Power Panel C50

User's manual

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Translation of the original documentation

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1 Introduction

Information:

B&R makes every effort to keep documents as current as possible. The most current versions can be downloaded from the B&R website (www.br-automation.com).

1.1 Manual history

Version	Date	Comment[1)]
2.00	March 2022	New content: • Support for Visual Components 4 (VC4) (see "Configuration in Automation Studio" on page 51 and the technical data). Content changes: • Updated disclaimer. • Revised and restructured general safety guidelines. • Updated technical data (added "Storage Health Data"). • Updated section Diagnostic LED status indicators. • Updated section Installing with retaining clips: Securing the retaining clips correctly.
1.20	July 2021	New content: • "Interchangeability of Power Panel C50:" on page 18. • "License information about the Terminal OS" on page 50. Content-related changes and corrections: • Editorial changes. • Updated section "Diagnostic LED status indicators".
1.11	December 2020	New content: • Information about new hardware revision and minimal system • Optional accessory 6ACCRPP2.0001-000 replaced by 6ACCRPP3.0000-000 • Examples of display brightness derating
1.10	May 2020	Content-related changes and corrections: • Added information regarding derating. • Updated description of the reset button. • Added information regarding permissible lengths of POWERLINK and Ethernet connections. • Added optional accessory 6ACCRPP2.0001-000. • Editorial changes.
1.02	April 2020	Updated system requirements.
1.01	November 2019	Corrected power consumption of the 7.0" and 15.6" variants in the technical data.
1.00	September 2019	First edition

1) Editorial changes are not listed.

1.2 Information about this document

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

1.2.1 Organization of notices

Safety notices

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

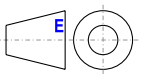
Signal word	Description
Danger!	Failure to observe these safety guidelines and notices will result in death, severe injury or substantial damage to property.
Warning!	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
Caution!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

General notices

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

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

1.2.2 Guidelines



European dimension standards apply to all dimension diagrams.

All dimensions in millimeters.

Unless otherwise specified, the following general tolerances apply:

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

1.2.3 Software-specific information

Information:

Graphics and paths to menu commands and help topics contained in this document refer to a specific Automation Studio version. There may be differences in display and path specifications when using a different version.

2 General safety guidelines

Notice!

If the device is not used in accordance with the manufacturer's instructions, the protection provided by the device may be impaired.

The following symbols appear on the device or its packaging:

Symbol	Explanation
	Observe the operating instructions! This documentation contains information about types of potential hazards and enables you to identify risks and implement countermeasures.
	Caution: Hot surface during operation (rear metal housing)! There is a risk of burning if touched.
	Take appropriate measures to prevent electrical discharges! See the additional notes in section "Protection against electrostatic discharge" on page 9.

2.1 Intended use

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

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

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

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

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

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

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

2.2 Protection against electrostatic discharge

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

2.2.1 Packaging

- Electrical assemblies with housing do not require special ESD packaging but must be handled properly (see "Electrical assemblies with housing" on page 9).
- Electrical assemblies without housing are protected by ESD-suitable packaging.

2.2.2 Regulations for proper ESD handling

Electrical assemblies with housing

- Do not touch the connector contacts on the device (bus data contacts).
- Do not touch the connector contacts of connected cables.
- Do not touch the contact tips on circuit boards.

Electrical assemblies without housing

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

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

Individual components

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

2.3 Regulations and measures

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

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

All work such as installation, commissioning and servicing are only permitted to be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, installation, assembly, commissioning and operation of the product and have the appropriate qualifications for their job (e.g. IEC 60364). National accident prevention regulations must be observed.

The safety guidelines, information about connection conditions (nameplate and documentation) and limit values specified in the technical data must be read carefully before installation and commissioning and must be strictly observed.

2.4 Transport and storage

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

2.5 Installation

- The devices are not ready for use and must be installed and wired according to the requirements of this documentation in order to comply with EMC limit values.
- Installation must be carried out according to the documentation using suitable equipment and tools.
- Devices are only permitted to be installed in a voltage-free state and by qualified personnel.
- General safety regulations and national accident prevention regulations must be observed.
- The electrical installation must be carried out in accordance with relevant regulations (e.g. wire cross section, fuse protection, protective ground connection).
- Take the necessary protective measures against electrostatic discharge (see "Protection against electrostatic discharge" on page 9).

2.6 Operation

2.6.1 Protection against contact with electrical parts

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

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

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

2.6.2 Ambient conditions - Dust, moisture, aggressive gases

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

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

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

2.6.3 Programs, viruses and malicious programs

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

2.7 Cybersecurity disclaimer for products

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

Information:

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

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

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

The aforementioned appropriate security measures include, for example:

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

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

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

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

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

3 System overview

Powerful, modern, maintenance-free

The Power Panel C50 offers the combined advantages of a powerful controller and a modern projected capacitive touch screen in a single HMI unit. A dedicated processor ensures optimum performance of mapp View HMI applications. The Power Panel C50 can be used from -20°C to 60°C. The fanless design makes it maintenance-free.

Integrated connectivity

Motion axes, I/O and safety components can all be hooked up to the Power Panel C50 directly. Additional controllers are not necessary. The connectivity options are tailored to the needs of the user. All variants are equipped with POWERLINK, Gigabit Ethernet, USB and X2X Link interfaces. Depending on the version, the CAN, RS232 and/or RS485 fieldbus interfaces are also available.

User-friendly

The multi-touch panel is available with a clear or anti-glare glass surface. The touch screen responds precisely and reliably even when operated with thick leather gloves. Gestures such as zoom or swipe allow for intuitive operation.

Using the advantages of mapp View

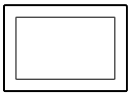
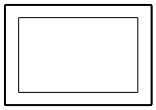
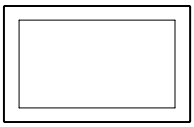
The powerful Power Panel C50 is ideal for mapp View HMI applications. The mapp View software package from B&R makes the possibilities of web technology available directly in the automation software. This allows any automation engineer to create easy-to-operate HMI solutions. Knowledge of HTML5, CSS and JavaScript is not necessary. mapp View is based 100% on web standards, ensuring optimal viewing on all output devices. It is also easy to implement different displays for different users or user groups.

3.1 Model number key

Product area															
4															Embedded PC-based automation
Product family															
	P	P													Power Panel
Model															
			C												Controller series
				5	0										2x ARM processor (Cortex-A9, dual core)
Diagonal															
						.	0	7	0						7.0"
						.	1	0	1						10.1"
						.	1	2	1						12.1"
						.	1	5	6						15.6"
Resolution															
										2					WVGA (800 x 480) landscape
										B					HD (1366 x 768) landscape
										E					WXGA (1280 x 800) landscape
Display / Touch screen technology															
											-	1			TFT color + multi-touch PCT (glass)
Optional interfaces and features															
													0		No optional interfaces/features
													1		2x CAN bus
													2		1x CAN bus and 1x RS232
													3		1x CAN bus and 1x RS485
Front design															
Standard variants															
														B	Black
														A	Black, anti-glare glass
Industry-specific variant															
														I . . .	Seq. number: I[0...Z][0...Z][0...Z]
Customized glass front variant															
														G . . .	Seq. number: G[0...Z][0...Z][0...Z]
Complete customized variant															
														C . . .	Seq. number: C[0...Z][0...Z][0...Z]
Settings or OS variant															
Customized settings, configurations, boot logos, etc.															
														S . .	Seq. number: S[0...Z][0...Z]
Customized OS variant															
														I . .	Seq. number: I[0...Z][0...Z]
Model or I/O variants															
															Base model
														- 0 1	Derivative: Sequential number [0...Z]
Examples															
4	**P**	**P**	**C**	**5**	**0**	**.**	**0**	**7**	**0**	**2**	**-**	**1**	**0**	**A**	Power Panel C50, **7.0"**, glass front **(anti-glare)**, controller with mapp View HMI unit. CPU and memory of the controller: 766 MHz (ARM Cortex-A9), 512 MB DRAM, 64 kB FRAM, 2 GB onboard flash drive. CPU and memory of the terminal: 800 MHz (ARM Cortex-A9), 1 GB DRAM. Display and touch screen: **7.0", 800 x 480 (WVGA)** resolution, projected capacitive touch screen, multi-touch support, **anti-glare** glass front with black frame, landscape and portrait format configurable with software. Interfaces: 1x POWERLINK, 1x Ethernet 10/100 Mbit/s, 1x X2X Link, 2x USB 2.0.
4	**P**	**P**	**C**	**5**	**0**	**.**	**1**	**0**	**1**	**E**	**-**	**1**	**2**	**B**	Power Panel C50, **10.1"**, glass front, controller with mapp View HMI unit, **fieldbus interfaces: 1x CAN bus, 1x RS232**. CPU and memory of the controller: 766 MHz (ARM Cortex-A9), 512 MB DRAM, 64 kB FRAM, 2 GB onboard flash drive. CPU and memory of the terminal: 800 MHz (ARM Cortex-A9), 1 GB DRAM. Display and touch screen: **10.1", 1280 x 800 (WXGA)** resolution, projected capacitive touch screen, multi-touch support, glass front with black frame, landscape and portrait format configurable with software. Interfaces: 1x POWERLINK, 1x Ethernet 10/100 Mbit/s, 1x X2X Link, 2x USB 2.0, **1x CAN bus, 1x RS232**.
4	**P**	**P**	**C**	**5**	**0**	**.**	**1**	**5**	**6**	**B**	**-**	**1**	**3**	**B**	Power Panel C50, **15.6"**, glass front, controller with mapp View HMI unit, **fieldbus interfaces: 1x CAN bus, 1x RS485**. CPU and memory of the controller: 766 MHz (ARM Cortex-A9), 512 MB DRAM, 64 kB FRAM, 2 GB onboard flash drive. CPU and memory of the terminal: 800 MHz (ARM Cortex-A9), 1 GB DRAM. Display and touch screen: **15.6", 1366 x 768 (HD)** resolution, projected capacitive touch screen, multi-touch support, glass front with black frame, landscape and portrait format configurable with software. Interfaces: 1x POWERLINK, 1x Ethernet 10/100 Mbit/s, 1x X2X Link, 2x USB 2.0, **1x CAN bus, 1x RS485**.

4 Device description

4.1 Type overview

Panel size	7.0"	10.1"	12.1"	15.6"
Model number	4PPC50.0702-1xx	4PPC50.101E-1xx	4PPC50.121E-1xx	4PPC50.156B-1xx
				
Format/Resolution	**Landscape/Portrait format**			
Resolution	WVGA 800 x 480	WXGA 1280 x 800	WXGA 1280 x 800	HD 1366 x 768
Model number	0702	101E	121E	156B
	4PPC50.xxxx-xxx			
Front	**Black**			
	Glass		Glass, anti-glare	
Model number	4PPC50.xxxx-xxB		4PPC50.xxxx-xxA	
Interfaces	4PPC50.xxxx-x0x			
	0	1	2	3
IF1: POWERLINK	•	•	•	•
IF2: Ethernet	•	•	•	•
IF3: USB	•	•	•	•
IF4: USB	•	•	•	•
IF5: X2X Link master	•	•	•	•
IF6: CAN bus		•	•	
IF7: CAN bus		•		
IF8: RS232			•	
IF9: RS485				•

4.2 Order overview

Order number	Display	Front	IF6	IF7	IF8	IF9
4PPC50.0702-10A	7.0"	Glass, chemically hardened (6H), anti-glare				
4PPC50.0702-10B	7.0"	Glass, chemically hardened (6H)				
4PPC50.0702-11A	7.0"	Glass, chemically hardened (6H), anti-glare	CAN bus	CAN bus		
4PPC50.0702-11B	7.0"	Glass, chemically hardened (6H)	CAN bus	CAN bus		
4PPC50.0702-12A	7.0"	Glass, chemically hardened (6H), anti-glare	CAN bus		RS232	
4PPC50.0702-12B	7.0"	Glass, chemically hardened (6H)	CAN bus		RS232	
4PPC50.0702-13A	7.0"	Glass, chemically hardened (6H), anti-glare	CAN bus			RS485
4PPC50.0702-13B	7.0"	Glass, chemically hardened (6H)	CAN bus			RS485
4PPC50.101E-10A	10.1"	Glass, chemically hardened (6H), anti-glare				
4PPC50.101E-10B	10.1"	Glass, chemically hardened (6H)				
4PPC50.101E-11A	10.1"	Glass, chemically hardened (6H), anti-glare	CAN bus	CAN bus		
4PPC50.101E-11B	10.1"	Glass, chemically hardened (6H)	CAN bus	CAN bus		
4PPC50.101E-12A	10.1"	Glass, chemically hardened (6H), anti-glare	CAN bus		RS232	
4PPC50.101E-12B	10.1"	Glass, chemically hardened (6H)	CAN bus		RS232	
4PPC50.101E-13A	10.1"	Glass, chemically hardened (6H), anti-glare	CAN bus			RS485
4PPC50.101E-13B	10.1"	Glass, chemically hardened (6H)	CAN bus			RS485
4PPC50.121E-10A	12.1"	Glass, chemically hardened (6H), anti-glare				
4PPC50.121E-10B	12.1"	Glass, chemically hardened (6H)				
4PPC50.121E-11A	12.1"	Glass, chemically hardened (6H), anti-glare	CAN bus	CAN bus		
4PPC50.121E-11B	12.1"	Glass, chemically hardened (6H)	CAN bus	CAN bus		
4PPC50.121E-12A	12.1"	Glass, chemically hardened (6H), anti-glare	CAN bus		RS232	
4PPC50.121E-12B	12.1"	Glass, chemically hardened (6H)	CAN bus		RS232	
4PPC50.121E-13A	12.1"	Glass, chemically hardened (6H), anti-glare	CAN bus			RS485
4PPC50.121E-13B	12.1"	Glass, chemically hardened (6H)	CAN bus			RS485
4PPC50.156B-10A	15.6"	Glass, chemically hardened (6H), anti-glare				
4PPC50.156B-10B	15.6"	Glass, chemically hardened (6H)				
4PPC50.156B-11A	15.6"	Glass, chemically hardened (6H), anti-glare	CAN bus	CAN bus		
4PPC50.156B-11B	15.6"	Glass, chemically hardened (6H)	CAN bus	CAN bus		
4PPC50.156B-12A	15.6"	Glass, chemically hardened (6H), anti-glare	CAN bus		RS232	
4PPC50.156B-12B	15.6"	Glass, chemically hardened (6H)	CAN bus		RS232	
4PPC50.156B-13A	15.6"	Glass, chemically hardened (6H), anti-glare	CAN bus			RS485
4PPC50.156B-13B	15.6"	Glass, chemically hardened (6H)	CAN bus			RS485

4.2.1 Content of delivery

Power Panel C50	Retaining clips	Accessory plate	Cable clamps	0TB6102.2110-01	0TB5104.2110-01	0TB5106.2110-01
7.0" variants						
4PPC50.0702-10A	6	1		1	1	
4PPC50.0702-10B	6	1		1	1	
4PPC50.0702-11A	6	1		1	1	1
4PPC50.0702-11B	6	1		1	1	1
4PPC50.0702-12A	6	1		1	1	1
4PPC50.0702-12B	6	1		1	1	1
4PPC50.0702-13A	6	1		1	1	1
4PPC50.0702-13B	6	1		1	1	1
10.1" variants						
4PPC50.101E-10A	8	1		1	1	
4PPC50.101E-10B	8	1		1	1	
4PPC50.101E-11A	8	1		1	1	1
4PPC50.101E-11B	8	1		1	1	1
4PPC50.101E-12A	8	1		1	1	1
4PPC50.101E-12B	8	1		1	1	1
4PPC50.101E-13A	8	1		1	1	1
4PPC50.101E-13B	8	1		1	1	1
12.1" variants						
4PPC50.121E-10A	8	1		1	1	
4PPC50.121E-10B	8	1		1	1	
4PPC50.121E-11A	8	1		1	1	1
4PPC50.121E-11B	8	1		1	1	1
4PPC50.121E-12A	8	1		1	1	1
4PPC50.121E-12B	8	1		1	1	1
4PPC50.121E-13A	8	1		1	1	1
4PPC50.121E-13B	8	1		1	1	1
15.6" variants						
4PPC50.156B-10A	9		3	1	1	
4PPC50.156B-10B	9		3	1	1	
4PPC50.156B-11A	9		3	1	1	1
4PPC50.156B-11B	9		3	1	1	1
4PPC50.156B-12A	9		3	1	1	1
4PPC50.156B-12B	9		3	1	1	1
4PPC50.156B-13A	9		3	1	1	1
4PPC50.156B-13B	9		3	1	1	1

Model number	Description
0TB6102.2110-01	Accessory terminal block, 2-pin (3.81), cage clamp terminal block 1.5 mm²
0TB5104.2110-01	Accessory terminal block, 4-pin (2.5), cage clamp terminal block 0.5 mm²
0TB5106.2110-01	Accessory terminal block, 6-pin (2.5), cage clamp terminal block 0.5 mm²
Retaining clips	Accessory set retaining clip for securing the panel in the installation cutout
Accessory plate	Plate for securing /strain relief of the connection lines and connecting the shielding
Cable clamps	Cable clamps for securing / strain relief of connecting cables and for connecting the shielding.

4.2.2 Required accessories

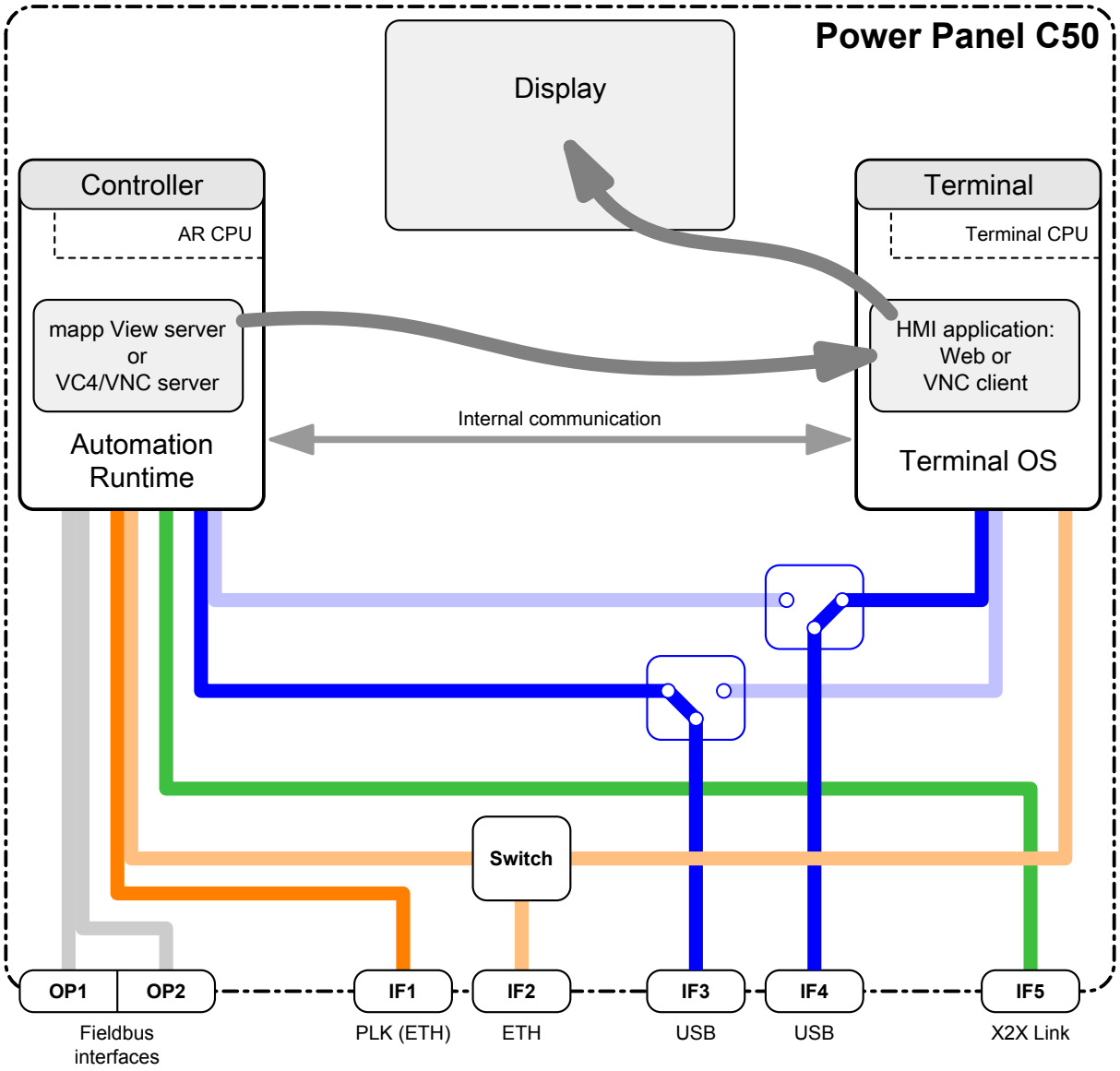
Model number	Description
0TG:220198.081-00	Technology Guard (0TG1000.02) including mapp View basic package license (1TGMPVIEW.00-01)

4.2.3 Optional accessories

Model number	Description
0TB6102.2010-01	Accessory terminal block, 2-pin (3.81), screw clamp terminal block 1.5 mm²
5MMUSB.2048-01	USB 2.0 flash drive 2048 MB B&R
5MMUSB.4096-01	USB 2.0 flash drive 4096 MB B&R
6ACCRPP3.0000-000	Installation kit for Power Panel C-Series variants: 9x retaining clip with torque limiting, 1x 2-pin cage clamp terminal block, 1x 2-pin screw clamp terminal block, 1x 4-pin cage clamp terminal block, 1x 6-pin cage clamp terminal block. See the accessories of the Power Panel variant in the corresponding data sheet or on the website.

4.3 System architecture

The Power Panel C50 combines the strengths of a controller and a Power Panel of the T-Series. The controller and terminal bundle your possibilities. The following diagram illustrates the principle of the Power Panel C50:



This graphic also defines some of the terms used in this documentation:

Controller

The controller is where Automation Runtime runs together with the application, which handles a wide variety of control tasks. A mapp View server configured with Automation Studio can provide the HMI application.

Automation Runtime

Automation Runtime, the operating system on the controller, provides the basis for the application and a stable runtime environment for the control tasks.

mapp View server

A mapp View server provides an HMI application that is suitable for the control tasks. The web standards used allow it to be displayed on different output devices.

Terminal

The web browser integrated in the terminal handles the display of the HMI application (e.g. mapp View) on the device display. The HMI application can be obtained from any web server.

Terminal OS

Terminal OS is the operating system of the terminal and provides technologies for visualization and communication with the web server.

HMI application

Visualization on the display is handled by the integrated web browser, which can display both a mapp View HMI application as well as any HTML application.

4.4 Technical information

This section contains general technical information about this product:

- System requirements
- Data and real-time clock retention
- Projected capacitive touch (PCT)
- Viewing angles
- Derating of the display brightness
- Surface resistance

4.4.1 System requirements

Order number	4PPC50.xxxx-x0x	4PPC50.xxxx-x1x	4PPC50.xxxx-x2x	4PPC50.xxxx-x3x
General information				
System requirements				
Automation Studio	4.7.1	4.7.3	4.7.1	4.7.1
Automation Runtime	4.71	4.73	4.71	4.71

4.4.2 Dependencies to hardware upgrades and Automation Runtime

Interchangeability of Power Panel C50:

Certain Power Panel variants can be replaced without changing the Automation Studio project if the following features are identical:

- Quantity and type of interfaces
- Display size and resolution
- Display orientation

This means: Power Panel variants can be replaced by each other if they differ only by the device color (coating) or glass variant (anti-glare / not anti-glare, glass print, front panel overlays).

This way, a Power Panel can be replaced with a corresponding panel overlay variant (including customized panel overlay variant) without having to change the Automation Studio project.

System requirements for interchangeability:

- Hardware upgrade ≥1.1.3.0
- Automation Runtime ≥F4.73

4.4.3 Data and real-time clock retention

Power Panels are not designed for use with batteries. This makes them completely maintenance-free. Eliminating the backup battery was made possible by the following measures:

Data and real-time clock retention	Backup type	Note
Remanent variables	FRAM	This FRAM stores its contents ferroelectrically. Unlike normal SRAM, this does not require a battery.
Real-time clock	Gold foil capacitor	The real-time clock is backed up for approx. 1000 hours by a gold foil capacitor. The gold foil capacitor is completely charged after 3 continuous hours of operation.

4.4.4 Projected capacitive touch (PCT)

Operation	
Number of fingers	10
Glove operation	Yes
Passive stylus pens	Yes
Active stylus pens	No
Error detection	
Ball of hand	Yes
Water	Yes
Front	
Hardened front glass	Yes

Operation with gloves

Projected capacitive touch screens (PCT) are suitable for operation with or without gloves.

A large number of gloves (rubber gloves, light/heavy leather gloves, disposable latex gloves, etc.) are supported.

Due to the variety of commercially available gloves, however, B&R cannot guarantee all types.

Support for stylus pens

Passive stylus pens:
In principle, the Power Panel supports passive stylus pens. Due to the large number of passive stylus pens available on the market, there may be functional differences. For this reason, B&R cannot comprehensively guarantee their functionality.

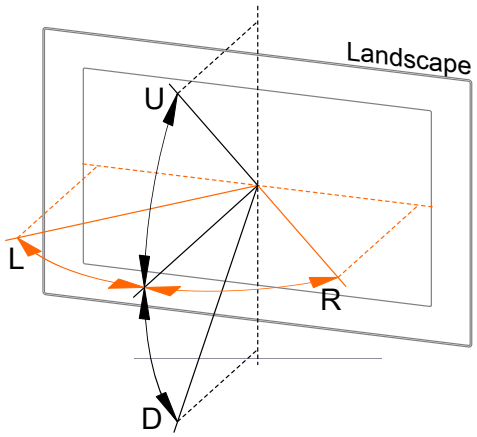
Active stylus pens are not supported!

Touch actions during cleaning

Touch actions can be triggered during cleaning of the PCT touch screen. If this is not desired, this behavior must be taken into account in the application.

4.4.5 Viewing angles

For the viewing angles values (U, D, R, L) of the display types, see the technical data of the respective device.



Legend	Display viewing angle
U	From top
D	From bottom
L	From left
R	From right

The viewing angles are specified for the horizontal (L, R) and vertical (U, D) axes in reference to the vertical axis of the display. The specified viewing angles above always refer to the standard mounting orientation of the respective Power Panel.

Standard mounting orientation: Interfaces are at the bottom.

4.4.6 Derating the ambient temperature

If the device is installed outside the corresponding specifications, derating of the maximum permissible ambient temperature (see "Temperature specifications" in chapter "Technical data") must be taken into account. Depending on the display size, derating must be taken into account under the following conditions:

- Spacing for air circulation is not being observed (see "Installation instructions" on page 44)
- Permissible mounting orientations are not observed (see "Mounting orientations" on page 45).
- Derating depends on the display brightness (see "Derating of the display brightness" on page 21).

The following derating must be taken into account during commissioning:

	Display size			
Condition for derating	**7.0"**	**10.1"**	**12.1"**	**15.6"**
Spacing for air circulation not observed	10°C	10°C	10°C	10°C
Deviation from permissible mounting orientations (e.g. horizontal)	5°C	5°C	5°C	5°C
High display brightness	-	-	-	Up to 10°C
Max. derating (all conditions apply)	10°C	15°C	15°C	25°C

If one or more of the above conditions apply, the device is permitted to be derated up to the maximum operating temperature[2)] minus the specified derating temperatures.

If several conditions apply, the individual derating values must be added together.

[2)] See ambient conditions in the technical data.

4.4.7 Derating of the display brightness

Display brightness of 15.6" variants

Operating the display at the maximum ambient temperature (see technical data) and maximum display brightness results in impairments in the display. The following derating of the display brightness must therefore be observed:

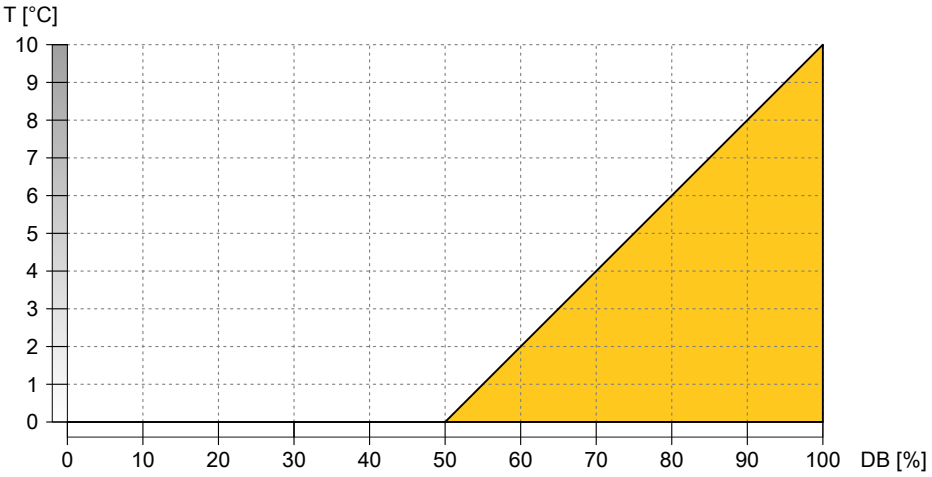


Diagram legend			
DB [%]	Display brightness (DB) in percent	T [°C]	Derating in °C

Information:

The display brightness can be derated in two ways:

1) **Reducing the display brightness according to the max. ambient temperature.**
2) **Observing the maximum permissible ambient temperature for the selected display brightness.**

In addition to this derating, a further derating must be observed depending on the installation conditions (see "Derating the ambient temperature" on page 20).

Examples illustrating the two derating possibilities

Reduction of the display brightness	
Example 1:	If the Power Panel is operated at the maximum permitted ambient temperature, the display brightness must be reduced to 50%.
Example 2:	If the ambient temperature is kept 5°C below the maximum permissible ambient temperature using appropriate measures, the display brightness must be reduced to at least 75%.
Reduction of the maximum permissible ambient temperature	
Example 3:	If the Power Panel should be operated continuously with a display brightness of 100%, appropriate measures must be taken to keep the ambient temperature at least 10°C below the maximum permitted ambient temperature.

4.4.8 Surface resistance

Chemical resistance of the front glass per ASTM D 1308-02 and ASTM F 1598-95 for an exposure time of 24 hours without visible changes:

- Acetone
- Alkaline cleaning agents
- Ammonia 5%
- Gasoline (unleaded)
- Beer
- Brake fluid
- Chlorine-alkaline cleaning and disinfecting agents (pH value min. 11) 1.5%
- Hydrogen chloride 6%
- Coca-Cola
- Diesel
- Diesel oil
- Dimethylbenzene
- Vinegar
- Ethanol
- Grease
- Ammonia-based glass cleaners
- Sidolin glass cleaner
- Graphite
- Hydraulic fluid (Skydrol)
- Isopropanol
- Coffee
- Ink
- Lysol
- Methylbenzene
- Methyl ethyl ketone
- Naphtha
- Caustic soda 5%
- Nitric acid 70%
- Hydrochloric acid 5%
- Lubricants
- Sulphuric acid 40%
- Suntan oil and UV radiation
- Cooking oil
- Stamping ink
- Tea
- Turpentine
- Turpentine oil replacement (thinner)
- Trichloroethylene

4.5 Technical data

General technical data

Order number	4PPC50.xxxx-xxx
General information	
Cooling	Passive
Power button	No
Reset button	Yes
Status indicators	Operating state, license violation, overtemperature shutdown, interface status
Buzzer	Yes
Support	
mapp View	Yes [1]
Controller redundancy	No
ACOPOS support	Yes
Visual Components support	Yes [2]
Controller	
Real-time clock [3]	Nonvolatile, resolution 1 s, -25 to 37 ppm accuracy at 25°C
FPU	Yes
Processor	
Type	ARM Cortex-A9
Clock frequency	2x 766 MHz
L1 cache	
Data code	32 kB
Program code	32 kB
L2 cache	512 kB
Mode/Node switches	No
Remanent variables	64 kB FRAM, retention > 10 years [4]
DRAM	512 MB
Shortest task class cycle time	0.4 ms
Typical instruction cycle time	0.01 µs
Application memory	
Type	2 GB eMMC flash memory
Data retention	10 years
Writable data amount	
Guaranteed	40 TB
Results for 5 years	21.9 GB/day
Guaranteed erase/write cycles	20,000
Error-correcting code (ECC)	Yes
Storage health data support [5]	Yes, AR 4.90 and later
Temperature cutoff	Yes
Terminal	
Processor	
Type	ARM Cortex-A9
Clock frequency	2x 800 MHz
L1 cache	
Data code	32 kB
Program code	32 kB
L2 cache	512 kB
DRAM	1 GB
Application memory	
Type	2 GB eMMC flash memory
Data retention	10 years
Writable data amount	
Guaranteed	40 TB
Results for 5 years	21.9 GB/day
Guaranteed erase/write cycles	20,000
Error-correcting code (ECC)	Yes
Interfaces	
Interface IF1	
Fieldbus	POWERLINK V2 managing or controlled node
Type	Type 6 [6]
Variant	1x RJ45 shielded
Line length	Max. 100 m between 2 nodes (segment length)
Max. transfer rate	100 Mbit/s
Transfer	
Physical layer	100BASE-TX
Half-duplex	Yes
Full-duplex	POWERLINK mode: No / Ethernet mode: Yes
Autonegotiation	Yes
Auto-MDI/MDIX	Yes

Order number	4PPC50.xxxx-xxx
Interface IF2	
Type	Ethernet
Variant	1x RJ45 shielded
Line length	Max. 100 m between 2 nodes (segment length)
Max. transfer rate	10/100/1000 Mbit/s
Transfer	
Physical layer	10BASE-T/100BASE-TX/1000BASE-T
Half-duplex	Yes
Full-duplex	Yes
Autonegotiation	Yes
Auto-MDI/MDIX	Yes
Interface IF3	
Type	USB 2.0
Variant	Type A
Current-carrying capacity	0.5 A
Interface IF4	
Type	USB 2.0
Variant	Type A
Current-carrying capacity	0.5 A
Interface IF5	
Fieldbus	X2X Link master
Line length	Max. 100 m between 2 nodes (segment length)
Electrical properties	
Nominal voltage	24 VDC -25% / +30%, PELV
Fuse	3 A slow-blow, internal [7]
Reverse polarity protection	Yes
Electrical isolation	POWERLINK (IF1), Ethernet (IF2) and X2X Link (IF5) isolated from each other, from other interfaces and from the base device
Operating conditions	
Permissible mounting orientations	
Standard mounting orientation	Vertical
Inclination	±25°
Rotation	In 90° increments (portrait/landscape)
Installation elevation above sea level	
0 to 2000 m	No limitation
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m
Degree of protection per EN 60529	Front: IP55, Back: IP20
Mechanical properties	
Front	
Design	Black

1) Due to the performance of the Power Panel, the following widget classes are fully supported: A, B
2) Requirements:
   - Controller supports VC4/VNC server starting with hardware upgrade 1.1.6.0.
   - Terminal operation as VNC client for VC4/VNC server is supported starting with terminal OS 1.1.2.
3) The real-time clock is backed up for approx. 1000 hours @ 25°C by a gold foil capacitor. The gold foil capacitor is completely charged after 3 continuous hours of operation.
4) The memory size for remanent variables is configurable in Automation Studio.
5) For details about *storage health data*, see Automation Help.
6) See section "Communication → POWERLINK → General information → Hardware - IF/LS" of Automation Help
7) The internal fuse cannot be replaced by the user or reset.

Ambient conditions

Order number	4PPC50.0702-xxx	4PPC50.101E-xxx	4PPC50.121E-xxx	4PPC50.156B-xxx
Ambient conditions				
Temperature				
Operation	-20 to 60°C			
Storage	-20 to 80°C			-20 to 70°C
Transport	-20 to 80°C			-20 to 70°C
Relative humidity	See temperature/humidity diagram.			

4.5.1 Interface variants

Order number	4PPC50.xxxx-xxA	4PPC50.xxxx-xxB
Display		
Touch screen		
Surface	Glass, chemically hardened (6H), anti-glare	Glass, chemically hardened (6H)

4.5.2 Specific technical data of the display variants

Order number	4PPC50.0702-xxx	4PPC50.101E-xxx	4PPC50.121E-xxx	4PPC50.156B-xxx
Display				
Type	TFT color			
Diagonal	7.0"	10.1"	12.1"	15.6"
Colors	16.7 million (RGB, 8 bits per channel)			
Resolution	WVGA, 800 x 480 pixels	WXGA, 1280 x 800 pixels		HD, 1366 x 768 pixels
Contrast	Typ. 600:1	Typ. 800:1		Typ. 1000:1
Viewing angles				
Horizontal	Direction L / Direction R = Typ. 70°	Direction L / Direction R = Typ. 85°	Direction L / Direction R = Typ. 80°	Direction L / Direction R = Typ. 85°
Vertical	Direction U / Direction D = Typ. 60°	Direction U / Direction D = Typ. 85°	U direction = Typ. 80° / D direction = Typ. 65°	Direction U / Direction D = Typ. 85°
Backlight				
Type	LED			
Brightness	Typ. 500 cd/m²		Typ. 400 cd/m²	
Half-brightness time [1]	50,000 h			70,000 h
Touch screen				
Type	Multi-touch			
Technology	PCT (projected capacitive touch)			
Screen rotation	Yes			
Electrical properties				
Power consumption [2]	Max. 21 W	Max. 23 W	Max. 24 W	Max. 34 W
Mechanical properties				
Dimensions				
Width	197 mm	271.5 mm	324 mm	414 mm
Height	140 mm	190 mm	221.5 mm	258.5 mm
Depth	42.2 mm		41.7 mm	
Weight	1.13 kg	1.78 kg	2.37 kg	3.44 kg

1) At 25°C ambient temperature. Reducing the brightness by 50% can typically result in an approximately 50% increase in the half-brightness time.
2) Power consumption including all interfaces.

4.5.3 Technical data of the interface variants

IF6: CAN bus interface

Order number	4PPC50.xxxx-x1x, 4PPC50.xxxx-x2x, 4PPC50.xxxx-x3x
Interfaces	
Interface IF6	
Type	CAN bus
Variant	3 pins of the 6-pin multipoint connector
Max. distance	1000 m
Max. transfer rate [1]	
Bus length ≤25 m	1 Mbit/s
Bus length ≤60 m	500 kbit/s
Bus length ≤200 m	250 kbit/s
Bus length ≤1000 m	50 kbit/s

1) In addition to the bus length, the maximum achievable transfer rate also depends on other factors:
(1) The configuration of the CAN interface in Automation Studio using predefined values or bit timing registers
(2) The cable material used
(3) The number and configuration of the other CAN stations

IF7: CAN bus interface

Order number	4PPC50.xxxx-x1x
Interfaces	
Interface IF7	
Type	CAN bus
Variant	3 pins of the 6-pin multipoint connector
Max. distance	1000 m
Max. transfer rate [1]	
Bus length ≤25 m	1 Mbit/s
Bus length ≤60 m	500 kbit/s
Bus length ≤200 m	250 kbit/s
Bus length ≤1000 m	50 kbit/s

1) In addition to the bus length, the maximum achievable transfer rate also depends on other factors:
(1) The configuration of the CAN interface in Automation Studio using predefined values or bit timing registers
(2) The cable material used
(3) The number and configuration of the other CAN stations

IF8: RS232 interface

Order number	4PPC50.xxxx-x2x
Interfaces	
Interface IF8	
Type	RS232
Variant	3 pins of the 6-pin multipoint connector
Max. distance	900 m
Transfer rate	Max. 115.2 kbit/s

IF9: RS485 interface

Order number	4PPC50.xxxx-x3x
Interfaces	
Interface IF9	
Type	RS485
Variant	3 pins of the 6-pin multipoint connector
Max. distance	1200 m
Transfer rate	Max. 115.2 kbit/s

4.5.4 Certifications

The status of the certifications listed in this manual does not necessarily correspond to the current status. For the current status of product approvals, see the corresponding product page (www.br-automation.com).

CE	Yes
UL	cULus E115267 Industrial control equipment
EAC	Yes

4.6 Temperature/Humidity diagrams

4.6.1 7.0" variants

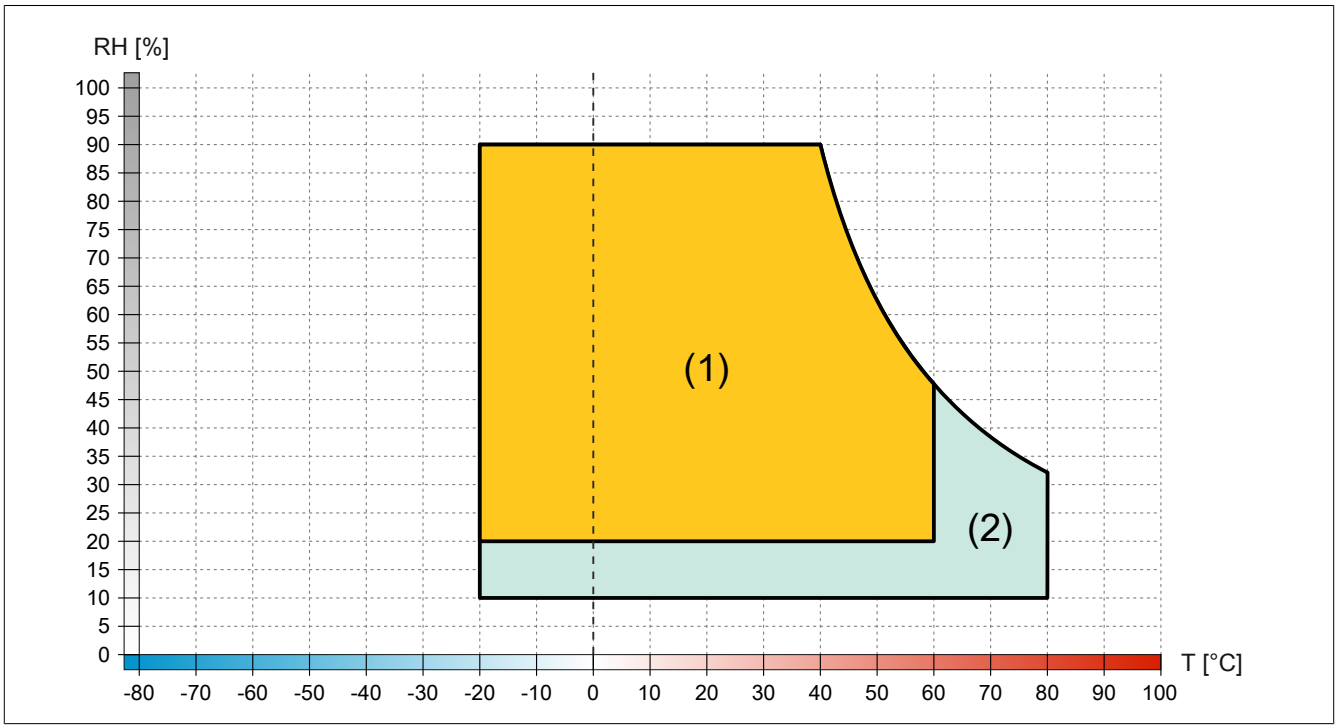


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.6.2 10.1" variants

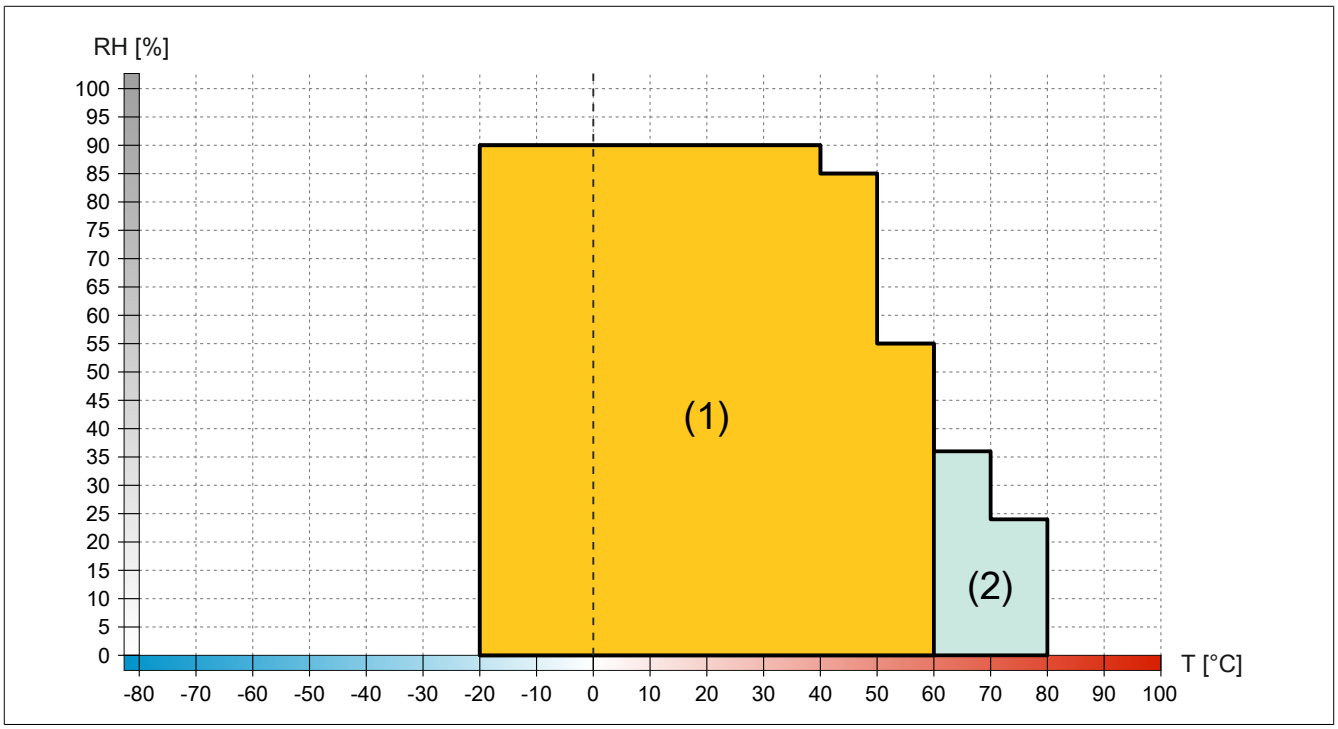


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.6.3 12.1" variants

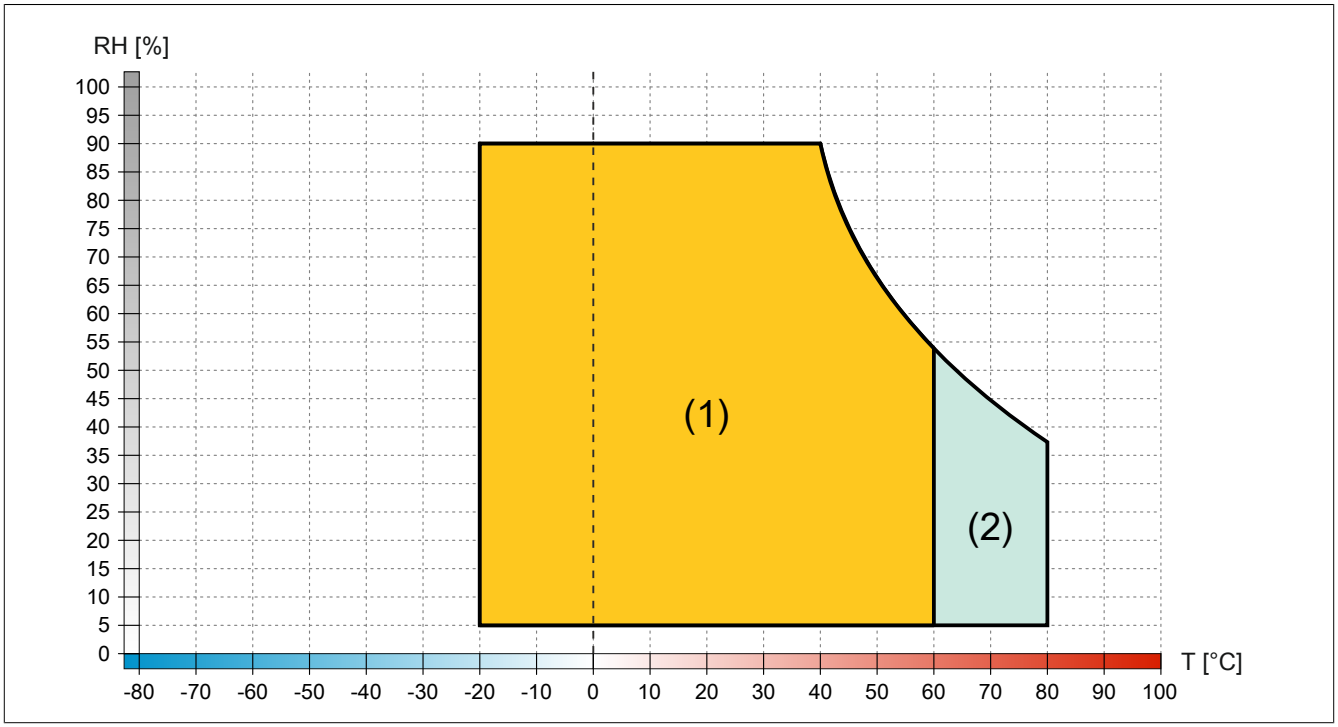


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.6.4 15.6" variants

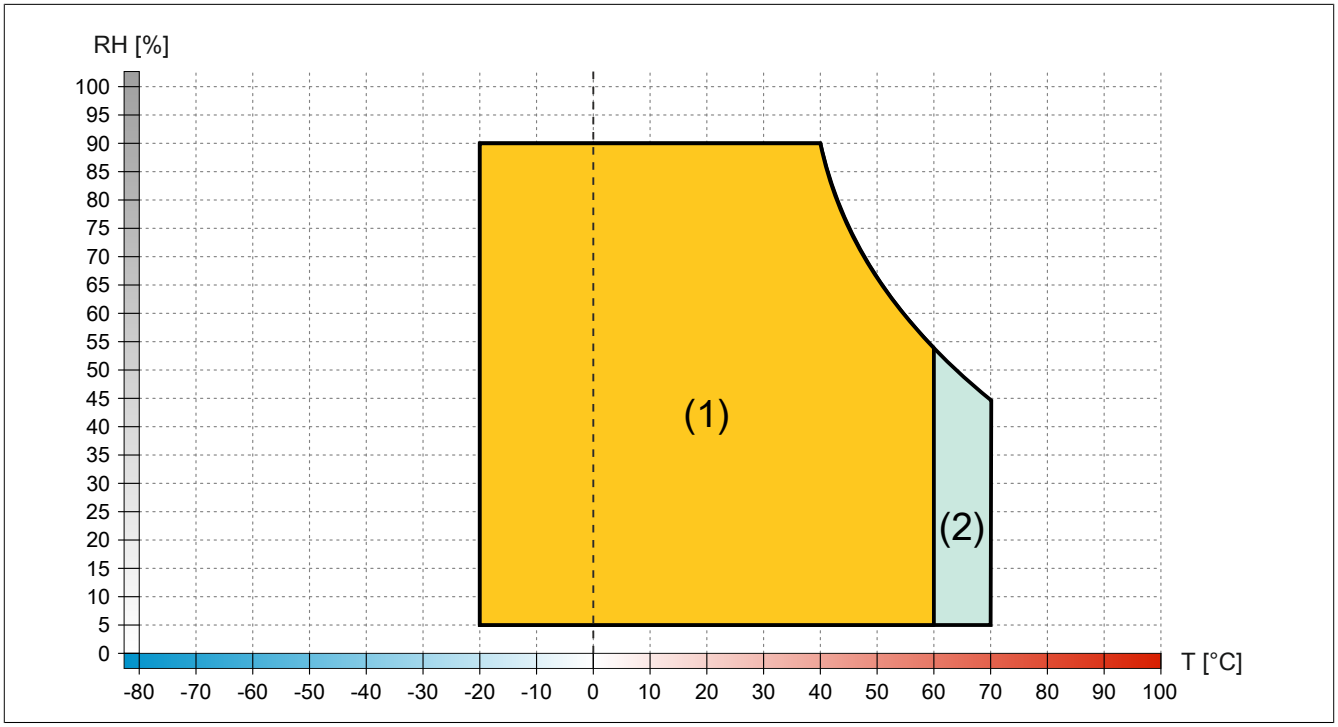
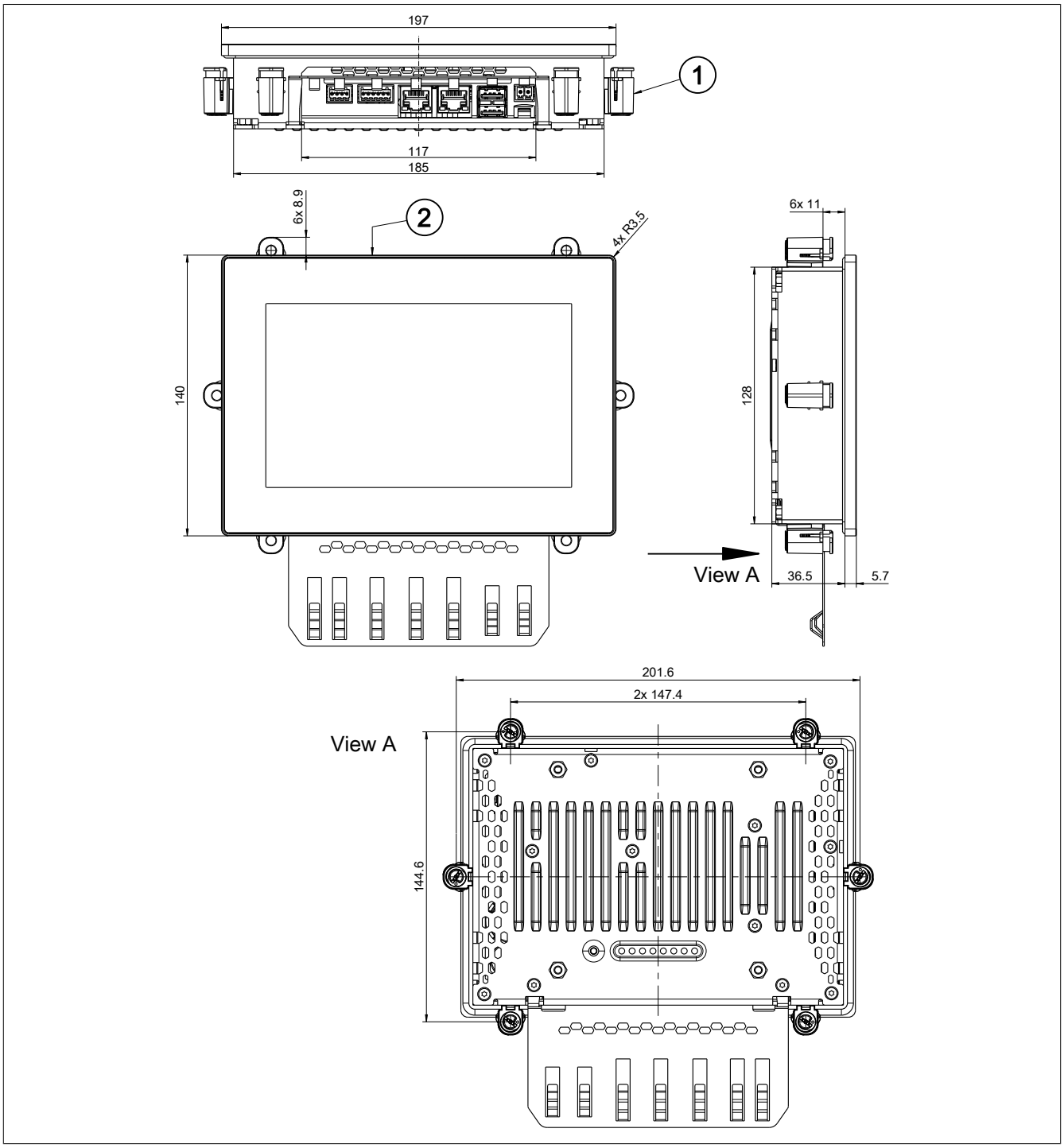


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

4.7 Dimensions

4.7.1 7.0" variants

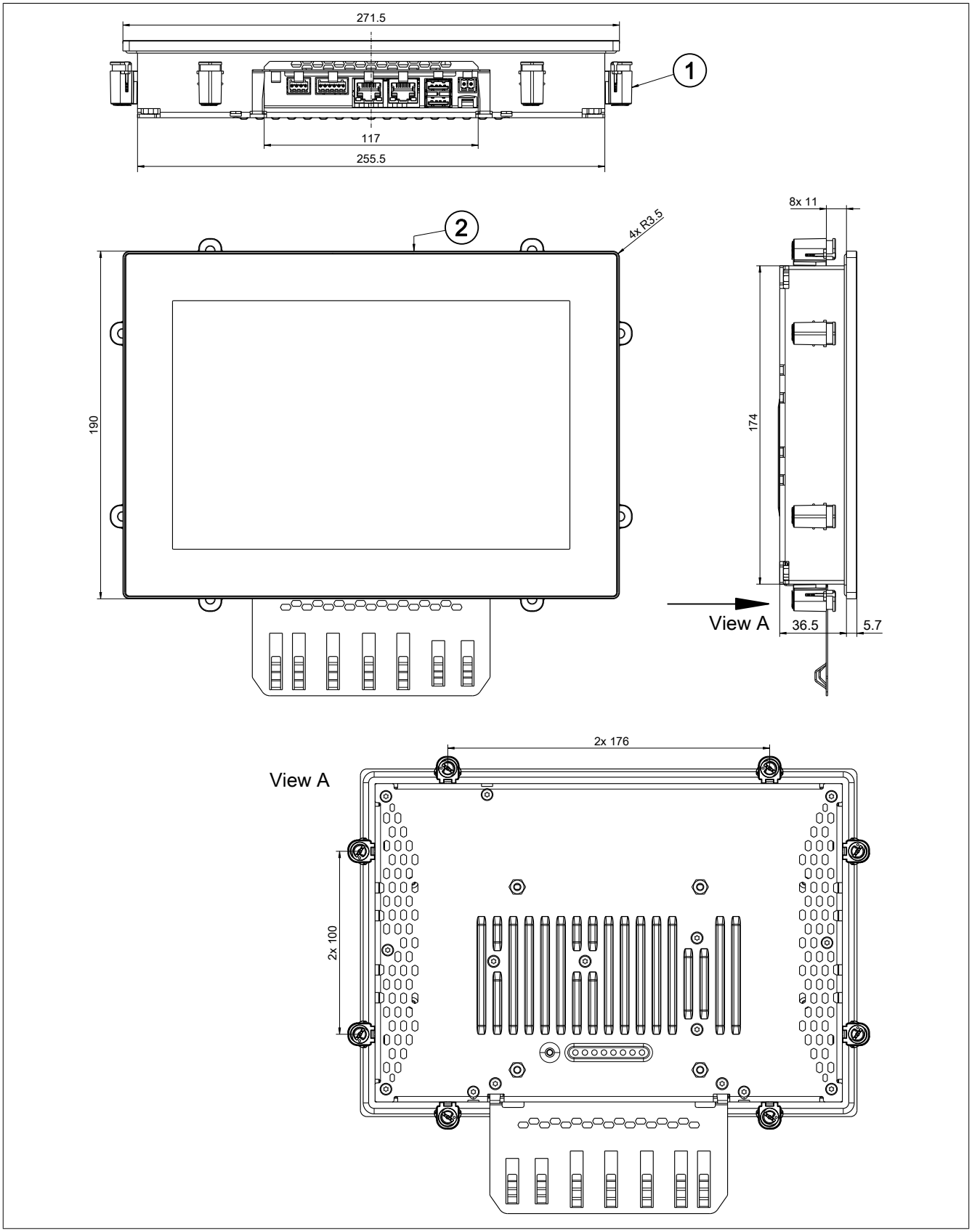


1	6x retaining clips with torque limiting
2	Anodized front plate E6/C8 (black)

Dimensions of the installation cutout for this Power Panel variant: 187 ±1 mm x 130 ±1 mm

See also "Requirements for the installation cutout" on page 42.

4.7.2 10.1" variants

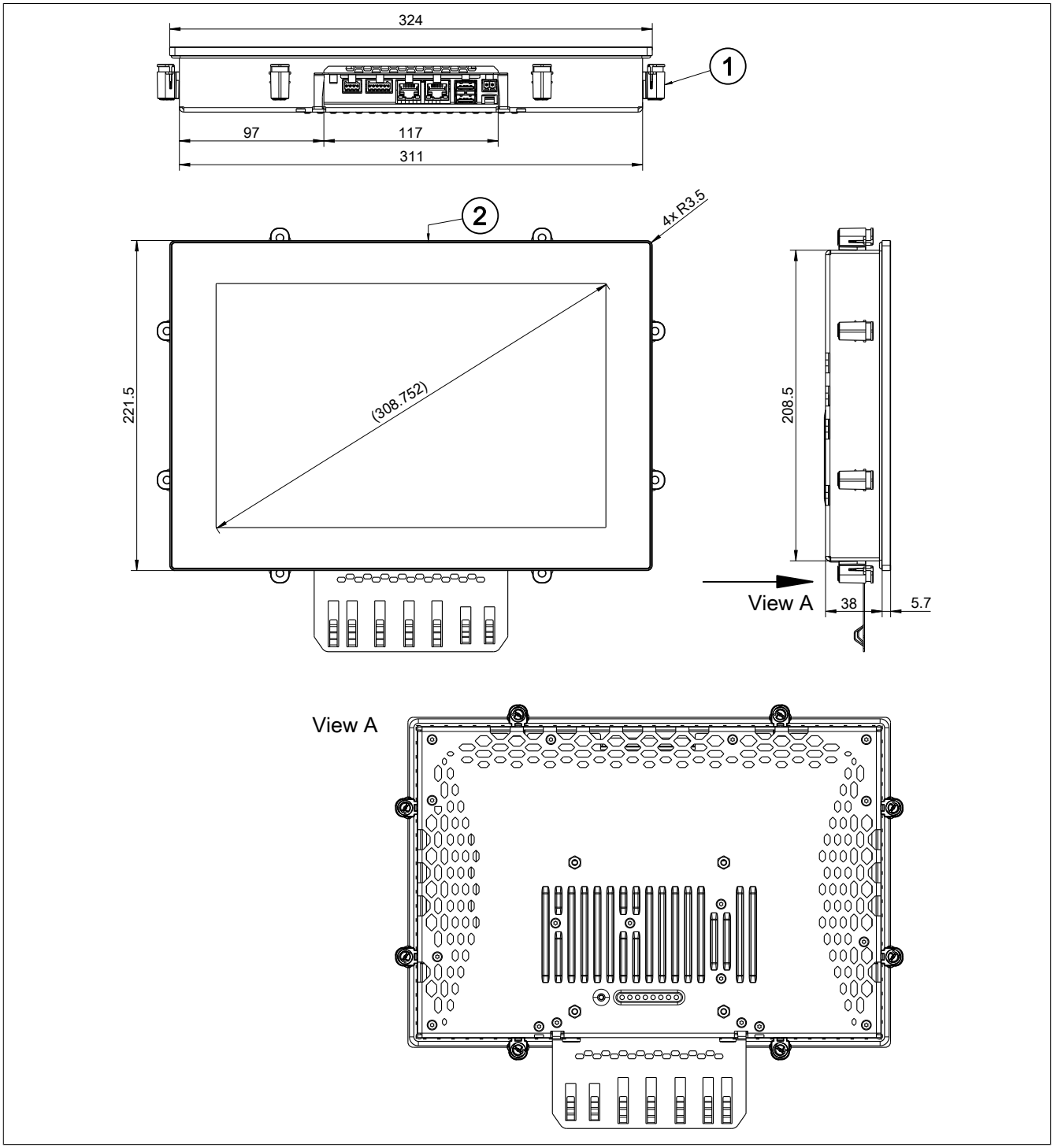


1	8x retaining clips with torque limiting
2	Anodized front plate E6/C8 (black)

Dimensions of the installation cutout for this Power Panel variant: 257.5 ±1 mm x 176 ±1 mm

See also "Requirements for the installation cutout" on page 42.

4.7.3 12.1" variants

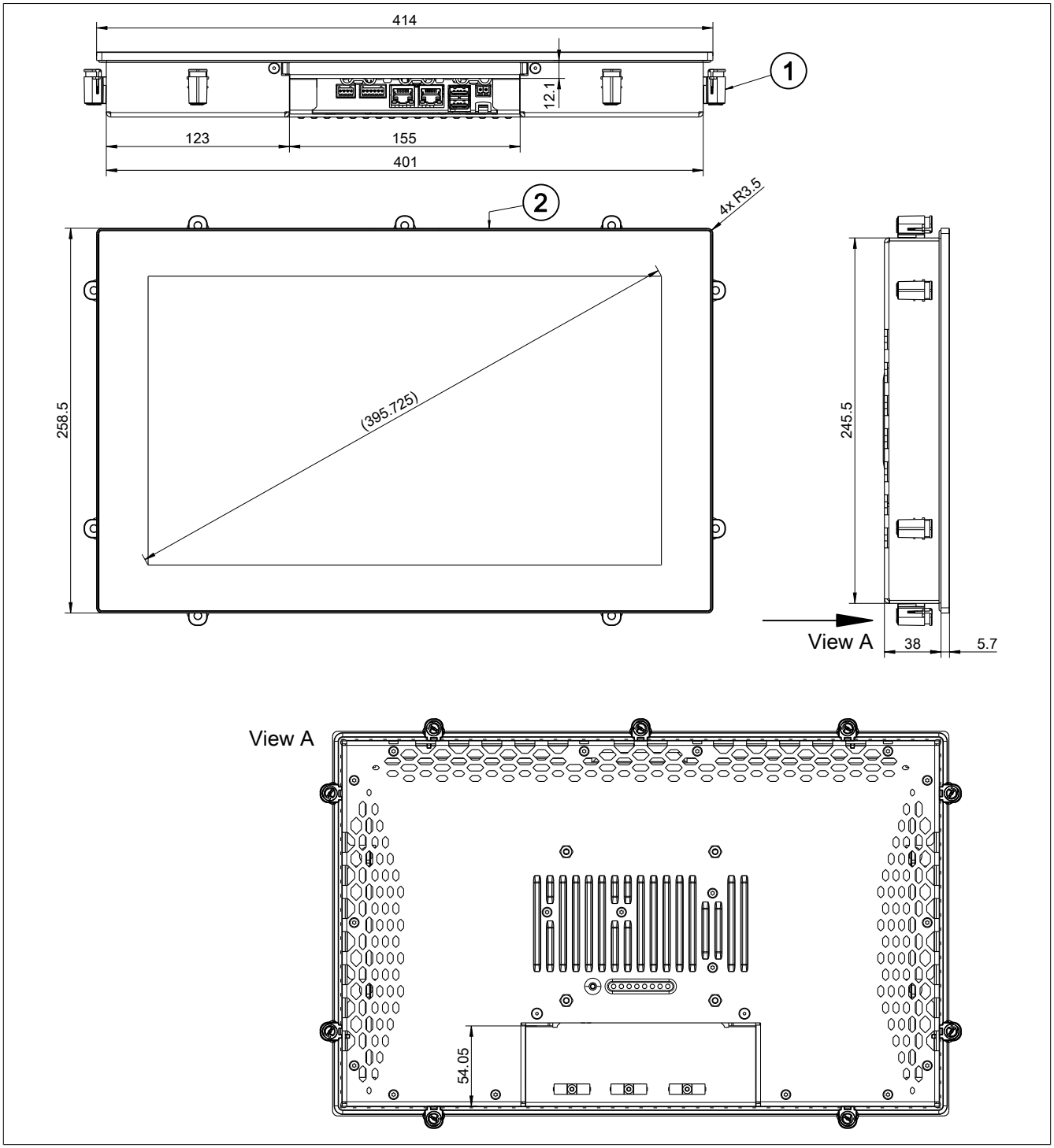


1	8x retaining clips with torque limiting
2	Anodized front plate E6/C8 (black)

Dimensions of the installation cutout for this Power Panel variant: 313 ±1 mm x 210.5 ±1 mm

See also "Requirements for the installation cutout" on page 42.

4.7.4 15.6" variants

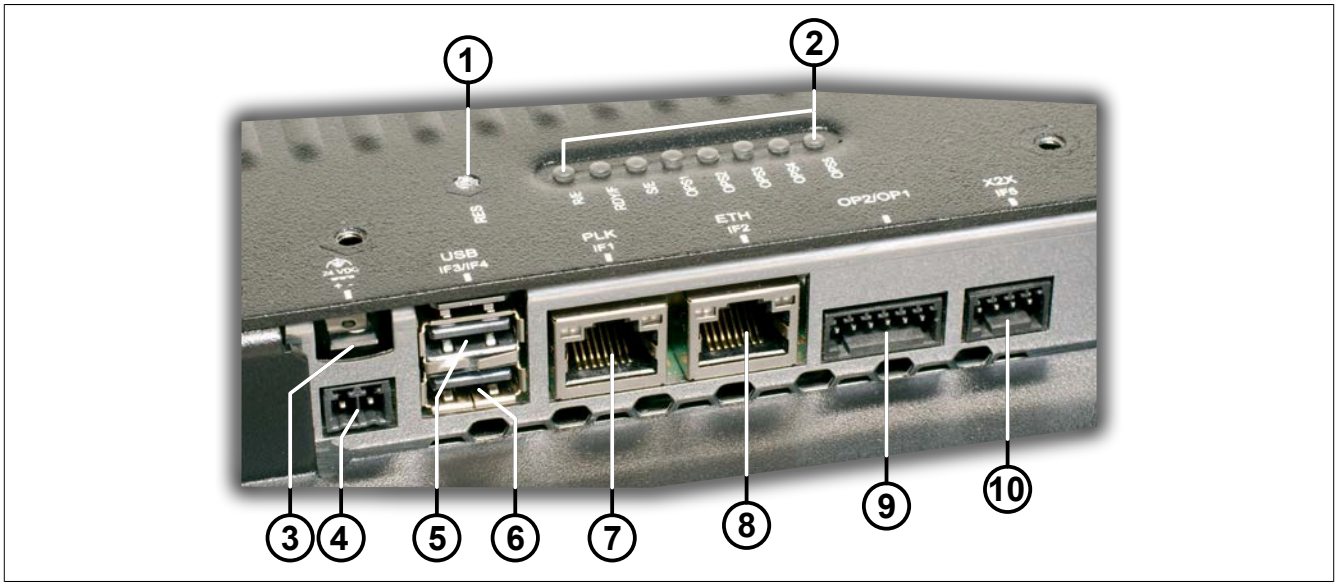


1	9x retaining clips with torque limiting
2	Anodized front plate E6/C8 (black)

Dimensions of the installation cutout for this Power Panel variant: 403 ±1 mm x 247.5 ±1 mm

See also "Requirements for the installation cutout" on page 42.

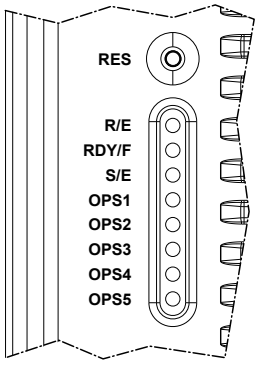
4.8 Operating and connection elements



1	Reset button
2	Diagnostic LED status indicators
3	Grounding clip
4	Power supply
5	IF3: USB interface
6	IF4: USB interface
7	IF1: POWERLINK interface
8	IF2: Ethernet interface
9	OP1/OP2: Fieldbus interfaces (depending on the Power Panel variant)
10	IF5: X2X Link interface

4.8.1 Diagnostic LED status indicators

The following diagnostic LEDs are located on the back of the Power Panel C50:

Figure	LED	Color	Status	Description
	R/E	Green/ Red		See following table "LEDs R/E and RDY/F (operating states)" on page 32.
	RDY/F	Yellow		
	S/E	Green/ Red		LED "Status/Error" for the POWERLINK interface. For a description, see section "LED "S/E" (status/error LED)" on page 33.
	OPS1 OPS2 OPS3 OPS4 OPS5	These LEDS have a different meaning depending on the Power Panel variant. See the description in the following sections: • "OPS" LEDs - Variant without fieldbus interfaces • "OPS" LEDs - Variant with 2x CAN bus • "OPS" LEDs - Variant with 1x CAN bus and 1x RS232 • "OPS" LEDs - Variant with 1x CAN bus and 1x RS485		

LEDs R/E and RDY/F (operating states)

	R/E		RDY/F	
Operating state	**Color**	**Status**	**Color**	**Status**
System startup: Bootloader and early startup phase	-	Off	-	Off
System startup: Installation error [1]	Red	Double flash	-	-
System startup: Automation Runtime	Green	Blinking	Yellow	On
System startup: During firmware update	Green	Double flash	Yellow	On
Application running (RUN)	Green	On	-	Off
Application running with license violation [2]	Red	Blinking	Yellow	Blinking
Mode SERVICE, BOOT or DIAG	Red	On	Yellow	On

1) AR 4.93 and later: The project installation (initial installation or update) via USB flash drive was aborted with an error.
2) The two LEDs blink alternately.

4.8.1.1 LED "S/E" (status/error LED)

This LED is a green/red dual LED and indicates the state of the POWERLINK interface. The LED states have a different meaning depending on the operating mode of the POWERLINK interface.

4.8.1.1.1 Ethernet mode

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

LED "S/E"		
Green	**Red**	**Description**
On	Off	The interface is operated as an Ethernet interface.

Table: LED "S/E": Interface in Ethernet mode

4.8.1.1.2 POWERLINK V2 mode

Error message

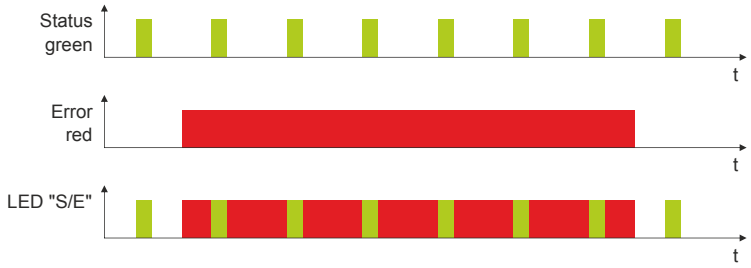
LED "S/E"		
Green	**Red**	**Description**
Off	On	The interface is in error mode (failed Ethernet frames, increased number of collisions on the network, etc.). Note: Several red blinking signals are displayed immediately after the device is switched on. These are not errors, however.
Blinking	On	If an error occurs in the following modes, then the green LED blinks over the red LED: • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

Table: LED "S/E" - Error message (interface in POWERLINK mode)

Interface status

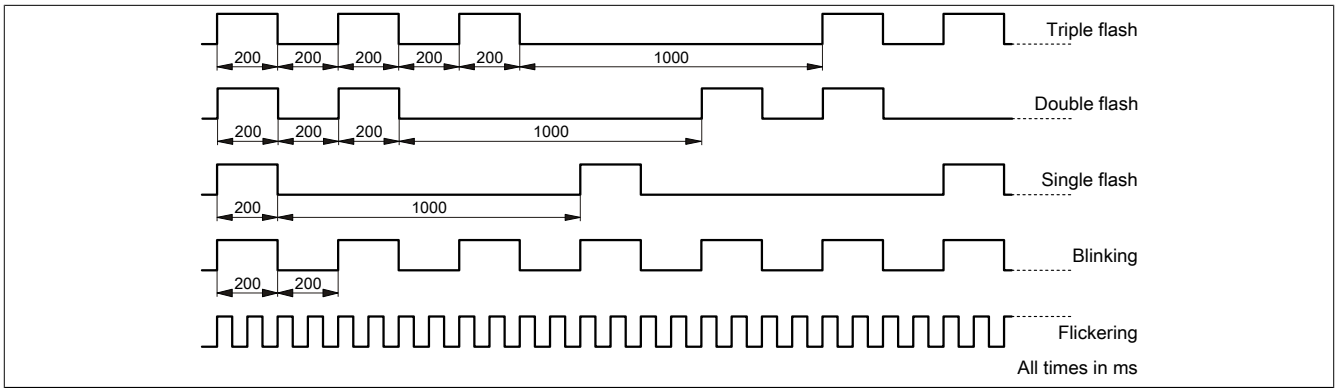
LED "S/E"		
Green	**Red**	**Description**
Off	Off	**Mode:** NOT_ACTIVE The interface is either in mode NOT_ACTIVE or one of the following modes or errors is present: • The device is switched off. • The device is in the startup phase. • The interface or device is not configured correctly in Automation Studio. • The interface or device is defective. **Managing node (MN)** The network is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1. If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The network is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode BASIC_ETHERNET. If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1.
Flickering (approx. 10 Hz)	Off	**Mode:** BASIC_ETHERNET The interface is in mode BASIC_ETHERNET. The interface is operated in Ethernet mode. **Managing node (MN)** This mode can only be exited by resetting the controller. **Controlled node (CN)** If POWERLINK communication is detected during this mode, the interface enters mode PRE_OPERATIONAL_1.

Table: LED "S/E" - Interface state (interface in POWERLINK mode)

LED "S/E"		
Green	**Red**	**Description**
Single flash (approx. 1 Hz)	Off	**Mode:** PRE_OPERATIONAL_1 The interface is in mode PRE_OPERATIONAL_1. **Managing node (MN)** The MN is in "reduced cycle" mode. The CNs are configured in this mode. Cyclic communication is not yet taking place. **Controlled node (CN)** The CN can be configured by the MN in this mode. The CN waits until it receives an SoC frame and then switches to mode PRE_OPERATIONAL_2.
	On	**Controlled node (CN)** If the red LED lights up in this mode, this means that the MN has failed.
Double flash (approx. 1 Hz)	Off	**Mode:** PRE_OPERATIONAL_2 The interface is in mode PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this mode. **Controlled node (CN)** The CN can be configured by the MN in this mode. A command then switches the mode to READY_TO_OPERATE.
	On	**Controlled node (CN)** If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz)	Off	**Mode:** READY_TO_OPERATE The interface is in mode READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the CN is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated.
	On	**Controlled node (CN)** If the red LED lights up in this mode, this means that the MN has failed.
On	Off	**Mode:** OPERATIONAL The interface is in mode OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz)	Off	**Mode:** STOPPED The interface is in mode STOPPED. **Managing node (MN)** This mode does not occur for the MN. **Controlled node (CN)** Output data is not being output, and no input data is being provided. This mode can only be reached and exited by a corresponding command from the MN.

Table: LED "S/E" - Interface state (interface in POWERLINK mode)

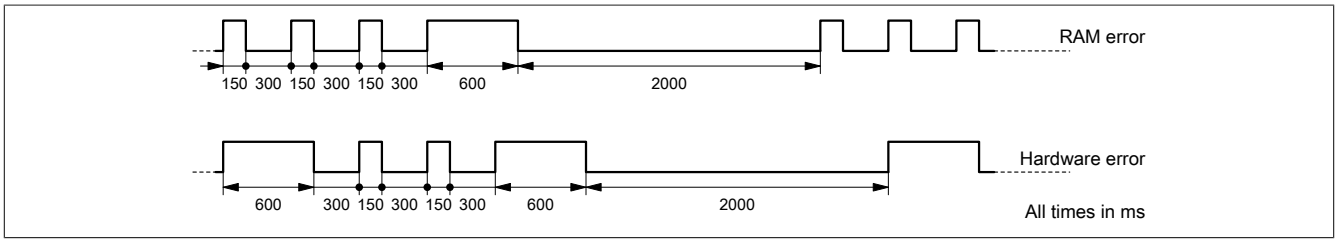
Blink times



4.8.1.1.3 System stop error codes

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

The error code is indicated by LED "S/E" blinking red. The blinking signal of the error code consists of 4 switch-on phases with short (150 ms) or long (600 ms) duration. The error code is repeated every 2 seconds.



Error	Error description
RAM error	The device is defective and must be replaced.
Hardware error	The device or a system component is defective and must be replaced.

4.8.1.2 "OPS" LEDs - Variant without fieldbus interfaces

LEDs "OPS1" to "OPS5" do not have a function for Power Panel variants without fieldbus interfaces (4PPC50.xxxx-10x).

4.8.1.3 "OPS" LEDs - Variant with 2x CAN bus

LED	Color	Status	Description	Interface
OPS1	-	-	Reserved.	-
OPS2	Yellow	Off	Terminating resistor not switched on.	IF6: CAN bus
		On	Terminating resistor switched on.	
OPS3	Yellow	On	TxD/RxD: Data is being transmitted or received.	
OPS4	Yellow	On	TxD/RxD: Data is being transmitted or received.	IF7: CAN bus
OPS5	Yellow	Off	Terminating resistor not switched on.	
		On	Terminating resistor switched on.	

4.8.1.4 "OPS" LEDs - Variant with 1x CAN bus and 1x RS232

LED	Color	Status	Description	Interface
OPS1	-	-	Reserved.	-
OPS2	Yellow	Off	Terminating resistor not switched on.	IF6: CAN bus
		On	Terminating resistor switched on.	
OPS3	Yellow	On	TxD/RxD: Data is being transmitted or received.	
OPS4	Yellow	On	TxD/RxD: Data is being transmitted or received.	IF8: RS232
OPS5	-	-	Reserved	-

4.8.1.5 "OPS" LEDs - Variant with 1x CAN bus and 1x RS485

LED	Color	Status	Description	Interface
OPS1	-	-	Reserved.	-
OPS2	Yellow	Off	Terminating resistor not switched on.	IF6: CAN bus
		On	Terminating resistor switched on.	
OPS3	Yellow	On	TxD/RxD: Data is being transmitted or received.	
OPS4	Yellow	On	TxD/RxD: Data is being transmitted or received.	IF9: RS485
OPS5	Yellow	Off	Terminating resistor not switched on.	
		On	Terminating resistor switched on.	

4.8.2 Reset button / Operating modes

Only press the reset button with a suitable tool.

Tool properties:

- Diameter D: 2 mm
- Length x: Min. 15 mm

The reset button can be used to switch to one of 3 operating modes. The following key codes are used to select the desired operating mode:

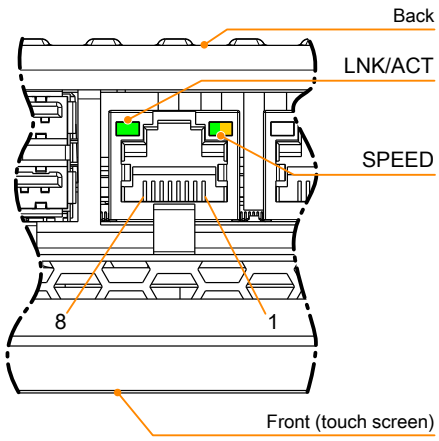
Operating mode[1)]	Key code / Description
RUN	**Key code:** 1. Press key briefly (<2 s). 2. As soon as LED "R/E" lights up red, the button can be released.
	A **hardware reset** is triggered. • All application programs are stopped. • The outputs of all connected modules are set to zero. The device then starts up in **mode RUN** and an existing application is started. The device starts up in mode SERVICE by default. The startup mode that follows after pressing the reset button can be set in Automation Studio. • SERVICEmode (default) • Warm restart • Cold restart • Mode DIAG
DIAG	**Key code:** 1. Press and hold key (>2 s). 2. LED "R/E" lights up red and then goes dark. 3. As soon as LED "R/E" goes dark, the button can be released.
	The device is started in **mode DIAG**. Program sections in User RAM and in the User FlashPROM are not initialized. A warm restart always take place after exiting mode DIAG.
BOOT	**Key code:** 1. Press key briefly (<2 s). 2. As soon as LED "R/E" lights RED, the button can be released. 3. Short pause (<2 s) 4. Press the key. 5. As soon as LED "R/E" is no longer lit, the button can be released.
	The device changes to **mode BOOT**. Boot AR is started. In this mode, the runtime system can be installed with Automation Studio via the online interface. User flash memory is erased only when the download begins.

1) The operating mode can be seen in the display during the startup phase of the device.

Mode RUN is always enabled if a warm or cold restart of the device is triggered with Automation Studio.

4.8.3 POWERLINK interface (IF1)

Figure



Pinout

Terminal	Ethernet	
1	RXD	Receive data
2	RXD\	Receive data\
3	TXD	Transmit data
4	Termination	
5	Termination	
6	TXD\	Transmit data\
7	Termination	
8	Termination	

Diagnostic LEDs (POWERLINK mode)

LED	Color	Status	Description
LNK/ACT	Link/Activity		
	Green	On	Link established to a POWERLINK network.
		Blinking	Link established to a POWERLINK network and POWERLINK activity taking place on the bus.
		Off	No link established to a POWERLINK network.
SPEED	Transfer rate		
	Orange + Green	Off	Not used.

Diagnostic LEDs (Ethernet mode)

LED	Color	Status	Description
LNK/ACT	Link/Activity		
	Green	On	Link established to an Ethernet network.
		Blinking	Link established to an Ethernet network and Ethernet activity taking place on the bus.
		Off	No link established to an Ethernet network.
SPEED	Transfer rate		
	Orange + Green	Off	Not used.

Information:

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

POWERLINK V2 mode

By default, the POWERLINK interface is operated as a managing node (MN). In the managing node, the node number is set to a fixed value of 240.

If the POWERLINK node is operated as a controlled node (CN), a node number from 1 to 239 can be set in the POWERLINK configuration in Automation Studio.

Ethernet mode

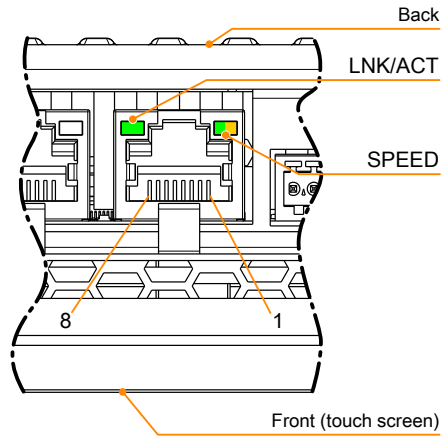
In this mode, the interface is operated as an Ethernet interface. The INA2000 station number is set using the Automation Studio software.

Information:

If interface IF1 is operated in Ethernet mode, then this interface receives its own IP address and works independently of Ethernet interface IF2.

4.8.4 Ethernet interface (IF2)

Figure



Pinout

Terminal	Ethernet	
1	D1+	Data 1+
2	D1-	Data 1-
3	D2+	Data 2+
4	D2-	Data 2-
5	D3+	Data 3+
6	D3-	Data 3-
7	D4+	Data 4+
8	D4-	Data 4-

Diagnostic LED status indicators

LED	Color	Status	Description
LNK/ACT	Link/Activity		
	Green	On	Link established to an Ethernet network.
		Blinking	Link established to an Ethernet network and Ethernet activity taking place on the bus.
		Off	No link established to an Ethernet network.
SPEED	Transfer rate		
	Orange	On	1000 Mbit/s
	Green	On	100 Mbit/s
	Orange + Green	Off	10 Mbit/s

The INA2000 node number is set with Automation Studio.

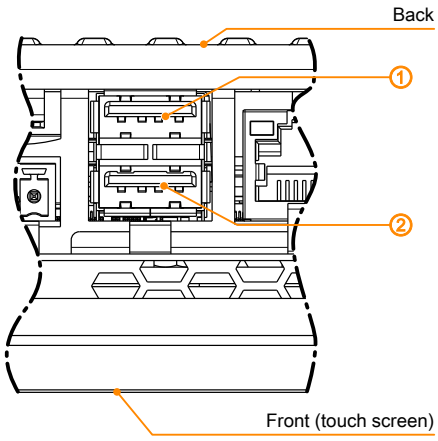
Information:

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

Information:

This Ethernet interface (IF2) is not suitable for POWERLINK.

4.8.5 USB interfaces



1	USB interface IF3
2	USB interface IF4

The Power Panel has a USB 2.0 host controller with 2 USB interfaces:

	USB interfaces IF3 and IF4
Transfer rate[1)]	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Power supply	Max. 0.5 A per interface

1) The actual value depends on the operating system or driver used.

Notice!

Possible damage to USB interfaces or USB devices!

- **USB peripheral devices can be connected to the USB interfaces. Due to the variety of USB devices available on the market, B&R cannot guarantee their functionality. The functionality of USB devices available from B&R is ensured.**
- **Due to the general PC specification, these USB interfaces must be handled with the utmost care with regard to EMC, cable routing, etc.**

Notice!

Possible malfunction of interfaces and touch screen!

If functional ground is not present, faults in interface communication and touch screen functionality can occur.

The device is only permitted to be operated if properly grounded.

Assigning the USB interfaces

The USB interfaces can be independently assigned to either the controller or terminal:

Interface	Default assignment	Alternative assignment
IF3	AR Embedded (controller)	Terminal
IF4	Terminal	AR Embedded (controller)

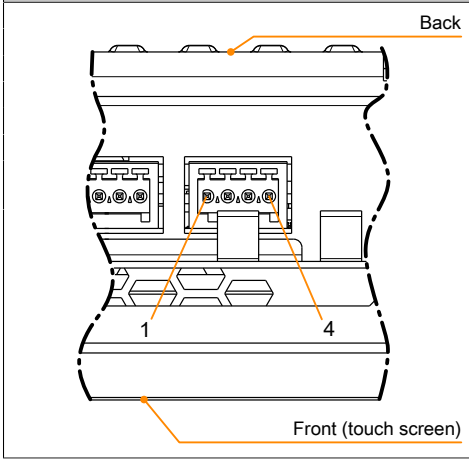
Using the USB interfaces

Depending on the assignment, the USB interfaces can be used as follows:

Assignment	Usage
AR Embedded (controller)	Technology Guard with mapp View license and/or additional licenses.
	USB memory (e.g. flash drive)
Terminal	USB memory with system image for updating the terminal system (see "Update " on page 57).
	USB keyboard[1)]
	USB mouse[1)]

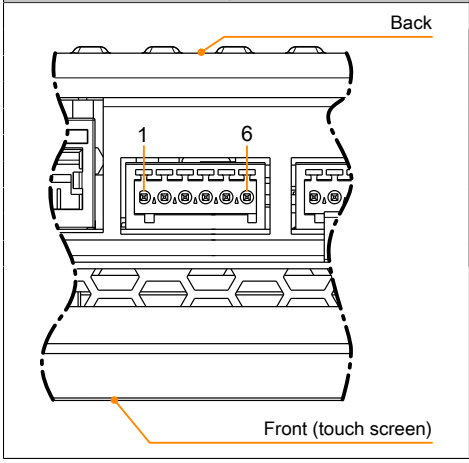
1) USB keyboard and/or USB mouse are automatically recognized by the terminal.

4.8.6 X2X Link interface

Figure	Pinout		
	**Terminal**	**X2X Link**	
	1	X2X	X2X data
	2	X2X⊥	X2X ground
	3	X2X\	X2X data inverted
	4	SHLD	Shield
	Required accessories		
	0TB5104.2110-01		Accessory terminal block, 4-pin (2.5), cage clamp terminal block 0.5 mm²

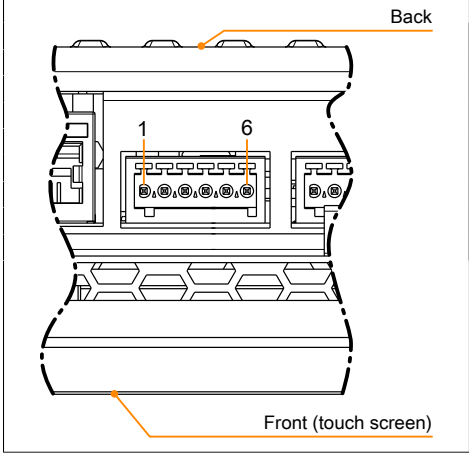
4.8.7 Fieldbus interfaces

4.8.7.1 Variant with 2x CAN bus

Figure	Terminal	Pinout	
	**IF7: CAN bus**		
	1	CAN_H	CAN high
	2	GND	Ground
	3	CAN_L	CAN low
	IF6: CAN bus		
	4	CAN_H	CAN high
	5	GND	Ground
	6	CAN_L	CAN low
	Required accessories		
	0TB5106.2110-01		Accessory terminal block, 6-pin (2.5), cage clamp terminal block 0.5 mm²

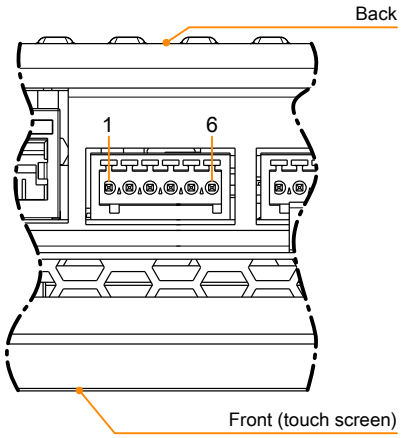
A terminating resistor can be switched on individually and independently for each interface via software (configuration in Automation Studio).

4.8.7.2 Variant with 1x CAN bus and 1x RS232

Figure	Terminal	Pinout	
	**IF8: RS232**		
	1	TxD	Transmit signal
	2	GND	Ground
	3	RxD	Receive signal
	IF6: CAN bus		
	4	CAN_H	CAN high
	5	GND	Ground
	6	CAN_L	CAN low
	Required accessories		
	0TB5106.2110-01		Accessory terminal block, 6-pin (2.5), cage clamp terminal block 0.5 mm²

A terminating resistor can be switched on individually and independently for each interface via software (configuration in Automation Studio).

4.8.7.3 Variant with 1x CAN bus and 1x RS485

Figure	Terminal	Pinout	
	**IF9: RS485**		
	1	DATA	Data
	2	GND	Ground
	3	DATA\	Data inverted
	IF6: CAN bus		
	4	CAN_H	CAN high
	5	GND	Ground
	6	CAN_L	CAN low
	Required accessories		
	0TB5106.2110-01		Accessory terminal block, 6-pin (2.5), cage clamp terminal block 0.5 mm²

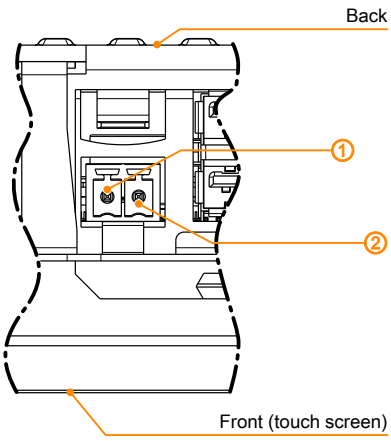
A terminating resistor can be switched on individually and independently for each interface via software (configuration in Automation Studio).

4.8.8 Power supply

Danger!

The device is only permitted to be supplied with protective extra-low voltage (PELV).

Ground potential (grounding clip on the device) and the GND connection for the power supply are connected internally on the Power Panel.



For the pinout of the power supply, see either the following table or the back of the Power Panel. The Power Panel is protected against incorrect connection of the supply voltage by reverse polarity protection, which prevents damage to the device.

Terminal	Pinout	Explanation
1	+	24 VDC
2	–	GND

Required accessories	
0TB6102.2010-01	Accessory terminal block, 2-pin (3.81), screw clamp terminal block 1.5 mm²
0TB6102.2110-01	Accessory terminal block, 2-pin (3.81), cage clamp terminal block 1.5 mm²

The supply voltage is internally protected against supply voltage overload by a permanently soldered fuse (see technical data). The device must be sent to B&R for repairs if the fuse is destroyed in the event of error (fuse replacement).

5 Commissioning

5.1 Installation

Notice!

Possible damage to the device!

- **Commissioning and maintenance work is only permitted to be carried out when the device is in a voltage-free state. To do this, disconnect the power cable from the power supply and from the device.**
- **Do not use excessive force! Handle all modules and components carefully.**
- **All covers and components, accessories, hardware and cables must be installed or secured before the device is connected to the power supply and switched on.**
- **Observe ESD instructions (see "Protection against electrostatic discharge" on page 9).**

Notice!

Possible errors and damage to the touch screen functionality!

- **Do not cover the front panel or touch screen.**
  Full or partial coverage of the front panel can have an impact on immunity to interference in relation to electrostatic discharge and conducted disturbances. In this case, compliance with the required limit values can no longer be guaranteed.

Important information about installation

- Observe climatic ambient conditions.
- Install the device on a flat, clean and burr-free surface.
- Observe the bend radius when connecting cables.
- When installing the device in a closed housing, observe the minimum distances for air circulation.
- Ensure ventilation holes remain open (do not obstruct air flow with covers).
- Observe the permissible mounting orientations.
- Install the device so that it can be viewed optimally by the user (see viewing angle data in the technical data).

5.1.1 Requirements for the installation cutout

When installing the Power Panel, it is important to ensure that the surface and wall thickness meet the following conditions:

Installation cutout property	Value
Permissible deviation from evenness **Note:** This condition must also be observed when the device is installed.	≤0.5 mm
Permissible surface roughness in the area of the gasket	≤120 µm (Rz 120)
Min. wall thickness	2 mm
Max. wall thickness	6 mm

Notice!

The degree of protection provided by the device (see technical data) can only be maintained if it is installed in an appropriate housing that has at least the same degree of protection and in accordance with the above requirements.

Notice!

The device must ultimately be installed in a protective housing with sufficient rigidity (per UL 61010-1 and UL 61010-2-201).

5.1.2 Installing with retaining clips

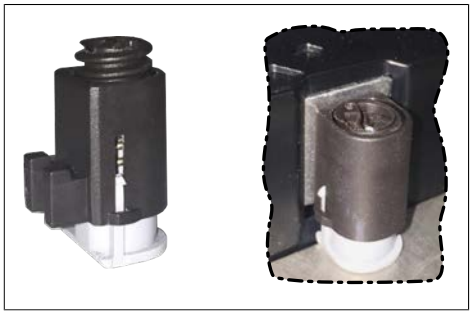


Figure: Retaining clips (symbolic)

The retaining clips are designed for a certain thickness of the material to be clamped (max. 6 mm, min. 2 mm).

A large flat-blade screwdriver is needed to tighten and loosen the screw.

The device must be installed on a flat, clean and burr-free surface since tightening screws on an uneven area can result in damage to the display or the ingress of dust and water.

See also "Requirements for the installation cutout" on page 42.

Procedure

1. Insert the device into the front of the prepared, burr-free and flat installation cutout. For the dimensions of the installation cutout, see section "Dimensions" for the individual devices.
2. Install the retaining clips on the device. To do this, insert the clips into the openings on the sides of the device (indicated by the orange circles). The number of openings may vary depending on the size of the device.

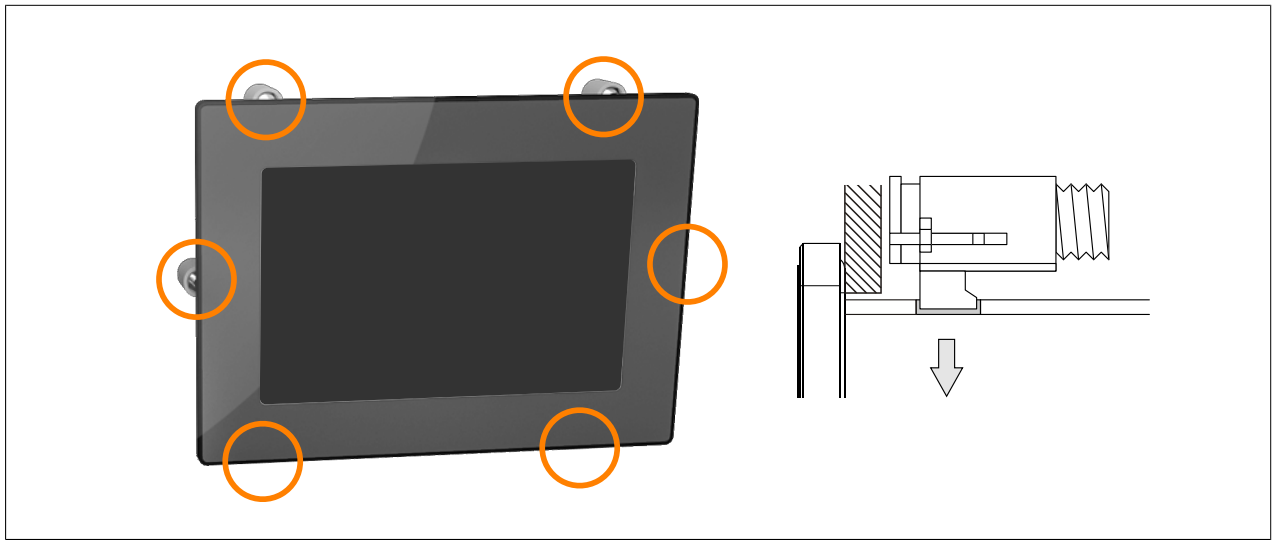


Figure: Inserting the retaining clips

3. Slide the retaining clips all the way to the back of the openings.

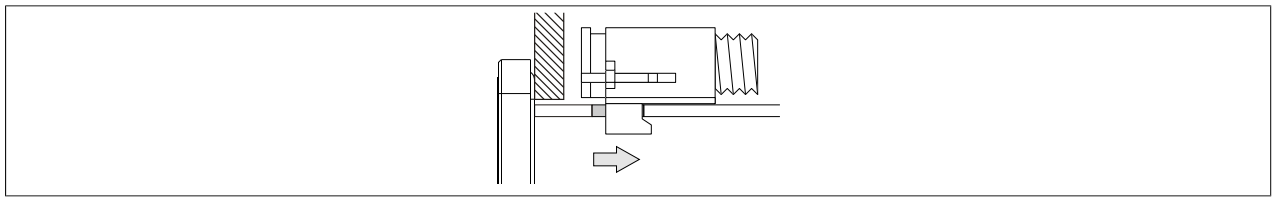


Figure: Sliding the retaining clips back

4. Secure the retaining clips to the wall or control cabinet panel by tightening the mounting screws with a flat-blade screwdriver.

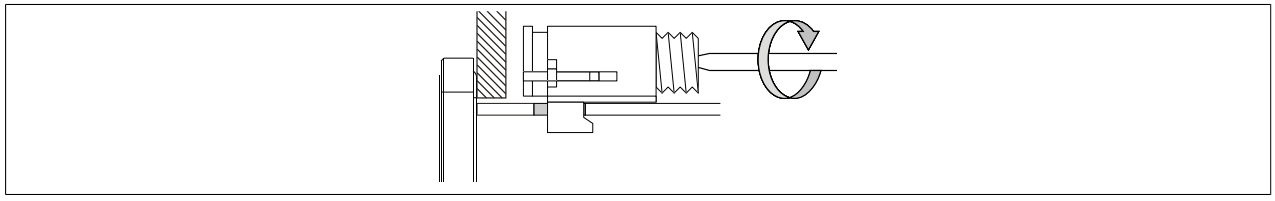


Figure: Securing the retaining clips

Torque limiting is built into the retaining clips.

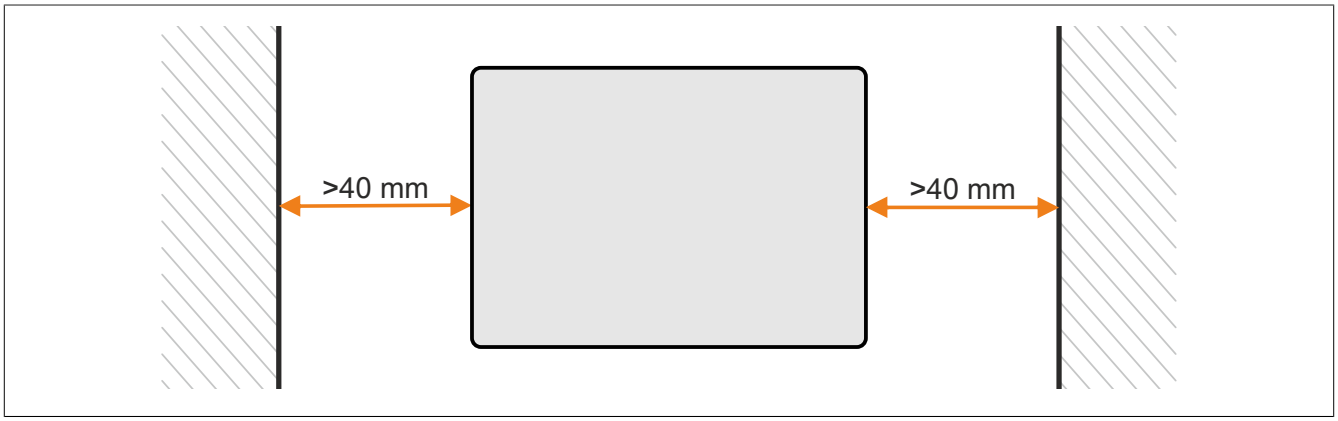
✓ The retaining clip is secured correctly if the following conditions apply:

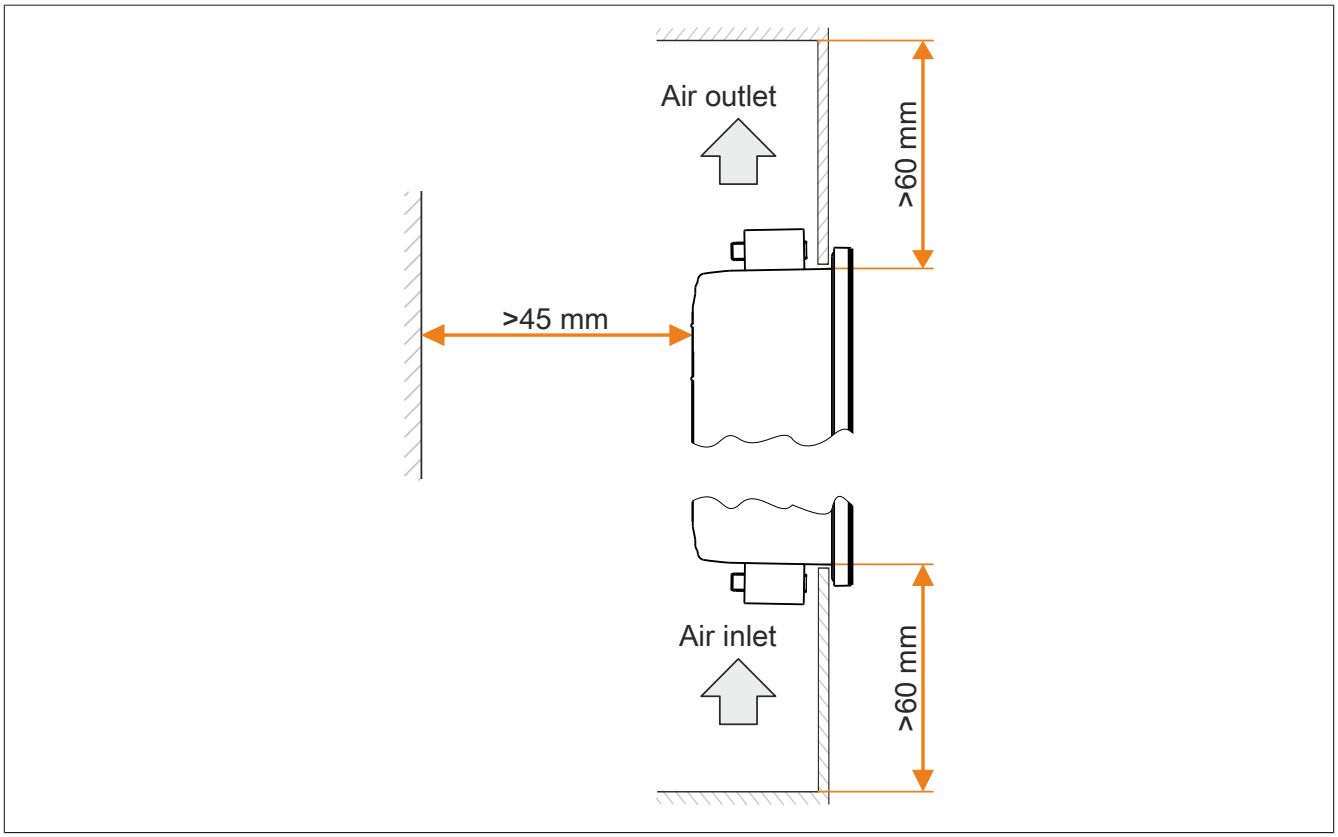
- As soon as torque limiting takes effect, the blade of the screwdriver is pushed out of the screw drive.
- The screwdriver can no longer grip and further tightening is no longer possible.

5.1.3 Installation instructions

The Power Panel must be installed using the retaining clips included in delivery.

In order to guarantee sufficient air circulation, allow the specified amount of space above, below, to the side and behind the Power Panel. The minimum specified spacing is indicated in the following schematic diagrams. This applies to all Power Panel variants.





Information:

In worst-case operation, the specified spacing for air circulation applies at the maximum specified ambient temperature (see "Temperature specifications" in chapter "Technical data") in compliance with the permissible mounting orientations (see "Mounting orientations" on page 45).

If the specified spacing for air circulation cannot be observed, either a corresponding derating must be taken into account (see "Derating the ambient temperature" on page 20) or the internal housing temperature must be monitored by the user (see "Temperature monitoring" on page 61).

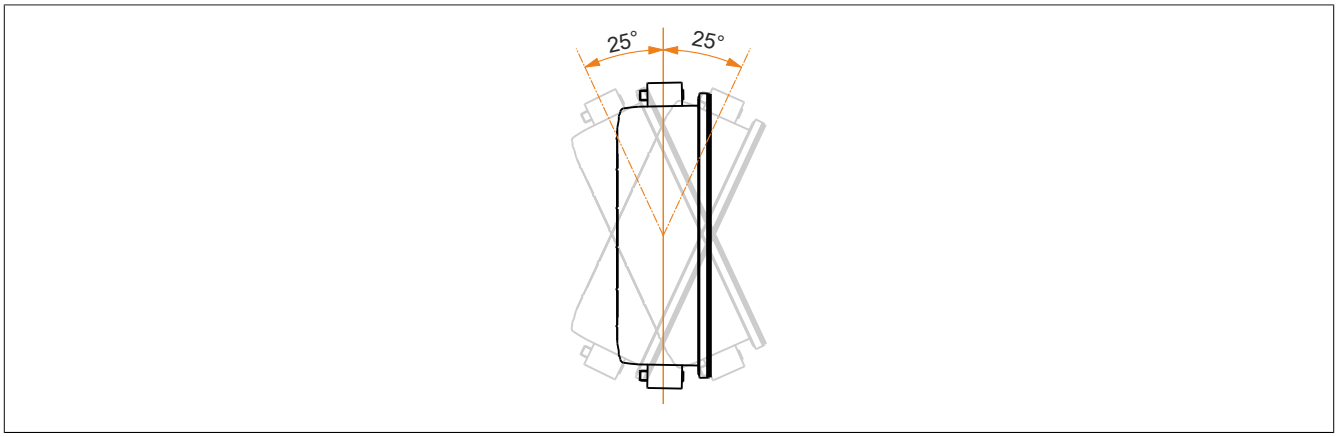
5.1.4 Mounting orientations

Notice!

Possible damage to the device!

- **Excessively high ambient temperature can result in damage to the device or malfunctions.**
- **For the maximum permissible ambient temperature, see the technical data for the respective device.**

Vertical or tilted mounting orientation



The device can be operated without derating (see ambient conditions in the technical data).

Other mounting orientations (horizontal, inclined, etc.)

The device can be operated in all other mounting orientations if an appropriate derating is observed (see "Derating the ambient temperature" on page 20) or the internal housing temperature is monitored by the application (see "Temperature monitoring" on page 61).

5.1.5 Grounding (functional ground)

Interference is effectively dissipated via a grounding clip. For additional information about electromagnetic compatibility, see the **INSTALLATIONS / EMC GUIDE** user's manual (MAEMV-ENG on the B&R website www.br-automation.com).

Notice!

Possible malfunction of interfaces and touch screen!

If functional ground is not present, faults in interface communication and touch screen functionality can occur.

The device is only permitted to be operated if properly grounded.

Grounding in the control cabinet

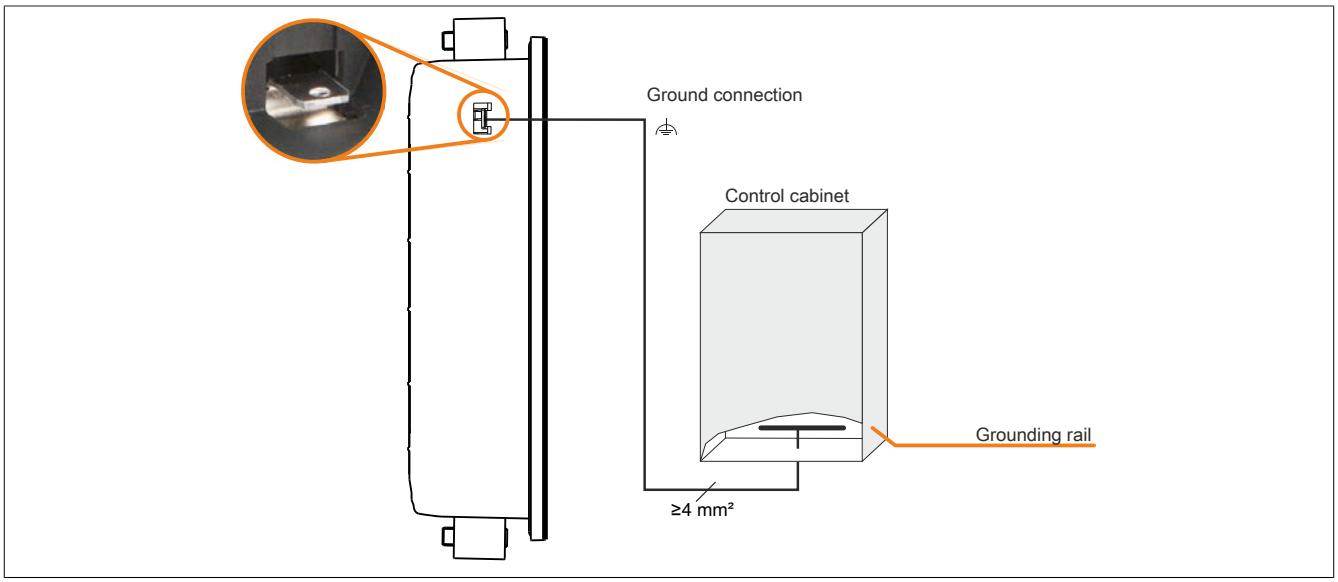


Figure: Grounding in the control cabinet (symbolic)

Notice!

The ground connection of the device must be low impedance and connected to ground (e.g. grounding rail in the control cabinet) using a short path.

Grounding / Securing cables

The cables to/from the Power Panel are secured as follows depending on the display variant:

Display variant	Securing the cables and grounding the cable shield
7.0" to 121"	Using cable ties on the supplied accessory plate
15.6"	Using the supplied cable clamps directly on the device

1) **Ground conductor**

   The connection to ground potential must be as short as possible and sufficiently strong (≥4 mm²) over the intended spade terminal (Faston 6.3 mm).

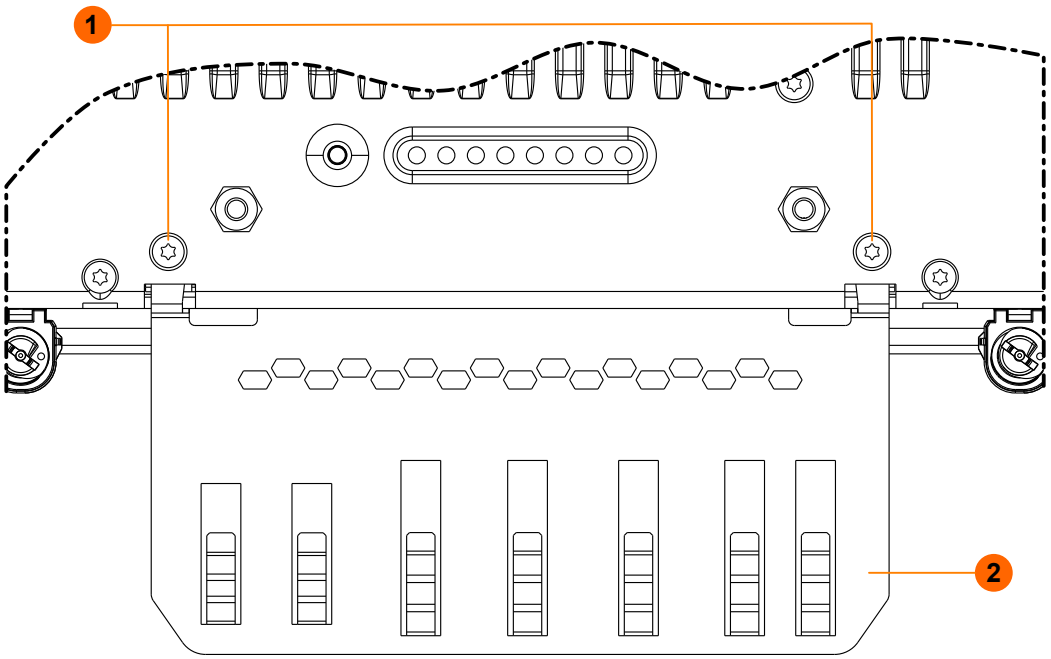
2) **Shielded lines**

   A central ground connection is available to effectively deflect interference. All cable shields must be connected to ground with good conductivity using cable ties on the accessory plate, cable clamps on the device or by other means.

3) **Unshielded lines**

   Strain relief of all unshielded cables must be provided using cable ties on the accessory plate or cable clamps on the device.

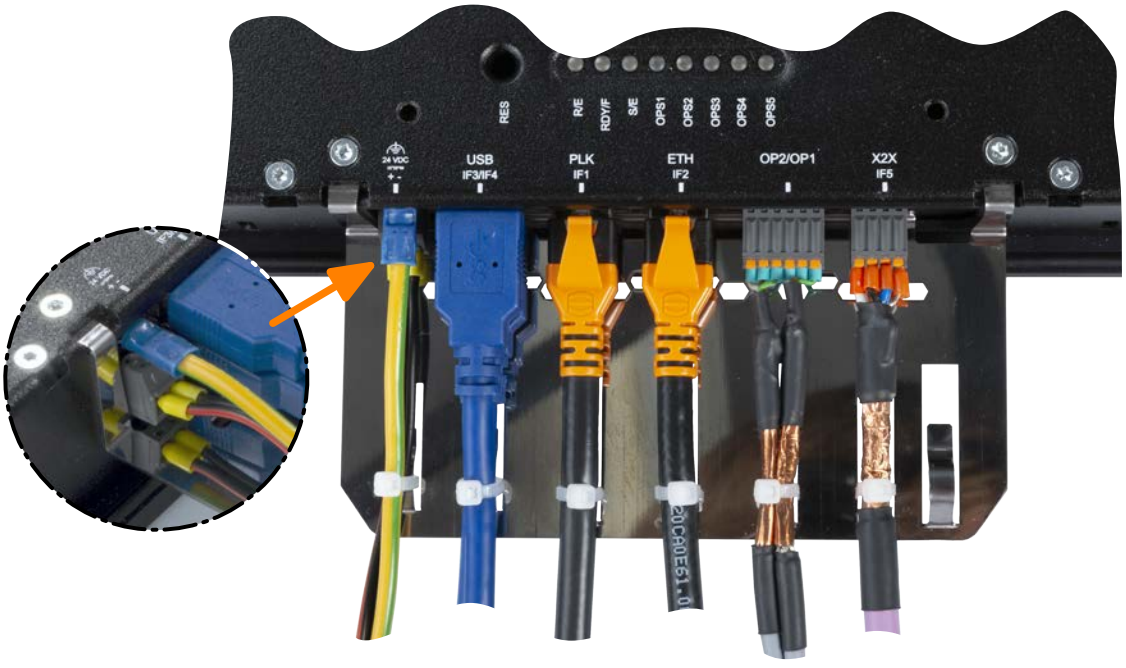
Installing the accessory plate



Required accessories from the content of delivery: (1) 2 M3x4 screws and (2) accessory plate

1. Attach the accessory plate (2) to the back of the device.
2. Secure the accessory plate with the mounting screws (1).
   Max. tightening torque of the screws: 0.55 Nm

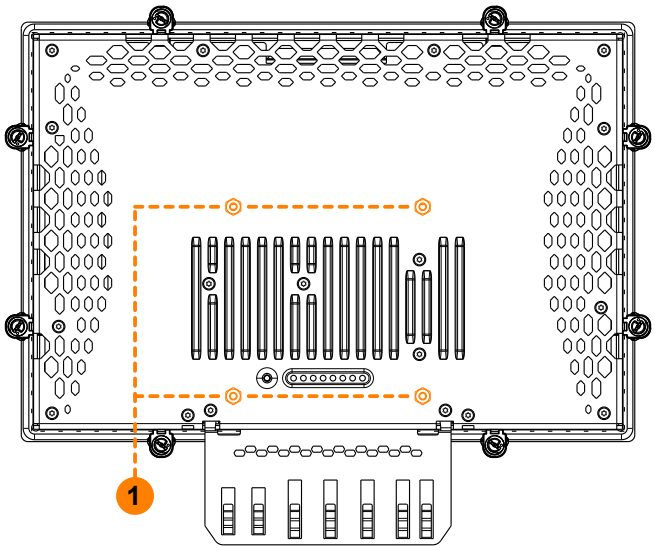
Grounding/Securing for 7.0" to 12.1" devices



Grounding/Securing for 15.6" devices

5.1.6 VESA mount

The Power Panel has 4 threaded inserts (1) to accept a VESA mount:



Notice!

Standard: VESA 100

Maximum screw-in depth of the mounting screws: 8 mm

Select screws of appropriate length to prevent damage to the device.

5.2 Commissioning (Automation Runtime)

The Power Panel is delivered with Boot AR. This is an operating system with a limited range of functions but that provides all functions necessary for an online connection between Automation Studio and the Power Panel.

A complete Automation Runtime version must be transferred to the Power Panel in order to start up the Power Panel. The following options are available for this:

- Transferring Automation Runtime over a network with a DHCP server
- Transferring Automation Runtime over a network without a DHCP server
- Project installation with USB install drive

Transferring Automation Runtime over a network with a DHCP server

See Automation Help:

⇨ *Real-time operating system / Target systems / Target systems - SG4 / Automation Runtime remote install*

Transferring Automation Runtime over a network without a DHCP server

The following steps outline how Automation Runtime is transferred to the Power Panel over the network without a DHCP server:

► Connect the Power Panel to the Ethernet network.

► Switch on the Power Panel.

► Create a new project with the Power Panel in Automation Studio.

► In a network without a DHCP server, an IP address must be assigned to the Power Panel in order for an online connection between Automation Studio and the Power Panel to be established:

– Menu option **Online / Settings.** opens connection window "Online settings".
– The target system search is started in this window with menu option **View / Online settings / Browse.**.
– The list of target systems found also includes the Power Panel. Since an IP address has not yet been assigned to the Power Panel, address 0.0.0.0 is displayed.
– Command **Set IP parameters** (Power Panel shortcut menu) opens the dialog box where all required network configurations can be made temporarily (they should be identical to the settings defined in the project).

> **Information:**
>
> **The data required for manual network configuration can be obtained from the network or system administrator.**

► Rebuild the project in Automation Studio with menu option **Project / Rebuild configuration**.

► The connection must first be enabled in order to transfer Automation Runtime to the Power Panel. This is done using command **Connect** from the Power Panel's shortcut menu.

► Automation Runtime can then be transferred to the Power Panel with the following menu option:

→ **Project / Project installation / Transfer Automation Runtime.**

✓ Then follow the instructions provided by Automation Studio.

> **Information:**
>
> **Memory is erased first during this procedure; Automation Runtime is then transferred and after 3 automatic restarts the Power Panel is in mode RUN.**

► For additional information about this topic, see Automation Help.

Project installation with USB install drive

See Automation Help:

⇨ *Project management / Project installation / Create USB install drive*

6 Software

This chapter describes the following software-specific topics and information:

6.1 License information about the Terminal OS

License information in ZIP archive *license.zip*

ZIP archive *license.zip* contains file *license.manifest*, which contains an overview of software components being used with name, version and license information. In addition, the ZIP archive also contains detailed version information for each individual software component.

Information: When unpacking the ZIP archive, note that for technical reasons files with the same name may be included.

ZIP archive *license.zip* is included in the following image packages:

Type of Terminal OS image[1]	Description
Automation Studio upgrade	Executable file for installation in Automation Studio[2] **Location of *license.zip* after installation:** • Typically in the local installation directory for Automation Studio: *C:\BrAutomation\AS\[PanelSeries]\[PanelVariant]\V[ImageVersion]* • *[PanelSeries]*: e.g. PPC, PPT, PMT or PFT • *[PanelVariant]*: e.g. 30, 50 or 80 • *[ImageVersion]*: Linux image version[3]
ZIP archive	ZIP archive that, in addition to the Linux image, also contains file `license.zip`.

1) The Terminal OS image is a Linux image. This image is an image of the Power Panel Terminal-OS (see "Terminal OS image" on page 60) that is required to installation or update it.
Install/Update Linux image on Power Panel: see "Update " on page 57
2) See Automation Help for information about the download and installation in Automation Studio.
3) The Linux image version is not identical to the version from the Power Panel hardware upgrade.

> **Information:**
>
> **The license information in *license.zip* always refers to a specific image version.**

6.2 Information regarding the minimum system

A Power Panel contains a permanently installed minimal system that handles the installation of a new terminal OS Image when commissioning or updating the operating system (terminal OS).

6.2.1 Minimum system 1.0.3

> **Notice!**
>
> **With minimal systems versions ≥1.0.3, the operating system is updated over the network if DHCP is disabled in the network configuration (see the corresponding setting in section "Network" on page 53).**

For devices with the following hardware revision, the minimum system has been updated to version 1.0.3.

Order number	4PPC50.0702-xxx	4PPC50.101E-xxx	4PPC50.121E-xxx	4PPC50.156B-xxx
Hardware revision	F0	E0	E0	E0

6.3 Configuration in Automation Studio

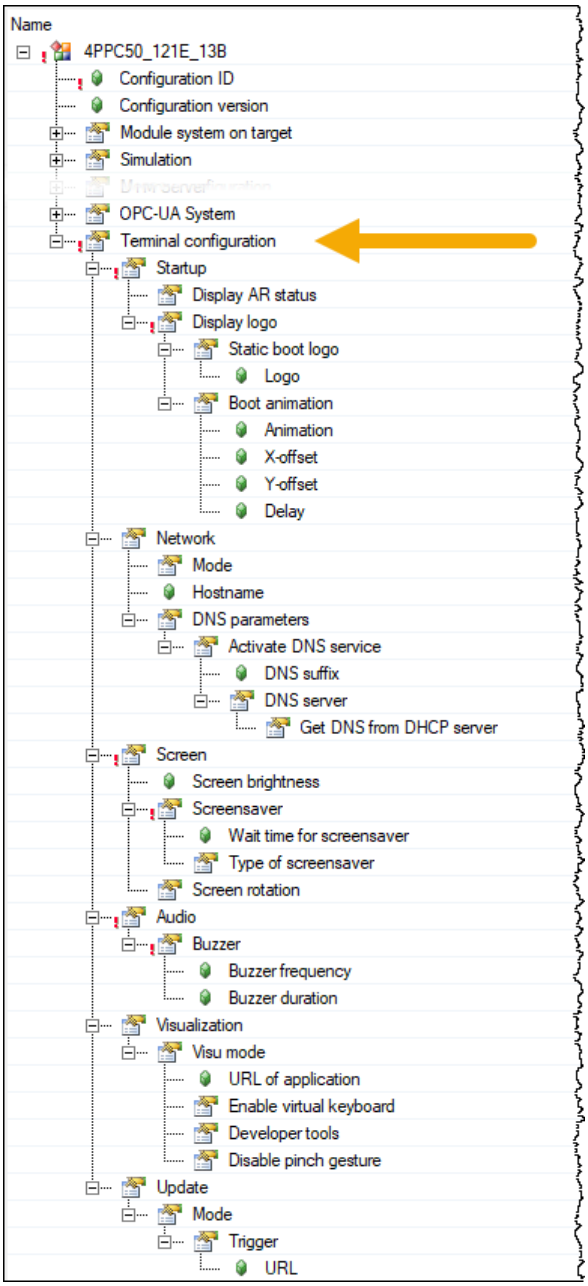
Standard options

The standard configuration options for the Power Panel C50 in Automation Studio are described in Automation Help:

⇨ Programming / Editors / Configuration editors / Hardware configuration / CPU configuration / SG4

Terminal configuration

The terminal (HMI application with mapp View or HTML application) is also configured in the CPU configuration in Automation Studio:



The individual options in group "Terminal configuration" are described in the following sections.

6.3.1 Startup

The behavior during device startup is defined with the options in group "Terminal configuration / Startup":

Parameter	Setting/Description
Display AR status	Default setting: on The terminal can display the status of the controller (Automation Runtime) on the screen during startup: **Selection** / **Description** off / The AR status is not displayed. on / The AR status is displayed. If the controller does not change to mode RUN after startup, a button will appear at the bottom right of the screen to open "System Diagnostics Manager" (SDM). For additional information about "System Diagnostics Manager", see Automation Help.
Display logo	Default setting: off This option defines whether a boot logo (static and/or animated) is displayed while establishing the connection between the terminal and web server (address specified under Web with option "URL of application"): **Selection** / **Description** off / A logo is not displayed. on / A logo is displayed.

Information:

To transfer logos from Automation Runtime to the terminal, the TFTP server must be enabled in the CPU configuration.

6.3.1.1 Static boot logo

Parameter	Setting/Description
Logo	Default setting: None Selects the boot logo: **Selection** / **Description** None / No boot logo selected. [Dateiname].bmp / Boot logo "[Dateiname].bmp" selected. A static boot logo for the Power Panel can be selected here that will be displayed during device startup and when establishing the connection to the web server. Information about the boot logo: "Boot logo" on page 60

6.3.1.2 Boot animation

Parameter	Setting/Description
Animation	Default setting: None Selects the boot animation **Selection** / **Description** None / No boot animation selected. [Dateiname].gif / Bool animation "[Dateiname].gif" selected. An animated boot logo for the Power Panel can be selected here that will be displayed during device startup and when establishing the connection to the web server. This will be placed on top of the static boot logo if necessary. Information about the boot animation: "Boot animation" on page 61
X-offset [pixel]	Defines the distance from an existing boot animation to the left edge of the display.
Y-offset [pixel]	Defines the distance from an existing boot animation to the top edge of the display.
Delay [ms]	Delay in milliseconds between individual images in the GIF animation. The individual values have the following effect: **Value [ms]** / **Description** 0 / In this case, the delay defined in the GIF file will be used. If no delay is defined in the GIF file, 100 ms is used. >0 / Applies the set delay time. It may not be possible to achieve small values due to the power limits of the device. In this case, the animation is displayed slower than the value specified.

6.3.2 Network

All settings here refer to the Ethernet interface of the terminal (see also "Network information" on page 58). The Ethernet interface on the controller must be configured in Automation Studio in the interface configuration (see the corresponding documentation in Automation Help).

Parameter	Setting/Description
Mode	Default setting: Get IP address from DHCP server Selects the network mode: **Selection** / **Description** Get IP address from DHCP server: When the Dynamic Host Configuration Protocol (DHCP) is enabled, the network configuration is automatically obtained from the DHCP server and assigned to the Power Panel; otherwise, it must be entered manually (e.g. IP address of the device, IP address of the gateway, etc.). enter IP address manually: If manual network configuration is selected, additional parameters must be defined (see "Network configuration without DHCP").
Hostname	Default setting: EMPTY (no hostname defined) Hostname of the terminal. The terminal of the Power Panel is identified in the network using its IP address or hostname. If a hostname is entered here, it can be used to identify and access the terminal in the network. Important information: • The hostname must be **unique** in the network. • The name can have a maximum length of 64 characters.

6.3.2.1 Network configuration without DHCP

The following additional parameters must be entered when selecting option "enter IP address manually":

Parameter	Setting/Description
IP address	Default setting: EMPTY The IP address of the terminal within the network must be entered here.
Default gateway	Default setting: EMPTY IP address of the default gateway.
Subnet mask	Default setting: 255.0.0.0 The subnet mask is entered here.

Information:

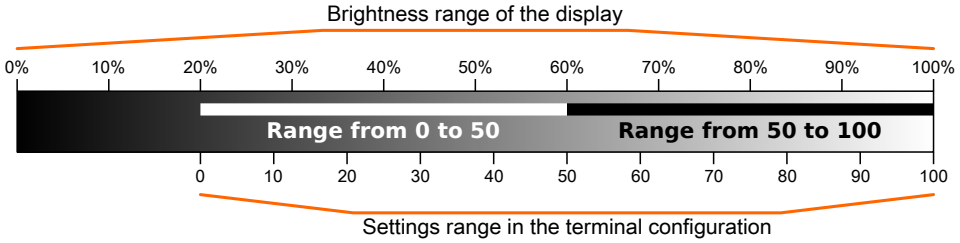
The data required for manual network configuration can be obtained from the network or system administrator.

6.3.2.2 DNS parameters

Parameter	Setting/Description
Activate DNS service	Default setting: on DNS usage of the terminal (DNS client) can be enabled or disabled with this option. **Selection** / **Description** on: DNS service: Enabled If the HMI application or update server should be accessed via a hostname, this option must be enabled so that the hostname can be resolved and the associated IP address obtained from the DNS server. off: DNS service: Disabled Options "DNS suffix" and "Get DNS from DHCP server" are not available in this case and will be hidden.
DNS suffix	Default setting: DnsSuffix A DNS suffix is usually entered when a hostname is defined. The DNS suffix is specific to the network in which the terminal is being operated. Information about this must be obtained from the network administrator. The hostname and the DNS suffix make up the full domain name (FQDN: fully qualified domain name) for the device: `hostname.dns-suffix` The full domain name could look like this, for example: **Hostname:** `ppt-visualization-machine-01` **DNS suffix:** `network-domain.com` **Fully qualified hostname (FQDN):** `ppt-visualization-machine-01.network-domain.com`
Get DNS from DHCP server	Default setting: on **Selection** / **Description** on: Get DNS from DHCP server: Enabled By default, the IP addresses for the DNS server are automatically obtained from the DHCP server. off: Get DNS from DHCP server: Disabled If it is necessary to manually enter the IP addresses of the DNS servers (without generally disabling DHCP), this can be done by disabling this option. If this option is disabled, up to three DNS servers can be entered.

6.3.3 Screen

Some settings for the display can be changed with the following parameters.

Parameter	Setting/Description
Screen brightness	Default setting: 50 Input range: 0 to 100 Unit: % This value configures the basic setting of the display. Setting 0% in the terminal configuration corresponds to a residual display brightness of 20%: 
Screensaver	Default setting: off This option disables or enables the screensaver: **Selection** / **Description** off / The screensaver is disabled. on / The screensaver is enabled. Options for the enabled screensaver are described in section "Screensaver settings".
Screen rotation	Default setting: 0° Input range: 0°, 90°, 180°, 270° (in 90° steps) The angle of rotation of the display is set here. This setting affects how screen content is output. After selection, the display content is rotated clockwise according to the specified angle.

6.3.3.1 Screensaver settings

If the screensaver is enabled, additional parameters are displayed:

Parameter	Setting/Description
Wait time for screensaver	Default setting: 15 Unit: Minutes If there is no touch screen activity for the specified duration, the screensaver is started. Touching the screen exits the screensaver and the last active screen contents are shown.
Type of screensaver	Default setting: Backlight off If the screensaver is active after the configured time, the display changes to the selected mode: **Selection** / **Description** Black Screen / The display is dark. The backlight remains on. Backlight off / The display is dark. The backlight is switched off (result: lower power consumption).

6.3.4 Audio

This parameter configures whether an acoustic signal is output during a touch operation.

The following settings can be made when the buzzer is enabled:

Parameter	Setting/Description
Buzzer	Default setting: off **Selection** / **Description** off / Audio signal disabled. on / Audio signal enabled.
Buzzer frequency	Default setting: 500 Input range: 40 to 15000 Unit: Hz This setting is used to configure the frequency of the generated audio signal.
Buzzer duration	Default setting: 25 Input range: 10 to 500 Unit: ms (milliseconds) This setting is used to configure the duration of the generated audio signal.

6.3.5 Visualization

The type of HMI application is selected with parameter **Visu mode**:

Parameter	Setting/Description
Visu mode	Default setting: Web **Selection** / **Description** Web / Configures the terminal as a web client. VNC / Configures the terminal as a VNC client. **Note:** Different parameters are available for configuring the HMI application depending on this selection.

6.3.5.1 Web

The terminal of the Power Panel works as a web client. A web browser in full screen mode represents an HMI or other application running on a web server (e.g. mapp View).

The following parameters can be configured:

<table>
<tr><th>Parameter</th><th>Setting/Description</th></tr>
<tr><td>URL of application</td><td>Default setting: <code>localhost:81/index.html</code>
To use the terminal as a web client, a complete URL must be entered. The following URLs are accepted by the terminal:
<code>[Server]/Path/HMIApplication</code>
In this case, "http://" is automatically added as the protocol.
<code>http://[Server]/Path/HMIApplication</code>
<code>http://[Server]:8080/Path/HMIApplication</code>
<code>https://[Server]/Path/HMIApplication</code>
If the URL does not include a port number, port 80 is used by default.
If web server <code>[Server]</code> is available on a different port, the port must be specified explicitly together with the IP address or hostname:<table><tr><th>Syntax</th><th>Example</th><th>Description</th></tr><tr><td><code>[IP address]:Port</code></td><td><code>10.23.20.17:8080</code></td><td>A connection to IP address <code>10.23.20.17</code> is established on port <code>8080</code>.</td></tr><tr><td><code>[Hostname]:Port</code></td><td><code>webserver1:8081</code></td><td>A connection to host <code>webserver1</code> is established on port <code>8081</code>.</td></tr></table>If the HMI application (mapp View or web server) is provided by the Power Panel C50 controller, <code>localhost</code> can be used as the hostname. This specific hostname is then automatically replaced by the IP address of the controller.</td></tr>
<tr><td>Enable virtual keyboard</td><td>Default setting: off<table><tr><td>off</td><td>The virtual keyboard for the web page is automatically displayed if a text input field in the web browser has the focus. This functionality must be made available by the web server.</td></tr><tr><td>on</td><td>The virtual keyboard is automatically displayed on the screen if a text input field in the web browser has the focus (see "Keyboard" on page 60).</td></tr></table>Input can also be made at any time using a connected USB keyboard.
Information:
The virtual keyboard is generated by the terminal's operating system. If the web application (e.g. mapp View) contains its own on-screen keyboard, the virtual keyboard should be disabled in the terminal configuration.</td></tr>
<tr><td>Developer tools</td><td>Default setting: off<table><tr><td>off</td><td>Developer tools are disabled.</td></tr><tr><td>on</td><td>The next time the web browser is started, the developer tools are enabled.
See: "Using the developer tools" on page 59</td></tr></table>Information:
Safety notice!
This option is for development purposes only while creating an HTML-based HMI application.
When using this option, it should be noted that the functions enabled in this way can be misused; it is therefore recommended to handle the developer tools with appropriate care.
After enabling this parameter, it is possible to change the port used:</td></tr>
<tr><td>Port number</td><td>Default setting: 9222
This setting defines the port used for the developer tools (see "Using the developer tools").</td></tr>
<tr><td>Disable pinch gesture</td><td>Default setting: off<table><tr><td>off</td><td>The browser recognizes the well-known two-finger gesture (pinch-to-zoom) and allows zooming of the browser content.</td></tr><tr><td>on</td><td>The two-finger gesture for zooming the browser content is disabled. Zooming the entire HMI application is prevented.
However, zoom is supported in some mapp View widgets (e.g. LineChart).</td></tr></table></td></tr>
</table>

6.3.5.2 VNC

The terminal of the Power Panel is configured as a VNC client. The VNC client displays HMI applications provided by a VNC server (e.g. VC4 Visual Components application developed in Automation Studio running on the Power Panel controller).

The following parameters can be configured:

<table>
<tr><th>Parameter</th><th>Setting/Description</th></tr>
<tr><td>URL of application</td><td>Default setting: <code>localhost</code>
A complete URL must be entered to use the terminal as a VNC client. The following URLs are accepted by the terminal:
<code>vnc-server</code>
<code>vnc-server-name:5908</code>
If the URL does not include a port number, port 5900 is used by default.
If web server <code>[Server]</code> is available on a different port, the port must be specified explicitly together with the IP address or hostname:
<table>
<tr><th>Syntax</th><th>Example</th><th>Description</th></tr>
<tr><td><code>[IP address]:Port</code></td><td><code>10.23.20.17:5907</code></td><td>Establishes a connection to IP address <code>10.23.20.17</code> on port <code>5907</code>.</td></tr>
<tr><td><code>[Hostname]:Port</code></td><td><code>vncserver1:5908</code></td><td>Establishes a connection to host <code>vncserver1</code> on port <code>5908</code>.</td></tr>
</table>
If the HMI application (VNC server) is provided by the Power Panel C50 controller, <code>localhost</code> can be used as the hostname. This specific hostname is then automatically replaced by the IP address of the controller.
Information:
If the entered IP address is incomplete or no VNC server exists for the IP address or entered hostname, a corresponding message will be output if a connection attempt fails in VNC mode.
The error message is only output if display of the boot logo is disabled in start mode VNC.</td></tr>
<tr><td>Password</td><td>Default setting: EMPTY (no password entered)
If a password has been entered, then the VNC client (Power Panel) is connected to the VNC server without an additional password query.
If no password has been entered, then the password will be queried on the Power Panel each time a connection to the VNC server is established.</td></tr>
<tr><td>Local window scaling</td><td>Default setting: off
<table>
<tr><td>off</td><td>Scales the VNC application to the display size of the Power Panel.</td></tr>
<tr><td>on</td><td>Displays the VNC application in its original size on the Power Panel display.</td></tr>
</table>
Information:
Enabling this option results in a reduction in the performance of the Power Panel due to increased computing power.</td></tr>
<tr><td>Background color</td><td>Default setting: EMPTY
This setting can be used to set the background color of the VNC client on this Power Panel. If the VNC-based HMI application is smaller than the size of the Power Panel display, the background of the display (border around the HMI application) is shown with the defined background color.
<table>
<tr><th>Value</th><th>Background color</th></tr>
<tr><td>RGB color value[1)]</td><td>The RGB color value is noted as a three-digit (#rgb) or six-digit (#rrggbb) hexadecimal number, with the value preceded by the # character. The color value is composed of the red, green and blue values.</td></tr>
<tr><td>HTML/CSS color name[1)]</td><td>The color name corresponds to a specific RGB color value.</td></tr>
<tr><td>EMPTY</td><td>Light gray.</td></tr>
<tr><td>Invalid values</td><td>Black.</td></tr>
</table>
1) For the syntax of the RGB color value and valid HTML/CSS color names, see the HTML/CSS standard.
Examples of color values and color names:
<table>
<tr><th><code>#rrggbb</code></th><th><code>#rgb</code></th><th>HTML/CSS color name</th><th>Color display</th></tr>
<tr><td><code>#ffffff</code></td><td><code>#fff</code></td><td><code>white</code></td><td></td></tr>
<tr><td><code>#ff0000</code></td><td><code>#f00</code></td><td><code>red</code></td><td></td></tr>
<tr><td><code>#00ff00</code></td><td><code>#0f0</code></td><td><code>lime</code></td><td></td></tr>
<tr><td><code>#008000</code></td><td>-</td><td><code>green</code></td><td></td></tr>
<tr><td><code>#ffff00</code></td><td><code>#ff0</code></td><td><code>yellow</code></td><td></td></tr>
<tr><td><code>#ff8800</code></td><td><code>#f80</code></td><td>-</td><td></td></tr>
<tr><td><code>#0000ff</code></td><td><code>#00f</code></td><td><code>blue</code></td><td></td></tr>
<tr><td><code>#000000</code></td><td><code>#000</code></td><td><code>black</code></td><td></td></tr>
</table></td></tr>
</table>

6.3.6 Update

In order to apply function enhancements, security fixes and other error corrections to the terminal, the Terminal OS (operating system of the terminal) must be updated.

The following options are available to update the Terminal OS (operating system of the terminal):

Parameter	Setting/Description
Mode	Default setting: User-defined update server The following modes can be selected: **User-defined update server** – Specifies a URL used to search for a Terminal OS image. **In preparation** – Future extensions in planning.

6.3.6.1 User-defined update server

The following options are available for configuring the update server:

Parameter	Setting/Description
Trigger	Default setting: Automatic The following triggers can be selected: **Application** – No automatic update. **Automatic** – On device startup (after a power failure or restart), a valid Terminal OS image of a terminal OS is searched for automatically (see Automatic update of the Terminal OS in the following section).

URL	Default setting: EMPTY
	The URL specifies the path on the network where a valid Terminal OS image is searched for:
	Example URL / Remark
	`servername/path/to/system/image`
	Specifies the server name and path.
	The "`http://`" protocol is updated automatically.
	`http://servername/path/to/system/image`
	Specification including HTTP protocol, server name and path.

Automatic update of the Terminal OS

If an automatic update is configured, the following search is performed during the restart:

1) If a URL for the update server is stored in the terminal configuration, the specified URL is searched for a valid Terminal OS image that differs from the current Terminal OS.
   If this is the case, no further search is performed and the update procedure is started.
2) Connected USB storage media*) are searched for a valid Terminal OS image that differs from the current Terminal OS.
   If this is the case, the update procedure is started.
3) If a valid Terminal OS image was not found, the current system is started.

Valid PPT image for updating the terminal OS

A Terminal OS image (in a network or on a USB storage medium) is valid if it meets the following conditions:

- The Terminal OS image consists of the following three files:
  - PPC50Image.img.gz
  - PPC50Image.info
  - PPC50Image.img.gz.sig
- The plausibility check using file PPC50Image.info does not return any errors.
- Verification of signature PPC50Image.img.gz.sig indicates that the system comes from a trusted source.

*) The USB storage medium must be connected to a USB interface. A USB interface is assigned to the terminal in the interface configuration in Automation Studio. USB interface IF4 is assigned to the terminal by default.

6.4 Network information

The device has an external POWERLINK interface and an external Ethernet interface. The interfaces are assigned according to the architecture of the device.

Interface	Description
POWERLINK interface (IF1)	This interface is permanently assigned to the controller.
Ethernet interface (IF2)	This interface is connected to two Ethernet interfaces via an internal switch: • Ethernet interface of the controller • Ethernet interface of the terminal

6.4.1 MAC addresses

The MAC addresses of the POWERLINK or Ethernet interfaces are located on the product label on the back of the device. The MAC addresses are printed below the serial number in the following format:

Printed MAC address	Interface
IF1: DD-DD-DD-DD-DD-DD	POWERLINK interface
IF2: 11-22-33-44-55-A1 (AR)	Ethernet interface of the controller
IF2: 11-22-33-44-55-A2 (T)	Ethernet interface of the terminal

6.5 Web browser information

The implemented web browser of the terminal offers full JavaScript support!

The following features are not supported, however:

- Java
- Flash

6.5.1 Supported fonts

System fonts

Fonts are installed in the Terminal OS that are used by the browser to display HTML-based HMI applications (mapp View):

	Installed starting with Terminal OS
Font	1.0.0
Arial	✓
Arial Unicode	✓
DejaVu Sans	✓
DejaVu Sans Mono	✓
Verdana	✓

Substitute fonts (font mapping)

If the HTML-based HMI application (mapp View) contains fonts that do not exist on the Terminal OS, the following system fonts are used as replacements instead:

	Replacement font starting with Terminal OS
Font	1.0.0
serif	Arial, Regular
sans-serif	DejaVu Sans, Book
monospace	DejaVu Sans Mono, Book
Arial	Arial, Regular
Helvetica	Arial, Regular
Verdana	Verdana, Regular
Times New Roman	Arial, Regular
Courier New	DejaVu Sans Mono, Book

*) "serif", "sans-serif" and "monospace" are "generic" fonts.

16 px is set as the default font size.

6.5.2 Supported video formats

Videos can be displayed in the HMI application. The following container formats are supported when embedding videos into a web-based HMI application:

- WebM
- MP4 (H.264)

6.5.3 User agent

For identification purposes, each web browser transmits various information (e.g. browser name, version, operating system) to the web server providing the HTML page.

As part of the HTTP header, a web browser identifies itself as a user agent. The web browser transmits additional information with the HTTP header:

Example:	`User-Agent: Mozilla/5.0 ... BRPanel/1.0 (PPT50;landscape;1280x800;6PPT50.101E-16B;)`

Description of the Power Panel information:

Identification := BRPanel/<Version> (<Type>;<Orientation>;<Resolution>;<OrderId>)		
BRPanel	Identification as B&R panel.	
<Version>	Version number of the comment (expression in parentheses), which is primarily used to evaluate the information within the parentheses correctly. **Format of <Version>:** `<Number>.<Number>`	
<Type>	Name of device family: `PPT50`, `PPC50`, etc.	
<Orientation>	The orientation of the screen display contains one of the following two values:	
	`landscape`	Landscape
	`portrait`	Portrait
<Resolution>	Resolution of the device in the format "WIDTHxHEIGHT". **Format of <Resolution>:** `WIDTHxHEIGHT`	
	`WIDTH`	Width of the display in pixels.
	`HEIGHT`	Height of the display in pixels.
	The width and height of the display are output according to the orientation: • Example for landscape format: `1280x800` • Example for portrait format: `800x1280`	
<OrderId>	Model number of the Power Panel.	

6.5.4 Using the developer tools

The developer tools make it possible to access the browser from any remote computer over the network. Developer tools can help to edit pages on the fly and quickly diagnose problems.

Information:

To be able to use the developer tools, either Google Chrome or the Chromium is required.

Information about the functionality and use of the developer tools: Chrome DevTools

Enabling remote developer tools:

1. Enable parameter Developer tools in the terminal configuration.
2. Set a valid free port (Port number).
3. In Automation Studio, compile the project and transfer it to the Power Panel.

✓ The web browser is started with the corresponding settings and enabled developer tools.

To use the remote developer tools, the following conditions must additionally be met:

- The Power Panel is accessible via the Ethernet network.
- The network and the computer used permit communication.
- A browser that supports the developer tools is required on the remote computer.

Launching the developer tools

If the developer tools are enabled and the web browser is started, the remote computer can launch the developer tools for the Power Panel browser with the following URL:

⇨ With the IP address of the Power Panel: `http://IP address:Port`

IP address	IP address of the terminal. If DNS is enabled and a hostname is specified for the terminal, the IP address of the terminal can be determined using appropriate network tools (e.g. nslookup).
Port	The port was configured in the corresponding parameter (default setting: 9222).

Additional functions

If the web browser on the Power Panel is running with developer tools enabled, the following additional features are enabled:

⇨ When using a USB mouse, a shortcut menu is opened with the right mouse button.

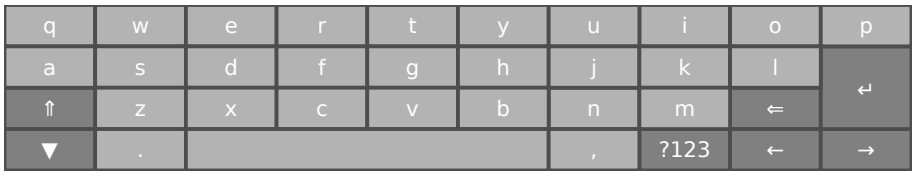
⇨ When using a USB keyboard, the following keys are also enabled:

[F5]	**Refresh:** Reloads the current browser window.
[Alt]+[Left]	**One page back:** Opens the previous page in the browser history.
[Alt]+[Right]	**One page forward:** Opens the next page in the browser history.

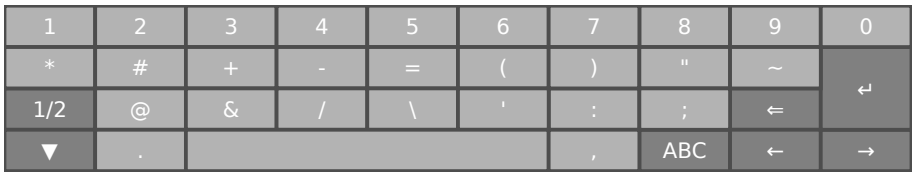
6.5.5 Keyboard

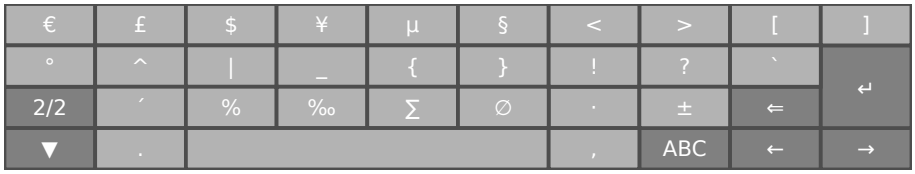
Text can be entered using a USB keyboard or virtual keyboard.

The virtual keyboard is displayed as soon as a text input field (blinking text input cursor "|") has the focus.



The [**?123**], [**ABC**], [**1/2**] and [**2/2**] keys can be used to open additional keyboard layouts:





6.6 File formats

6.6.1 Terminal OS image

The Terminal OS image is a compressed image of the Terminal OS (operating system of the terminal). The Terminal OS image is a package consisting of the following files:

File	Description
PPC50Image.img.gz	Compressed image of the Terminal OS.
PPC50Image.img.gz.sig	Signature of the image.
PPC50Image.info	Information about the image (MD5 checksum, image version, etc.).

Information:

This Power Panel supports signed images. During an update, the Power Panel uses the supplied signature to determine whether the image comes from a trusted source.

During an update, the MD5 checksum determines if the image is free of errors.

6.6.2 Boot logo

The boot logo is displayed during the startup phase of the Power Panel.

The boot logo must meet the following requirements:

File format	Only file format BMP (Windows bitmap) is permitted for the boot logo.
Size	The size of the graphic must correspond to the size of the display in full screen mode. To determine the size of the display on the Power Panel being used, see section "Technical data".
Name	The boot logo can be added with any name in Automation Studio.
Color depth	The color depth is limited to 24-bit.

6.6.3 Boot animation

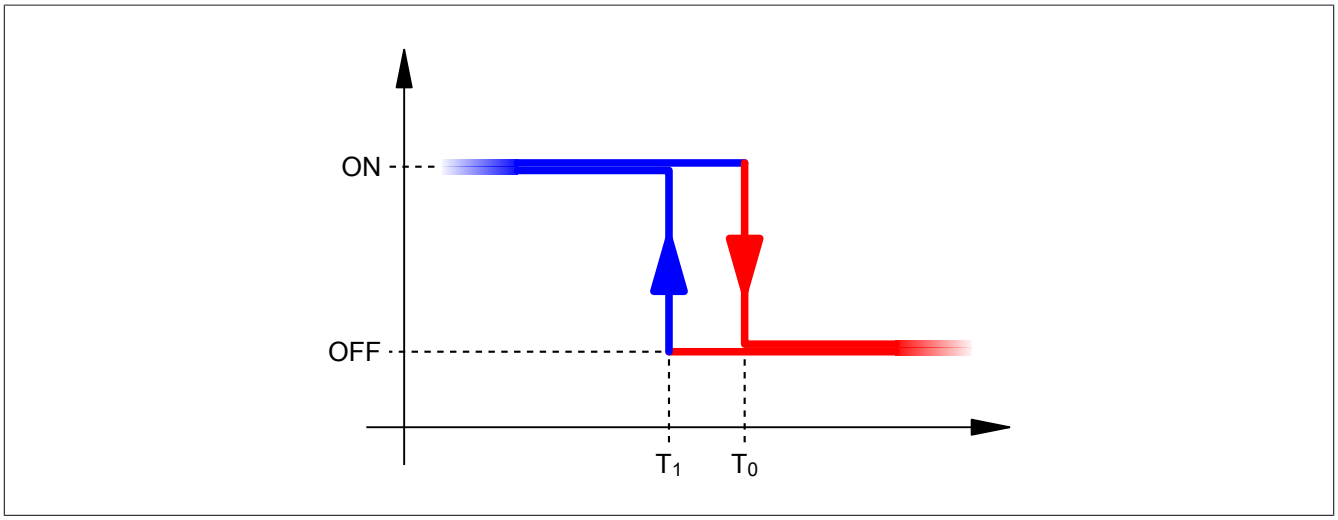
The boot animation must meet the following requirements:

File format	Only file format GIF (Graphics Interchange Format) is permitted for the boot animation.
Size	The size of the boot animation is not permitted to exceed the size of the used display in full screen mode.
Name	The boot animation can be added with any name in Automation Studio.
Position	When specifying the position of the boot animation (see "Configuration in Automation Studio" on page 51) it is important to ensure that the **entire** boot animation can still be shown on the display.
Application	The boot animation is superimposed over an existing static boot logo. The boot animation is only displayed when establishing the connection between the terminal and the HMI application (web application). It is not displayed while the device is booting.

6.7 Temperature monitoring

Automatic overtemperature shutdown

To prevent damage to the device, the inner temperature of the device is monitored continuously by multiple sensors. If the internal temperature of the Power Panel reaches or exceeds the switch-off temperature, an automatic shutdown occurs (OFF). The device is switched on again (ON) when the temperature drops at least 5°C below the switch-off temperature.



Temperature monitoring for the automatic shutdown is carried out at two places within the device:

Temperature monitoring	Switch-off temperature T_0	Switch-on temperature T_1	Datapoint
Mainboard	90°C	85°C	`TemperatureENV`
AR processor	100°C	95°C	`TemperatureCPU`

The following errors are entered in the logbook in the event of shutdown:

Error number	Short error text
9204	PLC restart triggered by the PLC CPU's temperature monitoring.
9210	Warning: Halt/Service after watchdog or manual reset.

Monitoring by the application

The application can also monitor temperatures and, if necessary, take appropriate corrective measures before an automatic shutdown occurs.

The following data points are available for this:

Datapoint	Description
`TemperatureCPU`	Temperature of the AR processor
`TemperatureENV`	Temperature of the mainboard
`TerminalTemperatureCPU`	Temperature of the terminal processor

7 Maintenance

7.1 Cleaning

Danger!

The Power Panel is only permitted to be cleaned while the device is switched off in order to prevent unintended functions from being triggered when handling the touch screen or pressing keys.

Power Panel devices should be cleaned with a moist cloth. Use only water with detergent, screen cleaner or alcohol (ethanol) to moisten the cloth. Apply the cleaning agent to the cloth first; do not spray it directly onto the Power Panel! Never use aggressive solvents, chemicals, abrasive cleaners, compressed air or steam cleaners.

Notice!

Cleaning the label on the back of the unit is only permitted with a dry cloth. This ensures readability of the thermal print during the service life of the device.

Information:

The display with the touch screen should be cleaned at regular intervals.

7.2 Screen burn-in on LCD/TFT monitors

Screen burn-in (afterimages, display memory effect, image retention or image persistence) occurs on LCD/TFT monitors if static image content is displayed for a prolonged period of time. This static screen content causes the build-up of parasitic capacitances within the LCD components that prevent liquid crystal molecules from returning to their original state. This condition is unpredictable and can depend on the following factors:

- Type of image displayed
- Color composition of the image
- Length of time that the image is displayed
- Ambient temperature

Preventing screen burn-in

Even if there is no possibility to avoid screen burn-in 100%, measures can be taken to reduce it significantly.

- Avoid static images or screen content.
- Use screensavers (moving) when the display is not in use
- Frequent picture change
- Turn off the display when not in use.

Turning off the backlight does not help prevent screen burn-in.

8 Accessories

8.1 Overview

Model number	Product ID	Page
Cage clamp terminal blocks for all Power Panel variants		
0TB6102.2110-01	Accessory terminal block, 2-pin (3.81), cage clamp terminal block 1.5 mm²	65
0TB5104.2110-01	Accessory terminal block, 4-pin (2.5), cage clamp terminal block 0.5 mm²	66
Cage clamp terminal blocks for Power Panel variants with fieldbus interfaces		
0TB5106.2110-01	Accessory terminal block, 6-pin (2.5), cage clamp terminal block 0.5 mm²	66
Screw clamp terminals		
0TB6102.2010-01	Accessory terminal block, 2-pin (3.81), screw clamp terminal block 1.5 mm²	65
USB accessories		
5MMUSB.2048-01	USB 2.0 flash drive, 2048 MB, B&R	68
5MMUSB.4096-01	USB 2.0 flash drive, 4096 MB, B&R	
Other accessories		
6ACCRPP3.0000-000	Installation kit for Power Panel C-Series variants: 9x retaining clip with torque limiting, 1x 2-pin cage clamp terminal block, 1x 2-pin screw clamp terminal block, 1x 4-pin cage clamp terminal block, 1x 6-pin cage clamp terminal block. See the accessories of the Power Panel variant in the corresponding data sheet or on the website.	67

POWERLINK/Ethernet cables

Model number	POWERLINK/Ethernet cables[1)2)]	Page
POWERLINK/Ethernet cables, RJ45 to RJ45		
X20CA0E61.00020	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.20 m	68
X20CA0E61.00025	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.25 m	
X20CA0E61.00030	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.30 m	
X20CA0E61.00035	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.35 m	
X20CA0E61.00040	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.40 m	
X20CA0E61.00050	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 0.50 m	
X20CA0E61.00100	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 1 m	
X20CA0E61.00150	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 1.50 m	
X20CA0E61.00200	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 2 m	
X20CA0E61.00300	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 3 m	
X20CA0E61.00500	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 5 m	
X20CA0E61.00800	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 8 m	
X20CA0E61.01000	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 10 m	
X20CA0E61.01200	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 12 m	
X20CA0E61.01500	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 15 m	
X20CA0E61.02000	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 20 m	
X20CA0E61.0300	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 30 m	
X20CA0E61.0500	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 50 m	
X20CA0E61.0600	POWERLINK/Ethernet connection cable, RJ45 to RJ45, 60 m	
POWERLINK/Ethernet cables, RJ45 to RJ45, can be used in cable drag chains		
X20CA3E61.0100	POWERLINK/Ethernet connection cable, RJ45 to RJ45, can be used in cable drag chains, 10 m	68
X20CA3E61.0150	POWERLINK/Ethernet connection cable, RJ45 to RJ45, can be used in cable drag chains, 15 m	
X20CA3E61.0200	POWERLINK/Ethernet connection cable, RJ45 to RJ45, can be used in cable drag chains, 20 m	
POWERLINK/Ethernet cables, RJ45 to M12		
X67CA0E41.0010	POWERLINK/Ethernet attachment cable, RJ45 to M12, 1 m	68
X67CA0E41.0050	POWERLINK/Ethernet attachment cable, RJ45 to M12, 5 m	
X67CA0E41.0150	POWERLINK/Ethernet attachment cable, RJ45 to M12, 15 m	
X67CA0E41.0500	POWERLINK/Ethernet attachment cable, RJ45 to M12, 50 m	
POWERLINK/Ethernet cables, RJ45 to M12, can be used in cable drag chains		
X67CA3E41.0150	POWERLINK/Ethernet attachment cable, RJ45 to M12, can be used in cable drag chains,15 m	68

1) POWERLINK cables from B&R can be used for Ethernet connections.
2) These cables are suitable for networks with transfer rates up to 100 Mbit/s and not for gigabit networks.

X2X Link cables

Model number	Product ID	Page
X2X Link cables, straight		
X67CA0X21.0005	X2X Link attachment cable, 0.50 m	68
X67CA0X21.0020	X2X Link attachment cable, 2 m	
X67CA0X21.0030	X2X Link attachment cable, 3 m	
X67CA0X21.0050	X2X Link attachment cable, 5 m	
X67CA0X21.0100	X2X Link attachment cable, 10 m	
X67CA0X21.0150	X2X Link attachment cable, 15 m	
X67CA0X21.0200	X2X Link attachment cable, 20 m	
X67CA0X21.0500	X2X Link attachment cable, 50 m	

Accessories

Model number	Product ID	Page
X2X Link cables, angled		
X67CA0X31.0020	X2X Link attachment cable, angled, 2 m	68
X67CA0X31.0040	X2X Link attachment cable, angled, 4 m	
X67CA0X31.0050	X2X Link attachment cable, angled, 5 m	
X67CA0X31.0100	X2X Link attachment cable, angled, 10 m	
X67CA0X31.0150	X2X Link attachment cable, angled, 15 m	
X67CA0X31.0500	X2X Link attachment cable, angled, 50 m	
X2X Link cables		
X67CA0X99.1000	Cable for custom assembly, 100 m	68
X67CA0X99.5000	Cable for custom assembly, 500 m	

8.2 0TB6102 - 2-pin terminal block for power supply

This 1-row 2-pin terminal block is required for the power supply.

8.2.1 Order data

Order number	Short description
	Terminal blocks
0TB6102.2010-01	Accessory terminal block, 2-pin (3.81), screw clamp terminal block 1.5 mm²
0TB6102.2110-01	Accessory terminal block, 2-pin (3.81), cage clamp terminal block 1.5 mm²

Table 1: 0TB6102.2010-01, 0TB6102.2110-01 - Order data

8.2.2 Technical data

Information:

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

The technical data in this manual is current as of its creation/publication. Subject to change without notice.

Order number	0TB6102.2010-01	0TB6102.2110-01
Terminal block		
Number of pins	2 (female)	
Type of terminal block	Screw clamp terminal block variant	Cage clamp terminal block variant
Cable type	Only copper wires (no aluminum wires!)	
Pitch	3.81 mm	
Connection cross section		
AWG wire	28 to 16	
Wire end sleeves with plastic covering	0.25 to 0.5 mm²	
With wire end sleeves	0.25 to 1.5 mm²	
Flexible	0.14 to 1.5 mm²	
Inflexible	0.14 to 1.5 mm²	
Tightening torque	0.22 to 0.25 Nm	-
Electrical properties		
Nominal voltage	300 V	
Nominal current [1)]	8 A	

Table 2: 0TB6102.2010-01, 0TB6102.2110-01 - Technical data

1) The limit data for each Power Panel must be taken into account.

8.3 0TB510x 4/6-pin terminal block

The single-row 4-pin terminal block is needed for the X2X Link interface.

The single-row 6-pin terminal block is needed for the fieldbus interfaces.

8.3.1 Order data

0TB5104.2110-01

0TB5106.2110-01

Order number	Short description
	Terminal blocks
0TB5104.2110-01	Accessory terminal block, 4-pin (2.5), cage clamp terminal block 0.5 mm²
0TB5106.2110-01	Accessory terminal block, 6-pin (2.5), cage clamp terminal block 0.5 mm²

Table 3: 0TB5104.2110-01, 0TB5106.2110-01 - Order data

8.3.2 Technical data

Information:

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

The technical data in this manual is current as of its creation/publication. Subject to change without notice.

Order number	0TB5104.2110-01	0TB5106.2110-01
Terminal block		
Number of pins	4	6
Type of terminal block	Cage clamp terminal block variant [1]	Cage clamp terminal block
Cable type	Only copper wires (no aluminum wires!)	
Pitch	2.5 mm	
Connection cross section		
AWG wire	26 to 20	
With wire end sleeves	0.25 to 0.5 mm²	
Flexible	0.14 to 0.5 mm²	
Inflexible	0.14 to 0.5 mm²	
Electrical properties		
Nominal voltage	125 V	
Nominal current [2]	4 A	

Table 4: 0TB5104.2110-01, 0TB5106.2110-01 - Technical data

1) The cage clamp terminal block cannot be used side by side.
2) The respective limit data of the I/O modules must be taken into account!

8.4 6ACCRPP3.0000-000

Installation kit for Power Panel C-Series

This installation kit contains the following replacement parts:

- 9 retaining clips with torque limiting
- 1x 2-pin cage clamp terminal block
- 1x 2-pin screw clamp terminal block
- 1x 4-pin cage clamp terminal block
- 1x 6-pin cage clamp terminal block

This installation kit is suitable for the following Power Panel devices:

- Power Panel C30
- Power Panel C50
- Power Panel C70

8.4.1 Order data

Order number	Short description	Figure
	Other	
6ACCRPP3.0000-000	Installation kit for Power Panel C-Series variants: 9x retaining clip with torque limiting, 1x 2-pin cage clamp terminal block, 1x 2-pin screw clamp terminal block, 1x 4-pin cage clamp terminal block, 1x 6-pin cage clamp terminal block. See the accessories of the Power Panel variant in the corresponding data sheet or on the website.	

Table 5: 6ACCRPP3.0000-000 - Order data

8.4.2 Technical data

Order number	6ACCRPP3.0000-000
Short description	
Accessories	Installation kit for Power Panel C-Series: 9 retaining clips with torque limiting, 1x 2-pin cage clamp terminal block (0TB6102.2110-01), 1x 2-pin screw clamp terminal block (0TB6102.2010-01), 1x 4-pin cage clamp terminal block (0TB5104.2110-01), 1x 6-pin cage clamp terminal block (0TB5106.2110-01).
General information	
Note	Suitable for Power Panel C30, C50 and C70.
Certifications	
CE	Yes

Table 6: 6ACCRPP3.0000-000 - Technical data

8.5 Storage media

For technical data and additional information about storage media, see the corresponding documentation. This can be found under the purchase order number of the storage medium at www.br-automation.com and can be downloaded from there.

8.6 Cable accessories

For technical data and additional information about the cable, see the corresponding documentation. This is located under the purchase order number of the cable on the B&R website (www.br-automation.com) and can be downloaded from there.

9 International and national certifications

Products and services from B&R comply with applicable regulations, directives and standards.

These are national, European and international regulations, mainly from organizations such as ISO, IEC and CENELEC. We are committed to ensuring the reliability of our products in industrial environments.

Information:

Certifications applicable to the respective Power Panel are available at the following locations:

- **B&R website (www.br-automation.com) > Product page > Technical data > General information > Certifications (The product page is found by searching for the order number.)**
- **User's manual: Chapter "Device description" > Technical data > General information > Certifications**
- **Product label on rear of housing**

Changes and new certifications are available promptly in electronic form on the B&R website (www.br-automation.com).

9.1 Overview of certifications

Mark	Explanation	Certificate authority	Region
CE	CE marking	Notified bodies	Europe (EU)
c UL us LISTED	Underwriters Laboratories Inc. (UL) (certification for Canada and USA)	UL	Canada USA
EAC	Eurasian Conformity (EAC)	Federal agency on technical regulating and metrology	Eurasian Economic Union

9.2 EU directives and standards (CE)

CE marking

Europe (EU)

The respective product complies with all applicable EU directives and relevant harmonized standards.

Certification of these products is performed in cooperation with accredited testing laboratories.

EMC Directive 2014/30/EU

All products meet the requirements of the "Electromagnetic Compatibility" directive and are designed for typical industrial use.

Applicable standards from this directive:

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

For information about the versions of applicable standards, see the declaration of conformity. The declaration of conformity is available for download from the B&R website.

Declaration of conformity
Website > Downloads > Certificates > Declarations of conformity > Power Panel:
> Declaration of conformity HMI_OI Power Panels

9.2.1 Overview of standards

Standard	Description
EN 55011 (CISPR 11)	Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement
EN 55016-2-1 (CISPR 16-2-1)	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements
EN 55016-2-3 (CISPR 16-2-3)	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements
EN 55022 (CISPR 22)	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
EN 60068-2-6	Environmental testing - Part 2-6: Procedures - Test Fc: Vibration (sinusoidal)
EN 60068-2-27	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock
EN 60068-2-31[1)]	Environmental testing - Part 2-31: Tests - Test Ec: Rough handling shocks, primarily for equipment-type specimens
EN 60529	Degrees of protection provided by enclosures (IP code)
EN 60664-1	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests
EN 60721-3-2	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 2: Transport
EN 60721-3-3	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 3: Stationary use at weather-protected locations
EN 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
EN 61000-4-3	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
EN 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measuring techniques - Surge immunity test
EN 61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-8	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measuring techniques - Power frequency magnetic field immunity test
EN 61000-4-11	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
EN 61000-4-29	Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on DC input power port immunity tests
EN 61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN 61131-2	Programmable logic controllers - Part 2: Equipment requirements and tests

1) Replacement for EN 60068-2-32

9.2.2 Requirements for immunity to disturbances

Test	Testing performed per standard:	Test values per standard:
Electrostatic discharge (ESD)	EN 61000-4-2	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-2: Generic standards - Immunity for industrial environments
Radiated high-frequency electromagnetic fields (RF radiated)	EN 61000-4-3	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-2: Generic standards - Immunity for industrial environments
High-speed transient electrical disturbances (Burst)	EN 61000-4-4	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-2: Generic standards - Immunity for industrial environments
Surge voltages (Surge)	EN 61000-4-5	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-2: Generic standards - Immunity for industrial environments
Conducted induced radio-frequency fields (RF-conducted)	EN 61000-4-6	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-2: Generic standards - Immunity for industrial environments
Power frequency magnetic fields (H field)	EN 61000-4-8	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-2: Generic standards - Immunity for industrial environments
Voltage dips (AC) Short-term interruptions (AC) Voltage fluctuations (AC)	EN 61000-4-11	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-2: Generic standards - Immunity for industrial environments
Short-term interruptions (DC) Voltage fluctuations (DC)	EN 61000-4-29	EN 61131-2: Product standard - Programmable controllers

Criteria to prove the performance of a PLC system against EMC disturbances

Criteria	During test	After test
A	The PLC system shall continue to operate as intended. No loss of function or performance.	The PLC system shall continue to operate as intended.
B	Degradation of performance accepted. The operating mode is not permitted to change. Irreversible loss of stored data is not permitted.	The PLC system shall continue to operate as intended. Temporary degradation of performance must be self-recoverable.
C	Loss of functions accepted, but no destruction of hardware or software (program or data).	The PLC system shall continue to operate as intended automatically, after manual restart or power off / power on.
D	Degradation or failure of functionality that can no longer be restored.	PLC system permanently damaged or destroyed.

Electrostatic discharge (ESD)

Testing performed per EN 61000-4-2	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
Contact discharge (CD) On conductive accessible parts	±4 kV Criteria B	
Air discharge (AD) On insulating accessible parts	±8 kV Criteria B	

Radiated high-frequency electromagnetic fields (RF radiated)

Testing performed per EN 61000-4-3	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
Housing, completely wired	80 MHz to 1 GHz, 10 V/m 1.4 to 2 GHz, 3 V/m 2 to 2.7 GHz, 1 V/m Criteria A	80 MHz to 1 GHz, 10 V/m 1.4 to 6 GHz, 3 V/m Criteria A

High-speed transient electrical disturbances (Burst)

Testing performed per EN 61000-4-4	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
AC mains inputs >3 m	±2 kV / 5 kHz Criteria B	±2 kV / 5 kHz or 100 kHz Criteria B
AC mains outputs >3 m	±2 kV / 5 kHz Criteria B	±2 kV / 5 kHz or 100 kHz[1)] Criteria B
Other AC inputs/outputs >3 m	±2 kV / 5 kHz Criteria B	-
DC mains inputs/outputs >3 m	±2 kV / 5 kHz Criteria B	±1 kV / 5 kHz or 100 kHz Criteria B
Other inputs/outputs and interfaces >3 m	±1 kV / 5 kHz Criteria B	±1 kV / 5 kHz or 100 kHz Criteria B

1) Without length limitation.

Surge voltages (Surge)

Testing performed per EN 61000-4-5	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
AC mains inputs/outputs (line to line)	±1 kV Criteria B	±1 kV Criteria B
AC mains inputs/outputs (line to PE)	±2 kV Criteria B	±2 kV Criteria B
DC mains inputs/outputs >30 m (line to line)	±0.5 kV Criteria B	±0.5 kV [1)] Criteria B
DC mains inputs/outputs >30 m (line to PE)	±0.5 kV Criteria B	±1 kV [1)] Criteria B
Unshielded signal connections >30 m (line to PE)	±1 kV Criteria B	±1 kV Criteria B
All shielded lines >30 m (line to PE)	±1 kV Criteria B	-

1) Without length limitation.

Conducted induced radio-frequency fields (RF-conducted)

Testing performed per EN 61000-4-6	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
AC mains inputs/outputs	10 V 150 kHz to 80 MHz 80% AM (1 kHz) Criteria A	
DC mains inputs/outputs	10 V 150 kHz to 80 MHz 80% AM (1 kHz) Criteria A	
Other inputs/outputs and interfaces	10 V [1)] 150 kHz to 80 MHz 80% AM (1 kHz) Criteria A	

1) Only for connections with a permitted cable length greater than 3 m.

Power frequency magnetic fields (H field)

Testing performed per EN 61000-4-8	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
Housing, completely wired	30 A/m 3 axes (x, y, z) 50/60 Hz [1)] Criteria A	

1) Mains frequency per manufacturer data

Voltage dips

Testing performed per EN 61000-4-11	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
AC power inputs	0% residual voltage 250/300 periods (50/60 Hz) [1)] 20 attempts Criteria C	
	40% residual voltage 10/12 periods (50/60 Hz) [1)] 20 attempts Criteria C	
	70% residual voltage 25/30 periods (50/60 Hz) [1)] 20 attempts Criteria C	

1) Mains frequency per manufacturer data

Short-term interruptions

Testing performed per EN 61000-4-11 / EN 61000-4-29	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
AC power inputs	0% residual voltage 0.5 periods (50/60 Hz) 1) 20 attempts Criteria A	0% residual voltage 1 period (50/60 Hz) 1) 3 attempts Criteria B
DC power inputs	0% residual voltage ≥10 ms (PS2) 2) 20 attempts Criteria A	-

1) Mains frequency per manufacturer data
2) Use of a B&R power supply guarantees that these requirements are met.

Voltage fluctuations

Testing performed per EN 61000-4-11 / EN 61000-4-29	Test values per EN 61131-2 (Zone B)	Test values per EN 61000-6-2
AC power inputs	-15% / +10% Test duration per 30 minutes Criteria A	-
DC power inputs	-15% / +20% Test duration per 30 minutes Criteria A	-

9.2.3 Emission requirements

Test	Testing performed per standard:	Limit values per standard
Emissions related to lines	EN 55011 / EN 55022 EN 55016-2-1	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-4: Generic standards - Emission standard for industrial environments
Radiated emissions	EN 55011 / EN 55022 EN 55016-2-3	EN 61131-2: Product standard - Programmable controllers
		EN 61000-6-4: Generic standards - Emission standard for industrial environments

Emissions related to lines

Testing performed per EN 55011 / EN 55022 / EN 55016-2-1	Limit values per EN 61131-2 (Zone B)	Limit values per EN 61000-6-4
AC mains connection 150 kHz to 30 MHz	150 to 500 kHz 79 dB (µV) quasi-peak value 66 dB (µV) average value	
	500 kHz to 30 MHz 73 dB (µV) quasi-peak value 60 dB (µV) average value	
Telecommunications / network connection 150 kHz to 30 MHz	-	150 to 500 kHz 97 to 87 dB (µV) quasi-peak value 53 to 40 dB (µA) quasi-peak value 84 to 74 dB (µV) average value 40 to 30 dB (µA) average value
	-	500 kHz to 30 MHz 87 dB (µV) quasi-peak value 43 dB (µA) quasi-peak value 74 dB (µV) average value 30 dB (µA) average value

Radiated emissions

Testing performed per EN 55011 / EN 55022 / EN 55016-2-3	Limit values per EN 61131-2 (Zone B)	Limit values per EN 61000-6-4
Electric field / Measured from 10 m 30 MHz to 1 GHz	30 to 230 MHz 40 dB (µV/m) quasi-peak value	
	230 MHz to 1 GHz 47 dB (µV/m) quasi-peak value	
Electric field / Measured from 3 m 1 to 6 GHz 1)	-	1 to 3 GHz 76 dB (µV/m) peak value 56 dB (µV/m) average value
	-	3 to 6 GHz 80 dB (µV/m) peak value 60 dB (µV/m) average value

1) Depends on the highest internal frequency

9.2.4 Mechanical conditions

Testing	Testing performed per standard:	Test values per standard:
Sinusoidal vibration / Operation	EN 60068-2-6	EN 61131-2: Product standard - Programmable controllers
		EN 60721-3-3 / Class 3M4
Shock / Operation	EN 60068-2-27	EN 61131-2: Product standard - Programmable controllers
		EN 60721-3-3 / Class 3M4
Sinusoidal vibration / Transport (packaged)	EN 60068-2-6	EN 60721-3-2 / Class 2M1
		EN 60721-3-2 / Class 2M2
		EN 60721-3-2 / Class 2M3
Shock / Transport (packaged)	EN 60068-2-27	EN 60721-3-2 / Class 2M1
		EN 60721-3-2 / Class 2M2
Free fall / Transport (packaged)	EN 60068-2-31 1)	EN 61131-2: Product standard - Programmable controllers
		EN 60721-3-2 / Class 2M1
Toppling / Transport (packaged)	EN 60068-2-31	EN 60721-3-2 / Class 2M1
		EN 60721-3-2 / Class 2M2
		EN 60721-3-2 / Class 2M3

1) Replacement for EN 60068-2-32

Sinusoidal vibration / Operation

Testing performed per EN 60068-2-6	Test values per EN 61131-2		Test values per EN 60721-3-3 / Class 3M4	
Vibration (sinusoidal) 1) Operation	**Frequency**	**Amplitude**	**Frequency**	**Amplitude**
	5 to 8.4 Hz	Deflection 3.5 mm	2 to 9 Hz	Deflection 3 mm
	8.4 to 150 Hz	Acceleration 1 g 2)	9 to 200 Hz	Acceleration 1 g 2)
	20 sweeps for each axis 3)			

1) Uninterrupted duty with movable frequency in all 3 axes (x, y, z); 1 octave per minute
2) 1 g = 10 m/s²
3) 2 sweeps = 1 frequency cycle ($f_{min} \rightarrow f_{max} \rightarrow f_{min}$)

Shock / Operation

Testing performed per EN 60068-2-27	Test values per EN 61131-2	Test values per EN 60721-3-3 / Class 3M4
Shock 1) Operation	Acceleration 15 g Duration 11 ms 18 shocks	Acceleration 10 g Duration 11 ms 18 shocks

1) Pulse (half-sine) stress in all 3 axes (x, y, z), 1 octave per minute

Sinusoidal vibration / Transport (packaged)

Testing performed per EN 60068-2-6	Test values per EN 60721-3-2 / Class 2M1		Test values per EN 60721-3-2 / Class 2M2		Test values per EN 60721-3-2 / Class 2M3	
Vibration (sinusoidal) 1) Transport (packaged)	**Frequency**	**Amplitude**	**Frequency**	**Amplitude**	**Frequency**	**Amplitude**
	2 to 9 Hz	Deflection 3.5 mm	2 to 9 Hz	Deflection 3.5 mm	2 to 8 Hz	Deflection 7.5 mm
	9 to 200 Hz	Acceleration 1 g 2)	9 to 200 Hz	Acceleration 1 g 2)	8 to 200 Hz	Acceleration 2 g 2)
	200 to 500 Hz	Acceleration 1.5 g 2)	200 to 500 Hz	Acceleration 1.5 g 2)	200 to 500 Hz	Acceleration 4 g 2)
	20 sweeps for each axis3)					

1) Uninterrupted duty with movable frequency in all 3 axes (x, y, z); 1 octave per minute
2) 1 g = 10 m/s²
3) 2 sweeps = 1 frequency cycle ($f_{min} \rightarrow f_{max} \rightarrow f_{min}$)

Shock / Transport (packaged)

Testing performed per EN 60068-2-27	Test values per EN 60721-3-2 / Class 2M1	Test values per EN 60721-3-2 / Class 2M2
Shock 1) Transport (packaged)	Type I Acceleration 10 g Duration 11 ms 18 shocks	
	Type II -	Type II Acceleration 30 g Duration 6 ms 18 shocks

1) Pulse (half-sine) stress in all 3 axes (x, y, z)

Free fall / Transport (packaged)

Testing performed per EN 60068-2-31 [1]	Test values per EN 61131-2 with shipping packaging		Test values per EN 61131-2 with product packaging		Test values per EN 60721-3-2 / Class 2M1	
Free fall Transport (packaged)	**Weight**	**Height**	**Weight**	**Height**	**Weight**	**Height**
	<10 kg	1.0 m	<10 kg	0.3 m	<20 kg	0.25 m
	10 to 40 kg	0.5 m	10 to 40 kg	0.3 m	20 to 100 kg	0.25 m
	>40 kg	0.25 m	>40 kg	0.25 m	>100 kg	0.1 m
	5 attempts					

1) Replacement for EN 60068-2-32

Toppling / Transport (packaged)

Testing performed per EN 60068-2-31	Test values per EN 60721-3-2 / Class 2M1		Test values per EN 60721-3-2 / Class 2M2		Test values per EN 60721-3-2 / Class 2M3	
Toppling Transport (packaged)	**Weight**	**Required**	**Weight**	**Required**	**Weight**	**Required**
	<20 kg	Yes	<20 kg	Yes	<20 kg	Yes
	20 to 100 kg	-	20 to 100 kg	Yes	20 to 100 kg	Yes
	>100 kg	-	>100 kg	-	>100 kg	Yes
	Topple on all edges		Topple on all edges		Topple on all edges	

9.2.5 Electrical safety

Overvoltage category

Requirement per EN 61131-2	Definition per EN 60664-1
Overvoltage category II	Equipment of "overvoltage category II" is energy-consuming equipment to be supplied from the fixed installation.

Pollution degree

Requirement per EN 61131-2	Definition per EN 60664-1
Pollution degree 2	Only non-conductive pollution occurs. Temporary conductivity caused by condensation must occasionally be expected, however.

Protection rating provided by enclosure (IP code)

Requirement per EN 61131-2	Definition per EN 60529	Explanation for the protection of equipment	Explanation for the protection of personnel
≥IP20	First number IP**2**x	Protected against solid foreign bodies with a diameter ≥12.5 mm.	Protected against touching dangerous parts with fingers.
	Second number IPx**0**	Not protected.	-

Requirement per manufacturer	Definition per EN 60529	Explanation for the protection of equipment	Explanation for the protection of personnel
Front: IP55	First number IP**5**x	Protected against dust.	Protected against touching dangerous parts with conductor.
	Second number IP x**5**	Protection against water jets.	-

9.3 Underwriters Laboratories (UL)

UL mark

Ind. cont. eq. E115267

Canada, USA

Products with this mark are tested by Underwriters Laboratories and listed as "industrial control equipment" in category NRAQ (programmable controllers) with file number E115267.

The mark is valid for the USA and Canada and facilitates the certification of your machines and systems in this economic area.

Standards applied:

UL 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
UL 61010-2-201	Standard for safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment
CSA C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
CSA C22.2 No. 61010-2-201	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment

For information about the versions of applicable standards, see the certificate. The certificate is available for download from the B&R website.

Certificate
Website > Downloads > Certificates > UL > Power Panel:
> E115267 UL CoC Power Panel C30, C50, T50 Series

9.4 Additional certifications

Eurasian Conformity (EAC)

Russia
Belarus
Kazakhstan, etc.

Products with this mark are tested by an accredited test laboratory and permitted to be imported into the newly established Eurasian Customs Union (based on EU conformity).

Certificate
Website > Downloads > Certificates > EAC > Power Panel:
> EAC declaration of conformity PowerPanel

10 Environmentally friendly disposal

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

10.1 Separation of materials

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

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

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