

DC20XX, ET20XX, ECC2100 Slim Dialog Controller, Ethernet Terminal



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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.

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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 and ECC2100 Slim	31
5.2.2.	Block circuit diagram, ET20XX	32
5.2.3.	Digital inputs and outputs, DC20XX and ECC2100 Slim	33
5.2.4.	Ethernet	37
5.2.5.	EtherCAT	38
5.2.6.	USB	39
5.2.7.	Serial interfaces	40
	Signal interference and terminating resistor	41

Connections with GND	41
5.2.8. CAN Bus	42
5.2.9. Analogue inputs.....	43
Basic considerations for analogue inputs	43
Data from analogue inputs	44
Operating modes for the analogue inputs	45
Basic considerations for analogue inputs	47
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.....	52
6.2.3. ECC2100 Slim.....	52
6.3. Operation	55
6.3.1. Status displays	55
Location of the operating status LEDs.....	55
Meaning of the LED displays.....	56
6.3.2. Start/Stop	56
6.3.3. Real time clock with battery back-up DC20XX and ECC2100 Slim.....	57
6.3.4. microSD card.....	57
6.4. Troubleshooting	58
6.4.1. In error stop mode for the ECC2100 Slim	58
6.4.2. Unknown IP-address on the ECC2100 Slim.....	58
7. MAINTENANCE/UPKEEP	59
7.1. Maintenance	59
7.2. Cleaning	60
7.3. Chemical resistance.....	60
7.3.1. Resistance of the touch screen	60
7.3.2. Resistance of the front diaphragm.....	61
8. UNINSTALLATION.....	64
8.1. Uninstallation, DC20XX and ET20XX.....	64
8.2. Uninstallation, ECC2100 Slim.....	66
9. DISPOSAL.....	67
10. TECHNICAL DATA.....	68
10.1. DC20XX Dialog Controller	68
10.2. ET20XX Ethernet Terminal.....	71
10.3. ECC2100 Slim Ethernet controller	73
10.4. Identification plate.....	75
10.5. Identification	76

11.	STANDARDS AND CERTIFICATES	78
11.1.	Standards	78
11.2.	UL certificate	79
11.3.	Declaration of conformity	80
12.	CUSTOMER SERVICES / ADDRESSES	81
12.1.	Customer services	81
12.2.	Addresses	81
13.	APPENDIX	82
13.1.	Table of figures	82
13.2.	Licences	83

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:


⚠ WARNING	Danger type and source Short description and possible consequences ▶ Preventive measures
Optional: additional symbols	

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:

⚠ DANGER	Serious injury or death Non-compliance with the safety features will result in death or serious injury. ▶ Take preventive measures.
⚠ WARNING	Possible serious injury or death Non-compliance with the safety features may result in death or serious injury. ▶ Take preventive measures.
⚠ CAUTION	Possible minor injuries Non-compliance with the safety features may result in minor injuries. ▶ Take preventive measures.
i NOTICE	Possible damage to property Non-compliance with the safety features may result in damage to property. ▶ Take preventive measures.

 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.

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 language 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 CODESYS control unit.

DC20XX and ECC2100 Slim controllers can be connected using various different interfaces. DC20XX controllers 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

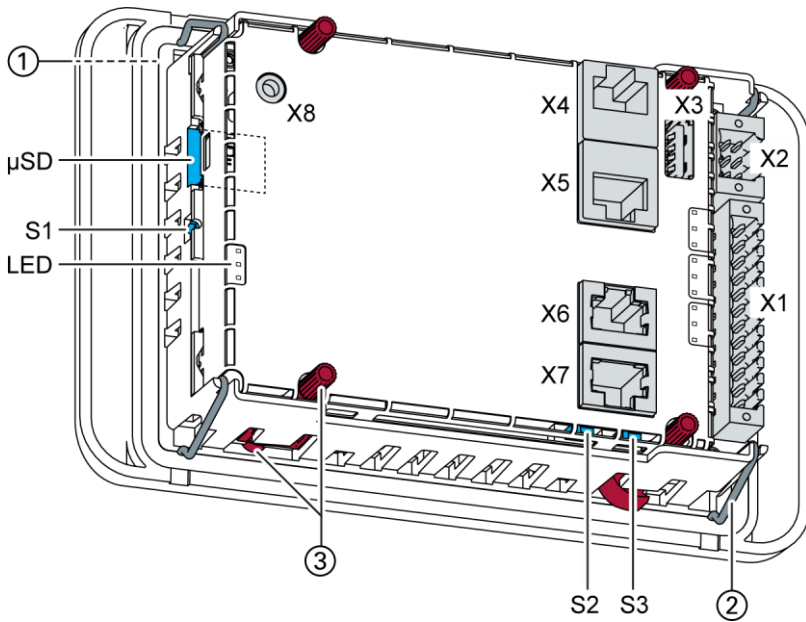


Fig. 1: Overview DC2004 (rear view)

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	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

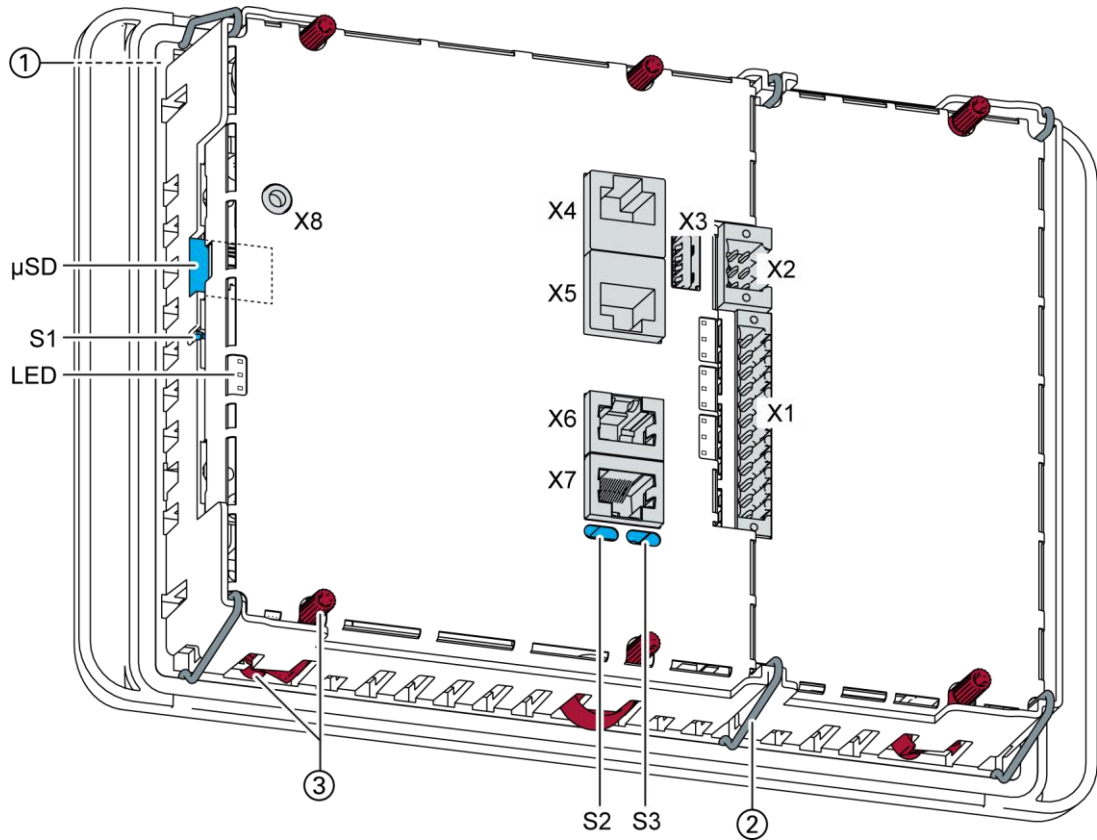


Fig. 2: Overview DC2007 (rear view)

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	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

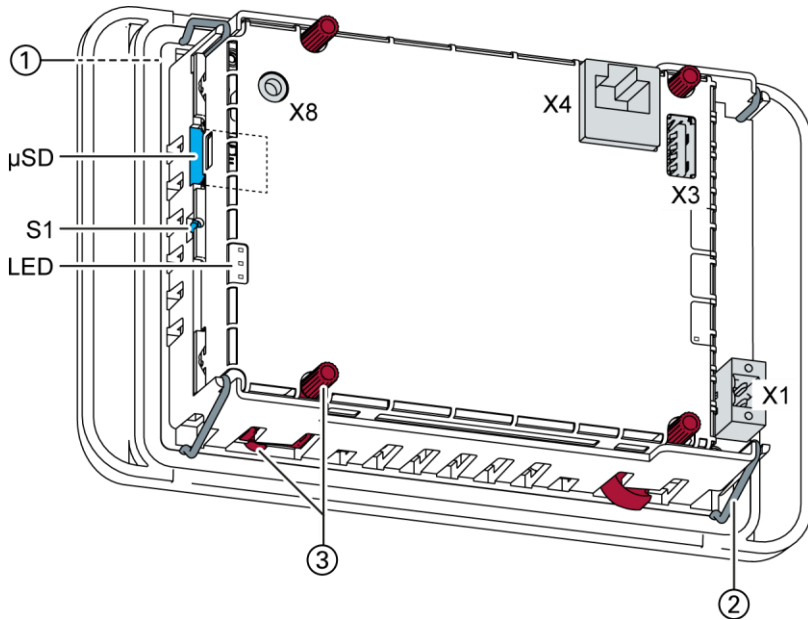


Fig. 3: Overview ET2004 (rear view)

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	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

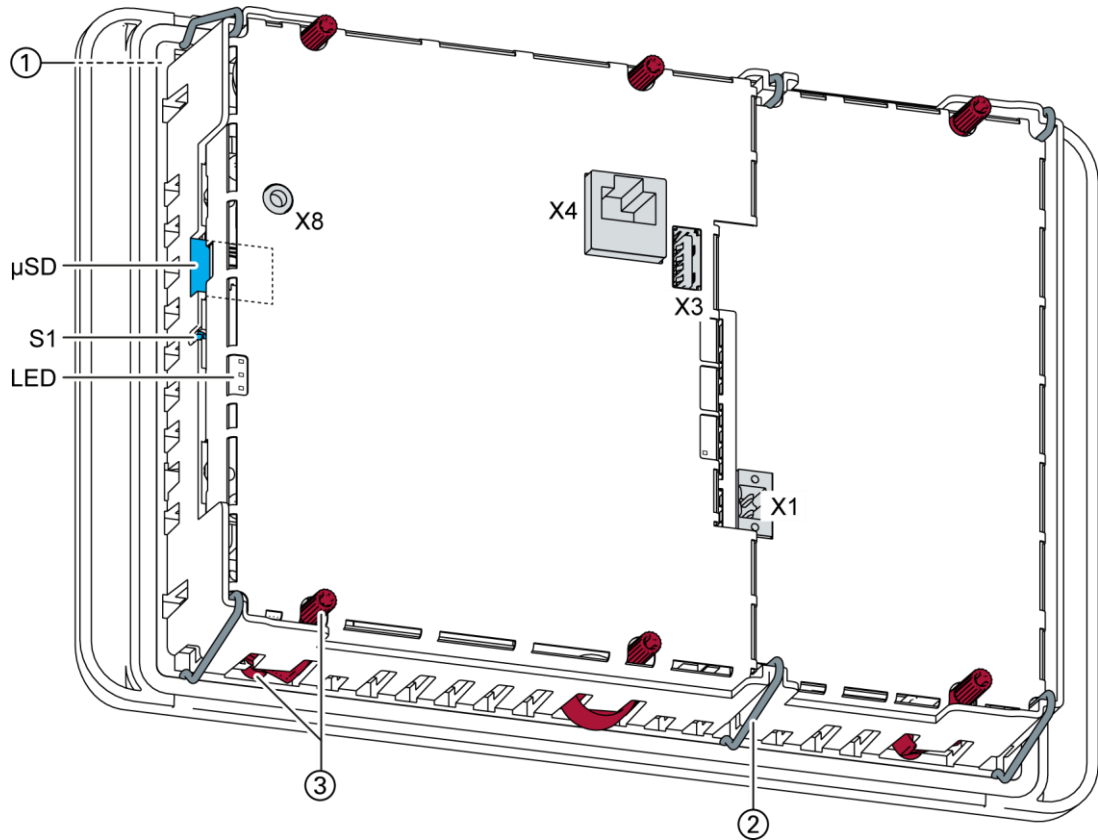


Fig. 4: Overview ET2007 (rear view)

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	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

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

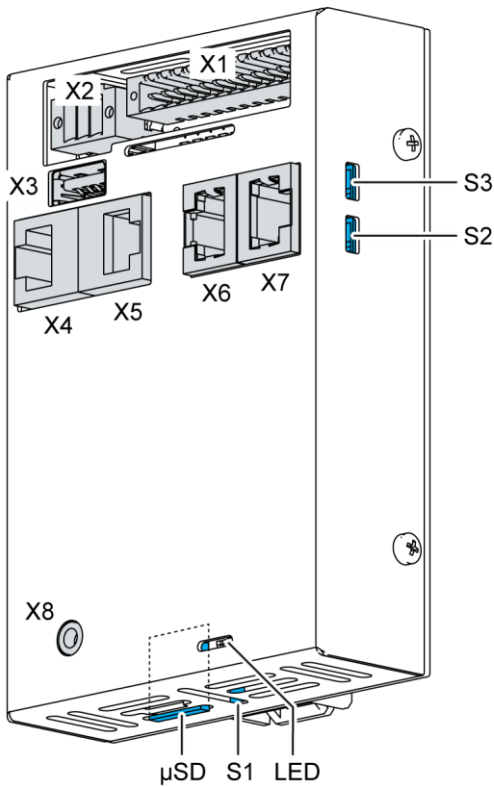


Fig. 5: Overview ECC2100 Slim

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	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

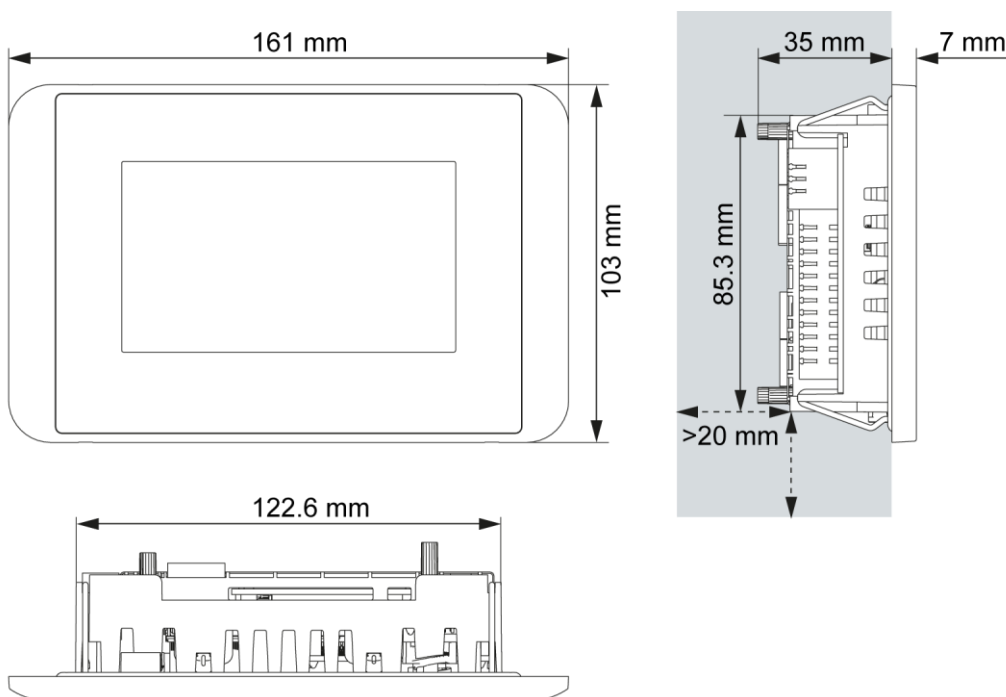


Fig. 6: Dimensions, DC2004 and ET2004

Requirements:

- The device must have a clear space of at least 20 mm all round at the rear, to allow sufficient air circulation.
- The 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.
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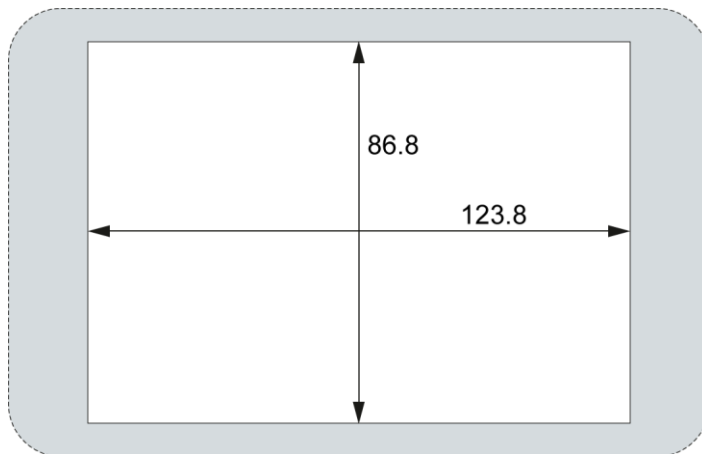


Fig. 7: Installation cut-out, DC2004 and ET2004

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

4.1.2. Installation cut-out, DC2007 and ET2007

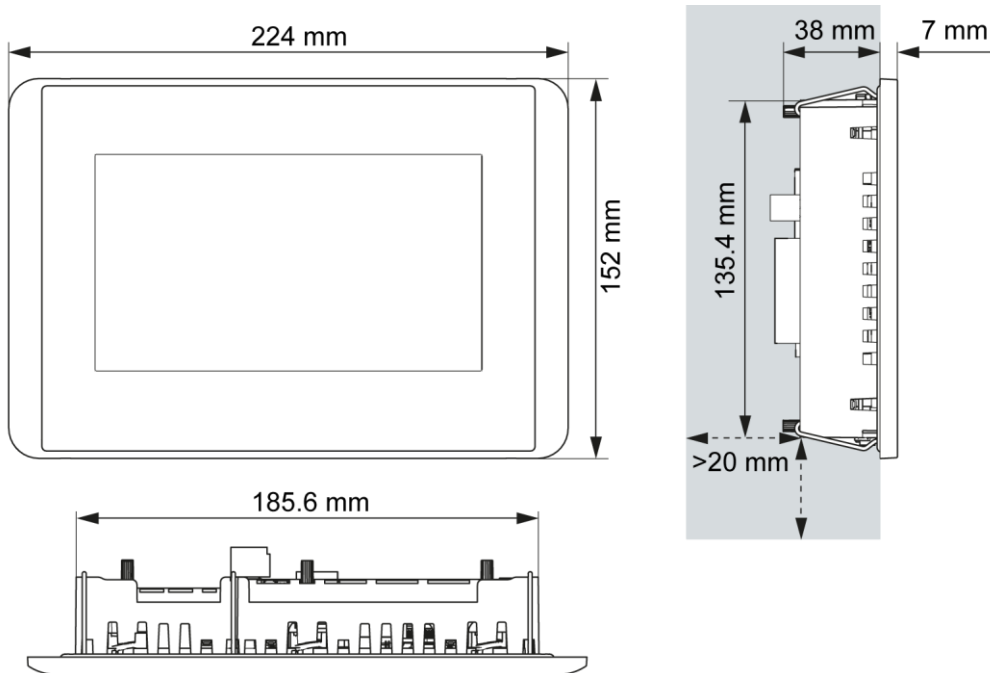


Fig. 8: Dimensions, DC2007 and ET2007

Requirements:

- The device must have a clear space of at least 20 mm all round at the rear, to allow sufficient air circulation.
- The support material for the installation cut-out must be flat, sufficiently stable, and be from 1 to 3 mm thick.



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.

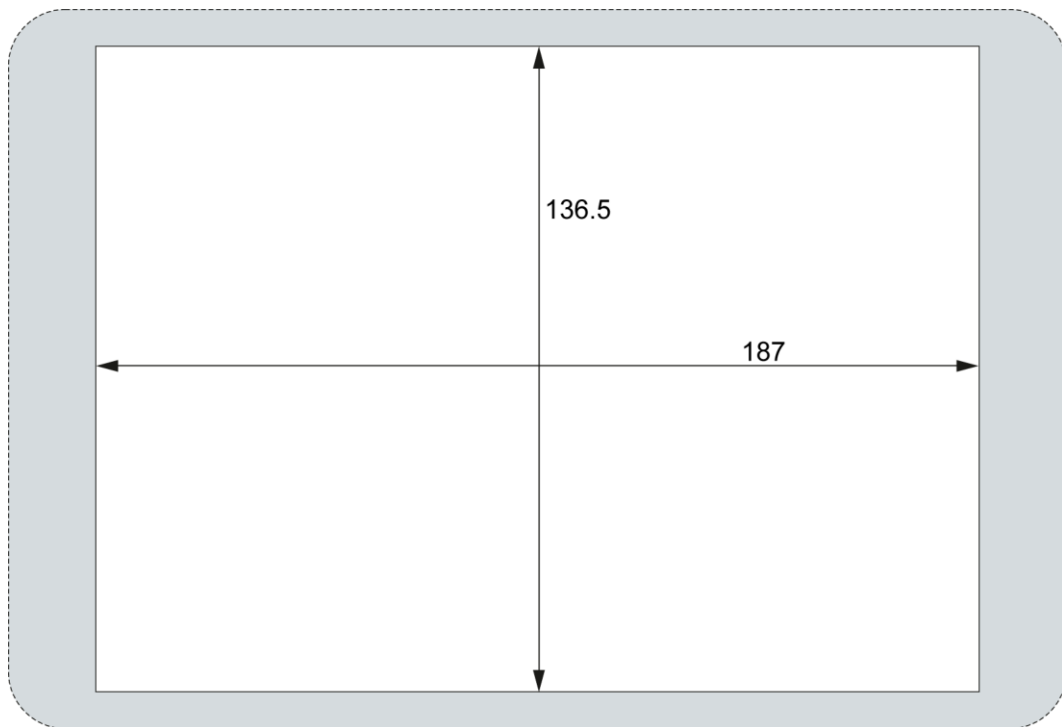


Fig. 9: Installation cut-out, DC2007 and ET2007

- ▶ Cut a rectangular installation cut-out in the support material:
Height: 136.5 mm
Width: 187.0 mm
Max. corner radius: 3.0 mm

4.2. Installation, DC20XX and ET20XX

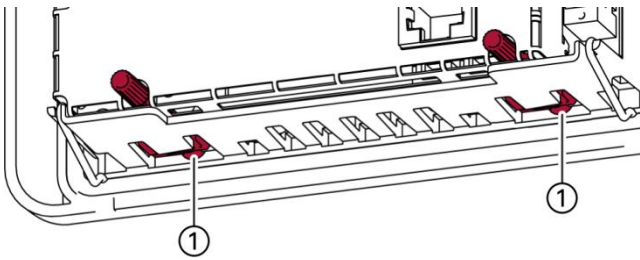


Fig. 10: Open the twist-lock catches

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).

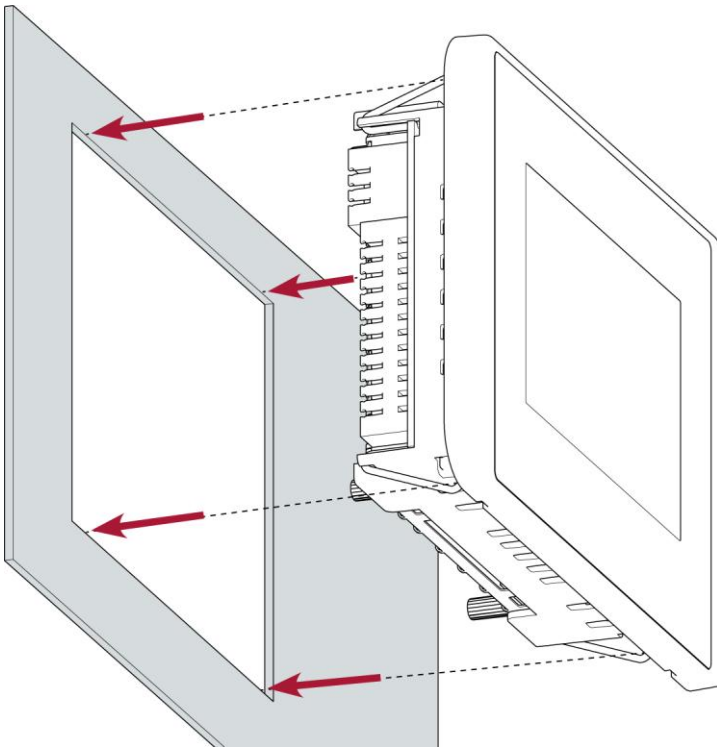


Fig. 11: Installation in an installation cut-out, example with 4 securing clips

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.

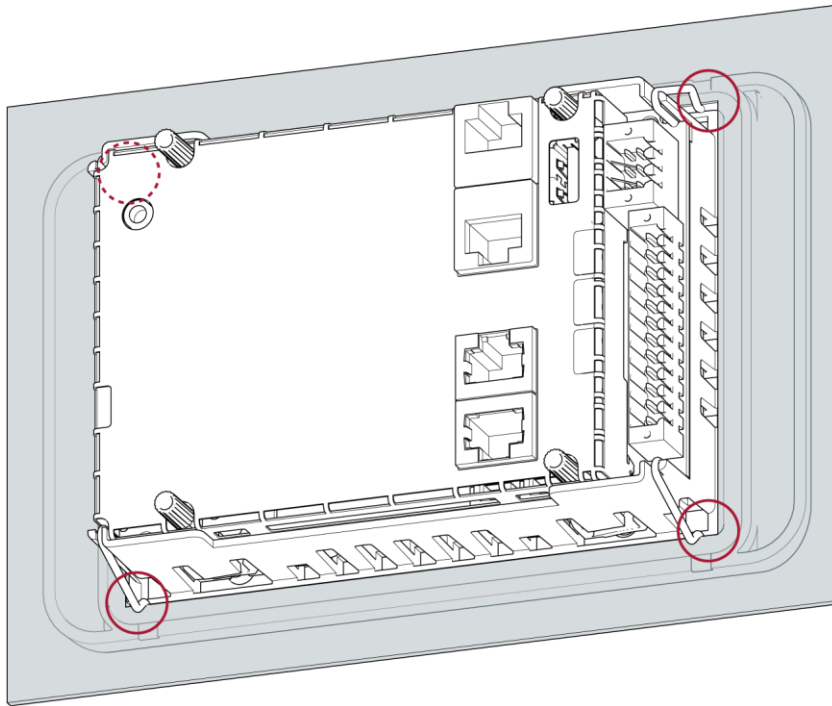


Fig. 12: Device clicked home in the installation cut-out, example with 4 securing clips

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.

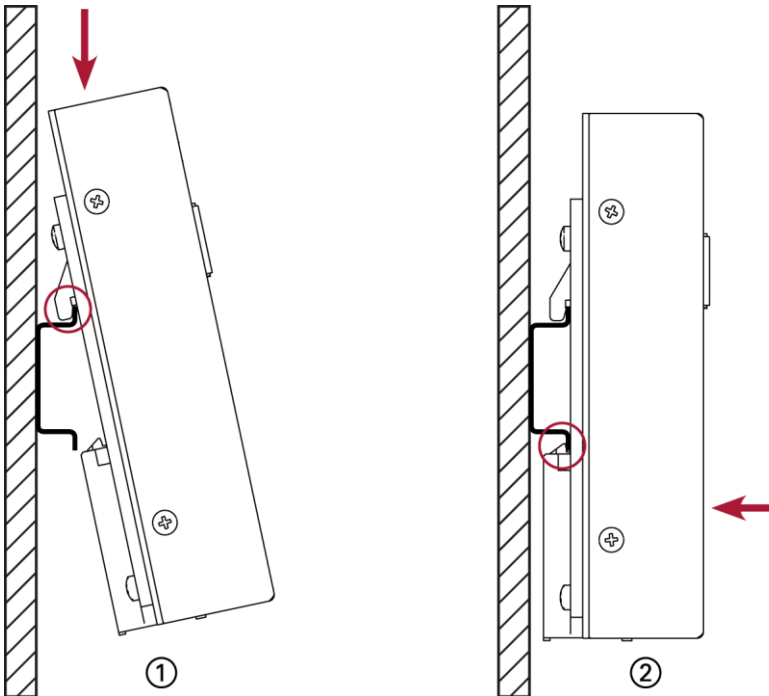


Fig. 13: Installing the device

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	<p>Uncontrolled and unpredictable operational behaviour!</p> <p>Failure in certain components in electronic control systems may result in uncontrolled and unpredictable operational behaviour.</p> <ul style="list-style-type: none"> ▶ 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.
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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.

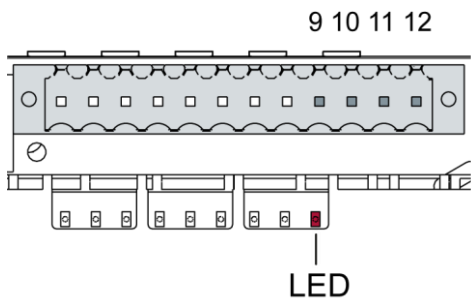


Fig. 14: Power supply to the DC20XX and ECC2100 Slim plug X1 with power LED

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



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.

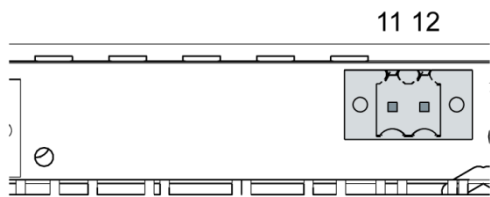


Fig. 15: Power supply ET20XX plug X1

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 and ECC2100 Slim

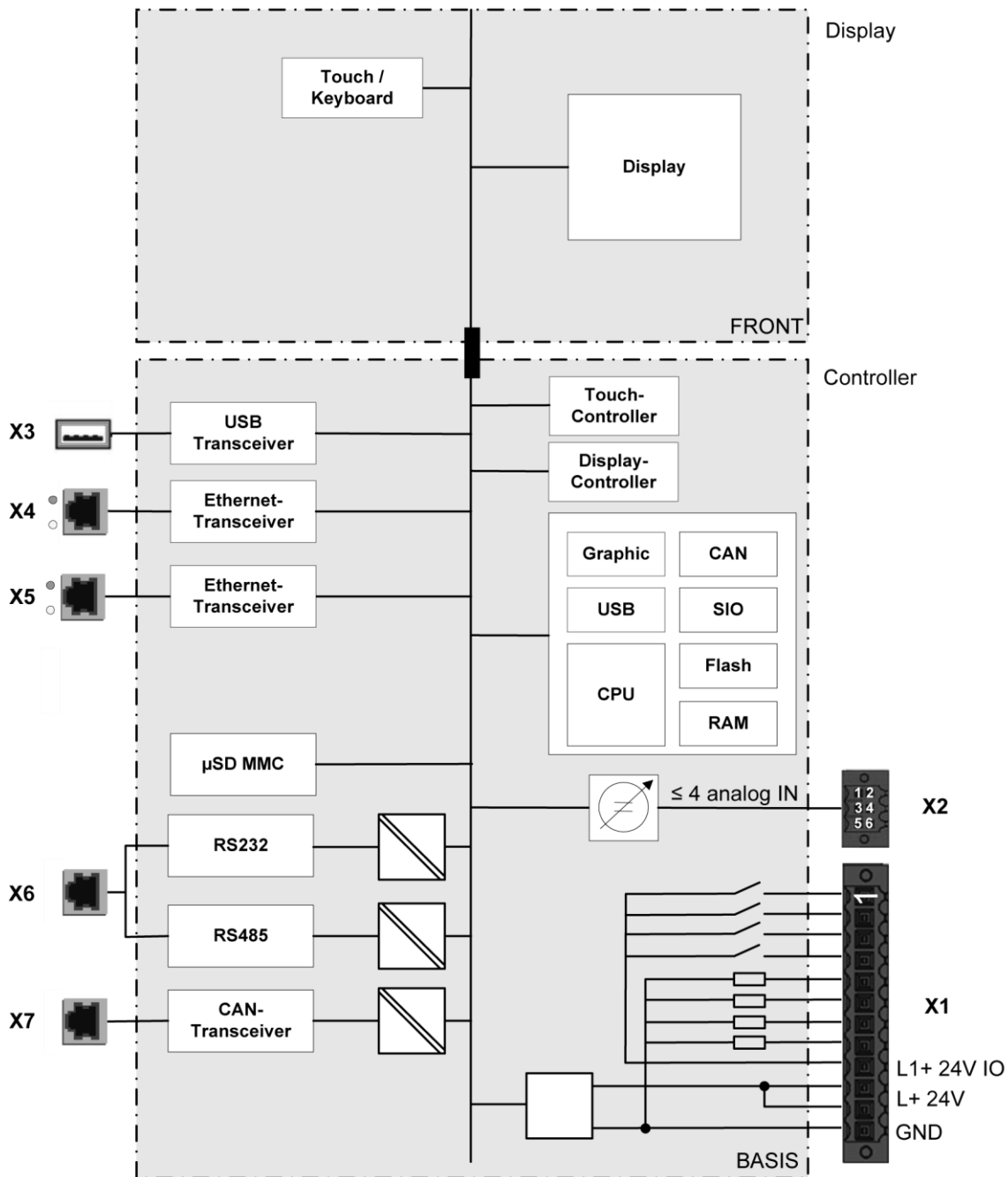


Fig. 16: Block circuit diagram, DC20XX and ECC2100 Slim

5.2.2. Block circuit diagram, ET20XX

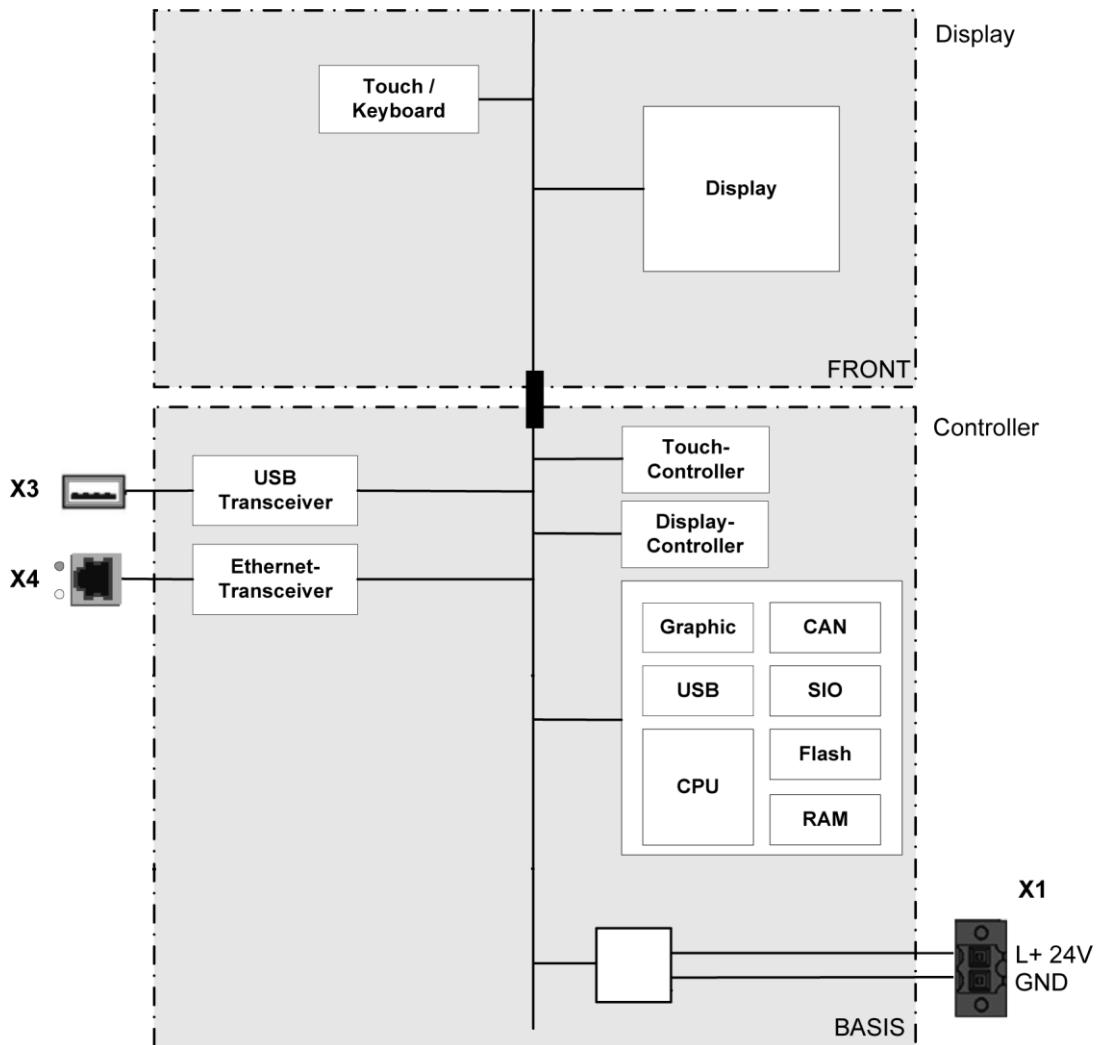


Fig. 17: Block circuit diagram, ET20XX

5.2.3. 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.



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

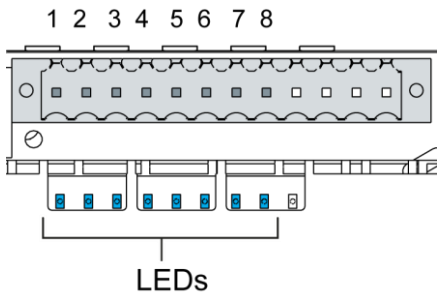


Fig. 18: Digital inputs and outputs, DC20XX and ECC2100 Slim plug X1 with LEDs 1 to 8

Digital inputs and outputs, plug X1		
Pin	Designation	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

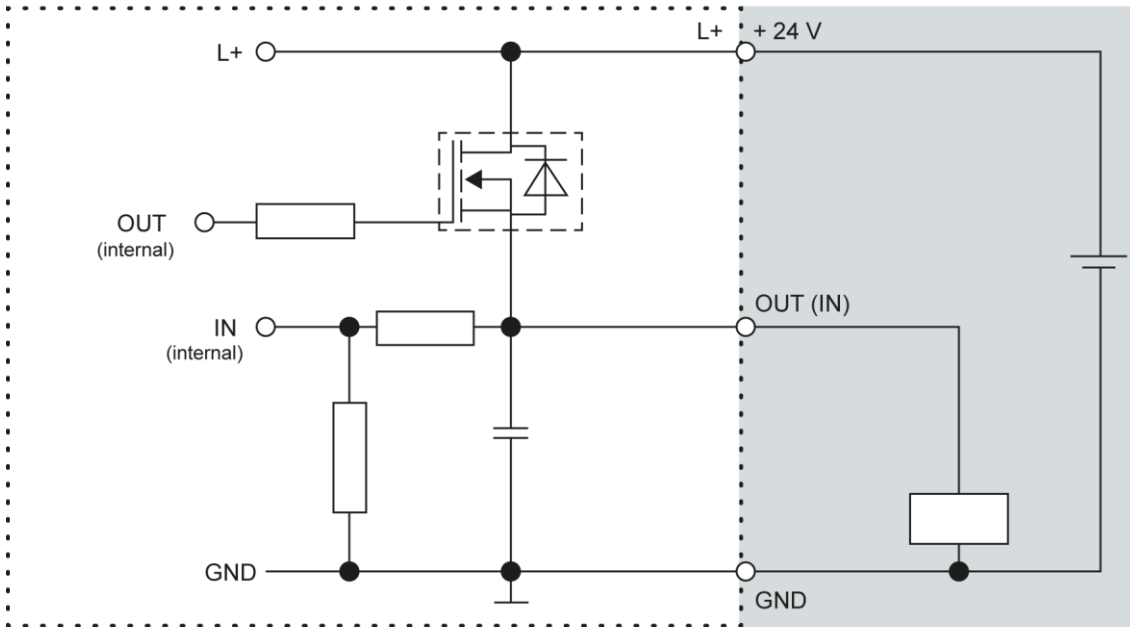


Fig. 19: Circuit diagram of the principles of positive switching output

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

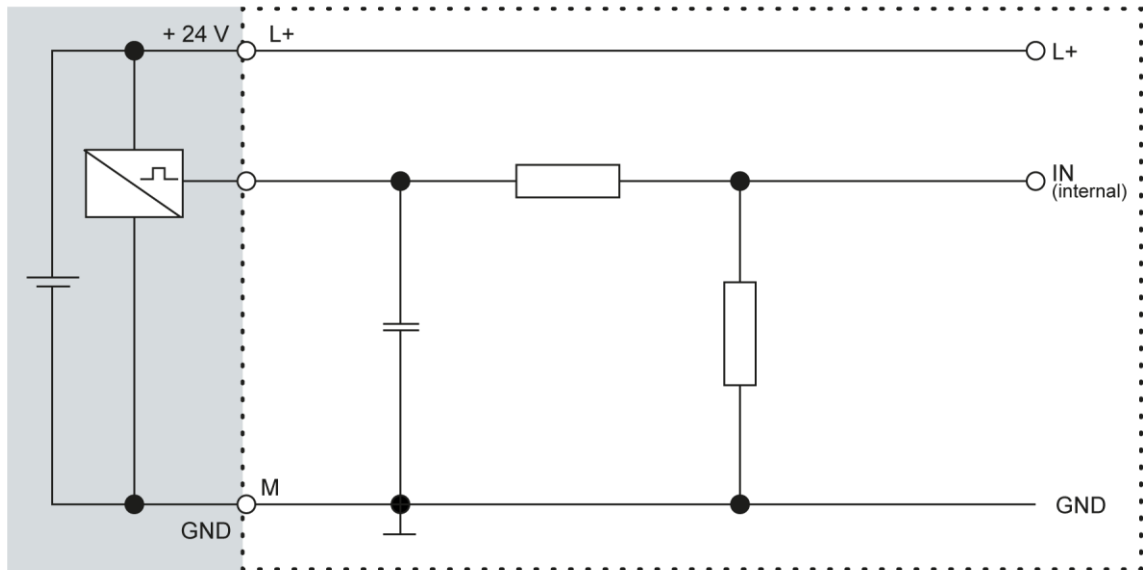


Fig. 20: Circuit diagram of the principles of positive switching input

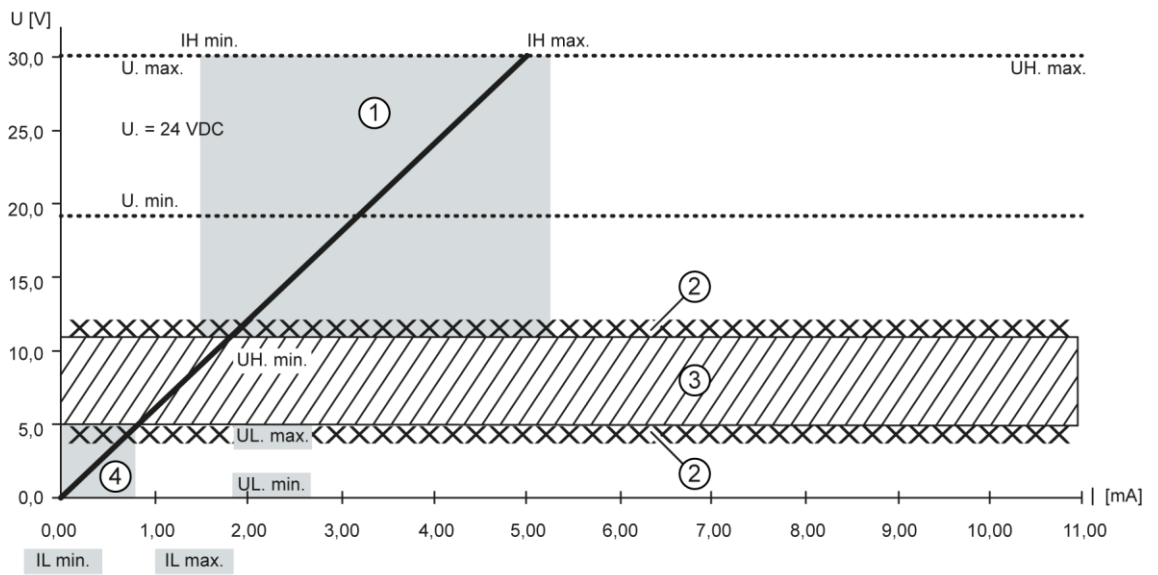


Fig. 21: Operating ranges of the digital inputs

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

5.2.4. 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.

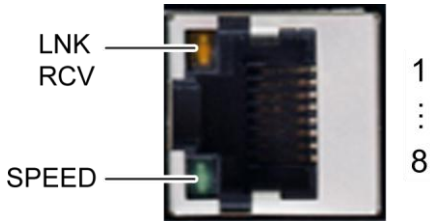


Fig. 22: Ethernet interface X4

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

5.2.5. 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 only as an EtherCAT master.

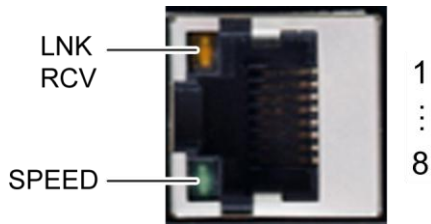


Fig. 23: EtherCAT interface X5

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

5.2.6. 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

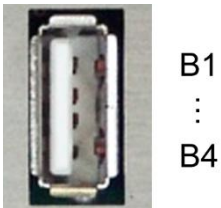
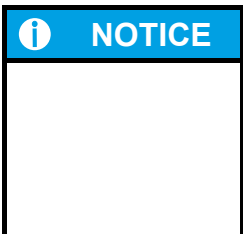


Fig. 24: USB interface X3

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.

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).

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

5.2.7. 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

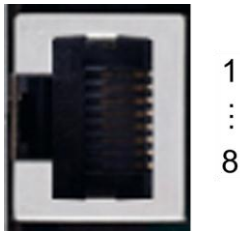


Fig. 25: RS-232 / RS-485 interface X6

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.

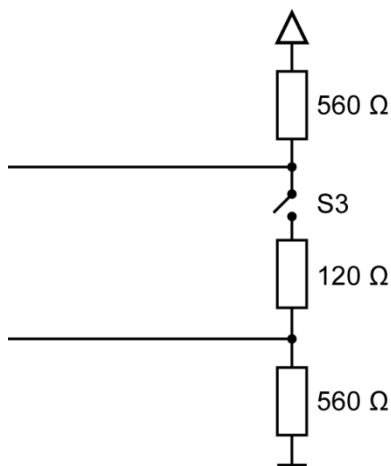


Fig. 26: RS-485 switchable terminating resistor



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.

5.2.8. 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

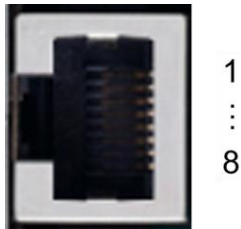


Fig. 27: CAN interface X7

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.

5.2.9. 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 SC-SMT 3.5 (Weidmüller) plug-in connector and are approved for use with the device:

- Weidmüller B2CF 3.50/06/180(F) SN BK

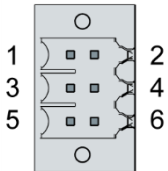


Fig. 28: Analogue inputs X2

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	–
Calibration frequency	12 months	Maintenance of accuracy class
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
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



Damage to channel
 High voltages can damage analogue channels, stopping them from working correctly.
 ► Ensure the input voltage does not exceed ± 30 V.

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	± 2500 ppm (± 25 mV)	–
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	11.9 μ V	–
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. From a voltage of ± 16 V, the values are distorted considerably and from +23 V an error bit is set which can be queried in the application program.
Input type	–	Unsymmetrical voltage metering (single-ended)
Reference potential	AGND	–
Dynamic characteristics		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 500 μ s	–
Greatest temporary deviation during	0.5% of measuring range	–

Operating mode: voltage input AI (U)		
Feature	Value	Description
electrical error testing according to IEC 61131-2		

Operating mode: voltage input AI (I)		
Feature	Value	Description
Connections per input	–	AI (I) and AGND; connect screening with AGND.
Protection	–	Thermal current limitation
Measuring range	–20 to +20 mA	Technical current direction into AI (I)
Load impedance	typ. 20 Ω	–
Max. errors at 25 °C	±2,000 ppm (±40 µA)	–
Temperature coefficient	±40 ppm/K (±0.8 µA/K)	–
Digital resolution	24 bit	–
Data format in user program	32 bit real	(floating-point number) in milliamps (mA)
Maximum permissible permanent overload	Max. ±25 mA	–
Output of digital value in case of overload	–	If a current greater than ±20 mA flows into an AI (I), a plausible value is still given up to approx. ±25 mA. The specified accuracy is only valid for the range – 20 to +20 mA.
Input type	–	Current measurement compared to AGND
Reference potential	AGND	–

Dynamic characteristics		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 215 µs	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

Operating mode: temperature inputs AI-PT		
Feature	Value	Description
Connections per input	–	Sensor connection between AI (U/T) and AGND
Possible sensors	PT100 and PT1000 acc. to EN 60751	Accuracy class AA, A, B and C platinum sensors may be used; recommendation: B or C
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 (3 rd degree polynomial)
Input type	–	2-wire measurement or 3-wire measurement
Reference potential	AGND	–
Dynamic characteristics		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 500 µs	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

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 strips) may be connected together.
- AGNDs may not be connected to the general GND of the control panel 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 SC-SMT 3.5 (Weidmüller) plug-in connector and are approved for use with the device:

- Weidmüller B2CF 3.50/06/180(F) SN BK

Voltage input AI (U)

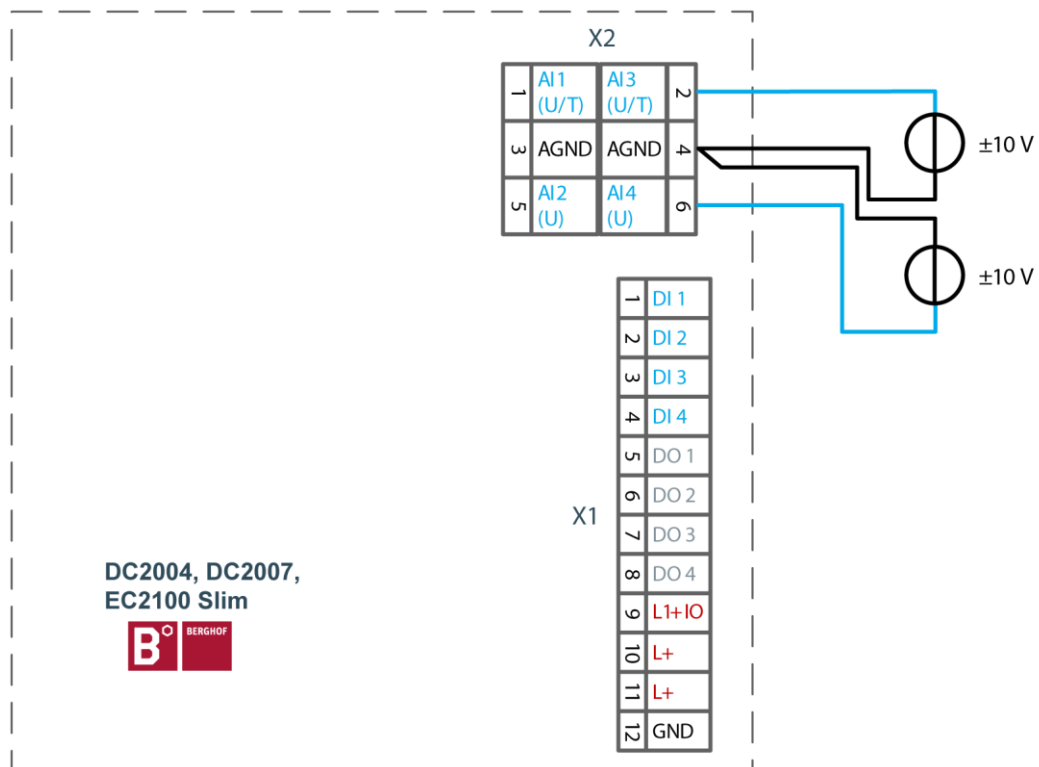


Fig. 29: example connection: voltage input

- ▶ 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)

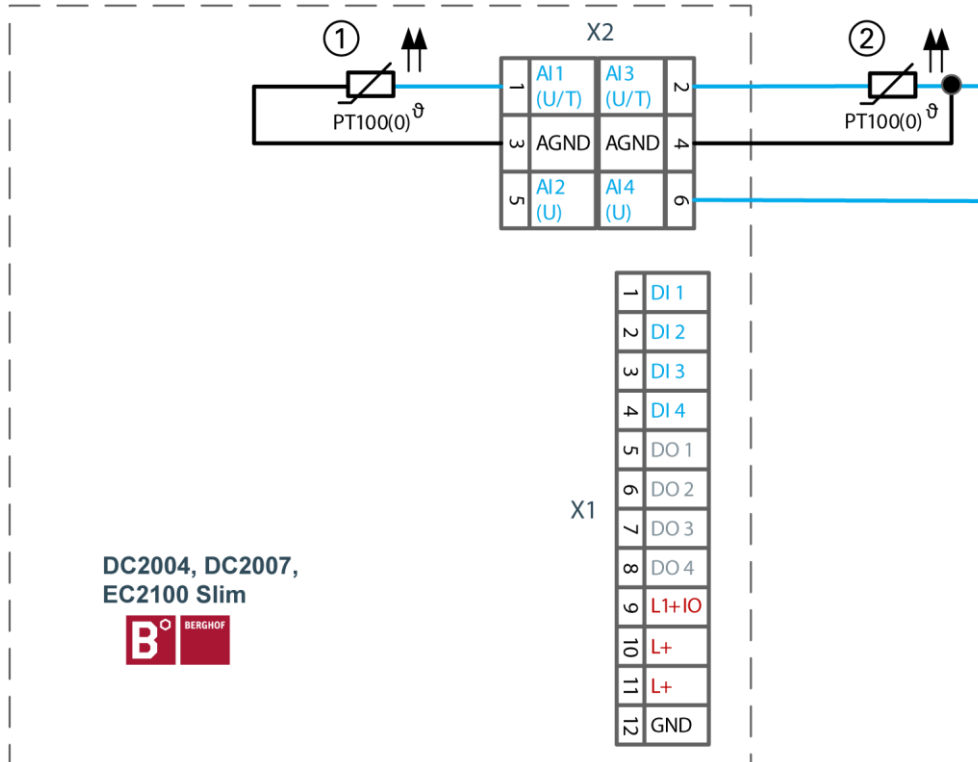


Fig. 30: example connection: temperature measurement

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

In preparation

6.2.2. ET20XX

In preparation

6.2.3. ECC2100 Slim

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

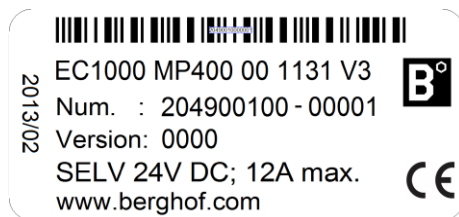


Fig. 31: identification plate with device serial number 00001 (example)

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 (X10) 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. 32: 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. 33: 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:

IPAddress:

NetMask:

ETH1

Mode:

Fig. 34: "Network Configuration" page

8. Check the network settings and make any changes in the text boxes if required.
ECC22XX configuration: ETH0 = X10...X12, ETH1 = X13
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.

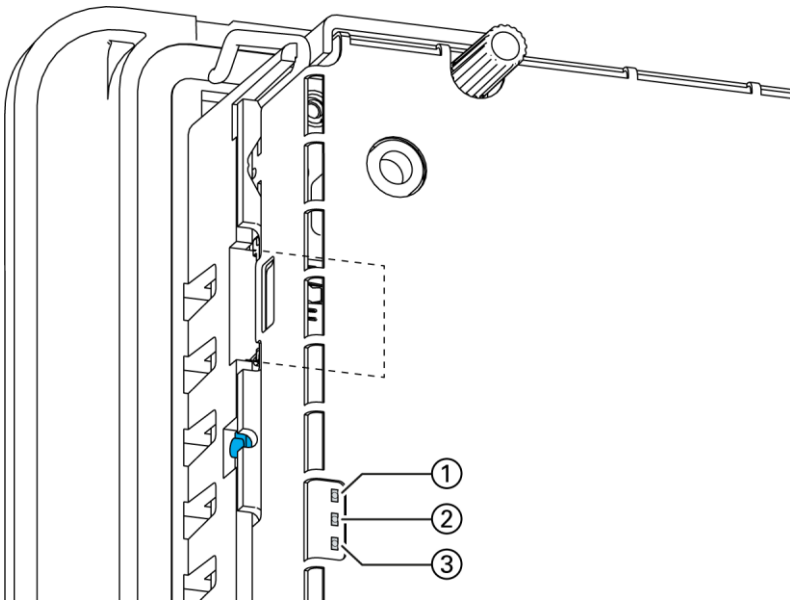


Fig. 35: Location of the operating status LEDs

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

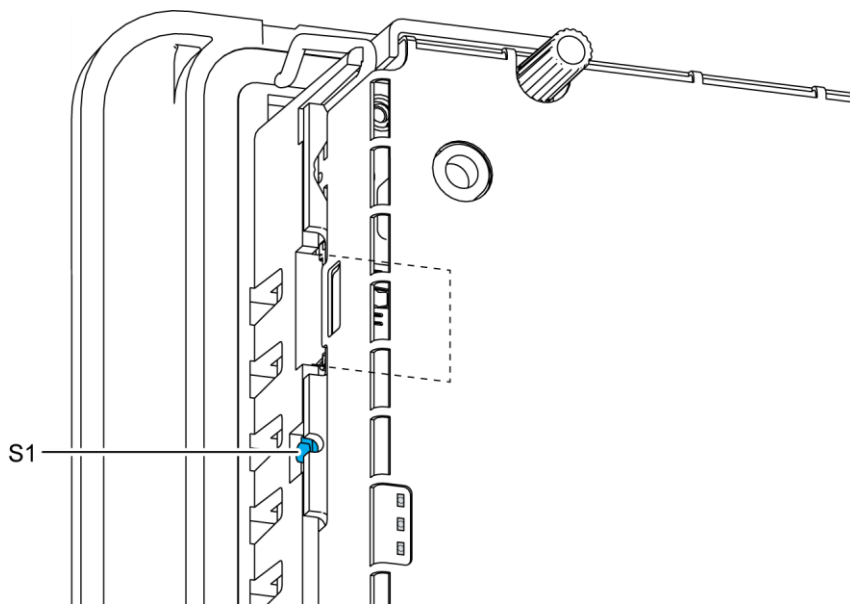


Fig. 36: function key (S1)

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 (except retain data)

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.

6.4. Troubleshooting

Work in progress for the DC20XX and ET20XX

6.4.1. In error stop mode for the ECC2100 Slim

1. Establish cause of fault (log into device on the web browser).
2. Correct the fault.
3. Restart the device (press “Reset” on the device).

The device is now ready for use.

6.4.2. 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

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

 WARNING	<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

i NOTICE	<p>Damage to the front panel!</p> <p>The front panel must not be exposed to any mechanical or chemical stress.</p> <ul style="list-style-type: none"> ▶ 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.

<p>i NOTICE</p>	<p>Damage to the device!</p> <p>If uninstallation is performed carelessly the device can fall out of the installation cut-out or be damaged.</p> <ul style="list-style-type: none"> ▶ Do not tilt the device. ▶ Secure the device against falling, especially when taking it out of the installation cut-out.
------------------------	--

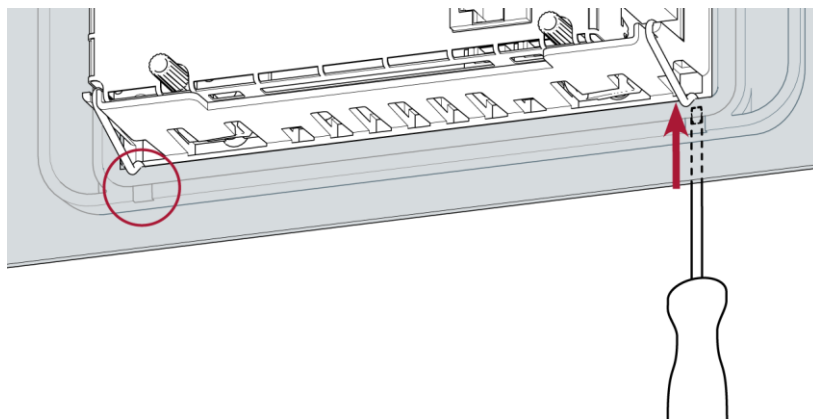


Fig. 37: Undo the securing clips

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.

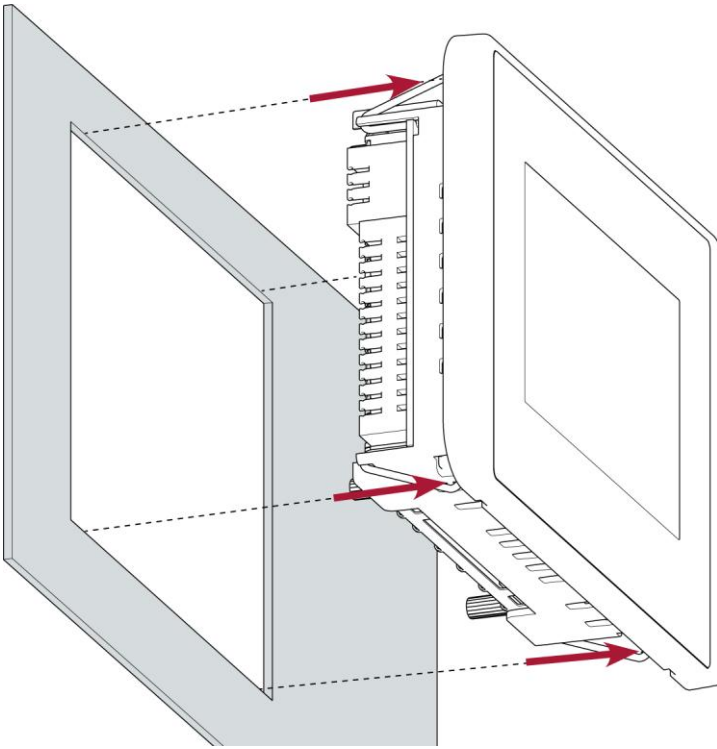


Fig. 38: Pushing the device out of the installation cut-out

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.

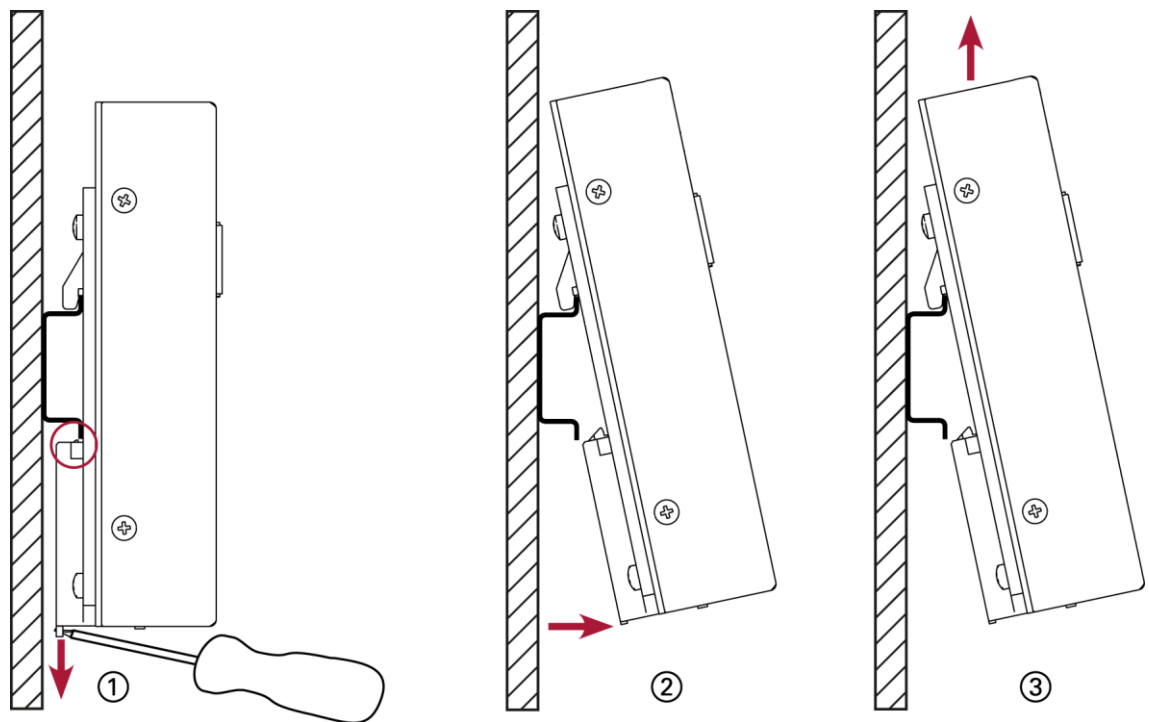


Fig. 39: Uninstalling the device

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		
Operating temperature	0 °C to 55 °C (in compliance with installation requirements)	
Relative humidity	max. 85%, non-condensing	
Transport and storage		
Operating 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	
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	

Dialog Controller	DC2004	DC2007
Protection rating	IP20, front IP54 (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	
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)	

Dialog Controller	DC2004	DC2007
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)		
Operating temperature (rel. atmospheric humidity 10...95 %)	-40...+60 °C	
Operating 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		
Operating temperature	0 °C to 55 °C (in compliance with installation requirements)	
Relative humidity	max. 85%, non-condensing	
Transport and storage		
Operating 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	
Development environment	CODESYS V3 (IEC 61131-3)	
Touch operation	Touch resistive	
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, front IP54 (IP65 only with twist-lock catches tightened)	

Ethernet Terminal	ET2004	ET2007
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)		
Operating temperature (rel. atmospheric humidity 10...95 %)	–40...+60 °C	
Operating 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	
Operating temperature	0 °C to 55 °C (in compliance with installation requirements)
Relative humidity	max. 85%, non-condensing
Transport and storage	
Operating 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)
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%
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 controller	ECC2100 Slim
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

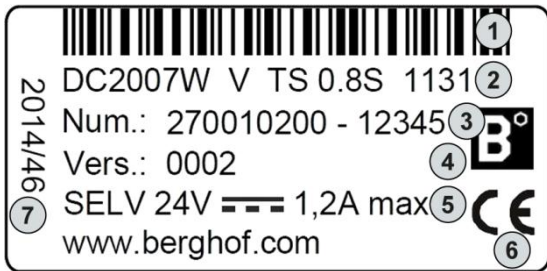


Fig. 40: Identification plate (example)

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.

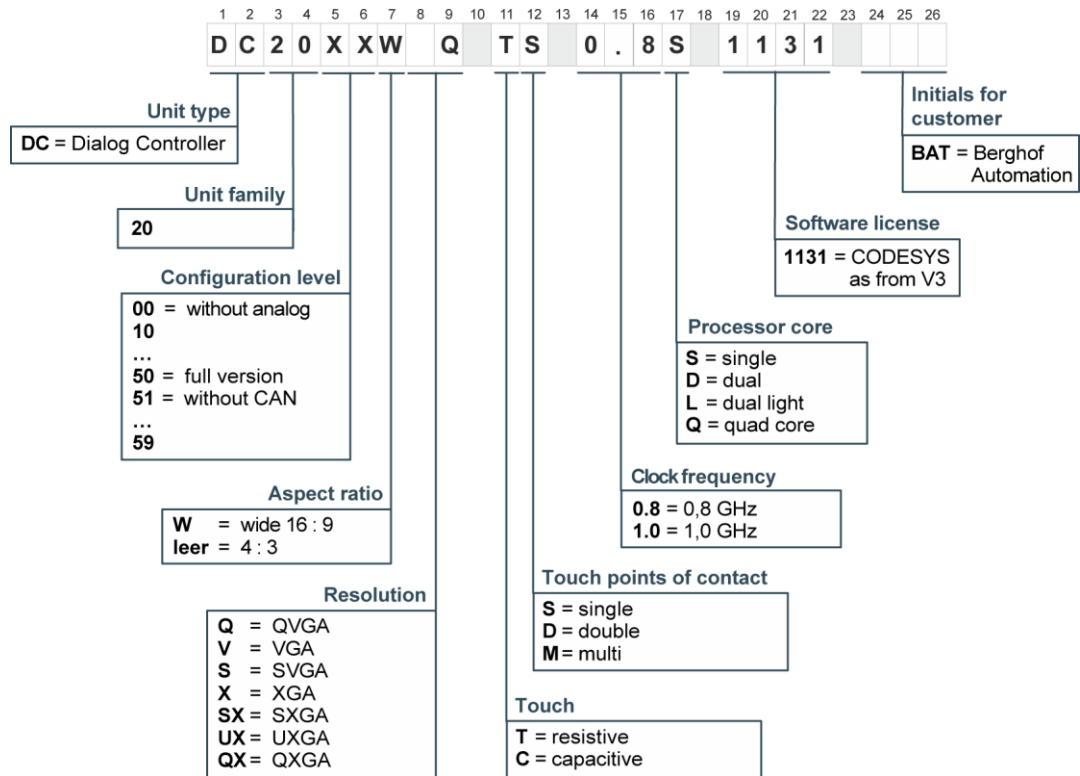


Fig. 41: DC20XX identification key

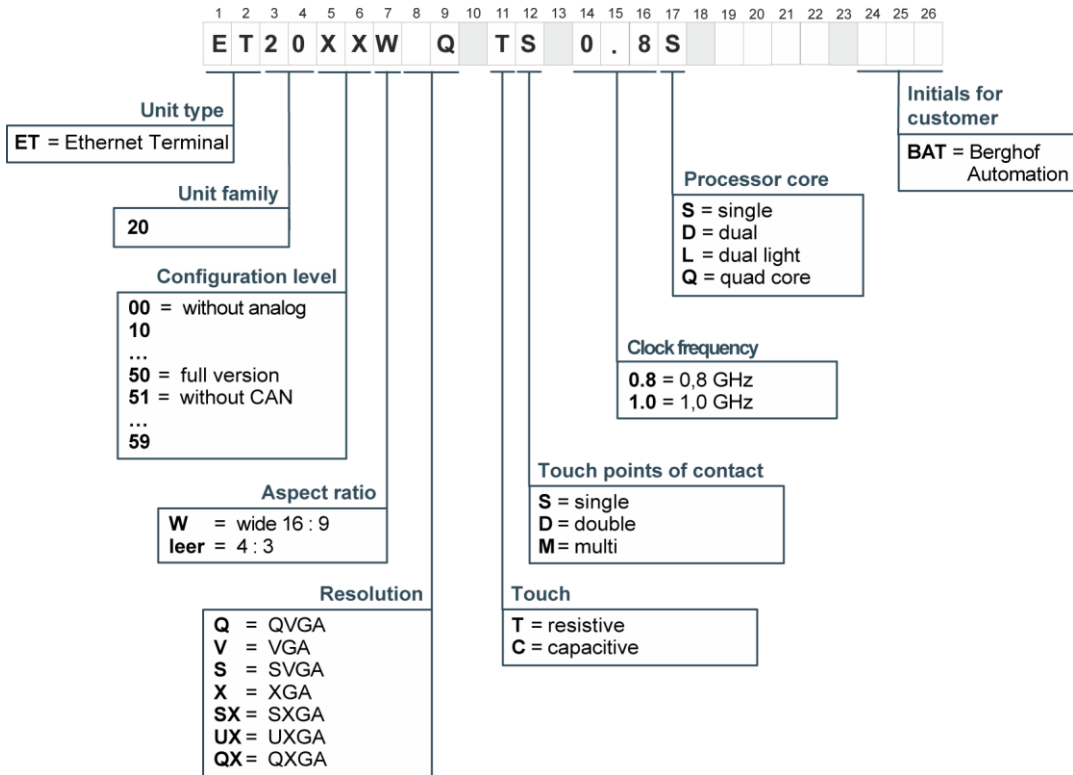


Fig. 42: ET20XX identification key

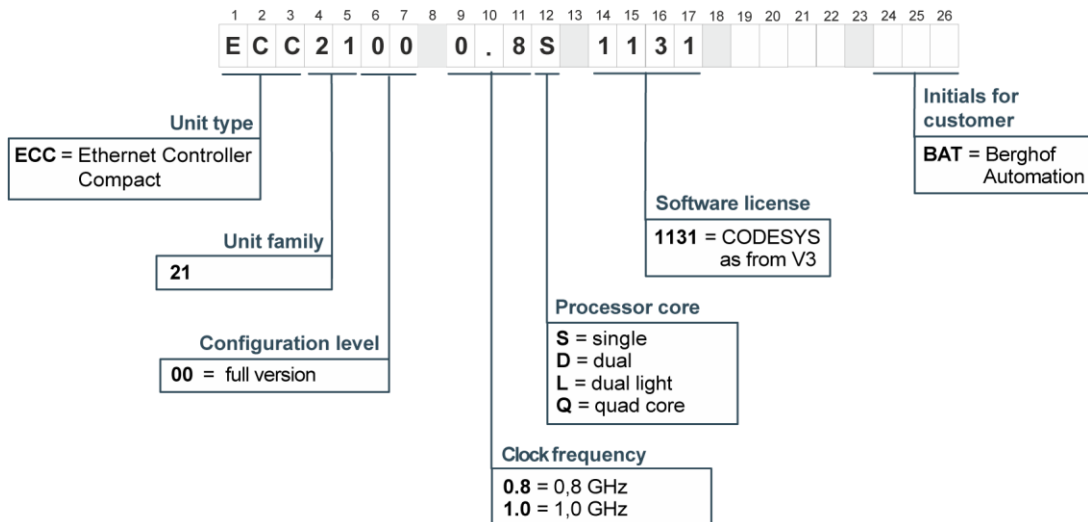


Fig. 43: ECC2100 Slim identification key

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

The cULus approval to the UL 61010-2-201 NRAQ /7 standard is in preparation.

Link:

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

→ UL File Number: E242595

11.3. Declaration of conformity

ZERTIFIKAT / CERTIFICATE

S. 1/1

EG-Konformitätserklärung 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 <hr style="border: 0; border-top: 1px solid black;"/> Datum Date	 Franz Ott <hr style="border: 0; border-top: 1px solid black;"/> Geschäftsführer Berghof Automation GmbH Chief Executive Officer Berghof Automation GmbH	 Uwe Manzow <hr style="border: 0; border-top: 1px solid black;"/> Projektingenieur Project Manager
---	--	--



Berghof Automation GmbH | Harretstrasse 1 | 72800 Eningen | www.berghof.com
 21-0099-88-10-02-032 | Dokument1

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
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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 and ECC2100 Slim.....	31
Fig. 17: Block circuit diagram, ET20XX.....	32
Fig. 18: Digital inputs and outputs, DC20XX and ECC2100 Slim plug X1 with LEDs 1 to 8.....	33
Fig. 19: Circuit diagram of the principles of positive switching output	35
Fig. 20: Circuit diagram of the principles of positive switching input.....	36
Fig. 21: Operating ranges of the digital inputs.....	36
Fig. 22: Ethernet interface X4.....	37
Fig. 23: EtherCAT interface X5.....	38
Fig. 24: USB interface X3.....	39
Fig. 25: RS-232 / RS-485 interface X6.....	40
Fig. 26: RS-485 switchable terminating resistor.....	40
Fig. 27: CAN interface X7	42
Fig. 28: Analogue inputs X2	43
Fig. 29: example connection: voltage input	48
Fig. 30: example connection: temperature measurement	49
Fig. 31: identification plate with device serial number 00001 (example)	52
Fig. 32: login window.....	53
Fig. 33: list of web interface settings	53
Fig. 34: "Network Configuration" page	54
Fig. 35: Location of the operating status LEDs.....	55
Fig. 36: function key (S1)	56
Fig. 37: Undo the securing clips.....	64
Fig. 38: Pushing the device out of the installation cut-out	65
Fig. 39: Uninstalling the device	66
Fig. 40: Identification plate (example)	75
Fig. 41: DC20XX identification key.....	76
Fig. 42: ET20XX identification key	77
Fig. 43: ECC2100 Slim identification key	77

13.2. Licences

In preparation