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PIWEK

IP-EFOY-GATEWAY



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1 History

Version	Date	Update	Author
V1.0 (preliminary)	04.05.12		Janus Piwek
V1.1	07.05.12	<ul style="list-style-type: none"> • Marginal corrections • Preview IP-EFOY-GATEWAY enhancements 	Janus Piwek
V1.2 (preliminary)	26.06.12	<ul style="list-style-type: none"> • English translation 	Janus Piwek
V1.3.	30.07.12	<ul style="list-style-type: none"> • Compatibility EFOY PRO versions 	Janus Piwek
V1.3.1	05.08.12	<ul style="list-style-type: none"> • Front page updated • chapter 4 included 	Janus Piwek
V1.4.0	13/09/12	<ul style="list-style-type: none"> • Email notification service support for firmware versions >= v0.6.1 	Janus Piwek
V1.4.1	10/08/12	<ul style="list-style-type: none"> • IP Configuration 	Janus Piwek
V1.4.2	07/11/12	<ul style="list-style-type: none"> • Getting started added 	Janus Piwek

Table 1: History

2 Introduction

The IP-EFOY-GATEWAY serves for remote control of a single SFC EFOY PRO fuel cell over the TCP/IP protocol. At this the entire fuel cell parameter defined by the the SFC EFOY PRO technical datasheet are readout continuously over the RS232 interface. These data sets are provided to the customer for control application in different formats.

- SNMP
- XML
- HTML web site
- Email
- TCP-UART-Bridge-Mode (direct EFOY Pro remote command line interface terminal)
- TCP socket services can be developed on request

Furthermore the IP-EFOY-GATEWAY gives the customer the opportunity to set up/reconfigure the EFOY PRO fuel cell either within a local area network or over the internet by using the web site. There is no need for further software installation.

The customer benefits from a simple and intuitive web menu navigation to preconfigure the fuel cell ex ante or in a live running system.

However the greatest benefit of the IP-EFOY-GATEWAY solution is that it makes it possible to give your EFOY PRO fuel cell an IP address and that it can be integrated in a given IP network very quickly without any limitations. From now on statically scheduled service tours are minimized and can be coordinated much better since EFOY PRO fuel cell's parameter/states may be retrieved from each location and 24 hours a day.

3 Technical Data

Data	Range	Comment
Power consumption	<1.5W	
Input voltage range	8V - 42V	<ul style="list-style-type: none"> Allowed with 12V/24V batteries Power supply on terminal block and over EFOY PRO data interface as well
Ethernet		<ul style="list-style-type: none"> 10/100BASE-T IEEE802.2 compatibility
RS232 (1 port)		<ul style="list-style-type: none"> communication EFOY PRO with 9600 Baud in future 2/4 port solution as well, providing remote control for up to 4 EFOY PRO fuel cells simultaneously
Relay output	2A at 12V 1A at 24V	<ul style="list-style-type: none"> optional
NTC temperature sensor input	10K at 25°C	<ul style="list-style-type: none"> optional

Table 2: Electrical Data

Data	Range	Comment
Housing size (W x H x D)	105 mm x 33 mm x 102 mm	
Housing material	Aluminium(silver anodised)	
Weight	330g	
Options		In futures in 10" housing with extension bracket for 19" server racks

Table 3: Mechanical Data

Data	Range	Comment
Ambient temperature	-25 °C ... +70 °C	

Table 4: Environment conditions

4 IP Configuration

The following Table 5 shows the default settings of the IP-EFOY-GATEWAY.

By pressing the „Default“ switch button 5 seconds (see Figure 1) you can restore the default setting.

DHCP	Nicht aktiviert
IP Adresse	192.168.96.210
Subnetzmaske	255.255.255.0
Gateway	192.168.96.1
Primary DNS	192.168.96.1
Secondary DNS	0.0.0.0

Table 5: IP default settings

5 Description Periphery

5.1 LED Panel and Default Button

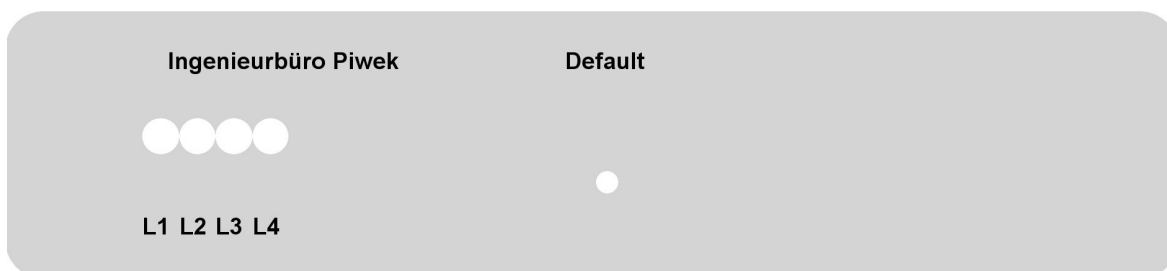


Figure 1: Signal LED description

L1	Power supply on
L2	1Hz heart beat, system
L3	Data communication EFOY Pro ↔ IP-EFOY-GATEWAY
L4	Not used
Default	Switch button must be pressed > 5 seconds, to restore default setting

Table 6: Description front panel 1

5.2 Interfaces and power supply

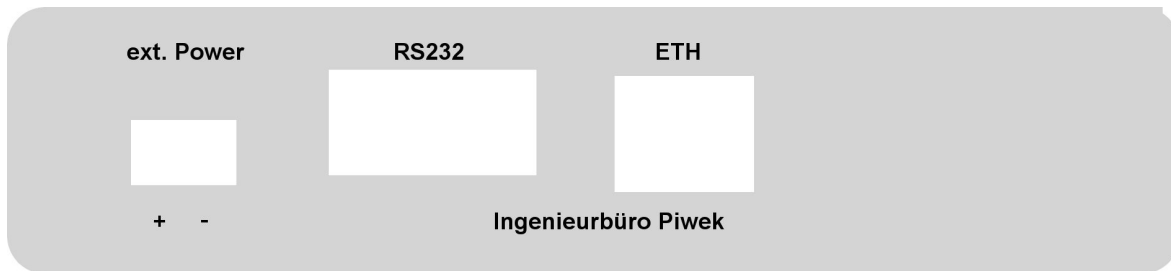


Figure 2: Interfaces and power supply description

Ext. Power	External power supply 8-42V <ul style="list-style-type: none"> • Inverse-polarity protection • TVS Diode >54V • Power supply filter
RS232	Communication IP-EFOY-GATEWAY ↔ EFOY PRO <ul style="list-style-type: none"> • just use with appropriate adapter (available on request in Cabel-Kit)
ETH	Ethernet 10/100BASE-T (cables available on request in Cabel-Kit)

Table 7: Description front panel 2

6 Supported Protocols

Protocol	Comment
HTTP	<ul style="list-style-type: none"> • Configuration • Fuel cell states
DCHP Client	<ul style="list-style-type: none"> • Automatic IP configuration
SNMP v2c	<ul style="list-style-type: none"> • Remote control EFOY PRO
SMTP	<ul style="list-style-type: none"> • Email notification service
Protocol stack EFOY PRO	<ul style="list-style-type: none"> • Communication with EFOY PRO over RS232
TCP-UART-BRIGE-MODE	<ul style="list-style-type: none"> • Remote communication with EFOY PRO over terminal command line interface
Socket Server Service	<ul style="list-style-type: none"> • Optional on request

Table 8: TCP/UDP Protocols

Protocol	Comment
Protocol stack EFOY PRO	<ul style="list-style-type: none"> • Communication with EFOY PRO over RS232

Table 9: Protocol RS232

7 EFOY PRO Compatibility

Fuel Cell	Comment
EFOY PRO 600/1600/2200/2200 XT	<ul style="list-style-type: none"> <li data-bbox="555 439 1102 495">Compatible with EFOY PRO versions equal or greater than QB date 2011-03-24

Table 10: Protocol RS232

8 Getting started

Figure 3 depicts schematically the cabling diagram of the IP-EFOY-GATEWAY to other communication devices and EFOY PRO periphery.

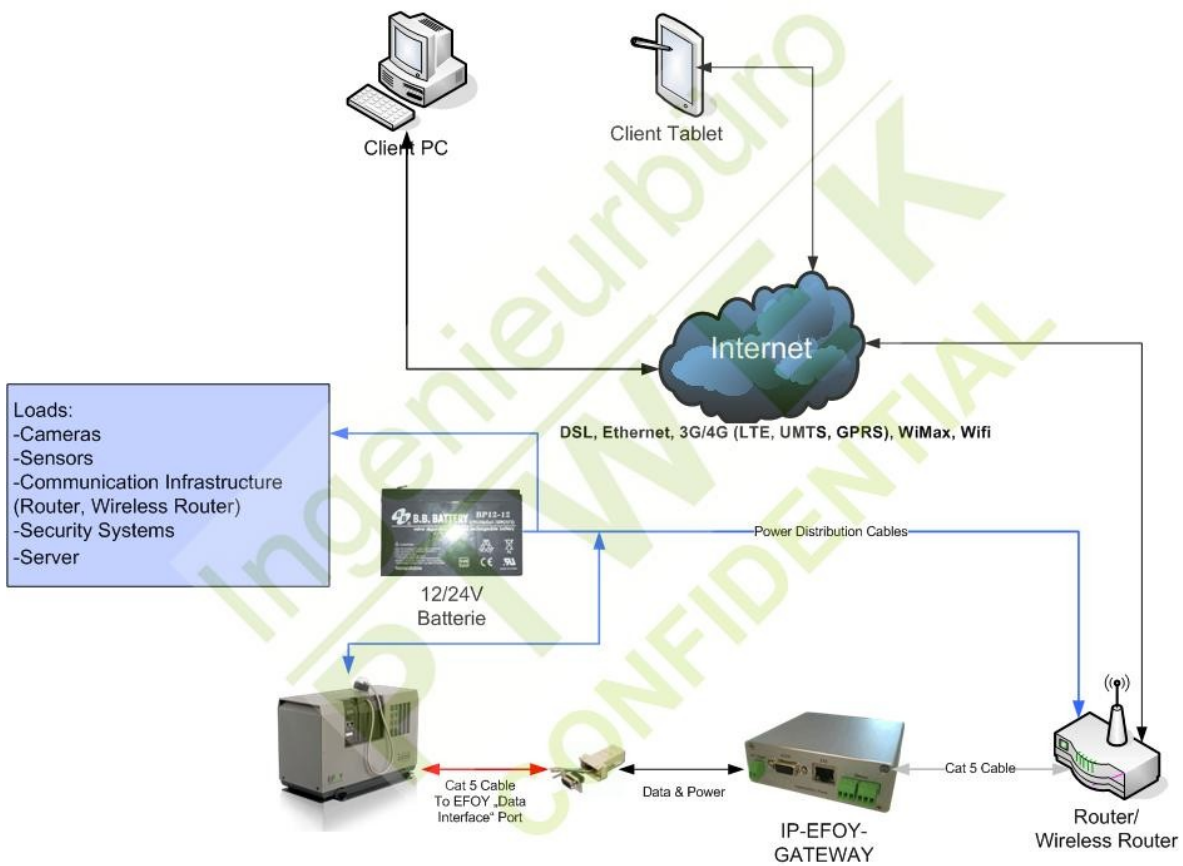


Figure 3: Schematic Installation

As a start please follow the following steps to set up the network configuration properly. The IP-EFOY-GATEWAY's default IP-Address is "192.168.96.210".

Use your browser on initial installation or after a default reset to access IP-EFOY-GATEWAY's web server. First you have to set up network settings to be conform with your local network.

1. Connect the IP-EFOY-GATEWAY RJ-45 interface labelled with "ETH" with the grey cable to your PC's network interface
2. Reconfigure the IP configuration under menu "Internet protocol version 4" of your PC's network interface and then press "properties" (see Figure 4)

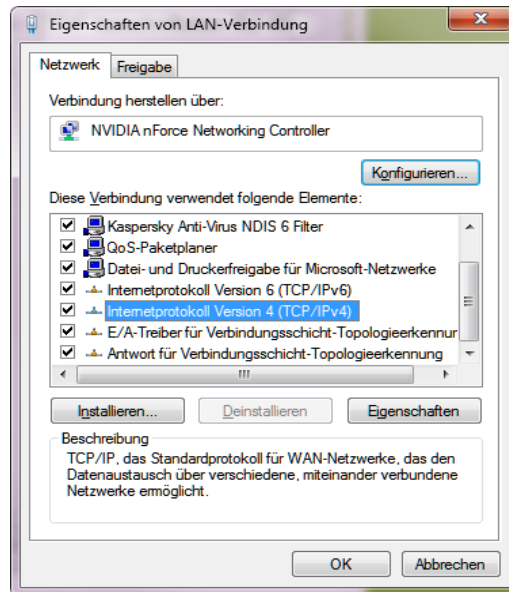


Figure 4: IP-Configuration Menu

3. Choose the following IP configuration for your PC (see Figure 5).

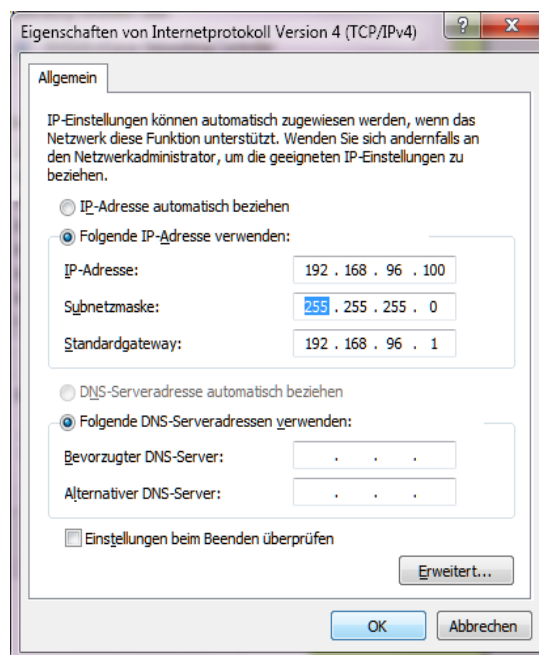


Figure 5: PC's static IP-Configuration

4. Open the browser and enter the default IP address of the IP-EFOY-GATEWAY (see Figure 7).
5. Choose menu item **"IP"** on the left of the website and enter the default login and password combination (see Figure 6 - Default user name: **"admin"** and default password: **"00000"**)

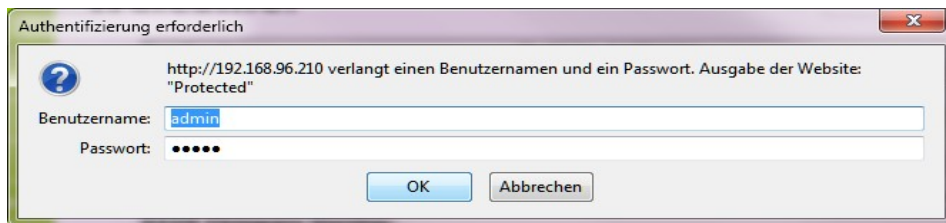


Figure 6: Login IP-EFOY-GATEWAY website

6. Afterwards choose new static IP-Configuration for your given network (see Figure 7). If you set the **"DHCP"** check box, the IP-Configuration may be accomplished by a DHCP server in the local network automatically.

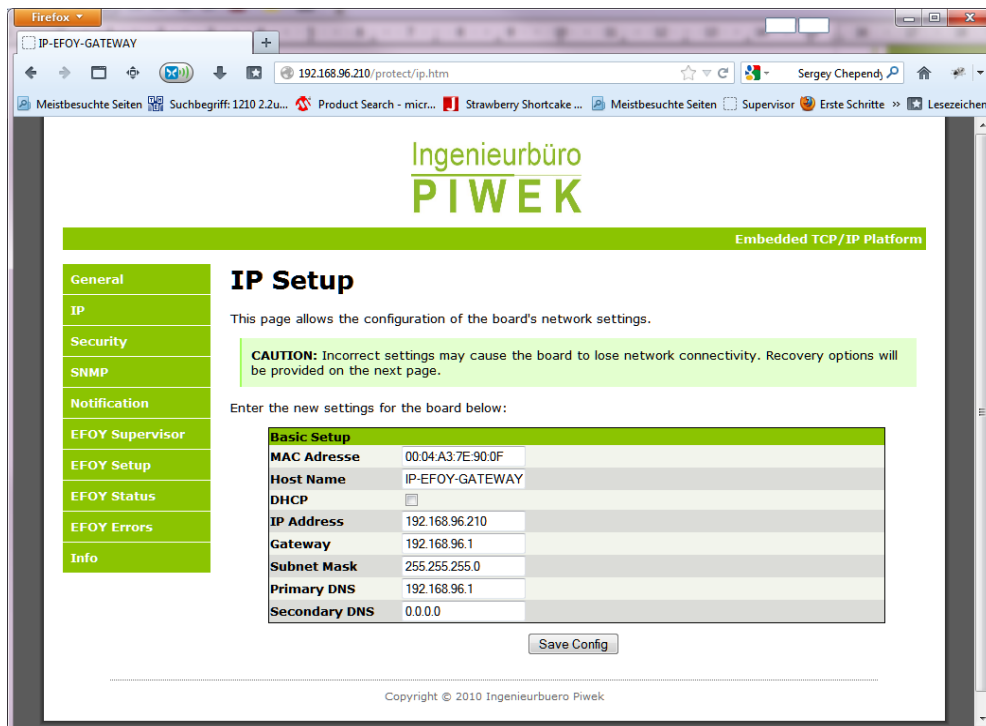


Figure 7: IP-Konfiguration IP-EFOY-GATEWAY

7. Now you may disconnect the network cable from your PC and reconnect it to a router or wireless router.
8. Now please open your browser again and enter the IP-EFOY-GATEWAY's IP-Address previously configured under item 6
9. Now you should have access to the web server over your local network

9 Use-Case

9.1 „Green“ Off-Grid 48V „Power Over Ethernet“ power supply for wireless base stations

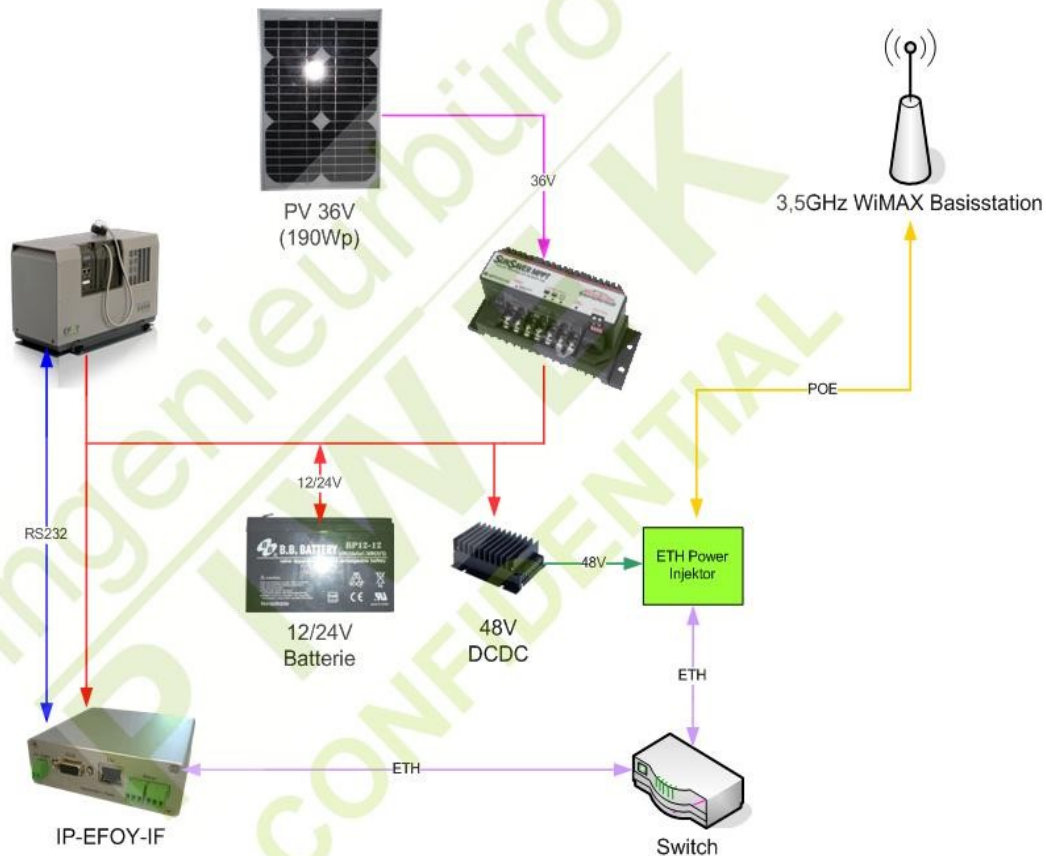


Figure 8: Green Power Supply

10 Overview screen shots

10.1 Email Notification Service

From firmware versions **v0.6.1** on, the IP-EFOY-GATEWAY supports an email notification service to deliver EFOY PRO events and warnings to an email address. From now on service personnel get real-time email fault reports on their smart phone or email account. The service is set up the easy way over the website menu "Notification" (see Figure 9). The user just need to have a valid email address and an email account login for the email server.

Embedded TCP/IP Platform

General	<h3 style="margin: 0;">Notification</h3> <p style="font-size: small; margin: 5px 0;">Enter the appropriate settings in the fields below: (Your SMTP server may not require a user name or password.)</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;"> <p>Email</p> <p>Notification Enabled <input checked="" type="checkbox"/></p> <p>SMTP Server <input type="text" value="smtp.pi-embedded.de"/> Port: <input type="text" value="25"/></p> <p>User <input type="text" value="notify@pi-embedded.de"/></p> <p>Password <input type="password" value="••••••••"/></p> <p>To <input type="text" value="notify@pi-embedded.de"/></p> <p style="text-align: center; margin-top: 5px;"> <input type="button" value="Save"/> <input type="button" value="Send Test Message"/> </p> </div>
IP	
Security	
SNMP	
Notification	
EFOY Supervisor	
EFOY Setup	
EFOY Status	
EFOY Errors	
Info	

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Figure 9: Website email notification

The following EFOY PRO events are delivered to the preconfigured email recipient via an email fault report (see Table 11).

EFOY PRO Parameter	Event description
Operating State	If error or off
Cartridge sensor	If cartridge below sensor level
Warning	if Warning message in memory

Table 11: Notification event

In the following Table 12 the email notification configuration is described.

Field name	Description	Option
Notification Enabled	Enables the email notification service	mandatory
SMTP Server	SMTP server used for email delivery. Please consult your administrator or email provider.	mandatory
Port	Port number of the SMTP server. Please consult your administrator or email provider. By default port 25 should be set	mandatory
User	User name of the SMTP servers. Please consult your administrator or email provider.	optional
Password	Password of the SMTP servers. Please consult your administrator or email provider.	optional
To	Email address of the recipient. The right email format is checked on pressing save button. If it is incorrect, an pop-up window shows an error message.	mandatory
Save	Saves the configuration. Please use this button after finishing the email configuration.	optional
Send Test Message	After saving the configuration, you can generate a test email message by pressing this button. Use this way to check if emails are delivered correctly to the configured recipient. The head of the website shows a message if the email was delivered or not. (see Figure 10 and Figure 11)	optional

Table 12: Configuration fields Email notification

Notification

Your message has been sent.

Figure 10: Email delivered successfully

Notification

ERROR: Your message could not be sent.
Check your SMTP server settings and try again.

Figure 11: Email not delivered successfully

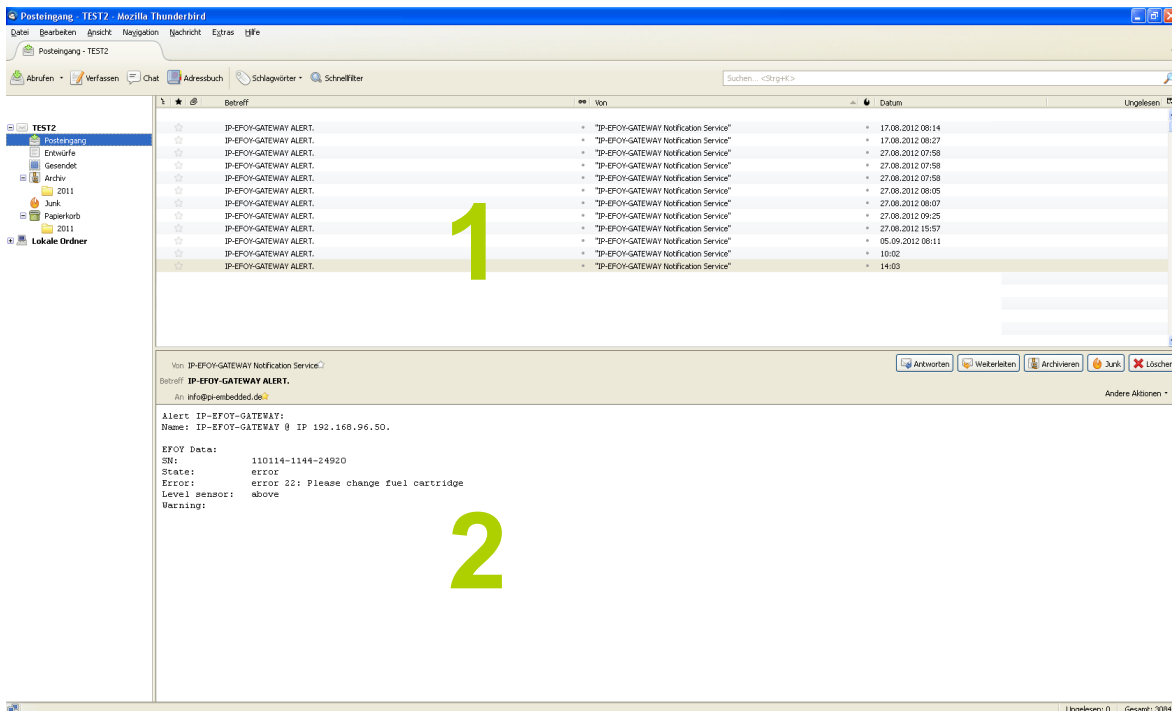


Figure 12: Email Client

Emails of the IP-EFOY-GATEWAY can be fetched with a default email client software like Microsoft Outlook, Mozilla Thunderbird (see Table 13) or a Smart-Phone.

Figure 12 depicts all fetched fault report emails in the area marked with „1“. Area „2“ shows the delivered IP-EFOY-GATEWAY emails with the fault report in more detail. Table 13 illustrates the email fields and the single rows of the fault report.

Email subject: IP-EFOY-GATEWAY ALERT.
Email from: IP-EFOY-GATEWAY Notification Service

Field name	Description
Name	Shows the name of the IP-EFOY-GATEWAY configured via the website menu „General“ and the corresponding IP address.
SN	Serial number EFOY PRO
State	Operating State EFOY PRO
Error	Error message EFOY PRO, if failure occurs. Otherwise filled with „no error“
Level sensor	State of the methanol cartridge sensor. If no methanol cartridge sensor is connected, this field is filled with „above“. If it is connected and the fuel cell runs out of methanol, the field is filled with „below“, otherwise with „above“.
Warning	Warning message EFOY PRO, if a warning is occurred, otherwise this field is empty.

Table 13: Description event protocol

10.2 EFOY PRO Status

This overview shows the customer EFOY PRO fuel cell's dynamic data. All values are updated dynamically and provided at a glance.

Embedded TCP/IP Platform

General	<h3>EFOY Status</h3> <table border="1" style="width: 100%;"> <thead> <tr> <th colspan="2" style="background-color: #008000; color: white;">Communication Status RS232</th> </tr> <tr> <th style="background-color: #008000; color: white;">Sync</th> <th style="background-color: #008000; color: white;">Error</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">•</td> <td style="text-align: center;">•[0]</td> </tr> </tbody> </table> <table border="1" style="width: 100%;"> <thead> <tr> <th colspan="2" style="background-color: #008000; color: white;">SFC Status</th> </tr> </thead> <tbody> <tr> <td>Battery voltage</td> <td>12.76 V</td> </tr> <tr> <td>Output current</td> <td>0.000 A</td> </tr> <tr> <td>Operating time</td> <td>2.2 h</td> </tr> <tr> <td>Operating state</td> <td>ERROR</td> </tr> <tr> <td>Operating mode</td> <td>AUTO</td> </tr> <tr> <td>Cumulative output energy</td> <td>110.5 Wh</td> </tr> <tr> <td>Fuel-cartridge sensor</td> <td style="text-align: center;">•</td> </tr> <tr> <td>DuoCartSwitch</td> <td>NA (0.000L)</td> </tr> <tr> <td>Error message</td> <td>error 22: Please change fuel cartridge</td> </tr> </tbody> </table> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;"> <p>Warning</p> </div>	Communication Status RS232		Sync	Error	•	•[0]	SFC Status		Battery voltage	12.76 V	Output current	0.000 A	Operating time	2.2 h	Operating state	ERROR	Operating mode	AUTO	Cumulative output energy	110.5 Wh	Fuel-cartridge sensor	•	DuoCartSwitch	NA (0.000L)	Error message	error 22: Please change fuel cartridge
Communication Status RS232																											
Sync		Error																									
•		•[0]																									
SFC Status																											
Battery voltage		12.76 V																									
Output current		0.000 A																									
Operating time		2.2 h																									
Operating state		ERROR																									
Operating mode		AUTO																									
Cumulative output energy	110.5 Wh																										
Fuel-cartridge sensor	•																										
DuoCartSwitch	NA (0.000L)																										
Error message	error 22: Please change fuel cartridge																										
IP																											
Security																											
SNMP																											
EFOY Supervisor																											
EFOY Setup																											
EFOY Status																											
EFOY Errors																											
Info																											

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Figure 13: EFOY PRO status overview

10.3 EFOY PRO Setup

The EFOY setup overview makes it possible to set up EFOY PRO fuel cell's configuration.



Embedded TCP/IP Platform

General	<h2>EFOY Setup</h2>
IP	
Security	
SNMP	
EFOY Supervisor	
EFOY Setup	
EFOY Status	
EFOY Errors	
Info	

Communication Status RS232	
Sync	Error
•	•[0]

Parameter	Current Value	New Value	Default Value	Value Range
Switch on voltage @ 12V	12300 mV	<input type="text"/>	mV 12300 mV	11000 - 13000 mV
Switch off voltage @ 12V	14200 mV	<input type="text"/>	mV 14200 mV	13500 - 14700 mV
Switch off current @ 12V	2000 mA	<input type="text"/>	mV 2000 mA	1000 - 10000 mA
Switch on voltage @ 24V	24600 mV	<input type="text"/>	mV 24600 mV	22000 - 26000 mV
Switch off voltage @ 24V	28400 mV	<input type="text"/>	mV 28400 mV	27000 - 29400 mV
Switch off current @ 24V	1000 mA	<input type="text"/>	mV 1000 mA	500 - 5000 mA
Reaction time	10 s	<input type="text"/>	s 10 s	2 - 300 s
Max output energy	600 Wh	<input type="text"/>	Wh 600 Wh	50 - 3000 Wh
Altitude up to	1500 m	<input type="text"/>	m 1500 m	0 - 2000 m
Full charge duration	180 min	<input type="text"/>	min 180 min	0 - 300 min
Battery protection @ 12V	11200 mV	<input type="text"/>	mV 11200 mV	10500 - 12000 mV
Battery protection @ 24V	22400 mV	<input type="text"/>	mV 22400 mV	21000 - 24000 mV

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Figure 14: EFOY PRO Setup

Mobil: +49 1 77 / 8 94 56 00

D-26452 Sande Tel: +49 4422 50 85 85

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Ausgabe 00/0000

10.4 EFOY PRO Supervisor

The EFOY Supervisor overview gives the customer further configuration and remote control opportunities as well.

- EFOY PRO restart
- EFOY PRO default settings
- EFOY PRO display language
- EFOY PRO error list
- ...

Embedded TCP/IP Platform

EFOY Request	Current State	Parameter	Execute Command
Battery Protection	ON	OFF ▾	Execute
Button	AUTO	OFF ▾	Execute
Default			Execute
Duo Cartridge Switch	NA (0.000L)	OFF ▾	Execute
Hybrid	•		Execute
Language	Deutsch	English ▾	Execute
Lock	OFF	OFF ▾	Execute
Remote	OFF	OFF ▾	Execute
Reset			Execute
Read Errors			Execute Show

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Figure 15: EFOY PRO Supervisor

10.5 TCP-UART-BRIDGE-MODE

Remote control over a command line interface is also possible. Figure 16 depicts the opportunity how to establish a remote connection to the IP-EFOY-GATEWAY over a terminal software like Hyperterm, Teraterm. To use this option, a service (TCP Service Port) has to be started first over the web interface.

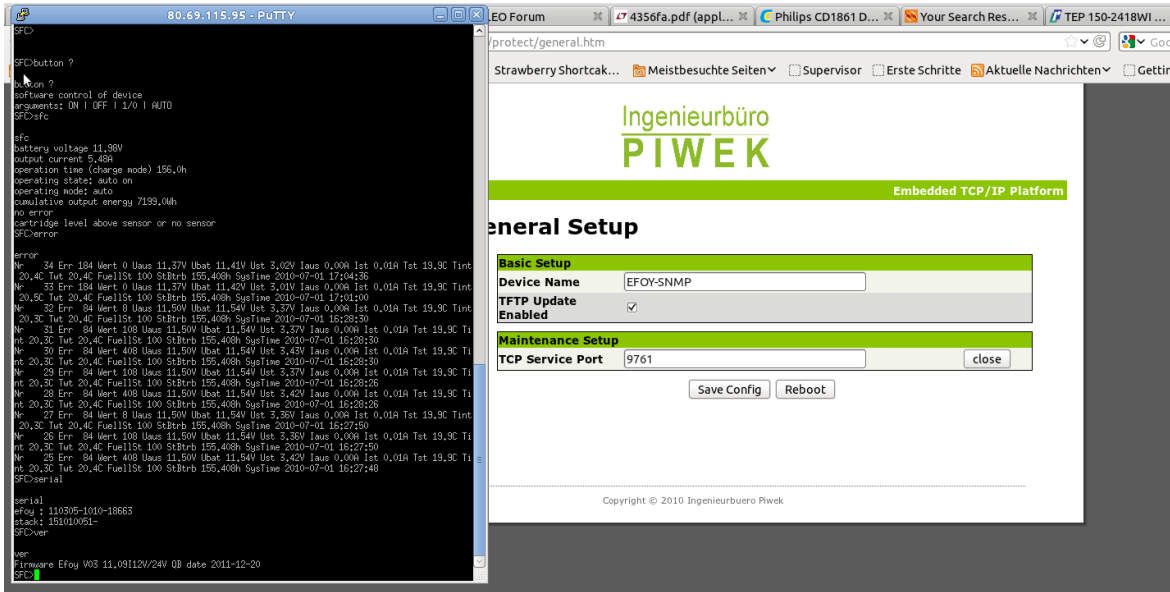


Figure 16: TCP-UART-BRIDGE-MODUS

10.6 SNMP EFOY PRO Fuel Cell Remote Control

Due to SNMP V2C network protocol support of the IP-EFOY-GATEWAY, the system is capable of providing a given set of variables called OIDs, reflecting the EFOY PRO fuel cell's state, to the customers network management system. Figure 17 shows a chart logged with a free network management system „The Dude“ over SNMP protocol. At this the blue curve reflects the EFOY PRO battery charging current and red curve reflects the EFOY PRO battery voltage. Furthermore it shows the charging/discharging intervals over the time in a detailed manner. Just due to these informations the customer is able to react to any events coming up very quickly. In many network management systems events can be triggered

- if the battery voltage falls below a threshold or if the EFOY PRO runs out of methanol, a SMS or Email is sent to a service engineer
- if the EFOY PRO operating time exceeds 5000 hours, send an message to a service engineer for EFOY PRO maintenance

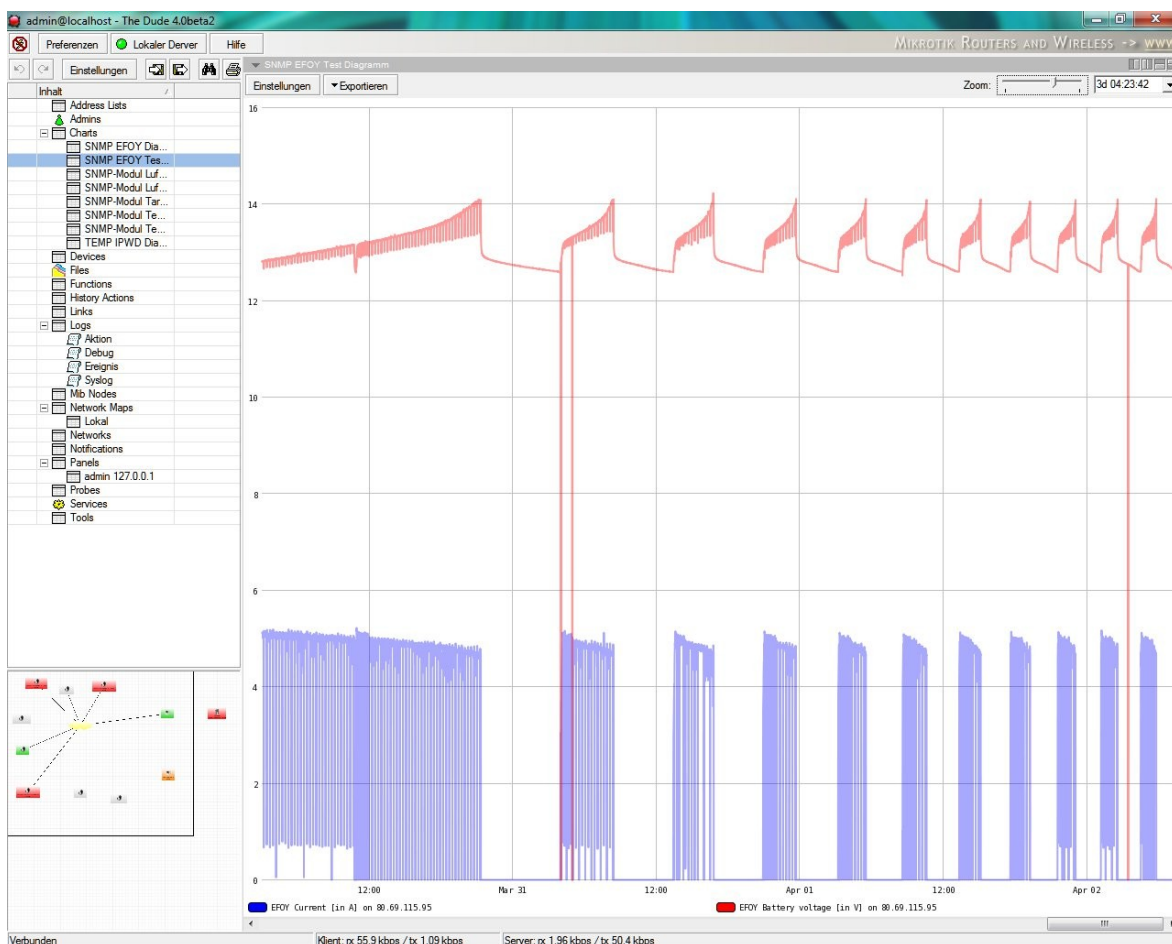


Figure 17: SNMP Chart