

DC20XX, ET20XX, ECC2100 Slim Dialog Controller, Ethernet Terminal



Copyright © Berghof Automation GmbH

Reproduction and duplication of this document and utilisation and communication of its content is prohibited unless with our express permission. All rights reserved.

Infringements will result in compensation for damages.

Legal disclaimer

The content of this document has been verified for conformity with the hardware and software described therein. It is, however, impossible to rule out all variations. As a result, we cannot be held responsible if the content is not fully compliant. The information given in this document is updated regularly and any corrections will be reflected in future versions. We are always willing to receive suggestions for improvements. Subject to technical modifications.

Trademarks

- CANtrol® and CANtrol®-dialog are trademarks belonging to Berghof Automation GmbH.
- Microsoft®, Windows® and the Windows® logo are registered trademarks belonging to the Microsoft Corp. in the USA and in other countries.
- EtherCAT® is a registered trademark and patented technology licensed from Beckhoff Automation GmbH, Germany.
- CiA® and CANopen® are registered trademarks belonging to CAN in Automation e. V.
- ARM ® and Cortex ® are registered trademarks belonging to ARM Limited.
- PROFINET® is a registered trademark belonging to PROFIBUS Nutzerorganisation e. V.
- Modbus® is a registered trademark belonging to the Modbus-IDA Organisation.
- i.MX6 is a registered trademark belonging to Freescale.

The rights of all companies and company names as well as products and product names mentioned in this website belong to the respective companies.

Notes on this handbook

This device handbook contains information which is specific to the product and which is valid at the time of printing.

This equipment manual is only complete in conjunction with the product-related hardware and software user manuals required for the individual application.

You can reach us at:

Berghof Automation GmbH

Harretstr. 1

72800 Eningen

Germany

T +49 7121 894 0

F +49 7121 894 100

E-mail: controls@berghof.com

www.berghof.com

Berghof Automation GmbH is certified to DIN EN ISO 9001:2000.

Change log

| Version | Date | Description |
|---------|------------|---|
| 1.0 | 22.01.2015 | Initial version |
| 1.1 | 28.01.2015 | Corrections, final UL certificate |
| 1.2 | 16.04.2015 | Corrections: protection rating, UL-symbol; Additions: mounting, notice USB-devices, technical data (shock, vibration) |
| | | |
| | | |
| | | |
| | | |
| | | |

Table of contents

| | | |
|-----------|--|-----------|
| 1. | GENERAL INFORMATION | 7 |
| 1.1. | Notes on the handbook | 7 |
| 1.2. | Symbols and visual depictions | 7 |
| 1.3. | Hazard categories and indications..... | 8 |
| 1.4. | Qualified personnel | 8 |
| 1.5. | Duty of care | 9 |
| 1.6. | Intended use..... | 9 |
| 1.7. | Transport and storage..... | 10 |
| 1.8. | Unpacking | 10 |
| 2. | SAFETY | 11 |
| 2.1. | Safety instructions | 11 |
| 3. | PRODUCT DESCRIPTION..... | 12 |
| 3.1. | Overview..... | 13 |
| 3.1.1. | Overview DC2004 | 13 |
| 3.1.2. | Overview DC2007 | 14 |
| 3.1.3. | Overview ET2004..... | 15 |
| 3.1.4. | Overview ET2007..... | 16 |
| 3.1.5. | Overview ECC2100 Slim | 17 |
| 3.2. | Scope of delivery and accessories | 18 |
| 3.3. | Product features..... | 18 |
| 4. | INSTALLATION..... | 21 |
| 4.1. | Preparation for installation, DC20XX and ET20XX..... | 21 |
| 4.1.1. | Installation cut-out, DC2004 and ET2004 | 21 |
| 4.1.2. | Installation cut-out, DC2007 and ET2007 | 23 |
| 4.2. | Installation, DC20XX and ET20XX | 25 |
| 4.3. | Installation, ECC2100 Slim | 27 |
| 5. | CONNECTION..... | 28 |
| 5.1. | Power supply..... | 28 |
| 5.1.1. | Connecting the power supply to the DC20XX and ECC2100 Slim | 29 |
| 5.1.2. | Connecting the power supply to the ET20XX..... | 30 |
| 5.2. | Data connections | 31 |
| 5.2.1. | Block circuit diagram, DC20XX | 31 |
| 5.2.2. | Block circuit diagram, ECC2100 Slim | 32 |
| 5.2.3. | Block circuit diagram, ET20XX..... | 33 |
| 5.2.4. | Digital inputs and outputs, DC20XX and ECC2100 Slim | 34 |
| 5.2.5. | Ethernet | 38 |
| 5.2.6. | EtherCAT | 39 |
| 5.2.7. | USB..... | 40 |
| 5.2.8. | Serial interfaces | 41 |

| | |
|--|-----------|
| Signal interference and terminating resistor..... | 42 |
| Connections with GND | 42 |
| 5.2.9. CAN Bus..... | 43 |
| 5.2.10. Analogue inputs | 44 |
| Basic considerations for analogue inputs | 44 |
| Data from analogue inputs..... | 45 |
| Operating modes for the analogue inputs..... | 46 |
| Voltage input AI (U) | 48 |
| Temperature measurement AI (T) | 49 |
| 6. OPERATION | 51 |
| 6.1. Switching on and off | 51 |
| 6.2. Network start-up | 52 |
| 6.2.1. DC20XX | 52 |
| 6.2.2. ET20XX..... | 54 |
| 6.2.3. ECC2100 Slim | 57 |
| 6.3. Operation | 60 |
| 6.3.1. Status displays..... | 60 |
| Location of the operating status LEDs..... | 60 |
| Meaning of the LED displays | 61 |
| 6.3.2. Start/Stop | 61 |
| 6.3.3. Real time clock with battery back-up DC20XX and ECC2100 Slim..... | 62 |
| 6.3.4. microSD card | 62 |
| 6.4. Troubleshooting..... | 63 |
| 6.4.1. No network connection | 63 |
| 6.4.2. In error stop mode for the DC20XX/ECC2100 Slim..... | 63 |
| 6.4.3. Unknown IP-address on the ECC2100 Slim | 63 |
| 7. MAINTENANCE/UPKEEP | 64 |
| 7.1. Maintenance..... | 64 |
| 7.2. Cleaning | 65 |
| 7.3. Chemical resistance..... | 65 |
| 7.3.1. Resistance of the touch screen..... | 65 |
| 7.3.2. Resistance of the front diaphragm | 66 |
| 8. UNINSTALLATION..... | 69 |
| 8.1. Uninstallation, DC20XX and ET20XX | 69 |
| 8.2. Uninstallation, ECC2100 Slim | 71 |
| 9. DISPOSAL | 72 |
| 10. TECHNICAL DATA | 73 |
| 10.1. DC20XX Dialog Controller..... | 73 |
| 10.2. ET20XX Ethernet Terminal | 76 |
| 10.3. ECC2100 Slim Ethernet controller | 78 |
| 10.4. Identification plate | 80 |
| 10.5. Identification | 81 |

11. STANDARDS AND CERTIFICATES 83

11.1. Standards 83

11.2. UL certificate 84

11.3. Declaration of conformity..... 87

11.4. Notes on copyright and software licences 88

12. CUSTOMER SERVICES / ADDRESSES 89

12.1. Customer services 89

12.2. Addresses 89

13. APPENDIX 90

13.1. Table of figures..... 90

1. General information

This user handbook is intended for use by qualified personnel and contains information on the assembly, installation, start-up and maintenance of the device.

1.1. Notes on the handbook

This user handbook is a component of the product and applies to the following devices:

- DC2000 Dialog Controller
- ET2000 Ethernet Terminal
- ECC2100 Slim Box Controller


It contains information on the following topics:

- Applications
- Safety
- Mechanical design
- Electrical design
- Connections
- Start-up
- Upkeep and maintenance
- Decommissioning
- Disposal


- Always keep this user handbook available alongside the product.

1.2. Symbols and visual depictions

The following symbols and visual depictions will be used in this handbook:

| Symbol | Meaning |
|---|---|
| → ... | List entry |
| ► ... | Individual instruction or list of instructions which can be carried out in any order. |
| 1. ... | List of instructions which must be carried out in the order given. |
| 2. ... | |
|  | Additional product information |





Design of warnings:

| | |
|--|---|
| <div data-bbox="308 383 536 427">  WARNING </div> <div data-bbox="319 434 432 537"> <p>Optional: additional symbols</p> </div> | <div data-bbox="592 387 874 421">Danger type and source</div> <div data-bbox="592 425 1083 459">Short description and possible consequences</div> <div data-bbox="592 465 882 497"> <ul style="list-style-type: none"> ► Preventive measures </div> |
|--|---|

1.3. Hazard categories and indications

The following indications are used in the case of warning messages so as to ensure your personal safety and avoid any damage to property.

The indications have the following meanings:

| | |
|---|--|
| <div data-bbox="308 866 536 911">  DANGER </div> | <div data-bbox="592 873 861 904">Serious injury or death</div> <div data-bbox="592 911 1415 945">Non-compliance with the safety features will result in death or serious injury.</div> <div data-bbox="592 952 941 983"> <ul style="list-style-type: none"> ► Take preventive measures. </div> |
| <div data-bbox="308 1048 536 1093">  WARNING </div> | <div data-bbox="592 1055 963 1084">Possible serious injury or death</div> <div data-bbox="592 1090 1430 1122">Non-compliance with the safety features may result in death or serious injury.</div> <div data-bbox="592 1128 941 1160"> <ul style="list-style-type: none"> ► Take preventive measures. </div> |
| <div data-bbox="308 1229 536 1274">  CAUTION </div> | <div data-bbox="592 1236 863 1263">Possible minor injuries</div> <div data-bbox="592 1270 1329 1301">Non-compliance with the safety features may result in minor injuries.</div> <div data-bbox="592 1308 941 1339"> <ul style="list-style-type: none"> ► Take preventive measures. </div> |
| <div data-bbox="308 1408 536 1453">  NOTICE </div> | <div data-bbox="592 1415 930 1442">Possible damage to property</div> <div data-bbox="592 1449 1398 1480">Non-compliance with the safety features may result in damage to property.</div> <div data-bbox="592 1487 941 1518"> <ul style="list-style-type: none"> ► Take preventive measures. </div> |



Further information

1.4. Qualified personnel

The installation, start-up and maintenance of the device must be carried out by qualified personnel. For the purposes of this documentation and the safety instructions contained therein, “qualified personnel” means trained staff with the authorisation to assemble, install, start up, earth and identify devices, systems and electrical circuits in accordance with standards set in safety engineering and who are familiar with safety concepts in automation engineering.

1.5. Duty of care

The user or processor (OEM) must ensure the following:

- The device must only be used according to regulations.
- The device must only be used in good working condition.
- The user handbook must always be kept legible and fully available.
- Only sufficiently qualified and authorised personnel may carry out the assembly, installation, start-up and maintenance of the device.
- This authorised personnel must receive regular training on all relevant occupational health and safety and environmental protection issues and must be fully familiar with the content of this user handbook, particularly the sections regarding safety features.
- Any markings or identification labels and safety and warning signs on the device must not be removed and must be kept legible at all times.
- The national and international regulations regarding the operating of machinery and facilities where the device is being used must be observed at all times.
- The user must always be kept abreast of any current relevant information regarding the device and its use or operation.

1.6. Intended use

The devices belong to the CANtrol modular automation system based on the CAN bus. This is a modular automation system for industrial control applications within the medium to high performance range. This extends the communications capabilities to include EtherCAT, Profinet, Modbus and others.

The automation system is designed for use within overvoltage category I (IEC 364-4-443) systems for the controlling and regulating of machinery and industrial processes in low-voltage installations in accordance with the following general parameters:

- maximum rated supply voltage of 1,000 V AC (50/60 Hz) or 1,500 V DC;
- for use in maximum category 2 pollution environment (EN 60950);
- for use up to a maximum altitude of 2,000 m above msn;
- for indoor use only in areas not exposed to direct UV radiation;
- max. ambient temperature inside and outside the control cabinet is within the technical specifications (see “Technical data”)

Qualified project planning and design, proper transport, storage, installation, use and careful maintenance are essential to the flawless and safe operation of the automation system.

The automation system may only be used within the scope of the data and applications specified in this documentation and associated user manuals.

The automation system must only be used:

- as intended;
 - in a technically perfect condition;
 - without any unauthorised modifications;
 - by qualified users.
- Observe the rules of the employer's liability insurance association, the technical inspectorate, and the VDE (Association of German Electrical Engineers) or corresponding country regulations.

The device is intended for installation within enclosed control cabinets of industrial machines and systems in indoor areas.

- ▶ When installing the device, check that the seal profiles are undamaged.
- ▶ For operation, refer to the applicable statement of ambient conditions (see “Technical data”).

1.7. Transport and storage

The device is susceptible to impacts, heavy vibration, moisture and extreme temperatures.

Transport and storage

- ▶ Protect the device against major mechanical stresses during transport.
- ▶ Always pack the device in its original packaging for transport.
- ▶ For storage, refer to the applicable statement of ambient conditions (see “Technical data”).
- ▶ Protect the device against condensation and damp.

Operation

- ▶ If the device has been stored or transported in cold weather or under conditions or large fluctuations in temperature, do not start to operate it until it has acclimatised to room temperature for the place it is used.
- ▶ If condensation is present, wait at least 12 hours before starting to operate the device.

1.8. Unpacking

Or receipt of the device, a check must be made that it is complete and undamaged.

1. Check the packaging for external damage.
2. If the packaging is seriously damaged or if damage to the contents is evident: Do not proceed further with opening the packaging, instead immediately inform the transport company and your supplier.
3. Remove the packaging and keep it safe for subsequent transport.
4. Check the contents for evidence of damage in transport.
5. Check the contents for completeness against the order documentation and keep all the delivery documentation for future reference. The delivery documentation contains important information about the device and is part of the product.
6. If you discover damage in transport or the contents do not match the order: Inform the supplier immediately.

2. Safety

Safety-related systems

The use of PLC in safety-related systems requires specific measures. Wherever a PLC is to be used in a safety-related system, the user must be given comprehensive advice by the PLC manufacturer in addition to information on any available standards or regulations regarding safety installations.

- ▶ Before starting any work on devices, switch off all power feeds, including peripherals.
- ▶ Keep all ventilation holes unobstructed.

Failure in certain components in an electronic control system may result in uncontrolled and/or unpredictable operational behaviour.

- ▶ All types of failure must be considered at the system level and the associated preventative measures identified.
- ▶ If necessary, request information from your automation system provider.

2.1. Safety instructions

The device may be operated only when it is in good working condition. Exposed sharp edges pose an injury risk.

- ▶ If you discover damage to the front glass of the device, do not continue to operate the device. Immediately disconnect it from the power supply.

Working on the device

Do not start work on the device until all necessary safety precautions have been taken. Take precautions to avoid unforeseeable functional events and movements of the system.

1. Bring the system into a safe condition.
2. Switch the system and the device off.
3. Secure the system against being switched on again.
4. Disconnect the device from the system.

The casing of the device must not be opened.

- ▶ If work on the internal parts of the device is necessary, contact the manufacturer (see “Addresses”).

3. Product description

The DC20XX Dialog Controller is a control module with a display for the control and regulation of automation and industrial processes in low-voltage installations in real time.

The ECC2100 Slim Box Controller has the same functions as the DC20XX Dialog Controller, but without the display.

The programming tool CODESYS 3.5 (IEC 61131-3) from 3S-Smart Software Solutions is used for programming the device.

The Ethernet terminals are specially configured for CODESYS visualisation and operation in machines and systems. The terminals show the CODESYS Web visualisation or the CODESYS Target visualisation, irrespective of whether the visualisation originates from a Berghof PLC control unit or some other compatible CODESYS control unit.

DC20XX and ECC2100 Slim controllers can be connected using various different interfaces and have in addition their own digital and analogue inputs / outputs.

On the devices with displays (DC20XX and ET20XX) the connection area for all external connections is located at the rear. These devices are intended for installation on a flat surface in a pre-prepared installation cut-out.

The connections to the ECC2100 Slim Box Controller are located on the front. This device is intended for installation on a mounting rail in the control cabinet.

All connections are of the plug-in type.

3.1. Overview

3.1.1. Overview DC2004

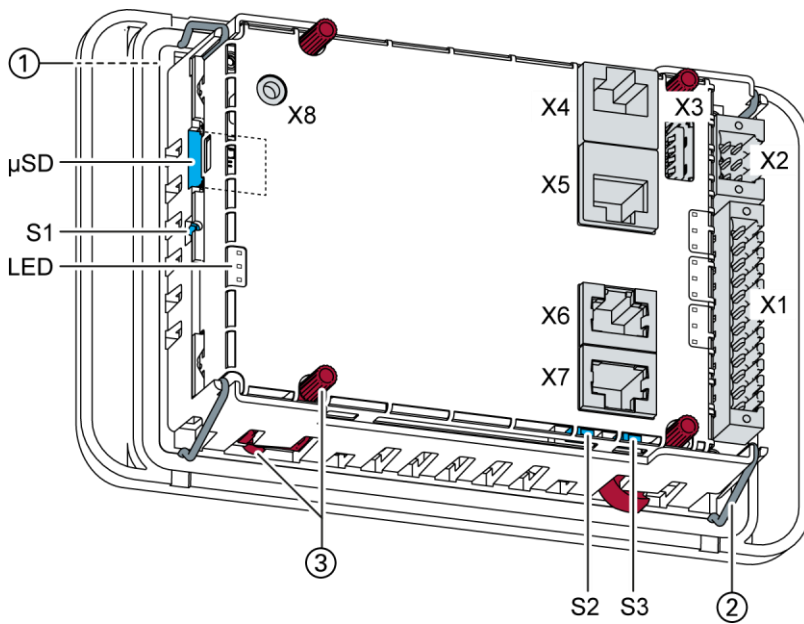


Fig. 1: Overview DC2004 (rear view)

| Item | Designation | Item | Designation |
|------|--|------|---------------------------------------|
| 1 | Display 4.3 inch | X6 | RS-232 / RS-485 |
| 2 | Securing clip (qty 4) | X7 | CAN bus |
| 3 | Twist-lock catch (qty 4) ¹ | X8 | Debug interface |
| X1 | Power supply , digital inputs / output | S1 | Function key (Reset and Run/Stop) |
| X2 | Analogue inputs | S2 | Terminating resistor CAN (120 Ohm) |
| X3 | USB 2.0 | S3 | Terminating resistor RS-485 (120 Ohm) |
| X4 | Ethernet (ETH0) | µSD | microSD card connection (optional) |
| X5 | EtherCAT (ETH1) | LED | LEDs: PWR, Run/Stop, Error |

¹ Required only for protection rating IP65

3.1.2. Overview DC2007

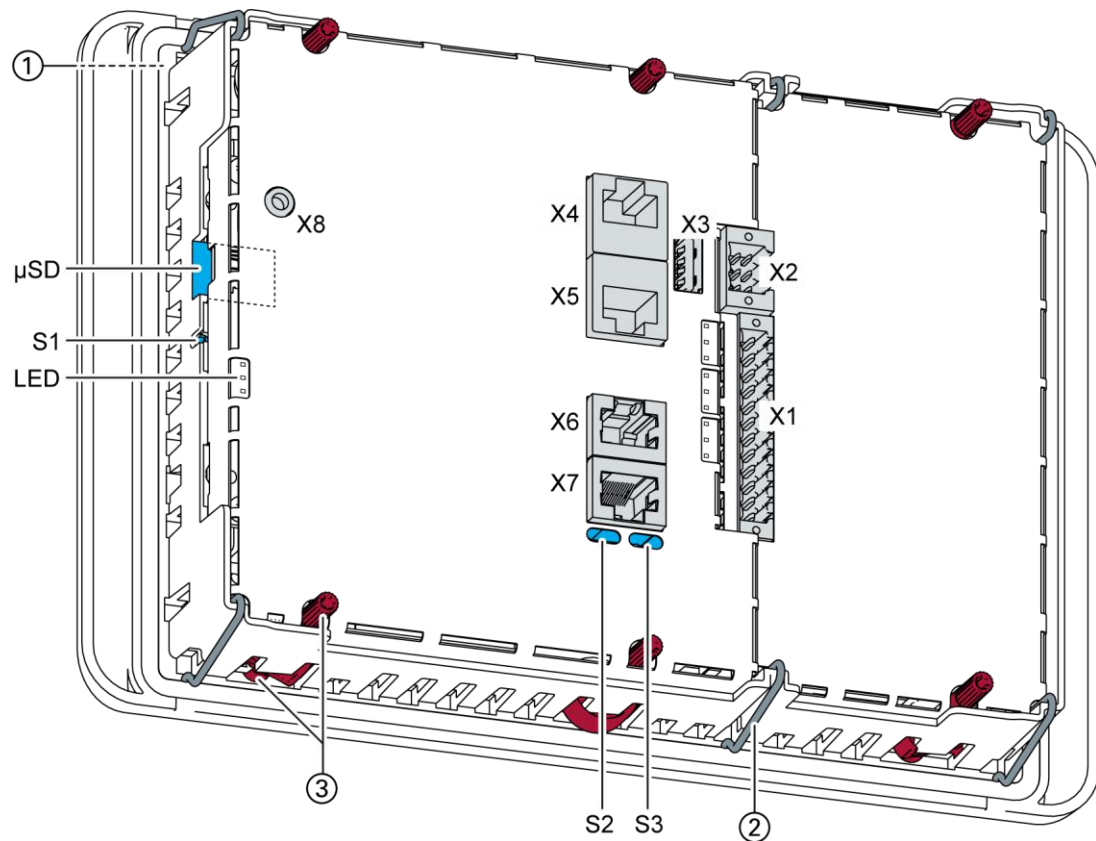


Fig. 2: Overview DC2007 (rear view)

| Item | Designation | Item | Designation |
|------|--|------|---------------------------------------|
| 1 | Display 7 inch | X6 | RS-232 / RS-485 |
| 2 | Securing clip (qty 6) | X7 | CAN bus |
| 3 | Twist-lock catch (qty 6) ¹ | X8 | Debug interface |
| X1 | Power supply , digital inputs / output | S1 | Function key (Reset and Run/Stop) |
| X2 | Analogue inputs | S2 | Terminating resistor CAN (120 Ohm) |
| X3 | USB 2.0 | S3 | Terminating resistor RS-485 (120 Ohm) |
| X4 | Ethernet (ETH0) | µSD | microSD card connection (optional) |
| X5 | EtherCAT (ETH1) | LED | LEDs: PWR, Run/Stop, Error |

¹ Required only for protection rating IP65

3.1.3. Overview ET2004

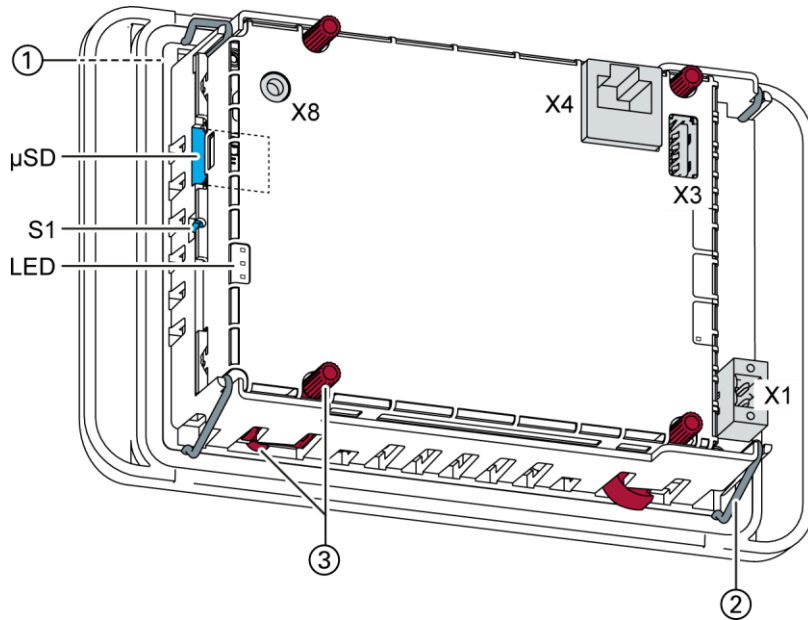


Fig. 3: Overview ET2004 (rear view)

| Item | Designation | Item | Designation |
|------|---------------------------------------|------|---|
| 1 | Display 4.3 inch | X1 | Power supply |
| 2 | Securing clip (qty 4) | X3 | USB 2.0 |
| 3 | Twist-lock catch (qty 4) ¹ | X4 | Ethernet (ETH0) |
| S1 | Function key (Reset and Run/Stop) | X8 | Debug interface |
| LED | LEDs: PWR, Run/Stop, Error | μSD | microSD card connection (for future applications) |

¹ Required only for protection rating IP65

3.1.4. Overview ET2007

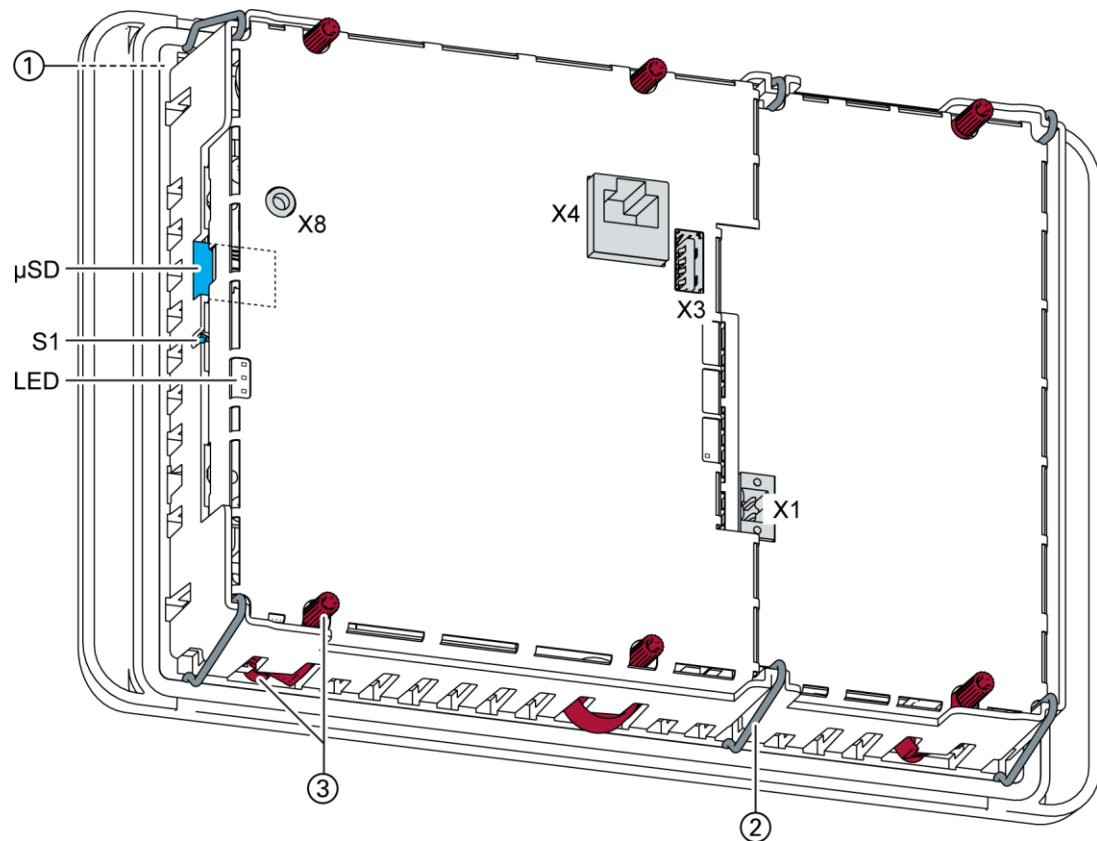


Fig. 4: Overview ET2007 (rear view)

| Item | Designation | Item | Designation |
|------|---------------------------------------|------|---|
| 1 | Display 7 inch | X1 | Power supply |
| 2 | Securing clip (qty 6) | X3 | USB 2.0 |
| 3 | Twist-lock catch (qty 6) ¹ | X4 | Ethernet (ETH0) |
| S1 | Function key (Reset and Run/Stop) | X8 | Debug interface |
| LED | LEDs: PWR, Run/Stop, Error | μSD | microSD card connection (for future applications) |

¹ Required only for protection rating IP65

3.1.5. Overview ECC2100 Slim



The ECC2100 Slim does not have a display of its own and is installed on a mounting rail.

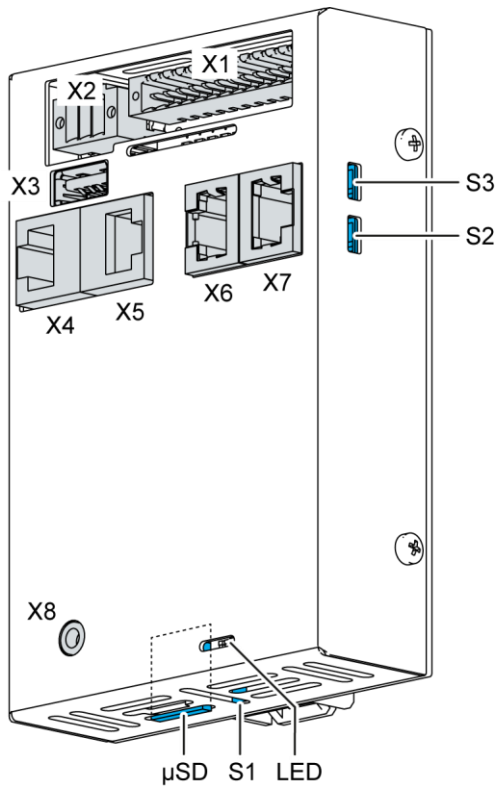


Fig. 5: Overview ECC2100 Slim

| Item | Designation | Item | Designation |
|------|--|------|---------------------------------------|
| X1 | Power supply , digital inputs / output | X8 | Debug interface |
| X2 | Analogue inputs | S1 | Function key (Reset and Run/Stop) |
| X3 | USB 2.0 | S2 | Terminating resistor CAN (120 Ohm) |
| X4 | Ethernet (ETH0) | S3 | Terminating resistor RS-485 (120 Ohm) |
| X5 | EtherCAT (ETH1) | μSD | microSD card connection (optional) |
| X6 | RS-232 / RS-485 | LED | LEDs: PWR, Run/Stop, Error |
| X7 | CAN bus | | |

3.2. Scope of delivery and accessories

Scope of delivery

Dialog Controller DC20XX:

- Device
- 12-pin plug connector for digital inputs / outputs and power supply
Weidmüller BLZF 3.50/12/180
- 6-pin plug connector for analogue inputs
Weidmüller B2CF 3.50/06/180

ET20XX Ethernet Terminal:

- Device
- 2-pin. plug connector for power supply
Weidmüller BLZF 3.50/02/180

ECC2100 Slim Box Controller:

- Device
- 12-pin plug connector for digital inputs / outputs and power supply
Weidmüller BLZF 3.50/12/180
- 6-pin plug connector for analogue inputs
Weidmüller B2CF 3.50/06/180

Accessories

- E-I/O plug, 6-pin, black (order no. 204803900)
- E-I/O plug, 12-pin, black (order no. 204803800)
- E-I/O plug, 2-pin, black (order no. 204801800)

3.3. Product features

Installation

DC20XX:

The device is designed for installation in a front panel or in a control panel in a rough industrial environment.

ET20XX:

The device is designed for installation in a front panel or in a control panel in a rough industrial environment.

ECC2100 Slim:

The device is designed for installation on a DIN rail (35 mm) in a control cabinet in an industrial environment with a category 2 level of pollution.

Processor

In its basic configuration the device is equipped with an 800 MHz ARM® CPU with a Cortex™-A9 core. Customer-specific variants are available, which instead of a single core processor are equipped with a dual core or quad core processor.

Ethernet

The device has two 10/100 Mbit/s Ethernet interfaces.

The first Ethernet interface is used for standard Ethernet connections. TCP/IP and UDP/IP protocols permit flexible connections to visualisation software, higher-level control units and to the IT infrastructure.

The second Ethernet interface is used as an EtherCAT master interface.

Other protocols available for the Ethernet interfaces: PROFINET, BACnet and Modbus.

USB

The USB host interface allows a wide range of peripherals to be connected to the device. This allows a USB stick to be used for updating the application or for downloading data directly.



USB sticks with FAT/FAT32 formatting are supported.

If you require support for other USB formats, please contact our Technical Support.

CAN interfaces

The device has one standard CAN interface which can be used at a speed of up to 1 Mbit/s.

Serial interfaces

The device has 2 serial interfaces (1x RS-485; 1x RS-232).

Onboard inputs / outputs

The device incorporates digital inputs / outputs and analogue inputs.

Additional interfaces

There is also a debugging interface located on the device. A special cable with a 3.5 mm jack plug can be connected to this interface. For further information, please contact our customer services team.

Real-time clock

A software interface permits the current time and date to be set and read on a real-time clock with battery back-up.

microSD card

The standard commercial microSD card interface allows data to be written to memory cards or read from memory cards.

Summary of features

DC20XX:

- ARM® CPU with Cortex™-A9 single core (800 MHz; optional dual core or quad core)
- user program and data memory (RAM): 256 MB onboard
- User program memory (flash): 256 MB onboard
- 1 USB host interface (USB 2.0)
- Retain memory 100 kB
- 2 Ethernet 10/100 Base T interfaces (2nd interface optionally as EtherCAT master interface)
- 1 CAN interface
- 2 serial interfaces (1x RS-485; 1x RS-232)
- 1 µSD card slot
- Onboard I/O
- Real-time clock
- 1 touch screen display: size denoted by XX in the family name

ET20XX:

- ARM® CPU with Cortex™-A9 single core (800 MHz; optional dual core or quad core)
- User program and data memory (RAM): 512 MB onboard
- User program memory (flash): 512 MB onboard
- 1 USB host interface (USB 2.0)
- 1 Ethernet 10/100 Base T interface
- 1 touch screen display: size denoted by XX in the family name

ECC2100 Slim:

- ARM® CPU with Cortex™-A9 single core (800 MHz; optional dual core or quad core)
- User program and data memory (RAM): 256 MB onboard
- User program memory (flash): 256 MB onboard
- 1 USB host interface (USB 2.0)
- Retain memory 100 kB
- 2 Ethernet 10/100 Base T interfaces (2nd interface: EtherCAT master interface)
- 1 CAN interface
- 2 serial interfaces (1x RS-485; 1x RS-232)
- 1 µSD card slot
- Onboard I/O (digital and analogue)
- Real-time clock

4. Installation

4.1. Preparation for installation, DC20XX and ET20XX

The devices are intended for installation in a rectangular cut-out on a front panel. The support material must be rigid and be from 1 to 3 mm thick.

4.1.1. Installation cut-out, DC2004 and ET2004

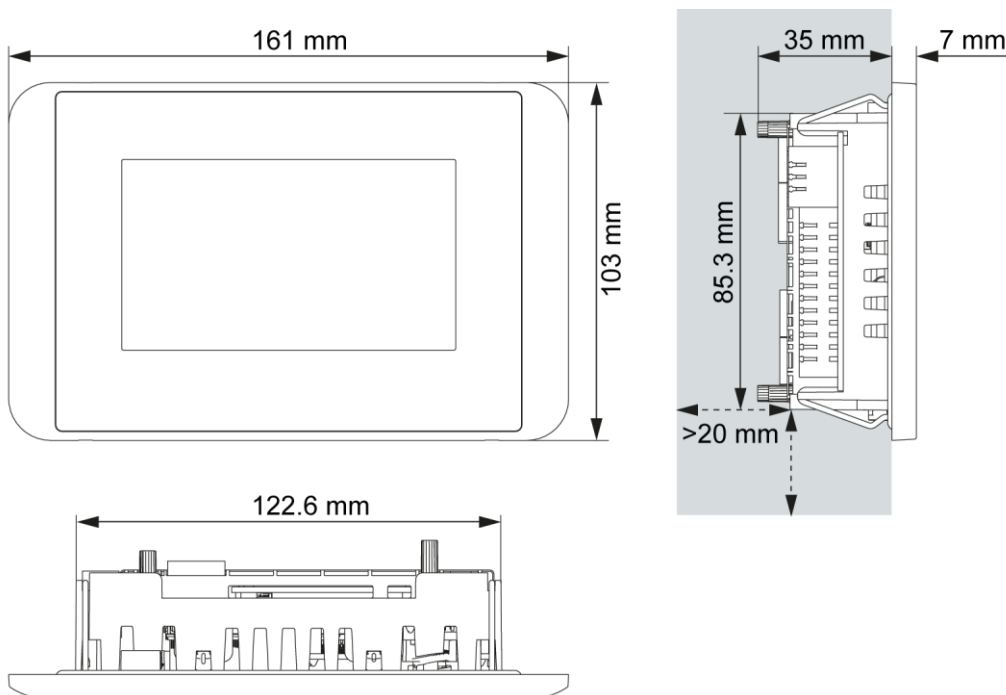


Fig. 6: Dimensions, DC2004 and ET2004

Requirements:

- The device must have a clear space of at least 20 mm all round at the rear, to allow sufficient air circulation.
- The max. surrounding air temperature in the control cabinet must not exceed 55°C during operation.
- The support material for the installation cut-out must be flat, sufficiently stable, and be from 1 to 3 mm thick.

| | |
|-----------------|---|
| i NOTICE | <p>Damage to the device!</p> <p>Installation on uneven support material can lead to mechanical stresses and cracks in the front face or malfunctioning of the touch screen.</p> <ul style="list-style-type: none"> ▶ Make sure that the mounting points of the device are all in a common plane, with no more than maximum ± 0.5 mm variation. |
|-----------------|---|

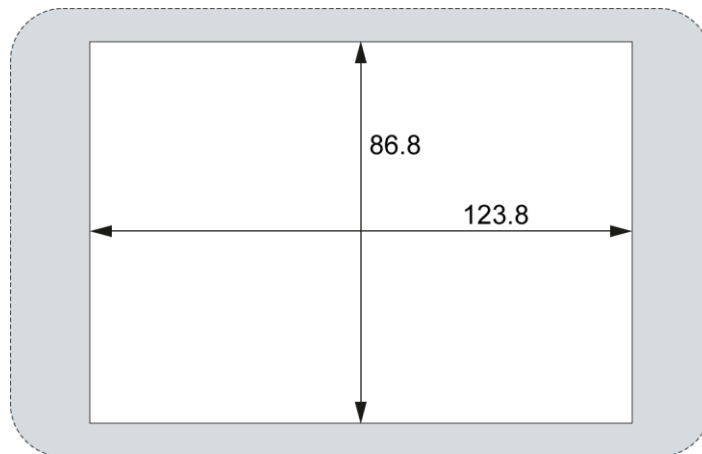


Fig. 7: Installation cut-out, DC2004 and ET2004

- ▶ Cut a rectangular installation cut-out in the support material:
 Height: 86.8 mm
 Width: 123.8 mm
 Max. corner radius: 3.0 mm

- i** Thickness of support material:
 Protection rating IP65 with twist-lock catches: only for 1.5–3.0 mm
 Optimal: 1.5–2.0 mm
 Max.: 3.0 mm

4.1.2. Installation cut-out, DC2007 and ET2007

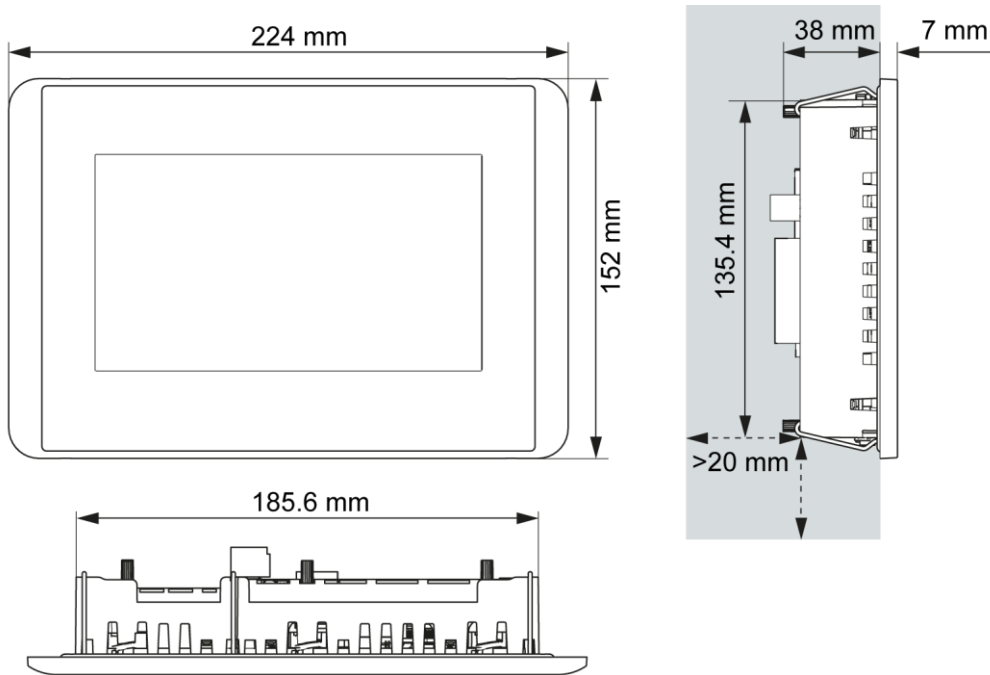


Fig. 8: Dimensions, DC2007 and ET2007

Requirements:

- The device must have a clear space of at least 20 mm all round at the rear, to allow sufficient air circulation.
- The max. surrounding air temperature in the control cabinet must not exceed 55°C during operation.
- The support material for the installation cut-out must be flat, sufficiently stable, and be from 1 to 3 mm thick.

NOTICE

Damage to the device!

Installation on uneven support material can lead to mechanical stresses and cracks in the front face or malfunctioning of the touch screen.

- Make sure that the mounting points of the device are all in a common plane, with no more than maximum ± 0.5 mm variation.

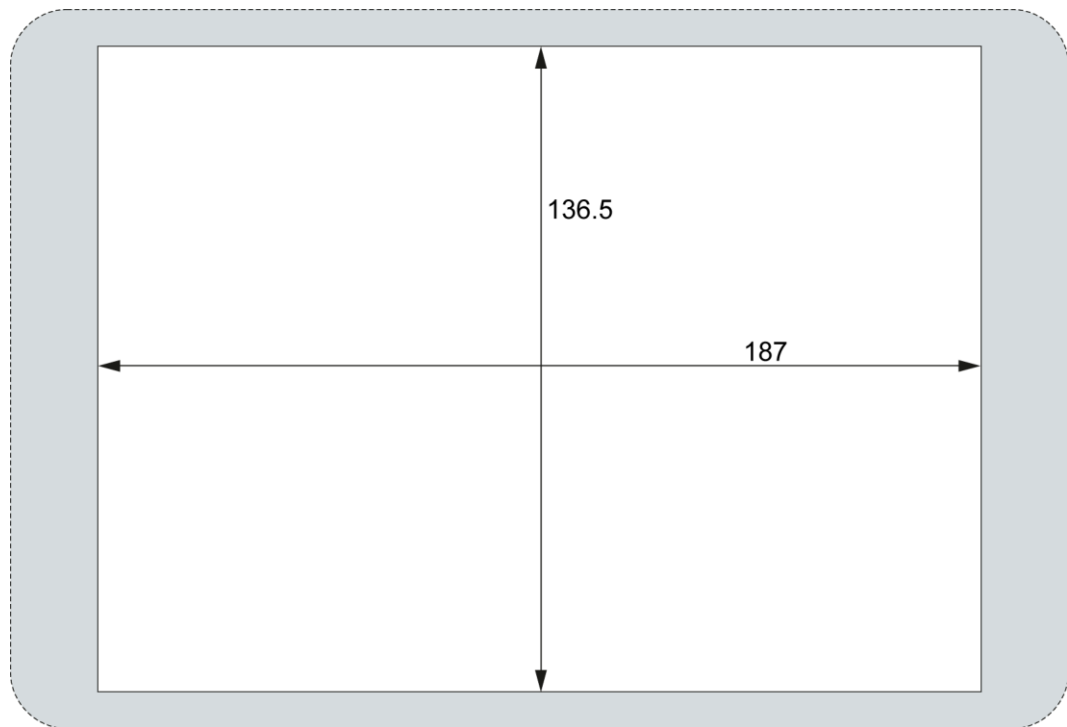


Fig. 9: Installation cut-out, DC2007 and ET2007

- ▶ Cut a rectangular installation cut-out in the support material:

Height: 136.5 mm

Width: 187.0 mm

Max. corner radius: 3.0 mm



Thickness of support material:

Protection rating IP65 with twist-lock catches: only for 1.5–3.0 mm

Optimal: 1.5–2.0 mm

Max.: 3.0 mm

4.2. Installation, DC20XX and ET20XX

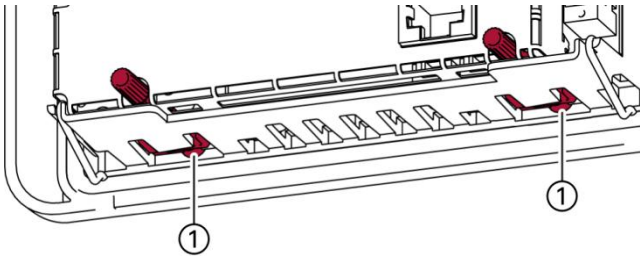


Fig. 10: Open the twist-lock catches

1. Device with twist-lock catches: make sure that the twist-lock catches are turned anti-clockwise to the limit and are fully open (1).

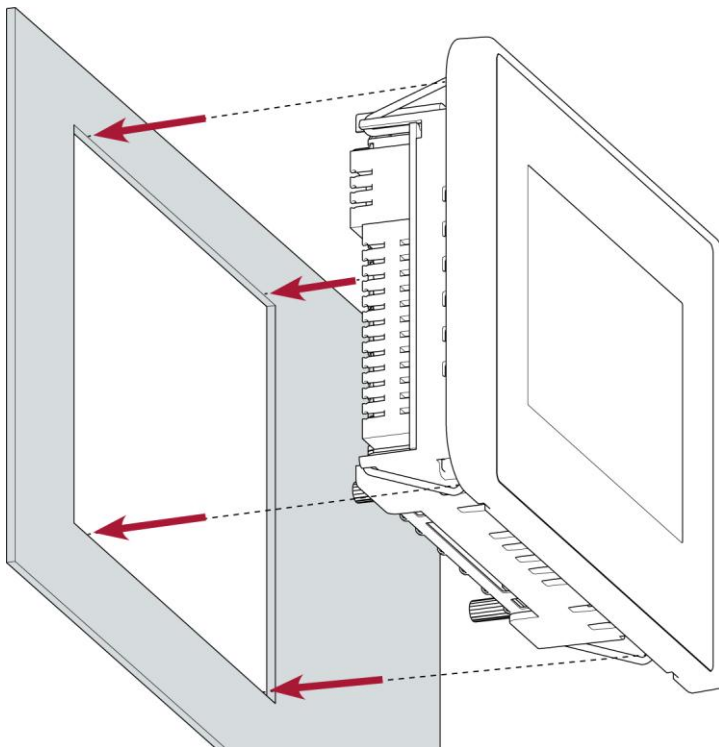


Fig. 11: Installation in an installation cut-out, example with 4 securing clips

2. Making sure the alignment is correct, push the device evenly into the installation cut-out until the 2 or 3 securing clips snap the device tight.

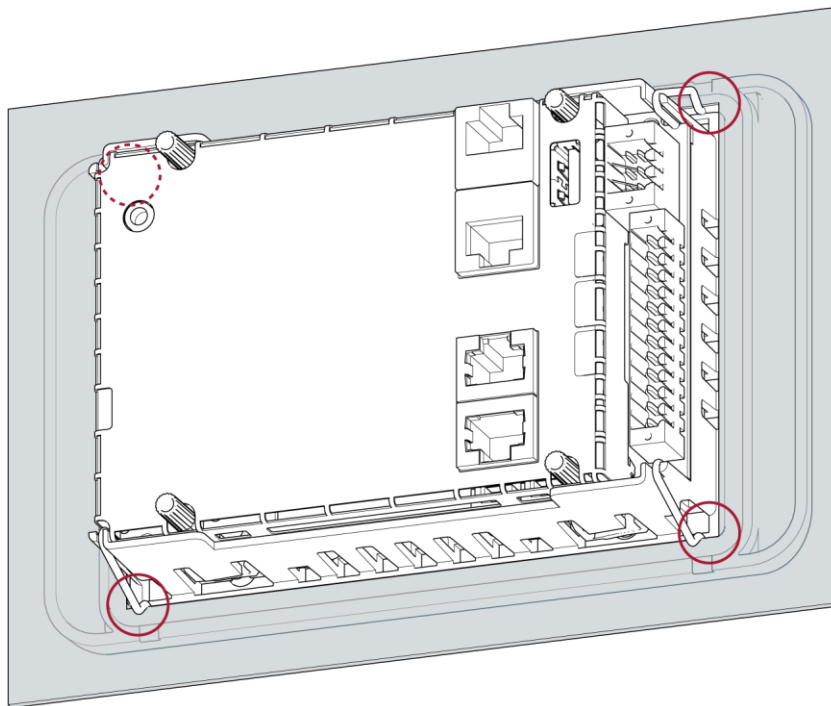


Fig. 12: Device clicked home in the installation cut-out, example with 4 securing clips

3. Make sure the device lies flush all round.
4. Device with twist-lock catches: Secure the twist-lock catches by turning them with a T9x50 screwdriver. Apply maximum 0.4 Nm torque.



The protection rating IP65 at the front face is achieved only when the twist-lock catches are used correctly.

4.3. Installation, ECC2100 Slim

The ECC2100 Slim is designed to be installed on a mounting rail to DIN EN 60715:2001, 35 x 7.5 mm.



Danger of burns!

The surface of the device can become hot.

- ▶ Ensure that there is sufficient convectional cooling for heat to dissipate.
- ▶ Ensure that there is also a minimum of 50 mm free space both above and below the device.

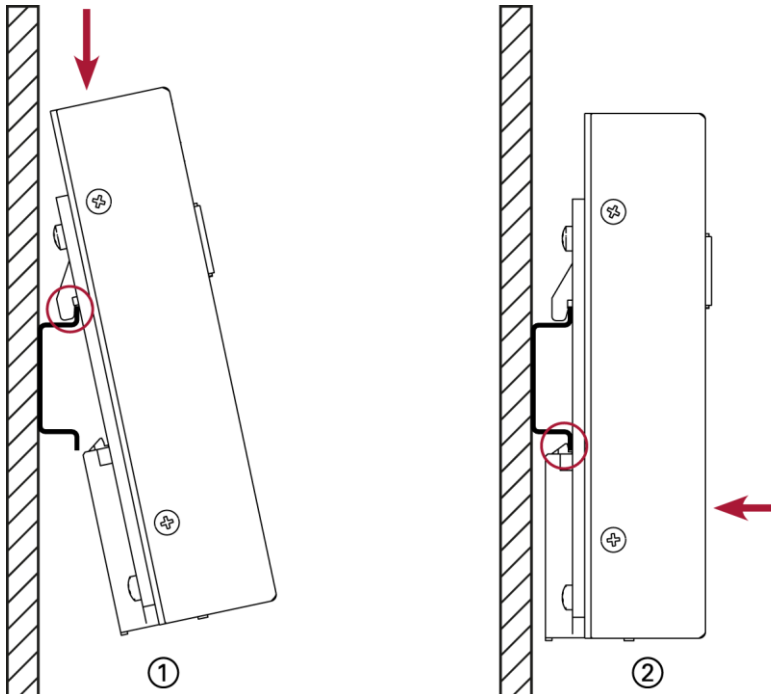


Fig. 13: Installing the device


Requirements:

→ At least 1 cm free space must be left between the device and the adjacent module.

1. Insert the device into the mounting rail from above so that the clip is resting on the rail.
2. Push the device down against the mounting surface so that the retaining spring engages.

The device is now engaged on the mounting rail.

5. Connection

**WARNING**

Uncontrolled and unpredictable operational behaviour!

Failure in certain components in electronic control systems may result in uncontrolled and unpredictable operational behaviour.

- ▶ All types of failure and the associated fuse systems are to be taken into account at system level.
- ▶ Comply with all automation system manufacturer instructions.

5.1. Power supply

The device is powered by an external 24 V DC power supply. It is not designed to be connected to a DC mains supply.

- ▶ Before plugging in the device, ensure that the external power supply meets the required specifications (type K to 61131-2).

| External power supply (24 V DC) | |
|---------------------------------|--|
| Supply voltage | +24 V DC SELV (–15% / +20%) |
| Alternating current proportion | Max. 5% The direct voltage level must not fall below 20.4 V. |
| Power consumption | Total max. 3.2 A at +24 V DC (1.2 A electronics; 2 A external I/O) |
| Energy buffering | 10 ms |

Internal power supply

A power supply for the system electronics for an input voltage of 24 V DC (–15% / +20%) is integrated into the device. The power supply has integrated protection against reverse polarity and surge current protection (1.2 A).

Installation

- ▶ All connections and cables must be laid out so as to prevent inductive and capacitive interference causing any damage to the device.
- ▶ Ensure that the infeed lines provide adequate current and voltage carrying capacity.

5.1.1. Connecting the power supply to the DC20XX and ECC2100 Slim



Live parts!

- ▶ Before starting any work on the device, switch off all power feeds, including peripherals.

- ▶ Connect the power supply to plug X1 according to the following table.

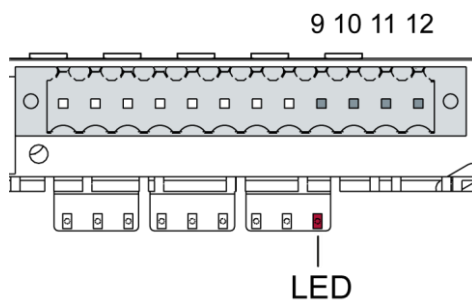


Fig. 14: Power supply to the DC20XX and ECC2100 Slim plug X1 with power LED

| Power supply plug X1 | | |
|----------------------|-------------|--|
| Pin | Designation | Assignment |
| 1...8 | I/O | Digital inputs and outputs (see "Digital inputs and outputs, DC20XX and ECC2100 Slim") |
| 9 | L1+ | Feed to digital output (max. 2 A) for I/O |
| 10 | L+ 24 V | Power supply 24 V DC (–15 %/+20 %) (PLC internal processing) max. 1.2 A |
| 11 | L+ 24 V | Power supply 24 V DC (–15 %/+20 %) (PLC internal processing) max. 1.2 A |
| 12 | GND | – |

The following counterparts have been tested for the SC-SMT 3.5 (Weidmüller) plug-in connector and are approved for use with the device:

→ BLZF 3.50/12/180

5.1.2. Connecting the power supply to the ET20XX



CAUTION

Live parts!

- ▶ Before starting any work on the device, switch off all power feeds, including peripherals.

- ▶ Connect the power supply to plug X1 according to the following table.

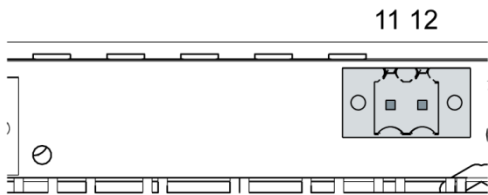


Fig. 15: Power supply ET20XX plug X1

| Power supply plug X1 | | |
|----------------------|-------------|---|
| Pin | Designation | Assignment |
| 11 | L+ 24 V | Power supply 24 V DC (–15 %/+20 %) max. 1.2 A |
| 12 | GND | – |

The following counterparts have been tested for the SC-SMT 3.5 (Weidmüller) plug-in connector and are approved for use with the device:

- BLZF 3.5/02/180 (F, LR, LH) SN BK

5.2. Data connections

5.2.1. Block circuit diagram, DC20XX

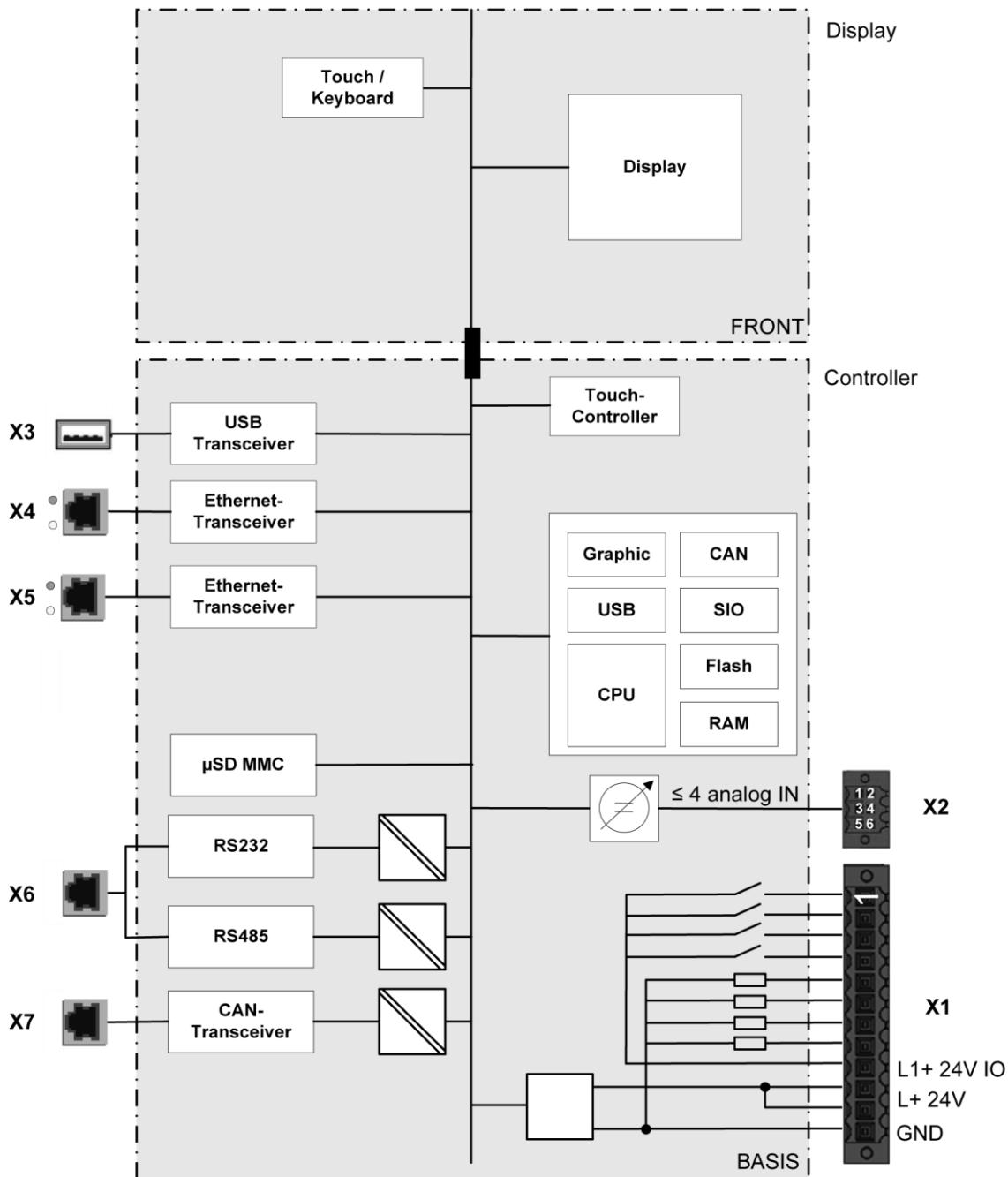


Fig. 16: Block circuit diagram, DC20XX

5.2.2. Block circuit diagram, ECC2100 Slim

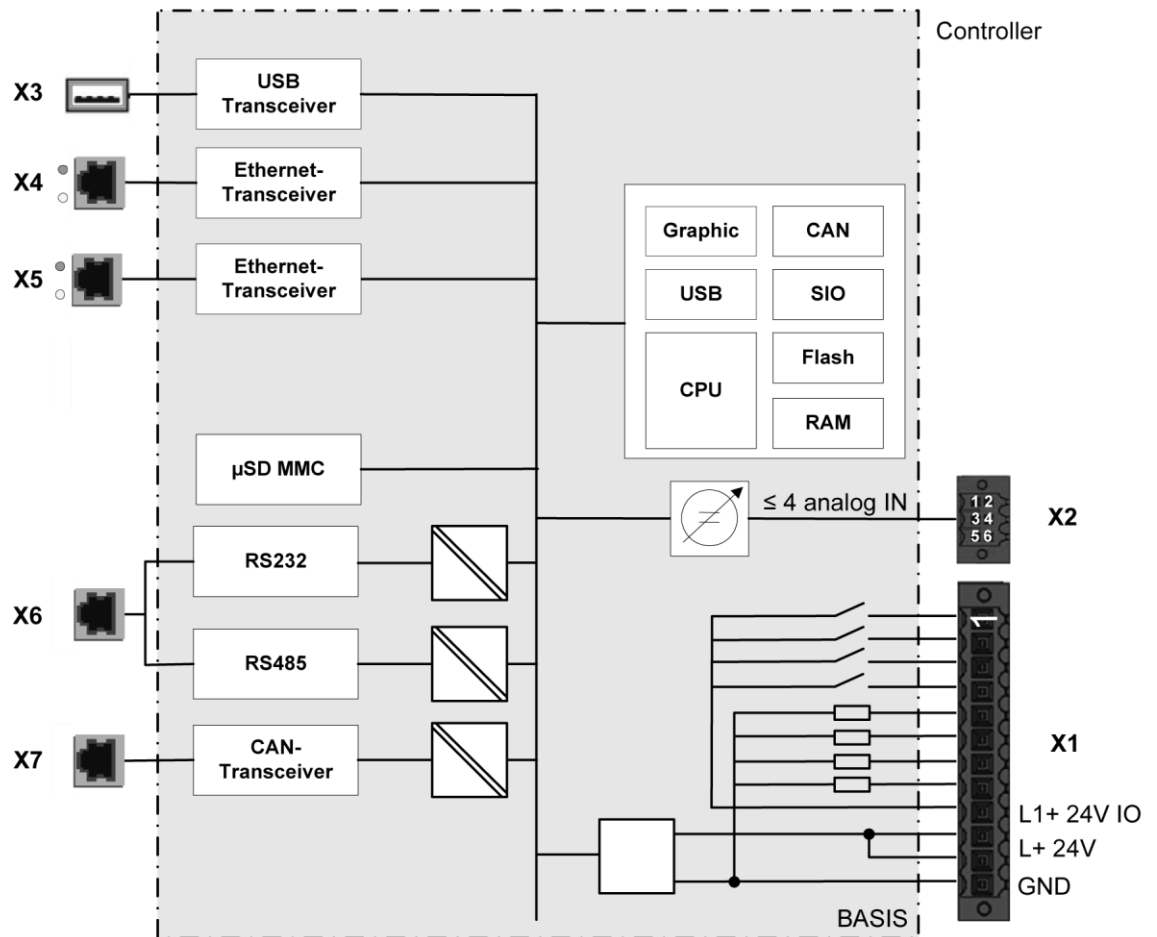


Fig. 17: Block circuit diagram, ECC2100 Slim

5.2.3. Block circuit diagram, ET20XX

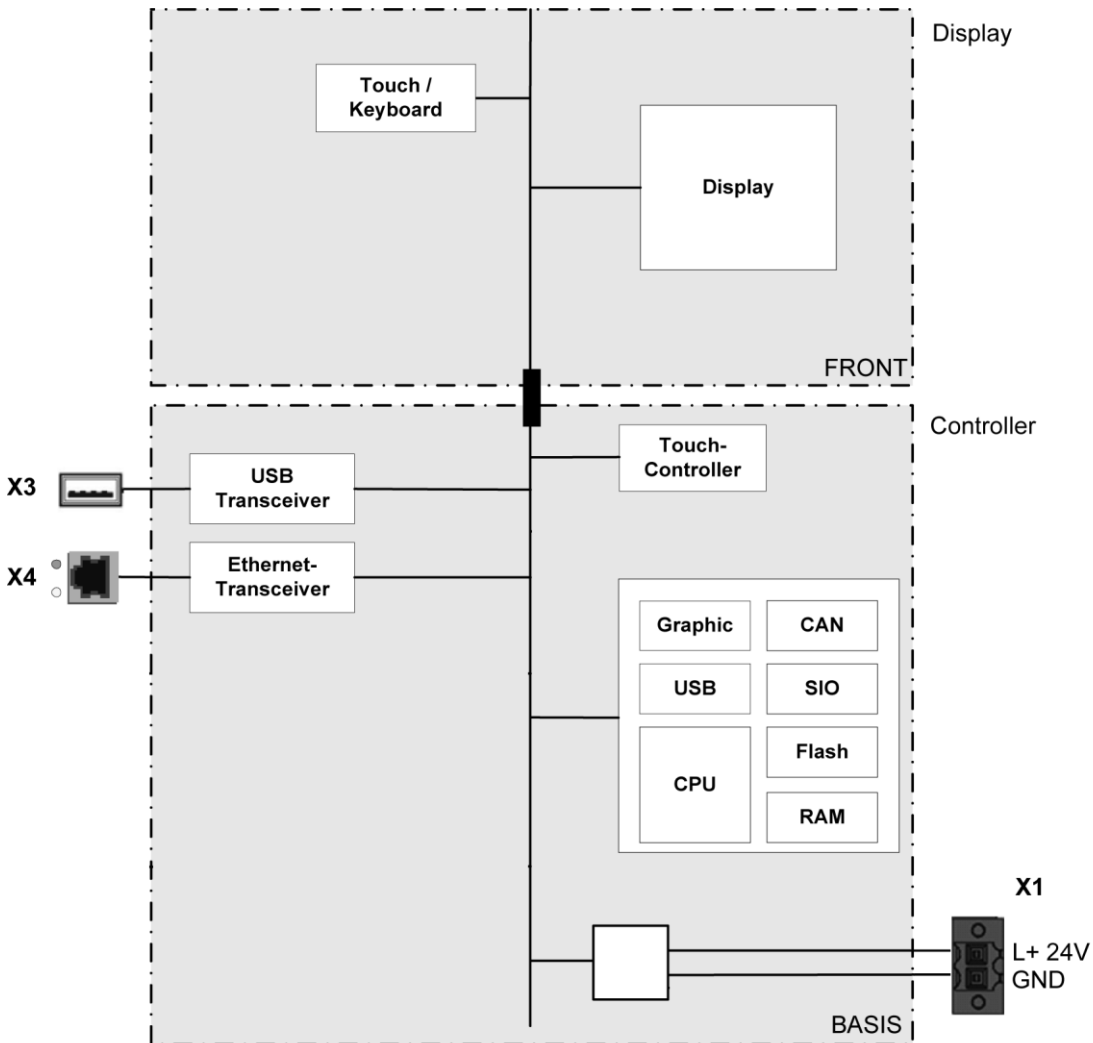



Fig. 18: Block circuit diagram, ET20XX

5.2.4. Digital inputs and outputs, DC20XX and ECC2100 Slim

The digital outputs are positive switching 24 V outputs with an output current of max. 500 mA. They have a common reference potential (GND) with the supply voltage.

 **NOTICE**

Damage to the inputs or to the device!

Voltages over ± 32 V can damage the inputs or the device.

► No voltage in excess of ± 32 V may be present at the inputs.

The digital inputs are type 1 or 3 (IEC 61131-2) positive switching inputs of type 1 or 3 (IEC 61131-2). They are designed for nominal input voltages of 24 V. The input signals are transmitted internally on a cyclical basis for process data processing. An open input is interpreted as static 0. The inputs also have a common reference potential (GND).

The following counterparts have been tested for the SC-SMT 3.5 (Weidmüller) plug-in connector and are approved for use with the device:

→ BLZF 3.50/12/180

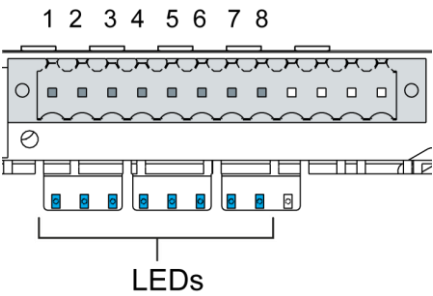


Fig. 19: Digital inputs and outputs, DC20XX and ECC2100 Slim plug X1 with LEDs 1 to 8

| Digital inputs and outputs, plug X1 | | |
|-------------------------------------|-----------------|-----------------------------------|
| Pin | Design ation | Assignment |
| 1 | DI 1 | digital input |
| 2 | DI 2 | digital input |
| 3 | DI 3 | digital input |
| 4 | DI 4 | digital input |
| 5 | DO 1 | digital output |
| 6 | DO 2 | digital output |
| 7 | DO 3 | digital output |
| 8 | DO 4 | digital output |
| 9...12 | – | Power supply (see “Power supply”) |

| Data from the digital outputs | | |
|---|--|---|
| Feature | Value | Description |
| Output type | Semiconductor | Non-storing, current supplying (positive switching) |
| Protective circuit for inductive loads | 41 V terminal voltage (typ.) compared to +24 V | Fast de-excitation (must be provided externally) |
| Status display | yes | One orange LED per output Lights at logical 1 |
| Overload protection | yes | In the case of thermal overload, auto-resetting |
| Short circuit protection response threshold | yes | Electronic voltage limitation: typ. 7 A The current is limited electronically. Activation of short circuit protection results in thermal overload and tripping of thermal overload protection. Permissible limits based on cold state: max. 10,000 short circuits; overall duration max. 500 hours. |
| Status under unclear operating conditions | Logical 0 | If the supply voltage is insufficient, and at booting up and shutting down the control system, the outputs are set to logical 0. |
| Output delay "0" after "1" | typ. 1 ms | — |
| Output delay "1" after "0" | typ. 1 ms | — |
| Output capacitance | < 20 nF | — |
| Rated voltage | +24 V DC | — |
| Voltage drop (at rated current) | < 0.1 V | — |
| Rated current at "1" signal | 0.5 A | — |
| Total current of all outputs | max. 2 A | — |
| Parallel circuit in two outputs | max. 1 A | Maximum permissible value with a logical connection to increase power |

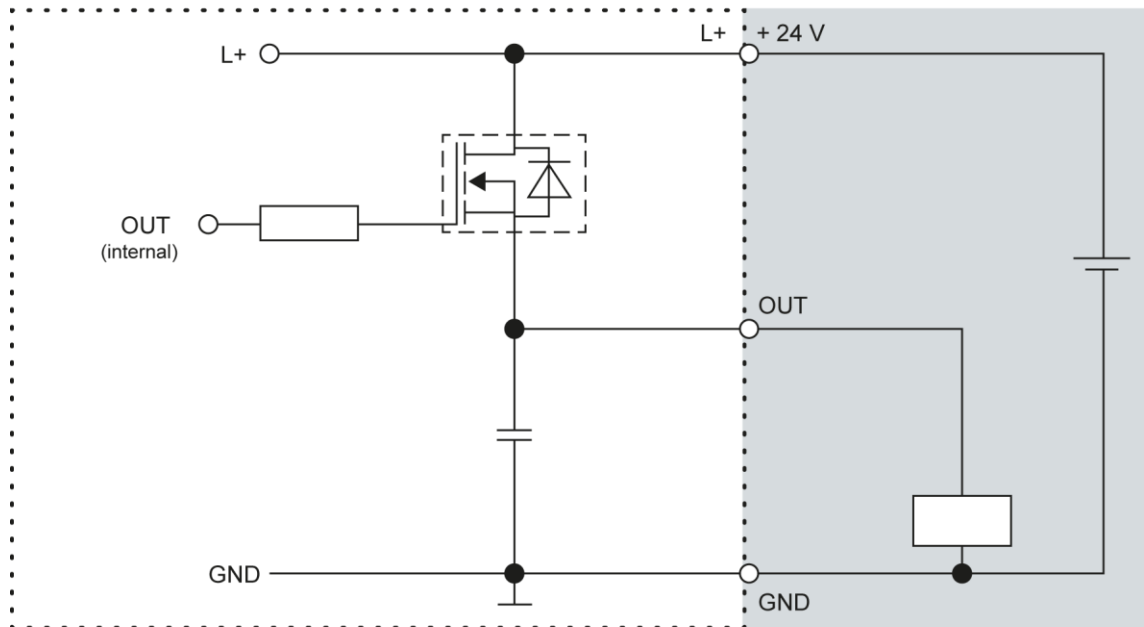


Fig. 20: Circuit diagram of the principles of positive switching output

| Data from the digital inputs | | |
|--|---|---|
| Feature | Value | Description |
| Type of inputs | Type 1, 3 | To IEC 61131-2 Current-consuming (positive switching) |
| Cable length | max. 30 m | For unshielded connection cables Cables over 30 m in length must be shielded |
| Cable cross-section in control cabinet | 0.14–1.5 mm ² (26-16 AWG) | Aim for plug connector limits to UL specifications. |
| Field wiring | according to regulations and standards | Comply with all local regulations and the stipulations of DIN EN 61131-2. |
| Rated load voltage | 24 V DC (SELV) | – |
| Delay time | 1 ms | Applies for transitions from 0 to 1 and 1 to 0 |
| Signal evaluation | cyclical | Dependent on the cycle time set in the programming system |
| Protection against reverse polarity | yes | – |
| Potential isolation | no | – |
| Status display | yes | One orange LED per input Lights at logical 1 |

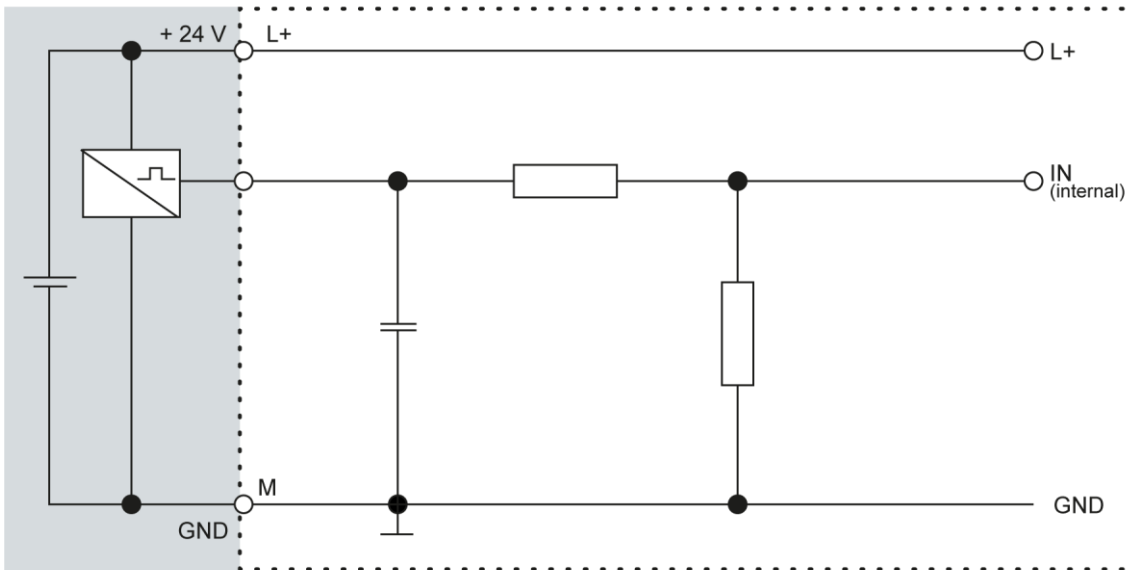


Fig. 21: Circuit diagram of the principles of positive switching input

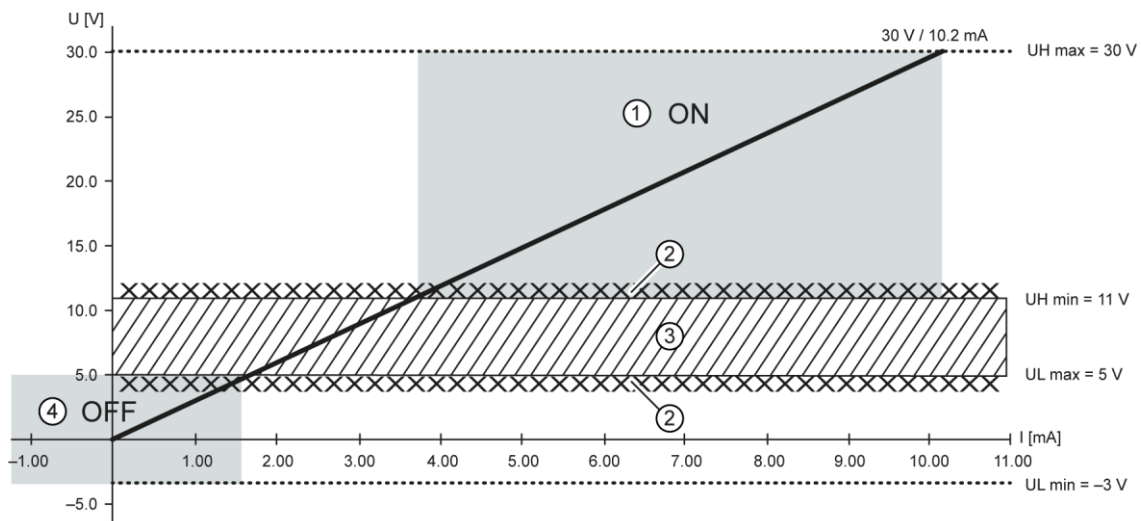


Fig. 22: Operating ranges of the digital inputs (type 1/3)

| Item | Designation | Item | Designation |
|------|--------------------------|------|------------------|
| 1 | "ON" range | 3 | Transition range |
| 2 | Signal-noise ratio < 1 V | 4 | "OFF" range |

5.2.5. Ethernet

The onboard Ethernet adapter has two 10/100 Base-T interfaces with RJ-45 connections for networking. The Ethernet interface X4 can be used as a standard Ethernet interface.

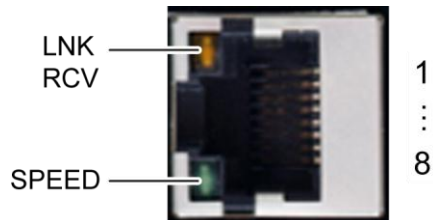


Fig. 23: Ethernet interface X4

| Assignment of Ethernet interface plug X4 | | | |
|--|------------|-----|------------|
| Pin | Assignment | Pin | Assignment |
| 1 | TX+ | 5 | NC |
| 2 | TX- | 6 | RX- |
| 3 | RX+ | 7 | NC |
| 4 | NC | 8 | NC |

| LEDs | | |
|---------|--------|--|
| LED | Colour | Meaning to IEEE 802.3 clause 25 |
| LNK/RCV | yellow | Link, Data Receive Flashing: connection active; data transfer in progress Off: no connection established |
| SPEED | green | On = 100 Mbit/s Off = 10 Mbit/s |

5.2.6. EtherCAT

The onboard Ethernet adapter has two 10/100 Base-T interfaces with RJ-45 connections for networking. The Ethernet interface X5 can be used as an EtherCAT master.

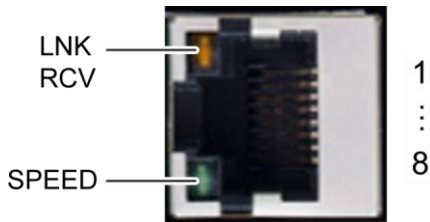


Fig. 24: EtherCAT interface X5

| Assignment of EtherCAT interface plug X5 | | | |
|--|------------|-----|------------|
| Pin | Assignment | Pin | Assignment |
| 1 | TX+ | 5 | NC |
| 2 | TX- | 6 | RX- |
| 3 | RX+ | 7 | NC |
| 4 | NC | 8 | NC |

| LEDs | | |
|---------|--------|--|
| LED | Colour | Meaning to IEEE 802.3 clause 25 |
| LNK/RCV | yellow | Link, Data Receive Flashing: connection active; data transfer in progress Off: no connection established |
| SPEED | green | On = 100 Mbit/s Off = 10 Mbit/s |

5.2.7. USB

Devices with a USB interface can be connected to the USB host port (Rev. 2.0). Suitable USB device classes are:

- CODESYS user: only USB stick
- Linux level: USB stick or mouse

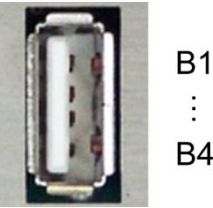



Fig. 25: USB interface X3


| Assignment USB interface plug X3 | | | |
|----------------------------------|------------|-----|------------|
| Pin | Assignment | Pin | Assignment |
| B1 | VCC | B3 | D+ |
| B2 | D– | B4 | GND |

 NOTICE

Damage to USB stick and malfunction due to data loss!

Removing a USB stick while it is still in use and data is being transferred can render the USB stick unusable. Open files which cannot be accessed due to removal of the USB stick can block the device.


- Therefore ensure that all operations are complete before removing the USB stick.

 NOTICE

Damage to property and malfunctions due to data loss!

The USB interface is protected against overloading (> 0.5 A). In the event of a short circuit during operation, the control unit may trigger a reset of the system. Substantial property damage and damage to the USB device may ensue.

- Before using a USB device, check carefully its power requirements.

 NOTICE

Failures and malfunctions due to direct connection to signal ground!

- Use only USB-devices that do not have a direct connection between signal ground and casing.

USB sticks can be inserted and removed whilst the system is in operation. The USB stick is detected automatically and incorporated into Linux as the directory /media/usbX. When the USB stick is removed the directory /media/usbX will be deleted from the directory structure.

Either the first partition on the USB stick, or, if the memory is not partitioned, the entire memory will be connected, i.e., the respective directory appears automatically.

The X represents a number from 1 (first USB device) to 8 (last/max. USB device).



The USB interface plug is designed to withstand 1,000 plugging and unplugging cycles.

5.2.8. Serial interfaces

The module has two serial communications interfaces (1x RS-232 and 1x RS-485), which are connected via the common RJ45 plug X6.

Maximum baud rate for both interfaces: 115 kBd

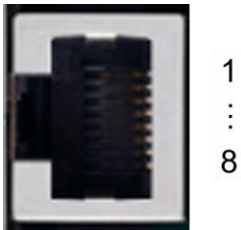


Fig. 26: RS-232 / RS-485 interface X6

| Pin assignment for RS-232 / RS-485 interface plug X6 | | | |
|--|---------------------------------|-----|---------------------------------|
| Pin | Assignment / software interface | Pin | Assignment / software interface |
| 1 | RS-232 RX / COM 1 | 5 | RS-485 Tx/Rx- / COM 2 |
| 2 | RS-232 TX / COM 1 | 6 | NC |
| 3 | NC | 7 | (reserved) |
| 4 | RS-485 Tx/Rx+ / COM 2 | 8 | ISO GND |

The RS-485 interface is “soft” terminated in the dialogue controller with 560 Ω .

If the interface is located at the start or end of the bus topology:

- Set switch S3 to ON in order to switch on the 120 Ω terminating resistor.

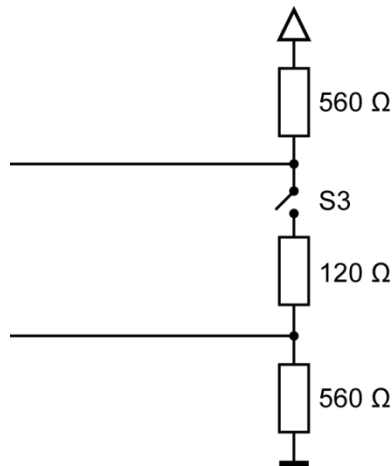


Fig. 27: RS-485 switchable terminating resistor



As far as possible, the assignment of the interfaces should be carried out in accordance with the specifications given in “MODBUS over Serial Line; Specification and Implementation Guide V1.02”.

Signal interference and terminating resistor

To minimise interference, the following instructions must be complied with.

Actively driven bus

- An appropriate protocol must be employed to ensure that at all times one of the bus participants is actively driving the bus.
- For a highly symmetrical signal-noise ratio the bus must have defined statuses for logical “1” ($A-B < -0.2\text{ V}$) and logical “0” ($A-B > +0.2\text{ V}$).

Undriven bus

- The bus termination must be as asymmetric as possible to ensure the greatest possible signal-noise ratio (to reduce the symmetrical signal-noise ratio).
- In order to achieve the necessary voltage difference between the signals, a suitable resistor network must be used as the line termination.
- The necessary size of the resistors is governed by the bus length and transmission rate (similarly to the line termination for Profibus, see DIN EN 61158-2).

Connections with GND

To minimise common-mode interference or malfunctions due to potential differences:

- ▶ Check the topology and line lengths to determine whether additional connection to GND are necessary.
- ▶ For electrically isolated interfaces with connections to the reference ground at one point: link to GND.
- ▶ Where necessary, provide an attenuated link to GND (e.g. via $200\ \Omega$) at multiple points.

5.2.9. CAN Bus

| Properties of the CAN interface | |
|---------------------------------|-----------------------|
| Standard | ISO 11898 |
| Maximum Baud rate | 1 MBit/s |
| Lowest adjustable Baud rate | 50 kBit/s |
| Contacts | Electrically isolated |
| Assignment | to CiA303 |



Fig. 28: CAN interface X7

| Assignment CAN interface plug X7 | | | |
|----------------------------------|------------|-----|------------|
| Pin | Assignment | Pin | Assignment |
| 1 | CAN_H | 5 | NC |
| 2 | CAN_L | 6 | NC |
| 3 | ISO GND | 7 | ISO GND |
| 4 | NC | 8 | NC |

If the CAN interface is located at the start or end of the CAN bus topology:

- Set switch S2 to ON in order to switch on the 120 Ω terminal resistance between CAN_L and CAN_H.

5.2.10. Analogue inputs

Basic considerations for analogue inputs

- An analogue input channel always consists of two connections: AI (U) or AI (U/T) and AGND.
- The AI (U/T) channels can measure either voltages (U) or evaluate PT100(o) sensors.
- The AI (U) channels can measure voltages or be used for compensation of the line resistances for PT100(o) measurements (3-wire measurement).
- The Earth/Ground/GND lead of a voltage sensor or temperature sensor connected to an analogue input may be connected only to AGND (not to GND or PE (equipotential)).
- Different AGNDs (e.g. on one terminal strip) may not be connected together.
- AGNDs may not be connected to the general GND of the control panels or to the “M” on the control unit (GND and AGND are already connected within the control unit, via a special filter).
- AGNDs may not be connected directly to the equipotential bonding conductor (PE) of the machine or system.
- Long cables and wires with a small cross-section lead to voltage drops and deviations in PT100(o) measurements (due to resistance of the lead). These unavoidable deviations must be taken into account when planning the wiring.
- To avoid interference, analogue I/O wires must be kept separate from digital signals and power cables.
- Screened cables are advisable for all analogue I/Os. The screen is maintained from the respective sensor or instrument through into the control panel or close to the control unit.

The following counterparts have been tested for the S2C-SMT 3.5 (Weidmüller) plug-in connector and are approved for use with the device:

- Weidmüller B2CF 3.50/06/18o(F) SN BK

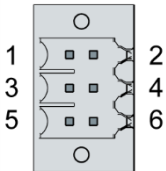


Fig. 29: Analogue inputs X2

| Analogue inputs X2 | | | |
|--------------------|------------|-----|------------|
| Pin | Assignment | Pin | Assignment |
| 1 | AI1 (U/T) | 2 | AI3 (U/T) |
| 3 | AGND | 4 | AGND |
| 5 | AI2 (U) | 6 | AI4 (U) |

Data from analogue inputs

| Data from analogue inputs | | |
|---|-------------------------------|---|
| Feature | Value | Description |
| Cable length | max. 30 m | Only valid for unshielded connection cables Cables over 30 m in length must be shielded |
| Modulation method | Delta-sigma modulation | – |
| Shared points between the channels | AGND reference ground | – |
| Clamp arrangement | Shielding on common AGND pins | – |
| Sampling duration/rate for measuring values | 1 ms | A reading is taken from each input channel every millisecond, regardless of how many channels are actually in operation. |
| Sampling rate Operating mode AI-PT | 250 ms | In operating mode AI-PT, calculations are carried out after the millisecond sampling rate. A new value is available in the user program every 250 ms. |

| Digital filtering | | |
|--------------------------|--------------------------|--|
| Possible filter settings | Time range for averaging | Time range for averaging Operating mode AI-PT |
| 0 | 1 ms | 0.25 s |
| 10 | 10 ms | 2.5 s |
| 100 | 100 ms | 25 s |
| 1,000 | 1,000 ms (1 s) | 250 s |

If filtering is active, an average is calculated for the set time range. However a value is still issued during the sampling rate interval. For example, if the filter is set to 1,000, the average of the measurements for the previous 1,000 ms / 1,000 measurements is issued each millisecond (or, in the case of operating mode AI-PT, the average for the last 250 ms / 1,000 measurements).

The filtering can be activated and configured using CODESYS V3. The sampling rate is constant. It can only be filtered with a whole multiple of the sampling rate.

Operating modes for the analogue inputs

| | |
|-----------------|---|
| i NOTICE | <p>Damage to channel</p> <p>High voltages can damage analogue channels, stopping them from working correctly.</p> <p>► Ensure the input voltage does not exceed ± 30 V.</p> |
|-----------------|---|

| Operating mode: voltage input AI (U) | | |
|---|--|---|
| Feature | Value | Description |
| Connections per input | – | AI (U/T) and AGND or AI (U) and AGND; connect screening with AGND. |
| Measuring range | -10 to $+10$ V | – |
| Input impedance in signal range | 100 k Ω | applies between AI (U/T) and AGND or between AI (U) and AGND value when the channel is switched on or off |
| Max. errors at 25 °C | $\pm 0.8\%$ ($\pm 2^\circ\text{C}$) | – |
| Temperature coefficient | ± 40 ppm/K (± 0.4 mV/K) | – |
| Digital resolution | 24 bit | – |
| Data format in user program | 32 bit real | (floating-point number) in millivolts (mV) |
| Maximum permissible permanent overload | Max. ± 30 V compared to AGND | ± 30 V = max. voltage on AI channel |
| Value of least significant bit | 1.2 μV | – |
| Output of digital value in case of overload | – | If a voltage of ± 10 V is applied to an AI (U), a plausible value is still given up to approx. ± 15 V. The specified accuracy is only valid for the range -10 to $+10$ V. When applying voltages above $+15$ V or below -15 V, a fault bit (FAULTN/FAULTP) is set in the process image which can be read by the user program.. |
| Input type | – | Unsymmetrical voltage metering (single-ended) |
| Reference potential | AGND | – |
| Dynamic characteristics | | |
| Analogue filtering | Second-grade low-pass filter; cut-off frequency 650 Hz | – |

| Operating mode: voltage input AI (U) | | |
|---|-----------------------|-------------|
| Feature | Value | Description |
| Greatest temporary deviation during electrical error testing according to IEC 61131-2 | 1% of measuring range | – |

| Operating mode: temperature inputs AI-PT | | |
|--|-----------------------------------|--|
| Feature | Value | Description |
| Connections per input | – | Sensor connection between AI (U/T) and AGND (if applicable, an additional AI (U) channel is used for 3-wire measurement) |
| Possible sensors | PT100 and PT1000 acc. to EN 60751 | Accuracy class AA, A, B and C platinum sensors may be used |
| Measuring range | –40 to +200 °C | – |
| Measuring current (RMS) | 0.3 mA | – |
| Conversion time | 250 ms | – |
| Max. errors at 25 °C | ±2100 ppm (±0.5 °C) | – |
| Temperature coefficient | ±50 ppm/K (±0.012 °C/K) | – |
| Digital resolution | 24 bit | – |
| Data format in user program | 2 × 32 bit real | (floating-point number) in Ohms (Ω) and degrees Celsius (°C) |
| Linearisation | – | The value in degrees Celsius is calculated from the resistance value and linearised (6 th degree polynomial) |
| Input type | – | 2-wire measurement or 3-wire measurement |
| Reference potential | AGND | – |

Dynamic characteristics

| | | |
|---|--|---|
| Analogue filtering | Second-grade low-pass filter; cut-off frequency 650 Hz | – |
| Greatest temporary deviation during electrical error testing according to IEC 61131-2 | 1% of measuring range | – |

Voltage input AI (U)

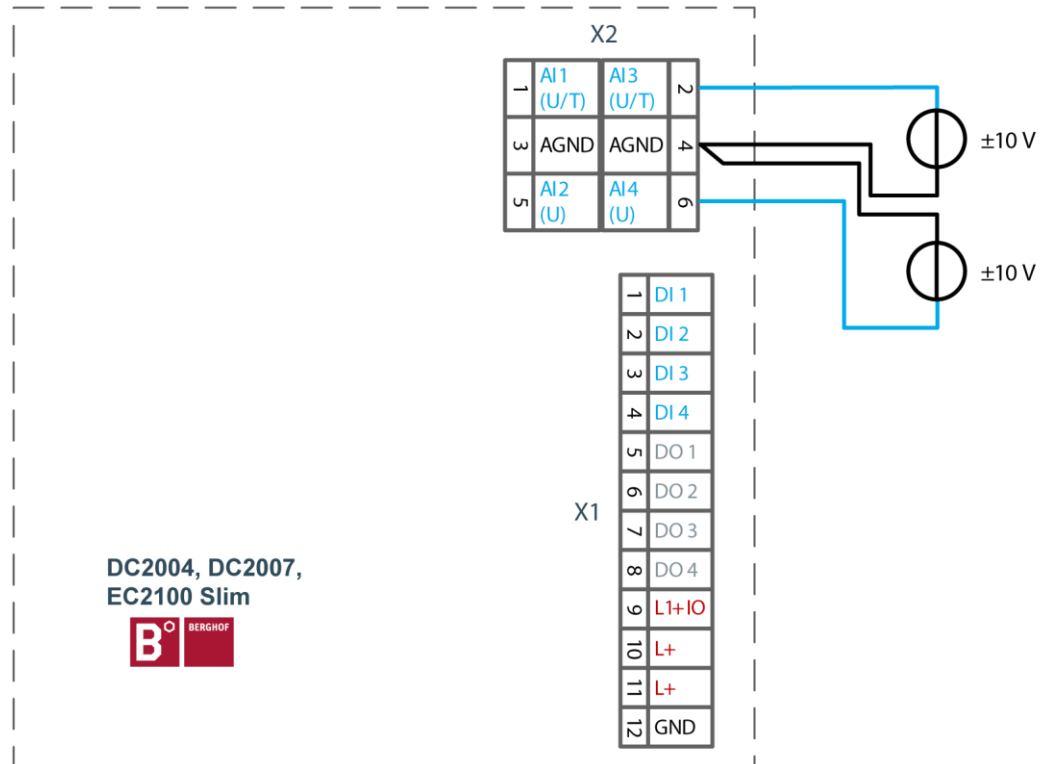


Fig. 30: example connection: voltage input

- ▶ Only use the corresponding AGND for each voltage input.
- ▶ Do not connect AGNDs from different channels.
- ▶ AGNDs from different channels must always be connected separately to the plug X1.
- ▶ Do not connect to the common GND. The required connections can already be found on the circuit board.
- ▶ Cables to the analogue sensors/encoders should be connected as directly as possible (avoid the use of terminals and terminal blocks).

Temperature measurement AI (T)

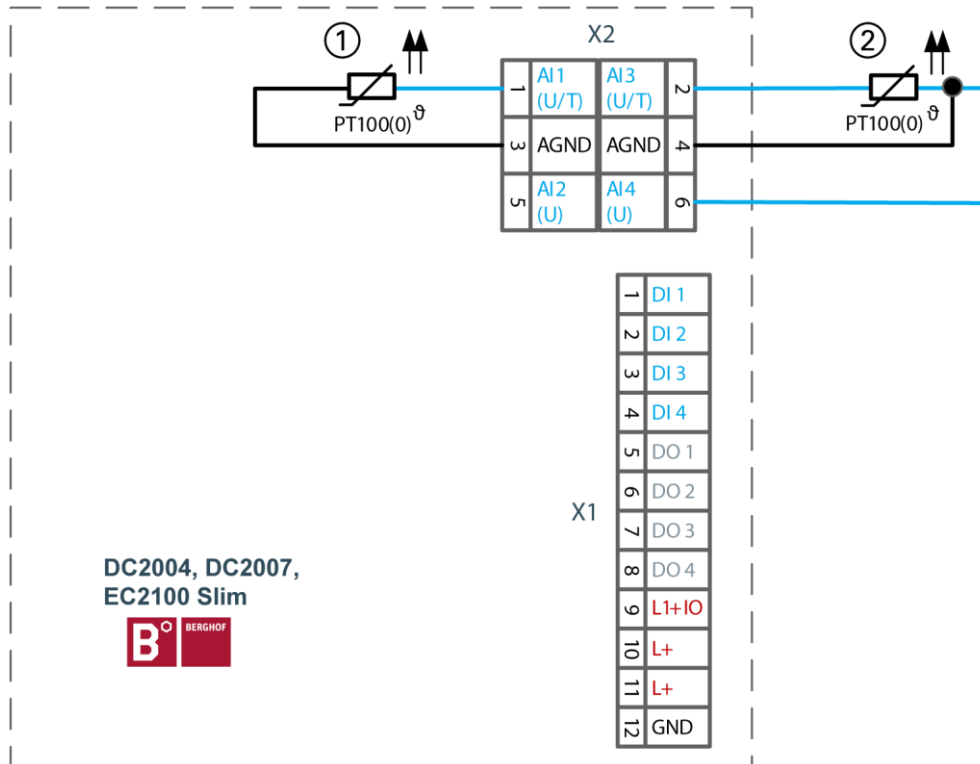


Fig. 31: example connection: temperature measurement

| Item | Description |
|------|-------------------------------|
| 1 | PT 100 with 2-wire connection |
| 2 | PT 100 with 3-wire connection |

- ▶ Only use the corresponding AGND for each input.
- ▶ Do not connect AGNDs from different channels.
- ▶ Do not connect to the common GND. The required connections can already be found on the circuit board.
- ▶ Cables to the PT100(o) sensors should be connected as directly as possible (avoid the use of terminals and terminal blocks).
- ▶ Only connect PT100(o) sensors to AI (U/T) channels.

2-wire measurement

Resistance can result in a measurement error, which in the case of long cables with a small cross-section can be up to 10°. If the temperature of the sensor is known, this deviation can be subtracted by the software automatically and compensated (alternatively, use 3-wire measurement).

3-wire measurement

The nearest AI (U) connection is used to compensate the resistance in the cable. It can only be used directly in conjunction with the following AI (U/T) channel. Channels 1 and 2, and also channels 3 and 4 each form a pair for 3-wire measurement.

6. Operation

6.1. Switching on and off

| | |
|-----------------|--|
| i NOTICE | Damage or malfunction! <ul style="list-style-type: none">▶ Do not insert, connect, undo or touch any connections whilst the device is in operation.▶ Before starting any work on the device, switch off all power feeds, including those to any connected peripherals (sensors and programmable devices etc. with independent power supplies). |
| i NOTICE | Damage to property <ul style="list-style-type: none">▶ Before connecting the power supply, ensure that all cabling and the polarity of all the connections are correct. |

Switching on

The device does not have an on/off switch. The device starts automatically when the system is switched on or the power is connected.

Switching off

The device is switched off when the system is switched off or the power supply is disconnected.

6.2. Network start-up

6.2.1. DC20XX

The device must be connected to the network with the correct settings before it can be used.

| | |
|-----------------|---|
| i NOTICE | Damage to property ► Before connecting the power supply, ensure that all cabling is correct, including the polarity of all the connections. |
|-----------------|---|

1. Supply the device with power (24 V).
After startup, the current IP-address and netmask of the DC20XX are shown in the top right of the display.
2. Connect the device to a programming computer using a network cable (X4) and network switch.
3. Open a web browser on the programming computer.
4. Enter the IP address of the device into the web browser.
The login screen will appear.



User Login:

Name:

Password:

Fig. 32: login window

5. Use the following user name and password to log into the device:
Name: admin
Password: admin

The web configuration page will be displayed.

Configuration

[Network](#)
[Real-Time-Clock](#)
[Display](#)
[FTP-Server](#)
[Users](#)

System

[Info](#)
[Update](#)
[Reboot](#)
[Format Filesys](#)

PLC-Manager

[Control](#)
[Application Info](#)
[Application Files](#)
[Font Files](#)

Fig. 33: list of web interface settings

6. Click on the “Network” link.
 The “Network Configuration” page is displayed.

Network Configuration

COMMON

| | |
|-----------------|---------------------------------------|
| Hostname | <input type="text" value="BGH-IMX6"/> |
| Default Gateway | <input type="text" value="0.0.0.0"/> |
| DNS Server 1 | <input type="text" value="0.0.0.0"/> |
| DNS Server 2 | <input type="text" value="0.0.0.0"/> |

ETH0

| | |
|----------|--|
| Mode: | <input type="text" value="static"/> |
| IPAdress | <input type="text" value="169.254.255.100"/> |
| NetMask | <input type="text" value="255.255.255.0"/> |

ETH1

| | |
|-------|---------------------------------------|
| Mode: | <input type="text" value="ethercat"/> |
|-------|---------------------------------------|

Fig. 34: “Network Configuration” page

7. Check the network settings and make any changes in the text boxes if required.
 DC2oXX configuration: ETH0 = X4, ETH1 = X5
8. Save the settings by clicking on “Save”.
9. Additional settings can also be viewed and/or modified on the web configuration page (e.g. system time, display resolution, TargetVisu).

10. In order to activate all of the modified settings, reboot the device:
 Disconnect the device temporarily from the power supply
 – or –
 Click on “Reboot” in the web interface and then confirm on the next screen by clicking on “Reboot Module”.

The device is now configured and ready for use.

6.2.2. ET20XX

The device must be connected to the network with the correct settings before it can be used.

| | |
|-----------------|---|
| i NOTICE | Damage to property ► Before connecting the power supply, ensure that all cabling is correct, including the polarity of all the connections. |
|-----------------|---|

1. Supply the device with power (24 V).
 After startup the current network settings are displayed (server IP, IP-address and netmask).

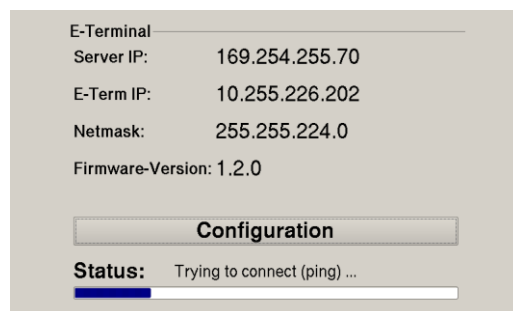


Fig. 35: Startup page with network settings

2. Press the button “Configuration”.

A page with further information appears.

E-Terminal Information

| | |
|-------------------|-------------------|
| Part-Name: | ET2007W V TS 0.8S |
| Part-Number: | 222001500 |
| Serial-Number: | 00138 |
| HW-Revision: | 0002 |
| FDT-Version: | 21 |
| Firmware-Version: | 1.2.0 |
| Firmware-Date: | 11/05/14 16:39 |
| MAC-Address: | 00:E0:BA:95:02:50 |
| Screenresolution: | 800x480 |

Back Cancel Next

Fig. 36: Info page

3. Press the button "Next".

The page with the current network settings of the device appears.

E-Terminal Settings: IP-Addresses

| | | |
|-----------|----------------|------|
| Terminal: | 10.255.226.202 | Edit |
| Netmask: | 255.255.224.0 | Edit |
| Gateway: | 0.0.0.0 | Edit |

Back Expert Cancel Next

Fig. 37: Network settings of the device

4. Where necessary press the button "Edit" to change the network setting accordingly (IP-address, netmask, gateway).

5. Press the button "Next".

The page with the settings of server IP and lifeguard appears.

E-Terminal Settings: VNC

| | | |
|------------|----------------|--------|
| Server: | 169.254.255.70 | Edit |
| Scaling: | no scaling | Change |
| Lifeguard: | Ping LG | |

Back Expert Cancel Next

Server:

10.255.226.146

| | | | |
|---|---|----|--------|
| 1 | 2 | 3 | <- |
| 4 | 5 | 6 | -> |
| 7 | 8 | 9 | Cancel |
| . | 0 | <= | OK |

Fig. 38: Netzwerkeinstellungen des Geräts

6. If necessary, press the button "Edit" to change the server IP.

7. Press the button "Expert" to change the lifeguard setting.
The page with the expert settings appears.
– or –
Press the button "Next" and skip the following step.

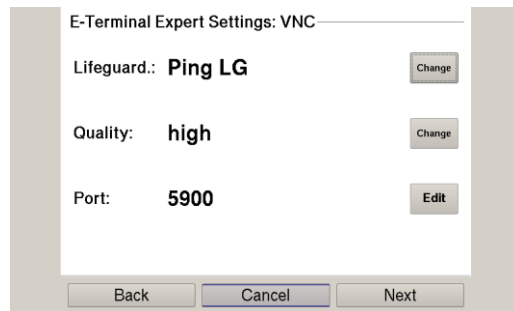


Fig. 39: Lifeguard-Einstellung ändern

8. Change the lifeguard setting via the button "Change" according to the version of the controller:
CODESYS V2: "Berghof VNC LG"
CODESYS V3: "Ping LG"
9. Skip the following pages via the button "Next" until the page with the summary of the network settings appears.

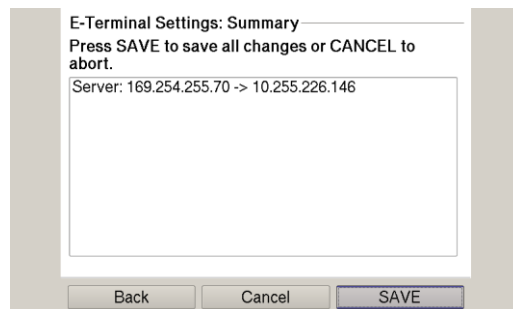


Fig. 40: Summary of the network settings

10. If no settings were changed, press the button "Okay".
The main screen of the device appears.
– or –
Press the button "Save".
The settings are saved and the device reboots automatically.
11. Connect the device to the controller using a network cable.

The device is now configured and ready for use.

6.2.3. ECC2100 Slim

The device must be connected to the network with the correct settings before it can be used.

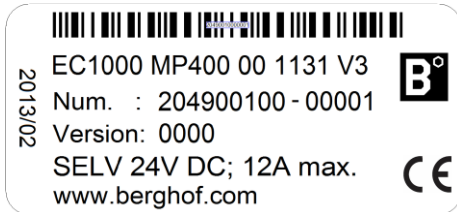


Fig. 41: identification plate with device serial number 00001 (example)

1. Note down the IP address and subnet mask:
 - IP address: 169.254.255.XX
XX corresponds to the last 2 digits of the device serial number. Exception: 00 becomes 100.
 - Subnet mask: 255.255.255.0



Damage to property

- Before connecting the power supply, ensure that all cabling is correct, including the polarity of all the connections.

2. Supply the device with power (24 V).
 3. Connect the device to a programming computer using a network cable (X4) and network switch.
 4. Open a web browser on the programming computer.
 5. Enter the IP address of the device into the web browser.
- The login screen will appear.



User Login:

Name:

Password:

Fig. 42: login window

6. Use the following user name and password to log into the device:
 - Name: admin
 - Password: admin

The web configuration page will be displayed.

Configuration

[Network](#)
[Real-Time-Clock](#)
[Display](#)
[FTP-Server](#)
[Users](#)

System

[Info](#)
[Update](#)
[Reboot](#)
[Format Filesys](#)

PLC-Manager

[Control](#)
[Application Info](#)
[Application Files](#)
[Font Files](#)

Fig. 43: list of web interface settings

7. Click on the “Network” link.
 The “Network Configuration” page is displayed.

Network Configuration

COMMON

Hostname

Default Gateway

DNS Server 1

DNS Server 2

ETH0

Mode:

IPAdress

NetMask

ETH1

Mode:

Fig. 44: “Network Configuration” page

8. Check the network settings and make any changes in the text boxes if required.
 ECC2100 Slim configuration: ETH0 = X4, ETH1 = X5
9. Save the settings by clicking on “Save”.
10. Additional settings can also be viewed and/or modified on the web configuration page (e.g. system time, display resolution, TargetVisu).

11. In order to activate all of the modified settings, reboot the device:
Disconnect the device temporarily from the power supply
– or –
Click on “Reboot” in the web interface and then confirm on the next screen by clicking on “Reboot Module”.

The device is now configured and ready for use.

6.3. Operation

6.3.1. Status displays

The status display function is dependent on the software development environment used in conjunction with the device.

The operating status LEDs show the current status of the power supply, the module mode and any error messages.

The signals from the LEDs depend on the current operating status of the device:

- CODESYS inactive: the firmware controls the LEDs.
- CODESYS active: only the CODESYS runtime system (CODESYS Runtime) controls the LEDs.

Location of the operating status LEDs

The Run/Stop and Error LEDs display the system status.

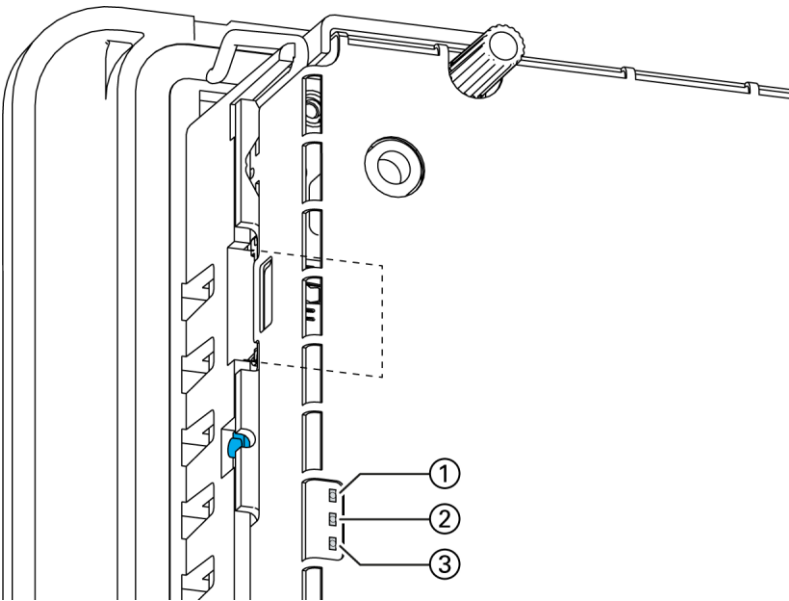


Fig. 45: Location of the operating status LEDs

| LED | Meaning |
|----------------------------------|--|
| 1 PWR (green) | shows that the power supply to the electronics is correct. |
| 2 Run/Stop (yellow/green/red) | shows the system statuses and CODESYS operating statuses. |
| 3 Error (red) | shows the device has been stopped due to an error. |

Meaning of the LED displays

- System statuses are shown using flashing signals on the Run/Stop LED in yellow.
- CODESYS operating statuses are shown via continuous illumination of the Run/Stop LED as either red or green.
- While the Run/Stop light is flashing yellow: the device is in use and must not be switched off.
- The device does not show warnings via the LEDs during start-up.

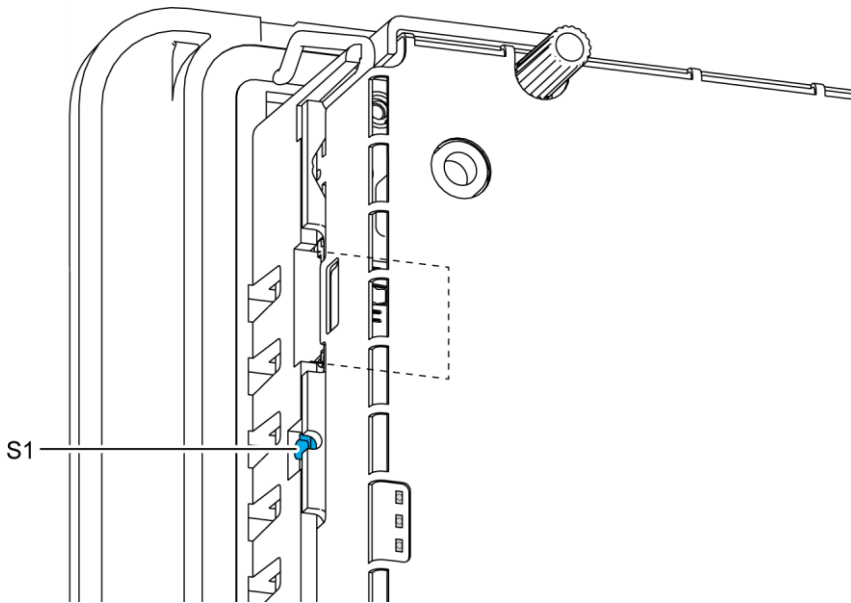
6.3.2. Start/Stop

Fig. 46: function key (S1)

| Function key (S1) | | |
|--------------------------|----------------|---|
| Operating status | Action | Command |
| Boot phase | Press | Change to maintenance mode |
| CODESYS PLC/ CP1131-P | Press quickly | Change between PLC run and stop mode. |
| | Press and hold | Stop PLC with reset of variables (cold reset) |

6.3.3. Real time clock with battery back-up DC20XX and ECC2100 Slim

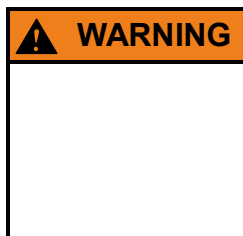
Setting the date and time

The time can be set via the web configuration page or the CODESYS V3 library.

Changing the battery

The battery is not designed to be changed by the user; the manufacturer should be contacted in order to change the battery.

6.3.4. microSD card



Serious injury as a result of uncontrolled and unpredictable operational behaviour!

Inserting or removing the microSD card can result in the device malfunctioning. Failure in electronic control systems may result in uncontrolled and unpredictable operational behaviour.

- Insert or remove a microSD card only when the device is switched off.



Loss of data!

microSD cards do not have their own write protection system.

- Ensure that no data is deleted or overwritten by accident.

Inserting a microSD card

1. Switch the device off.
2. Insert the microSD card into the microSD card slot.
3. Switch the device on again.

The microSD card is now ready for data transfer (read, write and copy).

Path: /media/sd



Max. possible storage capacity: 32 GB.

The life cycle of the gold-plated contacts is up to 10,000 plugging and unplugging cycles.

The microSD card drive has a push-in/push-out insertion and ejection mechanism.

To avoid malfunction, the microSD card may not be removed by pulling.

6.4. Troubleshooting

6.4.1. No network connection

- ▶ Check cabling/switch.
- ▶ Check if an IP-address has been allocated twice.
- ▶ Check the network settings: subnet and subnet mask must match the settings of the controller.
- ▶ Check firewall/anti-virus programs on the PC.
- ▶ ET20XX: Check the lifeguard settings.
- ▶ ECC2100 Slim: Check for unknown IP-address (see 6.4.3).

6.4.2. In error stop mode for the DC20XX/ECC2100 Slim

1. Log into device on the web browser.
2. Establish cause of fault (Diagnostics > PLC Log/System Log).
3. Correct the fault.
4. Restart the device (press “Reset” on the device).

The device is now ready for use.

6.4.3. Unknown IP-address on the ECC2100 Slim

If the IP address of the device is unknown, maintenance mode can be used to reconfigure it.

1. Reboot the device while pressing and holding S1 until the Run/Stop LED flashes every 2 seconds.

The device is now in maintenance mode and can be reached via the default IP address.

2. Connect to the device using the default IP address:

→ IP address: 169.254.255.XX

Netmask: 255.255.255.0

XX corresponds to the last 2 digits of the device serial number. Exception: 00 becomes 100.

3. Correct the network settings and make a note of them.
4. Restart the device.


Maintenance mode is turned off automatically.

The device is now configured and ready for use.

7. Maintenance/upkeep

Repairs and corrective maintenance may only be carried out by the manufacturer or authorised customer service centres.

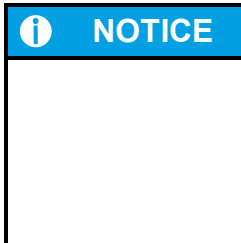
7.1. Maintenance

| | |
|---|---|
| <div data-bbox="304 680 544 734">  WARNING </div> <div data-bbox="304 734 544 978"></div> | <p>Uncontrolled and unpredictable operational behaviour!</p> <p>Failures or malfunctions may result in uncontrolled and unpredictable operational behaviour.</p> <ul style="list-style-type: none"> ▶ Do not insert, connect, undo or touch any connections whilst the device is in operation. ▶ Before starting any work on the device, switch off all power feeds, including those to any connected peripherals (sensors and programmable devices etc. with independent power supplies). |
|---|---|

If the device is used correctly it should not require maintenance.

- ▶ Make sure all the ventilation holes are kept free of obstructions.
- ▶ Do not open the device. If work is required on the device necessary contact customer service.

7.2. Cleaning



Damage to the front panel!

The front panel must not be exposed to any mechanical or chemical stress.

- ▶ Do not use any high-pressure cleaners or steam jets.
- ▶ Do not use any corrosive cleaning products, any thinners, any abrasive media or any hard objects.
- ▶ Do not apply any undue force to the front face.

- ▶ To avoid faults due to inadvertent activation, switch the device off before cleaning the front panel.
- ▶ Clean the device using only a dry, lint-free cloth.

7.3. Chemical resistance

7.3.1. Resistance of the touch screen

The active area of the touch screen is resistant to the following chemicals when exposed to them for a period of up to an hour at a temperature of max. 21 °C:

Domestic and industrial chemicals

- Detergent
- All-purpose cleaners
- Washing-up liquid
- Glass cleaner
- Hydrogen peroxide (3 %)
- Lysol
- Ethanol
- Isopropanol
- Acetone
- Methyl ethyl ketone
- Toluene
- Concentrated hydrochloric acid
- Petroleum
- White spirit
- Petrol
- Engine oil
- Diesel
- Gear oil
- Brake fluid
- Anti-freeze
- Hydraulic oil

Condiments

- Lemon juice
- Tomato juice
- Mustard
- Tomato ketchup

7.3.2. Resistance of the front diaphragm

| | |
|-----------------|--|
| i NOTICE | <p>Damage to the front diaphragm!</p> <p>The front diaphragm is not resistant to the following chemicals and influences, and can be damaged by their effects:</p> <ul style="list-style-type: none"> Benzyl alcohol Concentrated alkalis Concentrated inorganic acids Dichloromethane (methylene chloride) High-pressure steam above 100 °C long-term effects of direct sunlight <ul style="list-style-type: none"> ▶ Keep these substances away from the front diaphragm. ▶ Protect the display against direct sunlight. |
|-----------------|--|

The front diaphragm (Autoflex EB) is based on a polyester film with biaxial alignment. It is highly resistant to solvents.

The front diaphragm is resistant to the standard of DIN 42 115 part 2 against the following chemicals, without any evident change or damage:

Application of more than 24 hours

- 1,1,1 trichloro ethane
- Aliphatic hydrocarbons
- Benzene
- Cyclohexanol
- Diethyl ether
- Ethanol

- Acetaldehyde
- Acetone
- Acetic acid < 50 %
- Sulphuric acid 30 %
- Diacetone alcohol
- 1,4 dioxane
- DS2 decontamination fluid
- Fabric conditioner

- Acetonitrile
- Alkali carbonate
- Ammonia < 32 %
- Sal ammoniac < 10 %
- Bichromate

- Caustic potash (potassium hydroxide) < 2 %
- Sodium hydroxide 50 %
- Refrigerant (Hysol X)
- Diesel oil
- Castor oil
- Silver nitrate 20 %

- Ethyl acetate
- Acetaldehyde
- Fluorochlorinated hydrocarbons
- Glycerine
- Isopropanol
- Methanol

- Ferric chloride < 30 %
- Formic acid (methane acid) < 50 %
- Hydrochloric acid < 10 %
- Hydrogen peroxide < 25 %
- Isophorone
- Methyl ethyl ketone (butanone)
- Nitric acid < 10 %
- Tetrahydrofuran
- Formaldehyde (37 %) in water

- Linseed oil
- Paraffin oil
- Petrol
- Silicone oil
- Turpentine substitute
- Universal brake fluid (e.g. Castrol Girling)
- Dibasic ester 6
- Skydrol 500B4
- Lixtop
- Potassium ferrocyanide

- Tetrachloro ethylene (perchloro ethylene)
- Toluene
- Triacetin
- Trichloro ethylene
- Xylene

- Phosphoric acid < 30 %
- Potash
- Sodium hypochlorite < 20 %
- Sulphuric acid < 10 %
- Detergent
- Saturated seawater solution

Application of 24 hours at 50 °C

- Top Job
- Jet Dry
- Gumption
- Fantastic
- Formula 409
- Grape juice
- Milk
- Ariel
- Persil
- Wisk
- Lenor
- Downey
- Ajax
- Vim
- Domestos
- Vortex
- Windex

Application of less than 1 hour

- Glacial acetic acid (pure acetic acid)

8. Uninstallation

8.1. Uninstallation, DC20XX and ET20XX

1. Disconnect the device and its peripherals from the power supply.
2. Unplug all plug connectors and cables.
3. Device with twist-lock catches: Using a T9x50 screwdriver, fully open the twist-lock catches and turn them anti-clockwise to the stop.

NOTICE

Damage to the device!

If uninstallation is performed carelessly the device can fall out of the installation cut-out or be damaged.

- ▶ Do not tilt the device.
- ▶ Secure the device against falling, especially when taking it out of the installation cut-out.

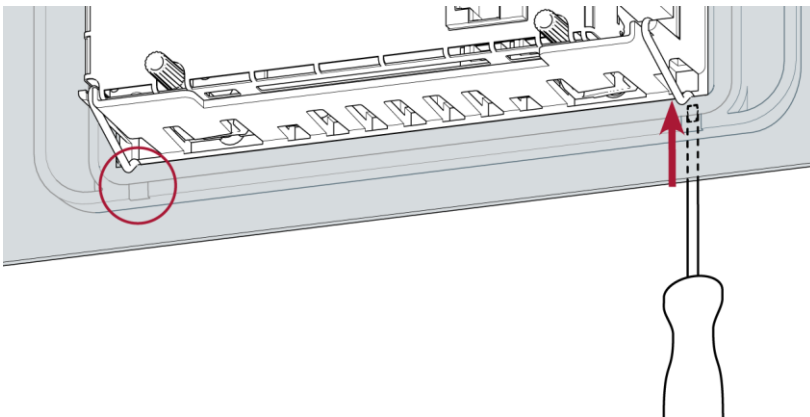


Fig. 47: Undo the securing clips

4. Using a slotted screwdriver (blade 3–3.5 mm) undo the securing clips.
 DC2004 and ET2004: 4 securing clips (2 at the bottom, 2 at the top)
 DC2007 and ET2007: 6 securing clips (3 at the bottom, 3 at the top)
5. Push the device sufficiently far out of the installation cut-out that the securing clips are no longer engaged.

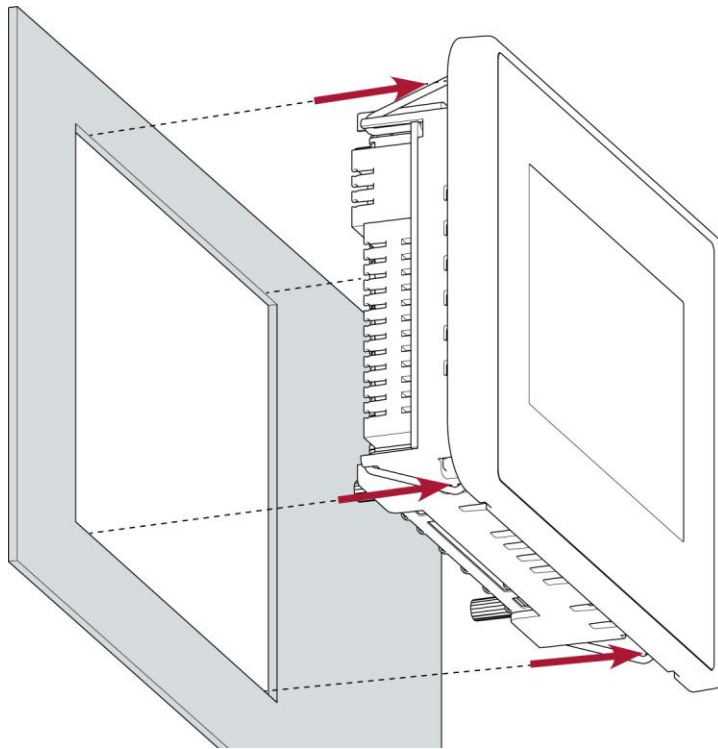


Fig. 48: Pushing the device out of the installation cut-out

6. Push the device evenly forwards out of the installation cut-out.

8.2. Uninstallation, ECC2100 Slim



Danger of burns!

The surface of the device can become hot.

- If necessary, allow the device to cool down before uninstalling it.

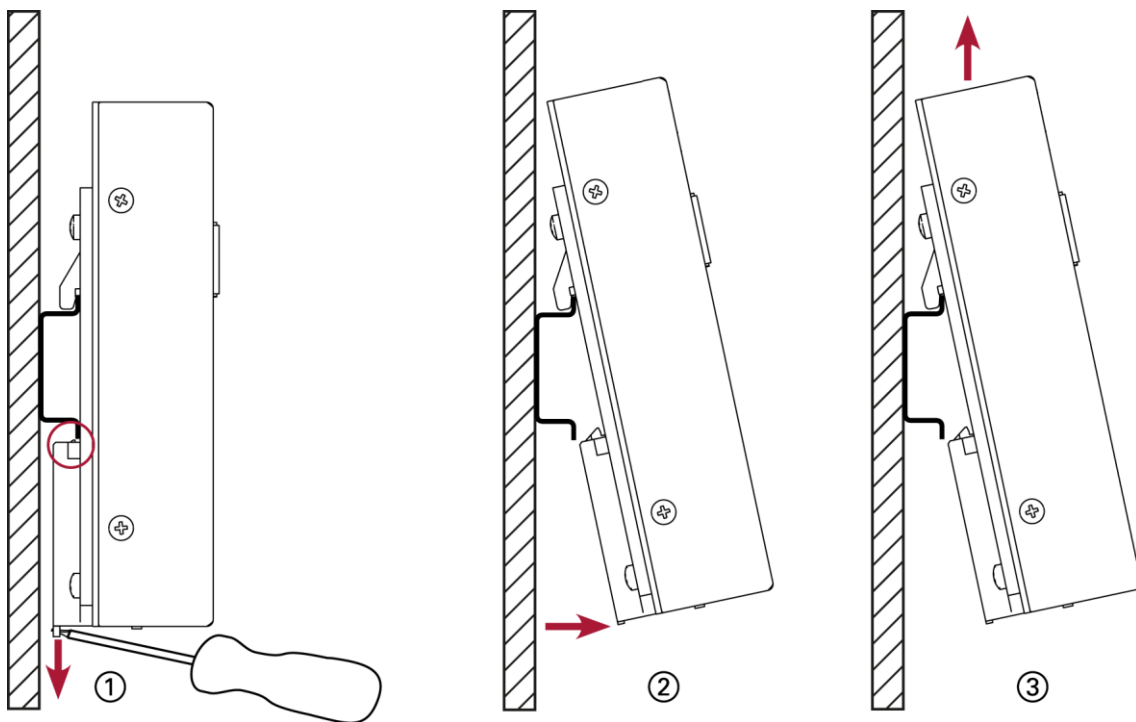


Fig. 49: Uninstalling the device

1. Use the slotted screwdriver to pull the retaining spring down fully and free the device below the mounting rail.
2. Pull the lower device catch off the mounting rail.
3. Push the device up and remove it from the mounting rail.

9. Disposal

The device contains the following components which need to be disposed of separately:

- Metals
- Electronic components
- Battery

The following options are available for disposal of the device:

Disposal by the manufacturer

- ▶ At the end of the device's life cycle you can return it to the manufacturer for a set fee. The manufacturer will then deal with the recycling of the device.

Disposal in accordance with regional regulations

- ▶ Dismantle the device and disassemble it completely into its component parts.
- ▶ Send the metal parts for metal recycling.
- ▶ Sort the electronic parts (circuit boards, drives etc.).
- ▶ Dispose of the electronic scrap in accordance with the national laws and regulations.
- ▶ Check that the battery is fully discharged.
- ▶ Dispose of the battery in accordance with the national laws and regulations, via an authorised collection point.

10. Technical data

10.1. DC20XX Dialog Controller

| Dialog Controller | DC2004 | DC2007 |
|--------------------------------------|--|-------------------|
| Display | WQVGA | WVGA |
| Across diagonals | 4.3" | 7" wide |
| Item no. | 27005800 | 27005900 |
| Resolution | 480 x 272 pixels | 800 x 480 pixels |
| Colours | TFT: 16.7 M (24 bits/pixel) | |
| CPU, user memory | | |
| CPU | 800 MHz ARM® CPU | |
| Program memory (flash) | 256 MB | |
| Program memory and data memory (RAM) | 256 MB | |
| Retain memory | 100 kB (FRAM) | |
| Dimensions and weight | | |
| Dimensions (WxHxD) | 161 x 103 x 57 mm | 222 x 152 x 57 mm |
| Weight | approx. 450 g | approx. 600 g |
| Operating conditions | | |
| Ambient temperature (front side) | 0 °C to 55 °C (in compliance with installation requirements) | |
| Surrounding temperature (rear side) | 0 °C to 55 °C (in compliance with installation requirements) | |
| Relative humidity | max. 85%, non-condensing | |
| Transport and storage | | |
| Ambient temperature | –20 °C to +70 °C | |
| Relative humidity | max. 85%, non-condensing | |
| Operation | | |
| Installation | integral securing clips | |
| Certification | to product standards EN 61010-2-201, EN 61131-2 | |
| Development environment | CODESYS V3 (IEC 61131-3) | |
| Touch operation | Touch resistive | |

| Dialog Controller | DC2004 | DC2007 |
|-------------------------------------|---|--------|
| Shock resistance | | |
| Vibration | sinusoidal (EN 60068-2-6) test: Fc 10...150 Hz, 10 m/s² | |
| Shock | 15 G (approx. 150 m/s²), 11 ms duration, sinusoidal half-wave (EN 60068-2-27) test: Ea | |
| EMC, protection rating | | |
| Emitted interference | EN 61131-2; EN 61000-6-3, residential areas | |
| Resistance to interference | EN 61131-2; EN 61000-6-2, industrial areas | |
| Protection class | III | |
| Protection rating | IP20 (IP65 only with twist-lock catches tightened) | |
| Power supply (24 V power) | | |
| Supply voltage | +24 V DC (–15 % / +20 %) SELV max. Alternating current proportion 5% | |
| Power consumption | typ. 0.3 A, max. 3 A at +24 V DC, fused depending on the load on the I/O | |
| Protection against reverse polarity | yes | |
| Voltage failure switching | 10 ms at < 20.4 V DC | |
| Ethernet interfaces | | |
| No. / type of interface | 1x 10/100 Base T | |
| Connection system | RJ45 | |
| Protocols | TCP/IP, Modbus TCP, BACnet, Profinet | |
| EtherCAT interfaces | | |
| No. / type of interface | 1x EtherCAT (EtherCAT master) | |
| Connection system | RJ45 | |
| USB interfaces | | |
| No. / type of interface | 1x host USB 2.0 / USB plug port A | |
| No. plugging/unplugging cycles | max. 1,000 | |
| CAN bus interfaces | | |
| No. / type of interface | 1x CAN bus | |
| Protocols | CAN-Bus and/or CANopen master | |
| Serial interfaces | | |
| No. / type of interface | 1x RS-232; 1 x RS-485 | |
| Protocols | Modbus RTU | |

| Dialog Controller | DC2004 | DC2007 |
|---|---|--------|
| Additional functions | | |
| Real-time clock | yes, with battery back-up | |
| microSD card slot | 1x microSD card | |
| I/O | | |
| Digital IN | 4x | |
| Digital OUT | 4x (0.5 A) | |
| Analogue IN | 2x (–10...+10 V, PT100/PT1000 with 2-wire) 2x (–10...+10 V, or return lead for 3-wire) | |
| Battery | | |
| Type | Panasonic VL2020 or similar | |
| Lifespan | 10 years (depends on operating temperature) | |
| Storage | 1 year without voltage (any longer and RTC data can be lost) | |
| Front membrane display (Autoflex) | | |
| Ambient temperature (rel. atmospheric humidity 10...95 %) | –40...+60 °C | |
| Ambient temperature (rel. atmospheric humidity < 10 %) | –40...+85 °C (without loss of functionality after 0.5 million activations at –40 °C) | |
| Use outdoors | Like all polyester-based membranes, Autoflex is unsuitable for long-term exposure to direct sunlight. | |

10.2. ET20XX Ethernet Terminal

| Ethernet Terminal | ET2004 | ET2007 |
|--------------------------------------|---|-------------------|
| Display | WQVGA | WVGA |
| Across diagonals | 4.3" | 7" wide |
| Item no. | 27005800 | 27005900 |
| Resolution | 480 x 272 pixels | 800 x 480 pixels |
| Colours | TFT: 16.7 M (24 bits/pixel) | |
| CPU, user memory | | |
| CPU | 800 MHz ARM® CPU | |
| Program memory (flash) | 512 MB | |
| Program memory and data memory (RAM) | 512 MB | |
| Dimensions and weight | | |
| Dimensions (WxHxD) | 161 x 103 x 57 mm | 222 x 152 x 57 mm |
| Weight | approx. 450 g | approx. 600 g |
| Operating conditions | | |
| Ambient temperature (front side) | 0 °C to 55 °C (in compliance with installation requirements) | |
| Surrounding temperature (rear side) | 0 °C to 55 °C (in compliance with installation requirements) | |
| Relative humidity | max. 85%, non-condensing | |
| Transport and storage | | |
| Ambient temperature | –20 °C to +70 °C | |
| Relative humidity | max. 85%, non-condensing | |
| Operation | | |
| Installation | integral securing clips | |
| Certification | to product standards EN 61010-2-201, EN 61131-1 | |
| Touch operation | Touch resistive | |
| Shock resistance | | |
| Vibration | sinusoidal (EN 60068-2-6) test: Fc 10...150 Hz, 10 m/s² | |
| Shock | 15 G (approx. 150 m/s²), 11 ms duration, sinusoidal half-wave (EN 60068-2-27) test: Ea | |

| Ethernet Terminal | ET2004 | ET2007 |
|---|---|--------|
| EMC, protection rating | | |
| Emitted interference | EN 61131-2; EN 61000-6-3, residential areas | |
| Resistance to interference | EN 61131-2; EN 61000-6-2, industrial areas | |
| Protection class | III | |
| Protection rating | IP20 (IP65 only with twist-lock catches tightened) | |
| Power supply (24 V power) | | |
| Supply voltage | +24 V DC (–15 % / +20 %) SELV max. Alternating current proportion 5% | |
| Power consumption | typ. 0.3 A, max. 3 A at +24 V DC, fused depending on the load on the I/O | |
| Protection against reverse polarity | yes | |
| Ethernet interfaces | | |
| No. / type of interface | 1x 10/100 Base T | |
| Connection system | RJ45 | |
| Protocols | TCP/IP | |
| USB interfaces | | |
| No. / type of interface | 1x host USB 2.0 / USB plug port A | |
| No. plugging/unplugging cycles | max. 1,000 | |
| Additional functions | | |
| microSD card slot | 1x microSD card (for future applications, currently not usable) | |
| Front membrane display (Autoflex) | | |
| Ambient temperature (rel. atmospheric humidity 10...95 %) | –40...+60 °C | |
| Ambient temperature (rel. atmospheric humidity < 10 %) | –40...+85 °C (without loss of functionality after 0.5 million activations at –40 °C) | |
| Use outdoors | Like all polyester-based membranes, Autoflex is unsuitable for long-term exposure to direct sunlight. | |

10.3. ECC2100 Slim Ethernet controller

| Ethernet controller | ECC2100 Slim |
|--------------------------------------|---|
| CPU, user memory | |
| CPU | 800 MHz ARM® CPU |
| Program memory (flash) | 256 MB |
| Program memory and data memory (RAM) | 256 MB |
| Retain memory | 100 kB (FRAM) |
| Dimensions and weight | |
| Dimensions (WxHxD) | 95 x 128 x 46 mm |
| Weight | approx. 550 g |
| Operating conditions | |
| Surrounding temperature | 0 °C to 55 °C (in compliance with installation requirements) |
| Relative humidity | max. 85%, non-condensing |
| Transport and storage | |
| Ambient temperature | –20 °C to +70 °C |
| Relative humidity | max. 85%, non-condensing |
| Operation | |
| Installation | on a mounting rail to DIN EN 60715:2001, 35 x 7.5 mm |
| Certification | to product standards DIN EN 61010-2-201, DIN EN 61131-2 |
| Development environment | CODESYS V3 (IEC 61131-3) |
| Shock resistance | |
| Vibration | sinusoidal (EN 60068-2-6) test: Fc 10...150 Hz, 10 m/s² |
| Shock | 15 G (approx. 150 m/s²), 11 ms duration, sinusoidal half-wave (EN 60068-2-27); test: Ea |
| EMC, protection rating | |
| Emitted interference | EN 61131-2; EN 61000-6-3, residential areas |
| Resistance to interference | EN 61131-2; EN 61000-6-2, industrial areas |
| Protection class | III |
| Protection rating | IP20 |
| Power supply (24 V power) | |
| Supply voltage | +24 V DC (–15 % / +20 %) SELV max. Alternating current proportion 5% |

| Ethernet controller | | ECC2100 Slim |
|-------------------------------------|--|---|
| Power consumption | | typ. 0.3 A, max. 3 A at +24 V DC, fused depending on the load on the I/O |
| Protection against reverse polarity | | yes |
| Voltage failure switching | | 10 ms at < 20.4 V DC |
| Ethernet interfaces | | |
| No. / type of interface | | 1x 10/100 Base T |
| Connection system | | RJ45 |
| Protocols | | TCP/IP, Modbus TCP, BACnet, Profinet |
| EtherCAT interfaces | | |
| No. / type of interface | | 1x EtherCAT (EtherCAT master) |
| Connection system | | RJ45 |
| USB interfaces | | |
| No. / type of interface | | 1x host USB 2.0 / USB plug port A |
| No. plugging/unplugging cycles | | max. 1,000 |
| CAN bus interfaces | | |
| No. / type of interface | | 1x CAN bus |
| Protocols | | CAN-Bus and/or CANopen master |
| Serial interfaces | | |
| No. / type of interface | | 1x RS-232; 1 x RS-485 |
| Protocols | | Modbus RTU |
| Additional functions | | |
| Real-time clock | | yes, with battery back-up |
| microSD card slot | | 1x microSD card |
| I/O | | |
| Digital | | 4x |
| Digital OUT | | 4x (0.5 A) |
| Analogue IN | | 2x (–10...+10 V, PT100/PT1000 with 2-wire) 2x (–10...+10 V, or return lead for 3-wire) |
| Battery | | |
| Type | | Panasonic VL2020 or similar |
| Lifespan | | 10 years (depends on operating temperature) |
| Storage | | 1 year without voltage (any longer and RTC data can be lost) |

10.4. Identification plate

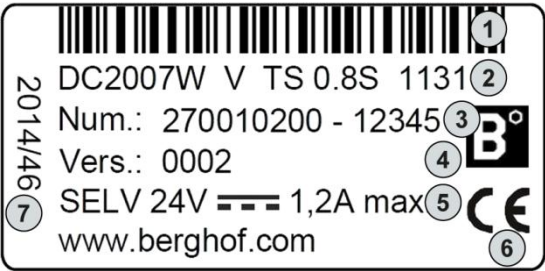


Fig. 50: Identification plate (example)

| Item | Designation | Item | Designation |
|------|---|------|---|
| 1 | Barcode (identification no.) | 5 | Supply voltage |
| 2 | Device type description | 6 | CE mark |
| 3 | Identification no. (article no. and serial no.) | 7 | Date of manufacture (year/calendar week) |
| 4 | Version (delivery version; as-delivered condition) | | |

The ‘Version’ field (delivered version) specifies the ex works condition of the module.

10.5. Identification

The characteristics of the device can be decoded from the identification key.

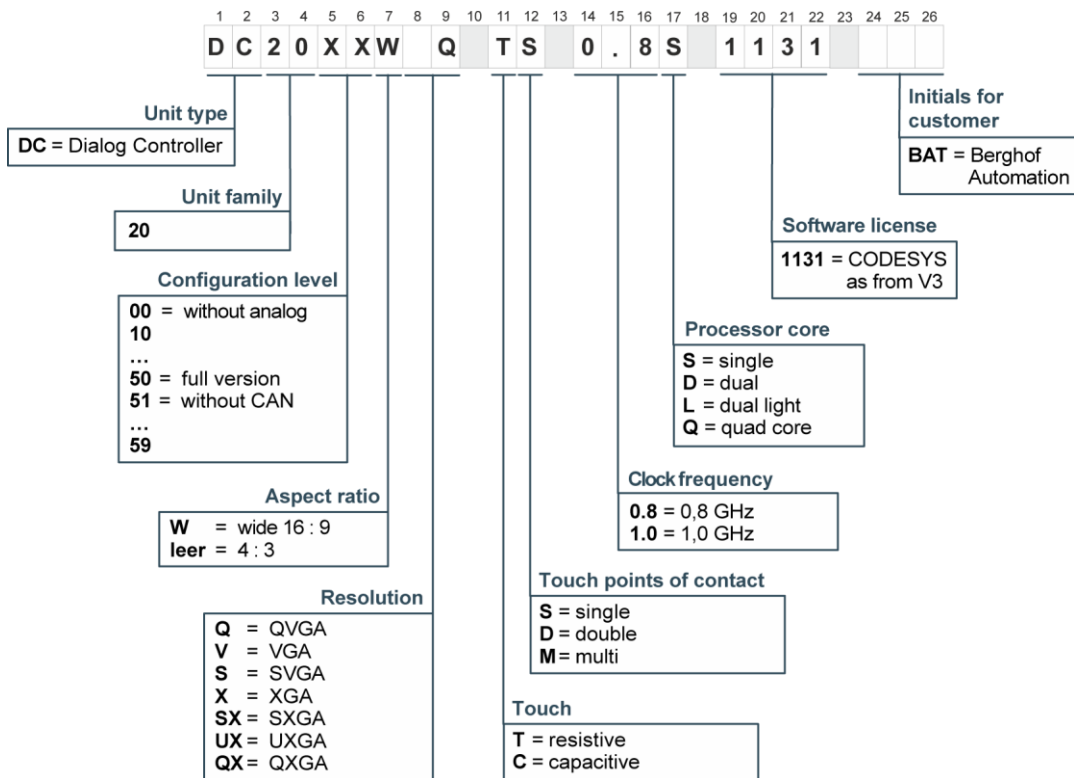


Fig. 51: DC20XX identification key

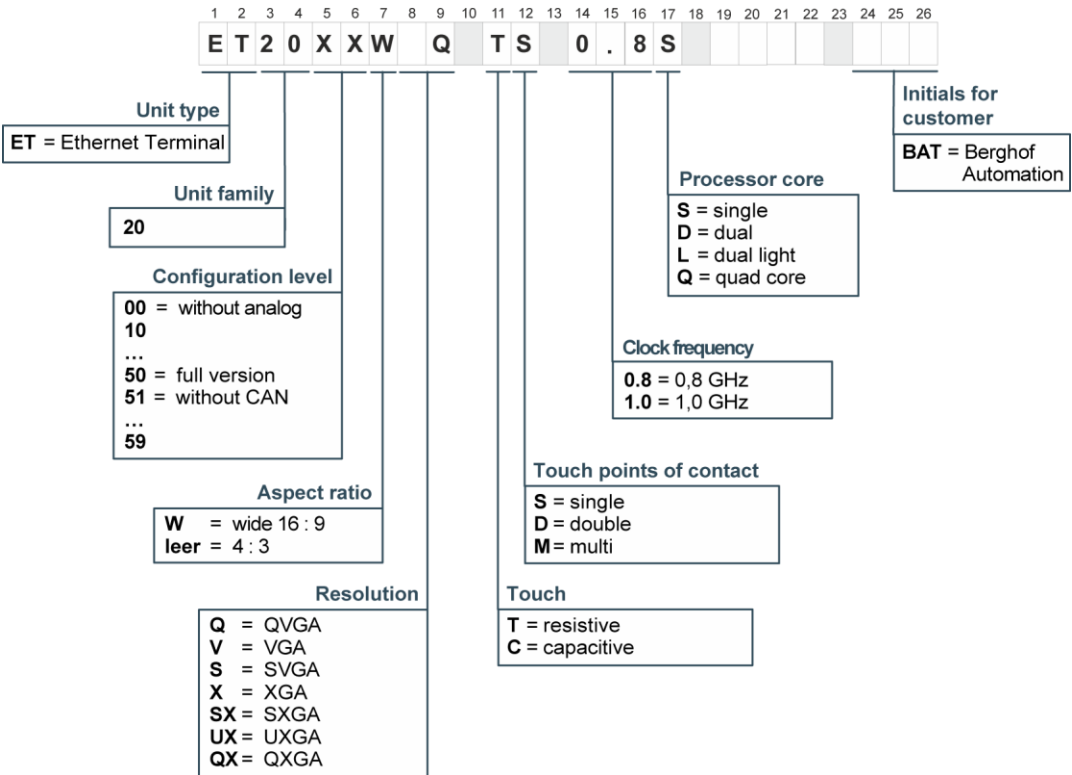


Fig. 52: ET20XX identification key

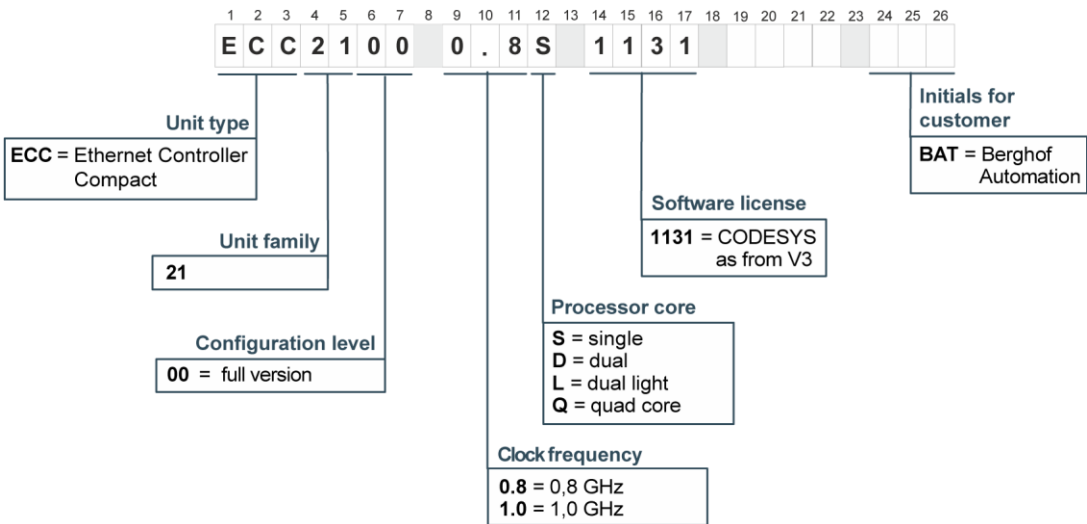


Fig. 53: ECC2100 Slim identification key

11. Standards and certificates

11.1. Standards

Applicable directives

- EMC directive 2004/108/EC

Applicable standards

- PLC standard EN 61131-2:2008-4
- Emission standards EN 61000-6-3:2012-11
- Safety provisions DIN EN 61010-2-201

11.2. UL certificate



Fig. 54: UL certificate page 1 of 2


CERTIFICATE OF COMPLIANCE

Certificate Number 20150126-E242595
Report Reference E242595-20150123
Issue Date 2015-JANUARY-26

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Programmable Logic Controllers, models DC or ET, followed by 20, followed by 00..99, followed by blank or W, followed by Q, V, S, X, SX, UX or QX, followed by blank, followed by T, followed by S, followed by blank, followed by 0.8 or 1.0, followed by S, D, L or Q, followed by blank, may be followed by additional suffixes

Programmable Logic Controllers, models ECC, followed by 21, followed by 00, followed by blank, followed by 0.8 or 1.0, followed by S, D, L or Q, followed by blank, may be followed by additional suffixes.



Bruce Mahrenholz, Assistant Chief Engineer, Global Inspection and Field Services

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at www.ul.com/contactus



Fig. 55: UL certificate page 2 of 2

The devices are authorised to use the following mark:



Fig. 56: cULus authorisation

The devices have been awarded cULus authorisation according to standard UL 61010-2-201 NRAQ/7.

Link:

- <http://database.ul.com/cgi-bin/XYV/cgifind.new/LISEXT/1FRAME/index.html>
- UL File Number: E242595

11.3. Declaration of conformity



Hiermit erklären wir in alleiniger Verantwortung, dass die nachstehend bezeichneten Geräte in ihrer Konzeption und Bauart sowie in der von uns in Verkehr gebrachten Ausführung der EG-Richtlinie 2004/108/EG entsprechen. Bei einer mit uns nicht abgestimmten Änderung der Geräte verliert diese Erklärung ihre Gültigkeit.

We hereby declare, that the following described modules in their conception, construction and form are in compliance with the EC directive 2004/108/EEC. In case of any alteration of the modules, not certified by us, this declaration is void.

Hersteller / manufacturer Berghof Automation GmbH
Harretstrasse 1
D-72800 Eningen

Produktbezeichnung / product name ECC2100 0.8S
DC2004W Q TS 0.8S
ET2004W Q TS 0.8S
DC2007W V TS 0.8S
ET2007W V TS 0.8S

Es wird die Übereinstimmung mit folgenden EG-Richtlinien und Normen erklärt:
The requirements of the following EC directives and standards are met:

Angewandte Richtlinien / applied directives

EMV-Richtlinie 2004/108/EU

Angewandte Normen / applied standards

Produktnorm SPS EN61131-2:2008-4

Fachgrundnorm: EN61000-6-3:2012-11
Störaussendung Wohnbereich

25.08.2014

Datum

Date

Franz Ott

Geschäftsführer Berghof Automation GmbH

Chief Executive Officer Berghof Automation GmbH

Uwe Manzow

Projektingenieur

Project Manager



Berghof Automation GmbH | Harretstrasse 1 | 72800 Eningen | www.berghof.com
21-0099-88-10-02-032 | Dokument 1

11.4. Notes on copyright and software licences

The firmware of the devices contains free software. Parts of this software are under the following and further open source licences:

- GNU General Public License (GPL)
- GNU Lesser General Public License (LGPL)
- Mozilla Public License (MPL)
- FreeType License (FTL)

The source code of the free software can be requested at cost by contacting the customer service of Berghof within three years after delivery of the device.

12. Customer services / addresses

Repairs and corrective maintenance may only be carried out by the manufacturer or authorised customer service centres.

12.1. Customer services

Berghof Automation GmbH
Harretstr. 1
72800 Eningen
Germany
T +49 7121 894 183
F +49 7121 894 100
e-mail: support-controls@berghof.com
www.berghof.com

12.2. Addresses

CAN in Automation; international manufacturer and user organisation for CAN users in automation:

CAN in Automation e.V. (CiA)
Am Weichselgarten 26
91058 Erlangen
headquarters@can-cia.de
www.can-cia.de

EtherCAT Technology Group
ETG Headquarters
Ostendstraße 196
90482 Nürnberg
info@ethercat.org
www.ethercat.org

Beuth Verlag GmbH, 10772 Berlin
or
VDE-Verlag GmbH, 10625 Berlin

VDE Verlag GmbH, 10625 Berlin
or
Internet research: www.iec.ch

13. Appendix

13.1. Table of figures

| | |
|--|----|
| Fig. 1: Overview DC2004 (rear view) | 13 |
| Fig. 2: Overview DC2007 (rear view) | 14 |
| Fig. 3: Overview ET2004 (rear view)..... | 15 |
| Fig. 4: Overview ET2007 (rear view)..... | 16 |
| Fig. 5: Overview ECC2100 Slim | 17 |
| Fig. 6: Dimensions, DC2004 and ET2004 | 21 |
| Fig. 7: Installation cut-out, DC2004 and ET2004 | 22 |
| Fig. 8: Dimensions, DC2007 and ET2007 | 23 |
| Fig. 9: Installation cut-out, DC2007 and ET2007 | 24 |
| Fig. 10: Open the twist-lock catches | 25 |
| Fig. 11: Installation in an installation cut-out, example with 4 securing clips..... | 25 |
| Fig. 12: Device clicked home in the installation cut-out, example with 4 securing clips..... | 26 |
| Fig. 13: Installing the device..... | 27 |
| Fig. 14: Power supply to the DC20XX and ECC2100 Slim plug X1 with power LED | 29 |
| Fig. 15: Power supply ET20XX plug X1 | 30 |
| Fig. 16: Block circuit diagram, DC20XX | 31 |
| Fig. 17: Block circuit diagram, ECC2100 Slim | 32 |
| Fig. 18: Block circuit diagram, ET20XX..... | 33 |
| Fig. 19: Digital inputs and outputs, DC20XX and ECC2100 Slim plug X1 with LEDs 1 to 8 | 34 |
| Fig. 20: Circuit diagram of the principles of positive switching output | 36 |
| Fig. 21: Circuit diagram of the principles of positive switching input | 37 |
| Fig. 22: Operating ranges of the digital inputs (type 1/3)..... | 37 |
| Fig. 23: Ethernet interface X4..... | 38 |
| Fig. 24: EtherCAT interface X5 | 39 |
| Fig. 25: USB interface X3..... | 40 |
| Fig. 26: RS-232 / RS-485 interface X6..... | 41 |
| Fig. 27: RS-485 switchable terminating resistor | 42 |
| Fig. 28: CAN interface X7 | 43 |
| Fig. 29: Analogue inputs X2 | 44 |
| Fig. 30: example connection: voltage input | 48 |
| Fig. 31: example connection: temperature measurement | 49 |
| Fig. 32: login window | 52 |
| Fig. 33: list of web interface settings..... | 53 |
| Fig. 34: "Network Configuration" page | 53 |
| Fig. 35: Startup page with network settings..... | 54 |
| Fig. 36: Info page..... | 55 |
| Fig. 37: Network settings of the device | 55 |
| Fig. 38: Netzwerkeinstellungen des Geräts | 55 |
| Fig. 39: Lifeguard-Einstellung ändern | 56 |
| Fig. 40: Summary of the network settings | 56 |
| Fig. 41: identification plate with device serial number 00001 (example)..... | 57 |
| Fig. 42: login window | 57 |
| Fig. 43: list of web interface settings..... | 58 |
| Fig. 44: "Network Configuration" page | 58 |
| Fig. 45: Location of the operating status LEDs..... | 60 |

| | |
|--|----|
| Fig. 46: function key (S1)..... | 61 |
| Fig. 47: Undo the securing clips | 69 |
| Fig. 48: Pushing the device out of the installation cut-out..... | 70 |
| Fig. 49: Uninstalling the device | 71 |
| Fig. 50: Identification plate (example)..... | 80 |
| Fig. 51: DC20XX identification key | 81 |
| Fig. 52: ET20XX identification key..... | 82 |
| Fig. 53: ECC2100 Slim identification key | 82 |
| Fig. 54: UL certificate page 1 of 2..... | 84 |
| Fig. 55: UL certificate page 2 of 2..... | 85 |
| Fig. 56: cULus authorisation | 86 |