Automation Panel 800

User's Manual

Version: **1.50 (April 2007)**

Model number: **MAAP800-ENG**

Chapter 1 • General information

1. Manual history

Version	Date	Change
0.01 Preliminary	17.07.2006	- First version
1.00	28.08.2006	Changes / new features - Chapter "Standards and certifications" on page 139 added. - Chapter "Software" on page 133 added. - Chapter "Commissioning" on page 101 added. - Chapter "Accessories" on page 153 added. - "Glossary" on page 173 added. - Table "Technical data - key switch switching element and key switch" on page 167 added. - Model number overview revised. - Accessories added. - Safety guidelines "Protection against electrostatic discharges" on page 13 added. - "Pin assignments" on page 42 added. - Dimensions of extension units added. - Selection guide added, (see section "System components / Configuration" on page 23).
1.10	30.08.2006	Changes / new features - Key dimensions added. - Numbering of the extensions corrected (see "Connection examples" on page 111). - X2X cable pin assignments added. - "X2X functionality if the PC crashes" on page 102 added. - "Internal numbering of the extension units" on page 125 added. - Cable photos added.
1.20	03.10.2006	Changes / new features - "SDL cable with extender 5CASDL.0xxx-30 Rev. < A5" on page 89 added. - "Extension flange 5AC800.FLG1-00" on page 84 changed. - "Key and LED configurations" on page 126 changed. - "USB extension cover 5AC800.COV2-00" on page 78 and "Dimensions - USB extension cover 5AC800.COV2-00" on page 79 added. - Touch screen precision changed. - "Selecting the display units" on page 111 added. - Chapter 7 "Maintenance / servicing" on page 161 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	Changes / new features - "Pin assignments - X2X cable 5CAX2X.0xxx-00" on page 100 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	Changes / new features - Hardware numbers for Illuminated Ring Keys corrected. - Descriptions of F-Keys and C-Keys on extension units added. - "Installation of components" on page 108 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 150 added. - Section about exchanging legend strips 2.1.2 "Extension units" on page 164 added. - Tolerances for voltage supply cable 5CAPWR.0xxx-20 added.
1.50	13.04.2007	Changes / new features - USB flash drive 5MMUSB.0256-00 and USB flash drive 5MMUSB.1024-00 cancelled. - Hardware numbers for the key switch corrected in figure 108 "Hardware numbers - 5AC800.EXT3-02 / 5AC800.EXT3-03" on page 130 and figure 109 "Hardware numbers - 5AC800.EXT3-04 / 5AC800.EXT3-05" on page 131. - Photos added to section "Exchanging the legend strips" on page 162. - Section "USB flash drive" on page 154 updated. - Figures of extension units with illuminated ring keys added.

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 may only 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 operational 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 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.

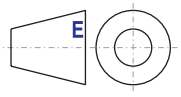
3. Organization of safety notices

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 2: 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 33
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 37

Table 3: 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 76
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 78
5AC800.CON1-00	**Extension connector** Straight connector; for connecting keyboard attachments to the Automation Panel 800; IP65[1] protection; painted.	See page 80
5AC800.CON2-00	**60° extension connector** 60° angled connector; for connecting keyboard attachments to the Automation Panel 800; IP65[1] protection; painted.	See page 82
5AC800.EXT1-00	**Keyboard extension** Keyboard extension for the Automation Panel 800; USB interface; IP65[1] protection, painted housing.	See page 44
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 48
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 51
5AC800.EXT3-00	**C**[3] **key 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 54

Table 4: 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 57
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 60
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 64
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 68
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 72
5AC800.FLG1-00	**Extension flange** Flange for Automation Panel 800 and standard swing arm systems (e.g. Rittal CP-S); painted housing.	See page 84

Table 4: 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

5.3 Cable

Model number	Short description	Note
5CASDL.0018-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 1.8 meters	See page 87 / 91
5CASDL.0050-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 5 meters	See page 87 / 91
5CASDL.0100-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 10 meters	See page 87 / 91
5CASDL.0150-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 15 meters	See page 87 / 91
5CASDL.0200-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 20 meters	See page 87 / 91
5CASDL.0250-20	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 25 meters	See page 87 / 91
5CASDL.0300-30	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 30 meters with extender	See page 89 / 94
5CASDL.0400-30	SDL cable for Automation Panel 800; Rev. < A5 / Rev. ≥ A5; length 40 meters with extender	See page 89 / 94
5CAPWR.0018-20	Voltage supply cable for Automation Panel 800; length 1.8 meters.	See page 97
5CAPWR.0050-20	Voltage supply cable for Automation Panel 800; length 5 meters.	See page 97
5CAPWR.0100-20	Voltage supply cable for Automation Panel 800; length 10 meters.	See page 97
5CAPWR.0150-20	Voltage supply cable for Automation Panel 800; length 15 meters.	See page 97
5CAPWR.0200-20	Voltage supply cable for Automation Panel 800; length 20 meters.	See page 97

Table 5: Model number overview - cables

Model number	Short description	Note
5CAPWR.0250-20	Voltage supply cable for Automation Panel 800; length 25 meters.	See page 97
5CAPWR.0300-20	Voltage supply cable for Automation Panel 800; length 30 meters.	See page 97
5CAPWR.0400-20	Voltage supply cable for Automation Panel 800; length 40 meters.	See page 97
5CAX2X.0018-00	X2X cable for Automation Panel 800; length 1.8 meters.	See page 99
5CAX2X.0050-00	X2X cable for Automation Panel 800; length 5 meters.	See page 99
5CAX2X.0100-00	X2X cable for Automation Panel 800; length 10 meters.	See page 99
5CAX2X.0150-00	X2X cable for Automation Panel 800; length 15 meters.	See page 99
5CAX2X.0200-00	X2X cable for Automation Panel 800; length 20 meters.	See page 99
5CAX2X.0250-00	X2X cable for Automation Panel 800; length 25 meters.	See page 99
5CAX2X.0300-00	X2X cable for Automation Panel 800; length 30 meters.	See page 99
5CAX2X.0400-00	X2X cable for Automation Panel 800; length 40 meters.	See page 99

Table 5: 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 03/2005* *Replaced by 5MMUSB.0512-00*
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	*Cancelled since 12/2007* *Replaced by 5MMUSB.0512-00*
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	See page 154
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 154

Table 6: 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 159
5AC800.EXTX-01	**Legend strip template for AP800 extension 1** for 5AC800.EXT3-00, 5AC800.EXT3-01, for 2 devices.	See page 159

Table 7: Model number overview - legend strip templates

Model number	Short description	Note
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 159
5AC800.EXTX-03	**Legend strip template for AP800 extension 3** for 5AC800.EXT3-02, 5AC800.EXT3-03, for 3 devices.	See page 159
5AC800.150x-00	**Legend strip template for AP800 display** for 5AP880.1505-00, for 3 devices.	See page 159

Table 7: 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 135

Table 8: 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 swing arm system, the operator panel can be placed in the most ergonomic position.

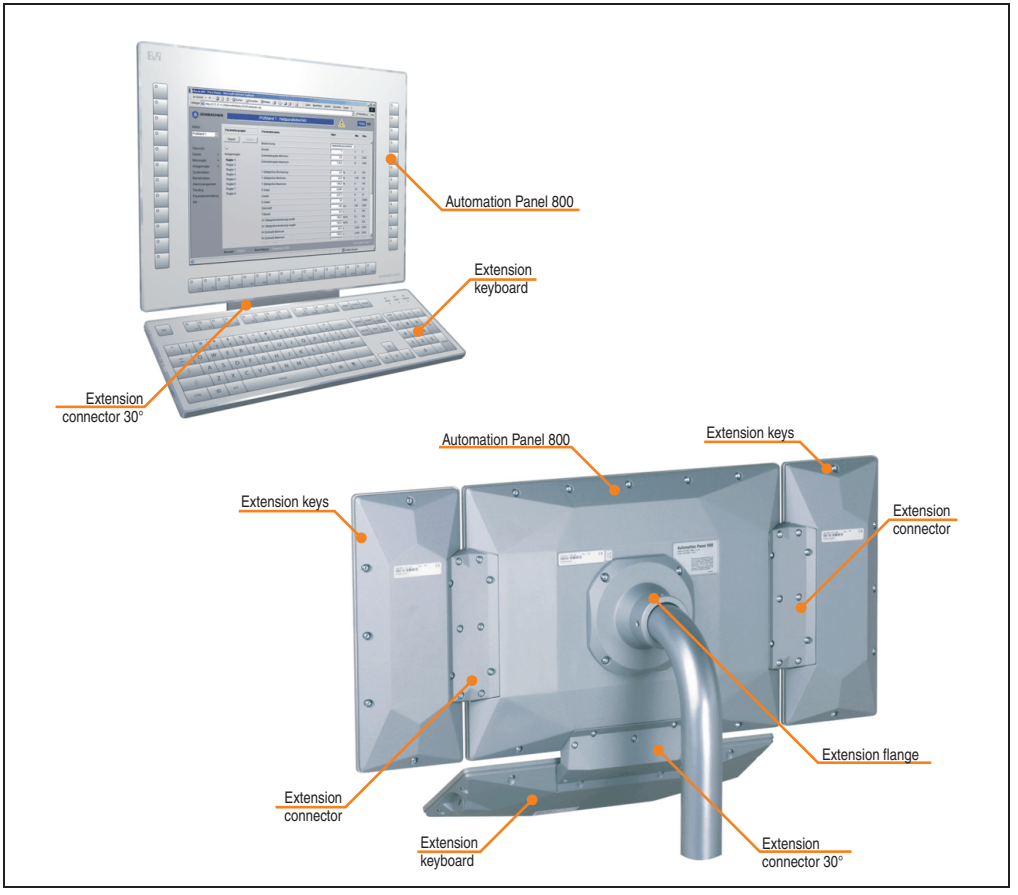


Figure 1: Component overview - Automation Panel 800 with extension units

1.1 Features

- Fully closed system
- Touch screen
- Industrial high-density plug
- USB interface[1)]
- 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 operational conditions.

1.2.1 Selection guide - basic system

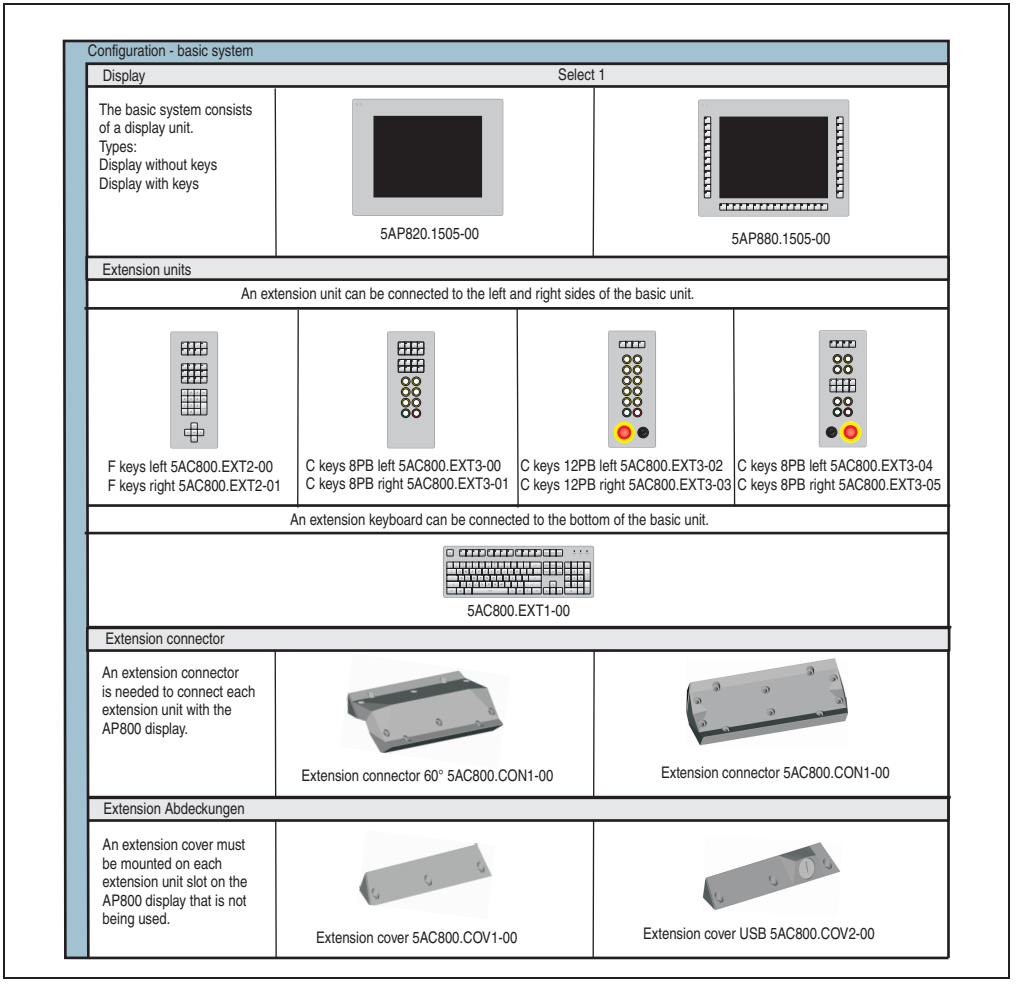


Figure 2: Configuration - basic system

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

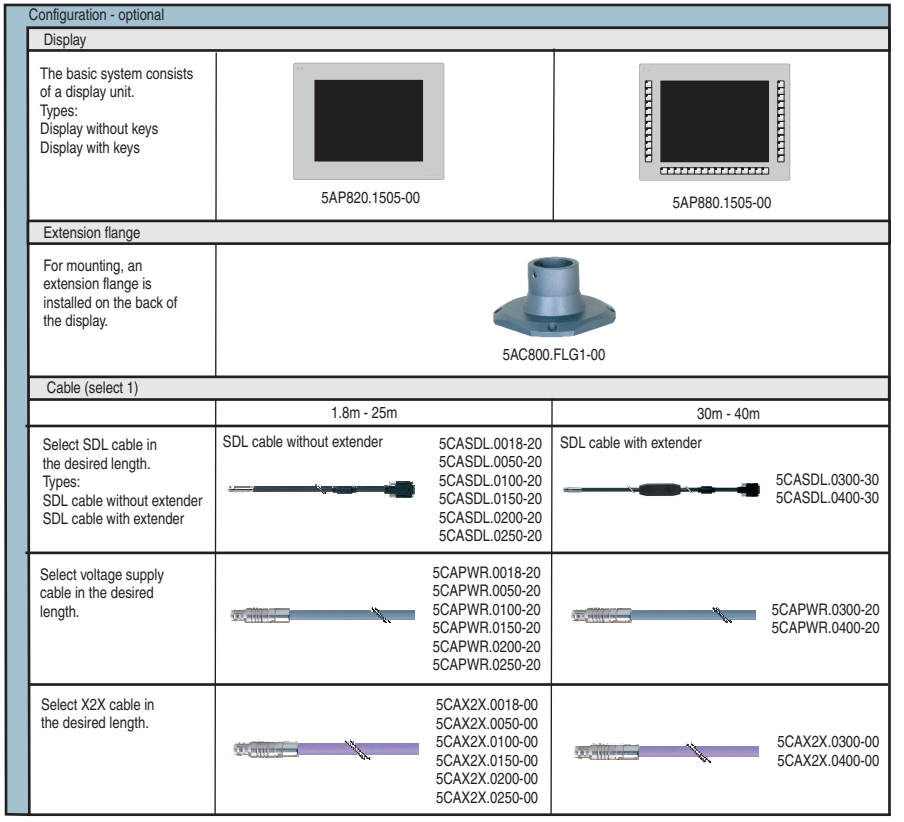


Figure 3: Selection guide - optional components

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.

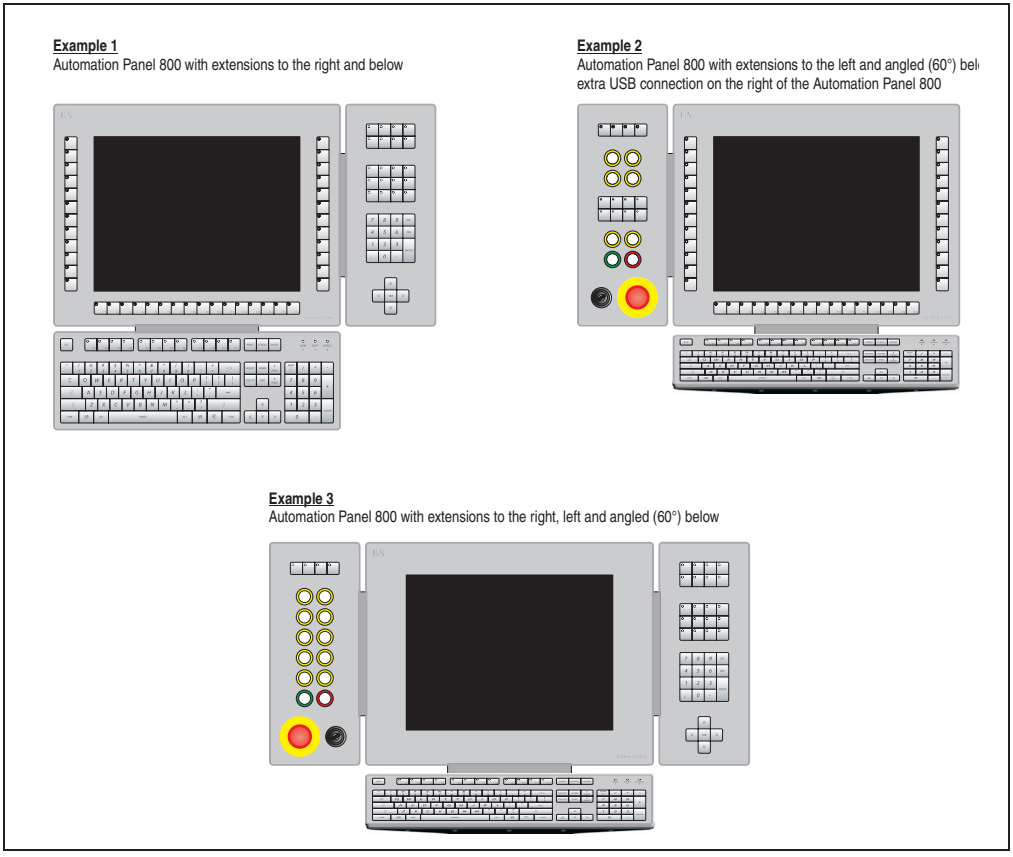


Figure 4: Example configurations

This page is only used as a place holder.

2.1 Example 1

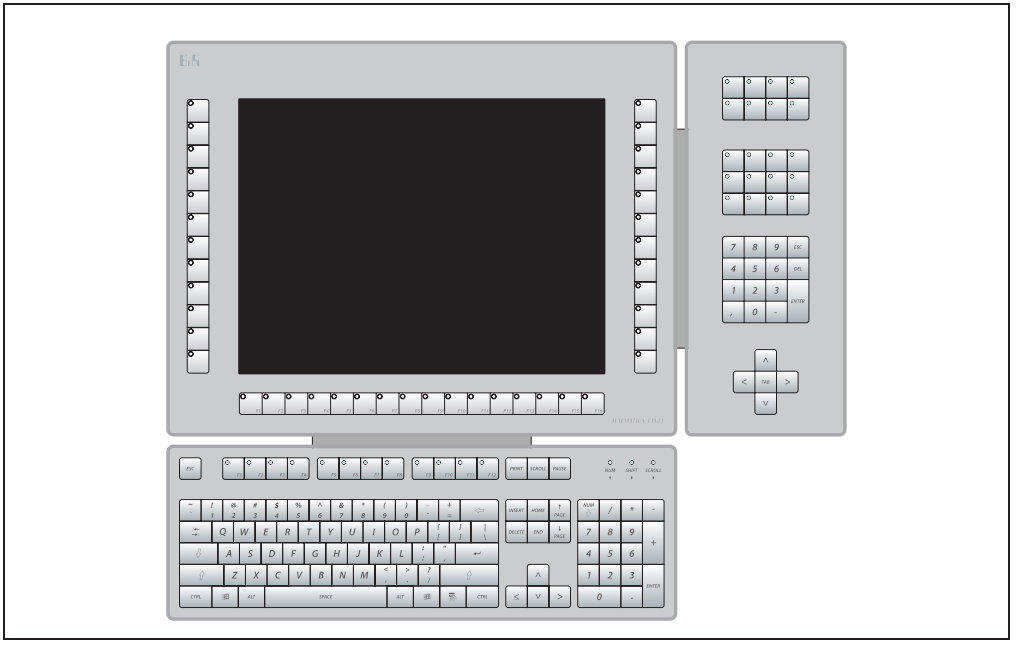


Figure 5: Configuration - Example 1

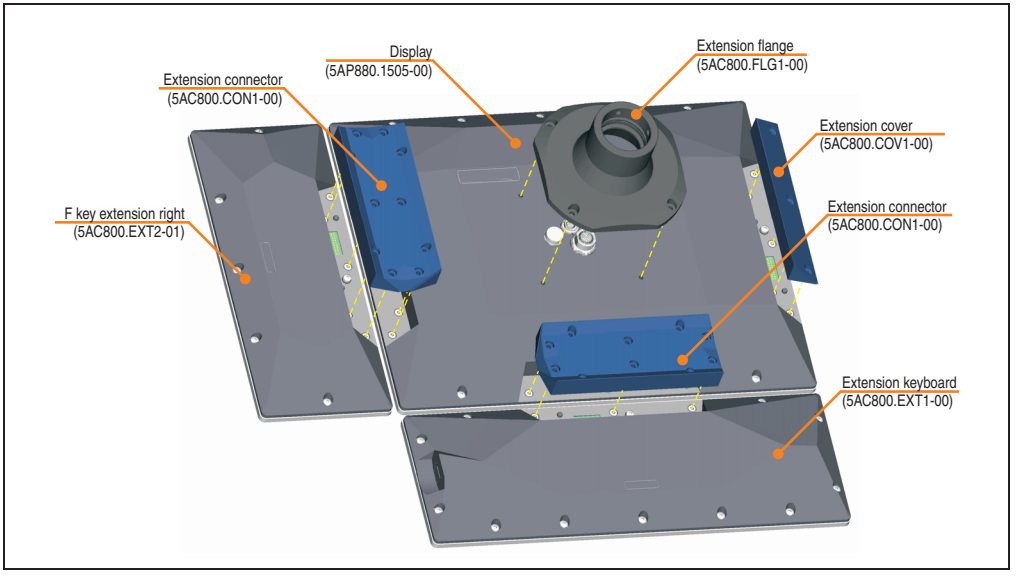


Figure 6: Required components - Example 1

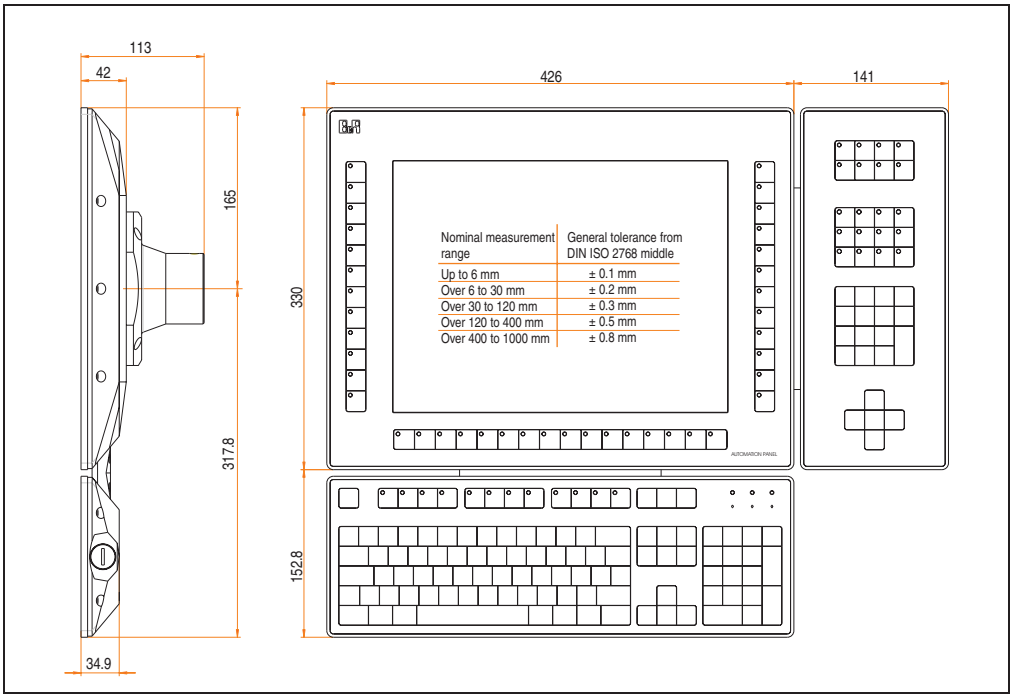


Figure 7: Dimensions - Example 1

2.1.1 Overview of the required components

Model number	Short description	Number
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 5 "Model number overview - cables" on page 18.	1
5CAPWR.0xxx-20	Voltage supply cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 5 "Model number overview - cables" on page 18.	1
5CAX2X.0xxx-00	X2X cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 5 "Model number overview - cables" on page 18.	1

Table 9: Overview of the required components - Example 1

2.2 Example 2

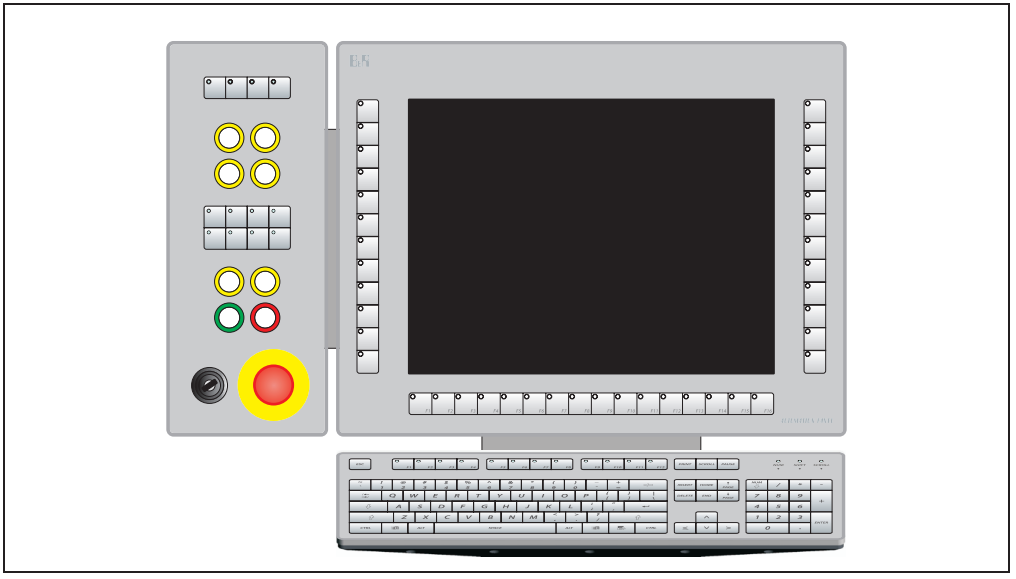


Figure 8: Configuration - Example 2

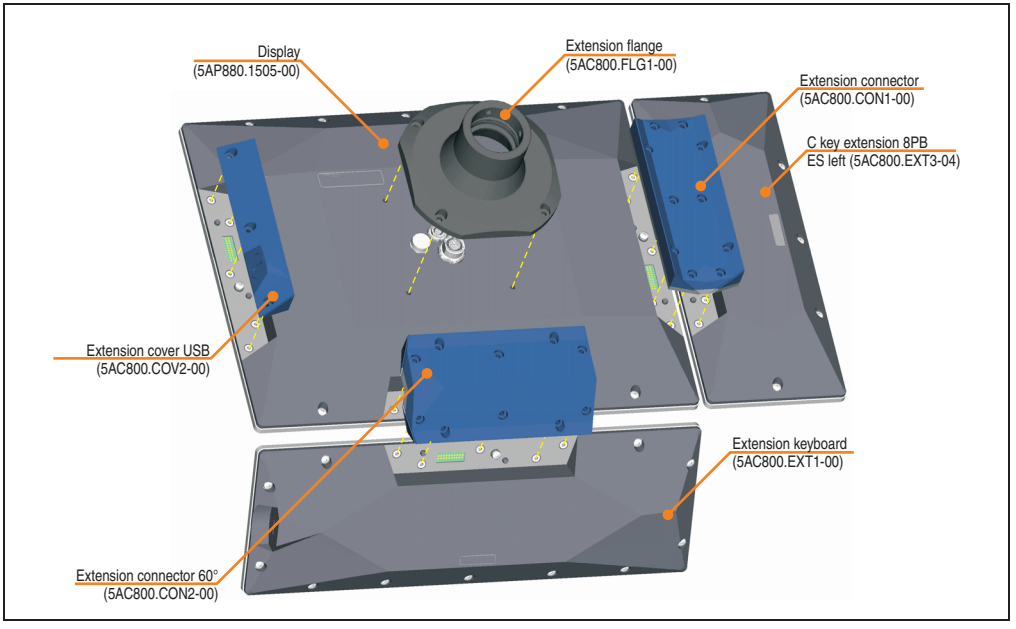


Figure 9: Required components - Example 2

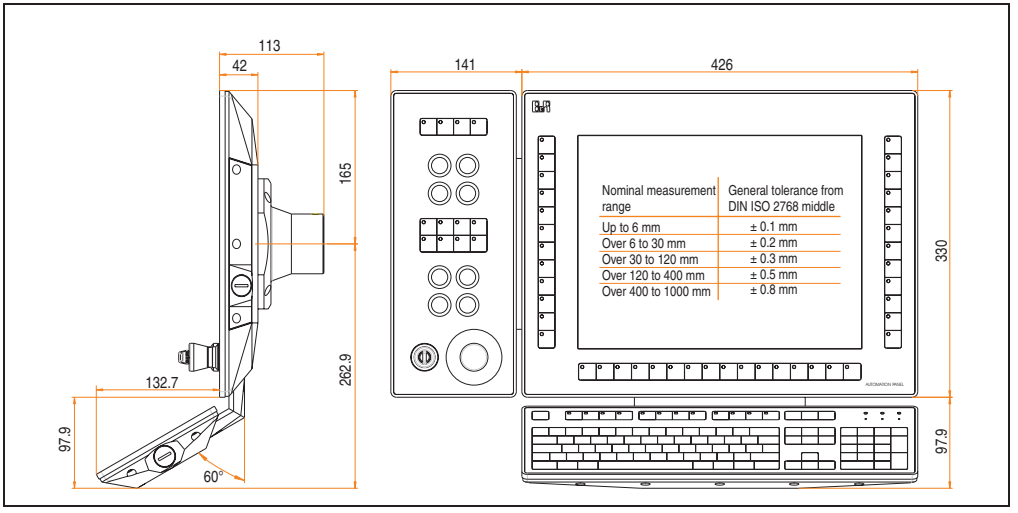


Figure 10: Dimensions - Example 2

2.2.1 Overview of the required components

Model number	Short description	Number
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 5 "Model number overview - cables" on page 18.	1
5CAPWR.0xxx-20	Voltage supply cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 5 "Model number overview - cables" on page 18.	1
5CAX2X.0xxx-00	X2X cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 5 "Model number overview - cables" on page 18.	1

Table 10: Overview of the required components - Example 2

2.3 Example 3

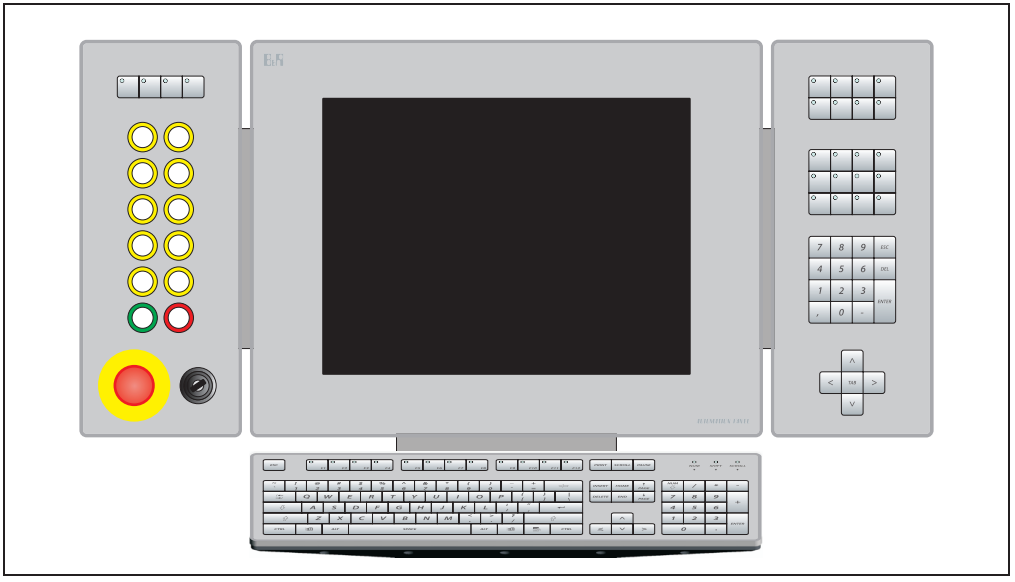


Figure 11: Configuration - Example 3

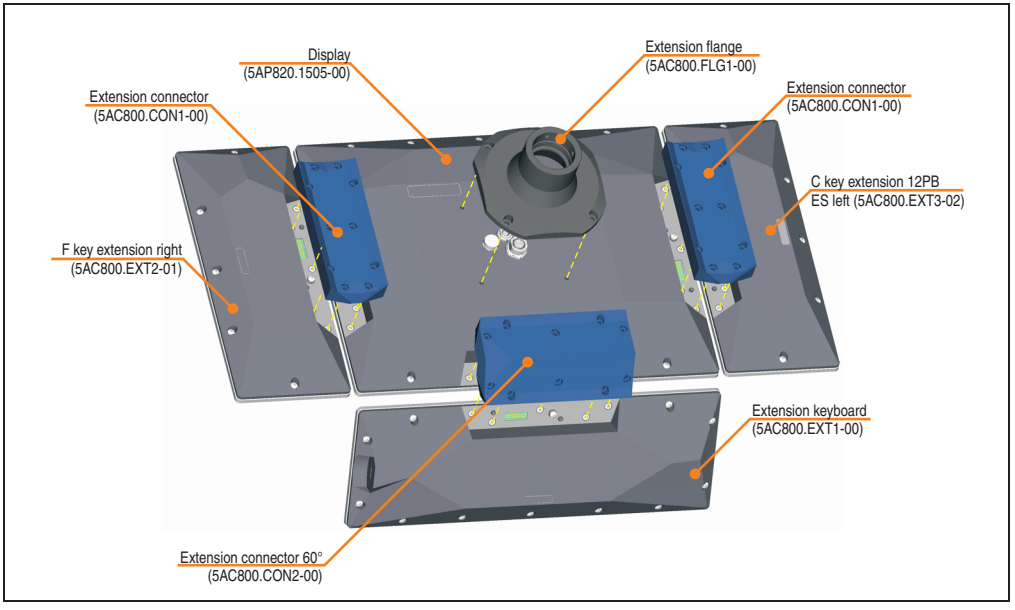


Figure 12: Required components - Example 3

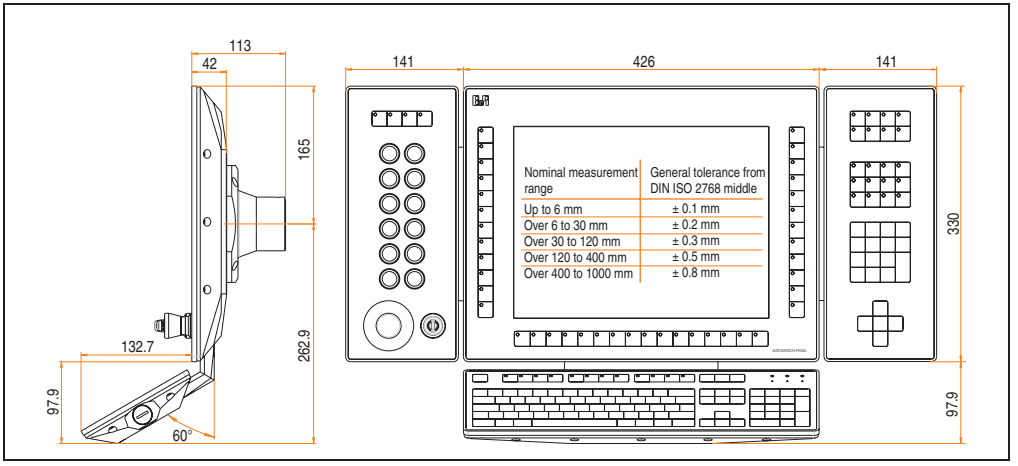


Figure 13: Dimensions - Example 3

2.3.1 Overview of the required components

Model number	Short description	Number
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 5 "Model number overview - cables" on page 18.	1
5CAPWR.0xxx-20	Voltage supply cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 5 "Model number overview - cables" on page 18.	1
5CAX2X.0xxx-00	X2X cable for Automation Panel 800 - length can be selected from 1.8 to 40 meters - see table 5 "Model number overview - cables" on page 18.	1

Table 11: Overview of the required components - Example 3

3. Individual components

3.1 Display units

3.1.1 5AP820.1505-00

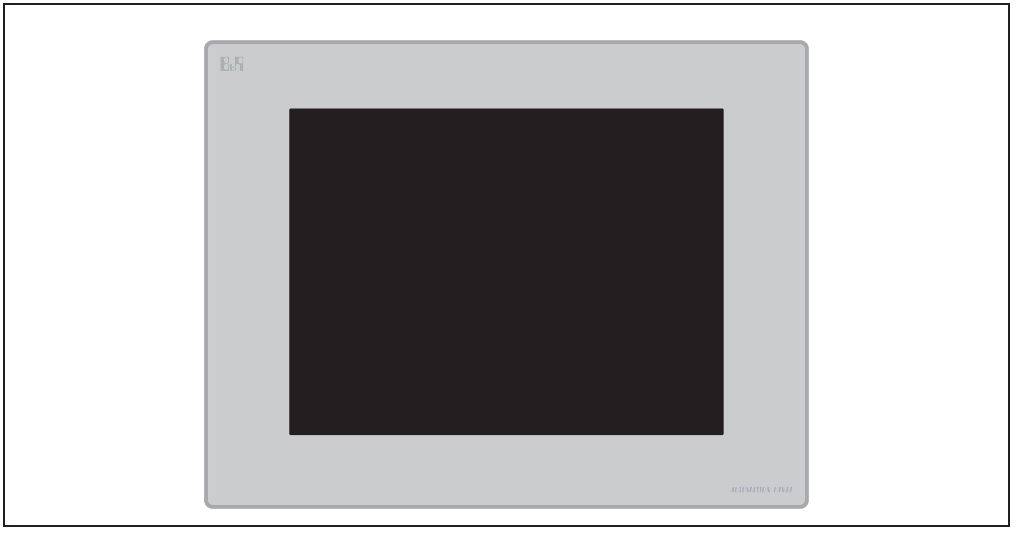


Figure 14: Front view - 5AP820.1505-00

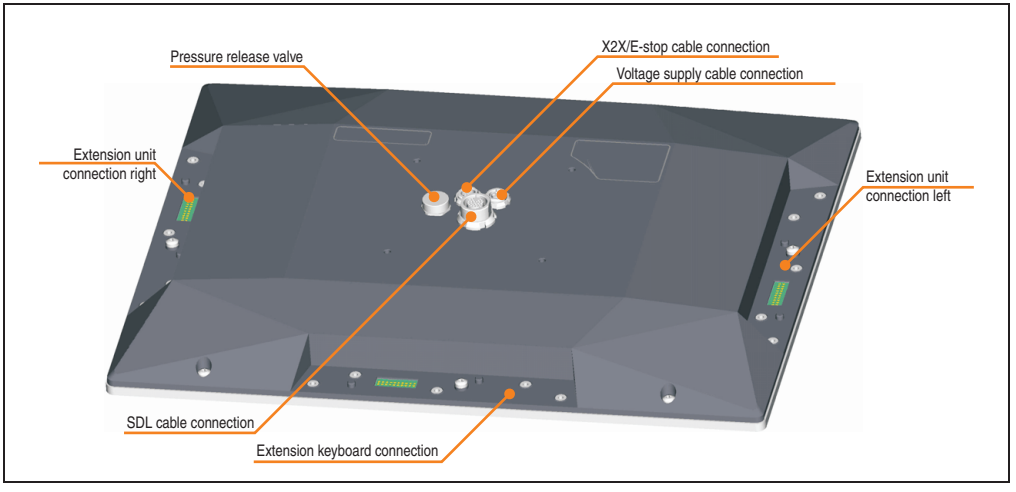


Figure 15: Rear view - 5AP820.1505-00

Technical data

Features	5AP820.1505-00
Display	
Type	TFT colors
Diagonal	15 inch (381 mm)
Colors	16 million colors
Resolution	XGA, 1024 x 768 pixels
Contrast	400:1
Perspective (see page 172)	
Horizontal	Direction a / direction b = 85°
Vertical	Direction c / direction d = 85°
Background lighting	
Brightness	250 cd/m²
Half-brightness time	50000 hours
Touch screen [1]	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	78%
Keys/LED	-
Function keys	
Soft keys	
Cursor keys	
Number block	
Other keys	
Key lifespan	
LED brightness	
Connections made using separate cables	
SDL[2]	Pin assignments see page 42
Supply voltage	Pin assignments see page 43
X2X	Pin assignments see page 43
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	3.2 A
Starting current	5 A typical, maximal 30 A for < 300 µs
Power consumption	27 W typical, maximal 35 W
X2X supply bus	
Rated voltage	12 - 20 VDC
Power consumption	Maximum 5 W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[3]
Design	Gray
Membrane	Polyester
Light background	Similar to Pantone 427CV[3]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[3] (semi-matt)

Table 12: 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 .. +50°C 0 .. +50°C 0 .. +45°C -25 .. +60°C -25 .. +60°C
Relative humidity Operation / Storage / Transport	 T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing
Vibration Operation (continuous) Operation (occasional) Storage / Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 12: Technical data - 5AP820.1505-00 (cont.)

1) The necessary drivers 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 4.2 "Mounting orientation" on page 109 .

Temperature humidity diagram - operation and storage

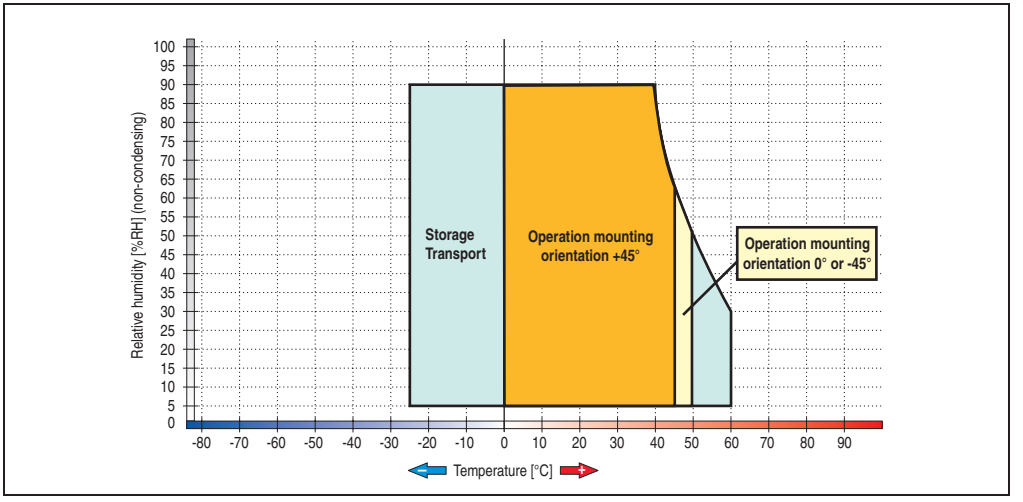
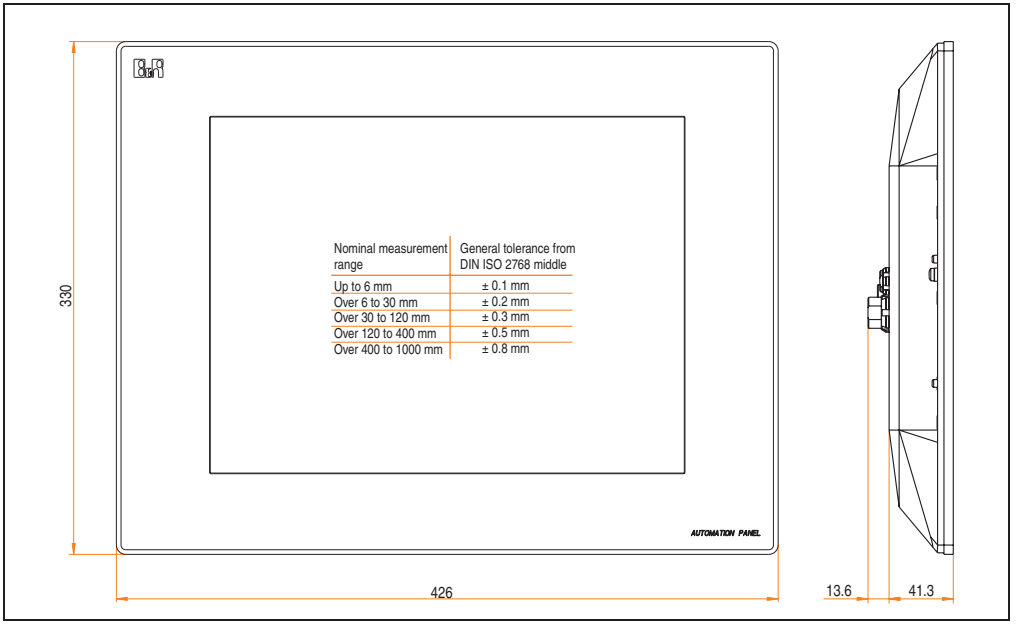


Figure 16: Temperature humidity diagram - 5AP820.1505-00

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

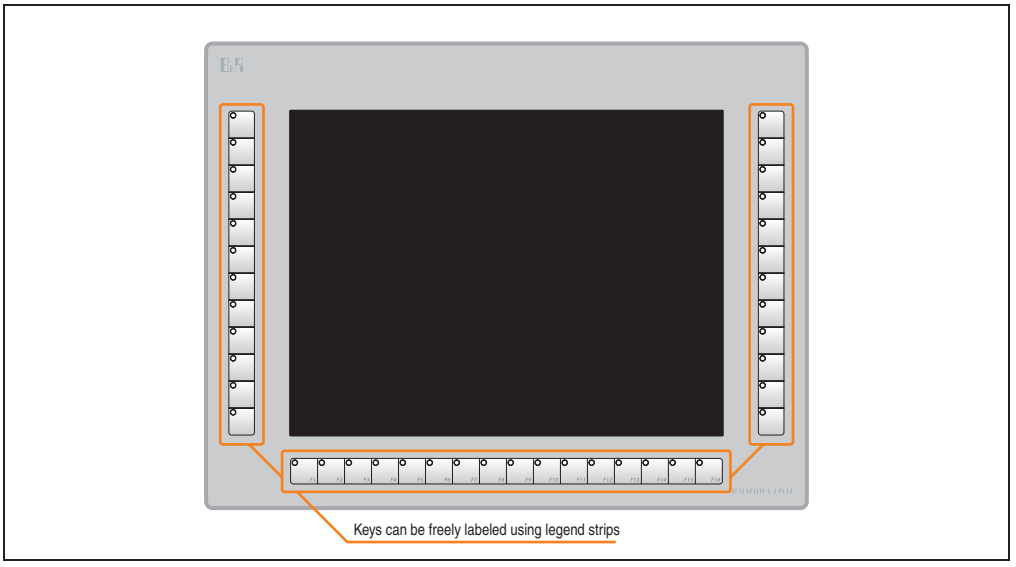


Figure 18: Front view - 5AP880.1505-00

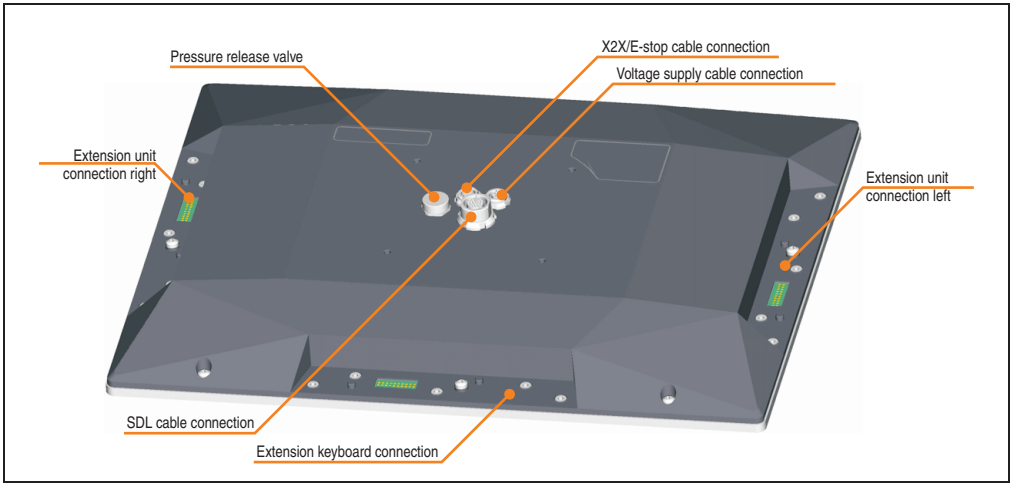


Figure 19: Rear view - 5AP880.1505-00

Technical data

Features	5AP880.1505-00
Display	
Type	TFT colors
Diagonal	15 inch (381 mm)
Colors	16 million colors
Resolution	XGA, 1024 x 768 pixels
Contrast	400:1
Perspective (see page 172)	
Horizontal	Direction a / direction b = 85°
Vertical	Direction c / direction d = 85°
Background lighting	
Brightness	250 cd/m²
Half-brightness time	50000 hours
Touch screen [1]	
Technology	Analog, resistive
Controller	Elo, serial, 12-bit
Degree of transmission	78%
Keys/LED[2]	
Function keys	40 with LED (yellow)
Operated using	PC
Soft keys	-
Cursor keys	-
Number block	-
Other keys	-
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 60 mcd (yellow)
Connections made using separate cables	
SDL[3]	Pin assignments see page 42
Supply voltage	Pin assignments see page 43
X2X	Pin assignments see page 43
Electrical characteristics	
Power supply	
Rated voltage	24 VDC ±25%
Rated current	3.2 A
Starting current	5 A typical, maximal 30 A for < 300 µs
Power consumption	27 W typical, maximal 36 W
X2X supply bus	
Rated voltage	12 - 20 VDC
Power consumption	Maximum 5 W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[4]
Design	Gray[4]
Membrane	Polyester
Light background	Similar to Pantone 427CV[4]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[4]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[4] (semi-matt)

Table 13: Technical data - 5AP880.1505-00

Mechanical characteristics	5AP880.1505-00
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°[5)] Mounting orientation up to -45°[5)] Mounting orientation up to +45°[5)] Storage Transport	 0 .. +50°C 0 .. +50°C 0 .. +45°C -25 .. +60°C -25 .. +60°C
Relative humidity Operation / Storage / Transport	 T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing
Vibration Operation (continuous) Operation (occasional) Storage / Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 13: Technical data - 5AP880.1505-00 (cont.)

1) The necessary drivers 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 4.2 "Mounting orientation" on page 109 .

Temperature humidity diagram - operation and storage

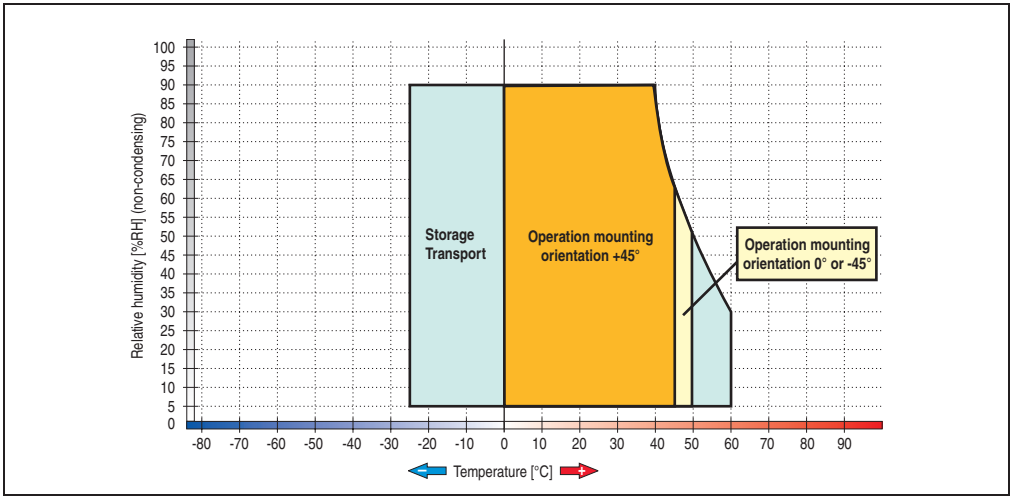


Figure 20: Temperature humidity diagram - 5AP880.1505-00

Dimensions

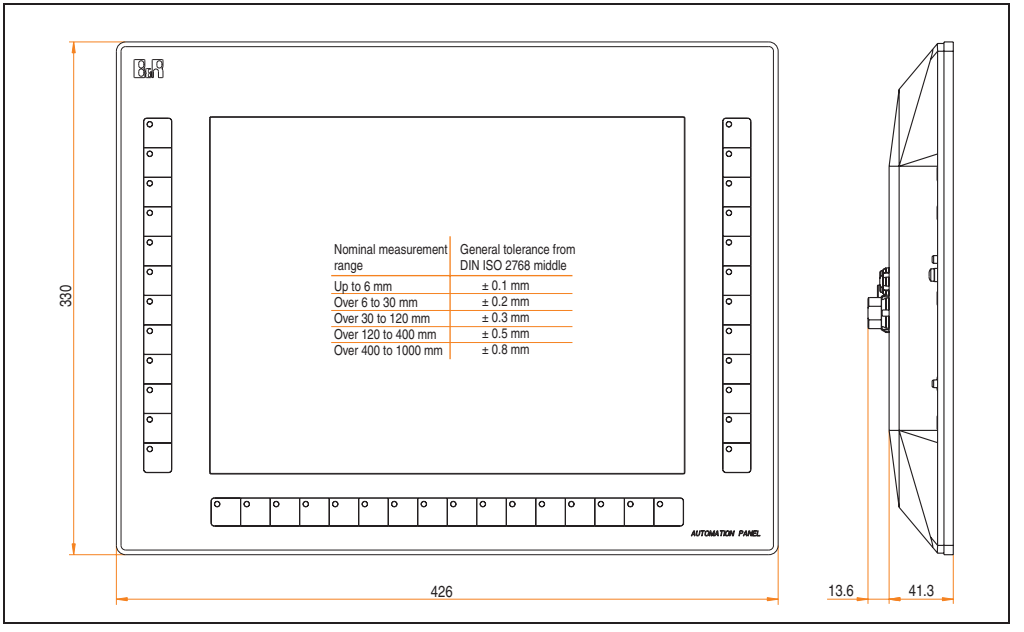


Figure 21: Dimensions - 5AP880.1505-00

Key dimensions

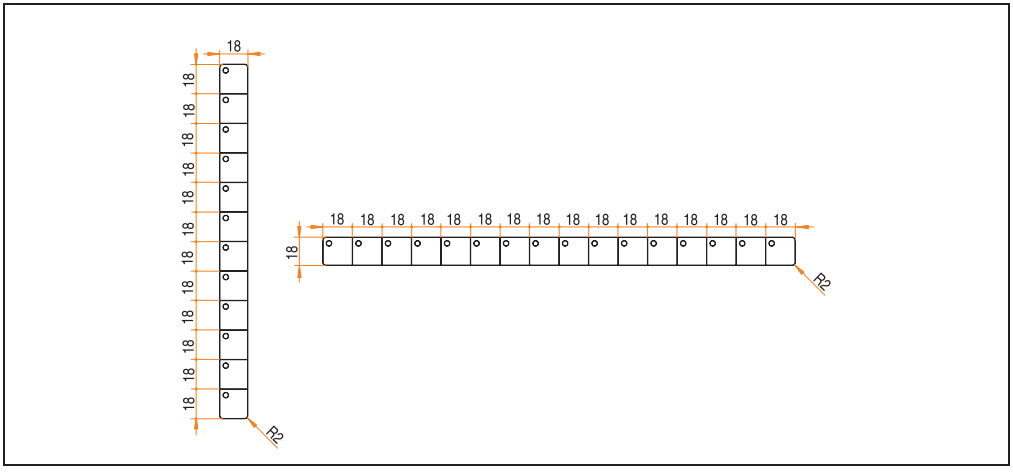


Figure 22: Key dimensions - 5AP880.1505-00

3.1.3 Pin assignments

Information:

The following information applies to 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 14: 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 grounding

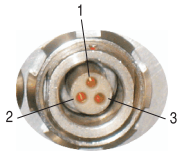


Table 15: Pin assignments - SDL cable connection

X2X / E-stop cable connection

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

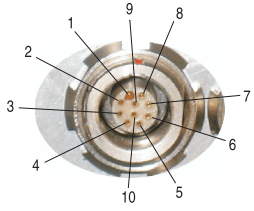


Table 16: Pin assignments - X2X / E-stop cable connection

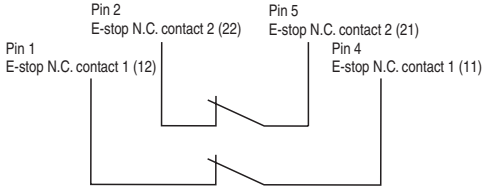


Figure 23: E-stop circuit connections

3.2 Extension units

3.2.1 Extension keyboard 5AC800.EXT1-00

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

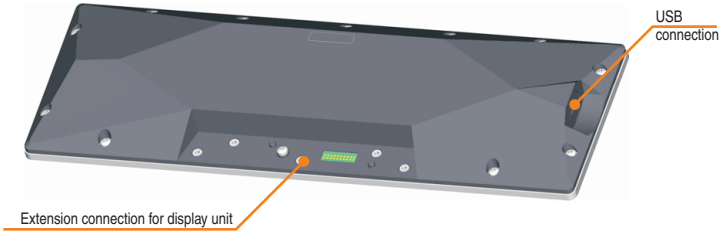


Figure 25: Rear view - 5AC800.EXT1-00

Technical data

Features	5AC800.EXT1-00
Keys/LED[1)]	Total of 104 keys / 15 LEDs
Cursor keys	4 without LED
Number block	17 without LED
Other keys	83 (12 with LED - yellow)
Other LED	3 green
Operated using	PC
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	Typ. 60 mcd (yellow) and 35 mcd (green)
USB interface	
Type	USB 1.1
Number	1 (left)
Transfer rate	Low speed (1.5 MBit/s), full speed (12 MBit/s)
Connection	Type A
Current load	Max. 500 mA
Electrical characteristics	
Power consumption	Max. 4W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[4)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[4)]
Color (color gradients)	Similar to Pantone white[4)] to Pantone 429CV[4)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[4)] (semi-matt)
Outer dimensions	
Width	426 mm
Height	146.8 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing
Vibration	
Operation (continuous)	5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak)
Operation (occasional)	5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak)
Storage / Transport	Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)

Table 17: Technical data - 5AC800.EXT1-00

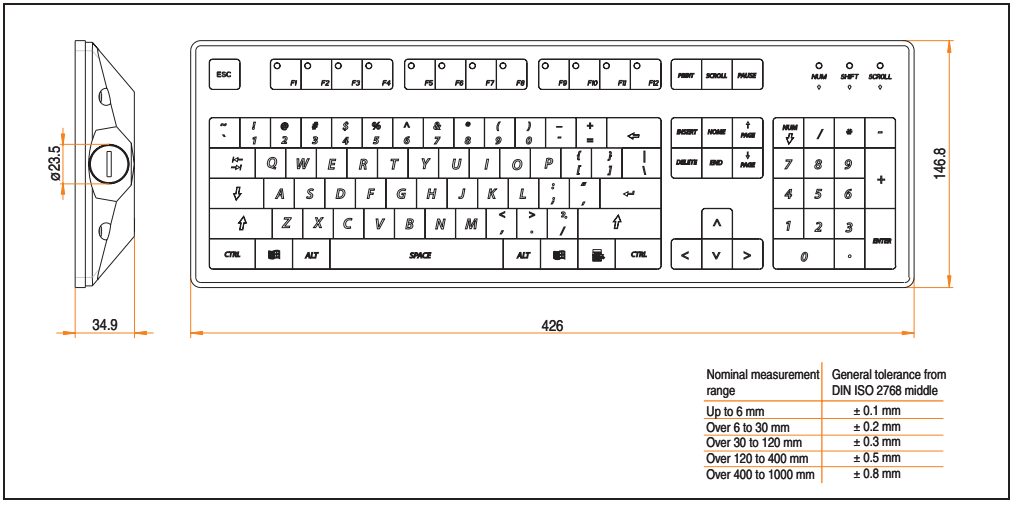
Environmental characteristics	5AC800.EXT1-00
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 17: 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.

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 26: Dimensions - 5AC800.EXT1-00

Key dimensions

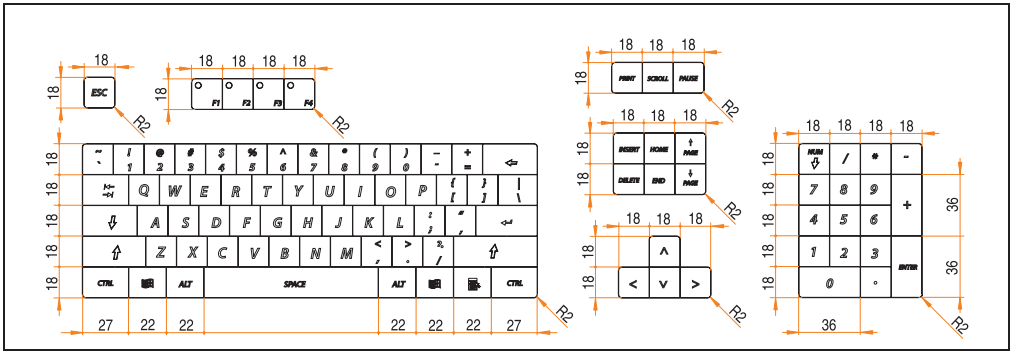


Figure 27: Key dimensions - 5AC800.EXT1-00

3.2.2 F key extension left 5AC800.EXT2-00

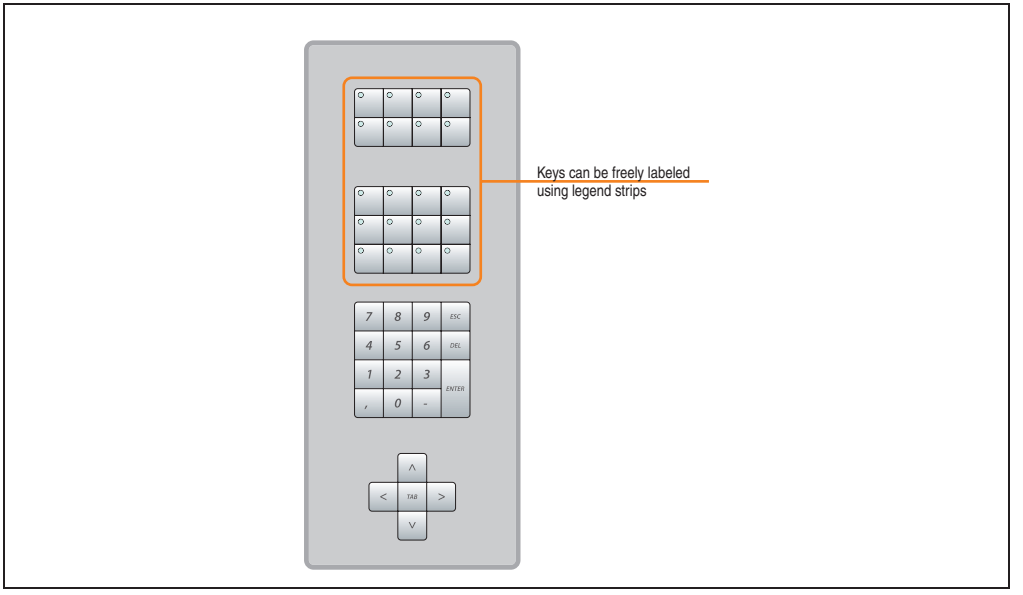


Figure 28: Front view - 5AC800.EXT2-00

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

Technical data

Features	5AC800.EXT2-00
Keys/LED[1)]	
Function keys	20 with LED (yellow)
Operated using	PC
Cursor keys	4 without LED
Number block	15 without LED
Other keys	-
Key lifespan	-
LED brightness	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd (yellow)
Electrical characteristics	
Power consumption	Max. 1W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[2)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[2)]
Color (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[4)] (semi-matt)
Outer dimensions	
Width	135 mm
Height	330 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing
Vibration	
Operation (continuous)	5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak)
Operation (occasional)	5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak)
Storage / Transport	Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)
Shock	
Operation	Max. 15 g (147 m/s² 0-peak) and 11 ms duration
Storage / Transport	Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)

Table 18: Technical data - 5AC800.EXT2-00

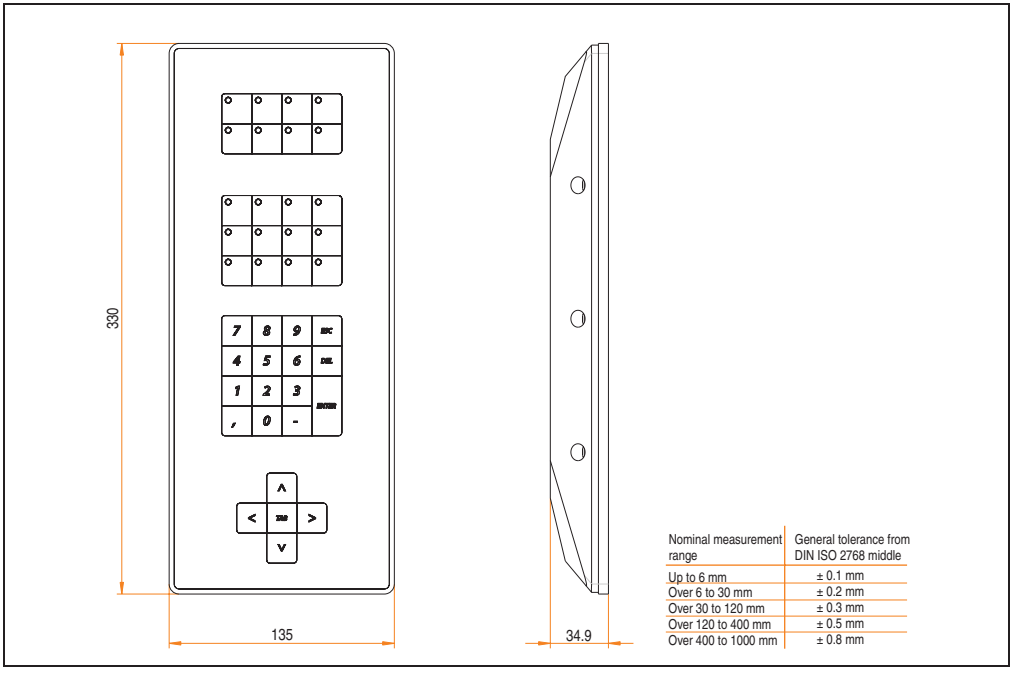
Environmental characteristics	5AC800.EXT2-00
Altitude	Max. 3000 m

Table 18: 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.

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 30: Dimensions - 5AC800.EXT2-00

Key dimensions

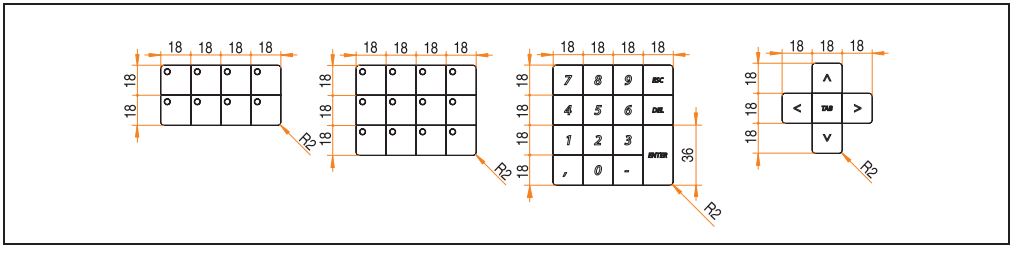


Figure 31: Key dimensions - 5AV800.EXT2-00

3.2.3 F key extension right 5AC800.EXT2-01

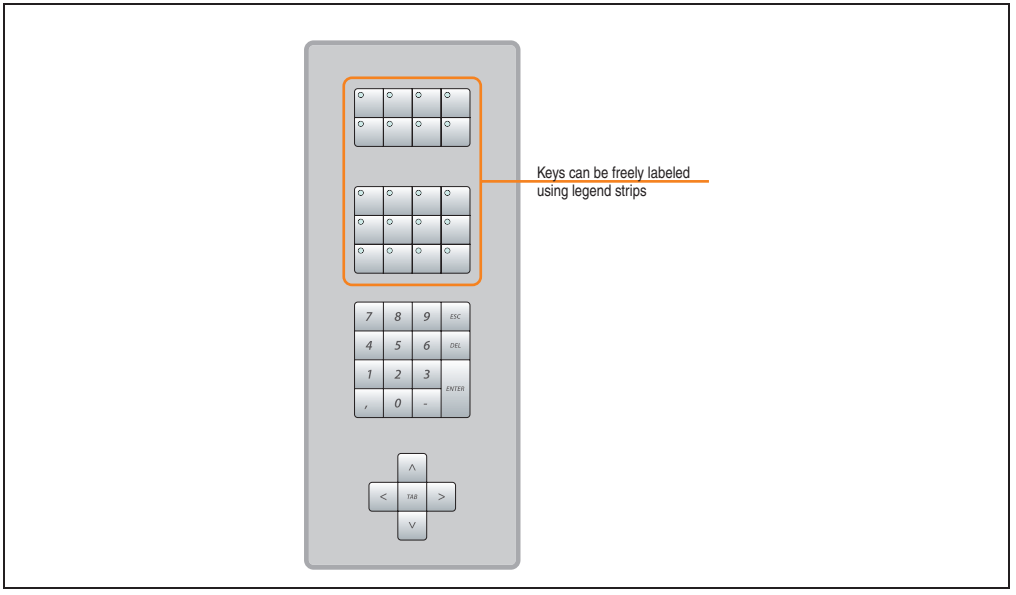


Figure 32: Front view - 5AC800.EXT2-01

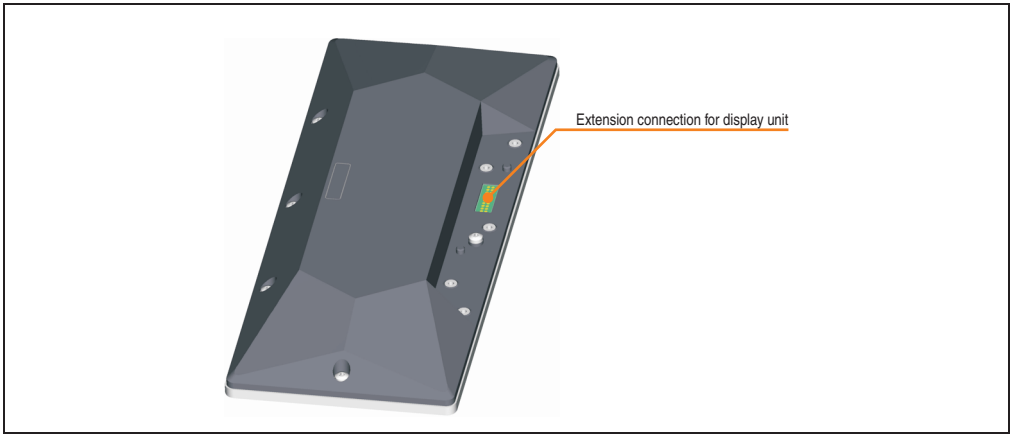


Figure 33: Rear view - 5AC800.EXT2-01

Technical data

Features	5AC800.EXT2-01
Keys/LED[1)]	
Function keys	20 with LED (yellow)
Operated using	PC
Cursor keys	4 without LED
Number block	15 without LED
Other keys	-
Key lifespan	-
LED brightness	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force Typ. 60 mcd (yellow)
Electrical characteristics	
Power consumption	Max. 1W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[2)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[2)]
Color (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[2)] (semi-matt)
Outer dimensions	
Width	135 mm
Height	330 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing
Vibration	
Operation (continuous)	5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak)
Operation (occasional)	5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak)
Storage / Transport	Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)
Shock	
Operation	Max. 15 g (147 m/s² 0-peak) and 11 ms duration
Storage / Transport	Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)

Table 19: Technical data - 5AC800.EXT2-01

Environmental characteristics	5AC800.EXT2-01
Altitude	Max. 3000 m

Table 19: 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.

Dimensions

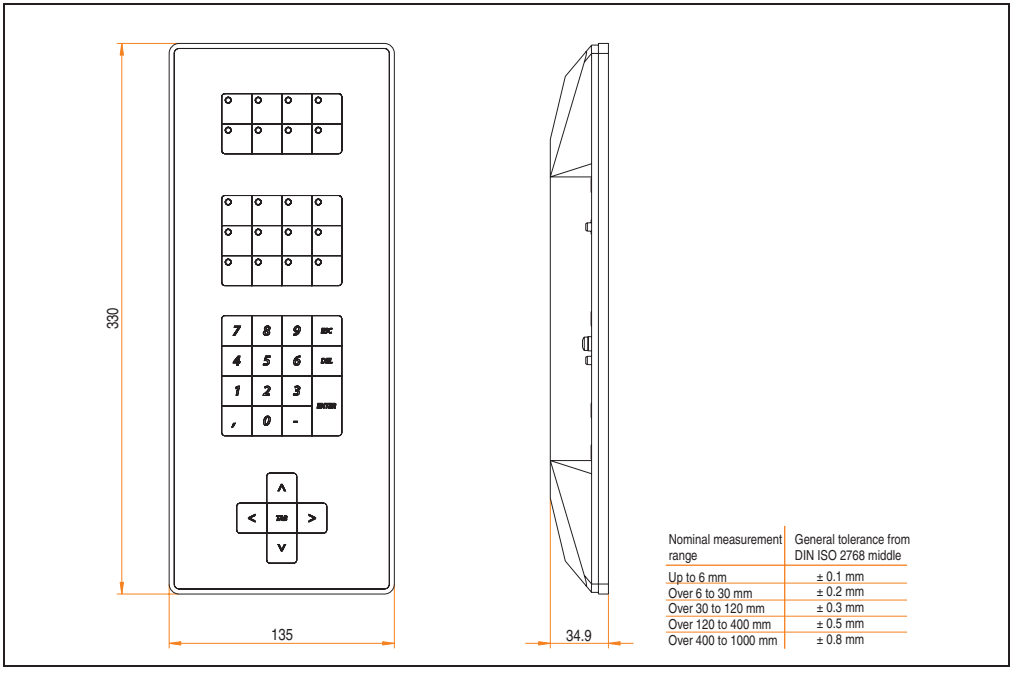


Figure 34: Dimensions - 5AC800.EXT2-01

Key dimensions

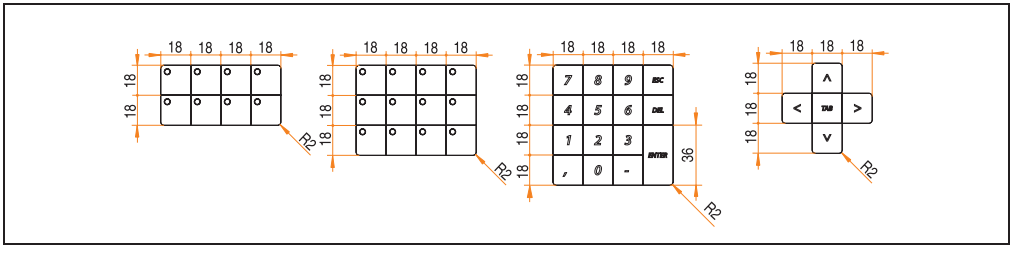


Figure 35: Key dimensions - 5AC800.EXT2-01

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

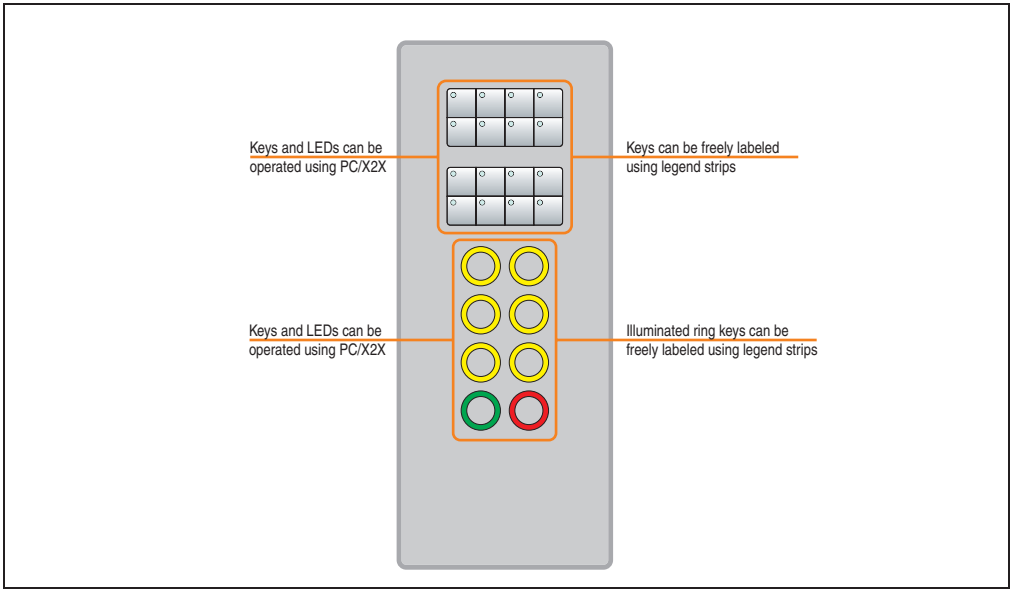


Figure 36: Front view - 5AC800.EXT3-00

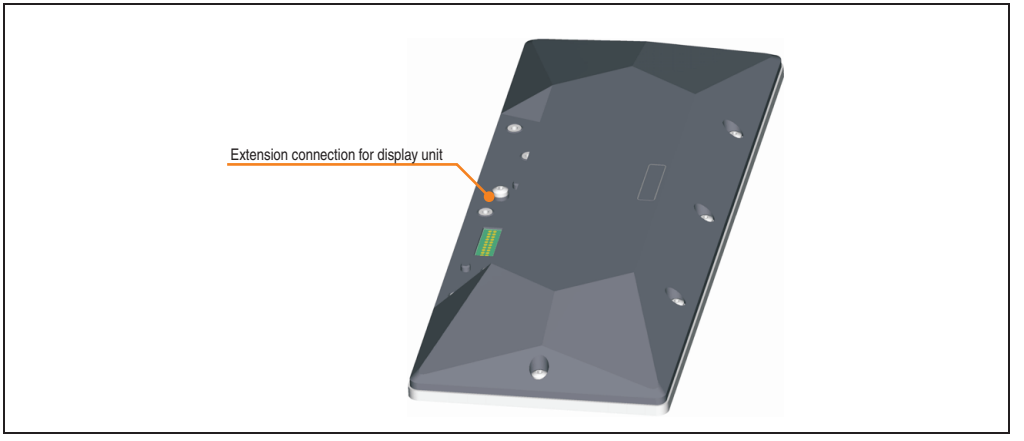


Figure 37: Rear view - 5AC800.EXT3-00

Technical data

Features	5AC800.EXT3-00
Keys/LED[1)]	
Function keys	16 with LED (yellow)
Operated using	PC, X2X
Cursor keys	-
Number block	-
Other keys	8 illuminated ring keys (PB - Push Button)
Operated using	PC, X2X
Key lifespan	1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	
Yellow	Typ. 60 mcd
Green	Typ. 35 mcd
Red	Typ. 54 mcd
Electrical characteristics	
Power consumption	Max. 7W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[2)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[2)]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[2)] (semi-matt)
Outer dimensions	
Width	135 mm
Height	330 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing
Vibration	
Operation (continuous)	5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak)
Operation (occasional)	5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak)
Storage / Transport	Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)

Table 20: Technical data - 5AC800.EXT3-00

Environmental characteristics	5AC800.EXT3-00
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 20: 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.

Dimensions

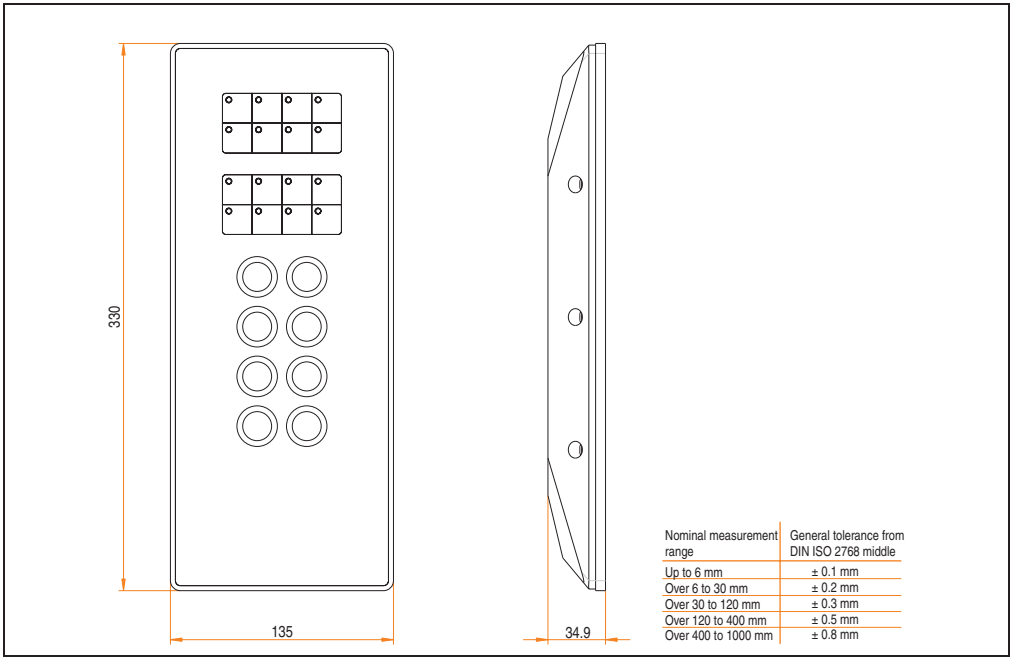


Figure 38: Dimensions - 5AC800.EXT3-00

Key dimensions

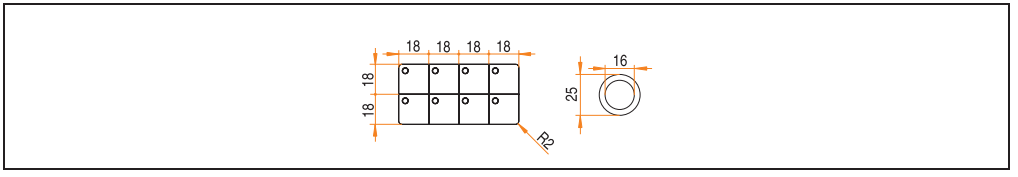


Figure 39: Key dimensions - 5AC800.EXT3-00

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

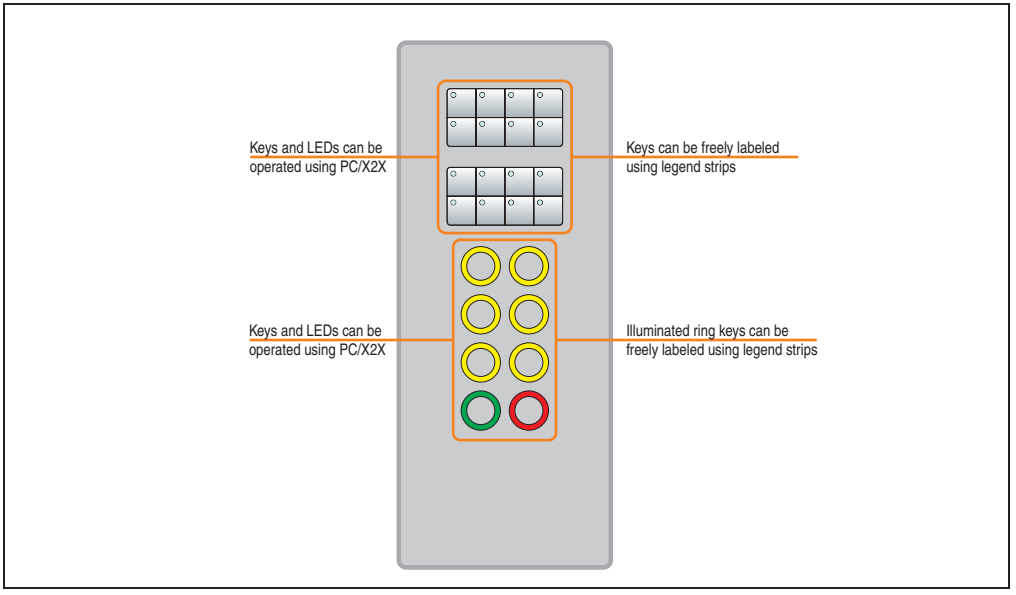


Figure 40: Front view - 5AC800.EXT3-01

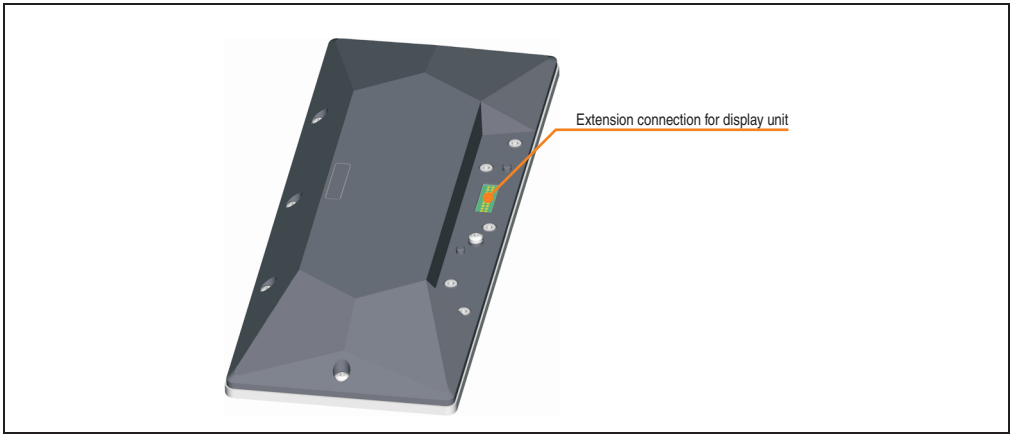


Figure 41: Rear view - 5AC800.EXT3-01

Technical data

Features	5AC800.EXT3-01
Keys/LED[1)]	
Function keys	16 with LED (yellow)
Operated using	PC, X2X
Cursor keys	-
Number block	-
Other keys	8 illuminated ring keys (PB - Push Button)
Operated using	PC, X2X
Key lifespan	1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	
Yellow	Typ. 60 mcd
Green	Typ. 35 mcd
Red	Typ. 54 mcd
Electrical characteristics	
Power consumption	Max. 7W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[2)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[2)]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[2)] (semi-matt)
Outer dimensions	
Width	135 mm
Height	330 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing
Vibration	
Operation (continuous)	5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak)
Operation (occasional)	5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak)
Storage / Transport	Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)

Table 21: Technical data - 5AC800.EXT3-01

Environmental characteristics	5AC800.EXT3-01
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 21: Technical data - 5AC800.EXT3-01

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.

Dimensions

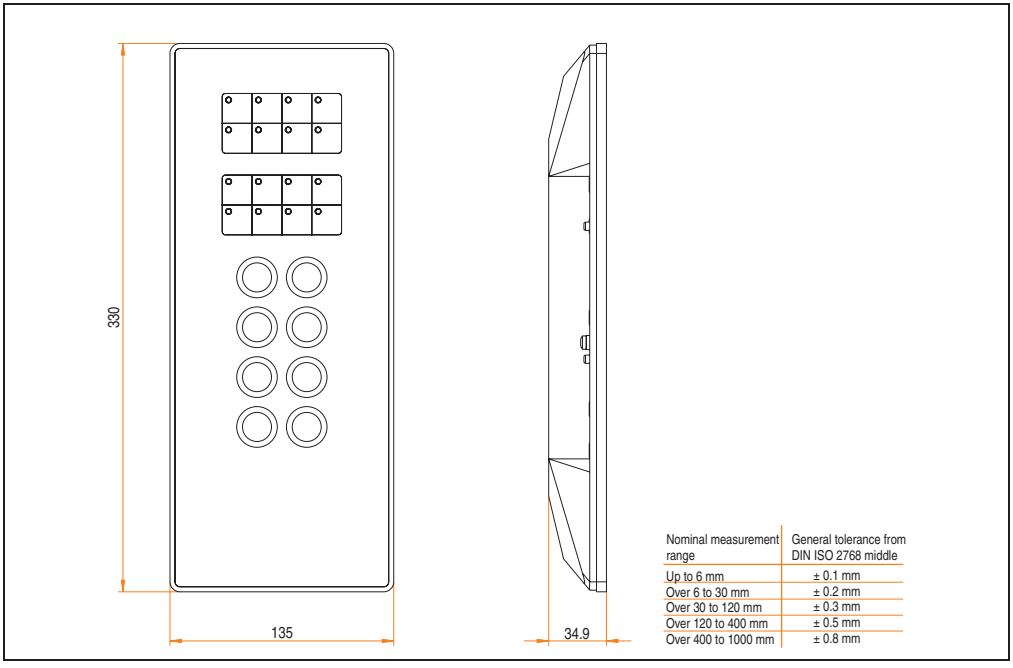


Figure 42: Dimensions - 5AC800.EXT3-01

Key dimensions

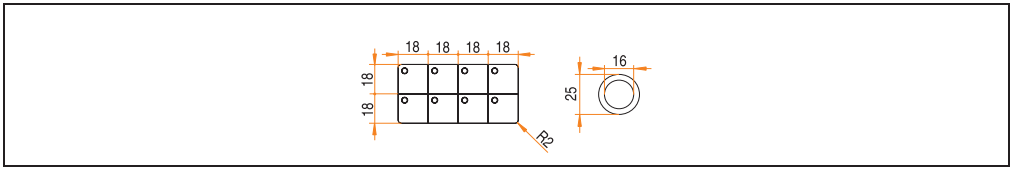


Figure 43: Key dimensions - 5AC.EXT3-01

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

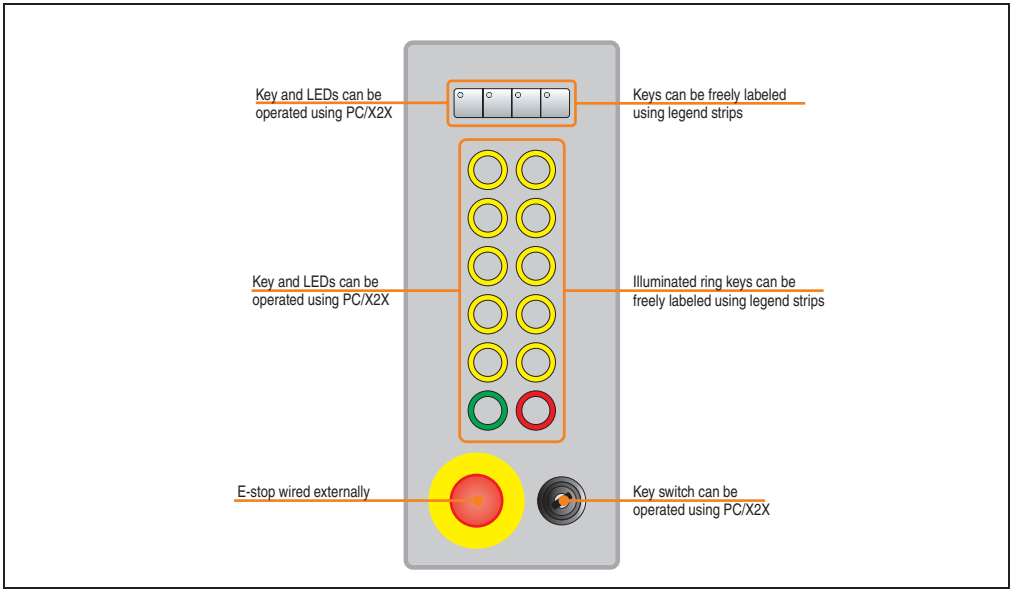


Figure 44: Front view - 5AC800.EXT3-02

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

Technical data

Features	5AC800.EXT3-02
Keys/LED[1)]	
Function keys	4 with LED (yellow)
Operated using	PC, X2X
Cursor keys	-
Number block	-
Other keys	12 illuminated ring keys (PB - Push Button)
Operated using	PC, X2X
Key lifespan	1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	
Yellow	Typ. 60 mcd
Green	Typ. 35 mcd
Red	Typ. 54 mcd
E-stop	Also see Appendix A, section 1 "E-stop button" on page 165 2 N.C. contacts, left position
Key switch	Also see Appendix A, section 2 "Key switch" on page 167 1 N.O. contact, right position
Electrical characteristics	
Power consumption	Max. 8W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[2)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[2)]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[2)] (semi-matt)
Outer dimensions	
Width	135 mm
Height	330 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing

Table 22: Technical data - 5AC800.EXT3-02

Environmental characteristics	5AC800.EXT3-02
Vibration Operation (continuous) Operation (occasional) Storage / Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 22: Technical data - 5AC800.EXT3-02

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.

Dimensions

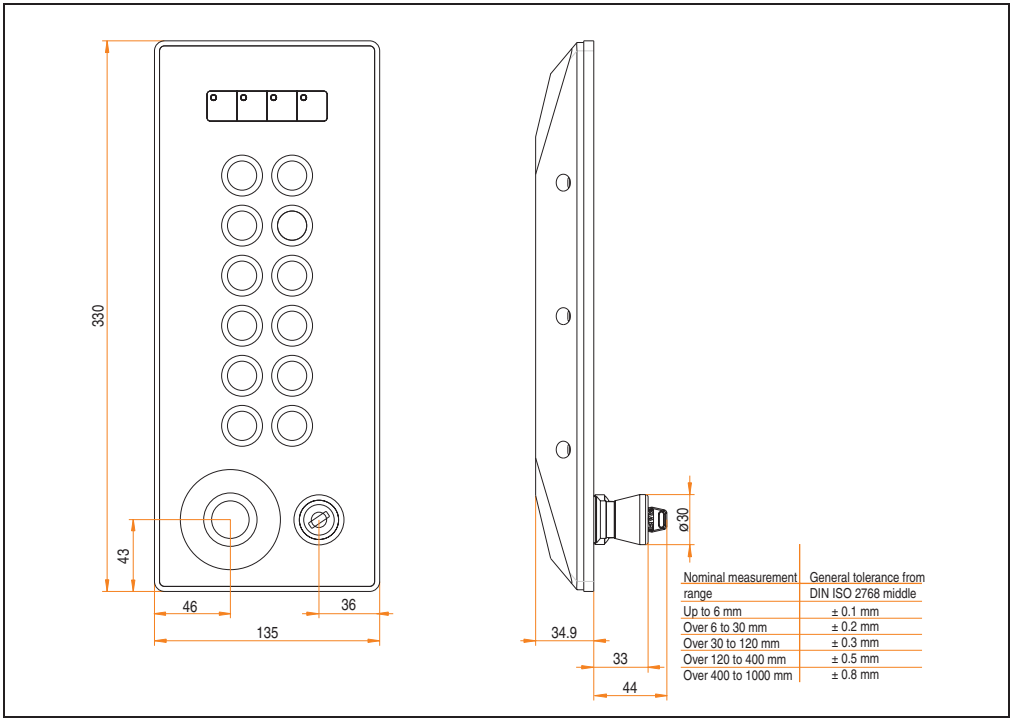


Figure 46: Dimensions - 5AC800.EXT3-02

Key dimensions

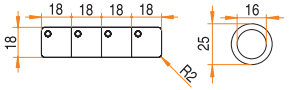


Figure 47: Key dimensions - 5AC800.EXT3-02

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

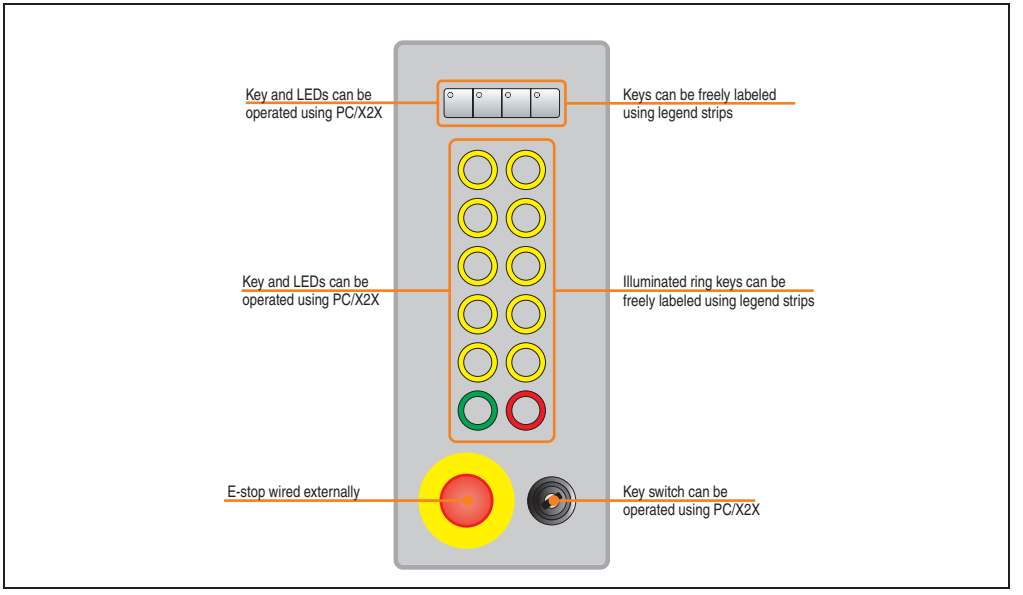


Figure 48: Front view - 5AC800.EXT3-03

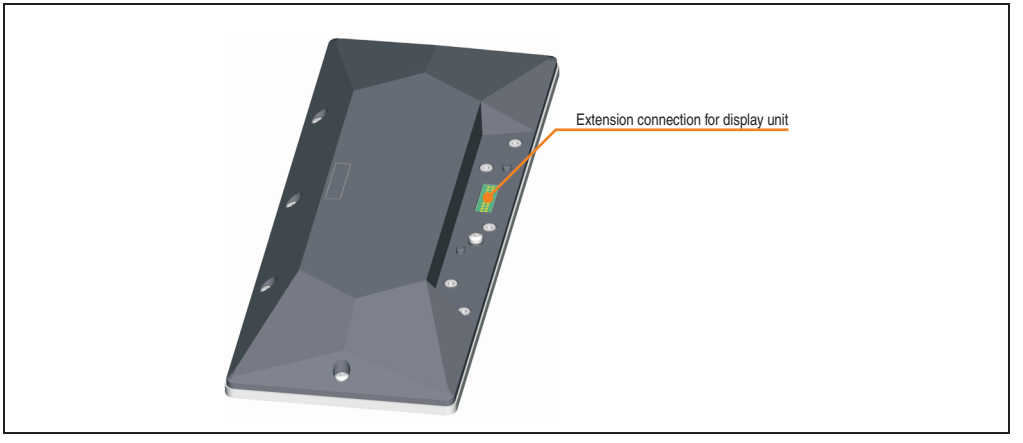


Figure 49: Rear view - 5AC800.EXT3-03

Technical data

Features	5AC800.EXT3-03
Keys/LED[1)]	
Function keys	4 with LED (yellow)
Operated using	PC, X2X
Cursor keys	-
Number block	-
Other keys	12 illuminated ring keys (PB - Push Button)
Operated using	PC, X2X
Key lifespan	1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	
Yellow	Typ. 60 mcd
Green	Typ. 35 mcd
Red	Typ. 54 mcd
E-stop	Also see Appendix A, section 1 "E-stop button" on page 165 2 N.C. contacts, left position
Key switch	Also see Appendix A, section 2 "Key switch" on page 167 1 N.O. contact, right position
Electrical characteristics	
Power consumption	Max. 8W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[2)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[2)]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[2)] (semi-matt)
Outer dimensions	
Width	135 mm
Height	330 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing

Table 23: Technical data - 5AC800.EXT3-03

Environmental characteristics	5AC800.EXT3-03
Vibration Operation (continuous) Operation (occasional) Storage / Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 23: Technical data - 5AC800.EXT3-03

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.

Dimensions

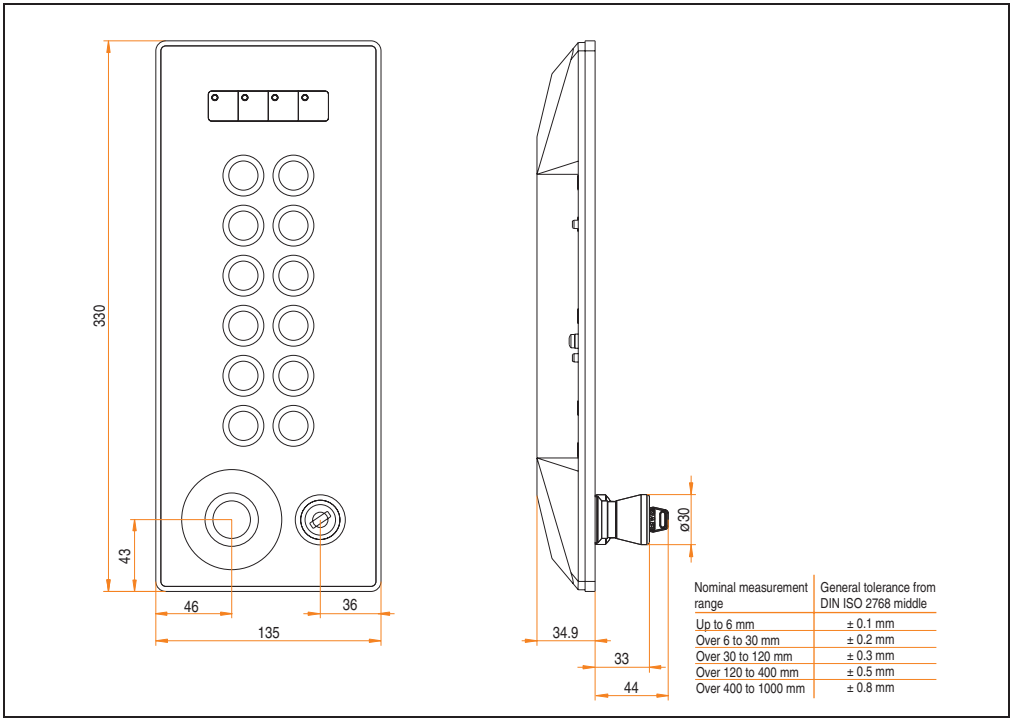


Figure 50: Dimensions - 5AC800.EXT3-03

Key dimensions

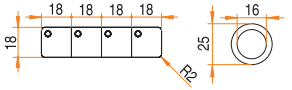


Figure 51: Key dimensions - 5AC800.EXT3-03

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

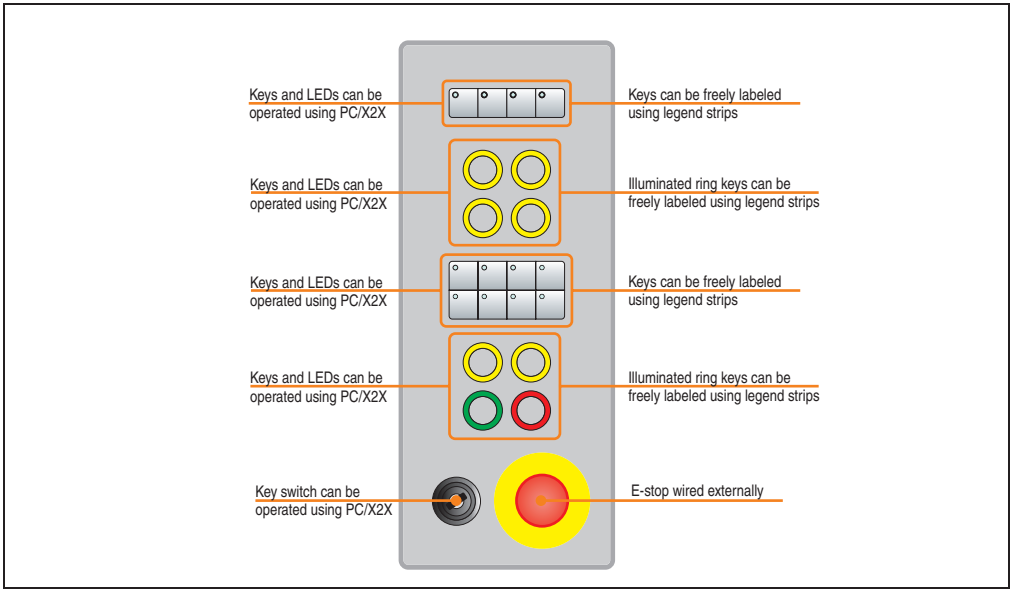


Figure 52: Front view - 5AC800.EXT3-04

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

Technical data

Features	5AC800.EXT3-04
Keys/LED[1)]	
Function keys	12 with LED (yellow)
Operated using	PC, X2X
Cursor keys	-
Number block	-
Other keys	8 illuminated ring keys (PB - Push Button)
Operated using	PC, X2X
Key lifespan	1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	
Yellow	Typ. 60 mcd
Green	Typ. 35 mcd
Red	Typ. 54 mcd
E-stop	Also see Appendix A, section 1 "E-stop button" on page 165 2 N.C. contacts, right position
Key switch	Also see Appendix A, section 2 "Key switch" on page 167 1 N.O. contact, left position
Electrical characteristics	
Power consumption	Max. 7W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[2)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[2)]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[2)] (semi-matt)
Outer dimensions	
Width	135 mm
Height	330 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing

Table 24: Technical data - 5AC800.EXT3-04

Environmental characteristics	5AC800.EXT3-04
Vibration Operation (continuous) Operation (occasional) Storage / Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 24: Technical data - 5AC800.EXT3-04

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.

Dimensions

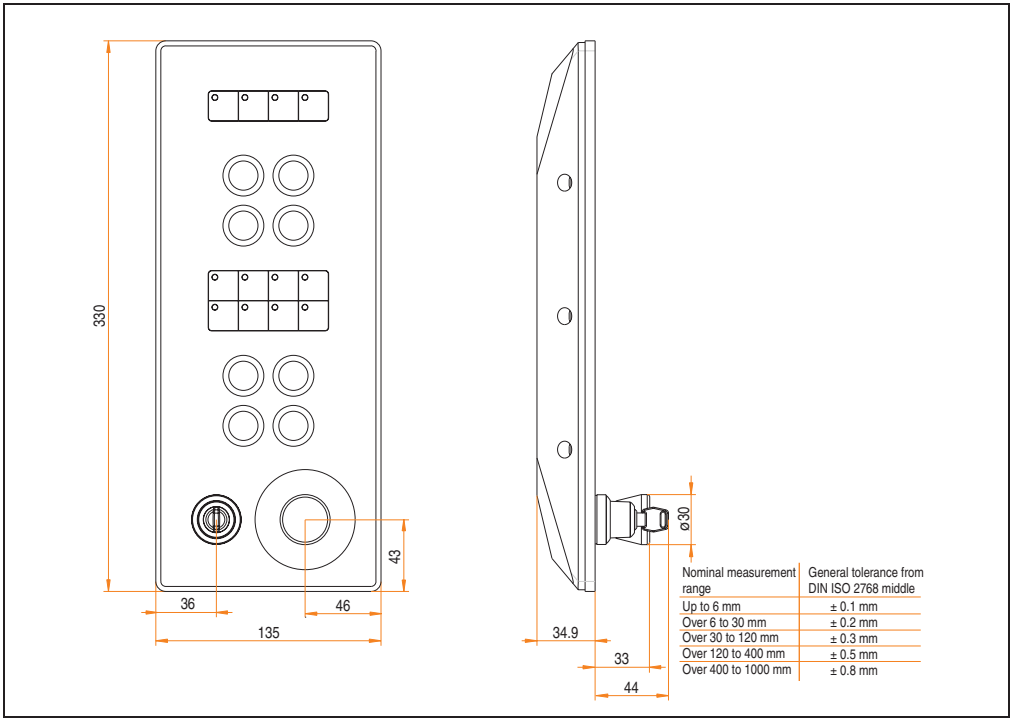


Figure 54: Dimensions - 5AC800.EXT3-04

Key dimensions

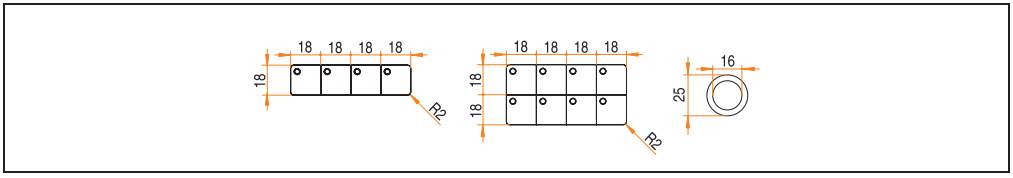


Figure 55: Key dimensions - 5AC800.EXT3-04

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

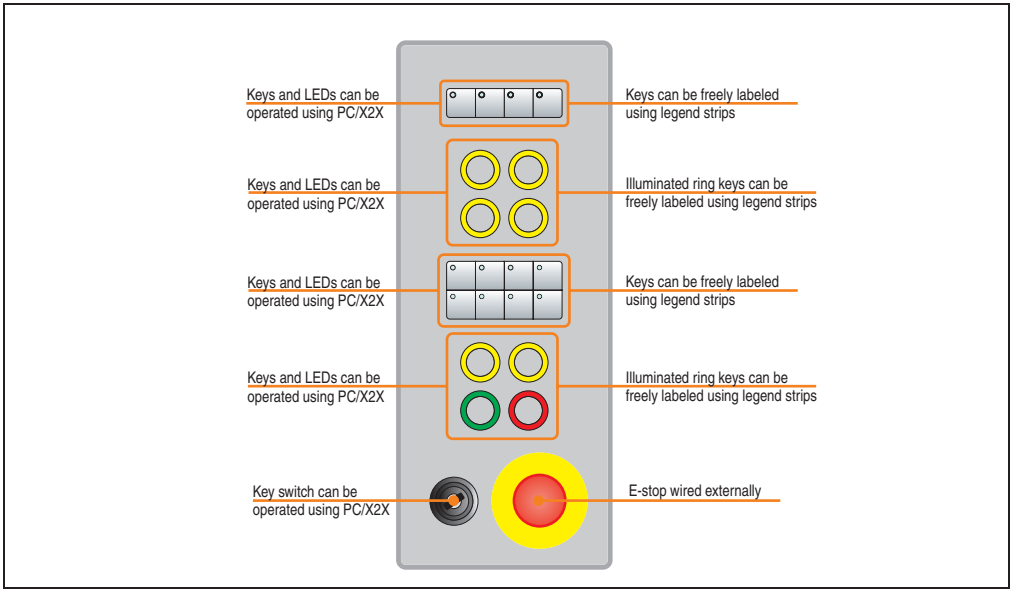


Figure 56: Front view - 5AC800.EXT3-05

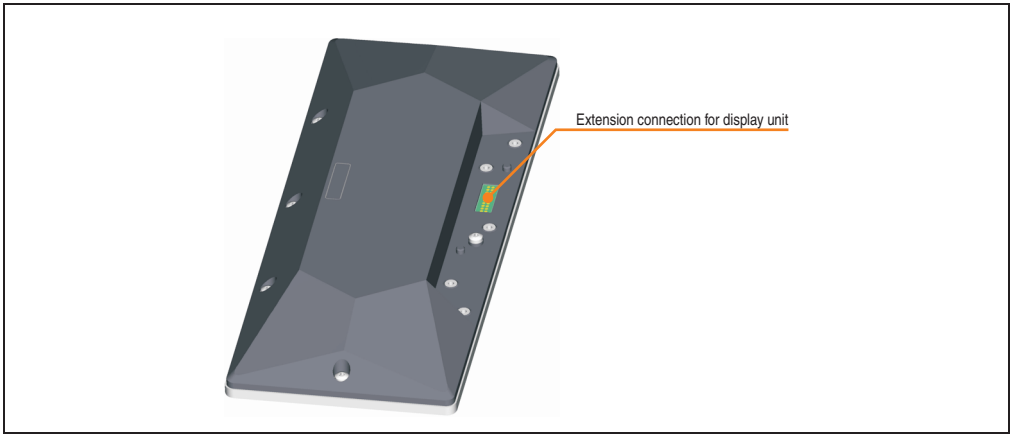


Figure 57: Rear view - 5AC800.EXT3-05

Technical data

Features	5AC800.EXT3-05
Keys/LED[1)]	
Function keys	12 with LED (yellow)
Operated using	PC, X2X
Cursor keys	-
Number block	-
Other keys	8 illuminated ring keys (PB - Push Button)
Operated using	PC, X2X
Key lifespan	1,000,000 actuations with 3.5 -0.5 to 3.5 +0.7 N operating force
Key lifespan	> 1,000,000 actuations with 1 ±0.3 to 3 ±0.3 N operating force
LED brightness	
Yellow	Typ. 60 mcd
Green	Typ. 35 mcd
Red	Typ. 54 mcd
E-stop	Also see Appendix A, section 1 "E-stop button" on page 165 2 N.C. contacts, right position
Key switch	Also see Appendix A, section 2 "Key switch" on page 167 1 N.O. contact, left position
Electrical characteristics	
Power consumption	Max. 7W
Mechanical characteristics	
Front	
Frame	Aluminum, naturally anodized[2)]
Design	Gray[2)]
Membrane	Polyester
Light background	Similar to Pantone 427CV[2)]
Color legend strips (color gradients)	Similar to Pantone white to Pantone 429CV[2)]
Housing	
Material	Aluminum (ADC12)
Gasket	Foam perimeter seal
Paint	Similar to silver metallic[2)] (semi-matt)
Outer dimensions	
Width	135 mm
Height	330 mm
Depth	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°)	0 .. +50°C
Storage	-25 .. +60°C
Transport	-25 .. +60°C
Relative humidity	
Operation / Storage / Transport	T <= 40°C: 5% to 90%, non-condensing T > 40°C: < 90%, non-condensing

Table 25: Technical data - 5AC800.EXT3-05

Environmental characteristics	5AC800.EXT3-05
Vibration Operation (continuous) Operation (occasional) Storage / Transport	 5 - 9 Hz: 1.75 mm amplitude / 9 - 150 Hz: 0.5 g (4.9 m/s² 0-peak) 5 - 9 Hz: 3 mm amplitude / 9 - 150 Hz: 1 g (9.8 m/s² 0-peak) Max. 10 - 57 Hz and 0.075 mm amplitude Max. 58 - 500 Hz and 1 g (9.8 m/s² 0-peak)
Shock Operation Storage / Transport	 Max. 15 g (147 m/s² 0-peak) and 11 ms duration Max. 50 g (490 m/s² 0-peak) and 11 ms duration
Protection type	IP65 / NEMA 250 type 4X, dust and sprayed water protection (from all sides)
Altitude	Max. 3000 m

Table 25: Technical data - 5AC800.EXT3-05

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.

Dimensions

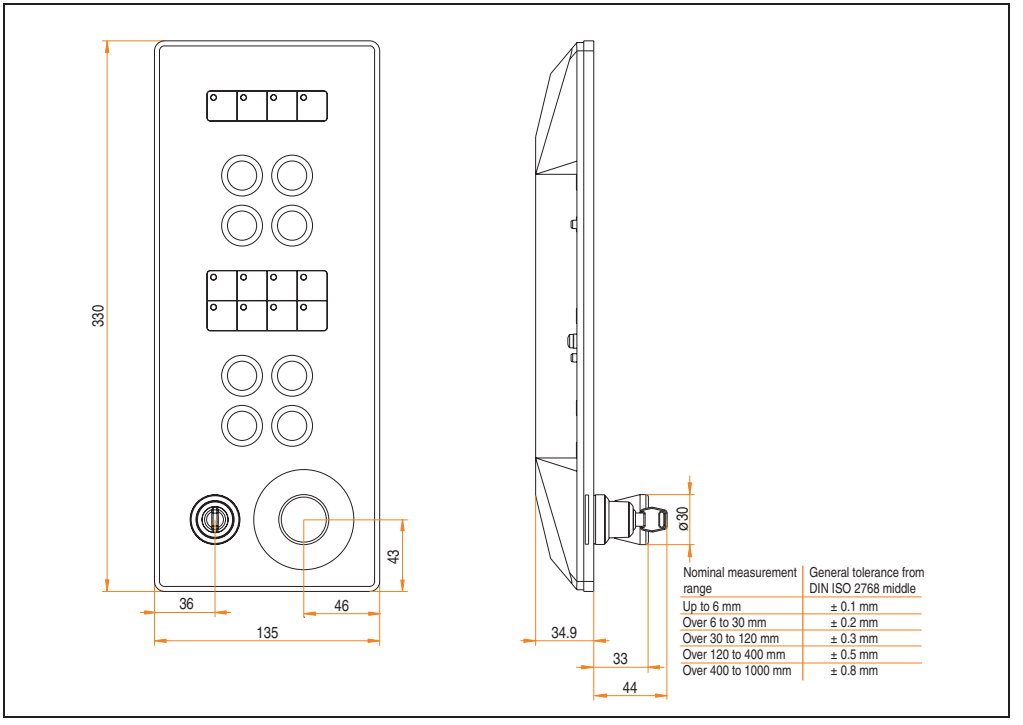


Figure 58: Dimensions - 5AC800.EXT3-05

Key dimensions

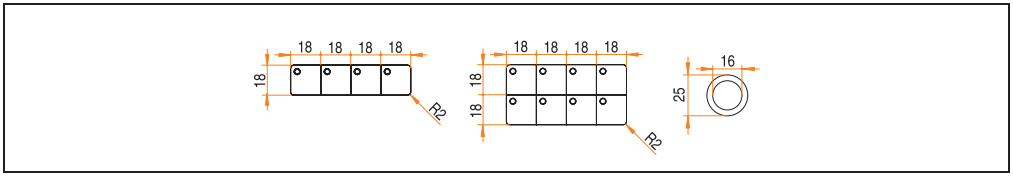


Figure 59: Key dimensions - EXT3-05

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 108).

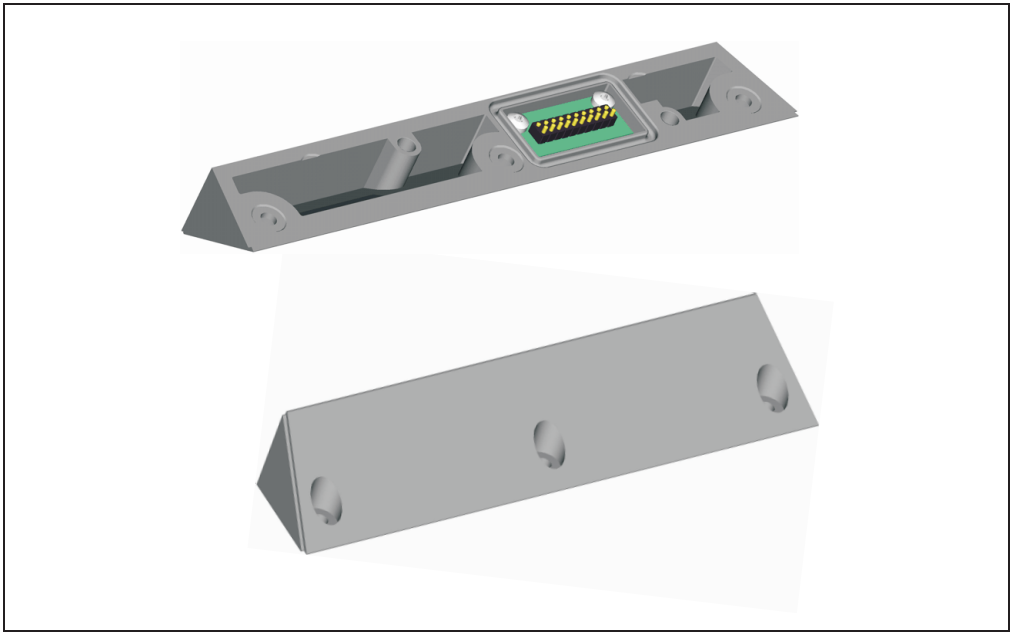


Figure 60: Extension cover 5AC800.COV1-00

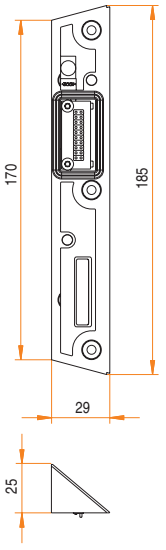
Technical data

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

Table 26: Technical data - 5AC800.COV1-00

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 61: Dimensions - extension cover 5AC800.COV1-00

Contents of delivery

Number	Component
1	Extension cover
3	Torx screws included

Table 27: 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 108). With this design, a USB flash drive can be connected to the AP800 display.

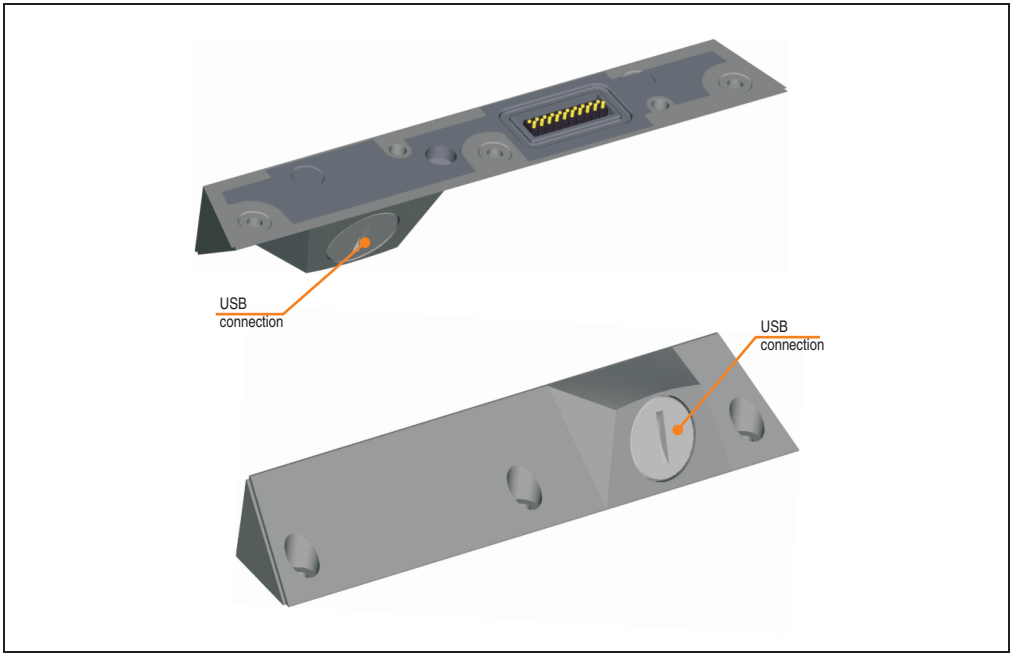


Figure 62: USB extension cover 5AC800.COV2-00

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

Table 28: Technical data - 5AC800.COV2-00

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

Dimensions

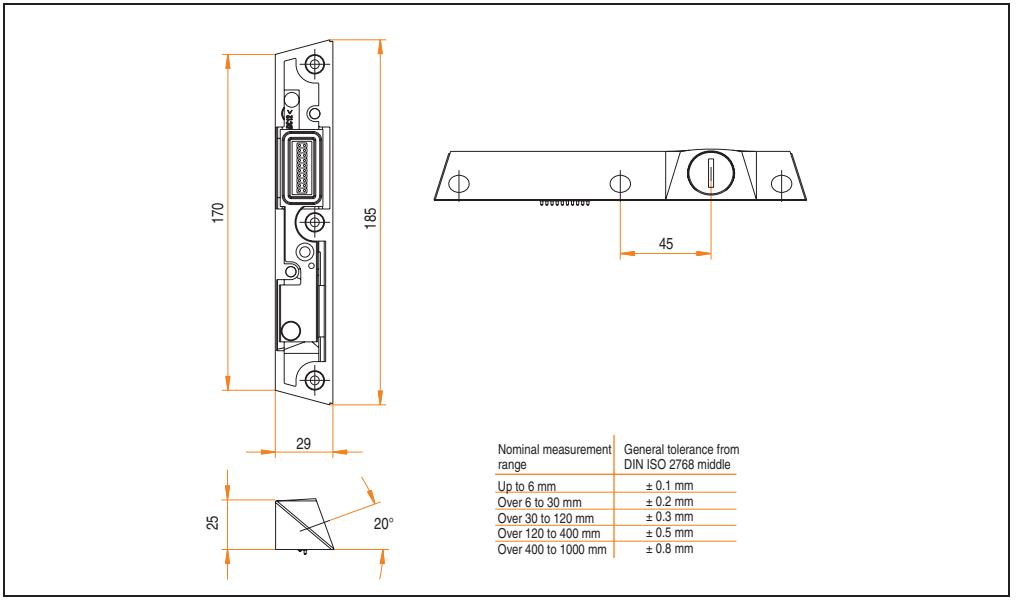


Figure 63: Dimensions - USB extension cover 5AC800.COV2-00

Contents of delivery

Number	Component
1	USB extension cover
3	Torx screws included

Table 29: 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 108). Straight design.

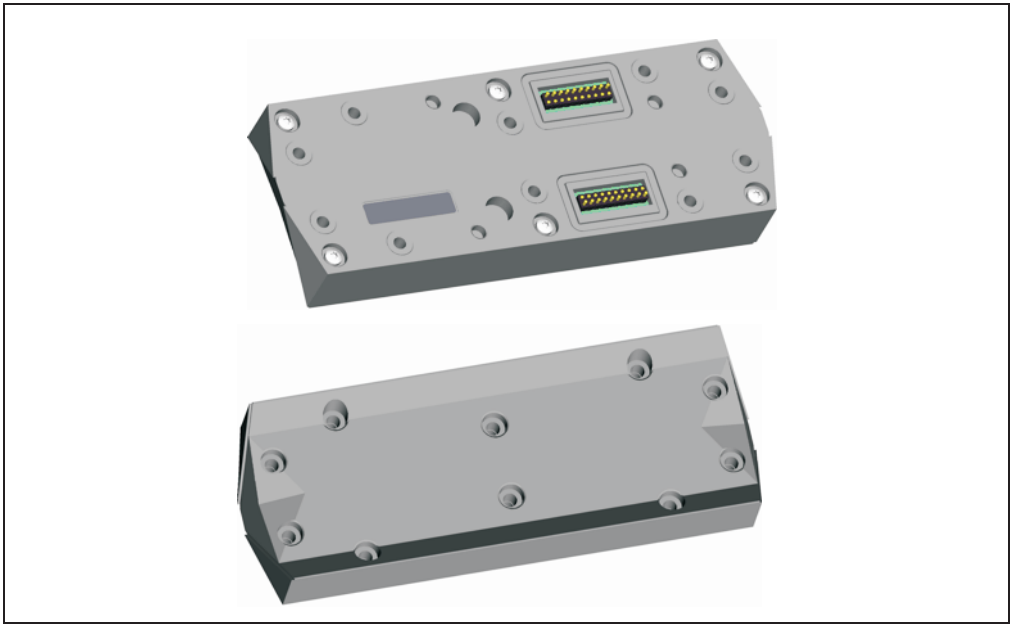


Figure 64: Extension connector 5AC800.CON1-00

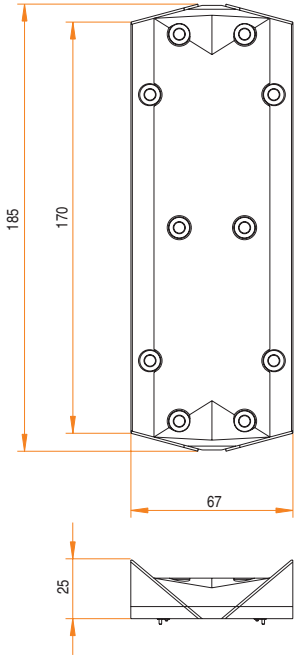
Technical data

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

Table 30: 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 65: Dimensions - extension connector 5AC800.CON1-00

Contents of delivery

Number	Component
1	Extension connector
10	Torx screws included

Table 31: 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 108). 60° design.

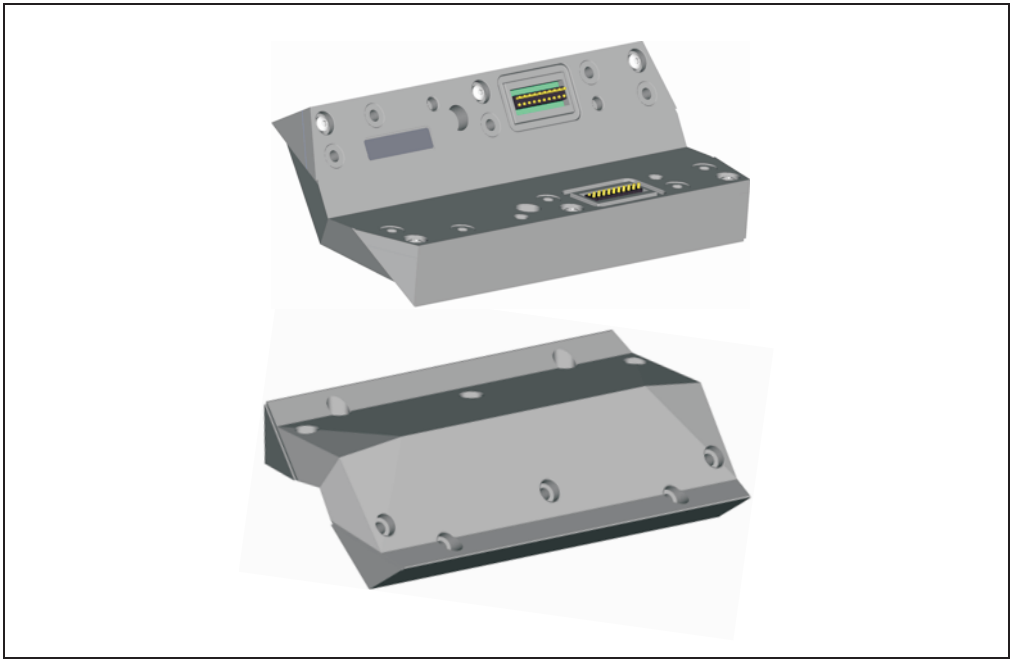


Figure 66: Extension connector 60° 5AC800.CON2-00

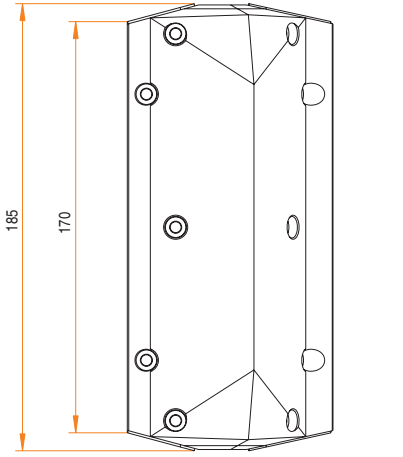
Technical data

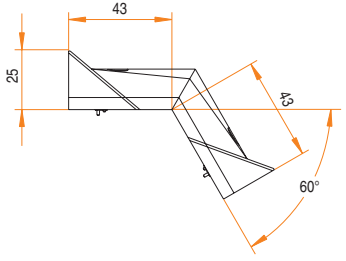
Features	5AC800.CON2-00
Housing Material Gasket Paint	 Aluminum (ADC12) Foam perimeter seal Similar to silver metallic[1] (semi-matt)
Weight	Approx. 0.5 kg

Table 32: 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 67: Dimensions - extension connector 60° 5AC800.CON2-00

Contents of delivery

Number	Component
1	60° extension connector
10	Torx screws included

Table 33: 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 swing arm system (see chapter 3 "Installation" on page 107 and "Installation of components" on page 108).

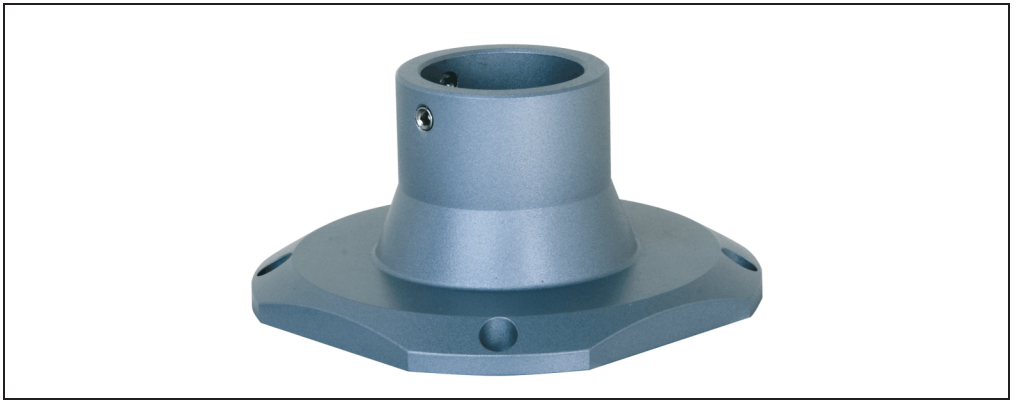


Figure 68: Extension flange 5AC800.FLG1-00

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 34: Technical data - 5AC800.FLG1-00

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

Dimensions

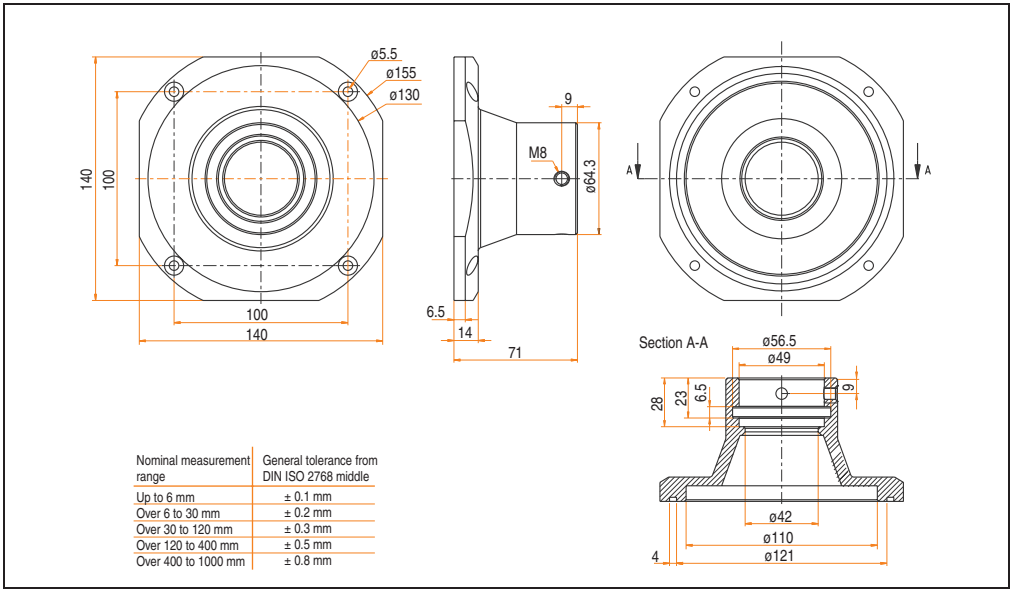


Figure 69: Dimensions - extension flange 5AC800.FLG1-00

Contents of delivery

Number	Component
1	Extension flange
4	Torx screws included

Table 35: 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.0018-00	X2X cable for Automation Panel 800; length 1.8 meters.	
5CAX2X.0050-00	X2X cable for Automation Panel 800; length 5 meters.	
5CAX2X.0100-00	X2X cable for Automation Panel 800; length 10 meters.	
5CAX2X.0150-00	X2X cable for Automation Panel 800; length 15 meters.	
5CAX2X.0200-00	X2X cable for Automation Panel 800; length 20 meters.	
5CAX2X.0250-00	X2X cable for Automation Panel 800; length 25 meters.	
5CAX2X.0300-00	X2X cable for Automation Panel 800; length 30 meters.	
5CAX2X.0400-00	X2X cable for Automation Panel 800; length 40 meters.	

Table 36: Model number overview - cables

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

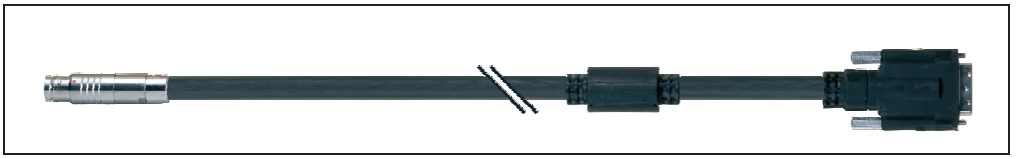


Figure 70: SDL cable 5CASDL.0xxx-20 Rev. < A5

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	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
Outer diameter	Max. 9 mm		Max. 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. 237 Ω/km		Max. 93 Ω/km			
Insulation resistance	Min. 10 MΩ/km					
Flexibility	Flexible (not for use in drag chain installations)					
Flex radius	Min. 172 mm		Min. 220 mm			
Plug connection cycles	100					
Weight	Approx. 300 g	Approx. 590 g	Approx. 2100 g	Approx. 3000 g	Approx. 4100 g	Approx. 5100 g

Table 37: Technical data - SDL cable 5CASDL.0xxx-20 Rev. < A5

Plug dimensions (ODU Minisnap)

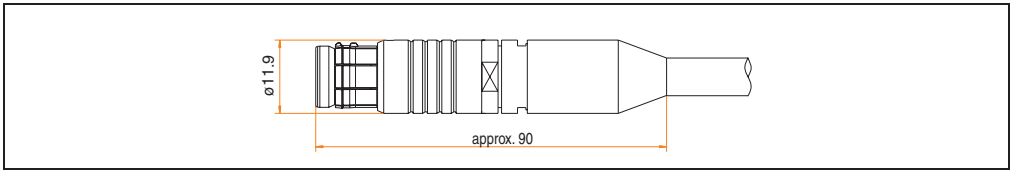


Figure 71: Plug dimensions (ODU Minisnap) - SDL cable 5CASDL.0xxx-20 Rev. < A5

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.

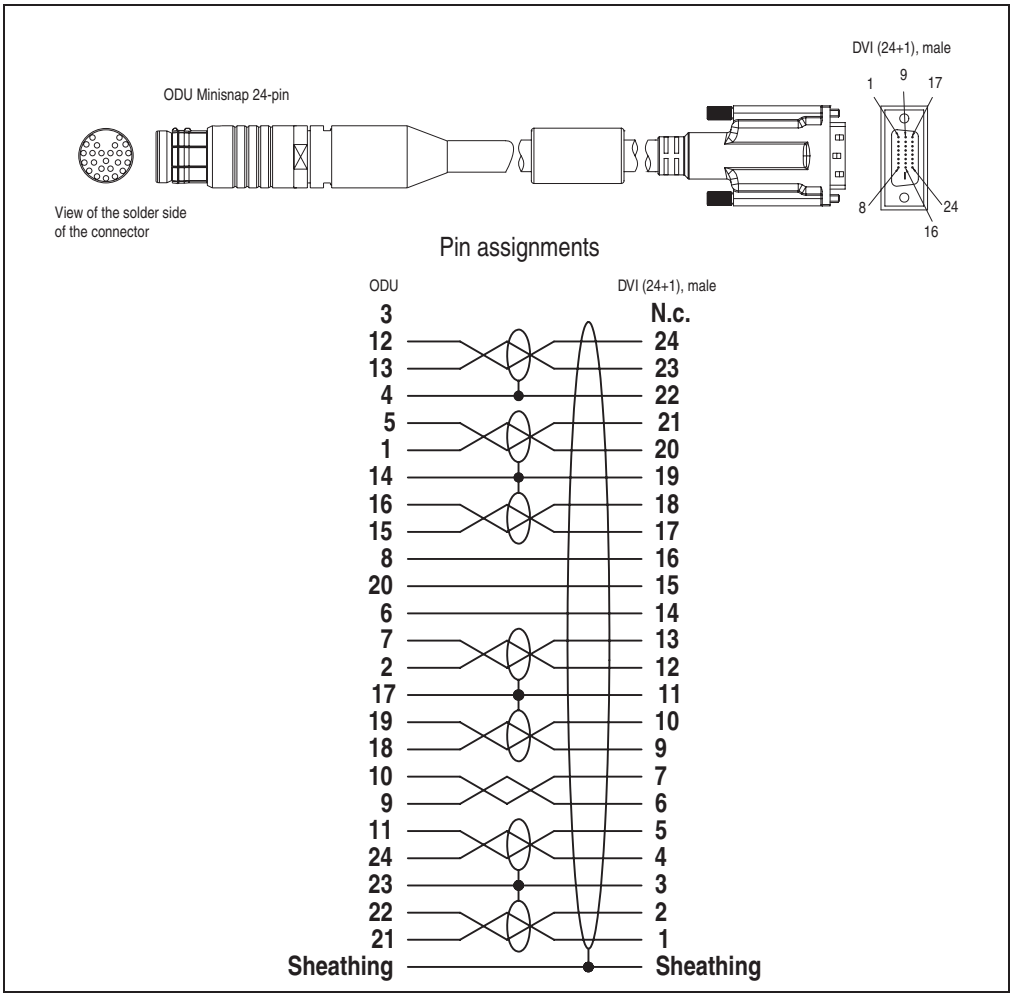


Figure 72: Pin assignments - SDL cable 5CASDL.0xxx-20 Rev. < A5

3.4.3 SDL cable with extender 5CASDL.0xxx-30 Rev. < A5

Figure 73: SDL cable with extender 5CASDL.0xxx-30 Rev. < A5

Caution!

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

Technical data

Features	5CASDL.0300-30	5CADSDL.0400-30
Length	30 m ± 280 mm	40 m ± 380 mm
Dimensions of extender box	Height 20 mm, width 34 mm, length 125 mm	
Outer diameter	Max. 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. 93 Ω/km	
Insulation resistance	Min. 10 MΩ/km	
Flexibility	Flexible (not for use in drag chain installations)	
Flex radius	Min. 220 mm	
Plug connection cycles	100	
Weight	Approx. 6250 g	Approx. 8250 g

Table 38: Technical data - SDL cable with extender 5CASDL.0xxx-30 Rev. < A5

Plug dimensions (ODU Minisnap)

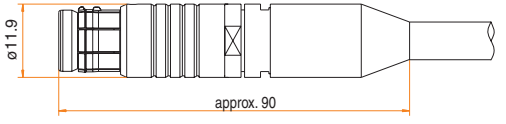


Figure 74: Plug dimensions (ODU Minisnap) - SDL cable 5CASDL.0xxx-30 Rev. < A5

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.

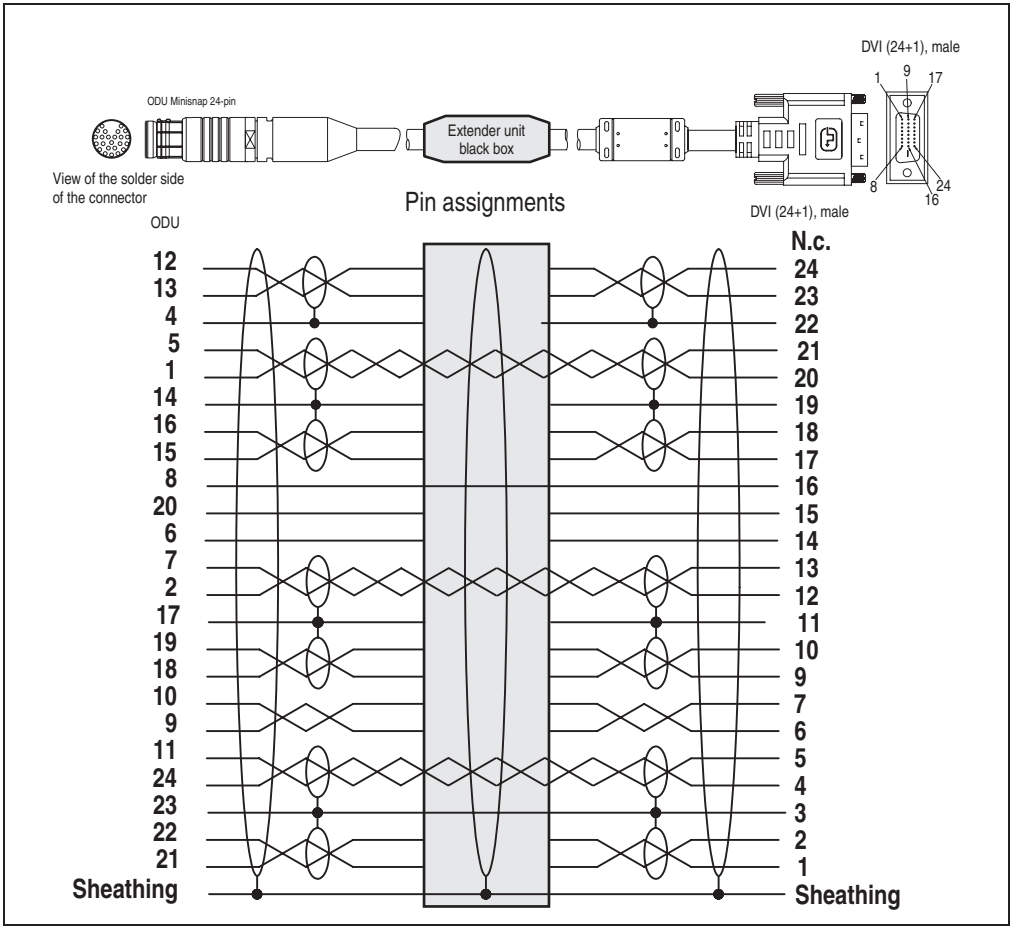


Figure 75: Pin assignments - SDL cable with extender 5CASDL.0xxx-30 Rev. < A5

3.4.4 SDL cable 5CASDL.0xxx-20 Rev. ≥ A5

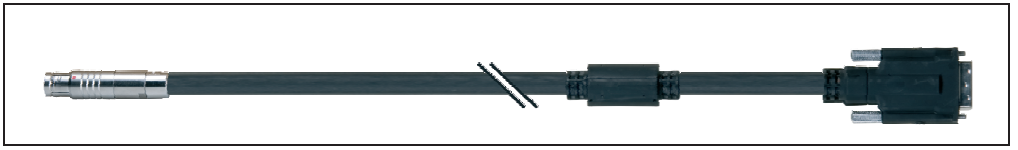


Figure 76: SDL cable 5CASDL.0xxx-20 Rev. ≥ A5

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	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	Max. 12 mm					
Connector type Connection cycles	ODU Minisnap 24-pin / DVI-D (24+1), male 2000 / 200					
Flexibility	Semi-flexible, occasional movement (limited use in cable drag chains)					
Flex radius Single Moving	 ≥ 10 x cable diameter ≥ 15 x cable diameter					
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	 ≤ 95 Ω/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					

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

Environmental characteristics	5CASDL.0018-20	5CASDL.0050-20	5CASDL.0100-20	5CASDL.0150-20	5CASDL.0200-20	5CASDL.0250-20
Temperature resistance Fixed installation Moving Storage	-20°C .. +80°C -5°C .. +60°C -20°C .. +80°C					
Standards and certifications						
Torsion load[1)]	100000 cycles					
Cable drag chain[1)]	250000 cycles					
Approbation	UL AWM 20236 80°C 30 V					
Oil and hydrolysis resistance	According to VDE 0282-10					

Table 39: Technical data - SDL cable 5CASDL.0xxx-20 Rev. ≥ A5 (cont.)

1) See "SDL flex cable - test description" on page 150

Plug dimensions (ODU Minisnap)

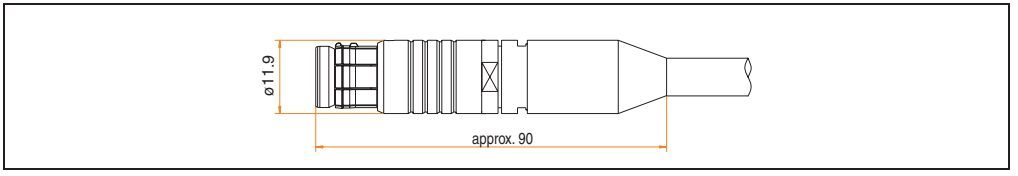


Figure 77: Plug dimensions (ODU Minisnap) - SDL cable 5CASDL.0xxx-20 Rev. ≥ A5

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.

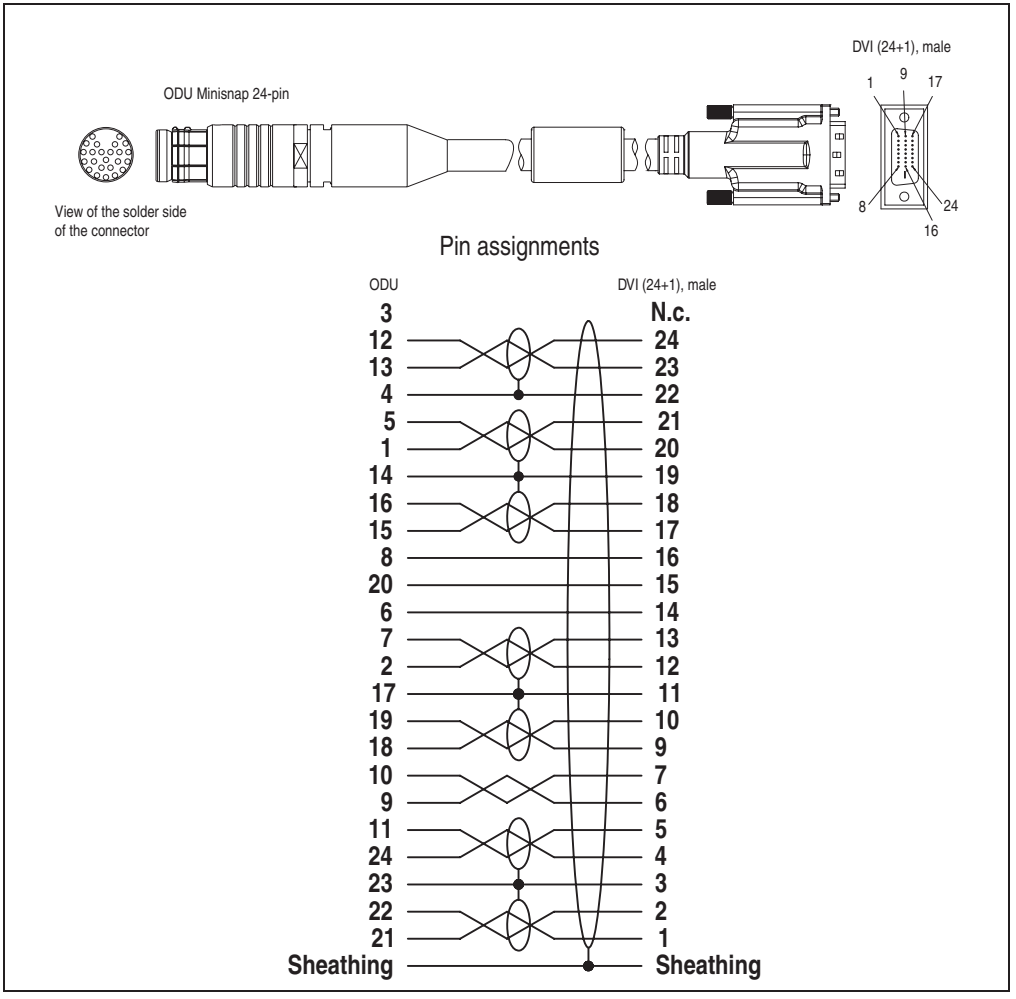


Figure 78: Pin assignments - SDL cable 5CASDL.0xxx-20 Rev. ≥ A5

3.4.5 SDL cable with extender 5CASDL.0xxx-30 Rev. ≥ A5

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

Caution!

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

Technical data

Mechanical characteristics	5CASDL.0300-30	5CADSDL.0400-30
Length	1.8 m ± 20 mm	5 m ± 45 mm
Weight	Approx. 450 g	Approx. 1000 g
Outer diameter	Max. 12 mm	
Connector type Connection cycles	ODU Minisnap 24-pin / DVI-D (24+1), male 2000 / 200	
Flexibility	Semi-flexible, occasional movement (limited use in cable drag chains)	
Flex radius Single Moving	 ≥ 10 x cable diameter (excluding extender) ≥ 15 x cable diameter (excluding extender)	
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	 ≤ 95 Ω/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	

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

Environmental characteristics	5CASDL.0300-30	5CADSDL.0400-30
Temperature resistance Fixed installation Moving Storage	-20°C .. +80°C -5°C .. +60°C -20°C .. +80°C	
Standards and certifications		
Torsion load[1)]	100000 cycles	
Cable drag chain[1)]	250000 cycles	
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.0xxx-30 Rev. ≥ A5

1) See "SDL flex cable - test description" on page 150

Plug dimensions (ODU Minisnap)

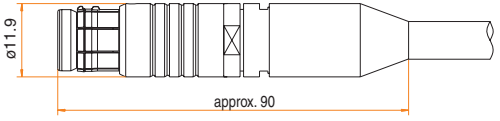


Figure 80: Plug dimensions (ODU Minisnap) - SDL cable 5CASDL.0xxx-30 Rev. ≥ A5

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.

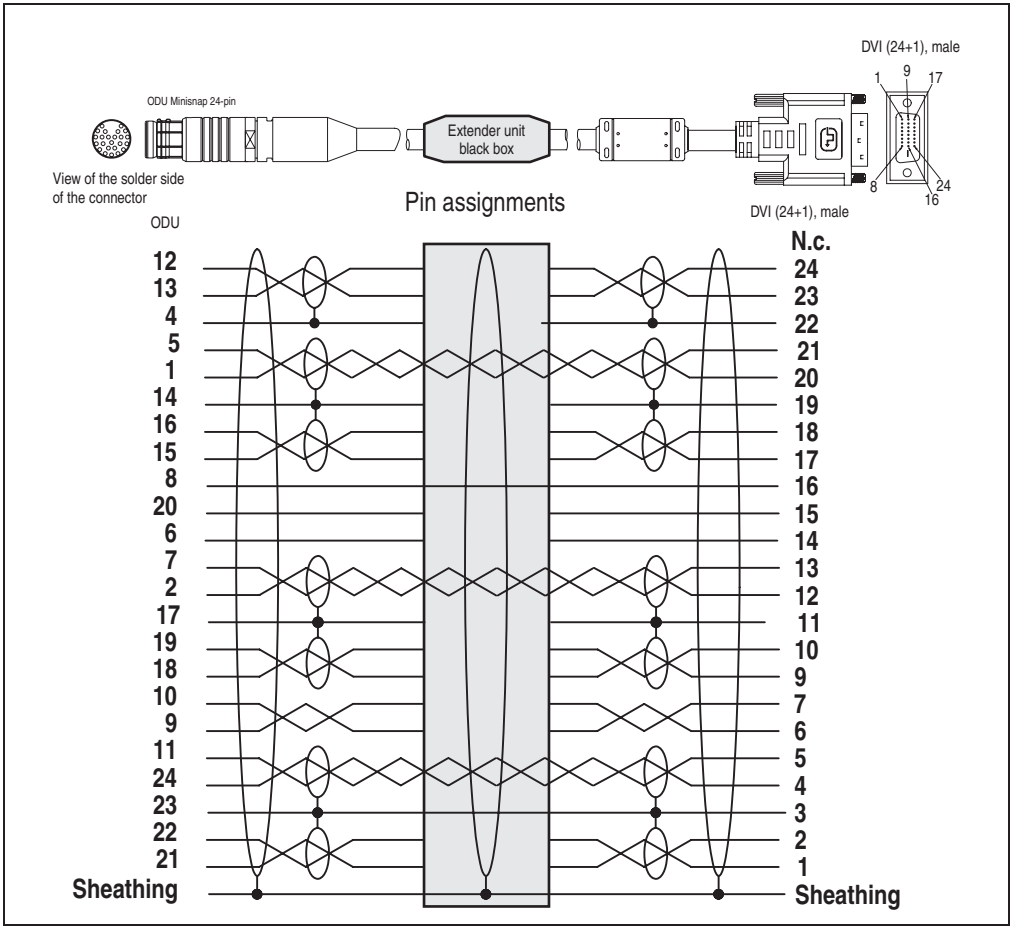


Figure 81: Pin assignments - SDL cable with extender 5CASDL.0xxx-30 Rev. ≥ A5

3.4.6 Voltage supply cable 5CAPWR.0xxx-20

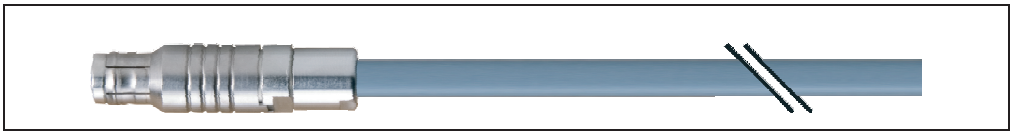


Figure 82: Voltage supply cable 5CAPWR.0xxx-20

Technical data

Features	5CAPWR.00 18-20	5CAPWR.00 50-20	5CAPWR.01 00-20	5CAPWR.01 50-20	5CAPWR.02 00-20	5CAPWR.02 50-20	5CAPWR.03 00-20	5CAPWR.04 00-20
Length	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
Connector type	ODU Minisnap 3-pin							
Weight kg/km	80.0							
Cable diameter	6.6 mm							
Flexibility	Flexible (not for use in drag chain installations)							
Flex radius	15x AD (outer diameter)							
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 41: Technical data - voltage supply cable 5CAPWR.0xxx-20

Plug dimensions (ODU Minisnap)

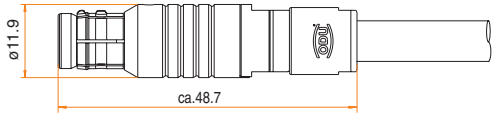


Figure 83: Plug dimensions (ODU Minisnap) - voltage supply cable 5CAPWR.0xxx-20

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. The SDL cables provided by B&R are guaranteed to function properly.

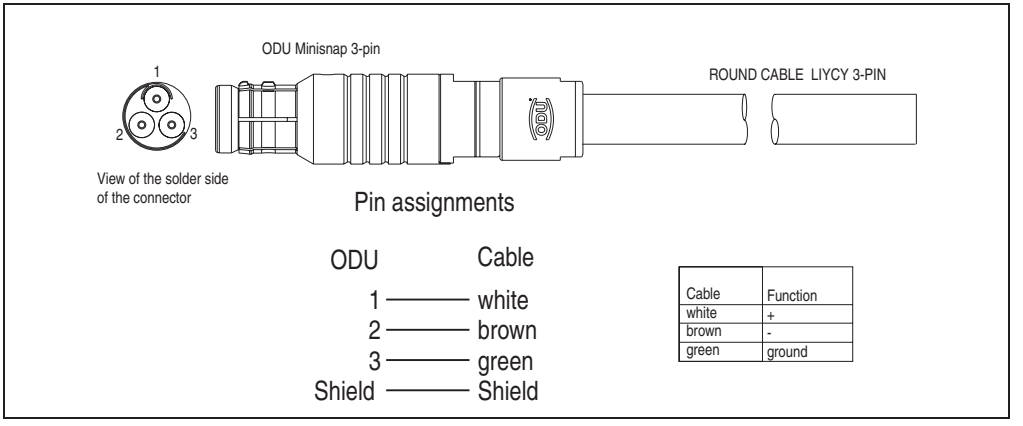


Figure 84: Pin assignments - voltage supply cable 5CAPWR.0xxx-20

3.4.7 X2X cable 5CAX2X.0xxx-00

Figure 85: X2X cable 5CAX2X.0xxx-00

Technical data

Features	5CAX2X.00 18-00	5CAX2X.00 50-00	5CAX2X.01 00-00	5CAX2X.01 50-00	5CAX2X.02 00-00	5CAX2X.02 50-00	5CAX2X.03 00-00	5CAX2X.04 00-00
Length	1.8 m ± 20mm	5 m ± 45mm	10 m ± 90mm	15 m ± 135mm	20 m ± 180mm	25 m ± 230mm	30 m ± 280mm	40 m ± 380mm
Connector type	ODU Minisnap 10-pin							
Weight kg/km	60 kg/km							
Cable diameter	6.8 mm							
Flexibility	Semi-flexible							
Flex radius Single Moving	10x outer diameter 15x outer diameter							
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. 200M Ω/km							
Test voltage	1000 V							
Operating voltage	Max. 30V							
Current load	TBD A							

Table 42: Technical data - X2X cable 5CAX2X.0xxx-00

Plug dimensions (ODU Minisnap)

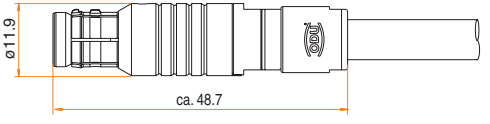


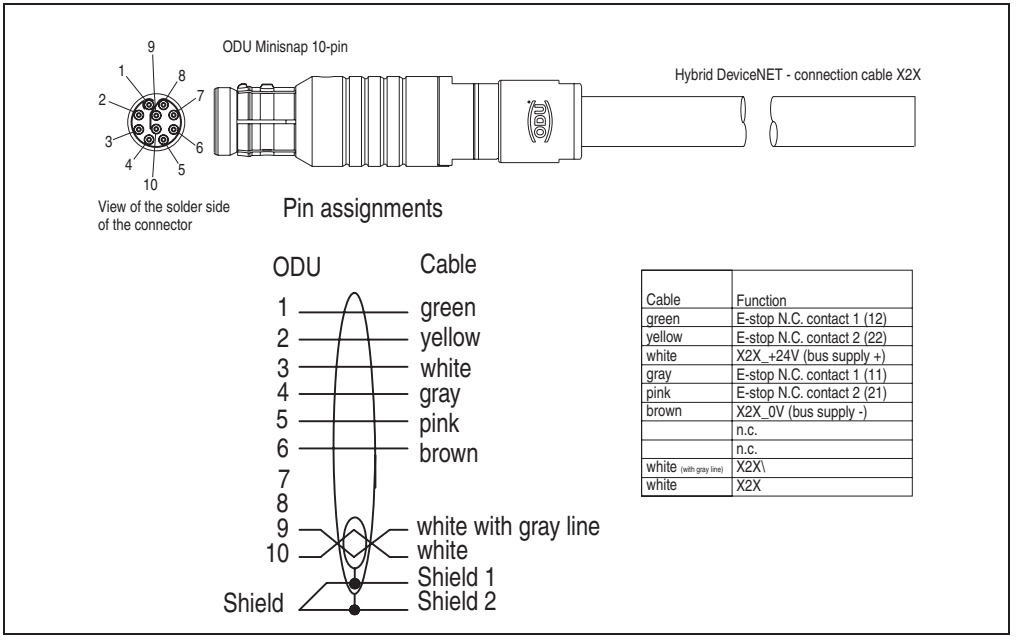
Figure 86: Plug dimensions (ODU Minisnap) - X2X cable 5CAX2X.0xxx-00

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. The SDL cables provided by B&R are guaranteed to function properly.



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 87: Pin assignments - X2X cable 5CAX2X.0xxx-00

Chapter 3 • Commissioning

1. X2X wiring diagram

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.

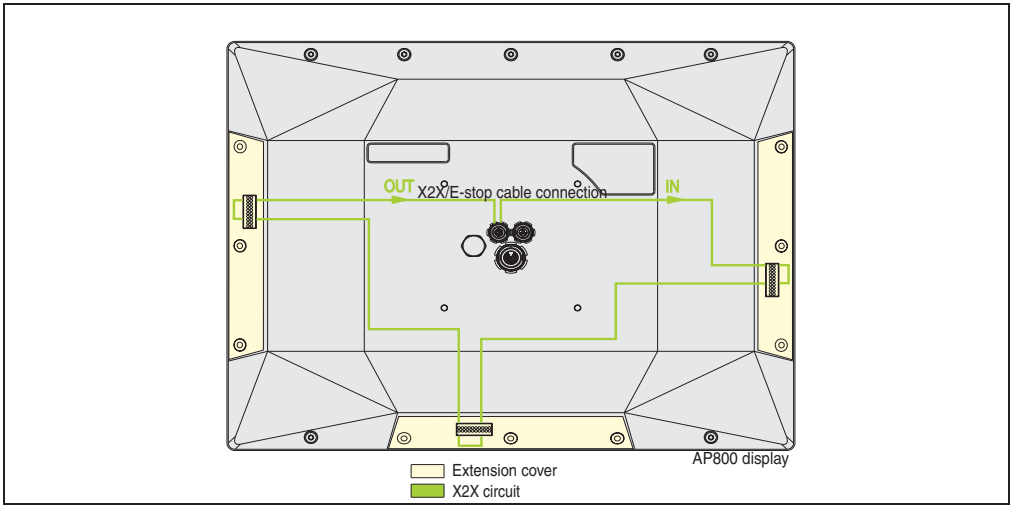


Figure 88: X2X circuit - rear view

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.

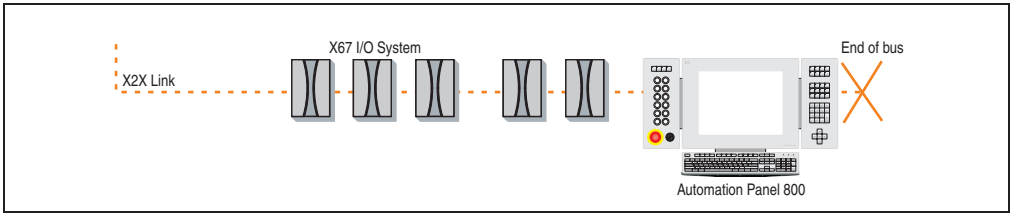


Figure 89: X2X Link topology

2. 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 to 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.

3. 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) Without extension unit

2) With extension unit, with E-stop button

3) With extension unit, without E-stop button

3.1 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.

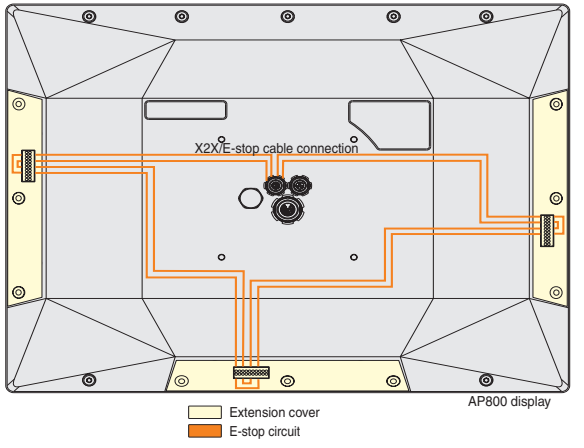


Figure 90: E-stop wiring diagram for the extension cover - rear view

3.2 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.

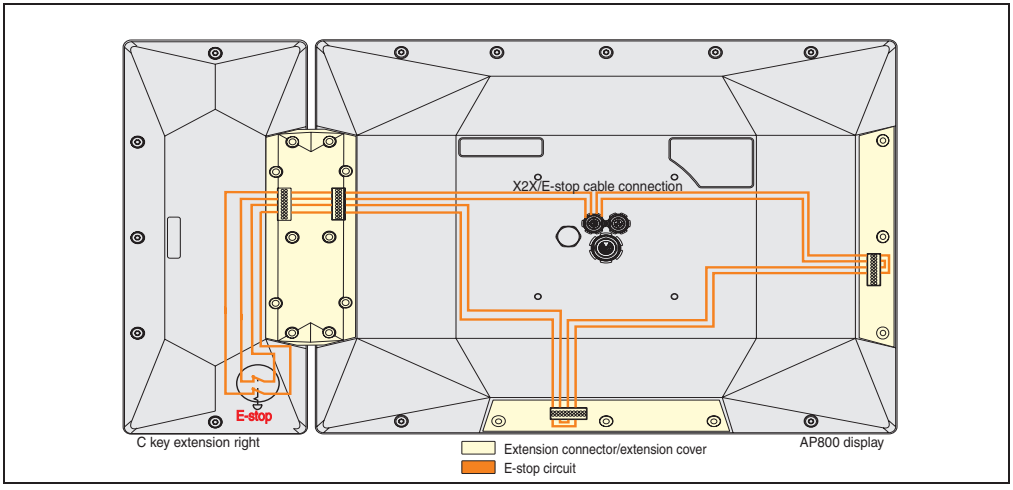


Figure 91: E-stop wiring diagram for the extension unit with E-stop - rear view

3.3 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.

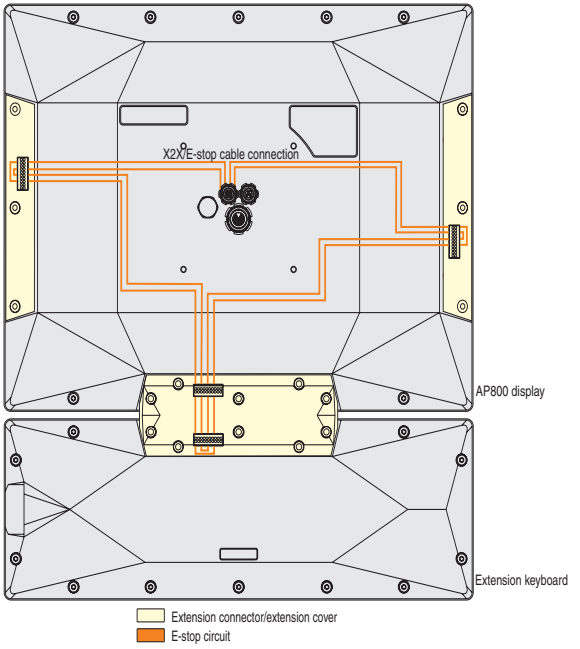


Figure 92: E-stop wiring diagram for the extension unit without E-stop - rear view

3.4 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 43: E-stop circuit current load

4. Installation

An Automation Panel 800 device is primarily mounted on a swing 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 84 and "Installation of components" on page 108). The tubing of the swing 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 86).

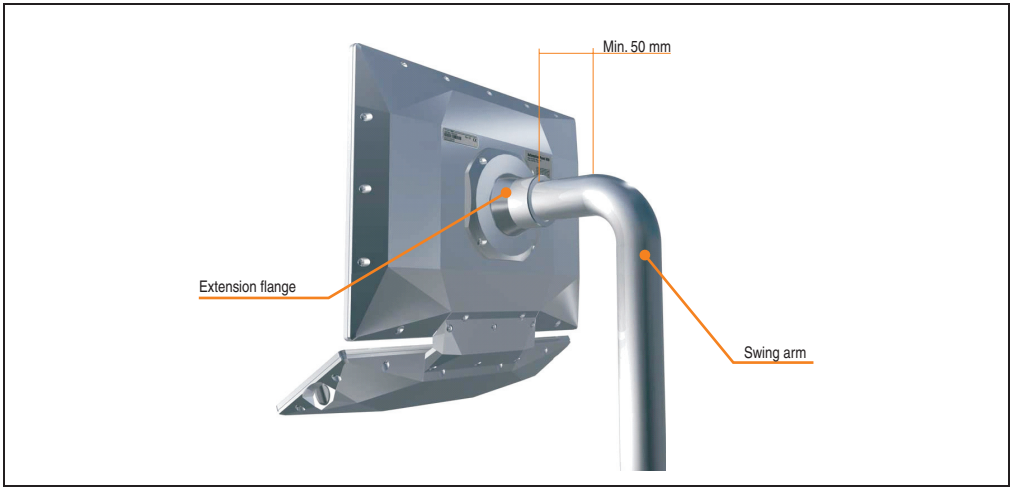


Figure 93: Swing arm system mounting

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 42).

4.1 Installation of components

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

The maximum torque is 2 Nm.

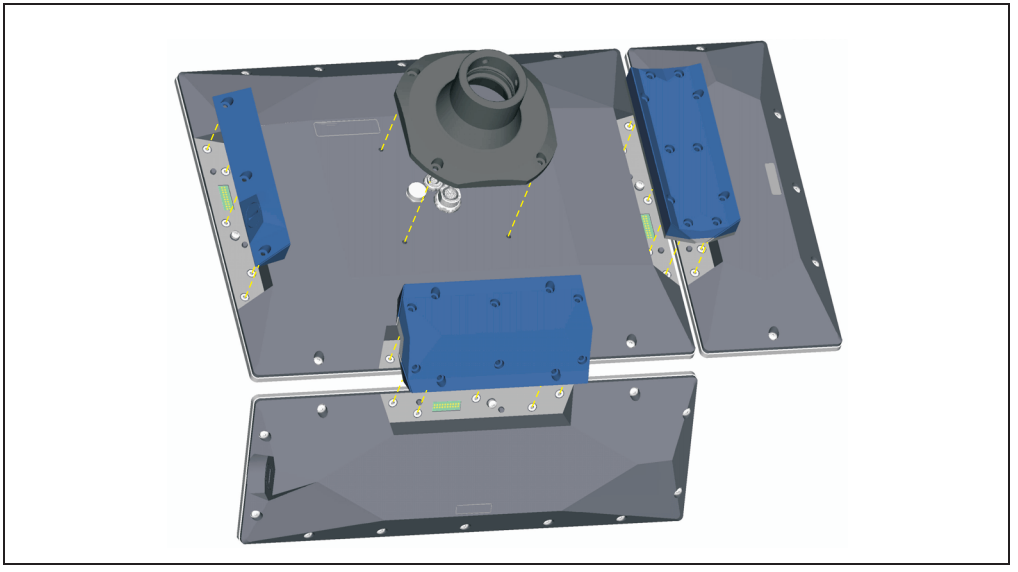


Figure 94: Configuration example 2 - installing the components

4.2 Mounting orientation

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

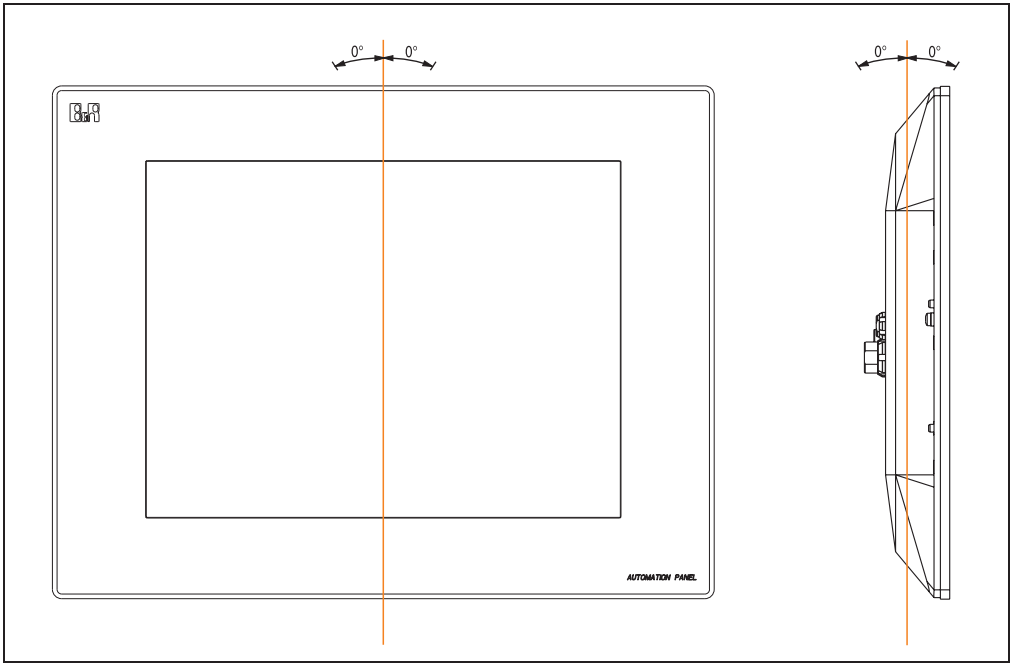


Figure 95: Mounting orientation 0°

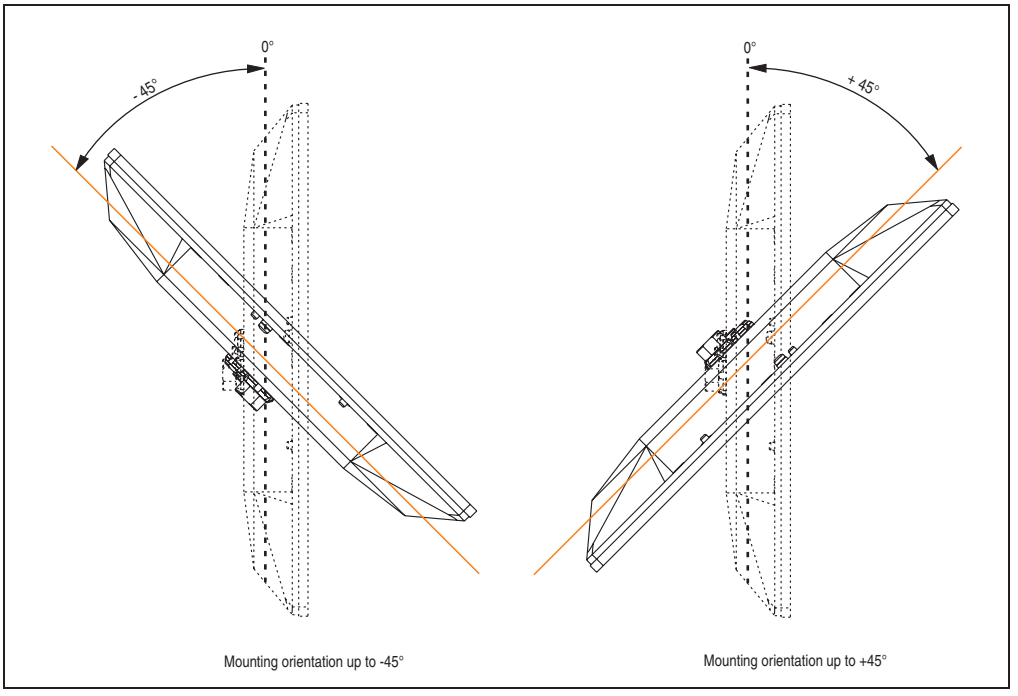


Figure 96: Mounting orientation -45° and +45°.

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.

5. 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?

5.1 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 44: Selecting the display units

5.2 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).

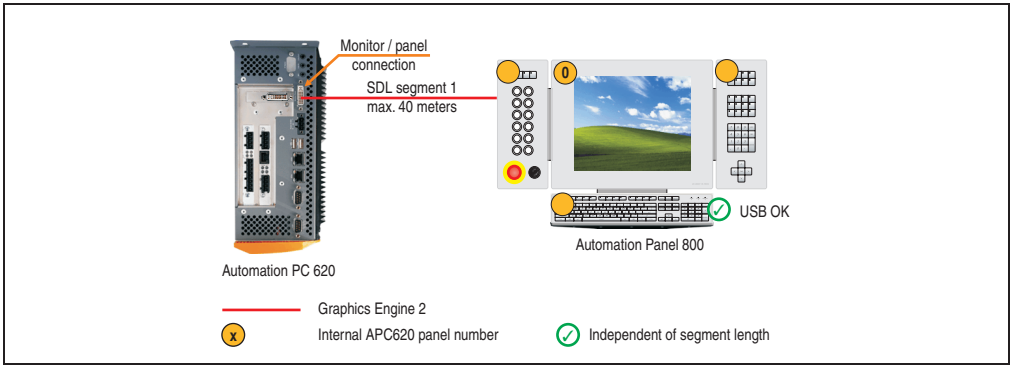


Figure 97: Configuration - An Automation Panel 800 via SDL (onboard)

5.2.1 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 Resolution
	5PC600.SX01-00	5PC600.SX02-00	5PC600.SX02-01	5PC600.SX05-00	5PC600.SX05-01	
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 45: Possible combinations of system unit and CPU board

5.2.2 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 46: 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:

Cable 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 47: Segment lengths, resolutions and SDL cables

1) See table 48 "Requirements for SDL cable with automatic cable adjustment (equalizer)"

2) See table 49 "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 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 48: 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 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 49: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

5.2.3 BIOS settings

No special BIOS settings are necessary for operation.

5.2.4 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.

5.2.5 Settings - Windows touch driver

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

5.3 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).

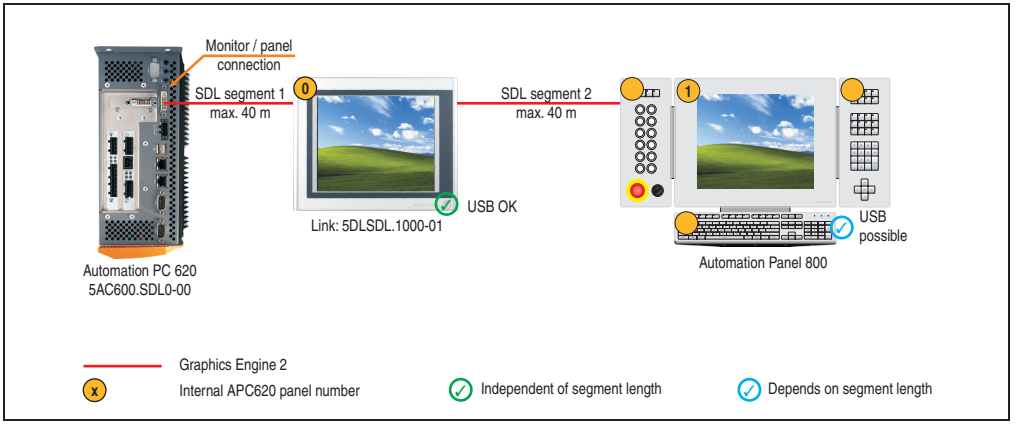


Figure 98: Configuration - An AP900 and an AP800 via SDL (onboard)

5.3.1 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 50: Possible combinations of system unit and CPU board

5.3.2 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 51: 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:

Cable 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 52: Segment lengths, resolutions and SDL cables

1) See table 53 "Requirements for SDL cable with automatic cable adjustment (equalizer)"

2) See table 54 "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 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 53: 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 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 54: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

5.3.3 BIOS settings

No special BIOS settings are necessary for operation.

5.3.4 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.

5.3.5 Settings - Windows touch driver

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

5.4 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).

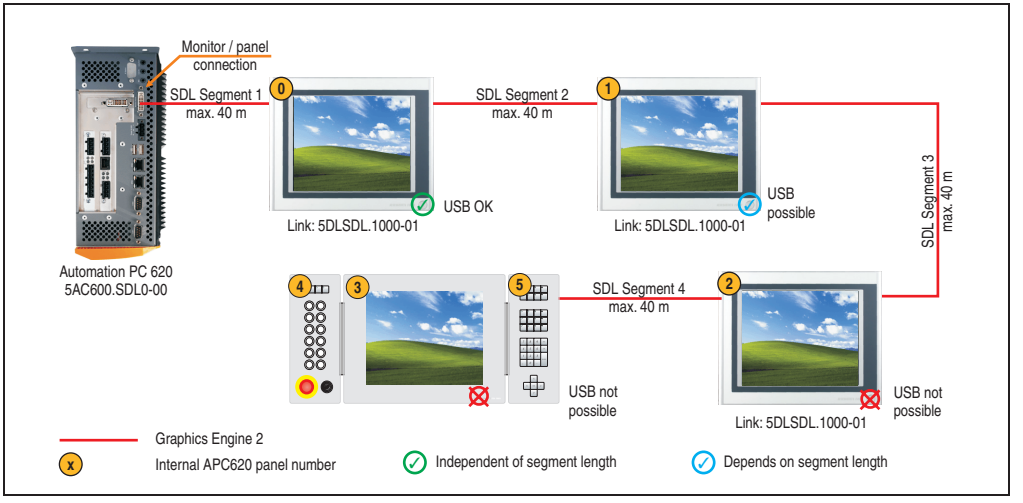


Figure 99: Configuration - Three AP900 devices and an AP800 via SDL (onboard)

5.4.1 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 Resolution
	5PC600.SX01-00	5PC600.SX02-00	5PC600.SX02-01	5PC600.SX05-00	5PC600.SX05-01	
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 55: Possible combinations of system unit and CPU board

5.4.2 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 56: 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:

Cable 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 57: Segment lengths, resolutions and SDL cables

1) See table 58 "Requirements for SDL cable with automatic cable adjustment (equalizer)"

2) See table 59 "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 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 58: 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 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 59: Requirements for SDL cable with extender and automatic cable adjustment (equalizer)

5.4.3 BIOS settings

No special BIOS settings are necessary for operation.

5.4.4 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.

5.4.5 Settings - Windows touch driver

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

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

Four Automation Panels (max. UXGA) are connected to the integrated SDL interface (onboard) via SDL. Four additional Automation Panels (max. UXGA) are connected to the optional SDL transmitter. The Automation Panels in each line must be the same type. The display content of the two lines is different (Extended Desktop), but the 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).

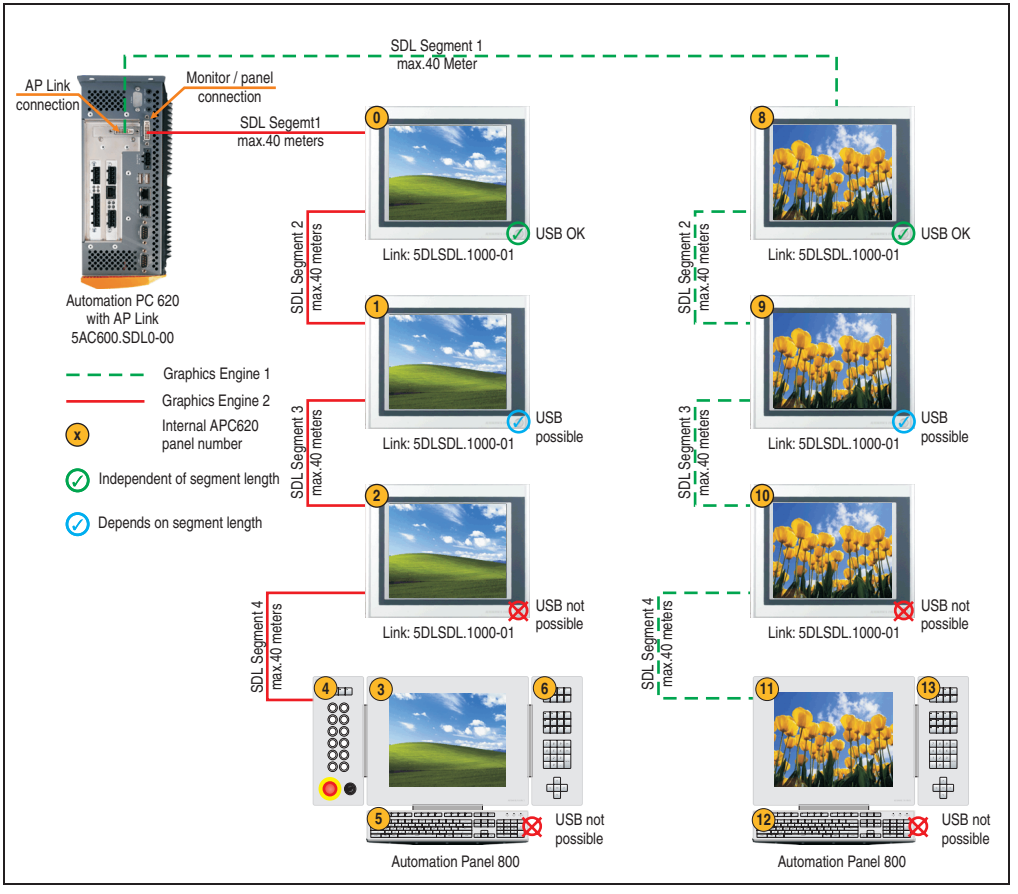


Figure 100: Configuration - Six AP900 and two AP800 devices via SDL (onboard) and SDL (AP Link)

5.5.1 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 Resolution
	5PC600.SX01-00	5PC600.SX02-00	5PC600.SX02-01	5PC600.SX05-00	5PC600.SX05-01	
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 60: Possible combinations of system unit and CPU board

5.5.2 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 61: 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:

Cable 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 62: Segment lengths, resolutions and SDL cables

1) See table 63 "Requirements for SDL cable with automatic cable adjustment (equalizer)"

2) See table 64 "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 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 63: 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 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	-

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

Firmware	Name	Version	Note
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 64: Requirements for SDL cable with extender and automatic cable adjustment (equalizer) (cont.)

5.5.3 BIOS settings

No special BIOS settings are necessary for operation.

5.5.4 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.

5.5.5 Settings - Windows touch driver

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

5.6 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.

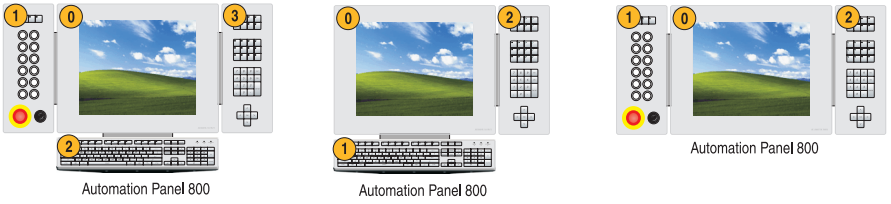


Figure 101: Examples - internal numbering of the extension units

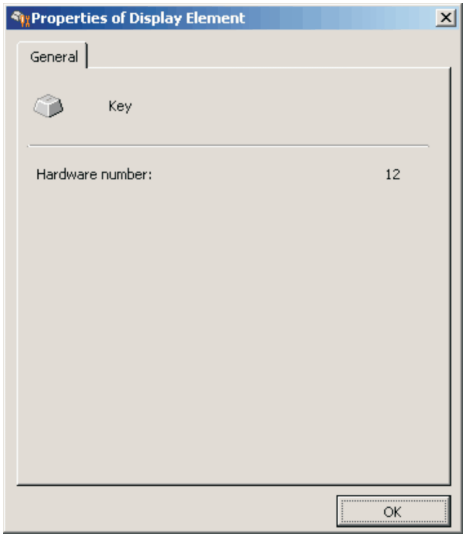
6. Key and LED configurations

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

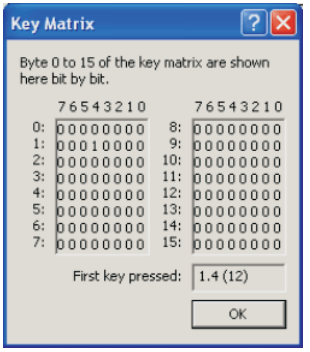
- B&R Key Editor for Windows operating systems
- Visual Components for Automation Runtime

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 102: 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.

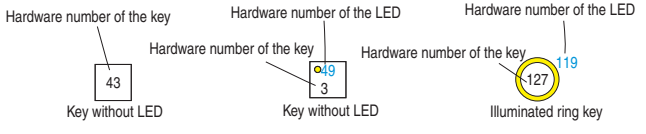


Figure 103: Display - keys and LEDs in the matrix

6.1 Display unit

6.1.1 5AP880.1505-00

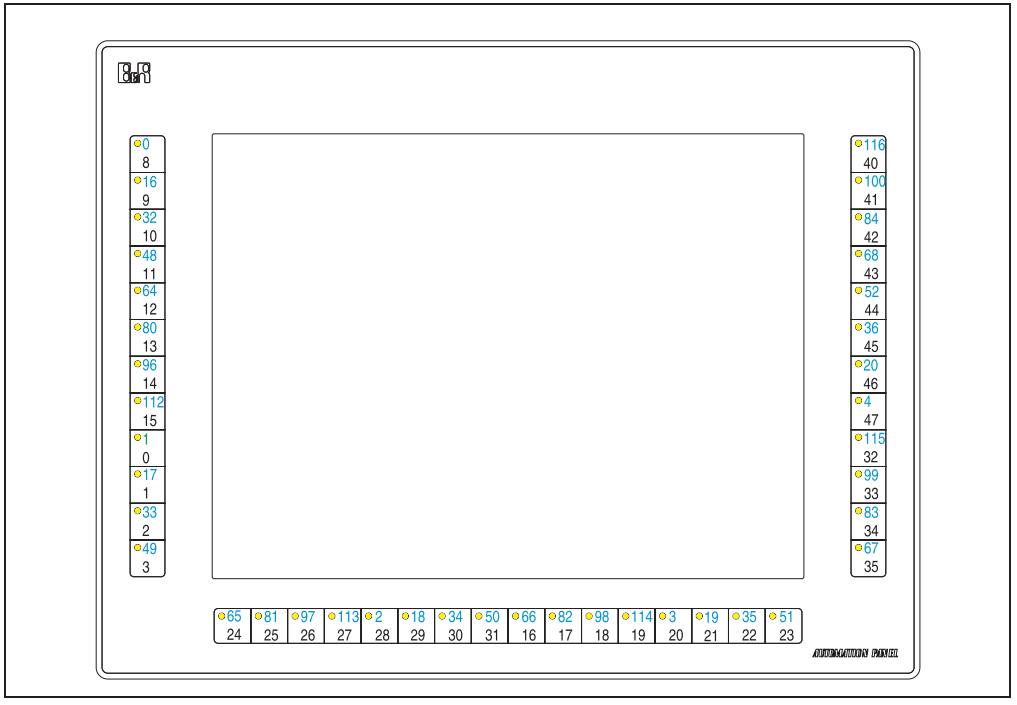


Figure 104: Hardware number - 5AP880.1505-00

6.2 Extension units

6.2.1 Extension keyboard 5AC800.EXT1-00

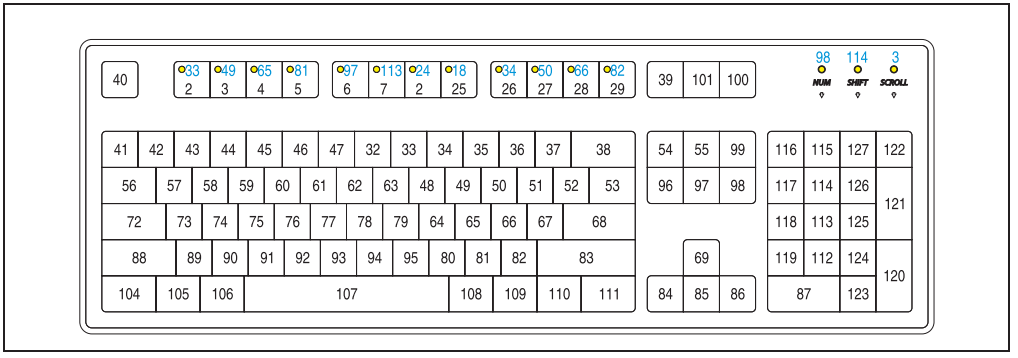


Figure 105: Hardware numbers - 5AC800.EXT1-00

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

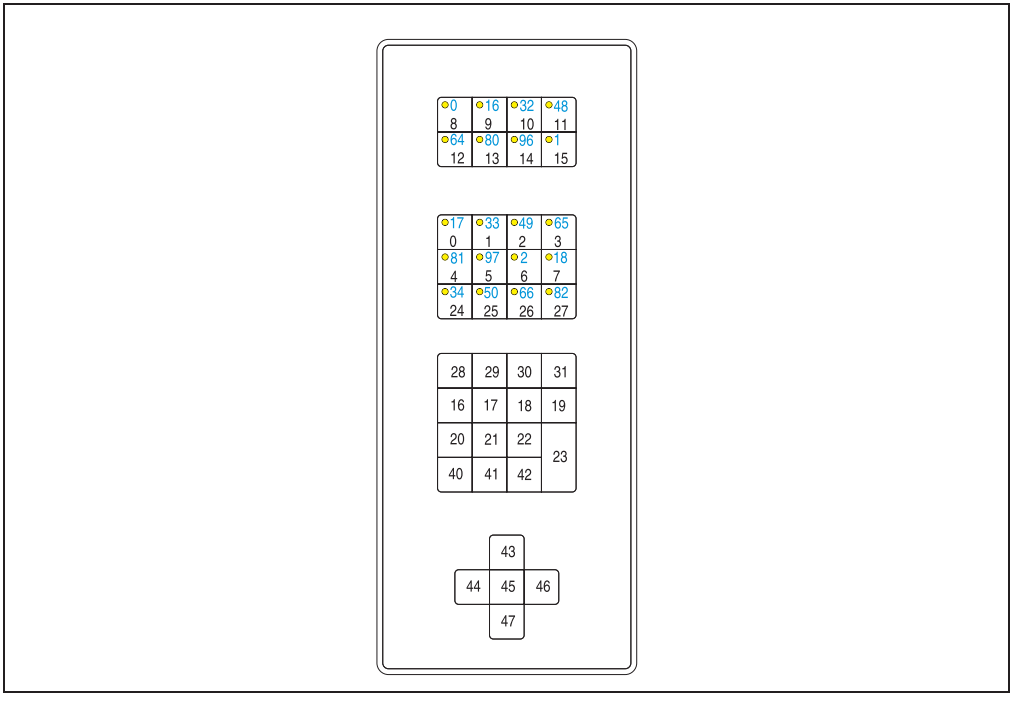


Figure 106: Hardware numbers - 5AC800.EXT2-00 / 5AC800.EXT2-01

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

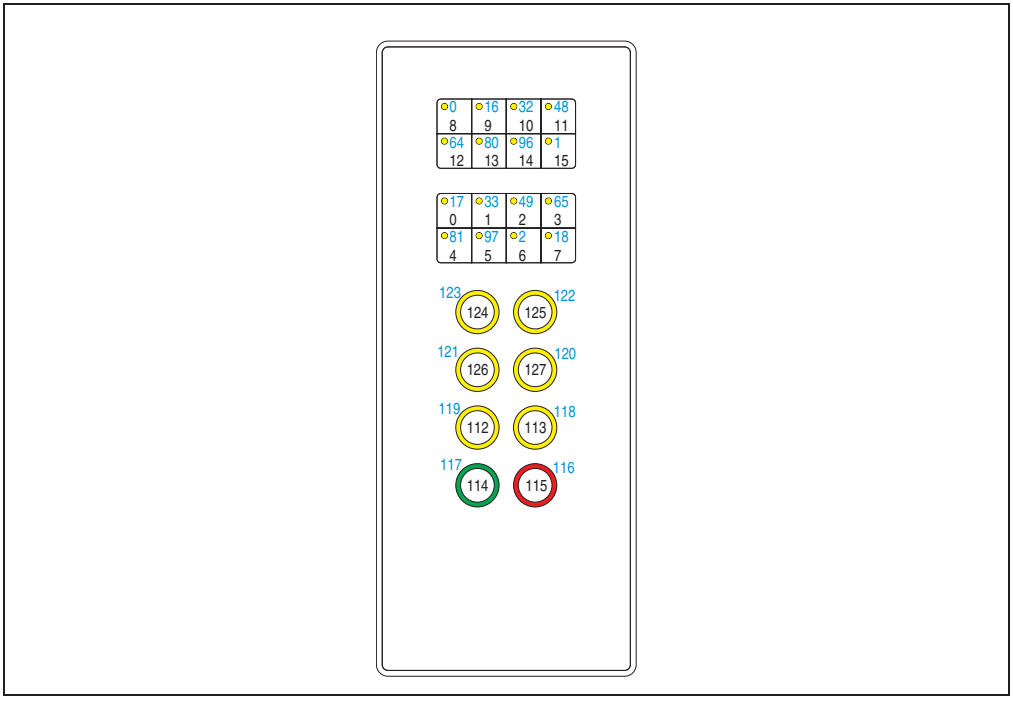


Figure 107: Hardware numbers - 5AC800.EXT3-00 / 5AC800.EXT3-01

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

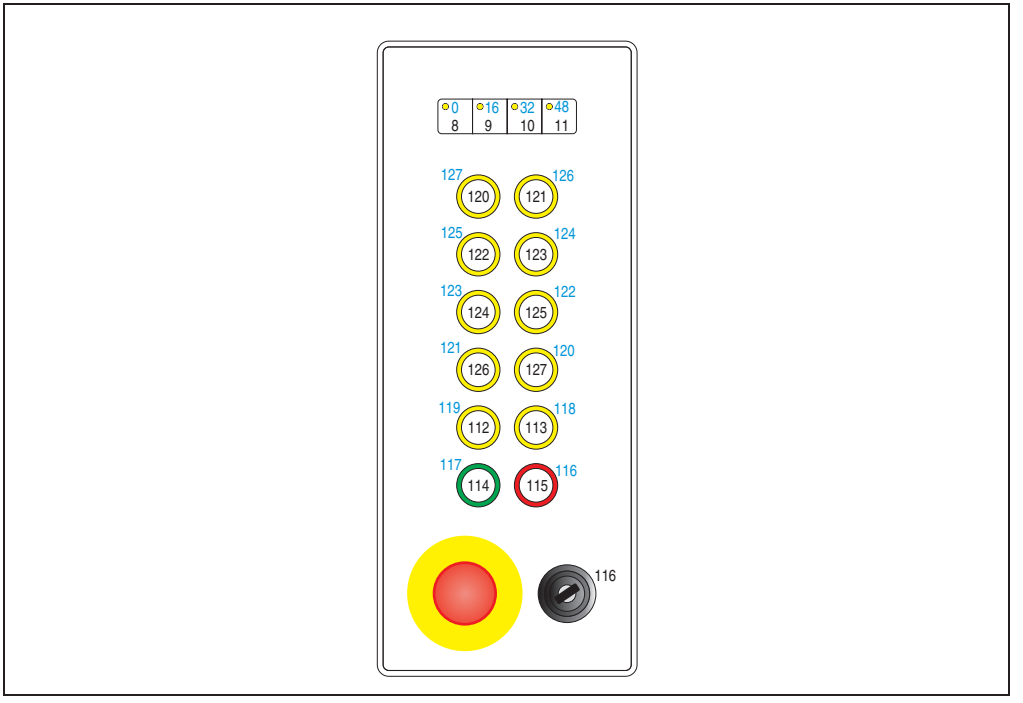


Figure 108: Hardware numbers - 5AC800.EXT3-02 / 5AC800.EXT3-03

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

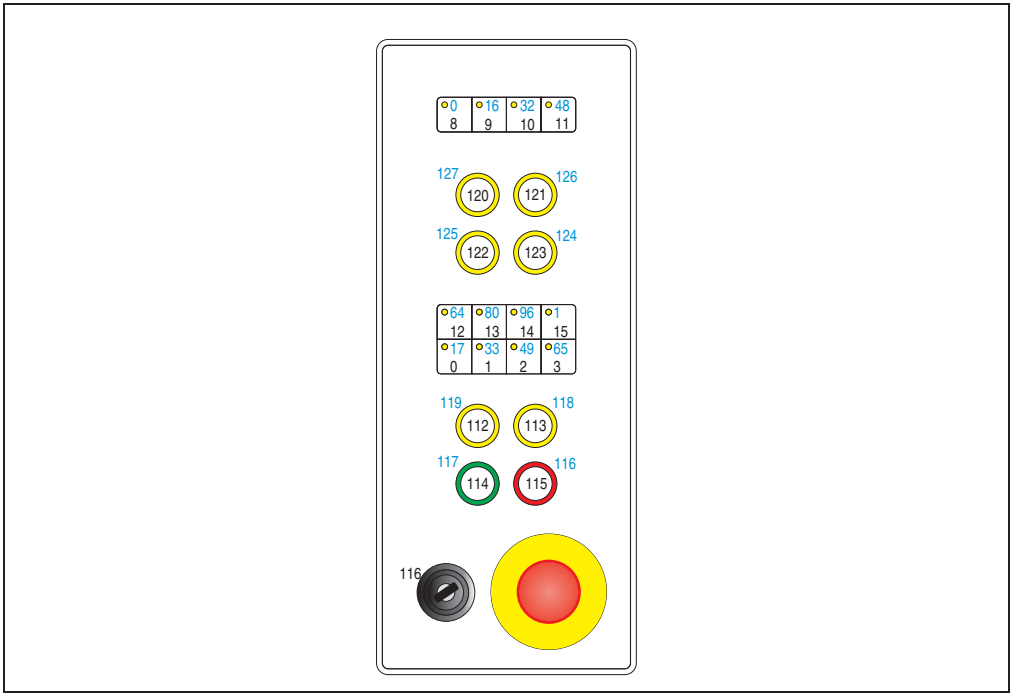


Figure 109: Hardware numbers - 5AC800.EXT3-04 / 5AC800.EXT3-05

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. Automation Panel 800 devices are supported starting with B&R Key Editor Version 2.50.

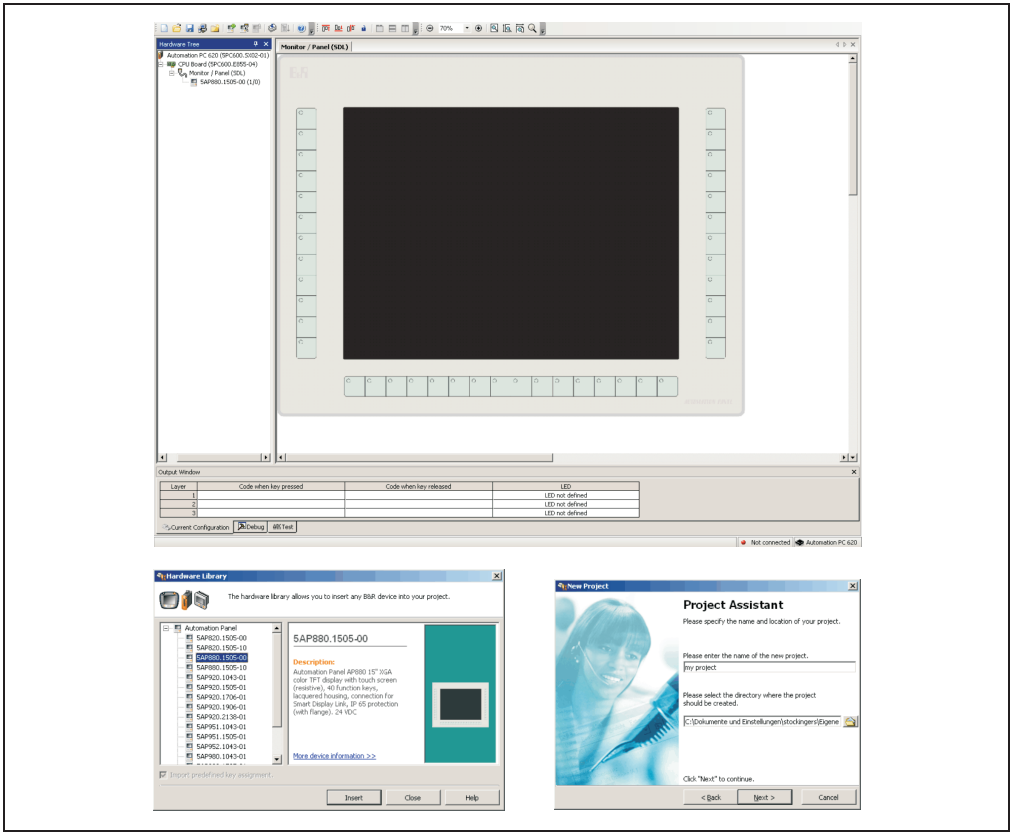


Figure 110: B&R Key Editor screenshots (Version 2.50)

Features:

- Configuration of normal keys like on a keyboard (A, B, C, etc.)
- Key combinations/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 Panel 800
- Automation Panel 900
- Automation PC 620
- 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 Driver and Utilities DVD (model number 5SWHMI.0000-00).

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

Figure 111: 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 65: 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 Protection 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 66: 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 66: Overview of standards (cont.)

3. Emission requirements

Emission	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 67: 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 68: 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 68: 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 69: 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 70: 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 71: 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 72: 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 73: Test requirements - high-speed transient electrical disturbances (burst)

1) For EN 55024 without length limitation.

4.4 Surge voltages (Surge)

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 74: 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 75: 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 75: 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 76: 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 77: 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 78: 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 79: 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 80: 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 81: 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 82: 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 83: 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 84: International certifications

8. SDL flex cable - test description

8.1 Torsion

8.1.1 Structure of the test

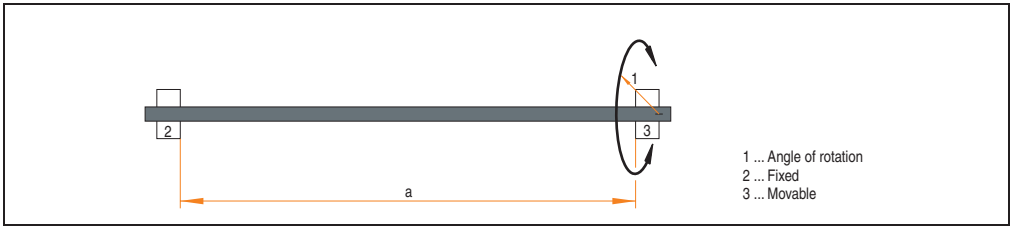


Figure 112: Test structure - torsion

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 for function (with a 21.3" Automation Panel - 5AP920.2138-01)
- 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

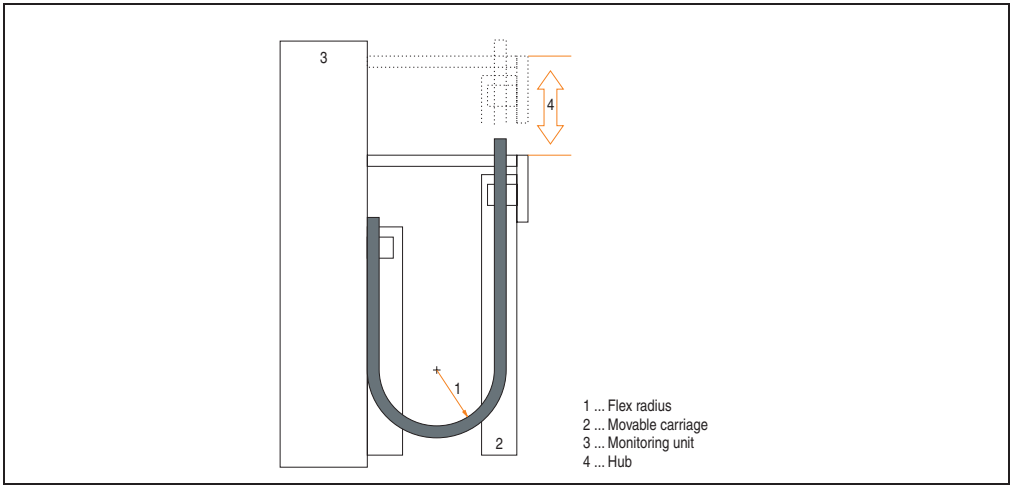


Figure 113: Test structure - cable drag chain

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 for function (with a 21.3" Automation Panel - 5AP920.2138-01)
- 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 03/2007*
5MMUSB.0256-00	**USB flash drive 256 MB SanDisk** USB 2.0 flash drive 256 MB	*Cancelled since 03/2007*
5MMUSB.0512-00	**USB flash drive 512 MB SanDisk** USB 2.0 flash drive 512 MB	
5MMUSB.1024-00	**USB flash drive 1 GB SanDisk** USB 2.0 flash drive 1 GB	*Cancelled since 03/2007*
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 85: 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. Therefore, the following measures might be necessary in order to boot from these flash drives (e.g. the SanDisk Cruzer Micro Flash Drive with 512 MB):

- **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`" is also executed on the USB flash drive.**

2.1 General information

USB flash drives are easy-to-exchange memory 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

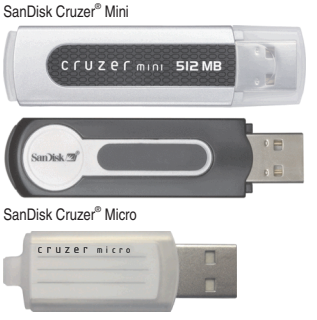
Model number	Description	Image
5MMUSB.0128-00	USB flash drive 128 MB SanDisk Cruzer Mini	
5MMUSB.0256-00	USB flash drive 256 MB SanDisk Cruzer Mini	
5MMUSB.0512-00	USB flash drive 512 MB SanDisk Cruzer Mini up to Rev. E0 or Cruzer Micro starting with Rev. E0	
5MMUSB.1024-00	USB flash drive 1 GB SanDisk 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 86: 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 from 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	100000 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°C .. +45°C -20°C .. +60°C -20°C .. +60°C				
Humidity Cruzer Mini / Cruzer Micro Operation Storage Transport	10% .. 90%, non-condensing 5% .. 90%, non-condensing 5% .. 90%, non-condensing				
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				

Table 87: Technical data - USB flash drive 5MMUSB.xxxx-00

Features	5MMUSB.0128-00	5MMUSB.0256-00	5MMUSB.0512-00	5MMUSB.1024-00	5MMUSB.2048-00
Shock Cruzer Mini / Cruzer Micro					
Operation	Max. 40 g (392 m/s^2 0-peak) and 11 ms length				
Storage	Max. 80 g (784 m/s^2 0-peak) and 11 ms length				
Transport	Max. 80 g (784 m/s^2 0-peak) and 11 ms length				
Altitude Cruzer Mini / Cruzer Micro					
Operation	3048 meters				
Storage	12192 meters				
Transport	12192 meters				

Table 87: 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

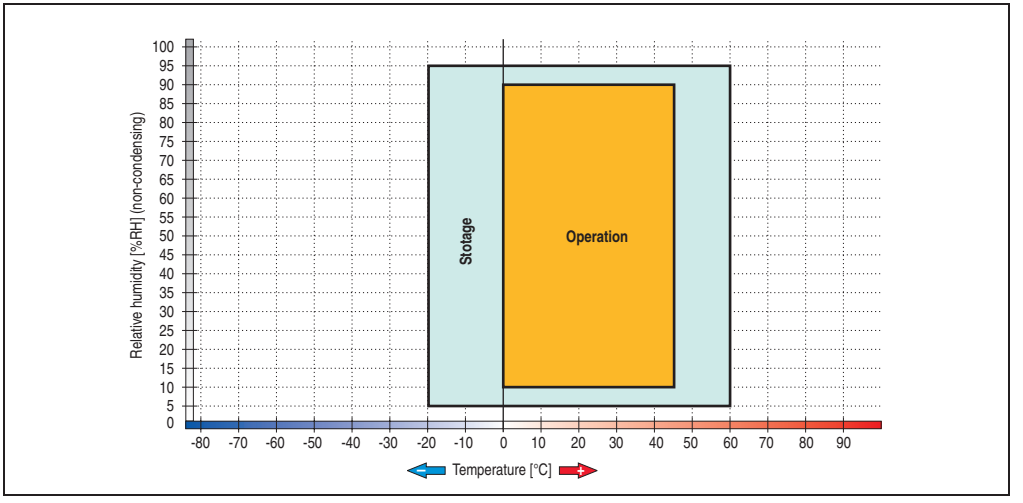


Figure 114: Temperature humidity diagram - USB flash drive - 5MMUSB.xxxx-00

2.4 Contents of delivery

SanDisk Cruzer Mini
1 USB flash drive in desired size + 1 strap 
SanDisk Cruzer Micro
1 USB flash drive in desired size + 2 replacement covers (blue and pink) + 1 strap[1)] 

Table 88: Contents of delivery - USB flash drives 5MMUSB.xxxx-00

1) Due to a change in the contents of delivery from the manufacturer, it is possible that the USB flash drive (with white cap) is delivered without the replacement caps or strap.

2.5 Creating a bootable USB flash drive

When used in connection with an Automation PC 620 / Panel PC 700, it is possible to boot the system from one of the flash drives available from B&R (5MMUSB.0512-00 and 5MMUSB.2048-00). The flash drive must be specially prepared for this.

2.5.1 Requirements

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

- B&R USB flash drive (see model number "USB Flash Drives", on page 30)
- Automation PC 620 or Panel PC 700
- USB floppy drive (external or slide-in USB floppy 5AC600.FDDS-00)
- PS/2 or 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!

2.5.2 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).

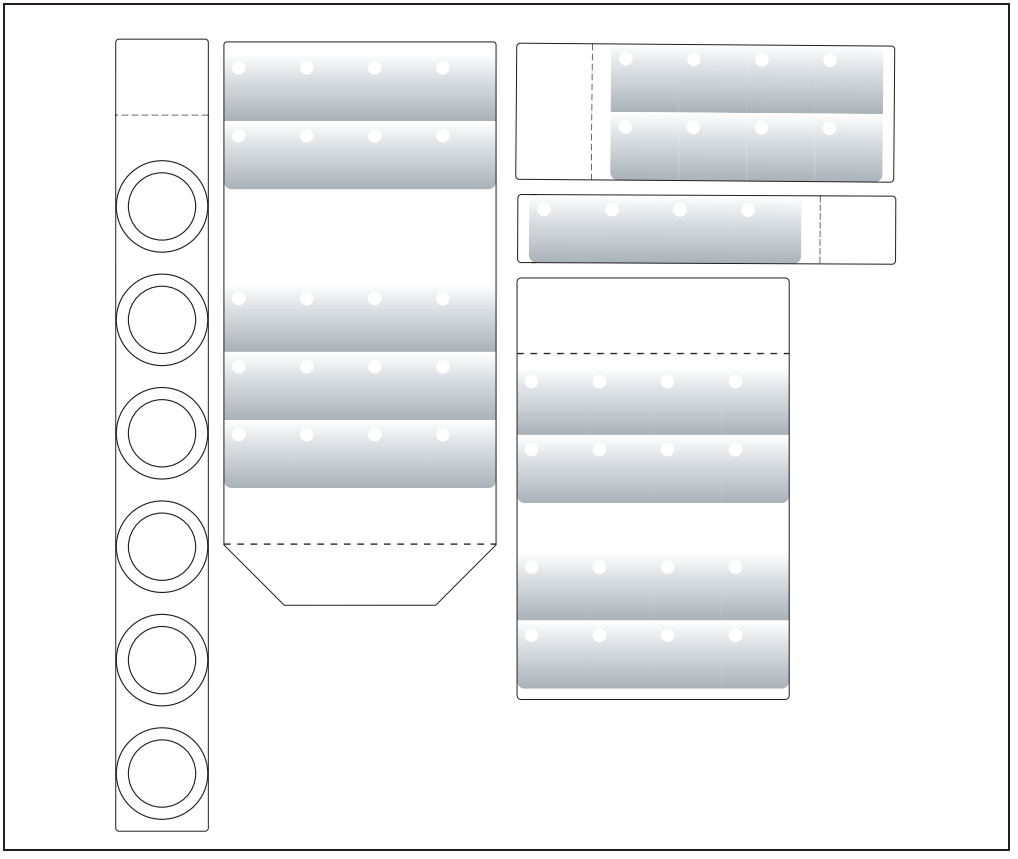


Figure 115: Legend strip templates

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. 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.

2.1 Procedure

2.1.1 Display

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

Figure 116: Remove screws

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

Figure 117: Open housing

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

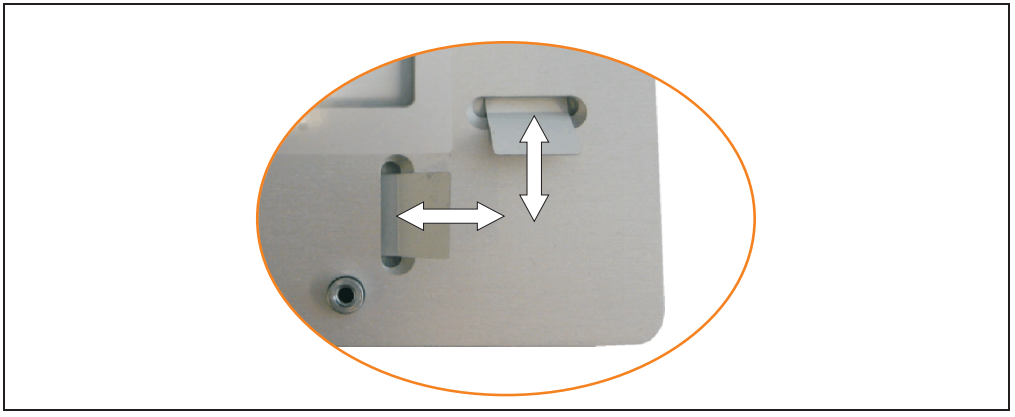


Figure 118: Exchange legend strips

4) Reassemble display in the reverse order.

2.1.2 Extension units

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

Figure 119: Remove screws

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

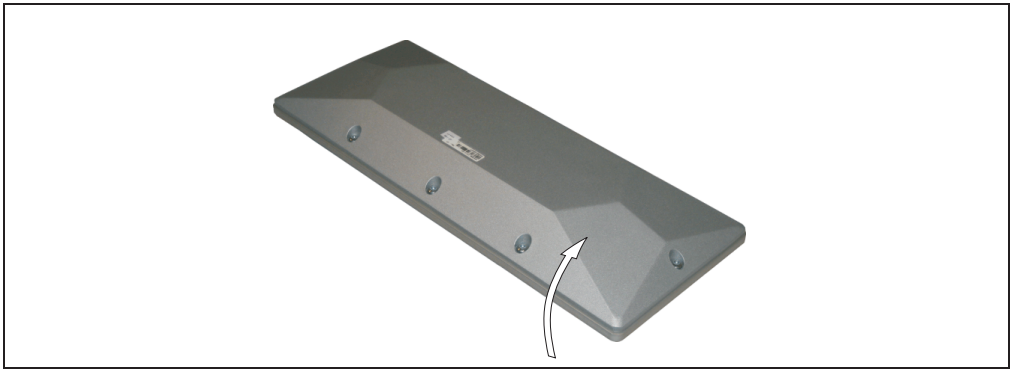


Figure 120: Open housing

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

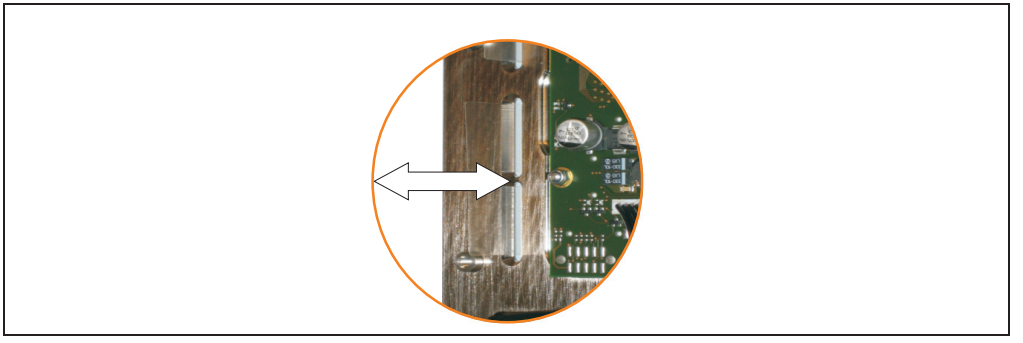


Figure 121: Exchange legend strips

4) Reassemble extension unit in the reverse order.

Appendix A

1. E-stop button

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

Figure 122: E-stop unit

Information:

The following characteristics, features and limit values only apply to these individual components and can deviate from those for the entire device. For the entire device in which these individual components are 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

E-stop button

Property	E-stop Switching element	E-stop button
Standards Normally closed 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°C to +70°C -40°C to +80°C -40°C 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 123: Key switch unit

Information:

The following characteristics, features and limit values only apply to these individual components and can deviate from those for the entire device. For the entire device in which these individual components are 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	
Rotation angle	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°C to +70°C -40°C to +80°C -40°C to +80°C	

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

2.1 Rotation angle

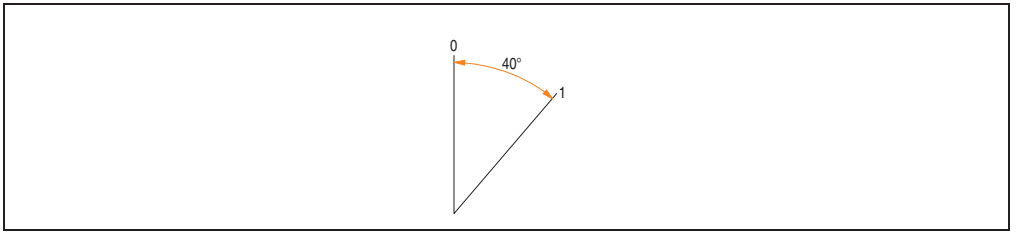


Figure 124: Angle of rotation - key switch

3. Touch screen

3.1 Elo

Information:

The following characteristics, features and limit values only apply to these individual components and can deviate from those for the entire device. For the entire device in which these individual components are 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 < than 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
Reaction time	< 10 ms
Release pressure	< 113 grams
Resolution	4096 x 4096 touch points
Light permeability	Up to 80% ± 5%
Temperature Operation Storage Transport	 - 10°C to + 50°C - 40°C to + 71°C - 40°C 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

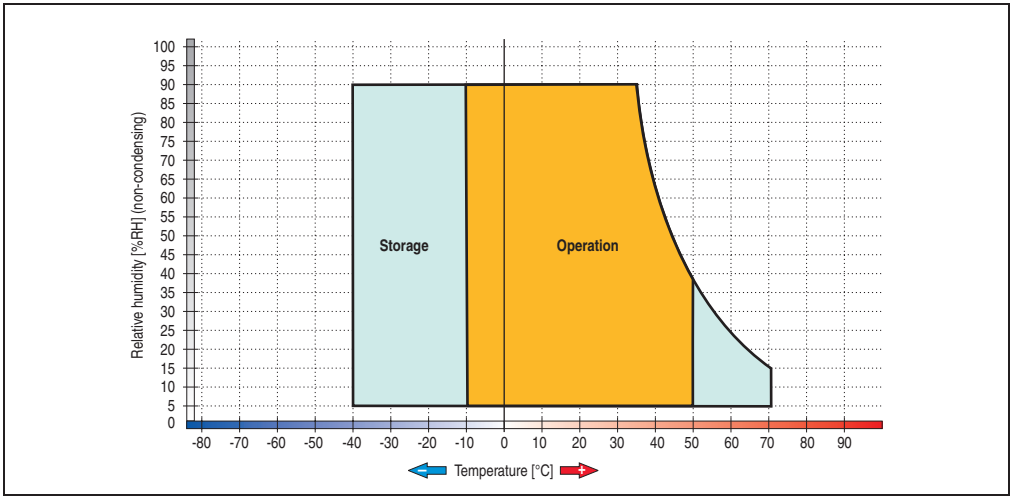


Figure 125: Temperature humidity diagram - Elo Accu touch screen 5-wire

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. Mylar

Information:

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

The mylar 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:

Alcohol Cyclohexanol Diacetone alcohol Glycol Isopropanol Glycerin 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 powders 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 mylar

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

5. Perspectives

The perspectives can be seen in the technical data for the display units.

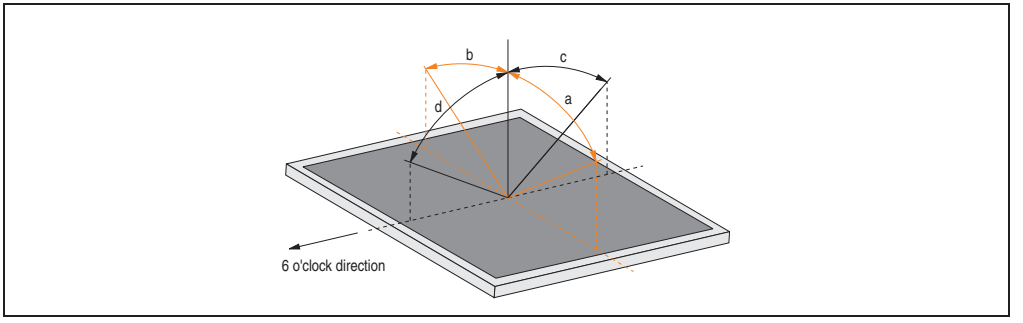


Figure 126: Perspectives

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, binary digit smallest discrete information unit. 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.

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.

Bus unit

Provit bus units consist of the housing, interface board slots and the power supply for the system units.

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 high 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 the 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 accommodated 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, in which one or more electron guns are installed. Each electron gun creates a horizontal electron beam, which 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 through by-passing the CPU.

DRAM

An abbreviation for »**D**ynamic **R**andom **A**ccess **M**emory« Dynamic RAM consists of an integrated semiconductor circuit, which 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, because 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 optic data carrier technology. Using this technology it is possible to code video, audio and computer data on CD. DVDs can store a higher volume of data than conventional CDs. Standard DVDs , which have a single coating, can hold 4.7 GB. Double coated DVDs can hold 8.5 GB. Double sided DVDs can hold up to 17 GB. A special drive is needed for DVDs. Conventional CDs can also be played on DVD drives.

E

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** > (complete 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, optical fiber cables

or twisted pair cabling. Data transfer on an Ethernet network takes place in frames of variable lengths, which 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

is an enhancement of standard Ethernet. It enables data exchange under strict real-time conditions with cycle times down to 200 µs and jitter under 1µs. This makes Ethernet power available on all communication levels of Automation technology – from control levels to I/O. Ethernet Powerlink was initialized 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, which 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, (i.e. 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, which 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, allowing 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 quasi standard for the transfer of data via Ethernet networks. FTP is one of the most-used protocols on the Internet. It is defined in RFC 959 in the official regulations for Internet communication.

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.

I

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.

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 [coding, signal level, pin assignments], which characterize the connection point between the modules, devices or systems. Depending on the type of data transfer, a differentiation is made between parallel [e.g. Centronics, IEEE 488] and serial interfaces [e.g. V.24, TTY, RS232, RS422, RS485], which are set up for different transfer speeds and transfer distances. From the point of view of software, the term interface describes the transfer point between program modules using specified rules for transferring the program data.

K

Keypad modules

Keypad modules are divided into two groups: **Standard Keypad Modules** (can be cascaded to a controller) and **Special Keypad Modules** (must be connected by an electrician according to the function e.g. Emergency Stop).

L

LCD

An abbreviation for »**L**iquid **C**rystal **D**isplay« A display type, based on liquid crystals which 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, which 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.

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 equipment, an add-on card or external device, which allows information to be exchanged between computers over the telephone network using digital/analog or analog/digital signal conversion.

Motherboard

A circuit board, which 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, which allows several computer tasks to be executed parallel and simultaneously.

N

.NET

DOTNET - Microsoft's new development platform provides a common runtime library and a 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 especially created for .NET), .NET My Services, a group of services taking over functions such as authentication, .NET Enterprise Server, which apart from the names, is independent of the other technologies and includes the products Exchange Server 2000, Application Center 2000, SQL Server 2000. .NET devices, supported by a slimmed down version of the .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 simply 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. Many used for time-critical factory automation applications.

R

RAM

An abbreviation for »**R**andom **A**ccess **M**emory« A 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, however they cannot be written to. The term RAM refers to a more temporary memory that can be written to as well as read.

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'.

ROM

An abbreviation for »**R**ead-**O**nly **M**emory« A semiconductor in which programs or data have already been 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

SDRAM

An abbreviation for »**S**ynchronous **D**ynamic **R**andom **A**ccess **M**emory« A construction of dynamic semiconductor components (DRAM), which 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), which only keeps stored information while the operating voltage is active. In computers, static RAM is generally only used for the cache memory.

T

Task

Program unit, which 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, 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« Generally, a module consisting of a single integrated circuit, which combines the circuits required for asynchronous serial communication for both sending and receiving. UART represents the most common type of circuit in modems for connection to a personal 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 which 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 which was introduced by IBM in 1990. This standard supports a 640 * 480 resolution with 65,536 colors or a 1024 * 768 resolution with 256 colors. This standard is generally used in workstation systems.

5

Symbols

A

B

C

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