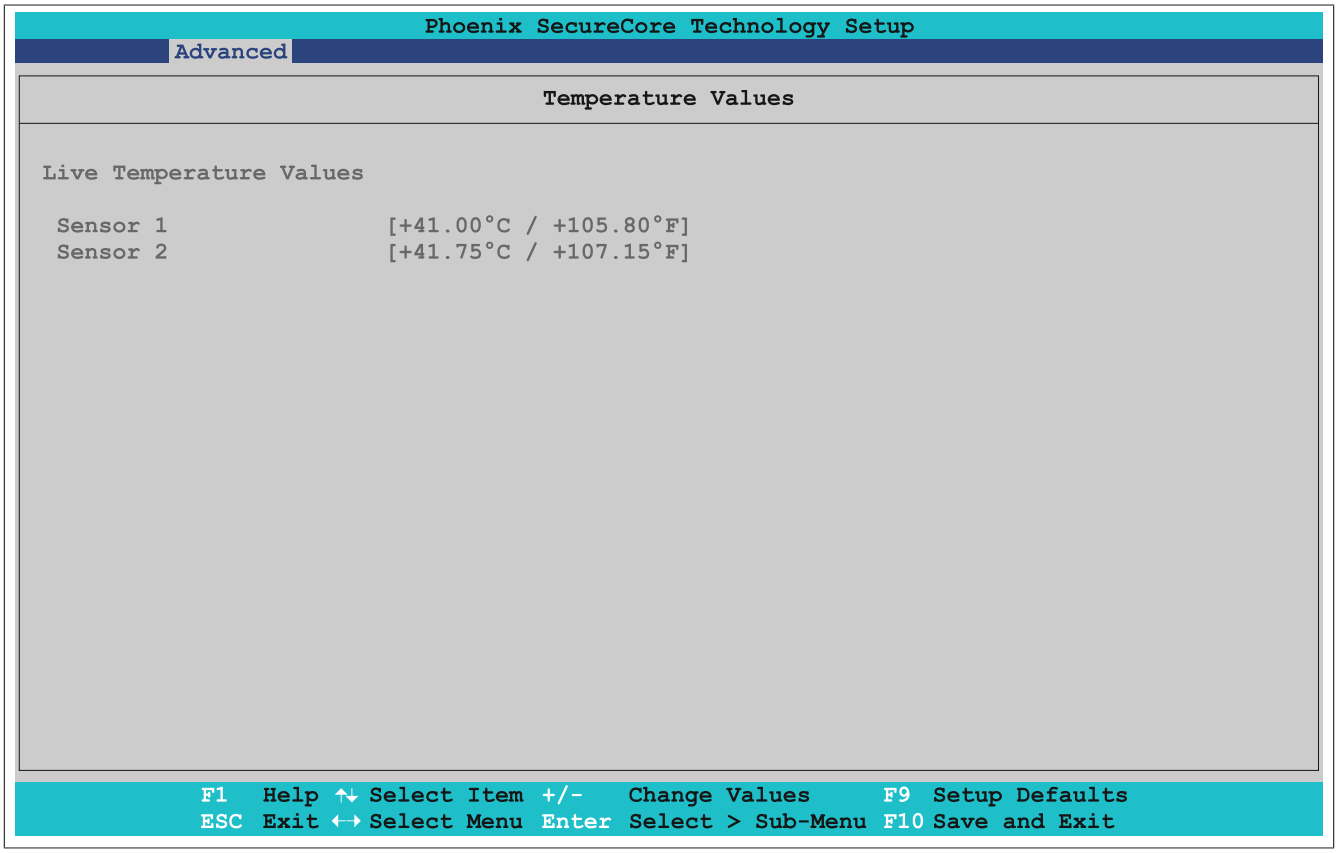


Figure 51: Advanced - OEM features - System board features - Temperature values

BIOS setting	Explanation	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (system unit sensor 2) in °C and °F (sensor near the RAM).	None	-
Sensor 2	Displays the current temperature of sensor 2 (system unit sensor 1) in °C and °F (sensor near the CPU).	None	-

Table 170: Advanced - OEM features - System board features - Temperature values

1.6.1.4 Display link features

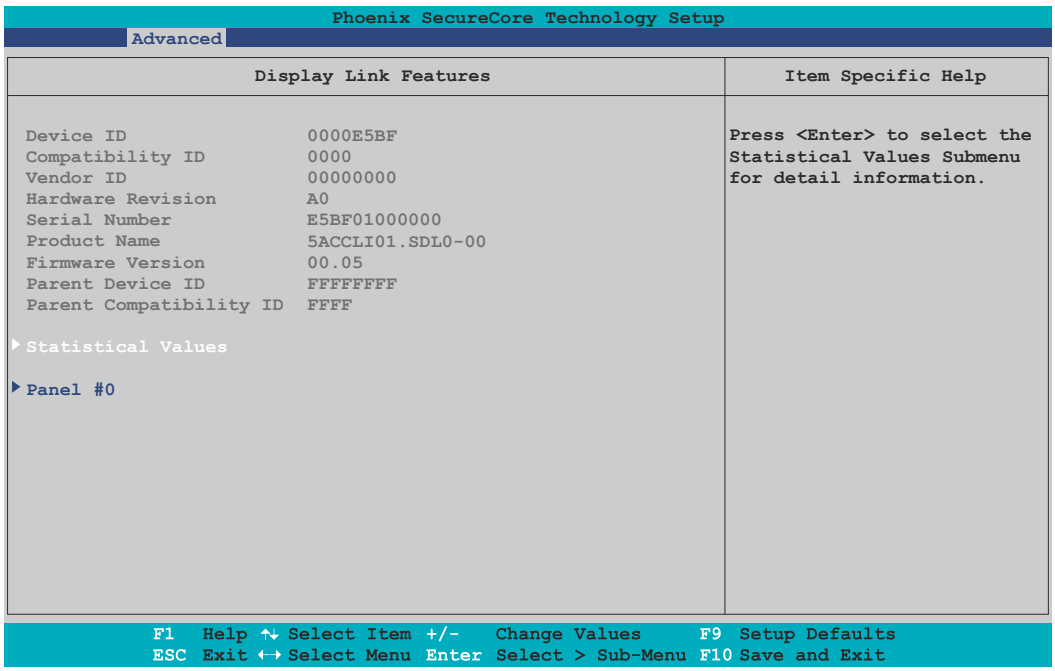


Figure 52: Advanced - OEM features - Display link features

BIOS setting	Explanation	Configuration options	Effect
Device ID	Displays the device ID of the connected display 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 display unit	None	-
Serial number	Displays the B&R serial number.	None	-
Product name	Displays the B&R model number.	None	-
Firmware version	Displays the firmware version	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 See "Statistical values" on page 150.
Panel #X	Displays the panel properties of the display unit	Enter	Opens this submenu See "Panel #x" on page 151.

Table 171: Advanced - OEM features - Display link features

1.6.1.4.1 Statistical values

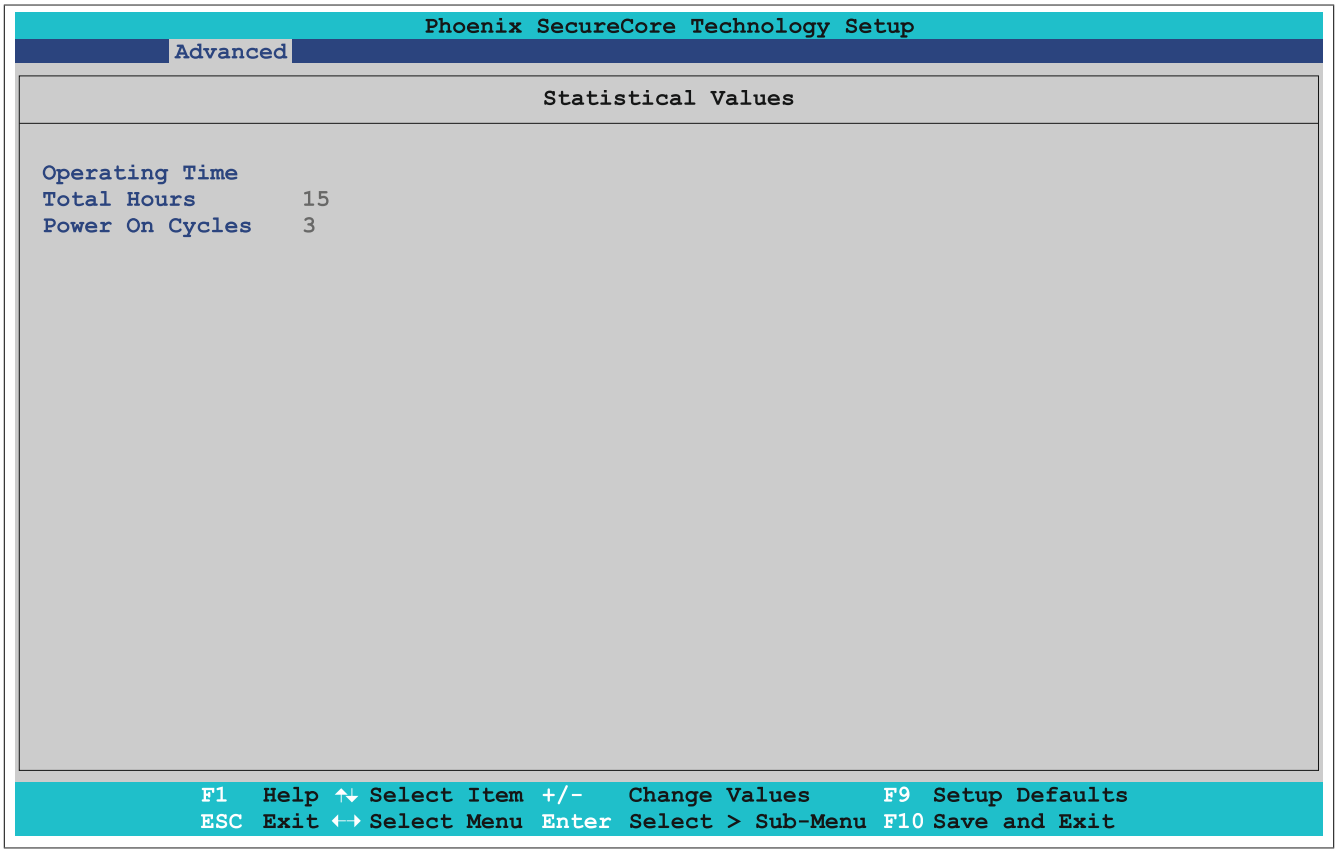


Figure 53: Advanced - OEM features - Display link features - Statistical values

BIOS setting	Explanation	Configuration options	Effect
Total hours	Displays the runtime in hours.	None	-
Power on cycles	Displays the number of power cycles. Each restart increases the counter by one.	None	-

Table 172: Advanced - OEM features - Display link features - Statistical values

1.6.1.4.2 Panel #x

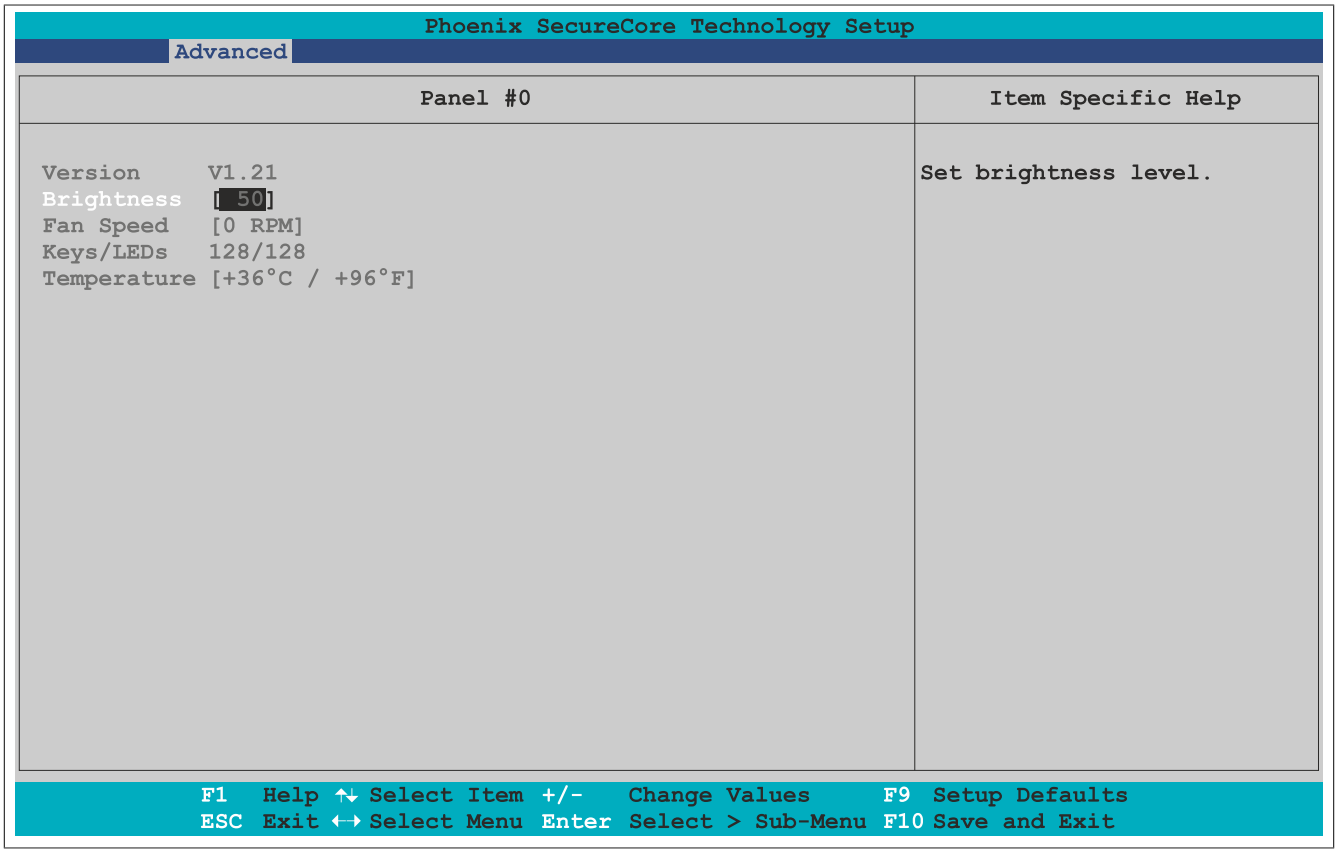


Figure 54: Advanced - OEM features - Display link features - Panel #x

BIOS setting	Explanation	Configuration options	Effect
Version	Displays the panel firmware version.	None	-
Brightness	Sets the display brightness.	0 to **100**	Sets the brightness (in %) of the selected panel. Settings take effect immediately.
Fan speed	Displays the fan speed of the display unit	None	-
Keys/LEDs	Displays the available keys and LEDs for the display unit	None	-
Temperature	Displays the temperature of the display unit in °C and °F	None	-

Table 173: Advanced - OEM features - Display link features - Panel #x

1.6.1.5 IF board features

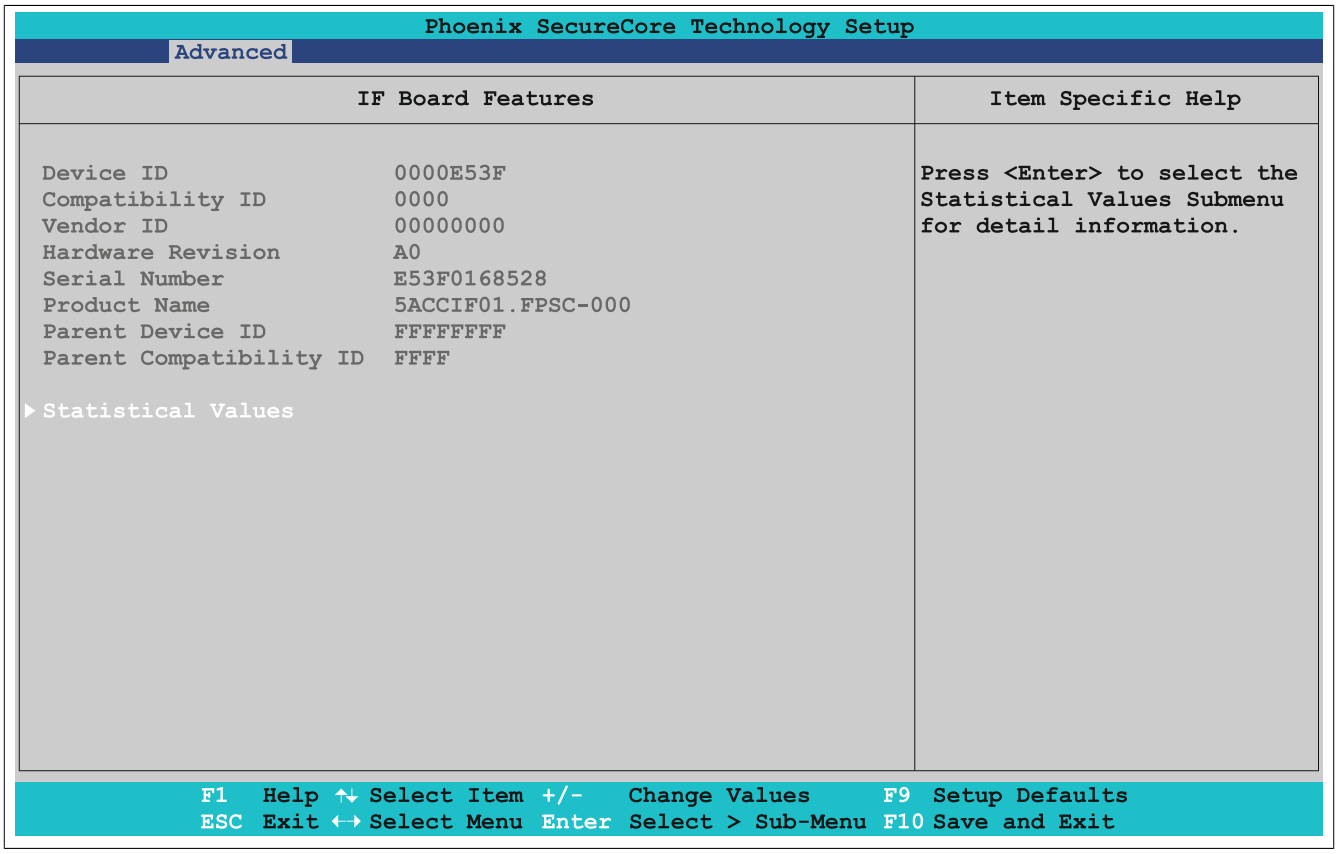


Figure 55: Advanced - OEM features - IF board features

BIOS setting	Explanation	Configuration options	Effect
Device ID	Displays the device ID of the IF option.	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 IF option.	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 See "Statistical values" on page 153.

Table 174: Advanced - OEM features - IF board features

1.6.1.5.1 Statistical values

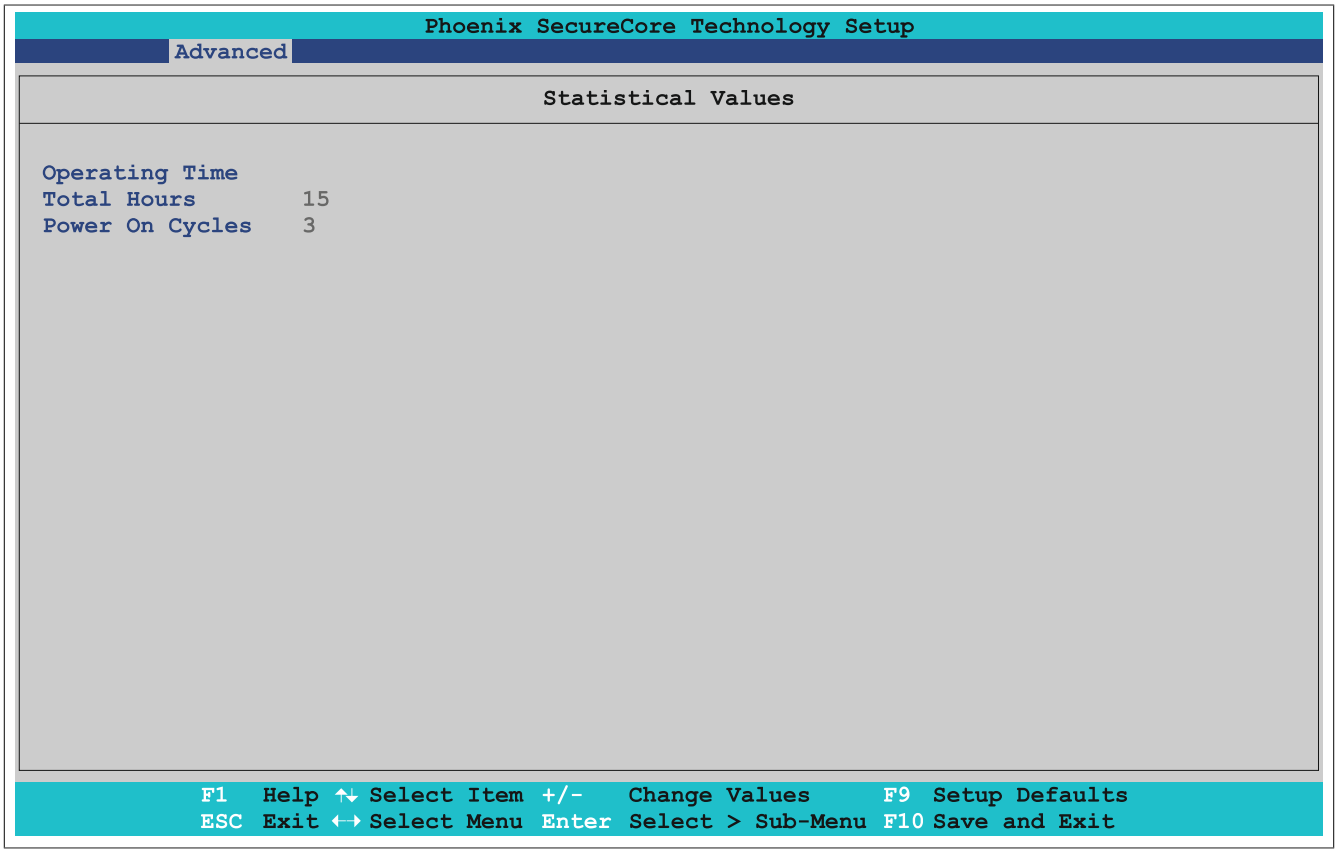


Figure 56: Advanced - OEM features - IF board features - Statistical values

BIOS setting	Explanation	Configuration options	Effect
Total hours	Displays the runtime in hours.	None	-
Power on cycles	Displays the number of power cycles. Each restart increases the counter by one.	None	-

Table 175: Advanced - OEM features - IF board features - Statistical values

1.6.2 CPU configuration

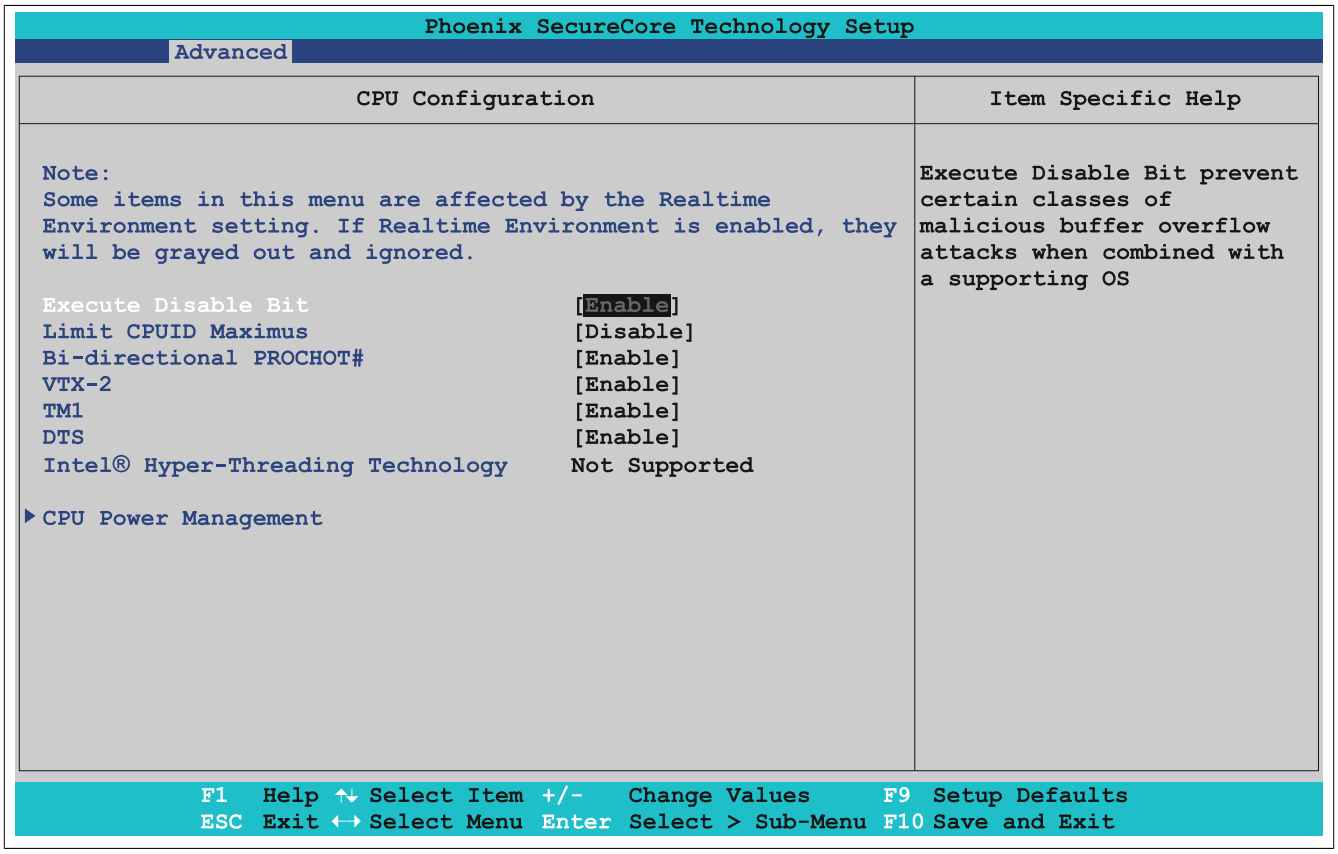


Figure 57: Advanced - CPU configuration

BIOS setting	Explanation	Configuration options	Effect
Execute disable bit	Option for enabling/disabling hardware support for prevention of data execution.	Disabled	Disables this function.
		Enabled	Enables this function.
Limit CPUID maximum	Option for limiting the CPU ID value. This may be necessary for older operating systems that do not support any CPUID functions, for example.	**Disabled**	Current maximum value returned by the processor when requesting the CPU ID value.
		Enabled	Maximum CPU ID value limited by the processor to 03h if needed if the processor supports a higher value.
Bi-directional PROCHOT#[1)]	Option for enabling/disabling the PROCHOT signal. The PROCHOT signal initiates temperature throttling to reduce the speed of the CPU and protect it from overheating.	Disabled	Disables this function. Only allows the processor cores to enable the PROCHOT signal and throttle down the processor.
		Enabled	Enables this function. Allows external services to enable the PROCHOT signal and throttle down the processor.
VTX-2	Option for enabling/disabling a virtual machine. **Information:** **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.
TM1	Option for configuring temperature monitoring.	Disabled	Disables temperature monitoring.
		Enabled	Enables Intel thermal mode 1. If the CPU reaches excessive temperatures, the processor speed will be reduced by 50%.
DTS	Option for enabling/disabling the CPU digital thermal sensor function.	Disabled	Disables this function.
		Enabled	Enables this function.
Intel® Hyper-Threading Technology	Indicates whether Intel® Hyper-Threading Technology is supported.	None	-
CPU power management	Configuration of CPU energy settings.	Enter	Opens this submenu See "CPU power management" on page 155.

Table 176: Advanced - CPU configuration

1) PROCHOT = Processor hot.

1.6.2.1 CPU power management

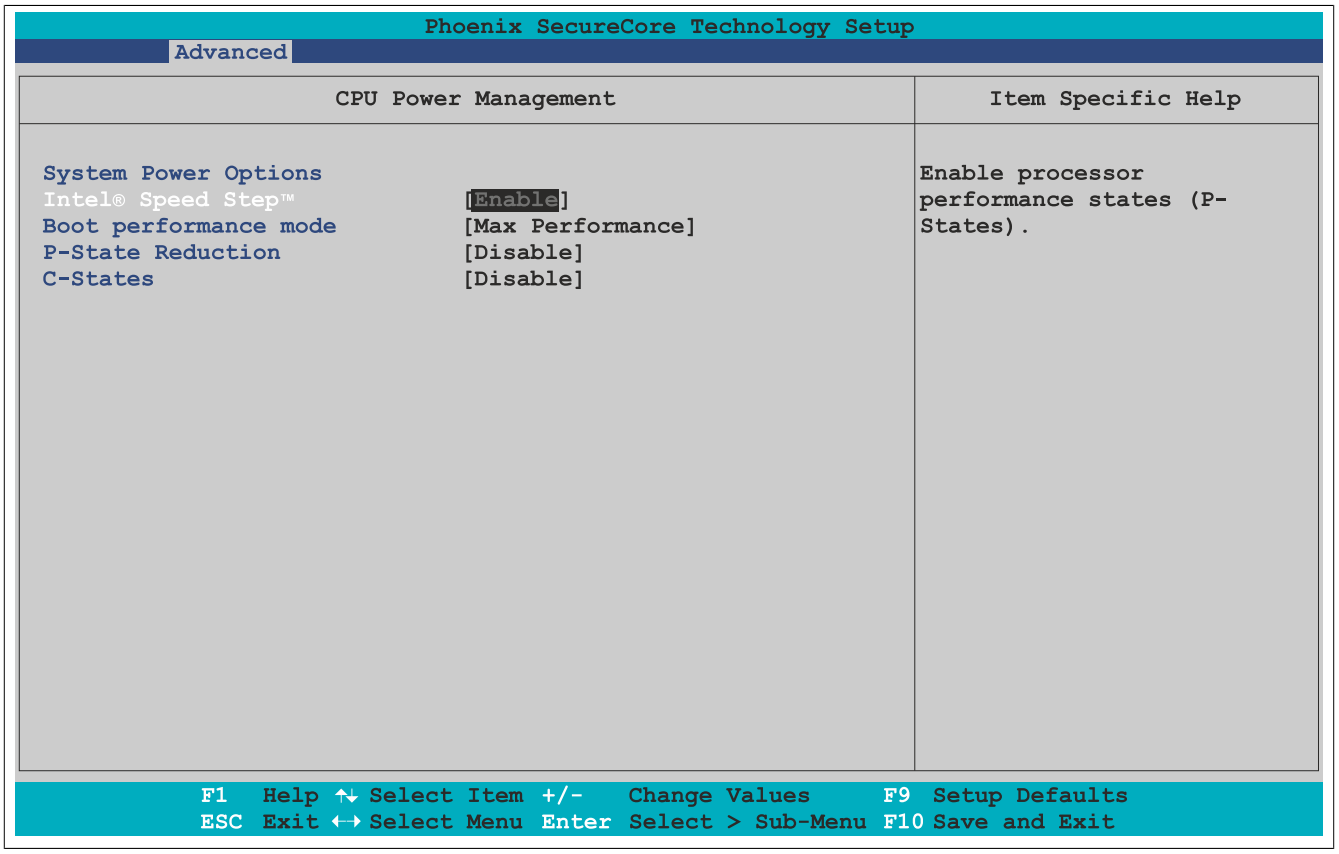


Figure 58: Advanced - CPU configuration - CPU power management

BIOS setting	Explanation	Configuration options	Effect
Intel® SpeedStep™	Option for controlling 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 this function.
		Enabled	The processor speed is regulated by the operating system.
Boot performance mode	Option for setting the CPU speed. **Information:** **This setting can be changed in ACPI operating systems by activating Intel® SpeedStep™ technology.**	**Max performance**	Maximum CPU and graphics speed.
		Max battery	Throttles down the CPU and graphics speed.
P-state reduction	Option for reducing CPU performance and power usage.	**Disabled**	Disables this function.
		By 1, 2, 3, 4, 5, 6, 7, 8	Reduces the performance by the configured value depending on the CPU being used.
C-States	This setting allows the operating system to set the processor clock speed on its own, thereby saving energy.	**Disabled**	Disables this function.
		Enabled	Enables this function. Additional settings can be selected.
Max C-States[1)]	This setting monitors the maximum C-State that the processor can support.	C7	Maximum C-State C7. CPU voltage is switched off completely.
		C6	Maximum C-State C6. CPU voltage is reduced to nearly 0 V.
		C1	Maximum C-State C1. Processor is in sleep mode, switch between C0 and C1.

Table 177: Advanced - CPU configuration - CPU power management

1) This setting is only possible if *C-States* is set to *Enabled*.

1.6.3 Graphics (IGD) configuration

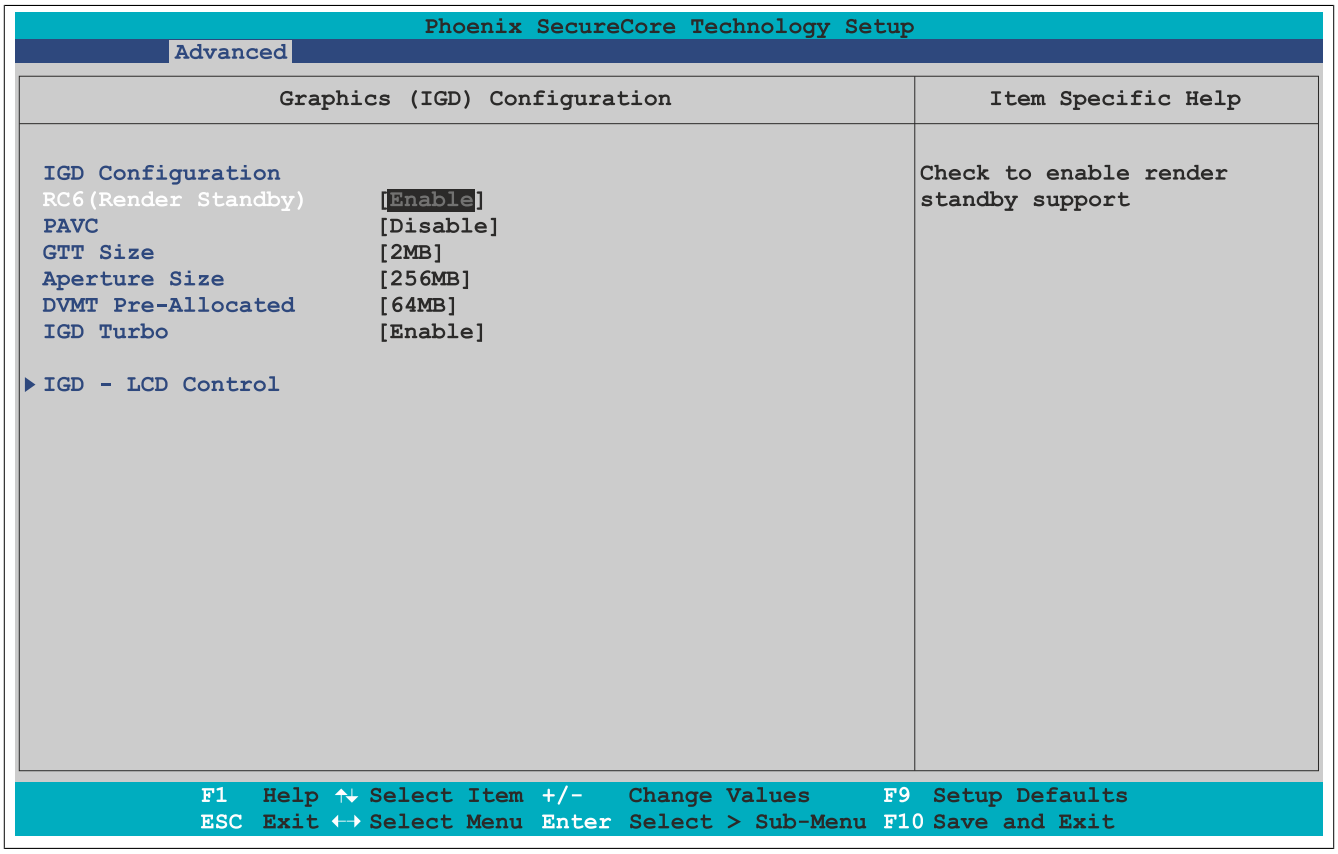


Figure 59: Advanced - Graphics (IGD) configuration

BIOS setting	Explanation	Configuration options	Effect
RC6 (render standby)	Option for enabling/disabling standby mode for onboard graphics to use less power.	Disabled	Disables this function.
		Enabled	Enables this function.
PAVC	Protected audio video control that protects data inside of the PC.	**Disabled**	Disables this function.
		LITE mode	Reserves memory.
		SERPENT mode	Reserves memory, which is not recognized by the operating system.
GTT size	Option for setting the size of the GTT (graphics translation table).	1 MB	1 MB GTT
		2 MB	2 MB GTT
Aperture size	Option for configuring the maximum amount of RAM made available to the main memory when graphics memory is full.	128 MB	Reserves 128 MB
		256 MB	Reserves 256 MB
		512 MB	Reserves 512 MB
DVMT pre-allocated	Option for setting the fixed amount of memory used for the internal graphics controller.	**64 MB**, 96 MB, 128 MB, 160 MB, 192 MB, 224 MB, 256 MB, 288 MB, 320 MB, 352 MB, 384 MB, 416 MB, 448 MB, 480 MB, 512 MB	Specifies the permanent graphic memory between 64 and 512 MB.
IGD turbo	Option for setting the graphic controller's turbo boost.	Disabled	Disables this function.
		Enabled	Enables this function.
IGD - LCD control	Configures the display settings of the connected panel.	Enter	Opens this submenu See "IGD - LCD control" on page 157.

Table 178: Advanced - Graphics (IGD) configuration

1.6.3.1 IGD - LCD control

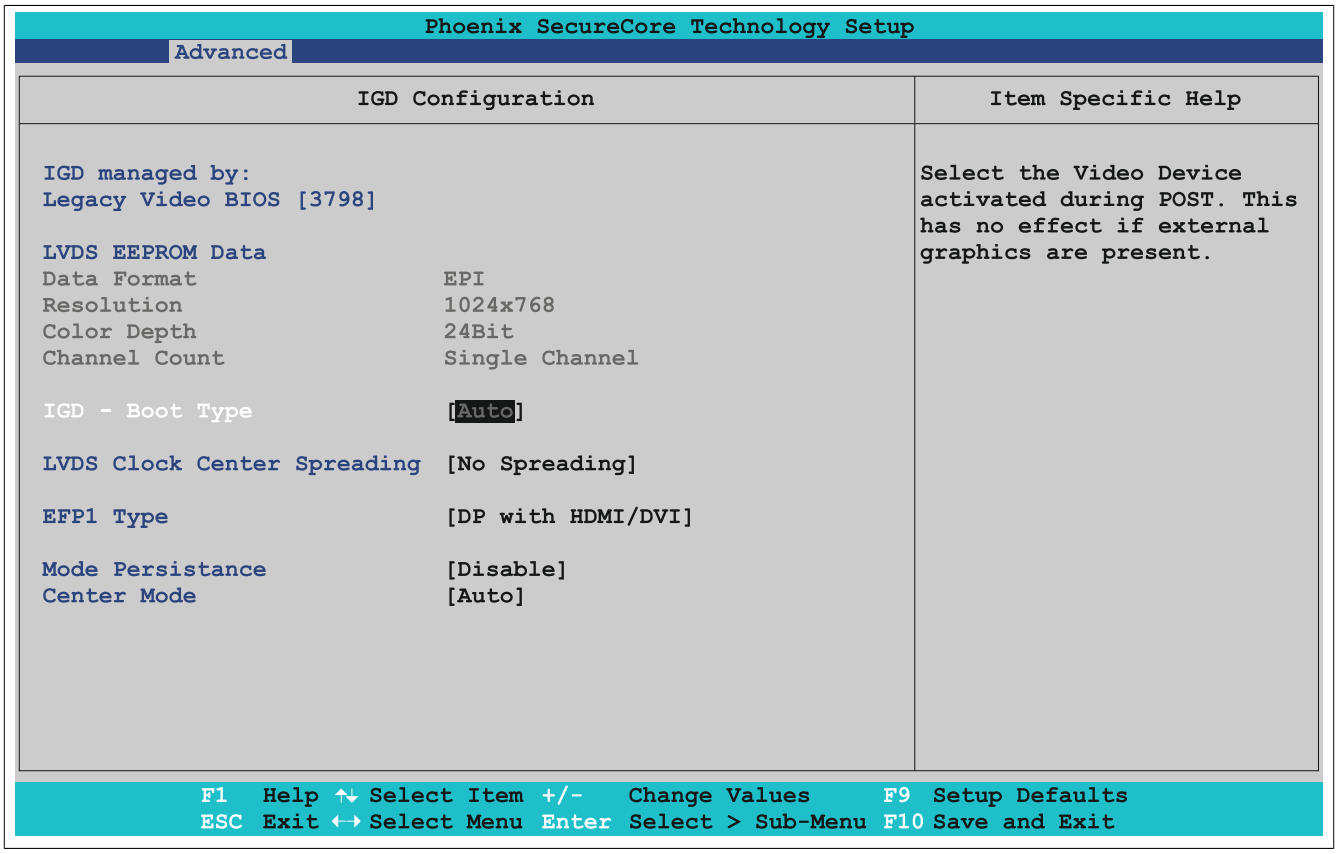


Figure 60: Advanced - Graphics (IGD) configuration - IGD configuration

BIOS setting	Explanation	Configuration options	Effect
Data format	Displays the data format of the LFP[1].	None	-
Resolution	Displays the display resolution of the LFP.	None	-
Color depth	Displays the display color depth of the LFP.	None	-
Channel count	Displays the LFP channels.	None	-
IGD - Boot type	Option for defining the primary enabled panel during POST.	**Auto**	Automatic selection.
		CRT	Uses the CRT (cathode ray tube) channel.
		EFP	Uses the EFP (external flat panel) channel.
		LFP	Uses the LFP (local flat panel) channel.
IGD - Secondary boot type[2]	Option for defining the secondary enabled panel during POST. **Information:** **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.
		CRT	Uses the CRT (cathode ray tube) channel.
		EFP	Uses the EFP (external flat panel) channel.
		LFP	Uses the LFP (local flat panel) channel.
LFP type[3]	Option for manually setting the LFP (local flat panel) type.	Auto	Automatically defines the LFP type based on the EDID data.
		VGA 640 x 480 1x18 to WUXGA 1920 x 1200 2x24	Manual setting of the resolution from 640 x 480 to 1920 x 1200.
LVDS clock center spreading	Option for modulating the LVDS clock frequency to slightly reduce electromagnetic interference.	**No spreading**	Disables this function.
		0.5%, 1.0%, 1.5%, 2.0%, 2.5%	Varies the LVDS clock frequency by the configured value to improve the EMC characteristics.
EFP1 type[4]	Option for setting the type of external flat panel 1.	DisplayPort only	Configures the interface as a DisplayPort interface.
		DP with HDMI/DVI	Configures the interface as a DisplayPort interface with HDMI/DVI.
		HDMI/DVI	Configures the interface as an HDMI/DVI interface.
Mode persistence	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 179: Advanced - Graphics (IGD) configuration - IGD configuration

BIOS setting	Explanation	Configuration options	Effect
Center mode	Displays the image in the middle of panels without a scaler chip.	Disabled	Disables this function.
		Auto	Enables this function for all connected panels/monitors.
		CRT	Enables this function for CRT monitors.
		EFP	Enables this function for panels.

Table 179: Advanced - Graphics (IGD) configuration - IGD configuration

1) LFP = Local flat panel.
2) This setting is only possible if *IGD - Boot type* is set to *CRT*, *EFP* or *LFP*.
3) This setting is only possible if *IGD - Boot type* is set to *LFP*.
4) This setting is only possible if *IGD - Boot type* is set to *Auto* or *EFP*.

1.6.4 LAN

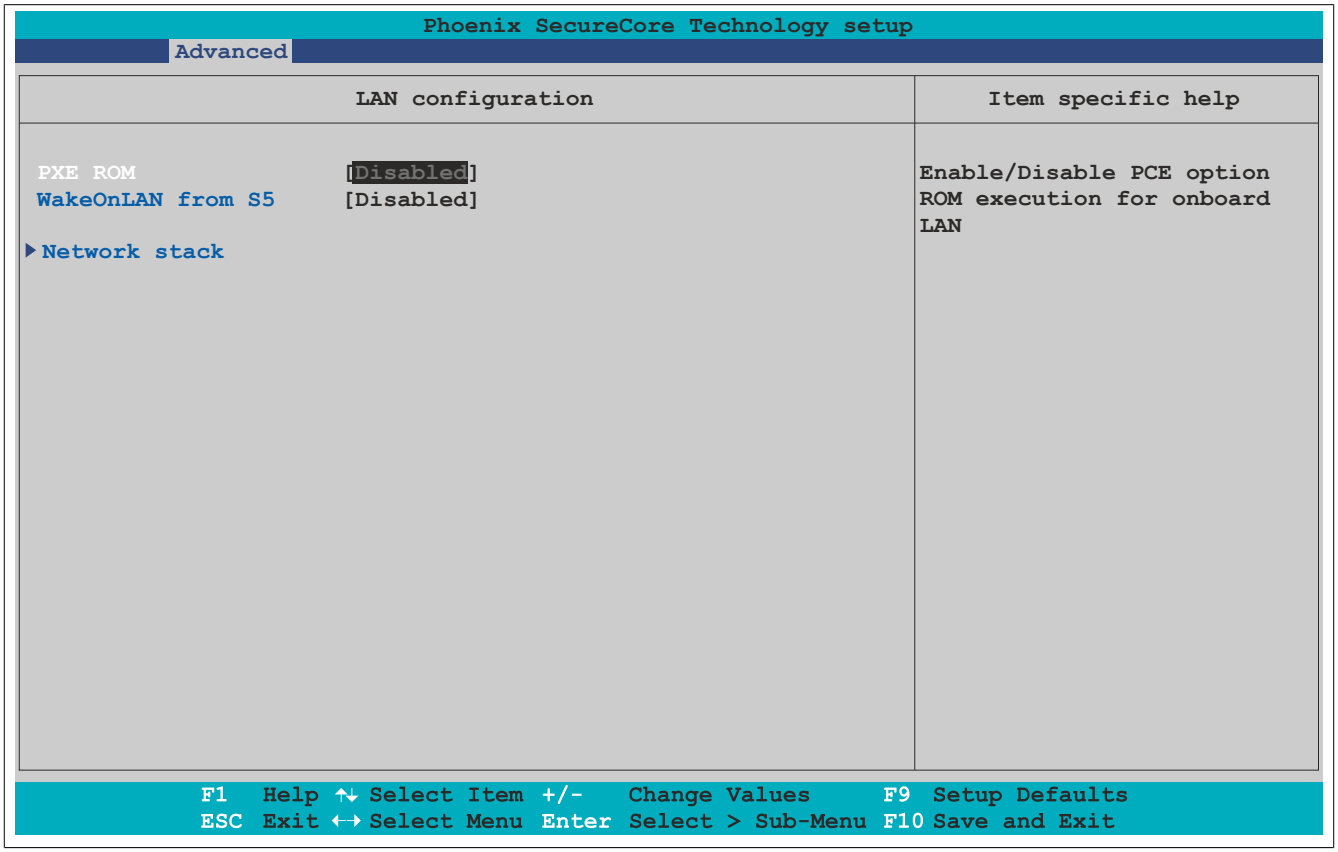


Figure 61: Advanced - LAN

BIOS setting	Explanation	Configuration options	Effect
PXE ROM	Option for configuring PXE boot features.	**Disabled**	Disables this function.
		Onboard ETH1 only	Enables this function for ETH1.
		Onboard ETH2 only	Enables this function for ETH2.
		Both onboard only	Enables this function for ETH1 and ETH2.
		Add-on only	Enables this function for an optional add-on card.
		Any	Enables this function for all devices, ETH1 and ETH2.
WakeOnLAN from S5	Option for switching on the system via the onboard Ethernet controller (ETH1) from mode S5.	Disabled	Disables this function. The Ethernet controller cannot switch on the system.
		Enabled	Enables this function. The Ethernet controller can switch on the system.
Network stack	Configures the network stack	Enter	Opens submenu "Network stack" on page 159

Table 180: Advanced - LAN

1.6.4.1 Network stack

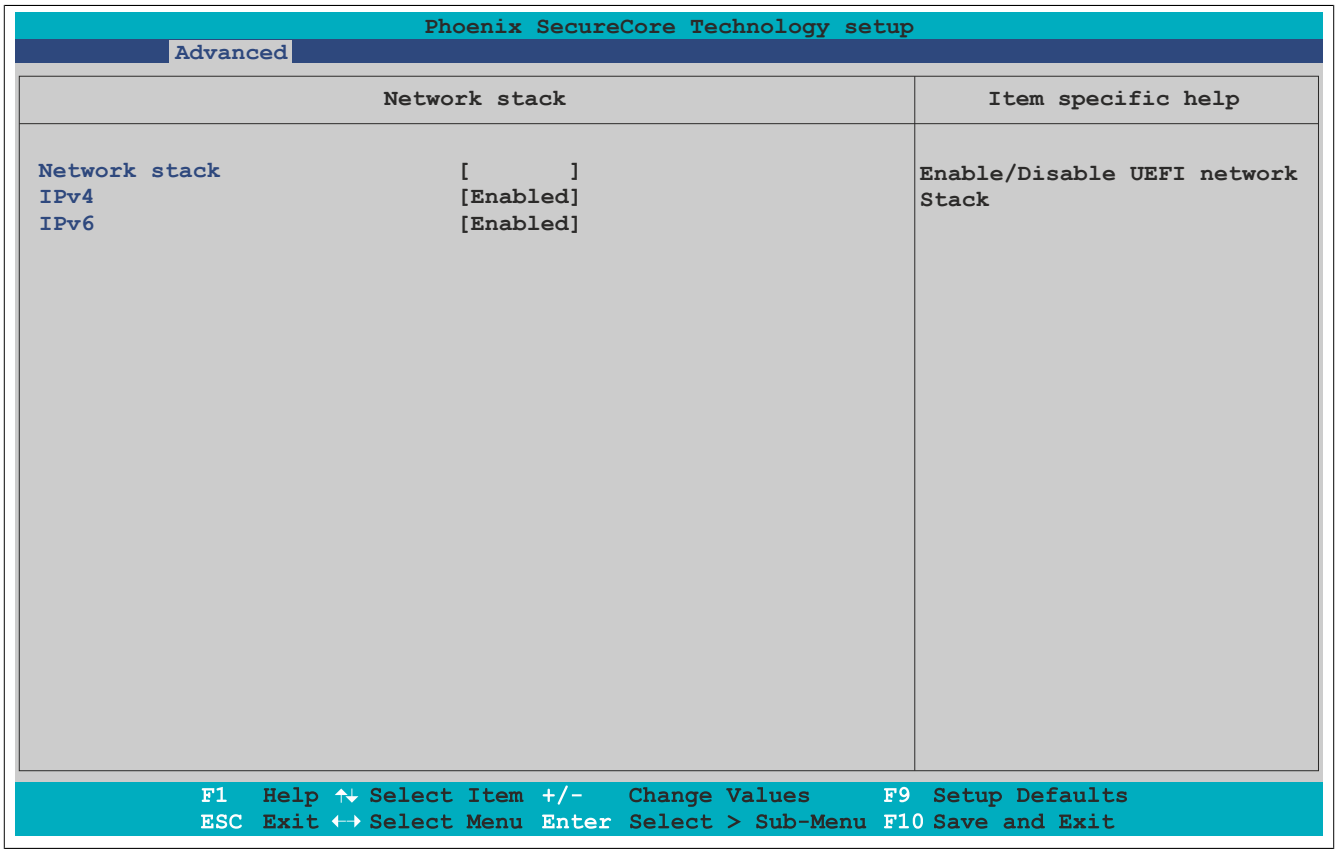


Figure 62: Advanced - Network stack

BIOS setting	Explanation	Configuration options	Effect
Network stack	Option for enabling/disabling the UEFI network stack	**Disabled**	Disables this function.
		Enabled	Enables this function.
IPv4	Option for enabling/disabling IPv4 PXE support.	**Enabled**	Enables this function.
		Disabled	Disables this function.
IPv6	Option for enabling/disabling IPv6 PXE support.	**Enabled**	Enables this function.
		Disabled	Disables this function.

Table 181: Advanced - Network stack

1.6.5 PCI express configuration

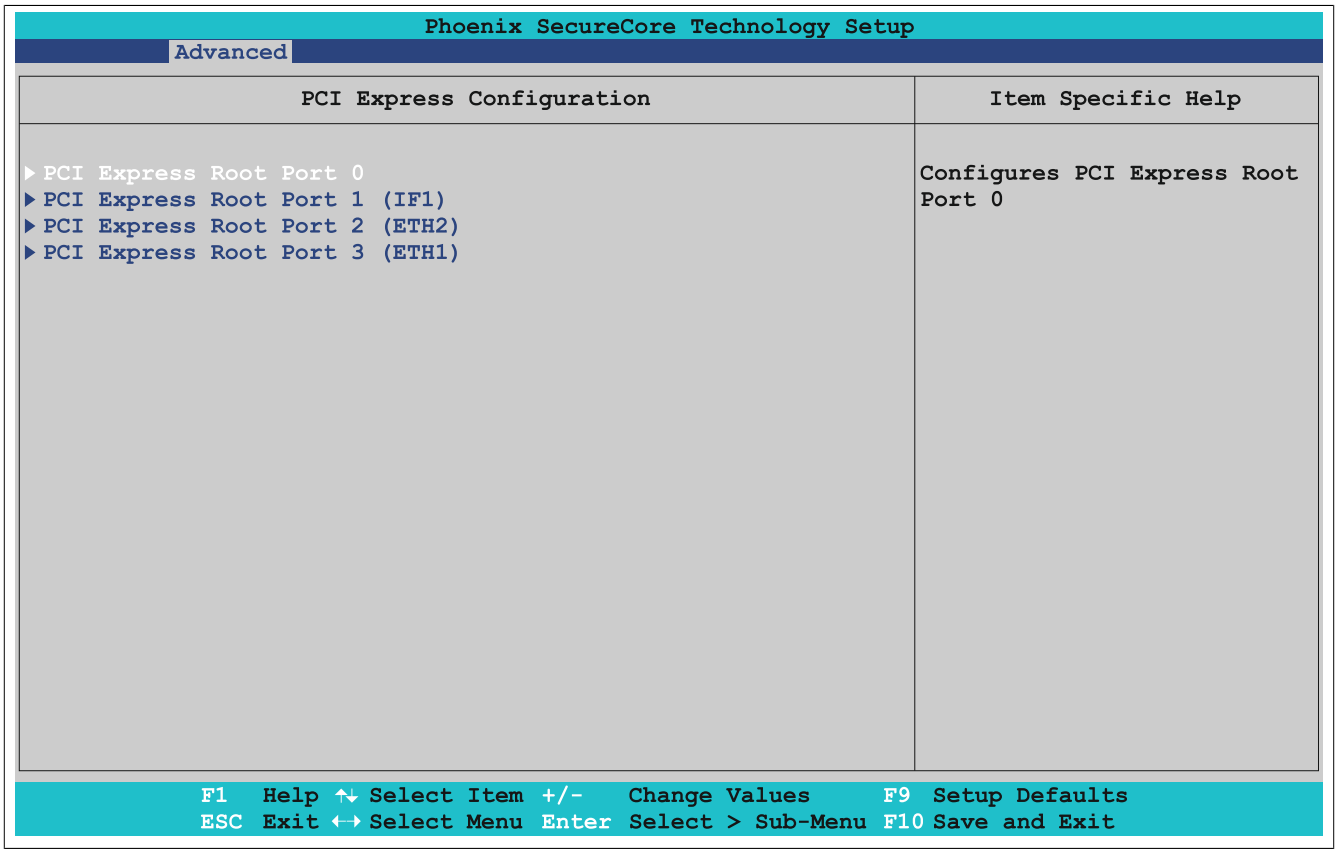


Figure 63: Advanced - PCI express configuration

BIOS setting	Explanation	Configuration options	Effect
PCI Express root port 0	Configures PCI Express settings on port 0.	Enter	Opens this submenu See "PCI Express root port 0 to 3" on page 161.
PCI Express root port 1 (IF1)	Configures PCI Express settings on port 1 (interface option).	Enter	Opens this submenu See "PCI Express root port 0 to 3" on page 161.
PCI Express root port 2 (ETH2)	Configures PCI Express settings on port 2 (ETH2).	Enter	Opens this submenu See "PCI Express root port 0 to 3" on page 161.
PCI Express root port 3 (ETH1)	Configures PCI Express settings on port 3 (ETH1).	Enter	Opens this submenu See "PCI Express root port 0 to 3" on page 161.

Table 182: Advanced - PCI express configuration

1.6.5.1 PCI Express root port 0 to 3

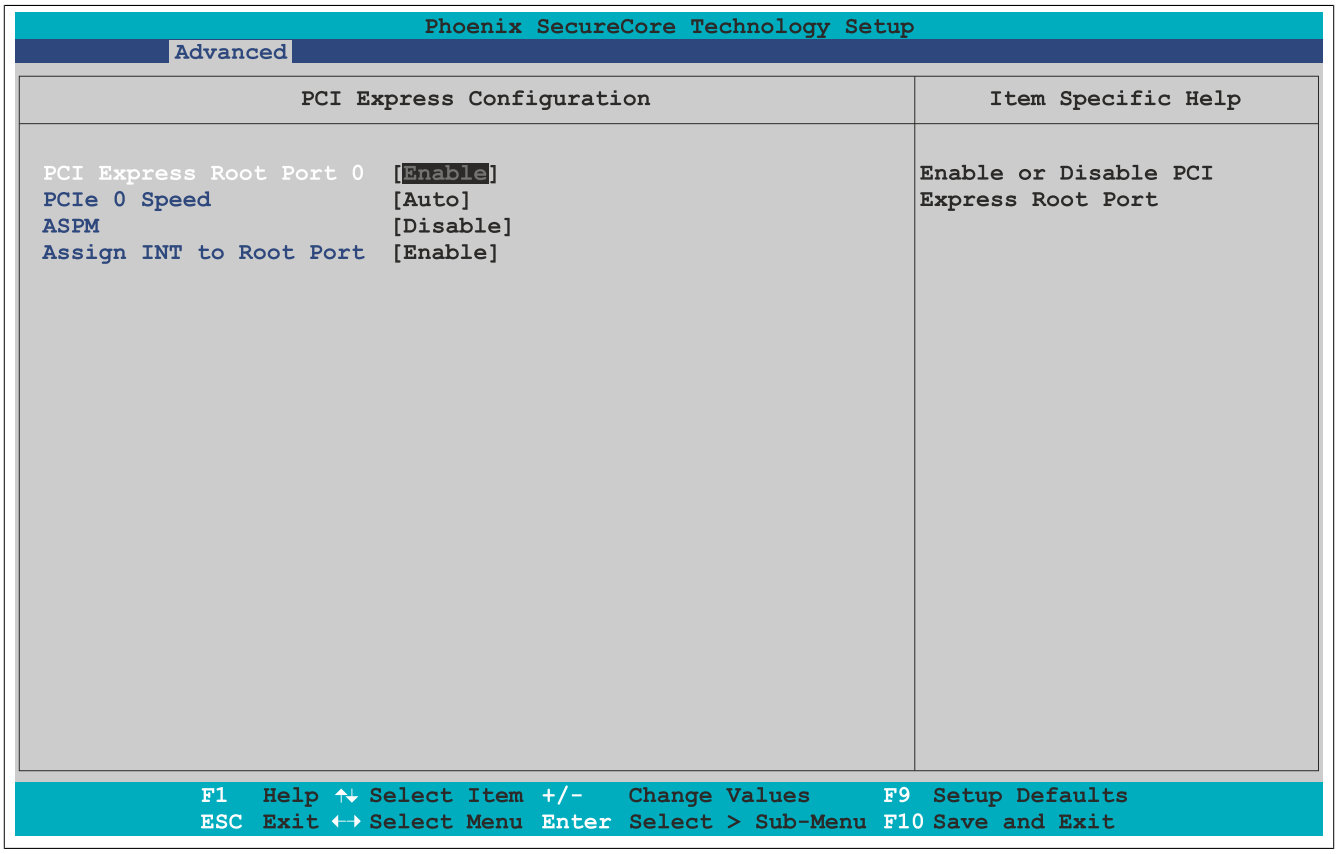


Figure 64: Advanced - PCI Express configuration - PCI Express root port

BIOS setting	Explanation	Configuration options	Effect
PCI Express root port x	Option for enabling/disabling the PCI Express root port.	**Enabled**	Enables the PCI Express root port.
		Disabled	Disables the PCI Express root port.
PCIe x 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.
ASPM	*Active State Power Management* 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.
		L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device.
		Auto	Automatic assignment by BIOS and the operating system.
Assign INT to root port	Option for enabling/disabling the IRQ for the root port.	**Enabled**	Enables this function.
		Disabled	Disables this function.

Table 183: Advanced - PCI Express configuration - PCI Express root port

1.6.6 USB configuration

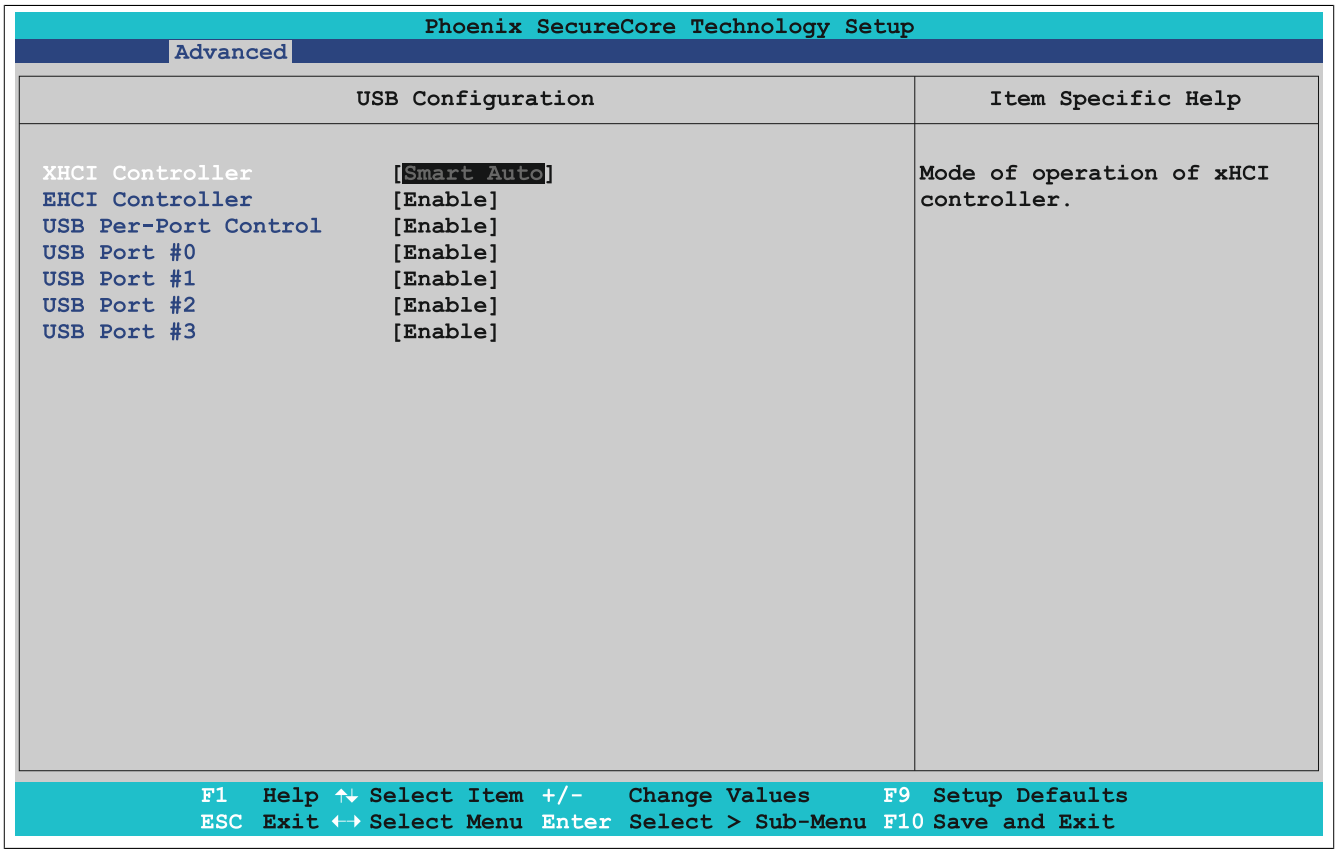


Figure 65: Advanced - USB configuration

BIOS setting	Explanation	Configuration options	Effect
XHCI controller	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 PC is rebooted, then the USB 3.0 interfaces are still handled as USB 3.0 during booting.
		Disabled	Disables the xHCI controller. All USB 3.0 interfaces become USB 2.0 interfaces.
		Enabled	Enables the xHCI controller so that USB 3.0 interfaces are always identified as such.
EHCI controller	Configures USB EHCI controllers for the USB interfaces.	Disabled	Disables the EHCI controller.
		Enabled	Enables the EHCI controller.
USB per port control	Option for enabling/disabling individual USB interfaces.	Disabled	Hides the BIOS settings for "USB port #x".
		Enabled	Shows the BIOS settings for "USB port #x".
USB port #0	Option for enabling/disabling the USB1 interface.	Disabled	Disables this USB interface.
		Enabled	Enables this USB interface.
USB port #1	Option for enabling/disabling the USB2 interface.	Disabled	Disables this USB interface.
		Enabled	Enables this USB interface.
USB port #2	Option for enabling/disabling the monitor/panel option	Disabled	Disables this USB interface.
		Enabled	Enables this USB interface.
USB port #3	No function	Disabled	-
		Enabled	-

Table 184: Advanced - USB configuration

1.6.7 SATA configuration

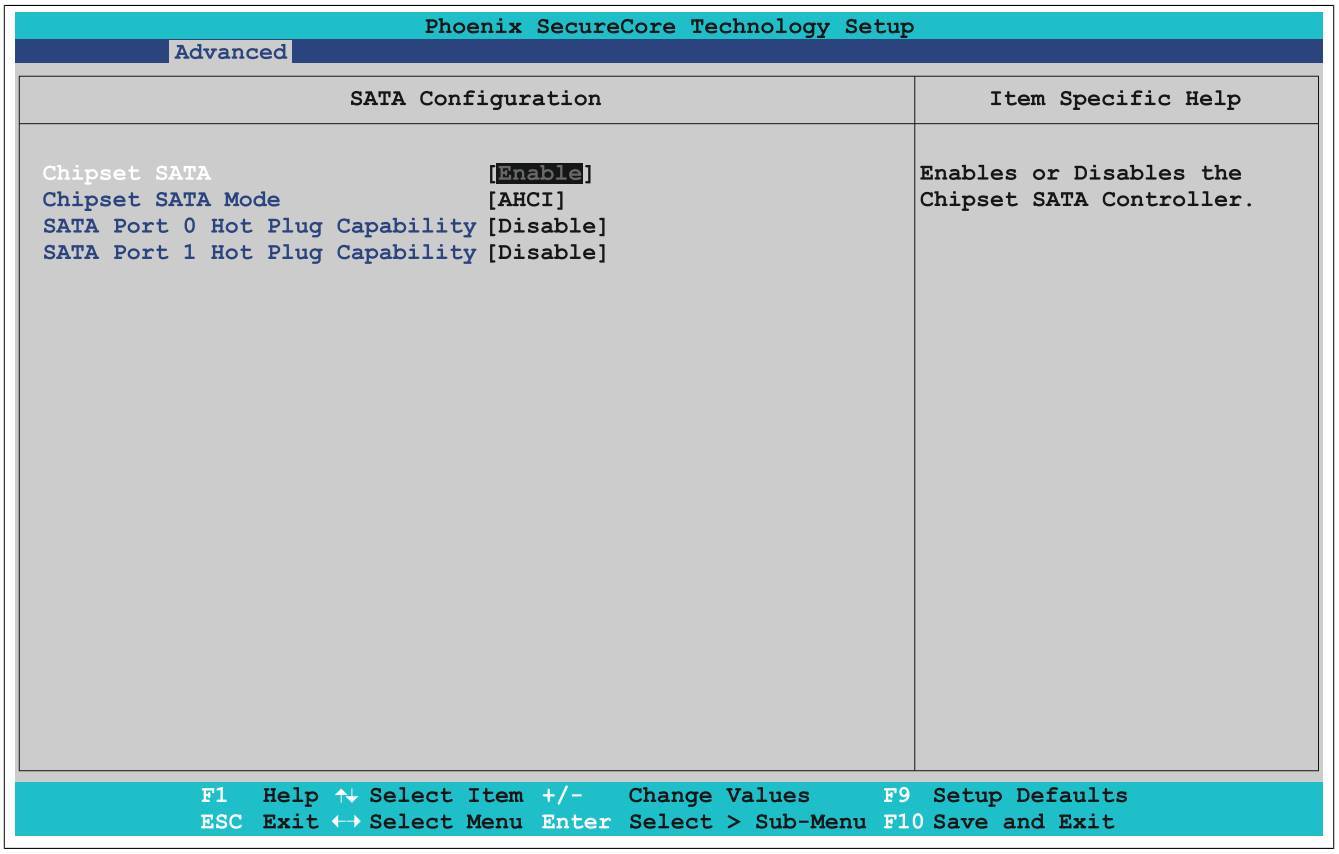


Figure 66: Advanced - SATA configuration

BIOS setting	Explanation	Configuration options	Effect
Chipset SATA	Option for configuring SATA support.	**Enabled**	Provides support for SATA devices.
		Disabled	No support for SATA devices.
Chipset SATA mode	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.
SATA port 0 hot plug capability	Option for configuring hot plugging for SATA interface 0.	Enabled	Enables hot plugging for SATA interface 0. Devices can be connected/disconnected during operation.
		Disabled	Disables hot plugging for SATA interface 0.
SATA port 1 hot plug capability	Option for configuring hot plugging for SATA interface 1.	Enabled	Enables hot plugging for SATA interface 1. Devices can be connected/disconnected during operation.
		Disabled	Disables hot plugging for SATA interface 1.

Table 185: Advanced - SATA configuration

1.6.8 Miscellaneous configuration

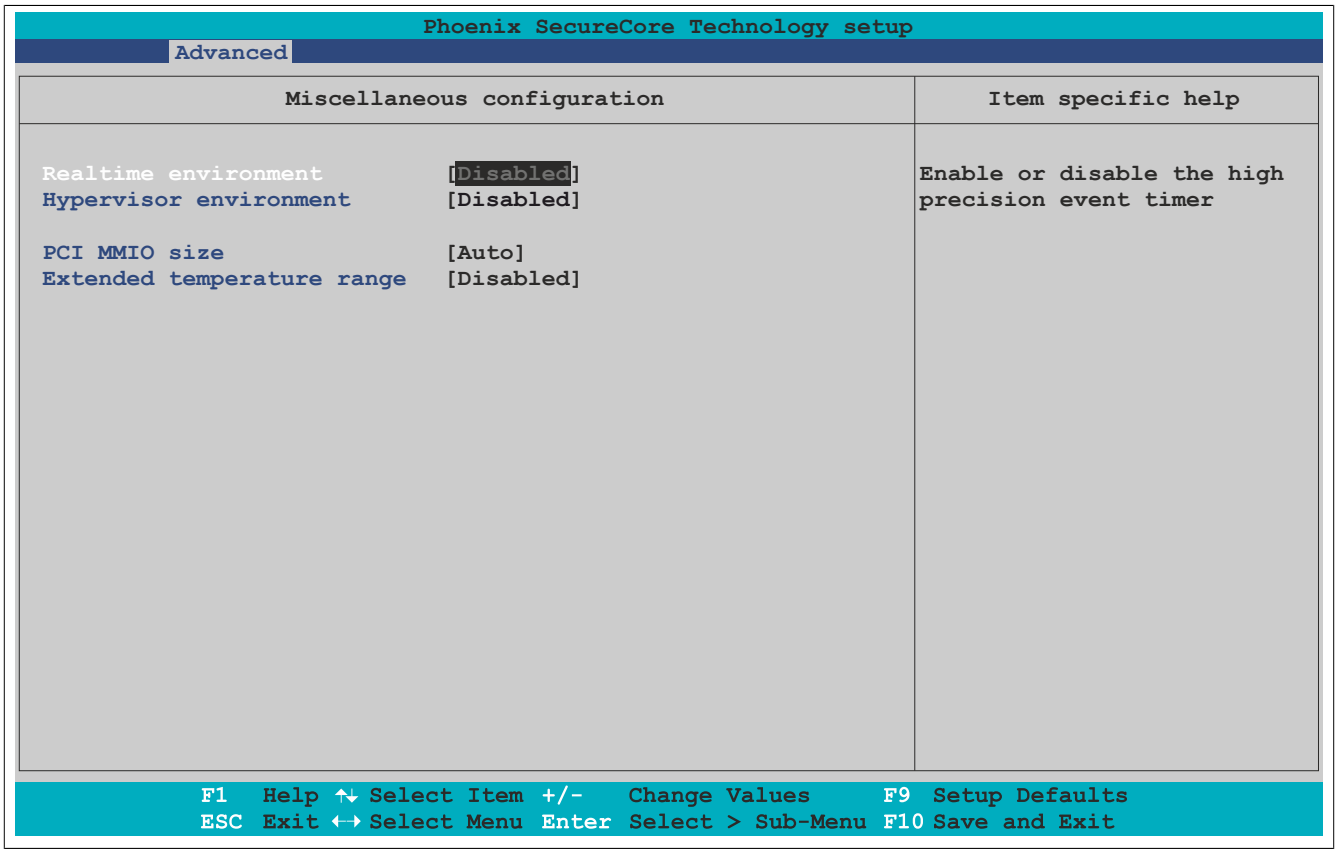


Figure 67: Advanced - Miscellaneous configuration

BIOS setting	Explanation	Configuration options	Effect
Realtime environment	Configures settings for real-time operating systems such as Automation Runtime.	**Disabled**	Disables this function.
		Enabled	Disables DTS, Turbo Boost, SpeedStep, ASPM and the INT of root port 1 (IF). "CPU C-states" are also disabled, and "Boot performance mode" is set to "Max. performance". The options that are disabled and configured by Realtime environment are grayed out and cannot be changed.
Hypervisor environment	This option configures settings for hypervisor operation.	**Disabled**	Disables this function.
		Enabled	VTX (Virtualization technology) is enabled. The options that are configured by the hypervisor environment are grayed out and cannot be changed.
PCI MMIO size	Option for setting the PCI MMIO (memory-mapped I/O) size. **Information:** **With 32-bit operating systems, the configured MMIO size is stored in the memory under 4 GB. There is therefore less memory available (by the MMIO size) on systems with 4 GB main memory.** **This is not the case with 64-bit operating systems.**	2 GB, 1.5 GB, 1.25 GB, 1 GB, **auto**	Sets the selected memory size.
Extended temperature range	Option for configuring the RAM refresh rate for the extended temperature range.	**Disabled**	Default RAM refresh rate.
		Enabled	Increases the RAM refresh rate.

Table 186: Advanced - Miscellaneous configuration

1.6.9 Thermal configuration

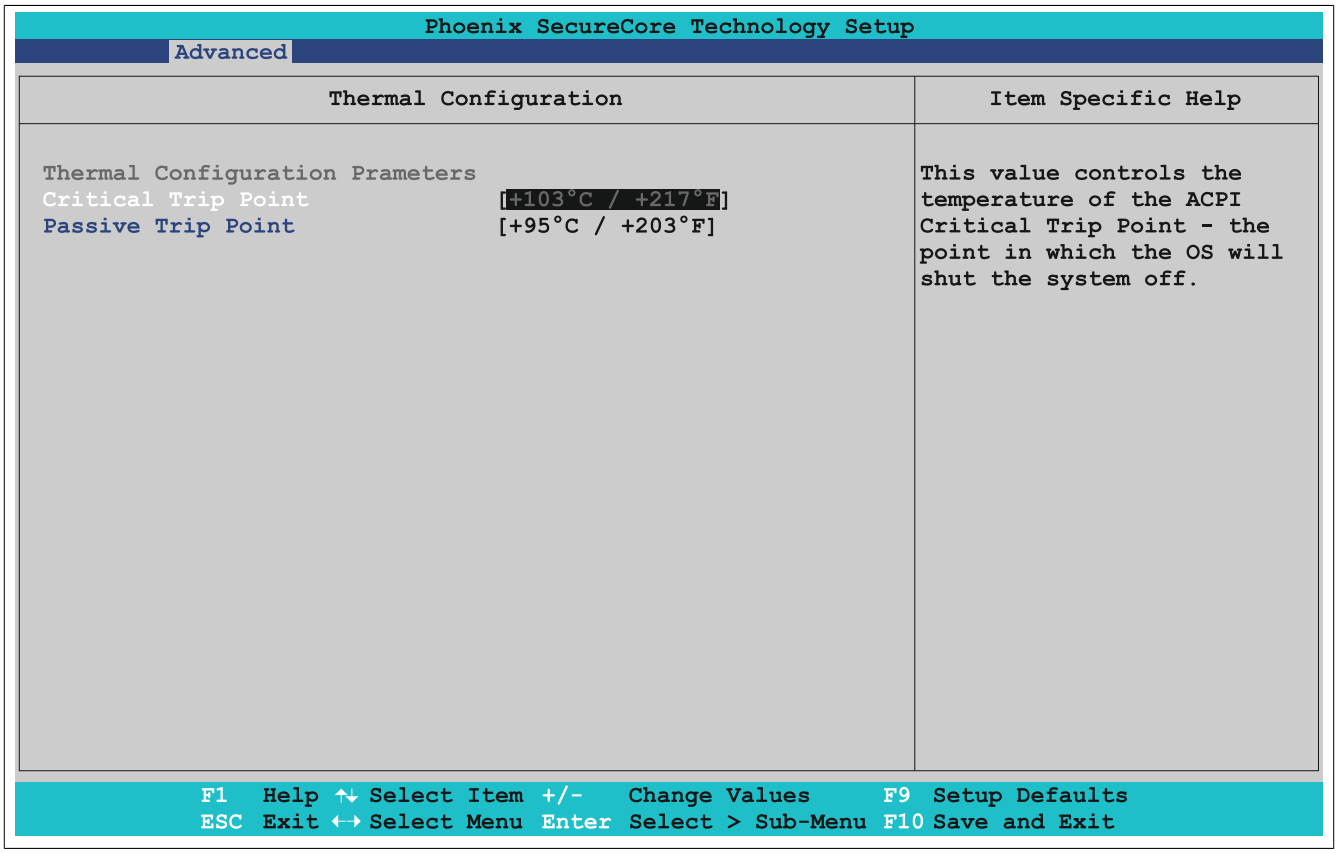


Figure 68: Advanced - Thermal configuration

BIOS setting	Explanation	Configuration options	Effect
Critical trip point	Option for configuring a CPU temperature at which the operating system automatically shuts down.	15°C / 59°F, 23°C / 73°F, 31°C / 88°F, 39°C / 102°F, 47°C / 117°F, 55°C / 131°F, 63°C / 145°F, 71°C / 160°F, 79°C / 174°F, 85°C / 185°F, 87°C / 189°F, 90°C / 194°F, 95°C / 203°F, **103°C / 217°F**, 111°C / 232°F	Temperature setting for the critical trip point.
		Disabled	Disables this function.
Passive trip point	Option for configuring a CPU temperature at which the operating system throttles the CPU speed.	15°C / 59°F, 23°C / 73°F, 31°C / 88°F, 39°C / 102°F, 47°C / 117°F, 55°C / 131°F, 63°C / 145°F, 71°C / 160°F, 79°C / 174°F, 85°C / 185°F, 87°C / 189°F, 90°C / 194°F, **95°C / 203°F**, 103°C / 217°F	Temperature setting for the passive trip point.
		Disabled	Disables this function.

Table 187: Advanced - Thermal configuration

1.7 Security

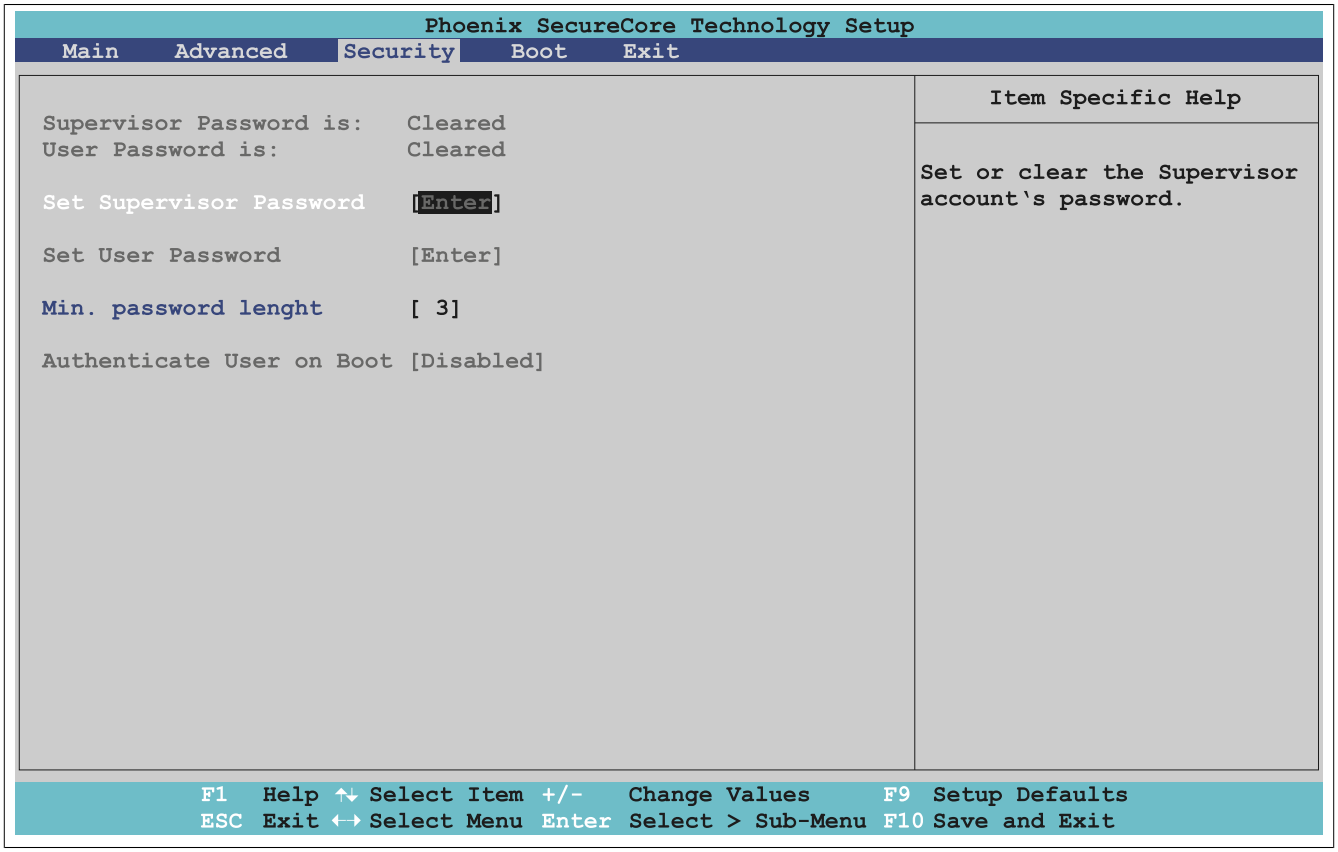


Figure 69: Security

BIOS setting	Explanation	Configuration options	Effect
Supervisor password is:	Displays whether a supervisor password has been set.	None	-
User password is:	Displays whether a user password has been set.	None	-
Set supervisor password	Function for entering, changing or deleting a supervisor password. A supervisor password is necessary to edit all BIOS settings.	Enter	Password entry.
Set user password[1)]	Function for entering, changing or deleting a user password. The user password allows only certain BIOS settings to be changed.	Enter	Password entry.
Minimum password length	Option for setting the minimum length of a password.	**3** to 20	Enters the minimum length of a password.
Authenticate user on boot[1)]	Option for configuring whether the user password must be entered on each system boot.	Disabled	Does not require the user password to be entered when booting.
		Enabled	Requires the user password to be entered when booting.

Table 188: Security

1) This setting can only be configured if a *supervisor password* has been set.

1.8 Boot

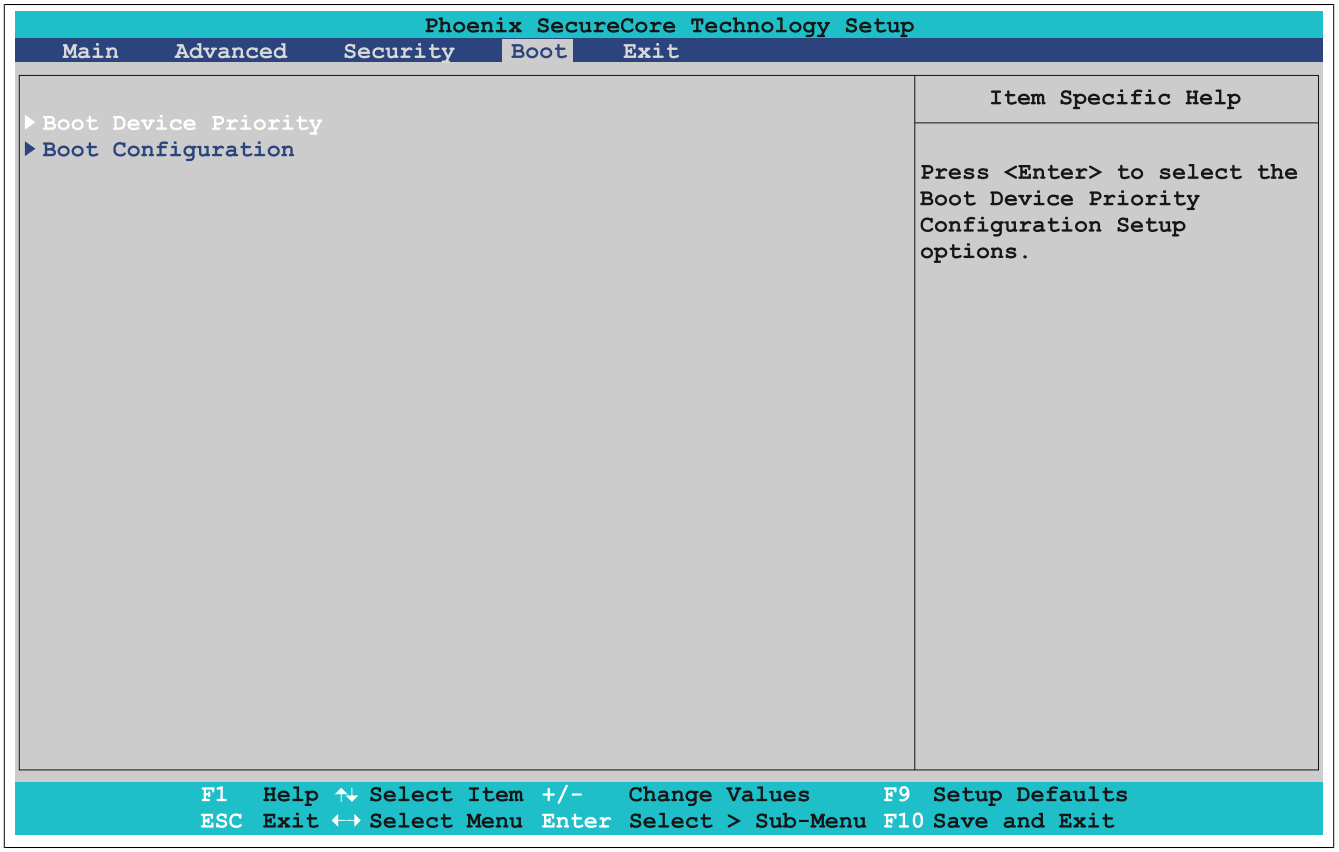


Figure 70: Boot

BIOS setting	Explanation	Configuration options	Effect
Boot device priority	Configures the boot order.	Enter	Opens this submenu See "Boot device priority" on page 168.
Boot configuration	Configures the boot settings.	Enter	Opens this submenu See "Boot configuration" on page 169.

Table 189: Boot

1.8.1 Boot device priority

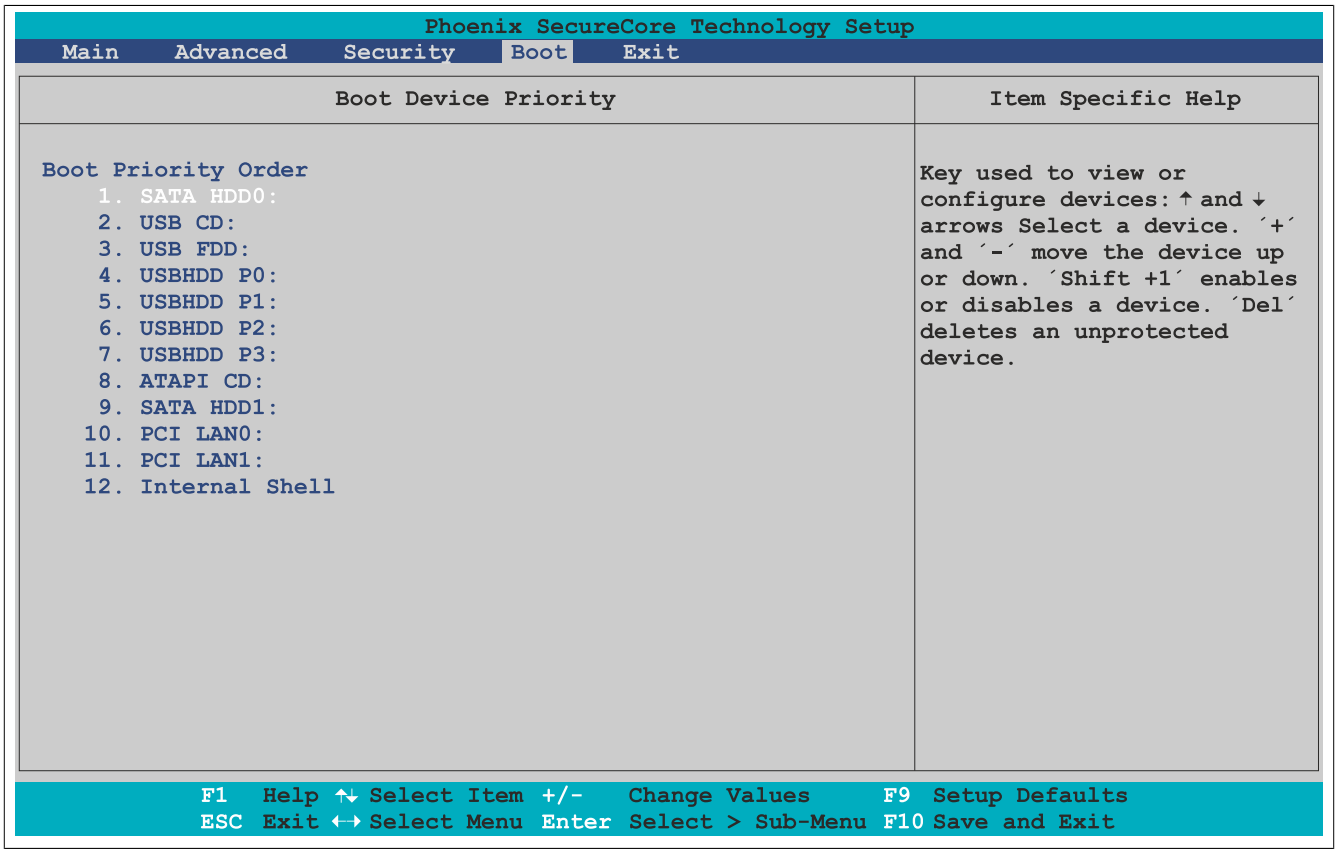


Figure 71: Boot - Boot device priority

BIOS setting	Explanation	Configuration options	Effect
Boot priority order	Option for configuring the desired boot order.	SATA HDD0:	Specifies the desired boot sequence. Boot devices can be selected with the ↑ and ↓ arrow keys. The order is changed with "+" and "-". "Shift + 1" enables/disables a boot device.
		USB CD:	
		USB FDD:	
		USBHDD P0:	
		USBHDD P1:	
		USBHDD P2:	
		USBHDD P3:	
		ATAPI CD:	
		SATA HDD1:	
		PCI LAN0:	
		PCI LAN1:	
		Internal shell	

Table 190: Boot - Boot device priority

1.8.2 Boot configuration

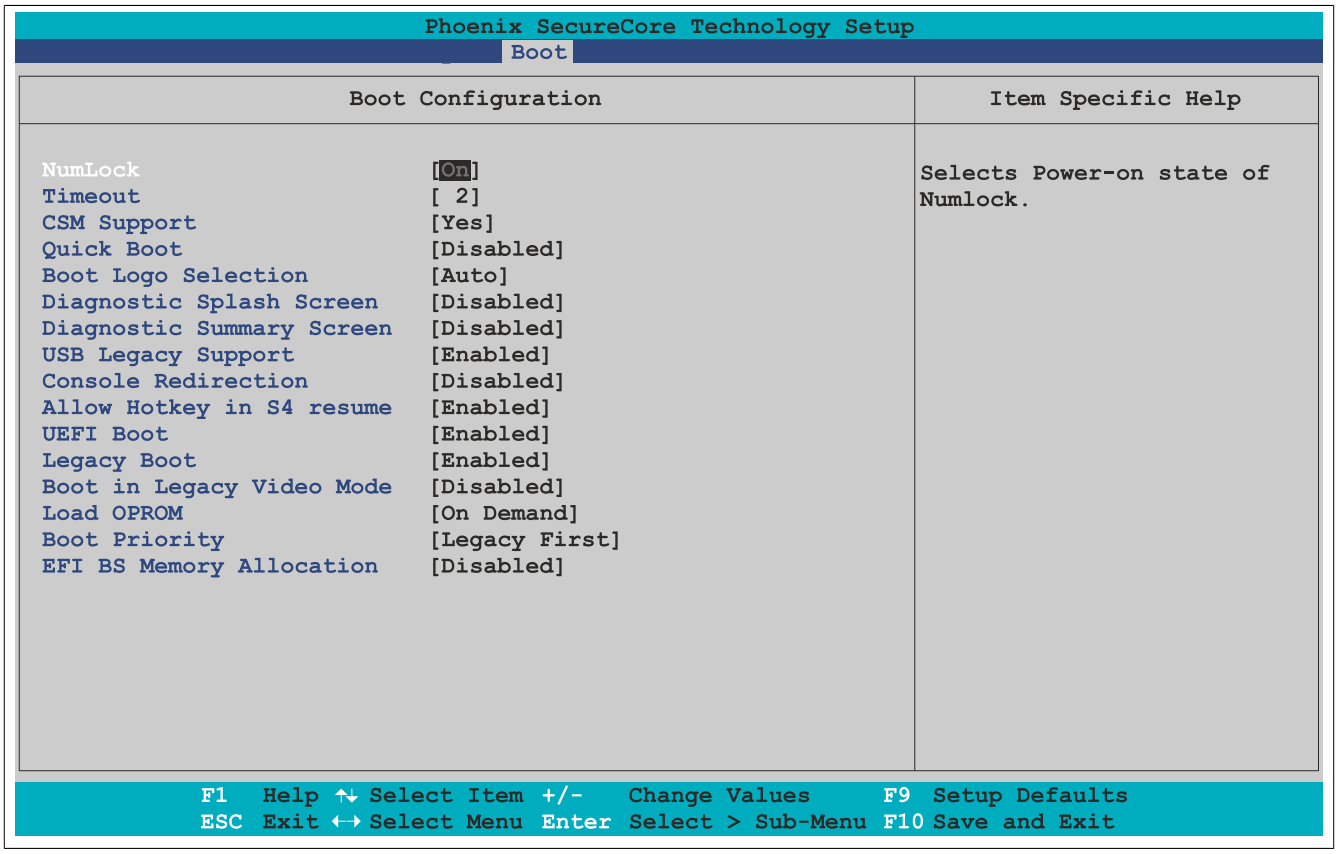


Figure 72: Boot - Boot configuration

BIOS setting	Explanation	Configuration options	Effect
NumLock	Option for configuring the numeric keypad (Num Lock) when booting the system.	**On**	Enables the numeric keypad.
		Off	Only enables the cursor (movement) functions of the numeric keypad.
Timeout	Option for configuring how long the setup activation key (key for entering BIOS) and boot logo are displayed.	**2** to 99	Displays the setup activation key for x seconds.
CSM support	Depending on the operating system, the compatibility support module (BIOS compatibility mode) supports backwards compatibility for BIOS legacy boot settings.	**Yes**	Enables BIOS compatibility mode and allows the use of operating systems without UEFI support. Legacy and UEFI boot are possible.
		No	BIOS compatibility mode is enabled and only the UEFI boot is possible. Legacy boot is not supported.
Quick boot	Option for reducing the boot time by skipping some POST procedures.	**Disabled**	Disables this function.
		Enabled	Enables this function.
Boot logo selection	Options for displaying the boot logo.	Disabled	Displays the default logo.
		Enabled	Displays the OEM logo.
		Auto	Displays the OEM logo automatically (if present).
Diagnostic splash screen	Setting for enabling/disabling the "Diagnostic splash screen" when booting.	**Disabled**	Does not display the "Diagnostic splash screen".
		Enabled	Always displays the "Diagnostic splash screen" when booting.
Diagnostic summary screen	Option for enabling/disabling the "Diagnostic splash screen" when booting.	**Disabled**	Disables this function.
		Enabled	Enables this function.
USB legacy support	Option for configuring USB legacy support.	Disabled	Disables this function. Disables all USB support (mouse, keyboard, USB mass storage devices, etc.).
		Enabled	Enables this function.
Console redirection	Option for configuring the remote console. The remote console can be used to access BIOS Setup via the serial interface using a terminal emulator (PuTTY or HyperTerminal). **Information:** **This function is only possible with IF option 5ACCIF01.FPLS-000 or 5ACCIF01.FPLS-001.**	**Disabled**	Disables this function.
		Enabled	Enables this function.

Table 191: Boot - Boot configuration

BIOS setting	Explanation	Configuration options	Effect
Port console[1]	Option for configuring the serial interface.	All	Allows access via any serial interface.
		UART A, UART B, UART C, UART D, UART E, UART F	Allows access via the selected serial interface.
Terminal type[1]	Option for configuring keyboard input.	ANSI	Enables the ANSI convention (extended ASCII character set).
		VT100	Enables the VT100 convention (ASCII character set).
		VT100+	Enables the VT100+ convention (ASCII character set and support for color, function keys, etc.).
		UTF8	Enables the UTF-8 convention (uses UTF-8 encoding to assign Unicode characters to one or more bytes).
Baud rate[1]	Option for setting the transfer rate of the serial interface (bits per second).	9600, 19200, 38400, 57600, 115200	Enables a transfer rate of x bits
Flow control[1]	Option for configuring the data flow control.	None	Disables data flow control.
		RTS/CTS	Enables hardware handshake.
		XON/XOFF	Enables software handshake.
Continue C.R. after POST[1]	Option for enabling/disabling console redirection after POST.	Disabled	Disables this function.
		Enabled	Enables this function.
Allow hotkey in S4 resume	Option for enabling/disabling hotkey recognition from the S4 state.	Disabled	Disables this function.
		Enabled	Enables this function. The PC exits the S4 state when a key is pressed.
UEFI boot	Option for enabling/disabling UEFI boot.	Disabled	Disables this function.
		Enabled	Enables this function.
Legacy boot	Option for enabling/disabling legacy boot.	Disabled	Disables this function.
		Enabled	Enables this function.
Boot in legacy video mode[2]	Option for enabling/disabling graphics initialization after BIOS POST with legacy ROM.	**Disabled**	Disables this function.
		Enabled	Enables this function. **Information:** **The screen remains black and displays nothing after BIOS POST.**
Load OPROM[2]	Setting for loading all option ROMs or those depending on the boot device.	All	Loads all option ROMs.
		On demand	Loads option ROMs depending on the boot device.
Boot priority	Setting for prioritizing the boot option between UEFI and legacy boot.	UEFI first	Boots first from UEFI ROM.
		Legacy first	Boots first from legacy ROM.
EFI BS memory allocation	Option for configuring the memory for EFI boot services.	**Disabled**	Reserves the minimum amount of memory necessary for EFI boot services.
		Enabled	Reserves the maximum amount of memory necessary for EFI boot services (approx. 130 MB more).

Table 191: Boot - Boot configuration

1) This setting is only possible if *Console redirection* is set to *Enabled*.
2) This setting is only possible if *Legacy boot* is set to *Enabled*.

1.9 Exit

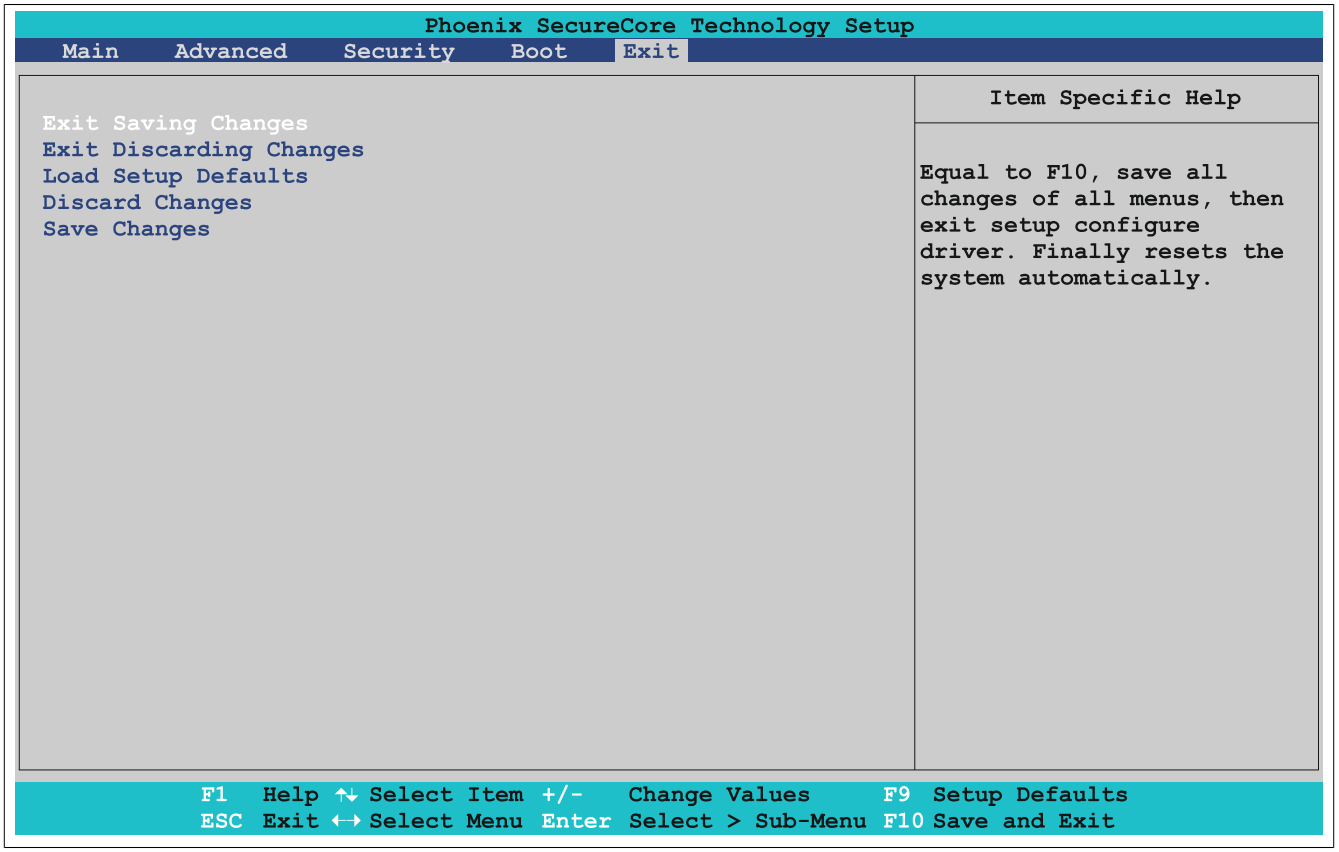


Figure 73: Exit

BIOS setting	Explanation	Configuration options	Effect
Exit saving changes	Selecting this option closes BIOS Setup. Selecting this option saves any changes made to CMOS after confirmation.	Yes/No	
Exit discarding changes	Selecting this option closes BIOS Setup without saving any changes made.	Yes/No	
Load setup defaults	Selecting this option restores the BIOS default values.	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	
Save changes	Selecting this option saves any changes made to CMOS after confirmation.	Yes/No	

Table 192: Exit

1.10 Allocation of resources

1.10.1 RAM address assignments

Address in hexadecimal	Size	Resource
00000000 to 0009FFFF	640 kB	DOS (real mode) memory
000A0000 to 000BFFFF	128 kB	Video memory
000C0000 to 000CBFFF	48 kB	VGA BIOS
000CC000 to 000DFFFF	80 kB	Option ROM or XMS
000E0000 to 000FFFFF	64 kB	System BIOS shadow RAM
00100000 to 7FFFFFFF	2 GB to 1 MB	System memory (low DRAM)
80000000 to FFF00000	2 GB to 1 MB	PCI Low MMIO
FEC00000 to FEC00040	64 bytes	IO APIC
FED00000 to FED003FF	1 kB	HPET (timer)
FED01000 to FED1CFFF	112 kB	Chipset internal register space
FEE00000 to FEFFFFFF	2 MB	Local APIC
100000000 to 17FFFFFFF	2 GB	System memory (high DRAM)
180000000 to F00000000	58 GB	High MMIO

Table 193: RAM address assignments

1.10.2 I/O address assignments

I/O address	Resource
0000h - 00FFh	Motherboard resources
02E8h - 02EFh	COM D (optional)
02F8h - 02FFh	COM B (optional)
0384h - 0385h	CAN controller (optional)
03B0h - 03DFh	Video system
03E8h - 03EFh	COM C (optional)
03F8h - 03FFh	COM A (optional)
0400h - 04FFh	Motherboard resources
0500h - 0G1Fh	Motherboard resources
0CF8h - 0CFBh	PCI config address register
0CFCh - 0CFFh	PCI config data register
0D00h - FFFFh	PCI / PCI Express bus
4100h - 41FFh	MTCX

Table 194: I/O address assignments

1.10.3 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				●														
ACPI[1]											●							
Real-time clock										●								
Co-processor (FPU)															●			
B&R Option-al	COM B[2]				●	○	○	○	○			○	○	○				
	COM C[3]				○	○	○	○	○			○	●	○				
	COM A[4]				○	●	○	○	○			○	○	○				
	COM D[5]				○	○	○	○	○			●	○	○				
	CAN				○	○	○	○	○			●	○	○				

Table 195: IRQ interrupt assignments in PIC mode

1) **A**dvanced **C**onfiguration and **P**ower **I**nterface.
2) Onboard resistive touch screen on Panel PC 2100.
3) Monitor/Panel option, SDL/DVI transmitter, SDL3 transmitter
4) If option 5ACCIF01.FPLS-000, 5ACCIF01.FPLS-001, COMA
5) IF option

● ... Default setting
○ ... Optional setting

1.10.4 Interrupt assignments in APIC mode

A total of 23 IRQs are available in APIC (**A**dvanced **P**rogrammable **I**nterrupt **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				●																						
ACPI[1]											●															
Real-time clock										●																
Co-processor (FPU)															●											
B&R Option-al	COM B[2]				●	○	○	○	○			○	○	○												
	COM C[3]				○	○	○	○	○			○	●	○												
	COM A[4]				○	●	○	○	○			○	○	○												
	COM D[5]				○	○	○	○	○			●	○	○												
	CAN				○	○	○	○	○			●	○	○												
PIRQ A[6]																		●								
PIRQ B[7]																			●							
PIRQ C[8]																				●						
PIRQ D[9]																					●					
PIRQ E[10]																						●				
PIRQ F[11]																							●			
PIRQ G[12]																								●		
PIRQ H[13]																									●	

Table 196: IRQ interrupt assignments in APIC mode

1) **A**dvanced **C**onfiguration and **P**ower **I**nterface.
2) Onboard resistive touch screen on Panel PC 2100.
3) Monitor/Panel option, SDL/DVI transmitter, SDL3 transmitter
4) If option 5ACCIF01.FPLS-000, 5ACCIF01.FPLS-001, COMA
5) IF option
6) PIRQ A: For PCIe, PCI Express root port 0, VGA controller
7) PIRQ B: For PCIe, PCI Express root port 1, optional interface option
8) PIRQ C: For PCIe, PCI Express root port 2, SMBus controller, ETH2 controller
9) PIRQ D: For PCIe, PCI Express root port 3, serial ATA controller, ETH1 controller
10) PIRQ E: XHCI host controller
11) PIRQ F: Unused
12) PIRQ G: Optional High Definition Audio controller
13) PIRQ H: EHCI host controller

● ... Default setting
○ ... Optional setting

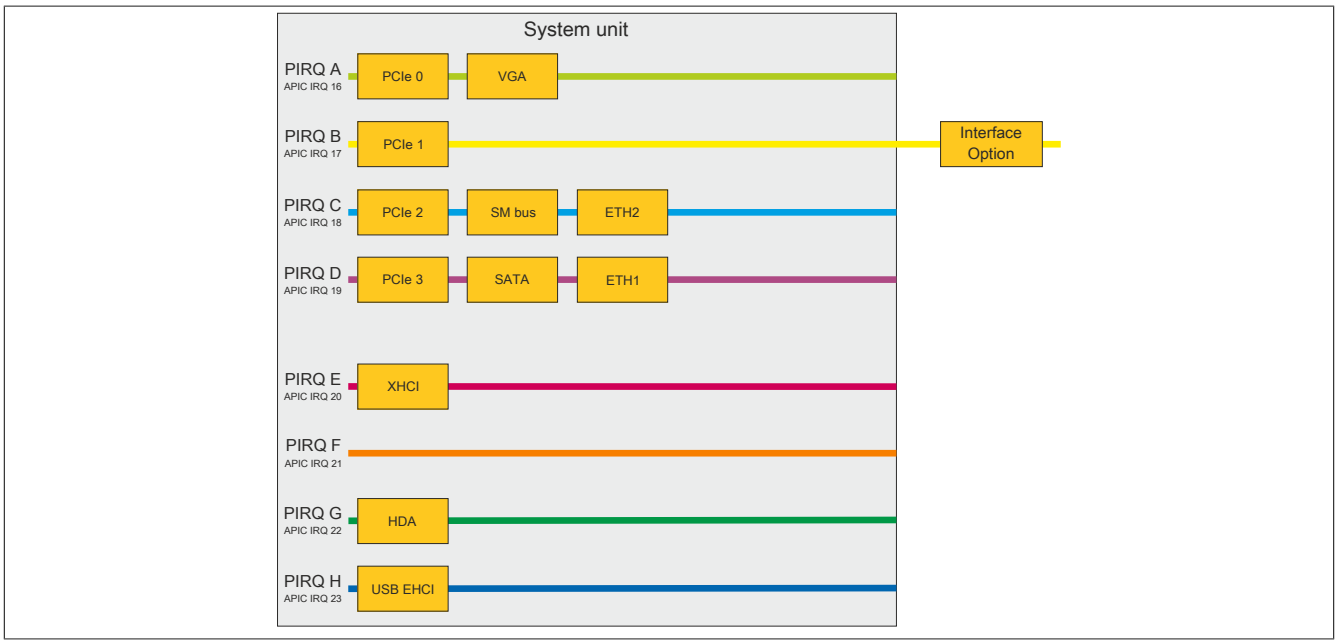


Figure 74: PCIe routing with enabled APIC

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).

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 (for information about changes, see 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 is displayed on the following BIOS Setup screen:

- After switching on the PC, BIOS Setup is accessed by pressing "F2".
- From the "Advanced" menu in BIOS, select "OEM features".

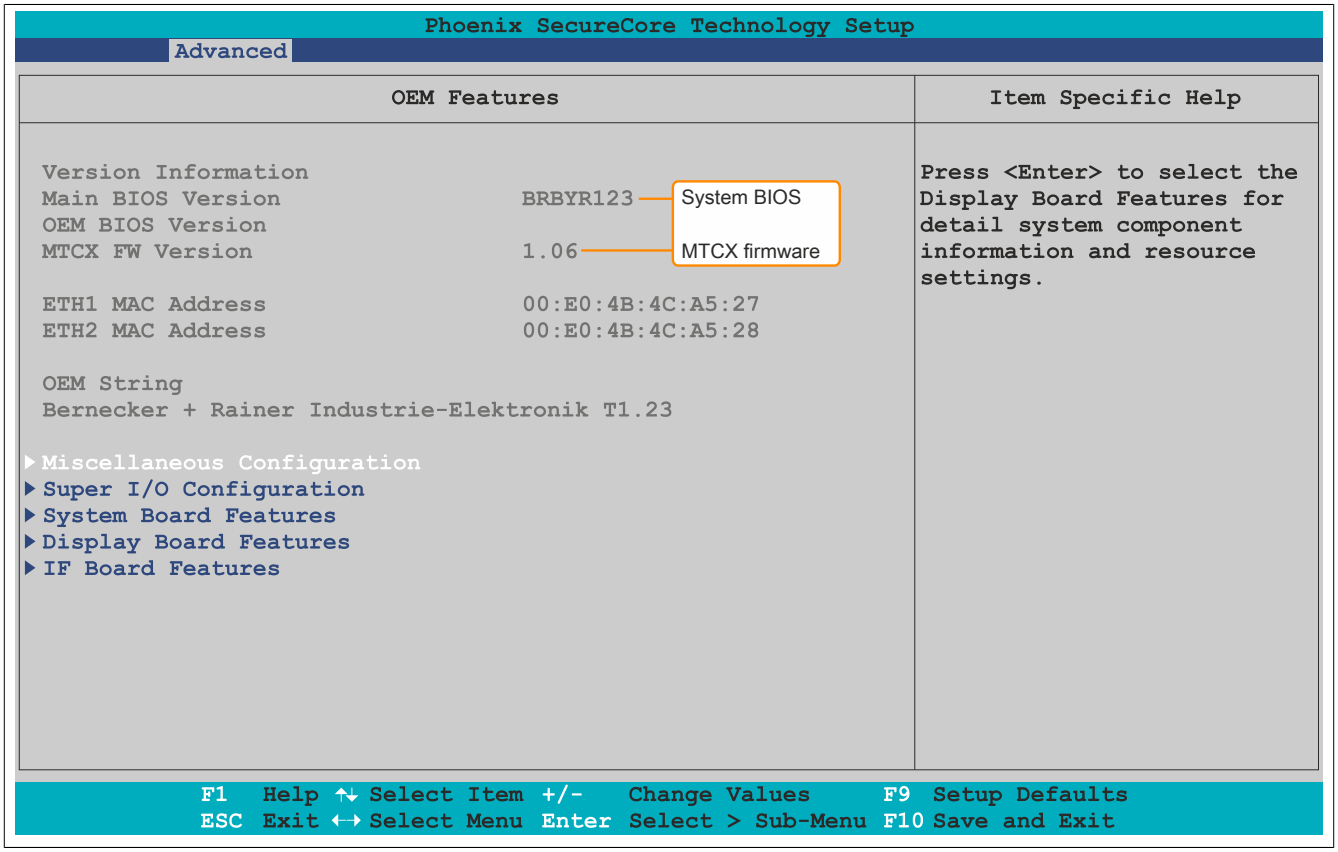


Figure 75: Software version

2.1.2 Procedure in EFI shell

Caution!

The PC is not permitted to be switched off or reset while performing an update!

1. Download the ZIP file from the B&R website (www.br-automation.com).
2. Unzip the ZIP file and copy the data to a USB flash drive formatted in FAT16 or FAT32. Alternatively, a CFast card can be used.
3. Reboot the PC and select "UEFI: Internal shell" as the boot device (press key "F5" to open the boot menu).
4. After the EFI shell is booted, "startup.nsh" is executed and the BIOS upgrade is started.
5. The system must be rebooted after a successful upgrade.
6. Reboot and press "F2" to enter BIOS Setup and load the setup defaults; then select "Save changes and exit".

2.2 Upgrading the firmware on the Automation PC 2100

The "Firmware upgrade (MTCX, SDLT, SDL3T)" software makes it possible to update the firmware for multiple controllers (MTCX, SDLT, SDL3T) depending on the APC2100 system variant.

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

Caution!

The PC is not permitted to be switched off or reset while performing an update!

2.2.1 Procedure in Windows (B&R Control Center)

1. Download the ZIP file from the B&R website (www.br-automation.com).
2. Open 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.

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 ADI driver user's manual.

2.2.2 Procedure in EFI shell

1. Download the ZIP file from the B&R website (www.br-automation.com).
2. Unzip the ZIP file and copy the data to a USB flash drive formatted in FAT16 or FAT32. Alternatively, a CFast card can be used.
3. Reboot the PC and select "UEFI: Internal shell" as the boot device (press key "F5" to open the boot menu).
4. After the EFI shell is booted, "startup. nsh" is executed and the MTCX, SDLT and SDL3T upgrades are started in sequence.
5. The system must be switched off and back on after a successful upgrade.

Warning!

Pressing panel keys while the firmware is being transferred is not permitted! This can disrupt the procedure.

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.

2.3 Upgrading the firmware on the Automation Panel

The "Firmware upgrade (Automation Panel, SDL3 Converter)" software makes it possible to update the firmware for multiple controllers (SDLR, SDL3R, SDL4R, SDL3 Converter) depending on how the system is designed.

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

Caution!

The PC is not permitted to be switched off or reset while performing an update!

2.3.1 Procedure in Windows (B&R Control Center)

1. Download the ZIP file from the B&R website (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.

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 ADI driver user's manual.

2.3.2 Procedure in EFI shell

1. Download the ZIP file from the B&R website (www.br-automation.com).
2. Unzip the ZIP file and copy the data to a USB flash drive formatted in FAT16 or FAT32. Alternatively, a CFast card can be used.
3. Reboot the PC and select "UEFI: Internal shell" as the boot device (press key "F5" to open the boot menu).
4. After the EFI shell is booted, "startup. nsh" is executed and the SDLR, SDL3R and SDL3 converter upgrades are started in sequence.
5. The system must be switched off and back on after a successful upgrade.

Warning!

Pressing panel keys while the firmware is being transferred is not permitted! This can disrupt the procedure.

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.

3 Windows 10 IoT Enterprise 2016 LTSB

3.1 General information

Windows 10 IoT Enterprise 2016 LTSB is the successor to Windows 10 IoT Enterprise 2015 LTSB and based on new Windows 10 technology. This operating system also provides a high degree of protection for industrial applications with additional lockdown functions. Windows 10 IoT Enterprise 2016 LTSB is a version of Windows 10 Enterprise specifically developed for use in industrial applications (Long-Term Servicing Branch).

3.2 APC2100 - Order data

Model number	Short description	Figure
	Windows 10 IoT Enterprise	
5SWW10.0542-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Entry - Multilingual - APC2100 with Bay Trail chipset - License (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	Windows 10 IoT Enterprise	
5SWW10.0800-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Language Pack DVD	

Table 197: 5SWW10.0542-MUL - Order data

3.3 APC2100 - Overview

Model number	Edition	Target system	Processor	Chipset	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWW10.0542-MUL	Entry	APC2100	E3826, E3827, E3845	Bay Trail	64-Bit (legacy BIOS boot)	Multilingual	20 GB [1]	2 GB [2]

1) The memory space required by additional language packs is not taken into account in the minimum size specified for the data storage device.
2) The specified memory size is the minimum requirement according to Microsoft. B&R recommends at least 4 GB RAM when using 64-bit operating systems, however.

3.4 Features

The list of features shows the most important device functions included in Windows 10 IoT Enterprise 2016 LTSB.

Function	Windows 10 IoT Enterprise 2016 LTSB
Range of functions of Windows 10 Enterprise	✓
Internet Explorer 11, including Enterprise Mode	✓
Multi-touch support	✓
Multilingual support	After installation using language pack DVDs (default language is English)
Page file	Configurable (disabled in image by default by the UWF)
Hibernate file	Configurable (disabled in image by default)
System restore	Configurable (disabled in image by default by the UWF)
SuperFetch	Configurable (disabled in image by default by the UWF)
File indexing service	Configurable (disabled in image by default by the UWF)
Fast boot	Configurable (disabled in image by default by the UWF)
Defragmentation service	✓ (disabled when enabling the UWF)
Additional embedded lockdown functions	
Assigned access	Configurable
AppLocker	Configurable
Shell Launcher	Configurable
Unified Write Filter	✓
Keyboard Filter	Configurable

Table 198: Features with Windows 10 IoT Enterprise 2016 LTSB.

3.5 Installation

B&R preinstalls Windows 10 IoT Enterprise 2016 LTSB on a suitable data storage device (64-bit: minimum 20 GB). When switched on for the first time, the system runs through the out-of-box experience (OOBE), which allows different settings to be made (e.g. language, region, keyboard layout, computer name, username, etc.).

Windows 10 IoT Enterprise 2016 LTSB is installed on APC2100 and PPC2100 devices in Legacy BIOS mode.

Note when backing up or restoring the installation that the GPT file system must be supported by the software being used.

3.6 Drivers

The operating system contains all drivers necessary for operation. If an older version of the driver is still being used, the latest version can be downloaded from the B&R website (www.br-automation.com) and installed over it. Note that the Unified Write Filter (UWF) must be disabled for this.

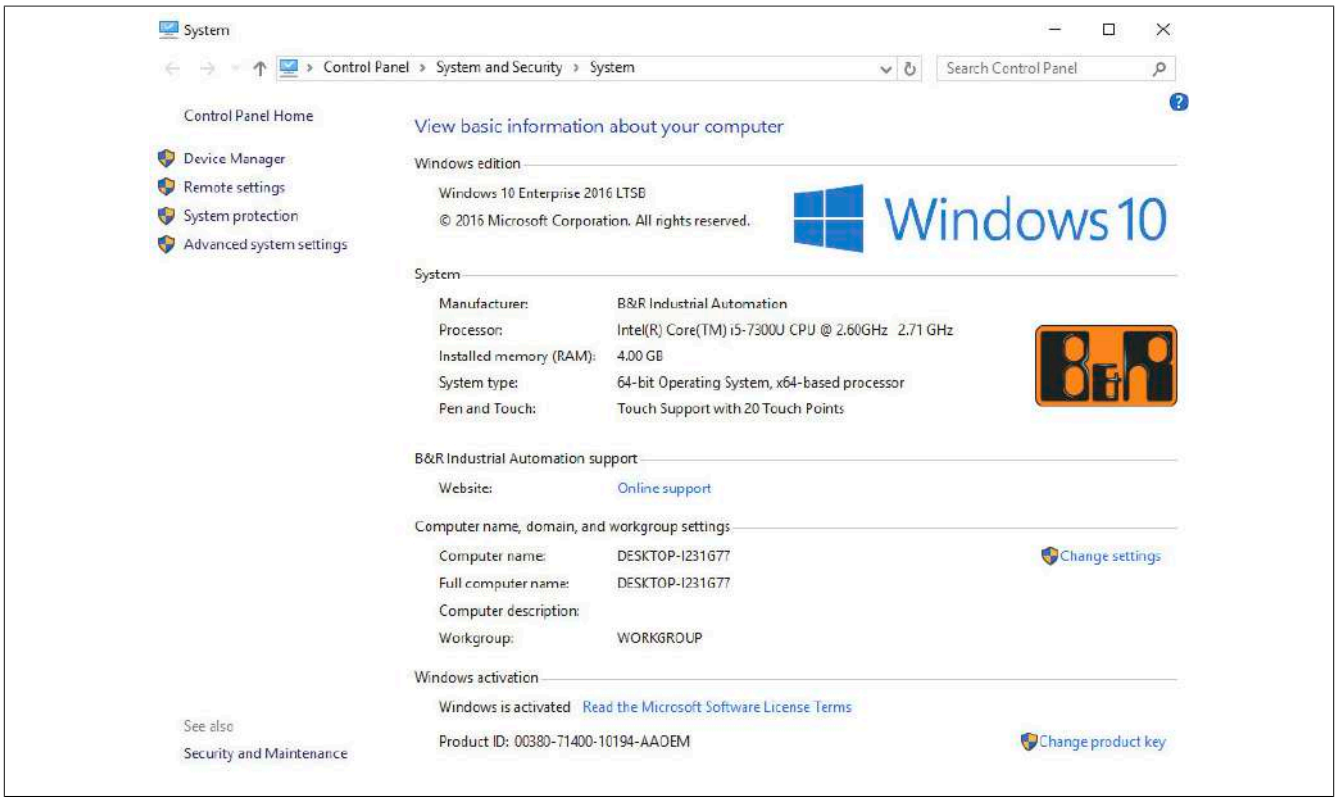
Information:

Only download necessary drivers from the B&R website, not from vendor websites.

3.7 Activation

Windows 10 IoT Enterprise 2016 LTSB must be activated like its predecessor, Windows 10 IoT Enterprise 2015 LTSB. This has already been done at B&R.

The activation status can be checked in the Control Panel:



The activation performed by B&R is supported by special B&R extensions in the operating system and theoretically should not be lost when modifying hardware (e.g. replacing components in the event of repair) or, in contrast to Windows 10 IoT 2015 LTSB, when reinstalling the system (subject to technical changes by Microsoft).

Information:

It is not necessary to enter a product key for activation.

3.8 Issues and limitations

- Unlike the standard Windows 10 Enterprise edition,Windows 10 IoT Enterprise 2016 LTSB does not include applications such as Cortana, the Microsoft Edge browser or the Microsoft Store.
- The LTSB version is based on Windows 10 Build 14393and does not contain any feature updates.

The version installed by B&R includes settings that have been optimized for industrial environments. These are described in detail in the "Windows 10 IoT 2016 LTSB application note". It can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com) (login required).

Information:

As a result of these settings and the features that are excluded from the LTSB version, the system will behave differently than a standard Windows 10 Enterprise installation.

3.9 Supported display resolutions

In accordance with Microsoft requirements, Windows 10 IoT Enterprise 2016 LTSB requires SVGA resolution (800 x 600) or higher in order to fully operate the Windows user interface (including system dialog boxes, apps, etc.). A lower resolution can be selected for applications.

4 Windows 10 IoT Enterprise 2015 LTSB

4.1 General information

Windows 10 IoT Enterprise 2015 LTSB 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 LTSB is a version of Windows 10 Enterprise specifically developed for use in industrial applications (Long-Term Servicing Branch).

4.2 Order data

Model number	Short description	Figure
	Windows 10 IoT Enterprise	
5SWW10.0242-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Multilingual - APC2100 Bay Trail chipset - License (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	Windows 10 IoT Enterprise	
5SWW10.0200-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Multilingual - Recovery DVD	
5SWW10.0400-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Language Pack DVD	

Table 199: 5SWW10.0242-MUL - Order data

4.3 Overview

Model number	Edition	Target system	Processor	Chipset	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWW10.0242-MUL	Embedded	APC2100	No limitations	Bay Trail	64-bit	Multilingual	20 GB [1]	2 GB [2]

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.

4.4 Features

The list of features shows the most important device functions included in Windows 10 IoT Enterprise 2015 LTSB.

Function	Windows 10 IoT Enterprise 2015 LTSB
Range of functions in Windows 10 Enterprise 2015 LTSB	✓
Internet Explorer 11, including Enterprise Mode	✓
Multi-touch support	✓
Multilingual support	After installation using language pack DVDs (default language is English)
Page file	Configurable (disabled in image by default by the UWF)
Hibernate file	Configurable (disabled in image by default)
System restore	Configurable (disabled in image by default by the UWF)
SuperFetch	Configurable (disabled in image by default by the UWF)
File indexing service	Configurable (disabled in image by default by the UWF)
Fast boot	Configurable (disabled in image by default by the UWF)
Defragmentation service	Configurable (disabled in image by default by the UWF)
Additional embedded lockdown functions	
Assigned access	Configurable
AppLocker	Configurable
Shell Launcher	Configurable
Unified Write Filter	✓

Table 200: Features with Windows 10 IoT Enterprise 2015 LTSB.

4.5 Installation

B&R preinstalls Windows 10 IoT Enterprise 2015 LTSB on a suitable data storage device (64-bit: minimum 20 GB). When switched on for the first time, the system runs through the out-of-box experience (OOBE), which allows different settings to be made (e.g. language, region, keyboard layout, computer name, username, etc.).

4.6 Drivers

The operating system contains all drivers necessary for operation. If an older version of the driver is still being used, the latest version can be downloaded from the B&R website (www.br-automation.com) and installed over it. Note that the Unified Write Filter (UWF) must be disabled for this.

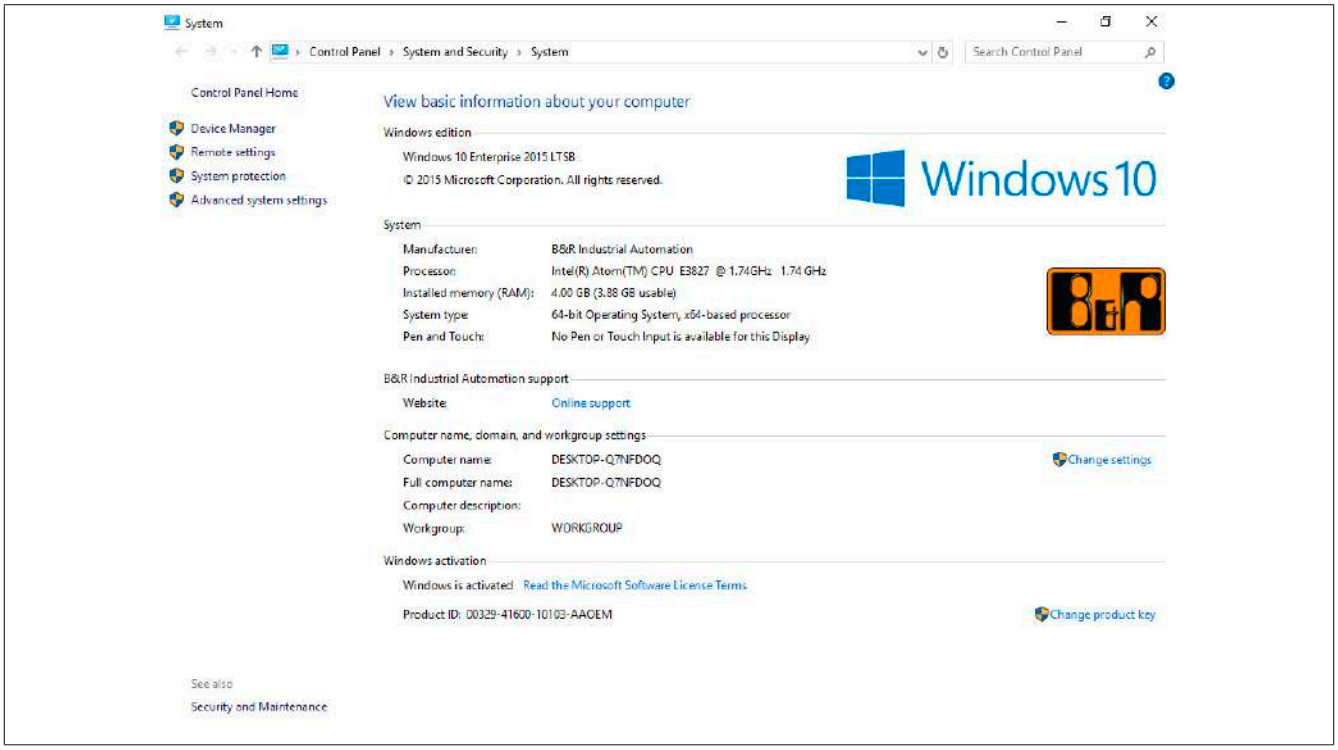
Information:

Only download necessary drivers from the B&R website, not from vendor websites.

4.7 Activation

Windows 10 IoT Enterprise 2015 LTSB must be activated like its predecessor, Windows Embedded 8.1 Industry Pro. This has already been done at B&R.

The activation status can be checked 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. For instructions on how to do this, see the Windows Control Panel under Update & Security > Activation.

Information:

The product key never has to be entered for reactivation.

4.8 Recovery DVD - Content of delivery

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 LTSB. 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 Issues and limitations

- Unlike the standard Windows 10 Enterprise edition,Windows 10 IoT Enterprise 2015 LTSB does not include applications such as Cortana, the Microsoft Edge browser or the Microsoft Store.
- The LTSB version is based on Windows 10 Build 10240and does not contain any feature updates.

The version installed by B&R includes settings that have been optimized for industrial environments. These are described in detail in the "Windows 10 IoT 2015 LTSB working guide". It can be downloaded free of charge from the Downloads section of the B&R website (www.br-automation.com) (login required).

Information:

As a result of these settings and the features that are excluded from the LTSB version, the system will behave differently than a standard Windows 10 Enterprise installation.

4.10 Supported display resolutions

In accordance with Microsoft requirements, Windows 10 IoT Enterprise 2015 LTSB requires SVGA resolution (800 x 600) or higher in order to fully operate the Windows user interface (including system dialog boxes, apps, etc.). A lower resolution can be selected for applications.

5 Windows Embedded 8.1 Industry Pro

5.1 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.

5.2 Order data

Model number	Short description	Figure
	Windows Embedded 8.1 Industry Professional	
5SWWI8.0342-MUL	Windows Embedded 8.1 Industry Pro - 32-bit - Multilingual - For APC2100 - License	
5SWWI8.0442-MUL	Windows Embedded 8.1 Industry Pro - 64-bit - Multilingual - For APC2100 - License	
	Optional accessories	
	Windows Embedded 8.1 Industry Professional	
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 201: 5SWWI8.0342-MUL, 5SWWI8.0442-MUL - Order data

5.3 Overview

Model number	Edition	Target system	Chipset	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWWI8.0342-MUL	Embedded	APC2100	Bay Trail	32-bit	Multilingual	16 GB [1)]	1 GB [2)]
5SWWI8.0442-MUL	Embedded	APC2100	Bay Trail	64-bit	Multilingual	20 GB [1)]	2 GB [3)]

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.

5.4 Features

The 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 (disabled in image by default by the UWF)
Hibernate file	Configurable (disabled in image by default)
System restore	Configurable (disabled in image by default by the UWF)
SuperFetch	Configurable (disabled in image by default by the UWF)
File indexing service	Configurable (disabled in image by default by the UWF)
Fast boot	Configurable (disabled in image by default by the UWF)
Defragmentation service	Configurable (disabled in image by default by the UWF)
Additional embedded lockdown functions	
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 202: Device functions in Windows Embedded 8.1 Industry Pro

5.5 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 out-of-box experience (OOBE), 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".

5.6 Drivers

The operating system contains all drivers necessary for operation. If an older version of the driver is still being used, the latest version can be downloaded from the B&R website (www.br-automation.com) and installed over it. Note that only the Unified Write Filter (UWF) must be disabled for this.

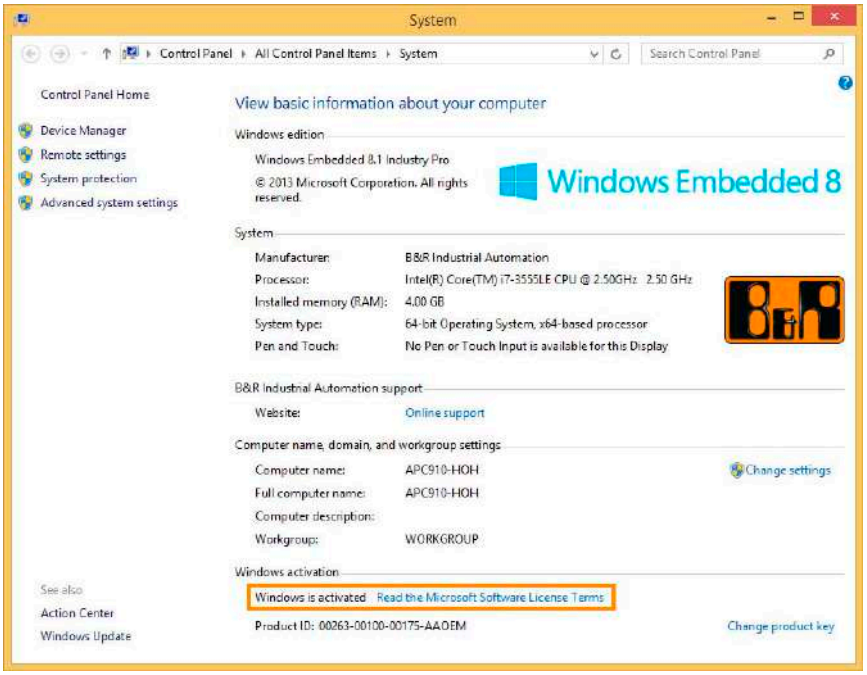
Information:

Only download necessary drivers from the B&R website, not from vendor websites.

5.7 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 activation status can be checked 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. For instructions, see the Microsoft website.

Activation via direct Internet connection:
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

Information:

The product key never has to be entered for reactivation.

5.8 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").

5.9 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 or to allow only certain registry keys to be accessed, for example. 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).

For more information about lockdown functions, see the Microsoft website:
http://msdn.microsoft.com/en-us/library/dn449278(v=winembedded.82).aspx

5.10 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 fully operate the Windows user interface (including system dialog boxes, apps, etc.). A lower resolution can be selected for applications.

6 Windows 7

6.1 General information

Windows 7 offers a wide range of innovative features and performance improvements. The 64-bit variants can 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 provided by 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 starting with 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.

6.2 Order data

Model number	Short description	Figure
	Windows 7 Professional/Ultimate	
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 203: 5SWWI7.1100-GER, 5SWWI7.1100-ENG, 5SWWI7.1200-GER, 5SWWI7.1200-ENG, 5SWWI7.1300-MUL, 5SWWI7.1400-MUL - Order data

6.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Architecture	Language	Required storage space on data storage device	Minimum RAM required
5SWWI7.1100-GER	Professional	APC510 APC511 APC810 APC910 APC2100 PPC800 PPC900 PPC2100 PP500	945GME GM45 QM77/HM76 NM10 US15W Bay Trail	SP1	32-bit	German	16 GB	1 GB [1]
5SWWI7.1100-ENG	Professional	APC510 APC511 APC810 APC910 APC2100 PPC800 PPC900 PPC2100 PP500	945GME GM45 QM77/HM76 NM10 US15W Bay Trail	SP1	32-bit	English	16 GB	1 GB [1]
5SWWI7.1200-GER	Professional	APC810 APC910 APC2100 PPC800 PPC900 PPC2100	945GME Intel Core 2 Duo GM45 QM77/HM76 QM170/HM170/CM236 Bay Trail	SP1	64-bit	German	20 GB	2 GB [2]
5SWWI7.1200-ENG	Professional	APC810 APC910 APC2100 PPC800 PPC900 PPC2100	945GME Intel Core 2 Duo GM45 QM77/HM76 QM170/HM170/CM236 Bay Trail	SP1	64-bit	English	20 GB	2 GB [2]
5SWWI7.1300-MUL	Ultimate	APC510 APC511 APC810 APC910 APC2100 PPC800 PPC900 PPC2100 PP500	945GME GM45 QM77/HM76 NM10 US15W Bay Trail	SP1	32-bit	Multilingual	16 GB [3]	1 GB [1]
5SWWI7.1400-MUL	Ultimate	APC810 APC910 APC2100 PPC800 PPC900 PPC2100	945GME Intel Core 2 Duo GM45 QM77/HM76 QM170/HM170/CM236 Bay Trail	SP1	64-bit	Multilingual	20 GB [3]	2 GB [2]

Table 204: Windows 7 - Overview

1) The specified amount of memory is the minimum requirement according to Microsoft. B&R recommends using at least 2 GB RAM with 32-bit operating systems, however.
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.

6.4 Installation

B&R preinstalls the required Windows 7 version 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.

6.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Information:

Only download necessary drivers from the B&R website, not from vendor websites.

6.6 Issues and 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).

Information:

32-bit operating systems are not recommended for system units with 4 GB or more of main memory. For more information, see section "Miscellaneous configuration" on page 164 under heading "PCI MMIO Size".

6.7 Supported display resolutions

In accordance with Microsoft requirements, Windows 7 requires XGA resolution (1024 x 768) or higher in order to fully operate the Windows user interface (including system dialog boxes, etc.). A lower resolution can be selected for applications.

7 Windows Embedded Standard 7

7.1 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 2 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 in both 32-bit and 64-bit versions (64-bit versions are not supported by all systems). As a result, even demanding applications based on 64-bit technology are supported.

7.2 Order data

Model number	Short description	Figure
	Windows Embedded Standard 7	
5SWWI7.1542-ENG	Windows Embedded Standard 7 SP1 - 32-bit - English - For APC2100 - License	
5SWWI7.1642-ENG	Windows Embedded Standard 7 SP1 64-bit, English; for APC2100; license.	
5SWWI7.1742-MUL	Windows Embedded Standard 7 Premium SP1 32-bit, multilingual; for APC2100; license.	
5SWWI7.1842-MUL	Windows Embedded Standard 7 Premium SP1 64-bit, multilingual; for APC2100; license.	
	Optional accessories	
	Windows Embedded Standard 7	
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 205: 5SWWI7.1542-ENG, 5SWWI7.1642-ENG, 5SWWI7.1742-MUL, 5SWWI7.1842-MUL - Order data

7.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWWI7.1542-ENG	Embedded	APC2100	Bay Trail	SP1	32-bit	English	16 GB	1 GB [1]
5SWWI7.1642-ENG	Embedded	APC2100	Bay Trail	SP1	64-bit	English	16 GB	2 GB [2]
5SWWI7.1742-MUL	Premium	APC2100	Bay Trail	SP1	32-bit	Multilingual	16 GB [3]	1 GB [1]
5SWWI7.1842-MUL	Premium	APC2100	Bay Trail	SP1	64-bit	Multilingual	16 GB [3]	2 GB [2]

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.

7.4 Features

The 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 Filter (EWF)	✓	✓
File-Based Write Filter (FBWF)	✓	✓
Administrator accounts	✓	✓
User accounts	Configurable	Configurable
Windows Explorer shell	✓	✓
Registry filter	✓	✓
Internet Explorer 11.0	✓	✓
Internet Information Service (IIS) 7.0	✓	✓
Anti-malware (Windows Defender)	-	✓
Add-ons (Snipping Tool, Sticky Notes)	-	✓
Windows Firewall	✓	✓

Table 206: Device functions in Windows Embedded Standard 7

Function	Windows Embedded Standard 7	Windows Embedded Standard 7 Premium
.NET Framework 3.5	✓	✓
32-bit and 64-bit	✓	✓
Remote Desktop Protocol 7.0	✓	✓
File Compression Utility	✓	✓
Windows Installer Service	✓	✓
Windows XP mode	-	-
Media Player 12	✓	✓
DirectX	✓	✓
Multilingual user interface 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 USB flash drive	✓	✓
Accessories	✓	✓
Page file	Configurable	Configurable
Number of fonts	134	134

Table 206: Device functions in Windows Embedded Standard 7

7.5 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.

7.6 Drivers

The operating system contains all drivers necessary for operation. If an older driver version is installed, the latest version of it can be downloaded and installed from the B&R website (www.br-automation.com). Note that the "Enhanced Write Filter" (EWF) must be disabled for this.

7.7 Issues and limitations

Information:

32-bit operating systems are not recommended for system units with 4 GB or more of main memory. For more information, see section "Miscellaneous configuration" on page 164 under heading "PCI MMIO Size".

7.8 Supported display resolutions

In accordance with Microsoft requirements, Windows Embedded Standard 7 requires XGA resolution (1024 x 768) or higher in order to fully operate the Windows user interface (including system dialog boxes, etc.). A lower resolution can be selected for applications.

8 Automation Runtime

8.1 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 relevant programming language 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.).

8.2 Order data

Model number	Short description	Figure
	Technology Guard	
0TG1000.01	Technology Guard (MSD)	
0TG1000.02	Technology Guard (HID)	
1TG4600.10-5	Automation Runtime Windows, TG license	
1TG4601.06-5	Automation Runtime Embedded, TG license	

Table 207: 0TG1000.01, 0TG1000.02, 1TG4600.10-5, 1TG4601.06-5 - Order data

8.3 Automation Runtime Windows (ARwin)

System requirements

The following software versions (or higher) are required to run Automation Runtime Windows on an Automation PC 2100:

- ARwin upgrade AR C4.10
- ARwin upgrade AR N4.10 for 5APC2100.BY48-000
- Automation Studio V4.1.4.0
- Technology Guard

Information:

In order to operate Automation Runtime Windows (ARwin), BIOS setting *Advanced - Miscellaneous configuration - Realtime environment* must be set to *Enabled*.

Information:

In order to slightly improve the real-time behavior (jitter) of Automation Runtime Windows (ARwin) in graphics-intensive applications, set BIOS setting *Advanced - Graphics (IGD) configuration - IGD turbo* to *Disabled*.

Important: If BIOS setting *Advanced - Graphics (IGD) configuration - IGD turbo* is set to *Disabled*, the graphics performance of the system is noticeably reduced.

8.4 Automation Runtime Embedded (ARemb)

System requirements

The following software versions (or higher) are required to operate Automation Runtime Embedded on an Automation PC 2100:

- ARemb upgrade AR C4.10
- ARemb upgrade AR N4.10 for 5APC2100.BY48-000
- Automation Studio V4.1.4.0
- Visual Components Runtime (VC) V4.15.1
- Process Visualization Interface (PVI) V4.1.5
- Technology Guard

PVI Development Setup must be downloaded from the B&R website (www.br-automation.com) and installed separately!

Information:

In order to operate Automation Runtime Embedded (ARemb), BIOS setting *Advanced - Miscellaneous configuration - Realtime environment* must be set to *Enabled*.

Information:

In order to slightly improve the real-time behavior (jitter) of Automation Runtime Embedded (ARemb) in graphics-intensive applications, set BIOS setting *Advanced - Graphics (IGD) configuration - IGD turbo* to *Disabled*.

Important: If BIOS setting *Advanced - Graphics (IGD) configuration - IGD turbo* is set to *Disabled*, the graphics performance of the system is noticeably reduced.

8.5 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 later. Earlier versions of Automation Runtime do not require a Technology Guard.

For more information about Technology Guarding, see Automation Help.

9 B&R Hypervisor

The B&R hypervisor allows multiple operating systems to run in parallel on a single device. The operating systems can communicate with each other via a virtual network.

Intelligent distribution of CPU resources

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

Virtual network

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

Maximum flexibility

The user configures the hypervisor and allocates hardware resources in the B&R Automation Studio software development environment. The configurations are defined separately for each system, providing maximum flexibility in how resources are utilized. Whereas previous parallelization solutions were tailored to a specific Windows version, the B&R Hypervisor is completely independent of the version of the operating systems used.

System requirements

The following minimum software versions are required to operate B&R Hypervisor on the Automation PC 2100:

- ARemb upgrade AR F4.44
- Automation Studio V4.4
- APC2100 BIOS V1.40
- APC2100 MTCX V1.13

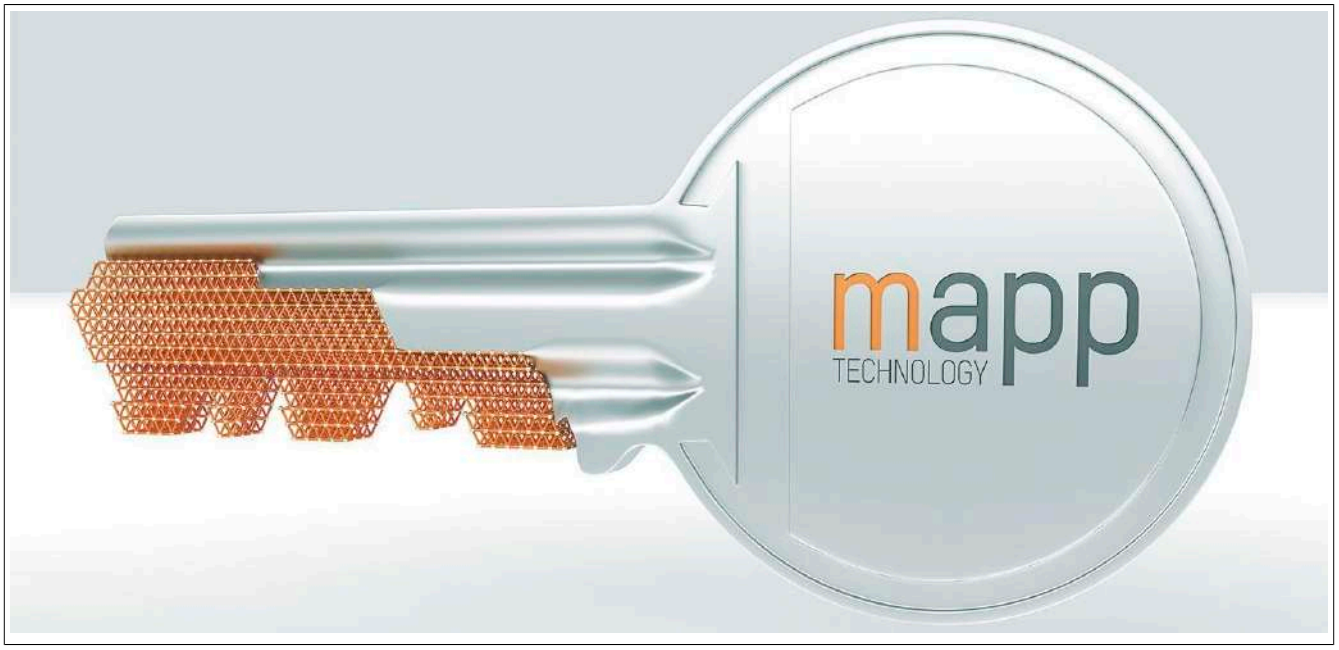
Information:

To operate the B&R Hypervisor, the settings *Advanced - Miscellaneous configuration - Realtime environment* and *Hypervisor environment* must be set to *Enabled* in BIOS.

Information:

For details about the B&R Hypervisor, see Automation Help.

10 mapp Technology



mapp Technology revolutionizes the creation of machine and plant software. mapp components – mapps for short – are as easy to use as smartphone apps. Instead of programming user/role systems, alarm systems or axis control line by line, the developer of the machine software only configures the finished mapps. Complex algorithms are easy to master. The programmer can fully concentrate on the machine process.

mapp SERVICES

Set up all basic functions for a machine or system with just a few clicks: recipe system, alarm system, OEE evaluation, user-role system, audit trail system, energy monitoring, database system and much more.

mapp CONTROL

Complex control algorithms in the form of easy-to-use software blocks. Crane control, hydraulics control, filter design, closed-loop design and much more. Advanced technology made accessible for the average user.

mapp VIEW

The only HMI solution on the market that works independently of platform and operating system. Modern HTML5-based HMI applications are easily created with ready-made widgets.

mapp SAFETY

Maximum productivity through integrated safety technology. mapp Safety covers the entire spectrum, including safe axes and robots. Safe machine options can be enabled or disabled in the field.

mapp MOTION

mapp Motion provides uniform solutions for all areas of motion control: from individual axes to multi-axis systems and even complex robotics and CNC applications.

Information:

For details about mapp Technology, see the B&R website www.br-automation.com or Automation Help.

11 B&R Linux 8 (GNU/Linux)

11.1 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 Linux operating system developed by B&R is based on Debian 8, 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.

11.2 Order data

Model number	Short description	Figure
	B&R Linux 8	
5SWLIN.0542-MUL	B&R Linux 8 - 32-bit - Multilingual - APC2100 chipset Bay Trail - Installation (without Recovery DVD) - Only available with a new device	
5SWLIN.0642-MUL	B&R Linux 8 - 64-bit - Multilingual - APC2100 chipset Bay Trail - Installation (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	CFast cards	
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 208: 5SWLIN.0542-MUL, 5SWLIN.0642-MUL - Order data

11.3 Overview

Model number	Target system	Chipset	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWLIN.0542-MUL	APC2100	Bay Trail	32-bit	Multilingual	4 GB	1 GB
5SWLIN.0642-MUL	APC2100	Bay Trail	64-bit	Multilingual	4 GB	1 GB

11.4 Features

- LXDE desktop environment
- Touch driver
- MTCX driver
- ADI library
- HMI diagnostics tool
- Tool for right-click support via touch screen
- Virtual keyboard

Detailed information about B&R Linux 8 for B&R devices is available in the Downloads section of the B&R website (www.br-automation.com).

11.5 Installation

B&R preinstalls B&R Linux 8 on the desired data storage device (e.g. CFast card). 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 also 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).

Installation packages are also available on the B&R website (www.br-automation.com) for the necessary B&R modifications.

11.6 Drivers

The operating system contains all drivers necessary for operation.

The most current versions of B&R-specific drivers can be downloaded and installed from the B&R website (www.br-automation.com).

12 B&R Linux 9 (GNU/Linux)

12.1 General information

Linux and GNU/Linux are usually free, Unix-like multi-user operating systems based on the Linux kernel and essentially on GNU software. The wide, also commercial distribution was made possible by the licensing of the Linux kernel under the GPL starting in 1992.

The Linux-based Debian 9 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.

12.2 Order data

Model number	Short description	Figure
	B&R Linux 9	
5SWLIN.0742-MUL	B&R Linux 9 - 64-bit - Multilingual - APC2100 chipset Bay Trail - Installation (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	CFast cards	
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.256G-10	CFast card, 256 GB MLC	
5CFAST.4096-00	CFast card, 4 GB SLC	
5CFAST.8192-00	CFast card, 8 GB SLC	

Table 209: 5SWLIN.0742-MUL - Order data

12.3 Overview

Model number	Target system	Chipset	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWLIN.0742-MUL	APC2100	Bay Trail	64-bit	Multilingual	4 GB [1)]	1 GB

1) The memory space required by additional language packs is not taken into account in the minimum size specified for the data storage device.

12.4 Features

- LXDE desktop environment
- Touch driver
- MTCX driver
- ADI library
- Tool for right-click support via touch screen
- Virtual keyboard

Detailed information about B&R Linux 9 for B&R devices is available in the Downloads section of the B&R website (www.br-automation.com).

12.5 Installation

B&R preinstalls B&R Linux 9 on the desired storage device (e.g. CompactFlash card,CFast card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

Debian 9 can also be downloaded from the Debian website (http://www.debian.org). Corresponding instructions are also available on the Debian website.

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).

Installation packages are also available on the B&R website for the necessary B&R modifications (www.br-automation.com).

12.6 Drivers

The operating system contains all drivers necessary for operation.

The most current versions of B&R-specific drivers can be downloaded and installed from the B&R website (www.br-automation.com).

13 B&R Automation Device Interface (ADI) Control Center

The Automation Device Interface (ADI) makes it possible to access specific functions of B&R devices. In Windows, the settings for these devices can be viewed and modified using the B&R Control Center in the Control Panel.

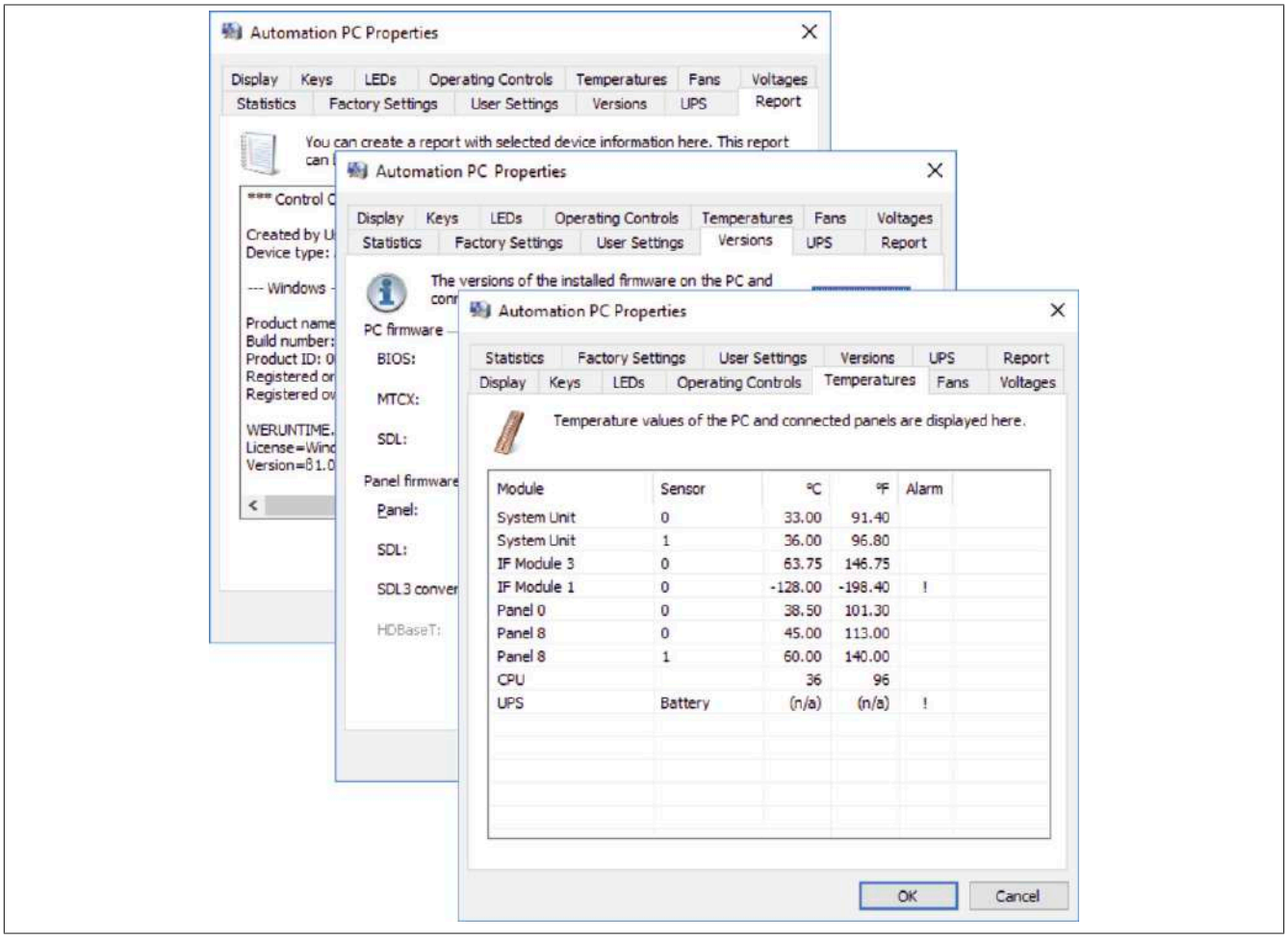


Figure 76: ADI Control Center screenshots - Examples

Information:

The temperature and voltage values (e.g. CPU temperature, core voltage, battery voltage) displayed represent uncalibrated values for informational purposes. They cannot be used to draw conclusions about possible hardware alarms or error states. The hardware components being used include automatic diagnostic functions in the event of error.

13.1 Functions

Information:

The functions provided by the Control Center depend on the device family.

- 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 positions
- Reading operating hours (power-on hours)
- Reading user settings 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

For a detailed description of the Control Center, see Automation Help or the user documentation (depends on the version).

13.2 Installation

The B&R Automation Device Interface (ADI) driver (also includes the Control Center) and user documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

Information:

The ADI driver is included in most B&R Windows operating systems; it can also be installed on demand.

If a more current ADI driver version exists (see the Downloads section of the B&R website), it can be installed later. Note that the write filter must be disabled during installation.

14 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.

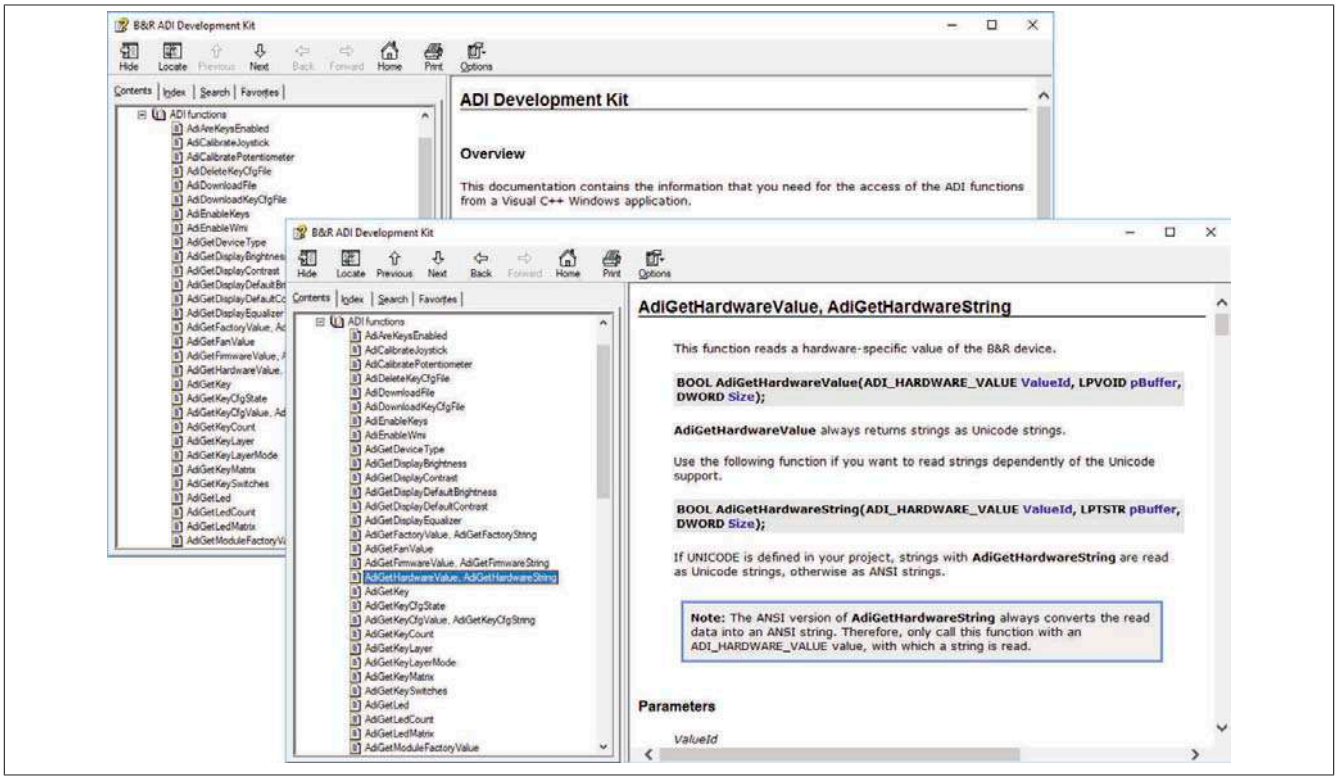


Figure 77: ADI Development Kit Screenshots (Symbolbild)

Features:

- Header files and import libraries
- Help files
- Sample projects
- ADI DLL (for testing applications if no ADI driver is installed)

The appropriate ADI driver must be installed for the specified product family. The ADI driver is already included in the embedded operating system images from B&R.

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

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

15 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 in Microsoft Visual Studio.

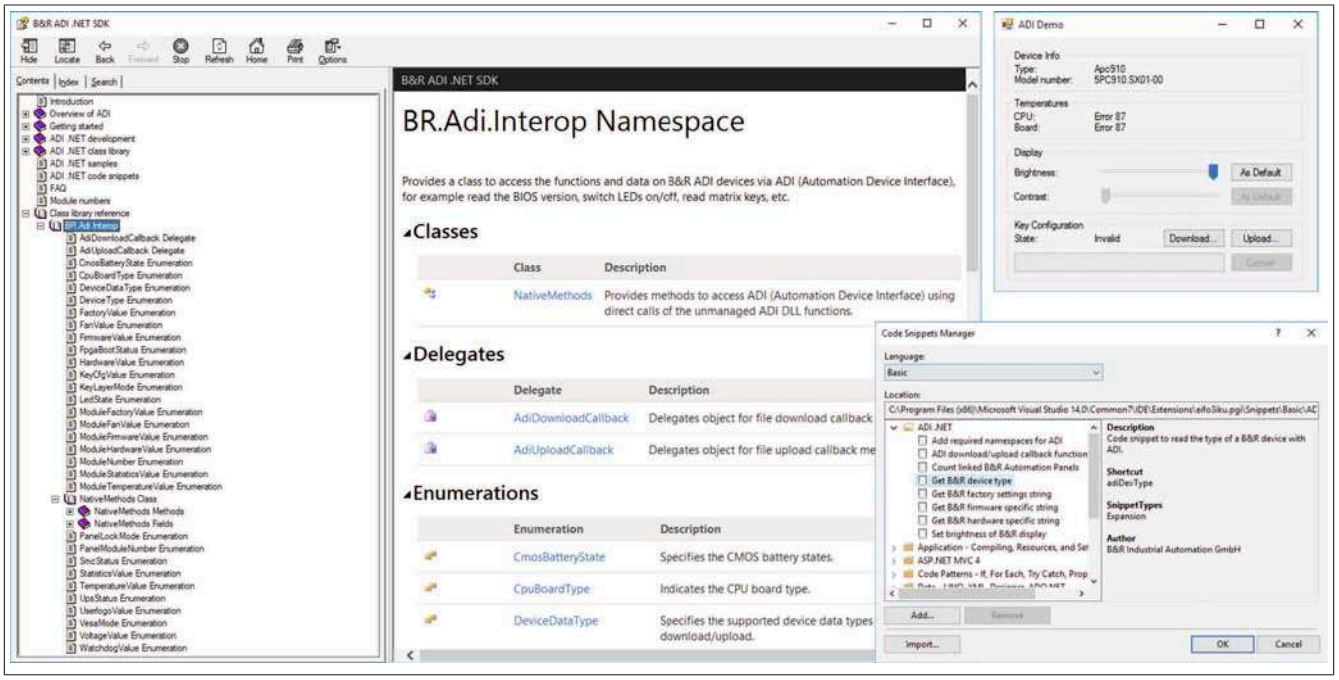


Figure 78: ADI .NET SDK screenshots

Features:

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

The appropriate ADI driver must be installed for the specified product family. The ADI driver is already included in the embedded operating system images from B&R.

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

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

16 B&R Key Editor

A common panel requirement is to adapt function keys and LEDs directly to the application software. The B&R Key Editor makes this individual adaptation to the application quick and easy.

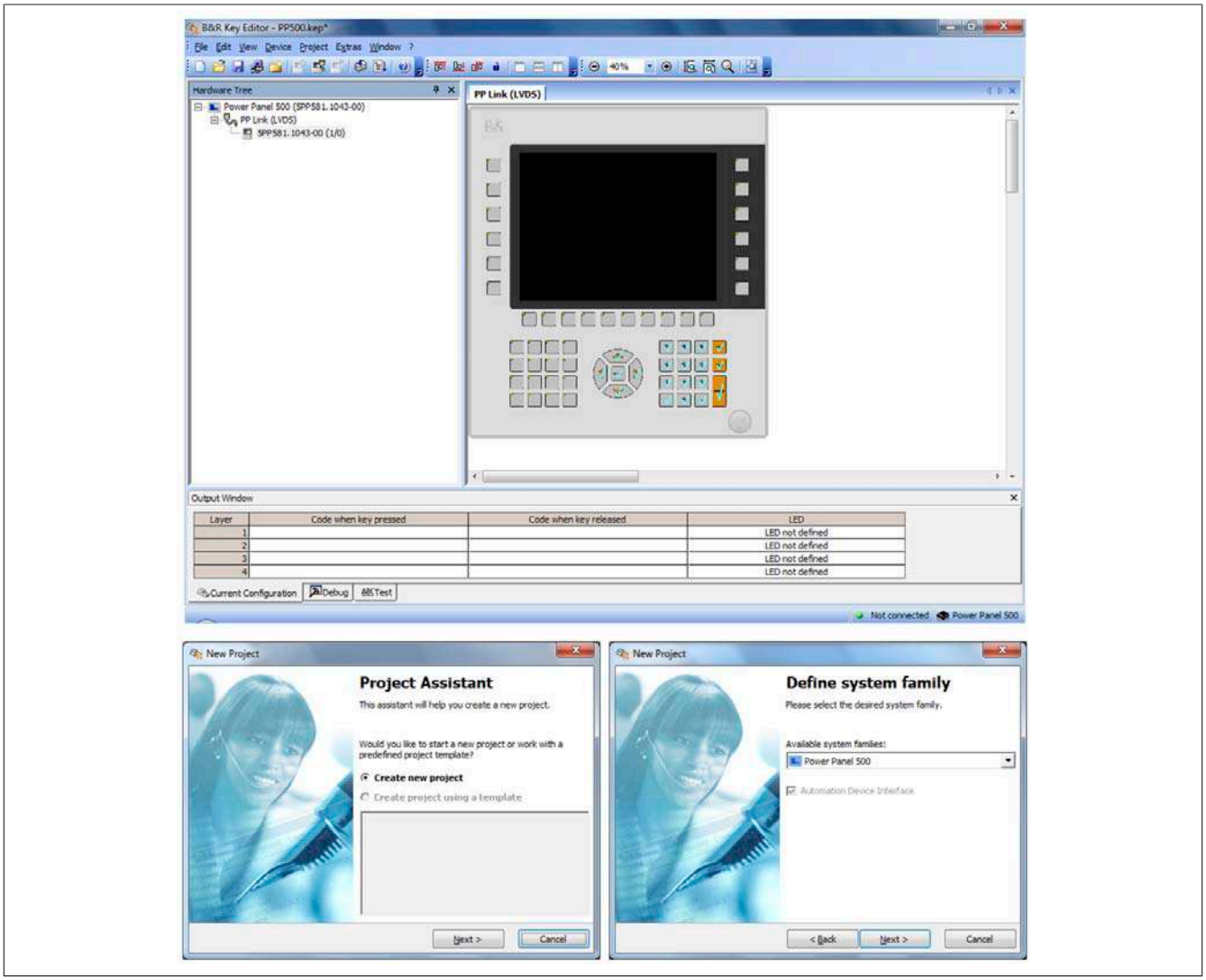


Figure 79: B&R Key Editor screenshots

Features:

- Configuration of normal keyboard keys (A, B, C, etc.)
- Keyboard shortcuts (CTRL+C, SHIFT+DEL, etc.) using a single 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 connecting multiple Automation Panel devices to Automation PCs and Panel PCs.

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

17 B&R KCF Editor

The B&R KCF Editor can be used as a simple alternative to B&R Key Editor. This tool also allows function keys and LEDs to be adapted to the application software. Unlike the B&R Key Editor, operation takes place in a simple Windows dialog box instead of on a visual representation of the device. 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.

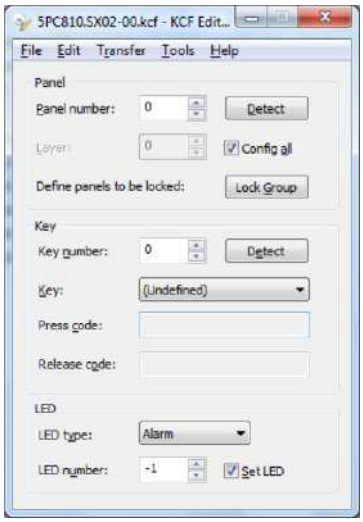


Figure 80: B&R KCF Editor V1.0 screenshot

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 connecting multiple Automation Panel devices to B&R PCs.
- Exporting and importing configurations (INI files)
- Saving configurations as a report (text file)

Additional features if the B&R KCF Editor is executed on the target device[3)]

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

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

18 HMI Service Center

18.1 5SWUTI.0001-000

18.1.1 General information

The HMI Service Center is software for testing B&R industrial PCs and Automation Panels. Various categories such as COM interfaces, network connectivity and SRAM are tested.

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

For details about the HMI Service Center, see the HMI Service Center user's manual. This can be downloaded for free from the B&R website (www.br-automation.com).

18.1.2 Order data

Model number	Short description	Figure
	Accessories	
5SWUTI.0001-000	HMI Service Center USB flash drive - Hardware diagnostic software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC2200/PPC2200 - For APC3100/PPC3100 - For APC51x/PP500 - For Automation Panel 800/900 - For Automation Panel 1000/5000	

Table 210: 5SWUTI.0001-000 - Order data

Chapter 5 • Standards and certifications

1 Standards and guidelines

1.1 CE marking

All guidelines applicable to the product and their harmonized EN standards are fulfilled.

1.2 EMC directive

These products meet the requirements of EU directive "Electromagnetic compatibility2014/30/EU" and are designed for industrial use:

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

Information:

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

2 Certifications

Danger!

A complete system can only receive certification if ALL of the individual components installed therein have the corresponding certifications. If an individual component is used that DOES NOT have a corresponding certification, then the complete system also DOES NOT have 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 industrial environments.

Information:

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

2.1 UL certification

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

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

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

Ind.Cont.Eq.
E115267

It is important to note that the device is classified as "open type" when used in the area of "Industrial control equipment" per UL 508. The device must therefore be installed in a UL508-compliant housing as a requirement for certification or operation per UL 508.

2.2 GOST-R

Products with this mark are tested by an accredited testing laboratory and permitted for import to the Russian Federation (based on EU compliance).

2.3 EAC

Products with this mark are tested by an accredited testing laboratory and permitted for import to the Eurasian Economic Union (based on EU compliance).

2.4 KC

Products with this mark are tested by an accredited testing laboratory and permitted for import to the Korean market (based on EU compliance).

2.5 RCM

Products with this mark are 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 this economic region (based on EU compliance).

2.6 DNV GL certification

Products with this certification have been certified by classification society DNV GL and are suitable for maritime environments. DNV GL certificates (type approval) are generally accepted by other classification societies during ship acceptance procedures.

DNV GL per standard DNVGL-CG-0339 from November 2016
IACS E10
EN 60945 section 1c

These products are suitable for the following DNV GL environmental conditions (DNV GL classes):

Temperature	B
Moisture	B
Vibration	A
EMC	B
Housing	When installing on board, the guidelines for meeting the required protection level must be observed.

Products used on a ship's bridge must be dimmable using software in accordance with the regulations and guidelines from the respective classification society.

Windows 7 operating systems are only permitted to be used as embedded variants. For all other B&R-approved operating systems there are no restrictions.

The following table lists the revisions from which DNV GL certification applies to individual components.

Model number	Description	DNV GL starting with rev.
5APC2100.BY48-000	APC2100 system unit - Intel Atom E3845 1.91 GHz - Quad core - 8 GB SDRAM	C5
5APC2100.BY44-000	APC2100 system unit - Intel Atom E3845 1.91 GHz - Quad core - 4 GB SDRAM	D0
5ACCFF00.0000-000	APC2100 front cover - Orange - With B&R logo	D0
5ACCFF00.0000-001	APC2100 front cover - Dark gray - Without logo	C0
5ACCFF00.0000-002	APC2100 front cover - Orange - Without logo	C0
5CFAST.2048-00	CFast card, 2 GB SLC	D0
5CFAST.4096-00	CFast card, 4 GB SLC	D0
5CFAST.8192-00	CFast card, 8 GB SLC	D0
5CFAST.016G-00	CFast card, 16 GB SLC	D0
5CFAST.032G-00	CFast card, 32 GB SLC	D0
5CFAST.032G-10	CFast card, 32 GB MLC	D0
5CFAST.064G-10	CFast card, 64 GB MLC	D0
5CFAST.128G-10	CFast card, 128 GB MLC	D0
5CFAST.256G-10	CFast card, 256 GB MLC	C0
5ACCIF01.FPCC-000	Interface card - 2x CAN interfaces - 1x X2X Link interface - 1x POWERLINK interface - 512 kB nvSRAM - For APC2100/PPC2100	C0
5ACCIF01.FPLS-000	Interface card - 1x RS232 interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100	D0
5ACCIF01.FPSC-000	Interface card - 1x RS232 interface - 1x CAN interface - 1x POWERLINK interface - 32 kB FRAM - For APC2100/PPC2100	D0
5ACCLI01.SDL0-000	SDL/DVI transmitter for APC2100	D0
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	D0
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	D0
0TB1210.3100	Connector - Female 10-pin - Cage clamp terminal block - Protected against vibration by the screw flange	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.

2.7 UL Haz. Loc. certification

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

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

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

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

2.7.1 General safety guidelines

APC2100 systems that are certified for use in potentially explosive environments and carry the marking above are suitable for use in Class 1, Division 2, Groups A, B, C and D or in nonexplosive environments and correspond to the following standards: UL Std. 508 - 17th Edition, ANSI/ISA 12.12.01:2015, CSA Std. C22.2 No. 213-16.

2.7.2 Mounting and installation

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

Devices must be installed in a suitable protective housing that can only be opened with the assistance of a tool. In order to ensure sufficient air circulation, the specified clearance values must be observed. Usage is only permitted in environments with pollution degree 2. The maximum ambient temperature varies depending on the individual components being used, see section "Temperature specifications" on page 31.

The certification mark on the device must be checked before each installation or use of a device in potentially explosive atmospheres. Additional equipment must be suitable for the site of operation. The final assembly must be approved by the responsible local authorities. Wiring must be performed in accordance with national regulations and the requirements of the authorities.

Devices must remain voltage-free until installation work is completed. The tightening torque for the power supply terminals is 0.5 Nm. Cables must be suitable for a surface temperature of 75°C. APC2100 systems are only permitted to be operated with 24 VDC.

Unshielded/Ungrounded cables are not permitted to be used in potentially explosive atmospheres under any circumstances. Devices must be securely connected to the potential equalization terminal. Power supply, communication and accessory cables must be secured on the device or control cabinet. Power supply, communication and accessory cables are not permitted to exert excessive strain on connections. This must take into account possible vibrations in the area.

2.7.3 Operation

To switch APC2100 systems on/off in a potentially explosive atmosphere, either a switch must be located outside the potentially explosive atmosphere or a switch certified for use in potentially explosive atmospheres must be used.

Danger!

Explosion hazard: Accessories are not permitted to be connected or disconnected with voltage applied unless the area is considered nonhazardous and is free of ignitable concentrations!

Explosion hazard: Replacing components may impair eligibility for Class I, Division 2!

Danger !

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

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

With the exception of USB dongle 0TG1000.01 or in accordance with the requirements listed in "USB connection with the Automation PC 2100" and "USB connection with the 4-port hub", USB interfaces are not certified for operation in potentially explosive areas and are only permitted to be used for service purposes.

2.7.4 Servicing, disturbances and removal

Devices must be switched off and protected against accidental startup. A suitable voltmeter must be used to check that the power supply has been cut off.

Before removing or installing accessories, components or cables, the power supply to APC2100 systems and power supplies must be disconnected. Defective devices are only permitted to be replaced by knowledgeable and qualified personnel. Before switching on or connecting to the power supply, all covers and system components must be reinstalled and secured.

Danger!

Failure to follow these instructions can result in death, serious injury or damage to property!

Danger !

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

2.7.5 USB connection with the Automation PC 2100

2.7.5.1 Introduction

The information below describes the use of USB peripheral devices on USB interfaces 1 and 2 of the B&R Automation PC 2100 in hazardous locations Class I, Division 2, Groups A, B, C and D.

Danger!

DANGER OF EXPLOSION

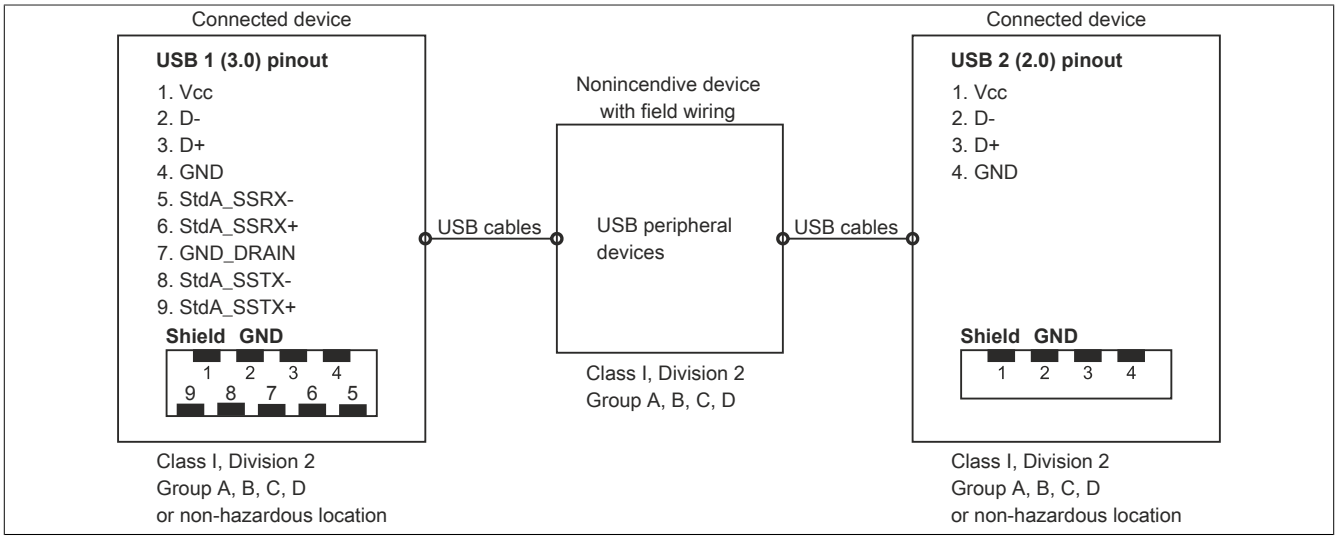
- **Before installation or use in a potentially explosive atmosphere, the explosion protection class of the device must be checked per ANSI/ISA 12.12.01 and CSA C22.2 No. 213.**
- **The following must be used to switch on/off B&R devices installed in a potentially explosive atmosphere:**
  - **A switch outside the potentially explosive atmosphere, or**
  - **A switch that is certified in accordance with the hazardous location class and division for "tube use"**
- **As long as the electrical circuit is activated, cables or wires are not permitted to be connected or disconnected unless the area is known to be free of ignitable concentrations of vapors, gases and other flammable or combustible materials. This applies to all connections and switches. This includes electrical, ground and network connections as well as series and parallel connections.**
- **Unshielded/Ungrounded cables are not permitted to be used in potentially explosive atmospheres under any circumstances.**
- **Only configurations with nonincendive USB devices are permitted to be used.**
- **Doors and openings on housings must remain closed. This prevents the accumulation of foreign bodies within the workstation.**

Failure to follow these instructions can result in death, serious injury or damage to property!

2.7.5.2 Description

Nonincendive devices (keyboards, mouse) are certified for use on the rear USB interfaces of the B&R Automation PC 2100 (connected device) and are permitted to be connected and disconnected during operation. In addition to the nonincendive property, devices that can be connected to rear USB interfaces 1 and 2 must meet the following criteria.

The figure shows a wiring diagram of the USB cable:



The following tables indicate the nonincendive electrical circuit parameters:

Interface USB1 (USB 3.0):	
No-load voltage [V_{oc}]	5.13 V
Short circuit current [I_{sc}]	2060 mA
Associated capacitance [C_a]	20 µF
Associated inductance [L_a]	4.8 µH

Table 211: Nonincendive circuit parameters for interface USB1

Interface USB2 (USB 2.0):	
No-load voltage [V_{oc}]	5.13 V
Short circuit current [I_{sc}]	2060 mA
Associated capacitance [C_a]	20 µF
Associated inductance [L_a]	4.8 µH

Table 212: Nonincendive circuit parameters for interface USB2

The entity concept allows interconnection of nonincendive devices with connected devices with not specifically inspected combinations as a system. For this, the permissible values of V_{oc} (or U_o) and I_{sc} (or I_o) for the connected device must be less than or equal to V_{max} (U_i) and I_{max} (I_i) for the nonincendive device, and the permissible values of C_a (C_o) and L_a (L_o) for the connected device must be greater than or equal to $C_i + C_{Cable}$ and $L_i + L_{Cable}$ for the nonincendive device with field wiring.

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

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

Table 213: Connected nonincendive device with field wiring

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

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

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

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

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

Warning!

- **Replacing components may impair eligibility for Division 2 hazardous (classified) locations.**
- **The device is not permitted to be switched on or off if the area is known to represent an explosion hazard.**
- **The nonincendive device with field wiring is not permitted to be connected via a parallel connection. This applies unless the device has received express approval for this.**

This B&R device is suitable for use in Class I, Division 2, Groups A, B, C and D. In addition, it offers nonincendive field wiring for devices in Class I, Division 2, Groups A, B, C and D.

2.7.6 USB connection with the 4-port hub

2.7.6.1 Introduction

The information below describes the use of USB peripheral devices for the B&R 4-port USB hub in hazardous locations Class I, Division 2, Groups A, B, C and D.

Danger!

DANGER OF EXPLOSION

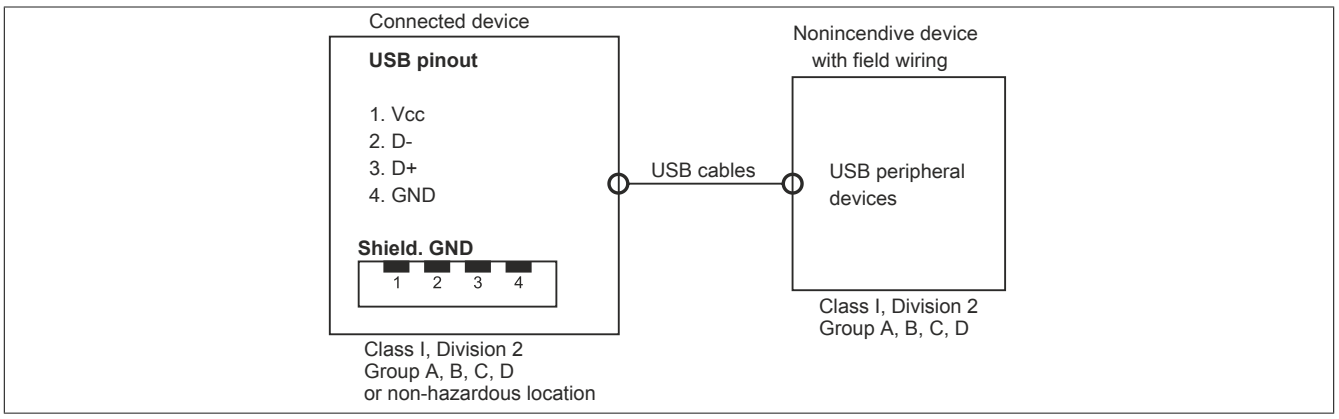
- **Before installation or use in a potentially explosive atmosphere, the explosion protection class of the device must be checked per ANSI/ISA 12.12.01 and CSA C22.2 No. 213.**
- **The following must be used to switch on/off B&R devices installed in a potentially explosive atmosphere:**
  - **A switch outside the potentially explosive atmosphere, or**
  - **A switch that is certified in accordance with the hazardous location class and division for "tube use"**
- **As long as the electrical circuit is activated, cables or wires are not permitted to be connected or disconnected unless the area is known to be free of ignitable concentrations of vapors, gases and other flammable or combustible materials. This applies to all connections and switches. This includes electrical, ground and network connections as well as series and parallel connections.**
- **Unshielded/Ungrounded cables are not permitted to be used in potentially explosive atmospheres under any circumstances.**
- **Only configurations with nonincendive USB devices are permitted to be used.**
- **Doors and openings on housings must remain closed. This prevents the accumulation of foreign bodies within the workstation.**

Failure to follow these instructions can result in death, serious injury or damage to property!

2.7.6.2 Description

Nonincendive devices (keyboards, mouse) are certified for use on the B&R 4-port hub (connected device) and are permitted to be connected and disconnected during operation. In addition to the nonincendive property, devices that can be connected to the USB interfaces must meet the following criteria.

The figure shows a wiring diagram of the USB cable:



The following table indicates the nonincendive electrical circuit parameters:

USB interfaces (USB 2.0):	
No-load voltage [V_{oc}]	5.11 V
Short circuit current [I_{sc}]	1621 mA
Associated capacitance [C_a]	20 µF
Associated inductance [L_a]	16.8 µH

Table 214: Nonincendive electrical circuit parameters for the 4-port USB interfaces

The entity concept allows interconnection of nonincendive devices with connected devices with not specifically inspected combinations as a system. For this, the permissible values of V_{oc} (or U_o) and I_{sc} (or I_o) for the connected device must be less than or equal to V_{max} (U_i) and I_{max} (I_i) for the nonincendive device, and the permissible values of C_a (C_o) and L_a (L_o) for the connected device must be greater than or equal to $C_i + C_{Cable}$ and $L_i + L_{Cable}$ for the nonincendive device with field wiring.

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

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

Table 215: Connected nonincendive device with field wiring

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

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

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

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

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

Warning!

- **Replacing components may impair eligibility for Division 2 hazardous (classified) locations.**
- **The device is not permitted to be switched on or off if the area is known to represent an explosion hazard.**
- **The nonincendive device with field wiring is not permitted to be connected via a parallel connection. This applies unless the device has received express approval for this.**

This B&R device is suitable for use in Class I, Division 2, Groups A, B, C and D. In addition, it offers nonincendive field wiring for devices in Class I, Division 2, Groups A, B, C and D.

Chapter 6 • Accessories

The functionality of the following accessories has been tested and approved by B&R in connection with this device. Nevertheless, there may be possible limitations with regard to operation with other individual components as part of the complete system. For the operation of the complete system, all individual specifications of the components must be observed.

All components listed in this manual have been subjected to extensive system and compatibility testing and approved 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 for the power supply.

1.1.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm²	
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm²	

Table 216: 0TB103.9, 0TB103.91 - Order data

1.1.3 Technical data

> **Information:**
>
> **The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.**

Model number	0TB103.9	0TB103.91
General information		
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]	
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]	
Terminal block		
Note	Protected against vibration by the screw flange Nominal values per UL	
Number of pins	3 (female)	
Type of terminal block	Screw clamp terminal block	Cage clamp terminal block [3)]
Cable type	Only copper wires (no aluminum wires!)	
Spacing	5.08 mm	

Table 217: 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 mm²	
Solid wires	0.20 to 2.50 mm²	
Fine strand wires	0.20 to 1.50 mm²	0.20 to 2.50 mm²
With wire end sleeves	0.20 to 1.50 mm²	
Tightening torque	0.4 Nm	-
Electrical characteristics		
Nominal voltage	300 V	
Nominal current [4]	10 A / contact	
Contact resistance	≤5 mΩ	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	

Table 217: 0TB103.9, 0TB103.91 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) Cage clamp terminal blocks cannot be used side-by-side.
4) The respective limit data for the I/O modules must be taken into account.

2 Terminal block IF options

2.1 0TB1210.3100

2.1.1 General information

This 2-row, 10-pin TB1210 terminal block is used to connect to the interfaces on various interface options.

2.1.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB1210.3100	Connector 300 VDC - 10-pin female - Cage clamp terminal block - Protected against vibration by the screw flange	

Table 218: 0TB1210.3100 - Order data

2.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	0TB1210.3100
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]
Terminal block	
Note	Nominal values according to UL
Number of pins	10 (female)
Type of terminal block	PUSH IN cage clamp terminal block connector
Cable type	Only copper wires (no aluminum wires!)
Spacing	3.5 mm
Connection cross section	
AWG wire	26 to 16 AWG
Wire end sleeves with plastic covering	0.14 to 1 mm²
Solid wires	0.14 to 1.5 mm²
Fine strand wires	0.14 to 1.5 mm²
With wire end sleeves	0.14 to 1.5 mm²
Electrical characteristics	
Nominal voltage	300 V
Nominal current [3)]	10 A
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

Table 219: 0TB1210.3100 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification and the complete system itself carries the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) The limit data for each I/O module must be taken into consideration.

3 USB flash drives

3.1 5MMUSB.xxxx-01

3.1.1 General information

USB flash drives are easily exchangeable data storage devices. Because of their high-speed data transfer (USB 2.0), USB flash drives are ideal for use as portable storage media. Without requiring additional drivers ("Hot Plug & Play"), the USB flash drive becomes an additional drive where data can be read or written.

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 provide alternative products. The following measures may therefore be necessary in order to also boot from these USB flash drives:

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

3.1.2 Order data

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

Table 220: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

3.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMUSB.2048-01	5MMUSB.4096-01
General information		
Capacity	2 GB	4 GB
LED status indicators	1 LED (green) [1]	1 LED (green) [2]
MTBF	>3,000,000 hours	
Type	USB 1.1, USB 2.0	
Maintenance	None	
Default file system	FAT32	
Certifications		
CE	Yes	
GOST-R	Yes	
Interfaces		
USB		
Type	USB 1.1, USB 2.0	
Connection	To any USB type A interface	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Sequential reading	Full speed max. 1 MB/s, High speed max. 32 MB/s	Full speed max. 1 MB/s, high speed max. 32 MB/s
Sequential writing	Full speed max. 0.9 MB/s, High speed max. 23 MB/s	Full speed max. 0.9 MB/s, high speed max. 23 MB/s
Endurance		
SLC flash	Yes	
Data retention	>10 years	
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses	<1 unrecoverable error per 10^{14} bits read
Connection cycles	>1500	

Table 221: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Model number	5MMUSB.2048-01	5MMUSB.4096-01
Support		
Operating systems		
Windows 10 IoT Enterprise LTSB 64-bit	Yes	
Windows Embedded 8.1 Industry Pro 32-bit	Yes	
Windows Embedded 8.1 Industry Pro 64-bit	Yes	
Windows 7 32-bit	Yes	
Windows 7 64-bit	Yes	
Windows Embedded Standard 7 32-bit	Yes	
Windows Embedded Standard 7 64-bit	Yes	
Windows XP Professional	Yes	
Windows XP Embedded	Yes	
Windows 2000	Yes	
Windows CE 5.0	Yes	
Windows CE 4.2	Yes	
B&R Linux 8	Yes	
B&R Linux 9	Yes	
Electrical characteristics		
Current consumption	Max. 500 µA sleep mode, max. 120 mA read/write	Max. 500 µA in sleep mode, max. 120 mA read/write
Environmental conditions		
Temperature		
Operation	0 to 70 °C [3]	0 to 70 °C [3]
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 [3]	Max. 3048 m [3]
Storage	Max. 12192 m	
Transport	Max. 12192 m	
Mechanical properties		
Dimensions		
Width	17.97 mm	
Length	67.85 mm	
Height	8.35 mm	

Table 221: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

1) Indicates data being transferred (sending and receiving).
2) Indicates data transfer (receiving and transmitting).
3) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.

3.1.4 Temperature/Humidity diagram

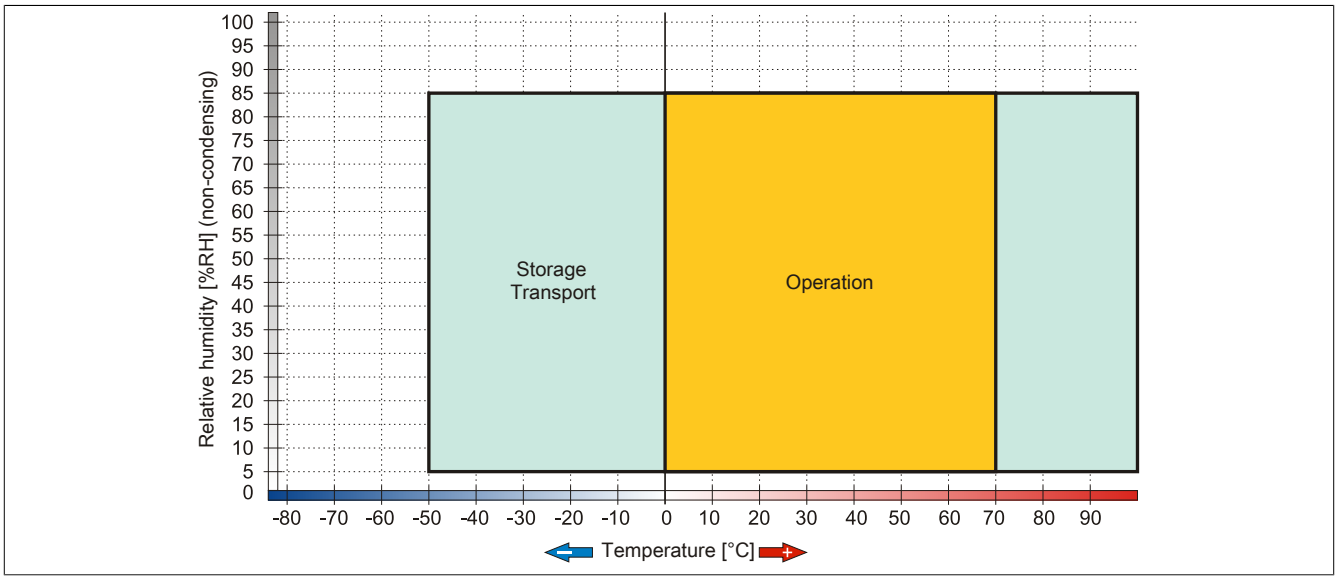


Figure 81: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

3.2 5MMUSB.032G-02

3.2.1 General information

USB flash drives are easily exchangeable data storage devices. Because of their high-speed data transfer (USB 3.0), USB flash drives are ideal for use as portable storage media. Without requiring additional drivers ("Hot Plug & Play"), the USB flash drive becomes an additional drive where data can be read or written. USB 3.0 (XHCI) is supported starting with Windows 7 (USB 3.0 driver required).

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 provide alternative products. The following measures may therefore be necessary in order to also boot from these USB flash drives:

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

3.2.2 Order data

Model number	Short description	Figure
	USB accessories	
5MMUSB.032G-02	USB 3.0 flash drive 32 GB MLC	

Table 222: 5MMUSB.032G-02 - Order data

3.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMUSB.032G-02
General information	
Capacity	32 GB
LED status indicators	1 LED (green) [1]
MTBF	>3,000,000 hours
Type	USB 2.0, USB 3.0
Maintenance	None
Certifications	
CE	Yes
Interfaces	
USB	
Type	USB 2.0, USB 3.0
Connection	To any USB type A interface
Transfer rate	High speed (480 Mbit/s) to SuperSpeed (4 Gbit/s)
Sequential reading	USB 3.0 max. 100 MB/s
Sequential writing	USB 3.0 max. 50 MB/s
Endurance	
MLC flash	Yes
Data reliability	<1 unrecoverable error per 10^{14} bits read
Connection cycles	>1500
Electrical characteristics	
Current consumption	Max. 67 mA in sleep mode, max. 122 mA read, max. 141 mA write
Environmental conditions	
Temperature	
Operation	0 to 70 °C [2]
Storage	-55 to 95 °C
Transport	-55 to 95 °C

Table 223: 5MMUSB.032G-02 - Technical data

Model number	5MMUSB.032G-02
Relative humidity	
Operation	10 to 95%, non-condensing
Storage	10 to 95%, non-condensing
Transport	10 to 95%, non-condensing
Vibration	
Operation	7 to 2000 Hz: 20 g
Storage	7 to 2000 Hz: 20 g
Transport	7 to 2000 Hz: 20 g
Shock	
Operation	1500g, 0.5 ms
Storage	1500g, 0.5 ms
Transport	1500g, 0.5 ms
Elevation	
Operation	Max. 3048 m [2)]
Storage	Max. 12192 m
Transport	Max. 12192 m
Mechanical properties	
Dimensions	
Width	16.58 mm
Length	48.30 mm
Height	7.60 mm
Weight	10 g
Manufacturer information	
Manufacturer	Innodisk
Manufacturer's product ID	DEUA1-32GI61BCH88 (USB drive 3ME)

Table 223: 5MMUSB.032G-02 - Technical data

1) Indicates data transfer (receiving and transmitting).
2) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.

3.2.4 Temperature/Humidity diagram

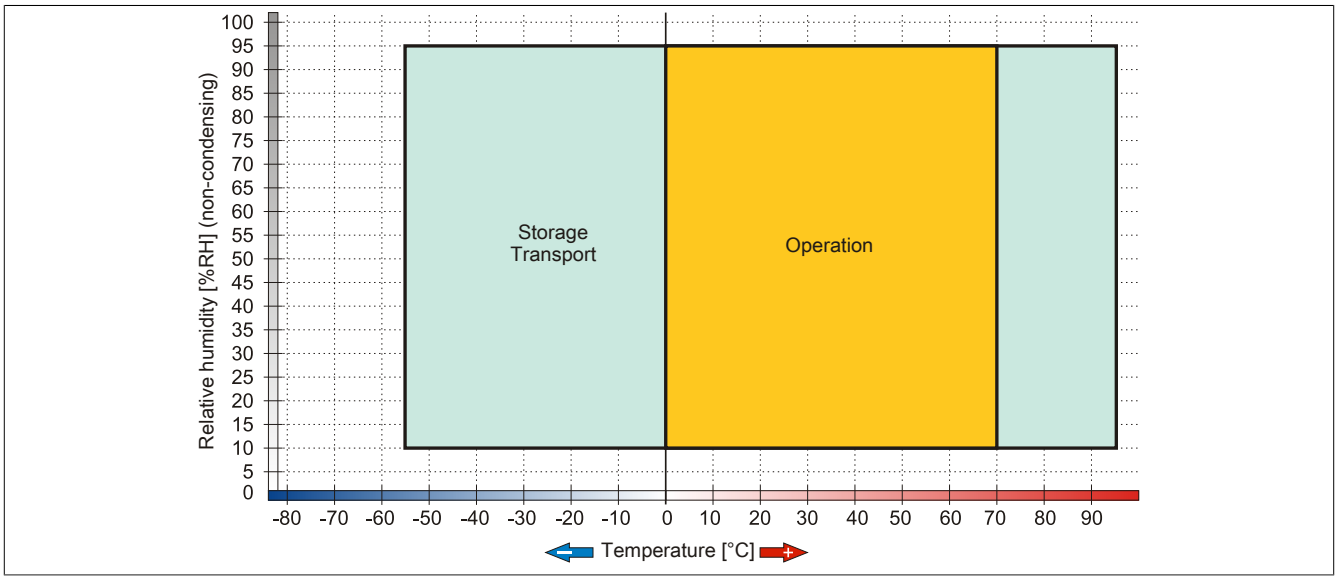


Figure 82: 5MMUSB.032G-02 - Temperature/Humidity diagram

4 USB hub

4.1 5ACCUSB4.0000-000

4.1.1 General information

- 4x USB 2.0, interfaces
- Compatible with the APC2100 and PPC2100

The USB hub can be installed starting with the following revisions:

- 5APC2100.BY01-000 - Rev. E0 and later
- 5APC2100.BY11-000 - Rev. E0 and later
- 5APC2100.BY22-000 - Rev. E0 and later
- 5APC2100.BY34-000 - Rev. E0 and later
- 5APC2100.BY44-000 - Rev. E0 and later
- 5APC2100.BY48-000 - Rev. A0 and later

Information:

If the USB hub is selected during device configuration, 1 of the 3 front covers (5ACCFF00.0001-000, 5ACCFF00.0001-001 or 5ACCFF00-0001-002) must also be ordered.

4.1.2 Order data

Model number	Short description	Figure
	Accessories	
5ACCUSB4.0000-000	USB hub 4x passive - For APC2100/PPC2100	

Table 224: 5ACCUSB4.0000-000 - Order data

4.1.3 Technical data

Warning!

Peripheral USB devices can be connected to the USB interfaces. Due to the large number of USB devices available on the market, B&R cannot guarantee their functionality. Functionality is ensured when using the USB devices available from B&R.

Caution!

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

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACCUSB4.0000-000
General information	
B&R ID code	0xEABA
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]
Interfaces	
USB	
Quantity	4
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	Total max. 1 A (sum of all 4 ports)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	Back: IP20 (front: depends on the panel used) [2)]
Environmental conditions	
Temperature	
Operation	0 to 60 °C [3)]
Storage	-20 to 60 °C
Transport	-20 to 60 °C
Relative humidity	
Operation	5 to 90 %, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Elevation	
Operation	Max. 3000 m [3)]
Mechanical characteristics	
Housing	
Material	Stainless steel, coated
Coating	Anthracite gray
Dimensions	
Width	21.5 mm
Height	29.5 mm
Depth	97 mm
Weight	100 g

Table 225: 5ACCUSB4.0000-000 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Only when all interface covers are installed.
3) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.

4.1.3.1 USB interfaces

The 4-port USB hub is equipped with a Universal Serial Bus 2.0 (USB) host controller with multiple USB interfaces, of which 4 USB 2.0 interfaces are accessible externally for the user.

Warning!

Peripheral USB devices can be connected to the USB interfaces. Due to the large number of USB devices available on the market, B&R cannot guarantee their functionality. Functionality is ensured when using the USB devices available from B&R.

Caution!

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

USB HUB 1, USB HUB 2, USB HUB 3, USB HUB 4

Universal Serial Bus (USB HUB 1, USB HUB 2, USB HUB 3, USB HUB 4)[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[2]	Max. 1 A
Cable length	Max. 5 m

1x USB type A, female

Table 226: USB HUB 1, USB HUB 2, USB HUB 3, USB HUB 4 interface

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

Information:

If a Technology Guard (USB dongle) is used, it is recommended to connect it to the USB HUB 3 interface.

4.1.4 Dimensions

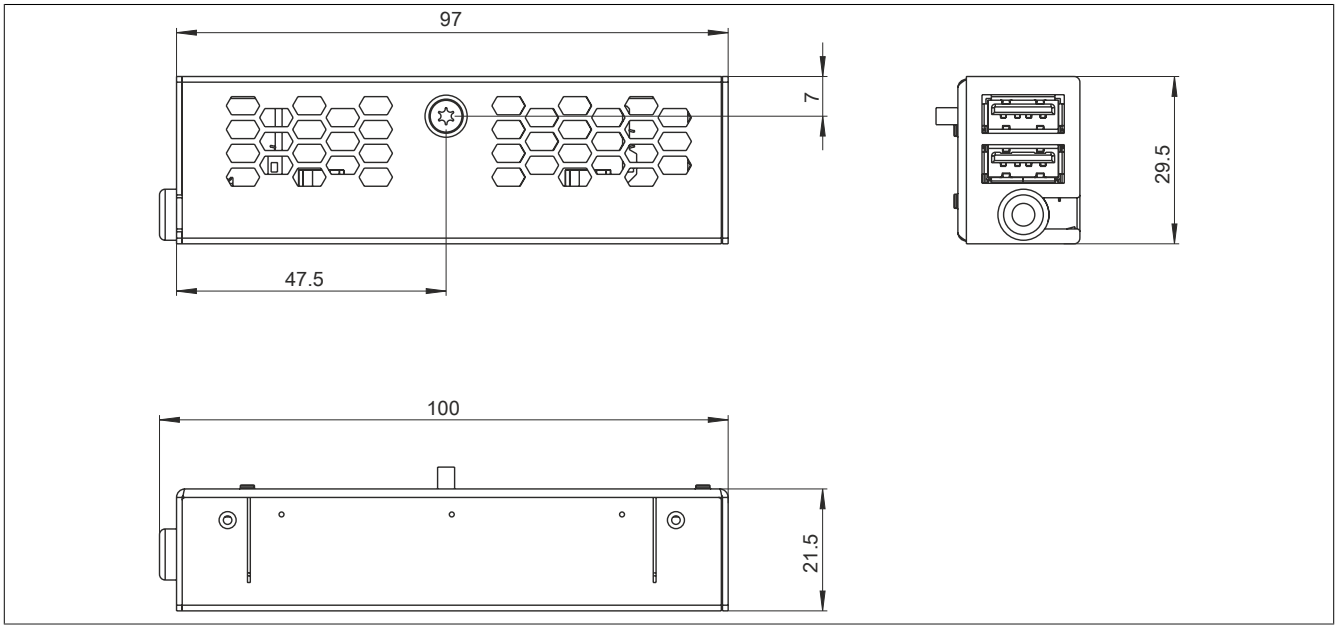


Figure 83: 5ACCUSB4.0000-000 - Dimensions

5 Cables

5.1 SDL3/SDL4 cables

5.1.1 5CASD3.xxxx-00

5.1.1.1 General information

5CASD3.xxxx-00 SDL3/SLD4 cables are designed to transfer SDL3/SDL4 data and simplify cable installation. The RJ45 connector allows these cables to be connected in very narrow spaces, for example in swing arm shafts.

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

5.1.1.2 Order data

Model number	Short description	Figure
	SDL3/SDL4 cables	
5CASD3.0030-00	SDL3/SDL4 cable - 3 m	
5CASD3.0050-00	SDL3/SDL4 cable - 5 m	
5CASD3.0100-00	SDL3/SDL4 cable - 10 m	
5CASD3.0150-00	SDL3/SDL4 cable - 15 m	
5CASD3.0200-00	SDL3/SDL4 cable - 20 m	
5CASD3.0300-00	SDL3/SDL4 cable - 30 m	
5CASD3.0500-00	SDL3/SDL4 cable - 50 m	
5CASD3.1000-00	SDL3/SDL4 cable - 100 m	

Table 227: 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

5.1.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CASD3. 0030-00	5CASD3. 0050-00	5CASD3. 0100-00	5CASD3. 0150-00	5CASD3. 0200-00	5CASD3. 0300-00	5CASD3. 0500-00	5CASD3. 1000-00
General information								
Certifications								
CE	Yes							
UL	cULus E115267 Industrial control equipment							
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]							
Cable construction								
Wire cross section	4x 2x 26/7 AWG					4x 2x 23/1 AWG		
Properties	Flame-retardant, halogen-free, lead-free							
Outer jacket								
Material	Polyurethane (PUR)							
Color	Yellow, RAL 1021							
Labeling	HARTING INDUSTRIAL CABLE S/FTP CAT 6A PUR 4x2xAWG26/7					HARTING INDUSTRIAL INSTALLATION CABLE S/FTP CAT 7 PUR 4x2xAWG23/1		
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 [2)]								
Operating voltage	≤100 V					≤125 V		
Conductor resistance	≤290 Ω/km					≤75 Ω/km		

Table 228: 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. 0030-00	5CASD3. 0050-00	5CASD3. 0100-00	5CASD3. 0150-00	5CASD3. 0200-00	5CASD3. 0300-00	5CASD3. 0500-00	5CASD3. 1000-00
Wave impedance	100 ±5 Ω (at 100 MHz)							
Transfer properties	Category 6A / Class EA up to 500 MHz per ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)					Category 7 / Class F up to 600 MHz per ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)		
Insulation resistance	≥500 MΩ/km					≥5 GΩ/km		
Operating conditions								
Pollution degree per EN 61131-2	Pollution degree 2							
Flame-retardant	IEC 60332-1-2							
Oil and hydrolysis resistance	EN 60811-2-1 (90°C / 7x24 h)							
Degree of protection per EN 60529								
Cables	IP20							
RJ45 connector	IP20, only when properly connected							
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 properties								
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 228: 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 in the complete system have this certification and the complete system bears the corresponding mark.
2) At an ambient temperature of 20°C.

5.1.1.4 Bend radius specifications

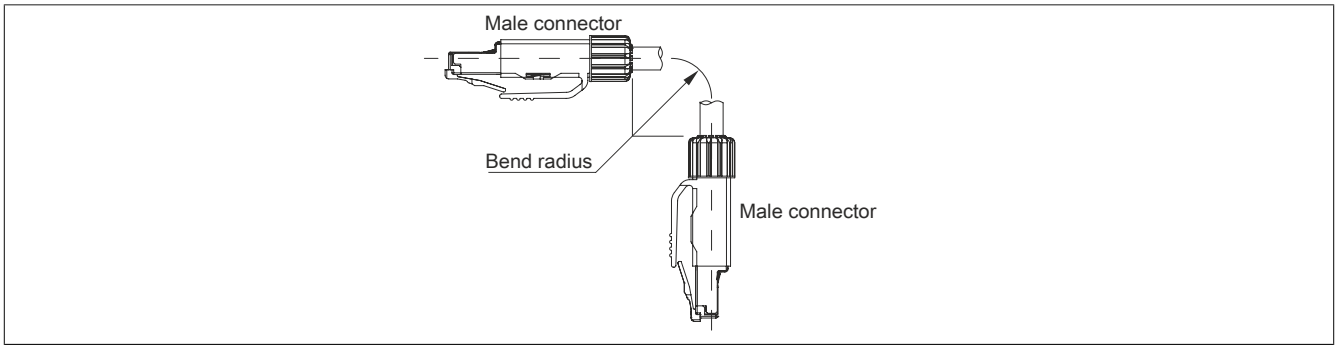


Figure 84: SDL3/SDL4 bending radius specification

5.1.1.5 Dimensions

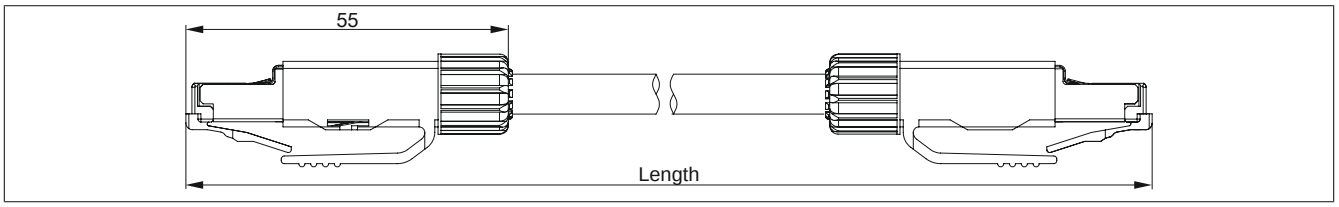


Figure 85: 5CASD3.xxxx-00 - Dimensions

5.1.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

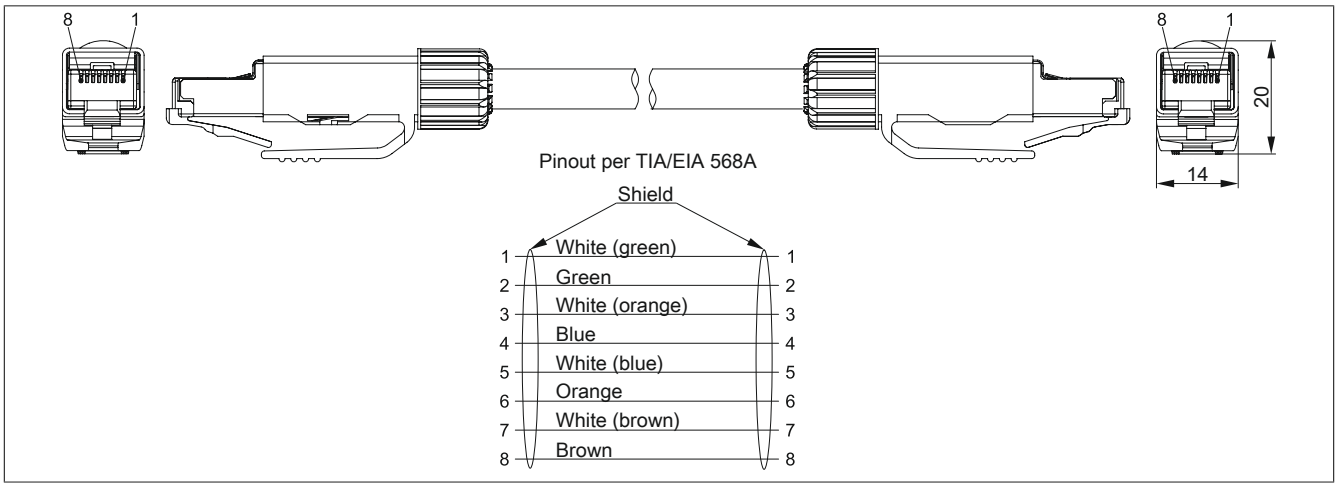


Figure 86: 5CASD3.xxxx-00 - Pinout

5.1.1.7 Wiring

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).

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

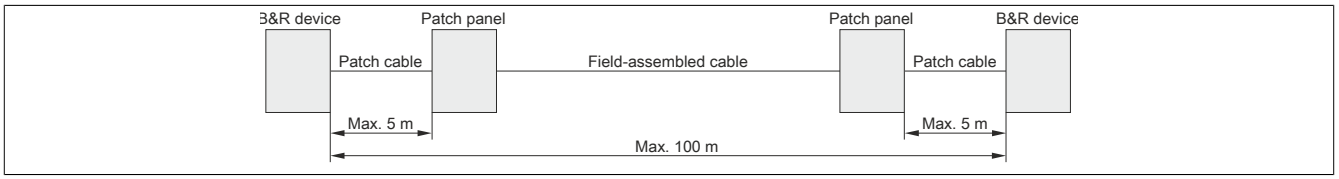


Figure 87: Wiring with a field-assembled cable

5.2 SDL cables

5.2.1 5CASDL.0xxx-00

5.2.1.1 General information

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

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

5.2.1.2 Order data

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

Table 229: 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

5.2.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CASDL. 0008-00	5CASDL. 0018-00	5CASDL. 0050-00	5CASDL. 0100-00	5CASDL. 0150-00	5CASDL. 0200-00	5CASDL. 0250-00	5CASDL. 0300-00
General information								
Certifications								
CE	Yes							
UL	cULus E115267 Industrial control equipment							
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]							
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]							
GOST-R	-	Yes						
Cable construction								
Wire cross section	28 AWG			24 AWG				
Shield	Individual cable pairs, entire cable							
Complete shielding	Tinned copper braiding, optical coverage >85%							
Outer jacket								
Material	PVC							
Color	Black							
Labeling	E74020-C (UL) AWM STYLE 20176 80°C 30 V VW-1 DVI DIGITAL LINK							
Connector								
Type	2x DVI-D (24+1), male							
Connection cycles	100							
Contacts	Gold-plated							
Mechanical protection	Metal cover with crimped strain relief							
Locating screw tightening torque	Max. 0.5 Nm							
Electrical characteristics								
Conductor resistance								
24 AWG	-			≤93 Ω/km				
28 AWG	≤237 Ω/km			-				

Table 230: 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. 0008-00	5CASDL. 0018-00	5CASDL. 0050-00	5CASDL. 0100-00	5CASDL. 0150-00	5CASDL. 0200-00	5CASDL. 0250-00	5CASDL. 0300-00
Insulation resistance	Min. 10 MΩ/km							
Operating conditions								
Pollution degree per EN 61131-2	Pollution degree 2							
Mechanical properties								
Dimensions								
Length	0.8 m ±25 mm	1.8 m ±30 mm	5 m ±30 mm	10 m ±50 mm	15 m ±100 mm	20 m ±100 mm	25 m ±100 mm	30 m ±100 mm
Diameter	Typ. 8.6 ±0.2 mm Max. 9 mm			Typ. 11 ±0.2 mm 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. 206 g	Approx. 300 g	Approx. 580 g	Approx. 1500 g	Approx. 2250 g	Approx. 2880 g	Approx. 4800 g	Approx. 5520 g

Table 230: 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 in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

5.2.1.4 Bend radius specifications

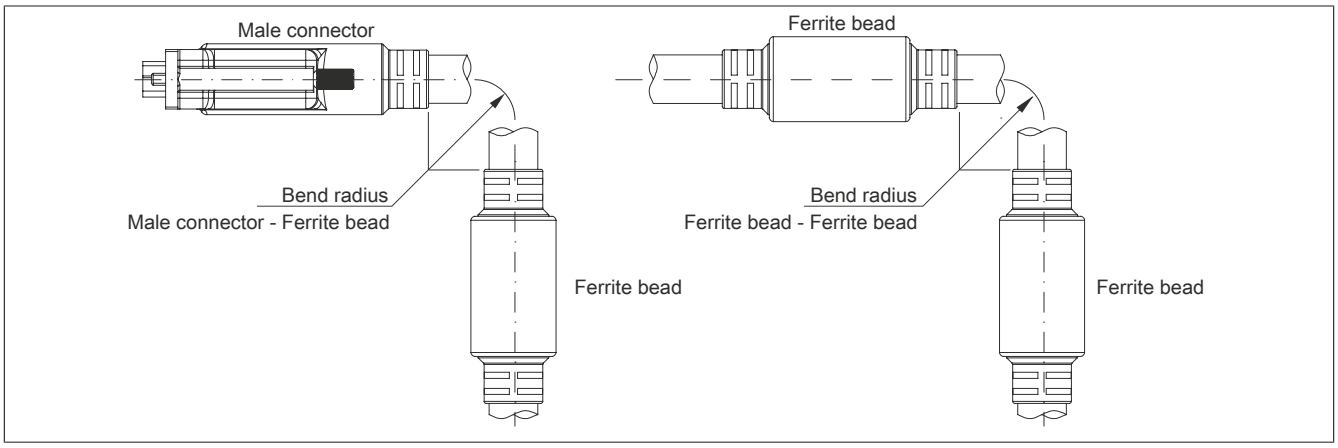


Figure 88: Bend radius specifications

5.2.1.5 Dimensions

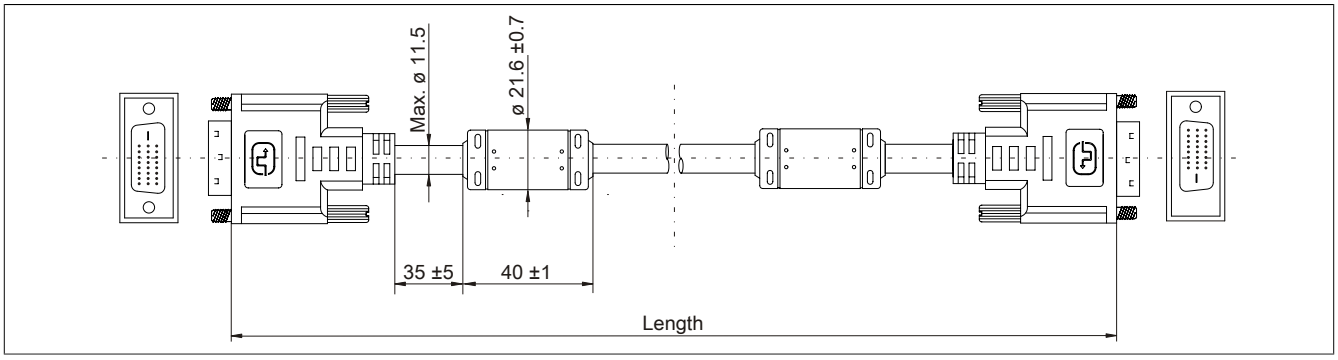


Figure 89: 5CASDL.0xxx-00 - Dimensions

5.2.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

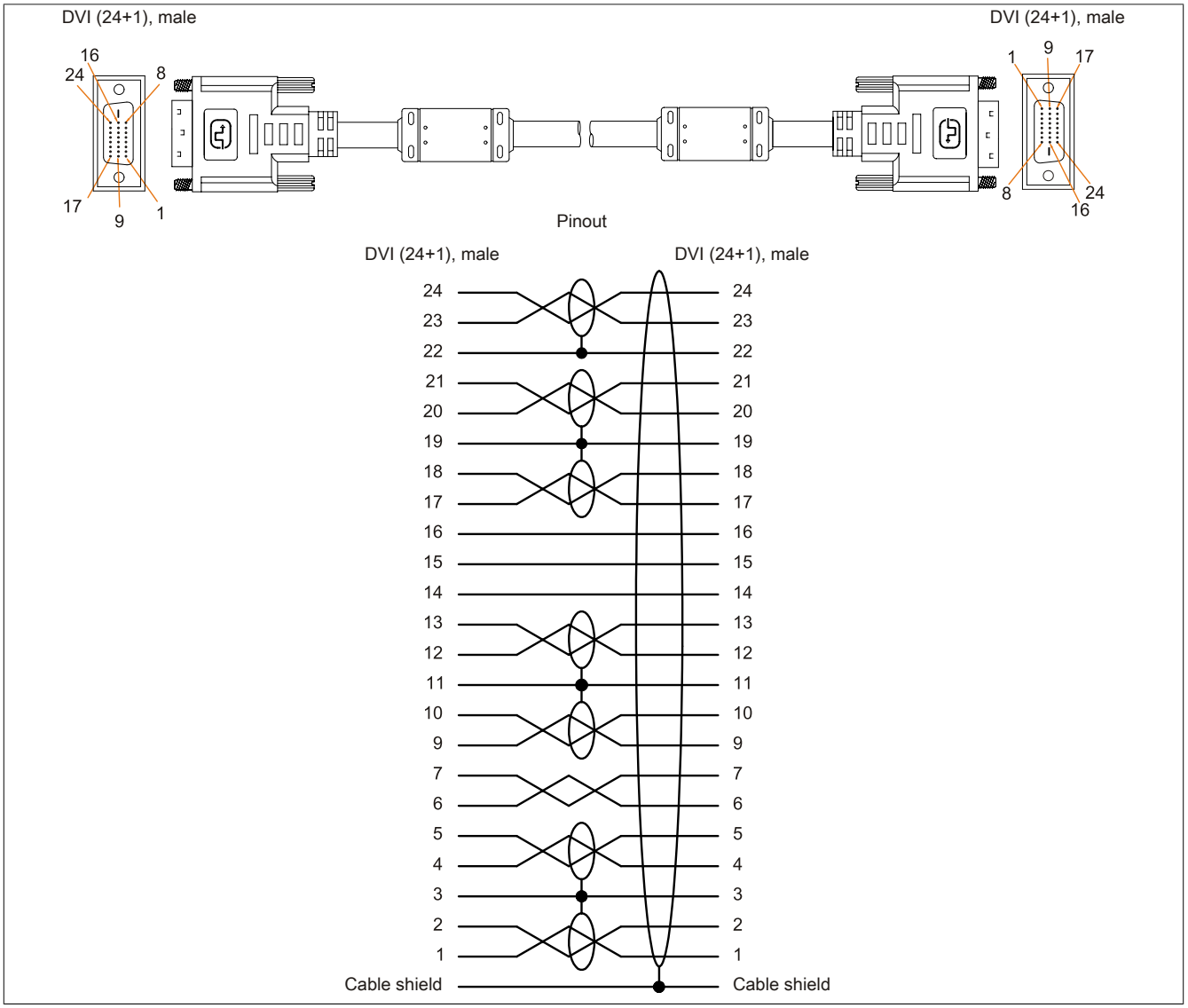


Figure 90: 5CASDL.0xxx-00 - Pinout

5.3 SDL cables with 45° male connector

5.3.1 5CASDL.0xxx-01

5.3.1.1 General information

5CASDL.0xxx-01 SDL cables with 45° connector are designed for use in fixed installations.

> **Caution!**
>
> **The cable is only permitted to be connected or disconnected when the power is switched off.**

5.3.1.2 Order data

Model number	Short description	Figure
	SDL cables 45° connection	
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 231: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Order data

5.3.1.3 Technical data

> **Information:**
>
> **The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.**

Model number	5CASDL.0018-01	5CASDL.0050-01	5CASDL.0100-01	5CASDL.0150-01
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]			
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]			
GOST-R	Yes			
Cable construction				
Wire cross section	28 AWG		24 AWG	
Shield	Individual cable pairs, entire cable			
Complete shielding	Tinned copper braiding, optical coverage >85%			
Outer jacket				
Material	PVC			
Color	Black			
Connector				
Type	2x DVI-D (24+1), male			
Connection cycles	100			
Contacts	Gold-plated			
Mechanical protection	Metal cover with crimped strain relief			
Locating screw tightening torque	Max. 0.5 Nm			
Electrical characteristics				
Conductor resistance				
24 AWG	-		≤93 Ω/km	
28 AWG	≤237 Ω/km		-	
Insulation resistance	Min. 10 MΩ/km			
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			
Mechanical properties				
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	

Table 232: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

Model number	5CASDL.0018-01	5CASDL.0050-01	5CASDL.0100-01	5CASDL.0150-01
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 232: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

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

5.3.1.4 Bend radius specifications

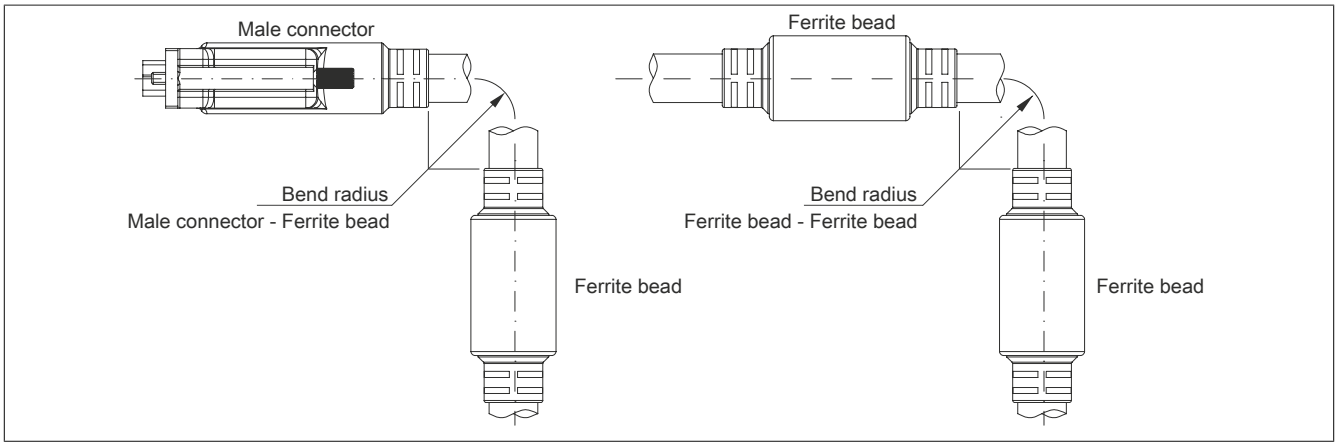


Figure 91: Bend radius specifications

5.3.1.5 Dimensions

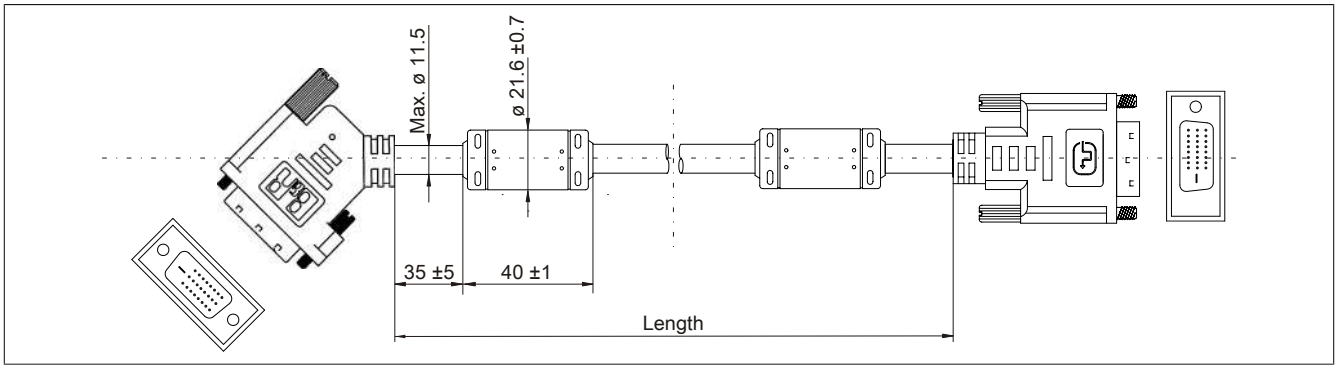


Figure 92: 5CASDL.0xxx-01 - Dimensions

5.3.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

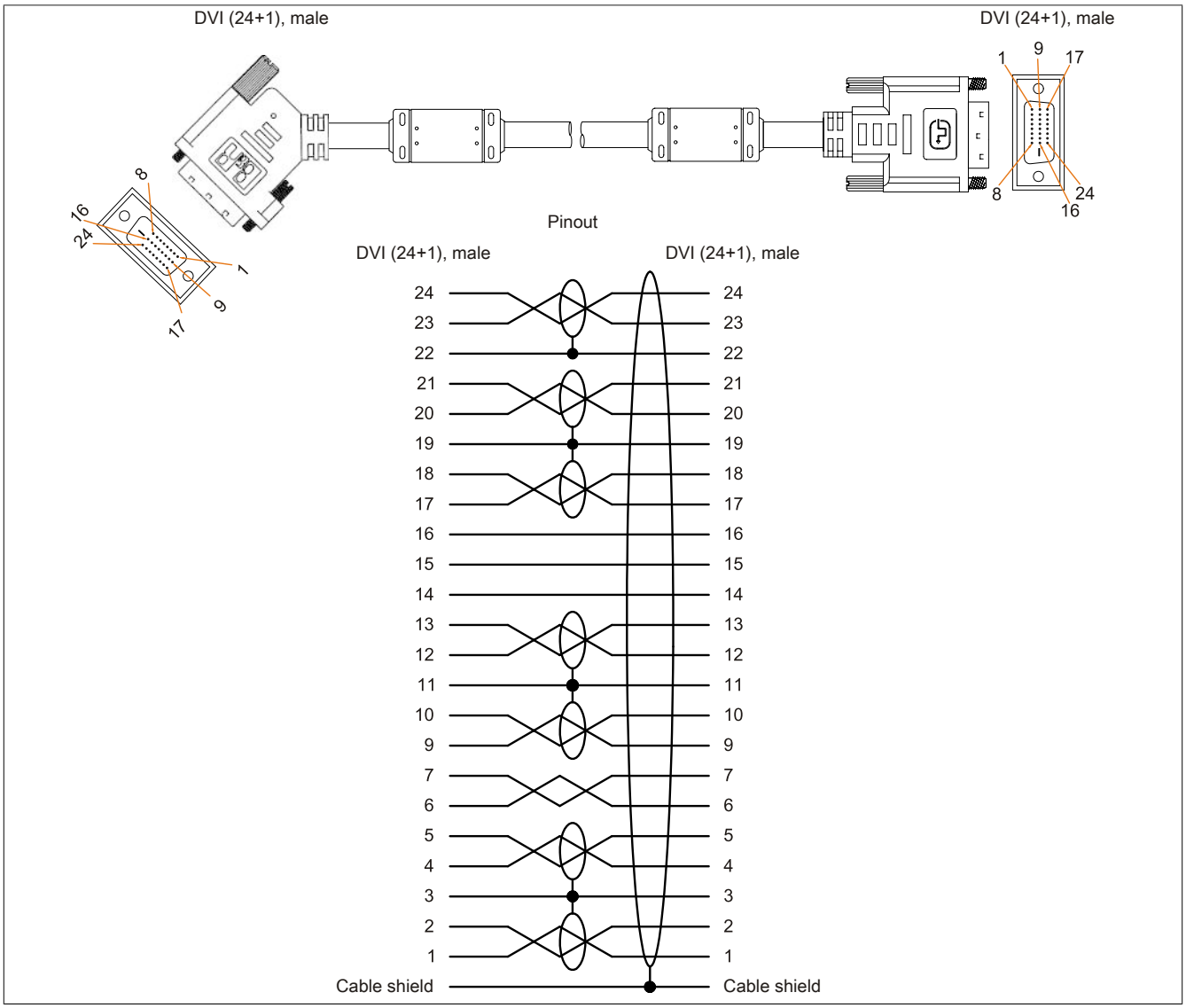


Figure 93: 5CASDL.0xxx-01 - Pinout

5.4 SDL flex cables

5.4.1 5CASDL.0xxx-03

5.4.1.1 General information

5CASDL.0xxx-03 SDL flex cables are designed for use in both fixed and flexible installations (e.g. swing arm systems).

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

5.4.1.2 Order data

Model number	Short description	Figure
	SDL cables flex	
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 233: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Order data

5.4.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CASDL. 0018-03	5CASDL. 0050-03	5CASDL. 0100-03	5CASDL. 0150-03	5CASDL. 0200-03	5CASDL. 0250-03	5CASDL. 0300-03
General information							
Certifications							
CE	Yes						
UL	cULus E115267 Industrial control equipment						
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]						
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]						
GOST-R	Yes						
Cable construction							
Wire cross section	24 AWG (control wires) 26 AWG (DVI, USB, data)						
Properties	Silicone- and halogen-free						
Shield	Individual cable pairs, entire cable						
Complete shielding	Aluminum-clad foil and tinned copper braiding						
Outer jacket							
Material	Special semi-matte TMPU						
Color	Black						
Labeling	(B&R) SDL cable (UL) AWM 20236 80°C 30 V E 63216						
Connector							
Type	2x DVI-D (24+1), male						
Connection cycles	Min. 200						
Contacts	Gold-plated						
Mechanical protection	Metal cover with crimped strain relief						
Locating screw tightening torque	Max. 0.5 Nm						
Electrical characteristics							
Operating voltage	≤30 V						

Table 234: 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. 0018-03	5CASDL. 0050-03	5CASDL. 0100-03	5CASDL. 0150-03	5CASDL. 0200-03	5CASDL. 0250-03	5CASDL. 0300-03
Test voltage							
Wire/Wire	1 kV						
Wire/Shield	0.5 kV						
Wave impedance	100 ±10 Ω						
Conductor resistance							
24 AWG	≤95 Ω/km						
26 AWG	≤145 Ω/km						
Insulation resistance	>200 MΩ/km						
Operating conditions							
Pollution degree per EN 61131-2	Pollution degree 2						
Approbation	UL AWM 20236 80°C 30 V						
Flame-retardant	Per UL 758 (cable vertical flame test)						
Oil and hydrolysis resistance	Per VDE 0282-10						
Environmental conditions							
Temperature							
Storage	-20 to 80°C						
Fixed installation	-20 to 80°C						
Flexible installation	-5 to 60°C						
Mechanical properties							
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 (ferrite bead - ferrite bead)						
Flexibility	Flexible, applies to ferrite bead - ferrite bead (tested 300000 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 234: 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 in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

5.4.1.4 Bend radius specifications

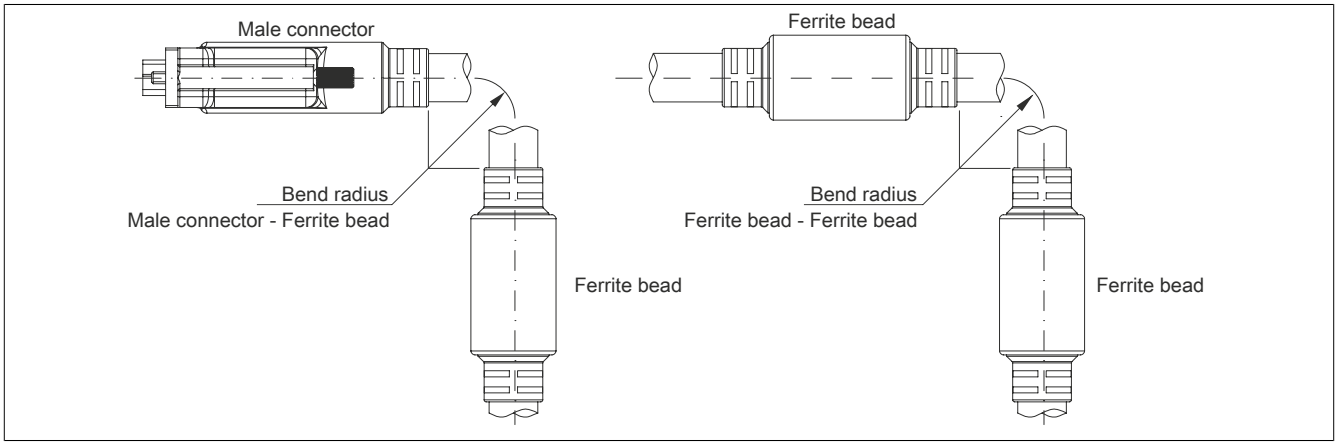


Figure 94: Bend radius specifications

5.4.1.5 Dimensions

All dimensions are specified in mm.

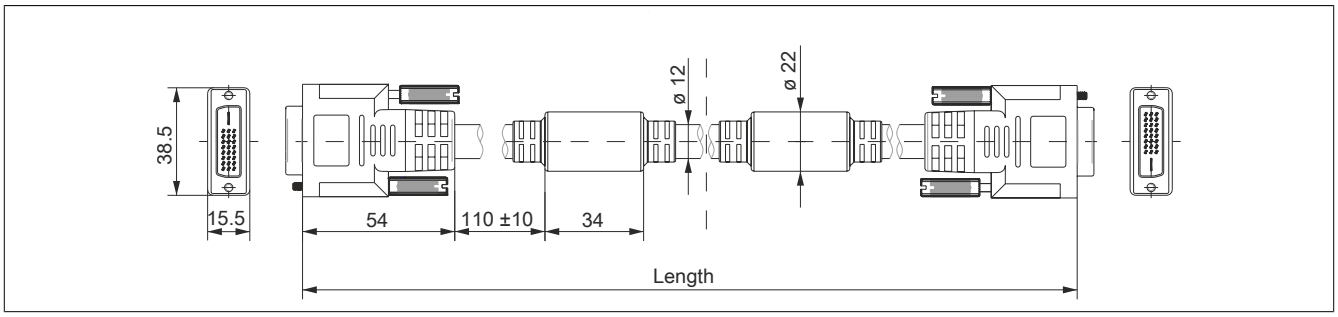


Figure 95: 5CASDL.0xxx-03 ≥Rev. E0 - Dimensions

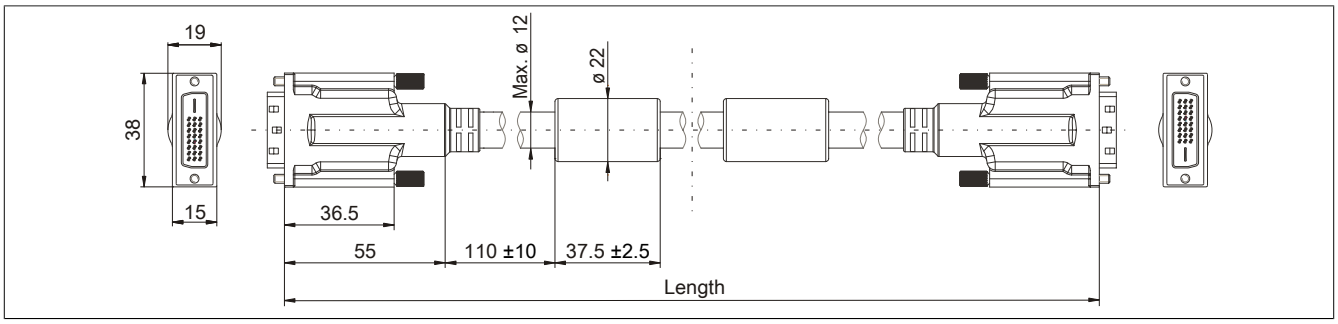


Figure 96: 5CASDL.0xxx-03 ≤Rev. D0 - Dimensions

5.4.1.6 Construction

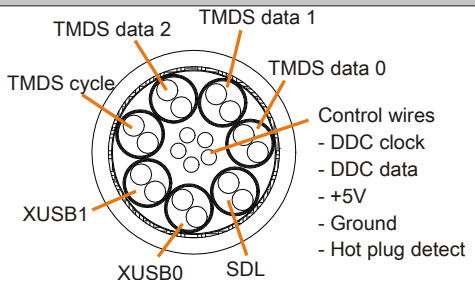
Element	Assignment	Cross section	
DVI	TMDS data 0	26 AWG	
	TMDS data 1	26 AWG	
	TMDS data 2	26 AWG	
	TMDS cycle	26 AWG	
USB	XUSB0	26 AWG	
	XUSB1	26 AWG	
Data	SDL	26 AWG	
Control wires	DDC cycle	24 AWG	
	DDC data	24 AWG	
	+5 V	24 AWG	
	Ground	24 AWG	
	Hot plug detect	24 AWG	

Table 235: 5CASDL.0xxx-03 SDL flex cables - Construction

5.4.1.7 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

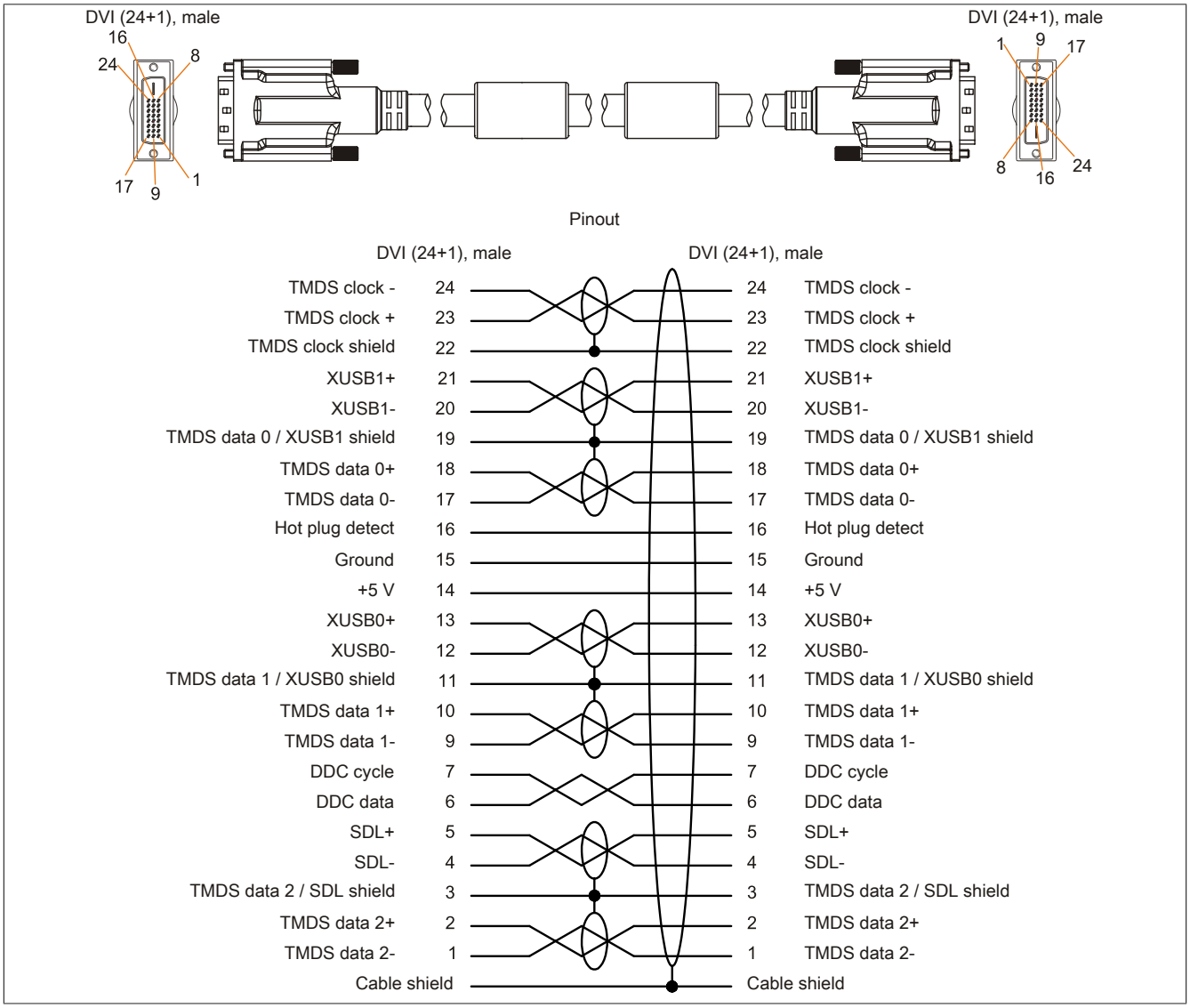


Figure 97: 5CASDL.0xxx-03 - Pinout

5.5 SDL flex cables with extender

5.5.1 5CASDL.0xx0-13

5.5.1.1 General information

5CASDL.0xx0-13 SDL flex cables with extender are designed for use in both fixed and flexible installations (e.g. swing arm systems).

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

5.5.1.2 Order data

Model number	Short description	Figure
	SDL cables flex	
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 236: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Order data

5.5.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
General information			
Certifications			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4[1)]		
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[2)]		
GOST-R	Yes		
Cable construction			
Wire cross section	24 AWG (control wires) 26 AWG (DVI, USB, data)		
Properties	Silicone- and halogen-free		
Shield	Individual cable pairs, entire cable		
Complete shielding	Aluminum-clad foil and tinned copper braiding		
Outer jacket			
Material	Special semi-matte TMPU		
Color	Black		
Labeling	(B&R) SDL cable (UL) AWM 20236 80°C 30 V E63216		
Connector			
Type	2x DVI-D (24+1), male		
Connection cycles	Min. 200		
Contacts	Gold-plated		
Mechanical protection	Metal cover with crimped strain 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			
24 AWG	≤95 Ω/km		
26 AWG	≤145 Ω/km		
Insulation resistance	>200 MΩ/km		

Table 237: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

Model number	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
Operating conditions			
Pollution degree per EN 61131-2		Pollution degree 2	
Approbation		UL AWM 20236 80°C 30 V	
Flame-retardant		Per UL 758 (cable vertical flame test)	
Oil and hydrolysis resistance		Per VDE 0282-10	
Environmental conditions			
Temperature			
Storage		-20 to 60°C	
Fixed installation		-20 to 60°C	
Flexible installation		-5 to 60°C	
Mechanical properties			
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 (male connector - ferrite bead) ≥10x cable diameter (ferrite bead - ferrite bead)	
Flexible installation		≥15x cable diameter (ferrite bead - ferrite bead)	
Flexibility		Flexible, applies to ferrite bead - ferrite bead (tested 300000 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 237: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

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

5.5.1.4 Bend radius specifications

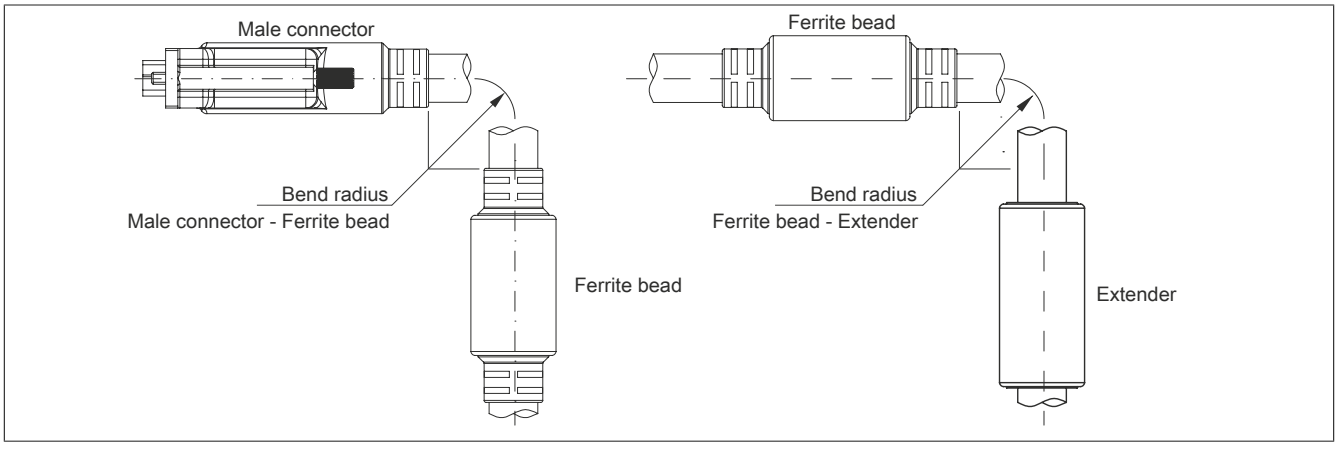


Figure 98: Bend radius specification with extender

5.5.1.5 Dimensions

All dimensions are specified in mm.

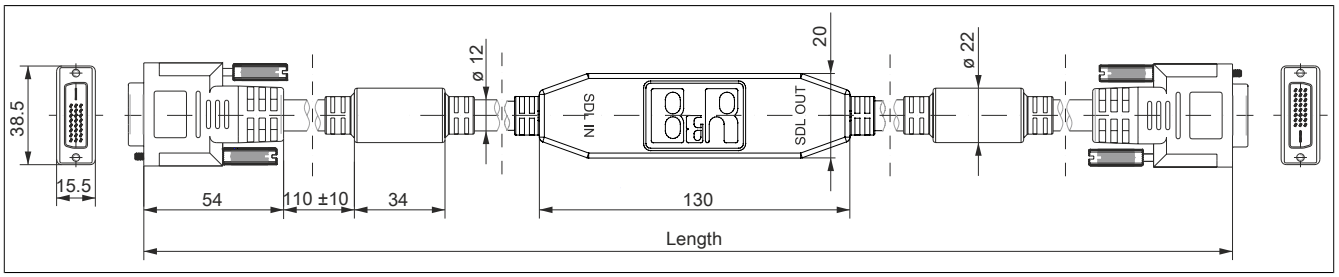


Figure 99: 5CASDL.xxxx-13 ≥Rev. E0 - Dimensions

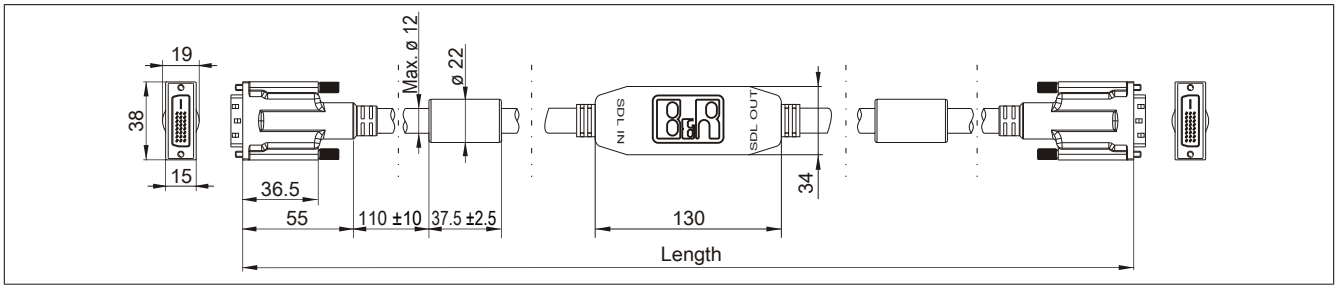


Figure 100: 5CASDL.0xx0-13 ≤Rev. D0 - Dimensions

5.5.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

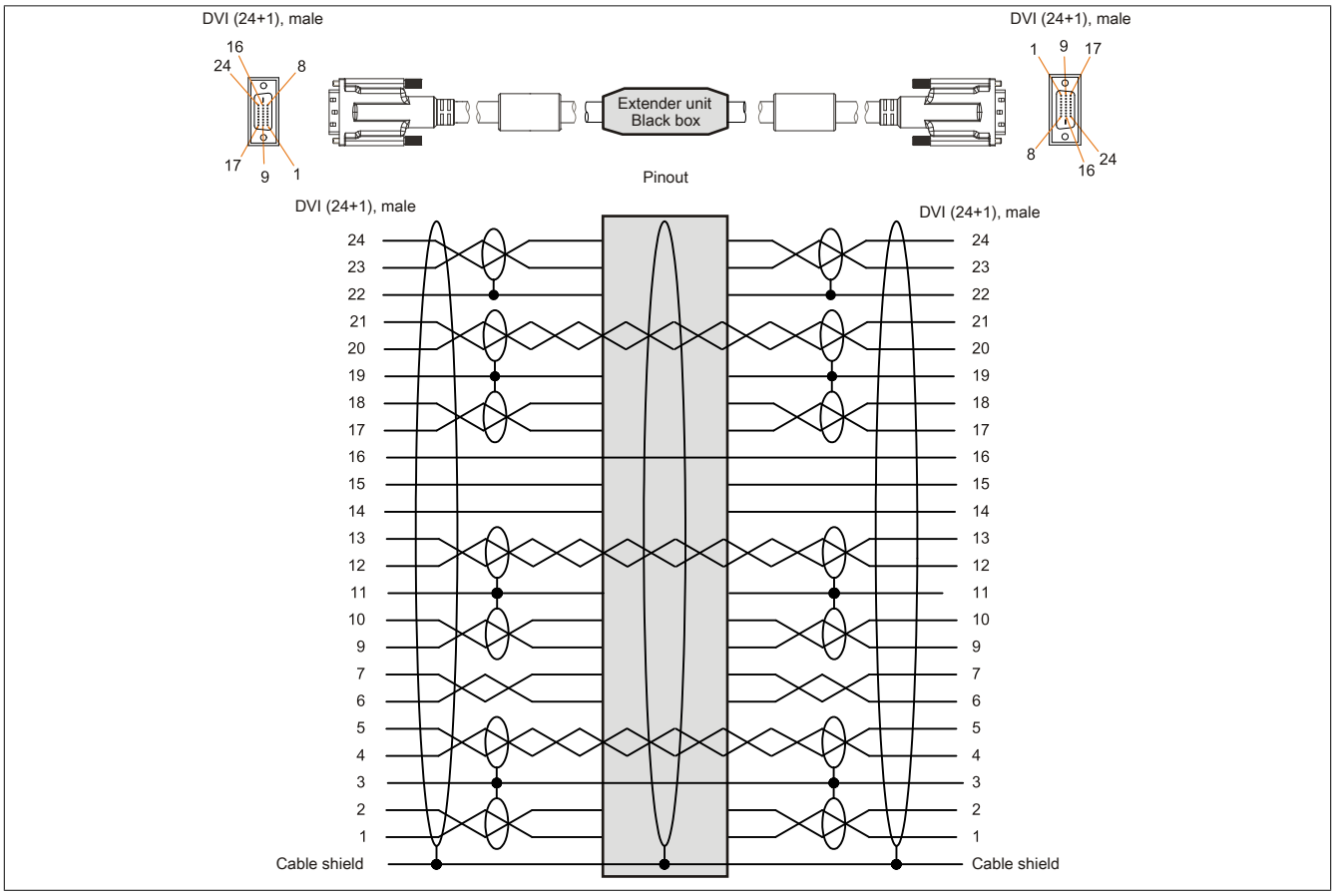


Figure 101: 5CASDL.0xx0-13 - Pinout

5.5.1.7 Cable connection

SDL flex cables with extender must be connected between the B&R industrial PC and Automation Panel in the correct direction. The correct signal direction is indicated on the extender.

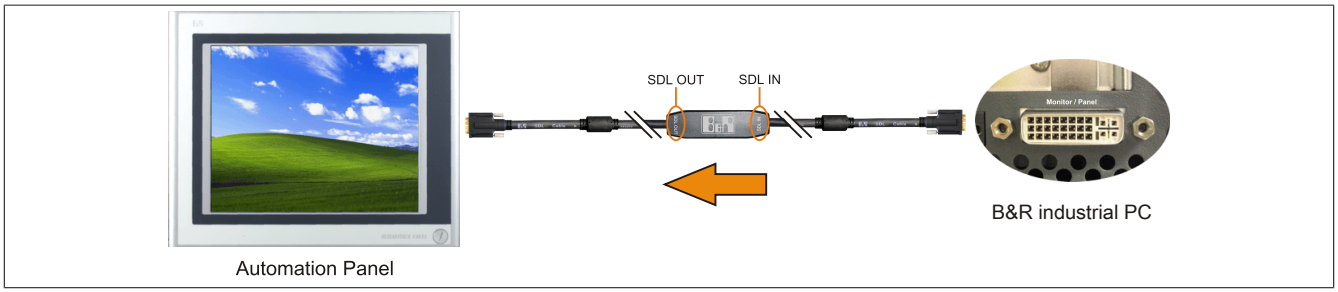


Figure 102: Signal direction for SDL flex cable with extender - Example

5.6 DVI cables

5.6.1 5CADVI.0xxx-00

5.6.1.1 General information

5CADVI.0xxx-00 DVI cables are designed for use in fixed installations.

> **Caution!**
>
> **The cable is only permitted to be connected or disconnected when the power is switched off.**

5.6.1.2 Order data

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

Table 238: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data

5.6.1.3 Technical data

> **Information:**
>
> **The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.**

Model number	5CADVI.0018-00	5CADVI.0050-00	5CADVI.0100-00
General information			
Certifications			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[1)]		
GOST-R	Yes		
Cable construction			
Wire cross section	28 AWG		
Shield	Individual cable pairs, entire cable		
Complete shielding	Tinned copper braiding, optical coverage >86%		
Outer jacket			
Material	PVC		
Color	Beige		
Labeling	AWM STYLE 20276 80°C 30 V VW1 DVI DIGITAL SINGLE LINK DER AN		
Connector			
Type	2x DVI-D (18+1), male		
Connection cycles	100		
Locating screw tightening torque	Max. 0.5 Nm		
Electrical characteristics			
Conductor resistance	Max. 237 Ω/km		
Insulation resistance	Min. 100 MΩ/km		
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		
Mechanical properties			
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 239: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Technical data

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

5.6.1.4 Bend radius specifications

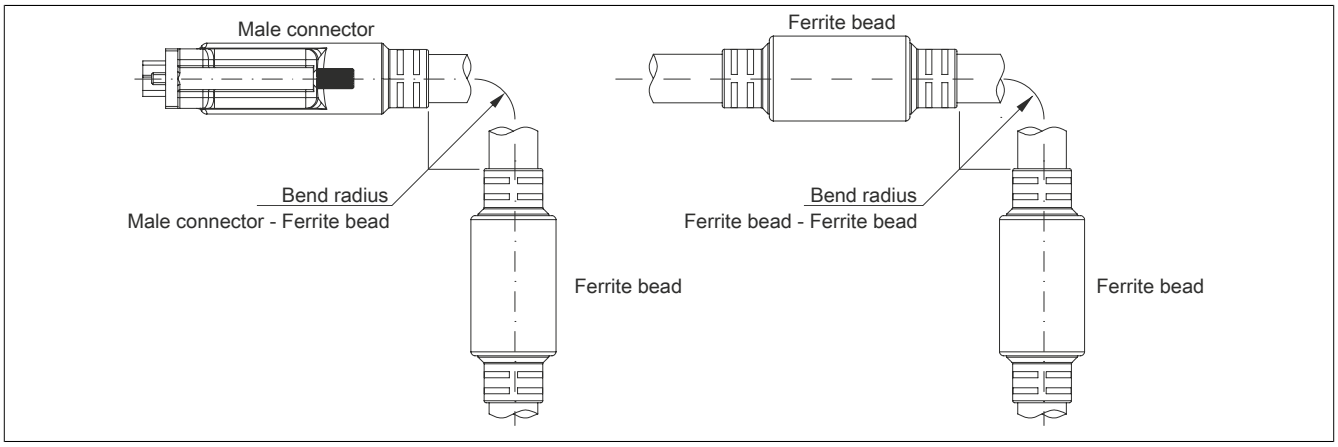


Figure 103: Bend radius specifications

5.6.1.5 Dimensions

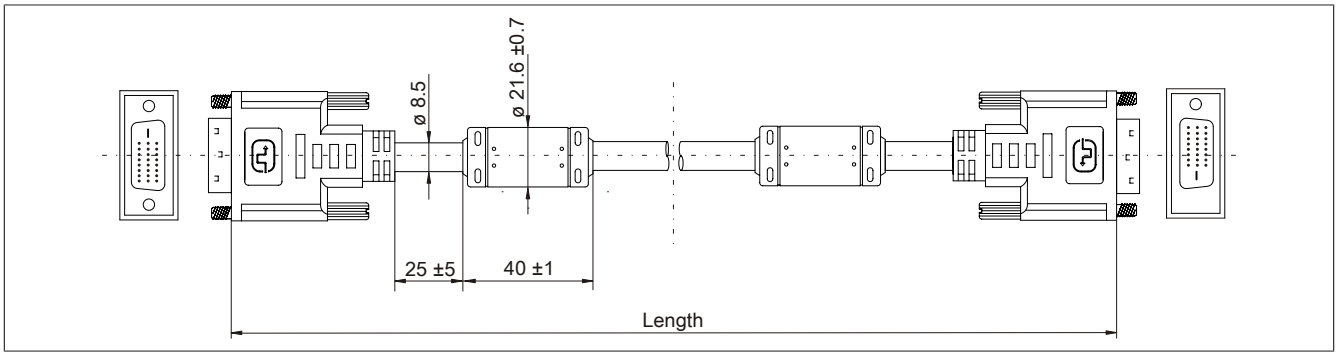


Figure 104: 5CADVI.0xxx-00 - Dimensions

5.6.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

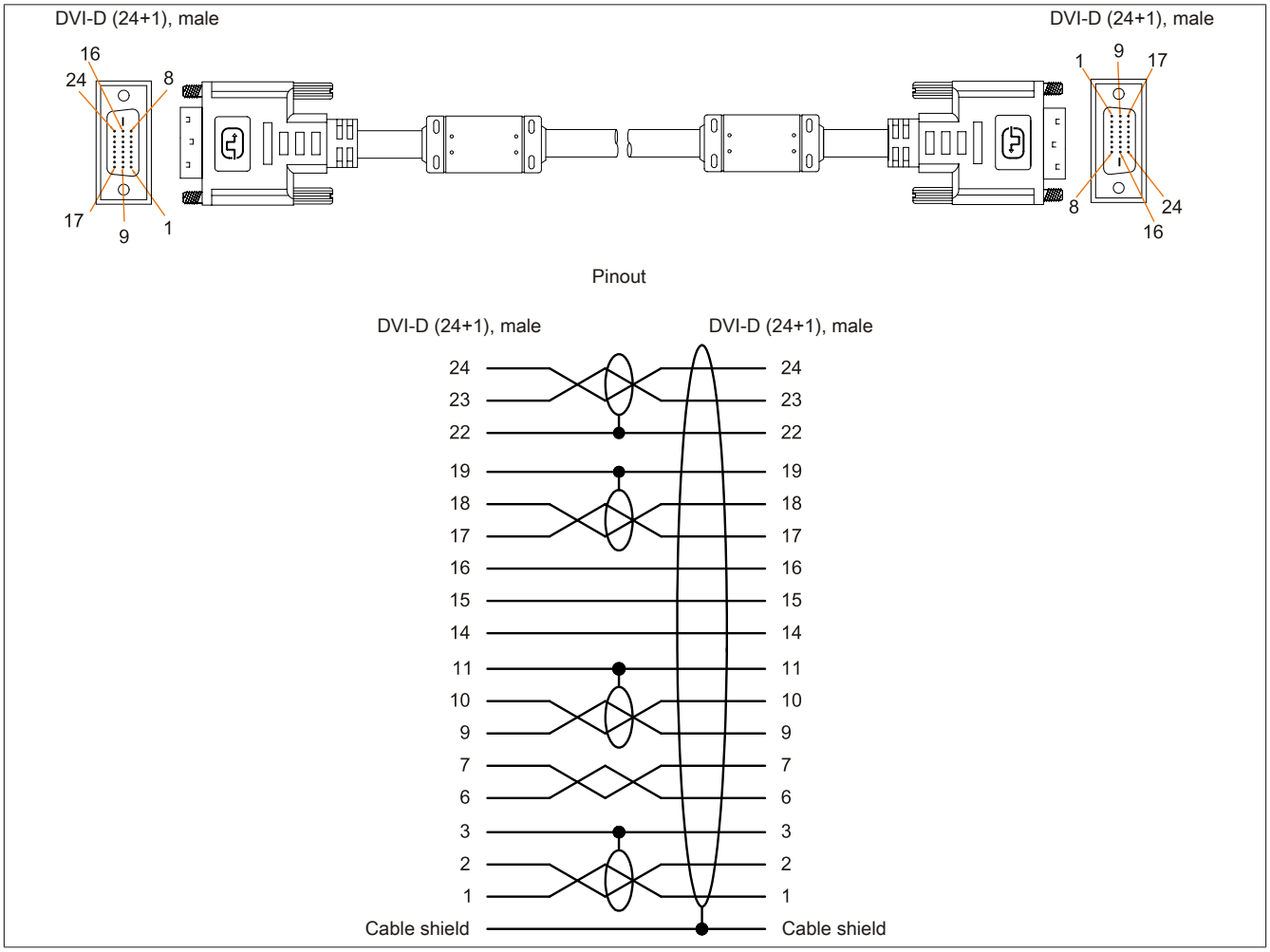


Figure 105: 5CADVI.0xxx-00 - Pinout

5.7 RS232 cables

5.7.1 9A0014.xx

5.7.1.1 General information

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

5.7.1.2 Order data

Model number	Short description	Figure
	RS232 cables	
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 240: 9A0014.02, 9A0014.05, 9A0014.10 - Order data

5.7.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	9A0014.02	9A0014.05	9A0014.10
General information			
Certifications			
CE		Yes	
GOST-R	-	Yes	
Cable construction			
Wire cross section	26 AWG		AWG 26
Shield		Entire cable	
Outer jacket			
Color		Beige	
Connector			
Type		9-pin male/female DSUB connector	
Locating screw tightening torque		Max. 0.5 Nm	
Operating conditions			
Pollution degree per EN 61131-2		Pollution degree 2	
Mechanical properties			
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 241: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data

5.7.1.4 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

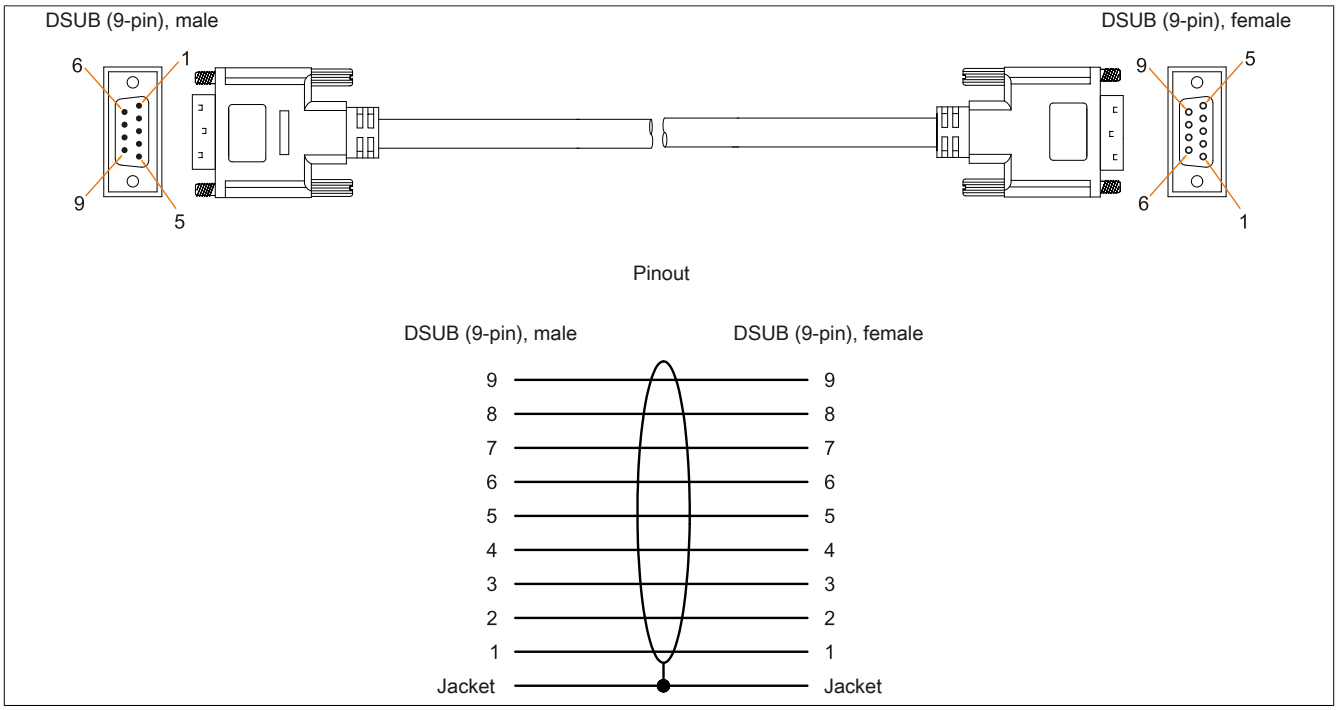


Figure 106: 9A0014.xx RS232 cables - Pinout

5.8 USB cables

5.8.1 5CAUSB.00xx-00

5.8.1.1 General information

USB cables are designed for a USB 2.0 transfer rate.

5.8.1.2 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 242: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data

5.8.1.3 Technical data

> **Information:**
>
> **The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.**

Model number	5CAUSB.0018-00	5CAUSB.0050-00
General information		
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (Bridge and open deck)[1)]	
GOST-R	Yes	
Cable construction		
Wire cross section	24, 28 AWG	
Shield	Entire cable	
Outer jacket		
Color	Beige	
Connector		
Type	USB type A male and USB type B male	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Mechanical properties		
Dimensions		
Length	1.8 m ±30 mm	5 m ±50 mm
Diameter	Max. 5 mm	
Bend radius	Min. 100 mm	

Table 243: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data

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

5.8.1.4 Cable pinout

> **Warning!**
>
> **If a field-assembled cable is desired, it must be wired according to this pinout.**
>
> **If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.**

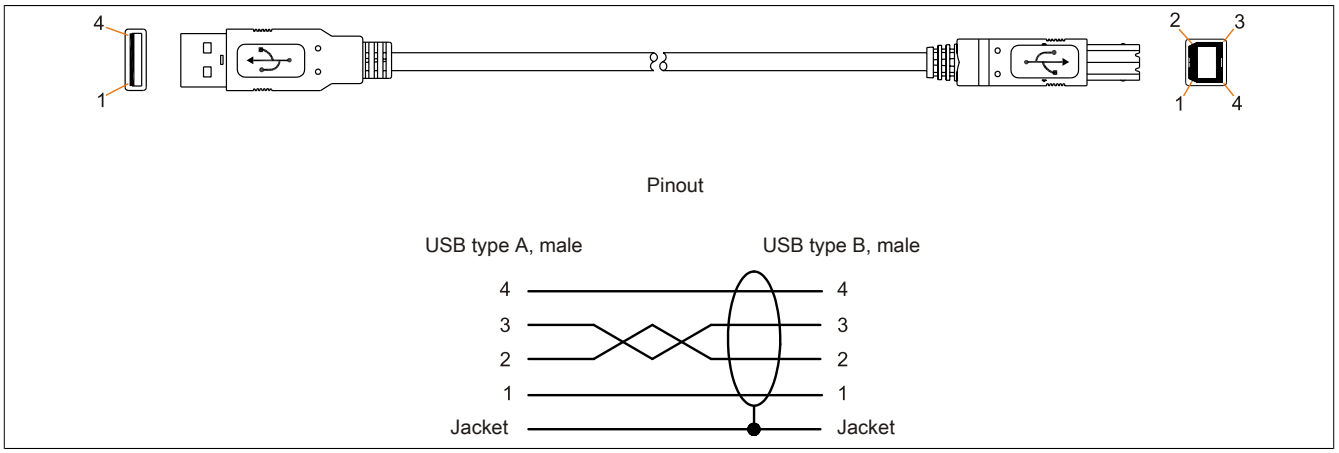


Figure 107: 5CAUSB.00xx-00 USB cables - Pinout

Chapter 7 • Servicing and maintenance

This chapter describes the servicing/maintenance work that is possible to be carried out by a trained and qualified end user.

Information:

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

1 Replacing a CFast card

Caution!

Replacing the CFast card is only permitted when the power is switched off.

Improper handling of the ejection lever (e.g. using too much force) can result in a defective ejection mechanism.

The CFast card can be replaced quickly and easily by pressing the ejector (see image) with a pointed object such as a pen.

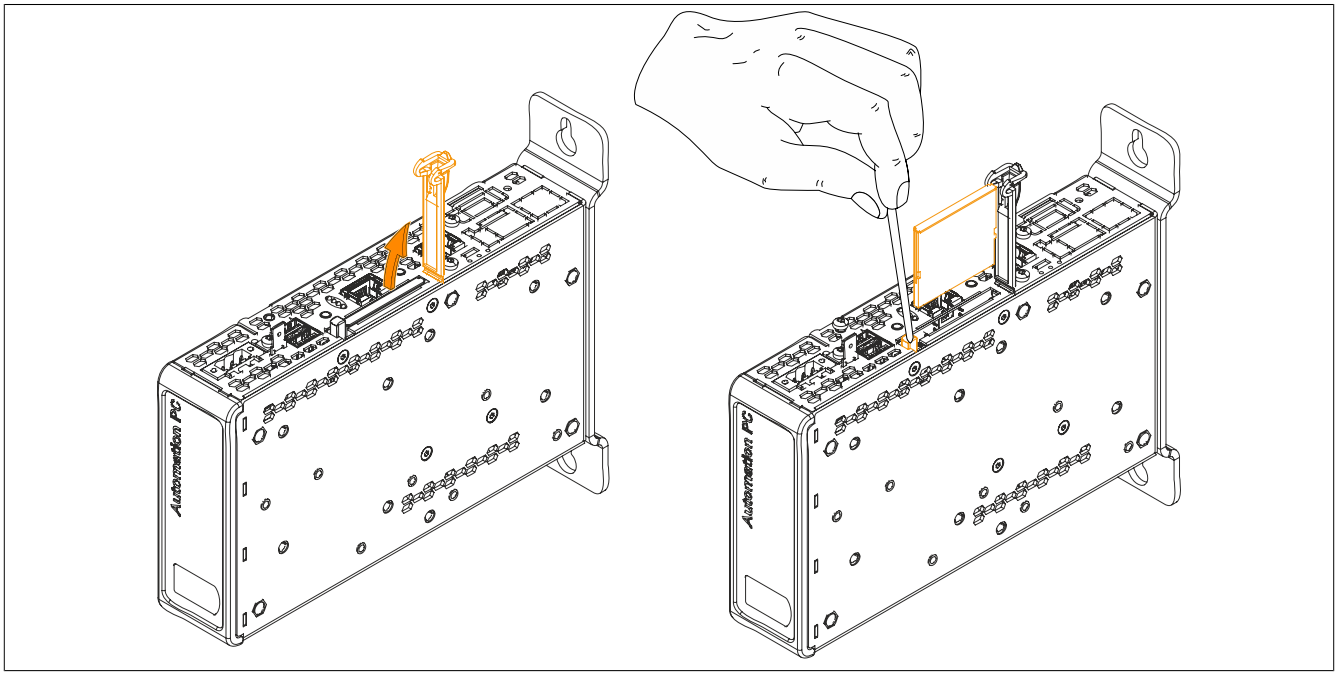


Figure 108: Replacing a CFast card

2 Repairs, complaints and replacement parts

Danger!

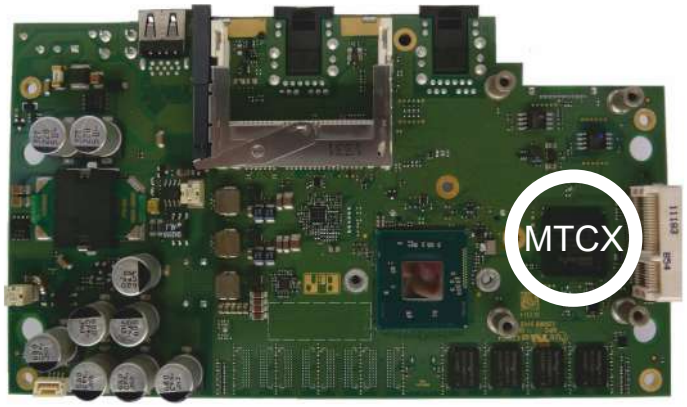
The unauthorized opening or repair of the device can result in injury and/or extensive damage to property. Therefore, do not attempt to perform repairs yourself. Repairs are only permitted to be performed by authorized qualified personnel at the place of manufacture.

To process a repair/complaint, please create a repair order or complaint using the B&R Material Return Portal on the B&R website at www.br-automation.com.

Appendix A

1 Maintenance Controller Extended (MTCX)

The MTCX controller (FPGA processor) is located on the mainboard (component of every system unit) of the APC2100 and PPC2100 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 of B&R panels)
- Advanced desktop operation (keys, USB redirection)
- Daisy chain display operation (touch screen, USB redirection)
- Panel locking mechanism (configurable using the B&R Control Center - ADI driver)
- Backlight control of a connected B&R display
- Calculation of statistical data (power cycles - every switch-on, power-on and fan hour is calculated, data is updated at 15-minute intervals)
- SDL data transfer (display, matrix keyboard, touch screen, service data, USB)
- LED status indicators (Power, HDD, Link, Run)
- Optimal default BIOS settings are reported to BIOS by the MTCX based on the existing hardware.

The functions of the MTCX can be extended by upgrading its firmware[4)]. The version can be read in BIOS or with the B&R Control Center in approved Microsoft Windows operating systems.

[4)] Can be downloaded from the Downloads section of the B&R website (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 on the module side.
ND	Not defined	In technical data tables, this stands for a value that is not defined. This may be because a cable manufacturer does not provide a value for certain technical data, for example.
NO	Normally open	Normally open relay contact.
TBD	To be defined	Used in technical data tables when there is currently no value for specific technical data. The value will be provided at a later point in time.
B_{10D}	-	Number of cycles before 10% of the components have experienced hazardous failure (per channel).
$MTTF_D$	Mean time to dangerous failure	Average time before hazardous failure occurs (per channel).
DC	Diagnostic coverage	Diagnostic coverage
PL	Performance level	Discrete level that specifies the ability of safety-related devices to perform a safety function under foreseeable conditions.
PFH	Probability of failure per hour	Probability of failure per hour.
SIL	Safety integrity level	Safety integrity level

Table 244: Abbreviations used in this user's manual

A

B

C

D

E

F

G

H

I

K

L

M

O

P

R

S

T

U

V

W

X