DC2115, ET2115
Dialog Controller, Ethernet Terminal
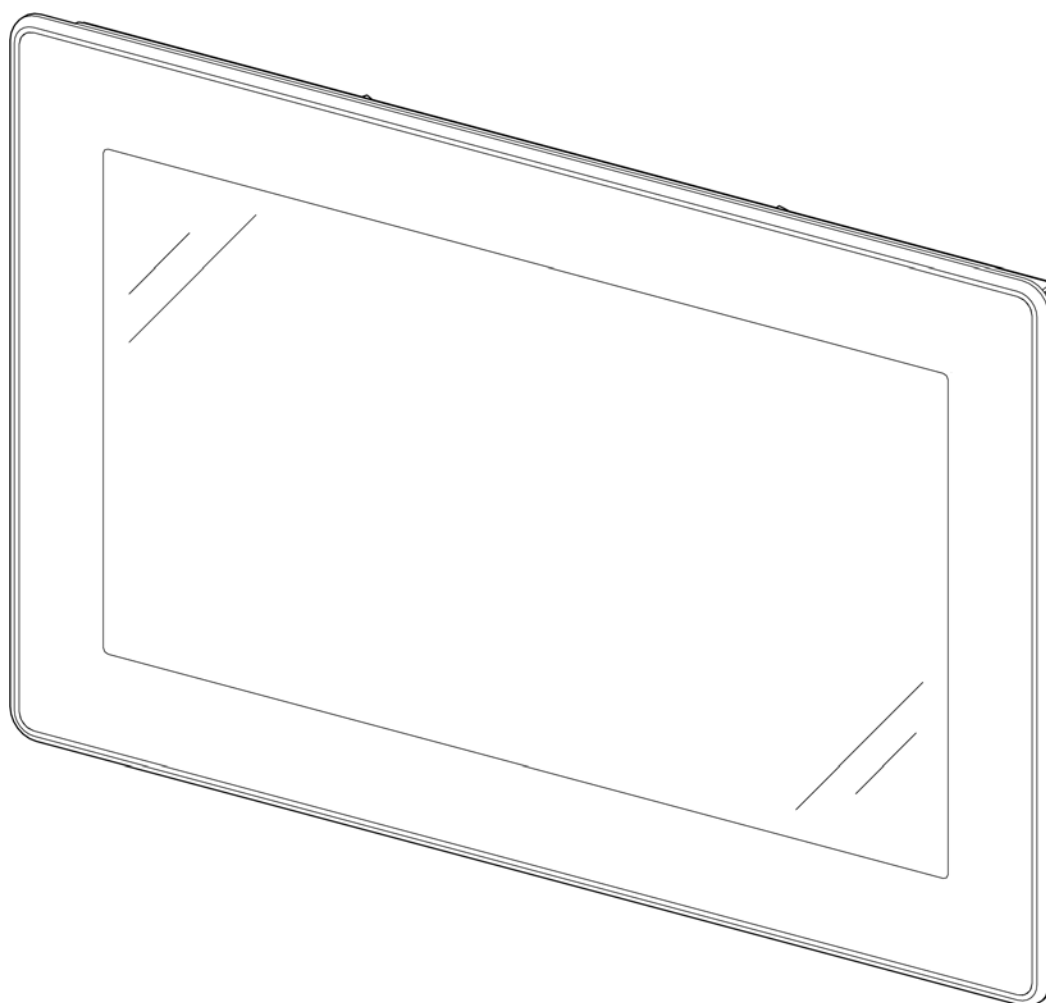
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Notes on this handbook

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

Change log

Version	Date	Description
0.8	17/11/2016	Draft
0.9	19/12/2016	Preliminary version
1.0	20/01/2017	First version

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Table of contents

1. General information

This user handbook is intended for use by qualified professionals 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:
→ DC2115 Dialog Controller
→ ET2115 Ethernet Terminal

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. … 2. …	List of instructions which must be carried out in the order given.
i	Additional product information

Design of warnings:

⚠ **WARNING** Optional: additional sym-bols	**Danger type and source** Short description and possible consequences ▶ Preventive measures

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.

❶ **NOTE**	**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 order.
→ 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 device is part of a modular automation system for industrial control applications within the medium to high performance range. It 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 controlling and regulating 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 in accordance with the technical data (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 into a suitable cut-out on 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, humidity 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 to 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 order. 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 housing of the device must not be opened.

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

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3.   Product description

The DC2115 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 CODESYS 3.5 (IEC 61131-3) development environment from 3S-Smart Software Solutions is used for programming the device.

The Ethernet Terminal ET2115 is an input device with a display for connection to a control system for machines or systems. The terminal shows the CODESYS Web visualisation or CODESYS Target visualisation, irrespective of whether the visualisation originates from a Berghof PLC control unit or some other CODESYS control unit.

The Ethernet Terminal ET2115 can be connected via Ethernet interfaces; the Controller DC2115 can be connected via different interfaces and has additional digital and analogue inputs/outputs.

The device connection area for all external connections is located at the rear of the devices. These devices are intended for installation on a flat surface in a pre-prepared installation cut-out.

All connections are of the insertion type.

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3.1. Overview

3.1.1. Overview DC2115
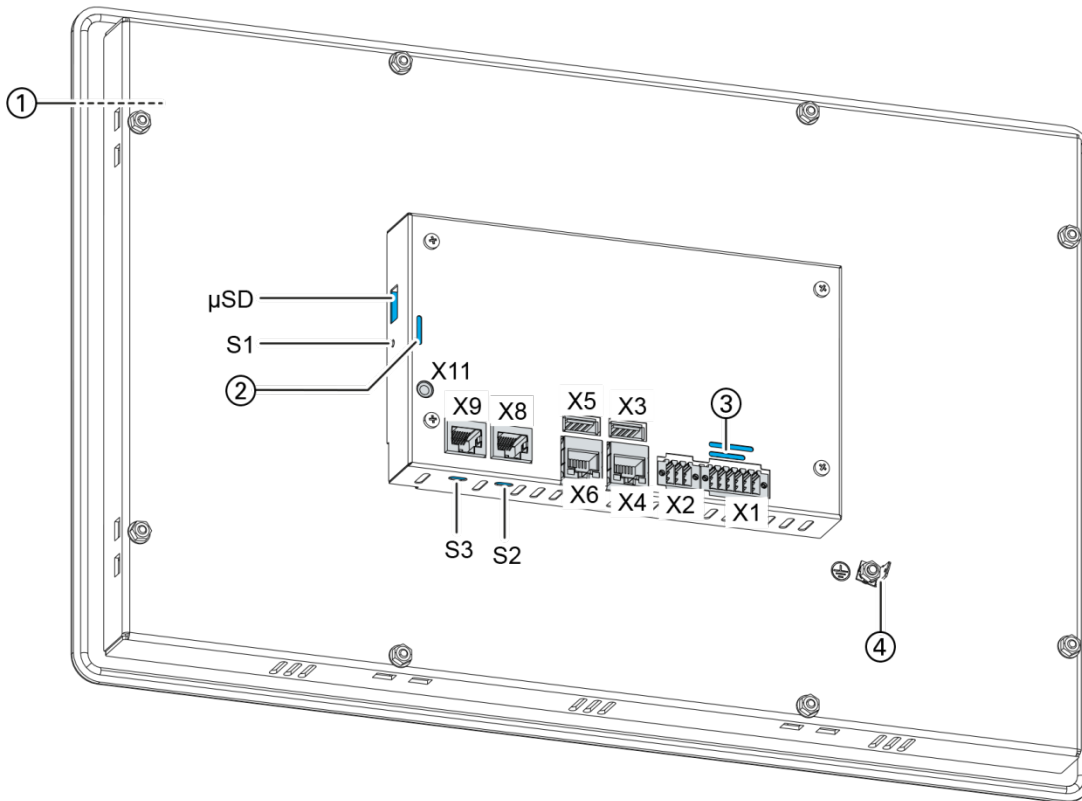
Fig. 1: Overview of DC2115 (rear view)

Item	Designation	Item	Designation
1	Display 15.6 inch	X6	EtherCAT (ETH1)
2	LEDs: PWR, Run/Stop, Error	X8	CAN bus
3	LEDs: Power, digital I/O	X9	RS-232 / RS-485
4	Earth connection	X11	Debug interface (do not use this - it is for use only by Berghof Service Engineers)
X1	Power supply, digital inputs / output	S1	Function button (do not use this - it is for use only by Berghof Service Engineers)
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 slot (for memory extension)
X5	USB 2.0		

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3.1.2. Overview ET2115
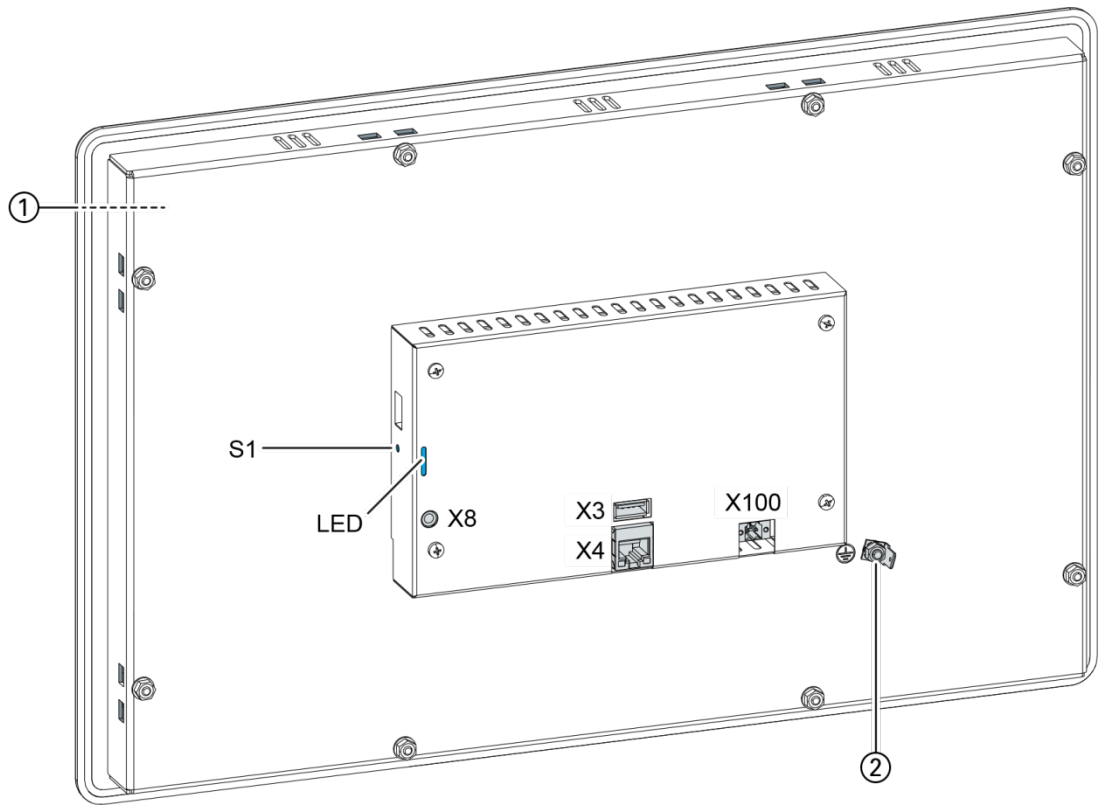
Fig. 2: Overview ET2115 (rear view)

Item	Designation	Item	Designation
1	Display 15.6 inch	X8	Debug interface (do not use this - it is for use only by Berghof Service Engineers)
2	Earth connection	X100	Power supply
X3	USB 2.0	S1	Function button (do not use this - it is for use only by Berghof Service Engineers)
X4	Ethernet (ETH0)	LED	LEDs: PWR, Run/Stop, Error

3.2.   Scope of delivery and accessories

Scope of delivery

DC2115

→   Device

→   E-I/O connector, 12-pin, black (order no. 15838)

ET2115

→   Device

→   E-I/O connector, 2-pin, black (order no. 204801800)

Accessories

DC2115

→   E-I/O connector, 6-pin, black (order no. 204803900)

→   E-I/O connector, 12-pin, black (order no. 15838)

ET2115

→   E-I/O connector, 2-pin, black (order no. 204801800)

3.3.   Product features

Installation

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

Processor

In its the basic configuration the device is equipped with an 800 MHz ARM® CPU with a Cortex™-A9 core.

Ethernet

1 Ethernet interface with 10/100 Mbit/s

The 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.

EtherCAT (DC2115)

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.

> ℹ️   USB sticks with FAT/FAT32 formatting are supported.
>
> If you require support for other USB formats, please contact our Technical Support.

CAN interface DC2115
The device has one standard CAN interface which can be used at a speed of up to 1 Mbit/s.

Serial interface (DC2115)
The device has 2 serial interfaces (1x RS-485; 1x RS-232).

Onboard inputs / outputs (DC2115)
The device incorporates digital inputs / outputs and analogue inputs.

Real-time clock (DC2115)
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 (DC2115)
The standard commercial microSD card interface (SDHC up to max. 32 GB) allows data to be written to memory cards or read from memory cards.

Summary of features

DC2115
→ ARM® CPU with Cortex™-A9 single-core (800 MHz; optional dual or quad core)
→ User program and data memory (RAM): 256 MB onboard
→ User program memory (flash): 256 MB onboard
→ 2 USB host interfaces (USB 2.0)
→ Non-volatile 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
→ Real-time clock

ET2115
→ ARM® CPU with Cortex™-A9 single-core (800 MHz)
→ 1 USB host interface (USB 2.0)
→ 1 Ethernet 10/100 Base T interface

4. Installation

4.1. Preparation for installation

The device is intended for installation from the front into a rectangular cut-out on a panel. The support material must be rigid and be from 1 to 4 mm thick.
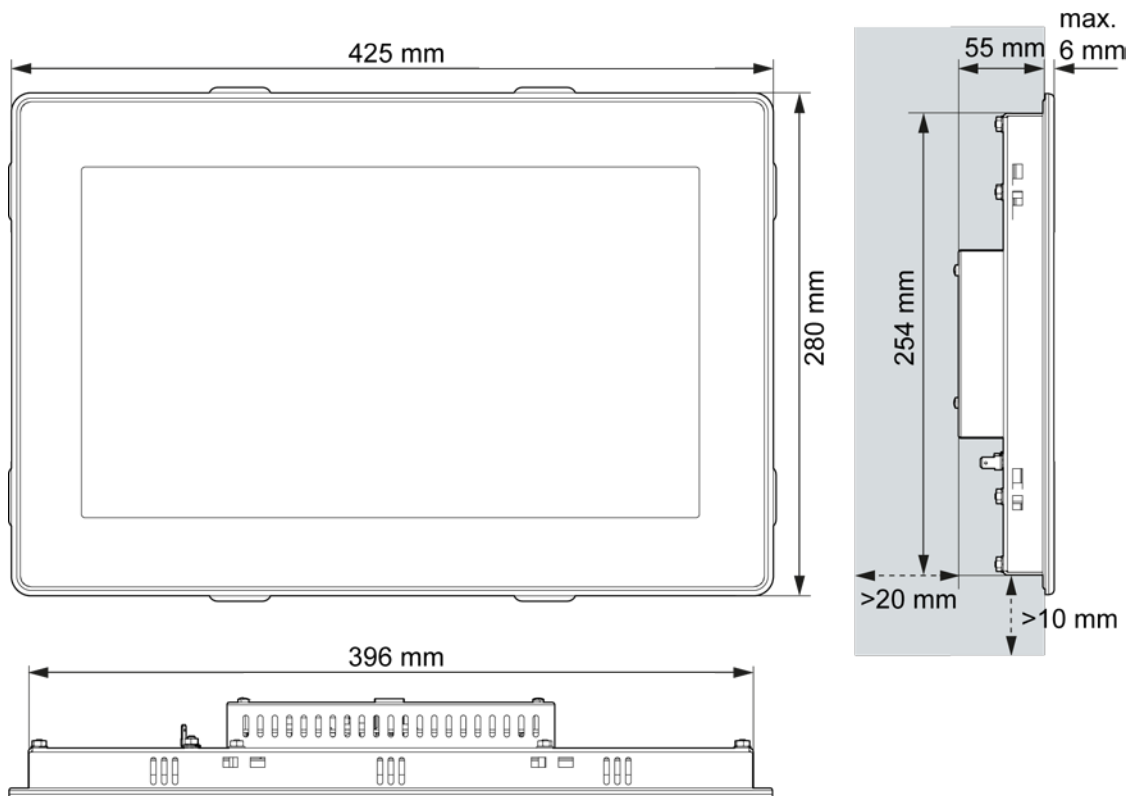
Fig. 3: Dimensions

Requirements:
→ To allow sufficient air circulation, it must be ensured that the device has a clear space of at least 20 mm all round at the rear.
→ The max. ambient temperature inside the control cabinet must not exceed 55 °C in operation.
→ The support material for the installation cut-out must be flat, sufficiently stable, and be from 1 to 4 mm thick.

❶ NOTE	**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.

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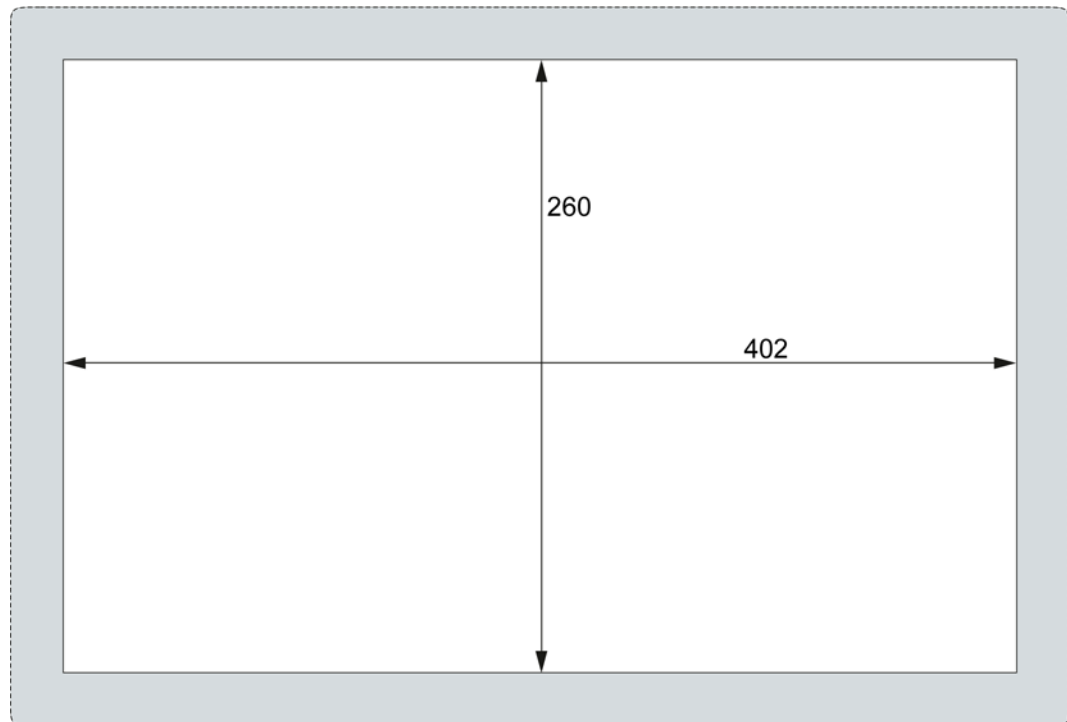
Fig. 4: Installation cut-out

▶ **Cut a rectangular installation cut-out in the support material:**
Height: 260 mm
Width: 402 mm
Max. Corner radius: 3.0 mm

Thickness of the support material:
Optimally: 2.0–3.0 mm
Max.: 4.0 mm

4.2. Installation
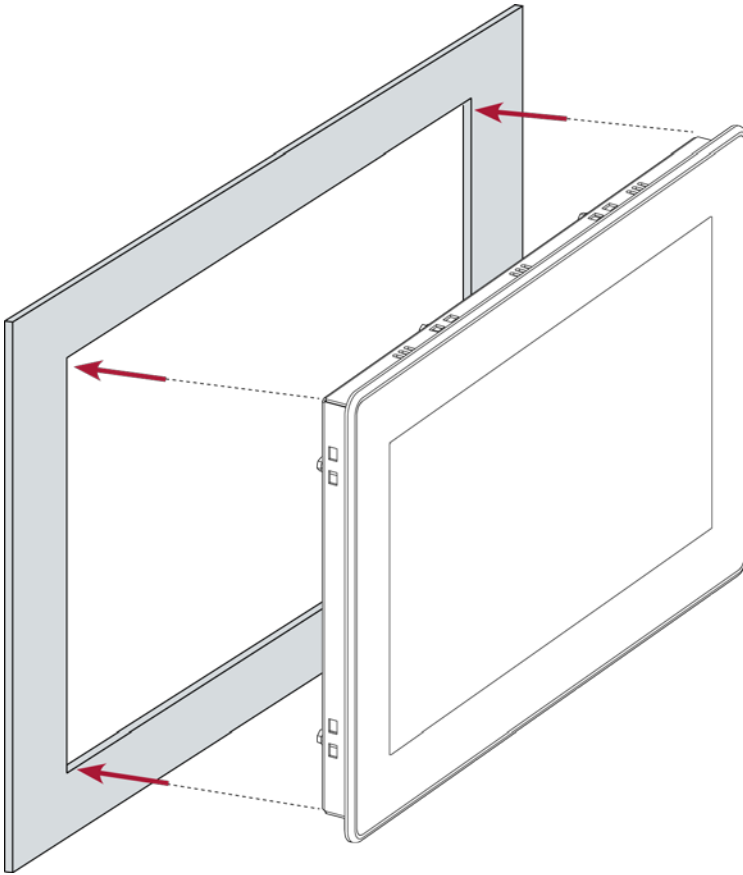
Fig. 5: Insertion into the installation cut-out

Requirements:
→   The securing clips must not be attached to the device.

1.   Making sure the alignment is correct, push the device evenly into the installation cut-out.

❶ NOTE	**Damage to the device!**
	If installation is performed carelessly the device can fall out of the installation cut-out or be damaged.
	▶ Do not tilt the device.
	▶ Restrain the device against falling until the securing clips have been secured.

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2. Make sure the device lies flush all round.
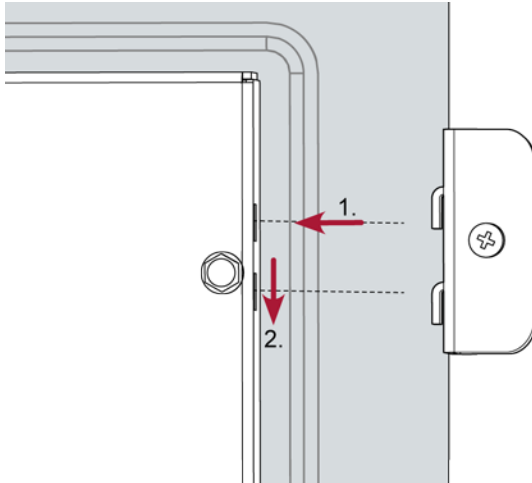
Fig. 6: Inserting the securing clips (rear view)

3. Secure the device with 2 securing clips: Insert the securing clips into the cover at diagonally opposite points and tighten the screws finger-tight.
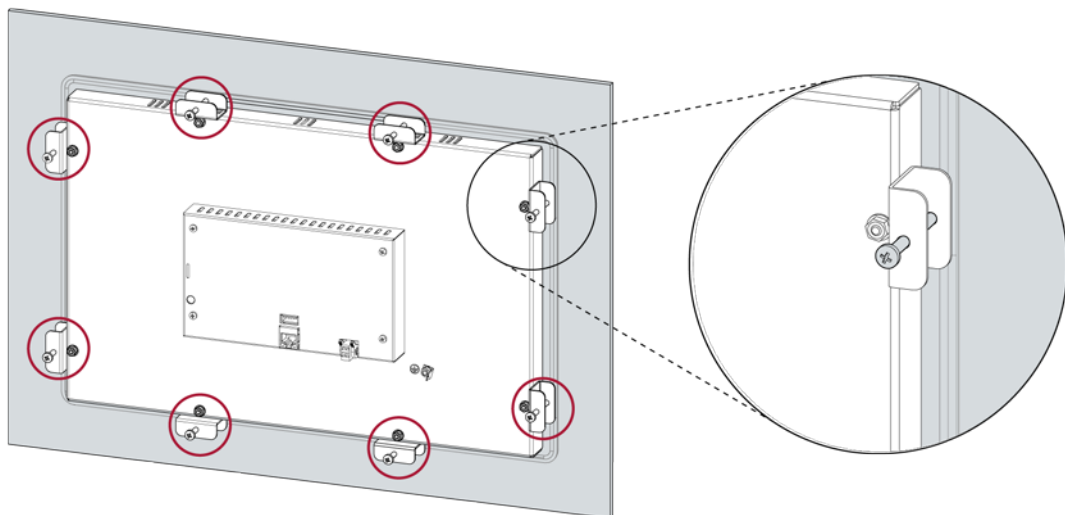
Fig. 7: Tightening the securing clips

4. Insert the remaining 6 securing clips and tighten all 8 screws equally.

5.   Connection

⚠ **WARNING**	**Uncontrolled and unpredictable operational behaviour!**
	Failure of certain components in electronic control systems may result in uncontrolled and unpredictable operational behaviour.
	▶ All types of failure and the associated protection systems must 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 connecting 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%)
Ripple current proportion	Max. 5% The direct voltage level must not fall below 20.4 V.
Power consumption	ET2115 Total max. 0.6 A at +24 V DC (peak current 1.2 A) DC2115 Total max. 0.8 A at +24 V DC (peak current 1.2 A)

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 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.

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5.1.1. Connecting the power supply to the DC2115

⚠ CAUTION	**Live parts!** ▶ Before starting any work on the device, switch off all power feeds, including peripherals.

▶ Connect the power supply to connector X1 according to the following table.
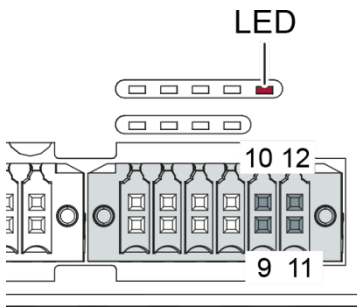
Fig. 8: Power supply DC2115 connector X1 with power LED

Power supply connector X1		
Pin	**Designation**	**Assignment**
1…8	I/O	digital inputs and outputs (see "Digital inputs and outputs DC2115")
9	L0+ 24 V	Power supply 24 V DC (–15 %/+20 %) (PLC internal processing) max. 1.2A
10	L1+ 24 V I/O	Feed to digital output (max. 2 A for 0.5 A per output) for I/O
11	M0 / GND	–
12	L0+ 24 V	Power supply 24 V DC (–15 %/+20 %) (PLC internal processing) max. 1.2A

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

→ B2CF 3.50/12/180

5.1.2. Connecting the power supply to the ET2115

⚠ **CAUTION**	**Live parts!**
	▶ Before starting any work on the device, switch off all power feeds, including peripherals.

▶ Connect the power supply to connector X100 according to the following table.
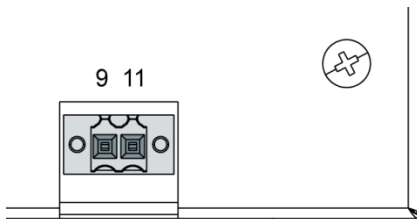
Fig. 9: Power supply connector X100

Power supply connector X100		
Pin	**Designation**	**Assignment**
9	L0+ 24 V	Power supply 24 V DC (–15 %/+20 %), max. 0.6 A (peak current 1.2 A)
11	GND	M0 / GND

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

→ BLZF 3.5/02/180 (F,LR,LH)SN

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5.2. Data connections

5.2.1. Block circuit diagram, DC2115
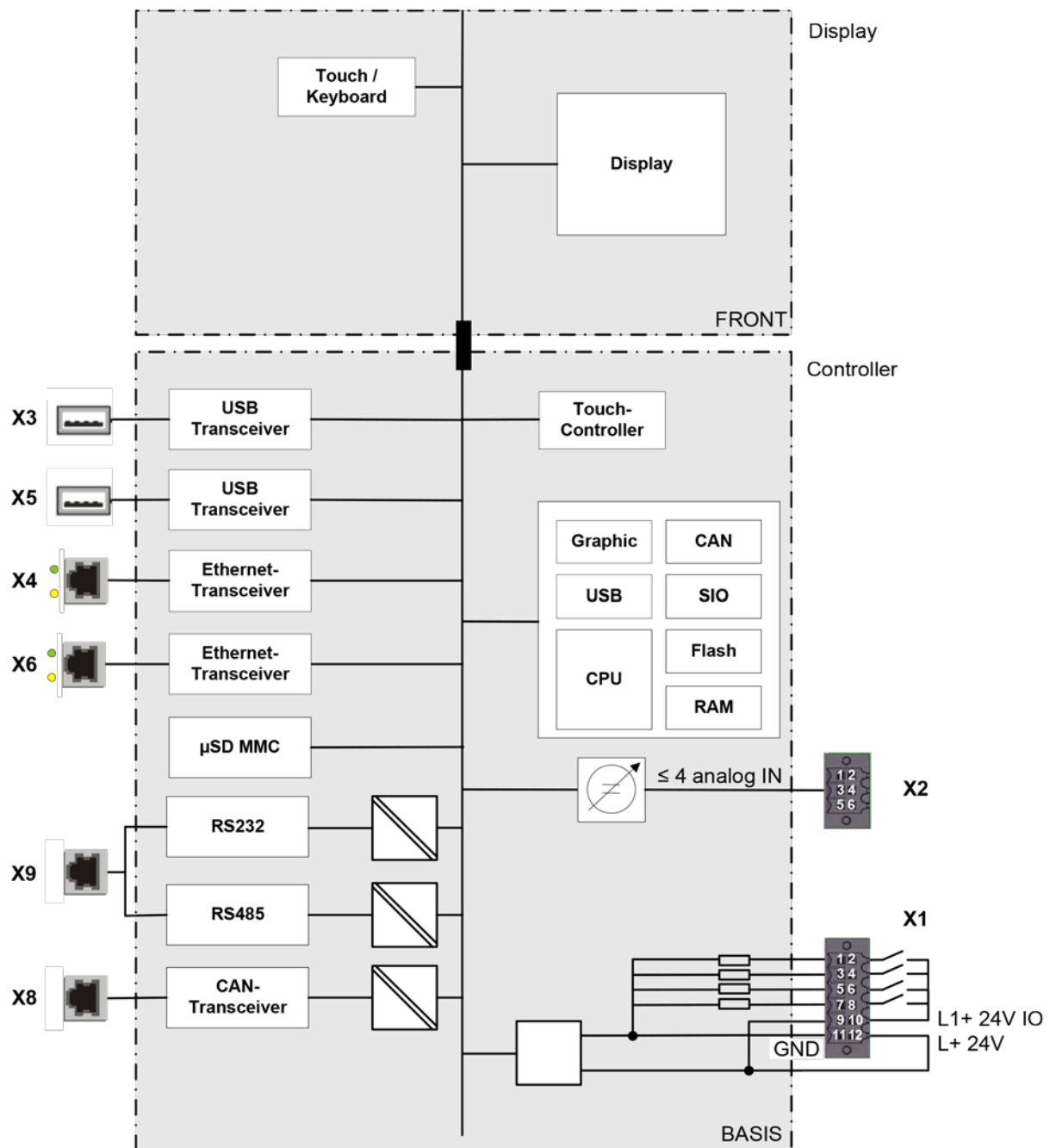
Fig. 10: Block circuit diagram, DC2115

5.2.2. Block circuit diagram, ET2115

Fig. 11: Block circuit diagram, ET2115

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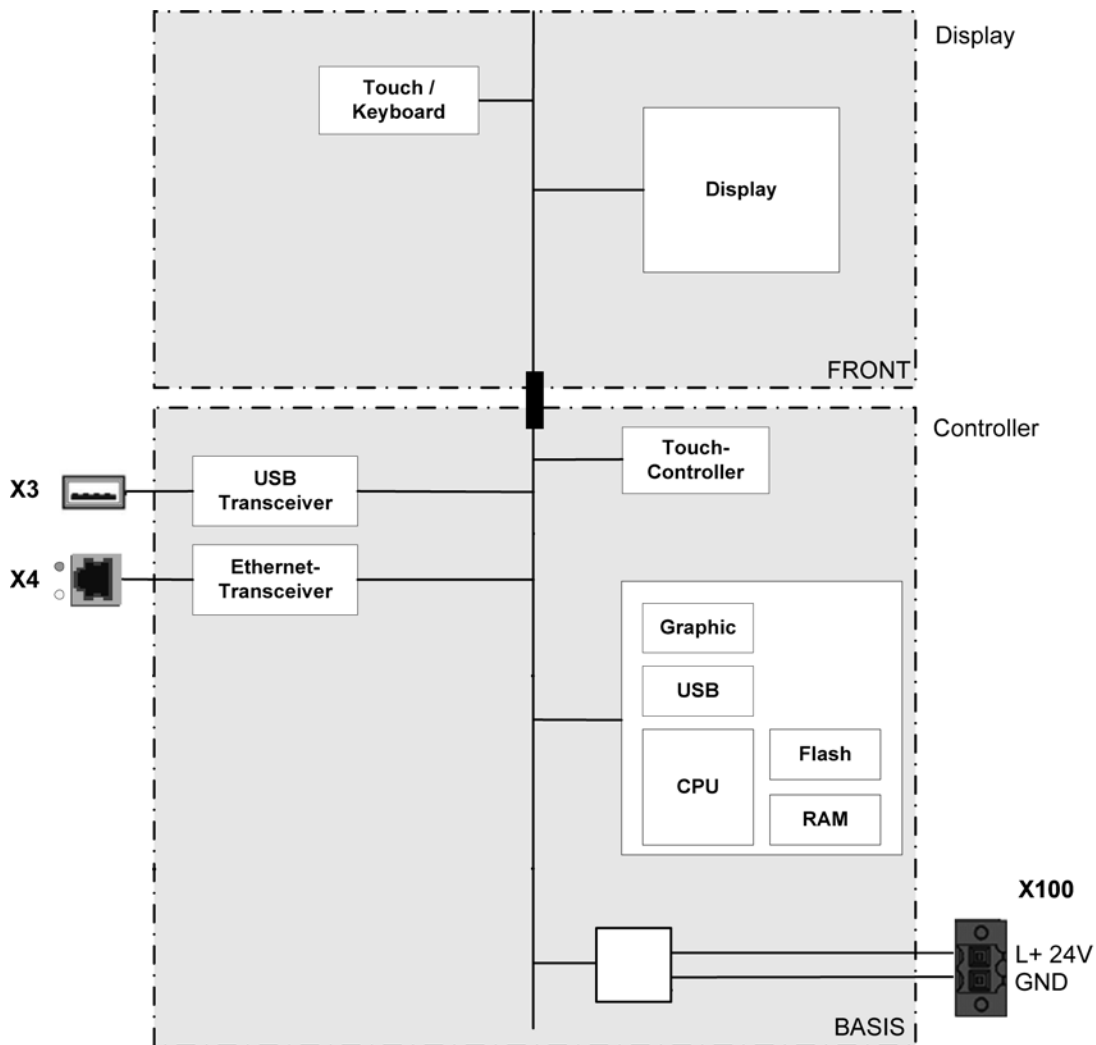
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5.2.3. Digital inputs and outputs (DC2115)

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.

	NOTE	**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 with the S2C-SMT 3.5 (Weidmüller) connector and are approved for use with the device:
→   B2CF 3.50/12/180F
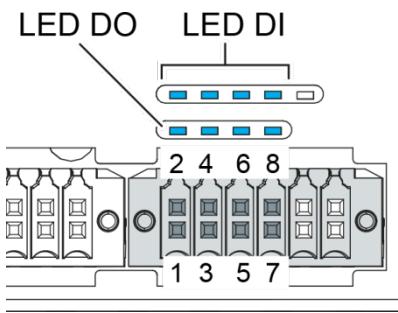
Fig. 12: Digital inputs and outputs, DC2115 connector X1 with LEDs 1 to 8

Digital inputs and outputs, connector X1		
Pin	**Desig-nation**	**Assignment**
1	DO 1	digital output
2	DI 1	digital input
3	DO 2	digital output
4	DI 2	digital input
5	DO 3	digital output
6	DI 3	digital input
7	DO 4	digital output
8	DI 4	digital input
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	Last 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
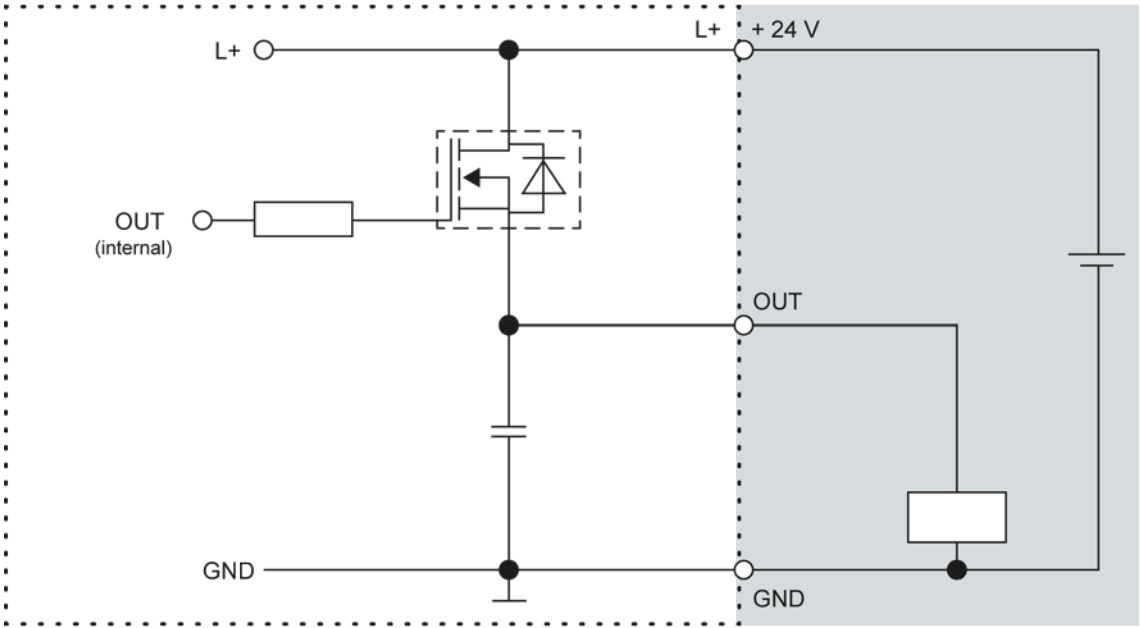
Fig. 13: Circuit diagram of the principles of positive switching output

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 within the control cabinet	0.14 – 1.5 mm² (26-16 AWG)	Aim for 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 yellow LED per input lights at logical 1
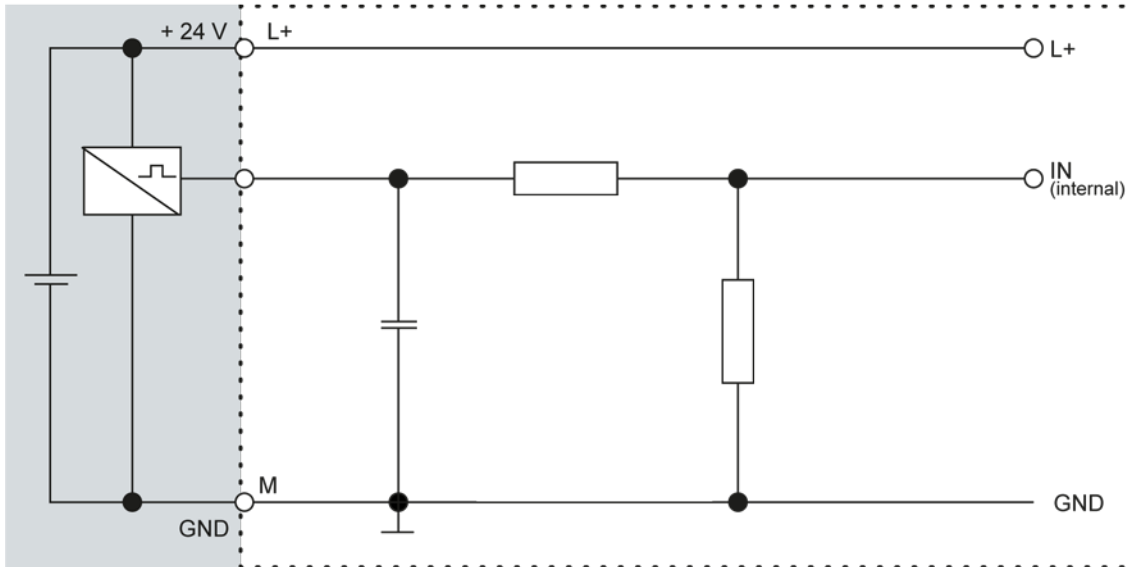
Fig. 14: Circuit diagram of the principles of positive switching input
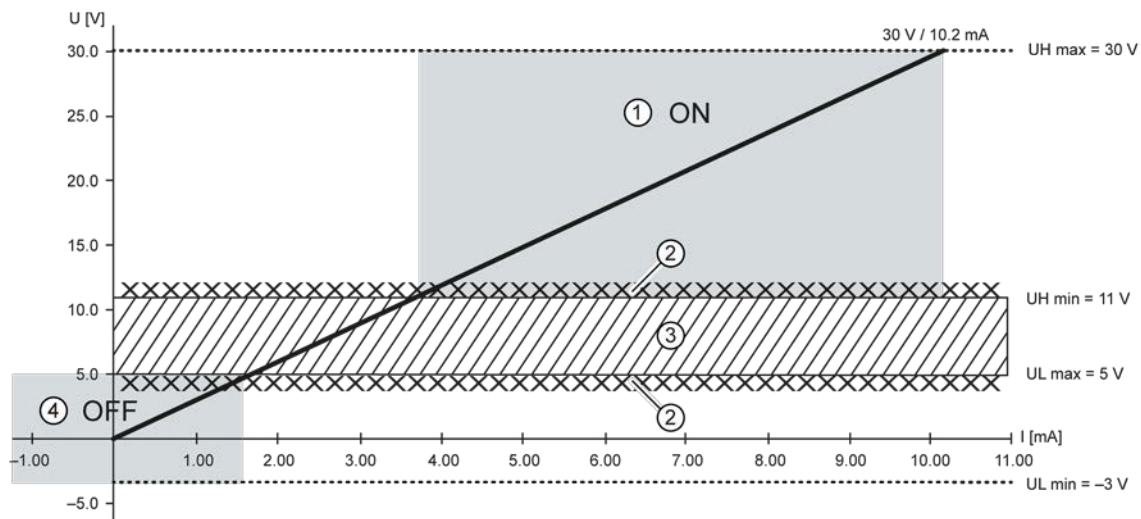
Fig. 15: Operating ranges of the digital inputs (type 1/3), negative switching

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

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5.2.4. Analogue inputs DC2115

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(0) sensors.
→ The AI (U) channels can measure voltages or be used for compensation of the line resistances for PT100(0) 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(0) 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 with the S2C-SMT 3.5 (Weidmüller) connector and are approved for use with the device:
→ Weidmüller B2CF 3.50/06/180(F) SN BK
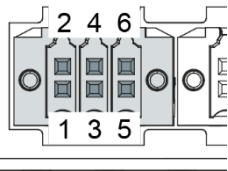

Fig. 16: Analogue inputs X2

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.

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Operating modes for the analogue inputs

ℹ️ **NOTE**	**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 kΩ	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	±0.8 % (±2 °C)	–
Temperature coefficient	±40 ppm/K (±0.4 mV/K)	–
Digital resolution	24 bit	–
Data format in the 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 at 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. If the voltages applied are greater than +15 V or less than –15 V, an error 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	Low-pass second order, limit 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 necessary a further AI (U) channel can be used for 3-wire measurement)
Possible sensors	PT100 and PT1000 acc. to EN 60751	Platinum sensors of accuracy classes AA, A, B and C 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 the 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 (6th degree polynomial)
Input type	–	2-wire measurement or 3-wire measurement
Reference potential	AGND	–
Dynamic characteristics		
Analogue filtering	Low-pass second order, limit frequency 650 Hz	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	1% of measuring range	–

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Voltage input AI (U)

Fig. 17: 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 connector 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. 18: Example connection: Temperature measurement

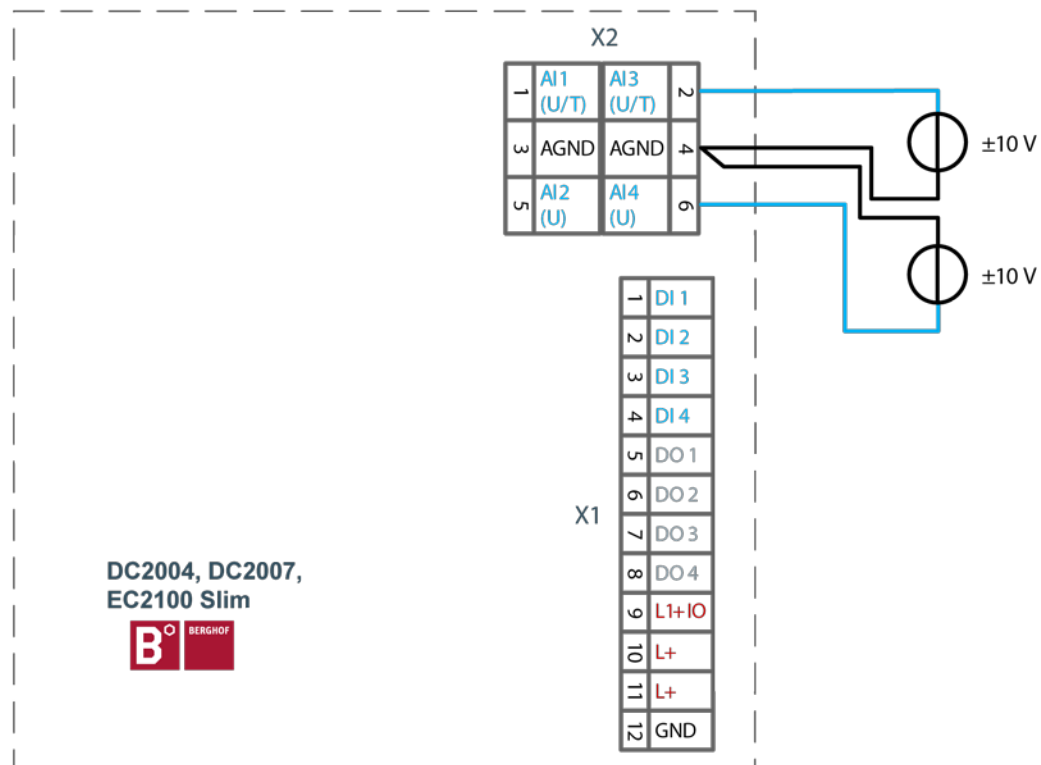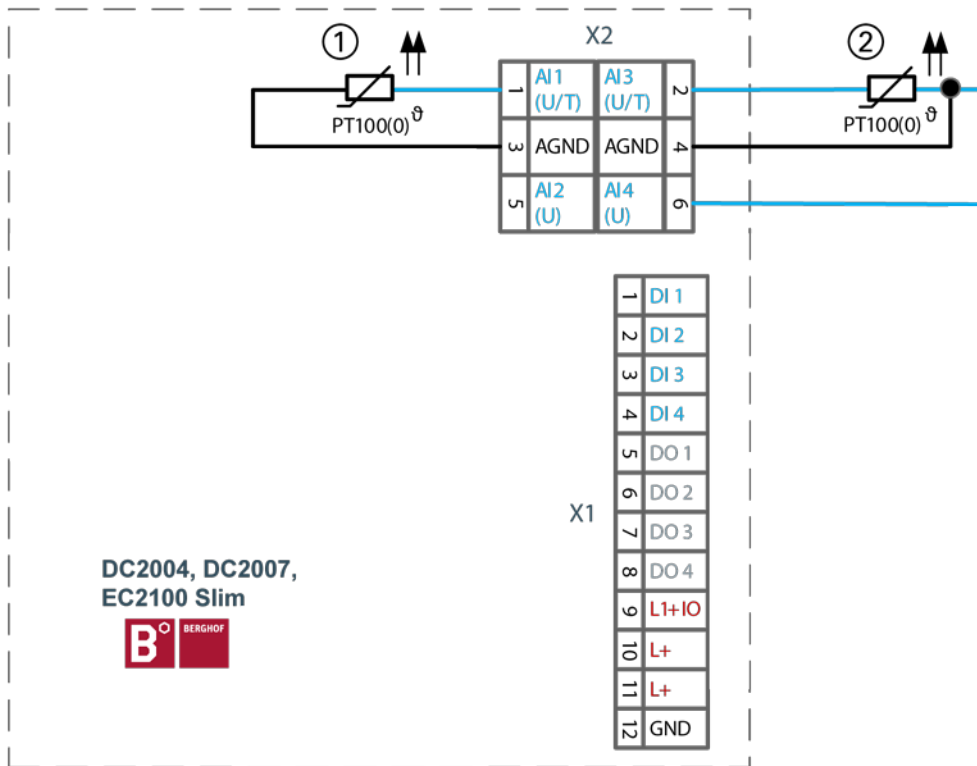| Item	Description
1	PT 100 with 2-wire connection
2	PT 100 with 3-wire connection

- ▶ 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(0) sensors should be connected as directly as possible (avoid the use of terminals and terminal blocks).
- ▶ Only connect PT100(0) 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.

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5.2.5. Ethernet

The on-board Ethernet adapter has one 10/100-Base-T RJ-45 port for connection to the network.
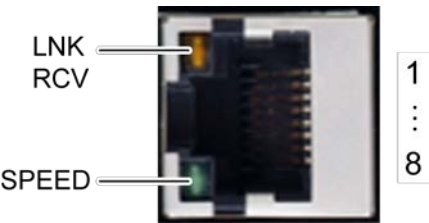
Fig. 19: Ethernet interface X4

Assignment of Ethernet interface connector 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 (DC2115)

The onboard Ethernet adapter has two 10/100 Base-T interfaces with RJ-45 connections for networking. The Ethernet interface X6 can be used as the EtherCAT master.
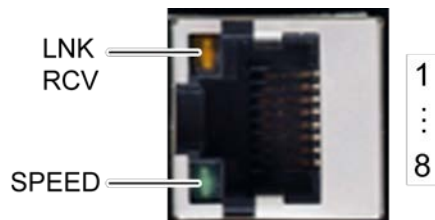

Fig. 20: EtherCAT interface X6

Assignment of EtherCAT interface connector X6			
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

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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:

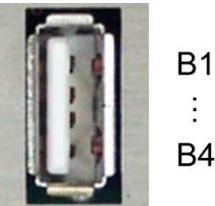→ CODESYS user: only USB stick
→ Linux level: USB stick or mouse

Fig. 21: USB interfaces X3 and X5 (DC2115)

Assignment of USB interface connectors X3 and X5 (DC2115)			
Pin	**Assignment**	**Pin**	**Assignment**
B1	VCC	B3	D+
B2	D–	B4	GND

ℹ NOTE	**Damage to USB stick and malfunction due to data loss!**
	Removing a USB stick while it is still in use and data are 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.

ℹ NOTE	**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.

ℹ NOTE	**Failures and malfunctions will occur if direct connections are made to signal earth!**
	▶ Use only USB devices that have no direct connection between signal earth and the housing.

ℹ The USB interface connector is designed to withstand 1,000 insertion and withdrawal cycles.

5.2.8. CAN Bus (DC2115)

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
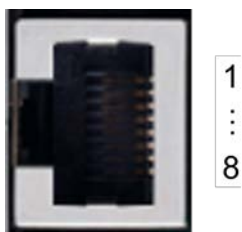
Fig. 22: CAN interface X8

Assignment of CAN interface connector X8			
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.

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5.2.9. Serial interfaces (DC2115)

The module has two serial communications interfaces (1x RS-232 and 1x RS-485), which are connected via the common RJ45 connector X6.
Maximum baud rate for both interfaces: 115 kBd

Fig. 23: RS-232 / RS-485 interface X9

Pin assignment for RS-232 / RS-485 interface connector X9			
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.
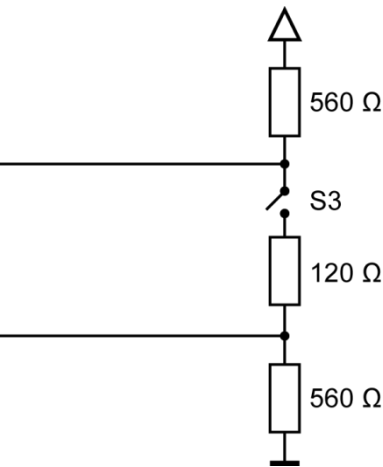

Fig. 24: RS-485 switchable terminating resistor

ℹ 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 V) and logical "0" (A–B > +0.2 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 Ω) at multiple points.

6. Operation

6.1. Switching on and off

ⓘ NOTE	**Damage or malfunction!**
	▶ 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).

ⓘ NOTE	**Damage to property!**
	▶ 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. DC2115 Web interface

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

❶ NOTE	**Damage to property!**
	▶ Before connecting the power supply, ensure that all cabling and the polarity of all the connections are correct.

1. Supply the device with power (24 V).

After the start the current IP address and network mask of the DC2115 are shown at 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.

Fig. 25: 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. 26: List of web interface settings

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

Network Configuration

COMMON

Hostname	BGH-IMX6
Default Gateway	0.0.0.0
DNS Server 1	0.0.0.0
DNS Server 2	0.0.0.0

ETH0

Mode:	static
IPAdress	169.254.255.100
NetMask	255.255.255.0

ETH1

Mode:	ethercat

[Save]

Fig. 27: "Network Configuration" page

7.   Check the network settings and make any changes in the text boxes if required.
      DC20XX 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 (for example, "system time", display resolution, TargetVisu).

10. In order to save 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. DC2115 OnScreen config

ⓘ NOTE	**Damage to property!**
	▶ Before connecting the power supply, ensure that all cabling and the polarity of all the connections are correct.

1. Supply the device with power (24 V).
After the start the current IP address and network mask of the DC2115 are shown at the top right of the display.

Fig. 28: Main screen of the device

2. To change the IP address via the display, press the "Settings" icon (1).
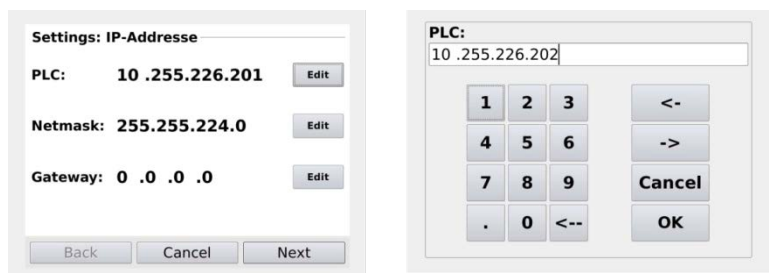The page with the network settings of the device appears.

Fig. 29: Network settings

3. If necessary, press the "Edit" button and change the network settings as required (IP address, network mask, gateway).
4. Press the "Next" button.

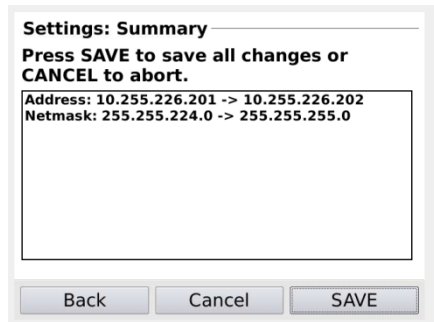The page with the summary of the network settings appears.

Fig. 30: Summary of the network settings

5. To change other settings or to correct the changes, press the "Back" button.
6. If no settings were changed, press "OK".
   The main screen of the device will appear.
   – or –
   Press the "Save" button.
   The settings will be saved and the device automatically restarts itself.

The device is now configured and ready for use.

6.2.3. ET2115

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

ⓘ NOTE	**Damage to property!**
	▶ Before connecting the power supply, ensure that all cabling and the polarity of all the connections are correct.

1. Supply the device with power (24 V).

After the start the current network settings are displayed (server IP, IP address and network mask).
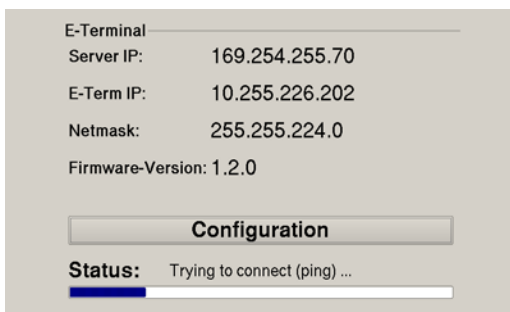

Fig. 31: Start page, with network settings

2. Press the "Configuration" button.

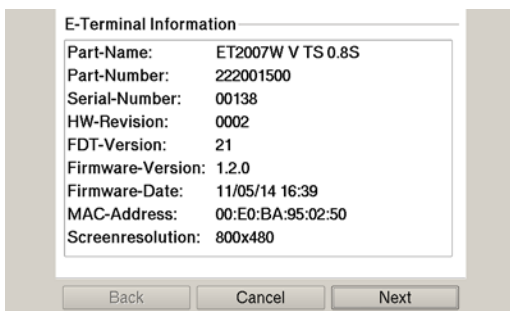A page with further information appears.

Fig. 32: Information page

3. Press the "Next" button.

The page with the network settings of the device appears.

Fig. 33: Network settings of the device

4.   If necessary, press the "Edit" button and change the network settings as required (IP address, network mask, gateway).

5.   Press the "Next" button.

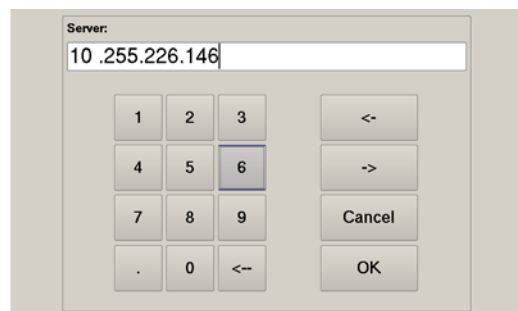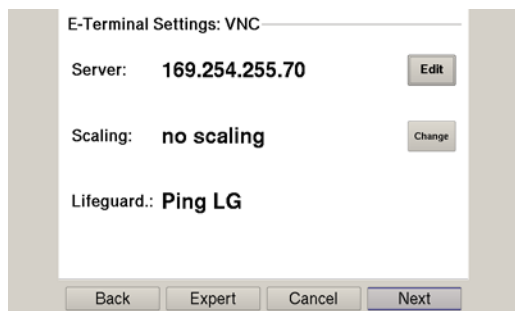The page with the settings for the server IP and Lifeguard appears.

Fig. 34: Setting the server IP

6.   If necessary, press the "Edit" button and change the server IP as required.

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

Fig. 35: Changing the Lifeguard setting

8. Depending on the controller version, press the "Change" button to change the Lifeguard setting:
   CODESYS V2: "Berghof VNC LG"
   CODESYS V3: "Ping LG"
9. Press the "Next" button to skip the following pages with until the page with the summary of the network settings appears.
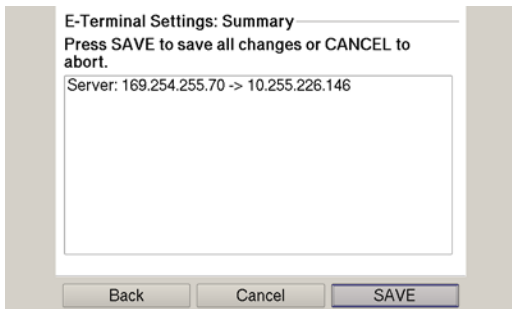

Fig. 36: Summary of the network settings

10. If no settings were changed, press "OK".
    The main screen of the device will appear.
    – or –
    Press the "Save" button.
    The settings will be saved and the device automatically restarts itself.
11. Connect the device to the controller, using the network cable.

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.

Location of the operating status LEDs
The Run/Stop and Error LEDs display the system status.
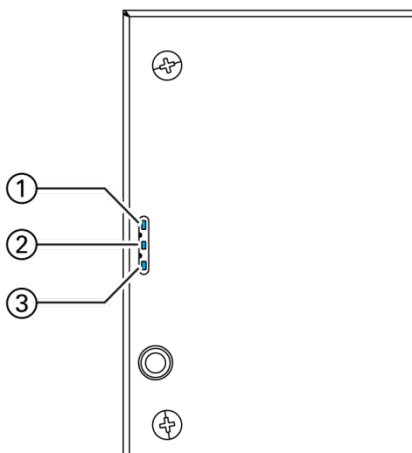
Fig. 37: Location of the operating status LEDs

LED		Meaning
1	PWR (green)	Shows that the power supply to the electronics is correct.
2	Run/Stop (yel-low/green/red)	Shows the system 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.
→   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. Function key S1
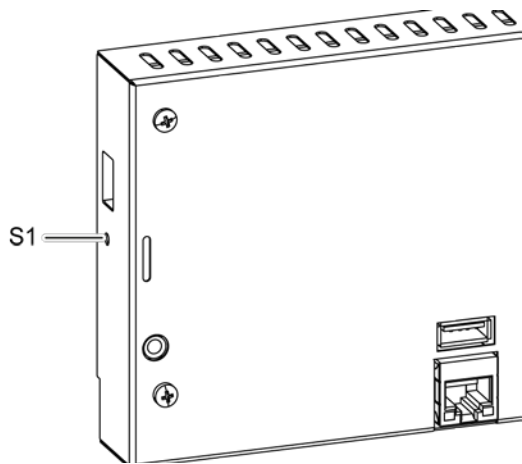
Fig. 38: Function key (S1)

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 the PLC with resetting of variables (cold re-set)

6.3.3. Real-time clock with buffer battery DC2115

Setting the date and time
The time can be set via the web configuration page or via 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.

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6.3.4. microSD card

⚠ **WARNING**	**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.

ⓘ **NOTE**	**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 insertion and withdrawal cycles.

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

To avoid malfunctions, do not withdraw the microSD card by pulling it.

6.4. Troubleshooting

6.4.1. No network connection

▶ Check the cabling / switch.
▶ Check whether an IP address has been duplicated.
▶ Check the network settings on the PC: The subnet and the subnet mask settings must be the same as those for the controller.
▶ Check the firewall / anti-virus programs on the PC.
▶ Check the Lifeguard settings.

6.4.2. In error stop mode DC2115

1. Log in to the device via a web browser.
2. Determine the cause of the 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.

7. Maintenance/upkeep

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

7.1. Maintenance

⚠ **WARNING**	**Uncontrolled and unpredictable operational behaviour!**
	Failures or malfunctions may result in uncontrolled and unpredictable operational behaviour.
	▶ 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

⚠ NOTE	**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 surfaces 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

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→ Tomato juice
→ Mustard
→ Tomato ketchup

7.3.2. Resistance of the front diaphragm

ⓘ NOTE	**Damage to the front diaphragm!**
	The front diaphragm is not resistant to the following chemicals and influences, and can be damaged by their effects:
	Benzyl alcohol
	Concentrated alkalis
	Concentrated inorganic acids
	Dichloromethane (methylene chloride)
	High-pressure steam above 100 °C
	long-term effects of direct sunlight
	▶ 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.
In accordance with the standard DIN 42 115 part 2, the front diaphragm is resistant to the following chemicals, without any evident change or damage:

Application for 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

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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

1. Disconnect the device and its peripherals from the power supply.
2. Unplug all connector connectors and cables.

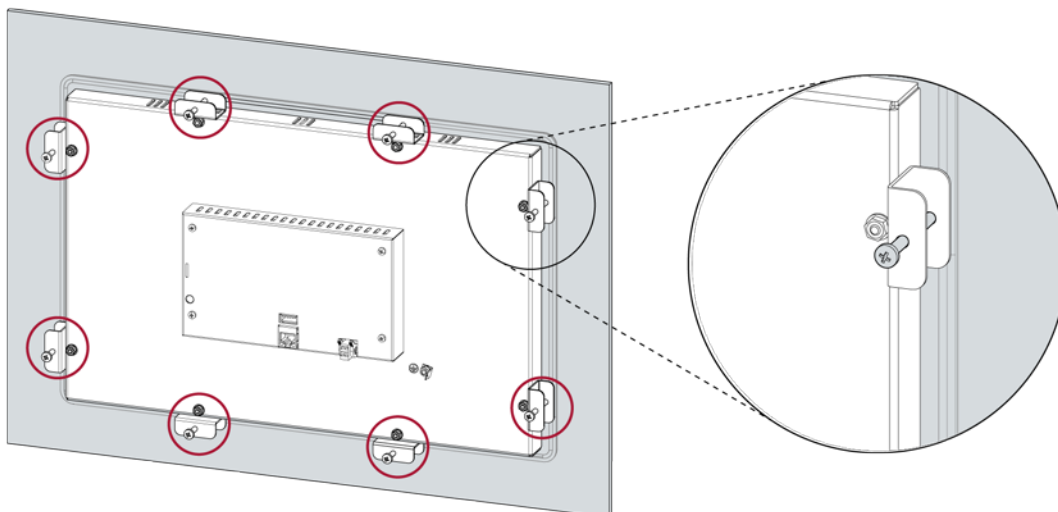| ⓘ NOTE	**Damage to the device!**
	If uninstallation is performed carelessly the device can fall out of the installation cut-out or be damaged.
	▶ Do not tilt the device.
	▶ Secure the device against falling, especially when taking it out of the installation cut-out.

Fig. 39: Undoing the screws

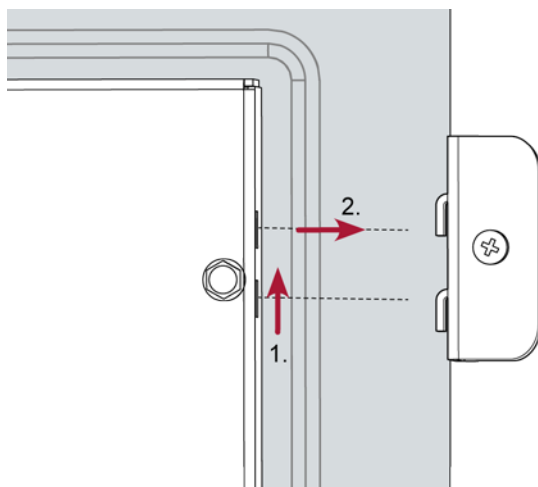3. Undo equally the screws of the 8 securing clips.

Fig. 40: Removing the securing clips

4.   **Remove the 8 securing clips.**
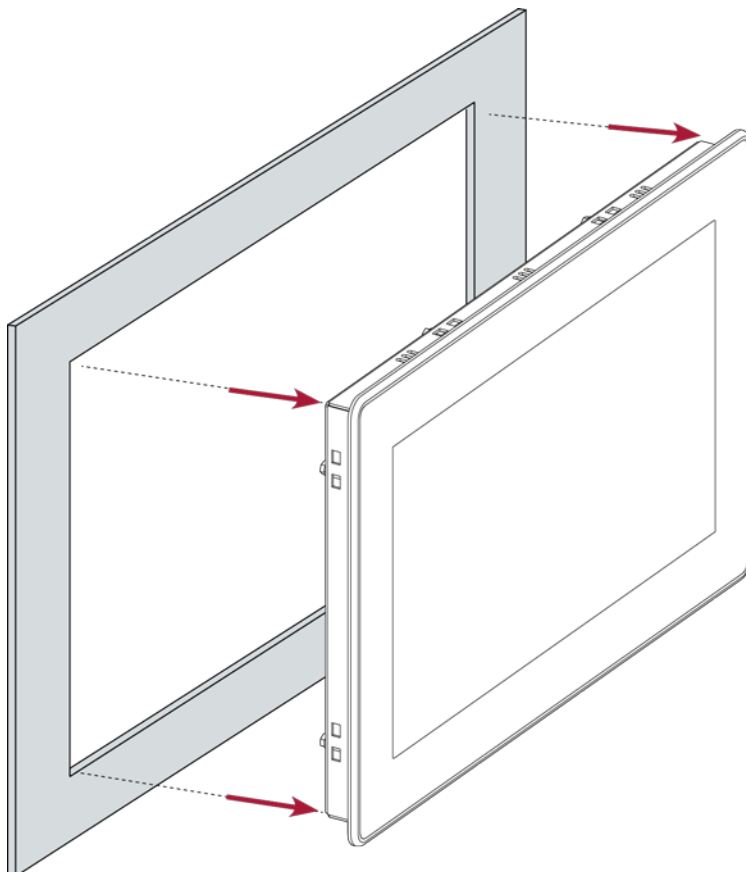
Fig. 41: Pushing the device out of the installation cut-out

5.   **Push the device evenly forwards out of the installation cut-out.**

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. DC2115 Dialog Controller

Dialog Controller	DC2115
Display	**WXGA**
Across diagonals	15.6"
Item no.	270010900
Resolution	1366 x 768 pixels
Colours	TFT: 16.7 M
CPU, user memory	
CPU	800 MHz ARM® with Cortex™-A9 single core
Program memory (flash)	2048 MB
Program memory and data memory (RAM)	512 MB
Non-volatile memory	100 kB (FRAM)
Dimensions and weight	
Dimensions (WxHxD)	425 x 280 x 55 mm
Weight	approx. 3 kg
Operating conditions	
Operating temperature	0 °C to 55 °C (front and rear of the device; 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	removable securing clips
Certification	to product standards EN 61010-2-201, EN 61131-2
Development environment	CODESYS V3 (IEC 61131-3)
Protocols	Standard EtherCAT master, CANopen master Optional: Modbus RTU M/S, Modbus TCP M/S, SNMP, OPC UA, Ethernet/IP, Powerlink, PROFINET, BACnet
Visualisation	Target Visu (Display), Web Visu (Web Server, HTML5)
Touch operation	Touch resistive

Dialog Controller	DC2115
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, industrial zone
Protection class	III
Insulation resistance	EN 61131-2; 500 V DC test voltage
Protection rating	IP20 (front IP65)
Power supply (24 V power)	
Supply voltage	+24 V DC (–15 % / +20 %) SELV max. ripple component 5%
Power consumption	Max. 0.8 A, peak current 1.2 A at +24 V DC
Power consumption, dig. Outputs	Depending on the output load, max. 2 A continuous rating
Protection against reverse polarity	Yes
Ethernet interfaces	
No. / type of interface	1x 10/100 Base T
Connection system	RJ45
EtherCAT interface	
No. / type of interface	1x EtherCAT (EtherCAT master)
Connection system	RJ45
CAN bus interface	
No. / type of interface	1x CAN bus
Protocols	CAN-Bus and/or CANopen master
Serial interfaces	
No. / type of interface	1 x RS-232; 1 x RS-485
Protocols	Modbus RTU
USB interfaces	
No. / type of interface	2 x host USB 2.0 / USB connector port A
Number of insertion/withdrawal cycles	max. 1000

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Dialog Controller	DC2115
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	4 x universal analogue inputs (–10 V…+10 V, 2 x PT100/PT1000) Resolution 24 bit 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 (depending on the operating temperature)
Storage	1 year without voltage (any longer and RTC data can be lost)

10.2. ET2115 Ethernet Terminal

Ethernet Terminal	ET2115
Display	**WXGA**
Across diagonals	15.6"
Item no.	222002100, 222002600
Resolution	1366 x 768 pixels
Colours	TFT: 16.7 M
CPU	
CPU	i.MX6 800 MHz / single core
Dimensions and weight	
Dimensions (WxHxD)	425 x 280 x 55 mm
Weight	approx. 3 kg
Operating conditions	
Operating temperature	0 °C to 55 °C (front and rear of the device; 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	Removable securing clips
Certification	to product standards EN 61010-2-201, EN 61131-2
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
EMC, protection rating	
Emitted interference	EN 61131-2
Resistance to interference	EN 61131-2, industrial zone
Protection class	III
Insulation resistance	EN 61131-2; 500 V DC test voltage

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| Ethernet Terminal	ET2115
Protection rating	IP20 (front IP65)
Power supply (24 V power)	
Supply voltage	+24 V DC (–15 % / +20 %) SELV max. ripple component 5%
Power consumption	Max. 0.8 A, peak current 1.2 A at +24 V DC
Protection against reverse polarity	Yes
Ethernet interface	
No. / type of interface	1x 10/100 Base T
Connection system	RJ45
Protocols	TCP/IP
USB interface	
No. / type of interface	1x host USB 2.0 / USB connector port A
Number of insertion/withdrawal cycles	max. 1,000

10.3. Identification plate
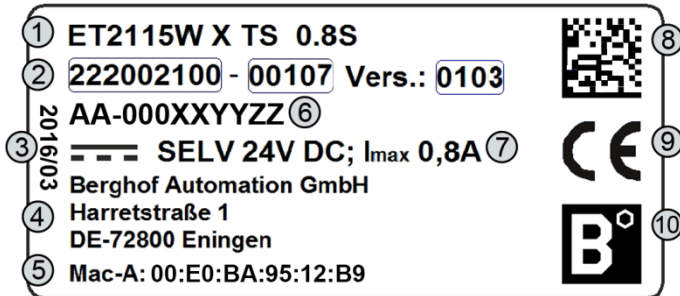
Fig. 42: ET2115 identification plate

Item	Designation	Item	Designation
1	Device type description	6	Customer no.
2	Identification no. (Article no., serial no. and version/as-delivered condition)	7	Supply voltage und maximum current consumption
3	Date of manufacture (year/week)	8	QR-code (Identification no.)
4	Manufacturer's address	9	CE mark
5	Mac addresses	10	Manufacturer's mark (trademark)

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

10.4. Identification

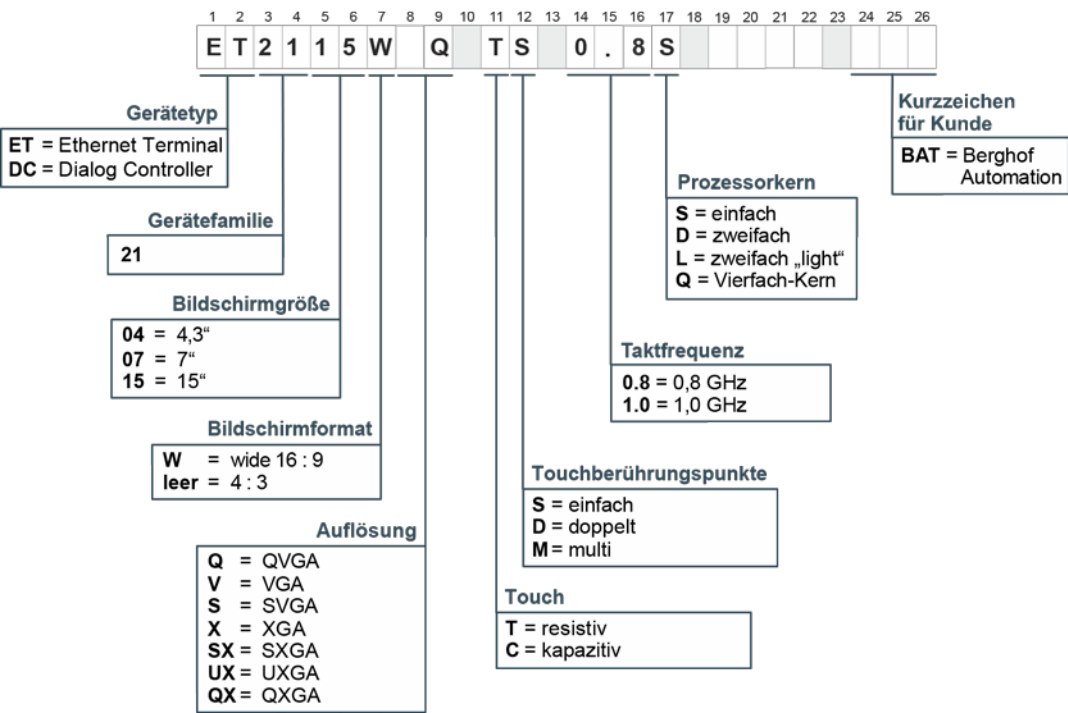The characteristics of the device can be decoded from the identification key.

Fig. 43: Identification key ET2115 and DC2115

11. Standards and certificates

11.1. Standards

Applicable directives

→ EMC directive 2014/30/EU

Applicable standards

→ PLC standard EN 61131-2:2008-4
→ Safety provisions DIN EN 61010-2-201
→ Emitted interference, residential areas DIN EN 61000-6-3

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11.2. UL certificate

CERTIFICATE OF COMPLIANCE

Certificate Number	2015-12-23-E242595
Report Reference	E242595-D1001-1/A0/C0-UL
Issue Date	2015-12-23

Issued to:
Applicant Company:

BERGHOF AUTOMATION GMBH

Harreststrasse 1

ENINGEN, BADEN-WUERTTEMBERG 72800 GERMANY

Listed Company: Same as Applicant

This is to certify that representative samples of

Programmable controller

ET2115W X TS 0.8S followed by 3 letter code

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 61010-1, 3rd Edition, May 11, 2012, Revised July 15, 2015, CAN/CSA-C22.2 No. 61010-1, 3rd Edition, Revision date July 1, 2015

Additional Information: See the UL Online Certifications Directory at www.ul.com/database for additional information.

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.

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

Bruce Mahrenholz, Assistant Chief Engineer, Global Inspection and Field Services, UL LLC
Joseph Hosey, General Manager, Director of Sales – Canada, UNDERWRITERS LABORATORIES OF CANADA INC.

Helena Y. Wolf, Director, Global Market Access Operations, 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 www.ul.com/contactus

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Fig. 44: UL certificate

The devices are authorised to use the following mark:

Fig. 45: 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

11.3.1. ET2115

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 den aufgeführten Richtlinien und Normen 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 listed directives and standards. 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	ET2115 W X TS 0.S XXX
Produktnummer / product number	2220020000 222002100 222002400 222002600
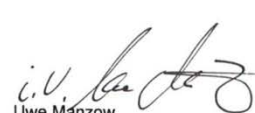
Es wird die Übereinstimmung mit folgenden EG-Richtlinen und Normen erklärt:
The requirements of the following EC directives and standards are met:

Angewandte Richtlinien / applied directives

EMV Richtlinie	2014/30/EU

Angewandte Normen / applied standards

Produkt-Norm	DIN EN61131-2:2008-04
Grundnorm Störausendung Wohnbereich	DIN EN61000-6-3:2012-11
Sicherheitsbestimmungen für elektr. Mess-, Steuer- und Regelgeräte	DIN EN 61010-2-201:2014-01

26.01.2016	Stefan Stemmer	Uwe Manzow
Datum	Geschäftsführer Berghof Automation GmbH	Projektleiter
Date	Chief Executive Officer Berghof Automation GmbH	Project Manager

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11.3.2. DC2115

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 den aufgeführten Richtlinien und Normen 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 listed directives and standards. 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	**DC2115 W X TS 0.S XXX**
Produktnummer / product number	**270010900**

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

Angewandte Richtlinien / applied directives

EMV-Richtlinie	2014/30/EU

Angewandte Normen / applied standards

Produkt Norm	EN 61131-2:2008-04
Grundnorm Störausendung Wohnbereich	EN 61000-6-3:2012-11

15.12.2016	Marc Finger	i.V. Uwe Manzow
Datum	Bereichsleiter Berghof Automation GmbH	Projektleiter
Date	Business Unit Manager Berghof Automation GmbH	Project Manager

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11.4. Information on copyright and software licence

The firmware of the devices contains der free software. Parts of this software are available under the following OpenSource licences, amongst others:
- → 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 may be requested from Berghof Customer Service within three years pf delivery of the device, at cost price.

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 Nuremberg
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

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13. Appendix

13.1. List of figures

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