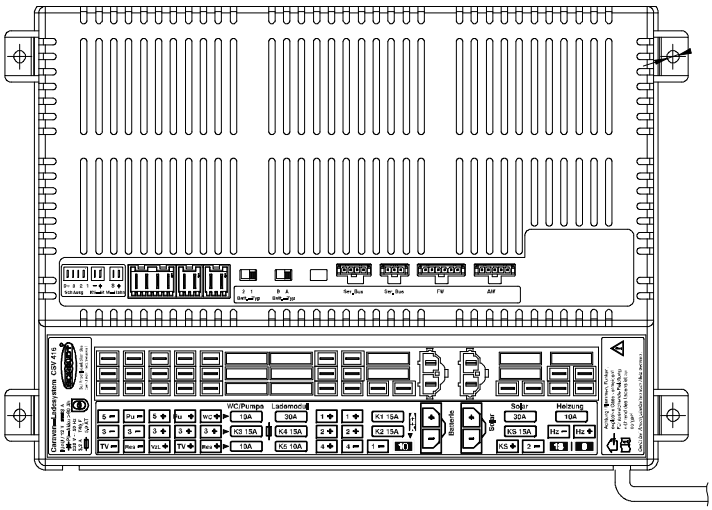
Operating Instructions



Caravan-charging system CSV 416

Table of contents

1 Introduction

This instruction manual contains important information for the safe operation of equipment supplied by Schaudt. Make sure you read and follow the safety instructions provided.

The operating instructions should always be kept in the vehicle. All safety information must be passed on to other users.

2 Safety information

2.1 Meaning of safety symbols

▲ DANGER!
Failure to comply with this sign may result in danger to life or physical condition.

▲ WARNING!
Failure to comply with this sign may result in injury.

▲ ATTENTION!
Failure to comply with the sign may result in damage to equipment or other connected consumers.

▲ This symbol references recommendations or special features.

2.2 General safety instructions

The design of the device is state-of-the-art and complies with approved safety regulations. Failure to observe the safety instructions may nonetheless lead to injury or damage to the device.

Only use the device when it is in perfect technical condition.

Any faults affecting the safety of individuals or the proper functioning of the device must be repaired immediately by specialists.

▲ DANGER!
230V units carrying mains voltage.

Risk of fatal injury due to electric shock or fire:

- The motorhome or caravan's electrical system must comply with DIN, VDE and ISO regulations.
- Never try to modify the electrical system.
- Do not try to modify the device.
- Only qualified electricians are permitted to establish electrical connections in accordance with the installation instructions supplied by Schaudt.
- Connection work may only be carried out after the power has been disconnected.

- Never try to start the device using a defective mains cable or a faulty connection.
- Never undertake maintenance on the device when it is live.

▲ DANGER!

Incorrect installation

Electric shock or damage to connected devices:

- Install as shown in installation instructions.
- The mains connection line may only be replaced by an authorised customer service department or by those qualified.

▲ WARNING!

Hot components

Burns:

- Blown fuses may only be changed after the power to the system has been disconnected
- Blown fuses may only be replaced once the cause of the fault is known and has been rectified
- Never bypass or repair fuses
- The back of the device can get hot during operation. Do not touch them.
- Only use original fuses rated as specified on the device
- Never store heat sensitive objects close to the device (e.g. temperature sensitive clothes if the device has been installed in a wardrobe)

3 Operation

▲ This device is not intended to be used by those (including children) with limited physical, sensory or mental aptitude or lack of experience and/or knowledge unless they are supervised by a person responsible for their safety or have received instruction from this person as to how the device is used.
Children must be supervised to ensure they do not play with the device.

This device is intended for installation into a vehicle.

▲ The caravan charging system is operated solely from the control and switch panel connected.

The CSV 416A caravan charging system does not require daily operation.

Initial setting is only needed after the type of battery (lead-acid / lead-gel) is changed, or for initial use or when upgrading with accessories (see section 3.3 and the CSV 416A installation instructions for details).

3.1 Starting up the caravan charging system

Battery

▲ ATTENTION!

An incorrect setting on the caravan charging system will result in damage to the battery connected. Ensure therefore that, prior to start-up, the battery selector switch (Fig. 4, Pos. 10) is in the correct position for the battery installed.

Generator operation and passenger vehicle ferries

▲ ATTENTION!

The caravan charging system, 12V consumers and connected devices can be damaged if the thresholds for the 230V supply are exceeded. So therefore:

- Do not connect a generator until it is running smoothly.
- It is essential that the generator conforms to the specifications of the mains supply.
- Do not connect the caravan charging system to the onboard mains voltage on car ferries (non-problematic mains voltage cannot always be guaranteed on car ferries).
  The use of an upstream overvoltage protection device is recommended.

Operation with solar regulator

▲ ATTENTION!

When connecting a solar regulator, note that the buffer function of the battery is an absolute requirement, i.e. the battery must be connected before a solar regulator is connected.

Operation on towing vehicle

▲ ATTENTION!

Switch off the ignition when the towing vehicle is parked (when the caravan is connected to the towing vehicle). Otherwise the starter battery of the towing vehicle might discharge.

3.2 Switching on and off

Control and switch panels must be supplied with a separate operating manual (kept with the vehicle). Please refer to this manual for instructions on operation.

Activating the 12V main switch (12V ON) on the operating panel connected enables/disables the following electrical circuits:

Pos.	Circuit	Fuse with
1	Heater	10 A – With the mains supply, there is no switch-off by the main 12V switch
2	Pump/WC	10 A – Can be enabled individually over the bus
3	Circuit 1	15 A – Can be enabled individually over the bus
4	Circuit 2	15 A – Can be enabled individually over the bus
5	Circuit 3	15 A
6	Awning light	10 A
7	TV	
8	Spare	
5	Circuit 4	15 A
5	Circuit 5	10 A

Outputs

- switching output 1
- switching output 2
- switching output N

can only be enabled over the bus, regardless of whether the main 12V switch (12V ON) is switched on or off.

3.3 Changing the battery

▲ **ATTENTION!**

The use of incorrect battery types or incorrectly designed batteries can damage the battery itself or devices connected to the caravan charging system. So therefore:

- Batteries may only be changed by qualified personnel.
- Follow the battery manufacturer's instructions.
- The caravan charging system is only suited for connecting to 12V power supplies with chargeable batteries (of the types specified below).
- Do not use non-approved battery types such as NiMH batteries.

▲ Normally only batteries of the same type and capacity should be used, i.e. the same as those installed by the manufacturer.

It is possible to swap from lead-acid batteries to other battery types.

Switching to lead-acid batteries is only possible in certain circumstances. Contact the vehicle manufacturer for more information.

Changing the battery

Proceed as follows for a battery change:

- ▶ Disconnect the battery from the caravan charging system by switching the main 12 V switch off.
- ▶ Disconnect the caravan charging system from the 230 V supply.
- ▶ Unhitch the caravan from the towing vehicle.
- ▶ Replace the battery.
- ▶ After changing the battery, recheck which type of battery has been inserted.

▲ DANGER!

Incorrectly setting the battery selector switch poses a risk of explosion (by the formation of detonating gas). Move the battery selector switch to the correct position

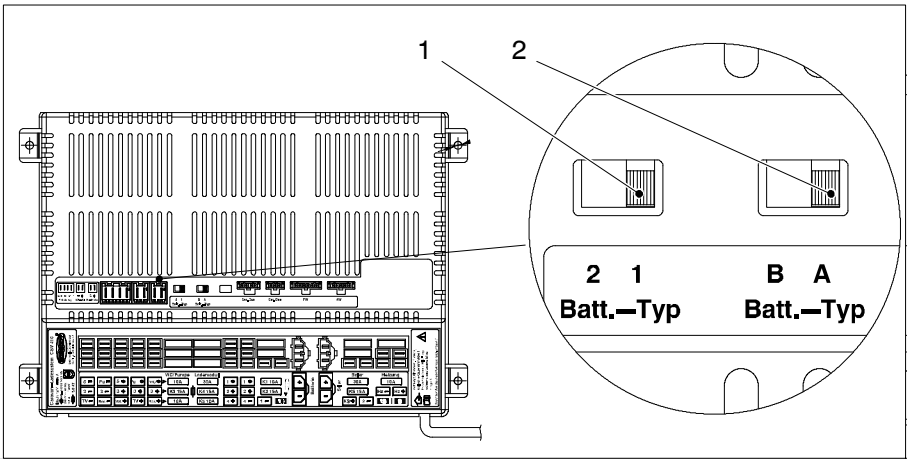


Fig. 1 Battery selector switch

- ▶ Move both battery selector switches (Fig. 1, Pos. 1) to the correct position using a thin object (e.g. a ballpoint pen):

Battery type	Switch 2/1	Switch B/A
Lead-acid batteries	2	B
Lead-gel batteries / AGM 1 batteries	2	A
AGM 2 batteries	1	B
Lithium batteries	1	A

Starting up

- ▶ Start up the system as described in Section 3.1.

4 Application and function

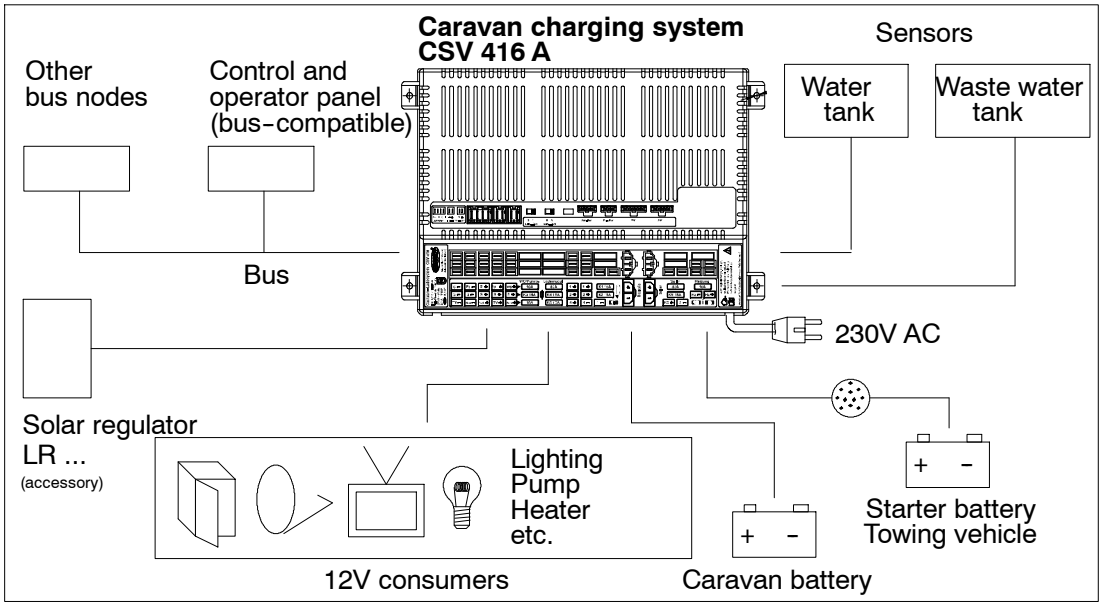


Fig. 2 On-board power supply system

The CSV 416 caravan charging system is the central power supply unit for all 12 V consumers connected to the caravan's electrical system. It is usually located in a cupboard or storage area and is accessible from the front in order to change fuses.

The caravan charging system has been designed solely for connecting to a 12 V onboard supply.

Connected units can be supplied from the caravan battery or the towing vehicle's battery if a mains supply is not available.

Because the device provides a hum-free, stabilised output voltage, sensitive consumers such as transistor lights and radios can be connected and powered.

Modules The CSV 416A caravan charging system comprises:

- a charge module for charging all batteries connected
- a main switch relay to switch certain consumers on and off
- the complete 12V distribution system
- fuses for the 12V circuits
- a battery booster
- LIN bus interface
- Tank analysis

Actuation

A bus-compatible control panel must be connected for operation.

Connections provided for:

- Bus devices
- Two tank sensors
- Solar charge regulator (optional)

Flat vehicle fuses protect the various circuits.

Protective circuits

- Excess temperature
- Overload
- Short circuit

Mains

230V AC ± 10%, 47 – 63 Hz sinusoidal, protection class I

Current

12V outputs may only be loaded up to a maximum of 90% of the rated current of the associated fuse (see block diagram or nameplate).

All consumers together may not exceed the following load:

- Mains operation: 28 A
- Operation with towing vehicle, ignition ON: 8 A

4.1 Battery functions

Batteries

Lead-acid, lead-gel, AGM (1/2) or lithium batteries from 80 Ah

Battery charging when vehicle is moving

Charging the caravan battery whilst driving; increasing the supply voltage coming from the towing vehicle via the battery booster

Maximum charging current	8 A

Battery charging for mains connector

Caravan battery	
Characteristic charging curve	IUoU
Final charging voltage	Dependent on battery type (see Section 6)
Charging current	28 A
Voltage for trickle charge	Dependent on battery type (see Section 6)

12V main switch

The main 12V switch on the control panel connected isolates most 12V consumers from the caravan battery (see also Page 5).

This prevents the caravan battery from being slowly discharged by standby currents.

The batteries can continue to be charged by the caravan charging system, the towing vehicle or the solar charge regulator (if available), even when the main battery switch is OFF.

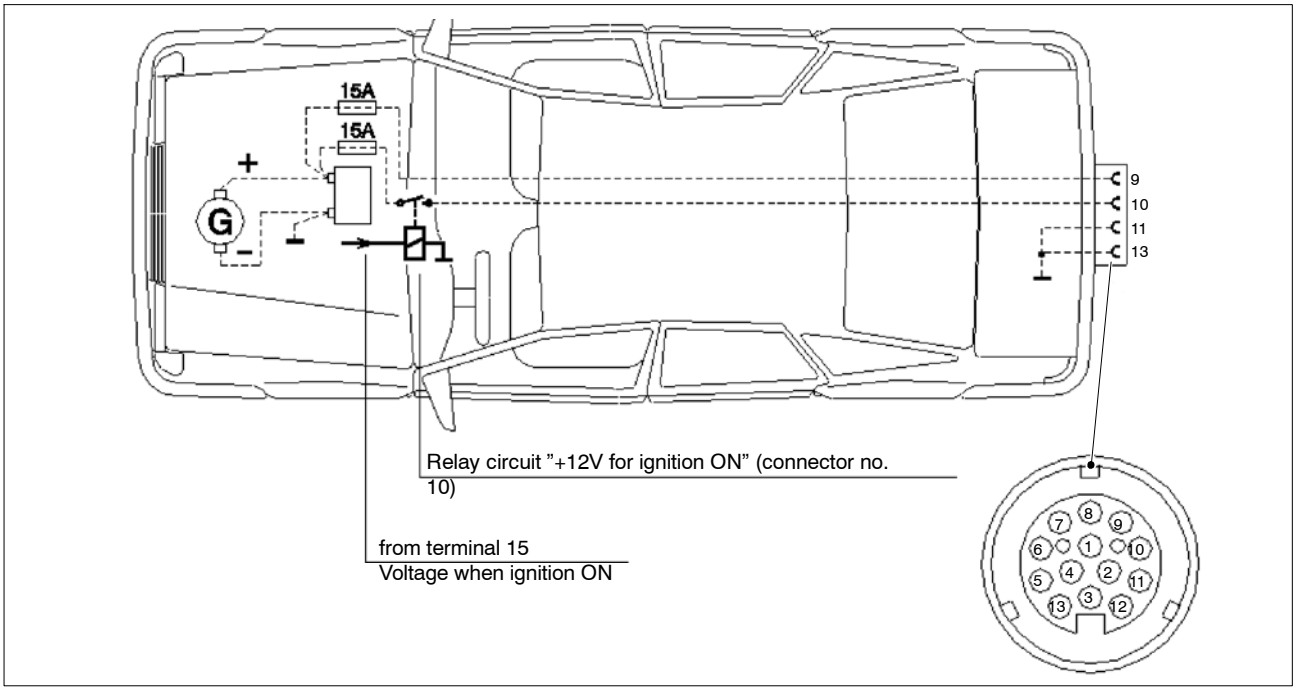


Fig. 3 Connector for towing vehicle power socket

▲ For the "Automatic shutoff" and "Towing vehicle battery standby current" functions to be guaranteed in line with the following specifications, both the 13-pin connector of the caravan, and the socket of the towing vehicle, must be assigned as per EN 1648-1 (see Fig. 3).

Automatic disconnector

Consumers are switched off (with the exception of these with a continual supply, see Page 5) when the caravan is hitched to the towing vehicle and the ignition is switched on (power on terminal 10 of trailer hitch TH). Consumers can be switched on again at any time (the automatic disconnector does not prevent this).

Standby current towing vehicle battery

No standby current when the towing vehicle ignition is OFF, plus power consumption of control electronics of refrigerator (see documentation from refrigerator manufacturer and other consumers with a continual supply, see Page 5); measurement taken when all consumers in the caravan are switched off.

Battery monitor

For systems in which the CSV 416 caravan power supply is used, another device monitors the leisure area battery voltage (such as the panel connected to the LIN bus). When the voltage is too low, this device must send a control signal to the CSV 416, that disconnects all consumers from the battery (12 V OFF and switching outputs 1 to 3 OFF).

If this battery monitoring function of the external device fails, and the leisure area battery voltage falls to below 10.6V for longer than a minute, 12V OFF and switch-off of switching outputs 1 to 3 are performed automatically by the CSV 416.

▲ This monitoring function of the CSV 416 is regarded as an emergency function when the rest of the system is operating erroneously.

Monitoring of the battery connection

An internal monitoring function ascertains whether a caravan battery is connected. If yes, a charge process is performed as in Section 6.2. If no caravan battery is connected, the device transitions to supply mode and a constant voltage of 13.2V is applied at the outputs.

▲ The input circuits of connected devices are then subjected to a lower load than with a higher voltage.

▲ **ATTENTION!**

The CSV 416 can no longer detect a deeply discharged battery (battery is high-impedance) and so transitions to supply mode. When the battery ”recovers” (such as with charging when the vehicle is moving using a booster, or with solar charging), it is detected automatically again by the CSV 416 and charged.

▲ For a fully charged battery, the CSV 416 also transitions to supply mode in isolated cases. It is not until battery charging is required again that the charge process starts (as in Section 6.2).

4.2 Additional functions

Refrigerator controller

This output supplies the control electronics of a fridge:

- From the caravan battery
- From the towing vehicle’s battery when the ignition is switched on
- From the mains supply when it is connected up

▲ The refrigerator only operates on 12 V when the caravan is hitched to the towing vehicle and the ignition is switched on.

▲ **ATTENTION!**

The caravan / towing vehicle battery can be damaged beyond repair by a total discharge. So therefore:

- Avoid continuous 12V operation.
  The refrigerator only operates on 12V when the caravan is hitched to the towing vehicle and its ignition is ON.

Water pump

The water pump is connected directly to the CSV 416A (Pump output). The supply voltage to the pump is enabled from the Pump switch on the operator and control panel. The pump is switched on when a control voltage of 12V is applied to input ”Water Tap Signal” (via a switch in the water tap). The other output, ”WC”, is connected in parallel.

Battery charging with solar charging regulator

Maximum permitted charge current 27 A, protected with 30 A

Switching outputs

Three switching outputs (1, 2 and 3) can be enabled with control over the bus.

D+

Output D+ shows whether:

- the caravan is hitched to a towing vehicle and
- the ignition of the towing vehicle is on

This means the booster is active.

▲ Signal D+ does not show whether the engine of the towing vehicle is running. So when the ignition is *on*, but the engine is *not started*, the battery of the towing vehicle is under load and could discharge fully.

Monitoring of the charge current (from 05/2021)

An internal shunt monitors the charge current and makes available a data telegram on the LIN bus. Refer to the instructions for the associated control panel with bus connection for whether a display is possible (see also the block diagram in Appendix E).

5 Layout

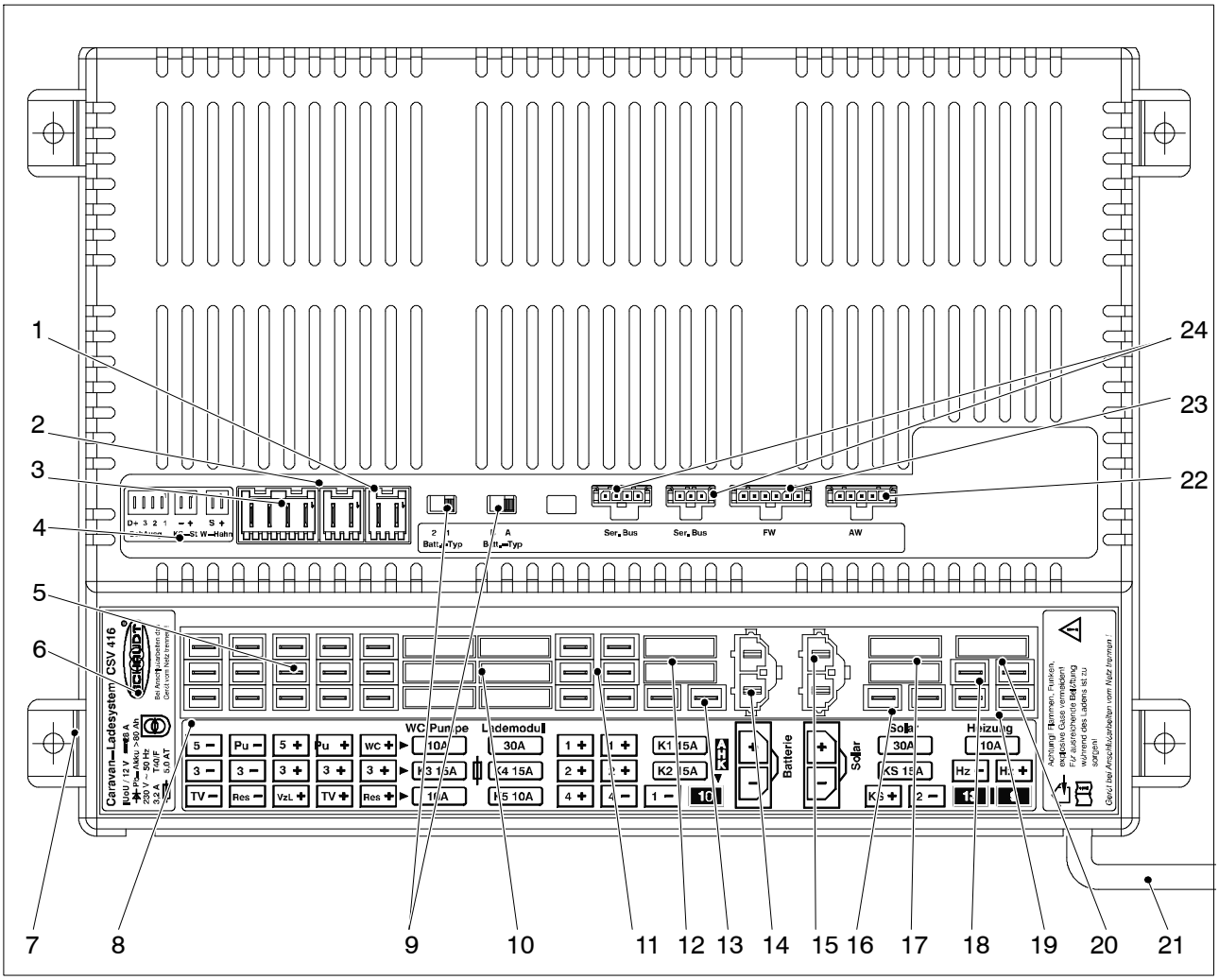


Fig. 4 Front view of CSV 416 A caravan charging system

1 Connector for water tap
2 Connector for refrigerator controller
3 Connectors for switching outputs 1, 2, 3 and D+
4 Adhesive label for functions (top)
5 Connectors for circuits 3 and 5, WC, pump, TV, awning light and spare
6 Nameplate
7 Housing
8 Adhesive label for functions (front)
9 Battery selector switch 1/2 and A/B
10 Flat vehicle fuses, charger module Circuits 3 to 5, spare
11 Connector for circuits 1, 2 and 4
12 Fuses for circuits 1 and 2
13 Connector for trailer coupling plug 10
14 Connector for caravan battery
15 Connector for solar charge regulator LR ...
16 Connector for refrigerator supply
17 Flat vehicle fuses, solar regulator and refrigerator supply
18 Connector for heater
19 Connector for plug for trailer couplings 12 and 9
20 Flat vehicle fuse, heater
21 Mains cable
22 Connector for wastewater tank sensor
23 Connector for water tank sensor
24 LIN bus connectors

5.1 Faults

Flat vehicle fuses

A fault in the power supply system is usually caused by a blown fuse.

Please contact our customer service address if you cannot rectify the fault using the following table.

If this is not possible, e.g. if you are abroad, you can have the caravan charging system repaired at a specialist workshop. In this case, you must ensure that the warranty is not invalidated by incorrect repairs being carried out. Schaudt GmbH will not accept any liability for damage resulting from such repairs.

Fault	Possible cause	Remedy
Caravan battery is not charged during 230 V operation	No mains voltage	Switch on the automatic circuit breaker in the vehicle; check the mains voltage
	Defective caravan charging system	Contact customer service
Caravan battery is not charged whilst driving	Defective alternator	Have the alternator checked
	No voltage applied to ”Ignition ON” input or permanent plus	Have the fuse and cabling checked
		Check the towing vehicle plug connection
	Defective caravan charging system	Contact customer service
Solar charger is not working (mains supply off)	Solar charge regulator not plugged in	Plug in solar charge regulator
	Defective fuse or cabling	Have the fuse and cabling checked
	Solar charge regulator defective	Have solar charge regulator checked
12V supply does not work in the leisure area	12V main switch is switched off	12V main switch must be switched on
	Defective fuse or cabling	Have the fuse and cabling checked
	Defective caravan charging system	Contact customer service
Caravan charging system cannot be switched on from the control panel.	Defective caravan charging system	Contact customer service
	No supply voltage	Check the battery or mains connection
	LIN bus not ready	Contact customer service
	Panel defective	Contact customer service

Fault	Possible cause	Remedy
Pump does not switch on when a water tap is opened.	Pump supply not switched on from control panel	Switch on the pump supply (refer to the operating instructions for the relevant control panel)
	Fuse blown	Replace the fuse
	Water tap switch or cabling for water tap defective	Contact customer service
	Pump supply not switched on from control panel	Switch on the pump supply (refer to the operating instructions for the relevant control panel)

▲ The charging current is reduced automatically if the device becomes too hot due to excessive ambient temperature or lack of ventilation. Always prevent the device from overheating nevertheless.

5.2 Shutting down the system

▶ Switch off the main 12V switch on the control panel connected.

5.3 Shutting down the system

▲ **ATTENTION!**

Total discharge causes damage to the caravan battery. So therefore:

- Fully charge the caravan battery before and after closing down the system. Connect a vehicle with an 80 Ah battery and a vehicle with a 160 Ah battery to the mains for at least 24 and 36 hours respectively.

The caravan battery is then protected against total discharge. This only applies if the battery is intact. Follow the battery manufacturer's instructions.

▲ **ATTENTION!**

Connected consumers can be damaged on exceeding the input voltages permitted. So therefore:

- Do not operate any connected Schaudt LR ... solar charge regulator without battery.
- When the battery is replaced or removed, unplug the "Caravan battery" connector on the CSV 416A beforehand (or unplug the "+ Solar cell" connector on the solar charge regulator).

▶ Unplug the "Solar charge regulator" connector on the CSV 416A (or unplug the "+ Solar cell" connector on the solar charge regulator).

▶ Unplug the "Caravan battery" connector on the CSV 416A (or remove the clamps from the battery terminals).

6 Technical details

6.1 Mechanical details

Dimensions 320 x 217 x 111 (W x D x H in mm), including attachment feet

Weight 2.0 kg

Casing PA (polyamide), gentian blue (RAL 5010)

Base plate Aluminium, bare

6.2 Electrical details

Mains connection 230 V AC voltage ±10 %, 47-63Hz sinewave, protection class I

Current consumption Approx. 3.2 A at full load
Approx. 3.0 W in idle

Suitable batteries Lead-acid, lead-gel, AGM (1/2) or lithium batteries from 80 Ah

Standby current from Caravan battery 18 mA (Sleep-Mode) @12,6V; plus consumption of refrigerator control electronics

Conditions for the measurement:

- approx. 10 minutes after disconnection from the mains
- 12.6V battery voltage
- All consumers switched off
- 12 V main switch OFF

Current-carrying capacity

12 V outputs	A maximum of 90% of the nominal current
	of the relevant fuse may be drawn.
D+ output	Approx. 2.5 A

Battery charging caravan battery connected to mains

Charge curve	IUoU (in 5 phases)
End of charge voltage	between 14.3 V and 14.8 V
Charge current	28 A in the entire mains voltage range, limited electronically
Voltage for float charge	between 13.2 V and 13.8 V (depending on battery type), with automatic switchover
New charge cycle, Switchover to main charge	with battery voltage below 13.2 V and 13.8 V (depending on battery type) with a couple of seconds delay

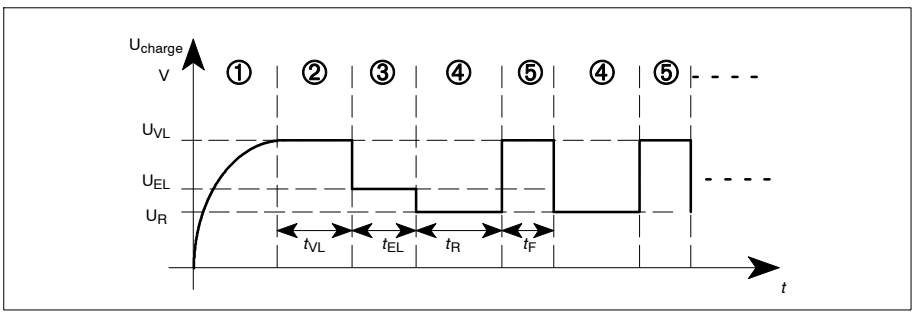


Fig. 5 Example of the charging voltage curve with the CSV 416 power supply

① I ("Bulk")
Main charge with maximum 20 A charging current, electronically limited, up to end-of-charge voltage U_{VL}. Start of charge also for completely discharged batteries.

② Uo ("Absorption")
Automatic switchover to full charging with constant voltage U_{VL}. The duration of the full charge phase is based on the battery type (is set from an EBL ... control panel connected). This sets a full charge time and minimal charge current.

③ U ("Float")
Automatic switchover to trickle charging with constant U_{EL}. In the trickle charge phase, a constant voltage is applied to the charger module output.

④ U ("Standby")
Further reduction of charge voltage to U_R. This phase lasts time t_R.

⑤ U ("Refresh")
A refresh with full charge voltage U_{VL} for time t_F is started once idle phase time t_R has expired.

▲ All voltages and times are dependent on the battery type used. These parameters are set automatically by setting the correct battery type:

	Phase 1	Phase 2		Phase 3		Phase 4		Phase 5
	I ("Bulk")	Uo ("Absorption")		U ("Float")		U ("Standby")		U ("Refresh")
Battery type	I_{max}	U_{VL}	t_{VL}	U_{EL}	t_{EL}	U_R	t_R	t_F
Lead-acid	28 A	14.40 V	4 hour	13.40 V	72 hour	13.00 V	120 hour	1 hour
Lead-gel/A GM1	28 A	14.40 V	8 hour	13.80 V	72 hour	13.20 V	120 hour	1 hour
AGM 2	28 A	14.70 V	4 hour	13.70 V	72 hour	13.20 V	120 hour	1 hour
LiFePo4*	28 A	14.40 V	2 hour	13.80 V	contin-uo us	–	–	–

* Only batteries with their own battery management system fitted may be used.

6.3 Environmental parameters

Operating temperature -20 °C to +45 °C

Storage temperature -20 °C to +70 °C

Protection rating IP 20

Humidity Operation in dry environment only

Yes CE mark

7 Maintenance

The CSV 416A caravan charging system requires no maintenance.

Cleaning Clean the caravan charging system using a soft, slightly damp cloth and mild detergent. Never use spirit, thinners or similar substances. Do not allow fluid to ingress the caravan charging system.

Appendix

A EC Declaration of Conformity

Schaudt GmbH hereby confirms that the design of the CSV 416A caravan charging system complies with the following relevant regulations:

The original EC declaration of conformity is available for reference at any time.

Manufacturer Schaudt GmbH, Elektrotechnik & Apparatebau

Address Planckstraße 8
88677 Markdorf
Germany

B Special fittings/accessories

Solar-charge regulator

Schaudt solar charger LR ... model for solar modules with a total current of 14A, including 0.5 m connection cable and connector plug

C Customer service

Customer service

Schaudt GmbH, Elektrotechnik & Apparatebau
Planckstraße 8
88677 Markdorf, Germany

Phone: +49 7544 9577-16 Email: kundendienst@schaudt-gmbh.de

Website: www.schaudt-gmbh.de

Send in device

Returning a faulty device:

- ▶ Always use well-padded packaging.
- ▶ Complete and enclose the fault report, see Appendix D.
- ▶ Send it to the addressee (free delivery).

D Fault report

In the event of damage, please fill in the fault report and send it with the faulty device to the manufacturer.

Device type: _____
Part no.: _____
Vehicle: Manufacturer: _____
Model: _____
Own installation? Yes ❑ No ❑
Upgrade? Yes ❑ No ❑
Upstream overvoltage protection? Yes ❑ No ❑

Following fault has occurred (please tick):

❑ Electrical consumers do not work – which? (please specify below)
❑ Switching on and off not possible
❑ Persistent fault
❑ Intermittent fault/loose contact

Other comments:

_____

_____

_____

_____

_____

E Block diagram/wiring diagram