Interface description MeterExtension #1

Project: EnergyRadar

Product: MeterExtension #1

Region: Innsbrucker Kommunal Betriebe

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Document number:	xxxxx
Version:	01.0
Date:	August 26, 2024

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Imprint

This documentation is being published by:
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Register Court: Amtsgericht Jena
Register Number: HR B 50 10 89
VAT-ID: DE252755319

DIN EN ISO 9001 certified company

Version History

Date	Version	Modification	Name
26.08.2024	1.0	Initial document	Horst Toddenrott

Contents

1 Introduction

1.1 Target for this document

This document describes the local API interface of the MeterExtension #1 .
The user should then be able to use the API calls to integrate the device in a local APP, Home Energy Management system or other application and useful services. Some basic knowledge about REST API calls and Curl commands are needed.

2 Installation Procedure

The following sections describes how to set up the MeterExtension.

2.1 Wifi Setup

2.1.1 Operational Modes

The Wifi interface will work in two operation modes:

- Access Point Mode
- Client Mode

Access Point Mode After first power up, the MeterExtension starts in the configuration mode. In this phase, the MeterExtension establishes an WiFi accsess point with the following parameters:
WiFi-SSID: meterextension:xxxx
WiFi-Password: welinkwelink

The user has to select the local WIFI network he wants to connect to and provide the password for these local WiFi Network. The MeterExtension will then configure the client mode and connects to the local WiFi network.
If the MeterExtension is connected to a smart meter with encrypted data, the User need to add the smart meter key provided by the supplier to decrypt the data from the Smart Meter. The AP mode is disabled after 10 Minutes for security reasons. If you need to restart the AP mode, then you have to disconnect and reconnect the device to the Smart Meter.

Client Mode The normal operation mode allows the user to access the real time data of the connected smart meter. The MeterExtension will also via this connection the complete REST-API commands. The developer of a portal, APP or other application has access to all functionality of the MeterExtension. To get the ip address in the local network, an api command is provide (see section "REST-API Specification"). The MeterExtension is then visible in the local Wifi networks as a client.

3 REST-API Specification

3.1 WiFi Setup.

The Wifi interface will work in two operation modes:

- Configuration Mode
- Operational Mode

3.1.1 Configuration Mode

After first power up, the MeterExtension starts in the access point mode. In this phase, the MeterExtension establishes an WiFi accsess point with the following parameters:

- WiFi-SSID: meterextension:xxxx
- WiFi-Password: welinkwelink

At this stage, a look up of the existing WiFi Networks which can be reached from the MeterExtension can be started.The user can then chose the WiFi Network he wants to use in the operational mode. The user has then to provide the password for the local WiFi Network. The MeterExtension will then configure the client mode and connects to the local WiFi network.
If the MeterExtension is connected to a smart meter with encrypted data, the APP will ask for the smart meter key provided by the supplier to decrypt the data from the Smart Meter.

3.1.2 Operation Mode

The normal operation mode allows the user to access the real time data of the connected smart meter. The MeterExtension will also via this connection the complete REST-API commands. The developer of a portal, APP or other application has access to all functionality of the MeterExtension.

Firmware Update via OTA To update the MeterExtension via ota, you need to start a browser and go to

```
For MeterExtension #1:
http://<ip-address>/ota

For MeterExtension #3:
http://<ip-address>/ota.html
```

```
Your Browser should get a "Update␣Success!␣Rebooting..." message to
    confirm the successful update, if you get a different response,
    please repeat the Update.
```

3.2 General Information on Rest-API

Content/typ: Application/json

3.2.1 Unkown Command

Response if an command is not recognized

```
response:      {"error":"unkown␣cmd","result","id":"123"}
```

3.3 WIFI Functions

3.3.1 WiFi config

This command sets the configuration parameter for the MeterExtension to connect to the local WiFi network.

```
Command:       {"cmd":"wifi_config","ssid":"solimlis","password":"
    blub123ber","id":"123"}
Response:      {"result":"OK","id":"123"}
```

3.3.2 WiFi Status

This command reads the actual WiFi credentials of the MeterExtension

```
Command:       {"cmd":"wifi_status","id":"123"}
Response:      {"ssid":"<ssid>","rssi":"-63","ap-mac":"<devicve_mac>","IP"
    :"<device_ip>","result":"OK","id":"123"}
```

3.3.3 WiFi setup with curl

```
curl -i -X POST -d "{\"cmd\":\"wifi_status\"}" <ip>/api
curl -i -X POST -d "{\"cmd\":\"wifi_config\",\"ssid\":\"????????\",\"
    password\":\"????????\",\"mode\":\"????????\"}" <ip>/api //it is not
    necessary to enter all the fields- mode can be "sta" or "sta_ap"
```

3.4 System Functions

3.4.1 System Status

This commands provides information about the MeterExtension itself and some infos to the actual configuration.

```
Command:      {"cmd":"system_status","id":"123"}
Response:     {"model":"<device_typ>","sw-version":"<sw_version>","hw-
    version":"<hw_version>","mac":"<device_mac>","sys-ts":"<sys_time>","
    result":"OK","id":"123"}
```

3.4.2 Factory Reset

This command resets all parameters and sets the MeterExtension back to factory default configuration.

```
Command:      {"cmd":"meter_factreset","id":"123"}
Response:     {"result":"OK","id":"123"}
```

3.4.3 System Restart

This command resets reboots the MeterExtension .

```
Command:      {"cmd":"system_restart","id":"123"}
Response:     {"result":"OK","id":"123"}
```

3.4.4 get ip info

```
Command:      {"cmd":"get_ip_info","id":"123"}
Response example:
IP: 192.168.0.158
GW: 192.168.0.1
Net Mask: 255.255.255.0
```

3.4.5 System functions with curl

```
curl -i -X POST -d "{\"cmd\":\"firmware_update\",\"firmware_uri\":\"http
    ://192.168.2.228:8001/welink.bin\",\"cert\":\"ca_cert.pem\"}" <ip>/api
             //be careful of http and https.       //cert is optional.
    default is ca_cert.pem
```

```
curl -i -X POST -d "{\"cmd\":\"download_file\",\"file_uri\":\"http
    ://192.168.2.228:8001/test.txt\",\"cert\":\"ca_cert.pem\"}" <ip>/api
                           //cert is optional.default is ca_cert.pem
curl -i -X POST -d "{\"cmd\":\"request_post\",\"file_uri\":\"http
    ://192.168.2.47:80/api\",\"message\":\"????????\",\"cert\":\"ca_cert.
    pem\"}" <ip>/api  //cert is optional.default is ca_cert.pem

curl -i -X POST -d "{\"cmd\":\"system_restart\"}" <ip>/api
curl -i -X POST -d "{\"cmd\":\"meter_factreset\"}" <ip>/api

curl -i -X POST -d "{\"cmd\":\"system_status\"}" <ip>/api

curl -i -X POST -d "{\"cmd\":\"get_ip_info\"}" <ip>/api
```

3.5 Commands for reading Meter Data

3.5.1 meter reading

This command reads out the actual meter readings via the MeterExtension API. The number of OBIS Codes send from the smart meter to the meter extension differ from region to region. The API will provide the complete set of actually known OBIS codes send by the different meter types. Also not only the number of OBIS Codes will differ from area to area also the number of different telegrams differ. For more information see the specification of the local port of the given smart meter.

```
Command:       {"cmd":"meter_reading","id":"123"}
Response:      {"meter":[{"meterid":"12398764","data":[...]}],"result":"OK
    ","id":"123"}

Example empty:
{"meter":[{"meterid":"lu","data":"[{}]}]","result":"OK","id":"123"}

Example filled:
{"meter":[{"meterid":"1KFM0100000015","data":[
{"OBIS":"1-0:32.7.0.255","scale":"-1","unit":"35","entry":[{"val":"2381",
    "ts":"1532715540"}]},
{"OBIS":"1-0:31.7.0.255","scale":"-2","unit":"33","entry":[{"val":"0","ts
    ":"1532715540"}]},
{"OBIS":"1-0:1.7.0.255","scale":"0","unit":"27","entry":[{"val":"0","ts":
    "1532715540"}]},
{"OBIS":"1-0:2.7.0.255","scale":"0","unit":"27","entry":[{"val":"0","ts":
    "1532715540"}]},
```

```
{"OBIS":"1-0:1.8.0.255","scale":"0","unit":"30","entry":[{"val":"0","ts":
    "1532715540"}]},
{"OBIS":"1-0:2.8.0.255","scale":"0","unit":"30","entry":[{"val":"0","ts":
    "1532715540"}]},
{"OBIS":"1-0:3.8.0.255","scale":"0","unit":"32","entry":[{"val":"0","ts":
    "1532715540"}]}]},
{"result":"OK","id":"123"}
```


3.5.2 meter setkey

This command sets the meter key to decrypt the messages from the smart meter to the MeterExtension. This function is only necessary for specific areas.

```
Command:      {"cmd":"meter_setkey","key":"<meter_key>","id":"123"
    }
Response:     {"result":"OK","id":"123"}
```

3.5.3 Read data with curl

```
curl -i -X POST -d "{\"cmd\":\"meter_reading\"}" <ip>/api
curl -i -X POST -d "{\"cmd\":\"meter_setkey\",\"key\":\"xxxxx\"}" <ip>/
    api
```

4 Obis Codes

The following chapter describes the needed test setup to make sure, that the highest level of quality could be guaranteed.

4.1 Definitions of OBIS Code structure

The OBIS key figure consists of various value groups from whose combination the specification of a value is derived. For each value group there are tables with key values. (See below) The code consists of (up to) 6 group sub-identifiers marked by letters A to F. All these may or may not be present in the identifier (e.g. groups A and B are often omitted). In order to decide to which group the sub-identifier belongs, the groups are separated by unique separators:

```
Prinicpal structure of OBIS Codes:  A-B:C.D.E*F.
```

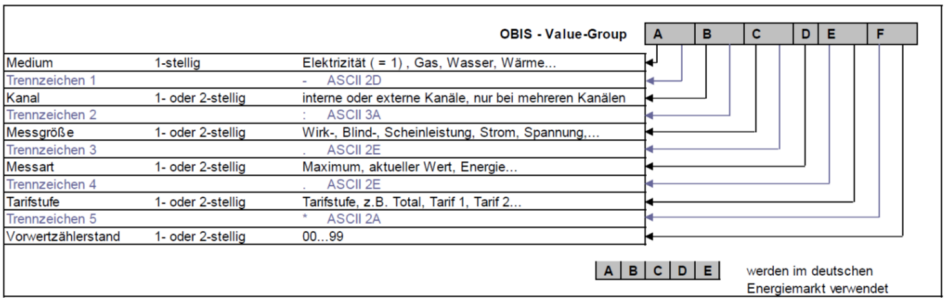

Figure 1: Example for OBIS Electric Energy

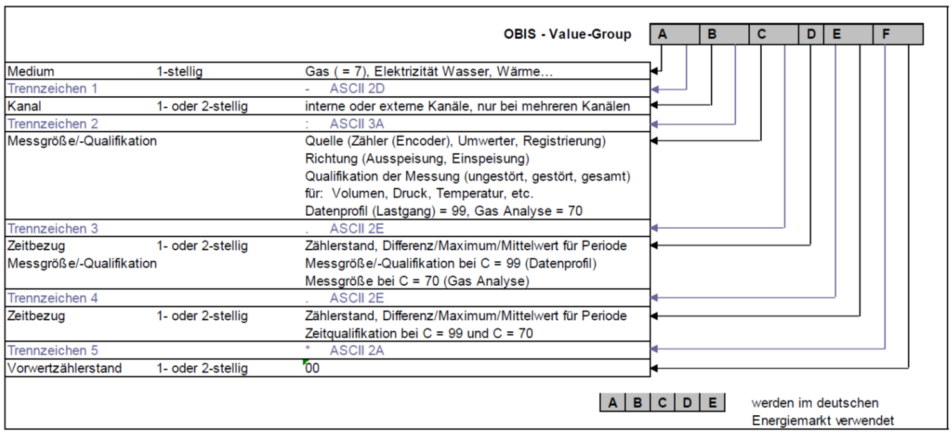

Figure 2: Example for OBIS Thermal Energy

- The A group specifies the medium (0=abstract objects, 1=electricity, 6=heat, 7=gas, 8=water ...)
- The B group specifies the channel. Each device with multiple channels generating measurement results, can separate the results into the channels.
- The C group specifies the physical value (current, voltage, energy, level, temperature, ...)
- The D group specifies the quantity computation result of specific algorithm
- The E group specifies the measurement type defined by groups A to D into individual measurements (e.g. switching ranges)
- The F group separates the results partly defined by groups A to E. The typical usage is the specification of individual time ranges.

4.2 Examples of code usage

4.2.1 Active energy registers

1.8.0 Positive active energy (A+) total [kWh]
1.8.1 Positive active energy (A+) in tariff T1 [kWh]
1.8.2 Positive active energy (A+) in tariff T2 [kWh]
1.8.3 Positive active energy (A+) in tariff T3 [kWh]
1.8.4 Positive active energy (A+) in tariff T4 [kWh]
2.8.0 Negative active energy (A+) total [kWh]
2.8.1 Negative active energy (A+) in tariff T1 [kWh]
2.8.2 Negative active energy (A+) in tariff T2 [kWh]
2.8.3 Negative active energy (A+) in tariff T3 [kWh]
2.8.4 Negative active energy (A+) in tariff T4 [kWh]
15.8.0 Absolute active energy (A+) total [kWh]
15.8.1 Absolute active energy (A+) in tariff T1 [kWh]
15.8.2 Absolute active energy (A+) in tariff T2 [kWh]
15.8.3 Absolute active energy (A+) in tariff T3 [kWh]
15.8.4 Absolute active energy (A+) in tariff T4 [kWh]
16.8.0 Sum active energy without reverse blockade (A+ - A-) total [kWh]
16.8. Sum active energy without reverse blockade (A+ - A-) in tariff T1 [kWh]
16.8.2 Sum active energy without reverse blockade (A+ - A-) in tariff T2 [kWh]
16.8.3 Sum active energy without reverse blockade (A+ - A-) in tariff T3 [kWh]
16.8.4 Sum active energy without reverse blockade (A+ - A-) in tariff T4 [kWh]

4.2.2 Reactive energy registers

3.8.0 Positive reactive energy (Q+) total [kvarh]
3.8.1 Positive reactive energy (Q+) in tariff T1 [kvarh]
3.8.2 Positive reactive energy (Q+) in tariff T2 [kvarh]
3.8.3 Positive reactive energy (Q+) in tariff T3 [kvarh]
3.8.4 Positive reactive energy (Q+) in tariff T4 [kvarh]
4.8.0 Negative reactive energy (Q-) total [kvarh]
4.8.1 Negative reactive energy (Q-) in tariff T1 [kvarh]
4.8.2 Negative reactive energy (Q-) in tariff T2 [kvarh]
4.8.3 Negative reactive energy (Q-) in tariff T3 [kvarh]
4.8.4 Negative reactive energy (Q-) in tariff T4 [kvarh]
5.8.0 Imported inductive reactive energy in 1-st quadrant (Q1) total [kvarh]
5.8.1 Imported inductive reactive energy in 1-st quadrant (Q1) in tariff T1 [kvarh]
5.8.2 Imported inductive reactive energy in 1-st quadrant (Q1) in tariff T2 [kvarh]
5.8.3 Imported inductive reactive energy in 1-st quadrant (Q1) in tariff T3 [kvarh]
5.8.4 Imported inductive reactive energy in 1-st quadrant (Q1) in tariff T4 [kvarh]
6.8.0 Imported capacitive reactive energy in 2-nd quadrant (Q2) total [kvarh]
6.8.1 Imported capacitive reactive energy in 2-nd quadr. (Q2) in tariff T1 [kvarh]
6.8.2 Imported capacitive reactive energy in 2-nd quadr. (Q2) in tariff T2 [kvarh]
6.8.3 Imported capacitive reactive energy in 2-nd quadr. (Q2) in tariff T3 [kvarh]
6.8.4 Imported capacitive reactive energy in 2-nd quadr. (Q2) in tariff T4 [kvarh]
7.8.0 Exported inductive reactive energy in 3-rd quadrant (Q3) total [kvarh]
7.8.1 Exported inductive reactive energy in 3-rd quadrant (Q3) in tariff T1 [kvarh]
7.8.2 Exported inductive reactive energy in 3-rd quadrant (Q3) in tariff T2 [kvarh]
7.8.3 Exported inductive reactive energy in 3-rd quadrant (Q3) in tariff T3 [kvarh]
7.8.4 Exported inductive reactive energy in 3-rd quadrant (Q3) in tariff T4 [kvarh]
8.8.0 Exported capacitive reactive energy in 4-th quadrant (Q4) total [kvarh]
8.8.1 Exported capacitive reactive energy in 4-th quadr. (Q4) in tariff T1 [kvarh]
8.8.2 Exported capacitive reactive energy in 4-th quadr. (Q4) in tariff T2 [kvarh]
8.8.3 Exported capacitive reactive energy in 4-th quadr. (Q4) in tariff T3 [kvarh]
8.8.4 Exported capacitive reactive energy in 4-th quadr. (Q4) in tariff T4 [kvarh]

4.2.3 Apparent energy registers

9.8.0 Apparent energy (S+) total [kVAh]
9.8.1 Apparent energy (S+) in tariff T1 [kVAh]
9.8.2 Apparent energy (S+) in tariff T2 [kVAh]
9.8.3 Apparent energy (S+) in tariff T3 [kVAh]
9.8.4 Apparent energy (S+) in tariff T4 [kVAh]

4.2.4 Registers of active energy per phases

21.8.0 Positive active energy (A+) in phase L1 total [kWh]
41.8.0 Positive active energy (A+) in phase L2 total [kWh]
61.8.0 Positive active energy (A+) in phase L3 total [kWh]
22.8.0 Negative active energy (A-) in phase L1 total [kWh]
42.8.0 Negative active energy (A-) in phase L2 total [kWh]
62.8.0 Negative active energy (A-) in phase L3 total [kWh]
35.8.0 Absolute active energy (|A|) in phase L1 total [kWh]
55.8.0 Absolute active energy (|A|) in phase L2 total [kWh]
75.8.0 Absolute active energy (|A|) in phase L3 total [kWh]

4.2.5 Maximum demand registers

1.6.0 Positive active maximum demand (A+) total [kW]
1.6.1 Positive active maximum demand (A+) in tariff T1 [kW]
1.6.2 Positive active maximum demand (A+) in tariff T2 [kW]
1.6.3 Positive active maximum demand (A+) in tariff T3 [kW]
1.6.4 Positive active maximum demand (A+) in tariff T4 [kW]
2.6.0 Negative active maximum demand (A-) total [kW]
2.6.1 Negative active maximum demand (A-) in tariff T1 [kW]
2.6.2 Negative active maximum demand (A-) in tariff T2 [kW]
2.6.3 Negative active maximum demand (A-) in tariff T3 [kW]
2.6.4 Negative active maximum demand (A-) in tariff T4 [kW]
15.6.0 Absolute active maximum demand (|A|) total [kW]
15.6.1 Absolute active maximum demand (|A|) in tariff T1 [kW]
15.6.2 Absolute active maximum demand (|A|) in tariff T2 [kW]
15.6.3 Absolute active maximum demand (|A|) in tariff T3 [kW]
15.6.4 Absolute active maximum demand (|A|) in tariff T4 [kW]
3.6.0 Positive reactive maximum demand (Q+) total [kvar]
4.6.0 Negative reactive maximum demand (Q-) total [kvar]
5.6.0 Reactive maximum demand in Q1 (Q1) total [kvar]
6.6.0 Reactive maximum demand in Q2 (Q2) total [kvar]
7.6.0 Reactive maximum demand in Q3 (Q3) total [kvar]
8.6.0 Reactive maximum demand in Q4 (Q4) total [kvar]
9.6.0 Apparent maximum demand (S+) total [kVA]

4.2.6 Cumulative maximum demand registers

1.2.0 Positive active cumulative maximum demand (A+) total [kW]
1.2.1 Positive active cumulative maximum demand (A+) in tariff T1 [kW]
1.2.2 Positive active cumulative maximum demand (A+) in tariff T2 [kW]
1.2.3 Positive active cumulative maximum demand (A+) in tariff T3 [kW]
1.2.4 Positive active cumulative maximum demand (A+) in tariff T4 [kW]
2.2.0 Negative active cumulative maximum demand (A-) total [kW]
2.2.1 Negative active cumulative maximum demand (A-) in tariff T1 [kW]
2.2.2 Negative active cumulative maximum demand (A-) in tariff T2 [kW]
2.2.3 Negative active cumulative maximum demand (A-) in tariff T3 [kW]
2.2.4 Negative active cumulative maximum demand (A-) in tariff T4 [kW]
15.2.0 Absolute active cumulative maximum demand (|A|) total [kW]
15.2.1 Absolute active cumulative maximum demand (|A|) in tariff T1 [kW]
15.2.2 Absolute active cumulative maximum demand (|A|) in tariff T2 [kW]
15.2.3 Absolute active cumulative maximum demand (|A|) in tariff T3 [kW]
15.2.4 Absolute active cumulative maximum demand (|A|) in tariff T4 [kW]
3.2.0 Positive reactive cumulative maximum demand (Q+) total [kvar]
4.2.0 Negative reactive cumulative maximum demand (Q-) total [kvar]
5.2.0 Reactive cumulative maximum demand in Q1 (Q1) total [kvar]
6.2.0 Reactive cumulative maximum demand in Q2 (Q2) total [kvar]
7.2.0 Reactive cumulative maximum demand in Q3 (Q3) total [kvar]
8.2.0 Reactive cumulative maximum demand in Q4 (Q4) total [kvar]
9.2.0 Apparent cumulative maximum demand (S+) total [kVA]

4.2.7 Demands in a current demand period

1.4.0 Positive active demand in a current demand period (A+) [kW]
2.4.0 Negative active demand in a current demand period (A-) [kW]
15.4.0 Absolute active demand in a current demand period (|A|) [kW]
3.4.0 Positive reactive demand in a current demand period (Q+) [kvar]
4.4.0 Negative reactive demand in a current demand period (Q-) [kvar]
5.4.0 Reactive demand in a current demand period in Q1 (Q1) [kvar]
6.4.0 Reactive demand in a current demand period in Q2 (Q2) [kvar]
7.4.0 Reactive demand in a current demand period in Q3 (Q3) [kvar]
8.4.0 Reactive demand in a current demand period in Q4 (Q4) [kvar]
9.4.0 Apparent demand in a current demand period (S+) [kVA]

4.2.8 Demands in the last completed demand period

1.5.0 Positive active demand in the last completed demand period (A+) [kW]
2.5.0 Negative active demand in the last completed demand period (A-) [kW]
15.5.0 Absolute active demand in the last completed demand period (|A|) [kW]
3.5.0 Positive reactive demand in the last completed demand period (Q+) [kvar]
4.5.0 Negative reactive demand in the last completed demand period (Q-) [kvar]
5.5.0 Reactive demand in the last completed demand period in Q1 (Q1) [kvar]
6.5.0 Reactive demand in the last completed demand period in Q2 (Q2) [kvar]
7.5.0 Reactive demand in the last completed demand period in Q3 (Q3) [kvar]
8.5.0 Reactive demand in the last completed demand period in Q4 (Q4) [kvar]
9.5.0 Apparent demand in the last completed demand period (S+) [kVA]

4.2.9 Instantaneous power registers

1.7.0 Positive active instantaneous power (A+) [kW]
21.7.0 Positive active instantaneous power (A+) in phase L1 [kW]
41.7.0 Positive active instantaneous power (A+) in phase L2 [kW]
61.7.0 Positive active instantaneous power (A+) in phase L3 [kW]
2.7.0 Negative active instantaneous power (A-) [kW]
22.7.0 Negative active instantaneous power (A-) in phase L1 [kW]
42.7.0 Negative active instantaneous power (A-) in phase L2 [kW]
62.7.0 Negative active instantaneous power (A-) in phase L3 [kW]
15.7.0 Absolute active instantaneous power (|A|) [kW]
35.7.0 Absolute active instantaneous power (|A|) in phase L1 [kW]
55.7.0 Absolute active instantaneous power (|A|) in phase L2 [kW]
75.7.0 Absolute active instantaneous power (|A|) in phase L3 [kW]
16.7.0 Sum active instantaneous power (A+ - A-) [kW]
36.7.0 Sum active instantaneous power (A+ - A-) in phase L1 [kW]
56.7.0 Sum active instantaneous power (A+ - A-) in phase L2 [kW]
76.7.0 Sum active instantaneous power (A+ - A-) in phase L3 [kW]
3.7.0 Positive reactive instantaneous power (Q+) [kvar]
23.7.0 Positive reactive instantaneous power (Q+) in phase L1 [kvar]
43.7.0 Positive reactive instantaneous power (Q+) in phase L2 [kvar]
63.7.0 Positive reactive instantaneous power (Q+) in phase L3 [kvar]
4.7.0 Negative reactive instantaneous power (Q-) [kvar]
24.7.0 Negative reactive instantaneous power (Q-) in phase L1 [kvar]
44.7.0 Negative reactive instantaneous power (Q-) in phase L2 [kvar]
64.7.0 Negative reactive instantaneous power (Q-) in phase L3 [kvar]
9.7.0 Apparent instantaneous power (S+) [kVA]

29.7.0 Apparent instantaneous power (S+) in phase L1 [kVA]
49.7.0 Apparent instantaneous power (S+) in phase L2 [kVA]
69.7.0 Apparent instantaneous power (S+) in phase L3 [kVA]

4.2.10 Electricity network quality registers

11.7.0 Instantaneous current (I) [A]
31.7.0 Instantaneous current (I) in phase L1 [A]
51.7.0 Instantaneous current (I) in phase L2 [A]
71.7.0 Instantaneous current (I) in phase L3 [A]
91.7.0 Instantaneous current (I) in neutral [A]
11.6.0 Maximum current (I max) [A]
31.6.0 Maximum current (I max) in phase L1 [A]
51.6.0 Maximum current (I max) in phase L2 [A]
71.6.0 Maximum current (I max) in phase L3 [A]
91.6.0 Maximum current (I max) in neutral [A]
12.7.0 Instantaneous voltage (U) [V]
32.7.0 Instantaneous voltage (U) in phase L1 [V]
52.7.0 Instantaneous voltage (U) in phase L2 [V]
72.7.0 Instantaneous voltage (U) in phase L3 [V]
13.7.0 Instantaneous power factor
33.7.0 Instantaneous power factor in phase L1
53.7.0 Instantaneous power factor in phase L2
73.7.0 Instantaneous power factor in phase L3
14.7.0 Frequency [Hz]

4.2.11 Tamper registers Energy registers and registers of elapsed time

C.53.1 Tamper 1 energy register
C.53.2 Tamper 2 energy register
C.53.3 Tamper 3 energy register
C.53.4 Tamper 4 energy register
C.53.11 Tamper 5 energy register
C.53.5 Tamper 1 time counter register
C.53.6 Tamper 2 time counter register
C.53.7 Tamper 3 time counter register
C.53.9 Tamper 4 time counter register
C.53.10 Tamper 5 time counter register

4.2.12 Events registers / counters and time-stamps

C.2.0 Event parameters change - counter
C.2.1 Event parameters change - timestamp
C.51.1 Event terminal cover opened - counter
C.51.2 Event terminal cover opened - timestamp
C.51.3 Event main cover opened - counter
C.51.4 Event main cover opened - timestamp
C.51.5 Event magnetic field detection start - counter
C.51.6 Event magnetic field detection start - timestamp
C.51.7 Event reverse power flow - counter
C.51.8 Event reverse power flow - timestamp
C.7.0 Event power down - counter
C.7.10 Event power down - timestamp
C.51.13 Event power up - counter
C.51.14 Event power up – timestamp
C.51.15 Event RTC (Real Time Clock) set - counter
C.51.16 Event RTC (Real Time Clock) set - timestamp
C.51.21 Event terminal cover closed - counter
C.51.22 Event terminal cover closed - timestamp
C.51.23 Event main cover closed - counter
C.51.24 Event main cover closed - timestamp
C.51.25 Event log-book 1 erased - counter
C.51.26 Event log-book 1 erased - timestamp
C.51.27 Event fraud start - counter
C.51.28 Event fraud start - timestamp
C.51.29 Event fraud stop - counter
C.51.30 Event fraud stop - timestamp

4.2.13 Miscellaneous registers used in sequences

0.9.1 Current time (hh:mm:ss)
0.9.2 Date (YY.MM.DD or DD.MM.YY)
0.9.4 Date and Time (YYMMDDhhmmss)
0.8.0 Demand period [min]
0.8.4 Load profile period [min] (option)
0.0.0 Device address 1
0.0.1 Device address 2
0.1.0 MD reset counter
0.1.2 MD reset timestamp

0.2.0 Firmware version
0.2.2 Tariff program ID
C.1.0 Meter serial number
C.1.2 Parameters file code
C.1.4 Parameters check sum
C.1.5 Firmware built date
C.1.6 Firmware check sum
C.6.0 Power down time counter
C.6.1 Battery remaining capacity
F.F.0 Fatal error meter status
C.87.0 Active tariff
0.2.1 Parameters scheme ID
C.60.9 Fraud flag
0.3.0 Active energy meter constant
0.4.2 Current transformer ratio
0.4.3 Voltage transformer ratio

5 Units for Obis Codes

The following chapter describes the unitcodes which are used in the OBIS coded information

5.1 Overview of unit codes

See picture 3 "Physical units for OBIS codes" !

5.2 Scale for Obis Codes

The following chapter describes the scale factor which are used in the OBIS coded information of the MeterExtension #1. The "Val" has to be multiplied with the Scale factor 10 exp "Scale". Example:

```
"OBIS" : "1-0:32.7.0.255",
"scale" : "-1",
"unit" : "35",
"entry" : [ {
       "val" : "2323",
       "ts" : "1625733090"
```

"OBIS" : "1-0:32.7.0.255", means 232,2 Volt.

Table 4 – Enumerated values for physical units

unit ::= enum	Unit	Quantity	Unit name	SI definition (comment)
(1)	a	time	year	
(2)	mo	time	month	
(3)	wk	time	week	7*24*60*60 s
(4)	d	time	day	24*60*60 s
(5)	h	time	hour	60*60 s
(6)	min	time	minute	60 s
(7)	s	time (t)	second	s
(8)	°	(phase) angle	degree	rad*180/π
(9)	°C	temperature (T)	degree-celsius	K-273.15
(10)	currency	(local) currency		
(11)	m	length (l)	metre	m
(12)	m/s	speed (v)	metre per second	m/s
(13)	m^3	volume (V) r_V , meter constant or pulse value (volume)	cubic metre	m^3
(14)	m^3	corrected volume	cubic metre	m^3
(15)	m^3/h	volume flux	cubic metre per hour	m^3/(60*60s)
(16)	m^3/h	corrected volume flux	cubic metre per hour	m^3/(60*60s)
(17)	m^3/d	volume flux		m^3/(24*60*60s)
(18)	m^3/d	corrected volume flux		m^3/(24*60*60s)
(19)	l	volume	litre	10^{-3} m^3
(20)	kg	mass (m)	kilogram	
(21)	N	force (F)	newton	
(22)	Nm	energy	newton meter	J = Nm = Ws
(23)	Pa	pressure (p)	pascal	N/m^2
(24)	bar	pressure (p)	bar	10^5 N/m^2
(25)	J	energy	joule	J = Nm = Ws
(26)	J/h	thermal power	joule per hour	J/(60*60s)
(27)	W	active power (P)	watt	W = J/s
(28)	VA	apparent power (S)	volt-ampere	
(29)	var	reactive power (Q)	var	
(30)	Wh	active energy r_W , active energy meter constant or pulse value	watt-hour	W*(60*60s)
(31)	VAh	apparent energy r_S , apparent energy meter constant or pulse value	volt-ampere-hour	VA*(60*60s)
(32)	varh	reactive energy r_B , reactive energy meter constant or pulse value	var-hour	var*(60*60s)
(33)	A	current (I)	ampere	A
(34)	C	electrical charge (Q)	coulomb	C = As
(35)	V	voltage (U)	volt	V
(36)	V/m	electric field strength (E)	volt per metre	V/m
(37)	F	capacitance (C)	farad	C/V = As/V
(38)	Ω	resistance (R)	ohm	Ω = V/A
(39)	$\Omega m^2/m$	resistivity (ρ)		Ωm

angleangle

Figure 3: Physical units for OBIS codes

List of Figures

List of Tables

References

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