EFOY
ENERGY FOR YOU

Operation and Installation Manual

EFOY Pro Series

GB

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 and follow the installation instructions.

Please contact our sales partner where you have bought the product in case you have questions about installation or operation.

Manufacturer's address:

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

Phone: +49 89 673 5920
Fax: +49 89 673 592 369
Email: hotline@efoy.com
web: www.efoy.com

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 45° C. Keep away from heat and direct sunlight.

Store the unit where there is no danger of freezing, or use the automatic antifreeze feature. (see Chapter 3.9)

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 (i.e. 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.

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 Pro fuel cells are automatic charging devices for 12V and 24V lead batteries.

The unit may be used only to charge lead batteries that conform to the specifications in Chapter 2.3.

The unit can be used according the specification in Chapter 2.3 for stationary and mobile operation in 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.

The parallel operation of units to increase the charging current is possible.

The serial operation of units to increase the voltage output is not permitted.

Do not operate unit if housing is damaged.

1.4 Declaration of Conformity

CE

SFC Smart Fuel Cell AG, Eugen-Saenger-Ring 4, 85649 Brunnthal-Nord declares that the EFOY Pro 600, EFOY Pro 1200 and the EFOY Pro 1600 conform to the European Community's 89/336/EWG guidelines for electro-magnetic 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.

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 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.

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

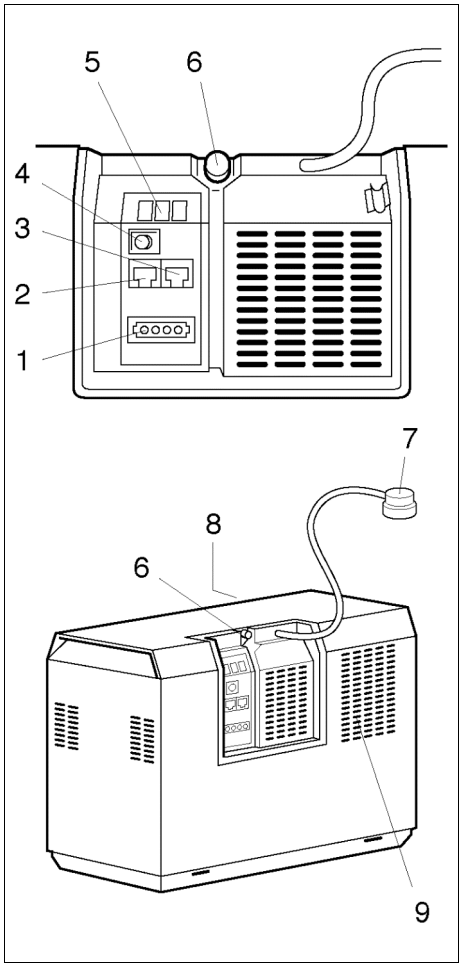
Old units are still valuable! Proper disposal can yield valuable raw materials while protecting the environment. Your supplier can advise you about returning old units.

2.1 Standard Equipment

The following is included in the standard delivery package:

- EFOY Pro fuel cell
- Remote control with data line
- Fuel cartridge holder with belt
- Mounting plate for EFOY Pro
- Exhaust hose
- Charge line
- Service Fluid
- User manual

2.2 System Overview



1 Charge line connection
2 Remote-control connection
3 Data interface
4 Push button
5 LEDs
6 Connection for EH 1 exhaust hose and nozzle for service fluid
7 Fuel-cartridge connection
8 Cooling inlet (reverse)
9 Warm-air outlet and connection for off-heat duct

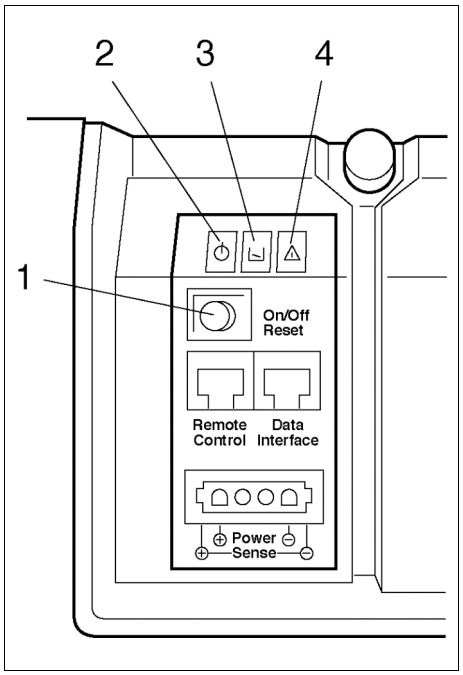
2.3 Specifications

Fuel cells	**EFOY Pro 600**	**EFOY Pro 1200**	**EFOY Pro 1600**
Max. charging power per day	600 Wh/day	1200 Wh/day	1560 Wh/day
Nominal power	25 W	50 W	65 W
Nominal voltage	12 V / 24 V	12 V / 24 V	12 V / 24 V
Nominal charging current (12 V / 24 V)	2.1 A / 1.05 A	4.2 A / 2.1 A	5.4 A / 2.7 A
Recommended battery capacity * (12 V)	10 to 100 Ah	20 to 200 Ah	25 to 250 Ah
(24 V)	5 to 50 Ah	10 to 100 Ah	12 to 120 Ah
Weight	7.8 kg (17.2 lbs)	8.2 kg (18.1 lbs)	8.4 kg (18.5 lbs)
Switching threshold for automatic battery charging (12 V / 24 V) **	On: <12.3 V / <24.6 V Off: >14.2 V / >28.4 V		
Required start-up voltage (12 V / 24 V)	>10.5 V / >21.0 V		
Noise level (at 1m / 7m)	39 / 23 dB(A)		
Nominal consumption ***	0.9 l/kWh		
Quiescent current draw	15 mA		
Operating temperature	-20 °C to +45 °C (-2°F to +113°F)		
Start-up temperature	+5 °C to +45 °C (41°F to 113°F)		
Storage temperature	+1 °C to +45 °C (34°F to 113°F)		
Recommended altitude	Up to 1500 m (4920 ft)		
Dimensions L x W x H	433 x 188 x 278 mm (17 x 8 x 11 in)		
Inclination along the roll axis	Permanent: max. 35°; temporary (<10 min): max. 45°		
Inclination along the lateral axis	Permanent: max. 20°		
User interface	At the unit or via Remote Control with text display		
Data interface	RJ-45 plug for accessories (e.g. Interface adapter)		
Electrical interface	MNL-plug 4-pins (e.g. Tyco Electronics Universal Mate-N-Lok – Nr. 350779)		

* Depends on battery type and application - bigger batteries possible, if charging current sufficient (e.g. solar battery)
** Factory Setting - can be modified with Interface Adapter and PC
*** Effective consumption depends on operating conditions

Fuel Cartridges	**M5**	**M10**	**M28** (requires M28 adapter)
Volume	5 l (1.32 gallons)	10 l (2.64 gallons)	28 l (7.4 gallons)
Weight	4.3 kg (9.5 lbs)	8.4 kg (18.5 lbs)	22 kg (48.5 lbs)
Nominal capacity	5.5 kWh	11.1 kWh	31.1 kWh
Dimensions L x W x H	190 x 145 x 283 mm	230 x 193 x 318 mm	420 x 280 x 360 mm

3.1 Integrated user interface



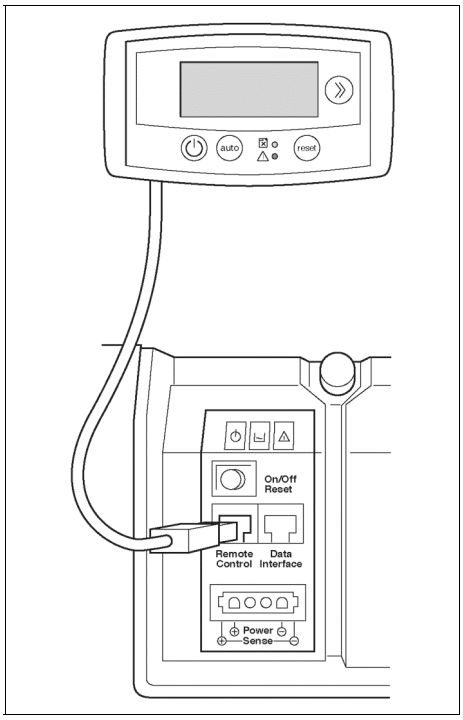
1 Push-button
2 Green LED
3 Yellow LED
4 Red LED

The LED's indicate the EFOY Pro system status. The push-button is used to control the unit.

Push-button action	Result	Starting state	Resulting state
Push shortly (‹ 0,5s)	Reset	On, Off or Automatic	Automatic
Push longer (› 3s)	Switch On / off	On or Automatic	Off
		Off	On

LED state	Green LED	Yellow LED	Red LED
On	Ready	Add service fluid	Error
Blinking	Shutting down	Fuel empty	Interruption
Off	Off or error	No error	No error

3.2 Remote Control



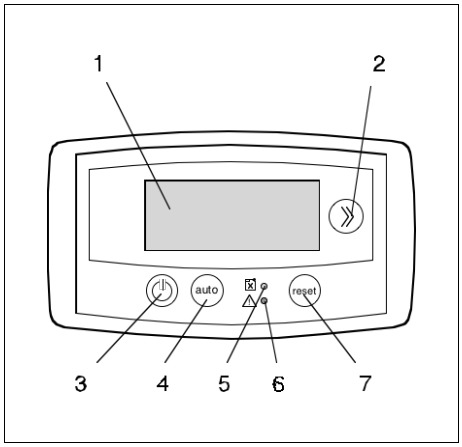
The optional remote control displays the current status and is used to control the EFOY Pro.

Remote control connection:

Connect the remote control with the included data line DL1.

Then insert the plug into the left socket on the EFOY Pro marked „Remote Control“.

If the included data line DL1 is not long enough, you can replace it with a commercially available network cable (Cat. 5 patch cable).



1 Display
2 Information button and language-selection button [>>]
3 On/Off button [⏻]
4 Button for automatic operation [auto]
5 Yellow warning light “Please change fuel cartridge“
6 Red error warning light
7 Reset button [reset]

Automatic
Please change fuel cartridge

The first line indicates the operating mode selected, such as “Automatic“.

The second line of the display provides information about normal operation, errors or malfunctions (see Chapter 5 Troubleshooting).

Press [>>] to obtain the following information.

Automatic
Voltage 13.6 V

- Battery voltage

Automatic
Current 4.6 A

- Charging current

  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.

Automatic
V03 9.06I12V/24V QB

- Firmware version

Automatic
100200-0808-0002

- Serial number

Automatic
Operating hours 500 h

- Total operating hours

Automatic
Standby

- Standard display

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

Automatic
Charging mode

- 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.

3.3 Select Language

- Press [>>] on the control panel for two seconds. The control panel will display the language currently selected.

Deutsch

- 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.

3.4 Remote Control with Computer

It is also possible to remote control the EFOY Pro with a computer. By using a modem this can also be done remotely. The computer interface enables the same functions as the remote control (see chapter 7).

3.5 Connecting the Fuel Cartridge

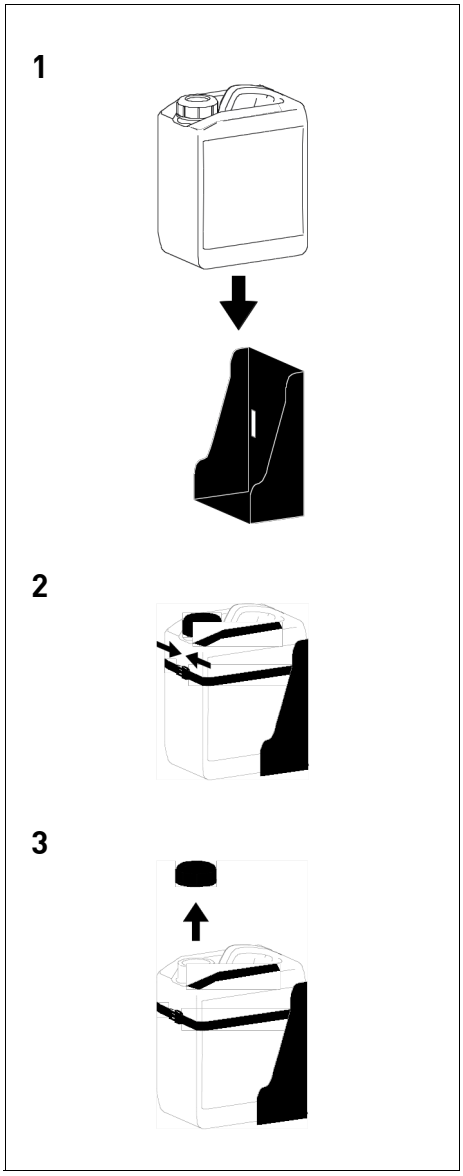
For safety's sake, use only original EFOY fuel cartridges. Do not smoke while changing the cartridge and avoid open flames! Do not expose fuel cartridges to temperatures above 45°C.

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 at the EFOY Pro and the remote control will blink. The cartridge may be changed while the system is running.

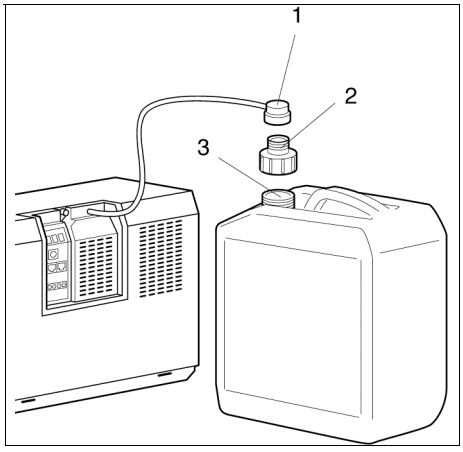
- Unscrew the empty fuel cartridge and remove.
- Close each cartridge tightly with the cap after use.
- EFOY fuel cartridges are intended for one-way use only. They may not be refilled.
- Sort empty fuel cartridges with plastics. Dispose of partly filled fuel cartridges in the same manner as solvents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



- Place a new sealed original-equipment EFOY fuel cartridge in the system (1).
- **Make sure the cartridge is fixed properly for mobile applications (2).**
- **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.

Notes:

- For mobile applications the fuel cartridge needs to be properly fixed with a fuel cartridge holder.
- The optional M28 adaptor is required to connect the M28 cartridge to the EFOY Pro.



Connect the M28 fuel cartridge

- Connect the EFOY Pro fuel cartridge connector (1) with the M28 adaptor (2).
- Screw the M28 adaptor (2) onto the M28 fuel cartridge (3).

3.6 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 6.6).

As soon as you connect the unit to the battery and after every reset the unit will start the automatic operation mode.

The unit monitors the battery voltage and starts charging as soon as the battery voltage drops bellow a defined threshold. It will stop charging as soon as the battery voltage exceeds the defined switch off threshold.

The thresholds for automatic charging can be modified with a computer – see Computer interface user manual.

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.

Automatic
Charging mode

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 Chapter 5).

3.7 Switching On manually

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 / 26.4 V.

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 switch-off point.

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

3.8 Switching Off manually

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 not charge the battery automatically if it is switched off. The unit needs to be switched on manually and can only start up if it is connected to an intact battery.

3.9 Automatic Antifreeze Feature

Off
Antifreeze mode

This unit features an intelligent antifreeze feature. If the temperature drops close to the freezing point then the EFOY Pro starts automatically the charging mode to prevent freezing. As soon as the unit has warmed up enough it stops the antifreeze mode. The antifreeze mode works also if the unit is switched off.

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.

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

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.

3.10 Storage

- Press ⏻ on the remote control to switch off the unit.

Off
Antifreeze mode

- 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 and remove the EFOY Pro from 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 3.9)
- 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.

4.1 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.

4.2 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 3.9).

5.1 Safety

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

Please contact our sales partner where you have bought the product if you are unable to fix a malfunction by using these instructions.

Manufacturer's address:

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

Phone: +49 89 673 5920
Fax: +49 89 673 592 369
Email: hotline@efoy.com
Web: www.efoy.com

5.2 Problems and Solution

At the EFOY Pro and at the remote control the red and yellow light indicate a system error. The remote control additionally shows a detailed error message..

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 connection or Check battery	Check remote control connection – proper socket on the EFOY Pro is marked „Remote Control“. Check battery voltage. If under 10.5 V, use an external battery charger to recharge.
Interruption: Please defrost device slowly (Error 40)	The unit is frozen. Let stand at room temperature for approx. 24 hours before operating.
Interruption: Surroundings too warm (Error 32, 41)	Ambient temperature is too high. The unit starts again as soon as it has cooled down.
Please contact service (Error 1, 10, 13, 14, 15, 17, 70, 73, 75, 76, 80)	System periphery error. Please contact the SFC partner where you have bought the product if the problem remains after a restart.
Please check exhaust hose (Error 11, 18)	Stack does not reach expected voltage. 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.
Please change fuel cartridge (Error 20, 22)	Insert a new fuel cartridge as described in Chapter 3.5. Check connection and screw cartridge on tightly. Check cartridge hose for kinks. Check hose and connection for dirt.

Message	Solution
Please check fuel cartridge connector (Error 72)	Check fuel cartridge connection and screw cartridge on tightly. Check cartridge hose for kinks. Check hose and connection for dirt.
Please refill service fluid (Error 30, 31)	Add service fluid (see Chapter 5.4). Check that exhaust can escape and that ambient temperature is below 45° C.
Please check battery voltage (Error 50, 51, 52, 53)	Error 50: Battery voltage is too low (sense line) Error 51: Battery voltage is too high (sense line) Error 52: Battery voltage is too low (power line) Error 53: Battery voltage is too high (power line) Check connections. Check whether the battery is the proper type. Check battery voltage. If too low, use an external battery charger to recharge. Check other charging devices such as generators or regulators for defects.
Automatic restart	Unit is restarting automatically - please wait.

5.3 Problems without Error Messages

Please check the following if the device doesn't respond and nothing is displayed on the remote control.

If problem recurs: please contact the SFC partner where you have bought the product.

Cause	Solution
Remote control has no or wrong connection	Check remote control connection
No battery connected, wrong battery or undercharged.	Check contacts, polarity, cables and battery fuses. Connect a charged battery to start device.

5.4 Replacing Service Fluid

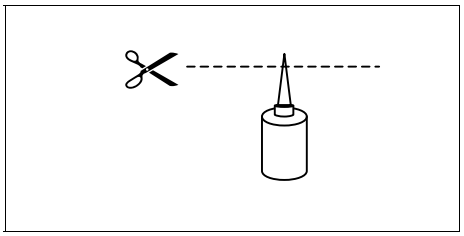
If service fluid is low the yellow light will turn on at the EFOY Pro and the message "Please refill service fluid" will appear at the control panel display.

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

Use EFOY brand service fluid only.

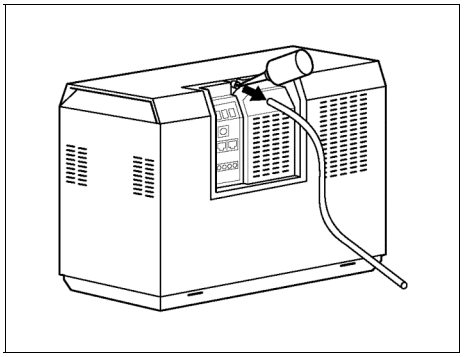
Switch off the unit before refilling fluid. Unplug the charge line.

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.
- Order a spare bottle service fluid at your local dealer.

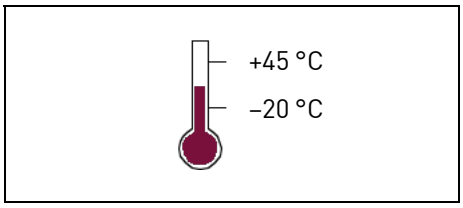
6.1 Installation Space Requirements

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

Do not operate unit if there is danger of explosion.

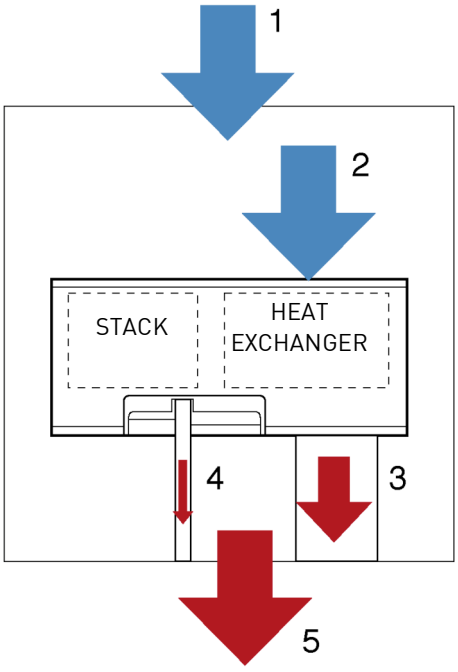
Unit is not watertight. Make sure that no water can enter.

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



Make sure when choosing an installation space, that the temperature ranges between –20° C and +45 °C.

The unit requires air from the outside and generates off-heat that needs to be conducted to the outside. Please take this into account when considering possible locations.



1 Air intake for installation space

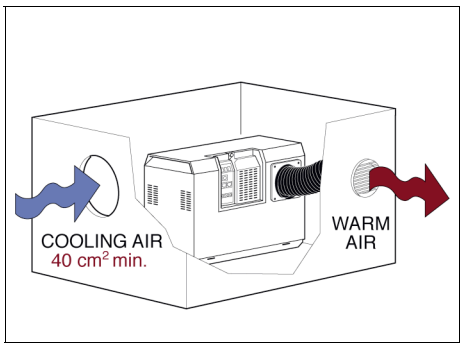
2 Air intake for heat exchange and for stack

3 Off-heat from heat exchanger (see chapter 6.3)

4 Exhaust from stack (see chapter 6.4)

5 Off-heat from installation space

6. Installation



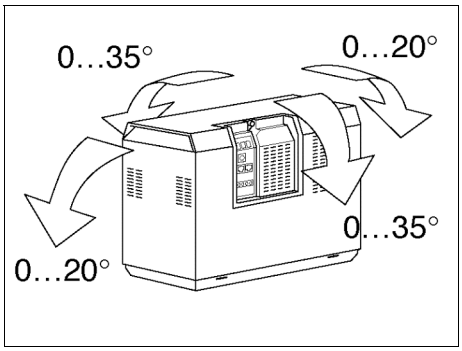
The installation space should have a minimum size of 510 x 350 x 300 mm (L x W x H).

In closed chambers please provide an opening with an opening cross section of at least 10 cm or 40 cm^2 for the air intake - at structured openings (fine grid, narrow gap) accordingly more.

Use the off-heat duct to conduct the off-heat out of the installation space.

The air openings of the installation space need to be protected against the penetration of water and particles.

A forced ventilation of the installation space is required to prevent heat accumulation. This can be done with additional openings or an additional temperature controlled ventilator.

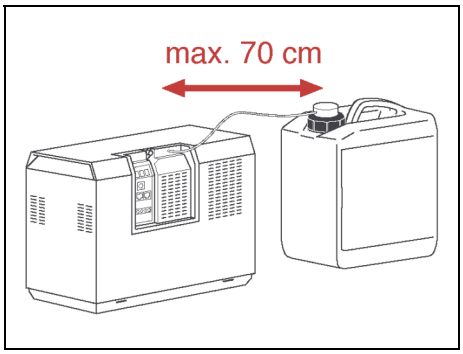


Install only in upright position.

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

Inclination along the direct axis: 35° (temporary 45°)
Inclination along the quadrature axis: 20° max.

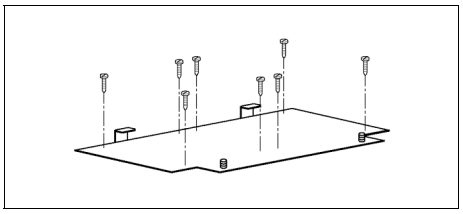
All electrical connections, the fill opening for service fluid and the fuel cartridge should be easily accessible.



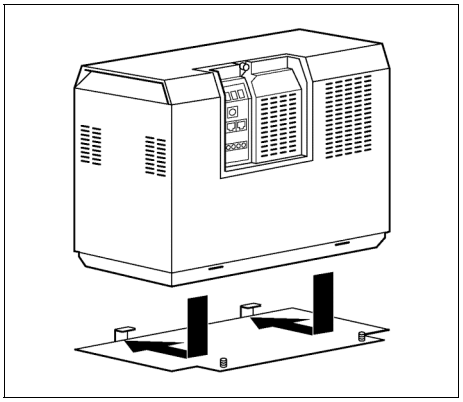
Make sure that the fuel cartridge is located within reach of the connecting hose (70 cm) and that the hose is neither kinked nor crushed.

6.2 Mounting of the Fuel Cell

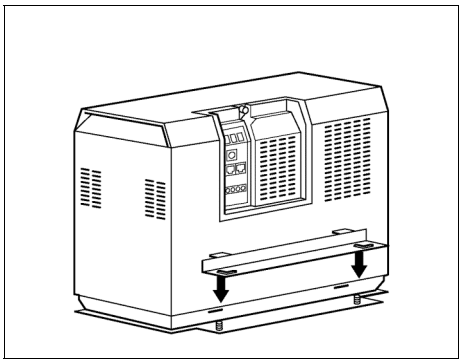
Select a suitable location as described in Chapter 6.1, paying attention to the dimensions in Chapter 2.3.



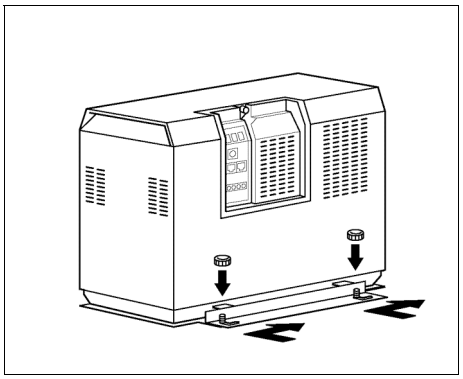
1. Secure the mounting plate tightly to the desired location. Use proper screws and dowels, if necessary, so that the mounting plate cannot shake loose in case of an accident.



2. Place the unit onto the mounting plate. It is possible to mount the unit in 2 possible directions.

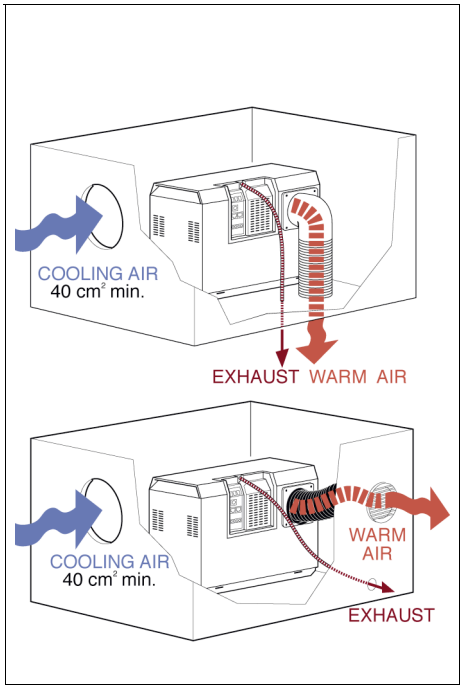


3. Put the mounting bar at the screws of the mounting plate.



4. Move the mounting bar to the fuel cell and then to the right hand side. Adjust the mounting bar in this position with the two mounting nuts.

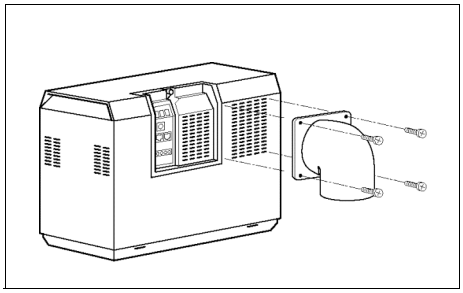
6.3 Connecting the Off-Heat Duct



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

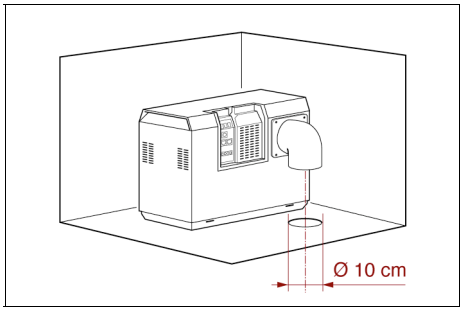
The off-heat of the heat exchanger needs to be conducted to the outside with a 100 mm duct. The cross section of the opening should be at least 35 cm² - at structured openings (fine grid, narrow gap) accordingly more.

The air intake side should not be guided by a duct to enable forced ventilation within the installation space.



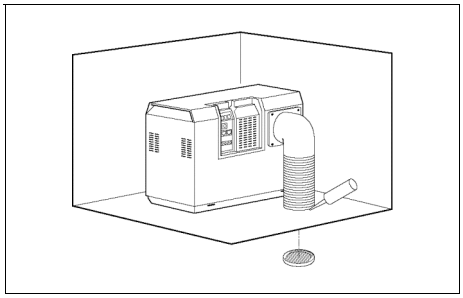
Sink the screws for the off-heat flange into the holes provided.

Use the bow to conduct warm air to the side. If you do not need the off-heat bow, you can connect the off-heat tube directly to the flange.



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

Make sure the off-heat tube has no kinks.



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.

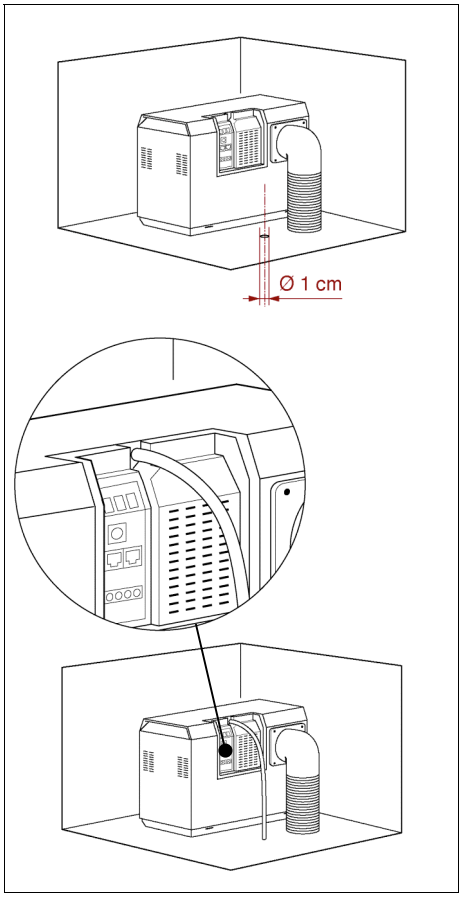
6.4 Connecting the Exhaust Hose

Within the fuel cell methanol and oxygen are converted into water and carbon dioxide. This chemical reaction generates off-heat which needs to be conducted together with water vapour and carbon dioxide to the outside.

Connect the included exhaust hose and conduct the exhaust to the outside.

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

It is possible to collect the generated water in a separate water cartridge. But make sure that there is a hose that allows the gasses including the carbon dioxide to evaporate from the water cartridge to the outside.

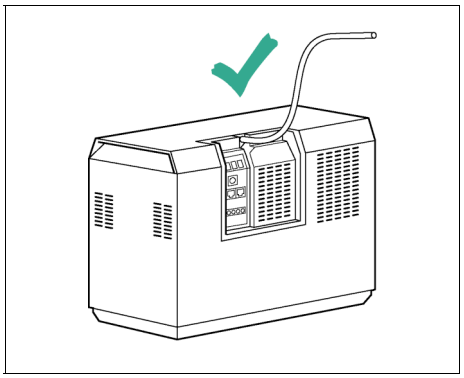


- Remove the cap from the exhaust port. Retain the cap for winter storage or for possible returns.
- Attach the exhaust hose (included) to the exhaust port.
- Route the hose to the exterior and use a suitable sealant to seal the opening. The hose may be shortened as needed. The opening must be10 mm in diameter.
- Make sure the exhaust hose has no kinks or blockage and that exhaust can escape freely.

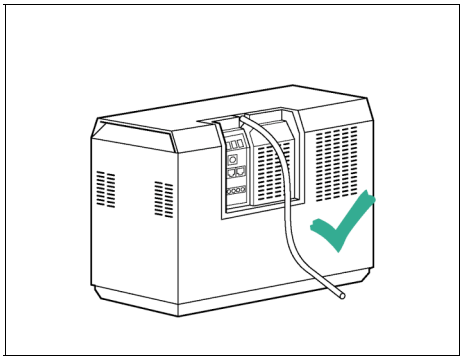
Routing the exhaust hose

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

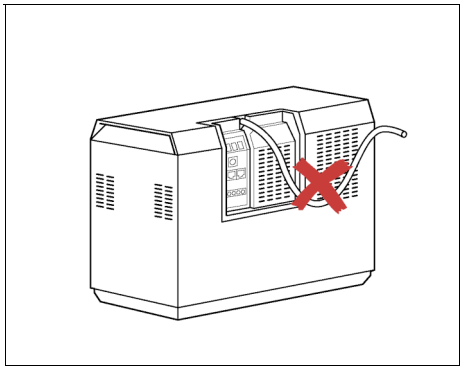
The exhaust hose may not be longer than 50 cm in order to prevent freezing in winter. The hose may be up to 150 cm long for summer operation and during transitional seasons.



Up



Down



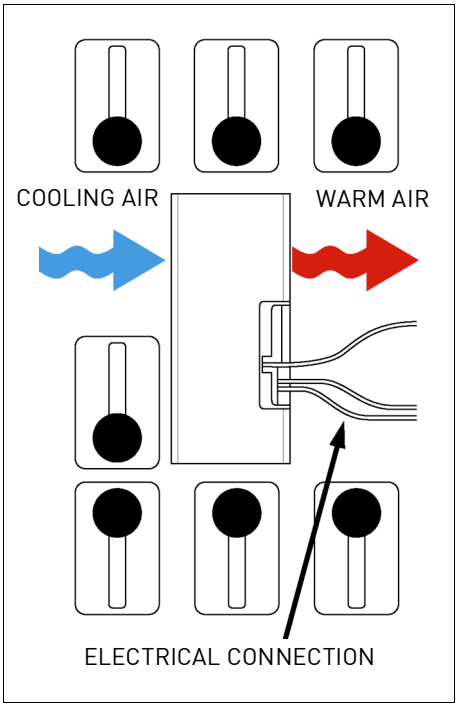
Avoid siphoning

6.5 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.

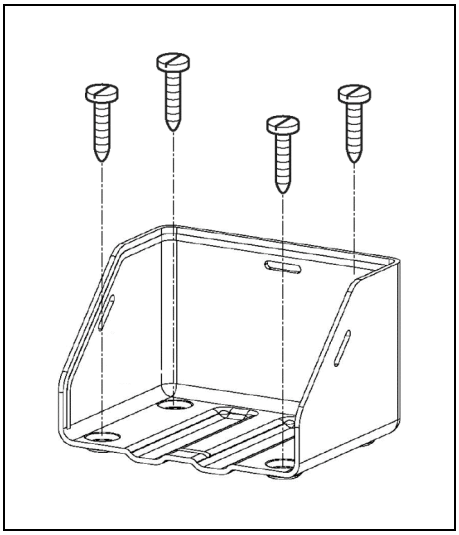
Make sure that the fuel-cartridge connecting hose is neither crushed nor kinked.



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

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

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



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.

6.6 Electrical Connection to the Battery

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.

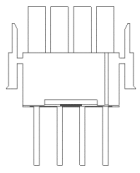
Use the wire harness (included) to connect the unit.

The circuit connecting the battery must contain a fuse.

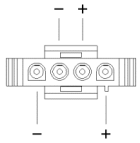
Check the polarity (see illustration) before connecting the unit.

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.



POWER LEAD



SENSE LEAD

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.

Sense 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:

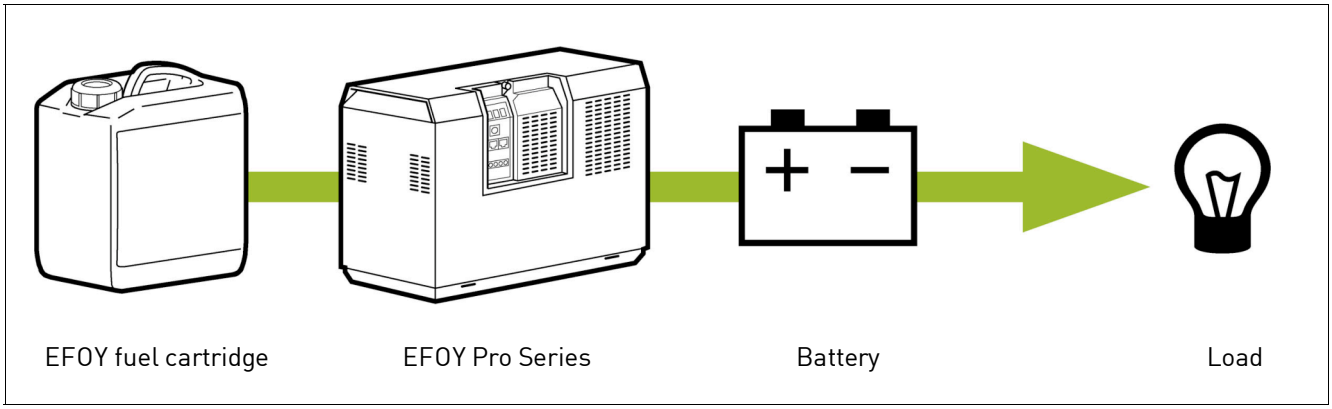
Length [m]	min. cross section
< 5 m	2,5 mm²
5 – 10 m	4 mm²
10 – 15 m	6 mm²

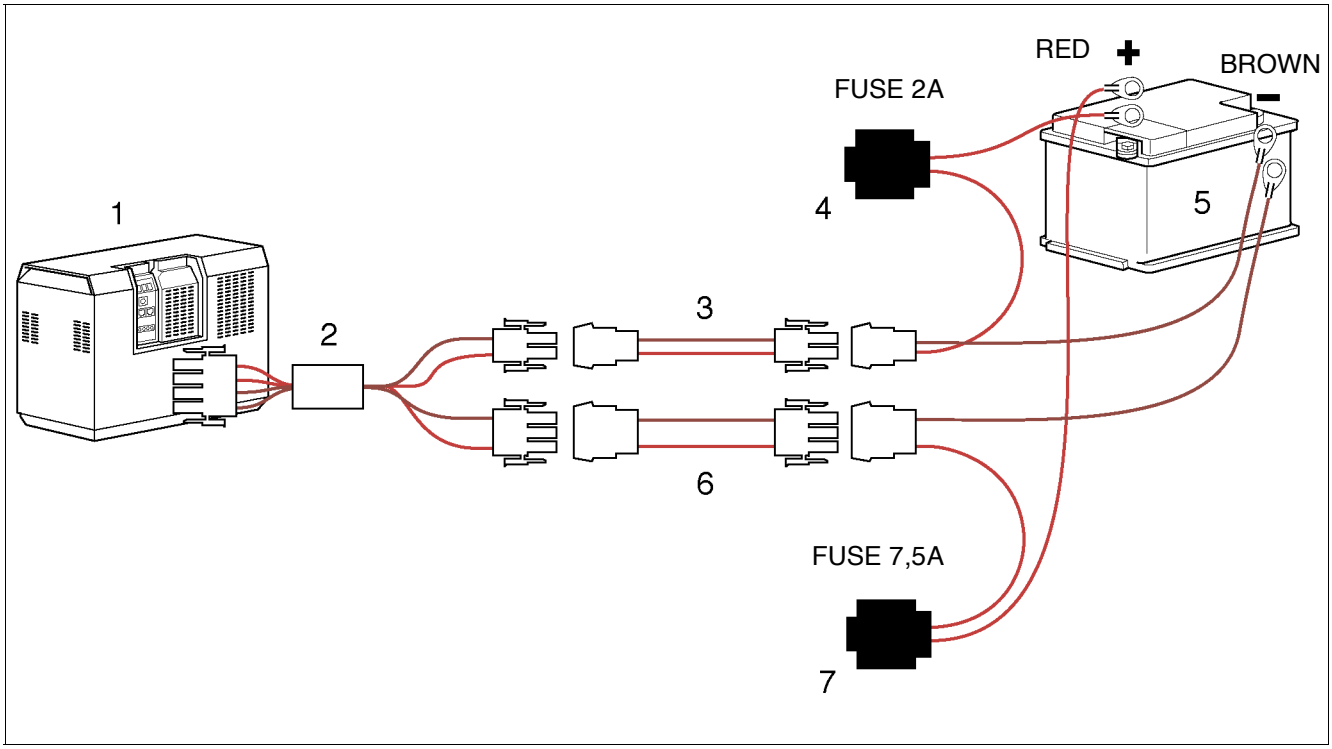
Accessories:
Extension sense line 8 m (Art. No. 151 906 005)
Extension Power line 8 m (Art. No. 151 906 006)

Notes:

- The EFOY Pro is charging the connected battery and the battery supplies the power for the application..
- **The EFOY Pro can only be used to charge lead batteries which conform to the technical specification (see chapter 2.3).**
- The EFOY Pro can charge 12 V and 24 V batteries and automatically detects the voltage of the connected battery.
- The charging parameters for the automatic mode can be adjusted with a standard PC – see user manual of computer interface adapter.
- To protect the battery against deep discharging it is recommended to install a low-voltage load disconnector that disconnects the load from the battery.

Connection diagram



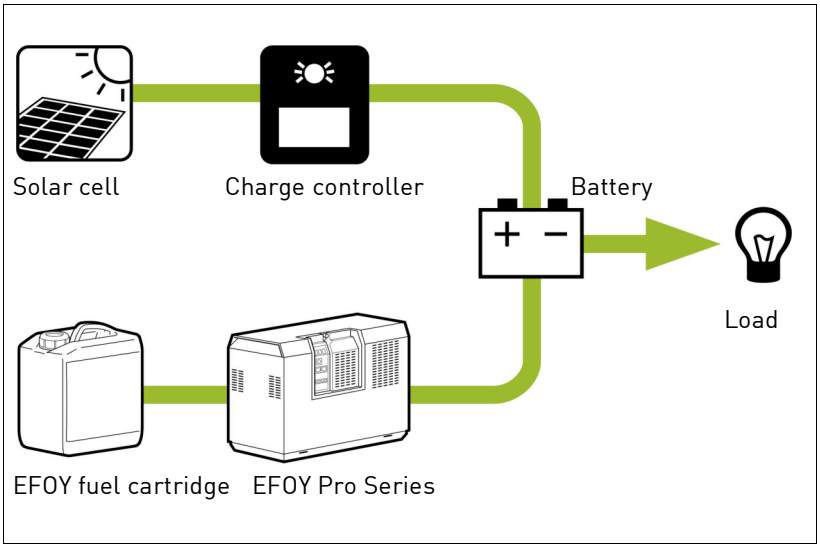


1 EFOY Pro Series
2 connecting line to fuel cell
3 extension sense line (optional)
4 battery fuse 2 A
5 battery
6 extension power line (optional)
7 battery fuse in power line 7,5 A

6.7 Combination with other energy sources

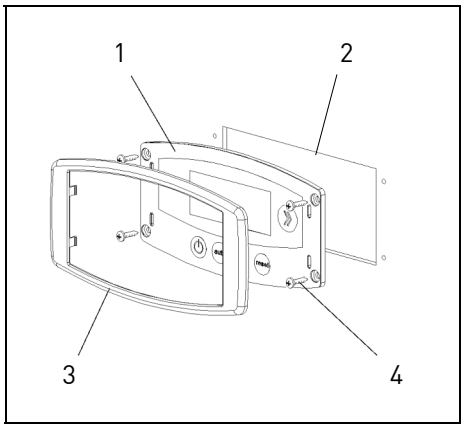
The EFOY Pro can be combined with other energy sources which then load the battery together.
A widely used combination is together with solar cells.
In this case it is recommended to adjust the charging parameter of the EFOY Pro so that it only switches on if solar alone can not provide enough energy (e.g. in winter times).

Connection diagram



6.8 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.



Flush mounting:
1 remote control
2 opening
3 frame
4 screws

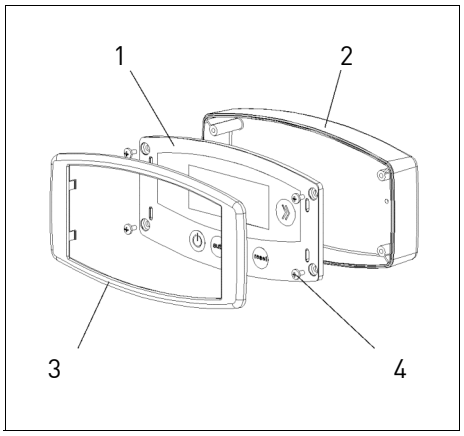
Flush mounting

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.

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.



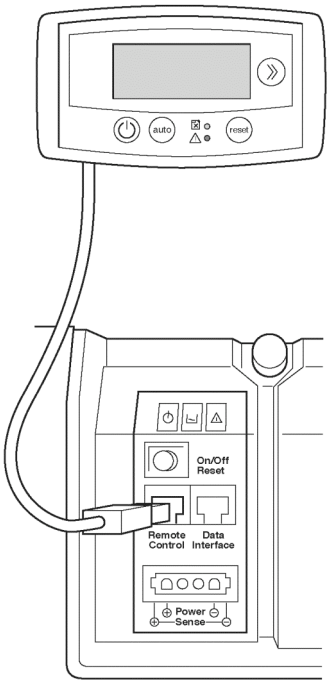
Surface mounting:
1 remote control
2 surface mount
3 frame
4 screws

Surface mounting

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.

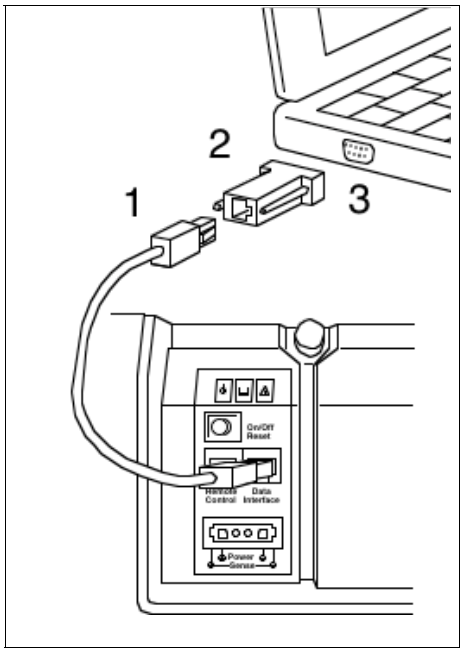


Connect the remote control with the DL data line (included).

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

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).

7.1 Data Interface Functionality



1 data line
2 interface adapter
3 PC (COM interface)

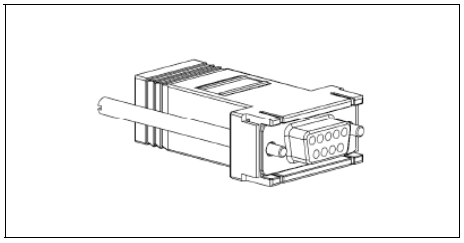
The EFOY Pro data interface enables the connection of:

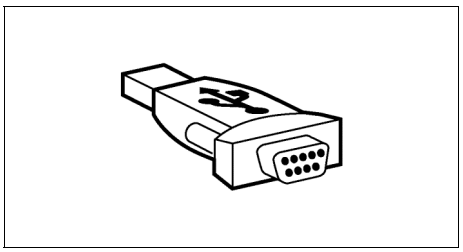
- Computer or Modem with the interface adapter IA1
- Fuel cartridge sensor FS1
- Cluster Controller CC1

Important: the data interface cannot be connected directly to a computer - the interface adapter is required for this.

Pin configuration of data interface:
Pin 1: Output (reserved)
Pin 2: RS232 RxD (Receive)
Pin 3: RS232 TxD (Transmit)
Pin 4: Ground
Pin 5: + Battery voltage
Pin 6: Input fuel cartridge sensor (FS1)
Pin 7: Input Remote-on contact (CC1)
Pin 8: Master/slave parallel operation control (CC1)

7.2 Computer Interface Adapter





With a computer it is possible to communicate with the EFOY Pro via a serial COM interface. By using a modem this can also be done remotely.

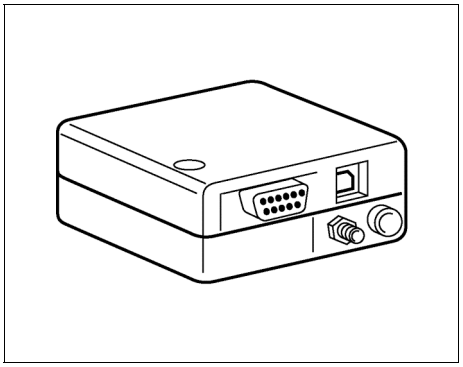
This enables to check the current system status, change parameter or remote control the EFOY Pro.

For a detailed description please see the computer interface adapter user manual.

The Interface Adapter IA1 is used to connect the EFOY Pro to a computer COM-interface.

The USB-Adapter is used to connect the interface adapter to a computer USB-interface, if no COM-interface is available.

7.3 GSM Modem GSM-2



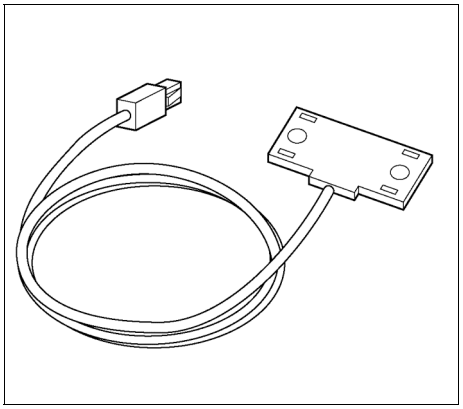
The optional GSM modem allows to control and configure the EFOY Pro remotely. It is recommended to use such a solution if the EFOY Pro is installed remotely.

Functions:

- Notification if errors occur
- Notification if fuel cartridge goes low (with optional fuel cartridge sensor FS1)
- Remote diagnostics
- Remote control
- Remote programming

For further details see GSM modem user manual,

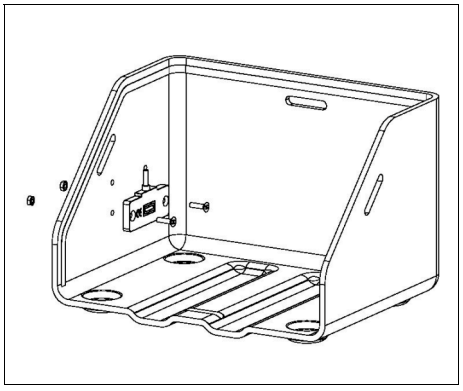
7.4 Fuel Level Sensor FS1



The EFOY Pro by default does not supervise the fuel cartridge level. The EFOY Pro will go in an error as soon as the fuel cartridge is empty.

The optional fuel cartridge sensor FS1 monitors the level of the fuel cartridge and indicates if the fuel level drops below the position where the fuel cartridge sensor is positioned at the fuel cartridge. This early warning gives the user time to change the cartridge before it is completely empty and the fuel cell stops.

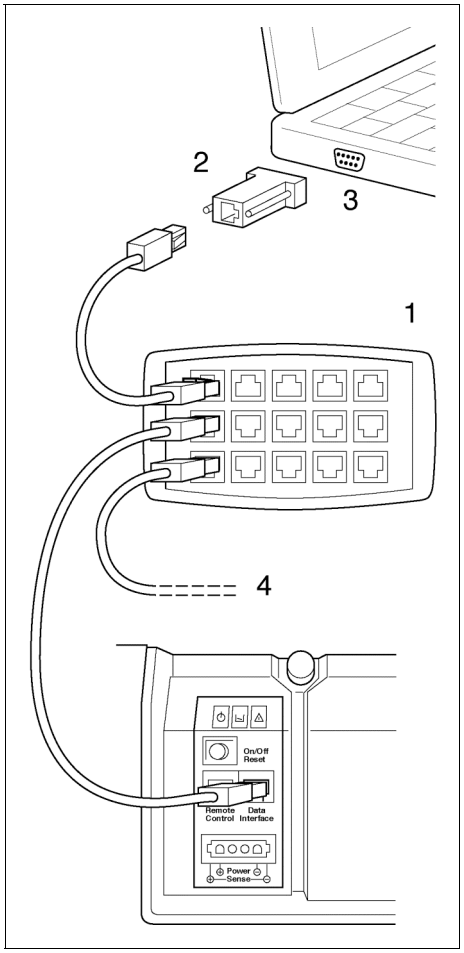
This sensor should be combined with a remote management system – e.g. the GSM modem GSM-2.



The FS1 is mounted with two screws at the fuel cartridge holder. There are two different levels available to mount the FS1.

The FS1 sensor is connected to the EFOY Pro data interface.

7.5 Cluster Controller CC1



1 cluster controller
2 interface adapter
3 computer connection
4 to fuel cartridge sensor

The cluster controller CC1 provides 3 functions:

- Interface splitter (provide 2 sockets)
- Parallel operation of up to 5 EFOY Pro's
- Remote control of one EFOY Pro (remote-on pin)

Interface splitter

The cluster controller splits the data interface and provides two sockets to connect the interface adapter IA1 and the fuel cartridge sensor FS1 together.

Parallel operation

It is possible to parallel up to 5 EFOY Pro's to provide a higher power output. The cluster controller C1 is used to synchronize the units so that they switch on and off together and act like one bigger fuel cell.

Units running in parallel must all be in the same operating mode.

For a detailed description please see the cluster controller user manual.

Automatic Charging mode	P

A "P" for "Parallel" will appear in the first line when the unit is operating in parallel.

Remote control (remote-on)

The EFOY Pro can be activated via a switching contact at the CC1, which means that the charging mode can be activated

The same function can be activated via the computer interface. .

Automatic Charging mode	R

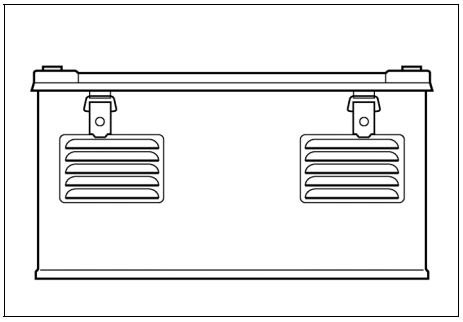
An “R” for “remote” will appear in the first line when the unit is operating in remote mode.

Automatic Charging mode	R🔒

You can lock or unlock the unit’s software from a remote location by pressing auto and >> simultaneously. This will deactivate the function and the unit cannot be started by a remote signal.

If you have locked the software, a padlock 🔒 will appear in the first line of the display.

7.6 EFOY ProCube



The EFOY ProCube is a modular plug&play solution for outdoor operation of the EFOY Pro.. The unit includes preinstalled electronics, air ventilation and all mounting materials. The integrated solar charge controller allows the easy combination with solar panels. .

The EFOY ProCube allows the installation of:

1x EFOY Pro (600, 1200, 1600)
1x Fuel cartridge (M5, M10 or M28)
1x Battery (40, 60, or 90 Ah)
1x Fuel cartridge sensor FS1
1x GSM modem GSM-2

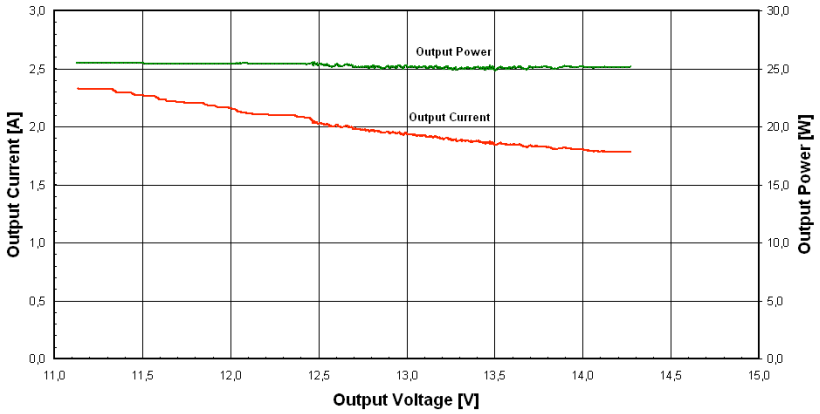
Use only original equipment! Use of unauthorized parts compromise safety and void the warranty.

Category	Description	Item number
Fuel cartridges	Fuel cartridge M5 (2 pieces)	150 905 006
	Fuel cartridge M10	150 905 008
	Fuel cartridge M28	150 905 040
Accessories	M28 adapter	151 905 012
	Fuel level sensor FS1	151 905 006
	Cluster Controller CC1	151 076 058
	Interface adapter IA1	151 075 001
	USB adapter	151 906 018
	GSM modem GSM-2	151 906 019
	EFOY ProCube	153 002 001
Spare parts	Mounting plate EFOY Pro	151 908 012
	Fuel-cartridge holder with belt FH1	150 905 002
	Belt for fuel-cartridge holder	150 905 007
	Remote control with surface mount and data line	151 077 029
	Frame for remote control	151 077 007
	Surface mount for remote control	151 077 006
	Data line DL1 (5 m)	151 075 003
	Exhaust hose EH1 (1.5 m)	150 904 004
	Service fluid	151 903 001
	Charge line CL1 (Set incl. connecting line, battery fuse lines sense and power)	151 906 009
	Connecting line to fuel cell	151 906 004
	Battery fuse in sense line (2 A) – BF1	151 906 007
	Battery fuse in power line (7,5 A) – BF2	151 906 008
	Extension sense line 8 m	151 906 005

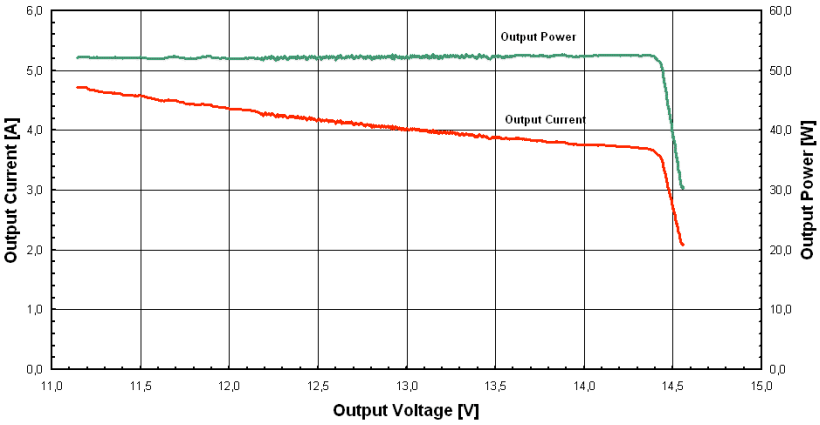
Category	Description	Item number
	Extension power line 8 m	151 906 006
	Off-heat duct EFOY Pro (set incl. flange, bow, tube, face plate and screws)	151 903 021
	Off-heat flange EFOY Pro	151 903 020
	Off-heat bow	151 903 014
	External face plate (heat duct)	151 903 013
	Off-heat tube	151 904 001
	Screw for fastening off heat flange (4 pcs.)	000 992 629
	Packaging EFOY Pro	151 902 015
	User manual EFOY Pro	151 901 070

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

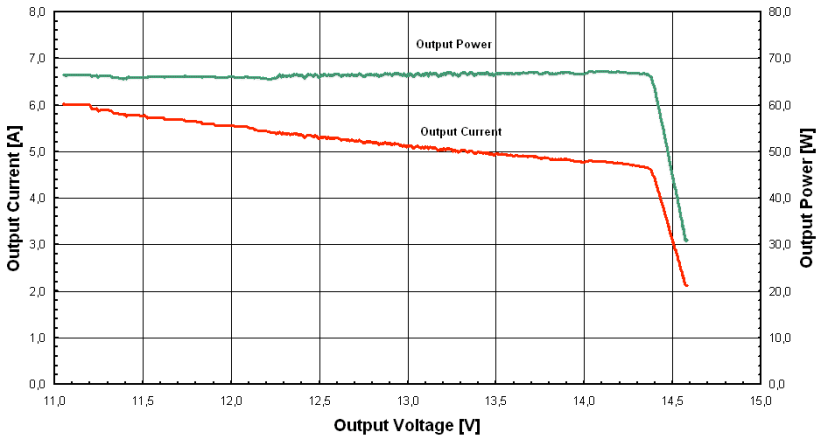
EFOY 600: U-I- and U-P- Characteristic



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



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



10. Material Safety Data Sheet Methanol

We deliver methanol in the form of secure and certified fuel cartridges that protect you in normal operation from direct contact with methanol..

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.

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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.

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- Ingredients with limit values that require monitoring at the workplace:

67-56-1 methanol

AGW (Germany)	270 mg/m³, 200 ppm 4(II);DFG, EU, H, Y
IOELV (European Union)	260 mg/m³, 200 ppm Skin
WEL (Great Britain)	Short-term value: 333 mg/m³, 250 ppm Long-term value: 266 mg/m³, 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 trough 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

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- **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

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- ***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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