

# EFOY

## EFOY 80 | 150

**DE** Bedienungsanleitung

**EN** User Manual

**FR** Mode d'emploi

**IT** Manuale d'istruzioni

**ES** Instrucciones de uso

**NL** Gebruiksaanwijzing



[efoy.com](http://efoy.com)

MADE BY **SFC**  
ENERGY |

## Thank you!

Congratulations on choosing an EFOY fuel cell from SFC Energy AG.

We hope you enjoy your new power supply. If you have any questions about installation or operation, please contact your sales partner or the EFOY hotline.

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*Specifications may change without prior notice. Revision from October 2020*

## Notes on safe operation



**Read the operating instructions before commissioning the unit. For your own safety, follow the instructions and warnings in these operating instructions. Store the operating instructions near the EFOY fuel cell.**



### WARNING



The EFOY fuel cell is intended for operation in well-ventilated environments and requires sufficient incoming air that is free of exhaust gas. The device is to be protected against direct weather influences, especially moisture penetration. The device generates exhaust gases that must be ventilated to open air using the accompanying exhaust gas hose. Always ensure sufficient ventilation.



Do not open the EFOY fuel cell. Do not open fuel cartridges and do not refill them.



Transport in an upright position only.



Protect the EFOY fuel cell and fuel cartridges from heat and direct sunlight. Observe the temperature specifications for operation and storage in SECTION 2.3.3.



Store the EFOY fuel cell in a place protected from frost. For frost-free operation at temperatures under 3 °C, leave a full fuel cartridge and intact battery connected.



Do not smoke around the EFOY fuel cell or fuel cartridges. Keep sources of heat and ignition away from the device and fuel cartridges.



The EFOY fuel cells and empty or partially emptied fuel cartridges are not intended for use by persons (including children) with limited physical, sensory or mental capacities or persons who lack experience and/or knowledge unless they are supervised by a person responsible for their safety or have received instructions from them on how the device is to be

used. Children must be supervised to ensure that they do not play with the device.

## Service and contact

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Web: [www.efoy.com](http://www.efoy.com)

*\*The toll-free number can be called free of charge from a landline telephone in the following countries: Germany, Belgium, Denmark, France, Great Britain, Italy, the Netherlands, Norway, Austria, Sweden, Switzerland and Spain.*

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# 1 Safety

## 1.1 Explanation of signal words



### DANGER

Indicates a hazard with a high degree of risk which, if not avoided, will result in death or serious injury.

- ▶ Pay attention to the danger warning.



### WARNING

Indicates a hazard with a medium degree of risk which, if not avoided, can result in death or serious injury.

- ▶ Pay attention to the danger warning.



### CAUTION

Indicates a hazard with a low degree of risk which, if not avoided, can result in minor or moderate injury.

- ▶ Pay attention to the danger warning.



### INFO

Indicates an action which can result in damage.

- ▶ Pay attention to the information.



Includes further information and tips on using the EFOY fuel cell in an optimal way.

## 1.2 Safety instructions for the EFOY fuel cell



### **DANGER**

**Risk of electric shock!** The EFOY fuel cell is not waterproof. Penetrating water connecting with electricity creates a risk of injury.

- ▶ Ensure that no water can enter the EFOY fuel cell.
- ▶ Choose an area protected from exposure to water for installing the EFOY fuel cell.
- ▶ Do not use the EFOY fuel cell if any part of it has been submerged in water. A fuel cell which has been damaged by water is extremely dangerous. Attempting to use the EFOY fuel cell can lead to fire or explosion. Notify SFC Energy or your service partner immediately to have the EFOY fuel cell examined and the affected functional parts replaced.



### **WARNING**

Inadequate installation and attachment of the EFOY fuel cartridges and EFOY fuel cell creates a risk of injury.

- ▶ Attach the EFOY fuel cell and EFOY fuel cartridges in a safe and secure way.



### **CAUTION**

Unapproved parts can damage the EFOY fuel cell. This creates a risk of injury.

- ▶ Use only original accessories.

Information on installing the EFOY fuel cell and requirements on the installation area can be found in the revision 10/2020 of the mounting instructions at [www.efoy.com](http://www.efoy.com).

## Safety instructions for ventilation



### WARNING

Exhaust gases from the EFOY fuel cell may contain harmful compounds.

- ▶ Do not breathe in exhaust gases directly or for prolonged periods.
- ▶ Use only the accompanying exhaust gas hose.
- ▶ Using the exhaust hose, direct the exhaust gases from the installation area to the open air.



### WARNING

Blocked or congested ventilation openings prevent the required air supply and removal.

- ▶ The EFOY fuel cell may only be operated in a well-ventilated environment.
- ▶ Ensure that the openings for the incoming and outgoing air are not blocked by any objects.
- ▶ Keep the environment around the EFOY fuel cell clean and free of gasoline, flammable substances and other ignitable vapors and liquids.

Information on the requirements on ventilation can be found in the revision 10/2020 of the /mounting instructions at [www.fooy.com](http://www.fooy.com).

## Safety instructions for the electronics and battery



### DANGER

**Risk of fire!** Incorrectly laid or sized cables can cause a fire.

- ▶ Ensure that all connected lines have sufficient insulation and electric strength.
- ▶ Ensure that the contact points are protected from being touched.
- ▶ Do not install any bare metal lines or contacts.
- ▶ Allow only professional electricians to work on electrical systems.
- ▶ Use only the accompanying EFOY charging cable.
- ▶ The battery terminal which is not connected to the chassis is to be connected first. The other connection is to be made to the chassis at a distance from the battery and gasoline line.

**WARNING**

Insufficient ventilation of the batteries results in a risk of explosion.

- ▶ Avoid flames and sparks.
- ▶ While charging the battery, ensure sufficient ventilation.
- ▶ Follow the safety instructions of the battery manufacturer.

**WARNING**

Risk of fire!

- ▶ Non-rechargeable batteries may not be charged with the EFOY fuel cell.
- ▶ Use only battery types that correspond with the specifications.

### 1.3 Safety instructions for methanol

Safe and tested EFOY fuel cartridges contain methanol approved by SFC Energy AG. When the EFOY fuel cell and EFOY fuel cartridges are used properly, there is no risk of coming into contact with methanol.

**DANGER**

**Risk of fire!** Methanol is highly flammable. Escaping methanol vapors can cause a fire.

- ▶ Do not smoke while changing an EFOY fuel cartridge and keep all sources of ignition away.
- ▶ Keep the area around the EFOY fuel cell and fuel cartridge clean and free of gasoline and other sources of ignition.
- ▶ Protect the EFOY fuel cell and EFOY fuel cartridges from temperatures over 50 °C.



**DANGER**


**Risk of poisoning!** Breathing in, touching or swallowing methanol can cause poisoning.

- ▶ Do not breathe in exhaust gases directly or for prolonged periods.
- ▶ Do not touch leaked methanol. In small quantities, methanol evaporates without residue in a ventilated environment.
- ▶ Contact a doctor immediately in case of direct contact, an accident or if you are feeling unwell. Show the doctor the fuel cartridge label or methanol safety data sheet.

The storage and transportation of methanol are regulated by law. More information can be found on the safety data sheets at <https://www.my-efoy.com/safety-data-sheets/>

## 1.4 Certificates

### 1.4.1 Declaration of conformity

 The SFC Energy AG company (Eugen-Sänger-Ring 7, 85649 Brunnthal, Germany) declares that the following devices comply with the regulations of EU Directives 2014/30/EU (electromagnetic compatibility), 2011/65/EU and 2015/863 (restriction on the use of certain hazardous substances in electrical and electronic equipment RoHS) and REACH Directive (EC) No. 1907/2006 REACH:

EFOY 80, EFOY 150

The following harmonized standards were applied: BS EN 61000 6-2:2005, BS EN 61000-6-3:2007 + A1:2011, FCC 47 CFR Part 15 and ICES-003, Issue 6.

### 1.4.2 Seals of approval



EFOY fuel cells have been tested for electromagnetic compatibility in accordance with ECE Regulation No. 10 and approved for operation in motor vehicles:

Seals of approval: 10 R – 05 3266



EFOY fuel cells have been voluntarily submitted for testing by TÜV SÜD Industrie und Service GmbH for compliance with the basic requirements of DIN EN IEC 62282-5-100 (VDE 0130-5-100):2019-05/EN IEC 62282-5-100:2018 and labeled with the seal of approval for product safety.

### 1.4.3 Warranty

The warranty period begins with the purchase of a new EFOY fuel cell and only takes effect following registration. Retain the purchase receipt in a secure place. Warranty service is based on the warranty conditions of SFC Energy AG valid at the time of purchase for the

respective country. Observe the warranty conditions accompanying the product or available at [www.efoy.com](http://www.efoy.com).

## 1.5 Proper use

EFOY fuel cells from the SFC Energy AG company are automatic charging devices for 12 V and 24 V lead batteries and lithium iron phosphate batteries (LiFePO<sub>4</sub>).

- Only batteries which comply with the specifications of the device (see [SECTION 2.3](#)) may be charged.
- Only EFOY fuel cells with intact, undamaged housings may be operated.
- Use only undamaged original EFOY fuel cartridges.
- **Permissible:** Parallel connection of EFOY fuel cells for increasing the charging current.
- **Not permissible:** Serial connection of EFOY fuel cells for increasing the voltage.
- EFOY fuel cells are not intended for use as an emergency supply of power for medical, life-sustaining or agricultural devices.

## 1.6 Transportation and disposal

Information on transportation can be obtained by calling the EFOY hotline.



### WARNING

**Risk of suffocation** from films and folding boxes.

- ▶ Keep packaging and parts of packaging away from **children**.

The EFOY fuel cell is protected by packaging. All materials used are environmentally friendly and recyclable. Dispose of the packaging and EFOY fuel cell in an environmentally responsible way in accordance with the local regulations.

In accordance with EU Directive 2012/19/EU, EFOY fuel cells are registered under WEEE Reg. No. DE 85008411.

**Old devices:** Old electronic devices may not be disposed of with household garbage.

Information on returning old devices can be obtained by calling the EFOY hotline.

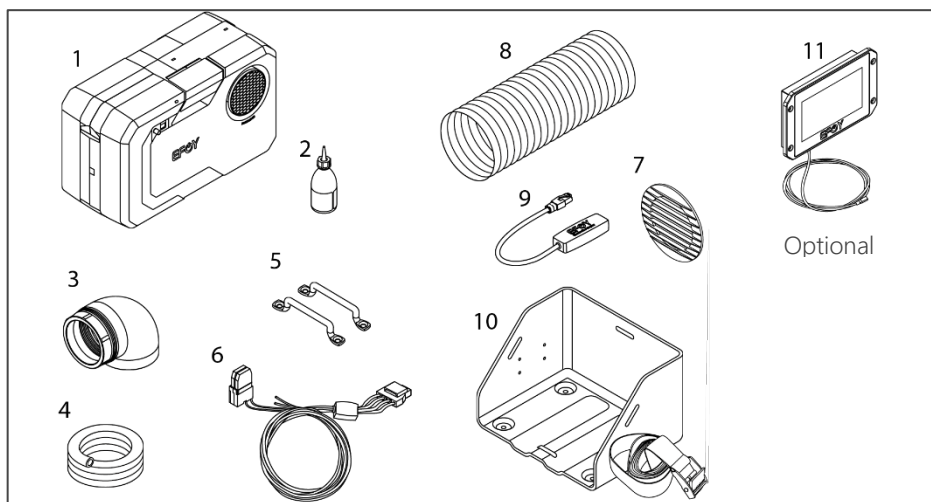
**Special waste:** Dispose of EFOY fuel cartridges as special waste.

## 2 Design and specifications

### 2.1 Product contents

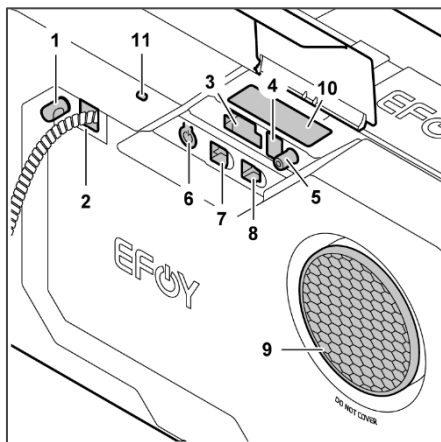
The set contains the following: Operating instructions with warranty conditions

- |                                |  |
|--------------------------------|--|
| (1) EFOY fuel cell             | (7) External cover                     |
| (2) EFOY service fluid         | (8) Exhaust heat tube                  |
| (3) Exhaust heat elbow         | (9) Bluetooth adapter                  |
| (4) Insulated exhaust gas hose | (10) Fuel cartridge holder, incl. belt |
| (5) Belt brackets              | (11) Operating panel OP3 (optional)    |
| (6) Charging cable             |  |



A complete list of accessories and spare parts can be found at [www.efoy.com](http://www.efoy.com).

## 2.2 Connections of the EFOY fuel cell



- 1 Exhaust gas hose connection with protective cap
- 2 Fuel cartridge connection
- 3 Charging cable connection
- 4 Power connection for optional accessories
- 5 Retainer for protective cap/factory defaults
- 6 On/off/reset button
- 7 Ethernet connection (RJ-45 port)
- 8 Accessory connection (RJ-12 port)
- 9 Connection for exhaust heat diversion
- 10 Device type, serial number and MAC address
- 11 Status LED

## 2.3 Specifications

### 2.3.1 12 V performance data<sup>1</sup>

	EFOY 80	EFOY 150
Max. output power	40 W	75 W
Output power <sup>2</sup> after 3,000 operating hours	24 W	45 W
Max. charging current at 10.5 V	3.8 A	7.1 A
Recommended minimum battery capacity of lead batteries	40 Ah	60 Ah
Maximum settable battery capacity of lead batteries	800 Ah	
Recommended minimum battery capacity of LiFePO <sub>4</sub> batteries	20 Ah	30 Ah
Maximum settable battery capacity of LiFePO <sub>4</sub> batteries	600 Ah	

Quiescent power consumption	42 mA
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## 2.3.2 24 V performance data<sup>1</sup>

	EFOY 80	EFOY 150
Max. output power	40 W	75 W
Output power <sup>2</sup> after 3,000 operating hours	21 W	43 W
Max. charging current at 21.0 V	1.9 A	3.6 A
Recommended minimum battery capacity of lead batteries	20 Ah	30 Ah
Maximum settable battery capacity of lead batteries	400 Ah	
Recommended minimum battery capacity of LiFePO <sub>4</sub> batteries	10 Ah	15 Ah
Maximum settable battery capacity of LiFePO <sub>4</sub> batteries	300 Ah	
Quiescent power consumption	25 mA	

## 2.3.3 General specifications of the EFOY fuel cell

Nominal voltage	Lead: 12 V/24 V (lead gel, lead acid or AGM) LiFePO <sub>4</sub> : 12.8 V/25.6 V	
Permissible battery types	Lead: 2 V cells: 6S (12 V) and 12S (24 V) LiFePO <sub>4</sub> : 3.2 V cells: 4S (12.8 V) and 8S (25.6 V)	
Consumption <sup>3</sup>	0.9 l/kwh	
Number of fuel cartridges	1	
Length of fuel cartridge connection	75 cm	
Weight	6.5 kg	6.9 kg
Dimensions (L x W x H)	448 x 198 x 275 mm	

Operation	At the device, using the EFOY app, using the operating panel or via the EFOY cloud	
Data interface	RJ-12 port (CAN & RS232) for the use of accessories RJ-45 port (Ethernet)	
Communication protocol	MODBUS TCP; plain text (SIO commands)	
Electrical interface	4-pin port for EFOY charging cable Power: plus (+) and minus (-): 4 mm <sup>2</sup> Sensors: plus (+) and minus (-): 0.75 mm <sup>2</sup>	
Electrical interface for EFOY accessories	2-pin port: plus (+) and minus (-): min. 0.75 mm <sup>2</sup> /max. 2.5 mm <sup>2</sup> Available voltage: battery voltage, max. current 3 A	
Sound pressure level <sup>4</sup> at 1 m	< 44 dB (A)	< 47 dB (A)
Installation space (L x W x H)	510 x 320 x 290 mm	
Incline along longitudinal axis	Continual: 35°	
Incline along lateral axis	Continual: 35°	
Operating temperature <sup>5</sup>	-20 °C to +40 °C	
Start temperature	+3 °C to +40 °C	
Storage temperature	+1 °C to +50 °C	
IP protection class	IP 21	
Usage elevation	Performance may be reduced at approx. 2,000 meters above sea level	
Warranty	24 months (up to 3,000 operating hours)	

<sup>1</sup>All performance data is based on measurement at the connection for the charging cable on the sides of the fuel cell.

<sup>2</sup>The output power varies by  $\pm 10\%$  and decreases with the number of operating hours, depending on the installation situation and operating conditions.

<sup>3</sup>Actual consumption depends on the operating conditions and operating hours.

<sup>4</sup>The sound pressure level will vary and depends on different components and operating conditions.

<sup>5</sup>At temperatures over +35 °C (EFOY), the output power may be reduced. At temperatures under 0 °C, it may not always be possible to charge lithium batteries (LiFePO<sub>4</sub>). Observe the information from the battery manufacturer.



All specifications obtained through testing under normal conditions. We reserve the right to make changes to the specifications.

## 2.3.4 EFOY fuel cartridges

The M28 EFOY fuel cartridges and MT60 methanol tank are not suitable for use in vehicles.

	M5	M10	M28 <sup>1</sup>	MT60
<b>Volume</b>	5 liters	10 liters	28 liters	60 liters
<b>Weight</b>	4.3 kg	8.4 kg	23.4 kg	51.1 kg
<b>Energy capacity</b>	5.6 kWh	11.1 kWh	31.1 kWh	66.0 kWh
<b>Dimensions (L x W x H)</b>	190 x 145 x 283 mm	230 x 193 x 318 mm	370 x 285 x 395 mm With M28 adapter: 370 x 285 x 425 mm	340 x 390 x 670 mm

<sup>1</sup>An M28 adapter is required for the M28 EFOY fuel cartridge.

## 2.4 Charging parameters

### 2.4.1 Lead batteries (AGM, lead acid and lead gel)

	12 V/24 V factory default	Min. 12 V/24 V	Max. 12 V/24 V
Switch-on voltage	12.3 V/24.6 V	11.0 V/22.0 V	13.0 V/26.0 V
Switch-off voltage	14.2 V/28.4 V	13.5 V/27.0 V	14.7 V/29.4 V
Switch-off current	2.0 A/1.0 A	0.5 A/0.25 A	10.0 A/5.0 A
Absorption time	180 min	0 min	300 min
Capacity <sup>1</sup>	---	20 Ah	400 Ah
Max. charging duration	24 h	0 h	120 h
Min. charging duration	30 min	30 min	180 min
Switch-on delay	60 sec	2 sec	300 sec
Battery protection	11.2 V/22.4 V	10.5 V/21.0 V	12.0 V/24.0 V
Required start voltage	9 V/18.5 V		
Max. "charge now" voltage	13.2 V/26.4 V		
Max. battery voltage	16.0 V/31.5 V		

### 2.4.2 LiFePO<sub>4</sub> batteries (lithium iron phosphate)



For optimum charging, we recommend using a LiFePO<sub>4</sub> battery with communication with the EFOY fuel cell, such as the EFOY Li 70 or EFOY Li 105.

	Factory default 12 V/24 V	Min. 12 V/24 V	Max. 12 V/24 V
Switch-on voltage	12.6 V/25.2 V	12.0 V/24.0 V	13.4 V/25.2 V
Switch-off voltage	14.5 V/29.0 V	13.8 V/27.6 V	14.6 V/29.2 V
Switch-off current	2.0 A/1.0 A	0.5 A/0.25 A	10.0 A/5.0 A
Absorption time	180 min	0 min	300 min
Capacity <sup>1</sup>	---	20 Ah	600 Ah
Max. charging duration	48 h	0 h	120 h
Min. charging duration	30 min	30 min	180 min
Switch-on delay	300 sec	2 sec	600 sec
Battery protection	11.0 V/22.0 V	10.5 V/21.0 V	12.5 V/25.0 V
Required start voltage	9 V/18.0 V		
Max. "charge now" voltage	13.4 V/26.8 V		
Max. battery voltage	16.0 V/31.5 V		

<sup>1</sup>Depends on the battery type and application. Larger battery capacities are possible if additional energy sources are available (e.g. solar power).

### 2.4.3 EFOY Lithium Battery

	factory default	Min.	Max.
Switch-on threshold (charge level)	20%	5 %	50 %
Switch-off threshold (charge level)	80 %	50 %	100 %
Battery protection	10 %	5 %	20 %



## 3 Operating the EFOY fuel cell

You can operate the EFOY fuel cell as follows:

- EFOY app (see [SECTION 3.1](#)).
- Operating panel (see [SECTION 3.2](#)).
- Buttons on device (see [SECTION 3.3](#)).

### 3.1 Using the app

The EFOY app is freely available from the App Store and Google Play.

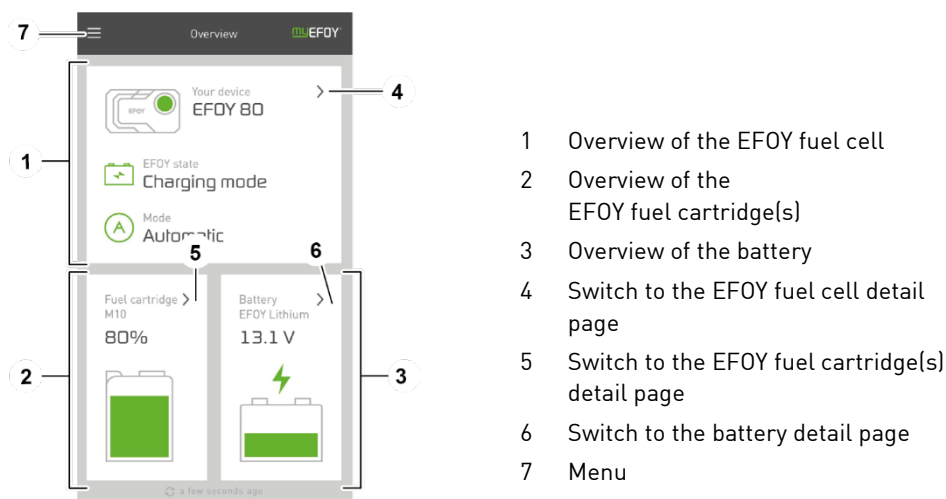
The myEFOY function of the EFOY app is available starting with Android version 4.4 and iOS 8.0 for Bluetooth 4.0-capable devices.

More information can be found at [www.efoy.com](http://www.efoy.com).

To use the myEFOY function, you will need the EFOY Bluetooth adapter and the current firmware.

- ▶ In the app, touch **myEFOY**.
- ▶ Enter the serial number of your EFOY fuel cell.
- ▶ For the initial commissioning, follow the EFOY app's instructions. See [SECTION 4.1](#).

Following the initial commissioning and deactivation of transportation protection, the main screen will appear.

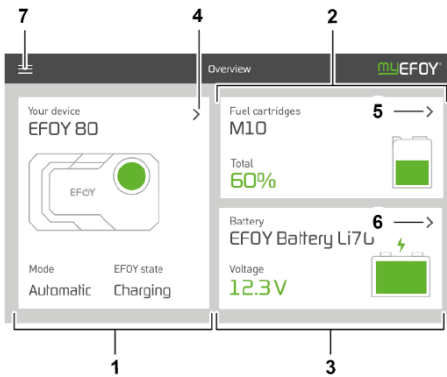


### 3.2 Using the operating panel

When you connect the EFOY fuel cell for the first time, the language must be configured.

- ▶ For information on connecting the operating panel, see [SECTION 2.2](#)
- ▶ Select the desired language.
- ▶ Follow the instructions on the operating panel for the initial configuration. See [SECTION 4.1](#).

Following the initial configuration and deactivation of transportation protection, the main screen will appear.



- 1 Overview of the EFOY fuel cell
- 2 Overview of the EFOY fuel cartridge(s)
- 3 Overview of the battery
- 4 Switch to the EFOY fuel cell detail page
- 5 Switch to the EFOY fuel cartridge(s) detail page
- 6 Switch to the battery detail page
- 7 Menu



You can also connect the EFOY fuel cell to a computer via the **Accessory** connection (see [SECTION 2.2](#)). Use an interface adapter and a USB adapter for this purpose.

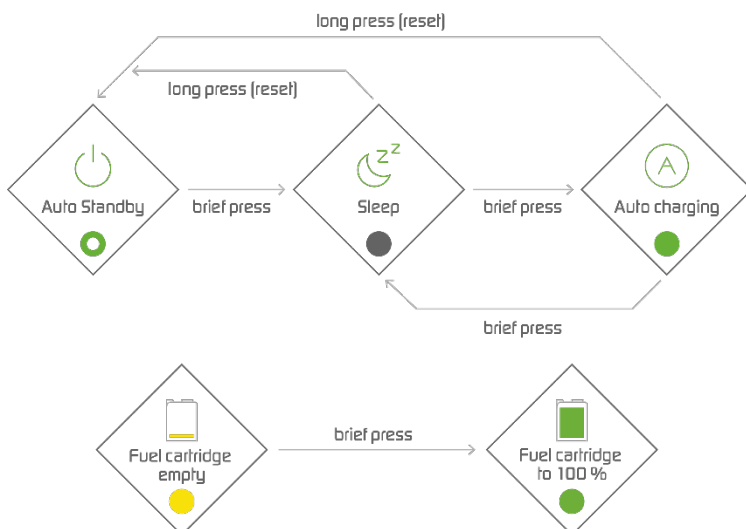
## 3.3 Using the button on the EFOY

The figure below shows the actions you can initiate with the button (see [SECTION 2.2, NUMBER 6](#)).

The LED status overview (see [SECTION 8](#)) also lists all other color codes.

The glossary (see [SECTION 9](#)) explains the various different operating modes and statuses of the EFOY fuel cell.

Button operation procedure: One brief press (less than 1 second) switches between the operating modes, and one long press (over 5 seconds) initiates a reset.



## 4 Commissioning the EFOY fuel cell

### Requirement:

The EFOY fuel cell and fuel cartridge are installed. Should this not be the case, refer to the steps for mounting, electrical connection and use of the EFOY fuel cell and fuel cartridge in the revision 10/2020 of the mounting instructions which you can download from [www.efoy.com](http://www.efoy.com).

### 4.1 Initial commissioning

During the initial commissioning, the following required and recommended settings must be made:

- ▶ Battery type (required)
- ▶ Battery capacity (required)
- ▶ Fuel cartridge configuration (recommended)
- ▶ Deactivation of transportation protection (Required in order to start operation. If only settings are to be made, transportation protection can remain active.)

#### 4.1.1 Configuring a battery

When a new battery is connected, it must be configured. Select the battery type (lead or lithium iron phosphate) and the voltage (12 V or 24 V).



#### CAUTION

Only lithium batteries of type "LiFePO4" with a rated voltage of 12.8 V or 25.6 V and a built-in battery management system (BMS) can be recharged.

- ▶ Observe the charging information from the battery manufacturer.

#### 4.1.2 Configuring the fuel cartridge

For an accurate indication of the fuel cartridge fill level, the connected fuel cartridge type must be selected.

The fill level of the fuel cartridge can be adjusted manually if a partially filled fuel cartridge is connected.

#### 4.1.3 Deactivating transportation protection

The EFOY fuel cell is delivered with transportation protection activated.

This condition prevents frost damage during transportation, among other things.

If only settings are to be made to the device, transportation protection can remain activated.

To use the EFOY fuel cell, transportation protection must be deactivated using the EFOY app or the operating panel.

## 4.2 Operation

The EFOY fuel cell indicates its status by way of the status LED on the device (see [SECTION 2.2, ITEM 11](#)). A detailed overview of the LED color codes can be found in [SECTION 8](#).

The EFOY fuel cell can be operated in two different operating modes:

- Automatic (see [SECTION 4.2.1](#)).
- Sleep (see [SECTION 4.2.2](#)).



For optimum operation of the EFOY fuel cell, we recommend always using the **Automatic** operating mode.

The following functions can be carried out in both operating modes:

- Begin charging (see [SECTION 4.2.3](#)).
- Restart (see [SECTION 4.2.4](#)).
- Reset to the factory defaults (see [SECTION 4.2.6](#)).

For information on changing the operating mode using the button (see [SECTION 2.2, NUMBER 6](#)), refer to the overview in [SECTION 3.3](#).

### 4.2.1 Automatic operating mode

Following the initial configuration and deactivation of transportation protection, the device is in Automatic mode. The LED flashes green.

The EFOY fuel cell monitors the battery voltage by itself.

If the battery voltage drops below the switch-on voltage or switch-on threshold (see [SECTION 2.3](#)), the EFOY fuel cell switches on automatically.

The battery is charged until the switch-off voltage or switch-off threshold is reached (see [SECTION 2.3](#)). The EFOY fuel cell then switches off. The switch-off duration depends on the switch-off current and absorption time (see [SECTION 9](#)).



In normal operation, the EFOY fuel cell interrupts current generation for approx. 30 seconds several times per hour. A charging current of 0.0 A is displayed here.

For optimum care of the battery, the EFOY fuel cell does not cut off the charging current abruptly when it switches off. The EFOY fuel cell continues charging up to the maximum absorption time (see [SECTION 2.3](#)) at a reduced current. The duration of recharging depends on the battery voltage and

whether or not the switch-off current is reached. You can set the charging duration manually.

### 4.2.2 Sleep operating mode

In the **Sleep** operating mode, the battery is no longer charged automatically. Only battery protection and antifreeze are still maintained. A sufficiently full fuel cartridge and battery must be connected for this purpose.

This mode can be used, for example, if the battery will not be used for a longer period of time or charging must be interrupted manually.

In the **Sleep** operating mode, the LED is off.



If you switch the EFOY fuel cell to Sleep mode before the minimum charging duration has been reached (see [SECTION 2.3](#)), it continues running for the corresponding amount of time until the charging cycle is complete. Leave the fuel cartridge and battery connected during the shutdown procedure.

### 4.2.3 Starting the charging process

#### Requirement

The battery voltage is below the maximum voltage at which the fuel cell can start (see [SECTION 2.3](#)).

The EFOY fuel cell charges the battery until the switch-off voltage is reached (see [SECTION 2.3](#)). The EFOY fuel cell then switches off automatically and remains in the **Automatic** operating mode, regardless of the previous operating mode. During the charging process, the LED continuously lights up green.



The EFOY fuel cell is in a start-up phase in which the device is warming up when charging begins. Once the start-up phase is complete, the EFOY fuel cell reaches its full output power level.

### 4.2.4 Ending the charging process

If you would like to stop charging, switch the EFOY fuel cell to the **Sleep** operating mode. If you would like the device to then start up again automatically, it must be switched back to the **Automatic** operating mode.

### 4.2.5 Restarting the EFOY fuel cell

The **Reset** function enables you to restart the EFOY fuel cell. The reset can occur either in the Automatic operating mode or in the Sleep operating mode. For this purpose, press and hold the button (see [SECTION 2.2, NUMBER 6](#)) for 5–10 seconds (see [SECTION 3.3](#))

## 4.2.6 Resetting the EFOY fuel cell to the factory defaults

Using a paper clip, push the button in the opening on the protective cap retainer for 10 seconds (see [SECTION 2.2, NUMBER 5](#)).

By resetting the factory defaults, the following settings are reset:

- ▶ Battery type
- ▶ Battery capacity
- ▶ Fuel cartridge configuration
- ▶ Charge cycle monitor (average duration and the duration of the previous cycle)
- ▶ Ethernet configuration (manually configured IP, IP mask, gateway address and DHCP client is enabled)

## 5 Maintaining and caring for the EFOY fuel cell



Under normal usage conditions, the EFOY fuel cell is maintenance free. The EFOY fuel cell does not contain any parts which you yourself can maintain or repair. Do not open the EFOY fuel cell.

### 5.1 Changing the fuel cartridge



The fuel cartridge can be changed while the device is running. Each fuel cartridge can only be used once; they cannot be refilled. Do not change the EFOY fuel cartridge until it is completely empty.

The shelf life of EFOY fuel cartridges is limited. Pay attention to the expiration date on the back of the EFOY fuel cartridge: MM/YYYY.

If the fuel cartridge is empty, the LED on the device will light up (see [SECTION 3.3](#) and [SECTION 8](#)).

**Fuel cartridge empty** appears in the EFOY app and on the operating panel.



#### INFO

Contamination or foreign particles in commercially available methanol will damage the EFOY fuel cell.

- ▶ Use only original EFOY fuel cartridges approved by SFC Energy AG.
- ▶ Check the fuel cartridge connection for proper functioning on a regular basis.

Only use the EFOY fuel cartridge in an upright position during operation.

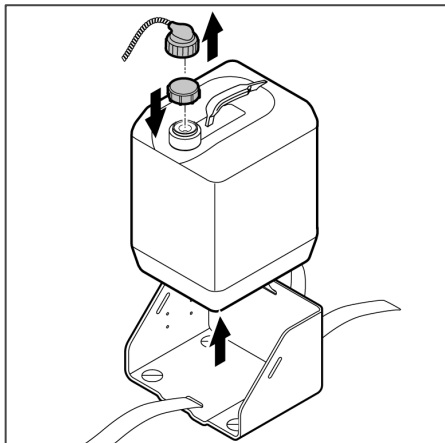
Exception: fuel cartridge M28. If using the EFOY fuel cartridge without a fuel cartridge holder, ensure that it is secured properly.



Store the sealing cap of the EFOY fuel cartridge in a safe place so that you can reseal the EFOY fuel cartridge when you remove it.

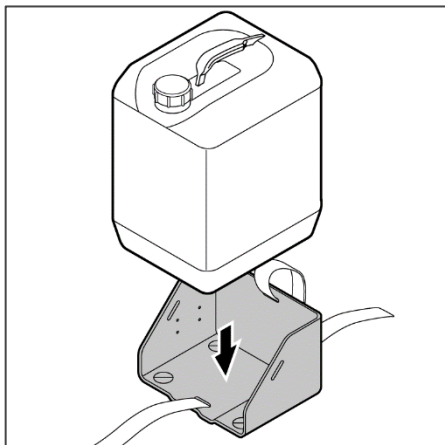


## 5.1.1 Removing the fuel cartridge



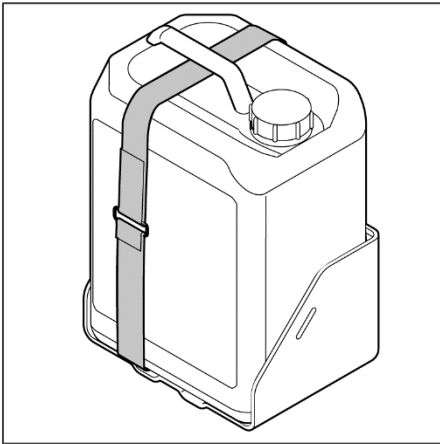
- ▶ Unscrew the fuel cartridge connection from the empty fuel cartridge.
- ▶ Seal the fuel cartridge tight using the sealing cap.
- ▶ Open the belt.
- ▶ Remove the fuel cartridge.

## 5.1.2 Connecting an M5/M10 fuel cartridge



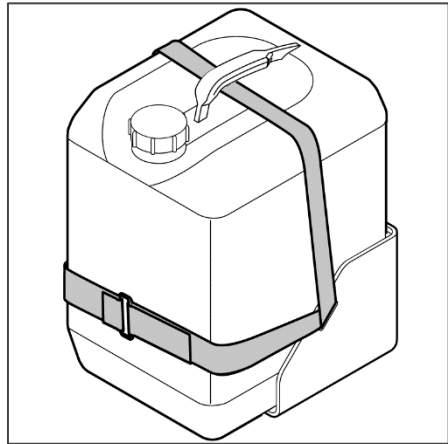
### **M5 and M10 fuel cartridge:**

- ▶ Insert a sealed original EFOY fuel cartridge into the fuel cartridge holder with the connection facing upwards.



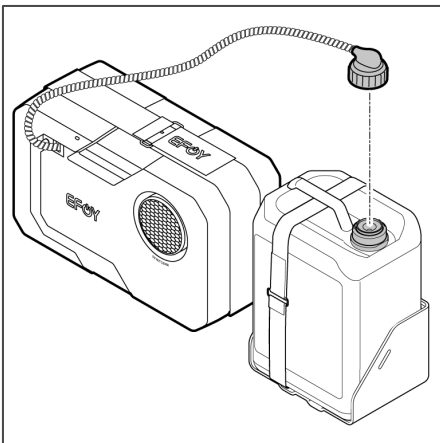
### M5 fuel cartridge:

- ▶ Secure the belt of the fuel cartridge holder **vertically**.
- ▶ Remove the sealing cap.



### M10 fuel cartridge:

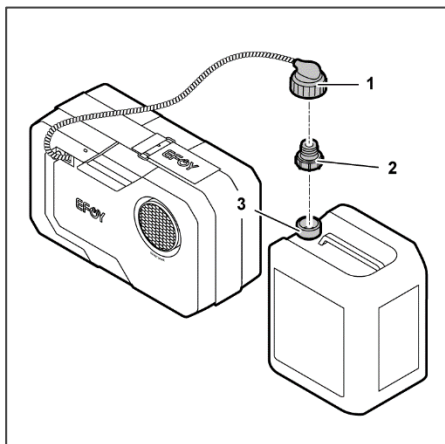
- ▶ Secure the belt of the fuel cartridge holder **across the side**.
- ▶ Remove the sealing cap.



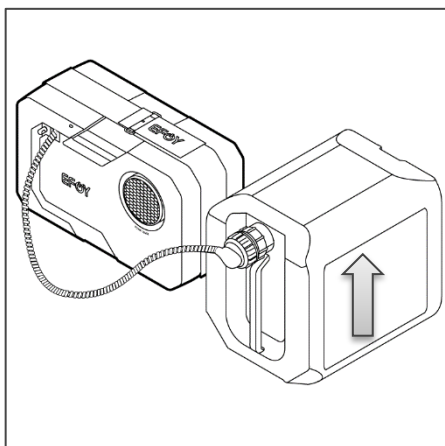
- ▶ Screw the fuel cartridge connection onto the EFOY fuel cartridge.

### 5.1.3 Connecting an M28 fuel cartridge

An M28 adapter is required for connection. The M28 fuel cartridge is not suitable for use in vehicles.



- ▶ Remove the sealing cap of the EFOY M28 fuel cartridge.
- ▶ Screw the M28 adapter (2) onto the EFOY M28 fuel cartridge (3).
- ▶ Screw the fuel cartridge connection (1) onto the M28 adapter (2).



The EFOY M28 fuel cartridge can also be used in a horizontal position. The safety valve and fuel cartridge connector must always be on the top side of the fuel cartridge when lying on its side.



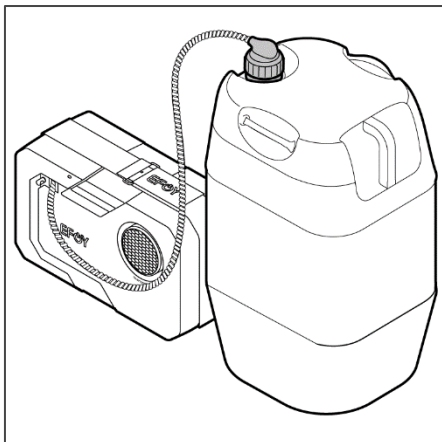
## CAUTION

If the fuel cartridge is inserted incorrectly, methanol can leak out.

- ▶ If the M28 fuel cartridge is used in a horizontal position, the safety valve and fuel cartridge connector must always be on the top side of the fuel cartridge when lying on its side.

### 5.1.4 Connecting the MT60 methanol tank

The **MT60** is not suitable for use in vehicles.



- ▶ Remove the sealing cap.
- ▶ Screw the fuel cartridge connection onto the EFOY methanol tank.

**MT60 tank:**

The MT60 tank must be installed and secured upright in stationary and mobile applications.

Installation must be inspected and approved for safety.

## 5.2 Cleaning the EFOY fuel cell



**WARNING**

Risk of injury from electric shock.

- ▶ Do not allow moisture to penetrate the EFOY fuel cell.

- ▶ Switch off the EFOY fuel cell (see [SECTION 4.2.4](#)).
- ▶ Unplug the charging cable (see [SECTION 7.1](#)).
- ▶ Slightly moisten a soft cloth with a mild cleaning agent.
- ▶ Clean the EFOY fuel cell with the cloth.
- ▶ Reconnect the charging cable.

## 5.3 Changing the battery or working on the battery

- ▶ Switch off the EFOY fuel cell (see [SECTION 4.2.4](#)).
- ▶ Unplug the charging cable (see [SECTION 7.1](#)).
- ▶ Do not reconnect the charging cable until you have changed the battery or are finished working on the battery.
- ▶ Set the new battery type using the EFOY app or the operating device.

## 5.4 Firmware update

When the EFOY fuel cell is connected to a router with an Internet connection, it searches for available firmware updates automatically. If a new update is available, the update is

automatically saved in the EFOY fuel cell. The update itself can only be carried out if charging is not in progress.




During the update process, ensure that the EFOY fuel cell is connected to the battery and that there is an Internet connection.

The firmware update can last several minutes.

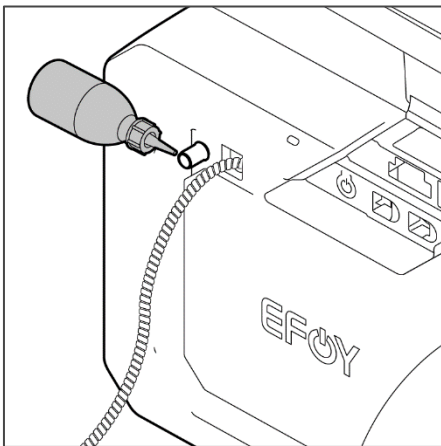
Check for firmware updates at least once a year with your sales partner, using the EFOY hotline or at [www.foy.com](http://www.foy.com).

## 5.5 Refilling EFOY service fluid

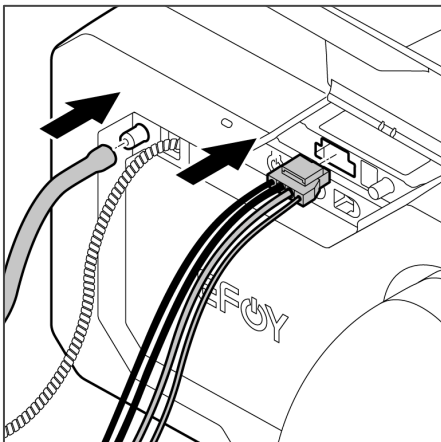
If the **Please refill service fluid** message appears in the operating panel or EFOY app, please follow the instructions.

 Use only original EFOY service fluid. Add a bottle of EFOY service fluid as needed. Do not add a second bottle of EFOY service fluid unless the message appears again. A bottle is only intended for one use.

- ▶ Switch off the EFOY fuel cell (see [SECTION 4.2.4](#)).
- ▶ Unplug the charging cable (see [SECTION 7.1](#)).
- ▶ Cut off the tip of the bottle with a clean pair of scissors.



- ▶ Disconnect the exhaust gas hose. Ensure that dirt or foreign bodies do not enter the filling hole.
- ▶ Guide the tip of the bottle into the exhaust gas opening.
- ▶ Slowly squeeze the entire contents into the hole.
- ▶ If EFOY service fluid spills over, wipe it up with a cloth.



- ▶ Reattach the exhaust gas hose.
- ▶ Reattach the charging cable. The EFOY is now in Automatic mode once again.
- ▶ Obtain a new bottle of EFOY service fluid from your specialist dealer.

## 6 Remedying malfunctions

### 6.1 Malfunctions indicated by messages

In case of interruptions and malfunctions, the status LED will flash or light up (see [SECTION 8](#)) and a message appears in the EFOY app and on the operating panel. There you will find instructions on how you can remedy the interruption/malfunction.

### 6.2 Malfunctions not indicated by messages

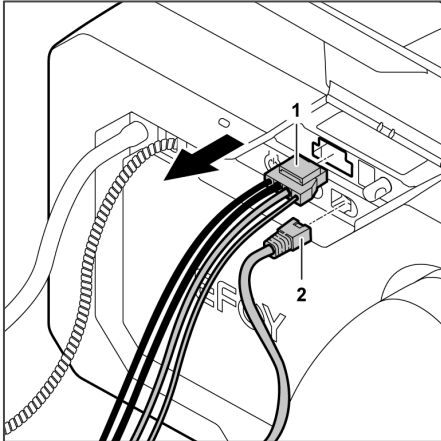
Error	Possible cause	Remedy
The EFOY fuel cell does not start automatically, and the LED is off.	The battery is connected incorrectly, defective or fully discharged.	<ul style="list-style-type: none"> <li>▶ Check the contacts, polarity and cable.</li> <li>▶ Connect a charged battery.</li> </ul>
	The EFOY fuel cell is in the Sleep operating mode.	<ul style="list-style-type: none"> <li>▶ Switch to the Automatic operating mode.</li> </ul>
The operating panel is not working.	The operating panel is not connected or is connected incorrectly.	<ul style="list-style-type: none"> <li>▶ Check the connection of the operating panel.</li> </ul>
The connection to the EFOY app is not working.	The Bluetooth adapter is not connected or is connected incorrectly.	<ul style="list-style-type: none"> <li>▶ Check the connection of the Bluetooth adapter.</li> </ul>
	The Bluetooth adapter is no longer communicating with the EFOY.	<ul style="list-style-type: none"> <li>▶ Disconnect the Bluetooth adapter and connect it again. If the LED is flashing, a connection can be established.</li> </ul>
The EFOY fuel cell repeatedly activates the battery protection function.	The battery is damaged, or too much energy has been drained.	<ul style="list-style-type: none"> <li>▶ Check the system.</li> <li>▶ Change the battery if necessary.</li> </ul>

Should errors occur repeatedly, contact the EFOY hotline.

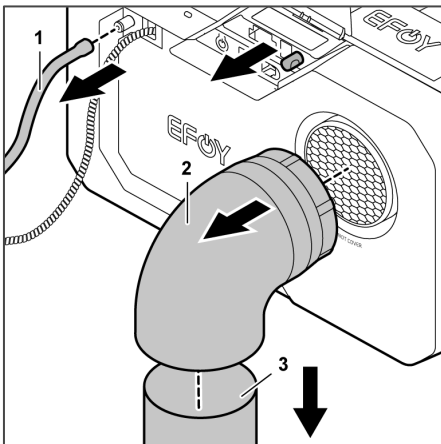
## 7 Shutting down and storing the EFOY fuel cell

### 7.1 Shutting down the EFOY fuel cell

- ▶ Switch off the EFOY fuel cell (see [SECTION 4.2.4](#)).
- ▶ Remove the EFOY fuel cartridge.



- ▶ Unplug the charging cable (1).
- ▶ Unplug the cable (2) for the operating panel or Bluetooth adapter.



- ▶ Disconnect the exhaust gas hose (1) and seal the exhaust gas opening with the protective cap. (See [SECTION 2.2](#))
- ▶ Disconnect the exhaust heat elbow (2) and the exhaust heat tube (3).
- ▶ Loosen the belt.
- ▶ Remove the EFOY fuel cell from the installation space.

### 7.2 Storing the EFOY fuel cell

- ▶ Always carry out the transportation protection procedure prior to storing the EFOY fuel cell to prevent it from freezing (see [SECTION 7.3](#)).
- ▶ The EFOY fuel cell may only be stored upright in a suitable box, e.g. the box it came in.



- ▶ Store the EFOY fuel cell in a cool and well-ventilated place which is over 1 °C.

**INFO**

If the EFOY fuel cell is exposed to temperatures below 1 °C without the battery connected and without a sufficiently filled EFOY fuel cartridge, there is a risk of frost damage.

- ▶ Allow the EFOY fuel cell to defrost for approx. 24 hours at room temperature before operating it.













### 7.3 Activating transportation protection/carrying out the transportation protection procedure




- ▶ **Using the EFOY app/operating device:** See fuel cell detail page. (See [SECTION 3.1](#))
- ▶ Follow the instructions.

The transportation protection procedure and successful activation of transportation protection are indicated by the LED (see [SECTION 8](#)).

## 8 LED status overview

The following table provides an overview of the various color codes of the LED status indicator of the EFOY fuel cell.

LED	Description	EFOY status	EFOY mode
	Off	Off	Sleep
 Green	Continuous	Deep discharge protection	Sleep
 Green	Flashing slowly (every 5 seconds)	Standby	Auto
 Green	Continuous	Charging and start-up phase	Auto
 Green	Flashing quickly (every 2 seconds)	Shutdown procedure	Auto/sleep
 Blue	Continuous	Antifreeze	Auto/sleep
 Yellow	Continuous	Fuel cartridge empty	Auto/sleep
 Red	Continuous	Malfunction	Auto/sleep
 Red	Flashing quickly (once per second)	Info	Auto/sleep
 White	Continuous	Antifreeze error	Auto/sleep
 Red/Green	Flashing in alternating fashion	Transportation protection active	Transportation protection
 White	Continuous	Transportation protection in progress	--

 White	Flashing quickly (four times per second)	Resetting to factory defaults	--
 Blue	Flashing quickly (two times per second)	Firmware update in progress	--
 Magenta	Continuous	Firmware update failed	--

## 9 Glossary

<b>Absorption time</b>	<b>Automatic operating mode:</b> If the switch-off voltage has been reached, but the switch-off current is not reached within the absorption time, the EFOY fuel cell switches off when the absorption time is reached.
<b>Antifreeze (EFOY state)</b>	The EFOY fuel cell is in operation in order to warm itself. The battery is charged if necessary. Antifreeze switches on automatically as soon as the temperature drops below +3 °C. For a five-month winter period in Central Europe, the EFOY fuel cell requires about 10 liters of methanol for antifreeze.
<b>Automatic (operating mode)</b>	The EFOY fuel cell switches on automatically when the battery voltage falls below the switch-on voltage (or switch-on threshold). The EFOY fuel cell charges the battery until the switch-off voltage (or switch-off threshold) is reached and then switches off.
<b>Battery protection (EFOY status)</b>	Battery protection is activated automatically if the battery voltage drops below the voltage for battery protection, even if the EFOY fuel cell is in Sleep mode (see <a href="#">SECTION 2.3</a> ).
<b>Charge now</b>	<b>Automatic and Off operating modes:</b> If the battery voltage is below the max. "charge now" voltage, the EFOY fuel cell can be switched on regardless of the operating mode. The EFOY fuel cell charges the battery until the switch-off voltage is reached. The fuel cell is then in the Automatic operating mode.
<b>Charging (EFOY state)</b>	The EFOY fuel cell charges the battery.
<b>EFOY state</b>	The EFOY state is the respective phase in which the EFOY fuel cell is currently found. The operating phases are: charging, standby, off, shutdown procedure, battery protection, antifreeze, transportation protection, malfunction and information.
<b>Malfunction (EFOY state)</b>	There is a malfunction, and the corresponding information is displayed.
<b>Max. charging duration</b>	If the switch-off voltage is not reached within the max. charging duration, the EFOY fuel cell switches off.
<b>Min. charging duration</b>	The EFOY fuel cell calculates the average duration of a charging cycle. If the value drops below the set value, this indicates a defective battery or a battery which is too old or too small. It could also indicate incorrectly set battery parameters. Persistently short charging cycles can cause damage to the EFOY fuel cell or battery.
<b>Mode</b>	The operating mode determines the behavior of the EFOY fuel cell. There are two operating modes: Automatic and Sleep. The recommended operating mode is Automatic.

---

Off (EFOY status)	<b>Off operating mode:</b> The switch-on voltage (switch-on threshold) is not taken into account. To protect the fuel cell and battery, antifreeze and battery protection are activated if necessary.
Shutdown procedure (EFOY state)	<b>Off operating mode:</b> The EFOY fuel cell has been switched to the Off operating mode. Charging is stopped. The switch-off duration depends on the switch-off current and absorption time.
Sleep (operating mode)	The EFOY fuel cell is switched off. The switch-on voltage is not taken into account. To protect the fuel cell and battery, antifreeze and battery protection are activated if necessary. If you switch the EFOY fuel cell to Sleep mode before the minimum charging duration has been reached (see <a href="#">SECTION 2.3</a> ), it continues running for the corresponding amount of time until the charging cycle is complete. Leave the fuel cartridge and battery connected during the shutdown procedure.
Standby (EFOY state)	<b>Automatic operating mode:</b> The EFOY fuel cell is in Standby mode and monitors the battery voltage or charge level. The battery is sufficiently charged.
Start phase (EFOY state)	<b>Automatic and Off operating modes:</b> The EFOY fuel cell is in a start-up phase in which the device is warming up when charging begins. Once the start-up phase is complete, the EFOY fuel cell reaches its full output power level.
Switch-off current	<b>Automatic operating mode:</b> When the switch-off voltage is reached, the charging current is reduced. When the charging current drops below the set switch-off current, the EFOY fuel cell switches off. The switch-off duration depends on the absorption time, in addition to the switch-off current.
Switch-off threshold	<b>Automatic operating mode:</b> <b>Only pertains to smart batteries (see “Switch-off voltage” for standard batteries).</b> The EFOY fuel cell charges the battery until the charge level reaches the maximum charge level and then switches off (see <a href="#">SECTION 2.3</a> ).
Switch-off voltage	<b>Automatic operating mode:</b> The EFOY fuel cell charges the battery until the battery voltage reaches the switch-off voltage and then switches off (see <a href="#">SECTION 2.3</a> ). The switch-off duration depends on the switch-off current and absorption time.
Switch-on delay	<b>Automatic operating mode:</b> If the battery voltage drops below the switch-on voltage for the duration of the switch-on delay, the EFOY fuel cells start automatically.
Switch-on threshold	<b>Automatic operating mode:</b> <b>Only pertains to smart batteries (see “Switch-on voltage” for standard batteries).</b>

The EFOY fuel cell switches on automatically if the charge level drops below the maximum discharge level (see [SECTION 2.3](#)).

**Switch-on voltage**

**Automatic operating mode:**

The EFOY fuel cell switches on automatically when the battery voltage falls below the switch-on voltage (or switch-on threshold) (see [SECTION 2.3](#)). The switch-on delay is taken into account here.

**Transportation protection (EFOY state)**

The EFOY fuel cell is delivered with transportation protection activated. To protect against freezing, there is no water in any critical components. Settings for the battery and fuel cartridge can be made. Transportation protection must be deactivated in order to operate the unit.

**Transportation protection procedure**

To activate transportation protection, water must be removed from critical components of the EFOY. This occurs as part of the transportation protection procedure. Follow the instructions on the operating panel or app. If the transportation protection procedure has been completed successfully, the EFOY fuel cell is in the transportation protection operating phase.

## 10 Software licenses of third-party suppliers used

You can download extensive use of all third-party supplier software licenses at <https://www.my-efoy.com/third-party-licenses>. All specified license conditions, disclaimers and copyright information is available for download here.