SCHMITZ CARGOBULL

The Trailer Company.

Operating instructions
High-voltage system

Version 1
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Legal notice

Editorial department

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Some illustrations show optional equipment – We reserve the right to make changes resulting from technical advances.

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1 About these instructions

The present Operating instructions contain information and instructions for the safe use, fault-free operation and maintenance of the S.KOe COOL's high-voltage system. For optimum readability the product is referred to below as "high-voltage system":

The Operating instructions are aimed at drivers and vehicle owners. The Operating instructions are intended to increase the reliability and service life of the unit, avert hazards and downtimes and, where applicable, the loss of warranty claims. It is imperative that the Operating instructions be read and understood.

The vehicle indications "left", "right", "front" and "rear" are always to be understood as relative to the direction of travel.

1.1 Validity of the operating instructions

The operating instructions apply exclusively to the high-voltage system of the S.KOe COOL semi-trailer box with the following components:

- ROTOS.e generator axle (referred to below as "generator axle")
- EloTrail30 high-voltage battery (referred to below as "high-voltage battery")
- S.CU ep85 semi-trailer cooling unit (referred to below as "cooling unit")

The components are intended for use in the S.KOe COOL all-electric semi-trailer box.

1.2 Product identification and type plates

Type plates are attached to the main assemblies for product identification.

1.2.1 Generator axle type plate

The type plate is attached to the axle tube on the right in the direction of travel and contains the following information:

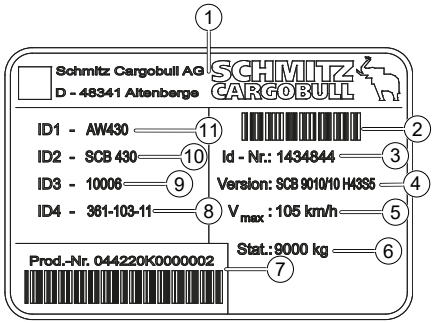


Figure 1: Generator axle type plate

1	Manufacturer
2	Barcode
3	ID no.
4	Version
5	Max. speed
6	Static weight
7	Production number
8	ID4
9	ID3
10	ID2
11	ID1

1.2.2 High-voltage battery type plate

The type plate is attached to the battery cover on the left in the direction of travel and contains the following information:

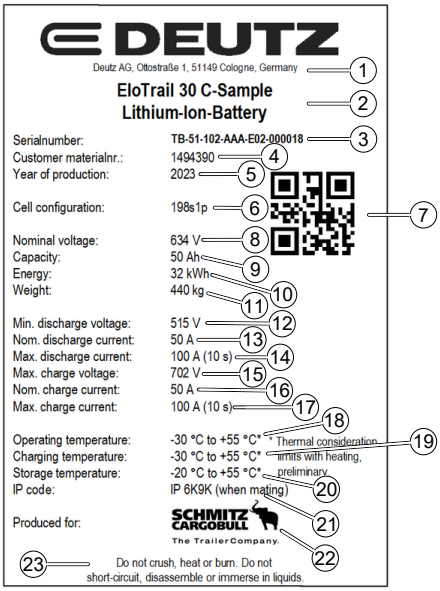


Figure 2: High-voltage battery type plate

1 Manufacturer
2 Battery designation and type
3 Serial number
4 Customer material number
5 Year of production
6 Cell configuration
7 QR code
8 Rated voltage
9 Capacity
10 Power energy
11 Weight
12 Min. discharge voltage
13 Nominal discharge current
14 Max. discharge current
15 Max. charging voltage
16 Nominal charging current
17 Max. charging current
18 Operating temperature
19 Charging temperature
20 Storage temperature
21 IP code
22 Produced for
23 Note: Do not damage, heat or scorch. Do not short-circuit, disassemble or immerse in liquids.

1.2.3 Cooling unit type plate

The type plate is attached to the bottom right of the cooling unit frame and contains the following information:

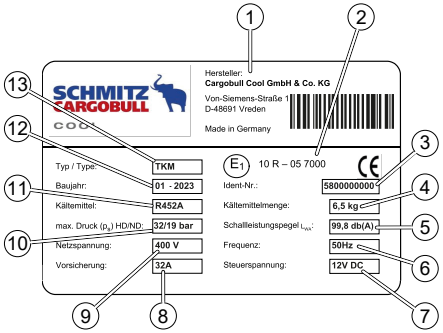


Figure 3: Cooling unit type plate

1 Manufacturer
2 CE marking
3 Identification number
4 Refrigerant quantity
5 Sound power level
6 Frequency
7 Control voltage
8 Back-up fuse
9 Mains voltage
10 Max. pressure HP/LP
11 Refrigerant
12 Year of manufacture
13 Type

1.3 Text markings and symbols used

Different text markings and symbols are used in the operating instructions.

These are explained below.

✓ Precondition for subsequent actions

▷ Instruction or required action

1. Numbered action steps
2. Numbered action steps
   - ➔ Intermediate result of action steps

▶ Result of action steps

- Symbol for an unnumbered enumeration

1. Numbered enumeration

`Software messages, menus and buttons on the control panel`

[linked cross-reference to a chapter or further content]

INFORMATION

Additional information and instructions

⚠ The warning symbol shown on the left is used in warning notices and is graded according to the severity of the hazard.

▷ Observe the instructions and explanations in the “Safety” chapter. [Safety ▸ 10]

1.4 Illustrations used

In the operating instructions the illustrations in some instances show views with removed parts or that are simplified for a better presentation and explanation. This is for a better understanding.

▷ Observe the following notes on the illustrations.

- Disassembly is not always strictly necessary for the particular description provided.
- Different equipment versions are not shown in the illustrations unless a description of them is provided.
- The illustrations are always accompanied by the corresponding descriptive texts.

1.5 Applicable documents

The following documents are supplied with these operating instructions:

- Declaration of conformity
- Operating instructions for S.KO COOL semi-trailer box
- Operating instructions for S.CU semi-trailer cooling unit
- Cooling unit circuit diagram in the switch cabinet
- Low-voltage circuit diagram in the switch cabinet
- Connector diagram on the side of the switch cabinet

1.6 Storage of the documents

▷ Keep these instructions and all other applicable documents in a safe place so that they are available at all times.

▷ Hand over the documents in full to the next driver or owner.

1.7 Warranty

Excluded from the warranty is damage due to:

- overstressing,
- unprofessional, improper usage,
- unauthorised changes,

- incorrect installation or repair of components,
- incorrect commissioning.

Natural wear is also excluded from the warranty.

The content and scope of warranty claims are governed by the Schmitz Cargobull New Vehicle Delivery Conditions (subject matter of the purchase contract between Schmitz Cargobull and the buyer) and the GTC.

2 Safety

The present operating instructions contain instructions for your safety.

The basic safety instructions include instructions that generally apply to the safe use of the S.KOe COOL's high-voltage components or their maintenance in a safe condition.

The action-related warning notices warn you of residual dangers and indicate a dangerous action step.

▷ Follow all instructions to prevent personal injury, environmental damage or damage to property.

2.1 Presentation and structure of warning notices

The action-related warning notices are structured as follows:

⚠ DANGER

Nature and source of the hazard!

Explanation of the nature and source of the hazard.

▷ Measures to avert the hazard.

2.2 Hazard classification of warning notices

The warning notices are graded according to the severity of the hazard. The hazard levels with the corresponding signal words and warning symbols are explained below.

⚠ DANGER

Immediate danger to life or serious injury.

⚠ WARNING

Possible danger to life or serious injury.

⚠ CAUTION

Possible minor injuries.

NOTE

Possible damage to the environment or property.

2.3 Personnel qualification

The following personnel qualifications are differentiated in the operating instructions:

- operators,
- drivers and
- specialist personnel.

The operator must ensure that the drivers and specialist personnel are sufficiently instructed in the use of the system as well as the necessary measures in the event of malfunctions, and are familiar with all necessary safety instructions.

The operator, the drivers and the specialist personnel must have read and understood the operating instructions.

Operators

The operator is responsible for the proper operation of the semi-trailer box with high-voltage system.

The operator must:

- have reached the legal minimum age,
- instruct the drivers in the use of the semi-trailer box with high-voltage system and
- ensure that the semi-trailer box with high-voltage system is regularly inspected and serviced in an authorised specialist workshop.

Drivers

The driver is always the driver of the vehicle, including the co-driver where appropriate.

The driver is responsible for the proper operation of the semi-trailer box with high-voltage system and must:

- have read and understood the operating instructions,
- have reached the legal minimum age.

Only drivers who have received oral and workplace-related instruction before starting work for the first time and thereafter at least once a year may operate the refrigerated vehicle with high-voltage system.

The instruction must cover the following points in particular:

- the vehicle-specific measures to be taken in the event of malfunctions and accidents,
- the particular hazards involved in operating cooling systems and
- the particular dangers of operating high-voltage systems.

Specialist personnel

Specialist workshop personnel are authorised to carry out maintenance work (servicing and repairs). Authorised specialist personnel must have the qualifications listed below.

In order to carry out work on the refrigeration circuit, the specialist personnel must have a training attestation in the form of a certificate of competence in accordance with Regulation (EC) No. 2015/2067 or higher.

Schmitz Cargobull AG requires the following qualifications for the performance of troubleshooting, repair work or maintenance on battery, mains and generator circuits:

“Qualified electrician for specified activities on transport cooling units”

Note: Qualification as an "Electrically instructed person" is not sufficient as a qualification measure.

According to the BGV (Employers’ Liability Association Regulations) and the VDE (Association of German Electricians) regulations, work on mains and generator circuits may only be carried out by qualified electricians.

In other European countries a person with a qualification in electrical engineering is required.

The following certificates and attestations are required for work on refrigerated vehicles with high-voltage system:

- BGR 500 (Employers’ Liability Association Rule 500); Chapter 2.35 “Operating cooling systems, heat pumps and cooling equipment” (formerly BGV D4 or VBG 20 (German regulations for the prevention of accidents caused by refrigerating equipment).
- Maintenance and repair work may only be carried out by qualified personnel in service workshops authorised by the manufacturer.

- The specialist personnel must be knowledgeable in the fields of electrics and refrigeration technology. System-specific training is conducted and confirmed by the manufacturer.
- Qualification for work on vehicles with high-voltage systems: Only competent persons for level 2S high-voltage systems, comparable or higher, who are familiar with the hazards of high-voltage systems and with their use are permitted to de-energise the high-voltage system and test whether it is voltage-free.

2.4 Danger areas

To keep the danger areas to a minimum, all moving parts are protected by covers during normal operation so as to prevent accidents.

The high-voltage battery is protected against access. The high-voltage cables are marked in orange.

▷ Avoid touching high-voltage components.

▷ Have maintenance work carried out only by qualified personnel.[Personnel qualification ▸ 10]

▷ Expel unauthorised persons from the danger area.

During pre-start checks, daily inspections and maintenance work, it is possible that hazardous components may be exposed.

▷ When the cooling unit is switched on, keep a sufficient distance from these components. The possible dangers are described in the basic safety instructions. [Basic safety instructions ▸ 13]

▷ Expel unauthorised persons from the danger area.

2.5 Protection devices

Covers to protect against access

The high-voltage components of the S.KOe COOL are secured against access with covers.

▷ Only operate the high-voltage system of the S.KOe COOL with the covers fitted and undamaged.

Protective housing of the battery

The battery's protective housing is made of 2 mm thick stainless steel and protects the battery from damage from the outside. It also prevents the life-threatening flying around of parts in the event of an explosion.

▷ Do not damage the protective housing of the battery.

▷ Do not attach accessories to the battery's protective housing.

▷ Do not drill into or cut the protective housing of the battery.

The temperature of the high-voltage battery cells is monitored by the battery management system and can be preconditioned at low ambient temperatures via the CEE socket.

▷ Check the battery temperature when charging. [Check state of charge and battery temperature ▸ 32]

Vehicle safety systems

The generator axle has no negative influence on the driving dynamics.

Lockable doors

The cooling unit is closed off from access by doors.

▷ Always keep the doors of the cooling unit closed.

2.6 Information, warning and mandatory signs

The warning notices and safety requirements in these operating instructions are also attached to the cooling unit and the high-voltage battery as signs. The dangers and the measures are described in detail before the corresponding instructions and in the following section. [Basic safety instructions ▸ 13]


Risk due to automatic start/stop


Risk of crushing due to drive belt


Danger due to sharp-edged fan wheel


Danger due to strong magnetic field


Risk of electric shock


Danger due to electric arc


Danger due to hot surface


Danger from explosive substances


Danger from flammable substances


Danger from charging of battery


Danger from corrosive substances


Switch off


Disconnect the power supply


Read instructions before use


Disconnect the battery


Do not use a steam jet


Open fire and ignition sources prohibited


Climbing onto the surface prohibited


Battery contains harmful heavy metals (separate collection)


For reuse (recycling)

- ▷ Observe and follow the signs.
- ▷ Keep signs clean and legible.
- ▷ Do not clean signs with solvents, petrol or other corrosive chemicals.
- ▷ Never remove, paint over or stick over signs.
- ▷ Replace illegible or missing signs immediately.

2.7 Basic safety instructions

The basic existing hazards and residual risks are listed below, together with the corresponding measures for working with the S.KOe COOL's high-voltage system.

Electromagnetic hazards

For technical reasons, electromagnetic (non-ionising) radiation can be produced at the electrical cables. This radiation can be dangerous to persons with implants such as pacemakers or defibrillators.

▷ Advise persons with implants to maintain a safe distance.

▷ Persons with implants must refrain from standing in the immediate vicinity of the assembly.

Thermal hazards

The high-voltage battery is a lithium iron phosphate accumulator. Lithium iron phosphate batteries are considered very safe due to their cell chemistry. Nevertheless, it cannot be ruled out that thermal events may occur due to improper maintenance or improper servicing measures. In the worst case, fire and explosions can occur inside the battery housing. This can result in serious or even fatal injuries and extensive damage to property.

▷ Have prescribed maintenance and servicing carried out at the specified intervals.

▷ Have damaged or defective components replaced immediately.

▷ Work on high-voltage components may only be carried out by trained high-voltage technicians.

▷ In the event of smoke generation and fire, observe the accident rules.

▷ In the event of smoke generation and fire, inform the rescue services about the rescue disconnection point.

Electrical hazards

A high voltage of up to 690 V can be applied to the high-voltage system. Touching live parts can lead to serious injury or even death.

▷ Observe the following instructions to avoid electrical hazards.

- Touching electrical components with wet or damp body parts is prohibited.
- Pulling on electrical cables is prohibited.
- Damage to electrical cables and components is prohibited.

▷ Work on the electrical system may only be carried out by specialist personnel with a qualification as a competent person for high-voltage systems.

▷ Follow the instructions in the Schmitz Cargobull maintenance manual and generally applicable operating instructions when carrying out maintenance work.

Material damage to the control unit

The electrical control unit with display and membrane keypad consists of sensitive components that can be damaged quickly. Improper use of voltmeters, connecting wires, continuity testers etc. can damage the control unit.

▷ Switch off the cooling unit immediately in the event of electrical or control system faults.

▷ Do not repair the control unit and its display.

▷ Contact Schmitz-Cargobull Service immediately if the control unit is defective.

Material damage due to low state of charge

If the S.KOe COOL is unused for longer than a year, the high-voltage battery may be damaged if the state of charge is below 30 %.

▷ Check the state of charge of the high-voltage battery at least once a year.

▷ If the state of charge is below 30%, charge the high-voltage battery via the mains.

Charge loss

The high-voltage system of the S.KOe COOL is designed for a maximum top speed of 100 km/h. When the vehicle is travelling above the maximum speed, the control system switches off the charging of the high-voltage battery. As a result, the loaded refrigerated goods may thaw and spoil.

▷ Adhere to the specified speeds in and out of town.

▷ Do not exceed the maximum speed limit of 100 km/h.

2.8 Limited system availability at low temperatures

Operation of the cooling unit and the S.KOe COOL in battery mode is possible down to a minimum battery temperature of -20°C. Recharging via the generator axle is possible at battery temperatures above 0°C.

The battery is automatically preconditioned when the trailer is connected to the mains for charging.

▷ If it can be assumed that the battery has cooled down due to long down-times, the minimum cell temperature can be read on the S.CU ep 85 display. (To ensure unrestricted operation of the system under all ambient conditions, a minimum cell temperature of > 20°C is recommended, especially at outside temperatures < 0°C)

▷ Observe the following guide values for low temperatures.

- Outside temperature -10°C to 0°C: charge for 1 hour before continuing the journey
- Outside temperature -10°C to -30°C: charge for 4 hours before continuing the journey

2.9 Use of the S.KOe in a road-train combination

When using the S.KOe COOL in a road-train combination (S.KOe COOL + dolly), the generator axle must be switched off.

▷ To do this, select the “OFF” generator mode in the S.CU menu (see also Section 6.5.4).

▷ Alternatively, this setting can be made via the TrailerConnect® portal.

2.10 Behaviour in an emergency

To avoid further damage in the event of an accident, take the following measures, depending on the circumstances:

1. Secure the accident site properly.
2. Set the system to a safe state (EMERGENCY STOP).

Normal fault case:

1. Switch off the display on the cooling unit.

2. Switch off the main switch on the cooling unit.
3. Disconnect the trailer from the CEE socket during the charging process.

Behaviour in the event of an electrical accident:

1. Secure the accident site.
▷ Switch off the voltage source.
▷ Switch off the main switch. [Main switch ▸ 20]
▷ Disconnect the rescue disconnection point. [Rescue disconnection point ▸ 16]
▷ Remove the CEE plug. [Connecting/disconnecting the mains ▸ 29]
▷ Disconnect the mains fuse of the charging infrastructure in use at the time of the accident. (if possible)
▷ Separate accident victims from the electrical conductor using insulated objects.
2. Call the emergency services.
▷ Call the fire brigade and describe the situation briefly and factually. (Detailed information is specifically requested.)
3. Carry out life-saving emergency measures.
▷ Perform resuscitation.
▷ Use a defibrillator.
4. Provide further first aid
▷ Stop bleeding.
▷ Move the accident victim into the recovery position.
▷ Use an eye wash bottle for eye injuries.
5. Await the arrival of rescue services.
▷ Inform the employer.

Behaviour in case of fire

Battery fires produce toxic fumes which spread very quickly. Lithium batteries can explode or cells/parts can fly off due to overpressure. Overpressure is characterised by e.g. expansion of the battery box.

1. Leave the area around the accident site immediately. (If the accident site is inside a building, leave the building immediately)
2. Make everyone leave the vicinity of the accident site or the building by shouting loudly.
3. Trigger a fire alarm.
4. Immediately make an emergency call to the fire brigade.
5. Inform the employer.

2.11 Rescue disconnection point

In the event of an accident, authorised rescue personnel can safely deactivate the high-voltage system at the rescue disconnection point.

On the S.KOe COOL, there are two rescue disconnection points on the outside of the landing gear. The rescue disconnection points are marked with a yellow flag.

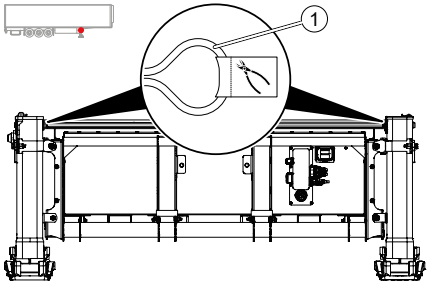


Figure 4: S.KOe COOL rescue disconnection point

1 Rescue disconnection point

3 Layout and function

3.1 Main assemblies

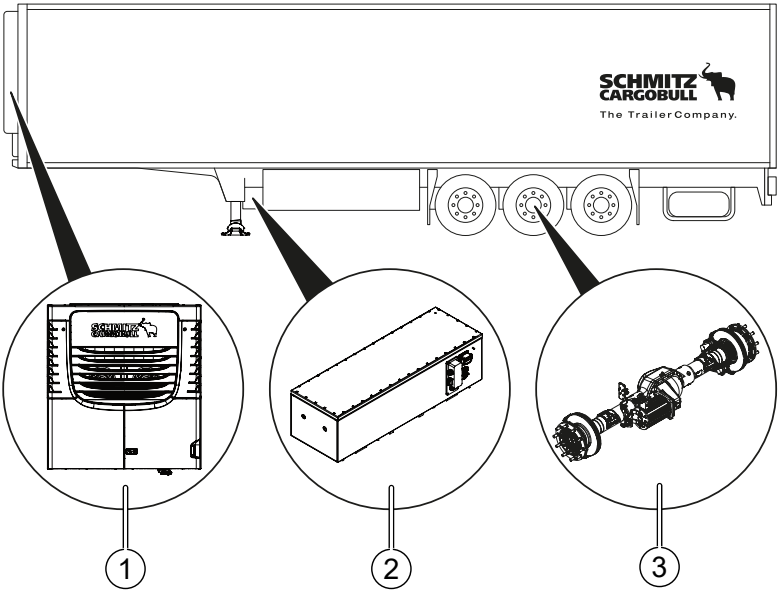


Figure 5: S.KOe COOL main assemblies

1 S.CU ep85 semi-trailer cooling unit
2 EloTrail30 high-voltage battery
3 ROTOS.e generator axle

3.2 Assemblies

3.2.1 Cooling unit

The cooling unit is used for the heating and cooling of transported goods. The cooling unit contains the following electrical and electronic components in addition to the cold/hot assemblies:

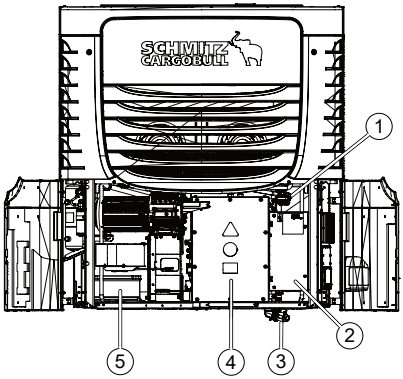


Figure 6: S.CU ep85 cooling unit – Layout of electrical and electronic components (with open doors)

1	Coolant pump
2	Switch cabinet
3	CEE socket (400 V AC, 50 Hz, 32 A)
4	High-voltage switch cabinet
5	12-V battery

The following components are housed in the high-voltage switch cabinet:

- fuses,
- inverter,
- direct current transformer and
- Tr.CU trailer control unit (central control unit of the high-voltage system)

Further information on the S.CU ep85 can be found in the operating instructions for the S.CU semi-trailer cooling unit. [Applicable documents ▸ 8]

3.2.2 High-voltage battery

The high-voltage battery consists of lithium iron phosphate accumulators (LFP rechargeable batteries). The high-voltage battery stores the supplied electrical energy and makes it available again when required. Charging and discharging of the battery cells is controlled by the BMS (battery management system). The BMS also monitors the condition of the battery. The battery unit is fitted in the area of the landing gear underneath the refrigerated box.

The following plugs and connections are located on the battery:

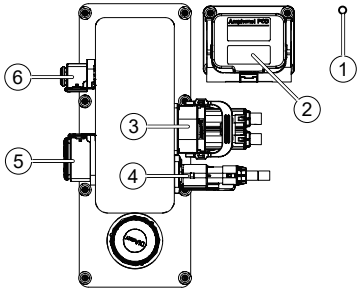


Figure 7: High-voltage battery – overview of plugs and connections

1	Ground bolt / grounding point
2	Service disconnect plug
3	High voltage DC
4	Battery heater
5	Communications interface
6	High-voltage disconnection point

3.2.3 Generator axle

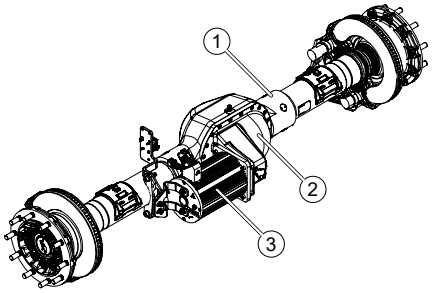


Figure 8: Generator axle – electrical design

1	Axle

2 Gear unit
3 Generator

The generator is connected via a gear unit to the right-hand wheel in the direction of travel. There is neither a clutch nor a differential. The wheels on this axle rotate independently of each other.

The generator on the axle uses the kinetic energy to recover energy while the vehicle is travelling. The electric generator axle has no influence on the brake system. The trailer control unit recognizes ABS/RSP interactions and switches off the generator immediately.

3.3 Function

The S.KOe COOL with S.CU ep85 cooling unit is an all-electric unit for zero-emission trailers in distribution or hub-to-hub transport.

The S.CU ep85 cooling unit operates emission-free with electrical energy from the high-voltage battery.

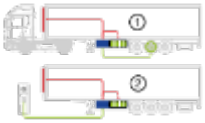


Figure 9: S.KOe COOL function

During the journey the generator axle charges the high-voltage battery as required. The high-voltage battery serves as the main energy supplier for stops, such as:

- traffic jams,
- standstill times
- and at (un)loading points.

When the vehicle is parked the battery is charged from the mains via a CEE32 socket.

3.4 Operating and display elements

3.4.1 Main switch

The main switch is located on the switch cabinet in the cooling unit. The main switch is used to start up and shut down the cooling unit and the entire high-voltage power supply system. The main switch is only intended for maintenance and servicing work, for decommissioning or in an emergency.

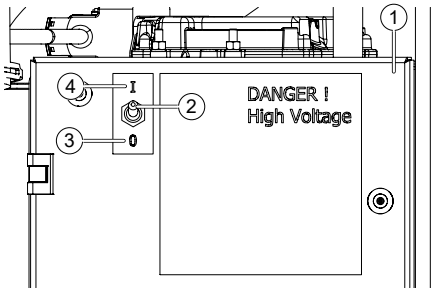


Figure 10: Main switch

1 Switch cabinet
2 Main switch
3 Position 0
4 Position 1

3.4.2 Control panel

The cooling unit and the high-voltage system are operated and information on their state is displayed via the control panel on the left-hand door of the cooling unit. [Operation ▸ 25]

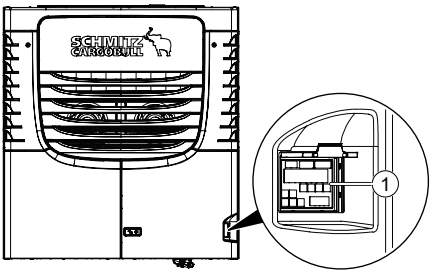


Figure 11: Control panel on the cooling unit

1	Control panel

3.5 Operating modes

The S.KOe COOL can be operated in the following operating modes:

- mains operation
- battery operation

The currently set operating mode is indicated by a green LED in the button  .

4 Transportation and storage

4.1 Transportation

⚠ WARNING

Mortal danger due to fire!

During the transportation of vehicles with high-voltage batteries on a ferry or train, a battery fire can lead to severe material damage and life-threatening situations.

- ▷ Before transporting the S.KOe COOL on a ferry or train, inform the ferry or railway operator about the presence of an active high-voltage system with a high-voltage battery.
- ▷ Before transporting the S.KOe COOL on a ferry or train, obtain the ferry or train operator's approval for the transportation.

⚠ WARNING

Smoke poisoning due to fire in a tunnel!

In the event of a fire in the high-voltage battery, this can spread to the insulated body and lead to the production of thick smoke. Toxic smoke in tunnels leads to severe smoke poisoning and life-threatening lung injuries.

- ▷ Call the emergency services.
- ▷ Alert persons in the vicinity of the vehicle and other road users to the hazardous situation.
- ▷ Instruct all persons in the vicinity to leave the danger zone and the tunnel.

As the S.KOe COOL has a high-voltage battery, precautions must be taken for transportation by ferry or rail.

- ▷ Before transporting the S.KOe COOL on a ferry or train, inform the ferry or train operator about the presence of an active high-voltage system with a high-voltage battery.
- ▷ Before transporting the S.KOe COOL on a ferry or train, obtain the ferry or train operator's approval for the transportation.

During transportation or in traffic jams in tunnels, careful behaviour is necessary due to the high-voltage battery.

- ▷ Pay attention to possible smoke generation at the high-voltage battery.
- ▷ In the event of smoke emission or fire, react immediately and follow the emergency procedures. [Behaviour in an emergency ▸ 15]

4.2 Storage

NOTE

Material damage due to low state of charge!

If the S.KOe COOL is unused for longer than a year, the high-voltage battery may be damaged if the state of charge falls below 30 %.

▷ Check the state of charge of the high-voltage battery at least once a year.

▷ If the state of charge is below 30 %, charge the high-voltage battery via the mains.

Storage of the high-voltage components is only provided for at Schmitz Cargobull within the production process and for installation.

5 Installation and commissioning

5.1 Installation

Installation of the S.KOe components on the refrigerated box body vehicle is carried out by Schmitz Cargobull. Schmitz Cargobull delivers the vehicle with an operational high-voltage system.

5.2 Initial commissioning

The high-voltage components have been installed ready for operation on the refrigerated box body vehicle by Schmitz Cargobull and have been handed over to you in a proper condition.

Carry out the initial commissioning in the following steps:

✓ The operating instructions for the S.KO COOL semi-trailer box, the S.CU semi-trailer cooling unit and the S.KOe COOL have been read and understood. [Applicable documents ▸ 8]

1. Take over the semi-trailer box with high-voltage system with the high-voltage components.
2. Fill in the handover protocol.
3. Upon taking over the vehicle, undergo instruction in the high-voltage components.
4. Ask questions if anything is unclear.
5. Follow the instructions for initial commissioning in the operating instructions for the S.KO COOL semi-trailer box and the S.CU semi-trailer cooling unit.
6. Switch on the cooling unit and the high-voltage components at the main switch and on the control panel so they are ready for operation. [Main switch ▸ 20] [Operation ▸ 25]

▶ Initial commissioning has now been completed.

5.3 Commissioning before each use

To ensure that the S.KOe COOL components are in good working order, the driver must check the components regularly and before each use to ensure they are functioning correctly and switch them on.

Carry out commissioning before each use in the following steps:

1. Carry out a visual inspection for commissioning.

▷ Check all assemblies and components for a proper condition.

▷ Report any defects found to the operator and have them rectified.

2. Switch on the cooling unit at the main switch and on the control panel. [Main switch ▸ 20] [Operation ▸ 25]
3. Check the state of charge of the high-voltage battery. [Check state of charge and battery temperature ▸ 32]

▶ The S.KOe COOL is ready for operation.

6 Operation

6.1 Layout of the control panel

The control panel consists of the display and the operating buttons with LEDs. An alarm LED is also fitted.

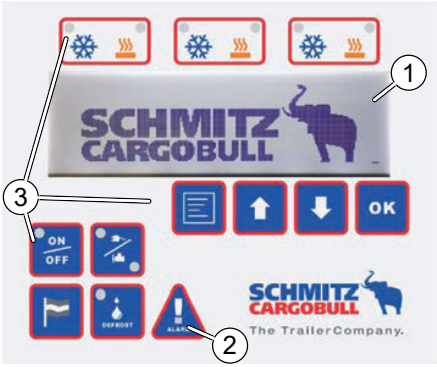


Figure 12: Control panel with start screen (3-chamber version)

1 Display
2 Alarm LED
3 Control buttons

6.2 Display

The display shows all the important information in the various operating states. The menus and settings are shown on the display.

After the cooling unit is started the start screen is displayed for a few seconds.

After the cooling unit has started up the standby display is shown. How to operate the S.CU semi-trailer cooling unit is included in the supplied operating instructions. [Applicable documents ▸ 8]

The layout of the cooling unit control panel includes additional information on the high-voltage battery and on charging.

6.3 Control buttons

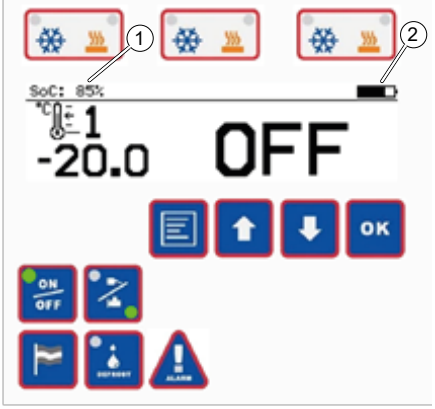


Figure 13: Status messages on the display

1 Status and alarm line
2 State of charge (during the charging process the battery symbol flashes from empty to full.)

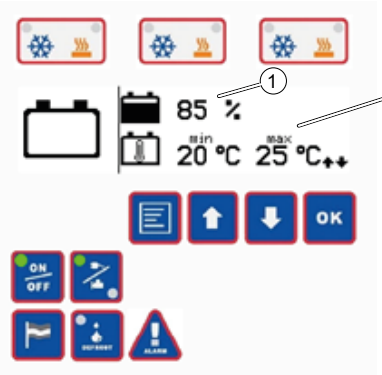
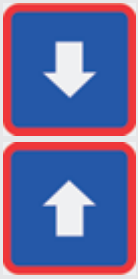


Figure 14: Charge status and temperature

1 State of charge (during the charging process the battery symbol flashes from empty to full and the percentage value is displayed)
2 Temperature of the coldest and the warmest battery cell

The following overview provides a brief description of the operating buttons, the alarm LED and the associated functions.

Overview of the control buttons

Button	Button	Function
ON/OFF		Switch on/off the cooling unit readiness. After it is switched on the cooling unit is ready for operation. When the electronics are switched on, the LED in the button lights up green.
Chambers		Switch on individual chambers of the cooling unit. Depending on the setpoint temperature set in the menu, the corresponding chamber of the cooling unit heats or cools. Cooling mode active: LED lights up blue Heating mode active: LED lights up red
Language		Set the language. The language is set using the selection buttons.
Menu		Call up the menu. Pressing the button advances you through the menu levels.
Switch between mains and battery operation		Switching of the operating modes “mains” or “battery operation”. The set operating mode is saved and is set following a restart. The currently set operating mode is indicated by a green LED.
Selection		Select the settings.

Confirm/OK		Confirm the settings. If a setting is not confirmed the last value set is used.
Defrost		Defrost Start of the defrosting process. The process cannot be interrupted once it has been started. Defrosting mode active: LED lights up orange
Alarm		Alarm (cannot be pressed) The LED lights up when the alarm is active. When the alarm is active the alarm LED lights up red.

6.4 Switching between mains operation and battery operation

The mains operation/ battery operation switch-over button switches between the two operating modes:

mains operation

battery operation

The currently set operating mode is indicated by a green LED in the button.

The “mains operation” operating mode always has priority as long as the cooling unit is connected to the mains. Charging of the high-voltage battery starts automatically.

If the cooling unit is not connected to the mains it switches over automatically to battery operation.

INFORMATION

In the event of a mains failure the cooling unit switches over automatically to battery operation. After 30 minutes an unexpected power failure error message is displayed.

6.5 Charging

6.5.1 Charging the high-voltage battery – general instructions

⚠ WARNING

Burns and material damage due to electric arcs!

Unplugging the unit under load can lead to arcing. This can result in burns to the skin and eyes and damage to electrical components.

▷ Only unplug the unit when it is switched off.

⚠ WARNING

Damage due to plug disconnection while under load

The S.CU ep85 must be shut down before the mains plug is disconnected. Do not disconnect the plug while under load to avoid personal injury and property damage.

- ▷ Before carrying out any work, de-energise the system in accordance with the instructions.
- ▷ Do not work on the unit while it is under load (disconnect the plug).
- ▷ Only unplug the unit when it is switched off.

⚠ WARNING

Personal injury and property damage due to improperly installed infrastructure!

If the (pre-)installation of the socket on the infrastructure side and the upstream protective measures for connection to the mains have not been carried out in accordance with the relevant and applicable local, regional and national regulations, this can have serious consequences in the worst case. The consequences are burns, electric shock, fire in the infrastructure and the trailer, damage to the trailer, spoilage of goods due to damage to the system and failure of the cooling system.

- ▷ Observe the applicable regulations.
- ▷ The operator is responsible for the (pre-)installation of the infrastructure-side socket and the upstream protective measures for connection to the mains.

NOTE

Loss of charge due to incorrect PIN assignment of the CEE plug!

The charging process will not start if the N conductor is not installed. If the PIN assignment of the CEE plug is incorrect, the charging process will not start. Loss of charge is the possible consequence.

- ▷ Check the PIN assignment of the CEE plug.

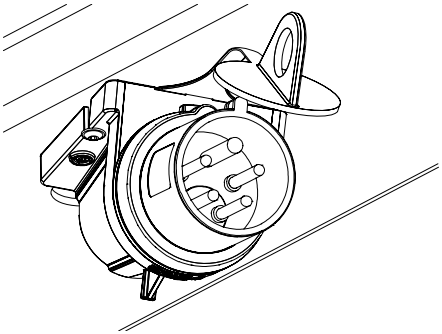


Figure 15: S.KOe COOL CEE socket

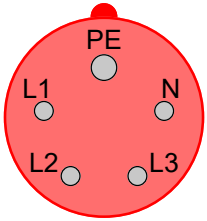


Figure 16: CEE assignment

Required charging infrastructure

The S.CU ep85 all-electric cooling unit and the high-voltage battery in the area of the landing gear are supplied with electrical energy via a CEE 3P+N+PE, 6h 32 A 400 V plug connection in accordance with IEC 60309 ([S.KOe COOL CEE socket ▸ 29]).

The S.CU ep85 is connected to the mains via an extension cable and an infrastructure-side socket.

The plug connections must be of type CEE 3P+N+PE, 6h 32 A 400 V in accordance with IEC 60309.

A consistent five-pole supply (3P+N+PE) is mandatory.

The use of a type K fuse (slow blow characteristic) is recommended.

The charging process will not start if the N conductor is not connected! If it is not certain whether the cable is defective, check the display of the S.CU ep85 to determine whether the charging process has started.

The S.CU ep85 may only be operated with fully functional plug connections, extension cables and protective devices. Connecting cables and protective devices must be adequately dimensioned for the 32 A current.

Correct charging

- Once the battery is fully charged, the charging process stops and the mains cable needs to be disconnected from the vehicle.
- We recommend charging the high-voltage battery when the S.CU ep85 is deactivated.

▷ In the case of a long standstill time, ensure that the state of charge does not fall below 30% in order to avoid deep discharging.

▷ To maintain the state of charge of the HV batteries, the S.KOe COOL must be charged for at least 4 hours once per month or continuously charged up to a displayed charge capacity of 100%.

▷ To protect the high-voltage battery we recommend running the vehicle through a complete charging cycle with equalisation charging at least three times per week.

6.5.2 Connecting/disconnecting the mains

⚠ WARNING

Burns and material damage due to electric arcs!

Unplugging the unit under load can lead to arcing. This can result in burns to the skin and eyes and damage to electrical components.

▷ Only unplug the unit when it is switched off.

⚠ WARNING

Risk of injury due to automatic start-up!

While the high-voltage battery is charging the condenser fans may start to work in order to cool down the power electronics. This can cause injuries to the upper limbs.

▷ Keep the doors of the cooling unit closed while charging the high-voltage battery.

Figure 17: Connecting to the mains

Connection

The mains plug can be connected in all operating modes.

▷ Connect the mains plug.

▶ The cooling unit is connected to the mains.

Disconnection

Figure 18: Procedure – disconnecting the mains

✓ The cooling unit is switched off or is in standby mode and is not being charged.

INFORMATION

If the system is not actively switched over and the plug is pulled out, the `unexpected grid loss` alarm will appear after 30 minutes.

▷ Disconnect the mains plug.

▶ The cooling unit is disconnected from the mains.

✓ The cooling unit is running (cooling/heating/defrosting) and/or the battery is charging.

1. Switch over the cooling unit to battery operation or switch it off.
2. Wait for 15 seconds.
3. Disconnect the mains plug.

▶ The cooling unit is disconnected from the mains.

6.5.3 Charging the high-voltage battery via the mains

⚠ WARNING

Risk of injury due to automatic start-up!

While the high-voltage battery is charging the condenser fans may start to work in order to cool down the power electronics. This can cause injuries to the upper limbs.

▷ Keep the doors of the cooling unit closed while charging the high-voltage battery.

✓ The cooling unit is in standby or operating mode.

Figure 19: Procedure – charging the high-voltage battery via the mains

1. Switch on the display on the control panel with ON.
2. Follow the instructions on the charging station.
3. Connect the mains plug. [Connecting/disconnecting the mains ▸ 29]
4. Switch operating mode to mains operation.

Figure 20: Switching to “mains operation” operating mode

→ The battery symbol flashes from empty to full.

→ The high-voltage battery is charged.

→ The state of charge is shown on the control panel display.

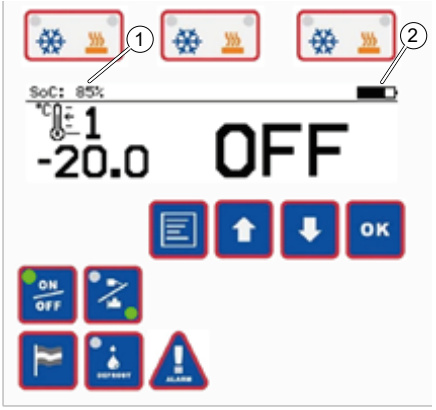


Figure 21: S.KOe COOL – state of charge of the high-voltage battery

1 Status and alarm line

2 State of charge (during the charging process the battery symbol flashes from empty to full.)

→ The charging process ends automatically when the battery is fully charged.

5. Disconnect the mains plug when the charging process has ended. [Connecting/disconnecting the mains ▸ 29]

▶ Charging of the high-voltage battery via the mains is completed.

Recommendation to protect the high-voltage battery:

▷ Charge the system from the mains at least once a month for at least four hours without interruption.

6.5.4 Charging the high-voltage battery using the generator axle

The high-voltage battery can be charged during the journey using the generator of the generator axle:

■ through recuperation during braking

- at speeds above 15 km/h

The generator can be operated in the following modes for charging:

Mode	Description
Generator mode ECO	The state of charge of the battery is maintained constantly at approx. 10% by switching on the generator of the electric axle.
Generator mode STANDARD	The state of charge of the battery is maintained constantly at approx. 50% by switching on the e-axle generator.
Generator mode SAFE	The state of charge of the battery is maintained constantly at approx. 90% by switching on the generator of the electric axle.

The high-voltage battery is charged, depending on the set mode, during the journey. The STANDARD generator mode is the factory default. Recuperation is always active during braking, regardless of the set mode.

✓ The cooling unit is in standby or operating mode.

1. Switch on the display on the control panel with ON.
2. Switch operating mode to battery operation.

Figure 22: Switching to “battery operation” operating mode

3. Confirm in the menu with OK.
4. Select generator mode.

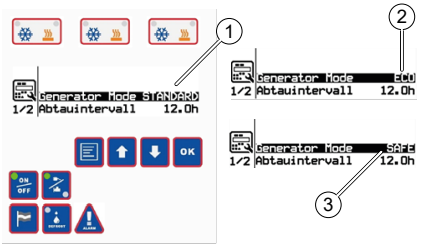


Figure 23: S.KOe COOL – selecting the generator mode

1 Generator mode STANDARD
2 Generator mode ECO
3 Generator mode SAFE

▶ The high-voltage battery is charged.

INFORMATION

Once the generator axle has been activated, the system remains in standby mode for 10 hours. This ensures that a high-voltage battery charging operation by means of the generator is not discontinued after a break in driving. During this time, energy may be transferred from the high-voltage battery to the 12 V battery. (Usually the system only remains in standby mode for 10 minutes when the chambers are switched off.)

6.5.5 Check state of charge and battery temperature

NOTE

Material damage due to low state of charge!

If the S.KOe COOL is unused for longer than a year, the high-voltage battery may be damaged if the state of charge falls below 30 %.

▷ Check the state of charge of the high-voltage battery at least once a year.

▷ If the state of charge is below 30 %, charge the high-voltage battery via the mains.

The state of charge and the battery temperature can be read on the display when it is switched on. The temperature of the coldest and the warmest battery cell is displayed in each case.

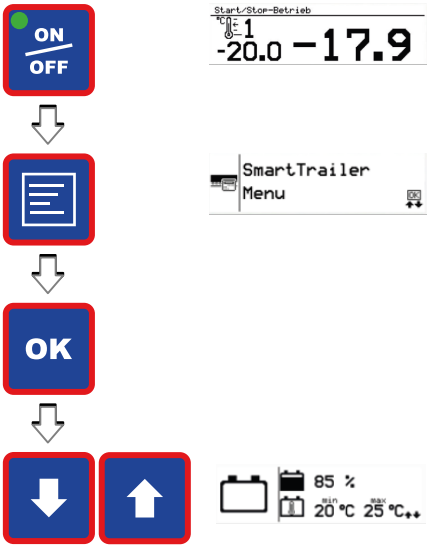


Figure 24: Checking the state of charge

INFORMATION

If the outside temperature is below freezing, the temperature of the coldest battery cell must be at least 10°C before driving off. This prevents the battery cells from cooling down below 0°C during the journey, which means that recharging via the generator is no longer possible. To heat up the battery cells, the battery has a heater that can be operated in mains mode using a CEE plug.

6.5.6 Autonomous run time and charging time

The autonomous run time is 4.5 hours with a fully charged battery. This specification refers to the boundary condition at an outside temperature of approx. 20°C and operation of the cooling unit with a setpoint value of -20°C (pre-cooled goods and no door openings). Depending on the boundary conditions, shorter or longer run times may result.

During the journey the battery is recharged depending on the driving profile. The charging time with a 400 V, 32 A CEE connection is approx. 2 hours.

In parallel operation (charging and cooling) the charging time may be longer. The charging time can also be extended due to low ambient temperatures. It is therefore advisable to connect the trailer permanently to the mains, especially at outside temperatures below 0 C.

7 Troubleshooting for malfunctions

If a malfunction occurs that you cannot rectify, contact an authorised Service Partner or Schmitz Cargobull Customer Service. [Spare parts and customer service ▸ 39]

8 Servicing

8.1 Care and cleaning

⚠ DANGER

Mortal danger due to electric shock!

A high voltage of up to 690 V can be applied to the high-voltage system. Touching live parts and cleaning with water can lead to serious injury or even death.

- ▷ Only clean externally.
- ▷ Refrain from high-pressure washing in the area of the high-voltage components.
- ▷ Do not open any covers.
- ▷ Only clean the outside with a suitable brush, broom or damp cloth.

8.2.1 Maintenance work

⚠ DANGER

Mortal danger due to electric shock!

A high voltage of up to 690 V can be applied to the high-voltage system. Improper maintenance work and touching live parts can lead to serious injury or even death.

- ▷ Maintenance work on the electrical system may only be carried out by specialist personnel with a qualification as a competent person for high-voltage systems in a service workshop authorised by Schmitz Cargobull.

1. Switch off the high-voltage system at the control panel and via the main switch. [Operation ▸ 25] [Main switch ▸ 20]
2. Carry out cleaning work on the outside of the high-voltage components with a suitable brush, broom or damp cloth.
3. Remove any contamination.
4. Clean the cooling unit according to the instructions in the S.KO COOL box body operating instructions. [Applicable documents ▸ 8]
5. Clean the cooling unit according to the operating instructions for the S.CU semi-trailer cooling unit. [Applicable documents ▸ 8]

▶ Cleaning has now been completed.

8.2 Maintenance

NOTE

Material damage due to improper maintenance!

Failure to carry out maintenance correctly or properly can result in serious material damage to the S.KOe COOL components and the trailer.

▷ Have the specified maintenance work carried out on the S.KOe COOL components at the prescribed intervals.

▷ Maintenance work on the S.KOe COOL components may only be carried out by qualified specialist personnel in a service workshop authorised by Schmitz Cargobull.

INFORMATION

The service workshops authorised by Schmitz Cargobull are provided with service instructions and checklists for carrying out the specified maintenance work.

▷ Have maintenance work carried out annually on the S.KOe COOL components in accordance with the prescribed checklists and within the framework of the Full Service contract.

▷ Have the completed annual maintenance documented by filling out the corresponding form in the Cargobull Repair System.

8.3 Repair

⚠ DANGER

Mortal danger due to electric shock!

A high voltage of up to 690 V can be applied to the high-voltage system. Improper repair work and touching live parts can lead to serious injury or even death.

▷ Repair work on the electrical system may only be carried out by specialist personnel with a qualification as a competent person for high-voltage systems in a service workshop authorised by Schmitz Cargobull.

NOTE

Material damage due to improper repair!

Incorrectly carried out repairs can lead to serious material damage to the S.KOe COOL components and the trailer.

▷ Repair work on the S.KOe COOL components may only be carried out by qualified specialist personnel in a service workshop authorised by Schmitz Cargobull.

Repairs include the following work:

- disassembly,
- replacement,
- repair,
- overhaul
- and installation

of defective or worn components.

▷ All repair work on the S.KOe COOL components may only be carried out by service workshops authorised by Schmitz Cargobull.

9 Technical data

Assembly	Technical data
Required cooling unit capacity	Max. 20 kW
Power supply via battery system or mains	400 V AC / 32 A / 50 Hz
Battery	Lithium iron phosphate (LFP)
Battery rated voltage	634 V
Battery capacity	50 Ah
Battery power energy	32 kWh
Autonomous run time	Approx. 4.5 to 9 h
Charging power	Up to 22 kW (via OBC)
Charging infrastructure	Via 32 A mains (standard CEE32 socket)
Battery weight complete	440 kg
Electric axle weight	556 kg
Electric axle gear oil	1.5 l SAE 75W-80

10 Spare parts and customer service

Cargobull Parts & Services GmbH

Siemensstraße 49

D 48341 Altenberge

Phone: +49 (0) 2558 / 81-2999

Email: ersatzteil-center@cargobull.com

www.cargobull-serviceportal.de

If you require original spare parts, please contact your central regional spare parts warehouse directly or our spare parts centre in Altenberge or one of our authorised Service Partners.

Required information

Have the following information on the name plate ready when ordering spare parts:

- Production number
- Chassis number

NOTE

Warranty

The warranty becomes invalid if spare parts are used that have not been approved by Schmitz Cargobull.

In case of breakdown, get in touch with Schmitz Cargobull Euroservice on:

11 Decommissioning

11.1 Temporary decommissioning

NOTE

Material damage due to low state of charge!

If the S.KOe COOL is unused for longer than a year, the high-voltage battery may be damaged if the state of charge falls below 30 %.

▷ Check the state of charge of the high-voltage battery at least once a year.

▷ If the state of charge is below 30 %, charge the high-voltage battery via the mains.

INFORMATION

The system can only determine the SOH (state of health) correctly if the battery undergoes at least one complete charging cycle from empty to full. A complete charging cycle corresponds to a charge level rise from 0% to 100%. To ensure that the state of health currently displayed is correct, the trailer battery must be drained in ECO mode or when the vehicle is stationary, and then recharged in mains operation.

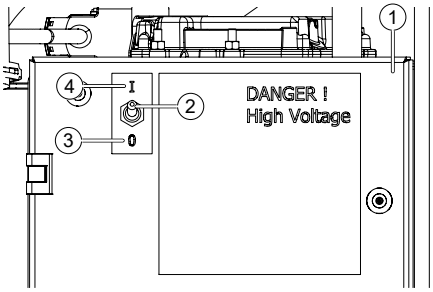


Figure 25: Main switch

1 Switch cabinet
2 Main switch
3 Position 0
4 Position 1

▷ Set the main switch to position 0.

➔ The system is switched off and not ready for operation.

If the high-voltage system is taken out of operation for a period of more than one month, carry out the following measures:

1. Regularly carry out a visual inspection of the external condition and the battery condition.
2. Run the system in cooling mode (set-point -30 °C) for at least 15 minutes once a month. (To avoid or minimise maintenance work on the refrigeration circuit)
3. Carry out commissioning before each use. [Commissioning before each use ▸ 24]
4. Charge the high-voltage battery during prolonged decommissioning periods. [Charging ▸ 27]
5. Avoid deep discharging during long standstill times. (Ensure a state of charge of at least 30%) [Charging ▸ 27]

▶ The high-voltage system and the cooling unit are temporarily taken out of operation.

11.2 Recommissioning

1. Check the high-voltage battery and charge if necessary. [Check state of charge and battery temperature ▸ 32] [Charging ▸ 27]
2. Carry out commissioning before each use. [Commissioning before each use ▸ 24]

▶ Recommissioning has now been completed.

11.3 Final decommissioning

NOTE

Environmental hazard!

Operating materials can contaminate the groundwater. High-voltage batteries can pollute the environment.

▷ Dispose of all operating materials properly.

▷ Coordinate the disposal of the high-voltage battery with Schmitz Cargobull Customer Service.

The use of multiple operating materials poses a risk to the environment. After final decommissioning the operating materials and components of the S.KOe COOL must be disposed of.

▷ Observe the country-specific legal regulations for disposal.

▷ Collect the operating fluids in suitable containers.

▷ Contact Customer Service to dispose of the high-voltage battery. [Spare parts and customer service ▸ 39]

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