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2.1 Foreword

Thank you for purchasing an EFOY Pro 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 Energy AG
Eugen-Sänger-Ring 7
D-85649 Brunnthal-Nord

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

2.2 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 5.10)



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.

WARNING

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

2.3 Safety notice for methanol cartridges

WARNING

You are given the methanol in the form of safe, tested fuel cartridges that protect you from coming into direct contact with the contents if used correctly. We are required by law to print the following notice.

Methanol is easily flammable. Methanol is toxic 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 the methanol material safety data sheet to the consultation.

Storage and transport of methanol may be subject to statutory regulations.

More information is provided in the methanol safety data sheet on our website www.efoy.com or by SFC directly.

2.4 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 0.

The unit can be used according the specification in Chapter 0 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.

2.5 Declaration of Conformity



SFC Energy AG, Eugen-Saenger-Ring 7, 85649 Brunnthal-Nord declares that the EFOY Pro 600, EFOY Pro 1600, EFOY Pro 2200 and the EFOY Pro 2200 XT conform to the European Community's 2004/108/EG guidelines for electro-magnetic compatibility. The following norms apply: DIN EN 61000-6-1, DIN EN 61000-6-3

2.6 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.

2.7 Warranty

The warranty period begins when the new unit is purchased. Your proof of purchase can be used as a record of this date. Please keep these documents carefully. Our warranty services are based on the SFC warranty conditions which are valid at the time of purchase.

Service

For technical queries on EFOY Pro fuel cells, our EFOY customer service can be reached during office hours at the following numbers:

Freecall (Germany): 00800 / 73 27 62 78*

From any other country, please dial:
+49 89 / 673 5920

SFC Energy AG
Eugen-Sänger-Ring 7
85649 Brunnthal-Nord
Germany
Fax.: +49 89 / 673 592 369
Sales@sfc.com
www.sfc.com

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

2.8 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.

WARNING

Danger of Suffocation!

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

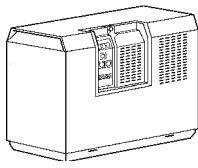
Fuel Cartridges

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.

3.1 Standard Equipment



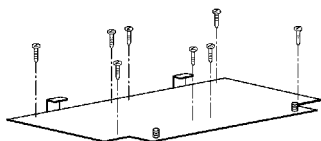
Unit



*Remote control with data line
RC1*



*Fuel-cartridge holder with
belt FH1*



Mounting plate



Exhaust hose EH1



Off-heat duct OD1



Service Fluid

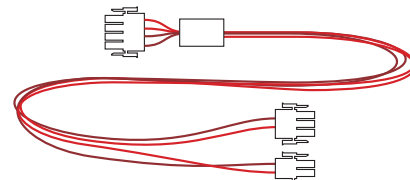
The following is included in the standard delivery package:

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

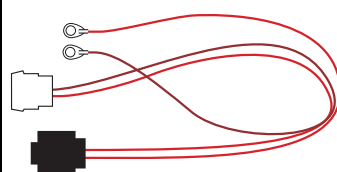
A basic-set is also available on demand:

- EFOY Pro fuel cell
- Service Fluid
- User manual

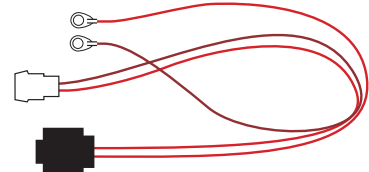
Charge line CL4:



Connecting line to fuel-cell 1m

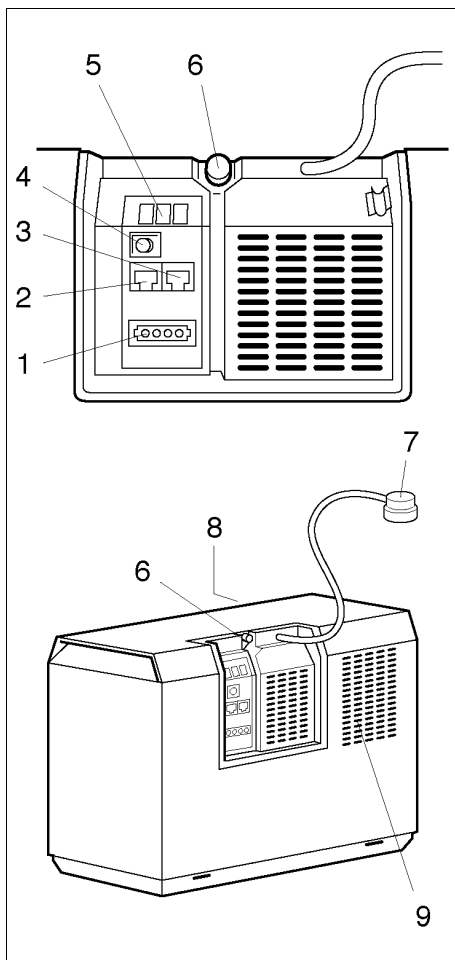


*Battery fuse power 15 A
Length 0,5m*



*Battery fuse sense 2.0 A
Length 0,5m*

3.2 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

3.3 Specifications

Fuel Cells	EFOY Pro 600	EFOY Pro 1600	EFOY Pro 2200	EFOY Pro 2200 XT
Max. charging power per day	600 Wh/day	1560 Wh/day	2160 Wh/day	2160 Wh/day
Nominal power	25 W	65 W	90 W	90 W
Nominal voltage	12 V / 24 V	12 V / 24 V	12 V / 24 V	12 V / 24 V
Nominal charging current at 12 V/24 V	2.1 A / 1.05 A	5.4 A / 2.7 A	7.5 A / 3.75 A	7.5 A / 3.75 A
Recommended battery capacity*	at 12 V 10 to 100 Ah at 24 V 5 to 50 Ah	40 to 250 Ah 20 to 120 Ah	60 to 350 Ah 30 to 175 Ah	60 to 350 Ah 30 to 175 Ah
Weight	6.8 kg (15 lbs)	8.3 kg (18.3 lbs)	8.6 kg (19 lbs)	8.95 kg (19.7 lbs)
Switching threshold for automatic battery charging at 12 V / 24 V **	On: <12.3 V / <24.6 V Off: >14.2V / >28.4 V			
Required start-up voltage at 12 V / 24 V	>9 V / >18,5.0 V			
Noise level (at 1m / 7m distance)	39 / 23 dB(A)			
Nominal consumption***	0.9 l/kWh (0.2 imp gal/kWh)			
Quiescent current draw	15 mA			
Operating temperature	-20 °C to +45 °C (-4°F to +113°F)			
Start-up temperature	+5 °C to +45 °C (41°F to 113°F)			
Storing temperature	+1 °C to +45 °C (34°F to 113°F)			
Recommended altitude	Up to 1500 m (4920 ft)			
Dimensions L x W x D	433 x 188 x 278 mm (17.0 x 7.4 x 11.0 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 (1.1 imp gal)	10 l (2.2 gal)	28 l (6.2 imp gal)
Weight	4.3 kg (9.5 lbs)	8.4 kg (18.5 lbs)	22.0 kg (48.5 lbs)
Nominal capacity	5.5 kWh	11.1 kWh	31.1 kWh
Dimensions L x W x H	19.0 x 14.5 x 28.3 cm 7.5 x 5.7 x 11.1 in	23.0 x 19.3 x 31.8 cm 9.0 x 7.6 x 12.5 in	42.0 x 28.0 x 36.0 cm 16.5 x 11.0 x 14.2 in

4.1 Installation Space Requirements

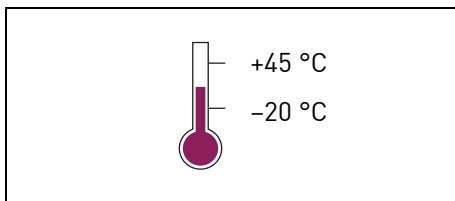
WARNING

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

Do not operate unit if there is danger of explosion.

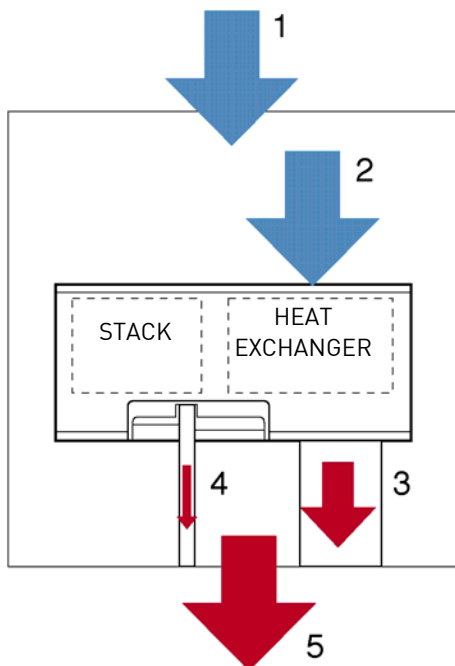
Unit is not watertight. Make sure that no water can enter.

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



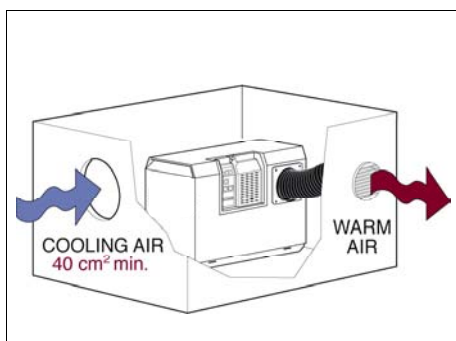
Make sure when choosing an installation space, that the temperature ranges between -20 °C and +45 °C.

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 4.3, page 17)
- 4 Exhaust from stack
(see chapter 4.4, page 18)
- 5 Off-heat from installation space

4. Installation



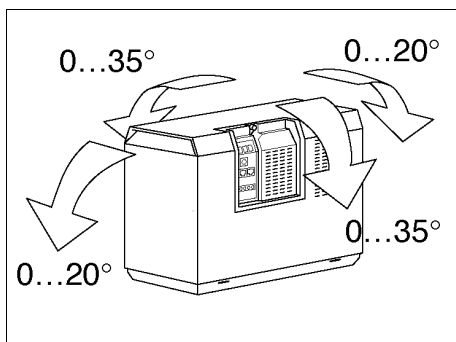
The installation space should have a minimum size of 510 x 350 x 300 mm (L x W x H).

In closed chambers please provide an opening with an opening cross section of at least 10 cm 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.



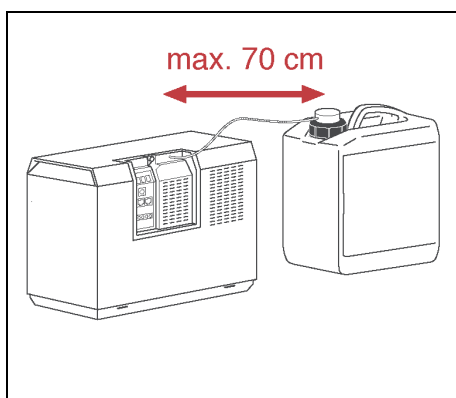
Install only in upright position.

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.



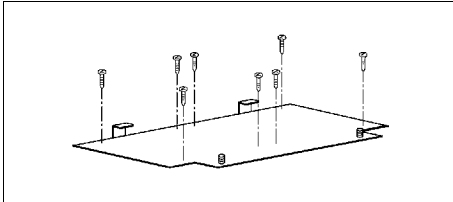
Make sure that the fuel cartridge is located within reach of the connecting hose (70 cm) and that the hose is neither kinked nor crushed.

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

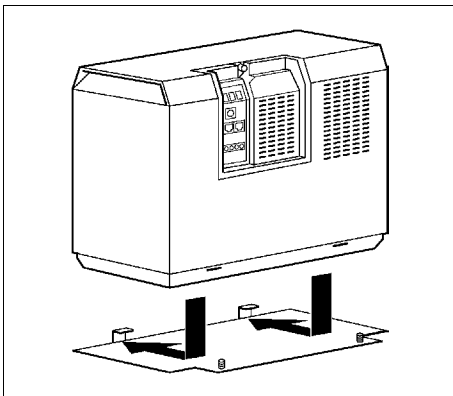
Use only original-equipment EFOY hoses.

4.2 Mounting of the Fuel Cell

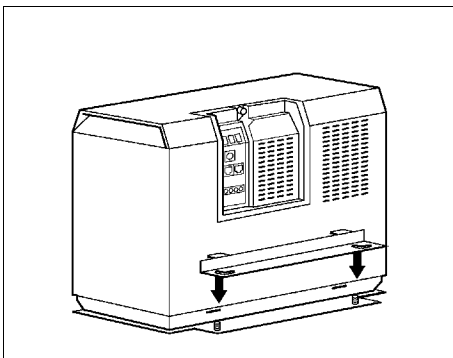
Select a suitable location as described in Chapter 4.1, paying attention to the dimensions in Chapter 3.3, page 13.



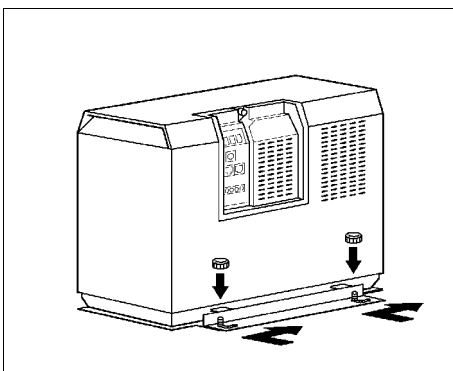
1. Secure the mounting plate tightly to the desired location. Use proper screws and dowels, if necessary, so that the mounting plate cannot shake loose in case of an accident.



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

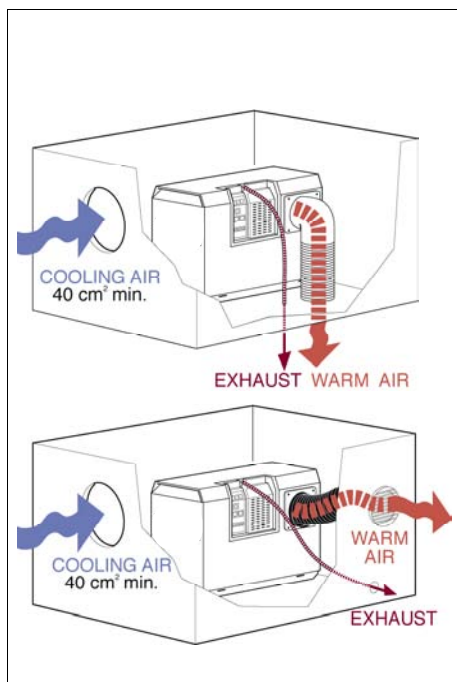


3. Put the mounting bar at the screws of the mounting plate.



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.

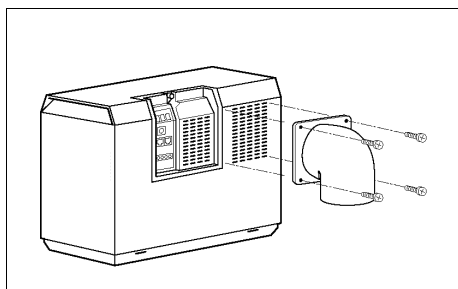
4.3 Connecting the Off-Heat Duct



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

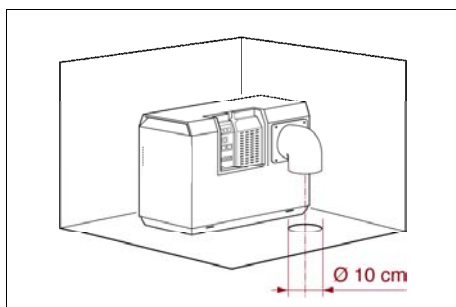
The off-heat of the heat exchanger needs to be conducted to the outside with a 10 cm duct. The diameter of the opening should be at least 10 cm - at structured openings (fine grid, narrow gap) accordingly more.

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



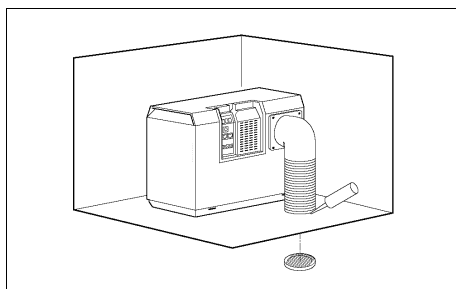
Sink the screws for the off-heat flange into the holes provided.

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.

4.4 Connecting the Exhaust Hose

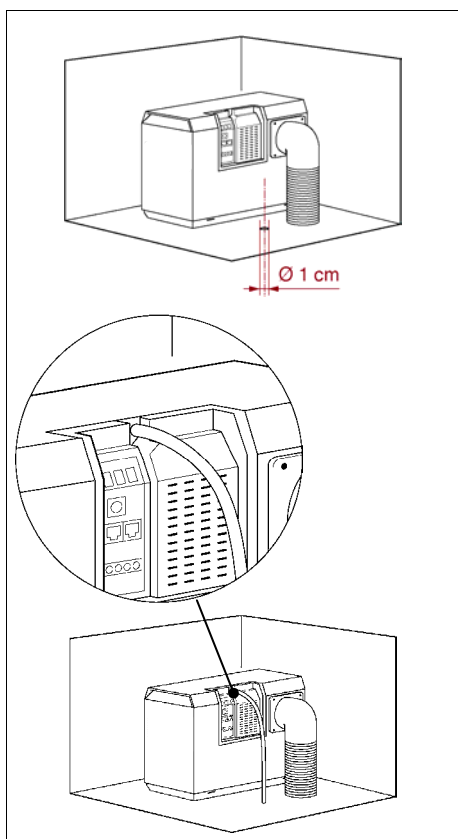
Within the fuel cell methanol and oxygen are converted into water and carbon dioxide. This chemical reaction generates off-heat which needs to be conducted together with water vapour and carbon dioxide to the outside.

WARNING

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.**

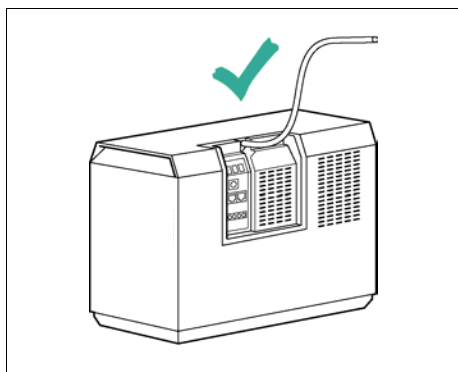


- Remove the cap from the exhaust port. Retain the cap for winter storage or for possible returns.
- Attach the exhaust hose (included) to the exhaust port.
- Route the hose to the exterior and use a suitable sealant to seal the opening. The hose may be shortened as needed. The opening must be 10 mm in diameter.
- Make sure the exhaust hose has no kinks or blockage and that exhaust can escape freely.
- The exhaust hose should be as short as possible. The part of the hose at the outside should not be longer than 5 cm. Cut diagonally the end of the hose to avoid the emergence of drops.

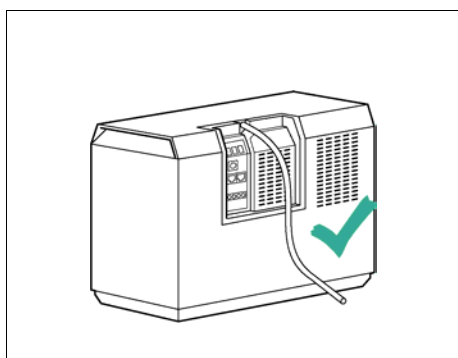
Routing the exhaust hose

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

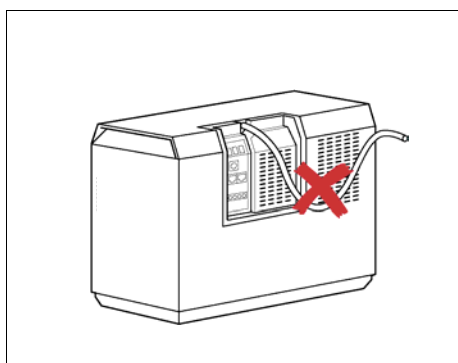
The exhaust hose may not be longer than 50 cm in order to prevent freezing in winter. The hose may be up to 150 cm long for summer operation and during transitional seasons.



Up



Down



Avoid siphoning

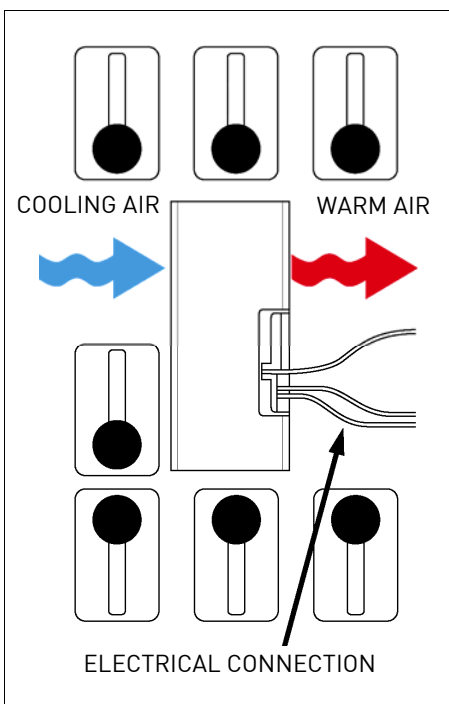
4.5 Installing the Fuel Cartridge Holder

WARNING

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.

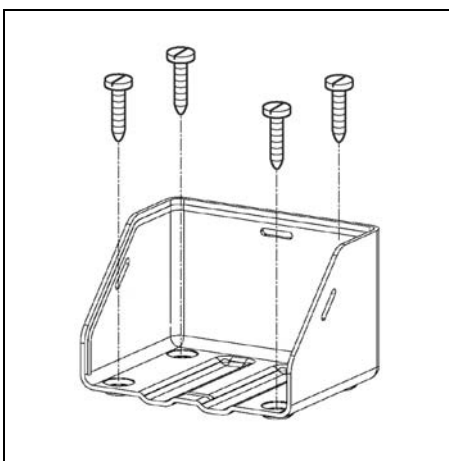
Make sure that the fuel-cartridge connecting hose is neither crushed nor kinked.



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.

4.6 Electrical Connection to the Battery

WARNING

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.

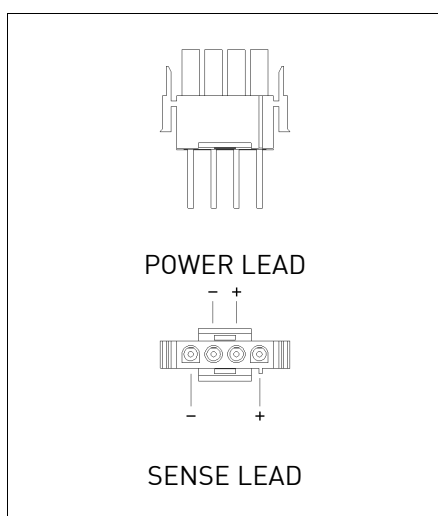
Use the wire harness (included) to connect the unit.

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.



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 mm ²
5 – 10 m	4.0 mm ²
10 – 15 m	6.0 mm ²

Accessories:

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

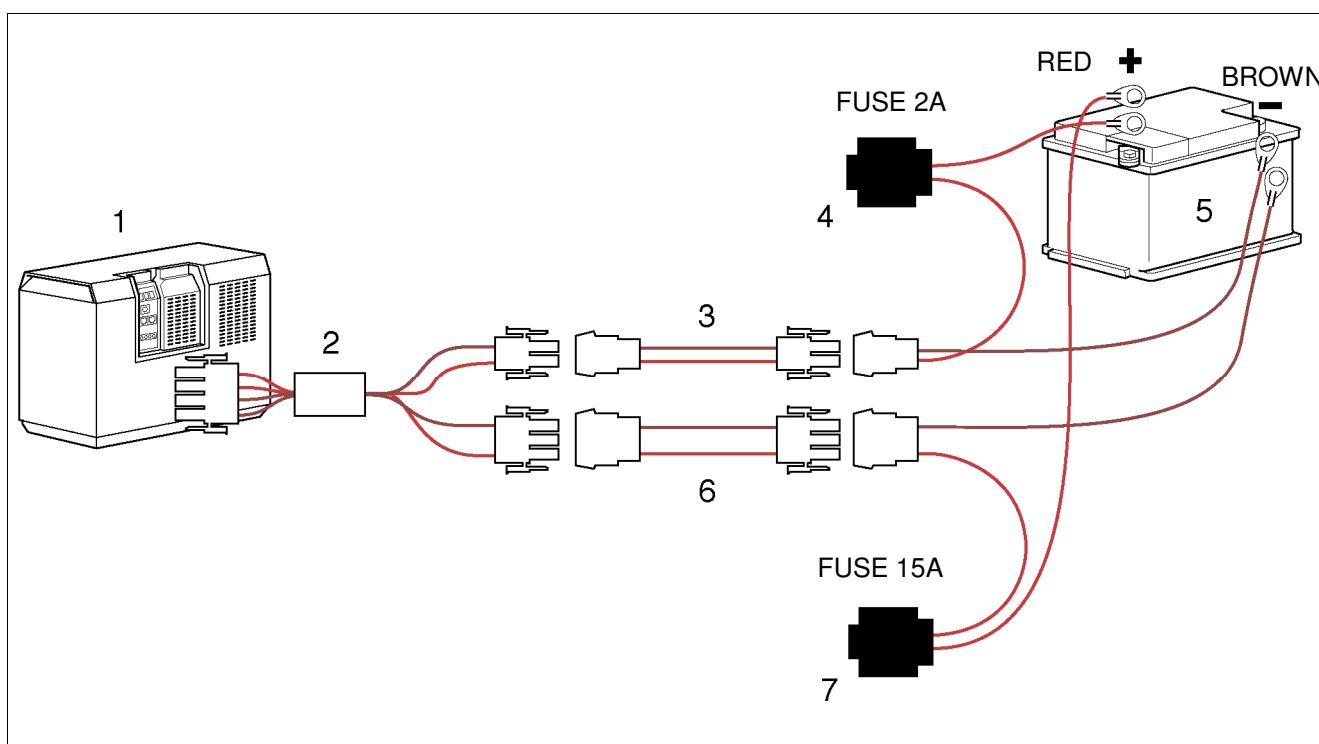
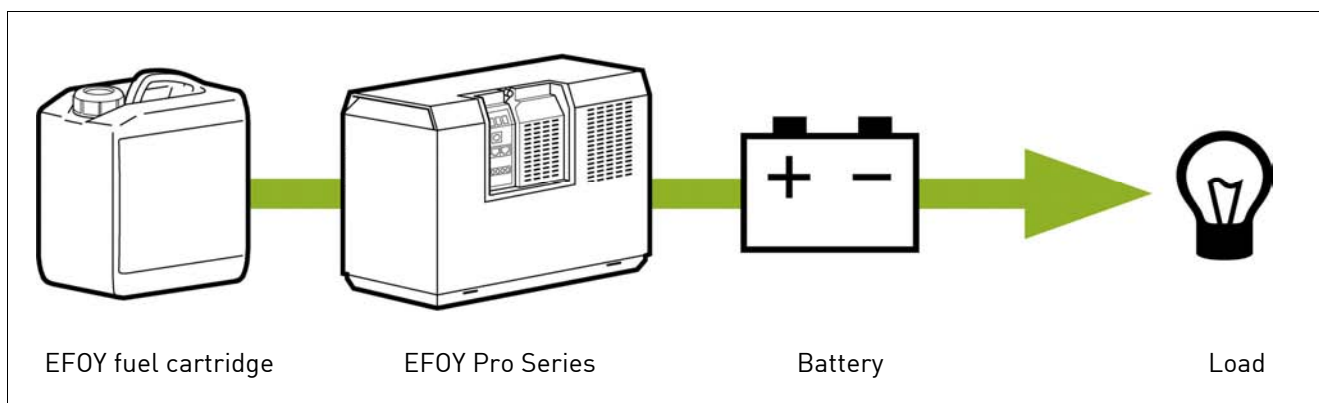
Extension Power line 8 m (Art. No. 151 906 006)

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 3.3, page 13).**
- 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 disconnecter that disconnects the load from the battery.

4. Installation

Connection diagram

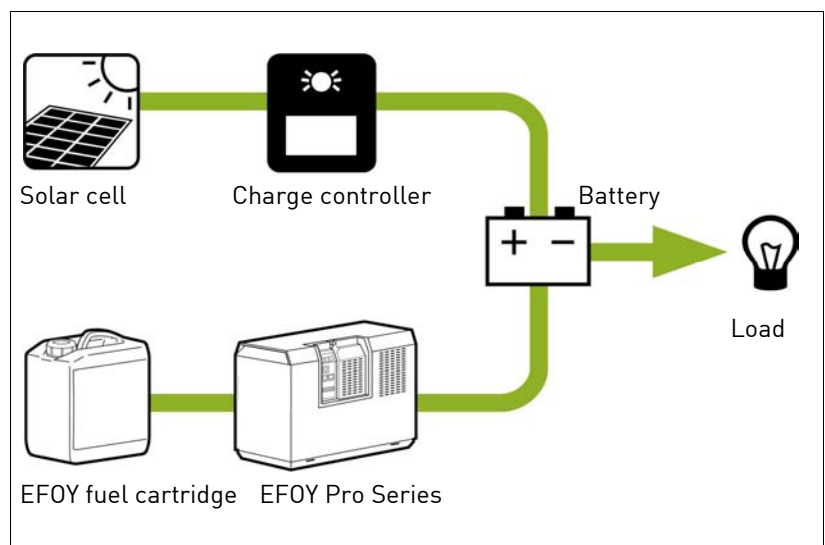


- 1 EFOY Pro Series
- 2 connecting line to fuel cell
- 3 extension sense line (optional)
- 4 battery fuse 2 A
- 5 battery
- 6 extension power line (optional)
- 7 battery fuse in power line 15 A

4.7 Combination with other energy sources

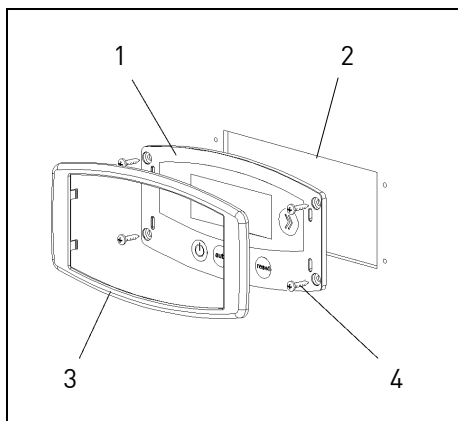
The EFOY Pro can be combined with other energy sources which then load the battery together. A widely used combination is together with solar cells. **In this case it is recommended to adjust the charging parameter of the EFOY Pro so that it only switches on if solar alone can not provide enough energy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

Connection diagram



4.8 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

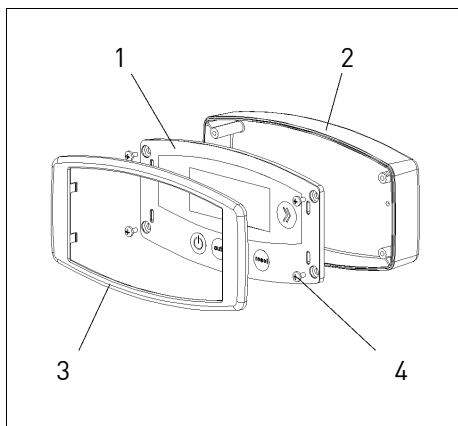
Flush mounting

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 2 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

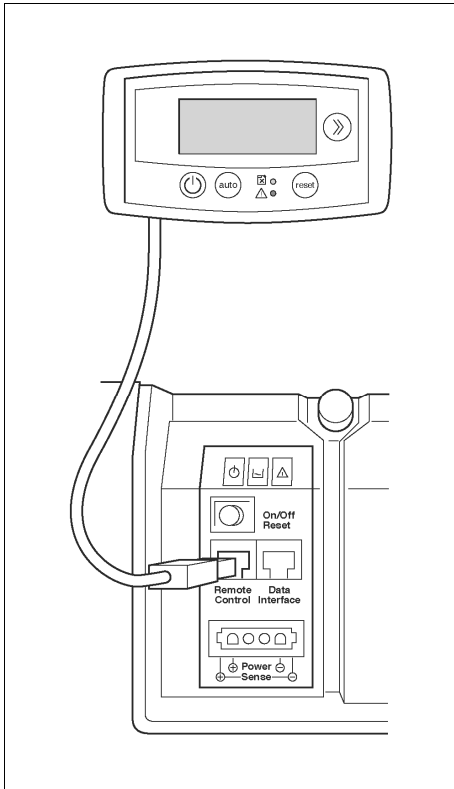
Surface mounting

Secure the surface mount with two screws.

Connect the remote control with the DL 2 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

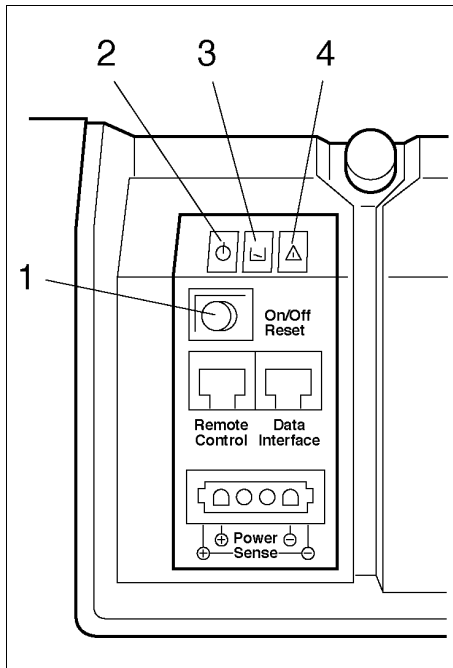


Connect the remote control with the DL 2 data line (included).

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

If the DL 2 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).

5.1 Integrated user interface



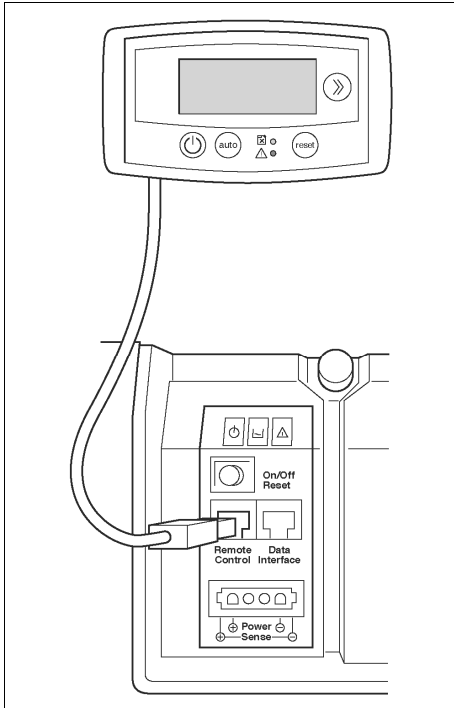
- 1 Push-button
- 2 Green LED
- 3 Yellow LED
- 4 Red LED

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

5.2 Remote Control



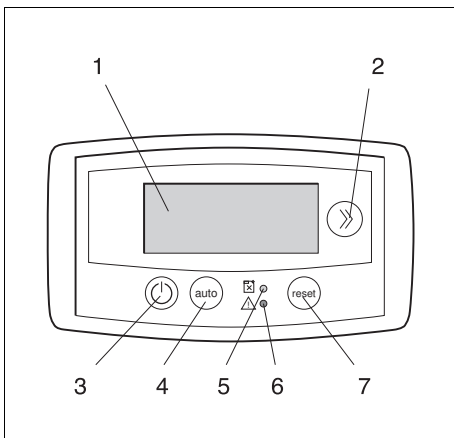
The optional remote control displays the current status and is used to control the EFOY Pro.

Remote control connection:

Connect the remote control with the included data line DL2.

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

If the included data line DL2 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
- 5 Yellow warning light "Please change fuel cartridge"
- 6 Red error warning light
- 7 Reset button

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 7 Troubleshooting).

Press **>>** to obtain the following information.

Automatic
Voltage 13.6 V

- Battery voltage

5. Operation

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

Please check on a regular basis (at least once a year), if software updates are available.

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.

5.3 Select Language

Deutsch

- Press  on the control panel for two 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.

5.4 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 8).

5.5 Connecting the Fuel Cartridge

WARNING

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.

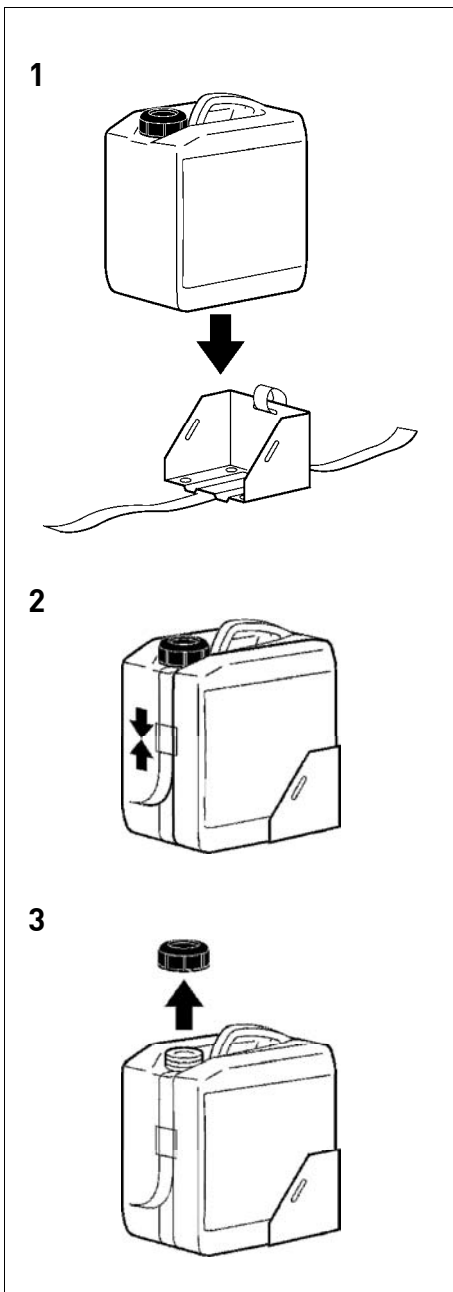
Do not place the fuel cartridge in front of the air intake or outlet.

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.

Please pay attention to the Safety notice for methanol cartridges (chapter 2.3, page 7)

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.

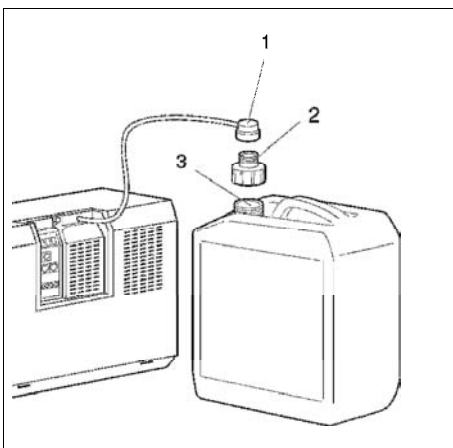
- Unscrew the empty fuel cartridge and remove.
- Close each cartridge tightly with the cap after use.
- EFOY fuel cartridges are intended for one-way use only. They may not be refilled.
- Sort empty fuel cartridges with plastics. Dispose of partly filled fuel cartridges in the same manner as solvents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

5.6 Automatic Operation

CAUTION

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 4.6).

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 below a defined threshold. It will stop charging as soon as the battery voltage exceeds the defined switch off threshold.

Note: To guarantee optimal battery maintenance, it is important that the charge current is not stopped abruptly when the deactivation threshold is reached. For this reason, the EFOY Pro continues to charge for up to 3 h after the deactivation threshold set is reached (by default, 14.2 Volt is preset). The recharging period depends on the battery voltage and the electricity consumption.

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.

5. Operation

Automatic
Standby

If the battery is sufficiently charged 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 7, page 44).

5.7 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.

5.8 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 and full fuel cartridge.

5.9 Battery protection

Off
Battery protection

The EFOY Pro fuel cell has an integrated battery protection function. This function prevents deep discharge of the battery when the operating mode is set to “Off”.

Battery protection is automatically activated when the battery voltage is lower than 11.2 V (24.4 V) for more than 15 minutes. The battery protection charging mode ends when the voltage reaches 12.8 V (25.6 V).

This function only serves to protect the battery, and does not recharge it.

Off
Battery protection -> to shut down
press off

Press the  button to switch off the fuel cell after the battery protection function starts. The function is reactivated automatically when the unit is switched on or operated in automatic mode.

Note: If you stop protective charging manually, battery protection is deactivated until the fuel cell is started again. Deep discharge can damage your battery. If battery protection starts repeatedly, please check your system.

Battery protection only functions when a full EFOY fuel cartridge is connected.

5.10 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.

5.11 Storage

Off
Antifreeze mode

- 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.

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

■ **CAUTION**
Unscrew the fuel cartridge and close it with a cap. Keep all elements clean.

■ **WARNING**
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.
- **CAUTION**
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 5.10, page 36)

■ CAUTION

If the device is exposed to temperatures below 0 °C without connected batteries and sufficiently filled fuel cartridges (frost protection), it must be thawed out for approximately 24 hours at room temperature before commencing 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

WARNING

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.

Please check on a regular basis (at least once a year), if software updates are available.

EFOY Updater – Update your EFOY Pro fuel cell quickly



It's really easy: Simply connect the EFOY Updater to the EFOY Pro fuel cell and the update runs automatically.

For further information on firmware updates, please contact your service partner or check our website: <http://www.efoy.com/en>.

Or
Freecall: 00800 732 762 78
Hotline: +49 89 673 5920
Sales@sfc.com

6.2 Cleaning

WARNING

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

CAUTION

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 5.10, page 36).

6.3 Change the filter (EFOY Pro 2200 XT)

NOTICE

- 🔌 Replace the filter as soon as the demand note “Please change Filter XT” is displayed on the remote control. Otherwise the warranty is void.
- 🔌 Open the package of the replaceable filter not until case of use.
- 🔌 Keep filter and packaging out of the reach of children.
- 🔌 Do not store the filter at temperatures below 0°C.
- 🔌 When changing the filter, make sure that the surrounding area is clean and free from dust.
- 🔌 Ensure that no dirt gets into the openings in the device.
- 🔌 Dispose used filters with plastic waste.

Automatic
Please change Filter XT

A message will be displayed on the remote control panel or via the modem when the filter has to be changed.



1. Remove the device.
To do this, disconnect the plugs, exhaust air vent, and the exhaust gas hose



2. Turn the device over onto its back

3. Unscrew fixing screw **1** on service cover **2** using a suitable Allen key.

4. Pull service cover **2** down.

5. Pull foam **3** on the right side out

6. Push filter **4** to the right along flap **5** until the filter is exposed

7. Take filter **4** out of the filter compartment.

A few drops of liquid may leak out.

Dispose the used filter as described in Chapter 6.4, page 42.



8. Fit the new filter **6** in the filter compartment.

9. Push new filter **6** to the left until it engages in place on the wall of the filter compartment.

10. Slide foam **3** back to the right beside the filter.

11. Slide service cover **2** onto the device and screw it tight.

12. Press "Auto" and "Reset" together on remote control unit **7** to confirm that the filter has been changed.

The service message will go out.

6.4 Disposal Filter XT1

Dispose of used filters with plastic waste.

6.5 FAQs und Service

1. The service message is displayed on my remote control/via my modem. How much time do I have to change the filter?

The message is displayed at 2200 hours of operation. The filter must be changed until max. 3000 hours of operation, otherwise the warranty is void.

2. I have removed the filter and the EFOY Pro was not lying on the back. Some liquid leaked out. What should I do?

This is the liquid needed to operate the fuel cell. The EFOY Pro 2200 XT needs this liquid to be able to start. Please fill in 2 bottles of Service Fluid in the nozzle for the exhaust hose at the fuel cell.

3. After having placed in the new filter, the unit shows error code 30. What happened?

The unit has not been placed on the back while the filter has been changed. Some liquid must have spoiled out. Please add service fluid (see. 2).

4. Some liquid leaked out by removing the filter.

A few drops of liquid may leak out. Please use a clean and fluff less cloth to absorb the liquid.

5. I have placed the new filter and the service message is still running.

Did you confirm the action via the remote control or your computer?

7.1 Safety

WARNING

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 Energy AG
Eugen-Sänger-Ring 7
D-85649 Brunnthal-Nord

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

7.2 Problems and Solutions

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 9 V, use an external battery charger to recharge.
Please contact service (Error 1, 10, 13, 14, 15, 17, 70, 73, 75, 76, 80, 83, 84)	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, 12, 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, 21, 22, 23)	Insert a new fuel cartridge as described in Chapter 5.5, page 31. Check 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 7.4, page 48). Check that exhaust can escape and that ambient temperature is below 45° C.
Interruption: Surroundings too warm (Error 32, 41)	Ambient temperature is too high. The unit starts again as soon as it has cooled down.

Message	Solution
Interruption: Please defrost device slowly (Error 40)	The unit is frozen. Let stand at room temperature for approx. 24 hours before operating.
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 (Error 63, 65)	Unit is restarting automatically - please wait.
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.

7.3 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.
Short-circuit fuse tripped	Check polarity of charge line. Turn off unit, check reason for short circuit/overload or wrong polarity and correct
If problem recurs	Contact the hotline at: Freecall: 00800 732 762 78 Hotline: +49 89 673 5920 Sales@sfc.com www.sfc.com

7.4 Replacing Service Fluid

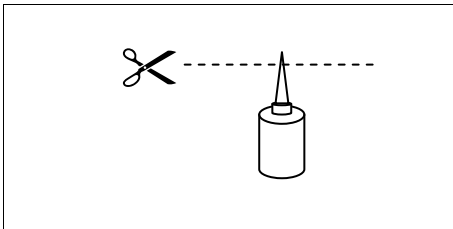
If service fluid is low the yellow light will turn on at the EFOY Pro and the message "Please refill service fluid" will appear at the control panel display.

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

Use EFOY brand service fluid only.

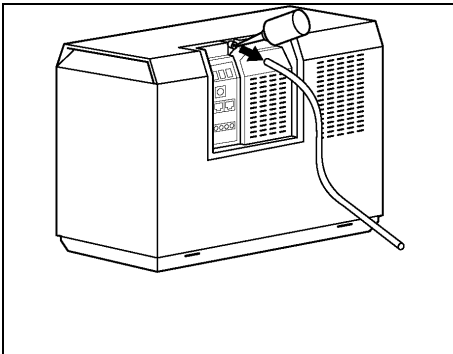
Switch off the unit before refilling fluid. Unplug the charge line.

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.

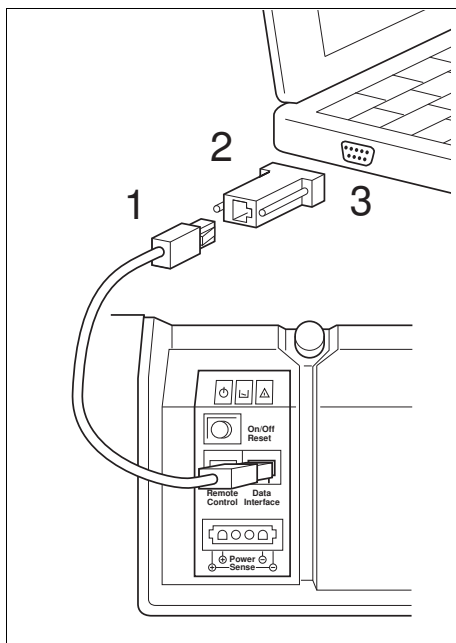


- Remove the exhaust hose from the device's service fluid nozzle.
- Insert the tip into nozzle and gently squeeze the entire contents into the nozzle.

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.

8.1 Data Interface Functionality



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

The EFOY Pro data interface enables the connection of:

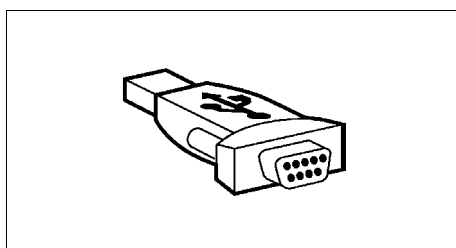
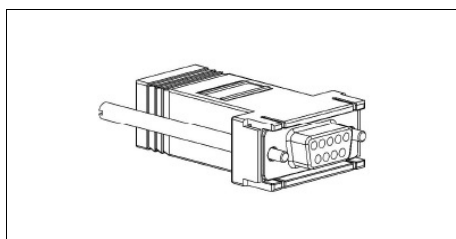
- Computer or Modem with the interface adapter IA1
- Fuel cartridge sensor FS1
- Cluster Controller CC1
- DuoCartSwitch

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)

8.2 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.

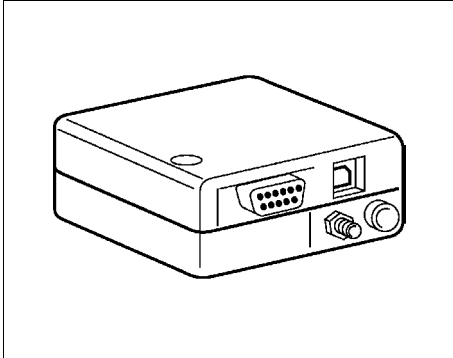
This enables to check the current system status, change parameter or remote control the EFOY Pro.

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.

8.3 GSM Modem GSM-2-SMS



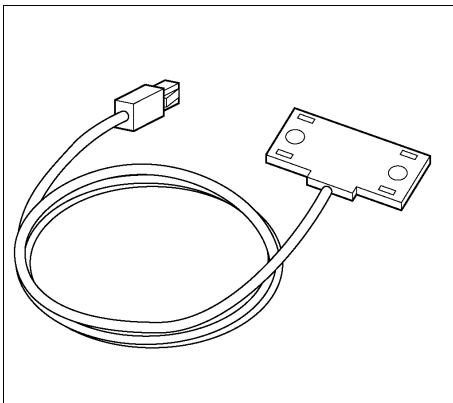
The optional GSM modem allows controlling and configuring the EFOY Pro remotely. It is recommended to use such a solution if the EFOY Pro is installed remotely.

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.

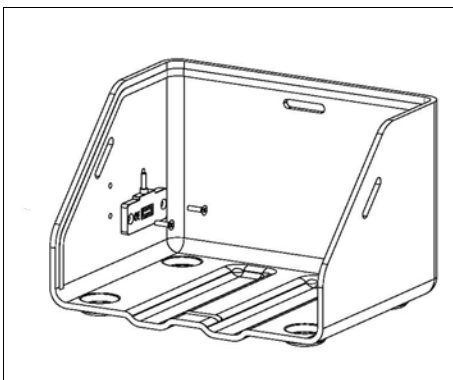
8.4 Fuel Level Sensor FS1



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.

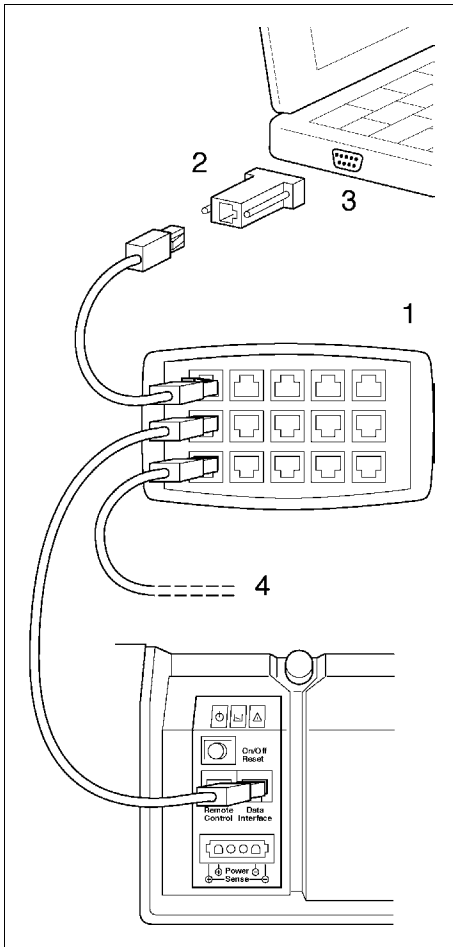
This sensor should be combined with a remote management system – e.g. the GSM modem GSM-2-SMS.



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.

8.5 Cluster Controller CC1



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

Automatic
Charging mode

P

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.

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
----------------------------	---

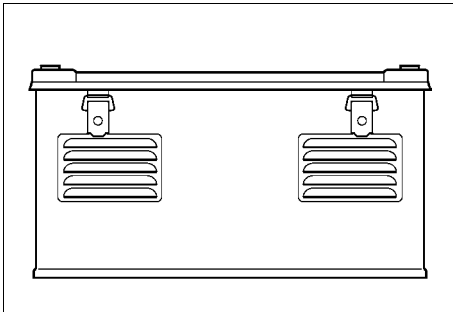
An “R” for “remote” will appear in the first line when the unit is operating in remote mode.

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.

8.6 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, 1600, 2200, 2200 XT)
- 1x Fuel cartridge (M5, M10 or M28)
- 1x Battery (40, 60, or 90 Ah)
- 1x Fuel cartridge sensor FS1
- 1x GSM modem GSM-2

8.7 DuoCartSwitch



The DuoCartSwitch enables the connection of two EFOY fuel cartridges to one EFOY Pro fuel cell. The switching valves switches automatically from one cartridge to the other. The autonomy of the application can be doubled.

Dimensions:
174 x 119 x 196 cm

Weight:
0.7 kg

9.1 Accessories and Spare Parts

WARNING

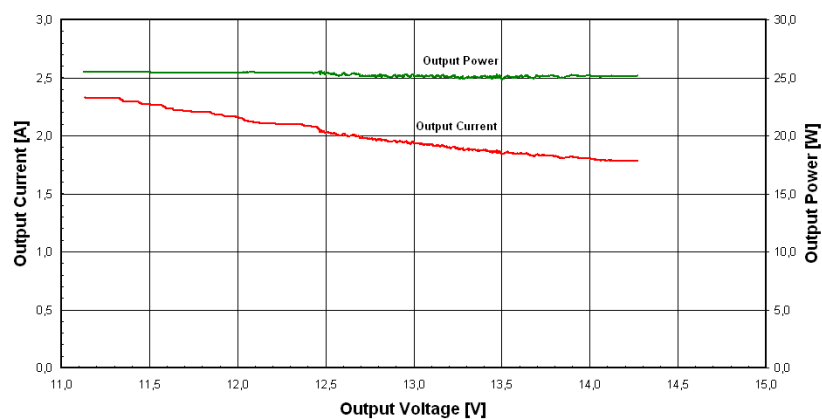
Use only original equipment! Use of unauthorized parts compromise safety and void the warranty.

For a full accessories and spare parts list please visit www.efoy.com

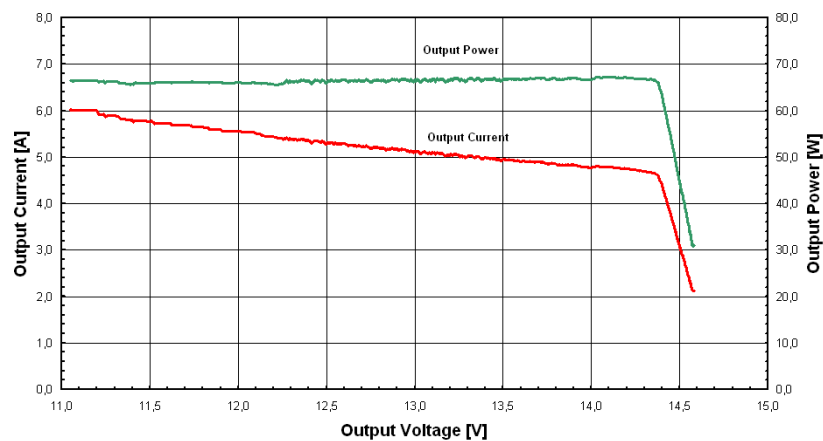
9.2 Output characteristic

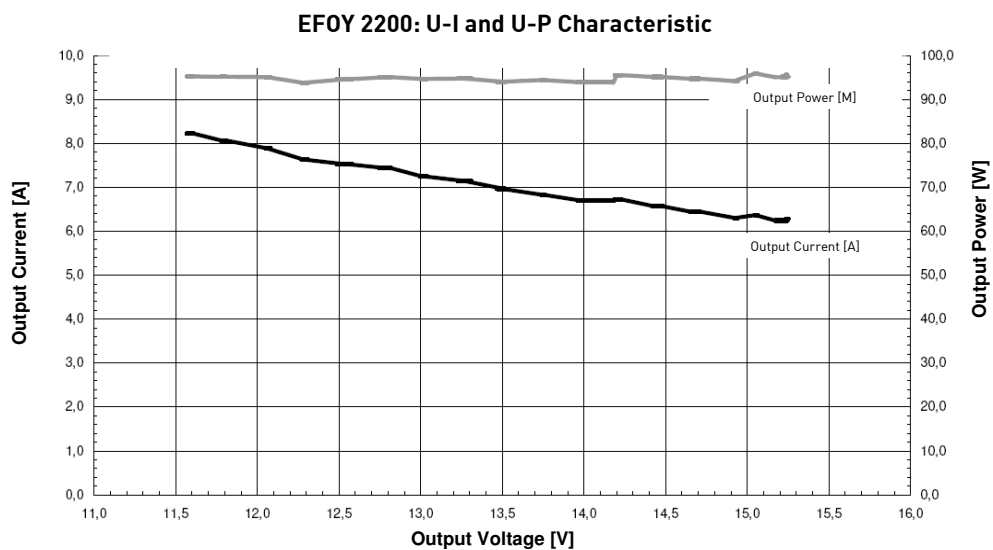
U-I and U-P characteristic as per CE test

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



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





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