PowerBooster

Manual

Oudoor battery storage system

PowerBooster GSS0813

DVK-GSS0813 010-AE

DVK-GSS0813 020-AE

adstec
Energy

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PowerBooster GSS0813

Outdoor battery storage system

DVK-GSS0813 010-AE / DVK-GSS0813 020-AE

Instruction sheet - Operating regulations and rules of conduct

For handling lithium-ion batteries

Place the filled form clearly visible near the system!

Whoever operates a system is responsible for its proper operation

Information about the system

Designation and address of the system:

Operating company of the system:

Model (lithium-ion) and battery capacity (kWh):

Conduct in case of fire

Stay calm

1. Report fire

Operational contact person: .....

Fire brigade .....

Police .....

2. Get to safety

- **Follow the instructions**
- **Help people in danger**
- **Clear the danger zone**

3. Make no attempts to extinguish the fire

- **Wait for fire brigades**
- **Make no attempts to extinguish the fire**
- **Close off danger zone over a large area**

⚠ DANGER

No smoking!

Lithium-ion batteries included!

Risk of explosion in case of fire

Electrical voltage

Operating regulations and rules of conduct

For handling lithium-ion batteries

Place the filled form or one adapted to local conditions clearly visible near the system!

Please provide this information sheet or one adapted to local conditions to the local fire protection officer or to the control center for the local fire protection concept.

EU-Konformitätserklärung

EC Declaration of Conformity

Hersteller und Adresse *Manufacturer and address*	ads-tec Energy GmbH Heinrich-Hertz-Straße 1 72622 Nürtingen / Germany
Produktbezeichnung: *Product description*	PowerBooster GSS0813
Modell / *Model*:	DVK-GSS0813 010-AE, DVK-GSS0813 020-AE

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller /
This declaration of conformity is issued under the sole responsibility of the manufacturer.

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Bestimmungen folgender Richtlinien und Verordnung überein: /
The product described above as delivered is in conformity with the provisions of the following Directives and Regulation:

2014/53/EU	Richtlinie des Europäischen Parlaments und des Rates über die Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung von Funkanlagen auf dem Markt. *Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.*
2011/65/EU	Richtlinie des Europäischen Parlaments und des Rates zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten (RoHS). *Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).*
2006/66/EG	Richtlinie des Europäischen Parlaments und des Rates vom 6. September 2006 über Batterien und Akkumulatoren sowie Altbatterien und Altakkumulatoren. *Directive of the European Parliament and of the Council on batteries and accumulators and waste batteries and accumulators.*
(EG) 1907/2006	Verordnung des Europäischen Parlaments und des Rates zur Registrierung, Bewertung, Zulassung und Beschränkung chemischer Stoffe (REACH). *Regulation of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).*

Die Übereinstimmung des bezeichneten Produkts mit den Vorschriften der angewandten Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen:
The conformity of the product described above with the provisions of the applied Directives is demonstrated by compliance with the following standards:

Liste der herangezogenen harmonisierten Normen:
Table of the applied harmonised standards:

Funk / *Radio*	ETSI EN 301 908-1 V13.1.1; ETSI EN 301 908-13 V13.1.1
EMV / *EMC*	ETSI EN 301 489-1 V1.9.2; EN 55032:2015+AC:2016+A1:2020+A11:2020 EN 62040-2:2006/AC; EN 61000-6-4:2007 +A1:2011.
Niederspannung / *Low voltage*	EN 62368-1:2014 +AC:2015; EN 62311:2008; EN 61439-1:2011; EN 62109-1:2010.

Liste der herangezogenen Vorschriften, Normen und Anwendungsregeln:
Table of the applied regulations, standards and application rules:

EMV / *EMC*	ETSI EN 301 489-52 V1.2.1; IEC 61000-6-4:2019 (Class A).
Sicherheit / *Safety*	IEC 62619:2022; IEC 62109-1:2010; IEC 62109-2:2011; IEC 61439-7:2018; IEC 61508 Reihe/*serie* Ed. 2; IEC 62485-5:2020; EN IEC 62311:2020.
Transport / *transport*	UN 38.3 Revision 7:2019 (auf Batteriemodulebene / *on module level*).
Sonstiges / *Others*	VDE-AR-E 2510-2:2021 *(*mit externem NA-Schutz */ with external NA-protection)*; VDE-AR-N 4100:2019; VDE-AR-N 4105:2018 *(*mit externem NA-Schutz */ with external NA-protection)*; VDE-AR-N 4110:2018 *(*mit externem NA-Schutz */ with external NA-protection).*

Ort, Datum
Place and date

Nürtingen, 07.06.2023

Name und Unterschrift
Name and signature

Thomas Speidel
- Geschäftsführer -
- Chief Executive Officer (CEO) -

Dr. Anselm Berg
- Leiter Entwicklung -
- Head of Research and Development -

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie nach §443 BGB. Die Sicherheits- und Einbauhinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the conformity to the specified directives but does not imply any warranty for properties. The safety and installation documentation accompanying the product shall be considered in detail.

Version 1.5

Translation of the original instruction manual

Translation of the original instruction manual

PowerBooster GSS0813

Outdoor battery storage system

DVK-GSS0813 010-AE (with master system setup)
DVK-GSS0813 020-AE (with EMS functionality)

adstec Energy

Last changed: 08/2023

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1 General information

1.1 About this document

This instruction manual is intended to ensure safe and efficient handling of the storage system. The instruction manual and all additional documents provided are part of the storage system and must be kept in the immediate vicinity of the system.

The instruction manual must be accessible to all persons who are involved in installation and commissioning of the device and must be read and understood before any work is started. The instruction manual must be passed on to the operator after commissioning has been completed. All of the safety instructions and handling instructions given in the manual must be obeyed in order to ensure that work is carried out safely.

Operation of the system is subject to the laws and regulations which are applicable in the respective country at national, federal, European and international level by operators. The operating company is independently responsible for compliance with and observance of any corresponding technical innovations or new legal requirements.

Figures used in this instruction manual are provided for basic understanding and may differ from the actual design. The original version of this instruction manual was written in German. All non-German versions of this instruction manual are translations of the German instruction manual.

1.2 Legal regulations and other information

In Germany, the law regarding the placement on the market, the taking back and the environmentally compatible disposal of batteries and accumulators (German Battery Act – BattG) from 3 November 2020 and the law regarding the placement on the market, the taking back and the environmentally compatible disposal of electrical and electronic devices (German Electrical and Electronic Equipment Act – ElektroG) from 15 August 2019 apply.

The instruction manual is intended to provide assistance for adhering to legal regulations. It does not, however, replace them. Responsibility for adherence to the applicable laws and regulations lies with the users of the product. All details in this instruction manual were compiled to the best of our knowledge. Despite taking utmost care, no liability can be assumed for accuracy, completeness and actuality of the information.

1.3 Applicable documents

In addition to this instruction manual, the suppliers and manufacturers provide further detailed information and other applicable documents.

- Manual GSS0813 with instruction manual, maintenance manual, technical data, electrical diagram, MSDS.
- Transport and preliminary information GSS0813 with checklist requirements for commissioning.
- Manufacturer's instruction manuals for the inverter, air-conditioning system, smoke detector.
- ADS-TEC EMS machine interface for SRS and GSS.
- ADS-TEC master interface description for Modbus/TCP.
- ADS-TEC smart meter connection and parameterisation.
- Diagram of recommended wiring for backup power (*SD_isolated_operation_GS_protection*)
- Settings for VDE-AR-N 4105 instruction manual for service and users (only for Germany).

1.4 Limitation of liability

ads-tec Energy GmbH shall not be liable for personal injury, property damage or damage caused to the system as well as consequential damage that is/was the result of non-compliance with this instruction manual, improper use of the system, repairs and other actions on the system by unqualified electricians, or that is/was the result of using unapproved replacement parts. Failure to observe the maintenance intervals shall also result in exclusion from liability. Furthermore, it is strictly forbidden to make any unauthorised alterations or technical modifications to the system.

All assembly work, installation work and disassembly work on the battery storage system, both mechanical as well as electrical in nature, must only be performed by qualified electricians.

The owner and operator of the storage system are obliged to verify the scope of insurance cover for the case in question with their insurance company and, where necessary, to adjust the scope of this cover.

1.5 Manufacturer and contact details

The manufacturer of the product is ads-tec Energy GmbH. The company is referred to in the following as ADS-TEC.

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1.6 Data, figures and modifications

All data, text and figures were prepared according to the current state of technical development and experience and do not constitute assurance of product properties. The figures are intended for basic understanding and are symbolically represented in individual cases.

1.7 Trademarks

It is noted that any software and/or hardware trademarks and any company brand names mentioned in this documentation are all subject to the general trademark protection rights. BigLinX® is a registered trademark of ADS-TEC. All other used third-party trademarks are hereby acknowledged. In the case of trademark infringement, ADS-TEC reserves the right to exercise all rights.

1.8 Copyright

2 Safety

2.1 General safety instructions

The system contains live components. Should comprehensive modifications be required, it is necessary to consult either with the manufacturer directly or with support personnel authorised by the manufacturer. If the system is opened up by an unauthorised person, the user may be subject to hazards as well as personal injury and the warranty will be invalidated.

Take the battery storage cabinet out of operation before beginning any service or maintenance work.

(➲ *10 Switching off the system*).

CAUTION

Risk of death due to high voltages!

High voltages can result in death.

- ➡ Check that no voltage is present prior to all work.
- ➡ Wear an appropriate protective equipment.
- ➡ Remove watches, rings, necklaces, bracelets and similar conductive items from your body and clothing.

2.2 Structure of safety instructions

The safety and warning notices used in this documentation are based on the standards DIN ISO 3864-2 (signal words), ISO 3864-1 (safety colours), DIN EN 82079-1 and ANSI Z 535.4 (design).

Signal word	Meaning
DANGER	**Indicates a hazardous situation where non-compliance** will lead to fatal or serious injury.
WARNING	**Indicates a hazardous situation where non-compliance** can lead to serious injury.
CAUTION	**Indicates a hazardous situation where non-compliance** can lead to minor injury and property damage.
NOTE	Indicates tips for easier operation and cross-references. It **eliminates the risk of property damage or injury.**

Table 1: Signal colours

Example:

DANGER

Description of the type and source of the potential hazard!

Description of the consequences resulting from non-compliance.

- ➡ Description of the measures for hazard prevention.

NOTE

Description of the type of information given in the note!

- ➡ Description of the information given in the note.

2.3 Safety symbols

Symbol	Meaning
	Designation of batteries in accordance with § 13 of the German Battery Act (BattG). Batteries may not be disposed of with household waste, but must rather be disposed of separately. Used batteries must be returned to the point of sale or a disposal system.
	No naked flames; fire, open ignition sources and smoking prohibited
	"Do not extinguish with water" in accordance with BGV A8 and DIN 4844
	Follow the instructions
	Warning of a danger area
	Warning of electrical voltage
	Warning of hazards from charging batteries
	Warning of non-observance of the discharging time
	Environmental hazard
	Symbol for DC voltage
	Provide earth connection before use

Table 2: Safety symbols

2.4 Special rules of conduct in the event of fire

The system is equipped with a smoke detector that outputs an acoustic signal in the event of smoke emission and stops the power flow by opening the AC and DC isolating elements.

NOTE

Fire protection concept requirement.

- ➡ The operating company is required to provide a fire protection concept with appropriate notices in accordance with local regulations for the entire plant.
- ➡ Observe the example of a "Conduct in case of fire" instruction sheet (➲ *Conduct in case of fire instruction sheet in manual GSS0813*).
- ➡ Note also the safety instructions from the German Energy Storage Association (Bundesverband Energiespeicher Systeme e.V.): (➲ attachment/BVES online*: Preventive and defensive fire protection for large lithium-ion storage systems).*

DANGER

Risk of death from fire and thick smoke!

In the event of fire and heavy smoke emission, severe injuries to the body's surface and respiratory passages can occur which could lead to death.

- ➡ Leave the danger area immediately.
- ➡ Notify the fire brigade immediately and observe the instructions listed below.

DANGER

Risk of suffocation from fast and sudden propagation of gases!

If a cell overheats, gases can quickly and suddenly spread and an immediate reaction can occur involving the propagation of flames. The direction of propagation can vary depending on the installation site.

- ➡ Should there be a noticeable smell of gas, remove yourself immediately from the danger area and inform the fire brigade. Observe the instructions listed below.

DANGER

Hazard from flying parts in the event of detonation of the battery system!

In the event of an unexpected malfunction or external influence, the system may detonate.

- ➡ Leave the danger area immediately.

If there is smoke or fire **inside** and/or **outside** the storage system, if there is a smell of gas or if the acoustic warning signal of the smoke detector sounds:

- Remain calm and leave the danger area immediately.
- Warn all persons at the location and require that they leave the danger area via marked escape routes (walk crouched down, as hot gases rise).
- Do not attempt to put out the fire yourself.
- Contact the fire brigade immediately and inform them that lithium-ion batteries are involved in the fire.
- If possible, switch off the main switch or the fuses connected upstream.
- Secure the hazardous area.

2.5 Lithium-ion batteries

CAUTION

Risk of burns due to electrolyte escaping!

Injuries to skin, eyes and respiratory tract or severe damage possible due to incorrect handling.

- ➡ Check the packaging of the battery modules for visible damage.
- ➡ Avoid contact with escaping fluids.
- ➡ Pay attention to the nominal voltage and capacity of the battery modules.

CAUTION

Risk of damage to property due to improper storage and transport!

The storage system contains battery modules. They are delivered on separate pallets. The battery modules are temperature-sensitive and can be damaged if stored incorrectly.

- ➡ Store the battery modules in the original packaging in a dry place (preferably in an air-conditioned room) until installation in the system. Optimum storage conditions SRB7143: 10 to 25 °C (32 to 77 °F) at less than 80% humidity.
- ➡ Protect the battery modules from direct sunlight with high heat and from frost.
- ➡ Protect the packaging from rain and penetrating moisture. The packaging is not waterproof.

2.5.1 Transportation of new and used lithium-ion batteries

The transport of lithium-ion batteries is subject to conditions that are listed in the regulations for dangerous goods for the individual modes of transport. The packaging for transport and shipping must be in compliance with the respective current regulations;
such as IATA (air), IMDG code (maritime traffic), ADR (road traffic in Europe).

The customer is responsible for informing himself about the developments of the respective regulations and laws. This may vary from country to country. Countries that are not bound by the ADR (European road traffic), IATA (International Air Transport) or IMDG (maritime traffic) may have their own requirements.

Lithium-ion batteries are, for all modes of transport, subject to the regulations for dangerous goods applicable for the respective mode of transport**.** These are to be complied with by all parties involved in the transport, including packers, shippers and consignors. All parties involved in the transport must have completed the training and earned proof of the training required for the respective mode of transport prior to participating in transport.

Classification (as of 2019):

	Shipment name: lithium-ion batteries UN number: UN 3480 Classification: Class 9, danger sign 9A

The lithium-ion batteries correspond to a type that was tested in accordance with the UN Manual of Tests and Criteria, sub-section 38.3.

For the air transport of lithium-ion batteries, a maximum charge state of 30% has been required since 1 April 2016.

With the SRB7143, the optimum transport temperature of the lithium-ion batteries is at least 10°C up to a maximum of 25°C. Exceeding or falling below this temperature (even only temporarily) leads to a decrease in the guaranteed number of cycles. In case of doubt, it is the responsibility of the person responsible for the transport and storage conditions to prove this.

Lithium-ion batteries SRB are assigned Class 9 in all dangerous goods regulations and may be transported in compliance with the regulations specified under number UN3480. Lithium-ion batteries SRB have a rated energy of more than 100 Wh, a mass of more than 12 kg and, thus, are NOT subject to special regulations SV188 (ADR, IMDG) and P965 part IB and part II.

Training:

Persons who are involved with the transport of dangerous goods must be trained in the applicable requirements regarding dangerous goods (details available in the UN regulations).

Handling and battery packaging:

The packaging and labelling of the lithium-ion batteries must be designed and executed in accordance with the UN regulations for the given mode of transport. Responsibility for compliance with the legal regulations lies with the packer and shipper.

The battery packaging should be stored in case the battery needs to be returned or reused.

Not only is compliance with the packaging materials specified there required but also all information on preparing the goods before packing, for packing the goods in the inner and outer packaging, for fastening and for securing within the packaging, for closing the packaging and for labelling.

Used lithium-ion batteries are subject to these regulations as well. For intact and undamaged used lithium-ion batteries, the regulations for new batteries can generally be applied. Please also refer to chapter Disposal (➲ *12 Disposal*).

2.5.2 Transportation of defective or damaged lithium-ion batteries

Defective or damaged lithium-ion batteries are subject to more stringent regulations, which include up to a complete ban on transport. The transport ban applies for air carriers (ICAO T.I., IATA DGR special provision A154, freely available online).

DANGER

Risk of death due to poisoning!

Outgassing substances can cause injury to eyes, skin and respiratory passages. Escaping smoke is highly flammable.

➡ Leave the danger area immediately. Cordon off the hazardous area immediately and notify the fire brigade.

If one of the following questions can be answered with **YES**, the packaging and transport regulations for **damaged/defective** lithium-ion batteries (SV376; P908; LP904, freely available online) apply:

- Battery housing/battery cells exhibit a damaged or deformed housing.
- Fluid is escaping.
- Strange smell of gas is noticeable.
- Measurable increase in temperature in the OFF state.
- Melted or deformed plastic parts.
- Melted power supply lines.
- Battery management system has identified defective cells.

If, even under normal transport conditions, the defective/damaged battery is at a risk of rapid decomposition, dangerous reaction, flame formation, dangerous heat development or dangerous emission of poisonous, corrosive or flammable gases or vapours, then regulations SV376; sentence 5 et seq. / P911; LP906 apply.

2.5.3 Storage and supply of new and used lithium-ion batteries

Observe the manufacturer specifications and safety data sheets of the lithium-ion batteries

- It is strongly advised that directive VDS-3103: 2019-06 also be observed.
- Store the battery modules in their original packaging in a dry, ideally air-conditioned indoor space until installed. The battery modules of the SRB7143 type may be stored between 10°C and 25°C at a relative humidity of <80% (non-condensing). Exceeding or falling below this temperature (even only temporarily) leads to a decrease in the guaranteed number of cycles. In case of doubt, it is the responsibility of the person responsible for the transport and storage conditions to prove this.
- Avoid direct sunlight, large temperature fluctuations and frost.

2.5.4 Storage and supply of defective or damaged lithium-ion batteries

Observe the manufacturer specifications and safety data sheets of the lithium-ion batteries. You can find these in the appendix.

It is strongly advised that directive VDS-3103: 2019-06 (freely available online) also be observed.

- Separate the defective lithium-ion batteries (quantity restriction).
- Remove damaged or defective lithium-ion batteries from storage and production areas and store them in a separate, fire-resistant area that is engineered for fire protection until they are disposed of.
- Alternatively, store damaged or defective lithium-ion batteries in a spatially separated area (e.g., hazardous materials warehouse or hazardous materials container). Minimum safety distance 5 m. Avoid mixed storage with other products on a shelf or block.
- Make certain that a suitable fire alarm system with connection to a constantly occupied post is present for the storage area.

For fire extinguishing systems, use suitable extinguishing agents according to the product data sheets.

2.6 Residual risks

The battery system corresponds to the state of the art and was built in accordance with the recognised safety regulations. The system was subjected to a careful inspection. However, residual hazards cannot be excluded when using the system. For this reason it is essential that all activities at the battery system are carried out in accordance with the information in this instruction manual.

2.6.1 Electric shock from touching the battery poles of the serially connected battery string

DANGER

Risk of fatal electric shock!

During maintenance and service work, touching the battery poles on the serially connected string can cause serious injuries that can lead to death.

- ➡ Wear appropriate personal protective equipment.
- ➡ Training of the personnel.
- ➡ When working on the battery system or its components, the power supply must be disconnected and secured against being switched on again.

2.6.2 Crushing during movement and installation of a battery module

WARNING

Risk of crushing!

Crushing of hands, arms and other limbs may occur if the user is not qualified and does not use the system as intended.

- ➡ Training of the personnel.
- ➡ Wear appropriate personal protective equipment.
- ➡ Use recommended lifting equipment.
- ➡ Have read and understood the entire instruction manual

2.6.3 Off-gassing batteries

WARNING

Hazard due to off-gassing batteries!

If damaged, gasses can escape from the batteries.

- ➡ Observe the battery cell safety data sheet
- ➡ Training of the personnel.

3 Product description

3.1 General

The battery storage system is a compact storage system with a maximum discharging power of 75 kW and a maximum charging capacity of 50 kW. The system with lithium-ion battery modules is designed for outdoor setup directly at the installation site. The GSS0813 stores electrical energy from the AC grid and feeds it back into the AC grid as needed.

In addition, the GSS0813 system offers a backup power functionality. If this functionality is in use and a power failure occurs, the system creates an isolated grid and supplies connected loads with the energy from the internal storage system.

- Complete system with integrated inverters
- Especially powerful and efficient
- For many application areas such as optimisation of personal consumption, peak-load capping or backup power supply.
- The battery storage system is scalable in terms of capacity and power (➲ *14.1Grid-connected mode (scaling of multiple systems in a group)*).

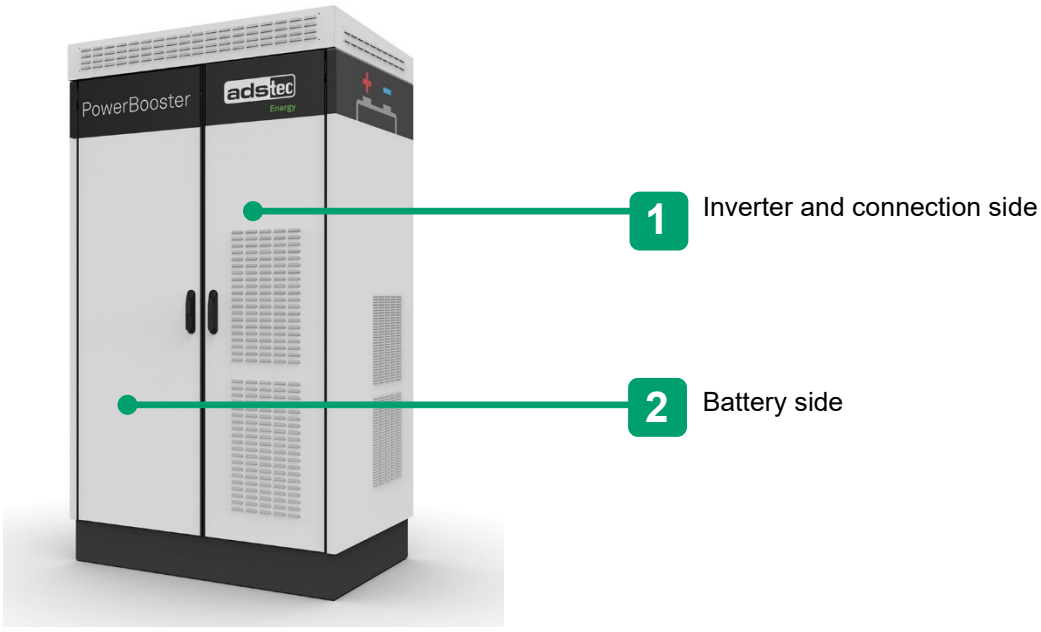


FIGURE 1: VIEW OF BATTERY STORAGE SYSTEM

The storage system consists of an outdoor cabinet, which has a battery rack, inverter, controller box, air-conditioning system and built-in roof fan.
For a description of the system components, see chapter 6.

3.2 Technical data

System configuration	Operating configuration	ads-tec Energy Master System or via ads-tec Energy Management System (EMS)
	Mechanical configuration	1 x Outdoor cabinet
	Inverter configuration	3 x TH TruConvert AC 3025 in parallel
	Battery configuration	1 x SRS0128
Communication	System Controller	EMM3821
	User interface	Ethernet
	Communication protocol	ads-tec Master Interface Modbus/TCP
Dimensions	Outdoor Unit	Inverters, Battery, Cooling system
	System Dimensions (H x W x D)	2500 x 1430 x 940 mm (+/-20 mm)
	System Weight	approx. 1420 kg
	Module Weight SRB7143	approx. 80 kg
	Mechanical Setup	19'' double cabinet
	Protection from mechanical impact	IK 10
Electrical	AC Side	
	Grid Form	TN-S with 3L + N + PE (stationary)
	Grid Frequency	50 Hz
	Grid Voltage	400 Vac
	Nominal Power	75 kW
	Operation mode	Grid-Synchronous or Microgrid (Island-Mode)
	Max. Current per line	130 A
	Max. AC short circuit current (I_{CC})	10 kA
	Overvoltage category	III (internal use of SPD Type 1/2)
	Safety	External use of RCD Type B or RCMS with feedback to external NA protection
	AC Side (Microgrid – Island Mode, information according to VDE-AR-E 2510-2 A.1 – A.3)	Earthing via monitored neutral (star) point within GSS0813
	Asymmetric load	Max. 24.9 kVA/phase
	Max. short circuit current	240 A for 500ms
	Max. voltage during short circuit	400 Vac

	Automatic reconnection	No automatic reconnection after short circuit
	Withstand current neutral (star) point	2,1 kA for 5s
	Withstand current neutral (star) point	159 A for normal operation
	DC Side (inverter)	
	Min. Voltage	720 Vdc
	Max. Voltage	950 Vdc
	Maximum Current	3 x 36 Adc
Battery	Number of Battery Strings	1 x SRS0128
	Nominal system voltage	805.9 Vdc
	Minimum system voltage	669.6 Vdc
	Maximum system voltage	896.4 Vdc
	Minimum operating voltage	691.2 Vdc
	Maximum operating voltage	891.0 Vdc
	Max. charge current	98 A
	Max. discharge current	157 A
	Nominal system capacity	163.2 Ah
	Nominal system energy	128.7 kWh
	Cell technology	Lithium-NMC
	Nominal module capacity	163.2 Ah
	Nominal module energy	14.3 kWh
	Self discharge	< 2 % per month at 25°C
	Storage time	12 months at 25 °C @ SOC > 30%
Ambient conditions	Operating temperature	-20 to 40 °C
	Max. altitude	2000 m above sea level
	Cooling	air cooling (HVAC included)
	Degree of pollution (internal)	II
	Protection type (EN 60529)	IP55
Interfaces (Communication)	Mobile	4G/LTE, 3G and 2G
	Channel 1	Remote-Service-Access (Big-LinX)
	Ethernet	2x RJ45 100/1000 Mbit/s
	Channel 1	Local customer control
	Channel 2 (optional)	Local service interface and interface for integration of external smart meters in EMS operating mode.

Interfaces (Installation)	AC connection	
	Connection type	5x High-current terminal block; screw connection
	Min. cable cross section	25 mm² | AWG3 (flexible)
	Max. cable cross section* (*difficult assembly when using solid cables)	70 mm² | AWG2/0 (flexible)
	Cross section of AC supply	Min. cross section depends on cable type and type of laying
	Stripping length	24 mm
	Cross section cable entry plate	27 – 48 mm
	Ethernet-Connection ‚Channel 1 Customer' & ‚Channel 2 Service-Access'	
	Connection type	RJ45 socket
	Cable type	Cable type depends on cable type and type of laying
	Inputs/Outputs "External Stop", "Customer Signal 1/2/3", "Status Neutral (star) Point", "Status Grid", „Status Coupling Switch"; Optional: „U+/U-/f+/f-"	
	Connection type	Surge protection device; screw connection
	Max. cable cross section	4 mm² | AWG 12
	Cross section of signal cable	Min. cross section depends on cable type and type of laying
	Stripping length	10 mm
	Cross section cable entry plate	max. 10 mm
	Grounding	
	Number of grounding points	1x M6 connection point at internal equipotential bonding rail
	Cross section and cable type	Cross section and cable type depends on use case and local requirements but min. 16mm² (recommendation: 35mm²)
Standards	Transport certification	UN 38.3 (on module level)
	EMC immunity	IEC 61000-6-2 (Industrial Level)
	EMC emission	IEC 61000-6-4 (Class A)

	Safety (functional and electrical)	IEC 61439-1:2011; IEC 61439-7:2020; IEC 62109-1:2010; IEC 61508; IEC 62619:2017; IEC 62485-5:2017.
	Application rule	VDE-AR-E 2510-2:2021 (with external NA-protection); VDE-AR-N 4100:2019; VDE-AR-N 4105:2018 (with external NA-protection); VDE-AR-N 4110:2018 (with external NA-protection).
Warranty	Deadline for claims for defects	24 months.
Durabillity	In connection with existing BigLinX-Service contract	Up to 10 years
Operation & Service	Qualification of service personnel	electrically skilled person only, initial and repetitive training recommended
	Qualification of user	no qualification required

Table 3: Technical data

4 Operating instructions

4.1 Obligations of the operating company

4.1.1 Documentation storage obligation

The technical documentation required for the installation and operation of the system must be kept on site at the location (unless provided by a user interface) so that if required it is available to all persons to which these activities are assigned. The printed manual is a quick guide which is stored in the document pocket. It has a QR code/link to the online manual (with the complete documentation).

The operating company must observe and comply with the locally applicable safety regulations during installation, commissioning, operation, maintenance and repair of the system. The local regulations regarding safety markings must be observed. If required, additional safety markings such as prohibition and information signs must be attached by the operating company.

All maintenance work (➲ *11 Maintenance*) must be performed at the specified intervals. All modifications to the battery storage system are prohibited.

4.1.2 Responsibility for installation location

- The operating company is responsible for the installation location. Observe the requirements regarding the installation location (➲ *4.9 Requirements regarding installation location)* and check in advance whether the planned installation location is subject to legal requirements.
- It is the responsibility of the operating company to check the noise emissions at the respective installation location. Any available certification of the system for use in industrial and residential areas refers to the pure system under test conditions. Depending on the installation location, the operating company must take additional measures to comply with the technical instructions for protection against noise, particularly in residential areas. Suitable measures are, for example, noise barriers.

4.1.3 Responsibility for safety

NOTE

Ensure fire and explosion protection of the entire system.

Fire and explosion can cause major damage.

- ➡ The fire protection of the entire system and its effects are the responsibility of the operating company.
- ➡ According to the local conditions, the operating company is obliged to provide an instruction sheet on site in the system area regarding conduct in case of fire together with the corresponding information. For an example of the instruction sheet, see the attachment.
- ➡ The distances to areas with a risk of fire and explosion (e.g. filling stations) must be defined for each location by the operating company according to TRGS 751.

Note also the safety instructions from the German Energy Storage Association (Bundesverband Energiespeicher Systeme e.V.):
(attachment: *Preventive and defensive fire protection for large lithium-ion storage systems)*

(Attachment*: Safety instructions for users of battery storage systems in the event of water damage and flooding*).

- All work on the system may only be assigned to persons who are familiar with the basic regulations on work safety and accident prevention. The assigned personnel must be at least 18 years old. The responsibilities of the personnel must be clearly defined.
- The operating company or person authorised by the operating company must regularly check that the work of persons assigned to the work is performed in a safety-conscious and hazard-aware manner in compliance with the safety regulations applicable on site.
- If necessary, this document must be supplemented by instructions, including supervisory and reporting obligations, which contain special operational features, e.g. with regard to work organization, work processes, the personnel used and the national or locally applicable provisions.

4.1.4 Compliance with application rule VDE-AR-N-4105

When operating a GSS0813 system, it is mandatory to comply with

VDE-AR-N-4105 "Power Generating Plants in the Low Voltage Network – Technical Minimum Requirements for the Connection to and Parallel Operation of Power Generating Plants in the Low Voltage Network". Further information is available in the VDE4105 attachment (➲ attachment: *VDE4105_instruction manual for service and users*).

4.1.5 Attaching the information sign

The GSS0813 is a battery storage system with a backup power functionality (isolated grid).

Therefore, according to application rule VDE-AR-E 2510-2:2021, information sign C.1 from its appendix must

be attached during customer installation. The information sign can be purchased from various providers.

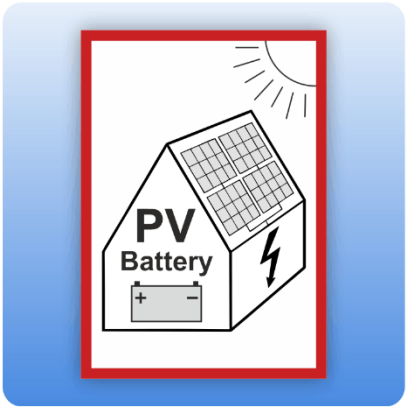


FIGURE 2: INFORMATION SIGN FOR THE PV SYSTEM WITH BATTERY STORAGE SYSTEM

4.1.6 Fault protection according to IEC 62109-2

A protective device must be installed to prevent permanent leakage currents.
In earthed or unearthed power generating plants with an additional battery storage system, there may be a risk of fire due to permanent leakage currents in conductive plant parts that are not intended for current flow. When combined with the non-isolated design of the Trumpf Hüttinger inverters used, permanent DC-side earth connections may cause the destruction of the device. Leakage current monitoring according to IEC 62109-2 can be implemented with an AC/DC sensitive residual current monitor of type B (RCD Type B)
(➲ attachment: *Instruction manual for inverter*).

4.2 Intended use

The storage system is used to store electrical energy. Assembly and connection of the battery modules take place at the installation site. The storage system may only be operated with the inverters installed by ADS-TEC. The storage system is only to be assembled, installed and operated within the permissible specification. All requirements with respect to the environment and the installation location must be adhered to. Use in non-specified environments is prohibited.

4.3 Improper use

Operation other than or beyond that described for the storage system shall be deemed improper use. Therefore, the battery storage cabinet must not be put into operation in the case of transport damage, non-observance of the environmental conditions and non-compliance with the requirements regarding the installation location and, if necessary, must be taken out of operation in the case of changing conditions.

In the case of improper use, ADS-TEC shall not accept responsibility or liability for injury or damage that is directly or indirectly attributable to the handling of the storage system. Should the battery storage cabinet have evident signs of damage caused by, for example, improper operation or storage conditions or due to improper use or handling, it must be shut down immediately. Ensure that it is secured against being started up inadvertently.

Damage due to improper use

Should the product or one of its components have evident signs of damages caused, e.g., by improper operation / storage / transport conditions or due to improper use or handling, it must be immediately shut down and secured against being started up accidentally.

4.4 Personnel qualification

- Safe operation requires the storage system to be operated by personnel who have received sufficient training. Unqualified personnel are unable to recognise risks and are therefore subject to a higher degree of danger.
- Only trained and authorised persons are allowed to perform the activities described in this instruction manual.
- The operating company must ensure that the personnel comply with the locally applicable rules and regulations for safe and hazard-conscious work.
- The personnel must have read and understood the instruction manual.
- The operating company must ensure that no hazards exist for persons with a restricting medical condition (e.g. persons with implants, cardiac pacemakers) when working on the system.
- If hazards exist due to a restricting medical condition, work on the system is prohibited.

The following qualifications for personnel are addressed in this instruction manual:

- Electricians
- Transport personnel
- Instructed personnel

4.4.1 Electricians

Electricians must satisfy the following qualification criteria and requirements in order to perform work on the GSS and to recognise and avoid hazards independently:

- Professional training and experience.
- Specific product training by ADS-TEC.
- Knowledge of relevant standards and regulations.

4.4.2 Transport personnel

Transport personnel must meet the following qualifications and requirements in order to be able to carry out transport work at storage system and to independently recognise and avoid hazards:

- Trained in driving conveyor vehicles with driver's seat or driver's platform. Proof of qualification is mandatory.
- Trained to operate a crane. Proof of qualification is mandatory.
- Trained to drive lorries. Proof of qualification is mandatory.
- Trained or participation in the transport of battery systems.
- Due to physical, mental and character qualities suitable for driving conveyor vehicles and lorries.

4.4.3 Instructed personnel

Instructed personnel have been informed about transferable work activities, potential hazards and intended use.

– Work only according to the instructions for transport, assembly and operation of the system.

4.4.4 Target group matrix

Life phases	Electricians	Transport personnel	Instructed personnel
Transport/ setup		X	X
Installation/ commissioning	X		
Operation	X		X
Maintenance	X		
Repair	X (ADS-TEC)		
Decommissioning	X		

Table 4: Target group matrix

4.5 Personal protective equipment

To prevent personal injury and damage to the plant, every activity requires the utmost concentration of the persons involved because these activities are always carried out close to earthed or live components. It is essential to ensure that all used tools must always be insulated and are in good order and condition. The following protective clothing is recommended:

	**Use eye protection** Flying parts/particles or coolant: Use eye protection
	**Wear protective clothing** Chemicals, heat, cold: Wear protective clothing
	**Use foot protection** Foot injuries caused by objects or contact with hot or chemical materials
	**Use hand protection** Hand injuries caused by objects or contact with hot or chemical materials

Table 5: Personal protective equipment

4.6 Warranty / repairs

Repairs must be performed only by ADS-TEC or by trained electricians. Failure to observe this point will invalidate the warranty. The warranty will also be invalidated in the case of failure to observe the maintenance intervals, work on the battery storage system by non-authorised persons, use of an

inverter not approved by ADS-TEC, operation of the system outside its specifications, use of non-approved replacement parts, and any other activity that deviates from this instruction manual.

4.7 Service Agreement

In addition to the statutory warranty, we recommend entering a service agreement. The service agreement regulates arrangements for monitoring and remote service, maintenance, support as well as battery cell performance for a fixed warranty period of up to 10 years. Further information can be found at support.est@ads-tec-energy.com.

4.8 Damage due to improper use

Should the system or one of its components have evident signs of damages caused, e.g., by improper operation / storage / transport conditions or due to improper use or handling, the device must be immediately shut down and secured against being started up accidentally.

Do not drill holes in the system or its components.

4.9 Requirements regarding installation location

The system is designed for stationary use in an outdoor area. Make certain that the specified environmental conditions are maintained at all times. Use in non-specified environments, e.g. on board ships, in explosive atmospheres or at high altitude (see the climatic environmental conditions) is prohibited.

CAUTION

Hazard due to environmental and property damage!

➡ If modifications or changes are made at the installation location at a later stage, the environmental conditions and compliance with the requirements regarding the installation location must be observed.

4.9.1 Environmental conditions

Observe the environmental conditions information in the technical data (➲ *3.2 Technical data*).

4.9.2 Requirements regarding installation location

Please note that the battery system may not be set up and operated

- in buildings, garages, courtyards and other covered structures
- in areas where there is a risk of flooding
- in the vicinity of sea water
- in areas where there is a risk of fire and explosion
- in the vicinity of combustible materials
- in areas with sandstorms

- in permanent residential areas
- in the vicinity of escape routes

Installation conditions

- The checklist "Commissioning Requirements" must be completed and signed (➲ attachment: *Transport and preliminary information*).
- The system is only suitable for outdoor installation.
- Observe the following floor space requirements for the system:
- The floor space is to be constructed at the installation location in accordance with the local conditions and technical data (➲ *3.2 Technical data*).
  - Protected against wind
  - The floor space is exactly horizontal.
  - Cable entry is from below.
  - The floor space has the required load capacity for the 1.5 t weight of the system and has to withstand this load permanently.
    If applicable, also take into account the weight of the means of transport.
- Sufficient drainage is available.
- Earthing via ring earth electrode for flexible connection cable (min. 16 mm²) according to national and local regulations and conditions must be in place.
- Observe the following minimum distances:
  - Clearance from rear side to wall or to other objects/other storage systems: no clearance required.
  - Clearance from sides (left + right) to wall or to other objects: min. 1 m.
  - Clearance from front side to other objects: 1.5 m (0.7 m for opened doors + 0.8 m for service activities).
  - Take into consideration any additional clearance required for escape routes (min. 0.8 m).
- Note that ventilation openings must be kept clear.
- The air at the ventilation openings must be able to circulate freely.
- During the entire operating time, no leaves, dirt, etc. must be sucked in from the ventilation openings.
- Protect the system against penetrating water (groundwater or flood hazard area).
- Keep the existing housing doors closed.

Installing multiple systems in a group (scaling)

- Observe the minimum clearance for each individual system
- Observe the resulting requirements with regard to floor space
- Observe the supplementary information as well as the examples for installing in a group (➲ *14.1 Grid-connected mode (scaling of multiple systems in a group)*)

Installation in built-up areas

- When installing in built-up areas, observe the local noise abatement regulations (Germany: "Technische Anleitung zum Schutz gegen Lärm" (Technical Instructions for Protection against Noise), abbreviated "TA Lärm"). Observe the resulting minimum distances to residential buildings.

Electrical connections

- Note the information in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).

4.10 Standards

Compliance with the protective aims of the applicable CE directives is confirmed by the EU conformity declaration and is represented by a CE mark on the product. The EU conformity declaration is part of the documentation.

5 Transport

5.1 Scope of delivery

Check that the delivery package is complete and in flawless condition. If parts are missing or damaged, do not use the product and submit a complaint to the supplier.

The storage system is delivered in 3 parts:

- 1x pallet with preassembled storage system, without battery modules
  Weight approx. 700 kg net / 725 kg gross.
- 1x pallet with 4 battery modules as well as installation kit (1x CAN terminator, 8x power cables, 8x communication cables, key for outdoor cabinet, 36x socket head cap screws Tx30 galvanized x 36, 4x cable clamps, 2x ferrite and manual)
  Weight approx. 330 kg net / 355 kg gross.
- 1x pallet with 5 battery modules
  Weight approx. 400 kg net / 425 kg gross.

5.2 Transporting the storage system

CAUTION

Risk of irreversible damage to the components!

Improper transport can irreversibly damage components.

- ➡ Use only means of transport that are designed for the weight of the storage system and battery modules.
- ➡ Transport the battery modules to the final location separately from the storage system.
- ➡ Transport the storage system upright with the help of a forklift to the final location.
- ➡ Bear in mind that the centre of gravity of the storage system is not positioned centrally.
- ➡ Move the storage system only when in a lifted state.
- ➡ Use non-slip mats on any surfaces where the storage system will have to be set down temporarily.

WARNING

Hazard from heavy loads!

If the storage system or the battery modules tip over or fall, they can cause serious injuries.

- ➡ Hazard from falling or tipping loads.
- ➡ Risk of crushing hands and feet during transport.

The centre of gravity of the storage system without installed module is indicated on the packaging as follows:

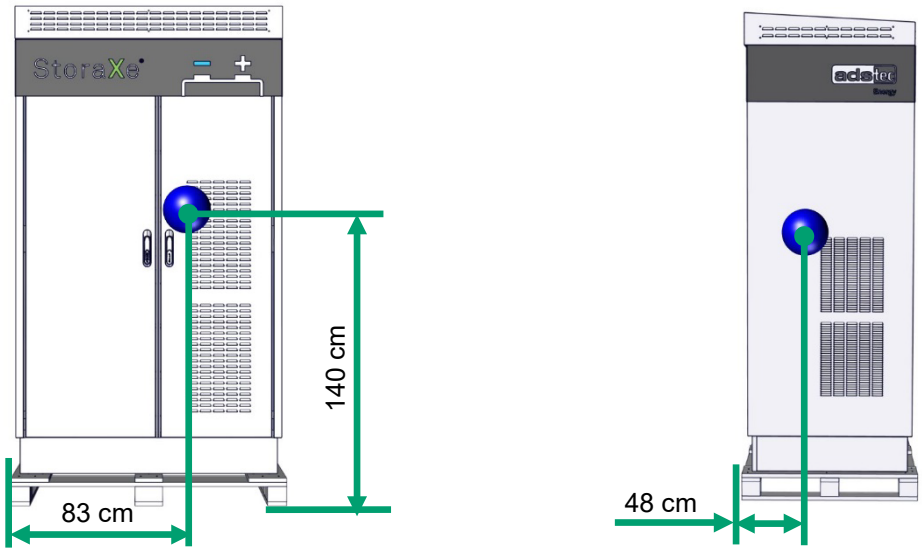


FIGURE 3: CENTRE OF GRAVITY INDICATED ON PACKAGING

5.3 Temporary storage of the battery modules

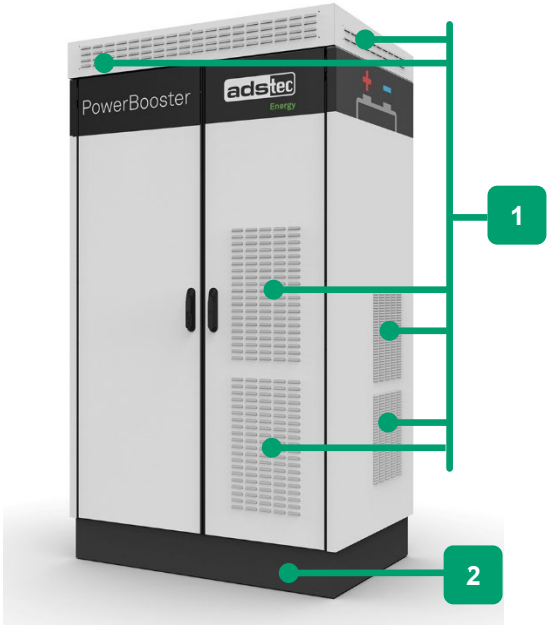
Always observe the environmental conditions for storing batteries (no direct sunlight, dry indoor area, no frost). Check the charge state of the batteries regularly if they remain in storage for longer than 6 months. Follow the instructions on storage (➲ 2.5.3 *Storage and supply of new and used lithium-ion batteries).*

	CAUTION
	**Damage to property due to incorrect storage!** ➡ Store the battery modules properly until installation according to the specifications in the battery module data sheet (➲ *2.5.3 Storage and supply of new and used lithium-ion batteries*).

6 Brief description of system components

6.1 Outdoor cabinet

The outdoor cabinet housing is designed to accommodate all system components. Depending on the components used, it has recesses for cable entry in the base, ventilation openings in the roof as well as ventilation grilles in the right door and on the right side of the cabinet.



1 Ventilation grille with filter mat

2 Condensate drain hose for air-conditioning system

– Lay down the condensate drain hose and make sure that it is not soiled or clogged.

FIGURE 4: OUTDOOR CABINET COMPONENT

The system is lockable to prevent unauthorised access.

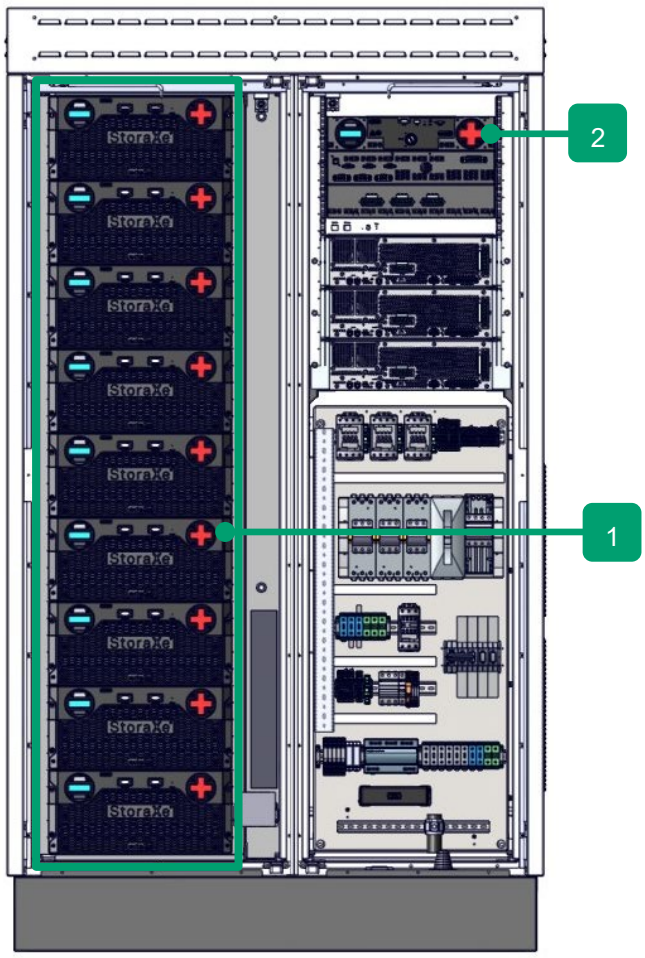
NOTE

Observe access.

➡ It must be ensured that the two doors are freely accessible.
➡ To ensure air circulation, the ventilation grilles must be unobstructed.

6.2 SRS Storage Rack System

The system contains an integrated battery storage system, equipped with 9x SRB7143 battery modules and 1x SRC4310 storage rack controller.



Storage rack system containing:

1. 9 x battery modules SRB7143
2. 1 x Storage Rack Controller SRC4310

FIGURE 5: SRS STORAGE RACK SYSTEM COMPONENT

6.3 Storage Rack Battery – SRB7143

The Storage Rack Battery (SRB) component represents one battery module of the storage system. The battery module contains the cells and its own battery management system (BMS). The SRB module displays its current status via a display on the front.

6.3.1 Connections on front side

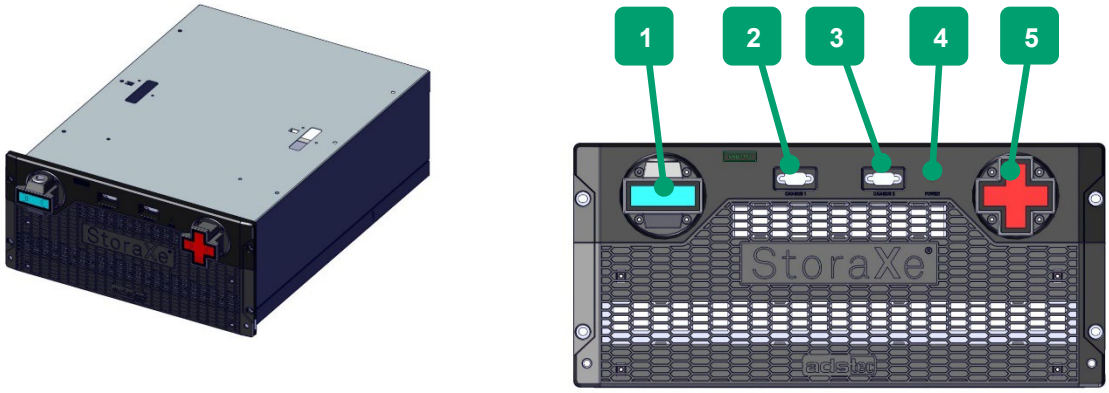


FIGURE 6: SRB STORAGE RACK BATTERY COMPONENT

Position	Description
1	Minus pole – connector
2	CAN-BUS1 – IN
3	CAN-BUS2 – OUT
4	Status LED
5	Plus pole – connector (with transport cover)

6.3.2 Status indicators

Symbol	Behaviour	Description
	Off	System is switched off
	Static	SRB is performing an update
	Static	SRB is operating normally and is in an idle state
	Static	SRB in fault state
	Static	SRB is operating normally and is being charged/discharged

Table 6: SRC LED status indicators

DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

- ➡ Do not come into contact with the + and – poles of the battery modules under any circumstances.
- ➡ Do not remove the transport cover until the respective installation step, shortly before connecting the power cable.
- ➡ Wear insulating gloves.
- ➡ Note the information in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).

6.4 Storage Rack Controller – SRC4310 (SRC4)

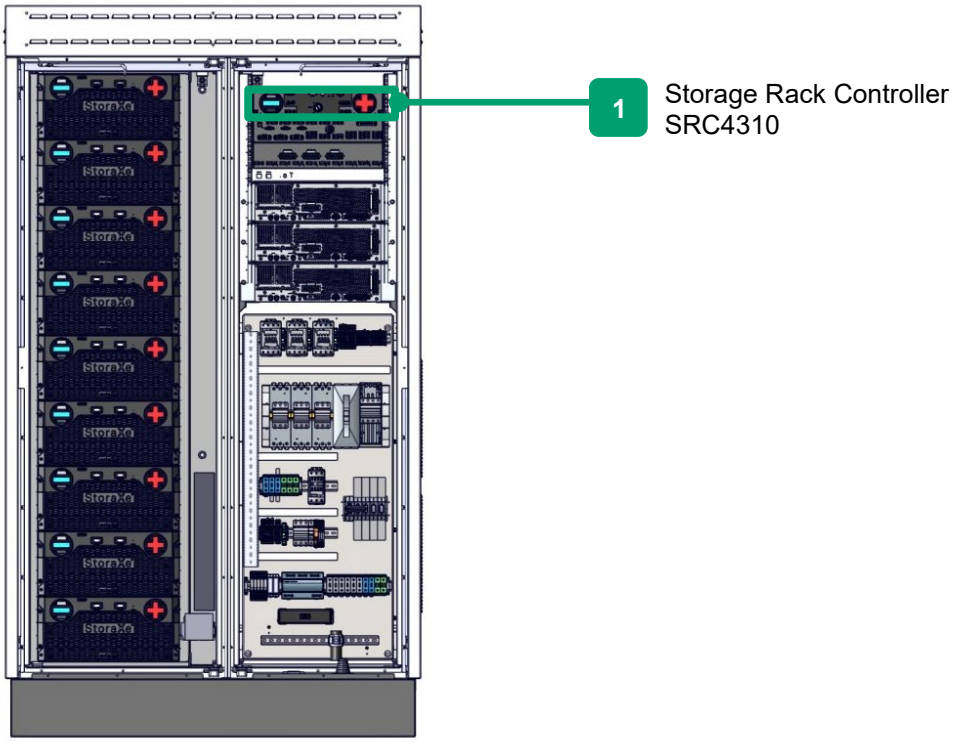


FIGURE 7: POSITION OF STORAGE RACK CONTROLLER

The storage rack controller (SRC4310) component is the control unit of the storage system and handles functions such as the following:

- Controls and monitors the connected battery modules via the battery management system (BMS) and supplies power to the BMS.
- Communicates the battery conditions to the internal Energy Management Module.
- Controls and monitors the functioning of the integrated DC disconnectors.
- Controls and monitors the roof fan installed in the system.
- Measures and monitors the DC current

– Protects the battery string against short circuits by means of a fuse in the positive and negative path of the battery string

NOTE

Recommendation for use

➡ The key on the SRC4310 should only be operated in the case of decommissioning, servicing and faults as well as for maintenance work. The key must then be removed to prevent the switch from being switched on again. A switch in any other position may lead to damage to both the battery system and the connected power electronics. To do this, proceed as described in chapter 10.1 (➲ *10.1 Switching off the system before performing maintenance or decommissioning*).

6.4.1 Connections on front side

The Storage Rack Controller SRC4 is already configured and connected. Only the key of the key switch (2) has to be inserted.

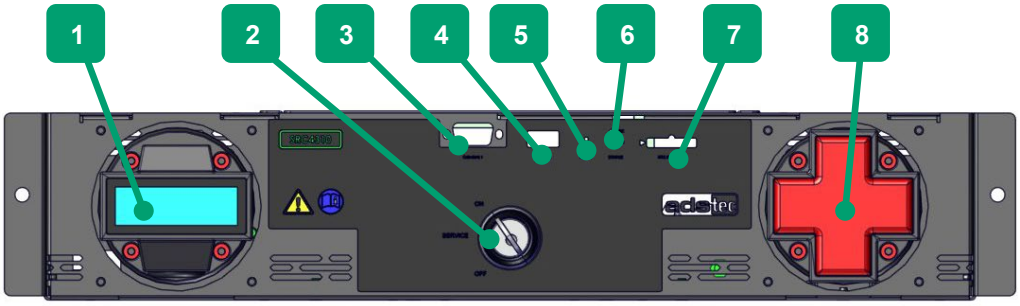


FIGURE 8: STORAGE RACK CONTROLLER FRONT VIEW (EXAMPLE FIGURE)

Position	Description
1	Minus pole to SRB
2	-S1 key switch (ON – SERVICE – OFF)
3	CAN BUS 1
4	SERVICE USB 2.0, only for internal service purposes
5	RESET reset button
6	STATUS SRC LED (top) SRB LED (bottom)
7	Lithium battery (CR2032 - 230 mAh) for SRC4310 real time clock
8	Plus pole to SRB

DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

➡ Do not come into contact with the + and – poles of the battery modules under any circumstances.

- ➡ Do not remove the transport cover until the respective installation step, shortly before connecting the power cable.
- ➡ Wear insulating gloves.
- ➡ Note the information in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).

In the "Service" position of the key switch (2), the control cables of the DC contactors are disconnected. This serves to protect against switching back on again. It is not possible to close the contactors with a software command in this switch position.

The reset button (5) allows the SRC4310 to be reset to the delivered state. To do this, the button must be pressed for five seconds while in operation. As confirmation, the SRC LED and the SRB LED then flash red for five seconds. Once in this phase, the Reset button must not be pressed. The SRC4310 then performs an automatic restart.

6.4.2 Status indicators

SRC LED (top)

Symbol	Behaviour	Description
	Off	System is switched off
	Flashing	SRC4 is starting up
	Flashing	SRC4 is performing an update
	Static	SRC4 in operating state
	Static	SRC4 in warning state
	Static	SRC4 in fault state
	Flashing	Reset to factory settings

Table 7: LED overview – SRC (top)

SRB LED (bottom)

Symbol	Behaviour	Description
	Off	System is switched off
	Flashing	SRB modules are starting up
	Flashing	SRB modules are performing an update
	Static	SRB modules in operating state
	Static	SRB modules in warning state
	Static	SRB modules in fault state
	Flashing	Reset to factory settings

Table 8: LED overview - SRB (bottom)

6.5 SRS controller box

The SRS controller box is the control unit of the overall system. Its main component is the EMM3821 Energy Management Module.

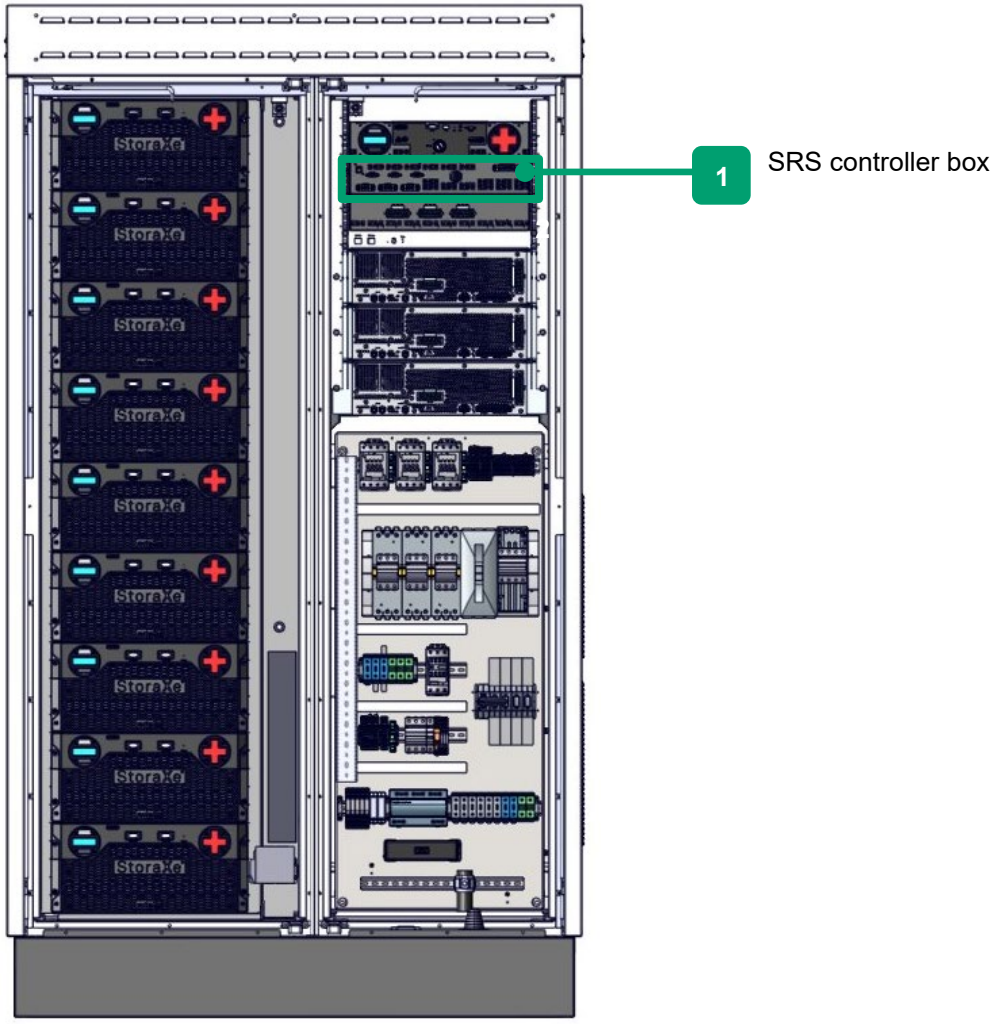


FIGURE 9: POSITION OF CONTROLLER BOX AND FUSE BOX

Furthermore, the SRS controller box can connect to the ADS-TEC BigLinX Energy Monitoring Portal via 4G. This is necessary for every service level agreement. The smart card required to do this is already included.

6.5.1 View of front side

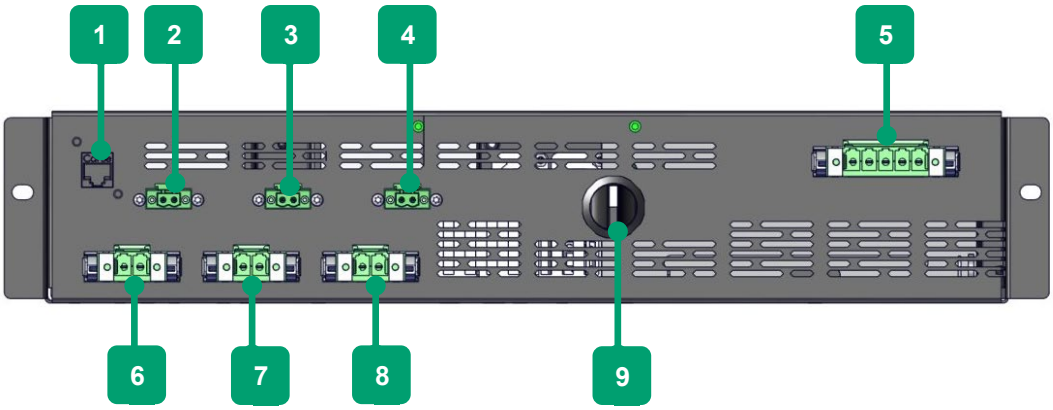


FIGURE 10: SRS CONTROLLER BOX – VIEW OF FRONT SIDE

Position	Description
1	-XF267 Ethernet connection to TH system control
2	X100 contactor enable signal – inverter 1
3	X200 contactor enable signal – inverter 2
4	X300 contactor enable signal – inverter 3
5	-X1 400V supply
6	-X10 24V supply – inverter 1
7	-X20 24V supply – inverter 2
8	-X30 24V supply – inverter 3
9	-S208 switch – black start

6.5.2 EMM3821

The main component of the SRS controller box is the EMM3821 Energy Management Module. To perform remote servicing via LTE, a SIM card must be installed (➲ *8.1 Installing and configuring SIM cards)*.

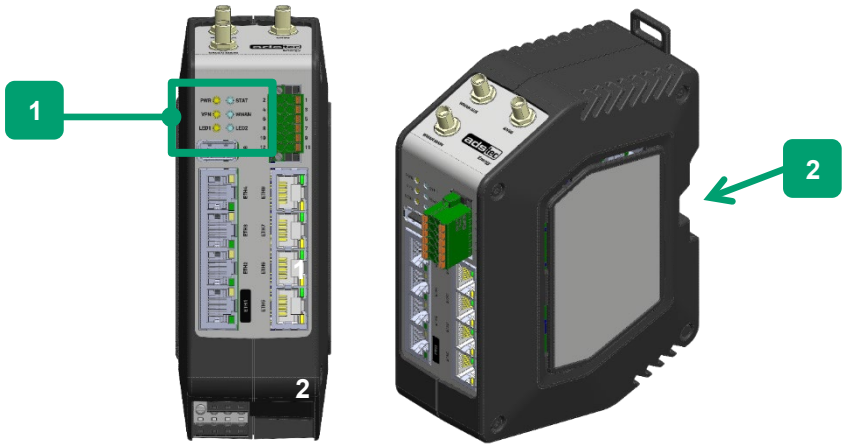


FIGURE 11: COMPONENT EMM3821, INSTALLED IN SRS CONTROLLER BOX

6.6 Inverter unit

Three TruConvert AC3025 bidirectional inverters from Trumpf Hüttinger connected in parallel are integrated in the storage system. They are controlled by the EMM3821 Energy Management Module via the TruConvert SysControl control unit (➲ attachment: *Instruction manual for inverter*).

In order to protect the devices on the DC side, the DC fuse box is integrated in the system.

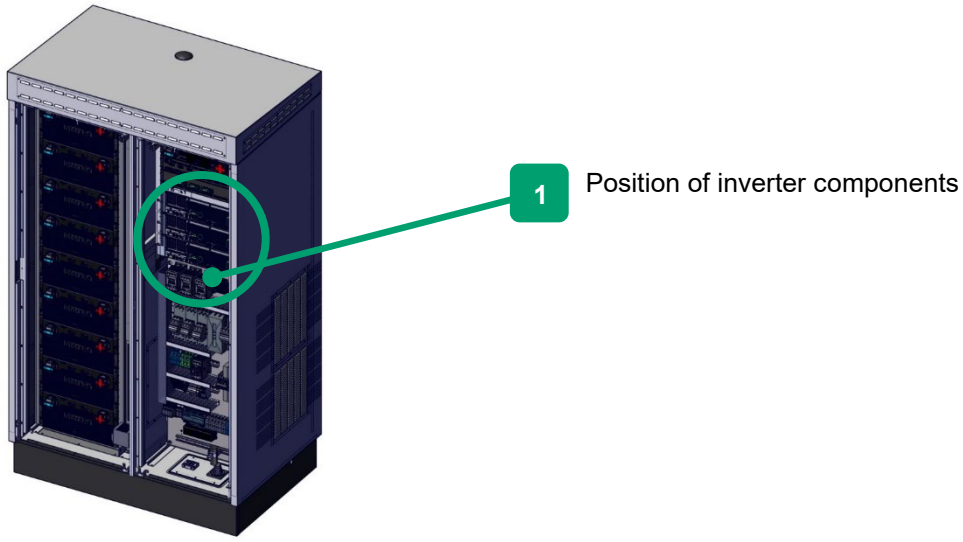


FIGURE 12: POSITION OF INVERTER

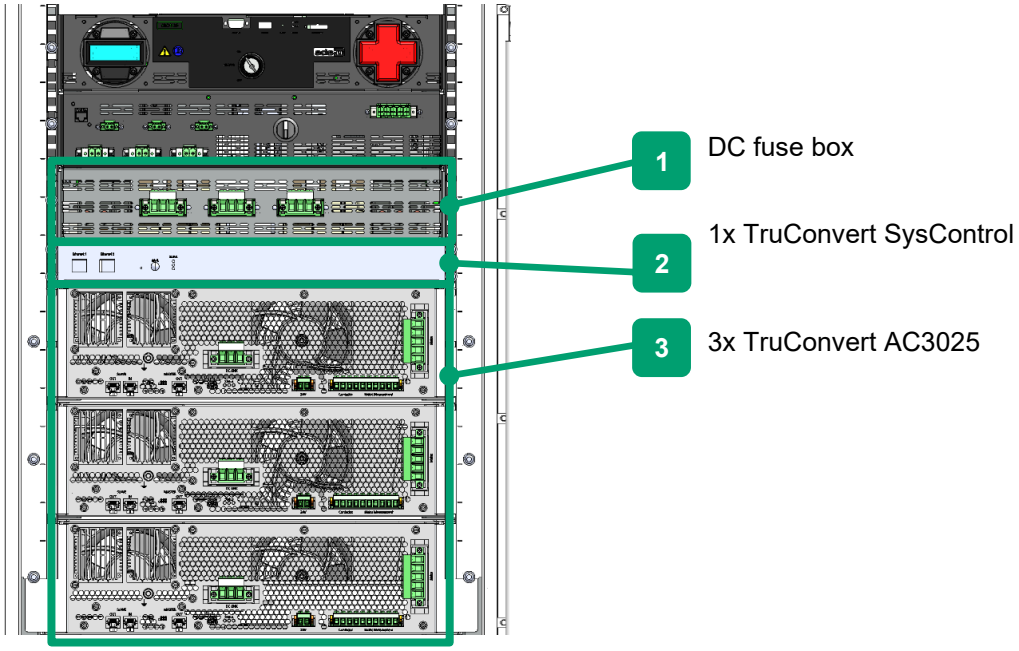


FIGURE 13: COMPONENTS OF INVERTER SERIES

6.6.1 DC fuse box

The DC fuse box contains the fuses for protecting the DC side of the three parallel-connected inverters. Details on the fuse protection can be found in the supplied electrical diagram (➲ *Electrical diagram in manual GSS0813*).

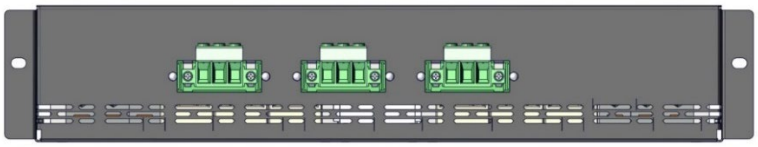


FIGURE 14: FUSE BOX – VIEW OF FRONT SIDE

6.6.2 Safety instructions

NOTE

Observe qualifications.

- ➡ All work must be performed by qualified and specially trained electricians only!
- ➡ Make sure that the units concerned are in a secured and de-energised condition, and wear personal protective equipment.
- ➡ Observe the manufacturer's documentation (➲ 1.3 Applicable documents).

DANGER

Risk of death due to hazardous voltage and residual voltage!

The AC supply must be switched off before any work is performed, otherwise a potentially fatal electric shock can occur.

Observe the safety instructions for the overall system given in the maintenance manual.

- ➡ Touching can result in electric shock or burns.
- ➡ Do not remove the cover.
- ➡ Switch off the system and lock it before beginning maintenance work.
- ➡ Observe a waiting period of at least 5 minutes to reliably exclude residual voltages.
- ➡ The touch current can be above 3.5 mA and cause physical disorders. Connection of protective earth eliminates the danger.
- ➡ Observe the 5 safety rules.

6.6.3 TruConvert SysControl inverter control unit

The TruConvert SysControl inverter control unit groups the three inverters into an inverter unit and serves as the interface to the EMM3821 system controller.

FIGURE 15: TRUCONVERT SYSCONTROL – VIEW OF FRONT SIDE

6.6.3.1 Connections

Position	Description
1	Data connection for PC (Modbus TCP, already connected)
2	Data connection for further system control
3	Reset button (reset IP address)
4	Status indicators

6.6.3.2 Status indicators

Symbol	Behaviour	Description
Status LED		
	Permanently lit	- Bootloader
	Flashing	- Error
	Permanently lit	- Energy direction: lights up when energy is flowing from the public grid into the DC intermediate circuit. - Idle - Error
	Flashing	- Energy direction: flashes when energy is flowing from the DC intermediate circuit into the public grid. - Bootloader - Initialisation
	Permanently lit	- Bootloader
	Flashing	- Initialisation - Idle - Operation

Table 9: Overview of TruConvert SysControl status LEDs

6.6.4 TruConvert AC3025 inverter

3 inverters of the type AC3025 are installed in the GSS0813. Each module has a nominal power of 25 kW.

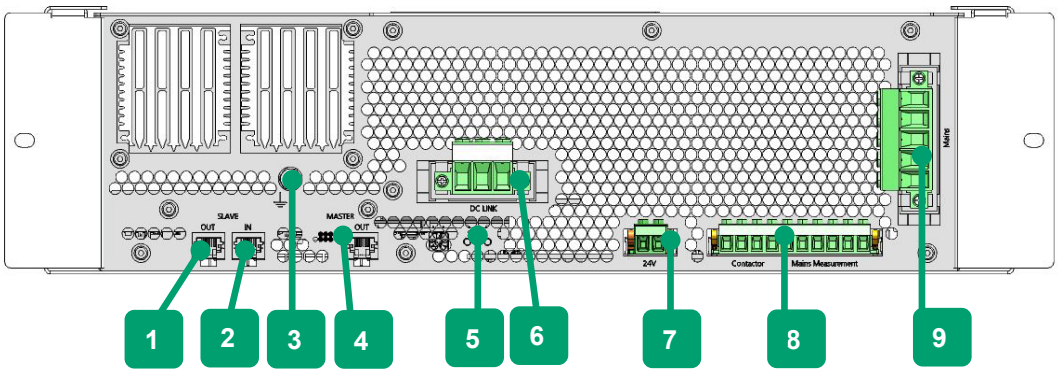


FIGURE 16: TRUCONVERT AC3025 – VIEW OF REAR SIDE

Position	Description
1	"SLAVE OUT" data cable
2	"SLAVE IN" data cable
3	Threaded bolt for potential equalisation
4	"MASTER OUT" data cable
5	LED status display
6	DC intermediate circuit voltage ("DC Link")
7	24 V supply voltage
8	Contactor enable contact and mains voltage measurement ("contactor/mains measurement")
9	Grid input ("mains")

Symbol	Behaviour	Description
Status LED		
	Permanently lit	- Bootloader on
	Flashing	- Initialise - Error
	Off	- Idle - Operation
	Permanently lit	- Energy direction: Lights up when energy is flowing from the public grid into the DC intermediate circuit.
	Flashing	- Energy direction: flashes when energy is flowing from the DC intermediate circuit into the public grid. - Bootloader - Initialisation
	Off	- Idle - Error
	Permanently lit	- Bootloader on
	Flashing	- Initialise - Idle - Operation
	Off	- Error

Table 10: Overview of LED status indicators of TruConvert AC3024

6.7 Air-conditioning system

The air-conditioning system is a switching cabinet-type cooling unit of the Blue e+ series from Rittal. The air-conditioning system is preconfigured for cooling the battery modules. In addition, a heating module is installed in the GSS0813 on the battery side.

The air-conditioning system is preset to a temperature of 23°C for the battery side.

The heater switches on automatically when temperatures fall below 15°C.

Speed-controlled fans on the housing dissipate the heat of the active components.

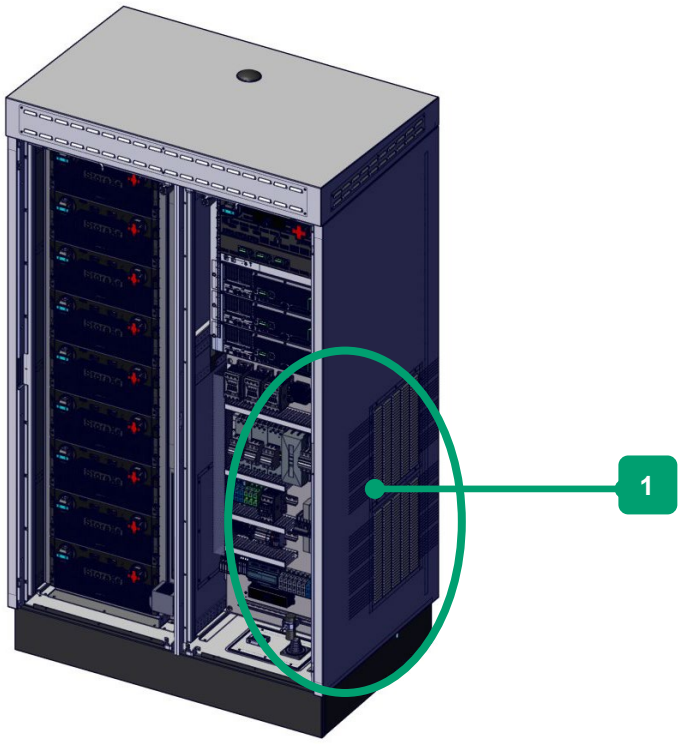
NOTE

Ensure correct lubrication and cooling!

➡ The accumulation of oil in the compressor of the air-conditioning system can ensure sufficient lubrication and cooling.

The air-conditioning components are monitored via a central IoT interface.

The climate control system as delivered is already preconfigured and does not need to be adjusted.



1 Air-conditioning system position.

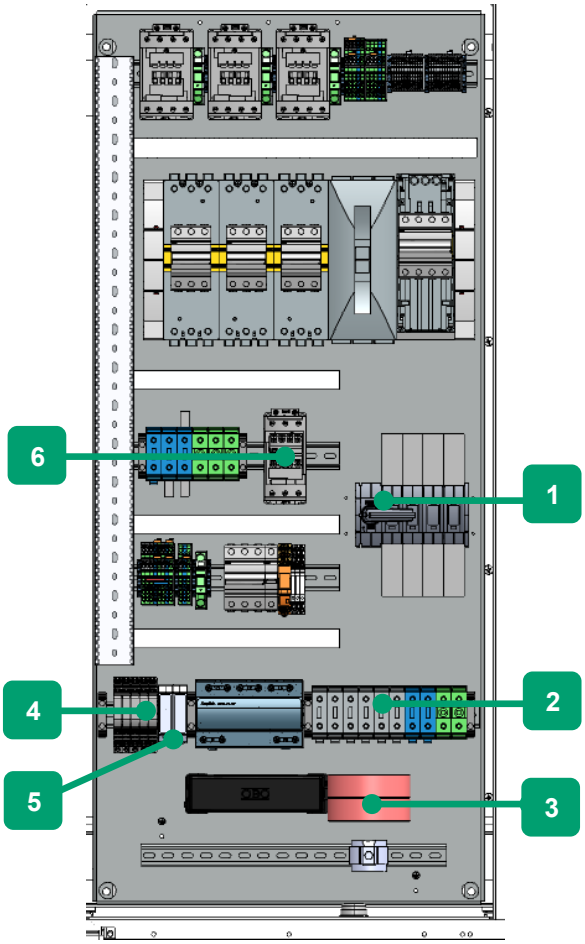
INFO:
The air-conditioning system is behind the mounting plate and is not visible when the cabinet door is open.

FIGURE 17: AIR-CONDITIONING SYSTEM COMPONENT – POSITION (EXAMPLE FIGURE)

6.8 Mounting plate

The mounting plate of the GSS0813 acts as the interface to the customer.

This is where the AC supply lines and all signal lines and communication lines are connected. In addition, the system for AC sub-distribution to the inverters and the contactor for neutral point creation are integrated on the mounting plate.



1 Main switch

2 AC terminal strip

3 Ferrites

4 Connection area for signal lines

5 Connection area for communication lines

6 Contactor for neutral point creation

FIGURE 18: MOUNTING PLATE

Main switch

The main switch de-energises the GSS0813 on the AC side.

NOTE

Information about the voltages present.

- Even when the main switch is switched off, there is always a voltage between + and –. It is not possible to de-energise the system in this area.
- On the DC-side, the inverter is de-energised via the key switch on the SRC4310.
- On the AC side, the area upstream of the main switch is de-energised by disconnecting the supply line.
- Observe the warning notices in the respective processing step.

NOTE

Continued supply after switching off.

When the main switch is switched from "ON" to "OFF", the integrated 24-VDC consumers are supplied with power for a further three minutes.

➡ It is normal for the internal LEDs to remain lit up.

AC connection area

High-current terminals for connecting the AC supply lines (➲ *7.3.3 AC power connection*).

Ferrites

The ferrites are supplied as part of the installation kit and must be installed on the AC supply lines (➲ *7.3.3 AC power connection*).

Connection area for signal lines

The overvoltage protection elements connect the signal lines to the system (➲ *7.3.5 Connecting signal lines*).

Connection area for communication lines

The overvoltage protection elements connect the communication lines to the system (➲ *7.3.4 Connecting communication lines).*

Depending on the customer application, smart meters are required. They are connected to the customer interface provided in the connection area. For this purpose, please refer to the list of supported smart meter models (➲ attachment: *Connection and parameterisation of the power meters*).

Contactor for neutral point creation

Contactor for connecting N and PE when creating the isolated grid using the GSS0813. The functionality of the contactor is monitored constantly via the auxiliary contact.

7 Installation

7.1 Installation requirements

NOTE

Observe requirements regarding installation location.

- ➡ Observe the environmental conditions at the installation location as well as the installation location requirements (➲ *4.9 Requirements regarding installation location*).
- ➡ Assembly must be performed only by qualified and trained specialists.
- ➡ The storage system must not be put into operation in the case of transport damage, non-observance of the environmental conditions and non-compliance with the requirements regarding the installation location. If necessary, the storage system must be taken out of operation in the case of changing conditions.

NOTE

Observe weather conditions.

- ➡ Make sure that the weather conditions are suitable for installing the system:
- ➡ There is no wind or only a light wind up to wind force 2 (up to 12 km/h).
- ➡ No rain is expected for the entire duration of all work operations. If rain is expected, it may be necessary to set up a protective tent.
- ➡ The ambient temperature during assembly is at least -20 °C and at most +40 °C.

The storage system is delivered preassembled. The individual components are pre-installed and already connected. The exception to this are the installation and cabling of the battery modules.

Ensure that the two doors are freely accessible for installation, service and operation (recommended: clearance of at least 1.5 m).

It must be possible to open both doors without obstructing or blocking an escape route or possible escape doors in the installation area.

NOTE

Pay attention to the position of the cable entry.

- ➡ When preparing the floor space, pay attention to the recess for cable entry from below.

7.2 Installing at the final location

CAUTION

Risk of injury!

There is a risk of crushing during installation of the storage system. Do not stand underneath suspended loads.

➡ Wear an appropriate protective equipment.

Assembly must be performed only by qualified personnel.

– Check the suitability of the floor space/foundation (➲ *4.9 Requirements regarding installation location*).

– When installing multiple systems in a group, ensure that all floor spaces are suitable.

– Observe the dimensions for screwing down the system as well as the position of the cable glands (➲ *14.2 Construction drawing*).

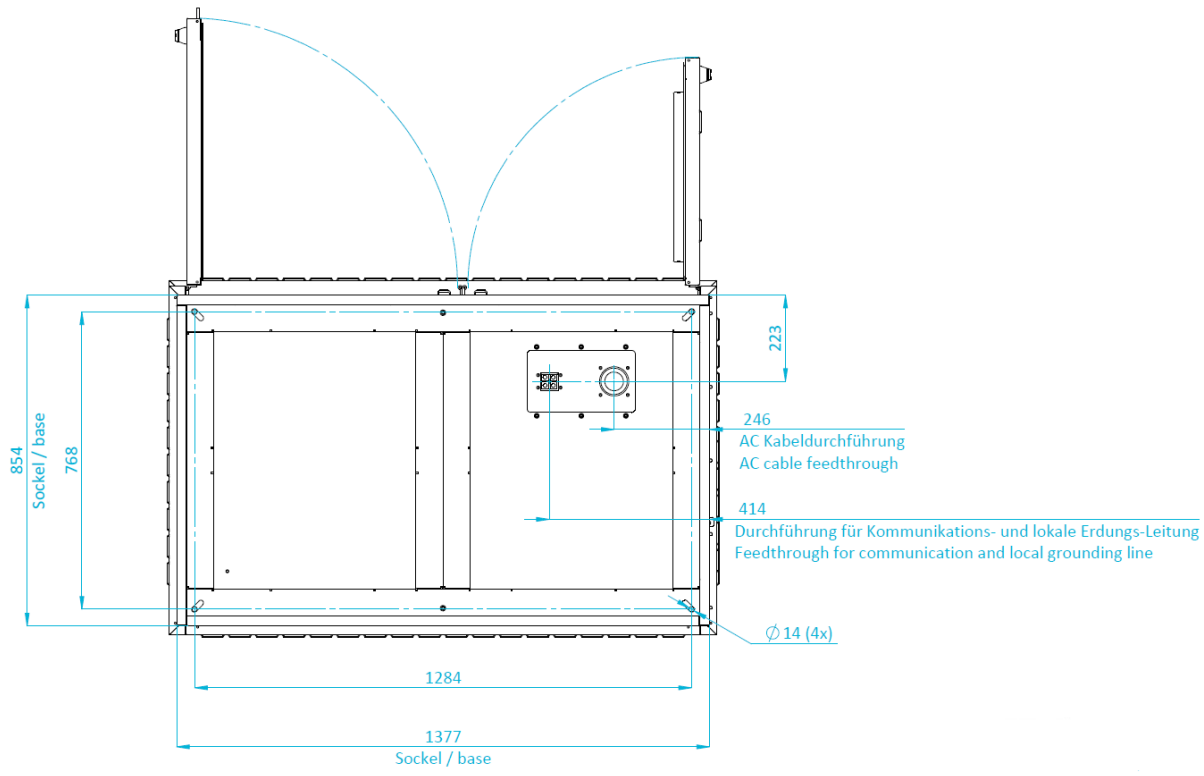


FIGURE 19: DIMENSIONS FOR SCREW CONNECTION TO FLOOR SPACE (DETAIL FROM CONSTRUCTION DRAWING)

Located on the bottom are recesses for screwing to the floor. To secure, use anchors and screws that are suitable for the substrate (anchors and screws are not provided).

– Screw down the system using screws and anchors suitable for the substrate.

The supply lines are fed in from the underside of the storage cabinet; see the following chapter.

7.3 Electrical connection

DANGER

Risk of death due to electric shock!

The AC supply must be switched off before any work is performed on the system, otherwise a potentially fatal electric shock can occur.

Open cable ends can cause an electric shock with fatal consequences when touched under existing mains voltage.

- Comply with national and international safety rules and regulations according to IEC 60364-6 (DIN VDE 0105-100) for working on electrical systems.
- Wear the appropriate protective clothes
- Before starting work, make sure that the AC supply of the supply lines to the system is switched off and secured to prevent it from being switched on again inadvertently.
- Make sure that the main switch is set to the **OFF** position.
- Set the SRC4 key switch to the **OFF** position.
- Observe a waiting period of at least 5 minutes to reliably exclude residual voltages.
- Check that the system is de-energised.
- Before making any changes to the interior, check that the fan has stopped.

DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

- Do not come into contact with the + and – poles of the battery modules under any circumstances.
- Do not remove the transport cover until the respective installation step, shortly before connecting the power cable.
- Wear insulating gloves.
- Note the information in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).

NOTE

Observe qualifications.

- All electrical connections may only be performed by a trained electrician.
- Follow the electrical diagram documentation for all electrical connections (➲ *Electrical diagram in manual GSS0813*).
- When replacing cables and protective earth connections, observe the respective cable cross sections in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).
- Installation and commissioning can be performed by the ADS-TEC service team (➲ *13 Service & support*).

NOTE

Observe qualifications.

- Commissioning must be performed only by qualified electricians!
- Commissioning is performed by the ADS-TEC service team or a person/company authorised.

7.3.1 Cable glands

Cables are fed through the cable gland insert on the right-hand underside of the cabinet.

1 Cable gland insert, underside

2 Bushing for communication lines, signal lines and foundation earth electrodes

3 Bushing for AC supply line

FIGURE 20: UNDERSIDE WITH CABLE GLAND SET

7.3.2 Earth connection

NOTE

Observe the earth connection.

- The system must be properly earthed at the designated location with an additional local earth connection and maintained in accordance with VDE0113 (➲ *Electrical diagram in manual GSS0813*).
- Ensure that the PE conductor has at least half the cross section of a phase conductor and is at least 16 mm^2 (recommended: 35 mm^2).

The earth connection is made via a foundation earth electrode, which must be installed according to local conditions.

Foundation earth electrodes must meet the DIN 18014:2014-03 standard.

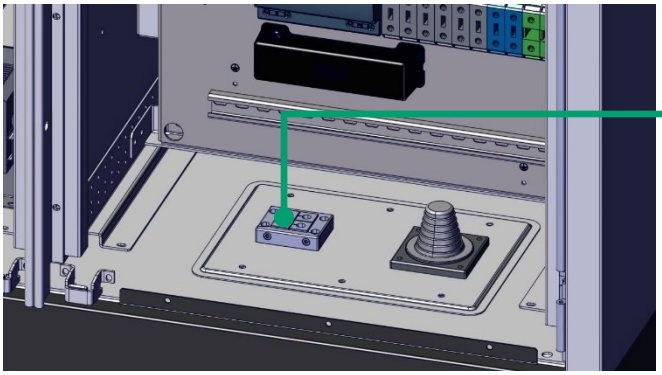


FIGURE 21: FOUNDATION EARTH ELECTRODE IMPLEMENTATION

Follow the electrical diagram for all electrical connections.

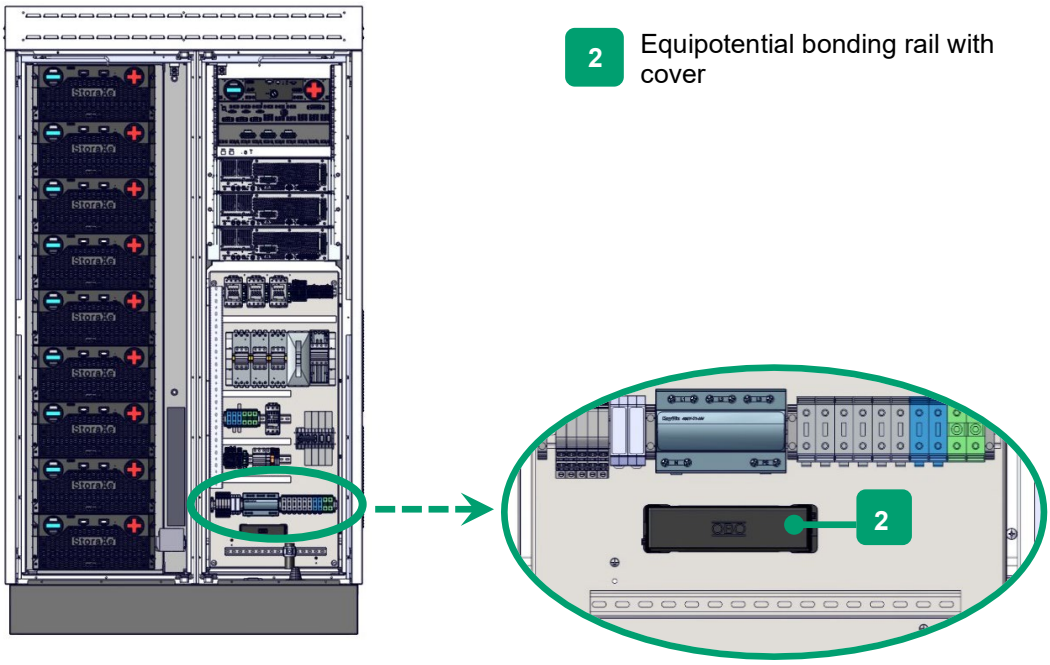
1 Cable glands

1 – Feed the foundation earth electrode from the outside through the cable gland.

2 – Make sure that the cable inlet is sealed from the outside.

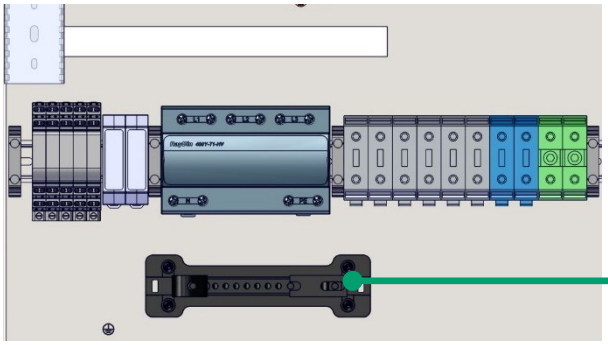
3 – Use the Icotek sealing inserts intended for this purpose.

NOTE: It may be necessary to obtain Icotek inserts that are suitable for the corresponding cable diameter.



2 Equipotential bonding rail with cover

FIGURE 22: POSITION OF EQUIPOTENTIAL BONDING RAIL



3 Equipotential bonding rail without cover

FIGURE 23: EQUIPOTENTIAL BONDING RAIL WITHOUT COVER

4 – Remove the cover of the equipotential bonding rail.

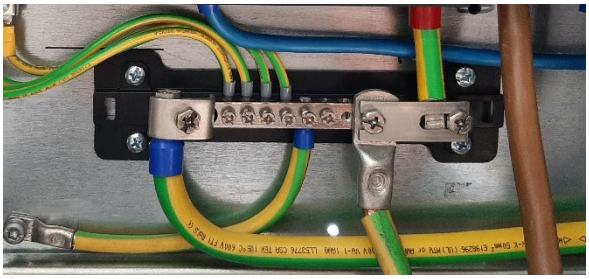


FIGURE 24: CONNECTING THE FOUNDATION EARTH ELECTRODE

5 – Connect the foundation earth electrode to the equipotential bonding rail. Keep the earth connection as short as possible.

6 – Reattach the equipotential bonding rail cover.

7.3.3 AC power connection

The AC power cable is fed in via the cable inlet on the underside of the housing. Observe the maximum possible cable diameter (27–48 mm) of the 5-wire cable in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).

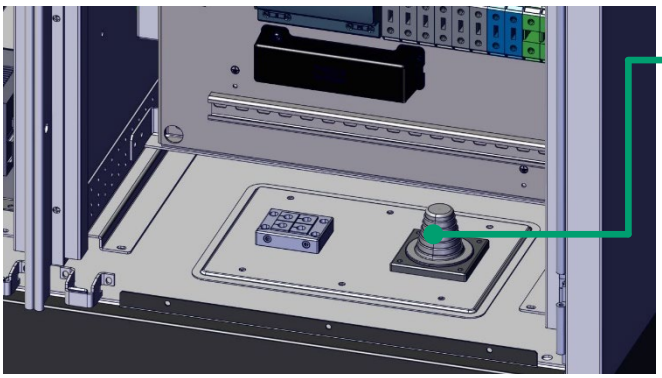


FIGURE 25: AC SUPPLY LINE IMPLEMENTATION

Follow the electrical diagram for all electrical connections.

1 Cable gland for AC supply line

1 – Prepare the cable gland to fit the existing AC supply line.

2 – Feed in the 5-wire AC supply line from the outside through the cable gland.

3 – Make sure that the cable gland is sealed.

4 – Use the existing C-rail to provide strain relief for the AC supply line using a suitable cable clamp.

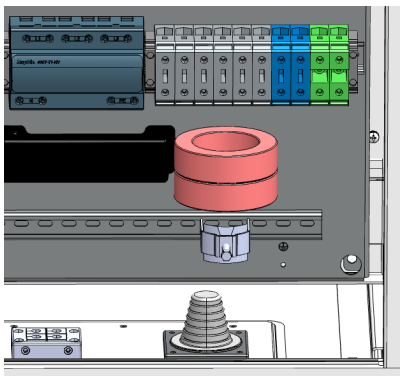


FIGURE 26: INSTALLING FERRITE RINGS

5 – Route the AC supply lines (L1, L2, L3, N) through the two ferrite rings from the installation kit.

6 – Attach the ferrite rings to the supply lines using cable ties.

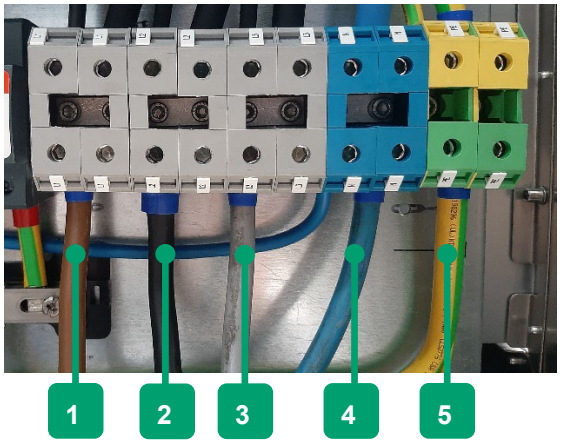


FIGURE 27: CONNECTING THE AC SUPPLY LINE

7 – Connect the wires of the AC supply line from below as follows (torque 10 Nm):

1	L 1	(phase 1)
2	L 2	(phase 2)
3	L 3	(phase 3)
4	N	(neutral conductor)
5	PE	(protective earth)

NOTE:
Observe the clockwise rotating field.

7.3.4 Connecting communication lines

The communication line to the customer network and customer control is fed in via the cable inlets on the underside of the housing.

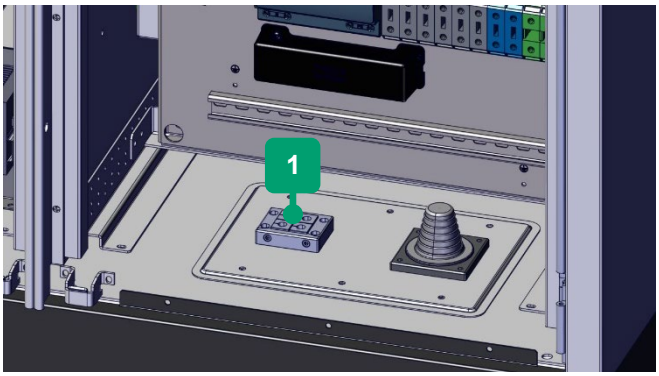


FIGURE 28: COMMUNICATION LINE IMPLEMENTATION

Follow the electrical diagram for all electrical connections.

1 Cable gland for communication lines

1
- Feed in the communication line to the customer network (Customer LAN) from the outside through the cable gland

2
- Optional: Feed in the LAN connection line of the smart meter (provided by the customer) from the outside through the cable gland.

3
- Make sure that the cable inlets are sealed from the outside!

4
- Use the Icotek sealing inserts intended for this purpose.

NOTE: It may be necessary to obtain Icotek inserts that are suitable for the corresponding cable diameter.

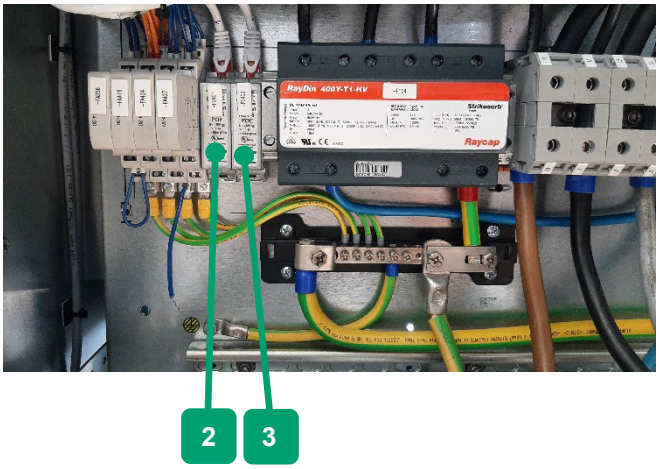


FIGURE 29: PLUGGING IN THE COMMUNICATION LINE

2 -FU401: Communication line for customer network (Customer LAN)

- Connect the LAN communication line to the RayDat overvoltage protection device (-FU401).

3 -FU402: Optional supply line for connecting ext. smart meters. Service connection.

- Connect the LAN connection for smart meter or service, for example, to the RayDat overvoltage protection device -FU402.

7.3.5 Connecting signal lines

An external emergency stop signal as well as further signal lines are fed in via the cable inlets on the underside of the housing.

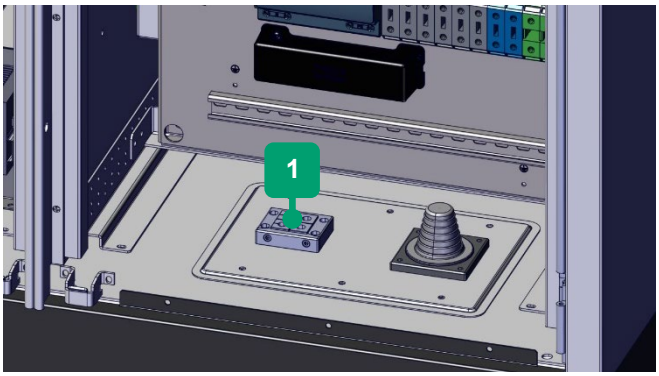


FIGURE 30: COMMUNICATION LINE IMPLEMENTATION

Follow the electrical diagram for all electrical connections.

1 Cable gland for communication lines

- Make sure that the cable inlets are sealed from the outside!
- Use the Icotek sealing inserts intended for this purpose.

NOTE: It may be necessary to obtain Icotek inserts that are suitable for the corresponding cable diameter.

7.3.5.1 "External stop"

Electrical connection: -FA256.1 and -FA256.3

Specifications: Max. 24 VDC; max. 1 A

Delivery state: Bridged

Summarised explanation and system reaction:

When the external stop signal is triggered (open), the auxiliary supply of the integrated TH inverter is switched off straightaway. This immediately stops the power flow in the charging or discharging direction. The system then switches to the error state. Please note that the other internal auxiliary supply of the GSS0813 remains active. As a result, functions such as the climate control of the device can be sustained. Possible applications in which the signal can be used include the integration of the GSS0813 into an external emergency stop chain or the connection of an externally installed RCMS to achieve single-fault protection according to IEC 62109-2.

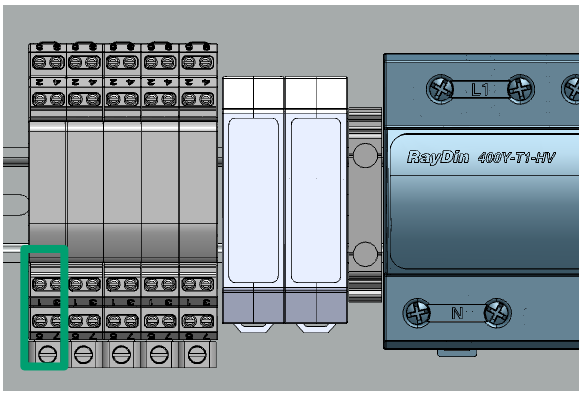


FIGURE 31: ELECTRICAL CONNECTION OF "EXTERNAL STOP"

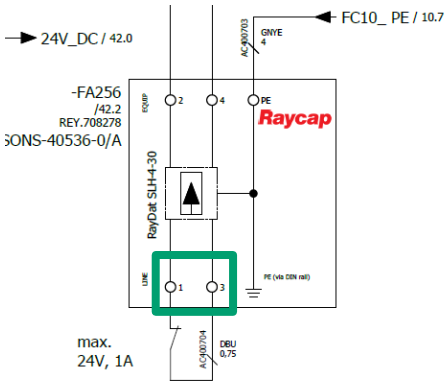


FIGURE 32: DETAIL FROM THE ELECTRICAL DIAGRAM FOR "EXTERNAL STOP"

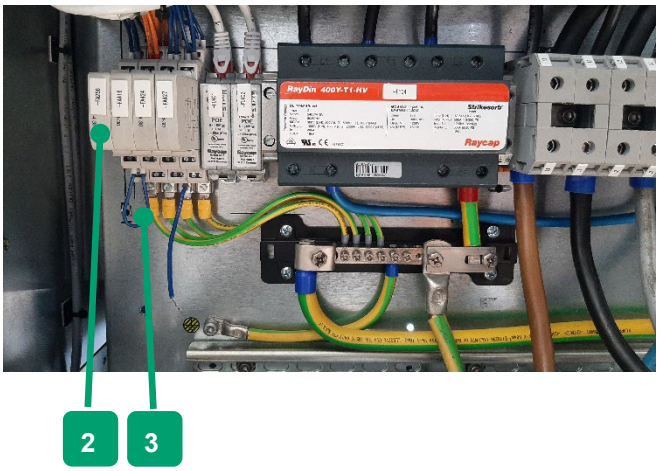


FIGURE 33: ELECTRICAL CONNECTION OF "EXTERNAL STOP"

2

- FA256: Connection option for an external emergency stop signal (connection 1 + 3)
- Connect 2x1.5mm² cable lines.

3

- With bridge = normally closed.
- Alternatively customer-specific: potential-free contact connectable.
- In the case of isolated grid applications, connect external cable lines according to the electrical diagram rather than bridges (➲ attachment: *Electrical diagram SD_isolated_operation_GS_protection*).

7.3.5.2 "Customer Signal 1/2/3"

Electrical connection: -FA416.1, -FA416.3, -FA416.5 and -FA416.7

Specifications: Max. 24 VDC; max. 1 A

Delivery state: Open and unconfigured

Summarised explanation and system reaction:

The three available customer signals can be linked to almost any specifications or states of the system by performing a corresponding configuration in the HMI of the Energy Management Module. Possible applications include discarding or adding loads when SOC thresholds have been configured previously and the backup power functionality being used (see chapter 8 of this manual).

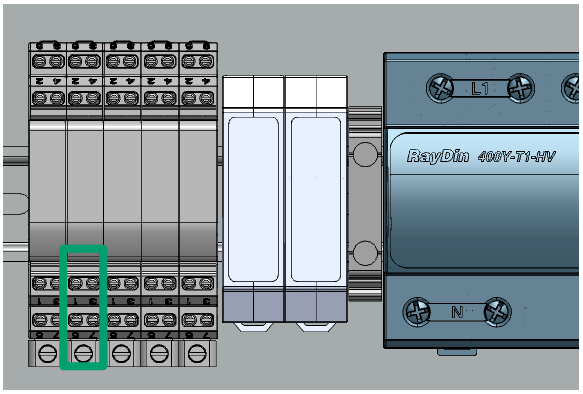


FIGURE 34: ELECTRICAL CONNECTION OF "CUSTOMER SIGNAL 1/2/3"

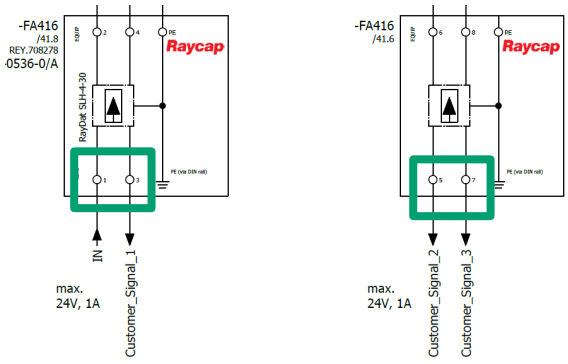


FIGURE 35: DETAIL FROM THE ELECTRICAL DIAGRAM FOR "CUSTOMER SIGNAL 1/2/3"

7.3.5.3 "Status Grid" input

Electrical connection: -FA427.1 and -FA427.3

Specifications: Max. 24 VDC; max. 1 A

Delivery state: Open

Summarised explanation and system reaction:

The "Status Grid" signal (grid OK/NOK) is a fundamental signal when using the backup power functionality and is primarily used as a source of information for the GSS0813 in order to switch automatically from the "isolated grid" operation mode (SysState = 3 = island mode) via off to "grid-connected mode" (SysState = 4 = line commutated/grid) in the event of power recovery. When using the backup power functionality, refer to the diagram of recommended wiring for the required sub-distribution system at this point (➲ attachment: *SD_isolated_operation_GS_protection*). The corresponding signal exchange takes place with the component DOLD RP 9800.12.

Note: If the backup power functionality is not being used or the GSS0813 is being operated only in grid-connected mode, the signal path between -FA427.1 and -FA427.3 must be bridged.

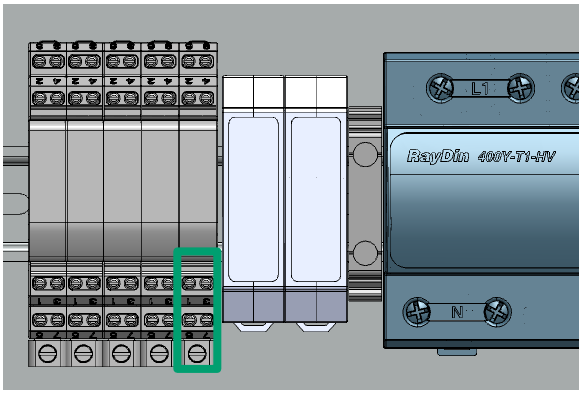


FIGURE 36: ELECTRICAL CONNECTION OF "STATUS GRID"

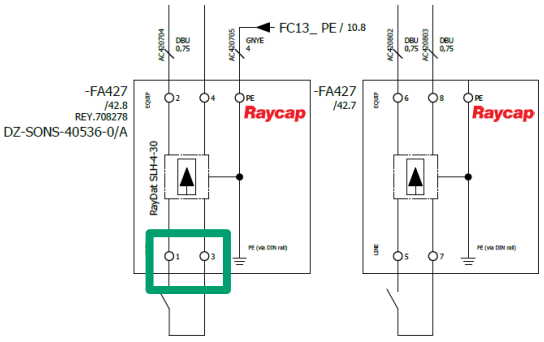


FIGURE 37: DETAIL FROM THE ELECTRICAL DIAGRAM FOR "STATUS GRID"

7.3.5.4 "Status Coupling Switch" input

Electrical connection: -FA427.5 and -FA427.7

Specifications: Max. 24 VDC; max. 1 A

Delivery state: Open

Summarised explanation and system reaction:

The "Status Coupling Switch" signal (open/closed) is a fundamental signal when using the backup power functionality and is primarily used as a source of information for the GSS0813 in order to establish an isolated grid in the event of power failure and an open coupling switch or

to switch to grid-connected mode in the event of power recovery and a closed coupling switch. When using the backup power functionality, refer to the diagram of recommended wiring for the required sub-distribution system at this point (➲ attachment: *SD_isolated_operation_GS_protection*). The corresponding signal exchange takes place with the coupling switch module, or rather its auxiliary contact ABB 1SDA066423R1 AUX 1Q 24DC.

Note: If the backup power functionality is not being used or the GSS0813 is being operated only in grid-connected mode, the signal path between -FA427.5 and -FA427.7 must be bridged.

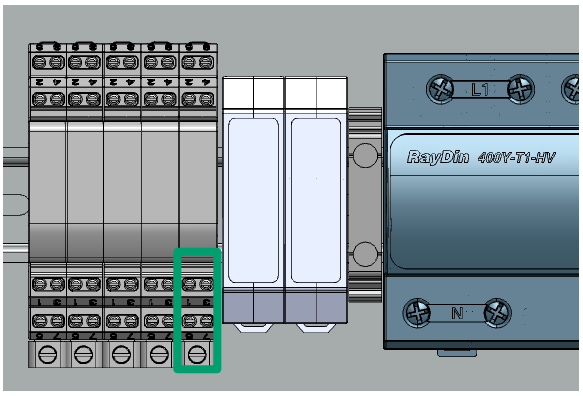


FIGURE 38: ELECTRICAL CONNECTION OF "STATUS COUPLING SWITCH"

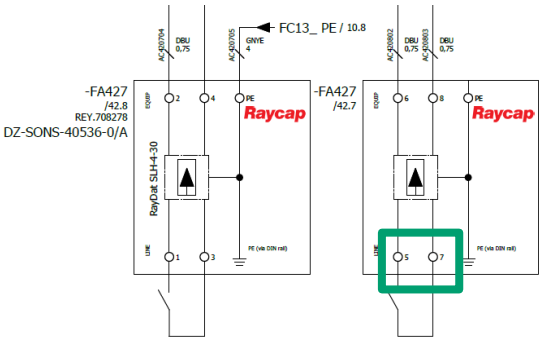


FIGURE 39: DETAIL FROM THE ELECTRICAL DIAGRAM FOR "STATUS COUPLING SWITCH"

7.3.5.5 "Status Neutral (star) Point" output

Electrical connection: -FA420.1 and -FA420.3

Specifications: Max. 24 VDC; max. 1 A

Delivery state: Open

Summarised explanation and system reaction:

The "Status Neutral (star) Point" signal (open/closed) is a fundamental signal when using the backup power functionality and acts as a remote trigger signal for the upstream GS protection in the event of backup power or an isolated grid. When using the backup power functionality, refer to the diagram of recommended wiring for the required sub-distribution system at this point (➲ attachment: *SD_isolated_operation_GS_protection*). The corresponding signal exchange takes place with the GS protection ABB CM-UFD.M31, or rather its input Y3. It is important to note that this input for the GS protection must be parameterised as the "remote trigger". In the event of power recovery, using the remote trigger prevents the coupling switch from closing as long as the GSS0813 is still creating an isolated grid or the neutral point is still created within the GSS0813.

Note: If the backup power functionality is not being used or the GSS0813 is being operated only in grid-connected mode, this signal path is not required.

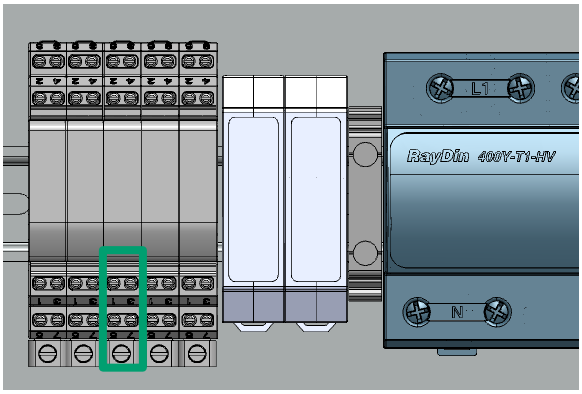


FIGURE 40: ELECTRICAL CONNECTION OF "STATUS NEUTRAL (STAR) POINT"

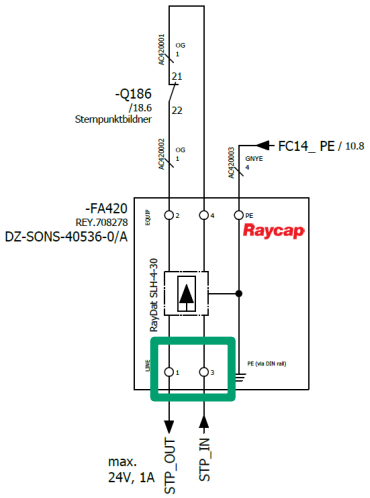


FIGURE 41: DETAIL FROM THE ELECTRICAL DIAGRAM FOR "STATUS NEUTRAL (STAR) POINT"

7.3.5.6 "Control Pulses for Grid Tracking U+/U-/f+/f-" inputs

Electrical connection: -FA256.5; -FA256.7; -FA424.1; -FA424.3; -FA424.5; -FA424.7;

Specifications: Max. 24 VDC; max. 1 A

Delivery state: Open

Summarised explanation and system reaction:

ads-tec Energy intends to use the "Control Pulses for Grid Tracking" inputs for future product features. Currently, they do not need to be connected.

-FA256

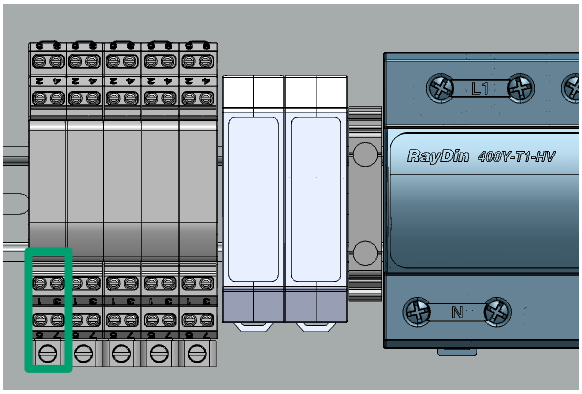


FIGURE 42: ELECTRICAL CONNECTION OF "CONTROL PULSES FOR GRID TRACKING -FA256"

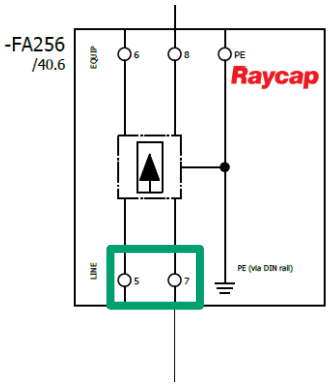


FIGURE 43: DETAIL FROM THE ELECTRICAL DIAGRAM FOR "CONTROL PULSES FOR GRID TRACKING - FA256"

-FA424

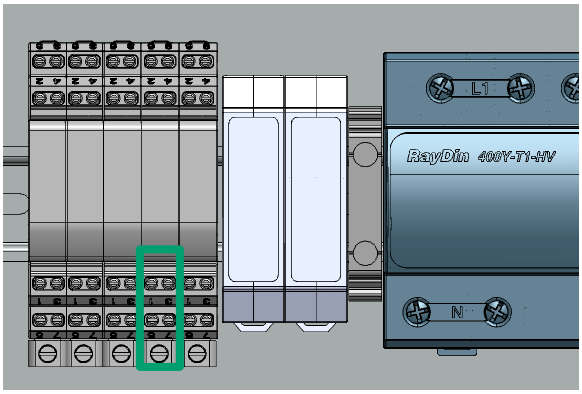


FIGURE 44: ELECTRICAL CONNECTION OF "CONTROL PULSES FOR GRID TRACKING -FA424"

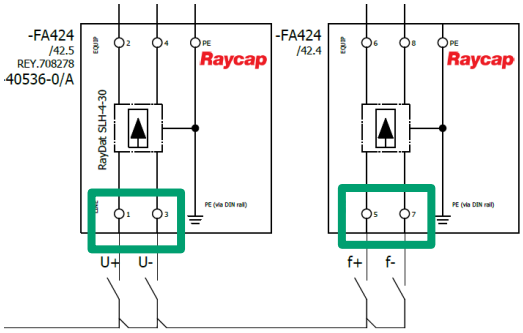


FIGURE 45: DETAIL FROM THE ELECTRICAL DIAGRAM FOR "CONTROL PULSES FOR GRID TRACKING - FA424"

7.4 Installing the battery modules

NOTE

Observe qualifications.

- Only qualified electricians who have received the relevant product training are allowed to install the battery modules!
- Follow the electrical diagram documentation for all electrical connections.
- Observe the electrical connection sequence given in the following chapters.

The procedure described in the following for assembling the storage system is to be observed under all circumstances. The module label can be found imprinted on the front label of the module.

DANGER

Risk of death due to electric shock!

The AC supply must be switched off before any work is performed on the system, otherwise a potentially fatal electric shock can occur.

Open cable ends can cause an electric shock with fatal consequences when touched under existing mains voltage.

- Comply with national and international safety rules and regulations according to IEC 60364-6 (DIN VDE 0105-100) for working on electrical systems.
- Wear the appropriate protective clothes
- Before starting work, make sure that the AC supply of the supply lines to the system is switched off and secured to prevent it from being switched on again inadvertently.
- Make sure that the main switch is set to the **OFF** position.
- Set the SRC4 key switch to the **OFF** position.
- Observe a waiting period of at least 5 minutes to reliably exclude residual voltages.
- Check that the system is de-energised.
- Before making any changes to the interior, check that the fan has stopped.

DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

- ➡ Do not come into contact with the + and – poles of the battery modules under any circumstances.
- ➡ Do not remove the transport cover until the respective installation step, shortly before connecting the power cable.
- ➡ Wear insulating gloves.
- ➡ Note the information in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).

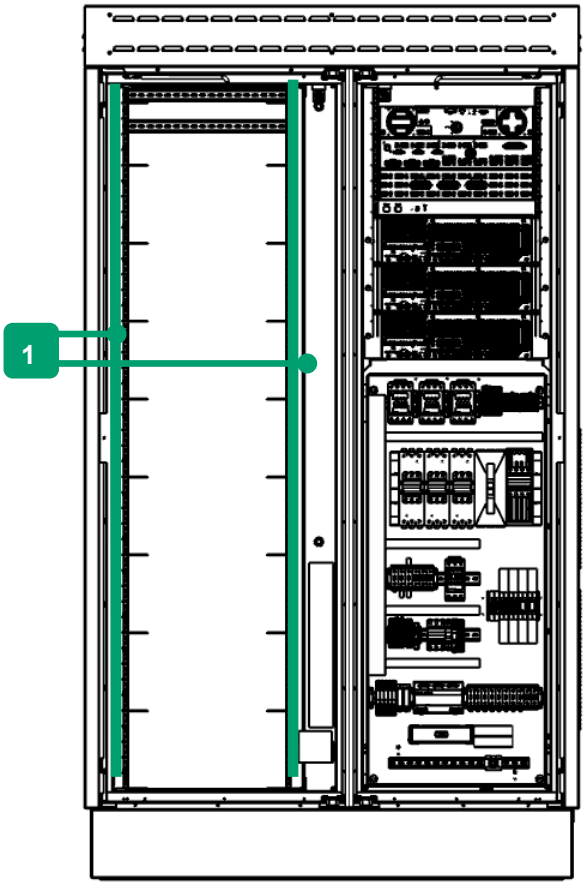
CAUTION

Hazard due to damaged battery modules!

If battery modules fall down, they can be damaged and must be replaced**.**

- ➡ Installation of a dropped battery module is not permitted.
- ➡ Replace the dropped battery module according to the following instructions (➲ 2.5.2 *Transportation of defective or damaged lithium-ion batteries*).
- ➡ Battery modules must be installed on the day of commissioning.

7.4.1 Removing the cable guide rails



1 Remove cable guide rails

1 – Remove the cable guide rails and keep the screws in a safe place.

FIGURE 46: REMOVING CABLE GUIDE RAILS

7.4.2 Inserting the battery modules

Owing to the heavy weight of the SRB modules, it is essential to follow the procedure described below for installing the components. The SRB modules are equipped with a transport safety device on the plus pole. Do not remove the transport safety device when installing the modules in the cabinet. They are only to be removed within the scope of the DC cabling.

WARNING

Risk of death from falling and tipping loads!

Falling and tipping loads can cause fatal injury.

- The battery module is very heavy (approx. 80 kg) and must be installed by two people at a minimum.
- To lift loads, use only lifting equipment that is suitable for the task and in perfect working order. Lifting eyes are provided on the top of the modules.
- Make sure that no persons are located in the hazardous area underneath the suspended load.
- Due to their heavy weight, install the battery modules from the bottom up.
- Wear the appropriate protective equipment.

WARNING

Risk of crushing and cuts from sharp edges!

Inserting the battery modules may cause crush injuries and cuts.

- Wear gloves.
- Have at least 2 people to install the battery module.

Basic procedure for inserting battery modules:

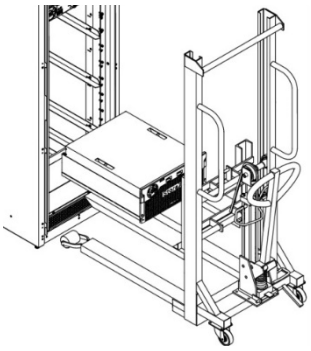
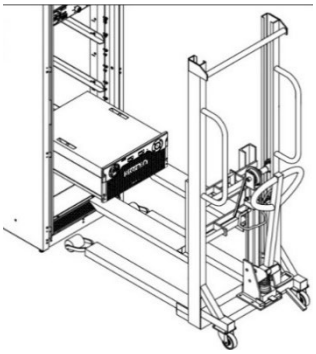


FIGURE 47: POSITIONING THE BATTERY MODULE

1 Place the battery module on the support rails of the lifting equipment and position at the intended installation height. When doing so, observe the installation sequence from bottom to top.



2 Push the module halfway into the rack.

FIGURE 48: INSERTING THE BATTERY MODULE INTO THE RACK

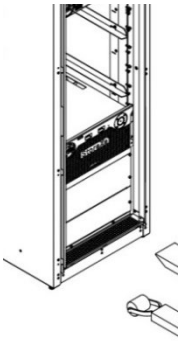
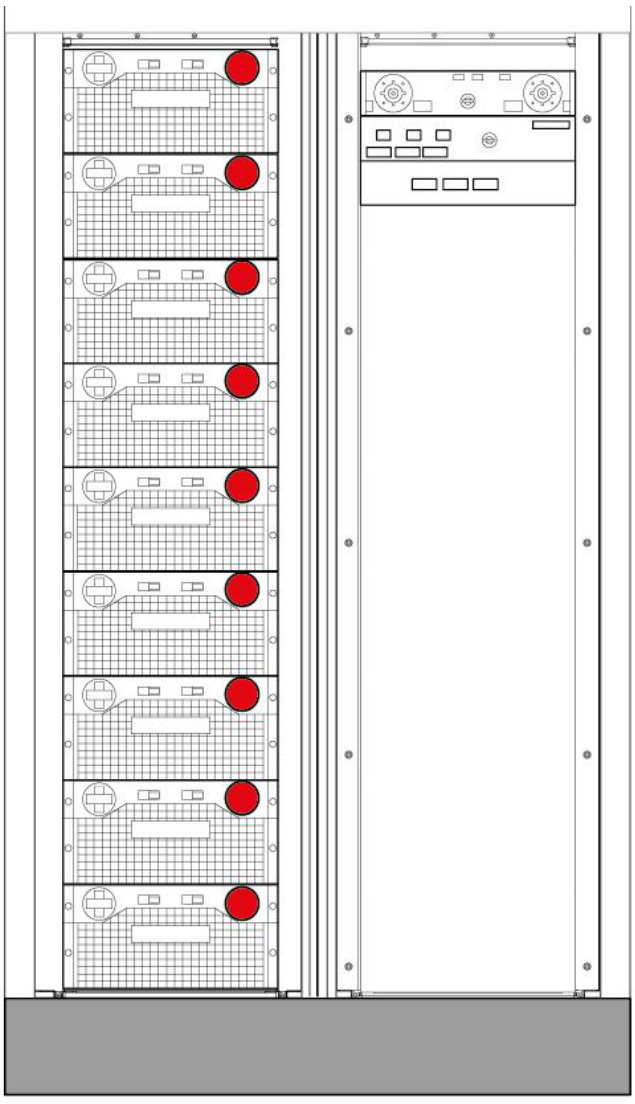


FIGURE 49: SCREWING ON THE BATTERY MODULE

3 Slide the battery module into the rack until it is flush.

Using a torque of 2 Nm, fix the modules on the front side with the socket head cap screws provided. (M6x16 DIN 912, 4 for each module).

Repeat steps 1 to 3 for the remaining modules.

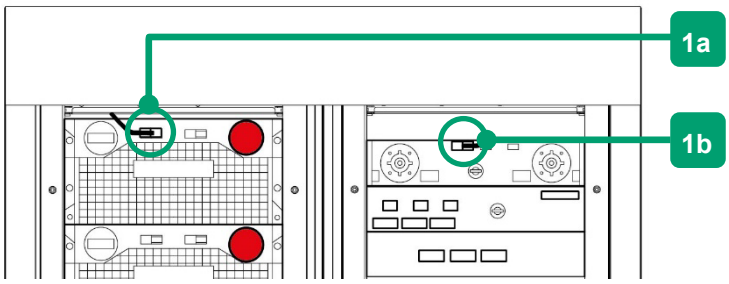


System with inserted battery modules

FIGURE 50: SYSTEM WITH INSTALLED BATTERY MODULES

7.4.3 Installing the communication cabling

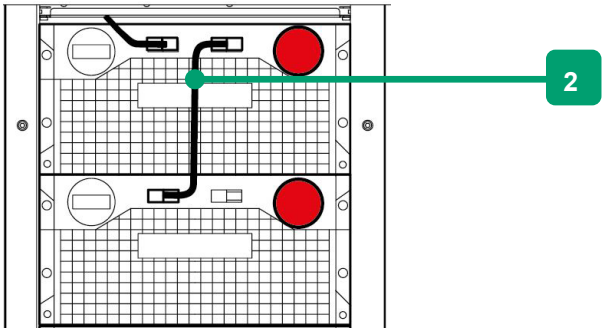
The procedure for installing the communication cabling described below must be observed. The designation on the SRB modules is CAN-BUS1 for the input and CAN-BUS2 for the output to the next module. The module label can be found imprinted on the front label of the module.



Communication cable 1:

– Connect the already installed communication cable from SRC4310 1b to the first CAN-BUS1 battery module. 1a

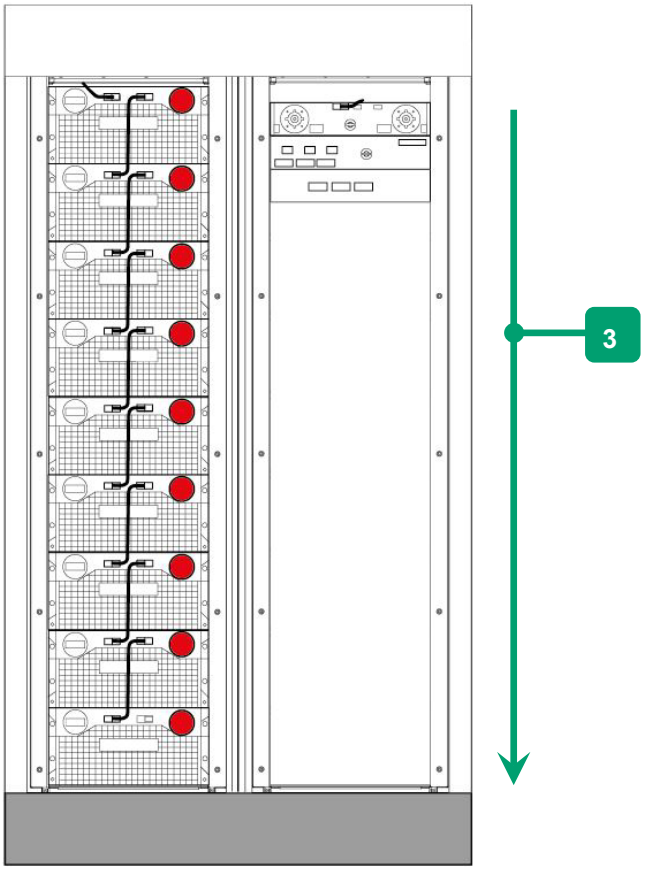
FIGURE 51: ATTACHING THE COMMUNICATION CABLE - 1



Communication cable 2:

– Connect the first of the supplied communication cables from the first to the second battery module.

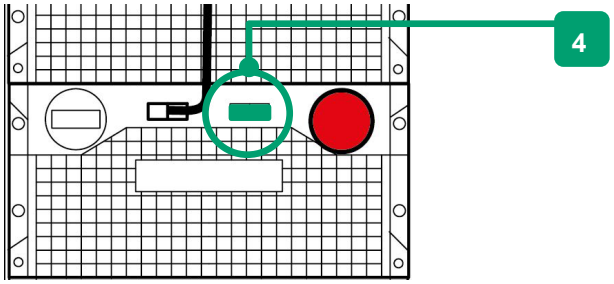
FIGURE 52: ATTACHING THE COMMUNICATION CABLE - 2



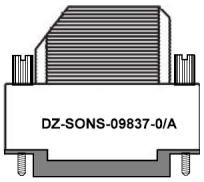
Order of all communication cables:

– Repeat the previous step for the remaining modules. Note that the order is from top to bottom.

FIGURE 53: ATTACHING THE COMMUNICATION CABLE - 3



Terminator plug:



– Attach the terminator plug (shown in green in the drawing) to the bottom battery module.

FIGURE 54: ATTACHING THE COMMUNICATION CABLE - 4

7.4.4 Installing the power cabling

The procedure described in the following for assembling the power cabling is to be observed under all circumstances. The module label can be found imprinted on the front label of the module.

The modules are equipped ex factory with a transport cover on the plus pole. This transport cover is screwed to the module with Torx-TR 20 safety screws. All cables are included in the scope of delivery (➲ *5.1 Scope of delivery*).

NOTE

Observe the key switch position.

➡ Before beginning the installation, make sure that the key switch of the SRC4310 is in the "OFF" position.

NOTE

It is essential to observe the installation sequence.

➡ Do not remove the transport cover until requested to do so in the described installation sequence. The sequential procedure from top to bottom prevents incorrect cabling and ensures safe installation.

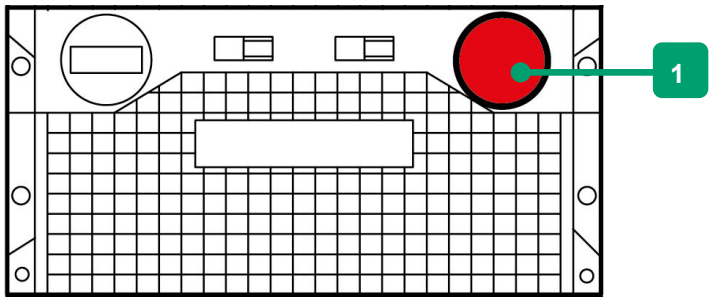
DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

➡ Do not come into contact with the + and – poles of the battery modules under any circumstances.
➡ Do not remove the transport cover until the respective installation step, shortly before connecting the power cable.
➡ Wear insulating gloves.
➡ Note the information in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).



Transport cover:

NOTE:
Remove the transport cover on the individual battery modules only during the respective installation step.

FIGURE 55: TRANSPORT COVER INFORMATION (EXAMPLE FIGURE)

Check the power cables for damage. **If damaged:**

Do not use the power cables!

The power cables have coded plugs. The power cable negative plug only fits into the minus pole of the module. Similarly, the positive plug only fits into the plus pole of a module.

The power cables can be securely connected to the battery module with four screws. Tighten the screws crosswise to 0.5 Nm.

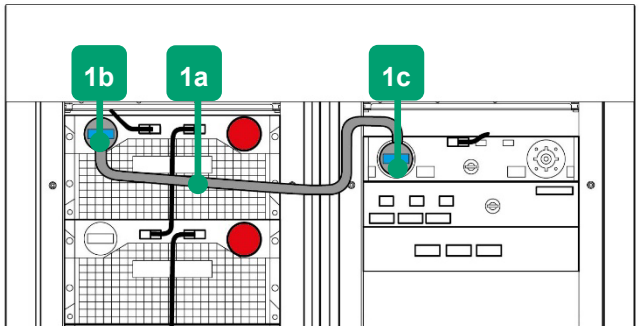


FIGURE 56: ATTACHING THE POWER CABLE - 1

1a Negative power cable (- -)

1b Minus pole of top battery module

1c Minus pole of SRC4310 controller

1 Connect the preinstalled negative power cable (- -) from the minus pole of the SRC4310 controller to the minus pole of the top battery module. Screw on the plug with 4 screws crosswise to 0.5 Nm.

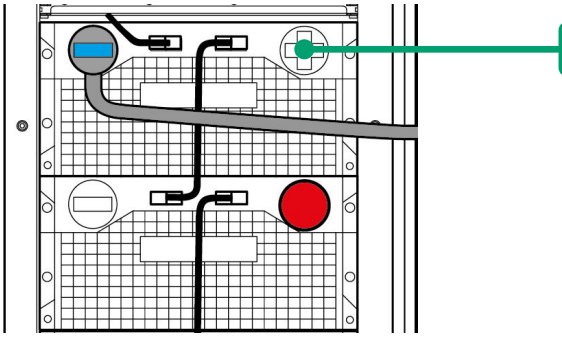


FIGURE 57: ATTACHING THE POWER CABLE - 2

2 Transport cover 1

2 – Remove the transport cover on the first battery module.

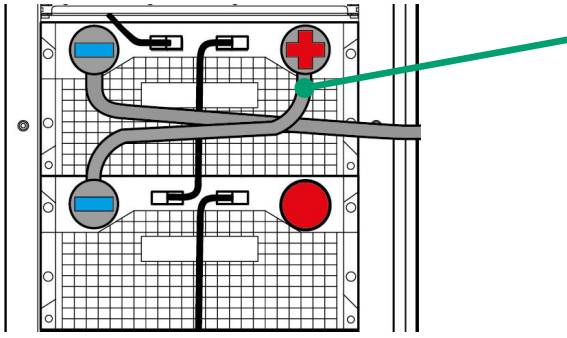


FIGURE 58: ATTACHING THE POWER CABLE - 3

3 Power cable 1 (+ -)

3 – Insert the positive plug of the power cable at the plus pole of the top battery module.

4 – Connect the power cable to the minus pole of the second battery module and insert the negative plug.

5 – Screw on each plug securely with 4x Torx 20 screws crosswise to 0.5 Nm.

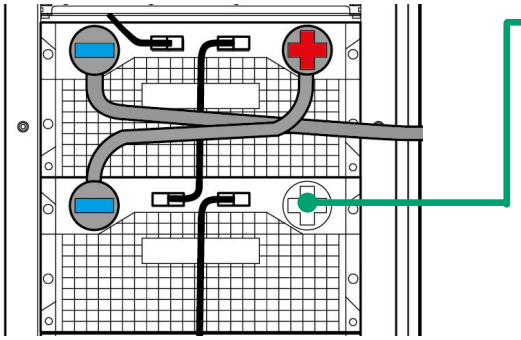


FIGURE 59: ATTACHING THE POWER CABLE - 4

4 Transport cover 2

6 Remove the transport cover on the second battery module.

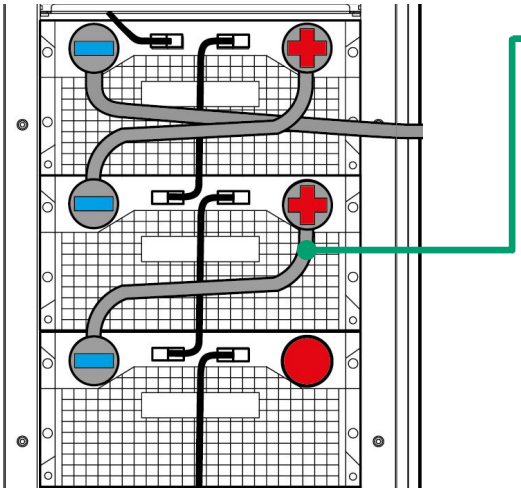


FIGURE 60: ATTACHING THE POWER CABLE - 5

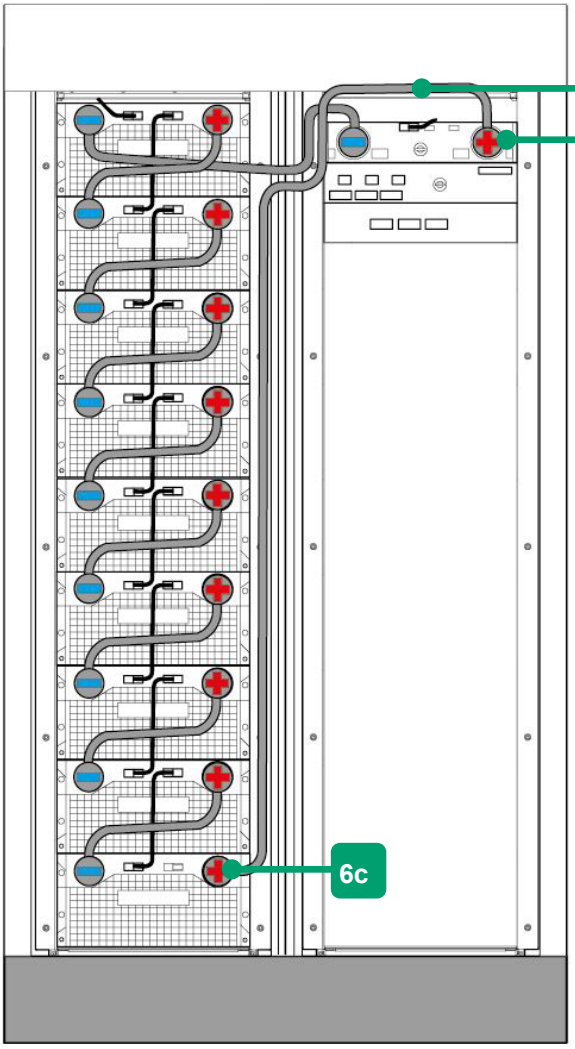
5 Power cable 2 (+ -)

7 – Insert the positive plug of the next power cable at the plus pole of the second battery module.

8 – Connect the power cable to the minus pole of the third battery module and insert the negative plug.

9 – Screw on each plug securely with 4x Torx 20 screws crosswise to 0.5 Nm.

10 – Repeat steps 4 and 5 for the remaining modules in the left side of the cabinet.



6a Long positive power cable (+ +):

6b Plus pole of SRC4310 controller

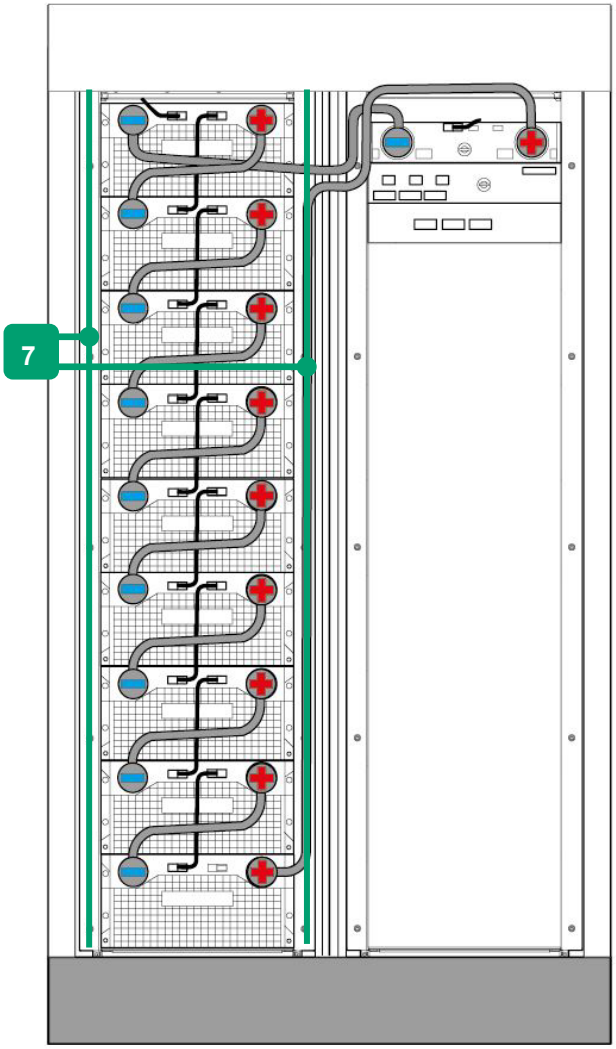
6c Plus pole of bottom battery module

11 – Connect the preinstalled positive power cable (+ +) at the SRC4310 controller to the plus pole of the bottom battery module and screw on the plug securely with 4 Torx 20 screws.

12 – Secure the installed positive power cable at 4 points using the 4 cable clamps from the installation kit.

FIGURE 61: ATTACHING THE POWER CABLE - 6

7.4.5 Attaching the cable guide rails



7 Attach cable routing guide rails

1 – Attach the cable guide rails again and screw them on using the screws that were previously removed.

FIGURE 62: ATTACHING CABLE GUIDE RAILS

8 Commissioning

NOTE

Observe qualifications.

- Commissioning must be performed only by qualified electricians!
- Commissioning is performed by the ADS-TEC service team or a person/company authorised.

Unless otherwise indicated, the commissioning procedure applies to both GSS variants (DVK-GSS0813 010-AE with master system setup and DVK-GSS0813 020-AE with EMS functionality).

8.1 Installing and configuring SIM cards

SIM cards and smart cards (SC) in the ID-000 format as defined in ISO 7816 (25x15 mm) can be used.

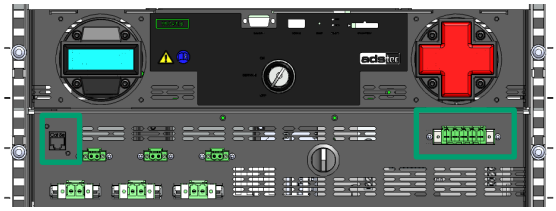


FIGURE 63: DISCONNECTING THE CABLES ON THE SRS CONTROLLER BOX

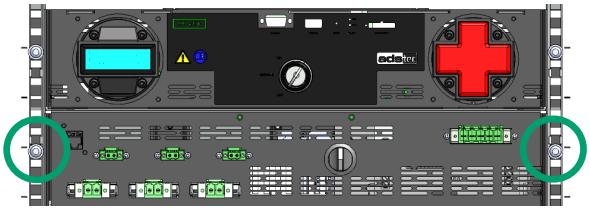


FIGURE 64: DETACHING THE SRS CONTROLLER BOX

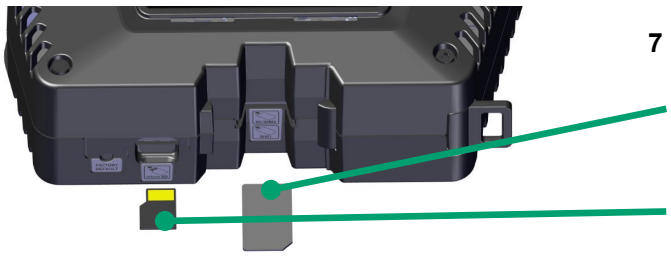


FIGURE 65: INSERTING THE SIM CARDS

1. Check that the SRC4 key switch is set to the "OFF" position.
2. Check that the main switch is set to the "OFF" position.
3. Disconnect the Ethernet cable at plug -XF267 and the cable -W161 at plug -X1.
4. Detach the controller box by undoing and removing 2x Torx 30 screws.
5. Pull the controller box halfway forwards so that the EMM3821 is accessible.
6. Carefully remove the EMM3821 (-U264) from the top-hat rail.
7. Insert the SIM cards.

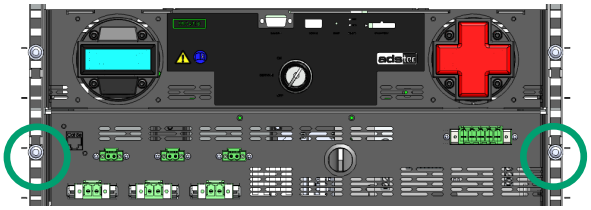


FIGURE 66: ATTACHING THE SRS CONTROLLER BOX

8 Reattach the EMM3821 to the top-hat rail.

9 Reattach the controller box.

10 Secure the controller box using 2x Torx 30.

11 As described in the electrical diagram, connect the Ethernet cable and cable -W161 to the controller box at plug -X263 and plug -X1 respectively.

8.2 System start

NOTE:
System start: Please make sure that an initial check has been performed according to VDE0100-600 at the location and the system is approved. Attach the protocol to the commissioning protocol.

FIGURE 67: MAIN SWITCH "OFF"

1 Make sure that the main switch is set to "OFF".

FIGURE 68: SRC4 KEY SWITCH "OFF"

2 Set the SRC4 key switch to "ON".

3 Connect the external power supply.

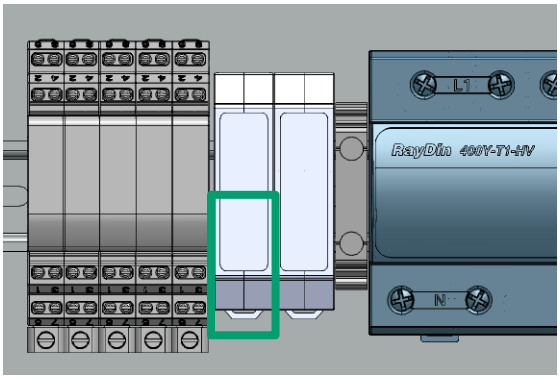
NOTE: Observe the clockwise rotating field.

FIGURE 69: MAIN SWITCH "ON"

4 Switch on the main switch by turning the lever by 90°.

Note: The indicator lamps on the controller box and the inverters light up.

8.3 Information about commissioning the system



1 Access takes place via the customer web interface.

2 Connect the Ethernet cable to the LAN connection -FU401.

3 To access the system, follow the procedure from chapter 3.2 in the EMS attachment (➲ *Machine interface_EMS_for SRS_GSS*).

FIGURE 70: LAN CONNECTION -FU401

NOTE

Setting recommendation

➡ Adjust the settings only when connected to the grid.
➡ Do not adjust any settings in the event of a black start.

8.4 Network settings

Refer to chapter 3.2 in the EMS attachment (➲ *Machine interface_EMS_for SRS_GSS*).

Enter the IP address in the web browser to bring up the login screen:

The IP address must be in the same network as the storage system.

- Open the browser.
- Check which IP address has been assigned to the storage system.
  The ADS-TEC "detection tool" lists the IP addresses of all ADS-TEC systems.
  Link to download centre with detection tool: Industrial IT - Software - ads-tec (ads-tec-iit.com).
- Enter the IP address in the browser line. The login screen appears.
- Enter the user name and password.
  User name: guest
  Password: no password

FIGURE 71: LOGIN SCREEN

From the menu, select the "System settings" tab -> "Network". Now, you see the overview of the currently configured network settings.

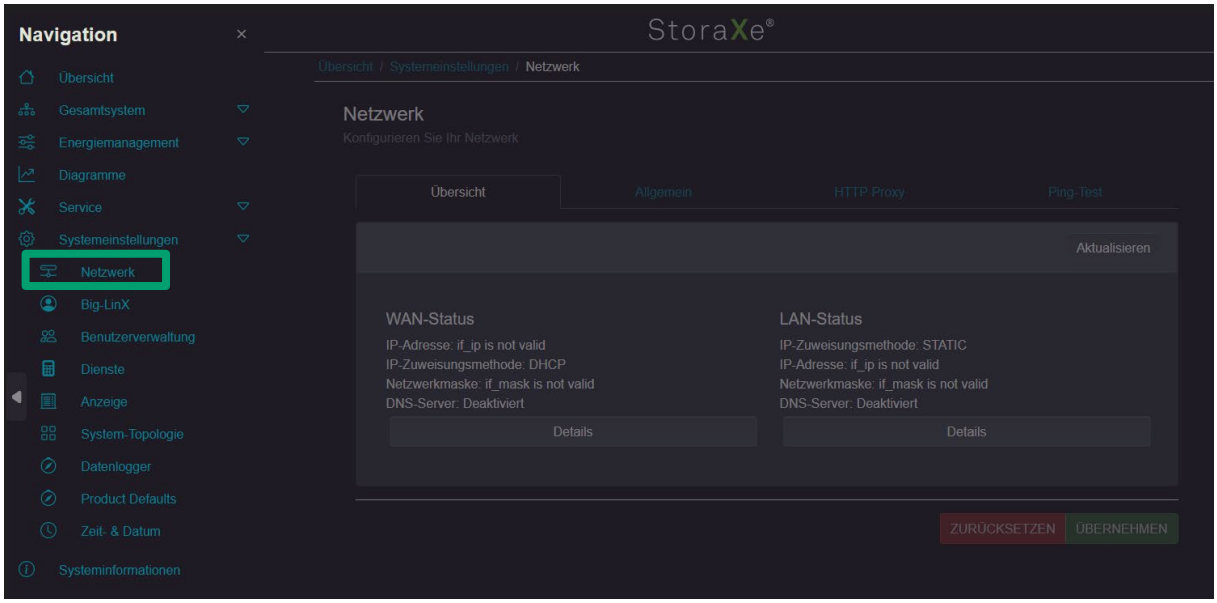


FIGURE 72: NETWORK SETTINGS - OVERVIEW

From the "Network" menu, select the "General" tab. Here, you can adjust the network settings of the GSS0813 in the "WAN settings" area.

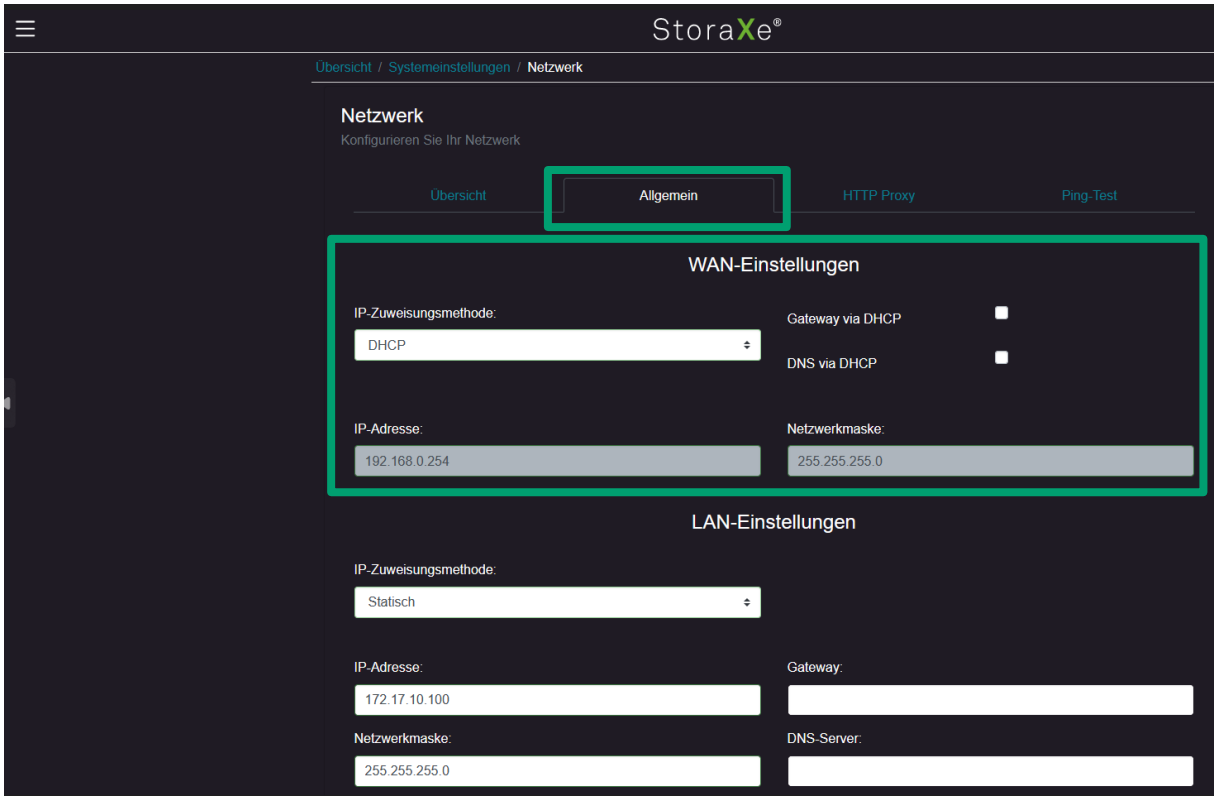


FIGURE 73: ENTERING NETWORK SETTINGS

8.5 Configuring customer signals 1/2/3

The three optional customer signals can also be configured via the HMI. To do so, select "Signal rules" under the "Energy management" tab. Here, the existing signal rules are displayed and there is the option to filter them.

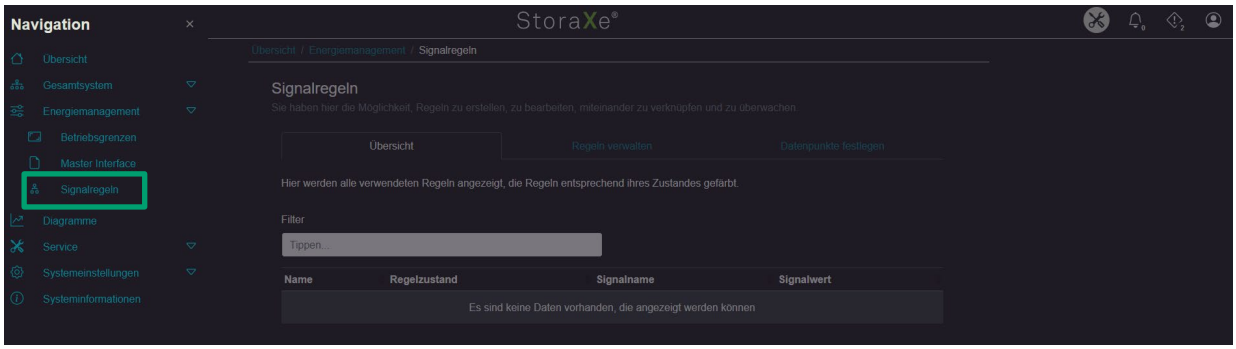


FIGURE 74: SETTING THE SIGNAL RULES

Under the "Manage rules" tab, new rules can be created or existing rules can be adjusted.

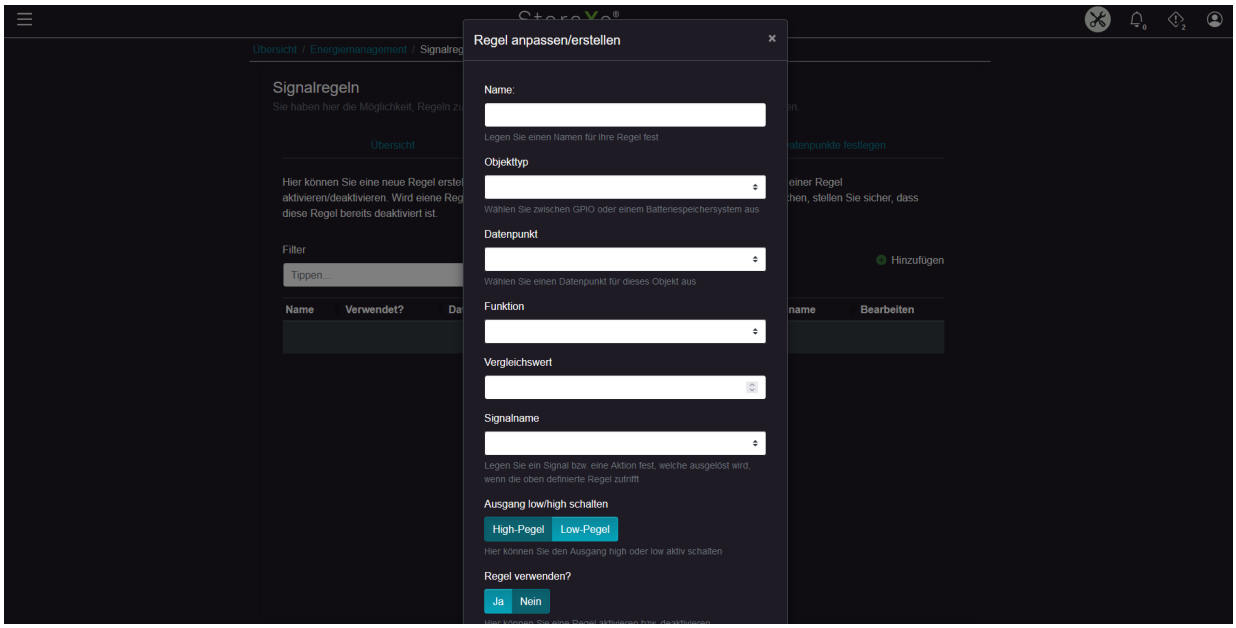


FIGURE 75: ADJUSTING/CREATING RULES

Next, save the new rule or deactivate an existing rule.

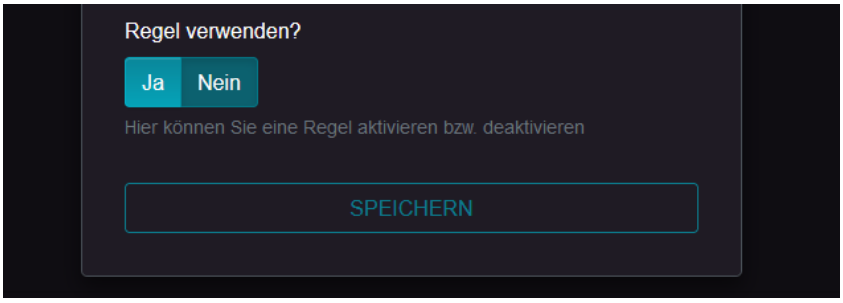


FIGURE 76: SAVING OR DEACTIVATING A RULE

Example configuration of a customer signal

In the following example, a signal rule has been defined for customer signal 1. In this specific example, the signal status of customer signal 1 would change from "low" to "high" if the state of charge (SOC) of the GSS0813 dropped below 20%.

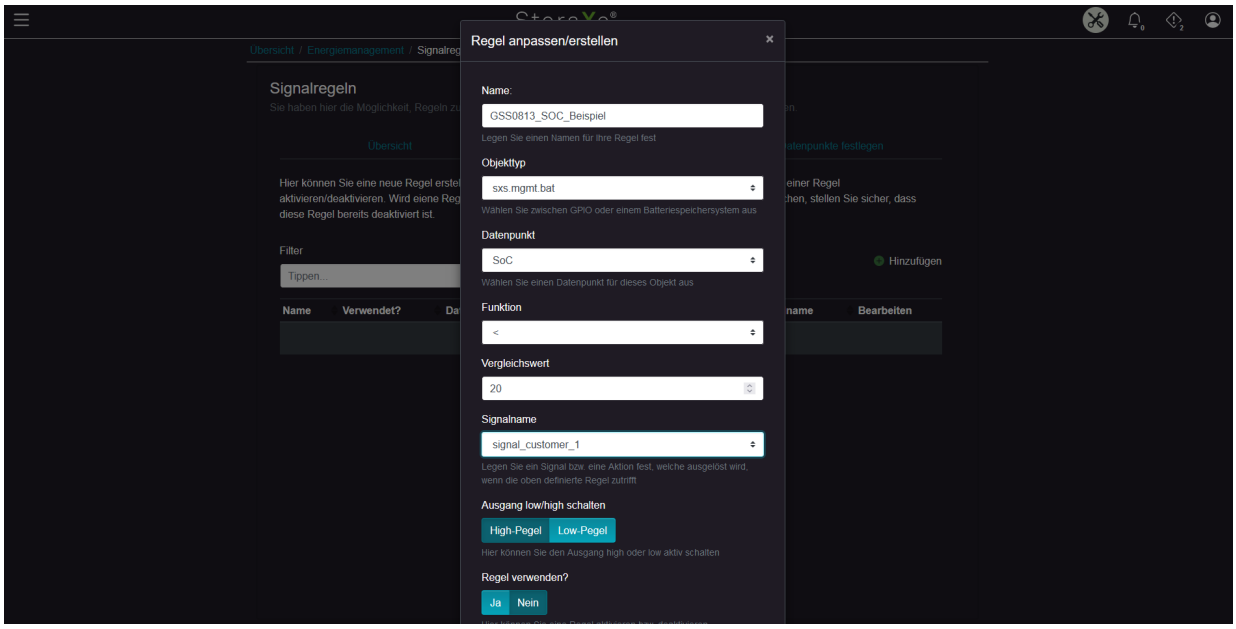


FIGURE 77: EXAMPLE CONFIGURATION OF A CUSTOMER SIGNAL

8.6 Other settings

For other individual settings, use the EMS attachment (➲ *Machine interface_EMS_for SRS_GSS*).

8.7 Configuring the SIM cards

To configure the SIM card, please contact ADS-TEC support (➲ *13.1 ADS-TEC support*).

8.8 Configuring the firmware

To configure the firmware, please contact ADS-TEC support (➲ *13.1 ADS-TEC support*).

8.9 "Black start functionality" feature

The GSS0813 offers a "black start functionality" so that the system can be started even without an AC grid connection or in isolated operation if an AC grid is not available. In the event of a black start, the internal auxiliary supply is provided via a 4-Ah lead-gel battery installed in the device. This battery is recharged when the AC grid is available or when the isolated grid is established.

NOTE

Limited number of black start attempts

The number of black start attempts is limited by the amount of energy in the lead-gel battery.

- ➡ Do not use the black start functionality until all electrical connection work is complete.
- ➡ Do not use the black start functionality until the external control or external components are able to communicate with the GSS0813 and put the system into island mode.

Adhere to the following sequence when performing a system "black start":

8.9.1 Preparations

Requirements for black start functionality:

- All electrical connections are connected.
- A check has been performed successfully according to VDE0100-600 and the system is approved.
- The external connection adheres to the diagram of recommended wiring for the backup power functionality (➲ attachment: *Electrical diagram SD_isolated_operation_GS_protection*).
- Signals are being exchanged with the GSS0813.
- The external components (e.g. GS protection, voltage and frequency converter etc.) are parameterised correctly.
- The external control is able to establish a connection to the system and send control commands (if operating via master interface).
- The externally installed smart meters are fully configured and are able to communicate with the GSS0813 (if operating via EMS functionality).

8.9.2 Performing a black start

FIGURE 78: SRC4 KEY SWITCH "ON"

1 Open the right door of the system.

2 Check that the key switch of the SRC4310 is set to the "ON" position. If not, set the key switch to the "ON" position.

FIGURE 79: FRONT SWITCH ON THE CONTROLLER BOX

3 Turn the front switch on the SRS controller box -S208 to the right, then back into its original position.

4 After actuating the switch, the internal 24-VDC supply is started for 3 minutes.

5 Close the right door of the system.

NOTE: When the door is open, it is not possible to establish an isolated grid.

8.9.2.1 Starting a black start with the master interface

Start the system using the external customer control via the ModbusTCP interface (➲ attachment: *Master-Interface_eng*).

Using the command **SysStReq=2=auto** or **SysStReq=3=islandmode**, the system establishes the isolated grid. If the system start is successful, the system switches into **SysState=3=islandmode**.

8.9.2.2 Starting a black start with EMS functionality

With EMS functionality in the GSS0813, the system starts island mode automatically. For this to happen, the emergency power reserve app must be activated in the web interface and the inputs must be connected correctly according to the diagram of recommended wiring (➲ attachment: *SD_isolated_operation_GS_protection*).

9 Operation

9.1 Operating mode: Master protocol

(DVK-GSS0813 010-AE with master system setup):

NOTE

Observe documentation.

➡ For details on the Master communication interface, please see the description attachment "*Master-Interface_eng*".

If the ADS-TEC storage system as a complete unit with inverter is controlled by means of an external energy management system provided by the customer, then the storage system is controlled via the ADS-TEC master protocol, which uses Modbus/TCP.

In this case, the task of the external energy management system is to control the storage system and while doing so to monitor the condition of the battery strings and inverter and to define the energy flows.

The interface enables operating data and permissible operating parameters to be queried according to customer specifications.

For this purpose, ADS-TEC provides the corresponding Modbus/TCP protocol description.

The EMM3821 supplies additional data for information purposes or for fault diagnosis.

Configuration:

The control parameters are specified by the customer.

9.2 Operating mode: ADS-TEC EMS

(DVK-GSS0813 020-AE with EMS functionality):

NOTE

Observe documentation.

➡ For details on the EMS communication interface, see the description "*Machine interface_EMS_for SRS_GSS*".

The control is automated via the local ADS-TEC EMS energy management system for

easy operation and control of the storage system.

Various standard apps are available for the respective applications described in greater detail below.

NOTE

Recommendation for use

➡ To be able to use the apps, it is necessary to connect smart meters (depending on the respective application type).

➡ For this purpose, please refer to the list of supported smart meter models (➲ attachment: *Smart meter connection and parameterisation of GSS SRS*).

9.2.1 Operation

The battery system is operated via the web browser.

With the energy management display in the browser, you can keep an eye on all operating parameters of the storage system from your PC, notebook, smartphone or tablet. The display provides information on the usage behaviour of the storage system and presents it in graphical form. All settings for the energy management system of the battery storage system can be carried out conveniently via this display.

9.2.2 Optimisation of personal consumption

Excess energy from power generators that cannot be used is stored in the battery storage system. This stored energy can then be discharged to the loads at a later time, e.g., at night or during inclement weather. As a result, power does not need to be supplied from the public grid or the amount of power that is supplied is significantly reduced.

9.2.3 Peak-load capping

Peak-load capping is targeted explicitly at end customers who wish to operate the battery storage system in situations where the electricity rates have a connection and service price. Here, the battery storage system is used to cap peaks in the energy drawn from the public grid.
The storage system is used so as to keep the effective power drawn from the public grid below the average value within the 15-minute billing interval.

If the system detects that the requirement cannot be met, the "PeakLoadMgr" signal is set.

Configuration

Peak-load capping: Maximum power drawn from the public grid that should not exceed the 15-minute average.

Peak load power: Definition of the maximum load power.

9.2.4 Backup power mode (isolated grid)

If a fault occurs in the public grid (grid frequency, voltage) or in the event of a complete power failure, the battery storage system switches to backup power mode. Backup power mode requires GS protection (must be provided by the customer). The GS protection then handles the separation from the public power supply network. After a short time, an isolated grid is established and the backup power function sets the signal with the "BackupSupply" role. All consumers connected according to the connection scenario and the available power of the storage system now continue to be supplied via the battery storage system.

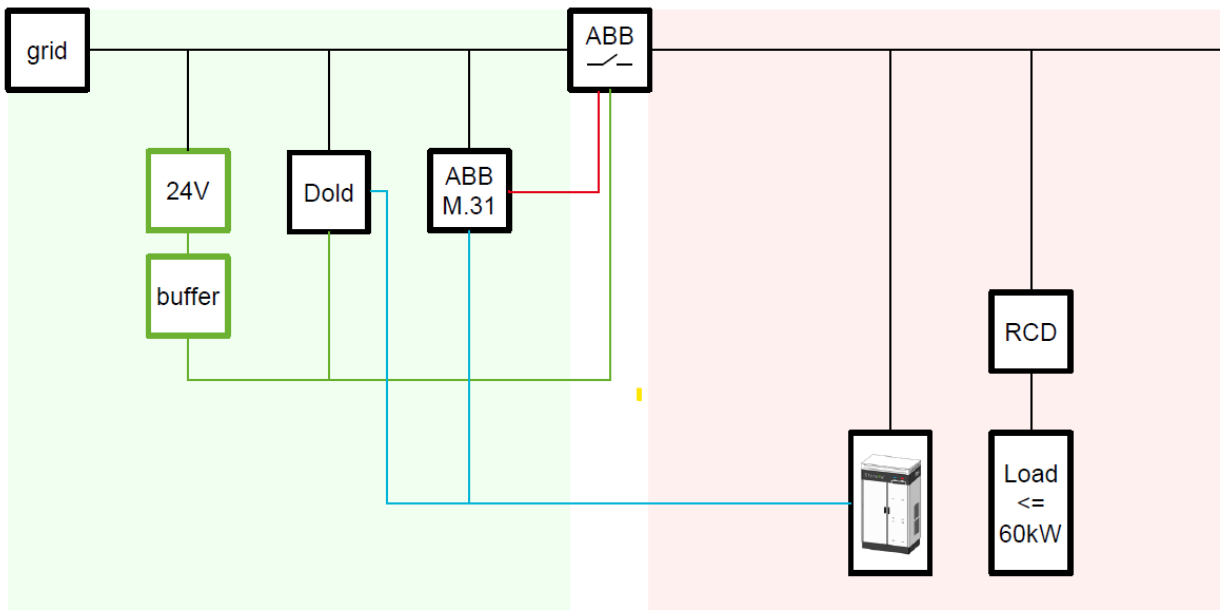
In the event of power recovery, the system switches out of grid-connected mode. Make sure that the transitions in the event of power failure and power recovery are not without interruption. The transition from grid-connected mode to island mode requires a power failure of approx. 30 s. The transition from island mode to grid-connected mode requires a power failure of approx. 80 s (60 s of this results from the response delay of the upstream GS protection).

NOTE

Recommendation for use

- ➡ The battery storage system does not have any UPS function. Do not connect any critical loads, such as servers or medical equipment, to the battery storage system.
- ➡ In backup power mode, observe the wiring recommendations in the isolated grid attachment (➲ attachment: *Wiring recommendations*).
- ➡ In backup power mode, refer to the supplementary GS protection electrical diagram in the isolated grid attachment (➲ attachment: *SD_isolated_operation_GS_protection*).

Typical single line diagram of the isolated grid:



9.3 Grid-connected mode with multiple devices (multi-master)

If multiple devices are operated together in a group, multi-master mode is required. If multiple storage systems are used, a controller is used for higher-level control. For customer-specific settings and device controls, it is necessary to have commissioning performed by the ADS-TEC service team (➲ *13.1 ADS-TEC support*). Use of GS protection ensures disconnection from the public power supply network and must be provided by the customer.

For additional information on grid-connected mode, see the appendix (➲ *14.1 Grid-connected mode (scaling of multiple systems in a group)*).

10 Switching off the system

10.1 Switching off the system before performing maintenance or decommissioning

NOTE

Observe qualifications.

- Maintenance and service work as well as decommissioning must be performed only by qualified electricians.
- Only work with insulated tools and remove body jewellery to avoid short circuits and electrical shock.
- Never work on the system on your own.

DANGER

Risk of death due to electric shock!

The AC supply must be switched off before any work is performed on the system, otherwise a potentially fatal electric shock can occur.

Open cable ends can cause an electric shock with fatal consequences when touched under existing mains voltage.

- Comply with national and international safety rules and regulations according to IEC 60364-6 (DIN VDE 0105-100) for working on electrical systems.
- Wear the appropriate protective clothes
- Before starting work, make sure that the AC supply of the supply lines to the system is switched off and secured to prevent it from being switched on again inadvertently.
- Make sure that the main switch is set to the **OFF** position.
- Set the SRC4 key switch to the **OFF** position.
- Observe a waiting period of at least 5 minutes to reliably exclude residual voltages.
- Check that the system is de-energised.
- Before making any changes to the interior, check that the fan has stopped.

DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

- Do not come into contact with the + and – poles of the battery modules under any circumstances.
- Wear insulating gloves.
- Attach the transport cover immediately after disconnecting the power connection.
- Note the information in the electrical diagram (➲ *Electrical diagram in manual GSS0813*).

Procedure:

1. Initialise the shut-down process via the controller software.
2. Switch off the backup fuses in the supply line of the storage system at the connection point and secure them against being accidentally switched on again, or remove the fuses.
3. Open the two system doors.

4. Turn the AC main switch to the OFF position.
5. Set the key switch on the SRC4310 to the OFF position. Remove the key to prevent it from being switched on again.
6. Wait at least 5 minutes until any residual voltage has been eliminated.
7. Observe the 5 safety rules and use a suitable testing device to ensure that no voltage is present.

Maintenance and repair work can now begin (➲ *11Maintenance).* For complete decommissioning or disassembly of the system, further disassembly steps are described below (➲ *10.2 Removing all power supply lines*).

10.2 Removing all power supply lines

The procedure described in the following for disassembling the storage system is to be observed under all circumstances. The modules are removed from the cabinet starting with the top module and working down.

The module label can be found imprinted on the front label of the module.

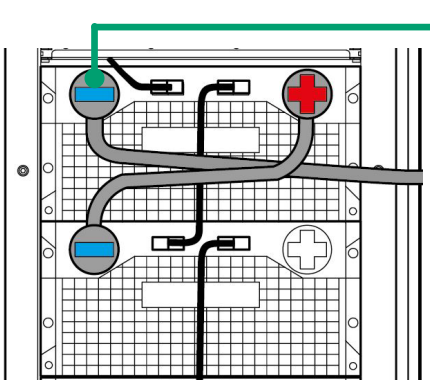
DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

- ➡ Do not come into contact with the + and – poles of the battery modules under any circumstances.
- ➡ Do not remove the transport cover until the respective installation step, shortly before connecting the power cable.
- ➡ Wear insulating gloves.
- ➡ Observe the information given in the electrical diagram (➲ attachment: *Electrical diagram*)

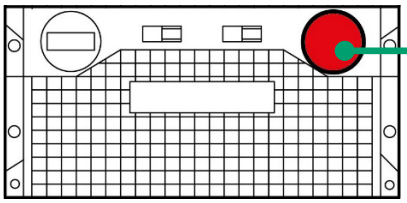


Power plug

1 – Undo the screws securing the DC power cabling (4 screws per connector).

2 – Disconnect all power cables in the cabinet.

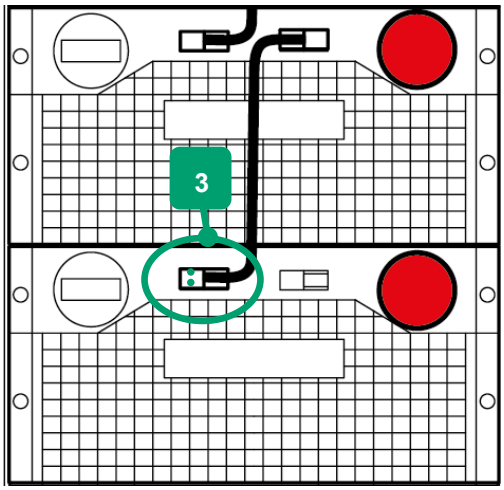
FIGURE 80: ATTACHING THE TRANSPORT COVER



2 Transport cover

3 – Attach the protective covers.

FIGURE 81: ATTACHING THE TRANSPORT COVER

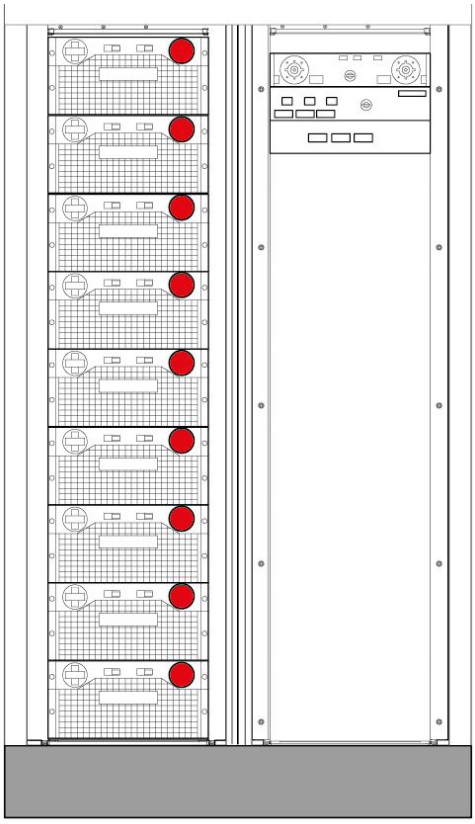


3 Communication cable

4 – Undo the screws of the communication cables.

5 – Disconnect all communication cables in the cabinet.

FIGURE 82: DISCONNECTING THE COMMUNICATION CABLES



Battery modules with detached power supply lines and attached transport covers

FIGURE 83: BATTERY MODULES WITH POWER SUPPLY LINES DETACHED

10.3 Disassembly of the overall system

WARNING

Risk of death from falling and tipping loads!

Falling and tipping loads can cause fatal injury.

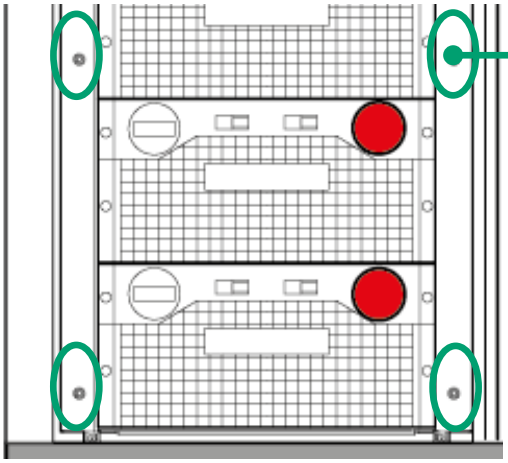
- ➡ The battery module is very heavy (approx. 80 kg) and must be removed by two people at a minimum.
- ➡ To lift loads, use only lifting equipment that is suitable for the task and in perfect working order. Lifting eyes are provided on the top of the modules.
- ➡ Make sure that no persons are located in the hazardous area underneath the suspended load.
- ➡ Due to their heavy weight, remove the battery modules from top to bottom.
- ➡ Wear the appropriate protective equipment.

WARNING

Risk of crushing and cuts from sharp edges!

Crush injuries and cuts can occur when removing the battery modules.

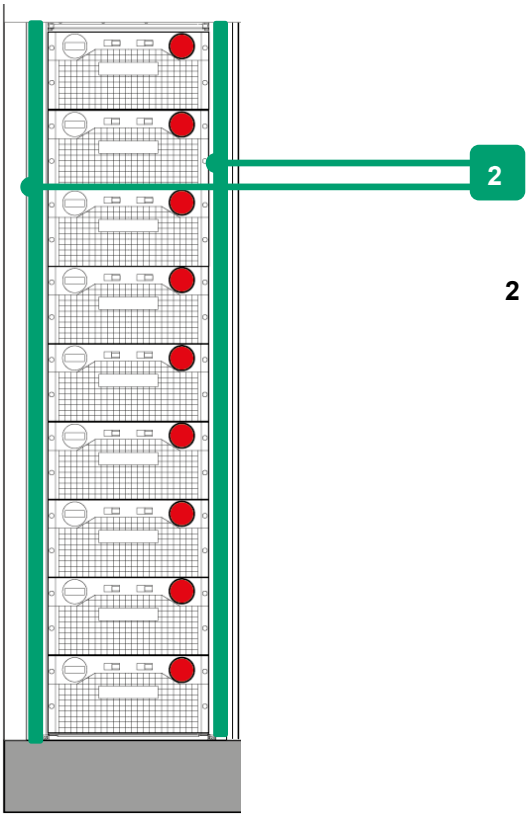
- ➡ Wear gloves.



Socket head cap screw M8x16 DIN 912

1 – Undo the socket head cap screws securing the cable guide rails

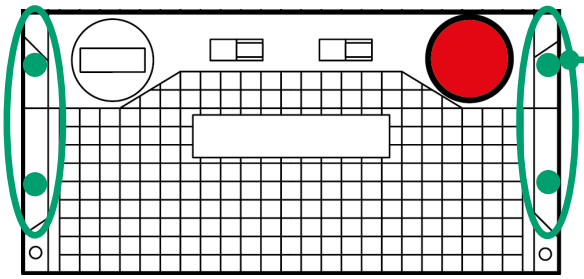
FIGURE 84: UNSCREWING THE CABLE GUIDE RAILS



Cable guide rails

2 – Detach the front cable guide rails.

FIGURE 85: DETACHING THE CABLE GUIDE RAILS



Socket head cap screw M6x16 DIN 912 (4 for each module)

3 – Remove the socket head cap screws securing the modules.

FIGURE 86: REMOVING THE BATTERY MODULE SCREWS

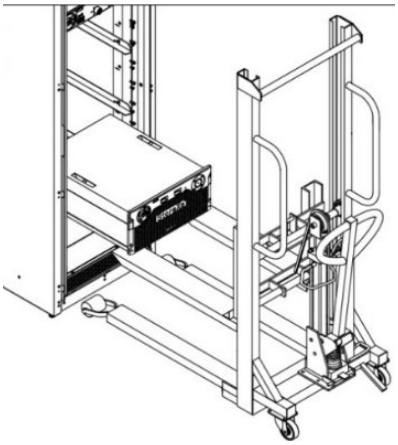


FIGURE 87: LIFTING OUT THE BATTERY MODULE

NOTE: Use lifting equipment to remove the battery modules.

4 – Pull out the top battery module. The module can be pulled halfway out of the cabinet without tipping.

5 – Lift the other modules out from top to bottom.

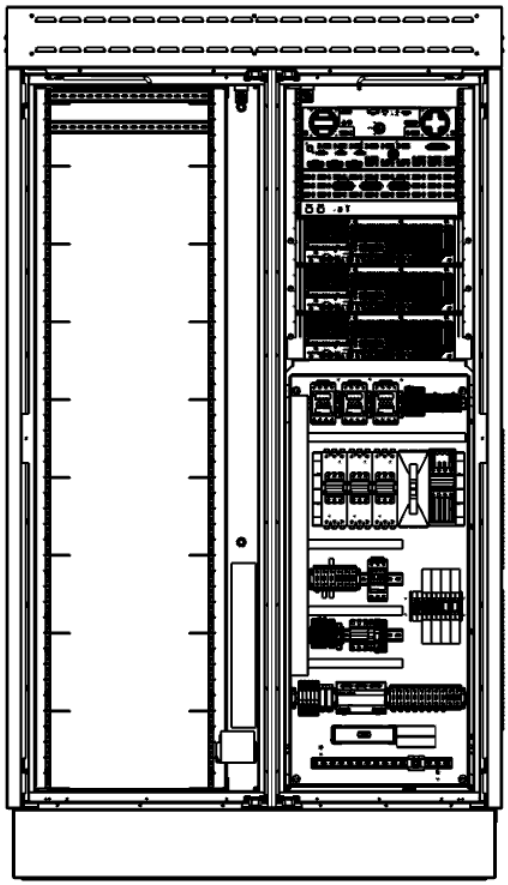


FIGURE 88: SYSTEM WITH BATTERY MODULES REMOVED

System with battery modules removed

11 Maintenance

For details on maintenance of the system, see the separate maintenance manual (➲ *GSS0813_maintenance_manual*).

12 Disposal

When lithium-ion batteries are transported for disposal, the relevant regulations applicable to the respective mode of transport must be observed. SV 377 applies (ADR, IMDG).
Special regulations apply to damaged/defective lithium batteries (➲ *2.5.2 Transportation of defective or damaged lithium-ion batteries*).

The battery packaging should be stored in case the battery needs to be returned or reused.

When disposing of the system, observe the disposal directive WEEE 2012/19/EU as well as the German Electrical and Electronic Equipment Act (ElektroG).

- The crossed-out wheeled bin symbol identifies materials that are not allowed to be disposed of with domestic waste. Collect these materials separately to ensure specific and safe recycling of the components.
- Return used electronic devices to the point of sale or take them to a disposal facility.
- Observe the regulations and supplementary information on the disposal of lithium-ion batteries.
- Dispose of the coolant in accordance with the specifications given in the safety data sheet for the coolant.
- Dispose of the remaining components in accordance with the legal requirements and guidelines applicable at the installation location.

13 Service & support

ADS-TEC and its partner companies provide you with comprehensive maintenance and support services, ensuring quick and competent assistance should you have any questions or queries with regard to ADS-TEC products and equipment.

13.1 ADS-TEC support

The ADS-TEC support team is available for inquiries from direct customers between

8:30am and 5:00pm, Monday to Friday. The support team can be reached via phone or e-mail:

Phone: +49 7022 2522-203

E-mail: support.est@ads-tec-energy.com

Alternatively, you can contact us by completing a support form on our website www.ads-tec-energy.com. Our Support team will then get in touch with you as soon as possible.

13.2 Company address

ads-tec Energy GmbH
Heinrich-Hertz-Str.1
72622 Nürtingen
Germany

Phone: +49 7022 2522-201
E-mail: energy@ads-tec-energy.com
Home: www.ads-tec-energy.com

13.3 Replacement parts

If you need to order replacement and wear parts for the system or you require detailed advice in this regard, contact the manufacturer. Have the serial number available.

14 Appendix

14.1 Grid-connected mode (scaling of multiple systems in a group)

GSS0813 outdoor storage systems are suitable for grid-connected operation in a group (scaling).

With GSS0813, up to 8 devices can be scaled.

If a system in grid-connected mode is planned, the software will need to be adapted. This is done by the ADS-TEC service team during commissioning.

Therefore please contact the ADS-TEC service team and order the commissioning appropriate for your system.

DV-SV-413037 Commissioning of GSS with 2-3 units as multistring

DV-SV-413039 Commissioning of GSS with 4-5 units as multistring

DV-SV-413041 Commissioning of GSS with 6-8 units as multistring

14.1.1 Network topology for grid-connected operation with multiple systems

Connection is via the customer interface.

System example:

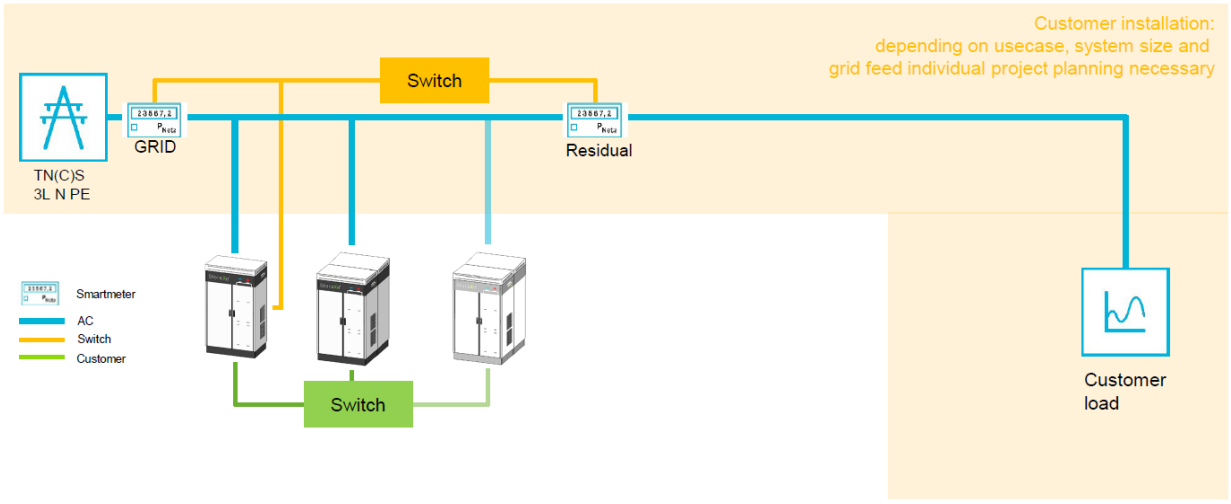


FIGURE 89: SYSTEM EXAMPLE OF POWERBOOSTER SCALING

14.1.2 Installing multiple systems in a group (scaling)

Scaling is possible up to 8 systems.

When planning the system layout, observe the required minimum clearance of the storage cabinet in order to prevent the obstruction of ventilation openings, door openings, etc.

Layout examples for 4 systems / 8 systems:

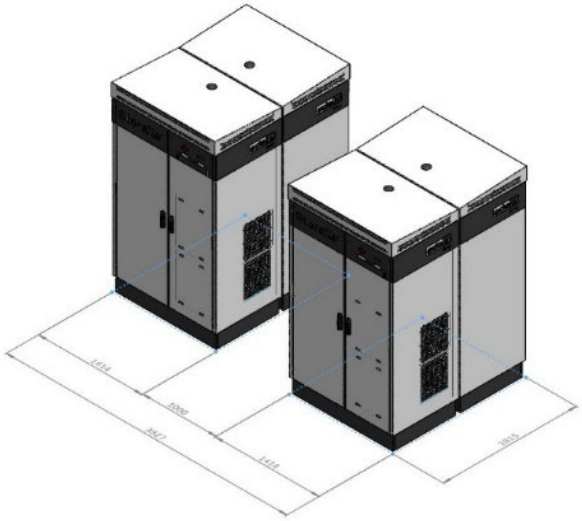


FIGURE 90: SCALING – 2X2 LAYOUT

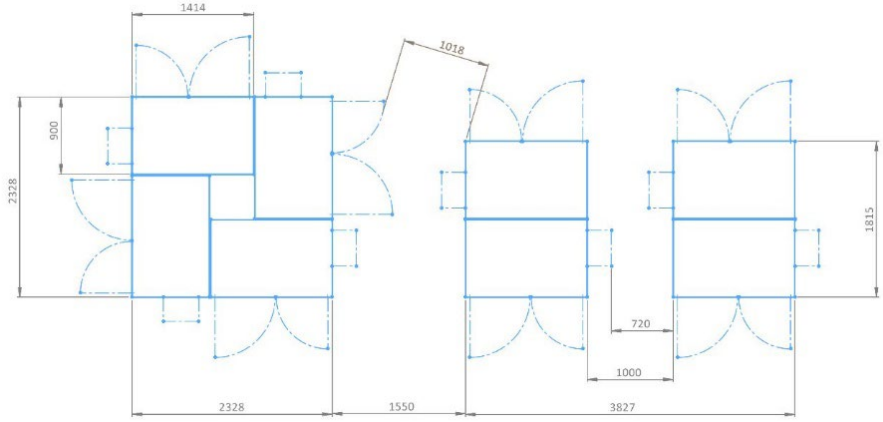


FIGURE 91: SCALING – 2X2 + 1X4 LAYOUT

Minimum clearance:

- Clearance from rear side to wall: no clearance required
- Clearance from sides (left + right) to wall or to other objects: min. 1 m
- Clearance from front side to other objects: 1.5 m (0.7 m for opened doors + 0.8 m for service activities).
- Take into consideration any additional clearance required for escape routes (min. 0.8 m).
- Note that ventilation openings must be kept clear.

14.1.3 AC supply lines and sub-distribution system

A multi-master system consisting of multiple GSS0813 systems requires an on-site switch for interconnecting the GSS0813 systems and smart meters.

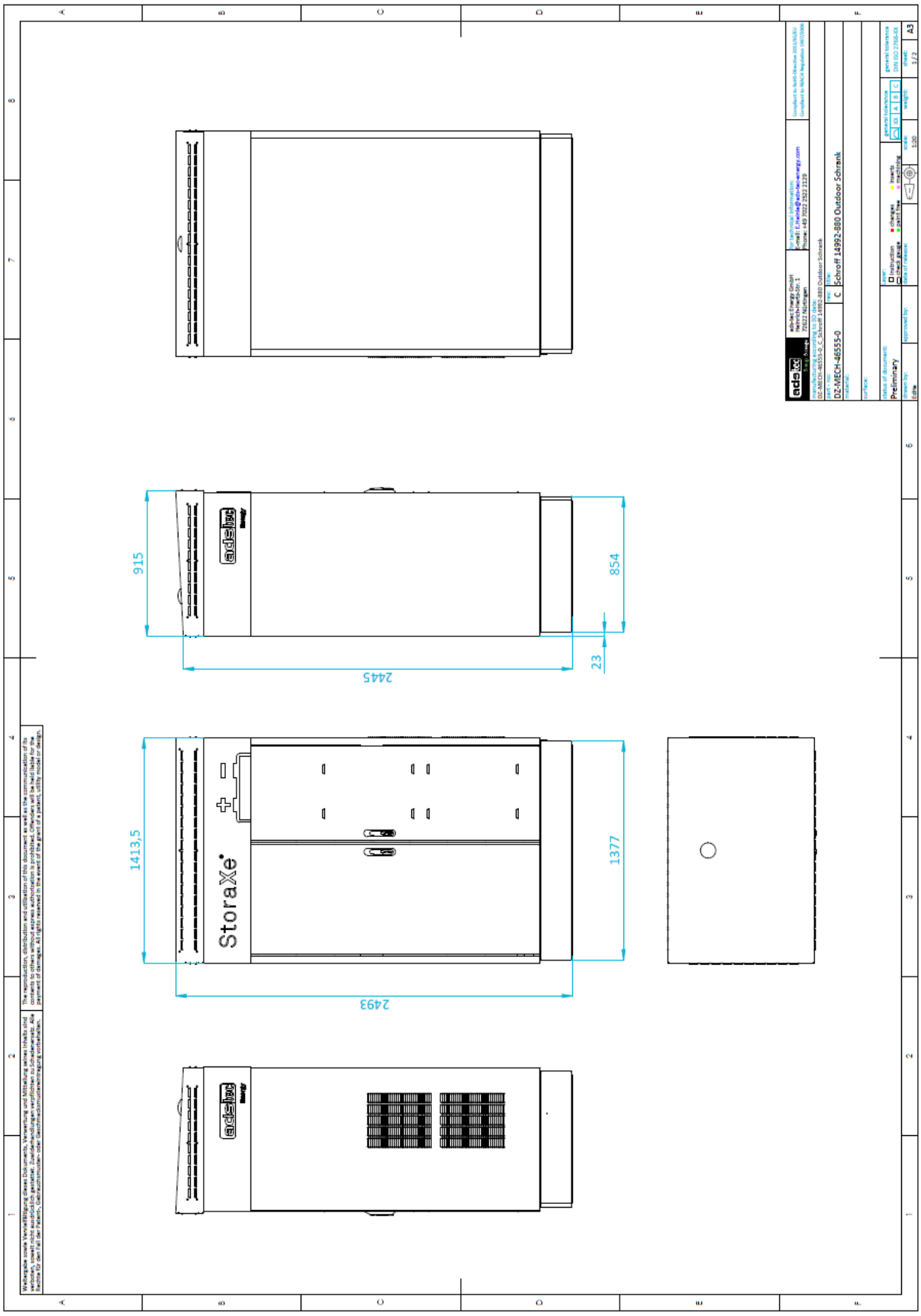
- An electrical diagram based on the electrical diagram of the individual system is required for the specific customer layout with multiple individual systems (to be provided by the customer).
- The merging of individual systems is customer-specific (to be provided by the customer).
- Connect each individual PowerBooster with its own fuse protection.

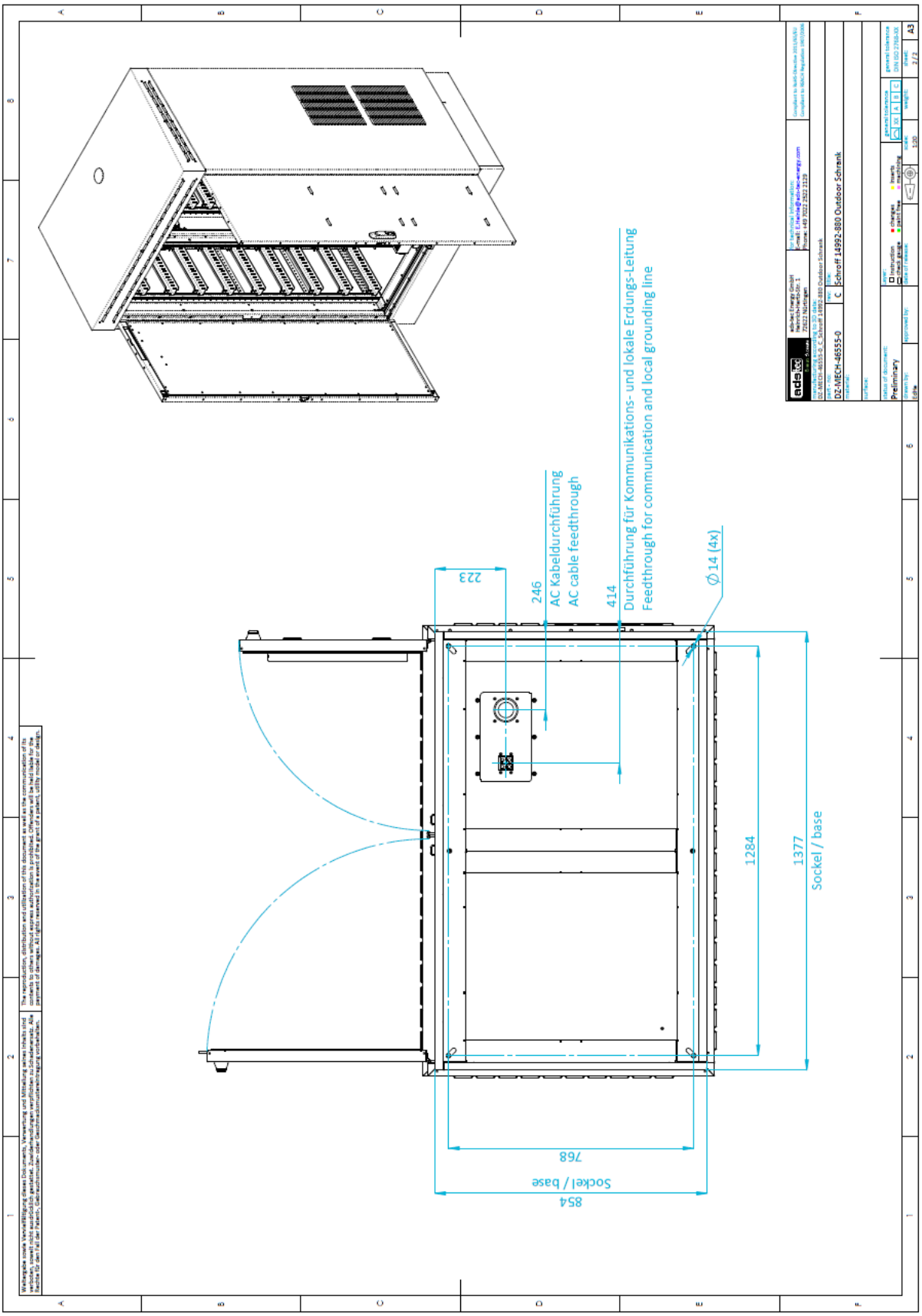
NOTE

Provide a sub-distribution system.

- ➡ When scaling multiple devices, note that the appropriate sub-distribution system must be provided by the operating company.
- ➡ The sub-distribution system must be planned only by an electrician.
- ➡ Here, factor in the electrical diagram as well as an appropriate backup fuse of 160 A.

14.2 Construction drawing




223
246
AC Kabeldurchführung
AC cable feedthrough
414
Durchführung für Kommunikations- und lokale Erdungs-Leitung
Feedthrough for communication and local grounding line
Ø14 (4x)
1284
1377
Sockel / base
768
Sockel / base
854
DE-MECH-46555-0
Preliminary

14.3 Status indicators EMM3821 (front LEDs)

Symbol	Behaviour	Description
PWR (power)		
	Permanently lit	- Ready for operation
	Flashing slowly	- Bootloader
	Flashing rapidly	- Firmware update
	Off	Device is not supplied with voltage.
STAT (status)		
	Permanently lit	- Error during the boot-up process
	Off	Device is not supplied with voltage.
VPN		
	Permanently lit	- VPN connection active
	Off	- No VPN connection active
WWAN		
	Permanently lit	Logged in, standby
	Flashing	Logged in, online
	Permanently lit	Logged in, offline
	Flashing rapidly	Firmware update of the radio module
	Flashing	Login declined
	Flashing slowly	Network search
	Off	No mobile radio connection active

14.4 List of tables

14.5 List of figures

14.6 Revision history

Date	Revision	Change	Creation	Release
06.04.2023	V1.1 Beta	Beta version as preliminary information for customer	Ruoss	
15.05.2023	V1.2 Beta	Adaptations to chap. SRS controller box, commissioning, operation, grid-connected mode, backup power mode, technical data, layout.	Ruoss	
07.06.2023	V1.3 Beta	Information about isolated grid operation added.	Ruoss	
28.06.2023	V1.4	Layout adjustments, chapt. 6 Brief description revised and signal lines added, chapt. 8 Commissioning added, chapt.14.2 and 14.3 added, chapt. 4 Operating instructions revised, chapt. 6.6 Safety instructions added.	Ruoss / Trautmann	Dr Anselm Berg
08.08.2023	V1.5	Chapt. 3.2 Technical data revised, chapt. 1.3 Applicable documents revised, layout adaptations.	Ruoss	

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Fax +49 7022 2522-406
E-mail support@ads-tec.de

Customer	
Street	
ZIP code / City	
Phone	
Fax	
E-mail	

Project name	EPE000060_GSS0813_0-Serie
Job number	EPE000060
Project description	Grid Service Station 0813
Commission	0-Serie, Köngen
Responsible for project	
Created on	2023
Project end	
Edit date	16.06.2023
by (short name)	
Number of pages	69

Manufacturer (company)	ads-tec Energy GmbH
Make	DVK-GSS0813 0-Serie
Input lead	min. 50mm² - max. 95mm²
Power supply	Absicherung/Prefuse 160A gG
Control voltage	24V DC
Control system	DVG-SRC1XXX
Degree of protection	GSS=IP55 SRS=IP20

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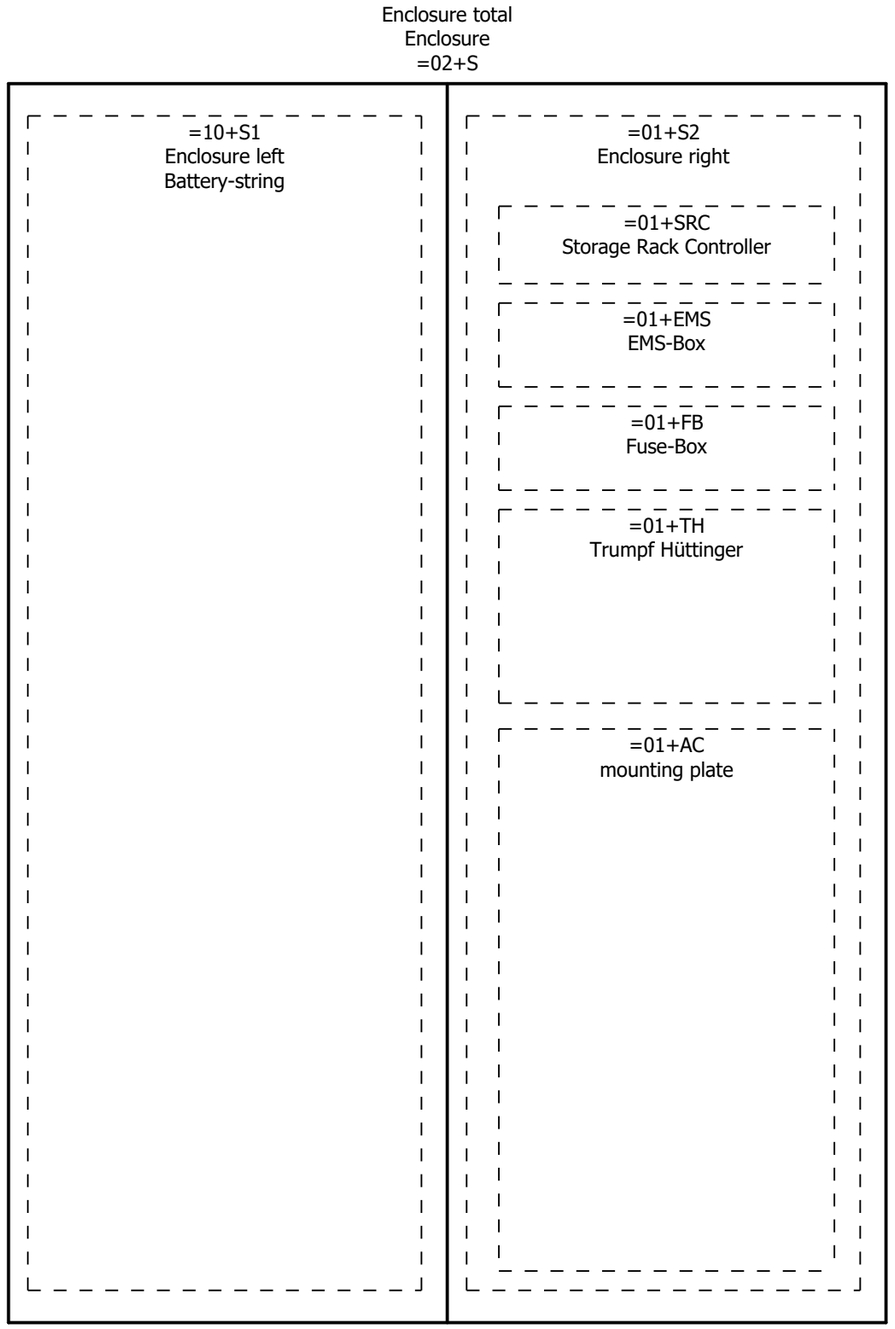
F06_001-b

			Date	16.06.2023	0-Serie, Köngen	ads-tec Energy GmbH	Table of contents : =BPC/1.d - =BPC/1.f		= 00	
			Ed	BnVr					+ A	
			Appr		Grid Service Station 0813					
Modification	Date	Name	Original		Replacement of	Replaced by		EPE000060	Page	2.b
									Page	4 / 69

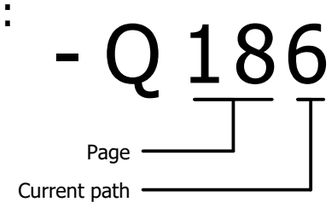


Structure identifier overview

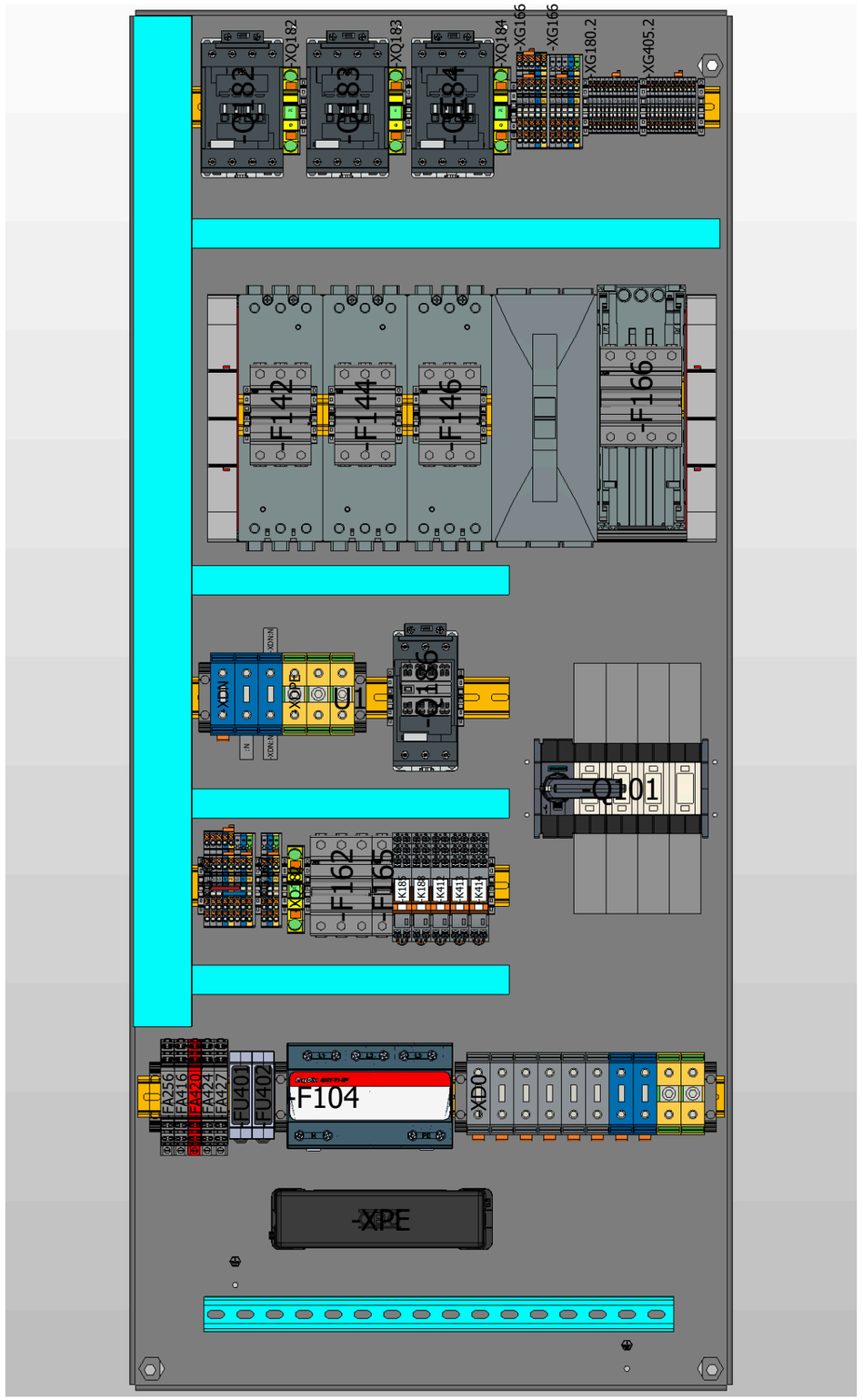
Full designation	Structure description
Function designation	
=00	General
=01	Electrical engineering schematic
=02	Enclosure
=10	Battery-string
=BPA	Summarized parts list
=BPC	Parts list
+S	Enclosure total
+S1	Enclosure left
+S2	Enclosure right
+AC	mounting plate
+EMS	EMS-Box
+TH	Trumpf Hüttinger
+SRC	Storage Rack Controller
+BS1	Battery string 1
+FB	Fuse-Box
+MEM	Antenna
+A	Cover sheet Table of contents

Equipment identification

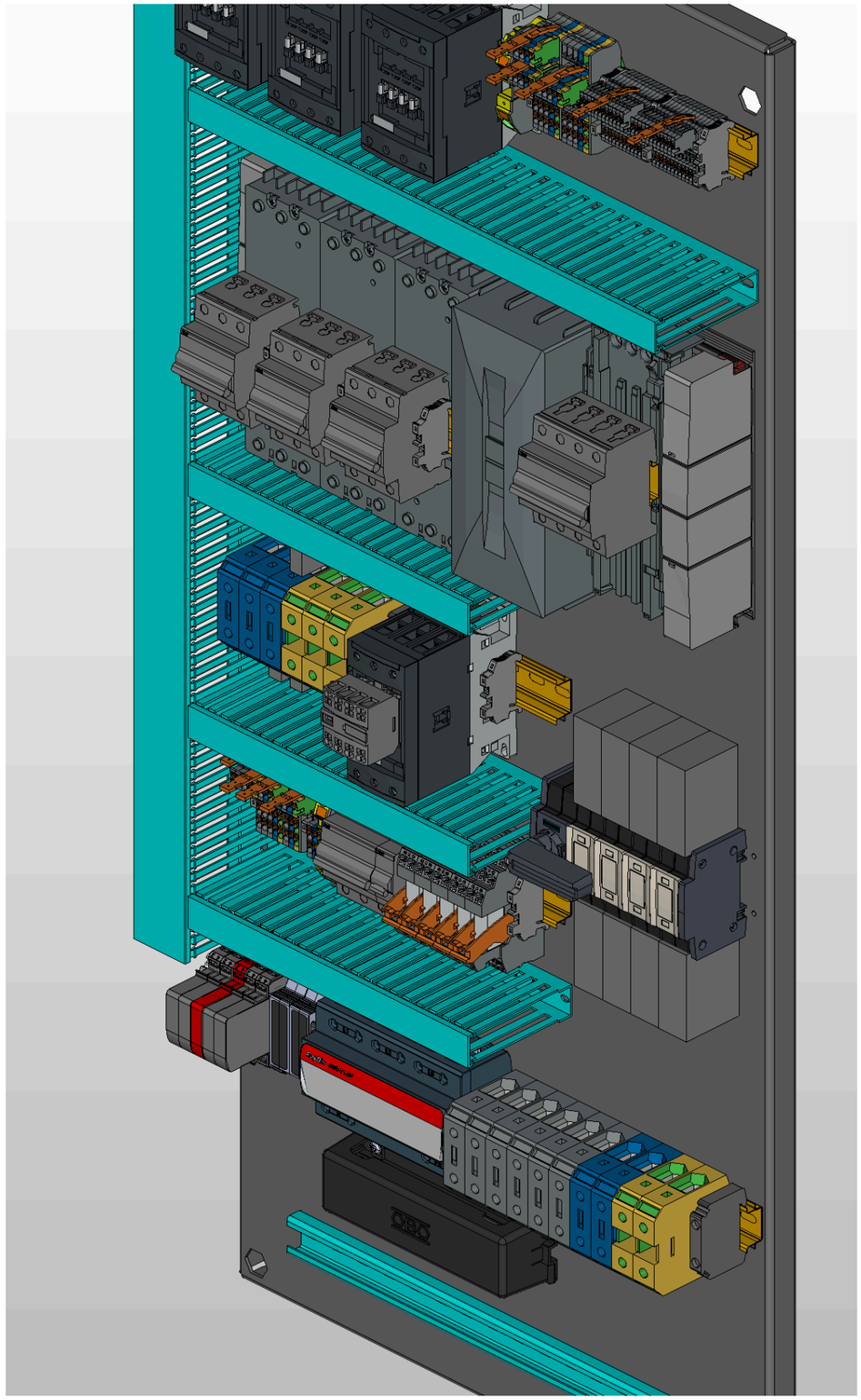
example:



			DATE	01.12.2021	0-Serie, Köngen		Location designation - datasheet	EPE000060	=00
			NAME	BnVr	Grid Service Station 0813				+A
			PLOT	16.06.2023					SH. 5
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		9 SHS



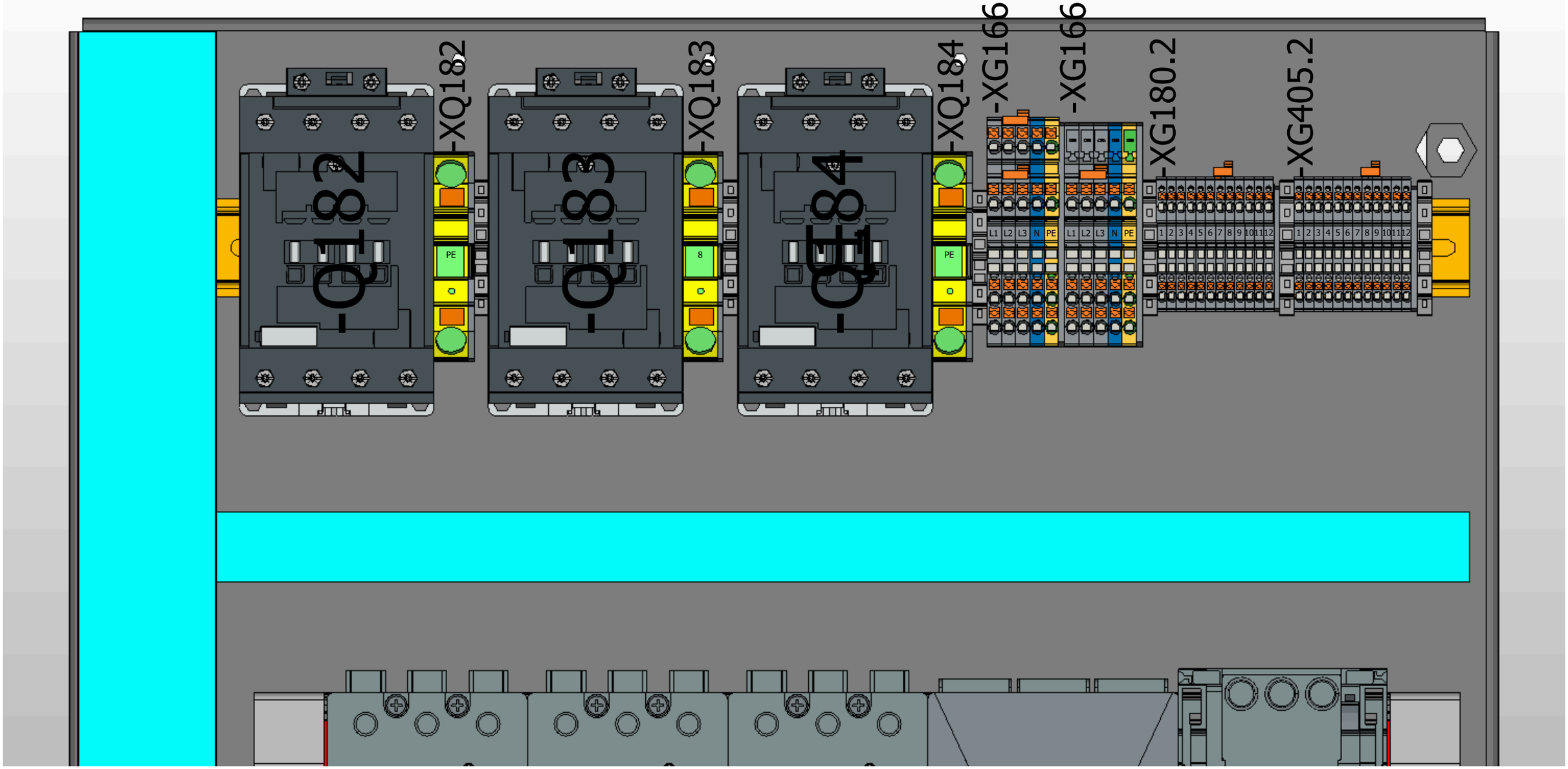
+AC



5

6.b

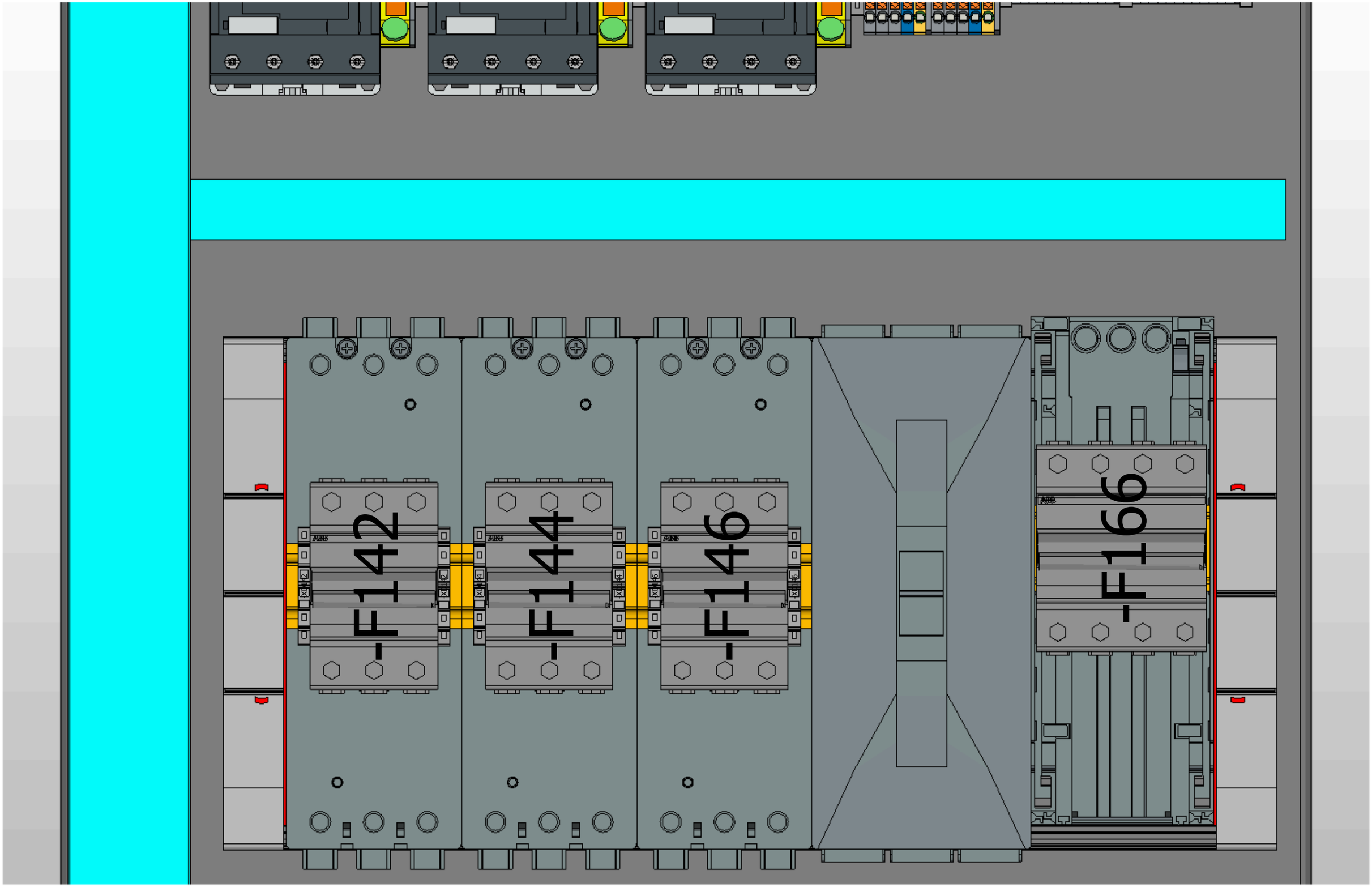
			DATE	01.12.2021	0-Serie, Köngen		Device overview	EPE000060	=00
			NAME	BnVr					+A
			PLOT	16.06.2023	Grid Service Station 0813				SH. 6.a
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		9 SHS



6.a

6.c

			DATE	01.12.2021	0-Serie, Köngen		Device overview	EPE000060	=00
			NAME	BnVr		adstec			+A
			PLOT	16.06.2023	Grid Service Station 0813				SH. 6.b
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG. / EST.WITH	EST.BY			9 SHS



6.b 6.d

			DATE	01.12.2021	0-Serie, Köngen	adstec	Device overview	EPE000060	=00
			NAME	BnVr					+A
			PLOT	16.06.2023	Grid Service Station 0813				SH. 6.c
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		9 SHS

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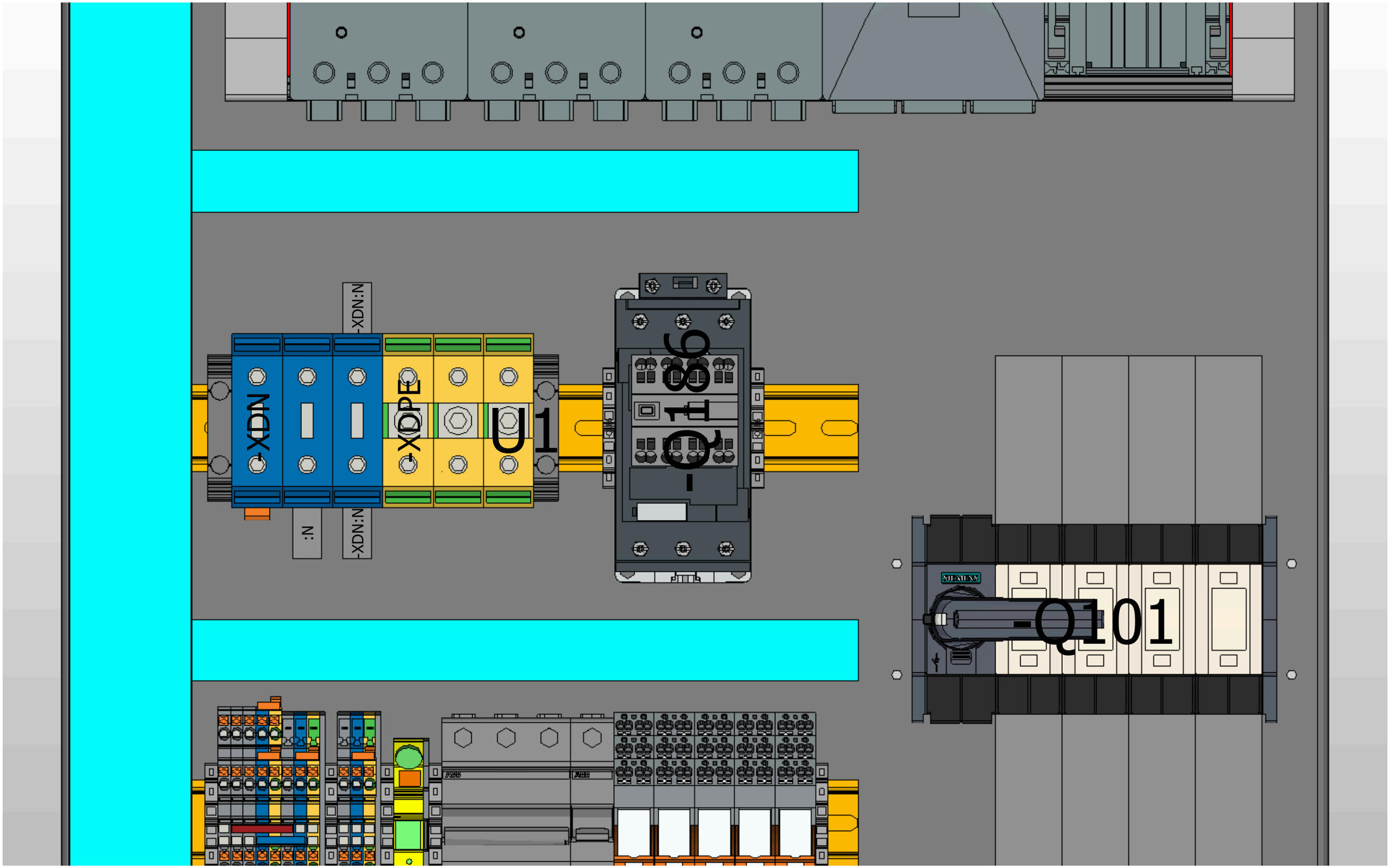

6.c

6.e

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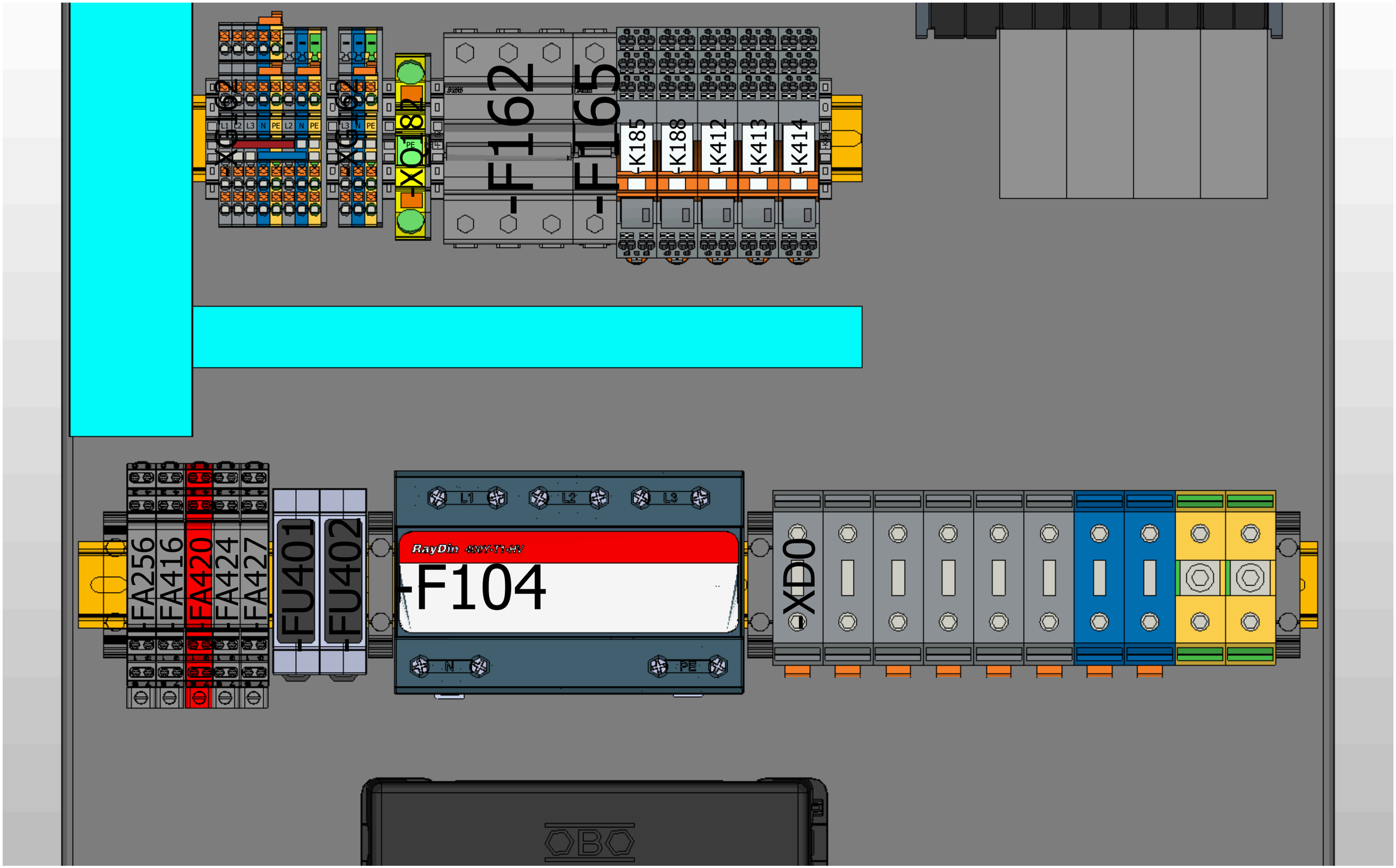
			PLOT	16.06.2023	Grid Service Station 0813				SH. 6.d
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		9 SHS



6.d 6.f

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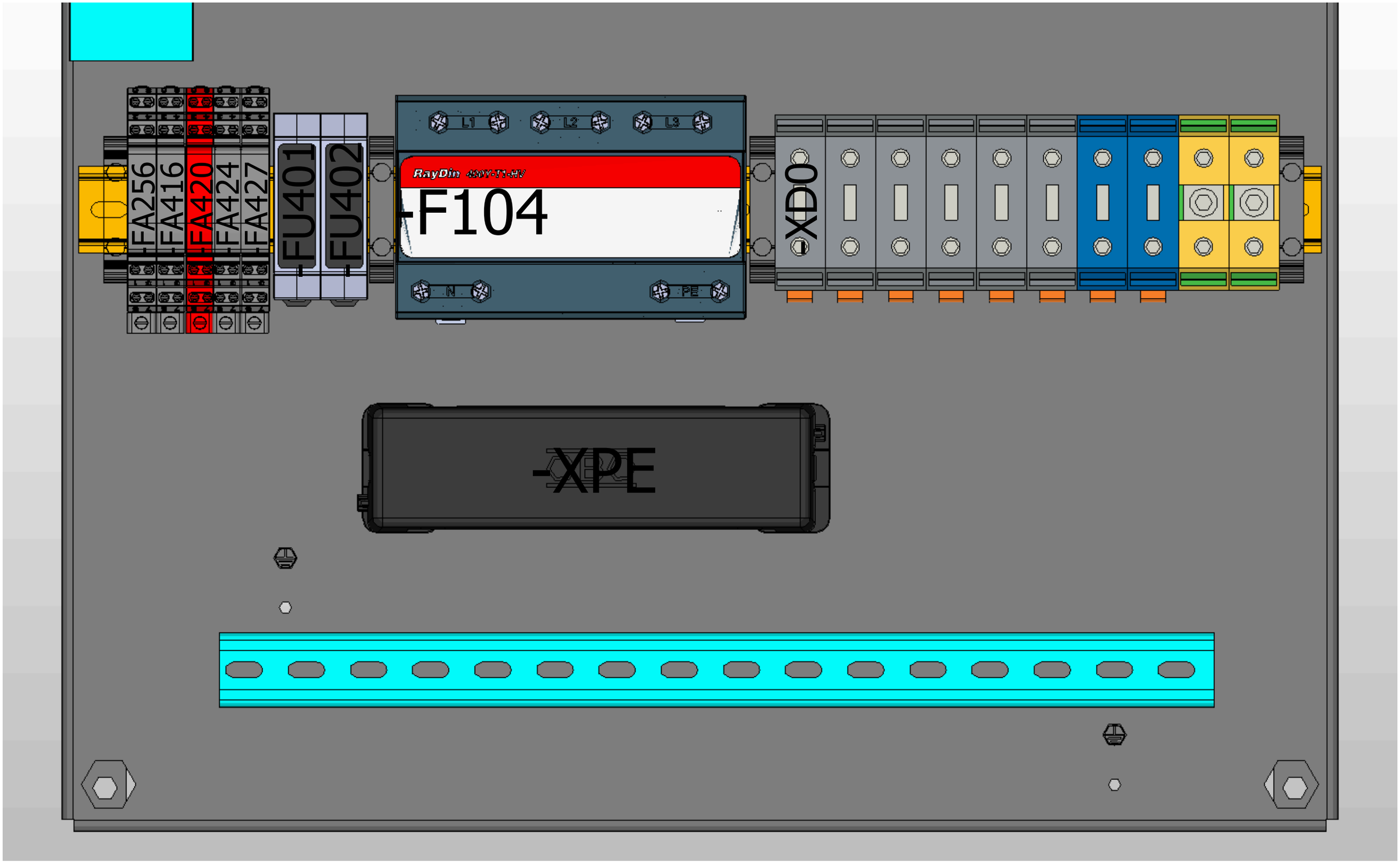
			PLOT	16.06.2023	Grid Service Station 0813				SH. 6.e
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		9 SHS



6.e 6.g

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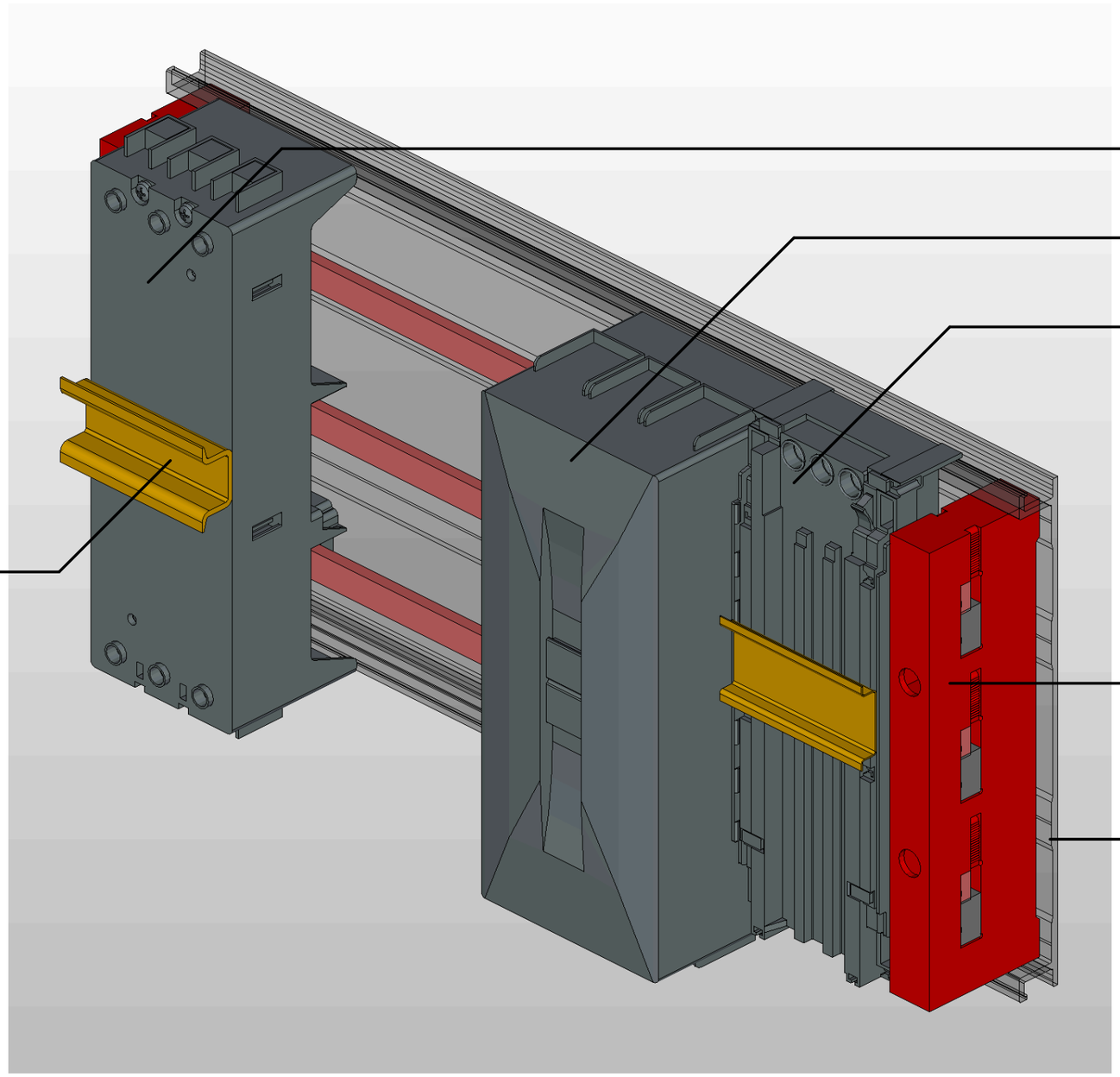
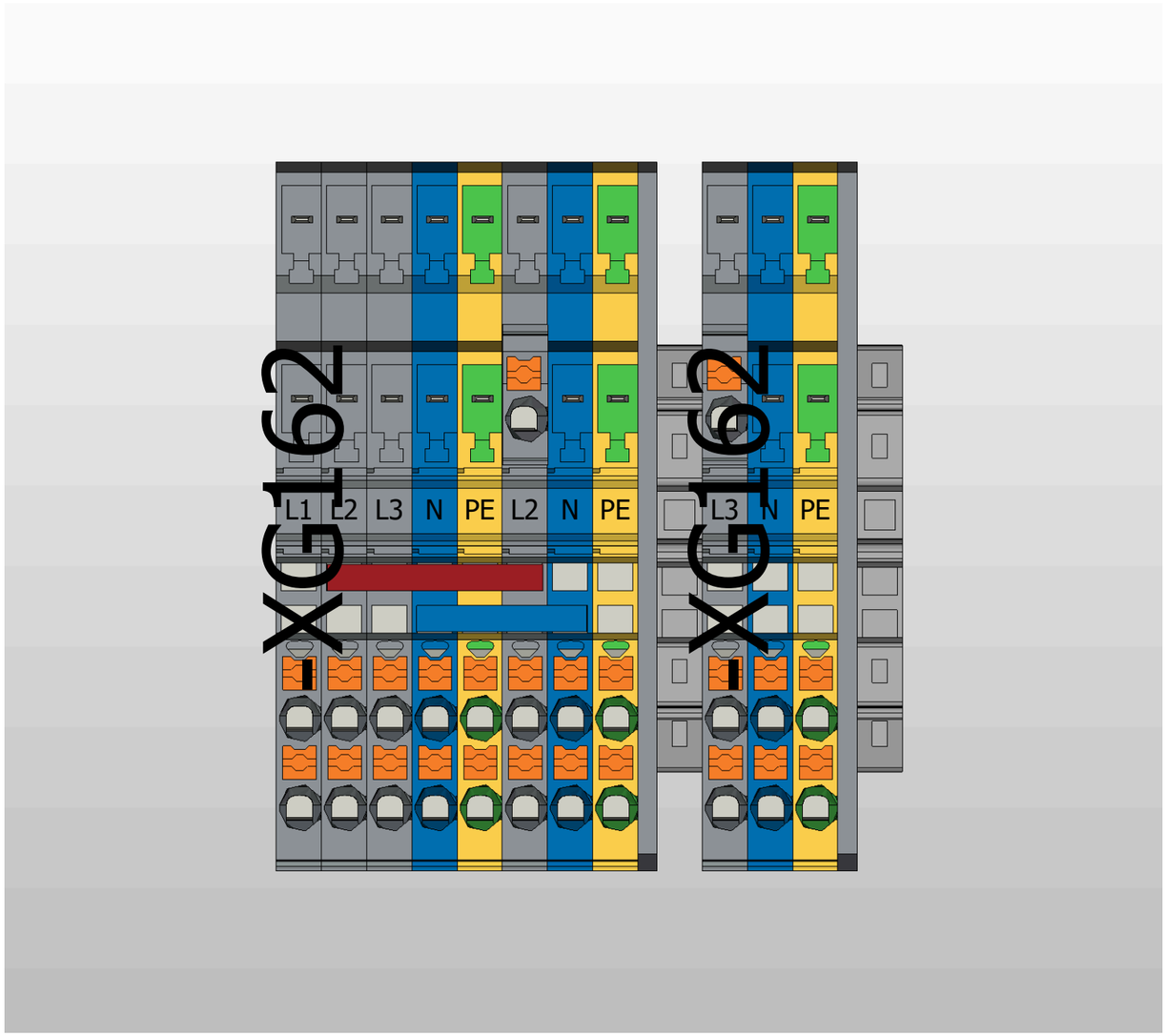
			PLOT	16.06.2023	Grid Service Station 0813				SH. 6.f
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG. EST.WITH	EST.BY			9 SHS

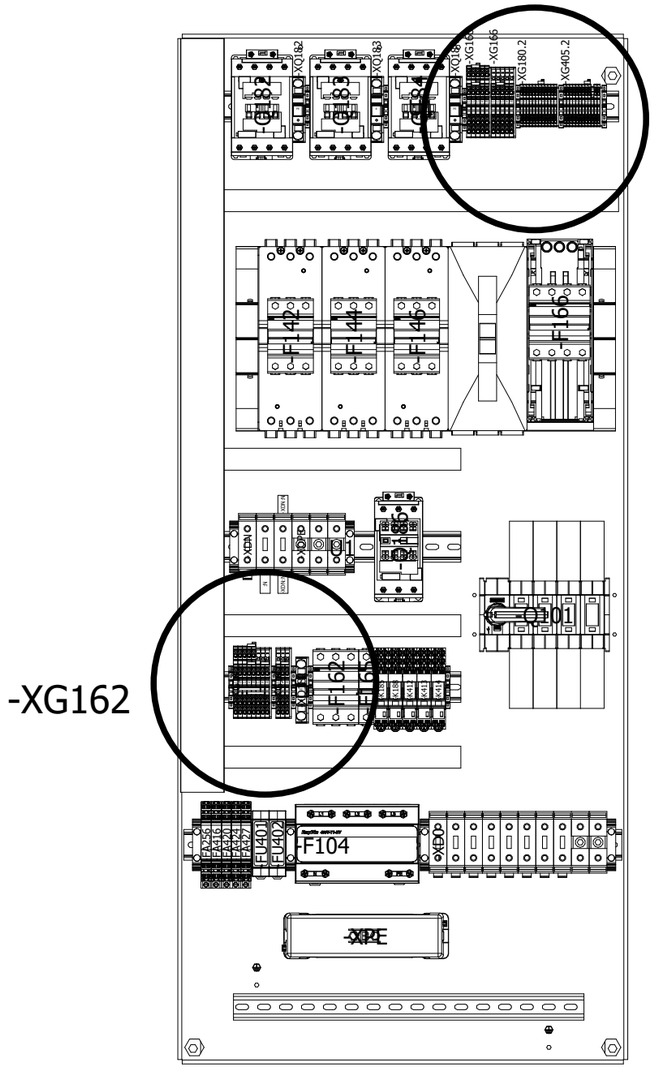


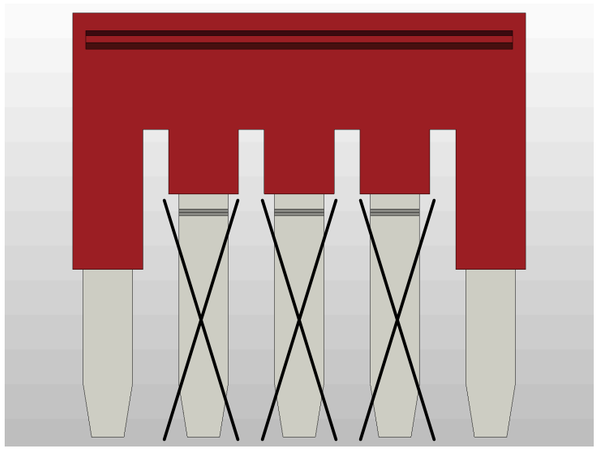
6.f

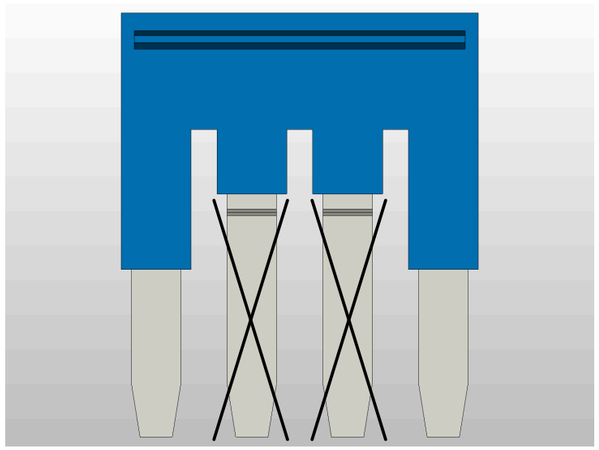
6.h

			DATE	01.12.2021	0-Serie, Köngen		adstec	Device overview	EPE000060	=00
			NAME	BnVr						+A
			PLOT	16.06.2023	Grid Service Station 0813					SH. 6.g
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY			9 SHS





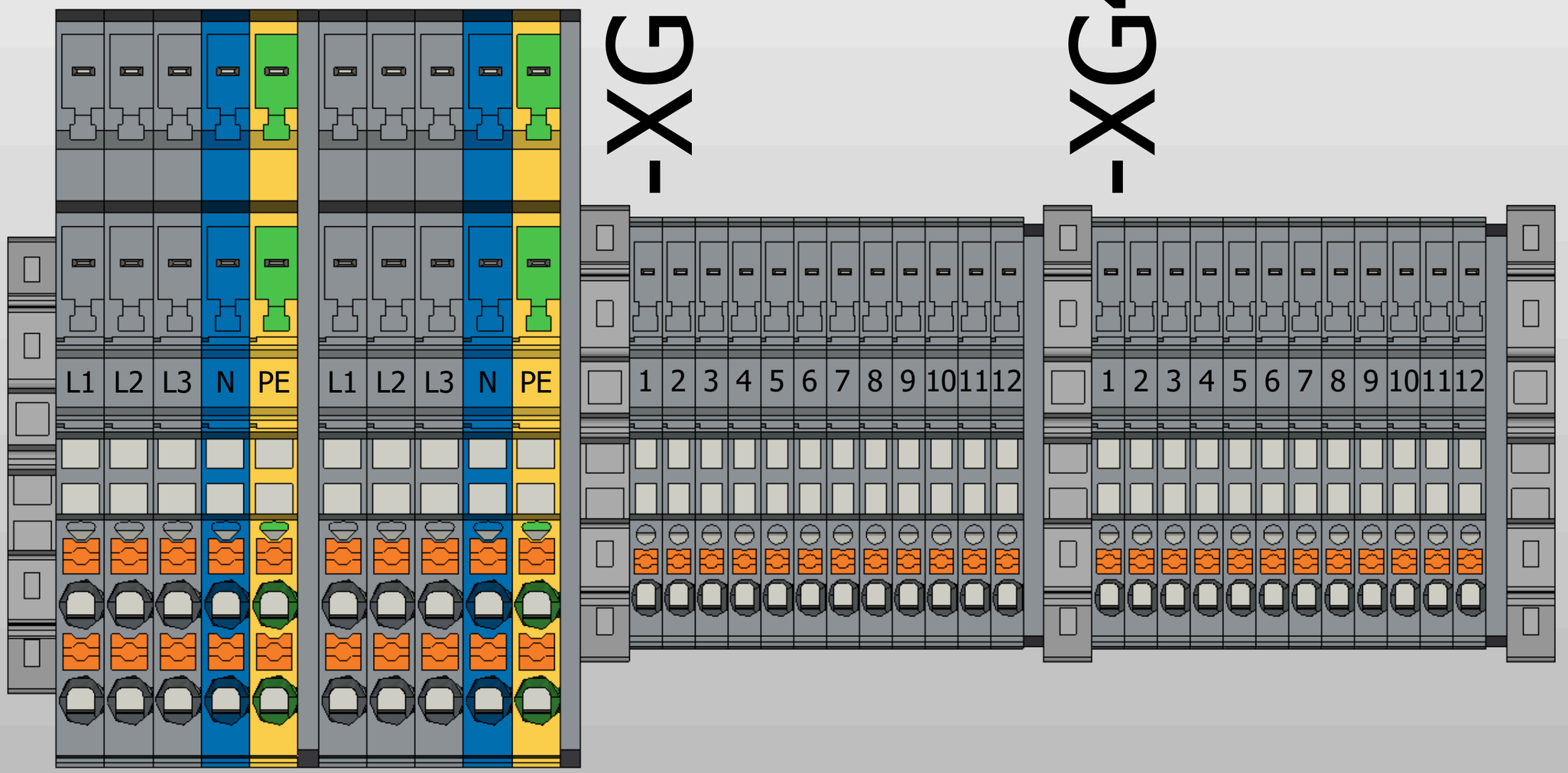




6.g

6.i

			Date	16.06.2023	0-Serie, Köngen		400/230VAC	==	= 00
			Ed.	BnVr			Overview of the terminals		+ A
			Appr		Grid Service Station 0813			++	General / Cover sheet
Modification	Date	Name	Original		Replacement of	Replaced by			Page 6.h / Page 13 / 69



6.h

6.j

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			Ed.	BnVr					+ A
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Modification	Date	Name	Original		Replacement of	Replaced by			Cover sheet

Page 6.i

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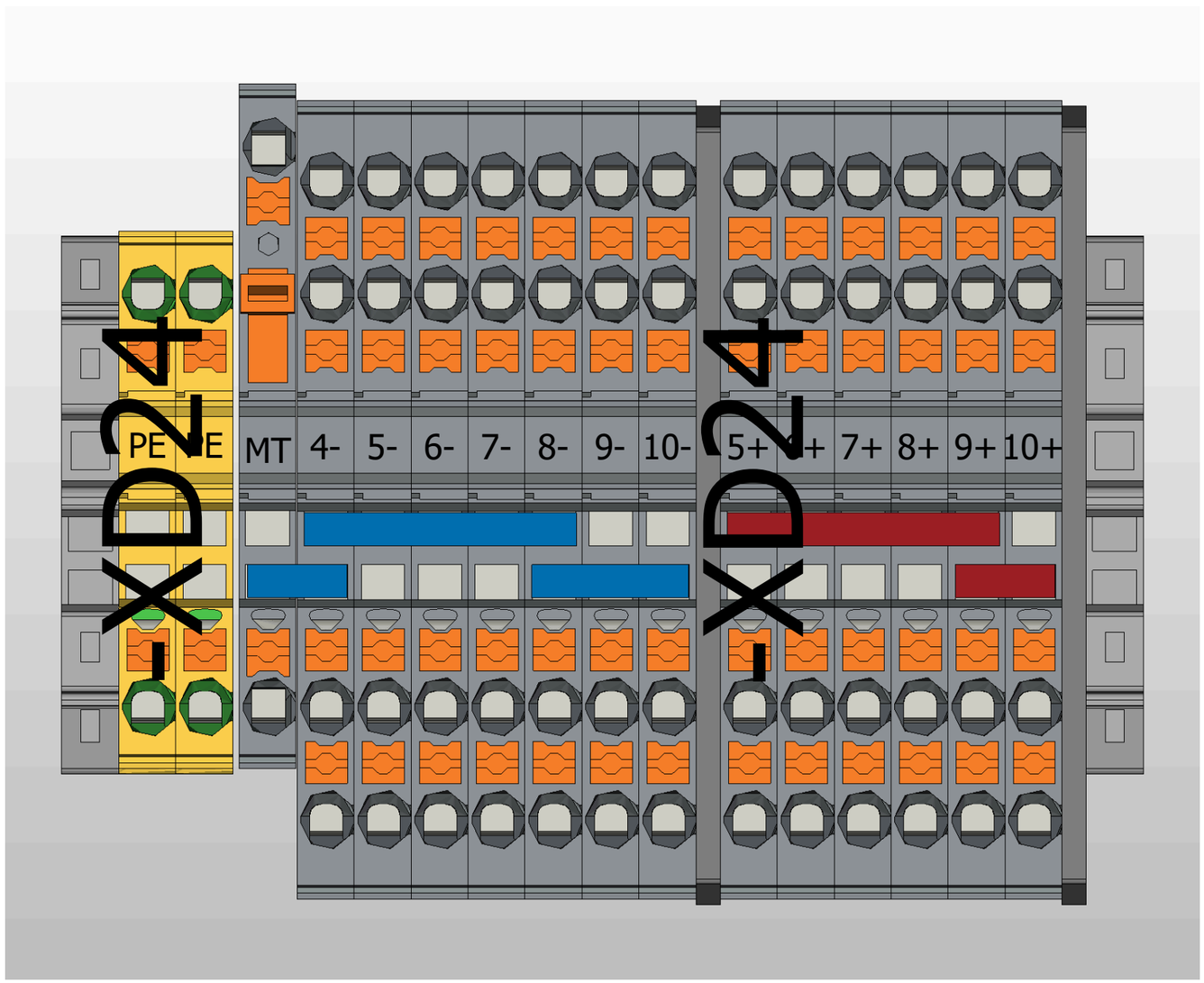

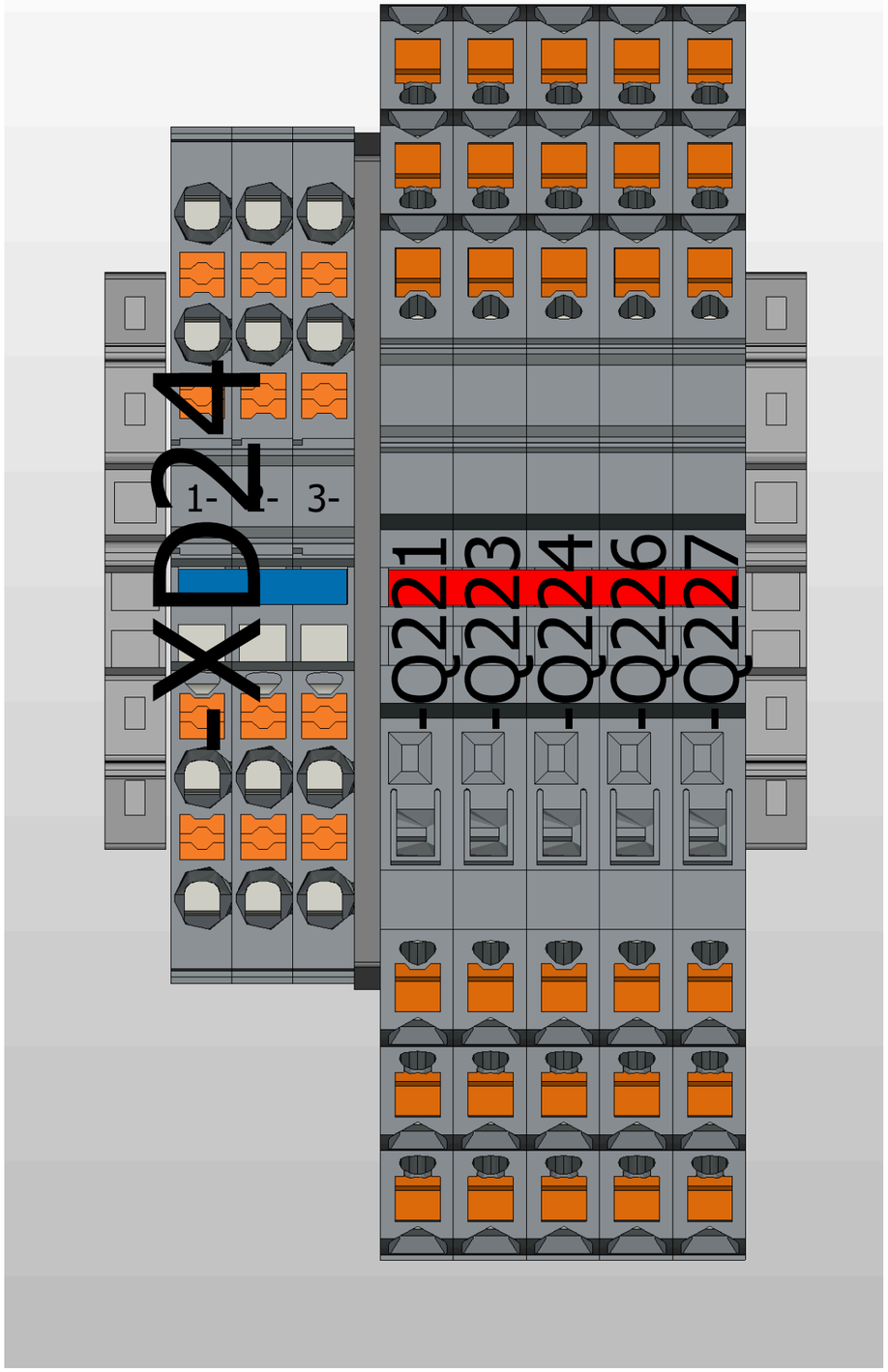

6.i

7.a

			Date	16.06.2023	0-Serie, Köngen	adstec	Terminal drawing	==	= 00
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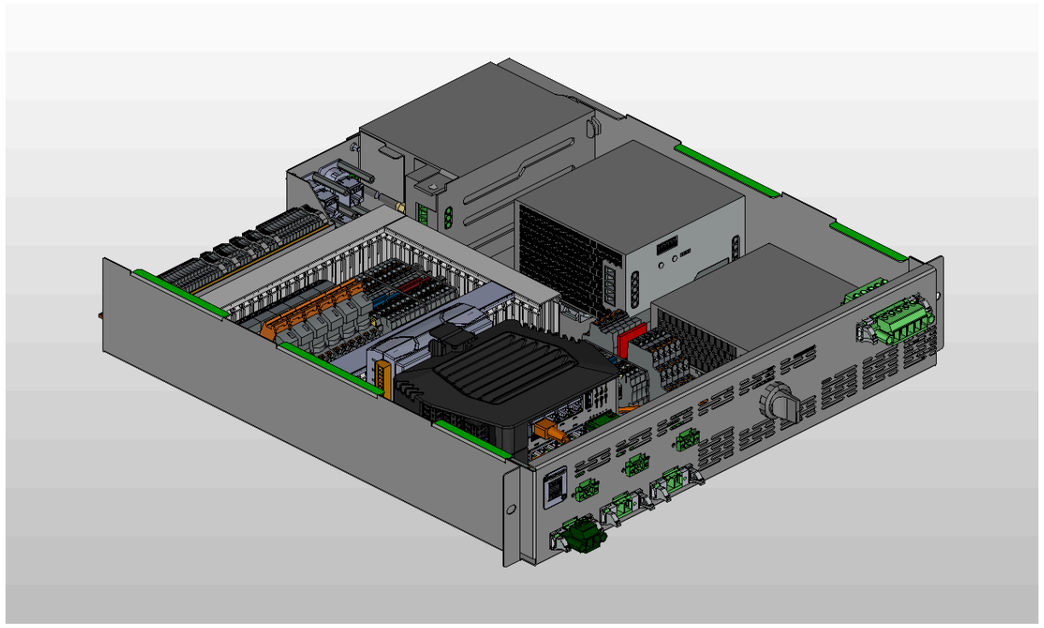
			Appr		Grid Service Station 0813			++	General
Modification	Date	Name	Original		Replacement of	Replaced by			Cover sheet

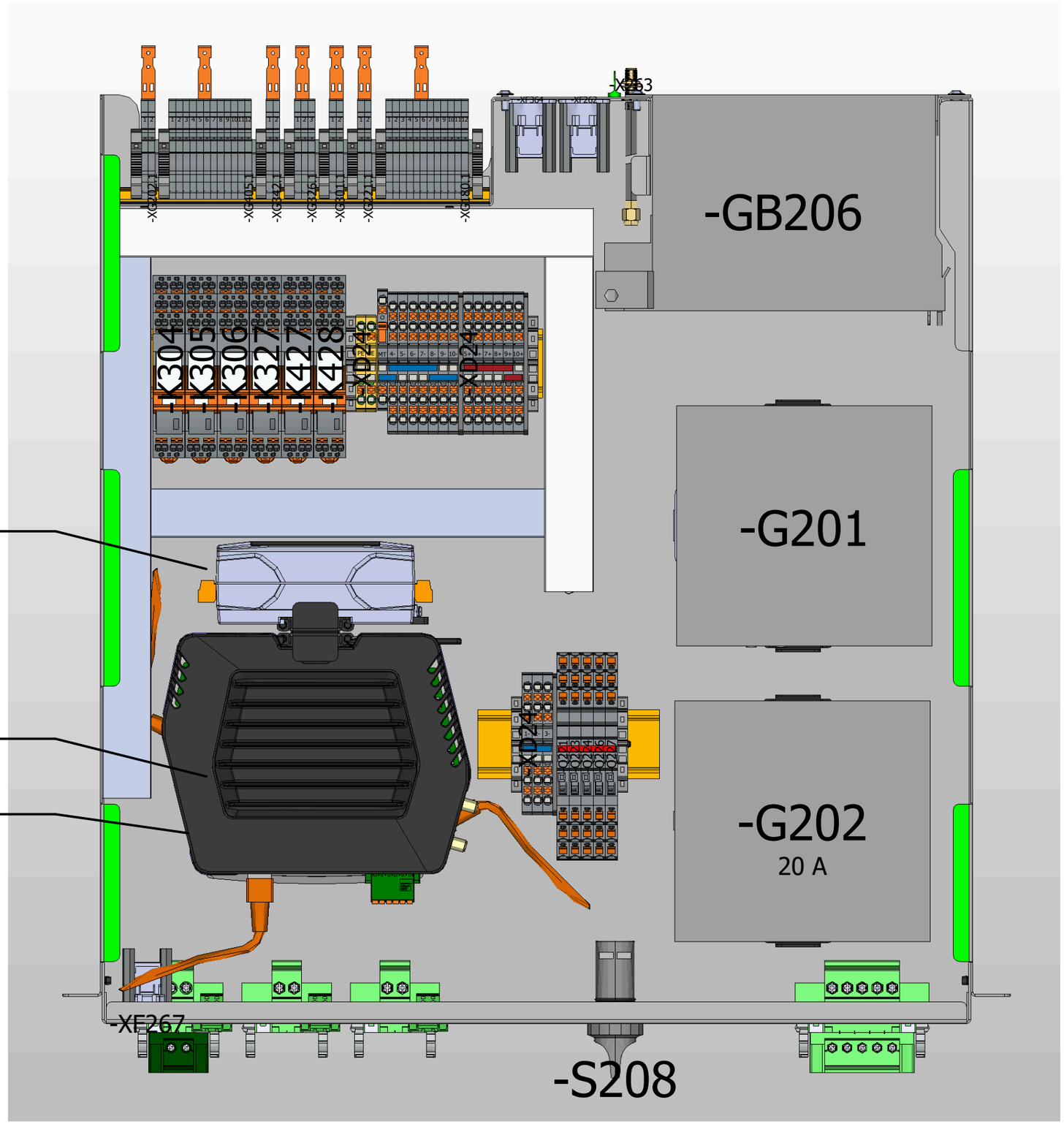


+EMS

-A281

-U264

-EC361

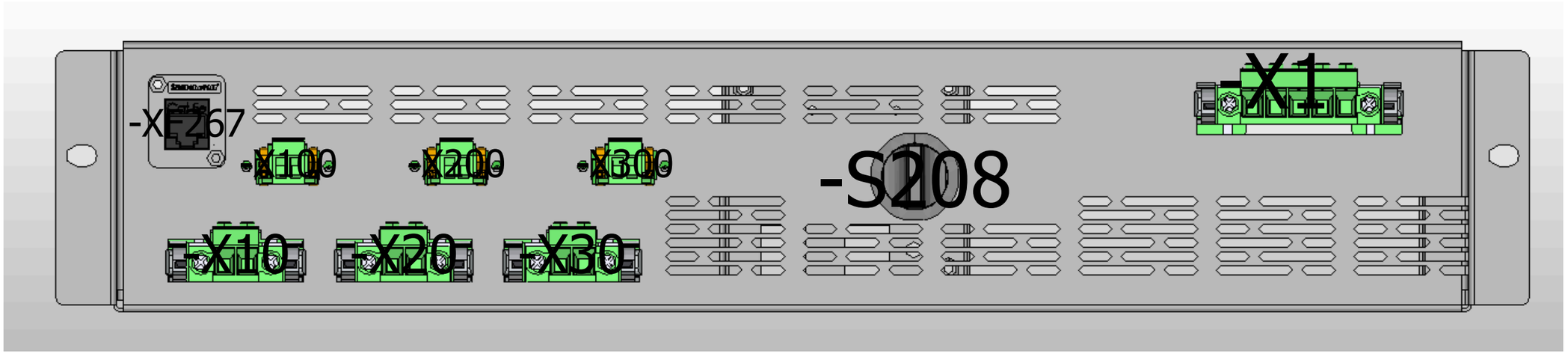


6.j

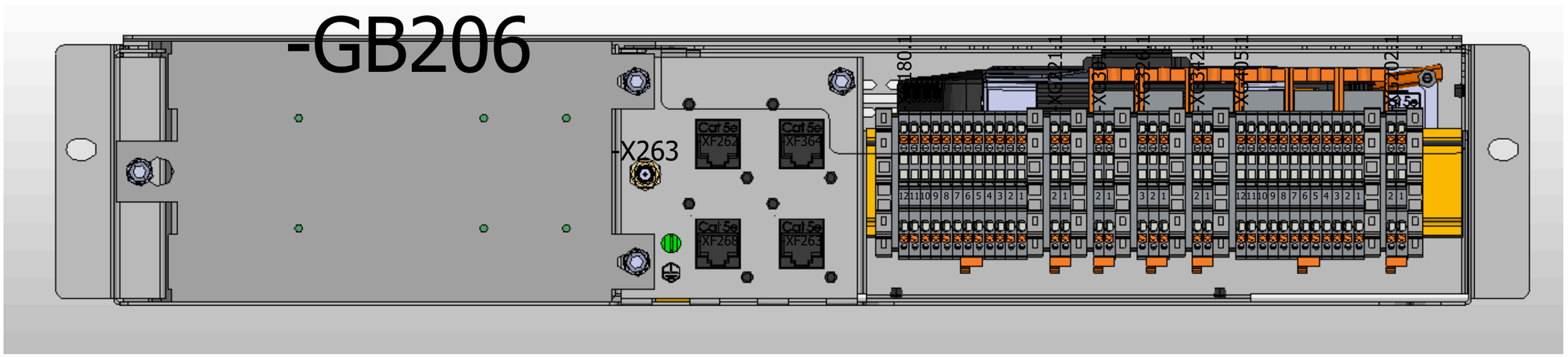
7.b

			DATE	01.12.2021	0-Serie, Köngen		adstec	Device overview EMX-Box	EPE000060	=00
			NAME	BnVr						+A
			PLOT	16.06.2023	Grid Service Station 0813					SH. 7.a
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY			9 SHS

+EMS



Frontansicht

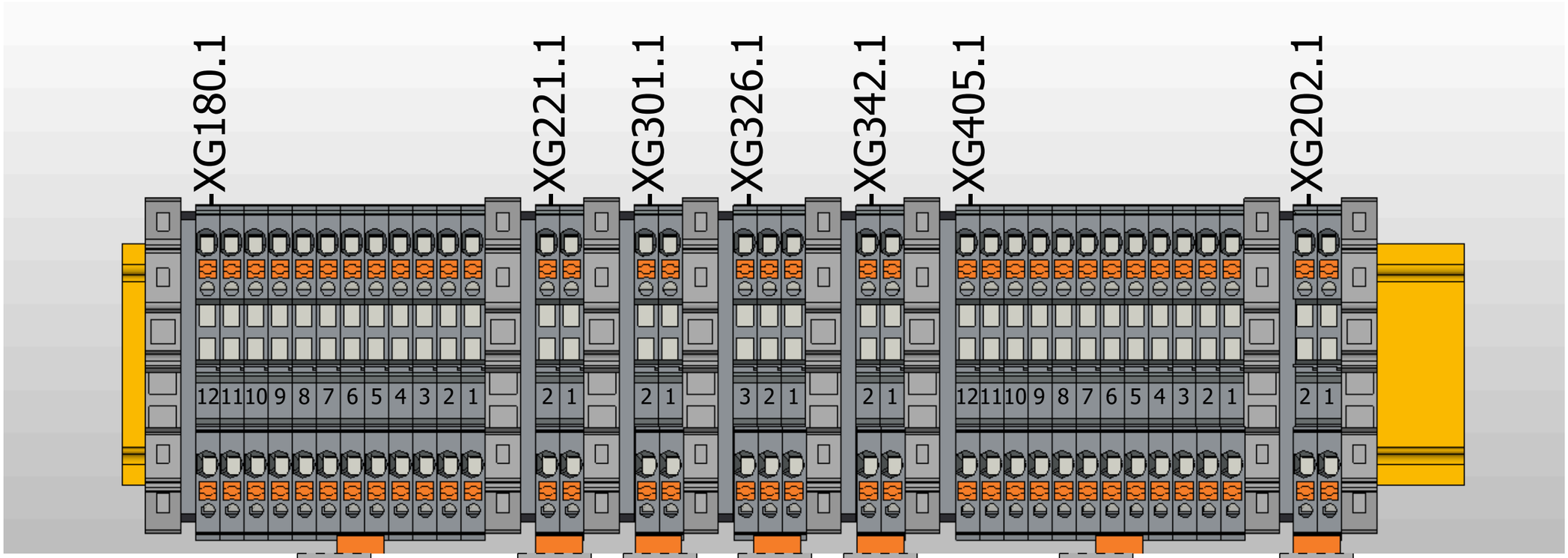


Rückansicht

7.a

7.c

			Date	16.06.2023	0-Serie, Köngen	adstec	Overview plug EMS-Box	==	= 00
			Ed.	BnVr					+ A
			Appr		Grid Service Station 0813			++	General
Modification	Date	Name	Original		Replacement of	Replaced by			Cover sheet



Attention!

Observe terminal numbering!

=01+S-W180
=01+AC/18.0

=01+S-W221
=01+AC/22.1

=01+S-W301_SRC4
=01+AC/30.1

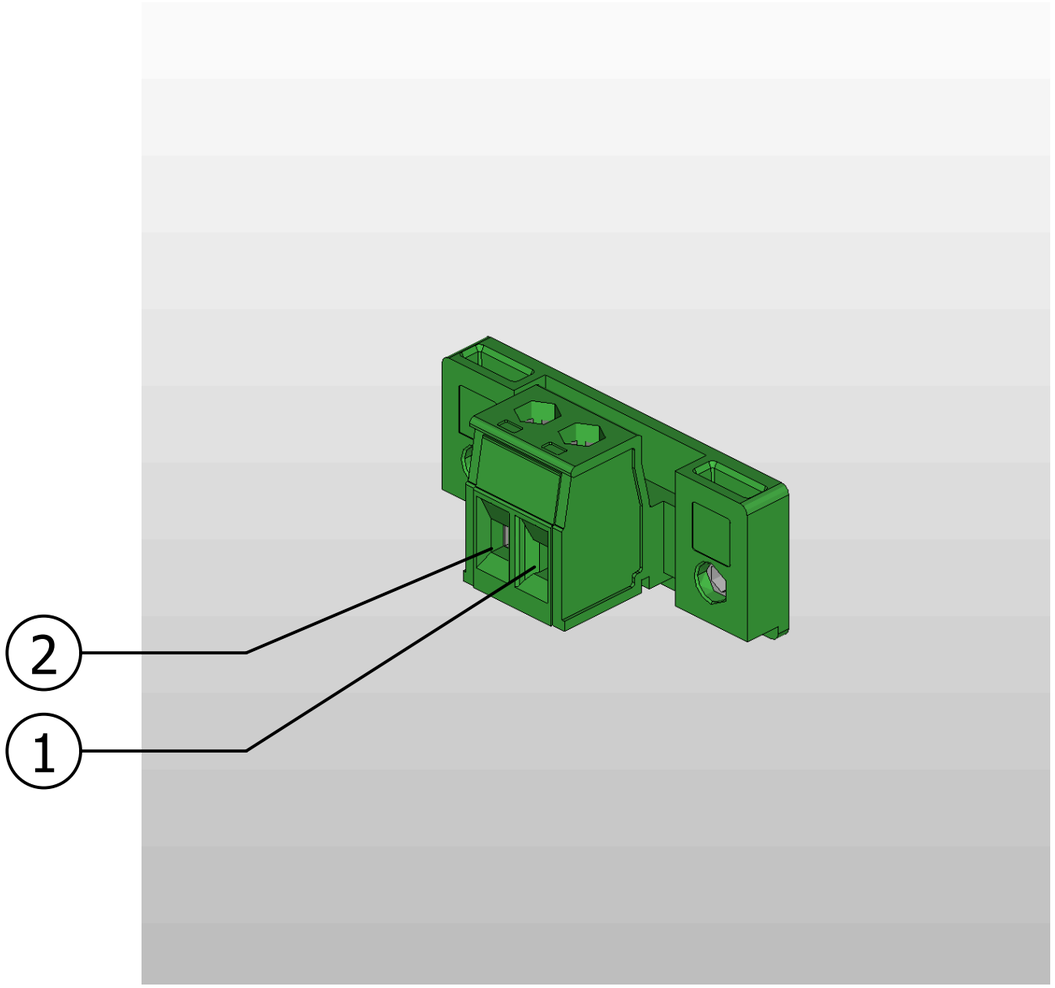
=01+S-W321
=01+AC/32.2

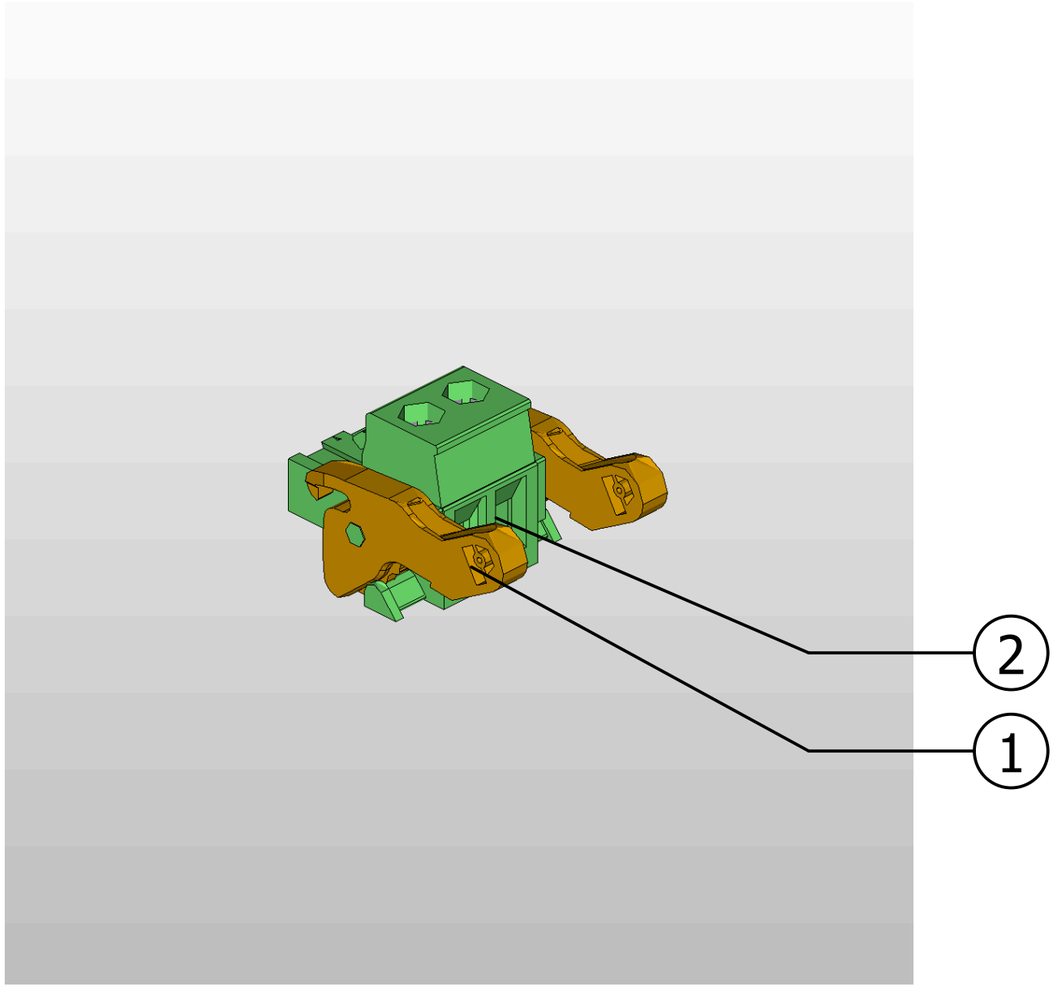
=01+S-W342
=01+AC/34.2

=01+S-W405
=01+AC/40.5

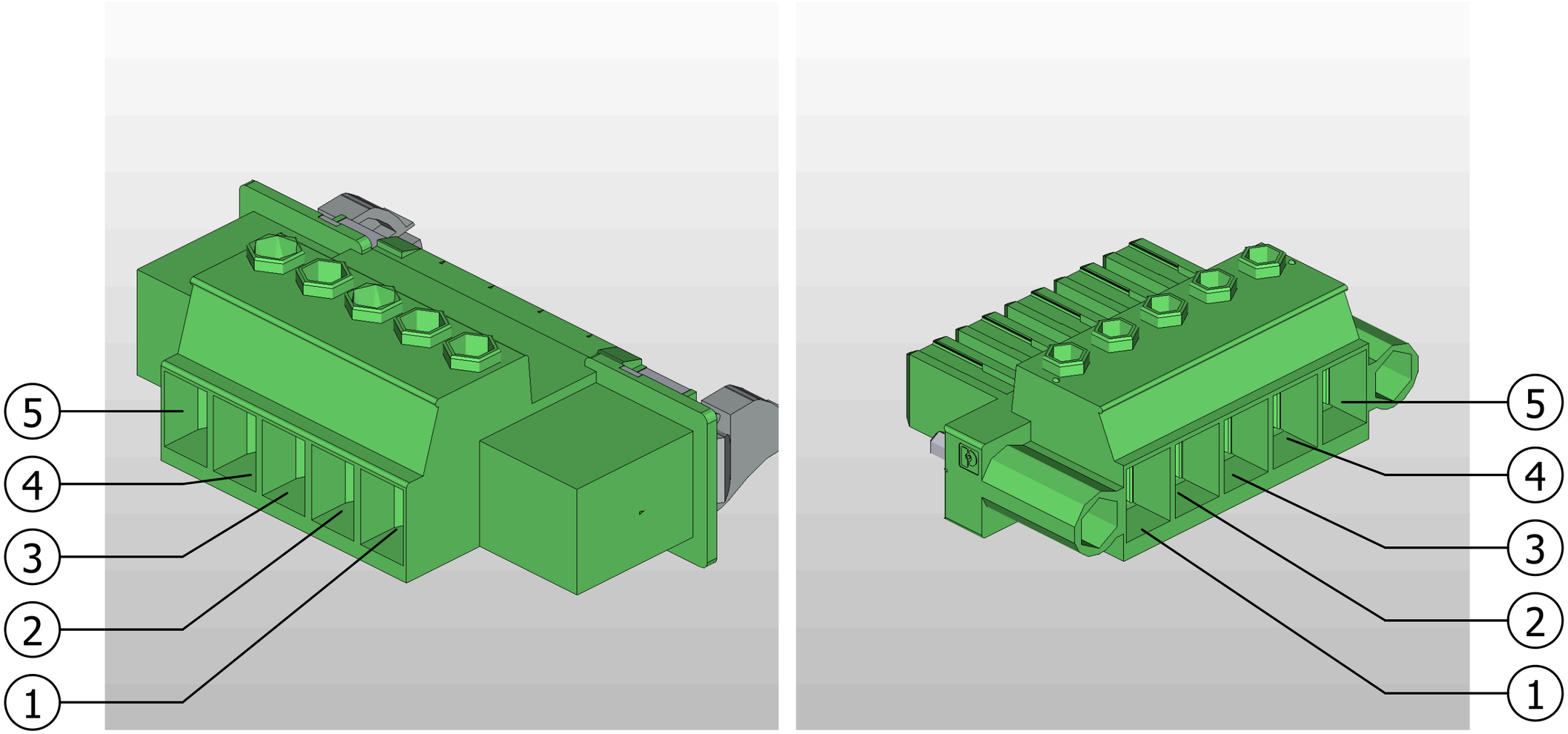
=01+S-WX203
=01+BS1/72.8

Rückansicht





-X100
-X200
-X300



-X1

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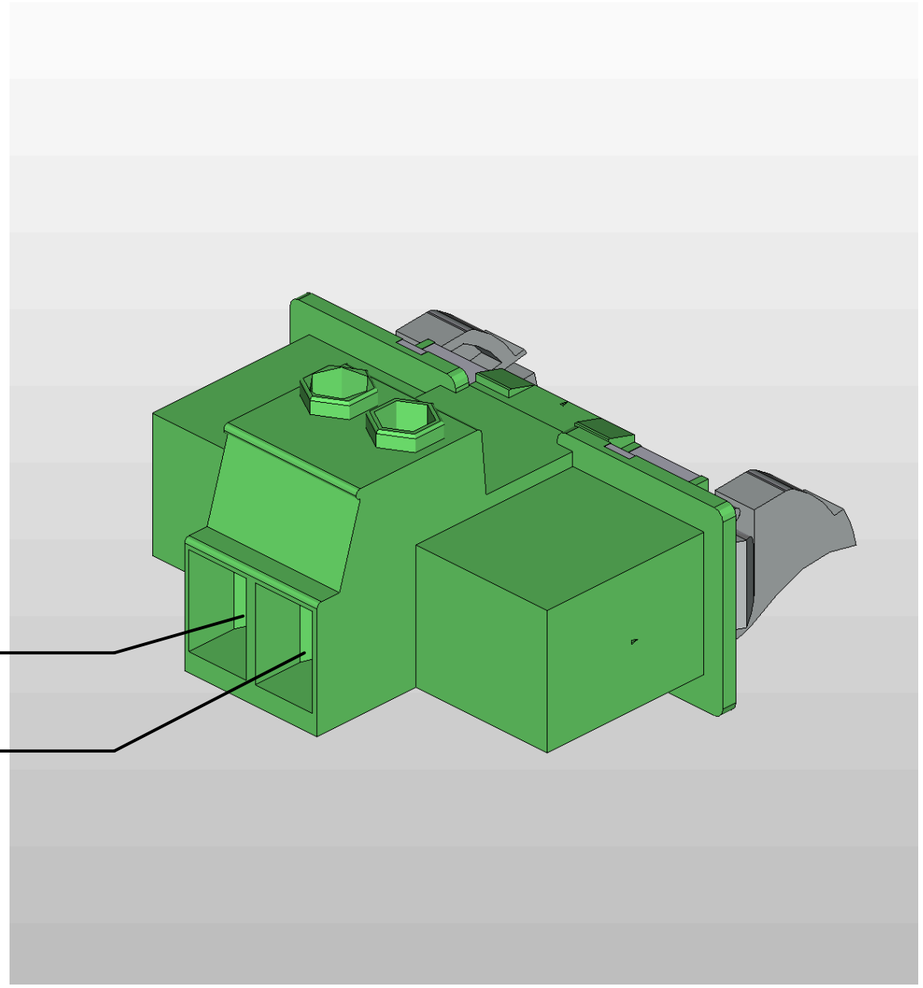
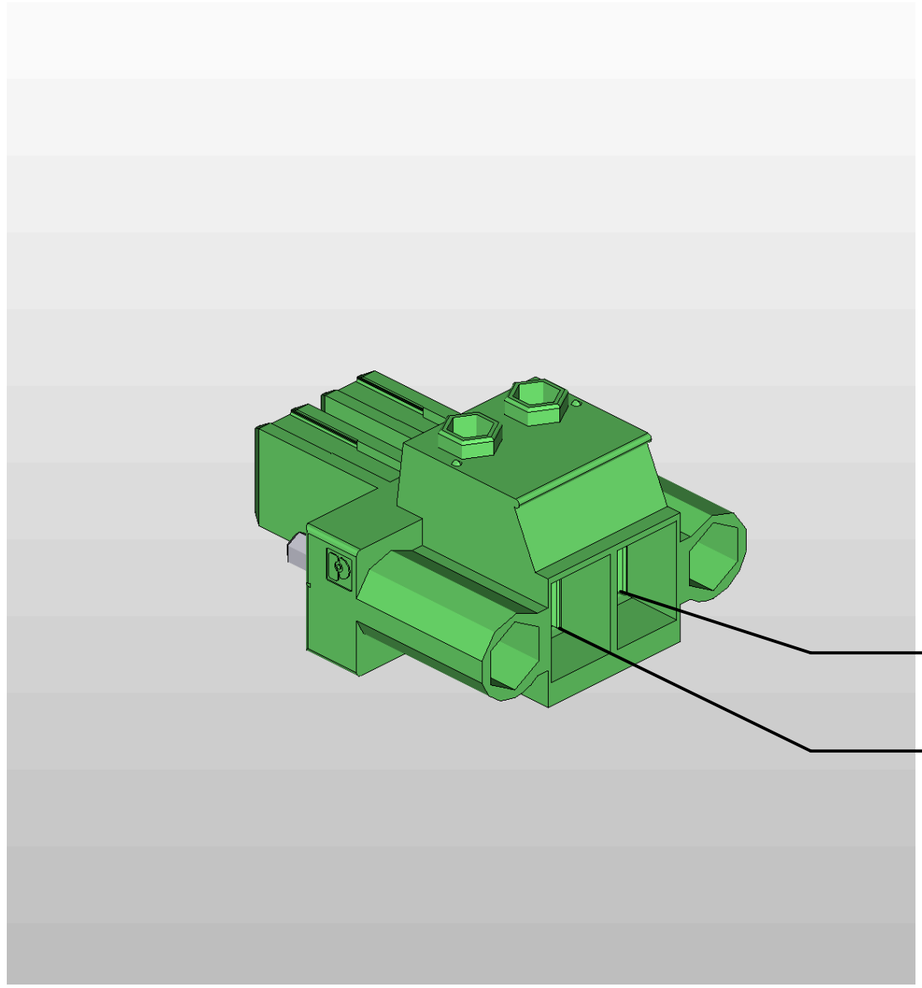
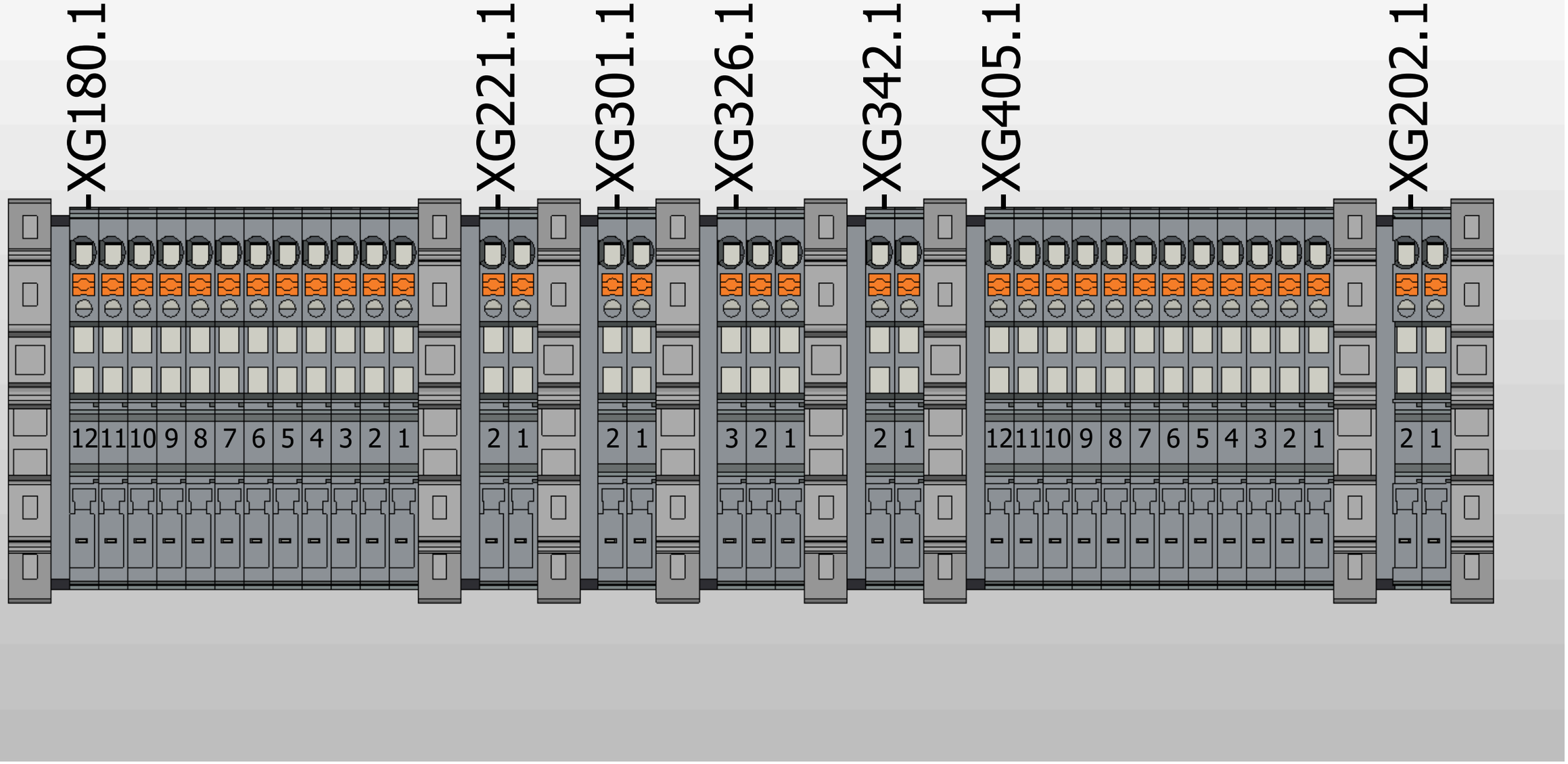
			Ed.	BnVr					+ A
			Appr		Grid Service Station 0813			++	General Cover sheet
Modification	Date	Name	Original		Replacement of	Replaced by			Page 7.e Page 20 / 69





-X10
-X20
-X30

			Date	16.06.2023	0-Serie, Köngen	adstec	Auxiliary voltage Plug drawing	==	= 00
			Ed.	BnVr					+ A
			Appr		Grid Service Station 0813			++	General Cover sheet
Modification	Date	Name	Original		Replacement of	Replaced by			Page 7.f / Page 21 / 69



7.f

8.a

			Date	16.06.2023	0-Serie, Köngen		Terminal drawing	==	= 00
			Ed.	BnVr					+ A
			Appr		Grid Service Station 0813			++	General
Modification	Date	Name	Original		Replacement of	Replaced by			Cover sheet

Page 7.g

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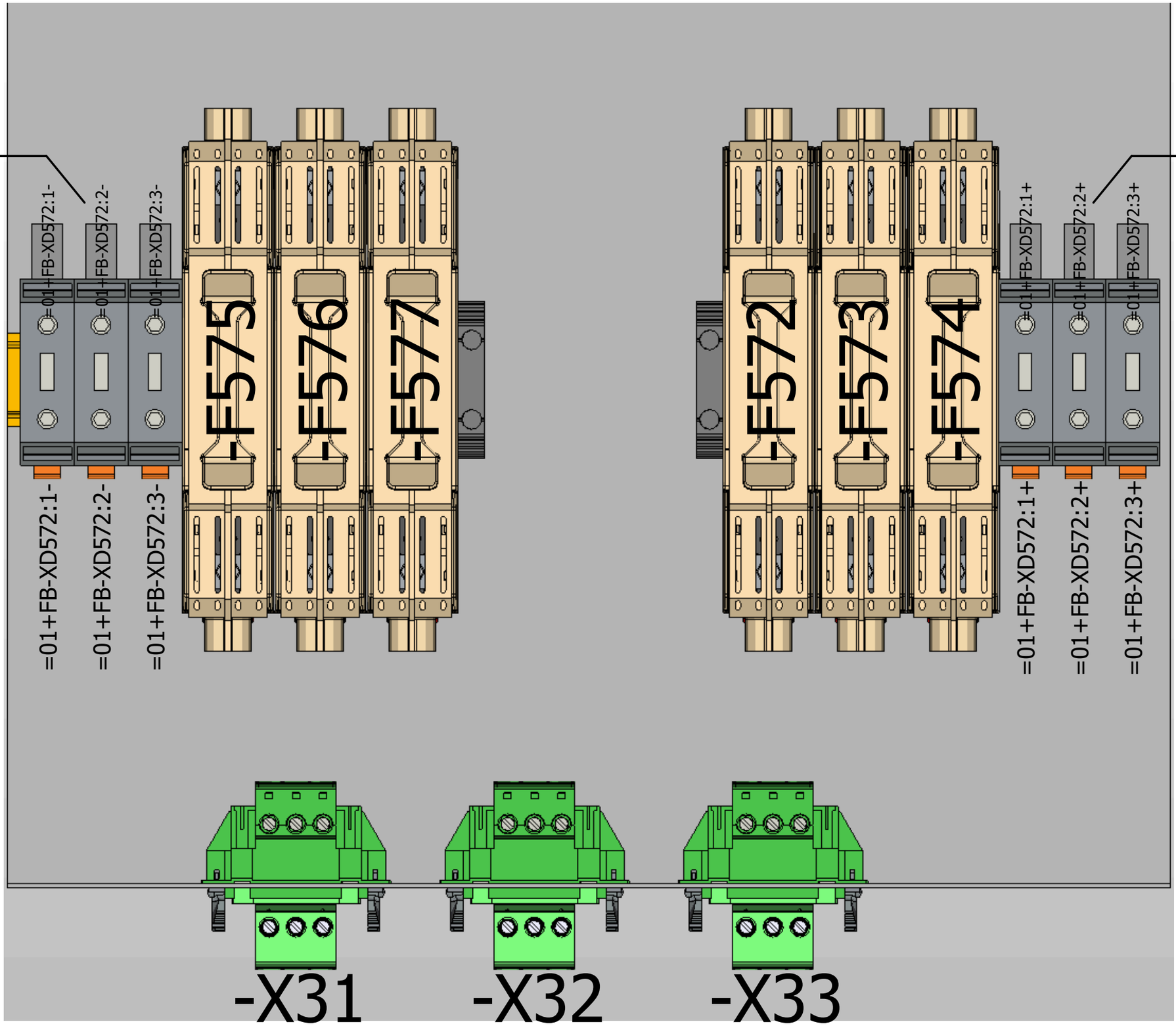
+FB

3x
Pick-off terminal block
AGK 10-UKH 50

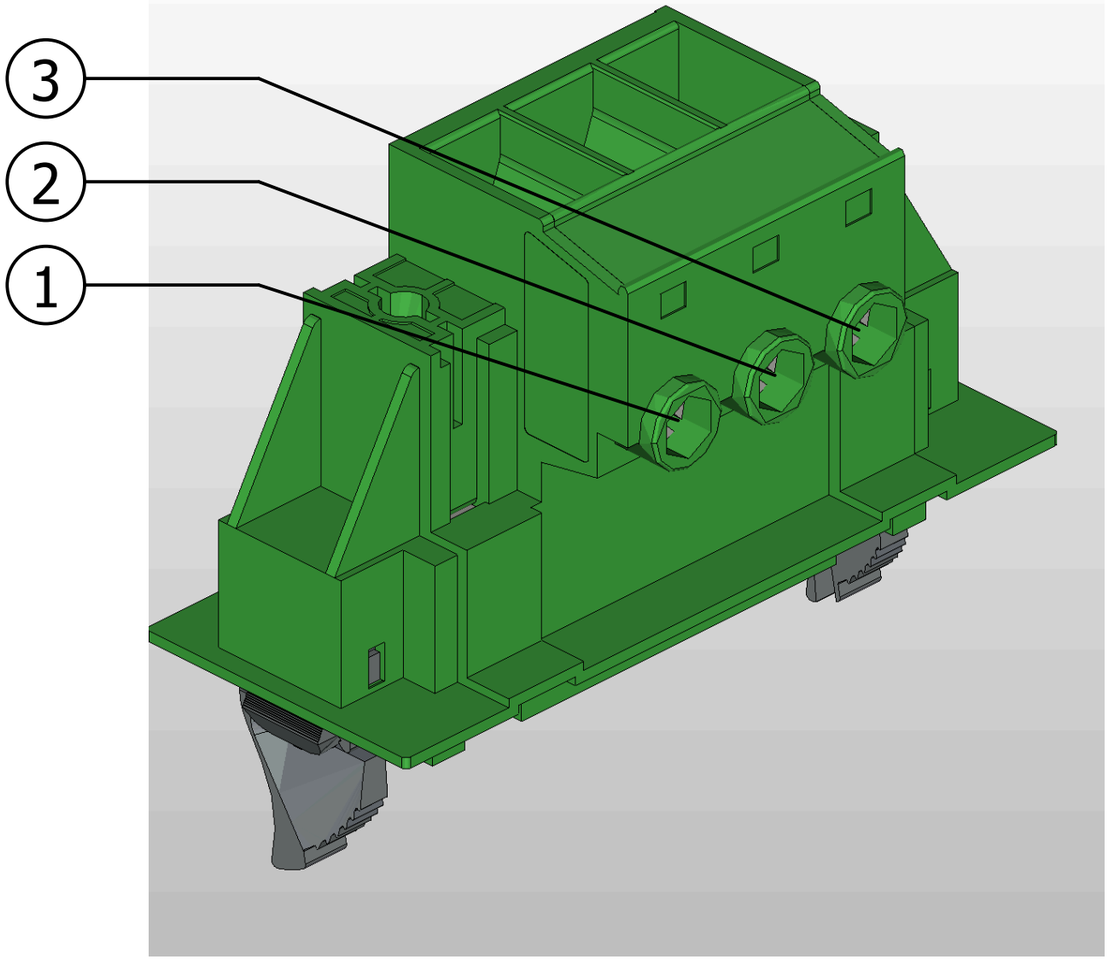


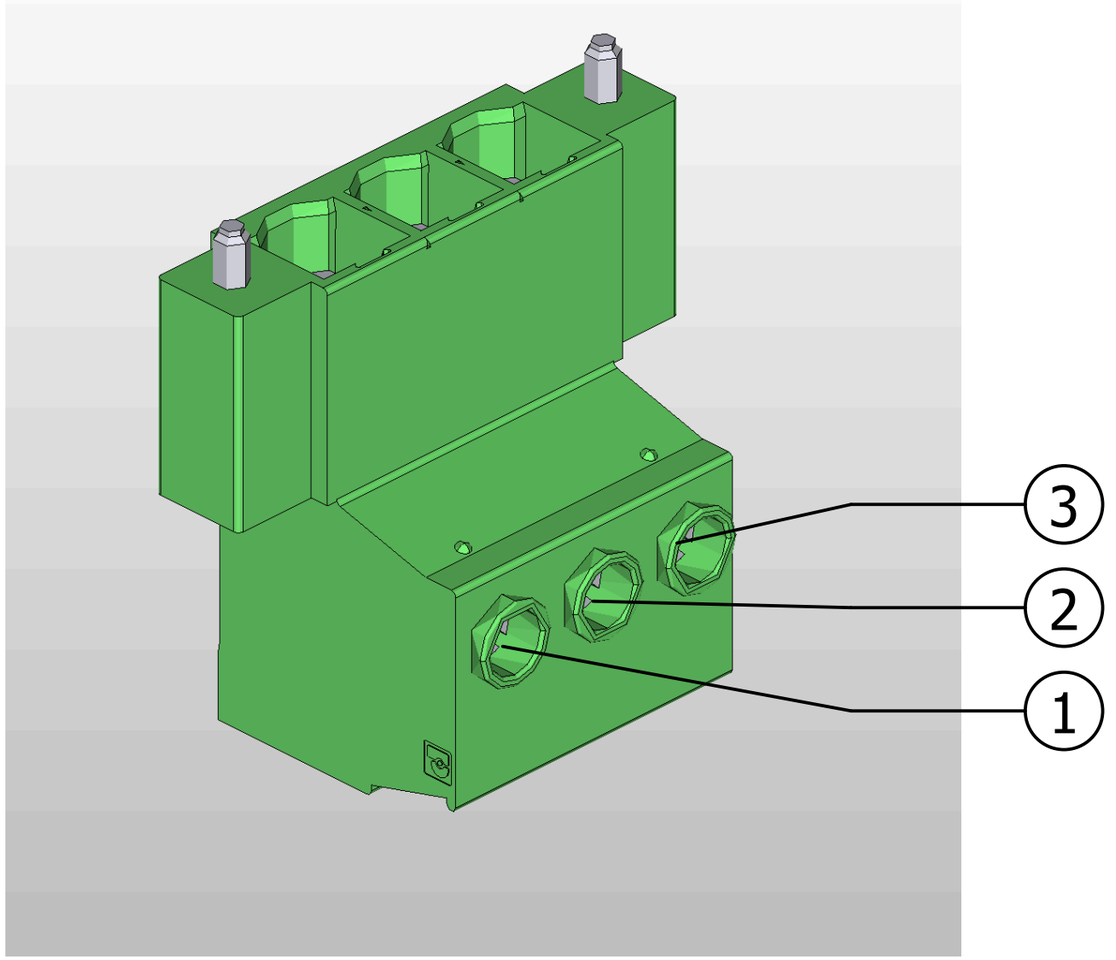
3x
Pick-off terminal block
AGK 10-UKH 50

7.g

8.b

			DATE	01.12.2021	0-Serie, Köngen	adstec	Overview DC Fuses Arrangement	EPE000060	=00
			NAME	BnVr					+A
			PLOT	16.06.2023	Grid Service Station 0813				SH. 8.a
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		9 SHS





-X31
-X32
-X33

			DATE	01.12.2021	0-Serie, Köngen		DC Fuses Connector drawing	EPE000060	=00
			NAME	BnVr					+A
			PLOT	16.06.2023	Grid Service Station 0813				SH. 8.b
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		9 SHS

Cable overview

F10_001-ads

Cable name	Source (from)	Target (to)	Cable type	all conductors	Conductors used	Cross-section [mm]	Length [m]	Function text	ERP number
=01+S-W161	=01+S-XG162.1	=01+EMS-X1	ÖLFLEX 191	5G	5	2,5	2,55	400VAC Supply Power adapter	DZ-SONS-20276-0/B
=01+S-W180	=01+S-XG180.1	=01+S-XG180.2	ÖLFLEX CLASSIC 130 H	12	12	0,75	2,6	24V DC signal	DZ-SONS-20277-1/A
=01+S-W201	=01+AC-PE_Chassis	=01+EMS-PE_EMS_BOX	GNYE	1	1	2,5	0,9	PE	DZ-SONS-20205-0/A
=01+S-W221	=01+S-XG221.1	=01+TH-U500-X5	ÖLFLEX 191	2	2	1,5	1,5	Trumpf System Control	DZ-SONS-20278-0/C
=01+S-W261.2	=01+EMS-X263	=01+MEM-X261	RG174	2	1	coax RG174	2,5	Antenna	
=01+S-W301_SRC4	=01+S-XG301.1	=01+BS1-X1200	ÖLFLEX CLASSIC 130 H	2	2	0,75	1,3	SRC4 Enable	DZ-SONS-20279-0/C
=01+S-W321	=01+S-XG326.1	=01+S1-U321-A1	ÖLFLEX CLASSIC 130 H	3	3	0,75	3,1	smoke detector	DZ-SONS-20280-1/A
=01+S-W342	=01+S-XG342.1	=01+S2-S342	ÖLFLEX CLASSIC 130 H	2	2	0,75	2	Door switch right	DZ-SONS-20281-1/A
=01+S-W345	=01+S-XG162.5	=01+S1-EC345	ÖLFLEX 191	2	2	1,5	1,65	Heater left Enclosure	DZ-SONS-20282-1/A
=01+S-W348.1	=01+S-XG162.3	=01+S-X348.1	ÖLFLEX 191	3G	3	1,5	2,4	Roof Fan right Enclosure	DZ-SONS-20283-0/B
=01+S-W365	=01+S1-S367	=01+S2-EC366	ÖLFLEX CLASSIC 130 H	2	2	0,75	3	Door switch left	DZ-SONS-20284-0/B
=01+S-W366	=01+S-XG162.2	=01+S2-EC366	ÖLFLEX 191	4G	4	2,5	2,5	400VAC Air conditioning unit	DZ-SONS-20285-1/A
=01+S-W405	=01+S-XG405.1	=01+S-XG405.2	ÖLFLEX CLASSIC 130 H	12	12	0,75	2,6	Interface Customer	DZ-SONS-20277-2/A
=01+S-W512	=01+TH-U500-X6.3	=01+TH-U510-X6.2	Patchkabel	8	1		2	Communication Trumpf Hüttinger	DZ-SONS-41653-3/A
=01+S-W522	=01+TH-U510-X6.1	=01+TH-U520-X6.2	Patchkabel	8	1		0,3	=	DZ-SONS-41653-0/A
=01+S-W532	=01+TH-U520-X6.1	=01+TH-U530-X6.2	Patchkabel	8	1		0,3	=	DZ-SONS-41653-0/A
=01+S-W571	=01+TH-PE_Chassis	=01+FB-PE_EMS_BOX	GNYE	1	1	2,5	0,9	PE	DZ-SONS-20205-0/A
=01+S-W724	=01+BS1-PE_Chassis	=01+BS1-SRC4310-PE_SRCxxxx	GNYE	1	1	2,5	0,9	=	DZ-SONS-20205-0/A
=01+S-WETH1.2	=01+EMS-XF262	=01+AC-FU401	Patchkabel	8	1		3	LAN interface Customer	DZ-SONS-41707-4/A
=01+S-WETH3.2	=01+EMS-XF263	=01+AC-FU402	Patchkabel	8	1		3	LAN interface Support	DZ-SONS-41707-4/A
=01+S-WETH7.2	=01+EMS-XF268	=01+BS1-SRC4310-X1400	Patchkabel	8	1		2	ads tec Battery	DZ-SONS-41707-3/A
=01+S-WETH8.2	=01+EMS-XF267	=01+TH-U500-X6.0	Patchkabel	8	1		0,3	Trumpf Hüttinger System Control	DZ-SONS-41707-0/A
=01+S-WG348.1	=01+S-XG348.1	=01+BS1-X1300			3		0,8		DZ-SONS-41780-0/A
=01+S-WX203	=01+S-XG202.1	=01+BS1-X203	ÖLFLEX CLASSIC 130 H	2	2	0,75	1,3	24V DC	DZ-SONS-20286-1/A
=01+EMS-W261.1	=01+EMS-U264	=01+EMS-X263	RG174	2	1		2,5	Antenna	
=01+EMS-WETH1.1	=01+EMS-XF262	=01+EMS-U264	Patchkabel	8	1		0,5	LAN interface Customer	DZ-SONS-41707-1/A
=01+EMS-WETH3.1	=01+EMS-XF263	=01+EMS-U264	Patchkabel	8	1		0,5	LAN interface Support	DZ-SONS-41707-1/A
=01+EMS-WETH5	=01+EMS-A281-E1	=01+EMS-U264	Patchkabel	8	1		0,3	I/O module	DZ-SONS-41707-0/A
=01+EMS-WETH6	=01+EMS-EC361	=01+EMS-U264	Patchkabel	8	1		0,3	Rittal IOT	DZ-SONS-41707-0/A
=01+EMS-WETH7.1	=01+EMS-XF268	=01+EMS-U264	Patchkabel	8	1		0,5	ads tec Battery	DZ-SONS-41707-1/A
=01+EMS-WETH8.1	=01+EMS-XF267	=01+EMS-U264	Patchkabel	8	1		0,3	IRF3821	DZ-SONS-41707-0/A

Grid1_L1 / 16.2
Grid1_L2 / 16.2
Grid1_L3 / 16.2

DZ-SONS-41147-0/A
Busbar
3x 12 x 5mm
-L1:1
-L2:1
-L3:1
400V AC 50 Hz

-WC100
/14.0
/16.4

Grid0_L1 / 14.0
Grid0_L2 / 14.0
Grid0_L3 / 14.0

-XD101
RIT.9342250
DZ-SONS-41153-0/A

AC100101 BK 50
AC100103 BK 50
AC100201 BK 50
AC100204 BK 50 Protective hose Blue

Grid0_N / 12.0

-Q101
Main switch
160A
SIE.3KD3442-0NE10-0
DZ-SONS-41685-1/A
SIE.3KD9204-5
DZ-SONS-41688-0/A

1 3 5 N
2 4 6 N.
Fixing
4 x M4x10

Attention!
Voltage

AC100401 BK 35
AC100402 BK 35
AC100403 BK 35
AC100404 BU 35

Protective hose Blue

AC100102 BK 50
AC100104 BK 50
AC100202 BK 50
AC100203 BK 50
AC100204 BK 50

-XD0
L1 L1 L2 L2 L3 L3 N N

-W0
5x50-95mm²
500 V
L1 L2 L3 N
1 2 3 4

Main_Grid0_L1
Main_Grid0_L2
Main_Grid0_L3
Main_Grid0_N

Grid0_PE1 / 16.0
AC100301 GNYE 16
PE
PE
GNYE

Main_Grid0_PE

Grid0_PE2 / 12.0
AC100302 GNYE 50
PE
AC100303 GNYE 50

Caution Voltage !
Voltage also present when main switch is turned off

Attention
Ensure clockwise rotating field

Main connection

Grid connection
Prefuse 160A gG

-F104
REY.RayDIN 400Y-T1-HV
DZ-SONS-40533-0/A

Raycap
L1 L2 L3 N PE
L1 L2 L3 N PE

RayDIN 400Y-T1-HV

Overvoltage protection

FC10_ PE / 40.7
FC11_ PE / 41.7
FC14_ PE / 42.1
FC12_ PE / 42.4
FC13_ PE / 42.7

AC100701 GNYE 35
AC100901 GNYE 16

PE rail 1
XPE:0 XPE:1
XPE:2 XPE:3 XPE:4 XPE:5 XPE:6 XPE:7 XPE:8 XPE:9

OBO.5015111
DZ-SONS-40561-0/A

M6
PE

foundation earth electrode

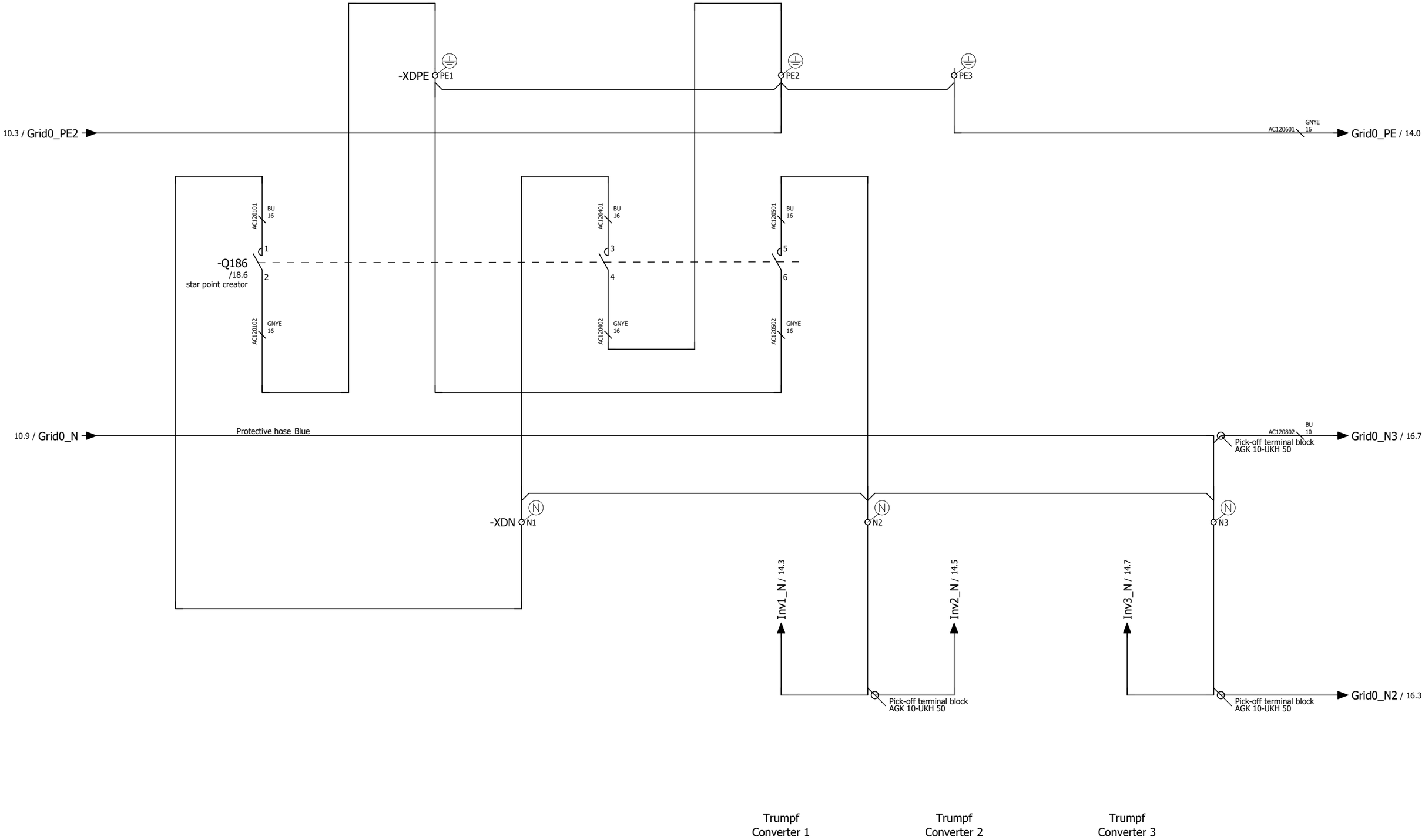
Mounting panel

PE rail

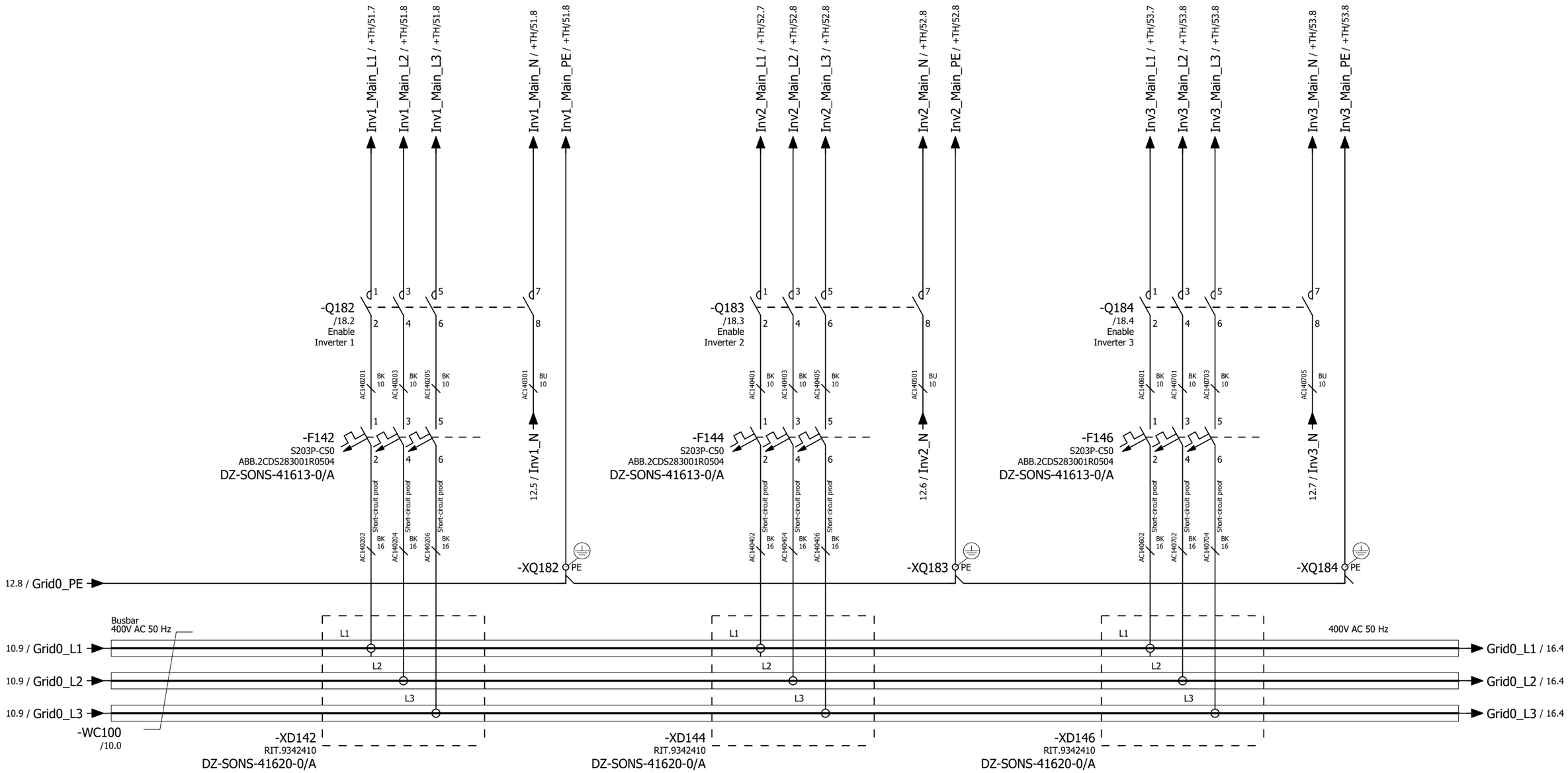
=00+A/9

12

			Date	16.06.2023	0-Serie, Köngen	adstec	Grid connection	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 10 / Page 26 / 69



			Date	25.05.2023	0-Serie, Köngen		star point creator	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 12 / Page 27 / 69

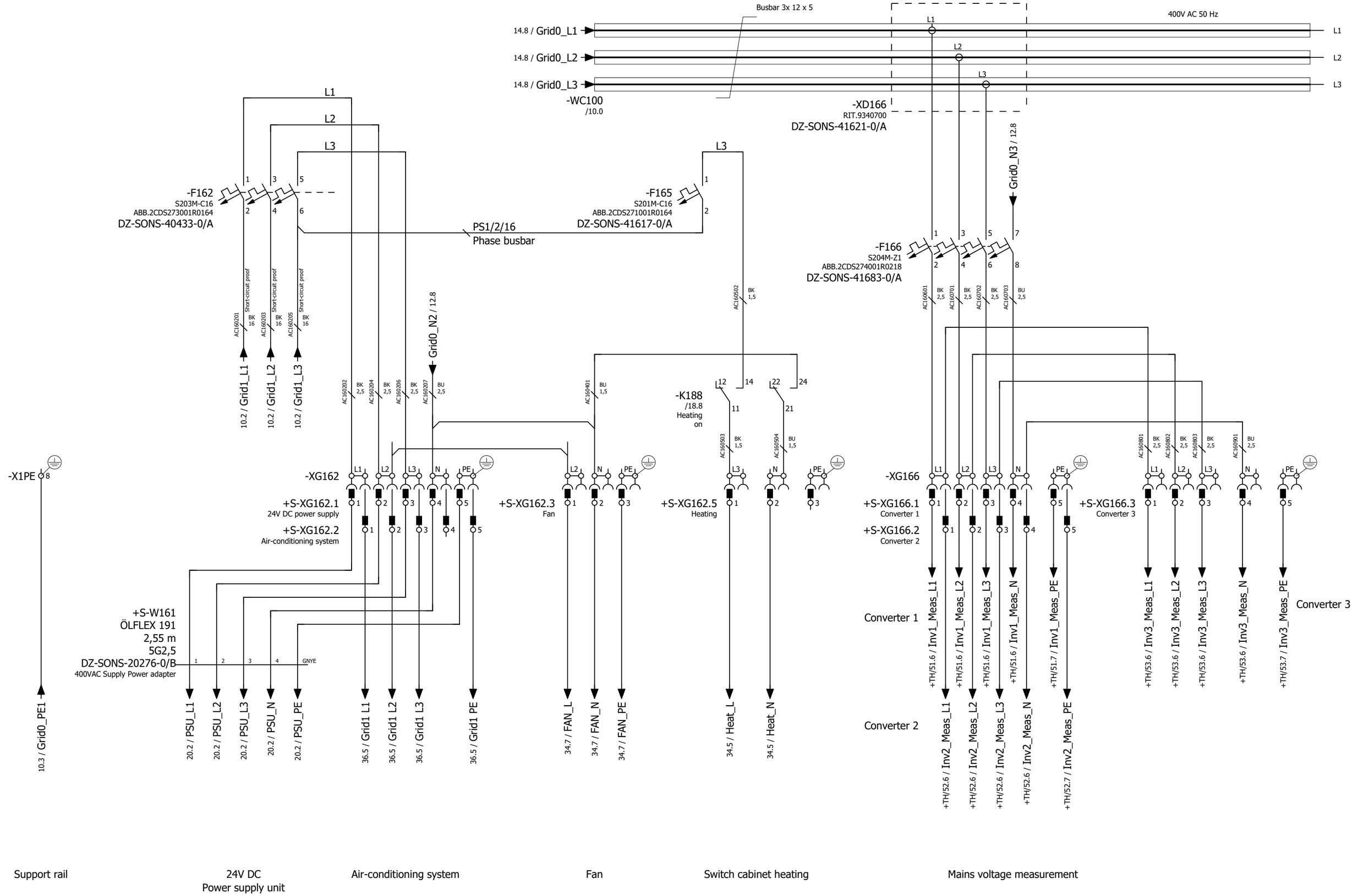


Trumpf
Converter 1

Trumpf
Converter 2

Trumpf
Converter 3

			Date	08.05.2023	0-Serie, Köngen	adstec	400VAC Converter	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 14 / Page 28 / 69



Support rail

24V DC
Power supply unit

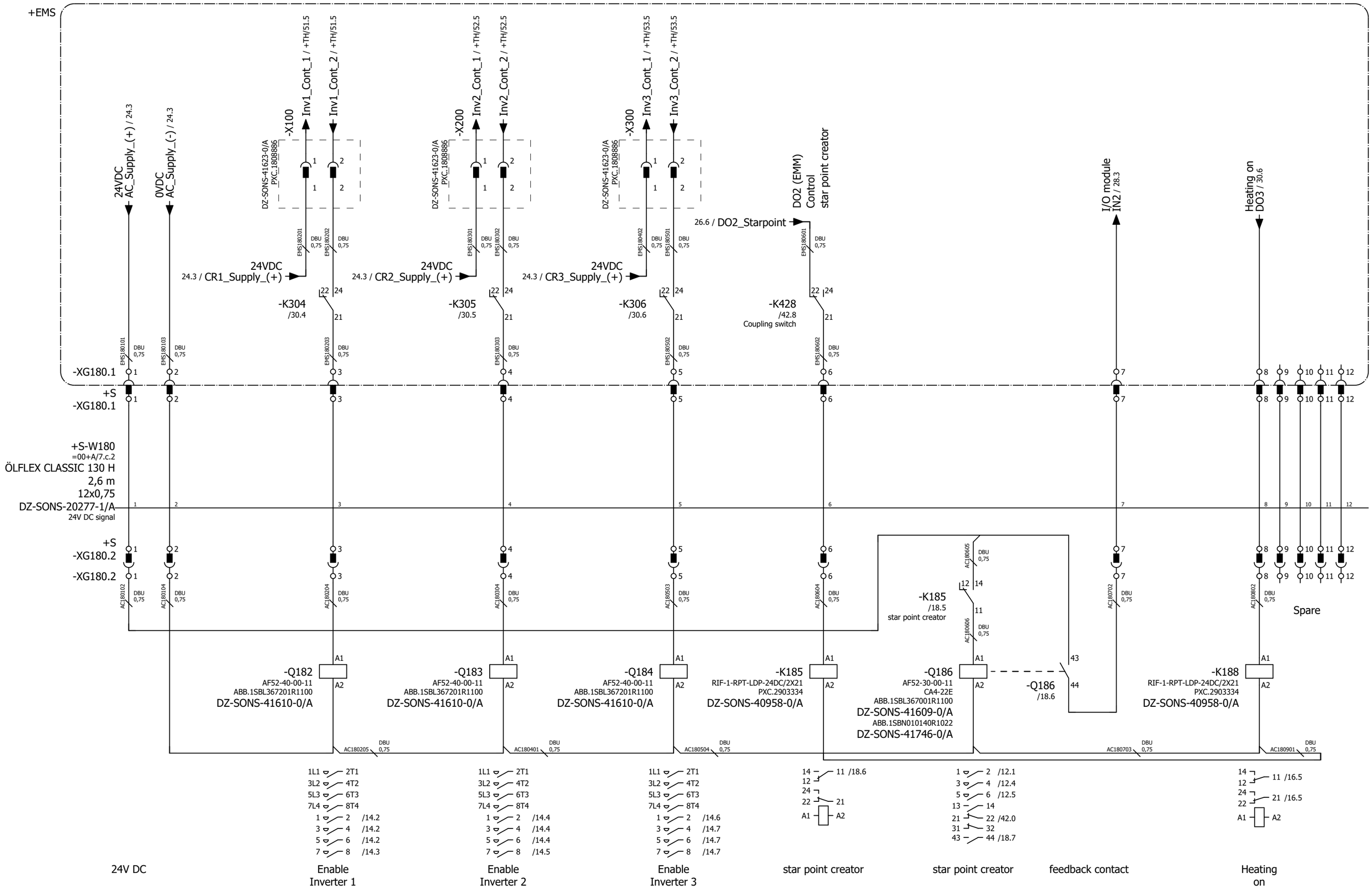
Air-conditioning system

Fan

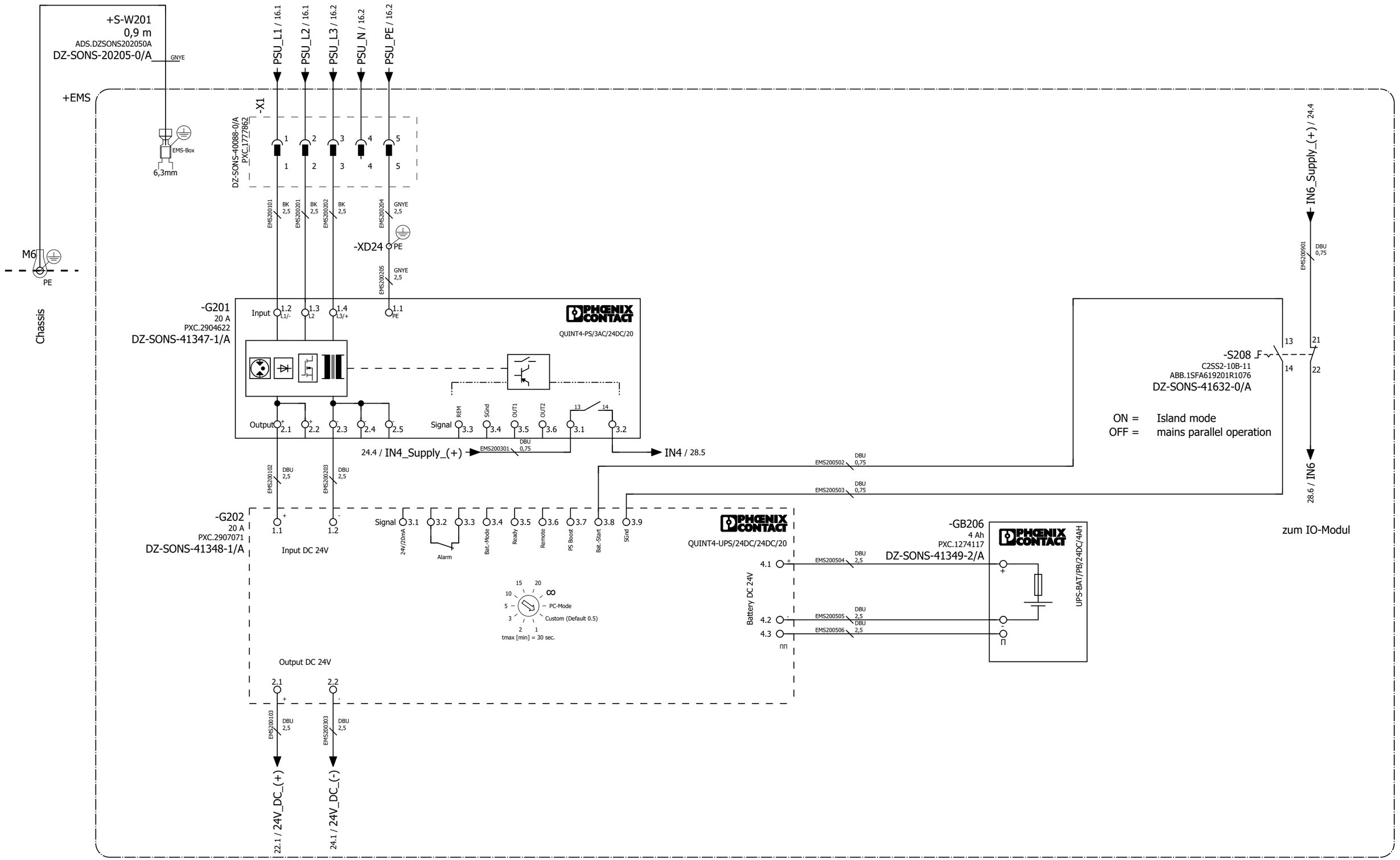
Switch cabinet heating

Mains voltage measurement

			Date	25.05.2023	0-Serie, Köngen		400VAC	==	= 01
			Ed.	BnVr			Auxiliary consumers		+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 16 / Page 29 / 69



			Date	25.05.2023	0-Serie, Köngen	adstec	Release Converter Starpoint creator	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 18 / Page 30 / 69



			Date	26.05.2023	0-Serie, Köngen		Auxiliary voltage	==	= 01
			Ed.	BnVr	Grid Service Station 0813				+ AC
			Appr					++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 20
									Page 31 / 69

+EMS

20.2 / 24V_DC_(+)

1 x FBS 5-6

24.4 / IN5_Supply_(+)

-Q221
PXC.2908262
DZ-SONS-41496-1/A

-Q223

-Q224

-Q226

-Q227

PTCB E1 24DC/1-8A NO

15 A

8 A

8 A

8 A

8 A

6 A

OUT = 8 A

OUT = 8 A

OUT = 8 A

OUT = 8 A

OUT = 6 A

IN5 / 28.5

24V_DC4_(+) / 24.1

24V_DC_(-) / 24.1

-K304
/30.4

-K305
/30.5

-K306
/30.6

-XG221.1

+S-XG221.1
24VDC

+S-W221
ÖLFLEX 191
1,5 m
2x1,5
DZ-SONS-20278-0/C
=00+A/7.c.3

-XD24.

-X10

-X20

-X30

DZ-SONS-40184-0/A
PXC.1777833

+TH/50.4 / TRU_Control_Supply_24VDC_(+)

+TH/50.4 / TRU_Control_Supply_24VDC_(-)

26.7 / DI5_enable

+TH/51.4 / Inv1_Supply_24VDC_(+)

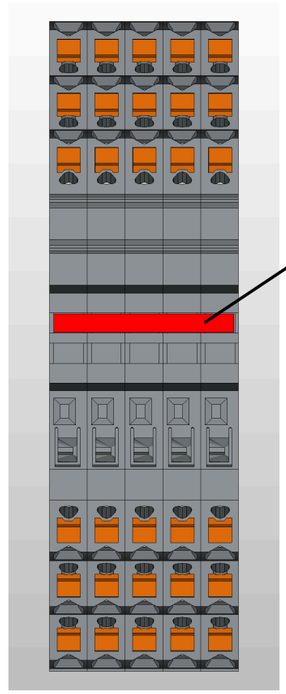
+TH/51.4 / Inv1_Supply_24VDC_(-)

+TH/52.4 / Inv2_Supply_24VDC_(+)

+TH/52.4 / Inv2_Supply_24VDC_(-)

+TH/53.4 / Inv3_Supply_24VDC_(+)

+TH/53.4 / Inv3_Supply_24VDC_(-)



Trumpf
System Control

Trumpf
Inverter 1

Trumpf
Inverter 2

Trumpf
Inverter 3

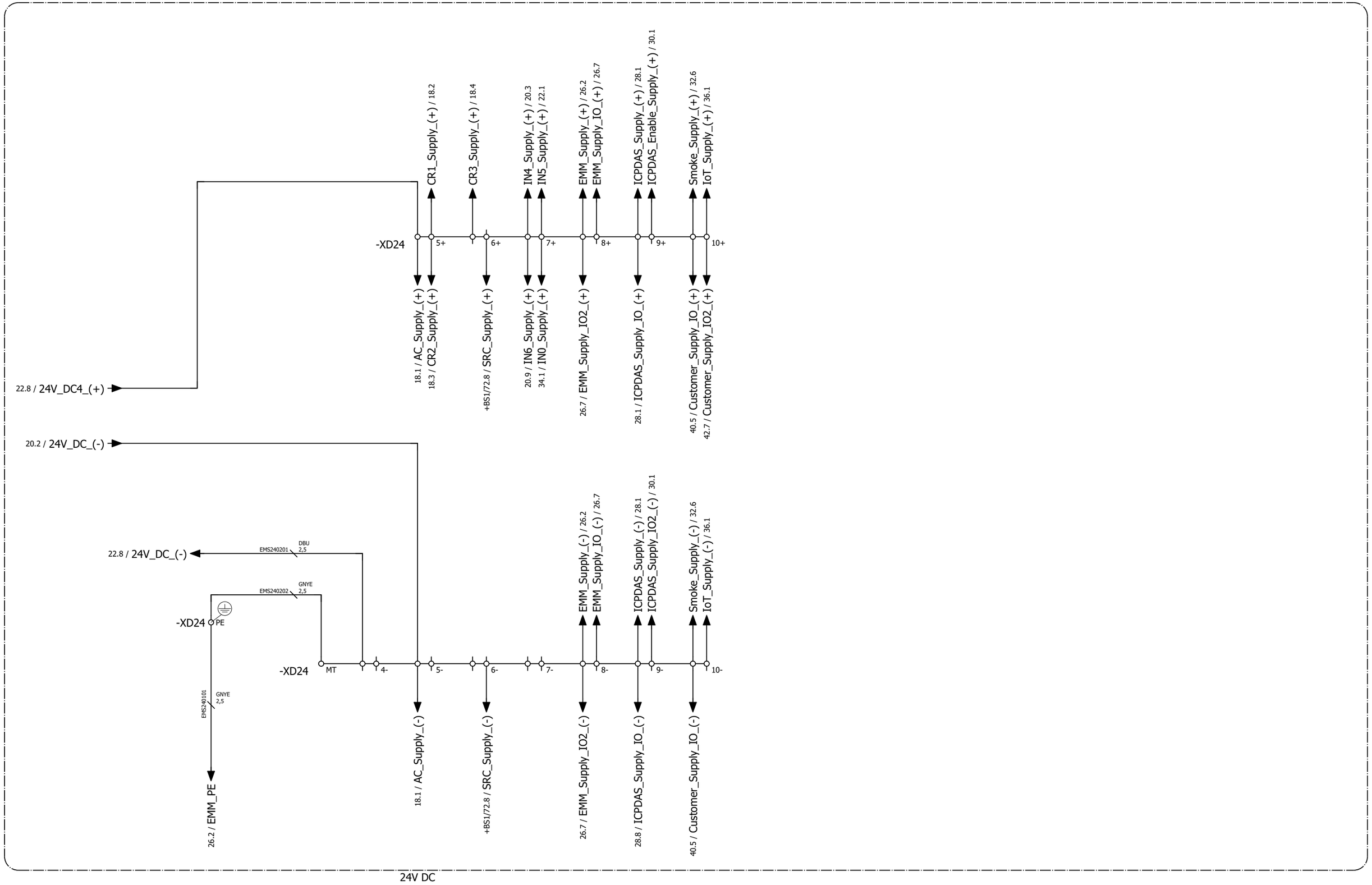
24V DC

20

24

			Date	16.06.2023	0-Serie, Köngen		Auxiliary voltage protecting	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 22 / Page 32 / 69

+EMS


-XD24
5+
6+
7+
8+
9+
10+
CR1_Supply_(+) / 18.2
CR3_Supply_(+) / 18.4
IN4_Supply_(+) / 20.3
IN5_Supply_(+) / 22.1
EMM_Supply_(+) / 26.2
EMM_Supply_IO_(+) / 26.7
ICPDAS_Supply_(+) / 28.1
ICPDAS_Enable_Supply_(+) / 30.1
Smoke_Supply_(+) / 32.6
IoT_Supply_(+) / 36.1
18.1 / AC_Supply_(+)
18.3 / CR2_Supply_(+)
+BS1/72.8 / SRC_Supply_(+)
20.9 / IN6_Supply_(+)
34.1 / IN0_Supply_(+)
26.7 / EMM_Supply_IO2_(+)
28.1 / ICPDAS_Supply_IO_(+)
40.5 / Customer_Supply_IO_(+)
42.7 / Customer_Supply_IO2_(+)
22.8 / 24V_DC4_(+)
20.2 / 24V_DC_(-)
22.8 / 24V_DC_(-)
DBU
2,5
EMS240201
GNYE
2,5
EMS240202
-XD24
PE
-XD24
MT
4-
5-
6-
7-
8-
9-
10-
GNYE
2,5
EMS240101
26.2 / EMM_PE
18.1 / AC_Supply_(-)
+BS1/72.8 / SRC_Supply_(-)
26.7 / EMM_Supply_IO2_(-)
28.8 / ICPDAS_Supply_IO_(-)
40.5 / Customer_Supply_IO_(-)
EMM_Supply_(-) / 26.2
EMM_Supply_IO_(-) / 26.7
ICPDAS_Supply_(-) / 28.1
ICPDAS_Supply_IO2_(-) / 30.1
Smoke_Supply_(-) / 32.6
IoT_Supply_(-) / 36.1

24V DC

+EMS

+MEM-U261
Celphone.60603141
DZ-SONS-41310-0/A

+MEM-X261

+EMS-W261.1
RG174
2,5 m
2x

-X263
AMPH.3511004M05
DZ-SONS-05667-0/A

+S-W261.2
2,5 m

-U264
ADS.DZSKE0001170A
DZ-SKE-000117-0/A

Front
WWAN AUX
GPS
WWAN MAIN

IP : 172.17.10.100

adstec

PWR STAT
VPN WWAN
LED1 LED2

USB

X12

Energy Management Module
Controller EMM3821

Reserve

ETH4 ETH8
ETH3 ETH7
ETH2 ETH6
ETH1 ETH5

GND D- D+
V+ DI2 DO2 GND
DI1 FE 0V V+

RS485
2x DIG IN
1x DIG OUT

-X12 Pinout for IRF3XXX

3 x DIG IN/OUT

V+	EMM_Supply_IO_(+)
DI3	DI3_f+
DI4	DI4_f-
DI5	DI5_enable
DO3	DO3_CSignal_1
DO4	DO4_CSignal_2
DO5	DO5_CSignal_3
GND	EMM_Supply_IO_(-)

Grid adaption

1	DO.PWR	EMS260601 DBU 0,75	EMM_Supply_IO_(+) / 24.4	
2	DO.GND	EMS260602 DBU 0,75	EMM_Supply_IO_(-) / 24.4	
3	DO3		DO3_CSignal_1 / 41.2	
4	DI3		DI3_f+ / 42.5	
5	DO4		DO4_CSignal_2 / 41.3	Frequency
6	DI4		DI4_f- / 42.5	
7	DO5		DO5_CSignal_3 / 41.4	
8	DI5		DI5_enable / 22.2	
9	CAN_HIGH			
10	CAN_LOW			
11	CAN_Shield			
12	CAN_GND			

+EMS-WETH8.1
0,3 m
DZ-SONS-41707-0/A
cable

-XF267
IN OUT
EHRJ45P5E
DZ-SONS-40098-0/A

+S-WETH8.2
0,3 m
DZ-SONS-41707-0/A
cable

Trumpf Hüttinger
System Control
TRU_Control_Eth / +TH/50.1

+S-WETH3.2
3 m
DZ-SONS-41707-4/A
cable

40.2 / SERVICE_LAN

LAN interface Support

-XF263
OUT IN
EHRJ45P5E
DZ-SONS-40098-0/A

-WETH3.1
0,5 m
DZ-SONS-41707-1/A
cable

+EMS-WETH7.1
0,5 m
DZ-SONS-41707-1/A
cable

-XF268
IN OUT
EHRJ45P5E
DZ-SONS-40098-0/A

+S-WETH7.2
2 m
DZ-SONS-41707-3/A
cable

ads tec
Battery
SRC4 / +BS1/72.2

+EMS-WETH6
0,3 m
DZ-SONS-41707-0/A
cable

ETH_6 / 36.1

Rittal IOT

+S-WETH1.2
3 m
DZ-SONS-41707-4/A
cable

40.1 / CUSTOMER_LAN

LAN interface
Customer

-XF262
OUT IN
EHRJ45P5E
DZ-SONS-40098-0/A

-WETH1.1
0,5 m
DZ-SONS-41707-1/A
cable

+EMS-WETH5
0,3 m
DZ-SONS-41707-0/A
cable

ETH_5 / 28.0

I/O module

24.4 / EMM_Supply_(+) → 24VDC — EMS260301 DBU 0,75 → V+
24.4 / EMM_Supply_(-) → 0VDC — EMS260302 DBU 0,75 → 0V
24.1 / EMM_PE → PE → FE

GND
D-
D+

Grid adaption

V+IO		EMS260605 DBU 0,75	EMM_Supply_IO2_(+) / 24.4	
DI2			DI2_U- / 42.4	
DO2			DO2_Starpoint / 18.5	Voltage
GND		EMS260607 DBU 0,75	EMM_Supply_IO2_(-) / 24.4	
DI1			DI1_U+ / 42.4	

Antenna

IRF3821

			Date	26.05.2023	0-Serie, Köngen		==	= 01
			Ed.	BnVr				+ AC
			Appr		Grid Service Station 0813		++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by		Page 26 / Page 34 / 69

adstec

Energy Management Module

+EMS

24.4 / ICPDAS_Supply_(+) → 24V DC — EMS280201 DBU 0,75

24.4 / ICPDAS_Supply_(-) → 0V DC — EMS280202 DBU 0,75

EMS280302 DBU 0,75

-A281
/30.2
ICP.ET7252CR
DZ-SONS-40769-0/A

5 +VS · 6 +VS. · 7 GND · 8 GND.

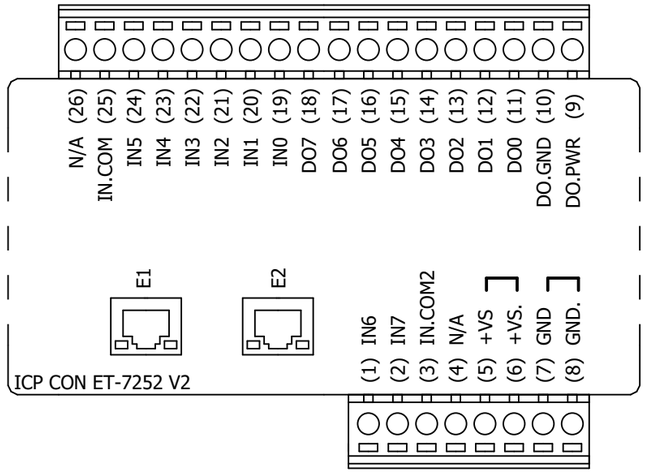
ICP DAS ET-7252CR

RUN
E1
E2

26.7 / ETH_5 → -E1

IP : 172.17.10.10

-E2



IN0 17 · IN1 18 · IN2 19 · IN3 20 · IN4 21 · IN5 22 · IN6 23 · IN7 24 · IN.COM2 3 · IN.COM 25

EMS280203 DBU 0,75 — 34.1 / IN0 — Door switch right

EMS280301 DBU 0,75 — -K427 /42.7 Status Grid (12 | 14 / 11) — Status Grid

EMS280701 DBU 0,75 — 18.7 / IN2 — star point creator

EMS280401 DBU 0,75 — 0 = smoke detector not released / 1 = smoke detector released — -K327 /32.7 smoke detector not released (12 | 14 / 11) — smoke detector

EMS280501 DBU 0,75 — 20.4 / IN4 — 24V DC OK

EMS280502 DBU 0,75 — 22.8 / IN5 — 24V DC Fuses

EMS280601 DBU 0,75 — 20.9 / IN6 — OFF GRID switch

EMS280602 DBU 0,75 — -K428 /42.8 Coupling switch (12 | 14 / 11) — Coupling switch

24.4 / ICPDAS_Supply_IO_(+) → 24V DC — EMS280204 DBU 0,75 — EMS280303 DBU 0,75 — EMS280402 DBU 0,75

EMS280602 DBU 0,75 — 0V DC — 24.4 / ICPDAS_Supply_IO_(-)

0V DC

26 30

			Date	26.05.2023	0-Serie, Köngen		I/O-Modul Inputs	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 28 / Page 35 / 69

+EMS

24.4 / ICPDAS_Enable_Supply_(+)

EMS300101 DBU 0,75

22 24

-K327
/32.7
smoke detector
not released

21

EMS300102 DBU 0,75

-XG301.1 1

+S-XG301.1 1
SRC4 Enable

+S-W301_SRC4
ÖLFLEX CLASSIC 130 H
1,3 m
2x0,75
DZ-SONS-20279-0/C
SRC4 Enable

/30.1
1 =00+A/7.c.4

+S1

ENABLE_A
+BS1/72.2
-SRC4_X1200
+BS1/72.2
ENABLE_B

+S-W301_SRC4
/30.1
2x 2

+S-XG301.1 2

-XG301.1 2

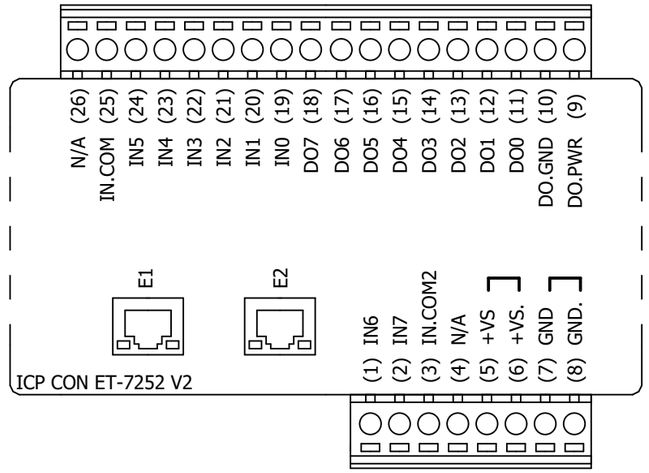
24V DC

0V DC

24.4 / ICPDAS_Supply_IO2_(-)

-A281
/28.1

ICP DAS ET-7252CR



DO.PWR1 9 DO.GND1 10 DO0 11 DO1 12 DO2 13 DO3 14 DO4 15 DO5 16 DO6 17 DO7 18

EMS300301 DBU 0,75
EMS300302 DBU 0,75
EMS300401 DBU 0,75
EMS300501 DBU 0,75
EMS300601 DBU 0,75
EMS300602 DBU 0,75

18.8 / DO3

-K304
RIF-1-RPT-LDP-24DC/2X21
PXC.2903334
DZ-SONS-40958-0/A

-K305
RIF-1-RPT-LDP-24DC/2X21
PXC.2903334
DZ-SONS-40958-0/A

-K306
RIF-1-RPT-LDP-24DC/2X21
PXC.2903334
DZ-SONS-40958-0/A

A1 A2

40.6 / Ext_Stop

EMS300303 DBU 0,75
EMS300402 DBU 0,75
EMS300502 DBU 0,75

External stop

14 12 24 22 A1 A2
11 /22.3
21 /18.2

14 12 24 22 A1 A2
11 /22.4
21 /18.3

14 12 24 22 A1 A2
11 /22.6
21 /18.4

Signal Enable

Release external

Converter 1 ON

Converter 2 ON

Converter 3 ON

Heating on

			Date	25.05.2023	0-Serie, Köngen		I/O-Modul Outputs	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 30
									Page 36 / 69

+S1

-U321

ESYLUX

ER10018930
9V=

smoke detector

Relay
ESYLUX
ER10018923

DZ-SONS-40487-0/A
DZ-SONS-40895-0/A
DZ-SONS-40488-0/A

rt | or | bl
9V | (+) | (-)

rd | or | bl

NC | C | NO

+S
-W321
ÖLFLEX CLASSIC 130 H
3,1 m
3x0,75
DZ-SONS-20280-1/A
DZ-SONS-20280-1/A
smoke detector

1 | 2 | 3 =00+A/7.c.4

+EMS

24.5 / Smoke_Supply_(+)

EMS320601 DBU 0,75
EMS320602 DBU 0,75

-XG326.1 1 | 2 | 3
+S-XG326.1 1 | 2 | 3

-K327
RIF-1-RPT-LDP-24DC/2X21
PXC.2903334
DZ-SONS-40958-0/A

A1
A2

EMS320701 DBU 0,75

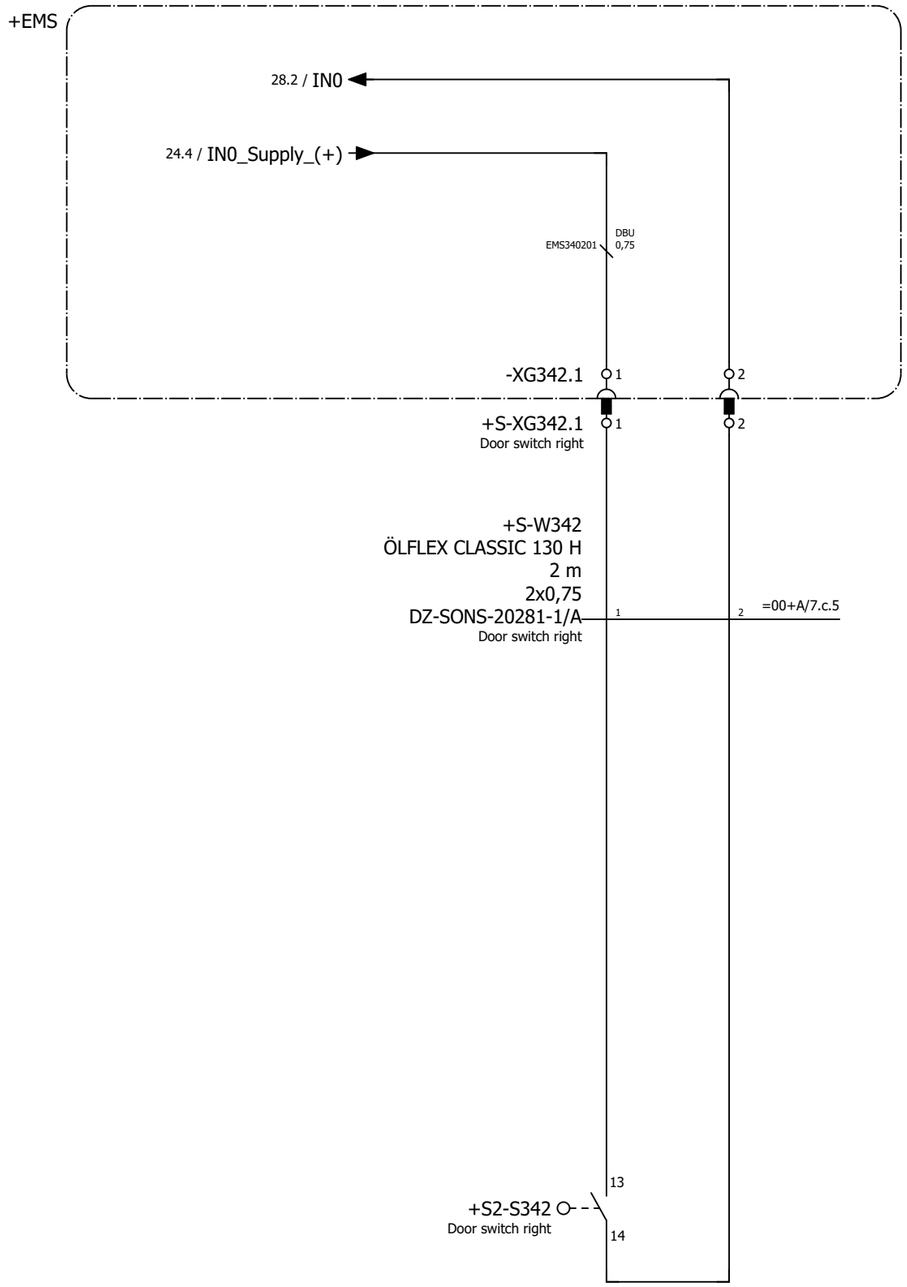
24.5 / Smoke_Supply_(-)

14 — 11 /28.4
12
24 — 21 /30.1
22
A1 — A2

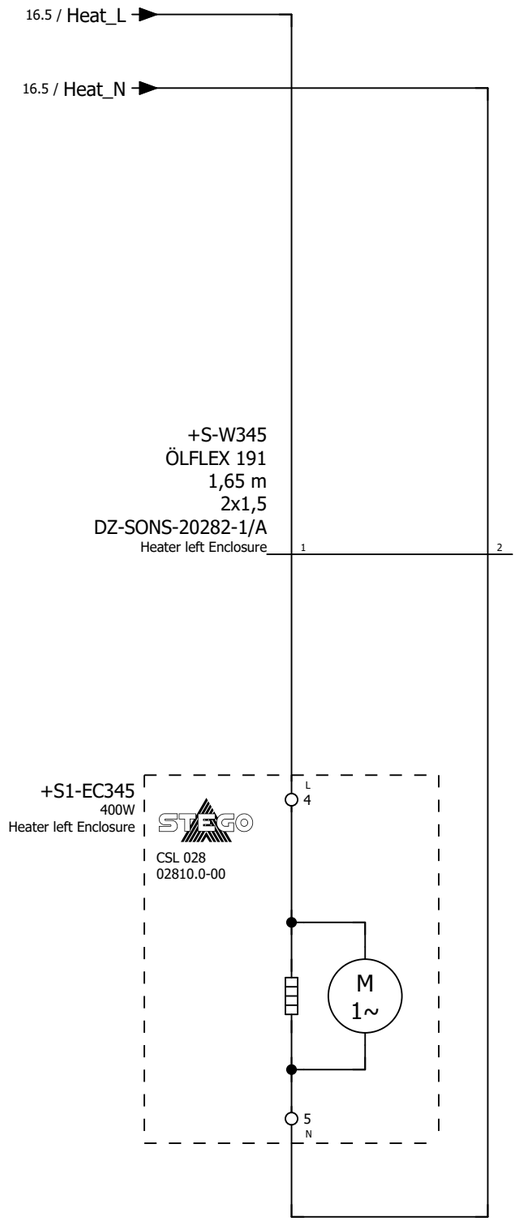
smoke detector

smoke detector
not released

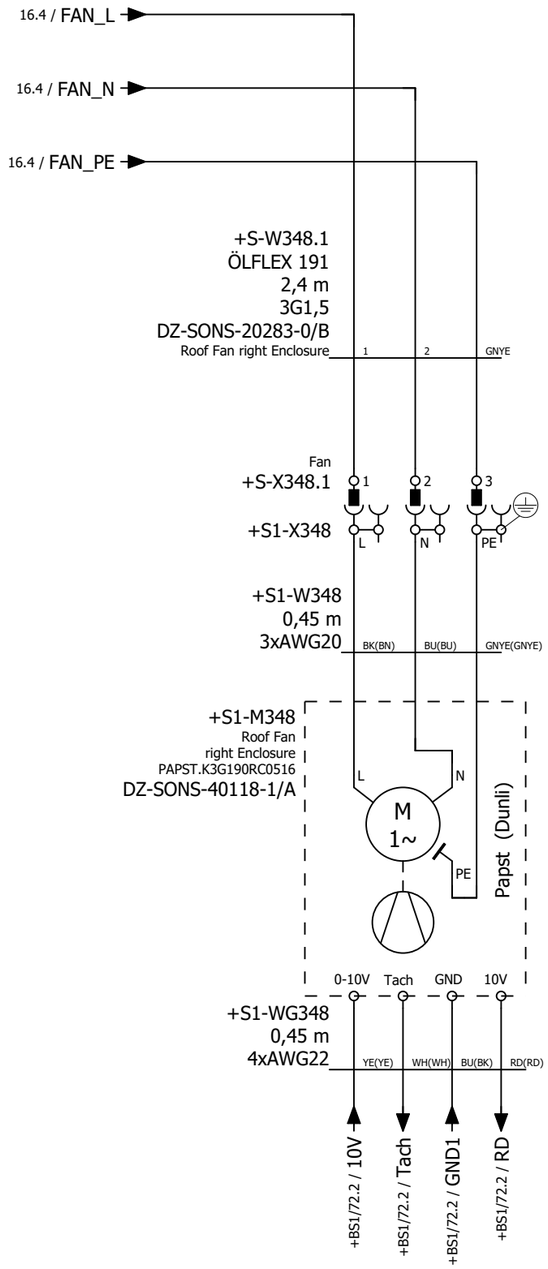
			Date	25.05.2023	0-Serie, Köngen		smoke detector	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 32 / Page 37 / 69



Door switch right

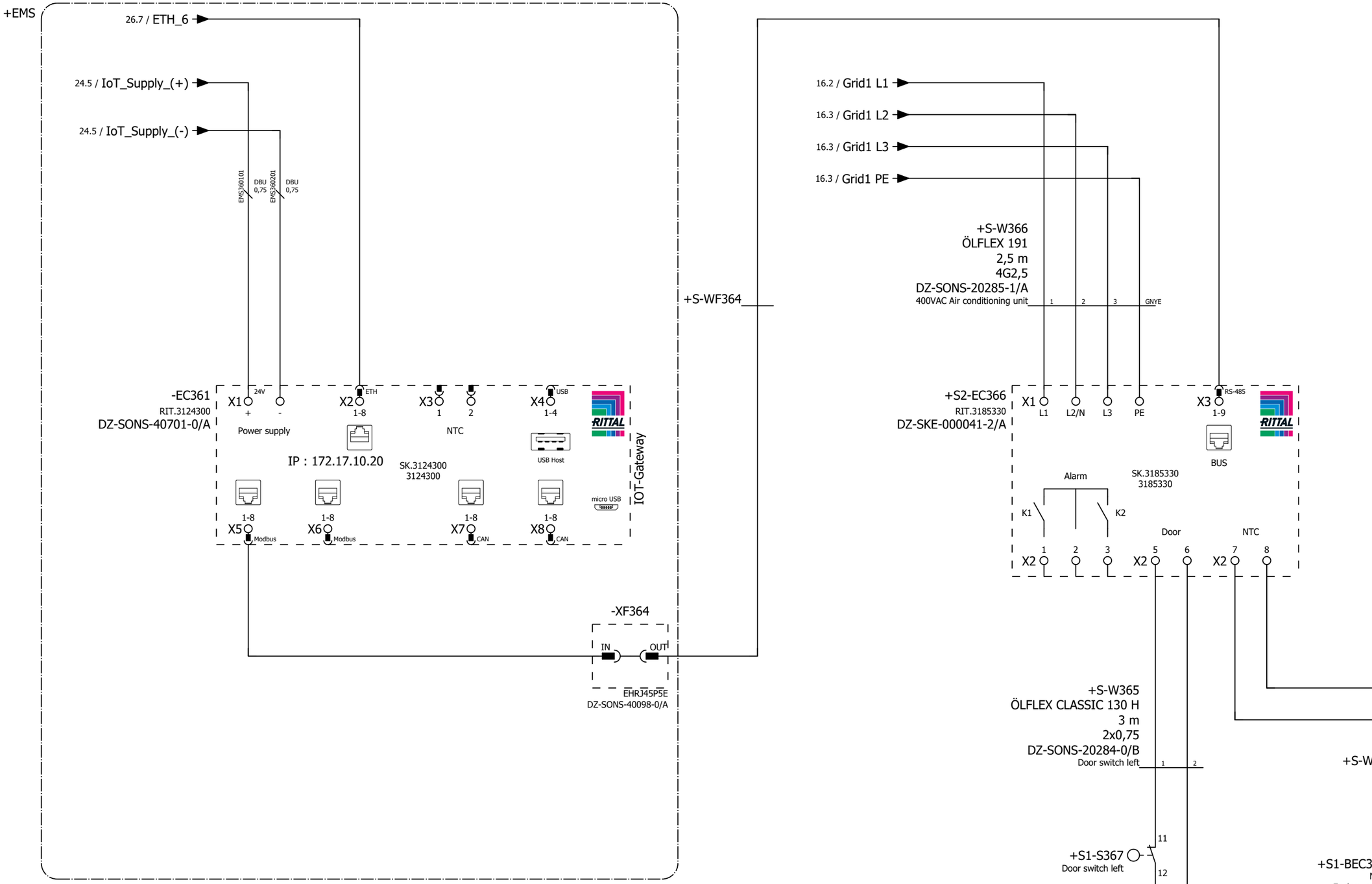


Heater left Enclosure



Roof Fan right Enclosure

			Date	26.05.2023	0-Serie, Köngen	adstec	Door switch, Heater and roof vent	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 34 / Page 38 / 69

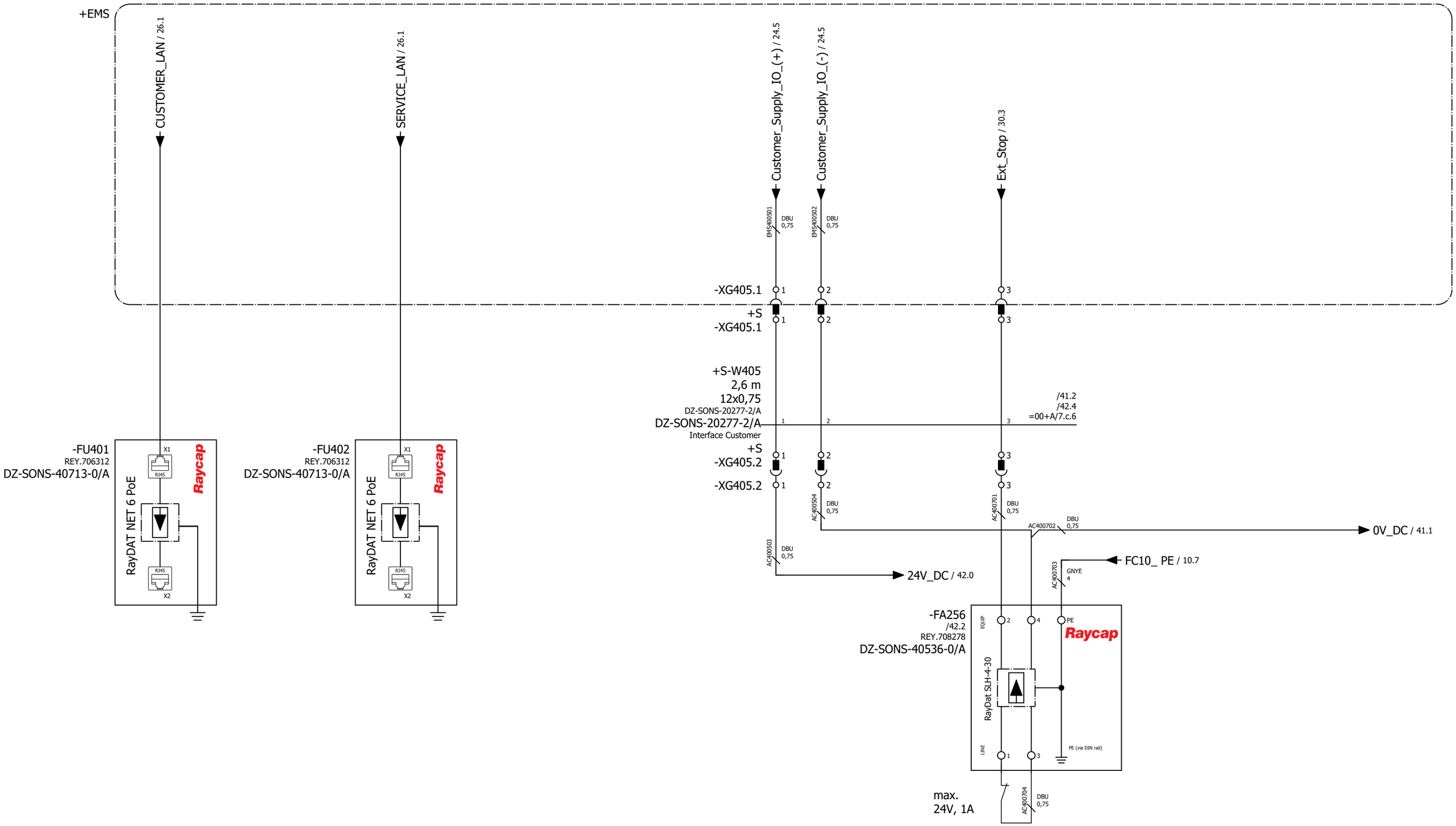


IoT Interface

Air-conditioning unit

Temperature sensor

			Date	26.05.2023	0-Serie, Köngen		climate monitoring systems, IoT Interface	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 36 / Page 39 / 69



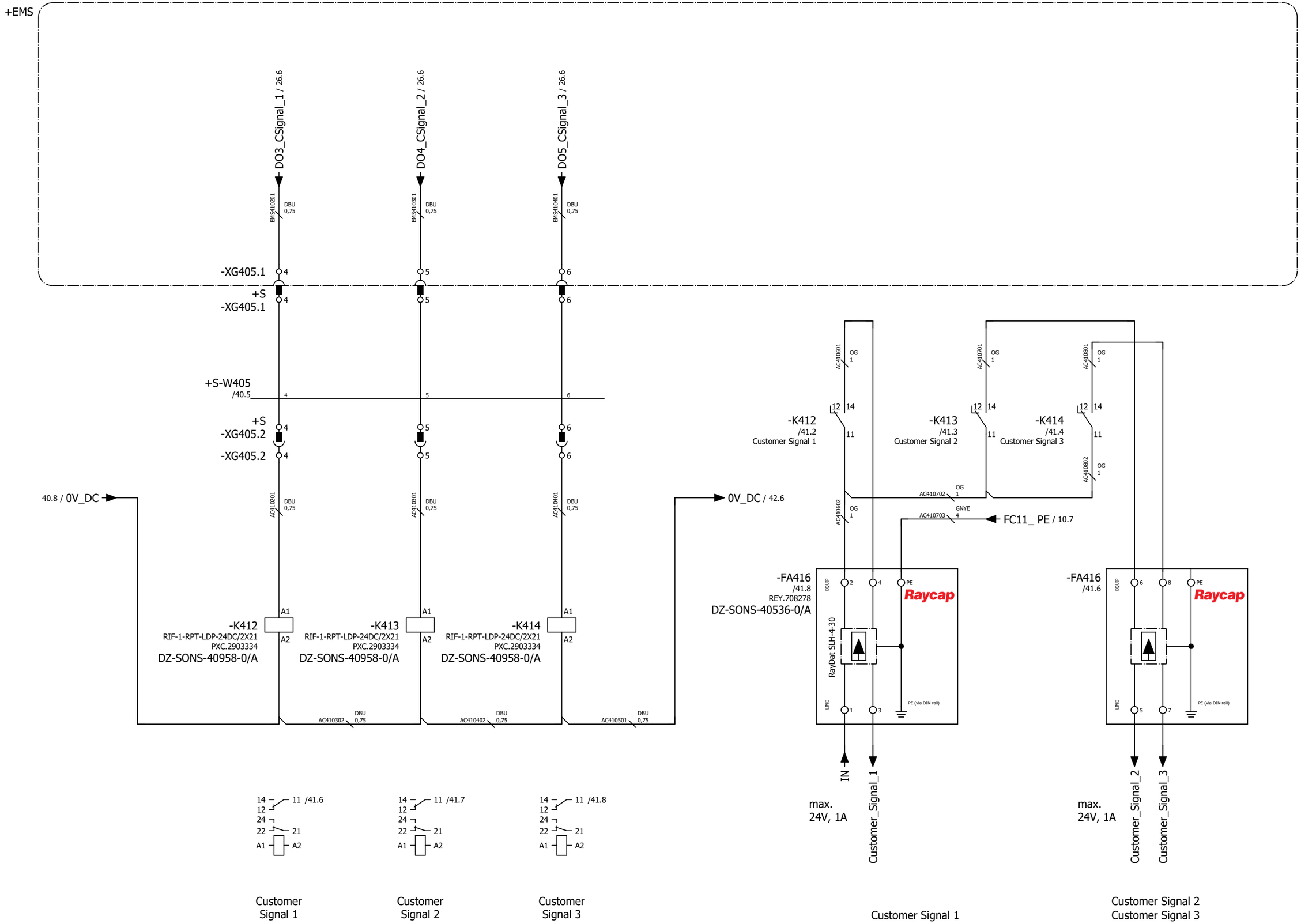
LAN interface Customer

LAN interface Support

24V DC

External Stop Customer

			Date	26.05.2023	0-Serie, Köngen	adstec	Customer interface Surge protection	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 40 / 69



			Date	25.05.2023	0-Serie, Köngen Grid Service Station 0813	adstec	Customer interface Customer Signal 1-3	==	= 01 + AC
			Ed.	BnVr				++	Electrical engineering schematic mounting plate
			Appr						Page 41 Page 41 / 69
Modification	Date	Name	Original		Replacement of	Replaced by			

+EMS

24.5 / Customer_Supply_IO2_(+)

DI1_U+ / 26.7
DI2_U- / 26.7
DI3_f+ / 26.7
DI4_f- / 26.7

-K427
RIF-1-RPT-LDP-24DC/2X21
PXC.2903334
DZ-SONS-40958-0/A

-K428
RIF-1-RPT-LDP-24DC/2X21
PXC.2903334
DZ-SONS-40958-0/A

-XG405.1
+S
-XG405.1
+S-W405
/40.5
+S
-XG405.2
-XG405.2

40.6 / 24V_DC

41.5 / 0V_DC

-Q186
/18.6
star point creator

FC14_ PE / 10.8
FC12_ PE / 10.8
FC13_ PE / 10.8

-FA420
REY.708278
DZ-SONS-40536-0/A
RayDat SLH-4-30

-FA256
/40.6

-FA424
/42.5
REY.708278
DZ-SONS-40536-0/A

-FA424
/42.4

-FA427
/42.8
REY.708278
DZ-SONS-40536-0/A

-FA427
/42.7

max.
24V, 1A

STP_OUT
STP_IN

U+
U-
f+
f-

14 — 11 /28.2
12
24
22 — 21
A1 — A2

Relais R3

14 — 11 /28.6
12
24
22 — 21 /18.5
A1 — A2

Zustand
Sternpunktbildner

Setting pulses
Grid adaption

U+/U-

f+/f-

Status Grid

Coupling switch

			Date	25.05.2023	0-Serie, Köngen		Customer interface Surge protection	==	= 01
			Ed.	BnVr					+ AC
			Appr		Grid Service Station 0813			++	Electrical engineering schematic mounting plate
Modification	Date	Name	Original		Replacement of	Replaced by			Page 42 Page 42 / 69

-U500
DZ-SKE-000106-0/A
TRUH.SystemControl
DZ-SKE-000106-0/A

TRUMPF
Trumpf Hüttinger
TruConvert System Control

IP : 172.17.10.200

-X2
PE 2,5mm²
M4

reset

WIFI

Ethernet 1
RJ-45

Ethernet 2
RJ-45

RS485
RJ-45

Status

-X5
24V
DZ-SONS-41139-0/A
PXC.1847055
+
1
-
2

TH500201
GNYE
2,5

Chassis
M6

+AC/26.8 / TRU_Control_Eth

Modbus
TCP/UDP

51.2 / Inv1_Slave_IN

RS-485

+AC/22.2 / TRU_Control_Supply_24VDC_(+)

+AC/22.2 / TRU_Control_Supply_24VDC_(-)

Potential equalization

24V DC

+AC/42

			Date	26.05.2023	0-Serie, Köngen		Trumpf System Control	==	= 01
			Ed.	BnVr					+ TH
			Appr		Grid Service Station 0813			++	Electrical engineering schematic Trumpf Hüttinger
Modification	Date	Name	Original		Replacement of	Replaced by			Page 50 / Page 43 / 69

-U510
25 kW
TRUH.TruConvertAC3025
DZ-SKE-000104-0/A

TRUMPF
Trumpf Hüttinger
TruConvert AC 3025

L1 L2 L3 N PE — AC / DC — DC+ MP DC-

Slave
OUT RJ-45
IN RJ-45

Master
OUT RJ-45

Status

-X2
PE 4mm²
M6

-X3
DZ-SONS-41628-0/A
PXC.1969467
1 2 3
+ MP -

TH1_PLUS / 57.2
TH1_MINUS / 57.3
TH510301 DRU.15020 BK 10
TH510401 DRU.15020 BK 10

DC LINK

-X5
24V
DZ-SONS-41624-0/A
PXC.1812759
+ -
1 2

-X4
DZ-SONS-41626-0/A
PXC.1812830
n.c. 1 2 n.c. L1 L2 L3 N n.c PE
1 2 3 4 5 6 7 8 9 10

Mains voltage measurement
Contactor
Mains Measurement

DZ-SONS-41629-0/A
PXC.1969483
-X1
5 PE
4 N
3 L3
2 L2
1 L1
Mains

+S-W512
2 m
DZ-SONS-41653-3/A
cable

TH510201 GNYE 4

TH510402 DBU 1,5
TH510403 DBU 1,5

TH510501 DBU 1,5
TH510502 DBU 1,5

TH510601 BK 2,5
TH510602 BK 2,5
TH510603 BK 2,5
TH510604 BU 2,5

TH510701 GNYE 2,5

TH510702 BK 10
TH510801 BK 10
TH510802 BK 10
TH510803 BU 10
TH510804 GNYE 10

52.2 / Inv2_Slave_IN
50.3 / Inv1_Slave_IN
M6
+AC/22.3 / Inv1_Supply_24VDC_(+)
+AC/22.3 / Inv1_Supply_24VDC_(-)
+AC/18.2 / Inv1_Cont_1
+AC/18.2 / Inv1_Cont_2
+AC/16.6 / Inv1_Meas_L1
+AC/16.7 / Inv1_Meas_L2
+AC/16.7 / Inv1_Meas_L3
+AC/16.7 / Inv1_Meas_N
+AC/16.7 / Inv1_Meas_PE
+AC/14.2 / Inv1_Main_L1
+AC/14.2 / Inv1_Main_L2
+AC/14.2 / Inv1_Main_L3
+AC/14.3 / Inv1_Main_N
+AC/14.3 / Inv1_Main_PE

RS-485 OUT
RS-485 IN

SCHWARZ Potential equalization
24V DC
Contactor release
Mains voltage measurement
Powerterminal Grid

			DATE	01.12.2021	0-Serie, Köngen	adstec	Trumpf-Hüttinger-Inverter 1	EPE000060	=01
			NAME	BnVr					+TH
			PLOT	16.06.2023	Grid Service Station 0813				SH. 51
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		57 SHS

-U520
25 kW
TRUH.TruConvertAC3025
DZ-SKE-000104-0/A

TRUMPF
Trumpf Hüttinger
TruConvert AC 3025

L1 L2 L3 N PE — AC/DC — DC+ MP DC-

-X3
DZ-SONS-41628-0/A
PXC.1969467
1 (+) 2 (MP) 3 (-)
DC LINK

TH2_PLUS / 57.4 — DRU.15020 — TH520301 — BK 10
TH2_MINUS / 57.5 — DRU.15020 — TH520401 — BK 10

-X2
PE 4mm²
M6

Slave
OUT RJ-45
IN RJ-45

Master
OUT RJ-45

Status

+S-W522
0,3 m
DZ-SONS-41653-0/A
cable

53.2 / Inv3_Slave_IN
51.1 / Inv2_Slave_IN

RS-485 OUT
RS-485 IN

Ethernet-Kabel mit Sonder-Farbe
zur Unterscheidung von Ethernet/RS485-Bus

TH520201 — GNYE 4 — M6
Potential equalization

-X5
DZ-SONS-41624-0/A
PXC.1812759
24V
+ 1
- 2

TH520402 — DBU 1,5 — +AC/22.5 / Inv2_Supply_24VDC_(+)
TH520403 — DBU 1,5 — +AC/22.5 / Inv2_Supply_24VDC_(-)
24V DC

Mains voltage measurement
Contactor
Mains Measurement

-X4
DZ-SONS-41626-0/A
PXC.1812830
n.c. 1
1 2
2 3
n.c. 4
L1 5
L2 6
L3 7
N 8
n.c 9
PE 10

TH520501 — DBU 1,5 — +AC/18.3 / Inv2_Cont_1
TH520502 — DBU 1,5 — +AC/18.3 / Inv2_Cont_2
Contactor release

TH520601 — BK 2,5 — +AC/16.7 / Inv2_Meas_L1
TH520602 — BK 2,5 — +AC/16.7 / Inv2_Meas_L2
TH520603 — BK 2,5 — +AC/16.7 / Inv2_Meas_L3
TH520604 — BU 2,5 — +AC/16.7 / Inv2_Meas_N
TH520701 — GNYE 2,5 — +AC/16.7 / Inv2_Meas_PE
Mains voltage measurement

DZ-SONS-41629-0/A
PXC.1969483
-X1
5 PE
4 N
3 L3
2 L2
1 L1
Mains

TH520702 — BK 10 — +AC/14.4 / Inv2_Main_L1
TH520801 — BK 10 — +AC/14.4 / Inv2_Main_L2
TH520802 — BK 10 — +AC/14.4 / Inv2_Main_L3
TH520803 — BU 10 — +AC/14.5 / Inv2_Main_N
TH520804 — GNYE 10 — +AC/14.5 / Inv2_Main_PE
Powerterminal Grid

			DATE	01.12.2021	0-Serie, Köngen	adstec	Trumpf-Hüttinger-Inverter 2	EPE000060	=01
			NAME	BnVr					+TH
			PLOT	16.06.2023	Grid Service Station 0813				SH. 52
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		57 SHS

-U530
25 kW
TRUH.TruConvertAC3025
DZ-SKE-000104-0/A

TRUMPF
Trumpf Hüttinger
TruConvert AC 3025

L1 L2 L3 N PE — AC/DC — DC+ MP DC-

TH3_PLUS / 57.6
TH3_MINUS / 57.7
TH530301 DRU.15020 BK 10
TH530401 DRU.15020 BK 10

-X3
DZ-SONS-41628-0/A
PXC.1969467
1 + 2 MP 3 -
DC LINK

-X2
PE 4mm²
M6

Slave
OUT RJ-45
IN RJ-45

Master
OUT RJ-45

Status

-X5
DZ-SONS-41624-0/A
PXC.1812759
24V
1 + 2 -

-X4
DZ-SONS-41626-0/A
PXC.1812830
Contactor
Mains Measurement
n.c. 1 1 2 2 n.c. 3 L1 4 L2 5 L3 6 N 7 n.c 8 PE 9 10

Mains voltage measurement

DZ-SONS-41629-0/A
PXC.1969483
-X1
Mains
5 PE
4 N
3 L3
2 L2
1 L1

R-ON

+S-W532
0,3 m
DZ-SONS-41653-0/A
cable
52.1 / Inv3_Slave_IN

termination resistor

TH530201 GNYE 4

M6

RS-485
IN

Ethernet-Kabel mit Sonder-Farbe
zur Unterscheidung von Ethernet/RS485-Bus

Potential equalization

TH530402 DBU 1,5 +AC/22.6 / Inv3_Supply_24VDC_(+)
TH530403 DBU 1,5 +AC/22.6 / Inv3_Supply_24VDC_(-)

24V DC

TH530501 DBU 1,5 +AC/18.4 / Inv3_Cont_1
TH530502 DBU 1,5 +AC/18.4 / Inv3_Cont_2

Contactor release

TH530601 BK 2,5 +AC/16.8 / Inv3_Meas_L1
TH530602 BK 2,5 +AC/16.8 / Inv3_Meas_L2
TH530603 BK 2,5 +AC/16.8 / Inv3_Meas_L3
TH530604 BU 2,5 +AC/16.9 / Inv3_Meas_N
TH530701 GNYE 2,5 +AC/16.9 / Inv3_Meas_PE

Mains voltage measurement

TH530702 BK 10 +AC/14.6 / Inv3_Main_L1
TH530801 BK 10 +AC/14.7 / Inv3_Main_L2
TH530802 BK 10 +AC/14.7 / Inv3_Main_L3
TH530803 BU 10 +AC/14.7 / Inv3_Main_N
TH530804 GNYE 10 +AC/14.8 / Inv3_Main_PE

Powerterminal Grid

			DATE	01.12.2021	0-Serie, Köngen	adstec	Trumpf-Hüttinger-Inverter 3	EPE000060	=01
			NAME	BnVr					+TH
			PLOT	16.06.2023	Grid Service Station 0813				SH. 53
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		57 SHS

DC-link

+S-W571
0,9 m
ADS.DZSONS202050A
DZ-SONS-20205-0/A
GNYE

+FB

EMS-Box
6,3mm

M6
PE

Chassis

FB570801 TR 50
DZ-SONS-41418-2/A
DRU.15184
PLUS / +BS1/71.7

DC-Link
from SRC4

FB570802 TR 50
DZ-SONS-41418-2/A
DRU.15184
MINUS / +BS1/71.6

-XD572 1+ Pick-off terminal block AGK 10-UKH 50

DC-Voltage : 905,5 V

2+ Pick-off terminal block AGK 10-UKH 50

3+ Pick-off terminal block AGK 10-UKH 50

-XD572 1- Pick-off terminal block AGK 10-UKH 50

2- Pick-off terminal block AGK 10-UKH 50

3- Pick-off terminal block AGK 10-UKH 50

FB740201 DRU.15020 TR 10
FB570301 DRU.15020 TR 10
FB570401 DRU.15020 TR 10
FB570501 DRU.15020 TR 10
FB570601 DRU.15020 TR 10
FB570701 DRU.15020 TR 10

-F572 60A LFXV15060 BC DZ-SONS-41615-0/A
-F573 60A LFXV15060 BC DZ-SONS-41616-0/A
-F574 60A LFXV15060 BC DZ-SONS-41615-0/A
-F575 60A LFXV15060 BC DZ-SONS-41616-0/A
-F576 60A LFXV15060 BC DZ-SONS-41615-0/A
-F577 60A LFXV15060 BC DZ-SONS-41616-0/A

FB570202 DRU.15020 TR 10
FB570302 DRU.15020 TR 10
FB570402 DRU.15020 TR 10
FB570502 DRU.15020 TR 10
FB570602 DRU.15020 TR 10
FB570702 DRU.15020 TR 10

-X31 DZ-SONS-41628-0/A PXC.1969467
-X32 DZ-SONS-41628-0/A PXC.1969467
-X33 DZ-SONS-41628-0/A PXC.1969467

51.3 / TH1_PLUS
51.4 / TH1_MINUS
52.3 / TH2_PLUS
52.4 / TH2_MINUS
53.3 / TH3_PLUS
53.4 / TH3_MINUS

Converter 1
Converter 2
Converter 3

			DATE	01.12.2021	0-Serie, Köngen	adstec	DC Fuses	EPE000060	=01
			NAME	BnVr					+TH
			PLOT	16.06.2023	Grid Service Station 0813				SH. 57
CHANGES	DATE	NAME	FORM.	EPLAN 4.10 :14.09.93	ORIG.	EST.WITH	EST.BY		57 SHS

Caution Voltage !

Voltage also present when main switch is turned off

-W1
NSGAFÖU
1x50
3000 V BK

-W2
NSGAFÖU
1x50
3000 V BK

-W10
NSGAFÖU
1x50
3000 V BK

-SRB1
SRB5106

-CAN1 -CAN2

DVG-SRB7129 XXX-YYY

9 BATTERY MODULE

713 - 903 V DC

-R_CAN
termination resistor

-SRB9
SRB5106

-CAN1 -CAN2

DVG-SRB7129 XXX-YYY

CAN:

Data Out:	
1	
2	CAN_L
3	CAN_GND
4	
5	CAN_SHLD
6	
7	CAN_H
8	
9	

-SRC4310
/72.2

DVG-SRC4310-001-AA/AD

-X300 D-SUB9 -X1600 USB

Current Sensor LF 310-S

-X300

Storage Rack Controller

Front

SRC4310

CAN-BUS1 USB RESET BATT CR2032

-S1

-X400 -X500 -X2000 -X203 -X401 -X501 -X2001

-S1 13 14 RD BK

-K1 Charge + X1(+) X2(-)

-K2 Discharge- X1(+) X2(-)

-K3 Precharge X1(+) X2(-)

23 24 RD BK

33 34 RD BK

43 44 51 52 61 62

72.6 / 24Vdc

72.6 / GND

600A, aR Gigavac 1 2

450A, aR SIBA 1 2

-K2 /71.4 A2- A1+

-K1 /71.4 A2- A1+

-K3 /71.5 A2- A1+ 1 25A, gPV SIBA 2

X2000:1 72.3

X2000:2 / 72.3

OG WH T1 T2

-K1 /71.4 -K2 /71.4 -K3 /71.5

-X1100 Rear - DC_HV-

+ DC_HV+

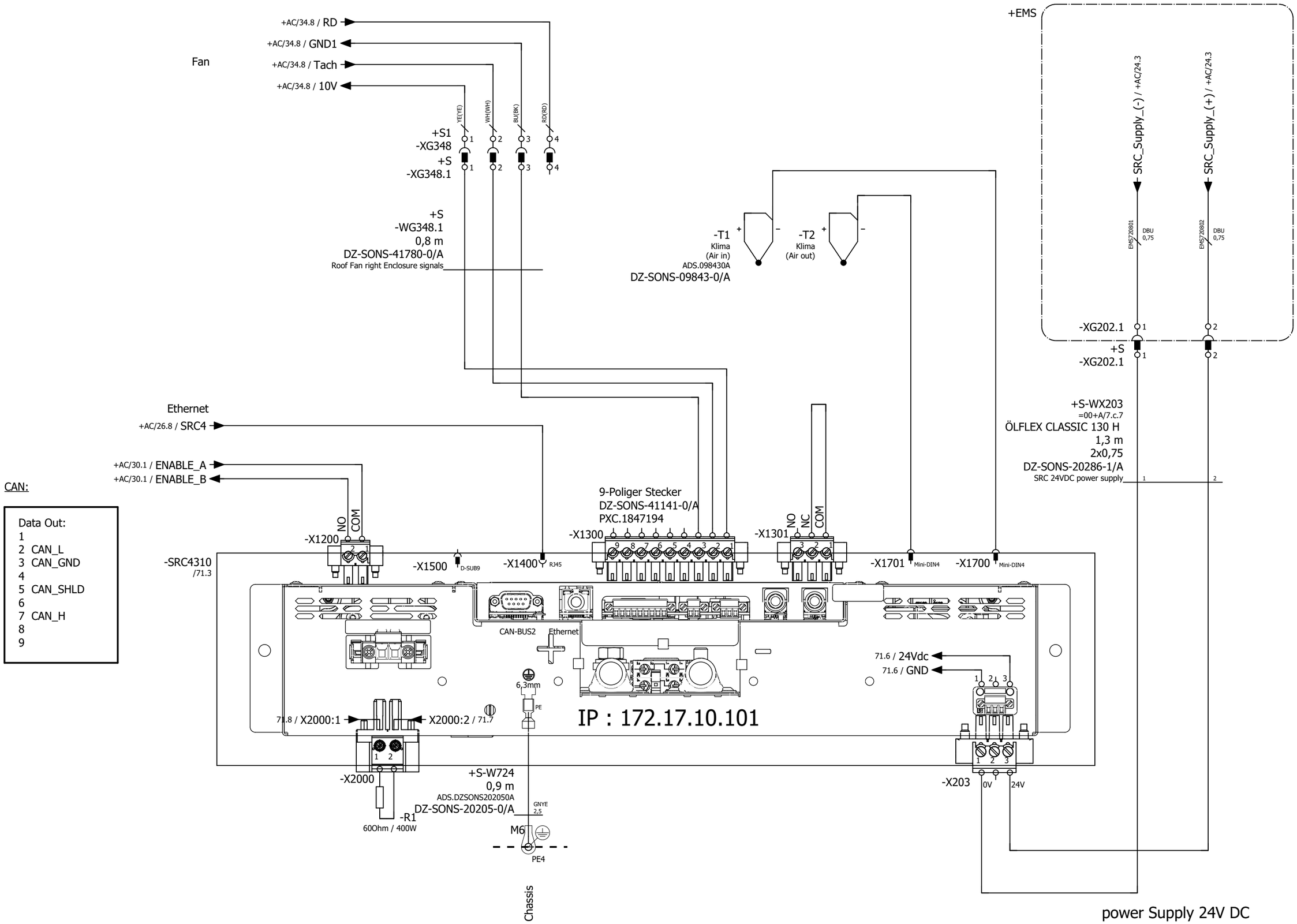
MINUS +TH/57.8

PLUS +TH/57.8

HX241CAC /71.7 /71.8 HX241CAC /71.6 /71.8 HX241CAC /71.8 /71.9

			Date	16.06.2023	0-Serie, Köngen	adstec	BATTERIE-STRING 1 SRC4310 front view	==	= 01 + BS1
			Ed.	BnVr					
			Appr		Grid Service Station 0813			++	Electrical engineering schematic Battery string 1
Modification	Date	Name	Original		Replacement of	Replaced by			Page 71 Page 48 / 69

0	1	2	3	4	5	6	7	8	9



71

=BPA+S/1

			Date	26.05.2023	0-Serie, Köngen		BATTERIE-STRING 1	==	= 01
			Ed.	BnVr			SRC4310 rear view		+ BS1
			Appr		Grid Service Station 0813			++	Electrical engineering schematic
Modification	Date	Name	Original		Replacement of	Replaced by			Battery string 1

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Summarized parts list

F02_001-ads

Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
DZ-SONS-20276-0/B	DZ-SONS-20276-0/B	1 Piece	-W161 Power supply	DZ-SONS-20276-0/B ADS.DZSONS202760B	ads-tec GmbH ADS-TEC	
DZ-SONS-20277-1/A	DZ-SONS-20277-1/A	1 Piece	-W180 24VDC signals	DZ-SONS-20277-1/A ADS.DZSONS202771A	ads-tec GmbH ADS-TEC	
DZ-SONS-20205-0/A	DZ-SONS-20205-0/A	2,70 Piece	-W201;-W571;-W724 GSS0606 PE battery compartment	DZ-SONS-20205-0/A ADS.DZSONS202050A	ads-tec GmbH ADS-TEC	
DZ-SONS-20278-0/C	DZ-SONS-20278-0/C	1	-W221 Trumpf system control	DZ-SONS-20278-0/C ADS.DZSONS202780C	ads-tec GmbH ADS-TEC	
DZ-SONS-20279-0/C	DZ-SONS-20279-0/C	1 Piece	-W301_SRC4 signal enable	DZ-SONS-20279-0/C ADS.DZSONS202790C	ads-tec GmbH ADS-TEC	
DZ-SONS-20280-1/A	DZ-SONS-20280-1/A	1 Piece	-W321 smoke detector	DZ-SONS-20280-1/A ADS.DZSONS202801A	ads-tec GmbH ADS-TEC	
DZ-SONS-20281-1/A	DZ-SONS-20281-1/A	1 Piece	-W342 door contact right side	DZ-SONS-20281-1/A ADS.DZSONS202811A	ads-tec GmbH ADS-TEC	
DZ-SONS-20282-1/A	DZ-SONS-20282-1/A	1 Piece	-W345 heater left compartment	DZ-SONS-20282-1/A ADS.DZSONS202821A	ads-tec GmbH ADS-TEC	
DZ-SONS-20283-0/B	DZ-SONS-20283-0/B	1 Piece	-W348.1 ??? Übersetzung fehlt	DZ-SONS-20283-0/B ADS.DZSONS202830B	ads-tec GmbH ADS-TEC	
DZ-SONS-20284-0/B	DZ-SONS-20284-0/B	1 Piece	-W365 climate control door contact left side	DZ-SONS-20284-0/B ADS.DZSONS202840B	ads-tec GmbH ADS-TEC	
DZ-SONS-20285-1/A	DZ-SONS-20285-1/A	1 Piece	-W366 400V AC air condition supply	DZ-SONS-20285-1/A ADS.DZSONS202851A	ads-tec GmbH ADS-TEC	
DZ-SONS-20277-2/A	DZ-SONS-20277-2/A	1 Piece	-W405 24VDC signals	DZ-SONS-20277-2/A ADS.DZSONS202772A	ads-tec GmbH ADS-TEC	
BS08-22035	DZ-SONS-41653-3/A	1 Piece	-W512 Patchcable 2m cat. 6 U/UTP slim, black	BS08-22035 SHI.BS0822035	Shiverpeaks SHI	
BS08-22305	DZ-SONS-41653-0/A	2 Piece	-W522;-W532 Patchcable 0,3m cat. 6 U/UTP slim, black	BS08-22305 SHI.BS0822305	Shiverpeaks SHI	
BS08-22040	DZ-SONS-41707-4/A	2 Piece	-WETH1.2;-WETH3.2 Patchcable 3m cat. 6 U/UTP slim, grey	BS08-22040 SHI.BS0822040	Shiverpeaks SHI	
BS08-22030	DZ-SONS-41707-3/A	1 Piece	-WETH7.2 Patchcable 2m cat. 6 U/UTP slim, grey	BS08-22030 SHI.BS0822030	Shiverpeaks SHI	
BS08-22300	DZ-SONS-41707-0/A	1 Piece	-WETH8.2 Patchcable 0,3m cat. 6 U/UTP slim, grey	BS08-22300 SHI.BS0822300	Shiverpeaks SHI	
DZ-SONS-41780-0/A	DZ-SONS-41780-0/A	1 Piece	-WG348.1 Roof Fan right Enclosure signals	DZ-SONS-41780-0/A ADS.DZSONS417800A	ads-tec GmbH ADS-TEC	
DZ-SONS-20286-1/A	DZ-SONS-20286-1/A	1 Piece	-WX203 SRC 24VDC power supply	DZ-SONS-20286-1/A ADS.DZSONS202861A	ads-tec GmbH ADS-TEC	

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
3210062	DZ-SONS-40326-0/A	8 Piece	-X348.1;-XG162.1...-XG162.3;-XG162.5;-XG166.1...-XG166.3 Plug L	PP-H 2,5/1-L PXC.3210062	PHOENIX CONTACT PXC	
3210101	DZ-SONS-40760-0/A	8 Piece	-X348.1;-XG162.1...-XG162.3;-XG162.5;-XG166.1...-XG166.3 Plug M BU	PP-H 2,5/1-M BU PXC.3210101	PHOENIX CONTACT PXC	
3210143	DZ-SONS-40328-0/A	8 Piece	-X348.1;-XG162.1...-XG162.3;-XG162.5;-XG166.1...-XG166.3 Plug R GNYE	PP-H 2,5/1-R GNYE PXC.3210143	PHOENIX CONTACT PXC	
3040614	DZ-SONS-40329-0/A	8 Piece	-X348.1;-XG162.1...-XG162.3;-XG162.5;-XG166.1...-XG166.3 Latching	PRZ PXC.3040614	PHOENIX CONTACT PXC	
3212905	DZ-SONS-40210-0/A	12 Piece	-XG18.2;-XG180.1;-XG180.2;-XG202.1;-XG221.1;-XG301.1;-XG326.1;-XG342.1;-XG348.1;-XG405.1;-XG405.2 Latching	PRZ 1,5/S PXC.3212905	PHOENIX CONTACT PXC	
3212714	DZ-SONS-40757-0/A	12 Piece	-XG18.2;-XG180.1;-XG180.2;-XG202.1;-XG221.1;-XG301.1;-XG326.1;-XG342.1;-XG348.1;-XG405.1;-XG405.2 Plug R	PP-H 1,5/S/1-R PXC.3212714	PHOENIX CONTACT PXC	
3210091	DZ-SONS-40758-0/A	10 Piece	-XG162.1;-XG162.2;-XG166.1...-XG166.3 Plug M	PP-H 2,5/1-M PXC.3210091	PHOENIX CONTACT PXC	
3212659	DZ-SONS-41157-0/A	11 Piece	-XG180.1;-XG180.2;-XG202.1;-XG221.1;-XG301.1;-XG326.1;-XG342.1;-XG348.1;-XG405.1;-XG405.2 Plug L	PP-H 1,5/S/1-L PXC.3212659	PHOENIX CONTACT PXC	
3212688	DZ-SONS-40759-0/A	45 Piece	-XG180.1;-XG180.2;-XG326.1;-XG348.1;-XG405.1;-XG405.2 Plug M	PP-H 1,5/S/1-M PXC.3212688	PHOENIX CONTACT PXC	

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
SK 3124.400	DZ-SONS-40373-0/A	1 Piece	-BEC368 Temperature sensor for Blue e+ cooling units, Blue e+ chillers 2,5m	SK 3124.400 RIT.3124400	Rittal RIT	
02810.0-00		1 Piece	-EC345 fan heater CSL 028, 400 W, AC 230 V, Clip	CSL 028 STE.02810.0-00	Stego STE	
K3G190-RC05-16	DZ-SONS-40118-1/A	1 Piece	-M348 EC Centrifugal fan	K3G190-RC05-16 PAPST.K3G190RC0516	ebmpapst PAPST	
ER10018930	DZ-SONS-40487-0/A	1 Piece	-U321 Smoke detector PROTECTOR K 9 V Lithium	ER10018930 ESY.ER10018930	ESYLUX GmbH ESY	
ER10018985	DZ-SONS-40895-0/A	1 Piece	-U321 Base for PROTECTOR K AP socket, H=27mm	ER10018985 ESY.ER10018985	ESYLUX GmbH ESY	
ER10018923	DZ-SONS-40488-0/A	1 Piece	-U321 Switching relay changer for PROTECTOR K 9 V Lithium	ER10018923 ESY.ER10018923	ESYLUX GmbH ESY	
3209662	DZ-SONS-40800-0/A	1 Piece	-X348 Feed-through terminal	PT 2,5-QUATTRO/2P PXC.3209662	PHOENIX CONTACT PXC	
3209675	DZ-SONS-40801-0/A	1 Piece	-X348 Feed-through terminal	PT 2,5-QUATTRO/2P BU PXC.3209675	PHOENIX CONTACT PXC	
3209688	DZ-SONS-40802-0/A	1 Piece	-X348 Ground modular terminal block	PT 2,5-QUATTRO/2P-PE PXC.3209688	PHOENIX CONTACT PXC	
3040083	DZ-SONS-40803-0/A	1 Piece	-X348 End cover	D-ST 2,5-QUATTRO/2P PXC.3040083	PHOENIX CONTACT PXC	
3022276	DZ-SONS-40212-0/A	3 Piece	-X348;-XG348 End bracket	CLIPFIX 35-5 PXC.3022276	PHOENIX CONTACT PXC	
3208582	DZ-SONS-40206-0/A	4 Piece	-XG348 Feed-through terminal	PT 1,5/S/1P PXC.3208582	PHOENIX CONTACT PXC	
3208142	DZ-SONS-40106-0/A	1 Piece	-XG348 End cover	D-PT 1,5/S PXC.3208142	PHOENIX CONTACT PXC	

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
3185330	DZ-SKE-000041-2/A	1 Piece	-EC366 Wall-mounted cooling unit Blue e+ outdoor	SK.3185330 RIT.3185330	Rittal RIT	
1201662	DZ-SONS-40745-0/A	10 Piece	-X1N;-XD0 End bracket	E/AL-NS 35 PXC.1201662	PHOENIX CONTACT PXC	

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
RayDIN 400Y-T1-HV	DZ-SONS-40533-0/A	1 Piece	-F104 Discharger	RayDIN 400Y-T1-HV REY.RayDIN 400Y-T1-HV	Raycap GmbH RAY	
2CDS283001R0504	DZ-SONS-41613-0/A	3 Piece	-F142;-F144;-F146 Circuit breaker - S200P - 3P - C - 50 A	S203P-C50 ABB.2CDS283001R0504	ABB ABB	
2CDS273001R0164	DZ-SONS-40433-0/A	1 Piece	-F162 Circuit breaker - S200M - 3P - C - 16 A	S203M-C16 ABB.2CDS273001R0164	ABB ABB	
3022276	DZ-SONS-40212-0/A	23 Piece	-F162;-K414;-Q186;-X1PE;-XD142;-XD144;-XD146;-XG162;-XG166;-XG180.2;-XG405.2;-XQ182...-XQ184 End bracket	CLIPFIX 35-5 PXC.3022276	PHOENIX CONTACT PXC	
2CDS271001R0164	DZ-SONS-41617-0/A	1 Piece	-F165 Circuit breaker - S200M - 1P - C - 16 A	S201M-C16 ABB.2CDS271001R0164	ABB ABB	
2CDL210001R1602	DZ-SONS-41687-0/A	1 Piece	-F165 Phase busbar	PS1/2/16 ABB.2CDL210001R1602	ABB ABB	
2CDS274001R0218	DZ-SONS-41683-0/A	1 Piece	-F166 Circuit breaker - S200M - 4P - Z - 1 A	S204M-Z1 ABB.2CDS274001R0218	ABB ABB	
7082.78	DZ-SONS-40536-0/A	5 Piece	-FA256;-FA416;-FA420;-FA424;-FA427 Discharger	RayDat SLH-4-30 REY.708278	Raycap GmbH RAY	
706 312	DZ-SONS-40713-0/A	2 Piece	-FU401;-FU402 Lightning protection LAN CAT6 48V	RayDat NET 6 REY.706312	Raycap GmbH RAY	
2903334	DZ-SONS-40958-0/A	5 Piece	-K185;-K188;-K412...-K414 Relay module	RIF-1-RPT-LDP-24DC/2X21 PXC.2903334	PHOENIX CONTACT PXC	
3KD3442-0NE10-0	DZ-SONS-41685-1/A	1 Piece	-Q101 Switch disconnector 690V 160A 4P	3KD3442-0NE10-0 SIE.3KD3442-0NE10-0	Siemens SIE	
3KD9204-5	DZ-SONS-41688-0/A	8 Piece	-Q101 Cable connection cover short version contains 8 units, Accessory for 3KD size 2	3KD9204-5 SIE.3KD9204-5	Siemens SIE	
4027 4 10	DZ-MECH-47143-0/A	4 Piece	-Q101 Cylinder screw	M4x10 T20 A2 WÜRT.4027410	Würth Elektronik WÜRT	
1SBL367201R1100	DZ-SONS-41610-0/A	3 Piece	-Q182...-Q184 AF52-40-00-11 contactor 24-60VAC 20-60VDC	AF52-40-00-11 ABB.1SBL367201R1100	ABB ABB	
1SBN123402R1000	DZ-SONS-41727-0/A	6 Piece	-Q182...-Q184 LT52-40 Main terminal protection	LT52-40 ABB.1SBN123402R1000	ABB ABB	
1SBL367001R1100	DZ-SONS-41609-0/A	1 Piece	-Q186 AF52-30-00-11 contactor 24-60V50/60Hz 20-60VDC	AF52-30-00-11 ABB.1SBL367001R1100	ABB ABB	
1SBN010140R1022	DZ-SONS-41746-0/A	1 Piece	-Q186 CA4-22E auxiliary contact block 4-pole / 2 NO, 2 NC / screw type connecting terminals	CA4-22E ABB.1SBN010140R1022	ABB ABB	
1SBN123401R1000	DZ-SONS-41728-0/A	2 Piece	-Q186 LT65-30 Main terminal protection	LT65-30 ABB.1SBN123401R1000	ABB ABB	
1SBN010140R1122	DZ-SONS-41618-0/A	1 Piece	-Q186 CA4-22M auxiliary contact block 4-pole / 2 NO, 2 NC / screw type connecting terminals	CA4-22M ABB.1SBN010140R1122	ABB ABB	

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
9340100	DZ-MECH-47212-0/A	1 Piece	-WC100 Base tray	SV.9340100-(ADS-TEC) ADS.DZMECH472120A	ads-tec GmbH ADS-TEC	
9340070	DZ-SONS-41149-0/A	2 Piece	-WC100 End cover	SV.9340070 RIT.9340070	Rittal RIT	
9340000	DZ-SONS-41148-0/A	2 Piece	-WC100 Busbar support for flat copper busbars	SV.9340000 RIT.9340000	Rittal RIT	
9340090	DZ-SONS-41154-0/A	6 Piece	-WC100 Spacer	SV.9340090 RIT.9340090	Rittal RIT	
3212147	DZ-SONS-40663-0/A	6 Piece	-X1PE;-XQ182...-XQ184 Ground modular terminal block	PT 16 N-PE PXC.3212147	PHOENIX CONTACT PXC	
3212060	DZ-SONS-40671-0/A	6 Piece	-X1PE;-XQ182...-XQ184 End cover	D-PT 16 N PXC.3212060	PHOENIX CONTACT PXC	
1201662	DZ-SONS-40745-0/A	16 Piece	-XD0;-XDN;-XDP1.1;-XDPE End bracket	E/AL-NS 35 PXC.1201662	PHOENIX CONTACT PXC	
3213140	DZ-SONS-40447-0/A	6 Piece	-XD0 Power terminal	UKH 70 PXC.3213140	PHOENIX CONTACT PXC	
3213210	DZ-SONS-40698-0/A	6 Piece	-XD0;-XDPE Fixed bridge	FBI 2-20 N EX PXC.3213210	PHOENIX CONTACT PXC	
3244601	DZ-SONS-40449-0/A	5 Piece	-XD0;-XDN Power terminal	UKH 70 BU PXC.3244601	PHOENIX CONTACT PXC	
3213141	DZ-SONS-40450-0/A	5 Piece	-XD0;-XDPE;-XQ182;-XQ184 Ground modular terminal block	UKH 70-PE/S PXC.3213141	PHOENIX CONTACT PXC	
9342250	DZ-SONS-41153-0/A	1 Piece	-XD101 Connection adapter	SV.9342250 RIT.9342250	Rittal RIT	
9342410	DZ-SONS-41620-0/A	3 Piece	-XD142;-XD144;-XD146 Circuit-breaker component adaptor	SV.9342410 RIT.9342410	Rittal RIT	
9320120	DZ-SONS-41708-0/A	5 Piece	-XD142;-XD144;-XD146 Support rail 35 x 15 mm	SV.9320120 RIT.9320120	Rittal RIT	
9340700	DZ-SONS-41621-0/A	1 Piece	-XD166 OM adaptor	SV.9340700 RIT.9340700	Rittal RIT	
9340460	DZ-SONS-41152-0/A	1 Piece	-XD166 OM adaptor	SV.9340460 RIT.9340460	Rittal RIT	
3001763	DZ-SONS-40595-0/A	6 Piece	-XDN Pick-off terminal block	AGK 10-UKH 50 PXC.3001763	PHOENIX CONTACT PXC	
3213211	DZ-SONS-41163-0/A	1 Piece	-XDN Fixed bridge	FBI 3-20 N EX PXC.3213211	PHOENIX CONTACT PXC	
3209662	DZ-SONS-40800-0/A	11 Piece	-XG162;-XG166 Feed-through terminal	PT 2,5-QUATTRO/2P PXC.3209662	PHOENIX CONTACT PXC	

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
3030190	DZ-SONS-40500-0/A	1 Piece	-XG162 Plug-in bridge	FBS 5-5 PXC.3030190	PHOENIX CONTACT PXC	
3209675	DZ-SONS-40801-0/A	5 Piece	-XG162;-XG166 Feed-through terminal	PT 2,5-QUATTRO/2P BU PXC.3209675	PHOENIX CONTACT PXC	
3036893	DZ-SONS-40778-0/A	1 Piece	-XG162 Plug-in bridge	FBS 4-5 BU PXC.3036893	PHOENIX CONTACT PXC	
3209688	DZ-SONS-40802-0/A	5 Piece	-XG162;-XG166 Ground modular terminal block	PT 2,5-QUATTRO/2P-PE PXC.3209688	PHOENIX CONTACT PXC	
3040083	DZ-SONS-40803-0/A	4 Piece	-XG162;-XG166 End cover	D-ST 2,5-QUATTRO/2P PXC.3040083	PHOENIX CONTACT PXC	
3036929	DZ-SONS-41507-0/A	1 Piece	-XG166 Plug-in bridge, number of positions: 20, blue	FBS 20-5 BU PXC.3036929	PHOENIX CONTACT PXC	
3208582	DZ-SONS-40206-0/A	24 Piece	-XG180.2;-XG405.2 Feed-through terminal	PT 1,5/S/1P PXC.3208582	PHOENIX CONTACT PXC	
3208142	DZ-SONS-40106-0/A	2 Piece	-XG180.2;-XG405.2 End cover	D-PT 1,5/S PXC.3208142	PHOENIX CONTACT PXC	
5015111	DZ-SONS-40561-0/A	1 Piece	-XPE Potential bonding rail for outside	5015111 OBO.5015111	OBO Bettermann Holding GmbH & Co. KG OBO	

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
ET-7252 CR	DZ-SONS-40769-0/A	1 Piece	-A281 I/O-Modul 8DI 8DO RJ45	ET-7252 CR ICP.ET7252CR	ICP DAS-EUROPE GmbH ICP	
3124300	DZ-SONS-40701-0/A	1 Piece	-EC361 IoT Interface	SK.3124300 RIT.3124300	Rittal RIT	
2904622	DZ-SONS-41347-1/A	1 Piece	-G201 Power supply	QUINT4-PS/3AC/24DC/20 PXC.2904622	PHOENIX CONTACT PXC	
2907071	DZ-SONS-41348-1/A	1 Piece	-G202 Uninterruptible power supply	QUINT4-UPS/24DC/24DC/20 PXC.2907071	PHOENIX CONTACT PXC	
1274117	DZ-SONS-41349-2/A	1 Piece	-GB206 Energy storage	UPS-BAT/PB/24DC/4AH PXC.1274117	PHOENIX CONTACT PXC	
2903334	DZ-SONS-40958-0/A	6 Piece	-K304...-K306;-K327;-K427;-K428 Relay module	RIF-1-RPT-LDP-24DC/2X21 PXC.2903334	PHOENIX CONTACT PXC	
2908262	DZ-SONS-41496-1/A	5 Piece	-Q221;-Q223;-Q224;-Q226;-Q227 Electronic circuit breaker	PTCB E1 24DC/1-8A NO PXC.2908262	PHOENIX CONTACT PXC	
3030349	DZ-SONS-41630-0/A	1 Piece	-Q221 Plug-in bridge	FBS 5-6 PXC.3030349	PHOENIX CONTACT PXC	
3022276	DZ-SONS-40212-0/A	15 Piece	-Q227;-XD24;-XG180.1;-XG202.1;-XG221.1;-XG301.1;-XG326.1;-XG342.1;-XG405.1 End bracket	CLIPFIX 35-5 PXC.3022276	PHOENIX CONTACT PXC	
1SFA619201R1076	DZ-SONS-41632-0/A	1 Piece	-S208 Selector Switch, black, 2-position 1NO+	C2SS2-10B-11 ABB.1SFA619201R1076	ABB ABB	
3036877	DZ-SONS-41637-0/A	2 Piece	-U4;-XD24 Plug-in bridge	FBS 2-5 BU PXC.3036877	PHOENIX CONTACT PXC	
DZ-SKE-000117-0/A	DZ-SKE-000117-0/A	1 Piece	-U264 Controller EMM3821	EMM3821 001-AA ADS.DZSKE0001170A	ads-tec GmbH ADS-TEC	
BS08-22010	DZ-SONS-41707-1/A	3 Piece	-WETH1.1;-WETH3.1;-WETH7.1 Patchcable 0,5m cat. 6 U/UTP slim, grey	BS08-22010 SHI.BS0822010	Shiverpeaks SHI	
BS08-22300	DZ-SONS-41707-0/A	3 Piece	-WETH5;-WETH6;-WETH8.1 Patchcable 0,3m cat. 6 U/UTP slim, grey	BS08-22300 SHI.BS0822300	Shiverpeaks SHI	
17778862	DZ-SONS-40088-0/A	1 Piece	-X1 PCB connector	PC 5/5-STF1-7,62 PXC.1777862	PHOENIX CONTACT PXC	
1716645	DZ-SONS-40092-1/A	1 Piece	-X1.0 Feed-through plug	DFK-PC 5/ 5-STF-7,62 PXC.1716645	PHOENIX CONTACT PXC	
1777833	DZ-SONS-40184-0/A	3 Piece	-X10;-X20;-X30 PCB connector	PC 5/ 2-STF1-7,62 PXC.1777833	PHOENIX CONTACT PXC	
1716616	DZ-SONS-40176-0/A	3 Piece	-X10.0;-X20.0;-X30.0 Feed-through plug	DFK-PC 5/ 2-STF-7,62 PXC.1716616	PHOENIX CONTACT PXC	
1808886	DZ-SONS-41623-0/A	3 Piece	-X100;-X200;-X300 PCB connector	MSTB 2,5/ 2-ST-5,08-LR PXC.1808886	PHOENIX CONTACT PXC	

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1096152	DZ-SONS-41622-0/A	3 Piece	-X100.0;-X200.0;-X300.0 Feed-through plug	DFK-MSTB 2,5/ 2-STF-5,08-LR PXC.1096152	PHOENIX CONTACT PXC	
3209578	DZ-SONS-40597-0/A	19 Piece	-XD24;-XD24. Feed-through terminal	PT 2,5-QUATTRO PXC.3209578	PHOENIX CONTACT PXC	
3036880	DZ-SONS-40665-0/A	3 Piece	-XD24;-XD24. Plug-in bridge	FBS 3-5 BU PXC.3036880	PHOENIX CONTACT PXC	
1043963	DZ-SONS-41298-0/A	0 Piece	-XD24 Cover segment	DS-PT 2,5-MT PXC.1043963	PHOENIX CONTACT PXC	
3030514	DZ-SONS-40598-0/A	3 Piece	-XD24 End cover	D-ST 2,5-QUATTRO PXC.3030514	PHOENIX CONTACT PXC	
3209536	DZ-SONS-40129-0/A	2 Piece	-XD24 Ground modular terminal block	PT 2,5-PE PXC.3209536	PHOENIX CONTACT PXC	
3210157	DZ-SONS-40841-0/A	0 Piece	-XD24 Knife-disconnect terminal block	PT 2,5-MTB PXC.3210157	PHOENIX CONTACT PXC	
3036903	DZ-SONS-40501-0/A	1 Piece	-XD24 Plug-in bridge	FBS 5-5 BU PXC.3036903	PHOENIX CONTACT PXC	
3210156	DZ-SONS-41279-0/A	1 Piece	-XD24 Knife-disconnect terminal block	PT 2,5-MT PXC.3210156	PHOENIX CONTACT PXC	
3030226	DZ-SONS-41508-0/A	1 Piece	-XD24 Plug-in bridge, number of positions: 20, red	FBS 20-5 PXC.3030226	PHOENIX CONTACT PXC	
3030190	DZ-SONS-40500-0/A	1 Piece	-XD24 Plug-in bridge	FBS 5-5 PXC.3030190	PHOENIX CONTACT PXC	
3030161	DZ-SONS-40123-0/A	1 Piece	-XD24 Plug-in bridge	FBS 2-5 PXC.3030161	PHOENIX CONTACT PXC	
3036929	DZ-SONS-41507-0/A	1 Piece	-XD24. Plug-in bridge, number of positions: 20, blue	FBS 20-5 BU PXC.3036929	PHOENIX CONTACT PXC	
EHRJ45P5E	DZ-SONS-40098-0/A	5 Piece	-XF262;-XF263;-XF267;-XF268;-XF364 Coupling	EHRJ45P5E SWCR.EHRJ45P5E	Switchcraft Conxall SWCR	
3208582	DZ-SONS-40206-0/A	35 Piece	-XG180.1;-XG202.1;-XG221.1;-XG301.1;-XG326.1;-XG342.1;-XG405.1 Feed-through terminal	PT 1,5/S/1P PXC.3208582	PHOENIX CONTACT PXC	
3208142	DZ-SONS-40106-0/A	9 Piece	-XG180.1;-XG202.1;-XG221.1;-XG301.1;-XG326.1;-XG342.1;-XG405.1 End cover	D-PT 1,5/S PXC.3208142	PHOENIX CONTACT PXC	

Summarized parts list

F02_001-ads

Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
TruConvert SysCon 2418064	DZ-SKE-000106-0/A	1 Piece	-U500 System Control	Trumpf Hüttinger TruConvert System Control TRUH.SystemControl	TRUMPF Hüttinger GmbH + Co. KG TRUH	
1847055	DZ-SONS-41139-0/A	1 Piece	-U500-X5 PCB connector	MC 1,5/ 2-STF-3,5 PXC.1847055	PHOENIX CONTACT PXC	
TruConvertAC3025	DZ-SKE-000104-0/A	3 Piece	-U510;-U520;-U530 AC-DC-Modul	TruConvert AC 3025 TRUH.TruConvertAC3025	TRUMPF Hüttinger GmbH + Co. KG TRUH	
1969483	DZ-SONS-41629-0/A	3 Piece	-U510-X1;-U520-X1;-U530-X1 PCB connector	IPC 16/ 5-STF-10,16 PXC.1969483	PHOENIX CONTACT PXC	
1969467	DZ-SONS-41628-0/A	3 Piece	-U510-X3;-U520-X3;-U530-X3 PCB connector	IPC 16/ 3-STF-10,16 PXC.1969467	PHOENIX CONTACT PXC	
1812830	DZ-SONS-41626-0/A	3 Piece	-U510-X4;-U520-X4;-U530-X4 PCB connector	GMSTB 2,5 HCV/10-ST-7,62-LR PXC.1812830	PHOENIX CONTACT PXC	
1812759	DZ-SONS-41624-0/A	3 Piece	-U510-X5;-U520-X5;-U530-X5 PCB connector	GMSTB 2,5 HCV/ 2-ST-7,62-LR PXC.1812759	PHOENIX CONTACT PXC	

+EMS/1.a

+BS1/1

			Date	16.06.2023	0-Serie, Köngen Grid Service Station 0813		ads-tec Energy GmbH	Summarized parts list : TRUH.SystemControl - PXC.1812759	= BPA
			Ed	BnVr					+ TH
			Appr					EPE000060	Page 1
Modification	Date	Name	Original		Replacement of	Replaced by			Page 59 / 69

Summarized parts list

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
RXLG400W60RJ	DZ-SONS-40245-0/A	1 Piece	-R1 High Power Aluminum Case Resistor	Fullde: RXLG400J GUAN.RXLG400W60RJ	GUANGDONG FULLDE ELECTRONICS CO., LTD. GUAN	
SRB7129	DVG-SRB7129 XXX-YYY	2 Piece	-SRB1;-SRB9 High-performance energy storage	SRB7129 ADS.SRB7129	ads-tec GmbH ADS-TEC	
DVG-SRC4310 001-AA/AD	DVG-SRC4310-001-AA/AD	1 Piece	-SRC4310 Battery Controller	SRC4310 ADS.DVGSRC4310001AAAD	ads-tec GmbH ADS-TEC	
GFP410	DZ-SONS-41156-0/A	1	-SRC4310 Passive electromechanical overcurrent protection; 1000 V; continuous current 400 A	GFP410 GIG.GFP410	Sensata Technologies GIG	
2072332.450	DZ-SONS-40177-0/A	1	-SRC4310 URS Fuse-Links with bolted blade connections aR	2072332.450 SIB.2072332450	SIBA GmbH SIB	
5023926.25	DZ-SONS-09801-0/A	1	-SRC4310 URZ Fuse-Link for photovoltaic applications gPV	5023926.25 SIB.502392625	SIBA GmbH SIB	
HX241CAC	Dz-SONS-40629-0/A	3	-SRC4310-K1...-SRC4310-K3 1500 VDC Contactor; 400 ADC; Main contact	HX241CAC GIG.HX241CAC	Sensata Technologies GIG	
3SB3500-4AD01		1	-SRC4310-S1 22MM ROUND METAL ACTUATOR: RONIS	3SB3500-4AD01 SIE.3SB35004AD01	Siemens SIE	
3SB3400-0B		2	-SRC4310-S1 Contact block with 1 contact element, 1 NO, screw terminal	3SB3400-0B SIE.3SB34000B	Siemens SIE	
DZ-SONS-09843-0/A	DZ-SONS-09843-0/A	2 Piece	-T1;-T2 One wire Temperatursensor SRC2xxx	ADS.098430A ADS.098430A	ads-tec GmbH ADS-TEC	
1900950	DZ-SONS-40186-0/A	1 Piece	-X1300 PCB connector	MC 1,5/ 9-ST1F-5,08 PXC.1900950	PHOENIX CONTACT PXC	
1900895	DZ-SONS-40185-0/A	1 Piece	-X1301 PCB connector	MC 1,5/ 3-ST1F-5,08 PXC.1900895	PHOENIX CONTACT PXC	

Summarized parts list

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
LFXV15060BC	DZ-SONS-41615-0/A	6 Piece	-F572...-F577 fuseholder	LFXV15060 BC LF.LFXV15060BC	Littlefuse, Inc. LF	
SPXV060	DZ-SONS-41616-0/A	6 Piece	-F572...-F577 DC-fuse 60A	LFXV15060 BC LF.SPXV060	Littlefuse, Inc. LF	
1969467	DZ-SONS-41628-0/A	3 Piece	-X31...-X33 PCB connector	IPC 16/ 3-STF-10,16 PXC.1969467	PHOENIX CONTACT PXC	
1703784	DZ-SONS-41360-0/A	3 Piece	-X31.0;-X32.0;-X33.0 Feed-through plug	DFK-IPC 16/ 3-STF-10,16 PXC.1703784	PHOENIX CONTACT PXC	
1201662	DZ-SONS-40745-0/A	2 Piece	-XD572 End bracket	E/AL-NS 35 PXC.1201662	PHOENIX CONTACT PXC	
3213140	DZ-SONS-40447-0/A	6 Piece	-XD572 Power terminal	UKH 70 PXC.3213140	PHOENIX CONTACT PXC	
3213211	DZ-SONS-41163-0/A	2 Piece	-XD572 Fixed bridge	FBI 3-20 N EX PXC.3213211	PHOENIX CONTACT PXC	
3001763	DZ-SONS-40595-0/A	6 Piece	-XD572 Pick-off terminal block	AGK 10-UKH 50 PXC.3001763	PHOENIX CONTACT PXC	

+BS1/1

+MEM/1

			Date	16.06.2023	0-Serie, Köngen	ads-tec Energy GmbH	Summarized parts list : LF.LFXV15060BC - PXC.3001763	= BPA	
			Ed	BnVr				+ FB	
			Appr		Grid Service Station 0813			EPE000060	Page 1
Modification	Date	Name	Original		Replacement of	Replaced by			Page 61 / 69

Summarized parts list

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Order number	Part number	Quantity	Description Designation	Type number Part number	Manufacturer	Pos
60603141	DZ-SONS-41310-0/A	1 Piece	-U261 Planar recessed antenna GSM/UMTS/LTE	60603141 Celphone.60603141	Celphone Schweiz AG Celphone	

Parts list

F01_001-ads

Device tag	Quantity	Designation	Type number	Supplier	Part number	Part number
=01+S-W161	1	Power supply	DZ-SONS-20276-0/B	ads-tec GmbH	ADS.DZSONS202760B	DZ-SONS-20276-0/B
=01+S-W180	1	24VDC signals	DZ-SONS-20277-1/A	ads-tec GmbH	ADS.DZSONS202771A	DZ-SONS-20277-1/A
=01+S-W201	1	GSS0606 PE battery compartment	DZ-SONS-20205-0/A	ads-tec GmbH	ADS.DZSONS202050A	DZ-SONS-20205-0/A
=01+S-W221	1	Trumpf system control	DZ-SONS-20278-0/C	ads-tec GmbH	ADS.DZSONS202780C	DZ-SONS-20278-0/C
=01+S-W301_SRC4	1	signal enable	DZ-SONS-20279-0/C	ads-tec GmbH	ADS.DZSONS202790C	DZ-SONS-20279-0/C
=01+S-W321	1	smoke detector	DZ-SONS-20280-1/A	ads-tec GmbH	ADS.DZSONS202801A	DZ-SONS-20280-1/A
=01+S-W342	1	door contact right side	DZ-SONS-20281-1/A	ads-tec GmbH	ADS.DZSONS202811A	DZ-SONS-20281-1/A
=01+S-W345	1	heater left compartment	DZ-SONS-20282-1/A	ads-tec GmbH	ADS.DZSONS202821A	DZ-SONS-20282-1/A
=01+S-W348.1	1	??? Übersetzung fehlt	DZ-SONS-20283-0/B	ads-tec GmbH	ADS.DZSONS202830B	DZ-SONS-20283-0/B
=01+S-W365	1	climate control door contact left side	DZ-SONS-20284-0/B	ads-tec GmbH	ADS.DZSONS202840B	DZ-SONS-20284-0/B
=01+S-W366	1	400V AC air condition supply	DZ-SONS-20285-1/A	ads-tec GmbH	ADS.DZSONS202851A	DZ-SONS-20285-1/A
=01+S-W405	1	24VDC signals	DZ-SONS-20277-2/A	ads-tec GmbH	ADS.DZSONS202772A	DZ-SONS-20277-2/A
=01+S-W512	1	Patchcable 2m cat. 6 U/UTP slim, black	BS08-22035	Shiverpeaks	SHI.BS0822035	DZ-SONS-41653-3/A
=01+S-W522	1	Patchcable 0,3m cat. 6 U/UTP slim, black	BS08-22305	Shiverpeaks	SHI.BS0822305	DZ-SONS-41653-0/A
=01+S-W532	1	Patchcable 0,3m cat. 6 U/UTP slim, black	BS08-22305	Shiverpeaks	SHI.BS0822305	DZ-SONS-41653-0/A
=01+S-W571	1	GSS0606 PE battery compartment	DZ-SONS-20205-0/A	ads-tec GmbH	ADS.DZSONS202050A	DZ-SONS-20205-0/A
=01+S-W724	1	GSS0606 PE battery compartment	DZ-SONS-20205-0/A	ads-tec GmbH	ADS.DZSONS202050A	DZ-SONS-20205-0/A
=01+S-WETH1.2	1	Patchcable 3m cat. 6 U/UTP slim, grey	BS08-22040	Shiverpeaks	SHI.BS0822040	DZ-SONS-41707-4/A
=01+S-WETH3.2	1	Patchcable 3m cat. 6 U/UTP slim, grey	BS08-22040	Shiverpeaks	SHI.BS0822040	DZ-SONS-41707-4/A
=01+S-WETH7.2	1	Patchcable 2m cat. 6 U/UTP slim, grey	BS08-22030	Shiverpeaks	SHI.BS0822030	DZ-SONS-41707-3/A
=01+S-WETH8.2	1	Patchcable 0,3m cat. 6 U/UTP slim, grey	BS08-22300	Shiverpeaks	SHI.BS0822300	DZ-SONS-41707-0/A
=01+S-WG348.1	1	Roof Fan right Enclosure signals	DZ-SONS-41780-0/A	ads-tec GmbH	ADS.DZSONS417800A	DZ-SONS-41780-0/A
=01+S-WX203	1	SRC 24VDC power supply	DZ-SONS-20286-1/A	ads-tec GmbH	ADS.DZSONS202861A	DZ-SONS-20286-1/A
=01+S-X348.1	1	Plug L	PP-H 2,5/1-L	PHOENIX CONTACT	PXC.3210062	DZ-SONS-40326-0/A
=01+S-X348.1	1	Plug M BU	PP-H 2,5/1-M BU	PHOENIX CONTACT	PXC.3210101	DZ-SONS-40760-0/A
=01+S-X348.1	1	Plug R GNYE	PP-H 2,5/1-R GNYE	PHOENIX CONTACT	PXC.3210143	DZ-SONS-40328-0/A
=01+S-X348.1	1	Latching	PRZ	PHOENIX CONTACT	PXC.3040614	DZ-SONS-40329-0/A
=01+S-XG18.2	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG18.2	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG162.1	1	Plug L	PP-H 2,5/1-L	PHOENIX CONTACT	PXC.3210062	DZ-SONS-40326-0/A
=01+S-XG162.1	2	Plug M	PP-H 2,5/1-M	PHOENIX CONTACT	PXC.3210091	DZ-SONS-40758-0/A
=01+S-XG162.1	1	Plug M BU	PP-H 2,5/1-M BU	PHOENIX CONTACT	PXC.3210101	DZ-SONS-40760-0/A
=01+S-XG162.1	1	Plug R GNYE	PP-H 2,5/1-R GNYE	PHOENIX CONTACT	PXC.3210143	DZ-SONS-40328-0/A
=01+S-XG162.1	1	Latching	PRZ	PHOENIX CONTACT	PXC.3040614	DZ-SONS-40329-0/A
=01+S-XG162.2	1	Plug L	PP-H 2,5/1-L	PHOENIX CONTACT	PXC.3210062	DZ-SONS-40326-0/A
=01+S-XG162.2	2	Plug M	PP-H 2,5/1-M	PHOENIX CONTACT	PXC.3210091	DZ-SONS-40758-0/A
=01+S-XG162.2	1	Plug M BU	PP-H 2,5/1-M BU	PHOENIX CONTACT	PXC.3210101	DZ-SONS-40760-0/A
=01+S-XG162.2	1	Plug R GNYE	PP-H 2,5/1-R GNYE	PHOENIX CONTACT	PXC.3210143	DZ-SONS-40328-0/A
=01+S-XG162.2	1	Latching	PRZ	PHOENIX CONTACT	PXC.3040614	DZ-SONS-40329-0/A
=01+S-XG162.3	1	Plug L	PP-H 2,5/1-L	PHOENIX CONTACT	PXC.3210062	DZ-SONS-40326-0/A
=01+S-XG162.3	1	Plug M BU	PP-H 2,5/1-M BU	PHOENIX CONTACT	PXC.3210101	DZ-SONS-40760-0/A
=01+S-XG162.3	1	Plug R GNYE	PP-H 2,5/1-R GNYE	PHOENIX CONTACT	PXC.3210143	DZ-SONS-40328-0/A
=01+S-XG162.3	1	Latching	PRZ	PHOENIX CONTACT	PXC.3040614	DZ-SONS-40329-0/A
=01+S-XG162.5	1	Plug L	PP-H 2,5/1-L	PHOENIX CONTACT	PXC.3210062	DZ-SONS-40326-0/A
=01+S-XG162.5	1	Plug M BU	PP-H 2,5/1-M BU	PHOENIX CONTACT	PXC.3210101	DZ-SONS-40760-0/A
=01+S-XG162.5	1	Plug R GNYE	PP-H 2,5/1-R GNYE	PHOENIX CONTACT	PXC.3210143	DZ-SONS-40328-0/A
=01+S-XG162.5	1	Latching	PRZ	PHOENIX CONTACT	PXC.3040614	DZ-SONS-40329-0/A
=01+S-XG166.1	1	Plug L	PP-H 2,5/1-L	PHOENIX CONTACT	PXC.3210062	DZ-SONS-40326-0/A
=01+S-XG166.1	2	Plug M	PP-H 2,5/1-M	PHOENIX CONTACT	PXC.3210091	DZ-SONS-40758-0/A
=01+S-XG166.1	1	Plug M BU	PP-H 2,5/1-M BU	PHOENIX CONTACT	PXC.3210101	DZ-SONS-40760-0/A
=01+S-XG166.1	1	Plug R GNYE	PP-H 2,5/1-R GNYE	PHOENIX CONTACT	PXC.3210143	DZ-SONS-40328-0/A
=01+S-XG166.1	1	Latching	PRZ	PHOENIX CONTACT	PXC.3040614	DZ-SONS-40329-0/A
=01+S-XG166.2	1	Plug L	PP-H 2,5/1-L	PHOENIX CONTACT	PXC.3210062	DZ-SONS-40326-0/A
=01+S-XG166.2	2	Plug M	PP-H 2,5/1-M	PHOENIX CONTACT	PXC.3210091	DZ-SONS-40758-0/A
=01+S-XG166.2	1	Plug M BU	PP-H 2,5/1-M BU	PHOENIX CONTACT	PXC.3210101	DZ-SONS-40760-0/A
=01+S-XG166.2	1	Plug R GNYE	PP-H 2,5/1-R GNYE	PHOENIX CONTACT	PXC.3210143	DZ-SONS-40328-0/A

Parts list

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Device tag	Quantity	Designation	Type number	Supplier	Part number	Part number
=01+S-XG166.2	1	Latching	PRZ	PHOENIX CONTACT	PXC.3040614	DZ-SONS-40329-0/A
=01+S-XG166.3	1	Plug L	PP-H 2,5/1-L	PHOENIX CONTACT	PXC.3210062	DZ-SONS-40326-0/A
=01+S-XG166.3	2	Plug M	PP-H 2,5/1-M	PHOENIX CONTACT	PXC.3210091	DZ-SONS-40758-0/A
=01+S-XG166.3	1	Plug M BU	PP-H 2,5/1-M BU	PHOENIX CONTACT	PXC.3210101	DZ-SONS-40760-0/A
=01+S-XG166.3	1	Plug R GNYE	PP-H 2,5/1-R GNYE	PHOENIX CONTACT	PXC.3210143	DZ-SONS-40328-0/A
=01+S-XG166.3	1	Latching	PRZ	PHOENIX CONTACT	PXC.3040614	DZ-SONS-40329-0/A
=01+S-XG180.1	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG180.1	10	Plug M	PP-H 1,5/S/1-M	PHOENIX CONTACT	PXC.3212688	DZ-SONS-40759-0/A
=01+S-XG180.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG180.1	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG180.2	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG180.2	10	Plug M	PP-H 1,5/S/1-M	PHOENIX CONTACT	PXC.3212688	DZ-SONS-40759-0/A
=01+S-XG180.2	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG180.2	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG202.1	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG202.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG202.1	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG221.1	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG221.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG221.1	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG301.1	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG301.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG301.1	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG326.1	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG326.1	1	Plug M	PP-H 1,5/S/1-M	PHOENIX CONTACT	PXC.3212688	DZ-SONS-40759-0/A
=01+S-XG326.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG326.1	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG342.1	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG326.1	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG342.1	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG342.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG342.1	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG348.1	2	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG348.1	2	Plug M	PP-H 1,5/S/1-M	PHOENIX CONTACT	PXC.3212688	DZ-SONS-40759-0/A
=01+S-XG348.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG348.1	2	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG405.1	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG405.1	10	Plug M	PP-H 1,5/S/1-M	PHOENIX CONTACT	PXC.3212688	DZ-SONS-40759-0/A
=01+S-XG405.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG405.1	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S-XG405.2	1	Plug L	PP-H 1,5/S/1-L	PHOENIX CONTACT	PXC.3212659	DZ-SONS-41157-0/A
=01+S-XG405.2	10	Plug M	PP-H 1,5/S/1-M	PHOENIX CONTACT	PXC.3212688	DZ-SONS-40759-0/A
=01+S-XG405.2	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A
=01+S-XG405.2	1	Latching	PRZ 1,5/S	PHOENIX CONTACT	PXC.3212905	DZ-SONS-40210-0/A
=01+S1-BEC368	1	Temperature sensor for Blue e+ cooling units, Blue e+ chillers 2,5m	SK 3124.400	Rittal	RIT.3124400	DZ-SONS-40373-0/A
=01+S1-EC345	1	fan heater CSL 028, 400 W, AC 230 V, Clip	CSL 028	Stego	STE.02810.0-00	
=01+S1-M348	1	EC Centrifugal fan	K3G190-RC05-16	ebmpapst	PAPST.K3G190RC0516	DZ-SONS-40118-1/A
=01+S1-U321	1	Smoke detector PROTECTOR K 9 V Lithium	ER10018930	ESYLUX GmbH	ESY.ER10018930	DZ-SONS-40487-0/A
=01+S1-U321	1	Base for PROTECTOR K AP socket, H=27mm	ER10018985	ESYLUX GmbH	ESY.ER10018985	DZ-SONS-40895-0/A
=01+S1-U321	1	Switching relay changer for PROTECTOR K 9 V Lithium	ER10018923	ESYLUX GmbH	ESY.ER10018923	DZ-SONS-40488-0/A
=01+S1-X348	1	Feed-through terminal	PT 2,5-QUATTRO/2P	PHOENIX CONTACT	PXC.3209662	DZ-SONS-40800-0/A
=01+S1-X348	1	Feed-through terminal	PT 2,5-QUATTRO/2P BU	PHOENIX CONTACT	PXC.3209675	DZ-SONS-40801-0/A
=01+S1-X348	1	Ground modular terminal block	PT 2,5-QUATTRO/2P-PE	PHOENIX CONTACT	PXC.3209688	DZ-SONS-40802-0/A
=01+S1-X348	1	End cover	D-ST 2,5-QUATTRO/2P	PHOENIX CONTACT	PXC.3040083	DZ-SONS-40803-0/A
=01+S1-X348	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+S1-XG348	4	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+S1-XG348	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+S1-XG348	1	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A

Parts list

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Device tag	Quantity	Designation	Type number	Supplier	Part number	Part number
=01+S2-EC366	1	Wall-mounted cooling unit Blue e+ outdoor	SK.3185330	Rittal	RIT.3185330	DZ-SKE-000041-2/A
=01+S2-X1N	5	End bracket	E/AL-NS 35	PHOENIX CONTACT	PXC.1201662	DZ-SONS-40745-0/A
=01+S2-XD0	5	End bracket	E/AL-NS 35	PHOENIX CONTACT	PXC.1201662	DZ-SONS-40745-0/A
=01+AC-F104	1	Discharger	RayDIN 400Y-T1-HV	Raycap GmbH	REY.RayDIN 400Y-T1-HV	DZ-SONS-40533-0/A
=01+AC-F142	1	Circuit breaker - S200P - 3P - C - 50 A	S203P-C50	ABB	ABB.2CDS283001R0504	DZ-SONS-41613-0/A
=01+AC-F144	1	Circuit breaker - S200P - 3P - C - 50 A	S203P-C50	ABB	ABB.2CDS283001R0504	DZ-SONS-41613-0/A
=01+AC-F146	1	Circuit breaker - S200P - 3P - C - 50 A	S203P-C50	ABB	ABB.2CDS283001R0504	DZ-SONS-41613-0/A
=01+AC-F162	1	Circuit breaker - S200M - 3P - C - 16 A	S203M-C16	ABB	ABB.2CDS273001R0164	DZ-SONS-40433-0/A
=01+AC-F162	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-F165	1	Circuit breaker - S200M - 1P - C - 16 A	S201M-C16	ABB	ABB.2CDS271001R0164	DZ-SONS-41617-0/A
=01+AC-F165	1	Phase busbar	PS1/2/16	ABB	ABB.2CDL210001R1602	DZ-SONS-41687-0/A
=01+AC-F166	1	Circuit breaker - S200M - 4P - Z - 1 A	S204M-Z1	ABB	ABB.2CDS274001R0218	DZ-SONS-41683-0/A
=01+AC-FA256	1	Discharger	RayDat SLH-4-30	Raycap GmbH	REY.708278	DZ-SONS-40536-0/A
=01+AC-FA416	1	Discharger	RayDat SLH-4-30	Raycap GmbH	REY.708278	DZ-SONS-40536-0/A
=01+AC-FA420	1	Discharger	RayDat SLH-4-30	Raycap GmbH	REY.708278	DZ-SONS-40536-0/A
=01+AC-FA424	1	Discharger	RayDat SLH-4-30	Raycap GmbH	REY.708278	DZ-SONS-40536-0/A
=01+AC-FA427	1	Discharger	RayDat SLH-4-30	Raycap GmbH	REY.708278	DZ-SONS-40536-0/A
=01+AC-FU401	1	Lightning protection LAN CAT6 48V	RayDat NET 6	Raycap GmbH	REY.706312	DZ-SONS-40713-0/A
=01+AC-FU402	1	Lightning protection LAN CAT6 48V	RayDat NET 6	Raycap GmbH	REY.706312	DZ-SONS-40713-0/A
=01+AC-K185	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+AC-K188	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+AC-K412	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+AC-K413	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+AC-K414	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+AC-K414	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-Q101	1	Switch disconnector 690V 160A 4P	3KD3442-0NE10-0	Siemens	SIE.3KD3442-0NE10-0	DZ-SONS-41685-1/A
=01+AC-Q101	8	Cable connection cover short version contains 8 units, Accessory for 3KD size 2	3KD9204-5	Siemens	SIE.3KD9204-5	DZ-SONS-41688-0/A
=01+AC-Q101	4	Cylinder screw	M4x10 T20 A2	Würth Elektronik	WÜRT.4027410	DZ-MECH-47143-0/A
=01+AC-Q182	1	AF52-40-00-11 contactor 24-60VAC 20-60VDC	AF52-40-00-11	ABB	ABB.1SBL367201R1100	DZ-SONS-41610-0/A
=01+AC-Q182	2	LT52-40 Main terminal protection	LT52-40	ABB	ABB.1SBN123402R1000	DZ-SONS-41727-0/A
=01+AC-Q183	1	AF52-40-00-11 contactor 24-60VAC 20-60VDC	AF52-40-00-11	ABB	ABB.1SBL367201R1100	DZ-SONS-41610-0/A
=01+AC-Q183	2	LT52-40 Main terminal protection	LT52-40	ABB	ABB.1SBN123402R1000	DZ-SONS-41727-0/A
=01+AC-Q184	1	AF52-40-00-11 contactor 24-60VAC 20-60VDC	AF52-40-00-11	ABB	ABB.1SBL367201R1100	DZ-SONS-41610-0/A
=01+AC-Q184	2	LT52-40 Main terminal protection	LT52-40	ABB	ABB.1SBN123402R1000	DZ-SONS-41727-0/A
=01+AC-Q186	1	AF52-30-00-11 contactor 24-60V50/60Hz 20-60VDC	AF52-30-00-11	ABB	ABB.1SBL367001R1100	DZ-SONS-41609-0/A
=01+AC-Q186	1	CA4-22E auxiliary contact block 4-pole / 2 NO, 2 NC / screw type connecting terminals	CA4-22E	ABB	ABB.1SBN010140R1022	DZ-SONS-41746-0/A
=01+AC-Q186	2	LT65-30 Main terminal protection	LT65-30	ABB	ABB.1SBN123401R1000	DZ-SONS-41728-0/A
=01+AC-Q186	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-Q186	1	CA4-22M auxiliary contact block 4-pole / 2 NO, 2 NC / screw type connecting terminals	CA4-22M	ABB	ABB.1SBN010140R1122	DZ-SONS-41618-0/A
=01+AC-WC100	1	Base tray	SV.9340100-(ADS-TEC)	ads-tec GmbH	ADS.DZMECH472120A	DZ-MECH-47212-0/A
=01+AC-WC100	2	End cover	SV.9340070	Rittal	RIT.9340070	DZ-SONS-41149-0/A
=01+AC-WC100	2	Busbar support for flat copper busbars	SV.9340000	Rittal	RIT.9340000	DZ-SONS-41148-0/A
=01+AC-WC100	6	Spacer	SV.9340090	Rittal	RIT.9340090	DZ-SONS-41154-0/A
=01+AC-WC100	3	Busbar E-Cu	SV.3580000	Rittal	RIT.3580000	DZ-SONS-41147-0/A
=01+AC-X1PE	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-X1PE	1	Ground modular terminal block	PT 16 N-PE	PHOENIX CONTACT	PXC.3212147	DZ-SONS-40663-0/A
=01+AC-X1PE	1	End cover	D-PT 16 N	PHOENIX CONTACT	PXC.3212060	DZ-SONS-40671-0/A
=01+AC-XD0	2	End bracket	E/AL-NS 35	PHOENIX CONTACT	PXC.1201662	DZ-SONS-40745-0/A
=01+AC-XD0	6	Power terminal	UKH 70	PHOENIX CONTACT	PXC.3213140	DZ-SONS-40447-0/A
=01+AC-XD0	5	Fixed bridge	FBI 2-20 N EX	PHOENIX CONTACT	PXC.3213210	DZ-SONS-40698-0/A
=01+AC-XD0	2	Power terminal	UKH 70 BU	PHOENIX CONTACT	PXC.3244601	DZ-SONS-40449-0/A
=01+AC-XD0	2	Ground modular terminal block	UKH 70-PE/S	PHOENIX CONTACT	PXC.3213141	DZ-SONS-40450-0/A
=01+AC-XD101	1	Connection adapter	SV.9342250	Rittal	RIT.9342250	DZ-SONS-41153-0/A
=01+AC-XD142	1	Circuit-breaker component adaptor	SV.9342410	Rittal	RIT.9342410	DZ-SONS-41620-0/A
=01+AC-XD142	1	Support rail 35 x 15 mm	SV.9320120	Rittal	RIT.9320120	DZ-SONS-41708-0/A
=01+AC-XD142	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A

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Parts list

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Device tag	Quantity	Designation	Type number	Supplier	Part number	Part number
=01+AC-XD144	1	Circuit-breaker component adaptor	SV.9342410	Rittal	RIT.9342410	DZ-SONS-41620-0/A
=01+AC-XD144	2	Support rail 35 x 15 mm	SV.9320120	Rittal	RIT.9320120	DZ-SONS-41708-0/A
=01+AC-XD144	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-XD146	1	Circuit-breaker component adaptor	SV.9342410	Rittal	RIT.9342410	DZ-SONS-41620-0/A
=01+AC-XD146	2	Support rail 35 x 15 mm	SV.9320120	Rittal	RIT.9320120	DZ-SONS-41708-0/A
=01+AC-XD146	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-XD166	1	OM adaptor	SV.9340700	Rittal	RIT.9340700	DZ-SONS-41621-0/A
=01+AC-XD166	1	OM adaptor	SV.9340460	Rittal	RIT.9340460	DZ-SONS-41152-0/A
=01+AC-XDN	2	End bracket	E/AL-NS 35	PHOENIX CONTACT	PXC.1201662	DZ-SONS-40745-0/A
=01+AC-XDN	6	Pick-off terminal block	AGK 10-UKH 50	PHOENIX CONTACT	PXC.3001763	DZ-SONS-40595-0/A
=01+AC-XDN	3	Power terminal	UKH 70 BU	PHOENIX CONTACT	PXC.3244601	DZ-SONS-40449-0/A
=01+AC-XDN	1	Fixed bridge	FBI 3-20 N EX	PHOENIX CONTACT	PXC.3213211	DZ-SONS-41163-0/A
=01+AC-XDP1.1	10	End bracket	E/AL-NS 35	PHOENIX CONTACT	PXC.1201662	DZ-SONS-40745-0/A
=01+AC-XDPE	2	End bracket	E/AL-NS 35	PHOENIX CONTACT	PXC.1201662	DZ-SONS-40745-0/A
=01+AC-XDPE	3	Ground modular terminal block	UKH 70-PE/S	PHOENIX CONTACT	PXC.3213141	DZ-SONS-40450-0/A
=01+AC-XDPE	1	Fixed bridge	FBI 2-20 N EX	PHOENIX CONTACT	PXC.3213210	DZ-SONS-40698-0/A
=01+AC-XG162	3	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-XG162	5	Feed-through terminal	PT 2,5-QUATTRO/2P	PHOENIX CONTACT	PXC.3209662	DZ-SONS-40800-0/A
=01+AC-XG162	1	Plug-in bridge	FBS 5-5	PHOENIX CONTACT	PXC.3030190	DZ-SONS-40500-0/A
=01+AC-XG162	3	Feed-through terminal	PT 2,5-QUATTRO/2P BU	PHOENIX CONTACT	PXC.3209675	DZ-SONS-40801-0/A
=01+AC-XG162	1	Plug-in bridge	FBS 4-5 BU	PHOENIX CONTACT	PXC.3036893	DZ-SONS-40778-0/A
=01+AC-XG162	3	Ground modular terminal block	PT 2,5-QUATTRO/2P-PE	PHOENIX CONTACT	PXC.3209688	DZ-SONS-40802-0/A
=01+AC-XG162	2	End cover	D-ST 2,5-QUATTRO/2P	PHOENIX CONTACT	PXC.3040083	DZ-SONS-40803-0/A
=01+AC-XG166	6	Feed-through terminal	PT 2,5-QUATTRO/2P	PHOENIX CONTACT	PXC.3209662	DZ-SONS-40800-0/A
=01+AC-XG166	2	Feed-through terminal	PT 2,5-QUATTRO/2P BU	PHOENIX CONTACT	PXC.3209675	DZ-SONS-40801-0/A
=01+AC-XG166	2	Ground modular terminal block	PT 2,5-QUATTRO/2P-PE	PHOENIX CONTACT	PXC.3209688	DZ-SONS-40802-0/A
=01+AC-XG166	2	End cover	D-ST 2,5-QUATTRO/2P	PHOENIX CONTACT	PXC.3040083	DZ-SONS-40803-0/A
=01+AC-XG166	1	Plug-in bridge, number of positions: 20, blue	FBS 20-5 BU	PHOENIX CONTACT	PXC.3036929	DZ-SONS-41507-0/A
=01+AC-XG166	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-XG180.2	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-XG180.2	12	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+AC-XG180.2	1	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+AC-XG405.2	12	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+AC-XG405.2	1	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+AC-XG405.2	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-XPE	1	Potential bonding rail for outside	5015111	OBO Bettermann Holding GmbH & Co. KG	OBO.5015111	DZ-SONS-40561-0/A
=01+AC-XQ182	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-XQ182	2	Ground modular terminal block	PT 16 N-PE	PHOENIX CONTACT	PXC.3212147	DZ-SONS-40663-0/A
=01+AC-XQ182	2	End cover	D-PT 16 N	PHOENIX CONTACT	PXC.3212060	DZ-SONS-40671-0/A
=01+AC-XQ182	0	Ground modular terminal block	UKH 70-PE/S	PHOENIX CONTACT	PXC.3213141	DZ-SONS-40450-0/A
=01+AC-XQ183	2	End cover	D-PT 16 N	PHOENIX CONTACT	PXC.3212060	DZ-SONS-40671-0/A
=01+AC-XQ183	2	Ground modular terminal block	PT 16 N-PE	PHOENIX CONTACT	PXC.3212147	DZ-SONS-40663-0/A
=01+AC-XQ183	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+AC-XQ184	0	Ground modular terminal block	UKH 70-PE/S	PHOENIX CONTACT	PXC.3213141	DZ-SONS-40450-0/A
=01+AC-XQ184	1	Ground modular terminal block	PT 16 N-PE	PHOENIX CONTACT	PXC.3212147	DZ-SONS-40663-0/A
=01+AC-XQ184	1	End cover	D-PT 16 N	PHOENIX CONTACT	PXC.3212060	DZ-SONS-40671-0/A
=01+AC-XQ184	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-A281	1	I/O-Modul 8DI 8DO RJ45	ET-7252 CR	ICP DAS-EUROPE GmbH	ICP.ET7252CR	DZ-SONS-40769-0/A
=01+EMS-EC361	1	IoT Interface	SK.3124300	Rittal	RIT.3124300	DZ-SONS-40701-0/A
=01+EMS-G201	1	Power supply	QUINT4-PS/3AC/24DC/20	PHOENIX CONTACT	PXC.2904622	DZ-SONS-41347-1/A
=01+EMS-G202	1	Uninterruptible power supply	QUINT4-UPS/24DC/24DC/20	PHOENIX CONTACT	PXC.2907071	DZ-SONS-41348-1/A
=01+EMS-GB206	1	Energy storage	UPS-BAT/PB/24DC/4AH	PHOENIX CONTACT	PXC.1274117	DZ-SONS-41349-2/A
=01+EMS-K304	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+EMS-K305	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+EMS-K306	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+EMS-K327	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A

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Parts list

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Device tag	Quantity	Designation	Type number	Supplier	Part number	Part number
=01+EMS-K427	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+EMS-K428	1	Relay module	RIF-1-RPT-LDP-24DC/2X21	PHOENIX CONTACT	PXC.2903334	DZ-SONS-40958-0/A
=01+EMS-Q221	1	Electronic circuit breaker	PTCB E1 24DC/1-8A NO	PHOENIX CONTACT	PXC.2908262	DZ-SONS-41496-1/A
=01+EMS-Q221	1	Plug-in bridge	FBS 5-6	PHOENIX CONTACT	PXC.3030349	DZ-SONS-41630-0/A
=01+EMS-Q223	1	Electronic circuit breaker	PTCB E1 24DC/1-8A NO	PHOENIX CONTACT	PXC.2908262	DZ-SONS-41496-1/A
=01+EMS-Q224	1	Electronic circuit breaker	PTCB E1 24DC/1-8A NO	PHOENIX CONTACT	PXC.2908262	DZ-SONS-41496-1/A
=01+EMS-Q226	1	Electronic circuit breaker	PTCB E1 24DC/1-8A NO	PHOENIX CONTACT	PXC.2908262	DZ-SONS-41496-1/A
=01+EMS-Q227	1	Electronic circuit breaker	PTCB E1 24DC/1-8A NO	PHOENIX CONTACT	PXC.2908262	DZ-SONS-41496-1/A
=01+EMS-Q227	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-S208	1	Selector Switch, black, 2-position 1NO+	C2SS2-10B-11	ABB	ABB.1SFA619201R1076	DZ-SONS-41632-0/A
=01+EMS-U1	1	support rail punched 35/7,5	NS 35/ 7,5 PERF 755MM	PHOENIX CONTACT	PXC.1207640	DZ-MECH-46650-0/A
=01+EMS-U2	1	support rail punched 35/7,5	NS 35/ 7,5 PERF 755MM	PHOENIX CONTACT	PXC.1207640	DZ-MECH-46650-0/A
=01+EMS-U4	1	support rail punched 35/7,5	NS 35/ 7,5 PERF 755MM	PHOENIX CONTACT	PXC.1207640	DZ-MECH-46650-0/A
=01+EMS-U4	1	Plug-in bridge	FBS 2-5 BU	PHOENIX CONTACT	PXC.3036877	DZ-SONS-41637-0/A
=01+EMS-U264	1	Controller EMM3821	EMM3821 001-AA	ads-tec GmbH	ADS.DZSKE0001170A	DZ-SKE-000117-0/A
=01+EMS-WETH1.1	1	Patchcable 0,5m cat. 6 U/UTP slim, grey	BS08-22010	Shiverpeaks	SHI.BS0822010	DZ-SONS-41707-1/A
=01+EMS-WETH3.1	1	Patchcable 0,5m cat. 6 U/UTP slim, grey	BS08-22010	Shiverpeaks	SHI.BS0822010	DZ-SONS-41707-1/A
=01+EMS-WETH5	1	Patchcable 0,3m cat. 6 U/UTP slim, grey	BS08-22300	Shiverpeaks	SHI.BS0822300	DZ-SONS-41707-0/A
=01+EMS-WETH6	1	Patchcable 0,3m cat. 6 U/UTP slim, grey	BS08-22300	Shiverpeaks	SHI.BS0822300	DZ-SONS-41707-0/A
=01+EMS-WETH7.1	1	Patchcable 0,5m cat. 6 U/UTP slim, grey	BS08-22010	Shiverpeaks	SHI.BS0822010	DZ-SONS-41707-1/A
=01+EMS-WETH8.1	1	Patchcable 0,3m cat. 6 U/UTP slim, grey	BS08-22300	Shiverpeaks	SHI.BS0822300	DZ-SONS-41707-0/A
=01+EMS-X1	1	PCB connector	PC 5/5-STF1-7,62	PHOENIX CONTACT	PXC.1777862	DZ-SONS-40088-0/A
=01+EMS-X1.0	1	Feed-through plug	DFK-PC 5/ 5-STF-7,62	PHOENIX CONTACT	PXC.1716645	DZ-SONS-40092-1/A
=01+EMS-X10	1	PCB connector	PC 5/ 2-STF1-7,62	PHOENIX CONTACT	PXC.1777833	DZ-SONS-40184-0/A
=01+EMS-X10.0	1	Feed-through plug	DFK-PC 5/ 2-STF-7,62	PHOENIX CONTACT	PXC.1716616	DZ-SONS-40176-0/A
=01+EMS-X20	1	PCB connector	PC 5/ 2-STF1-7,62	PHOENIX CONTACT	PXC.1777833	DZ-SONS-40184-0/A
=01+EMS-X20.0	1	Feed-through plug	DFK-PC 5/ 2-STF-7,62	PHOENIX CONTACT	PXC.1716616	DZ-SONS-40176-0/A
=01+EMS-X30	1	PCB connector	PC 5/ 2-STF1-7,62	PHOENIX CONTACT	PXC.1777833	DZ-SONS-40184-0/A
=01+EMS-X30.0	1	Feed-through plug	DFK-PC 5/ 2-STF-7,62	PHOENIX CONTACT	PXC.1716616	DZ-SONS-40176-0/A
=01+EMS-X100	1	PCB connector	MSTB 2,5/ 2-ST-5,08-LR	PHOENIX CONTACT	PXC.1808886	DZ-SONS-41623-0/A
=01+EMS-X100.0	1	Feed-through plug	DFK-MSTB 2,5/ 2-STF-5,08-LR	PHOENIX CONTACT	PXC.1096152	DZ-SONS-41622-0/A
=01+EMS-X200	1	PCB connector	MSTB 2,5/ 2-ST-5,08-LR	PHOENIX CONTACT	PXC.1808886	DZ-SONS-41623-0/A
=01+EMS-X200.0	1	Feed-through plug	DFK-MSTB 2,5/ 2-STF-5,08-LR	PHOENIX CONTACT	PXC.1096152	DZ-SONS-41622-0/A
=01+EMS-X300	1	PCB connector	MSTB 2,5/ 2-ST-5,08-LR	PHOENIX CONTACT	PXC.1808886	DZ-SONS-41623-0/A
=01+EMS-X300.0	1	Feed-through plug	DFK-MSTB 2,5/ 2-STF-5,08-LR	PHOENIX CONTACT	PXC.1096152	DZ-SONS-41622-0/A
=01+EMS-XD24	4	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-XD24	16	Feed-through terminal	PT 2,5-QUATTRO	PHOENIX CONTACT	PXC.3209578	DZ-SONS-40597-0/A
=01+EMS-XD24	2	Plug-in bridge	FBS 3-5 BU	PHOENIX CONTACT	PXC.3036880	DZ-SONS-40665-0/A
=01+EMS-XD24	0	Cover segment	DS-PT 2,5-MT	PHOENIX CONTACT	PXC.1043963	DZ-SONS-41298-0/A
=01+EMS-XD24	3	End cover	D-ST 2,5-QUATTRO	PHOENIX CONTACT	PXC.3030514	DZ-SONS-40598-0/A
=01+EMS-XD24	2	Ground modular terminal block	PT 2,5-PE	PHOENIX CONTACT	PXC.3209536	DZ-SONS-40129-0/A
=01+EMS-XD24	0	Knife-disconnect terminal block	PT 2,5-MTB	PHOENIX CONTACT	PXC.3210157	DZ-SONS-40841-0/A
=01+EMS-XD24	1	Plug-in bridge	FBS 2-5 BU	PHOENIX CONTACT	PXC.3036877	DZ-SONS-41637-0/A
=01+EMS-XD24	1	Plug-in bridge	FBS 5-5 BU	PHOENIX CONTACT	PXC.3036903	DZ-SONS-40501-0/A
=01+EMS-XD24	1	Knife-disconnect terminal block	PT 2,5-MT	PHOENIX CONTACT	PXC.3210156	DZ-SONS-41279-0/A
=01+EMS-XD24	1	Plug-in bridge, number of positions: 20, red	FBS 20-5	PHOENIX CONTACT	PXC.3030226	DZ-SONS-41508-0/A
=01+EMS-XD24	1	Plug-in bridge	FBS 5-5	PHOENIX CONTACT	PXC.3030190	DZ-SONS-40500-0/A
=01+EMS-XD24	1	Plug-in bridge	FBS 2-5	PHOENIX CONTACT	PXC.3030161	DZ-SONS-40123-0/A
=01+EMS-XD24.	3	Feed-through terminal	PT 2,5-QUATTRO	PHOENIX CONTACT	PXC.3209578	DZ-SONS-40597-0/A
=01+EMS-XD24.	1	Plug-in bridge, number of positions: 20, blue	FBS 20-5 BU	PHOENIX CONTACT	PXC.3036929	DZ-SONS-41507-0/A
=01+EMS-XD24.	1	Plug-in bridge	FBS 3-5 BU	PHOENIX CONTACT	PXC.3036880	DZ-SONS-40665-0/A
=01+EMS-XF262	1	Coupling	EHRJ45P5E	Switchcraft Conxall	SWCR.EHRJ45P5E	DZ-SONS-40098-0/A
=01+EMS-XF263	1	Coupling	EHRJ45P5E	Switchcraft Conxall	SWCR.EHRJ45P5E	DZ-SONS-40098-0/A
=01+EMS-XF267	1	Coupling	EHRJ45P5E	Switchcraft Conxall	SWCR.EHRJ45P5E	DZ-SONS-40098-0/A
=01+EMS-XF268	1	Coupling	EHRJ45P5E	Switchcraft Conxall	SWCR.EHRJ45P5E	DZ-SONS-40098-0/A
=01+EMS-XF364	1	Coupling	EHRJ45P5E	Switchcraft Conxall	SWCR.EHRJ45P5E	DZ-SONS-40098-0/A

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Parts list

F01_001-ads

Device tag	Quantity	Designation	Type number	Supplier	Part number	Part number
=01+EMS-XG180.1	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-XG180.1	12	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+EMS-XG180.1	1	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+EMS-XG202.1	2	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+EMS-XG202.1	1	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+EMS-XG202.1	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-XG221.1	2	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+EMS-XG221.1	1	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+EMS-XG221.1	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-XG301.1	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-XG301.1	2	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+EMS-XG301.1	2	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+EMS-XG326.1	3	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+EMS-XG326.1	1	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+EMS-XG326.1	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-XG342.1	2	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+EMS-XG342.1	2	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+EMS-XG342.1	2	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+EMS-XG405.1	12	Feed-through terminal	PT 1,5/S/1P	PHOENIX CONTACT	PXC.3208582	DZ-SONS-40206-0/A
=01+EMS-XG405.1	1	End cover	D-PT 1,5/S	PHOENIX CONTACT	PXC.3208142	DZ-SONS-40106-0/A
=01+EMS-XG405.1	1	End bracket	CLIPFIX 35-5	PHOENIX CONTACT	PXC.3022276	DZ-SONS-40212-0/A
=01+TH-U500	1	System Control	Trumpf Hüttinger TruConvert System Control	TRUMPF Hüttinger GmbH + Co. KG	TRUH.SystemControl	DZ-SKE-000106-0/A
=01+TH-U500-X5	1	PCB connector	MC 1,5/ 2-STF-3,5	PHOENIX CONTACT	PXC.1847055	DZ-SONS-41139-0/A
=01+TH-U510	1	AC-DC-Modul	TruConvert AC 3025	TRUMPF Hüttinger GmbH + Co. KG	TRUH.TruConvertAC3025	DZ-SKE-000104-0/A
=01+TH-U510-X1	1	PCB connector	IPC 16/ 5-STF-10,16	PHOENIX CONTACT	PXC.1969483	DZ-SONS-41629-0/A
=01+TH-U510-X3	1	PCB connector	IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1969467	DZ-SONS-41628-0/A
=01+TH-U510-X4	1	PCB connector	GMSTB 2,5 HCV/10-ST-7,62-LR	PHOENIX CONTACT	PXC.1812830	DZ-SONS-41626-0/A
=01+TH-U510-X5	1	PCB connector	GMSTB 2,5 HCV/ 2-ST-7,62-LR	PHOENIX CONTACT	PXC.1812759	DZ-SONS-41624-0/A
=01+TH-U520	1	AC-DC-Modul	TruConvert AC 3025	TRUMPF Hüttinger GmbH + Co. KG	TRUH.TruConvertAC3025	DZ-SKE-000104-0/A
=01+TH-U520-X1	1	PCB connector	IPC 16/ 5-STF-10,16	PHOENIX CONTACT	PXC.1969483	DZ-SONS-41629-0/A
=01+TH-U520-X3	1	PCB connector	IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1969467	DZ-SONS-41628-0/A
=01+TH-U520-X4	1	PCB connector	GMSTB 2,5 HCV/10-ST-7,62-LR	PHOENIX CONTACT	PXC.1812830	DZ-SONS-41626-0/A
=01+TH-U520-X5	1	PCB connector	GMSTB 2,5 HCV/ 2-ST-7,62-LR	PHOENIX CONTACT	PXC.1812759	DZ-SONS-41624-0/A
=01+TH-U530	1	AC-DC-Modul	TruConvert AC 3025	TRUMPF Hüttinger GmbH + Co. KG	TRUH.TruConvertAC3025	DZ-SKE-000104-0/A
=01+TH-U530-X1	1	PCB connector	IPC 16/ 5-STF-10,16	PHOENIX CONTACT	PXC.1969483	DZ-SONS-41629-0/A
=01+TH-U530-X3	1	PCB connector	IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1969467	DZ-SONS-41628-0/A
=01+TH-U530-X4	1	PCB connector	GMSTB 2,5 HCV/10-ST-7,62-LR	PHOENIX CONTACT	PXC.1812830	DZ-SONS-41626-0/A
=01+TH-U530-X5	1	PCB connector	GMSTB 2,5 HCV/ 2-ST-7,62-LR	PHOENIX CONTACT	PXC.1812759	DZ-SONS-41624-0/A
=01+BS1-R1	1	High Power Aluminum Case Resistor	Fullde: RXLG400J	GUANGDONG FULLDE ELECTRONICS CO., LTD.	GUAN.RXLG400W60RJ	DZ-SONS-40245-0/A
=01+BS1-SRB1	1	High-performance energy storage	SRB7129	ads-tec GmbH	ADS.SRB7129	DVG-SRB7129 XXX-YYY
=01+BS1-SRB9	1	High-performance energy storage	SRB7129	ads-tec GmbH	ADS.SRB7129	DVG-SRB7129 XXX-YYY
=01+BS1-SRC4310	1	Battery Controller	SRC4310	ads-tec GmbH	ADS.DVGSRC4310001AAAD	DVG-SRC4310-001-AA/AD
=01+BS1-SRC4310	1	Passive electromechanical overcurrent protection; 1000 V; continuous current 400 A	GFP410	Sensata Technologies	GIG.GFP410	DZ-SONS-41156-0/A
=01+BS1-SRC4310	1	URS Fuse-Links with bolted blade connections aR	2072332.450	SIBA GmbH	SIB.2072332450	DZ-SONS-40177-0/A
=01+BS1-SRC4310	1	URZ Fuse-Link for photovoltaic applications gPV	5023926.25	SIBA GmbH	SIB.502392625	DZ-SONS-09801-0/A
=01+BS1-SRC4310-K1	1	1500 VDC Contactor; 400 ADC; Main contact	HX241CAC	Sensata Technologies	GIG.HX241CAC	Dz-SONS-40629-0/A
=01+BS1-SRC4310-K2	1	1500 VDC Contactor; 400 ADC; Main contact	HX241CAC	Sensata Technologies	GIG.HX241CAC	Dz-SONS-40629-0/A
=01+BS1-SRC4310-K3	1	1500 VDC Contactor; 400 ADC; Main contact	HX241CAC	Sensata Technologies	GIG.HX241CAC	Dz-SONS-40629-0/A
=01+BS1-SRC4310-S1	1	22MM ROUND METAL ACTUATOR: RONIS	3SB3500-4AD01	Siemens	SIE.3SB35004AD01	
=01+BS1-SRC4310-S1	2	Contact block with 1 contact element, 1 NO, screw terminal	3SB3400-0B	Siemens	SIE.3SB34000B	
=01+BS1-T1	1	One wire Temperatursensor SRC2xxx	ADS.098430A	ads-tec GmbH	ADS.098430A	DZ-SONS-09843-0/A
=01+BS1-T2	1	One wire Temperatursensor SRC2xxx	ADS.098430A	ads-tec GmbH	ADS.098430A	DZ-SONS-09843-0/A
=01+BS1-X1300	1	PCB connector	MC 1,5/ 9-ST1F-5,08	PHOENIX CONTACT	PXC.1900950	DZ-SONS-40186-0/A
=01+BS1-X1301	1	PCB connector	MC 1,5/ 3-ST1F-5,08	PHOENIX CONTACT	PXC.1900895	DZ-SONS-40185-0/A
=01+FB-F572	1	fuseholder	LFXV15060 BC	Littlefuse, Inc.	LF.LFXV15060BC	DZ-SONS-41615-0/A
=01+FB-F572	1	DC-fuse 60A	LFXV15060 BC	Littlefuse, Inc.	LF.SPXV060	DZ-SONS-41616-0/A

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Parts list

F01_001-ads

Device tag	Quantity	Designation	Type number	Supplier	Part number	Part number
=01+FB-F573	1	fuseholder	LFXV15060 BC	Littlefuse, Inc.	LF.LFXV15060BC	DZ-SONS-41615-0/A
=01+FB-F573	1	DC-fuse 60A	LFXV15060 BC	Littlefuse, Inc.	LF.SPXV060	DZ-SONS-41616-0/A
=01+FB-F574	1	fuseholder	LFXV15060 BC	Littlefuse, Inc.	LF.LFXV15060BC	DZ-SONS-41615-0/A
=01+FB-F574	1	DC-fuse 60A	LFXV15060 BC	Littlefuse, Inc.	LF.SPXV060	DZ-SONS-41616-0/A
=01+FB-F575	1	fuseholder	LFXV15060 BC	Littlefuse, Inc.	LF.LFXV15060BC	DZ-SONS-41615-0/A
=01+FB-F575	1	DC-fuse 60A	LFXV15060 BC	Littlefuse, Inc.	LF.SPXV060	DZ-SONS-41616-0/A
=01+FB-F576	1	fuseholder	LFXV15060 BC	Littlefuse, Inc.	LF.LFXV15060BC	DZ-SONS-41615-0/A
=01+FB-F576	1	DC-fuse 60A	LFXV15060 BC	Littlefuse, Inc.	LF.SPXV060	DZ-SONS-41616-0/A
=01+FB-F577	1	fuseholder	LFXV15060 BC	Littlefuse, Inc.	LF.LFXV15060BC	DZ-SONS-41615-0/A
=01+FB-F577	1	DC-fuse 60A	LFXV15060 BC	Littlefuse, Inc.	LF.SPXV060	DZ-SONS-41616-0/A
=01+FB-U2	2	support rail punched 35/7,5	NS 35/ 7,5 PERF 755MM	PHOENIX CONTACT	PXC.1207640	DZ-MECH-46650-0/A
=01+FB-X31	1	PCB connector	IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1969467	DZ-SONS-41628-0/A
=01+FB-X31.0	1	Feed-through plug	DFK-IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1703784	DZ-SONS-41360-0/A
=01+FB-X32	1	PCB connector	IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1969467	DZ-SONS-41628-0/A
=01+FB-X32.0	1	Feed-through plug	DFK-IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1703784	DZ-SONS-41360-0/A
=01+FB-X33	1	PCB connector	IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1969467	DZ-SONS-41628-0/A
=01+FB-X33.0	1	Feed-through plug	DFK-IPC 16/ 3-STF-10,16	PHOENIX CONTACT	PXC.1703784	DZ-SONS-41360-0/A
=01+FB-XD572	2	End bracket	E/AL-NS 35	PHOENIX CONTACT	PXC.1201662	DZ-SONS-40745-0/A
=01+FB-XD572	6	Power terminal	UKH 70	PHOENIX CONTACT	PXC.3213140	DZ-SONS-40447-0/A
=01+FB-XD572	2	Fixed bridge	FBI 3-20 N EX	PHOENIX CONTACT	PXC.3213211	DZ-SONS-41163-0/A
=01+FB-XD572	6	Pick-off terminal block	AGK 10-UKH 50	PHOENIX CONTACT	PXC.3001763	DZ-SONS-40595-0/A
=01+MEM-U261	1	Planar recessed antenna GSM/UMTS/LTE	60603141	Celphone Schweiz AG	Celphone.60603141	DZ-SONS-41310-0/A
+S-XG348.1	2	Plug M	PP-H 1,5/S/1-M	PHOENIX CONTACT	PXC.3212688	DZ-SONS-40759-0/A
+S-XG348.1	1	Plug R	PP-H 1,5/S/1-R	PHOENIX CONTACT	PXC.3212714	DZ-SONS-40757-0/A

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			Date	16.06.2023	0-Serie, Köngen	ads-tec Energy GmbH	Parts list : LF.LFXV15060BC - PXC.3212714	= BPC	
			Ed	BnVr				+	
			Appr		Grid Service Station 0813			EPE000060	Page 1.f
Modification	Date	Name	Original		Replacement of	Replaced by			Page 69 / 69

Version 1.2

Translation of the original maintenance manual

adstec Energy

Translation of the original maintenance manual

PowerBooster GSS0813

Outdoor battery storage system

DVK-GSS0813 010-AE (with master system setup)
DVK-GSS0813 020-AE (with EMS functionality)

Last changed: 06/2023

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Table of Contents

1 General information

This maintenance manual must be accessible to all persons who are involved in maintenance of the battery storage system and must be read and understood before any work is started. Compliance with the specified maintenance steps is a requirement. Safety instructions and handling instructions must be obeyed in order to ensure that work is carried out safely. Figures used in this instruction manual are provided for basic understanding and may differ from the actual design. The maintenance manual is part of the overall documentation for the GSS battery storage system.

1.1 Legal regulations and other information

The maintenance manual is intended to provide assistance for adhering to legal regulations. It does not, however, replace them. Responsibility for adherence to the applicable laws and regulations lies with the users of the product. All information in this maintenance manual has been compiled according to the current state of technical development and experience.

1.2 Applicable documents

In addition to this maintenance manual the suppliers and manufacturers provide further detailed information and other applicable documents.

The manual and the additional documents can be accessed via https://share.ads-tec.de/index.php/s/BWX4W5Ao9nZjXBW:

NOTE

Observe applicable documents

- ➡ For all work on the battery storage system, also observe the main documents such as the instruction manual, electrical diagram and safety data sheets.
- ➡ For all work on the battery storage system, also observe the documents of the individual components.

1.3 Limitation of liability

ADS-TEC shall not be liable for personal injury, property damage or damage caused to the system as well as consequential damage that is/was the result of non-compliance with this maintenance manual, improper use of the system, repairs and other actions on the product by inadequately trained and unauthorised technical personnel, or that is/was the result of using unapproved replacement parts. Failure to observe the maintenance intervals shall also result in exclusion from liability. ADS-TEC shall not be liable for the contents of documentation from system providers and operating companies. It is strictly forbidden to make any unauthorised alterations or technical modifications to the system.

1.4 Data, figures and modifications

All data, text and figures were prepared to the best of our knowledge. They do not represent any assurance for the properties themselves. The figures are intended for basic understanding and are symbolically represented in individual cases. Subject to changes.

1.5 Trademarks

It is noted that any software and/or hardware trademarks and any company brand names mentioned in this documentation are all subject to the general trademark protection rights. BigLinX® is a registered trademark of ADS-TEC. All other used third-party trademarks are hereby acknowledged. In the case of trademark infringement, ADS-TEC reserves the right to exercise all rights.

1.6 Copyright

1.7 Warranty / repairs

Assembly, commissioning, decommissioning as well as repair and maintenance may be performed only by specially trained personnel from the manufacturer or operating company. Failure to observe this point will invalidate the warranty. The warranty will also be invalidated in the case of failure to observe the maintenance intervals, work on the system by unauthorised persons, operation of the product outside of its specifications and use of non-approved replacement parts as well as any other activity that deviates from this maintenance manual.

1.8 Target group for this manual

This maintenance manual is intended for persons entrusted with or responsible for maintenance of a battery storage system or its sub-assemblies.

1.9 Obligations of the operating company

The maintenance manual must be completely read and fully understood by all persons who work with the battery storage system. At the installation site of the system, the applicable rules and regulations for accident prevention must be observed. All maintenance work must be performed at the specified intervals.

2 Safety

2.1 General safety instructions

The system contains electrical voltages. Should comprehensive modifications be required, it is necessary to consult either with the manufacturer directly or with support personnel authorised by the manufacturer. If the system is opened up by an unauthorised person, the user may be subject to hazards as well as personal injury and the warranty will be invalidated.

Take the battery storage cabinet out of operation before beginning any service or maintenance work (*3 Switching off the system*).

CAUTION

Risk of death due to high voltages!

High voltages can result in death.

- ➡ Check that no voltage is present prior to all work.
- ➡ Wear an appropriate protective equipment.
- ➡ Remove watches, rings, necklaces, bracelets and similar conductive items from your body and clothing.

2.2 Structure of safety instructions

The safety and warning notices used in this documentation are based on the standards DIN ISO 3864-2 (signal words), ISO 3864-1 (safety colours), DIN EN 82079-1 and ANSI Z 535.4 (design).

Signal word	Meaning
DANGER	**Indicates a hazardous situation where non-compliance** will lead to fatal or serious injury.
WARNING	**Indicates a hazardous situation where non-compliance** can lead to fatal or serious injury.
CAUTION	**Indicates a hazardous situation where non-compliance** can lead to minor injury and property damage.
NOTE	Indicates tips for easier operation and cross-references. It **eliminates the risk of property damage or injury.**

Table 1: Signal colours

Example:

DANGER

Description of the type and source of the potential hazard!

Description of the consequences resulting from non-compliance.

- ➡ Description of the measures for hazard prevention.

NOTE

Description of the type of information given in the note!

➡ Description of the information given in the note.

2.3 Safety symbols

Symbol	Meaning
	Designation of batteries in accordance with § 13 of the German Battery Act (BattG). Batteries may not be disposed of with household waste, but must rather be disposed of separately. Used batteries must be returned to the point of sale or a disposal system.
	No naked flames; fire, open ignition sources and smoking prohibited
	"Do not extinguish with water" in accordance with BGV A8 and DIN 4844
	Follow the instructions
	Warning of a danger area
	Warning of electrical voltage
	Warning of hazards from charging batteries
	Warning of non-observance of the discharging time
	Environmental hazard
	Symbol for DC voltage
	Provide earth connection before use

Table 2: Safety symbols

2.4 Special rules of conduct in the event of fire

The system is equipped with a smoke detector that outputs an acoustic signal in the event of smoke emission and stops the power flow by opening the AC and DC isolating elements.

NOTE

Fire protection concept requirement.

- ➡ The operating company is required to provide a fire protection concept with appropriate notices in accordance with local regulations for the entire plant.
- ➡ Observe the example of a "Conduct in case of fire" instruction sheet (➲ *Conduct in case of fire instruction sheet in manual GSS0813*).
- ➡ Note also the safety instructions from the German Energy Storage Association (Bundesverband Energiespeicher Systeme e.V.): (➲ attachment/BVES online*: Preventive and defensive fire protection for large lithium-ion storage systems).*

DANGER

Risk of death from fire and thick smoke!

- ➡ In the event of fire and heavy smoke emission, severe injuries to the body's surface and respiratory passages can occur which could lead to death.
- ➡ Leave the danger area immediately.
- ➡ Notify the fire brigade immediately and observe the instructions listed below.

DANGER

Risk of suffocation from fast and sudden propagation of gases!

If a cell overheats, gases can quickly and suddenly spread and an immediate reaction can occur involving the propagation of flames. The direction of propagation can vary depending on the installation site.

- ➡ Should there be a noticeable smell of gas, remove yourself immediately from the danger area and inform the fire brigade. Observe the instructions listed below.

DANGER

Hazard from flying parts in the event of detonation of the battery system!

In the event of an unexpected malfunction or external influence, the system may detonate.

- ➡ Leave the danger area immediately.

If there is smoke or fire **inside** and/or **outside** the storage system, if there is a smell of gas or if the acoustic warning signal of the smoke detector sounds:

- Remain calm and leave the danger area immediately.
- Warn all persons at the location and require that they leave the danger area via marked escape routes (walk crouched down, as hot gases rise).
- Do not attempt to put out the fire yourself.
- Contact the fire brigade immediately and inform them that lithium-ion batteries are involved in the fire.
- If possible, switch off the main switch or the fuses connected upstream.
- Secure the hazardous area.

2.5 Lithium-ion batteries

CAUTION

Risk of burns due to electrolyte escaping!

Injuries to skin, eyes and respiratory tract or severe damage possible due to incorrect handling.

- Check the packaging of the battery modules for visible damage.
- Avoid contact with escaping fluids.
- Pay attention to the nominal voltage and capacity of the battery modules.

CAUTION

Risk of damage to property due to improper storage and transport!

The storage system contains battery modules. They are delivered on separate pallets. The battery modules are temperature-sensitive and can be damaged if stored incorrectly.

- Store the battery modules in the original packaging in a dry place (preferably in an air-conditioned room) until installation in the system. Optimum storage conditions SRB7143: 10 to 25°C (32 to 77°F) at less than 80% humidity.
- Protect the battery modules from direct sunlight with high heat and from frost.
- Protect the packaging from rain and penetrating moisture. The packaging is not waterproof.

2.5.1 Transportation of new and used lithium-ion batteries

The transport of lithium-ion batteries is subject to conditions that are listed in the regulations for dangerous goods for the individual modes of transport. The packaging for transport and shipping must be in compliance with the respective current regulations;
such as IATA (air), IMDG code (maritime traffic), ADR (road traffic in Europe).

The customer is responsible for informing himself about the developments of the respective regulations and laws. This may vary from country to country. Countries that are not bound by the ADR (European road traffic), IATA (International Air Transport) or IMDG (maritime traffic) may have their own requirements.

Lithium-ion batteries are, for all modes of transport, subject to the regulations for dangerous goods applicable for the respective mode of transport**.** These are to be complied with by all parties involved in the transport, including packers, shippers and consignors. All parties involved in the transport must have completed the training and earned proof of the training required for the respective mode of transport prior to participating in transport.

Classification (as of 2019):

	Shipment name: lithium-ion batteries UN number: UN 3480 Classification: Class 9, danger sign 9A

The lithium-ion batteries correspond to a type that was tested in accordance with the UN Manual of Tests and Criteria, sub-section 38.3.

For the air transport of lithium-ion batteries, a maximum charge state of 30% has been required since 1 April 2016.

With the SRB7143, the optimum transport temperature of the lithium-ion batteries is at least 10°C up to a maximum of 25°C. Exceeding or falling below this temperature (even only temporarily) leads to a decrease in the guaranteed number of cycles. In case of doubt, it is the responsibility of the person responsible for the transport and storage conditions to prove this.

Lithium-ion batteries SRB are assigned Class 9 in all dangerous goods regulations and may be transported in compliance with the regulations specified under number UN3480. Lithium-ion batteries SRB have a rated energy of more than 100 Wh, a mass of more than 12 kg and, thus, are NOT subject to special regulations SV188 (ADR, IMDG) and P965 part IB and part II.

Training:

Persons who are involved with the transport of dangerous goods must be trained in the applicable requirements regarding dangerous goods (details available in the UN regulations).

Handling and battery packaging:

The packaging and labelling of the lithium-ion batteries must be designed and executed in accordance with the UN regulations for the given mode of transport. Responsibility for compliance with the legal regulations lies with the packer and shipper.

The battery packaging should be stored in case the battery needs to be returned or reused.

Not only is compliance with the packaging materials specified there required but also all information on preparing the goods before packing, for packing the goods in the inner and outer packaging, for fastening and for securing within the packaging, for closing the packaging and for labelling.

Used lithium-ion batteries are subject to these regulations as well. For intact and undamaged used lithium-ion batteries, the regulations for new batteries can generally be applied. Please also refer to chapter Disposal (➲ *5 Disposal*)

2.5.2 Transportation of defective or damaged lithium-ion batteries

Defective or damaged lithium-ion batteries are subject to more stringent regulations, which include up to a complete ban on transport. The transport ban applies for air carriers (ICAO T.I., IATA DGR special provision A154, freely available online).

DANGER

Risk of death due to poisoning!

Outgassing substances can cause injury to eyes, skin and respiratory passages. Escaping smoke is highly flammable.

➡ Leave the danger area immediately. Cordon off the hazardous area immediately and notify the fire brigade.

If one of the following questions can be answered with **YES**, the packaging and transport regulations for **damaged/defective** lithium-ion batteries (SV376; P908; LP904, freely available online) apply:

- Battery housing/battery cells exhibit a damaged or deformed housing.
- Fluid is escaping.
- Strange smell of gas is noticeable.
- Measurable increase in temperature in the OFF state.
- Melted or deformed plastic parts.
- Melted power supply lines.
- Battery management system has identified defective cells.

If, even under normal transport conditions, the defective/damaged battery is at a risk of rapid decomposition, dangerous reaction, flame formation, dangerous heat development or dangerous emission of poisonous, corrosive or flammable gases or vapours, then regulations SV376; sentence 5 et seq. / P911; LP906 apply.

2.5.3 Storage and supply of new and used lithium batteries

Observe the manufacturer specifications and safety data sheets of the lithium-ion batteries

- It is strongly advised that directive VDS-3103: 2019-06 also be observed.
- Store the battery modules in their original packaging in a dry, ideally air-conditioned indoor space until installed. The battery modules of the SRB7143 type may be stored between 10°C and 25°C at a relative humidity of <80% (non-condensing). Exceeding or falling below this temperature (even only temporarily) leads to a decrease in the guaranteed number of cycles. In case of doubt, it is the responsibility of the person responsible for the transport and storage conditions to prove this.
- Avoid direct sunlight, large temperature fluctuations and frost.

2.5.4 Storage and supply of defective or damaged lithium batteries

. Observe the manufacturer specifications and safety data sheets of the lithium-ion batteries. You can find these in the appendix.

It is strongly advised that directive VDS-3103: 2019-06 (freely available online) also be observed.

- Separate the defective lithium-ion batteries (quantity restriction).
- Remove damaged or defective lithium-ion batteries from storage and production areas and store them in a separate, fire-resistant area that is engineered for fire protection until they are disposed of.
- Alternatively, store damaged or defective lithium-ion batteries in a spatially separated area (e.g., hazardous materials warehouse or hazardous materials container). Minimum safety distance 5 m. Avoid mixed storage with other products on a shelf or block.
- Make certain that a suitable fire alarm system with connection to a constantly occupied post is present for the storage area.
  For fire extinguishing systems, use suitable extinguishing agents according to the product data sheets.

2.6 Residual risks

The battery system corresponds to the state of the art and was built in accordance with the recognised safety regulations. It was subjected to a careful inspection. However, residual hazards cannot be excluded when using the system. For this reason it is essential that all activities at the battery system are carried out in accordance with the information in this instruction manual.

2.6.1 Electric shock from touching the battery poles of the serially connected battery string

DANGER

Risk of fatal electric shock!

During maintenance and service work, touching the battery poles on the serially connected string can cause serious injuries that can lead to death.

- ➡ Wear appropriate personal protective equipment.
- ➡ Training of the personnel.
- ➡ When working on the battery system or its components, the power supply must be disconnected and secured against being switched on again.

2.6.2 Crushing during movement and installation of a battery module

WARNING

Risk of crushing!

Crushing of hands, arms and other limbs may occur if the user is not qualified and does not use the system as intended. These can lead to serious injuries.

- ➡ Training of the personnel.
- ➡ Wear appropriate personal protective equipment.
- ➡ Use recommended lifting equipment.
- ➡ Have read and understood the entire instruction manual

2.6.3 Off-gassing batteries

WARNING

Hazard due to off-gassing batteries!

If damaged, gasses can escape from the batteries.

- ➡ Observe the battery cell safety data sheet
- ➡ Training of the personnel.

3 Switching off the system

3.1 Switching off the system before performing maintenance or decommissioning

NOTE

Observe qualifications.

- Maintenance and service work as well as decommissioning must be performed only by qualified electricians.
- Only work with insulated tools and remove body jewellery to avoid short circuits and electrical shock.
- Never work on the system on your own.

DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

- Do not come into contact with the + and – poles of the battery modules under any circumstances.
- Do not remove the transport cover until shortly before connecting the power cable.
- Wear insulating gloves.
- Observe the information in the electrical diagram (➲ *Electrical diagram in the manual GSS0813*).

Procedure:

1. Initialise the shut-down process via the controller software.
2. Switch off the backup fuses in the supply line of the storage system at the connection point and secure them against being accidentally switched on again, or remove the fuses.
3. Open the two system doors
4. Turn the AC main switch to the OFF position.
5. Set the key switch on the SRC4310 to the OFF position. Remove the key to prevent it from being switched on again.
6. Wait at least 5 minutes until any residual voltage has been eliminated.
7. Observe the 5 safety rules and use a suitable testing device to ensure that no voltage is present.

Maintenance and repair work can now begin.

For complete decommissioning or disassembly of the system, the further disassembly steps in the instruction manual must be observed (➲ *instruction manual chapter 10.2 Removing all power supply lines*).

4 Maintenance

4.1 Safety instructions

NOTE

Observe qualifications.

- Maintenance work may only be performed by trained and qualified electricians.
- Follow the electrical diagram documentation for all electrical connections (➲ *Electrical diagram in manual GSS0813*).

NOTE

Observe the manufacturer's specifications.

- Before performing any maintenance and service work, follow the manufacturer's specifications in the documentation of the individual components.

NOTE

Contact ADS-TEC service

- If SRB modules need to be replaced, please contact ADS-TEC support. Replacement and exchange may only be carried out by qualified and trained electricians.

NOTE

Observe the maintenance intervals

- Regular maintenance work is required in order to prevent potential damage to and failure of the complete system. The operator's obligation to cooperate will ensure a long service life of the complete system.

DANGER

Risk of death due to electric shock!

The AC supply must be switched off before any work is performed on the system, otherwise a potentially fatal electric shock can occur.

Open cable ends can cause an electric shock with fatal consequences when touched under existing mains voltage.

- Comply with national and international safety rules and regulations according to IEC 60364-6 (DIN VDE 0105-100) for working on electrical systems.
- Wear the appropriate protective clothes.
- Before starting work, make sure that the AC supply of the supply lines to the system is switched off and secured to prevent it from being switched on again inadvertently.
- Make sure that the main switch is set to the **OFF** position.
- Set the SRC4 key switch to the **OFF** position.
- Observe a waiting period of at least 5 minutes to reliably exclude residual voltages.
- Check that the system is de-energised.
- Before making any changes to the interior, check that the fan has stopped.

DANGER

Risk of death due to electric shock!

Coming into contact with the battery poles can cause fatal injuries.

Even when the main switch and the SRC4310 are switched off, there is always a voltage between + and –.

- ➡ Do not come into contact with the + and – poles of the battery modules under any circumstances.
- ➡ Do not remove the transport cover until shortly before connecting the power cable.
- ➡ Wear insulating gloves.
- ➡ Observe the information in the electrical diagram (➲ *Electrical diagram in the manual GSS0813*).

Also observe the safety instructions for the inverter:

DANGER

Risk of death due to hazardous voltage and residual voltage!

The AC supply must be switched off before any work is performed, otherwise a potentially fatal electric shock can occur.

Observe the safety instructions for the overall system given in the maintenance manual.

- ➡ Touching can result in electric shock or burns
- ➡ Do not remove the cover
- ➡ Switch off the system and lock it before beginning maintenance work.
- ➡ Observe a waiting period of at least 5 minutes to reliably exclude residual voltages.
- ➡ The touch current can be above 3.5 mA and cause physical disorders. Connection of protective earth eliminates the danger.

Maintenance and repair work can now begin.

For complete decommissioning or disassembly of the system, the further disassembly steps in the instruction manual must be observed (➲ *Instruction manual chap. 10.2 Removing all power supply lines*).

4.2 Maintenance/visual inspection for operating company

Assembly	Component	Description	Maintenance interval
		– Observe the safety instructions	
		– Complete the maintenance checklist (➲ *7.3 Maintenance checklist for operating company*)	
Overall system		– Visual inspection (exterior) – Clean the exterior if necessary (➲ *4.3.1.1 Cleaning the exterior*)	Every 3 months
		– Visual inspection (interior) – Check for soiling and damage on the exterior and in the interior	Every 3 months

	Fan	– Listen for loud noises. Notify the service team if necessary.	Every 3 months
	Smoke detector	– Test activation and if necessary replace battery (➲ *4.3.8 Smoke detector*)	Every 12 months
	Air-conditioning system Rittal Blue e+ Outdoor SK 3185.330	– Check ventilation grilles at the right cabinet door for soiling and whether they are free from leaves, etc.	Every 6 months, more frequently as necessary if extremely soiled.

Table 3: Maintenance schedule for the operating company

4.3 Maintenance for certified maintenance personnel

The maintenance intervals depend on the degree of contamination of the ambient air. If a high degree of contamination is expected, it may be necessary to carry out maintenance activities more frequently. Contamination can reduce the performance of the cooling unit and thereby also reduce the performance or service life of the system and/or individual components and potentially result in faults.

Assembly	Component	Description	Maintenance interval
		– Observe the safety instructions	
		– Complete the maintenance checklist (➲ *7.4 Maintenance checklist for certified maintenance personnel*)	
Overall system	Overall system	– Visual inspection (exterior)	Every 12 months
	Overall system	– Visual inspection (interior) – Check for soiling – Check for humidity – Clean if necessary (➲ *4.3.1 Cleaning*)	Every 12 months
	Fan components 	– Listen out for unusual noises during operation	Every 12 months
		– Check the ventilation grilles from the outside (➲ *4.3.2 Exterior of the ventilation grilles*)	Every 12 months
		– Check the filter mats in the door (➲ *4.3.3 Filter mats in the door*)	Every 12 months
		– Fan test via EMM3821 – Replace the fan if necessary	Every 12 months
	Condensate drain hose	– Check the condensate drain hose for soiling	Every 12 months
	Earth connections	– If necessary, arrange via the operating company: Have electricians licensed to carry out work on electrical systems check the connections and perform a functional check.	According to VDE0113
Overall system		– Check the device according to DIN VDE 0100-600 and DIN VDE 0105-100 (➲ *4.3.4 VDE 0100-600 check*)	Initial check, repeat check every 4 years
	Battery modules SRB7xxx	– The battery modules SRB7xxx are maintenance-free, which means that regular maintenance is not required.	
	Door contact switches	– Check the door contact switches (➲ *4.3.5 Checking door contact switches*)	Every 12 months

Sub-distribution system	AC connection	– Check the torques of the AC terminal strip (➲ *4.3.6 Checking the AC terminal strip*)	Every 12 months
	DC cabling	– Check the strain relief of the DC cabling (➲ *4.3.7 Checking the DC cabling*)	Every 12 months
	Smoke detector	– Perform a visual inspection of the smoke detector (➲ *4.3.8 Smoke detector*)	Every 12 months
		– Perform a functional check (➲ *4.3.8 Smoke detector*)	Every 12 months
		– Replace the battery/smoke detector (➲ *4.3.8 Smoke detector*)	As needed
	SRC4310	– Replace button cell (➲ 4.3.9 *Replacing the SRC4310 backup battery*)	Every 3 years
	SRS controller box	– Replace the energy storage system (➲ *4.3.10 Replacement of the energy storage system*)	Every 6 years
	TruConvert AC3025 inverter	– Follow the maintenance instructions in the manufacturer's documentation! (➲ *7.1 Excerpt from inverter maintenance*)	
		– Clean (clean with a dry cloth if necessary)	As required
		– Replace the fan (carried out by Trumpf personnel)	Every 6 years
		– Perform software updates (carried out by Trumpf personnel)	As required
	Air-conditioning system Rittal Blue e+ Outdoor SK 3185.330	– Make the air-conditioning system accessible (➲ *4.4 Making the* **air-conditioning system**)	
		– Follow the maintenance instructions in the manufacturer's documentation! (➲ *7.2 Excerpt from air-conditioning system maintenance*)	
		– Clean the cooling unit – Clean with compressed air	Every 5000–8000 operating hours
		– Check the fans for operating noises	Every 40,000 operating hours

Table 4: Maintenance schedule for certified maintenance personnel

4.3.1 Cleaning

4.3.1.1 Cleaning the exterior

All surfaces accessible from the outside can be cleaned using a cloth that is damp. Do not use any cleaning agents or solvents.

4.3.1.2 Cleaning the interior

NOTE

Observe procedure.

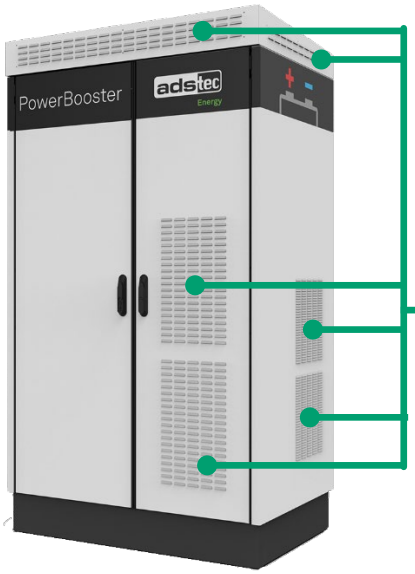
➡ The maintenance intervals/cleaning of the storage system may only be carried out after the system is shut down.

NOTE

Observe the aids.

➡ Compressed air and dry-cleaning cloths must be used for any cleaning work that is required.

4.3.2 Exterior of the ventilation grilles



Every 12 months

– From the outside, check the ventilation grilles for damage and soiling (free from leaves, insects etc.).

1 Ventilation grilles

FIGURE 1: EXTERIOR OF THE VENTILATION GRILLES

4.3.3 Filter mats in the door

FIGURE 2: FILTER MATS IN THE RIGHT DOOR

Every 12 months

- Check the two filter mats in the right door for soiling.
- Replace the filter mats if necessary.

4.3.4 VDE 0100-600 check

Check according to DIN VDE 0100 and DIN VDE 0105	**Initial check,** **Repeat check every 4 years**	**Check the system according to these regulations:** Check electrical systems according to DIN VDE 0100-600 and according to DIN VDE 0105-100. – Attach the protocols to the checklist after performing the check (➲ *7.4 Maintenance checklist for certified maintenance personnel*).

4.3.5 Checking door contact switches

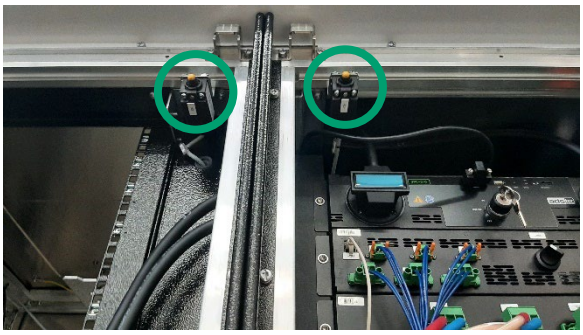


FIGURE 3: POSITIONS OF THE DOOR CONTACT SWITCHES

Every 12 months

- Check the door contact switches by opening the left and right doors one after the other.
- When the doors open, a warning message must appear in the web interface.

4.3.6 Checking the AC terminal strip

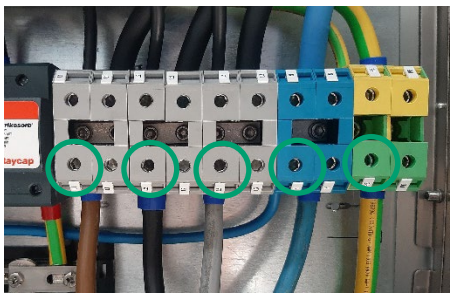


FIGURE 4: AC TERMINAL STRIP CONNECTIONS

Every 12 months

- Check the five supply lines and their torques (10 Nm) at the AC terminal strip.

From left to right:

- L1-L2-L3, N, PE

4.3.7 Checking the DC cabling

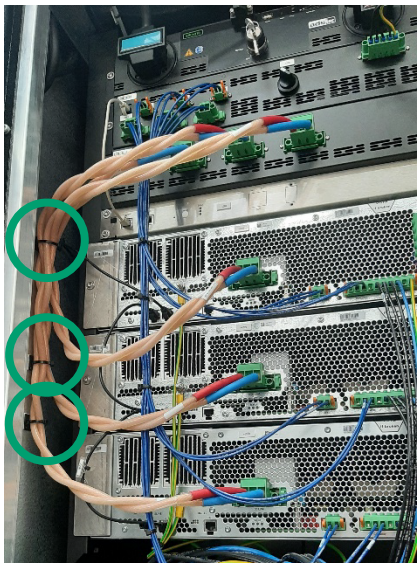


FIGURE 5: STRAIN RELIEF DEVICES

Every 12 months

- Perform a visual inspection of the three strain relief devices of the DC cabling.
- Attach new strain relief devices if necessary.

4.3.8 Smoke detector

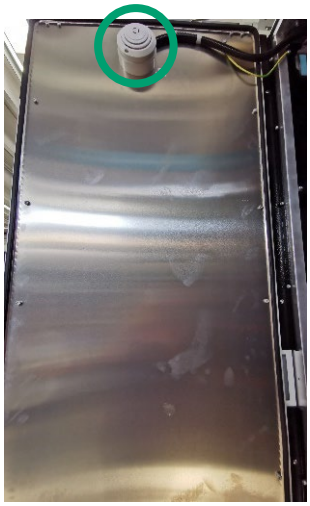


FIGURE 6: POSITION OF THE SMOKE DETECTOR

Every 12 months

Visual inspection and care:

- Perform a visual inspection of the smoke detector for humidity, dust, traces of heat or other abnormalities.
- The device should be wiped dry if necessary and vacuumed from the outside with a vacuum cleaner.

Every 12 months and after each battery replacement

Functional check:

- Check the function of the smoke detector:
  Press the test button (for up to 20 seconds) until a loud and pulsating alarm tone sounds (approx. 85 dB). The test alarm resets automatically a few seconds after the test button is released.
- Replace the smoke detector if necessary.

1 x annually

Automatic functional check:

The detector performs an automatic self-test every 45 seconds:

- OK: red LED
- Not OK: beeps (about every 45 seconds), about 30 days in advance → Battery replacement required

FIGURE 7: BATTERY REPLACEMENT

As required	**Battery replacement:** Do not use rechargeable batteries. – Perform a function test after each battery change. – Use a 9V lithium block battery.
As required	**Smoke detector replacement:** In the event of a malfunction, the red LED flashes alternately to the beep tone about every 45 seconds. In this case the detector must be replaced. The detector automatically resets itself when an alarm is triggered if there are no more particles in the smoke chamber.

4.3.9 Replacing the SRC4310 backup battery

A lithium CR2032 button cell is built into the SRC4310. A maintenance interval of **three years** is recommended for the button cell. The procedure described in the following for maintenance is to be observed under all circumstances.

NOTE

Adjusting the time

➡ Replacing the button cell causes the set time to be lost. Replace the button cell of the clock at the same time and then reset the clock via the web interface.

FIGURE 8: REMOVING THE SRC4310 BACKUP BATTERY

Every 3 years

– Remove the battery holder with the aid of a screw driver through the opening via the slot in the front (marked in blue in the drawing).

FIGURE 9: REPLACING THE SRC4310 BACKUP BATTERY

– Replace the battery (CR2032), paying attention to the polarity.

FIGURE 10: INSTALLING THE SRC4310 BACKUP BATTERY

– Reinsert the slot. When correctly installed, the arrows on the slot and the front point towards one another.
– Push the slot in all the way. The battery holder audibly snaps into place.

4.3.10 Replacement of the energy storage system

FIGURE 11: POSITION OF THE ENERGY STORAGE SYSTEM

every 6 years

Replacement of the energy storage system

Energy storage system

Electrical diagram No.: -GB206

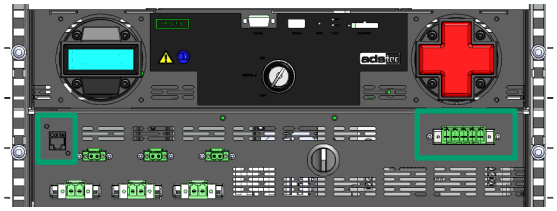


FIGURE 12: DISCONNECTING THE CABLES ON THE SRS CONTROLLER BOX

Disconnect the Ethernet cable at plug -XF267 and the cable -W161 at plug -X1.

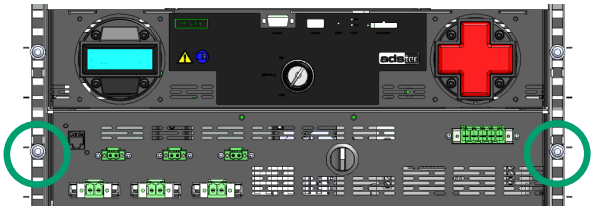


FIGURE 13: DETACHING THE SRS CONTROLLER BOX

Detach the controller box by undoing and removing 2x Torx 30 screws.

Pull the controller box forwards and disconnect the cables on the rear side.

Label the cables at the energy storage system.

Detach the energy storage system by undoing and removing three screws on the rear side of the energy storage system.

Disconnect the cables.

FIGURE 14: ENERGY STORAGE SYSTEM

Position the new energy storage system so that you are able to connect the cables in accordance with the electrical diagram (➲ *electrical diagram in manual GSS0813)*.

Attach the new energy storage system to the rear side of the energy storage system using the three screws.

Insert the fuse according to the enclosed instructions from the manufacturer.

NOTE:

When installing, observe the manufacturer specifications.

4.4 Making the air-conditioning system accessible

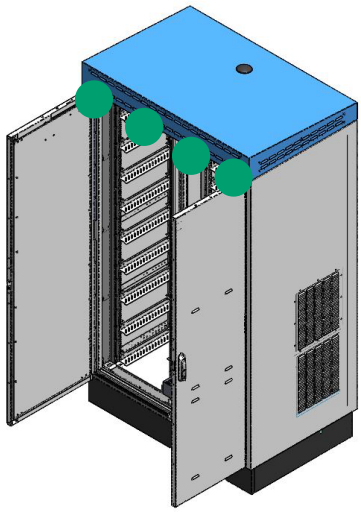


FIGURE 15: DETACHING THE ROOF

1 – Open both doors.

2 – Detach the roof by undoing and removing 4x M6 screws.

3 – Slide the roof towards the doors. The roof can then be removed carefully.

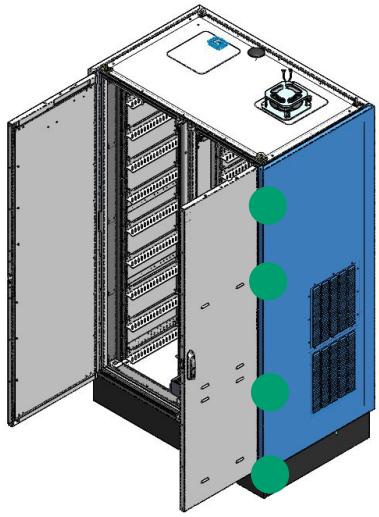


FIGURE 16: DETACHING THE SIDE PANEL

4 – Detach the right side panel by undoing and removing 4x M6 screws from the inside.

5 – Fully remove the side panel.

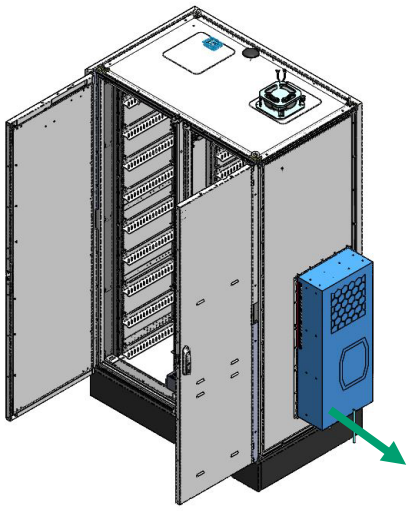


FIGURE 17: PULLING OUT THE AIR-CONDITIONING SYSTEM

6 – Carefully pull the air-conditioning system out to the side.

4.5 Information on storage

Always observe the environmental conditions for storing batteries (no direct sunlight, dry room, no frost). Check the charge state of the batteries regularly. Follow the instructions on storage (➲ 2.5.3 *Storage and supply of new and used lithium batteries).*

NOTE

Recharging the battery

➡ If the value drops below 20% SOC, it is recommended that the battery storage system be charged. The level of self-discharging at room temperature is < 2 % SOC / month.

5 Disposal

When lithium-ion batteries are transported for disposal, the relevant regulations applicable to the respective mode of transport must be observed. SV 377 applies (ADR, IMDG).

Special regulations apply to damaged/defective lithium batteries (➲ *2.6 Lithium-ion batteries*).

The battery packaging should be stored in case the battery needs to be returned or reused.

When disposing of the system, observe the disposal directive WEEE 2012/19/EU as well as the German Electrical and Electronic Equipment Act (ElektroG).

- The crossed-out wheeled bin symbol identifies materials that are not allowed to be disposed of with domestic waste. Collect these materials separately to ensure specific and safe recycling of the components.
- Return used electronic devices to the point of sale or take them to a disposal facility.
- Observe the regulations and supplementary information on the disposal of lithium-ion batteries.
- Dispose of the coolant in accordance with the specifications given in the safety data sheet for the coolant.
- Dispose of the remaining components in accordance with the legal requirements and guidelines applicable at the installation location.

6 Service & support

ADS-TEC and its partner companies provide you with comprehensive maintenance and support services, ensuring quick and competent assistance should you have any questions or queries with regard to ADS-TEC products and equipment.

6.1 ADS-TEC support

The ADS-TEC support team is available for inquiries from direct customers between

8:30am and 5:00pm, Monday to Friday. The support team can be reached via phone or e-mail:

Phone: +49 7022 2522-203

E-mail: support.est@ads-tec-energy.com

Alternatively, you can contact us by completing a support form on our website www.ads-tec-energy.com. Our Support team will then get in touch with you as soon as possible.

6.2 Company address

ads-tec Energy GmbH
Heinrich-Hertz-Str.1
72622 Nürtingen
Germany

Phone: +49 7022 2522-201
E-mail: energy@ads-tec-energy.com
Home: www.ads-tec-energy.com

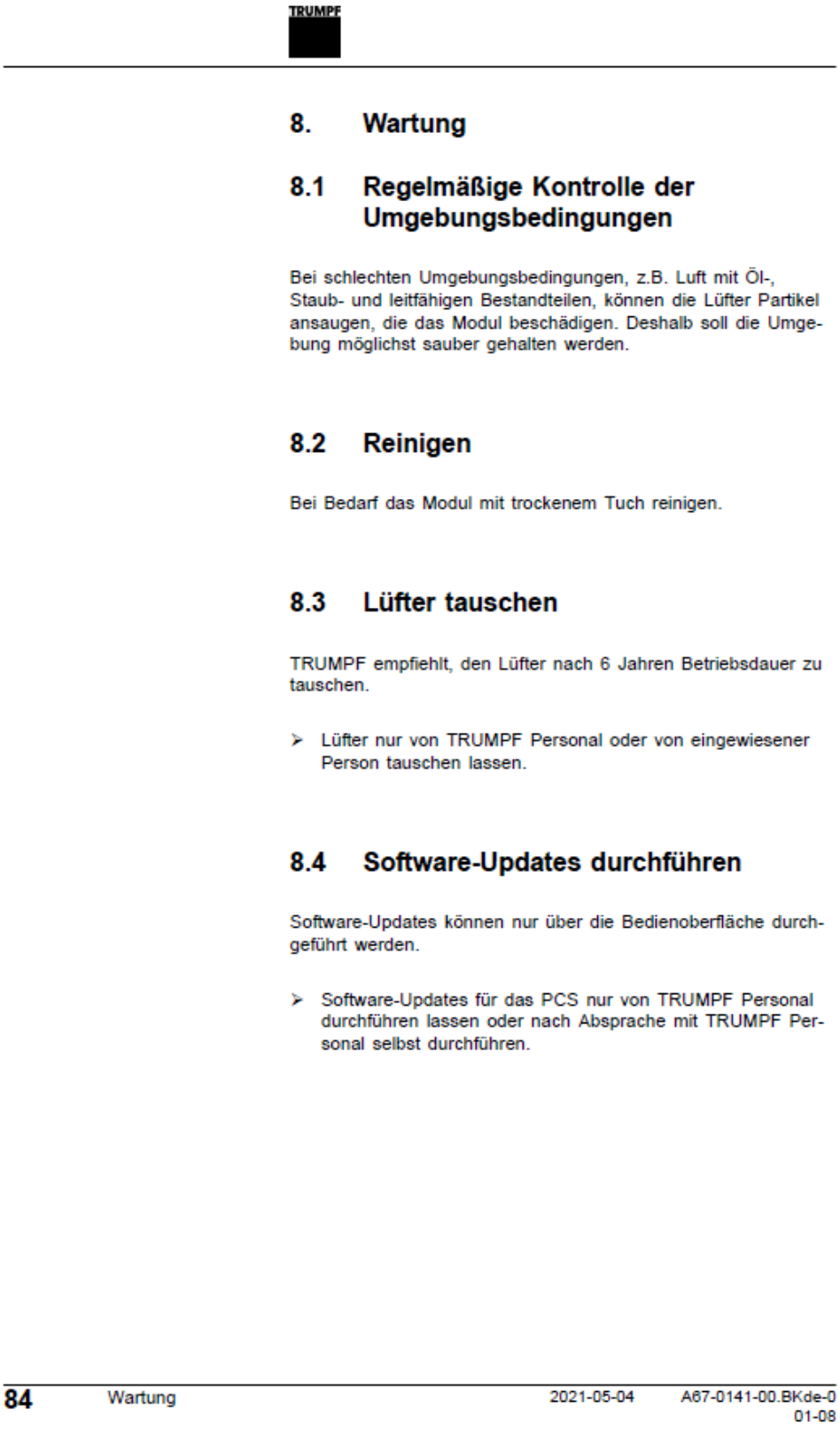
6.3 Replacement parts

If you need to order replacement and wear parts for the system or you require detailed advice in this regard, contact the manufacturer. Have the serial number available.

7 Appendix

7.1 Excerpt from inverter maintenance

Look online regularly to check that the documentation is up to date.



TRUMPF

8. Wartung

8.1 Regelmäßige Kontrolle der Umgebungsbedingungen

Bei schlechten Umgebungsbedingungen, z.B. Luft mit Öl-, Staub- und leitfähigen Bestandteilen, können die Lüfter Partikel ansaugen, die das Modul beschädigen. Deshalb soll die Umgebung möglichst sauber gehalten werden.

8.2 Reinigen

Bei Bedarf das Modul mit trockenem Tuch reinigen.

8.3 Lüfter tauschen

TRUMPF empfiehlt, den Lüfter nach 6 Jahren Betriebsdauer zu tauschen.

➢ Lüfter nur von TRUMPF Personal oder von eingewiesener Person tauschen lassen.

8.4 Software-Updates durchführen

Software-Updates können nur über die Bedienoberfläche durchgeführt werden.

➢ Software-Updates für das PCS nur von TRUMPF Personal durchführen lassen oder nach Absprache mit TRUMPF Personal selbst durchführen.

84 Wartung 2021-05-04 A67-0141-00.BKde-0 01-08

7.2 Excerpt from air-conditioning system maintenance

Look online regularly to check that the documentation is up to date.

8 Inspektion und Wartung

8 Inspektion und Wartung

8.1 Sicherheitshinweise zu Wartungsarbeiten

Für die Wartungsarbeiten muss das Gerät geöffnet werden. Es besteht Verletzungsgefahr durch Stromschlag.

- Schalten Sie vor den Wartungsarbeiten die Spannungsversorgung ab.
- Sichern Sie die Spannungsversorgung gegen versehentliches Einschalten.
- Trennen Sie das elektrische Anschlusskabel des Kühlgeräts an der Anschlussbox vom netzseitigen Anschluss.
- Halten Sie anschließend eine Wartezeit von mindestens fünf Minuten ein, bevor Sie am Gerät hantieren. Erst dann haben sich die im Gerät verbauten Kondensatoren entladen.
- Achten Sie auch beim Hantieren im Schaltschrank, sofern erforderlich, auf offenliegende Spannungsquellen.
- Trennen Sie, falls möglich, den gesamten Schaltschrank vom Netz.

Des Weiteren besteht Verletzungsgefahr an scharfen Kanten, z. B. den Lamellen des Wärmeaustauschers.

- Tragen Sie für alle Wartungsarbeiten schnittfeste Handschuhe.

An Komponenten im Inneren des Geräts besteht nach dem Abnehmen der Haube Verbrennungsgefahr an heißen Oberflächen.

- Lassen Sie vor Arbeiten im Inneren das Gerät mindestens zehn Minuten abkühlen.

8.2 Hinweise zum Kältemittelkreislauf

Das Kühlgerät ist werkseitig mit der erforderlichen Kältemittelmasse gefüllt, auf Dichtigkeit geprüft und einem Funktionsprobelauf unterzogen worden. Der Kältemittelkreislauf ist ein wartungsfreies und hermetisch geschlossenes System. Daher sind am Kältemittelkreislauf vom Betreiber keine Wartungsarbeiten durchzuführen.

Vorsicht!
Eventuell notwendige Reparaturarbeiten am Kältemittelkreislauf dürfen nur von Kälte-Fachpersonal durchgeführt werden.

8.3 Wartungen am Kühlgerät

Die Komponenten des äußeren Luftkreislaufes müssen bei sichtbarem Verschmutzungsgrad mit Hilfe eines Staubsaugers bzw. mit Druckluft gereinigt werden.

Hinweis:
Die im Folgenden angegebenen Wartungsintervalle hängen insbesondere vom Verschmutzungsgrad der Umgebungsluft ab. Bei stärker belasteter Luft reduzieren sich die Wartungsintervalle entsprechend.

- Reinigen Sie das Kühlgerät außen und innen wenigstens alle 5000-8000 Betriebsstunden wie in Abschnitt 8.4 „Druckluftreinigung“ beschrieben.
- Entfernen Sie zusätzlich hartnäckigen, ölgetränkten Schmutz mit nicht brennbarem Reiniger, z. B. Kaltreiniger.

Vorsicht!
Verwenden Sie niemals brennbare Flüssigkeiten zur Reinigung des Geräts.

Die eingebauten wartungsfreien Ventilatoren sind kugelgelagert, feuchtigkeits- und staubgeschützt und mit einem Temperaturwächter ausgestattet.

- Rittal empfiehlt, nach einer Laufzeit von 40000 Betriebsstunden die Ventilatoren des Kühlgeräts z. B. auf ungewöhnliche Laufgeräusche prüfen zu lassen.

8.4 Druckluftreinigung

8.4.1 Demontage der Haube

- Lösen Sie unten an der Haube mit Hilfe des Spezialschlüssels für Torx TX25 aus dem Versandbeutel die drei Befestigungsschrauben und nehmen Sie diese nach unten weg.

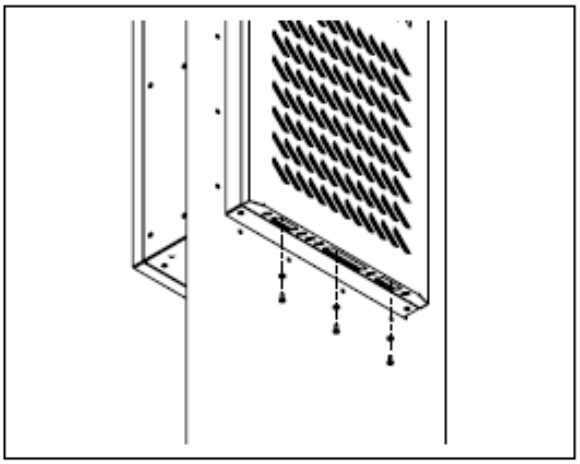


Abb. 47: Lösen der Befestigungsschrauben

- Heben Sie die Haube leicht nach oben an und ziehen Sie sie leicht vom Gehäuse weg nach vorne.

8 Inspektion und Wartung

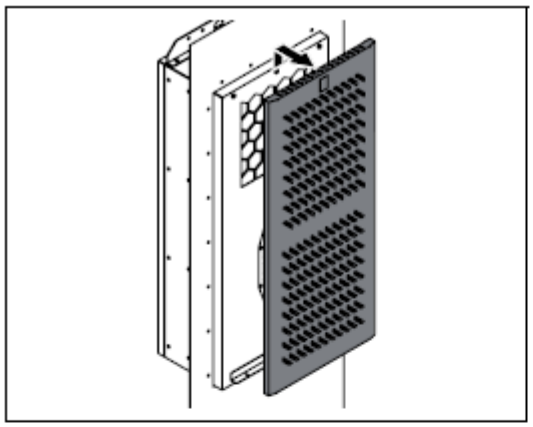


Abb. 48: Anheben der Haube

- Schwenken Sie die Haube dann leicht zur Seite.

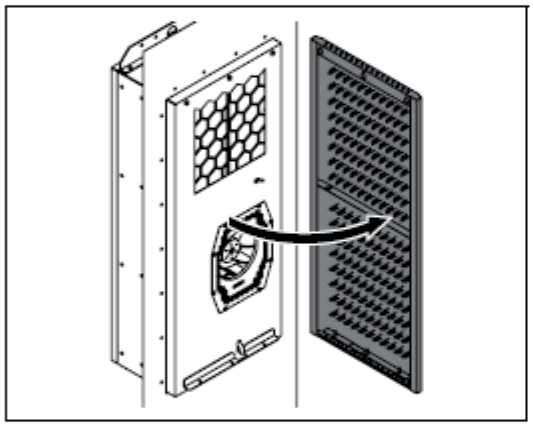


Abb. 49: Aufschwenken der Haube

- Seitlich rechts, etwa auf mittlerer Höhe befindet sich die Schutzleiterverbindung zwischen der Haube und dem Gehäuse.
- Ziehen Sie den Flachstecker des Schutzleiters innen vorzugsweise am Gehäuse ab und entfernen Sie die Haube dann komplett vom Gerät.

8.4.2 Druckluftreinigung der Komponenten

Nach dem Abnehmen der Haube des Geräts haben Sie Zugriff auf die Komponenten des Außenkreises, insbesondere den Verflüssiger, den Verflüssigerventilator und den Verdichterraum.

- Tragen Sie für die Druckluftreinigung schnittfeste Handschuhe, um Verletzungen an scharfen Kanten im Inneren des Geräts zu vermeiden.
- Blasen Sie die Komponenten mit Druckluft so aus, so dass eventuell vorhandene Verschmutzungen seitlich aus dem Kühlgerät herausgeblasen werden.
- Saugen Sie alternativ alle Komponenten mit einem geeigneten Staubsauger ab und aus.

8.4.3 Montage der Haube

Nach Abschluss der Reinigungsarbeiten muss die Haube wieder am Kühlgerät montiert werden.

- Montieren Sie die Haube wieder auf dem Gehäuse in umgekehrter Reihenfolge.
- Stellen Sie hierbei unbedingt sicher, dass der Schutzleiter, der Haube und Gehäuse verbindet, an beiden Steckern angeschlossen wird.

7.3 Maintenance checklist for operating company

After successful completion of the maintenance activities, this checklist must be sent to support.est@ads-tec-energy.com immediately.

Master data of the electrical system		
1	Address of the system:	
2	System serial number:	
3	Date of commissioning:	
4	Customer:	
5	Address of the customer:	
6	Contact person:	
7	Telephone number of contact person:	
8	Email address of contact person:	

Maintenance activities					
		Interval	**OK**	**nOK**	**Comment**
1	Safety instructions observed	Every 3 months			
2	Visual inspection of housing done	Every 3 months			
3	No signs of forced entry or vandalism visible on housing	Every 3 months			
4	No signs of forced entry or vandalism visible at door locks	Every 3 months			
5	The warning stickers are attached above the two door handles and undamaged 	Every 3 months			
6	No internal damage or soiling visible	Every 3 months			
7	No unusual noises detectable in or around system	Every 3 months			
8	No abnormalities relating to humidity, dust, traces of heat or similar visible on the smoke detector	Annually			
9	Test activation of smoke detector successful	Annually			
10	Replace smoke detector battery (Beeps (about every 45 seconds), about 30 days in advance)	as needed			
11	Smoke detector replacement: (Malfunction: red LED flashes alternately to beep tone approx. every 45 seconds)	as needed			
12	No soiling in the ventilation grilles in the right cabinet door	Every 6 months			

Remarks

With my signature, I hereby confirm that the maintenance of the PowerBooster battery storage system was performed properly.

Date	Location	Name (in block letters)	Signature

7.4 Maintenance checklist for certified maintenance personnel

After successful completion of the maintenance activities, this checklist must be sent to support.est@ads-tec-energy.com immediately.

1. Master data of the electrical system		
1	Address of the system:	
2	System serial number:	
3	Date of commissioning:	
4	Customer:	
5	Address of the customer:	
6	Contact person:	
7	Telephone number of contact person:	
8	Email address of contact person:	

Maintenance					
		Interval	**OK**	**nOK**	**Comment**
1	Safety instructions observed	Annually			
2	Visual inspection of housing done	Annually			
3	No signs of forced entry or vandalism visible on housing	Annually			
4	No signs of forced entry or vandalism visible at door locks	Annually			
5	The warning stickers are attached above the two door handles and undamaged 	Annually			
6	No internal damage or soiling visible	Annually			
7	No unusual noises detectable in or around system	Annually			
8	No soiling visible on the exterior of the ventilation grilles	Annually			
9	Filter mats in the door checked for soiling and replaced if necessary	Annually			
10	Fan test performed via EMM3821	Annually			
11	No soiling visible in the condensate drain hose	Annually			
12	Check of the earth connection arranged via the operating company	According to VDE0113			
13	Inspection in accordance with DIN VDE 0100-600	every 4 years			
14	Inspection in accordance with DIN VDE 0105-100	every 4 years			
15	Door contact switches are functional	Annually			
16	Check of the torques of AC terminal strip (10 Nm)	Annually			
17	All three strain relief devices are correctly attached	Annually			

18	No abnormalities relating to humidity, dust, traces of heat or similar visible on the smoke detector	Annually			
19	Test activation of smoke detector successful	Annually			
20	Replace smoke detector battery (Beeps (about every 45 seconds), about 30 days in advance)	as needed			
21	Smoke detector replacement: (Malfunction: red LED flashes alternately to beep tone approx. every 45 seconds)	as needed			
22	Button cell of SRC4310 replaced	every 3 years			
23	Replacement of the energy storage system (-GB206)	every 6 years			
24	Inverter maintenance performed according to the manufacturer's documentation				
25	Air-conditioning system maintenance performed according to the manufacturer's documentation				

Remarks

With my signature, I hereby confirm that the maintenance of the PowerBooster battery storage system was performed properly.

Date	Location	Name (in block letters)	Signature

7.5 List of tables

7.6 List of figures

7.7 Revision history

Date	Revision	Change	Creation	Release
06.04.2023	V1.0 Beta	Beta version, interim version for customer information	Ruoss	Schledzewski
28.06.2023	V1.1	Overall revision	Trautmann	Straub
09.08.2023	V1.2	Links revised; Chap. 4.3.1 Cleaning revised.	Ruoss	

DATA SHEET

PROTECTOR K RELAY

Item number	GTIN
ER10018923	4015120018923

Product description

- Switching relay for triggering external devices such as sirens, flash lights and alarm horns
- Can be used with PROTECTOR K 9 V, PROTECTOR K 9 V Lithium, PROTECTOR GD 230 V and PROTECTOR K 230 V
- Separate surface- or recessed-mounted switchbox required

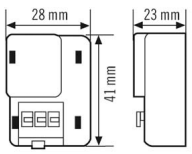
Technical data

GENERAL	
Device category	Electrical accessories
Remote controllable	–
Conformity	CE, EAC, RoHS
Relay switching capacity	230 V/50 Hz, 5 A (cos phi = 0) 24 V DC, 10 A

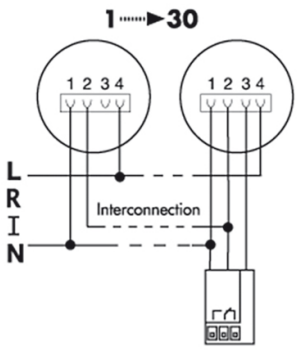
ATTACHMENT	
Installation position	Device

HOUSING	
Dimensions	Length 41 mm x Width 28 mm x Height/Depth 23 mm
Weight	2,4 g
Colour	white, similar to RAL 9010

Scale drawing

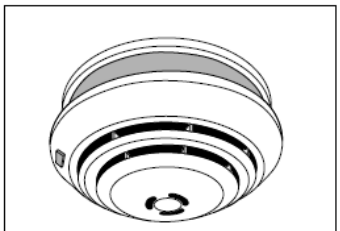


Circuit diagram

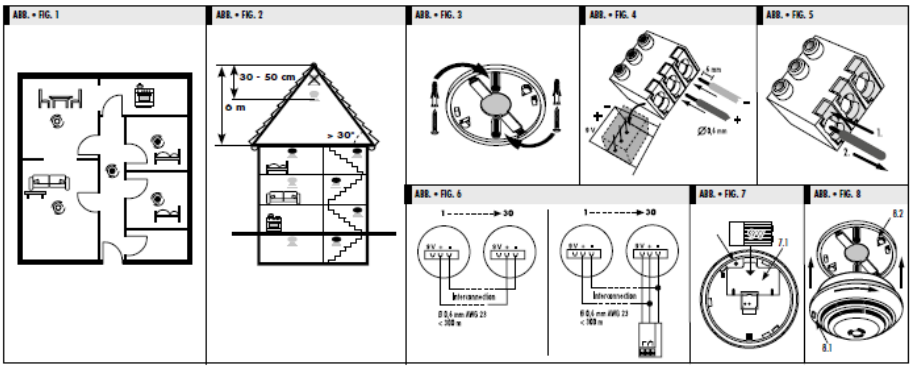


Connection 230 V AC and interconnection + external switching relay (optional) for switching of external devices such as sirens, flashlights and telephone diallers.

DE RAUCHWARNMELDER
GB SMOKE DETECTOR
FR DÉTECTEUR DE FUMÉE
NL ROOKMELDER
DK RØGALARM
SE RÖKDETEKTOR



• PROTECTOR K 9 V
• PROTECTOR K 9 V LITHIUM



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• TECHNISCHE DATEN • TECHNICAL DATA • DONNÉES TECHNIQUES • TECHNISCHE GEGEVENS • TEKNISKE DATA • TEKNISKA UPPGIFTER

BATTERIEBETRIEB BATTERY OPERATION PILE	9 Volt	BATTERIJVOEDING DRIFT MED BATTERI BATTERIDRIFT
EMPFOHLENE BATTERIEN RECOMMENDED BATTERIES MODÈLES DE PILES RECOMMANDÉS	Energizer 6LR61, Power Line 6LR61, Duracell MN1604, Ultralife U9VL-J-P	AANBEVOLEN BATTERIJEN ANBEFALEDE BATTERIER REKOMMENDERADE BATTERIER
GEPRÜFT NACH TESTED TO CONFORME À	EN 14604:2005/AC:2008	GEKEURD VOLGENS AFPRØVET IFØLGE KONTROLLERAD ENLIGT
LUFTFEUCHTIGKEIT HUMIDITY TAUX D'HUMIDITÉ DE L'AIR	10 % - 95 %	LUCHTVOCHTIGHEID LUFTFUGTIGHED LUFTFUKTIGHET
SIGNALLAUTSTÄRKE SIGNAL VOLUME VOLUME DU SIGNAL	ca. 85 dB/3 m	STERKTE GELUIDSSIGNAAL SIGNALETS LYDSTYRKE SIGNALLJUDSTYRKA

Technische und optische Änderungen ohne Ankündigung vorbehalten • Technical and design features may be subject to change • Des modifications techniques et esthétiques peuvent être apportées sans préavis • Technische en optische wijzigingen zonder kennisgeving voorbehouden • Ret til tekniske og optiske ændringer uden varsel forbeholdes • Vi förbehåller oss rätten till tekniska och utseendemässiga ändringar utan föregående meddelande.

GB • SMOKE DETECTOR

Congratulations on your purchase of this high-quality ESYLUX product. To ensure proper operation, please read these user instructions carefully and keep them for future reference.

1 • SAFETY INSTRUCTIONS

Use this product only as intended (as described in the user instructions). Changes or modifications to the product or painting it will result in loss of warranty. You should check the device for damage immediately after unpacking it. If there is any damage, you should not install the device under any circumstances. If you suspect that safe operation of the device cannot be guaranteed, you should turn the device off immediately and make sure that it cannot be operated unintentionally.

2 • DESCRIPTION

The ESYLUX PROTECTOR K is a reliable photoelectric smoke detector designed for use in residential buildings. It triggers the alarm as soon as smoke is detected.
A beam of light is generated every 10 seconds in the PROTECTOR K's smoke chamber. If smoke enters the chamber, the light is reflected onto a light-sensitive cell which triggers an alarm signal (approx. 85 dB). When an alarm is triggered, the detector automatically resets itself if there are no longer any particles in the smoke chamber. The detector can also be switched off manually by removing the battery.

Application possibilities:
- Stand-alone mode
- Wire interconnection of up to 30 PROTECTOR detectors

For optimum protection of your home, install smoke detectors in all rooms, corridors, basements and store rooms. Ensure basic protection by installing PROTECTOR smoke detectors in all bedrooms, playrooms and in the corridors on all floors **(fig. 1 + 2)**.

If used in stand-alone mode or with wire interconnection, external devices such as sirens, flash lights and alarm horns can be triggered via the PROTECTOR K switching relay.

3 • INSTALLATION/ASSEMBLY/CONNECTION

- Install the base on the ceiling as centrally as possible in the room **(fig. 3)**. We recommend that you use PROTECTOR K surface- or recessed-mounted boxes (accessories) if you intend to network several detectors together.
- Protect the device from dust when drilling holes.
- Up to 30 smoke detectors can be networked together by wire. Remove the terminal from the detector and insert the wires into the terminal at the **+ and - connection (fig. 4)**. Press the orange button to release the wire from the terminal **(fig. 5)**.
- Check the wiring to ensure that the alarm signal will be relayed to all networked detectors in the event of fire **(fig. 6)**.

NOTE:
In the case of wire interconnection, do not link the 9 V relay connection of individual detectors together, but only the + and - connection **(fig. 6)**.

- The total wire length must not exceed 300 m. Use J-Y(St)Y2x2x0.6 or AWG 23 wires.
- Fit the battery into the device **(fig. 7.1)**. The red LED will flash every 45 seconds to indicate that the battery is fitted correctly **(fig. 8.1)**. The smoke detector features a mounting lock **(fig. 7.2)**, which prevents the detector from being mounted if the battery is not fitted correctly.
- Fit the terminal back inside the detector **(fig. 4)**.
- Mount the detector on its base and turn until it clicks into place **(fig. 8.2)**. Perform a function test (see 5, Testing/Maintenance).
- If a PROTECTOR K switching relay is being used, the PROTECTOR K smoke detector must be mounted on a recessed box. The PROTECTOR K switching relay is placed in the recessed box and wired using matching connector sleeves (0.2 - 0.25 mm²/AWG 24). (possible recessed boxes: for example Kaiser types 1055-04, 1055-62, 9264-21, 9066-01, 9064-01, 9063-01, 9061-00).
- In the event of any technical problems, contact the manufacturer or your local distributor.

Wiring **(fig. 6)**

Detector connection	Relay wire colour	Function
–	blue	common minus
+	orange	interconnection, activates the relay
9 V	red	relay connection (permanent positive)

NOTE:
- Mount the detector on the ceiling in the centre of the room.
- Do not install smoke detectors in bathrooms (high ambient humidity), garages (exhaust fumes), draughty environments or lofts **(fig. 2)**.
- On roofs which slope by more than 30° the detector can be mounted on the pitched roof area.
- Maintain a distance of 50 cm from walls, ceiling joints (beams) and lights.
- Several detectors need to be installed in rooms of over 60 m² and corridors measuring over 10 m.
- Maintain a distance of 4 m from open fireplaces and cookers.
- A central power supply or remote powering is not permitted. Each detector needs to be powered by its own battery fitted into the battery compartment.

4 • FUNCTION TABLE

Alarm signal	Red LED	Description
Intermittent alarm signal	Flashes at the same time as the audible alarm signal	Alarm triggered on individual detector if smoke is detected.
Intermittent alarm signal	No LED	Alarm triggered by networked detector. The triggered detector can be identified by the intermittent alarm signal and flashing LED.
Short signal emitted every 45 seconds	Flashes at the same time as the audible signal	Battery needs to be replaced.
No signal	Flashes every 45 seconds	Device is ready for use
Short signal emitted > every 45 seconds	Flashes alternately with the audible signal	Device is faulty. Detector needs to be replaced.

5 • TESTING/MAINTENANCE

The detector can be fully tested using the LED test button **(fig. 8.1)**: battery test, electronic smoke chamber test and pulsating electronics test. Perform a test at least once a year and every time you replace the batteries.
Press the test button (for up to 20 seconds) until a loud, pulsating alarm signal (c. 85 dB) can be heard. The test alarm automatically resets itself a few seconds after the test button has been released. When necessary (usually about twice a year), wipe the device with a clean, dry cloth and clean the outside with a vacuum cleaner. The device automatically performs a test approx. every 45 seconds which checks the pulsating electronics, voltage and battery internal resistance. The red LED flashes briefly **(fig. 8.1)** to indicate that this test is being performed. If the 9 V battery supply falls beneath a certain value, the detector will emit an audible signal (approx. every 45 seconds), approx. 30 days before the battery needs to be replaced (see 3. Installation/Assembly/Connection). The life of a battery is highly dependent on, among other things, local conditions, for example temperature, temperature fluctuations, humidity and the number of test alarms/alarms. Alkaline: approx. 2 - 3 years. Lithium: up to approx. 5 years. The use of rechargeable batteries is not permitted. Test the equipment each time after replacing the battery. If the device is faulty, the red LED will flash approx. every 45 seconds alternately with the audible signal. This indicates that the detector needs to be replaced. When an alarm is triggered, the detector automatically resets itself if there are no longer any particles in the smoke chamber. The detector can also be switched off manually by removing the battery.

NOTE:

- Where detectors are linked together, a low battery signal from one detector does not get relayed via the network to the others. It is displayed only on the one unit.
- Where detector are linked together, when one detector is checked using the test feature run via the LED test button **(fig. 8.1)**, all of the networked alarms are automatically triggered, i.e. just as in the event of a real alarm, a pulsating alarm sound (of limited duration) is emitted and on the tested detector the red LED **(fig. 8.1)** flashes in tandem with this sound, while the others emit only the sound without the LED coming on.
- An excessive amount of dust, damp or other particles in the smoke chamber can trigger smoke detectors.

NOTE: this device must not be disposed of as unsorted household waste. Used devices must be disposed of correctly. Contact your local town council for more information.

NOTE: used batteries must not be disposed of as unsorted household waste. Used batteries must be recycled and may be returned free-of-charge to the place of sale. Batteries contain substances which are harmful to the environment and to human health and must therefore be disposed of correctly.

6 • ACCESSORIES

ESYLUX PROTECTOR K surface-mounted box H20mm
ESYLUX PROTECTOR K surface-mounted box H27mm
ESYLUX PROTECTOR K switching relay

7 • CORRECT ACTION IN THE EVENT OF A FIRE

Keep calm!
Alert the fire service.

It is important that the fire service is told the following information:

- Your name (name, phone number)
- The location of the fire (address)
- What has happened (extent of fire)
- How many people are injured
- Then wait to see if the operator has any questions.

Alert all the people who live with you.
Help aged, sick and disabled persons.
Close all windows and doors.
Do not use lifts.

If you have any doubts as to whether or not it is a genuine alarm, still act as if there is a real fire.

8 • ESYLUX MANUFACTURER'S GUARANTEE

The ESYLUX manufacturer's warranty can be found online at www.esylux.com.

Rittal – The System.

Faster – better – everywhere.

Enclosure cooling unit

SK 3185330
SK 3186330
SK 3187330
SK 3188340
SK 3189340

Assembly and operating instructions

ENCLOSURES | POWER DISTRIBUTION | CLIMATE CONTROL | IT INFRASTRUCTURE | SOFTWARE & SERVICES

RITTAL

FRIEDHELM LOH GROUP

EN

Preface

Dear Customer!

Thank you for choosing a "Blue e+ Outdoor" enclosure cooling unit (referred to hereafter as "cooling unit") from Rittal.

Yours
Rittal GmbH & Co. KG

Rittal GmbH & Co. KG
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www.rittal.com
www.rittal.de

We are always happy to answer any technical questions regarding our entire range of products.

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Contents

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1 Notes on documentation

1.1 CE labelling

Rittal GmbH & Co. KG confirms the conformity of the cooling unit with the European Union's Machinery Directive 2006/42/EC and EMC Directive 2014/30/EU. A simplified declaration of conformity can be found in the assembly and installation instructions enclosed with the device (see also the Rittal website). These are the original operating instructions.

CE

1.2 Storing the documents

The assembly and operating instructions as well as all other applicable documents are an integral part of the product. They must be issued to everyone who works with the unit and must always be available and on hand for operating and maintenance personnel.

1.3 Symbols used in these operating instructions

The following symbols are used in this documentation:

Warning!
Hazardous situation which may lead to death or serious injury if the instructions are not followed.

Caution!
Hazardous situation which may lead to (minor) injuries if the instructions are not followed.

Note:
Indicates situations that can lead to material damage.

- This symbol indicates an "action point" and shows that you should perform an operation or procedure.

1.4 Other applicable documents

Assembly and operating instructions exist as paper documents for the unit types described here and are enclosed with the equipment.

We cannot accept any liability for damage associated with failure to observe these instructions.

- Please also observe the instructions for any accessories used.

2 Safety instructions

2.1 General safety instructions

Please observe the following general safety instructions for the installation and operation of the system:

– Always wear the required personal safety equipment when working on this device.
– Before removing the hood, allow the unit to cool for at least 10 minutes to eliminate the risk of burns from hot surfaces.
– Please do not make any changes to the cooling unit that are not described in these operating instructions or other applicable assembly and operating instructions.
– The products should only be combined and operated with the prescribed Rittal system accessories.
– Other than these general safety instructions, it is also vital to observe the specific safety instructions when carrying out the tasks described in the following chapters.

2.2 Safety instructions for transportation

– Please observe the maximum permissible weight to be lifted by one person. Use suitable lifting devices, if needed.
– Cooling units must be transported in an upright position and secured to prevent them from tipping over.
– Shipping braces (such as a structure made from square timbers or boards) must be used when transporting cooling units already mounted on the enclosure. These braces support the cooling unit and prevent it from slipping in case of impact.
– Use a sufficiently large pallet to prevent it tipping over.
– If the cooling unit has been mounted on a door, close the door and keep it closed during transportation.

2.3 Safety instructions for assembly

– During assembly, the cooling unit is at risk of dropping through the mounting cut-out.
– Do not assemble and re-activate the device until it is completely dry.

2.4 Safety instructions for installation

– Please be sure to observe the applicable regulations governing electrical installations of the country in which the device is installed and operated as well as national regulations for accident prevention. Please also observe any internal company regulations, such as work, operating and safety regulations.
– The connection regulations of the appropriate power supply company are to be followed. Otherwise, there is risk of injury from electric shock if the connection to the unit is defective or connected incorrectly in any way.
– Do not strip too much insulation from the connection cable, otherwise the admissible clearance/creepage distances from the terminal point may not be met.
– The cooling unit must be connected to the mains via an all-pole disconnect to overvoltage category III (IEC 61058-1).

2.5 Safety instructions for operation

– The operational safety of the cooling unit is only warranted if used as intended. The technical specifications and limit values stated must not be exceeded under any circumstances. In particular, this applies to the specified ambient temperature range and IP protection category.
– Operating the cooling unit in direct contact with aggressive materials or inflammable gases and vapours is prohibited.
– At ambient temperatures above 30 °C/86 °F, the surface temperatures of the cooling unit may exceed the threshold temperatures for 1st and 2nd degree burns with contact times ≤1 second.
– At ambient temperatures below -7 °C/19.4 °F, the surface temperatures of the cooling unit may drop below the threshold values for frostbite with contact times of ≤10 seconds.

2.6 Safety instructions for maintenance

– The device must only be cleaned by trained specialists. De-energise the device prior to cleaning.
– Never use flammable liquids for cleaning.

2.7 Operating and technical staff

– The assembly, installation, commissioning, maintenance and repair of this cooling unit may only be performed by qualified, trained personnel.
– Only properly instructed personnel may operate a cooling unit with the system operational.
– Children and persons with limited cognitive/coordinative abilities must **not** operate, maintain or clean the unit or be allowed to use it as a toy.

2.8 Other dangers when using the cooling unit

When installing the cooling unit (see section 5 "Installation"), there is a risk that the enclosure could become unbalanced and tip over.

■ In such cases, the enclosure should be bolted to the floor as a precaution.

There is also a risk of the cooling unit tipping over after the mounting frame has been fitted onto the cooling unit. The cooling unit is only stable whilst the mounting frame is not fitted.

■ It is therefore particularly important to brace the unit and prevent it from becoming unbalanced once the mounting frame has been installed.

If the air inlet or outlet of the cooling unit is obstructed, there is a risk of air short-circuits, resulting in inadequate climate control.

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- Please ensure that the electronic assemblies in the enclosure are installed in accordance with section 5.3.1 "Assembly instructions".
- Where applicable, use suitable components to divert the air.
- Please observe the prescribed minimum distances at the installation site as outlined in section 5.3.1 "Assembly instructions".

2.9 IT safety instructions

To ensure the availability, confidentiality and integrity of data, products, networks and systems must be protected against unauthorised access.
Such protection can be achieved only with organisational and technical measures. To satisfy the increased safety requirements, Rittal recommends the observance of the following measures. Furthermore, more detailed information can be found on the websites of Bundesamt für Sicherheit in der Informationstechnik (Federal Office for IT Security – BSI).

2.9.1 Measures for products and systems

Embed products and systems not in public networks.

- Make sure that the system is only operated in protected networks.

Configure the firewall

- To protect your networks, and the embedded products and systems against external effects, configure a firewall.
- Also deploy a firewall for segmentation of a network or to isolate a controller.

Consider defence-in-depth mechanisms during the planning phase

- Consider defence-in-depth mechanisms for your system planning.
- Defence-in-depth mechanisms cover several levels of mutually coordinated security measures.

Restrict access authorisations

- Restrict access authorisations to networks and systems to only persons that need an authorisation.

Protect accesses

- Do not use the default passwords; instead, use secure, long passwords containing numbers, a mix of upper case and lower case letters, symbols and no repetitions.
- Create random passwords with a password manager.

Deploy the current firmware version

- Ensure that the current Rittal firmware is deployed on all devices.
- The firmware can be downloaded from the associated product pages in the Internet.
- Observe the associated Release Notes for new firmware versions.

Deploy current security software

- To identify and eliminate security threats, such as viruses, trojans and other malicious software, security software should be installed on all PCs and kept up-to-date.
- Deploy whitelist tools to monitor the device context.
- Deploy an intrusion-detection system to validate the communication of your system.

Perform regular threat analyses

- Rittal recommends that you perform regular threat analyses.
- The threat analyses allow you to determine whether your adopted measures are effective.

Protect USB ports against access

- USB ports must be protected against physical access. Ensure that no unauthorised persons have access to USB ports.
- Sensitive data can be read for an unauthorised access to USB ports.

EN

3 Product description

3.1 Functional description and components

3.1.1 Function

There are two separate cooling circuits installed in the cooling unit.

– One conventional refrigerant circuit (compression system), and
– One heat pipe integrated into the condenser and evaporator coil.

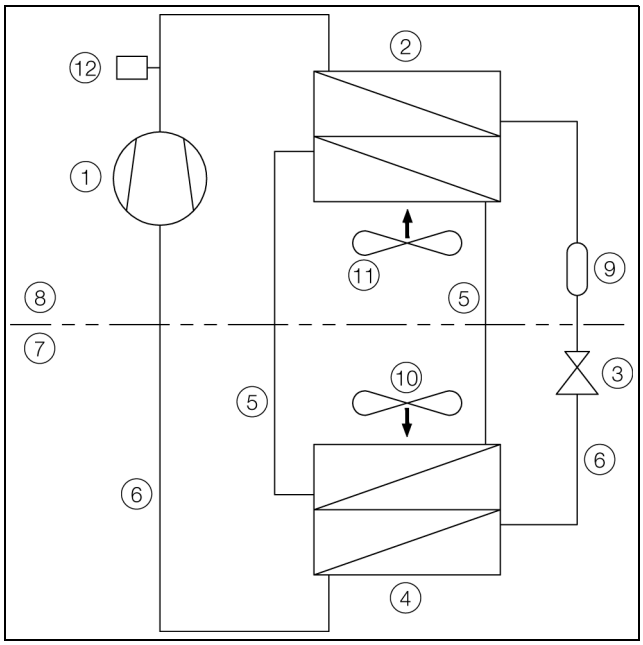


Fig. 1: Cooling circuit

Key

1 Compressor
2 Condenser (dual version)
3 Expansion valve
4 Evaporator coil (dual version)
5 Refrigerant circuit with heat pipe
6 Refrigerant circuit with compression system
7 Internal circuit
8 External circuit
9 Dryer/collector
10 Internal fan
11 External fan
12 PSA^{H} pressure monitor

In both cooling circuits, the individual components are connected with pipes in which the refrigerant R134a is circulating. This refrigerant is very environmentally friendly, thanks to the following properties:

– Chlorine-free
– Does not deplete the ozone layer (ozone destruction potential ODP = 0)

Refrigerant circuit with compression system

The refrigerant circuit with compression system is comprised of the following four main components:

1. Evaporator coil
2. Compressor
3. Condenser
4. Expansion valve

The evaporator coil fan draws hot air from the enclosure in the internal circuit of the cooling unit and passes it over the evaporator coil. After the evaporator coil, the cooled air is fed back into the enclosure via the outlet opening.

The air is cooled down by evaporating the refrigerant in the evaporator coil. The refrigerant vapour is transported by the compressor in the external circuit of the cooling unit to the condenser. There, the refrigerant condenses and becomes a liquid. The heat produced is dissipated by the condenser fan. The downstream electronic expansion valve reduces the high pressure of the refrigerant, and the refrigerant is then fed back into the evaporator coil.

Both the compressor and the two fans in the cooling unit are activated via an inverter. This makes it possible to control these components, so that the fan and compressor may be activated for a longer time but at a lower output and improved efficiency.

Refrigerant circuit with heat pipe

The additional second refrigerant circuit operates without a compressor, expansion valve or other control elements, and is integrated into the evaporator coil and condenser as a heat pipe.

The refrigerant inside the heat pipe (R134a) absorbs thermal energy from the intake of enclosure air and evaporates. The gaseous refrigerant then rises through the pipeline until it reaches the condenser. The refrigerant is cooled down again in the condenser (provided Tu < Ti), and the heat released is emitted into the environment. Gravity then causes the liquid refrigerant to flow back down the pipelines. The whole cycle begins again.

EN

3.1.2 Components

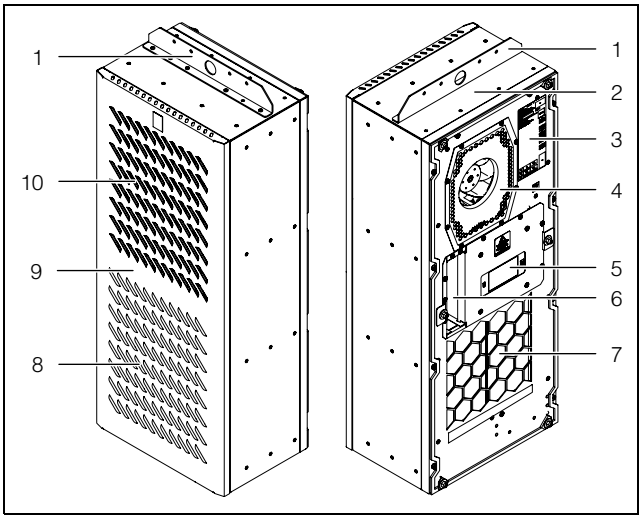


Fig. 2: Main components of cooling unit (SK 3185330)

Key

1 Crane bracket
2 Housing
3 Rating plate
4 Air inlet, inside
5 Display
6 Electrical connections and interfaces
7 Air outlet, inside
8 Air inlet, outside
9 Cover
10 Air outlet, outside

Note:
Illustration shows unit SK 3185330 as an example.

3.1.3 Control

Rittal enclosure cooling units are fitted with a controller for setting the functions of the cooling unit.

Operation using this controller is described in section 7 "Operation".

3.1.4 Safety devices

– In the refrigerant circuit, the cooling units have a type-tested pressure monitor (to EN 12263) which switches off the cooling unit if the maximum admissible pressure is exceeded. Once the pressure drops back below the admissible pressure, the unit will automatically resume operation.
– Temperature monitoring prevents the evaporator coil from icing over. If there is a risk of icing, the compressor switches itself off and automatically switches itself back on again at higher temperatures.
– The compressor is monitored and protected by the inverter to prevent overloading.
– The fans have a built-in overload protection with automatic reset.
– In order to allow a reduction of pressure inside the compressor and hence a safe restart, once it has been switched off (e.g. upon reaching the set temperature via the door limit switch function or via de-energising), the device will switch back on with a delay of 180 seconds.
– The device has floating contacts on the connection pins on terminals 1 and 3 of the signal connector (X2), via which system messages from the device may be polled, e.g. using a PLC.

3.1.5 Condensation

At high levels of humidity and low temperatures inside the enclosure, condensate water may form on the evaporator coil.

The cooling units have an automatic electrical condensate water evaporator. The thermal component used for this purpose is based on self-regulating PTC technology. Condensate water arising on the evaporator coil is collected in a tank in the external circuit of the cooling unit, and partially evaporated via the airflow. When the water level rises, the water enters the PTC thermal component and is evaporated (through-flow heater principle). The water vapour streams out of the cooling unit with the airflow from the external fan.

The PTC thermal component is activated automatically when the compressor is running, and continues to run for around 15 minutes after the compressor has been switched off. During the after-run phase, the condenser fan will likewise continue to run at low speed.

In the event of a short-circuit in the PTC component or if there is a risk of inverter overload (possible at high ambient temperatures), the PTC component will be deactivated. This means that any condensate water arising can be discharged via the safety overflow.

If the fuse has tripped, any condensate water is drained off via the safety overflow. The condensation is routed downwards out of the unit via a drain pipe on the evaporator coil divider panel. For this purpose, a hose may be connected to the condensate water nozzle (see section 5.3.6 "Connect the condensate water discharge (optional)").

3.1.6 Door limit switch

The cooling unit may be operated with a floating door limit switch connected. The door limit switch is available as accessory from Rittal (see section 13 "Accessories", page 52).

The door limit switch function causes the fans and the compressor in the cooling unit to gradually slow down and then switch off after approximately 15 seconds when the enclosure door is opened (contacts 5 and 6 closed). This prevents the formation of condensate water inside the enclosure while the enclosure door is open. In order to prevent damage to the unit, it is equipped with an ON delay: The evaporator fan will cut in again after a delay of a few seconds on closure of the door.

Please note that no external voltage may be applied to the door contacts (connection clamps 5 and 6).

3.2 Intended use, foreseeable misuse

The cooling unit is designed solely for cooling sealed enclosures (within the scope of validity covered by EN 60204, EN 61439 and UL 508A), and IT and telecommunications equipment (within the scope of validity covered by EN 62368) within the permitted temperature range, for indoor and outdoor use, and for professional use as defined in DIN EN 61000-3-2. Any other use is not permitted.

– Any form of use in potentially explosive areas, outside the permissible temperature range, on power supply systems not defined for this unit, on oil rigs and offshore installations, on transport routes in tunnels, in commercial applications such as refrigeration chambers, refrigerated counters and kiosk coolers, as well as for room air-conditioning, is prohibited.
– The cooling unit is suitable for use in direct sunlight, snow, rain, sand, dust and condensation.
– The unit is designed solely for stationary use.

The cooling unit must not be used in environments with conductive, flammable and explosive dusts.
These include:

– Graphite dusts
– Metal dusts
– Cereal dusts
– Wood dusts
– Textile fibres and lint

The cooling unit is state of the art and built according to recognised safety regulations. Nevertheless, improper use can pose a threat to the life and limb of the user or third parties, or result in possible damage to the system and other property.

Consequently, the cooling unit must only be used properly and in a technically sound condition! Any malfunctions which impair safety should be rectified immediately.

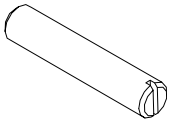
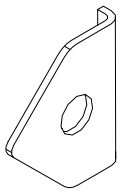
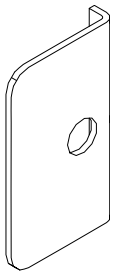
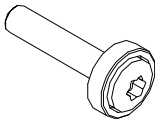
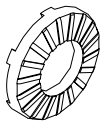
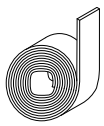
Proper use also includes the observance of the documentation provided, and compliance with the inspection and maintenance conditions.

Rittal GmbH & Co. KG is not liable for any damage which may result from failure to comply with the documentation provided. The same applies to failure to comply with the valid documentation for any accessories used.
Inappropriate use may be dangerous. Examples of inappropriate use include:

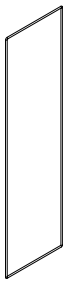
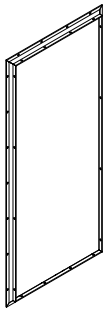
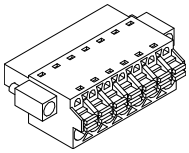
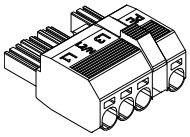
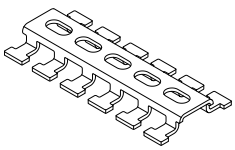
– Use of the cooling unit over long periods with the enclosure open.
– Use of impermissible tools.
– Improper operation.
– Improper rectification of malfunctions.
– Use of accessories not approved by Rittal GmbH & Co. KG.

EN

3.3 Scope of supply

Description	Illustration	SK 3185330	SK 3186330 SK 3187330	SK 3188340 SK 3189340
Enclosure cooling unit		1x		
Shipping bag with		1x		
– Assembly and installation instructions		1x		
– Grub screw M8 x 40 mm		6x	8x	
– Nut M8		6x	8x	
– Washer		6x	8x	
– Corner bracket		4x		
– L-shaped bracket		2x	4x	
– Screw M5x16		16x	20x	
– Serrated washer		2x		
– Sealing tape 10x10 mm		L = 2.7 m	L = 4.6 m	

Tab. 1: Scope of supply

Description	Illustration	SK 3185330	SK 3186330 SK 3187330	SK 3188340 SK 3189340
– Torx wrench TX25		1x		
– Sealing section		1x		
– Mounting frame		1x		
– Signal connector		1x		
– Connector		1x		
– T-rail		1x		
– Connection box cover		1x		
– Ferrite core		1x		

Tab. 1: Scope of supply

EN

4 Transport and handling

4.1 Delivery

The cooling unit is supplied in one packaging unit.

- Check the packaging carefully for signs of damage. Traces of oil on damaged packaging indicate a loss of refrigerant and/or a leak in the cooling unit. Any packaging damage may be the cause of a subsequent functional failure.

4.2 Unpacking

- Remove the packaging materials from the cooling unit.

Note:
After unpacking, the packaging materials must be disposed of in an environmentally friendly way.

- Check the cooling unit for any damage that may have occurred during transport.

Note:
Damage and other faults, e.g. incomplete delivery, should be reported immediately, in writing, to the shipping company and to Rittal GmbH & Co. KG.

- Check the supply contents for completeness (see section 3.3 "Scope of supply").

4.3 Transport

Depending on the chosen version, the cooling unit may weigh up to 73 kg.

Warning!
Please note the maximum weights that may be lifted by individuals. It may be necessary to use lifting gear.

There is a crane bracket pre-fitted to the top of the cooling unit. The cooling unit is readily transported with the aid of lifting gear and an indoor crane.

Note:
For the "external" mounting position (see section 5.3.5 "Fitting the cooling unit with a mounting frame"), the position of the crane bracket will need to be modified, otherwise the mounting frame cannot be screw-fastened to the cooling unit.

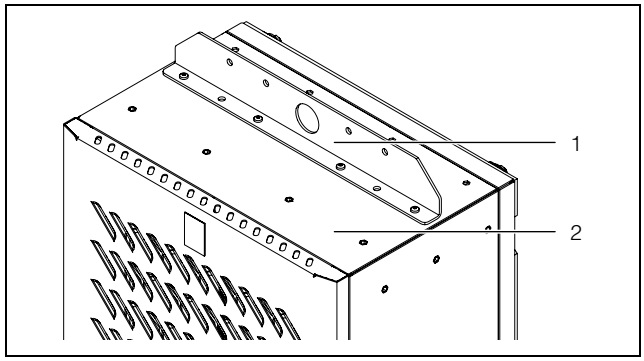


Fig. 3: Crane bracket on the top of the cooling unit

Key

1 Crane bracket
2 Housing

- Before transporting by crane, please ensure that the lifting gear and crane have sufficient load capacity to transport the cooling unit safely.
- Never allow anyone to stand beneath a suspended load, even for a short time, during transportation by crane.
- Protect the lifting gear on the crane hook from load deflection, because the load's centre of gravity may be off-centre.
- First position the cooling unit close to the installation site and protect from accidentally being knocked over.

Transport of a fitted cooling unit

- Shipping braces (such as a structure made from square timbers or boards – fig. 4 and fig. 5) must be used when transporting cooling units already mounted on the enclosure.
  These braces support the cooling unit and prevent it from slipping in case of impact.
- Use a sufficiently large pallet to prevent it from tipping over.
- If the cooling unit has been mounted on a door, close the door and keep it closed during transportation.

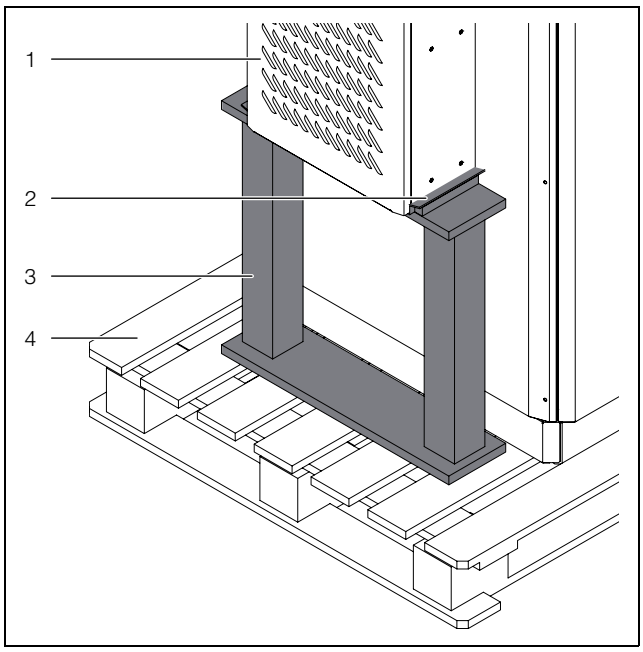


Fig. 4: External mounting of the shipping braces

Key

1 Fitted cooling unit
2 Bubble wrap
3 Supporting structure
4 Pallet underneath the cooling unit

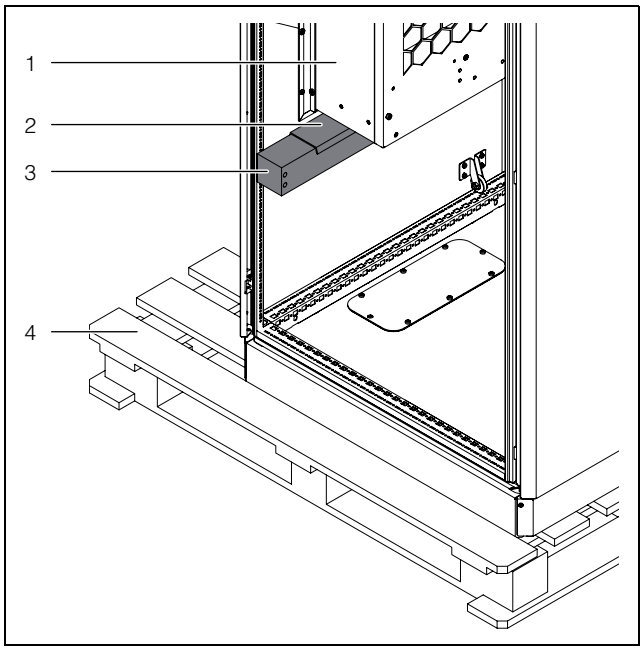


Fig. 5: Internal mounting of the shipping braces

Key

1 Fitted cooling unit
2 Bubble wrap
3 Supporting structure
4 Pallet underneath the cooling unit

EN

5 Installation

5.1 Safety instructions

– Work on electrical systems or equipment may only be carried out by an electrician or by trained personnel under the guidance and supervision of an electrician. All work must be carried out in accordance with electrical engineering regulations.
– The cooling unit may only be connected after the aforementioned personnel have read this information!
– Use only insulated tools.
– Follow the connection regulations of the appropriate electrical supply company. Otherwise, there is risk of injury from electric shock if the connection to the unit is defective or connected incorrectly in any way.
– The cooling unit must be connected to the mains via an all-pole disconnecting device to overvoltage category III (IEC 61058-1).
– The cooling unit is not de-energised until all of the voltage sources have been disconnected!
– Do not assemble and re-activate the device until it is completely dry.

■ Please note the maximum weights that may be lifted by individuals. It may be necessary to use lifting gear.
■ During assembly, the cooling unit is at risk of dropping through the mounting cut-out.
■ Always wear the required personal safety equipment when working on this device.
■ Please be sure to observe the applicable regulations governing electrical installations of the country in which the device is installed and operated as well as national regulations for accident prevention. Please also observe any internal company regulations, such as work, operating and safety regulations.
■ The technical specifications and limit values stated must not be exceeded under any circumstances. In particular, this applies to the specified ambient temperature range and IP protection category.

5.2 Siting location requirements

When choosing the installation site for the enclosure, please observe the following:

– The site for the enclosure, and hence the positioning of the cooling unit, must be carefully selected so as to ensure good ventilation (distance between cooling units at least 200 mm, distance from wall see distance "y" in fig. 6 or tab. 2).
– The cooling unit must be installed and operated with a maximum deviation of 2° from the vertical.
– The installation site must be free from excessive dirt and aggressive ambient conditions.
– The maximum humidity (non-condensing) must not exceed 95%.
– The ambient temperature must not fall below -30 °C/ -22 °F or exceed +60 °C/140 °F.
– It must be possible to fit a condensate water discharge (see section 5.3.6 "Connect the condensate water discharge (optional)").
– The mains connection data as stated on the rating plate of the cooling unit must be guaranteed.

Size of installation room

– **Unit SK 3185.330** must not be installed in rooms of less than 3 m^3.
– **Units SK 3186330 and SK 3187330** must not be installed in rooms of less than 6 m^3.
– **Units SK 3188340 and SK 3189340** must not be installed in rooms of less than 12 m^3.

Electromagnetic interference (EMI)

– Interfering electrical installations (high frequency) must be avoided.
– Signal cables must be laid separately from live cables (fig. 40).

Designing a suitable enclosure heater

Enclosure heaters are used to prevent the formation of condensation inside the enclosure, particularly with the type of fluctuating ambient temperatures that may occur with outdoor siting or in unheated rooms, and to maintain a constant minimum operating temperature (e.g. when the system is switched off overnight).

Enclosure heaters that regulate relative humidity, prevent temperatures from dropping below the dew point and stop condensation forming inside the enclosure. This in turn prevents consequential damages associated with corrosion and electrical short-circuits.

Rittal recommends you calculate the required enclosure heater, which should be used in conjunction with a hygrostat or enclosure internal thermostat. It is important to ensure that the enclosure internal temperature does not drop below -20 °C/-4 °F, because the internal fan will not operate below that temperature. In such cases, the error message "Ambient temperature outside" will appear on the display.

A sample calculation for the Rittal CS Toptec enclosure series is given below.

Dimensions W x H x D mm	Required thermal output [W] at a minimal ambient temperature		
	-10 °C/14 °F	-20 °C/-4 °F	-30 °C/-22 °F
800 x 1200 x 800	350	530	720
800 x 1600 x 800	430	650	880
800 x 1800 x 800	480	810	960

5.3 Assembly procedure

5.3.1 Assembly instructions

- Before starting assembly, please ensure that the following tools are available:
  - Slotted-head screwdriver
  - Open-end spanner SW13
  - Torx screwdriver TX25
  - Phillips-head screwdriver
- Before assembling, please ensure that the enclosure is sealed on all sides (IP54 or Type 12). Increased condensation will occur later during operation if the enclosure is not airtight.
- If applicable, additionally fit a door limit switch (such as 4127010) to the enclosure which switches off the cooling unit when the enclosure door is opened to prevent excessive condensation (see section 3.1.6 "Door limit switch").
- Please ensure that the electronic assemblies in the enclosure allow the even circulation of air.
- Take care to ensure that the cooling unit and its surroundings are dry at the time of installation.
- Always have two people to lift the cooling unit, or preferably use lifting gear and an indoor crane. Ensure that it is secured against toppling over.
- Do not rest the cooling unit on the fitted mounting frame.
- Measure the distance "x" (fig. 6) from electronic components and other installed equipment inside the enclosure so that the required air circulation is not obstructed.

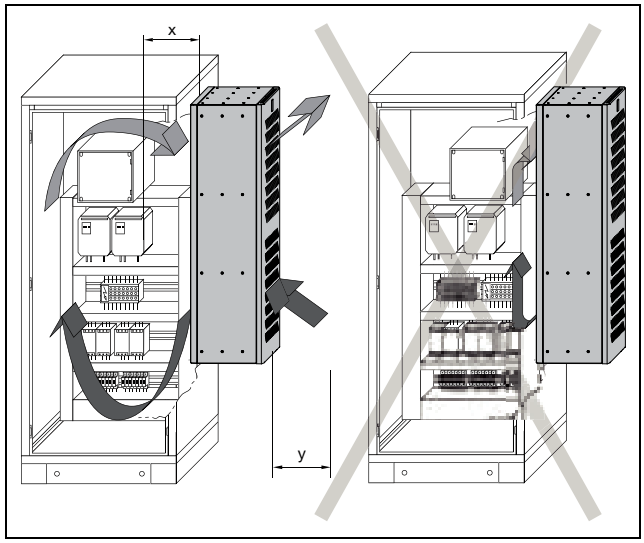


Fig. 6: Air circulation inside the enclosure

Model No.	Dimensions x and y [mm]
SK 3185330	175
SK 3186330, SK 3187330	165
SK 3188340, SK 3189340	225

Tab. 2: Dimensions "x" and "y"

- Under no circumstances should the air inlet and outlet openings of the cooling unit be obstructed. Only in this way is it possible to ensure that the maximum cooling output is available.
- Please ensure that the cold airflow from the cooling unit is not directed at active components.

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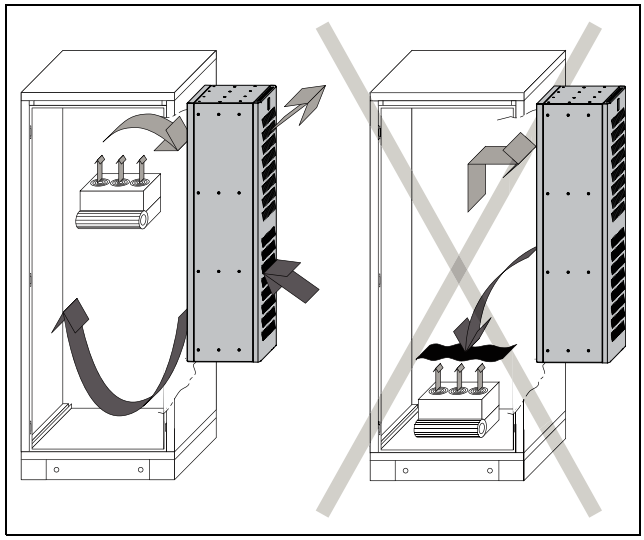

Fig. 7: Never direct the cold airflow at active components (example illustration)

- If appropriate, install components to divert the air.
- When installing in a dismantled door or side panel, please ensure that it cannot fall over when installing the cooling unit in the mounting cut-out.

Note:
– When mounting unit SK 3185330, the minimum dimensions of the enclosure are 600 mm x 1200 mm (width x height), both on the door and on the side panel.
– When mounting units SK 3186330, SK 3187330, SK 3188340 and SK 3189340, the minimum dimensions of the enclosure are 800 mm x 1800 mm (width x height), both on the door and on the side panel.

Note:
The pictures in this chapter illustrate the installation of the cooling unit in an enclosure door. Installation in a side panel is carried out in the same way.
Assembly is illustrated using unit SK 3185330 as an example. Variations for other units are labelled accordingly.

5.3.2 Mounting options

In principle, the cooling unit is suitable for mounting on single-walled and twin-walled enclosures. There are two different options for mounting the cooling unit on an enclosure door or side panel:
– Fitting **without** a mounting frame
– Fitting **with** a mounting frame

Fitting without a mounting frame

When mounted **without** a mounting frame, the cooling unit can only be externally mounted on single-walled enclosure panels. In such cases, the entire cooling unit is outside the enclosure.

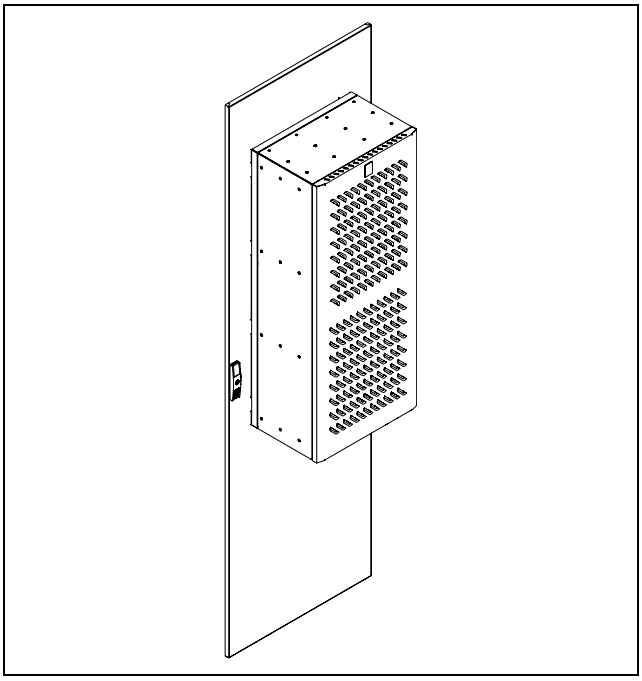

Fig. 8: Fitting without a mounting frame

Fitting with a mounting frame

When fitting **with** a mounting frame, there are three different mounting types, depending on where the mounting frame is positioned on the cooling unit:
– External mounting: All of the cooling unit is outside the enclosure.
– Partial internal mounting: Approximately half of the cooling unit's depth is inside the enclosure, and the other half is outside.
– Full internal mounting: All of the cooling unit is inside the enclosure. Only the cover projects to the outside.

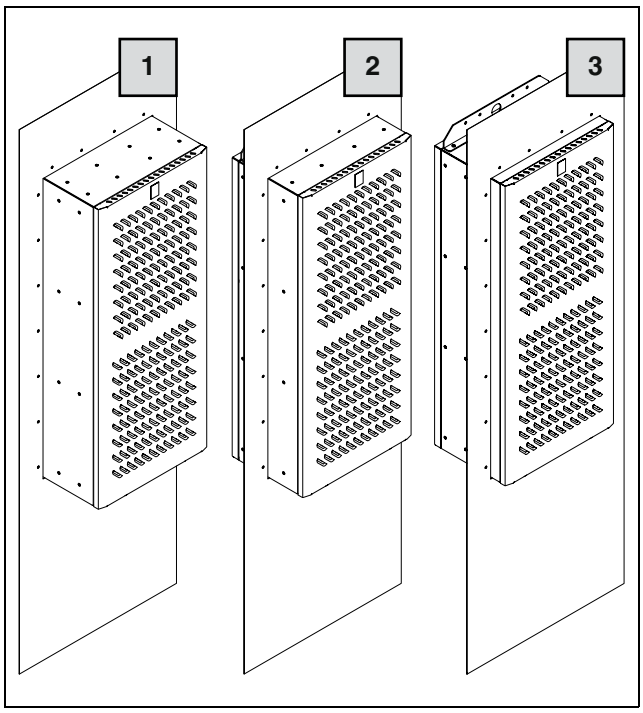

Fig. 9: Mounting options with a mounting frame

Key

1 External mounting
2 Partial internal mounting
3 Full internal mounting

Your chosen installation option will ultimately depend on how much space you require inside and outside the enclosure. The various mounting options have no influence on the cooling output of the cooling unit, which remains the same in all cases.

If there are a large number of components installed **inside the enclosure**, external mounting or partial internal mounting of the cooling unit may be appropriate. In such cases, the space inside the enclosure may be insufficient for full internal mounting, or it may not be possible to guarantee adequate cooling of all components inside the enclosure.

5.3.3 Make a mounting cut-out in the enclosure

Twin-walled enclosure

For mounting on a twin-walled enclosure, the appropriate door or side panel must be purchased from Rittal.

- Please contact us to discuss your requirements.

Single-walled enclosure

For mounting on a single-walled enclosure, a suitable mounting cut-out must be made. The mounting cut-out is the same for all three mounting options, but differs depending on whether it is fitted with or without a mounting frame.

Note:
The dimensions of the mounting cut-outs can be found in sections 12.1 "Mounting cut-outs on single-walled enclosure panels without a mounting frame" and 12.2 "Mounting on single- and twin-walled enclosure panels with a mounting frame".

- Using the diagrams, calculate the required dimensions for your mounting cut-out.
- Drill all the required holes and make the mounting cut-out.
- Carefully deburr all drilled holes and the cut-out to prevent injuries caused by sharp edges.

Caution!
There is a risk of injury on sharp cut-outs which have not been properly deburred, especially while mounting the cooling unit.

5.3.4 Fitting the cooling unit without a mounting frame

- Cut the sealing tape provided in the dispatch bag to the required length so that it can be placed all around the rear of the cooling unit.
- Start by sticking the sealing tape at the bottom edge, so that the joint between the two ends of the sealing tape is likewise on the bottom edge of the unit.
- Carefully stick the sealing tape onto the rear. Carefully go round the screw heads on the inside, as this is the only way to ensure continuous sealing against the enclosure.

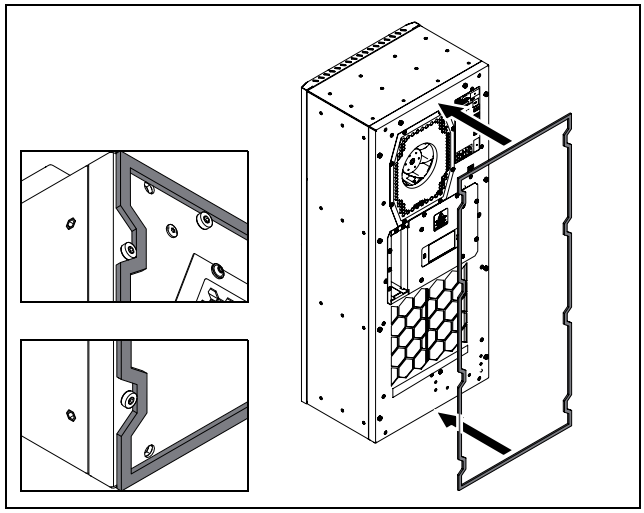

Fig. 10: Laying the seal

- Screw the two grub screws into the blind threaded bushes at the bottom rear of the cooling unit (M_A = 5 Nm).

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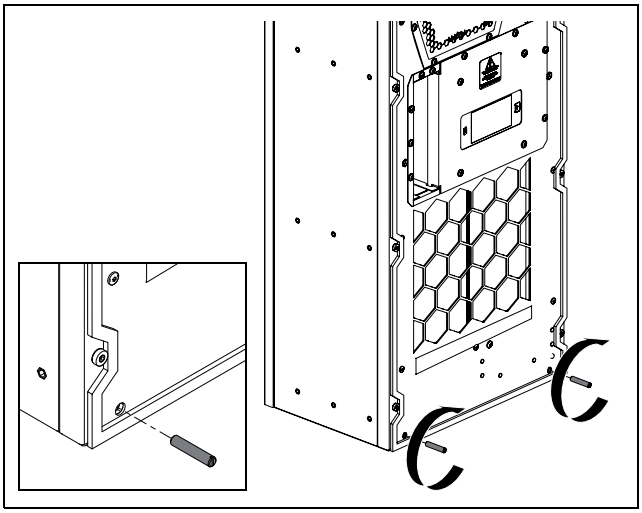

Fig. 11: Tighten the grub screws at the bottom

- In the same way, screw two grub screws into the blind threaded bushes at the top rear of the cooling unit (M_A = 5 Nm).

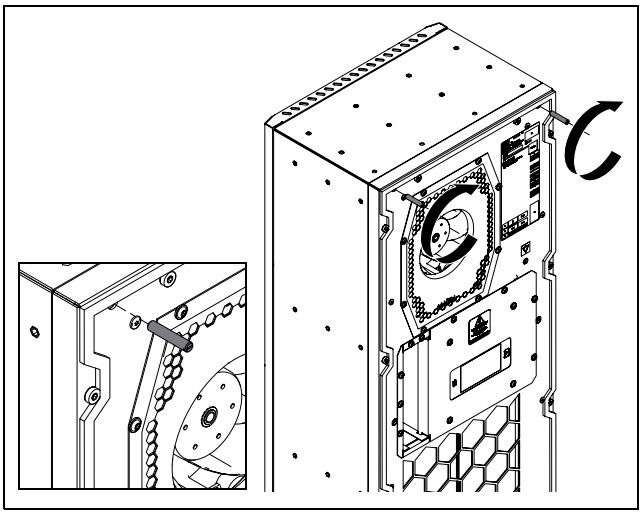

Fig. 12: Tighten the grub screws at the top

Note:
In the subsequent step, take care to ensure that the cooling unit is only resting on the grub screws, never on the sealing tape, otherwise it could become damaged.

- Lift up the cooling unit, preferably from a crane bracket using suitable lifting gear, and initially set the cooling unit down with the two bottom grub screws on the door or side panel of the enclosure.

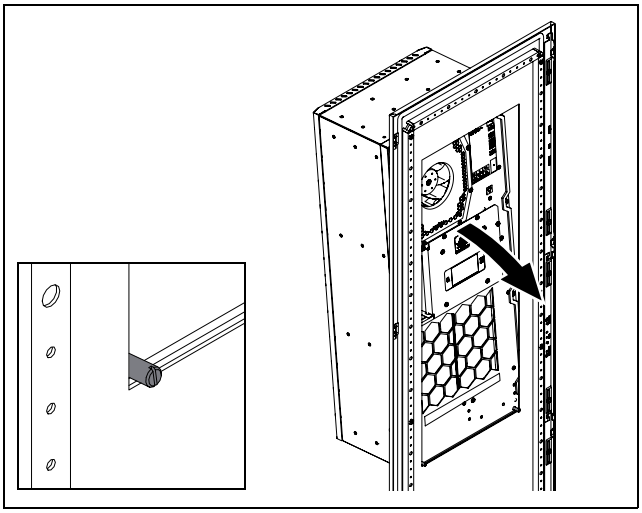

Fig. 13: Lower the cooling unit into the mounting cut-out

- Attach the two corner brackets to the top grub screws and secure with the corresponding washers and hex nuts (M_A = 5 Nm). Pay particular attention to the correct orientation of the corner brackets.

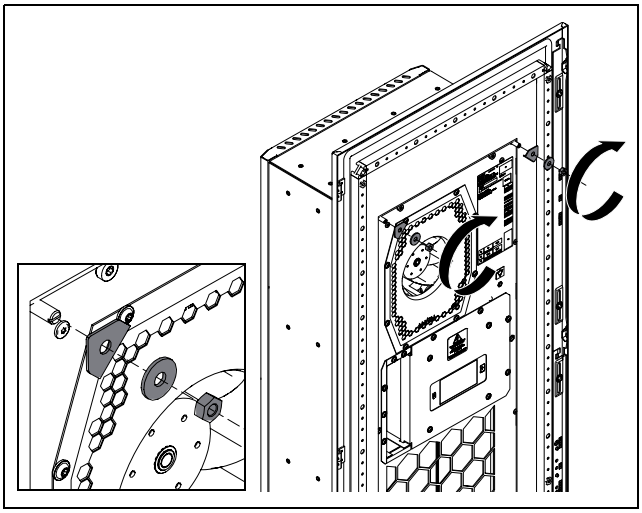

Fig. 14: Fit the top corner brackets

- Next, attach the two corner brackets to the bottom grub screws and secure with the corresponding washers and hex nuts (M_A = 5 Nm). Once again, pay particular attention to the correct orientation of the corner brackets.

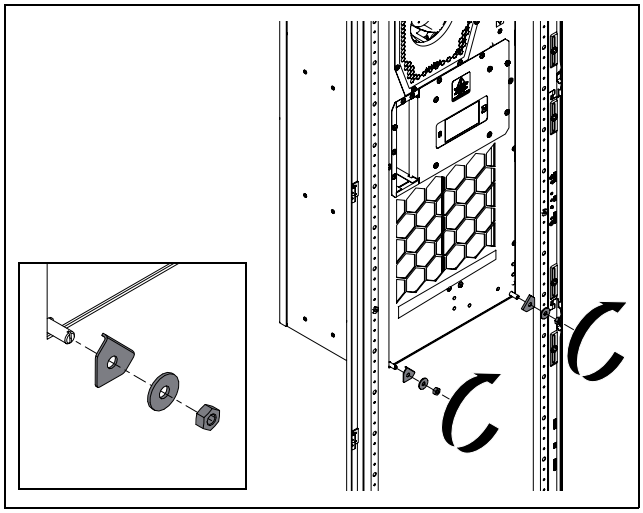

Fig. 15: Fit the bottom corner brackets

- For SK 3185330: In the centre, screw two grub screws into the blind threaded bushes around halfway up the cooling unit.

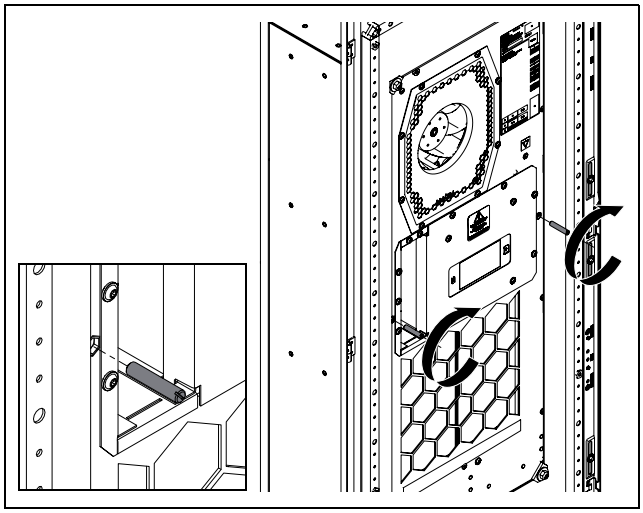

Fig. 16: Tighten the central grub screws

- For SK 3186330, SK 3187330, SK 3188340, SK 3189340: In the centre, screw four grub screws into the blind threaded bushes around halfway up the cooling unit.

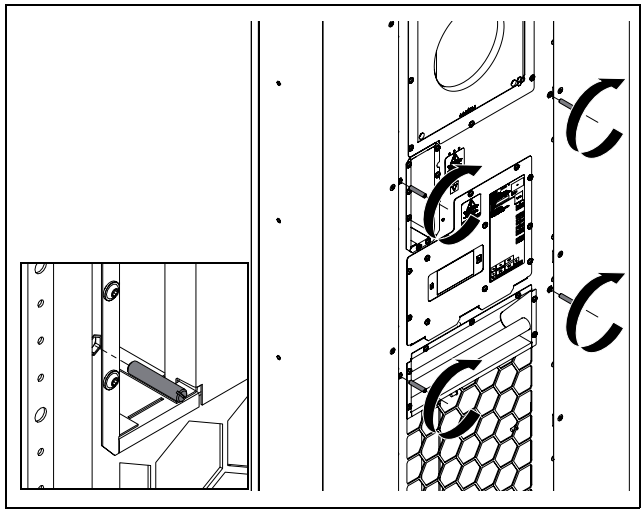

Fig. 17: Tighten the central grub screws

- For SK 3185330: Next, attach the two L-shaped brackets to the grub screws and secure with the corresponding washers and hex nuts (MA = 5 Nm). Once again, pay particular attention to the correct orientation of the L-shaped brackets.

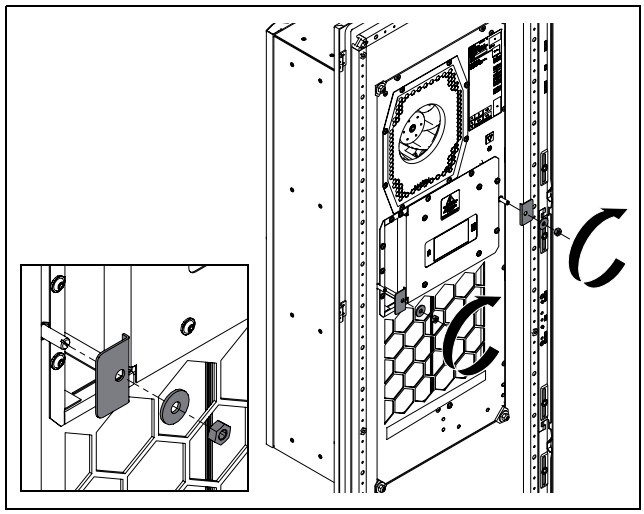

Fig. 18: Fit the central L-shaped brackets

- For SK 3186330, SK 3187330, SK 3188340, SK 3189340: Next, attach the four L-shaped brackets to the grub screws and secure with the corresponding washers and hex nuts (M_A = 5 Nm). Once again, pay particular attention to the correct orientation of the L-shaped brackets.

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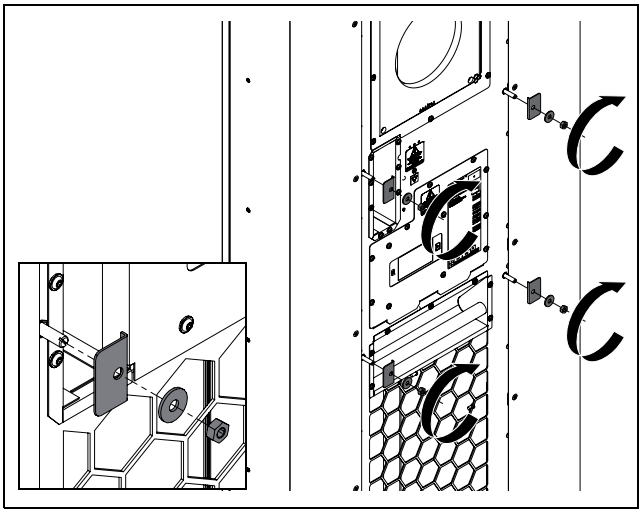

Fig. 19: Fit the central L-shaped brackets

5.3.5 Fitting the cooling unit with a mounting frame

■ Please observe the following instructions:
- Full internal mounting of the cooling unit is illustrated below. External mounting and partial internal mounting are performed in the same way, except that the mounting frame is positioned differently on the cooling unit.
- Furthermore, for external mounting, the crane bracket on the cooling unit will need to be moved.
- When mounting on a single-walled enclosure with mounting frame, screws with an under-head gasket or blind rivet nuts may be used. Please contact Rittal if you require further information.
- The attachment points and mounting cut-out are already provided on the enclosure panel for mounting on a twin-walled Rittal enclosure with mounting frame.
- All suitable enclosures with mounting cut-outs can be found on the Rittal website.
- The customer is responsible for ensuring appropriate mounting on the enclosure.

The mounting frame is included with the cooling unit supply. The following positions are possible, depending on the installation position of the cooling unit.

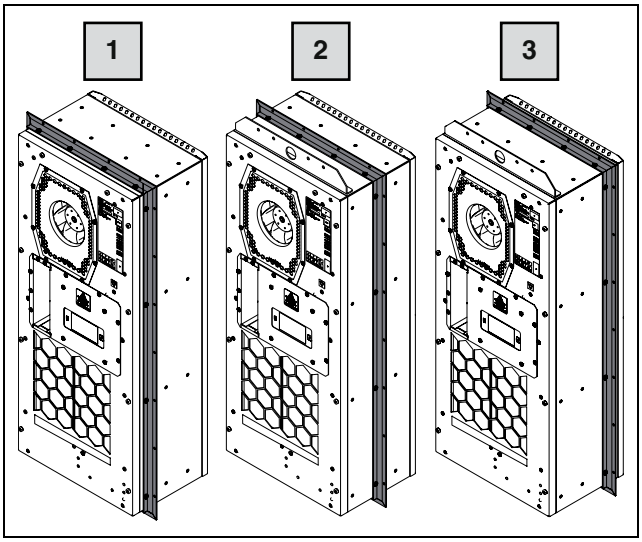

Fig. 20: Possible positions of the mounting frame

Key
1 Rear position for external mounting
2 Central position for partial internal mounting
3 Front position for full internal mounting

■ Set the cooling unit down on a suitable surface on its back, taking care not to damage the unit.

Note:
Never place the cooling unit on its cover when fitting the mounting frame.

■ Remove the mounting frame from the packaging and position it in the required mounting position on the cooling unit.

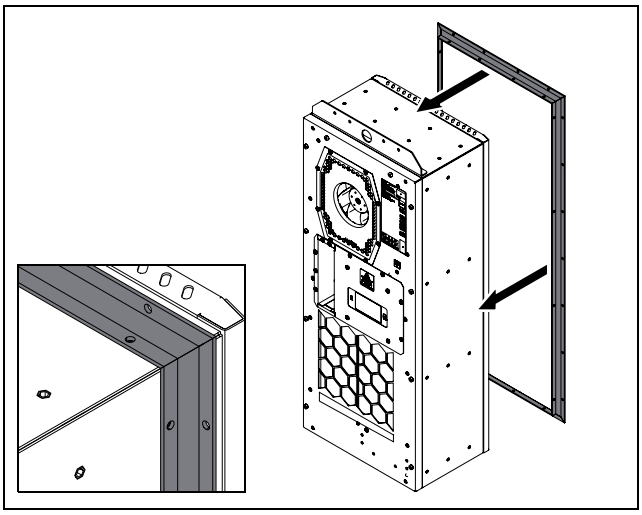

Fig. 21: Position the mounting frame

■ For SK 3185330: Secure the mounting frame in the desired position using the 16 assembly screws included with the supply (M_A = .5 Nm).

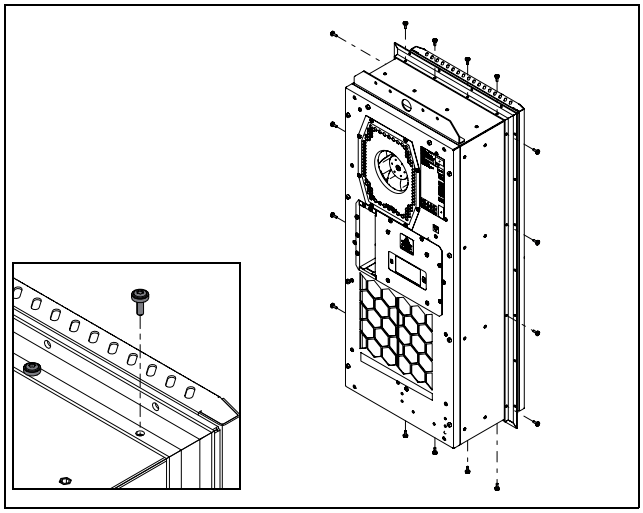

Fig. 22: Secure the mounting frame to the cooling unit

- For SK 3186330SK 3187330, SK 3188340, SK 3189340: Secure the mounting frame in the desired position using the 20 assembly screws included with the supply (M_A = 3.5 Nm).

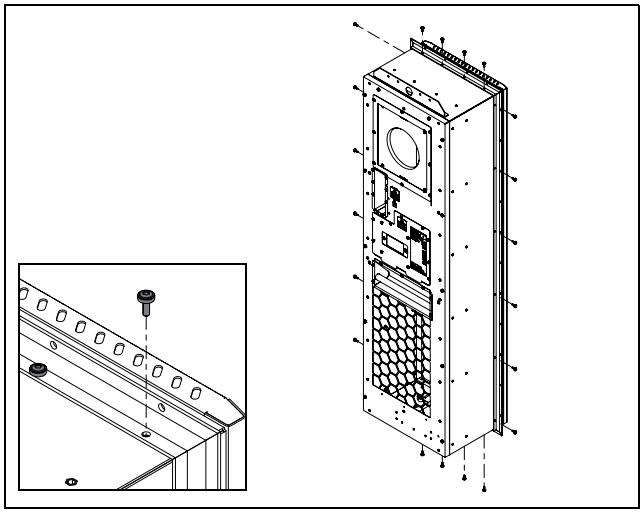

Fig. 23: Secure the mounting frame to the cooling unit

- Using a clean, lint-free fabric or cellular cloth, lubricate the seal included with the supply with Vaseline or acid-free oil.
- Working from the front, slide the seal over the cooling unit.

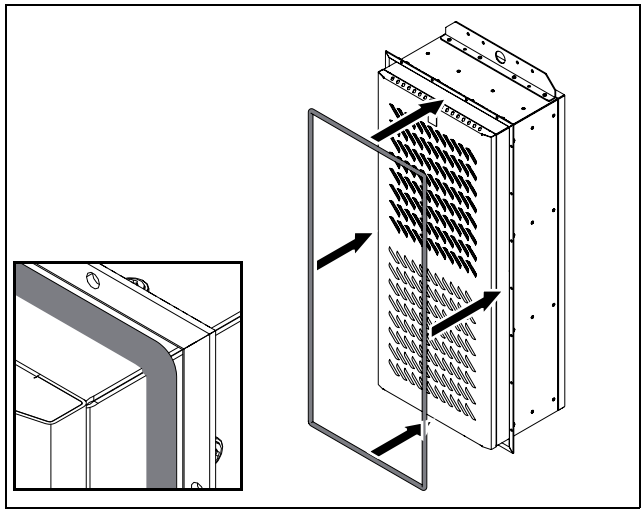

Fig. 24: Slide over the seal position

- Ensure that the seal has been pressed into the mounting frame around the entire circumference.
- Lift up the cooling unit, preferably from a crane bracket using suitable lifting gear, and set the cooling unit and mounting frame down on the door or side panel of the enclosure.

Single-walled panels with a mounting frame

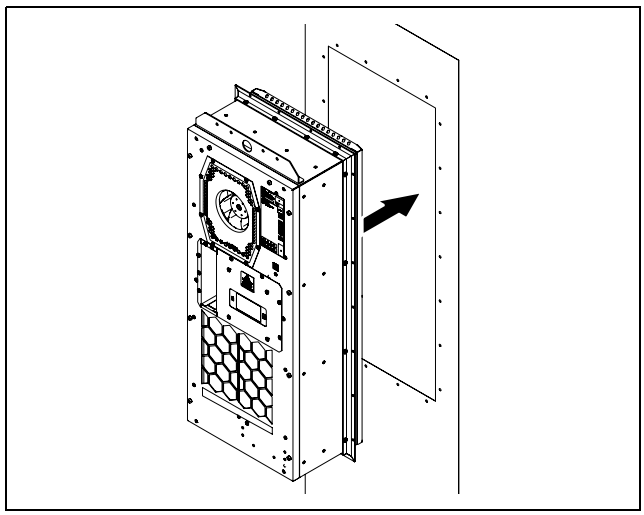

Fig. 25: Inserting the cooling unit into a single-walled enclosure panel

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Twin-walled panels with a mounting frame

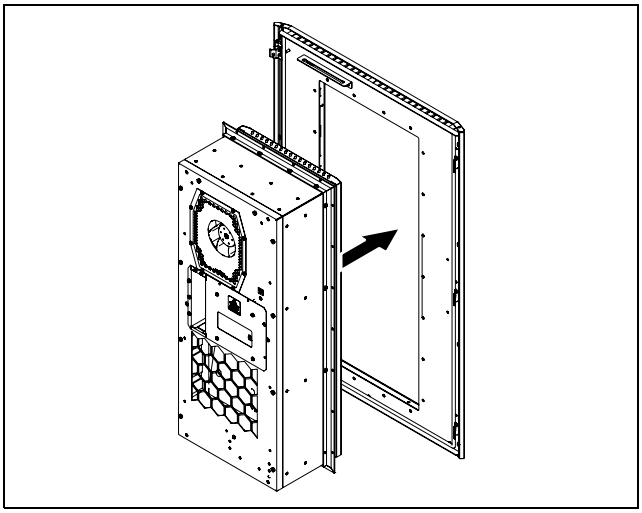


Fig. 26: Inserting the cooling unit into a twin-walled enclosure panel

Attachment with single- and twin-walled enclosure panels

- Secure the mounting frame (and hence the cooling unit) to the door or side panel, e.g. using suitable screws with washers to ensure a perfect seal between the frame and the enclosure door or side panel. Only loosely tighten the screws to begin with, then tighten crosswise with the required torque, depending on the type of fastening.
- Create potential equalisation between the mounting frame and the door or side panel using a suitable PE conductor connection and the serrated washer included with the supply.
- If applicable, finally, re-attach the door or side panel to the enclosure if not mounting directly on the enclosure.

5.3.6 Connect the condensate water discharge (optional)

There is a condensate water evaporator fitted in the external circuit of the cooling unit. With an enclosure connected, this condensate water evaporator may typically evaporate condensate water volumes of up to 100 ml/h.

If larger quantities of condensate water are produced, a condensate water discharge hose may additionally be fitted. This hose allows condensate water to be routed out of the cooling unit pressurelessly. A suitable hose is available as an accessory from Rittal (see section 13 "Accessories").

Please follow the instructions given below:

– The hose must be laid with an adequate and constant gradient to prevent siphoning.
– The hose must be laid without any kinks.
– If extended, the cross-section of the hose must not be reduced.
– The hose should be routed to a drain or external condensate water evaporator by the customer.

- Using the special TX25 torx wrench from the dispatch bag, loosen the three assembly screws underneath the cover and pull them off downwards.

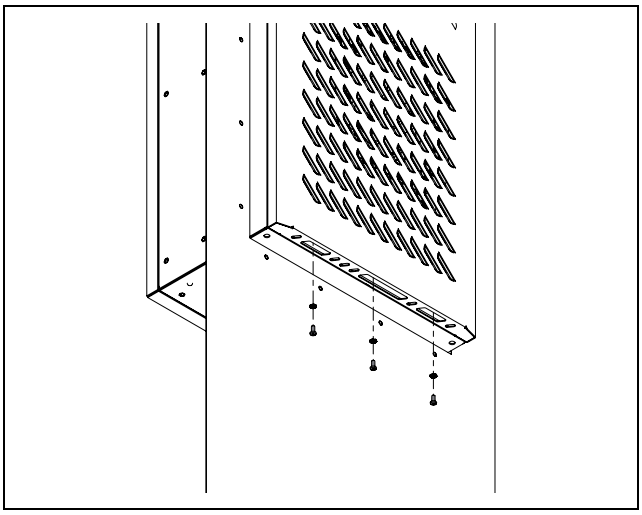


Fig. 27: Loosen the assembly screws

- Raise the cover slightly and gently pull it forwards away from the enclosure.

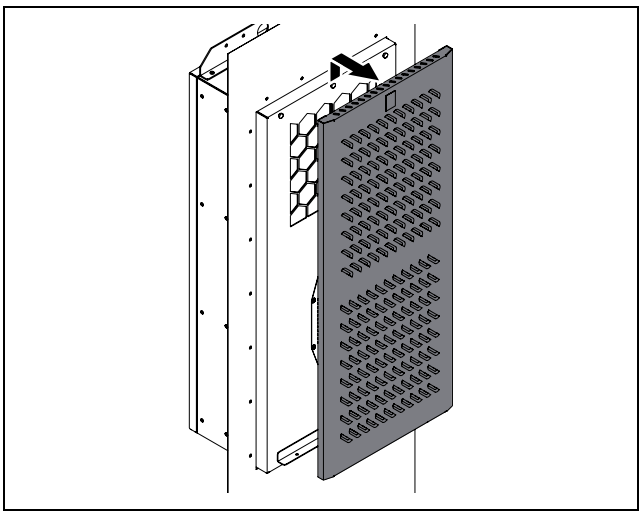


Fig. 28: Raise the cover

- Then swing the cover gently to the side.

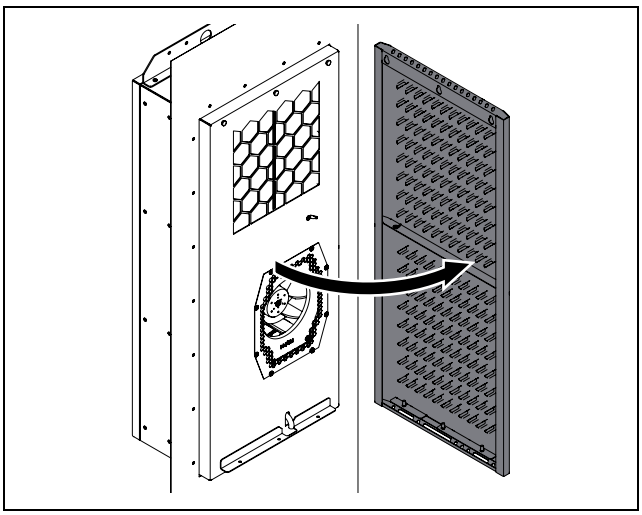


Fig. 29: Swing the cover sideways

- The PE conductor connection between the cover and the chassis is located on the right-hand side, around half-way up.
- Disconnect the flat-pin connector of the internal PE conductor, preferably on the enclosure, then remove the cover completely from the unit.
- Connect a suitable hose to the condensate discharge nozzle and secure using a hose clamp.

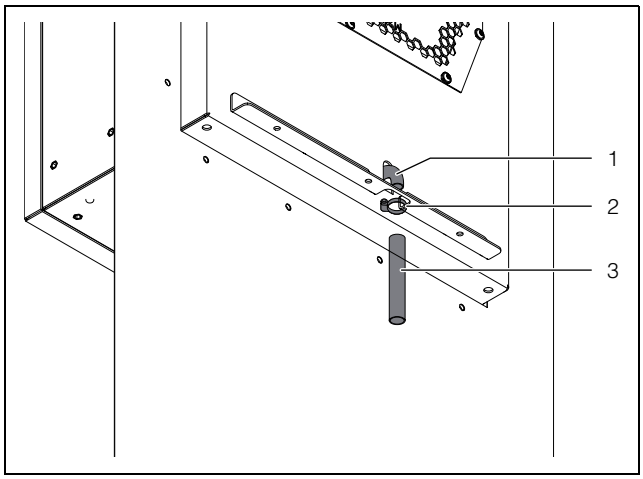


Fig. 30: Connection for condensate discharge hose

Key

1 Connection point
2 Hose clamp
3 Hose

- Lay the hose as per the instructions above.
- Re-fit the cover onto the enclosure in the reverse order.
- Please note, it is important to ensure that the PE conductor connecting the cover to the enclosure is connected at both ends.

5.4 Electrical connection

5.4.1 Notes on electrical installation

- When carrying out the electrical installation, it is important to observe all valid national and regional regulations as well as the provisions of the responsible power supply company.

– Electrical installation must only be carried out by a qualified electrician who is responsible for compliance with the existing standards and regulations.
– All cables routed into the wiring compartment have to be insulated for the maximum voltage of the power supply.

Connection data

– The connected voltage and frequency must correspond to the ranges stated on the rating plate. The units support multiple voltages.
– The cooling unit must be connected to the mains via an all-pole disconnect to overvoltage category III (IEC 61058-1).
– The unit is intrinsically safe and does not require any additional external safety devices for safe operation.
– The connection cable must be protected with a miniature circuit-breaker.
– To ensure the proper functioning of internal pressostats in the event of a malfunction, a line fuse of no less than 15 A is required.
– If a motor circuit-breaker or circuit-breaker is used, it should be selected in accordance with EN 60898-1.
– For applications in UL-approved facilities, any CCMR-type fuse from Littelfuse may be used, or alternatively, a UL-certified air circuit-breaker.
– Suitable miniature circuit-breakers and circuit-breakers can be found under Rittal accessories (see section 10 "Technical specifications" and section 13 "Accessories").
– Thanks to the integral inverter technology, conventional start-up currents (start-up of internal motors) are not externally visible.
– The mains infeed and the signal cable may optionally be of a shielded design. The cable shield may be contacted at the potential equalisation point.
– No additional temperature control may be connected upstream of the unit at the supply end
– Low-noise potential equalisation must be guaranteed with the mains connection.

Overvoltage protection and supply line load

Rittal recommends the following measures for protecting the cooling units in non-standard environmental and connection conditions.

– The unit does not have its own overvoltage protection. Measures must be taken at the supply end by the switchgear manufacturer or operator to ensure effective protection against lightning and overvoltage.
– The units are classified as overvoltage category III and meet the requirements of EN 60204-1 on the electrical equipment of machines. The mains voltage must not deviate by more than the tolerance specified in section 10 "Technical specifications".
– The discharge current may exceed 3.5 mA.
– The units are high-voltage tested ex works. An additional high voltage test must only be carried out with a DC voltage supply source (1500 VDC max.).
– EMC interference signals arising in local industry and plant networks may deviate significantly from those specified in the standards. In these types of network situations, an external EMC filter should be used.
– If the combined output of the frequency converters, power converters or transformers in the network where the device is being operated is >70 kVA, the customer must connect a Class II surge voltage protector in the mains supply line upstream of the cooling unit. The surge voltage protector must be designed to EN 61800 -1. The following values may be assumed as starting-points for the design:

EN

Transformers, power electronics	Assumed discharge energy
70 kVA…100 kVA	40 J
100 kVA…200 kVA	80 J
200 kVA…400 kVA	160 J
400 kVA…800 kVA	320 J

Tab. 3: Design of the surge voltage protector

Technical specifications for a suitable overvoltage protection module:
– Terminal voltage Uc = 350…400 V, 50/60 Hz
– Maximum current Imax = 40 kA
– Rated current In = 20 kA
– Breakdown voltage Up = 1.75 kV

Three-phase devices

– There is no need to observe a counterclockwise or clockwise phase rotation when making the electrical connection to a three-phase voltage supply. The electronics incorporated into the devices automatically create the required phase rotation.
– In three-phase devices, the absence of a phase is detected, and the device is switched off.
– Outgoing equipment is monitored by the inverter, and deactivated in the event of a malfunction in the electricity supply.

SCCR – Short-circuit resistance

Under UL508A Supplement SB, the standard SCCR for cooling units is 5 kA.
If the device is installed on a UL508A feeder circuit >5 kA, a protective device with the corresponding SCCR of the feeder circuit and a peak let-through of <5 kA should be connected upstream in the cooling unit branch.

Door limit switch

– Each door limit switch can only be assigned to one cooling unit.
– Several door limit switches may be operated in parallel with one cooling unit.
– The minimum cross-section for the connection cable is 0.3 mm^2 for a cable length of 2 m.
– The line resistance to the door limit switch must not exceed a maximum of 50 Ω.
– The maximum admissible line length is 10 m.
– The door limit switch only supports a floating connection; no external voltages.
– The contact of the door limit switch must be closed when the door is open.
– The safety extra-low voltage for the door limit switch is provided by the internal power pack: Current approx. 5 mA DC.

■ Connect the door limit switch to terminals 5 and 6 of the signal connector.

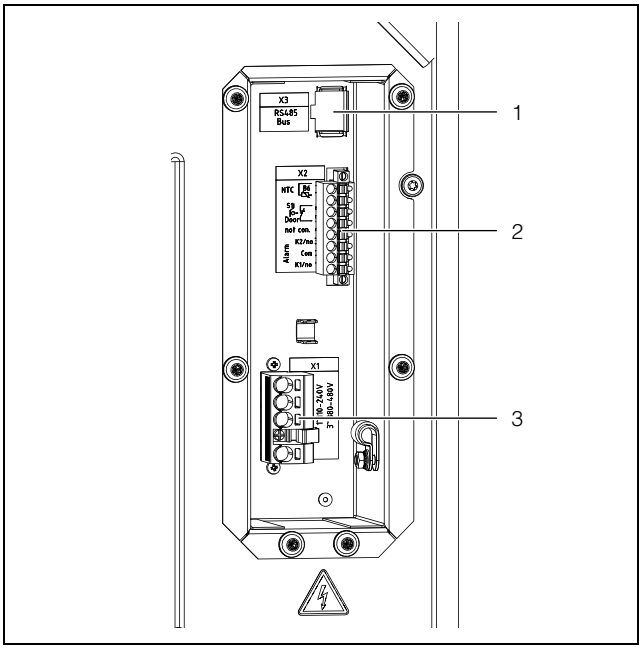


Fig. 31: Connections at rear (example illustration)

Key

1 Connection for IoT interface 3124.300 (X3)
2 Connection for signal connector (X2)
3 Connection for mains connector (X1)

Ferrite core

■ Attach the ferrite core (1x for SK 3185330 as shown in fig. 32 and 2x for SK 3186330, SK 3187330, SK 3188340, SK 3189340 as shown in fig. 33) included with the supply to the signal cables near the connector to prevent interference with signal transmission. The cables should be looped around the ferrite core.

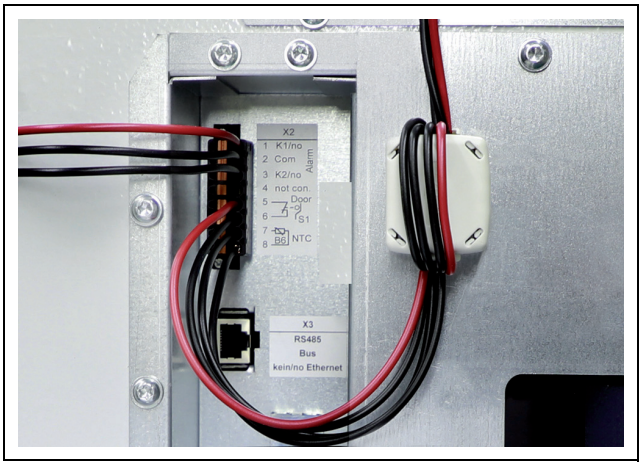


Fig. 32: Mounting point for the ferrite core on SK 3185330

Fig. 33: Mounting point for the ferrite cores on SK 3186330, SK 3187330, SK 3188340, SK 3189340

Potential equalisation

If, for EMC reasons, the unit is to be integrated into the customer's existing potential equalisation system, a conductor may be connected to the potential equalisation connection point. The connection point is labelled with the required switch symbol.

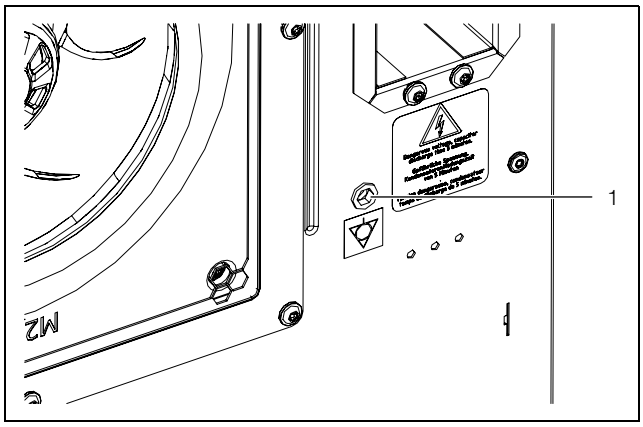


Fig. 34: Connection point for potential equalisation (example illustration)

Key

1 Connection point M6

- Attach the potential equalisation to the unit's connection point using the screw, washer and contact washer.

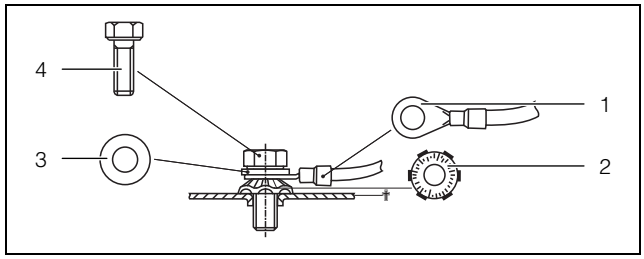


Fig. 35: Potential equalisation arrangement

Key

1 Ring terminal with PE conductor
2 Contact washer
3 Washer
4 Screw

Note:
According to the standard, the PE conductor in the mains connection cable is not classed as an equipotential bonding conductor.

5.4.2 Install the power supply

Note:
- We recommend that the power supply cable and the signal cable should be of a shielded design.
- The cable shield can make contact with the T-rail (fig. 39).

- Remove the mains connector from the dispatch bag and connect to the mains as shown on the connection diagram (fig. 37 or fig. 38).
- Use copper conductors only to connect the supply cable to the mains connector.

Note:
The cover may optionally be secured over the electrical connection to provide protection. In IT and container applications, covers must always be secured (M_A = 2 Nm).

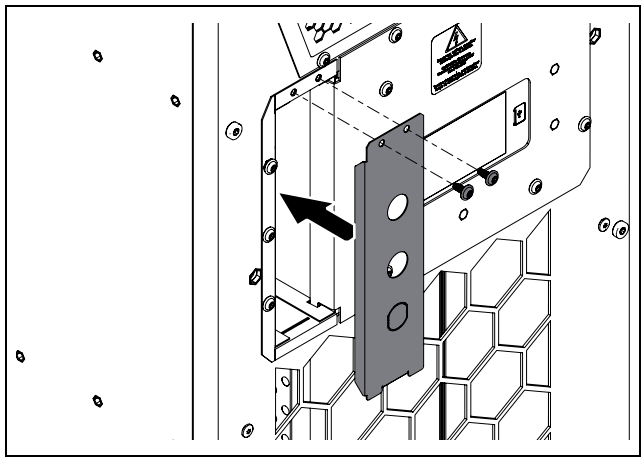


Fig. 36: Fitting the cover

EN

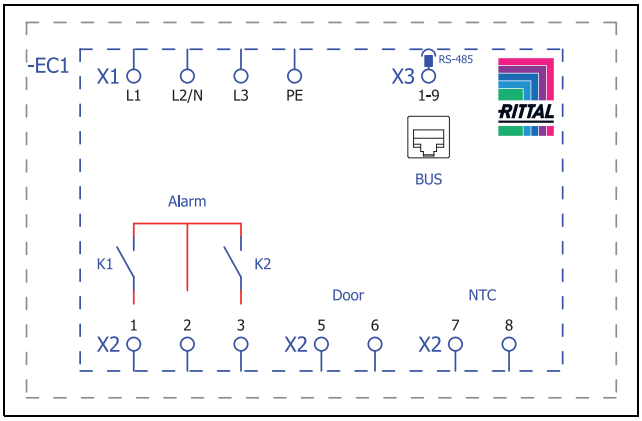


Fig. 37: Circuit diagram SK 3185330, SK 3186330, SK 3187330

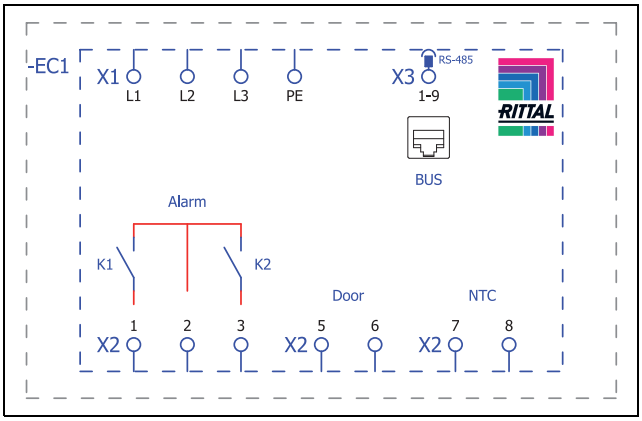


Fig. 38: Circuit diagram SK 3188340, SK 3189340

Key

X1 Main terminal strip
K1 Alarm relay 1
K2 Alarm relay 2
Door Door limit switch (optional, without door limit switch: terminal 5, 6 open)
NTC External temperature sensor (optional)
X3 RS 485 interface

Attachment option for cable routing

- Remove the T-rail from the pack and attach it to the connection unit.

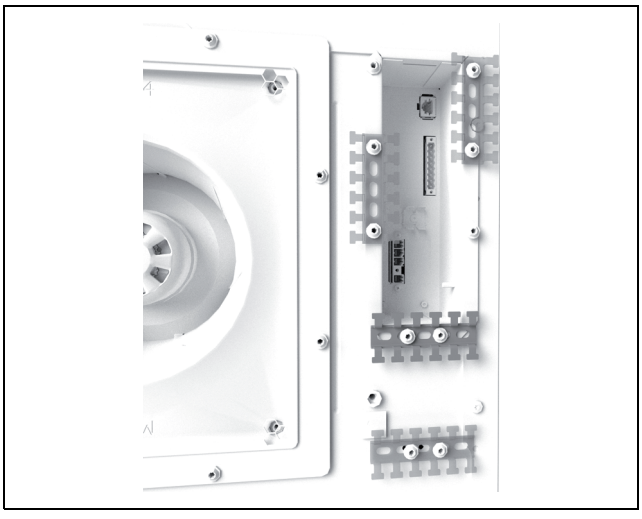


Fig. 39: Attach the T-rail (example illustration)

- Then create the strain relief.

Fig. 40: Create the strain relief using cable ties (example illustration)

5.4.3 Connect the alarm relays

System messages from the cooling unit may be output to an external signal source via two floating relay outputs.

The relay outputs are in the de-energised state NO (Normally Open). As soon as voltage is applied to the cooling unit, the alarm relays will pick up. This is the factory setting for the cooling unit's normal operating state. Whenever a system message occurs or the power supply is interrupted, the alarm relays will drop out and open the contact.

- Connect a suitable connection cable to the connection terminals 1 (Alarm K1) and/or 3 (Alarm K2) of the signal connector (X2).
- Configure the alarm relays you wish to use to output error messages (see section 7.4.3 "Alarm relays").

AC cos ϕ = 1	DC Res. Load
I max. = 2 A U max. = 250 V	I min. = 100 mA U max. = 30 V I max. = 2 A

Tab. 4: Contact data

5.4.4 Interfaces

The cooling unit has the following interfaces, located on the rear, for communicating with external systems:

– Micro-USB interface
– RS 485 interface
– NFC interface

Micro-USB interface

A micro-USB interface is located on the rear, to the right of the display. A laptop may be connected here to update the device.

- To update the device, connect a laptop with installed software to the micro-USB interface.

No other USB devices will be detected on this connection.

RS 485 interface

An RS 485 interface is located on the rear of the connection box. The IoT interface for linking the cooling unit to the customer's own monitoring, energy management and/or superordinate systems may be connected here.

- Connect the the IoT interface (accessory) to the RS 485 interface (X3).

Note:
A direct connection to the cooling unit via the RS 485 interface is not possible.

NFC interface

The cooling unit may be accessed with the "Rittal Scan & Service" app via the integral NFC interface to the left of the display. Access is only possible with the app supplied by Rittal.

EN

6 Commissioning

Note:
The oil must collect in the compressor in order to ensure adequate lubrication and cooling. For this reason, do not operate the cooling unit for at least 30 minutes after assembling the equipment.

- Observe the aforementioned waiting period of at least 30 minutes before commissioning the unit after assembly.
- Next, switch on the voltage supply to the cooling unit.

The Rittal logo will initially appear on the display, followed a short time later by the start screen.

- You can now make your individual settings on the unit, e.g. set the temperature or assign the network identifier, etc. (refer to chapter 7 "Operation").

Note:
It is **not** necessary to carry out leak or pressure tests on the cooling unit prior to commissioning. Rittal has already done this in the factory.

Note:
The current software version is shown on the display (see section 7.3.2 "Device information").
Before commissioning, Rittal recommends checking the Rittal website for any software updates. The current firmware and a program for updating the firmware are available for downloading on the relevant product pages of the Rittal website.

- Install the latest firmware to access the full range of functions below.

EN

7 Operation

7.1 General

The cooling unit is equipped with a touch function display for making basic settings and displaying error messages. This is an industrial-grade touch display which is pressure-sensitive and may therefore be operated with gloves.

As well as operating directly on the cooling unit itself, there is also a smartphone app available. This offers almost the same functions as the actual display, and additionally provides extended explanations of error messages, as well as the option of contacting the Rittal Service team directly.

Note:
The current firmware and a program for updating the firmware are available for downloading on the relevant product pages of the Rittal website.

- Install the latest firmware to access the full range of functions below.

7.2 Layout of the display

The display is divided into a top section on a dark background, and a bottom section with the menu bar. This layout is always identical, but the content of the two sections will vary according to the menu selected.

7.2.1 Start screen

The start screen is always displayed while the cooling unit is in normal operation, provided there are no error messages.

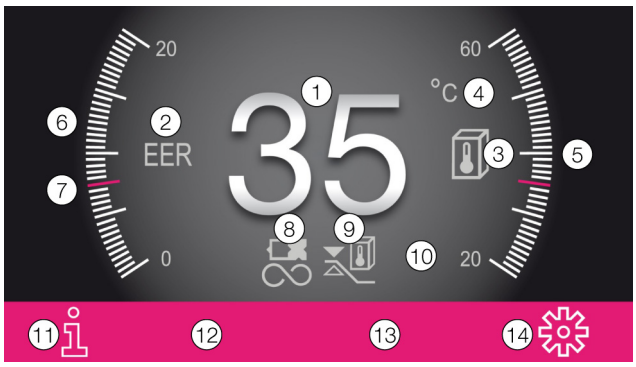


Fig. 41: Layout of the start screen

Key

Item	Description	Possible icons
1	Internal temperature display (2-digit °C/3-digit °F)	Numbers from 0-9
2	EER scale: Range 0...20 / current average EER value of the last 24 hours	EER

Tab. 5: List of all icons with descriptions

Item	Description	Possible icons
3	Ti scale: Range 20 ...60 / value: Average enclosure internal temperature of the last 24 hours	
4	Display temperature unit	°C °F
5	USB connection (if connected)	
6	Self-test (if initiated)	
7	NFC connection (max. 120 seconds after connecting)	
8	Type of cooling	
9	Control based on ...	
10	External sensor	
11	Information menu	
12	System messages (where applicable)	
13	Service icon (if required)	
14	Configuration	

Tab. 5: List of all icons with descriptions

Type of cooling

The current form of cooling is indicated by one of the following four icons.

Symbol	Parameters
	Cooling in compressor mode without support from the heat pipe
	Cooling in compressor mode with support from the heat pipe
	Cooling via the heat pipe only
	No cooling

Tab. 6: Possible icons for the current type of cooling

EN

7.2.2 Changing a parameter value

If a parameter value is changed, the display including the menu bar will also change.

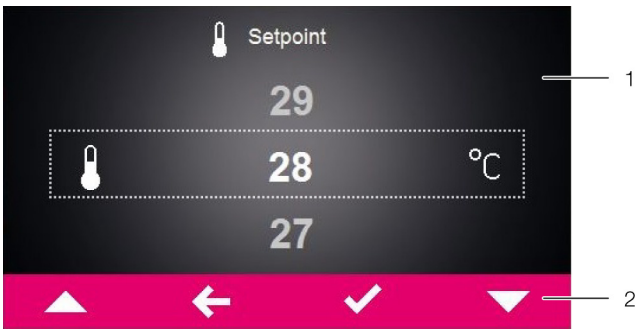


Fig. 42: Screen for changing a parameter value

Key

1 Main screen
2 Control bar

The currently selected parameter value is displayed in the centre of the main screen. To change this value, you always proceed in the same way, as described below with the example of adjusting the set temperature:

- On the start screen, click on the "Configuration" button.
- Enter the PIN to gain access to the lower-level screen pages of the "Configuration" zone.
  "22" is the default PIN.
- Click on the "Temperature" symbol.
- Click on the "Control mode" symbol.
- Select your preferred control mode from the display.
- Change the setting to the required temperature using the "Up" and "Down" arrows.
- Alternatively, you can also select the one of the displayed higher or lower values directly.
- Finally, confirm the set value with "OK".
- Exit this screen page with the "Back" button.

7.3 Information menu

- Click on the "Information" symbol to display a list of lower-level screen pages.

Symbol	Parameters
	Temperature info
	Device info
	Efficiency info

Tab. 7: "Information" zone

7.3.1 Temperature information

- Click on the "Temperature information" symbol.

The ambient temperature and internal temperature are displayed, in each case as an average for the last 24 hours of operation.

Symbol	Parameter
	ØTU 24h Average ambient temperature (external temperature) over the last 24 hours of operation.
	ØTI 24h Average internal temperature over the last 24 hours of operation.

Tab. 8: "Temperature information" zone

7.3.2 Device information

- Click on the "Device information" symbol.
  A list of general information about the device will be displayed.
- Page through the list using the "Up" and "Down" arrows.

Symbol	Parameter
	Serial number
	Manufacture date YYYY-MM-DD
	Hardware Release x.xx.xx
	Firmware Release x.xx.xx
	Software Release x.xx.xx
	Last update YYYY-MM-DD
	Last maintenance YYYY-MM-DD
	User device name Name assigned to the cooling unit by the customer. The name can be assigned via the "Rittal Scan & Service" app to distinguish between individual devices.
	Act. control mode
	If the unit is configured as a "slave": Slave number.

Tab. 9: "Device information" zone

7.3.3 Efficiency information

■ Click on the "Efficiency information" symbol.
The average energy efficiency ratio (EER) for the last 24 hours of operation will be displayed. The energy efficiency ratio is the ratio of the cooling output generated to the electrical power used.

Symbol	Parameter
EER	Average EER 24h Average energy efficiency ratio (EER) of the last 24 hours of operation.

Tab. 10: "Efficiency information" zone

7.4 Configuration menu

■ Click on the "Configuration" symbol.
A screen page will appear asking you to enter the PIN in order to access the lower-level screen pages.

Note:
"22" is preset in the factory as the default PIN.

■ For the first digit, page through the digits "0" to "9" using the "Up" and "Down" arrows until the required digit appears in the box.
■ Confirm your selection with "OK".
■ For the second digit, once again page through the digits "0" to "9" using the "Up" and "Down" arrows until the required digit appears in the box.
■ Confirm your selection with "OK".
A list of lower-level screen pages will be displayed.

Symbol	Parameter
	Temperature Settings for set temperature and control mode
	Network Display of network information from the IoT interface (3124300)
	Alarm relay Settings for the alarm relays.
	Filter mats (no function)
	Display language Choice of language for display texts.
	Self-test Perform a self-test.

Tab. 11: "Configuration" zone

7.4.1 Temperature

■ Click on the "Temperature" symbol to display a list of lower-level screen pages.

Symbol	Parameter
	Change unit Set the unit "°C" or "°F"
	Control mode
	Alarm threshold Temperature limit which will trigger an alarm message if exceeded.

Tab. 12: "Temperature" zone

Change unit
All temperature values for the unit may be displayed either in degrees Celsius "°C" or degrees Fahrenheit "°F".
■ Click on the "Change unit" symbol.
■ Change the required unit ("°C" or "°F") using the "Up" or "Down" arrows.
■ Confirm your entry with "OK".

Control mode
The cooling unit controls cooling output according to one of the following three temperature values:
– **Inside temp. (factory setting):** The temperature at which air is drawn out of the enclosure into the cooling unit.
– **External sensor:** The temperature measured with an external temperature sensor at a so-called hot spot in the enclosure.
– **Outlet temp.:** The temperature measured with an external temperature sensor at the cold air outlet from the cooling unit.

Control mode "external sensor"
Please observe the following when selecting the sensor position: The sensor must **not**
– be influenced directly by the cold air expelled from the cooling unit,
– be influenced by external heat sources or heat radiation,
– be exposed to humidity,
– have its connection cable laid in the vicinity of AC cables,
– be exposed to different temperature levels within the first 10 cm of the connection cable.

The sensor **must**
– be located within the effective range of the cooling unit,
– be surrounded by adequate moving air which has blended well with the air expelled by the cooling unit,

– be at an adequate distance from solid and liquid substances.

Control mode "outlet temperature"

■ Attach the temperature sensor in front of the cold air outlet from the cooling unit, in the centre (fig. 43).

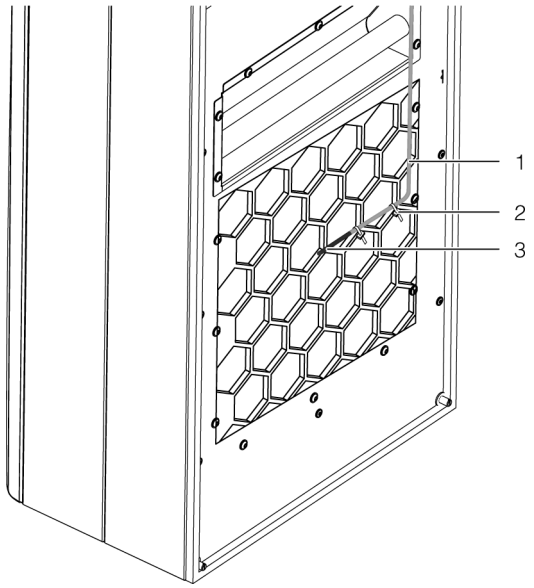


Fig. 43: Temperature sensor in front of cold air outlet (example illustration)

Key

1 Sensor cable
2 Cable ties (2x)
3 Sensor element

Note:
The sensor element must not be in contact with the enclosure.

Note:
To ensure the accuracy of the outlet temperature, at least 50% of the total cooling output should be installed as heat loss. The output can be taken from the characteristic curve for this unit.

Selecting a control mode

■ Click on the "Control mode" symbol.
The setpoint for the currently set control mode is displayed.
■ Choose your preferred control mode by selecting it from the display:

Symbol	Parameter	Setpoint	Factory setting
	Internal temperature	20 °C (68 °F) … 50 °C (122 °F)	35 °C (95 °F)
	External sensor		
	Outlet temperature	18 °C (64 °F) … 28 °C (82 °F)	24 °C (75 °F)

Tab. 13: "Control mode" zone

The corresponding symbol for the chosen control mode is likewise displayed on the overview page.

Note:
The external temperature sensor is available as accessory from Rittal (see section 13 "Accessories").

■ Change the setpoint using the "Up" and "Down" arrows or select the required temperature directly.
■ Confirm your entry with "OK".

Alarm threshold

This limit is used for an alarm message. The set value must therefore be above the actual setpoint to which the cooling unit has been set.
For example:
– Setpoint: 35 °C (95 °F)
– Alarm limit min.: 38 °C (100 °F)
– Alarm limit max.: 50 °C (122 °F)

Symbol	Parameter	Alarm limit	Factory setting
	Internal temperature	Setpoint + 3 °C (5 °F) … Setpoint + 15 °C (27 °F)	Setpoint + 5 °C (9 °F)
	External sensor		
	Outlet temperature	Setpoint + 12 °C (21 °F) … Setpoint + 24 °C (40 °F)	Setpoint + 14 °C (25 °F)

Tab. 14: Alarm limit

■ Click on the "Alarm limit" symbol.
■ Change the setpoint using the "Up" and "Down" arrows or select the required temperature directly.
■ Confirm your entry with "OK".

Note:
In "external sensor" and "outlet temperature" control mode, the cooling unit additionally monitors the temperature of the air as it is drawn in. If the set alarm limit seems likely to be exceeded (e.g. due to a rise in heat loss), the cooling output is increased for the duration of the threatened overtemperature, and the setpoint is undercut.

The absolute temperature at which the "Overtemperature" alarm message is output is therefore calculated as follows:
– Limit temperature = Setpoint + alarm threshold

Example of "outlet temperature" control mode:
– Setpoint: 24 °C/75 °F
– Alarm limit (difference): 14 °C/25 °F
– Limit temperature: 38 °C/100 °F

Current situation:
– Temperature of air intake: 37 °C/98.6 °F (< alarm limit)
– Temperature of expelled air: 24 °C/75.2 °F (= setpoint)

If the alarm limit is exceeded:
– Temperature of air intake: 39 °C/102.2 °F (> alarm limit)
– Temperature of expelled air: 22 °C/71.6 °F (< setpoint)

If the alarm limit is subsequently undercut due to an increase in the cooling output:
– Temperature of air intake: 37 °C/98.6 °F (< alarm limit)
– Temperature of expelled air: 24 °C/75.2 °F (= setpoint)

7.4.2 Network

■ Click on the "Network" symbol to display a list of lower-level screen pages.

Symbol	Parameter
	Network on/off
	Network info

Tab. 15: "Network" zone

Network on/off

Here, you can activate / deactivate data communication to the IoT interface. Data communication is activated by default.

■ Click on the "Network on/off" symbol.
■ Select your preferred setting by selecting it from the display.
■ Confirm your entry with "OK".

Symbol	Parameter
	Network off
	Network on

Tab. 16: Data communication settings

Network info

Get IP information about how the IoT interface is incorporated into the network.

■ Click on the "Network info" symbol to display a list of lower-level screen pages.

Symbol	Parameter
	IPv4
	IPv6

Tab. 17: Select the protocol version

IPv4

■ Click on the "IPv4" symbol.
A list of general information about the IPv4 settings will be displayed.
■ Page through the list using the "Up" and "Down" arrows.

Parameter	Setting
DHCP	off/on
IP address	xxx.xxx.xxx.xxx
Network mask	xxx.xxx.xxx.xxx
Router address	xxx.xxx.xxx.xxx

Tab. 18: IPv4 settings

IPv6

■ Click on the "IPv6" symbol.
A list of general information about the IPv6 settings will be displayed.
■ Page through the list using the "Up" and "Down" arrows.
■ Click on the desired entries to display the IPv6 addresses.

Parameter	Setting
DHCP	off/on

Tab. 19: IPv6 settings

EN

Parameter	Setting
IP address 1	…
IP address 2	…
Auto address	…
Link-local addr.	…

Tab. 19: IPv6 settings

7.4.3 Alarm relays

There are two floating relay outputs in the connection box on the rear of the unit, which may be used to output system messages from the cooling unit to an external signal source (see section 5.4.3 "Connect the alarm relays"). The relay outputs may be configured here.

- Click on the "Alarm relay" symbol to display a list of lower-level screen pages.

Symbol	Parameter
	Switch NO/NC Switch the alarm relay as a normally closed or normally open contact.
	Function list Allocation of a function to the respective alarm relay.

Tab. 20: "Alarm relay" zone

Note:
For the factory setting of alarm relay allocation see section 7.6 "List of system messages" (Tab. 23).

Switch NO/NC

The switch logic of the relay output, i.e. whether it is to be used as a normally closed or normally open contact, may be set here.

- Click on the "Switch NO/NC" symbol.
- Choose your preferred switch logic by selecting it from the display.
- Confirm your entry with "OK".

Symbol	Parameters
	Normally open Switch the alarm relay as a normally open contact.
	Normally closed Switch the alarm relay as a normally closed contact.

Tab. 21: Switch logic of the alarm relay

Note:
The factory setting of the relay outputs in their de-energised state is NO (Normally Open).

List of functions

This is where you specify which error messages should lead to switching of the respective relay output.

- Click on the "Relay 1" or "Relay 2" symbol, and select the alarm relay to which you wish to assign a function.
- From the list of errors, select the function which should cause the previously selected relay output to switch.
- If applicable, assign further functions to the relay output, and the output will then be switch if **at least one** of the assigned functions leads to an error message.
- Confirm your entry with "OK".
- If applicable, configure the other relay output with other functions.

Symbol	Parameter
	Assign relay 1
	Assign relay 2

Tab. 22: List of functions

7.4.4 Language settings

All displays on the unit are available in 21 different languages.

- Click on the "Display language" symbol.
- Page through to the required language using the "Up" and "Down" arrows.
- Confirm the chosen language with "OK".

The language will change over immediately, and all menu displays will appear in the chosen language.

7.4.5 Self-test

In the event of a malfunction in the unit which fails to produce an error message, it may be useful to check the key functions of all components with a self-test. You may continue to operate the unit as normal while the self-test is being carried out.

- Click on the "Self-test" symbol.
- Confirm the start of the self-test with "OK".

While the self-test is being carried out, a progress indicator will appear on the display. Once the test is complete, either the message "Unit OK" or "Check error" will be displayed.

- If applicable, use the error list to determine which malfunction applies.

7.5 System messages

We distinguish between three different types of system messages on the unit:

– Malfunctions ⚠
– Errors ⚠
– Servicing

If a corresponding message applies, the "System messages" symbol is displayed in the menu bar (fig. 41, item 13). A list of all possible system messages may be found in section 7.6 "List of system messages".

■ Click on the "System messages" symbol.

A list of all active system messages will be displayed. The individual messages are arranged in ascending order as they occur according to the above three categories.

If an error message can only be resolved by the Rittal Service team, the "Service" symbol Ⓢ will additionally appear after the error message.

■ In such cases, please contact Rittal Service (see section 14 "Customer service addresses").

7.5.1 Occurrence of a malfunction

In the event of a malfunction, the start screen will be superimposed with an error message.

Fig. 44: Screen in the event of a malfunction

Key
1 Superimposed
2 Menu bar in red

The start screen is superimposed with a message in the following three cases:

1. There is a malfunction on the unit itself.
2. There is a malfunction on one of the units in the master-slave combination.
3. The enclosure door is open and a connected door contact is emitting a corresponding message.

If the malfunctions cannot be resolved by the operator himself, the Service symbol will additionally be displayed (fig. 41, item 14).

■ Contact the Rittal Service team if you are unable to resolve the malfunction yourself (see section 14 "Customer service addresses").

7.5.2 Display in case of errors

If errors have occurred or servicing is required, the "System messages" symbol will appear in the menu bar (see section 7.5 "System messages").

Most system messages are reset automatically once the fault has been resolved.

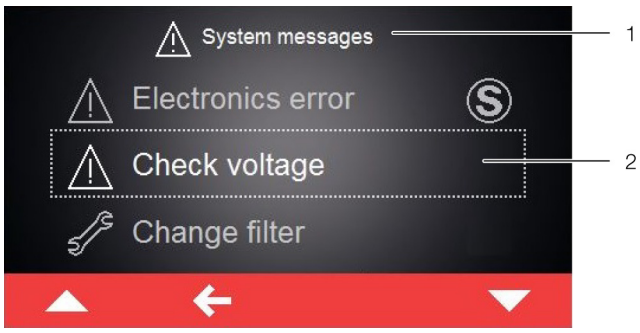


Fig. 45: Screen showing error messages

Key
1 "Errors" menu
2 Error message

If an error message applies that cannot be resolved by the operator himself and which is not reset automatically, the "Service" symbol will appear after the error message and in the control bar next to the symbol for system messages (fig. 46, item 2).

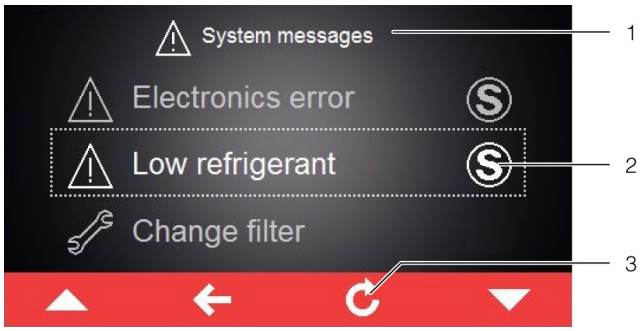


Fig. 46: Screen showing error messages

Key
1 "Errors" menu
2 Error message
3 "Return" button

■ Contact Rittal Service (see section 14 "Customer service addresses").

■ Acknowledge the error message by pressing the "Return" button.

7.5.3 Parallel device control

The IoT interface (Model No. SK 3124300, see section 13 "Accessories") supports parallel activation and deactivation of up to two cooling units. Further information can be found in the "Additional instructions" document for the IoT interface. This document is available for downloading on the Rittal website.

EN

7.6 List of system messages

The applicable error messages are displayed with the corresponding symbol in the Errors list (see section 7.5 "System messages"). Extended information for resolving individual faults may be found in this section.

Contact details for the Rittal Service team can be found in section 14 "Customer service addresses".

System message	Alarm relay output (factory setting)	Troubleshooting measures/solutions
Door open 	–	Please close the enclosure door and check the door contact switch. The error message will terminate automatically approximately 30 seconds after it has been resolved.
Int.temp too high 	–	The measured interior temperature exceeds the set alarm limit for your cooling unit. Please check any maintenance and error messages, and check the rating of your cooling unit. For any further questions, please contact Rittal Service directly.
Clean condenser 	–	The condenser in your cooling unit is dirty. Please remove the top louvred grille and clean the heat exchanger, e.g. using compressed air. The error message will terminate automatically approximately 30 seconds after it has been resolved.
Ext. air circuit 	1	The air inlet or outlet in the external circuit is blocked. Please remove the blockage and ensure that minimum distances from the air inlet or outlet are observed.
Int. air circuit 	–	The air inlet or outlet in the internal circuit is blocked. Please remove the blockage and ensure that minimum distances from the air inlet or outlet to components inside the enclosure are observed.
Exp. valve defect 	–	A malfunction has been detected in the electronic expansion valve. Please contact your Rittal Service.
Ambient temperature outside 	–	Your cooling unit is being operated outside of the admissible ambient temperature. Please ensure that the ambient temperature does not go above or below the admissible range (-30 °C…+60 °C/ -22 °F…+140 °F).
Low refrigerant 	2	Your cooling unit is reporting a lack of cooling in the active refrigerant cycle. Please contact the Rittal Service team immediately. The system message will need to be acknowledged manually once the cause has been rectified.
Condensate alert 	1	Please check whether the condensate water drain of your cooling unit is blocked, and remove the blockage. If you are unable to resolve the fault, please contact your Rittal Service team.
Int. fan alarm 1 	1	The fan in the internal circuit of your cooling unit is blocked. Please check if you can see a blockage and remove it. If no blockage is visible, please replace the fan in the internal circuit. The required spare part may be ordered directly from Rittal using the "Rittal Scan & Service" app. Please use the contact form "Generate service order".

Tab. 23: Error messages

System message	Alarm relay output (factory setting)	Troubleshooting measures/solutions
Int. fan alarm 2 	1	The fan in the internal circuit of your cooling unit is defective. Please replace the fan in the internal circuit. The required spare part may be ordered directly from Rittal using the "Rittal Scan & Service" app. Please use the contact form "Generate malfunction report".
Ext. fan alarm 1 	1	The fan in the external circuit of your cooling unit is blocked. Please check if you can see a blockage and remove it. If no blockage is visible, please replace the fan in the external circuit. The required spare part may be ordered directly from Rittal using the "Rittal Scan & Service" app. Please use the contact form "Generate service order".
Ext. fan alarm 2 	1	The fan in the external circuit of your cooling unit is defective. Please replace the fan in the external circuit. The required spare part may be ordered directly from Rittal using the "Rittal Scan & Service" app. Please use the contact form "Prepare malfunction report".
Inverter cooler 	–	The cooling body of the inverter in your cooling unit is dirty. Please remove the filter grille and the cover at the front and clean the cooling body, e.g. using compressed air. The error message will terminate automatically approximately 30 seconds after it has been resolved.
Compressor defect 	2	The compressor in your cooling unit is reporting a malfunction. Please contact the Rittal Service team immediately.
Sensor xx defect 	1	Sensor xx in your cooling unit is reporting a sensor failure. Please contact the Rittal Service team.
Ext.sens. missing 	1	The external sensor is not connected or has a malfunction. Please check the connection or select another control mode.
Check voltage 	1	You are operating your cooling unit outside of the admissible voltage ranges. Please check the power supply to the cooling unit and observe the specifications on the rating plate. With a three-phase infeed, please also check that all three phases are correctly connected.
Electronics error 	2	The electronics in your cooling unit are reporting an electronic fault. Please contact the Rittal Service team.
Check parameters 	–	Due to an error, the cooling unit has been reset to the factory defaults. Please check the current messages or contact your Rittal Service team.
Inverter fault 	2	The inverter in your cooling unit is reporting a malfunction. Please contact the Rittal Service team.
Alarm mode active 	–	Due to a previous error your cooling unit is only operating with a performance of 50%. Please remedy this error and/or contact your Rittal Service team.

Tab. 23: Error messages

System message	Alarm relay output (factory setting)	Troubleshooting measures/solutions
Compressor phase 	2	The compressor in your cooling unit is reporting a malfunction. Please contact your Rittal Service team.
Overload 	1	Please check the rating of your cooling unit. For any further questions, please contact your Rittal Service team directly.
Alarm act.cooling 	–	The active cooling function of your unit is defective. Please contact the Rittal Service team immediately, and/or check the rating of your cooling unit.

Tab. 23: Error messages

8 Inspection and maintenance

8.1 Safety instructions for maintenance work

The unit must be opened in order to carry out maintenance work. There is a risk of injury from electric shock.

- Switch off the power supply before carrying out maintenance work.
- Secure the power supply to prevent it being switched back on accidentally.
- Disconnect the electrical connection cable of the cooling unit from the power supply at the connection box.
- Wait at least five minutes before handling the unit. Only then will the capacitors built into the unit have discharged themselves.
- When handling the enclosure, be aware of any exposed power sources, where applicable.
- If possible, disconnect the entire enclosure from the power.

There is also a risk of injury from sharp edges, such as the louvres of the heat exchanger.

- Wear cut-resistant gloves for all maintenance work.

After removing the cover, there is a risk of burn injuries from hot surfaces on the components inside the unit.

- Before carrying out any work on the interior of the unit, allow it to cool down for at least ten minutes.

8.2 Notes on the refrigerant circuit

The cooling unit is filled with the amount of refrigerant required at the factory, checked for leaks, and subjected to a functional test run. The refrigerant circuit is designed in the form of a maintenance-free, hermetically sealed system. For this reason, the operator should not carry out any maintenance work on the refrigerant circuit.

Caution!
Maintenance tasks on the refrigerant circuit must only be undertaken by a qualified refrigeration specialist.

8.3 Maintenance work on the cooling unit

If there is visible dirt present, the components in the outer air circuit should be cleaned using a vacuum cleaner or compressed air.

Note:
The maintenance intervals given below depend to a large extent on the level of contamination in the ambient air. For heavily contaminated air, the maintenance intervals will be reduced accordingly.

- Clean the cooling unit inside and out at least every 5,000-8,000 operating hours as described in section 8.4 "Compressed air cleaning".
- Any stubborn, oily stains may additionally be removed using a non-flammable detergent, such as degreaser.

Caution!
Never use flammable liquids for cleaning the unit.

The installed maintenance-free fans are mounted on ball bearings, protected against moisture and dust, and fitted with a temperature monitor.

- Rittal recommends that the cooling unit fans should be checked e.g. for unusual running noises after around 40,000 operating hours.

8.4 Compressed air cleaning

8.4.1 Removing the cover

- Using the special TX25 torx wrench from the dispatch bag, loosen the three assembly screws underneath the cover and pull them off downwards.

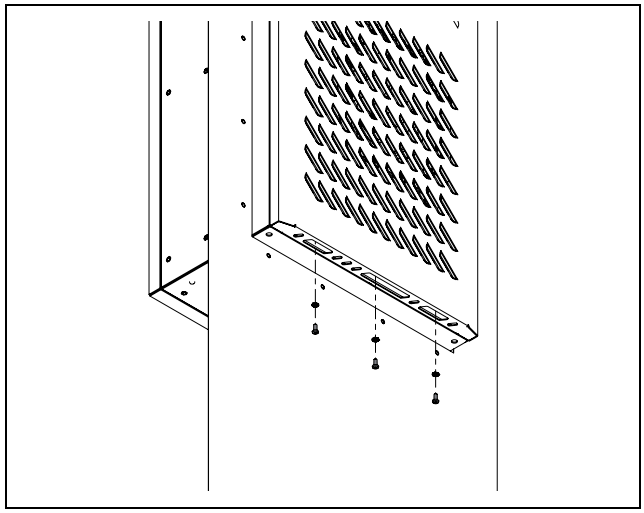


Fig. 47: Loosen the assembly screws

- Raise the cover slightly and gently pull it forwards away from the enclosure.

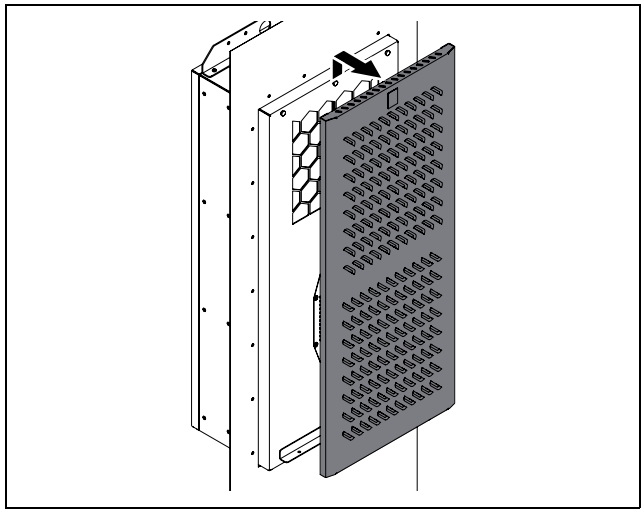


Fig. 48: Raise the cover

- Then swing the cover gently to the side.

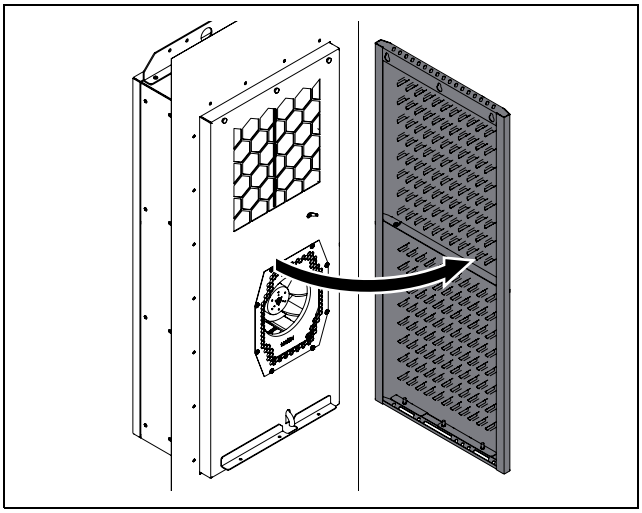


Fig. 49: Swing the cover sideways

- The PE conductor connection between the cover and the chassis is located on the right-hand side, around half-way up.
- Disconnect the flat-pin connector of the internal PE conductor, preferably on the enclosure, then remove the cover completely from the unit.

8.4.2 Cleaning the components with compressed air

After removing the cover from the unit, you will be able to access the components in the outer circuit, particularly the condenser, the condenser fan and the compressor chamber.

- Wear cut-resistant gloves when cleaning with compressed air, so as to avoid injuries caused by sharp edges inside the unit.
- When cleaning the components with compressed air, blow dirt sideways out of the cooling unit.
- Alternatively, use a suitable vacuum cleaner to clean all components.

8.4.3 Re-fitting the cover

Once cleaning work is complete, re-fit the cover onto the cooling unit.

- Re-fit the cover onto the enclosure in the reverse order.
- Please note, it is important to ensure that the PE conductor connecting the cover to the enclosure is connected at both ends.

EN

9 Storage and disposal

Note:
When storing the cooling unit, please observe the temperature range given in the technical specifications.

- Store the cooling unit in the appropriate position for transport.

The closed refrigerant circuit contains refrigerant and oil which must be properly disposed of for the sake of the environment. Facilities for disposal are available at the Rittal plant or a specialist company. Give us a call (see section 14 "Customer service addresses").

EN

10 Technical specifications

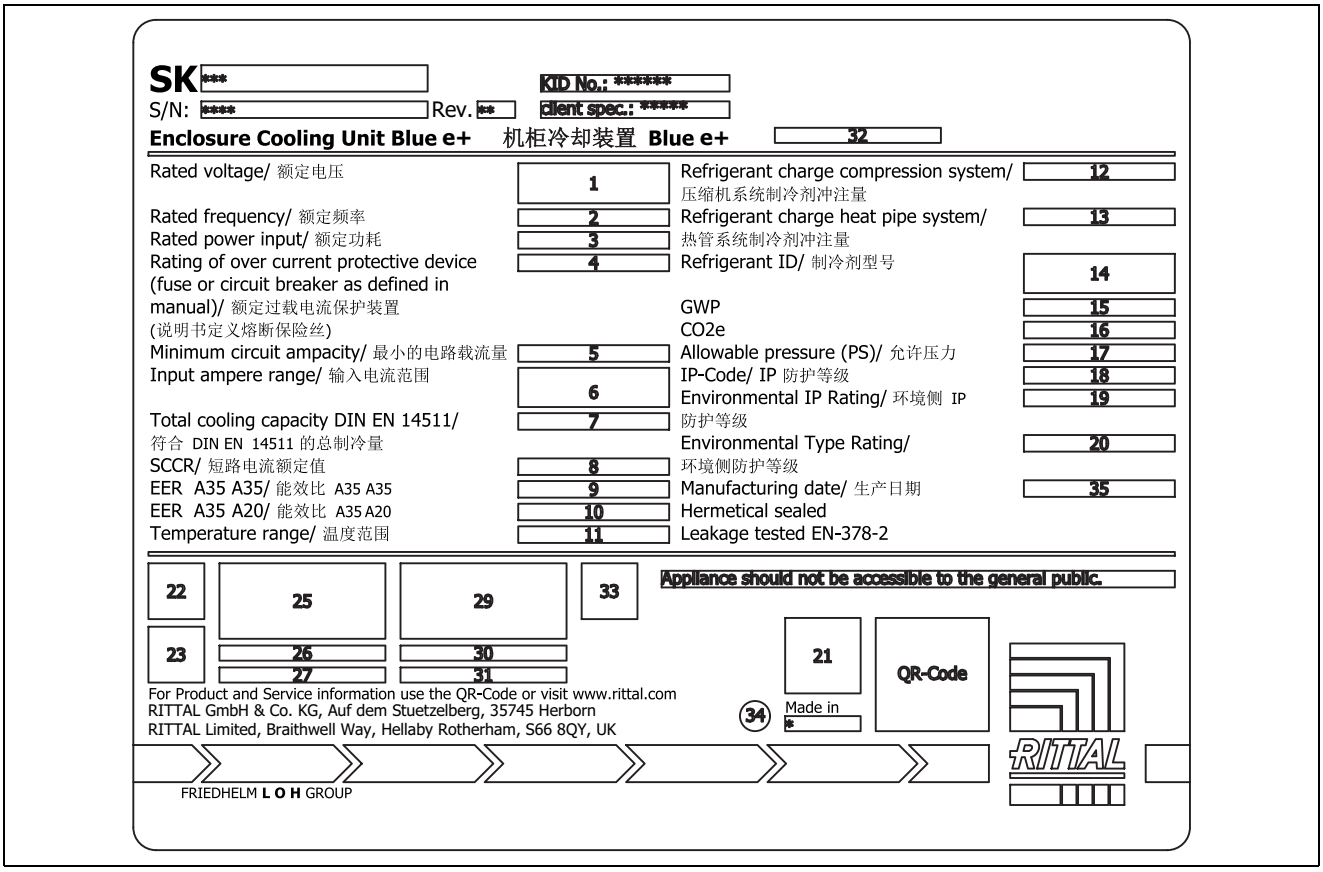
Pos.	Technical specifications		SK 3185330	SK 3186330	SK 3187330	SK 3188340	SK 3189340
	General specifications						
	Model No.		SK 3185330	SK 3186330	SK 3187330	SK 3188340	SK 3189340
	Dimensions (width x height x depth) [mm]		415 x 990 x 280	465 x 1640 x 260		465 x 1640 x 360	
	Cooling output to EN 14511 [kW]						
7	Total cooling output Pc	L35 L35	1.50	2.00	2.50	3.80	5.00
		L35 L50	1.13	1.29	1.75	2.66	3.62
8	Sensible cooling capacity Ps	L35 L35	1.50	2.00	2.50	3.78	4.73
	Power consumption Pel	L35 L35	0.57	0.65	1.08	1.48	2.42
		L35 L50	0.64	0.68	1.03	1.57	2.42
9	Energy efficiency ratio (EER)	L35 L35	2.63	3.08	2.31	2.57	2.07
		L35 L50	1.77	1.89	1.71	1.70	1.5
	Electrical specifications						
1	Rated voltage [V, ~], tolerance		110 … 240, 1, +10%/-10%			–	
			380 … 480, 3, +5%/-15%				
2	Rated frequency [Hz]		50/60				
	Rated insulation voltage Ui [V]		500				
	Rated impulse withstand voltage Uimp [kV]		2.5				
3	Rated output [kW]		0.62	0.85	1,05	1.45	2.2
4	Rating of over current protective device [A]		≥15				
5	Minimum circuit ampacity [A]		15				
6	Input ampere range [A]		6.2@110 V – 1.1@380 V	7.3@110 V – 1.3@380 V	11@110 V – 1.8@380 V	2.3@380 V – 1.8@480 V	3.7@380 V – 3.0@480 V
	Pre-fuse T [A]	EN 61439	≥16				
		UL 508A	≥15				
	Pre-fuse type		CCMR				
	Alternatively one of the following pre-fuses		SK 3235600: miniature circuit-breaker 5SY4116-8 (IEC)			–	
			SK 3235610: circuit-breaker 3RV2021-4AA10-0RT0 (IEC) (SCCR = 55 kA)				
			SK 3235620: circuit-breaker 3RV2711-4AD10-0RT0 (UL und CSA) (SCCR = 65kA)				
	SCCR [kA]		5				
	Cable cross-section [mm²]	EN 61439	1.5				
		UL 508A	≥2.1 or ≤14 AWG				
	Overvoltage category		III				
	Level of contamination		III				

Tab. 24: Technical specifications Blue e+ Outdoor

Pos.	Technical specifications		SK 3185330	SK 3186330	SK 3187330	SK 3188340	SK 3189340
	Protection category with the unit externally mounted						
17	IP protection category with mounting frame		56				
18	IP protection category without mounting frame		54				
19	UL type rating with mounting frame		12, 3R and 4				
20	UL type rating without mounting frame		12 and 4				
	Electromagnetic compatibility						
	Immunity to interference		For industrial areas to EN 61000-6-2				
	Emitted interference		For residential, business and commercial areas and small companies to EN 61000-6-3				
	Refrigerant circuit						
16	Admissible pressure (PS) HP/LP [MPa]		2.4				
10	Operating temperature range [°C/°F]		-30…+60/-22…+140				
	Heat pipe active mode [°C/°F]		-30…< Setpoint/-22…< Setpoint				
	Refrigerant cycle active mode [°C/°F]		+3…+60/+37…+140				
	Setting range set value [°C/°F]		+20…+50/+68…+122				
13	Refrigerant identification		R134a, Tetrafluorethane (CH2FCF3)				
11	Refrigerant filling mass compression system [g]		450	650		1050	
12	Refrigerant filling mass heat pipe system [g]		300	500		700	
14	GWP		1430				
	CO_2e [t]		1.07	1.64		2.50	
	Other						
	Weight [kg]		36	56.8		72.8	
	Storage temperature range [°C/°F]		-40…+70/-40…+158				
	Humidity [%]		5…95, non-condensing				
	Noise pressure level Lp [dB(A)]		<67	<70		<71	
	Material		Aluminium (AlMg3)				
	Colour		RAL 7035				
	Approvals: See product page on the Rittal website						

Tab. 24: Technical specifications Blue e+ Outdoor

EN



Note:
The illustration shows the rating plate for a "Blue e+" device as an example.

EN

11 List of spare parts

You can find spare parts on the relevant Rittal website under the relevant Model No.

Note:
The components used are Rittal-specific components. We recommend using only original Rittal spare parts to ensure the guaranteed unit properties (output).

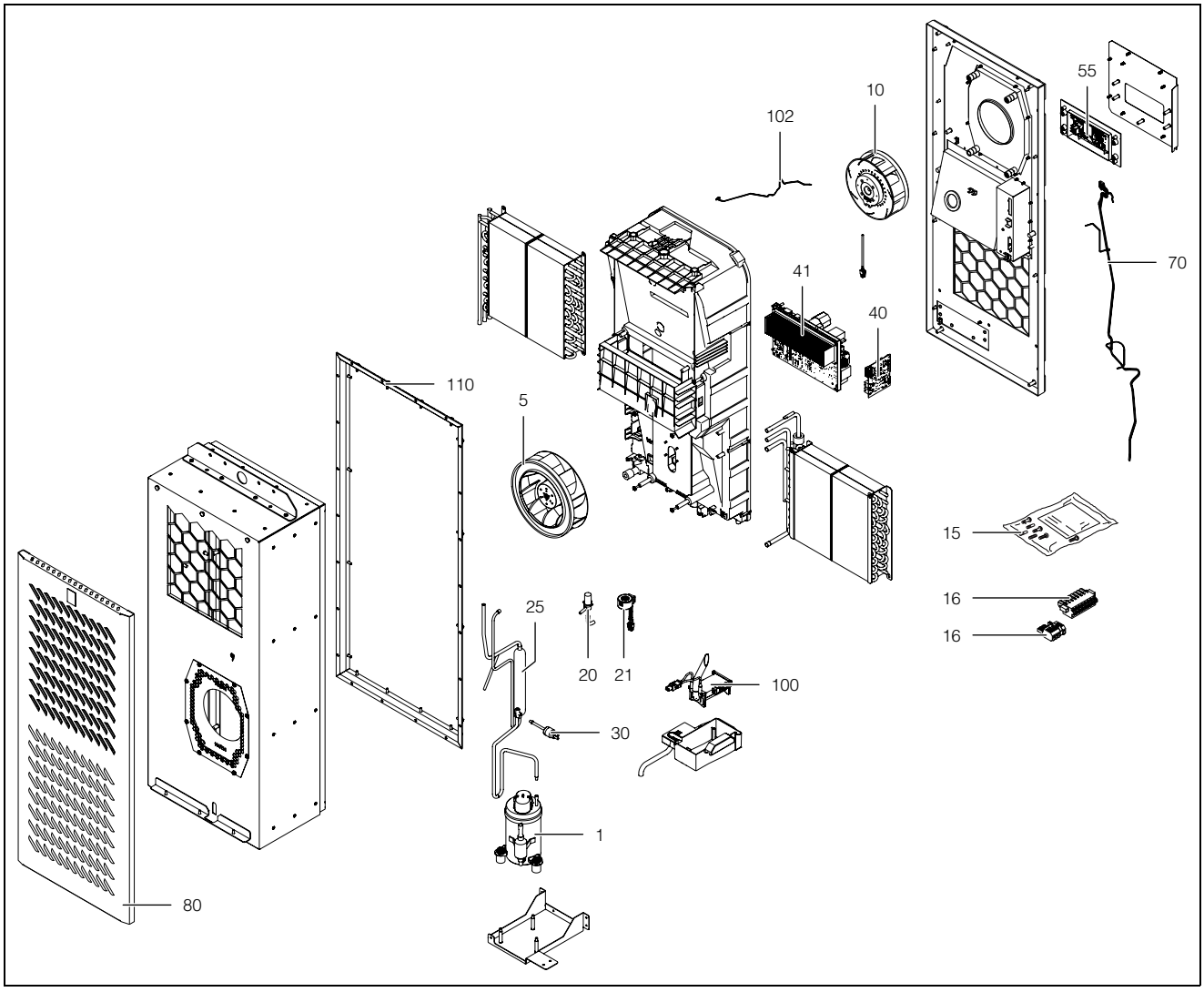


Fig. 50: Spare parts (example illustration)

Key

1 Compressor
5 Condenser fan
10 Evaporator coil fan
15 Accessories bag
16 Connector
20 Expansion valve
21 Coil for expansion valve
25 Filter dryer
30 PSA^H pressure-operated switch as pressostat
40 I/O-board
41 Inverter
55 Display/controller
70 Temperature sensor kit
80 Cover
100 Condensate water evaporator
102 Display cable
110 Mounting frame

EN

12 Drawings

12.1 Mounting cut-outs on single-walled enclosure panels without a mounting frame

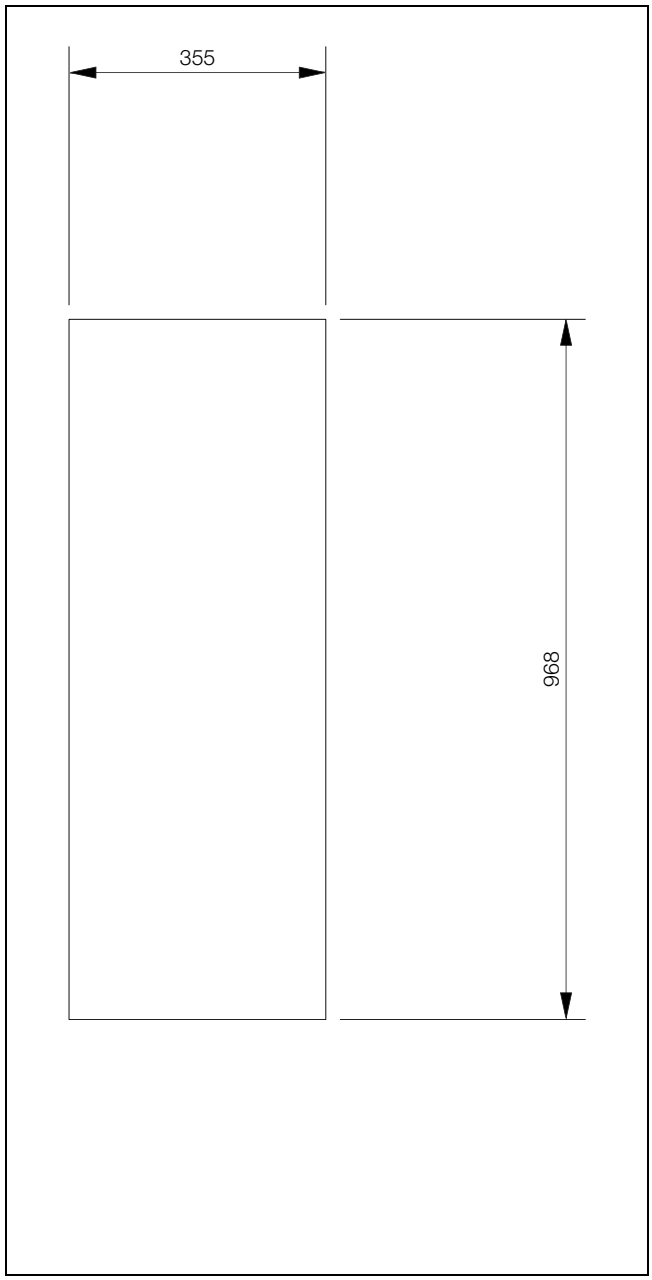


Fig. 51: SK 3185330

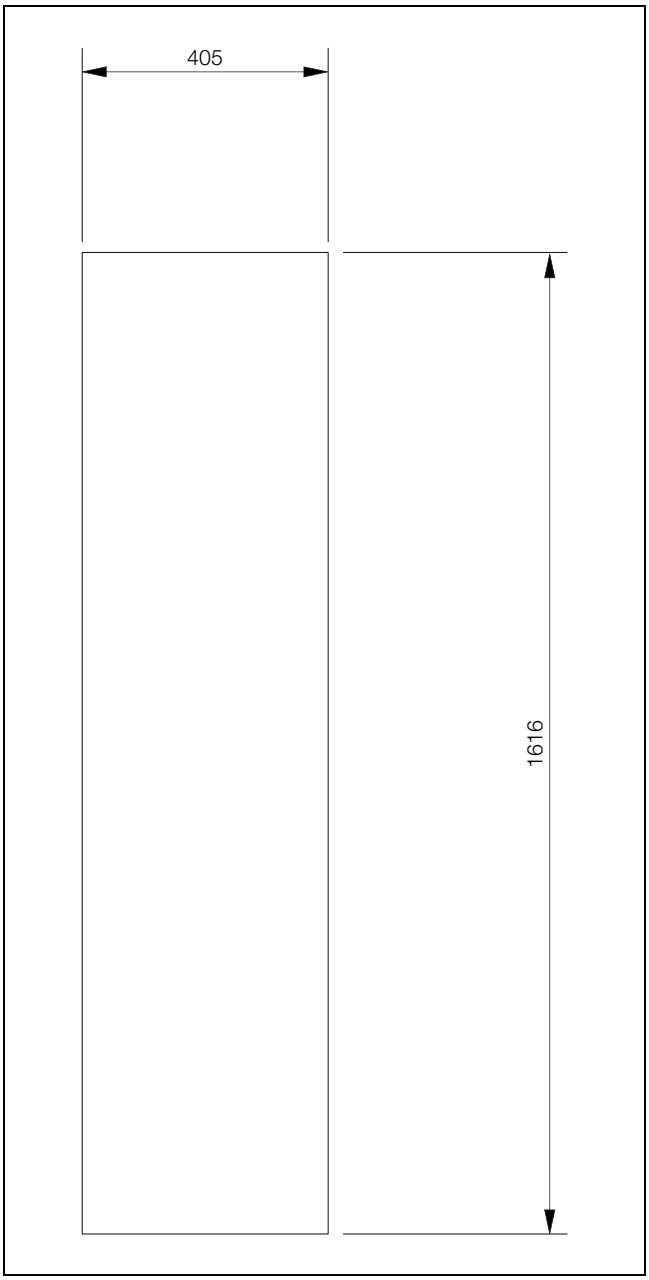
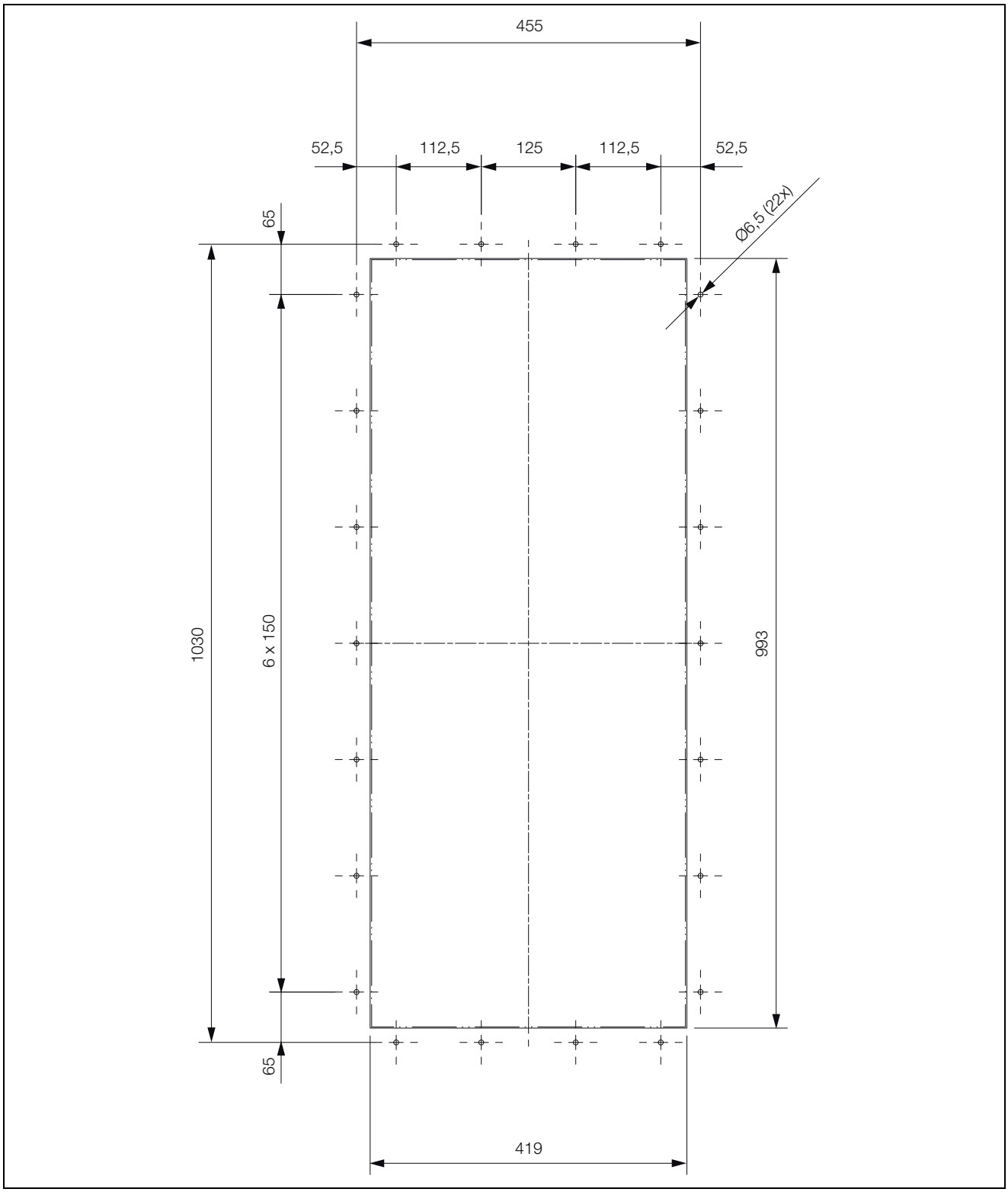


Fig. 52: SK 3186330, SK 3187330, SK 3188340, SK 3189340

EN

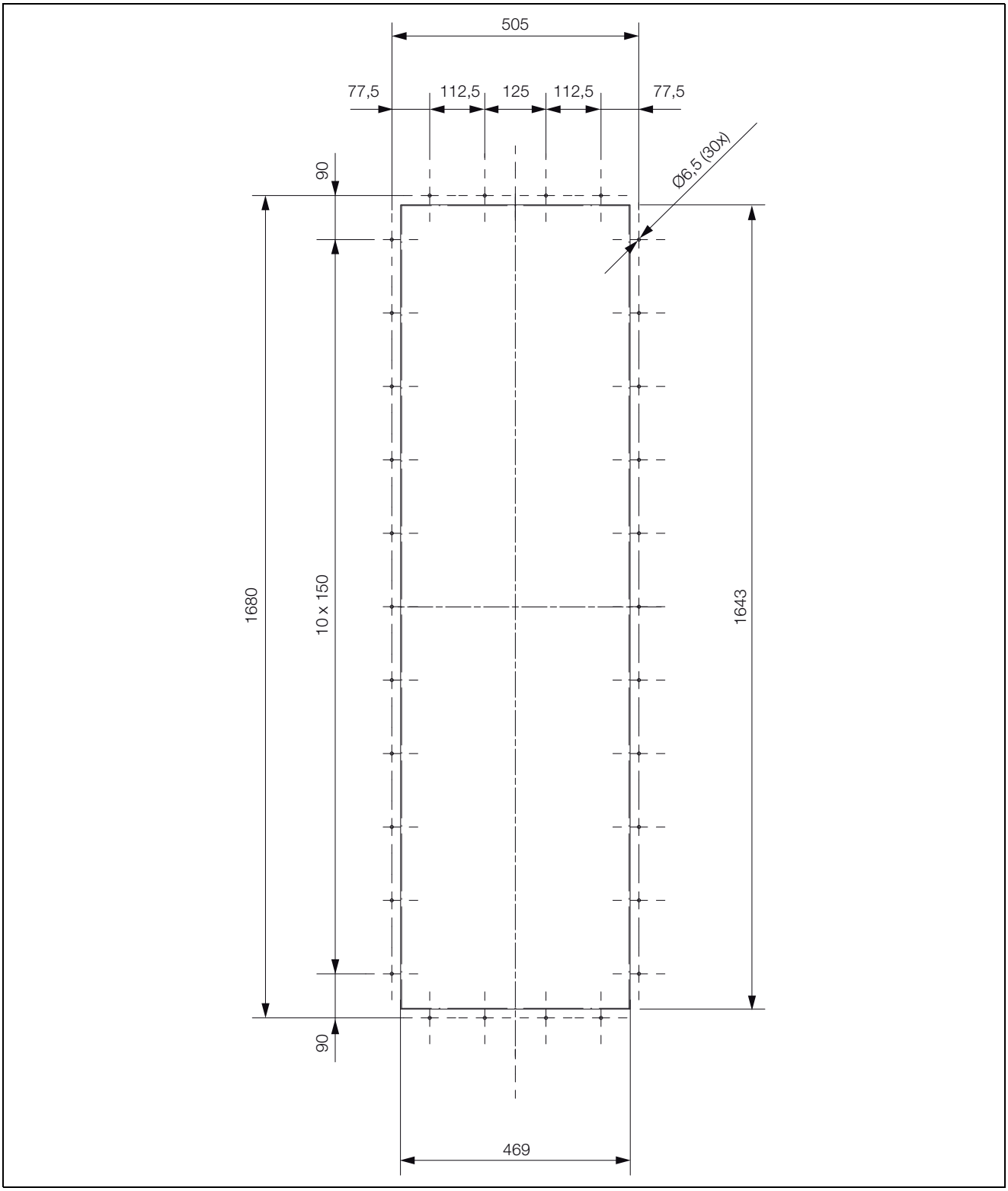
12.2 Mounting on single- and twin-walled enclosure panels with a mounting frame

12.2.1 SK 3185330



EN

12.2.2 SK 3186330, SK 3187330, SK 3188340, SK 3189340



12.3 Dimensions and installation depths

12.3.1 External mounting, partial internal mounting and full internal mounting (SK 3185330)

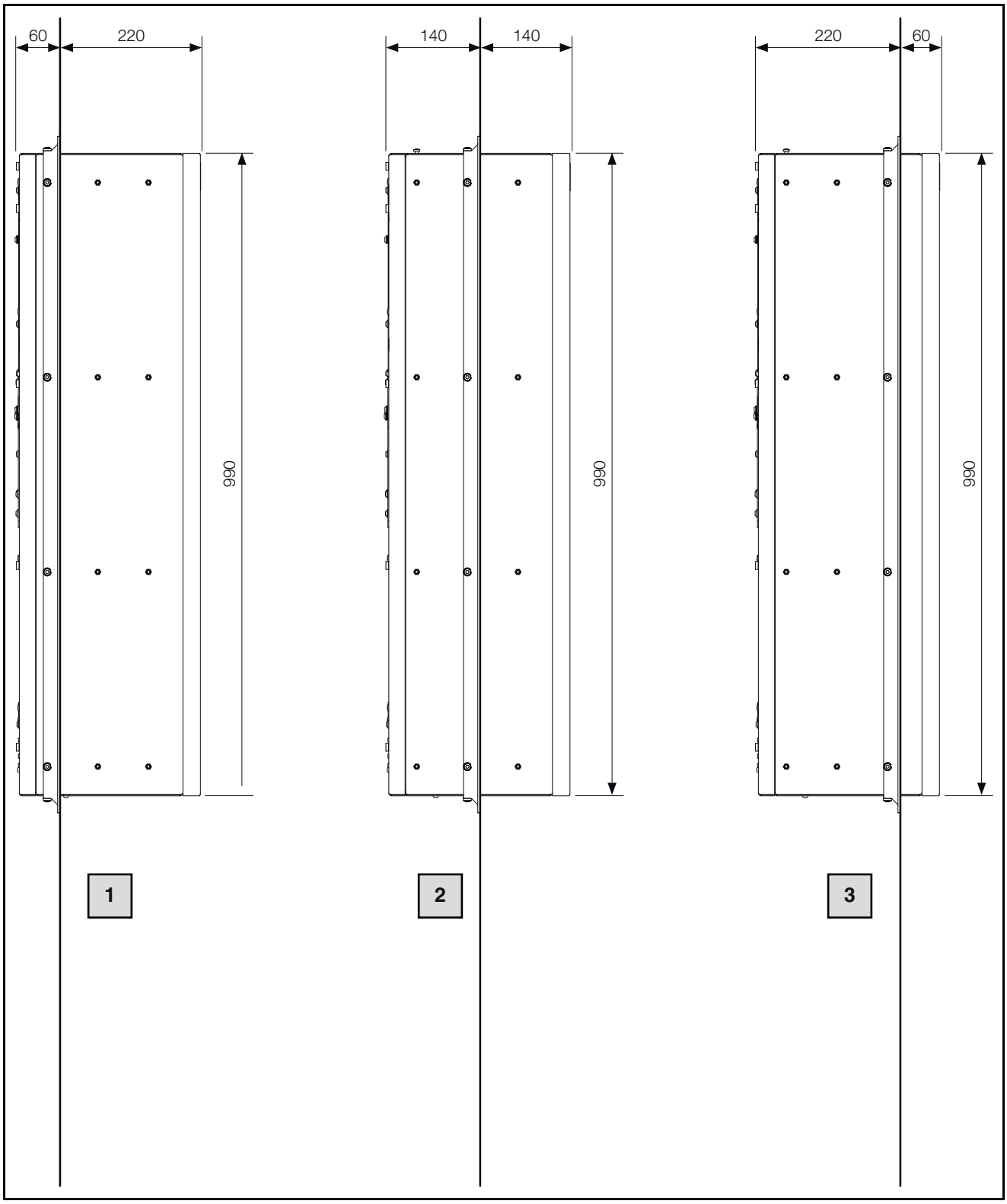


Fig. 53: Dimensions

Key

1 External mounting
2 Partial internal mounting
3 Full internal mounting

EN

12.3.2 External mounting, partial internal mounting and full internal mounting (SK 3186330 and SK 3187330)

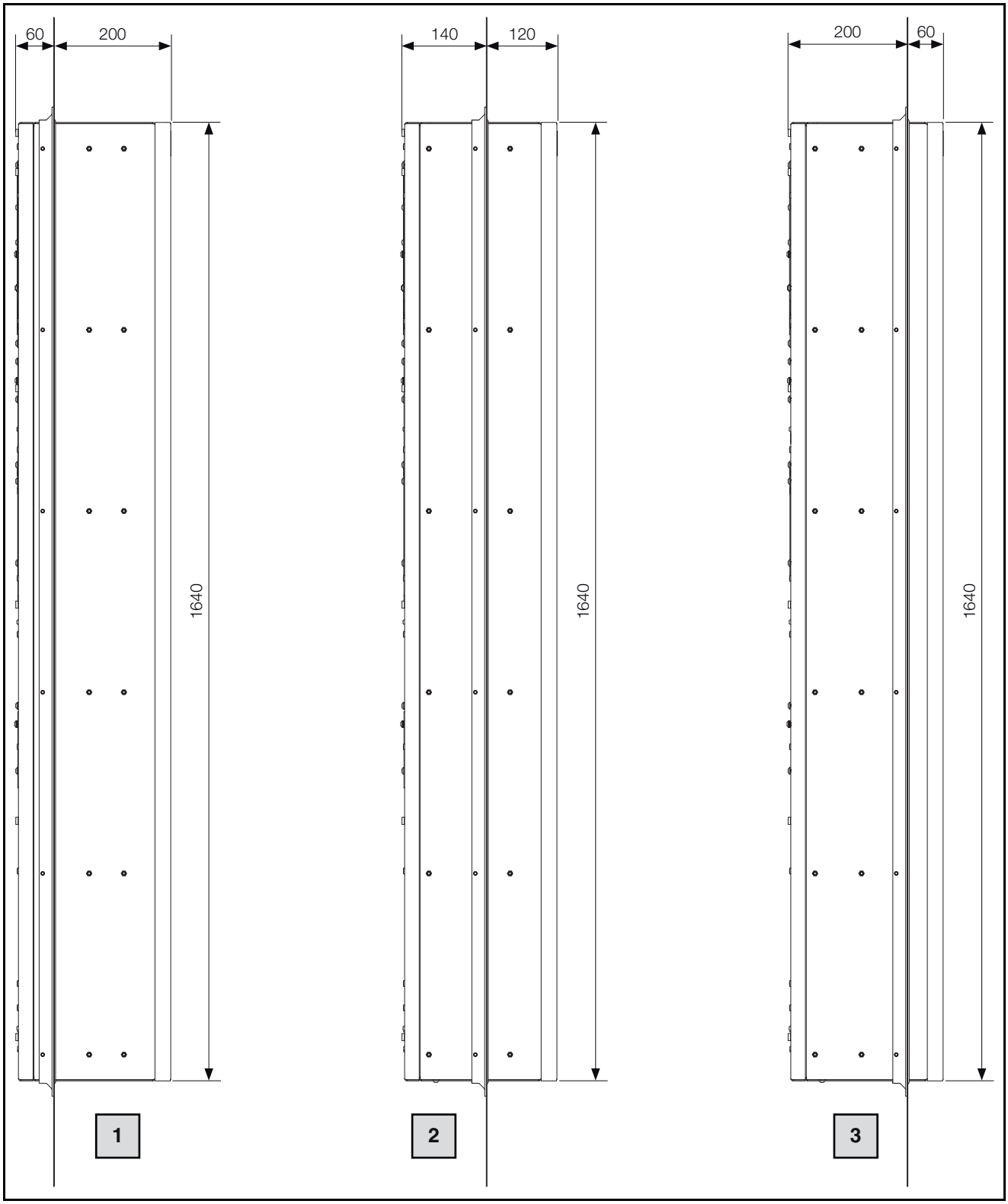


Fig. 54: Dimensions

Key

1 External mounting
2 Partial internal mounting
3 Full internal mounting

12.3.3 External mounting, partial internal mounting and full internal mounting (SK 3188340 and SK 3189340)

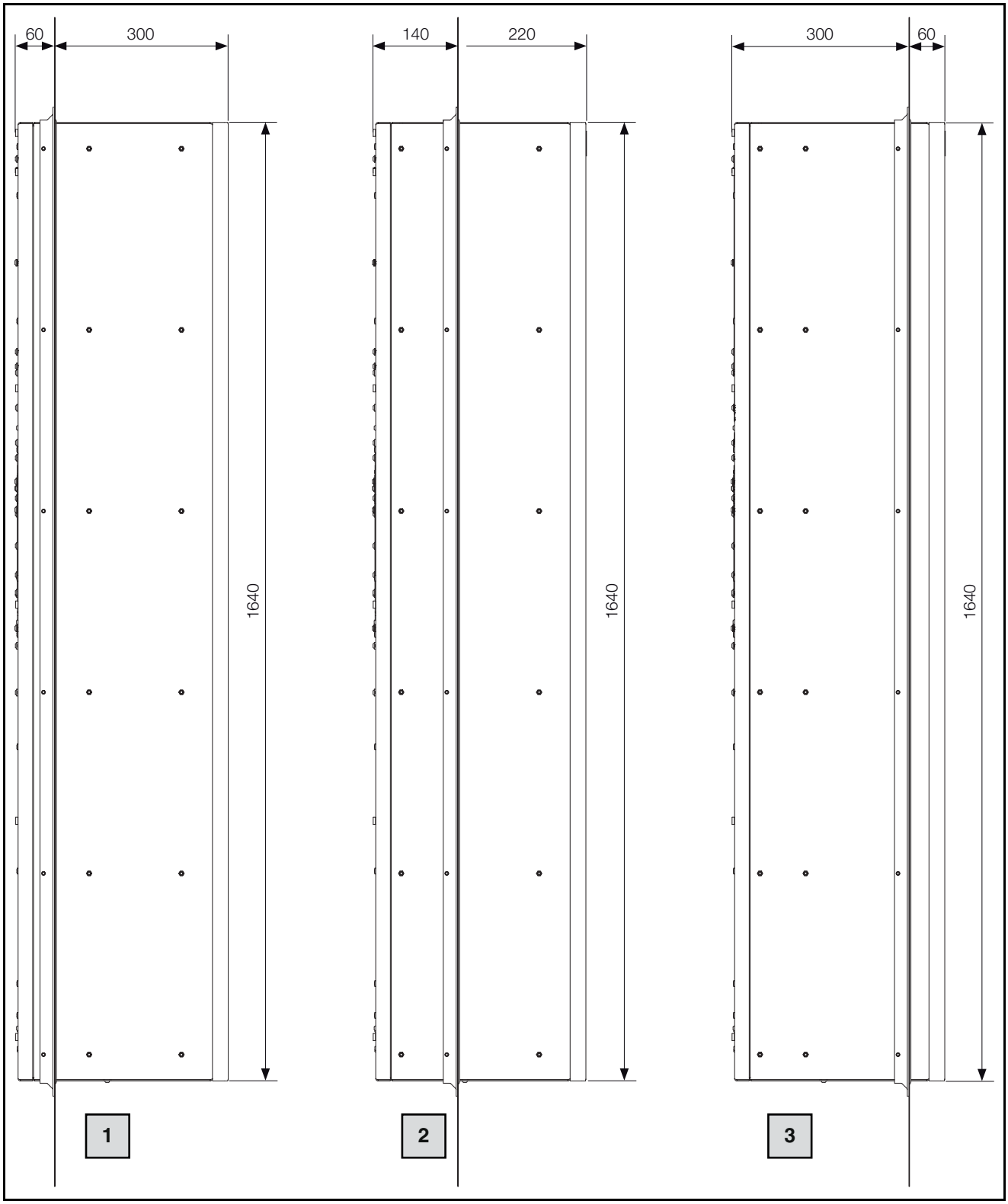


Fig. 55: Dimensions

Key

1 External mounting
2 Partial internal mounting
3 Full internal mounting

EN

13 Accessories

As well as the accessories listed below, details of our full range of accessories can be found on the Rittal website.

Item	Model No.
Door limit switch	4127010
Condensate water hose	3301612
External temperature sensor	3124400
IoT Interface	3124300
"Rittal Scan & Service" app	Download on the App Store GET IT ON Google Play

Tab. 25: List of accessories

14 Customer service addresses

Headquarters Germany
RITTAL GmbH & Co. KG
Auf dem Stuetzelberg
35745 Herborn
Germany
Phone: +49(0)2772 505-1855
Fax: +49(0)2772 505-1850
E-mail: service@rittal.de

Service HUB USA
RITTAL LLC
801 State Route 55 Dock 25
Urbana, OH 43078
Phone: +1 800 477 4000, option 3
E-mail: rittal@rittal.us

Service HUB China
RITTAL Electro-Mechanical Technology Co. Ltd.
No. 1658, Minyi Road
Songjiang District
Shanghai, 201612
Phone: +86 21 5115 7799-213
Fax: +86 21 5115 7788
E-mail: service@rittal.cn

Service HUB India
RITTAL India Pvt. Ltd.
Nos. 23 & 24, KIADB
Industrial Area Veerapura
Doddaballapur-561 203
Bengaluru District
Phone: +91 (80) 22890792
Fax: +91 (80) 7623 343
E-mail: service@rittal-india.com

■ For technical queries, please contact:
Phone: +49(0)2772 505-9052
E-mail: info@rittal.com
Homepage: www.rittal.com

■ For complaints or service requests, please contact your local Rittal organisation.

Argentina
Phone: +54 (11) 4760 6660
E-mail: service@rittal.com.ar

Australia
Phone: +61 (2) 95 25 27 66
E-mail: service@rittal.com.au

Austria
Phone: +43 (0) 599 40 -0
E-mail: service@rittal.at

Belarus
■ Please contact Lithuania.
E-mail: service@rittal.lt

Belgium
Phone: +32 (9) 353 91 45
E-mail: service@rittal.be

Bosnia-Herzegovina
■ Please contact the headquarters in Germany.
Phone: +49 (0) 2772 505 1855
E-mail: service@rittal.de

Brazil
Phone: +55 (11) 3622 2377
E-mail: service@rittal.com.br

Bulgaria
Phone: +359 (2) 8890055
E-mail: service@rittal.bg

Canada
Phone: +1 (905) 877 COOL 292
E-mail: service@rittal.ca

Chile
Phone: +56 2 9477 400
E-mail: info@rittal.cl

China
Phone: +86 800 820 0866
E-mail: service@rittal.cn

Columbia
Phone: +571 621 8200
E-mail: service@rittal.com.co

Costa Rica
■ Please contact Mexico.
E-mail: servicemx@rittal.com.mx

Croatia
Phone: +385 1 3455 256
E-mail: service@rittal.hr

Cyprus
■ Please contact the headquarters in Germany.
E-mail: service@rittal.de

14 Customer service addresses

EN

Czech Republic
Phone: +420 234 099 063
E-mail: servis@rittal.cz

Denmark
Phone: +45 70 25 59 20
E-mail: info@rittal.dk

Dubai
Phone: +971 3416855 206
E-mail: service@rittal-middle-east.com

Ecuador
■ Please contact Peru.
E-mail: info@rittal.pe

El Salvador
■ Please contact Mexico.
E-mail: servicemx@rittal.com.mx

Estonia
■ Please contact Lithuania.
E-mail: service@rittal.lt

Finland
Phone: +358 9 413 444 50
E-mail: service@rittal.fi

France
Phone: +33 472231275
E-mail: service@rittal.fr

Germany
Phone: +49(0)2772 505-1855
E-mail: service@rittal.de

Greece
Phone: +30 210 271 79756
E-mail: service@rittal.gr

Guatemala
■ Please contact Mexico.
E-mail: servicemx@rittal.com.mx

Honduras
■ Please contact Mexico.
E-mail: servicemx@rittal.com.mx

Hong Kong
■ Please contact China.
E-mail: marvis.lun@rittal.com

Hungary
Phone: +36 1 399 800
E-mail: rittal@rittal.hu

Iceland
■ Please contact the headquarters in Germany.
E-mail: srj@sminor.is

India
Phone: +91 (80) 33720783
E-mail: service@rittal-india.com

Indonesia
■ Please contact Singapore.
E-mail: service@rittal.com.sg

Iran
■ Please contact Dubai.
E-mail: service@rittal-middle-east.com

Ireland
Phone: +353 (59) 9 18 21 00
E-mail: sales@rittal.ie

Israel
Phone: +972 (4) 6275505
E-mail: service@rittal.co.il

Italy
Phone: +39 (02) 95 930 308
E-mail: service@rittal.it

Japan
Phone: 0120-998-631 (Japan only)
E-mail: service@rittal.co.jp

Jordan
■ Please contact Dubai.
E-mail: service@rittal-middle-east.com

Kazakhstan
■ Please contact Lithuania.
E-mail: service@rittal.lt

Latvia
■ Please contact Lithuania.
E-mail: service@rittal.lt

Lebanon
■ Please contact Dubai.
E-mail: service@rittal-middle-east.com

Lithuania
Phone: +37 (0) 52105738
E-mail: service@rittal.lt

Luxembourg
■ Please contact the headquarters in Germany.
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Vietnam
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15 Compact service information

Step	See	OK/comment
Assembly and connection		
– Installation site requirements taken into account	Section 5.2	
Assembly instructions		
– Observe the relevant assembly instructions	Section 5.3.1	
– Condensate water discharge connected	Section 5.3.6	
– Electrical installation (overvoltage protection, door limit switch)	Section 5.4	
Commissioning		
Check the assembly – All attachments checked		
Commissioning – At least 30 minutes after assembly	Section 6	
– Download the "Rittal Scan & Service" app to support commissioning and subsequent operation		
– Commissioning check carried out via "Rittal Scan & Service" app		
Operation		
– Check the device status during operation using the "Rittal Scan & Service" app		
– Read maintenance instructions and warnings or fault messages using the "Rittal Scan & Service" app		

Tab. 26: Quick installation check

For all other service enquiries:

Original spare parts	Maintenance, warranty extensions (up to 5 years), service contracts
– Enquire directly via "Rittal Scan & Service" app – http://www.rittal.com	– Enquire directly via "Rittal Scan & Service" app – http://www.rittal.com – Enquire at the relevant national company – http://www.rittal.com/de_de/service_contact/index.asp
Other service contacts worldwide: Rittal International Service HUBs (see section 14 "Customer service addresses")	

Tab. 27: Service contacts worldwide

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E-mail: info@rittal.de · www.rittal.com

Operator's manual

TruConvert AC 3025
TruConvert System Control

TruConvert Modular

TRUMPF

Operator's manual

TruConvert AC 3025
TruConvert System Control

TruConvert Modular

Original operator's manual

Edition **2023-07-10**

Order Information

Please specify when ordering this document:

Operator's manual
TruConvert AC 3025 TruConvert System Control
Edition 2023-07-10
Document number A67-0141-00.BKen-001-10

Address for orders

TRUMPF Hüttinger GmbH + Co. KG
Technische Redaktion
Bötzinger Straße 80
D-79111 Freiburg
Fon: +49 761 8971 - 0
Fax: +49 761 8971 - 1150
Internet: http://www.trumpf-huettinger.com
E-Mail: info.elektronik@de.trumpf.com

Good to know

Need help?

Provide the **serial number** when you contact the Service department.

How to reach our Service department:

Telephone **+49 761 8971-2170**

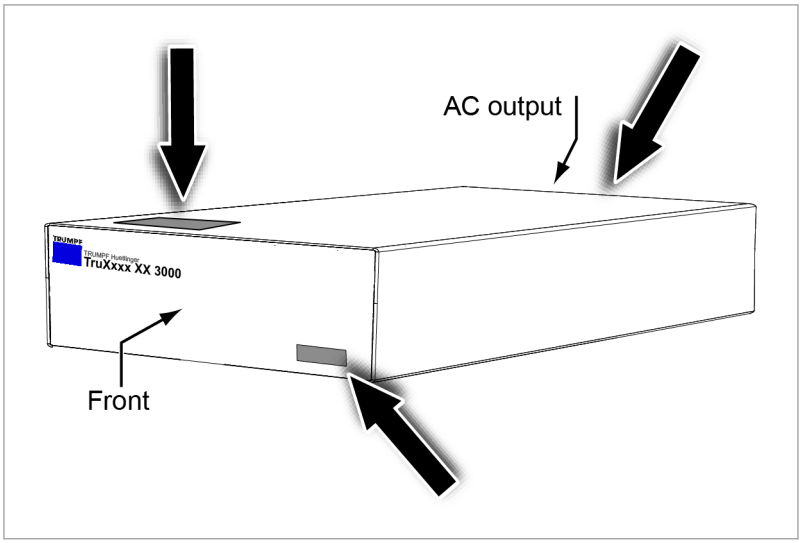
Fax **+49 761 8971-1178**

E-Mail **service.electronic@trumpf.com**

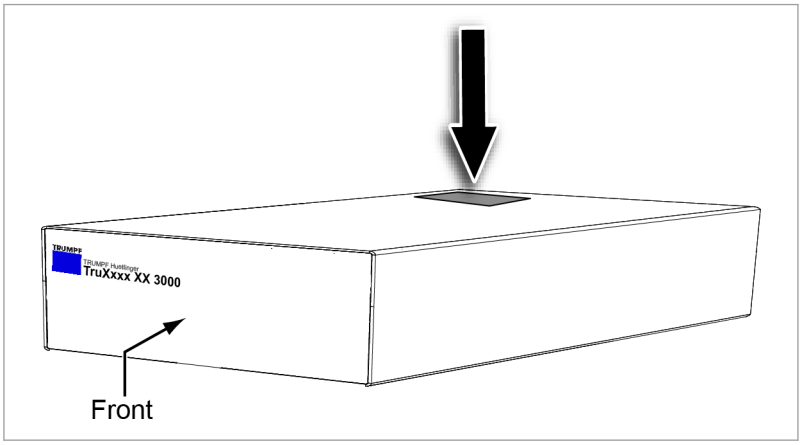
Where can the serial number be found?

- On the name plate of the device (top).
- On the front and rear side of the device.
- Web GUI, menu path: >*About*, "Identification".

Position of the serial number



Position of the serial number on the TruConvert AC Fig. 1



Position of the serial number on the TruConvert System Control Fig. 2

Table of contents

1. Safety

1.1 Storing the operating instructions

⚠ CAUTION

IMPORTANT SAFETY INSTRUCTIONS

➢ SAVE THESE INSTRUCTIONS.

These operating instructions contain safety notices that must be observed during installation and maintenance. Therefore, keep the operating instructions in a safe place for the entire life cycle of the device.

Include the operating instructions if you sell the device or set it up at another location.

1.2 Warning signs

Certain activities can cause danger during operation. Corresponding warning signs concerning the dangers should precede instructions concerning the activities. Danger signs are located on the device.

A warning sign contains signal words which are explained in the following table:

Signal word	Description
DANGER (DANGER)	Indicates a major danger. If it is not avoided, serious injuries or death will result.
WARNING (WARNING)	Indicates a dangerous situation. If it is not avoided, it may lead to serious injuries.
CAUTION (CAUTION)	Indicates a potentially dangerous situation. If it is not avoided, injuries may occur.
NOTICE (NOTICE)	If such a situation is ignored, material damage may result.

Description of the signal words Tab. 1

1.3 Using the device

Typical fields of application

The device is a bidirectional inverter. It is used for charging a DC link from a three-phase grid and for feeding the grid from the DC link's energy.

- The power and the energy flow direction are adjustable.
- The device draws sinusoidal current from the mains or delivers sinusoidal current to the mains. The power factor cosφ is adjustable.
- The DC link voltage is balanced to earth.

Liability exclusion

Any use not listed under "Typical fields of application" contravenes the intended purpose. TRUMPF is not liable for any ensuing damages, in particular for property damage, personal injury and loss of production. The operator bears all risks. The warranty is rendered null and void.

Impermissible uses

Impermissible uses include, for example:

- Use of incorrect components.
- Operation on mains voltage outside the specification.
- Faulty installation (e.g., cables reversed).
- Use in unauthorized installation position.
- Misuse by untrained personnel.
- Use in unsuitable environmental conditions:
  - Condensation, icing.
  - Conductive soiling.
  - Corrosive conditions (e.g. battery fumes, salt spray).
  - Voltages outside of overvoltage category III (max. 4 kV impulse withstand voltage).
  - Operation at more than 2000 m above sea level.
  - Outdoors.
  - Failure to observe pollution degree 2 environmental condition.
  - In an explosive environment.

1.4 Authorized personnel

Authorized personnel

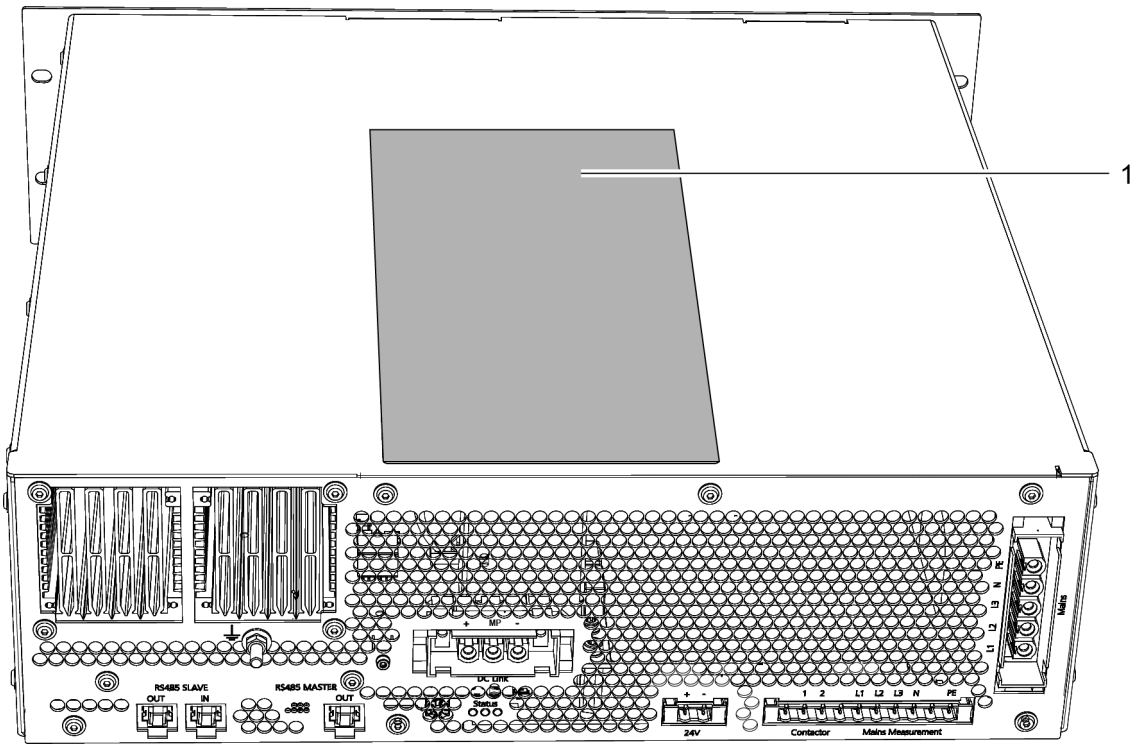
Authorized persons must, given their authorization, training and instruction, be capable of understanding their tasks and recognizing potential dangers. Therefore, authorized persons must be trained and be familiar with the standards and regulations relevant to their tasks.

It is the duty and responsibility of the operator to maintain the qualifications of the authorized personnel through regular training.

The following activities may only be performed by authorized persons:

- Positioning
- Connect
- Dismantling
- Operation

1.5 Warning signs on the AC-DC module



1 Sign with multiple warning signs,
e.g. dangerous voltage, residual voltage with specification of the discharging time, electromagnetic fields, weight

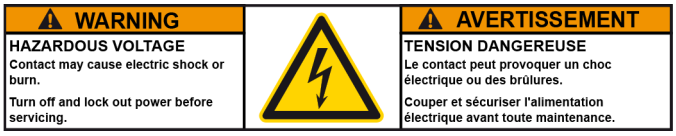
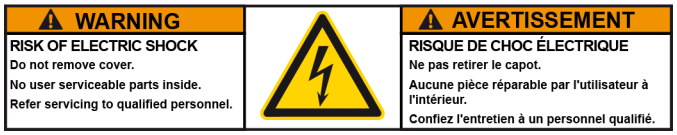
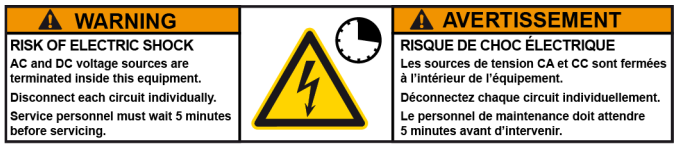
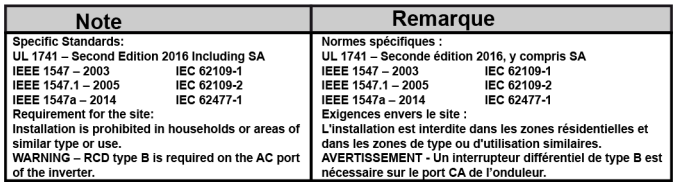
Warning signs on the AC-DC module Fig. 3

1.6 Meaning of the warning signs

Note

All warning signs must be present and legible.

If one or more of these warning signs is missing or not legible, contact TRUMPF to request new warning signs.

Warning sign	Meaning
	Sign warns of hazardous voltage.
	Sign warns of electric shock.
	Sign warns of hazardous voltage. Sign warns of hazardous residual voltage.
	This sign warns of dangers that arise from the weight of the device.
	Sign warns of contact current.
	Sign warns against connecting the photovoltaic modules without string optimizers.
	This sign indicates that the operator's manual must be read.
	This sign indicates specific properties of the device.

Meaning of the warning signs Tab. 2

1.7 Dangers from high voltages

⚠ WARNING

Life threatening voltage!

The voltages present at the device are life-threatening.

➢ Have work on the device performed by trained personnel only.

The device produces voltages that can endanger human life and health. These voltages occur both in the device as well as at the outputs of the device.

The device's connection cables carry voltages that are life-threatening.

A person who comes into contact with live device parts may be killed or severely injured.

⚠ WARNING

Simultaneous control via web GUI and Modbus is possible!

Power transmission stopped using the user interface can be started again and reversed via Modbus.

- Before carrying out work on the device, deenergize all supply lines and secure against reenergizing.
- Make sure that the device is controlled via one channel only (user interface or Modbus).

Protective measures taken by the manufacturer

The AC-DC module is installed in an enclosed metal casing.

1.8 Device damages from improper handling

NOTICE

Damage to impact-sensitive components

If the device is set down heavily or tips over, impact-sensitive components inside the device will be damaged (e.g. fans, circuit boards).

- Do **not** set down the device heavily or drop it.
- Stand the device on its underside or on its side.
- If necessary, secure the device against tipping over.

1.9 Ensuring safe operation of the device

1. Only operate the device within the conditions described in chapter "Technical specifications".
2. The device must not be opened.
3. Only operating personnel **without** pacemaker or implants may work in the operational site.

4. For the electrical connection, use only cables that are in perfect condition and have the correct dimensions.
5. Periodically retest acc. to DGUV regulation 3 (DGUV = Deutsche Gesetzliche Unfallversicherung – German Statutory Accident Insurance Association).

2. Description

2.1 Fields of application

The fields of application are described in chapter **Safety**, (see "Typical fields of application", pg. 6).

Control

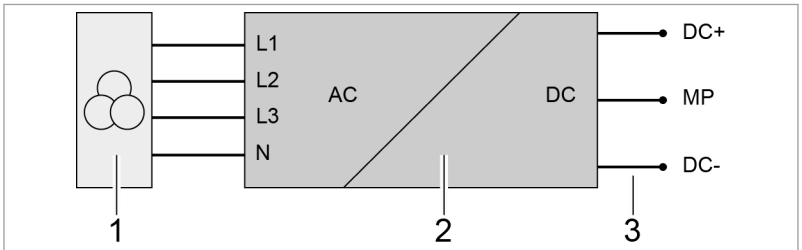
The **TruConvert System Control** external control must be used to monitor and control the AC-DC module.

2.2 Function description

Function modes

- The AC-DC module draws energy from a three-phase grid and feeds it into a DC link.
- The AC-DC module draws energy from a DC link and feeds it into a three-phase grid.

Description of principle



1 Three-phase grid
2 TruConvert AC 3025
3 DC link

Description of principle Fig. 4

Operation

The AC-DC module can be operated:

- with a PC with a web browser
- via Modbus

In both cases, the **TruConvert System Control** control device must be connected upstream (see "Fig. 5", pg. 12).

2.3 Configurations

Permissible configurations

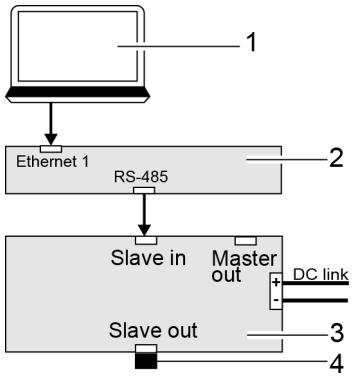
- The TruConvert AC 3025 must always be operated together with a TruConvert System Control.
- TruConvert AC 3025 can be operated on its own on a DC link ("DC link").

- 16 TruConvert AC 3025 units can be operated simultaneously on the DC link.
- One TruConvert AC 3025 can be operated together with up to 4 TruConvert DC 1008.

Impermissible configurations

- The connection of other DC voltage converters is only permissible in consultation with TRUMPF.
- The parallel connection of TruConvert AC 3025 with other bidirectional inverters on the DC link side is permissible only in consultation with TRUMPF.

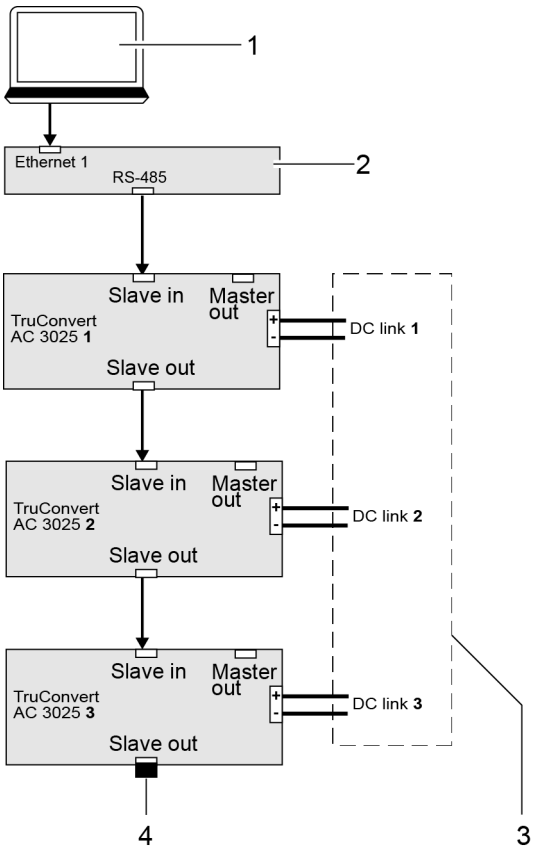
One TruConvert System Control controls one TruConvert AC 3025



1	PC	3	TruConvert AC 3025
2	TruConvert System Control	4	Terminating resistor

1 x TruConvert System Control, 1 x TruConvert AC 3025 Fig. 5

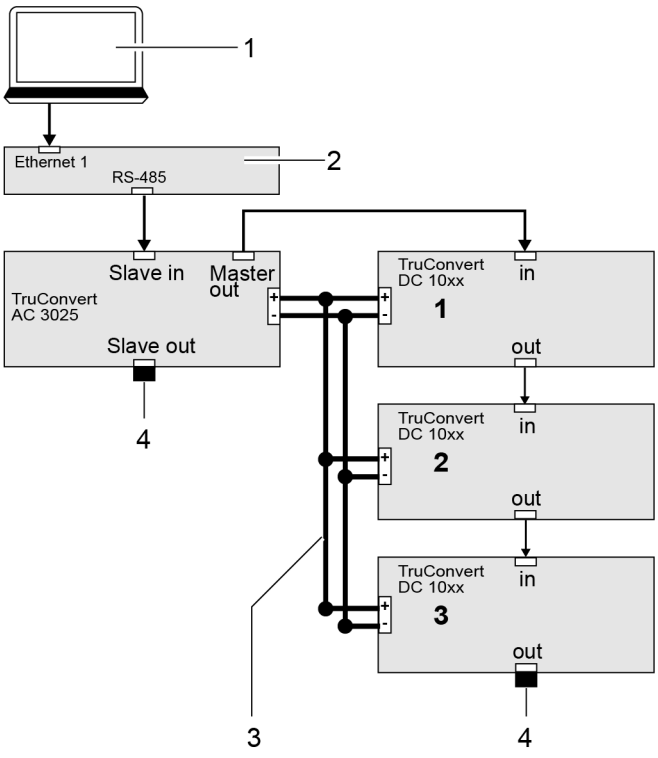
One TruConvert System Control controls several TruConvert AC 3025



1	PC with web browser or Modbus master	3	DC link
2	TruConvert System Control	4	Terminating resistor

1 x TruConvert System Control, n x TruConvert AC 3025 (n ≤ 16) Fig. 6

One TruConvert System Control controls one TruConvert AC 3025 and several TruConvert DC 10xx



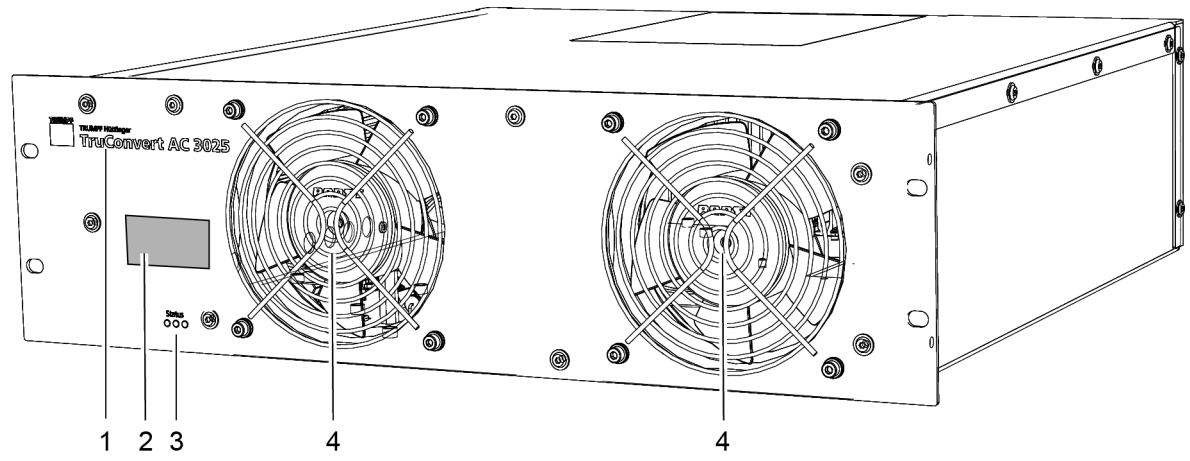
1	PC	3	DC link
2	TruConvert System Control	4	Terminating resistor

1 TruConvert System Control controls 1 TruConvert AC 3025 and m x TruConvert DC 10xx (m ≤ 4) Fig. 7

2.4 Construction

The AC-DC module is housed in an enclosed 19-inch metal housing.

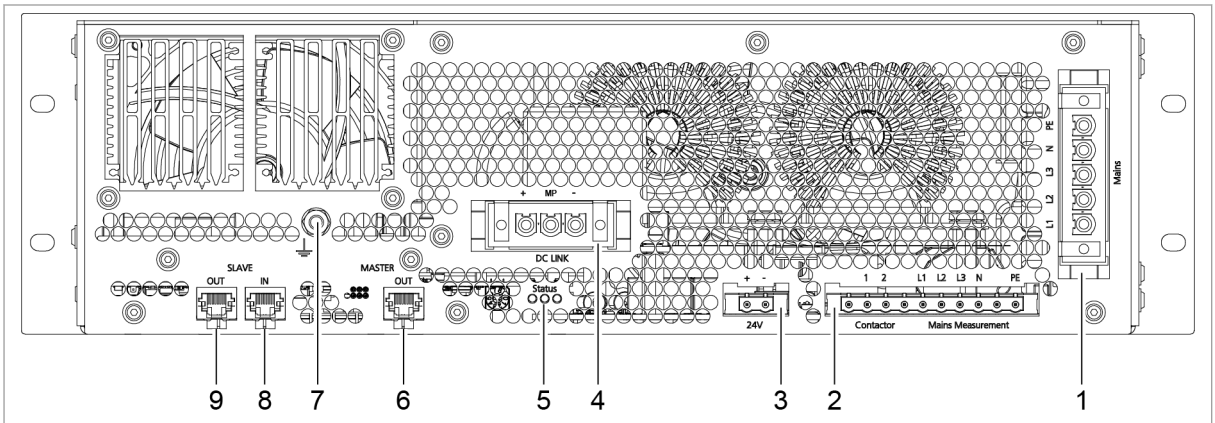
Overview



1	Device name	3	Status LEDs	3	Fan (air is sucked)
2	Name plate				

Overall view of the TruConvert AC 3025 Fig. 8

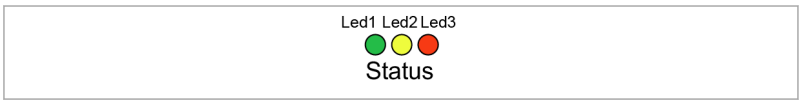
Rear side



1	Mains input ("Mains")	4	DC link voltage ("DC Link")	7	Threaded bolts for potential equalization
2	Contactor release contact and mains voltage measurement ("Contactor / Mains Measurement")	5	LED status display	8	Data cable "SLAVE IN"
3	24 V supply voltage	6	Data cable "MASTER OUT"	9	Data cable "SLAVE OUT"

TruConvert AC 3025 rear side Fig. 9

Display elements



Status LEDs on TruConvert AC 3025 and TruConvert System Control Fig. 10

	Device condition				
LED	**Bootloader**	**Initialize**	**Errors**	**Idling**	**Operation**
1 (green)	on	Flashing	off	Flashing	Flashing
2 (yellow)	Flashing	Flashing	off	off	LED indicates the energy direction. ▪ Illuminates if the energy flows from mains to the DC link. ▪ Flashes if the energy flows from the DC link to mains.
3 (red)	on	Flashing	Flashing	off	off

Status LEDs Tab. 3

3. Technical specifications

3.1 Data TruConvert AC 3025

Entire device

Description	Value
Max. efficiency	98 %
Voltage supply	24 VDC ± 10 % / 8 A **Note** Observe for external fuses: switch-on current is briefly 3 times the nominal current.
Decisive voltage class (DVC)	C
Reaction time for nominal power reversal	Mains current regulation: < 75 ms Voltage regulation: < 200 ms
Protection class according to 62109-1	I
Overvoltage category Grid input	III (max. impulse withstand voltage: 4 kV)
Overvoltage category DC link (connection panels for PV system)	II

Entire device Tab. 4

Grid connection data

Description	Value
Mains voltage range (3 phases)	380 V -10 % … 480 V +10 %
Decisive voltage class (DVC)	C
Phase sequence	L1, L2, L3 (required rotating field: clockwise)
Maximum permitted mains voltage	528 V
Mains frequency range	45 Hz to 65 Hz
Nominal mains frequency	50 Hz / 60 Hz
Charging/discharging nominal apparent power	25 kVA
Asymmetrical load	Up to 8.3 kVA/phase **Note** The nominal current on the neutral conductor must not be exceeded in the case of asymmetry!
Charging/discharging power factor (cosφ)	-1 to 1 Inductive and capacitive phase shift

Grid connection data

Description	Value
Nominal current for listed voltage	380 V: 38 A 400 V: 37 A 415 V: 35 A 440 V: 33 A 460 V: 32 A 480 V: 31 A
Overload capacity 125% (10 min)	32 kVA[1]
Overload capacity 150% (1 min)	37.5 kVA[1]
Excess current capacity 300% (0.5 s island operation)	▪ Mains current regulation: rms value 80 A[1] ▪ Voltage regulation: Limited to absolute value: 125 A (0.5 s)[1]
Distortion due to harmonics in nominal power	< 5 %
Maximum grid impedance for flicker (according to AS/NZS 4777.2)	Z_{max} = 0.04 Ω + j0.04 Ω
Max. switch-on current	< nominal current
Recommended external fuses / power circuit breakers	380 V: 3 x 50 A 400 V: 3 x 50 A 415 V: 3 x 50 A 440 V: 3 x 40 A 460 V: 3 x 40 A 480 V: 3 x 40 A ▪ For region EN / IEC – Fuse: EN60127-1/ EN60269-1: gG – Power circuit breaker: IEC/EN 60947-2 – Rated switching capacity [Icu]: 15 kA IEC/EN 60947-2 – Rated current [In]: 50 A – Trigger characteristic: C – Smallest required prospective short-circuit current [Icp, mr]: 230 A (6 x In) ▪ For region UL / CSA – Fuse: UL248: Class J time-delay – Power circuit breaker: UL 489 / CSA-C22.2

1 At ambient temperatures of: charging: -5°C to 35°C, discharging: -5°C to 40°C.

Grid connection data

Description	Value
Mains type	TN-S, TN-C-S, TN-C, 3-phase + N N conductor and PE conductor are not connected in the TruConvert AC 3025. N conductor and PE conductor must be connected outside of the TruConvert AC 3025.
Ground leakage current	< 3 mA (If residual current devices are used: use type B.)
AC short-circuit values	▪ Conditional short-circuit current: Current regulation [I_{CC}]: 80 A rms Voltage regulation: [I_{CC}]: 125 A rms ▪ Rated short-time withstand current [I_{cw}]: 125 A/500 ms ▪ Surge current stability [I_{pk}]: 730 A/ <1 ms ▪ Maximum output residual current [I_{SC}] 24.05 A rms for 3 periods
Active stand-alone network detection	A slight, cyclical grid disturbance is imprinted on the connected AC grid and the corresponding grid response is monitored.

Grid connection data Tab. 5

DC link

Description	Value
Nominal power charging/discharging (at 40°C / 104°F)	25 kW
Position to ground potential	The DC link is balanced to earth.
DC link nominal current at:	750 V: 36 A 800 V: 33 A 850 V: 31 A 900 V: 30 A 950 V: 28 A
Maximum output voltage	950 VDC
Decisive voltage class (DVC)	C
Maximum voltage between DC+ and PE or DC- and PE	650 VDC

DC link

Description	Value	
Minimum voltages of the DC-link halves at specified mains voltage[2]	Mains voltage	Minimum voltages of DC-link halves[3]
	380 V (+10 %)	311 V (345 V)
	400 V (+10 %)	327 V (360 V)
	415 V (+10 %)	339 V (375 V)
	440 V (+10 %)	360 V (400 V)
	460 V (+10 %)	376 V (415 V)
	480 V (+10 %)	392 V (435 V)
DC short-circuit values	▪ Sustained short-circuit current [I_{cc}]: current flow is sustained if: $U_{DC\ link} \geq (30\ V + 2 \times \sqrt{2} \times U_{AC,\ rms})$ ▪ Surge current stability [I_{pk}]: 4600 A duration < 0.1 ms	
Allowed battery models	On request	
Allowed battery voltage range (input and output variable)	750 V – 950 V	

2 To operate on mains, the voltages of the DC-link halves (DC+ to MP or DC- to MP) must each be greater than the corresponding mains amplitudes.

3 Calculation of the minimum voltage of the DC link halves: √2 × mains voltage ÷ √3

DC link

Description	Value
Recommended external fuses	The DC fuses must be provided on-site by the customer. For an installation with max. 4 TruConvert DC 1008/1010, it is – after consulting with TRUMPF – possible to forego the use of DC fuses. The parameters required for dimensioning the fuses depend on the installation situation in the customer system. The following system parameters form the basis for dimensioning: ▪ Internal resistances of the sources present in the DC link ▪ Capacitances present in the DC link ▪ Inductivities present in the DC link **Note** The fuses must be dimensioned such that country-specific requirements are observed. Aging and peak current effects must be taken into consideration! In this case, contact your fuse manufacturer. The following dimensioning of the nominal fuse current yields: $I_{Fuse} \geq I_{Rated}$ x 1.56 = 36 A x 1.56 = 56.16 A The permissible operating voltage of the fuse must be higher than the DC link voltage. Fuse ratings: $U_{Operation}$ = 1000 VDC I_{Rated} = 63 ADC Suitable model, e.g.: EATON Bussmann PV-63ANH1, size NH1 with suitable holders.

DC link Tab. 6

PV input variables

Description	Value
$U_{MAX\ PV}$ (absolute maximum value)	950 V
PV input voltage range	750 V – 950 V
PV input operating current (maximum continuous value) (determined by the TruConvert AC 3025)	36 A
I_{SC} PV (absolute maximum value) (determined by the TruConvert AC 3025)	50 A
Maximum regenerative current of the inverter in the PV system	0 A

PV input variables

Description	Value
Recommended PV string optimizer	Ampt, LLC
PV module type	Class A acc. to IEC 61730

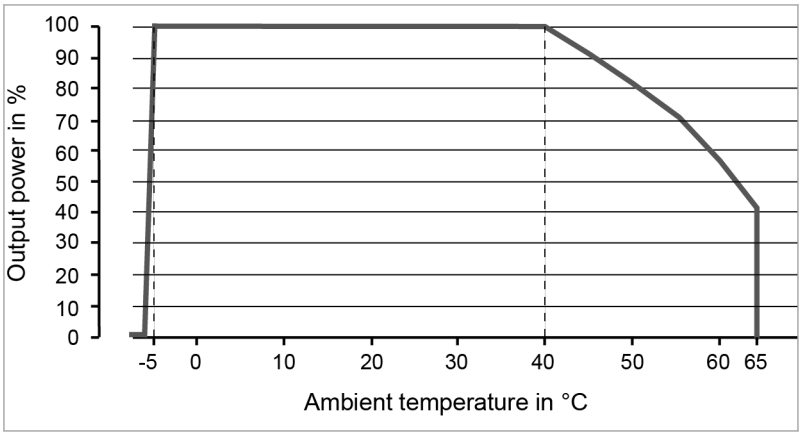
DC link Tab. 7

Note

If the device is used in a PV system, other requirements must be met (see "Connection acc. to IEC 62109-2", pg. 45).

Derating operation

At ambient temperatures > 40 °C, the output apparent power is reduced.



Derating Fig. 11

Interfaces

Description	Connection
DC link	▪ DC Link – PCB plug connector, 3-pin
24 V supply voltage (DC)	▪ 24V – PCB plug connector, 2-pin
Mains power connection	▪ L1, L2, L3, N, PE – PCB plug connector, 5-pin

Interfaces

Description	Connection
Measurement of mains voltage and contact for contactor release	▪ Contactor Mains Measurement – PCB plug connector, 10-pin Recommended external fuses ▪ Circuit breaker, 4-pin ▪ Current [I]: 1 A ▪ For region EN / IEC acc. to IEC/ EN60947-2: – Voltage [V]: 400 V – Rated switching capacity: 10 kA – Shutdown characteristics: Type B ▪ For region UL / CSA acc. to UL489: – Voltage [V]: 480Y/277 V – Rated switching capacity: 10 kA – Shutdown characteristics: Type B
Data output master	▪ MASTER – RJ-45
Data output slave	▪ SLAVE OUT – RJ-45
Data input slave	▪ SLAVE IN – RJ-45

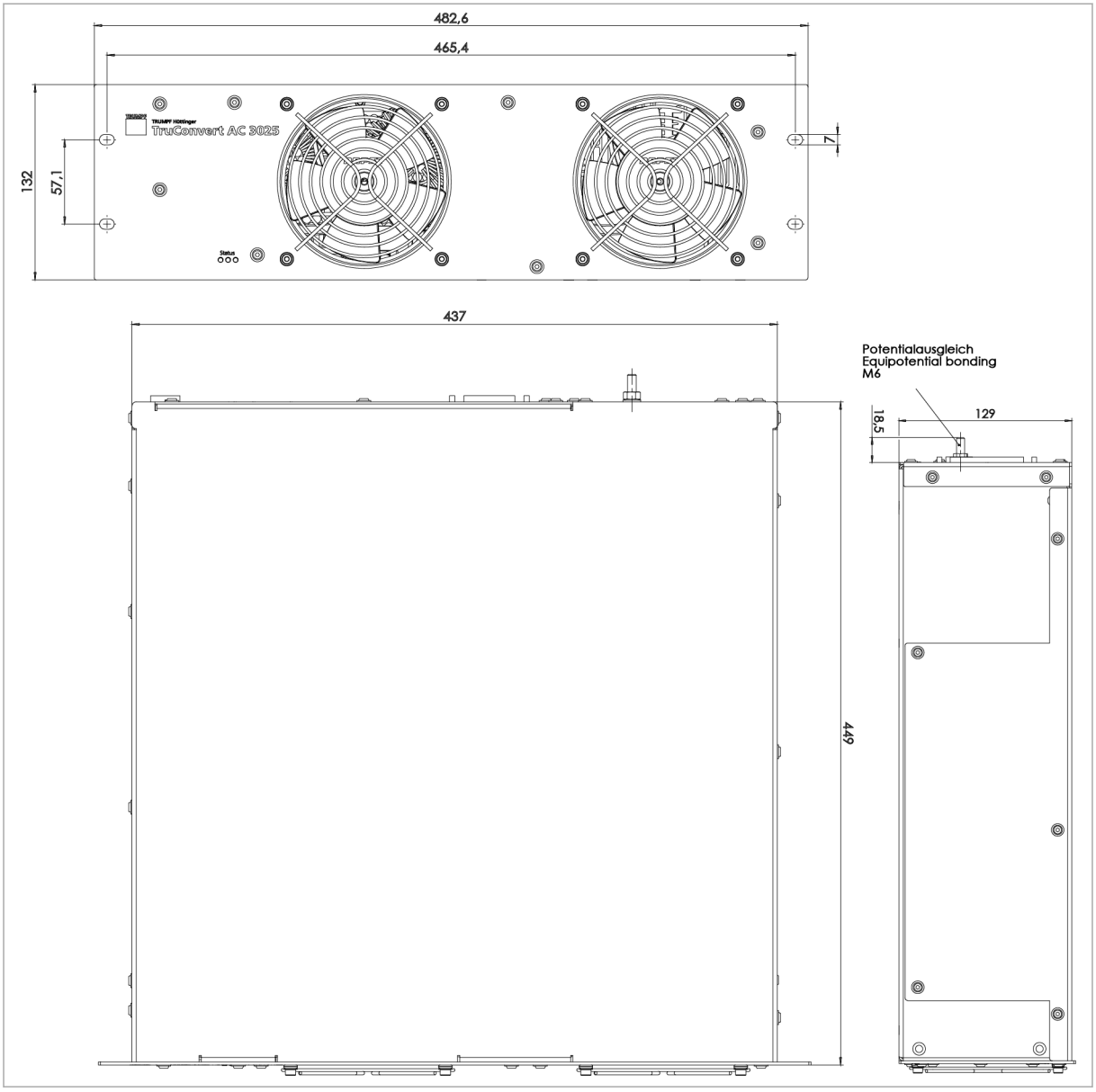
Interfaces Tab. 8

Housing

Description	Value
Dimensions without connectors (W x H x D)	437 mm x 129 mm x 500 mm 17.20" x 5.08" x 19.69"
Dimensions of front panel W x H	482 mm x 132 mm 19" x 5.20"
Weight	27 kg
Housing material	Body: galvanized sheet steel Front: stainless steel
Protection class	IP 20

Housing data Tab. 9

Dimensional drawing



Dimensional drawing Fig. 12

Environmental conditions

Condition	Temperature	Humidity [4]	Air pressure	Contamination[5]
Rated operation[6]	-5 °C to +40 °C +23 °F to +104 °F	5 … 90 %	Up to approx. 78 kPa (≙ 2000 m high above sea level)	Pollution degree 2
Limited power operation	+40 °C to +65 °C +104 °F to +149 °F			
Storage	-20 °C to +80 °C -4 °F to +176 °F	5 … 90 %		
Transport	-20 °C to +80 °C -4 °F to +176 °F	< 90 %		

Environmental conditions Tab. 10

3.2 TruConvert System Control data

Interfaces

Description	Value
24 V supply voltage, DC	24 V DC ± 10 % / 250 mA PCB plug connector, 2-pin
Ethernet interface 1	▪ Connection for web-based user interface or Modbus TCP/UDP ▪ RJ-45
RS-485 interface	▪ Connection for TruConvert AC 3025 or TruConvert DC series 1000 ▪ RJ-45
Reset button	Resetting the IP address
Display	3 status LEDs

TruConvert System Control interfaces Tab. 11

Housing

Description	Value
Dimensions without connectors (W x H x D)	435 mm x 44.5 mm x 219 mm 17.13" x 1.75" x 8.62"
Dimensions of front panel W x H	482 mm x 44.5 mm 19" x 1.75"
Weight	1.6 kg

4 No condensation or icing

5 Micro-environment complies with IEC 62109-1

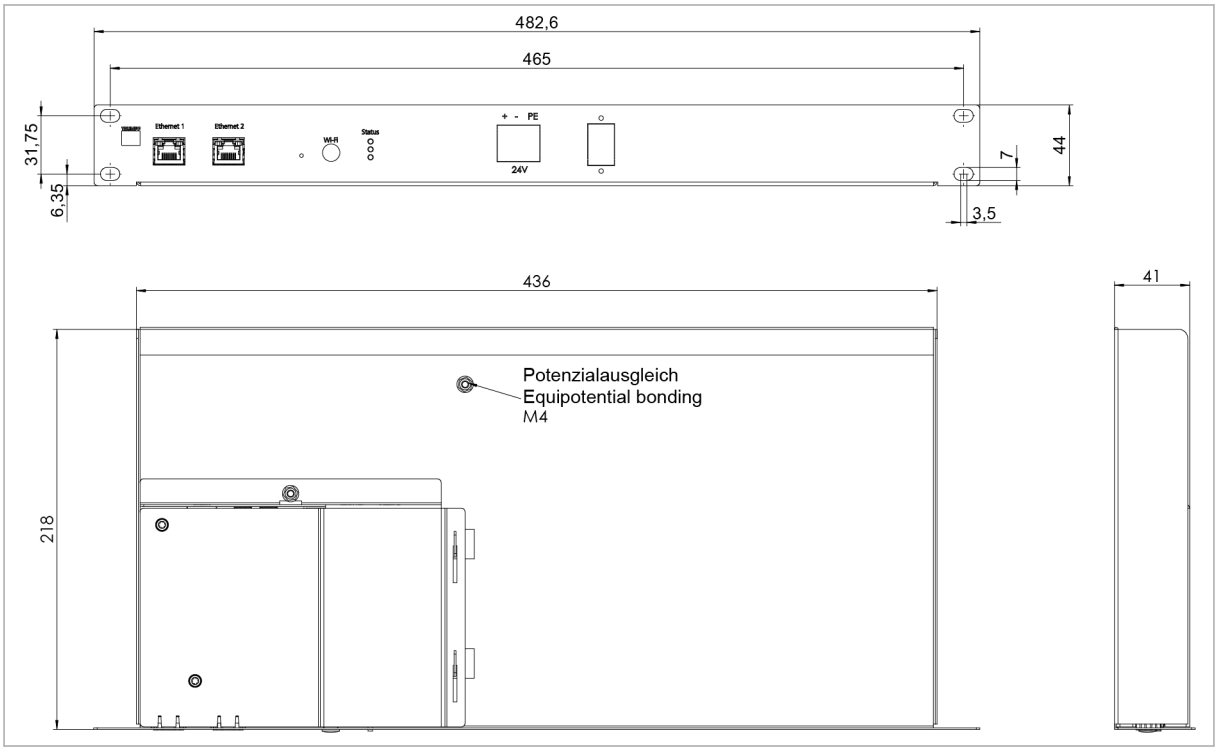
6 Applies to operation indoors with and without air conditioning.

Housing

Description	Value
Housing material	Body: galvanized sheet steel Front: stainless steel
Protection class	IP 20

Housing data Tab. 12

Dimensional drawing



Dimensional drawing Fig. 13

Environmental conditions

Condition	Temperature	Humidity [7]	Air pressure	Contamination Micro-environment complies with IEC 62109-1
Operation[8]	-5 °C to +65 °C 23 °F to +149 °C	5 … 90 %	Up to approx. 78 kPa (≙ 2000 m high above sea level)	Pollution degree 2
Storage	-20 °C to +80 °C -4 °F to +176 °F	5 … 90 %		
Transport	-20 °C to +80 °C -4 °F to +176 °F	< 90 %		

Environmental conditions Tab. 13

7 No condensation or icing

8 Applies to operation indoors with and without air conditioning.

4. Interfaces

4.1 Mains power connection

View

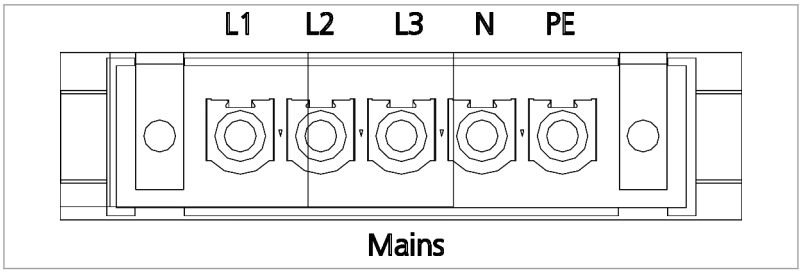


Fig. 14

Connection

- On AC 3025 module: Phoenix PCB plug connector
- Required counterpart: 5-pin connector, 76A, IPC 16/ 5-STF-10, 16
- Locking mechanism of male connector: Torque: **0.3 Nm**

Cable requirement

	For region EN / IEC	For region UL / CSA
With 50 A external fuse	5 x 10 mm^2	5 x AWG 8
With 40 A external fuse	5 x 6 mm^2	5 x AWG 10

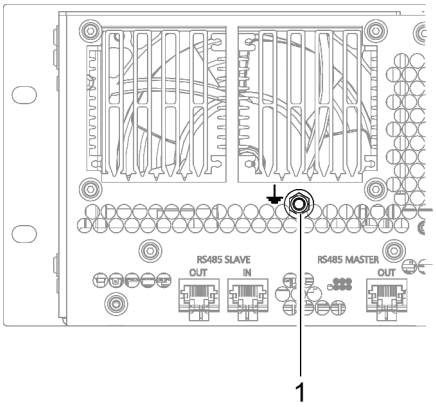
Cable requirement for grid connection Tab. 14

The information applies to:

- Ambient temperature 30 °C, 86 °F
- Cable operating temperature: 90 °C, 194 °F
- Installation type: Open air
- If the environmental conditions differ from those listed above, contact TRUMPF Service.

4.2 Potential equalization

View



1 Threaded bolts for potential equalization

Potential equalization Fig. 15

Connection

- M6 threaded bolt, torque: **5 Nm**

Cable requirement

- 1 x 4 mm^2 / 1 x AWG 10

4.3 DC link

View

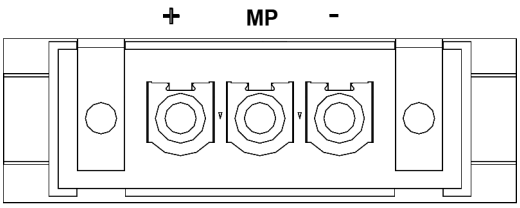
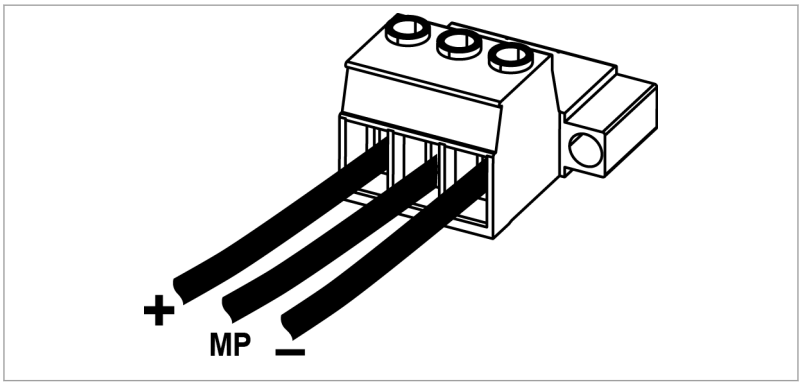


Fig. 16

Connection

- At the AC-DC module: Phoenix PCB plug connector
- Required counterpart: connector, 3pin, 76 A, IPC 16/ 3-STF-10.16
- Locking mechanism of male connector: Torque: **0.3 Nm**



Connector for DC link voltage Fig. 17

Cable requirement

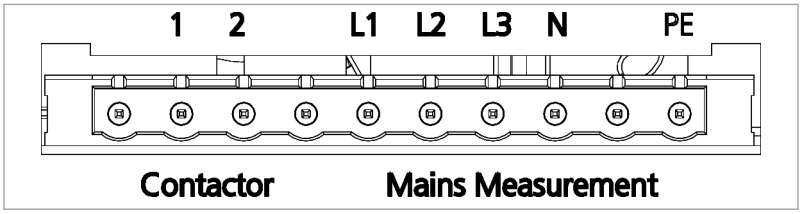
- For region EN / IEC: 3 x 6 mm²
- For region UL / CSA: 3 x AWG 10
- The information applies to:
  - Ambient temperature 30 °C, 86 °F
  - Cable operating temperature: 90 °C, 194 °F
  - Installation type: Open air
  - If the environmental conditions differ from those listed above, contact TRUMPF Service.

Note

To keep inductivity at a minimum cables should be twisted.

4.4 Contactor release contact and mains voltage measurement

View



Contactor release contact and mains voltage measurement ("Contactor / Mains Measurement") Fig. 18

Connection

- On AC 3025 module: Phoenix PCB plug connector
- Required counterpart: 10-pin connector, 16A, GMSTB 2.5 HCV/ 10-ST-7.62-LR

Cable requirement

- 10 x 1.5 mm^2 / 10 x AWG 16

4.5 24 V supply voltage (DC)

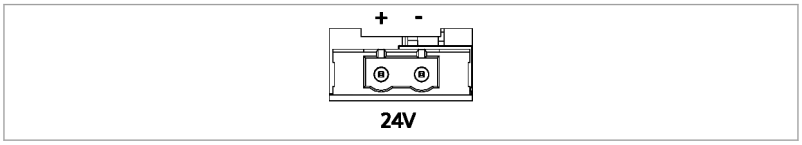
NOTICE

Destruction of the device through improper grounding of the 24 V supply voltage source.

The negative terminal of the supply voltage is not connected to PE in the AC-DC module. If the incorrect terminal (positive terminal) of the external 24 V supply voltage source is grounded, the device will be damaged or destroyed.

➢ If grounding of the external 24 V supply voltage source is performed by the customer: ground the **negative terminal**.

View



24 V supply voltage (DC) Fig. 19

Connection

- At the AC-DC module: Phoenix PCB plug connector
- Required counterpart: 2-pin connector, 16A, GMSTB 2.5 HCV/ 2-ST-7.62-LR

Cable requirement

- 2 x 1.5 mm^2 / 2 x AWG 16

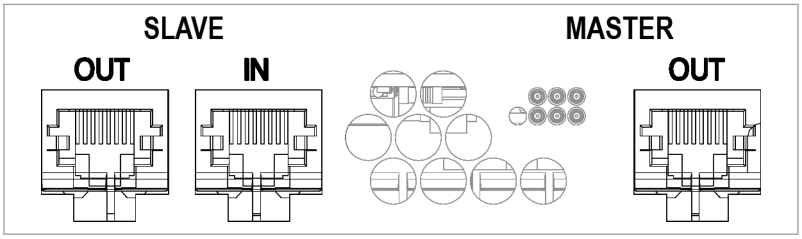
Use

The 24V supply voltage is necessary for supplying the following components of the AC-DC module:

- Control
- Fan
- Driver of power stages

4.6 Communication interfaces

View



Communication interfaces Fig. 20

Connection

- RJ-45

Cable requirement

- Twisted pair patch cable in accordance with standard TIA/EIA-568A/B
- CAT 5 or higher
- Max. length: 30 m

Use

The use of the communication interfaces is dependent on the configuration (see "Configurations", pg. 11).

Example

Connect system control (RS-485 connection) to the AC-DC module (RS-485 SLAVE IN connection).

Connect the AC-DC module (RS-485 SLAVE OUT connection) to the supplied terminating resistor.

A DC-DC module (RS-485 IN connection) is connected from the AC-DC module (RS-485 MASTER connection).

If further DC-DC modules are operated, the RS-485 OUT connection of the preceding DC-DC module is connected to the RS-485 IN connection of the following DC-DC module.

Notes

- The total length of the data cable from the system control to the last DC-DC module via the AC-DC module must not exceed 30 m.
- If no further DC-DC module is connected to the DC-DC module, the RS-485 OUT connection must be terminated with a terminating resistor.

4.7 Interfaces on the system control

TruConvert System Control

These interfaces are located on the system control TruConvert System Control.

24 V supply voltage (DC)

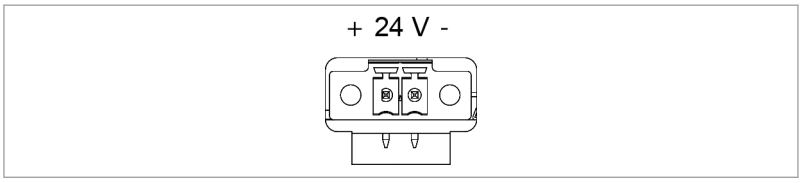
NOTICE

Destruction of the device through improper grounding of the 24 V supply voltage source.

The negative terminal of the supply voltage is not connected to PE in the AC-DC module. If the incorrect terminal (positive terminal) of the external 24 V supply voltage source is grounded, the device will be damaged or destroyed.

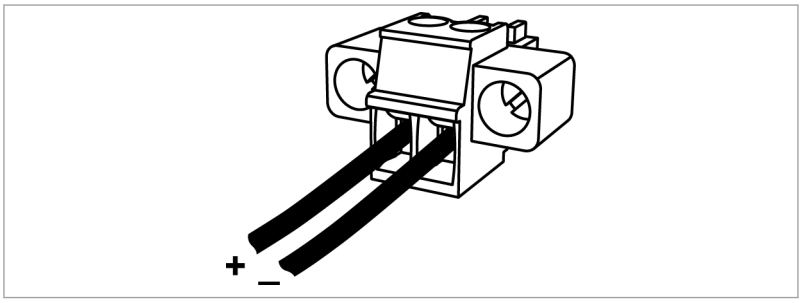
➢ If grounding of the external 24 V supply voltage source is performed by the customer: ground the **negative terminal**.

View



24 V supply voltage (DC) Fig. 21

Connection



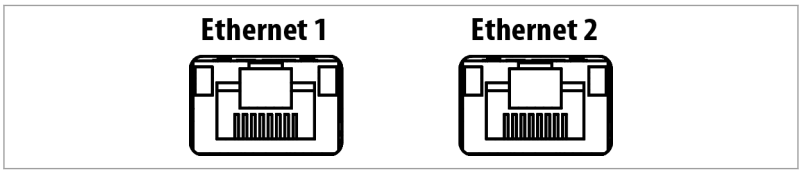
Connector for 24 V supply voltage (DC) Fig. 22

- On the device: Phoenix PCB plug connector
- Required counterpart: connector, 2-pin, 8A, CS 3.5 mm
- Locking mechanism of male connector: Torque: **0.3 Nm**

Fuse External fuse protection must be provided by the customer.

Ethernet

View



Ethernet data connection Fig. 23

Connection

- RJ-45 male connector

Cable requirement

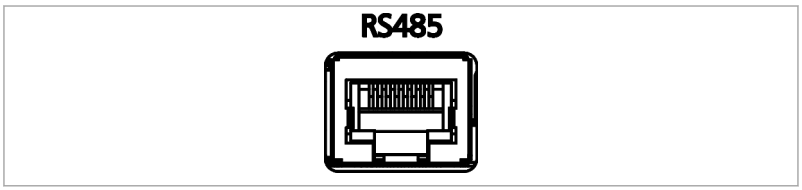
- Twisted pair patch cable in accordance with standard TIA/EIA-568A/B
- CAT 5 or higher
- Max. length: 100 m

Note

The total length of the data cable must not exceed 100 m from the PC to the last system control.

RS-485

View



RS-485 data connection Fig. 24

Connection

- RJ-45 male connector

Cable requirement

- Twisted pair patch cable in accordance with standard TIA/EIA-568A/B
- CAT 5 or higher
- Max. length: 30 m

Note

The total length of the data cable from the system control to the last DC-DC module via the AC-DC module must not exceed 30 m.

5. Standards and directives

5.1 CE certification

EU directives:

- Low-voltage directive 2014/35/EU
- Electromagnetic compatibility directive 2014/30/EU

Standards taken into account:

- EN 62040-2: 2006/AC class C2
- EN 62109-1:2010
- UL 1741
- IEC 62109-2
- IEC 62477-1

5.2 EU declaration of conformity TruConvert AC 3025

TRUMPF

EU Declaration of Conformity

in accordance with
Low Voltage Directive 2014/35/EU
Directive relating to electromagnetic compatibility 2014/30/EU

We hereby declare that the following device complies with all the relevant requirements of the EU directives listed above.

Device:	TruConvert AC 3025
Serial number:	≥ 204298566
Applied harmonized standards, in particular:	EN 62109-1:2010, EN 62040-2:2006/AC Klasse C2
Party authorized to compile the technical file:	Benedikt Röser

Town / Date / Signature Freiburg im Breisgau, 11.12.2019

Benedikt Röser
Quality Director

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www.trumpf.com

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EU declaration of conformity TruConvert AC 3025 Fig. 25

5.3 EU declaration of conformity TruConvert System Control

Class C1 is achieved when the supply lines of the 24 V supply voltage are equipped with the provided ferrite cores. Otherwise class C2 is achieved.

TRUMPF

EU Declaration of Conformity

in accordance with
Low Voltage Directive 2014/35/EU
Directive relating to electromagnetic compatibility 2014/30/EU

We hereby declare that the following device complies with all the relevant requirements of the EU directives listed above.

Device:	TruConvert System Control
Serial number:	≥ 203622306
Applied harmonized standards, in particular:	EN 62109-1:2010, EN 62040-2:2006 / AC Klasse C1
Party authorized to compile the technical file:	Benedikt Röser

Town / Date / Signature Freiburg im Breisgau, 10.02.2020

Benedikt Röser
Quality Director

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EU declaration of conformity TruConvert System Control Fig. 26

6. Installation

6.1 Inspecting the delivery

1. Check the device immediately as soon as it is delivered for completeness in accordance with the delivery note and also for visible damages incurred during transport.
2. In order to retain the right of recourse, report any shipping damages immediately in writing to the forwarding agent, the insurance company and TRUMPF.

6.2 Disposing of packaging material

If you do not want to keep the packaging material for a subsequent transport:

➢ Dispose of all packaging materials in compliance with the relevant regional waste disposal regulations.

6.3 Transport

⚠ CAUTION

Risk of injury due to the weight of the device

➢ Do not carry or lift the device **alone**.
➢ Do not use protruding parts to lift the device.
➢ Lift device using suitable lifting gear.

NOTICE

Damage to impact-sensitive components

If the device is set down heavily or tips over, impact-sensitive components inside the device will be damaged (e.g. fans, circuit boards).

➢ Do **not** set down the device heavily or drop it.
➢ Stand the device on its underside or on its side.
➢ If necessary, secure the device against tipping over.

6.4 Storage conditions

If you do not install the device immediately following delivery:

1. Store the device in original packaging.
2. Ensure that the specified environmental conditions are maintained.

6.5 Requirements for the site

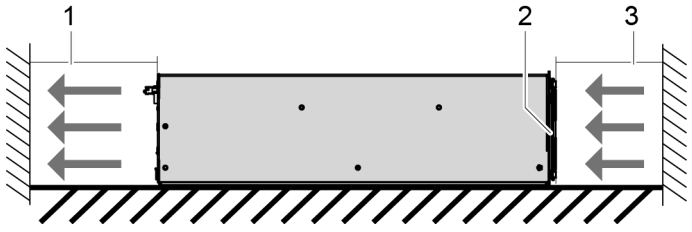
Installation indoors

- Operation is permissible in a closed electrical operating room only.
- Installation, mounting and operation according to **IEC 62109-2**:
  - Access restriction for the electrical operating room.
  - Only electrically instructed persons may work within the operating room.
  - If the specified operating conditions for TruConvert AC 3025 are observed, it is permissible to forgo residual current devices (RCD) unless country-specific requirements state otherwise.

    If necessary, post a notice at the electrical operating room indicating that these are not present.
- According to **IEC 62477-1**, installation, mounting and operation are only permissible in:
  - Non-flammable environment.
  - Indoors with air conditioning.

Air intake and air outlet

Sufficient space must be present for air intake and air outlet in order to ensure adequate cooling of the device.



1 Minimum distance for air outlet: 300 mm
2 Fan
3 Minimum distance for air intake: 200 mm

Air circulation intervals Fig. 27

Maximum back pressure

Sufficient cooling of the module is only ensured if a sufficient air flow rate up to a maximum permissible back pressure is provided.

In addition, note that the air flow rate must be multiplied by the number of devices if several modules are operated.

Air short circuits and mutual interference of the modules must be prevented.

Number of modules	Air flow rate	Maximum back pressure in the air duct
1	400 m³/h	20 Pa
n	n x 400 m³/h	20 Pa

Maximum back pressure Tab. 15

Mains separation device

Access to the external mains separation device must not be obstructed by the device.

Fuses

Fuses must be provided on-site by the customer (see "Grid connection data", pg. 17).

Residual current device

If a TruConvert AC3025 is or multiple devices are operated together with a DC-coupled PV system that is not electrically isolated, a suitable residual current device must be installed depending on the installation location of the system.

- Observe all country-specific requirements regarding location and installation.
- Install a **type B** residual current device (RCD or similar).
- Maximum permissible continuous residual current (IEC 62109-2:2011 Sec.4.8.3.5):
  - Single installation: 300 mA.
  - Multiple installation within a system: 10 mA per 1 kVA nominal output power.
- Separation time of outer conductors and/or neutral conductor: 0.3 s.
- Determine the rated current specifications corresponding to the system layout.
- Set up the residual current devices in accordance with the country-specific grid frequencies and grid voltages.

Ground fault and leakage current monitoring

- The TruConvert AC 3025 device does not have any integrated ground fault or residual current monitoring.
- If the device is used in a battery energy storage system (BESS), the technical specifications of the system integrator and of the respective system manual with respect to ground fault and leakage current monitoring must be observed.

Dependent safety requirements

The TruConvert AC 3025 device is a transformerless inverter:

- Without internal voltage isolation.
- Without integrated, automatic separation device.
- Without integrated residual current device.

The implementation of, compliance with and monitoring of the dependent safety requirements lies solely and completely with the responsible system operator or a third party commissioned by the system operator (see "Connection diagram", pg. 44).

6.6 Electrical connection

DANGER

Connection cables carry life threatening voltage!

- Do not work under voltage.
- Before connecting, check mains cables to ensure that they are not electrically live.
- Before connecting, check DC link (DC Link) voltage cables to ensure that they are not electrically live.

DANGER

Danger of fire!

- Observe the installation regulations of the installation site.
- Fuse the DC link connection (DC Link) according to the specifications (see "DC link", pg. 19).
- The following applies to UL-bound countries: The "National Electrical Code, ANSI/NFPA 70" wiring methods are to be used.

NOTICE

Failure to observe the torques can damage the AC-DC module!

- Note torques when screwing.

NOTICE

Observe regional requirements for the grid connection!

- The following applies to UL-bound countries: The "National Electrical Code, ANSI/NFPA 70" wiring methods are to be used.

Establishing electrical connection

Condition

- Components to be provided by the customer are installed (see "Connection diagram", pg. 44).

Means, Tools, Materials

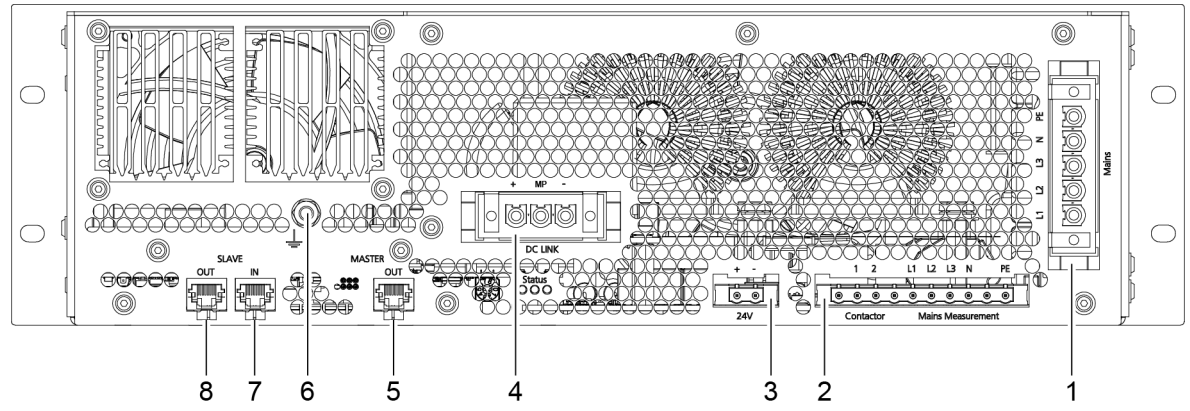
- Terminating resistor for the data output (provided).
- Male connector (provided):
  - Connector "Mains", 5-pin
  - Connector "Contactor / Mains Measurement", 10-pin
  - Connector "DC Link", 3-pin
  - Connector "24V", 2-pin

Note

Observe regional requirements for the grid connection!

The regional requirements must be clarified at the customer's location with the mains operator before the device is connected and commissioned.

Connect mains supply



1	Mains input ("Mains")	4	DC link voltage ("DC Link")	7	Data cable "SLAVE IN"
2	Contactor release contact and mains voltage measurement ("Contactor / Mains Measurement")	5	Data cable "MASTER OUT"	8	Data cable "SLAVE OUT"
3	24 V supply voltage	6	Threaded bolts for potential equalization		

Connection points Fig. 28

Note

Required rotating field: clockwise. Maintain correct phase sequence: L1, L2, L3.

1. Attach the 5-pin connector to the 5-wire mains cable. Assignment (see "Mains power connection", pg. 27).
2. Plug male connector into "Mains" (1).

   Screw the connector securely to the flange using the two screws.

   The device is connected to the 3 phases, the neutral conductor and the protective earth (PE).

Connect mains synchronization and contactor release contact

3. Attach the 10-pin connector to the lines for the contactor release contact, mains voltage measurement and PE. Assignment (see "Contactor release contact and mains voltage measurement", pg. 29).
4. Plug male connector into "Contactor Mains Measurement" (2).

   Make sure that the automatic locking mechanism engages.

Connect 24 V supply voltage

NOTICE

Destruction of the device through improper grounding of the 24 V supply voltage source.

The negative terminal of the supply voltage is not connected to PE in the AC-DC module. If the incorrect terminal (positive terminal) of the external 24 V supply voltage source is grounded, the device will be damaged or destroyed.

➢ If grounding of the external 24 V supply voltage source is performed by the customer: ground the **negative terminal**.

5. Mount 2-pin connector on 24 V cable. Assignment (see "24 V supply voltage (DC)", pg. 30).
6. Plug male connector into "24V" (3).

   Make sure that the automatic locking mechanism engages.
7. Switch on 24 V supply voltage on the AC-DC module.

Connecting DC link

If photovoltaic modules are connected to the DC link:

- Connection permissible only via a string optimizer approved by TRUMPF.
- Only use photovoltaic modules and string optimizers that may be used together.
- Observe the reverse current stability of the photovoltaic modules (see "PV input variables", pg. 21).

⚠ DANGER

Connection cables carry life-threatening voltage.

➢ Do not work under voltage.

➢ Before connecting, check DC link voltage cables to ensure that they are not electrically live.

8. Mounting 3-pin male connectors on DC link cables:
   - DC+ and DC-.
   - Neutral point MP of the DC link, if present (optional).
   - Assignment (see "DC link", pg. 28).
9. Plug male connector into "DC Link" (4).

   Screw the connector securely to the flange using the two screws.

Connecting potential equalization to AC-DC module

10. Optionally, a potential equalization conductor can be screwed onto the potential equalization bolt (6). Max. torque: 5 Nm.

Connecting protective earth to system control

11. Screw protective earth on TruConvert System Control. Max. torque: 2 Nm.

Connecting data cable

12. Connect data connection "RS-485" of the TruConvert System Control with data input "SLAVE IN"(7) of the AC-DC module.
13. Either
    - ➢ Connect the terminating resistor to the "SLAVE OUT"(8) data output of the AC-DC module.

    or

    - ➢ Connect the "SLAVE OUT" data output (8) to the "SLAVE IN" data input (7) of the next AC-DC module.
14. Connect the data output "MASTER OUT" (5) of the AC-DC module to the data input of the DC-DC module.
15. Connect the TruConvert System Control to the master (Modbus master or PC with web browser)

Connecting 24 V supply voltage to system control

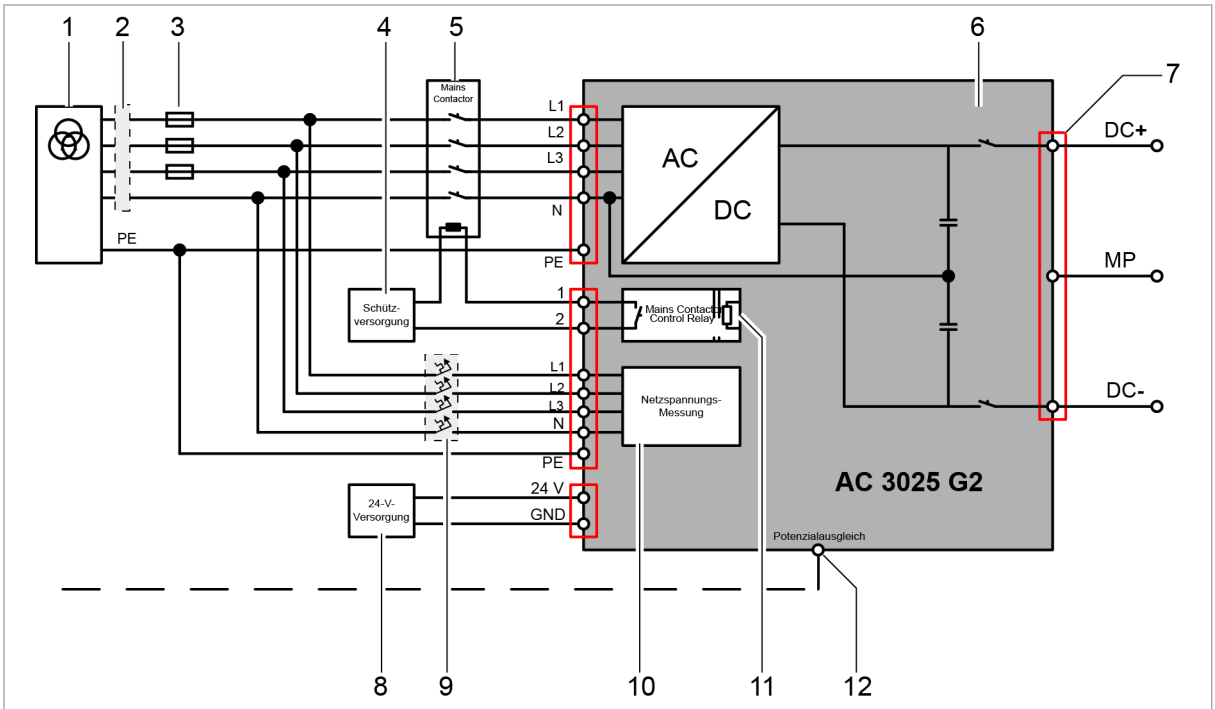
16. Connect and switch on 24 V supply voltage to TruConvert System Control.

    If the system control does not recognize the AC-DC module:

    - ➢ For the system control to detect the AC-DC module, first supply 24 V to the AC-DC module and then to the system control.
    - ➢ Alternatively, simultaneously apply the 24 V supply voltage to the system control and to the AC-DC module.

LED1 (green) flashes and shows that the AC-DC module is operational (see "Display elements", pg. 16).

Connection diagram



1	Mains	5	Mains contactor	9	Circuit breaker for mains voltage measurement
2	Mains and system protection	6	AC-DC module	10	Mains voltage measurement
3	Fuses / power circuit breakers	7	DC link	11	Contact for contactor release
4	Contactor supply	8	24 VDC supply voltage	12	Potential equalization

Electrical connection Fig. 29

Customer area

The following components are not part of the AC-DC module, but must rather be provided by the customer:

- Australia and New Zealand: Observe the special requirements regarding installation (see "Connection according to AS/NZS 4777.2", pg. 53).
- Mains and system protection (2)

  (If residual current devices are used: use type B.)
- Fuses / power circuit breakers (3)

  (see "Grid connection data", pg. 17)
- Mains contactor (5)
  - Dielectric strength corresponding to mains voltage: 400 / 480 V ±10%
  - Current-carrying capacity: 64 A
  - Operation mode: AC-3
- 24 VDC supply voltage (8)

  (see "Entire device", pg. 17)

- Contactor supply (4)
  - Is switched via device-internal switching contact (11).
  - Permissible operational data for switching contact: 24 – 60 VDC, 5 A or 85 – 277 VAC, 5 A.
  - The 24 VDC supply voltage can be used to supply the mains contactor if necessary if voltage and power are sufficient.
- Circuit breaker for mains voltage measurement (9)
  (see "Interfaces", pg. 22)
- Connection of energy sources to the DC link (7)
  Observe the country-specific requirements regarding the installation of external mains separation devices.

Note

Observe regional requirements for the mains connection!

The regional requirements must be clarified at the customer's location with the mains operator before the device is connected and commissioned.

Connection acc. to IEC 62109-2

Single-fault protection

Single-fault protection between PV system and AC mains

The device has internal, simple basic insulation. To satisfy the requirements of IEC 62109-2 for the protection of the operating staff, an external, monitored, automatic separation device is also required. This external separation device is to be installed by the customer.

This combination of internal basic insulation and external separation device guarantees at a minimum in the single-fault case that the basic insulation or a simple, mechanical interruption between the AC supply network and the PV system exists.

The implementation of the basic insulation in the device is based on the specifications of IEC 62109-1.

Implementation of the single-fault protection

All automatic separation devices are also to be monitored.

The electrical or electronic fault indication can be accessed and evaluated remotely.

Recommendation: Monitor separation devices via mechanical, positive-opening auxiliary contacts at the respective separation device. Depending on the design of the used contactors, the mechanical, positive-opening auxiliary contacts may already be integrated in the contactor or can be mounted retroactively.

Due to the different amount of installation work required, the appropriate implementation variant is recommended for a low number of devices (A, B) or a large number of devices (C).

Depending on the number of devices used, one or the other implementation variant is to be recommended, as the amount of work associated with the installation differs.

Variant	Protection 1	Protection 2	Conductor system	Number of devices
A	Internal basic insulation	4-pin mains contactor	5-conductor system (L1, L2, L3, N, PE)	Up to 4
B	Internal basic insulation	1 monitored section switch	4-conductor system (L1, L2, L3, PEN) 5-conductor system (L1, L2, L3, N, PE)	Up to 4
C	1 monitored section switch	1 monitored section switch	4-conductor system (L1, L2, L3, PEN)	5 to 16
Condition for variant C: The two section switches are inserted before separation of the PEN conductor into PE and N.				

Possible implementation variants of the single-fault protection Tab. 16

Examples: External separation devices and auxiliary switch modules

Component	Example
Mains contactor, 4-pin	EATON DIL M125
Auxiliary switch module	EATON DILM1000-XHI11-SI
Coupling switch (mains contactor, 3-pin)	EATON DILM 1000

Examples for external separation devices and auxiliary switch modules Tab. 17

Auxiliary switch modules must meet the following normative requirements:

- Positive-opening contacts are designed in accordance with IEC/EN 60947-5-1.
- General use in accordance with IEC/EN 60947.
- For use in U.S. or Canadian territories, corresponding UL and/or CSA verification is to be provided.

Peripheral evaluation of the monitoring

The evaluation of the monitoring of the external separation devices as well as the direct display of a fault caused by the separation devices is performed neither by the TruConvert system control nor by the TruConvert AC 3025.

In order to depict the various fields of use of the TruConvert system, the necessary unit for evaluating the monitoring and for fault indication is to be individually tailored to the respective system by the responsible system operator.

Requirements on the evaluation of the monitoring elements:

- The basic insulation of the external separation devices is checked each time before connecting the TruConvert AC 3025 to AC mains.

  This prevents one or more contacts of the mains contactor from bridging one of the two basic insulations between the AC mains and the PV system.
- In the event of a fault at one of the external separation devices, the monitoring unit prevents TruConvert AC 3025 from being connected between the PV system and the identical AC grid connection point.
- TruConvert AC 3025 cannot be reconnected until after troubleshooting and subsequent active acknowledgment of the fault.
- Monitoring unit at the place of TruConvert AC 3025 installation triggers an optical or acoustic warning signal for the duration of the error state until active acknowledgment.
  - The warning signal is uniquely assigned to the error state of one or more separation devices.
  - A separate warning signal for each individual separation device is not necessary.
  - The display unit may be installed outside of the electrical operating room in which the TruConvert AC 3025 are installed.

Examples: Monitoring evaluation

Component	Example
Safety relay, certified according to EN 60204-1	EATON ESR5-NO-31-24VAC-DC
Elements for optical or acoustic fault indication	–
Elements for fault acknowledgment	–

Examples: Monitoring evaluation Tab. 18

Detection of stuck mains contactors

If the switching contacts of a mains contactor that is connected upstream of the AC-DC module are stuck, the AC mains voltage is directly at the unsynchronized AC output of the AC-DC module. This results in an alarm message at the affected AC-DC module. The AC-DC module cannot be operated again until the cause has been rectified and the alarm message has been reset.

Alarm messages that are displayed in the event of a stuck mains contactor
(example with AC-DC module = slave 2 and phase = L2):

- Code: 50006, Source: SLAVE 2
  Param: 0 ACDC module → Current → Overcurrent L2
- Code: 50019, Source: SLAVE 2
  Param: 0 ACDC module → HW → Overcurrent L2 hardware
- Code: 50094, Source: SLAVE 2
  Param: 0 ACDC module → HW → ACDC module alarm

Note

The connection of additional AC-DC modules that are connected in parallel must be prevented by the peripheral monitoring unit, the hierarchically higher-level battery management system (BMS) or the energy management system (EMS). This must be implemented by the system operator.

Connection of photovoltaic power generation units (PV systems)

⚠ WARNING

Dangerous voltage on DC link cables!

If the sun shines on the PV modules, the DC link cables are under voltage.

- ➢ Open the DC separation device between DC link and PV system or battery.
- ➢ Secure against reenergizing.
- ➢ Comply with the valid safety and accident-prevention laws of the country and of the region.

Requirements for connecting PV systems:

- PV modules must satisfy the requirements of Class A acc. to IEC 61730.
- PV string optimizer must be connected between the PV system and the DC link.
  - The PV systems must not be connected directly to the DC link of the AC-DC module.
  - The used PV string optimizers must be approved by TRUMPF.
  - Installation notes, regulations and operating parameters of the used PV string optimizer must be observed and complied with.
- A protection device that protects against continuous residual currents must be installed.
  - In grounded or ungrounded photovoltaic power generation systems with and without additional battery storage, continuous residual currents can pose a risk of fire in conductive system parts that are not intended for the flow of current.
  - In combination with the non-isolated version of the AC-DC module, continuous DC-side ground faults can result in the destruction of the device and void the warranty.
- All safety requirements specified in IEC 62109-1 and IEC 62109-2 are to be complied with for the operation of a TruConvert system on a PV system.

Implementation of the connection to PV systems

Residual current monitoring acc. to IEC 62109-2 can be implemented with an AC/DC sensitive residual current monitoring system of type B [9]

Example: AC/DC sensitive residual current monitoring system

An AC/DC sensitive residual current monitoring system can be implemented by combining a monitoring unit and a suitable current sensor.

Component	Example
Monitoring unit	Bender RCMS460
Current sensor	Bender CTUB102/CTBC60

Example: AC/DC sensitive residual current monitoring system Tab. 19

Special features of this example:

- Unlike residual current devices (RCD), the residual current monitoring system (RCMS) shown here does not cause a direct, automatic shutdown of the monitored circuit according to DIN VDE 0100 or IEC 60364.
- The suggested RCMS460 monitoring unit monitors the current flow and can, via the two relays on the central coupling switch, cause the inverter system or the entire system to disconnect.
  - Use relay with contact data acc. to IEC 60947-5-1.
- TT- and TN-S systems: The RCMS460 monitoring unit and the CTUB102/CTBC60 current sensor are intended for the approved use in TT- and TN-S systems.
- IT systems: The suggested combination is not permissible here.

  Please contact TRUMPF to obtain more detailed information on the implementation possibilities.

Connection and settings of the RCMS460 monitoring unit:

- Integrate in the safety circuit to cause the external mains separation device to switch off in the event of a fault: relay contacts K1, K2.
- In the main menu of the RCMS460 monitoring unit, set:
  - Response value I(dn).

    The size of the response value is determined by the continuous output power in kVA that is to be monitored. The response value may be increased by 10 mA for each kVA of the nominal output power.
  - Type of measuring current converter

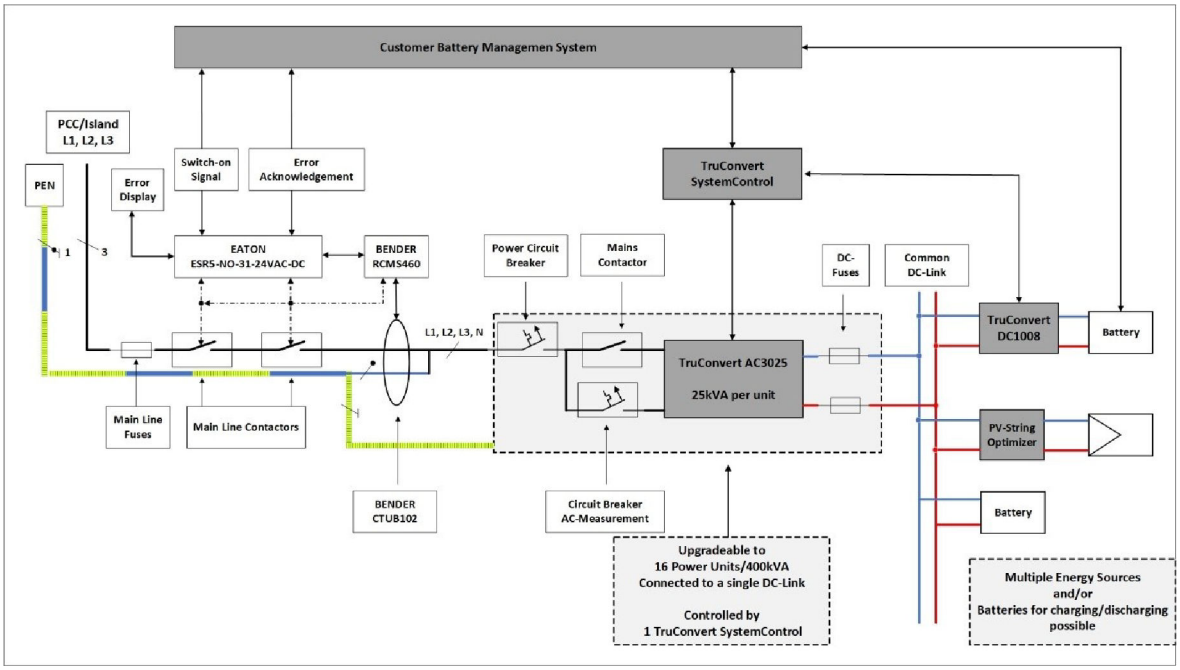
    For the current sensor CTUB102/CTBC60 used in the example: Type AB.
- Further, system-specific settings on the Bender RCMS460 can be found in the manufacturer documentation.

9 Type B acc. to IEC 60755 for the monitoring of alternating currents, pulsating and smooth DC residual currents.

Connection diagram for variant A: recommended for up to 4 TruConvert AC 3025

For economic reasons, connection variant A is recommended for 1 to 4 TruConvert AC 3025 units in grouped systems up to a combined total power of 100 kVA. Here, double the basic insulation is used. This insulation consists of the monitored 4-pin mains contactors and basic insulation within the AC-DC modules.

In principle, connection variant A can also be implemented for up to 16 AC-DC modules.



Connection diagram for variant A: recommended for up to 4 TruConvert AC 3025 Fig. 30

The block diagram contains all elements relevant to safety:

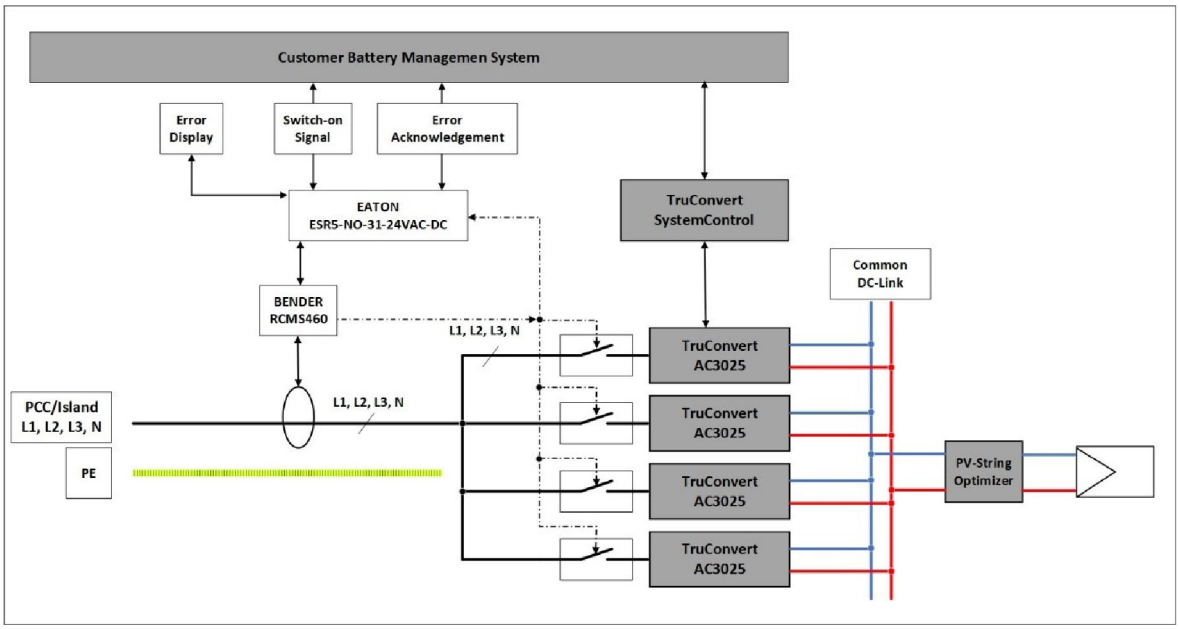
- Residual current monitoring system
  - Current sensor
  - Monitoring unit
- Double basic insulation
  - Monitored mains contactor
  - Permanent, simple basic insulation within the TruConvert AC 3025 implemented in the layout
- Devices for fault indication and release

Connection diagram for variant C: recommended for 5 to 16 TruConvert AC 3025

For grouped systems with 5 to 16 AC-DC modules (up to a combined total power of 400 kVA), connection variant C is recom-

mended for economic reasons. Here, two monitored section switches are used.

Connection variant C can, in principle, also be implemented for 1 to 4 AC-DC modules.



Connection diagram for variant C: recommended for 5 to 16 TruConvert AC 3025 Fig. 31

The figure shows the block diagram of a possible complete system including the connection possibility to the public low-voltage grid (PCC: Point of CommonCoupling) or via the same connection possibilities in isolated operating mode.

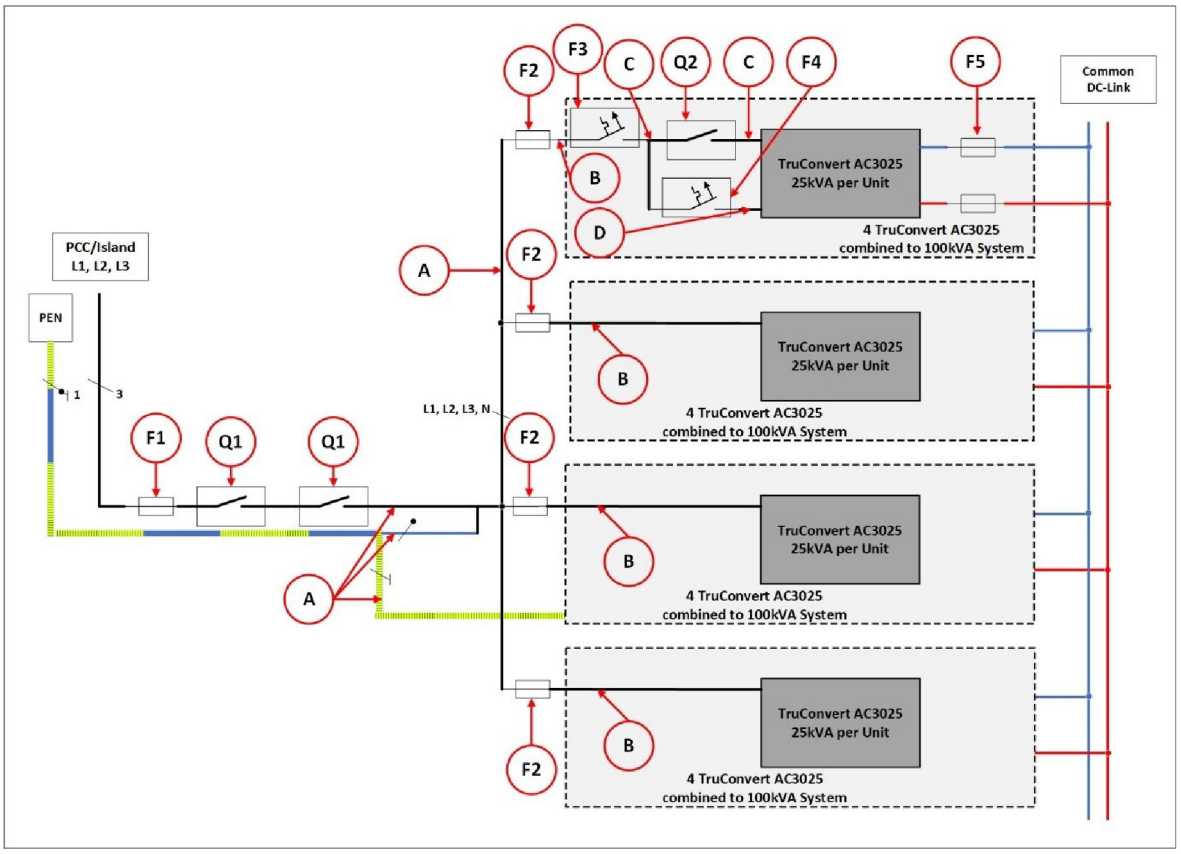
There is no explicit switch-over and synchronization unit shown for the transition from grid-tied operation to island operation.

An automatic change between grid-tied to island operation is permissible only in compliance with the country-specific regulations.

Example: Recommended components and cross sections for a 400 kVA system

In the following, components and cross sections for a 400 kVA system consisting of 16 TruConvert AC 3025 are recommended.

In the figure (see "Fig. 32", pg. 52), each gray block corresponds to a 100 kVA unit, which in turn consists of 4 TruConvert AC 3025. Described in the first block from above are the fuse and power components that are specified for each of the used 16 TruConvert AC 3025.



Overview of fuse and power components for a 400 kVA system Fig. 32

	Meaning	Number	Design
Shown in: (see "Fig. 32", pg. 52)			
A	Cross section	–	EN / IEC: 1000 A busbar 5 x 800 mm² (L1, 2, 3, N, PE) UL / CSA: 1000 A busbar 5 x 1.24 mm² (L1, 2, 3, N, PE)
B	Cross section	–	EN / IEC: 200 A busbar 5 x 75 mm² (L1, 2, 3, N, PE) UL / CSA: 200 A busbar 5 x 0.12 in² (L1, 2, 3, N, PE)
C	Cross section	–	EN / IEC: 50 A cable 5 x 10 mm² (L1, 2, 3, N, PE) UL / CSA: 50 A cable 5 x AWG 6 (L1, 2, 3, N, PE)
D	Cross section	–	EN / IEC: cable 5 x 1 mm² (L1, 2, 3, N, PE) UL / CSA: cable 5 x AWG 16 (L1, 2, 3, N, PE)
Q1	Contactor	2	EATON DIL M1000/22(RA250) / AC3
Q1	Auxiliary switch module	2	EATON DIL M820-XHI11-SI
Q2	Contactor	16	EATON DIL MP125(RDC24) / AC3
Q2	Auxiliary switch module	16	EATON DIL M1000-XHI11-SI
F1	Fuse	1	NH4 1000 A 3-pin Class gG IEC60269-1 500V
F2	Fuse	4	NH1 250 A 3-pin Class gG IEC60269-1 500V
F3	Power circuit breaker	16	EATON FAZ-C50/4 Circuit breaker 3-pin 50 A 15 kA breaking capacity Class D 480 V IEC60947-2

	Meaning	Number	Design
F4	Power circuit breaker	16	EATON FAZ-C1/4 Circuit breaker 4-pin 1 A 15 kA breaking capacity Class D 480 V IEC60947-2
F5	Fuse	32	NH1 EATON Bussmann PV-63A
Shown in: (see "Fig. 31", pg. 51)			
	Monitoring unit	1	BENDER RCMS460
	Current sensor	1	BENDER CTUB102/CTBC60
	Monitoring evaluation	1	EATON ESR5-NO-31-24VAC-DC

Tab. 20

Connection according to AS/NZS 4777.2

This chapter describes additional country-specific installation requirements for Australia and New Zealand.

Multiple-mode inverter

The multiple-mode inverter can switch between 2 modes: grid-tied mode and stand-alone mode in island operation.

The nominal values and connecting elements specified in this chapter (see "Connection according to AS/NZS 4777.2", pg. 53) apply to AC-DC modules that are used as multiple-mode inverters.

For electrical installation, the following points must be observed:

- The external load separation device disconnects **only** the three active conductors (L1,L2, L3). The neutral conductor is not interrupted.
- It must be possible to secure the main switch or the main contactor against being switched on again.
- Dimension the overcurrent protection according to the technical specification (see "Grid connection data", pg. 17).
- Before switching over to stand-alone mode, the system operator must disconnect the energy storage system including inverter from the grid.

  In stand-alone mode, the "Grid-interactive port" is used as the stand-alone connection.
- The TruConvert AC 3025 device does not have any integrated ground fault or residual current monitoring.

  If the device is used in a battery energy storage system (BESS), an external unit for monitoring ground faults must be installed. This external unit must meet the requirements specified in AS/NZS 5139.

Demand response mode (DRM)

Function description "Demand response mode"

For installation of the TruConvert AC3025 in grid-tied energy storage systems in Australia, the implementation of "Demand Response Mode 0" (DRM 0) is obligatory.

The activation of DRM 0 mode triggers the mains separation device. Depending on the version of the energy storage system, the mains separation device may be activated at system level (main connection point) or individually for each inverter (integrated load separation device).

The responsible local distribution network operator sends the signal that activates DRM 0 mode.

A "Demand Response Enabling Device" (DRED) as receiver device must be integrated in the system. The DRED forwards the signal to the DRM 0 device TruConvert DRM-0 Device. The DRM 0 device sends the signal to the inverter and the integrated load separation device.

The system operator must ensure the prioritization of the DRM 0 command in conjunction with the requirements from table 2.6 AS/NZS 4777.2:2020.

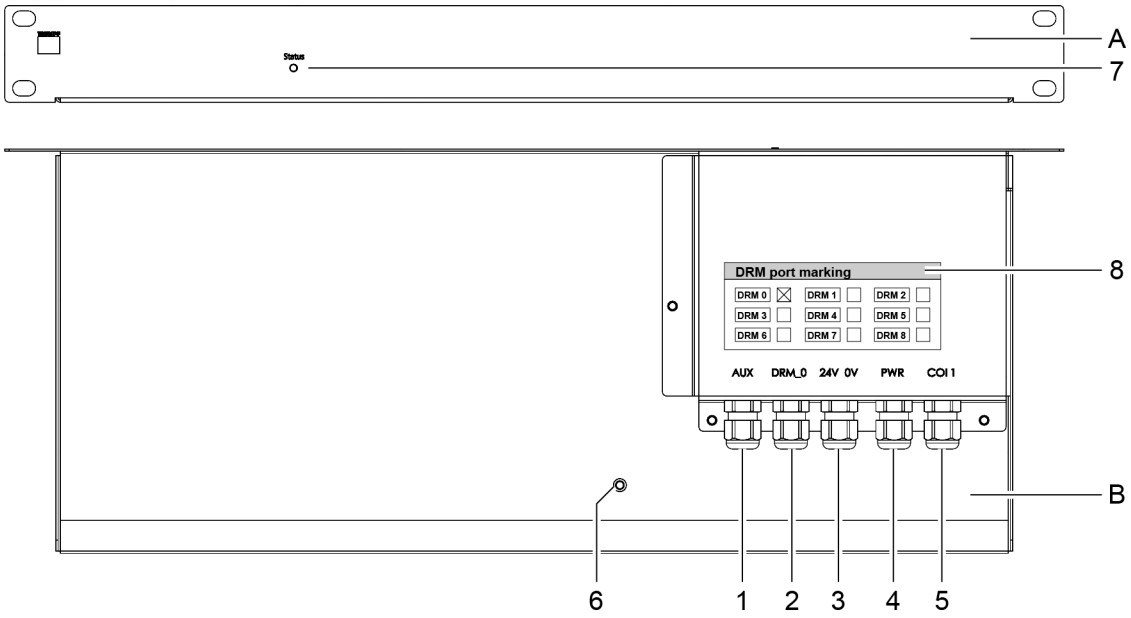
After the DRM 0 command has been received, the AC-DC module is disconnected from the grid. If the DRED withdraws the DRM 0 command, the errors must first be reset at the AC-DC module and the AC-DC module must then be restarted. The AC-DC module does not reconnect to the grid automatically.

On request, TRUMPF can provide further information on the TruConvert DRM-0 Device.

DRM designation

On the TruConvert DRM-0 Device, a sign (8) indicates which mode of the "demand response mode" is supported (see "Fig. 33", pg. 55).

View of TruConvert DRM 0 device



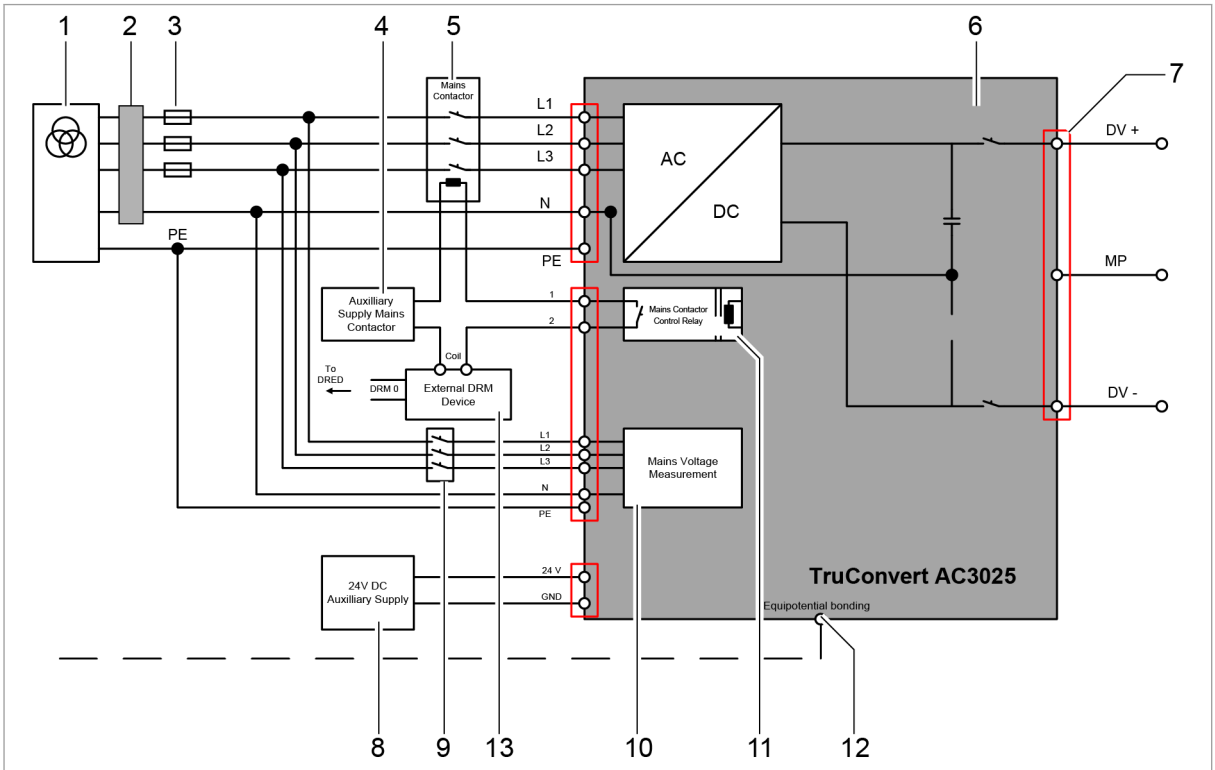
A	View of the front side	3	PLC status monitoring 1	6	Potential equalization
B	View from above	4	PLC status monitoring 2	7	Status LED
1	24 V DC auxiliary voltage supply	5	2-conductor connection for looping in auxiliary voltage supply "Mains contactor"	8	DRM designation
2	DRED 2-conductor connection (REF GEN/0, COM LOAD/0)				

Fig. 33

Installing TruConvert DRM-0 Device

- Connect the TruConvert DRM-0 Device in series with the auxiliary voltage supply for the main switch (see "Fig. 34", pg. 56).
- Cable requirement: 10 × 1.5 mm^2 / 10 × AWG 16

Connection diagram for Australia and New Zealand and requirements regarding installation



1	Mains	6	AC-DC module	10	Mains voltage measurement
2	Residual current device (4-pin type B RCD)	7	DC link	11	Contact for contactor release
3	Fuses / power circuit breakers	8	24 VDC supply voltage	12	Potential equalization
4	Contactor supply	9	Circuit breaker for mains voltage measurement	13	TruConvert DRM-0 Device
5	Mains contactor				

Electrical connection (Australia–New Zealand) Fig. 34

Customer area

The following components are not part of the AC-DC module, but must rather be provided by the customer:

- Residual current device (2)
  - Type B (RCD or similar)
  - Rated differential operating current $I_{\Delta n}$: 10 mA to 500 mA
  - Response delay t_{on}: 0 s to 10 s
  - Rated frequency: 0 Hz to 2000 Hz
  - Rated current: 40 A to 1000 A
- Fuses / power circuit breakers (3)

(see "Grid connection data", pg. 17)

- Mains contactor (5)
  - External load separation devices must meet the requirements of AS/NZS 4777.1.
  - It must be possible to disconnect all active conductors L1,L2, L3.
  - The neutral conductor may not be interrupted by separation devices.
  - AC separation devices checked according to AS/NZS 4777.2:2020 that together with TruConvert AC 3025 form the "Automatic Disconnection Device" required by the standard specified in section 4.2: ABB AF38-40-00-1 1 and EATON DIL MP125.
  - Dielectric strength corresponding to mains voltage: 400 / 480 V ±10%
  - Current-carrying capacity: 64 A
  - Operation mode: AC-3
- 24 VDC supply voltage (8)
  (see "Entire device", pg. 17)
- Contactor supply (4)
  - Is switched via device-internal switching contact (11).
  - Permissible operational data for switching contact: 24 – 60 VDC, 5 A or 85 – 277 VAC, 5 A.
  - The 24 VDC supply voltage can be used to supply the mains contactor if necessary if voltage and power are sufficient.
- Circuit breaker for mains voltage measurement (9)
  (see "Interfaces", pg. 22)
- Connection of energy sources to the DC link (7)
  Observe the country-specific requirements regarding the installation of external DC separation devices.
  - The external DC separation device must satisfy the requirements of AS 60947.3.

Note

Observe regional requirements for the mains connection!

The regional requirements must be clarified at the customer's location with the mains operator before the device is connected and commissioned.

6.7 Requirements for grid-forming mode

TruConvert AC 3025 as voltage source in grid-forming mode

The device can be used as a grid-following inverter and as a grid-forming inverter. As a grid-forming inverter, it can be operated with up to 16 parallel units independently of the public grid. The device can form a stand-alone network on its own or together with other inverters (island operation).

Note

The function as "uninterruptible power supply" is not fulfilled and is not permissible.

Load cases in grid-forming mode

Permissible load cases:

- Resistive-symmetric three-phase alternating current load.
- Three-phase alternating current motors in star and/or delta configuration.
- 1-phase loads (resistive-inductive or capacitive-motoric).
- Unbalanced load with 1-phase loads:
  - A maximum unbalanced load of 4.6 kVA between the phases should not be exceeded.

    The value is recommended based on normative requirements regarding connection to public low-voltage grids.
  - The device is designed for a maximum unbalanced load of 8.3 kVA between the phases.

NOTICE

Destruction of the device through excessive current on the neutral conductor!

➢ Ensure that the nominal current on the neutral conductor is not exceeded in the case of asymmetries.

Impermissible load cases:

- Electrical loads that must ensure personal safety.
- Preservation of the electrical supply of medical devices of every type.
- Loads that could result in property and system damage if the stand-alone network is impaired.

In the event of questions regarding the general voltage supply in the stand-alone network through TruConvert AC 3025 or for the implementation of load cases that are not listed here, contact TRUMPF service.

Permissible system types in grid-forming mode

A system consisting of TruConvert AC 3025 may be operated in grid-forming mode in the following system configurations:

- TN-C system.
- TN-C-S system.

The corresponding system images are shown in VDE-AR-E-2510-2:2015-09 Appendix B.

Observe the following points:

- N conductor and PE conductor are not connected in the TruConvert AC 3025.
- N conductor and PE conductor must be connected outside of the TruConvert AC 3025.
- In TN-C systems and in the TN-C part of a TN-C-S system, the PEN conductor must not be separated.

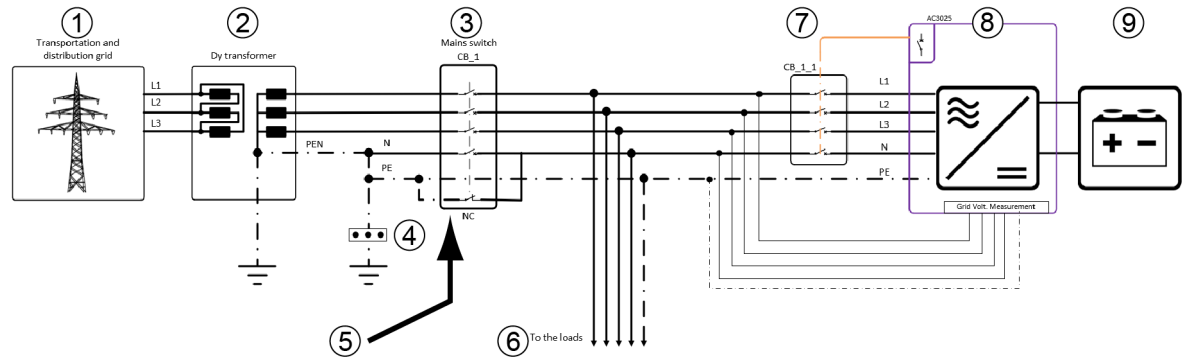
Central earthing point in stand-alone network

If the TruConvert AC 3025 is alternately operated parallel to the public grid and within a stand-alone network, a central earthing point (CEP) must be provided within the stand-alone network. The current-carrying capacity up to the CEP must also be ensured.

In order to provide a CEP as soon as the connection to the pubic grid is disconnected and switches to island operation, it may be necessary to install an earthing switch.

Example:

If the inverter is disconnected at all poles (L1, L2, L3, N) from a grid in the TNC-S system, operation as a stand-alone network is only possible if the N-PE connection is restored using an earth selector switch (see "Fig. 35", pg. 59).



1	Transport and distribution grid	4	Equipotential bonding rail	7	Separation switch CB_1_1
2	Transformer with delta-star connection	5	Earth selector switch	8	TruConvert AC 3025 inverter
3	Mains isolator CB_1	6	Connection of loads	9	Battery

Earth selector switch for all-pole mains separation in TNC-S system Fig. 35

Electrical protection devices in grid-forming mode

- The setup of low-voltage systems with an isolated supply must satisfy the requirements of DIN VDE 0100-100 or the corresponding country-specific regulations.

Making settings for grid-forming mode

Other information, (see "Operation with voltage regulation (grid-forming or grid-following mode)", pg. 106).

6.8 Series-connected batteries on DC link

2 batteries can be connected in series to the DC link: battery 1 to the positive DC link half and battery 2 to the negative DC link half. In this arrangement, the power flow in the two batteries can be set independently of each other.

Other information, (see "Function description "Operation with series-connected batteries"", pg. 117).

Connecting 2 batteries in series

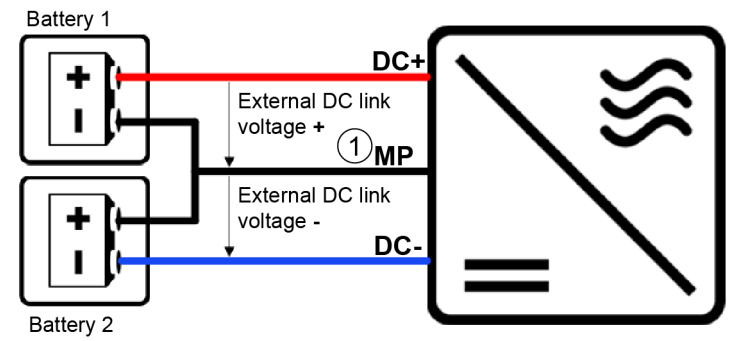
⚠ WARNING

Risk of electric shock!

The neutral point (MP) of the DC link ("MP") is connected to the neutral conductor inside the device.

An incorrectly connected "MP" can cause circulating currents. There is then a risk of touch contact with a live conductor.

- Connect the "MP" only to the potential-free batteries.
- Do not make any further connections to grid-tied or earth-tied potentials.



1 "MP" as neutral point connection

Connection principle for operation with series-connected batteries Fig. 36

1. At the "DC Link" connector, connect battery 1: Between "DC +" and "MP".

   (Positive DC link half)

2. Connect battery 2: Between "MP" and "DC-".

   (Negative DC link half)

3. Make the settings for series-connected batteries: (see "Function description "Operation with series-connected batteries"", pg. 117).

6.9 Dismantling

⚠ WARNING

Connection cables carry life threatening voltage!

- ➢ Open the external mains separation device between mains and the power connection of the device.
- ➢ De-energize the cable between mains and the mains synchronization connection.
- ➢ De-energize the connection cables to the DC link voltage.
- ➢ Maintain discharging time: at least 5 min.

Removing residual voltages

1. Open external mains separation device.
2. De-energize the connection cables to the DC link voltage.
3. De-energize the connection cables to the 24 V supply voltage.

⚠ WARNING

Dangerous residual voltage

- ➢ Maintain discharging time: at least 5 min.

4. Check mains cable and DC link-voltage cable to ensure that they are not electrically live.

Unscrew or unplug cables

5. At power connection "Mains":
   - Undo the 2 screws on the flange.
   - Disconnect mains cable.
6. At DC link connection:
   - Undo the 2 screws on the flange.
   - Disconnect the DC link cable.
7. At connection for contactor release contact and mains voltage measurement "Contactor / Mains Measurement":
   - Release the automatic locking mechanism.
   - Disconnect the cable for mains voltage measurement / release contact.
8. 24 V supply voltage:
   - Release the automatic locking mechanism.
   - Disconnect the 24 V supply cable.
9. Disconnect data cable.
10. Unscrew and remove the equipotential bonding conductor if necessary.

6.10 Shipping the module

➢ Use packaging material which can withstand transport stresses to ship the module.

If the original packaging is no longer available:
Suitable packaging material can be purchased from TRUMPF.

6.11 Disposing of the module

➢ Observe the local regulations when disposing of the module.

7. Operation

7.1 Commissioning

Performing initial commissioning

Conditions

- PC on which one of the following browsers is installed:
  - Microsoft Internet Explorer from version 11.
  - Microsoft Edge.
  - Google Chrome from version 46.
  - Firefox from version 40.
- Ethernet cable for connecting PC and TruConvert System Control.

The initial commissioning of the device is **only** possible via the web GUI.

Establishing and testing the connection

1. Set the same IP Subnet Mask on the PC as on the TruConvert System Control.

   IP Subnet Mask of the TruConvert System Control on delivery: 255.255.255.0
2. Set the same address range on the PC as on the TruConvert System Control:
   192.168.1.-
3. On the PC, set the last block of the IP address.

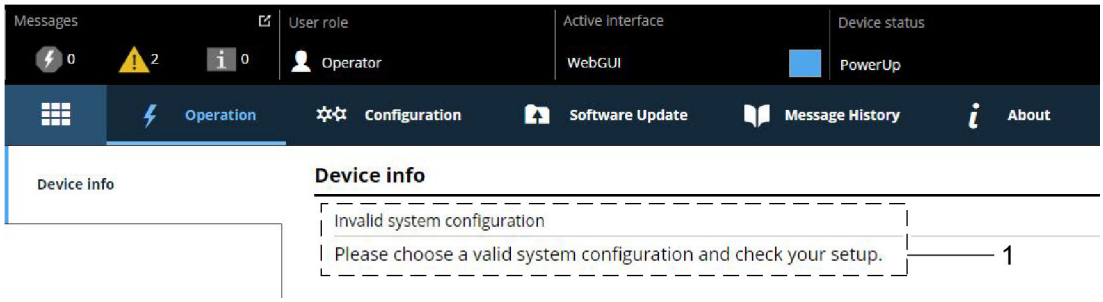
   Do not set the same address as on the TruConvert System Control!

   IP address of the TruConvert System Control on delivery: 192.168.1.2

   Do not set 0!
4. Connect PC and TruConvert System Control with Ethernet cable.
5. To switch on the system control and the AC-DC module: switch on the 24 V supply voltage.

   All 3 status LEDs blink to display the "Initialization" state.
6. Open the web browser on the PC.
7. Enter IP address of the TruConvert System Control in the address line.

   IP address of the TruConvert System Control on delivery: 192.168.1.2



1 Message: Invalid system configuration

Initial commissioning display Fig. 37

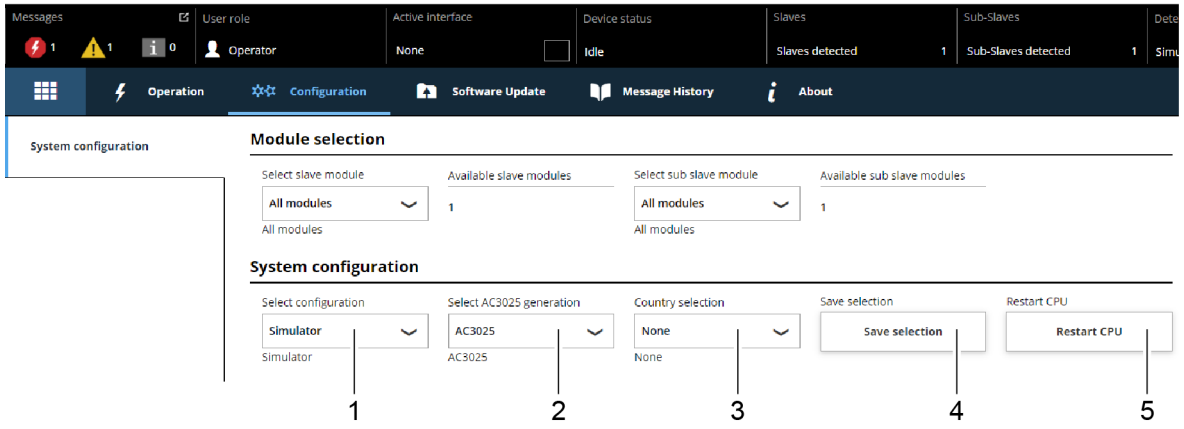
The browser displays the web GUI.

Several system controls are used in one system?

➢ Connect one system control after another to the PC and change the default IP address to a unique IP address.

Setting the system configuration

8. Select >*Configuration* >*System configuration*.



1 Select system configuration
2 Select device generation
3 Select country
4 Save settings
5 Restart system control

Screen: Set system configuration Fig. 38

9. In the "Module selection" section under "Select slave module", select: "All modules".

10. In the "System configuration" section under "Select configuration", select the existing system configuration:
    - No configuration

      This configuration only occurs in the event of an error, e.g., if there is no connection to the modules (check cables) or if an incorrect module type was detected (check alarm messages).
    - Simulator

      The system control alone is used and connected modules are simulated.

- DC-DC configuration

  Only DC-DC modules are connected to the system control.
- n*(AC-DC + m*DC-DC)

  AC/DC and DC/DC modules are connected to the system control.

11. Under "Select AC3025 generation", select the device generation: "AC3025".
12. Under "Country selection", select the location of the device.

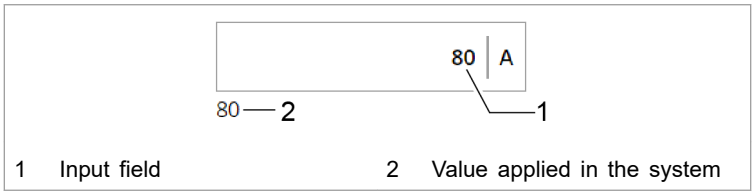
    If the factory setting "None" is retained, it will not be possible to switch on the device later.
13. To save the selection: press "Save selection".
14. To restart the TruConvert System Control: press "Restart CPU".

    The system control balances the set system configuration with the actually connected modules. If both values match, the set system configuration is displayed in the status bar under "Detected Configuration".

    If the set system configuration differs from the automatically detected system configuration, "None" is displayed in the status bar under "Detected Configuration". In addition, a message is output. Press in the sidebar to display the messages.

Set process set values ("AC-DC module settings")

15. Select *>Operation >AC-DC module settings*.
16. Every input in the following steps must be confirmed with the enter key ↵.



1 Input field 2 Value applied in the system

Confirm input Fig. 39

The value applied in the system is then displayed below the input field.

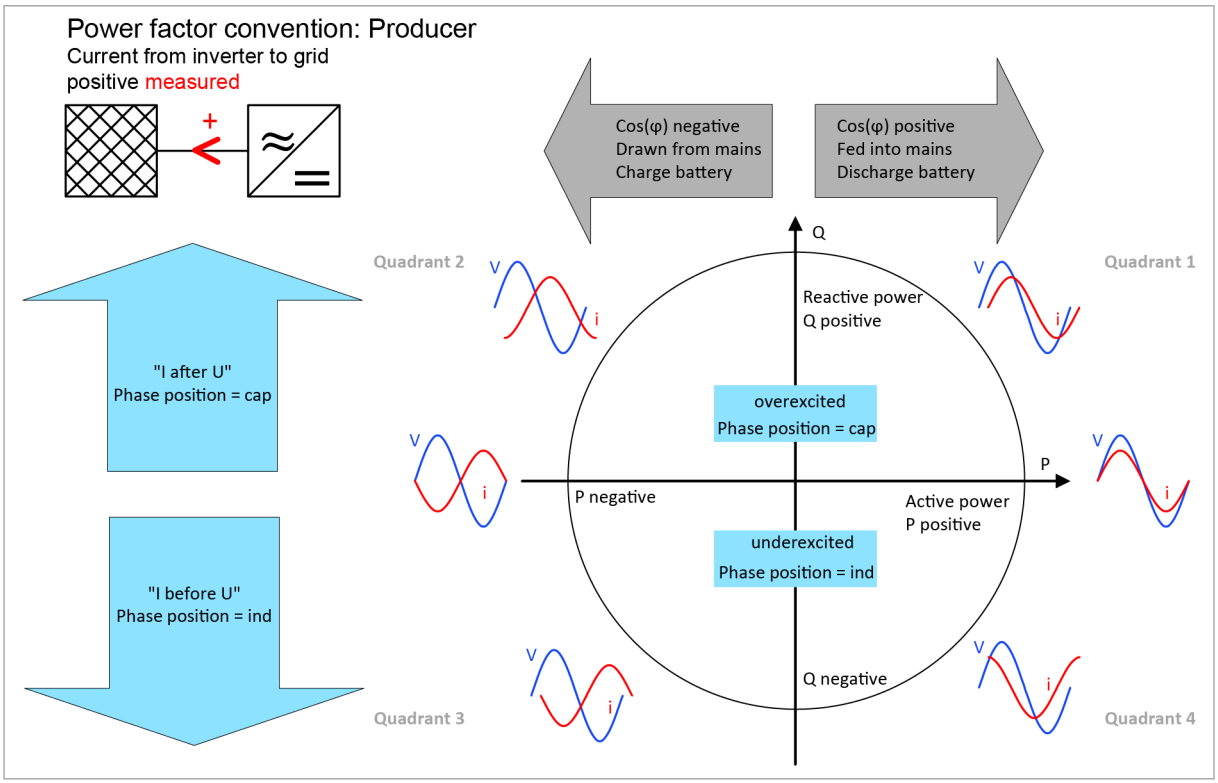
17. To ensure that the settings apply to all AC-DC modules:
    - User interface:

      In the "Module selection" section, under "Select slave module", enter "All modules".
    - Modbus: (see "Tab. 28", pg. 91)

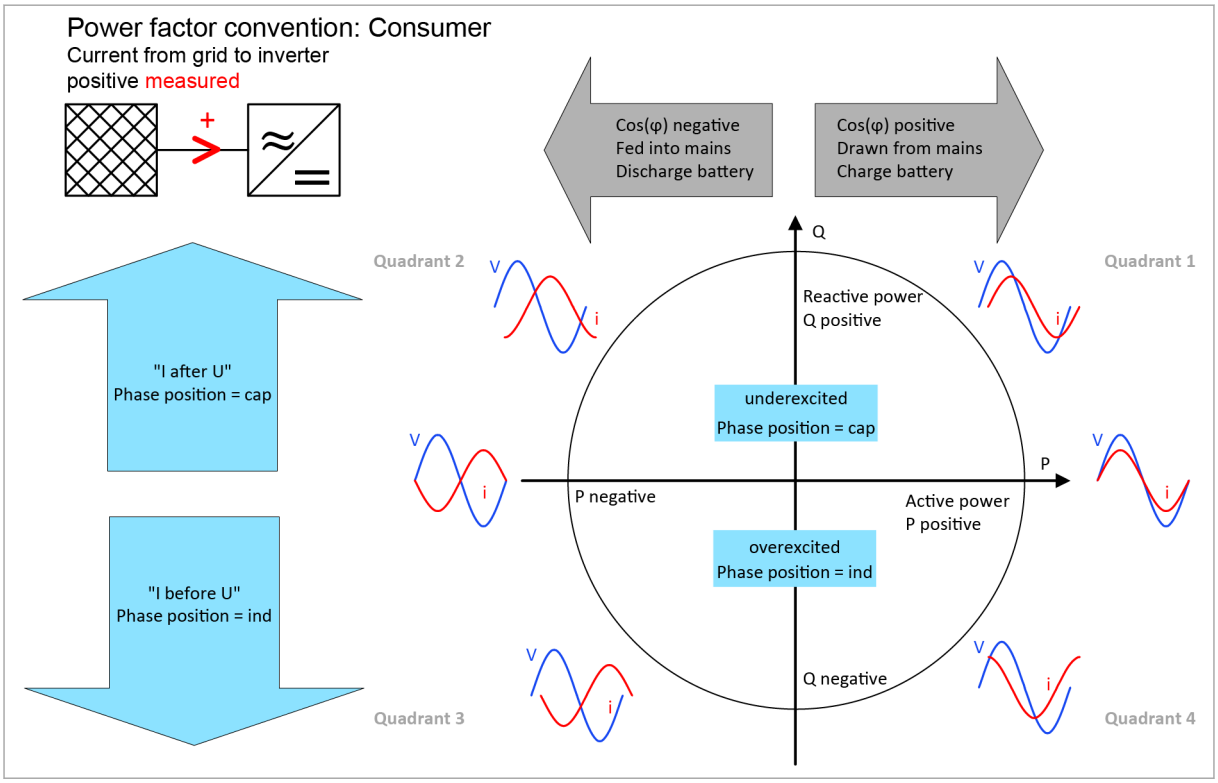
      Enter the number of the slave to be addressed = "0".
18. In the "General AC settings" section under "Controler and grid type selection", select the regulator type as well as the grid voltage and grid frequency:

- Mains current regulation + voltage/frequency of AC grid.
  E.g. "Current control 400 V / 50 Hz (grid-tied only)"
- voltage regulation + voltage/frequency of AC grid.
  Additionally under "Voltage source mode", select the regulation mode (see "Operation with voltage regulation (grid-forming or grid-following mode)", pg. 106).
  E.g. "Voltage control 480 V / 60 Hz" and "grid-forming".

19. In the "Power factor convention", select operation mode:
    - "Producer": producer reference arrow system.
      Positive sign for cosφ means: energy flows from DC link towards mains.
      Negative sign for cosφ means: energy flows from mains towards DC link.
      (see "Fig. 40", pg. 66)
    - "Consumer": consumer reference arrow system.
      Positive sign for cosφ means: energy flows from mains towards DC link.
      Negative sign for cosφ means: energy flows from DC link towards mains.
      (see "Fig. 41", pg. 67)



Producer reference arrow system Fig. 40



Consumer reference arrow system Fig. 41

20. Under "Grid contactor delay", enter the maximum delay time in ms that may elapse between the "Close contactor" command and the actual closing of the contactor.

    If there is no feedback within the delay time, an alarm is output.

Setting the DC link ("DC link settings")

21. Change preset values:
    - No: The DC link settings made at the factory are appropriate for most applications.
    - Yes: This can be useful with energy storage systems that are directly connected to the DC link (see "Setting DC link with "voltage regulation" regulator type", pg. 101).

Setting the "AC voltage control settings"

22. If the "voltage regulation" regulator type is used ("Controler and grid type selection" = "Voltage control ..."): Under "AC voltage control settings", enter the corresponding parameters (see "Operation with voltage regulation (grid-forming or grid-following mode)", pg. 106).

Setting operation with series-connected batteries ("Stacked HV battery settings")

23. If 2 series-connected batteries are used: Under "Stacked HV battery settings", enter the corresponding parameters (see "Operation with series-connected batteries", pg. 117).

Setting grid codes ("Grid code control settings")

24. Under "Grid code control settings", enter the corresponding parameters (see "Setting grid codes", pg. 123).

Start transmission of power

25. Check the device status in the status bar at the top of the user interface:
    - "Device status: Idle": Idle: The device is ready for use.
    - "Device status: Error, Power Up": Error: The device is not ready for use. An alarm message is pending (see "Displaying and resetting messages", pg. 94).

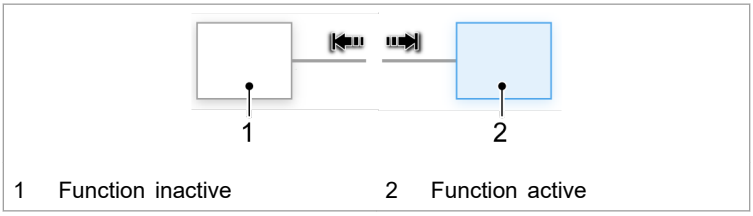
    or

    ➢ Check status LED 1 on the AC-DC module and system control:
    - LED flashes green: The device is ready for use.
    - LED flashes red: The device is not ready for use. An alarm message is pending (see "Displaying and resetting messages", pg. 94).
26. Select >*Operation* >*Device control AC-DC mode*.
27. In the "Device control AC-DC" section, enter in "Power factor cos(φ)":
    - Value between: -1 to +1 (in increments of 0.01)
    - Note the selected reference arrow system and set the sign accordingly.
28. In the "Device control settings AC-DC" area under "DC link precharge config", set from which side the DC link voltage is to be precharged:

Web GUI	Modbus register 4005 Bit	Description
external	0	Device is waiting for external precharging of the DC link.
internal	1	Device is charging the DC link to the required voltage.
internal with DC module	2	Setting similar to "internal" with support of the DC-DC modules (required in isolated mode).
internal & wait	3	Device is charging the DC link to the required voltage and is waiting until "DC link precharge config" is set back to "internal" or "internal with DC module" in order to connect to the AC grid.

Tab. 21

29. Under "Activate power stage": click on the slide control.



Slide control Fig. 42

The slide control changes position and is displayed in blue: The function is active.

In the status bar, the operating state changes from "Idle" to "Operation".

The status LEDs on the AC-DC module and system control light up orange. The contactor connects the mains.

Stop transmission of power

30. To stop the transmission of power: press "Activate power stage" again.

    The slide control changes position and is displayed in white: The function is disabled.

    In the status bar, the operating state changes from "Operation" to "Idle".

    The status LEDs on the AC-DC module and system control light up green. The contactor disconnects the mains.

The initial commissioning is completed.

The device can now continue to be operated via the web GUI or via Modbus.

Tip

The Modbus register provides an overview of the set default values (see "Modbus Register Map", pg. 77).

7.2 Active interface

The device can be **simultaneously** controlled via the web GUI and Modbus.

Enabling/disabling interface

- Web GUI: In the "Interface control" area of the expandable menu, click on the slide control.
- Other interfaces: get/release control via interface command, (see "Modbus Register Map", pg. 77).

Communication timeout

During power operation ("Device status" = "operation"), communication between the active interface and the device is monitored. As soon as no communication occurs for a period exceeding the time-out time, the device switches off with an alarm message.

Setting the time-out time:

- Select >*Configuration* >*System configuration*.
- In the "General sytem settings" area, enter the desired time under "Active interface communication timeout".
- To switch off the time-out mechanism: enter 65535.

7.3 Operation via web-based user interface

Calling up the web GUI

Condition

- Initial commissioning was performed (see "Commissioning", pg. 63).

1. To switch on the TruConvert System Control and the connected modules: switch on the 24 V supply voltage.
2. Open the web browser on the PC.
3. Enter IP address of the TruConvert System Control in the address line.

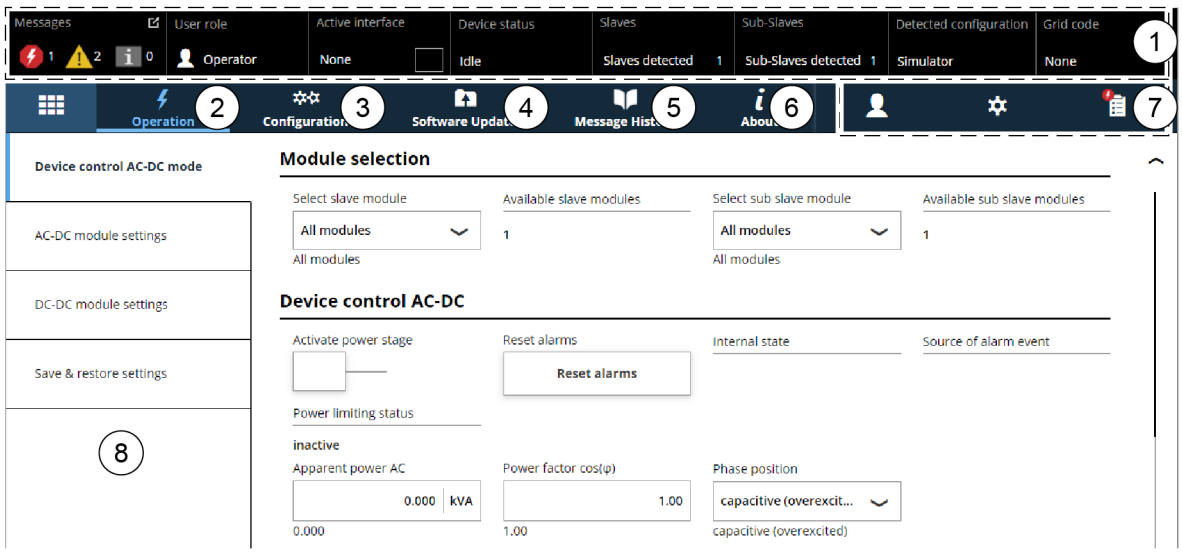
   IP address of the TruConvert System Control on delivery: 192.168.1.2

   The browser displays the user interface of the TruConvert System Control and the connected modules.

Orientation of the user interface

After entering the IP address in a web browser, the web GUI opens.

Start screen



1	Status bar (operating state)	4	Software update	7	Sidebar (user level, settings, current messages)
2	Main operating parameters (start page)	5	Message history	8	Submenu
3	System configuration	6	Device information (display only)		

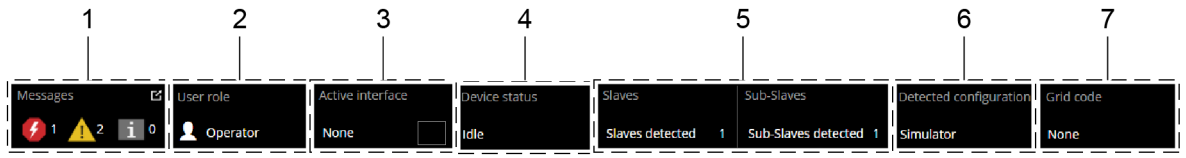
Start screen Fig. 43

User interface

1	Status bar	3	Submenu	5	Input area
2	Main menu	4	Expandable sidebar		

Arrangement of the user interface Fig. 44

Status bar signaling



1	Pending alarm, warning and info messages	4	Operating state	6	Detected system configuration
2	User level	5	Subordinate devices	7	Selected grid code
3	Active interface				

Status bar: information Fig. 45

Expandable sidebar

The sidebar is divided into three menu items that are labeled with an icon.

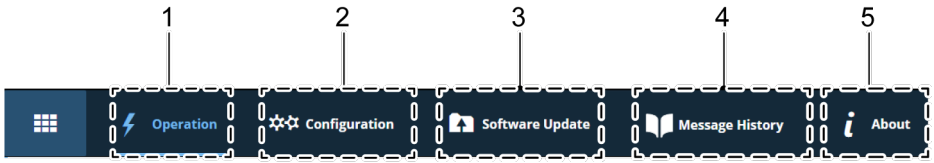
- User settings
- Network settings
- Pending messages

Simply click on the icon to open / close the submenu.

"Change user role" ▪ Display active user role. ▪ Change user role.	Set system clock and date.	"Pending messages" ▪ "Alarm" ▪ "Warning" ▪ "Info" **Note** The display can be activated / deactivated for each message type.
"Interface control" ▪ Activate the web GUI. ▪ Deactivate the web GUI.	Network settings ▪ enter ▪ edit	"Reset" Pending messages in the generator are deleted. More information, (see "Displaying and resetting messages", pg. 94).

Overview of expandable sidebar Tab. 22

Main menu



1	Diagnostics and input values	3	Software update	5	Device information
2	Parameter settings	4	Message history		

Main menu Fig. 46

Input area

Clicking on the submenu items opens the input area. Displayed here are the areas of the submenu items for reading or editing.

Operation is explained in the individual chapters of the function descriptions.

Input functions:

- Selection fields
- Input fields
- Slide control

Input fields

A new entry is activated by pressing the Enter key.

1	Input field	2	Value applied in the system

Confirm input Fig. 47

Slide control

The slide control is moved with a simple click.

1	Function inactive	2	Function active

Slide control Fig. 48

Menu structure

Global menu structure (expandable sidebar)

Main menu	Area	Description
Operation Settings	▪ *>Change User Role.* ▪ *>Interface Control.*	▪ Setting the user roles (For service only) ▪ Enabling interface, (see "Active interface", pg. 69).
System settings	▪ System clock and time setting ▪ Network settings	▪ (see "Setting the system time", pg. 125). ▪ (see "Changing network settings", pg. 126).
Messages	*>Pending messages*	(see "Displaying messages of the web GUI", pg. 94).

Menu structure of the sidebar Tab. 23

Menu structure of the main menu

Main menu	Submenu	Description
>Home	—	Start screen (see "Calling up the web GUI", pg. 70)
>Operation	*>Device control AC-DC* mode	(see "Transmission of power", pg. 91) (see "Actual values", pg. 100)
	>AC-DC module settings	"General AC settings" (see "Set process set values (AC-DC module settings)", pg. 65) "DC link settings" (see "Setting DC link with "voltage regulation" regulator type", pg. 101) "AC voltage control settings" (see "Operation with voltage regulation (grid-forming or grid-following mode)", pg. 106) "Stacked HV battery settings" (see "Operation with series-connected batteries", pg. 117) "Grid code control settings" (see "Setting grid codes", pg. 123)
	>DC-DC module settings	Menu item only present if the DC-DC modules are also connected to the AC-DC module. See the "TruConvert DC 1008-1010" or "TruConvert DC 1030" operator's manual.
	>Save & restore settings	(see "Saving parameters and resetting to factory settings", pg. 120)
>Configuration	*>System configuration*	(see "Setting the system configuration", pg. 121) (see "Communication timeout", pg. 69) (see "Setting grid codes", pg. 123)
>Software Update	—	(see "Perform software update", pg. 127)
>About	—	(see "Displaying device information", pg. 128)

Menu structure of the web GUI Tab. 24

7.4 Operation via Modbus

Protocol: TCP/UDP.

Differences for Modbus – user interface

Note

Operation via Modbus is the standard method of operation for regular operation.

Configuration, initial commissioning and software update of the TruConvert System Control and the connected modules can be performed via the user interface.

Function	User interface	Modbus
Operation	x	x
System configuration	x	x
Software update	x	—
Changing the IP address	x	—
Data backup	x	—

Differences in operation Tab. 25

Instructions for using Modbus

Instructions and information for using Modbus are given mainly in this sub-chapter "Operation via Modbus". The individual Modbus registers and their description can be found in the Modbus Register Map (see "Modbus Register Map", pg. 77).

In cases where a more detailed explanation of the procedure via Modbus is required, an additional description for using Modbus is given in the chapter "Operation" of the general description (web GUI).

Establishing a connection

Condition

- Initial commissioning was performed (see "Commissioning", pg. 63).

1. Connect the TruConvert System Control to the Modbus master with an Ethernet cable.
2. To switch on the system control and the modules: switch on the 24 V supply voltage.

The PCS (Power Conversion System) is ready for communication via Modbus.

Addressing modules via Modbus

Within a configuration consisting of the system control, multiple AC-DC modules and multiple DC-DC modules, it is possible to address a specific module directly via the Modbus.

There are two ways to address a module:

- Addressing with registers 4007 and 4010 (default setting)
- Addressing via slave ID/unit ID (alternative)

Only one of the two options can be selected. It is not possible to use both simultaneously.

Addressing modules via Modbus registers 4007 and 4010

1. To address an AC-DC module (slave modules), enter the following in register 4007:
   - 0 = Address all slave modules.
   - 1 – n = Address selected slave module.
2. To address a DC-DC module (subslave modules), enter the following in register 4010:
   - 0 = Address all subslave modules.
   - 1 – m = Address selected subslave module.

Address modules via slave ID (unit ID)

1. Set Modbus register 4011 to 1.
2. To address a module directly in the Modbus register:
   - Specify the address of the desired module in field "Slave-ID".
   - Observe the structure of the module address.

Structure of the module address	Description
AC-DC module ("Slave-ID")	▪ The slave ID has max. 3 digits (0 to 169). ▪ Slave ID = 1 to 16: The command is transmitted to the explicitly named slave (AC-DC module). ▪ Slave ID = 0: The command is transmitted to all connected slaves. ▪ Accesses to a slave register with slave IDs > 16 are ignored.
DC-DC module (combination of "Slave-ID" and "Sub slave module")	▪ Slave ID = (slave number x 10) + subslave number: The command is transmitted to the explicitly named "Sub slave module". ▪ Slave ID = 0: The command is transmitted to all connected subslaves. ▪ Accesses to a subslave register with slave IDs < 10 or > 169 are ignored.

Definition: structure of the module address Tab. 26

Register for	Slave no.	Sub slave no.	"Slave-ID"	Description
Slave	3	–	3	To slave 3.
Slave	0	–	0	To all slaves.
Subslave	1	4	14	To subslave 4 from slave 1.
Subslave	16	4	164	To subslave 4 from slave 16.
Subslave	1	0	10	To all subslaves from slave 1
Subslave	16	0	160	To all subslaves from slave 16
Subslave	0	0	0	To all subslaves.

Examples: structure of the module address Tab. 27

Modbus Register Map

- Base settings: address range 1000 to 1999
- Info system: address range 2000 to 2399
- Alarm and warning messages: address range 2400 to 3999
- Process set values: address range 4000 to 4999
- Process actual values: address range 5000 to 5999

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
1000	Date	dd.mm.yyyy					UINT32	Register	2	03	16
1002	Time	hh:mm:ss					UINT32	Register	2	03	16
1004	IP address	xxx.xxx.xxx.xxx		0xC0A80102	1	0xFFFFFFFF	UINT32	Register	2	04	
1006	Subnet	xxx.xxx.xxx.xxx		0xFFFFFF00	1	0xFFFFFFFF	UINT32	Register	2	04	
1008	Gateway	xxx.xxx.xxx.xxx		0xC0A80101	1	0xFFFFFFFF	UINT32	Register	2	04	
1010	Reset parameters to factory settings	-	1.0	0	0	1	UINT16	Coil	1	01	05

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
1016	Master communication timeout (65535 disables mechanism)	s	1.0	10	1		UINT16	Register	1	03	06
1017	Setting this flag will restart the CPU (only in idle or error state)	-	1.0	0	0	1	UINT16	Coil	1	01	05
1018	Setting for connected system configuration: No config = 0, Simulator config = 1, DC-DC only config = 2, n*AC-DC m*DC-DC config = 3	-	1.0	0	0	6	UINT16	Register	1	03	06
1026	1: triggerst automatic system software update (if necessary)			0	0	1	UINT16	Register	1	03	06
1027	1: automatic system software update required			0	0	1	UINT16	Register	1	04	
1028	Variable to save or reset customer values: 1: save parameter -1: restore default settings	-	1.0	0	-1	1	INT16	Register	1	03	06
2000	Serial number system control	String					UINT32	Register	2	04	16
2008	Serial number AC-DC module	-	1.0		0		UINT32	Register	2	03	16
2050	Integration level (device software)			0			UINT16	Register	1	03	
2051	Buildnumber of integration level			0			UINT16	Register	1	03	
6493	Material number AC-DC module	-	1.0		0		UINT32	Register	2	03	16
4000	Power stage configuration: 1 = power stage on; 0 = power stage off;	-	1.0	0	0	1	UINT16	Coil	1	01	05
4001	Configuration AC set values for phases L1 - L3: 1 = symmetric; 0 = asymmetric (individual configuration possible);	-	1.0	1	0	1	UINT16	Coil	1	01	05
4002	Resets current alarm and warning messages	-	1.0	0	0	1	UINT16	Coil	1	01	05

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
4005	Precharge DC link configuration: 0 = device waits for external precharge of DC link 1 = device precharges external DC link to necessary start-up voltage 2 = behaviour similar to 1 with additional support of DC submodules (necessary for island operation) 3 = device precharges external DC link to necessary start-up voltage and waits until PrechargeDcLinkConfig gets set back to 1 or 2	-	1.0	1	0	3	UINT16	Register	1	03	06
4006	Sets reference frame convention (0 = producer reference frame; 1 = consumer reference frame)	-	1.0	0	0	1	UINT16	Register	1	03	06
4007	Specifies the slave that will be addressed (0 = broadcast / same values for all slaves)	-	1.0	0	0	16	UINT16	Register	1	03	06
4008	Alarm policy for modules: 0 = strict (system switches to alarm state if at least one module is in alarm state) 1 = relaxed (system switches to alarm state if all modules are in alarm state)	-	1.0	0			UINT16	Register	1	03	06
4009	Grid type: 0 = grid-tied, 400V, 50Hz 1 = grid-tied, 480V, 60Hz 2 = island mode, 400V, 50Hz 3 = island mode, 480V, 60Hz 4 = grid-tied, 380V, 60Hz	-	1.0	0	0	4	UINT16	Register	1	03	06
4010	Specifies the sub slave that will be addressed (0 = broadcast / same values for all sub slaves)	-	1.0	0	0	16	UINT16	Register	1	03	06
4011	Use the modbus slave ID for addressing	-	1.0	0	0	1	UINT16	Coil	1	01	05

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
4012	Alarm policy for sub-modules: 0 = strict (AC-DC module switches to alarm state if at least one sub-module is in alarm state) 1 = relaxed (AC-DC module switches to alarm state if all sub-modules are in alarm state) 2 = off (If possible AC-DC module continues operation even if all sub-modules are in alarm state)	-	1.0	0	0	2	UINT16	Register	1	03	05
4182	0 = Power setpoints become active immediately 1 = Power setpoints become active after trigger is set (register 4183)	-	1.0	0	0	1	UINT16	Register	1	03	06
4183	0 = Idle 1 = Send power setpoints	-	1.0	0	0	1	UINT16	Register	1	03	06
4184	Switch to change inputs from S, cosphi, PhaseCap to P, Q	-	1.0	0	0	1	UINT16	Register	1	03	06
4185	Active Power set value AC (Only available with ARN4110 or AS/NZS 4777.2)	kW	0.001	0	-37500	37500	INT32	Register	2	03	16
4187	Reactive Power set value AC (Only available with ARN4110 or AS/NZS 4777.2)	kVAr	0.001	0	-37500	37500	INT32	Register	2	03	16
4189	Active Power set value AC L1 (Only available with ARN4110 or AS/NZS 4777.2)	kW	0.001	0	-12500	12500	INT16	Register	1	03	06
4190	Active Power set value AC L2 (Only available with ARN4110 or AS/NZS 4777.2)	kW	0.001	0	-12500	12500	INT16	Register	1	03	06
4191	Active Power set value AC L3 (Only available with ARN4110 or AS/NZS 4777.2)	kW	0.001	0	-12500	12500	INT16	Register	1	03	06
4192	Reactive Power set value AC L1 (Only available with ARN4110 or AS/NZS 4777.2)	kVAr	0.001	0	-12500	12500	INT16	Register	1	03	06
4193	Reactive Power set value AC L2 (Only available with ARN4110 or AS/NZS 4777.2)	kVAr	0.001	0	-12500	12500	INT16	Register	1	03	06

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
4194	Reactive Power set value AC L3 (Only available with ARN4110 or AS/NZS 4777.2)	kVAr	0.001	0	-12500	12500	INT16	Register	1	03	06
4195	Signed power set value AC (sign influences cos phi)	kVA	0.001	0	-32000	32000	INT16	Register	1	03	06
4196	Signed power set value AC L1 (sign influences cos phi)	kVA	0.001	0	-12500	12500	INT16	Register	1	03	06
4197	Signed power set value AC L2 (sign influences cos phi)	kVA	0.001	0	-12500	12500	INT16	Register	1	03	06
4198	Signed power set value AC L3 (sign influences cos phi)	kVA	0.001	0	-12500	12500	INT16	Register	1	03	06
4199	Power set value AC	kVA	0.001	0	0	37500	UINT16	Register	1	03	06
4200	Power set value AC L1	kVA	0.001	0	0	12500	UINT16	Register	1	03	06
4201	Power set value AC L2	kVA	0.001	0	0	12500	UINT16	Register	1	03	06
4202	Power set value AC L3	kVA	0.001	0	0	12500	UINT16	Register	1	03	06
4203	Maximum grid current RMS L1 (charging and discharging)	A	0.01	8000	0	8000	UINT16	Register	1	03	06
4204	Maximum grid current RMS L2 (charging and discharging)	A	0.01	8000	0	8000	UINT16	Register	1	03	06
4205	Maximum grid current RMS L3 (charging and discharging)	A	0.01	8000	0	8000	UINT16	Register	1	03	06
4206	Set value cos phi L1	-	0.01	100	-100	100	INT16	Register	1	03	06
4207	Set value cos phi L2	-	0.01	100	-100	100	INT16	Register	1	03	06
4208	Set value cos phi L3	-	0.01	100	-100	100	INT16	Register	1	03	06
4213	Phase L1 inductive/capacitive (TRUE = capacitive)	-	1.0	1	0	1	UINT16	Coil	1	01	05
4214	Phase L2 inductive/capacitive (TRUE = capacitive)	-	1.0	1	0	1	UINT16	Coil	1	01	05
4215	Phase L3 inductive/capacitive (TRUE = capacitive)	-	1.0	1	0	1	UINT16	Coil	1	01	05
4216	Phases are inductive/capacitive (TRUE = capacitive)	-	1.0	1	0	1	UINT16	Coil	1	01	05
4217	Set value cos phi for L1-L3	-	0.01	100	-100	100	INT16	Register	1	03	06
4218	Set value sin phi L1-L3	-	0.01	0	-100	100	INT16	Register	1	03	06

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
4219	Set value sin phi L1	-	0.01	0	-100	100	INT16	Register	1	03	06
4220	Set value sin phi L2	-	0.01	0	-100	100	INT16	Register	1	03	06
4221	Set value sin phi L3	-	0.01	0	-100	100	INT16	Register	1	03	06
4222	Frequency offset in island operation	Hz	0.01	0	-500	500	INT16	Register	1	03	06
4223	Voltage adjustment factor in island operation	%	1.0	100	75	120	UINT16	Register	1	03	06
4224	Set value for balancer controller, for voltage difference (pos - neg) of internal DC-Bus voltages.	V	0.01	0	-15000	15000	INT16	Register	1	03	06
4225	Voltage reserve of DC link at pre-charge	V	1.0	10	-10		INT16	Register	1	03	06
4226	max. instantaneous current (pos/neg) L1 (in grid-forming mode)	A	0.01	12500	0	15000	UINT16	Register	1	03	06
4227	max. instantaneous current (pos/neg) L2 (in grid-forming mode)	A	0.01	12500	0	15000	UINT16	Register	1	03	06
4228	max. instantaneous current (pos/neg) L3 (in grid-forming mode)	A	0.01	12500	0	15000	UINT16	Register	1	03	06
4229	Voltage source mode, grid-forming: 0 = not grid-forming (grid-following) 1 = grid-forming	-	1.0	1	0	1	UINT16	Register	1	03	06
4230	DC link reference voltage 380/400V grid	V	0.1	8500	6000	9500	UINT16	Register	1	03	06
4231	DC link min voltage 380/400V grid	V	0.1	8300	6000	9500	UINT16	Register	1	03	06
4232	DC link max voltage 380/400V grid	V	0.1	8700	6000	9600	UINT16	Register	1	03	06
4233	DC link reference voltage 480V grid	V	0.1	9000	6000	9500	UINT16	Register	1	03	06
4234	DC link min voltage 480V grid	V	0.1	8800	6000	9500	UINT16	Register	1	03	06
4235	DC link max voltage 480V grid	V	0.1	9200	6000	9600	UINT16	Register	1	03	06
4236	Frequency slope in function fN = f(active grid power) of droop control in island operation.	%	0.01	200	10	400	UINT16	Register	1	03	06
4237	Voltage slope in function VN = f(reactive grid power) of droop control in island operation.	%	0.01	500	10	1000	UINT16	Register	1	03	06

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
4238	Maximum (positive) difference frequency of the linearization point above the nominal frequency in combined controller mode (parameter for the statics controller).	Hz	0.01	250	-600	600	INT16	Register	1	03	06
4239	Maximum (negative) difference frequency of the linearization point below the nominal frequency in combined controller mode (parameter for the statics controller).	Hz	0.01	-250	-600	600	INT16	Register	1	03	06
4240	Factor for the maximum voltage of the linearization point with respect to the nominal voltage in combined controller mode (parameter for the statics controller).	%	1.0	115	75	120	UINT16	Register	1	03	06
4241	Factor for the minimum voltage of the linearization point with respect to the nominal voltage in combined controller mode (parameter for the statics controller).	%	1.0	85	75	120	UINT16	Register	1	03	06
4242	Max Time until the controller starts to control after closing the relay	ms	1.0	100	0	10000	UINT16	Register	1	03	06
4243	Voltage at which the droop control function delivers the maximum possible intervention due to maximum DC-bus voltage. Value applies to grids with voltages greater than 440 V (US grid).	V	0.1	9500	6000	9600	UINT16	Register	1	03	06
4244	Voltage at which the droop control function starts to intervene due to a too high DC link voltage. Value applies to grids with voltages greater than 440 V (US grid).	V	0.1	9150	6000	9590	UINT16	Register	1	03	06
4245	Voltage at which the droop control function starts to intervene due to a too low DC link voltage. Value applies to grids with voltages greater than 440 V (US grid).	V	0.1	8850	6000	9500	UINT16	Register	1	03	06

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
4246	Voltage at which the droop control function delivers the maximum possible intervention due to minimum DC-bus voltage. Value applies to grids with voltages greater than 440 V (US grid).	V	0.1	8500	6000	9490	UINT16	Register	1	03	06
4247	Voltage at which the droop control function delivers the maximum possible intervention due to maximum DC-bus voltage. Value applies to grids with voltages lower than 440 V (no US grid).	V	0.1	9300	6000	9600	UINT16	Register	1	03	06
4248	Voltage at which the droop control function starts to intervene due to a too high DC link voltage. Value applies to grids with voltages lower than 440 V (no US grid).	V	0.1	8700	6000	9590	UINT16	Register	1	03	06
4249	Voltage at which the droop control function starts to intervene due to a too low DC link voltage. Value applies to grids with voltages lower than 440 V (no US grid).	V	0.1	8300	6000	9500	UINT16	Register	1	03	06
4250	Voltage at which the droop control function delivers the maximum possible intervention due to minimum DC-bus voltage. Value applies to grids with voltages lower than 440 V (no US grid).	V	0.1	7500	6000	9490	UINT16	Register	1	03	06
4251	Time constant for the DC-bus droop control function.	ms	1.0	33	1	50000	UINT16	Register	1	03	06
4252	HB PWM ON(=2); AUTOMATIC(=1); OFF(=0)	-	1.0	1	0	2	UINT16	Register	1	03	06
4253	Gain factor for controlling the influence of the "symmetration/asymmetration from grid" (0..1).		0.01	100	0	100	UINT16	Register	1	03	06
4280	Sets the output power to S = 0 kVA. Only available for some grid code functions.	-	1.0	0	0	1	UINT16	Register	1	03	06
4281	maximum P, controllable by VNB via ModBus. 100 % is equivalent to Smax * OLC (e.G. 25000 * 1,5 = 37500)	W	0.01	15000	0	20000	UINT16	Register	1	03	06

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
4282	Activates a startup ramp. Only available for some grid code functions.	-	1.0	0	0	1	UINT16	Register	1	03	06
4300	Configuration DC stage: 0 = DC module is off, power electronic circuit is deactivated, battery voltage can be measured. 1 = DC module is active (DC link voltage control) 2 = DC module is active (current source mode or in DC droop mode)	-	1.0	1	0	2	UINT16	Register	1	03	06
5000	State of device: PowerUP -> 0, Error -> 1, Idle -> 2, Operation -> 3, Maintenance -> 4	-	1.0	-1	-2	10	INT16	Register	1	04	
5001	Number of connected slave modules	cnt	1.0	0		16	UINT16	Register	1	04	
5002	Number of connected sub slave modules	cnt	1.0	0	0	5	UINT16	Register	1	04	
5020	Nominal grid frequency	Hz	0.1	500			UINT16	Register	1	04	
5021	Nominal grid voltage	V	1.0	400			UINT16	Register	1	04	
5022	Nominal apparent power capability	VA	1.0	25000			UINT16	Register	1	04	
5023	Actvie grid type: 0 = grid-tied, 400V, 50Hz 1 = grid-tied, 480V, 60Hz 2 = island mode, 400V, 50Hz 3 = island mode, 480V, 60Hz 4 = grid-tied, 380V, 60Hz	-	1.0	0	0		UINT16	Register	1	04	
5024	Status of power limiting controller 0 = inactive, 1 = DC link limiting controller active 2 = grid code limiting active 3 = overload limiting active 4 = temperature derating active		1.0	0	0	10	UINT16	Register	1	04	
5025	Active DC link reference voltage	V	0.1	0	6000	9500	UINT16	Register	1	04	

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
5026	Active DC link min voltage	V	0.1	0	6000	9500	UINT16	Register	1	04	
5027	Active DC link max voltage	V	0.1	0	6000	9600	UINT16	Register	1	04	
5028	Voltrage threshold of DC link half	V	0.01	0	0	50000	UINT16	Register	1	04	
5029	Active voltage source mode, grid-forming: 0 = not grid-forming (grid-following) 1 = grid-forming	-	1.0	1	0	1	UINT16	Register	1	04	
5030	State inverter: 0 = Idle 1 = DC link internal test 2 = DC syncronize to external voltage 3 = DC link charge 4 = AC syncronize to external voltage 5 = AC close mains contactor 6 = AC connected 7 = AC open mains contactor 99 = Alarm 100 = Parameter not valid for chosen module		1.0	100	0	100	UINT16	Register	1	04	

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
5031	Indicates the source of the alarm event: 0 = Idle state 1 = DC link internal test state 2 = DC syncronize to external voltage state 3 = DC link charge state 4 = AC syncronize to external voltage state 5 = AC close mains contactor state 6 = AC connected state 7 = AC open mains contactor state 99 = Alarm state 100 = No alarm present or parameter not valid for chosen module 101 = RS-485 master		1.0	100	0	101	UINT16	Register	1	04	
5032	Voltage at which the droop control function delivers the maximum possible intervention due to maximum DC-bus voltage.	V	0.1	0	6000	9600	UINT16	Register	1	04	
5033	Voltage at which the droop control function starts to intervene due to a too high DC link voltage.	V	0.1	0	6000	9590	UINT16	Register	1	04	
5034	Voltage at which the droop control function starts to intervene due to a too low DC link voltage.	V	0.1	0	6000	9500	UINT16	Register	1	04	
5035	Voltage at which the droop control function delivers the maximum possible intervention due to minimum DC-bus voltage.	V	0.1	0	6000	9500	UINT16	Register	1	04	
5037	Maximum possible voltage adjustment factor given by the available DC link voltage halfes (for voltage regulation).	%	1.0	110			UINT16	Register	1	04	
5038	Voltage adjustment factor	%	1.0	100			UINT16	Register	1	04	
5130	Apparent power L1	kVA	0.001		0		UINT16	Register	1	04	

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
5131	Apparent power L2	kVA	0.001		0		UINT16	Register	1	04	
5132	Apparent power L3	kVA	0.001		0		UINT16	Register	1	04	
5133	Overload capacity L1	%	0.1	0	0	1000	UINT16	Register	1	04	
5134	Overload capacity L2	%	0.1	0	0	1000	UINT16	Register	1	04	
5135	Overload capacity L3	%	0.1	0	0	1000	UINT16	Register	1	04	
5140	Active power L1 with corrected sign	kW	0.001				INT16	Register	1	04	
5141	Active power L2 with corrected sign	kW	0.001				INT16	Register	1	04	
5142	Active power L3 with corrected sign	kW	0.001				INT16	Register	1	04	
5150	Grid current RMS L1	A	0.01		0	8800	UINT16	Register	1	04	
5151	Grid current RMS L2	A	0.01		0	8800	UINT16	Register	1	04	
5152	Grid current RMS L3	A	0.01		0	8800	UINT16	Register	1	04	
5160	Grid voltage RMS L1	V	0.1		0	3100	UINT16	Register	1	04	
5161	Grid voltage RMS L2	V	0.1		0	3100	UINT16	Register	1	04	
5162	Grid voltage RMS L3	V	0.1		0	3100	UINT16	Register	1	04	
5170	cos phi L1	-	0.01		-100	100	INT16	Register	1	04	
5171	cos phi L2	-	0.01		-100	100	INT16	Register	1	04	
5172	cos phi L3	-	0.01		-100	100	INT16	Register	1	04	
5180	Sum apparent power L1	kVA	0.001				UINT32	Register	2	04	
5182	Sum apparent power L2	kVA	0.001				UINT32	Register	2	04	
5184	Sum apparent power L3	kVA	0.001				UINT32	Register	2	04	
5186	Sum power L1	kW	0.001				INT32	Register	2	04	
5188	Sum power L2	kW	0.001				INT32	Register	2	04	
5190	Sum power L3	kW	0.001				INT32	Register	2	04	
5200	Grid frequency (If outside of 45-65Hz range or Vg_rms below 35 V, -1 will be promted.)	Hz	0.01	0	-100	7000	INT16	Register	1	04	

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
5210	Intern DC link voltage upper half	V	1.0	0	0	1100	UINT16	Register	1	04	
5211	Intern DC link voltage lower half	V	1.0	0	0	1100	UINT16	Register	1	04	
5212	Extern DC link voltage upper half	V	1.0	0	0	1100	UINT16	Register	1	04	
5213	Extern DC link voltage lower half	V	1.0	0	0	1100	UINT16	Register	1	04	
5220	Voltage internal N to PE	V	0.1	0			INT16	Register	1	04	
5221	Voltage external N to PE	V	0.1	0			INT16	Register	1	04	
5231	Reactive Power L1 with corrected sign	kVAr	0.001				INT16	Register	1	04	
5232	Reactive Power L2 with corrected sign	kVAr	0.001				INT16	Register	1	04	
5233	Reactive Power L3 with corrected sign	kVAr	0.001				INT16	Register	1	04	
5234	Sum Reactive Power L1	kVAr	0.001				INT32	Register	2	04	
5236	Sum Reactive Power L2	kVAr	0.001				INT32	Register	2	04	
5238	Sum Reactive Power L3	kVAr	0.001				INT32	Register	2	04	
5500	Inlet air temperature	°C	0.1	0			INT16	Register	1	04	
5501	Temperature sensor for IGBT module L1	°C	0.1	0			UINT16	Register	1	04	
5502	Temperature sensor for IGBT module L2	°C	0.1	0			UINT16	Register	1	04	
5503	Temperature sensor for IGBT module L3	°C	0.1	0			UINT16	Register	1	04	
5504	Temperature sensor for IGBT balancer module	°C	0.1	0			UINT16	Register	1	04	
5505	Fan revolutions per minute	rpm	1.0				UINT16	Register	1	04	
2401	Sum of all pending warnings	Count			0		UINT16	Register	1	04	
2402	Count of pending module specific warnings	Count					UINT16	Register	1	04	
2403	Warning code of alarm 1						UINT16	Register	1	04	
2404	Warning code of alarm 2						UINT16	Register	1	04	
2405	Warning code of alarm 3						UINT16	Register	1	04	
2406	Warning code of alarm 4						UINT16	Register	1	04	
2407	Warning code of alarm 5						UINT16	Register	1	04	

Addr	Description	Unit	Resolu-tion	Default	Min	Max	Datatype	Type	Length	FCr	FCw
2408	Warning code of alarm 6						UINT16	Register	1	04	
2409	Warning code of alarm 7						UINT16	Register	1	04	
2410	Warning code of alarm 8						UINT16	Register	1	04	
2411	Warning code of alarm 9						UINT16	Register	1	04	
2412	Warning code of alarm 10						UINT16	Register	1	04	
2413	Warning code of alarm 11						UINT16	Register	1	04	
2414	Warning code of alarm 12						UINT16	Register	1	04	
2415	Warning code of alarm 13						UINT16	Register	1	04	
2416	Warning code of alarm 14						UINT16	Register	1	04	
2417	Warning code of alarm 15						UINT16	Register	1	04	
2418	Warning code of alarm 16						UINT16	Register	1	04	
2419	Warning code of alarm 17						UINT16	Register	1	04	
2420	Warning code of alarm 18						UINT16	Register	1	04	
2421	Warning code of alarm 19						UINT16	Register	1	04	
2422	Warning code of alarm 20						UINT16	Register	1	04	
2808	Sum of all pending alarms	Count			0		UINT16	Register	1	04	
2809	Count of pending module specific alarms	Count					UINT16	Register	1	04	
2810	Alarm code of alarm 1						UINT16	Register	1	04	
2811	Alarm code of alarm 2						UINT16	Register	1	04	
2812	Alarm code of alarm 3						UINT16	Register	1	04	
2813	Alarm code of alarm 4						UINT16	Register	1	04	
2814	Alarm code of alarm 5						UINT16	Register	1	04	
2815	Alarm code of alarm 6						UINT16	Register	1	04	
2816	Alarm code of alarm 7						UINT16	Register	1	04	
2817	Alarm code of alarm 8						UINT16	Register	1	04	

Addr	Description	Unit	Resolution	Default	Min	Max	Datatype	Type	Length	FCr	FCw
2818	Alarm code of alarm 9						UINT16	Register	1	04	
2819	Alarm code of alarm 10						UINT16	Register	1	04	
2820	Alarm code of alarm 11						UINT16	Register	1	04	
2821	Alarm code of alarm 12						UINT16	Register	1	04	
2822	Alarm code of alarm 13						UINT16	Register	1	04	
2823	Alarm code of alarm 14						UINT16	Register	1	04	
2824	Alarm code of alarm 15						UINT16	Register	1	04	
2825	Alarm code of alarm 16						UINT16	Register	1	04	
2826	Alarm code of alarm 17						UINT16	Register	1	04	
2827	Alarm code of alarm 18						UINT16	Register	1	04	
2828	Alarm code of alarm 19						UINT16	Register	1	04	
2829	Alarm code of alarm 20						UINT16	Register	1	04	

Modbus Tab. 28

7.5 Transmission of power

Switching the transmission of power on/off

Conditions

- Initial commissioning was performed (see "Commissioning", pg. 63).
- Operation via web GUI and/or Modbus.

Note

User interface and Modbus may have different scaling. For Modbus parameters, the resolutions specified in the Modbus Register Map must be taken into account (see "Modbus Register Map", pg. 77).

For example:
Enter 100 A for parameter "Max. charging current, DC module 1" with resolution 0.1:
Input via web GUI: 100.0
Transfer via Modbus: 1000.

Selecting an AC-DC module

1. Selection of an AC-DC module (only relevant if multiple modules are connected to a TruConvert System Control).
   - Select >*Operation* >*Device control AC-DC mode*.

     In the "Module selection" area under "Select slave module", select a module.
   - Modbus: Enter the number of the module to be addressed (see "Tab. 28", pg. 91).

Entering process set values: S, cos(φ), phase position

The set value specification differs depending on the installation location of the system and the thereby selected grid code. Thus, a set value specification of S, cosPhi and phase position is possible in some regions while a set value specification of P and Q is possible in others.

2. Enter set value for the apparent power in kVA:
   - Select >*Operation* >*Device control AC-DC mode*.
   - In the "Device control AC-DC" section under "Apparent power AC", enter the value[10].
   - Press key ↵.
3. For "Power factor cos(φ)", enter:
   - Value between: -1 to +1 (in increments of 0.01)[12].

     Press key ↵.
   - Modbus: Value between: -100 to +100 (in increments of 1).
   - Note the selected reference arrow system and set the sign accordingly.
4. Under "Phase position", select:
   - "inductive" (default setting)
   - "capacitive"

Entering process set values: P and Q

5. Enter set value for the effective power in kW:
   - Select >*Operation* >*Device control AC-DC mode*.

     In the "Device control AC-DC" section under "Active power AC", enter the value[11].
   - Press key ↵.
   - Note the selected reference arrow system and set the sign accordingly.
6. Enter set value for the reactive power in kVAr:
   - Under "Reactive power AC", enter the value[12].

     Press key ↵.
   - Note the selected reference arrow system and set the sign accordingly.

10 In the user interface, a period character is used as the decimal separator.

11 In the user interface, a period character is used as the decimal separator.

12 In the user interface, a period character is used as the decimal separator.

If no reactive power Q can be entered:

A setting has been selected in the grid codes that does not permit the manual entry of the value.

- ➢ Only enter the set value for the effective power P.
- ➢ (see supplement to the "TruConvert System Control, Grid Codes" operator's manual)

Changing process set values: S and cos(φ) ⇔ P and Q

Depending on the installation location of the system and the thereby selected grid code, it may be possible to switch between the two input forms for process set values.

7. Selecting input forms for process set values:
   - Select >*Operation* >*Device control AC-DC mode*.
     In the "Device control settings AC-DC" section, select the desired input form under "Power setpoint type".
   - Press key ↵.

Precharging DC link voltage

8. In the "Device control settings AC-DC" area under "DC link precharge config", set from which side the DC link voltage is to be precharged:

Web GUI	Modbus register 4005	Description
	Bit	
external	0	Device is waiting for external precharging of the DC link.
internal	1	Device is charging the DC link to the required voltage.
internal with DC module	2	Setting similar to "internal" with support of the DC-DC modules (required in isolated mode).
internal & wait	3	Device is charging the DC link to the required voltage and is waiting until "DC link precharge config" is set back to "internal" or "internal with DC module" in order to connect to the AC grid.

Tab. 29

Start transmission of power

9. Start transmission of power:
   - Select >*Operation* >*Device control AC-DC mode*.
     Under "Activate power stage": click on the slide control.
   - Modbus: Register for power operation, set bit = 1 (see "Tab. 28", pg. 91).

   The regulator slides to the right and is displayed in blue.

Stop transmission of power

10. To stop the transmission of power:

- Under "Activate power stage": click on the slide control..
- Modbus: Register for power operation, set bit = 0 (see "Tab. 28", pg. 91).

Starting/stopping power transmission for other AC-DC modules

11. Starting/stopping power transmission for other AC-DC modules

➢ Select another AC-DC module (via user interface or slave address via Modbus) and perform the previous steps again.

or

➢ To switch on all AC-DC modules simultaneously:

- In the "Module selection" section under "Select slave module", select = "All modules".
- Modbus: Enter the number of the slave to be addressed = "0".

➢ Start transmission of power.

Simultaneously changing set values for power transfer

By default, each set value change is applied immediately. This can result in undesired intermediate states until all new set values have been entered. This can be avoided by using function "Activate power setpoint trigger". First, all three set values can be entered for the power transfer ("Apparent power AC", "Power factor cos(φ)", "Phase position"). The changed set values are then adopted at the same time.

12. To transfer the set values simultaneously:

- In the "Device control settings AC-DC" section under "Activate power setpoint trigger": click on the slide control..

  The "Send power setpoints" button appears in the "Device control AC-DC" section.
- Enter the new set values in the "Device control AC-DC" section.
- Click on "Send power setpoints".

or

➢ Modbus:

- Register 4182 "Activate power setpoint trigger": Set bit = 1.
- In the registers for the set values: Enter the new set values.
- Register 4183 "Send power setpoints" Set bit = 1.

7.6 Displaying and resetting messages

Displaying messages of the web GUI

There are various options for reading the pending messages:

- Status bar: type and number of pending messages, .
- "Message History" Main menu, (see "Orientation of the user interface", pg. 70): type, code, module, date/time.
- Expandable sidebar: type, number, code, module, date/time and message text.

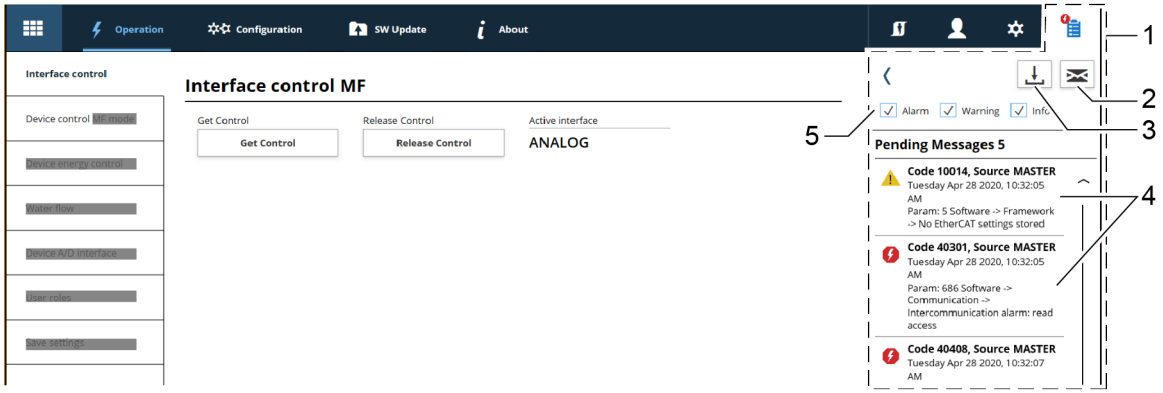
Displaying messages

If a message is pending, the icon for messages in the sidebar is colored orange or red . If there are any warnings present, the icon is orange. If at least one alarm is pending, the icon is colored red.

1 "Message" icon: Color coding of pending messages
2 Sidebar

Sidebar, collapsed Fig. 49

1. In the sidebar, click on the icon to display the messages.



1 Displayed messages
2 Send messages as e-mail
3 Save messages as list
4 Alarm and warning messages
5 Display/hide messages by type

Sidebar, expanded Fig. 50

A message consists of 3 components: "Code" (message number), "Source" (originator) and message text.

- The module that has caused the message is indicated by the description and number in the "Source" field.

  MASTER = System control

- SLAVE = AC-DC module

  Each slave number has 4 digits. The first 2 digits stand for the slave modules (AC-DC modules) connected to the system control, and the 3rd and 4th digits stand for the subslave modules (DC-DC modules).

Example:
Source: Slave 0204 → A subslave 04 (DC-DC module) is connected to slave 02 (AC-DC module). DC-DC module number 4 has caused the message.

- If TRUMPF Service is to be contacted, it is recommended to note down the message number.

Tip

To display the window of the sidebar larger: click on the ‹ arrow.

To hide the window of the sidebar: click on the active icon again.

Download alarm list

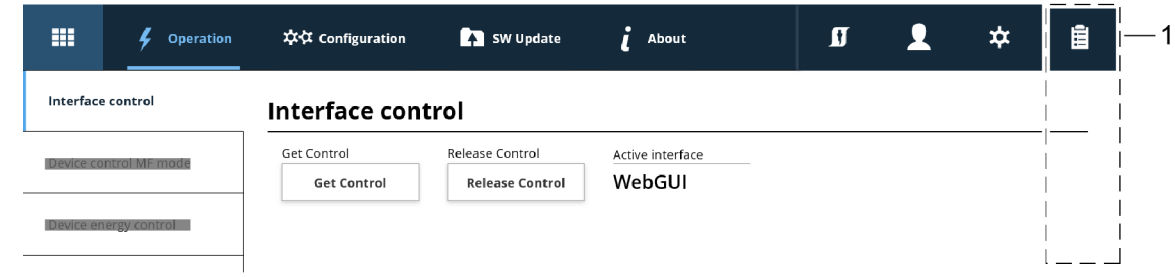
2. To download a list of all alarm messages that have occurred:
   - Press the "Meldungen als Liste speichern" (3) button.
   - Save as a csv file.
3. To generate a prepared e-mail to TRUMPF Service:
   - Press the "Meldungen als E-Mail verschicken" (2) button.
   - Press "Save " download to save the zip file on the PC.
   - The e-mail program opens and displays a prepared e-mail.
   - Attach the zip file saved under >*Downloads* on the PC.

Reset messages

4. In the sidebar, click on the icon to display the messages.
5. Press "Reset".

   The icon turns white again. All messages are reset.
6. Hide messages:

   To hide the window of the sidebar: click on the active icon again.



1 Icon inactive: no message

Sidebar, collapsed, no messages Fig. 51

7. To reset the messages of a specific module:

- Select >*Operation* >*Device control DC-DC mode*.
- In the "Module selection" area under "Select slave module", select a module.
- In the "Device control DC-DC" section, press "Reset alarms".

All messages of the selected module are reset.

If the message is not reset:

➢ If MASTER is displayed under "Source", select "All modules" under "Select slave module". All messages are reset, including the messages from the master (system control).

➢ If SLAVE 1 is display under "Source", select "Module 1" under "Slave module selection" in order to reset only the messages from slave 1 and its subslaves.

Modbus: displaying and resetting messages

Two types of message types are used: alarm, warning.

The number of pending messages can be queried by message type and the message numbers read out.

Displaying the number of all pending messages

1. Read out the number of current alarm/warning messages that have occurred on the entire system:
   - Sum of the alarm messages: register 2808
   - Sum of the warning message: register 2401
   - (see "Tab. 28", pg. 91)

   The number of all messages that occurred in the system is output.

Displaying the number of messages pending on the selected module

2. Read out the number of current alarm/warning messages that have occurred on the selected module:
   - Sum of the alarm messages: register 2809
   - Sum of the warning messages: register 2402

   The number of all messages that have occurred on the selected module is output.

Reading out message numbers

3. Read out message numbers (alarm/warning messages 1 to 20) that have occurred on the selected module:

- Alarm messages: registers 2810 – 2829
- Warning message: registers 2403 – 2422
- The corresponding message number is stored in each register.

All message numbers that have occurred at the selected module are stored in these register areas as a kind of overview list. The message numbers are stored in the order in which they occurred (e.g., alarm message 1 in register 2810, alarm message 2 in register 2811, etc.). The corresponding texts are listed in the message table(see "Messages", pg. 131).

Reset messages

4. Reset messages:
   - Select the desired module (see "Addressing modules via Modbus registers 4007 and 4010", pg. 76).
   - Modbus: (see "Tab. 28", pg. 91)

     For Modbus register 4002, set "Alarm reset" bit = 1.

   All messages are reset. No further messages are pending.

   If the cause of a message persists, this message is displayed again.

7.7 Overload

To permit load peaks when starting up motors or when starting devices, the modules can be operated in overload operation. This method of operation is permissible only for a short time and is regulated accordingly by the system.

The overload is monitored and regulated separately for each phase.

Operating with overload

Note

Overload operation is possible only in the following ambient temperature ranges:

– Charging: -5°C to 35°C.

– Discharging: -5°C to 40°C.

Via user interface

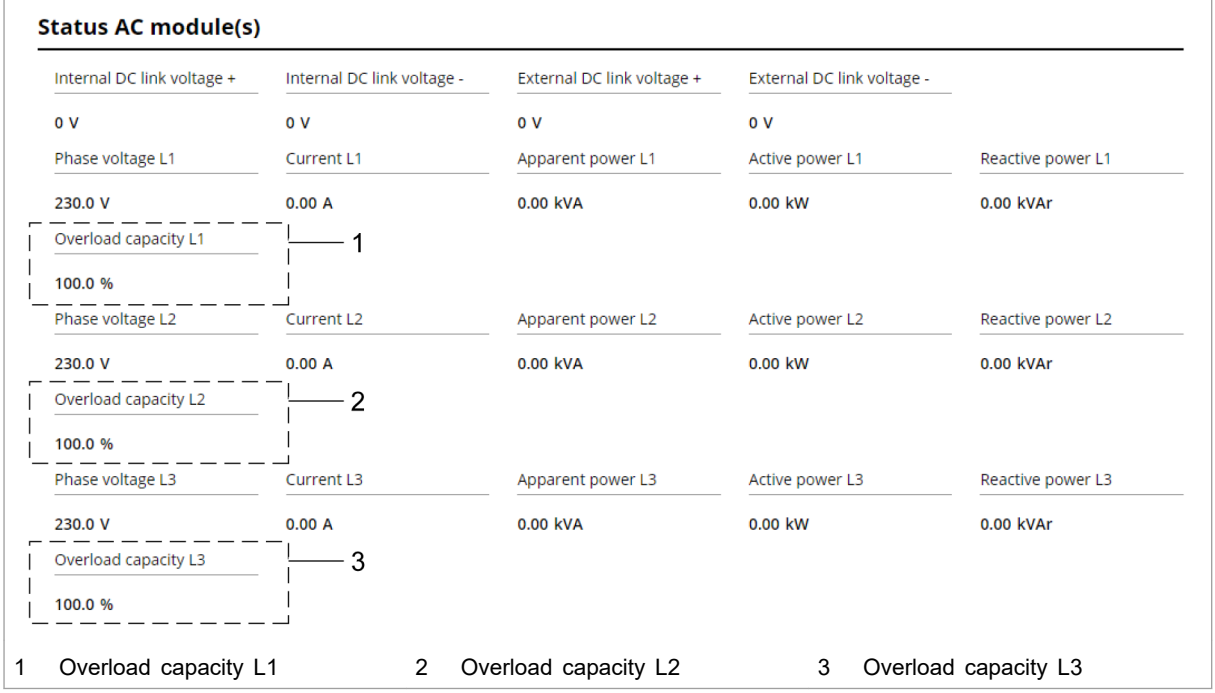
1. >*Operation* >*Device control AC-DC mode* under "Apparent power AC":

   Increase the maximum values for the apparent power.

   Increase the apparent power up to max. 37.5 kVA.

2. Start transmission of power.

   As soon as a higher phase current and AC power that is higher than the nominal apparent power is called, the system can supply this for a certain time span.



Status display for the overload capacity (user interface) Fig. 52

The overload capacities are displayed in the "Status AC module(s)" section.

During overload operation, the overload capacity is reduced continuously. The still remaining overload capacity is displayed on the user interface in percent. As soon as the overload capacity has dropped to "0%", only operation at nominal apparent power is possible.

Exception:
In grid-forming mode (see "Operation with voltage regulation (grid-forming or grid-following mode)", pg. 106), the formed grid cannot be sustained with an overload capacity of "0 %". The device switches off with a corresponding message. In addition, a message is displayed regarding overcurrent on the respective phase.

To restore the overload capacity, the AC-DC module must be operated for a period of time at less than 90% or less than 80% of the nominal power.

Via the Modbus

3. Increase the maximum values for the apparent power.

   Modbus registers 5130/5131/5132 "Apparent power Lx".

   Modbus: (see "Tab. 28", pg. 91)

4. Start transmission of power.

Set Modbus register 4000 "Power stage configuration" bit = 1.

5. Read out overload capacities.

   Modbus registers 5133/5134/5135 "Overload capacity Lx".

Examples: Reduce and then again increase overload capacity

Reduce overload capacity from 100% to 0%

The overload capacity drops from 100% to 0% if the system is operated at overload with:

- AC power set value between 100% and 125%.
  For 10 minutes.
  or
- AC power set value between 125% and 150%.
  For 1 minute.

Increase overload capacity again from 0% to 100%

The overload capacity increases again from 0% to 100% if the system is operated under normal load with:

- AC power set value of <90%.
  For 20 minutes.
  or
- AC power set value of <80%.
  For 10 minutes.

7.8 Actual values

Display actual values

Display AC values

➢ Display the current values at the grid connection of the AC-DC module.

- Select >*Operation* >*Device control AC-DC mode*.
  In the "Module selection" section under "Select slave module", select the desired module. Or select "All modules" in order to display the generally applicable or sum values of all modules (0 is displayed in the case of values that cannot be summed).
  Read the actual values in the "Status AC module(s)" section.
- Modbus: (see "Tab. 28", pg. 91)
  Read actual value.

7.9 Process set values

Set process set values

➢ Set the process set values via the web GUI: (see "Set process set values (AC-DC module settings)", pg. 65).

or

➢ Set the process set values via Modbus registers: (see "Tab. 28", pg. 91).

7.10 DC link

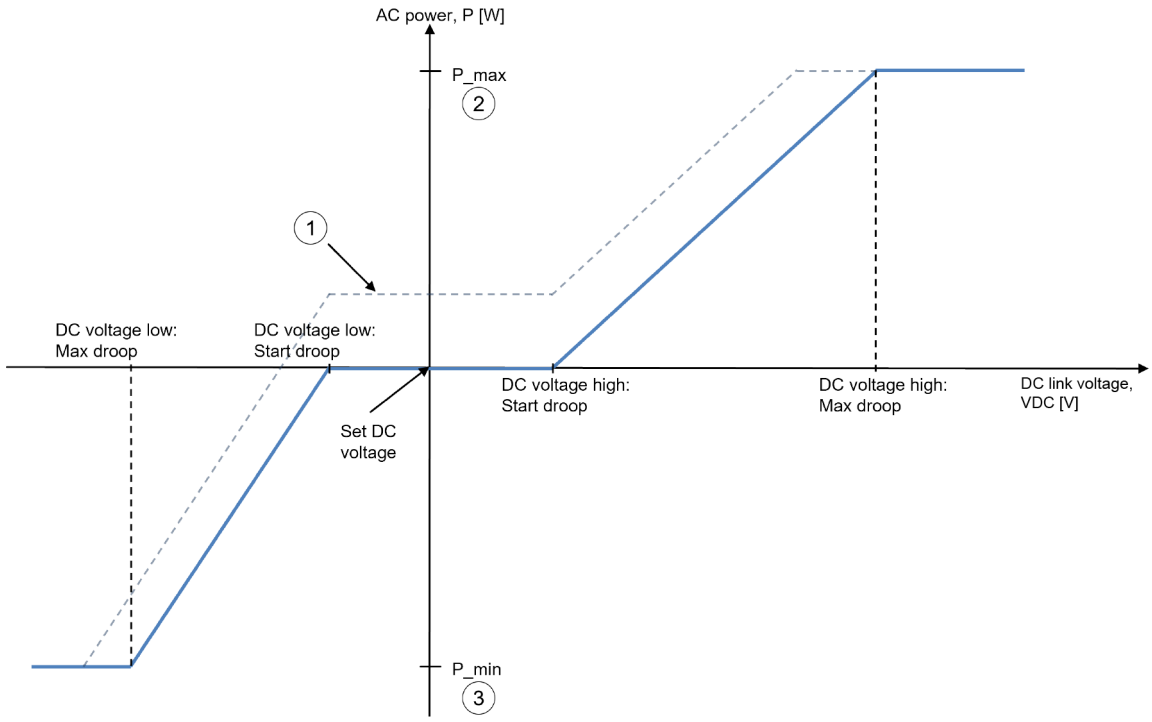
The parameters set at the factory are suitable for the majority of applications. For energy storage systems that are directly connected to the DC link, it can be useful to adjust these settings.

The possible settings for the DC link differ depending on the selected regulator type: voltage regulation or mains current regulation. Depending on the regulator type, the DC link voltage is influenced in different ways.

Setting DC link with "voltage regulation" regulator type

The effective power on the grid side is controlled using an adjustable "droop characteristic curve" depending on the DC link voltage.

All values on the x-axis are adjustable parameters (see "Tab. 30", pg. 104).



1 Active power offset, possibly set by operator (set value ≠ 0)

2 Maximum possible effective power

3 Minimum possible effective power

Droop characteristic curve, P = f(VDC) Fig. 53

The "droop control" influences the set value for effective power using the internal AC droop that acts on the power regulation of the system. The maximum possible dynamics for "droop control" are therefore below the underlying AC droop with power regulation. Other information, (see "Operation with voltage regulation (grid-forming or grid-following mode)", pg. 106).

The adjustable parameters directly influence the slope of the "droop characteristic curve" and therefore also its gain. The gain in turn influences the dynamic behavior. A large slope (high kW/VDC) means a high gain.

Furthermore, the dynamic behavior is also influenced by the structure of the DC busbar which is connected to the DC link. The behavior of the connected participants as well as their quantity can vary.

For these reasons, not every combination of DC busbar and droop characteristic parameter settings form a stable system.

The parameters set at the factory are suitable for the majority of applications.

The parameters can be changed if required. The system stability must then be checked for the individual case in question.

If the DC busbar voltage is predetermined by external devices or devices provided by the customer or if influence by the TruConvert AC 3025 is not desired, the parameters can be set in such a way that "droop control" only acts outside of the desired voltage window. In this case, the operations management must ensure that the necessary DC busbar voltage is available in order to prevent unwanted shutdowns.

Via user interface

1. Select >*Operation* >*AC-DC module settings*.
2. To set the parameters for this function:
   - Enter the desired values in the "DC link settings" section.

   Parameter description: (see "Tab. 30", pg. 104).

   The adopted and, thus, active values are displayed below the input fields.

Via the Modbus

3. To set the parameters for this function:
   - In register area 4230 – 4250, enter the desired values.

   Parameter description: (see "Tab. 30", pg. 104).

All adjustable parameters are listed in the following table.

Parameter**	Description
DC voltage low: Max droop Register 4250 Register 4246	With this voltage value, the maximum negative effective power is added to the power set value. This counteracts the drop in DC link voltage.* **Note** The value must be greater than twice the grid voltage amplitude. Otherwise, the entry is ignored. Example for a 400 V grid: $\sqrt{\frac{2}{3}} \times 400\,V \times 2 = 654\,V$ The measured grid voltage amplitude is displayed in the same section under "Voltage threshold of DC link half".
DC voltage low: Start droop Register 4249 Register 4245	With this voltage value, the "droop control" begins to request negative effective power. This counteracts the drop in DC link voltage.*
Set DC voltage Register 4230 Register 4233	If further DC-DC modules are connected to the AC-DC module and if in the "active" operating state, the set value of the DC link voltage can be set here.* Querying the operating state of the DC-DC modules: ▪ Select >*Operation* >*DC-DC module settings*. ▪ In the "Module selection" section under "Select slave module", select "All modules". ▪ Read the current status in the "Slave module status" section under "Status DC module".

Parameter**	Description
DC voltage high: Start droop Register 4248 Register 4244	With this voltage value, the "droop control" begins to request positive effective power. This counteracts the rise in DC link voltage.*
DC voltage high: Max droop Register 4247 Register 4243	With this voltage value, the maximum positive effective power is added to the power set value. This counteracts the rise in DC link voltage.*
DC link precharge voltage reserve Register 4225	With this parameter, it is possible to increase the voltage level of the precharging process for the DC link. The value refers to a DC link half. Thus, an increase of 10 V causes the voltage of the DC link to increase by 20 V. The AC-DC module is configured so that the precharge process of the DC link is performed as quickly as possible. For mains connection points with a **short-circuit power ratio < 5**, it can be necessary to provide a larger voltage reserve at the DC link to ensure reliable switching of the AC-DC module to the AC grid.
*) Only plausible set values are adopted. The set values must satisfy the conditions: Minimum < Set < Maximum **) If 2 registers are named: 1st register applies to 400 V at 50 Hz, 2nd register applies to 480 V at 60 Hz (see "Tab. 28", pg. 91).	

Adjustable parameters for "DC link settings" Tab. 30

Setting DC link with "mains current regulation" regulator type

1. Select >*Operation* >*AC-DC module settings*.
2. Enter the desired values in the "DC link settings" section.

Parameter**	Description
Minimum DC voltage Register 4231 Register 4234	Below this lower voltage limit, the AC-DC module stabilizes the DC link voltage and prevents the DC link voltage from dropping further.* **Note** The value must be greater than twice the grid voltage amplitude. Otherwise, the entry is ignored. Example for a 400 V grid: $\sqrt{\frac{2}{3}} \times 400\,V \times 2 = 654\,V$ The measured grid voltage amplitude is displayed in the same section under "Voltage threshold of DC link half".
Set DC voltage Register 4230 Register 4233	If further DC-DC modules are connected to the AC-DC module and if in the "active" operating state, the set value of the DC link voltage can be set here.* Querying the operating state of the DC-DC modules: ▪ Select *>Operation >DC-DC module settings*. ▪ In the "Module selection" section under "Select slave module", select "All modules". ▪ Read the current status in the "Slave module status" section under "Status DC module".
Maximum DC voltage Register 4232 Register 4235	Above this upper voltage limit, the AC-DC module stabilizes the DC link voltage and prevents the DC link voltage from rising further.*
DC link precharge voltage reserve Register 4225	With this parameter, it is possible to increase the voltage level of the precharging process for the DC link. The value refers to a DC link half. Thus, an increase of 10 V causes the voltage of the DC link to increase by 20 V. The AC-DC module is configured so that the precharge process of the DC link is performed as quickly as possible. For mains connection points with a **short-circuit power ratio < 5**, it can be necessary to provide a larger voltage reserve at the DC link to ensure reliable switching of the AC-DC module to the AC grid.
*) Only plausible set values are adopted. The set values must satisfy the conditions: Minimum < Set < Maximum **) If 2 registers are named: 1st register applies to 400 V at 50 Hz, 2nd register applies to 480 V at 60 Hz (see "Tab. 28", pg. 91).	

Adjustable parameters for "DC link settings" Tab. 31

The adopted and, thus, active values are displayed below the input fields.

7.11 Operation with voltage regulation (grid-forming or grid-following mode)

Function description "Operation with voltage regulation"

The voltage regulator of the TruConvert AC 3025 can replicate the behavior of a synchronous machine. Thus, its operating performance can be compared to that of a rotating machine, e.g., a diesel generator or steam turbine.

The system[13] can be operated parallel to the grid or to support a stand-alone network[14]. Moreover, the system is able to establish a stand-alone network on its own (black start capable).

The internal droop allows multiple AC-DC modules to be connected in parallel without the individual AC-DC modules needing to communicate with one another. Furthermore, a virtual impedance realized in the AC-DC module ensures the necessary attenuation of dynamic processes for the parallel connection.

In the case of operation with voltage regulation, 2 different regulation modes can be selected:

- "grid-forming"

  In grid-forming mode, the internal droop uses static linearization points for frequency and voltage, which have been specified by the operator. The internal droop thus forms a rigid voltage system.

  In this mode, the inverter can be used as:

  - Stand-alone device.
  - Grid-forming device within a stand-alone network that consists of multiple devices.
  - Grid-forming device within a public grid.
- "grid-following"

  In grid-following mode, the internal droop adjusts the linearization points for frequency and voltage to the variables that exist in the grid. In the adjusted state, the influence of the droop is therefore suppressed. The behavior of the inverter remains stationary, similar to operation with mains current regulation.

  In this mode, the inverter must be connected to a public grid or a stand-alone network.

13 A system can consist of: 1 AC-DC module, multiple AC-DC modules connected in parallel or 1 AC-DC module with connected DC-DC modules.

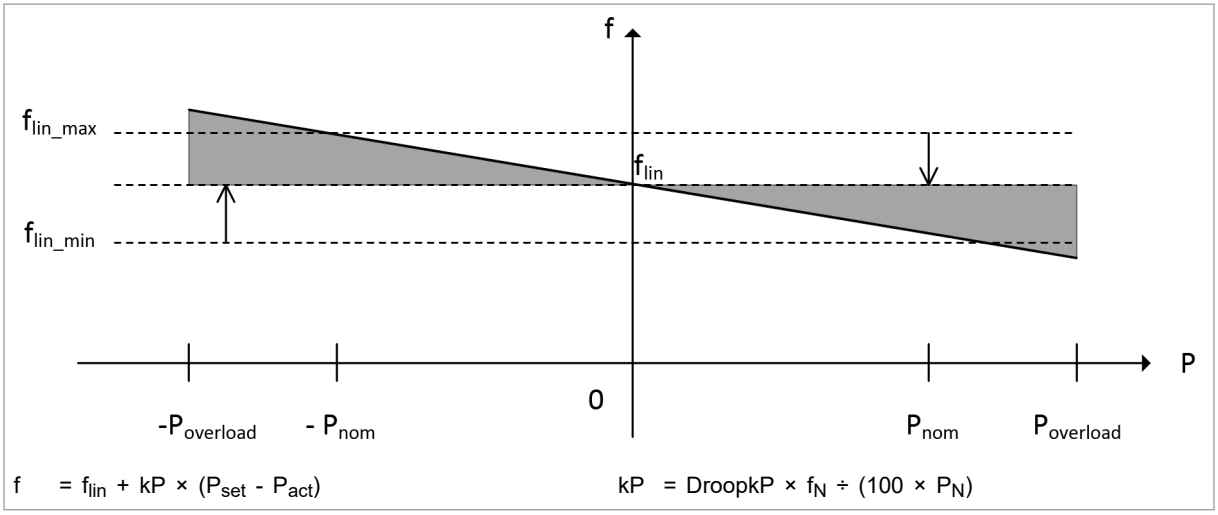
14 Restrictions are to be observed.

Frequency - effective power characteristic curve

For grid-forming operation of a single device, the stand-alone network frequency is determined as a function of:

- Device nominal values f_N and P_N
- Parameters f_{lin} and DroopKP
- Effective power set value Pset
- Effective power P_{act} consumed by load

The device typically has, e.g., a frequency deviation of -2% at the rated effective power output.



Frequency - effective power characteristic curve, shown as an example Fig. 54

Example:

f_{lin} = 50 Hz, f_N = 50 Hz, P_{set} = 0 W, P_{act} = P_N = 25 kW

DroopKP = 2 % = 0.02

f = 50 Hz + 0.02 × 50 Hz/25000 W × (0 W – 25000 W)

= 50 Hz + 40E-6 Hz/W × (-25000 W)

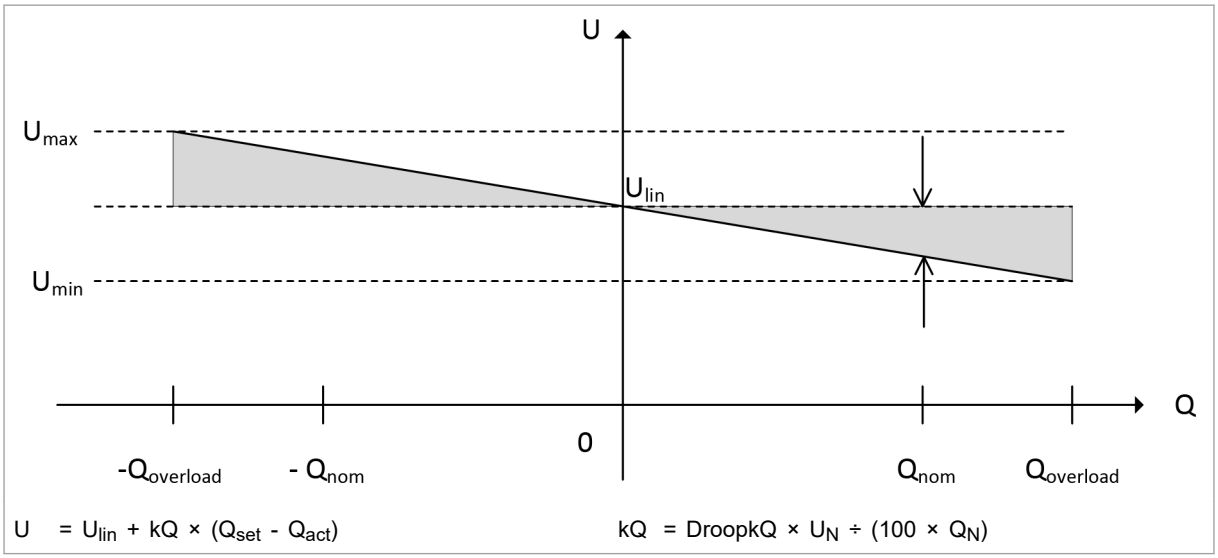
= 49 Hz

Voltage - reactive power characteristic curve

For grid-forming operation of a single device, the stand-alone network voltage is determined as a function of:

- Device nominal values U_N and Q_N
- Parameters U_{lin} and DroopKQ
- Reactive power set value Q_{set}
- Reactive power Q_{act} drawn by the load

The device typically has, e.g., a voltage deviation of -5% at the rated reactive power output (inductive loads).



Voltage - reactive power characteristic curve, shown as an example Fig. 55

Example:

U_{lin} = 231 V, U_N = 231 V, Q_{set} = 0 VAr, Q_{act} = QN = 25 kVAr

DroopKQ = 5 % = 0.05

U = 231 V + 0.05 × 231 V/25000 VAr × (0 VAr – 25000 VAr)

= 231 V + 462E-6 V/VAr × (-25000 VAr)

= 219.45 V

Supported loads

As the inverter is a full-fledged 4-quadrant device, in grid-forming mode it can support any loads and power factors on all 3 phases.

Load type	Power [kVA]
Resistive	100 %
Capacitive	70%
Inductive	70%
Non-linear	50% (max. crest factor = 3%)

Load types supported in grid-forming mode in relation to device nominal power Tab. 32

The following must be observed in grid-forming mode:

- Continuous operation possible at: ≤25 kW
- 125% of the rated effective power for 10 min*
- 150% of the rated effective power for 1 min*
- *) The power can only be maintained for this length of time; afterward, the device switches off.

Setting operation with voltage regulation

Condition

- No power is transferred: The device is in "Idle" mode.

⚠ DANGER

Life threatening voltage!

If the device is connected to the public grid in voltage regulation mode ("Controller and grid type selection" = "voltage control"), this can lead to a forbidden island situation because the safety function to prevent islanding is not active.

- ➢ Make sure that the local technical connection requirements (grid codes) allow connection in voltage regulation mode.
- ➢ Or obtain the express permission of the responsible grid operator.
- ➢ If no permission has been given, do **not** connect the device to the public grid.

Selecting regulator and grid type

1. Setting the regulation system:
   - Select *>Operation >AC-DC module settings*.
   - In the "General AC settings" section under "Controller and grid type selection", select "voltage control".
2. Under "Voltage source mode", select a regulation mode:
   - "grid-forming": grid-forming mode.
   - "grid-following": grid-following mode.
3. To set the parameters for this operating mode, (see "Parameterization "Operation with voltage regulation"", pg. 111).

Performing a black start (only with grid-forming mode)

A black start is possible in grid-forming mode only ("grid-forming").

With a black start, the AC voltage is built up by one or more AC-DC modules from 0 V.

All AC-DC modules that are connected together on one system control must be in the same AC grid.

Depending on the composition of the system (1 or n AC-DC modules and 0 or m connected DC-DC modules), the appropriate precharging mechanism must be selected for the internal DC link voltage.

If the precharging of the DC link is concluded using one of the scenarios mentioned in the following, the AC-DC module closes its mains contactor and begins to establish the off-grid voltage. To avoid excessive switch-on currents, the voltage is increased to the desired value within approximately one half grid period. Multiple AC-DC modules connected in parallel build up the AC voltage simultaneously and share the current of the load if they are activated simultaneously.

4. If the system includes TruConvert DC modules as sub-slaves: activate internal precharging circuit with DC-DC modules.
   - Select >*Operation* >*Device control AC-DC mode*.
   - In the "Device control settings AC-DC" section under "DC link precharge config", select: "internal with DC module".

   The device then uses its internal precharging circuit to bring the DC link voltage to the required level and then automatically starts the DC-DC modules. The AC voltage is now built up.
5. If the system includes independent TruConvert DC modules (separate system controls for AC-DC modules and DC-DC modules):
   - Select >*Operation* >*Device control AC-DC mode*.
   - In the "Device control settings AC-DC" section under "DC link precharge config", select: "internal & wait".
   - The AC module precharges the DC link to the required startup voltage of the DC-DC modules but without building up the off-grid voltage.

     As soon as the startup voltage of the DC-DC modules is reached in the DC link, the battery management system (BMS) can activate the power stage of the DC-DC modules.
   - Once the DC-DC modules are in operation and the DC link voltage is stable: Select "internal" under "DC link precharge config".

   The off-grid voltage is now built up.
6. If the DC link voltage is provided by an external supply (e.g., high-voltage battery):
   - In the "Device control settings AC-DC" section under "DC link precharge config", select: "external".
   - The BMS must ensure that the DC link voltage is stable before the power release of the AC-DC module is requested.

Starting with available network

7. Select appropriate precharging mechanism for the internal DC link voltage:
   - If the system includes independent TruConvert DC modules (separate system controls for AC-DC modules and DC-DC modules): See step 4.
   - If the DC link voltage is provided by an external supply (e.g., high-voltage battery): See step 6.

   The device first synchronizes with the present grid voltage before the mains contactor is closed.

Switching on power transfer

8. To switch on power transfer and specify the set values: proceed in the same way as for operation with mains current

regulation (see "Switching the transmission of power on/off", pg. 91).

The following applies in the case of grid-following mode: Only if the real values for grid frequency and grid voltage correspond to the preselected linearization points do the actual values P_{act} and Q_{act} assume the set values P_{set} and Q_{set} after the start-up time.

Parameterization "Operation with voltage regulation"

The inverter has an internal droop that makes its operating performance comparable to that of a rotating machine.

In the stationary state in grid-forming mode, the functional relationships that are described by the frequency-effective power characteristic curve (see "Fig. 54", pg. 107) and the voltage-reactive power characteristic curve (see "Fig. 55", pg. 108) apply.

Unlike in grid-forming mode, in grid-following mode the effect of the droop is suppressed in the stationary state and the inverter behaves in a similar way to operation with mains current regulation. This is why the characteristic curves do not apply to grid-following mode.

Both characteristic curves can be set individually using appropriate parameters. The parameters each influence the slope and the offset of the characteristic curves.

To avoid undesirably large deviations of the linearization points from the nominal frequency and voltage values, minimum and maximum limits of the linearization points can also be configured.

All adjustable parameters are listed in the following table.

Parameter	Description	Unit	Adjustment range		Factory settings	Step size
			Minimum	Maximum		
DroopkP (referred to as "Frequency slope" in the web GUI)	Parameter influences the slope "Frequency slope" (kP) of the characteristic curve.	% of f_N/P_N	0.1	4	2	0.01
Frequency lin. point offset	Linearization point	Hz	-5	5	0	0.01
Maximum neg. flin delta f	Maximum negative frequency difference of the lin. point (to f_N)	Hz	-6	6	-2.5	0.01
Maximum pos. flin delta f	Maximum positive frequency difference of the lin. point (to f_N)	Hz	-6	6	2.5	0.01

Parameter	Description	Unit	Adjustment range		Factory settings	Step size
			Minimum	Maximum		
DroopkQ (referred to as "Voltage slope" in the web GUI)	Parameter influences the slope "Voltage slope" (kP) of the characteristic curve.	% of V_N/Q_N	0.1	10	5	0.01
Voltage adjustment factor	Voltage factor, specifies the linearization point.	% of V_{nom}	75	120	100	1
Minimum voltage factor	Minimum voltage as a percentage	% of V_{nom}	75	120	85	1
Maximum voltage factor	Maximum voltage as a percentage	% of V_{nom}	75	120	115	1
Abbreviations: V_{nom} = V_N = Nominal voltage / P_{nom} = P_N = Nominal effective power / Q_{nom} = Q_N = Nominal reactive power / f_{nom} = f_N = Nominal frequency						

Adjustable parameters for frequency - effective power characteristic curve and voltage - reactive power characteristic curve Tab. 33

All parameters can also be set by means of Modbus (see "Tab. 28", pg. 91).

Parameter	**Description**
DroopkP (referred to as "Frequency slope" in the web GUI)	Used to calculate the slope Frequency slope (kP). Calculation of the slope: kP = DroopkP × $f_N/(100 \times P_N)$ Example: DroopkP = 2 Slope kP = 40 µHz/W or 40mHz/kW for a 25 kW device on a 50 Hz grid Parameters cannot be changed during running operation.
Frequency lin. point offset	Frequency linearization point offset: Specifies the linearization point. Calculation: flin = f_N + frequency offset Example: Frequency offset = 0.5 Linearization point = 50.5 Hz on a 50 Hz grid Working frequency = Linearization point if P_{set} = P_{act}

Parameter	Description
Maximum neg. flin delta f Maximum pos. flin delta f	The individual specification of the parameters for slope and linearization point of the droop characteristic curve can, under certain operating conditions, lead to relatively large deviations of the nominal frequency of the stand-alone network. For this reason, it is possible to define the minimum and maximum limit of the linearization point. Settings of "Frequency lin. point offset" outside of these limits are ignored; the corresponding limit value is used. The limit values refer to the linearization point and limit only this point. The operating value for the frequency can go beyond the limit values depending on the target/ actual value difference of the power. Example: With Frequency slope = 4 and Frequency lin. point offset = -1 Hz The effective power is specified with: P_{set} = -P_N (S_{set} = S_N, cos(φ) = -1) and the effective power actual value is P_{act} = +P_N. This means that a frequency of 45 Hz is set on the 50 Hz stand-alone network. f = f_N + Freq-Offs + (DroopkP/100 × f_N)/P_N × (P_{set} – P_{act}) = 49 Hz + (2 Hz)/P_N × (-P_N - P_N) = 45 Hz. Parameters cannot be changed during running operation.
DroopkQ (referred to as "Voltage slope" in the web GUI)	Used to calculate the slope Voltage slope (kQ). Calculation of the slope: kQ = DroopkQ × UN/(100 × QN) Example: DroopkQ = 5 Slope kQ = 462 µV/VAr or 462 mV/kVAr for a 25 kVAr device on the grid with 230 V phase voltage Parameters cannot be changed during running operation.
Voltage adjustment factor	Voltage adjustment factor: Specifies the linearization point. Calculation: U_{lin} = voltage factor × U_N Example: Voltage factor = 1.05 Linearization point = 242.5 V on grid with 230 V phase voltage Mains voltage = Linearization point if Q_{set} = Q_{act} Adoption of the specified linearization point is indicated in the "Active voltage adjustment factor" field. Restriction: ▪ "Voltage adjustment factor" < "Minimum voltage factor": Value is adopted, but the limit value "Minimum voltage factor" still remains effective. (See parameter description "Minimum voltage factor") ▪ "Voltage adjustment factor" > "Max possible voltage adjustment factor": Value is not adopted. (See parameter description "Maximum voltage factor")

Parameter	Description
Minimum voltage factor	The individual specification of the parameters for slope and linearization point of the droop characteristic curve can, under certain operating conditions, lead to relatively large deviations of the nominal voltage of the stand-alone network. This is why a limit value can be defined for the linearization point. The minimum possible value of the linearization point is determined by: ▪ Adjustable limiting under "Minimum voltage factor". ▪ Currently available DC link voltage. If the value under "Voltage adjustment factor" is lower than the value under "Minimum voltage factor", this "Voltage adjustment factor" is adopted in the "Active voltage adjustment factor" field. The limit value "Minimum voltage factor" still remains effective. The limit value refers to the linearization point and limits only this point. The operating value for the voltage can go beyond the limit value depending on the target/actual value difference of the power.
Maximum voltage factor	The individual specification of the parameters for slope and linearization point of the droop characteristic curve can, under certain operating conditions, lead to relatively large deviations of the nominal voltage of the stand-alone network. This is why a limit value can be defined for the linearization point. The maximum possible value of the linearization point is determined by: ▪ Adjustable limiting under "Maximum voltage factor". ▪ Currently available DC link voltage. The value is shown in the "Max possible voltage adjustment factor" field. The limit value refers to the linearization point and limits only this point. The operating value for the voltage can go beyond the limit value depending on the target/actual value difference of the power. Parameters cannot be changed during running operation.

Description of the parameters Tab. 34

Entering parameters for "Operation with voltage regulation"

1. Select >*Operation* >*AC-DC module settings*. Enter the desired values in the "AC voltage control settings" section.
2. Or: Set parameters via Modbus registers (see "Tab. 28", pg. 91).

Further information on "Operation with voltage regulation"

Virtual impedance

Due to the nature of the system, rotating machines, such as synchronous generators, have reactances on account of their winding impedances. In dynamic processes, these reactances have an attenuating effect and typically limit short-circuit currents to approximately 10 times the nominal current.

The device has an integrated virtual impedance that provides appropriate attenuation and supports the parallel connection of multiple systems, especially during dynamic operating processes.

Short circuit behavior

In voltage-regulated mode, the inverter has the characteristics of a voltage source. The phase currents are determined by the connected loads or feeding sources. If these lead to overcurrents, the voltage regulation is replaced by a current limiting regulator. The current limiting regulator limits the absolute value of the current to a maximum value of approx. 125 A.

Overcurrents are caused e.g. by overloads, high crest factors or short circuits.

A short circuit with low impedance gives rise to an almost square-wave alternating current with an amplitude of approx. 125 A. The short-circuit management of the inverter maintains this short-circuit current for approx. 500 ms before the device shuts down with a corresponding error message. By using appropriate fuses, this enables selectivity for grid protection.

If the current limit is only partially exceeded within a given period, the time until shutdown increases accordingly. If the current limit is exceeded during less than 10 % of the period duration, no shutdown occurs.

Note

Each intervention by the current limiting regulator immediately causes a deviation of the voltage from its sine-wave shape. At this point in time, the voltage drops to such an extent that the current does not increase above its limit value.

All connected loads or feeding sources are subject to this voltage distortion, resulting in impairment of their normal operation.

Grid-forming mode: Multiple devices in a group

If multiple devices in a group operate a stand-alone network, the total load of the stand-alone network is automatically divided over the individual devices.

Furthermore, there are various possibilities to, on the one hand, adjust the frequency and voltage of the stand-alone network and, on the other hand, individually distribute the effective powers and reactive powers over the individual devices.

By preselecting the two parameters "frequency offset" and "voltage factor", the linearization points flin and Ulin of the curves can be influenced (see "Fig. 54", pg. 107) (see "Fig. 55", pg. 108). This results in a parallel shift of the straight lines.

With:

- f_{lin} = f_N + frequency offset
- U_{lin} = voltage factor × U_N

In addition, the slope kP and kQ of the straight lines can be changed by specifying the two parameters "DroopKP" and "DroopKQ".

With:

- kP = DroopkP × f_N/(100 × P_N)
- kQ = DroopkQ × U_N/(100 × Q_N)

To influence the distribution of the effective and reactive powers on the individual devices in a targeted manner, the set values for apparent power, power factor cosφ and the phase shift can be appropriately selected.

Grid-forming mode: Resulting frequency and voltage

If a number of n devices in a group are operating in a stand-alone network, the resulting frequency and voltage of the stand-alone network are determined as a function of the mentioned settings on the individual devices (index i) and on the total power P_{act_system} and Q_{act_system} drawn by the stand-alone network, using:

$$f = \frac{-Pact\_system + \left(\sum_{i=1}^{n} Pset_i\right) + \left(\sum_{i=1}^{n} \frac{flin_i}{kP_i}\right)}{\sum_{i=1}^{n} \frac{1}{kP_i}}$$

Fig. 56

$$U = \frac{-Qact\_system + \left(\sum_{i=1}^{n} Qset_i\right) + \left(\sum_{i=1}^{n} \frac{Ulin_i}{kQ_i}\right)}{\sum_{i=1}^{n} \frac{1}{kQ_i}}$$

Fig. 57

For the case that all n devices are given identical parameters for frequency offset, voltage factor, DroopKP and DroopKQ, the resulting frequency and voltage of the stand-alone network are simplified to:

$$f = \frac{\left(\sum_{i=1}^{n} Pset_i\right) kP + flin\ n - Pact\_system\ kP}{n}$$

Fig. 58

$$U = \frac{\left(\sum_{i=1}^{n} Qset_i\right) kQ + Ulin\ n - Qact\_system\ kQ}{n}$$

Fig. 59

The output effective and reactive power of the individual device (index k) is determined as a function of its specified set value using:

$$Pact_k = \frac{n\ Pset_k - \left(\sum_{i=1}^{n} Pset_i\right) + Pact\_system}{n}$$

Fig. 60

$$Qact_k = \frac{n\ Qset_k - \left(\sum_{i=1}^{n} Qset_i\right) + Qact\_system}{n}$$

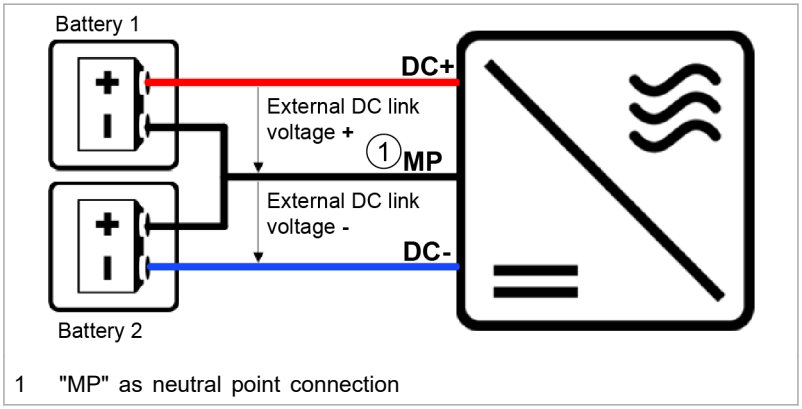
Fig. 61

The given relationships apply provided the settings of the linearization points f_{lin} and U_{lin} are within the limits defined by the limiting parameters (see "Parameterization "Operation with voltage regulation"", pg. 111).

7.12 Operation with series-connected batteries

Function description "Operation with series-connected batteries"

2 batteries can be connected in series to the DC link: battery 1 to the positive DC link half and battery 2 to the negative DC link half. In this arrangement, the power flow in the two batteries can be set independently of each other.



1 "MP" as neutral point connection

Connection principle for operation with series-connected batteries Fig. 62

The total power is determined by the usual mains power specification. How the total power is split between the 2 batteries can be set at the "balancer stage" by entering the differential voltage.

The inverter regulates the desired charging capacity (discharge capacity) bidirectionally on the grid side. This power is fed to (drawn from) the DC link, whereby the voltage of the DC link rises (falls) slightly. In the connected batteries, this rise (fall) in DC link voltage leads to consumption (output) of a current, i.e. the charging current (discharge current). The "balancer stage" can now transport power from the positive to the negative DC link half and vice versa. The "balancer stage" can shift the DC link half voltages relative to each other and split the power flow accordingly between the two DC link halves.

Setting "Operation with series-connected batteries"

Via user interface

1. Select >*Operation* >*AC-DC module settings*. Enter the desired values in the "Stacked HV battery settings" section.

   Parameter description: (see "Parameterization "Operation with series-connected batteries"", pg. 119).

Via the Modbus

2. To set the parameters for this function:
   - In the registers, enter the desired values.

   Parameter description: (see "Parameterization "Operation with series-connected batteries"", pg. 119).

Parameterization "Operation with series-connected batteries"

All adjustable parameters are listed in the following table.

Parameter	Description	Unit	Adjustment range		Factory settings	Step size
			Minimum	Maxi-mum		
Set value Δ V (pos-neg DC link half) Register 4224		V	-150.00	150.00	0.00	0.01
Balancing mode selection Register 4252		–	on /automatic / off		automatic	–
Gain for balancing via grid Register 4253		–	0.00	1.00	1.00	0.01

Adjustable parameters for balancer stage Tab. 35

Parameter	Description
Set value Δ V (pos-neg DC link half)	Set value for the voltage difference between the positive and negative half of the DC link voltage. This set value is set to the current actual value of the existing voltage difference (External DC link voltages = current battery voltages) usually before power release so that the "balancer stage" initially does not shift power from one DC link half to the other after power release has occurred. Example: "External DC link voltage +" of 380 V and "External DC link voltage -" of 400 V yield a ΔV of: Set value ΔV = 380 V – 400 V = -20.00 V. Based on this start value, the set value for the differential voltage can then gradually be changed in the desired direction e.g. in order to balance the batteries (in the example above: from -20.00 V toward 0.00 V). The nominal value is usually predetermined by a higher-level battery charge regulation system.
Balancing mode selection	Various modes can be selected for the balancer stage: ▪ "off": Switched off. ▪ "automatic": The balancer stage intervenes actively as soon as the deviation between the set value and actual value is approx. 10 V. ▪ "on": Permanently switched on. The balancer stage is always operating, even if the set value and actual value are the same. **Tip** If symmetrical battery voltages exist, the balancer stage can be switched off in order to increase efficiency.
Gain for balancing via grid	In addition to the balancer stage, the inverter has another function for balancing the DC link halves. In this case, the phase currents are influenced by DC offsets. The extent to which the phase currents are influenced can be set using the "Gain for balancing via grid" factor. ▪ "0.00": Switched off, no influence whatsoever. ▪ "1.00": Maximum influence. In some applications, this function may be unwanted, e.g. in the case of operation with series-connected batteries or in grid-forming mode. This is why the function can be completely switched off (0.00) or set individually (0.01 to 1.00).

Description of the parameters Tab. 36

7.13 Data backup

Saving parameters and resetting to factory settings

All general settings that were made under >*Operation* >*AC-DC module settings* and >*DC-DC module settings* with "Select slave module" = "All modules" can be stored in the device and are retained following a restart as well as after switching the device off and back on again.

The general settings can be exported as a json file and then imported into another device.

Individually generated settings for single modules ("Select slave module" = "Module 1" to "Module n") cannot be stored.

Conditions

- Operation via web GUI
- Settings to be saved are entered under >*Operation* >*AC-DC module settings* for "Select slave module" = "All modules" and "Select subslave module" = "All modules".

1. Select >*Operation* >*Save & restore settings*.
2. In the "Save & restore settings" area under "Customer settings", select "Save" to save the current settings in the TruConvert System Control.
3. In the "Save & restore settings" area under "Customer settings", select "Restore" to restore the factory settings.
4. To save the current settings as a file on a hard drive of the PC:
   - In the "Import & export parameters" area under "Export parameters", press "Download".
   - In the browser window that opens, select "Save as".
5. In the "Import & export parameters" area, press to search for and select a file on a hard drive of the PC.
6. To load the selected file to the system control:
   - Press the button to upload the file.
   - To permanently save the settings in the TruConvert System Control: In the "Save & restore settings" area under "Customer settings", select "Save".

7.14 System configuration

If the combination of devices connected to the system control is changed, the new system configuration must then be entered via the web-based user interface.

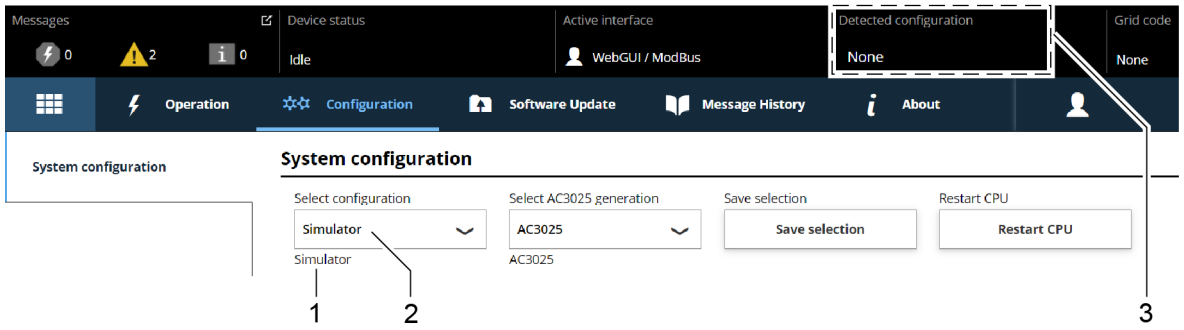
Setting the system configuration

Conditions

- Operation via web GUI
- Devices (AC-DC module, DC-DC modules) are connected to the system control

Switching on devices

1. To switch on the system control and the modules: switch on the 24 V supply voltage.



1	Most recently saved configuration	2	Most recently saved configuration is displayed as the suggested value.	3	"Detected configuration" = "None": Most recently saved configuration does not match the detected configuration.

Input screen "System configuration" Fig. 63

The input screen "System configuration" is displayed.

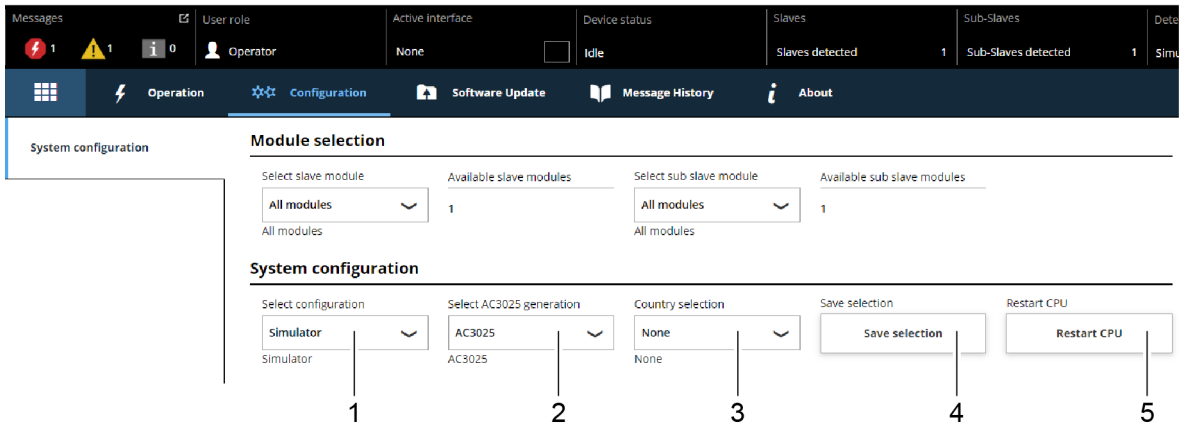
The connected devices do not match the expected configuration, i.e. the most recently saved configuration.

Status LEDs on the system control: All 3 LEDs blink synchronously.

Status LEDs on the AC-DC module: The green and red LEDs light up and the yellow LED flashes.

Setting the system configuration

2. Select >*Configuration* >*System configuration*.



1	Select system configuration	3	Select country	5	Restart system control
2	Select device generation	4	Save settings		

Screen: Set system configuration Fig. 64

3. In the "Module selection" section under "Select slave module", select: "All modules".

4. In the "System configuration" section under "Select configuration", select the existing system configuration:

- No configuration

  This configuration only occurs in the event of an error, e.g., if there is no connection to the modules (check cables) or if an incorrect module type was detected (check alarm messages).
- Simulator

  The system control alone is used and connected modules are simulated.
- DC-DC configuration

  Only DC-DC modules are connected to the system control.
- n*(AC-DC + m*DC-DC)

  AC/DC and DC/DC modules are connected to the system control.

5. Under "Select AC3025 generation", select the device generation: "AC3025".
6. Under "Country selection", select the location of the device.

   If the factory setting "None" is retained, it will not be possible to switch on the device later.
7. To save the selection: press "Save selection".
8. To restart the TruConvert System Control: press "Restart CPU".

   The system control balances the set system configuration with the actually connected modules. If both values match, the set system configuration is displayed in the status bar under "Detected Configuration".

   If the set system configuration differs from the automatically detected system configuration, "None" is displayed in the status bar under "Detected Configuration". In addition, a message is output. Press in the sidebar to display the messages.

Status LEDs on the AC-DC module and system control: The LEDs remain off immediately after the restart. The green LED begins to flash after a few seconds.

The system is ready for operation: It is in the "Idle" operating state and the start screen is displayed.

7.15 Setting grid codes

Grid codes define rules that generation systems must obey for authorization to connect to the public grid. In particular, these rules regulate behavior in the event of grid fluctuations.

The grid operator determines the behavior of systems in the event of undervoltage, overvoltage and frequency deviation, and also defines the connect and disconnect conditions.

Conditions

- Initial commissioning was performed (see "Commissioning", pg. 63).
- Password for grid codes is available. (Request from TRUMPF Service).)
- AC-DC module is idling: In the status bar under "Device status" = "Idle".

NOTICE

External grid and system protection required!

- ➢ Install external grid and system protection.
- ➢ The grid and system protection must meet the country-specific requirements for grid and system protection.

NOTICE

To connect and operate the TruConvert AC 3025 in parallel operation with the public low-voltage grid, the following points are to be adhered to:

- ➢ The applicable legal and official regulations.
- ➢ Country-specific grid codes (TAB: technical connection requirements) of the mains operator.
- ➢ The configuration of the grid codes is to be agreed upon, implemented and documented together with the grid operator prior to connection.
- ➢ During operation, the conditions (grid codes, TAB) on which the decisions regarding the connection of the generating system and/or of the accumulator were based may **only** be changed with the consent of the grid operator.

Selecting grid code

1. Select >*Configuration* >*System configuration*.
2. In the "Grid code configuration" area under "Password", enter the password for editing the grid codes.

   Additional input fields are displayed.
3. In the "Grid code configuration" area under "Select grid code", select the desired grid code.

   The selected grid code must correspond to the previously selected AC grid.

   The selected grid code is displayed as an additional submenu item in the submenu.
4. Select >*Configuration* >*"Grid code xxx"*.
5. Set the parameters for the selected grid code.

   The individual functions are described separately (see supplement to the "TruConvert System Control, Grid Codes" operating instructions).

Adopting grid code settings in system

Note

After entering the password, there is a time window of 15 min in which the parameters can be set and permanently stored.

If the parameters are not stored until after the window has elapsed, they are only applied for the current operation. After a 24 V reset, restart of the CPU or a software update, the settings are lost.

6. To save the changes:
   - Select >*Configuration* >*System configuration*.
   - In the "Grid code conriguration" area, click on "Save grid code settings".

7.16 System settings

Setting the system time

User interface

As soon as the device is connected to the PC, the local time of the PC is converted to UTC and adopted in the system control as system time.

In addition, adoption of the system time can also be triggered manually.

1. In the sidebar, click on "Settings" ✡.

   The sidebar is displayed.

2. To adopt the system time from the PC for the device, press "Synchronize to local computer".

   The system time of the PC is displayed on the user interface ("Show advanced settings") and transferred to the device.

3. To make your own settings: Press "Show advanced settings" in the "Time and date" area.
   - Under "Time zone", select the desired time shift relative to UTC.
   - Use the "Time format" slide switch to select between 24-hour display and 12-hour display.
   - Under "Time" and "Date", enter the desired time and the date.
   - Then press "Submit time and date".

Changing network settings

Note

Network settings can only be changed via the web GUI.

Changing the IP address

1. In the sidebar, click on "Settings" ✲.
2. In the "Network" area under "IP address", enter new values.

   IP address of the device on delivery:

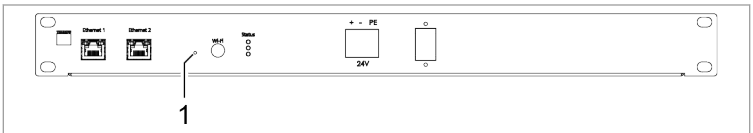
   - 192.168.1.2
3. Note the new IP address so as to be able to access the device via the user interface.
4. Press "Submit network settings".

   The network settings are transferred to the device.
5. To restart the system control: press "Reboot".

Using the Reset button to reset the IP address

If the IP address of the device was changed and is not known, the IP address can be reset to the factory settings with the help of the Reset button.

Notice: This function can also be used to reset all customer parameters to the factory settings.



1 Opening for reset button

Reset button on the system control Fig. 65

6. Insert a small pen tip or piece of wire into the opening for the Reset button and press the Reset button.
   - Press for 3-5 seconds: IP address is reset to the factory settings.
   - Press and hold for 10 seconds: all device parameters are reset to factory settings.

   After the reset, the operating panel automatically performs a restart.

Changing network settings (IP subnet and gateway)

7. In the sidebar, click on "Settings" ✲.
8. In the "Network" area, enter new values.

Input field	Value	Description
"Host address"	Text field	The device can be given an individual name. This name instead of the IP address can be entered in the web browser in order to access the device.
"DHCP client"	OFF	The device receives a fixed IP address. The IP address is entered in the "IP address" input field.
	ON	The DHCP client is enabled and receives an IP address from the customer DHCP server.
"IP address"	192.168.1.3 (example)	The IP address is used to integrate the device in a network. The IP address can be entered in the web browser in order to access the device.
"Subnet mask"	255.255.255.128 (example)	Set the same subnet mask as that on the higher-level system control.

Input fields for network settings Tab. 37

9. Press "Submit network settings".

   The network settings are transferred to the device.

10. To restart the system control: press "Reboot".

7.17 Software update

Perform software update

Conditions

- Operation via web GUI
- Zip file with new software stored on PC.

1. Select >*Software Update* .
2. In the "Software update" area, press the button and open the zip file.
3. Press the button to upload the zip file.

   If the update was performed successfully, the system control automatically performs a restart.

Tip

To ensure that the new software is adopted error-free, perform a manual restart of the generator.

7.18 Device information

Displaying device information

System control

1. Select >*About*.
2. In the "Software package" section, read the details on the installed software package.

   Relevant details are: "Integration level" and "Buildnumber".
3. In the "System control" section, read off the individual items of information for the system control:
   - Under "Software version application" and "Software version bootloader": the software versions on the system control (part of the "Software package").
   - Under "Serial number": the serial number of the system control.

Reading off software version and serial number of AC-DC modules

4. In the "Module selection" section, read off the number of available AC-DC modules under "Available slave modules".

   The AC-DC module, which is directly connected to the system control with the data cable, is "Module 1". The next AC-DC module, which is connected to data output "OUT" of "Module 1", is "Module 2", etc.
5. Under "Select slave module", select the desired AC-DC module.
6. In the "AC-DC module" section under "Software version application" and "Software version bootloader", read off the software versions on the AC-DC module (part of the "Software package").
7. Under "Serial number", read off the serial number of the AC-DC module.

Reading off software version and serial number of DC-DC modules

8. In the section "Module selection" under "Select slave module", enter the AC-DC module to which the desired DC-DC module is connected.
9. In the "Module selection" section, read off the number of available DC-DC modules under "Available sub slave modules".

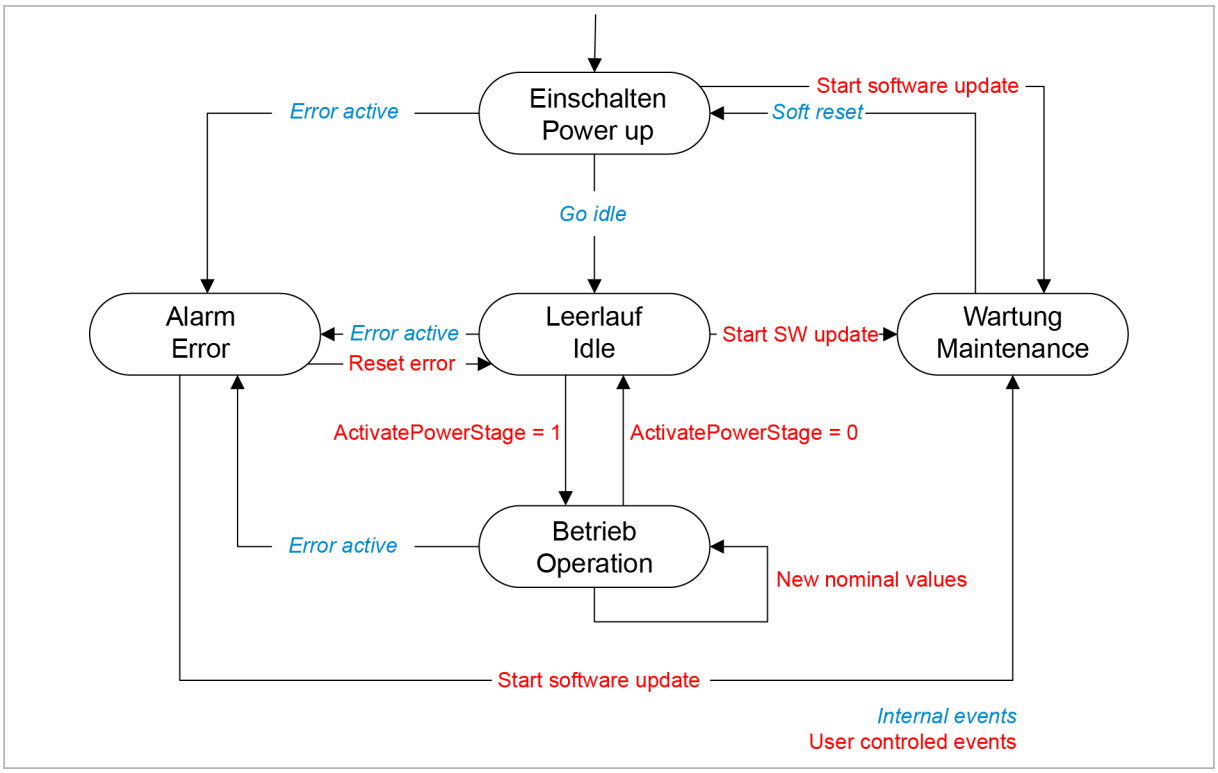
   The DC-DC module, which is directly connected to the AC-DC module with the data cable, is "Module 1". The next DC-DC module, which is connected to data output "OUT" of "Module 1", is "Module 2", etc.
10. Under "Select sub slave module", select the desired DC-DC module.
11. In the "DC-DC module" section under "Software version application" and "Software version bootloader", read off the software versions on the DC-DC module (part of the "Software package").

12. Under "Serial number", read off the serial number of the DC-DC module.

Tip

The serial numbers of the system control and the modules can also be queried via Modbus (see "Modbus Register Map", pg. 77).

7.19 State diagram



State machine Fig. 66

8. Maintenance

Note

Housing must not be opened
The housing of the generator is sealed with stickers. Damage to the seals or opening the housing will invalidate the warranty.

8.1 Periodic check of the environmental conditions

In the event of poor environmental conditions, e.g. air with oil, dust and conductive parts, the fans may draw in particles that damage the module. The environment should therefore be kept as clean as possible.

8.2 Cleaning

If necessary, clean the module with a dry cloth.

8.3 Exchanging fans

TRUMPF recommends replacing the ventilator after an operation lifetime of 6 years.

- Only have fans exchanged by TRUMPF personnel or trained staff.

8.4 Performing software updates

Software updates can only be made via the user interface.

- Have software updates for the PCS performed by TRUMPF personnel only; if you perform the updates yourself, consult with TRUMPF personnel beforehand.

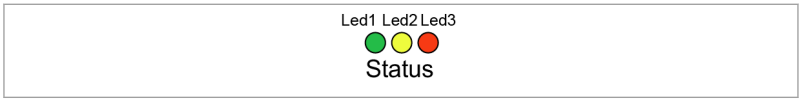
9. Troubleshooting

9.1 Fault indication and messages

Faults are displayed at different positions:

- Status LEDs on the AC-DC module.
- Status LEDs on the TruConvert System Control.
- On the web-based user interface.
- Via the Modbus.

Fault indication with the LEDs



Status LEDs on TruConvert AC 3025 and TruConvert System Control — Fig. 67

LED	Errors
1 (green)	off
2 (yellow)	off
3 (red)	Flashing

Display of the status LEDs in the event of a fault — Tab. 38

9.2 Messages

A distinction is made between alarm messages and warning messages.

Alarm message

Power operation is automatically shut off if serious errors occur. The PCS switches to the alarm state and outputs an alarm message. Power operation can only be restarted after the cause of the alarm has been removed and the alarm message has been reset (see "State diagram", pg. 129).

Warning message

In case of less severe faults, the power operation is not interrupted, but a warning message is issued.

Display of alarm and warning messages

The messages that are output always consists of an alarm or warning number and a message text.

When operating the device with the web GUI, the alarm and warning numbers are displayed together with the message text.

In case of control with Modbus, only the numbers and no text are transmitted.

Resetting alarm and warning messages

(see "Displaying and resetting messages", pg. 94)

List of alarm and warning messages

The following tables show the most important alarm and warning messages, with notes on error causes and how to correct them.

If a message reappears repeatedly after resetting and restarting the device, please contact TRUMPF Service.

If a message appears whose number is not listed in the table, please also contact TRUMPF Service.

Alarm messages

Number	Message	Effect	Cause	Action	Detected by
40300	RS-485 communication alarm.	No operation possible.	Communication problem on RS-485 bus.	Check RS-485 communication.	System control
40301	RS-485 communication alarm.	No operation possible.	Communication problem on RS-485 bus.	Check RS-485 communication.	System control
40302	Active interface (Modbus or WebGUI) communication timeout has occured	No operation possible.	Active interface (Modbus or WebGUI) communication timeout has occured	Check active interface (Modbus or WebGUI) or disable timeout.	System control
40303	RS-485 communication alarm.	No operation possible.	Communication problem on RS-485 bus.	Check RS-485 communication.	System control
40304	No slave module was found, please check RS-485 connection(s).	System cannot finish start-up procedure	No slave module was found.	Check RS-485 connection(s) and modules.	System control
40305	Number of or combination of connected slave types not supported.	System cannot finish start-up procedure	Number of or combination of connected slave types not supported.	Check module configuration. Only homogeneous modules are allowed on one RS-485 bus.	System control
40412	Software versions of system control and module(s) do not match.	System cannot finish start-up procedure	Software versions of system control and module(s) do not match.	Software update necessary.	System control
40413	Software versions of system control and module(s) do not match.	System cannot finish start-up procedure	Software versions of system control and module(s) do not match.	Software update necessary.	System control
40414	Software versions of system control and module(s) do not match.	System cannot finish start-up procedure	Software versions of system control and module(s) do not match.	Software update necessary.	System control
40415	Software versions of system control and module(s) do not match.	System cannot finish start-up procedure	Software versions of system control and module(s) do not match.	Software update necessary.	System control
40416	Software versions of system control and module(s) do not match.	System cannot finish start-up procedure	Software versions of system control and module(s) do not match.	Software update necessary.	System control
50000	Overtemperature IGBT bridge 1.	No operation possible.	Overtemperature IGBT bridge 1.	Check the fan and the ambient temperature.	AC-DC module
50001	Overtemperature IGBT bridge 2.	No operation possible.	Overtemperature IGBT bridge 2.	Check the fan and the ambient temperature.	AC-DC module
50002	Overtemperature IGBT bridge 3.	No operation possible.	Overtemperature IGBT bridge 3.	Check the fan and the ambient temperature.	AC-DC module

Number	Message	Effect	Cause	Action	Detected by
50003	Overtemperature balancer.	No operation possible.	Overtemperature balancer bridge.	Check the fan and the ambient temperature.	AC-DC module
50004	Ambient temperature over allowed range.	No operation possible.	Ambient temperature over allowed range.	Check the ambient temperature.	AC-DC module
50005	Overcurrent L1.	Device switches off.	Overcurrent L1.	Check cabling of L1, grid voltage sense lines, AC contactor, external components (fuses etc.)	AC-DC module
50006	Overcurrent L2.	Device switches off.	Overcurrent L2.	Check cabling of L2, grid voltage sense lines and AC contactor, external components (fuses etc.)	AC-DC module
50007	Overcurrent L3.	Device switches off.	Overcurrent L3.	Check cabling of L3, grid voltage sense lines and AC contactor, external components (fuses etc.)	AC-DC module
50008	Overcurrent balancer.	Device switches off.	Overcurrent balancer bridge.	Contact service.	AC-DC module
50009	Overvoltage grid L1.	No operation possible.	Overvoltage grid L1.	Check grid voltage L1 and external devices.	AC-DC module
50010	Overvoltage grid L2.	No operation possible.	Overvoltage grid L2.	Check grid voltage L2 and external devices.	AC-DC module
50011	Overvoltage grid L3.	No operation possible.	Overvoltage grid L3.	Check grid voltage L3 and external devices.	AC-DC module
50012	Overvoltage filter capacitor L1.	Device switches off.	Overvoltage filter capacitor L1.	Check grid voltage L1, grid voltage sense lines and AC contactor.	AC-DC module
50013	Overvoltage filter capacitor L2.	Device switches off.	Overvoltage filter capacitor L2.	Check grid voltage L2, grid voltage sense lines and AC contactor.	AC-DC module
50014	Overvoltage filter capacitor L3.	Device switches off.	Overvoltage filter capacitor L3.	Check grid voltage L3, grid voltage sense lines and AC contactor.	AC-DC module
50015	Overvoltage DC link positive part.	Device switches off.	Overvoltage DC link positive part.	Check DC link voltage and midpoint.	AC-DC module
50016	Overvoltage DC link negative part.	Device switches off.	Overvoltage DC link negative part.	Check DC link voltage and midpoint.	AC-DC module
50018	Overcurrent L1 hardware.	Device switches off.	Overcurrent L1.	Check cabling of L1, grid voltage sense lines and AC contactor.	AC-DC module

Number	Message	Effect	Cause	Action	Detected by
50019	Overcurrent L2 hardware.	Device switches off.	Overcurrent L2.	Check cabling of L2, grid voltage sense lines and AC contactor.	AC-DC module
50020	Overcurrent L3 hardware.	Device switches off.	Overcurrent L3.	Check cabling of L3, grid voltage sense lines and AC contactor.	AC-DC module
50021	Overcurrent balancer hardware.	Device switches off.	Overcurrent balancer bridge.	Contact service.	AC-DC module
50024	Overcurrent/short circuit in island L1	Device switches off.	Overcurrent/short circuit in island L1	Check loads and fuses in micro-grid.	AC-DC module
50025	Overcurrent/short circuit in island L2	Device switches off.	Overcurrent/short circuit in island L2	Check loads and fuses in micro-grid.	AC-DC module
50026	Overcurrent/short circuit in island L3	Device switches off.	Overcurrent/short circuit in island L3	Check loads and fuses in micro-grid.	AC-DC module
50030	DC current component L1 too high.	Device switches off.	DC current component L1 too high.	Contact service.	AC-DC module
50031	DC current component L2 too high.	Device switches off.	DC current component L2 too high.	Contact service.	AC-DC module
50032	DC current component L3 too high.	Device switches off.	DC current component L3 too high.	Contact service.	AC-DC module
50033	Grid frequency too high.	No operation possible.	Grid frequency too high.	Check the grid frequency.	AC-DC module
50034	Grid frequency too low.	No operation possible.	Grid frequency too low.	Check the grid frequency.	AC-DC module
50036	Synchronization to grid failed.	No operation possible.	Internal filter capacitor voltage and grid voltage do not line up.	Check grid settings and AC-connection (alignment of power and sense lines)	AC-DC module
50037	DC link voltage too low for operation.	No operation possible.	DC link voltage too low for operation.	Check DC link settings and wiring.	AC-DC module
50038	DC link unbalanced.	No operation possible.	DC link unbalanced.	Check DC link settings and wiring.	AC-DC module
50041	Overcurrent L1 RMS.	Device switches off.	Overcurrent L1 RMS.	Check cabling of L1, grid voltage sense lines and AC contactor.	AC-DC module
50042	Overcurrent L2 RMS.	Device switches off.	Overcurrent L2 RMS.	Check cabling of L2, grid voltage sense lines and AC contactor.	AC-DC module
50043	Overcurrent L3 RMS.	Device switches off.	Overcurrent L3 RMS.	Check cabling of L3, grid voltage sense lines and AC contactor.	AC-DC module
50044	Overcurrent balancer RMS.	Device switches off.	Overcurrent balancer RMS.	Contact service.	AC-DC module
50047	Overvoltage L1 RMS.	No operation possible.	Overvoltage L1 RMS.	Check grid settings, grid voltage L1 and external devices.	AC-DC module
50048	Overvoltage L2 RMS.	No operation possible.	Overvoltage L2 RMS.	Check grid settings, grid voltage L2 and external devices.	AC-DC module

Number	Message	Effect	Cause	Action	Detected by
50049	Overvoltage L3 RMS.	No operation possible.	Overvoltage L3 RMS.	Check grid settings, grid voltage L3 and external devices.	AC-DC module
50050	Undervoltage L1 RMS.	No operation possible.	Undervoltage L1 RMS.	Check grid settings, grid voltage L1 and external devices.	AC-DC module
50051	Undervoltage L2 RMS.	No operation possible.	Undervoltage L2 RMS.	Check grid settings, grid voltage L2 and external devices.	AC-DC module
50052	Undervoltage L3 RMS.	No operation possible.	Undervoltage L3 RMS.	Check grid settings, grid voltage L3 and external devices.	AC-DC module
50053	Grid contactor could not be closed.	No operation possible.	Grid contactor could not be closed.	Check the contactor, delaytime, cabling, AUX-suppy of contactor etc.	AC-DC module
50068	Subslave communication alarm.	No operation possible.	Subslave communication alarm.	Check cabling to subslaves and system start-up routine.	AC-DC module
50069	Master communication alarm.	No operation possible.	Master communication alarm.	Check cabling to master and system start-up routine.	AC-DC module
50080	Overvoltage grid N to PE.	No operation possible.	Overvoltage grid N to PE.	Check voltage N to PE, N and PE connections.	AC-DC module
50081	Overvoltage internal DC link.	Device switches off.	Overvoltage internal DC link.	Contact service.	AC-DC module
50082	Overvoltage internal N to PE.	Device switches off.	Overvoltage internal N to PE.	Contact service.	AC-DC module
50083	Overvoltage external DC link positive part.	Device switches off.	Overvoltage external DC link positive part.	Check DC link voltage and midpoint.	AC-DC module
50084	Overvoltage external DC link negative part.	Device switches off.	Overvoltage external DC link negative part.	Check DC link voltage and midpoint.	AC-DC module
50085	Overvoltage external DC link.	Device switches off.	Overvoltage external DC link negative part.	Check DC link voltage and midpoint.	AC-DC module
50086	Overvoltage external DC link midpoint to PE.	Device switches off.	DC link is unsymetric.	Check DC link voltage and midpoint.	AC-DC module
50087	Wrong polarity on DC link detected.	Device switches off.	Wrong polarity on DC link detected.	Check DC link polarity.	AC-DC module
50088	Overvoltage external 24-V auxiliary supply.	Device switches off.	Overvoltage external 24-V auxiliary supply.	Check the external 24-V auxiliary supply.	AC-DC module
50089	Undervoltage external 24-V auxiliary supply.	Device switches off.	Undervoltage external 24-V auxiliary supply.	Check the external 24-V auxiliary supply.	AC-DC module
50095	AC-DC module hardware protection alarm.	Device switches off.	AC-DC module hardware protection alarm.	Check for other error messages.	AC-DC module
50096	DC link precharge unit alarm.	No operation possible.	Precharge unit failed.	Contact service.	AC-DC module

Number	Message	Effect	Cause	Action	Detected by
50097	DC link discharge unit alarm.	No operation possible.	Discharge unit failed or balancer failed.	Contact service.	AC-DC module
50098	DC link could not be charged.	No operation possible.	Charging of DC link bus failed.	Check DC link bus and cabling of connected components.	AC-DC module
50100	DC link relay could not be closed.	No operation possible.	DC link relay could not be closed.	Check external DC link voltage.	AC-DC module
50101	DC link relay was forced to disconnect.	Device switches off.	DC link relay was forced to disconnect.	Check external DC link.	AC-DC module
50102	Fan alarm.	No operation possible.	Fan is defictive or stuck.	Check the fan.	AC-DC module
50115	Overvoltage filter capacitor L1 RMS.	Device switches off.	Overvoltage filter capacitor L1 RMS.	Check grid settings, grid voltage L1 and external devices.	AC-DC module
50116	Overvoltage filter capacitor L2 RMS.	Device switches off.	Overvoltage filter capacitor L2 RMS.	Check grid settings, grid voltage L2 and external devices.	AC-DC module
50117	Overvoltage filter capacitor L3 RMS.	Device switches off.	Overvoltage filter capacitor L3 RMS.	Check grid settings, grid voltage L3 and external devices.	AC-DC module
50118	Anti-island detection alarm L1.	Device switches off.	Anti-island detection alarm L1.	Check grid settings and the installation.	AC-DC module
50119	Anti-island detection alarm L2.	Device switches off.	Anti-island detection alarm L2.	Check grid settings and the installation.	AC-DC module
50120	Anti-island detection alarm L3.	Device switches off.	Anti-island detection alarm L3.	Check grid settings and the installation.	AC-DC module
50121	Missmatch of internal and external N.	No operation possible.	Missmatch of internal and external N.	Check cabling of N and PE.	AC-DC module
50130	DC link relay disconnect not allowed - DC link voltage unstable.	Failed to disconnect from DC-Link.	DC link relay disconnect not allowed - DC link voltage unstable.	Check DC link.	AC-DC module
50131	Grid code ride through time exceeded.	Device switches off.	Grid code ride through time exceeded.	Review grid code settings. Ride throughs can be part of active grid code).	AC-DC module
50132	Grid does not match grid code requirements.	No operation possible.	Grid does not match grid code requirements (voltage and frequency).	Review grid code settings. Requirements for voltage and frequency can be part of active grid code).	AC-DC module
50134	Overload capabilitiy exceeded	Device switches off.	Overload capabilitiy exceeded	Reduce load in island mode operation.	AC-DC module
50135	Overcurrent capabilitiy exceeded	Device switches off.	Overcurrent capabilitiy exceeded	Reduce load in island mode operation.	AC-DC module
60090	Battery overvoltage.	No operation possible.	Battery voltage too high.	Check battery voltage.	DC-DC module
60093	DC link overvoltage.	No operation possible.	DC link voltage too high.	Check DC link.	DC-DC module

Number	Message	Effect	Cause	Action	Detected by
60102	DC link voltage too low for operation.	No operation possible.	DC link voltage too low.	Check DC link precharge.	DC-DC module
60129	Battery voltage under threshold setting.	No operation possible.	Battery voltage under threshold setting.	Change battery threshold setting.	DC-DC module
60132	RS-485 communication alarm.	No operation possible.	Communication problem on RS-485 bus.	Check RS-485 communication.	DC-DC module
60142	Battery undervoltage.	No operation possible.	Battery voltage too low.	Check battery voltage.	DC-DC module
60145	Wrong polarity on DC terminal detected.	Risk of damaging hardware.	Wrong polarity on battery detected.	Check battery polarity.	DC-DC module
60150	Battery voltage over threshold setting.	No operation possible.	Battery voltage over threshold setting.	Change battery threshold setting.	DC-DC module
60168	Ambient temperature over allowed range.	No operation possible.	Ambient temperature over allowed range.	Check the ambient temperature.	DC-DC module
60186	Ambient temperature under allowed range.	No operation possible.	Ambient temperature under allowed range.	Check the ambient temperature.	DC-DC module
60192	Fan defective or stuck.	No operation possible.	Fan is defective or stuck.	Check fan.	DC-DC module
60200	Precharge conditions could not be met.	No operation possible.	Precharge conditions could not be met.	Check droop-mode settings, DC link and battery voltage.	DC-DC module
60201	Attached load on DC link can not be handled.	No operation possible.	Attached load on DC link can not be handled.	Reduce DC link load or change precharge procedure.	DC-DC module
60202	DC link could not be charged	No operation possible.	DC link could not be charged	Check DC link and connected components.	DC-DC module
60700	Auxiliary supply overvoltage.	Risk of damaging hardware.	Auxiliary supply voltage too high.	Check the external 24-V auxiliary supply.	DC-DC module
60703	Auxiliary supply undervoltage.	Unstable system.	Auxiliary supply voltage too low.	Check the external 24-V auxiliary supply.	DC-DC module

AC-DC alarm messages Tab. 39

Warning messages

Number	Message	Caused by
10016	Power failure of 24-V auxiliary supply has been detected.	System control

Warning messages Tab. 40

VDE RENEWABLES

UN 38.3 Test Report Summary

We herewith confirm that each battery of the tested type is proved to meet the requirements of applicable tests in the UN Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, Part III, Sub-Section 38.3.

Lithium battery test summary in accordance with Sub-Section 38.3.5:

(a) Customer:	ads-tec Energy GmbH Heinrich-Hertz-Str. 1 72622 Nürtingen Germany	
(b) Manufacturer:	ads-tec Energy GmbH Schwabacher Str. 5 01665 Klipphausen Germany	
(c) Test laboratory:	VDE Renewables GmbH Goethering 43 63067 Offenbach am Main Germany	Phone: +49(0)69-63085300 Fax: +49(0)69-63085320 E-Mail: renewables@vde.com Webpage: www.vde.com/renewables
(d) Test report identification no.:	2022-40196-BESS-1-Rev.1	
(e) Date of test report:	2023-06-12	
(f) Description of test samples:	(i) Type: (ii) Mass: (iii) Watt-hour rating: (iv) Physical description: (v) Model numbers:	Li-ion battery 80 Kg 14,3 kWh 24S 34P SRB7143
(g) Test results:	T.1 Altitude simulation: T.2 Thermal test: T.3 Vibration: T.4 Shock: T.5 External short circuit T.6 Impact/Crush: T.7 Overcharge: T.8 Forced discharge:	Passed Passed Passed Passed Passed Not Performed Not Performed Not Performed
(h) Reference to assembled battery testing requirements:	Not applicable	
(i) Revised edition applied:	UN ST/SG/AC.10/11/Rev.7/Amend.1 Recommendations on the TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Part III, Sub-Section 38.3, Lithium metal and lithium ion batteries	

(j) Signature: 2023-06-12 Tim Topitsch, Test engineer

(name, function)

Note: This confirmation is valid only in connection with the test report reference.

SAFETY DATA SHEET

INR21700 Lithium-Ion Battery

LG CHEMICAL LIMITED

1. Chemical Product and Company Identification

Product Identification

INR21700 M50L (4950mAh) Lithium-Ion Battery

Manufacturer

LG Chemical Limited
Twin Tower
Youido-Dong, Youngdeungpo-Ku
Seoul, Korea

Emergency Telephone Number

82-2-3773-1114

2. Composition Information

Hazardous Ingredients	%	CAS Number
Aluminum Foil	2-10	7429-90-5
Nickel compound (proprietary)	0-80	
Manganese compound (proprietary)	0-15	
Cobalt compound (proprietary)	0-15	
Styrene-Butadiene-Rubber	<1	
Polyvinylidene Fluoride (PVDF)	<5	24937-79-9
Copper Foil	2-10	7440-50-8
Carbon (proprietary)	10-30	7440-44-0
Electrolyte (proprietary)	10-20	
Steel, Nickel and inert materials	Remainder	N/A

3. Hazards Identification

Primary routes of entry

Skin contact	:	NO
Skin absorption	:	NO
Eye contact	:	NO
Inhalation	:	NO
Ingestion	:	NO

Symptoms of exposure

Emergency Overview

May explode in a fire, which could release hydrogen fluoride gas.
Use extinguishing media suitable for materials burning in fire.

Skin contact

No effect under routine handling and use.

Skin absorption

No effect under routine handling and use.

Eye contact

No effect under routine handling and use.

Inhalation

No effect under routine handling and use.

Reported as carcinogen

Not applicable

4. First Aid Measures

Inhalation
Not a health hazard.

Eye contact
Not a health hazard.

Skin contact
Not a health hazard.

Ingestion
If swallowed, obtain medical attention immediately.

IF EXPOSURE TO INTERNAL MATERIALS WITHIN CELL DUE TO DAMAGED OUTER CASING, THE FOLLOWING ACTIONS ARE RECOMMENDED ;

Inhalation
Leave area immediately and seek medical attention.

Eye contact
Rinse eyes with water for 15 minutes and seek medical attention.

Skin contact
Wash area thoroughly with soap and water and seek medical attention.

Ingestion
Drink milk/water and induce vomiting; seek medical attention.

5. Fire Fighting Measures

General Hazard
Cell is not flammable but internal organic material will burn if the cell is incinerated. Combustion products include, but are not limited to hydrogen fluoride, carbon monoxide and carbon dioxide.

Extinguishing Media
Use extinguishing media suitable for the materials that are burning.

Special Firefighting Instructions
If possible, remove cell(s) from fire fighting area. If heated above 125℃, cell(s) may explode/vent.

Firefighting Equipment
Use NIOSH/MSHA approved full-face self-contained breathing apparatus (SCBA) with full protective gear.

6. Accidental Release Measures

On Land
Place material into suitable containers and call local fire/police department.

In Water
If possible, remove from water and call local fire/police department.

7. Handling and Storage

Handling
No special protective clothing required for handling individual cells.

Storage
Store in a cool, dry place.

8. Exposure Controls / Personal Protection

Engineering controls

Keep away from heat and open flame. Store in a cool dry place.

Personal Protection

Respirator

Not required during normal operations. SCBA required in the event of a fire.

Eye/face protection

Not required beyond safety practices of employer.

Gloves

Not required for handling of cells.

Foot protection

Steel toed shoes recommended for large container handling.

9. Physical and Chemical Properties

State	Solid
Odor	N/A
PH	N/A
Vapor pressure	N/A
Vapor density	N/A
Boiling point	N/A
Solubility in water	Insoluble
Specific gravity	N/A
Density	N/A

10. Stability and Reactivity

Reactivity
None

Incompatibilities
None during normal operation. Avoid exposure to heat, open flame, and corrosives.

Hazardous Decomposition Products
None during normal operating conditions. If cells are opened, hydrogen fluoride and carbon monoxide may be released.

Conditions To Avoid
Avoid exposure to heat and open flame. Do not puncture, crush or incinerate.

11. Toxicological Information

This product does not elicit toxicological properties during routine handling and use.

Sensitization	Teratogenicity	Reproductive toxicity	Acute toxicity
NO	NO	NO	NO

If the cells are opened through misuse or damage, discard immediately. Internal components of cell are irritants and sensitizers.

12. Ecological Information

Some materials within the cell are bioaccumulative. Under normal conditions, these materials are contained and pose no risk to persons or the surrounding environment.

13. Disposal Considerations

California regulated debris

RCRA Waste Code : Nonregulated

Dispose of according to all federal, state, and local regulations.

14. Transport Information

Lithium batteries are classified in Class 9 – Miscellaneous dangerous goods as:
• UN 3480, Lithium ion batteries
• UN 3481, Lithium ion batteries contained in equipment; or
• UN 3481, Lithium ion batteries packed with equipment.

With regard to transport of the product, the following regulations are cited and considered:

- The International Civil Aviation Organization (ICAO) Technical Instructions,
- The International Air Transport Association (IATA) Dangerous Goods Regulations
- The International Maritime Dangerous Goods (IMDG) Code,
- US Hazardous Materials Regulations 49 CFR(Code of Federal Regulations) Sections 173-185 Lithium batteries and cells,
- The UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria 38.3 Lithium batteries,

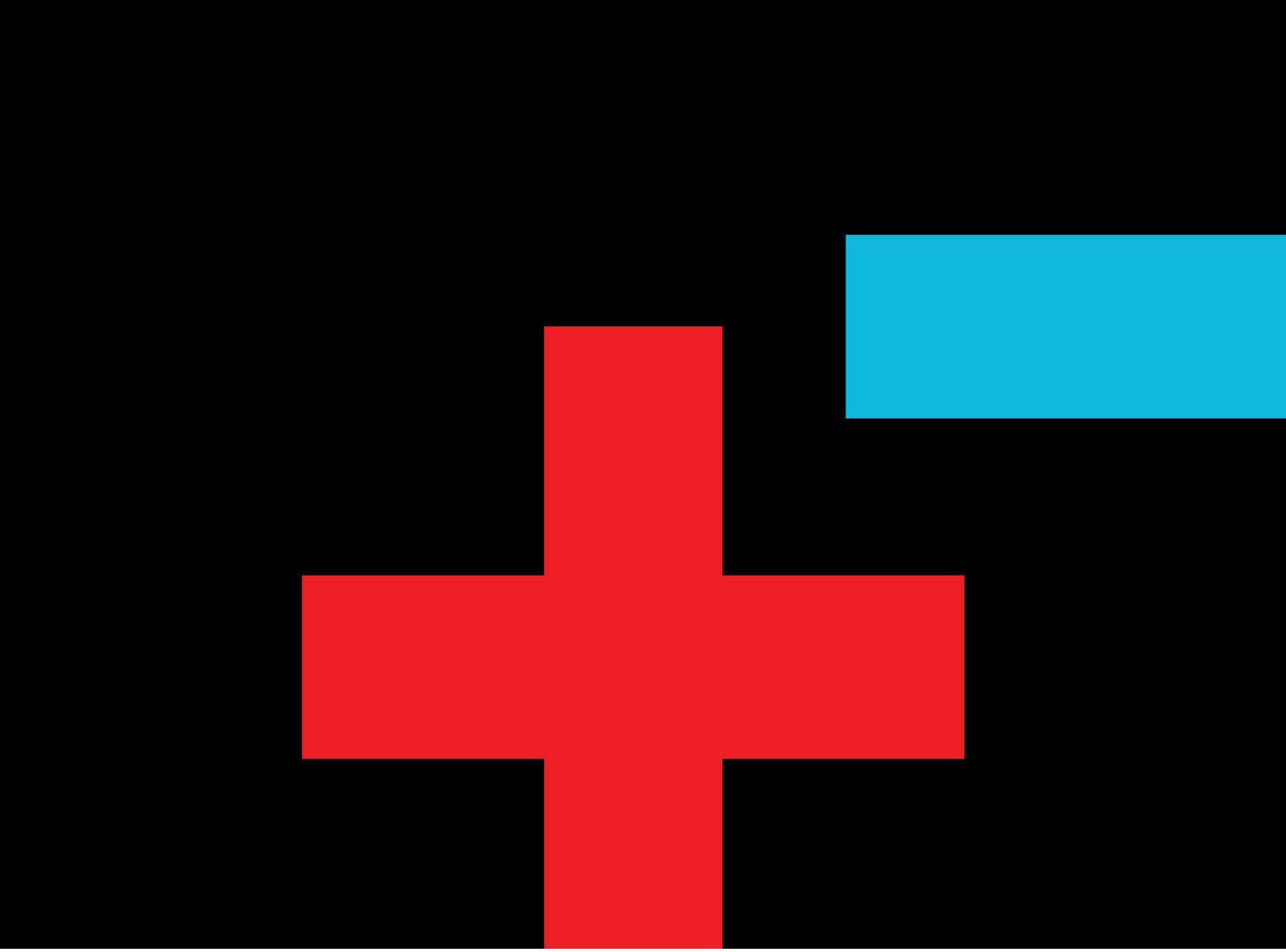
If those lithium-ion batteries are packed with or contained in an equipment, then it is the responsibility of the shipper to ensure that the consignment are packed in compliance to the latest edition of the IATA Dangerous Goods Regulations Section Ⅱ of either Packing Instruction 966 or 967 in order for that consignment to be declared as NOT RESTRICTED (non-hazardous/non-Dangerous). If those lithium-ion batteries are packed with or contained in an equipment, UN No. is UN3481

Each cell or battery is of the type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, subsection 38.3;

15. Regulatory Information

OSHA hazard communication standard (29 CFR 1910.1200)

_____Hazardous ___✔___Non-hazardous



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