Automation Panel 800

User's Manual

Version: **2.20 (April 2009)**

Model number: **MAAP800-ENG**

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Chapter 1 • General information

1. Manual history

Version	Date	Change
0.01 Preliminary	17.07.2006	- First version
1.00	28.08.2006	- Chapter "Standards and certifications" on page 155 added. - Chapter "Software" on page 149 added. - Chapter "Commissioning" on page 115 added. - Chapter "Accessories" on page 169 added. - "Glossary" on page 191 added. - Table "Technical data - key switch switching element and key switch" on page 185 added. - Model number overview revised. - Accessories added. - Safety guidelines "Protection against electrostatic discharges" on page 16 added. - "Pin assignments" on page 45 added. - Dimensions of extension units added. - Selection guide added, (see section "System components / Configuration" on page 27).
1.10	30.08.2006	- Key dimensions added. - Numbering of the extensions corrected (see "Connection examples" on page 126). - X2X cable pin assignments added. - "X2X functionality if the PC crashes" on page 116 added. - "Internal numbering of the extension units" on page 140 added. - Cable photos added.
1.20	03.10.2006	- "SDL cable with extender 5CASDL.0x00-30 Rev. < A5" on page 105 added. - "Extension flange 5AC800.FLG1-00" on page 91 changed. - "Key and LED configurations" on page 141 changed. - "USB extension cover 5AC800.COV2-00" on page 85and "Dimensions - USB extension cover 5AC800.COV2-00" on page 86 added. - Touch screen precision changed. - "Selecting the display units" on page 126 added. - Chapter 7 "Maintenance / Servicing" on page 177 added. - Mounting orientation revised, +45° and -45° added. - Connection examples revised (description of USB support, graphics). - Cable pin assignments revised and corrected. - Plug measurements (ODU Minisnap) added. - 30° extension connector changed to 60° extension connector and dimensions changed.
1.30	15.11.2006	- "Pin assignments, X2X cable 5CAX2X.0xxx-20" on page 113 changed. - 2 USB flash drive 5MMUSB.2048-00 from SanDisk added. - Pin assignments - X2X / E-stop cable connection changed (pin 7 and pin 8). - Perspective description modified. - Key switch information modified. - German terminology for key switch changed. - Technical data on pages 52 and 74 added. - Technical data on page 95 added.

Table 1: Manual history

Version	Date	Change
1.40	19.02.2007	- Hardware numbers for Illuminated Ring Keys corrected. - Descriptions of F-Keys and C-Keys on extension units added. - "Installation of components" on page 123 added. - Contents of delivery added for extension connector, extension covers and extension flange. - Technical data for SDL cables Rev. ≥ A5 changed. - "SDL flex cable - test description" on page 166 added. - Section about exchanging legend strips 3.1.2 "Extension units" on page 181 added. - Tolerances for voltage supply cable 5CAPWR.0xxx-20 added.
1.50	13.04.2007	- USB flash drive 5MMUSB.0256-00 and USB flash drive 5MMUSB.1024-00 cancelled. - Hardware numbers for the key switch corrected in figure 116 "Hardware numbers - 5AC800.EXT3-02 / 5AC800.EXT3-03" on page 145 and figure 117 "Hardware numbers - 5AC800.EXT3-04 / 5AC800.EXT3-05" on page 146. - Photos added to section "Exchanging the legend strips" on page 179. - Section "USB flash drive" on page 170 updated. - Figures of extension units with illuminated ring keys added.
1.60	05.06.2007	- Description of the X2X Link supply voltage revised.´ - X2X cable order numbers corrected.
1.70	11.06.2007	- Section "Connection examples" on page 126 updated.
1.80	08.08.2007	- Section 2 "Preventing after-image effect in LCD/TFT monitors" on page 178 added - Section 6 "Touch screen calibration" on page 147 added - Additional temperature humidity diagram information - Section 2.6.2 "Environmental conditions - dust, humidity, aggressive gases" on page 18 added - Section 3.1 "Installation of components" on page 123 updated. - Note: Fasten the screws alternately and diagonally. - Loop resistance value of E-stop circuits in individual components as well as during start-up (see section 2.5 "Loop resistance" on page 121) explained.
1.90	25.03.2008	- Error in the hardware number listing for the 5AC800.EXT1-00 corrected. - Cable descriptions updated. - Vibration / shock specifications for all Automation Panel 800 devices updated - Safety notices regarding environmental conditions - dust, humidity, aggressive gasses - updated. - Visual Components key and LED numbering added in section "Key and LED configurations" on page 141. - Section "Preventing after-image effect in LCD/TFT monitors" on page 178 updated.
2.00	11.09.2008	- Dimension diagrams for SDL cable and SDL cable with extender updated (circular plug data corrected). - Bending radius diagrams for SDL cable and SDL cable with extender updated (no ferrite in connection to circular plug). - Order of cable descriptions changed (newer revisions first).
2.10	12.11.2008	- Note: "Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions." added - Key dimensions for extension units added to the respective dimension diagrams. - B&R Key Editor information updated. - 5MMUSB.0512-00 marked as cancelled.

Table 1: Manual history (cont.)

Version	Date	Change
2.20	04.03.2009	- Formatting in table 93 "Chemical resistance of the décor foil" on page 189 changed. - Image 128 "Open housing" on page 181 adjusted to fit border. - Wording and formatting of technical data revised (line breaks, etc. = - Section "USB flash drive" on page 170 updated. - Figure 2 "Configuration - Basic system" on page 27, figure 3 "Selection guide - Optional components" on page 28 and updated. - Temperature humidity diagrams added for extension units. - Section 2.7 "Environmentally-friendly disposal" on page 19 added - Figure 101 "Installation in support arm system" on page 122 updated. - Formatting in table 45 "Selecting the display units" on page 126 changed. - Dimension lines changed in image 103 "Mounting orientation 0°" on page 124. - "Compact Flash" spelling changed to "CompactFlash". - Figure 70 "Dimensions - Extension flange 5AC800.FLG1-00" on page 92 updated.

Table 1: Manual history (cont.)

2. Safety guidelines

2.1 Intended use

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

2.2 Protection against electrostatic discharges

Electrical components that are vulnerable to electrostatic discharge (ESD) must be handled accordingly.

2.2.1 Packaging

- Electrical components with housing
  … do not require special ESD packaging, but must be handled properly (see "Electrical components with housing").
- Electrical components without housing
  … must be protected by ESD-suitable packaging.

2.2.2 Guidelines for proper ESD handling

Electrical components with housing

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

Electrical components without housing

In addition to "Electrical components with housing", the following also applies:

- Any persons handling electrical components or devices that will be installed in the electrical components must be grounded.
- Components can only be touched on the small sides or on the front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.).
  Metallic surfaces are not suitable storage surfaces!

- Electrostatic discharges should be avoided on the components (e.g. through charged plastics).
- A minimum distance of 10 cm must be kept from monitors and TV sets.
- Measurement devices and equipment must be grounded.
- Measurement probes on potential-free measurement devices must be discharged on sufficiently grounded surfaces before taking measurements.

Individual components

- ESD protective measures for individual components are thoroughly integrated at B&R (conductive floors, footwear, arm bands, etc.).

The increased ESD protective measures for individual components are not necessary for our customers for handling B&R products.

2.3 Policy and procedures

Electronic devices are generally not failsafe. In the event of a failure on the programmable control system, operating or monitoring device, or uninterruptible power supply, the user is responsible for ensuring that other devices that may be connected, e.g. motors, are in a secure state.

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

All tasks such as installation, commissioning, and maintenance are only permitted to be carried out by qualified personnel. Qualified personnel are persons who are familiar with the transport, mounting, installation, commissioning, and operation of the product and who have the appropriate qualifications (e.g. IEC 60364). National accident prevention guidelines must be followed.
The safety guidelines, connection descriptions (rating plate and documentation) and limit values listed in the technical data must be read carefully and must be observed before installation and commissioning.

2.4 Transport and storage

During transport and storage, devices must be protected from excessive stress (mechanical load, temperature, humidity, aggressive atmosphere, etc.).

2.5 Installation

- Installation must take place according to the documentation, using suitable equipment and tools.
- Devices must be installed without voltage applied and by qualified personnel.
- General safety regulations and nationally applicable accident prevention guidelines must be observed.
- Electrical installation must be carried out according to the relevant guidelines (e.g. line cross section, fuse, protective ground connection).

2.6 Operation

2.6.1 Protection against touching electrical parts

To operate programmable logic controllers, operating and monitoring devices, and uninterruptible power supplies, certain components must carry dangerous voltage levels of over 42 VDC. A life-threatening electrical shock could occur if you come into contact with these parts. This could result in death, severe injury or material damage.

Before turning on the programmable logic controller, the operating and monitoring devices and the uninterruptible power supply, ensure that the housing is properly grounded (PE rail). The ground connection must be established when testing the operating and monitoring devices or the uninterruptible power supply, even when operating them for only a short time.

Before turning the device on, make sure that all voltage-carrying parts are securely covered. During operation, all covers must remain closed.

2.6.2 Environmental conditions - dust, humidity, aggressive gases

Use of operating and monitoring devices (e.g. industrial PCs, power panels, mobile panels, etc.) and uninterruptible power supplies in very dusty environments should be avoided. Dust collection on the devices influences their function and, especially in systems with active cooling (fans), sufficient cooling cannot be guaranteed.

The presence of aggressive gases in the environment can also lead to malfunctions. When combined with high temperature and humidity, aggressive gases - e.g. with sulfur, nitrogen and chlorine components - start chemical processes that can damage electronic components very quickly. Signs of the presence of aggressive gases are blackened copper surfaces and cable ends on existing installations.

For operation in dusty or humid conditions, correctly installed (cutout installation) operating and monitoring devices like Automation Panel or Power Panel are protected on the front side. The rear side of all devices must be protected from dust and humidity and must be cleaned at suitable intervals.

2.6.3 Programs, viruses and dangerous programs

The system is subject to potential danger each time data is exchanged or software is installed from a data medium (e.g. diskette, CD-ROM, USB flash drive, etc.), a network connection, or the Internet. The user is responsible for assessing these dangers, implementing preventative measures such as virus protection programs, firewalls, etc. and obtaining software from reliable sources.

2.7 Environmentally-friendly disposal

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

2.7.1 Separation of materials

It is necessary to separate different materials so the device can undergo an environmentally-friendly recycling process.

Component	Disposal
Programmable logic controllers Operating and monitoring devices Uninterruptible power supply Cables	Electronics recycling
Cardboard box / paper packaging	Paper / cardboard recycling
Plastic packaging	Plastic recycling

Table 2: Environmentally-friendly separation of materials

Disposal must comply with the respective legal regulations.

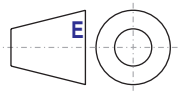
3. Organization of safety notices

The safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding the safety regulations and guidelines can be life-threatening.
Caution!	Disregarding the safety regulations and guidelines can result in severe injury or major damage to material.
Warning!	Disregarding the safety regulations and guidelines can result in injury or damage to material.
Information:	Important information for preventing errors.

Table 3: Organization of safety notices

4. Guidelines



European dimension standards apply to all dimensions (e.g. dimension diagrams, etc.).

5. Model numbers

5.1 Display units

Model number	Short description	Note
5AP820.1505-00	**TFT C[1] XGA 15" T[2]** Automation Panel AP820; 15" XGA color TFT display with touch screen (resistive); painted housing; connection for Smart Display Link; IP 65 protection[3] . 24 VDC.	See page 36
5AP880.1505-00	**TFT C[1] XGA 15" FT[4]** Automation Panel AP880; 15" XGA color TFT display with touch screen (resistive); 40 function keys; painted housing; connection for Smart Display Link; IP 65 protection[3] . 24 VDC.	See page 40

Table 4: Model number overview - display units

1) C ... Color
2) T ... Touch screen
3) Assembled
4) FT ... function keys and touch screen

5.2 Extension units

Model number	Short description	Note
5AC800.COV1-00	**Extension cover** Cover for an unused extension slot on an AP800 display unit; IP65[1] protection; painted.	See page 83
5AC800.COV2-00	**USB extension cover** Cover for an unused extension slot on an AP800 display unit with additional USB interface; IP65[1] protection; painted.	See page 85
5AC800.CON1-00	**Extension connector** Straight connector; for connecting keyboard attachments to the Automation Panel 800; IP65[1] protection; painted.	See page 87
5AC800.CON2-00	**60° extension connector** 60° angled connector; for connecting keyboard attachments to the Automation Panel 800; IP65[1] protection; painted.	See page 89
5AC800.EXT1-00	**Keyboard extension** Keyboard extension for the Automation Panel 800; USB interface; IP65[1] protection, painted housing.	See page 47
5AC800.EXT2-00	**F[2] key extension left** Keyboard attachment for the left side of the Automation Panel 800; 20 function keys with LEDs and 20 system keys; IP65[1] protection; painted housing.	See page 51
5AC800.EXT2-01	**F[2] key extension right** Keyboard attachment for the right side of the Automation Panel 800; 20 function keys with LEDs and 20 system keys; IP65[1] protection; painted housing.	See page 55
5AC800.EXT3-00	**C[3] keys extension 8PB[4] left** Keyboard attachment for the left side of the Automation Panel 800; 16 function keys with LEDs and 8 illuminated ring keys; IP65[1] protection; painted housing.	See page 59

Table 5: Model number overview - extensions and accessories

Model number	Short description	Note
5AC800.EXT3-01	**C[3] key extension 8PB[4] right** Keyboard attachment for the right side of the Automation Panel 800; 16 function keys with LEDs and 8 illuminated ring keys; IP65[1] protection; painted housing.	See page 63
5AC800.EXT3-02	**C[3] key extension 12PB[4] ES[5] left** Keyboard attachment for the left side of the Automation Panel 800; 4 function keys with LEDs and 12 illuminated ring keys; E-stop; key switch; IP65[1] protection; painted housing.	See page 67
5AC800.EXT3-03	**C[3] key extension 12PB[4] ES[5] right** Keyboard attachment for the right side of the Automation Panel 800; 4 function keys with LEDs and 12 illuminated ring keys; E-stop; key switch; IP65[1] protection; painted housing.	See page 71
5AC800.EXT3-04	**C[3] key extension 8PB[4] ES[5] left** Keyboard attachment for the left side of the Automation Panel 800; 12 function keys with LEDs and 8 illuminated ring keys; E-stop; key switch; IP65[1] protection; painted housing.	See page 75
5AC800.EXT3-05	**C[3] key extension 8PB[4] ES[5] right** Keyboard attachment for the right side of the Automation Panel 800; 12 function keys with LEDs and 8 illuminated ring keys; E-stop; key switch; IP65[1] protection; painted housing.	See page 79
5AC800.FLG1-00	**Extension flange** Flange for Automation Panel 800 and standard support arm systems (e.g. Rittal CP-S); painted housing.	See page 91

Table 5: Model number overview - extensions and accessories (cont.)

1) Assembled
2) F ... Function keys
3) C ... Illuminated ring keys
4) PB ... Push button
5) ES ... Emergency stop (E-stop)

5.3 Cables

Model number	Short description	Note
5CASDL.0018-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; Length 1.8 meter	See page 98 / 94
5CASDL.0050-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; Length 5 meter	See page 98 / 94
5CASDL.0100-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; Length 10 meter	See page 98 / 94
5CASDL.0150-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; Length 15 meter	See page 98 / 94
5CASDL.0200-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; Length 20 meter	See page 98 / 94
5CASDL.0250-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; Length 25 meter	See page 98 / 94
5CASDL.0300-30	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; Length 30 meters with extender	See page 105 / 101
5CASDL.0400-30	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; Length 40 meters with extender	See page 105 / 101
5CAPWR.0018-20	Voltage supply cable for Automation Panel 800; length 1.8 meters.	See page 108

Table 6: Model number overview - Cables

Model number	Short description	Note
5CAPWR.0050-20	Voltage supply cable for Automation Panel 800; length 5 meters.	See page 108
5CAPWR.0100-20	Voltage supply cable for Automation Panel 800; length 10 meters.	See page 108
5CAPWR.0150-20	Voltage supply cable for Automation Panel 800; length 15 meters.	See page 108
5CAPWR.0200-20	Voltage supply cable for Automation Panel 800; length 20 meters.	See page 108
5CAPWR.0250-20	Voltage supply cable for Automation Panel 800; length 25 meters.	See page 108
5CAPWR.0300-20	Voltage supply cable for Automation Panel 800; length 30 meters.	See page 108
5CAPWR.0400-20	Voltage supply cable for Automation Panel 800; length 40 meters.	See page 108
5CAX2X.0018-20	X2X cable for Automation Panel 800; length 1.8 meters.	See page 111
5CAX2X.0050-20	X2X cable for Automation Panel 800; length 5 meters.	See page 111
5CAX2X.0100-20	X2X cable for Automation Panel 800; length 10 meters.	See page 111
5CAX2X.0150-20	X2X cable for Automation Panel 800; length 15 meters.	See page 111
5CAX2X.0200-20	X2X cable for Automation Panel 800; length 20 meters.	See page 111
5CAX2X.0250-20	X2X cable for Automation Panel 800; length 25 meters.	See page 111
5CAX2X.0300-20	X2X cable for Automation Panel 800; length 30 meters.	See page 111
5CAX2X.0400-20	X2X cable for Automation Panel 800; length 40 meters.	See page 111

Table 6: Model number overview - Cables (cont.)

5.4 Accessories

5.4.1 USB flash drives

Model number	Short description	Note
5MMUSB.0128-00	**USB flash drive 128 MB SanDisk** USB 2.0 flash drive 128 MB	Cancelled since 12/2005 Replaced by 5MMUSB.2048-00
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	Cancelled since 03/2007 Replaced by 5MMUSB.2048-00
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	Cancelled since 07/2007 Replaced by 5MMUSB.2048-00
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	Cancelled since 03/2007 Replaced by 5MMUSB.2048-00
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	See page 170

Table 7: Model number overview - USB flash drives

5.4.2 Legend strip templates

Model number	Short description	Note
5AC800.EXTX-00	**Legend strip template for AP800 extension** for 5AC800.EXT2-00, 5AC800.EXT2-01, for 3 devices.	See page 174
5AC800.EXTX-01	**Legend strip template for AP800 extension 1** for 5AC800.EXT3-00, 5AC800.EXT3-01, for 2 devices.	See page 174
5AC800.EXTX-02	**Legend strip template for AP800 extension 2** for 5AC800.EXT3-04, 5AC800.EXT3-05, for 1 device right and device left.	See page 174
5AC800.EXTX-03	**Legend strip template for AP800 extension 3** for 5AC800.EXT3-02, 5AC800.EXT3-03, for 3 devices.	See page 174
5AC800.150x-00	**Legend strip template for AP800 display** for 5AP880.1505-00, for 3 devices.	See page 174

Table 8: Model number overview - legend strip templates

5.4.3 Miscellaneous

Model number	Short description	Note
5SWHMI.0000-00	**HMI Drivers & Utilities DVD** Contains drivers, utilities, software upgrades and user's manuals for B&R panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).	See page 151

Table 9: Model numbers - Other items

Chapter 2 • Technical data

1. General information

Automation Panel 800 (AP800) devices are fully closed display units. When installed on a support arm system, the operator panel can be placed in the most ergonomic position.

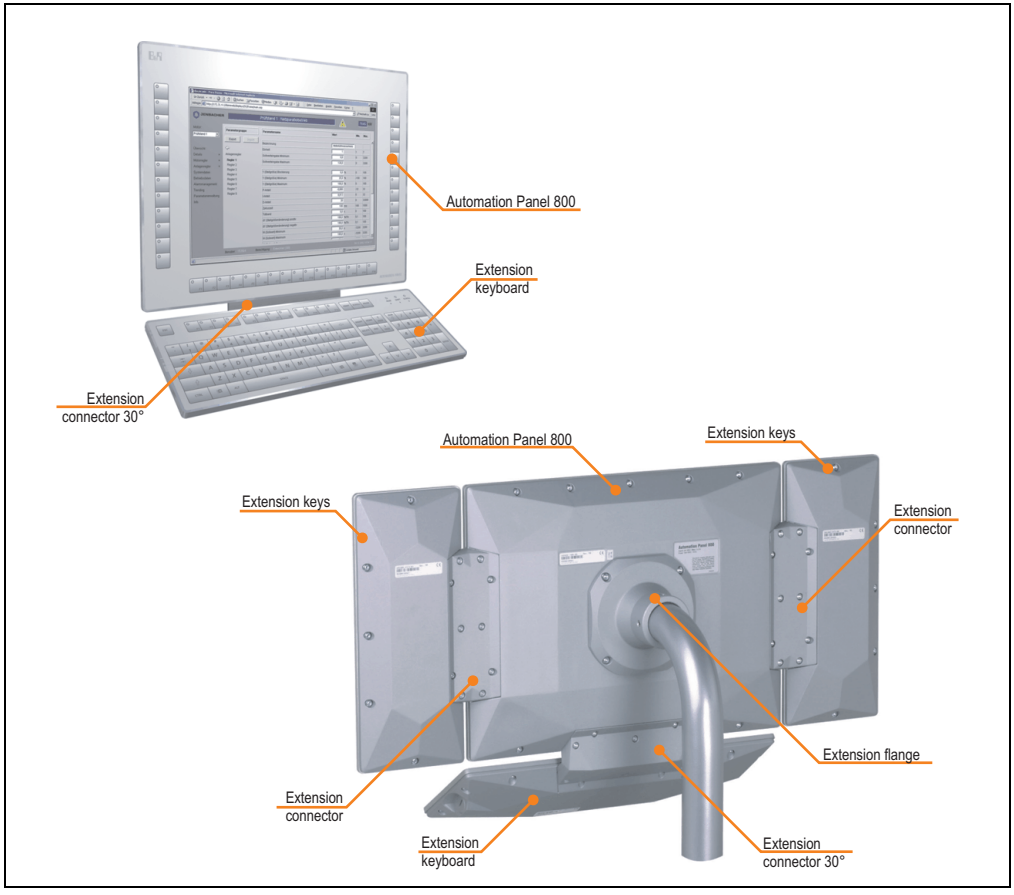


Figure 1: Component overview - Automation Panel 800 with extension units

1.1 Features

- Fully closed system
- Touch screen
- Industrial high-density plug
- USB 1.1 interface[1)] (Type A)
- Expandable using extension units
- E-stop[1)]
- Key Switch [1)]
- Illuminated ring keys[1)]
- SDL (Smart Display Link) transfer technology up to 40 meters
- Function keys are easily configured using the B&R Key Editor[2)]

1) Depends on the device configuration.
2) Can be downloaded from the B&R homepage (www.br-automation.com).

1.2 System components / Configuration

The AP800 system can be assembled to meet individual requirements and operating conditions.

1.2.1 Selection guide - basic system

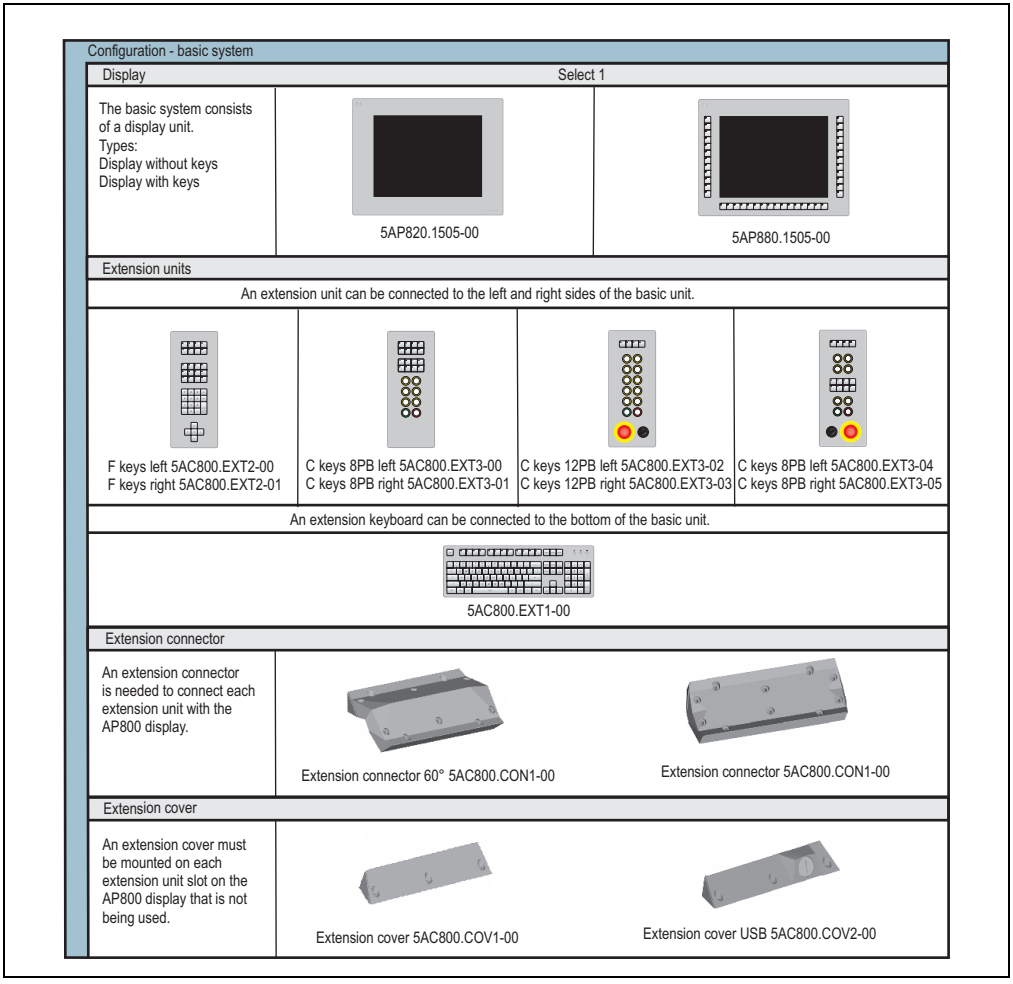


Figure 2: Configuration - Basic system

Explanation:

1) Select the basic system (select 1).

2) Select the extension units according to requirements.

3) Make selection depending on the number of extension units, extension connectors and extension covers.

4) Select optional components.

1.2.2 Selection guide - optional components

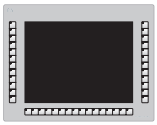
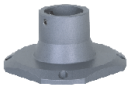
Configuration - optional		
Display		
The basic system consists of a display unit. Types: Display without keys Display with keys	 5AP820.1505-00	 5AP880.1505-00
Extension flange		
For mounting, an extension flange is installed on the back of the display.	 5AC800.FLG1-00	
Cable (select 1)		
Select SDL cable in the desired length. Types: SDL cable without extender SDL cable with extender	SDL cable without extender 5CASDL.0018-20 5CASDL.0050-20 5CASDL.0100-20 5CASDL.0150-20 5CASDL.0200-20 5CASDL.0250-20	SDL cable with extender 5CASDL.0300-30 5CASDL.0400-30
Select voltage supply cable in the desired length.	 5CAPWR.0018-20 5CAPWR.0050-20 5CAPWR.0100-20 5CAPWR.0150-20 5CAPWR.0200-20 5CAPWR.0250-20 5ACPWR.0300-20 5ACPWR.0400-20	
Select X2X cable in the desired length.	 5CAX2X.0018-00 5CAX2X.0050-00 5CAX2X.0100-00 5CAX2X.0150-00 5CAX2X.0200-00 5CAX2X.0250-00 5CAX2X.0300-00 5CAX2X.0400-00	

Figure 3: Selection guide - Optional components

Information:

The optional components are required for installation and commissioning.

2. Configuration

The following 3 examples should be helpful for the configuration of AP800 systems. They will explain which components are required for the respective configuration.

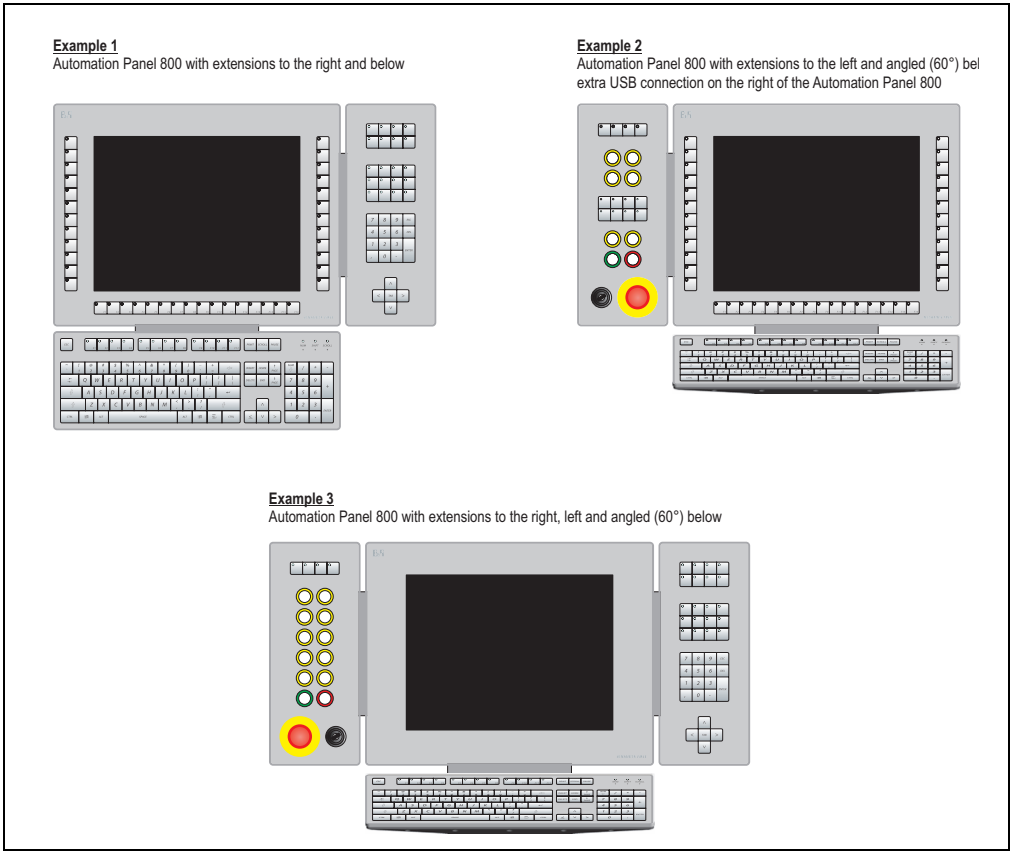


Figure 4: Example configurations

2.1 Example 1

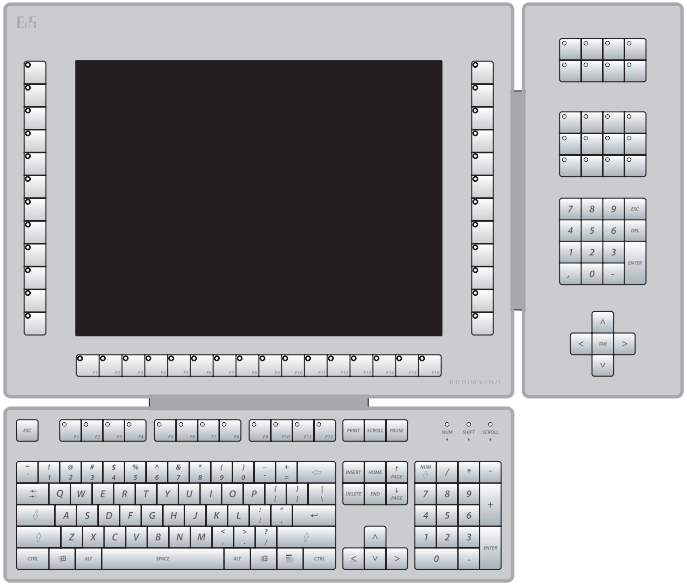


Figure 5: Configuration - Example 1

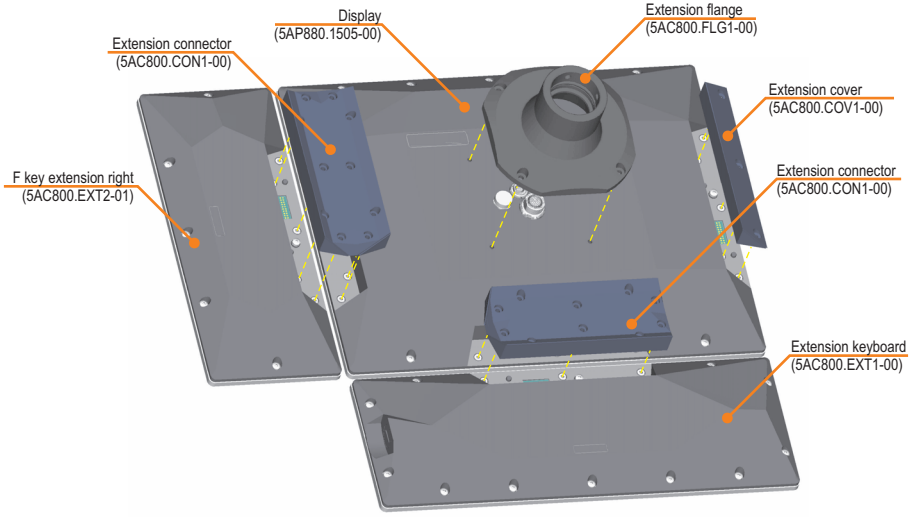


Figure 6: Required components - Example 1

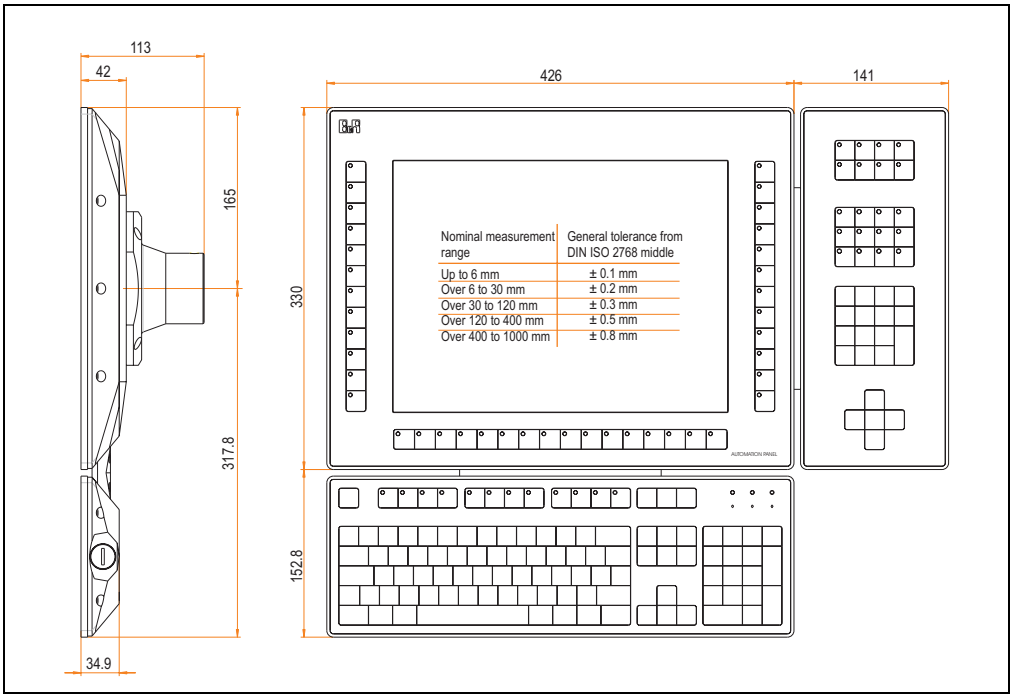


Figure 7: Dimensions - Example 1

2.1.1 Overview of the required components

Model number	Short description	Amount
5AP880.1505-00	TFT C XGA 15" FT	1
5AC800.EXT1-00	Keyboard extension	1
5AC800.EXT2-01	F key extension right	1
5AC800.CON1-00	Extension connector	2
5AC800.COV1-00	Extension cover	1
5AC800.FLG1-00	Extension flange	1
5CASDL.0xxx-20	SDL cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1
5CAPWR.0xxx-20	Voltage supply cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1
5CAX2X.0xxx-20	X2X cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1

Table 10: Overview of the required components - Example 1

2.2 Example 2

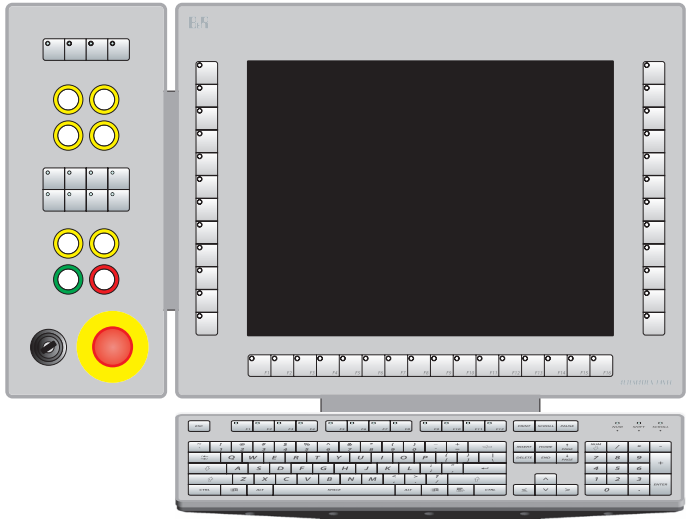


Figure 8: Configuration - Example 2

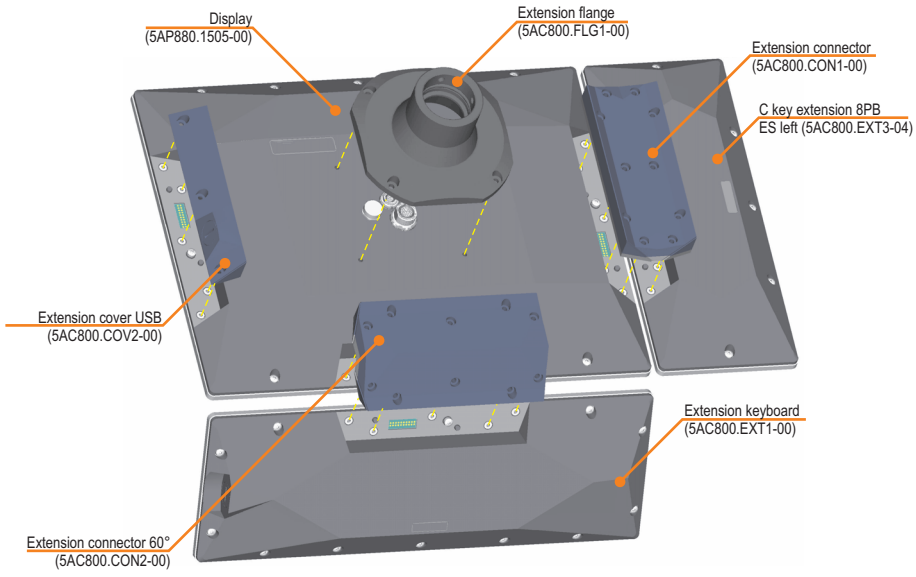


Figure 9: Required components - Example 2

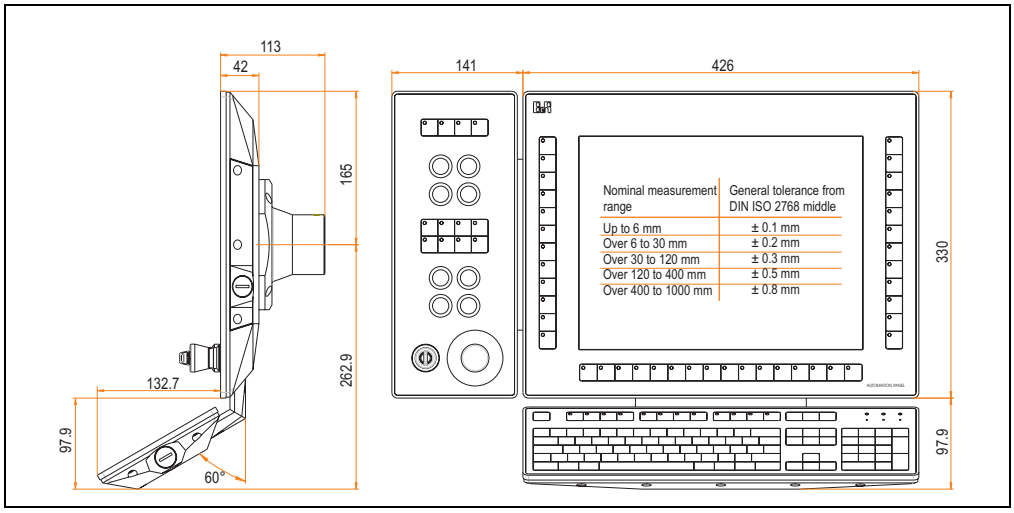


Figure 10: Dimensions - Example 2

2.2.1 Overview of the required components

Model number	Short description	Amount
5AP880.1505-00	TFT C XGA 15" FT	1
5AC800.EXT1-00	Keyboard extension	1
5AC800.EXT3-04	C key extension 8PB ES left	1
5AC800.CON1-00	Extension connector	1
5AC800.CON2-00	60° extension connector	1
5AC800.COV2-00	USB extension cover	1
5AC800.FLG1-00	Extension flange	1
5CASDL.0xxx-20	SDL cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1
5CAPWR.0xxx-20	Voltage supply cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1
5CAX2X.0xxx-20	X2X cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1

Table 11: Overview of the required components - Example 2

2.3 Example 3

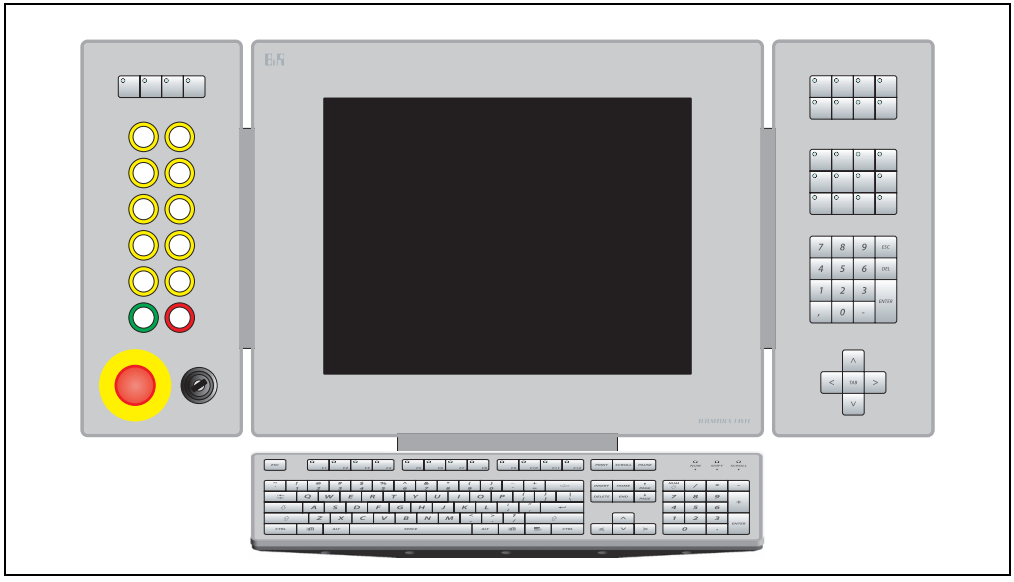


Figure 11: Configuration - Example 3

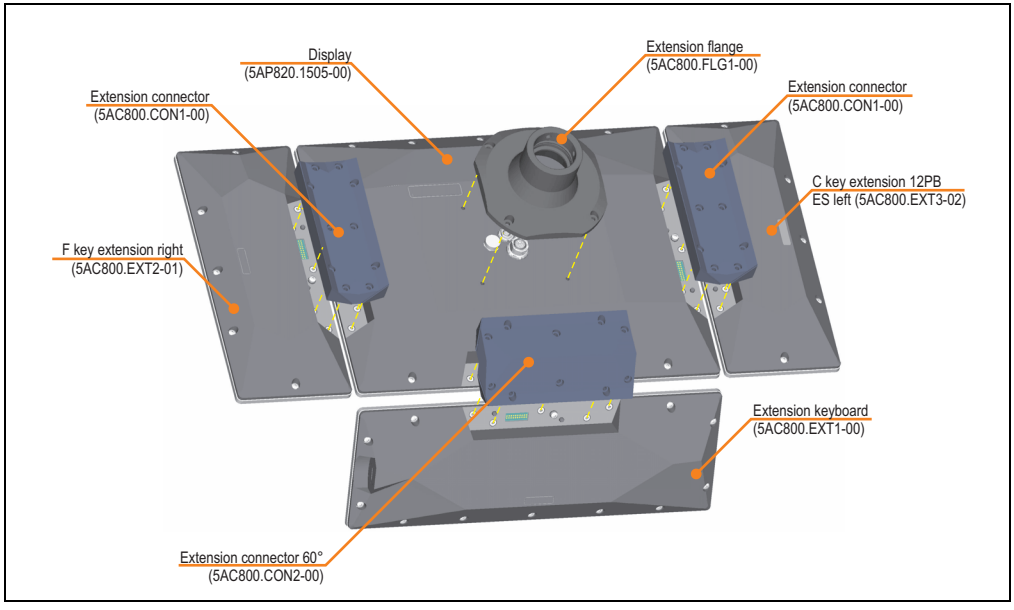


Figure 12: Required components - Example 3

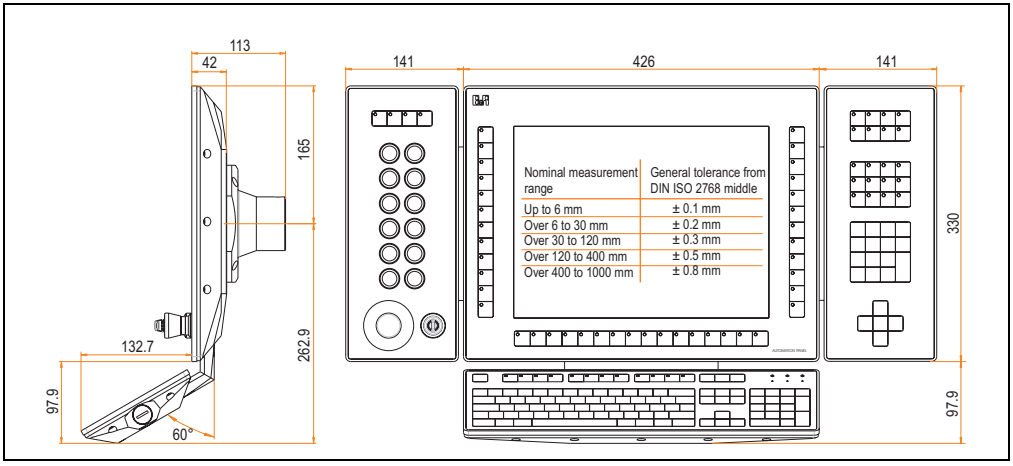


Figure 13: Dimensions - Example 3

2.3.1 Overview of the required components

Model number	Short description	Amount
5AP820.1505-00	TFT C XGA 15" T	1
5AC800.EXT2-01	F key extension right	1
5AC800.EXT3-02	C key extension 12PB ES left	1
5AC800.EXT1-00	Keyboard extension	1
5AC800.CON1-00	Extension connector	2
5AC800.CON2-00	60° extension connector	1
5AC800.FLG1-00	Extension flange	1
5CASDL.0xxx-20	SDL cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1
5CAPWR.0xxx-20	Voltage supply cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1
5CAX2X.0xxx-20	X2X cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 6 "Model number overview - Cables" on page 22.	1

Table 12: Overview of the required components - Example 3

3. Individual components

3.1 Display units

3.1.1 5AP820.1505-00

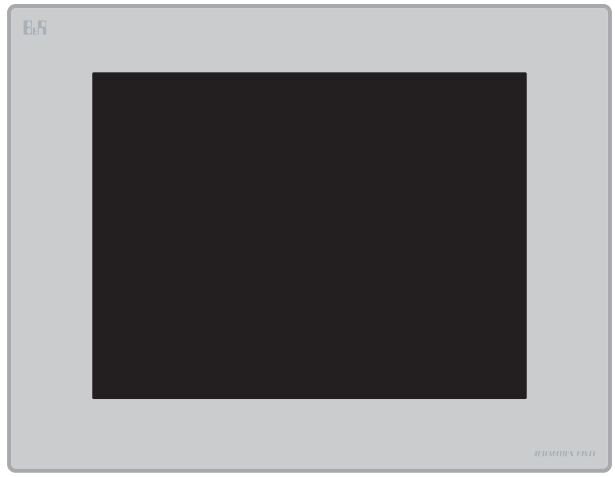


Figure 14: Front view - 5AP820.1505-00

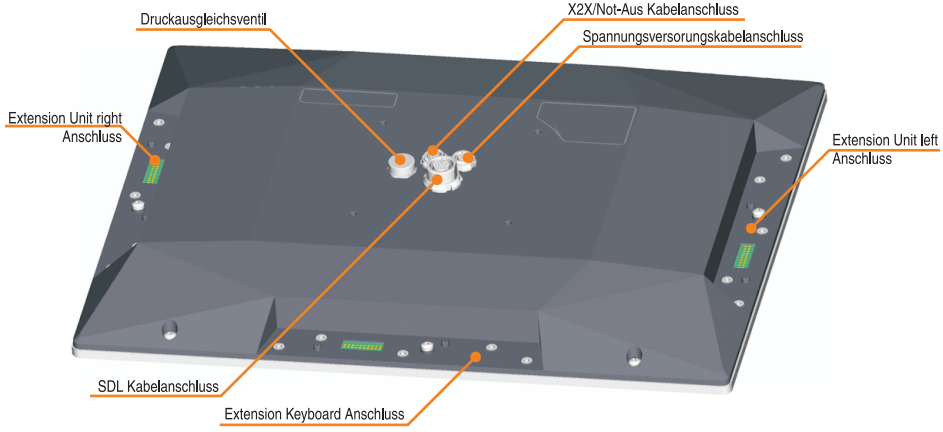


Figure 15: Rear view - 5AP820.1505-00

Technical data

Features	5AP820.1505-00
Display Type Diagonal Colors Resolution Contrast Viewing angle (see page 190) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT colors 15 inch (381 mm) 16 million colors XGA, 1024 x 768 pixels 400:1 Direction R / direction L =85° Direction U / direction D = 85° 250 cd/m² 50000 hours
Touch screen [1)] Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12- bit 78 %
Keys/LED Function keys Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	-
Connections made using separate cables SDL[2)] Supply voltage X2X	 Pin assignments see page 45 Pin assignments see page 46 Pin assignments see page 46
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption	 24 VDC ±25 % 3,2 A 5 A typical, maximal 30 A for < 300 µs 27 W typical, maximum 35 W
X2X supply bus Power consumption	Only power supplies provided by B&R are to be used. Maximum 3 W
E-stop circuit loop resistance	Max. 5.5 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background	 Aluminum, naturally anodized[3)] Gray Polyester Similar to Pantone 427CV[3)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[3)] (semi-matt)

Table 13: Technical data - 5AP820.1505-00

Mechanical characteristics	5AP820.1505-00
Outer dimensions Width Height Depth (without flange)	 426 mm 330 mm 41,3 mm
Weight	Approx. 5 kg
Environmental characteristics	
Ambient temperature Operation Mounting orientation 0°[4)] Mounting orientation up to -45°[4)] Mounting orientation up to +45°[4)] Storage Transport	 0 to +50°C 0 to +50°C 0 to +45°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 39
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 13: Technical data - 5AP820.1505-00 (cont.)

1) Drivers for the approved operating systems can be downloaded from the download area on the B&R homepage (www.br-automation.com).

2) SDL ... Smart Display Link

3) Depending on the process or batch, there may be visible deviations in the color and surface structure.

4) Specified mounting orientation - see chapter 3 "Commissioning", section 3.2 "Mounting orientation" on page 124 .

Temperature humidity diagram - Operation and storage

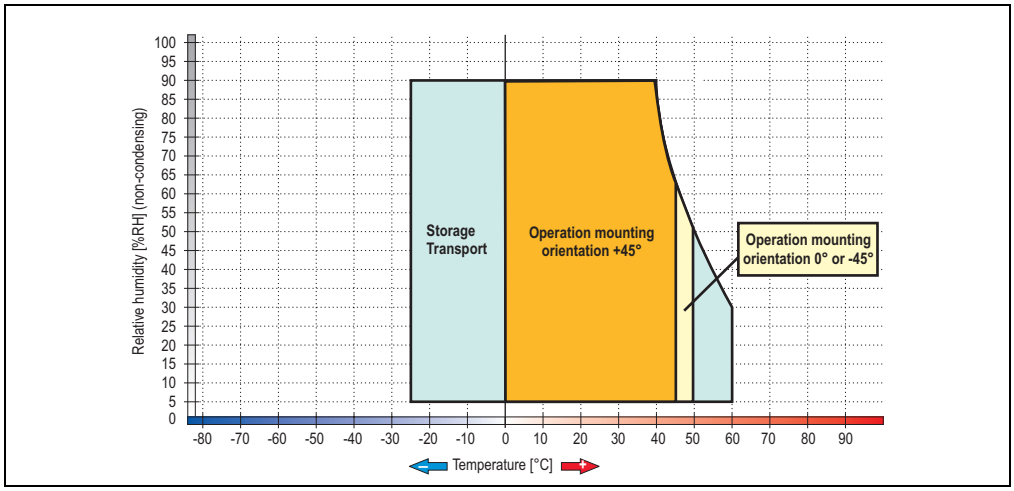
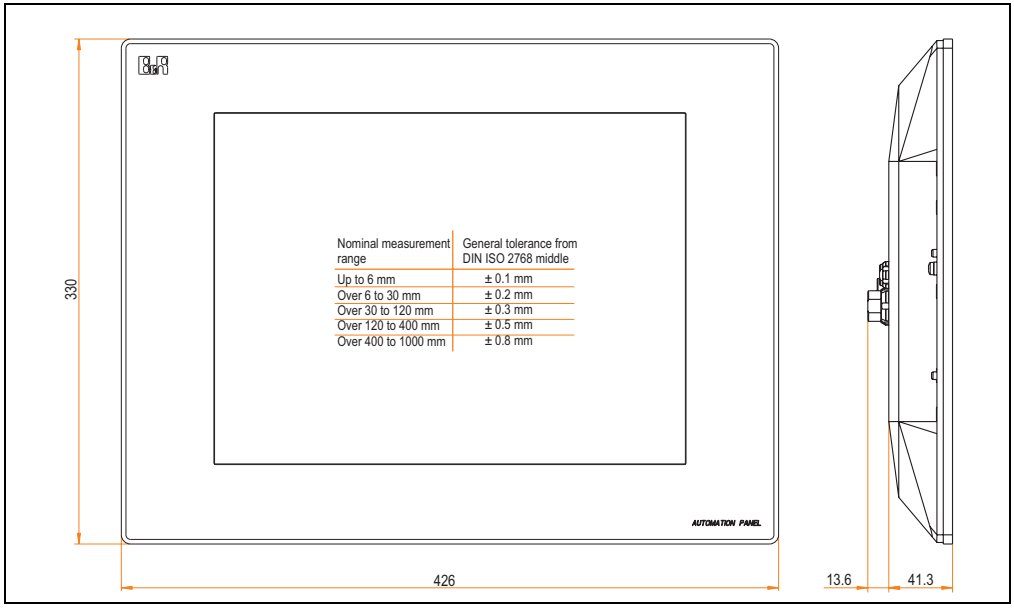


Figure 16: Temperature humidity diagram - 5AP820.1505-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 17: Dimensions - 5AP820.1505-00

3.1.2 5AP880.1505-00

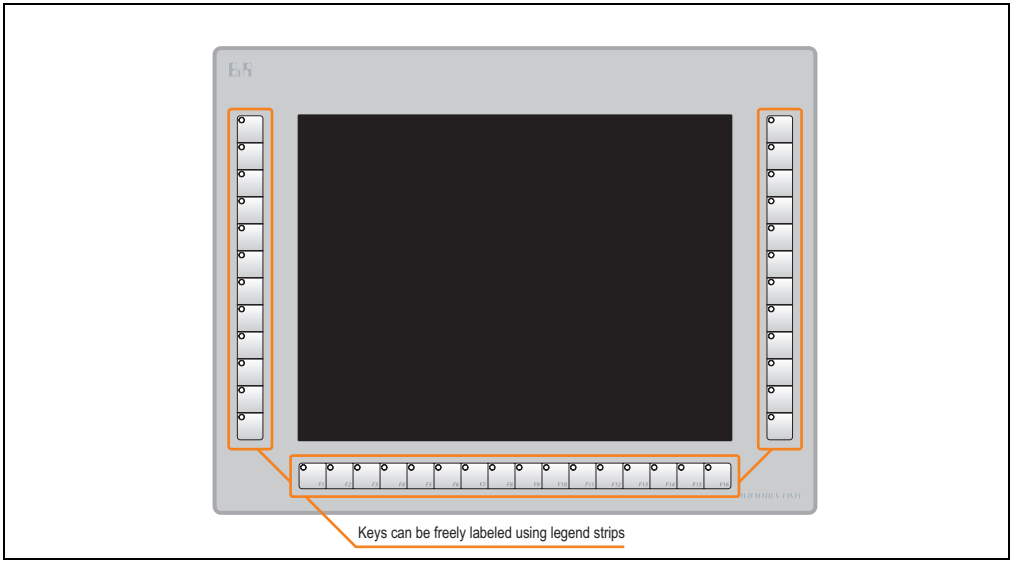


Figure 18: Front view - 5AP880.1505-00

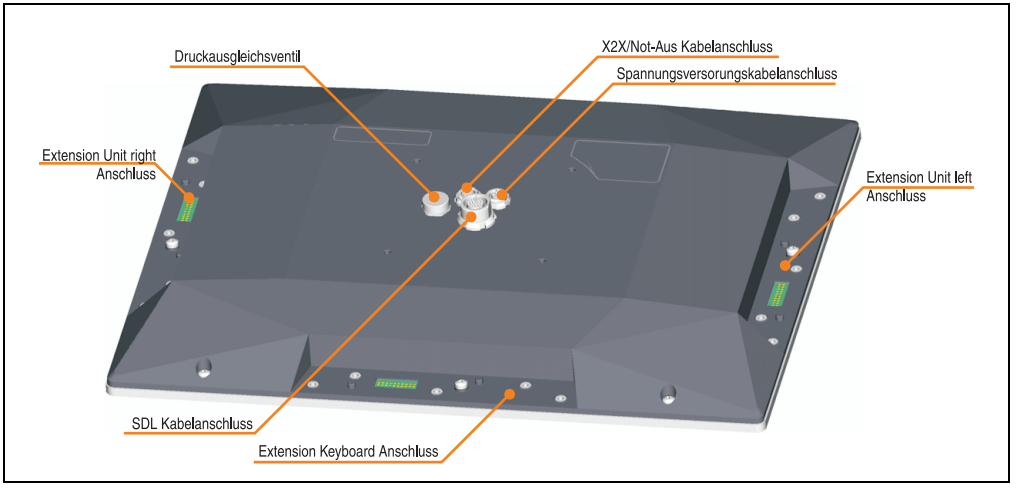


Figure 19: Rear view - 5AP880.1505-00

Technical data

Features	5AP880.1505-00
Display Type Diagonal Colors Resolution Contrast Viewing angle (see page 190) Horizontal Vertical Background lighting Brightness Half-brightness time	 TFT colors 15 inch (381 mm) 16 million colors XGA, 1024 x 768 pixels 400:1 Direction R / direction L =85° Direction U / direction D = 85° 250 cd/m² 50000 hours
Touch screen [1)] Technology Controller Degree of transmission	 Analog, resistive Elo, serial, 12- bit 78 %
Keys/LED[2)] Function keys Operated using Soft keys Cursor keys Number block Other keys Key lifespan LED brightness	 40 with LED (yellow) PC - - - - > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd (yellow) **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
Connections made using separate cables SDL[3)] Supply voltage X2X	 Pin assignments see page 45 Pin assignments see page 46 Pin assignments see page 46
Electrical characteristics	
Power supply Rated voltage Rated current Starting current Power consumption	 24 VDC ±25 % 3,2 A 5 A typical, maximal 30 A for < 300 µs 27 W typical, maximum 36 W
X2X supply bus Power consumption	Only power supplies provided by B&R are to be used. Maximum 3 W
E-stop circuit loop resistance	Max. 5.5 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color legend strips (color gradients)	 Aluminum, naturally anodized[4)] Gray[4)] Polyester Similar to Pantone 427CV[4)] Similar to Pantone white to Pantone 429CV[4)]

Table 14: Technical data - 5AP880.1505-00

Mechanical characteristics	5AP880.1505-00
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[4] (semi-matt)
Outer dimensions Width Height Depth (without flange)	 426 mm 330 mm 41,3 mm
Weight	Approx. 5 kg
Environmental characteristics	
Ambient temperature Operation Mounting orientation 0°[5] Mounting orientation up to -45°[5] Mounting orientation up to +45°[5] Storage Transport	 0 to +50°C 0 to +50°C 0 to +45°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 43
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 14: Technical data - 5AP880.1505-00 (cont.)

1) Drivers for the approved operating systems can be downloaded from the download area on the B&R homepage (**www.br-automation.com**).

2) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (**www.br-automation.com**) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

3) SDL ... Smart Display Link

4) Depending on the process or batch, there may be visible deviations in the color and surface structure.

5) Specified mounting orientation - see chapter 3 "Commissioning", section 3.2 "Mounting orientation" on page 124 .

Temperature humidity diagram - Operation and storage

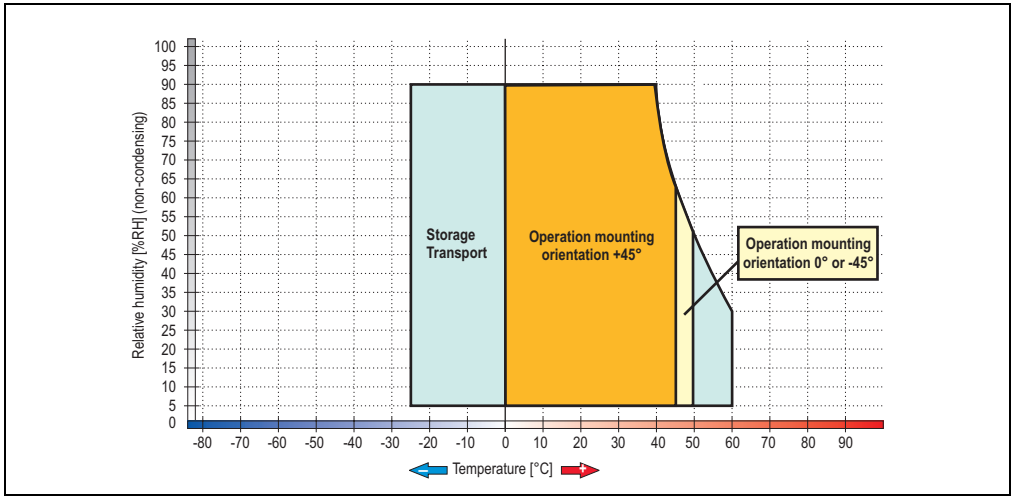
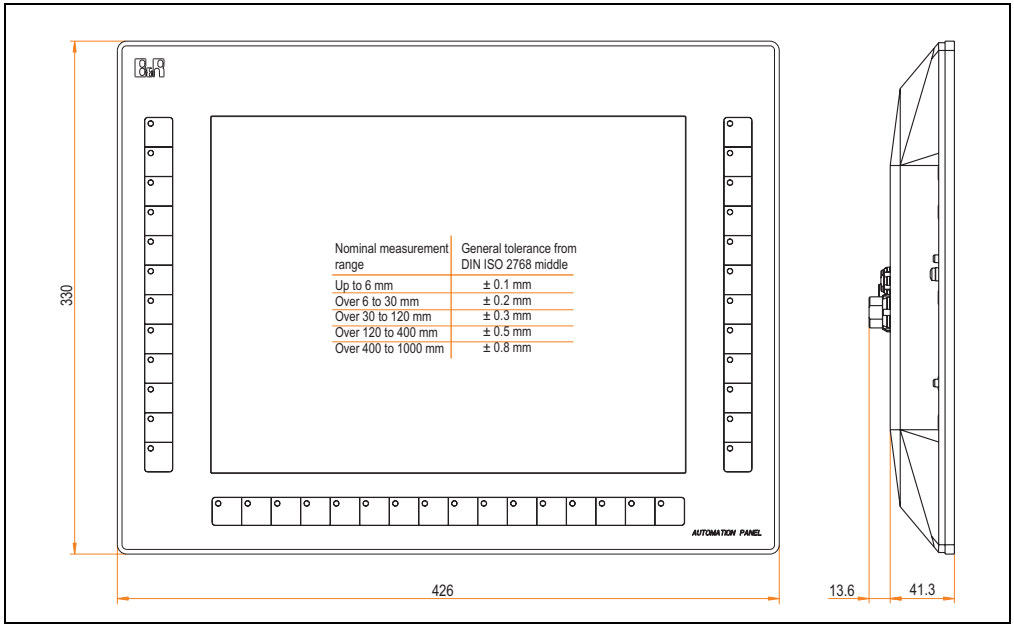


Figure 20: Temperature humidity diagram - 5AP880.1505-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 21: Dimensions - 5AP880.1505-00

Key dimensions

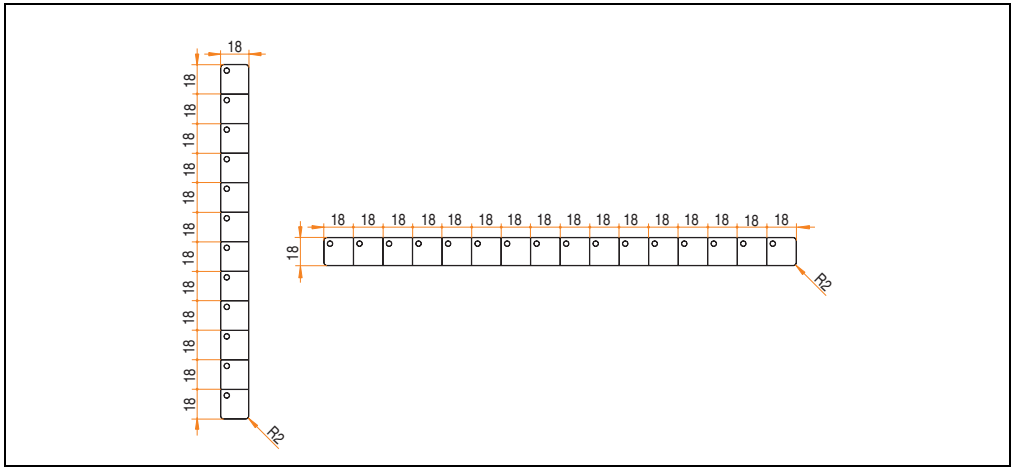


Figure 22: Key dimensions - 5AP880.1505-00

3.1.3 Pin assignments

Information:

The following information is valid for both display units (5AP820.1505-00, 5AP880.1505-00).

SDL cable connection

Caution!

SDL cables can only be plugged in and unplugged when the APC620 or PPC700 and display device (Automation Panel 800) are turned off.

Pin assignments - SDL cable connection				
ODU Minisnap 24-pin				
Pin	Assignment	Pin	Assignment	
1	XUSB1-	16	T.M.D.S. data 0+	
2	XUSB0-	17	T.M.D.S. DATA 1/XUBS0 shield	
3	n.c.	18	DDC Clock T.M.D.S. DATA 1-	
4	T.M.D.S. clock shield	19	DDC Data T.M.D.S. DATA 1+	
5	XUSB1+	20	Ground (return for + 5V, HSync and VSync)	
6	+ 5 V power [1)]	21	T.M.D.S. data 2-	
7	XUSB0+	22	T.M.D.S. data 2+	
8	Hot Plug detect	23	T.M.D.S. data 2/SDL shield	
9	DDC clock	24	SDL-	
10	DDC data			
11	SDL+			
12	T.M.D.S. clock -			
13	T.M.D.S. clock +			
14	T.M.D.S. DATA 0/XUSB1 shield			
15	T.M.D.S. data 0-			

Table 15: Pin assignments - SDL cable connection

1) Protected internally by a multifuse

Supply voltage

Pin assignments - supply voltage	
ODU Minisnap 3-pin Electrically isolated	
Pin	**Assignment**
1	+
2	-
3	Functional ground

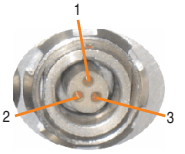


Table 16: Pin assignments - SDL cable connection

X2X / E-stop cable connection

Pin assignments - X2X / E-stop cable connection	
ODU Minisnap 10-pin Electrically isolated	
Pin	**Assignment**
1	E-stop N.C. contact 1 (12)
2	E-stop N.C. contact 2 (22)
3	X2X_+24V (bus supply +)
4	E-stop N.C. contact 1 (11)
5	E-stop N.C. contact 2 (21)
6	X2X_0V (bus supply -)
7	n. c.
8	n. c.
9	X2X\ (IN)
10	X2X (IN)

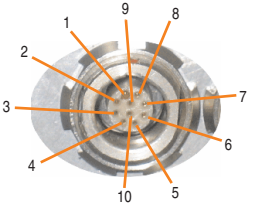


Table 17: Pin assignments - X2X / E-stop cable connection

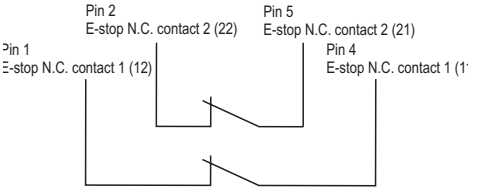


Figure 23: E-stop circuit connections

3.2 Extension units

3.2.1 Extension keyboard 5AC800.EXT1-00

Figure 24: Front view - 5AC800.EXT1-00

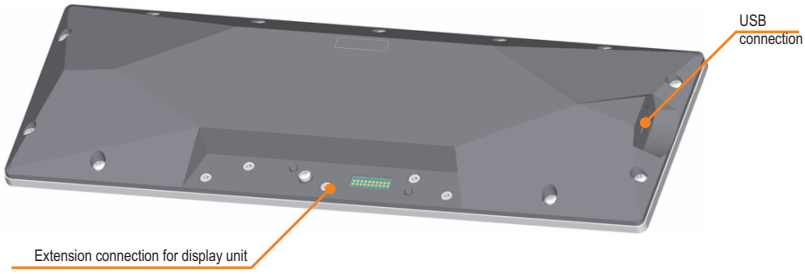


Figure 25: Rear view - 5AC800.EXT1-00

Technical data

Features	5AC800.EXT1-00
Keys/LED[1)] Cursor keys Number block Other keys Other LED Operated using Key lifespan LED brightness	Total of 104 keys / 15 LEDs 4 without LED 17 without LED 83 (12 with LED - yellow) 3 green PC > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd (yellow) and 35 mcd (green) **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
USB interface Type Amount Transfer rate Connection Current load	 USB 1.1 1 (left) Low speed (1.5 MBit/s), full speed (12 MBit/s) Type A Max. 500 mA
Electrical characteristics	
Power consumption	Max. 4 W
E-stop circuit loop resistance	Max. 1 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color (color gradients)	 Aluminum, naturally anodized[2)] Gray[4)] Polyester Similar to Pantone 427CV[4)] Similar to Pantone white[4)] to Pantone 429CV[4)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[4)] (semi-matt)
Outer dimensions Width Height Depth	 426 mm 146.8 mm 34.9 mm
Weight	Approx. 1.6 kg
Connection	Required for installation below an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 49

Table 18: Technical data 5AC800.EXT1-00

Environmental characteristics	5AC800.EXT1-00
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 18: Technical data 5AC800.EXT1-00

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

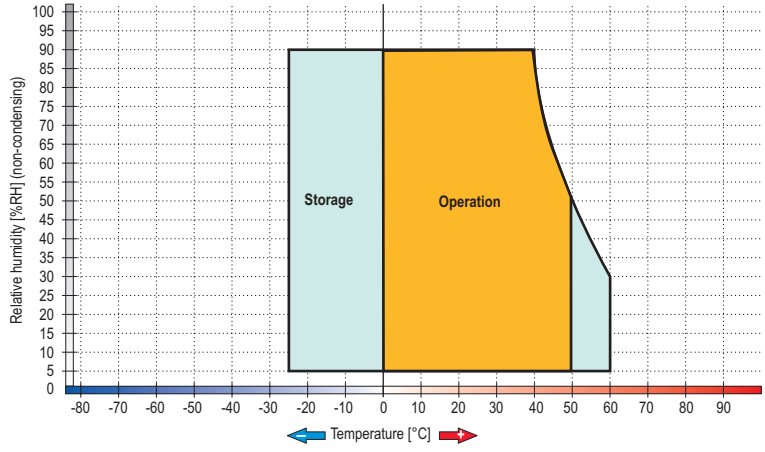
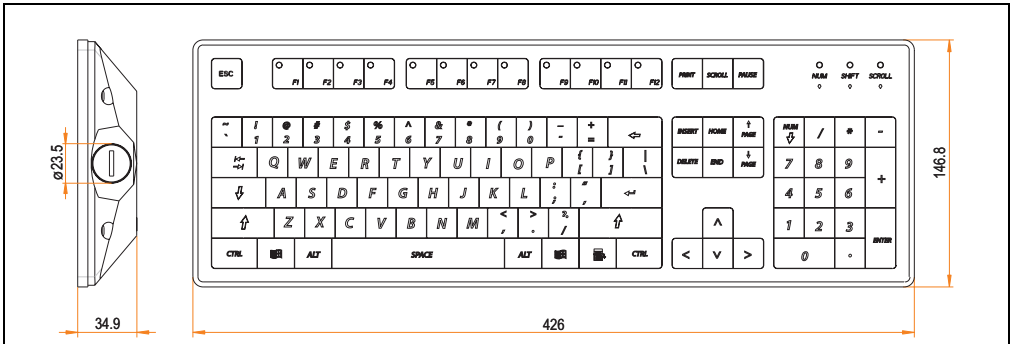


Figure 26: Temperature humidity diagram - 5AC800.EXT1-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 27: Dimensions - 5AC800.EXT1-00

Key dimensions

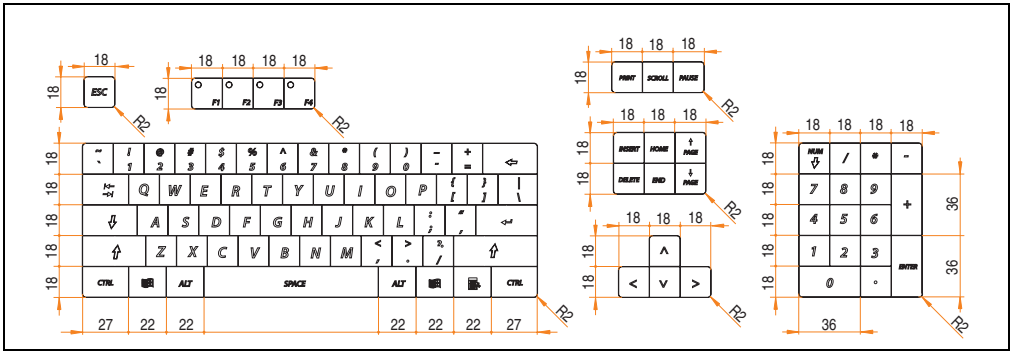


Figure 28: Key dimensions - 5AC800.EXT1-00

3.2.2 F key extension left 5AC800.EXT2-00

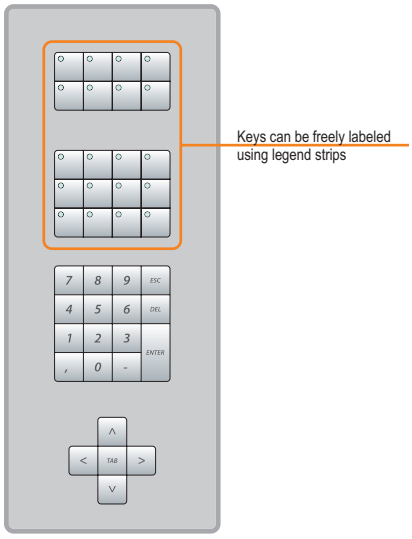


Figure 29: Front view - 5AC800.EXT2-00

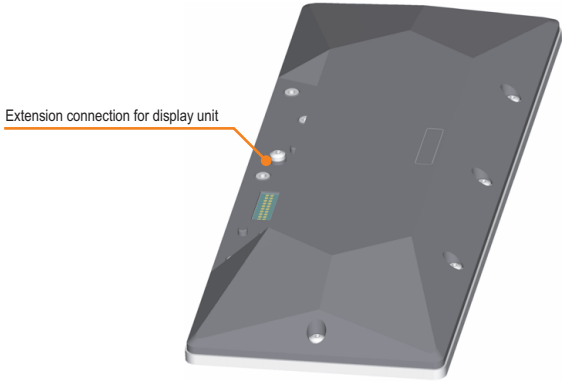


Figure 30: Rear view - 5AC800.EXT2-00

Technical data

Features	5AC800.EXT2-00
Keys/LED[1)] Function keys Operated using Cursor keys Number block Other keys Key lifespan LED brightness	 20 with LED (yellow) PC 4 without LED 15 without LED - > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd (yellow) **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
Electrical characteristics	
Power consumption	Max. 1 W
E-stop circuit loop resistance	Max. 1 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color (color gradients) Color legend strips (color gradients)	 Aluminum, naturally anodized[2)] Gray[2)] Polyester Similar to Pantone 427CV[2)] Similar to Pantone white to Pantone 429CV[2)] Similar to Pantone white to Pantone 429CV[2)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[4)] (semi-matt)
Outer dimensions Width Height Depth	 135 mm 330 mm 34.9 mm
Weight	Approx. 1.1 kg
Connection	Required for installation to the left of an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 53
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g

Table 19: Technical data 5AC800.EXT2-00

Environmental characteristics	5AC800.EXT2-00
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 19: Technical data 5AC800.EXT2-00

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

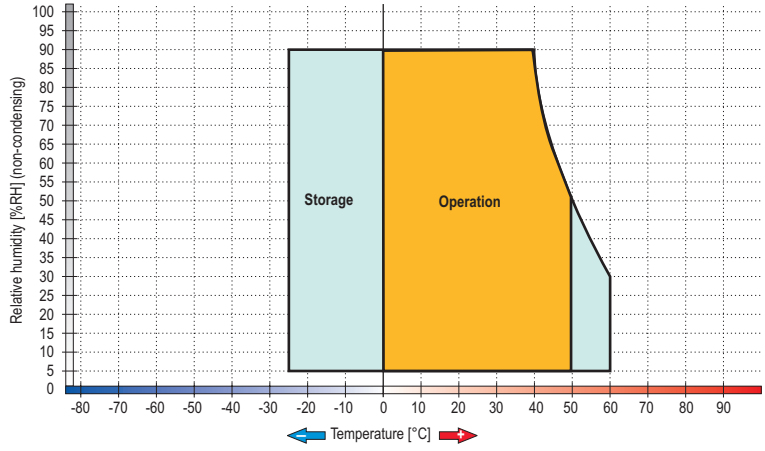
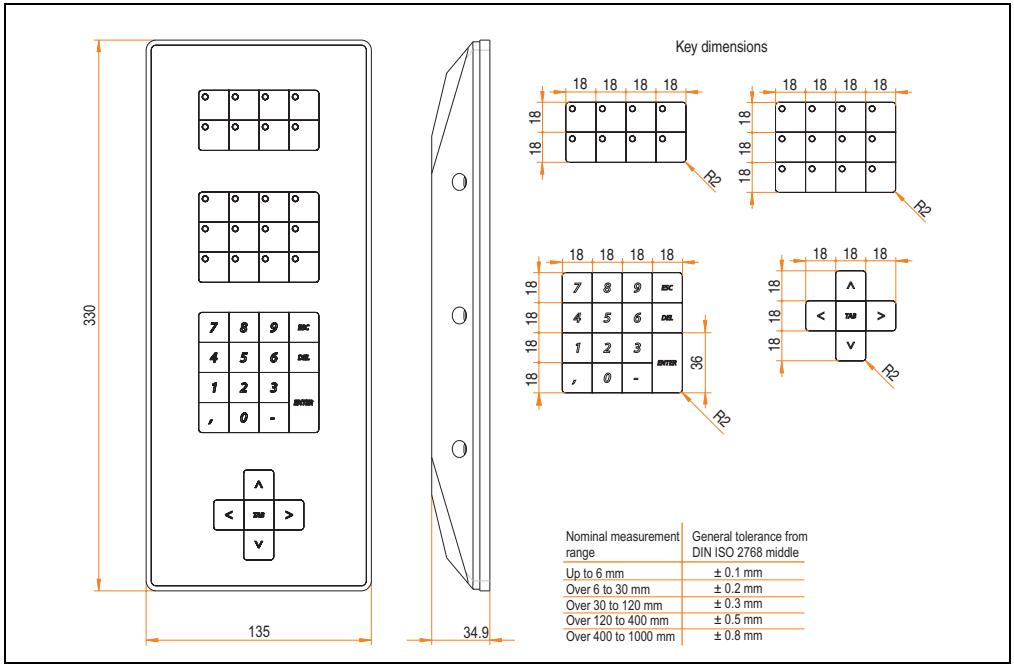


Figure 31: Temperature humidity diagram - 5AC800.EXT2-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 32: Dimensions - 5AC800.EXT2-00

3.2.3 F key extension right 5AC800.EXT2-01

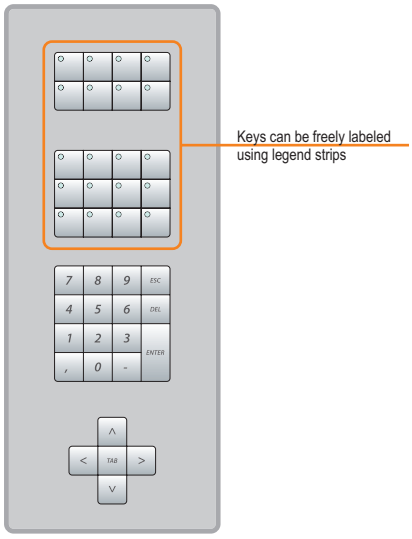


Figure 33: Front view - 5AC800.EXT2-01

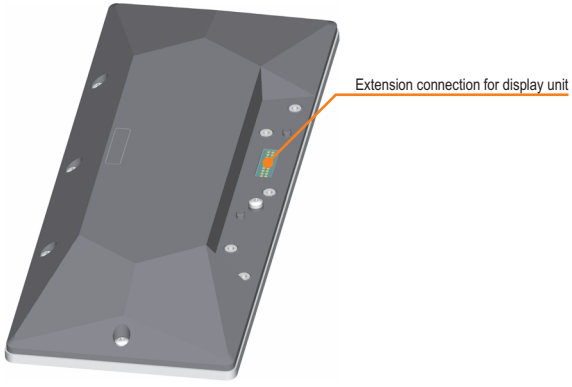


Figure 34: Rear view - 5AC800.EXT2-01

Technical data

Features	5AC800.EXT2-01
Keys/LED[1)] Function keys Operated using Cursor keys Number block Other keys Key lifespan LED brightness	 20 with LED (yellow) PC 4 without LED 15 without LED - > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd (yellow) **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
Electrical characteristics	
Power consumption	Max. 1 W
E-stop circuit loop resistance	Max. 1 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color (color gradients) Color legend strips (color gradients)	 Aluminum, naturally anodized[2)] Gray[2)] Polyester Similar to Pantone 427CV[2)] Similar to Pantone white to Pantone 429CV[2)] Similar to Pantone white to Pantone 429CV[2)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[2)] (semi-matt)
Outer dimensions Width Height Depth	 135 mm 330 mm 34.9 mm
Weight	Approx. 1.1 kg
Connection	Required for installation to the right of an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 57
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g

Table 20: Technical data 5AC800.EXT2-01

Environmental characteristics	5AC800.EXT2-01
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 20: Technical data 5AC800.EXT2-01

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

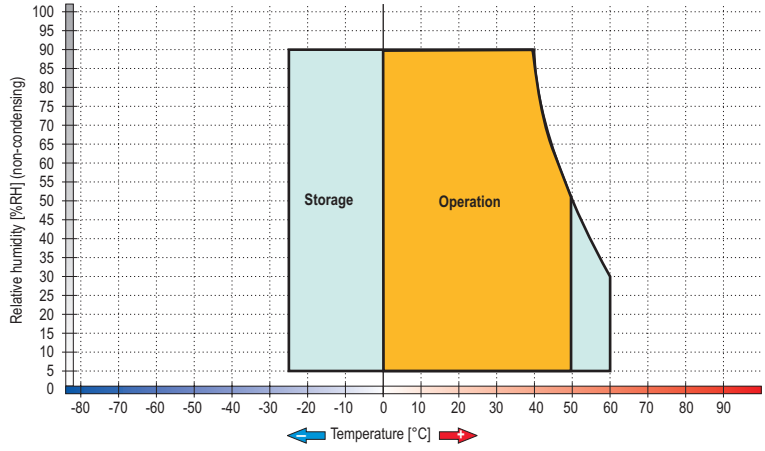
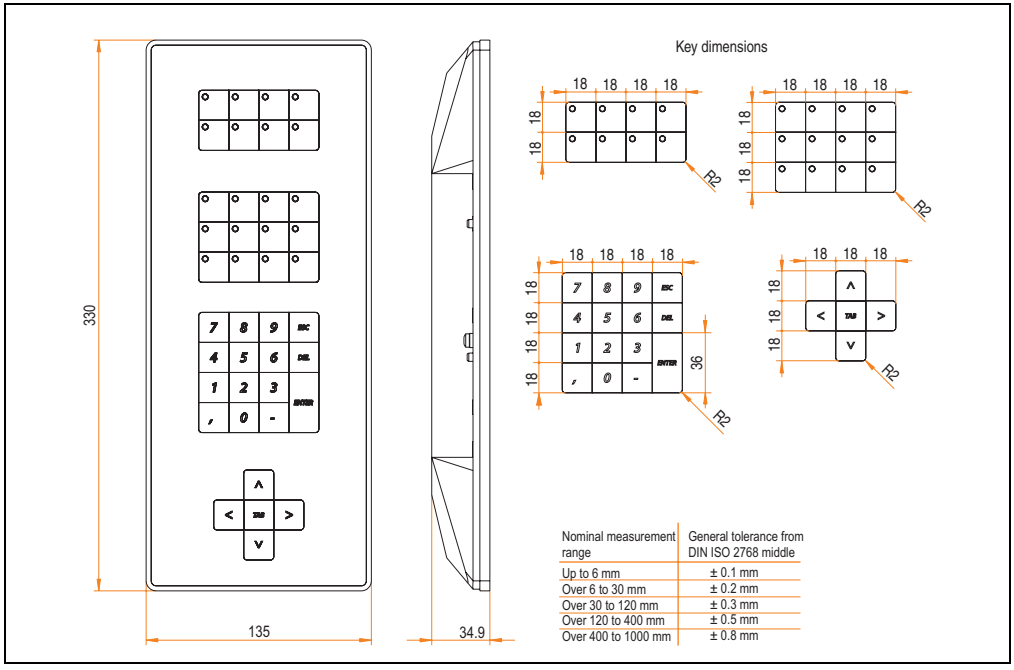


Figure 35: Temperature humidity diagram - 5AC800.EXT2-01

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 36: Dimensions - 5AC800.EXT2-01

3.2.4 C key extension 8PB left 5AC800.EXT3-00

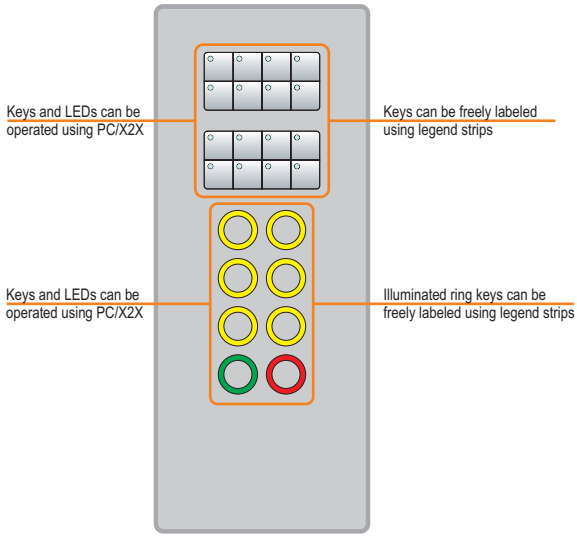


Figure 37: Front view - 5AC800.EXT3-00

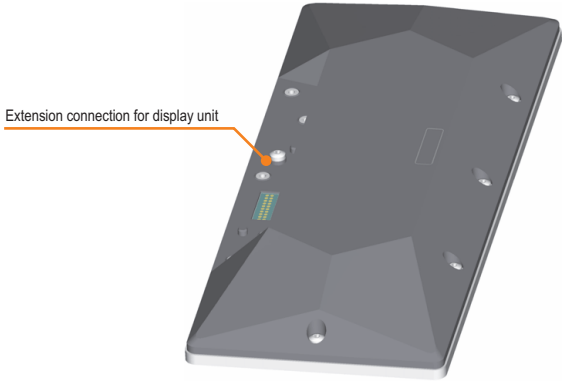


Figure 38: Rear view - 5AC800.EXT3-00

Technical data

Features	5AC800.EXT3-00
Keys/LED[1)] Function keys Operated using Cursor keys Number block Other keys Operated using Key lifespan Key lifespan LED brightness Yellow Green Red	 16 with LED (yellow) PC, X2X - - 8 illuminated ring keys (PB - Push Button) PC, X2X 1,000,0000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd Typ. 35 mcd Typ. 54 mcd **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
Electrical characteristics	
Power consumption	Max. 7 W
E-stop circuit loop resistance	Max. 5 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color legend strips (color gradients)	 Aluminum, naturally anodized[2)] Gray[2)] Polyester Similar to Pantone 427CV[2)] Similar to Pantone white to Pantone 429CV[2)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[2)] (semi-matt)
Outer dimensions Width Height Depth	 135 mm 330 mm 34.9 mm
Weight	Approx. 1.1 kg
Connection	Required for installation to the left of an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 61

Table 21: Technical data - 5AC800.EXT3-00

Environmental characteristics	5AC800.EXT3-00
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 21: Technical data - 5AC800.EXT3-00

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

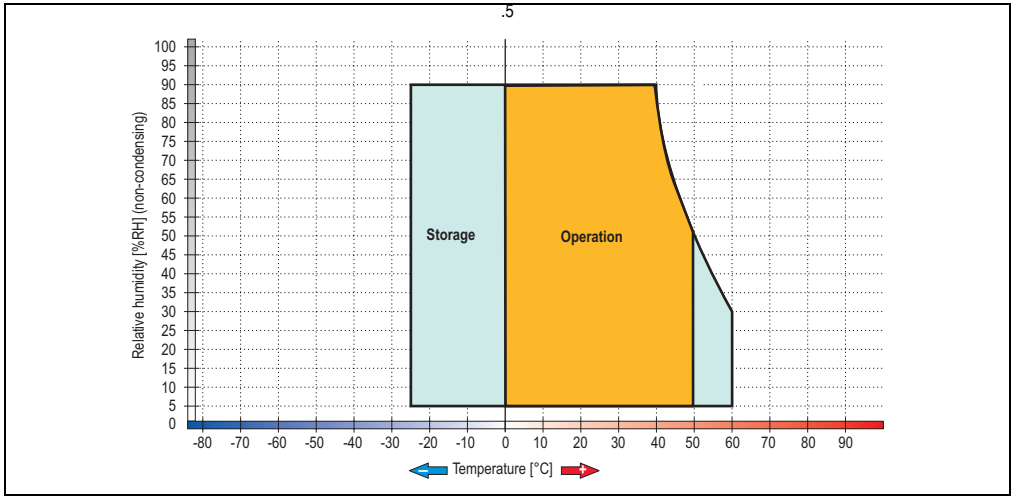
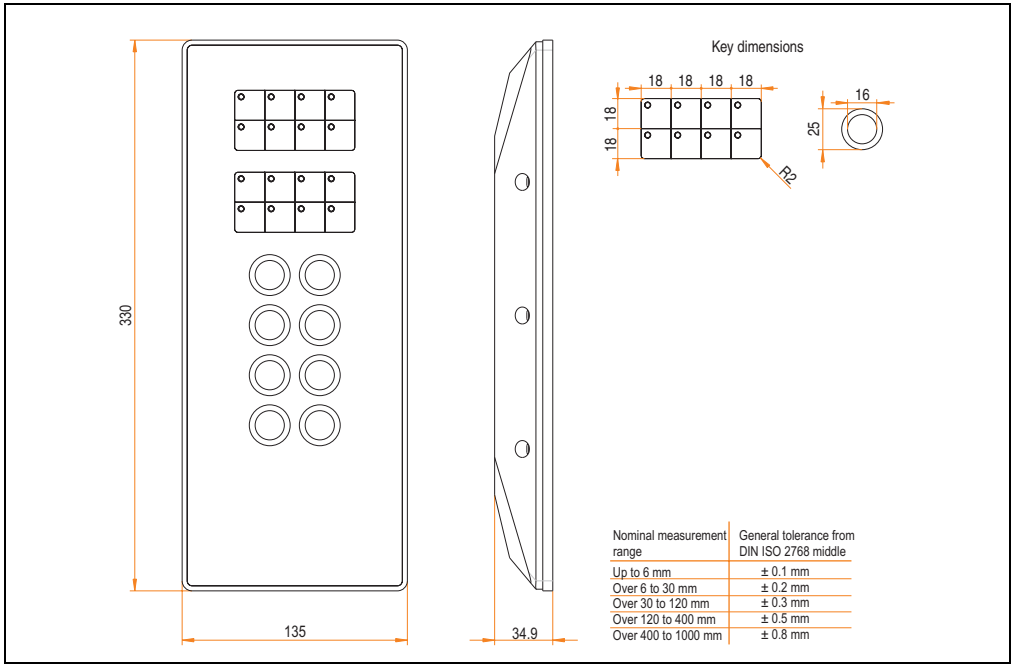


Figure 39: Temperature humidity diagram - 5AC800.EXT3-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 40: Dimensions - 5AC800.EXT3-00

3.2.5 C key extension 8PB right 5AC800.EXT3-01

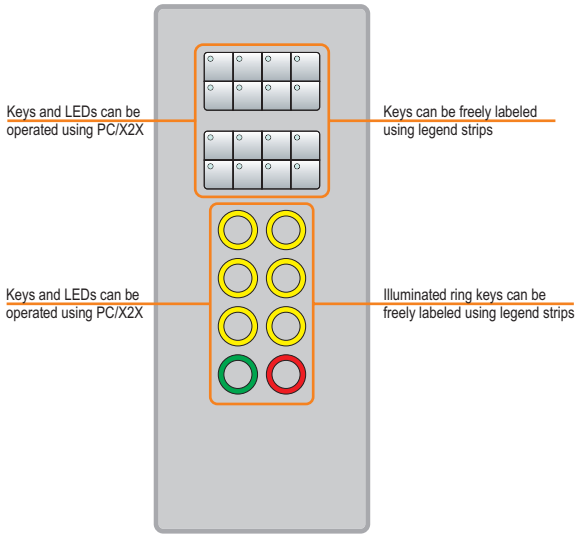


Figure 41: Front view - 5AC800.EXT3-01

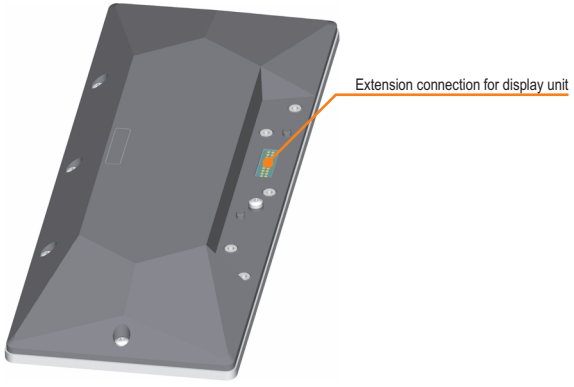


Figure 42: Rear view - 5AC800.EXT3-01

Technical data

Features	5AC800.EXT3-01
Keys/LED[1)] Function keys Operated using Cursor keys Number block Other keys Operated using Key lifespan Key lifespan LED brightness Yellow Green Red	 16 with LED (yellow) PC, X2X - - 8 illuminated ring keys (PB - Push Button) PC, X2X 1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd Typ. 35 mcd Typ. 54 mcd **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
Electrical characteristics	
Power consumption	Max. 7 W
E-stop circuit loop resistance	Max. 5 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color legend strips (color gradients)	 Aluminum, naturally anodized[2)] Gray[2)] Polyester Similar to Pantone 427CV[2)] Similar to Pantone white to Pantone 429CV[2)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[2)] (semi-matt)
Outer dimensions Width Height Depth	 135 mm 330 mm 34.9 mm
Weight	Approx. 1.1 kg
Connection	Required for installation to the right of an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 65

Table 22: Technical data 5AC800.EXT3-01

Environmental characteristics	5AC800.EXT3-01
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 22: Technical data 5AC800.EXT3-01

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

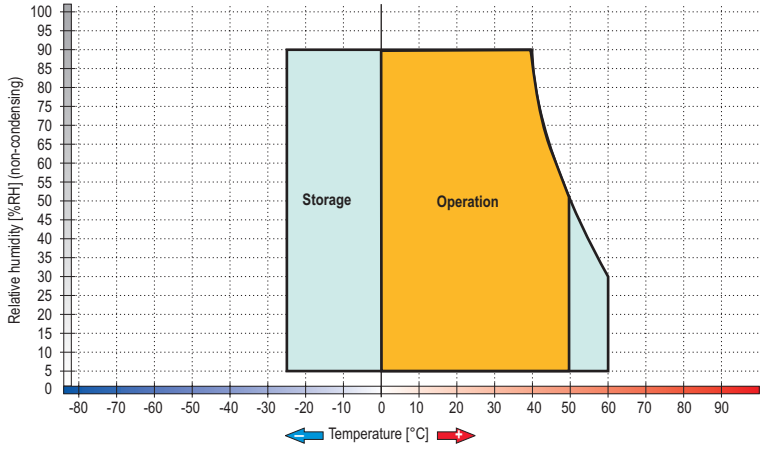
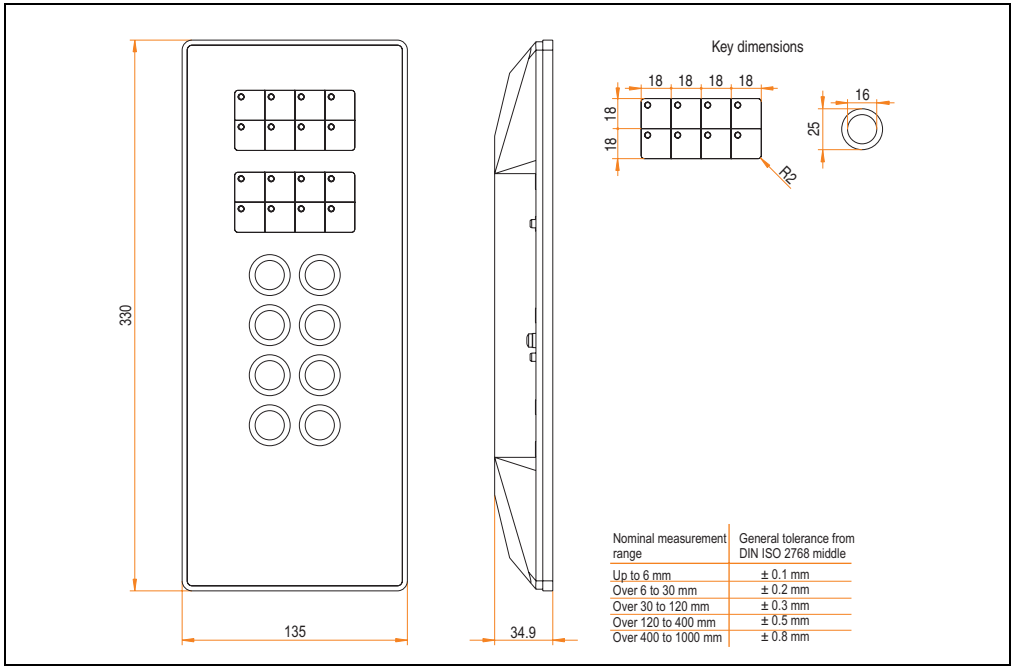


Figure 43: Temperature humidity diagram - 5AC800.EXT3-01

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 44: Dimensions - 5AC800.EXT3-01

3.2.6 C key extension 12PB ES left 5AC800.EXT3-02

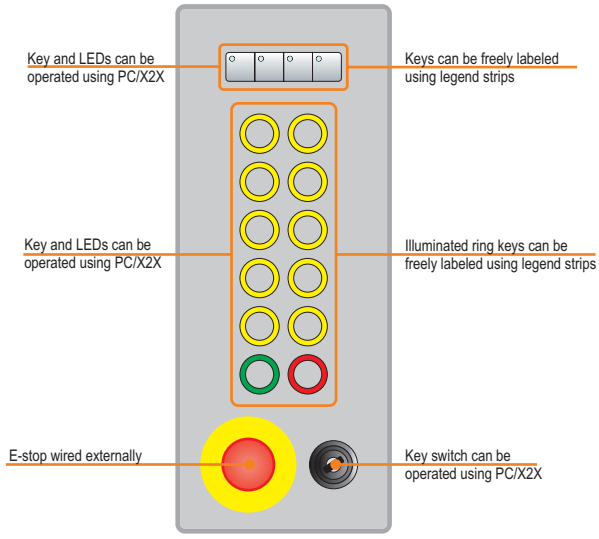


Figure 45: Front view - 5AC800.EXT3-02

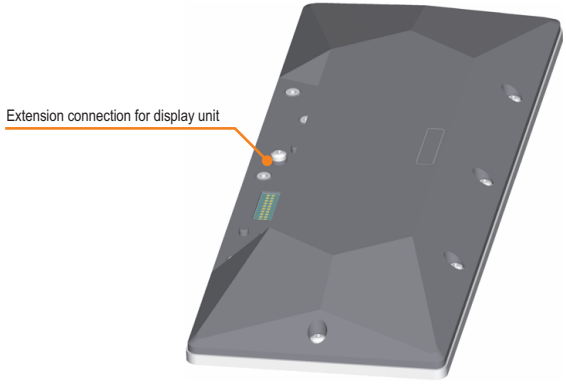


Figure 46: Rear view - 5AC800.EXT3-02

Technical data

Features	5AC800.EXT3-02
Keys/LED[1)] Function keys Operated using Cursor keys Number block Other keys Operated using Key lifespan Key lifespan LED brightness Yellow Green Red	 4 with LED (yellow) PC, X2X - - 12 illuminated ring keys (PB - Push Button) PC, X2X 1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd Typ. 35 mcd Typ. 54 mcd **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
E-stop	also see Appendix A, section 1 "E-stop button" on page 183 2 N.C. contacts, left position
Key switch	also see Appendix A, section 2 "Key switch" on page 185 1 N.O. contact, right position
Electrical characteristics	
Power consumption	Max. 8 W
E-stop circuit loop resistance	Max. 5.5 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color legend strips (color gradients)	 Aluminum, naturally anodized[2)] Gray[2)] Polyester Similar to Pantone 427CV[2)] Similar to Pantone white to Pantone 429CV[2)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[2)] (semi-matt)
Outer dimensions Width Height Depth	 135 mm 330 mm 34.9 mm
Weight	Approx. 1.1 kg
Connection	Required for installation to the left of an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 69

Table 23: Technical data - 5AC800.EXT3-02

Environmental characteristics	5AC800.EXT3-02
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 23: Technical data - 5AC800.EXT3-02

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

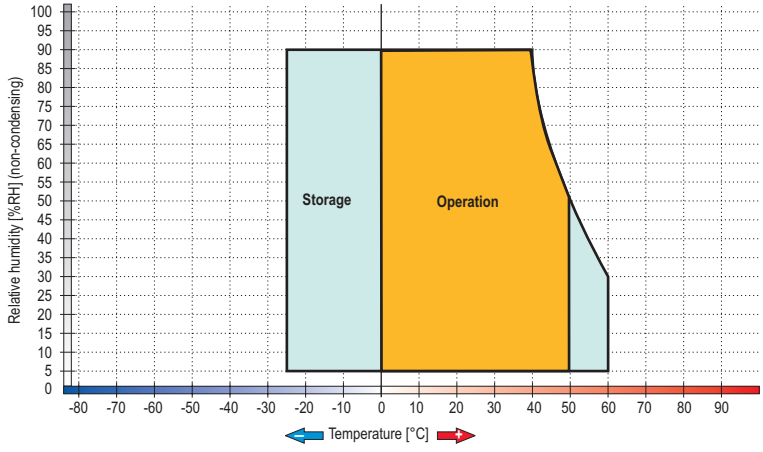


Figure 47: Temperature humidity diagram - 5AC800.EXT3-02

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions

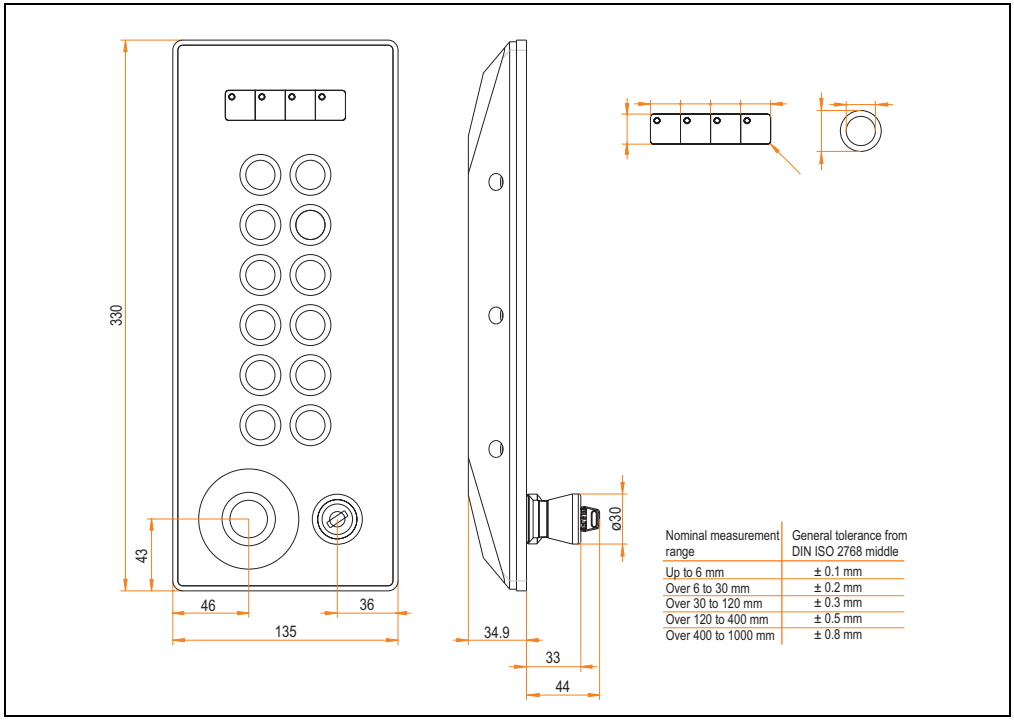


Figure 48: Dimensions - 5AC800.EXT3-02

3.2.7 C key extension 12PB ES right 5AC800.EXT3-03

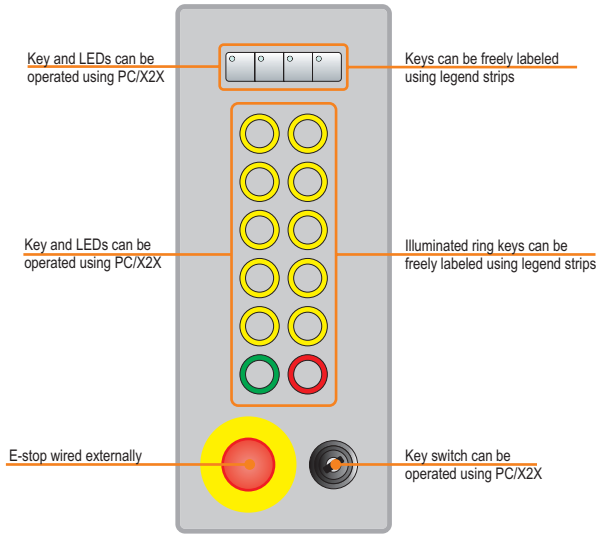


Figure 49: Front view - 5AC800.EXT3-03

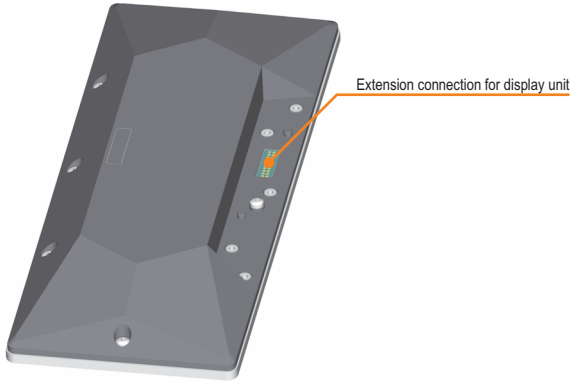


Figure 50: Rear view - 5AC800.EXT3-03

Technical data

Features	5AC800.EXT3-03
Keys/LED[1)] Function keys Operated using Cursor keys Number block Other keys Operated using Key lifespan Key lifespan LED brightness Yellow Green Red	 4 with LED (yellow) PC, X2X - - 12 illuminated ring keys (PB - Push Button) PC, X2X 1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd Typ. 35 mcd Typ. 54 mcd **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
E-stop	also see Appendix A, section 1 "E-stop button" on page 183 2 N.C. contacts, left position
Key switch	also see Appendix A, section 2 "Key switch" on page 185 1 N.O. contact, right position
Electrical characteristics	
Power consumption	Max. 8 W
E-stop circuit loop resistance	Max. 5.5 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color legend strips (color gradients)	 Aluminum, naturally anodized[2)] Gray[2)] Polyester Similar to Pantone 427CV[2)] Similar to Pantone white to Pantone 429CV[2)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[2)] (semi-matt)
Outer dimensions Width Height Depth	 135 mm 330 mm 34.9 mm
Weight	Approx. 1.1 kg
Connection	Required for installation to the right of an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See ".5Temperature humidity diagram - Operation and storage" on page 73

Table 24: Technical data - 5AC800.EXT3-03

Environmental characteristics	5AC800.EXT3-03
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 24: Technical data - 5AC800.EXT3-03

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

.5Temperature humidity diagram - Operation and storage

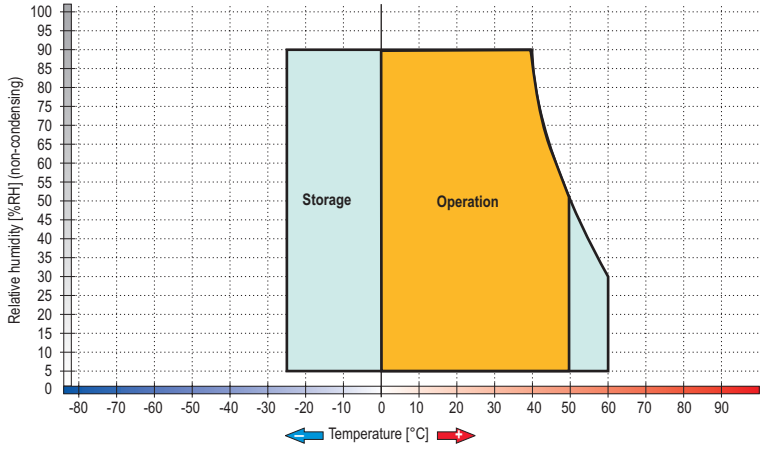
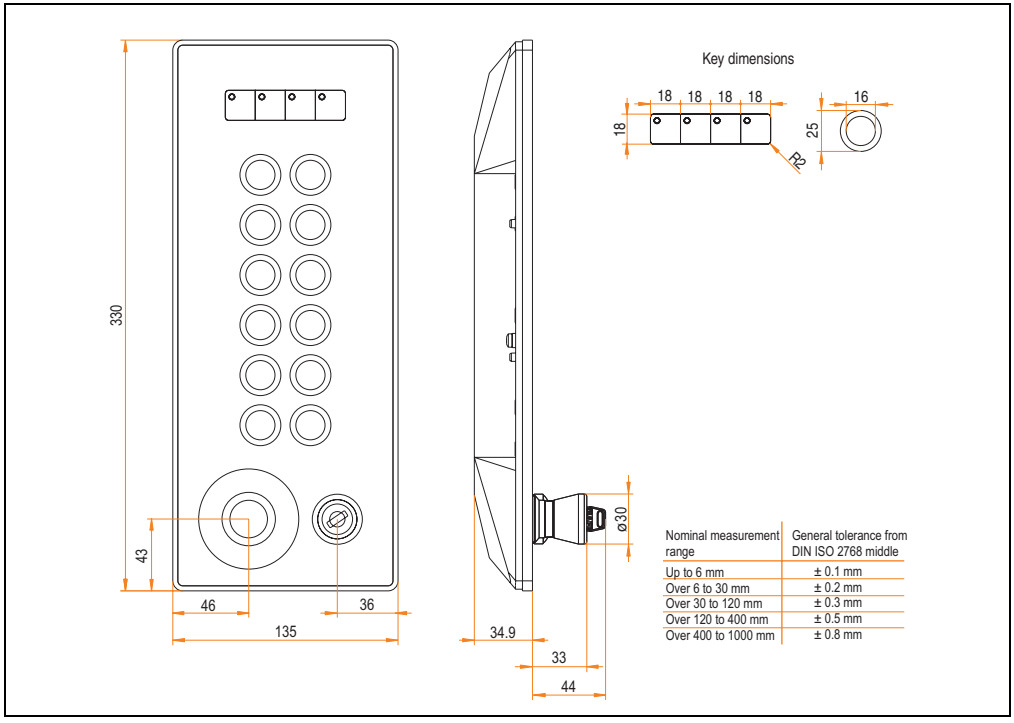


Figure 51: Temperature humidity diagram - 5AC800.EXT3-03

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 52: Dimensions - 5AC800.EXT3-03

3.2.8 C key extension 8PB ES left 5AC800.EXT3-04

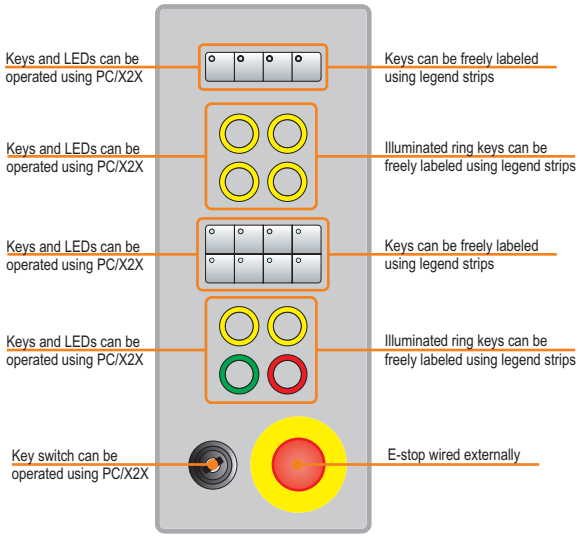


Figure 53: Front view - 5AC800.EXT3-04

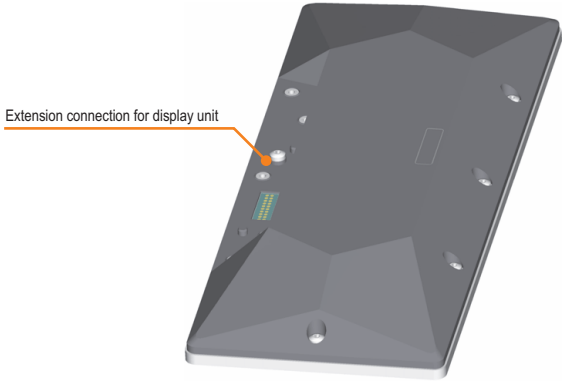


Figure 54: Rear view - 5AC800.EXT3-04

Technical data

Features	5AC800.EXT3-04
Keys/LED[1)] Function keys Operated using Cursor keys Number block Other keys Operated using Key lifespan Key lifespan LED brightness Yellow Green Red	 12 with LED (yellow) PC, X2X - - 8 illuminated ring keys (PB - Push Button) PC, X2X 1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd Typ. 35 mcd Typ. 54 mcd **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
E-stop	also see Appendix A, section 1 "E-stop button" on page 183 2 N.C. contacts, right position
Key switch	also see Appendix A, section 2 "Key switch" on page 185 1 N.O. contact, left position
Electrical characteristics	
Power consumption	Max. 7 W
E-stop circuit loop resistance	Max. 5.5 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color legend strips (color gradients)	 Aluminum, naturally anodized[2)] Gray[2)] Polyester Similar to Pantone 427CV[2)] Similar to Pantone white to Pantone 429CV[2)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[2)] (semi-matt)
Outer dimensions Width Height Depth	 135 mm 330 mm 34.9 mm
Weight	Approx. 1.1 kg
Connection	Required for installation to the left of an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 77

Table 25: Technical data - 5AC800.EXT3-04

Environmental characteristics	5AC800.EXT3-04
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 25: Technical data - 5AC800.EXT3-04

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

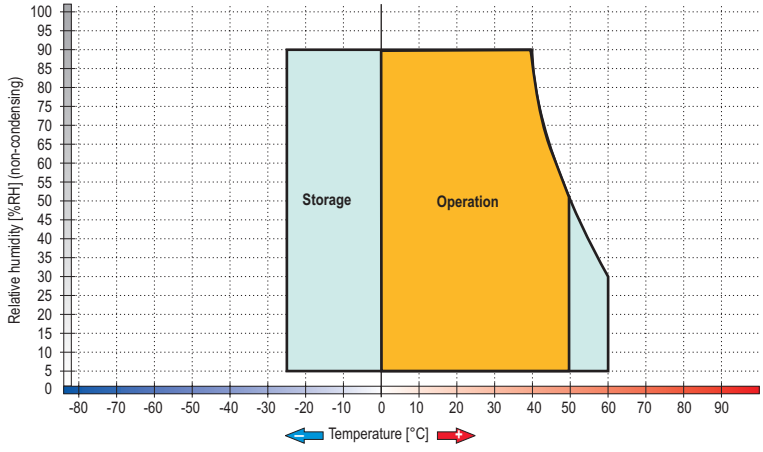


Figure 55: Temperature humidity diagram - 5AC800.EXT3-04

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions

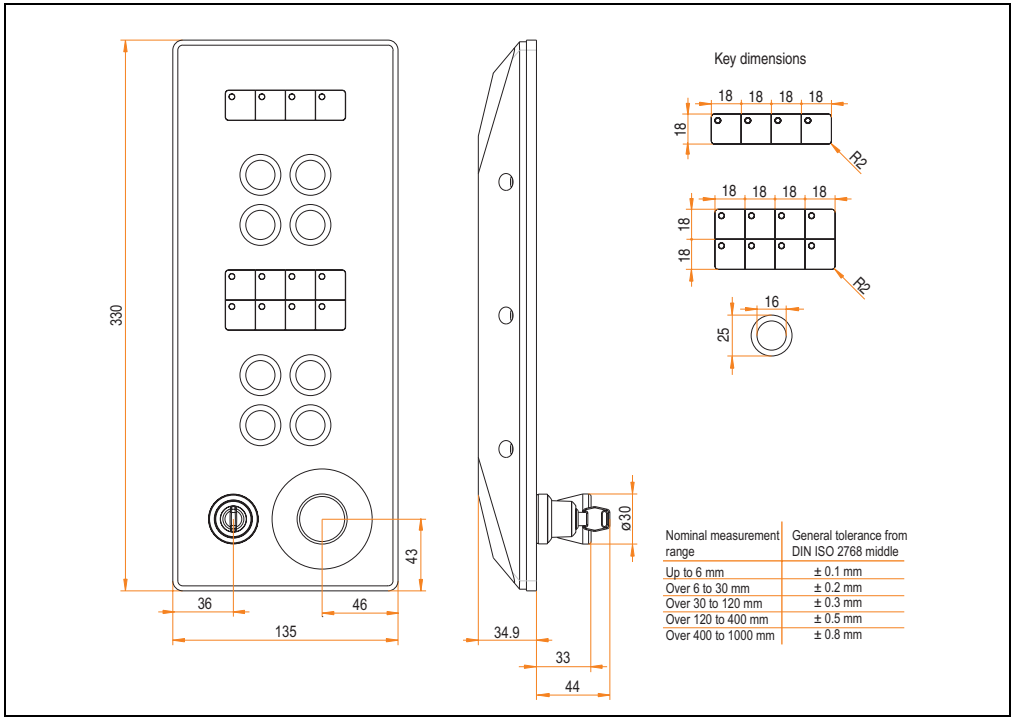


Figure 56: Dimensions - 5AC800.EXT3-04

3.2.9 C key extension 8PB ES right 5AC800.EXT3-05

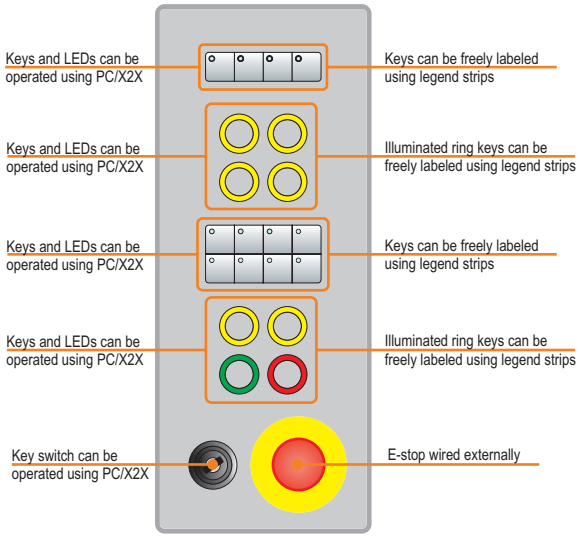


Figure 57: Front view - 5AC800.EXT3-05

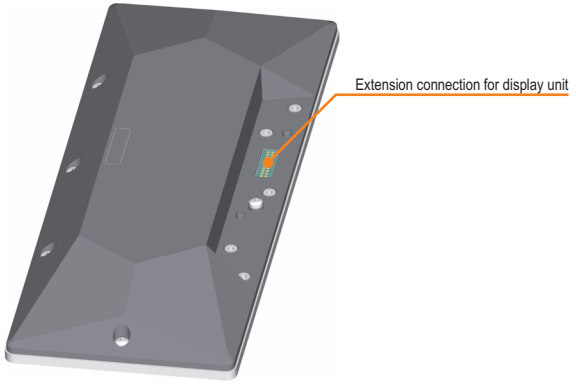


Figure 58: Rear view - 5AC800.EXT3-05

Technical data

Features	5AC800.EXT3-05
Keys/LED[1)] Function keys Operated using Cursor keys Number block Other keys Operated using Key lifespan Key lifespan LED brightness Yellow Green Red	 12 with LED (yellow) PC, X2X - - 8 illuminated ring keys (PB - Push Button) PC, X2X 1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force > 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd Typ. 35 mcd Typ. 54 mcd **Pressing more than one key at a time may result in so-called phantom keys, and may trigger unintended actions.**
E-stop	also see Appendix A, section 1 "E-stop button" on page 183 2 N.C. contacts, right position
Key switch	also see Appendix A, section 2 "Key switch" on page 185 1 N.O. contact, left position
Electrical characteristics	
Power consumption	Max. 7 W
E-stop circuit loop resistance	Max. 5.5 Ohm
Mechanical characteristics	
Front Frame Design Membrane Light background Color legend strips (color gradients)	 Aluminum, naturally anodized[2)] Gray[2)] Polyester Similar to Pantone 427CV[2)] Similar to Pantone white to Pantone 429CV[2)]
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[2)] (semi-matt)
Outer dimensions Width Height Depth	 135 mm 330 mm 34.9 mm
Weight	Approx. 1.1 kg
Connection	Required for installation to the right of an Automation Panel 800 display
Environmental characteristics	
Ambient temperature Operation (0°, -45°, +45°) Storage Transport	 0 to +50°C -25 to +60°C -25 to +60°C
Relative humidity	See "Temperature humidity diagram - Operation and storage" on page 81

Table 26: Technical data - 5AC800.EXT3-05

Environmental characteristics	5AC800.EXT3-05
Vibration Operation (continuous) Operation (occasional) Storage Transport	 2 - 9 Hz: 1.75 mm amplitude / 9 - 200 Hz: 0.5 g 2 - 9 Hz: 3.5 mm amplitude / 9 - 200 Hz: 1 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g 2 - 8 Hz: 7.5 mm amplitude / 8 - 200 Hz: 2 g / 200 - 500 Hz: 4 g
Shock Operation Storage Transport	 15 g, 11 ms 30 g, 15 ms 30 g, 15 ms
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 26: Technical data - 5AC800.EXT3-05

1) The key and LED functions can be freely configured with the B&R Key Editor, which can be found in the download area of the B&R homepage (www.br-automation.com) or on the B&R HMI Driver & Utilities DVD (model number 5SWHMI.0000-00).

2) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Temperature humidity diagram - Operation and storage

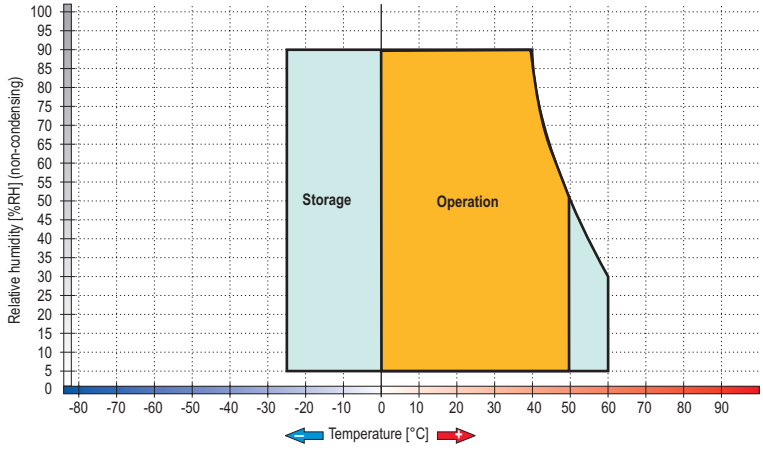


Figure 59: Temperature humidity diagram - 5AC800.EXT3-05

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1 °C per 1000 meters (from 500 meters above sea level).

Dimensions

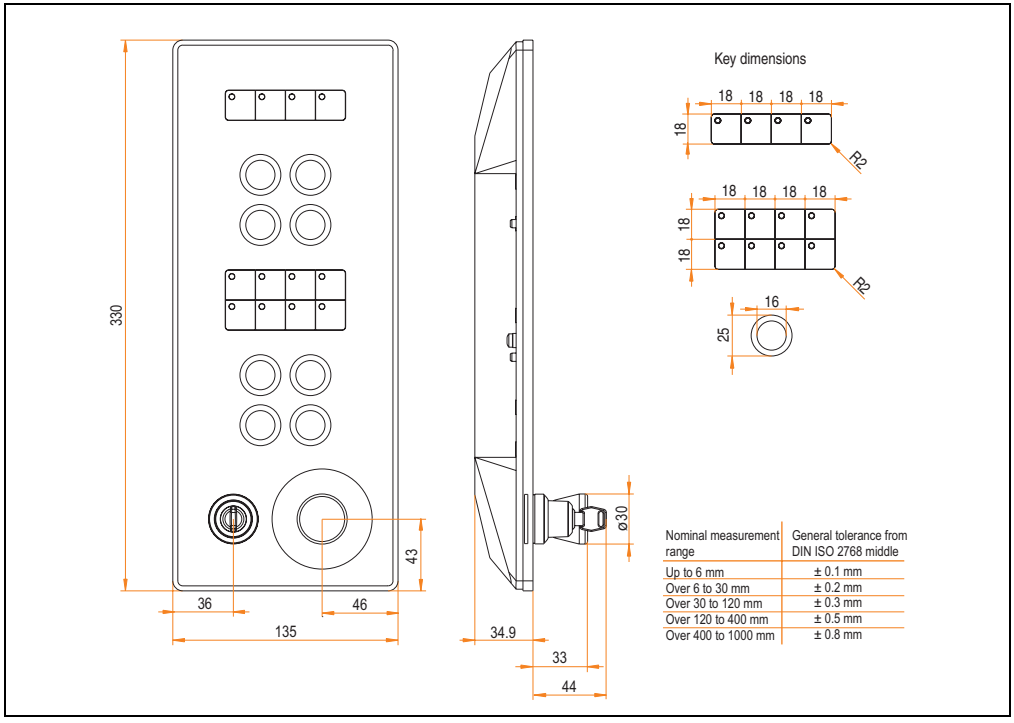


Figure 60: Dimensions - 5AC800.EXT3-05

3.3 Extension connector / flange

3.3.1 Extension cover 5AC800.COV1-00

The cover must be mounted on each extension unit connection slot that is not being used on the AP800 display (see "Installation of components" on page 123).

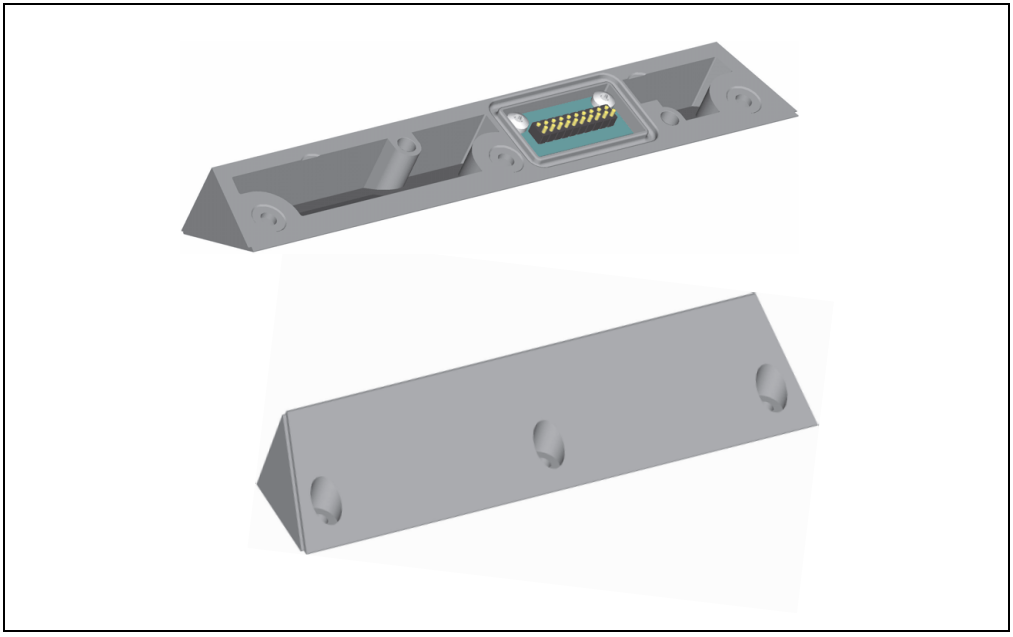


Figure 61: Extension cover 5AC800.COV1-00

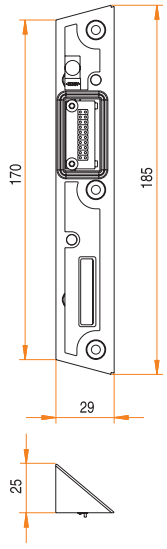
Technical data

Features	5AC800.COV1-00
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[1] (semi-matt)
Weight	Approx. 0.1 kg
Electrical characteristics	
E-stop circuit loop resistance	Max. 0.5 Ohm

Table 27: Technical data - 5AC800.COV1-00

1) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Dimensions



Nennmaßbereich	Allgemeintoleranz nach DIN ISO 2768 mittel
bis 6 mm	± 0,1 mm
über 6 bis 30 mm	± 0,2 mm
über 30 bis 120 mm	± 0,3 mm
über 120 bis 400 mm	± 0,5 mm
über 400 bis 1000 mm	± 0,8 mm

Figure 62: Dimensions - extension cover 5AC800.COV1-00

Contents of delivery

Amount	Component
1	Extension cover
3	Torx screws included

Table 28: Contents of delivery - extension cover 5AC800.COV1-00

3.3.2 USB extension cover 5AC800.COV2-00

The cover must be mounted on each extension unit connection slot that is not being used on the AP800 display (see "Installation of components" on page 123). With this design, a USB flash drive can be connected to the AP800 display.

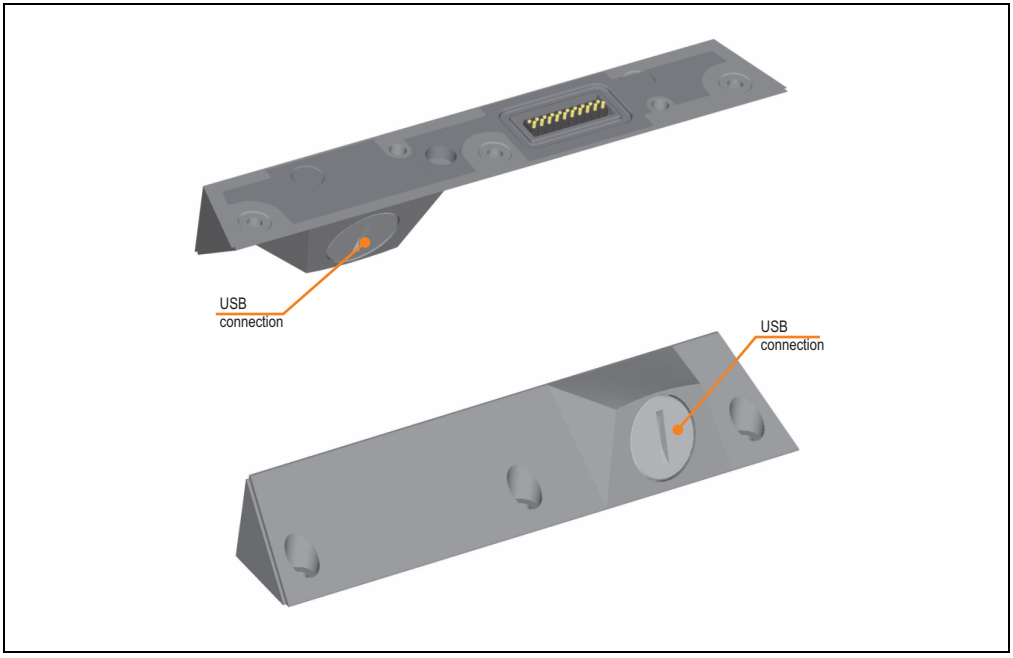


Figure 63: USB extension cover 5AC800.COV2-00

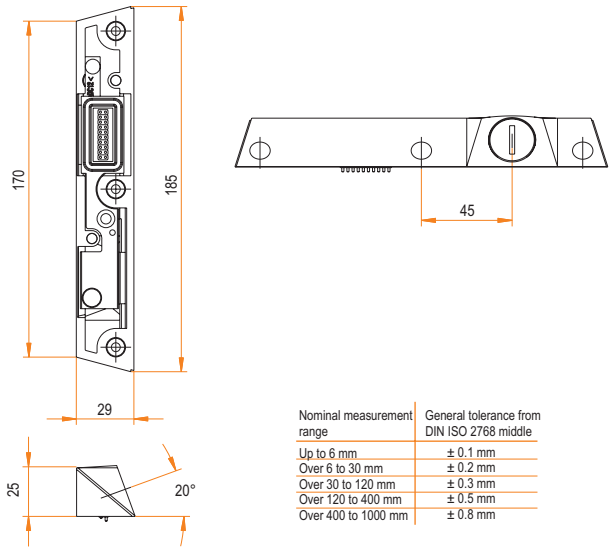
Technical data

Features	5AC800.COV2-00
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[1] (semi-matt)
Weight	Approx. 0.1 kg
Electrical characteristics	
E-stop circuit loop resistance	Max. 0.5 Ohm

Table 29: Technical data - 5AC800.COV2-00

1) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 64: Dimensions - USB extension cover 5AC800.COV2-00

Contents of delivery

Amount	Component
1	USB extension cover
3	Torx screws included

Table 30: Contents of delivery - extension cover USB 5AC800.COV2-00

3.3.3 Extension connector 5AC800.CON1-00

This extension connector is required to connect AP800 displays and extension units (see "Installation of components" on page 123). Straight design.

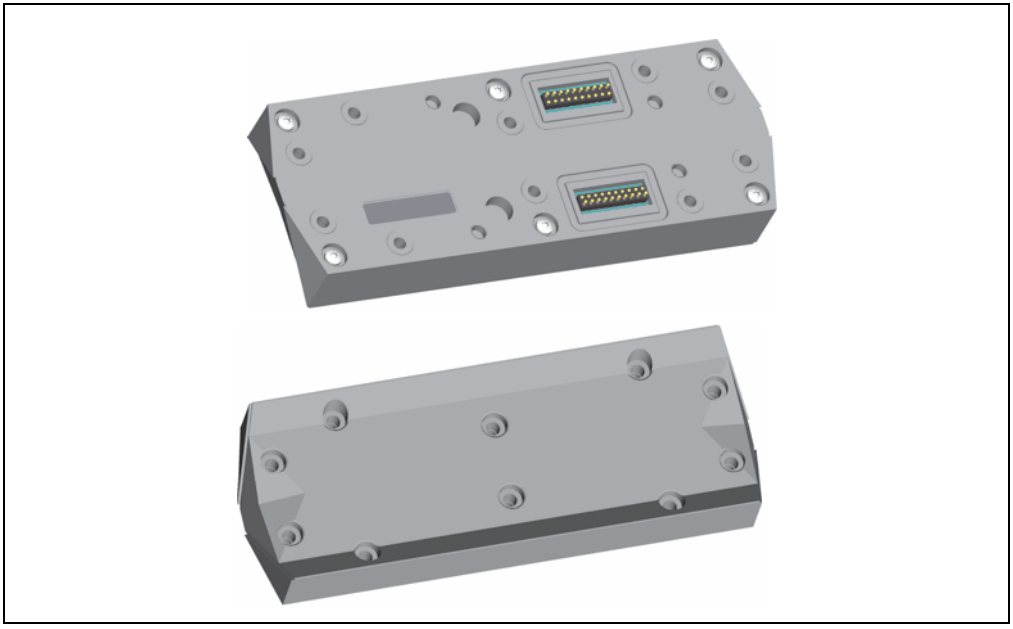


Figure 65: Extension connector 5AC800.CON1-00

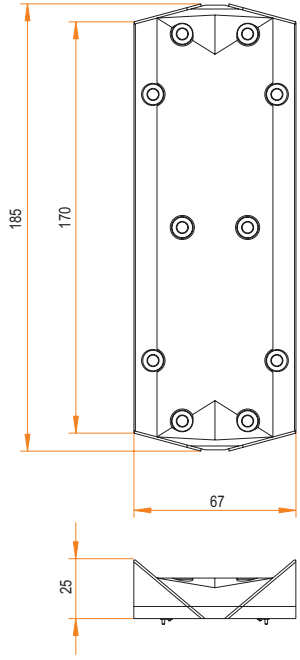
Technical data

Features	5AC800.CON1-00
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[1] (semi-matt)
Weight	Approx. 0,3 kg
Electrical characteristics	
E-stop circuit loop resistance	Max. 1 Ohm

Table 31: Technical data - 5AC800.CON1-00

1) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 66: Dimensions - extension connector 5AC800.CON1-00

Contents of delivery

Amount	Component
1	Extension connector
10	Torx screws included

Table 32: Contents of delivery - extension connector 5AC800.CON1-00

3.3.4 Extension connector 60° 5AC800.CON2-00

This extension connector is required to connect AP800 displays and extension units (see "Installation of components" on page 123). 60° design.

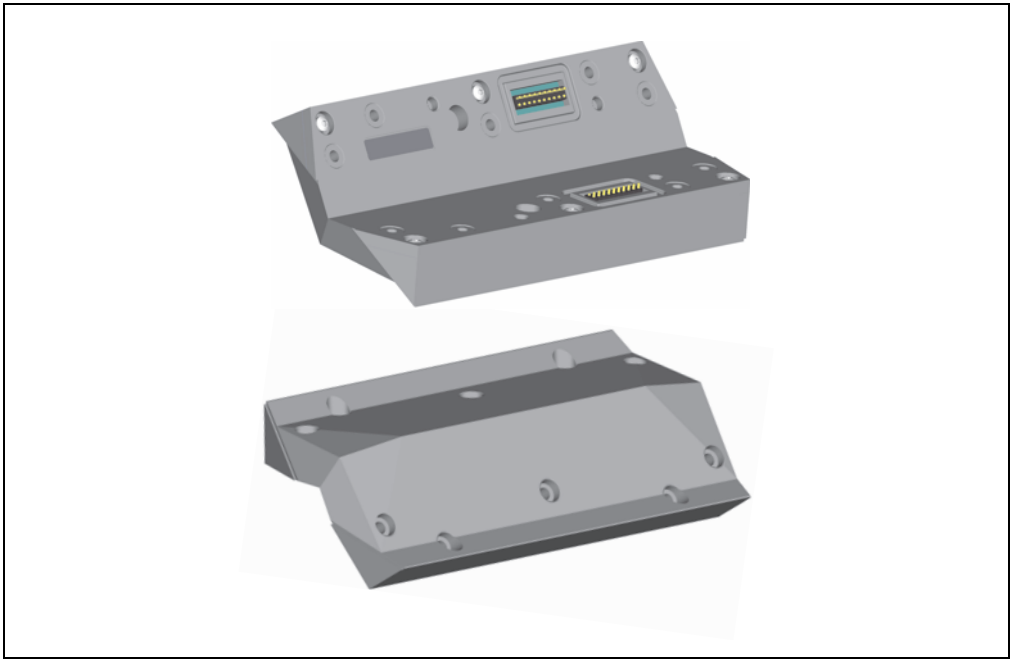


Figure 67: Extension connector 60° 5AC800.CON2-00

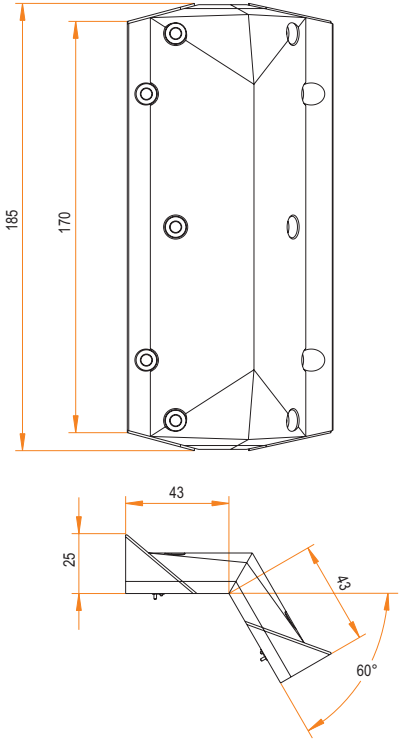
Technical data

Features	5AC800.CON2-00
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[1] (semi-matt)
Weight	Approx. 0.5 kg
Electrical characteristics	
E-stop circuit loop resistance	Max. 1 Ohm

Table 33: Technical data - 5AC800.CON2-00

1) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Dimensions



Nominal measurement range	General tolerance from DIN ISO 2768 middle
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

Figure 68: Dimensions - extension connector 60° 5AC800.CON2-00

Contents of delivery

Amount	Component
1	60° extension connector
10	Torx screws included

Table 34: Contents of delivery - extension connector 60° 5AC800.CON2-00

3.3.5 Extension flange 5AC800.FLG1-00

The extension flange is required for mounting on a support arm system (see chapter 3 "Installation" on page 122 and "Installation of components" on page 123).

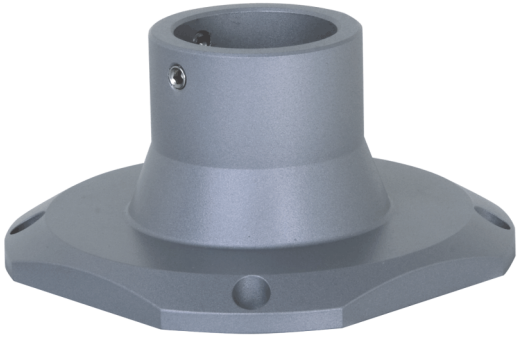


Figure 69: Extension flange 5AC800.FLG1-00

Technical data

Features	5AC800.FLG1-00
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[1] (semi-matt)
Weight	Approx. 0.6 kg

Table 35: Technical data - 5AC800.FLG1-00

1) Depending on the process or batch, there may be visible deviations in the color and surface structure.

Dimensions

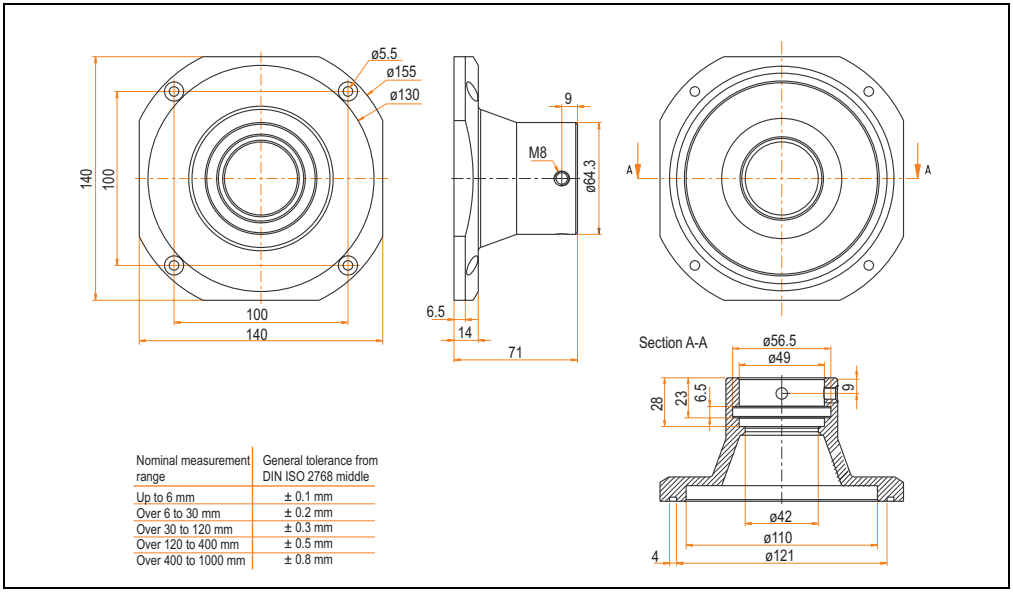


Figure 70: Dimensions - Extension flange 5AC800.FLG1-00

Contents of delivery

Amount	Component
1	Extension flange
4	Torx screws (M4) included

Table 36: Contents of delivery - extension flange 5AC800.FLG1-00

3.4 Cables

3.4.1 Overview

Model number	Short description	Note
5CASDL.0018-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 1.8 meters	
5CASDL.0050-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 5 meters	
5CASDL.0100-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 10 meters	
5CASDL.0150-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 15 meters	
5CASDL.0200-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 20 meters	
5CASDL.0250-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 25 meters	
5CASDL.0300-30	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 30 meters with extender	
5CASDL.0400-30	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 40 meters with extender	
5CAPWR.0018-20	Voltage supply cable for Automation Panel 800; length 1.8 meters.	
5CAPWR.0050-20	Voltage supply cable for Automation Panel 800; length 5 meters.	
5CAPWR.0100-20	Voltage supply cable for Automation Panel 800; length 10 meters.	
5CAPWR.0150-20	Voltage supply cable for Automation Panel 800; length 15 meters.	
5CAPWR.0200-20	Voltage supply cable for Automation Panel 800; length 20 meters.	
5CAPWR.0250-20	Voltage supply cable for Automation Panel 800; length 25 meters.	
5CAPWR.0300-20	Voltage supply cable for Automation Panel 800; length 30 meters.	
5CAPWR.0400-20	Voltage supply cable for Automation Panel 800; length 40 meters.	
5CAX2X.0018-20	X2X cable for Automation Panel 800; length 1.8 meters.	
5CAX2X.0050-20	X2X cable for Automation Panel 800; length 5 meters.	
5CAX2X.0100-20	X2X cable for Automation Panel 800; length 10 meters.	
5CAX2X.0150-20	X2X cable for Automation Panel 800; length 15 meters.	
5CAX2X.0200-20	X2X cable for Automation Panel 800; length 20 meters.	
5CAX2X.0250-20	X2X cable for Automation Panel 800; length 25 meters.	
5CAX2X.0300-20	X2X cable for Automation Panel 800; length 30 meters.	
5CAX2X.0400-20	X2X cable for Automation Panel 800; length 40 meters.	

Table 37: Model number overview - Cables

3.4.2 SDL cable 5CASDL.0xxx-20 Rev. >= A5

The 5CASDL.0xxx-20 Rev. ≥ A5 SDL cables are designed for both fixed and flexible installations (e.g. in support arm systems).

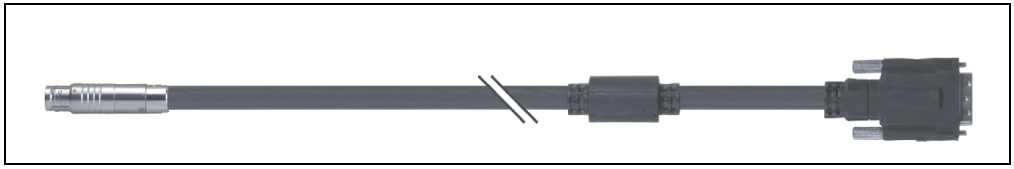


Figure 71: SDL cable 5CASDL.0xxx-20 Rev. ≥ A5

Caution!

SDL cables can only be plugged in and unplugged when the device is turned off.

Technical data

Mechanical characteristics	5CASDL.0018-20	5CASDL.0050-20	5CASDL.0100-20	5CASDL.0150-20	5CASDL.0200-20	5CASDL.0250-20
Length Tolerance	1.8 m ±20 mm	5 m ±45 mm	10 m ±90 mm	15 m ±135 mm	20 m ±180 mm	25 m ±230 mm
Weight	Approx. 450 g	Approx. 1000 g	Approx. 2000 g	Approx. 3000 g	Approx. 4000 g	Approx. 5000 g
Outer diameter Maximum	12 mm					
Connector type Connection cycles	ODU Minisnap 24-pin / DVI-D (24+1), male 2000 / 200					
Flexibility	Flexible; valid for circular plug - ferrite magnet (tested 300,000 cycles with 15x cable diameter, 4800 cycles / hour)					
Flex radius Fixed layout flexible installation	See figure "Flex radius specification" on page 95 ≥6x cable diameter (from plug - ferrite magnet, circular plug - ferrite magnet) ≥ 15x cable diameter (from plug - ferrite magnet, circular plug - ferrite magnet)					
Max. tension During installation During operation	≤400 N ≤50 N					
Materials Cable shielding Color	RoHS compliant Aluminum foil clad + tinned copper mesh Black (similar to RAL 9005)					
Shielding	Individual cable pairs and entire cable					
Electrical properties (at +20°C)						
Wire cross section	AWG 24 / AWG 26					
Line resistance AWG 24 AWG 26	≤95Ω/km ≤145 Ω/km					
Insulation resistance	Min. 10 MΩ/km					

Table 38: Technical data - SDL cable 5CASDL.0xxx-20 Rev. ≥ A5

Electrical properties (at +20°C)	5CASDL.0018-20	5CASDL.0050-20	5CASDL.0100-20	5CASDL.0150-20	5CASDL.0200-20	5CASDL.0250-20
Wave impedance	100 ±10Ω					
Test voltage Wire/wire Wire/shield	1 kV_{eff} 0.5 kV_{eff}					
Operating voltage	≤30 V					
Environmental characteristics						
Temperature resistance Fixed installation Moving Storage	-20 to +80°C -5 to +60°C -20 to +80°C					
Standards and certifications						
Torsion load[1)]	100,000 cycles (tested angle of rotation: ± 85°; speed: 50 cycles / minute)					
Cable drag chain[1)]	300,000 cycles Tested flex radius: 180 mm;15 x cable diameter; hub: 460 mm; speed: 4800 cycles / hour					
Approbation	UL AWM 20236 80 °C 30 V					
Oil and hydrolysis resistance	According to VDE 0282-10					

Table 38: Technical data - SDL cable 5CASDL.0xxx-20 Rev. ≥ A5 (cont.)

1) See also "SDL flex cable - test description" on page 166

Flex radius specification

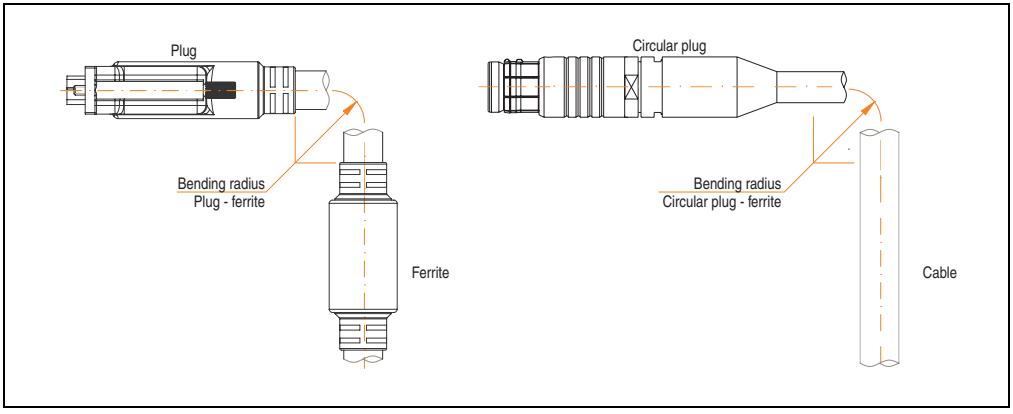


Figure 72: Flex radius specification

Dimensions

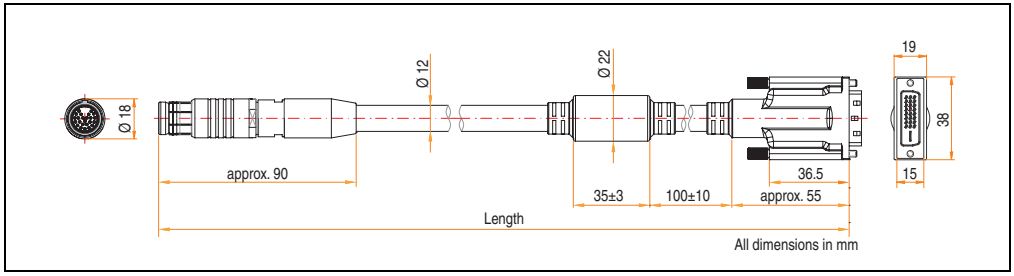


Figure 73: Dimensions - SDL cable 5CASDL.0xxx-20 Rev. ≥ A5

Cable specifications

The following figure shows the pin assignments for the SDL cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The SDL cables provided by B&R are guaranteed to function properly.

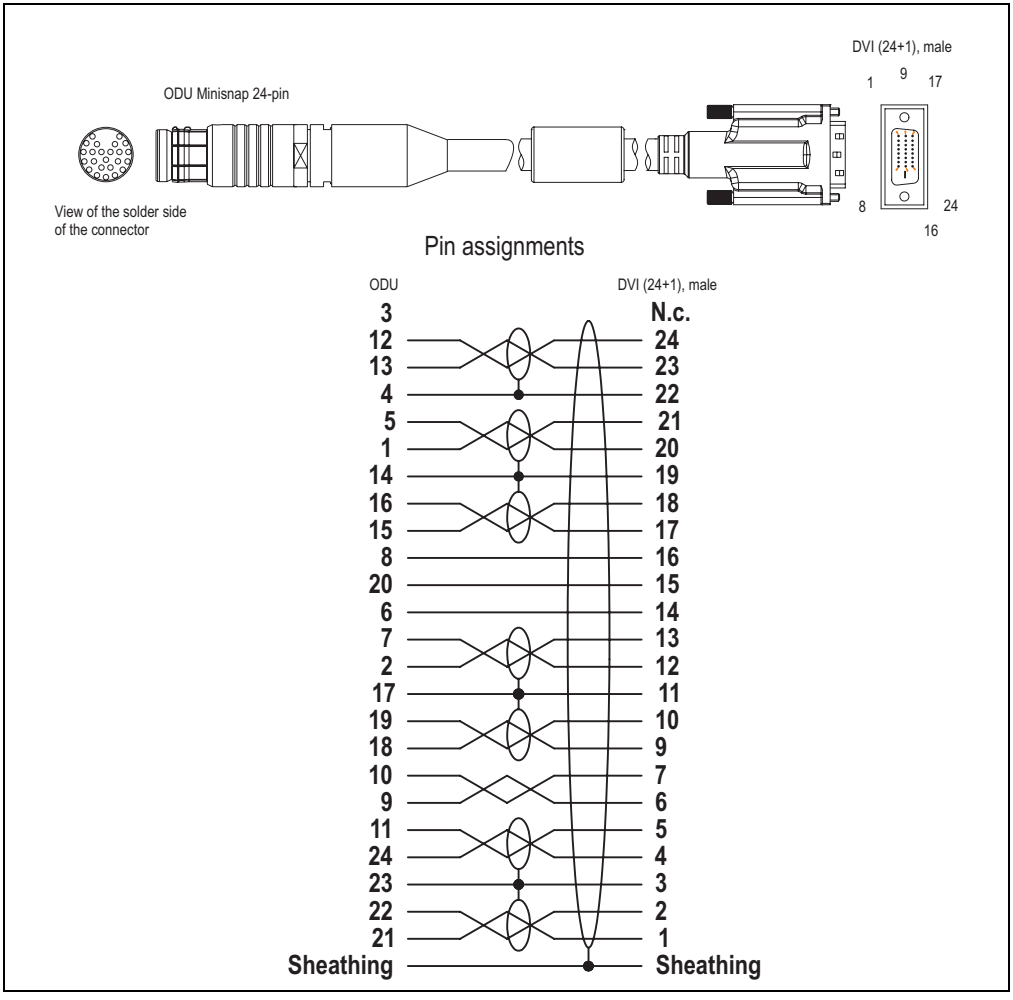


Figure 74: Pin assignments - SDL cable 5CASDL.0xxx-20 Rev. ≥ A5

3.4.3 SDL cable 5CASDL.0xxx-20 Rev. < A5

The SDL cable 5CASDL.0xxx-20 Rev. < A5 is designed for a fixed layout. The SDL flex cable 5CASDL.0xxx-20 Rev. ≥ A5 is required for a flexible installation (e.g. in support arm systems).

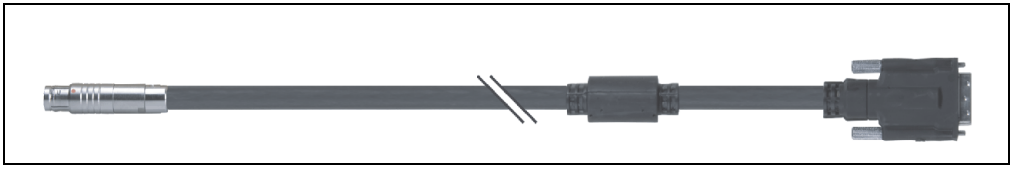


Figure 75: SDL cable 5CASDL.0xxx-20 Rev. < A5

Caution!

SDL cables can only be plugged in and unplugged when the device is turned off.

Technical data

Features	5CASDL.0018-20	5CASDL.0050-20	5CASDL.0100-20	5CASDL.0150-20	5CASDL.0200-20	5CASDL.0250-20
Length Tolerance	1.8 m ±50 mm	5 m ±200 mm	10 m ±100 mm	15 m ±120 mm	20 m ±150 mm	25 m ±200 mm
Cable diameter Typical Maximum	8.6 ±0.2 mm 9 mm		11 ±0.2 mm 11.5 mm			
Shielding	Individual cable pairs and entire cable					
Connector type	ODU Minisnap 24-pin, DVI-D (24+1), male					
Wire cross section	AWG 28		AWG 24			
Line resistance	Max. 237Ω/km		Max. 93Ω/km			
Insulation resistance	Min. 10 MΩ/km					
Flexibility	Limited flexibility; valid for cable - circular plug (tested 100 cycles with 5x cable diameter, 20 cycles / minute)					
Flex radius Fixed layout	See figure "Flex radius specification" on page 99 ≥ 5x cable diameter (plug - ferrite magnet and circular plug - cable)					
Plug connection cycles	100					
Weight	Approx. 300 g	Approx. 590 g	Approx. 2100 g	Approx. 3000 g	Approx. 4100 g	Approx. 5100 g

Table 39: Technical data - SDL cable 5CASDL.0xxx-20 Rev. < A5

Flex radius specification

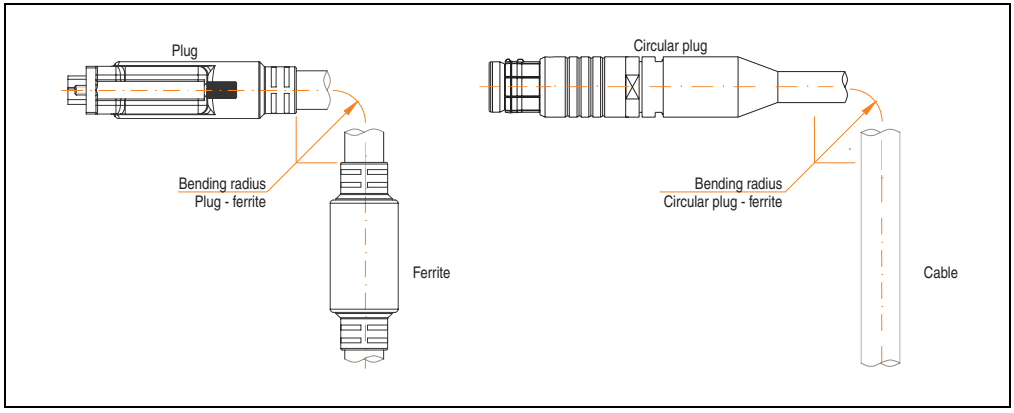


Figure 76: Flex radius specification

Dimensions

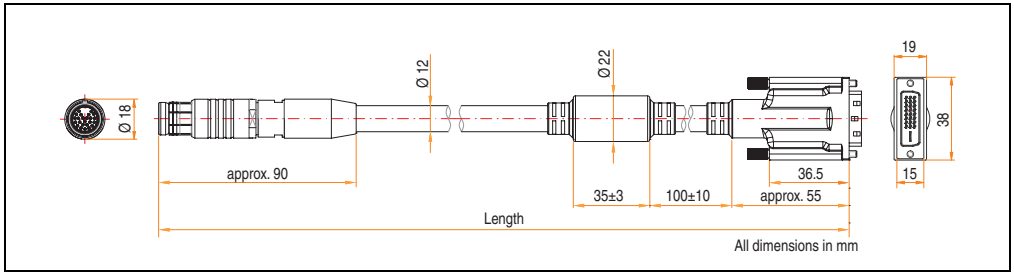


Figure 77: Dimensions - SDL cable 5CASDL.0xxx-20 Rev. < A5

Cable specifications

The following figure shows the pin assignments for the SDL cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The SDL cables provided by B&R are guaranteed to function properly.

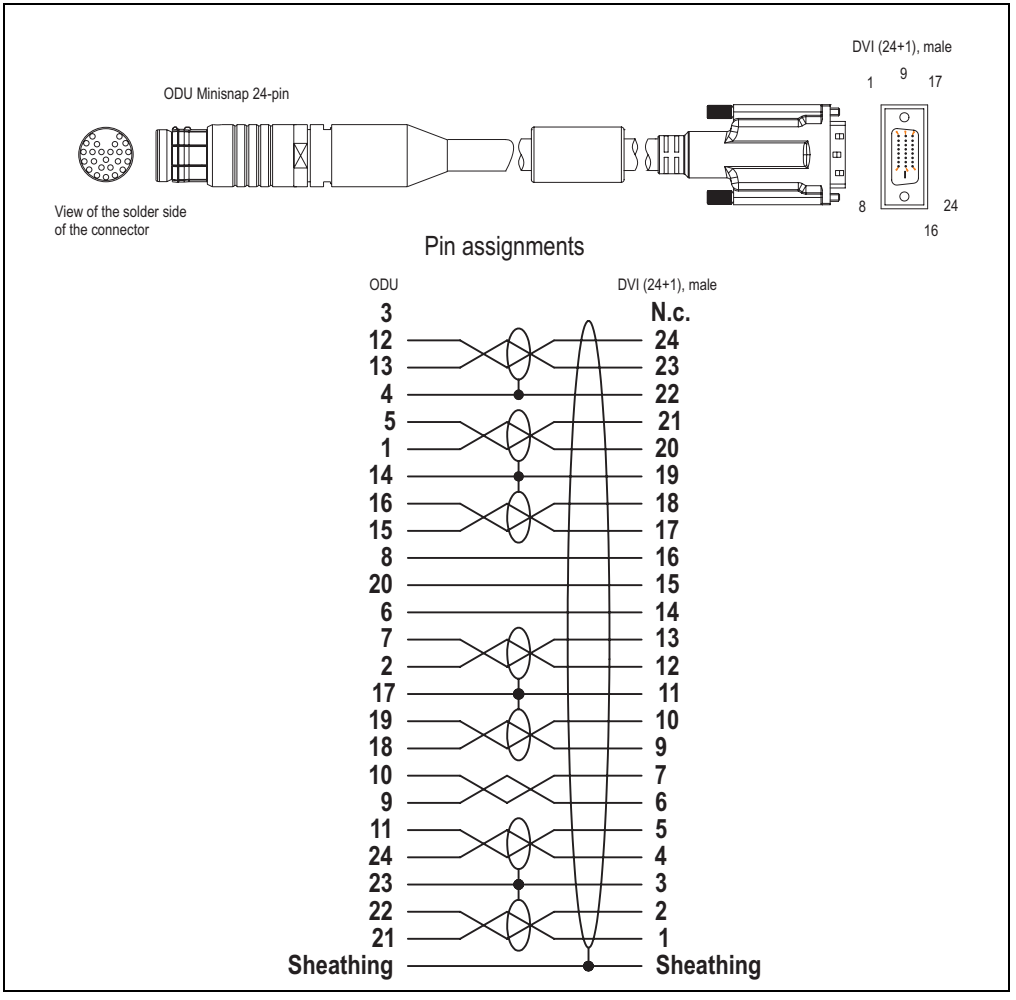


Figure 78: Pin assignments - SDL cable 5CASDL.0xxx-20 Rev. < A5

3.4.4 SDL cable with extender 5CASDL.0x00-30 Rev. >= A5

The SDL cable with extender 5CASDL.0x00-30 Rev. ≥ A5 is designed for both fixed and flexible installations (e.g. in support arm systems).

Figure 79: SDL cable with extender 5CASDL.0x00-30 Rev. ≥ A5

Caution!

SDL cables with extender can only be plugged in and unplugged when the device is turned off.

Technical data

Mechanical characteristics	5CASDL.0300-30	5CASDL.0400-30
Length Tolerance	30 m ±280 mm	40 m ±380 mm
Dimensions of extender box Height Width Length	20 mm 34 mm 125 mm	
Weight	Approx. 6250 g	Approx. 8250 g
Outer diameter Maximum	12 mm	
Connector type Connection cycles	ODU Minisnap 24-pin / DVI-D (24+1), male 2000 / 200	
Flexibility	flexible; valid for ferrite magnet - ferrite magnet (tested 300,000 cycles with 15 x cable diameter, 4800 cycles / hour)	
Flex radius Fixed layout flexible installation	See figure "Flex radius specification" on page 102 ≥ 6x cable diameter (from plug - ferrite magnet, circular plug - extender) ≥ 10 x cable diameter (from ferrite magnet - extender) ≥ 15x cable diameter (from plug - ferrite magnet)	
Max. tension During installation During operation	≤400 N ≤50 N	
Materials Cable shielding Color	RoHS compliant Aluminum foil clad + tinned copper mesh Black (similar to RAL 9005)	
Shielding	Individual cable pairs and entire cable	

Table 40: Technical data - SDL cable with extender 5CASDL.0x00-30 Rev. ≥ A5

Electrical properties (at +20°C)	5CASDL.0300-30	5CADSDL.0400-30
Wire cross section	AWG 24 / AWG 26	
Line resistance AWG 24 AWG 26	 ≤95Ω/km ≤145 Ω/km	
Insulation resistance	Min. 10 MΩ/km	
Wave impedance	100 ± 10Ω	
Test voltage Wire/wire Wire/shield	 1 kV_{eff} 0.5 kV_{eff}	
Operating voltage	≤30 V	
Environmental characteristics		
Temperature resistance Fixed installation Moving Storage	 -20 to +80°C -5 to +60°C -20 to +80°C	
Standards and certifications		
Torsion load[1)]	100,000 cycles (tested angle of rotation: ± 85°; speed: 50 cycles / minute)	
Cable drag chain[1)]	300,000 cycles Tested flex radius: 180 mm;15 x cable diameter; hub: 460 mm; speed: 4800 cycles / hour	
Approbation	UL AWM 20236 80 °C 30 V	
Oil and hydrolysis resistance	According to VDE 0282-10	

Table 40: Technical data - SDL cable with extender 5CASDL.0x00-30 Rev. ≥ A5

1) See "SDL flex cable - test description" on page 166

Flex radius specification

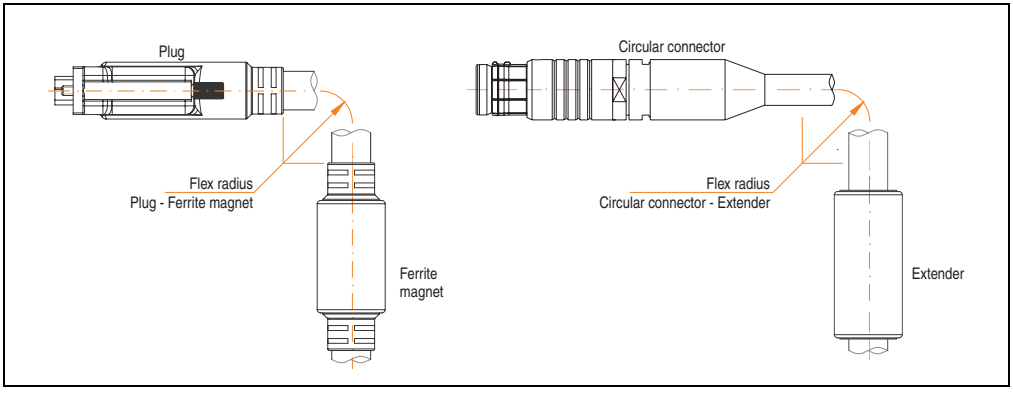


Figure 80: Flex radius specification

Dimensions

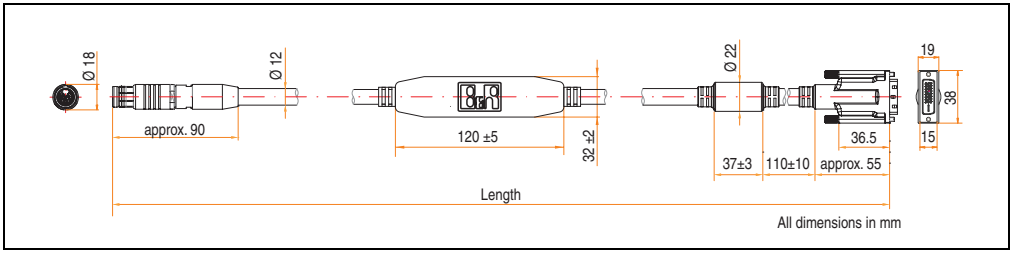


Figure 81: Dimensions - SDL cable with extender 5CASDL.0x00-30 Rev. ≥ A5

Cable specifications

The following figure shows the pin assignments for the SDL cable with extender available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The SDL cables provided by B&R are guaranteed to function properly.

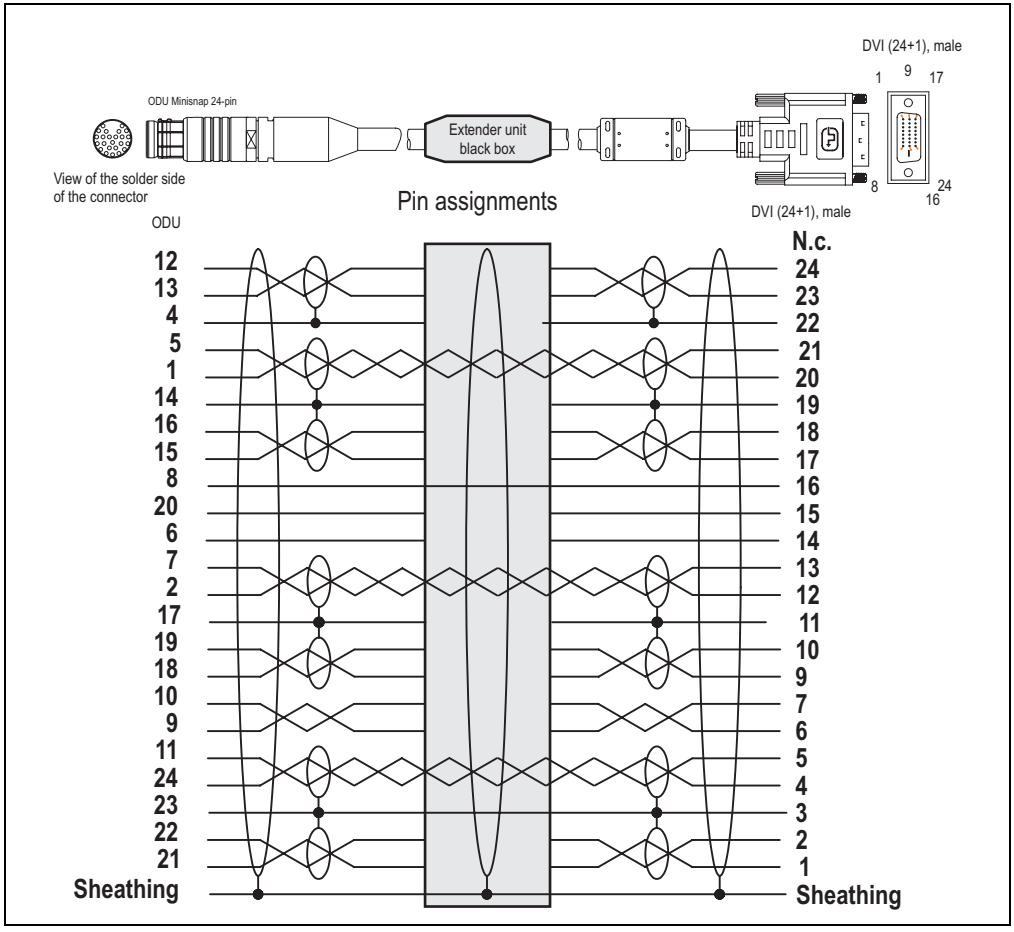


Figure 82: Pin assignments - SDL cable with extender 5CASDL.0x00-30 Rev. ≥ A5

3.4.5 SDL cable with extender 5CASDL.0x00-30 Rev. < A5

The SDL cable with extender 5CASDL.0x00-30 Rev. < A5 is designed for a fixed layout. Use of the SDL cable (with extender) 5CASDL.0x00-30 Rev. ≥ A5 is required for a flexible installation (e.g. in support arm systems).

Figure 83: SDL cable with extender 5CASDL.0x00-30 Rev. < A5

Caution!

SDL cables with extender can only be plugged in and unplugged when the device is turned off.

Technical data

Features	5CASDL.0300-30	5CASDL.0400-30
Length Tolerance	30 m ±280 mm	40 m ±380 mm
Dimensions of extender box Height Width Length	20 mm 34 mm 125 mm	
Cable diameter Maximum	11.5 mm	
Shielding	Individual cable pairs and entire cable	
Connector type	ODU Minisnap 24-pin, DVI-D (24+1), male	
Wire cross section	AWG 24	
Line resistance	Max. 93Ω/km	
Insulation resistance	Min. 10 MΩ/km	
Flexibility	Limited flexibility; valid for ferrite magnet - circular plug (tested 100 cycles with 5x cable diameter, 20 cycles / minute)	
Flex radius Fixed layout	See figure "Flex radius specification" on page 106 ≥ 5x cable diameter (from plug - ferrite magnet, circular plug - extender)	
Plug connection cycles	100	
Weight	Approx. 6250 g	Approx. 8250 g

Table 41: Technical data - SDL cable with extender 5CASDL.0x00-30 Rev. < A5

Flex radius specification

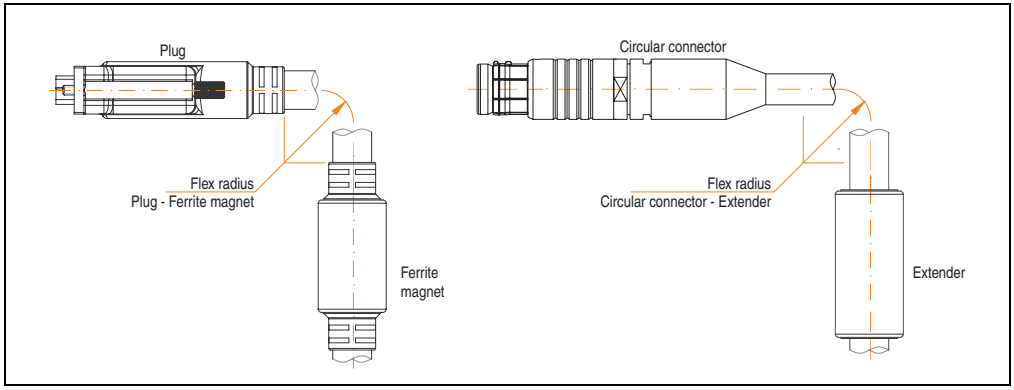


Figure 84: Flex radius specification

Dimensions

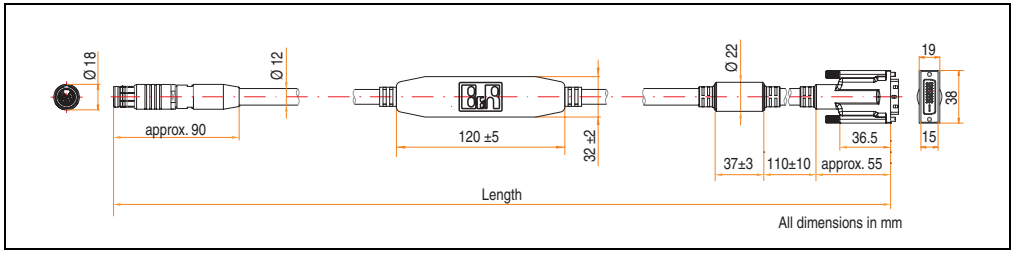


Figure 85: Dimensions - SDL cable with extender 5CASDL.0x00-30 Rev. < A5

Cable specifications

The following figure shows the pin assignments for the SDL cable with extender available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. The SDL cables provided by B&R are guaranteed to function properly.

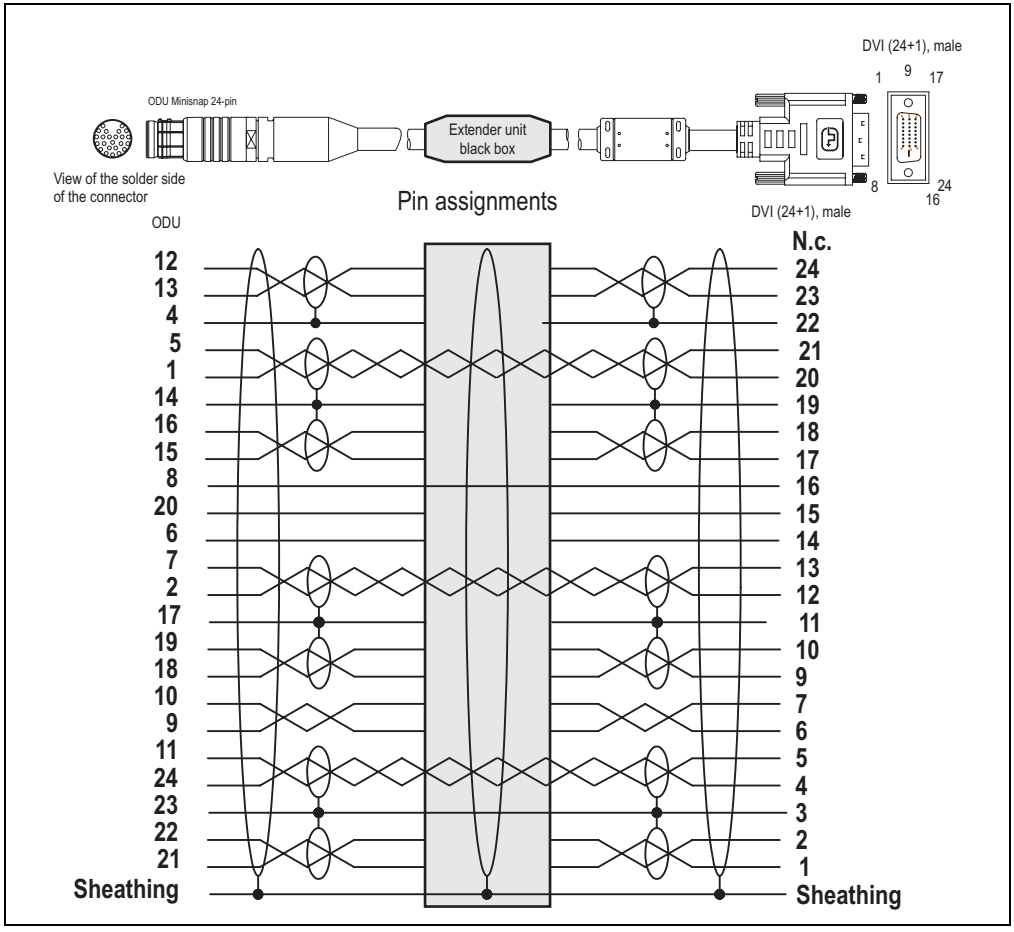


Figure 86: Pin assignments - SDL cable with extender 5CASDL.0x00-30 Rev. < A5

3.4.6 Voltage supply cable 5CAPWR.0xxx-20

The voltage supply cables 5CAPWR.0xxx-20 are designed for both fixed and flexible installations (e.g. in support arm systems).

Figure 87: Voltage supply cable 5CAPWR.0xxx-20

Technical data

Features	5CAPWR.0018-20	5CAPWR.0050-20	5CAPWR.0100-20	5CAPWR.0150-20	5CAPWR.0200-20	5CAPWR.0250-20	5CAPWR.0300-20	5CAPWR.0400-20
Length Tolerance	1.8 m ±20 mm	5 m ±45 mm	10 m ±90 mm	15 m ±135 mm	20 m ±180 mm	25 m ±230 mm	30 m ±330 mm	40 m ±380 mm
Weight	Approx. 350 g	Approx. 450 g	Approx. 840 g	Approx. 1 kg	Approx. 1.4 kg	Approx. 1.7 kg	Approx. 2 kg	Approx. 2.7 kg
Connector type	ODU Minisnap 3-pin							
Cable diameter	Max. 6.6 mm							
Flexibility	Flexible							
Flex radius Fixed layout flexible installation	See figure "Flex radius specification" on page 109 ≥ 10x cable diameter (from circular plug - cable) ≥ 15x cable diameter (from circular plug - cable)							
Materials Cable shielding Color	Aluminum foil clad + tinned copper mesh Gray (similar to RAL 7001)							
Wire cross section	1,00 mm^2 / AWG 17							
Line resistance	Max. 19.5 Ω/km							
Insulation resistance	Min. 200 MΩ/km at +20°C							
Test voltage	2000 V							
Operating voltage	Max. 500 V							
Current load	16,0 A at +25°C							

Table 42: Technical data - voltage supply cable 5CAPWR.0xxx-20

Flex radius specification

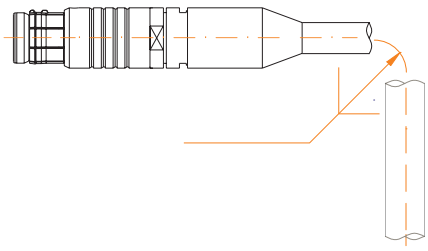


Figure 88: Flex radius specification

Plug dimensions (ODU Minisnap)

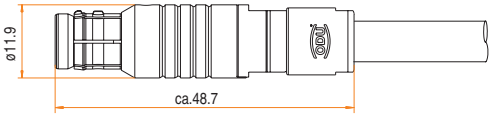


Figure 89: Plug dimensions (ODU Minisnap) - voltage supply cable 5CAPWR.0xxx-20

Cable specifications

The following figure shows the pin assignments for the voltage supply cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications. The maximum length is also 40 m for self-built cables.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. B&R guarantees the performance of all cables that they provide.

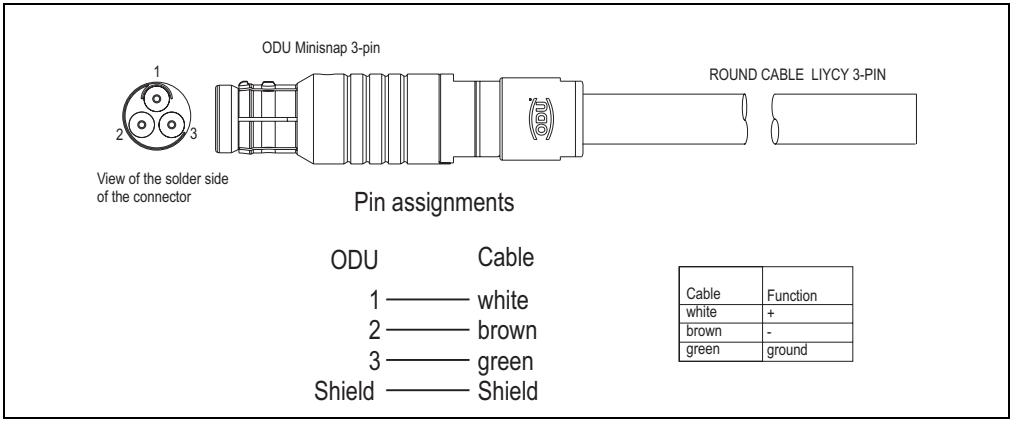


Figure 90: Pin assignments - voltage supply cable 5CAPWR.0xxx-20

3.4.7 X2X cable 5CAX2X.0xxx-20

The voltage supply cables 5CAX2X.0xxx-20 are designed for both fixed and flexible installations (e.g. in support arm systems).

Figure 91: X2X cable 5CAX2X.0xxx-20

Technical data

Features	5CAX2X.0018-20	5CAX2X.0050-20	5CAX2X.0100-20	5CAX2X.0150-20	5CAX2X.0200-20	5CAX2X.0250-20	5CAX2X.0300-20	5CAX2X.0400-20
Length Tolerance	1.8 m ±20 mm	5 m ±45 mm	10 m ±90 mm	15 m ±135 mm	20 m ±180 mm	25 m ±230 mm	30 m ±280 mm	40 m ±380 mm
Weight	Approx. 150 g	Approx. 340 g	Approx. 650 g	Approx. 1 kg	Approx. 1.3 kg	Approx. 1.6 kg	Approx. 1.8 kg	Approx. 2.6 kg
Connector type	ODU Minisnap 10-pin							
Cable diameter	6.8 mm							
Flexibility	Flexible							
Flex radius Fixed layout flexible installation	See figure "Flex radius specification" on page 112 ≥ 10x cable diameter (from circular plug - cable) ≥ 15x cable diameter (from circular plug - cable)							
Materials Cable shielding Color	Aluminum foil clad + tinned copper mesh Violet (similar to RAL 4001)							
Wire cross section DeviceNet data pair 6 wires	AWG 24 AWG 28							
Line resistance AWG 24 AWG 28	Max. 89 Ω/km Max. 220 Ω/km							
Insulation resistance	Min. 200 MΩ/km							
Test voltage	1000 V							
Operating voltage	Max. 30 V							
Current load	TBD A							

Table 43: Technical data - X2X cable 5CAX2X.0xxx-20

Flex radius specification

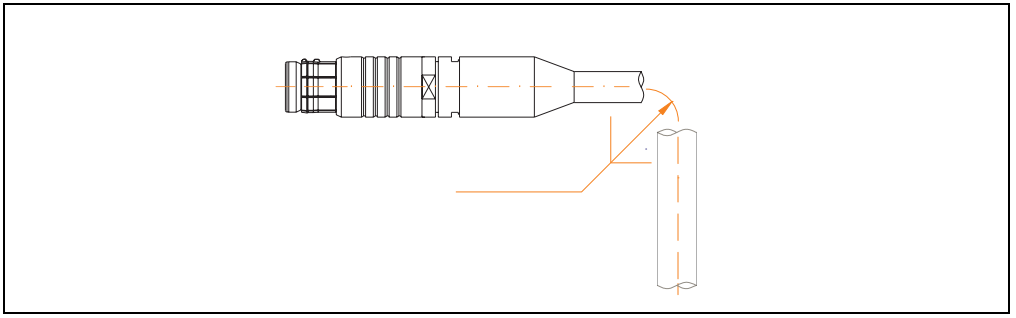


Figure 92: Flex radius specification

Plug dimensions (ODU Minisnap)

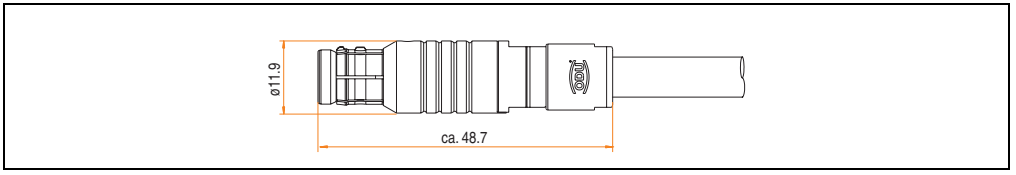


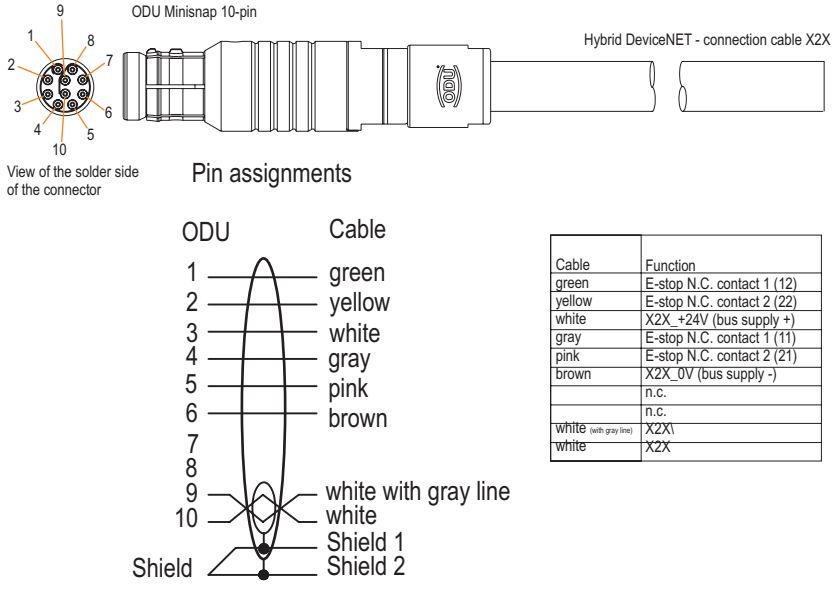
Figure 93: Plug dimensions (ODU Minisnap) - X2X cable 5CAX2X.0xxx-20

Cable specifications

The following figure shows the pin assignments for the X2X cable available at B&R. If you want to build a suitable cable yourself, it should be wired according to these specifications.

Warning!

If a self-built cable is used, B&R cannot guarantee that it will function properly. B&R guarantees the performance of all cables that they provide.



Cable	Function
green	E-stop N.C. contact 1 (12)
yellow	E-stop N.C. contact 2 (22)
white	X2X_+24V (bus supply +)
gray	E-stop N.C. contact 1 (11)
pink	E-stop N.C. contact 2 (21)
brown	X2X_0V (bus supply -)
	n.c.
	n.c.
white (with gray line)	X2X\
white	X2X

Figure 94: Pin assignments, X2X cable 5CAX2X.0xxx-20

Chapter 3 • Commissioning

1. X2X wiring diagram

Information:

Only power supplies provided by B&R can be used to supply the X2X Link bus connection.

The X2X Link bus connection uses an RS485 half-duplex point-to-point connection; transfer is unidirectional. X2X topology uses a point-to-point connection. A series connection is made to each extension unit connection slot from the X2X/E-stop cable connector on the main unit. The link has a specified direction for transferring data. The transfer rate is 12 MBaud.

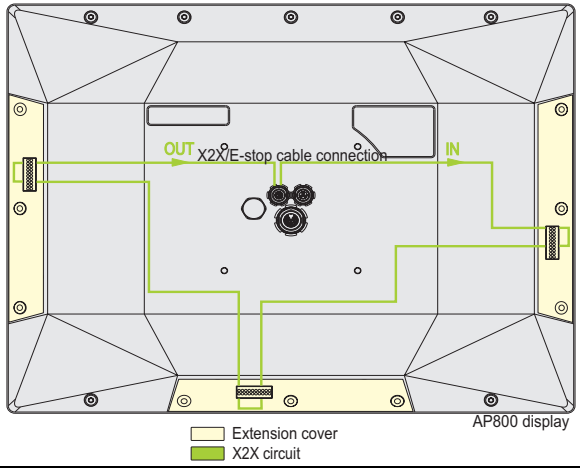


Figure 95: X2X circuit - rear view

The AP800 is always at the end of the bus connection, i.e.: The bus connection cannot be forwarded to any other X2X nodes after the AP800.

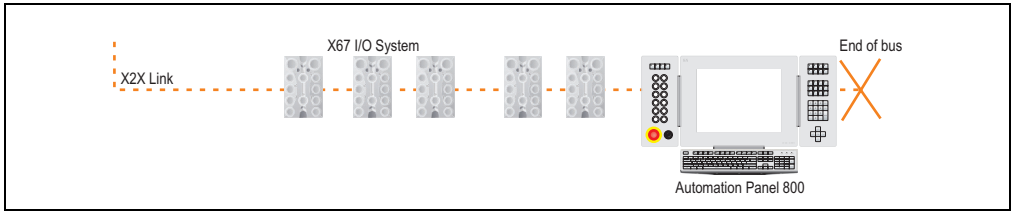


Figure 96: X2X Link topology

1.1 X2X functionality if the PC crashes

The Automation Panel 800 device is connected to the PC using an SDL connection. The supply and the X2X Link bus connection are both connected to the AP800 device independent of the SDL connection.
For X2X functionality, the supply and the X2X Link bus connection are required. If this is the case, extension units that can be operated via the PC and X2X (C key extensions) can also be accessed and operated without a connection to the PC. That means the machine or system remains operational.

2. E-stop wiring diagram

Each extension unit can have its own E-stop button.
To guarantee that the E-stop functions properly, a two-channel E-stop series connection is made to each extension unit connection slot from the X2X/E-stop cable connector on the main unit.

The following wiring diagrams provide a more detailed explanation of various configurations.

1) Example 1: Without extension unit

2) Example 2: With extension unit, with E-stop button

3) Example 3: With extension unit, without E-stop button

2.1 Without extension unit

An extension cover must be mounted on each extension unit connection slot that is not being used. The cover uses a spring contact on an intermediate circuit board to connect the E-stop series circuit and therefore guarantees that it functions properly.

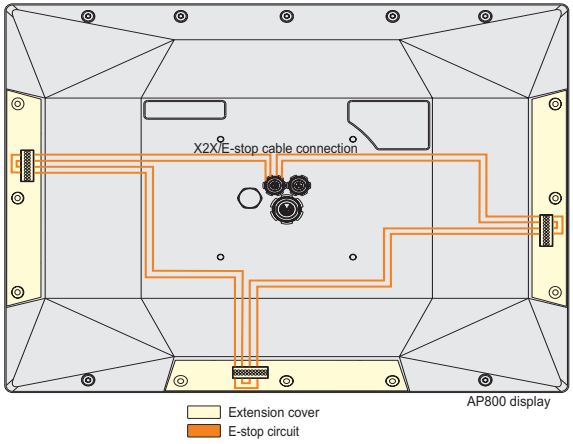


Figure 97: Example 1 - E-stop wiring diagram for the extension cover - rear view

2.2 Extension unit with E-stop

For an extension unit (in this case C key extension right) with an E-stop button, the connection from the AP800 display to the extension unit is made using an extension connector with spring contacts on an intermediate circuit board. The E-stop button is on the extension unit, and both N.C. contacts on the E-stop switching element (and therefore the E-stop series circuit) are closed when it is not activated.

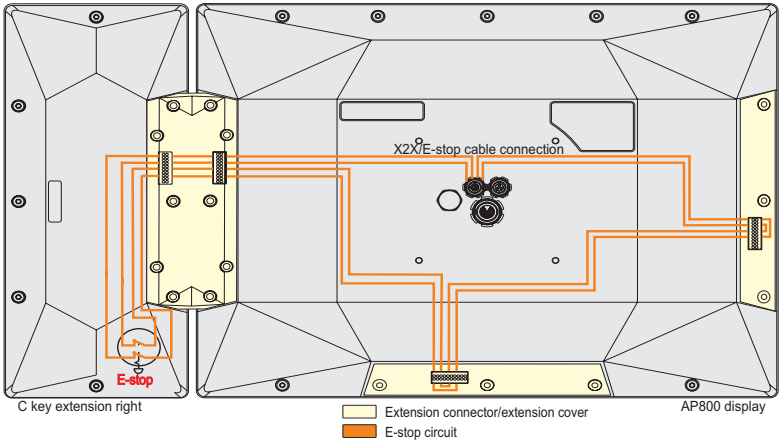


Figure 98: Example 2 - E-stop wiring diagram for the extension unit with E-stop - rear view

2.3 Extension unit without E-stop

For an extension unit (in this case extension keyboard) without an E-stop button, the connection from the AP800 display to the extension unit is made using an extension connector with two spring contacts on an intermediate circuit board. The E-stop contacts are connected so that the E-stop series circuit remains intact.

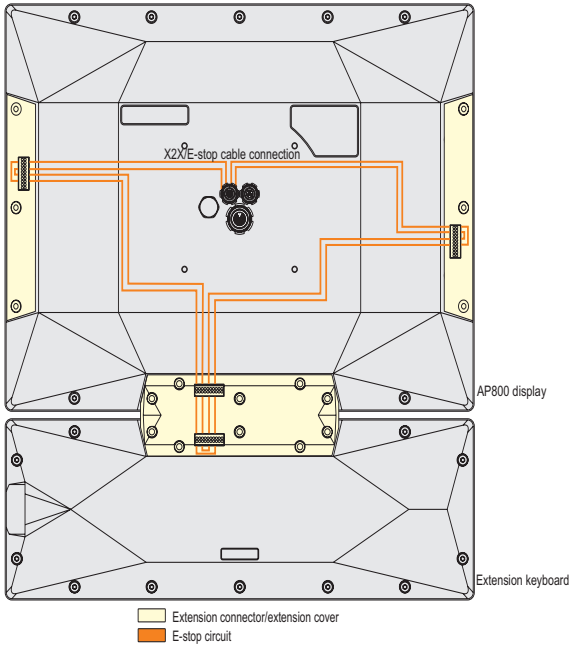


Figure 99: Example 3 - E-stop wiring diagram for the extension unit without E-stop - rear view

2.4 Current load

Warning!

Pay attention to the max. permitted current load of the E-stop circuit!

	Max. current load	Max. voltage
E-Stop circuit	0.4 A	32 VDC

Table 44: E-stop circuit current load

2.5 Loop resistance

The sum of the loop resistances of the individual components of both of the assembled E-stop circuits is a maximum of 25 Ohm (measured on Automation Panel 800 X2X/E-stop cable connector).

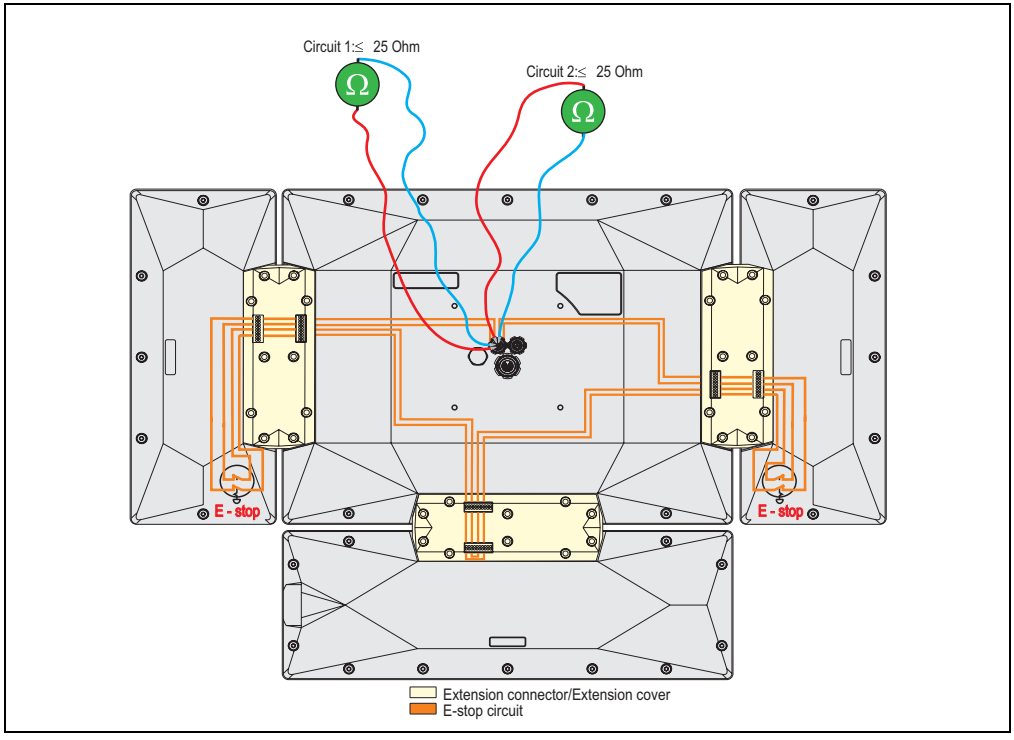


Figure 100: Loop resistance information

At a maximum cable length of 40 meters, the loop resistance of the X2X / E-stop cable (5CAX2X.0xxx-20) is 17.6 Ohm.

The exact loop resistance value can be obtained using a loop resistance measuring device.

3. Installation

An Automation Panel 800 device is primarily mounted on a support arm system. To make this possible, an extension flange is installed on the back of the display (also see chapter 2 "Extension flange 5AC800.FLG1-00" on page 91 and "Installation of components" on page 123). The tubing of the support arm system cannot be bent immediately after the end of the flange; it must be straight for a min. of 50 mm so that the plugs can be connected. The bending radius of the cables must also be taken into consideration (see "Cables" on page 93).

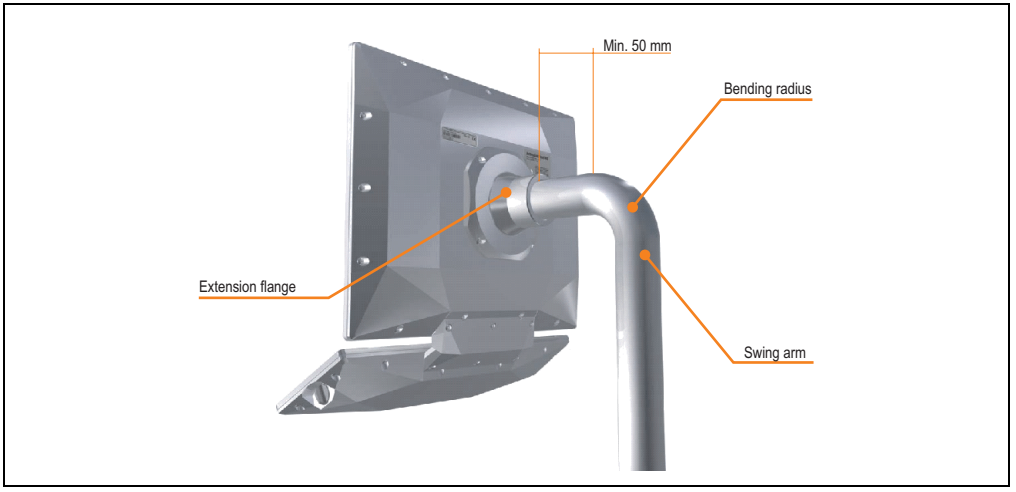


Figure 101: Installation in support arm system

The cables run through the tubing and the plugs are covered by the extension flange. The plugs must be connected to the respective sockets.
The plugs and the sockets are marked with a red dot to ensure proper connection (see "Pin assignments" on page 45).

3.1 Installation of components

The extension flange (and depending on the configuration the extension connector and extension covers) are installed using the included Torx screws.

Information:

The contacts on the display, extension keyboard and on the extension units must be thoroughly cleaned before installation.

A size 20 Torx screwdriver is needed for this. The maximum torque of the Torx screws is 2 Nm - fasten the screws alternately and diagonally.

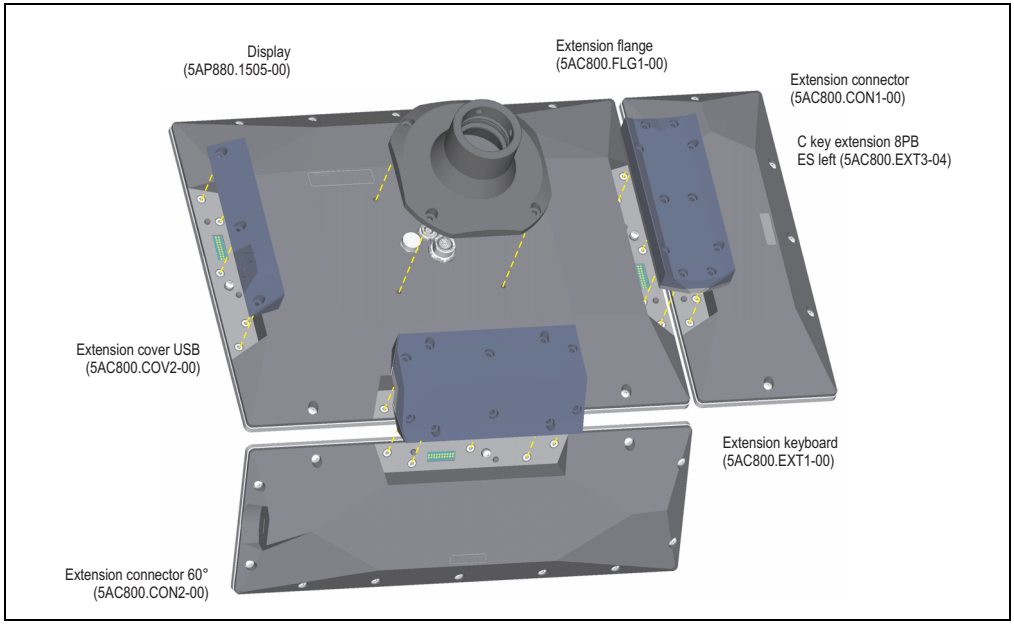


Figure 102: Configuration example - installing the components

3.2 Mounting orientation

The following diagrams show the specified mounting orientation for the Automation Panel 800 device.

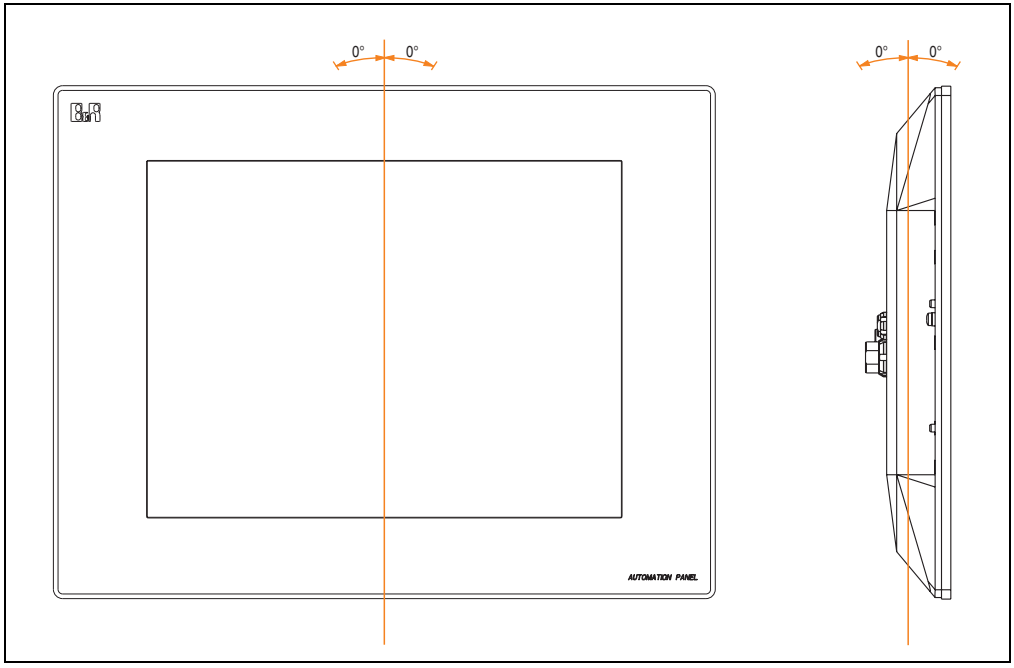


Figure 103: Mounting orientation 0°

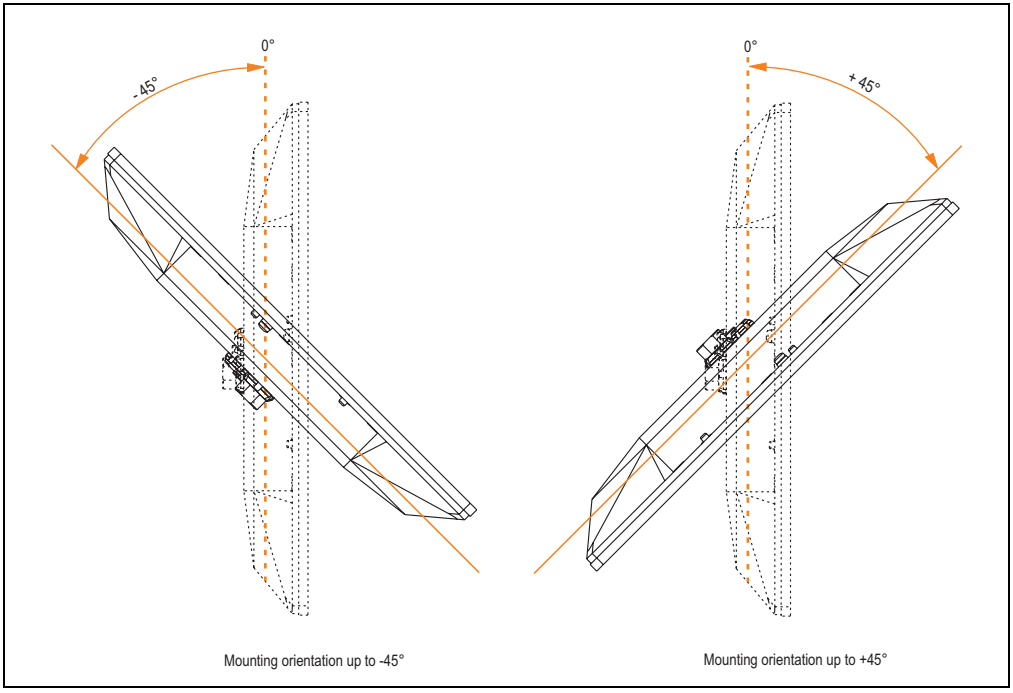


Figure 104: Mounting orientation -45° and +45°.

Warning!

Because of the changed thermal properties with some mounting orientations, e.g. +/- 45°, the maximum ambient temperature of the Automation Panel 800 specified for 0° mounting orientation cannot be achieved during operation. The limit values that apply in this situation can be found in the technical data for the Automation Panel device.

4. Connection examples

The following examples provide an overview of the configuration options for connecting Automation Panel 800 and Automation Panel 900 devices with the APC620. The following questions will be answered:

- How are Automation Panel 800 devices connected to the monitor / panel output of the APC620, and what needs to be considered?
- How are Automation Panel 800 and Automation Panel 900 devices connected to the monitor / panel output of the APC620, and what needs to be considered?
- What are "Display Clone" and "Extended Desktop" modes?
- How many Automation Panel 900 devices can be connected to an Automation Panel 800 device per line?
- How are the connected Automation Panel 800 and Automation Panel 900 devices numbered internally?
- Are there limitations to the segment length and if so, what are they?
- Which cables are required?
- Do BIOS settings have to be changed for a specific configuration?

4.1 Selecting the display units

If an Automation Panel 800 and an Automation Panel 900 should be connected on the same line, the devices must have the same display type.
The following table lists the AP900 devices that can be connected on the same line with an AP800 device.

Automation Panel 800	Automation Panel 900
5AP820.1505-00	5AP920.1505-01 5AP951.1505-01 5AP980.1505-01 5AP981.1505-01
5AP880.1505-00	5AP920.1505-01 5AP951.1505-01 5AP980.1505-01 5AP981.1505-01

Table 45: Selecting the display units

4.2 An Automation Panel 800 via SDL (onboard)

An Automation Panel 800 is connected to the integrated SDL interface (onboard) via an SDL cable. USB devices can only be connected directly to the extension keyboard (without a hub).

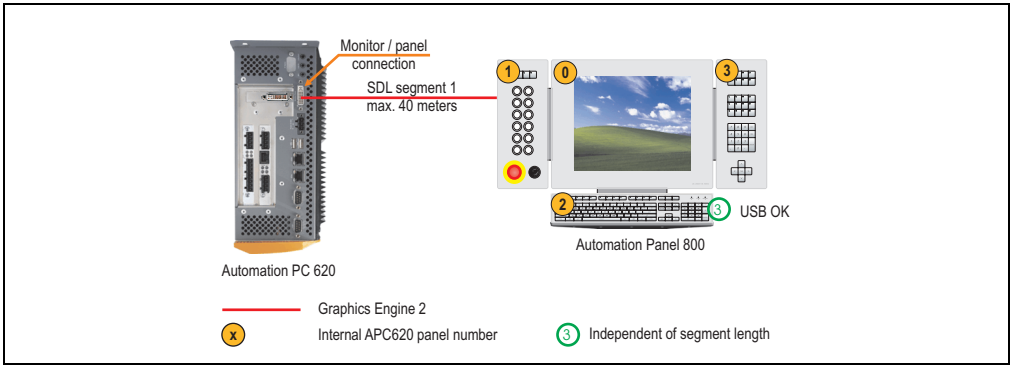


Figure 105: Configuration - An Automation Panel 800 via SDL (onboard)

4.2.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table.

CPU board	with system unit					Limitation
	5PC600.SX01-00	5PC600.SX02-00	5PC600.SX02-01	5PC600.SX05-00	5PC600.SX05-01	Resolution
5PC600.E855-00	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-01	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-02	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-03	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-04	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-05	✓	✓	✓	✓	✓	Max. UXGA

Table 46: Possible combinations of system unit and CPU board

4.2.2 Cables

Select an SDL cable from the following table.

Model number	Type	Length
5CASDL.0018-20	SDL w/o extender	1.8 m
5CASDL.0050-20	SDL w/o extender	5 m
5CASDL.0100-20	SDL w/o extender	10 m
5CASDL.0150-20	SDL w/o extender	15 m
5CASDL.0200-20	SDL w/o extender	20 m
5CASDL.0250-20	SDL w/o extender	25 m
5CASDL.0300-30	SDL w/ extender	30 m
5CASDL.0400-30	SDL w/ extender	40 m

Table 47: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables Segment length [m]	Resolution XGA 1024 x 768
1.8	5CASDL.0018-20
5	5CASDL.0050-20
10	5CASDL.0100-20
15	5CASDL.0150-20
20	5CASDL.0200-20[1)]
25	5CASDL.0250-20[1)]
30	5CASDL.0300-30[2)]
40	5CASDL.0400-30[2)]

Table 48: Segment lengths, resolutions and SDL cables

1) See table 49 "Requirements for SDL cable with automatic cable adjustment (equalizer)"
2) See table 50 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)"

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

Firmware	Name	Version	Note
MTCX FPGA	Firmware on the APC620	V 01.15	The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) **V01.10**, available in the download area of the B&R homepage.
MTCX PX32	Firmware on the APC620	v 01.55	

Table 49: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

Firmware	Name	Version	Note
MTCX FPGA	Firmware on the APC620	V 01.15	The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) **V01.10**, available in the download area of the B&R homepage.
MTCX PX32	Firmware on the APC620	v 01.55	
Hardware	**Name**	**Revision**	**Note**
5PC600.SX01-00	System 1 PCI	Rev. E0	-
5PC600.SX02-00	System 2 PCI, 1 disk drive slot, 1 AP Link slot	Rev. D0	-
5PC600.SX02-01	System 2 PCI, 1 disk drive slot	Rev. E0	-
5PC600.SX05-00	System 5 PCI, 2 disk drive slots, 1 AP Link slot	Rev. C0	-
5PC600.SX05-01	System 5 PCI, 2 disk drive slots	Rev. C0	-

Table 50: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

4.2.3 BIOS settings

No special BIOS settings are necessary for operation.

4.2.4 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver.
For detailed information, see the APC620 user's manual.

4.2.5 Settings - Windows touch driver

For detailed information, see the APC620 user's manual.

4.3 An AP900 and an AP800 via SDL (onboard)

An Automation Panel 900 and an Automation Panel 800 are connected to the integrated SDL interface (onboard) via SDL.

USB is supported up to a maximum distance (segment 1 + segment 2) of 30 m on the two displays. Starting at a distance of 30 m, USB is only available on the first display (front and back) up to a maximum of 40 m. USB devices can only be connected directly to the Automation Panel 900 or extension keyboard (without a hub).

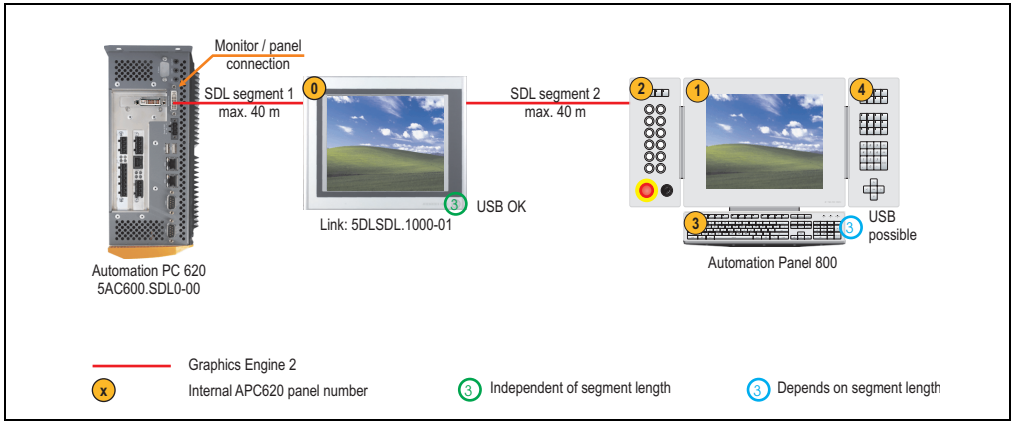


Figure 106: Configuration - An AP900 and an AP800 via SDL (onboard)

4.3.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table.

CPU board	with system unit					Limitation
	5PC600.SX01-00	5PC600.SX02-00	5PC600.SX02-01	5PC600.SX05-00	5PC600.SX05-01	Resolution
5PC600.E855-00	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-01	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-02	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-03	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-04	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-05	✓	✓	✓	✓	✓	Max. UXGA

Table 51: Possible combinations of system unit and CPU board

4.3.2 Cables

Selecting an SDL cable for the connection of the AP800 display to the AP900 display.
The selection table for the cable used to connect the AP900 displays can be found in the AP900 user's manual or the APC620 user's manual.

Information:

The following model numbers are only for connecting the AP800 display. Cables for the other SDL segments can be found in the APC620 user's manual.

Model number	Type	Length
5CASDL.0018-20	SDL w/o extender	1.8 m
5CASDL.0050-20	SDL w/o extender	5 m
5CASDL.0100-20	SDL w/o extender	10 m
5CASDL.0150-20	SDL w/o extender	15 m
5CASDL.0200-20	SDL w/o extender	20 m
5CASDL.0250-20	SDL w/o extender	25 m
5CASDL.0300-30	SDL w/ extender	30 m
5CASDL.0400-30	SDL w/ extender	40 m

Table 52: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables Segment length [m]	Resolution XGA 1024 x 768
1.8	5CASDL.0018-20
5	5CASDL.0050-20
10	5CASDL.0100-20
15	5CASDL.0150-20
20	5CASDL.0200-20[1)]
25	5CASDL.0250-20[1)]
30	5CASDL.0300-30[2)]
40	5CASDL.0400-30[2)]

Table 53: Segment lengths, resolutions and SDL cables

1) See table 54 "Requirements for SDL cable with automatic cable adjustment (equalizer)"
2) See table 55 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)"

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

Firmware	Name	Version	Note
MTCX FPGA	Firmware on the APC620	V 01.15	The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) **V01.10**, available in the download area of the B&R homepage.
MTCX PX32	Firmware on the APC620	v 01.55	

Table 54: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

Firmware	Name	Version	Note
MTCX FPGA	Firmware on the APC620	V 01.15	The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) **V01.10**, available in the download area of the B&R homepage.
MTCX PX32	Firmware on the APC620	v 01.55	
Hardware	**Name**	**Revision**	**Note**
5PC600.SX01-00	System 1 PCI	Rev. E0	-
5PC600.SX02-00	System 2 PCI, 1 disk drive slot, 1 AP Link slot	Rev. D0	-
5PC600.SX02-01	System 2 PCI, 1 disk drive slot	Rev. E0	-
5PC600.SX05-00	System 5 PCI, 2 disk drive slots, 1 AP Link slot	Rev. C0	-
5PC600.SX05-01	System 5 PCI, 2 disk drive slots	Rev. C0	-

Table 55: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

4.3.3 BIOS settings

No special BIOS settings are necessary for operation.

4.3.4 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver.
For detailed information, see the APC620 user's manual.

4.3.5 Settings - Windows touch driver

For detailed information, see the APC620 user's manual.

4.4 Three AP900 devices with an AP800 via SDL (onboard)

Up to four Automation Panels can be connected to the integrated SDL interface (onboard). At the fourth location, an Automation Panel 800 can be operated via SDL. All four displays show the same content (Display Clone).

USB is supported up to a maximum distance (segment 1 + segment 2) of 30 m on the first two displays. Starting at a distance of 30 m, USB is only available on the first display (front and back) up to a maximum of 40 m. USB devices can only be connected directly to Automation Panel 900 devices (without a hub).

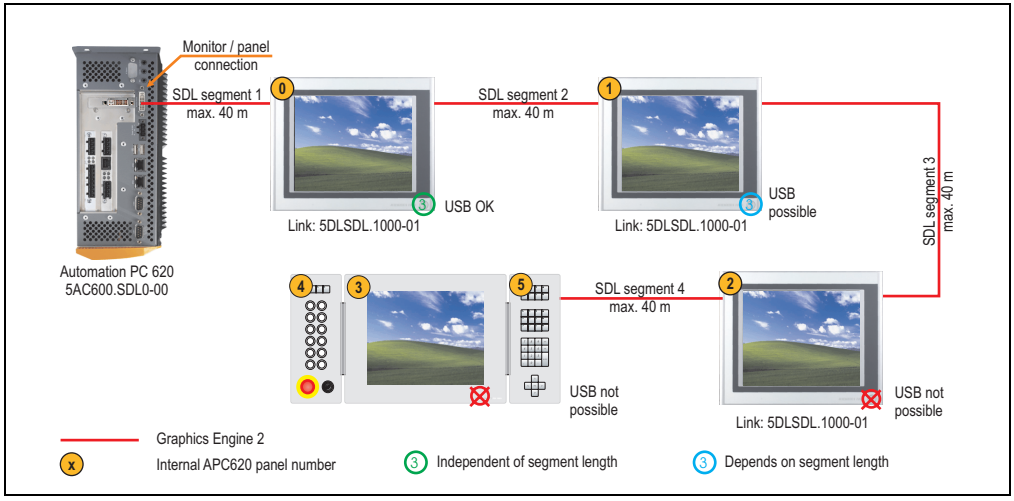


Figure 107: Configuration - Three AP900 devices and an AP800 via SDL (onboard)

4.4.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table.

CPU board	with system unit					Limitation
	5PC600.SX01-00	5PC600.SX02-00	5PC600.SX02-01	5PC600.SX05-00	5PC600.SX05-01	Resolution
5PC600.E855-00	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-01	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-02	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-03	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-04	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-05	✓	✓	✓	✓	✓	Max. UXGA

Table 56: Possible combinations of system unit and CPU board

4.4.2 Cables

Selecting an SDL cable for the connection of the AP800 display to the last AP900 display.
The selection table for the cable used to connect the AP900 displays can be found in the AP900 user's manual or the APC620 user's manual.

Information:

The following model numbers are only for connecting the AP800 display. Cables for the other SDL segments can be found in the APC620 user's manual.

Model number	Type	Length
5CASDL.0018-20	SDL w/o extender	1.8 m
5CASDL.0050-20	SDL w/o extender	5 m
5CASDL.0100-20	SDL w/o extender	10 m
5CASDL.0150-20	SDL w/o extender	15 m
5CASDL.0200-20	SDL w/o extender	20 m
5CASDL.0250-20	SDL w/o extender	25 m
5CASDL.0300-30	SDL w/ extender	30 m
5CASDL.0400-30	SDL w/ extender	40 m

Table 57: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables	Resolution
Segment length [m]	XGA 1024 x 768
1.8	5CASDL.0018-20
5	5CASDL.0050-20
10	5CASDL.0100-20
15	5CASDL.0150-20
20	5CASDL.0200-20[1)]
25	5CASDL.0250-20[1)]
30	5CASDL.0300-30[2)]
40	5CASDL.0400-30[2)]

Table 58: Segment lengths, resolutions and SDL cables

1) See table 59 "Requirements for SDL cable with automatic cable adjustment (equalizer)"
2) See table 60 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)"

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

Firmware	Name	Version	Note
MTCX FPGA	Firmware on the APC620	V 01.15	The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) **V01.10**, available in the download area of the B&R homepage.
MTCX PX32	Firmware on the APC620	v 01.55	

Table 59: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

Firmware	Name	Version	Note
MTCX FPGA	Firmware on the APC620	V 01.15	The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) **V01.10**, available in the download area of the B&R homepage.
MTCX PX32	Firmware on the APC620	v 01.55	
Hardware	**Name**	**Revision**	**Note**
5PC600.SX01-00	System 1 PCI	Rev. E0	-
5PC600.SX02-00	System 2 PCI, 1 disk drive slot, 1 AP Link slot	Rev. D0	-
5PC600.SX02-01	System 2 PCI, 1 disk drive slot	Rev. E0	-
5PC600.SX05-00	System 5 PCI, 2 disk drive slots, 1 AP Link slot	Rev. C0	-
5PC600.SX05-01	System 5 PCI, 2 disk drive slots	Rev. C0	-

Table 60: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

4.4.3 BIOS settings

No special BIOS settings are necessary for operation.

4.4.4 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver.
For detailed information, see the APC620 user's manual.

4.4.5 Settings - Windows touch driver

For detailed information, see the APC620 user's manual.

4.5 Six AP900 and two AP800 devices via SDL (onboard) and SDL (AP Link)

Three Automation Panel 900 (max. UXGA) units and one Automation Panel 800 are connected to the integrated SDL interface (onboard) via SDL. Additionally, three Automation Panel 900 (max. UXGA) units and one Automation Panel 800 are operated on the optional SDL transmitters. The Automation Panels in each line must be the same type. The two lines display different content (Extended Desktop), but displays in the same line show the same content (Display Clone).

USB is supported up to a maximum distance (segment 1 + segment 2) of 30 m on the first two displays. Starting at a distance of 30 m, USB is only available on the first display (front and back) up to a maximum of 40 m. USB devices can only be connected directly to Automation Panel 900 devices (without a hub).

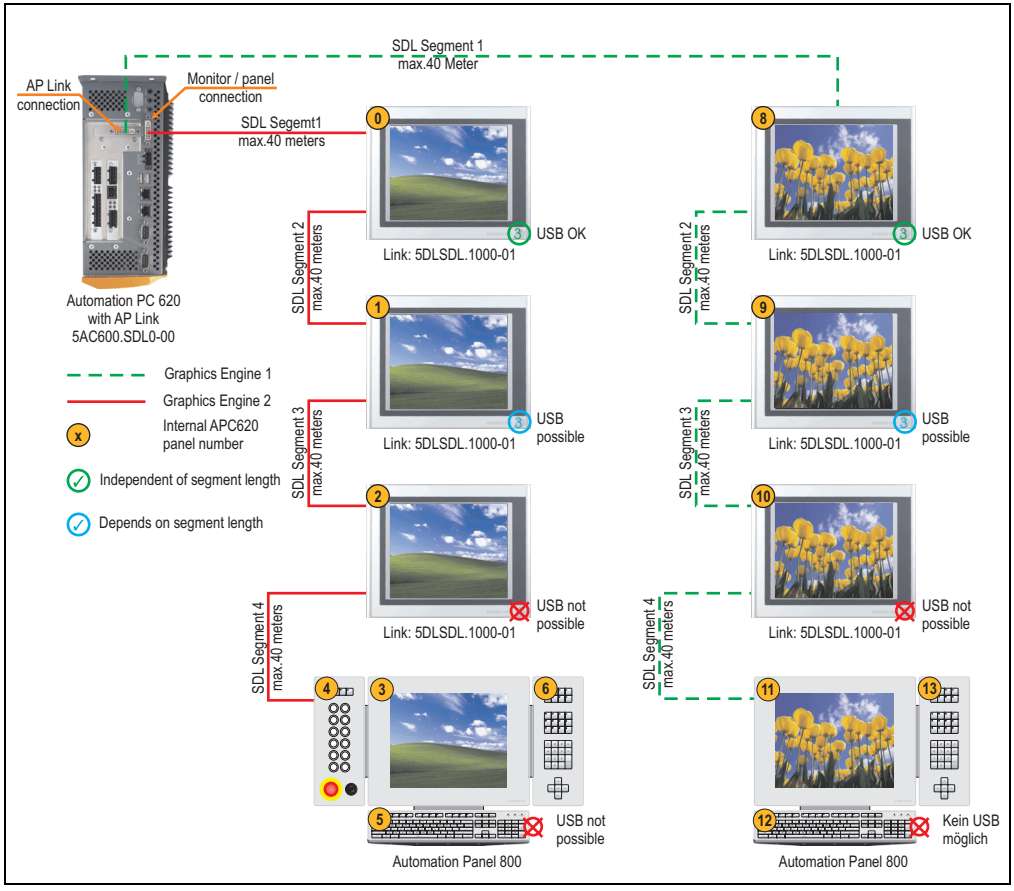


Figure 108: Configuration - Six AP900 and two AP800 devices via SDL (onboard) and SDL (AP Link)

4.5.1 Basic system requirements

The following table shows the possible combinations for the APC620 system unit with CPU board to implement the configuration shown in the figure above. If the maximum resolution is limited when making the combination then it is also shown in this table.

CPU board	with system unit					Limitation
	5PC600.SX01-00	5PC600.SX02-00	5PC600.SX02-01	5PC600.SX05-00	5PC600.SX05-01	Resolution
5PC600.E855-00	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-01	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-02	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-03	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-04	✓	✓	✓	✓	✓	Max. UXGA
5PC600.E855-05	✓	✓	✓	✓	✓	Max. UXGA

Table 61: Possible combinations of system unit and CPU board

4.5.2 Cables

Selecting an SDL cable for the connection of the AP800 display to the last AP900 display.
The selection table for the cable used to connect the AP900 displays can be found in the AP900 user's manual or the APC620 user's manual.

Information:

The following model numbers are only for connecting the AP800 display. Cables for the other SDL segments can be found in the APC620 user's manual.

Model number	Type	Length
5CASDL.0018-20	SDL w/o extender	1.8 m
5CASDL.0050-20	SDL w/o extender	5 m
5CASDL.0100-20	SDL w/o extender	10 m
5CASDL.0150-20	SDL w/o extender	15 m
5CASDL.0200-20	SDL w/o extender	20 m
5CASDL.0250-20	SDL w/o extender	25 m
5CASDL.0300-30	SDL w/ extender	30 m
5CASDL.0400-30	SDL w/ extender	40 m

Table 62: Cables for SDL configurations

Cable lengths and resolutions for SDL transfer

The following table shows the relationship between segment lengths and the maximum resolution according to the SDL cable used:

Cables Segment length [m]	Resolution XGA 1024 x 768
1.8	5CASDL.0018-20
5	5CASDL.0050-20
10	5CASDL.0100-20
15	5CASDL.0150-20
20	5CASDL.0200-20[1)]
25	5CASDL.0250-20[1)]
30	5CASDL.0300-30[2)]
40	5CASDL.0400-30[2)]

Table 63: Segment lengths, resolutions and SDL cables

1) See table 64 "Requirements for SDL cable with automatic cable adjustment (equalizer)"
2) See table 65 "Requirements for SDL cable with extender and automatic cable adjustment (equalizer)"

The cable types and resolutions shown with a footnote 1) in the previous table can only be implemented starting with the following firmware and hardware versions:

Firmware	Name	Version	Note
MTCX FPGA	Firmware on the APC620	V 01.15	The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) **V01.10**, available in the download area of the B&R homepage.
MTCX PX32	Firmware on the APC620	v 01.55	

Table 64: Requirements for SDL cable with automatic cable adjustment (equalizer)

The cable types and resolutions shown with a footnote 2) in the previous table can only be implemented starting with the following firmware and hardware versions:

Firmware	Name	Version	Note
MTCX FPGA	Firmware on the APC620	V 01.15	The version is read from BIOS - see the BIOS description. Supported starting with the APC620 / PPC 700 Firmware upgrade (MTCX, SDLR, SDLT) **V01.10**, available in the download area of the B&R homepage.
MTCX PX32	Firmware on the APC620	v 01.55	
Hardware	**Name**	**Revision**	**Note**
5PC600.SX01-00	System 1 PCI	Rev. E0	-
5PC600.SX02-00	System 2 PCI, 1 disk drive slot, 1 AP Link slot	Rev. D0	-

Table 65: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

Firmware	Name	Version	Note
5PC600.SX02-01	System 2 PCI, 1 disk drive slot	Rev. E0	-
5PC600.SX05-00	System 5 PCI, 2 disk drive slots, 1 AP Link slot	Rev. C0	-
5PC600.SX05-01	System 5 PCI, 2 disk drive slots	Rev. C0	-

Table 65: Requirements for SDL cable with extender and automatic cable adjustment (equalizer) (cont.)

4.5.3 BIOS settings

No special BIOS settings are necessary for operation.

4.5.4 Windows graphics driver settings

"Digital display" must be defined as output device in the graphics driver.
For detailed information, see the APC620 user's manual.

4.5.5 Settings - Windows touch driver

For detailed information, see the APC620 user's manual.

4.6 Internal numbering of the extension units

An extension unit for an AP800 device is numbered like another device. The numbering of the extension units starts from the display unit and goes in the counter-clockwise direction; all extension unit slots that are not used are left out.
The following graphic shows numbering examples.

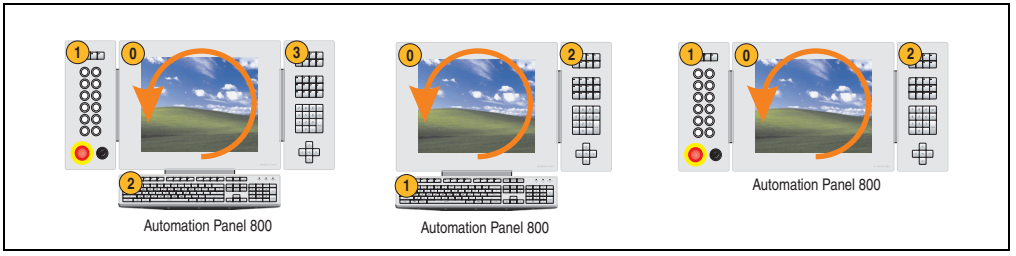


Figure 109: Examples - internal numbering of the extension units

Numbering of the keys and LEDs when connecting multiple devices in Visual Components is as follows:

Device 0: 0 - 127

Device 1: 128 - 255

Device 2: 256 - 383

Device 3: 384 - 511

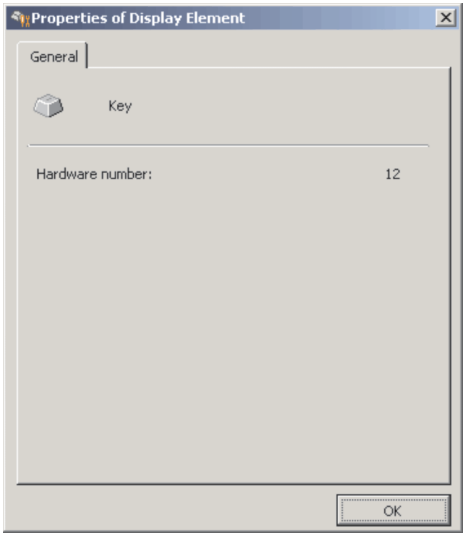
5. Key and LED configurations

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

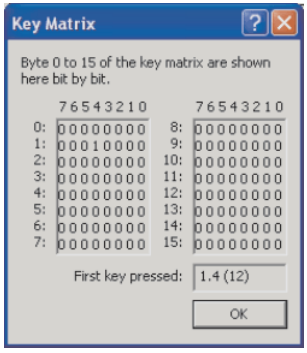
- B&R Key Editor for Windows operating systems
- Visual Components for Automation Runtime (hardware number of the key = hardware number of the LED)

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

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



Screenshot from B&R Key Editor



Screenshot from B&R Control Center

Figure 110: Example - Hardware number in the B&R Key Editor or in the B&R Control Center

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

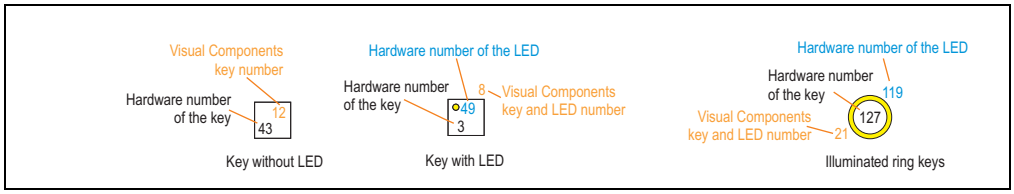


Figure 111: Display - Keys and LEDs in the matrix

5.1 Display unit 5AP880.1505-00

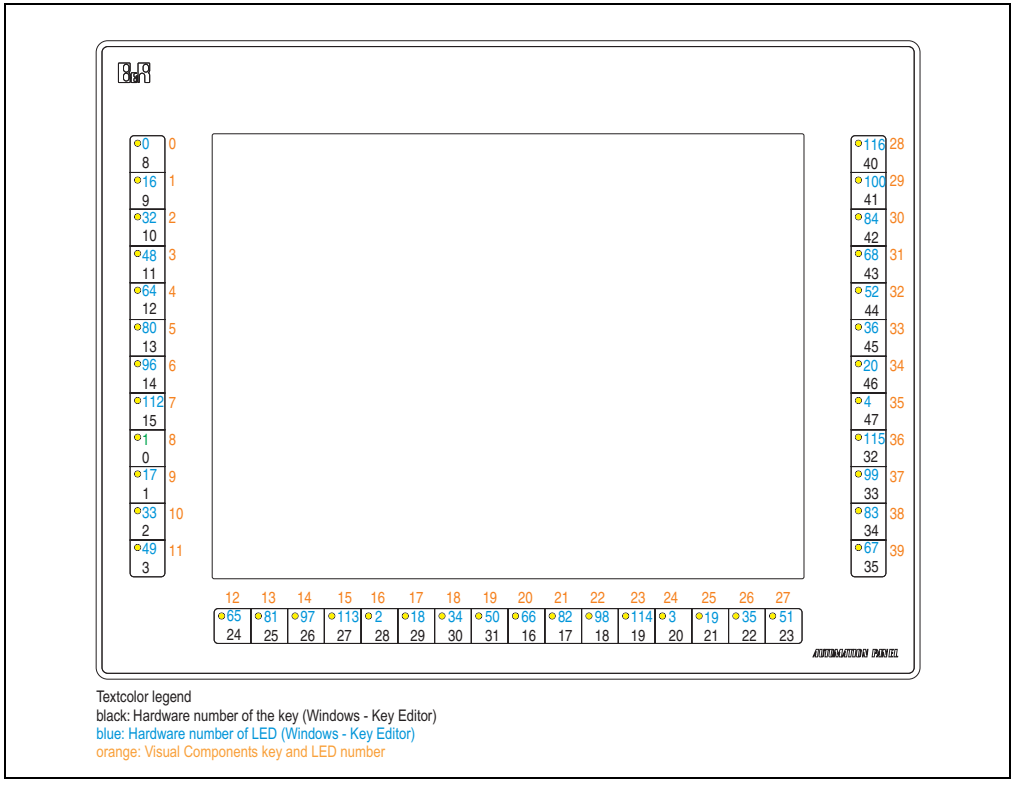
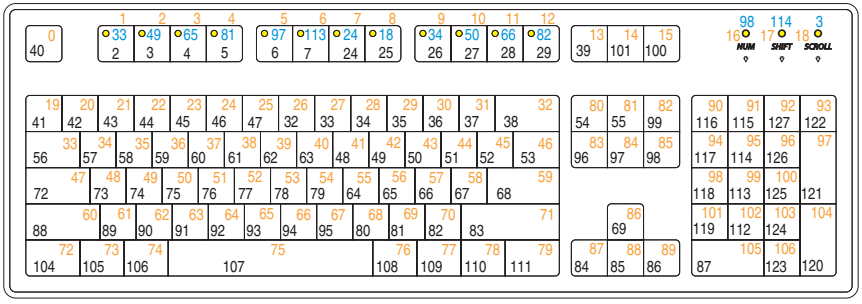


Figure 112: Hardware number - 5AP880.1505-00

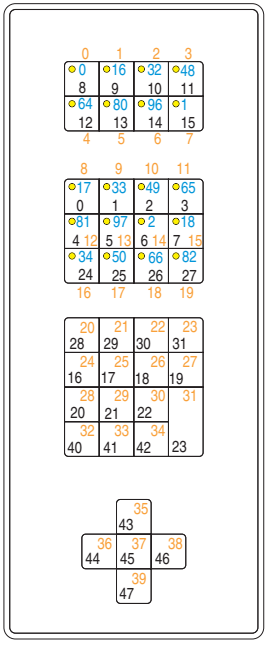
5.2 Extension keyboard 5AC800.EXT1-00



Textcolor legend
black: Hardware number of the key (Windows - Key Editor)
blue: Hardware number of LED (Windows - Key Editor)
orange: Visual Components key and LED number

Figure 113: Hardware numbers - 5AC800.EXT1-00

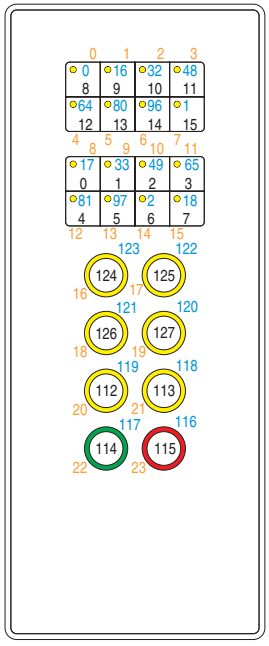
5.3 F key extension left 5AC800.EXT2-00 / right 5AC800.EXT2-01



Textcolor legend
black: Hardware number of the key (Windows - Key Editor)
blue: Hardware number of LED (Windows - Key Editor)
orange: Visual Components key and LED number

Figure 114: Hardware numbers - 5AC800.EXT2-00 / 5AC800.EXT2-01

5.4 C key extension 8PB left 5AC800.EXT3-00 / right 5AC800.EXT3-01



Textcolor legend
black: Hardware number of the key (Windows - Key Editor)
blue: Hardware number of LED (Windows - Key Editor)
orange: Visual Components key and LED number

Figure 115: Hardware numbers - 5AC800.EXT3-00 / 5AC800.EXT3-01

5.5 C key extension 12PB left 5AC800.EXT3-02 / right 5AC800.EXT3-03

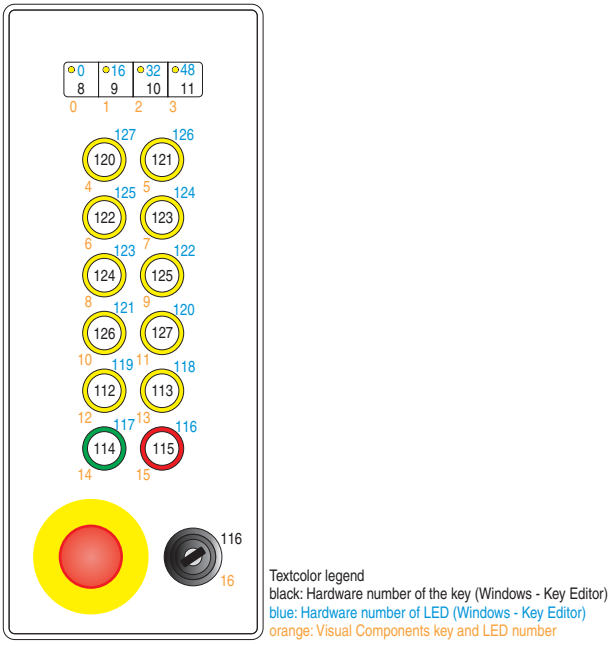


Figure 116: Hardware numbers - 5AC800.EXT3-02 / 5AC800.EXT3-03

5.6 C key extension 8PB left 5AC800.EXT3-04 / right 5AC800.EXT3-05

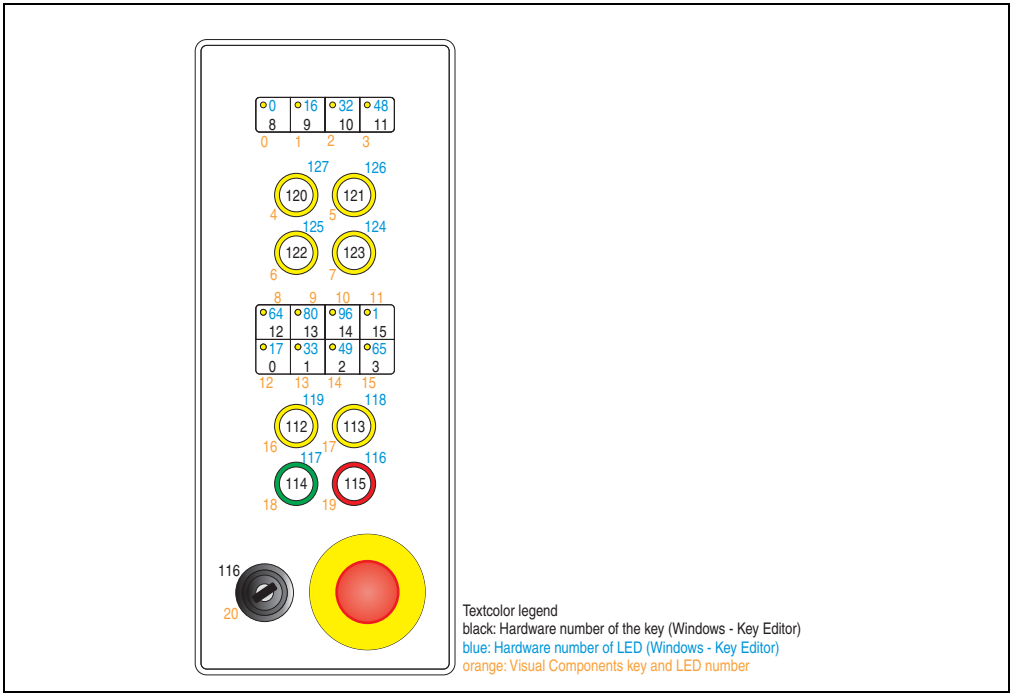


Figure 117: Hardware numbers - 5AC800.EXT3-04 / 5AC800.EXT3-05

6. Touch screen calibration

B&R touch screen devices are equipped with a touch controller, which supports hardware calibration. This means that the devices are pre-calibrated from stock (pre-calibration). This feature proves advantageous in the case of a replacement part because a new calibration is no longer required when exchanging devices (identical model / type). Nevertheless, we recommend calibrating the device in order to achieve the best results and to better readjust the touch screen to the user's preferences.

Regardless of this, the touch screen driver requires calibration following installation.

6.1 Windows XP Professional

After installing Windows XP Professional, the touch screen driver must be installed in the device in order to operate the touch screen. The corresponding drivers can be downloaded from the download area on the B&R homepage (**www.br-automation.com**). The touch screen should be calibrated while installing the driver.

6.2 Windows CE

Windows CE starts the touch screen calibration sequence during its first boot in the default configuration / delivered state.

6.3 Windows XP Embedded

After first starting Windows XP embedded (First Boot Agent), the touch screen driver must be installed in the device in order to operate the touch screen. The corresponding drivers can be downloaded from the download area on the B&R homepage (**www.br-automation.com**). The touch screen should be calibrated while installing the driver.

6.4 Automation Runtime / Visual Components

The first time the touch screen is used, it must be calibrated once in the customer application for the existing device and project.

Chapter 4 • Software

1. B&R Key Editor information

On display units, it is often necessary to adjust the function keys and LEDs for the application software being used. With the B&R Key Editor, it is possible to quickly and easily set up the application individually.

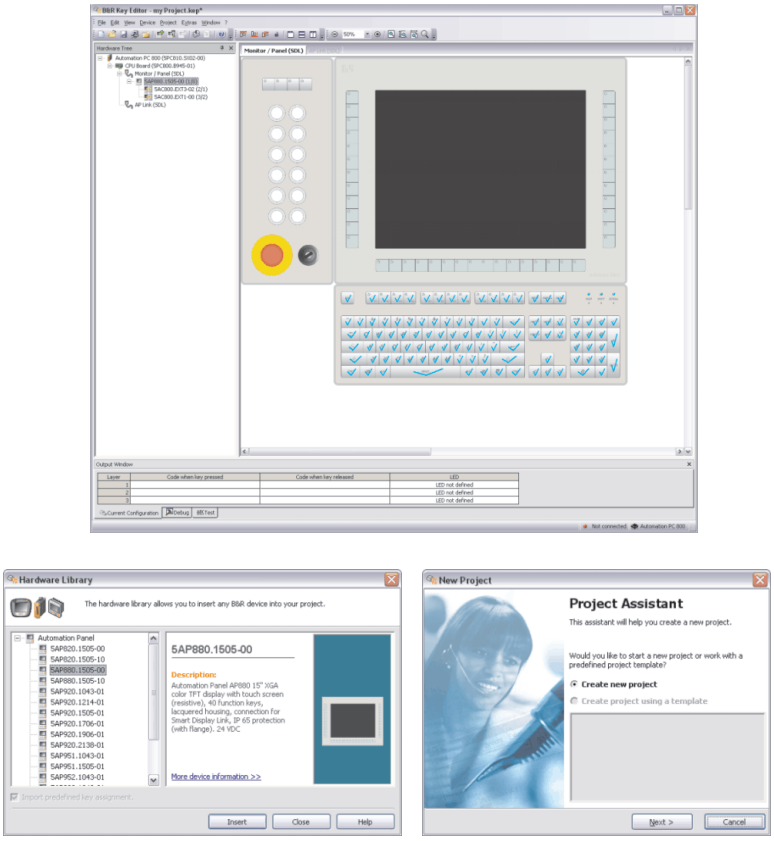


Figure 118: B&R Key Editor screenshots (Version 2.80)

Features:

- Configuration of normal keys like on a keyboard (A, B, C, etc.)
- Keyboard shortcuts (CTRL+C, SHIFT+DEL, etc.) on one key
- Special key functions (change brightness, etc.)
- Assign functions to LEDs (HDD access, power, etc.)
- 4 assignments per key possible (using layer function)
- Configuration of panel locking time when multiple Automation Panel 900 devices are connected to Automation PC 620 and Panel PC 700 devices

Supports following systems:

- Automation PC 620
- Automation PC 810
- Automation Panel 800
- Automation Panel 900
- Panel PC 700
- Provit 2000
- Provit 5000
- Power Panel BIOS devices
- Mobile Panel BIOS devices

A detailed guide for configuring keys and LEDs can be found in the B&R Key Editor's online help.

The B&R Key Editor can be downloaded for free from the download area on the B&R homepage (**www.br-automation.com**). Additionally, it can also be found on the B&R HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00).

2. HMI Drivers & Utilities DVD 5SWHMI.0000-00

Figure 119: HMI Drivers & Utilities DVD 5SWHMI.0000-00

Model number	Short description	Note
5SWHMI.0000-00	**HMI Drivers & Utilities DVD** Contains drivers, utilities, software upgrades and user's manuals for B&R panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).	

Table 66: Model number - HMI Drivers & Utilities DVD

This DVD contains drivers, utilities, software upgrades and user's manuals for B&R Panel system products (see B&R homepage – Industrial PCs, Visualization and Operation).

Information in detail:

BIOS upgrades for the products

- Automation PC 620
- Panel PC 700
- Automation PC 680
- Provit 2000 product family - IPC2000/2001/2002
- Provit 5000 product family - IPC5000/5600/5000C/5600C
- Power Panel 100 BIOS devices
- Mobile Panel 100 BIOS devices
- Power Panel 100 / Mobile Panel 100 user boot logo
- Power Panel 100 / Mobile Panel 100 REMHOST utility

Drivers for the devices

- Automation Device Interface (ADI)
- Audio
- Chipset
- CD-ROM
- LS120
- Graphics
- Network
- PCI RAID controller
- Touch screen
- Touchpad
- Interface board

Updates

- Firmware upgrades (e.g. MTCX, SMXC)

Utilities/Tools

- Automation Device Interface (ADI)
- Miscellaneous
- MTC utilities
- Key editor
- MTC & Mkey utilities
- Mkey utilities
- UPS configuration software
- ICU ISA configuration
- Intel PCI NIC boot ROM
- Diagnostics
- CompactFlash lifespan calculation for Silicon Systems CompactFlash cards 5CFCRD.xxxx-03

Windows and embedded operating systems

- Thin client
- Windows CE
- Windows NT Embedded
- Windows XP Embedded

MCAD templates for

- Industrial PCs
- Visualization and operating devices
- Legend strip templates

Documentation for

- Automation Panel 800
- B&R Windows CE
- Automation PC 620
- Automation PC 680
- Automation Panel 900
- Panel PC 700
- Power Panel 15/21/35/41
- Power Panel 100/200
- Provit 2000
- Provit 3030
- Provit 4000
- Provit 5000
- Provit Benchmark
- Provit Mkey
- Windows NT Embedded application guide
- Windows XP Embedded application guide
- Uninterruptible power supply

Service tools

- Acrobat Reader 5.0.5 (freeware in German, English, and French)
- Power Archiver 6.0 (freeware in German, English, and French)
- Internet Explorer 5.0 (German and English)
- Internet Explorer 6.0 (German and English)

Chapter 5 • Standards and certifications

1. Applicable European guidelines

- EMC guidelines 89/336/EWG
- Low-voltage guidelines 73/23/EWG
- Machine guidelines 98/37/EG
- Personal protective equipment 93/68/EWG, 93/95/EWG and 96/58/EG

2. Overview of standards

Standard	Description
EN 55022 Class A, B	Electromagnetic compatibility (EMC), radio disturbance characteristics, information technology equipment (ITE devices), limits and methods of measurement
EN 55024	Electromagnetic compatibility (EMC), immunity characteristics, information technology equipment (ITE devices), limits and methods of measurement
EN 61000-4-2	Electromagnetic compatibility (EMC) - part 4-2: Testing and measuring techniques; electrostatic discharge immunity test
EN 61000-4-3	Electromagnetic compatibility (EMC) - part 4-3: Testing and measuring techniques; radiated radio-frequency electromagnetic field immunity test
EN 61000-4-4	Electromagnetic compatibility (EMC) - part 4-4: Testing and measuring 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 measuring 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 61000-4-12	Electromagnetic compatibility (EMC) - part 4-12: Testing and measuring techniques; oscillatory waves immunity test
EN 61000-4-17	Electromagnetic compatibility (EMC) - part 4-12: Testing and measuring techniques; ripple on DC input power port immunity test
EN 61000-6-2 (EN 50082-2)	Electromagnetic compatibility (EMC), generic immunity standard - part 2: industrial environments (EN 50082-2 has been replaced by EN 61000-6-2)
EN 61000-6-4 (EN 50081-2)	Electromagnetic compatibility (EMC), generic emission standard - part 2: industrial environments (EN 50081-2 has been replaced by EN 61000-6-4)

Table 67: Overview of standards

Standard	Description
EN 61131-2 IEC 61131-2	Product standard, programmable logic controllers - part 2: Equipment requirements and tests
47 CFR	Federal Communications Commission (FCC), 47 CFR Part 15 Subpart B Class A

Table 67: Overview of standards (cont.)

3. Emission requirements

Emissions	Test carried out according to	Limits according to
Network-related emissions	EN 55022	EN 55022: Information technology equipment (ITE devices), class B (residential areas)
		EN 61000-6-4: Generic standard (industrial areas)
		EN 55022: Information technology equipment (ITE devices), class A (industrial areas)
		EN 61131-2: Programmable logic controllers
		47 CFR Part 15 Subpart B Class A (FCC)
Emissions	EN 55022	EN 55022: Information technology equipment (ITE devices), class B (residential areas)
		EN 61000-6-4: Generic standard (industrial areas)
		EN 55022: Information technology equipment (ITE devices), class A (industrial areas)
		EN 61131-2: Programmable logic controllers
		47 CFR Part 15 Subpart B Class A (FCC)

Table 68: Overview of limits and testing guidelines for emissions

3.1 Network related emissions

Test carried out according to EN 55022	Limits according to EN 61000-6-4	Limits according to EN 55022 class A
Power mains connections 150 kHz - 500 kHz	-	79 dB (µV) Quasi-peak value 66 dB (µV) Average
Power mains connections 500 kHz - 30 MHz	-	73 dB (µV) Quasi-peak value 60 dB (µV) Average
Test carried out according to EN 55022	**Limits according to EN 61000-6-4**	**Limits according to EN 55022 class A**
AC mains connections 150 kHz - 500 kHz	79 dB (µV) Quasi-peak value 66 dB (µV) Average	-

Table 69: Test requirements - Network-related emissions for industrial areas

AC mains connections 500 kHz - 30 MHz	73 dB (µV) Quasi-peak value 60 dB (µV) Average	-
Other connections 150 kHz - 500 kHz	-	97 - 87 dB (µV) and 53 - 43 dB (µA) Quasi-peak value 84 - 74 dB (µV) and 40 - 30 dB (µA) Average
Other connections 500 kHz - 30 MHz	-	87 dB (µV) and 43 dB (µA) Quasi-peak value 74 dB (µV) and 30 dB (µA) Average
Test carried out according to EN 55022	**Limits according to EN 61131-2**	**Limits according to 47 CFR Part 15 Subpart B class A**
Power mains connections [1)] 150 kHz - 500 kHz	79 dB (µV) Quasi-peak value 66 dB (µV) Average	-
Power mains connections 500 kHz - 30 MHz	73 dB (µV) Quasi-peak value 60 dB (µV) Average	-
AC mains connections 150 kHz - 500 kHz	-	79 dB (µV) Quasi-peak value 66 dB (µV) Average
AC mains connections 500 kHz - 30 MHz	-	73 dB (µV) Quasi-peak value 60 dB (µV) Average
Other connections 150 kHz - 500 kHz	Only informative for cable lengths > 10 m 40 - 30 dB (µA) Quasi-peak value 30 - 20 dB (µA) Average	-
Other connections 500 kHz - 30 MHz	Only informative for cable lengths > 10 m 30 dB (µA) Quasi-peak value 20 dB (µA) Average	-

Table 69: Test requirements - Network-related emissions for industrial areas (cont.)

1) AC network connections only with EN 61131-2

3.2 Emissions, electromagnetic emissions

Test carried out according to EN 55022	Limits according to EN 61000-6-4	Limits according to EN 55022 class A
30 MHz - 230 MHz measured at a distance of 10 m	< 40 dB (µV/m) Quasi-peak value	< 40 dB (µV/m) Quasi-peak value
230 MHz - 1 GHz measured at a distance of 10 m	< 47 dB (µV/m) Quasi-peak value	< 47 dB (µV/m) Quasi-peak value
Test carried out according to EN 55022	**Limits according to EN 61131-2**	
30 MHz - 230 MHz measured at a distance of 10 m	< 40 dB (µV/m) Quasi-peak value	
230 MHz - 1 GHz measured at a distance of 10 m	< 47 dB (µV/m) Quasi-peak value	
Test carried out	**Limits according to 47 CFR Part 15 Subpart B class A**	
30 MHz - 88 MHz measured at a distance of 10 m	< 90 dB (µV/m) Quasi-peak value	
88 MHz - 216 MHz measured at a distance of 10 m	< 150 dB (µV/m) Quasi-peak value	
216 MHz - 960 MHz measured at a distance of 10 m	< 210 dB (µV/m) Quasi-peak value	
>960 MHz measured at a distance of 10 m	< 300 dB (µV/m) Quasi-peak value	

Table 70: Test requirements - Electromagnetic emissions for industrial areas

4. Requirements for immunity to disturbances

Immunity	Test carried out according to	Limits according to
Electrostatic discharge (ESD)	EN 61000-4-2	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity against high-frequency electromagnetic fields (HF field)	EN 61000-4-3	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to high-speed transient electrical disturbances (burst)	EN 61000-4-4	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to surge voltages	EN 61000-4-5	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to conducted disturbances	EN 61000-4-6	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity against magnetic fields with electrical frequencies	EN 61000-4-8	EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to voltage dips, short-term interruptions and voltage fluctuations		EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)
Immunity to damped vibration	EN 61000-4-12	EN 61000-6-2: Generic standard (industrial areas)
		EN 61000-6-2: Generic standard (industrial areas)
		EN 61131-2: Programmable logic controllers
		EN 55024: Information technology equipment (ITE devices)

Table 71: Overview of limits and testing guidelines for immunity

Evaluation criteria according to EN 61000-6-2

Criteria A:
The operating equipment must continue to work as intended **during** the test. There should be no interference in the operating behavior and no system failures below a minimum operating quality as defined by the manufacturer.

Criteria B:
The operating equipment must continue to work as intended **after** the test. There should be no interference in the operating behavior and no system failures below a minimum operating quality as defined by the manufacturer.

Criteria C:
A temporary function failure is permitted when the function restores itself, or the function can be restored by activating configuration and control elements.

Criteria D:
Impairment or failure of the function, which can no longer be established (operating equipment destroyed).

4.1 Electrostatic discharge (ESD)

Test carried out according to EN 61000-4-2	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Contact discharge to powder-coated and bare metal housing parts	±4 kV, 10 discharges, criteria B	±4 kV, 10 discharges, criteria B	±4 kV, 10 discharges, criteria B
Discharge through the air to plastic housing parts	±8 kV, 10 discharges, criteria B	±8 kV, 10 discharges, criteria B	±8 kV, 10 discharges, criteria B

Table 72: Test requirements - Electrostatic discharge (ESD)

4.2 High-frequency electromagnetic fields (HF field)

Test carried out according to EN 61000-4-3	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Housing, completely wired	80 MHz - 1 GHz, 10 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	80 MHz - 1 GHz, 1.4 - 2 GHz, 10 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A 800-960 MHz (GSM), 10 V/m, pulse modulation with 50% duty cycle, criteria A	80 MHz - 1 GHz, 1.4 - 2 GHz, 3 V/m, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A

Table 73: Test requirements - High-frequency electromagnetic fields (HF field)

4.3 High-speed transient electrical disturbances (burst)

Test carried out according to EN 61000-4-4	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O	±2 kV, criteria B	-	±1 kV, criteria B
AC power inputs	-	±2 kV, criteria B	-
AC power outputs	-	±1 kV, criteria B	-
DC power I/O >10 m [1)]	±2 kV, criteria B	-	±0.5 kV, criteria B
DC power inputs >10 m	-	±2 kV, criteria B	-
DC power outputs >10 m	-	±1 kV, criteria B	-
Functional ground connections, signal lines and I/Os >3 m	±1 kV, criteria B	±1 kV, criteria B	±0.5 kV, criteria B
Unshielded AC I/O >3 m	-	±2 kV, criteria B	-
Analog I/O	±1 kV, criteria B	±1 kV, criteria B	-

Table 74: Test requirements - High-speed transient electrical disturbances (burst)

1) For EN 55024 without length limitation.

4.4 Surges

Test carried out according to EN 61000-4-5	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O, L to L	±1 kV, criteria B	±1 kV, criteria B	±1 kV, criteria B
AC power I/O, L to PE	±2 kV, criteria B	±2 kV, criteria B	±2 kV, criteria B
DC power I/O, L+ to L-, >10 m	±0.5 kV, criteria B	-	-
DC power I/O, L to PE, >10 m	±0.5 kV, criteria B	-	±0.5 kV, criteria B
DC power inputs, L+ to L-	-	±0.5 kV, criteria B	-
DC power inputs, L to PE	-	±1 kV, criteria B	-
DC power outputs, L+ to L-	-	±0.5 kV, criteria B	-
DC power outputs, L to PE	-	±0.5 kV, criteria B	-
Signal connections >30 m	±1 kV, criteria B	±1 kV, criteria B	±1 kV, criteria B
All shielded cables	-	±1 kV, criteria B	-

Table 75: Test requirements - Surge voltages

4.5 Conducted disturbances

Test carried out according to EN 61000-4-6	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
AC power I/O	150 kHz - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A

Table 76: Test requirements - Conducted disturbances

Test carried out according to EN 61000-4-6	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
DC power I/O	150 kHz - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A
Functional ground connections	0.15 - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, Length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	-
Signal connections >3 m	0.15 - 80 MHz, 10 V, 80% amplitude modulation with 1 kHz, Length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, length 3 seconds, criteria A	150 kHz - 80 MHz, 3 V, 80% amplitude modulation with 1 kHz, criteria A

Table 76: Test requirements - Conducted disturbances (cont.)

4.6 Magnetic fields with electrical frequencies

Test carried out according to EN 61000-4-8	Limits according to EN 61000-6-2	Limits according to EN 61131-2	Limits according to EN 55024
Test direction x, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A
Test direction y, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A
Test direction z, test in the field of an induction coil 1 m x 1 m	30 A/m, criteria A	30 A/m, criteria A	50 Hz, 1 A/m, criteria A

Table 77: Test requirements - Magnetic fields with electrical frequencies

4.7 Damped vibration

Test carried out according to EN 61000-4-12	Limits according to EN 61131-2		
Power I/O, L to L	±1 kV, 1 MHz, repeat rate 400/seconds, length 2 seconds, connection lengths 2 m, criteria B		
Power I/O, L to PE	±2.5 kV, 1 MHz, repeat rate 400/seconds, length 2 seconds, connection lengths 2 m, criteria B		

Table 78: Test requirements - Damped vibration

5. Climate conditions

Temperature / humidity	Test carried out according to	Limits according to
Dry heat	EN 60068-2-2	EN 61131-2: Programmable logic controllers

Table 79: Overview of limits and testing guidelines for temperature and humidity

5.1 Dry heat

Test carried out according to EN 60068-2-2	Limits according to EN 61131-2		
Dry heat	16 hours at +70°C for 1 cycle, then 1 hour acclimatization and function testing, duration approximately 17 hours		

Table 80: Test requirements - Dry heat

6. Safety

Safety	Test carried out according to	Limits according to
Ground resistance	EN 61131-2	EN 61131-2: Programmable logic controllers
Residual voltage	EN 61131-2	EN 61131-2: Programmable logic controllers

Table 81: Overview of limits and testing guidelines for safety

6.1 Leakage current

Test carried out	B&R		
Leakage current: Phase to ground	< 1 mA		

Table 82: Test requirements - Leakage current

6.2 Voltage range

Test carried out according to	Limits according to EN 61131-2	
Supply voltage	Measurement value	Tolerance min/max
	24 VDC 48 VDC 125 VDC	-15% +20%
	24 VAC 48 VAC 100 VAC 110 VAC 120 VAC 200 VAC 230 VAC 240 VAC 400 VAC	15% +10%

Table 83: Test requirements - Voltage range

6.3 Protection type

Test carried out according to	Limits according to EN 60529		
Protection of the operating equipment	IP.6 Protection against large solid foreign bodies: dust-proof		
Protection of personnel	IP.6 Protection against touching dangerous parts with conductor		
Protection against water permeation with damaging consequences	IP.5 Protected against sprayed water		

Table 84: Test requirements - Protection

7. International certifications

B&R products and services comply with applicable standards. They are international standards from organizations such as ISO, IEC and CENELEC, as well as national standards from organizations such as UL, CSA, FCC, VDE, ÖVE, etc. We give special consideration to the reliability of our products in an industrial environment.

Certifications	
USA and Canada	All important B&R products are tested and listed by Underwriters Laboratories and checked quarterly by a UL inspector. This mark is valid for the USA and Canada and simplifies certification of your machines and systems in these areas.
Europe	All harmonized EN standards for the applicable guidelines are met.

Table 85: International certifications

8. SDL flex cable - test description

8.1 Torsion

8.1.1 Structure of the test

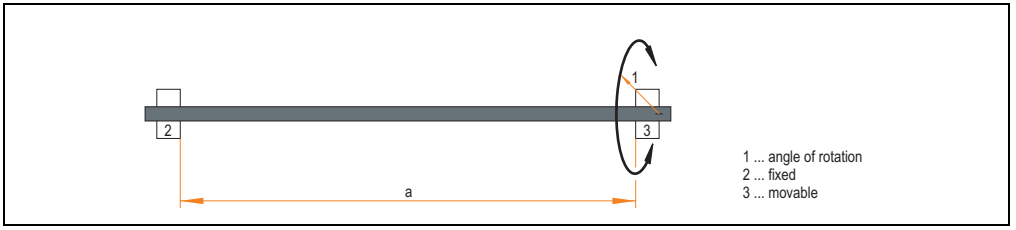


Figure 120: Test structure - torsion

8.1.2 Test conditions

- Distance a: 450 mm
- Rotation angle: ±85°
- Speed: 50 cycles / minute
- Special feature: The cable was clamped down twice in the machine.

8.1.3 Individual tests

- Visible pixel errors: At the beginning of the test, the minimum equalizer setting was determined. This is the value between 0-15 at which no more pixel errors are visible. If the equalizer setting is changed due to the mechanical load, this is noted.
- Touch screen function
- USB mouse function
- Hot plug function tested by unplugging the USB plug
- After a test duration of 15000 cycles, the test was ended with a result of "OK".

8.2 Cable drag chain

8.2.1 Structure of the test

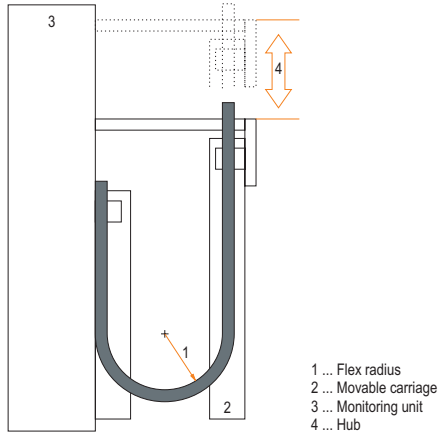


Figure 121: Test structure - cable drag chain

8.2.2 Test conditions

- Flex radius: 180 mm (= 15 x cable diameter)
- Hub: 460 mm
- Speed: 4800 cycles / hour
- Special feature: The cable was clamped down twice in the machine.

8.2.3 Individual tests:

- Visible pixel errors: At the beginning of the test, the minimum equalizer setting is determined. This is the value between 0-15 at which no more pixel errors are visible. If the equalizer setting is changed due to the mechanical load, this is noted.
- Touch screen function
- USB mouse function
- Hot plug function tested by unplugging the USB plug
- After a test duration of 30000 cycles, the test was ended with a result of "OK".

Chapter 6 • Accessories

1. Overview

Model number	Product ID	Note
5MMUSB.0128-00	**USB flash drive 128 MB SanDisk** USB 2.0 flash drive 128 MB	Cancelled since 12/2005 Replaced by 5MMUSB.2048-00
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	Cancelled since 03/2007 Replaced by 5MMUSB.2048-00
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	Cancelled since 07/2007 Replaced by 5MMUSB.2048-00
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	Cancelled since 03/2007 Replaced by 5MMUSB.2048-00
5MMUSB.2048-00	**USB flash drive 2 GB SanDisk** USB 2.0 flash drive 2 GB	
5AC800.EXTX-00	**Legend strip template for AP800 extension** for 5AC800.EXT2-00, 5AC800.EXT2-01, for 3 devices.	
5AC800.EXTX-01	**Legend strip template for AP800 extension 1** for 5AC800.EXT3-00, 5AC800.EXT3-01, for 2 devices.	
5AC800.EXTX-02	**Legend strip template for AP800 extension 2** for 5AC800.EXT3-04, 5AC800.EXT3-05, for 1 device right and device left.	
5AC800.EXTX-03	**Legend strip template for AP800 extension 3** for 5AC800.EXT3-02, 5AC800.EXT3-03, for 3 devices.	
5AC800.150x-00	**Legend strip template for AP800 display** for 5AP880.1505-00, for 3 devices.	

Table 86: Model numbers - Accessories

2. USB flash drive

Information:

We reserve the right to supply alternative products due to the vast quantity of flash drives available on the market and their corresponding short product lifecycle. As a result, the following measures may be necessary (e.g. using the SanDisk Cruzer Micro flash drive with 512 MB) to take the following measures in order to boot from these flash drives:

- **The flash drive must be reformatted or in some cases even re-partitioned (set active partition).**
- **The flash drive must be at the top of the BIOS boot order, or alternatively the IDE controllers can also be deactivated in the BIOS. This can be avoided in most cases if a "`fdisk /mbr`" command is also executed on the USB flash drive.**

2.1 General information

USB flash drives are easy-to-exchange storage media. Because of the fast data transfer (USB 2.0), the USB flash drives are ideal for use as a portable memory medium. Without requiring additional drivers ("Hot Plug & Play" - except with Windows 98SE), the USB flash drive can be converted immediately into an additional drive where data can be read or written. Only USB flash drives from the memory specialists SanDisk are used.

2.2 Order data

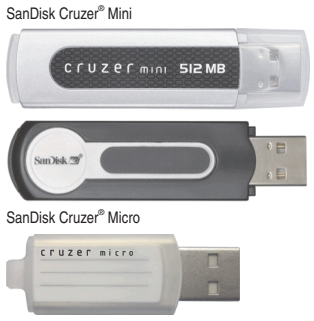
Model number	Description	Figure
5MMUSB.0128-00	USB flash drive 128 MB SanDisk Cruzer Mini	
5MMUSB.0256-00	USB flash drive 256 MB SanDisk Cruzer Mini	
5MMUSB.0512-00	USB flash drive 512 MB SanDisk Cruzer Mini up to Rev. E0 or Cruzer Micro starting with Rev. E0	
5MMUSB.1024-00	USB flash drive 1 GB SanDisk Cruzer Mini up to Rev. C0 or Cruzer Micro starting with Rev. C0	
5MMUSB.2048-00	USB flash drive 2 GB SanDisk Cruzer Micro	

Table 87: Order data - USB flash drives

2.3 Technical data

Information:

The following characteristics, features and limit values only apply to this accessory and can deviate those specified for the entire device. For the entire device where this accessory is installed, refer to the data provided specifically for the entire device.

Features	5MMUSB.0128-00	5MMUSB.0256-00	5MMUSB.0512-00	5MMUSB.1024-00	5MMUSB.2048-00
LED Cruzer Mini / Cruzer Micro	1 LED (green), signals data transfer (send and receive)				
Power supply Current requirements Cruzer Mini / Cruzer Micro	Via the USB port 650 µA sleep mode, 150 mA read/write				
Interface Cruzer Mini / Cruzer Micro Type Transfer rate Sequential reading Sequential writing Connection	USB specification 2.0 high speed device, mass storage class, USB-IF and WHQL certified USB 1.1 and 2.0 compatible Up to 480 Mbit (high speed) Max. 8.7 MB/second Max. 1.7 MB/second To each USB type A interface				
MTBF (at 25°C) Cruzer Mini / Cruzer Micro	100,000 hours				
Data retention Cruzer Mini / Cruzer Micro	10 years				
Maintenance Cruzer Mini / Cruzer Micro	None				
Operating system support Cruzer Mini Cruzer Micro	Windows CE 4.1, CE 4.2, 98SE[1)] , ME, 2000, XP, Mac OS 9.1.x and Mac OS X 10.1.2 Windows CE 4.2, CE 5.0, ME, 2000, XP and Mac OS 9.1.x+, OS X v10.1.2+				
Mechanical characteristics					
Dimensions Height - Cruzer Mini / Cruzer Micro Width - Cruzer Mini / Cruzer Micro Depth - Cruzer Mini / Cruzer Micro	62 mm / 52.2 mm 19 mm / 19 mm 11 mm / 7.9 mm				
Environmental characteristics					
Environmental temperature Cruzer Mini / Cruzer Micro Operation Storage Transport	0 to +45°C -20 to +60°C -20 to +60°C				
Humidity Cruzer Mini / Cruzer Micro Operation Storage Transport	10 to 90%, non-condensing 5 to 90%, non-condensing 5 to 90%, non-condensing				

Table 88: Technical data - USB flash drive 5MMUSB.xxxx-00

Features	5MMUSB.0128-00	5MMUSB.0256-00	5MMUSB.0512-00	5MMUSB.1024-00	5MMUSB.2048-00
Vibration Cruzer Mini / Cruzer Micro Operation Storage Transport	At 10 - 500 Hz: 2 g (19.6 m/s^2 0 peak), oscillation rate 1/minute At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute At 10 - 500 Hz: 4 g (39.2 m/s^2 0 peak), oscillation rate 1/minute				
Shock Cruzer Mini / Cruzer Micro Operation Storage Transport	Max. 40 g (392 m/s^2 0-peak) and 11 ms length Max. 80 g (784 m/s^2 0-peak) and 11 ms length Max. 80 g (784 m/s^2 0-peak) and 11 ms length				
Altitude Cruzer Mini / Cruzer Micro Operation Storage Transport	3048 meters 12192 meters 12192 meters				

Table 88: Technical data - USB flash drive 5MMUSB.xxxx-00 (cont.)

1) For Win 98SE, a driver can be downloaded from the SanDisk homepage.

2.3.1 Temperature humidity diagram - Operation and storage

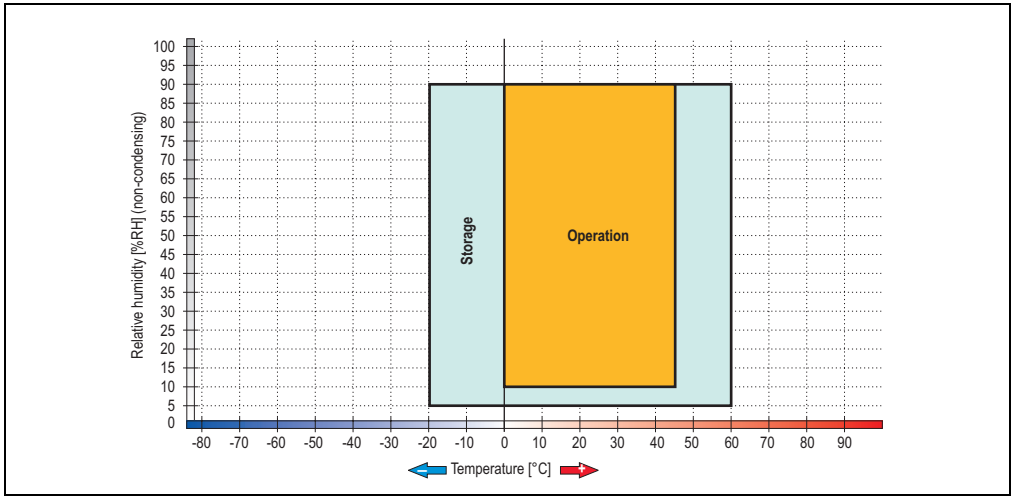


Figure 122: Temperature humidity diagram - USB flash drive - 5MMUSB.xxxx-00

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

2.4 Creating a bootable USB flash drive

When used in connection with a B&R industrial PC, it is possible to boot the system from one of the flash drives available from B&R. The flash drive must be specially prepared for this.

2.4.1 Requirements

The following peripherals are required for creating a bootable flash drive:

- B&R USB flash drive
- B&R Industrial PC
- USB floppy drive (external)
- USB keyboard
- A start disk created using MS-DOS 6.22 or Windows 98 - 1.44MB HDD (Windows Millennium, NT4.0, 2000, XP start disks cannot be used).
  The tools "`format.com`" and "`fdisk.exe`" must be located on the diskette!

2.4.2 Procedure

- Plug in the flash drive and boot from the start disk.
- Set active partition on the flash drive using "`fdisk`" and follow the further instructions.
- Reboot the system from the start disk.
- Format and simultaneously transfer the system files to the flash drive with the command "`format c: /s`".

3. Legend strip templates

Automation Panel 800 devices with keys and the extension units are delivered with partially pre-labeled key legend strips (F1, F2, etc.). The key legend strip slots are accessible on the back of the Automation Panel 800 display and extension units (above and below).

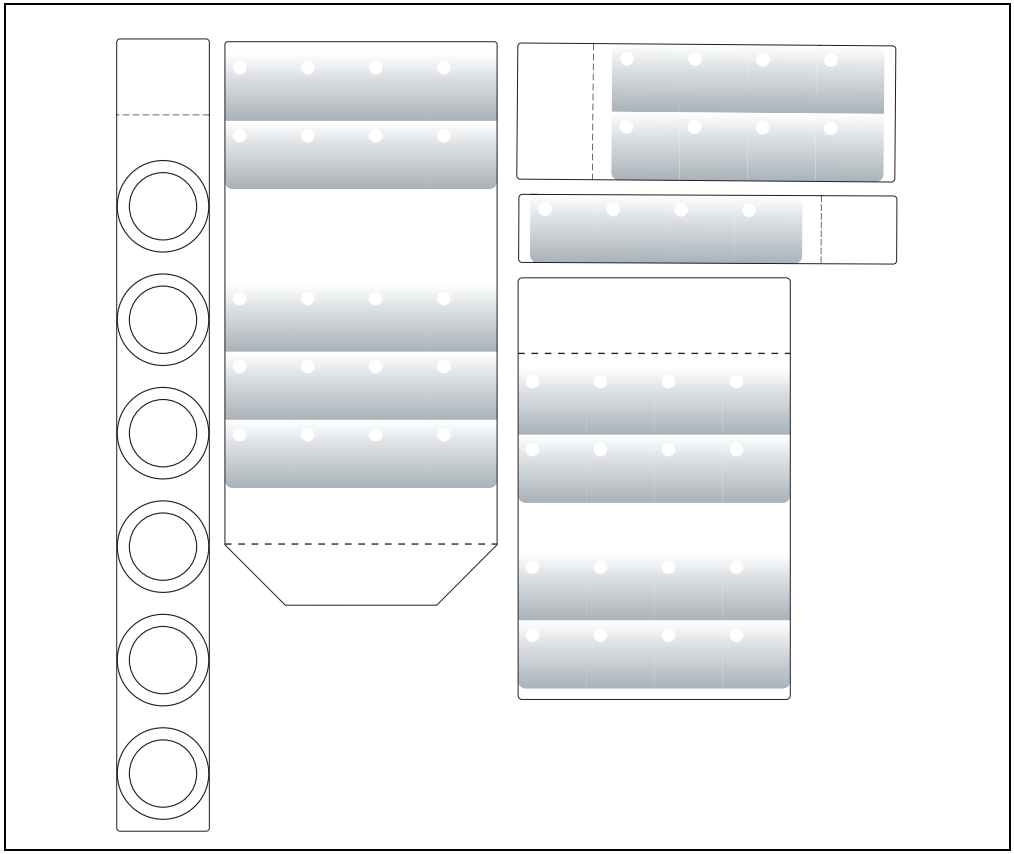


Figure 123: Legend strip templates

Printable legend strips in A4 format for the extension units and in A3 format for display unit 5AP880.1505-00 can be ordered from B&R. They can be printed using a standard laser printer (b/w or color) in a temperature range from -40°C to +125°C. A print template (available for Corel Draw version 7, 9 and 10) for the respective legend strip template can be downloaded from the B&R homepage **www.br-automation.com**. The print templates can also be found on the HMI Drivers & Utilities DVD (model number 5SWHMI.0000-00).

3.1 Order data

Model number	Short description	Note
5AC800.EXTX-00	**Legend strip template for AP800 extension** for 5AC800.EXT2-00, 5AC800.EXT2-01, for 3 devices.	
5AC800.EXTX-01	**Legend strip template for AP800 extension 1** for 5AC800.EXT3-00, 5AC800.EXT3-01, for 2 devices.	
5AC800.EXTX-02	**Legend strip template for AP800 extension 2** for 5AC800.EXT3-04, 5AC800.EXT3-05, for 1 device right and 1 device left.	
5AC800.EXTX-03	**Legend strip template for AP800 extension 3** for 5AC800.EXT3-02, 5AC800.EXT3-03, for 3 devices.	
5AC800.150x-00	**Legend strip template for AP800 display** for 5AP880.1505-00, for 3 devices.	

Table 89: Order data - legend strip template

Chapter 7 • Maintenance / Servicing

1. Cleaning

Danger!

Automation Panel 800 devices may only be cleaned when switched off. This is to prevent unintended functions from being triggered when touching the touch screen or pressing the buttons or entry devices.

A moist towel should be used to clean the Automation Panel 800 device. When moistening the cloth, use only water with detergent, screen cleaning agent, or alcohol (ethanol). The cleaning agent should be applied to the cloth beforehand, not sprayed directly on the Automation Panel 800 device! Never use aggressive solvents, chemicals, scouring agents, pressurized air or steam jet.

Information:

Displays with touch screens should be cleaned at regular intervals.

2. Preventing after-image effect in LCD/TFT monitors

Burn-in effect (after images, display memory effect, image retention or also image sticking) occurs in LCD/TFT monitors when a static image is displayed for a long period of time. This static screen content causes the build-up of parasitic capacities within the LCD components that prevent the liquid crystal molecules from returning to their original states. This condition may arise, is not predictable and depends on the following factors:

- Type of image displayed
- Color composition of the image
- Length of image output
- Ambient temperature

2.1 What measures can be taken against this?

There is no total solution, however, measures can be taken to significantly reduce this effect:

- Avoid static pictures or screen content
- Use screen savers (moving) when the display is not in use
- Frequent picture change
- Shut off the display when not in use

Turning off the background lighting (backlight) does not influence the prevention of the after-image effect.

3. Exchanging the legend strips

Danger!

The legend strips may only be exchanged when the device is turned off, and only by knowledgeable and qualified personnel.

3.1 Procedure

3.1.1 Display

1) Loosen the screws on the back of the display (using Torx screw driver size 20).

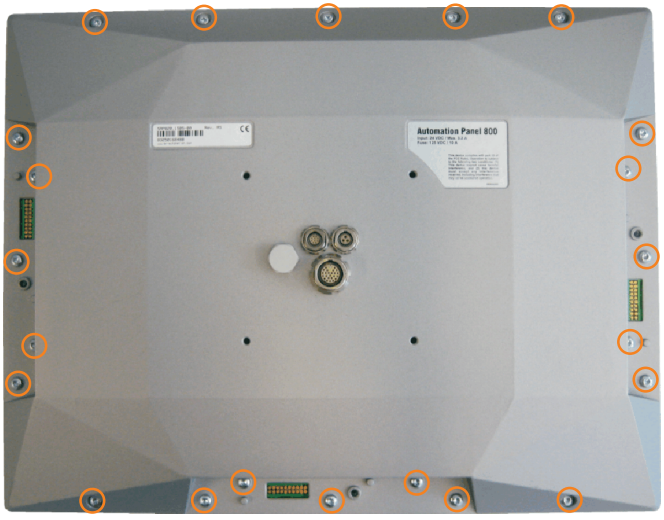


Figure 124: Remove screws

2) Open housing (lift carefully to the side).

Figure 125: Open housing

3) Remove blank legend strips and replace with printed ones.

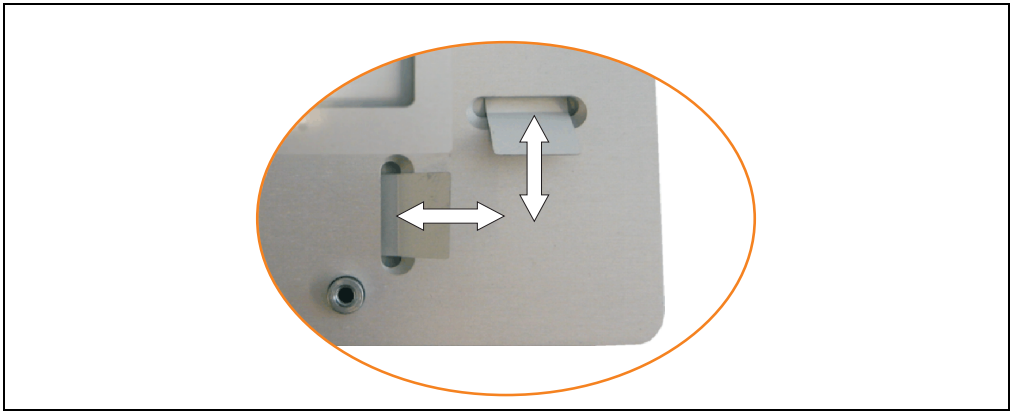


Figure 126: Exchange legend strips

4) Reassemble display in reverse order - Fasten the screws alternately and diagonally.

3.1.2 Extension units

1) Loosen the screws on the back of the extension unit (using a size 20 Torx screw driver).

Figure 127: Remove screws

2) Open housing (lift carefully to the side).

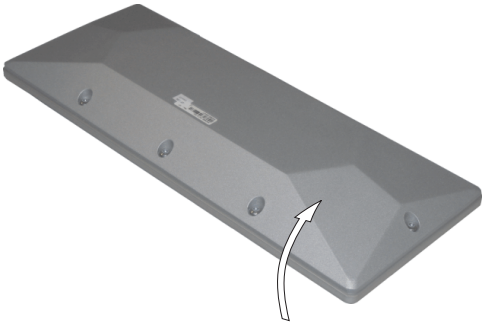


Figure 128: Open housing

3) Remove blank legend strips and replace with printed ones.

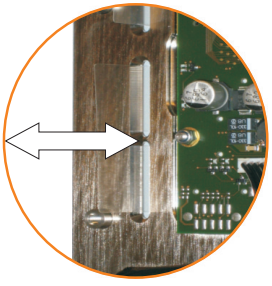


Figure 129: Exchange legend strips

4) Reassemble display in reverse order - Fasten the screws alternately and diagonally.

Appendix A

1. E-stop button

The E-stop unit consists of an E-stop switching element and an E-stop button.

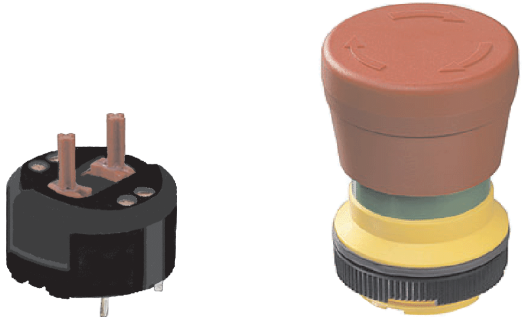


Figure 130: E-stop entry device

Information:

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

Property	E-stop switching element	E-stop button
Manufacturer Type	RAFI 22FS switching element E-stop, 2 N.C. contacts	RAFI 22FS E-stop, not illuminated
Operating voltage AC/DC	Max. 120 V	-
Operating current AC/DC	Max. 550 mA	-
Contact system	Self-cleaning bridge contact	-

Table 90: Technical data - E-stop switching element and E-stop button

Property	E-stop switching element	E-stop button
Standards N/C contact Weathering resistance Salt mist Protection (front side) Approbations	 Positive opening contact according to IEC 947-5-1 - - - -	 - According to IEC 68-1-2, 2-2 and 2-30 According to IEC 68-2-11 IP65 IEC 947, 1058; UL 508;CSA 22.2; EU-NSR 73/23; Ulc
Impact resistance	At least 100 N	
Operating force	Approx. 5 N per contact element	-
Lifespan	1 million actuations at 10 mA/24 VDC	50000 actuations
Ambient temperature Operation Storage Transport	 -25 to +70°C -40 to +80°C -40 to +80°C	

Table 90: Technical data - E-stop switching element and E-stop button (cont.)

2. Key switch

The key switch unit consists of a key switch switching element and a key switch.

Key switch switching element

Key switch

Figure 131: Key switch unit

Information:

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

Property	Key switch switching element	Key switch
Manufacturer Type	RAFI 22FS universal switching element, 1 N.O. contact	RAFI 22FS key switch, round collar
Contact function	Key	
Operating voltage AC/DC	Max. 42 V	-
Operating current AC/DC	Max. 100 mA	-
Contact system	Self-cleaning bridge contact	-
Standards Normally open contact Weathering resistance Salt mist Protection (front side) Approbations	 - - - - -	 - According to IEC 68-1-2, 2-2 and 2-30 According to IEC 68-2-11 IP65 IEC 947, 1058; UL 508;CSA 22.2; EU-NSR 73/23; ULc
Impact resistance	At least 100 N	
Angle of rotation	1 x 40 degrees, clockwise	
Outlet position for the key	0	

Table 91: Technical data - key switch switching element and key switch

Property	Key switch switching element	Key switch
Lifespan	1 million actuations at 10 mA/24 VDC	0.3 million, operations
Ambient temperature Operation Storage Transport	 -25 to +70°C -40 to +80°C -40 to +80°C	

Table 91: Technical data - key switch switching element and key switch (cont.)

2.1 Angle of rotation

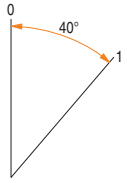


Figure 132: Angle of rotation - key switch

3. Touch screen

3.1 Elo

Information:

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

Elo Accu touch screen	Specifications
Manufacturer	Elo
Accuracy For < 18" diagonals For > 18" diagonals	 Typically < 0.080 inches (2.032 mm) Maximum error in all directions 0.180 inches (4.752 mm) Maximum 1% of the diagonal for the active area of the touch screens
Response time	< 10 ms
Release pressure	< 113 grams
Resolution	4096 x 4096 touch points
Light permeability	Up to 80% ±5%
Temperature Operation Storage Transport	 - 10 to + 50°C - 40 to + 71°C - 40 to + 71°C
Relative humidity Operation Storage Transport	 Max. 90% at max. 35°C Max. 90% at max. 35°C for 240 hours, non-condensing Max. 90% at max. 35°C for 240 hours, non-condensing
Waterproofing	IP65
Lifespan	35 million contacts on the same point
Chemical resistance [1)]	Acetone, ammonia-based glass cleaner, normal food and drinks, hexane, methylene chloride, methyl ethyl ketone, mineral spirits, turpentine, isopropyl alcohol
Activation	Finger, pointer, credit card, glove
Drivers	Touch screen drivers can be downloaded from the download area on the B&R homepage (www.br-automation.com). Additionally, they can also be found on the B&R HMI Driver and Utilities DVD (Mod. No. 5SWHMI.0000-00).

Table 92: Technical data - Elo Accu touch screen 5-wire

1) The active area of the touch screen is resistant to these chemicals for a timeframe of one hour at 21°C.

3.1.1 Temperature humidity diagram - Operation and storage

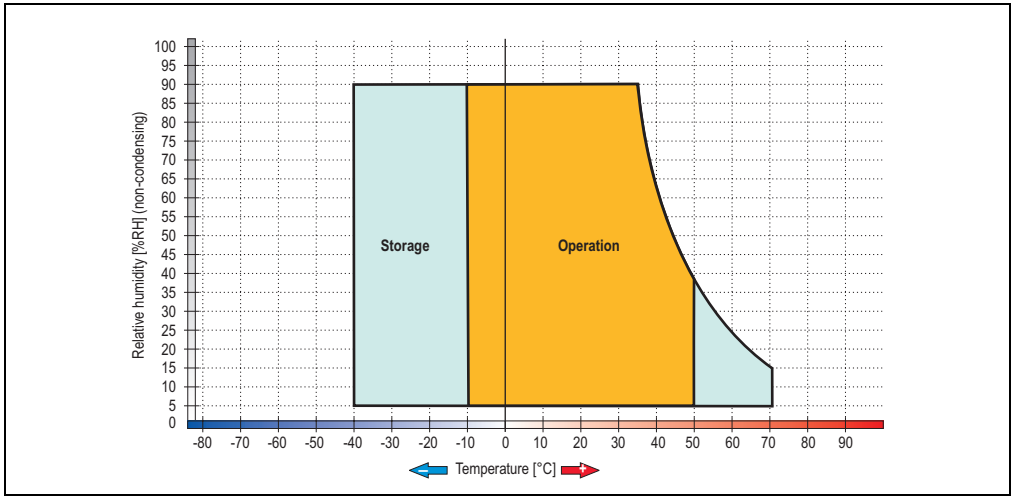


Figure 133: Temperature humidity diagram - Elo Accu touch screen 5-wire

Temperature data is for operation at 500 meters. Derating the max. ambient temperature - typically 1°C per 1000 meters (from 500 meters above sea level).

3.1.2 Cleaning

The touch screen should be cleaned with a moist lint-free cloth. When moistening the cloth, use only water with detergent, screen cleaning agent, or alcohol (ethanol). The cleaning agent should be applied to the cloth beforehand and not sprayed directly onto the touch screen itself. Never use aggressive solvents, chemicals, scouring agents, pressurized air or steam jet.

4. Décor foil

Information:

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

The décor foil conforms to DIN 42115 (section 2). This means it is resistant to exposure to the following chemicals for a 24-hour period with no visible signs of damage:

Ethanol Cyclohexanol Diacetone alcohol Glycol Isopropanol Glycerine Methanol Triacetin Dowandol DRM/PM	Formaldehyde 37%-42% Acetaldehyde Aliphatic hydrocarbons Toluene Xylene White spirits	1.1.1.Trichloroethane Ethyl acetate Diethyl ether N-Butyl acetate Amyl acetate Butylcellosolve Ether
Acetone Methyl ethyl ketone Dioxan Cyclohexanone MIBK Isophorone	Formic acid <50% Acetic acid <50% Phosphoric acid <30% Hydrochloric acid <36% Nitric acid <10% Trichloracetic acid <50% Sulphuric acid <10%	Sodium hypochlorite <20% Hydrogen peroxide <25% Potassium carbonate Washing agents Fabric conditioner Ferric chloride Ferrous chloride (FeCl2) Ferrous chloride (FeCl3) Dibutyl phthalate Dioctyl phthalate Sodium carbonate
Ammonia <40% Caustic soda <40% Potassium hydroxide Alkali carbonate Bichromate Potassium Acetonitrile Sodium bisulphate	Cutting oil Diesel oil Linseed oil Paraffin oil Blown castor oil Silicon oil Turpentine oil substitute Universal brake fluid Aviation fuel Petrol Water Sea water Decon	

Table 93: Chemical resistance of the décor foil

The décor foil conforms to DIN 42115 section 2 for exposure to glacial acetic acid for less than one hour without visible damage.

5. Viewing angles

The viewing angle information of the display types (R, L, U, D) can be seen in the technical data for the individual components.

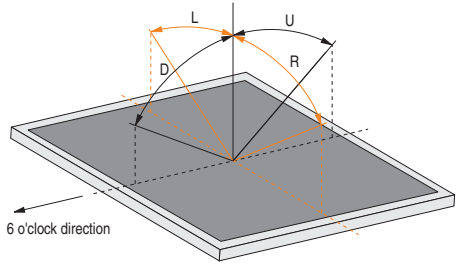


Figure 134: Viewing angles

6. Glossary

A

APC

Abbreviation for "**A**utomation **PC**".

Automation Runtime

A uniform runtime system for all B&R automation components.

B

Baud rate

Measurement unit for data transfer speed. It indicates the number of states for a transferred signal per second and is measured using the baud unit of measurement. 1 baud = 1 bit/sec or 1 bps.

BIOS

An abbreviation for "**B**asic **I**nput/**O**utput **S**ystem". Core software for computer systems with essential routines for controlling input and output processes on hardware components, for performing tests after system start, and for loading the operating system. Although BIOS is used to configure a system's performance, the user does not usually come into contact with it.

Bit

Binary digit > binary position, binary character, smallest discrete unit of information. A bit can have the value 0 or 1.

Bit rate

The number of bits that can be transferred within a specified time unit. 1 bit/sec = 1 baud.

Byte

Data format [1 byte = 8 bits] and a unit for characterizing information amounts and memory capacity. The following units are the commonly used units of progression: KB, MB, GB.

B&R Automation Runtime

Windows-based program for creating installation disks to install B&R Automation Runtime™ on the target system.

B&R Automation Studio

B&R Automation Studio™ is the integrated software development environment which includes tools for all parts of an automation project, making it the foundation for applications of any size and scope. Regardless of which stage a project is in – planning, implementation, testing, production, commissioning, or service – this same environment always makes up the interface to the machine.

C

CD-ROM

Abbreviation for "**C**ompact **D**isc **R**ead-**O**nly **M**emory". A removable data medium with a capacity of ~700 MB. CD-ROMs are optically scanned.

CE mark

A CE mark for a product. It consists of the letters "CE" and indicates conformity to all EU guidelines for the labeled product. It indicates that the individual or corporate body who has performed or attached the label assures that the product conforms to all EU guidelines for complete harmonization. It also indicates that all mandatory conformity evaluation procedures have taken place.

CompactFlash®

CompactFlash memory cards [CF cards] are exchangeable nonvolatile mass memory systems with very small dimensions [43 x 36 x 3.3 mm, approximately half the size of a credit card]. In addition to the flash memory chips, the controller is also present on the cards. CF cards provide complete PC card / ATA functionality and compatibility. A 50-pin CF card can be simply inserted in a passive 68-pin type II adapter card. It conforms to all electrical and mechanical PC card interface specifications. CF cards were launched by SanDisk back in 1994. Currently, memory capacities reach up to 8 GB per unit. Since 1995, CompactFlash Association [CFA] has been looking after standardization and the worldwide distribution of CF technology

CPU

An abbreviation for "**C**entral **P**rocessing **U**nit". Interprets and executes commands. It is also known as a "microprocessor" or "processor" for short. A processor is able to receive, decode and execute commands, as well as transfer information to and from other resources via the computer bus.

CRT

An abbreviation for "**C**athode **R**ay **T**ube". The main component of a television set or a standard computer screen. A cathode ray tube consists of a vacuum tube that contains one or more electron guns. Each electron gun creates a horizontal electron beam that appears on the front of the tube (the screen). The inner surface of the screen is coated with phosphor, which is lit when hit by the electrons. Each of the electron beams move in a line from top to bottom. In order to prevent flickering, the screen content is updated at least 25 times per second. The sharpness of the picture is determined by the number of pixels on the screen.

D

DMA

Direct **M**emory **A**ccess >. Accelerated direct access to a computer's RAM by bypassing the CPU.

DRAM

An abbreviation for "**D**ynamic **R**andom **A**ccess **M**emory". Dynamic RAM consists of an integrated semiconductor circuit that stores information based on the capacitor principle. Capacitors lose their charge in a relatively short time. Therefore, dynamic RAM circuit boards must contain a logic that allows continual recharging of RAM chips. Since the processor cannot access dynamic RAM while it is being recharged, one or more waiting states can occur when reading or writing data. Although it is slower, dynamic RAM is used more often than static RAM since the simple design of the circuits means that it can store four times more data than static RAM.

DVD

An abbreviation for "**D**igital **V**ersatile **D**isc". The next generation of optical data carrier technology. Using this technology it is possible to encode video, audio and computer data on CD. DVDs can store a higher volume of data than conventional CDs. Standard DVDs, which have a single layer, can hold 4.7 GB. Dual-layer DVDs can hold 8.5 GB. Double-sided DVDs can therefore hold up to 17 GB. A special drive is needed for DVDs. Conventional CDs can also be played on DVD drives.

E

Real time

A system is operating in real time or has real-time capability if the input sizes (e.g. signals, data) are received and processed in a defined time period, and the results are made available in real time for a partner system or the system environment. See also "real-time demands" and "real-time system".

EMC

"**E**lectro**m**agnetic **C**ompatibility". The ability of a device or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment [IEV 161-01-07].

EPROM

Erasable **PROM** >(completely with ultraviolet light).

Ethernet

An IEEE 802.3 standard for networks. Ethernet uses bus or star topology and controls the traffic on communication lines using the access procedure CSMA/CD (Carrier Sense Multiple Access with Collision Detection). Network nodes are connected using coaxial cables, fiber optic cables

or twisted pair cabling. Data transfer on an Ethernet network takes place in frames of variable lengths that consist of supply and controller information as well as 1500 bytes of data. The Ethernet standard provides base band transfers at 10 megabit and 100 megabit per second.

Ethernet POWERLINK

An enhancement of standard Ethernet. It enables data exchange under strict real-time conditions with cycle times down to 200 µs and jitter under 1 µs. This makes Ethernet power available on all communication levels of automation technology – from control levels to I/O. Ethernet POWERLINK was initiated by the company B&R Industrie-Elektronik and is now managed by the open end user and vendor association, EPSG - Ethernet POWERLINK Standardization Group (www.ethernet-powerlink.org).

F

FDD

Abbreviation for "**F**loppy **D**isk **D**rive". Reading device for removable magnetic memory from the early days of PC technology. Due to their sensitivity and moving components, FDDs have been almost completely replaced by CompactFlash memory in modern automation solutions.

Firmware

Programs stored permanently in read-only memory. Firmware is software used to operate computer-controlled devices that generally stays in the device throughout its lifespan or over a long period of time. Such software includes operating systems for CPUs and application programs for industrial PCs as well as programmable logic controllers (e.g. the software in a washing machine controller). This software is written in read-only memory (ROM, PROM, EPROM) and cannot be easily replaced.

Floppy

Also known as a diskette. A round plastic disk with an iron oxide coating that can store a magnetic field. When the floppy disk is inserted in a disk drive, it rotates so that the different areas (or sectors) of the disk's surface are moved under the read/write head. This allows the magnetic orientation of the particle to be modified and recorded. Orientation in one direction represents binary 1, while the reverse orientation represents binary 0.

FPC

An abbreviation for "**F**lat **P**anel **C**ontroller".

FPD

An abbreviation for "**F**lat **P**anel **D**isplay".

FTP

"**F**ile **T**ransfer **P**rotocol". Rules for transferring data over a network from one computer to another computer. This protocol is based on TCP/IP, which has established itself as the standard for transferring data over Ethernet networks. FTP is one of the most used protocols on the Internet. It is defined in RFC 959 in the official regulations for Internet communication.

G

GB

Gigabyte (1 GB = 230 or 1,073,741,824 bytes)

H

HDD

An abbreviation for "**H**ard **D**isk **D**rive". Fixed magnetic mass memory with high capacities, e.g. 120 GB.

L

LCD

An abbreviation for "**L**iquid **C**rystal **D**isplay". A display type, based on liquid crystals that have a polarized molecular structure and are enclosed between two transparent electrodes as a thin layer. If an electrical field is applied to the electrodes, the molecules align themselves with the field and form crystalline arrangements that polarize the light passing through. A polarization filter, which is arranged using lamellar electrodes, blocks the polarized light. In this way, a cell (pixel) containing liquid crystals can be switched on using electrode gates, thus coloring this pixel black. Some LCD displays have an electroluminescent plate behind the LCD screen for lighting. Other types of LCD displays can use color.

LED

An abbreviation for "**L**ight **E**mitting **D**iode". A semiconductor diode which converts electrical energy into light. LEDs work on the principle of electroluminescence. They are highly efficient because they do not produce much heat in spite of the amount of light they emit. For example, "operational status indicators" on floppy disk drives are LEDs.

Illuminated ring keys

They are luminous rings developed by B&R. The LEDs are available in red, yellow, and green, and can be combines as one-tone or two-tone illuminated key rings. Keys are labeled using legend strips.

M

MB

Megabyte (1 MB = 220 or 1,048,576 bytes).

Microprocessor

Highly integrated circuit with the functionality of a CPU, normally housed on a single chip. It comprises a control unit, arithmetic and logic unit, several registers and a link system for connecting memory and peripheral components. The main performance features are the internal

and external data bus and address bus widths, the command set and the clock frequency. Additionally, a choice can be made between CISC and RISC processors. The first commercially available worldwide microprocessor was the Intel 4004. It came on the market in 1971.

Modem

Modulator/demodulator. > Modulation/demodulation device, add-on card, or external device that allows information to be exchanged between computers over the telephone network using digital/analog or analog/digital signal conversion.

Motherboard

A circuit board that houses the main components of a computer such as the CPU switching circuit, co-processors, RAM, ROM for firmware, interface circuits, and expansion slots for hardware expansions.

Multitasking

Multitasking is an operating mode in an operating system that allows several computer tasks to be executed virtually simultaneously.

N

.NET

DOTNET, Microsoft's new development platform that provides a common runtime library and type system for all programming languages. DOTNET is the umbrella term for the following products, strategies and technologies: .NET Framework, a new software platform, Visual Studio .NET, a new development environment that supports several .NET programming languages (e.g. C# or VB.NET, specially created for .NET), .NET My Services, a group of services taking over functions such as authentication, .NET Enterprise Server, which, apart from its name, is independent of the other technologies and includes the products Exchange Server 2000, Application Center 2000, and SQL Server 2000. .NET devices, supported by a slimmed down version of .NET Framework (.NET Compact Framework).

P

Panel

A common term for B&R display units (with or without keys).

Panelware

A generic term given for standard and special keypad modules offered by B&R.

POWERLINK

See "Ethernet POWERLINK".

PROFIBUS DP

PROFIBUS for "decentralized peripherals". PROFIBUS DP can be used to allow simple digital and analog I/O modules as well as intelligent signal and data processing units to be installed in the machine room, which among other things can significantly reduce cabling costs. Often used for time-critical factory automation applications.

R

RAM

An abbreviation for "**R**andom **A**ccess **M**emory". Semiconductor memory which can be read or written to by the microprocessor or other hardware components. Memory locations can be accessed in any order. The various ROM memory types do allow random access, but they cannot be written to. The term RAM refers to a more temporary memory that can be written to as well as read.

ROM

An abbreviation for "**R**ead-**O**nly **M**emory". Semiconductor memory where programs or data were permanently stored during the production process.

RS485

Recommended **S**tandard **N**umber **485**. Interface standard upgraded from RS422. High level: 1.5 ... -6 V, low level: +1,5 ... +6 V; 2-wire connection [half duplex operation] or 4-wire connection [full duplex operation. Cable lengths up to 1200 m, transfer rates up to 10 Mbit/s. Up to 32 participants can be connected to an RS485 bus [sender/receiver].

S

Interface

From the hardware point of view, an interface is the connection point between two modules/devices/systems. The units on both sides of the interface are connected by the interface lines so that data, addresses, and control signals can be exchanged. The term interface includes all functional, electrical and constructive conditions [encoding, signal level, pin assignments] that characterize the connection point between the modules, devices, or systems. Depending on the type of data transfer, a differentiation is made between parallel [e.g. Centronics, IEEE 488] and serial interfaces [e.g. V.24, TTY, RS232, RS422, RS485], which are set up for different transfer speeds and transfer distances. From the point of view of software, the term "interface" describes the transfer point between program modules using specified rules for transferring the program data.

SDRAM

An abbreviation for "**S**ynchronous **D**ynamic **R**andom **A**ccess **M**emory". A construction of dynamic semiconductor components (DRAM) that can operate with higher clock rates than conventional DRAM switching circuits. This is made possible using block access. For each access, the DRAM determines the next memory addresses to be accessed.

SRAM

An abbreviation for "**S**tatic **R**andom **A**ccess **M**emory". A semiconductor memory (RAM) made up of certain logic circuits (flip-flop) that only keeps stored information while powered. In computers, static RAM is generally only used for cache memory.

T

Task

Program unit that is assigned a specific priority by the real-time operating system. It contains a complete process and can consist of several modules.

TCP/IP

Transmission Control Protocol/Internet Suit of Protocols. Network protocol that has become the generally accepted standard for data exchange in heterogeneous networks. TCP/IP is used both in local networks for communication between various computer and also for LAN to WAN access.

Touch screen

Screen with touch sensors for activating an item with the finger.

U

UART

An abbreviation for "**U**niversal **A**synchronous **R**eceiver-**T**ransmitter". A module generally consisting of a single integrated circuit that combines the circuits required for asynchronous serial communication for both sending and receiving. UART represents the most common type of circuit in modems for connecting to a personal computer.

Bootstrap loader

A program that automatically runs when the computer is switched on or restarted. After some basic hardware tests have been carried out, the bootstrap loader starts a larger loader and hands over control to it, which in turn boots the operating system. The bootstrap loader is typically found in ROM on the computer.

USB

An abbreviation for "**U**niversal **S**erial **B**us". A serial bus with a bandwidth of up to 12 megabits per second (Mbit/s) for connecting a peripheral device to a microcomputer. Up to 127 devices can be connected to the system using a single multipurpose connection, the USB bus (e.g. external CD drives,
Printer, modems, mouse and keyboard. This is done by connecting the devices in a row. USB allows devices to be changed when the power supply is switched on (hot plugging) and multi-layered data flow.

V

Visual Components

Integrated in B&R Automation Studio. Visual Components can be used to configure visualization projects that use text and graphics.

W

Windows CE

Compact 32-bit operating system with multitasking and multithreading that Microsoft developed especially for the OEM market. It can be ported for various processor types and has a high degree of real-time capability. The development environment uses proven, well-established development tools. It is an open and scalable Windows operating system platform for many different devices. Examples of such devices are handheld PCs, digital wireless receivers, intelligent mobile phones, multimedia consoles, etc. In embedded systems, Windows CE is also an excellent choice for automation technology.

X

XGA

An abbreviation for "E**X**tended **G**raphics **A**rray". An expanded standard for graphics controllers and monitors that was introduced by IBM in 1990. This standard supports 640x480 resolution with 65,536 colors or 1024x768 resolution with 256 colors. This standard is generally used in workstation systems.

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