SCHMITZ CARGOBULL

The TrailerCompany.

High-voltage sensitisation

For trailers with high-voltage technology (S.KOe COOL)

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Scope/foreword

- The purpose of this document is to raise the awareness of persons performing non-electrical work on an S.KOe COOL trailer with an S.CU ep85
- It is expressly not intended for:
  - Work on HV trailers from other manufacturers
  - Repairs or other work on the trailer

Non-electrical work includes:

•Departure checks, test drives, loading, cleaning

•Switching on and off and adjusting the cooling unit

•Mechanical maintenance such as replacing wheels, refrigerant etc.

•Replacing and repairing mechanical components

The following work may only be carried out after prior consultation with an HV electrician (level 2 or level 3)

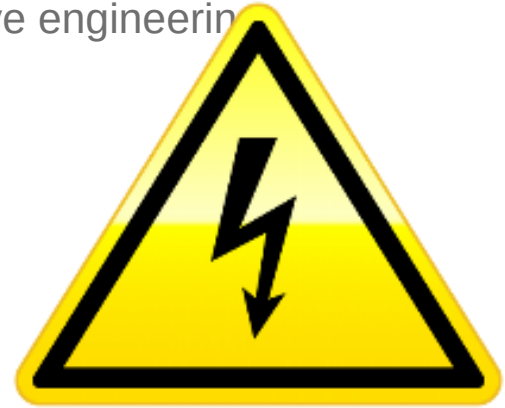
- Body work (welding, flexing, painting, drilling)
- Modifying, replacing, repairing vehicle electric network components (12V hardware & software)

Abbreviations

Abbreviation	Explanation
S.KOe COOL	Box body trailer with electric cooling unit and high voltage system
S.CU ep 85	Electric cooling unit on the S.KOe COOL
EIP	Electrically instructed person
HV	High voltage
AC	Alternating current
DC	Direct current

High-voltage systems (definitions)

High voltage (HV) covers the following voltages in automotive engineering:



- > 30 V and ≤ 1,000 V alternating voltage (AC)
- > 60 V and ≤ 1,500 V direct voltage (DC)

Trailers with an HV system may pose an electrical hazard!

High-voltage systems (definitions)

- Intrinsically safe HV vehicle
  According to DGUV (German Social Accident Insurance) Information 209-093, this means that the HV system is equipped with comprehensive contact and arc protection via technical measures on the vehicle.

Marking of HV vehicles

ACHTUNG: HOCHVOLT

Das HV-System ist AKTIV.

ACHTUNG: HOCHVOLT

Das HV-System ist freigeschaltet.
Nicht einschalten!

Attachment and removal of the warning signs only by trained personnel

Protective measures – barriers

Cordoning off work area

- Surround work area on all sides with barrier posts and **visibly** mark with warning signs

When to cordon off:

- Work in progress on the trailer (cordoning off even after work hours)
- There is a suspicion of a defect in the trailer
- There is an HV fault (see display)
- When in doubt, always cordon off

When not to cordon off:

- Good working order is confirmed by trained personnel
- Trailer is marked as an HV vehicle
- All employees in the work area are appropriately sensitised

In the case of insufficient cordoning off, please inform the trained personnel

Electrical hazards

Dangers of electric current

- Electrocution

Ventricular fibrillation, BruceBlaus, CC BY-SA 3.0

- Electric arcs

- Secondary accidents (e.g. fall, short circuit, battery fire etc.)

Electrical hazards

Consequences of electrocution

Acute damage

- Muscle cramps and breathing problems
- Burns
- Blood clots
- Death

Secondary damage (also possible many hours later)

- Cardiac arrhythmia
- Ventricular fibrillation
- Death

Ventricular fibrillation, BruceBlaus, CC BY-SA 3.0

After any electrical accident, it is essential to consult a doctor!

Electrical hazards

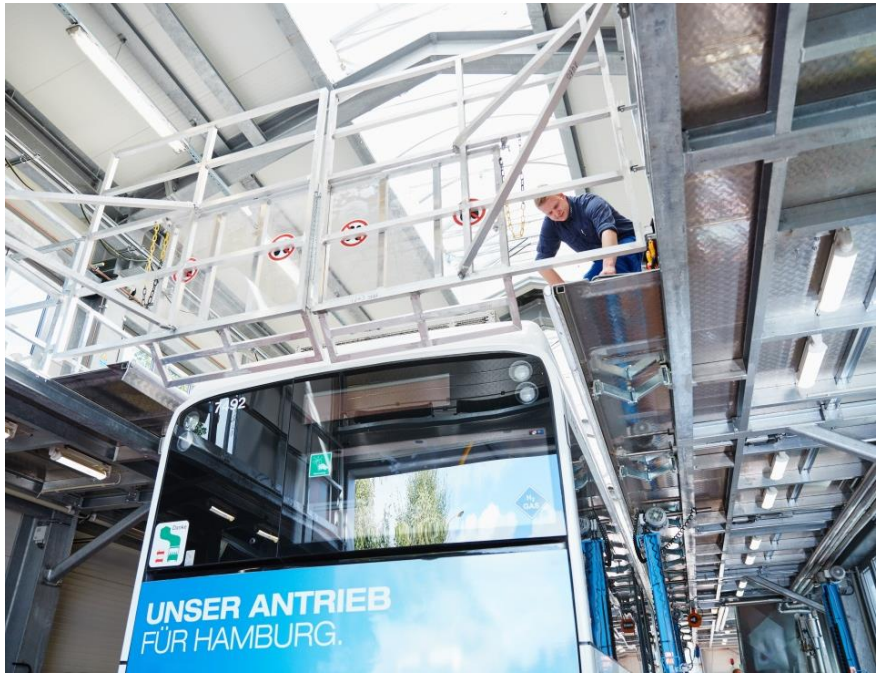
Consequences of electric arcs:

- Corneal flash burns (similar to injuries caused by welding)
- Burns
- Blast trauma
- Flying parts
- Toxic gases
- Death

Electrical hazards

Secondary accidents

- Startle reaction
- Uncontrolled movements
- Stumbling, falling
- …. etc.



Behaviour in the event of (electrical) accidents

1. Secure the accident scene:

   Switch off the voltage source.

   - Press the emergency stop switch.
   - Switch off the main switch.
   - Disconnect at the HV disconnection point.
   - Remove the service disconnect plug.
   - Remove the CEE plug.
   - Switch off the mains fuse.
   - Use insulated objects to separate the accident victim from the electrical conductor.

2. Call the emergency services (check breathing beforehand)

3. Life-saving emergency measures
   - Reanimation
   - Defibrillator

4. Further first aid
   - Stop bleeding, recovery position, …

5. Wait until the rescue services arrive

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Behaviour in the event of fires

Battery fires produce toxic fumes which spread very quickly. Li batteries can explode or cells/parts can fly off due to overpressure!

Overpressure is characterised by expansion of the battery box, for example.

- Immediately leave building / move away from danger area
- Call out loudly to make everyone aware of the need to leave the building
- Trigger a fire alarm
- Immediately make an emergency call to the fire brigade

Activities on HV vehicles

- All employees must be qualified/instructed for activities on or with trailers with high-voltage systems
- Instructed persons (level 1) must not work on the high-voltage system!
- When working on the trailer, **it must be disconnected beforehand!**

Hands off orange lines and components with this sticker!

Activities that do not affect the HV system

A distinction is made between::

Sensitisation for

- operating activities (driving/connecting, charging, cleaning, adjusting the cooling unit)

Instruction for

- work on vehicle components that are not part of the HV system (level 1 HV EIP)

Conditions for work according to level 1

Conditions for work that does not affect the HV system:

- The work and the protective measures necessary for it must be known to the employee
- There must not be any active alarms concerning the HV system
  (to be checked by trained personnel)

and

- The employee must master the markings of the HV components and safe operation of the vehicle
  (Instruction for HV EIP / level 1 is always required!)

Procedure for work according to level 1

- Contact person for queries must be known.
- Carry out work on the vehicle only in accordance with work instruction / order..
- Do not carry out any independent work on the HV system.
  (“Hands off orange!” and observe warning stickers)
- Stop work in the case of uncertainties and ask the trained personnel.

Procedure for work according to level 1

The following work may only be carried out after prior consultation with trained personnel (level 2 or level 3)

- Body work
- Replacement and repair of components that are not connected to the HV system but are installed in its vicinity (mechanical components)
- Modifying, replacing, repairing vehicle electric network components (12V hardware & software)

Activities on HV vehicles

Activities to be performed		Required qualification in Germany
Driving, operating and cleaning		Sensitisation for operating activities
Mechanical work and work on the 12 V vehicle electric network	Trailer de-energisation	Electrically instructed person EIP (level 1)
Working on the **voltage-free** HV system	Trailer de-energisation	Qualified electrician QE (level 2)
Working on the **live** HV system	Trailer de-energisation	Qualified electrician QE (level 3)

The applicable local regulations must be observed and taken into account!

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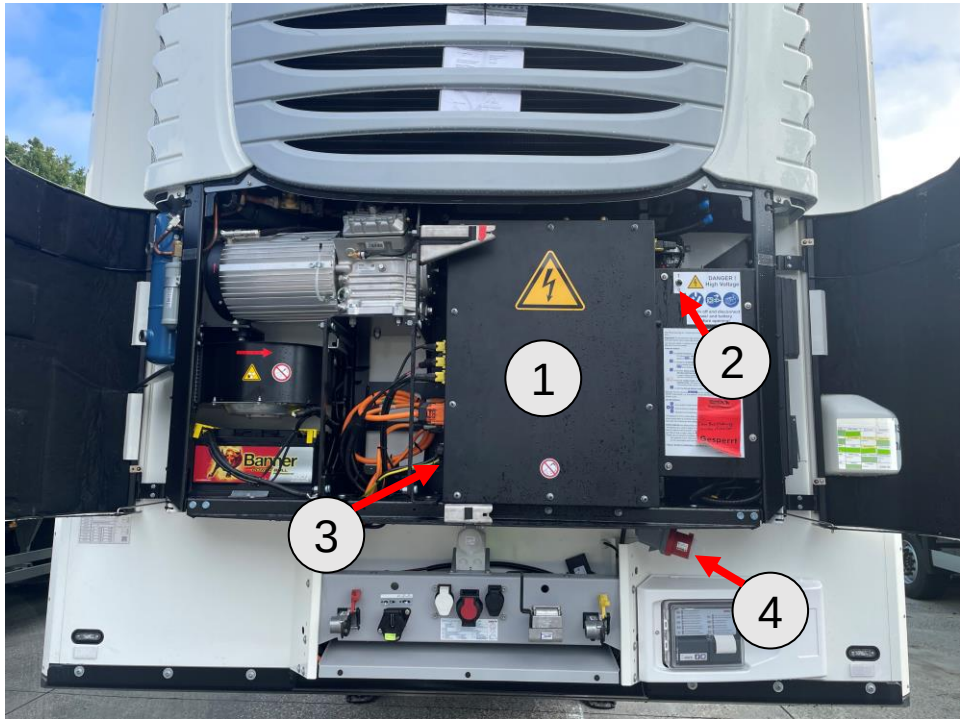
Overview of HV components on the S.KOe COOL

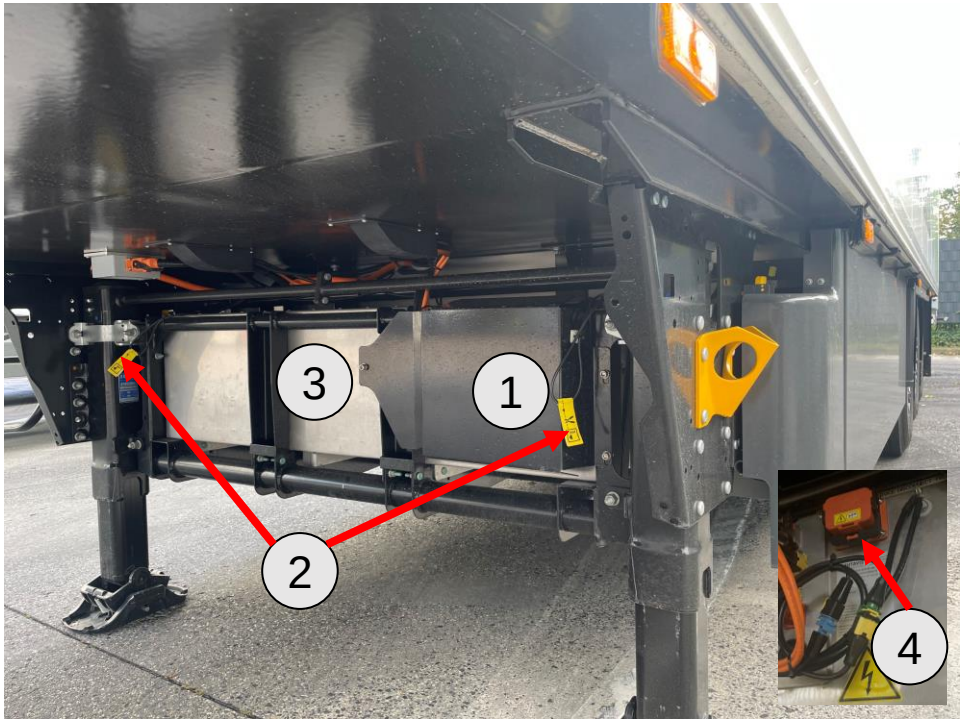


1. HV control box
2. Main switch
3. Test sockets
4. CEE socket

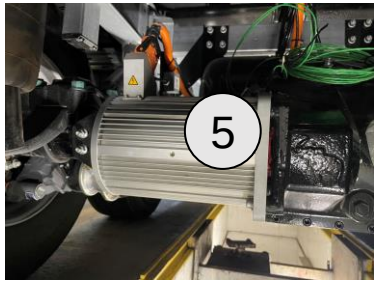
The main switch switches off the S.CU ep85 transport cooling unit as well as the entire HV network of the S.KOe COOL.

The main switch is only intended for maintenance and repair work as well as for decommissioning or in the event of emergencies.

Overview of HV components on the S.KOe COOL



1. Cover of service disconnect
2. HV disconnection point
3. Battery case
4. Service disconnect
5. Axle generator



Operating the S.KOe COOL with S.CU ep85

Operating activities include:

- Switching the cooling unit on and off
- Making settings on the cooling unit
- Charging
- Cleaning (no jets of water on the HV components)
- Vehicle system checks (departure check)

The described activities are also to be explained live on the HV system!

Non-electrical activities on S.KOe COOL with S.CU ep85

Non-electrical work includes, for example:

- Maintenance and repair work outside the HV system
- Mechanical work with machine tools / body work (flexing, drilling, welding, painting)
- only after prior consultation with trained personnel

The described activities are also to be explained live on the HV system!

Non-electrical activities may only be performed after the system has been de-energised!

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CAUTION: HIGH VOLTAGE

Do not reach over the barrier!

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CAUTION: HIGH VOLTAGE

Do not touch!

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CAUTION: HIGH VOLTAGE

The HV system is ACTIVE.

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CAUTION: HIGH VOLTAGE

The HV system is de-energised.
Do not switch on!

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