REST interface LINAX PQ3000 / PQ5000

Content

GMC INSTRUMENTS

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1 General

This document describes the Representational State Transfer Application Programming Interface (REST API) of the device. This is a way to access measurement or configuration data using http commands. Although only http commands are used in the subsequent descriptions, communication works identically with https if the user has activated this secure communication extension.

1.1 Supported http methods

The following methods are utilized by the REST API

`GET`	GET requests are the most common request types used in this API. They never contain any request body data and alter data only in special occasions
`POST`	POST requests are used in this API to either send large data to the server or requesting a wide variety of values in one request. These requests must always contain the request header `Content-Type: application/xml`
`DELETE`	DELETE requests are used in this API to explicitly delete resources. Like a GET request this request does not contain any request body data

1.2 Http status codes

The REST API can respond to a request with a variety of http status codes.

1.2.1 Successful requests

In any case a request is considered successful, if the http status code is `200 OK` or `204 No Content`.

1.2.2 Redirects

If the http status code is `301 Moved Permanently` or `302 Moved Temporarily` the device is trying to redirect the user to a valid resource. This might be the case if Role Based Access Control (RBAC) or https is enabled.

1.2.3 Client side errors

If RBAC is enabled and the user is not allowed to access a resource the device responds with the http status `403 Forbidden`.

Typing errors in the request are usually answered with the http status code `400 Bad Request` and in some cases with `404 Not Found`.

If the Content-Type header is missing in a POST request the device responds with `415 Unsupported Media Type`.

1.2.4 Server side errors

General server side errors (e.g. missing data values) are usually indicated by the http status code `500 Internal Server Error`.

If the user is trying to use an unsupported endpoint the device responds with the http status code `501 Not Implemented`.

During the boot process of the device the REST API is unavailable, so it responds with http status code `502 Bad Gateway` or `504 Gateway Timeout`. The same status codes might appear if the back end is overloaded. `503 Service Unavailable` on the other hand is indicating that the REST API is ready but measurement or configuration values cannot be requested yet or the rate limit of the web server has been hit.

The limit for concurrent connections to the device is 20 (18 on devices with a display). If this limit is exceeded any new connection attempt is responded with the http status code `507 Insufficient Storage`.

1.3 Response payload

The primary data format used in the response payload is Extensible Markup Language (XML). In some rare cases the payload is either plain text or even completely empty. Whenever a request described in this document does not have any payload data its response is displayed like this:

```
<empty response>
```

Some requests are used to download binary data which is displayed in this document in a similar way:

```
<pqdif file>
```

XML responses are color coded:

```
<tag attribute_key="attribute_value">content</tag>
```

And lastly plain text looks like this

```
Plain text
```

1.4 Data format of measurement values

Measurement values have a fixed structure consisting of a quality flag, a timestamp and the actual value. The format of the value is indicated by the tag. The quality flag and the timestamp are attributes and the value is placed in the content:

```
<[format] timestamp="[Timestamp]" quality="[Quality]">
   <value>[Value]</value>
</[format]>
```

[format]	description
VTQ	Triple of float value, timestamp and quality
DTQ	Triple of double value, timestamp and quality
ITQ	Triple of 32bit integer value, timestamp and quality
STQ	Triple of 16bit integer value, timestamp and quality
BTQ	Triple of Boolean value, timestamp and quality
ETQ	Event with timestamp and quality (does not contain any value)
LTQ	Triple of 64bit integer value, timestamp and quality
CTQ	Triple of complex value, timestamp and quality

Timestamp	Seconds with fractions in unix-time
Quality	Flags displayed as hexadecimals (see chapter 1.5)
Value	Actual measurement value (not available for ETQ)

1.5 PQ Event flagging

Flagging is represented as part of the common quality marking system:

- Each value in the system has 32 bits of quality information
- PQ event markers are stored in Bit 20…31
- Every module that aggregates or calculates data makes an aggregation of the quality of all inputs. For example:
  - Aggregation modules “OR” of all qualities over time
  - Math / logic function blocks: “OR” of qualities over all values / logical inputs
  - …
- Quality information is part of the VTQ, see chapter 2.2.1 and 1.4
- Quality flag concept complies to IEC61000-4-30, chapter 4.7
- Bit 0…19 are proprietary and for internal use at CBMAG only. They do not contain any user relevant information

Bit	Source module	Name	Content
20	Event	QUALITY_OVERRANGE	Event marker “value out of range” (not in standard)
21	Event	QUALITY_VOLTAGE_DIP	PQ event marker: voltage dip (IEC61000-4-30, 5.4)
22	Event	QUALITY_VOLTAGE_SWELL	PQ event marker: voltage swell (IEC61000-4-30, 5.4)
23	Event	QUALITY_VOLTAGE_INTERRUPT	PQ event marker: voltage interruption (IEC61000-4-30, 5.5)
24	Event	QUALITY_VOLTAGE_CHANGE	PQ event marker: rapid voltage change, RVC (IEC61000-4-30, 5.11)
25	Event	QUALITY_VOLTAGE_TRANSIENT	PQ event marker: transient voltage (IEC61000-4-30, A.4)
26	-	-	PQ event marker: reserved for future use
27	Event	QUALITY_CURRENT_POSITIVE_CHANGE	PQ event marker: current positive change between two consecutive RMS(1/2)
28	Event	QUALITY_CURRENT_NEGATIVE_CHANGE	PQ event marker: current negative change between two consecutive RMS(1/2)
29	Event	QUALITY_SNAP_SHOT	PQ event marker: manual triggered snapshot
30	-	-	PQ event marker: reserved for future use
31	-	-	PQ event marker: reserved for future use

1.6 Sessions

The REST API can handle multiple clients. Up to 20 connections can be served at a time. Normally this is possible without the need of distinguishing between users. Some requests however require this information, as these requests are either part of consecutive calls or they change data of the device. Therefore, the device is issuing session tokens to identify clients. These tokens are stored in a cookie and do not contain any personal data about the client.

The session token is using the key word `sessionToken` and the token itself is a universally unique identifier `[UUID]`. The structure in the cookie header is defined as:

```
sessionToken={[UUID]};
```

If the device is sending a session token in the `Set-Cookie` header, the client should incorporate this token in future calls. Sessions that are not used for around 2 minutes get invalidated. As a login is bound to a session, the session token gets mandatory if Role Based Access Control (RBAC) is enabled.

Example of a Set-Cookie header sent by the device:

Set-Cookie: `sessionToken={5d1ca47c-8d38-4a08-85d5-fefbd941fa20}; Path=/`

After receiving the token, it has to be applied to the request header of future request:

Cookie: `sessionToken={5d1ca47c-8d38-4a08-85d5-fefbd941fa20}`

Example of a `Set-Cookie` header after sending an invalid session token to the server:

Set-Cookie: `sessionToken={5d1ca47c-8d38-4a08-85d5-fefbd941fa20}; Path=/; Expires=Thu, 01 Jan 1970 00:00:00 GMT;`

Set-Cookie: `sessionToken={7ce8ce62-12b5-467b-95d2-14633b9ad821}; Path=/`

In this case the device sends the `Set-Cookie` header twice. The first Set-Cookie header tells the client to remove the current session token and the second header provides a valid one. Therefore, the client should replace its current session token in the `Cookie` header with the new one:

Cookie: `sessionToken={7ce8ce62-12b5-467b-95d2-14633b9ad821}`

2 General data access

The majority of the device's data is accessible via an id. There is a differentiation between measurement values and configuration values and therefore the REST API provides separate endpoint for it. Furthermore, the device offers meta data for every id, which is available via an additional endpoint.

2.1 Structure of an id

The structure of an id generally follows a fixed scheme:

```
[MODULE].[CHANNEL].[OUTPUT].[VALUE]
```

Although this leads in some cases to confusing ids, this scheme actually helps to understand where values stem from and to which other values they share similarities.

Example:

The measurement value voltage UNE has the following id: `rms.rms.out.une`
The configuration value to select if UNE shall be measured or calculated has the id:
`rms.rms.MeasprincipleUn`
The configuration value select the system type has the id: `rms.SystemType`

All three ids stem from the module rms. `rms.SystemType` and `rms.rms.MeasprincipleUn` do not have a `[OUTPUT]` as they are configuration parameter. In addition `rms.SystemType` does not even have a `[CHANNEL]`. Therefore, this configuration value is a module parameter which is valid for all underlying channels.

2.2 Access to measurement values

2.2.1 Read one value

The device is able to automatically format measurement values. This is handy if the measurement value just gets used to display information to a user:

GET `http://[device]/cb/value/display/[id]`

Not every measurement value is suited for automatic scaling and the measurement value might lose precision during the process. Hence the measurement value can also be requested without automatic scaling:

GET `http://[device]/cb/value/[id]`

Example:

GET `http://[device]/cb/value/rms.rms.out.u1n`

Response:


```xml
<values>
    <vtq id="rms.rms.out.u1n" timestamp="1651563961.990380321" quality="#00000000" numValues="1">
        <value>0</value>
    </vtq>
</values>
```

2.2.2 Read multiple values

There are several ways to access multiple values:

2.2.2.1 Complete output container

Complete output container can be requested by only supplying the [MODULE], [CHANNEL] and [OUTPUT] part of an id in a request.

Example:

Reading all harmonics of U1N.
The full id of a single component would be: `rms.fft.harm_u1n.harm_u1n_[index]`
To get all harmonic at once, the id is shortened to: `rms.fft.harm_u1n`

GET `http://[device]/cb/value/rms.fft.harm_u1n`

Answer:


```xml
<values>
    <vtq id="rms.fft.harm_u1n" timestamp="1651073913.025202215" quality="#00000000" numValues="90">
        <value>1.2979</value>
        ...
        <value>0.180335</value>
        <value>1.92954</value>
    </vtq>
</values>
```


2.2.2.2 Wildcards

Wildcards are supported in `[OUTPUT]` and `[VALUE]` part of the value id

Example:

GET `http://[device]/cb/value/rms.rms.out.u*`

Response:


```xml
<values>
    <vtq id="rms.rms.out.u1n" timestamp="1651568055.393045592" quality="#00000000" numValues="1">
        <value>0</value>
    </vtq>
    <vtq id="rms.rms.out.u2n" timestamp="1651568055.393045592" quality="#00000000" numValues="1">
        <value>0</value>
    </vtq>
    <vtq id="rms.rms.out.u3n" timestamp="1651568055.393045592" quality="#00000000" numValues="1">
        <value>0</value>
    </vtq>
    <vtq id="rms.rms.out.u4n" timestamp="1651568055.393045592" quality="#00000000" numValues="1">
        <value>0</value>
    </vtq>
    <vtq id="rms.rms.out.umean" timestamp="1651568055.393045592" quality="#00000000" numValues="1">
        <value>0</value>
    </vtq>
    <vtq id="rms.rms.out.umean_pn" timestamp="1651568055.393045592" quality="#00000000" numValues="1">
        <value>0</value>
    </vtq>
</values>
```

2.2.2.3 List of ids

By using a POST request, a list of ids can be requested. This type of request only works on display value (formatted values)

```
POST        http://[device]/cb/value/display
```

Body:

```
<paths>
    <path>[id 1]</path>
    <path>[id 2]</path>
    ...
    <path>[id n-1]</path>
    <path>[id n]</path>
</paths>
```

Example:

```
POST        http://[device]/cb/value/display
```

Body:

```
<paths>
    <path>rms.rms.out.u1n</path>
    <path>rms.rms.out.f</path>
</paths>
```

Response:

```
<values>
    <vtq id="rms.rms.out.u1n" timestamp="1651574993.783647913" quality="#00000000" numValues="1">
        <value>0.00</value>
    </vtq>
    <vtq id="rms.rms.out.f" timestamp="1651574993.783647913" quality="#00000000" numValues="1">
        <value>50.000</value>
    </vtq>
</values>
```

2.3 Meta information

Meta information can be requested from any id. A meta information entry contains common information and properties about the requested id. There are two ways to request meta information

2.3.1 Single meta information entry

Only full ids may be provided. Partial ids or wildcards cannot be processed.

```
GET        http://[device]/cb/value/meta/[value id]
```

Example:

```
GET        http://[device]/cb/value/meta/rms.rms.out.u1n
```

Response:

```
<meta id="rms.rms.out.u1n" measValueType="MEASVALUETYPE_RMS1012" phase="1N" base="U"
unitCode="UNIT_TYPE_VOLTAGE" integration_interval="TRMS" siUnit="V" precision="2" maximum="520.0"
unitPrefix="" integration_interval_type="text" timestamp="false" phaseInfo="PHASE_L1N" shortName="U1N"
readonly="false"></meta>
```

2.3.2 List of meta information entries

Just like the request of a single meta information entry, the request of several meta information entries only accepts full ids.

POST `http://[device]/cb/value/meta`

Body:

```
<paths>
    <path>[id 1]</path>
    <path>[id 2]</path>
    ...
    <path>[id n-1]</path>
    <path>[id n]</path>
</paths>
```

Example:

POST `http://[device]/cb/value/meta`

Body:

```
<paths>
    <path>rms.rms.out.u1n</path>
    <path>rms.rms.out.f</path>
</paths>
```

Response:


```
<metas>
    <meta id="rms.rms.out.u1n" measValueType="MEASVALUETYPE_RMS1012" phase="1N" base="U" unitCode="UNIT_TYPE_VOLTAGE" integration_interval="TRMS" siUnit="V" precision="2" maximum="520.0" unitPrefix="" integration_interval_type="text" timestamp="false" phaseInfo="PHASE_L1N" shortName="U1N" readonly="false"></meta>
    <meta id="rms.rms.out.f" measValueType="MEASVALUETYPE_RMS1012" base="F" unitCode="UNIT_TYPE_FREQUENCY" integration_interval="TRMS" siUnit="Hz" precision="3" maximum="100.0" unitPrefix="" integration_interval_type="text" timestamp="false" phaseInfo="PHASE_SYS" shortName="F" readonly="false"></meta>
</metas>
```


2.4 Read configuration values

There are three types of configuration values. All of them can be read using the same interface

2.4.1 Read a single configuration value

To read a single value, a full id must be provided

GET `http://[device]/cb/value/config/[id]`

Example:

GET `http://[device]/cb/value/config/sys.config.serial`

Response:

```
<values>
    <value id="sys.config.serial">1205176002</value>
</values>
```

2.4.2 Read a list of configuration values

To read a list of configuration values, the list of ids must be supplied in the request body

POST `http://[device]/cb/value/config`

Body:

```
<paths>
    <path>[id 1]</path>
    <path>[id 2]</path>
    ...
    <path>[id n-1]</path>
    <path>[id n]</path>
</paths>
```

Example:

POST `http://[device]/cb/value/config`

Body:

```
<paths>
    <path>sys.config.serial</path>
    <path>sys.config.deviceTag</path>
</paths>
```

Response:

```
<values>
    <value id="sys.config.serial">1205176002</value>
    <value id="sys.config.deviceTag">PQ5000</value>
</values>
```

2.4.3 Search configuration ids by using a wildcard

Configuration values can be searched by using a wildcard. There are no restrictions for the wildcard. Furthermore, if the wildcard only consists of a single asterisk (*), the full list of configuration values is returned. However, this request does not return any values, only ids

GET `http://[device]/cb/value/config/[wildcard]`

Example:

GET `http://[device]/cb/value/config/*.config.s*`

Response:

```
<values>
    <value id="powerquality.config.signal_InputValue"></value>
    <value id="powerquality.config.snapshot_id"></value>
    <value id="sys.config.serial"></value>
    <value id="sys.config.subject"></value>
</values>
```

2.5 Write configuration values

As mentioned in chapter 2.4 there are three types of configuration: user configuration, static configuration and adjustment values. Only user configuration values can be altered permanently. The other two are set during the manufacturing or by the device itself and are not meant to be changed by the user.

As the device can handle multiple sessions and distinguish between different users (chapter 0), every user has its own copy of the configuration. Therefore, if a user alters a configuration value, other users are not affected immediately. The changes are made in the users own “session storage”. To make the changes available to all users of the REST API the changes in the session storage have to be stored onto the device using a special command.

Thereby that this mechanism works properly, requests to alter the configuration must always contain the session token that has been issued by the device.

2.5.1 Writing a single configuration value

To alter a configuration value the new value has to be appended to the request as a query parameter. Only full ids are valid. The value may be URI encoded if necessary.

GET `http://[device]/cb/value/config/[id]?value=[new value]`

Example:

GET `http://[device]/cb/value/config/rms.NomVoltage?value=400`

Response:

```
<response>
    <status id="rms.NomVoltage" ok="true" message=" "> </status>
</response>
```

2.5.2 Writing multiple configuration values

Multiple configuration values can be altered by providing a list of ids and its new values

POST `http://[device]/cb/value/set`

Body:

```
<values>
    <conf id="[id 1]">
        <value>[value 1]</value>
    </conf>
    <conf id="[id 2]">
        <value>[value 2]</value>
    </conf>
    ...
    <conf id="[id n-1]">
        <value>[value n-1]</value>
    </conf>
    <conf id="[id n]">
        <value>[value n]</value>
   </conf>
</values>
```

Example:

POST http://[device]/cb/value/set

Body:

```
<values>
    <conf id="rms.NomVoltage">
        <value>400</value>
    </conf>
    <conf id="rms.NomCurrent">
        <value>5</value>
   </conf>
</values>
```

Response:

```
<response>
    <status id="rms.NomVoltage" ok="true" message=""/>
    <status id="rms.NomCurrent" ok="true" message=""/>
</response>
```

2.5.3 Write changes from the session storage to the device configuration

As already mentioned, the requests described in chapter 2.5.1 and 2.5.2 only affects the configuration of the user who issued the requests. To apply the changes to the device (and therefore for every other user), the user has to issue a store request. There are two different requests:

GET http://[device]/cb/value/configstore/store
GET http://[device]/cb/value/configstore/storenoreload

While `store` forces the graphical user interface to reload, `storenoreload` applies the changes quietly in the background, which can cause issues with measurement values scaling in some cases.

Mobile devices (e.g. PQ5000Mobile) are able to store multiple configurations. Therefore, on these devices it is necessary to declare in which configuration slot the changes should be made

GET http://[device]/cb/value/configstore/store?slot=[slot number]
GET http://[device]/cb/value/configstore/storenoreload?slot=[slot number]

Example for storing the changes in the first configuration slot:

GET http://[device]/cb/value/configstore/store?slot=0

Response:

```
<ok>true</ok>
```

2.5.4 Withdraw changes in the session storage

A user can clear its own session storage to withdraw changes and reload the configuration from the device:

GET http://[device]/cb/value/configstore/clear

Response:

```
<ok>true</ok>
```

3 System parameters

3.1 Device parameters

These parameters are often used to identify a device. While the serial number is set during the manufacturing process, the other parameters can be configured by the user. All parameters in this chapter are configuration values and can be accessed using the request described in chapter 2.4.

Information	[id]
Unique serial number	sys.config.serial
User defined device tag	sys.config.deviceTag
User defined device location (test point)	sys.config.locationObject
User defined device location (general location)	sys.config.location
User defined device location (street)	sys.config.locationAddressStreet
User defined device location (city)	sys.config.locationAddressCity
User defined name of energy distributor	sys.config.energyDistributor

3.2 Firmware version

The firmware version number is directly read from the internal application and is therefore similar to a measurement value (see chapter 2.2)

Information	[id]
Firmware version Major	sys.sysinfo.version.major
Firmware version Minor	sys.sysinfo.version.minor
Firmware version Revision	sys.sysinfo.version.revision
Firmware version Build	sys.sysinfo.version.build

Note: The whole firmware version can be acquired in one request by using the id `sys.sysinfo.version`

3.3 Dates of the last calibration and the last adjustment

The dates of the last calibration and the last adjustment are set during the manufacturing or during a re-calibration. They can be read just like configuration values (chapter 2.4), but they cannot be written.

Information	[id]
Last adjustment	sys.config.lastAdjustment
Last calibration	sys.config.lastCalibration

4 Current Link and PME

PQ devices of the CL series and devices that are equipped with a PME option are able to monitor several systems at once. To configure the parameter of these systems as well as the parameters of the sensors, the REST API consists of several specialized commands.

4.1 State

To check whether the option is running correctly, the state can be checked by using the following request:

GET `http://[device]/cb/currentmodule/state`

Response when the option is running correctly:

```
<response>
    <status ok="true"></status>
</response>
```

Response when the option encountered an error:

```
<response>
    <status ok="false"></status>
</response>
```

Please note that in case of an error, the HTTP status code changes to `503 Service Unavailable`

4.2 Reset

The reset command issues a resynchronization between the device and all connected modules

GET `http://[device]/cb/currentmodule/reset`

Response:

```
<response>
    <status ok="true"></status>
</response>
```

4.3 Sensor state and configuration

4.3.1 Read sensor list

A complete list of current sensors and their state and configuration can be requested. Additional optional query parameters are supported to filter the list for specific sensors:

GET `http://[device]/cb/currentmodule/sensor[filter query]`

Filter	[filter query]
Only sensors that have been connected to the device	`paired=true`
Only sensors that not have been connected to the device	`paired=false`
Only sensors that are actively sending data	`alive=true`
Only sensors that are currently not sending any data	`alive=false`

Note : As Current Link modules are connected via cable, the filter queries `paired` and `alive` are essentially the same for this type of system.

Example for a Current Link system:

```
GET         http://[device]/cb/currentmodule/sensor?paired=true
```

Response:


```
<sensors>
    <sensor   id="cl.cl_system1.out.i1"
              paired="true"
              alive="true"
              serial="1228613006_1"
              name=""
              type="CM_HW_TYPE_4_ROGOWSKI_REV1_4E"
              typeNr="3"
              phaseShift="-10.646619796753"
              scale="1.020690917969"
              scaleOC="1.000152587891"
              status="b11110100"
              multichannel="true"/>
              ...
    <sensor   id="cl.cl_system3.out.in"
              paired="true"
              alive="true"
              serial="1228613003_4"
              name=""
              type="CM_HW_TYPE_4_ROGOWSKI_REV1_4E"
              typeNr="3"
              phaseShift="-10.662639617920"
              scale="1.023162841797"
              scaleOC="1.000213623047"
              status="b11110100"
              multichannel="true"/>
</sensors>
```


Example for a PME system:

```
GET         http://[device]/cb/currentmodule/sensor?paired=true&alive=false
```

Response:


```xml
<sensors>
    <sensor    id="pme.pme1.out.i"
               paired="true"
               alive="false"
               serial="4973ecb2_1"
               name="Office 1st floor [1]"
               type="PME_SENSOR_HW_TYPE_4_ROGOWSKI"
               typeNr="e6"
               phaseShift="0.000000000000"
               scale="0.000000000000"
               scaleOC="0.000000000000"
               status="b00000000"
               multichannel="true"/>
    ...
    <sensor    id="pme.pme4.out.i"
               paired="true"
               alive="false"
               serial="4973ecb2_4"
               name="Office 1st floor [4]"
               type="PME_SENSOR_HW_TYPE_4_ROGOWSKI"
               typeNr="e6"
               phaseShift="0.000000000000"
               scale="0.000000000000"
               scaleOC="0.000000000000"
               status="b00000000"
               multichannel="true"/>
</sensors>
```


4.3.2 Read configuration of a single sensor

To read the configuration of a single sensor, its id must be provided in the request. The id of a sensor is defined by the device and depends on the order of which the sensors have been connected. Furthermore the type of system used (PME or Current Link) determines the general structure of the id:

Type	[sensor id]	Further information
Current Link	cl.cl_system[idx].out.i[phs]	1 ≤ idx ≤ 10 (index of system); phs = 1 or 2 or 3 or n (phase)
PME	pme.pme[idx].out.i	1 ≤ idx ≤ 100 (index of sensor)

```
GET        http://[device]/cb/currentmodule/sensor/[sensor id]
```

Example for a Current Link system:

```
GET        http://[device]/cb/currentmodule/sensor/cl.cl_system3.out.in
```

Response:

```
<sensors>
    <sensor    id="cl.cl_system3.out.in"
               paired="true"
               alive="true"
               serial="1228613003_4"
               name=""
               type="CM_HW_TYPE_4_ROGOWSKI_REV1_4E"
               typeNr="3"
               phaseShift="0.000000000000"
               scale="-10.662639617920"
               scaleOC="1.023162841797"
               status="b00000000"
               multichannel="true"/>
</sensors>
```

Note: As the Current Link modules always consist of three to four sensors, a single sensor cannot have a name configured. In addition the serial number is always shown with a postfix indicating the sensors position on the corresponding module and the attribute multichannel is always set to true.

Example for a PME system:

GET `http://[device]/cb/currentmodule/sensor/pme.pme2.out.i`

Response:

```
<sensors>
    <sensor    id="pme.pme2.out.i"
               paired="true"
               alive="false"
               serial="4973ecb2_2"
               name=" Office 1st floor [2]"
               type="PME_SENSOR_HW_TYPE_4_ROGOWSKI"
               typeNr="e6"
               phaseShift="0.000000000000"
               scale="0.000000000000"
               scaleOC="0.000000000000"
               status="b00000000"
               multichannel="true"
               version="1.0"
               radioPower="RADIO_TXPOWER_AUTO"
               interval="INTER_1"/>
</sensors>
```

Note: The attributes scale, scaleOC and phaseShift are not used. If the serial number contains a postfix and the attribute multichannel is set to true, the sensor is part of a module that contains more than one sensor.

4.3.3 Read state of all connected sensors (PME only)

PME sensors provide additional status information. Sensors that are not paired or not available at the time of the request are not shown.

GET `http://[device]/cb/currentmodule/sensor/status`

Example:

GET `http://[device]/cb/currentmodule/sensor/status`

Response:


```xml
<sensors>
    <sensor
       id="pme.pme1.out.i"
       paired="true"
       alive="true"
       serial="4973e8c9_1"
       name="System 1"
       type="PME_SENSOR_HW_TYPE_3_ROGOWSKI"
       typeNr="e7"
       phaseShift="0.000000000000"
       scale="1.000000000000" scaleOC="1.000000000000"
       status="b00001100"
       multichannel="true"
       version="1.0"
       radioPower="RADIO_TXPOWER_AUTO"
       interval="INTER_1"
       encryption="true"
       age="0"
       rssi="-56"
       rssiMean="-58"
       linkQuality="95"
       power="26"
    />
    ...
</sensors>
```

4.3.4 Modify sensor parameters

This is only possible for PME systems.

POST `http://[device]/cb/currentmodule/sensor`

Body:

```
<sensor id="[sensor id]" name="[sensor name]" radioPower="[radio power]" interval="[interval]" />
```

<table>
<tr><th>Attribute</th><th>Description</th></tr>
<tr><td>sensor id</td><td>Id of sensor (pme.pme[idx].out.i)</td></tr>
<tr><td>sensor name</td><td>Name of sensor
(Any UTF-8 formatted String)</td></tr>
<tr><td>radio power</td><td>Transmission power of the sensor
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>RADIO_TXPOWER_AUTO</td><td>Automatically adjusted</td></tr>
<tr><td>RADIO_TXPOWER_8dBm</td><td>+8 dBm</td></tr>
<tr><td>RADIO_TXPOWER_4dBm</td><td>+4 dBm</td></tr>
<tr><td>RADIO_TXPOWER_0dBm</td><td>+0 dBm</td></tr>
<tr><td>RADIO_TXPOWER_m4dBm</td><td>-4 dBm</td></tr>
<tr><td>RADIO_TXPOWER_m8dBm</td><td>-8 dBm</td></tr>
<tr><td>RADIO_TXPOWER_m12dBm</td><td>-12 dBm</td></tr>
</table></td></tr>
<tr><td>interval</td><td>Polling interval
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>INTER_1</td><td>Every second</td></tr>
<tr><td>INTER_2</td><td>Every 2 seconds</td></tr>
<tr><td>INTER_3</td><td>Every 3 seconds</td></tr>
<tr><td>INTER_4</td><td>Every 4 seconds</td></tr>
<tr><td>INTER_5</td><td>Every 5 seconds</td></tr>
<tr><td>INTER_6</td><td>Every 6 seconds</td></tr>
<tr><td>INTER_10</td><td>Every 10 seconds</td></tr>
<tr><td>INTER_12</td><td>Every 12 seconds</td></tr>
<tr><td>INTER_15</td><td>Every 15 seconds</td></tr>
<tr><td>INTER_20</td><td>Every 20 seconds</td></tr>
</table></td></tr>
</table>

Example:

POST `http://[device]/cb/currentmodule/sensor`

Body:

```
<sensor id="pme.pme5.out.i"
        name="AC Unit Phs A"
        radioPower="RADIO_TXPOWER_0dBm"
        interval="INTER_4"
/>
```

Response:

```
<empty response>
```

Note: Assigning values to a sensor is a configuration change which must be stored (see 2.5.3)

4.3.5 Add new sensors (PME only)

PME sensors must be paired with the base station, before they can be used in systems. To pair a sensor the id and the installation code must be provided to the base station. The pairing process is automatically performed as soon as the sensor is reachable. Therefore it is not necessary for the sensor to be available during the performance of the following request.

```
POST        http://[device]/cb/currentmodule/sensor
```

Body:

```
<sensor serial="[serial]" type="[device type]" installcode="[install code]" />
```

Attribute	Description
serial	Unique 8 digit serial number. Printed onto the label as second part of ID (XX-YYYYYYYY)
device type	type number. Printed onto the label as first part of ID (XX-YYYYYYYY). It is printed as a hexadecimal value and must be converted to a decimal value
install code	9x 4 digit code. Printed onto the label

Example:

```
ID: E7 - 4973E8C9
Install Code
9B68 - 66C2 - D257
9683 - 4623 - 4091
05A8 - 26DF - CE7F
```

```
POST        http://[device]/cb/currentmodule/sensor
```

Body:

```
<sensor serial=" 4973E8C9"
        type="231"
        installcode=" 9B6866C2D25796834623409105A826DFCE7F"
/>
```

Response:

```
<empty response>
```

4.3.6 Remove sensor pairing (PME only)

The pairing to a sensor can be removed at any time

```
DELETE      http://[device]/cb/currentmodule/sensor/[sensor id]
```

Example:

```
DELETE      http://[device]/cb/currentmodule/sensor/pme.pme1.out.i
```

Response:

```
<empty response>
```

4.3.7 Discover sensors (PME only)

Non-paired sensors can be discovered by the base station

GET http://[device]/cb/currentmodule/sensor/discover

Example:

GET http://[device]/cb/currentmodule/sensor/discover

Response:


```
<sensors>
    <sensor serial="4973e8cf" type="231" rssi="-56"/>
    <sensor serial="4973e8df" type="231" rssi="-68"/>
    <sensor serial="7c0516ce" type="230" rssi="-77"/>
    <sensor serial="4973e8d8" type="231" rssi="-56"/>
    <sensor serial="4973e8cb" type="231" rssi="-79"/>
    <sensor serial="85aa9004" type="230" rssi="-60"/>
    <sensor serial="4973ecb3" type="230" rssi="-66"/>
</sensors>
```


4.3.8 Identify connected sensors (PME only)

Paired sensors that are available can be identified by letting them blink red for about five seconds

Let all connected sensors blink:

GET http://[device]/cb/currentmodule/sensor/identify

Let specific sensor blink:

GET http://[device]/cb/currentmodule/sensor/identify?id=[sensor id]

Example:

http://[device]/cb/currentmodule/sensor/identify?id=pme.pme1.out.i

Response:


```
<response>
    <status ok="true" id=" "/>
</response>
```

4.4 System configuration

A system consists of one or more sensors and is used to assign the current values from the sensors to the corresponding voltage values of the device.

4.4.1 Read system list

A complete list of all system can be requested. By using the filter query the list can be adjusted.

GET `http://[device]/cb/currentmodule/system[filter query]`

Filter	[filter query]
Only systems that contain at least one configured sensor	`configured=true`
Only systems that have not been configured yet	`configured=false`

Note: The sensors of a Current Link system are automatically assigned, when the module is connected to the device. A Current Link system that is not configured is therefore not connected and vice versa.

Example for a Current Link system:

GET `http://[device]/cb/currentmodule/system?configured=true`

Response:


```
<systems>
    <system  index="1"
             name="Busbar Basement"
             c0="cl.cl_system1" c1="cl.cl_system1" c2="cl.cl_system1" c3="cl.cl_system1"
             sysType="CM_SYS_STAR"
             configured="true"
             serial="1228613006"
             moduleType="3"
             moduleName="CM_HW_TYPE_4_ROGOWSKI_REV1_4E"
             version="3.02"
             adcType="0"
             adcName="ADS8568SRGC"
             nomCurrent="160.000000"
             scaleC0="1.000000" scaleC1="0.000000" scaleC2="0.000000" scaleC3="1.000000"
    />
    ...
    <system  index="3"
             name="Main Feeder"
             c0="cl.cl_system3" c1="cl.cl_system3" c2="cl.cl_system3" c3="cl.cl_system3"
             sysType="CM_SYS_STAR_PEN"
             configured="true"
             serial="1228613003"
             moduleType="3"
             moduleName="CM_HW_TYPE_4_ROGOWSKI_REV1_4E"
             version="3.02"
             adcType="0"
             adcName="ADS8568SRGC"
             nomCurrent="315.000000"
             scaleC0="1.000000" scaleC1="0.000000" scaleC2="0.000000" scaleC3="1.000000"
    />
</systems>
```

Example for a PME system:

GET `http://[device]/cb/currentmodule/system?configured=true`

Response:


```
<systems>
    <system  index="0"
             name="Office 2nd floor"
             c0="pme.pme8.out.i" c1="pme.pme9.out.i" c2="pme.pme10.out.i" c3=""
             sysType="LOAD_2PU"
             configured="true"
             serial="9999999999"
             moduleType="-1"
             moduleName=""
             version="0.0.0"
             adcType="-1"
             adcName=""
             nomCurrent="400.000000"
             scaleC0="1.000000"
             scaleC1="1.000000"
             scaleC2="1.000000"
             scaleC3="1.000000"/>
    <system  index="1"
             name="Office 1st floor"
             c0="pme.pme1.out.i" c1="pme.pme2.out.i" c2="pme.pme3.out.i" c3="pme.pme4.out.i"
             sysType="LOAD_1P_L2N"
             configured="true"
             serial="9999999999"
             moduleType="-1"
             moduleName=""
             version="0.0.0"
             adcType="-1"
             adcName=""
             nomCurrent="400.000000"
             scaleC0="1.000000"
             scaleC1="1.000000"
             scaleC2="1.000000"
             scaleC3="1.000000"/>
</systems>
```

4.4.2 Modify a system

Both Current Link systems and PME systems can be configured whereas the latter got more parameters to adjust. The modification is done via a POST request

POST   http://[device]/cb/currentmodule/system

Body:

```
<system index="[system index]" name="[system name]" c0="[sensor0]" c1="[sensor1]" c2="[sensor2]"
c3="[sensor3]" scaleC0="[scale0]" scaleC1="[scale1]" scaleC2="[scale2]" scaleC3="[scale3]"
sysType="[system type] nomCurrent="[nominal current]" />
```

Attribute	Description	Current Link System	PME System
index	Index of system	1 ≤ index ≤ 10 (mandatory)	1 ≤ index ≤ 100 (mandatory)
name	Name of the system	Any UTF-8-formatted String (optional)	
c0	Id of sensor at position 0 or empty if no sensor is present	(not supported)	pme.pme[idx].out.i (optional)
c1	Id of sensor at position 1 or empty if no sensor is present	(not supported)	pme.pme[idx].out.i (optional)
c2	Id of sensor at position 2 or empty if no sensor is present	(not supported)	pme.pme[idx].out.i (optional)
c3	Id of sensor at position 3 or empty if no sensor is present	(not supported)	pme.pme[idx].out.i (optional)
scaleC0	Ratio of measured current to actual current (gain) of sensor at position 0	0< scaleC0 < $3.4 \cdot 10^{38}$ Gain applies to position 1 and 2 aswell (optional)	0< scaleC0 < $3.4 \cdot 10^{38}$ (optional)
scaleC1	Ratio of measured current to actual current (gain) of sensor at position 1	(not supported)	0< scaleC1 < $3.4 \cdot 10^{38}$ (optional)
scaleC2	Ratio of measured current to actual current (gain) of sensor at position 2	(not supported)	0< scaleC2 < $3.4 \cdot 10^{38}$ (optional)
scaleC3	Ratio of measured current to actual current (gain) of sensor at position 3	0< scaleC3 < $3.4 \cdot 10^{38}$ (optional)	
sysType	Type of system	See 4.4.2.1 (optional)	
nomCurrent	Nominal current (used for scaling of the harmonic and TDD values)	1 ≤ nomCurrent ≤ 100000 (optional)	

4.4.2.1 System types

Current Link system types:

Name	Description
CM_SYS_STAR	Connected to L1,L2 and L3
CM_SYS_STAR_N	Connected to L1, L2, L3 and N
CM_SYS_STAR_PEN	Connected to L1, L2, L3 and PEN
CM_SYS_DEFAULT	System type not defined

PME system types:

Name	Description
LOAD_1P	Single phase load (not available for Rogowski sensors)
LOAD_1P_L1N	Single phase load at L1N (not available for Rogowski sensors)
LOAD_1P_L2N	Single phase load at L2N (not available for Rogowski sensors)
LOAD_1P_L3N	Single phase load at L3N (not available for Rogowski sensors)
LOAD_2PU	Two phase load (not available for Rogowski sensors)
LOAD_2PB_L1	Two phase load balanced – current measured at L1 (not available for Rogowski sensors)
LOAD_2PB_L2	Two phase load balanced – current measured at L2 (not available for Rogowski sensors)
LOAD_2P_L12	Two phase load connected to L1 and L2 (not available for Rogowski sensors)
LOAD_2P_L13	Two phase load connected to L1 and L3 (not available for Rogowski sensors)
LOAD_2P_L23	Two phase load connected to L2 and L3 (not available for Rogowski sensors)
LOAD_3PU	Three phase load unbalanced
LOAD_3PB_L1	Three phase load balanced – current measured at L1 (not available for Rogowski sensors)
LOAD_3PB_L2	Three phase load balanced – current measured at L2 (not available for Rogowski sensors)
LOAD_3PB_L3	Three phase load balanced – current measured at L3 (not available for Rogowski sensors)
LOAD_4PU	Four phase load unbalanced
LOAD_4PU_N	Four phase load unbalanced with neutral wire
LOAD_NONE	System type not defined

Note: To disable a PME system the system type can be set to LOAD_NONE. Current Link systems cannot be disabled as they are part of the link.

Example:

```
POST        http://[device]/cb/currentmodule/system

Body:

<system     index="1"
            name="Office 1st floor: coffee machine"
            c0="pme.pme1.out.i" c1="" c2="" c3=""
            sysType="LOAD_1P_L2N"
            nomCurrent="10.000000"
/>
```

Response:

```
<empty response>
```

Note: Assigning values to a system is a configuration change which must be stored (see 2.5.3)

4.4.3 Move systems (Current Link only)

Only Current Link systems can be moved, because their configuration is depending on the position of the module in the link.

POST `http://[device]/cb/currentmodule/system`

Body:

```
<system sourceindex="[source index]" targetindex="[target index]" mode="[move mode]" />
```

<table>
<tr><th>Attribute</th><th>Description</th></tr>
<tr><td>source index</td><td>Index of system that should be moved (1 ≤ source index ≤ 10)</td></tr>
<tr><td>target index</td><td>Index where system should be moved to (1 ≤ target index ≤ 10 ; target index ≠ source index)
(not required when move mode = delete)</td></tr>
<tr><td>move mode</td><td>Behavior of move operation
<table>
<tr><th>move mode</th><th>Behavior</th></tr>
<tr><td>insert</td><td>Inserts system from source index to target index every subsequent system is moved one index towards 10</td></tr>
<tr><td>swap</td><td>Swaps systems at source index and target index</td></tr>
<tr><td>delete</td><td>Moves system from source index to the last position and resets all configurable parameters to default. Every subsequent system of the source index is moved one index towards 1 to fill the gap.</td></tr>
</table>
</td></tr>
</table>

Example:

POST `http://[device]/cb/currentmodule/system`

Body:

```
<system sourceindex="9" targetindex="7" mode="insert" />
```

Response:

```
<empty response>
```

Note: Moving systems is a configuration change which must be stored (see 2.5.3)

5 Measurements

5.1 Used Syntax

14 | 2L | 3G | 3P | 3U | 3A | 4U | 4O	Availability of the measured quantities, depending on the connected system
	14 = single phase system or 4-wire balanced load **2L** = two phase system (split phase) **3G** = 3-wire balanced load **3P** = 3-wire balanced load, phase shift (2U,1I) **3U** = 3-wire unbalanced load **3A** = 3-wire balanced load, Aron connection **4U** = 4-wire unbalanced load **4O** = 4-wire unbalanced load, Open-Y connection

Hint: **3P** and **4O** are not supported by PQ3000 or PQ5000

5.2 General instantaneous values

Aggregation: 10/12 cycles (~200ms)

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
U	●	●	-	●	-	-	-	-	rms.rms.out.u	System voltage [V]
U1N	-	●	-	-	-	-	●	●	rms.rms.out.u1n	Voltage phase L1 to N [V]
U2N	-	●	-	-	-	-	●	●	rms.rms.out.u2n	Voltage phase L2 to N [V]
U3N	-	-	-	-	-	-	●	●	rms.rms.out.u3n	Voltage phase L3 to N [V]
U12	-	-	●	-	●	●	●	●	rms.rms.out.u12	Voltage phase L1 to L2 [V]
U23	-	-	●	-	●	●	●	●	rms.rms.out.u23	Voltage phase L2 to L3 [V]
U31	-	-	●	-	●	●	●	●	rms.rms.out.u31	Voltage phase L3 to L1 [V]
UNE	●	●	-	-	-	-	●	●	rms.rms.out.une	Zero displacement voltage in 4-wire systems [V]
I	●	-	●	●	-	-	-	-	rms.rms.out.i	System current [A]
I1	-	●	-	-	●	●	●	●	rms.rms.out.i1	Current in phase L1 [A]
I2	-	●	-	-	●	●	●	●	rms.rms.out.i2	Current in phase L2 [A]
I3	-	-	-	-	●	●	●	●	rms.rms.out.i3	Current in phase L3 [A]
I4 / IN	-	●	-	-	-	-	●	●	rms.rms.out.in	Neutral current [A]
P	●	●	●	●	●	●	●	●	rms.rms.out.p	Active power system [W]
P1	-	●	-	-	-	-	●	●	rms.rms.out.p1	Active power phase 1 (L1 – N) [W]
P2	-	●	-	-	-	-	●	●	rms.rms.out.p2	Active power phase 2 (L2 – N) [W]
P3	-	-	-	-	-	-	●	●	rms.rms.out.p3	Active power phase 3 (L3 – N) [W]
Q	●	●	●	●	●	●	●	●	rms.rms.out.q	Reactive power system [var]
Q1	-	●	-	-	-	-	●	●	rms.rms.out.q1	Reactive power phase 1 (L1 – N) [var]
Q2	-	●	-	-	-	-	●	●	rms.rms.out.q2	Reactive power phase 2 (L2 – N) [var]
Q3	-	-	-	-	-	-	●	●	rms.rms.out.q3	Reactive power phase 3 (L3 – N) [var]
S	●	●	●	●	●	●	●	●	rms.rms.out.s	Apparent power system S [VA]
S1	-	●	-	-	-	-	●	●	rms.rms.out.s1	Apparent power phase 1 (L1 – N) [VA]
S2	-	●	-	-	-	-	●	●	rms.rms.out.s2	Apparent power phase 2 (L2 – N) [VA]
S3	-	-	-	-	-	-	●	●	rms.rms.out.s3	Apparent power phase 3 (L3 – N) [VA]
F	●	●	●	●	●	●	●	●	rms.rms.out.f	System frequency [Hz]
PF	●	●	●	●	●	●	●	●	rms.rms.out.pf	PF = P / S, Power factor system
PF1	-	●	-	-	-	-	●	●	rms.rms.out.pf1	Power factor phase 1 (L1 – N)
PF2	-	●	-	-	-	-	●	●	rms.rms.out.pf2	Power factor phase 2 (L2 – N)
PF3	-	-	-	-	-	-	●	●	rms.rms.out.pf3	Power factor phase 3 (L3 – N)
QF	●	●	●	●	●	●	●	●	rms.rms.out.qf	QF = Q / S, Reactive power factor system
QF1	-	●	-	-	-	-	●	●	rms.rms.out.qf1	Reactive power factor phase 1 (L1 – N)
QF2	-	●	-	-	-	-	●	●	rms.rms.out.qf2	Reactive power factor phase 2 (L2 – N)
QF3	-	-	-	-	-	-	●	●	rms.rms.out.qf3	Reactive power factor phase 3 (L3 – N)
LF	●	●	●	●	●	●	●	●	rms.rms.out.lf	sign(Q)·(1 – abs(PF)), Load factor system
LF1	-	●	-	-	-	-	●	●	rms.rms.out.lf1	Load factor phase 1 (L1 – N)
LF2	-	●	-	-	-	-	●	●	rms.rms.out.lf2	Load factor phase 2 (L2 – N)
LF3	-	-	-	-	-	-	●	●	rms.rms.out.lf3	Load factor phase 3 (L3 – N)
U_MEAN	-	●	●	-	●	●	●	-	rms.rms.out.umean	Average value of voltages (U1x+U2x+U3x)/3 [V]

I_MEAN	-	●	-	-	●	-	●	●	rms.rms.out.imean	Average value of currents (I1+I2+I3)/3 [A]
UF12	-	-	●	-	●	●	●	●	rms.fft.out.uf12	Phase angle voltage U1-U2 [ ]
UF23	-	-	●	-	●	●	●	●	rms.fft.out.uf23	Phase angle voltage U2-U3 [ ]
UF31	-	-	●	-	●	●	●	●	rms.fft.out.uf31	Phase angle voltage U3-U1 [ ]
DEV_UMAX	-	●	●	-	●	●	●	●	rms.rms.out.deltau	Max. deviation from the average value of voltages [V]
DEV_IMAX	-	●	-	-	●	●	●	●	rms.rms.out.deltai	Max. deviation from the average value of currents [A]
IMS	●	●	●	●	●	●	●	●	rms.rms.out.ims	Average value of currents with sign of P [A]
IPE	-	●	-	-	●	-	●	●	rms.rms.out.ipe	Earth current [A]

5.3 System analysis

5.3.1 Instantaneous values of harmonic analysis

Calculated from harmonics

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
THD_U1N	U	U1N		U			U1N	U1N	rms.fft.out.thd_u1n	Total Harmonic Distortion [%]
THD_U2N		U2N					U2N	U2N	rms.fft.out.thd_u2n	Total Harmonic Distortion [%]
THD_U3N		-					U3N	U3N	rms.fft.out.thd_u3n	Total Harmonic Distortion [%]
THD_U12			U12		U12	U12			rms.fft.out.thd_u12	Total Harmonic Distortion [%]
THD_U23			U23		U23	U23			rms.fft.out.thd_u23	Total Harmonic Distortion [%]
THD_U31		-	U31		U31	U31			rms.fft.out.thd_u31	Total Harmonic Distortion [%]
TDD_I1	I	I1	I	I	I1	I1	I1	I1	rms.fft.out.tdd_i1	Total Demand Distortion [%]
TDD_I2	-	I2	-	-	I2	I2	I2	I2	rms.fft.out.tdd_i2	Total Demand Distortion [%]
TDD_I3	-	-	-	-	I3	I3	I3	I3	rms.fft.out.tdd_i3	Total Demand Distortion [%]
THD_I1	I	I1	I	I	I1	I1	I1	I1	rms.fft.out.thd_i1	Total Harmonic Distortion [%]
THD_I2	-	I2	-	-	I2	I2	I2	I2	rms.fft.out.thd_i2	Total Harmonic Distortion [%]
THD_I3	-	-	-	-	I3	I3	I3	I3	rms.fft.out.thd_i3	Total Harmonic Distortion [%]

►THD_U: Harmonic content related to the fundamental of the RMS value of the voltage

►TDD_I: Harmonic content related to the **rated value** of the current

►THD_I: Harmonic content related to the fundamental of the RMS value of the current

Calculated from harmonic subgroups

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
THDS_U1N	U	U1N		U			U1N	U1N	rms.fft.out.thds_u1n	Total Harmonic Distortion [%]
THDS_U2N		U2N					U2N	U2N	rms.fft.out.thds_u2n	Total Harmonic Distortion [%]
THDS_U3N		-					U3N	U3N	rms.fft.out.thds_u3n	Total Harmonic Distortion [%]
THDS_U12			U12		U12	U12			rms.fft.out.thds_u12	Total Harmonic Distortion [%]
THDS_U23			U23		U23	U23			rms.fft.out.thds_u23	Total Harmonic Distortion [%]
THDS_U31		-	U31		U31	U31			rms.fft.out.thds_u31	Total Harmonic Distortion [%]
TDDS_I1	I	I1	I	I	I1	I1	I1	I1	rms.fft.out.tdds_i1	Total Demand Distortion [%]
TDDS_I2	-	I2	-	-	I2	I2	I2	I2	rms.fft.out.tdds_i2	Total Demand Distortion [%]
TDDS_I3	-	-	-	-	I3	I3	I3	I3	rms.fft.out.tdds_i3	Total Demand Distortion [%]
THDS_I1	I	I1	I	I	I1	I1	I1	I1	rms.fft.out.thds_i1	Total Harmonic Distortion [%]
THDS_I2	-	I2	-	-	I2	I2	I2	I2	rms.fft.out.thds_i2	Total Harmonic Distortion [%]
THDS_I3	-	-	-	-	I3	I3	I3	I3	rms.fft.out.thds_i3	Total Harmonic Distortion [%]

5.3.2 Harmonic subgroups

Name	14	2L	3G	3G	3U	3A	4U	4O	ID	Description
H2_U1N	U	U1N		U			U1N	U1N	rms.fft.harm_u1n.harm_u1n_2	Content of 2^{nd} harmonic [%]
..... H89_U1N									rms.fft.harm_u1n.harm_u1n_89	..... Content of 89^{th} harmonic [%]
H2_U2N		U2N					U2N	U2N	rms.fft.harm_u2n.harm_u2n_2	Content of 2^{nd} harmonic [%]
..... H89_U2N									rms.fft.harm_u2n.harm_u2n_89	..... Content of 89^{th} harmonic [%]
H2_U3N							U3N	U3N	rms.fft.harm_u2n.harm_u3n_2	Content of 2^{nd} harmonic [%]
..... H89_U3N									rms.fft.harm_u2n.harm_u3n_89	..... Content of 89^{th} harmonic [%]
H2_U12			U12		U12	U12			rms.fft.harm_u12.harm_u12_2	Content of 2^{nd} harmonic [%]
..... H89_U12									rms.fft.harm_u12.harm_u12_89	..... Content of 89^{th} harmonic [%]
H2_U23			U23		U23	U23			rms.fft.harm_u23.harm_u23_2	Content of 2^{nd} harmonic [%]
..... H89_U23									rms.fft.harm_u23.harm_u23_89	..... Content of 89^{th} harmonic [%]
H2_U31			U31		U31	U31			rms.fft.harm_u31.harm_u31_2	Content of 2^{nd} harmonic [%]
..... H89_U31									rms.fft.harm_u31harm_u31_89	..... Content of 89^{th} harmonic [%]
H2_I1X	I	I1	I	I	I1	I1	I1	I1	rms.fft.harm_i1.harm_i1_2	Content of 2^{nd} harmonic [%]
..... H89_I1X									rms.fft.harm_i1.harm_i1_89	..... Content of 89^{th} harmonic [%]
H2_I2X	-	I2	-	-	I2	I2	I2	I2	rms.fft.harm_i2.harm_i2_2	Content of 2^{nd} harmonic [%]
..... H89_I2X									rms.fft.harm_i2.harm_i2_89	..... Content of 89^{th} harmonic [%]
H2_I3X	-	-	-	-	I3	I3	I3	I3	rms.fft.harm_i3.harm_i3_2	Content of 2^{nd} harmonic [%]
..... H89_I3X									rms.fft.harm_i3.harm_i3_89	..... Content of 89^{th} harmonic [%]

►Hi_Uxy: Harmonic content of the voltage related to the fundamental 100 %

►Hi_Ixy: Harmonic content of the current related to the **rated** current

►At rated frequency 60Hz harmonics are available up to the 75^{th} only, the other values are 0.0

5.3.3 Interharmonic groups

Name	14	2L	3G	3G	3U	3A	4U	4O	ID	Description
IH2_U1N	U	U1N		U			U1N	U1N	rms.fft.int_harm_grp_u1n.int_harm_grp_u1n_2	2^{nd} interharmonic group [%]
..... IH89_U1N									rms.fft.int_harm_grp_u1n.int_harm_grp_u1n_89	..... 89^{th} interharmonic group [%]
IH2_U2N		U2N					U2N	U2N	rms.fft.int_harm_grp_u2n.int_harm_grp_u2n_2	2^{nd} interharmonic group [%]
..... IH89_U2N									rms.fft.int_harm_grp_u2n.int_harm_grp_u2n_89	..... 89^{th} interharmonic group [%]
IH2_U3N							U3N	U3N	rms.fft.int_harm_grp_u2n.int_harm_grp_u3n_2	2^{nd} interharmonic group [%]
..... IH89_U3N									rms.fft.int_harm_grp_u2n.int_harm_grp_u3n_89	..... 89^{th} interharmonic group [%]
IH2_U12			U12		U12	U12			rms.fft.int_harm_grp_u12.int_harm_grp_u12_2	2^{nd} interharmonic group [%]
..... IH89_U12									rms.fft.int_harm_grp_u12.int_harm_grp_u12_89	..... 89^{th} interharmonic group [%]
IH2_U23			U23		U23	U23			rms.fft.int_harm_grp_u23.int_harm_grp_u23_2	2^{nd} interharmonic group [%]
..... IH89_U23									rms.fft.int_harm_grp_u23.int_harm_grp_u23_89	..... 89^{th} interharmonic group [%]
IH2_U31			U31		U31	U31			rms.fft.int_harm_grp_u31.int_harm_grp_u31_2	2^{nd} interharmonic group [%]
..... IH89_U31									rms.fft.int_harm_grp_u31int_harm_grp_u31_89	..... 89^{th} interharmonic group [%]
IH2_I1X	I	I1	I	I	I1	I1	I1	I1	rms.fft.int_harm_grp_i1.int_harm_grp_i1_2	2^{nd} interharmonic group [%]
..... IH89_I1X									rms.fft.int_harm_grp_i1.int_harm_grp_i1_89	..... 89^{th} interharmonic group [%]
IH2_I2X	-	I2	-	-	I2	I2	I2	I2	rms.fft.int_harm_grp_i2.int_harm_grp_i2_2	2^{nd} interharmonic group [%]
..... IH89_I2X									rms.fft.int_harm_grp_i2.int_harm_grp_i2_89	..... 89^{th} interharmonic group [%]
IH2_I3X	-	-	-	-	I3	I3	I3	I3	rms.fft.int_harm_grp_i3.int_harm_grp_i3_2	2^{nd} interharmonic group [%]
..... IH89_I3X									rms.fft.int_harm_grp_i3.int_harm_grp_i3_89	..... 89^{th} interharmonic group [%]

5.3.4 Instantaneous values of imbalance analysis acc. Fortescue

IEC 61000-4-30, 5.7 and 5.13.6

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
UR1	-	-	●	-	●	●	●	-	rms.fft.out.ur1_h1	Voltage [V]: Positive sequence
UR2	-	-	●	-	●	●	●	-	rms.fft.out.ur2_h1	Voltage [V]: Negative sequence
U0	-	-	-	-	-	-	●	-	rms.fft.out.u0_h1	Voltage [V]: Zero sequence
IR1	-	-	-	-	●	-	●	●	rms.fft.out.ir1_h1	Current [A]: Positive sequence
IR2	-	-	-	-	●	-	●	●	rms.fft.out.ir2_h1	Current [A]: Negative sequence
I0	-	-	-	-	-	-	●	●	rms.fft.out.i0_h1	Current [A]: Zero sequence
UNB_UR2_UR1	-	-	●	-	●	●	●	-	rms.fft.out.ur2r1_h1	Imbalance factor voltage: UR2/UR1 [%]
UNB_IR2_IR1	-	-	-	-	●	-	●	●	rms.fft.out.ir2r1_h1	Imbalance factor current: IR2/IR1 [%]
UNB_U0_UR1	-	-	-	-	-	-	●	-	rms.fft.out.u0r1_h1	Imbalance factor voltage: U0/UR1 [%]
UNB_I0_IR1	-	-	-	-	-	-	●	●	rms.fft.out.i0r1_h1	Imbalance factor current: I0/IR1 [%]

5.3.5 Instantaneous values of extended power analysis

Name	14	2L	3G	3G	3U	3A	4U	4O	ID	Description
P_H1	●	●	●	●	●	●	●	●	rms.fft.out.q_h1	Active power of fundamental, system [var]
P1_H1	-	●	-	-	-	-	●	●	rms.fft.out.q1_h1	Active power of fundamental, phase L1 [var]
P2_H1	-	●	-	-	-	-	●	●	rms.fft.out.q2_h1	Active power of fundamental, phase L2 [var]
P3_H1	-	-	-	-	-	-	●	●	rms.fft.out.q3_h1	Active power of fundamental, phase L3 [var]
Q_H1	●	●	●	●	●	●	●	●	rms.fft.out.q_h1	Reactive power of fundamental, system [var]
Q1_H1	-	●	-	-	-	-	●	●	rms.fft.out.q1_h1	Reactive power of fundamental, phase L1 [var]
Q2_H1	-	●	-	-	-	-	●	●	rms.fft.out.q2_h1	Reactive power of fundamental, phase L2 [var]
Q3_H1	-	-	-	-	-	-	●	●	rms.fft.out.q3_h1	Reactive power of fundamental, phase L3 [var]
S_H1	●	●	●	●	●	●	●	●	rms.fft.out.q_h1	Apparent power of fundamental, system [var]
S1_H1	-	●	-	-	-	-	●	●	rms.fft.out.q1_h1	Apparent power of fundamental, phase L1 [var]
S2_H1	-	●	-	-	-	-	●	●	rms.fft.out.q2_h1	Apparent power of fundamental, phase L2 [var]
S3_H1	-	-	-	-	-	-	●	●	rms.fft.out.q3_h1	Apparent power of fundamental, phase L3 [var]
D	●	●	●	●	●	●	●	●	deformed_power.d.out.defpow	Distortion reactive power, system [var]
D1	-	●	-	-	-	-	●	●	deformed_power.d1.out.defpow	Distortion reactive power, phase L1 [var]
D2	-	●	-	-	-	-	●	●	deformed_power.d2.out.defpow	Distortion reactive power, phase L2 [var]
D3	-	-	-	-	-	-	●	●	deformed_power.d3.out.defpow	Distortion reactive power, phase L3 [var]
CPHI	●	●	●	●	●	●	●	●	rms.fft.out.cosphi	cos(φ) of fundamental, system
CPHI1	-	●	-	-	-	-	●	●	rms.fft.out.cosphi_l1	cos(φ) of fundamental, phase L1
CPHI2	-	●	-	-	-	-	●	●	rms.fft.out.cosphi_l2	cos(φ) of fundamental, phase L2
CPHI3	-	-	-	-	-	-	●	●	rms.fft.out.cosphi_l3	cos(φ) of fundamental, phase L3
TPHI	●	●	●	●	●	●	●	●	rms.fft.out.tanphi	tan(φ) of fundamental, system
TPHI1	-	●	-	-	-	-	●	●	rms.fft.out.tanphi_l1	tan(φ) of fundamental, phase L1
TPHI2	-	●	-	-	-	-	●	●	rms.fft.out.tanphi_l2	tan(φ) of fundamental, phase L2
TPHI3	-	-	-	-	-	-	●	●	rms.fft.out.tanphi_l3	tan(φ) of fundamental, phase L3

5.3.6 Mains signalling voltages

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
UMSIG1N	-	●	-	-	-	-	●	●	rms.fft.mains_signalling.ms_u1n	Mains Signalling Voltage [V] on U1N
UMSIG2N	-	●	-	-	-	-	●	●	rms.fft.mains_signalling.ms_u2n	Mains Signalling Voltage [V] on U2N
UMSIG3N	-	-	-	-	-	-	●	●	rms.fft.mains_signalling.ms_u3n	Mains Signalling Voltage [V] on U3N
UMSIG12	-	-	●	-	●	●	●	●	rms.fft.mains_signalling.ms_u12	Mains Signalling Voltage [V] on U12
UMSIG23	-	-	●	-	●	●	●	●	rms.fft.mains_signalling.ms_u23	Mains Signalling Voltage [V] on U23
UMSIG31	-	-	●	-	●	●	●	●	rms.fft.mains_signalling.ms_u31	Mains Signalling Voltage [V] on U31

5.4 Minimum / maximum values of system quantities

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
U_MAX	●	●	-	●	-	-	-	-	minmax.u_mm.max.max	Maximum value of U [V]
U1N_MAX	-	●	-	-	-	-	●	●	minmax.u1n_mm.max.max	Maximum value of U1N [V]
U2N_MAX	-	●	-	-	-	-	●	●	minmax.u2n_mm.max.max	Maximum value of U2N [V]
U3N_MAX	-	-	-	-	-	-	●	●	minmax.u3n_mm.max.max	Maximum value of U3N [V]
U12_MAX	-	-	●	-	●	●	●	●	minmax.u12_mm.max.max	Maximum value of U12 [V]
U23_MAX	-	-	●	-	●	●	●	●	minmax.u23_mm.max.max	Maximum value of U23 [V]
U31_MAX	-	-	●	-	●	●	●	●	minmax.u31_mm.max.max	Maximum value of U31 [V]
UNE_MAX	●	●	-	-	-	-	●	●	minmax.une_max.max.max	Maximum value of UNE [V]
I_MAX	●	-	●	●	-	-	-	-	minmax.i_max.max.max	Maximum value of I [A]
I1_MAX	-	●	-	-	●	●	●	●	minmax.i1_max.max.max	Maximum value of I1 [A]
I2_MAX	-	-	-	-	●	●	●	●	minmax.i2_max.max.max	Maximum value of I2 [A]
I3_MAX	-	-	-	-	●	●	●	●	minmax.i3_max.max.max	Maximum value of I3 [A]
IN_MAX	-	●	-	-	-	-	●	●	minmax.in_max.max.max	Maximum value of IN [A]
P_MAX	●	●	●	●	●	●	●	●	minmax.p_max.max.max	Maximum value of P [W]
P1_MAX	-	●	-	-	-	-	●	●	minmax.p1_max.max.max	Maximum value of P1 [W]
P2_MAX	-	●	-	-	-	-	●	●	minmax.p2_max.max.max	Maximum value of P2 [W]
P3_MAX	-	-	-	-	-	-	●	●	minmax.p3_max.max.max	Maximum value of P3 [W]
Q_MAX	●	●	●	●	●	●	●	●	minmax.q_max.max.max	Maximum value of Q [var]
Q1_MAX	-	●	-	-	-	-	●	●	minmax.q1_max.max.max	Maximum value of Q1 [var]
Q2_MAX	-	●	-	-	-	-	●	●	minmax.q2_max.max.max	Maximum value of Q2 [var]
Q3_MAX	-	-	-	-	-	-	●	●	minmax.q3_max.max.max	Maximum value of Q3 [var]
S_MAX	●	●	●	●	●	●	●	●	minmax.s_max.max.max	Maximum value of S [VA]
S1_MAX	-	●	-	-	-	-	●	●	minmax.s1_max.max.max	Maximum value of S1 [VA]
S2_MAX	-	●	-	-	-	-	●	●	minmax.s2_max.max.max	Maximum value of S2 [VA]
S3_MAX	-	-	-	-	-	-	●	●	minmax.s3_max.max.max	Maximum value of S3 [VA]
F_MAX	●	●	●	●	●	●	●	●	minmax.f_mm.max.max	Maximum value of F [Hz]
DEV_UMAX_MAX	-	-	●	-	●	●	●	●	minmax.deltau_max.max.max	Maximum value of DEV_UMAX [V]
DEV_IMAX_MAX	-	-	-	-	●	●	●	●	minmax.deltai_max.max.max	Maximum value of DEV_IMAX [A]
U_MIN	●	●	-	●	-	-	-	-	minmax.u_mm.min.min	Minimum value of U [V]
U1N_MIN	-	●	-	-	-	-	●	●	minmax.u1n_mm.min.min	Minimum value of U1N [V]
U2N_MIN	-	●	-	-	-	-	●	●	minmax.u2n_mm.min.min	Minimum value of U2N [V]
U3N_MIN	-	-	-	-	-	-	●	●	minmax.u3n_mm.min.min	Minimum value of U3N [V]
U12_MIN	-	-	●	-	●	●	●	●	minmax.u12_mm.min.min	Minimum value of U12 [V]
U23_MIN	-	-	●	-	●	●	●	●	minmax.u23_mm.min.min	Minimum value of U23 [V]
U31_MIN	-	-	●	-	●	●	●	●	minmax.u31_mm.min.min	Minimum value of U31 [V]
PF_MIN_QI	●	●	●	●	●	●	●	●	minmax.pf_minq_qdr1.min.min	min. power factor quadrant I
PF_MIN_QIV	●	●	●	●	●	●	●	●	minmax.pf_minq_qdr4.min.min	min. power factor quadrant IV
PF_MIN_QIII	●	●	●	●	●	●	●	●	minmax.pf_minq_qdr2.min.min	min. power factor quadrant III
PF_MIN_QII	●	●	●	●	●	●	●	●	minmax.pf_minq_qdr3.min.min	min. power factor quadrant II
F_MIN	●	●	●	●	●	●	●	●	minmax.f_mm.min.min	Minimum value of F [Hz]
IPE_MAX [1)]	-	●	-	-	●	-	●	●	minmax.ipe_max.max.max	Maximum value of IPE [A]

► A timestamp "1.1.1970" indicates that the associated measurement is invalid.

5.5 Minimum / maximum values of system analysis

5.5.1 Maximum values of harmonic analysis

Name	14	2L	3G	3G	3U	3A	4U	4O	ID	Description
H2_U1N_MAX	U	U1N		U	U12	U12	U1N	U1N	rms.fft.harm_u1n_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_U1N_MAX									rms.fft.harm_u1x_max.max_89	Max. content of 89^{th} harmonic [%]
H2_U2N_MAX		U2N					U2N	U2N	rms.fft.harm_u2x_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_U2N_MAX									rms.fft.harm_u2n_max.max_89	Max. content of 89^{th} harmonic [%]
H2_U3N_MAX							U3N	U3N	rms.fft.harm_u3n_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_U3N_MAX									rms.fft.harm_u3n_max.max_89	Max. content of 89^{th} harmonic [%]
H2_U12_MAX			U12		U12	U12			rms.fft.harm_u12_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_U12_MAX									rms.fft.harm_u12_max.max_89	Max. content of 89^{th} harmonic [%]
H2_U23_MAX			U23		U23	U23			rms.fft.harm_u23_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_U23_MAX									rms.fft.harm_u23_max.max_89	Max. content of 89^{th} harmonic [%]
H2_U31_MAX			U31		U31	U31			rms.fft.harm_u31_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_U31_MAX									rms.fft.harm_u31_max.max_89	Max. content of 89^{th} harmonic [%]
H2_I1X_MAX	I	I1	I	I	I1	I1	I1	I1	rms.fft.harm_i1_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_I1X_MAX									rms.fft.harm_i1_max.max_89	Max. content of 89^{th} harmonic [%]
H2_I2X_MAX	-	I2	-	-	I2	I2	I2	I2	rms.fft.harm_i2_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_I2X_MAX									rms.fft.harm_i2_max.max_89	Max. content of 89^{th} harmonic [%]
H2_I3X_MAX	-	-	-	-	I3	I3	I3	I3	rms.fft.harm_i3_max.max_2	Max. content of 2^{nd} harmonic [%]
.....										.....
H89_I3X_MAX									rms.fft.harm_i3_max.max_89	Max. content of 89^{th} harmonic [%]

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
THD_U1N_MAX	U	U1N		U			U1N	U1N	rms.fft.thd_u1n_max.max	Max. THD value phase 1N [%]
THD_U2N_MAX		U2N					U2N	U2N	rms.fft.thd_u2n_max.max	Max. THD value phase 2N [%]
THD_U3N_MAX							U3N	U3N	rms.fft.thd_u3n_max.max	Max. THD value phase 3N [%]
THD_U12_MAX			U12		U12	U12			rms.fft.thd_u12_max.max	Max. THD value phase 12 [%]
THD_U23_MAX			U23	-	U23	U23			rms.fft.thd_u23_max.max	Max. THD value phase 23 [%]
THD_U31_MAX			U31	-	U31	U31			rms.fft.thd_u31_max.max	Max. THD value phase 31 [%]
TDD_I1X_MAX	I	I1	I	I	I1	I1	I1	I1	rms.fft.tdd_i1_max.max	Max. TDD value phase 1 [%]
TDD_I2X_MAX	-	I2	-	-	I2	I2	I2	I2	rms.fft.tdd_i2_max.max	Max. TDD value phase 2 [%]
TDD_I3X_MAX	-	-	-	-	I3	I3	I3	I3	rms.fft.tdd_i3_max.max	Max. TDD value phase 3 [%]

► The maximum values of the harmonic analysis arise from monitoring the maximum values of THD resp. TDD. The maximum values of the individual harmonics are not monitored separately, but stored when a maximum value of THD or TDD is recognized. The image of the maximum harmonics therefore always corresponds to the associated THD resp. TDD.

► At rated frequency 60Hz only harmonics up to the 75^{th} are available, the other values are 0.0

► A timestamp "1.1.1970" indicates that the associated measurement is invalid.

5.5.2 Maximum values of imbalance analysis acc. Fortescue

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
UNB_UR2_UR1_MAX	-	-	●	-	●	●	●	-	minmax.ur2r1_max.max.max	max. imbalance UR2/UR1 [%]
UNB_IR2_IR1_MAX	-	-	-	-	-	-	●	●	minmax.ir2r1_max.max.max	max. imbalance IR2/IR1 [%]
UNB_U0_UR1_MAX	-	-	-	-	●	-	●	-	minmax.u0r1_max.max.max	max. imbalance U0/UR1 [%]
UNB_I0_IR1_MAX	-	-	-	-	-	-	●	●	minmax.i0r1_max.max.max	max. imbalance I0/IR1 [%]

► A timestamp "1.1.1970" indicates that the associated measurement is invalid.

The imbalance maximum values are implemented as 32-bit float numbers (2 registers per value).

5.5.3 Maximum values of extended power analysis

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
P_MAX_H1	●	●	●	●	●	●	●	-	minmax.ph1_max.max.max	Max. active power of fundamental, system [W]
P1_MAX_H1	-	●	-	-	-	-	●	●	minmax.p1h1_max.max.max	Max. active power of fundamental, phase L1 [W]
P2_MAX_H1	-	●	-	-	●	-	●	-	minmax.p2h1_max.max.max	Max. active power of fundamental, phase L2 [W]
P3_MAX_H1	-	-	-	-	-	-	●	●	minmax.p3h1_max.max.max	Max. active power of fundamental, phase L3 [W]
Q_MAX_H1	●	●	●	●	●	●	●	-	minmax.qh1_max.max.max	Max. reactive power fundamental, system [var]
Q1_MAX_H1	-	●	-	-	-	-	●	●	minmax.q1h1_max.max.max	Max. reactive power fundamental, phase L1 [var]
Q2_MAX_H1	-	●	-	-	●	-	●	-	minmax.q2h1_max.max.max	Max. reactive power fundamental, phase L2 [var]
Q3_MAX_H1	-	-	-	-	-	-	●	●	minmax.q3h1_max.max.max	Max. reactive power fundamental, phase L3 [var]
S_MAX_H1	●	●	●	●	●	●	●	-	minmax.sh1_max.max.max	Max. apparent power of fundamental, system[VA]
S1_MAX_H1	-	●	-	-	-	-	●	●	minmax.s1h1_max.max.max	Max. apparent power fundamental, phase L1 [VA]
S2_MAX_H1	-	●	-	-	●	-	●	-	minmax.s2h1_max.max.max	Max. apparent power fundamental, phase L2 [VA]
S3_MAX_H1	-	-	-	-	-	-	●	●	minmax.s3h1_max.max.max	Max. apparent power fundamental, phase L3 [VA]
D_MAX	●	●	●	●	●	●	●	-	minmax.d_max.max.max	Max. distortion reactive power, system [var]
D1_MAX	-	●	-	-	-	-	●	●	minmax.d1_max.max.max	Max. distortion reactive power, phase L1 [var]
D2_MAX	-	●	-	-	●	-	●	-	minmax.d2_max.max.max	Max. distortion reactive power, phase L2 [var]
D3_MAX	-	-	-	-	-	-	●	●	minmax.d3_max.max.max	Max. distortion reactive power, phase L3 [var]
CPHI_MIN_QI	●	●	●	●	●	●	●	●	minmax.cosphi_minq_qdr1.min.min	min. cos(φ) quadrant I (*)
CPHI _MIN_QIV	●	●	●	●	●	●	●	●	minmax.cosphi_minq_qdr4.min.min	min. cos(φ) quadrant IV (*)
CPHI _MIN_QIII	●	●	●	●	●	●	●	●	minmax.cosphi_minq_qdr2.min.min	min. cos(φ) quadrant III (*)
CPHI _MIN_OII	●	●	●	●	●	●	●	●	minmax.cosphi_minq_qdr3.min.min	min. cos(φ) quadrant II (*)

(*) min. cos(φ) of the system fundamental in all 4 quadrants

► A timestamp "1.1.1970" indicates that the associated measurement is invalid.

5.6 Mean-values: Trend, Last values, minimum / maximum values

5.6.1 Mean values of power (standard quantities), averaging interval t1

Name	Trend	Mean Value Last … -4T	Description	
AVG_P_I_IV	mean_t1.m_p_qdr14.out_trend.trend	mean_t1.m_p_qdr14.out.mean_out history_t1.mh_p_qdr14.out_1.out_1 history_t1.mh_p_qdr14.out_2.out_2 history_t1.mh_p_qdr14.out_3.out_3 history_t1.mh_p_qdr14.out_4.out_4	Mean-value P, quadrant I+IV	[W]
AVG_P_II_III	mean_t1.m_p_qdr23.out_trend.trend	mean_t1.m_p_qdr23.out.mean_out history_t1.mh_p_qdr23.out_1.out_1 history_t1.mh_p_qdr23.out_2.out_2 history_t1.mh_p_qdr23.out_3.out_3 history_t1.mh_p_qdr23.out_4.out_4	Mean-value P, quadrant II+III	[W]
AVG_Q_I_II	mean_t1.m_q_qdr12.out_trend.trend	mean_t1.m_q_qdr12.out.mean_out history_t1.mh_q_qdr12.out_1.out_1 history_t1.mh_q_qdr12.out_2.out_2 history_t1.mh_q_qdr12.out_3.out_3 history_t1.mh_q_qdr12.out_4.out_4	Mean-value Q, quadrant I+II	[var]
AVG_Q_III_IV	mean_t1.m_q_qdr34.out_trend.trend	mean_t1.m_q_qdr34.out.mean_out history_t1.mh_q_qdr34.out_1.out_1 history_t1.mh_q_qdr34.out_2.out_2 history_t1.mh_q_qdr34.out_3.out_3 history_t1.mh_q_qdr34.out_4.out_4	Mean-value Q, quadrant III+IV	[var]
AVG_S	mean_t1.m_s.out_trend.trend	mean_t1.m_s.out.mean_out history_t1.mh_s.out_1.out_1 history_t1.mh_s.out_2.out_2 history_t1.mh_s.out_3.out_3 history_t1.mh_s.out_4.out_4	Mean-value S	[VA]

Name	Maximum	Minimum	Description	
AVG_P_I_IV	minmax.m_p_qdr14_mm.max.max	minmax.m_p_qdr14_mm.min.min	Mean-value P, quadrant I+IV	[W]
AVG_P_II_III	minmax.m_p_qdr23_mm.max.max	minmax.m_p_qdr23_mm.min.min	Mean-value P, quadrant II+III	[W]
AVG_Q_I_II	minmax.m_q_qdr12_mm.max.max	minmax.m_q_qdr12_mm.min.min	Mean-value Q, quadrant I+II	[var]
AVG_Q_III_IV	minmax.m_q_qdr34_mm.max.max	minmax.m_q_qdr34_mm.min.min	Mean-value Q, quadrant III+IV	[var]
AVG_S	minmax.m_s_mm.max.max	minmax.m_s_mm.min.min	Mean-value S	[VA]

► A timestamp "1.1.1970" indicates that the associated measurement is invalid.

► For each of the standard quantities the mean-value for the last interval and the 4 previous values are provided.

5.6.2 Free configurable mean-value quantities, averaging interval t2

Name	Trend	Mean-value	Description
AVG_1	mean_t2.mean1.out_trend.trend	mean_t2.mean1.out.mean_out	Configured mean-value 1 [%]
AVG_2	mean_t2.mean2.out_trend.trend	mean_t2.mean2.out.mean_out	Configured mean-value 2 [%]
AVG_3	mean_t2.mean3.out_trend.trend	mean_t2.mean3.out.mean_out	Configured mean-value 3 [%]
AVG_4	mean_t2.mean4.out_trend.trend	mean_t2.mean4.out.mean_out	Configured mean-value 4 [%]
AVG_5	mean_t2.mean5.out_trend.trend	mean_t2.mean5.out.mean_out	Configured mean-value 5 [%]
AVG_6	mean_t2.mean6.out_trend.trend	mean_t2.mean6.out.mean_out	Configured mean-value 6 [%]
AVG_7	mean_t2.mean7.out_trend.trend	mean_t2.mean7.out.mean_out	Configured mean-value 7 [%]
AVG_8	mean_t2.mean8.out_trend.trend	mean_t2.mean8.out.mean_out	Configured mean-value 8 [%]
AVG_9	mean_t2.mean9.out_trend.trend	mean_t2.mean9.out.mean_out	Configured mean-value 9 [%]
AVG_10	mean_t2.mean10.out_trend.trend	mean_t2.mean10.out.mean_out	Configured mean-value 10 [%]
AVG_11	mean_t2.mean11.out_trend.trend	mean_t2.mean11.out.mean_out	Configured mean-value 11 [%]
AVG_12	mean_t2.mean12.out_trend.trend	mean_t2.mean12.out.mean_out	Configured mean-value 12 [%]

Name	Maximum	Minimum	Description
AVG_1	minmax.m1_mm.max.max	minmax.m1_mm.min.min	Configured mean-value 1 [%]
AVG_2	minmax.m2_mm.max.max	minmax.m2_mm.min.min	Configured mean-value 2 [%]
AVG_3	minmax.m3_mm.max.max	minmax.m3_mm.min.min	Configured mean-value 3 [%]
AVG_4	minmax.m4_mm.max.max	minmax.m4_mm.min.min	Configured mean-value 4 [%]
AVG_5	minmax.m5_mm.max.max	minmax.m5_mm.min.min	Configured mean-value 5 [%]
AVG_6	minmax.m6_mm.max.max	minmax.m6_mm.min.min	Configured mean-value 6 [%]
AVG_7	minmax.m7_mm.max.max	minmax.m7_mm.min.min	Configured mean-value 7 [%]
AVG_8	minmax.m8_mm.max.max	minmax.m8_mm.min.min	Configured mean-value 8 [%]
AVG_9	minmax.m9_mm.max.max	minmax.m9_mm.min.min	Configured mean-value 9 [%]
AVG_10	minmax.m10_mm.max.max	minmax.m10_mm.min.min	Configured mean-value 10 [%]
AVG_11	minmax.m11_mm.max.max	minmax.m11_mm.min.min	Configured mean-value 11 [%]
AVG_12	minmax.m12_mm.max.max	minmax.m12_mm.min.min	Configured mean-value 12 [%]

► A timestamp "1.1.1970" indicates that the associated measurement is invalid.

5.6.3 Bimetal current, averaging interval t3

Name	14	2L	3G	3P	3U	3A	4U	4O	Value	Maximum	Description
IB	●	-	●	●	-	-	-	-	bimetal_t3.ib.out.expfkt	minmax.ib_max.max.max	Damped current in balanced systems [A]
IB1	-	●	-	-	●	●	●	●	bimetal_t3.ib1.out.expfkt	minmax.ib1_max.max.max	Damped current in phase L1 [A]
IB2	-	●	-	-	●	●	●	●	bimetal_t3.ib2.out.expfkt	minmax.ib2_max.max.max	Damped current in phase L2 [A]
IB3	-	-	-	-	●	●	●	●	bimetal_t3.ib3.out.expfkt	minmax.ib3_max.max.max	Damped current in phase L3 [A]

► A timestamp "1.1.1970" indicates that the associated measurement is invalid.

5.7 Current Link specific values

5.7.1 Current and power values

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
CL1_I1 . . . . . CL10_I1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.i1 rms.rmsI_cl10.out.i1	Instantaneous value of current in phase L1 on CL 1 [A] … Instantaneous value of current in phase L1 on CL 10 [A]
CL1_I2 . . . . . CL10_I2	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.i2 rms.rmsI_cl10.out.i2	Instantaneous value of current in phase L2 on CL 1 [A] … Instantaneous value of current in phase L2 on CL 10 [A]
CL1_I3 . . . . . CL10_I3	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.i3 rms.rmsI_cl10.out.i3	Instantaneous value of current in phase L3 on CL 1 [A] … Instantaneous value of current in phase L3 on CL 10 [A]
CL1_IN . . . . . CL10_IN	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.in rms.rmsI_cl10.out.in	Instantaneous value of current in phase LN on CL 1 [A] … Instantaneous value of current in phase LN on CL 10 [A]
CL1_PHI1 . . . . . CL10_PHI1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.phi1 rms.rmsI_cl10.out.phi1	Instantaneous value of angle in phase L1 on CL 1 [°] … Instantaneous value of angle in phase L1 on CL 10 [°]
CL1_PHI2 . . . . . CL10_PHI2	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.phi2 rms.rmsI_cl10.out.phi2	Instantaneous value of angle in phase L2 on CL 1 [°] … Instantaneous value of angle in phase L2 on CL 10 [°]
CL1_PHI3 . . . . . CL10_PHI3	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.phi3 rms.rmsI_cl10.out.phi3	Instantaneous value of angle in phase L3 on CL 1 [°] … Instantaneous value of angle in phase L3 on CL 10 [°]
CL1_P1 . . . . . CL10_P1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.p1 rms.rmsI_cl10.out.p1	Instantaneous value of power in phase L1 on CL 1 [W] … Instantaneous value of power in phase L1 on CL 10 [W]
CL1_P2 . . . . . CL10_P2	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.p2 rms.rmsI_cl10.out.p2	Instantaneous value of power in phase L2 on CL 1 [W] … Instantaneous value of power in phase L2 on CL 10 [W]
CL1_P3 . . . . . CL10_P3	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.p3 rms.rmsI_cl10.out.p3	Instantaneous value of power in phase L3 on CL 1 [W] … Instantaneous value of power in phase L3 on CL 10 [W]
CL1_P . . . . . CL10_P	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.p rms.rmsI_cl10.out.p	Instantaneous value of power of the system on CL 1 [W] … Instantaneous value of power of the system on CL 10 [W]
CL1_Q1 . . . . . CL10_Q1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.q1 rms.rmsI_cl10.out.q1	Instantaneous value of power in phase L1 on CL 1 [VAr] … Instantaneous value of power in phase L1 on CL 10 [VAr]
CL1_Q2 . . . . . CL10_Q2	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.q2 rms.rmsI_cl10.out.q2	Instantaneous value of power in phase L2 on CL 1 [VAr] … Instantaneous value of power in phase L2 on CL 10 [VAr]
CL1_Q3 . . . . . CL10_Q3	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.q3 rms.rmsI_cl10.out.q3	Instantaneous value of power in phase L3 on CL 1 [VAr] … Instantaneous value of power in phase L3 on CL 10 [VAr]
CL1_Q . . . . . CL10_Q	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.q rms.rmsI_cl10.out.q	Instantaneous value of power of the system on CL 1 [VAr] … Instantaneous value of power of the system on CL 10 [VAr]
CL1_Q1H1 . . . . . CL10_Q1H1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.q1h1 rms.rmsI_cl10.out.q1h1	Inst. value of power in phase L1 H1 on CL 1 [VAr] … Inst. value of power in phase L1 H1 on CL 10 [VAr]
CL1_Q2H1 . . . . . CL10_Q2H1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.q2h1 rms.rmsI_cl10.out.q2h1	Inst. value of power in phase L2 H1 on CL 1 [VAr] … Inst. value of power in phase L2 H1 on CL 10 [VAr]
CL1_Q3H1 . . . . . CL10_Q3H1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.q3h1 rms.rmsI_cl10.out.q3h1	Inst. value of power in phase L3 H1 on CL 1 [VAr] … Inst. value of power in phase L3 H1 on CL 10 [VAr]
CL1_QH1 . . . . . CL10_QH1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.qh1 rms.rmsI_cl10.out.qh1	Inst. value of power of the system H1 on CL 1 [VAr] … Inst. value of power of the system H1 on CL 10 [VAr]

CL1_S1 . . . . . CL10_S1	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.s1 rms.rmsI_cl10.out.s1	Instantaneous value of power in phase L1 on CL 1 [VA] … Instantaneous value of power in phase L1 on CL 10 [VA]
CL1_S2 . . . . . CL10_S2	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.s2 rms.rmsI_cl10.out.s2	Instantaneous value of power in phase L2 on CL 1 [VA] … Instantaneous value of power in phase L2 on CL 10 [VA]
CL1_S3 . . . . . CL10_S3	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.s3 rms.rmsI_cl10.out.s3	Instantaneous value of power in phase L3 on CL 1 [VA] … Instantaneous value of power in phase L3 on CL 10 [VA]
CL1_S . . . . . CL10_S	-	-	-	-	-	-	●	●	rms.rmsI_cl1.out.s rms.rmsI_cl10.out.s	Instantaneous value of power of the system on CL 1 [VA] … Instantaneous value of power of the system on CL 10 [VA]

5.7.1 Imbalance

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
Upos	-	-	-	-	-	-	●	●	rms.asymetryU.components.positive	Instantaneous value of the positive asymmetry component of the voltage
Uneg	-	-	-	-	-	-	●	●	rms.asymetryU.components.negative	Instantaneous value of the negative asymmetry component of the voltage
Uzero	-	-	-	-	-	-	●	●	rms.asymetryU.components.zero	Instantaneous value of the zero asymmetry component of the voltage
Uneg_pos	-	-	-	-	-	-	●	●	rms.asymetryU.ratio.neg_pos	Instantaneous value of the negative to positive asymmetry component ratio of the voltage
CL1_Ipos . . . . . CL10_Ipos	-	-	-	-	-	-	●	●	rms.asymetryI_cl1.components.positive rms.asymetryI_cl10.components.positive	Inst. value of the positive asymmetry component of the current on CL1 Inst. value of the positive asymmetry component of the current on CL10
CL1_Ineg . . . . . CL10_Ineg	-	-	-	-	-	-	●	●	rms.asymetryI_cl1.components.negative rms.asymetryI_cl10.components.negative	Inst. value of the negative asymmetry component of the current on CL1 Inst. value of the negative asymmetry component of the current on CL10
CL1_Izero . . . . . CL10_Izero	-	-	-	-	-	-	●	●	rms.asymetryI_cl1.components.zero rms.asymetryI_cl10.components.zero	Inst. value of the zero asymmetry component of the current on CL1 Inst. value of the zero asymmetry component of the current on CL10
CL1_Ineg_pos . . . . . CL10_Ineg_pos	-	-	-	-	-	-	●	●	rms.asymetryI_cl1.ratio.neg_pos rms.asymetryI_cl10.ratio.neg_pos	Inst. value of the negative to positive asymmetry component ratio of the current on CL1 Inst. value of the negative to positive asymmetry component ratio of the current on CL10

5.7.2 Mean values and minimum/maximum

5.7.2.1 Current

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
I1_CL1_MEAN I1_CL1_MIN I1_CL1_MAX ..... I1_CL10_MEAN I1_CL10_MIN I1_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_0 mean_cl.i_cl1.out.min_0 mean_cl.i_cl1.out.max_0 mean_cl.i_cl10.out.mean_0 mean_cl.i_cl10.out.min_0 mean_cl.i_cl10.out.max_0	Mean value of current on phase L1 of CL1 Min value of current on phase L1 of CL1 Max value of current on phase L1 of CL1 Mean value of current on phase L1 of CL10 Min value of current on phase L1 of CL10 Max value of current on phase L1 of CL10
I2_CL1_MEAN I2_CL1_MIN I2_CL1_MAX ..... I2_CL10_MEAN I2_CL10_MIN I2_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_1 mean_cl.i_cl1.out.min_1 mean_cl.i_cl1.out.max_1 mean_cl.i_cl10.out.mean_1 mean_cl.i_cl10.out.min_1 mean_cl.i_cl10.out.max_1	Mean value of current on phase L2 of CL1 Min value of current on phase L2 of CL1 Max value of current on phase L2 of CL1 Mean value of current on phase L2 of CL10 Min value of current on phase L2 of CL10 Max value of current on phase L2 of CL10
I3_CL1_MEAN I3_CL1_MIN I3_CL1_MAX ..... I3_CL10_MEAN I3_CL10_MIN I3_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_2 mean_cl.i_cl1.out.min_2 mean_cl.i_cl1.out.max_2 mean_cl.i_cl10.out.mean_2 mean_cl.i_cl10.out.min_2 mean_cl.i_cl10.out.max_2	Mean value of current on phase L3 of CL1 Min value of current on phase L3 of CL1 Max value of current on phase L3 of CL1 Mean value of current on phase L3 of CL10 Min value of current on phase L3 of CL10 Max value of current on phase L3 of CL10
IN_CL1_MEAN IN_CL1_MIN IN_CL1_MAX ..... IN_CL10_MEAN IN_CL10_MIN IN_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_3 mean_cl.i_cl1.out.min_3 mean_cl.i_cl1.out.max_3 mean_cl.i_cl10.out.mean_3 mean_cl.i_cl10.out.min_3 mean_cl.i_cl10.out.max_3	Mean value of current on phase LN of CL1 Min value of current on phase LN of CL1 Max value of current on phase LN of CL1 Mean value of current on phase LN of CL10 Min value of current on phase LN of CL10 Max value of current on phase LN of CL10

5.7.2.2 THDI

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
THDI1_CL1_MEAN THDI1_CL1_MIN THDI1_CL1_MAX ..... THDI1_CL10_MEAN THDI1_CL10_MIN THDI1_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_4 mean_cl.i_cl1.out.min_4 mean_cl.i_cl1.out.max_4 mean_cl.i_cl10.out.mean_4 mean_cl.i_cl10.out.min_4 mean_cl.i_cl10.out.max_4	Mean value of THD I on phase L1 of CL1 Min value of THD I on phase L1 of CL1 Max value of THD I on phase L1 of CL1 Mean value of THD I on phase L1 of CL10 Min value of THD I on phase L1 of CL10 Max value of THD I on phase L1 of CL10
THDI2_CL1_MEAN THDI2_CL1_MIN THDI2_CL1_MAX ..... THDI2_CL10_MEAN THDI2_CL10_MIN THDI2_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_5 mean_cl.i_cl1.out.min_5 mean_cl.i_cl1.out.max_5 mean_cl.i_cl10.out.mean_5 mean_cl.i_cl10.out.min_5 mean_cl.i_cl10.out.max_5	Mean value of THD I on phase L2 of CL1 Min value of THD I on phase L2 of CL1 Max value of THD I on phase L2 of CL1 Mean value of THD I on phase L2 of CL10 Min value of THD I on phase L2 of CL10 Max value of THD I on phase L2 of CL10
THDI3_CL1_MEAN THDI3_CL1_MIN THDI3_CL1_MAX ..... THDI3_CL10_MEAN THDI3_CL10_MIN THDI3_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_6 mean_cl.i_cl1.out.min_6 mean_cl.i_cl1.out.max_6 mean_cl.i_cl10.out.mean_6 mean_cl.i_cl10.out.min_6 mean_cl.i_cl10.out.max_6	Mean value of THD I on phase L3 of CL1 Min value of THD I on phase L3 of CL1 Max value of THD I on phase L3 of CL1 Mean value of THD I on phase L3 of CL10 Min value of THD I on phase L3 of CL10 Max value of THD I on phase L3 of CL10
THDIN_CL1_MEAN THDIN_CL1_MIN THDIN_CL1_MAX ..... THDIN_CL10_MEAN THDIN_CL10_MIN THDIN_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_7 mean_cl.i_cl1.out.min_7 mean_cl.i_cl1.out.max_7 mean_cl.i_cl10.out.mean_7 mean_cl.i_cl10.out.min_7 mean_cl.i_cl10.out.max_7	Mean value of THD I on phase LN of CL1 Min value of THD I on phase LN of CL1 Max value of THD I on phase LN of CL1 Mean value of THD I on phase LN of CL10 Min value of THD I on phase LN of CL10 Max value of THD I on phase LN of CL10

5.7.2.3 TDDI

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
TDDI1_CL1_MEAN TDDI1_CL1_MIN TDDI1_CL1_MAX ..... TDDI1_CL10_MEAN TDDI1_CL10_MIN TDDI1_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_8 mean_cl.i_cl1.out.min_8 mean_cl.i_cl1.out.max_8 mean_cl.i_cl10.out.mean_8 mean_cl.i_cl10.out.min_8 mean_cl.i_cl10.out.max_8	Mean value of TDD I on phase L1 of CL1 Min value of TDD I on phase L1 of CL1 Max value of TDD I on phase L1 of CL1 Mean value of TDD I on phase L1 of CL10 Min value of TDD I on phase L1 of CL10 Max value of TDD I on phase L1 of CL10
TDDI2_CL1_MEAN TDDI2_CL1_MIN TDDI2_CL1_MAX ..... TDDI2_CL10_MEAN TDDI2_CL10_MIN TDDI2_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_9 mean_cl.i_cl1.out.min_9 mean_cl.i_cl1.out.max_9 mean_cl.i_cl10.out.mean_9 mean_cl.i_cl10.out.min_9 mean_cl.i_cl10.out.max_9	Mean value of TDD I on phase L2 of CL1 Min value of TDD I on phase L2 of CL1 Max value of TDD I on phase L2 of CL1 Mean value of TDD I on phase L2 of CL10 Min value of TDD I on phase L2 of CL10 Max value of TDD I on phase L2 of CL10
TDDI3_CL1_MEAN TDDI3_CL1_MIN TDDI3_CL1_MAX ..... TDDI3_CL10_MEAN TDDI3_CL10_MIN TDDI3_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_10 mean_cl.i_cl1.out.min_10 mean_cl.i_cl1.out.max_10 mean_cl.i_cl10.out.mean_10 mean_cl.i_cl10.out.min_10 mean_cl.i_cl10.out.max_10	Mean value of TDD I on phase L3 of CL1 Min value of TDD I on phase L3 of CL1 Max value of TDD I on phase L3 of CL1 Mean value of TDD I on phase L3 of CL10 Min value of TDD I on phase L3 of CL10 Max value of TDD I on phase L3 of CL10
TDDIN_CL1_MEAN TDDIN_CL1_MIN TDDIN_CL1_MAX ..... TDDIN_CL10_MEAN TDDIN_CL10_MIN TDDIN_CL10_MAX	-	-	-	-	-	-	●	●	mean_cl.i_cl1.out.mean_11 mean_cl.i_cl1.out.min_11 mean_cl.i_cl1.out.max_11 mean_cl.i_cl10.out.mean_11 mean_cl.i_cl10.out.min_11 mean_cl.i_cl10.out.max_11	Mean value of TDD I on phase LN of CL1 Min value of TDD I on phase LN of CL1 Max value of TDD I on phase LN of CL1 Mean value of TDD I on phase LN of CL10 Min value of TDD I on phase LN of CL10 Max value of TDD I on phase LN of CL10

5.7.2.4 Active power

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
P1_CL1_MEAN P1_CL1_MIN P1_CL1_MAX ..... P1_CL10_MEAN P1_CL10_MIN P1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_1 mean_energy.power_cl1.out.min_1 mean_energy.power_cl1.out.max_1 mean_energy.power_cl10.out.mean_1 mean_energy.power_cl10.out.min_1 mean_energy.power_cl10.out.max_1	Mean value of P on phase L1 of CL1 Min value of P on phase L1 of CL1 Max value of P on phase L1 of CL1 Mean value of P on phase L1 of CL10 Min value of P on phase L1 of CL10 Max value of P on phase L1 of CL10
P2_CL1_MEAN P2_CL1_MIN P2_CL1_MAX ..... P2_CL10_MEAN P2_CL10_MIN P2_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_2 mean_energy.power_cl1.out.min_2 mean_energy.power_cl1.out.max_2 mean_energy.power_cl10.out.mean_2 mean_energy.power_cl10.out.min_2 mean_energy.power_cl10.out.max_2	Mean value of P on phase L2 of CL1 Min value of P on phase L2 of CL1 Max value of P on phase L2 of CL1 Mean value of P on phase L2 of CL10 Min value of P on phase L2 of CL10 Max value of P on phase L2 of CL10
P3_CL1_MEAN P3_CL1_MIN P3_CL1_MAX ..... P3_CL10_MEAN P3_CL10_MIN P3_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_3 mean_energy.power_cl1.out.min_3 mean_energy.power_cl1.out.max_3 mean_energy.power_cl10.out.mean_3 mean_energy.power_cl10.out.min_3 mean_energy.power_cl10.out.max_3	Mean value of P on phase L3 of CL1 Min value of P on phase L3 of CL1 Max value of P on phase L3 of CL1 Mean value of P on phase L3 of CL10 Min value of P on phase L3 of CL10 Max value of P on phase L3 of CL10
P_CL1_MEAN P_CL1_MIN P_CL1_MAX ..... P_CL10_MEAN P_CL10_MIN P_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_0 mean_energy.power_cl1.out.min_0 mean_energy.power_cl1.out.max_0 mean_energy.power_cl10.out.mean_0 mean_energy.power_cl10.out.min_0 mean_energy.power_cl10.out.max_0	Mean value of P of system of CL1 Min value of P of system of CL1 Max value of P of system of CL1 Mean value of P of system of CL10 Min value of P of system of CL10 Max value of P of system of CL10

5.7.2.5 Reactive power

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
Q1_CL1_MEAN Q1_CL1_MIN Q1_CL1_MAX . . . . . Q1_CL10_MEAN Q1_CL10_MIN Q1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_5 mean_energy.power_cl1.out.min_5 mean_energy.power_cl1.out.max_5 mean_energy.power_cl10.out.mean_5 mean_energy.power_cl10.out.min_5 mean_energy.power_cl10.out.max_5	Mean value of Q on phase L1 of CL1 Min value of Q on phase L1 of CL1 Max value of Q on phase L1 of CL1 Mean value of Q on phase L1 of CL10 Min value of Q on phase L1 of CL10 Max value of Q on phase L1 of CL10
Q2_CL1_MEAN Q2_CL1_MIN Q2_CL1_MAX . . . . . Q2_CL10_MEAN Q2_CL10_MIN Q2_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_6 mean_energy.power_cl1.out.min_6 mean_energy.power_cl1.out.max_6 mean_energy.power_cl10.out.mean_6 mean_energy.power_cl10.out.min_6 mean_energy.power_cl10.out.max_6	Mean value of Q on phase L2 of CL1 Min value of Q on phase L2 of CL1 Max value of Q on phase L2 of CL1 Mean value of Q on phase L2 of CL10 Min value of Q on phase L2 of CL10 Max value of Q on phase L2 of CL10
Q3_CL1_MEAN Q3_CL1_MIN Q3_CL1_MAX . . . . . Q3_CL10_MEAN Q3_CL10_MIN Q3_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_7 mean_energy.power_cl1.out.min_7 mean_energy.power_cl1.out.max_7 mean_energy.power_cl10.out.mean_7 mean_energy.power_cl10.out.min_7 mean_energy.power_cl10.out.max_7	Mean value of Q on phase L3 of CL1 Min value of Q on phase L3 of CL1 Max value of Q on phase L3 of CL1 Mean value of Q on phase L3 of CL10 Min value of Q on phase L3 of CL10 Max value of Q on phase L3 of CL10
Q_CL1_MEAN Q_CL1_MIN Q_CL1_MAX . . . . . Q_CL10_MEAN Q_CL10_MIN Q_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_4 mean_energy.power_cl1.out.min_4 mean_energy.power_cl1.out.max_4 mean_energy.power_cl10.out.mean_4 mean_energy.power_cl10.out.min_4 mean_energy.power_cl10.out.max_4	Mean value of Q of system of CL1 Min value of Q of system of CL1 Max value of Q of system of CL1 Mean value of Q of system of CL10 Min value of Q of system of CL10 Max value of Q of system of CL10

5.7.2.6 Reactive power of H1

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
Q1H1_CL1_MEAN Q1H1_CL1_MIN Q1H1_CL1_MAX . . . . . Q1H1_CL10_MEAN Q1H1_CL10_MIN Q1H1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_9 mean_energy.power_cl1.out.min_9 mean_energy.power_cl1.out.max_9 mean_energy.power_cl10.out.mean_9 mean_energy.power_cl10.out.min_9 mean_energy.power_cl10.out.max_9	Mean value of Q of H1 on phase L1 of CL1 Min value of Q of H1 on phase L1 of CL1 Max value of Q of H1 on phase L1 of CL1 Mean value of Q of H1 on phase L1 of CL10 Min value of Q of H1 on phase L1 of CL10 Max value of Q of H1 on phase L1 of CL10
Q2H1_CL1_MEAN Q2H1_CL1_MIN Q2H1_CL1_MAX . . . . . Q2H1_CL10_MEAN Q2H1_CL10_MIN Q2H1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_10 mean_energy.power_cl1.out.min_10 mean_energy.power_cl1.out.max_10 mean_energy.power_cl10.out.mean_10 mean_energy.power_cl10.out.min_10 mean_energy.power_cl10.out.max_10	Mean value of Q of H1 on phase L2 of CL1 Min value of Q of H1 on phase L2 of CL1 Max value of Q of H1 on phase L2 of CL1 Mean value of Q of H1 on phase L2 of CL10 Min value of Q of H1 on phase L2 of CL10 Max value of Q of H1 on phase L2 of CL10
Q3H1_CL1_MEAN Q3H1_CL1_MIN Q3H1_CL1_MAX . . . . . Q3H1_CL10_MEAN Q3H1_CL10_MIN Q3H1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_11 mean_energy.power_cl1.out.min_11 mean_energy.power_cl1.out.max_11 mean_energy.power_cl10.out.mean_11 mean_energy.power_cl10.out.min_11 mean_energy.power_cl10.out.max_11	Mean value of Q of H1 on phase L3 of CL1 Min value of Q of H1 on phase L3 of CL1 Max value of Q of H1 on phase L3 of CL1 Mean value of Q of H1 on phase L3 of CL10 Min value of Q of H1 on phase L3 of CL10 Max value of Q of H1 on phase L3 of CL10
QH1_CL1_MEAN QH1_CL1_MIN QH1_CL1_MAX . . . . . QH1_CL10_MEAN QH1_CL10_MIN QH1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_8 mean_energy.power_cl1.out.min_8 mean_energy.power_cl1.out.max_8 mean_energy.power_cl10.out.mean_8 mean_energy.power_cl10.out.min_8 mean_energy.power_cl10.out.max_8	Mean value of Q of H1 of system of CL1 Min value of Q of H1 of system of CL1 Max value of Q of H1 of system of CL1 Mean value of Q of H1 of system of CL10 Min value of Q of H1 of system of CL10 Max value of Q of H1 of system of CL10

5.7.2.7 Apparent power

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
S1_CL1_MEAN S1_CL1_MIN S1_CL1_MAX ..... S1_CL10_MEAN S1_CL10_MIN S1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_13 mean_energy.power_cl1.out.min_13 mean_energy.power_cl1.out.max_13 mean_energy.power_cl10.out.mean_13 mean_energy.power_cl10.out.min_13 mean_energy.power_cl10.out.max_13	Mean value of S on phase L1 of CL1 Min value of S on phase L1 of CL1 Max value of S on phase L1 of CL1 Mean value of S on phase L1 of CL10 Min value of S on phase L1 of CL10 Max value of S on phase L1 of CL10
S2_CL1_MEAN S2_CL1_MIN S2_CL1_MAX ..... S2_CL10_MEAN S2_CL10_MIN S2_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_14 mean_energy.power_cl1.out.min_14 mean_energy.power_cl1.out.max_14 mean_energy.power_cl10.out.mean_14 mean_energy.power_cl10.out.min_14 mean_energy.power_cl10.out.max_14	Mean value of S on phase L2 of CL1 Min value of S on phase L2 of CL1 Max value of S on phase L2 of CL1 Mean value of S on phase L2 of CL10 Min value of S on phase L2 of CL10 Max value of S on phase L2 of CL10
S3_CL1_MEAN S3_CL1_MIN S3_CL1_MAX ..... S3_CL10_MEAN S3_CL10_MIN S3_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_15 mean_energy.power_cl1.out.min_15 mean_energy.power_cl1.out.max_15 mean_energy.power_cl10.out.mean_15 mean_energy.power_cl10.out.min_15 mean_energy.power_cl10.out.max_15	Mean value of S on phase L3 of CL1 Min value of S on phase L3 of CL1 Max value of S on phase L3 of CL1 Mean value of S on phase L3 of CL10 Min value of S on phase L3 of CL10 Max value of S on phase L3 of CL10
S_CL1_MEAN S_CL1_MIN S_CL1_MAX ..... S_CL10_MEAN S_CL10_MIN S_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_12 mean_energy.power_cl1.out.min_12 mean_energy.power_cl1.out.max_12 mean_energy.power_cl10.out.mean_12 mean_energy.power_cl10.out.min_12 mean_energy.power_cl10.out.max_12	Mean value of S of system of CL1 Min value of S of system of CL1 Max value of S of system of CL1 Mean value of S of system of CL10 Min value of S of system of CL10 Max value of S of system of CL10

5.7.2.8 cos(φ)

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
CPHI1_CL1_MEAN CPHI1_CL1_MIN CPHI1_CL1_MAX ..... CPHI1_CL10_MEAN CPHI1_CL10_MIN CPHI1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_17 mean_energy.power_cl1.out.min_17 mean_energy.power_cl1.out.max_17 mean_energy.power_cl10.out.mean_17 mean_energy.power_cl10.out.min_17 mean_energy.power_cl10.out.max_17	Mean value of cos(φ) on phase L1 of CL1 Min value of cos(φ) on phase L1 of CL1 Max value of cos(φ) on phase L1 of CL1 Mean value of cos(φ) on phase L1 of CL10 Min value of cos(φ) on phase L1 of CL10 Max value of cos(φ) on phase L1 of CL10
CPHI 2_CL1_MEAN CPHI 2_CL1_MIN CPHI 2_CL1_MAX ..... CPHI 2_CL10_MEAN CPHI 2_CL10_MIN CPHI 2_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_18 mean_energy.power_cl1.out.min_18 mean_energy.power_cl1.out.max_18 mean_energy.power_cl10.out.mean_18 mean_energy.power_cl10.out.min_18 mean_energy.power_cl10.out.max_18	Mean value of cos(φ) on phase L2 of CL1 Min value of cos(φ) on phase L2 of CL1 Max value of cos(φ) on phase L2 of CL1 Mean value of cos(φ) on phase L2 of CL10 Min value of cos(φ) on phase L2 of CL10 Max value of cos(φ) on phase L2 of CL10
CPHI 3_CL1_MEAN CPHI 3_CL1_MIN CPHI 3_CL1_MAX ..... CPHI 3_CL10_MEAN CPHI 3_CL10_MIN CPHI 3_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_19 mean_energy.power_cl1.out.min_19 mean_energy.power_cl1.out.max_19 mean_energy.power_cl10.out.mean_19 mean_energy.power_cl10.out.min_19 mean_energy.power_cl10.out.max_19	Mean value of cos(φ) on phase L3 of CL1 Min value of cos(φ) on phase L3 of CL1 Max value of cos(φ) on phase L3 of CL1 Mean value of cos(φ) on phase L3 of CL10 Min value of cos(φ) on phase L3 of CL10 Max value of cos(φ) on phase L3 of CL10
CPHI _CL1_MEAN CPHI _CL1_MIN CPHI _CL1_MAX ..... CPHI _CL10_MEAN CPHI _CL10_MIN CPHI _CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_16 mean_energy.power_cl1.out.min_16 mean_energy.power_cl1.out.max_16 mean_energy.power_cl10.out.mean_16 mean_energy.power_cl10.out.min_16 mean_energy.power_cl10.out.max_16	Mean value of cos(φ) of system of CL1 Min value of cos(φ) of system of CL1 Max value of cos(φ) of system of CL1 Mean value of cos(φ) of system of CL10 Min value of cos(φ) of system of CL10 Max value of cos(φ) of system of CL10

5.7.2.9 Power factor

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
PF1_CL1_MEAN PF1_CL1_MIN PF1_CL1_MAX . . . . . PF1_CL10_MEAN PF1_CL10_MIN PF1_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_21 mean_energy.power_cl1.out.min_21 mean_energy.power_cl1.out.max_21 mean_energy.power_cl10.out.mean_21 mean_energy.power_cl10.out.min_21 mean_energy.power_cl10.out.max_21	Mean value of PF on phase L1 of CL1 Min value of PF on phase L1 of CL1 Max value of PF on phase L1 of CL1 Mean value of PF on phase L1 of CL10 Min value of PF on phase L1 of CL10 Max value of PF on phase L1 of CL10
PF2_CL1_MEAN PF2_CL1_MIN PF2_CL1_MAX . . . . . PF2_CL10_MEAN PF2_CL10_MIN PF2_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_22 mean_energy.power_cl1.out.min_22 mean_energy.power_cl1.out.max_22 mean_energy.power_cl10.out.mean_22 mean_energy.power_cl10.out.min_22 mean_energy.power_cl10.out.max_22	Mean value of PF on phase L2 of CL1 Min value of PF on phase L2 of CL1 Max value of PF on phase L2 of CL1 Mean value of PF on phase L2 of CL10 Min value of PF on phase L2 of CL10 Max value of PF on phase L2 of CL10
PF3_CL1_MEAN PF3_CL1_MIN PF3_CL1_MAX . . . . . PF3_CL10_MEAN PF3_CL10_MIN PF3_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_23 mean_energy.power_cl1.out.min_23 mean_energy.power_cl1.out.max_23 mean_energy.power_cl10.out.mean_23 mean_energy.power_cl10.out.min_23 mean_energy.power_cl10.out.max_23	Mean value of PF on phase L3 of CL1 Min value of PF on phase L3 of CL1 Max value of PF on phase L3 of CL1 Mean value of PF on phase L3 of CL10 Min value of PF on phase L3 of CL10 Max value of PF on phase L3 of CL10
PF_CL1_MEAN PF_CL1_MIN PF_CL1_MAX . . . . . PF_CL10_MEAN PF_CL10_MIN PF_CL10_MAX	-	-	-	-	-	-	●	●	mean_energy.power_cl1.out.mean_20 mean_energy.power_cl1.out.min_20 mean_energy.power_cl1.out.max_20 mean_energy.power_cl10.out.mean_20 mean_energy.power_cl10.out.min_20 mean_energy.power_cl10.out.max_20	Mean value of PF of system of CL1 Min value of PF of system of CL1 Max value of PF of system of CL1 Mean value of PF of system of CL10 Min value of PF of system of CL10 Max value of PF of system of CL10

5.8 PME specific values

5.8.1 Current and power values

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
PME1_I1 . . . . . PME100_I1	●	●	●	●	●	●	●	●	pme.pme_system1.out.i1 pme.pme_system100.out.i1	Instantaneous value of current in phase L1 on PME 1 [A] … Instantaneous value of current in phase L1 on PME 100 [A]
PME1_I2 . . . . . PME100_I2	-	●	●	●	●	●	●	●	pme.pme_system1.out.i2 pme.pme_system100.out.i2	Instantaneous value of current in phase L2 on PME 1 [A] … Instantaneous value of current in phase L2 on PME 100 [A]
PME1_I3 . . . . . PME100_I3	-	-	●	●	●	●	●	●	pme.pme_system1.out.i3 pme.pme_system100.out.i3	Instantaneous value of current in phase L3 on PME 1 [A] … Instantaneous value of current in phase L3 on PME 100 [A]
PME1_IN . . . . . PME 100_IN	-	●	-	-	-	-	●	●	pme.pme_system1.out.in pme.pme_system100.out.in	Instantaneous value of current in phase LN on PME 1 [A] … Instantaneous value of current in phase LN on PME 100 [A]
PME1_PHI1 . . . . . PME100_PHI1	●	●	●	●	●	●	●	●	pme.pme_system1.out.phi1 pme.pme_system100.out.phi1	Instantaneous value of angle in phase L1 on PME 1 [°] … Instantaneous value of angle in phase L1 on PME 100 [°]
PME 1_PHI2 . . . . . PME 100_PHI2	-	●	●	●	●	●	●	●	pme.pme_system1.out.phi2 pme.pme_system100.out.phi2	Instantaneous value of angle in phase L2 on PME 1 [°] … Instantaneous value of angle in phase L2 on PME 100 [°]
PME 1_PHI3 . . . . . PME 100_PHI3	-	-	●	●	●	●	●	●	pme.pme_system1.out.phi3 pme.pme_system100.out.phi3	Instantaneous value of angle in phase L3 on PME 1 [°] … Instantaneous value of angle in phase L3 on PME 100 [°]
PME1_THD1 . . . . . PME100_THD1	●	●	●	●	●	●	●	●	pme.pme_system1.out.thd1 pme.pme_system100.out.thd1	Instantaneous value of THDI in phase L1 on PME 1 [%] … Instantaneous value of THDI in phase L1 on PME 100 [%]
PME1_THD2 . . . . . PME100_THD2	-	●	●	●	●	●	●	●	pme.pme_system1.out.thd2 pme.pme_system100.out.thd2	Instantaneous value of THDI in phase L2 on PME 1 [%] … Instantaneous value of THDI in phase L2 on PME 100 [%]
PME1_THD3 . . . . . PME100_THD3	-	-	●	●	●	●	●	●	pme.pme_system1.out.thd3 pme.pme_system100.out.thd3	Instantaneous value of THDI in phase L3 on PME 1 [%] … Instantaneous value of THDI in phase L3 on PME 100 [%]
PME1_THDN . . . . . PME100_THDN	-	●	-	-	-	-	●	●	pme.pme_system1.out.thdn pme.pme_system100.out.thdn	Instantaneous value of THDI of the system on PME 1 [%] … Instantaneous value of THDI of the system on PME 100 [%]

PME1_TDD1 ..... PME100_TDD1	●	●	●	●	●	●	●	●	pme.pme_system1.out.tdd1 pme.pme_system100.out.tdd1	Instantaneous value of TDDI in phase L1 on PME 1 [%] … Instantaneous value of TDDI in phase L1 on PME 100 [%]
PME1_TDD2 ..... PME100_TDD2	-	●	●	●	●	●	●	●	pme.pme_system1.out.tdd2 pme.pme_system100.out.tdd2	Instantaneous value of TDDI in phase L2 on PME 1 [%] … Instantaneous value of TDDI in phase L2 on PME 100 [%]
PME1_TDD3 ..... PME100_TDD3	-	-	●	●	●	●	●	●	pme.pme_system1.out.tdd3 pme.pme_system100.out.tdd3	Instantaneous value of TDDI in phase L3 on PME 1 [%] … Instantaneous value of TDDI in phase L3 on PME 100 [%]
PME1_TDDN ..... PME100_TDDN	-	●	-	-	-	-	●	●	pme.pme_system1.out.tddn pme.pme_system100.out.tddn	Instantaneous value of TDDI of the system on PME 1 [%] … Instantaneous value of TDDI of the system on PME 100 [%]
PME1_P1 ..... PME100_P1	●	●	●	●	●	●	●	●	pme.pme_system1.out.p1 pme.pme_system100.out.p1	Instantaneous value of active power in phase L1 on PME 1 [W] … Instantaneous value of active power in phase L1 on PME 100 [W]
PME1_P2 ..... PME100_P2	-	●	●	●	●	●	●	●	pme.pme_system1.out.p2 pme.pme_system100.out.p2	Instantaneous value of active power in phase L2 on PME 1 [W] … Instantaneous value of active power in phase L2 on PME 100 [W]
PME1_P3 ..... PME100_P3	-	-	●	●	●	●	●	●	pme.pme_system1.out.p3 pme.pme_system100.out.p3	Instantaneous value of active power in phase L3 on PME 1 [W] … Instantaneous value of active power in phase L3 on PME 100 [W]
PME1_P ..... PME100_P	-	●	-	-	-	-	●	●	pme.pme_system1.out.p pme.pme_system100.out.p	Instantaneous value of active power of the system on PME 1 [W] … Instantaneous value of active power of the system on PME 100 [W]
PME1_Q1 ..... PME100_Q1	●	●	●	●	●	●	●	●	pme.pme_system1.out.q1 pme.pme_system100.out.q1	Instantaneous value of reactive power in phase L1 on PME 1 [VAr] … Instantaneous value of reactive power in phase L1 on PME 100 [VAr]
PME1_Q2 ..... PME100_Q2	-	●	●	●	●	●	●	●	pme.pme_system1.out.q2 pme.pme_system100.out.q2	Instantaneous value of reactive power in phase L2 on PME 1 [VAr] … Instantaneous value of reactive power in phase L2 on PME 100 [VAr]
PME1_Q3 ..... PME100_Q3	-	-	●	●	●	●	●	●	pme.pme_system1.out.q3 pme.pme_system100.out.q3	Instantaneous value of reactive power in phase L3 on PME 1 [VAr] … Instantaneous value of reactive power in phase L3 on PME 100 [VAr]
PME1_Q ..... PME100_Q	-	●	-	-	-	-	●	●	pme.pme_system1.out.q pme.pme_system100.out.q	Instantaneous value of reactive power of the system on PME 1 [VAr] … Instantaneous value of reactive power of the system on PME 100 [VAr]

PME1_S1 . . . . . PME100_S1	●	●	●	●	●	●	●	●	pme.pme_system1.out.s1 pme.pme_system100.out.s1	Instantaneous value of apparent power in phase L1 on PME 1 [VA] … Instantaneous value of apparent power in phase L1 on PME 100 [VA]
PME1_S2 . . . . . PME100_S2	-	●	●	●	●	●	●	●	pme.pme_system1.out.s2 pme.pme_system100.out.s2	Instantaneous value of apparent power in phase L2 on PME 1 [VA] … Instantaneous value of apparent power in phase L2 on PME 100 [VA]
PME1_S3 . . . . . PME100_S3	-	-	●	●	●	●	●	●	pme.pme_system1.out.s3 pme.pme_system100.out.s3	Instantaneous value of apparent power in phase L3 on PME 1 [VA] … Instantaneous value of apparent power in phase L3 on PME 100 [VA]
PME1_S . . . . . PME100_S	-	●	-	-	-	-	●	●	pme.pme_system1.out.s pme.pme_system100.out.s	Instantaneous value of apparent power of the system on PME 1 [VA] … Instantaneous value of apparent power of the system on PME 100 [VA]
PME1_PF1 . . . . . PME100_PF1	●	●	●	●	●	●	●	●	pme.pme_system1.out.pf1 pme.pme_system100.out.pf1	Instantaneous value of power factor in phase L1 on PME 1 … Instantaneous value of power factor in phase L1 on PME 100 [VA]
PME1_PF2 . . . . . PME100_PF2	-	●	●	●	●	●	●	●	pme.pme_system1.out.pf2 pme.pme_system100.out.pf2	Instantaneous value of power factor in phase L2 on PME 1 … Instantaneous value of power factor in phase L2 on PME 100
PME1_PF3 . . . . . PME100_PF3	-	-	●	●	●	●	●	●	pme.pme_system1.out.pf3 pme.pme_system100.out.pf3	Instantaneous value of power factor in phase L3 on PME 1 … Instantaneous value of power factor in phase L3 on PME 100
PME1_PF . . . . . PME100_PF	-	●	-	-	-	-	●	●	pme.pme_system1.out.pf pme.pme_system100.out.pf	Instantaneous value of power factor of the system on PME 1 … Instantaneous value of power factor of the system on PME 100

5.8.2 Temperature

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
PME1_Temp . . . . . PME100_Temp	●	●	●	●	●	●	●	●	pme.pme1.out.temp pme.pme100.out.temp	Instantaneous value of temperature of PME 1 [°C] … Instantaneous value of temperature of PME 100 [°C]

Note: The temperature is measured per module. Therefore Rogowski type sensors only provide one temperature value, which is stored in its last slot

5.8.3 Mean values and minimum/maximum

5.8.3.1 Current

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
I1_PME1_MEAN	•	•	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_0	Mean value of current on phase L1 of PME1
I1_PME1_MIN									pme_mean.pme_mean1.out.min_0	Min value of current on phase L1 of PME1
I1_PME1_MAX									pme_mean.pme_mean1.out.max_0	Max value of current on phase L1 of PME1
. . . . .										
I1_PME100_MEAN									pme_mean.pme_mean100.out.mean_0	Mean value of current on phase L1 of PME100
I1_PME100_MIN									pme_mean.pme_mean100.out.min_0	Min value of current on phase L1 of PME100
I1_PME100_MAX									pme_mean.pme_mean100.out.max_0	Max value of current on phase L1 of PME100
I2_PME1_MEAN	-	•	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_1	Mean value of current on phase L2 of PME1
I2_PME1_MIN									pme_mean.pme_mean1.out.min_1	Min value of current on phase L2 of PME1
I2_PME1_MAX									pme_mean.pme_mean1.out.max_1	Max value of current on phase L2 of PME1
. . . . .										
I2_PME100_MEAN									pme_mean.pme_mean100.out.mean_1	Mean value of current on phase L2 of PME100
I2_PME100_MIN									pme_mean.pme_mean100.out.min_1	Min value of current on phase L2 of PME100
I2_PME100_MAX									pme_mean.pme_mean100.out.max_1	Max value of current on phase L2 of PME100
I3_PME1_MEAN	-	-	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_2	Mean value of current on phase L3 of PME1
I3_PME1_MIN									pme_mean.pme_mean1.out.min_2	Min value of current on phase L3 of PME1
I3_PME1_MAX									pme_mean.pme_mean1.out.max_2	Max value of current on phase L3 of PME1
. . . . .										
I3_PME100_MEAN									pme_mean.pme_mean100.out.mean_2	Mean value of current on phase L3 of PME100
I3_PME100_MIN									pme_mean.pme_mean100.out.min_2	Min value of current on phase L3 of PME100
I3_PME100_MAX									pme_mean.pme_mean100.out.max_2	Max value of current on phase L3 of PME100
IN_PME1_MEAN	-	•	-	-	-	-	•	•	pme_mean.pme_mean1.out.mean_3	Mean value of current on phase LN of PME1
IN_PME1_MIN									pme_mean.pme_mean1.out.min_3	Min value of current on phase LN of PME1
IN_PME1_MAX									pme_mean.pme_mean1.out.max_3	Max value of current on phase LN of PME1
. . . . .										
IN_PME100_MEAN									pme_mean.pme_mean100.out.mean_3	Mean value of current on phase LN of PME100
IN_PME100_MIN									pme_mean.pme_mean100.out.min_3	Min value of current on phase LN of PME100
IN_PME100_MAX									pme_mean.pme_mean100.out.max_3	Max value of current on phase LN of PME100

5.8.3.2 THDI

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
THDI1_PME1_MEAN	•	•	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_4	Mean value of THDI on phase L1 of PME1
THDI1_PME1_MIN									pme_mean.pme_mean1.out.min_4	Min value of THDI on phase L1 of PME1
THDI1_PME1_MAX									pme_mean.pme_mean1.out.max_4	Max value of THDI on phase L1 of PME1
. . . . .										
THDI1_PME100_MEAN									pme_mean.pme_mean100.out.mean_4	Mean value of THDI on phase L1 of PME100
THDI1_PME100_MIN									pme_mean.pme_mean100.out.min_4	Min value of THDI on phase L1 of PME100
THDI1_PME100_MAX									pme_mean.pme_mean100.out.max_4	Max value of THDI on phase L1 of PME100
THDI2_PME1_MEAN	-	•	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_5	Mean value of THDI on phase L2 of PME1
THDI2_PME1_MIN									pme_mean.pme_mean1.out.min_5	Min value of THDI on phase L2 of PME1
THDI2_PME1_MAX									pme_mean.pme_mean1.out.max_5	Max value of THDI on phase L2 of PME1
. . . . .										
THDI2_PME100_MEAN									pme_mean.pme_mean100.out.mean_5	Mean value of THDI on phase L2 of PME100
THDI2_PME100_MIN									pme_mean.pme_mean100.out.min_5	Min value of THDI on phase L2 of PME100
THDI2_PME100_MAX									pme_mean.pme_mean100.out.max_5	Max value of THDI on phase L2 of PME100
THDI3_PME1_MEAN	-	-	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_6	Mean value of THDI on phase L3 of PME1
THDI3_PME1_MIN									pme_mean.pme_mean1.out.min_6	Min value of THDI on phase L3 of PME1
THDI3_PME1_MAX									pme_mean.pme_mean1.out.max_6	Max value of THDI on phase L3 of PME1
. . . . .										
THDI3_PME100_MEAN									pme_mean.pme_mean100.out.mean_6	Mean value of THDI on phase L3 of PME100
THDI3_PME100_MIN									pme_mean.pme_mean100.out.min_6	Min value of THDI on phase L3 of PME100
THDI3_PME100_MAX									pme_mean.pme_mean100.out.max_6	Max value of THDI on phase L3 of PME100
THDIN_PME1_MEAN	-	•	-	-	-	-	•	•	pme_mean.pme_mean1.out.mean_7	Mean value of THDI on phase LN of PME1
THDIN_PME1_MIN									pme_mean.pme_mean1.out.min_7	Min value of THDI on phase LN of PME1
THDIN_PME1_MAX									pme_mean.pme_mean1.out.max_7	Max value of THDI on phase LN of PME1
. . . . .										
THDIN_PME100_MEAN									pme_mean.pme_mean100.out.mean_7	Mean value of THDI on phase LN of PME100
THDIN_PME100_MIN									pme_mean.pme_mean100.out.min_7	Min value of THDI on phase LN of PME100
THDIN_PME100_MAX									pme_mean.pme_mean100.out.max_7	Max value of THDI on phase LN of PME100

5.8.3.3 TDDI

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
TDDI1_PME1_MEAN TDDI1_PME1_MIN TDDI1_PME1_MAX . . . . . TDDI1_PME100_MEAN TDDI1_PME100_MIN TDDI1_PME100_MAX	•	•	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_8 pme_mean.pme_mean1.out.min_8 pme_mean.pme_mean1.out.max_8 pme_mean.pme_mean100.out.mean_8 pme_mean.pme_mean100.out.min_8 pme_mean.pme_mean100.out.max_8	Mean value of TDDI on phase L1 of PME1 Min value of TDDI on phase L1 of PME1 Max value of TDDI on phase L1 of PME1 Mean value of TDDI on phase L1 of PME100 Min value of TDDI on phase L1 of PME100 Max value of TDDI on phase L1 of PME100
TDDI2_PME1_MEAN TDDI2_PME1_MIN TDDI2_PME1_MAX . . . . . TDDI2_PME100_MEAN TDDI2_PME100_MIN TDDI2_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_9 pme_mean.pme_mean1.out.min_9 pme_mean.pme_mean1.out.max_9 pme_mean.pme_mean100.out.mean_9 pme_mean.pme_mean100.out.min_9 pme_mean.pme_mean100.out.max_9	Mean value of TDDI on phase L2 of PME1 Min value of TDDI on phase L2 of PME1 Max value of TDDI on phase L2 of PME1 Mean value of TDDI on phase L2 of PME100 Min value of TDDI on phase L2 of PME100 Max value of TDDI on phase L2 of PME100
TDDI3_PME1_MEAN TDDI3_PME1_MIN TDDI3_PME1_MAX . . . . . TDDI3_PME100_MEAN TDDI3_PME100_MIN TDDI3_PME100_MAX	-	-	•	•	•	•	•	•	pme_mean.pme_mean1.out.mean_10 pme_mean.pme_mean1.out.min_10 pme_mean.pme_mean1.out.max_10 pme_mean.pme_mean100.out.mean_10 pme_mean.pme_mean100.out.min_10 pme_mean.pme_mean100.out.max_10	Mean value of TDDI on phase L3 of PME1 Min value of TDDI on phase L3 of PME1 Max value of TDDI on phase L3 of PME1 Mean value of TDDI on phase L3 of PME100 Min value of TDDI on phase L3 of PME100 Max value of TDDI on phase L3 of PME100
TDDIN_PME1_MEAN TDDIN_PME1_MIN TDDIN_PME1_MAX . . . . . TDDIN_PME100_MEAN TDDIN_PME100_MIN TDDIN_PME100_MAX	-	•	-	-	-	-	•	•	pme_mean.pme_mean1.out.mean_11 pme_mean.pme_mean1.out.min_11 pme_mean.pme_mean1.out.max_11 pme_mean.pme_mean100.out.mean_11 pme_mean.pme_mean100.out.min_11 pme_mean.pme_mean100.out.max_11	Mean value of TDDI on phase LN of PME1 Min value of TDDI on phase LN of PME1 Max value of TDDI on phase LN of PME1 Mean value of TDDI on phase LN of PME100 Min value of TDDI on phase LN of PME100 Max value of TDDI on phase LN of PME100

5.8.3.4 Active power

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
P1_PME1_MEAN P1_PME1_MIN P1_PME1_MAX . . . . . P1_PME100_MEAN P1_PME100_MIN P1_PME100_MAX	•	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_1 pme_mean.pme_power_mean1.out.min_1 pme_mean.pme_power_mean1.out.max_1 pme_mean.pme_power_mean100.out.mean_1 pme_mean.pme_power_mean100.out.min_1 pme_mean.pme_power_mean100.out.max_1	Mean value of P on phase L1 of PME1 Min value of P on phase L1 of PME1 Max value of P on phase L1 of PME1 Mean value of P on phase L1 of PME100 Min value of P on phase L1 of PME100 Max value of P on phase L1 of PME100
P2_PME1_MEAN P2_PME1_MIN P2_PME1_MAX . . . . . P2_PME100_MEAN P2_PME100_MIN P2_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_2 pme_mean.pme_power_mean1.out.min_2 pme_mean.pme_power_mean1.out.max_2 pme_mean.pme_power_mean100.out.mean_2 pme_mean.pme_power_mean100.out.min_2 pme_mean.pme_power_mean100.out.max_2	Mean value of P on phase L2 of PME1 Min value of P on phase L2 of PME1 Max value of P on phase L2 of PME1 Mean value of P on phase L2 of PME100 Min value of P on phase L2 of PME100 Max value of P on phase L2 of PME100
P3_PME1_MEAN P3_PME1_MIN P3_PME1_MAX . . . . . P3_PME100_MEAN P3_PME100_MIN P3_PME100_MAX	-	-	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_3 pme_mean.pme_power_mean1.out.min_3 pme_mean.pme_power_mean1.out.max_3 pme_mean.pme_power_mean100.out.mean_3 pme_mean.pme_power_mean100.out.min_3 pme_mean.pme_power_mean100.out.max_3	Mean value of P on phase L3 of PME1 Min value of P on phase L3 of PME1 Max value of P on phase L3 of PME1 Mean value of P on phase L3 of PME100 Min value of P on phase L3 of PME100 Max value of P on phase L3 of PME100
P_PME1_MEAN P_PME1_MIN P_PME1_MAX . . . . . P_PME100_MEAN P_PME100_MIN P_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_0 pme_mean.pme_power_mean1.out.min_0 pme_mean.pme_power_mean1.out.max_0 pme_mean.pme_power_mean100.out.mean_0 pme_mean.pme_power_mean100.out.min_0 pme_mean.pme_power_mean100.out.max_0	Mean value of P on phase LN of PME1 Min value of P on phase LN of PME1 Max value of P on phase LN of PME1 Mean value of P on phase LN of PME100 Min value of P on phase LN of PME100 Max value of P on phase LN of PME100

5.8.3.5 Reactive power

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
Q1_PME1_MEAN Q1_PME1_MIN Q1_PME1_MAX ..... Q1_PME100_MEAN Q1_PME100_MIN Q1_PME100_MAX	•	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_5 pme_mean.pme_power_mean1.out.min_5 pme_mean.pme_power_mean1.out.max_5 pme_mean.pme_power_mean100.out.mean_5 pme_mean.pme_power_mean100.out.min_5 pme_mean.pme_power_mean100.out.max_5	Mean value of Q on phase L1 of PME1 Min value of Q on phase L1 of PME1 Max value of Q on phase L1 of PME1 Mean value of Q on phase L1 of PME100 Min value of Q on phase L1 of PME100 Max value of Q on phase L1 of PME100
Q2_PME1_MEAN Q2_PME1_MIN Q2_PME1_MAX ..... Q2_PME100_MEAN Q2_PME100_MIN Q2_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_6 pme_mean.pme_power_mean1.out.min_6 pme_mean.pme_power_mean1.out.max_6 pme_mean.pme_power_mean100.out.mean_6 pme_mean.pme_power_mean100.out.min_6 pme_mean.pme_power_mean100.out.max_6	Mean value of Q on phase L2 of PME1 Min value of Q on phase L2 of PME1 Max value of Q on phase L2 of PME1 Mean value of Q on phase L2 of PME100 Min value of Q on phase L2 of PME100 Max value of Q on phase L2 of PME100
Q3_PME1_MEAN Q3_PME1_MIN Q3_PME1_MAX ..... Q3_PME100_MEAN Q3_PME100_MIN Q3_PME100_MAX	-	-	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_7 pme_mean.pme_power_mean1.out.min_7 pme_mean.pme_power_mean1.out.max_7 pme_mean.pme_power_mean100.out.mean_7 pme_mean.pme_power_mean100.out.min_7 pme_mean.pme_power_mean100.out.max_7	Mean value of Q on phase L3 of PME1 Min value of Q on phase L3 of PME1 Max value of Q on phase L3 of PME1 Mean value of Q on phase L3 of PME100 Min value of Q on phase L3 of PME100 Max value of Q on phase L3 of PME100
Q_PME1_MEAN Q_PME1_MIN Q_PME1_MAX ..... Q_PME100_MEAN Q_PME100_MIN Q_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_4 pme_mean.pme_power_mean1.out.min_4 pme_mean.pme_power_mean1.out.max_4 pme_mean.pme_power_mean100.out.mean_4 pme_mean.pme_power_mean100.out.min_4 pme_mean.pme_power_mean100.out.max_4	Mean value of Q on phase LN of PME1 Min value of Q on phase LN of PME1 Max value of Q on phase LN of PME1 Mean value of Q on phase LN of PME100 Min value of Q on phase LN of PME100 Max value of Q on phase LN of PME100

5.8.3.6 Reactive power of H1

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
Q1H1_PME1_MEAN Q1H1_PME1_MIN Q1H1_PME1_MAX ..... Q1H1_PME100_MEAN Q1H1_PME100_MIN Q1H1_PME100_MAX	•	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_21 pme_mean.pme_power_mean1.out.min_21 pme_mean.pme_power_mean1.out.max_21 pme_mean.pme_power_mean100.out.mean_21 pme_mean.pme_power_mean100.out.min_21 pme_mean.pme_power_mean100.out.max_21	Mean value of Q of H1 on phase L1 of PME1 Min value of Q of H1 on phase L1 of PME1 Max value of Q of H1 on phase L1 of PME1 Mean value of Q of H1 on phase L1 of PME100 Min value of Q of H1 on phase L1 of PME100 Max value of Q of H1 on phase L1 of PME100
Q2H1_PME1_MEAN Q2H1_PME1_MIN Q2H1_PME1_MAX ..... Q2H1_PME100_MEAN Q2H1_PME100_MIN Q2H1_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_22 pme_mean.pme_power_mean1.out.min_22 pme_mean.pme_power_mean1.out.max_22 pme_mean.pme_power_mean100.out.mean_22 pme_mean.pme_power_mean100.out.min_22 pme_mean.pme_power_mean100.out.max_22	Mean value of Q of H1 on phase L2 of PME1 Min value of Q of H1 on phase L2 of PME1 Max value of Q of H1 on phase L2 of PME1 Mean value of Q of H1 on phase L2 of PME100 Min value of Q of H1 on phase L2 of PME100 Max value of Q of H1 on phase L2 of PME100
Q3H1_PME1_MEAN Q3H1_PME1_MIN Q3H1_PME1_MAX ..... Q3H1_PME100_MEAN Q3H1_PME100_MIN Q3H1_PME100_MAX	-	-	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_23 pme_mean.pme_power_mean1.out.min_23 pme_mean.pme_power_mean1.out.max_23 pme_mean.pme_power_mean100.out.mean_23 pme_mean.pme_power_mean100.out.min_23 pme_mean.pme_power_mean100.out.max_23	Mean value of Q of H1 on phase L3 of PME1 Min value of Q of H1 on phase L3 of PME1 Max value of Q of H1 on phase L3 of PME1 Mean value of Q of H1 on phase L3 of PME100 Min value of Q of H1 on phase L3 of PME100 Max value of Q of H1 on phase L3 of PME100
QH1_PME1_MEAN QH1_PME1_MIN QH1_PME1_MAX ..... QH1_PME100_MEAN QH1_PME100_MIN QH1_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_20 pme_mean.pme_power_mean1.out.min_20 pme_mean.pme_power_mean1.out.max_20 pme_mean.pme_power_mean100.out.mean_20 pme_mean.pme_power_mean100.out.min_20 pme_mean.pme_power_mean100.out.max_20	Mean value of Q of H1 on phase LN of PME1 Min value of Q of H1 on phase LN of PME1 Max value of Q of H1 on phase LN of PME1 Mean value of Q of H1 on phase LN of PME100 Min value of Q of H1 on phase LN of PME100 Max value of Q of H1 on phase LN of PME100

5.8.3.7 Apparent power

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
S1_PME1_MEAN	•	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_9	Mean value of S on phase L1 of PME1
S1_PME1_MIN									pme_mean.pme_power_mean1.out.min_9	Min value of S on phase L1 of PME1
S1_PME1_MAX									pme_mean.pme_power_mean1.out.max_9	Max value of S on phase L1 of PME1
. . . . .										
S1_PME100_MEAN									pme_mean.pme_power_mean100.out.mean_9	Mean value of S on phase L1 of PME100
S1_PME100_MIN									pme_mean.pme_power_mean100.out.min_9	Min value of S on phase L1 of PME100
S1_PME100_MAX									pme_mean.pme_power_mean100.out.max_9	Max value of S on phase L1 of PME100
S2_PME1_MEAN	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_10	Mean value of S on phase L2 of PME1
S2_PME1_MIN									pme_mean.pme_power_mean1.out.min_10	Min value of S on phase L2 of PME1
S2_PME1_MAX									pme_mean.pme_power_mean1.out.max_10	Max value of S on phase L2 of PME1
. . . . .										
S2_PME100_MEAN									pme_mean.pme_power_mean100.out.mean_10	Mean value of S on phase L2 of PME100
S2_PME100_MIN									pme_mean.pme_power_mean100.out.min_10	Min value of S on phase L2 of PME100
S2_PME100_MAX									pme_mean.pme_power_mean100.out.max_10	Max value of S on phase L2 of PME100
S3_PME1_MEAN	-	-	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_11	Mean value of S on phase L3 of PME1
S3_PME1_MIN									pme_mean.pme_power_mean1.out.min_11	Min value of S on phase L3 of PME1
S3_PME1_MAX									pme_mean.pme_power_mean1.out.max_11	Max value of S on phase L3 of PME1
. . . . .										
S3_PME100_MEAN									pme_mean.pme_power_mean100.out.mean_11	Mean value of S on phase L3 of PME100
S3_PME100_MIN									pme_mean.pme_power_mean100.out.min_11	Min value of S on phase L3 of PME100
S3_PME100_MAX									pme_mean.pme_power_mean100.out.max_11	Max value of S on phase L3 of PME100
S_PME1_MEAN	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_8	Mean value of S on phase LN of PME1
S_PME1_MIN									pme_mean.pme_power_mean1.out.min_8	Min value of S on phase LN of PME1
S_PME1_MAX									pme_mean.pme_power_mean1.out.max_8	Max value of S on phase LN of PME1
. . . . .										
S_PME100_MEAN									pme_mean.pme_power_mean100.out.mean_8	Mean value of S on phase LN of PME100
S_PME100_MIN									pme_mean.pme_power_mean100.out.min_8	Min value of S on phase LN of PME100
S_PME100_MAX									pme_mean.pme_power_mean100.out.max_8	Max value of S on phase LN of PME100

5.8.3.8 cos(φ)

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
CPHI1_PME1_MEAN	•	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_13	Mean value of cos(φ) on phase L1 of PME1
CPHI 1_PME1_MIN									pme_mean.pme_power_mean1.out.min_13	Min value of cos(φ) on phase L1 of PME1
CPHI 1_PME1_MAX									pme_mean.pme_power_mean1.out.max_13	Max value of cos(φ) on phase L1 of PME1
. . . . .										
CPHI 1_PME100_MEAN									pme_mean.pme_power_mean100.out.mean_13	Mean value of cos(φ) on phase L1 of PME100
CPHI 1_PME100_MIN									pme_mean.pme_power_mean100.out.min_13	Min value of cos(φ) on phase L1 of PME100
CPHI 1_PME100_MAX									pme_mean.pme_power_mean100.out.max_13	Max value of cos(φ) on phase L1 of PME100
CPHI 2_PME1_MEAN	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_14	Mean value of cos(φ) on phase L2 of PME1
CPHI 2_PME1_MIN									pme_mean.pme_power_mean1.out.min_14	Min value of cos(φ) on phase L2 of PME1
CPHI 2_PME1_MAX									pme_mean.pme_power_mean1.out.max_14	Max value of cos(φ) on phase L2 of PME1
. . . . .										
CPHI 2_PME100_MEAN									pme_mean.pme_power_mean100.out.mean_14	Mean value of cos(φ) on phase L2 of PME100
CPHI 2_PME100_MIN									pme_mean.pme_power_mean100.out.min_14	Min value of cos(φ) on phase L2 of PME100
CPHI 2_PME100_MAX									pme_mean.pme_power_mean100.out.max_14	Max value of cos(φ) on phase L2 of PME100
CPHI 3_PME1_MEAN	-	-	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_15	Mean value of cos(φ) on phase L3 of PME1
CPHI 3_PME1_MIN									pme_mean.pme_power_mean1.out.min_15	Min value of cos(φ) on phase L3 of PME1
CPHI 3_PME1_MAX									pme_mean.pme_power_mean1.out.max_15	Max value of cos(φ) on phase L3 of PME1
. . . . .										
CPHI 3_PME100_MEAN									pme_mean.pme_power_mean100.out.mean_15	Mean value of cos(φ) on phase L3 of PME100
CPHI 3_PME100_MIN									pme_mean.pme_power_mean100.out.min_15	Min value of cos(φ) on phase L3 of PME100
CPHI 3_PME100_MAX									pme_mean.pme_power_mean100.out.max_15	Max value of cos(φ) on phase L3 of PME100
CPHI _PME1_MEAN	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_12	Mean value of cos(φ) on phase LN of PME1
CPHI _PME1_MIN									pme_mean.pme_power_mean1.out.min_12	Min value of cos(φ) on phase LN of PME1
CPHI _PME1_MAX									pme_mean.pme_power_mean1.out.max_12	Max value of cos(φ) on phase LN of PME1
. . . . .										
CPHI _PME100_MEAN									pme_mean.pme_power_mean100.out.mean_12	Mean value of cos(φ) on phase LN of PME100
CPHI _PME100_MIN									pme_mean.pme_power_mean100.out.min_12	Min value of cos(φ) on phase LN of PME100
CPHI _PME100_MAX									pme_mean.pme_power_mean100.out.max_12	Max value of cos(φ) on phase LN of PME100

5.8.3.9 Power factor

Name	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
PF1_PME1_MEAN PF1_PME1_MIN PF1_PME1_MAX . . . . . PF1_PME100_MEAN PF1_PME100_MIN PF1_PME100_MAX	•	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_17 pme_mean.pme_power_mean1.out.min_17 pme_mean.pme_power_mean1.out.max_17 pme_mean.pme_power_mean100.out.mean_17 pme_mean.pme_power_mean100.out.min_17 pme_mean.pme_power_mean100.out.max_17	Mean value of PF on phase L1 of PME1 Min value of PF on phase L1 of PME1 Max value of PF on phase L1 of PME1 Mean value of PF on phase L1 of PME100 Min value of PF on phase L1 of PME100 Max value of PF on phase L1 of PME100
PF2_PME1_MEAN PF2_PME1_MIN PF2_PME1_MAX . . . . . PF2_PME100_MEAN PF2_PME100_MIN PF2_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_18 pme_mean.pme_power_mean1.out.min_18 pme_mean.pme_power_mean1.out.max_18 pme_mean.pme_power_mean100.out.mean_18 pme_mean.pme_power_mean100.out.min_18 pme_mean.pme_power_mean100.out.max_18	Mean value of PF on phase L2 of PME1 Min value of PF on phase L2 of PME1 Max value of PF on phase L2 of PME1 Mean value of PF on phase L2 of PME100 Min value of PF on phase L2 of PME100 Max value of PF on phase L2 of PME100
PF3_PME1_MEAN PF3_PME1_MIN PF3_PME1_MAX . . . . . PF3_PME100_MEAN PF3_PME100_MIN PF3_PME100_MAX	-	-	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_19 pme_mean.pme_power_mean1.out.min_19 pme_mean.pme_power_mean1.out.max_19 pme_mean.pme_power_mean100.out.mean_19 pme_mean.pme_power_mean100.out.min_19 pme_mean.pme_power_mean100.out.max_19	Mean value of PF on phase L3 of PME1 Min value of PF on phase L3 of PME1 Max value of PF on phase L3 of PME1 Mean value of PF on phase L3 of PME100 Min value of PF on phase L3 of PME100 Max value of PF on phase L3 of PME100
PF_PME1_MEAN PF_PME1_MIN PF_PME1_MAX . . . . . PF_PME100_MEAN PF_PME100_MIN PF_PME100_MAX	-	•	•	•	•	•	•	•	pme_mean.pme_power_mean1.out.mean_16 pme_mean.pme_power_mean1.out.min_16 pme_mean.pme_power_mean1.out.max_16 pme_mean.pme_power_mean100.out.mean_16 pme_mean.pme_power_mean100.out.min_16 pme_mean.pme_power_mean100.out.max_16	Mean value of PF on phase LN of PME1 Min value of PF on phase LN of PME1 Max value of PF on phase LN of PME1 Mean value of PF on phase LN of PME100 Min value of PF on phase LN of PME100 Max value of PF on phase LN of PME100

6 Energy meters

6.1 Meter contents of standard quantities

Name	ID	Description
P_I_IV_HT	meter_standard.meter_p_qdr14.ht.hightariff	Active energy QI+IV, high tariff [Wh]
P_II_III_HT	meter_standard.meter_p_qdr23.ht.hightariff	Active energy QII+III, high tariff [Wh]
Q_I_II_HT	meter_standard.meter_q_qdr12.ht.hightariff	Reactive energy QI+II, high tariff [varh]
Q_III_IV_HT	meter_standard.meter_q_qdr34.ht.hightariff	Reactive energy QIII+IV, high tariff [varh]
P_I_IV_LT	meter_standard.meter_p_qdr14.lt.lowtariff	Active energy QI+IV, low tariff [Wh]
P_II_III_LT	meter_standard.meter_p_qdr23.lt.lowtariff	Active energy QII+III, low tariff [Wh]
Q_I_II_LT	meter_standard.meter_q_qdr12.lt.lowtariff	Reactive energy QI+II, low tariff [varh]
Q_III_IV_LT	meter_standard.meter_q_qdr34.lt.lowtariff	Reactive energy QIII+IV, low tariff [varh]

- All values implemented as REAL64 numbers (4 registers per value).

6.2 Meter contents of free selectable quantities

Name	ID	Description
METER1_HT	meter_user.meter1.ht.hightariff	Free selectable meter 1, high tariff
METER2_HT	meter_user.meter2.ht.hightariff	Free selectable meter 2, high tariff
METER3_HT	meter_user.meter3.ht.hightariff	Free selectable meter 3, high tariff
METER4_HT	meter_user.meter4.ht.hightariff	Free selectable meter 4, high tariff
METER5_HT	meter_user.meter5.ht.hightariff	Free selectable meter 5, high tariff
METER6_HT	meter_user.meter6.ht.hightariff	Free selectable meter 6, high tariff
METER7_HT	meter_user.meter7.ht.hightariff	Free selectable meter 7, high tariff
METER8_HT	meter_user.meter8.ht.hightariff	Free selectable meter 8, high tariff
METER9_HT	meter_user.meter9.ht.hightariff	Free selectable meter 9, high tariff
METER10_HT	meter_user.meter10.ht.hightariff	Free selectable meter 10, high tariff
METER11_HT	meter_user.meter11.ht.hightariff	Free selectable meter 11, high tariff
METER12_HT	meter_user.meter12.ht.hightariff	Free selectable meter 12, high tariff
METER1_NT	meter_user.meter1.lt.lowtariff	Free selectable meter 1, low tariff
METER2_NT	meter_user.meter2.lt.lowtariff	Free selectable meter 2, low tariff
METER3_NT	meter_user.meter3.lt.lowtariff	Free selectable meter 3, low tariff
METER4_NT	meter_user.meter4.lt.lowtariff	Free selectable meter 4, low tariff
METER5_NT	meter_user.meter5.lt.lowtariff	Free selectable meter 5, low tariff
METER6_NT	meter_user.meter6.lt.lowtariff	Free selectable meter 6, low tariff
METER7_NT	meter_user.meter7.lt.lowtariff	Free selectable meter 7, low tariff
METER8_NT	meter_user.meter8.lt.lowtariff	Free selectable meter 8, low tariff
METER9_NT	meter_user.meter9.lt.lowtariff	Free selectable meter 9, low tariff
METER10_NT	meter_user.meter10.lt.lowtariff	Free selectable meter 10, low tariff
METER11_NT	meter_user.meter11.lt.lowtariff	Free selectable meter 11, low tariff
METER12_NT	meter_user.meter12.lt.lowtariff	Free selectable meter 12, low tariff

- All meter contents are scaled in the basic unit of the appropriate base quantity (Ah, Wh, VAh, varh)

6.3 Meter contents of digital inputs

Name	ID	Description
M1_1_HT	meter_digin.meter_digin_1_1.ht.hightariff	Meter content input 1 (option 1), high tariff
M1_2_HT	meter_digin.meter_digin_1_2.ht.hightariff	Meter content input 2 (option 1), high tariff
M1_3_HT	meter_digin.meter_digin_1_3.ht.hightariff	Meter content input 3 (option 1), high tariff
M1_4_HT	meter_digin.meter_digin_1_4.ht.hightariff	Meter content input 4 (option 1), high tariff
M2_1_HT	meter_digin.meter_digin_2_1.ht.hightariff	Meter content input 1 (option 2), high tariff
M2_2_HT	meter_digin.meter_digin_2_2.ht.hightariff	Meter content input 2 (option 2), high tariff
M2_3_HT	meter_digin.meter_digin_2_3.ht.hightariff	Meter content input 3 (option 2) high tariff
M2_4_HT	meter_digin.meter_digin_2_4.ht.hightariff	Meter content input 4 (option 2), high tariff
M3_1_HT	meter_digin.meter_digin_3_1.ht.hightariff	Meter content input 1 (option 3), high tariff
M3_2_HT	meter_digin.meter_digin_3_2.ht.hightariff	Meter content input 2 (option 3), high tariff
M3_3_HT	meter_digin.meter_digin_3_3.ht.hightariff	Meter content input 3 (option 3), high tariff
M3_4_HT	meter_digin.meter_digin_3_4.ht.hightariff	Meter content input 4 (option 3), high tariff
M1_1_NT	meter_digin.meter_digin_1_1.lt.lowtariff	Meter content input 1 (option 1), low tariff
M1_2_NT	meter_digin.meter_digin_1_2.lt.lowtariff	Meter content input 2 (option 1), low tariff
M1_3_NT	meter_digin.meter_digin_1_3.lt.lowtariff	Meter content input 3 (option 1), low tariff
M1_4_NT	meter_digin.meter_digin_1_4.lt.lowtariff	Meter content input 4 (option 1), low tariff
M2_1_NT	meter_digin.meter_digin_2_1.lt.lowtariff	Meter content input 1 (option 2), low tariff
M2_2_NT	meter_digin.meter_digin_2_2.lt.lowtariff	Meter content input 2 (option 2), low tariff
M2_3_NT	meter_digin.meter_digin_2_3.lt.lowtariff	Meter content input 3 (option 2) low tariff
M2_4_NT	meter_digin.meter_digin_2_4.lt.lowtariff	Meter content input 4 (option 2), low tariff
M3_1_NT	meter_digin.meter_digin_3_1.lt.lowtariff	Meter content input 1 (option 3), low tariff
M3_2_NT	meter_digin.meter_digin_3_2.lt.lowtariff	Meter content input 2 (option 3), low tariff
M3_3_NT	meter_digin.meter_digin_3_3.lt.lowtariff	Meter content input 3 (option 3), low tariff
M3_4_NT	meter_digin.meter_digin_3_4.lt.lowtariff	Meter content input 4 (option 3), low tariff

6.4 Present tariff of meters

The device supports two tariffs, high and low tariff. The same tariff is used for both, standard meters and free selectable meters. The tariff can be defined via digital input 0.1. The present state of this digital input therefore represents the active tariff.

Name	ID	Description
DIGIN0_1	basedigitalin.digitalinput1.digitalinputvalue.state	**Tariff situation** 0: high tariff 1: low tariff

6.5 Current Link specific values

Name	ID	Description
P1_I_IV_CL1 … P1_I_IV_CL10	cl_meter1.meter_l1.hightariff.ht1 cl_meter10.meter_l1.hightariff.ht1	Active energy QI+IV, L1 CL1 [Wh] … Active energy QI+IV, L1 CL10 [Wh]
P2_I_IV_CL1 … P2_I_IV_CL10	cl_meter1.meter_l2.hightariff.ht1 cl_meter10.meter_l2.hightariff.ht1	Active energy QI+IV, L2 CL1 [Wh] … Active energy QI+IV, L2 CL10 [Wh]
P3_I_IV_CL1 … P3_I_IV_CL10	cl_meter1.meter_l3.hightariff.ht1 cl_meter10.meter_l3.hightariff.ht1	Active energy QI+IV, L3 CL1 [Wh] … Active energy QI+IV, L3 CL10 [Wh]
P_I_IV_CL1 … P_I_IV_CL10	cl_meter1.meter_sys.hightariff.ht1 cl_meter10.meter_sys.hightariff.ht1	Active energy QI+IV, SYS CL1 [Wh] … Active energy QI+IV, SYS CL10 [Wh]

P1_II_III_CL1 … P1_II_III_CL10	cl_meter1.meter_l1.hightariff.ht2 cl_meter10.meter_l1.hightariff.ht2	Active energy QII+III, L1 CL1 [Wh] … Active energy QII+III, L1 CL10 [Wh]
P2_II_III_CL1 … P2_II_III_CL10	cl_meter1.meter_l2.hightariff.ht2 cl_meter10.meter_l2.hightariff.ht2	Active energy QII+III, L2 CL1 [Wh] … Active energy QII+III, L2 CL10 [Wh]
P3_II_III_CL1 … P3_II_IV_CL10	cl_meter1.meter_l3.hightariff.ht2 cl_meter10.meter_l3.hightariff.ht2	Active energy QI+III, L3 CL1 [Wh] … Active energy QII+III, L3 CL10 [Wh]
P_II_III_CL1 … P_II_III_CL10	cl_meter1.meter_sys.hightariff.ht2 cl_meter10.meter_sys.hightariff.ht2	Active energy QII+III, SYS CL1 [Wh] … Active energy QII+III, SYS CL10 [Wh]
Q1_I_II_CL1 … Q1_I_II_CL10	cl_meter1.meter_l1.hightariff.ht3 cl_meter10.meter_l1.hightariff.ht3	Reactive energy QI+II, L1 CL1 [Wh] … Active energy QI+II, L1 CL10 [Wh]
Q2_I_II_CL1 … Q2_I_II_CL10	cl_meter1.meter_l2.hightariff.ht3 cl_meter10.meter_l2.hightariff.ht3	Reactive energy QI+II, L2 CL1 [Wh] … Reactive energy QI+II, L2 CL10 [Wh]
Q3_I_II_CL1 … Q3_I_II_CL10	cl_meter1.meter_l3.hightariff.ht3 cl_meter10.meter_l3.hightariff.ht3	Reactive energy QI+II, L3 CL1 [Wh] … Reactive energy QI+II, L3 CL10 [Wh]
Q_I_II_CL1 … Q_I_II_CL10	cl_meter1.meter_sys.hightariff.ht3 cl_meter10.meter_sys.hightariff.ht3	Reactive energy QI+II, SYS CL1 [Wh] … Reactive energy QI+II, SYS CL10 [Wh]
Q1_I_IV_CL1 … Q1_I_IV_CL10	cl_meter1.meter_l1.hightariff.ht4 cl_meter10.meter_l1.hightariff.ht4	Reactive energy QIII+IV, L1 CL1 [Wh] … Reactive energy QIII+IV, L1 CL10 [Wh]
Q2_I_IV_CL1 … Q2_I_IV_CL10	cl_meter1.meter_l2.hightariff.ht4 cl_meter10.meter_l2.hightariff.ht4	Reactive energy QIII+IV, L2 CL1 [Wh] … Reactive energy QIII+IV, L2 CL10 [Wh]
Q3_I_IV_CL1 … Q3_I_IV_CL10	cl_meter1.meter_l3.hightariff.ht4 cl_meter10.meter_l3.hightariff.ht4	Reactive energy QIII+IV, L3 CL1 [Wh] … Reactive energy QIII+IV, L3 CL10 [Wh]
Q_I_IV_CL1 … Q_I_IV_CL10	cl_meter1.meter_sys.hightariff.ht4 cl_meter10.meter_sys.hightariff.ht4	Reactive energy QIII+IV, SYS CL1 [Wh] … Reactive energy QIII+IV, SYS CL10 [Wh]

6.6 PME specific values

Name	ID	Description
P_I_IV_PME1 … P_I_IV_PME100	pme_meter.meter1.hightariff.ht1 pme_meter.meter100.hightariff.ht1	Active energy QI+IV, SYS PME1 [Wh] … Active energy QI+IV, SYS PME100 [Wh]
P_II_III_PME1 … P_II_III_PME100	pme_meter.meter1.hightariff.ht2 pme_meter.meter100.hightariff.ht2	Active energy QII+III, SYS PME1 [Wh] … Active energy QII+III, SYS PME100 [Wh]
Q_I_II_PME1 … Q_I_II_PME100	pme_meter.meter1.hightariff.ht3 pme_meter.meter100.hightariff.ht3	Reactive energy QII+III, SYS PME1 [Wh] … Reactive energy QII+III, SYS PME100 [Wh]
Q_III_IV_PME1 … Q_III_IV_PME100	pme_meter.meter1.hightariff.ht4 pme_meter.meter100.hightariff.ht4	Reactive energy QIII+IV, SYS PME1 [Wh] … Reactive energy QIII+IV, SYS PME100 [Wh]

7 Operating hour counters

The operating hour counters have a resolution of [s]. This allow to measure operating times up to 136 years, whereby an overflow is excluded.

The operating hour counter of the device itself starts to count as soon as the power supply is applied to the device. The meter is designed as endless counter and can't be reset.

The resettable operating hour counters 1...3 count if the associated condition is fulfilled. Possible conditions are:

- always (power supply switched on)
- never (counter inactive)
- if a measured value goes above or below a certain limit value
- fulfilled monitoring function

Description	ID	Description	
OPR_CNTR	opcnt.opsecs.value_counter	Operating hour counter of the device	[s]
OPR_CNTR1	opcnt_user.opsecs1.value_counter	Resettable operating hour counter 1	[s]
OPR_CNTR2	opcnt_user.opsecs2.value_counter	Resettable operating hour counter 2	[s]
OPR_CNTR3	opcnt_user.opsecs3.value_counter	Resettable operating hour counter 3	[s]

The following request resets a resettable operation hour counter:

GET `http://[device]/cb/value/display/[reset id]?value`

Description	[reset id]
OPR_CNTR1 reset id	remote.reset_opcnt_1.remoteetq.event.input
OPR_CNTR2 reset id	remote.reset_opcnt_2.remoteetq.event.input
OPR_CNTR3 reset id	remote.reset_opcnt_3.remoteetq.event.input

Example:

GET

```
http://[device]/cb/value/display/
remote.reset_opcnt_1.remoteetq.event.input?value
```

Response:

```
<empty response>
```

8 Power quality instantaneous values

8.1 Power Frequency

Name	ID	Description
F_SYS	rms.rms.systemfrequency.f_sys	System Frequency 10s (acc. IEC61000-4-30)

8.2 Aggregated values of supply voltage and current

All mean values are addressed by the following id scheme: ID = [Module.Channel.Output.Value]

In all tables in this section, row “Base” stands for [Module.Channel].out.mean_out

Every channel contains the following values:

Value	[Output.Value]	Description
Mean	out.mean_out	Mean Value over the mean interval
Minimum	out.mean_min	Minimum value during the interval
Maximum	out.mean_max	Maximum value during the interval
Count	interval_count.count	Interval counter

8.2.1 150/180-Cycle (~3s) Aggregation values of supply voltage and current

Name	Base	Description
U1N_3S	mean_3s.u1n_3s.out.mean_out	150/180 cycle value of U1N
U2N_3S	mean_3s.u2n_3s.out.mean_out	150/180 cycle value of U2N
U3N_3S	mean_3s.u3n_3s.out.mean_out	150/180 cycle value of U3N
UNE_3S	mean_3s.une_3s.out.mean_out	150/180 cycle value of UNE
U12_3S	mean_3s.u12_3s.out.mean_out	150/180 cycle value of U12
U23_3S	mean_3s.u23_3s.out.mean_out	150/180 cycle value of U23
U31_3S	mean_3s.u31_3s.out.mean_out	150/180 cycle value of U31
I1_3S	mean_3s.i1_3s.out.mean_out	150/180 cycle value of I1
I2_3S	mean_3s.i2_3s.out.mean_out	150/180 cycle value of I2
I3_3S	mean_3s.i3_3s.out.mean_out	150/180 cycle value of I3
In_3S	mean_3s.in_3s.out.mean_out	150/180 cycle value of IN

8.2.2 10min Aggregation values of supply voltage and current

Name	Base	Description
U1N_10MIN	mean_10min.u1n_10min.out.mean_out	10min value of U1N
U2N_10MIN	mean_10min.u2n_10min.out.mean_out	10min value of U2N
U3N_10MIN	mean_10min.u3n_10min.out.mean_out	10min value of U3N
UNE_10MIN	mean_10min.une_10min.out.mean_out	10min value of UNE
U12_10MIN	mean_10min.u12_10min.out.mean_out	10min value of U12
U23_10MIN	mean_10min.u23_10min.out.mean_out	10min value of U23
U31_10MIN	mean_10min.u31_10min.out.mean_out	10min value of U31
I1_10MIN	mean_10min.i1_10min.out.mean_out	10min value of I1
I2_10MIN	mean_10min.i2_10min.out.mean_out	10min value of I2
I3_10MIN	mean_10min.i3_10min.out.mean_out	10min value of I3
IN_10MIN	mean_10min.in_10min.out.mean_out	10min value of IN

8.2.3 2h Aggregation values of supply voltage and current

Name	Base	Description
U1N_2H	mean_2h.u1n_2h.out.mean_out	2h value of U1N
U2N_2H	mean_2h.u2n_2h.out.mean_out	2h value of U2N
U3N_2H	mean_2h.u3n_2h.out.mean_out	2h value of U3N
UNE_2H	mean_2h.une_2h.out.mean_out	2h value of UNE
U12_2H	mean_2h.u12_2h.out.mean_out	2h value of U12
U23_2H	mean_2h.u23_2h.out.mean_out	2h value of U23
U31_2H	mean_2h.u31_2h.out.mean_out	2h value of U31
I1_2H	mean_2h.i1_2h.out.mean_out	2h value of I1
I2_2H	mean_2h.i2_2h.out.mean_out	2h value of I2
I3_2H	mean_2h.i3_2h.out.mean_out	2h value of I3
IN_2H	mean_2h.in_2h.out.mean_out	2h value of IN

8.3 Aggregated values of THD's and unbalance values

8.3.1 150/180-Cycle Aggregation values

Name	Base	Description
THDS_U1N_3S	fft_3s.u1n_thds_3s.out.mean_out	150/180-Cycle value of THDS(U1N)
THDS_U2N_3S	fft_3s.u2n_thds_3s.out.mean_out	150/180-Cycle value of THDS(U2N)
THDS_U3N_3S	fft_3s.u3n_thds_3s.out.mean_out	150/180-Cycle value of THDS(U3N)
THDS_U12_3S	fft_3s.u12_thds_3s.out.mean_out	150/180-Cycle value of THDS(U12)
THDS_U23_3S	fft_3s.u23_thds_3s.out.mean_out	150/180-Cycle value of THDS(U23)
THDS_U31_3S	fft_3s.u31_thds_3s.out.mean_out	150/180-Cycle value of THDS(U31)
TDD_I1_3S	fft_3s.i1_tdd_3s.out.mean_out	150/180-Cycle value of THDS(I1)
TDD_I2_3S	fft_3s.i2_tdd_3s.out.mean_out	150/180-Cycle value of THDS(I2)
TDD_I3_3S	fft_3s.i3_tdd_3s.out.mean_out	150/180-Cycle value of THDS(I3)
UR1_3S	fft_3s.ur1_h1_3s.out.mean_out	150/180-Cycle value of Positive sequence voltage (H1)
UR2_3S	fft_3s.ur2_h1_3s.out.mean_out	150/180-Cycle value of Negative sequence voltage (H1)
U0_3S	fft_3s.u0_h1_3s.out.mean_out	150/180-Cycle value of Zero sequence voltage (H1)
IR1_3S	fft_3s.ir1_h1_3s.out.mean_out	150/180-Cycle value of Positive sequence current (H1)
IR2_3S	fft_3s.ir2_h1_3s.out.mean_out	150/180-Cycle value of Negative sequence current (H1)
I0_3S	fft_3s.i0_h1_3s.out.mean_out	150/180-Cycle value of Zero sequence current (H1)
UR2R1_3S	fft_3s.ur2r1_h1_3s.out.mean_out	150/180-Cycle value of Unbalance factor UR2/UR1 (H1)
IR2R1_3S	fft_3s.ir2r1_h1_3s.out.mean_out	150/180-Cycle value of Unbalance factor IR2/IR1 (H1)
U0R1_3S	fft_3s.u0r1_h1_3s.out.mean_out	150/180-Cycle value of Unbalance factor U0/UR1 (H1)
I0R1_3S	fft_3s.i0r1_h1_3s.out.mean_out	150/180-Cycle value of Unbalance factor I0/IR1 (H1)

8.3.2 10min Aggregation values

Name	Base	Description
THDS_U1N_10MIN	fft_10min.u1n_thds_10min.out.mean_out	10 min value of THDS(U1N)
THDS_U2N_10MIN	fft_10min.u2n_thds_10min.out.mean_out	10 min value of THDS(U2N)
THDS_U3N_10MIN	fft_10min.u3n_thds_10min.out.mean_out	10 min value of THDS(U3N)
THDS_U12_10MIN	fft_10min.u12_thds_10min.out.mean_out	10 min value of THDS(U12)
THDS_U23_10MIN	fft_10min.u23_thds_10min.out.mean_out	10 min value of THDS(U23)
THDS_U31_10MIN	fft_10min.u31_thds_10min.out.mean_out	10 min value of THDS(U31)
TDD_I1_10MIN	fft_10min.i1_tdd_10min.out.mean_out	10 min value of THDS(I1)
TDD_I2_10MIN	fft_10min.i2_tdd_10min.out.mean_out	10 min value of THDS(I2)
TDD_I3_10MIN	fft_10min.i3_tdd_10min.out.mean_out	10 min value of THDS(I3)
UR1_10MIN	fft_10min.ur1_h1_10min.out.mean_out	10 min value of Positive sequence voltage (H1)
UR2_10MIN	fft_10min.ur2_h1_10min.out.mean_out	10 min value of Negative sequence voltage (H1)
U0_10MIN	fft_10min.u0_h1_10min.out.mean_out	10 min value of Zero sequence voltage (H1)
IR1_10MIN	fft_10min.ir1_h1_10min.out.mean_out	10 min value of Positive sequence current (H1)
IR2_10MIN	fft_10min.ir2_h1_10min.out.mean_out	10 min value of Negative sequence current (H1)
I0_10MIN	fft_10min.i0_h1_10min.out.mean_out	10 min value of Zero sequence current (H1)
UR2R1_10MIN	fft_10min.ur2r1_h1_10min.out.mean_out	10 min value of Unbalance factor UR2/UR1 (H1)
IR2R1_10MIN	fft_10min.ir2r1_h1_10min.out.mean_out	10 min value of Unbalance factor IR2/IR1 (H1)
U0R1_10MIN	fft_10min.u0r1_h1_10min.out.mean_out	10 min value of Unbalance factor U0/UR1 (H1)
I0R1_10MIN	fft_10min.i0r1_h1_10min.out.mean_out	10 min value of Unbalance factor I0/IR1 (H1)

8.3.3 2h Aggregation values

Name	Base	Description
THDS_U1N_2H	fft_2h.u1n_thds_2h.out.mean_out	2h value of THDS(U1N)
THDS_U2N_2H	fft_2h.u2n_thds_2h.out.mean_out	2h value of THDS(U2N)
THDS_U3N_2H	fft_2h.u3n_thds_2h.out.mean_out	2h value of THDS(U3N)
THDS_U12_2H	fft_2h.u12_thds_2h.out.mean_out	2h value of THDS(U12)
THDS_U23_2H	fft_2h.u23_thds_2h.out.mean_out	2h value of THDS(U23)
THDS_U31_2H	fft_2h.u31_thds_2h.out.mean_out	2h value of THDS(U31)
TDD_I1_2H	fft_2h.i1_tdd_2h.out.mean_out	2h value of THDS(I1)
TDD_I2_2H	fft_2h.i2_tdd_2h.out.mean_out	2h value of THDS(I2)
TDD_I3_2H	fft_2h.i3_tdd_2h.out.mean_out	2h value of THDS(I2)
UR1_2H	fft_2h.ur1_h1_2h.out.mean_out	2h value of Positive sequence voltage (H1)
UR2_2H	fft_2h.ur2_h1_2h.out.mean_out	2h value of Negative sequence voltage (H1)
U0_2H	fft_2h.u0_h1_2h.out.mean_out	2h value of Zero sequence voltage (H1)
IR1_2H	fft_2h.ir1_h1_2h.out.mean_out	2h value of Positive sequence current (H1)
IR2_2H	fft_2h.ir2_h1_2h.out.mean_out	2h value of Negative sequence current (H1)
I0_2H	fft_2h.i0_h1_2h.out.mean_out	2h value of Zero sequence current (H1)
UR2R1_2H	fft_2h.ur2r1_h1_2h.out.mean_out	2h value of Unbalance factor UR2/UR1 (H1)
IR2R1_2H	fft_2h.ir2r1_h1_2h.out.mean_out	2h value of Unbalance factor IR2/IR1 (H1)
U0R1_2H	fft_2h.u0r1_h1_2h.out.mean_out	2h value of Unbalance factor U0/UR1 (H1)
I0R1_2H	fft_2h.i0r1_h1_2h.out.mean_out	2h value of Unbalance factor I0/IR1 (H1)

8.4 Aggregated values of harmonics and interharmonics

All mean values of harmonics and interharmonics are addresses by the following id scheme:

ID = [Module.Channel.Output.Value]

Every output contains the following values:

[Module.Channel.Output.Value]	Description
Module.Channel.Output.mean_out_2 : Module.Channel.Output.mean_out_50	Content of 2nd harmonic : Content of 50th harmonic [%] [%]
Example: mean_fft_harm_3s.u1n_harm_3s.out.mean_out_2 : mean_fft_harm_3s.u1n_harm_3s.out.mean_out_50	U1N: Content of 2nd harmonic : U1N: Content of 50th harmonic [%] [%]

In the following tables in this section, row “Base” stands for [Module.Channel.Output]

Reading these Ids will return an array of the whole content (Order 0…50).

8.4.1 150/180-Cycle Aggregation values of voltage and current harmonics

Name	Base	Description
HU1N_3S	mean_fft_harm_3s.u1n_harm_3s.out	150/180 cycle harmonics values of U1N
HU2N_3S	mean_fft_harm_3s.u2n_harm_3s.out	150/180 cycle harmonics values of U2N
HU3N_3S	mean_fft_harm_3s.u3n_harm_3s.out	150/180 cycle harmonics values of U3N
HU12_3S	mean_fft_harm_3s.u12_harm_3s.out	150/180 cycle harmonics values of U12
HU23_3S	mean_fft_harm_3s.u23_harm_3s.out	150/180 cycle harmonics values of U23
HU31_3S	mean_fft_harm_3s.u31_harm_3s.out	150/180 cycle harmonics values of U31
HI1_3S	mean_fft_harm_3s.i1_harm_3s.out	150/180 cycle harmonics values of I1
HI2_3S	mean_fft_harm_3s.i2_harm_3s.out	150/180 cycle harmonics values of I2
HI3_3S	mean_fft_harm_3s.i3_harm_3s.out	150/180 cycle harmonics values of I3

8.4.2 150/180-Cycle Aggregation values of voltage and current interharmonics

Name	Base	Description
IHU1N_3S	mean_fft_harm_3s.u1n_inter_3s.out	150/180 cycle interharmonics values of U1N
IHU2N_3S	mean_fft_harm_3s.u2n_inter_3s.out	150/180 cycle interharmonics values of U2N
IHU3N_3S	mean_fft_harm_3s.u3n_inter_3s.out	150/180 cycle interharmonics values of U3N
IHU12_3S	mean_fft_harm_3s.u12_inter_3s.out	150/180 cycle interharmonics values of U12
IHU23_3S	mean_fft_harm_3s.u23_inter_3s.out	150/180 cycle interharmonics values of U23
IHU31_3S	mean_fft_harm_3s.u31_inter_3s.out	150/180 cycle interharmonics values of U31
IHI1_3S	mean_fft_harm_3s.i1_inter_3s.out	150/180 cycle interharmonics values of I1
IHI2_3S	mean_fft_harm_3s.i2_inter_3s.out	150/180 cycle interharmonics values of I2
IHI3_3S	mean_fft_harm_3s.i3_inter_3s.out	150/180 cycle interharmonics values of I3

8.4.3 10min Aggregation values of voltage and current harmonics

Name	Base	Description
HU1N_10MIN	mean_fft_harm_10min.u1n_harm_10min.out	10min harmonics values of U1N
HU2N_10MIN	mean_fft_harm_10min.u2n_harm_10min.out	10min harmonics values of U2N
HU3N_10MIN	mean_fft_harm_10min.u3n_harm_10min.out	10min harmonics values of U3N
HU12_10MIN	mean_fft_harm_10min.u12_harm_10min.out	10min harmonics values of U12
HU23_10MIN	mean_fft_harm_10min.u23_harm_10min.out	10min harmonics values of U23
HU31_10MIN	mean_fft_harm_10min.u31_harm_10min.out	10min harmonics values of U31
HI1_10MIN	mean_fft_harm_10min.i1_harm_10min.out	10min harmonics values of I1
HI2_10MIN	mean_fft_harm_10min.i2_harm_10min.out	10min harmonics values of I2
HI3_10MIN	mean_fft_harm_10min.i3_harm_10min.out	10min harmonics values of I3

8.4.4 10min Aggregation values of voltage and current interharmonics

Name	Base	Description
IHU1N_10MIN	mean_fft_harm_10min.u1n_inter_10min.out	10min interharmonics values of U1N
IHU2N_10MIN	mean_fft_harm_10min.u2n_inter_10min.out	10min interharmonics values of U2N
IHU3N_10MIN	mean_fft_harm_10min.u3n_inter_10min.out	10min interharmonics values of U3N
IHU12_10MIN	mean_fft_harm_10min.u12_inter_10min.out	10min interharmonics values of U12
IHU23_10MIN	mean_fft_harm_10min.u23_inter_10min.out	10min interharmonics values of U23
IHU31_10MIN	mean_fft_harm_10min.u31_inter_10min.out	10min interharmonics values of U31
IHI1_10MIN	mean_fft_harm_10min.i1_inter_10min.out	10min interharmonics values of I1
IHI2_10MIN	mean_fft_harm_10min.i2_inter_10min.out	10min interharmonics values of I2
IHI3_10MIN	mean_fft_harm_10min.i3_inter_10min.out	10min interharmonics values of I3

8.4.5 2h Aggregation values of voltage and current harmonics

Name	Base	Description
HU1N_2H	mean_fft_harm_2h.u1n_harm_2h.out	2h harmonics values of U1N
HU2N_2H	mean_fft_harm_2h.u2n_harm_2h.out	2h harmonics values of U2N
HU3N_2H	mean_fft_harm_2h.u3n_harm_2h.out	2h harmonics values of U3N
HU12_2H	mean_fft_harm_2h.u12_harm_2h.out	2h harmonics values of U12
HU23_2H	mean_fft_harm_2h.u23_harm_2h.out	2h harmonics values of U23
HU31_2H	mean_fft_harm_2h.u31_harm_2h.out	2h harmonics values of U31
HI1_2H	mean_fft_harm_2h.i1_harm_2h.out	2h harmonics values of I1
HI2_2H	mean_fft_harm_2h.i2_harm_2h.out	2h harmonics values of I2
HI3_2H	mean_fft_harm_2h.i3_harm_2h.out	2h harmonics values of I3

8.4.6 2h Aggregation values of voltage and current interharmonics

Name	Base	Description
IHU1N_2H	mean_fft_harm_2h.u1n_inter_2h.out	2h interharmonics values of U1N
IHU2N_2H	mean_fft_harm_2h.u2n_inter_2h.out	2h interharmonics values of U2N
IHU3N_2H	mean_fft_harm_2h.u3n_inter_2h.out	2h interharmonics values of U3N
IHU12_2H	mean_fft_harm_2h.u12_inter_2h.out	2h interharmonics values of U12
IHU23_2H	mean_fft_harm_2h.u23_inter_2h.out	2h interharmonics values of U23
IHU31_2H	mean_fft_harm_2h.u31_inter_2h.out	2h interharmonics values of U31
IHI1_2H	mean_fft_harm_2h.i1_inter_2h.out	2h interharmonics values of I1
IHI2_2H	mean_fft_harm_2h.i2_inter_2h.out	2h interharmonics values of I2
IHI3_2H	mean_fft_harm_2h.i3_inter_2h.out	2h interharmonics values of I3

8.5 Flicker Values

By choosing the nominal frequency of the PQ3000 the lamp model for the flicker calculation is set automatically corresponding to the following table:

Nominal Frequency [Hz]	Lamp Model
50	50Hz/230V
60	60Hz/120V

There are no other lamp models available so far.

Depending on the measurement setup of the system type, the measured flicker value corresponds to the appropriate line-line or line-neutral voltage.

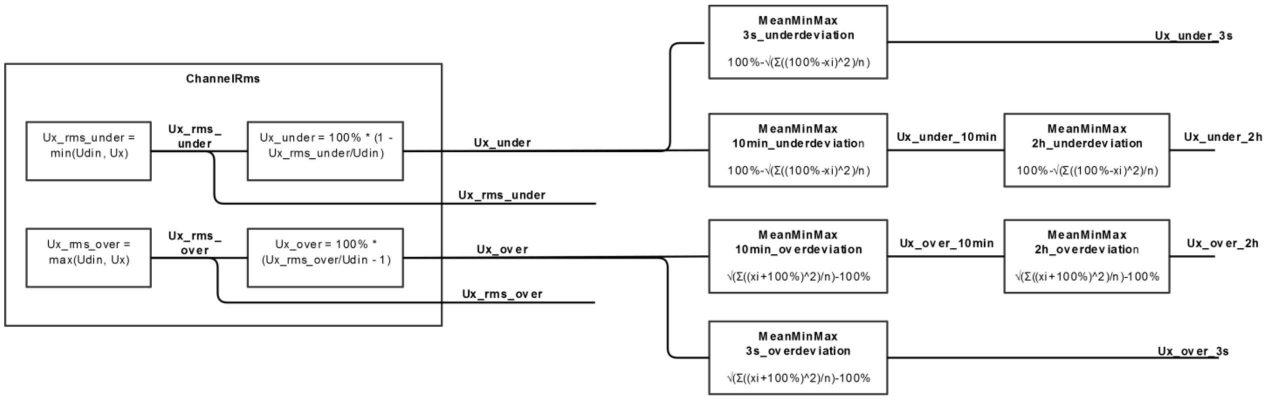
Description	14	2L	3G	3P	3U	3A	4U	4O	ID	Description
Flicker_U1N	●	●		●			●	●	rms.flicker_u1n.pinst.pinst rms.flicker_u1n.pst.pst flicker_2h.flicker_u1n_2h.out.mean_out	Instantaneous flicker sensation U1N Short term flicker U1N Long term flicker U1N
Flicker_U2N		●					●	●	rms.flicker_u2n.pinst.pinst rms.flicker_u2n.pst.pst flicker_2h.flicker_u2n_2h.out.mean_out	Instantaneous flicker sensation U2N Short term flicker U2N Long term flicker U2N
Flicker_U3N							●	●	rms.flicker_u3n.pinst.pinst rms.flicker_u3n.pst.pst flicker_2h.flicker_u3n_2h.out.mean_out	Instantaneous flicker sensation U3N Short term flicker U3N Long term flicker U3N
Flicker_U12			●		●	●			rms.flicker_u12.pinst.pinst rms.flicker_u12.pst.pst flicker_2h.flicker_u12_2h.out.mean_out	Instantaneous flicker sensation U12 Short term flicker U12 Long term flicker U12
Flicker_U23			●		●	●			rms.flicker_u23.pinst.pinst rms.flicker_u23.pst.pst flicker_2h.flicker_u23_2h.out.mean_out	Instantaneous flicker sensation U23 Short term flicker U23 Long term flicker U23
Flicker_U31			●		●	●			rms.flicker_u31.pinst.pinst rms.flicker_u31.pst.pst flicker_2h.flicker_u31_2h.out.mean_out	Instantaneous flicker sensation U31 Short term flicker U31 Long term flicker U31

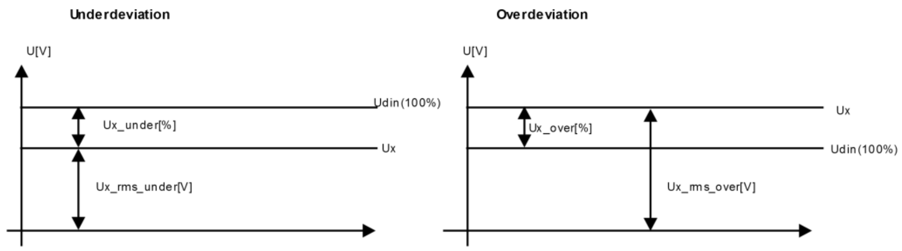
8.6 Under- and overdeviation

8.6.1 Aggregation chain

Following a visualization of the architecture with signal flow and aggregation of the under-/overdeviation of one value. X stands for the phase of the value.

Details to readout these values are located in the following chapters.





8.6.2 Instantaneous values of under- and overdeviation

8.6.2.1 Under- and overdeviation in V

Name	Base	Description
U_RMS_UNDER	rms.rms.out.u_rms_under	Underdeviation of System Voltage [V]
U1N_RMS_UNDER	rms.rms.out.u1n_rms_under	Underdeviation of U1N [V]
U2N_RMS_UNDER	rms.rms.out.u2n_rms_under	Underdeviation of U2N [V]
U3N_RMS_UNDER	rms.rms.out.u3n_rms_under	Underdeviation of U3N [V]
U12_RMS_UNDER	rms.rms.out.u12_rms_under	Underdeviation of U12 [V]
U23_UNDER	rms.rms.out.u23_rms_under	Underdeviation of U23 [V]
U31_RMS_UNDER	rms.rms.out.u31_rms_under	Underdeviation of U31 [V]
U_RMS_OVER	rms.rms.out.u_rms_over	Overdeviation of System Voltage [V]
U1N_RMS_OVER	rms.rms.out.u1n_rms_over	Overdeviation of U1N [V]
U2N_RMS_OVER	rms.rms.out.u2n_rms_over	Overdeviation of U2N [V]
U3N_RMS_OVER	rms.rms.out.u3n_rms_over	Overdeviation of U3N [V]
U12_RMS_OVER	rms.rms.out.u12_rms_over	Overdeviation of U12 [V]
U23_RMS_OVER	rms.rms.out.u23_rms_over	Overdeviation of U23 [V]
U31_RMS_OVER	rms.rms.out.u31_rms_over	Overdeviation of U31 [V]

8.6.2.2 Under- and overdeviation in % of Udin

Name	Base	Description
U_UNDER	rms.rms.out.u_under	Underdeviation of System Voltage [%]
U1N_UNDER	rms.rms.out.u1n_under	Underdeviation of U1N [%]
U2N_UNDER	rms.rms.out.u2n_under	Underdeviation of U2N [%]
U3N_UNDER	rms.rms.out.u3n_under	Underdeviation of U3N [%]
U12_UNDER	rms.rms.out.u12_under	Underdeviation of U12 [%]
U23_UNDER	rms.rms.out.u23_under	Underdeviation of U23 [%]
U31_UNDER	rms.rms.out.u31_under	Underdeviation of U31 [%]
U_OVER	rms.rms.out.u_over	Overdeviation of System Voltage [%]
U1N_OVER	rms.rms.out.u1n_over	Overdeviation of U1N [%]
U2N_OVER	rms.rms.out.u2n_over	Overdeviation of U2N [%]
U3N_OVER	rms.rms.out.u3n_over	Overdeviation of U3N [%]
U12_OVER	rms.rms.out.u12_over	Overdeviation of U12 [%]
U23_OVER	rms.rms.out.u23_over	Overdeviation of U23 [%]
U31_OVER	rms.rms.out.u31_over	Overdeviation of U31 [%]

8.6.3 Aggregated values of under- and overdeviation

All mean values are addresses by the following id scheme: ID = [Module.Channel.Output.Value]

In all tables in this section, row “Base” stands for [Module.Channel].out.mean_out

Every channel contains the following values:

Actual interval:

Value	[Output.Value]	Description
Mean	out.mean_out	Mean Value over the mean interval
Minimum	out.mean_min	Minimum value during the interval
Maximum	out.mean_max	Maximum value during the interval
Count	interval_count.count	Interval counter

Last interval:

Value	[Output.Value]	Description
Mean	out_last.mean_out	Mean Value over the mean interval
Minimum	out_last.mean_min	Minimum value during the interval
Maximum	out_last.mean_max	Maximum value during the interval

Additional values:

Value	[Output.Value]	Description
Trend	out_trend.trend	Trend
Count	interval_count.count	Interval counter

8.6.3.1 150/180-Cycle Aggregation values

Name	Base	Description
U_UNDER_3S	mean_under_3s.u_under_3s.out.mean_out	Underdeviation of System Voltage
U1N_UNDER_3S	mean_under_3s.u1n_under_3s.out.mean_out	Underdeviation of U1N
U2N_UNDER_3S	mean_under_3s.u2n_under_3s.out.mean_out	Underdeviation of U2N
U3N_UNDER_3S	mean_under_3s.u3n_under_3s.out.mean_out	Underdeviation of U3N
U12_UNDER_3S	mean_under_3s.u12_under_3s.out.mean_out	Underdeviation of U12
U23_UNDER_3S	mean_under_3s.u23_under_3s.out.mean_out	Underdeviation of U23
U31_UNDER_3S	mean_under_3s.u31_under_3s.out.mean_out	Underdeviation of U31
U_OVER_3S	mean_over_3s.u_over_3s.out.mean_out	Overdeviation of System Voltage
U1N_OVER_3S	mean_over_3s.u1n_over_3s.out.mean_out	Overdeviation of U1N
U2N_OVER_3S	mean_over_3s.u2n_over_3s.out.mean_out	Overdeviation of U2N
U3N_OVER_3S	mean_over_3s.u3n_over_3s.out.mean_out	Overdeviation of U3N
U12_OVER_3S	mean_over_3s.u12_over_3s.out.mean_out	Overdeviation of U12
U23_OVER_3S	mean_over_3s.u23_over_3s.out.mean_out	Overdeviation of U23
U31_OVER_3S	mean_over_3s.u31_over_3s.out.mean_out	Overdeviation of U31

8.6.4 10min Aggregation values

Name	Base	Description
U_UNDER_10MIN	mean_under_10min.u_under_10min.out.mean_out	Underdeviation of System Voltage
U1N_UNDER_10MIN	mean_under_10min.u1n_under_10min.out.mean_out	Underdeviation of U1N
U2N_UNDER_10MIN	mean_under_10min.u2n_under_10min.out.mean_out	Underdeviation of U2N
U3N_UNDER_10MIN	mean_under_10min.u3n_under_10min.out.mean_out	Underdeviation of U3N
U12_UNDER_10MIN	mean_under_10min.u12_under_10min.out.mean_out	Underdeviation of U12
U23_UNDER_10MIN	mean_under_10min.u23_under_10min.out.mean_out	Underdeviation of U23
U31_UNDER_10MIN	mean_under_10min.u31_under_10min.out.mean_out	Underdeviation of U31
U_OVER_10MIN	mean_over_10min.u_over_10min.out.mean_out	Overdeviation of System Voltage
U1N_OVER_10MIN	mean_over_10min.u1n_over_10min.out.mean_out	Overdeviation of U1N
U2N_OVER_10MIN	mean_over_10min.u2n_over_10min.out.mean_out	Overdeviation of U2N
U3N_OVER_10MIN	mean_over_10min.u3n_over_10min.out.mean_out	Overdeviation of U3N
U12_OVER_10MIN	mean_over_10min.u12_over_10min.out.mean_out	Overdeviation of U12
U23_OVER_10MIN	mean_over_10min.u23_over_10min.out.mean_out	Overdeviation of U23
U31_OVER_10MIN	mean_over_10min.u31_over_10min.out.mean_out	Overdeviation of U31

8.6.5 2h Aggregation values

Name	Base	Description
U_UNDER_2H	mean_under_2h.u_under_2h.out.mean_out	Underdeviation of System Voltage
U1N_UNDER_2H	mean_under_2h.u1n_under_2h.out.mean_out	Underdeviation of U1N
U2N_UNDER_2H	mean_under_2h.u2n_under_2h.out.mean_out	Underdeviation of U2N
U3N_UNDER_2H	mean_under_2h.u3n_under_2h.out.mean_out	Underdeviation of U3N
U12_UNDER_2H	mean_under_2h.u12_under_2h.out.mean_out	Underdeviation of U12
U23_UNDER_2H	mean_under_2h.u23_under_2h.out.mean_out	Underdeviation of U23
U31_UNDER_2H	mean_under_2h.u31_under_2h.out.mean_out	Underdeviation of U31
U_OVER_2H	mean_over_2h.u_over_2h.out.mean_out	Overdeviation of System Voltage
U1N_OVER_2H	mean_over_2h.u1n_over_2h.out.mean_out	Overdeviation of U1N
U2N_OVER_2H	mean_over_2h.u2n_over_2h.out.mean_out	Overdeviation of U2N
U3N_OVER_2H	mean_over_2h.u3n_over_2h.out.mean_out	Overdeviation of U3N
U12_OVER_2H	mean_over_2h.u12_over_2h.out.mean_out	Overdeviation of U12
U23_OVER_2H	mean_over_2h.u23_over_2h.out.mean_out	Overdeviation of U23
U31_OVER_2H	mean_over_2h.u31_over_2h.out.mean_out	Overdeviation of U31

9 Reading Logger Content

These requests are only available to devices which have a SD card or integrated flash storage. Recorded data is stored differently depending on its type. These different data storage types are referred to as “logger” and every one of these is accessed by a different request.

9.1 Mean value logger

Normally a mean values are comprised of three individual values: the mean value itself, a maxima and a minima. The only exception to this are the values of the short term flicker and harmonics, which only hold the mean value itself. In addition the mean values of the harmonics comprise of all harmonic components. Therefore the short term flicker and harmonics are available via separate requests.

9.1.1 Read raw mean values

The REST API provides a quick way to acquire a certain number `[num]` of mean values up until the moment of the request:

GET `http://[device]/cb/logger/loadprofile/rawTable/[id]?num=[num]`

This request however is not suitable for large amounts of data points. Because of that there is a two-stage request where in the first stage the id and the period is specified and in the second stage the values are then downloaded in several subsequent requests:

GET `http://[device]/cb/logger/loadprofile/download/[id]?start=[start_ts]&end=[end_ts]`

followed by:

GET `http://[device]/cb/logger/loadprofile/download/[id]`

Note: The subsequent call must be repeated until all Elements have been received

Example of requesting the three latest mean values of the apparent power:

GET `http://[device]/cb/logger/loadprofile/rawTable/mean_t1.m_s.out.mean_out?num=3`

Response:


```xml
<values>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1651749900.000000000" quality="#00000000">
        <min>68949.2</min>
        <mean>86849</mean>
        <max>116867</max>
    </vtq>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1651750200.000000000" quality="#00000010">
        <min>66010.7</min>
        <mean>84797.2</mean>
        <max>131761</max>
    </vtq>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1651750500.000000000" quality="#00000000">
        <min>68752</min>
        <mean>89104.1</mean>
        <max>130444</max>
    </vtq>
</values>
```

Example of requesting mean values of the apparent power within a certain time range:

GET `http://[device]/cb/logger/loadprofile/download/mean_t1.m_s.out.mean_out?start=1642636800&end=1642637700`

Response:

4

Subsequent call:

GET `http://[device]/cb/logger/loadprofile/download/mean_t1.m_s.out.mean_out`

Response:


```xml
<values>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1642636800.000000000" quality="#00000010">
        <min>7909.25</min>
        <mean>19060.6</mean>
        <max>63804.7</max>
    </vtq>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1642637100.000000000" quality="#00000000">
        <min>8291.11</min>
        <mean>17157.8</mean>
        <max>58343.1</max>
    </vtq>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1642637400.000000000" quality="#00000010">
        <min>7209.65</min>
        <mean>10395.6</mean>
        <max>17207.6</max>
    </vtq>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1642637700.000000000" quality="#00000000">
        <min>7218.83</min>
        <mean>9936.75</mean>
        <max>55902.8</max>
    </vtq>
</values>
```


9.1.2 Read aggregated mean values

The mean value logger is able to aggregate mean values to another interval. This can be used to easily analyze load profiles over different periods. The REST API provides two requests for this matter:

Aggregate to hourly mean values:

GET `http://[device]/cb/logger/loadprofile/day/[id]?start=[start_ts]&end=[end_ts]`

Aggregate to daily mean values:

GET `http://[device]/cb/logger/loadprofile/week/[id]?start=[start_ts]&end=[end_ts]`

Example for aggregating apparent power mean values to an hourly interval:

GET http://[device]/cb/logger/loadprofile/day/mean_t1.m_s.out.mean_out?start=1642636800&end=1642637700

Response:


```xml
<values>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1642636800.000000000" quality="#00010000">
        <min>7909.25</min>
        <mean>19060.6</mean>
        <max>63804.7</max>
    </vtq>
    <vtq id="mean_t1.m_s.out.mean_out" timestamp="1642640400.000000000" quality="#00010000">
        <min>7209.65</min>
        <mean>12496.7</mean>
        <max>58343.1</max>
    </vtq>
</values>
```


Note: The request covers an interval of 15 minutes. But because the start timestamp and end timestamp lie in different hourly intervals the device returns two mean values. One that covers the timestamp of the start and one that covers the end.

9.1.3 Read short time flicker (PST) values

Short time flicker values can only be requested as raw mean values. There is no possibility to automatically aggregate them.

GET http://[device]/cb/logger/loadprofile/vtqrawTable/[id]?num=[num]

For larger calls there is also an alternative request:

GET http://[device]/cb/logger/loadprofile/vtqdownload/[id]?start=[start_ts]&end=[end_ts]

followed by:

GET http://[device]/cb/logger/loadprofile/vtqdownload/[id]

Example for requesting the most recent short term flicker value:

GET http://[device]/cb/logger/loadprofile/vtqrawTable/rms.flicker_u1n.pst.pst?num=1

Response:


```xml
<values>
    <vtq id="rms.flicker_u1n.pst.pst" timestamp="1651755600.000000000" quality="#00000000">
        <value>1.002</value>
    </vtq>
</values>
```

9.1.4 Read harmonic values

Harmonic values cannot be aggregated as well. Furthermore, they are only available via a two-stage request:

```
GET    http://[device]/cb/logger/loadprofile/arraydownload/[id]
       ?start=[start_ts]&end=[end_ts]
```

followed by:

```
GET    http://[device]/cb/logger/loadprofile/arraydownload/[id]
```

Example:

```
GET    http://[device]/cb/logger/loadprofile/arraydownload/
       mean_fft_harm_10min.u1n_harm_10min.out.mean_out_0
       ?start=1648811400&end=1648812000
```

Response:

2

Subsequent call:

```
GET    http://[device]/cb/logger/loadprofile/arraydownload/
mean_fft_harm_10min.u1n_harm_10min.out.mean_out_0
```

Response:


```
<values>
    <vtq  id="mean_fft_harm_10min.u1n_harm_10min.out.mean_out_0"
          timestamp="1648811400.000000000"
          quality="#00000000"
     >
        <value>0.00112749</value>
        ...
        <value>0.00166643</value>
    </vtq>
    <vtq  id="mean_fft_harm_10min.u1n_harm_10min.out.mean_out_0"
          timestamp="1648812000.000000000"
          quality="#00000000"
     >
        <value>0.00137793</value>
        ...
        <value>0.00170179</value>
    </vtq>
</values>
```


9.1.5 Mean value ids

9.1.5.1 Standard

Name	[id]	Description
AVG_P_I_IV	mean_t1.m_p_qdr14.out.mean_out	Mean-value P, quadrant I+IV [W]
AVG_P_II_III	mean_t1.m_p_qdr23.out.mean_out	Mean-value P, quadrant II+III [W]
AVG_Q_I_II	mean_t1.m_q_qdr12.out.mean_out	Mean-value Q, quadrant I+II [var]
AVG_Q_III_IV	mean_t1.m_q_qdr34.out.mean_out	Mean-value Q, quadrant III+IV [var]
AVG_S	mean_t1.m_s.out.mean_out	Mean-value S [VA]

9.1.5.2 Free configurable

Name	[id]	Description
AVG_1	mean_t2.mean1.out.mean_out	Configured mean-value 1
AVG_2	mean_t2.mean2.out.mean_out	Configured mean-value 2
…	…	…
AVG_12	mean_t2.mean12.out.mean_out	Configured mean-value 12

9.1.5.3 Power quality

Name	[id]	Description
F 10min	mean_10min.f_10min.out.mean_out	Frequency mean value 10min
U 10min	rms.filter_u_10min.out.filter_out_0	Voltage U 10min (single phase)
U1N 10min	rms.filter_u1n_10min.out.filter_out_0	Voltage U1N 10min
U2N 10min	rms.filter_u2n_10min.out.filter_out_0	Voltage U2N 10min
U3N 10min	rms.filter_u3n_10min.out.filter_out_0	Voltage U3N 10min
UNE 10min	rms.filter_une_10min.out.filter_out_0	Voltage UNE 10min
U12 10min	rms.filter_u12_10min.out.filter_out_0	Voltage U12 10min
U23 10min	rms.filter_u23_10min.out.filter_out_0	Voltage U23 10min
U31 10min	rms.filter_u31_10min.out.filter_out_0	Voltage U31 10min
I 10min	rms.filter_i_10min.out.filter_out_0	Current I 10min (single phase)
I1 10min	rms.filter_i1_10min.out.filter_out_0	Current I1 10min
I2 10min	rms.filter_i2_10min.out.filter_out_0	Current I2 10min
I3 10min	rms.filter_i3_10min.out.filter_out_0	Current I3 10min
THD U1N 10min	rms.filter_u1n_thds_10min.out.filter_out_0	Total harmonic distortion (THD) U1N 10min
THD U2N 10min	rms.filter_u2n_thds_10min.out.filter_out_0	Total harmonic distortion (THD) U2N 10min
THD U3N 10min	rms.filter_u3n_thds_10min.out.filter_out_0	Total harmonic distortion (THD) U3N 10min
THD U12 10min	rms.filter_u12_thds_10min.out.filter_out_0	Total harmonic distortion (THD) U12 10min
THD U23 10min	rms.filter_u23_thds_10min.out.filter_out_0	Total harmonic distortion (THD) U23 10min
THD U31 10min	rms.filter_u31_thds_10min.out.filter_out_0	Total harmonic distortion (THD) U31 10min
Ur2r1 10min	rms.filter_ur2r1_h1_10min.out.filter_out_0	Voltage imbalance 10min
PLT U1N 2h	flicker_2h.flicker_u1n_2h.out.mean_out	Long term flicker U1N 2h
PLT U2N 2h	flicker_2h.flicker_u2n_2h.out.mean_out	Long term flicker U2N 2h
PLT U3N 2h	flicker_2h.flicker_u3n_2h.out.mean_out	Long term flicker U3N 2h
PLT U12 2h	flicker_2h.flicker_u12_2h.out.mean_out	Long term flicker U12 2h
PLT U23 2h	flicker_2h.flicker_u23_2h.out.mean_out	Long term flicker U23 2h
PLT U31 2h	flicker_2h.flicker_u31_2h.out.mean_out	Long term flicker U31 2h
TDD I1 10min	rms.filter_i1_tdd_10min.out.filter_out_0	Total demand distortion (TDD) I1 10min
TDD I2 10min	rms.filter_i2_tdd_10min.out.filter_out_0	Total demand distortion (TDD) I2 10min
TDD I3 10min	rms.filter_i3_tdd_10min.out.filter_out_0	Total demand distortion (TDD) I3 10min
Ir2r1 10min	rms.filter_ir2r1_h1_10min.out.filter_out_0	Current imbalance 10min

Short term flicker

Name	[id]	Description
PST U1N 10min	rms.flicker_u1n.pst.pst	Short term flicker U1N 10min
PST U2N 10min	rms.flicker_u2n.pst.pst	Short term flicker U2N 10min
PST U3N 10min	rms.flicker_u3n.pst.pst	Short term flicker U3N 10min
PST U12 10min	rms.flicker_u12.pst.pst	Short term flicker U12 10min
PST U23 10min	rms.flicker_u23.pst.pst	Short term flicker U21 10min
PST U31 10min	rms.flicker_u31.pst.pst	Short term flicker U31 10min

Harmonics

Name	[id]	Description
H U1N	mean_fft_harm_10min.u1n_harm_10min.out.mean_out_0	Harmonics U1N 10min
H U2N	mean_fft_harm_10min.u2n_harm_10min.out.mean_out_0	Harmonics U2N 10min
H U3N	mean_fft_harm_10min.u3n_harm_10min.out.mean_out_0	Harmonics U3N 10min
H U12	mean_fft_harm_10min.u12_harm_10min.out.mean_out_0	Harmonics U12 10min
H U23	mean_fft_harm_10min.u23_harm_10min.out.mean_out_0	Harmonics U23 10min
H U31	mean_fft_harm_10min.u31_harm_10min.out.mean_out_0	Harmonics U31 10min
IH U1N	mean_fft_harm_10min.u1n_inter_10min.out.mean_out_0	Inter harmonics U1N 10min
IH U2N	mean_fft_harm_10min.u2n_inter_10min.out.mean_out_0	Inter harmonics U2N 10min
IH U3N	mean_fft_harm_10min.u3n_inter_10min.out.mean_out_0	Inter harmonics U3N 10min
IH U12	mean_fft_harm_10min.u12_inter_10min.out.mean_out_0	Inter harmonics U12 10min
IH U23	mean_fft_harm_10min.u23_inter_10min.out.mean_out_0	Inter harmonics U23 10min
IH U31	mean_fft_harm_10min.u31_inter_10min.out.mean_out_0	Inter harmonics U31 10min
H I1	mean_fft_harm_10min.i1_harm_10min.out.mean_out_0	Harmonics I1 10min
H I2	mean_fft_harm_10min.i2_harm_10min.out.mean_out_0	Harmonics I2 10min
H I3	mean_fft_harm_10min.i3_harm_10min.out.mean_out_0	Harmonics I3 10min
IH I1	mean_fft_harm_10min.i1_inter_10min.out.mean_out_0	Inter harmonics I1 10min
IH I2	mean_fft_harm_10min.i2_inter_10min.out.mean_out_0	Inter harmonics I2 10min
IH I3	mean_fft_harm_10min.i3_inter_10min.out.mean_out_0	Inter harmonics I3 10min

9.2 Meter logger

A meter has always two values. A high tariff value and a low tariff value. Both are accessible by a separate id. The logger maintains this structure. Furthermore, the recorded values are not scaled.

9.2.1 Read raw meter values

To get a certain number `[num]` of the latest meter values the following request can be used:

GET `http://[device]/cb/logger/meter/rawTable/[id]?num=[num]`

For large data requests a two-staged request should be used:

GET `http://[device]/cb/logger/meter/download/[id]?start=[ts_start]&end=[ts_end]`

followed by:

GET `http://[device]/cb/logger/meter/download/[id]`

Example for getting the latest meter logger entry for the active energy Q I+IV (high tariff):

GET `http://[device]/cb/logger/meter/rawTable/meter_standard.meter_p_qdr14.ht.hightariff?num=1`

Response:


```xml
<values>
    <dtq id="meter_standard.meter_p_qdr14.ht.hightariff" timestamp="1650616920.000000000" quality="#00000000">
        <value>527027900</value>
    </dtq>
</values>
```

9.2.2 Meter value ids

Standard

Name	ID	Description
P_I_IV_HT	meter_standard.meter_p_qdr14.ht.hightariff	Active energy QI+IV, high tariff [Wh]
P_II_III_HT	meter_standard.meter_p_qdr23.ht.hightariff	Active energy QII+III, high tariff [Wh]
Q_I_II_HT	meter_standard.meter_q_qdr12.ht.hightariff	Reactive energy QI+II, high tariff [varh]
Q_III_IV_HT	meter_standard.meter_q_qdr34.ht.hightariff	Reactive energy QIII+IV, high tariff [varh]
P_I_IV_LT	meter_standard.meter_p_qdr14.lt.lowtariff	Active energy QI+IV, low tariff [Wh]
P_II_III_LT	meter_standard.meter_p_qdr23.lt.lowtariff	Active energy QII+III, low tariff [Wh]
Q_I_II_LT	meter_standard.meter_q_qdr12.lt.lowtariff	Reactive energy QI+II, low tariff [varh]
Q_III_IV_LT	meter_standard.meter_q_qdr34.lt.lowtariff	Reactive energy QIII+IV, low tariff [varh]

Free configurable

Name	ID	Description
METER1_HT	meter_user.meter1.ht.hightariff	Free selectable meter 1, high tariff
METER2_HT	meter_user.meter2.ht.hightariff	Free selectable meter 2, high tariff
…	...	…
METER12_HT	meter_user.meter12.ht.hightariff	Free selectable meter 12, high tariff
METER1_NT	meter_user.meter1.lt.lowtariff	Free selectable meter 1, low tariff
METER2_NT	meter_user.meter2.lt.lowtariff	Free selectable meter 2, low tariff
...	...	…
METER12_NT	meter_user.meter12.lt.lowtariff	Free selectable meter 12, low tariff

9.3 Histogram logger

The distribution of the grid frequency and the signaling voltage are available as daily histograms. The histogram logger is able to combine several days into one histogram. However, it is important that the requested time period starts and ends on midnight otherwise the histogram is inaccurate. The histogram can be calculated using cumulative probability (`[cpr]` = true).

Frequency:

GET
```
http://[device]/cb/logger/histogram/LoggerHistogramFrequency/
rms.rms.systemfrequency.f_sys?start=[start_ts]&end=[end_ts]
&cumulative=[cpr]
```

Signaling voltage:

GET
```
http://[device]/cb/logger/histogram/LoggerHistogramMainsSign/
mean_3s.signal_3s.out.mean_out?start=[start_ts]&end=[end_ts]
&cumulative=[cpr]
```

Example:

GET
```
http://[device]/cb/logger/histogram/LoggerHistogramFrequency/
rms.rms.systemfrequency.f_sys?start=1642633200.100000000&
end=1642719600.000000000&cumulative=false
```

Response:


```
<values>
  <histogram
    id="rms.rms.systemfrequency.f_sys"
    timestamp="1642633200.000000272"
    timestamp_end="1642719600.000000000"
    quality="#00000000"
  >
    <lower>42.5</lower>
    <upper>69</upper>
    <missing>0</missing>
    <total>8640</total>
    <max>8640</max>
    <histogram_values>
      <value>0</value>
      <value>0</value>
      ...
      <value>0</value>
      <value>0</value>
    </histogram_values>
  </histogram>
</values>
```


9.4 Statistic logger

The statistic logger is used to test power quality values against limits. As the statistic logger is compatible to a variety of recorded values, the request is rather complex.

A period (defined by `[start_ts]` and `[end_ts])` should always cover at least 10 minutes and limits should always be presented as percentage value

9.4.1 Mean value statistic logger

To assess a common power quality related mean value the statistic logger must be provided by its nominal value `[nominal]`, an upper border `[upper limit]` and a lower border `[lower limit]`. The default nominal value for values, which do not have a nominal value (e.g. flicker or imbalance), is 100

GET
```
http://[device]/cb/logger/statistic/LoggerMean/[id]
?start=[start_ts]&end=[end_ts]&nominal=[nominal]&lower=[lower limit]
&upper=[upper limit]
```

To assess the short term flicker a separate request has to be used:

GET
```
http://[device]/cb/logger/statistic/LoggerVtq/[id]
?start=[start_ts]&end=[end_ts]&nominal=[nominal]&lower=[lower limit]
&upper=[upper limit]
```

To be able to define limits for every harmonic component, harmonics are also assessed by a separate request. This request does not need to be provided with a nominal value. It takes instead the number `[num]` of harmonic components that shall be assessed, the order `[order array]` of the affected components and the limits `[upper limit array]` itself as comma separated values

GET

```
http://[device]/cb/logger/statistic/LoggerVtq/[id]
?start=[start_ts]&end=[end_ts]&num=[num]&orders=[order array]
&uppers=[upper limit array]
```

9.4.2 Histogram statistic logger

The histogram statistic logger is divided in two requests. One is used for the frequency histogram and the other is used for the signaling voltage histogram. The selected time period of histogram statistics must always begin at midnight, as otherwise the statistic might be incorrect.

GET

```
http://[device]/cb/logger/statistic/LoggerHistogramFrequency/
rms.rms.systemfrequency.f_sys?start=[start_ts]&end=[end_ts]
&nominal=[nominal_frequency]&lower=[lower limit]&upper=[upper limit]
```

GET

```
http://[device]/cb/logger/statistic/ LoggerHistogramMainsSign/
mean_3s.signal_3s.out.mean_out?start=[start_ts]&end=[end_ts]
&nominal=100&lower=[lower limit]&upper=[upper limit]
```

9.4.3 Statistic logger for fast mean values

Some standards require to record data of mean values that use a short interval (< 10 minutes). As these mean values would fill up the available memory rather quickly, only the statistic result is stored. The limits for these values are automatically selected based on the user's configuration and it is not possible to supply different or additional limits combined with the request. Furthermore, some ids for this request are exclusive to mobile devices:

GET

```
http://[device]/cb/logger/statistic/LoggerStatistic/[id]
?start=[start_ts]&end=[end_ts]
```

Name	ID	Description
Frequency	rms.rms.systemfrequency.f_sys	Frequency 10s (mobile devices only)
Signaling voltage	mean_3s.signal_3s.out.mean_out	Signaling voltage 3s (mobile devices only)
THD U1N 3s	fft_3s.u1n_thds_3s.out.mean_out	Total Harmonic Distortion U1N 3s
THD U2N 3s	fft_3s.u2n_thds_3s.out.mean_out	Total Harmonic Distortion U2N 3s
THD U3N 3s	fft_3s.u3n_thds_3s.out.mean_out	Total Harmonic Distortion U3N 3s
THD U12 3s	fft_3s.u12_thds_3s.out.mean_out	Total Harmonic Distortion U12 3s
THD U23 3s	fft_3s.u23_thds_3s.out.mean_out	Total Harmonic Distortion U23 3s
THD U31 3s	fft_3s.u31_thds_3s.out.mean_out	Total Harmonic Distortion U31 3s
H U1N 3s	mean_fft_harm_3s.u1n_harm_3s.out.mean_out_0	Harmonics U1N 3s
H U2N 3s	mean_fft_harm_3s.u2n_harm_3s.out.mean_out_0	Harmonics U2N 3s
H U3N 3s	mean_fft_harm_3s.u3n_harm_3s.out.mean_out_0	Harmonics U3N 3s
H U12 3s	mean_fft_harm_3s.u12_harm_3s.out.mean_out_0	Harmonics U12 3s
H U23 3s	mean_fft_harm_3s.u23_harm_3s.out.mean_out_0	Harmonics U23 3s
H U31 3s	mean_fft_harm_3s.u31_harm_3s.out.mean_out_0	Harmonics U31 3s
TDD I1 3s	fft_3s.i1_tdd_3s.out.mean_out	Total Demand Distortion I1 3s
TDD I2 3s	fft_3s.i2_tdd_3s.out.mean_out	Total Demand Distortion I2 3s
TDD I3 3s	fft_3s.i3_tdd_3s.out.mean_out	Total Demand Distortion I3 3s
H I1 3s	mean_fft_harm_3s.i1_harm_3s.out.mean_out_0	Harmonics I1 3s
H I2 3s	mean_fft_harm_3s.i2_harm_3s.out.mean_out_0	Harmonics I2 3s
H I3 3s	mean_fft_harm_3s.i3_harm_3s.out.mean_out_0	Harmonics I3 3s

9.5 Event and alarm lists

To read back the content of the event or alarm list, the number of entries that should be returned must be specified. The device will then return the latest `[num]` entries.

GET `http://[device]/cb/logger/event/download/[list type]?num=[num]`

Name	[list type]
Event list	event
Alarm list	alarm

Example for requesting the last 3 alarm entries:

GET `http://[device]/cb/logger/event/download/alarm?num=3`

Response:


```xml
<values>
    <event type="alarm" timestamp="1651059203.401635288" source="1">
        <id>44</id>
        <sid>174</sid>
        <text>Overvoltage U1N</text>
        <state>0</state>
    </event>
    <event type="alarm" timestamp="1651062780.310357042" source="1">
        <id>44</id>
        <sid>174</sid>
        <text>Overvoltage U1N</text>
        <state>1</state>
    </event>
    <event type="alarm" timestamp="1651063558.320508023" source="1">
        <id>44</id>
        <sid>174</sid>
        <text>Overvoltage U1N</text>
        <state>0</state>
    </event>
</values>
```


9.6 Get time range of recorded data

The time ranges of the recorded data since the last reset may be read using the following request:

GET `http://[device]/cb/logger/datarange`

Example response:


```xml
<timerange>
    <start>1566458368.000000000</start>
    <end>1652876416.000000000</end>
</timerange>
```

9.7 Current Link and PME

9.7.1 Current mean values

The following two staged request can be used to get recorded mean values of current, TDDI and THDI (Current Link see 5.7.2.1, 5.7.2.2, 5.7.2.3; PME see 5.8.3.1, 5.8.3.2, 5.8.3.3):

GET `http://[device]/cb/logger/loadprofile/array12download/[id]?start=[start_ts]&end=[end_ts]`

Followed by:

GET `http://[device]/cb/logger/loadprofile/array12download/[id]`

Example:

GET `http://[device]cb/logger/loadprofile/array12download/mean_cl.i_cl1.out.mean_4?start=1685916000.100000000&end=1686002400.000000000`

Followed by:

GET `http://[device]cb/logger/loadprofile/array12download/mean_cl.i_cl1.out.mean_4`

Response:


```
<values>
    <vtq id="mean_cl.i_cl1.out.mean_4" timestamp="1685916600.000000000" quality="#00000000">
        <min>54.6394</min>
        <mean>72.7434</mean>
        <max>113.856</max>
    </vtq>
    ...
    <vtq id="mean_cl.i_cl1.out.mean_4" timestamp="1685961000.000000000" quality="#00000000">
        <min>78.7239</min>
        <mean>87.5389</mean>
        <max>98.8116</max>
    </vtq>
</values>
```


9.7.2 Power mean values

The following two staged request can be used to get recorded mean values of power, cos(φ) an power factor (Current Link see 5.7.2.4, 5.7.2.5, 5.7.2.6, 5.7.2.7, 5.7.2.8, 5.7.2.9; PME see 5.8.3.4, 5.8.3.5, 5.8.3.6, 5.8.3.7, 5.8.3.8, 5.8.3.9):

GET `http://[device]/cb/logger/loadprofile/array24download/[id]?start=[start_ts]&end=[end_ts]`

Followed by:

GET `http://[device]/cb/logger/loadprofile/array24download/[id]`

Example:

GET http://[device]/cb/logger/loadprofile/array24download/mean_energy.power_cl1.out.mean_2?start=1685829600.001&end=1685961033.434413

Followed by:

GET http://[device]/cb/logger/loadprofile/array24download/mean_energy.power_cl1.out.mean_2

Response:


```
<values>
    <dtq id="mean_energy.power_cl1.out.mean_2" timestamp="1685830200.000000000" quality="#00000000">
        <min>-46.817</min>
        <mean>-32.8525</mean>
        <max>-18.9371</max>
    </dtq>
    ...
    <dtq id="mean_energy.power_cl1.out.mean_2" timestamp="1685961000.000000000" quality="#00000000">
        <min>191.154</min>
        <mean>208.09</mean>
        <max>240.27</max>
    </dtq>
</values>
```

10 PQ-Events

Every power quality event that the device detected is stored as a list entry, a RMS½ recording and a sample recording. This chapter describes how each of these recordings can be accessed.

10.1 Read power quality event list

The power quality event list can be acquired by using one of the following requests:

Get the latest `[num]` entries:

GET `http://[device]/cb/logger/faultrecorder/rawTable/pqeventlogger?num=[num]`

Get a list of events between a start date `[start_ts]` and end date `[end_ts]`:

GET `http://[device]/cb/logger/faultrecorder/rawTable/pqeventlogger?start=[start_ts]&end=[end_ts]`

As the latter request might deliver a large response, it can also be used as part of a two-staged request by adding the query parameter `&async`:

GET `http://[device]/cb/logger/faultrecorder/rawTable/pqeventlogger?start=[start_ts]&end=[end_ts]&async`

Followed by:

GET `http://[device]/cb/logger/faultrecorder/rawTable/pqeventlogger`

Example for requesting a PQ event list using a two-staged request:

GET `http://[device]/cb/logger/faultrecorder/rawTable/pqeventlogger?start=1632236400&end=1634914799async`

Response:


```
<ok start="true" num="1">true</ok>
```

Subsequent request:

GET `http://[device]/cb/logger/faultrecorder/rawTable/pqeventlogger`

Response:


```xml
<values>
   <event  type="pqeventlogger"
           timestamp="1634877655.701485972"
           duration="0.690339410"
           triggertype="4"
           source="7"
           systemtype="10"
   >
        <rms>
            <start>1634877654.691591769</start><end>1634877658.371942847</end>
            <start>1634877654.691591769</start><end>1634877658.371942847</end>
            <start>1634877654.691591769</start><end>1634877658.371942847</end>
            <start>1634877654.691591769</start><end>1634877658.371942847</end>
            <start>1634877654.701537589</start><end>1634877658.381888337</end>
            <start>1634877654.691647329</start><end>1634877658.371998407</end>
            <start>1634877654.700537449</start><end>1634877658.380888227</end>
            <start>1634877654.691591769</start><end>1634877658.371942847</end>
            <start>1634877654.691591769</start><end>1634877658.371942847</end>
            <start>1634877654.691591769</start><end>1634877658.371942847</end>
            <start>1634877654.691591769</start><end>1634877658.371942847</end>
        </rms>
        <samples>
            <start>1634877655.601692232</start><end>1634877655.901571052</end>
        </samples>
        <reference>230</reference>
        <value1>14.025</value1>
        <value2>2.28671</value2>
    </event>
</values>
```


Every event list entry contains the following information

`timestamp`: time when the event occurred in seconds
`duration`: duration of the event in seconds
`triggertype`: PQ-Event type, see chapter 10.1.1
`source`: bitmask of involved channels, see chapter 10.1.2
`systemtype`: System type, see chapter 10.1.3

`rms`: `start` and `stop` timestamps for each phase (U1N, U2N, U3N, UNE, U12, U23, U31, I1, I2, I3, IN)
`samples`: `start` and `stop` timestamps for samples

`reference`: nominal voltage
`value1`,`value2`: see chapter 10.1.1 for explanation

10.1.1 Event types

triggertype	event type	value1	unit	value2	unit
1	Voltage swell	maximum swell magnitude = largest U_{rms} value measured on any channel during the swell (IEC 61000-4-30, 5.4.3.2 Voltage swell evaluation)	V	-	-
2	Voltage dip	residual voltage = lowest U_{rms} value measured on any channel during the dip (IEC 61000-4-30, 5.4.2.2 Voltage dip evaluation)	V	depth = difference between the reference voltage and the residual voltage (IEC 61000-4-30, 5.4.2.2 Voltage dip evaluation)	V
3	Voltage interruption	residual voltage = lowest U_{rms} value measured on any channel during the dip (IEC 61000-4-30, 5.4.2.2 Voltage dip evaluation)	V	depth = difference between the reference voltage and the residual voltage (IEC 61000-4-30, 5.4.2.2 Voltage dip evaluation)	V
4	Rapid voltage change	ΔU_{max} = maximum absolute difference between any of the $U_{rms(1/2)}$ values during the RVC event and the final arithmetic mean (IEC 61000-4-30, 5.11.3 RVC event evaluation)	V	ΔU_{ss} = absolute difference between the final arithmetic mean value just prior to the RVC event and the first arithmetic mean (IEC 61000-4-30, 5.11.3 RVC event evaluation)	V
5	Current swell	Largest I_{rms} value measured on any channel during the swell	A	Lowest I_{rms} value measured on any channel during the swell	A
10	Snapshot	-	-	-	-
15	Frequency anomaly	Largest frequency measured during the anomaly	Hz	Lowest frequency measured during the anomaly	Hz
16	Digital input ON	-	-	-	-
17	Digital input OFF	-	-	-	
18	Voltage imbalance	residual voltage = lowest U_{rms} value measured on any channel during the voltage imbalance	V	-	-

10.1.2 Bitmask of the event source

The source of the event is encoded in a bitmask that has the following structure:

Bit (2^x)	Value	Source
0	1	U1
1	2	U2
2	4	U3
3	8	U4
4	16	U12
5	32	U23
6	64	U31
7	128	I1
8	256	I2
9	512	I3
10	1024	I4
11	2048	F
12	4096	Digital Input 1
13	8192	Digital Input 2
14	16384	Digital Input 3
15	32768	Digital Input 4
16	65536	Digital Input 5
17	131072	Digital Input 6
18	262144	Digital Input 7
19	524288	Digital Input 8
20	1048576	Digital Input 9
21	2097152	Digital Input 10
22	4194304	Digital Input 11
23	8388608	Digital Input 12

Note: Only fast digital inputs of the rack devices are able to trigger events

Example for calculating the trigger sources:

```
<values>
   <event  type="pqeventlogger"
           timestamp="1634877655.701485972"
           duration="0.690339410"
           triggertype="4"
           source="7"
           systemtype="10"
   >
   ...
    </event>
</values>
```

$$7 = 2^0 + 2^1 + 2^2 = 1 + 2 + 3 = U1 + U2 + U3$$

The event has therefore been triggered on U1N, U2N and U3N simultaneously.

10.1.3 System type

The system type is shown by a number that lays between 1 and 11. You can see in the table which number correspond to which system type

systemtype	Description
1	Single-phase
2	Split-phase
3	3-wire system, balanced load
4	3-wire system, balanced load, voltage measurement L1-L2 (only in non-PQ-devices possible)
5	3-wire system, balanced load, voltage measurement L2-L3 (only in non-PQ-devices possible)
6	3-wire system, balanced load, voltage measurement L3-L1 (only in non-PQ-devices possible)
7	3-wire system, unbalanced load
8	3-wire system, unbalanced load, Aron connection
9	4-wire system, balanced load
10	4-wire system, unbalanced load
11	4-wire system, unbalanced load, Open-Y (only in non-PQ-devices possible)

10.2 Read RMS½ records of an event

The RMS½ records of every phase is stored separately. A power quality event list entry shows eleven time intervals for the RMS½ values as these might differ. The RMS½ logger is only active during an event. Because of that the interval of a request must at least overlap with an event interval to provide data.

As RMS½ recordings might be large, they are requested in a two-staged request:

GET `http://[device]/cb/logger/faultrecorder/rms/[id]?start=[start_ts]&end=[end_ts]&async`

Followed by:

GET `http://[device]/cb/logger/faultrecorder/rms/[id]`

Example:

GET `http://[device]/cb/logger/faultrecorder/rms/u1n_rmslogger?start= 1634877654.691000000&end= 1634877658.371000000&async`

Response:


```xml
<ok start="true" num="367">true</ok>
```


Subsequent request:

GET `http://[device]/cb/logger/faultrecorder/rms/u1n_rmslogger`

Response:


```xml
<values>
    <vtq type="u1n_rmslogger" timestamp="1634877654.691591769" quality="#00000000">
        <value>117.769</value>
    </vtq>
    ...
    <vtq type="u1n_rmslogger" timestamp="1634877658.361941767" quality="#00000000">
        <value>117.85</value>
    </vtq>
</values>
```


10.2.1 RMS½ recorder ids

The following ids must be used to request data from the corresponding phases

Phase	id
U1N	u1n_rmslogger
U2N	u2n_rmslogger
U3N	u3n_rmslogger
UNE	une_rmslogger
U12	u12_rmslogger
U23	u23_rmslogger
U31	u31_rmslogger
I1	i1_rmslogger
I2	i2_rmslogger
I3	i3_rmslogger
IN	in_rmslogger

10.3 Read sample data of an event

The sample data of each phase is collected in a single logger. Therefore, a single sample request provides data for all phases.

The data is acquired by using a two-staged request:

GET `http://[device]/cb/logger/faultrecorder/samples/samples_logger?start=[start_ts]&end=[end_ts]&async`

Followed by:

GET `http://[device]/cb/logger/faultrecorder/samples/samples_logger`

Example:

GET `http://[device]/cb/logger/faultrecorder/samples/samples_logger?start= 1634877655.601692200&end= 1634877655.901571000&async`

Response:


```
<ok start="true" num="5399">true</ok>
```


Subsequent request:

GET `http://[device]/cb/logger/faultrecorder/samples/samples_logger`

Response:


```
<values>
    <vtq type="samples_logger" timestamp="1634877655.601692232" quality="#00000000">
        <u1n>-1.32575</u1n>
        <u2n>-1.30484</u2n>
        <u3n>-1.28435</u3n>
        <u4n>-1.27063</u4n>
        <u12>0.0209115</u12>
        <u23>0.020486</u23>
        <u31>-0.0413975</u31>
        <i1>0.00971414</i1>
        <i2>0.00939426</i2>
        <i3>0.00827529</i3>
        <i4>-2.5061e-5</i4>
    </vtq>
    ...
</values>
```

10.4 Current Link specific expansion

Current Link devices that are able to record current data (Current Link Multi PQ) will show additional information about current swell events and the RMS value of each from every module can be downloaded individually.

10.4.1 Addition in event list for current swell events

Current swell events will show an additional tag, which contains information about the module that triggered the event as well as how many modules in total recorded the event. The trigger type 23 indicates that the current swell occurred on a module:


```
<event type="pqeventlogger"
       timestamp="1685955948.512547509"
       duration="0.310155990"
       triggertype="23"
       source="256"
       systemtype="10">
        <rms>
            <start>1685955947.512064287</start>end>1685955949.813372447</end>
            <start>1685955947.518734037</start><end>1685955949.820042647</end>
            <start>1685955947.515399167</start>end>1685955949.816540787</end>
            <start>1685955947.512064287</start>end>1685955949.813372447</end>
            <start>1685955947.512547532</start>end>1685955949.821710197</end>
            <start>1685955947.512547532</start>end>1685955949.818375097</end>
            <start>1685955947.512547532</start><end>1685955949.815039997</end>
        </rms>
        <samples>
            <start>1685955947.912420007</start><end>1685955950.013478327</end>
        </samples>
        <reference>0.000000</reference>
        <value1>0.000000</value1>
        <value2>0.000000</value2>
        <extended>
            <recorded_channels>3</recorded_channels>
            <trigger_channel>1</trigger_channel>
            <trigger_channel_name>Bus bar 1st floor</trigger_channel_name>
        </extended>
    </event>
```

10.4.2 RMS½ record-ids for each current module

The following id's are used to request the data for the corresponding phases:

Phase	id
CL1 I1 … CL9 I1	m1_i1_rmslogger m9_i1_rmslogger
CL1 I2 … CL9 I2	m1_i2_rmslogger m9_i2_rmslogger
CL1 I3 … CL9 I3	m1_i3_rmslogger m9_i3_rmslogger
CL1 IN … CL9 IN	m1_in_rmslogger m9_in_rmslogger

11 Security and RBAC

The REST API can be protected against unauthorized access by enabling the Role Based Access Control (RBAC). After that every request must provide an additional access token to gain access to any REST command.

The access token is a JSON Web Token (JWT) that is signed by the device. It can be acquired in several ways that are described in chapter 11.1 and is exchanged via the Cookie header of a request. Furthermore, the access token is bound to a session, therefore the session token (chapter 1.6) must also be supplied in every request.

11.1 Acquiring an access token

Only the device itself can generate access token as every device has a unique private key that is used to sign the tokens.

The device can generate two types of tokens: Timely limited and timely unlimited tokens. Timely limited tokens are meant to be used by users that use the Graphical User Interface (GUI) whereas the timely unlimited tokens are called “API keys” and are meant to be used by an application.

In addition, the device grants timely unlimited access tokens to users of the GUI when they are not logged in. This access token belongs to the user “Anonymous”. This user has (if not configured otherwise) only read rights.

11.1.1 Acquiring an API key

API keys must be preconfigured using the GUI. Please refer to the device manual for more information.

11.1.2 Acquiring a timely unlimited access token for the user “Anonymous”

This access token can easily be acquired by anyone using the following request:

```
GET     http://[device]/auth/status
```

As this request has a second function (chapter 11.1.4) it is important that the request does not contain any access token to get one for the user “Anonymous”

Example response:

```
<empty response>
```

Note: The response contains a Set-Cookie header where the access token is supplied

11.1.3 Acquiring a timely limited access token for any valid user

To acquire an access token for any valid user, a login procedure must be performed. The login procedure is similar to the digest authentication but using a SHA256 hash instead of a MD5 hash.

The first request initializes the login process and requests a random number `[nonce]` that is used in subsequent calls:

GET `http://[device]/auth/login?init=true`

After that the random number in the response is used to calculate the login hash, which is done in two steps:

1. Create a hash `[HASH1]` of the `[username]` and the `[password]`:

   $[HASH1] = SHA265([username]:[password])$

2. Generate a second 16 digit random number `[cnonce]` and then create a second hash `[HASH2]` of the first random number `[nonce]`, the second random number `[cnonce]` and the first hash `[HASH1]`:

   $[HASH2] = SHA256([HASH1]:[nonce]:[cnonce])$

And this hash [HASH2] is then used in a subsequent request:

GET `http://[device]/auth/login`
`?user=[username]&nonce=[nonce]&cnonce=[cnonce]&response=[HASH2]`

Example:

GET `http://[device]/auth/login?init=true`

Response:

```
<nonce>ebc002312779c63b</nonce>
```

Calculations:

$$
\begin{aligned}
&username = admin \\
&password = 1234 \\
&nonce = ebc002312779c63b \\
&cnonce = bb088110acf5cf7b \\
&HASH1 = SHA256(admin:1234) = f8e68e8d44bfb5314974a97f787d017ff6ac9d0046083f28665fcf96f0cef80c \\
&HASH2 \\
&= SHA256(f8e68e8d44bfb5314974a97f787d017ff6ac9d0046083f28665fcf96f0cef80c:ebc002312779c63b:bb088110acf5cf7b) \\
&= da08965feae116ab10173faf17cca664739e78ff852ad43428a1bd8d50c13d93
\end{aligned}
$$

Subsequent call:

GET `http://[device]/auth/login`
`?user=admin&nonce=ebc002312779c63b&cnonce=bb088110acf5cf7b`
`&response=da08965feae116ab10173faf17cca664739e78ff852ad43428a1bd8d50c1`
`3d93`

Response:

```
<login>
    <loginattempts>0</loginattempts>
    <lastlogin>2022-05-19T01:18:47</lastlogin>
</login>
```

Note: The response contains a Set-Cookie header where the access token is supplied

If the login procedure fails the device responds with a single id sent in plain text:

- Username or password incorrect

  gui.security.credentialswrong

- The requested RBAC user is temporarily blocked because to many login attempts were unsuccessful:

  gui.security.userbanned

When a user is temporarily blocked it is not possible to use it to log into the device. The blocking time is increased with each unsuccessful attempt, up to a maximum of 1 hour. This is a countermeasure to prevent access through brute force:

Failed login attempt	Blocking time
1, 2	0
3	5 seconds
4	30 seconds
5	1 minute
6	30 minutes
> 6	1 hour

11.1.4 Refresh a timely limited access token

Calls that are made using an invalid or expired access token are automatically redirected, so that the device can issue a new valid token. Timely limited access tokens will automatically be refreshed by this redirect if the expiring date is no older than one minute. Due to limitations of the REST API, the redirection changes the http method of the initial request always to GET. Because of that it is possible that these requests then may fail or provide invalid data.

A timely limited access token can however be refreshed at any time while it is still valid by calling:

GET `http://[device]/auth/status`

Example response:

`<empty response>`

Note: The response contains a Set-Cookie header where the access token is supplied

11.2 Append an access token to requests

The access token is provided in the cookie field of the request header. It is using the keyword `AccessToken` and the token itself is a JSON Web Token `[JWT]`. The structure is defined as:

```
AccessToken=[JWT];
```

Both the access token and the session token are provided in the cookie field. Although some REST clients can create multiple Cookie headers, the API itself expects only one occurrence. Any further occurrence is ignored. Therefore, it is important that both cookies are placed in the same header (the order does not matter):

```
AccessToken=[JWT]; sessionToken={[UUID]};
```

or

```
sessionToken={[UUID]}; AccessToken=[JWT];
```

Example:

```
Cookie:
AccessToken=eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJhdWQiOiIxYjg4IiwiaWF0IjoxNTc5MTU4OTc4LCJzdWIiOi
Jhbm9ueW1vdXMiLCJ0eG4iOiIxOTIuMTY4LjU4LjExNCJ9.LiLjuJcs2bZAmYHlvdMXTAlr87gxUX-3kZ4cfz6jdMc;
sessionToken={5d1ca47c-8d38-4a08-85d5-fefbd941fa20}
```

Note: A session token may change after the login procedure or when an access token is used for the first time

12 Accessing local data storage

The device may be configured to store files on the internal SD card.

Currently the device supports the storage of the following files:

Type	Content
csv	Standard mean values
	User mean values
pqdif	Statistics
	Histograms
	Events

12.1 General folder structure and naming convention

12.1.1 CSV files

All CSV files are stored in a folder named `/csv`.
Inside this folder the files are named accordingly to this pattern:

```
[Device_Location]_[Test_Point]_[ISO_Date]_[Content_Type].csv
```

Name part	Explanation
`Device_Location`	Location of the device. This field can be configured by changing the configuration parameter `sys.config.location`
`Test_Point`	Test point. This field can be configured by changing the configuration parameter `sys.config.locationObject`
`ISO_Date`	Date and time of the first interval in the file. The display format is similar to an ISO 8601 date string.
`Content_Type`	Describes the content of the file. Can either be `Standard_Mean` or `User_Mean`

12.1.2 pqdif files

pqdif files are placed in a fixed folder structure. This structure contains the year, month and day at which the data for the corresponding files stem from (a file containing several days is placed in the folder corresponding to the last day of the file):

```
/pqdif/y[YYYY]/m[MM]/d[DD]
```

Name part	Explanation
`YYYY`	4 digit year
`MM`	2 digit month. Months smaller than 10 must contain a leading zero
`DD`	2 digit day. Days smaller than 10 must contain a leading zero.

The files itself are named accordingly to the following pattern:

```
One day:      [Device_Type]-[Serial_Number]_[Date_Start]_[Content_Type].pqd
Several days: [Device_Type]-[Serial_Number]_[Date_Start]—[Date_End]_[Content_Type].pqd
```

Name part	Explanation
`Device_Type`	Device type e.g. PQ5000
`Serial_Number`	Unique serial number of the device.
`Date_Start`	Date of the first day the file contains. The date is formatted as YYYYMMDD.
`Date_End`	Date of the last day the file contains. The date is formatted as YYYYMMDD.

12.2 Browsing the file structure

The folders in which the pqdif and csv files are stored can freely be browsed by using the following request:

GET `http://[device]/cb/localstorage/data/[folderpath]`

The request supports any depth.

Example for requesting a month folder:

GET `http://[device]/cb/localstorage/data/ pqdif/y2021/m11`

Response:


```xml
<directory path="pqdif/y2021/m11">
    <content type="directory">d06</content>
    <content type="directory">d08</content>
    <content type="directory">d28</content>
    <content type="directory">d14</content>
    <content type="directory">d22</content>
    <content type="directory">d11</content>
    <content type="directory">d21</content>
    <content type="directory">d26</content>
    <content type="directory">d05</content>
    <content type="directory">d19</content>
    <content type="directory">d15</content>
    <content type="directory">d18</content>
    <content type="directory">d25</content>
    <content type="directory">d07</content>
    <content type="directory">d23</content>
    <content type="directory">d29</content>
    <content type="directory">d01</content>
    <content type="directory">d27</content>
    <content type="directory">d13</content>
    <content type="directory">d10</content>
    <content type="directory">d02</content>
    <content type="directory">d12</content>
    <content type="directory">d03</content>
    <content type="directory">d20</content>
    <content type="directory">d16</content>
    <content type="directory">d17</content>
    <content type="directory">d09</content>
    <content type="directory">d04</content>
    <content type="directory">d30</content>
    <content type="directory">d24</content>
</directory>
```

Example for requesting a day folder:

```
GET         http://[device]/cb/localstorage/data/ pqdif/y2021/m11/d01
```

Response:


```xml
<directory path="pqdif/y2021/m11/d01">
    <content    type="file"
                suffix="pqd"
                timestamp="1635808336.660973116"
                size="969252"
                fullpath="pqdif/y2021/m11/d01/PQ5000-1211802001_20211101_Statistics.pqd"
     >
     PQ5000-1211802001_20211101_Statistics
     </content>
     <content   type="file"
                suffix="pqd"
                timestamp="1635808337.140973116"
                size="48620"
                fullpath="pqdif/y2021/m11/d01/PQ5000-1211802001_20211101_Histograms.pqd"
     >
     PQ5000-1211802001_20211101_Histograms
     </content>
</directory>
```


12.3 Downloading a file

The same request is used to download files. In this case the path must point directly to a file:

```
GET         http://[device]/cb/localstorage/data/[pathtofile]
```

Example for downloading a file from the previous example:

```
GET         http://[device]/cb/localstorage/data/
             pqdif/y2021/m11/d01/pqdif/y2021/m11/d01/PQ5000-
            1211802001_20211101_Statistics.pqd
```

Response:

```
<pqdif file>
```

12.4 Deleting a file or a folder

To remove a file or an entire folder including subfolders and files a DELETE request can be performed:

```
DELETE      http://[device]/cb/localstorage/data/[pathtofileorfolder]
```

Note: The only folders that may not be deleted are the base folders for the csv and pqdif files.

Example:

```
DELETE      http://[device]/cb/localstorage/data/pqdif/y2021/m11
```

Response

```
<empty response>
```

13 Special function values for certification

13.1 History Values

- out_0: value of last interval (t)
- out_1: value of interval (t-1T)

13.1.1 History values of Rms10/12 Values

ID	Description
history_rms.hist_u1n.out_1.out_1 history_rms.hist_u1n.out_0.out_0	History values of U1N
history_rms.hist_u2n.out_1.out_1 history_rms.hist_u2n.out_0.out_0	History values of U2N
history_rms.hist_u3n.out_1.out_1 history_rms.hist_u3n.out_0.out_0	History values of U3N
history_rms.hist_u12.out_1.out_1 history_rms.hist_u12.out_0.out_0	History values of U12
history_rms.hist_u23.out_1.out_1 history_rms.hist_u23.out_0.out_0	History values of U23
history_rms.hist_u31.out_1.out_1 history_rms.hist_u31.out_0.out_0	History values of U31
history_rms.hist_i1.out_1.out_1 history_rms.hist_i1.out_0.out_0	History values of I1
history_rms.hist_i2.out_1.out_1 history_rms.hist_i2.out_0.out_0	History values of I1
history_rms.hist_i3.out_1.out_1 history_rms.hist_i3.out_0.out_0	History values of I1
history_rms.hist_u_rms_under.out_1.out_1 history_rms.hist_u_rms_under.out_0.out_0	History values of u_rms_under
history_rms.hist_u1n_rms_under.out_1.out_1 history_rms.hist_u1n_rms_under.out_0.out_0	History values of u1n_rms_under
history_rms.hist_u2n_rms_under.out_1.out_1 history_rms.hist_u2n_rms_under.out_0.out_0	History values of u2n_rms_under
history_rms.hist_u3n_rms_under.out_1.out_1 history_rms.hist_u3n_rms_under.out_0.out_0	History values of u3n_rms_under
history_rms.hist_u12_rms_under.out_1.out_1 history_rms.hist_u12_rms_under.out_0.out_0	History values of u12_rms_under
history_rms.hist_u23_rms_under.out_1.out_1 history_rms.hist_u23_rms_under.out_0.out_0	History values of u23_rms_under
history_rms.hist_u31_rms_under.out_1.out_1 history_rms.hist_u31_rms_under.out_0.out_0	History values of u31_rms_under
history_rms.hist_u_rms_over.out_1.out_1 history_rms.hist_u_rms_over.out_0.out_0	History values of u_rms_over
history_rms.hist_u1n_rms_over.out_1.out_1 history_rms.hist_u1n_rms_over.out_0.out_0	History values of u1n_rms_over
history_rms.hist_u2n_rms_over.out_1.out_1 history_rms.hist_u2n_rms_over.out_0.out_0	History values of u2n_rms_over
history_rms.hist_u3n_rms_over.out_1.out_1 history_rms.hist_u3n_rms_over.out_0.out_0	History values of u3n_rms_over
history_rms.hist_u12_rms_over.out_1.out_1 history_rms.hist_u12_rms_over.out_0.out_0	History values of u12_rms_over
history_rms.hist_u23_rms_over.out_1.out_1 history_rms.hist_u23_rms_over.out_0.out_0	History values of u23_rms_over
history_rms.hist_u31_rms_over.out_1.out_1 history_rms.hist_u31_rms_over.out_0.out_0	History values of u31_rms_over

13.1.2 History values of THD, TDD and unbalance values

- out_0: value of last interval (t)
- out_1: value of interval (t-1T)

ID	Description
history_thdunb.u1n_thds.out_1.out_1 history_thdunb.u1n_thds.out_0.out_0	History Values of THD(U1N)
history_thdunb.u2n_thds.out_1.out_1 history_thdunb.u2n_thds.out_0.out_0	History Values of THD(U2N)
history_thdunb.u3n_thds.out_1.out_1 history_thdunb.u3n_thds.out_0.out_0	History Values of THD(U3N)
history_thdunb.u12_thds.out_1.out_1 history_thdunb.u12_thds.out_0.out_0	History Values of THD(U12)
history_thdunb.u23_thds.out_1.out_1 history_thdunb.u23_thds.out_0.out_0	History Values of THD(U23)
history_thdunb.u31_thds.out_1.out_1 history_thdunb.u31_thds.out_0.out_0	History Values of THD(U31)
history_thdunb.i1_tdd.out_1.out_1 history_thdunb.i1_tdd.out_0.out_0	History Values of TDD(I1)
history_thdunb.i2_tdd.out_1.out_1 history_thdunb.i2_tdd.out_0.out_0	History Values of TDD(I2)
history_thdunb.i3_tdd.out_1.out_1 history_thdunb.i3_tdd.out_0.out_0	History Values of TDD(I3)
history_thdunb.ur1_h1.out_1.out_1 history_thdunb.ur1_h1.out_0.out_0	History Values of UR1(H1)
history_thdunb.ur2_h1.out_1.out_1 history_thdunb.ur2_h1.out_0.out_0	History Values of UR2(H1)
history_thdunb.u0_h1.out_1.out_1 history_thdunb.u0_h1.out_0.out_0	History Values of U0(H1)
history_thdunb.ir1_h1.out_1.out_1 history_thdunb.ir1_h1.out_0.out_0	History Values of IR1(H1)
history_thdunb.ir2_h1.out_1.out_1 history_thdunb.ir2_h1.out_0.out_0	History Values of IR2(H1)
history_thdunb.i0_h1.out_1.out_1 history_thdunb.i0_h1.out_0.out_0	History Values of I0(H1)
history_thdunb.ur2r1_h1.out_1.out_1 history_thdunb.ur2r1_h1.out_0.out_0	History Values of UR2/UR1(H1)
history_thdunb.ir2r1_h1.out_1.out_1 history_thdunb.ir2r1_h1.out_0.out_0	History Values of IR2/IR1(H1)
history_thdunb.ur0r1_h1.out_1.out_1 history_thdunb.ur0r1_h1.out_0.out_0	History Values of UR0/UR1(H1)
history_thdunb.ir0r1_h1.out_1.out_1 history_thdunb.ir0r1_h1.out_0.out_0	History Values of IR0/IR1(H1)

13.1.3 History values of Rms150/180 values

- out_0: value of last interval (t)
- out_1: value of interval (t-1T)

ID	Description
history_3s.hist_u1n_3s.out_1.out_1 history_3s.hist_u1n_3s.out_0.out_0	History values of U1N_3S
history_3s.hist_u2n_3s.out_1.out_1 history_3s.hist_u2n_3s.out_0.out_0	History values of U2N_3S
history_3s.hist_u3n_3s.out_1.out_1 history_3s.hist_u3n_3s.out_0.out_0	History values of U3N_3S
history_3s.hist_u12_3s.out_1.out_1 history_3s.hist_u12_3s.out_0.out_0	History values of U12_3S
history_3s.hist_u23_3s.out_1.out_1 history_3s.hist_u23_3s.out_0.out_0	History values of U23_3S
history_3s.hist_u31_3s.out_1.out_1 history_3s.hist_u31_3s.out_0.out_0	History values of U31_3S
history_3s.hist_i1_3s.out_1.out_1 history_3s.hist_i1_3s.out_0.out_0	History values of I1_3S
history_3s.hist_i2_3s.out_1.out_1 history_3s.hist_i2_3s.out_0.out_0	History values of I2_3S
history_3s.hist_i3_3s.out_1.out_1 history_3s.hist_i3_3s.out_0.out_0	History values of I3_3S

13.1.4 History of 150/180 cycle values of THD, TDD and unbalance values

- out_0: value of last interval (t)
- out_1: value of interval (t-1T)

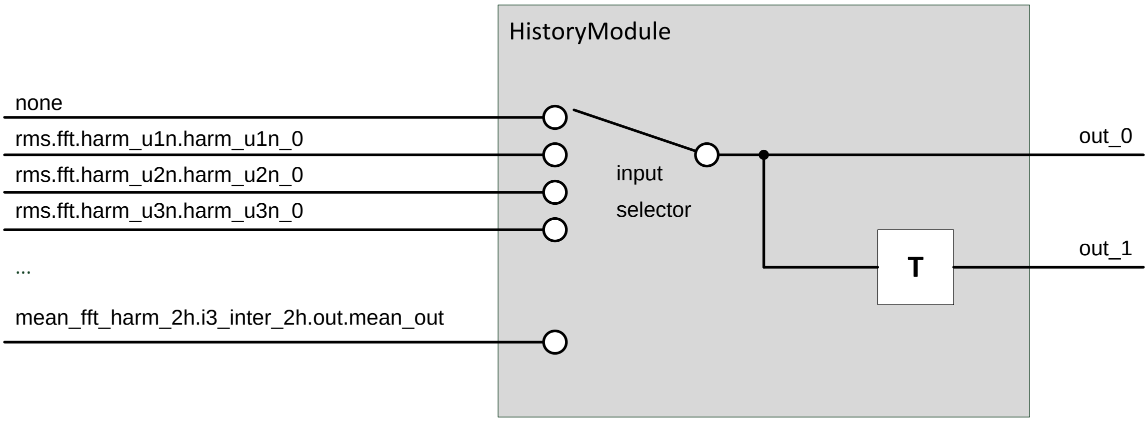
ID	Description
history_thdunb_3s.u1n_thds_3s.out_1.out_1 history_thdunb_3s.u1n_thds_3s.out_0.out_0	150/180 cycle History Values of THD(U1N)
history_thdunb_3s.u2n_thds_3s.out_1.out_1 history_thdunb_3s.u2n_thds_3s.out_0.out_0	150/180 cycle History Values of THD(U2N)
history_thdunb_3s.u3n_thds_3s.out_1.out_1 history_thdunb_3s.u3n_thds_3s.out_0.out_0	150/180 cycle History Values of THD(U3N)
history_thdunb_3s.u12_thds_3s.out_1.out_1 history_thdunb_3s.u12_thds_3s.out_0.out_0	150/180 cycle History Values of THD(U12)
history_thdunb_3s.u23_thds_3s.out_1.out_1 history_thdunb_3s.u23_thds_3s.out_0.out_0	150/180 cycle History Values of THD(U23)
history_thdunb_3s.u31_thds_3s.out_1.out_1 history_thdunb_3s.u31_thds_3s.out_0.out_0	150/180 cycle History Values of THD(U31)
history_thdunb_3s.i1_tdd_3s.out_1.out_1 history_thdunb_3s.i1_tdd_3s.out_0.out_0	150/180 cycle History Values of TDD(I1)
history_thdunb_3s.i2_tdd_3s.out_1.out_1 history_thdunb_3s.i2_tdd_3s.out_0.out_0	150/180 cycle History Values of TDD(I2)
history_thdunb_3s.i3_tdd_3s.out_1.out_1 history_thdunb_3s.i3_tdd_3s.out_0.out_0	150/180 cycle History Values of TDD(I3)
history_thdunb_3s.ur1_h1_3s.out_1.out_1 history_thdunb_3s.ur1_h1_3s.out_0.out_0	150/180 cycle History Values of UR1(H1)
history_thdunb_3s.ur2_h1_3s.out_1.out_1 history_thdunb_3s.ur2_h1_3s.out_0.out_0	150/180 cycle History Values of UR2(H1)
history_thdunb_3s.u0_h1_3s.out_1.out_1 history_thdunb_3s.u0_h1_3s.out_0.out_0	150/180 cycle History Values of U0(H1)
history_thdunb_3s.ir1_h1_3s.out_1.out_1 history_thdunb_3s.ir1_h1_3s.out_0.out_0	150/180 cycle History Values of IR1(H1)
history_thdunb_3s.ir2_h1_3s.out_1.out_1 history_thdunb_3s.ir2_h1_3s.out_0.out_0	150/180 cycle History Values of IR2(H1)
history_thdunb_3s.i0_h1_3s.out_1.out_1 history_thdunb_3s.i0_h1_3s.out_0.out_0	150/180 cycle History Values of I0(H1)
history_thdunb_3s.ur2r1_h1_3s.out_1.out_1 history_thdunb_3s.ur2r1_h1_3s.out_0.out_0	150/180 cycle History Values of UR2/UR1(H1)
history_thdunb_3s.ir2r1_h1_3s.out_1.out_1 history_thdunb_3s.ir2r1_h1_3s.out_0.out_0	150/180 cycle History Values of IR2/IR1(H1)
history_thdunb_3s.ur0r1_h1_3s.out_1.out_1 history_thdunb_3s.ur0r1_h1_3s.out_0.out_0	150/180 cycle History Values of UR0/UR1(H1)
history_thdunb_3s.ir0r1_h1_3s.out_1.out_1 history_thdunb_3s.ir0r1_h1_3s.out_0.out_0	150/180 cycle History Values of IR0/IR1(H1)

13.1.5 History values of harmonic values

- out_0: value of last interval (t)
- out_1: value of interval (t-T)

ID	Description
history_Harm.hist_harm.out_0.out_0_2 history_Harm.hist_harm.out_1.out_1_2	History values of 2nd harmonic [%]
history_Harm.hist_harm.out_0.out_0_3 history_Harm.hist_harm.out_1.out_1_3	History values of 3rd harmonic [%]
…	…
history_Harm.hist_harm.out_0.out_0_50 history_Harm.hist_harm.out_1.out_1_50	History values of 50th harmonic [%]

Function



Input configuration

Due to performance reasons, the history values are measured for only one channel at a time. The source of this module can be chanced at the following menu:

Menu > Settings > Power quality > Certification opt.

This history module can be connected to the following outputs:

All integration intervals of harmonics and interharmonics (10/12cycle, 150/180cycle, 10min, 2h)