

Firmware: 17.15

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No changes between FW 17.15 in comparison to the FW 17.13

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Command: ?

SFC>?

Description:

Help menu for public commands.

Response:

command	description
?	display command overview
BATTERY	select battery type_
BATTERYPROTECTION	control battery protection
BUTTON	software control of device
CARTRIDGE	set/view connected fuel cartridges/DuoCartSwitches
CONFIG	set customized operation parameters
DEFAULT	apply default operation parameters
ERROR	show ten most recent errors
FUELGAUGE	enable/disable fuel gauge
GET	get customized operation parameter
HYBRID	switch the device from automatic into hybrid mode for 15s
LANGUAGE	set language for panel
LIMITS	show limits of operation parameters
LOCKED	lock control contacts
LOG	show system status
MODBUS	configuration of software protocol
REMOTE	remote control via software interface
RESET	restart the device
SERIAL	show the device's serial numbers
SET	set customized operation parameter
SFC	show current operation state
STDVALUE	show default values of operation parameters
SYSTEM	display system operation information
VALUE	show current values of operation parameters
VER	show version of firmware

Command: BATTERY

SFC>BATTERY <type|list>

Description:

Set or view type of battery.

Possible transmission parameter:

Parameter	Description
LIST	List of adjustable battery types
#	Choose battery type # (# = 0, 1, 2, 3,4).
clearmonitors	Reset of charge cycle monitor values

Example:

```
SFC>battery
3: LiFePO4
```

```
SFC>battery 0
0: Lead acid
SFC>battery 3
3: LiFePO4
SFC>battery 4
4: EFOY GO!
SFC>battery list
0: Lead acid
1: Lead gel
2: AGM
3: LiFePO4
4: EFOY GO!
```

```
SFC>battery ?
select battery type
arguments: [0 | 1 | 2 | 3 | 4 | list | clearmonitors]
SFC>
```

Command: BATTERYPROTECTION

SFC>BATTERYPROTECTION <Parameter>

Description:

Deactivation or activation of deep discharge protection.

Possible transmission parameter:

Parameter	Description
ON	Activation of deep discharge protection
OFF	Deactivation of deep discharge protection

Response:

Response	Description
ON	Activation of deep discharge protection
OFF	Deactivation of deep discharge protection
no valid parameter	No or no valid parameter entered

Command: BUTTON

SFC>BUTTON <Parameter>

Description:

Sets operating mode via serial port.

Possible transmission parameter:

Parameter	Description
AUTO	Button „Auto“
ON	Turn on fuel cell
OFF	Shut down fuel cell

Response:

Response	Description
OK	Parameter accepted and executed
no valid parameter	No or no valid parameter entered

Command: CARTRIDGE

```
SFC>CARTRIDGE [port:(OFF | M5 | M10 | M28 | MT60 | DCS | SELECT | RESET)]
```

Description:

Configuration of connected fuel cartridges and/or DuoCartSwitch DCS1 and current information. Fuel cartridge connector 1 is located left; fuel cartridge connector 2 is located right at interface side view (only for EFOY Pro Duo)

Response (EFOY Pro):

```
SFC>CARTRIDGE 1:M10
-> M10 (25%) @ #1
SFC>CARTRIDGE 1:DCS
-> M10 (25%) @ #1.1
    M10 (100%) @ #1.2
SFC>CARTRIDGE 1.1:M5
-> M5 (50%) @ #1.1
    M10 (100%) @ #1.2
SFC>CARTRIDGE 1.2:M5
-> M5 (50%) @ #1.1
    M5 (100%) @ #1.2
SFC>CARTRIDGE 1.1:RESET
-> M10 (100%) @ #1.1
    M10 (100%) @ #1.2
SFC>CARTRIDGE 1.2:SELECT
    M10 (100%) @ #1.1
-> M10 (100%) @ #1.2
SFC>
```

Response (only EFOY Pro Duo):

```
SFC>CARTRIDGE 2:OFF
-> M10 (25%) @ #1.1
    M10 (100%) @ #1.2
SFC>CARTRIDGE 2:DCS
-> M10 (25%) @ #1.1
    M10 (100%) @ #1.2
    M10 (100%) @ #2.1
    M10 (100%) @ #2.2
SFC>CARTRIDGE 1.1:M5
-> M5 (50%) @ #1.1
    M10 (100%) @ #1.2
    M10 (100%) @ #2.1
    M10 (100%) @ #2.2
SFC>CARTRIDGE 2:OFF
-> M5 (50%) @ #1.1
    M10 (100%) @ #1.2
SFC>CARTRIDGE 1.1:RESET
-> M5 (100%) @ #1.1
    M10 (100%) @ #1.2
SFC>CARTRIDGE 1.2:SELECT
    M5 (100%) @ #1.1
-> M10 (100%) @ #1.2
SFC>
```

The individual arguments:

port	Describes the fuel cartridge connector: 1: EFOY- fuel cartridge connector 1 1.1: DCS1- fuel cartridge connector 1 1.2: DCS1- fuel cartridge connector 2 2: EFOY- fuel cartridge connector 2 (only Pro Duo) 2.1: DCS2- fuel cartridge connector 1 (only Pro Duo) 2.2: DCS2- fuel cartridge connector 2 (only Pro Duo)
OFF	Only EFOY Pro Duo: deactivates an EFOY-fuel cartridge connector. Only one connector can be deactivated.
M5 M10 M28 MT60	Selects the connected fuel cartridge type at the fuel cartridge connector.
DCS	Configuration when using a DuoCartSwitch DCS1 at the selected fuel cartridge connector. Two DuoCartSwitch DCS1 connectable to EFOY Pro Duo.
RESET	Resets the consumption counter at selected fuel cartridge to 0.
SELECT	Activates the selected fuel cartridge connector.

Command: CONFIG

SFC>CONFIG

Description:

Permits modification of variable operating parameters. This command is conducted in dialogue, so there are no interim results.

EFOY sends only the values of the set battery type and recognized battery voltage.

Response (Lead acid, lead gel, AGM @ 12 V):

switch on voltage @ 12V (actual 12300mV, min 11000mV, max 13000mV)?
switch off voltage @ 12V (actual 14200mV, min 13500mV, max 14700mV)?
switch off current @ 12V (actual 4000mA, min 2000mA, max 10000mA)?
battery protection @ 12V (actual 11200mV, min 10500mV, max 12000mV)?
charge voltage (hybrid) @ 12V (actual 14700mV, min 13500mV, max 15500mV)?
altitude up to (actual 1500m, min 0m, max 2000m)?
full charge duration (actual 180min, min 0min, max 300min)?
reaction time (actual 60s, min 2s, max 300s)?
maximum output time (actual 24h, min 2h, max 120h)?
minimum charge time (actual 30min, min 30min, max 180min)?
switch on voltage @ 12V: 12.3V
switch off voltage @ 12V: 14.2V
switch off current @ 12V: 4.0A
battery protection @ 12V: 11.2V
charge voltage (hybrid) @ 12V: 14.7V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 24.0h
minimum charge time: 30.0min

Response (Lead acid, lead gel, AGM @ 24 V):

switch on voltage @ 24V (actual 24600mV, min 22000mV, max 26000mV)?
switch off voltage @ 24V (actual 28400mV, min 27000mV, max 29400mV)?
switch off current @ 24V (actual 2000mA, min 1000mA, max 5000mA)?
battery protection @ 24V (actual 22400mV, min 21000mV, max 24000mV)?
charge voltage (hybrid) @ 24V (actual 29400mV, min 27000mV, max 31000mV)?
altitude up to (actual 1500m, min 0m, max 2000m)?
full charge duration (actual 180min, min 0min, max 300min)?
reaction time (actual 60s, min 2s, max 300s)?
maximum output time (actual 24h, min 2h, max 120h)?
minimum charge time (actual 30min, min 30min, max 180min)?
switch on voltage @ 24V: 24.6V
switch off voltage @ 24V: 28.4V
switch off current @ 24V: 2.0A
battery protection @ 24V: 22.4V
charge voltage (hybrid) @ 24V: 29.4V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 24.0h
minimum charge time: 30.0min

Response (LiFePO4 @ 12 V):

switch on voltage @ 12V (actual 12600mV, min 12000mV, max 13400mV)?
switch off voltage @ 12V (actual 14500mV, min 13800mV, max 14600mV)?
switch off current @ 12V (actual 4000mA, min 2000mA, max 10000mA)?
battery protection @ 12V (actual 11000mV, min 10500mV, max 12500mV)?
charge voltage (hybrid) @ 12V (actual 14600mV, min 13800mV, max 15500mV)?

altitude up to (actual 1500m, min 0m, max 2000m)?
full charge duration (actual 180min, min 0min, max 300min)?
reaction time (actual 60s, min 2s, max 300s)?
maximum output time (actual 48h, min 2h, max 120h)?
minimum charge time (actual 30min, min 30min, max 180min)?
switch on voltage @ 12V: 12.6V
switch off voltage @ 12V: 14.5V
switch off current @ 12V: 4.0A
battery protection @ 12V: 11.0V
charge voltage (hybrid) @ 12V: 14.6V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 48.0h
minimum charge time: 30.0min

Response (LiFePO4 @ 24 V):

switch on voltage @ 24V (actual 25200mV, min 24000mV, max 26800mV)?
switch off voltage @ 24V (actual 29000mV, min 27600mV, max 29200mV)?
switch off current @ 24V (actual 2000mA, min 1000mA, max 5000mA)?
battery protection @ 24V (actual 22000mV, min 21000mV, max 25000mV)?
charge voltage (hybrid) @ 24V (actual 29200mV, min 27600mV, max 31000mV)?
altitude up to (actual 1500m, min 0m, max 2000m)?
full charge duration (actual 180min, min 0min, max 300min)?
reaction time (actual 60s, min 2s, max 300s)?
maximum output time (actual 48h, min 2h, max 120h)?
minimum charge time (actual 30min, min 30min, max 180min)?
switch on voltage @ 24V: 25.2V
switch off voltage @ 24V: 29.0V
switch off current @ 24V: 2.0A
battery protection @ 24V: 22.0V
charge voltage (hybrid) @ 24V: 29.2V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 48.0h
minimum charge time: 30.0min

Response (EFOY GO!):

switch on voltage @ 12V (actual 12400mV, min 12000mV, max 13400mV)?
switch off voltage @ 12V (actual 14400mV, min 13800mV, max 14600mV)?
switch off current @ 12V (actual 500mA, min 500mA, max 1000mA)?
battery protection @ 12V (actual 11200mV, min 10500mV, max 12500mV)?
charge voltage (hybrid) @ 12V (actual 14400mV, min 13800mV, max 14600mV)?
altitude up to (actual 1500m, min 0m, max 2000m)?
full charge duration (actual 180min, min 0min, max 300min)?
reaction time (actual 60s, min 2s, max 300s)?
maximum output time @ 12V (actual 24h, min 2h, max 120h)?
switch on voltage @ 12V: 12.4V
switch off voltage @ 12V: 14.4V
switch off current @ 12V: 0.5A
battery protection @ 12V: 11.2V
charge voltage (hybrid) @ 12V: 14.4V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time @ 12V: 24.0h
charge time: 30.0min'

Example:

In the dialogue shown above the „reaction time“ has been changed from 60s to 90s. If a parameter is not valid it will be ignored and keeps the setting from before.

Description of variable parameters:

switch on voltage:	Fuel cell starts at this battery voltage
switch off voltage:	Fuel cell turns off at this battery voltage (charge end voltage)
switch off current:	Fuel cell will shut off once current dips below this level.
battery protection	Switch on voltage for deep discharge protection in operation mode OFF.
charge voltage (hybrid):	Max. battery voltage in Hybrid mode
altitude up to	Maximum altitude of the installation
full charge duration:	An additional switch-off criteria for the EFOY unit when the switch-off current won't be achieved in adjusted time
reaction time	Time to elapse while the battery voltage is below switch on voltage.
maximum output time	If the switch-off criteria, voltage and current, have not been satisfied, the EFOY unit will shut off after generating the number of hours.
minimum charge time	Minimum duration of one charge cycle

Command: DEFAULT

SFC>DEFAULT

Description:

Resets the variable parameters to factory / standard settings

EFOY sends only the values of the set battery type and recognized battery voltage.

Response (Lead acid, lead gel, AGM @ 12 V):

switch on voltage @ 12V: 12.3V
switch off voltage @ 12V: 14.2V
switch off current @ 12V: 4.0A
battery protection @ 12V: 11.2V
charge voltage (hybrid) @ 12V: 14.7V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 24.0h
minimum charge time: 30.0min

Response (Lead acid, lead gel, AGM @ 24 V):

switch on voltage @ 24V: 24.6V
switch off voltage @ 24V: 28.4V
switch off current @ 24V: 2.0A
battery protection @ 24V: 22.4V
charge voltage (hybrid) @ 24V: 29.4V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 24.0h
minimum charge time: 30.0min

Response (LiFePO4 @ 12 V):

switch on voltage @ 12V: 12.6V
switch off voltage @ 12V: 14.5V
switch off current @ 12V: 4.0A
battery protection @ 12V: 11.0V
charge voltage (hybrid) @ 12V: 14.6V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 48.0h
minimum charge time: 30.0min

Response (LiFePO4 @ 24 V):

switch on voltage @ 24V: 25.2V
switch off voltage @ 24V: 29.0V
switch off current @ 24V: 2.0A
battery protection @ 24V: 22.0V
charge voltage (hybrid) @ 24V: 29.2V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 48.0h
minimum charge time: 30.0min

Response (EFOY GO!):

switch on voltage: 12.4V
 switch off voltage: 14.4V
 switch off current: 0.5A
 battery protection: 11.2V
 charge voltage (hybrid): 14.4V
 altitude up to: 1500.0m
 full charge duration: 180.0min
 reaction time: 60.0s
 maximum output time: 24.0h
 minimum charge time: 30.0min

Variable parameters:

switch on voltage:	Fuel cell starts at this battery voltage
switch off voltage:	Fuel cell turns off at this battery voltage (charge end voltage)
switch off current:	Fuel cell will shut off once current dips below this level.
battery protection	Switch on voltage for deep discharge protection in operation mode OFF.
charge voltage (hybrid):	Max. battery voltage in Hybrid mode
altitude up to	Altitude at installation
full charge duration:	An additional switch-off criteria for the EFOY unit when the switch-off current won't be achieved in adjusted time.
reaction time	Time to elapse while the battery voltage is below switch on voltage.
maximum output time	If the switch-off criteria, voltage and current, have not been satisfied, the EFOY unit will shut off after generating the number of hours.
minimum charge time	Minimum duration of one charge cycle

Command: ERROR

SFC>ERROR

Description:

Shows the ten most recent errors in chronological order, starting with the latest error.

Response:

```

Nr    42 Err 184 Wert 0 Ubat 12.0V Ust 11.8V Iaus -0.1A Ist 0.0A Tst 70C Tint 27
C Twt 55C FuellSt 72 StBtrb  92h SysTime 2010-09-14 09:15:00
Nr    41 Err 184 Wert 0 Ubat 11.8V Ust 12.6V Iaus -0.1A Ist 0.0A Tst 71C Tint 27
C Twt 66C FuellSt 75 StBtrb  75h SysTime 2010-09-13 15:57:02
Nr    40 Err 184 Wert 0 Ubat 12.2V Ust 11.8V Iaus -0.1A Ist 0.0A Tst 73C Tint 29
C Twt 51C FuellSt 74 StBtrb  71h SysTime 2010-09-10 14:46:10
Nr    39 Err 141 Wert 2 Ubat 13.1V Ust 11.1V Iaus 7.1A Ist 10.0A Tst 75C Tint 41
C Twt 68C FuellSt 57 StBtrb  71h SysTime 2010-09-10 14:17:06
Nr    38 Err 184 Wert 0 Ubat 11.7V Ust 11.7V Iaus -0.1A Ist 0.0A Tst 68C Tint 28
C Twt 50C FuellSt 88 StBtrb  69h SysTime 2010-09-10 13:03:40
Nr    37 Err 184 Wert 0 Ubat 11.8V Ust 11.7V Iaus -0.1A Ist 0.0A Tst 76C Tint 28
C Twt 51C FuellSt 73 StBtrb  69h SysTime 2010-09-10 12:09:38
Nr    36 Err 184 Wert 0 Ubat 11.8V Ust 11.8V Iaus -0.1A Ist 0.0A Tst 75C Tint 29
C Twt 55C FuellSt 90 StBtrb  69h SysTime 2010-09-10 11:53:06
Nr    35 Err 184 Wert 0 Ubat 11.8V Ust 12.5V Iaus -0.1A Ist 0.0A Tst 73C Tint 28
C Twt 48C FuellSt 80 StBtrb  68h SysTime 2010-09-10 11:11:44
Nr    34 Err 184 Wert 0 Ubat 11.8V Ust 12.5V Iaus -0.1A Ist 0.0A Tst 71C Tint 28
C Twt 48C FuellSt 71 StBtrb  68h SysTime 2010-09-10 11:02:34
Nr    33 Err 184 Wert 0 Ubat 11.9V Ust 12.0V Iaus -0.1A Ist 0.0A Tst 72C Tint 28
C Twt 52C FuellSt 70 StBtrb  68h SysTime 2010-09-10 10:59:36
SFC>
    
```

Value specification	Description
Nr	Sequential error number
Err	Error code
Wert	Error value
Ubat	Battery voltage
Ust	Stack voltage
Iaus	Output current
Ist	Stack current
Tst	Stack temperature
Twt	Heat exchanger temperature
FuellSt	Filling level intermediate tank
StBtrb	Stack operating hours
SysTime	System time

Command: FUELGAUGE

SFC>FUELGAUGE {ON | OFF}

Description:

Controls the fuel cartridge level gauge at the operation panel OP2.

Response:

```
SFC>fuelgauge ON
ON
SFC>
```

Value specification:

ON	Fuel cartridge level gauge in the operation control device activated.
OFF	Fuel cartridge level gauge in the operation control device deactivated.

Command: GET

```
SFC>GET [LIST|id[:VAL|MIN|MAX|STD]]
```

Description:

Shows details of the variable parameters. With this command the same values can be displayed as with commands VALUES, LIMITS and STDVALUE.

EFOY sends only the values of the set battery type and recognized battery voltage.

Response (Lead acid, lead gel, AGM @ 12 V):

```
ID: 018,'switch on voltage @ 12V','mV'  
ID: 019,'switch off voltage @ 12V','mV'  
ID: 020,'switch off current @ 12V','mA'  
ID: 046,'battery protection @ 12V','mV'  
ID: 074,'charge voltage (hybrid) @ 12V','mV'  
ID: 024,'altitude up to','m'  
ID: 045,'full charge duration','min'  
ID: 017,'reaction time','s'  
ID: 049,'maximum output time','h'  
ID: 089,'minimum charge time','min'
```

Response (Lead acid, lead gel, AGM @ 24 V):

```
ID: 021,'switch on voltage @ 24V','mV'  
ID: 022,'switch off voltage @ 24V','mV'  
ID: 023,'switch off current @ 24V','mA'  
ID: 047,'battery protection @ 24V','mV'  
ID: 075,'charge voltage (hybrid) @ 24V','mV'  
ID: 024,'altitude up to','m'  
ID: 045,'full charge duration','min'  
ID: 017,'reaction time','s'  
ID: 049,'maximum output time','h'  
ID: 089,'minimum charge time','min'
```

Response (LiFePO4 @ 12 V):

```
ID: 025,'switch on voltage @ 12V','mV'  
ID: 026,'switch off voltage @ 12V','mV'  
ID: 027,'switch off current @ 12V','mA'  
ID: 048,'battery protection @ 12V','mV'  
ID: 076,'charge voltage (hybrid) @ 12V','mV'  
ID: 024,'altitude up to','m'  
ID: 045,'full charge duration','min'  
ID: 017,'reaction time','s'  
ID: 077,'maximum output time','h'  
ID: 089,'minimum charge time','min'
```

Response (LiFePO4 @ 24 V):

```
ID: 078,'switch on voltage @ 24V','mV'  
ID: 079,'switch off voltage @ 24V','mV'  
ID: 080,'switch off current @ 24V','mA'  
ID: 081,'battery protection @ 24V','mV'  
ID: 082,'charge voltage (hybrid) @ 24V','mV'  
ID: 024,'altitude up to','m'  
ID: 045,'full charge duration','min'  
ID: 017,'reaction time','s'  
ID: 077,'maximum output time','h'  
ID: 089,'minimum charge time','min'
```

Response (EFOY GO!):

```
ID: 029,'switch on voltage','mV'
```

ID: 030, 'switch off voltage', 'mV'
 ID: 031, 'switch off current', 'mA'
 ID: 014, 'battery protection', 'mV'
 ID: 015, 'charge voltage (hybrid)', 'mV'
 ID: 024, 'altitude up to', 'm'
 ID: 045, 'full charge duration', 'min'
 ID: 017, 'reaction time', 's'
 ID: 003, 'maximum output time', 'h'
 ID: 089, 'minimum charge time', 'min'

The parameters in detail (example: ID 018):

GET LIST	Lists all variable parameters of the fuel cell.
GET 018:VAL or GET 018	Displays the current value of the parameter 'switch on voltage @ 12V' in mV.
GET 018:STD	Displays the standard value of the parameter 'switch on voltage @ 12V' in mV
GET 018:MIN	Displays the minimum value of the parameter 'switch on voltage @ 12V' in mV.
GET 018:MAX	Displays the maximum value of the parameter 'switch on voltage @ 12V' in mV.

Command: HYBRID

```
SFC>HYBRID ["]Parameter["]
```

Description:

Switch the device from automatic into hybrid mode for 15s. If the fuel cell is not in operation mode „automatic“ (e.g. On, Off, Error) this command has no effect. The command has to be triggered continuously to keep the fuel cell in the hybrid mode.

Possible transmission parameter:

A transmission parameter is optional; it is displayed in the operating panel display in the first line. If there are spaces in the text, the text must be typed in quotation marks.

Example:

```
SFC>HYBRID "Solar Hybrid"
```

or

```
SFC>HYBRID SolarHybrid
```

Response:

Same as [Command SFC](#).

Command: LANGUAGE

SFC>LANGUAGE <Parameter>

Description:

Changes the language on the operating panel or displays the language currently selected.

Possible transmission parameter:

Parameter	Description
SHOW	Shows all available languages
<Language>	Sets the selected language
<no parameter>	Displays the actual language

Response:

Response	Description
OK	Language accepted and adopted
DEUTSCH (Deutsch) ENGLISH (English) ITALIANO (Italiano) ESPAÑOL (Español) FRANCAIS (Français) NEDERLANDS (Nederlands)	List of all available languages after SHOW
<Language>	Displays the actual language in operating panel
no valid parameter	No valid parameter entered

Command: LIMITS

SFC>LANGUAGE <Parameter>

Description:

Returns the limits of the variable parameters.

EFOY sends only the values of the set battery type and recognized battery voltage.

Response (Lead acid, Lead gel, AGM @ 12 V)

switch on voltage @ 12 V: min 11.0V max 13.0V
switch off voltage @ 12V: min 13.5 max 14.7V
switch off current @ 12V: min 2.0A max 10.0A
battery protection @ 12V: min 10.5V max 12.0V
charge voltage (hybrid) @ 12V: min 13.5V max 15.5V
altitude up to: min 0.0m max 2000.0m
full charge duration: min 0.0min max 300.0min
reaction time: min 2.0s max 300.0s
maximum output time: min 2.0h max 120.0h
minimum charge time: min 30.0min max 180.0min

Response (Lead acid, Lead gel, AGM @ 24 V)

switch on voltage @ 24V: min 22.0V max 26.0V
switch off voltage @ 24V: min 27.0V max 29.4V
switch off current @ 24V: min 1.0A max 5.0A
battery protection @ 24V: min 21.0V max 24.0V
charge voltage (hybrid) @ 24V: min 27.0V max 31.0V
altitude up to: min 0.0m max 2000.0m
full charge duration: min 0.0min max 300.0min
reaction time: min 2.0s max 300.0s
maximum output time: min 2.0h max 120.0h
minimum charge time: min 30.0min max 180.0min

Response (LiFePO4 @ 12 V):

switch on voltage @ 12V: min 12.0V max 13.4V
switch off voltage @ 12V: min 13.8V max 14.6V
switch off current @ 12V: min 2.0A max 10.0A
battery protection @ 12V: min 10.5V max 12.5V
charge voltage (hybrid) @ 12V: min 13.8V max 15.5V
altitude up to: min 0.0m max 2000.0m
full charge duration: min 0.0min max 300.0min
reaction time: min 2.0s max 300.0s
maximum output time: min 2.0h max 120.0h
minimum charge time: min 30.0min max 180.0min

Response (LiFePO4 @ 24 V):

switch on voltage @ 24V: min 24.0V max 26.8V
 switch off voltage @ 24V: min 27.6V max 29.2V
 switch off current @ 24V: min 1.0A max 5.0A
 battery protection @ 24V: min 21.0V max 25.0V
 charge voltage (hybrid) @ 24V: min 27.6V max 31.0V
 altitude up to: min 0.0m max 2000.0m
 full charge duration: min 0.0min max 300.0min
 reaction time: min 2.0s max 300.0s
 maximum output time: min 2.0h max 120.0h
 minimum charge time: min 30.0min max 180.0min

Response (EFOY GO!):

switch on voltage: min 12.0V max 13.4V
 switch off voltage: min 13.8V max 14.6V
 switch off current: min 0.5A max 10.0A
 battery protection: min 10.5V max 12.5V
 charge voltage (hybrid): min 13.8V max 14.6V
 altitude up to: min 0.0m max 2000.0m
 full charge duration: min 0.0min max 300.0min
 reaction time: min 2.0s max 300.0s
 maximum output time: min 2.0h max 120.0h
 minimum charge time: min 30.0min max 180.0min

Variable parameters:

switch on voltage:	Fuel cell starts at this battery voltage
switch off voltage:	Fuel cell turns off at this battery voltage (charge end voltage)
switch off current:	Fuel cell will shut off once current dips below this level
battery protection	Switch on voltage for deep discharge protection in operation mode OFF.
charge voltage (hybrid):	Max. battery voltage in Hybrid mode
altitude up to	Maximum altitude to installation
full charge duration	An additional switch-off criteria for the EFOY unit when the switch-off current won't be achieved in adjusted time
reaction time	Time to elapse while the battery voltage is below switch on voltage.
maximum output time	If the switch-off criteria, voltage and current, have not been satisfied, the EFOY unit will shut off after generating the number of hours.
minimum charge time	Minimum duration of one charge cycle

Command: LOCKED

SFC>LOCKED <Parameter>

Description:

Changes or indicates the current status of the software lock. In factory settings the software lock is active, so the fuel cell is prevented against external signals like remote, hybrid or cluster controller. If there is a signal during active software lock, a lock symbol is displayed in the operating panel display in the bottom right. If the software lock is deactivated, an open lock is displayed. If there is a signal of a cluster controller, a cluster symbol is displayed.

Possible transmission parameter:

Parameter	Description
<no parameter>	Shows actual setting
ON	Activates software lock
OFF	Deactivates software lock

Response:

Response	Description
ON	Software lock is active
OFF	Software lock is not active
OK	Parameter accepted and executed
no valid parameter	No valid parameter entered

Command: LOG

SFC>LOG

Description:

The LOG-Command views the operating status. It describes several system parameters in the current point of time. There are differences regarding the output of the LOG-Command depending on the firmware version.

The command is important for SFC to give support and troubleshooting.

Example:

```
Tst 41.6C  Tint 26.8C  Twt 32.0C  Tdcdc 27.8C  Tpcb 30.7C  Tres 26.8C  Taux 25.5
C  Ubat 12.77V  Uaus 12.83V  Uklemm 12.83V  Uper 13.60V  UperIn 12.76V  Ust 1.73
V  Uzell 61mV  ULF1 0.0V  Uref 2.47V  Ubb 3.20V  IntSteiu 0.0000n  Iaus -0.07A
Iper 0.01A  Ist 0.00A  Pst 0.0W  Pper 0.1W  FuellSt 93.3n  LastError 0n  Error 0
n  StBtrb 359.38h  SysBtrb 853.10h  PcStack 0n  PcAux 0n  ResF 0n  DHV 122.00n
DC-DC 0.00%  AdW 0n  SysTime 20110409.173417n
```

Display	Description
Tst	Stack temperature
Tint	Internal temperature = Reservoir temperature
Twt	Heat Exchanger temperature
Tdcdc	Converter temperature
Tpcb	PCB temperature
Tres	Reservoir temperature
Taux	Not in use
Ubat	Battery voltage
Uaus	Output voltage at
Uklemm	<i>Internal parameter</i>
Uper	<i>Internal parameter</i>
UperIn	<i>Internal parameter</i>
Ust	<i>Internal parameter</i>
Uzell	<i>Internal parameter</i>
ULF1	<i>Internal parameter</i>
Uref	<i>Internal parameter</i>
Ubb	<i>Coin cell voltage</i>
IntSteIU	<i>Internal parameter</i>
Iaus	<i>Charging current</i>
Iper	<i>Internal parameter</i>
Ist	<i>Internal parameter</i>
Pst	<i>Stack power</i>
Display	Description
Pper	<i>Periphery consumption</i>
FuellSt	<i>Reservoir Fluid level</i>
LastError	<i>List of occurred errors</i>
Error	<i>Current error</i>
StBtrb	<i>Operating hours of the fuel cell</i>
SysBtrb	<i>System operating hours</i>
PcStack	<i>Internal parameter</i>
PcMedien	<i>Internal parameter</i>
ResF	<i>Internal parameter</i>
DHV	<i>Internal parameter</i>
DC-DC	<i>Internal parameter</i>
AdW	<i>Internal parameter</i>
FS	<i>Fuel cartridge sensor status</i>
SysTime	<i>System time</i>

Command: MODBUS

SFC>MODBUS <Parameter>

Description:

Changes communication protocol to MODBUS RTU. WARNING! If MODBUS RTU communication is activated, the communication via HyperTerminal is blocked until the protocol is set back to SIO / clear text.

Possible transmission parameter:

Parameter	Description
?	Shows possible configurations
ON	Activates MODBUS RTU communication

```
SFC> MODBUS ON
-No respond, protocol changed to MODBUS RTU-
```

```
SFC>MODBUS ?
set ModBus Parameters or enable ModBus
arguments: [ON | CONFIG {1-4|?} | ADDRESS {1-247|?}]
```

Command: MODBUS ADDRESS

SFC>MODBUS ADDRESS <Parameter>

Description:

Set an address for the EFOY Pro unit before implementation into a RS 485 network. Addresses between 1 and 247 can be set.

Possible transmission parameter:

Parameter	Description
MODBUS ADDRESS	Shows possible addresses (1 - 247)
MODBUS ADDRESS ?	Shows possible addresses (1 - 247)
MODBUS ADDRESS #	Sets address to value # (# = 1 - 247)

Example:

```
SFC> MODBUS ADDRESS
MODBUS ADDRESS [1 - 247]
SFC>
```

```
SFC> MODBUS ADDRESS ?
MODBUS ADDRESS [1 - 247]
SFC>
```

```
SFC> MODBUS ADDRESS 32
32
SFC>
```


Command: MODBUS CONFIG

SFC>MODBUS CONFIG <Parameter>

Description:

Shows and changes settings of MODBUS configuration like parity and stop bits.

Possible transmission parameter:

Parameter	Description
MODBUS CONFIG	Shows actual configuration
MODBUS CONFIG ?	Shows possible configurations
MODBUS CONFIG #	Choose setting to # (# = 1, 2, 3, 4)

#	Text output	Description
1	9600 8,E,1	Baud rate: 9600, Data bits: 8, Even parity, Stop bits: 1
2	9600 8,O,1	Baud rate: 9600, Data bits: 8, Odd parity, Stop bits: 1
3	9600 8,N,2	Baud rate: 9600, Data bits: 8, No parity, Stop bits: 2
4	9600 8,N,1	Baud rate: 9600, Data bits: 8, No parity, Stop bits: 1

Example:

```
SFC> MODBUS CONFIG
1: 9600 8,E,1
SFC>
```

```
SFC> MODBUS CONFIG ?
-> 1: 9600 8,E,1 (Baud rate: 9600, Data bits: 8, Even parity, Stop bits: 1)
2: 9600 8,O,1 (Baud rate: 9600, Data bits: 8, Odd parity, Stop bits: 1)
3: 9600 8,N,2 (Baud rate: 9600, Data bits: 8, No parity, Stop bits: 2)
4: 9600 8,N,1 (Baud rate: 9600, Data bits: 8, No parity, Stop bits: 1)
SFC>
```

```
SFC> MODBUS CONFIG 2
2: 9600 8,O,1
SFC>
```

Command: REMOTE

SFC>REMOTE <Parameter>

Description:

This command is an alternative for a remote on signal of an external control. A virtual remote on signal is set via the serial interface. The fuel cells reaction is similar.

Possible transmission parameter:

Parameter	Description
<no parameter>	Shows actual setting
ON	Activates virtual remote on signal
OFF	Deactivates virtual remote on signal

Response:

Response	Description
ON	virtual remote on signal is active
OFF	virtual remote on signal is not active
OK	Parameter accepted and executed
no valid parameter	No valid parameter entered

Command: RESET

SFC>RESET

Description:

This command executes a system reset. The system data are saved before the reset.

Response:

None because of system reset

Command: SERIAL

SFC>SERIAL

Description:

Displays system- and stack number of the fuel cell.

Example response:

```
SFC>serial
EFOY : 281301-1305-12345
stack: 151010052-12345678
SFC>
```

Command: SET

```
SFC>SET id:value|MIN|MAX|STD
```

Description:

Changes values of variable parameters. With this command the same values can be changed as with commands CONFIG and DEFAULT. A list of the variable parameters can be viewed with command GET.

Variable parameters (Lead acid, lead gel, AGM @ 12 V):

```
ID: 018,'switch on voltage @ 12V','mV'  
ID: 019,'switch off voltage @ 12V','mV'  
ID: 020,'switch off current @ 12V','mA'  
ID: 046,'battery protection @ 12V','mV'  
ID: 074,'charge voltage (hybrid) @ 12V','mV'  
ID: 024,'altitude up to','m'  
ID: 045,'full charge duration','min'  
ID: 017,'reaction time','s'  
ID: 049,'maximum output time','h'  
ID: 089,'minimum charge time','min'
```

Variable parameters (Lead acid, lead gel, AGM @ 24 V):

```
ID: 021,'switch on voltage @ 24V','mV'  
ID: 022,'switch off voltage @ 24V','mV'  
ID: 023,'switch off current @ 24V','mA'  
ID: 047,'battery protection @ 24V','mV'  
ID: 075,'charge voltage (hybrid) @ 24V','mV'  
ID: 024,'altitude up to','m'  
ID: 045,'full charge duration','min'  
ID: 017,'reaction time','s'  
ID: 049,'maximum output time','h'  
ID: 089,'minimum charge time','min'
```

Variable parameters (LiFePO4 @ 12 V):

```
ID: 025,'switch on voltage @ 12V','mV'  
ID: 026,'switch off voltage @ 12V','mV'  
ID: 027,'switch off current @ 12V','mA'  
ID: 048,'battery protection @ 12V','mV'  
ID: 076,'charge voltage (hybrid) @ 12V','mV'  
ID: 024,'altitude up to','m'  
ID: 045,'full charge duration','min'  
ID: 017,'reaction time','s'  
ID: 077,'maximum output time','h'  
ID: 089,'minimum charge time','min'
```

Variable parameters (LiFePO4 @ 24 V):

```
ID: 078,'switch on voltage @ 24V','mV'  
ID: 079,'switch off voltage @ 24V','mV'  
ID: 080,'switch off current @ 24V','mA'  
ID: 081,'battery protection @ 24V','mV'  
ID: 082,'charge voltage (hybrid) @ 24V','mV'  
ID: 024,'altitude up to','m'  
ID: 045,'full charge duration','min'  
ID: 017,'reaction time','s'  
ID: 077,'maximum output time','h'  
ID: 089,'minimum charge time','min'
```

Variable parameters (EFOY GO!):

```
ID: 029,'switch on voltage','mV'
```

ID: 030, 'switch off voltage', 'mV'
 ID: 031, 'switch off current', 'mA'
 ID: 014, 'battery protection', 'mV'
 ID: 015, 'charge voltage (hybrid)', 'mV'
 ID: 024, 'altitude up to', 'm'
 ID: 045, 'full charge duration', 'min'
 ID: 017, 'reaction time', 's'
 ID: 003, 'maximum output time', 'h'
 ID: 089, 'minimum charge time', 'min'

Example response:

```
SFC>SET 018:12100
12100
SFC>SET 018:STD
12300
SFC>
```

Variable parameters (Example: ID 018):

SET 018:x	Sets the parameter 'switch on voltage @ 12V' to x mV.
SET 018:STD	Sets the parameter 'switch on voltage @ 12V' to the standard value.
SET 018:MIN	Sets the parameter 'switch on voltage @ 12V' to the feasible minimum value.
SET 018:MAX	Sets the parameter 'switch on voltage @ 12V' to the feasible maximum value.

Command: SFC

SFC>SFC

Description:

Permits monitoring of the current operating status by displaying the various parameters.

Response:

```
battery voltage 13.36V
output current -0.03A
operation time (charge mode) 14.6h
operating state: auto off
operating mode: auto
cumulative output energy 1548.1Wh
no error
cartridge level above sensor or no sensor (cartridge 1 consumed 0.5871)
Note: Supply problem at fuel connector #1.1 #1.2 Please check fuel connector. If this
problem occurs again please contact your service partner.
```

Response	Text output	Description
battery voltage	XX.XXV	Actual battery voltage
output current	X.XXA	Actual output current or rather power consumption of the fuel cell.
operation time (charge mode)	XXXX.Xh	Operating stack hours
operating state:	error	Error
	remote on	Remote on signal activated
	remote off	No remote on signal and fuel cell in hybrid mode
	auto on	Auto on operation
	slave on	Slave operation (only with Cluster Controller)
	on	On operation
	freeze protection	Freeze protection mode
	shut down	Shut down process
	off	Fuel cell off
	auto off	Fuel cell in automatic mode, but not charging.
operating mode:	battery protection	Fuel cell OFF, deep discharge protection active
	on	Userstatemachine in 1
	off	Userstatemachine in 0
	auto	Userstatemachine in automatic mode
cumulative output energy	hybrid	Userstatemachine in hybrid mode
	Shows energy output in operated hours	
<Errormessage> no error	Shows actual error message, which is displayed on the operating panel. If there is no error, „no error“ is shown.	

cartridge level	below sensor	Cartridge level is below sensor (only with fuel cartridge sensor FS1)
	above sensor or no sensor	Cartridge level is above sensor (only with fuel cartridge sensor FS1)
	(cartridge x consumed y.yyy1)	Activated fuel cartridge and calculated methanol consumption.
<Warning> no warning	Shows actual warning messages. If there is no warning, „no warning“ is shown.	
Note: <Warning>	<p>Following warning messages can appear:</p> <ul style="list-style-type: none"> - Note: EFOY GO! cannot be charged currently. Please refer to the user manual of the EFOY GO! The EFOY GO! includes a lithium battery (LiFePO4), which cannot be charged below 0°C. If this is recognized by the EFOY Pro fuel cell, the charging is interrupted, and the EFOY Pro switches in the manual off mode. The frost protection mode is not affected. Please confirm the warning once the temperature has increased. The EFOY Pro returns to Automatic Mode. - Note: Battery defective, too small or too old. Please check the battery and replace if necessary. The on-board electrical system including the battery has to be checked. The EFOY Pro has measured charging cycles which were too short. This is an indication of a defective, too old or too small battery. The battery parameters may also need to be reviewed. Charging cycles which are too short can damage the EFOY Pro fuel cell. - Note: Cooling insufficient. Please check installation and air supply The output power of the EFOY Pro is reduced during high temperature, Please verify the installation paying attention to the cooling air supply. - Note: Supply problem at fuel connector X.Y Please check fuel connector. If this problem occurs again please contact your service partner. If one or several fuel connectors have a problem drawing methanol from the fuel cartridges this message will occur. The EFOY Pro continues to operate using the remaining intact fuel connectors. - Note: Firmware out of date! Please update the firmware! This note is only a reminder to check, if there is a new firmware available. The fuel cell will operate without any problem. Only with FW 17.07. 	

Command: STDVALUE

SFC> STDVALUE

Description:

Displays the standard default settings of all operating parameters on the terminal interface but does not set them for actual operation.

EFOY sends only the values of the set battery type and recognized battery voltage.

Response (Lead-acid, lead-gel, AGM @ 12 V):

switch on voltage @ 12V: 12.3V
switch off voltage @ 12V: 14.2V
switch off current @ 12V: 4.0A
battery protection @ 12V: 11.2V
charge voltage (hybrid) @ 12V: 14.7V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 24.0h
minimum charge time: 30.0min

Response (Lead-acid, lead-gel, AGM @ 24 V):

switch on voltage @ 24V: 24.6V
switch off voltage @ 24V: 28.4V
switch off current @ 24V: 2.0A
battery protection @ 24V: 22.4V
charge voltage (hybrid) @ 24V: 29.4V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 24.0h
minimum charge time: 30.0min

Response (LiFePO4 @ 12 V):

switch on voltage @ 12V: 12.6V
switch off voltage @ 12V: 14.5V
switch off current @ 12V: 4.0A
battery protection @ 12V: 11.0V
charge voltage (hybrid) @ 12V: 14.6V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 48.0h
minimum charge time: 30.0min

Response (LiFePO4 @ 24 V):

switch on voltage @ 24V: 25.2V
switch off voltage @ 24V: 29.0V
switch off current @ 24V: 2.0A
battery protection @ 24V: 22.0V
charge voltage (hybrid) @ 24V: 29.2V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 48.0h
minimum charge time: 30.0min

Response (EFOY GO!):

switch on voltage: 12.4V
 switch off voltage: 14.4V
 switch off current: 0.5A
 battery protection: 11.2V
 charge voltage (hybrid): 14.4V
 altitude up to: 1500.0m
 full charge duration: 180.0min
 reaction time: 60.0s
 maximum output time: 24.0h
 minimum charge time: 30.0min

Variable parameters:

switch on voltage:	Fuel cell starts at this battery voltage
switch off voltage:	Fuel cell turns off at this battery voltage (charge end voltage)
switch off current:	Fuel cell will shut off once current dips below this level.
battery protection	Switch on voltage for deep discharge protection in operation mode OFF.
charge voltage (hybrid):	Max. battery voltage in Hybrid mode
altitude up to	Maximum altitude to installation
full charge duration	An additional switch-off criteria for the EFOY unit when the switch-off current won't be achieved in adjusted time
reaction time	Time to elapse while the battery voltage is below switch on voltage.
maximum output time	If the switch-off criteria, voltage and current, have not been satisfied, the EFOY unit will shut off after generating the number of hours.
minimum charge time	Minimum duration of one charge cycle

Command: SYSTEM

SFC>SYSTEM

Description:

Operating information of the system. (For example: reason of the last switching on and off, as well as the time of the last stack run, duration of the charging cycles, filling level of the fuel cartridges)

Example:

```
MeOH 1.791kg OnReason 0n OffReason 0n LoadDrops 0n AvgCycleAuto 0.000h
AvgCycleManual 0.000h AvgCycleRemote 0.000h LastCycleAuto 0.000h
LastCycleManual 0.000h LastCycleRemote 0.000h LastActive 20110307.123456n
Modus 2n Status 1n WarningBits 0n CumWOut 656Wh Cart1 9.413l Cart11 -
1.000l Cart12 -1.000l Cart2 -1.000l Cart21 10.000l Cart22 10.000l CartAll
29.413l
```

Values:

MeOH	Estimated value of consumed methanol in l
OnReason	Reason for start: <ul style="list-style-type: none"> • 0: System did not start after the last reset • 1: System was started manually • 2: System was started via remote • 3: System was started via hybrid remote • 4: System was started by a master fuel cell (Cluster Controller CC1) • 5: System started because battery voltage was below switch-on criteria. • 6: System started because battery voltage was below switch-on criteria, after 14 days inactive (switch-on voltage +0.2 V). • 7: System started anti-freeze. • 8: System started an automatic reset. • 9: System (manually off) started because due to battery protection mode
OffReason	Shut down reason: <ul style="list-style-type: none"> • 0: System shut down because switch off criteria has been reached • 1: System (only as slave) shut down by itself because of explicit transgression of the parameters.

	<ul style="list-style-type: none"> • 2: System was shut down manually • 3: System was shut down via hybrid remote off • 4: System shut down because of signal by master fuel cell (Cluster Controller CC1) • 5: System shut down because of an error. • 6: System shut down because of full charge duration value was reached. • 7: System shut down because anti-freeze mode finished. • 9: System (manually off) shut down because of battery protection mode switch off parameters. • 100: System shut down because the switch-off current parameter was reached, • 200: System shut down because full charge duration parameter was reached • 300: System shut down because of full battery. Battery does not absorb more energy, so the charging current at switch off voltage drops below value "switch off current". • 400: System shut down because of defective battery. Battery voltage dropped during system startup.
LoadDrops	Number of immediate consecutive switch-off due to load disconnection (OffReason: 300). Indicator of defective battery or battery capacity too small
AvgCycleAuto	Average charge cycle duration in automatic operation
AvgCycleManual	Average charge cycle duration in manual operation
AvgCycleRemote	Average charge cycle duration in remote operation
LastCycleAuto	Charge cycle duration of the last charge cycle in automatic operation
LastCycleManual	Charge cycle duration of the last charge cycle in manual operation
LastCycleRemote	Charge cycle duration of the last charge cycle in remote operation
LastActive	<p>Date of last stack run. Date is set starting with year, month and day, after semicolon hours, minutes and seconds: yyymmdd.hhmmss</p> <p>Example: 20150914.112434</p> <p>Date: 14/09/2015, 11:23:34</p>

Modus	Shows the actual operating mode of the system 0 = Off 1 = On 2 = Automatic 3 = Hybrid 4 = External control 5 = Transportsicherung
Status	Zeigt den aktuellen Betriebsmodus des Systems an. 0 = (nothing) 1 = Standby 2 = Start phase 3 = Charging mode 4 = Shutdown procedure 5 = Antifreeze 6 = Battery protection 7 = Error 8 = Interruption 9 = Reset 10 = Transportsicherung
WarningBits	Displays the active warnings. Several warnings can be active at the same time. They are output as a bit field in decimal format. The individual bits mean the following: 0x00 = No Warnings 0x01 = Warning 141 0x02 = Warning 176 0x04 = Warning 199 0x08 = Warning 150
CumWOut	Cumulated output energy in Wh
Cart1	Fill level of the cartridge port #1 in l. If no fuel cartridge is configured at this cartridge port, -1 l will be output

Cart11	Fill level of the cartridge port #1.1 in l. If no fuel cartridge is configured at this cartridge port, -1 l will be output
Cart12	Fill level of the cartridge port #1.2 in l. If no fuel cartridge is configured at this cartridge port, -1 l will be output
Cart2	Fill level of the cartridge port #2 in l. If no fuel cartridge is configured at this cartridge port, -1 l will be output
Cart21	Fill level of the cartridge port #2.1 in l. If no fuel cartridge is configured at this cartridge port, -1 l will be output
Cart22	Fill level of the cartridge port #2.2 in l. If no fuel cartridge is configured at this cartridge port, -1 l will be output
CartAll	Sum of the fill levels of all connected fuel cartridges in liters

Command: VALUE

SFC> VALUE

Description:

Displays the current set of operating parameters without modifying them.

EFOY sends only the values of the set battery type and recognized battery voltage.

Response (Lead-acid, lead-gel, AGM @ 12 V):

switch on voltage @ 12V: 12.3V
switch off voltage @ 12V: 14.2V
switch off current @ 12V: 4.0A
battery protection @ 12V: 11.2V
charge voltage (hybrid) @ 12V: 14.7V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 24.0h
minimum charge time: 30.0min

Response (Lead-acid, lead-gel, AGM @ 24 V):

switch on voltage @ 24V: 24.6V
switch off voltage @ 24V: 28.4V
switch off current @ 24V: 2.0A
battery protection @ 24V: 22.4V
charge voltage (hybrid) @ 24V: 29.4V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 24.0h
minimum charge time: 30.0min

Response (LiFePO4 @ 12 V):

switch on voltage @ 12V: 12.6V
switch off voltage @ 12V: 14.5V
switch off current @ 12V: 4.0A
battery protection @ 12V: 11.0V
charge voltage (hybrid) @ 12V: 14.6V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 48.0h
minimum charge time: 30.0min

Response (LiFePO4 @ 24 V):

switch on voltage @ 24V: 25.2V
switch off voltage @ 24V: 29.0V
switch off current @ 24V: 2.0A
battery protection @ 24V: 22.0V
charge voltage (hybrid) @ 24V: 29.2V
altitude up to: 1500.0m
full charge duration: 180.0min
reaction time: 60.0s
maximum output time: 48.0h
minimum charge time: 30.0min

Response (EFOY GO!):

switch on voltage: 12.4V
 switch off voltage: 14.4V
 switch off current: 0.5A
 battery protection: 11.2V
 charge voltage (hybrid): 14.4V
 altitude up to: 1500.0m
 full charge duration: 180.0min
 reaction time: 60.0s
 maximum output time: 24.0h
 minimum charge time: 30.0min

Variable parameters:

switch on voltage:	Fuel cell starts at this battery voltage
switch off voltage:	Fuel cell turns off at this battery voltage (charge end voltage)
switch off current:	Fuel cell will shut off once current dips below this level.
battery protection	Switch on voltage for deep discharge protection in operation mode OFF.
charge voltage (hybrid):	Max. battery voltage in Hybrid mode
altitude up to	Maximum altitude to installation
full charge duration	An additional switch-off criteria for the EFOY unit when the switch-off current won't be achieved in adjusted time
reaction time	Time to elapse while the battery voltage is below switch on voltage.
maximum output time	If the switch-off criteria, voltage and current, have not been satisfied, the EFOY unit will shut off after generating the number of hours.
minimum charge time	Minimum duration of one charge cycle

Command: VER

SFC>VER

Description:

Indicates the firmware version, firmware date

Response (after successful system configuration):

```
Firmware EFOY Pro 2400 Duo V13 17.06I12V/24V QB date 20xx-xx-xx  
SFC>
```

Response (without successful system configuration):

```
Firmware EFOY 17.06 date 20xx-xx-xx  
SFC>
```