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**ENERGA-OPERATOR SA Companion standard for COSEM objects  
 used in communication with residential electricity meters**

**communication interfaces with AMI and HAN systems**

**Rev 2.4**

(*includes corrections and extensions 2014* )

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| 2.1 | January 28,2014 | J. Swiderski | Correction to the Rev 1.1 8 July 2013 |
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|  |  |  | Broadcast transmission mode |
|  |  |  | Communication with HAN |
|  |  |  | Safe parametrization |
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**Table of Contents**

[1 Introduction 6](#_Toc379792228)

[1.1 Scope 6](#_Toc379792229)

[1.2 Specification Status 7](#_Toc379792230)

[2 Logical devices and associations (general concept) 7](#_Toc379792231)

[2.1 Clients 8](#_Toc379792232)

[2.1.1 Management Client –DSO - EOP 8](#_Toc379792233)

[2.1.2 Reading Client 8](#_Toc379792234)

[2.1.3 Firmware update Client 8](#_Toc379792235)

[2.1.4 Public Client 9](#_Toc379792236)

[2.1.5 HAN Client 9](#_Toc379792237)

[2.2 Access Levels 9](#_Toc379792238)

[2.3 USB operation mode in a meter 9](#_Toc379792239)

[2.4 Matrix of links between physical and logical ports of the meter and types of associations of individual clients 11](#_Toc379792240)

[3 DLMS/COSEM communication profiles 12](#_Toc379792241)

[3.1 DLMS/COSEM+ LLC+PLC/ PRIME Communication Profile 12](#_Toc379792242)

[3.2 DLMS/COSEM + TCP/IP GPRS communication profile 13](#_Toc379792243)

[3.3 DLMS/COSEM + TCP/IP Ethernet communication profile 13](#_Toc379792244)

[3.4 DLMS/COSEM+HDLC+ Virtual Serial Port (USB) communication profile to communicate with HAN 14](#_Toc379792245)

[4 Overview of AMI EOP object model 15](#_Toc379792246)

[4.1 Abstract objects 15](#_Toc379792247)

[4.1.1 COSEM logical device name, SAP assignment, Association and Security 15](#_Toc379792248)

[4.1.2 Identification Numbers 15](#_Toc379792249)

[4.1.3 Clock 16](#_Toc379792250)

[4.1.4 Activity calendars and special days tables 16](#_Toc379792251)

[4.1.5 Billing periods and profiles 17](#_Toc379792252)

[4.1.6 Long power failures 17](#_Toc379792253)

[4.1.7 Error and alarm handling 17](#_Toc379792254)

[4.1.8 Event handling 18](#_Toc379792255)

[4.1.9 Disconnect control 19](#_Toc379792256)

[4.1.10 Firmware update 19](#_Toc379792257)

[4.1.11 Data display 19](#_Toc379792258)

[4.1.12 Safe parametrization 19](#_Toc379792259)

[4.1.13 Data security 20](#_Toc379792260)

[4.1.14 Other abstract objects 20](#_Toc379792261)

[4.2 Electricity related objects 21](#_Toc379792262)

[4.2.1 Energy registers 21](#_Toc379792263)

[4.2.2 Average and maximum power 22](#_Toc379792264)

[4.2.3 Load profiles 22](#_Toc379792265)

[4.2.4 Instantaneous values 23](#_Toc379792266)

[4.2.5 Voltage sags and swells 24](#_Toc379792267)

[4.2.6 Power quality indices 25](#_Toc379792268)

[4.3 Data objects representing communication parameters 27](#_Toc379792269)

[4.3.1 PLC PRIME 27](#_Toc379792270)

[4.3.2 3GPP communication setup 27](#_Toc379792271)

[4.3.3 Ethernet communication setup 27](#_Toc379792272)

[4.3.4 USB port operational mode 27](#_Toc379792273)

[4.3.5 USB port status 28](#_Toc379792274)

[4.4 Event and alarm handling 28](#_Toc379792275)

[4.4.1 Events 28](#_Toc379792276)

[4.4.2 Events registers 34](#_Toc379792277)

[4.4.3 Error handling 34](#_Toc379792278)

[4.4.4 Alarm handling 34](#_Toc379792279)

[4.4.5 Profile status 35](#_Toc379792280)

[4.5 Disconnect control 36](#_Toc379792281)

[5 Abstract objects 40](#_Toc379792282)

[5.1 COSEM logical device name, SAP assignment, Association 40](#_Toc379792283)

[5.2 Devices identification numbers 43](#_Toc379792284)

[5.3 Clock 44](#_Toc379792285)

[5.4 Activity calendars and special days tables 45](#_Toc379792286)

[5.5 Billing periods and profiles 47](#_Toc379792287)

[5.6 Long power failures 48](#_Toc379792288)

[5.7 Error and alarm handling 50](#_Toc379792289)

[5.8 Event handling 52](#_Toc379792290)

[5.9 Disconnect control 61](#_Toc379792291)

[5.10 Firmware update 62](#_Toc379792292)

[5.11 Data display 63](#_Toc379792293)

[5.12 Safe parametrization 65](#_Toc379792294)

[5.13 Data security 67](#_Toc379792295)

[5.14 Other abstract objects 72](#_Toc379792296)

[6 Electricity related objects 73](#_Toc379792297)

[6.1 Energy Registers 73](#_Toc379792298)

[6.2 Demand Registers 75](#_Toc379792299)

[6.3 Load Profiles 77](#_Toc379792300)

[6.4 Instantaneous Values 80](#_Toc379792301)

[6.5 Voltage sags and swells 83](#_Toc379792302)

[6.6 Power Quality 86](#_Toc379792303)

[7 Communication parameters 89](#_Toc379792304)

[7.1 PLC PRIME 89](#_Toc379792305)

[7.2 3GPP communication setup 89](#_Toc379792306)

[7.3 Ethernet communication setup 90](#_Toc379792307)

[7.4 USB port configuration 90](#_Toc379792308)

[7.5 USB port status 90](#_Toc379792309)

[8 HAN communication interface specification 92](#_Toc379792310)

[8.1 Objects related to HAN communication 92](#_Toc379792311)

[9 Glossary of terms 94](#_Toc379792312)

[9.1 Technical terms 94](#_Toc379792313)

[10 References 97](#_Toc379792314)

[11 Appendix 1: PLC PRIME (OFDM PRIME) Classes 98](#_Toc379792315)

[12 Appendix 2: 3GPP modem parameters class (class id: 18 version:0) 105](#_Toc379792316)

[13 Appendix 3: Class of communication with HAN network in push data mode parameters (class id:40 version:0) 106](#_Toc379792317)

[14 Appendix 4: Message Queue Interface Class (class\_id: 8449, version: 0) 107](#_Toc379792318)

[15 Appendix 5: Single Action Schedule Class (class\_id: 22, version: 0) 109](#_Toc379792319)

**Table of Figures**

[Fig. 1.1 Interfaces in AMI system overview 6](#_Toc379792320)

[Fig. 3.1 Basic communication profile recommended to use in PLC PRIME channel 12](#_Toc379792321)

[Fig. 3.2 Optionally acceptable profile based on TCP/IP or UDP/IP in PLC PRIME channel 12](#_Toc379792322)

[Fig. 3.3 DLMS/COSEM + TCP/IP GPRSP Profile 13](#_Toc379792323)

[Fig. 3.4 DLMS/COSEM + TCP/IP + Ethernet communication profile 13](#_Toc379792324)

[Fig. 3.5 DLMS/COSEM + HDLC + Virtual Serial Port (USB) communication profile to communicate with HAN 14](#_Toc379792325)

# Introduction

## Scope

The AMI system can be divided into nine levels (relations) to exchange information. These include the following relations, Fig.1.1:

1. **data acquisition system- meter,**
2. data acquisition system- concentrator,
3. **concentrator - meter,**
4. concentrator – concentrator local service terminal,
5. concentrator –external device,
6. **meter – other media meters,**
7. **meter – consumer terminal,**
8. meter – local service terminal,
9. data acquisition system – data management system.

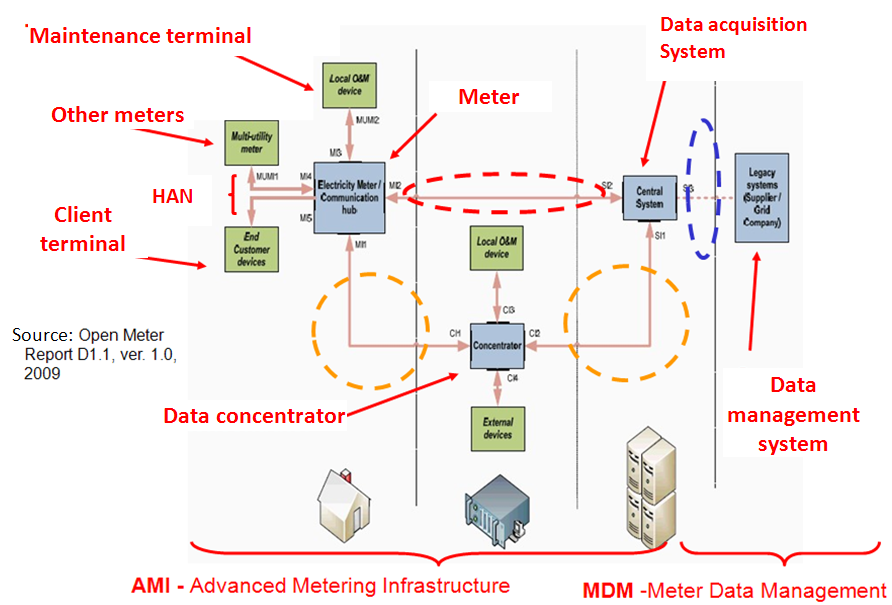


Fig. 1.1 Interfaces in AMI system overview

In the AMI Energa-Operator SA (EOP) meter interfaces 6 and 7 are replaced by a single interface: meter - home area network (Home Area Network - HAN), hereinafter referred to as the meter HAN interface. The scope of specification in this document relates to the relations (interfaces) 1, 3 in the list above and HAN interface.

This document is Energa-Operator SA companion Standard for COSEM objects used in communication between an AMI system smart meter in EOP and data acquisition system (either directly or through a concentrator), and to communicate with energy consumer HAN home network.

Smart energy meter interfaces were subject to standardization:

1. The data acquisition system interface using power lines as a physical medium (through data concentrator), wired telecommunication network (Ethernet port - min. 10Base-T) or radio communication implemented through the use of packet transmission services from the public operator (direct communications with a data acquisition system - performed using the 3GPP/CDMA modem built-in the meter or the external modem attached via the meter USB port).
2. HAN Interface – an interface realized with the use of the meter USB port, independent of the communication solution for HAN network (which may be for example the electric power network, the Wi-fi radio communication, Zig-Bee and other solutions). If the meter USB port is used to communicate with the HAN, this communication is performed using DLMS protocol provided a relevant association is set between the meter and the HAN client. There can also be auxiliary data being send between meter and HAN client for the purpose of the object push operation, by means of the link layer mechanism, as defined by HDLC standard.

Selecting one of these modes is accomplished with the use of USB\_port\_operational\_mode parameter.

It is assumed that the communication through interface 1 will use the DLMS / COSEM specification, and if the electric power line is used as a transmission medium (PLC), the PRIME specification will be used- according to TOR[[1]](#footnote-1) (Terms of Reference) V.6b- at the physical and the data link layer.

According to TOR.V.7i and additional assumptions formulated by the EOP, the scope of information exchanged through the interface 2 (HAN) includes:

* 1. energy consumption registers measurements of instantaneous values (power, current, voltage) sent to HAN network by the meter in an autonomous mode with configurable interval,
  2. selected data objects of the meter handled by the DLMS protocol, including:
* messages of up to 4096 B received by the meter from a data acquisition system via interface 1 and addressed to HAN client,
* messages of up to 4096 B received by the meter from HAN client and designed for data acquisition system,
* measurement data on other media consumption i.e. water, gas, generated by home network devices provided by general purpose registers.

## Specification Status

Group of IEC 62056 DLMS / COSEM standards [1] and [2] describe a set of data models and application layer protocol (DLMS), allowing designers of measuring devices the choice of models appropriate for certain functionality. As part of this companion standard for COSEM objects for electricity meters in the EOP, OBIS codes are assigned to implemented classes of interfaces defined in [1].

Country-specific objects have in their OBIS codes the indication number of the country in which the object is used (e.g. for Poland code 48, for Spain 34).

Specifications are thus created for certain countries or energy companies, which plan to use measuring devices of the same communication features. Examples of so far published specifications are:

* Dutch DSMR specification;
* French Linky specification;
* Spanish T5 specification;
* UK SSWG specification;
* German OMS specification.

# **Logical devices and associations (general concept)**

The functionality of the meter is represented by instances of COSEM interface classes according to IEC 62056-62 standard. Each COSEM interfaces class, in addition to the assigned functions (methods), defines the attributes of the class. COSEM Data Objects are instances of COSEM interfaces classes. These objects form the meter data model.

Each object is identified by an OBIS code (Object Identification System). Encoding objects using OBIS codes is consistent with IEC 62056-61 standard.

COSEM meter data model is fully independent of the application layer protocol used.

AMI EOP meter is a physical device that in the DLMS/COSEM is modeled as a single logical device (*logical device)* *- management logical device.*

## Clients

There are five associations related to a logical device, enabling data exchange with five defined clients, and these are:

* Management Client authorized to read and write data ( Distribution system Operator - DSO) – Management Client (M)
* Client authorized exclusively to read – Reading Client (R);
* Public Client (P);
* Client authorized to update meter Firmware – Firmware Update Client (F);
* HAN Client (H).

Above presented abbreviations M, R, P, F, H have been used to define access rights to certain data objects.

### Management Client –DSO - EOP

The Management Client (Client Id 1) is the client representing either a data concentrator or a data acquisition system, or the user running the utility/configuration software of community service (terminal). This client is entitled to perform all operations except the meter software update. The access to the meter requires the use of a password. The client uses the following DLMS protocol functions to communicate with the meter:

* Block transfer with Get
* Block transfer with Set
* Set
* Get
* Selective access
* Event notification
* Action.

### Reading Client

The client authorized exclusively to read (Client Id 2) parameters and measurement data. The access to the meter requires the use of a password. This client uses the following DLMS protocol functions:

* Block transfer with Get
* Get
* Selective access.

### Firmware update Client

Upgrade/replacement of the meter software must be performed only by the client authorized to upgrade the meter software (Client Id 3). Access to the meter requires the use of a password. The meter manufacturer could be a client.

This firmware update client uses the following DLMS protocol functions:

* Block transfer with Get
* Block transfer with Set
* Set
* Get
* Selective access
* Action

### Public Client

Public Client (Client Id 16) is for meters tests and identification purpose. He must not have access to measurement data or perform any changes in the meter.

This client uses the following DLMS protocol functions:

* Block transfer with Get
* Get
* Selective access

### HAN Client

It is mandatory for the HAN client to establish an association with the meter, in order to be able to perform data exchange between the meter and itself.

Communication of the client located in HAN network (Client Id 4) with the meter is implemented with the use of two buffers - each of a capacity of min. 4096 bytes:

* Write to HAN buffer
* Read from HAN buffer

The content of the information transferred to/from the HAN with the use of listed buffers is not interpreted by the meter.

Furthermore, general purpose registers (total 28) are intended to exchange data with the HAN network.

Access to the meter requires the use of a password. The client uses the following DLMS protocol functions to communicate with the meter:

* Block transfer with Get
* Block transfer with Set
* Set
* Get
* Selective access

## Access Levels

Access rights of individual clients to meter data objects (in particular individual attributes of these objects) are detailed in the tables specifying these objects. Access rights to specific data objects are designated with abbreviations M, R, P, C, H denoting individual meter clients.

## USB operation mode in a meter

A meter will offer following USB operating modes in the meter:

* USB port inactive;
* DLMS/COSEM mode to cooperate with an alternative communication, including AMI system, modem (typically 3GPP);
* DLMS/COSEM mode to cooperate with HAN with the provision for the object push mechanism

Operating modes description:

* USB port inactive

USB port desirable behaviour, in this operating mode, is the power disconnection of all pins, in particular 0V and +5 V. Connection of any device, also the one causing a short circuit between the pins, will not result in any action of the meter.

* DLMS / COSEM mode to cooperate with an alternative communication, including AMI system

In this mode the meter will cooperate with above mentioned modem connected to the USB port. Such a modem may be used for example in case it is not possible to implement PLC technology to communicate with higher functional layers of AMI system, that is, the data acquisition system.

Typically, a modem connected to the USB port will be handled in CDC mode, using the Abstract Control Model (ACM), which will allow one to create at the meter side a virtual interface, enabling communication between the modem and the meter.

In this mode, the modem and the external network will allow direct communication between the data acquisition system (and its functional components, such as specialized communications servers) and the smart meter, effectively replacing TAN B, and TAN C. The meter will operate as a DLM server, providing the opportunity to work in accordance with the DLMS/COSEM, with the data acquisition system as a DLMS client.

It will be possible to determine modem configuration parameters using OBIS codes. If 3GPP modem is connected to the USB port (see section 7.2 – 3GPP Communication Settings), it will also be possible to read the operating parameters, such as the strength of the radio signal.

Management Client (M) is authorized to read and write data in this mode.

* DLMS/COSEM mode to cooperate with HAN

In this mode, the meter will cooperate with a device such as the home gateway HAN. Based on CDC mode of USB port, the creation of an appropriate communication path - wired or wireless, will be possible, depending on the physical implementation of the home gateway connection with a smart meter.

The meter will act as a DLMS server, providing the opportunity to work in accordance with the DLMS/COSEM, with the home gateway as a DLMS client.

Effective messages transmitted:

- to the meter from HAN network

- from the meter to HAN network

- to the meter from data acquisition system

- from the meter to data acquisition system

these will be data blocks of the size not exceeding 4 kBytes, recorded and read in buffers located in the meter.

Buffer handling will be governed by the message queue interface and actions for it’s enqueing and dequeing.

Message Queue interface class will make it possible to implement a queue facility in a COSEM server.

The queue is modeled by a buffer containing a list of messages.Each message has unique monotonously incrementing serial number, hereafter called message\_id, and the payload field. Message\_id is used to implement FIFO discipline and avoid message duplicates. Payload may carry anything useful for specific task (PDU of some communication protocol, DLMS services, text messages, segments of firmware images, etc.) and should be specified separately for each task.

Two user application processes have to be distinguished:

* Enqueueing Application Process (hereafter EP) is the process which enqueues a message, i.e. adds the message to the rear terminal position of the queue. EP sets proper message\_id and invokes the enqueue\_message() method of the appropriate Message Queue object. Operation may fail if message\_id in the new message does not exceed that of the last message already enqueued, or the message size exceeds actual buffer free space.
* Dequeueing Application Process (hereafter DP) is the process which dequeues messages. DP dequeues messages in two steps:
  + On the first step DP reads all messages in the buffer using standard DLMS GET service,
  + On the second step DP removes all read messages from the front terminal position of the queue, invoking remove\_messages() method.

This interface class specifies access rights for two abstract application processes mentioned above. In real implementations the role of EP or/and DP can be played by a specific COSEM client or the server AP. Real AP playing the role of EP or/and DP for each Message Queue object (each instance of the Message Queue class) must be specified in the Companion Standard alongside with the OBIS codes, buffer size, etc

The client authorized to read and write data (i.e. buffers of the size not exceeding 4KB) in this mode will be:

- HAN Client (H) – from HAN,

- Management Client (M) – from the data acquisition system.

## Matrix of links between physical and logical ports of the meter and types of associations of individual clients

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Port/Client** | **Management**  **(M)** | **Reading**  **(R)** | **Public**  **(P)** | **Firmware update (F)** | **HAN (H)** |
| PLC |  |  |  |  |  |
| Opto |  |  |  |  |  |
| USB mode DLMS/COSEM Alternative communication modem (alternative communication with AMI reading system) |  |  |  |  |  |
| USB mode  DLMS/COSEM HAN |  |  |  |  |  |

# DLMS/COSEM communication profiles

There are four communication profiles:

* DLMS/COSEM+LLC+PLC /PRIME
* DLMS/COSEM+TCP/IP GPRS
* DLMS/COSEM+TCP/IP Ethernet
* DLMS/COSEM+HDLC/Virtual Serial Port (USB)

## DLMS/COSEM+ LLC+PLC/ PRIME Communication Profile

The basic communication profile with the meter using the PLC channel (PRIME) provides for the use of the data link layer IEC 61334-4-32 protocol.

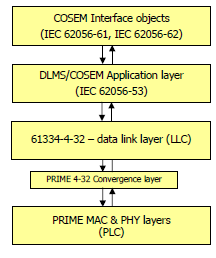


Fig. 3.1 Basic communication profile recommended to use in PLC PRIME channel

Optionally, acceptable communication profile based on TCP/IP stack.

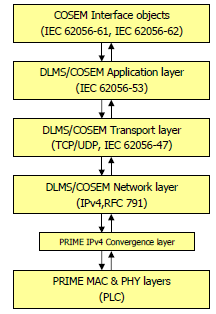


Fig. 3.2 Optionally acceptable profile based on TCP/IP or UDP/IP in PLC PRIME channel

## DLMS/COSEM + TCP/IP GPRS communication profile

Communication based on radio communication GSM/GPRS network as a medium.

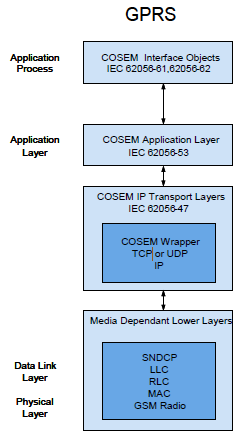


Fig. 3.3 DLMS/COSEM + TCP/IP GPRSP Profile

## DLMS/COSEM + TCP/IP Ethernet communication profile

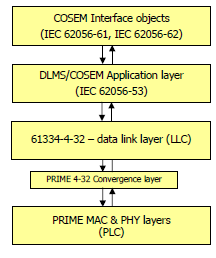
Profile using DLMS/COSEM + TCP/IP + Ethernet (standard TCP 4059 port for communication based on DLMS protocol).



Fig. 3.4 DLMS/COSEM + TCP/IP + Ethernet communication profile

## DLMS/COSEM+HDLC+ Virtual Serial Port (USB) communication profile to communicate with HAN

Profile based on DLMS/COSEM + HDLC + virtual serial port emulated on USB port, used for communication with the HAN client.



**Virtual Serial Port (USB)**

**HDLC**

Fig. 3.5 DLMS/COSEM + HDLC + Virtual Serial Port (USB) communication profile to communicate with HAN

# Overview of AMI EOP object model

Each data object in the meter data model is identified by the OBIS code (Object Identification System). Encoding objects using OBIS codes is consistent with IEC 62056-61 standard. AMI EOP meter data model contains four types of data objects:

* Abstract objects ( section 5),
* Electricity metering related objects (section 6),
* Objects representing communication parameters (section 7),
* Smart HAN interface related objects (section 8).

## Abstract objects

Abstract objects are used to model following groups of objects:

1. COSEM logical device name, SAP assignment, association LN
2. Identification numbers
3. Clock
4. Activity Calendars and Special Days Tables
5. Billing Periods and Profiles
6. Long Power Failures
7. Error and Alarm Handling
8. Event Handling
9. Disconnect Control and Log
10. Firmware Update
11. Other abstract objects

### COSEM logical device name, SAP assignment, Association and Security

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| SAP assignment | 17 | 0-0:41.0.0.255 | Acc. to s. 5.1. |
| Current association | 15 | 0-0:40.0.0.255 |
| Association – Public Client | 15 | 0-0:40.0.1.255 |
| Association –Reading Client | 15 | 0-0:40.0.2.255 |
| Association- Management Client | 15 | 0-0:40.0.3.255 |
| Association - Firmware Update Client | 15 | 0-0:40.0.4.255 |
| Association – HAN Client | 15 | 0-0:40.0.5.255 |
| COSEM logical device name | 1 | 0-0:42.0.0.255 |

### Identification Numbers

| **Object** | **COSEMclass\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Device ID 1 | 1 | 0-0:96.1.0.255 | Acc. to s. 5.2. |
| Device ID 2 | 1 | 0-0:96.1.1.255 |
| Device ID 3 | 1 | 0-0:96.1.2.255 |
| Device ID 4 | 1 | 0-0:96.1.3.255 |
| Device ID 5 | 1 | 0-0:96.1.4.255 |
| Device ID 6 | 1 | 0-0:96.1.5.255 |
| Device ID 7 | 1 | 0-0:96.1.6.255 |

### Clock

| **Object** | **COSEMclass\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Clock | 8 | 0-0:1.0.0.255 | Acc. to s. 5.3. |
| Clock synchronization | 1 | 0-0:96.2.12.255 |
| Clock limit inaccuracy | 3 | 1-0:0.9.11.255 |
| Local time | 1 | 0-0:0.9.1.255 |
| Local date | 1 | 0-0:0.9.2.255 |

### Activity calendars and special days tables

#### Tariffs plan activation

Within an activity calendar in the meter (object 0-0:13.0.0.255) it is possible to define up to 12 seasons i.e. periods characterized by the same cost calculation formula, written as the same within the season weekly schedule. The season is determined by the start date and the weekly schedule.

It is possible to define up to 12 weekly schedules. This means that each of the 12 seasons may be assigned a different weekly schedule. Weekly schedule is determined by weekdays (Monday - Friday) and weekend days (Saturday and Sunday). Apart from the definition of weekly plans there is a plate with special days in the meter (object 0-0:11.0.0.255). Since it is possible to define up to 12 weekly schedules, thus the number of defined weekdays and weekend days tariffs does not exceed 24 (two definitions of day tariff plan in one week tariff plan).

Tariff plan of the day (week, weekend, special) consists of 24 elements (hours). Each hour on the tariff plan (week, weekend, special) can be assigned a different time zone, which results from the zonal distribution of force in certain tariff.

| **Object** | **COSEM**  **class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Activity calendar | 20 | 0-0:13.0.0.255 | Acc. to s. 5.4. |
| Special days table | 11 | 0-0:11.0.0.255 |
| Active tariff zone identifier | 1 | 0-0:96.14.0.255 |
| Current tariff group | 1 | 0-0:0.2.2.255 |

#### Load limiter setting

Load limiter setting of 15 minutes power consumed by the customer recipient is represented by an object 0-1:94.48. X.255. Up to 4 values of settings have been provided (x = 1 to 4). The change of the setting is introduced to the object 0-1:94.48. X.255 (x = 11 to 14) - the so-called: setting passive value. Once the setting has been changed its passive value should be rewritten to the object 0-1:94.48. X.255 (x = 1 to 4) and thus become the active value of the setting i.e. the value associated with the load limiter operation.

| **Object** | **COSEM**  **class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Load limiter active limit value | 3 | 0-1:94.48.x.255 | x=1..4 –(4 limit values).  Acc. to s. 5.4. |
| Load limiter passive limit value | 3 | 0-1:94.48.x.255 | x=11..14 –(4 limit values).  Acc. to s. 5.4. |

### Billing periods and profiles

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Predefined Script – end of billing perion | 9 | 0-0:10.0.1.255 | Acc. to s. 5.5. |
| End of billing period (active)) | 22 | 0-0:15.1.0.255 | Acc. to s. 5.5. |
| End of billing period (passive) | 1 | 0-0:94.48.0.255 | Passive - to prepare an amendment to the later introduction as the – active  Acc.to s. 5.5. |
| Billing period data | 7 | 0-0:98.1.0.255 | Acc. to s. 5.5. |

### Long power failures

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Time threshold for long power failure | 3 | 0-0:96.7.20.255 | Acc. to s. 5.6. |
| Long power failure duration in all phases | 3 | 0-0:96.7.15.255 |
| Long power failure duration in L1 phase (s) | 3 | 0-0:96.7.16.255 |
| Long power failure duration in L2 phase | 3 | 0-0:96.7.17.255 |
| Long power failure duration in phase L3 | 3 | 0-0:96.7.18.255 |
| Number of long power failures in all phases | 1 | 0-0:96.7.5.255 |
| Number of long power failures in phase L1 | 1 | 0-0:96.7.6.255 |
| Number of long power failures in phase L2 | 1 | 0-0:96.7.7.255 |
| Number of long power failures in phase L3 | 1 | 0-0:96.7.8.255 |

### Error and alarm handling

Lists of defined errors and alarms are set forth accordingly in s. 5.5.3 and in s. 5.5.4.

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Object-Error | 1 | 0-0:97.97.0.255 | Acc. to  s. 5.7 |
| Object – Alarm | 1 | 0-0:97.98.0.255 |
| Alarm mask | 1 | 0-0:97.98.10.255 |

### Event handling

There are 10 registers of the events in the meter, each of which is designed to record the events belonging to a particular group and subgroup. Classification of events and the list of events is presented in section 4.5. Each register of the event is related to the mask, which refers to the recording of events into register and reporting events by the meter. Each mask with assigned OBIS code contains two 256-bit masks. If the bit n of the first mask is set to 1, then the nth event of a certain group is recorded in the event log for this particular group. If the bit n of the first mask is set to 0, then the nth event of a certain group is not recorded in the event log for this group. If the bit n of the second mask is set to 1, then the nth event of a particular event group is reported by the meter at the time of its occurrence. If the bit n of the second mask is set to 0, then the nth event of the event group is not reported by the meter.

| **Object** | **COSEM**  **class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Event number – standard events group | 1 | 0-0:96.11.0.255 | Acc. to s. 5.8. |
| Standard events register | 7 | 0-0:99.98.0.255 |
| Event number –group of events related to theft | 1 | 0-0:96.11.1.255 |
| Register of events related to theft | 7 | 0-0:99.98.1.255 |
| Event number – group of events related to voltage sags and swells | 1 | 0-0:96.11.5.255 |
| Register of events related to voltage sags and swells | 7 | 0-0:99.98.5.255 |
| Event number – group of events related to power quality | 1 | 0-0:96.11.6.255 |
| Register of events related to power quality | 7 | 0-0:99.98.6.255 |
| Event number – group of events related to power outages | 1 | 0-0:96.11.9.255 |
| Register of events related to power outages | 7 | 0-0:99.98.9.255 |
| Event number –group of events related to interfaces functioning | 1 | 0-0:96.11.7.255 |
| Register of events related to interfaces functioning | 7 | 0-0:99.98.7.255 |
| Event number – group of events related to meter firmware update | 1 | 0-0:96.11.4.255 |
| Register of events related to meter firmware update | 7 | 0-0:99.98.4.255 |
| Event number – group of events related to the clock synchronization | 1 | 0-0:96.11.8.255 |
| Register of events related to the clock synchronization | 7 | 0-0:99.98.8.255 |
| Event number – group of events related to the disconnect control | 1 | 0-0:96.11.2.255 |
| Register of events related to disconnect control | 7 | 0-0:99.98.2.255 |
| Event number – group of events related to data security | 1 | 0-0:96.11.3.255 |
| Register of events related to data security | 7 | 0-0:99.98.3.255 |
| Standard events mask | 1 | 0-1:94.48.105.255 |
| Mask of events related to theft | 1 | 0-1:94.48.106.255 |
| Mask of events related to power quality | 1 | 0-1:94.48.107.255 |
| Mask of events related to voltage sags and swells | 1 | 0-1:94.48.108.255 |
| Mask of events related to power outages | 1 | 0-1:94.48.109.255 |
| Mask of events related to functioning of interfaces | 1 | 0-1:94.48.110.255 |
| Mask of events related to meter firmware update | 1 | 0-1:94.48.112.255 |
| Mask of events related to the clock synchronization | 1 | 0-1:94.48.113.255 |
| Mask of events related to disconnect control | 1 | 0-1:94.48.114.255 |
| Mask of events related to data security | 1 | 0-1:94.48.111.255 |  |

### Disconnect control

Disconnect control is described in Section 4.6. The table lists the objects associated with the implementation of control.

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Disconnect control | 75 | 0-0:96.3.10.255 | Id\_class 75 definition in s. 4.6. Acc. to s. 5.9. |
| Automatic disconnect switch time | 3 | 0-0:94.48.21.255 | Acc. to s. 5.9. |

### Firmware update

| **Object** | **COSEM class\_id** | **Value** | **Comments** |
| --- | --- | --- | --- |
| Predefined Script – firmware activation | 9 | 0-0:10.0.107.22 | Acc. to s. 5.10. |
| New meter firmware transfer | 18 | 0-0:44.0.0.255 |
| Firmware activation management | 22 | 0-0:15.0.2.255 |
| Firmware version | 1 | 0-0:0.2.0.255 |

### Data display

| **Object** | **COSEM class\_id** | **Value** | **Comments** |
| --- | --- | --- | --- |
| Auto Scroll sequence | 7 | 0-0:21.0.1.255 | List of values in the display for Auto Scroll sequence. Acc. to s. 5.11. |
| Manual Scroll sequence | 7 | 0-0:21.0.2.255 | List of values in the display for Manual Scroll sequence. Acc. to s. 5.11. |
| Timeout for scroll display | 3 | 0-0:94.48.120.255 |  |
| Timeout for return to AutoScroll mode | 3 | 0-0:94.48.121.255 |  |

### Safe parametrization

| **Object** | **COSEM class\_id** | **Value** | **Comments** |
| --- | --- | --- | --- |
| Request Message Queue | 8449 | 0-0:138.0.0.255 |  |
| Response Message Queue | 8449 | 0-0:138.0.1.255 |  |

### Data security

| **Object** | **COSEM class\_id** | **Value** | **Comments** |
| --- | --- | --- | --- |
| Security Setup for Reading Client | 64 | 0-0:43.0.2.255 | Acc. to s. 5.13 |
| Security Setup for Management Client | 64 | 0-0:43.0.3.255 |
| Security Setup for Firmware Update Client | 64 | 0-0:43.0.4.255 |
| Security Setup for HAN Client | 64 | 0-0:43.0.5.255 |
| Frame counter for Reading Client | 1 | 0-x:43.1.2.255 |
| Frame counter for Management Client | 1 | 0-x:43.1.3.255 |
| Frame counter for Firmware Update Client | 1 | 0-x:43.1.4.255 |
| Frame counter for HAN Client | 1 | 0-x:43.1.5.255 |
| Counter of successful logins on PLC PRIME port | 1 | 0-1:94.48.100.255 |
| Counter of successful logins on 3 GPP port | 1 | 0-2:94.48.100.255 |
| Counter of successful logins on Virtual Serial port | 1 | 0-3:94.48.100.255 |
| Counter of successful logins on Ethernet port | 1 | 0-4:94.48.100.255 |
| Counter of unsuccessful logins on PLC PRIME port | 3 | 0-1:94.48.101.255 |
| Counter of unsuccessful logins on 3 GPP port | 3 | 0-2:94.48.101.255 |
| Counter of unsuccessful logins on Virtual Serial port | 3 | 0-3:94.48.101.255 |
| Counter of unsuccessful logins on Ethernet port | 3 | 0-4:94.48.101.255 |
| Threshold of unsuccessful logins on PLC PRIME port | 1 | 0-1:94.48.102.255 |
| Threshold of unsuccessful logins on 3 GPP port | 1 | 0-2:94.48.102.255 |
| Threshold of unsuccessful logins on Virtual Serial port | 1 | 0-3:94.48.102.255 |
| Threshold of unsuccessful logins on Ethernet port | 1 | 0-4:94.48.102.255 |

### Other abstract objects

| **Object** | **COSEM class\_id** | **Value** | **Comments** |
| --- | --- | --- | --- |
| Meter reset - total | 9 | 0-0:10.0.0.255 | Parameters take the default settings and billing profiles and energy consumption/ transfer profiles are reset Acc. to s. 5.14. |
| Resets register | 1 | 0-0:0.1.0.255 | Resets register  Acc. to s.5.14. |

## Electricity related objects

Electricity measurements have been modeled in the following groups of objects:

1. Electricity meters status and billing values (Energy Registers)
2. Average and peak power (Demand Registers)
3. Profiles of energy, peak power, voltages and currents (Load Profiles)
4. The instantaneous values
5. Power quality

### Energy registers

Data objects described in section 6.1 are the basic quantities used for the purpose of settlement of import/export of energy and maximum power. The first group relates to the size of the current state of the meters of the following values:

1. Active energy import (+ A)
2. Active energy export (-A)
3. Reactive energy QI (+ R)
4. Reactive energy QII (+ Rc)
5. Reactive energy QIII (R)
6. Reactive energy QIV (Rc)

All these values are counted as the integer and broken down into four time zones (acc.to TOR.V.8.l). It is assumed that energy is measured and recorded as the energy counter status (acc. to TOR.V.1). The second group relates to energy quantity and peak power recorded at the end of the billing period (acc.to TOR.VIII.2b):

1. Active energy import in zone Tx (+A Tx)
2. Active energy import total (+A)
3. Active energy export in zone Tx (-A Tx)
4. Active energy export total (-A)
5. Reactive energy QI in zone Tx (+Ri Tx)
6. Reactive energy QIV in zone Tx (-Rc Tx)
7. Reactive energy QI total (+Ri)
8. Reactive energy QII total (+Rc)
9. Reactive energy QIII total (-Ri)
10. Reactive energy QIV total (-Rc)
11. 15 minutes Peak power (Pmax)

| **Object** | **COSEMclass\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Active power import (+A) | 3 | 1-0:1.8.x.255 | x=0 –total, x=1..4 – in zone.  Acc. to s. 6.1. |
| Active energy export (-A) | 3 | 1-0:2.8.x.255 | As above |
| Reactive energy QI (+Ri) | 3 | 1-0:5.8.x.255 | As above |
| Reactive energy QII (+Rc) | 3 | 1-0:6.8.x.255 | As above |
| Reactive energy QIII (-Ri) | 3 | 1-0:7.8.x.255 | As above |
| Reactive energy QIV (-Rc) | 3 | 1-0:8.8.x.255 | As above |
| Billing values | 7 | 0-0:98.1.1.255 | Acc. to TOR.VIII.2b |

### Average and maximum power

The meter records the following average powers for defined period of 15 min. (acc. to TOR.V.2i) and the maximum power with and without zoning along with the time of maximum power occurrence.

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Average power import (+A) | 5 | 1-0:1.4.0.255 | 15 min period.  Acc. to s. 6.2. |
| Average power export (-A) | 5 | 1-0:2.4.0.255 | As above |
| Peak power import (+A) | 4 | 1-0:1.6.x.255 | x=0 – in all zones (average power 15 min).  x=1…4 –in zone (average power 15 min).  Acc. to s. 6.2. |
| Peak power export (-A) | 4 | 1-0:2.6.x.255 | As above |

### Load profiles

Two profiles are recorded:

1. Profile with time division minute mode (15 min. or 30 min. profile.) or hours mode in accordance with TOR.V.3a
2. Profile with time division - daily mode (data applies to the measurement for the day 24h)

Both in the profile of the time-division in minutes or hours, or in daily profile, the following quantities are recorded (acc. to TOR.VIII.2a):

1. Clock
2. Profile status
3. Active energy import +A
4. Active energy export -A
5. QI (+Ri)
6. QII (+Rc)
7. QIII (-Ri)
8. QIV (-Rc)
9. Pmax
10. U L1
11. U L2
12. U L3
13. I L1
14. I L2
15. I L3

| **Object** | **COSEMclass\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Hourly profile 1 status 1 | 1 | 0-0:96.10.7.255 | Acc. to s. 4.5.5 |
| Hourly profile 1 | 7 | 1-0:99.1.0.255 | Profile created based on states of meters for various types of energy, voltage and current every 15, 30 or 60 minutes. Acc. to s 6.3. |
| Daily profile 2 status | 1 | 0-0:96.10.8.255 | Acc. to s. 4.5.5 |
| Daily Profile 2 | 7 | 1-0:99.2.0.255 | Profile created based on the counters states of meters for various types of energy, voltage and current every 24 h Acc. to s 6.3. |

### Instantaneous values

Values recorded as the instantaneous values shown in the table.

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Instantaneous voltage( phase) | 3 | 1-0:x.7.0.255 | x=32 in phase L1  x=52 in phase L2  x=72 in phase L3  Acc. to s. 6.4. |
| Instantaneous current (phase) | 3 | 1-0:x.7.0.255 | x=31 in phase L1  x=51 in phase L2  x=71 in phase L3  Acc.to s. 6.4. |
| Currents sum in phases L1+L2+L3 | 3 | 1-0:90.7.0.255 | Acc. to s. 6.4. |
| Active power import P+ /phase | 3 | 1-0:x.7.0.255 | x=21 in phase L1  x=41 in phase L2  x=61 in phase L3  Acc. to s. 6.4. |
| Active power export P-/phase | 3 | 1-0:x.7.0.255 | x=22 in phase L1  x=42 in phase L2  x=62 in phase L3  Acc. to s. 6.4. |
| Reactive power import Q+/phase | 3 | 1-0:x.7.0.255 | x=23 in phase L1  x=43 in phase L2  x=63 in phase L3  Acc.to s. 6.4. |
| Reactive power export Q- /phase | 3 | 1-0:x.7.0.255 | x=24 in phase L1  x=44 in phase L2  x=64 in phase L3  Acc. to s. 6.4. |
| Total active power import P+ L1+L2+L3 | 3 | 1-0:1.7.0.255 | Acc. to s. 6.4. |
| Total active power export P- L1+L2+L3 | 3 | 1-0:2.7.0.255 |
| Total reactive power import Q+ L1+L2+L3 | 3 | 1-0:3.7.0.255 |
| Total reactive power export Q- L1+L2+L3 | 3 | 1-0:4.7.0.255 |
| Total reactive power import Ri+ L1+L2+L3 | 3 | 1-0:5.7.0.255 |
| Total reactive power export Rc- L1+L2+L3 | 3 | 1-0:8.7.0.255 |

### Voltage sags and swells

For voltage deviation from nominal value four voltage thresholds are defined with the following values (in accordance with TOR.V.3c):

1. Reduction by 10% of the rated value (Un)
2. Reduction by 20% of the rated value (Un)
3. Reduction by 50% of the rated value (Un) - recognized as a voltage sag
4. Increase by 10% of the rated value (Un)

For each of these thresholds, the number of exceedings is recorded in terms of various phases and the total duration of the power failure in all phases.

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| Rated voltage (any phase) | 3 | 1-0:12.48.0.255 |  |
| Threshold 1 of voltage sag | 3 | 1-0:12.31.0.255 | Threshold 1: -10% Un  Acc. to s. 6.5. |
| Time threshold to sag voltage below threshold 1 | 3 | 1-0:12.43.0.255 | Acc. to s. 6.5. |
| Threshold 2 of voltage sag | 3 | 1-0:12.31.1.255 | Threshold 2: -20% Un  Acc. to s. 6.5. |
| Time threshold to sag voltage below threshold 2 | 3 | 1-0:12.43.1.255 | Acc. to s. 6.5. |
| Threshold – no voltage | 3 | 1-0:12.39.0.255 | Threshold – lack of supply voltage:-50% Un.  Acc. to s. 6.5. |
| Time threshold to state lack of supply | 3 | 1-0:12.45.0.255 | Acc. to s. 6.5. |
| Overvoltage threshold | 3 | 1-0:12.35.0.255 | Overvoltage threshold: +10% Un.  Acc. to s. 6.5. |
| Time threshold for overvoltage threshold | 3 | 1-0:12.44.0.255 | Acc. to s. 6.5. |
| Voltage sags below Threshold 1 in all phases counter | 1 | 1-0:12.32.0.255 | Acc. to s. 6.5. |
| Voltage sags below Threshold 1 in phase Lx counter | 1 | 1-0:x.32.0.255 | x=32 – phase L1  x=52 – phase L2  x=72 – phase L3  Acc. to s. 6.5. |
| Voltage sags below Threshold 2 in all phases counter | 1 | 1-0:12.32.1.255 | Acc. to s. 6.5. |
| Voltage sags below Threshold 2 in phase Lx counter | 1 | 1-0:x.32.1.255 | x=32 – phase L1  x=52 – phase L2  x=72 – phase L3  Acc. to s. 6.5. |
| Voltage sags in all phases meters counter | 1 | 1-0:12.40.0.255 | Acc. to s. 6.5. |
| Voltage sags in phase Lx counter | 1 | 1-0:x.40.0.255 | x=32 – phase L1  x=52 – phase L2  x=72 – phase L3  Acc.to s. 6.5. |
| Voltage swells in all phases counter | 1 | 1-0:12.36.0.255 | Acc. to s. 6.5. |
| Voltage swells in phase Lx counter | 1 | 1-0:x.36.0.255 | x=32 – phase L1  x=52 – phase L2  x=72 – phase L3  Acc. to s. 6.5. |
| Total time of default voltage drop (reduction below 50% of Un) | 3 | 1-0:94.48.91.255 | Total time of voltage outage in any phase  Acc. to s. 6.5. |

### Power quality indices

The meter should calculate and store the following power quality indices:

W1 – slow voltage variation,

W2 – voltage waveform distortion,

W3 – voltage unbalance (asymmetry),

W4 – voltage fluctuation.

All a/m indices should be calculated on the base of 10 minutes rms voltage profiles and voltage harmonics from 1 to 13. The method of calculation should be consistent with the act of the ministry of Economy from 4th of May 2007 Dz. U. Nr 93Poz 623.

Every fact of the exceeding the thresholds values should be reported as the event.

**Calculation of the indices**

**W1 -Slow voltage variations**

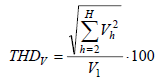
The slow voltage variation is quantified by calculation of the RMS value of the supply voltage and the 95 percentile over one week of 10-minute mean RMS values. Vv95 should be less then ±10 % of voltage nominal value. W1 threshold value is set to 0,05 and exciding this value is considered as the event.

**W2 - Waveform distortions**

The following site indices are considered:

* the 95 percentile of the voltage harmonic amplitude (Vh 95 );
* the 95 percentile of the Voltage Total Harmonic Distortion (THDV95).

The first index evaluates the harmonic distortion level in terms of the RMS value of the individual voltage harmonic components. The second index is the 95 percentile of the THDV , defined as:



where H = 13 is the maximum value of the harmonic order, Vh is the RMS value of the voltage harmonic of order h and V1 is the RMS value of the voltage at fundamental frequency.

**W3 - Voltage unbalance**

Voltage unbalance index W3 is the 95 percentile of the ratio between the RMS values of the supply voltage negative phase sequence component Vn and the positive phase sequence component Vp at fundamental frequency referred to a single bus and defined as:

100

W3 threshold value is set to 0,05.

**W4 - Voltage fluctuations**

Voltage fluctuations is characterized by the long term (2 hours) severity index Plt.

The long term severity index Plt values are calculated by using a sequence of 12 values of the Pst (10 minutes) over a time range of 2 hours.

The 95 percentile derived by the probability density function (pdf) of Pst has been used as the index.

W4 threshold value is set to 0,05.

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| W1 – slow voltage variation | 3 | 1-0:94.48.140.255 | Acc. to s. 6.6 |
| W2 – voltage waveform distortion | 3 | 1-0:94.48.142.255 |
| W3 – voltage unbalance (asymmetry) -- | 3 | 1-0:94.48.144.255 |
| W4 – voltage fluctuation | 3 | 1-0:94.48.146.255 |
| W1 – slow voltage variation threshold | 3 | 1-0:94.48.141.255 |
| W2 – voltage waveform distortion threshold | 3 | 1-0:94.48.143.255 |
| W3 – voltage unbalance (asymmetry) threshold | 3 | 1-0:94.48.145.255 |
| W4 – voltage fluctuation threshold | 1 | 1-0:94.48.147.255 |
| Weekly power quality indices profile status | 1 | 0-0:96.10.9.255 |
| Weekly power quality indices profile | 7 | 1-0:99.13.0.255 |

## **Data objects representing communication parameters**

### PLC PRIME

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| CL\_432 setup | 80 | 0-0:28.0.0.255 | address assigned by the concentrator and the concentrator address |
| Physical layer counters | 81 | 0-0:28.1.0.255 | PHY counters for management |
| MAC setup | 82 | 0-0:28.2.0.255 | MAC configuration |
| MAC counters | 84 | 0-0:28.4.0.255 | MAC layer counters containing statistical data related to the layer operation |
| MAC network administration data | 85 | 0-0:28.5.0.255 | MAC layer operating parameters |
| Application identification | 86 | 0-0:28.7.0.255 | Information on PRIME modem - VID, PID, logical name, firmware version |
| Prime device setup | 43 | 0-0:28.6.0.255 | MAC device address , class defined in Blue Book - MAC address setup |

### 3GPP communication setup

| **Object** | **COSEM class\_id** | **Value** | **Comments** |
| --- | --- | --- | --- |
| 3GPP connection parameters | 18 | 0-0:25.4.0.255 | Acc. to s. 7.2 |

### Ethernet communication setup

| **Object** | **COSEM class\_id** | **Value** | **Comments** |
| --- | --- | --- | --- |
| MAC address | 43 | 0-0:25.2.0.255 | Acc. to s. 7.3 |

### USB port operational mode

Selection of the USB port operating mode USB port will be performed by the object USB\_port\_operational\_mode

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| USB\_port\_operational\_mode | 1 | 0-0:94.48.224.255 | Acc. to s. 7.4:  0: USB port inactive  2: DLMS/COSEM mode Modem (alternative communication with AMI reading system)  3: DLMS/COSEM HAN mode |

### USB port status

USB\_port\_status includes information related to current USB port operational mode.

The object includes following information:

If the device supported by the meter has been placed in USB port

* Identifiers of the device connected to the USB port

| **Object** | **COSEM class\_id** | **OBIS code** | **Comments** |
| --- | --- | --- | --- |
| USB\_port\_status | 1 | 0-0:94.48.225.255 | Acc. to s. 7.5 |

## Event and alarm handling

This section provides an overview of event and alarm handling based on DLMS Objects for AMI EOP meter. All events are recorded in several event registers. Classification of events is given in the attached table. Event objects are defined in section 5.

### Events

According to the attached table five groups of events can be distinguished in the meter. Some of them are divided into sub-groups. Each group or sub-group has its own register (log) of events. There are 10 event registers in the meter.

Each event has a unique number (code), which is assigned to the event description. The event belonging to a certain group and subgroup may be recorded exclusively in one event log, which is intended for recording events from this particular group and subgroup. The division of events into groups and subgroups is rigid and cannot be changed dynamically.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Group** | **Sub- group (register)** | **Name** | **Min number of records (event log capacity)** | **Description** | **OBIS code** |
| 1 | 10 | Standard events - for example, related to the change of settings | 100 | Events not assigned to other groups | 99.98.0 |
| 11 | Firmware | 15 | Firmware update | 99.98.4 |
| 12 | Clock synchronization | 15 | Time and date of clock synchronization | 99.98.8 |
| 2 | 20 | Disconnect control | 20 | Events related to disconnect operation | 99.98.2 |
| 3 | 31 | Power outages | 15 | Events related to long power failures | 99.98.9 |
| 32 | Voltage sags and swells | 15 | Events related to voltage sags and swells | 99.98.5 |
| 33 | Power quality | 15 | Events related to power quality indices | 99.98.6 |
| 4 | 40 | Events related to theft reveal, Thefts | 10 | Events related to the theft reveal | 99.98.1 |
| 5 | 50 | Frequent events | 100 | Interface functioning –remote and local communication | 99.98.7 |
| 6 | 60 | Data security | 100 | Events related to data security | 99.98.3 |

#### Standard events –related to change of settings

| **Number** | | **Group** | **Sub-group** | **Description** | **Event description** |
| --- | --- | --- | --- | --- | --- |
| 255 | | 1, 2, 3, 4, 5, 6 |  | Event registers reset | Reset of 10 event registers |
| 1 | | 1 | 10 | Reset and supply disruptions | Reset with data loss |
| 2 | | 1 | 10 | Reset without data loss |
| 3 | | 1 | 10 | Power outages |
| 4 | | 1 | 10 | No connection to N |
| 5 | | 1 | 10 | Low battery |
| 6 | | 1 | 10 | Internal critical error |
| 10-20 | | 1 | 10 | Other errors | Other errors |
| 21 | | 1 | 10 |  | Change from winter to summer |
| 22 | | 1 | 10 |  | Change from summer to winter |
| 23-29 | | 1 |  | Reserved for future use | Reserved for future use |
| 30 | | 1 | 10 | Change of parameters | Change of parameters register |
| 31 | | 1 | 10 | Change of communication ports parameters |
| 32 | | 1 | 10 | Change of password to read |
| 33 | | 1 | 10 | Change of password for parameterization |
| 34 | | 1 | 10 | Change of password to firmware update |
| 35 | | 1 | 10 | Battery replaced |
| 36 | | 1 | 10 | Changing the time of seasonal transition |
| 37 | | 1 | 10 | Changing the minimum time between invoicing |
| 38 | | 1 | 10 | Changing the period for the load profile |
| 39 | | 1 | 10 | Changing the synchronization |
| 40 | | 1 | 10 | Changing program name (label) |
| 41-89 | | 1 |  | Reserved for future use | Reserved for future use |
| 90 | | 1 | 10 | Changing parameters of power quality settings | Changing duration of voltage sags and swells |
| 91 | | 1 | 10 | Changing the limit of the power outage |
| 92 | 1 | | 10 | Changing rated voltage |
| 93 | 1 | | 10 | Changing the upper limit of the permissible voltage |
| 94 | 1 | | 10 | Changing the lower limit of the permissible voltage |
| 95 | 1 | | 10 | Changing voltage value indicating lack of voltage (assumed 50%Un) |
| 96 | 1 | | 10 | Passwords reset | Passwords take the factory default settings |
| 97 | 1 | | 10 | Reset of parameters and registers – meter reset | Parameters take the factory default settings and billing and consumption/energy export profiles are reset |
| 98-254 | 1 | |  | Reserved for future use | Reserved for future use |

#### Disconnect control events

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | **Group** | **Sub-group** | **Description** | **Event description** |
| 1 | 2 | 20 | Events related to disconnect control | Manual (button) switching – energizing |
| 2 | Local switching (connector opto) - energizing |
| 3 | Local disconnect (connector opto) |
| 4 | Remote switching– energizing |
| 5 | Remote disconnect |
| 6 | Automatic disconnection-starting measuring the time delay for the transition into ready \_for \_reconnection state |
| 7 | End of the measuring the time delay – transition into ready \_for\_ reconnection state |
| 8 | Change of the power limiter settings |
| 9 | Lock of power limiter functions |
| 10 | Removing lock of power limiter |
|  |  |
| 11-255 | Reserved for future use | Reserved for future use |

#### Events related to firmware update

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | **Group** | **Sub-group** | **Description** | **Event description** |
| 1 | 1 | 11 | Firmware | Firmware – change |
| 2-255 | Reserved for future use | Reserved for future use |

#### Events related to clock synchronization

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | **Group** | **Sub-group** | **Description** | **Event description** |
| 1 | 1 | 12 | Clock synchronization | Clock synchronization performed |
| 2-255 | Reserved for future use | Reserved for future use |

#### Events related to power outages and returns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | **Group** | **Pod-Group** | **Description** | **Event description** |
| 1 | 3 | 31 | Power outages and recovery | Power outage in all phases (\*) |
| 2 | Power outage L1 (\*) |
| 3 | Power outage L2 (\*) |
| 4 | Power outage L3 (\*) |
| 5 | Power return in all phases |
| 6 | Power return L1 |
| 7 | Power return L2 |
| 8 | Power return L3 |
| 9-255 | Reserved for future use | Reserved for future use |

**(\*) Remark: *The threshold for the ‘power outage’ events has to be consistent with the (PN)-EN 50160 standard ( 1% of the rated phase voltage, i.e. 0.01 x 230 V rms);***

#### Events related to voltage sags and swells

| **Number** | **Group** | **Sub-Group** | **Description** | **Event description** |
| --- | --- | --- | --- | --- |
| 1 | 3 | 32 | Events related to voltage sags and swells | Voltage sag of 10%Un L1 |
|  | Voltage sag of 10%Un L2 |
| 2. | Voltage sag of 10%Un L3 |
| 3 | Voltage sag of 20%Un L1 |
| 4 | Voltage sag of 20%Un L2 |
| 5 | Voltage sag of 20%Un L3 |
| 6 | ~~Voltage sag of 50%Un L1~~ |
| 7 | ~~Voltage sag of 50%Un L2~~ |
| 8 | ~~Voltage sag of 50%Un L3~~ |
| 9 | Voltage swell of 10%Un L1 |
| 10 | Voltage swell of 10%Un L2 |
| 11 | Voltage swell of 10%Un L3 |
| 12 | Voltage return to an acceptable value L1 |
| 13 | Voltage return to an acceptable value L2 |
| 14 | Voltage return to an acceptable value L3 |
| 15-255 | Reserved for future use | Reserved for future use |

#### Events related to power quality

| **Number** | **Group** | **Sub-Group** | **Description** | **Event description** |
| --- | --- | --- | --- | --- |
| 1 | 3 | 33 | Events related to power quality indices | W1 – slow voltage variation threshold (0,05) |
| 2. | W2 – voltage waveform distortion threshold |
| 3 | W3 – voltage unbalance (asymetry) threshold (0,05) |
| 4 | W4 – voltage fluctuation threshold (0,05) |
|  |  |
|  |  |
| 5-255 | Reserved for future use | Reserved for future use |

#### Events related to energy theft

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | **Group** | **Sub-Group** | **Description** | **Event description** |
| 1 | 4 | 40 | Events related to energy theft | Opening the cover |
| 2 | Closing the cover |
| 3 | Detection of magnetic field |
| 4 | Disappearance of the magnetic field |
| 5 | Detection of phase and zero replacement - beginning |
| 6 | Detection of phase and zero replacement - end |
| 7 | Removing the cover of the terminal strip |
| 8 | Closing the cover of the terminal strip |
| 9 | Differential current detection – beginning |
| 10 | Differential current detection – end |
| 11-255 | Reserved for future use |

#### Frequent events - communication

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | **Group** | **Sub-Group** | **Description** | **Event description** |
| 1 | 5 | 50 | Communication events | End communication PLC Port |
| 2 | Begin communication PLC Port |
| 3 | End communication Optical Port |
| 4 | Begin communication Optical Port |
| 5 | End communication Ethernet Port |
| 6 | Begin communication Ethernet Port |
| 7 | End communication 3GPP Port |
| 8 | Begin communication 3GPP Port |
|  |  |
|  |  |
| 9-255 | Reserved for future use | Reserved for future use |

#### Data security events

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | **Group** | **Sub-Group** | **Description** | **Event description** |
| 1 | 6 | 60 | Data security events | Limit of unsuccessful logins on PLC PRIME port |
| 2 | Limit of unsuccessful logins on 3 GPP port |
| 3 | Limit of unsuccessful logins on Virtual Serial port |
| 4 | Limit of unsuccessful logins on Ethernet port |
|  |  |
| 5-255 | Reserved for future use | Reserved for future use |

### Events registers

The meter has 10 different event logs. Capacity of each event register is 1000 events – according to [6] (TOR.V.6l ii/iii):

* Standard events register [0-0:99.98.0.255]
* Theft events register [0-0:99.98.1.255]
* Voltage sag/swell events register [0-0:99.98.5.255]
* Power quality indices events register [0-0:99.98.6.255]
* Power outages events register [0-0:99.98.9.255]
* Communication related frequent events register [0-0:99.98.7.255]
* Meter firmware update events register [0-0:99.98.4.255]
* Clock synchronization events register [0-0:99.98.8.255]
* Disconnect control events register [0-0:99.98.2.255]
* Data security related events register [0-0:99.98.3.255].

### Error handling

The following table provides an overview of all errors and their distribution.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Reserved | | | | | | | | Reserved | | | | | | | | Critical errors | | | | | | | | Noncritical errors | | | | | | | |
| Byte 4 | | | | | | | | Byte 3 | | | | | | | | Byte 2 | | | | | | | | Byte1 | | | | | | | |
| 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Watch-dog error | System error | NV memory error | RAM memory error | Memory error | Not used | Not used | Not used | Not used | Not used | Not used | Battery | Wrong clock indication |

### Alarm handling

Events selected by the alarm filter are treated as alarms. The following table provides an overview of all alarms and their distribution.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Reserved | | | | | | | | Reserved | | | | | | | | Critical alarms | | | | | | | | Noncritical alarms | | | | | | | |
| Byte 4 | | | | | | | | Byte 3 | | | | | | | | Byte 2 | | | | | | | | Byte 1 | | | | | | | |
| 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 | 8 | 4 | 2 | 1 |
| Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | No zero wire | No supply | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Not used | Burglary detection używane | Replace battery | Not used |

### Profile status

Profile status is stored in 8 bits. The following table defines individual bits of the status.

|  |  |
| --- | --- |
| **Status bit (flag)** | **Description** |
| Bit 7 IV | Unreliable data |
| Bit 6 RES | Not used |
| Bit 5 RES | Not used |
| Bit 4 VH | **The clock correction**: Bit is set when the clock setting correction was did not exceed certain limit. |
| Bit 3 MP | **Change of parameters**: Bit is set when profile parameters have been changed |
| Bit 2 INT | **Detection of illegal communication with the meter: Bit is set**, if illegal trial to communicate with the meter has been revealed. |
| Bit 1 AL | **Power outage**: Bit is set if power outage has been detected |
| Bit 0 RES | Not used |

## Disconnect control

Disconnect control must meet the requirements of TOR.V.2a-f. The power limiter setting is represented by Object **1:94.48. X.255 (p.5.4).** Setting value to 0 is equivalent to the lock limiter function. According to TOR.V.2i 15 minutes power consumed represented by the Object **1-0:1.4.0.255 (p.6.2)** is subject to limitation. The setting of the time delay from the "Disconnected" (Rozl (0)) to the "Ready for reconnection” Zazb (2)) is resent by Object **0-0:94.48.21.255 (p.5.9).**

Disconnect control represents the below defined class of COSEM interface class\_id 75 Disconnect control for AMI EOP. This is a modified class of interface class\_id 70 (Blue Book, 10th edition [1].) In the definition of class\_id 75 there are the same attributes and methods as in the class\_id 70. The difference consists in a different definition of the array of transitions between logical states of the disconnect and in a different definition of billing values (enumerative) of control\_mode attribute.

Disconnect physical state takes two values:

* Connected (TRUE)
* Disconnected (FALSE).

Disconnect logical state takes three values:

* Connected – Zal (1),
* Disconnected – Rozl (0),
* Ready for reconnection (disconnected and ready for reconnection)- Zazb (2).

Meter disconnect can be disconnected:

* Locally - (loc),
* Remotely - (rem),
* Automatically- (a).

Disconnect can be reconnected:

* Locally - (loc),
* Remotely - (rem),
* Manually - (m).

Disconnect can be ready for reconnection:

* Locally – (loc)
* Remotely – (rem)
* Automatically – (a)

Note: Local disconnected/connected/ready\_for\_reconnection consists in disconnection/connection/ ready\_for\_reconnection operation with the use of opto connector.

According to the requirements, transitions between states Zal (1), Rozl (0) and Zazb (2) are possible. They are described in Table 4.1 and graphically presented in Figure 4.1.

In case the recipient exceeds 15 minutes power, the disconnect changes from Connected to Disconnected state (transition: a\_rozłączony (g)). In this state starts the timing defined by the Object 0-0:94.48.21.255 (from 1 to 60 min). Having measured the set time the disconnect changes from disconnected to the ready \_for\_reconnection state. (transition: a\_zazbrojony (h)) The transition to the Connected state is possible with the help of the button (manually - m\_załączony (e)), or using opto connector. - transition: lok\_załączony (f1), or by remote control - zd\_załączony (f).

After a power outage caused by the disruption of the network operation, the disconnect must remain in the same condition it was in before the power outage.

**id\_class 75 definition: Disconnect control (class\_id: 75)**

Table 4.1 The logical states and transitions between logical states of the disconnector

|  |  |  |  |
| --- | --- | --- | --- |
| **Logical states** | | | |
| **Logical state** | **State name** | | **State description** |
| **0** | Disconnected | | The output\_state is set to FALSE and the consumer is disconnected. |
| **1** | Connected | | The output\_state is set to TRUE and the consumer is connected. |
| **2** | Ready for reconnection | | The output\_state is set to FALSE and the consumer is disconnected. |
| **State transitions** | | | |
| **Transition** | **Transition name zd-remote, lok-locally, m-manually**  **a-automatically** | **State description** | |
| a | zd\_connect | Moves the Disconnect control object from the Disconnected (0) state to the Connected(1) state via remote control. | |
| a1 | lok\_connect | Moves the Disconnect control object from Disconnected (0) state to Connected (1) state via remote control using opto port. | |
| b | zd\_disconnect | Moves the Disconnect control object from Connected (1) state to Disconnected (0) state via remote control. | |
| b1 | lok\_disconnect | Moves the Disconnect control object from the Connected (1) state to the Disconnected (0) state via local disconnect control using opto port | |
| c | zd\_disconnect | Moves the Disconnect control object from ready\_for\_reconnection (2) state to Disccnnected (0) state via remote control. | |
| c1 | lok\_disconnect | Moves the Disconnect control object from ready\_for\_reconnectuion (2) state to Disconnected (0) state via local control using opto port.. | |
| d | zd\_ready\_for\_ ­reconnection | Moves the Disconnect control object from the Disconnected (0) state to ready\_for\_reconnection (2) state via remote cont. rolThis transition is possible even when time delay of the transition from the Disconnected (0) state to ready\_for\_reconnection (2) state is measured in the meter – in this case the delay measurement is broken. | |
| d1 | lok\_ready\_for\_reconnection | Moves the Disconnect control object from the Disconnected( 0) state to ready\_for\_reconnection (2) state via local control using opto port. This transition is possible even when time delay of the transition from the Disconnected(0) state to ready\_for\_reconnection (2) state is measured in the meater – in this case the measurement is broken | |
| e | m\_connect | Moves the Disconnect control object from the ready\_for\_reconnection (2) state to the Connected (1) state using a button in the meter . | |
| f | zd\_connect | Moves the Disconnect control object from the ready\_for\_reconnection (2) state to the Connected (1) state via remote control . | |
| f1 | lok\_connect | Moves the Disconnect control object from ready *for*reconnection (2) state to the Connected (1) state via local control using opto port. | |
| g | a\_disconnect | Moves the Disconnect control object from the Connected(1) state to the Disconnect (0) state by auto (self) disconnection of the disconnect control object by the meter in case of exceeding by the consumer the average 15 minutes power ( the value of the object **1-0:1.4.0.255 (s.6.2)** exceeds the threshold value defined by object **0-1:94.48.x.255 (s.5.4)** ). After disconnection in the Disconnected(0) state time delay of the transition from the Disconnected (0) state to ready\_for\_reconnection (2) state measurement, which value is determined by object **0-0:94.48.21.255 (s.5.9)**. | |

**zd\_ready\_for\_rreconnection(d) or lok\_ready\_for\_reconnection(d1)**

**Disconnected – Rozl (0)**

**a\_ready\_for\_reconnection(j)**

**Ready\_for\_reconnection – Zazb (2)**

**zd\_disconnect(c) or lok\_disconnect(c1)**

**zd\_connect (a)**

**or**

**lok\_connect(a1)**

**zd\_disconnect (b)**

**or**

**lok\_disconnect(b1)**

**zd\_connect(f)**

**or**

**lok\_connect(f1)**

**a\_disconnect (g)**

**m\_connect (e)**

**Connected – Zal (1)**

Fig. 4.1. Graphical representation of the meter logical states and possible transitions between these states

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Disconnect control** | **0..n** | **class\_id = 75** | | | |
| ***Attributes*** | **Data type** | ***Min.*** | ***Max.*** | ***Def.*** | ***Short name*** |
| 1. logical\_name (static) | octet-string |  |  |  | X |
| 2. output\_state (dyn.) | boolean |  |  |  | x+0x08 |
| 3. control\_state (dyn.) | enum |  |  |  | x+0x10 |
| 4. control\_mode (static) | enum |  |  |  | x+0x18 |
| ***Specific methods*** | ***m/o*** |  |  |  |  |
| 1. remote\_disconnect() | m |  |  |  | x+0x20 |
| 2. remote\_reconnect() | m |  |  |  | x+0x28 |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the instance of the object - as in [1] |
| **output\_state** | Indicates the disconnect current physical state:  boolean: TRUE = connected  FALSE -= disconnected |
| **control\_state** | Indicates the disconnect current physical state:  enum: (0) Disconnected - Rozl  (1) Connected - Zal  (2) Ready\_for\_reconnection – Zazb |
| **control\_mode** | The Disconnect control mode - determines the possible transitions between logical states of the disconnect  enum:  (0) No transitions. Disconnect is always in the Connected Zal(1)  (1) **Disconnection**: remotely (b, c), locally (b1,c1), automatically (g)  **Reconnection /Ready\_for\_reconnection**: remotely (a,d), locally (a1,d1), automatically (h), manually (e)  (2) **Disconnection** : remotely (b, c), locally (b1,c1), automatically (-)  **Reconnection/Ready\_for\_reconnection**: remotely (a,d), locally (a1,d1), automatically (-), manually (-)  (3) **Disconnection**: remotely (-), locally (b1,c1), automatically (-)  **Reconnection/Ready\_for\_reconnection**: remotely (-), locally (a1,d1), automaticaloly (-), manually (-)  (4) **Disconnection**: remotely (-), locally (b1,c1), automatically (-)  **Reconnection/ Ready\_for\_reconnection**:: remotely (-), locally (a1,d1), automatically (-), manually (e) |
| **Method description** |  |
| **remote\_disconnect** | Causes the transition of disconnect physical state to **Disconnected**, if it is enabled the value of attribute **control\_mode (1,2,3,4)** |
| **remote\_reconnect** | Causes the transition of disconnect logical state to **Connected Zal (1)** or **Ready\_for reconnection Zazb (2),** if it is enabled by the value of attribute **control\_mode (1,2,3,4)** |

# Abstract objects

## COSEM logical device name, SAP assignment, Association

| **No** | **Object/Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | SAP Assignment | 17 |  | 0-0:41.0.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000290000FF |  |  | R-/R-/--/--/R- |
| 2 | SAP\_assignment\_list |  | asslist\_type |  | List of logical devices -1  logical device (Management Logical device) with 5 associations:  - Public Client P (id=16)  - Reading Client R (id=2)  - Management Client M (id=1)  - Firmware update Client F (id=3)  - HAN Client H (id=4) | One logical device defined | R-/R-/--/--/R- |
|  | Current Association | 15 |  | 0-0:40.0.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000280000FF |  |  | R-/R-/R-/R-/R- |
| 2 | object\_list |  | object\_list\_type | List of all objects |  |  | R-/R-/R-/R-/R- |
| 3 | associated\_partners\_id |  | associated\_partners\_type |  |  |  | R-/R-/R-/R-/R- |
| 4 | application\_context\_name |  | application\_context\_name |  |  |  | R-/R-/R-/R-/R- |
| 5 | xDLMS\_context\_info |  | xDLMS\_context\_type |  |  |  | R-/R-/R-/R-/R- |
| 6 | authentication\_mechanism\_name |  | mechanism\_name |  |  |  | R-/R-/R-/R-/R- |
| 7 | LLS\_secret |  | octet-string[8] |  |  |  | -W/--/-W/-- /-- |
| 8 | association\_status |  | enum |  |  |  | R-/R-/R-/R- /R- |
|  |  |  |  |  |  |  |  |
|  | Association– Public Client | 15 |  | 0-0:40.0.1.255 | Public Client Association |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000280001FF |  |  | R-/R-/--/--/-- |
| 2 | object\_list |  | object\_list\_type | List of objects |  |  | R-/R-/--/--/-- |
| 3 | associated\_partners\_id |  | associated\_partners\_type | Management logical device (1) – P Client (16) |  |  | R-/R-/--/--/-- |
| 4 | application\_context\_name |  | application\_context\_name |  |  |  | R-/R-/--/--/-- |
| 5 | xDLMS\_context\_info |  | xDLMS\_context\_type |  |  |  | R-/R-/--/--/-- |
| 6 | authentication\_mechanism\_name |  | mechanism\_name |  |  |  | R-/R-/--/--/-- |
| 7 | LLS\_secret |  | octet-string[8] |  |  |  | --/--/--/--/-- |
| 8 | association\_status |  | enum |  |  |  | R-/--/--/R-/-- |
|  | Association – Reading Client | 15 |  | 0-0:40.0.2.255 | Reading Client Association |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000280002FF |  |  | R-/R-/--/--/-- |
| 2 | object\_list |  | object\_list\_type | List of objects |  |  | R-/R-/--/--/-- |
| 3 | associated\_partners\_id |  | associated\_partners\_type | Management logical device (1) – R Client (2) |  |  | R-/R-/--/--/-- |
| 4 | application\_context\_name |  | application\_context\_name |  |  |  | R-/R-/--/--/-- |
| 5 | xDLMS\_context\_info |  | xDLMS\_context\_type |  |  |  | R-/R-/--/--/-- |
| 6 | authentication\_mechanism\_name |  | mechanism\_name |  |  |  | R-/R-/--/--/-- |
| 7 | LLS\_secret |  | octet-string[8] |  |  |  | -W/--/--/--/-- |
| 8 | association\_status |  | enum |  |  |  | R-/R-/--/--/-- |
|  | Association – Management Client | 15 |  | 0-0:40.0.3.255 | Management Client Association |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000280003FF |  |  | R-/--/--/--/-- |
| 2 | object\_list |  | object\_list\_type | List of objects |  |  | RW/--/--/--/-- |
| 3 | associated\_partners\_id |  | associated\_partners\_type | Management logical device (1) – M Client (1) |  |  | RW/--/--/-- /-- |
| 4 | application\_context\_name |  | application\_context\_name |  |  |  | RW/--/--/--/-- |
| 5 | xDLMS\_context\_info |  | xDLMS\_context\_type |  |  |  | RW/--/--/-- /-- |
| 6 | authentication\_mechanism\_name |  | mechanism\_name |  |  |  | RW/--/--/--/-- |
| 7 | LLS\_secret |  | octet-string[8] |  |  |  | RW/--/--/-- /-- |
| 8 | association\_status |  | enum |  |  |  | RW/--/--/-- /-- |
|  | Association – Firmware Update Client | 15 |  | 0-0:40.0.4.255 | Firmware Update Client Association |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000280004FF |  |  | --/--/R-/--/-- |
| 2 | object\_list |  | object\_list\_type | List of objects |  |  | --/--/R-/--/-- |
| 3 | associated\_partners\_id |  | associated\_partners\_type | Management logical device (1) – F Client (3) |  |  | --/--/R-/--/-- |
| 4 | application\_context\_name |  | application\_context\_name |  |  |  | --/--/R-/--/-- |
| 5 | xDLMS\_context\_info |  | xDLMS\_context\_type |  |  |  | --/--/R-/--/-- |
| 6 | authentication\_mechanism\_name |  | mechanism\_name |  |  |  | --/--/R-/--/-- |
| 7 | LLS\_secret |  | octet-string[8] |  |  |  | --/--/-W/--/-- |
| 8 | association\_status |  | enum |  |  |  | --/--/R-/--/-- |
|  |  |  |  |  |  |  |  |
|  | Assiciation – HAN Client | 15 |  | 0-0:40.0.5.255 | HAN (H) Client Association |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000280005FF |  |  | R-/--/--/--/R- |
| 2 | object\_list |  | object\_list\_type | List of objects |  |  | R-/--/--/--/R- |
| 3 | associated\_partners\_id |  | associated\_partners\_type | Management logical device (1) - H Client (4) |  |  | R-/--/--/--/R- |
| 4 | application\_context\_name |  | application\_context\_name |  |  |  | R-/--/--/--/R- |
| 5 | xDLMS\_context\_info |  | xDLMS\_context\_type |  |  |  | R-/--/--/--/R- |
| 6 | authentication\_mechanism\_name |  | mechanism\_name |  |  |  | R-/--/--/--/R- |
| 7 | LLS\_secret |  | octet-string[8] |  |  |  | -W/--/--/--/-W |
| 8 | association\_status |  | enum |  |  |  | R-/--/--/--/R- |
|  | Logical COSEM device name | 1 |  | 0-0:42.0.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00002A0004FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | octet-string[16] |  | Logical device identifier (meter AMI EOP) | one logical device | R-/R-/--/R-/R- |

## Devices identification numbers

| **No** | **Object/Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Device ID 1 | 1 |  | 0-0:96.1.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00006001000FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | octet-string[16] |  | Meter serial number assigned by the producer |  | R-/R-/--/R-/R- |
|  | Device ID 2 | 1 |  | 0-0:96.1.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00006001001FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | octet-string[48] |  |  |  | R-/R-/--/R-/R- |
|  | Device ID 3 | 1 |  | 0-0:96.1.2.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00006001002FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | octet-string[48] |  |  |  | R-/R-/--/R-/R- |
|  | Device ID 4 | 1 |  | 0-0:96.1.3.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00006001003FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | octet-string[48] |  |  |  | RW/R-/--/R-/R- |
|  | Device ID 5 | 1 |  | 0-0:96.1.4.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00006001004FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | octet-string[48] |  |  |  | RW/R-/--/R-/R- |
|  | Device ID 6 | 1 |  | 0-0:96.1.5.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00006001005FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | octet-string[24] |  | Multicast communication identifier |  | RW/R-/--/R-/R- |
|  | Device ID 7 | 1 |  | 0-0:96.1.6.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00006001006FF |  |  | R-/R-/-R/R-/R- |
| 2 | value |  | octet-string[5] |  | Former firmware version |  | R-/R-/-R/R-/R- |
|  |  |  |  |  |  |  |  |

## Clock

| **No** | **Object/Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Clock | 8 |  | 0-0:1.0.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000010000FF |  |  | R-/R-/--/R-/R- |
| 2 | time |  | octet-string[12] |  | Current time and date |  | RW/R-/--/R-/R- |
| 3 | time\_zone |  | Long |  |  |  | RW/R-/--/--/R- |
| 4 | status |  | Unsigned |  |  |  | R-/R-/--/--/R- |
| 5 | daylights\_savings\_begin |  | octet-string[12] |  | last Sunday in March ,time 2.00 |  | RW/R-/--/--/R- |
| 6 | daylights\_savings\_end |  | octet-string[12] |  | Last Sunday in October, time. 3.00 |  | RW/R-/--/--/R- |
| 7 | daylights\_savings\_deviation |  | integer | 60 | Time delay – 60 min. |  | RW/R-/--/--/R- |
| 8 | daylights\_savings\_enabled |  | boolean | TRUE | Acceptable time change |  | RW/R-/--/--/R- |
| 9 | clock\_base |  | enum | 1 | internal quartz |  | RW/R-/--/--/R- |
| 10 | shift\_time |  |  |  | method shifting the time forwards / backwards, when the drift of the clock is known |  | -W/--/--/--/-- |
|  | Clock synchronization | 1 |  | 0-0:96.2.12.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 000060020CFF |  |  | R-/R-/--/--/R- |
| 2 | value |  | octet-string[12] |  | Time and date format |  | R-/R-/--/--/R- |
|  | Boundary clock inaccuracy | 3 |  | 1-0:0.9.11.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 000060020CFF |  |  | R-/R-/--/--/R- |
| 2 | value |  | unsigned |  | Max inaccuracy of clock time not causing event registration |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  | Local time | 1 |  | 0-0:0.9.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000000901FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | time |  |  |  | R-/R-/--/--/R- |
|  | Local date | 1 |  | 0-0:0.9.2.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000000902FF |  |  | R-/R-/--/R-/R- |
| 2 | value |  | date |  |  |  | R-/R-/--/--/R- |

## Activity calendars and special days tables

| **No** | **Object/Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Activity calendar | 20 |  | 0-0:13.0.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000D0000FF |  |  | R-/R-/--/--/R- |
| 2 | calendar\_name\_active |  | octet-string[8] |  |  |  | R-/R-/--/--/R- |
| 3 | season\_profile\_active |  | array[12] |  | Up to 12 seasons |  | R-/R-/--/--/R- |
| 4 | week\_profile\_table\_active |  | array[12] |  | Up to 12 week plans ( 1 week plan for 1 season). |  | R-/R-/--/--/R- |
| 5 | day\_profile\_table\_active |  | array[24] |  | Up to 2 tariff day plans for the season (the work day, weekend). Each day tariff plan can have up to 24 items (in general at every hour time zone resulting from decomposition zone in the applied tariff). |  | R-/R-/--/--/R- |
| 6 | calendar\_name\_passive |  | octet-string[6] |  |  |  | RW/R-/--/--/R- |
| 7 | season\_profile\_passive |  | array[12] |  | Up to 12 seasons. |  | RW/R-/--/--/R- |
| 8 | week\_profile\_table\_passive |  | array[12] |  | Up to 12 week plans ( 1 week plan for 1 season). |  | RW/R-/--/--/R- |
| 9 | day\_profile\_table\_passive |  | array[24] |  | Up to 2 tariff day plans for the season (the work day, weekend). Each day tariff plan can have up to 24 items (in general at every hour time zone resulting from decomposition zone in the applied tariff). |  | RW/R-/--/--/R- |
| 10 | activate\_passive\_calendar\_time |  | octet-string[12] |  | Activation by value change |  | RW/R-/--/--/R- |
|  | Special days tables | 11 |  | 0-0:11.0.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000B00FF |  |  | R-/R-/--/--/R- |
| 2 | entries |  | array[30] | Special days | Up to 30 special days |  | RW/R-/--/--/R- |
|  | Activ tariff zone identifier | 1 |  | 0-0:96.14.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600E00FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | octet-string[1] | ‘1’, ‘2’, ‘3’, ‘4’ | Active tariff zone number –read-only |  | R-/R-/--/--/R- |
|  | Current tariff group | 1 |  | 0-0:0.2.2.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000000202FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | octet-string[8] |  | Current tariff group number – read-only |  | R-/R-/--/--/R- |
|  | Active limit value of power  limiter | 3 |  | 0-1:94.48.x.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E30xxFF | x=1..4 (4 limit values) |  | R-/R-/--/--/R- |
| 2 | value |  | double-long- unsigned | 0; >0 | 0=limiter function off |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,27} | scaling=0,  unit=W,  accuracy 000.000 kW |  | R-/R-/--/--/R- |
|  | Passive limit value of power limiter | 3 |  | 0-1:94.48.x.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E3000FF | x=11..16 (6 limit values) |  | R-/R-/--/--/R- |
| 2 | value |  | double-long- unsigned | 0; >0 | 0=limiter function off |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,27} | scaling=0,  unit=W,  accuracy 000.000 kW |  | R-/R-/--/--/R- |

## Billing periods and profiles

| **No** | **Object/Attributr name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Predefined Script – end of billing period | 9 |  | 0-0:10.0.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000A0001FF |  |  | R-/R-/--/--/R- |
| 2 | scripts |  | array |  | End of billing period |  | R-/R-/--/--/R- |
| 1 | execute |  |  |  | Activation of this script is performed by calling the execute() method to the script identifier of the corresponding script object |  | -W/--/--/--/-- |
|  | End of the billing period (active) | 22 |  | 0-0:15.1.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000F0100FF |  |  | R-/R-/--/--/R- |
| 2 | executed\_script |  | script | 0-0:10.0.1.255 | End of billing period |  | R-/R-/--/--/R- |
| 3 | type |  | enum | 1 | Defined time, pattern date |  | R-/R-/--/--/R- |
| 4 | execution\_time |  | array |  |  |  | R-/R-/--/--/R- |
|  | End of the billing period (passive) | 1 |  | 0-0:94.48.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E3000FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | octet-string[12] |  |  |  | RW/R-/--/--/R- |
|  | Billing period data | 7 |  | 0-0:98.1.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000620100FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2};  {3,1-0:1.8.1.255,2};  {3,1-0:1.8.2.255,2};  {3,1-0:1.8.3.255,2};  {3,1-0:1.8.0.255,2};  {4,1-0:1.6.0,255,2}  {3,1-0:2.8.1.255,2};  {3,1-0:2.8.0.255,2};  {3,1-0:5.8.1.255,2};  {3,1-0:5.8.2.255,2};  {3,1-0:5.8.3.255,2};  {3,1-0:5.8.0.255,2};  {3,1-0:6.8.0.255,2};  {3,1-0:7.8.0.255,2};  {3,1-0:8.8.1.255,2};  {3,1-0:7.8.2.255,2};  {3,1-0:7.8.3.255,2};  {3,1-0:7.8.0.255,2}; | Clock  +A T1  +A T2  +A T3  +A  Pmax  -A T1  -A  QI (+Ri) T1  QI (+Ri) T2  QI (+Ri) T3  QI (+Ri)  QII (+Rc)  QIII (-Ri)  QIV (-Rc) T1  QIV (-Rc) T2  QIV (-Rc) T3  QIV (-Rc) |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >=12 | 12 months |  | R-/R-/--/-/R- |

## Long power failures

| **No** | **Object/Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Time threshold for long power failure | 3 |  | 0-0:96.7.20.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600714FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | long-unsigned | 180 | Power failure >= 3 min. |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  | Long power failures duration in all phases | 3 |  | 0-0:96.7.15.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 000060070FFF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  | Long power failures duration in phase L1 | 3 |  | 0-0:96.7.16.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600710FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  | Long power failures duration in phase L2 | 3 |  | 0-0:96.7.17.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600711FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  |  |  |  |  |  |  |  |
|  | Long power failures duration in phase L3 | 3 |  | 0-0:96.7.18.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600712FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  | Number of long power failures in all phases | 1 |  | 0-0:96.7.5.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600705FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
|  | Number of long power failures in phase L1 | 1 |  | 0-0:96.7.6.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600706FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
|  | Number of long power failures in phase L2 | 1 |  | 0-0:96.7.7.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600707FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
|  | Number of long power failures in phase L3 | 1 |  | 0-0:96.7.8.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600708FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
|  |  |  |  |  |  |  |  |

## Error and alarm handling

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Object- Error | 1 |  | 0-0:97.97.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000616100FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  | Error number |  | R-/R-/--/--/R- |
|  | Obiekt - Alarm | 1 |  | 0-0:97.98.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000616200FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  | Alarm number |  | R-/R-/--/--/R- |
|  | Alarm mask | 1 |  | 0-0:97.98.10.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 000061620AFF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  | Mask determines whether at the time of event, the event is treated as an alarm. Bit mask has a structure corresponding to the alarm structure described in s.4.5.4.  0- masked alarm  1- not masked alarm |  | RW/R-/--/--/R- |
|  |  |  |  |  |  |  |  |

## Event handling

| **No** | **Object/Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Event number – standard events group | 1 |  | 0-0:96.11.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B00FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | Unsigned |  | Event number |  | R-/R-/--/--/R- |
|  | Standard events register | 7 |  | 0-0:99.98.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636200FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.0.255,2,0} | Clock  Event number |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |
|  | Event number – group of events related to theft | 1 |  | 0-0:96.11.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B01FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | Unsigned |  | Event number |  | R-/R-/--/--/R- |
|  | Register of events related to theft | 7 |  | 0-0:99.98.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636201FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.1.255,2,0} | Clock  Event number |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |
|  | Event number – group of events related to voltage sags and swells | 1 |  | 0-0:96.11.5.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B05FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | Unsigned |  | Event number |  | R-/R-/--/--/R- |
|  | Register of events related to voltage sags and swells | 7 |  | 0-0:99.98.5.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636205FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.5.255,2,0} | Clock  Event number |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Event number – group of events related to power quality | 1 |  | 0-0:96.11.6.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B06FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | unsigned |  | Numer zdarzenia |  | R-/R-/--/--/R- |
|  | Register of events related to power quality | 7 |  | 0-0:99.98.6.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636206FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.6.255,2,0} | Zegar  Numer zdarzenia |  | RW/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronicznie |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | niesortowane (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | niesortowane |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | RW/R-/--/--/R- |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Event number – group of events related to power outages | 1 |  | 0-0:96.11.9.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B09FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | Unsigned |  | Event number |  | R-/R-/--/--/R- |
|  | Register of events related to power outages | 7 |  | 0-0:99.98.9.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636209FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.9.255,2,0} | Clock  Event number |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |
|  | Event number – group of events related to interfaces functioning | 1 |  | 0-0:96.11.7.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B07FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | Unsigned |  | Event number |  | R-/R-/--/--/R- |
|  | Register of events related to interfaces functioning | 7 |  | 0-0:99.98.7.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636207FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.7.255,2,0} | Clock  Event number |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |
|  | Event number – group of events related to meter firmware update | 1 |  | 0-0:96.11.4.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B04FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | Unsigned |  | Event number |  | R-/R-/--/--/R- |
|  | Register of events related to meter firmware update | 7 |  | 0-0:99.98.4.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636204FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.7.255,2,0}  {1,0-0:0.2.0.255,2,0}  {1,0-0:96.1.6.255,2,0} | Clock  Event code  Firmware version  Former firmware version |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |
|  | Event number – group of events related to the clock synchronization | 1 |  | 0-0:96.11.8.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B08FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | Unsigned |  | Event number |  | R-/R-/--/--/R- |
|  | Register of events related to the clock synchronization | 7 |  | 0-0:99.98.8.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636208FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.7.255,2,0}  {1,0-0:96.2.12.255,2,0} | Clock  Event number  Former state of the clock |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |
|  | Event number – group of events related to the disconnect control | 1 |  | 0-0:96.11.2.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B02FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | Unsigned |  | Event code |  | R-/R-/--/--/R- |
|  | Register of events related to disconnect control | 7 |  | 0-0:99.98.2.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636202FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.7.255,2,0}  {75,0-0:96.3.10.255,3,0} | Clock  Event code  Current logical state of disconnect control |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |
|  | Event number – group of events related to data security | 1 |  | 0-0:96.11.3.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000600B03FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | Unsigned |  | Event number |  | R-/R-/--/--/R- |
|  | Register of events related to data security | 7 |  | 0-0:99.98.3.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000636203FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2,0}  {1,0-0:96.11.3.255,2,0} | Clock  Event number |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 0 | asynchronously |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | unsorted (FIFO) |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none | unsorted |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >= 1000 |  |  | R-/R-/--/--/R- |
|  | Standard events mask | 1 |  | 0-1:94.48.105.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E3069FF |  |  | R-/R-/--/--/-- |
| 2 | value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the events register  (0 - no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 – event not reported , 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to theft | 1 |  | 0-1:94.48.106.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E306AFF |  |  | R-/R-/--/--/-- |
| 2 | value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0- no recording, 1 – recording)  Array[1] – mask of reporting events  (0 – event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to power quality | 1 |  | 0-1:94.48.107.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E306BFF |  |  | R-/R-/--/--/-- |
| 2 | value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0 -no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 – event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to voltage sags and swells | 1 |  | 0-1:94.48.108.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E306CFF |  |  | R-/R-/--/--/-- |
| 2 | value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0 -no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 – event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to power outages | 1 |  | 0-1:94.48.109.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E306DFF |  |  | R-/R-/--/--/-- |
| 2 | value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0 -no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 – event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to functioning of interfaces | 1 |  | 0-1:94.48.110.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E306EFF |  |  | R-/R-/--/--/-- |
| 2 | value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0 - no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 - event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to meter firmware update | 1 |  | 0-1:94.48.112.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E3070FF |  |  | R-/R-/--/--/-- |
| 2 | value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0- no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 – event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to the clock synchronization | 1 |  | 0-1:94.48.113.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E3071FF |  |  | R-/R-/--/--/-- |
| 2 | Value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0 no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 – event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to disconnect control | 1 |  | 0-1:94.48.114.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E3072FF |  |  | R-/R-/--/--/-- |
| 2 | Value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0 - no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 – event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  | Mask of events related to data security | 1 |  | 0-1:94.48.111.255 | Masking recording and reporting of events |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E306EFF |  |  | R-/R-/--/--/-- |
| 2 | Value |  | Array [2] of bit-string[256] |  | Array[0] – mask of recording in the register of events  (0 - no recording, 1 – recording)  Array[1] – mask of reporting the events  (0 – event not reported, 1- event reported) |  | RW/R-/--/--/-- |
|  |  |  |  |  |  |  |  |

## Disconnect control

| **No** | **Object/Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Disconnect Control | 75 |  | 0-0:96.3.10.255 | id\_class 75 j is defined in s. 4.6 |  |  |
| 1 | logical\_name |  | octet-string[6] | 000060030AFF |  |  | R-/R-/--/--/R- |
| 2 | output\_state |  | boolean |  | Physical state of disconnect control:  TRUE – connected  FALSE - disconnected |  | R-/R-/--/--/R- |
| 3 | control\_state |  | enum | 0;1;2 | Logical state of disconnect control:  0 – Disconnected  1 – Connected  2 – Ready\_for\_reconnection |  | R-/R-/--/--/R- |
| 4 | control\_mode |  | enum |  | Disconnect control behaviour – acc. to s. 4.6 |  | RW/R-/--/--/R- |
| 1 | remote\_disconnect |  |  |  |  |  | -W/--/--/--/-- |
| 2 | remote\_connect |  |  |  |  |  | -W/--/--/--/-- |
|  |  |  |  |  |  |  |  |
|  | Disconnect control auto switch time | 3 |  | 0-0:94.48.21.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E3015FF |  |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  | Value from 60 s to 3600 s |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |

## Firmware update

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Predefined Script – firmware activation | 9 |  | 0-0:10.0.107.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000A006BFF |  |  | R-/R-/--/--/R- |
| 2 | scripts |  | array |  | Firmware activation |  | R-/R-/--/--/R- |
| 1 | execute |  |  |  | Activation of this script is performed by calling the execute() method to the script identifier of the corresponding script object |  | -W/-/-W/--/-- |
|  | New meter firmware transfer | 18 |  | 0-0:44.0.0.255 | Enables transfer of firmware image to the meter |  |  |
| 1 | logical\_name |  | octet-string[6] | 00002C0000FF |  |  | --/--/R-/--/-- |
| 2 | image\_block\_size |  | double-long- unsigned |  |  |  | --/--/R-/--/-- |
| 3 | image\_transferred\_blocks\_status |  | bit-string |  |  |  | --/--/R-/--/-- |
| 4 | image\_first\_not\_transferred\_block\_number |  | double-long-unsigned |  |  |  | --/--/R-/--/-- |
| 5 | image\_transfer\_enabled |  | boolean |  |  |  | --/--/RW/--/-- |
| 6 | image\_transfer\_status |  | enumerated |  |  |  | --/--/R-/--/-- |
| 7 | image\_to\_activate\_info |  | array |  |  |  | --/--/R-/--/-- |
| 1 | image\_transfer\_initiate |  |  |  |  |  | --/--/-W/--/-- |
| 2 | image\_block\_transfer |  |  |  |  |  | --/--/-W/--/-- |
| 3 | image\_verify |  |  |  |  |  | --/--/-W/--/-- |
| 4 | image\_activate |  |  |  |  |  | --/--/-W-/--/-- |
|  | Firmware activation management | 22 |  | 0-0:15.0.2.255 | Activates a new version of meter firmware |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000F0002FF |  |  | --/--/R-/--/-- |
| 2 | Executed\_script |  | script | 0-0:10.0.107.255 |  |  | --/--/R-/--/-- |
| 3 | Type |  | enum | 1 | Time determined |  | --/--/R-/--/-- |
| 4 | Execution\_time |  | array | Time, date |  |  | --/--/RW/--/-- |
|  | Firmware version | 1 |  | 0-0:0.2.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000000200FF |  |  | R-/R-/R-/--/R- |
| 2 | Value |  | octed string[16] |  | Version identifier of the currently active firmware of the meter |  | RW/R-/RW/--/R- |

## Data display

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Auto Scroll sequence | 7 |  | 0-0:21.0.1.255 | List of values in the display for Auto Scroll sequence |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000150001FFF |  |  | R-/R-/--/--/-- |
| 2 | capture objects |  | array[20] | { {3,1-0:1.8.x.255,2}  (3,1-0:2.8.0.255,2}  (3,1-0:5.8.x.255,2}  (3,1-0:8.8.0.255,2}  {1,0-0:0.9.1.255,2}  {1,0-0:0.9.2.255,2}  {1, 0-0:0.2.2.255,2} | Active energy import (+A)  x=0 - total, x=1..4 – in time zones  Total active energy export (-A)  Reactive energy QI (+Ri)  x=0 - total, x=1..4 – in time zones  Total reactive energy QIV (-Rc)  time  date  current tariff group |  | RW/R-/--/--/-- |
| 3 | capture\_period |  | double-long-unsigned |  |  |  | RW/R-/R-/--/R- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | Manual Scroll sequence | 7 |  | 0-0:21.0.2.255 | List of values in the display for Manual Scroll sequence |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000150002FFF |  |  | R-/R-/--/--/-- |
| 2 | capture objects |  | array[30] | { {3,1-0:1.8.x.255,2}  (3,1-0:2.8.0.255,2}  (3,1-0:5.8.x.255,2}  (3,1-0:8.8.0.255,2}  {1,0-0:0.9.1.255,2}  {1,0-0:0.9.2.255,2}  {1, 0-0:0.2.2.255,2} | Active energy import (+A)  x=0 - total, x=1..4 – in time zones  Total active energy export (-A)  Reactive energy QI (+Ri)  x=0 - total, x=1..4 – in time zones  Total reactive energy QIV (-Rc)  time  date  current tariff group |  | R-/R-/--/--/-- |
| 3 | capture\_period |  | double-long-unsigned |  |  |  | RW/R-/R-/--/R- |
|  |  |  |  |  |  |  |  |
|  | Timeout for scroll display | 3 |  | 0-0:94.48.120.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E236EFF |  |  | R-/R-/--/--/-- |
| 2 | value |  | double-long-unsigned | 5 | default value |  | RW/R-/--/--/-- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scale=0, units=seconds |  | R-/R-/--/--/-- |
|  |  |  |  |  |  |  |  |
|  | Timeout for return to Auto Scroll mode | 3 |  | 0-0:94.48.121.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E236FFF |  |  | R-/R-/--/--/-- |
| 2 | value |  | double-long-unsigned | 60 | default value |  | R-/R-/--/--/-- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scale=0, units=seconds |  | R-/R-/--/--/-- |

## Safe parametrization

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Request Message Queue | 8449 |  | 0-0:138.0.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00008A0000FFF |  |  | R-/R-/--/--/-- |
| 2 | Buffer |  | array |  | Array of request messages for safe parametrization |  | R-/R-/--/--/-- |
| 3 | Buffer\_size |  | double-long-unsigned |  | 7680 bytes |  | R-/R-/--/--/-- |
| 4 | Buffer\_free\_space |  | double-long-unsigned |  |  |  | R-/R-/--/--/-- |
| 5 | last-enqueued\_message\_id |  | double-long-unsigned |  |  |  | R-/R-/--/--/-- |
| 1 | reset() |  |  |  | After invoking the method reset() for the Response Message Queue {8449,0-0:138.0.0.255} |  | -W/--/--/--/-- |
| 2 | enqueue\_message(message) |  |  |  |  |  | -W/--/--/--/-- |
| 3 | remove\_message(lasr\_read\_message\_id) |  |  |  |  |  | -W/--/--/--/-- |
|  | Response Message Queue | 8449 |  | 0-0:138.0.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00008A0001FFF |  |  | R-/R-/--/--/-- |
| 2 | Buffer |  | array |  | Array of response messages for safe parametrization |  | R-/R-/--/--/-- |
| 3 | Buffer\_size |  | double-long-unsigned |  | 3840 bytes |  | R-/R-/--/--/-- |
| 4 | Buffer\_free\_space |  | double-long-unsigned |  |  |  | R-/R-/--/--/-- |
| 5 | last-enqueued\_message\_id |  | double-long-unsigned |  |  |  | R-/R-/--/--/-- |
| 1 | reset() |  |  |  |  |  | -W/--/--/--/-- |
| 2 | enqueue\_message(message) |  |  |  |  |  | -W/--/--/--/-- |
| 3 | remove\_message(lasr\_read\_message\_id) |  |  |  |  |  | -W/--/--/--/-- |
|  |  |  |  |  |  |  |  |

## Data security

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Security Setup for Reading Client | 64 |  | 0-0:43.0.2.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00002B002FF |  |  | R-/R-/R-/R-/R- |
| 2 | security\_policy |  | enum |  | (0) – nothing;  (1) – all messages to be authenticated;  (2) – all messages to be encrypted;  (3) – all messages to be authenticated and encrypted |  | R-/R-/R-/R-/R- |
| 3 | security\_suite |  | enum |  | (0) AES-GCM-128 for authenticated encryption and AES-128 for key wrapping |  | R-/R-/R-/R-/R- |
| 4 | client\_system\_title |  | octet-string |  |  |  | R-/R-/R-/R-/R- |
| 5 | serwver\_system\_title |  | octet-string |  |  |  | R-/R-/R-/R-/R- |
| 1 | security\_activate (data) |  | mathod |  |  |  | -W/--/--/--/--/-- |
| 2 | global\_key\_transfer (data) |  | mathod |  |  |  | -W/--/--/--/--/-- |
|  | Security Setup for Management Client | 64 |  | 0-0:43.0.3.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00002B003FF |  |  | R-/R-/R-/R-/R- |
| 2 | security\_policy |  | enum |  | (0) – nothing;  (1) – all messages to be authenticated;  (2) – all messages to be encrypted;  (3) – all messages to be authenticated and encrypted |  | R-/R-/R-/R-/R- |
| 3 | security\_suite |  | enum |  | (0) AES-GCM-128 for authenticated encryption and AES-128 for key wrapping |  | R-/R-/R-/R-/R- |
| 4 | client\_system\_title |  | octet-string |  |  |  | R-/R-/R-/R-/R- |
| 5 | serwver\_system\_title |  | octet-string |  |  |  | R-/R-/R-/R-/R- |
| 1 | security\_activate (data) |  | mathod |  |  |  | -W/--/--/--/--/-- |
| 2 | global\_key\_transfer (data) |  | mathod |  |  |  | -W/--/--/--/--/-- |
|  | Security Setup for FirmwareUpdate Client | 64 |  | 0-0:43.0.4.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00002B004FF |  |  | R-/R-/R-/R-/R- |
| 2 | security\_policy |  | enum |  | (0) – nothing;  (1) – all messages to be authenticated;  (2) – all messages to be encrypted;  (3) – all messages to be authenticated and encrypted |  | R-/R-/R-/R-/R- |
| 3 | security\_suite |  | enum |  | (0) AES-GCM-128 for authenticated encryption and AES-128 for key wrapping |  | R-/R-/R-/R-/R- |
| 4 | client\_system\_title |  | octet-string |  |  |  | R-/R-/R-/R-/R- |
| 5 | serwver\_system\_title |  | octet-string |  |  |  | R-/R-/R-/R-/R- |
| 1 | security\_activate (data) |  | mathod |  |  |  | -W/--/--/--/--/-- |
| 2 | global\_key\_transfer (data) |  | mathod |  |  |  | -W/--/--/--/--/-- |
|  | Security Setup for HAN Client | 64 |  | 0-0:43.0.5.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00002B005FF |  |  | R-/R-/R-/R-/R- |
| 2 | security\_policy |  | enum |  | (0) – nothing;  (1) – all messages to be authenticated;  (2) – all messages to be encrypted;  (3) – all messages to be authenticated and encrypted |  | R-/R-/R-/R-/R- |
| 3 | security\_suite |  | enum |  | (0) AES-GCM-128 for authenticated encryption and AES-128 for key wrapping |  | R-/R-/R-/R-/R- |
| 4 | client\_system\_title |  | octet-string |  |  |  | R-/R-/R-/R-/R- |
| 5 | serwver\_system\_title |  | octet-string |  |  |  | R-/R-/R-/R-/R- |
| 1 | security\_activate (data) |  | mathod |  |  |  | -W/--/--/--/--/-- |
| 2 | global\_key\_transfer (data) |  | mathod |  |  |  | -W/--/--/--/--/-- |
|  | Frame counter for Reading Client | 1 |  | 0-x:43.1.2.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00xx2B0102FF | x= 1 – global unicast |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
|  | Frame counter for Management Client | 1 |  | 0-x:43.1.3.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00xx2B0103FF | x= 1 – global unicast  x= 2 – global broadcast |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
|  | Frame counter for Firmware Updated Client | 1 |  | 0-x:43.1.4.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00xx2B0104FF | x= 1 – global unicast  x= 2 – global broadcast |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
|  | Frame counter for HAN Client | 1 |  | 0-x:43.1.5.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00xx2B0105FF | x= 1 – global unicast  x= 2 – global broadcast |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | Counter of successful logins on PLC PRIME port | 1 |  | 0-1:94.48.100.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E3064FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
|  | Counter of successful logins on 3 GPP port | 1 |  | 0-2:94.48.100.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00025E3064FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
|  | Counter of successful logins on Virtual Serial port | 1 |  | 0-3:94.48.100.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00035E3064FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
|  | Counter of successful logins on Ethernet port | 1 |  | 0-4:94.48.100.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00045E3064FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
|  | Counter of unsuccessful logins on PLC PRIME port | 3 |  | 0-1:94.48.101.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E3065FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,255) | scaling=0  unit=count |  | R-/R-/R-/R-/R- |
| 1 | reset(data) |  |  |  |  | Reset of the counter is possible after the event generation | -W/R-/R-/R-/R- |
|  | Counter of unsuccessful logins on 3 GPP port | 3 |  | 0-2:94.48.101.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00025E3065FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,255) | scaling=0  unit=count |  | R-/R-/R-/R-/R- |
| 1 | reset(data) |  |  |  |  | Reset of the counter is possible after the event generation | -W/R-/R-/R-/R- |
|  | Counter of unsuccessful logins on Virtual Serial port | 3 |  | 0-3:94.48.101.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00035E3065FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,255) | scaling=0  unit=count |  | R-/R-/R-/R-/R- |
| 1 | reset(data) |  |  |  |  | Reset of the counter is possible after the event generation | -W/R-/R-/R-/R- |
|  | Counter of unsuccessful logins on Ethernet port | 3 |  | 0-4:94.48.101.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00045E3065FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/R-/R-/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,255) | scaling=0  unit=count |  | R-/R-/R-/R-/R- |
| 1 | reset(data) |  |  |  |  | Reset of the counter is possible after the event generation | -W/R-/R-/R-/R- |
|  | Threshold for the counter of unsuccessful logins on PLC PRIME port | 1 |  | 0-1:94.48.102.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00015E3066FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | RW/R-/R-/R-/R- |
|  | Threshold for the counter of unsuccessful logins on 3 GPP port | 1 |  | 0-2:94.48.102.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00025E3066FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | RW/R-/R-/R-/R- |
|  | Threshold for the counter of unsuccessful logins on Virtual Serial port | 1 |  | 0-3:94.48.102.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00035E3066FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | RW/R-/R-/R-/R- |
|  | Threshold for the counter of unsuccessful logins on Virtual Serial port | 1 |  | 0-4:94.48.102.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00045E3066FF |  |  | R-/R-/R-/R-/R- |
| 2 | value |  | double-long-unsigned |  |  |  | RW/R-/R-/R-/R- |
|  |  |  |  |  |  |  |  |

## Other abstract objects

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Meter reset | 9 |  | 0-0:10.0.0.255 | Meter parameters and registers reset | Parameters take the default settings and billing profiles and power import/export profiles are reset |  |
| 1 | logical\_name |  | octet-string[6] | 00002C0000FF |  |  | R-/R-/--/--/-- |
| 2 | scripts |  | array |  | Table of scripts run by the execute () method |  | R-/R-/--/--/-- |
| 1 | execute |  |  |  |  |  | -W/--/--/--/-- |
|  | Resets counter | 1 |  | 0-0:0.1.0.255 | Resets counter |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000000100FF |  |  | R-/R-/--/--/-- |
| 2 | value |  | long-unsigned |  |  |  |  |

# Electricity related objects

## Energy Registers

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Active energy import (+A) | 3 |  | 1-0:1.8.x.255 | Absolute value |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000108xxFF | x=0 - total.  x=1…4 – in time zone |  | R-/R-/--/--/R-- |
| 2 | Value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,30} | scaling=0,  unit=Wh,  accuracy: 000.000 kWh |  | R-/R-/--/--/R- |
|  | Active energy export (-A) | 3 |  | 1-0:2.8.x.255 | Absolute value |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000208xxFF | x=0 - total  x=1…4 – in zone |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,30} | scaling=0,  unit=Wh,  accuracy: 000.000 kWh |  | R-/R-/--/--/R- |
|  | Reactive energy QI (+Ri) | 3 |  | 1-0:5.8.x.255 | Absolute value |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000508xxFF | x=0 - total  x=1…4 – in zone |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,32} | scaling=0,  unit=varh,  accuracy: 000.000 kvarh |  | R-/R-/--/--/R- |
|  | Reactive energy QII (+Rc) | 3 |  | 1-0:6.8.x.255 | Absolute value |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000608xxFF | x=0 - total  x=1…4 – in zone |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,32} | scaling=0,  unit=varh,  accuracy: 000.000 kvarh |  | R-/R-/--/--/R- |
|  | Reactive energy QIII (-Ri) | 3 |  | 1-0:7.8.x.255 | Absolute value |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000708xxFF | x=0 - total  x=1…4 – in zone |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,32} | scaling=0,  unit=varh,  accuracy: 000.000 kvarh |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,32} | scaling=0,  unit=varh,  accuracy: 000.000 kvarh |  | R-/R-/--/--/R- |
|  | Reactive energy QIV (-Rc) | 3 |  | 1-0:8.8.x.255 | Absolute value |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000808xxFF | x=0 - total  x=1…4 – in zone |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,32} | scaling=0,  unit=varh,  accuracy: 000.000 kvarh |  | R-/R-/--/--/R- |
|  | Billing values | 7 |  | 0-0:98.1.1.255 | Set of current billing values |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000620101FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | Capture\_objects |  | array | {8,0-0:1.0.0.255,2};  {3,1-0:1.8.1.255,2};  {3,1-0:1.8.2.255,2};  {3,1-0:1.8.3.255,2};  {3,1-0:1.8.0.255,2};  {3,1-0:2.8.1.255,2};  {3,1-0:2.8.0.255,2};  {3,1-0:5.8.1.255,2};  {3,1-0:5.8.2.255,2};  {3,1-0:5.8.3.255,2};  {3,1-0:5.8.0.255,2};  {3,1-0:8.8.1.255,2};  {3,1-0:8.8.2.255,2};  {3,1-0:8.8.3.255,2};  {3,1-0:8.8.0.255,2};  {3,1-0:7.8.0.255,2};  {3,1-0:6.8.0.255,2};  {4,1-0:1.6.1.0,255,2} | Clock  Energy registers (absolute values) defined in this table (6.1),  +A T1, +A T2, +A T3, +A,  -A T1, -A  QI=+Ri  QI T1, QI T2, QI T3, QI  QIV=-Rc  QIV T1, QIV T2, QIV T3, QIV  QIII (-Ri)  QII (+Rc)  Pmax | Acc. to definition s. 5.5 | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 1 |  |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 0 | FIFO |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | object definition | none |  |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | 1 |  |  | R-/R-/--/--/R- |

## Demand Registers

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Mean power import(+A) | 5 |  | 1-0:1.4.0.255 | Mean value |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100010400FF |  |  | R-/R-/--/--/R- |
| 2 | current\_average\_value |  | double-long |  |  |  | R-/R-/--/--/R- |
| 3 | last\_average\_value |  | double-long |  |  |  | R-/R-/--/--/R- |
| 4 | scaler\_unit |  | scal\_unit\_type | {0,27} | scaling=0,  unit=W,  accuracy: 00.000 kW |  | R-/R-/--/--/R- |
| 5 | status |  | null-data |  |  |  | R-/R-/--/--/R- |
| 6 | capture\_time |  | octet-string[12] |  |  |  | R-/R-/--/--/R- |
| 7 | start\_time\_current |  | octet-string[12] |  |  |  | R-/R-/--/--/R- |
| 8 | period |  | double-long-unsigned | 900 | 900 s = 15 min |  | R-/R-/--/--/R- |
| 9 | number\_of\_periods |  | long-unsigned | 1 |  |  | R-/R-/--/--/R- |
| 10 | reset |  | integer |  |  |  | R-/R-/--/--/R- |
| 11 | next\_period |  | integer |  |  |  | R-/R-/--/--/R- |
|  | Mean power export (-A) | 5 |  | 1-0:2.4.0.255 | Mean value |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100020400FF |  |  | R-/R-/--/--/R- |
| 2 | current\_average\_value |  | double-long |  |  |  | R-/R-/--/--/R- |
| 3 | last\_average\_value |  | double-long |  |  |  | R-/R-/--/--/R- |
| 4 | scaler\_unit |  | scal\_unit\_type | {0,27} | scaling=0,  unit=W,  accuracy: 00.000 kW |  | R-/R-/--/--/R- |
| 5 | status |  | null-data |  |  |  | R-/R-/--/--/R- |
| 6 | capture\_time |  | octet-string[12] |  |  |  | R-/R-/--/--/R- |
| 7 | start\_time\_current |  | octet-string[12] |  |  |  | R-/R-/--/--/R- |
| 8 | period |  | double-long-unsigned | 900 | 900 s = 15 min |  | R-/R-/--/--/R- |
| 9 | number\_of\_periods |  | long-unsigned | 1 |  |  | R-/R-/--/--/R- |
| 10 | reset |  | integer |  |  |  | R-/R-/--/--/R- |
| 11 | next\_period |  | integer |  |  |  | R-/R-/--/--/R- |
|  | Maximum power import (+A) | 4 |  | 1-0:1.6.x.255 | Maximum value |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000106xxFF | x=0 – in all zones. (Pmax TIME)  x=1…4 – in zone |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,27} | scaling=0,  unit=W,  accuracy: 00.000 kW |  | R-/R-/--/--/R- |
| 4 | status |  | Unsigned | 1=aktive  0=inactive |  |  | R-/R-/--/--/R- |
| 5 | capture\_time |  | octet-string[12] |  |  |  | R-/R-/--/--/R- |
|  | Maximum power export (-A) | 4 |  | 1-0:2.6.x.255 | Maximum value |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000206xxFF | x=0 – in all zones.  x=1…4 – in zone |  | R-/R-/--/--/R- |
| 2 | value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,27} | scaling=0,  unit=W,  accuracy: 00.000 kW |  | R-/R-/--/--/R- |
| 4 | status |  | Unsigned | 1=active  0=inactive |  |  | R-/R-/--/--/R- |
| 5 | capture\_time |  | octet-string[12] |  |  |  | R-/R-/--/--/R- |

## Load Profiles

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Hourly profile 1 status | 1 |  | 0-0:96.10.7.255 | Recorded absolute values ​​(counter) latched with the period of 15, 30, or 60 min. |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600A07FF |  |  | R-/R-/--/R-/R- |
| 2 | status |  | Unsigned | {IV, RES, RES, VH , MP, INT, AL, RES} |  |  | R-/R-/--/R-/R- |
|  | Hourly profile 1 | 7 |  | 1-0:99.1.0.255 | Profile created based on the states of counters for various types of energy, voltage and current every 15, 30 or 60 minutes. |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100630100FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  | The buffer must be recorded on a continuous basis - irregularities of the recording in the buffer are not permitted (exactly one entry in the averaging period) |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2};  {1,0-0:96.10.7.255,2};  {3,1-0:1.8.0.255,2};  {3,1-0:2.8.0.255,2};  {3,1-0:5.8.0.255,2};  {3,1-0:6.8.0.255,2};  {3,1-0:7.8.0.255,2};  {3,1-0:8.8.0.255,2};  {4,1-0:1.6.1.0,255,2}  {3,1-0:32.7.0.255,2};  {3,1-0:52.7.0.255,2};  {3,1-0:72.7.0.255,2};  {3,1-0:31.7.0.255,2};  {3,1-0:51.7.0.255,2};  {3,1-0:71.7.0.255,2}; | Clock  Load profile 1 status  +A  -A  QI (+Ri)  QII (+Rc)  QIII (-Ri)  QIV (-Rc)  Pmax  U L1  U L2  U L3  I L1  I L2  I L3 |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | y | y=900, 1800, 3600 s |  | RW/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | FIFO |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | capture object definition | none | none |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >=6048 | >= 63 days with 15 min averaging period |  | R-/R-/--/--/R- |
|  | Daily Profile 2 status | 1 |  | 0-0:96.10.8.255 | Profile created with the period of 24 h |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000600A08FF |  |  | R-/R-/--/R-/R- |
| 2 | status |  | Unsigned | {IV, RES, RES, VH , MP, INT, AL, RES} |  |  | R-/R-/--/R-/R- |
|  | Daily profile 2 | 7 |  | 1-0:99.2.0.255 | Reading an absolute value recorded in the profile (meter reading) |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100630100FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  | The buffer must be recorded on a continuous basis - irregularities of the recording in the buffer are not permitted (exactly one entry in the averaging period) |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2};  {1,0-0:96.10.8.255,2};  {3,1-0:1.8.0.255,2};  {3,1-0:2.8.0.255,2};  {3,1-0:5.8.0.255,2};  {3,1-0:6.8.0.255,2};  {3,1-0:7.8.0.255,2};  {3,1-0:8.8.0.255,2};  {4,1-0:1.6.1.0,255,2}  {3,1-0:32.7.0.255,2};  {3,1-0:52.7.0.255,2};  {3,1-0:72.7.0.255,2};  {3,1-0:31.7.0.255,2};  {3,1-0:51.7.0.255,2};  {3,1-0:71.7.0.255,2}; | Clock  .Load profile 2 status  +A  -A  QI (+Ri)  QII (+Rc)  QIII (-Ri)  QIV (-Rc)  Pmax  U L1  U L2  U L3  I L1  I L2  I L3 |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | 86400 | 86400 s (24 h) |  | RW/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | FIFO |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | capture object definition | none | none |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >=63 | >= 63 days |  | R-/R-/--/--/R- |

## Instantaneous Values

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Instantaneous voltage (phase) | 3 |  | 1-0:x.7.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100200700FF | x=32 in phase L1  x=52 in phase L2 (only for 3 ph meter)  x=72 in phase L3 (only for 3 ph meter) |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,35} | scaling=0,  unit=V,  accuracy: 0.0 V |  | R-/R-/--/--/R- |
|  | Instantaneous current | 3 |  | 1-0:x.7.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01001F0700FF | x=31 in phase L1  x=51 in phase L2  x=71 in phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-1,33} | scaling=-1,  unit=A,  accuracy: 0.0 A |  | R-/R-/--/--/R- |
|  | Sum of currents in phases L1+L2+L3 | 3 |  | 1-0:90.7.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01005A0700FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-1,33} | scaling=-1,  unit=A,  accuracy: 0.0 A |  | R-/R-/--/--/R- |
|  | Active power import P+ /phase | 3 |  | 1-0:x.7.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100150700FF | x=21 in phase L1  x=41 in phase L2  x=61 in phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,27} | scaling=1,  unit=W,  accuracy: 0.00 kW |  | R-/R-/--/--/R- |
|  | Active power export P-/phase | 3 |  | 1-0:x.7.0.255 |  | Only 3- phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100160700FF | x=22 in phase L1  x=42 in phase L2  x=62 in phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | Active power - (QII+QIII) |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,27} | scaling=1,  unit=W,  accuracy: 0.00 kW |  | R-/R-/--/--/R- |
|  | Reactive power import Q+/phase | 3 |  | 1-0:x.7.0.255 |  | Only 3- phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100170700FF | x=23 in phase L1  x=43 in phase L2  x=63 in phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | Reactive power +(QI+QII) |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,29} | scaling=1,  unit=var,  accuracy: 0.00 kVAr |  | R-/R-/--/--/R- |
|  | Reactive power export Q- /phase | 3 |  | 1-0:x.7.0.255 |  | Only 3- phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100180700FF | x=24 in phase L1  x=44 in phase L2  x=64 in phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | L1 Reactive power -(QIII+QIV) |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,29} | scaling=1,  unit=var,  accuracy: 0.00 kVAr |  | R-/R-/--/--/R- |
|  | Sum of active power import P+ L1+L2+L3 | 3 |  | 1-0:1.7.0.255 |  | 1 and 3 phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100010700FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | L1+L2+L3 Active power |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,27} | scaling=1,  unit=W, accuracy: 0.00 kW |  | R-/R-/--/--/R- |
|  | Sum of active power export P- L1+L2+L3 | 3 |  | 1-0:2.7.0.255 |  | 1 and 3 phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100020700FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | L1+L2+L3 Active power |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,27} | scaling=1,  unit=W, accuracy: 0.00 kW |  | R-/R-/--/--/R- |
|  | Sum of reactive power import Q+ L1+L2+L3 | 3 |  | 1-0:3.7.0.255 |  | 1 and 3 phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100030700FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | L1+L2+L3 Reactive power |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,29} | scaling=1,  unit=var, accuracy: 0.00 kVAr |  | R-/R-/--/--/R- |
|  | Sum of reactive power export Q- L1+L2+L3 | 3 |  | 1-0:4.7.0.255 |  | 1 and 3 phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100040700FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | L1+L2+L3Reactive power - |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,29} | scaling=1,  unit=var, accuracy: 0.00 kVAr |  | R-/R-/--/--/R- |
|  | Sum of reactive power import Ri+ L1+L2+L3 | 3 |  | 1-0:5.7.0.255 |  | 1 and 3 phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100050700FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | L1+L2+L3 Reactive power +(QI) |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,29} | scaling=1,  unit=var, accuracy: 0.00 kVAr |  | R-/R-/--/--/R- |
|  | Sum of reactive power export Rc- L1+L2+L3 | 3 |  | 1-0:8.7.0.255 |  | 1 and 3 phase meter |  |
| 1 | logical\_name |  | octet-string[6] | 0100080700FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | double-long-unsigned | L1+L2+L3 Reactive power -(QIV) |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {1,29} | scaling=1,  unit=var, accuracy: 0.00 kVAr |  | R-/R-/--/--/R- |

## Voltage sags and swells

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Rated voltage (any phase) | 3 |  | 1-0:12.48.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C3000FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 230 |  |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,35} | scaling=0,  unit=V,  accuracy: 0.0 V |  | R-/R-/--/--/R- |
|  | Threshold 1 of voltage sag | 3 |  | 1-0:12.31.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C1F00FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 1000 | Threshold 1: -10% Un |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-2,56} | scaling=0,  unit=% |  | R-/R-/--/--/R- |
|  | Time threshold for voltage sag below threshold 1 | 3 |  | 1-0:12.43.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2B00FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Limit duration of voltage sag (<= -10% Un) |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  | Threshold 2 of voltage sag | 3 |  | 1-0:12.31.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C1F01FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 2000 | Threshold 2: -20% Un |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-2,56} | scaling=0,  unit=% |  | R-/R-/--/--/R- |
|  | Time threshold for voltage sag below threshold 2 | 3 |  | 1-0:12.43.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2B01FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Duration of voltage sag (<= -20% Un) |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  | Threshold – no voltage | 3 |  | 1-0:12.39.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C1700FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 5000 | Threshold – no voltage:-50% Un |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-2,56} | scaling=0,  unit=% |  | R-/R-/--/--/R- |
|  | Time threshold for determining the power failure | 3 |  | 1-0:12.45.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2D00FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Time threshold value for determining power failure (<= -50% Un) |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  | Overvoltage threshold | 3 |  | 1-0:12.35.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2300FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 1000 | Overvoltage threshold : +10% Un |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-2,56} | scaling=0,  unit=% |  | R-/R-/--/--/R- |
|  | Time threshold for overvoltage threshold | 3 |  | 1-0:12.44.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2C00FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Limit duration of voltage sag (<= -10% Un) |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {0,7} | scaling=0,  unit=s |  | R-/R-/--/--/R- |
|  |  |  |  |  |  |  |  |
|  | Counter of voltage sags below threshold 1 in all phases | 1 |  | 1-0:12.32.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2000FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Number of voltage sags below threshold 1 in all phases |  | R-/R-/--/--/R- |
|  | Counter of voltage sags below threshold 1 in phase Lx | 1 |  | 1-0:x.32.0.255 | x=32 – phase L1  x=52 – phase L2  x=72 – phase L3 |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100xx2000FF | xx=10 – phase L1  xx=35 – phase L2  xx=46 – phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Number of voltage sags below threshold 1 in phase Lx |  | R-/R-/--/--/R- |
|  | Counter of voltage sags below threshold 2 in all phases | 1 |  | 1-0:12.32.1.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2001FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Number of voltage sags below threshold 2 in all phases |  | R-/R-/--/--/R- |
|  | Counter of voltage sags below threshold 2 in phase Lx | 1 |  | 1-0:x.32.1.255 | x=32 – phase L1  x=52 – phase L2  x=72 – phase L3 |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100xx2001FF | xx=10 – phase L1  xx=35 – phase L2  xx=46 – phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Number of voltage sags below threshold 2 in phase Lx |  | R-/R-/--/--/R- |
|  | Counter of power failures in all phases | 1 |  | 1-0:12.40.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2800FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Number of power failures in all phases |  | R-/R-/--/--/R- |
|  | Counter of power failures in phase Lx | 1 |  | 1-0:x.40.0.255 | x=32 – phase L1  x=52 – phase L2  x=72 – phase L3 |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100xx2800FF | xx=10 – phase L1  xx=35 – phase L2  xx=46 – phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Number of power failures in phase Lx |  | R-/R-/--/--/R- |
|  | Counter of overvoltages in all phases | 1 |  | 1-0:12.36.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01000C2400FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Number of overvoltages in all phases |  | R-/R-/--/--/R- |
|  | Counter of overvoltages in phase Lx | 1 |  | 1-0:x.36.0.255 | x=32 – phase L1  x=52 – phase L2  x=72 – phase L3 |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100xx2400FF | xx=10 – phase L1  xx=35 – phase L2  xx=46 – phase L3 |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  | Number of over voltages in phase Lx |  | R-/R-/--/--/R- |
|  | Total time of default voltages ( reduction below 50% Un) | 3 |  | 1-0:94.48.91.255 | Total time of power failure in any phase |  |  |
| 1 | logical\_name |  |  | 01005E305BFF |  |  | R-/R-/--/--/R |
| 2 | value |  | long-unsigned |  |  |  | R-/R-/--/--/R |
| 3 | scaler\_unit |  | scal\_unit+type | {0,7} | scaling=0,  unit=5 |  | R-/R-/--/--/R |

## Power Quality

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | W1 – slow voltage variation | 3 |  | 1-0:94.48.140.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01005E308CFF | Slow voltage variation |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-3,255} | scaling=-3,  unit=no unit,  accuracy: 0.001 |  | R-/R-/--/--/R- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | W1 – slow voltage variation threshold | 3 |  | 1-0:94.48.141.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01005E308DFF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 5 | Slow voltage variation threshold |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-2,255} | scaling=-2,  unit=no unit |  | R-/R-/--/--/R- |
|  | W2 – voltage waveform distortion | 3 |  | 1-0:94.48.142.255- |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01005E308EFF | Voltage waveform distortion |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-3,255} | scaling=-3,  unit=no unit,  accuracy: 0.001 |  | R-/R-/--/--/R- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | W2 – voltage waveform distortion threshold | 3 |  | 1-0:94.48.143.255- |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 01005E308FFF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 5 | Voltage waveform distortion threshold |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-2,255} | scaling=-2,  unit=no unit |  | R-/R-/--/--/R- |
|  | W3 – voltage unbalance (asymmetry) | 3 |  | 1-0:94.48.144.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E3090FF | Voltage unbalance (asymmetry) |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-3,35} | scaling=-3,  unit=no unit,  accuracy: 0.001 |  | R-/R-/--/--/R- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | W3 – voltage unbalance (asymmetry) threshold | 3 |  | 1-0:94.48.145.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 010005E3091FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 5 | Voltage unbalance threshold |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-2,255} | scaling=-2,  unit=no unit |  | R-/R-/--/--/R- |
|  | W4 – voltage fluctuation | 3 |  | 0-0:94.48.146.255- |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E3092FF | Voltage fluctuation |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned |  |  |  | R-/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-3,35} | scaling=-3,  unit=no unit,  accuracy: 0.001 |  | R-/R-/--/--/R- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | W4 – voltage fluctuation  threshold | 3 |  | 0-0:94.48.147.255- |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E3092FF |  |  | R-/R-/--/--/R- |
| 2 | Value |  | long-unsigned | 5 | Voltage fluctuation threshold |  | RW/R-/--/--/R- |
| 3 | scaler\_unit |  | scal\_unit\_type | {-2,255} | scaling=-2,  unit=no units |  | R-/R-/--/--/R- |
|  | Weekly power quality indices profile status | 1 |  | 0-0:96.10.9.255 | Recorded W1-W4 values latched for one week period | Zgodnie z 4.5.5 |  |
| 1 | logical\_name |  | octet-string[6] | 0000600A09FF |  |  | R-/R-/--/R-/R- |
| 2 | status |  | Unsigned | {IV, RES, RES, VH , MP, INT, AL, RES} |  |  | R-/R-/--/R-/R- |
|  | Weekly power quality indices profile | 7 |  | 1-0:99.13.0.255 | Profile created based on the based weekly W1-W4 indices |  |  |
| 1 | logical\_name |  | octet-string[6] | 0100630D00FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  |  |  | R-/R-/--/--/R- |
| 3 | capture\_objects |  | array | {8,0-0:1.0.0.255,2};  {1, 0-0:96.10.9.255,2};  {3,1-0:94.48.140.255,2}  {3,1-0:94.48.142.255,2}  {3,1-0:94.48.144.255,2}  {3,1-0:94.48.146.255,2} | clock  profile status  W1 – slow voltage variation  W2 – voltage waveform distortion  W3 – voltage unbalance (asymmetry)  W4 – voltage fluctuation |  | R-/R-/--/--/R- |
| 4 | capture\_period |  | double-long-unsigned | y | y= 604800 (1 week) |  | R-/R-/--/--/R- |
| 5 | sort\_method |  | enum | 1 | FIFO |  | R-/R-/--/--/R- |
| 6 | sort\_object |  | capture object definition | none | none |  | R-/R-/--/--/R- |
| 7 | entries\_in\_use |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 8 | profile\_entries |  | double-long-unsigned | >=5 | >= 5 weeks |  | R-/R-/--/--/R- |

# Communication parameters

## PLC PRIME

PLC PRIME communication parameters must be consistent with the document PLC PRIME PLC (OFDM PRIME) Setup Classes set out in Appendix 1

## 3GPP communication setup

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 3GPP connection parameters | 18 |  | 0-0:25.4.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[16] | 00002C0000FF |  |  | --/--/R-/--/-- |
| 2 | APN\_name |  | octet-string[32] |  | Name of APN, to which modem should log |  | -W/--/--/--/-- |
| 3 | PIN\_code |  | octet-string[4] |  | PIN code |  | -W/--/--/--/-- |
| 4 | WWAN\_modem\_name |  | octet-string[16] |  | Modem name |  | --/--/R-/--/-- |
| 5 | WWAN\_modem\_type |  | octet-string[16] |  | Modem type |  | --/--/R-/--/-- |
| 6 | WWAN\_modem\_current\_service\_type |  | enum | 0;1;2;3;4 | GPRS/EDGE/3G/HSPA/CDMA – modem service type |  | --/--/R-/--/-- |
| 7 | WWAN\_modem\_current\_registration\_status |  | enum | 0;1;2 | Current registration status in the network unregistered/registering/registered |  | --/--/R-/--/-- |
| 8 | WWAN\_modem\_current\_signal\_strength |  | signed |  | Current signal strength in [dBm] |  | --/--/R-/--/-- |

## Ethernet communication setup

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | MAC address | 43 |  | 0-0:25.2.0.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000190200FF |  |  | R-/--/R-/--/-- |
| 2 | MAC\_address |  | octet-string[8] |  |  |  | RW/--/R-/--/-- |

## USB port configuration

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | USB\_port\_operational\_mode | 1 |  | 0-0:94.48.224.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E30E0FF |  |  | R-/--/R-/--/-- |
| 2 | value |  | enum | 0, 1 ,2, 3 | 0: USB port inactive  1: data push mode  2: DLMS/COSEM Modem mode (alternative communication with AMI readout system)  3: DLMS/COSEM HAN mode | USB port operation mode | RW/--/R-/--/-- |

## USB port status

| **No** | **Object/ Attribute name** | **Cl** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  **M/R/F/P/H** |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | USB\_port\_status | 1 |  | 0-0:94.48.225.255 |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00005E30E1FF |  |  | R-/--/R-/--/-- |
| 2 | value |  | USB\_Status |  | See USB\_status structure definition- below |  | R-/--/R-/--/-- |

USB\_Status structure definition

USB\_Status: structure

{

deviceStatus: enum; 0: no device in USB port

1: device in USB port recognized and supported

2: device in USB port not recognized

VID: long-unsigned; Vendor ID of the recognized device in USB port

PID: long-unsigned; Product ID of the recognized device in USB port

Rev: long-unsigned; revision of the recognized device in USB port

MI: unsigned; Manufacturer Info of the recognized device in USB port

Class: unsigned; Class of the recognized device in USB port

SubClass: unsigned; Sub-Class of the recognized device in USB port

Prot: unsigned; Protocol of the recognized device in USB port

}

# HAN communication interface specification

## Objects related to HAN communication

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Object/Attribute Name** | **CL** | **Type** | **Value** | **Meaning** | **Comments** | **Access Rights**  MC/RC/PreC/PC/HC |
| **3.1 HAN related objects** | | | | | | | |
|  | **Push setup** | **40** |  | **0-0:25.9.0.255** |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 0000190900FF |  |  | R-/R-/--/--/R- |
| 2 | push\_object\_list |  | array |  | Up to 11 objects |  | RW/R-/--/--/R- |
| 3 | send\_destination\_and\_method |  | structure |  | HDLC, A-XDR |  | R-/R-/--/--/R- |
| 4 | communication\_window |  | array |  | array[0] - the push operation is always possible |  | R-/R-/--/--/R- |
| 5 | randomisation\_start\_interval |  | long-unsigned | 0 | no delay is active |  | R-/R-/--/--/R- |
| 6 | number\_of\_retries |  | unsigned | 0 |  |  | R-/R-/--/--/R- |
| 7 | repetition\_delay |  | long-unsigned | 0 |  |  | R-/R-/--/--/R- |
| 1 | push (data) |  |  |  |  |  | R-/R-/--/--/R- |
|  | **Push scheduler object** | **22** |  | **0-0:15.0.4.255** |  |  |  |
| 1 | logical\_name |  | octet-string[6] | 00000F0004FF |  |  | R-/R-/--/--/R- |
| 2 | executed\_script |  | script | 0-0:10.0.108.255 |  |  | R-/R-/--/--/R- |
| 3 | type |  | enum | 6 | (6) - size of execution\_time = *n*; wildcards in *date*  allowed, *time* values specify execution period |  | R-/R-/--/--/R- |
| 4 | execution\_time |  | array |  | wildcards in date are allowed; time values specify period; hundredths of seconds must be zero. |  | RW/R-/--/--/R- |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **WAN2HAN Message Queue** | **84**  **49** |  | **0-0:138.0.2.255** | See “EOP 109K and 300K Projects. Message Queue Interface  Class” |  |  |
| 1 | logical\_name |  | octet-string[6] | 00008A0002FF |  |  | R-/R-/--/--/R- |
| 2 | Buffer |  | array |  | Array of WAN2HAN messages |  | R-/R-/--/--/R- |
| 3 | buffer\_size |  | double-long-unsigned |  | 4096 bytes |  | R-/R-/--/--/R- |
| 4 | buffer\_free\_space |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 5 | last\_enqueued\_message\_id |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 1 | reset() |  |  |  |  |  | -W/--/--/--/-- |
| 2 | enqueue\_message(message) |  |  |  |  |  | -W/--/--/--/-- |
| 3 | remove\_messages(last\_read\_message\_id) |  |  |  |  |  | --/--/--/--/-W |
|  | **HAN2WAN Message Queue** | **84**  **49** |  | **0-0:138.0.3.255** | See “EOP 109K and 300K Projects. Message Queue Interface  Class” |  |  |
| 1 | logical\_name |  | octet-string[6] | 00008A0003FF |  |  | R-/R-/--/--/R- |
| 2 | buffer |  | array |  | Array of HAN2WAN messages |  | R-/R-/--/--/R- |
| 3 | buffer\_size |  | double-long-unsigned |  | 4096 bytes |  | R-/R-/--/--/R- |
| 4 | buffer\_free\_space |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 5 | last\_enqueued\_message\_id |  | double-long-unsigned |  |  |  | R-/R-/--/--/R- |
| 1 | reset() |  |  |  |  |  | --/--/--/--/-W |
| 2 | enqueue\_message(message) |  |  |  |  |  | --/--/--/--/-W |
| 3 | remove\_messages(last\_read\_message\_id) |  |  |  |  |  | -W/--/--/--/-- |

# Glossary of terms

## Technical terms

**Smart metering AMI** *(AMI = Advanced Metering Infrastructure*) **system** - complete infrastructure including measuring devices (meters), networks, computer systems, communication protocols, and organizational processes for collecting by the distribution company the data on the power consumption of each customer and allowing the impact on the customer by controlling the energy consumption in a targeted manner and accepted by the customer.

Such an infrastructure should allow the collection of data from the client in a safe, secure and in a certain time mode, and allow easy expansion and development of the system. AMI smart metering system should enable energy companies to use functions such as: differentiation of tariffs, demand management (DSM), the detection of power failure, theft detection, optimization of network structure and operation on the energy market.

The so-defined infrastructure consists of:

Electricity meters, able to exchange data with the data concentrator or data acquisition system using a specific transmission medium. The basic functionality of meters in the AMI system comes down to record energy consumption broken down into periods of time (e.g. hourly) and the possibility of two-way data transmission to and from the meter.

**Transmission infrastructure** - communication network uses different transmission media (PLC, BLC, radio, telephone network, LAN, WAN) to transmit information between the meter and concentrator and GPRS radio transmission or computer network to transmit data to manage measurement data. Transmission infrastructure may include also data concentrators collecting data from tens of meters grouped geographically and transmitting data to measurement data management system, most often using GPRS transmission.

The measurement data management system MDM( AMM = *Automated Metering Management* or MDM = *Meter Data Management*) - IT system responsible for data acquisition from intermediary devices (concentrators) or readout servers, data processing and storage and making data available to other entities under certain conditions .

**Data transfer with the use of low-voltage distribution network PLC** (PLC-Power Line Carrier or Power Line Communication) – with reference to meter reading means the use of low-voltage distribution network as a medium for data transmission. Typically specialized systems are used that by imposing a sine wave (50 Hz) voltage or current signal of frequency of 3-95 kHz enables bidirectional data transmission, including the measurement information.

**Data transmission with the use of a high voltage distribution network DLC** (DLC - Distribution Line Carrier) - meaning close to the PLC with the difference that the distribution network of medium voltage (e.g. 15 kV) is used (PN-EN 61334- Polish –European Standard).

**Intelligent Network** (smart grid) – the power system integrating in an intelligent way the operations of all participants of the generation, transmission, transmission, distribution and use processes, in order to supply electricity in an economic, durable and safe way.

**HAN home network** (HAN-Home Area Network) - local data communication network covering a limited area of the household. It is used for communication between active devices located in the household and usually involves a small number of computers and other devices such as printers.

**WAN network** (Wide Area Network) - a vast IT network, in particular, enabling mutual connection of remote local networks LAN.

**Customer** - anyone who receives or uses power under a contract with the energy company.

**Distribution network** - power network of high, medium and low voltages where the distribution system operator is responsible for its network management.

**Tariff Zone** - defined periods during the day, week, month and year in with a uniform tariff

**Tariff** - a set of prices and rates and conditions for their application, developed by the energy company and introduced as binding to specific recipients in the manner prescribed by law.

**Tariff Group** - a group of consumers receiving power, or using the services related to the supply of this energy, for which one set of prices or charged rates and their conditions of implementation is used (tariff)

**Illegal consumption** – energy consumption without signing an energy contract, with total or partial omission of the measurement and billing system or by interfering with this system resulting in the falsification of the measurement by performed by the measuring and billing system

**The transmission system operator (TSO)** - Electric utility handling the transmission activity, responsible for the network operation within the power transmission system, current and long-term secure operation of this system, operation, maintenance, repairs and necessary development of the transmission network, including the connections to other power systems.

T**he distribution system operator (DSO**) - Electric utility handling the distribution activity, responsible for the network operation within the energy distribution system, current and long-term secure operation of this system, operation, maintenance, repairs and necessary development of the distribution network, including the connections to other power systems.

**Daily energy consumption profile** - a set of data on electricity consumption by the recipient in the individual days of the month (year).

**Day- hourly energy consumption profile** - a set of data on electricity consumption by the recipient in certain periods (15 min, 60 min.) of the day.

**Place of electricity supply ( Point of Electricity Supply PPE)** - a point in the network to which the power company is required to supply power, as defined in the connection agreement, the agreement on transmission services or energy sales contract.

**Delivery point** - Point in the network to which electric utility is supplying electricity. The point is defined in the connection agreement or the transmission or distribution services provision agreement, which at the same time is the place of consumption the electricity.

**Maximum 15-minute power** –the biggest 15 minutes active power consumption from the network in the given period.

**Average power** (e.g. 15 minutes) – power numerically equivalent to energy consumption for a given period of time (15 minutes) divided by the length of time (15 min).

**Connected power** - active power planned to consume or enter the network, defined in the agreement on connection as the maximum value of the average values of this power in a period of 15 minutes, used to design the connection.

**Contractual power** - active power consumed or supplied into the network specified in the contract on transmission services and power sales agreement as the maximum value of the average values ​​of this power in the period of 15 or 60 minutes - if the measuring devices permit.

**Billing Period** - set in the energy sales contract the interval between two successive measurement readings of indications of the metering and billing system.

**Metering and billing system** - meters and other measuring devices or metering and billing systems and connection systems between them used , directly or indirectly for the measurement and billing (e.g. time switches, current transformers, etc.).

**Interface** - contact or the point at which physical/logical communication link between two devices/programs is located

**The communication channel** - a set of two communication technical means used for one-way transfer of information between devices

**Communication link** – a set of two communication channels used to enable two-way transmission of information between devices.

**The communication protocol** - a set of services and procedures managing communication (exchange of information) between devices.

**Protocol stack** - often referred to as a communication profile - some cascading layers of software, which specify the appropriate protocols for the exchange between devices.

**Communication (network) architecture** - IT network design, including all network resources of this network with particular emphasis on used in the network protocol stack/stacks.

**Intranet** - acting within the enterprise data communications network, using communication stacks typically used in a public internet network.

**COSEM** - Companion Specification for Energy Metering - a set of specifications developed by the DLMS User Association defining the information technology model of inter alia electricity meters and DLMS application layer protocol used for communication with inter alia electricity meters. According to the conceptual model of the COSEM model the functionality of the meter "seen" from the perspective of a concentrator or data acquisition system is represented by the so-called. COSEM interfaces. Each of the interfaces contains defined data in the form of data attributes and functions, called methods, which can operate on these attributes. COSEM interfaces are in fact patterns (classes) on the basis of which COSEM objects can be defined. Thus, the meter is represented by a set of COSEM objects, which can be attributed, in accordance with strict rules, identifying them OBIS codes.

**DLMS** (Distribution Line Message Specification) connection-oriented application-layer protocol used for bi-directional data exchange with meters. DLMS protocol functioning in the "client-server" mode on COSEM objects can perform reading/writing of object attributes, or cause the action of specific methods (functions) on attributes. Regardless of the communication "client-server" mode there is a possibility of spontaneous sending messages (events) by the meter.

# References

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# Appendix 1: PLC PRIME (OFDM PRIME) Classes

**1.- PRIME PLC interface classes**

**1.1. – General**

For the management of the physical layer (PhL) PRIME PLC the following classes of interfaces are specified:

* PRIME PLC - meters of the physical layer. Contain data enabling to monitor operations at the physical layer.

For management at AMC PRIME PLC layer, the following four classes of interfaces are specified:

* PRIME PLC MAC setup
* PLC PRIME functional parameters (operating parameters)
* PRIME PLC MAC counters (counters at the MAC layer)
* PRIME PLC network administration data (parameters related to the management of network devices connected to PLC network).

**1.2.- CL\_432 Setup (class\_id: 80, version: 0)**

Instance of IEC 61334-4-32 LLC SSCS (Service Specific Convergence sub-layer, 4-32 CL) contains the addresses provided by the base node during the startup of the convergence layer in response to requests from service nodes, or while the message 'join service' is sent by the base node. In this way the service node can join a network managed by a base node.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PRIME device setup** | **0...n** | **class \_id = , version = 80** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1 logica l\_name (s ta tic) | octet-s tring |  |  |  | x |
| 2.device\_address (dyn) | long-u ns igned |  |  |  | x + 0x8 |
| 3.base node\_address dyn) | long-u ns igned |  |  |  | X + 0 x10 |
| ***Specif ic met hods*** | ***m/o*** |  | | |  |
| ***1. reset*** | ***o*** |  | | | x + 0x20 |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the ”Disconnectcontrol” object instance |
| **service\_node\_address** | Contains the value of the address assigned to the service node at the moment of registration in the base node |
| **base node\_address** | Contains the base node address value to which the service node has registered |

**Methods description**

**reset** Method initiated in processes CL\_432\_LEAVE or CL\_432\_RELEASE services.

**1.3.- PRIME PLC physical layer parameters**

Physical layer parameters are described in table PRIME-R1.3E of PRIME protocol.

**1.4.- Physical layer meters PRIME PLC(class\_id: 81, version: 0)**

PRIME PLC physical layer meters include records related to the data transmitted at the physical layer. Moreover, these meters provide statistical information and are used to manage the connection.

The attributes in this class interface are intended only for reading. They can be reset by a reset method.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PRIME PLC phys ica l layer coun te rs** | **0…n** | **class \_id = 81 , version = 0** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1. logica l\_name (s ta tic) | octet-s tring |  |  |  | x |
| 2. phy\_s ta ts \_crc\_incorrect\_coun t (dyn.) | long-u ns igned |  |  |  | x + 0x08 |
| 3. phy\_s ta ts \_crc\_fail\_coun t (dyn.) | long-u ns igned |  |  |  | x + 0x10 |
| 4. phy\_s ta ts \_tx\_drop\_count (dyn.) | long-u ns igned |  |  |  | x + 0x18 |
| 5. phy\_s ta ts \_rx\_d rop\_coun t (dyn.) | long-u ns igned |  |  |  | x + 0x20 |
| ***Specif ic met hods*** | ***m/o*** |  | | |  |
| *1. reset* | *o* |  | | |  |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the instance of physical layer meters object |
| **phy\_stats\_crc\_incorrect\_count** | Contains the value of variable PIB 0xA0 specified in PRIME R1.3E  Number of bursts received on the physical layer for which the CRC was incorrect. |
| **phy\_stats\_crc\_failed\_count** | Contains the value of variable PIB 0xA1 specified in PRIME R1.3E |
| **phy\_stats\_tx\_drop\_count** | Contains the value of variable PIB 0xA2 specified in PRIME R1.3E |
| **phy\_stats\_rx\_drop\_count** | Contains the value of variable PIB 0xA3 specified in PRIME R1.3E |

**1.5.- PRIME PLC MAC setup (class\_id: 82, version: 0)**

The instance of the interface of this class contains parameters necessary for compiling the MAC PRIME PLC layer.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PRIME PLC MAC se tup** | **0…n** | **class \_id = 82 , version = 0** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1. logica l\_name (s ta tic) | octet-s tring |  |  |  | x |
| 2. mac\_min\_sw itch\_sea rch\_time (s ta tic) | unsigned | 16 | 32 | 24 | x + 0x08 |
| 3. mac\_max \_promotion \_pd u (s ta tic) | unsigned | 1 | 4 | 2 | x + 0x10 |
| 4. mac\_p romotion\_p du \_tx\_period (s ta tic) | unsigned | 2 | 8 | 5 | x + 0x18 |
| 5. mac\_b ea con s\_per\_frame (s ta tic) | unsigned | 1 | 5 | 5 | x + 0x20 |
| 6. mac\_s cp \_max\_tx \_a ttemp ts (s ta tic) | unsigned | 2 | 5 | 5 | x +0x 28 |
| 7. mac\_ctl\_re\_tx\_timer (s ta tic) | unsigned | 2 | 20 | 15 | x + 0x30 |
| 8. mac\_max \_ctl\_re\_tx (s ta tic) | unsigned | 3 | 5 | 3 | x + 0x38 |
| ***Specif ic met hods*** | ***m/o*** |  | | |  |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the instance PRIME PLC setup occurrence |
| **mac\_min\_switch\_search\_time** | Contains the value of variable PIB 0x10 specified in PRIME R1.3E |
| **mac\_max\_promotion\_pdu** | Contains the value of variable PIB 0x11 specified in PRIME R1.3E |
| **mac\_promotion\_pdu\_tx\_period** | Contains the value of variable PIB 0x12 specified in PRIME R1.3E |
| **mac\_beacon\_per\_frame** | Contains the value of variable PIB 0x13 specified in PRIME R1.3E |
| **mac\_scp\_max\_tx\_attempts** | Contains the value of variable PIB 0x14 specified in PRIME R1.3E |
| **mac\_ctl\_re\_tx\_timer** | Contains the value of variable PIB 0x15 specified in PRIME R1.3E |
| **mac max\_ctl\_re\_tx** | Contains the value of variable PIB 0x18 specified in PRIME R1.3E |

**1.6.- Functional parameters PRIME PLC MAC (class\_id: 83 version: 0)**

Attributes of this interface are connected with the operation of MAC PRIME PLC layer.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PRIME PLC MAC func tiona l par a meters** | **0…n** | **class \_id = 83 , version = 0** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1. logica l\_name (s ta tic) | octet-s tring |  |  |  | x |
| 2. mac\_L NID (s ta tic) | long | 0 | 16383 |  | x + 0x08 |
| 3. mac\_LSI D (s ta tic) | unsigned | 0 | 255 |  | x + 0x10 |
| 4. mac\_SID (s ta tic) | unsigned | 0 | 255 |  | x + 0x18 |
| 5. mac\_SNA (s ta tic) | octets tring |  |  |  | x + 0x20 |
| 6. mac\_s ta te (s ta tic) | enum | 0 | 3 |  | x +0x 28 |
| 7. mac\_s cp \_leng th (s ta tic) | long |  |  |  | x + 0x30 |
| 8. mac\_n od e\_hierarch y\_level (s ta tic) | unsigned | 0 | 63 |  | x + 0x38 |
| 9. mac\_b ea con \_s lot\_coun t (s ta tic) | unsigned | 0 | 7 |  | x + 0x40 |
| 10. mac\_b ea con \_rx\_slot (s ta tic) | unsigned | 0 | 7 |  | x + 0x48 |
| 11. mac\_b ea con \_tx\_slot (s ta tic) | unsigned | 0 | 7 |  | x + 0x50 |
| 12. mac\_b ea con \_rx\_freq uency (s ta tic) | unsigned | 0 | 31 |  | x + 0x58 |
| 13. mac\_b ea con \_tx\_frequency (s ta tic) | unsigned | 0 | 31 |  | x + 0x60 |
| ***Specif ic met hods*** | ***m/o*** |  | | |  |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the instance 'PRIME PLC functional parameters’ occurrence |
| **mac\_LNID** | Contains the value of variable PIB 0x20 specified in PRIME R1.3E |
| **mac\_LSID** | Contains the value of variable PIB 0x21 specified in PRIME R1.3E |
| **mac\_SID** | Contains the value of variable PIB 0x22 specified in PRIME R1.3E |
| **mac\_SNA** | Contains the value of variable PIB 0x23 specified in PRIME R1.3E |
| **mac\_state** | Contains the value of variable PIB 0x24 specified in PRIME R1.3E |
| **mac\_scp\_length** | Contains the value of variable PIB 0x25 specified in PRIME R1.3E |
| **mac\_node\_hierarchy\_level** | Contains the value of variable PIB0x26 specified in PRIME R1.3E |
| **mac\_beacon\_slot\_count** | Contains the value of variable PIB 0x27 specified in PRIME R1.3E |
| **mac\_beacon\_rx\_slot** | Contains the value of variable PIB 0x28 specified in PRIME R1.3E |
| **mac\_beacon\_tx\_slot** | Contains the value of variable PIB 0x29 specified in PRIME R1.3E |
| **mac\_beacon\_rx\_frequency** | Contains the value of variable PIB 0x2A specified in PRIME R1.3E |
| **mac\_beacon\_tx\_frequency** | Contains the value of variable PIB 0x2B specified in PRIME R1.3E |

**1.7.- PRIME PLC MAC meters (class\_id: 84, version: 0)**

An instance of the interface class of PRIME PLC counters, in which information on the MAC layer operation necessary in the PLC network management, is stored.

The attributes of this class are exclusively read-only and can be reset with the use of the reset method.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PRIME PLC MAC counters** | **0…n** | **class \_id = 84 , version = 0** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1.logical\_name (s ta tic) | octet-s tring |  |  |  | x |
| 2.mac\_tx\_data\_pkt\_count (dyn.) | double-long- unsigned |  |  |  | x + 0x08 |
| 3.mac\_rx\_data\_pkt\_count (dyn.) | double-long- unsigned |  |  |  | x + 0x10 |
| 4.mac\_tx\_ctrl\_pkt\_count (dyn.) | double-long- unsigned |  |  |  | x + 0x18 |
| 5.mac\_rx\_ctrl\_pkt\_count (dyn.) | double-long- unsigned |  |  |  | x + 0x20 |
| 6.mac\_csma\_fail\_count (dyn.) | double-long- unsigned |  |  |  | x + 0x28 |
| 7.mac\_csma\_ch\_busy\_count (dyn.) | double-long- unsigned |  |  |  | x + 0x30 |
| ***Specif ic met hods*** | ***m/o*** |  | | |  |
| *1. reset* | *o* |  | | | x + 0x40 |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the instance “PRIME PLC MAC counters” occurrence. |
| **mac\_tx\_data\_pkt\_count** | Contains the value of variable PIB 0x40 specified in PRIME R1.3E |
| **mac\_rx\_data\_pkt\_count** | Contains the value of variable PIB 0x41 specified in PRIME R1.3E |
| **mac\_tx\_ctrl\_pkt\_count** | Contains the value of variable PIB 0x42 specified in PRIME R1.3E |
| **mac\_rx\_ctrl\_pkt\_count** | Contains the value of variable PIB 0x43 specified in PRIME R1.3E |
| **mac\_csma\_fail\_count** | Contains the value of variable PIB 0x44 specified in PRIME R1.3E |
| **mac\_csma\_ch\_busy\_count** | Contains the value of variable PIB 0x45 specified in PRIME R1.3E |

**1.8.- PRIME PLC MAC network administration data (class\_id: 85, version: 0)**

This class interface contains parameters related to the management of devices in the network PLC

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PRIMEPLC MAC network adminis trat ion dat a** | **0…n** | **class \_id = 85 , version = 0** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1. logica l\_name (s ta tic) | octet-s tring |  |  |  | x |
| 2. mac\_list\_multica s t\_en tries (dyn.) | array |  |  |  | x + 0x8 |
| 3. mac\_list\_sw itch \_tab le (dyn.) | array |  |  |  | x + 0x10 |
| 4. mac\_list\_d irect\_tab le (dyn.) | array |  |  |  | x + 0x18 |
| 5. mac\_list\_a vaila ble\_switches (dyn.) | array |  |  |  | x + 0x20 |
| 6. mac\_list\_p hy\_comm (dyn) | array |  |  |  | X + 0 x28 |
| ***Specif ic met hods*** | ***m/o*** |  | | |  |
| *1. reset* | *o* |  | | | x + 0x30 |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the instance “PRIME PLC MAC network administration data” occurrence. |
| **mac\_list\_multicast\_entries** | Contains the value of variable PIB 0x52 specified in PRIME R1.3E |
| **mac\_list\_switch\_table** | Contains the value of variable PIB 0x53 specified in PRIME R1.3E |
| **mac\_list\_direct\_table** | Contains the value of variable PIB 0x55 specified in PRIME R1.3E |
| **mac\_list\_available\_switches** | Contains the value of variable PIB 0x56 specified in PRIME R1.3E |
| **mac\_list\_phy\_comm** | Contains the value of variable PIB 0x42 specified in PRIME R1.3E |

**1.9.- Application PRIME PLC identification(class\_id: 86, version:0)**

An instance of this interface contains identification information related to the administration and operation of PRIME devices. It does not contain the communication parameters and allows to manage the devices.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PRIME PLC App licat ion ident if ica tion** | **0...n** | **class \_id = 86 , version = 0** | | | |
| **Attrib utes** | **Data type** | **Min.** | **Max.** | **Def.** | **Short name** |
| 1. logica l name (s ta tic) | octet-s tring |  |  |  | x |
| 2. firmware vers ion (static) | octet-s tring |  |  |  | x + 0x8 |
| 3. ven dor I d (static) | long-u ns igned |  |  |  | x + 0x10 |
| 4. product Id (static) | long-u ns igned |  |  |  | x + 0x18 |
| **Specif ic methods** | **m/o** |  | | |  |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the instance occurrence |
| **firmware version** | Contains the value of variable PIB 0x75 specified in PRIME R1.3E |
| **vendor Id** | Contains the value of variable PIB 0x76 specified in PRIME R1.3E |
| **product Id** | Contains the value of variable PIB 0x77 specified in PRIME R1.3E |

**1.10.- PRIME device settings (class\_id: 43, version: 0)**

This interface class hold the MAC address of the device. This MAC address is a EUI48. The interface class 43 used for Ethernet MAC address is renamed in order to be used for any type of media MAC address.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **MAC address se tup** | **0...n** | **class \_id = , version = 43** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1. logica l\_name (s ta tic) | octet-s tring |  |  |  | x |
| 2. MAC\_address (static) | octet-s tring |  |  |  | x + 0x8 |
| ***Specif ic met hods*** | ***m/o*** |  | | |  |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the instance occurrence |
| **MAC\_address** | Contains a unique MAC address (modem). The length 6 bites – according to EUI48 standard.  Holds the device identification value of the modem. The size of this octet string is 6 due to the fact that this address is a EUI48 and is unique. |

# Appendix 2: 3GPP modem parameters class (class id: 18 version:0)

Since class 45 defined in the Blue Book version 10 [1] does not provide a number of important parameters related to 3GPP modems, it is necessary to define a new class, with ID 18

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **3GPP modem parameters** |  | **class \_id = 18 , version = 0** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1. logical name | octet-s tring[6] |  |  |  | x |
| 2. APN name | octet-string[32] |  |  |  | x + 0x06 |
| 3. PIN code | octet-string[4] |  |  |  | x + 0x26 |
| 4. WWAN modem name | octet-string[16] |  |  |  | x + 0x2A |
| 5. WWAN modem type | octet-string[16] |  |  |  | x + 0x3A |
| 6. WWAN modem current service type | enum |  |  |  | x + 0x4A |
| 7. WWAN modem current registration status | enum |  |  |  | x + 0x4C |
| 8. WWAN modem current signal strength | signed |  |  |  | X + 0x4E |

# Appendix 3: Class of communication with HAN network in push data mode parameters (class id:40 version:0)

It is necessary to define a class, used to configure the meter in which the USB port operates in “data push" mode. This configuration is used to determine the values that will be periodically sent by the meter and time parameters of the communication window.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data push communication parameters** |  | **class \_id = 40 , version = 0** | | | |
| ***Attributes*** | ***Dat a type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1. logical name | octet-s tring[6] |  |  |  | x |
| 2. push object list | array of logical names |  |  |  | x +0x06 |
| 3. send and destination method | octet-string[2] |  |  |  | x+n\*0x06 |
| 4. communication window | long unsigned |  |  |  | x+ n\*0x06 + 0x02 |
| 5. randomization start interval | long unsigned |  |  |  | x + n\*0x06 + 0x06 |
| 6. number of retries | unsigned |  |  |  | x + n\*0x06 + 0x0B |
| 7. repetition delay | long unsigned |  |  |  | x + n\*0x06 + 0x0D |
| 8. push operation interval | long unsigned |  |  |  | x + n\*0x06 + 0x12 |

Table 'push object list' contains a list of logical names, belonging to the two sets of data:

* energy profiles, peak power, voltages and currents,
* instantaneous values of voltage, current and power.

As a result, the list of defined in this way, logical profile values and instantaneous values will be used by the meter to prepare a measurement data packet , which will be sent in a push data mode through the USB port.

The structure 'send and destination method' in the first octet specifies a “push data” mode of sending that corresponds to the class identifier of the USB device performing communication (default value 02h, corresponding to class CDC) while in the in the second octet contains the USB port identifier (default 1 - the first USB) . Such a universal definition will allow the use of other classes of USB devices as well as the identification of more than one USB port.

# Appendix 4: Message Queue Interface Class (class\_id: 8449, version: 0)

Message Queue interface class makes it possible to implement a queue facility in a COSEM server.

The queue is modeled by a buffer containing a list of messages. Each message has unique monotonously incrementing serial number, hereafter called message\_id, and the payload field. Message\_id is used to implement FIFO discipline and avoid message duplicates. Payload may carry anything useful for specific task (PDU of some communication protocol, DLMS services, text messages, segments of firmware images, etc.) and should be specified separately for each task.

Two user application processes have to be distinguished:

1. Enqueueing Application Process (hereafter EP) is the process which enqueues a message, i.e. adds the message to the rear terminal position of the queue. EP sets proper message\_id and invokes the enqueue\_message() method of the appropriate Message Queue object. Operation may fail if message\_id in the new message does not exceed that of the last message already enqueued, or the message size exceeds actual buffer free space.
2. Dequeueing Application Process (hereafter DP) is the process which dequeues messages. DP dequeues messages in two steps:

* On the first step DP reads all messages in the buffer using standard DLMS GE service,
* On the second step DP removes all read messages from the front terminal position of the queue, invoking remove\_messages() method.

This interface class specifies access rights for two abstract application processes mentioned above. In real implementations the role of EP or/and DP can be played by a specific COSEM client or the server application process. Real application process playing the role of EP or/and DP for each Message Queue object (each instance of the Message Queue class) must be instantiated alongside with the OBIS codes, buffer size, etc.

Message Queue Interface Class (class\_id: 8449, version: 0)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Message Queue** | **0..n** | **class\_id = 8449, version = 0** | | | | **Access** |
| ***Attributes*** | ***Data type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** | EP/DP |
| 1.logical\_name (static) | octet-string |  |  |  | x | R-/R- |
| 2.buffer (dyn.) | array |  |  |  | x + 0x?? | R-/R- |
| 3.buffer\_size (dyn.) | double-long- unsigned |  |  |  | x + 0x?? | R-/R- |
| 4.buffer\_free\_space (dyn.) | double-long- unsigned |  |  |  | x + 0x?? | R-/R- |
| 5.last\_enqueued\_message\_id (dyn.) | double-long- unsigned |  |  |  | x + 0x?? | R-/R- |
| ***Specific methods*** | ***m/o*** |  | | |  |  |
| 1. reset() | m |  | | | x + 0x?? | -W/-- |
| 2. enqueue\_message (message) | m |  | | | x + 0x?? | -W/-- |
| 3.remove\_messages(last\_read\_mesage\_id) | m |  | | | x + 0x?? | --/-W |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the Message Queue object instance |
| **buffer** | This is a buffer that contains list of messages.  buffer::=array of message  message::=structure  {message\_id double-long-unsigned,  payload octet-string }  **message\_id:** message number  **payload**: this is the message body. Payload internal structure is out of the scope of the Message Queue class definition  *selective access for this attribute is not available* |
| **buffer\_size** | Full size of queue buffer, bytes |
| **buffer\_free\_space** | Free memory space in buffer, bytes. |
| **last\_enqueued\_message\_id** | The last message number in queue. |

**Method description**

|  |  |
| --- | --- |
| **reset()** | This method forces a reset of the queue. After reset invocation the buffer becomes empty,  last\_enqueued\_message\_id is equal to 0,  buffer\_free\_space is equal to the buffer\_size |
| **enqueue\_message (message)** | This method enqueues a message (appends a new message to the end of queue).  Returned values:  Success = 0,  ErrorLength = read-write-denied (3),  ErrorMessageId = type-unmatched (12) |
| **remove\_messages (last\_read\_message\_id)** | This method deletes all messages, for which message\_id is less or equal than last\_read\_message\_id.  last\_read\_message\_id double-long-unsigned  Returned value:  buffer\_free\_space (after removing messages) |

# Appendix 5: Single Action Schedule Class (class\_id: 22, version: 0)

Project uses push setup object and single action schedule object for invoking DataNotification service to the HAN Controller Client. This object allows modeling the execution of periodic actions within a meter.

This document describes deviations in the Single Action Schedule object for push interface from the standard Blue Book Ed.10 specifications.

Single action schedule (class\_id: 22, version: 0)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Single action schedule** | **0..n** | **class\_id = 22, version = 0** | | | |
| ***Attributes*** | ***Data type*** | ***Min.*** | ***Max.*** | ***Def.*** | **Short name** |
| 1 logical\_name (static) | octet-string |  |  |  | x |
| 2 executed\_script (static) | script |  |  |  | x + 0x08 |
| 3. type (static) | enum |  |  |  | x + 0x10 |
| 4. execution\_time (static) | array |  |  |  | x + 0x18 |

**Attribute description**

|  |  |
| --- | --- |
| **logical\_name** | Identifies the “Single action schedule” object instance.  Contains the logical name of the “Script table” object and the script selector of the script to be executed.  script ::= structure |
| **executed\_script** | Script\_logical\_name: octet-string,  Script\_selector: long-unsigned type  Script\_logical\_name and script\_selector define the script to be executed.  This attribute is read only. Script\_logical\_name = {0-0:10.0.108.255 },  script\_selector = 201 |
| **type** | enum:  (1) size of execution\_time = 1; wildcard in date allowed,  (2) size of execution\_time = n; all time values are the same, wildcards in date not allowed,  (3) size of execution\_time = n; all time values are the same, wildcards in date are allowed,  (4) size of execution\_time = n; time values may be different, wildcards in date not allowed,  (5) size of execution\_time = n; time values may be different, wildcards in date are allowed,  (6) size of execution\_time = n; wildcards in date are allowed, time values specify execution period |
| **execution\_time** | Specifies the time and the date when the script is executed. array execution\_time\_date  execution\_time\_date ::= structure  {  time: octet-string,  date: octet-string  }  The two octet-strings contain time and date, in this order; time and date are formatted as defined in sub-section 4.1.6.1 in Blue Book Ed.10.  Wildards in date are allowed; hundredths of seconds must be zero.  If period is in hours, field “hour” has to define period and fields “minute” and “second” must be zero.  If period is in minutes, field “hour” must be FF, field “minute” has to define period and field “second” must be zero.  If period is in seconds, field “hour” and “minute” must be FF, field “second” has to define period.  Push transmissions are adjusted to 00:00:00. |

**Object push process description**

Since metering equipment in the DLMS/COSEM environment always operates as server (HDLC secondary station), it generally has no right to send out unsolicited UI frames immediately (“no right to talk”). Consequently, pending UI frames should be stored in the MAC layer, waiting to the opportunity to be sent out. Conditions, on which pending UI frames can be sent out, are:

* In the NRM: after receiving MA-DATA.request service primitive with frame\_type I-COMPLETE, I-FIRST-FRAGMENT, I-FRAGMENT, or I-LAST-FRAGMENT, on receipt of a RR frame with P=1, on receipt of an empty UI frame with P=1.

If NRM mode is used, the Extension Module is acting as HDLC primary station and is responsible of communication establishment and keeping.

* In the NDM: on receipt of an empty UI frame with P=1.

If NDM mode is used, the Extension Module can periodically poll the server with empty UI frames with P=1. This mode of operation is totally transparent to the application layer as it is carried out at HDLC level.

The process is as follows:

1. HAN client associates with the meter
2. HAN clients asks for the PushObjectList (PushObject class, attribute 2)
3. HAN client periodically sends empty UI frames, thus signalling to the meter it’s readiness to receive the objects according to the PushObject list
4. The meter releases the object list in interval configured by the PushPeriod parameter

1. TOR Terms of Reference – in Polish: SIWZ Specyfikacja Istotnych Warunków Zamówienia [↑](#footnote-ref-1)