

# Manual



## Expert PDU Energy 8311 Series



© 2021 GUDE Systems GmbH  
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from Firmware Ver. 1.4



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# Device Description

## 1 Device Description

### 1.1 Security Advice

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- The device must be installed only by qualified personnel according to the following installation and operating instructions.
- The manufacturer does not accept responsibility in case of improper use of the device and particularly any use of equipment that may cause personal injury or material damage.
- The device contains no user-maintenable parts. All maintenance has to be performed by factory trained service personnel.
- This device contains potentially hazardous voltages and should not be opened or disassembled.
- The device can be connected only to 230V AC (50 Hz or 60 Hz) power supply sockets.
- The power cords, plugs and sockets have to be in good condition. Always connect the device to properly grounded power sockets.
- The device is intended for indoor use only. Do NOT install them in an area where excessive moisture or heat is present.
- Because of safety and approval issues it is not allowed to modify the device without our permission.
- The device is NOT a toy. It has to be used or stored out of range of children.
- Care about packaging material. Plastics has to be stored out of range of children. Please recycle the packaging materials.
- In case of further questions, about installation, operation or usage of the device, which are not clear after reading the manual, please do not hesitate to ask our support team.
- Please, never leave connected equipment unattended, that can cause damage.
- Connect only electrical devices that do not have limited on-time. I.e. in case of failure, all connected appliances have to cope with a continuous on-time without causing damage.

### 1.2 Content of Delivery

---

The package includes:

- **Expert PDU Energy 8311**
- Quick Start Guide

### 1.3 Description

---

The **Expert PDU Energy 8311** multiple socket outlet with 7 load outputs. The device has the following features:

- Metering of energy, current, power factor, phase angle, frequency, voltage and active/apparent/reactive power
- Two energy meters, one meters continuously, the other energy meter is resettable
- Measurement of residual current type A (**model 8311-2**).
- Illuminated two-line LCD display

- Interface for optional sensors for environmental monitoring (temperature and humidity)
- Console commands via SSH and Telnet
- SSH support with public key and passwords
- Programmable timetables for console commands
- Dual TCP/IP stack with IPv4 and IPv6 support (IPv6-ready)
- Control and monitoring of the device via Ethernet with an integrated web server with SSL encryption (TLS 1.1, 1.2, 1.3)
- Configuration with CGI parameters and JSON messages via HTTP (REST API)
- SNMP (v1, v2c and v3, traps)
- Modbus TCP support
- Radius support
- Generation of messages (e-mail, syslog and SNMP traps) depending on sensor measurement limits
- Firmware update during operation via Ethernet possible
- Encrypted e-mails (SSL, STARTTLS)
- Access protection through IP access control
- Low own consumption
- Developed and produced in Germany

## 1.4 Installation

---



1. Illuminated two-line LCD display (16 x 2)
2. Button "Select"
3. Status LED
5. External sensor connector (RJ45)
6. Ethernet connector (RJ45)

### Start-up the device

- Connect the power cord (CEE 7/4, max. 16 A) to the mains supply.
- Plug the network cable into the Ethernet connector (RJ45).
- Insert optional external sensor into the sensor connector.
- Connect the consumers to the protective sockets (CEE 7/3, max. 16 A).

## 1.5 Technical Specifications

|                                                                                                                                    |                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interfaces                                                                                                                         | 1 x Ethernet connector (RJ45)<br>1 x Mains supply (CEE 7/3 type F, max. 16 A)<br>1 x External sensor connector (RJ45)<br>7 x Load outputs (CEE 7/3 type F, max. 16 A) |
| Network connectivity                                                                                                               | 10/100 MBit/s 10baseT Ethernet                                                                                                                                        |
| Protocols                                                                                                                          | TCP/IP, HTTP/HTTPS, SNMP v1/v2c/v3, SNMP traps, Syslog, E-Mail (SMTP)                                                                                                 |
| Power Supply                                                                                                                       | internal power supply (90-265V AC / -15% / +10%)                                                                                                                      |
| Environment <ul style="list-style-type: none"> <li>Operating temperature</li> <li>Storage temperature</li> <li>Humidity</li> </ul> | 0°C - 50 °C<br>-20°C - 70 °C<br>0% - 95% (non-condensing)                                                                                                             |
| Case                                                                                                                               | aluminium / plastic                                                                                                                                                   |
| Measurements                                                                                                                       | 19" (inches), 1 Rack Unit, depth: 4,4 cm                                                                                                                              |
| Weight                                                                                                                             | approx. 1.5 kg                                                                                                                                                        |

### 1.5.1 Electrical Measurement

typical fault tolerances for  $T_a=25^{\circ}\text{C}$ ,  $I=1\text{Arms}...16\text{Arms}$ ,  $U_n=90\text{Vrms}...265\text{Vrms}$

| Electrical Measurement Specification |               |      |            |                      |
|--------------------------------------|---------------|------|------------|----------------------|
| Category                             | Range         | Unit | Resolution | Inaccuracy (typical) |
| Voltage                              | 90-265        | V    | 0.01       | < 1%                 |
| Current                              | 0 - 16        | A    | 0.001      | < 1.5%               |
| Frequency                            | 45-65         | Hz   | 0.01       | < 0.03%              |
| Phase                                | -180 - +180   | °    | 0.1        | < 1%                 |
| Active power                         | 0 - 4000      | W    | 1          | < 1.5%               |
| Reactive power                       | 0 - 4000      | Var  | 1          | < 1.5%               |
| Apparent power                       | 0 - 4000      | VA   | 1          | < 1.5%               |
| Power factor                         | 0 - 1         | -    | 0.01       | < 3%                 |
| Energy Counter                       |               |      |            |                      |
| Active Energy (total)                | 9.999.999,999 | kWh  | 0.001      | < 1.5%               |
| Active Energy (temporary)            | 9.999.999,999 | kWh  | 0.001      | < 1.5%               |

## 1.6 Sensor

Two external sensors can be connected to the **Expert PDU Energy 8311**. The following sensors are currently available



7102

| Humidity/Temperature Sensor 7102 (End-of-Life) |                                                       |
|------------------------------------------------|-------------------------------------------------------|
| Cable length                                   | ≈ 2m                                                  |
| Connector                                      | RJ45                                                  |
| temperature range                              | -20°C to +80°C, ±0,5°C (maximum) and ±0,3°C (typical) |
| air humidity range (non-condensing))           | 0-100%, ±3% (maximum) and ±2% (typical)               |



7101



7104 - 7106

# Device Description

| Product Name                        | 7101                                                | 7104-1                                              | 7105-1                                              | 7106-1                                                |
|-------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------|
| Calibrated Sensor                   | -                                                   | 7104-2                                              | 7105-2                                              | 7106-2                                                |
| Cable length                        | ≈ 2m                                                | ≈ 2m                                                | ≈ 2m                                                | ≈ 2m                                                  |
| Connector                           | RJ45                                                | RJ45                                                | RJ45                                                | RJ45                                                  |
| temperature range                   | -20°C to +80°C at ±2°C (maximum) and ±1°C (typical) | -20°C to +80°C at ±2°C (maximum) and ±1°C (typical) | -20°C to +80°C at ±2°C (maximum) and ±1°C (typical) | -20°C to +80°C at ±2°C (maximum) and ±1°C (typical)   |
| air humidity range (non-condensing) | -                                                   | -                                                   | 0-100%, ±3% (maximum) and ±2% (typical)             | 0-100%, ±3% (maximum) and ±2% (typical)               |
| air pressure range (full)           | -                                                   | -                                                   | -                                                   | ± 1 hPa (typical) at 300 ... 1100 hPa, 0 ... +40 °C   |
| air pressure range (ext)            | -                                                   | -                                                   | -                                                   | ± 1.7 hPa (typical) at 300 ... 1100 hPa, -20 ... 0 °C |
| Protection                          | IP68                                                | -                                                   | -                                                   | -                                                     |



7201, 7202

| Product Name                        | 7201                                                | 7202                                                |
|-------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
| Cable length                        | -                                                   | -                                                   |
| Connector                           | RJ45                                                | RJ45                                                |
| temperature range                   | -20°C to +80°C at ±2°C (maximum) and ±1°C (typical) | -20°C to +80°C at ±2°C (maximum) and ±1°C (typical) |
| air humidity range (non-condensing) | -                                                   | 0-100%, ±3% (maximum) and ±2% (typical)             |

The sensors are automatically detected after connect. The sensor values are displayed at the Control Panel  web page:

| Id      | Name                 | Temperature °C | Humidity % | Dew Point °C | Dew Diff °C | Pressure hPa |
|---------|----------------------|----------------|------------|--------------|-------------|--------------|
| 1: 7106 | <a href="#">7106</a> | 22.5           | 34.2       | 5.9          | 16.6        | 1013.8       |

A click on the link in the "Name" column opens the display of the Min and Max values. The values in a column can be reset using the "Reset" button. The "Reset" button in the name column deletes all stored Min and Max values.

# Device Description

| Id      | Name                                 | Temperature<br>°C                    | Humidity<br>%                        | Dew Point<br>°C                      | Dew Diff<br>°C                       | Pressure<br>hPa                      |
|---------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 1: 7106 | 7106                                 | 22.5                                 | 34.4                                 | 6.1                                  | 16.5                                 | 1013.8                               |
|         | 30m min                              | 0.0                                  | 34.1                                 | 5.9                                  | 16.4                                 | 125.0                                |
|         | 30m max                              | 22.6                                 | 34.7                                 | 6.2                                  | 300.0                                | 1013.8                               |
|         | <input type="button" value="Reset"/> | <input type="button" value="Reset"/> | <input type="button" value="Reset"/> | <input type="button" value="Reset"/> | <input type="button" value="Reset"/> | <input type="button" value="Reset"/> |

**Operating**

## 2 Operating

### 2.1 Operating the device directly

---



#### Status-LED

The Status LED shows the different states of the device:

- red: The device is not connected to the Ethernet.
- orange: The device is connected to the Ethernet and waits for data from the DHCP server.
- green: The device is connected to the Ethernet and the TCP/IP settings are allocated.
- periodic blinking: The device is in Bootloader mode.

#### Display indicators

By pressing the "select" button, various information and measured values can be displayed on the display. Each time you press the button, a new page appears on the LCD:

|          |      |    |
|----------|------|----|
| 228V     | 0.0A | 0W |
| 0.000kWh |      |    |

The normal energy display. There, voltage, current and power are output in the upper line. The lower line shows the energy consumed. After 5 seconds of waiting time, all displays return to this view.

|               |
|---------------|
| 7:48:59 h:m:s |
| 0.000kWh      |

This shows the energy meter in the bottom line and the time interval in the upper line. The values are stored in the EEPROM every 5 minutes or every 0.1 kWh and are thus retained even during a power failure.

|      |        |
|------|--------|
| VRMS | 225.3V |
| IRMS | 0.000A |

Voltage  
Current

|                 |
|-----------------|
| Residual AC rms |
| 0.0mA           |

Residual Current

|          |      |
|----------|------|
| Active   | 0W   |
| Reactive | 0VAR |

Active Power  
Reactive Power

|          |          |
|----------|----------|
| Apparent | 0VA      |
| Phase    | -83.5deg |

Apparent Power  
Phase Angle

|           |         |
|-----------|---------|
| Freq      | 50.02Hz |
| Powerfact | -0.3    |

current Frequency  
Power Factor

|     |               |
|-----|---------------|
| PDU | 8311          |
|     | 192.168.1.123 |

Product name  
IP address

|           |                   |
|-----------|-------------------|
| PHY state | 100mb fulllduplex |
|-----------|-------------------|

PHY state

|          |              |
|----------|--------------|
| Firmware | 1.0.0        |
| MAC:     | 001932003f09 |

Firmware version number  
MAC Ethernet address

## 2.2 Control Panel

Access the web interface: <http://IP-address> and log-in.

| Id | Name   | Voltage | Current | Freq  | Phase | Power  |          |          |      | total Energy | resettable Energy |             |       |
|----|--------|---------|---------|-------|-------|--------|----------|----------|------|--------------|-------------------|-------------|-------|
|    |        | AC rms  | AC rms  |       |       | active | reactive | apparent | PF   | active       | active            | time        |       |
|    |        | V       | A       | Hz    | °     | W      | VAR      | VA       |      | kWh          | kWh               | h:m:s       |       |
| I1 | Meter1 | 230.9   | 1.604   | 50.02 | 22.0  | 285    | 115      | 270      | 0.93 | 14.463       | 0.124             | 1d 01:26:23 | Reset |

☒ show details

The web page provides an overview of the energy measurement values of all phases, as well as the external sensors, provided that they are connected.



The column "Residual Current" is only visible on models that support this feature.

## 2.3 Maintenance

The actual device generation with IPv6 and SSL allows all maintenance functions in the web interface to be carried out on the Maintenance Page <sup>16</sup>.

### Maintenance in the web interface

The following functions are available from the maintenance web page:

- Firmware Update
- Change the SSL certificate
- Load and save the configuration
- Restart the device
- Factory Reset

- Jump into the Bootloader
- Delete the DNS cache

## Upload Firmware, Certificate or Configuration

On the Maintenance Page , select the required file with "Browse .." in the sections "Firmware Update", "SSL Certificate Upload" or "Config Import File Upload" and press "Upload". The file is now transferred to the update area of the device and the contents are checked. Only now, pressing the "Apply" button will permanently update the data, or abort with "Cancel".

 Only one upload function can be initiated with a reboot, eg. you cannot transmit firmware and configuration at the same time.

 If after a firmware update, the web page is not displayed correctly anymore, this may be related to the interaction of Javascript with an outdated browser cache. If a Ctrl-F5 does not help, it is recommended that you manually delete the cache in the browser options. Alternatively, you can test start the browser in "private mode".

 During a firmware update, old data formats are sometimes converted to new structures. If an older firmware is newly installed, the configuration data and the energy meters may be lost! If the device then does not run correctly, please restore the factory settings (e.g. from the Maintenance Page .

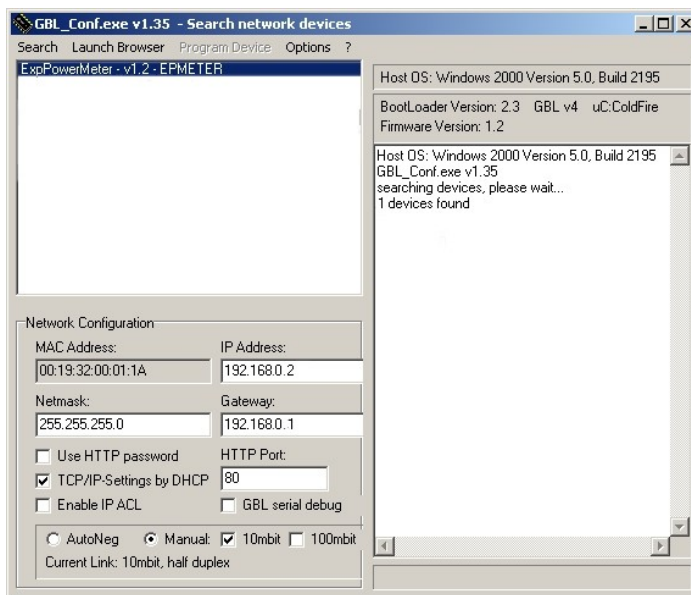
## Actions in Bootloader mode

If the web interface of the device is no longer accessible, the device can be put into Bootloader mode (see chapter Bootloader activation ) . The following functions can be executed using the GBL\_Conf.exe application:

- Set IPv4 address, net-mask and gateway
- Turn HTTP password on and off
- Turn IP-ACL on and off
- Factory Reset
- Jump into the bootloader (can be switched on and off)
- Restart the device

 For devices with relays, entering or exiting the bootloader mode does not change the state of the relays as long as the operating voltage is maintained.

The GBL\_Conf.exe program is available free of charge on our website [www.gude.info](http://www.gude.info) and can also be found on the enclosed CD-ROM.



Interface GBL\_Conf

To check the network settings with GBL\_Conf.exe, start the program and choose "All Devices" in the "Search" menu. From the list select the appropriate device. The lower part of the left half of the window now shows the current network settings of the device. If the IP address is displayed with the default settings (192.168.0.2), either no DHCP server is present on the network, or there could be no free IP address assigned to it.

- Activate the Bootloader Mode (see Chapter Bootloader Mode) and choose in menu "Search" the item "Bootloader-Mode Devices only"
- Enter the desired settings in the edit window and save them with "Save Config".
- Deactivate the boot loader mode for the changes to take effect. Select again "All Devices" in the "Search" menu of GBL\_Conf.exe.

The new network configuration is now displayed.

## Factory Reset

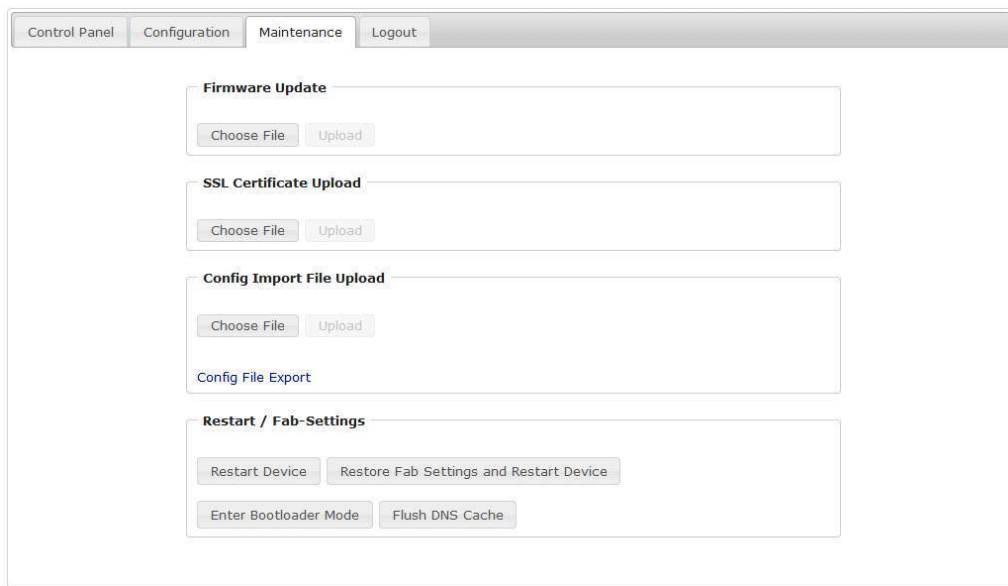
The device can be reset to the factory default via the web interface from the Maintenance Page [\[16\]](#) or from the Bootloader mode (see chapter Bootloader activation [\[19\]](#)). All TCP/IP settings are reset in this operation.



If a unit is set to factory defaults, an uploaded certificate or updated firmware will be preserved.

### 2.3.1 Maintenance Page

This section provides access to important functions such as Firmware Update or Re-start Device. It is advisable to set an HTTP password for this reason.



The screenshot shows the 'Maintenance' tab of a web interface. It contains several sections: 'Firmware Update' with 'Choose File' and 'Upload' buttons; 'SSL Certificate Upload' with 'Choose File' and 'Upload' buttons; 'Config Import File Upload' with 'Choose File' and 'Upload' buttons; 'Config File Export' with a link to 'Config File Export'; and 'Restart / Fab-Settings' with buttons for 'Restart Device', 'Restore Fab Settings and Restart Device', 'Enter Bootloader Mode', and 'Flush DNS Cache'.

Firmware Update: Start a firmware update.

SSL Certificate Upload: Saves your own SSL certificate. See chapter "SSL  49" for the generation of a certificate in the right format.

Config Import File Upload: Loads a new configuration from a text file. To apply the new configuration, a "Restart Device" must be executed after the "Upload".

Config File Export: Saves the current configuration in a text file.

 Saving the configuration should only be carried out in an SSL connection, since it contains sensitive password information (even if it is encrypted or hashed).

Restart Device: Restarts the device without changing the status of the relays.

 Some functions such as a firmware update or changing of the IP-address and HTTP settings require a restart of the device. A jump to the boot loader or a restart of the device lead by no means to a change of the relay states.

Restore Fab Settings and Restart Device: Performs a restart and resets the device to factory default .

Enter Bootloader Mode: Jumps into bootloader mode, where additional settings can be made with GBL\_Conf.exe.

Flush DNS Cache: All entries in the DNS cache are discarded and address resolutions are requested again.

## 2.3.2 Configuration Management

The device configuration can be saved and restored in the maintenance area .

**Config Import File Upload**

[Config File Export](#)

The "Config File Export" function can be used to save the current configuration as a text file. The syntax used in the configuration file corresponds to the commands of the Telnet console. If the configuration of a device is to be restored from a text file, load the file with "Upload" and restart the device with "Restart Device".

 Saving the configuration should only be carried out in an SSL connection, since it contains sensitive password information (even if it is encrypted or hashed). For the same reasons, it is advisable to carefully handle the generated configuration files when archiving.

## Editing the configuration file

It is possible to customize a saved configuration file with a text editor for your own needs. For example, one scenario would be to use a script language to automate the creation of many customized versions of a configuration, then equip a large number of devices with an individualized configuration. Also Upload and restart with CGI commands can be done in scripting languages. With use of the comment sign "#" you can quickly hide single commands or add personal notes.

If you modify a configuration file manually, it is not always clear which limits are allowed for parameters. After uploading and restarting, commands with invalid parameters are ignored. Therefore, the generated configuration includes comments describing the boundaries of the parameters. Where "range:" refers to a numeric value, and "len:" to a text parameter. E.g:

```
email auth set 0 #range: 0..2
email user set "" #len: 0..100
```

The command "system fabsettings" from the beginning of a generated configuration file brings the device into the factory state, and then executes the individual commands that modify the configuration state. It may be desirable to make the changes relative to the current configuration, and not out of the factory state. Then the "system fabsettings" should be removed.

## No output of default values

The configuration file contains (with exceptions) only values which differ from the default. The command "system fabsettings" (go to the factory state) from the beginning of a generated configuration file should not be removed, otherwise the device can get incompletely configured.

## Configuration via Telnet

The configuration files can in principle also be transferred in a Telnet session, but then the settings are changed during operation, and not completely when restarting, as it would have been the case with an upload. It can happen that events are triggered at the same time as the device is configured. One should therefore:

- a) disable the function
- b) completely parametrize

c) reactivate the function

An example:

```
email enabled set 0
email sender set "" #len: 0..100
email recipient set "" #len: 0..100
email server set "" #len: 0..100
email port set 25
email security set 0 #range: 0..2
email auth set 0 #range: 0..2
email user set "" #len: 0..100
email passwd hash set "" #len: 0..100
email enabled set 1 #range: 0..1
```

### 2.3.3 Bootloader Activation

The configuration of the device from the application "GBL\_Conf.exe" is only possible, if the device is in Bootloader Mode.

#### Activation of the Bootloader Mode (1-Button)

1) via push button:

- Press and hold the button for 3 seconds until the Status LED flashes slowly. If a display is available, "Press again to jump to BOOTLOADER" appears. Then briefly press the button again to activate the boot loader, or if you wait 3 seconds instead, the device returns to the initial state.

2) or

- Remove the power supply
- Hold down the "Select" button. If the push button is recessed, use a pin or paper clip
- Connect the operating voltage

3) by Software: (only if "Enable FW to BL" was previously activated in the "GBL\_Conf.exe" application)

- Start the "GBL\_Conf.exe" program
- Do a network search with the "Search" menu action
- Activate in menu "Program Device" the item "Enter Bootloader"

4) via web interface:

Press "Enter Bootloader Mode" on the maintenance  web page.

Whether the device is in Bootloader mode, is indicated by the flashing of the status LED, or it is shown in "GBL\_Conf.exe" application after a renewed device search (appendix "BOOT-LDR" after the device name). In Bootloader mode the program "GBL\_Conf.exe" can disable the password and the IP ACL, perform a firmware update, and restore the factory settings.



For devices with relays, entering or exiting the bootloader mode does not change the state of the relays as long as the operating voltage is maintained.

#### Abandonment of the Bootloader Mode (1-Button)

1) via push button:

- Hold down the button for 3 seconds until the status LED flashes in a long-on, short-out rhythm. If a display is available, "Press again to jump to FIRMWARE" appears. Then briefly press the button again to activate the boot loader, or if you wait 6 seconds instead, the device returns to the initial state.

2) or

- Remove and connect the power supply without operating a button

3) by Software:

- Start the "GBL\_Conf.exe" application
- Do a network search with the "Search" menu action
- In menu "Program Device" activate the item "Enter Firmware"

## Factory Reset (1-Button)

If the device is in bootloader mode, it can always be put back to its factory default. All TCP/IP settings are reset in this operation.



If a unit is set to factory defaults, an uploaded certificate or updated firmware will be preserved.

1) via push button:

- Activate the Bootloader Mode of the device
- Press and hold the button for 6 seconds. After the first 3 seconds, the status LED flashes in a long-on, short-out rhythm, and if a display is present, "Press again to jump to FIRMWARE" appears. Wait another 3 seconds, and the status LED flashes in a twice short, and once long rhythm. For devices with a display "Press again to FABSETTINGS" is shown. At this moment briefly press the button again to activate the factory reset, or if you wait 6 seconds instead, the device returns to the initial state.
- During reset to fabsetting, the status LED flashes rapidly, please wait until the LED flashes slowly (approx. 5 seconds).

2) by Software:

- Activate the Bootloader Mode of the device
- "Start the GBL\_Conf.exe" program
- In menu "Program Device" activate the item "Reset to Fab Settings"
- The status LED will blink in a fast rhythm, please wait until the LED blinks slowly (about 5 seconds)

# Configuration

## 3 Configuration

### TCP/IP configuration by DHCP

After switching on the device is scanning on the Ethernet for a DHCP server and requests an unused IP address. Check the IP address that has been assigned and adjust if necessary, that the same IP address is used at each restart. To turn off DHCP use the software GBL\_Conf.exe or use the configuration via the web interface.

To check the network settings with GBL\_Conf.exe, start the program and choose "All Devices" in the "Search" menu. From the list select the appropriate device. The lower part of the left half of the window now shows the current network settings of the device. If the IP address is displayed with the default settings (192.168.0.2), either no DHCP server is present on the network, or there could be no free IP address assigned to it.

## 3.1 Ethernet

### 3.1.1 IP Address

[IP Address](#) · [IP ACL](#) · [HTTP Server](#)

**Hostname**  
Hostname:

**IPv4**  
Use IPv4 DHCP: ☒ yes ☐ no  
IPv4 Address:   
IPv4 Netmask:   
IPv4 Gateway address:   
IPv4 DNS address:

**IPv6**  
Use IPv6 Protocol: ☐ yes ☒ no  
Use IPv6 Router Advertisement: ☐ yes ☒ no  
Use DHCP v6: ☐ yes ☒ no  
Use manual IPv6 address settings: ☐ yes ☒ no

Hostname: Here you can enter a name with up to 63 characters. This name will be used for registration on the DHCP server.

 Special characters and umlauts can cause problems in the network.

IPv4 Address: The IP address of the device.

IPv4 Netmask: The network mask used in the network.

IPv4 Gateway address: The IP address of the gateway.

IPv4 DNS address: The IP address of the DNS server.

Use IPv4 DHCP: Select "yes" if the TCP/IP settings should be obtained directly from the DHCP server: When the function is selected, each time the device powers up it is checked if a DHCP server is available on the network. If not, the last used TCP/IP setting will be used further.

Use IPv6 Protocol: Activates IPv6 usage.

Use IPv6 Router Advertisement: The Router Advertisement communicates with the router to make global IPv6 addresses available.

Use DHCP v6: Requests from an existing DHCPv6 server addresses of the configured DNS server.

Use manual IPv6 address settings: Activates the entry of manual IPv6 addresses.

IPv6 status: Displays the IPv6 addresses over which the device can be accessed, and additionally DNS and router addresses.

**IPv6 status**

Current IPv6 status:

IPv6 Addr:  
fe80::219:32ff:fe00:996d  
2007:7dd0:ffc1:l:219:32ff:fe00:996d

IPv6 DNS Server:  
2007:7dd0:ffc1:1:20c:29ff:feaf:93c

IPv6 Router:  
fe80::20c:29ff:feaf:93c

 For IP changes a firmware reset is required. This can be done in the Maintenance web page. A restart of the device leads by no means to a change of the relay states.

## Manual IPv6 Configuration

**IPv6 (manual)**

IPv6 Addresses:

2007:7dd0:ffc1:0:219:32ff:fe00:996d

/ 64  
/ 64  
/ 64  
/ 64

IPv6 DNS addresses:

2007:7dd0:ffc1:0:20c:29fffeaf:93c

IPv6 Gateway address:

fe80::20c:29ff:feaf:93c

The input fields for the manual setting of IPv6 addresses allow you to configure the prefix of four additional IPv6 device addresses, and to set two DNS addresses, and a gateway.

## 3.1.2 IP ACL

[IP Address](#) · [IP ACL](#) · [HTTP Server](#)

**ICMP Ping**  
Reply ICMP ping requests: ☒ yes ☐ no

**IP Access Control List**  
Enable IP filter: ☒ yes ☐ no

|                                 |                                      |   |   |
|---------------------------------|--------------------------------------|---|---|
| 1. Grant IP access to host/net: | 1234::4ef0:eec1:0:219:32ff:fe00:f124 | - | + |
| 2. Grant IP access to host/net: | 192.168.1.84                         | - | + |
| 3. Grant IP access to host/net: | mypc.locdom                          | - | + |
| 4. Grant IP access to host/net: | 192.168.1.0/24                       | - | + |
| 5. Grant IP access to host/net: | 1234:4ef0:eec1:0::/64                | - | + |

Apply

Reply ICMP ping requests: If you enable this feature, the device responds to ICMP pings from the network.

Enable IP filter: Enable or disable the IP filter here. The IP filter represents an access control for incoming IP packets.

 Please note that when IP access control is enabled HTTP and SNMP only work if the appropriate servers and clients are registered in the IP access control list.

 If you choose a wrong IP ACL setting and locked yourself out, please activate the Bootloader Mode and use GBL\_Conf.exe to deactivate the IP ACL. Alternatively, you can reset the device to factory default.

## 3.1.3 HTTP

The screenshot shows a web configuration interface for an HTTP server. At the top, there are navigation links: "IP Address", "IP ACL", and "HTTP Server". The "HTTP Server" link is active. Below the navigation, there are two main sections: "HTTP" and "HTTP Password".

**HTTP Section:**

- HTTP Server option:** Three radio buttons are present: "HTTP + HTTPS" (selected), "HTTPS only", and "HTTP only".
- Server port HTTP:** A text input field containing the value "80".
- Server port HTTPS:** A text input field containing the value "443".
- Enable Ajax autorefresh:** Two radio buttons: "yes" (selected) and "no".

**HTTP Password Section:**

- Enable password protection:** Two radio buttons: "yes" (selected) and "no".
- use radius server passwords:** Two radio buttons: "yes" (selected) and "no".
- use locally stored passwords:** Two radio buttons: "yes" (selected) and "no".
- Set new *admin* password:** A text input field with a masked password (four dots) and a note "(32 characters max)".
- Repeat *admin* password:** A text input field with a masked password (four dots).
- Set new *user* password:** A text input field with a masked password (four dots) and a note "(32 characters max)".
- Repeat *user* password:** A text input field with a masked password (four dots).

At the bottom of the "HTTP Password" section, there is an "Apply" button.

HTTP Server option: Selects whether access is possible only with HTTP, HTTPS, or both.

Server port HTTP: Here can be set the port number of the internal HTTP. Possible values are from 1 to 65534 (default: 80). If you do not use the default port, you must append the port number to the address with a colon to address the device from a web browser. Such as: "http://192.168.0.2:800"

Server port HTTPS: The port number to connect the web server via the SSL (TLS) protocol.

Supported TLS versions: Limits the supported TLS versions.

Enable Ajax autorefresh: If this is activated, the information of the status page is automatically updated via http request (AJAX).



For some HTTP configuration changes a firmware reset is required. This can be done in the Maintenance web page. A restart of the device leads by no means to a change of the relay states.

Enable password protection: Password access protection can be activated. If the admin password is assigned, you can only log in by entering this password to change settings. Users can log in by entering the user password in order to query the status information and initiate switching operations.

Use radius server passwords: Username and password are validated by a Radius Sever.

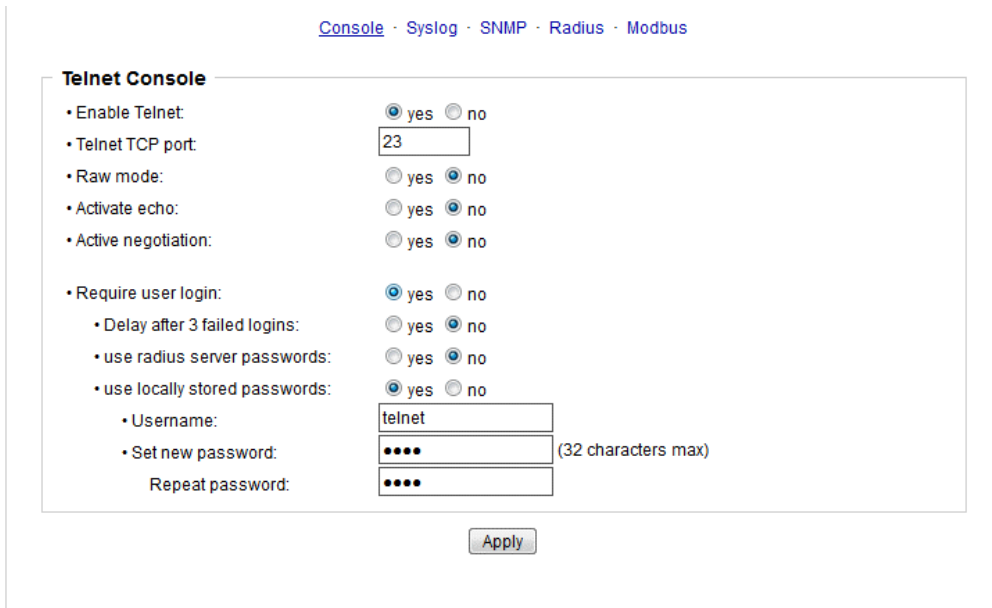
Use locally stored passwords: Username and password are stored locally. In this case, an admin password and a user password must be assigned. The password can have a maximum of 31 characters. The name "admin" and "user" are provided for the user name in the password entry mask of the browser. In factory settings, the password for the admin is set to "admin" or "user" for the user password.

 If the password mask is redisplayed, only four "bullets" are shown as a symbolic placeholder, since for security reasons the device never stores the password itself, but only the SHA2-256 hash. If you want to change a password, the complete password must always be re-entered.

 If you have forgotten your password, please activate the bootloader mode and then turn off the password prompt in GBL\_Conf.exe.

## 3.2 Protocols

### 3.2.1 Console



Enable Telnet: Enables Telnet console .

Telnet TCP port: Telnet sessions are accepted on this port.

Raw mode: The VT100 editing and the IAC protocol are disabled.

Activate echo: The echo setting if not changed by IAC.

Active negotiation: The IAC negotiation is initiated by the server.

Require user login: Username and password are required.

Delay after 3 failed logins: After 3 wrong entries of username or password, the next login attempt is delayed.

Use radius server passwords: Username and password are validated by a Radius Sever.

Use locally stored passwords: Username and password are stored locally

## 3.2.2 Syslog

[Console](#) · [Syslog](#) · [SNMP](#) · [Radius](#) · [Modbus](#)

**Syslog**

Enable Syslog: ☒ yes ☐ no

Syslog server:

Enable Syslog: Enables the usage of Syslog Messages.

Syslog Server: If you have enabled Syslog Messages, enter the IP address of the server to which the syslog information should be transmitted.

## 3.2.3 SNMP

[Console](#) · [Syslog](#) · [SNMP](#) · [Radius](#) · [Modbus](#)

**SNMP**

Enable SNMP options: ☒ SNMP get ☒ SNMP set

SNMP UDP port:

**SNMP v2**

Enable SNMP v2: ☒ yes ☐ no

SNMP v2 public Community:  (16 char. max)

SNMP v2 private Community:  (16 char. max)

**SNMP v3**

Enable SNMP v3: ☒ yes ☐ no

SNMP v3 Username:  (32 char. max)

SNMP v3 Authorization Algorithm:

Set new **Authorization** password:  (8 char. min, 32 char. max)

Repeat **Authorization** password:

SNMP v3 Privacy Algorithm:

Set new **Privacy** password:  (8 char. min, 32 char. max)

Repeat **Privacy** password:

**SNMP Traps**

Send SNMP Traps:

SNMP trap receiver 1 :

SNMP-get: Enables the acceptance of SNMP-GET commands.

SNMP-set: Allows the reception of SNMP-SET commands.

SNMP UDP Port: Sets the UDP port where SNMP messages are received.

Enable SNMP v2: Activates SNMP v2.



Because of security issues, it is advisable to use only SNMP v3, and to disable SNMP v2. Accesses to SNMP v2 are always insecure.

Community public: The community password for SNMP GET requests.

Community private: The community password for SNMP SET requests.

Enable SNMP v3: Activates SNMP v3.

SNMP v3 Username: The SNMP v3 User Name.

SNMP v3 Authorization Algorithm: The selected Authentication Algorithm.

SNMP v3 Privacy Algorithm: SNMP v3 Encryption Algorithm..



If the password mask is redisplayed, only four "bullets" are shown as a symbolic placeholder, since for security reasons the device never stores the password itself, but only the key formed using the Authorization Algorithm. If you want to change a password, the complete password must always be re-entered.



The calculation of the password hashes varies with the selected algorithms. If the Authentication or Privacy algorithms are changed, the passwords must be re-entered in the configuration dialog. "SHA-384" and "SHA512" are calculated purely in software. If "SHA-512" is set on the configuration page, the time for the key generation may take once up to approx. 45 seconds.

Send SNMP traps: Here you can specify whether, and in what format the device should send SNMP traps.

SNMP trap receiver: You can insert here up to eight SNMP trap receiver.

MIB table: The download link to the text file with the MIB table for the device.

More information about SNMP settings are available from our support or can be found on the Internet at [www.gude.info/wiki](http://www.gude.info/wiki).

## 3.2.4 Radius

[Console](#) · [Syslog](#) · [SNMP](#) · [Radius](#) · [Modbus](#)

**Radius**

Enable Radius Client: ☒ yes ☐ no

Use CHAP: ☐ yes ☒ no

Use Message Authentication: ☒ yes ☐ no

Default Session Timeout:

Primary Server:

Set new shared secret:

Repeat new shared secret:

Timeout:

Retries:

Use backup server: ☒ yes ☐ no

Backup Server:

Set new shared secret:

Repeat new shared secret:

Timeout:

Retries:

Enable Radius Client: Enables validation over Radius.

Use CHAP: Use CHAP password encoding.

Use Message Authentication: Adds the "Message Authentication" attribute to the Authentication Request.

Primary Server: Name or IP address of the Primary Radius server.

Shared secret: Radius Shared Secret. For compatibility reasons, only use ASCII characters.

Timeout: How long (in seconds) will be waited for a response from an Authentication Request.

Retries: How often an authentication request is repeated after a timeout.

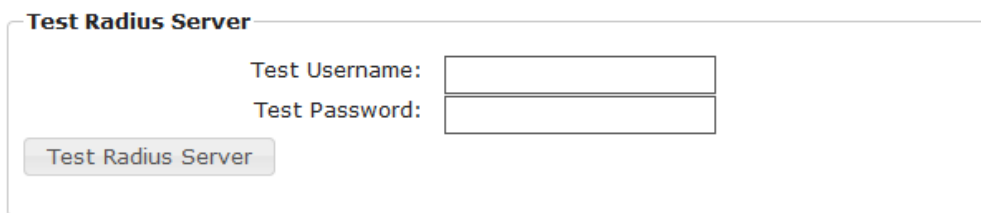
Use Backup Server: Activates a Radius Backup server.

Backup Server: Name or IP address of the Radius Backup server.

Shared secret: Radius Shared Secret. For compatibility reasons, only use ASCII characters.

Timeout: How long (in seconds) will be waited for a response from an Authentication Request.

Retries: How often an authentication request is repeated after a timeout.



The 'Test Radius Server' form is a rectangular box with a title bar. Inside, there are two input fields: 'Test Username:' and 'Test Password:'. Below these fields is a button labeled 'Test Radius Server'.

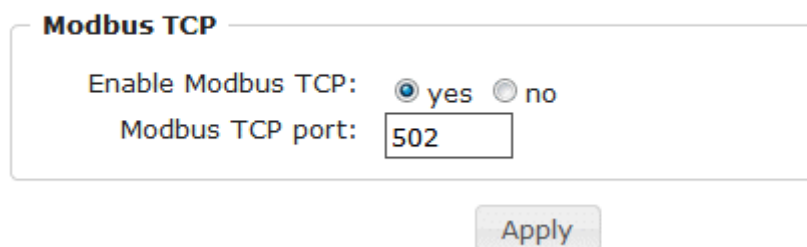
Test Username: Username input field for Radius test.

Test Password: Password input field for Radius test.

The "Test Radius Server" function allows you to check whether a combination of Username and Password is accepted by the configured Radius Servers.

## 3.2.5 Modbus TCP

[Console](#) · [Syslog](#) · [SNMP](#) · [Radius](#) · [Modbus](#)



The 'Modbus TCP' form is a rectangular box with a title bar. Inside, there are two settings: 'Enable Modbus TCP:' with radio buttons for 'yes' (selected) and 'no', and 'Modbus TCP port:' with a text input field containing '502'. Below the form is an 'Apply' button.

Enable Modbus TCP: Enables Modbus TCP support.

Modbus TCP port: The TCP/IP port number for Modbus TCP.

## 3.3 Clock

---

## 3.3.1 NTP

[NTP](#) · [Timer](#)

**NTP**  
Enable Time Synchronisation: ☒ yes ☐ no  
Primary NTP server:    
· reply 21s ago, 11ms signal delay  
· Tue Feb 19 2019 16:50:33 GMT+0100 (Central European Standard Time)  
Backup NTP server:

**Timezone:**  
Timezone:    
Daylight Saving Time (DST): ☒ yes ☐ no

**Clock**  
Current Systemtime (UTC): 15:50:54 19.02.2019 (1550591454)  
Current Localtime: 16:50:54 19.02.2019  
Browstime: 16:50:54 19.02.2019  
Set clock:

Enable Time Synchronization: Enables the NTP protocol.

Primary NTP server: IP address of the first NTP server.

Backup NTP server: IP address of the second NTP server. Used when the first NTP server does not respond.

Timezone: The set time zone for the local time.

Daylight Saving Time: If enabled, the local time is converted to Central European Summer Time.

set manually: The user can set a time manually.

set to Browstime: Sets the time corresponding to web browser.

 If Time synchronization is enabled, a manual time will be overwritten at the next NTP synchronization.

## 3.3.2 Timer

NTP · [Timer](#)

**Timer - Basic Settings**  
Enable Timer: ☒ yes ☐ no  
Syslog verbosity level: normal ▼

**Timer - Rules**  

New Rule: simple Timer

New Rule: advanced Timer

Apply

Enable Timer: enables or disables all timers globally.

Syslog verbosity level: Sets the verbosity level for timer syslog output.

New Rule simple Timer: Shows a dialog for a simple timer rule.

New Rule advanced Timer: Brings up the dialog for advanced timer settings.

## 3.3.3 Timer Configuration

There are three possibilities in the timer configuration: Create a simple timer, add an advanced timer, or change an existing configuration.

 Timer rules are only executed if the device has a valid time. See Configuration NTP [3.1](#).

 This chapter of the manual applies to all Gude devices. Devices without switchable ports can only have an advanced timer. For an action only the "Action CLI" tab is available there, and not the "Action PortSwitch" tab.

**Timer - Basic Settings**

Enable Timer: ☒ yes ☐ no

Syslog verbosity level:

**Timer - Rules**

🔒 Rule 1: 1: Power Port On

New Rule: simple Timer

New Rule: advanced Timer

## Create a simple timer

When "New Rule: simple Timer" is activated, the following dialog is displayed:

**Timer Rule** ✕

Switch

From  :  To  :

On weekdays: ☒ Mon ☒ Tue ☒ Wed ☒ Thu ☒ Fri ☐ Sat ☐ Sun

Here you set which port is to be switched for which period and on which weekdays the rule is active. In this example the period 9:00 to 17:00 is changed to 9:30 to 11:00 compared to the default input mask. This rule is also not applied to Saturdays and Sundays. The now existing rule says that on every day, except Saturday and Sunday, port 1 is switched on at 9:30 a.m. and switched off after 1.5 hours. A click on "Save" saves this rule

 For example, using only one timer rule to turn on a port at 9:00, and turn it off at 20:00. If at 9:00 the timer is triggered, a batch mode is created to switch off after 11 hours. If the batch mode is running, the port is locked against manual operation on the web page. Also nothing happens on a day at 20:00, if this rule is entered at 10:00, because the rule is triggered at 9:00, and the batch mode then switches off at 20:00. If you don't want this behavior, please use a second rule to explicitly switch off the port at 20:00.

## Creating an Advanced Timer

If you create a advanced timer or change an already existing timer, an extended dialog is always shown:

Timer Rule

Trigger: Date/Time Pattern Options Action PortSwitch Action Cli

Hours: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Minutes: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

Days: 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Month: 01 02 03 04 05 06 07 08 09 10 11 12

Days of week: Mon Tue Wed Thu Fri Sat Sun

Delete Save Cancel

Here you can see the extended representation of the simple timer from the previous example. The action is started every day of every month at 9:30. The weekdays Saturday and Sunday are excluded. An existing rule can be removed with the "Delete" button.

 If a rule is deleted, the following rules move up. The numbering of the subsequent rules also changes by one. This also applies to the index in the console commands.

Timer Rule

Trigger: Date/Time Pattern Options Action PortSwitch Action Cli

Rule Name: 1: Power Port On

Rule Valid from: [ ] to [ ] dd.mm.yyyy

Random Trigger Probability: 100

Random Trigger Jitter: 0 secs

enable trigger: ☒ yes ☐ no

Action mode: ☒ Switch Power Ports ☐ Perform CLI Cmd

A simple timer is directly "enabled", on a new complex timer the "enable trigger" option must be switched on manually. You can set a probability and a scatter for the timer rules. Here the rule is executed with 100% probability. A jitter of 0 means that the action takes place exactly at the programmed time. As an action mode a ports can be switched, alternatively a console command (CLI Cmd) can be executed.

On the "Action PortSwitch" tab the switching function can be set in more detail. Port 1 is switched on and switched off again after 1.5 hours.

**Timer Rule**

Trigger: Date/Time Pattern   Options   Action PortSwitch   Action Cli

Switch Power Ports Action1:

|     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| On  | On  | On  | On  | On  | On  | On  | On  | On  |
| Off | Off | Off | Off | Off | Off | Off | Off | Off |

Switch Power Ports Action2:

|     |   |   |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|---|---|
| On  | - | - | - | - | - | - | - | - |
| Off | - | - | - | - | - | - | - | - |

Between Action1 and Action 2 : wait  minute(s) ▼

"Action PortSwitch" is only available for devices with switchable ports.

## Extending a Rule

For demonstration purposes, the simple timer from the previous example is extended here:

**Timer Rule**

Trigger: Date/Time Pattern   Options   Action PortSwitch   Action Cli

Hours: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Minutes: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

Days: 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Month: 01 02 03 04 05 06 07 08 09 10 11 12

Days of week: Mon Tue Wed Thu Fri Sat Sun

The action will now not only start at 9:30, but also at 17:30. There are more changes: The timer is only active between October and December, also the action does not take place on the first day of a month.

 Since all fields in the mask are always taken into account, it is not possible to define the times 9:30 and 17:10 in a single timer rule. You need a second rule for this. If you set hours 9 and 17, as well as minutes 10 and 30, then the four times 9:10, 9:30, 17:10 and 17:30 would be programmed.

 In order to change a field in this input mask without changing the state of the other fields, the Ctrl key must be pressed during the mouse click.

The 'Timer Rule' configuration window shows the 'Options' tab. The 'Trigger' is set to 'Date/Time Pattern'. The 'Rule Name' is '1: Power Port On'. The 'Rule Valid from' is '05.12.2018' to '04.07.2019' in dd.mm.yyyy format. The 'Random Trigger Probability' is 90. The 'Random Trigger Jitter' is 0 secs. The 'enable trigger' is set to 'yes'. The 'Action mode' is 'Switch Power Ports'.

With this rule, the time period in the "Options" tab is limited to the period between December 5, 2018 and July 4, 2019. In this example, the timer rule is executed with a random trigger probability of 90%.

The 'Timer Rule' configuration window shows the 'Action PortSwitch' tab. It displays two actions: 'Switch Power Ports Action1' and 'Switch Power Ports Action2'. Action1 shows a grid of 16 ports, with port 5 highlighted as 'On'. Action2 shows a grid of 8 ports, with port 5 highlighted as 'Off'. The 'Between Action1 and Action 2 : wait' is set to 90 minute(s). A 'Test Action' button is at the bottom.

In addition to port 1, port 5 is activated here and deactivated again after 90 minutes.



A popup at the mouse pointer shows the port number of the corresponding field.

## Console Commands

The 'Timer Rule' configuration window shows the 'Action Cli' tab. The 'Perform CLI Command' field contains the text: 'port 1 reset' and 'port 3 stat set 1'. The 'Test Action' button is at the bottom.

Instead of switching a port, you can run one or more console commands. These commands are entered in the "Action CLI" tab. The "Action Cli" tab can only be selected if the option "Perform CLI Cmd" is activated under "Options".



## Example Switching a Port on a Date

If you want to switch on a timer on a certain date at a time and switch it off at a later time, you cannot do it directly with a simple timer. Therefore it can be useful to first create the timer as a simple timer and then adjust it in the extended dialog.

**Timer Rule**

Switch **3: Power Port** **On**

From **09:25** To **17:30**

On weekdays: ☒ Mon ☒ Tue ☒ Wed ☒ Thu ☒ Fri ☒ Sat ☒ Sun

Save Cancel

Switches port 3 on every day at 9:25, and off again at 17:30. Save the simple rule.

**Timer Rule**

Trigger: Date/Time Pattern Options Action PortSwitch Action Cli

Rule Name **3: Power Port On**

Rule Valid from **17.05.2019** to **17.05.2019** dd.mm.yyyy

Random Trigger Probability **100**

Random Trigger Jitter: **0** secs

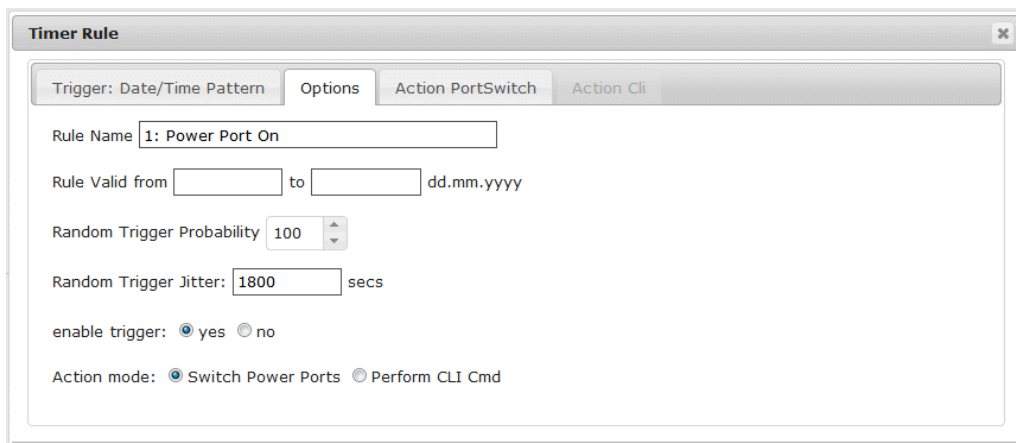
enable trigger: ☒ yes ☐ no

Action mode: ☒ Switch Power Ports ☐ Perform CLI Cmd

Delete Save Cancel

Then you call up the created timer and enter in the "Options" tab the date on which the switching process should take place.

## Example rolling shutter



**Timer Rule**

Trigger: Date/Time Pattern   Options   Action PortSwitch   Action Cli

Rule Name: 1: Power Port On

Rule Valid from: [ ] to [ ] dd.mm.yyyy

Random Trigger Probability: 100

Random Trigger Jitter: 1800 secs

enable trigger: ☒ yes ☐ no

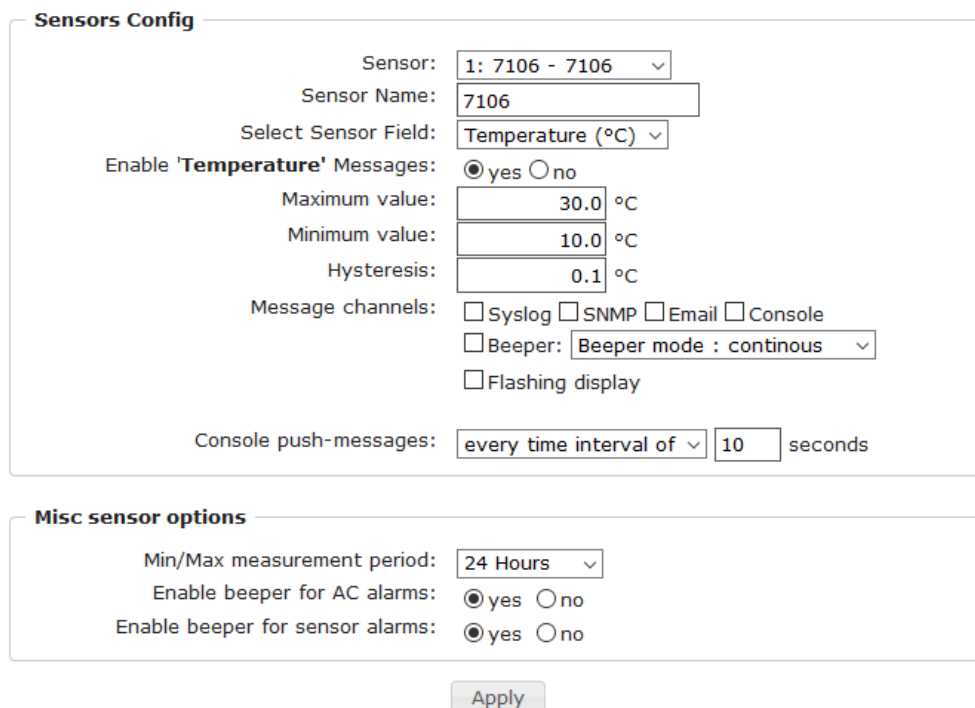
Action mode: ☒ Switch Power Ports ☐ Perform CLI Cmd

You can use the jitter e.g. for a roller shutter control. In the classic example of a roller shutter control, in order to confuse potential burglars, you do not always want to raise and lower the blinds at the same times. A jitter of 1800 seconds means that the action is performed randomly between 30 minutes before and 30 minutes after the programmed time. The probability (Random Trigger Probability) of the execution is here 100%.



Further examples can be found at [www.gude.info/wiki/timer](http://www.gude.info/wiki/timer)

## 3.4 Sensors



**Sensors Config**

Sensor: 1: 7106 - 7106

Sensor Name: 7106

Select Sensor Field: Temperature (°C)

Enable 'Temperature' Messages: ☒ yes ☐ no

Maximum value: 30.0 °C

Minimum value: 10.0 °C

Hysteresis: 0.1 °C

Message channels: ☐ Syslog ☐ SNMP ☐ Email ☐ Console

☐ Beeper: Beeper mode : continuous

☐ Flashing display

Console push-messages: every time interval of 10 seconds

**Misc sensor options**

Min/Max measurement period: 24 Hours

Enable beeper for AC alarms: ☒ yes ☐ no

Enable beeper for sensor alarms: ☒ yes ☐ no

Apply

Sensor: Selects a type of sensor to configure it. The first digit "1" indicates the number of the sensor port (only important for devices with more than one sensor port). This is followed by the sensor name, and the changeable sensor name.

Sensor Name: Changeable name for this sensor. Temperature and humidity can have different names, even if they are from the same sensor.

Select Sensor Field: Selects a data channel from a sensor.

Enable ... Messages: Enables the generation of sensor messages.

Maximum/Minimum value: Here you can choose whether, and at what Maximum/Minimum temperature or humidity measurements limits the alerts are sent via SNMP traps, syslog or e-mail.

Hysteresis: This describes the margin of when an event is generated after the measured value has crossed the chosen limit.

Message channels: Enables the generation of messages on different channels.

With the beeper you can choose between a continuous or an intermittent tone. Flashing display changes the brightness of the LCD backlight in cycles. By pressing a front panel button the beeper and the flashing display will be reset.

Console push-messages: This option allows the output of sensor values on the console at a configured time interval, or when a certain threshold has been reached.

Min/Max measurement period: Selects the time range for the sensor min/max values on the overview web page.

## Hysteresis Example:

A Hysteresis value prevents that too much messages are generated, when a sensor value is jittering around a sensor limit. The following example shows the behavior for a temperature sensor and a hysteresis value of "1". An upper limit of "50 °C" is set.

Example:

49.9 °C - is below the upper limit

50.0 °C - a message is generated for reaching the upper limit

50.1 °C - is above the upper limit

...

49.1 °C - is below the upper limit, but in the hysteresis range

49.0 °C - is below the upper limit, but in the hysteresis range

48.9 °C - a message is generated for underrunning the upper limit inclusive hysteresis range

...

## 3.5 E-Mail

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**E-Mail**

Enable E-Mail: ☒ yes ☐ no

Sender address:

Recipient address:

SMTP server:

SMTP server port:  (Default: 587)

SMTP Connection Security:

**Authentication**

SMTP Authentication (password):

Username:

Set new password:

Repeat password:

Enable E-Mail: Activates the E-Mail dispatch of messages.

Sender address: The E-Mail address of the sender.

Recipient address: The E-Mail address of the recipient. Additional E-Mail addresses, separated by comma, can be specified. The input limit is 100 characters.

SMTP Server: The SMTP IP-address of the E-Mail server. Either as FQDN, e.g: "mail.gmx.net", or as IP-address, e.g: "213.165.64.20". If required, attach a designated port, e.g: "mail.gmx.net:25".

SMTP server port: The port address of the E-Mail server. In the normal case this should be the same as the default, that is determined by the setting SMTP Connection Security.

SMTP Connection Security: Transmission via SSL or no encryption.

SMTP Authentication (password): Authentication method of the E-Mail Server.

Username: User name that is registered with the SMTP E-Mail server.

Set new password: Enter the password for the login to the E-Mail server.

Repeat password: Enter the password again to confirm it.

 If the password mask is redisplayed, only four "bullets" are shown as a symbolic placeholder, since for security reasons the password is never shown itself. If you want to change a password, the complete password must always be re-entered.

E-Mail Logs: Logging of E-Mail system messages.

## 3.6 Front Panel

---

**Front Panel**

Display Brightness:

High ▾

Display 1 default:

VIRMS Power ▾

Display 2 default:

Active Energy ▾

Apply

Display Brightness: The brightness of the LCD backlight can be set here.

Display X default: Selects the display of sensor values for both displays lines.

# Specifications

## 4 Specifications

### 4.1 IP ACL

---

#### IP Access Control List

The IP Access Control List (ACL IP) is a filter for incoming IP packets. If the filter is active, only the hosts and subnets whose IP addresses are registered in the list, can contact via HTTP or SNMP, and make changes. For incoming connections from unauthorized PCs, the device is not completely transparent. Due to technical restraints, a TCP/IP connection will be accepted at first, but then rejected directly.

Examples:

| Entry in the IP ACL   | Meaning                                                             |
|-----------------------|---------------------------------------------------------------------|
| 192.168.0.123         | the PC with IP Address "192.168.0.123" can access the device        |
| 192.168.0.1/24        | all devices of subnet "192.168.0.1/24" can access the device        |
| 1234:4ef0:eec1:0::/64 | all devices of subnet "1234:4ef0:eec1:0::/64" can access the device |



If you choose a wrong IP ACL setting and locked yourself out, please activate the Bootloader Mode and use GBL\_Conf.exe to deactivate the IP ACL. Alternatively, you can reset the device to factory default.

### 4.2 IPv6

---

#### IPv6 Addresses

IPv6 addresses are 128 bit long and thus four times as long as IPv4 addresses. The first 64 bit form a so-called prefix, the last 64 bit designate a unique interface identifier. The prefix is composed of a routing prefix and a subnet ID. An IPv6 network interface can be reached under several IP addresses. Usually this is the case under a global address and the link local address.

#### Address Notation

IPv6 addresses are noted in 8 hexadecimal blocks at 16 bit, while IPv4 normally is noted in decimal. The separator is a colon, not a period.

E.g.: 1234:4ef0:0:0:0019:32ff:fe00:0124

Leading zeros may be omitted within a block. The previous example can be rewritten as:

1234:4ef0:0:0:19:32ff:fe00:124

One may omit one or more successive blocks, if they consist of zeros. This may be done only once within an IPv6 address!

1234:4ef0::19:32ff:fe00:124

One may use the usual decimal notation of IPv4 for the last 4 bytes:

1234:4ef0::19:32ff:254.0.1.36

## 4.3 Radius

The passwords for HTTP, telnet, and serial console (depending on the model) can be stored locally and / or authenticated via RADIUS. The RADIUS configuration supports a primary server and a backup server. If the primary server does respond, the RADIUS request is sent to the backup server. If the local password and RADIUS are enabled at the same time, the system is first checking locally, and then in the event of a failure the RADIUS servers are contacted.

### RADIUS attributes

The following RADIUS attributes are evaluated by the client:

**Session-Timeout:** This attribute specifies (in seconds) how long an accepted RADIUS request is valid. After this time has elapsed, the RADIUS server must be prompted again. If this attribute is not returned, the default timeout entry from the configuration is used instead.

**Filter-Id:** If the value "admin" is set for this attribute, then an admin rights are assigned for the login, otherwise only user access.

**Service-Type:** This is an alternative to Filter-Id. A service type of "6" or "7" means admin rights for the HTTP login, otherwise only limited user access.

### HTTP Login

The HTTP login takes place via Basic Authentication. This means that it is the responsibility of the web server, how long the login credentials are temporarily stored there. The RADIUS parameter "Session-Timeout" therefore does not determine when the user has to login again, but at what intervals the RADIUS servers are asked again.

## 4.4 Automated Access

The device can be accessed automatically via four different interfaces, which offer different possibilities to access the configuration data and status information. Only http and the console (telnet and serial) provide full access to the device.

List of different access options (if supported by the model):

| Interface    | Scope of Access                                                                                                                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HTTP         | read / write all configuration data<br>read / write all status information                                                                                                                     |
| Console   51 | read / write all configuration data<br>read / write all status information                                                                                                                     |
| SNMP   45    | read / write status of Power Ports (relays or eFuses)<br>read / write names of Power Ports (relays or eFuses)<br>read / write status of Port start configuration<br>read / write status Buzzer |

|            |                                                                                                                                                                                                                                                                                                              |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | read / write configuration of power sources<br>read / write fan configuration<br>read measurement values of external sensors<br>read measurement values of all energy sensors<br>read NTP time and status<br>resetting the energy meters<br>read the status of Overvoltage Protection                        |
| Modbus TCP | read / write status of Power Ports (relays or eFuses)<br>read status of Inputs<br>read / write configuration of power sources<br>read / write fan configuration<br>read measurement values of external sensors<br>read measurement values of all energy sensors<br>read the status of Overvoltage Protection |

The device can be controlled via HTTP interface with CGI commands and returns the internal configuration and status in JSON format. The structure of the CGI commands and the JSON data is explained in more detail in our Wiki article:  
[http://wiki.gude.info/EPC\\_HTTP\\_Interface](http://wiki.gude.info/EPC_HTTP_Interface)

## 4.5 SNMP

SNMP can be used for status information via UDP (port 161). Supported SNMP commands are:

- GET
- GETNEXT
- GETBULK
- SET

To query via SNMP you need a Network Management System, such as HP OpenView, OpenNMS, Nagios etc., or the simple command line tools of NET-SNMP software. The device supports SNMP protocols v1, v2c and v3. If traps are enabled in the configuration, the device messages are sent as notifications (traps). SNMP Informs are not supported. SNMP Requests are answered with the same version with which they were sent. The version of the sent traps can be set in the configuration.

### MIB Tables

The values that can be requested or changed by the device, the so-called "Managed Objects", are described in Management Information Bases (MIBs). These substructures are subordinate to so-called "OID" (Object Identifiers). An OID digit signifies the location of a value inside a MIB structure. Alternatively, each OID can be referred to with its symbol name (subtree name). The device's MIB table can be displayed as a text file by clicking on the link "MIB table" on the SNMP configuration page in the browser.

### SNMP v1 and v2c

SNMP v1 and v2c authenticates the network requests by so-called communities. The SNMP request has to send along the so-called community public for queries (read access) and the community private for status changes (write access). The SNMP communities are read and write passwords. In SNMP v1 and v2 the communities are transmitted unencrypted on the network and can be easily intercepted with IP sniffers within this collision domain. To enforce limited access we recommend the use of DMZ or IP-ACL.

## SNMP v3

Because the device has no multiuser management, only one user (default name "standard") is detected in SNMP v3. From the User-based Security Model (USM) MIB variables, there is a support of "usmStats ..." counter. The "usmUser ..." variables will be added with the enhancement of additional users in later firmware versions. The system has only one context. The system accepts the context "normal" or an empty context.

### Authentication

The algorithms "HMAC-MD5-96" and "HMAC-SHA-96" are available for authentication. In addition, the "HMAC-SHA-2" variants (RFC7630) "SHA-256", "SHA-384" and "SHA-512" are implemented.

 "SHA-384" and "SHA512" are calculated purely in software. If "SHA-384" or "SHA-512" is set on the configuration page, the time for the key generation may take once up to approx. 45 seconds.

### Encryption

The methods "DES", "3DES", "AES-128", "AES-192" and "AES-256" are supported in combination with "HMAC-MD5-96" and "HMAC-SHA-96." For the "HMAC-SHA-2" protocols, there is currently neither RFC nor draft that will allow for cooperation with an encryption.

 While in the settings "AES-192" and "AES256" the key calculation is based on "draft-blumenthalphoto-aes-usm-04", the methods "AES 192-3DESKey" and "AES 256-3DESKey" utilize a key generation, which is also used in the "3DES" configuration ("draft-reeder-snmpv3-usm-3desede-00"). If one is not an SNMP expert, it is recommended to try in each case the settings with and without "...- 3DESKey".

### Passwords

The passwords for authentication and encryption are stored only as computed hashes for security reasons. Thus it is, if at all, very difficult to infer the initial password. However, the hash calculation changes with the set algorithms. If the authentication or privacy algorithms are changed, the passwords must be re-entered in the configuration dialog.

### Security

The following aspects should be considered:

- If encryption or authentication is used, then SNMP v1 and v2c should be turned off. Otherwise the device could be accessed with it.
- If only authentication is used, then the new "HMAC-SHA-2" methods are superior to the MD5 or SHA-1 hashing algorithms. Since only SHA-256 is accelerated in hardware, and SHA-384 and SHA-512 are calculated purely in software, one should normally select SHA-256. From a cryptographic point of view, the security of SHA-256 is sufficient for today's usage.
- For SHA-1, there are a little less attack scenarios than MD5. If in doubt, SHA-1 is preferable.
- Encryption "DES" is considered very unsafe, use only in an emergency for reasons of compatibility!
- For cryptologists it's a debatable point whether "HMAC-MD5-96" and "HMAC-SHA-96" can muster enough entropy for key lengths of "AES-192" or "AES-256".
- From the foregoing considerations, we would recommended at present "HMAC-

SHA-96" with "AES-128" as authentication and encryption method.

## Change in Trap Design

 In older MIB tables, a separate trap was defined for each combination of an event and a port number. This results in longer lists of trap definitions for the devices. For example, from **epc8221SwitchEvtPort1** to **epc8221SwitchEvtPort12**. Since new firmware versions can generate many more different events, this behavior quickly produces several hundred trap definitions. To limit this overabundance of trap definitions, the trap design has been changed to create only one specific trap for each event type. The port or sensor number is now available in the trap as an index OID within the variable bindings.

In order to recognize this change directly, the "Notification" area in the MIB table has been moved from sysObjectID.0 to sysObjectID.3. This way, unidentified events are generated until the new MIB table is imported. For compatibility reasons, SNMP v1 traps are created in the same way as before.

## NET-SNMP

NET-SNMP provides a very widespread collection of SNMP command-line tools (snmpget, snmpset, snmpwalk etc.) NET-SNMP is among others available for Linux and Windows. After installing NET-SNMP you should create the device-specific MIB of the device in NET-SMP share directory, e.g. after

```
c:\usr\share\snmp\mibs
```

or

```
/usr/share/snmp/mibs
```

So later you can use the 'subtree names' instead of OIDs:

Name: `snmpwalk -v2c -mALL -c public 192.168.1.232 gudeads`

OID: `snmpwalk -v2c -mALL -c public 192.168.1.232 1.3.6.1.4.1.28507`

## NET-SNMP Examples

Query Power Port 1 switching state:

```
snmpget -v2c -mALL -c public 192.168.1.232 epc822XPortState.1
```

Switch on Power Port 1:

```
snmpset -v2c -mALL -c private 192.168.1.232 epc822XPortState.1 integer 1
```

### 4.5.1 Device MIB

Below is a table of all device-specific OID 's which can be accessed via SNMP. In the numerical representation of the OID the prefix " 1.3.6.1.4.1.28507 " (Gude Enterprise OID) was omitted at each entry in the table to preserve space. The example for a complete OID would be "1.3.6.1.4.1.28507.62.1.1.1.1". A distinction is made in SNMP OID 's in between tables and scalars. OID scalar have the extension ".0" and only specify a value. In SNMP tables the "x" is replaced by an index (1 or greater) to address a value from the table.

# Specifications

| Name                                | Description                                                                                                                                   | OID                 | Type       | Acc. |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------|------|
| pdu8311TrapCtrl                     | 0 = off 1 = Ver. 1 2 = Ver. 2c 3 = Ver. 3                                                                                                     | .62.1.1.1.1.0       | Integer32  | RW   |
| pdu8311TrapIPIndex                  | A unique value, greater than zero, for each receiver slot.                                                                                    | .62.1.1.1.2.1.1.x   | Integer32  | RO   |
| pdu8311TrapAddr                     | DNS name or IP address specifying one Trap receiver slot. A port can optionally be specified: 'name:port' An empty string disables this slot. | .62.1.1.1.2.1.2.x   | OCTETS     | RW   |
| pdu8311Buzzer                       | turn Buzzer on and off                                                                                                                        | .62.1.3.10.0        | Integer32  | RW   |
| pdu8311ActivePowerChan              | Number of supported Power Channels.                                                                                                           | .62.1.5.1.1.0       | Unsigned32 | RO   |
| pdu8311PowerIndex                   | Index of Power Channel entries                                                                                                                | .62.1.5.1.2.1.1.x   | Integer32  | RO   |
| pdu8311ChanStatus                   | 0 = data not active, 1 = data valid                                                                                                           | .62.1.5.1.2.1.2.x   | Integer32  | RO   |
| pdu8311AbsEnergyActive              | Absolute Active Energy counter.                                                                                                               | .62.1.5.1.2.1.3.x   | Unsigned32 | RO   |
| pdu8311PowerActive                  | Active Power                                                                                                                                  | .62.1.5.1.2.1.4.x   | Integer32  | RO   |
| pdu8311Current                      | Actual Current on Power Channel.                                                                                                              | .62.1.5.1.2.1.5.x   | Unsigned32 | RO   |
| pdu8311Voltage                      | Actual Voltage on Power Channel                                                                                                               | .62.1.5.1.2.1.6.x   | Unsigned32 | RO   |
| pdu8311Frequency                    | Frequency of Power Channel                                                                                                                    | .62.1.5.1.2.1.7.x   | Unsigned32 | RO   |
| pdu8311PowerFactor                  | Power Factor of Channel between -1.0 and 1.00                                                                                                 | .62.1.5.1.2.1.8.x   | Integer32  | RO   |
| pdu8311Pangle                       | Phase Angle between Voltage and L Line Current between -180.0 and 180.0                                                                       | .62.1.5.1.2.1.9.x   | Integer32  | RO   |
| pdu8311PowerApparent                | L Line Mean Apparent Power                                                                                                                    | .62.1.5.1.2.1.10.x  | Integer32  | RO   |
| pdu8311PowerReactive                | L Line Mean Reactive Power                                                                                                                    | .62.1.5.1.2.1.11.x  | Integer32  | RO   |
| pdu8311AbsEnergyReactive            | Absolute Reactive Energy counter.                                                                                                             | .62.1.5.1.2.1.12.x  | Unsigned32 | RO   |
| pdu8311AbsEnergyActiveResettable    | Resettable Absolute Active Energy counter. Writing '0' resets all resettable counter.                                                         | .62.1.5.1.2.1.13.x  | Unsigned32 | RW   |
| pdu8311AbsEnergyReactiveResettable  | Resettable Absolute Reactive Energy counter.                                                                                                  | .62.1.5.1.2.1.14.x  | Unsigned32 | RO   |
| pdu8311ResetTime                    | Time in seconds since last Energy Counter reset.                                                                                              | .62.1.5.1.2.1.15.x  | Unsigned32 | RO   |
| pdu8311ForwEnergyActive             | Forward Active Energy counter.                                                                                                                | .62.1.5.1.2.1.16.x  | Unsigned32 | RO   |
| pdu8311ForwEnergyReactive           | Forward Reactive Energy counter.                                                                                                              | .62.1.5.1.2.1.17.x  | Unsigned32 | RO   |
| pdu8311ForwEnergyActiveResettable   | Resettable Forward Active Energy counter.                                                                                                     | .62.1.5.1.2.1.18.x  | Unsigned32 | RO   |
| pdu8311ForwEnergyReactiveResettable | Resettable Forward Reactive Energy counter.                                                                                                   | .62.1.5.1.2.1.19.x  | Unsigned32 | RO   |
| pdu8311RevEnergyActive              | Reverse Active Energy counter.                                                                                                                | .62.1.5.1.2.1.20.x  | Unsigned32 | RO   |
| pdu8311RevEnergyReactive            | Reverse Reactive Energy counter.                                                                                                              | .62.1.5.1.2.1.21.x  | Unsigned32 | RO   |
| pdu8311RevEnergyActiveResettable    | Resettable Reverse Active Energy counter.                                                                                                     | .62.1.5.1.2.1.22.x  | Unsigned32 | RO   |
| pdu8311RevEnergyReactiveResettable  | Resettable Reverse Reactive Energy counter.                                                                                                   | .62.1.5.1.2.1.23.x  | Unsigned32 | RO   |
| pdu8311ResidualCurrent              | Actual Residual Current on Power Channel. According Typ A IEC 60755. Only visible on models that support this feature.                        | .62.1.5.1.2.1.24.x  | Unsigned32 | RO   |
| pdu8311LineSensorName               | A textual string containing name of a Line Sensor                                                                                             | .62.1.5.1.2.1.100.x | OCTETS     | RW   |
| epc8311NTPTimeValid                 | Show if valid Time is received                                                                                                                | .62.1.5.15.1.0      | INTEGER    | RO   |
| epc8311NTPUnixTime                  |                                                                                                                                               | .62.1.5.15.2.0      | Unsigned32 | RO   |

|                              |                                                                       |                  |            |    |
|------------------------------|-----------------------------------------------------------------------|------------------|------------|----|
| epc8311NTPLastValidTimestamp | show received NTP time as unixtime (secs since 1 January 1970)        | .62.1.5.15.3.0   | Unsigned32 | RO |
| pdu8311SensorIndex           | show seconds since last valid NTP timestamp received                  | .62.1.6.1.1.1.x  | Integer32  | RO |
| pdu8311TempSensor            | None                                                                  | .62.1.6.1.1.2.x  | Integer32  | RO |
| pdu8311HygroSensor           | actual temperature                                                    | .62.1.6.1.1.3.x  | Integer32  | RO |
| pdu8311InputSensor           | actual humidity                                                       | .62.1.6.1.1.4.x  | INTEGER    | RO |
| pdu8311AirPressure           | logical state of input sensor                                         | .62.1.6.1.1.5.x  | Integer32  | RO |
| pdu8311DewPoint              | actual air pressure                                                   | .62.1.6.1.1.6.x  | Integer32  | RO |
| pdu8311DewPointDiff          | dew point for actual temperature and humidity                         | .62.1.6.1.1.7.x  | Integer32  | RO |
| pdu8311ExtSensorName         | difference between dew point and actual temperature (Temp - DewPoint) | .62.1.6.1.1.32.x | OCTETS     | RW |
|                              | A textual string containing name of a external Sensor                 |                  |            |    |

## 4.6 SSL

### TLS Standard

The device is compatible with TLS v1.1 to TLS v1.3 standards, but due to lack of security, SSL v3.0, TLS 1.0, and RC4, MD5, SHA1, and DES encryption are disabled. All ciphers use Diffie-Hellman key exchange (Perfect Forward Secrecy).

### TLS 1.3 performance

The interaction of TLS 1.3 and unsecure certificates and a web browser with Chromium Engine (Google Chrome or MS Edge) can lead to performance losses, and thus longer loading times. In this constellation, the Chromium Engine does not correctly support the SSL Session Cache (Session Tickets) and the math unit of the embedded CPU may be overwhelmed with continuous RSA operations. There are some possible workarounds:

- Use secure certificates (official certificate authority or marked as secure in the OS)
- or use of the Firefox browser
- or use of ECC 256 (no RSA) certificates
- or configure to "TLS v1.2 only"

### Creating your own Certificates

The SSL stack is supplied with a specially newly generated self-signed certificate. There is no function to generate the local certificate anew at the touch of a button, since the required random numbers in an embedded device are usually not independent enough. However, you can create new certificates and import them to the device. The server accepts RSA (2048/4096) and ECC (Elliptic Curve Cryptography) certificates.

Usually OpenSSL is used to create an SSL certificate. For Windows for example, there is the light version of Shining Light Productions. There you open a command prompt, change to the directory "C:\OpenSSL-Win32\bin" and set these environment variables:

```
set openssl_conf=C:\OpenSSL-Win32\bin\openssl.cfg
set RANDFILE=C:\OpenSSL-Win32\bin\.rnd
```

Here are some examples for the generation with OpenSSL:

## Creation of a self-signed RSA 2048-bit certificate

```
openssl genrsa -out server.key 2048
openssl req -new -x509 -days 365 -key server.key -out server.crt
```

## RSA 2048-bit certificate with Sign Request:

```
openssl genrsa -out server.key 2048
openssl req -new -key server.key -out server.csr
openssl req -x509 -days 365 -key server.key -in server.csr -out server.crt
```

 The server keys should be created with "openssl genrsa". The Gude device processes keys in the traditional PKCS#1 format. This can be recognized by the fact that the generated key file starts with "-----BEGIN RSA PRIVATE KEY-----". If the file starts with "-----BEGIN PRIVATE KEY-----", the file is in PKCS#8 format and the key is not recognized. If you have only a key in PKCS#8 format, you can convert it to PKCS#1 with openssl: "**openssl rsa -in pkcs8.key -out pkcs1.key**".

## ECC Certificate with Sign Request:

```
openssl ecparam -genkey -name prime256v1 -out server.key
openssl req -new -key server.key -out server.csr
openssl req -x509 -days 365 -key server.key -in server.csr -out server.crt
```

If you have created your key and certificate, both files are concatenated to one file:

Linux:

```
cat server.crt server.key > server.pem
```

Windows:

```
copy server.crt + server.key server.pem
```

The created server.pem can only be uploaded in the maintenance section of the device.

 If several certificates (Intermediate CRT's) should also be uploaded to the device, one should make sure, that firstly the server certificate and secondly the Intermediates are assembled, e.g:

```
cat server.crt IM1.crt IM2.crt server.key > server.pem
```

 An uploaded certificate will be preserved, when a device is put back to factory defaults <sup>20</sup>.

## Performance Considerations

If RSA 4096 certificates are used, the first access to the web server can take 8-10 seconds, because the math unit of the embedded CPU is highly demanded. After that, the parameters are in the SSL session cache, so all other requests are just as fast as with other certificate lengths. For a quick response even on the first access, we recommend RSA 2048-bit certificates that offer adequate security, too.

## 4.7 Console

For the configuration and control of the device, there is a set of commands with parameters that can be entered through a console. The console is available via Telnet, or for devices with RS232 port through using a serial terminal. It is not necessary to use Telnet, in **Raw Mode** a simple TCP/IP connection is sufficient to send commands. The communication can also be performed automated (e.g. via scripting languages). The console features are configured through the web interface [\[26\]](#).

### Command Set

There are several command levels. The following commands are usable from each level:

|          |                                   |
|----------|-----------------------------------|
| back     | go back one level                 |
| help     | all commands of the actual level  |
| help all | show all commands                 |
| logout   | logout (only when login required) |
| quit     | quit console                      |

The "help" command returns all the commands of the current level. If "help" is called from the top level, e.g. the line "http [subtopics]" appears. This means that there is another level for "http". With the command "http help" all commands below "http" are shown. Alternatively, with entering "http" you can select the http level, and "help" shows all the commands on the selected level. The command "back" again selects the top level. It is possible to use "help" at any position: "http passwd help" provides all commands that have the prefix "http passwd".

You will find a complete list of all possible device commands in the chapter "Cmd Overview".

### Parameter

If parameters are expected for the command, the parameter may be passed as numeric or constant. If e.g. you get the following line as help:

```
http server set {http_both=0|https_only=1|http_only=2}
```

the following instruction pairs are equivalent:

```
http server set https_only
http server set 1
```

or

```
http server set https_both
http server set 0
```

Numerical parameters can be entered with different bases. Here is an example of the decimal value 11:

| Base             | Input |
|------------------|-------|
| decimal (10)     | 11    |
| hexadecimal (16) | 0xb   |
| octal (8)        | 013   |

|            |        |
|------------|--------|
| binary (2) | 0b1011 |
|------------|--------|

## Bit Field Parameter

Some parameters can take several values at the same time. In the following example, all values between 0 and 5 can be set. In the help, this can be recognized by the fact that the values are not separated by the "|" character, but by commas.

```
"{EVT_SYSLOG=0,EVT_SNMP=1,EVT_EMAIL=2,EVT_SMS=3,EVT_GSMEMAIL=4,EVT_BEEPER=5}"
```

To set EVT\_SYSLOG and EVT\_EMAIL in a command, you can use the following syntax:

```
>extsensor 1 2 0 events type set "EVT_SYSLOG,EVT_EMAIL"  
OK.
```

or numeric

```
>extsensor 1 2 0 events type set "0,2"  
OK.
```

Additionally you can set all values with "ALLSET" or encode any bit pattern as hexadecimal with a syntax like "#7f1a".

## Return Values

If a command is unknown or a parameter is incorrect, the output "ERR." is given at the beginning of the line, followed by a description of the fault. Successful instructions without special return value will be acknowledged by "OK.". All other return values are output within a single line. There are of two exceptions:

1. Some configuration changes, that affect TCP / IP and UDP, need a restart to be applied. These parameters are output on two lines. In the first line the current value is shown, on the second row the value after a restart. In the "Cmd Overview" table this is marked with "Note 2".
2. Other configurations (such as the assigned IPv6 addresses) have several values that can change dynamically. This is marked with "Note 3" in the "Cmd Overview" table.

## Numerical Returns

For parameters that support constants, these constants are output as return values. To better deal with scripting languages, it may be easier to work only with numerical returns. The command "vt100 numeric set ON" enables that only numerical values appear.

## Comments

If you use a tool to send an entire file of commands via Telnet, it is helpful, if you can place comments in there. Beginning with the comment character "#", the remaining contents of a line is ignored.

## Telnet

If the configuration "Raw Mode" is turned off, it is tried to negotiate the Telnet configuration between client and server using IAC commands. If this fails, the editing functions

are not active, and the "Activate echo" option determines whether the characters sent to the Telnet server will be returned. Normally the client begins with the IAC negotiation. If this is not the case with the client, the device configuration "Active negotiation" should be turned on.

## Raw Mode

If you want to use the console only automated, it may be advantageous to set the configuration "Raw mode" to "yes" and "Activate echo" to "no" to. Then there is no interfering interaction with the editor functions and there is no need to filter the sent characters to process the return values.

 If in the console "Raw mode" is activated but not in the used Telnet client, the IAC commands sent at the beginning can appear as interfering characters in the command line (partially invisible).

## Editing

The following edit functions are available when the terminal supports VT100, and Raw Mode is deactivated. Entered characters are inserted at the cursor position.

| Keys          | Function                                     |
|---------------|----------------------------------------------|
| Left, Right   | moves cursor left or right                   |
| Pos1, End     | moves cursor to the beginning or end of line |
| Del           | deletes character under the cursor           |
| Backspace     | deletes character left of cursor             |
| Up, Down      | shows input lines history                    |
| Tab, Ctrl-Tab | completes the word at cursor                 |
| Ctrl-C        | clears the line                              |

## Sensor Examples

### a) External Sensors

```
>extsensor all show
E=1,L="7106",0="21.3°C",1="35.1%",3="1013hPa",4="5.2°C",5="16.0°C"
E=2,L="7102",0="21.2°C",1="35.4%",4="5.3°C",5="15.9°C"
```

The command lists one connected external sensor per line, and the individual measured values are separated by commas after the label name. The digit before the equal sign corresponds to the Index field in the External Sensor Table.

```
>extsensor 1 0 value show
```

Displays temperature of the sensor at Port 1

### b) Line Sensors

```
>linesensor all "0,1,2,3,12" show
L=1,L="Power Port",0="13000Wh",1="0W",2="225V",3="0A",12="998218s"
L=2,L="Power Port",0="13000Wh",1="0W",2="223V",3="0A",12="996199s"
```

This command outputs all line sensor values in one line. A list of all fields (according to the energy sensor table) is transferred as parameter. In this example these are the

fields Absolute Active Energy (0), Power Active (1), Voltage (2), Current (3) and Reset Time (12).

```
>linesensor 1 "0,1,2,3,12" show
>linesensor 1 1 show
```

These variants give the sensor values of the field list or of a sensor at Line-In 1.

 For devices with Overvoltage Protection, the "linesensor all" command also outputs the state of the protection ("OVP=x"). A "1" means ok, a "0" a failure of the protection.

## c) Port Sensors

```
>portsensor all "0,1,2,3,12" show
P=1,L="Power Port",0="13000Wh",1="0W",2="225V",3="0A",12="998218s"
P=2,L="Power Port",0="13000Wh",1="0W",2="225V",3="0A",12="996199s"
...
P=12,L="Power Port",0="13000Wh",1="0W",2="225V",3="0A",12="998218s"
```

This command outputs all port sensor values in one line. A list of all fields (according to the energy sensor table) is passed as parameter. In this example these are the fields Absolute Active Energy (0), Power Active (1), Voltage (2), Current (3) and Reset Time (12).

```
>portsensor 2 "0,1,2,3,12" show
>portsensor 2 1 show
```

These variants give the sensor values of the field list or a sensor to at Outlet Port 2.

## d) Displaying Port Relays

```
>port all state 1 show
P1=ON,P2=OFF,P3=ON,P4=OFF,P5=OFF,P6=OFF,P7=OFF,P8=ON
```

The command "port all state {MODE0=0|MODE1=1|MODE2=2} show" returns the switching state of all relays in 3 possible formats.

## e) Switching Port Relays

```
#port all state set "1,2,12" 1
OK.
```

The command syntax "port all state set "{port\_list}" {OFF=0|ON=1}" sets a list of ports to ON=1 or OFF=0.

### 4.7.1 SSH

The device supports SSH-2 connections with public key or username and password authentication. Users and passwords can be stored locally or retrieved via a radius server. If you want to use SSH in a terminal, Activate echo should be enabled.

## Public Keys

RSA and ECDSA public keys are accepted.

# Specifications

Key

Public key for pasting into OpenSSH authorized\_keys file:

```
ssh-rsa AAAAB3NzaC1yc2EAAAABJQAAQEAkA926b1dwfApsq1ra3Hzw
+tLSmdXuqglDgQ1Db7KLm16mqmzGoVBX6kmVWmx2XRucTUQohrVzvqAUj
+38VtDLcTIXbtZS7i7WrqDdougl28k5Jx7JORpMuNGBLOsdPK5KNeYm9SPo8wltnd
pc04U3r9unNjqTar2cXqui4XHdvvFr0dByaaeR3yBWjvjdV46uuXaia2T4p6Ou4Pkys0/b
/AnBVSw2SeRNIVoEAUx8eXrIRkvhrXZtzGaxK2xDE3l9Ziz//xt79o6V7yihO0ROuf1bit
```

Key fingerprint: ssh-rsa 2048 4b:4b:f9:b3:5f:9b:b7:f3:e5:40:cd:7c:70:df:af:86

Key comment: rsa-key-20201011

Key passphrase:

Confirm passphrase:

Actions

Generate a public/private key pair

Load an existing private key file

Save the generated key

Generated keys can be copied directly from e.g. putty gen,

Upload SSH public rsa key:

```
ssh-rsa
AAAAB3NzaC1yc2EAAA
ABJQAAQEAkA926b1d
```

☐ Delete public key

and inserted into the Configuration - Console input field. Public keys are accepted in SSH2 or OpenSSH format.

## 4.7.2 Push Messages

On the console channels (Telnet, SSH or serial console) push messages can be activated, which output sensor values in time intervals (every n seconds) or from an adjustable change of the sensor value threshold on this channel. The generated message always starts with a "#" and ends with a CR/LF. This also applies to sensor limit value messages if "Console" is selected as message channel in Sensors - Configuration.

If you open a Telnet or SSH connection, you can use "console telnet pushmsgs set 1" or "console ssh pushmsgs set 1" to temporarily activate the push messages. From now on push messages will be sent asynchronously on this channel. The asynchronicity of the messages can cause problems on a connection if you send commands yourself. Then there are the possibilities:

- Filter all incoming characters between "#" and CR/LF
- or open a second channel (Telnet, SSH, serial) and activate Push Messages

## 4.7.3 Cmd 8311

| Command | Description                     | Note |
|---------|---------------------------------|------|
| logout  | go to login prompt when enabled | 2    |

# Specifications

|                                                        |                                                  |   |
|--------------------------------------------------------|--------------------------------------------------|---|
| quit                                                   | quits telnet session - nothing in serial console | 2 |
| back                                                   | back one cmd level                               | 2 |
| help                                                   | show all cmds from this level                    | 2 |
| help all                                               | show all cmds                                    | 2 |
|                                                        |                                                  |   |
| clock                                                  | enters cmd group "clock"                         |   |
| clock ntp enabled set {OFF=0 ON=1}                     | enables ntp                                      |   |
| clock ntp enabled show                                 | shows if ntp enabled                             |   |
| clock timezone set {minutes}                           | sets timezone                                    |   |
| clock timezone show                                    | shows timezone                                   |   |
| clock dst enabled set {OFF=0 ON=1}                     | enables dst                                      |   |
| clock dst enabled show                                 | shows if dst is enabled                          |   |
| clock manual set "{hh:mm:ss yyyy-mm-dd}"               | sets time and date manually                      |   |
| clock show                                             | shows actual time and date                       |   |
| clock ntp server {PRIMARY=0 BACKUP=1} set "{dns_name}" | sets ntp server name                             |   |
| clock ntp server {PRIMARY=0 BACKUP=1} show             | shows ntp server name                            |   |
|                                                        |                                                  |   |
| console                                                | enters cmd group "console"                       |   |
| console version                                        | shows unique console version number              |   |
| console telnet enabled set {OFF=0 ON=1}                | enables telnet on/off                            |   |
| console telnet enabled show                            | shows if telnet enabled                          |   |
| console telnet port set {ip_port}                      | sets telnet port                                 |   |
| console telnet port show                               | shows telnet port                                |   |
| console telnet raw set {OFF=0 ON=1}                    | sets raw mode (disables editing) on/off          |   |
| console telnet raw show                                | shows if raw mode enabled                        |   |
| console telnet echo set {OFF=0 ON=1}                   | enables echo on/off                              |   |
| console telnet echo show                               | shows if echo enabled                            |   |
| console telnet activeneg set {OFF=0 ON=1}              | enables telnet active negotiation (IAC) on/off   |   |
| console telnet activeneg show                          | shows if active negotiation enabled              |   |
| console telnet login set {OFF=0 ON=1}                  | enables login on/off                             |   |
| console telnet login show                              | shows if login enabled                           |   |
| console telnet login local set {OFF=0 ON=1}            | enables local login on/off                       |   |
| console telnet login local show                        | shows if local login enabled                     |   |
| console telnet login radius set {OFF=0 ON=1}           | enables login for RADIUS on/off                  |   |
| console telnet login radius show                       | shows if RADIUS login enabled                    |   |
| console telnet login delay set {OFF=0 ON=1}            | enables delay (after 3 login fails) on/off       |   |
| console telnet login delay show                        | shows if login delay enabled                     |   |
| console telnet pushmsgs config set {OFF=0 ON=1}        | enables persistent push msgs                     |   |
| console telnet pushmsgs config show                    | shows if persistent push msgs are enabled        |   |
| console telnet pushmsgs set {OFF=0 ON=1}               | enables temporary push msgs                      |   |
| console telnet pushmsgs show                           | shows if temporary push msgs are enabled         |   |
| console telnet user set "{username}"                   | sets login user name                             |   |
| console telnet user show                               | shows login user name                            |   |
| console telnet passwd set "{passwd}"                   | sets login password                              |   |
| console telnet passwd hash set "{passwd}"              | sets login hashed password                       |   |
| console ssh enabled set {OFF=0 ON=1}                   | enables SSH                                      |   |
| console ssh enabled show                               | shows if SSH enabled                             |   |
| console ssh port set {ip_port}                         | sets SSH port                                    |   |
| console ssh port show                                  | shows SSH port                                   |   |
| console ssh echo set {OFF=0 ON=1}                      | enables echo on/off                              |   |
| console ssh echo show                                  | shows if echo enabled                            |   |
| console ssh pushmsgs config set {OFF=0 ON=1}           | enables persistent push msgs                     |   |
| console ssh pushmsgs config show                       | shows if persistent push msgs are enabled        |   |
| console ssh pushmsgs set {OFF=0 ON=1}                  | enables temporary push msgs                      |   |
| console ssh pushmsgs show                              | shows if temporary push msgs are enabled         |   |
| console ssh public hash set "{passwd}"                 | sets hash of SSH public key                      |   |
| console ssh public hash show                           | shows hash of SSH public key                     |   |
|                                                        |                                                  |   |
| email                                                  | enters cmd group "email"                         |   |
| email enabled set {OFF=0 ON=1}                         | enables email on/off                             |   |
| email enabled show                                     | shows if email is enabled                        |   |
| email sender set "{email_addr}"                        | sets email sender address                        |   |
| email sender show                                      | shows email sender address                       |   |
| email recipient set "{email_addr}"                     | sets email recipient address                     |   |
| email recipient show                                   | shows email recipient address                    |   |
| email server set "{dns_name}"                          | sets email SMTP server address                   |   |
| email server show                                      | shows email SMTP server address                  |   |
| email port set {ip_port}                               | sets email SMTP port                             |   |
| email port show                                        | shows email SMTP port                            |   |
| email security set {NONE=0 STARTTLS=1 SSL=2}           | sets SMTP connection security                    |   |
| email security show                                    | shows SMTP connection security                   |   |
| email auth set {NONE=0 PLAIN=1 LOGIN=2}                | sets email authentication                        |   |
| email auth show                                        | show email authentication                        |   |
| email user set "{username}"                            | sets SMTP username                               |   |

# Specifications

|                                                                                                                                                                       |                                                  |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---|
| email user show                                                                                                                                                       | shows SMTP username                              |   |
| email passwd set "{passwd}"                                                                                                                                           | sets SMTP password                               |   |
| email passwd hash set "{passwd}"                                                                                                                                      | sets crypted SMTP password                       |   |
| email testmail                                                                                                                                                        | send test email                                  |   |
| ethernet                                                                                                                                                              | enters cmd group "ethernet"                      |   |
| ethernet mac show                                                                                                                                                     | shows MAC address                                |   |
| ethernet link show                                                                                                                                                    | shows ethernet link state                        |   |
| ethernet phyprefer set {10MBIT_HD=0 10MBIT_FD=1 100MBIT_HD=2 100MBIT_FD=3}                                                                                            | sets preferred speed for PHY Auto Negotiation    |   |
| ethernet phyprefer show                                                                                                                                               | shows preferred speed for PHY Auto Negotiation   |   |
| extsensor                                                                                                                                                             | enters cmd group "extsensor"                     |   |
| extsensor all show                                                                                                                                                    | shows all values from connected external sensors |   |
| extsensor all show                                                                                                                                                    | shows all plugged sensors and fields             |   |
| extsensor {port_num} {sen_field} value show                                                                                                                           | shows sensor value                               | 6 |
| extsensor {port_num} {sen_type} label set "{name}"                                                                                                                    | sets sensor name to label                        | 6 |
| extsensor {port_num} {sen_type} label show                                                                                                                            | shows label of sensor                            | 6 |
| extsensor {port_num} type show                                                                                                                                        | shows type of sensor                             |   |
| extsensor {port_num} {sen_type} {sen_field} events set {off=0 on=1}                                                                                                   | enables sensor events on/off                     | 6 |
| extsensor {port_num} {sen_type} {sen_field} events show                                                                                                               | shows if sensor events are enabled               | 6 |
| extsensor {port_num} {sen_type} {sen_field} events type set "{EVT_SYSLOG=0,EVT_SNMP=1,EVT_EMAIL=2,EVT_SMS=3,EVT_GSMEMAIL=4,EVT_BEEPER=5,EVT_DISPLAY=6,EVT_CONSOLE=7}" | enables different event types                    | 6 |
| extsensor {port_num} {sen_type} {sen_field} events type show                                                                                                          | shows what event types are enabled               | 6 |
| extsensor {port_num} {sen_type} {sen_field} maxval set {num}                                                                                                          | sets maximum value for sensor                    | 6 |
| extsensor {port_num} {sen_type} {sen_field} maxval show                                                                                                               | shows maximum value for sensor                   | 6 |
| extsensor {port_num} {sen_type} {sen_field} minval set {num}                                                                                                          | sets minimum value for sensor                    | 6 |
| extsensor {port_num} {sen_type} {sen_field} minval show                                                                                                               | shows minimum value for sensor                   | 6 |
| extsensor {port_num} {sen_type} {sen_field} hyst set {num}                                                                                                            | sets hysteresis value for sensor                 | 6 |
| extsensor {port_num} {sen_type} {sen_field} hyst show                                                                                                                 | shows hysteresis value for sensor                | 6 |
| extsensor {port_num} {sen_type} {sen_field} publish mode set {NONE=0 INTERVAL=1 DIFFERENCE=2}                                                                         | sets publish mode                                |   |
| extsensor {port_num} {sen_type} {sen_field} publish mode show                                                                                                         | shows publish mode                               |   |
| extsensor {port_num} {sen_type} {sen_field} publish trigger set {float}                                                                                               | sets trigger value for publish                   |   |
| extsensor {port_num} {sen_type} {sen_field} publish trigger show                                                                                                      | shows trigger value for publish                  |   |
| extsensor period set {24H=0 12H=1 2H=2 1H=3 30MIN=4}                                                                                                                  | sets sensor Min/Max measurement period           |   |
| extsensor period show                                                                                                                                                 | shows sensor Min/Max measurement period          |   |
| http                                                                                                                                                                  | enters cmd group "http"                          |   |
| http server set {HTTP_BOTH=0 HTTPS_ONLY=1 HTTP_ONLY=2}                                                                                                                | sets connection types the webserver accepts      |   |
| http server show                                                                                                                                                      | shows webserver accepting connection types       |   |
| http port set {ip_port}                                                                                                                                               | sets http port                                   |   |
| http port show                                                                                                                                                        | shows http port                                  |   |
| http portssl set {ip_port}                                                                                                                                            | sets https port                                  |   |
| http portssl show                                                                                                                                                     | shows https port                                 |   |
| http tls mode set {TLS12=0 TLS13_12=1 TLS13=2 TLS13_12_11=3}                                                                                                          | restricts TLS mode                               |   |
| http tls mode show                                                                                                                                                    | shows TLS mode restriction                       |   |
| http ajax enabled set {OFF=0 ON=1}                                                                                                                                    | enables ajax autorefresh on/off                  |   |
| http ajax enabled show                                                                                                                                                | shows if ajax autorefresh enabled                |   |
| http passwd enabled set {OFF=0 ON=1}                                                                                                                                  | enables http password on/off                     |   |
| http passwd enabled show                                                                                                                                              | shows if http password enabled                   |   |
| http passwd local set {OFF=0 ON=1}                                                                                                                                    | enables local login on/off                       |   |
| http passwd local show                                                                                                                                                | shows if local login enabled                     |   |
| http passwd radius set {OFF=0 ON=1}                                                                                                                                   | enables login for RADIUS on/off                  |   |
| http passwd radius show                                                                                                                                               | shows if RADIUS login enabled                    |   |
| http passwd user set "{passwd}"                                                                                                                                       | sets http user password                          |   |
| http passwd admin set "{passwd}"                                                                                                                                      | sets http admin password                         |   |

# Specifications

|                                                                                                            |                                                               |   |
|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---|
| http passwd hash user set "{passwd}"                                                                       | sets hashed http user password                                |   |
| http passwd hash admin set "{passwd}"                                                                      | sets hashed http admin password                               |   |
|                                                                                                            |                                                               |   |
| ip4                                                                                                        | enters cmd group "ip4"                                        |   |
| ip4 hostname set "{name}"                                                                                  | sets device hostname                                          |   |
| ip4 hostname show                                                                                          | shows device hostname                                         | 3 |
| ip4 address set "{ip_address}"                                                                             | sets IPv4 address                                             |   |
| ip4 address show                                                                                           | shows IPv4 address                                            | 3 |
| ip4 netmask set "{ip_address}"                                                                             | sets IPv4 netmask                                             |   |
| ip4 netmask show                                                                                           | shows IPv4 netmask                                            | 3 |
| ip4 gateway set "{ip_address}"                                                                             | sets IPv4 gateway address                                     |   |
| ip4 gateway show                                                                                           | shows IPv4 gateway address                                    | 3 |
| ip4 dns set "{ip_address}"                                                                                 | sets IPv4 DNS server address                                  |   |
| ip4 dns show                                                                                               | shows IPv4 DNS server address                                 | 3 |
| ip4 dhcp enabled set {OFF=0 ON=1}                                                                          | enables IPv4 DHCP on/off                                      |   |
| ip4 dhcp enabled show                                                                                      | shows IPv4 DHCP state                                         | 3 |
|                                                                                                            |                                                               |   |
| ip6                                                                                                        | enters cmd group "ip6"                                        |   |
| ip6 enabled set {OFF=0 ON=1}                                                                               | enables IPv6 on/off                                           |   |
| ip6 enabled show                                                                                           | shows if IPv6 is enabled                                      | 3 |
| ip6 routadv enabled set {OFF=0 ON=1}                                                                       | enables IPv6 router advertisement                             |   |
| ip6 routadv enabled show                                                                                   | shows IPv6 router advertisement state                         | 3 |
| ip6 dhcp enabled set {OFF=0 ON=1}                                                                          | enables IPv6 DHCP on/off                                      |   |
| ip6 dhcp enabled show                                                                                      | shows if IPv6 DHCP is enabled                                 | 3 |
| ip6 address show                                                                                           | show all IPv6 addresses                                       | 4 |
| ip6 gateway show                                                                                           | show all IPv6 gateways                                        | 4 |
| ip6 dns show                                                                                               | show all IPv6 DNS server                                      | 4 |
| ip6 manual enabled set {OFF=0 ON=1}                                                                        | enables manual IPv6 addresses                                 |   |
| ip6 manual enabled show                                                                                    | shows if manual IPv6 addresses are enabled                    | 3 |
| ip6 manual address {1..4} set "{ip_address}"                                                               | sets manual IPv6 address                                      |   |
| ip6 manual address {1..4} show                                                                             | shows manual IPv6 address                                     | 3 |
| ip6 manual gateway set "{ip_address}"                                                                      | sets manual IPv6 gateway address                              |   |
| ip6 manual gateway show                                                                                    | shows manual IPv6 gateway address                             | 3 |
| ip6 manual dns {1..2} set "{ip_address}"                                                                   | sets manual IPv6 DNS server address                           |   |
| ip6 manual dns {1..2} show                                                                                 | shows manual IPv6 DNS server address                          | 3 |
|                                                                                                            |                                                               |   |
| ipacl                                                                                                      | enters cmd group "ipacl"                                      |   |
| ipacl ping enabled set {OFF=0 ON=1}                                                                        | enables ICMP ping on/off                                      |   |
| ipacl ping enabled show                                                                                    | shows if ICMP ping enabled                                    |   |
| ipacl enabled set {OFF=0 ON=1}                                                                             | enable IP filter on/off                                       |   |
| ipacl enabled show                                                                                         | shows if IP filter enabled                                    |   |
| ipacl filter {ipacl_num} set "{dns_name}"                                                                  | sets IP filter {ipacl_num}                                    |   |
| ipacl filter {ipacl_num} show                                                                              | shows IP filter {ipacl_num}                                   |   |
|                                                                                                            |                                                               |   |
| linesensor                                                                                                 | enters cmd group "linesensor"                                 |   |
| linesensor all {field_list} show                                                                           | shows energy sensors according field list of all line sensors | 5 |
| linesensor {line_num} {field_list} show                                                                    | shows energy sensors according field list of one line sensor  | 5 |
| linesensor {line_num} {energy_sensor} value show                                                           | shows energy sensor of given line                             | 5 |
| linesensor {line_num} ovp show                                                                             | show state of Overvoltage Protection                          |   |
| linesensor {line_num} counter reset                                                                        | resets energy metering counter                                |   |
| linesensor {line_num} label set "{name}"                                                                   | sets line meter to label                                      |   |
| linesensor {line_num} label show                                                                           | shows label of line meter                                     |   |
| linesensor {line_num} {energy_sensor} events set {OFF=0 ON=1}                                              | enables events on/off                                         |   |
| linesensor {line_num} {energy_sensor} events show                                                          | shows if events are enabled                                   |   |
| linesensor {line_num} {energy_sensor} events type set                                                      |                                                               |   |
| "EVT_SYSLOG=0,EVT_SNMP=1,EVT_EMAIL=2 enables different event types ,EVT_SMS=3,EVT_GSMEMAIL=4,EVT_BEEPER=5" |                                                               |   |
| linesensor {line_num} {energy_sensor} events type show                                                     | shows what event types are enabled                            |   |
| linesensor {line_num} {energy_sensor} maxval set {float}                                                   | sets maximum value for line meter                             |   |
| linesensor {line_num} {energy_sensor} maxval show                                                          | shows maximum value for line meter                            |   |
| linesensor {line_num} {energy_sensor} minval set {float}                                                   | sets minimum value for line meter                             |   |
| linesensor {line_num} {energy_sensor} minval show                                                          | shows minimum value for line meter                            |   |
| linesensor {line_num} {energy_sensor} hyst set {float}                                                     | sets hysteresis value for line meter                          |   |
| linesensor {line_num} {energy_sensor} hyst show                                                            | shows hysteresis value for line meter                         |   |
| linesensor {line_num} {energy_sensor} publish                                                              | sets publish mode                                             |   |

# Specifications

|                                                                                                                                                            |                                                                                  |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---|
| mode set {NONE=0 INTERVAL=1 <br>DIFFERENCE=2}                                                                                                              |                                                                                  |   |
| linesensor {line_num} {energy_sensor} publish<br>mode show                                                                                                 | shows publish mode                                                               |   |
| linesensor {line_num} {energy_sensor} publish<br>trigger set {float}                                                                                       | sets trigger value for publish                                                   |   |
| linesensor {line_num} {energy_sensor} publish<br>trigger show                                                                                              | shows trigger value for publish                                                  |   |
| linesensor {line_num} events set {OFF=0 ON=1}                                                                                                              | LEGACY - enables events on/off                                                   | L |
| linesensor {line_num} events show                                                                                                                          | LEGACY - shows if events are enabled                                             | L |
| linesensor {line_num} events type set<br>"{EVT_SYSLOG=0,EVT_SNMP=1,EVT_EMAIL=2,<br>EVT_SMS=3,EVT_GSMEMAIL=4,EVT_BEEPER<br>=5,EVT_DISPLAY=6,EVT_CONSOLE=7}" | LEGACY - enables different event types                                           | L |
| linesensor {line_num} events type show                                                                                                                     | LEGACY - shows what event types are enabled                                      | L |
| linesensor {line_num} maxval set {float}                                                                                                                   | LEGACY - sets maximum value for line meter                                       | L |
| linesensor {line_num} maxval show                                                                                                                          | LEGACY - shows maximum value for line meter                                      | L |
| linesensor {line_num} minval set {float}                                                                                                                   | LEGACY - sets minimum value for line meter                                       | L |
| linesensor {line_num} minval show                                                                                                                          | LEGACY - shows minimum value for line meter                                      | L |
| linesensor {line_num} hyst set {float}                                                                                                                     | LEGACY - sets hysteresis value for line meter                                    | L |
| linesensor {line_num} hyst show                                                                                                                            | LEGACY - shows hysteresis value for line meter                                   | L |
|                                                                                                                                                            |                                                                                  |   |
| modbus                                                                                                                                                     | enters cmd group "modbus"                                                        |   |
| modbus enabled set <off=0/on=1>                                                                                                                            | enables Modbus TCP support                                                       |   |
| modbus enabled show                                                                                                                                        | shows if Modbus is enabled                                                       |   |
| modbus port set <ip_port>                                                                                                                                  | sets Modbus TCP port                                                             |   |
| modbus port show                                                                                                                                           | shows Modbus TCP port                                                            |   |
|                                                                                                                                                            |                                                                                  |   |
| radius                                                                                                                                                     | enters cmd group "radius"                                                        |   |
| radius {PRIMARY=0 SECONDARY=1} enabled<br>set <off=0/on=1>                                                                                                 | enables radius client                                                            |   |
| radius {PRIMARY=0 SECONDARY=1} enabled<br>show                                                                                                             | show if radius client enabled                                                    |   |
| radius {PRIMARY=0 SECONDARY=1} server set<br>"<dns_name>"                                                                                                  | sets radius server address                                                       |   |
| radius {PRIMARY=0 SECONDARY=1} server<br>show                                                                                                              | shows radius server address                                                      |   |
| radius {PRIMARY=0 SECONDARY=1} password<br>set "{passwd}"                                                                                                  | sets radius server shared secret                                                 |   |
| radius {PRIMARY=0 SECONDARY=1} password<br>hash set "{passwd}"                                                                                             | sets radius server crypted shared secret                                         |   |
| radius {PRIMARY=0 SECONDARY=1} auth<br>timeout set {num_secs}                                                                                              | sets server request timeout                                                      |   |
| radius {PRIMARY=0 SECONDARY=1} auth<br>timeout show                                                                                                        | shows server request timeout                                                     |   |
| radius {PRIMARY=0 SECONDARY=1} retries set<br>{num}                                                                                                        | sets server number of retries                                                    |   |
| radius {PRIMARY=0 SECONDARY=1} retries<br>show                                                                                                             | shows server number of retries                                                   |   |
| radius chap enabled set <off=0/on=1>                                                                                                                       | enables CHAP                                                                     |   |
| radius chap enabled show                                                                                                                                   | shows if CHAP is enabled                                                         |   |
| radius message auth set <off=0/on=1>                                                                                                                       | enables request message authentication                                           |   |
| radius message auth show                                                                                                                                   | shows if request message authentication is enabled                               |   |
| radius default timeout set {num_secs}                                                                                                                      | sets default session timeout (when not returned as<br>Session-Timeout Attribute) |   |
| radius default timeout show                                                                                                                                | shows default session timeout                                                    |   |
|                                                                                                                                                            |                                                                                  |   |
| snmp                                                                                                                                                       | enters cmd group "snmp"                                                          |   |
| snmp port set {ip_port}                                                                                                                                    | sets SNMP UDP port                                                               |   |
| snmp port show                                                                                                                                             | shows SNMP UDP port                                                              |   |
| snmp snmpget enabled set {OFF=0 ON=1}                                                                                                                      | enables SNMP GET cmds on/off                                                     |   |
| snmp snmpget enabled show                                                                                                                                  | show if SNMP GET cmds are enabled                                                |   |
| snmp snmpset enabled set {OFF=0 ON=1}                                                                                                                      | enables SNMP SET cmds on/off                                                     |   |
| snmp snmpset enabled show                                                                                                                                  | show if SNMP SET cmds are enabled                                                |   |
| snmp snmpv2 enabled set {OFF=0 ON=1}                                                                                                                       | enables SNMP v2 on/off                                                           |   |
| snmp snmpv2 enabled show                                                                                                                                   | show if SNMP v2 is enabled                                                       |   |
| snmp snmpv2 public set "{text}"                                                                                                                            | enables SNMP v3 on/off                                                           |   |
| snmp snmpv2 public show                                                                                                                                    | show if SNMP v3 is enabled                                                       |   |
| snmp snmpv2 private set "{text}"                                                                                                                           | sets SNMP v2 public community                                                    |   |
| snmp snmpv2 private show                                                                                                                                   | shows SNMP v2 public community                                                   |   |
| snmp snmpv3 enabled set {OFF=0 ON=1}                                                                                                                       | sets SNMP v2 private community                                                   |   |
| snmp snmpv3 enabled show                                                                                                                                   | shows SNMP v2 private community                                                  |   |
| snmp snmpv3 username set "{text}"                                                                                                                          | sets SNMP v3 username                                                            |   |
| snmp snmpv3 username show                                                                                                                                  | shows SNMP v3 username                                                           |   |
| snmp snmpv3 authalg set {NONE=0 MD5=1 <br>SHA1=2 SHA256=3 SHA384=4 SHA512=5}                                                                               | sets SNMP v3 authentication                                                      |   |

# Specifications

|                                                                                              |                                                        |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------|
| snmp snmpv3 authalg show                                                                     | show SNMP v3 authentication algorithm                  |
| snmp snmpv3 privalg set {NONE=0 DES=1 3DES=2 AES128=3 AES192=4 AES256=5 AES192*=6 AES256*=7} | sets SNMP v3 privacy algorithm                         |
| snmp snmpv3 privalg show                                                                     | show SNMP v3 privacy algorithm                         |
| snmp snmpv3 authpasswd set "{passwd}"                                                        | sets SNMP v3 authentication password                   |
| snmp snmpv3 privpasswd set "{passwd}"                                                        | sets SNMP v3 privacy password                          |
| snmp snmpv3 authpasswd hash set "{passwd}"                                                   | sets SNMP v3 authentication hashed password            |
| snmp snmpv3 privpasswd hash set "{passwd}"                                                   | sets SNMP v3 privacy hashed password                   |
| snmp trap type set {NONE=0 V1=1 V2=2 V3=3}                                                   | sets type of SNMP traps                                |
| snmp trap type show                                                                          | show SNMP trap type                                    |
| snmp trap receiver {trap_num} set "{dns_name}"                                               | sets address and port of SNMP trap receiver {trap_num} |
| snmp trap receiver {trap_num} show                                                           | show address and port of SNMP trap receiver {trap_num} |
| syslog                                                                                       | enters cmd group "syslog"                              |
| syslog enabled set {OFF=0 ON=1}                                                              | enables syslog msgs on/off                             |
| syslog enabled show                                                                          | show if syslog enabled                                 |
| syslog server set "{dns_name}"                                                               | sets address of syslog server                          |
| syslog server show                                                                           | shows address of syslog server                         |
| system                                                                                       | enters cmd group "system"                              |
| system restart                                                                               | restarts device                                        |
| system fabsettings                                                                           | restore fab settings and restart device                |
| system bootloader                                                                            | enters bootloader mode                                 |
| system flushdns                                                                              | flush DNS cache                                        |
| system uptime                                                                                | number of seconds the device is running                |
| system name show                                                                             | shows device name                                      |
| system version show                                                                          | shows actual firmware version                          |
| system display {disp_num} default extsensor {port_num} {sen_type} set {sen_field}            | shows external sensor                                  |
| system display {disp_num} default linesensor {line_num} set {sen_field}                      | shows energy line sensor                               |
| system display {disp_num} default set {BLANK=0,LOCAL_TIME=1,UTC_TIME=2}                      | shows other contents                                   |
| system display {disp_num} default show                                                       | shows default setting for display                      |
| system display default hash set "{data}"                                                     | sets hashed display setting                            |
| system display default hash show                                                             | shows hashed display setting                           |
| system display brightness set {brightness_num}                                               | sets display brightness                                |
| system display brightness show                                                               | shows display brightness                               |
| system panel enabled set {OFF=0 ON=1}                                                        | blocks panel buttons when not enabled                  |
| system panel enabled show                                                                    | shows if panel buttons are enabled                     |
| timer                                                                                        | enters cmd group "timer"                               |
| timer enabled set {OFF=0 ON=1}                                                               | enables timer functions                                |
| timer enabled show                                                                           | shows if timer a enabled                               |
| timer syslog facility set {0..23}                                                            | sets facility level for timer syslog                   |
| timer syslog facility show                                                                   | shows facility level for timer syslog                  |
| timer syslog verbose set {0..7}                                                              | sets verbose level for timer syslog                    |
| timer syslog verbose show                                                                    | shows verbose level for timer syslog                   |
| timer {rule_num} enabled set {OFF=0 ON=1}                                                    | enables rule                                           |
| timer {rule_num} enabled show                                                                | shows if rule is enabled                               |
| timer {rule_num} name set "{name}"                                                           | sets name of rule                                      |
| timer {rule_num} name show                                                                   | shows name of rule                                     |
| timer {rule_num} {FROM=0 UNTIL=1} set "{yyyy-mm-dd}"                                         | sets date range of rule                                |
| timer {rule_num} {FROM=0 UNTIL=1} show                                                       | shows date range of rule                               |
| timer {rule_num} trigger jitter set {0..65535}                                               | sets jitter for rule                                   |
| timer {rule_num} trigger jitter show                                                         | show jitter of rule                                    |
| timer {rule_num} trigger random set {0..100}                                                 | sets probability for rule                              |
| timer {rule_num} trigger random show                                                         | shows rule probability                                 |
| timer {rule_num} trigger {HOUR=0 MIN=1 SEC=2 DAY=3 MON=4 DOW=5} set "{time_date_list}"       | sets time date list                                    |
| timer {rule_num} trigger {HOUR=0 MIN=1 SEC=2 DAY=3 MON=4 DOW=5} show                         | shows time date list                                   |
| timer {rule_num} action mode set {SWITCH=1 CLI=2}                                            | sets switch or cli cmd                                 |
| timer {rule_num} action mode show                                                            | shows if switch or cli cmd                             |
| timer {rule_num} action {SWITCH1=0 SWITCH2=1} {OFF=0 ON=1} set "{port_list}"                 | sets port list for switch cmd                          |
| timer {rule_num} action {SWITCH1=0 SWITCH2=1} {OFF=0 ON=1} show                              | shows port list for switch cmd                         |
| timer {rule_num} action delay set {0..65535}                                                 | delay between cmds                                     |
| timer {rule_num} action delay show                                                           | shows delay between cmds                               |
| timer {rule_num} action console set "{cmd}"                                                  | sets cmd string                                        |
| timer {rule_num} action console show                                                         | shows cmd string                                       |

# Specifications

|                                           |                          |
|-------------------------------------------|--------------------------|
| timer {rule_num} action hash set "{data}" | sets action binary form  |
| timer {rule_num} action hash show         | shows action binary form |
| timer {rule_num} delete                   | delete one timer         |
| timer delete all                          | delete all timer         |
| vt100                                     | enters cmd group "vt100" |
| vt100 echo set {OFF=0 ON=1}               | sets console echo state  |
| vt100 echo show                           | shows console echo state |
| vt100 numeric set {OFF=0 ON=1}            | sets numeric mode        |
| vt100 numeric show                        | shows numeric mode state |
| vt100 reset                               | resets terminal          |

## Notes

1. Legacy - The command has been replaced by a newer version
2. Command can be entered on any level
3. the output may show 2 lines - the 1st line shows the actual state, the 2nd line the status after reboot
4. the output may show several lines
5. Please see the **Energy Sensor Table** for the right energy index
6. Please see the **External Sensor Field Table** for the right sensor index

## Energy Sensor Table "{energy\_sensor}"

| Index | Description                                       | Unit       |
|-------|---------------------------------------------------|------------|
| 0     | Forward Active Energy                             | Wh         |
| 1     | Power Active                                      | W          |
| 2     | Voltage                                           | V          |
| 3     | Current                                           | A          |
| 4     | Frequency                                         | 0.01 hz    |
| 5     | Power Factor                                      | 0.001      |
| 6     | Power Angle                                       | 0.1 degree |
| 7     | Power Apparent                                    | VA         |
| 8     | Power Reactive                                    | VAR        |
| 9     | Forward Active Energy Resettable                  | Wh         |
| 10    | Forward Reactive Energy                           | VARh       |
| 11    | Forward Reactive Energy Resettable                | VARh       |
| 12    | Reset Time - sec. since last Energy Counter Reset | s          |
| 13    | Reverse Active Energy                             | Wh         |
| 14    | Reverse Reactive Energy                           | VARh       |
| 15    | Reverse Active Energy Resettable                  | Wh         |
| 16    | Reverse Reactive Energy Resettable                | VARh       |
| 17    | Absolute Active Energy                            | Wh         |
| 18    | Absolute Reactive Energy                          | VARh       |
| 19    | Absolute Active Energy Resettable                 | Wh         |
| 20    | Absolute Reactive Energy Resettable               | VARh       |
| 21    | Residual Current                                  | A          |

 Dependent on the device model Residual Current may not be supported

## External Sensor Type Table "{7x01=0|7x02=1|7x03=2}"

| Index | Description                         | Products         |
|-------|-------------------------------------|------------------|
| 0     | Temperature                         | 7001, 7101, 7201 |
| 1     | Temperature, Humidity               | 7002, 7102, 7202 |
| 2     | Temperature, Humidity, Air Pressure | 7003, 7103, 7203 |

## External Sensor Field Table "{sen\_field}"

| Index | Description                      | Unit |
|-------|----------------------------------|------|
| 0     | Temperature                      | °C   |
| 1     | Humidity                         | %    |
| 2     | Digital Input                    | bool |
| 3     | Air Pressure                     | hPa  |
| 4     | Dew Point                        | °C   |
| 5     | Dew Point Temperature Difference | °C   |

## 4.8 Modbus TCP

If Modbus TCP is activated in the configuration, the ports (relays, outputs, eFuses) can be switched and the following data is callable:

### Address range overview:

| Device Resource          | Start  | End    | Modbus Data Type  |
|--------------------------|--------|--------|-------------------|
| Power/Output/eFuse Ports | 0x000  | 0x3ff  | Coils             |
| DC Inputs                | 0x400  | 0x7ff  | Discrete Inputs   |
| Stop Condition active    | 0x800  | 0x800  | Discrete Inputs   |
| POE active               | 0x801  | 0x801  | Discrete Inputs   |
| Status Power Sources     | 0x1000 | 0x100f | Discrete Inputs   |
| OVP active (Line-Ins)    | 0x1010 | 0x101f | Discrete Inputs   |
| eFuse Errors             | 0x1100 | 0x11ff | Discrete Inputs   |
| Info Area                | 0x000  | 0x005  | Input Registers   |
| CPU Sensor values        | 0x080  | 0x083  | Input Registers   |
| External Sensors         | 0x100  | 0x1ff  | Input Registers   |
| Fan Level                | 0x200  | 0x20f  | Input Registers   |
| Line Energy Sensors      | 0x400  | 0x39ff | Input Registers   |
| Port Energy Sensors      | 0x3a00 | 0x81ff | Input Registers   |
| Bank Energy Sensors      | 0x8200 | 0x823f | Input Registers   |
| Power Source Sensors     | 0x8240 | 0x827f | Input Registers   |
| Bank Power Source Select | 0x000  | 0x00f  | Holding Registers |
| Fan Mode                 | 0x010  | 0x01f  | Holding Registers |



This chapter is general for all Gude devices. Depending on the device type, some ports or certain sensors are not available.



All calculations in this chapter are based on addresses starting at "0". For some Modbus TCP Utilities, however, the addresses start at 1, in which case a 1 must be added to the addresses in this chapter. Please try both possibilities for tests!

The Unit-ID is ignored because the device is uniquely identified by its IP address.

### Supported Modbus TCP Functions

| Function             | Request Code |
|----------------------|--------------|
| Read Coils           | 0x01         |
| Read Discrete Inputs | 0x02         |
| Write Single Coil    | 0x05         |

|                                  |             |
|----------------------------------|-------------|
| Write Multiple Coils             | 0x0f        |
| Read Input Registers             | 0x04        |
| Read Holding Registers           | 0x03        |
| Write Holding Register           | 0x06        |
| Write Multiple Holding Registers | 0x10        |
| Read Device Identification       | 0x2B / 0x0E |

## Coils

| Device Resource    | Start | End   | Device Function            |
|--------------------|-------|-------|----------------------------|
| Power/Output/eFuse | 0x000 | 0x3ff | Coil represents Port State |

## Discrete Inputs

| Device Resource       | Start  | End    | Function when set   |
|-----------------------|--------|--------|---------------------|
| DC Inputs             | 0x400  | 0x7ff  | Input logically 1   |
| Stop Condition active | 0x800  | 0x800  | Stop Input active   |
| POE active            | 0x801  | 0x801  | POE active          |
| Status Power Sources  | 0x1000 | 0x100f | Power Source active |
| OVP active (Line-Ins) | 0x1010 | 0x101f | OVP active          |
| eFuse Error           | 0x1100 | 0x11ff | eFuse Error         |

| Status Power Sources | Offset                         |
|----------------------|--------------------------------|
| EPC 8221 / 8226      | 0 = Bank A, 1 = Bank B         |
| ENC 2111 / 2191      | 0 = Pwr1, 1 = Pwr2             |
| ESB 7213 / 7214      | 0 = Pwr1, 1 = Pwr2 (only 7214) |

## Input Registers

| Device Resource      | Start  | End    | Function                |
|----------------------|--------|--------|-------------------------|
| Info Bereich         | 0x000  | 0x005  | see table               |
| CPU Sensor values    | 0x080  | 0x083  | see table               |
| Externe Sensoren     | 0x100  | 0x1ff  | see table               |
| Fan Level            | 0x200  | 0x20f  | 0 (aus) bis 3 (maximal) |
| Line Energy Sensors  | 0x400  | 0x39ff | see table               |
| Port Energy Sensors  | 0x3a00 | 0x81ff | see table               |
| Bank Energy Sensors  | 0x8200 | 0x823f | see table               |
| Power Source Sensors | 0x8240 | 0x827f | see table               |

## Info Area

| Address | Width  | Information                                       |
|---------|--------|---------------------------------------------------|
| 0       | 16-bit | Number of Ports (Relay)                           |
| 1       | 16-bit | Number of Ports (Outlets) with Energy Measurement |
| 2       | 16-bit | Number of Banks                                   |
| 3       | 16-bit | Number of Line-In                                 |

# Specifications

|   |        |                  |
|---|--------|------------------|
| 4 | 16-bit | Phases per line  |
| 5 | 16-bit | Number of Inputs |

## Sensor Type Description

| Address          | Width           | Information                 |
|------------------|-----------------|-----------------------------|
| 0x080 to 0x083   | 16-bit (signed) | CPU Sensor values           |
| 0x100 to 0x1ff   | 16-bit (signed) | external Sensors            |
| 0x400 to 0x39ff  | 32-bit (signed) | Line Energy Sensors         |
| 0x3a00 to 0x81ff | 32-bit (signed) | Port Energy Sensors         |
| 0x8200 to 0x823f | 16-bit (signed) | Bank Energy Sensors         |
| 0x8240 to 0x827f | 16-bit (signed) | Power Source Energy Sensors |

## CPU Sensor Values

| Offset | Sensor Field    | Unit   |
|--------|-----------------|--------|
| 0      | Vsystem         | 0.01 V |
| 1      | Vaux            | 0.01 V |
| 2      | Vmain           | 0.01 V |
| 3      | CPU Temperature | 0.1 °C |

## External Sensors:

The measured value of the external sensors are coded as fixed point arithmetic. For a factor of e.g. 0.1 in the unit the value must be divided by 10 in order to reach the real measured value. A value of 0x8000 means that no sensor is plugged into the corresponding port, or the corresponding field in the sensor is not available. The formula for the address is (the port numbers start at zero):

$$0x100 + \text{Port} * 8 + \text{Offset}$$



In the Expert Sensor Box 7213 / 7214 the internal sensor corresponds to the value Port = 0, and is coded Port = 1 for Sensor 2 and Port = 2 for Sensor 3.

| Offset | Sensor Field         | Unit             |
|--------|----------------------|------------------|
| 0      | Temperature          | 0.1 °C           |
| 1      | Humidity             | 0.1 %            |
| 2      | Digital Input        | bool             |
| 3      | Air Pressure         | 1 hPa (millibar) |
| 4      | Dew Point            | 0.1 °C           |
| 5      | Dew Point Difference | 0.1 °C           |

For example, the humidity of the second port has the address:  $0x100 + 1 * 8 + 1 = 0x109$

## Energy Sensors:

We distinguish the line sensors (which correspond to the input circuits) and the port sensors, which measure the energy that is passed over the switched port. The measured values of the energy sensors are returned as signed 32-bit integers. The high-order 16-bits are starting on the even address, followed by the low-order 16-bits on the odd address. To calculate the address, there are the following formulas (the values for line, port and phase start at zero):

$$\text{Line: } 0x0400 + \text{Line} * 0x120 + \text{Phase} * 0x60 + \text{Offset} * 2$$

# Specifications

Port:  $0x3a00 + \text{Port} * 0x120 + \text{Phase} * 0x60 + \text{Offset} * 2$



For devices with only one phase, the phase is set to zero in the formula.

## Examples:

"Power Active" for 1st line sensor and 3rd phase:  $0x400 + 0 * 0x120 + 2 * 0x60 + 1 * 2 = 0x4C2$

"Voltage" for 2nd line sensor and single phase device:  $0x400 + 1 * 0x120 + 2 * 2 = 0x524$

"Power Angle" for 4th port sensor and single phase device:  $0x3a00 + 3 * 0x120 + 6 * 2 = 0x3d6c$

| Offset | Sensor Field                                      | Unit       |
|--------|---------------------------------------------------|------------|
| 0      | Absolute Active Energy                            | Wh         |
| 1      | Power Active                                      | W          |
| 2      | Voltage                                           | V          |
| 3      | Current                                           | mA         |
| 4      | Frequency                                         | 0.01 hz    |
| 5      | Power Factor                                      | 0.001      |
| 6      | Power Angle                                       | 0.1 degree |
| 7      | Power Apparent                                    | VA         |
| 8      | Power Reactive                                    | VAR        |
| 9      | Absolute Active Energy Resettable                 | Wh         |
| 10     | Absolute Reactive Energy                          | VARh       |
| 11     | Absolute Reactive Energy Resettable               | VARh       |
| 12     | Reset Time - sec. since last Energy Counter Reset | s          |
| 13     | Forward Active Energy                             | Wh         |
| 14     | Forward Reactive Energy                           | VARh       |
| 15     | Forward Active Energy Resettable                  | Wh         |
| 16     | Forward Reactive Energy Resettable                | VARh       |
| 17     | Reverse Active Energy                             | Wh         |
| 18     | Reverse Reactive Energy                           | VARh       |
| 19     | Reverse Active Energy Resettable                  | Wh         |
| 20     | Reverse Reactive Energy Resettable                | VARh       |
| 21     | Residual Current Type A                           | mA         |
| 22     | Neutral Current                                   | mA         |
| 23     | Residual Current Type B RMS                       | 0.1 mA     |
| 24     | Residual Current Type B DC                        | 0.1 mA     |



Whether the measured values "Residual Current" and "Neutral Current" are supported depends on the respective device model. For measured values such as "Neutral Current", which are independent of the phase, the same value is returned for all phases.

## DC Energy Sensors:

With the EPC 8291 / 8290 devices, the voltage and current of the individual banks and voltage sources can be read out. The measured values of the energy sensors are returned as signed 16-bit integers. The following formulas are available for the address (the values for Bank and PowerSrc start at zero):

Bank:  $0x8200 + \text{Bank} * 2 + \text{Offset}$

Power Source:  $0x8240 + \text{PowerSrc} * 2 + \text{Offset}$

## Examples:

"Voltage" at third bank:  $0x8200 + 2 * 2 + 0 = 0x8204$

"Current" at first PowerSrc:  $0x8240 + 0 * 2 + 1 = 0x8241$

| Offset | Sensor Field | Unit   |
|--------|--------------|--------|
| 0      | Voltage      | 0.01 V |
| 1      | Current      | mA     |

## Holding Registers

| Device Resource   | Start | End   | Function                    |
|-------------------|-------|-------|-----------------------------|
| Bank Power Source | 0x000 | 0x00f | Sets Power Source for Bank  |
| Fan Mode          | 0x010 | 0x01f | 0 = Automatic / 1 = Maximum |

## Device Identification

Returns manufacturer name and device identification:

|                  |        |      |
|------------------|--------|------|
| Request Code     | 1 Byte | 0x2b |
| MEI Type         | 1 Byte | 0x0e |
| Read Dev ID code | 1 Byte | 0x01 |
| Object Id        | 1 Byte | 0x00 |

|                   |          |                   |
|-------------------|----------|-------------------|
| Response Code     | 1 Byte   | 0x2b              |
| MEI Type          | 1 Byte   | 0x0e              |
| Read Dev ID code  | 1 Byte   | 0x01              |
| Conformity Level  | 1 Byte   | 0x01              |
| More Follows      | 1 Byte   | 0x00              |
| NextObjectID      | 1 Byte   | 0x00              |
| Number of Objects | 1 Byte   | 0x03              |
| Object ID         | 1 Byte   | 0x00              |
| Object Length     | 1 Byte   | n1                |
| Object Value      | n1 Bytes | "Company Id"      |
| Object ID         | 1 Byte   | 0x00              |
| Object Length     | 1 Byte   | n2                |
| Object Value      | n2 Bytes | "Product Id"      |
| Object ID         | 1 Byte   | 0x00              |
| Object Length     | 1 Byte   | n3                |
| Object Value      | n3 Bytes | "Product Version" |

## 4.9 Messages

Depending on adjustable events, various messages can be sent from the device. The following message types are supported:

- Sending of e-mails
- SNMP Traps
- Syslog messages

## Email messages

Email messages are triggered by the following events:

- Turning on the device
- Exceeding of the max / min values of attached sensors
- State change of digital sensor input ports
- Exceeding of max / min values of the measured power consumption
- Exceeding max / min values of residual current type A (**Model 8311-2 only**)

## SNMP Traps

SNMP Traps are system messages that are sent via the SNMP protocol to different recipients. SNMP traps are triggered by the following events:

- Exceeding of the max / min values of attached sensors
- State change of digital sensor input ports
- Exceeding of max / min values of the measured power consumption
- Exceeding max / min values of residual current type A (**Model 8311-2 only**)

## Syslog messages

Syslog messages are simple text messages that are sent via UDP to a syslog server. Under Linux, normally a syslog daemon is already running (eg. syslog-ng), for Microsoft Windows systems some freeware programs are available on the market. The syslog messages are sent for the following events:

- Turning on the device
- Enable/disable of syslog in the configuration
- Exceeding of the max / min values of attached sensors
- State change of digital sensor input ports
- Exceeding of max / min values of the measured power consumption
- Exceeding max / min values of residual current type A (**Model 8311-2 only**)

**Support**

## 5 Support

You will find the latest product software on our website at [www.gude.info](http://www.gude.info) available for download. If you have further questions about installation or operation of the unit, please contact our support team. Furthermore, we present in our support wiki at [www.gude.info/wiki](http://www.gude.info/wiki) FAQs and configuration examples.

### 5.1 Data Security

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To provide the device with a high level of data security, we recommend the following measures:

- Check that the HTTP password is switched on.
- Set up your own HTTP password.
- Allow access to HTTP via SSL (TLS) only.
- Use TLS 1.3 if possible and avoid TLS 1.1.
- Enable authentication and encryption in SNMPv3.
- Disable SNMP v2 access.
- Enable STARTTLS or SSL in the e-mail configuration.
- Archive configuration files securely.
- In the IP ACL, enter only the devices that require access to HTTP or SNMP.
- Use SSH if possible, since Telnet is not encrypted.
- Set login for telnet or serial console.
- Modbus TCP is not encrypted, only activate it in a secure environment.
- Activate "Message Authentication" in RADIUS.

#### **When accessed from the Internet**

- Use a randomized password with at least 32 characters.
- If possible, place the device behind a firewall.

### 5.2 Contact

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## 5.3 Declaration of Conformity

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This product from the **Expert PDU Energy 8311** series is in conformity with the European directives for CE marking applicable to this product. The complete CE declaration of conformity for this product can be found on the website [www.gude.info](http://www.gude.info) in the download section of the product.

## 5.4 FAQ

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### 1. What can I do if the device is no longer accessible?

- If the Status LED is red, the device has no connection to the switch. Unplug and plug the Ethernet cable. If the Status LED is still red, try other switches. If one uses no switch, but connects e.g. a laptop directly to the device, make sure you are using a crossover Ethernet cable.
- If the status LED is orange for a longer time after unplugging and plugging the Ethernet cable, then DHCP is configured, but no DHCP server was found in the network. After a timeout, the last IP address is configured manually.
- If there is a physical link (status LED is green) to the device, but you can not access the web server, bring the device into bootloader mode and search for it with GBL\_Conf.exe<sup>[14]</sup>. Then check the TCP-IP parameters and change them if necessary.
- If the device is not found by GBL\_Conf.exe in bootloader mode, you can reset the settings to factory defaults<sup>[20]</sup> as the last option.

### 2. Why does it sometimes take so long to configure new SNMPv3 passwords on the website?

The authentication methods "SHA-384" and "SHA-512" are calculated purely in software, and can not use the crypto hardware. On the configuration page, e.g. "SHA-512", needs up to 45 seconds to calculate the key.

### 3. Can you enter multiple e-mail recipients?

- Yes. In the E-Mail configuration in the Recipient Address field, it is possible to enter multiple e-mail addresses separated by commas. The input limit is 100 characters.

### 4. Why did the MIB tables change after the firmware update?

- Since the number of possible event types was increased, the previous trap design resulted in an excess of trap definitions: See Change in Trap Design<sup>[47]</sup>.

### 5. Importing an older firmware

- During a firmware update, old data formats are sometimes converted to new structures. If an older firmware is newly installed, the configuration data and the energy meters may be lost! If the device then does not run correctly, please restore the factory settings (e.g. from the Maintenance Page<sup>[16]</sup>).

## 6. Disable switching events

- You can set the sending of syslog, emails etc. when switching ports (only concerns Gude devices with relays) under "System" in the sensor configuration .

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