



User Manual UM 1

1600 | 1200 | 900 | 600
Automatic Charge Control



1.1 Foreword

Thank you for purchasing an EFOY product. We hope that you will enjoy your new unit.

Please read these instructions first before using.

Should you have any questions about installation or operation, please consult the EFOY hotline.

SFC Smart Fuel Cell AG
Eugen-Sänger-Ring 4
D-85649 Brunnthal-Nord

Hotline: +49 89 673 5920
Freecall: 00800 732 762 78*
Fax: +49 89 673 592 369
hotline@efoy.com
www.efoy.com

*The toll-free number is available in the following countries: Germany, Belgium, Denmark, France, Great Britain, Italy, the Netherlands, Norway, Austria, Sweden, Switzerland and Spain.

1.2 Safety Information

Read the instructions before operating and keep them nearby. Be sure to follow all directions in the manual.



Do not open unit or fuel cartridges. Do not use force to open cartridges and do not refill them. Any modifications to the unit may affect safe operation, will lead to a loss of license and will void the warranty. Use only original EFOY equipment.



Do not store unit and fuel cartridges at temperatures above 45° C. Do not operate at temperatures above 40° C. Keep away from heat and direct sunlight.



Store the unit where there is no danger of freezing, or use the automatic antifreeze feature.



Do not smoke when handling the unit or the fuel cartridges.

Keep away from heat and open flame.



There is a danger of fire if methanol leaks out following an accident, or if the unit or the fuel cartridge has been damaged. Keep away from open fire and make sure area is well ventilated. Small amounts of methanol which may leak out will evaporate without leaving any residue.



Keep unit and fuel cartridges (including empty or partially filled cartridges) out of children's reach.

Operate the unit only in accordance with instructions and keep operating area well ventilated. Do not block exhaust. Avoid inhaling exhaust fumes directly or for prolonged periods of time.

1. Introduction

There is no risk of coming into contact with methanol provided that you handle the unit and fuel cartridges in accordance with instructions.

We are required by law to print the following notice.

Methanol is toxic if inhaled, ingested or if it comes into contact with skin. Irreparable damage may occur if inhaled, ingested or if it comes into contact with skin. In the event of an accident or if nausea occurs, consult a physician immediately. Be sure to bring the fuel cartridge label or these instructions to the consultation. (A caution concerning methanol can be found in the appendix.)

System exhaust may contain harmful components. Avoid inhaling exhaust directly or for prolonged periods of time. Use the exhaust hose to conduct exhaust gases to the exterior.

Improper use or improper connection to other electrical devices may result in damage.



In addition to these safety instructions, please observe the passages in bold type. Otherwise, you may endanger yourself and others.

1.3 Normal Operation

The EFOY 600, EFOY 900, EFOY 1200 and EFOY 1600 are automatic charging devices for 12V lead batteries.

The unit may be used only to charge lead batteries that conform to the specifications in Chapter 3.4, S. 12).

The specifications allow for solid-state operation (see Chapter 3.4) on boats and on motor vehicles. Operate only with original-equipment EFOY fuel cartridges.

The unit is not intended for emergency medical power generation, or for powering life-sustaining or agricultural devices.

Do not operate unit if housing is damaged.

1.4 Declaration of Conformity



SFC Smart Fuel Cell AG, Eugen-Saenger-Ring 4, 85649 Brunthal-Nord declares that the EFOY 600, EFOY 900, EFOY 1200 and the EFOY 1600 conform to the European Community's 89/336/EEG guidelines for electromagnetic compatibility. The following norms apply: DIN EN 61000-6-1, DIN EN 61000-6-3

1.5 Seals of Approval



These units have been tested in accordance with ECE Regulation No. 10 for electro-magnetic compatibility. Operation in motor vehicles is permitted.

Approval number: E24 10R-020234



These units have undergone voluntary testing by TÜV SÜD for conformity with the basic requirements of IEC 62282-5 and have been awarded the seal of approval for product safety.

1.6 Warranty

1. Warranty

SFC provides

- a) a 36-month warranty for up to 3,000 hours of operation. The warranty covers defects caused by materials or by the manufacturing process, provided that the manufacturer has a written registration of the unit on record. The unit must be registered online or by sending in the warranty card. The unit must be registered no later than 4 weeks after date of purchase. Registration is subject to the purchaser agreeing to have his data recorded by the manufacturer.
- b) a 24-month warranty for up to 3,000 hours of operation. The warranty covers defects caused by materials or by the manufacturing process should there be no registration of the unit on record as described in warranty 1a.

The warranty does not extend to cover improper use of the unit or operation that is not in accordance with the user manual, in particular:

- If fuel cartridges other than original EFOY fuel cartridges are used,
- Inappropriate handling,
- Water damage,
- Improper transportation,
- If the unit has been opened.

1. Introduction

2. Extent of the warranty

The warranty covers defects (see 1. Warranty) from the time of sale.

The manufacturer shall remedy such defects by either repair or replacement (updated model where applicable) as he deems appropriate. Should the manufacturer provide a warranty, the warranty period with regard to repair or replacement parts shall not recommence from the time of service. Instead, the warranty from time of sale will remain in force. Any other claims, in particular claims for damages on the part of the purchaser or a third party, are invalid. The provisions of the product liability law remain in effect as well as any claims against the manufacturer pertaining to warrantees remain in force as provide by law. The warranty does not extend to any extra costs associated with mounting or dismounting the unit such as disassembling furniture or parts of a motor vehicle.

3. In Case of Claim

Always notify the EFOY service center in writing in case of malfunction. Please describe the defect in detail. Please also indicate serial number and include the original invoice. The purchaser must bring or send the unit to the manufacturer at his own risk so that the manufacturer can determine whether the defect is covered by the warranty. The unit must be sent to the factory as freight. If the defect is covered by the warranty, the factory shall assume the transportation costs. Should the defect not be covered by warranty, the manufacturer shall notify the customer, informing the customer of what repair costs the manufacturer shall not assume. The customer shall bear the cost of transportation in this case.

1. Introduction

The manufacturer's address is:

SFC Smart Fuel Cell AG
Eugen-Saenger-Ring 4
D-85649 Brunnthal
Tel.: +49 89 / 673 59 20
Free Call: 00800 / 73 27 62 78**
Fax.: +49 89 / 673 592 369
sales@efoy.com
www.efoy.com

Service

EFOY customer service is available for technical inquiries concerning EFOY fuel cells during normal business hours at the following numbers:

Toll-free number: 00800/73 27 62 78*

If calling from outside the countries listed below, please dial +49 89 / 673 5920

*The toll-free number is available in the following countries: Germany, Austria, Belgium, Denmark, France, Great Britain, Italy, the Netherlands, Norway, Spain, Sweden and Switzerland.

1.7 Disposal

Packaging

Packaging protects your unit during shipping. All materials used are environmentally compatible and recyclable.

We recommend saving the packaging for eventual winter storage.

Should you nevertheless wish to dispose of the packaging, please do so properly.

Your dealer or your local recycling center can provide information about proper disposal.



Danger of Suffocation!

Keep packaging away from children. Plastic wrapping and cartons may cause suffocation.

Fuel Cartridges

Sort empty fuel cartridges with plastics. Dispose of partly filled fuel cartridges in the same manner as solvents or paint.

Old Units

Old units are still valuable! Proper disposal can yield valuable raw materials while protecting the environment.

The EFOY hotline:

Tel.: +49 89 673 5920 or 00800 732 762 78*

can advise you about returning old units.

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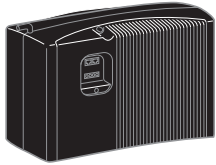
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3. Configuration

3.1 Standard Equipment



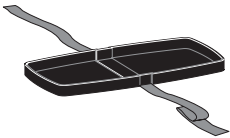
Unit



Remote control with data line RC1



Fuel-cartridge holder with belt FH1



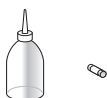
Mounting plate with belt MP1



Exhaust hose EH1



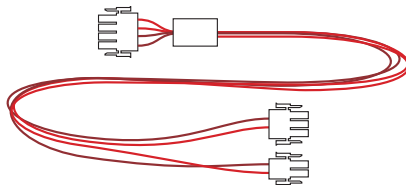
Off-heat duct OD1



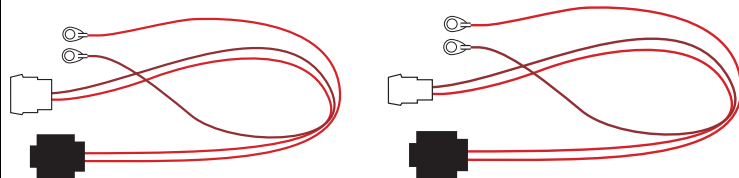
Service kit

The following is standard equipment:

- Unit
- Remote control with data line RC1
- Fuel-cartridge holder with belt FH 1
- Mounting plate with belt MP 1
- Exhaust hose (1.5 m) EH 1
- Charge line
- Service-Kit
- UM1 user manual



Connecting line to fuel-cell 1m

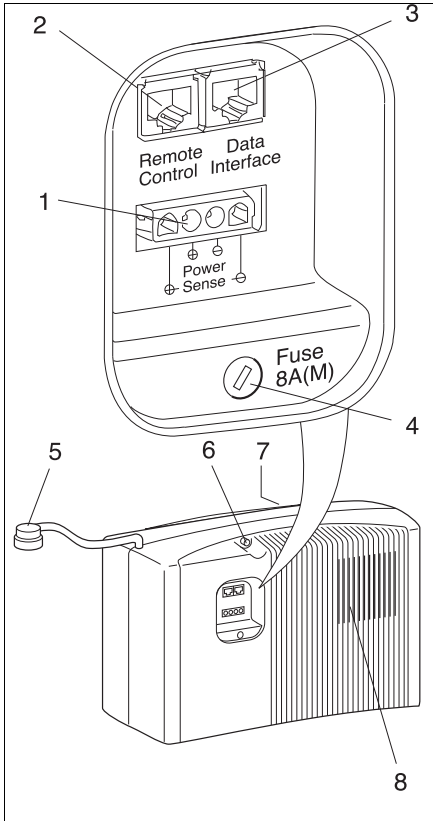


Battery fuse power 7.5A

Battery fuse sense 2A

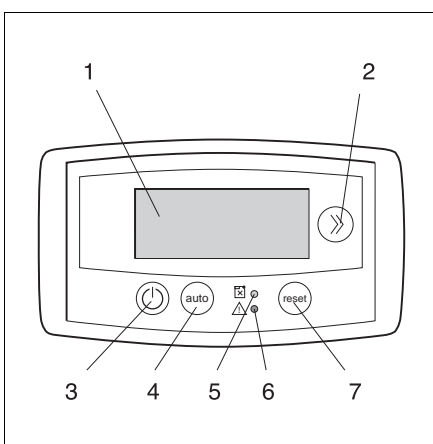
3. Configuration





3.2 Overview



- 1 Charge line connection
- 2 Remote-control connection RC 1
- 3 Data interface
- 4 G-fuse 250V 8A M, 5 x 20 mm
- 5 Fuel-cartridge connection
- 6 Connection for EH 1 exhaust hose and nozzle for service fluid
- 7 Cooling inlet (reverse)
- 8 Warm-air outlet and connection for off-heat duct

3.3 Remote Control



- 1 Display
- 2 Information button and language-selection button 
- 3 On/Off button 
- 4 Button for automatic operation 
- 5 Yellow warning light "Please change fuel cartridge"
- 6 Red error warning light
- 7 Reset button 

3. Configuration

3.4 Specifications

Performance

Product	EFOY 600	EFOY 900	EFOY 1200	EFOY 1600
Rating	25 W	38 W	50 W	65 W
Charge capacity	600 Wh/Day (50 Ah/Day)	900 Wh/Day (75 Ah/Day)	1200 Wh/Day (100 Ah/Day)	1600 Wh/Day (130 Ah/Day)
Nominal voltage	12 V	12 V	12 V	12 V
Charging current @ 12 V	2.1 A	3,1 A	4.2 A	5.4 A
Turn on threshold*	$U_{\text{batt}} < 12.3 \text{ V}$	$U_{\text{batt}} < 12.3 \text{ V}$	$U_{\text{batt}} < 12.3 \text{ V}$	$U_{\text{batt}} < 12.3 \text{ V}$
Cut off threshold*	$U_{\text{batt}} > 14.2 \text{ V}$ and $I_{\text{out}} < 2.0 \text{ A}$	$U_{\text{batt}} > 14.2 \text{ V}$ and $I_{\text{out}} < 2.0 \text{ A}$	$U_{\text{batt}} > 14.2 \text{ V}$ and $I_{\text{out}} < 2.0 \text{ A}$	$U_{\text{batt}} > 14.2 \text{ V}$ and $I_{\text{out}} < 2.0 \text{ A}$
Required starting voltage	$> 10.8 \text{ V}$	$> 10.8 \text{ V}$	$> 10.8 \text{ V}$	$> 10.8 \text{ V}$
Quiescent current requirement	15 mA	15 mA	15 mA	15 mA
Methanol requirement	1.1 l/kWh	1.1 l/kWh	1.1 l/kWh	1.1 l/kWh
Compatible batteries	12 V rechargeable (lead-acid or lead-gel) batteries			
	10 to 100 Ah	15 to 150 Ah	20 to 200 Ah	25 to 250 Ah

General Specifications

Sound pressure level at 7 m	23 dB(A)	23 dB(A)	23 dB(A)	23 dB(A)
Weight	6,3 kg	7,1 kg	7,1 kg	7,3 kg
Dimensions (L x W x H)	43,5 x 20,0 x 27,6 cm			

* factory setting

3. Configuration

Environmental conditions

Space requirement (L x W x H)	51 x 35 x 30 cm minimum	
Inclination along the direct axis	continual:	35°
	temporary (<10 min):	45°
Inclination along the quadrature axis	continual:	20°
Operating temperature	-20 to +40 °C	
Start temperature	+5 to +40 °C	
Storage temperature	+1 to +45 °C	

Instrumentation

Operation	via remote control with four buttons and multilingual display	
Electrical interface	MNL 4-prong plug	
	Type Tyco Electronics AMP Universal Mate-N-Lok (Mfr. No. 350779)	
Fuse	G fuse 250V 8.0A M, 5 x 20 mm	

Fuel Cartridge

	M5	M10
Volume	5 liter	10 liter
Weight	4.3 kg	8.4 kg
Dimensions (L x W x H)	19.0 x 14.5 x 28.3 cm	23.0 x 19.3 x 31.8 cm

4. Installation



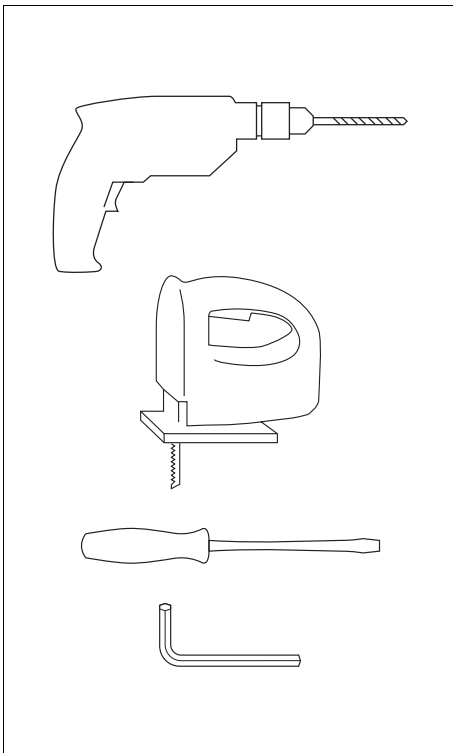
Securely fasten unit and fuel cartridges when using on board motor vehicles.

Do not operate unit if there is danger of explosion.

Unit is not watertight. Make sure that no water can enter.

Keep unit and fuel cartridges away from children, temperatures in excess of 45° C and direct sunlight.

4.1 Tools and Materials



You will need the following tools and sealants to install the fuel cell in an RV:

- electric drill
- jigsaw
- screwdriver
- hexagonal (Allen) wrench
- sealant such as Sikaflex

Use the following screws, depending on the mounting surface (screws are not included):

- 8 screws to attach the mounting plate
- 4 screws to attach the remote control
- 4 screws to attach the fuel-cartridge holder
- cable clamps and fixing screws, if needed

4. Installation

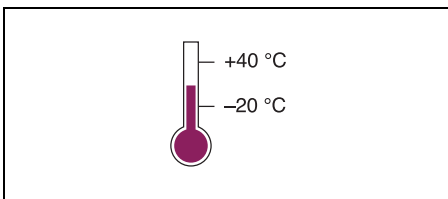
4.2 Space Requirements

Installation should be carried out by trained personnel only. Wear proper work clothes. Avoid flowing garments and wear a hair net if you have long hair. Clothing and hair can get caught in moving or rotating parts such as in a drill.

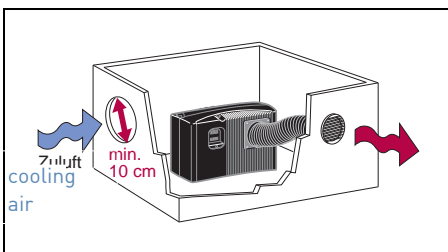
Be sure to leave enough space behind the installation area when drilling or cutting out openings. Also be sure to follow the tool manufacturer's safety instructions.

Solvents used in sealants may emit fumes. Make sure that there is sufficient ventilation and follow the instructions for the sealing compound.

Make sure when choosing a location, that the temperature ranges between -20°C and $+40^{\circ}\text{C}$.



This unit generates heat, thus requiring ventilation. Please take this into account when considering possible locations.



Provide for a vent opening measuring at least 10 cm across when installing. Use the off-heat duct (included) to remove warm air.

Install only in upright position. Use the mounting plate (included).

4. Installation

Make sure that the device does not exceed the maximum inclination.

Inclination along the direct axis:

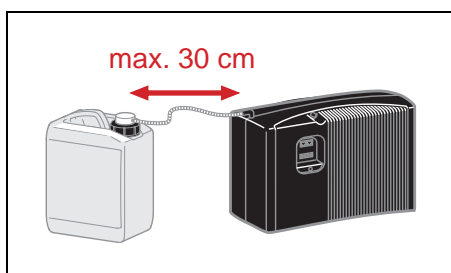
continual: 35°

temporary (<10min): 45°

Inclination along the quadrature axis:

continual: 20°

All electrical connections, the fill opening for service fluid and the fuel cartridge should be easily accessible.



Make sure that the fuel cartridge is located within reach of the connecting hose (30 cm) and that the hose is neither kinked nor crushed.

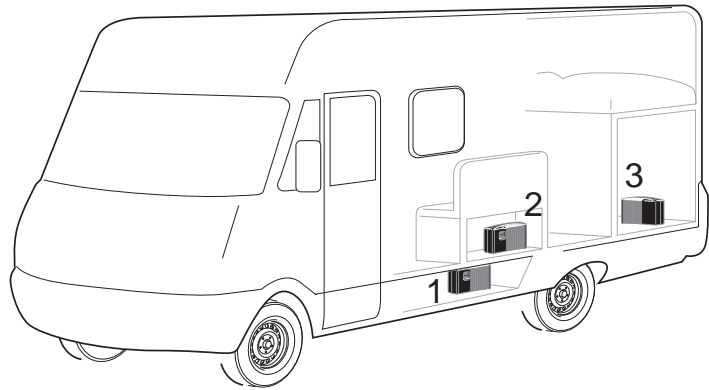


The fuel-cartridge hose and the exhaust hose may not be damaged. Do not substitute another hose for either of the two.

Use only original-equipment EFOY hoses.

4. Installation

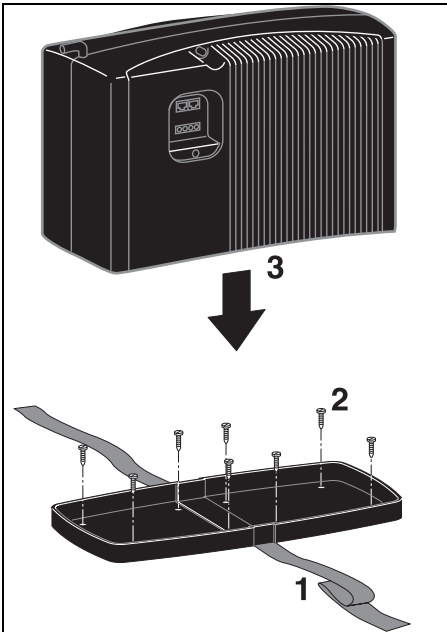
4.3 Locations



Ideas for installation:

- 1 false floor or side compartment
- 2 seat bench
- 3 rear storage area

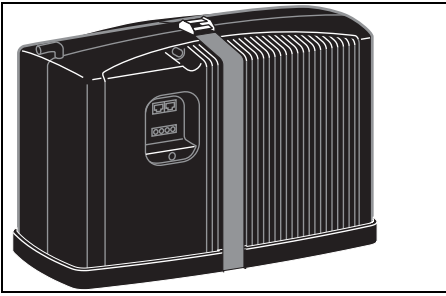
4.4 Securing the unit



Select a suitable location as described in Chapter 4.2, paying attention to the dimensions in Chapter 3.4.

1. Run the belt in the groove under the mounting plate.
2. Secure the mounting plate tightly to the desired location. Use eight proper screws and dowels, if necessary, so that the mounting plate cannot shake loose in case of an accident.
3. Place the unit onto the mounting plate.

4. Installation



4. Strap the unit tightly to the mounting plate.

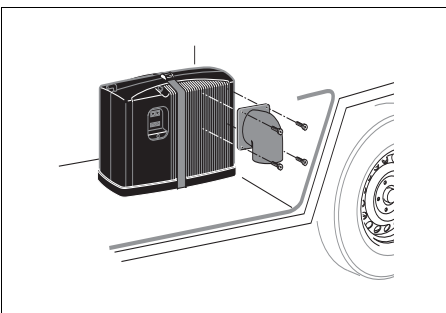
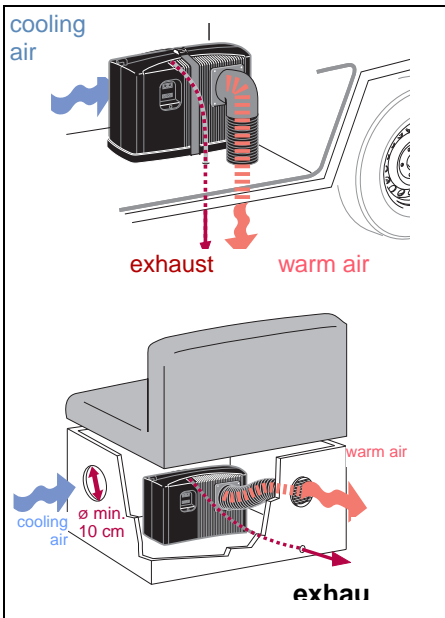
4.5 Off-heat duct

The off-heat duct (included) extracts warm air so that the unit can also be operated in close quarters.

Use the bow to conduct warm air to the side.

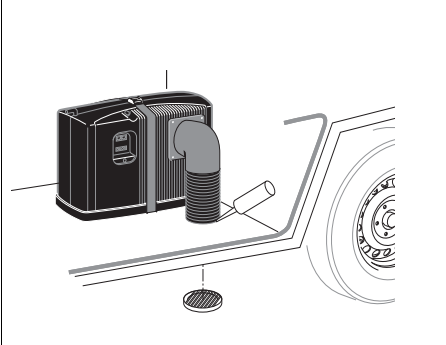
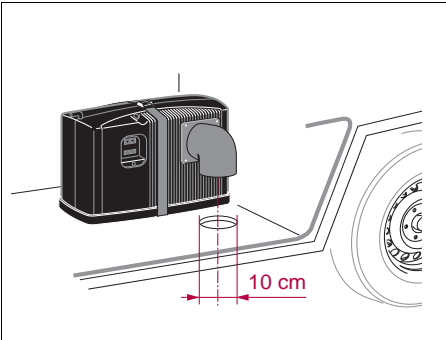
If you do not need the off-heat bow, you can disconnect it from the off-heat flange and connect the off-heat tube directly to the flange.

Make sure that the off-heat tube is not kinked; use a second bow if needed.



Sink the screws for the off-heat flange into the holes provided.

4. Installation



Then pass the off-heat tube to the exterior. You will need an opening with a 100 mm diameter.

Be careful of electrical lines when drilling. The RV manufacturer or your dealer can provide information as to the location of lines.

Pass the off-heat tube through the opening; any excess may be shortened.

It may be necessary to use an external face plate to protect the outlet. Use a suitable sealant to prevent moisture from penetrating into the body or into the interior.

4.6 Connecting the Exhaust Hose

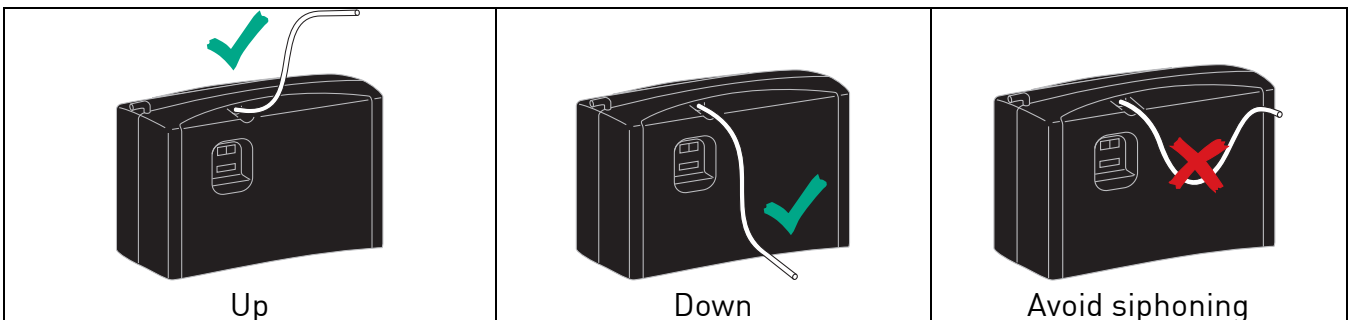


Exhaust gasses contain moisture and may exceed 60° C, causing scalding. Exhaust byproducts may contain injurious substances. Avoid inhaling exhaust directly or for long periods of time.

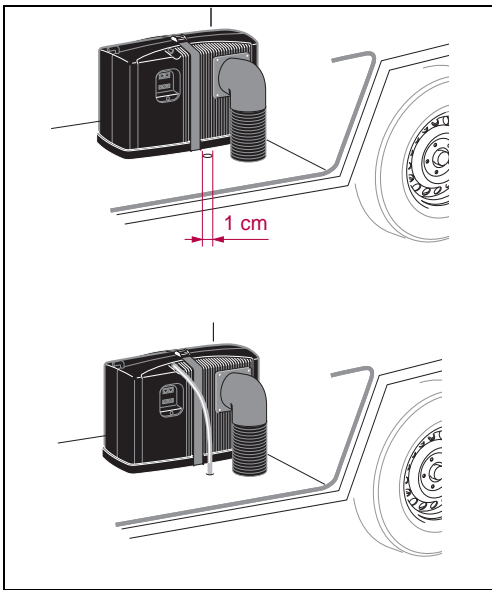
The exhaust hose may not be longer than 50 cm in order to prevent freezing in winter. The hose may be up to 150 cm long for summer operation and during transitional seasons.

At no time may siphoning occur in the hose. Make sure that the hose is neither clogged nor blocked.

Routing the exhaust hose



4. Installation



- Remove the cap from the exhaust port. Retain the cap for winter storage or for possible returns.
- Attach the exhaust hose (included) to the exhaust port.
- Route the hose to the exterior and use a suitable sealant to seal the opening. The hose may be shortened as needed. The opening must be 10 mm in diameter.
- Make sure the exhaust hose has no kinks or blockage and that exhaust can escape freely.

4.7 Installing the fuel-cartridge holder



Keep fuel cartridge and all reserve cartridges away from children. Keep cartridges away from heat and out of direct sunshine.

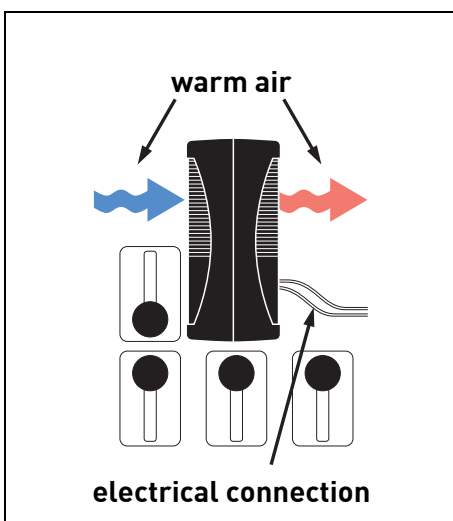
Secure fuel cartridge and all reserve cartridges so that they can not shift.

Make sure that the fuel-cartridge connecting hose is neither crushed nor kinked.

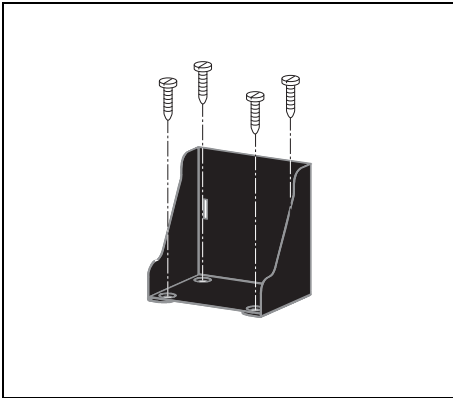
Do not place fuel cartridges or reserve cartridges in front of the air intake or outlet!

Place fuel cartridges next to or in front of the unit as illustrated.

Do not place objects such as reserve fuel cartridges in front of the air intake or outlet.



4. Installation



Install unit and fuel cartridge at the same level.

Secure the fuel-cartridge holder with four suitable screws and dowels, if necessary, so that it will not shake loose in the case of an accident.

4.8 Electrical Connections



All work should be carried out by qualified technicians in accordance with technical regulations.

Improper connections or the use of wrong gauge wires could result in fire.

All wires must be properly insulated and have adequate voltage rating. All connections must be tight. The use of uninsulated wires and contacts is not permitted.

Use the wire harness (included) to connect the unit.

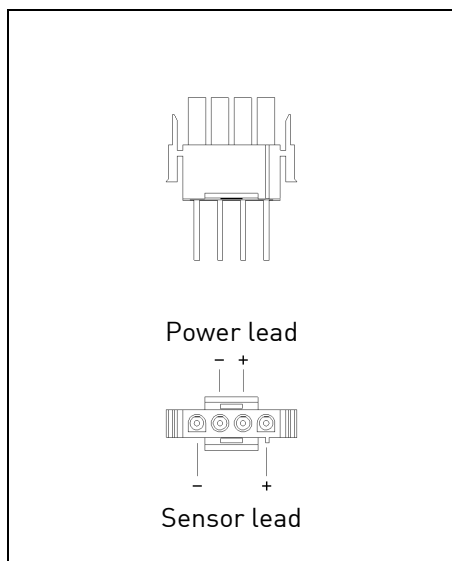
The circuit connecting the battery must contain a fuse. Alternatively, use the fuse (available as optional equipment) to connect the battery.

Check the polarity (see illustration) before connecting the unit.

Both sensor and power lines must always be connected.

Always use separate lines for charging (power) and for voltage metering (sensor) to the battery. Otherwise, the flow of current will cause false readings.

4. Installation



The charging lines consists of four leads that must be connected to the battery as follows:

Power lead:

This lead carries current from the fuel cell to the battery.

Sensor lead:

This lead measures battery voltage.

To minimize current loss in the leads, the following cross section is recommended, should the battery charging cable be insufficient:

Length [m]	min. cross section
< 5 m	2.5 mm ²
5 – 10 m	4 mm ²
10 – 15 m	6 mm ²

Option:

Extension sense line 8 m (Art. No. 151 906 005)

Extension Power line 8 m (Art. No. 151 906 006)

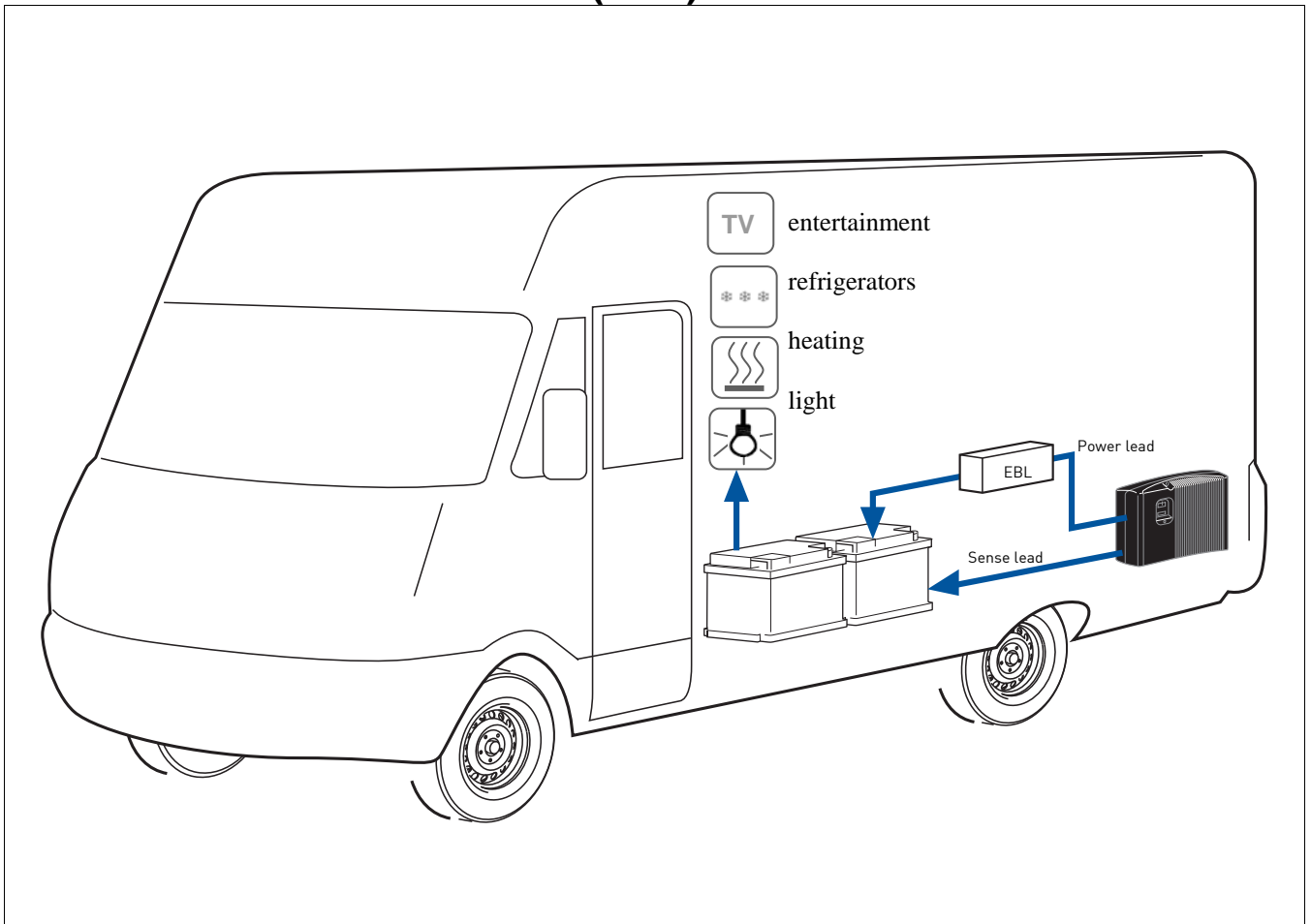
Two kinds of electrical connection are possible:

via the central electrical box (Chapter 4.8.1)

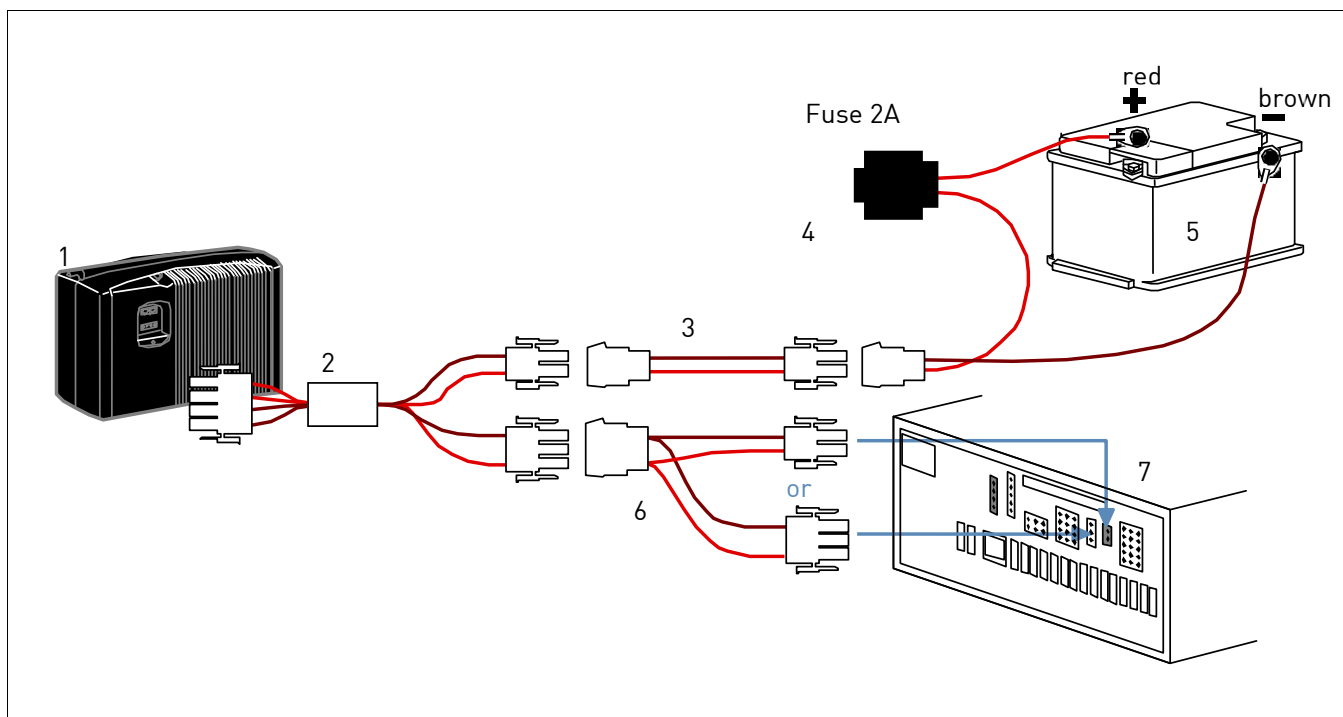
directly to the battery (Chapter 4.8.2)

4. Installation

4.8.1 Connection via the Central Electrical Box (EBL)



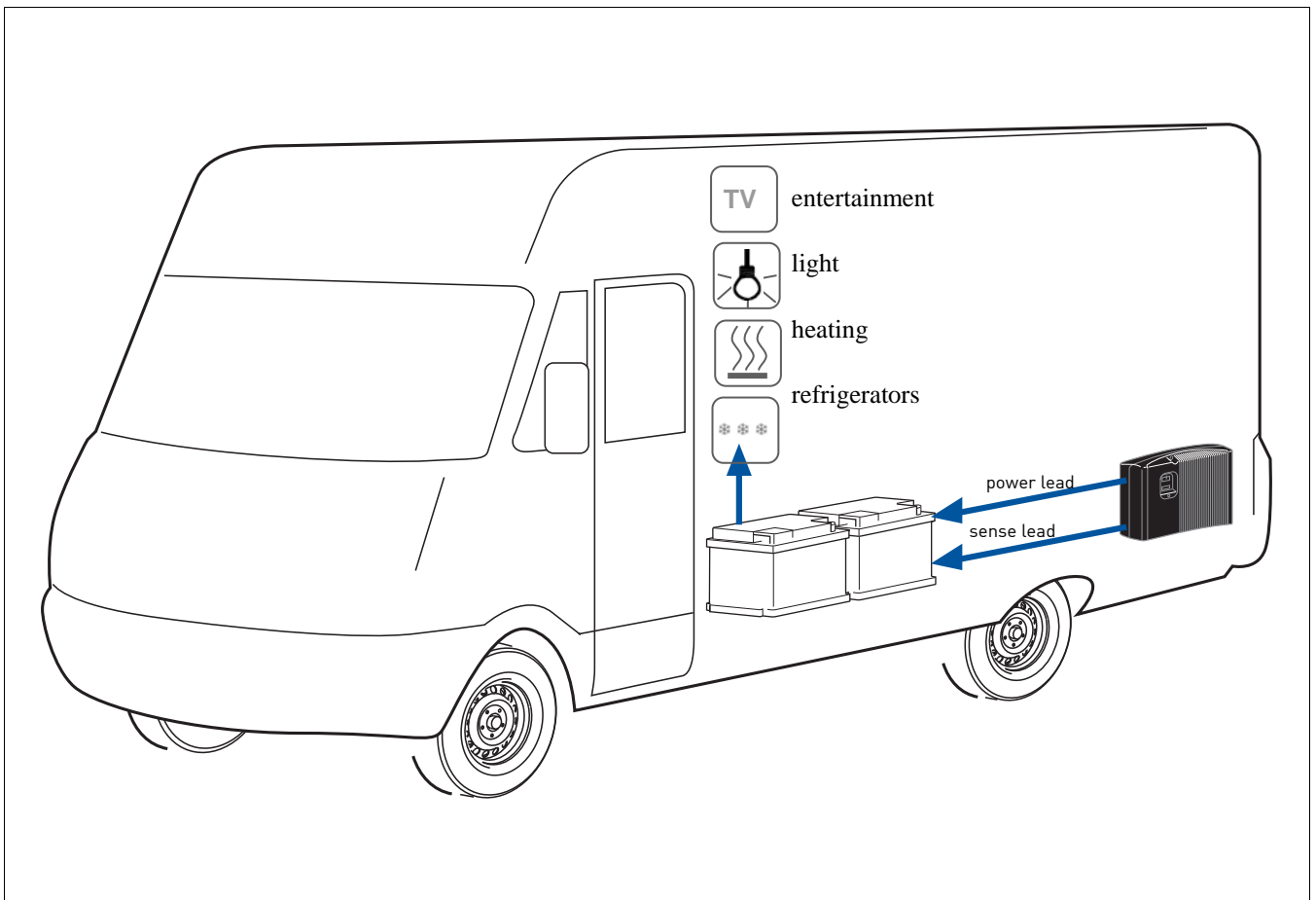
4. Installation



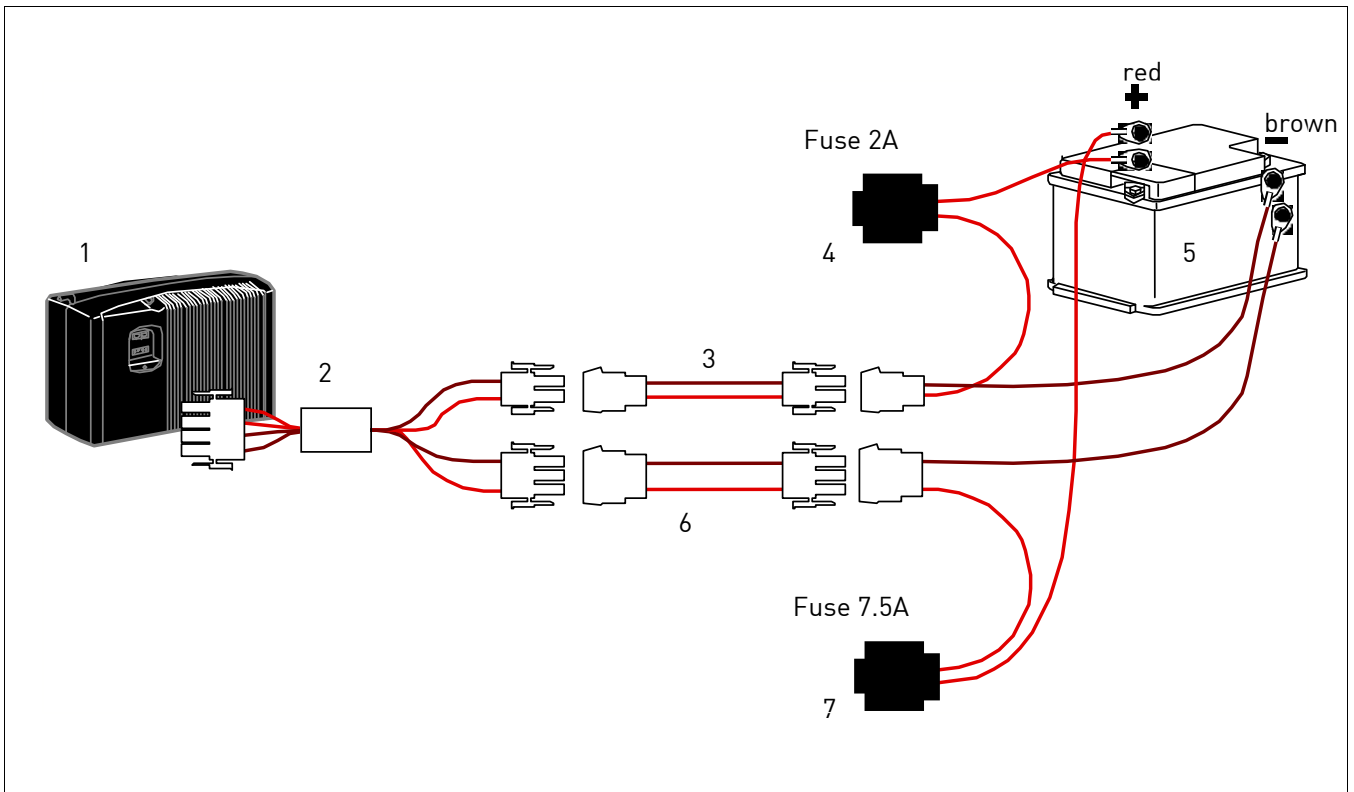
1. unit
2. connecting line to fuel cell
3. extension sense line (optional)
4. battery fuse 2 A
5. battery
6. extension power line with 2- or 3- pole plug (optional)
7. Central electrical box (EBL)

4. Installation

4.8.2 Connection directly to the battery



4. Installation



1. unit
2. connecting line to fuel cell
3. extension sense line (optional)
4. battery fuse sense 2 A
5. battery
6. extension power line with 3-pole plug (optional)
7. battery fuse power 7.5 A

4. Installation

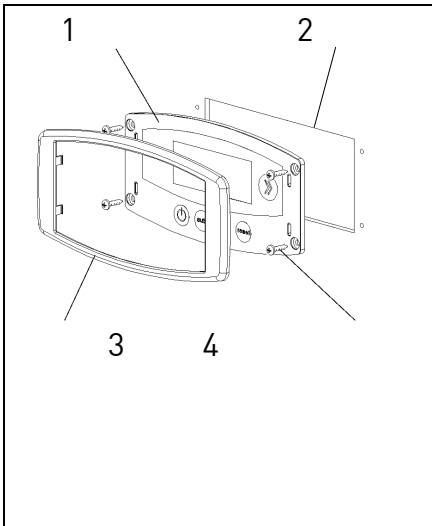
4.9 Connecting the Remote Control

The remote control (1) displays the current status and is used to control the device. Mount the panel where it is easily accessible such as in the cockpit.

If installing the panel flush with the surface of the unit, make sure that there is a sufficient opening for the electronic components behind the opening.

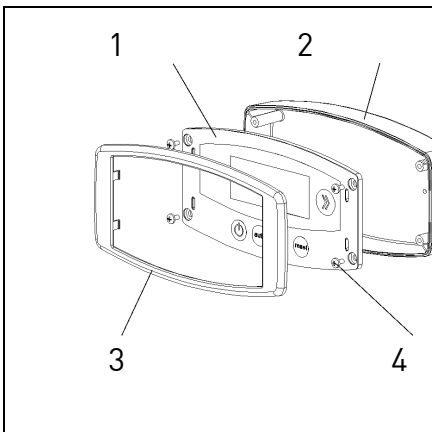
Use templates for drilling and sawing when flush or surface mounting (2). Use a drill to start the opening and then cut out the rest of the opening with a keyhole or compass saw.

Secure the control panel (1) with four suitable screws (4) and place the frame (3) over the control panel.



Flush mounting:

- 1 remote control
- 2 opening
- 3 frame
- 4 screws



Surface mounting:

- 1 remote control
- 2 surface mount
- 3 frame
- 4 screws

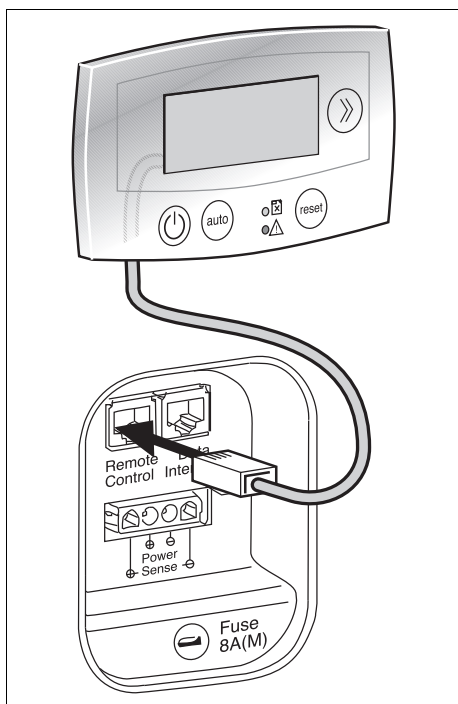
Surface mounting (optional)

Secure the surface mount with two screws.

Connect the remote control with the DL 1 data line (included).

Then secure the control panel (1) with four suitable screws (4) and place the frame (3) over the control panel.

4. Installation



Connect the remote control with the DL data line (included).

If the DL 1 data line is not long enough, you can replace it with a commercially available network line that is longer or shorter (Category 5 patch cable).

Then insert the plug into the left socket on the unit marked "Remote Control".

5.1 Connecting the Fuel Cartridge



For safety's sake, use only original EFOY fuel cartridges. Do not smoke while changing the cartridge and avoid open flames! Do not expose fuel cartridges to temperatures above 45°C.



Do not place the fuel cartridge in front of the air intake or outlet.

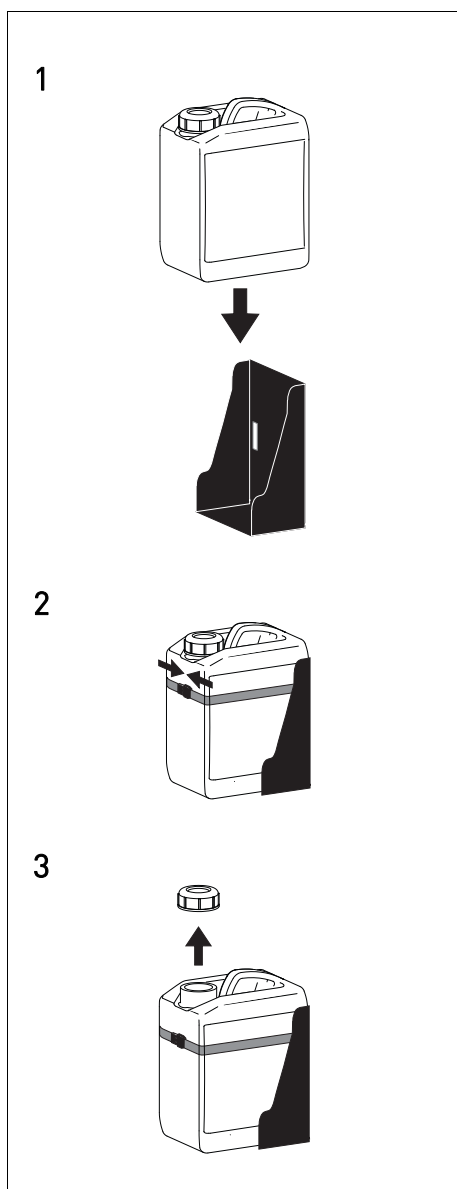


Original-equipment EFOY fuel cartridges contain EFOY-approved methanol. Even slight impurities in commercially available methanol may cause permanent damage to the unit and may void the warranty.

Note: When the cartridge is empty, "Please change fuel cartridge" will appear on the remote control and the yellow light will blink. The cartridge may be changed while the system is running.

- Unscrew the empty fuel cartridge and remove.
- Close each cartridge tightly with the cap after use.
- EFOY fuel cartridges are intended for one-way use only. They may not be refilled.
- Sort empty fuel cartridges with plastics. Dispose of partly filled fuel cartridges in the same manner as solvents or paint.

5. Operation



- Place a new sealed original-equipment EFOY fuel cartridge into the fuel-cartridge holder (1).
- **Fasten the belt on the fuel-cartridge holder (2). Do not attach fuel cartridges without a fuel-cartridge holder.**
- **Only remove the childproof cap when the new fuel cartridge has been placed into the fuel-cartridge holder (3).**
- Screw the connector onto the new fuel cartridge.
- Press `reset` on the control panel to extinguish the yellow warning light and the maintenance message.

5. Operation

5.2 Automatic Operation



Before connecting to the electrical system, make sure the unit has been positioned properly and that the electrical system is protected by fuses (as described in Chapter 3.4)

Do not operate at temperatures above 40° C or below - 20° C. If device has been exposed to temperatures under 0° C without being connected to a battery or with insufficiently filled fuel cartridge (antifreeze), it must stand at room temperature for 24 hours before operating.

Make sure that a full fuel cartridge has been connected.

Automatic operation will begin the moment that you connect the unit to a battery. The unit will monitor battery voltage by itself.

Automatic
Charging mode

The unit charges the battery as needed or assists the battery in providing output. The second line of the display will indicate “charging mode” as long as the unit is providing voltage to the electrical system.

Automatic
Start phase

The device goes through a cold start phase of about 20 minutes before reaching its full rated output.

Automatic
Standby

If the battery is sufficiently charged and the unit is not providing input, the unit will remain in the standby mode.

Automatic
Please change fuel cartridge

Should the device detect a malfunction such as an empty fuel cartridge, it will shut down and advise you how to correct the situation. (“Please change fuel cartridge“.) Resume automatic operation using the reset button after the error has been corrected. (See also Chapter 7 Troubleshooting).

5. Operation


5.3 Switching on the Fuel Cell

If desired, you can switch on the unit manually regardless of the battery voltage. The unit will then be in the “charging mode”.



This function is only possible when the battery voltage is below 13.2V


On
Charging mode

Press  on the control panel once if the unit has been switched off, and twice if it is operating in automatic mode. The unit will start up regardless of the battery voltage and will continue charging until it reaches the cutoff point ($U_{\text{batt}} > 14,2 \text{ V}$ und $I_{\text{out}} < 2,0 \text{ A}$).

The device will then switch to automatic mode by itself and will only charge if the battery or the demand for power requires it.

5.4 Display Information

The second line of the display provides information about normal operation, errors or malfunctions (see Chapter 7). The first line indicates the operating mode selected, such as “Automatic”.

Press  to obtain the following information.

■ Battery voltage

Automatic
Voltage 13.6 V

■ Charging current

Automatic
4.6 A


Please note that the device interrupts power generation briefly several times an hour during normal operation and a charging power of 0.0 A is displayed then.


5. Operation

Automatic
Firmware 1200 4.12L


Automatic
Operating hours 500 h


Automatic
Please change fuel cartridge

Automatic 
Charging mode

- Firmware version
- Total operating hours
- Maintenance messages (see also Chapter 7)
- If you have connected the optional cartridge sensor to your unit, a fuel cartridge  will appear in the display as soon as a predetermined amount is reached.

Always keep a reserve fuel cartridge at the ready. The cartridge need only be changed when the message “Please change cartridge” appears in the display.




The standard display will be restored after about 30 seconds. Alternatively, you can return to the standard display by pressing  again.

By pressing  for approximately 2 seconds, you will obtain the language menu (see Chapter 5.5).


5. Operation

5.5 Select Language

Deutsch

- Press  on the control panel for 2 seconds. The control panel will display the language currently selected.
- The following languages are available:
 - German (factory setting)
 - English
 - French
 - Italian
 - Dutch
 - Spanish
- Continue pressing  until the desired language appears.
- Then hold  2 more seconds in order to set your language choice.

5.6 Switching Off the Fuel Cell

Press  on the remote control to switch off the device.

The unit will gradually shut down, performing various function checks as it does so:

Off
Shutting down

To protect components, the unit must run at least 30 minutes before shutting down. If the unit is shut off beforehand, it will continue running until 30 minutes have elapsed. The message “Shutting down” will appear in the display. Leave the fuel cartridge and the battery connected during this time.

Please note that the fuel cell will only start up if it is connected to an intact battery. The fuel cell will not switch on if the battery is damaged.

5. Operation

5.7 Automatic Antifreeze Feature

Off
Antifreeze mode

This unit features an intelligent antifreeze feature. The unit can keep itself warm at temperatures below 3° C as long as it is connected to a working battery and it is supplied with methanol.

If the unit is in antifreeze mode, the message “Antifreeze mode” will appear on the second line. The first line will indicate the current operating mode, for example “Off”.

The antifreeze function works only as long as a fuel cartridge and a sufficiently intact battery are connected.

The unit will not be able to start if the battery voltage falls below 10.5 volts. Please note that the unit will not recharge the battery if the voltage drops below 10.5 volts.

Please observe the following maintenance tips for storage and winter operation:


- 1 To cut energy costs, we recommend dismantling the unit and storing it away from cold if it is to be inactive for longer periods of time. Dismantling is easy; it requires just a few steps, no tools and no particular technical finesse. Store the unit in the original carton.
- 2 If, despite precautions, the unit does freeze, let it thaw in a warm place for approximately 24 hours before operating. Please note that the unit’s performance may diminish if it freezes repeatedly.

Running in straight antifreeze mode, the unit will consume approximately 10 liters of methanol in the course of a five-month Central European winter.

5.8 Storage

Off
Shutting down



- Press  on the remote control to switch off the unit.
- Wait until the unit has shut down and the display has disappeared (approx. 30 min.).
- Unplug the charging line and the data line for the remote control.
- **Store the plugs and lines in a cool, dry place.**

**Do not smoke when handling unit and fuel cartridge.
Keep away from open flame!**



- Unscrew the fuel cartridge and close it with a cap. Keep all elements clean.
- **Keep unit and fuel cartridges – even empty or partially empty cartridges – away from children.**
- Remove the exhaust hose. Keep it clean and place a cap over the exhaust outlet.
- Remove the off-heat tube and the off-heat bow if necessary.
- Release the belt and lift the unit off the mounting plate.
- Store unit in a cool place; however, the temperature should exceed 1° C because the automatic antifreeze feature will only work if a fuel cartridge is attached along with a sufficiently charged battery. (See Chapter 5.7)
- If the unit has been exposed to temperatures below 0° C without being connected to a battery and sufficiently filled fuel cartridge (antifreeze), it will have to stand at room temperature for approximately 24 hours before operating.

5. Operation

- Use a proper box such as the original carton to ship the unit. Use padding to prevent shocks. Transport the unit in an upright position only.

6.1 Service



Do not open unit! Unauthorized tampering may jeopardize safe operation and void any warranty. The unit does not contain any components that you can service or repair yourself.



The unit is maintenance free under normal operating conditions. Contact SFC if you intend to use it for other than its intended purpose.

SFC Smart Fuel Cell AG
Eugen-Sänger-Ring 4
D-85649 Brunnthal-Nord

Hotline: +49 89 673 5920
Freecall: 00800 732 762 78*
sales@efoy.com
www.efoy.com

*The toll-free number is available in the following countries: Germany, Belgium, Denmark, France, Great Britain, Italy, the Netherlands, Norway, Austria, Sweden, Switzerland and Spain.

6.2 Cleaning



Switch off device before cleaning and unplug the battery charging cable.

The device is not watertight. Make sure that moisture cannot get inside.

Clean only with a soft cloth dampened with a mild detergent.

Reconnect the battery charging cable after cleaning so that the antifreeze feature remains activated. (See Chapter 5.7).

7. Troubleshooting

7.1 Safety



Do not open unit! It contains no components that you can repair yourself.

Contact SFC Smart Fuel Cell AG if you are unable to correct a malfunction using these instructions.

SFC Smart Fuel Cell AG
Eugen-Sänger-Ring 4
D-85649 Brunnthal-Nord

Hotline: +49 89 673 5920
Freecall: 00800 732 762 78*
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*The toll-free number is available in the following countries: Germany, Belgium, Denmark, France, Great Britain, Italy, the Netherlands, Norway, Austria, Sweden, Switzerland and Spain.

7. Troubleshooting

7.2 Problems and Solutions

The control panel signals problems via a red and/or yellow light and a running message on the second line of the display.

The messages will assist you in solving the problem quickly and easily.

Press the **reset** button on the control panel AFTER the problem has been solved.

Message	Solution
Check battery or No connect	Battery voltage is too low. If battery voltage is under 10.5 V, check connection between unit and battery (see Chapter 4.8).
Interruption: Surroundings too warm	Ambient temperature is too high. Unit will start automatically as soon as temperature drops below 30° C.
Interruption: Please defrost device slowly	Unit has been exposed to temperatures below 0° C without being connected to a battery and sufficiently filled fuel cartridge (automatic antifreeze feature). Let stand at room temperature for approx. 24 hours.
Error 10: Please contact service	Call the hotline at. Freecall: 00800 732 762 78* Hotline: +49 89 673 5920 hotline@efoy.com www.efoy.com
Error 11: Please check exhaust hose Error 12: Please check exhaust hose	Check that the exhaust hose has been properly connected and arrange it so that condensation cannot form. Check for kinks. Clean hose if necessary and keep opening clear. Shorten exhaust hose if condensation forms.

7. Troubleshooting

Message	Solution
Error 11: Please check exhaust hose	Check that the exhaust hose has been properly connected and arrange it so that condensation cannot form.
Error 12: Please check exhaust hose	Check for kinks. Clean hose if necessary and keep opening clear. Shorten exhaust hose if condensation forms.
Error 13: Please contact service Error 14: Please contact service Error 15: Please contact service Error 16: Please contact service Error 17: Please contact service	Call the hotline at. Freecall: 00800 732 762 78* Hotline: +49 89 673 5920 hotline@efoy.com www.efoy.com
Error 20: Please change fuel cartridge	Insert a new fuel cartridge as described in Chapter 5.1. Check connection and screw cartridge on tightly.
Error 21: Please change fuel cartridge Error 22: Please change fuel cartridge Error 23: Please change fuel cartridge	Check cartridge hose for kinks. Check hose and connection for dirt. Position fuel cartridge on the same level as unit. Check connection and screw cartridge on tightly.
Error 30: Please refill service fluid Error 31: Please refill service fluid	Check that exhaust can escape and that ambient temperature is below 40° C. Then add service fluid (see Chapter 7.5).

7. Troubleshooting

Message	Solution
Error 50: Please check battery voltage	Battery voltage is too low. Check battery voltage. If under 10.5 V, use an external battery charger to recharge. Check the connection of the sense line.
Error 51: Please check battery voltage	Battery voltage is too high. Check whether the battery is the proper type. Check the connection of the sense line. Check other charging devices such as generators or regulators for defects.
Error 52: Please check battery voltage	Battery voltage is too low. If battery voltage is under 10.5 V, check connection between unit and battery (see Chapter 4.8).
Error 53: Please check battery voltage	Battery voltage is too high. Check whether the battery is the proper type. Check other charging devices such as generators or regulators for defects.
Error 63: Automatic restart Error 65: Automatic restart	Unit is restarting automatically.

7. Troubleshooting

7.3 Problems without Error Messages

Description	Cause	Solution
The device doesn't respond and nothing is displayed on the remote control.	Remote control is not connected or is incorrectly connected.	Check the connection of the remote control (see chapter 4.9).
	No battery connected, wrong battery or undercharged.	Check contacts, polarity and cables. Connect a charged battery to start device.
	Short-circuit fuse tripped.	Check polarity of charge line. Turn off unit, check reason for short circuit/overload or wrong polarity and correct. Replace fuse (see Chapter 7.4).
	If problem recurs:	Contact the hotline at: Freecall: 00800 732 762 78* Hotline: +49 89 673 5920 hotline@efoy.com www.efoy.com

7. Troubleshooting

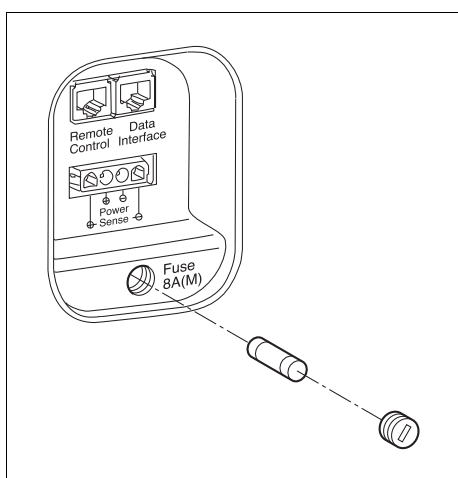
7.4 Changing the Fuse



Replace fuses only with fuses of the same type and rating. Never repair or override a fuse.

Before changing fuse, locate the reason for the malfunction and have your dealer repair it.

Switch off the unit before replacing the fuse. Unplug the charge line.



- Replace the fuse:
G fuse 250V 8 A M, 5 x 20 mm
- Reconnect the charge line.
- Make sure that you have replacement fuses on hand. Replacement fuses are available in electronics stores or from your dealer.

7. Troubleshooting

7.5 Replacing Service Fluid

If service fluid is low the red light will come on and the message "Please refill service fluid" will appear in the control panel display.

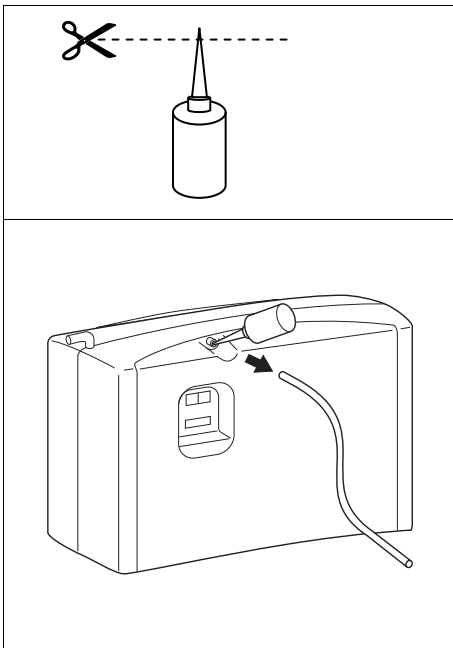


There is no need to add service fluid prior to the initial start-up.

Use EFOY brand service fluid only.

Switch off the unit before refilling fluid. Unplug the charge line.

Always keep the device's service fluid nozzle clean.



- Use a clean pair of scissors to cut off the tip of the cap.

The service fluid bottle is for one time use only.

- Remove the exhaust hose from the device's service fluid nozzle.
- Insert the tip into nozzle and gently squeeze the entire contents into the nozzle.
- **Never refill more than one bottle of Service Fluid at a time.**
- Wipe off any spilled service fluid with a cloth.
- Replace the exhaust hose.
- Reconnect the charge line.
- Press the **reset** button. The display will clear and the device will return to its former operating mode.
- Order a spare bottle service fluid at your local dealer.

8.1 Accessories and Spare Parts



Use only original equipment!

Use of unauthorized parts compromise safety and void the warranty.

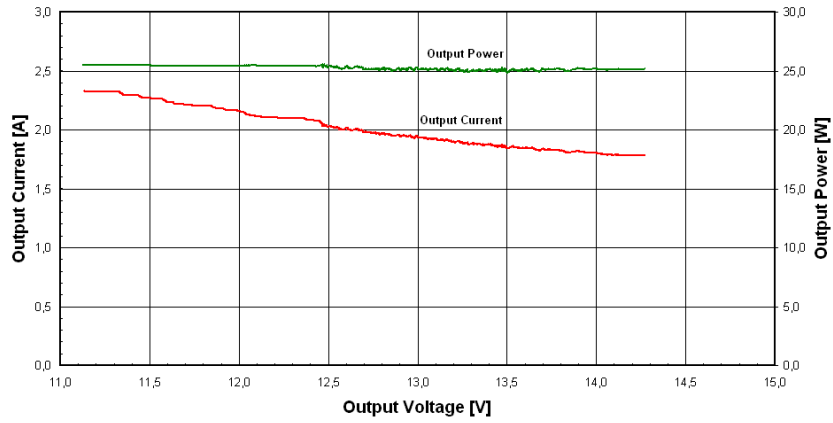
Description	Item number
Fuel cartridge M5 (2)	150 905 006
Fuel cartridge M10	150 905 008
Fuel-cartridge holder with belt FH1	150 905 002
Remote control with data line RC1	151 077 003
Frame for remote control	151 077 007
Surface mount for remote control	151 077 006
Data line DL1 (5 m)	151 075 003
Mounting plate	151 908 002
Belt	151 908 003
Charge line CL1	151 906 009
Exhaust hose EH1 (1.5 m)	000 999 674
Off-heat duct OD1	151 903 001
Off-heat flange and Off-heat bow	151 903 005
Off-heat tube	151 904 001
External face plate	151 903 013
Screw for fastening off heat flange M4 x 10 (4 pieces)	000 992 629
User manual UM1	151 901 001
G-fuse 250 V 8 A m, 5 x 20 mm (10 pieces)	151 906 001
Service-Kit	151 909 002

For further information on accessories and spare parts, please ask you dealer.

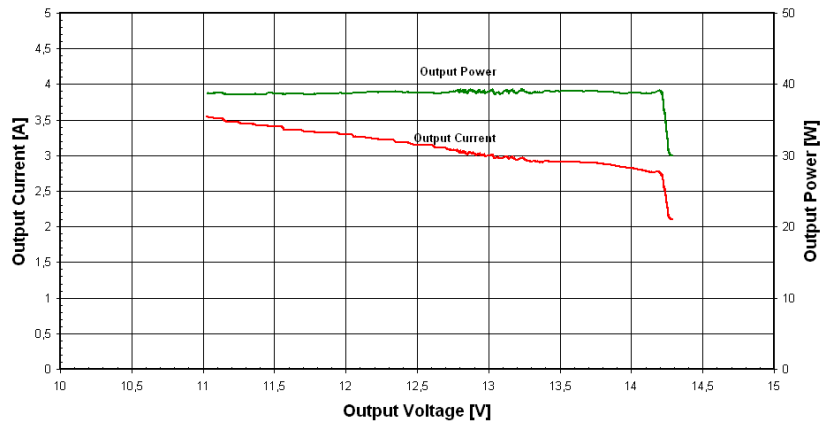
8.2 Output characteristic

U-I and U-P characteristic as per CE test

EFOY 600: U-I- and U-P- Characteristic

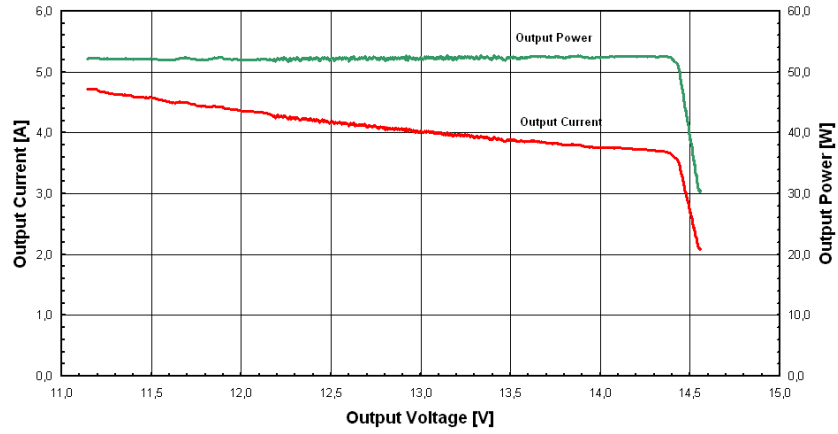


EFOY 900: U- I- and U- P- Characteristic

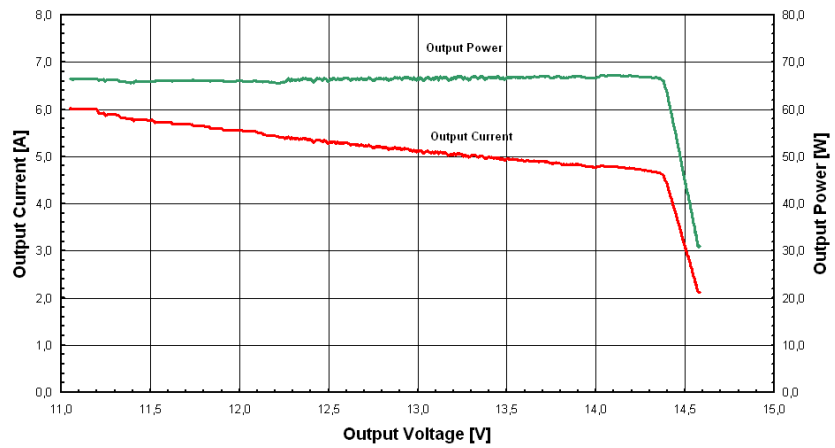


8. Appendix

EFOY 1200: U-I- and U-P- Characteristic



EFOY 1600: U-I- and U-P- Characteristic



8.3 **Material Safety Data Sheet Methanol**



When working with methanol fuel cartridges, be sure to comply with the following safety data sheet.

In case of accident or nausea, immediately seek medical assistance and present this safety data sheet.

Safety Data Sheet

according to 1907/2006/EC, Article 31

Printing date 15.11.2007

Revision: 15.11.2007

1 Identification of the substance/preparation and of the company/undertaking

- Product details

- Trade name: METHANOL

- Application of the substance / the preparation Solvents

- Manufacturer/Supplier:

SFC Smart Fuel Cell AG

Eugen-Saenger-Ring 4

85649 Brunnthal

Tel.: +49 (0)89 673 592-0

Fax: +49 (0)89 673 592-169

- Further information obtainable from: Safety Department

- Department issuing MSDS: info@chemie1.de

- Information in case of emergency: Giftnotruf München: +49 89/19 240

2 Hazards identification

- Hazard description:



T Toxic

F Highly flammable

- Information concerning to particular hazards to man and environment:

R 11 Highly flammable.

R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.

R 39/23/24/25 Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

3 Composition/information on ingredients

- Chemical characterization:

- CAS No. Description

67-56-1 methanol

- Identification number(s)

- EINECS Number: 200-659-6

- EU Number: 603-001-00-X

4 First-aid measures

- General information:

Immediately remove any clothing soiled by the product.

Remove breathing equipment only after contaminated clothing have been completely removed.

In case of irregular breathing or respiratory arrest provide artificial respiration.

- After inhalation:

Supply fresh air or oxygen; call for doctor.

In case of unconsciousness place patient stably in side position for transportation.

- After skin contact:

After contact with skin, wash immediately with plenty of soap and water.

If skin irritation continues, consult a doctor.

- After eye contact:

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

- After swallowing:

Fresh air. Induce vomiting. Make victim drink ethanol (e.g. 1 drinking glass of a 40% alcoholic beverage).

Call in physician, mentioning methanol ingestion.

EU

(Contd. on page 2)

Safety Data Sheet

according to 1907/2006/EC, Article 31

Printing date 15.11.2007

Revision: 15.11.2007

Trade name: **METHANOL**

(Contd. of page 1)

5 Fire-fighting measures

- **Suitable extinguishing agents:**
CO₂, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- **Special hazards caused by the substance, its products of combustion or resulting gases:**
Can form explosive gas-air mixtures.
Formation of toxic gases is possible during heating or in case of fire.
- **Protective equipment:**
Wear self-contained respiratory protective device.
Do not inhale explosion gases or combustion gases.
- **Additional information**
Cool endangered receptacles with water spray.
Dispose of fire debris and contaminated fire fighting water in accordance with official regulations.

6 Accidental release measures

- **Person-related safety precautions:**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources.
- **Measures for environmental protection:**
Prevent seepage into sewage system, workpits and cellars.
Inform respective authorities in case of seepage into water course or sewage system.
- **Measures for cleaning/collecting:**
Ensure adequate ventilation.
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose of the material collected according to regulations.
- **Additional information:** Fumes can combine with air to form an explosive mixture.

7 Handling and storage

- **Handling:**
- **Information for safe handling:**
Keep receptacles tightly sealed.
Ensure good interior ventilation, especially at floor level. (Fumes are heavier than air).
- **Information about fire - and explosion protection:**
Keep ignition sources away - Do not smoke.
Protect against electrostatic charges.
- **Storage:**
- **Requirements to be met by storerooms and receptacles:**
Store in a cool location.
Store only in the original receptacle.
- **Information about storage in one common storage facility:** Store away from foodstuffs.
- **Further information about storage conditions:**
Keep receptacle tightly sealed.
Store under lock and key and with access restricted to technical experts or their assistants only.
Store under lock and key and out of the reach of children.
Protect from heat and direct sunlight.

8 Exposure controls/personal protection

- **Additional information about design of technical facilities:** No further data; see item 7.

(Contd. on page 3)

Safety Data Sheet

according to 1907/2006/EC, Article 31

Printing date 15.11.2007

Revision: 15.11.2007

Trade name: **METHANOL**

(Contd. of page 2)

- Ingredients with limit values that require monitoring at the workplace:**67-56-1 methanol**

AGW (Germany)	270 mg/m ³ , 200 ppm 4(II);DFG, EU, H, Y
IOELV (European Union)	260 mg/m ³ , 200 ppm Skin
WEL (Great Britain)	Short-term value: 333 mg/m ³ , 250 ppm Long-term value: 266 mg/m ³ , 200 ppm Sk

- Additional information: The lists valid during the making were used as basis.

- Personal protective equipment:**- General protective and hygienic measures:**

Keep away from foodstuffs, beverages and feed.

Immediately remove all soiled and contaminated clothing

Avoid contact with the eyes and skin.

- Respiratory protection: Use suitable respiratory protective device in case of insufficient ventilation.

- Protection of hands:

Protective gloves (EN 374)

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.

Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.

Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

- Material of gloves

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.

- Penetration time of glove material

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

- Eye protection: Tightly sealed goggles

- Body protection: Use protective suit.

9 Physical and chemical properties

- General Information

Form:	Fluid
Colour:	Colourless
Odour:	Alcohol-like

- Change in condition

Melting point/Melting range: -98°C

Boiling point/Boiling range: 64°C

- Flash point: 11°C

- Ignition temperature: 455°C

- Danger of explosion: Product is not explosive. However, formation of explosive air/vapour mixtures are possible.

- Explosion limits:

Lower: 5,5 Vol %

Upper: 44 Vol %

- Vapour pressure at 20°C: 128 hPa

- Density at 20°C: 0,79 g/cm³

(Contd. on page 4)

Safety Data Sheet

according to 1907/2006/EC, Article 31

Printing date 15.11.2007

Revision: 15.11.2007

Trade name: METHANOL

(Contd. of page 3)

- **Solubility in / Miscibility with water:** Fully miscible.

10 Stability and reactivity

- **Thermal decomposition / conditions to be avoided:** Protect from heat and direct sunlight.
- **Dangerous reactions** Forms explosive gas mixture with air.
- **Dangerous decomposition products:**
No dangerous products of decomposition if used and stored according to specifications.

11 Toxicological information

- **Acute toxicity:**
 - **LD/LC50 values relevant for classification:**
- | | | |
|-------------------------|------|-------------------|
| 67-56-1 methanol | | |
| Oral | LD50 | 13000 mg/kg (rat) |
- **Primary irritant effect:**
 - **on the skin:** No irritant effect.
 - **on the eye:** No irritating effect.
 - **Sensitization:** No sensitizing effects known.

12 Ecological information

- **General notes:**
Water hazard class 1 (German Regulation) (Assessment by list): slightly hazardous for water
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

13 Disposal considerations

- **Product:**
- **Recommendation** Disposal must be made according to official regulations.

- European waste catalogue

07 00 00	WASTES FROM ORGANIC CHEMICAL PROCESSES
07 01 00	wastes from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals
07 01 04	other organic solvents, washing liquids and mother liquors

- **Uncleaned packaging:**
- **Recommendation:** Disposal must be made according to official regulations.
- **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

14 Transport information

- **Land transport ADR/RID (cross-border)**
- **ADR/RID class:** 3 (FT1) Flammable liquids.
- **Danger code (Kemler):** 336
- **UN-Number:** 1230
- **Packaging group:** II
- **Hazard label:** 3+6.1

(Contd. on page 5)

Safety Data Sheet
according to 1907/2006/EC, Article 31

Printing date 15.11.2007

Revision: 15.11.2007

Trade name: METHANOL

(Contd. of page 4)

- **Description of goods:** 1230 METHANOL
 - **Limited quantities (LQ)** LQ0
 - **Transport category** 2
 - **Tunnel restriction code** D1E

- **Maritime transport IMDG:**
 - **IMDG Class:** 3
 - **UN Number:** 1230
 - **Label** 3+6.1
 - **Packaging group:** II
 - **EMS Number:** F-E,S-D
 - **Proper shipping name:** METHANOL

- **Air transport ICAO-TI and IATA-DGR:**
 - **ICAO/IATA Class:** 3
 - **UN/ID Number:** 1230
 - **Label** 3+6.1
 - **Packaging group:** II
 - **Proper shipping name:** METHANOL

15 Regulatory information

- **Labelling according to EU guidelines:**

The product has been classified and marked in accordance with EU Directives / Ordinance on Hazardous Materials.

- **Code letter and hazard designation of product:**

T Toxic
 F Highly flammable

- **Risk phrases:**

11 Highly flammable.
 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
 39/23/24/25 Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

- **Safety phrases:**

1/2 Keep locked up and out of the reach of children.
 7 Keep container tightly closed.
 16 Keep away from sources of ignition - No smoking.
 36/37 Wear suitable protective clothing and gloves.
 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

- **National regulations:**

- **Waterhazard class:** Water hazard class 1 (Assessment by list): slightly hazardous for water.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

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