Technical Prescriptions

TAU-301.4-TV10

eMUCS-A1

Version 5.0.2

Revisions

The Belgian A1 interface specification evolves resulting from changing regulation to support the energy transition. The on-going evolution leads to several versions of the A1 specification. For each interface version a new eMUCS-A1 specification document (this document) is created.

The interface specification is included in the eMUCS A1 document. The interface specification has a version number, that unambiguously determines the properties of the interface including the set of data elements. An increment of the interface specification requires an implementation change of the E-meter and - to achieve full support for the new version – also of the OSM.

The eMUCS P1 document includes the interface specification but has other chapters like the introduction and revision history. The eMUCS P1 document has also a version number.

Both the interface version number and document version number are explained below:

The interface version number is formatted X.Y where and are increased as follows:

- X reflects a major version change, e.g. introduced with a new generation of E-meters.
- Y reflects a minor version change, e.g. extra data-objects, telegram change with backwards compatibility from OSM perspective. In other words, only data elements will be added. Existing data elements will not be removed or changed.

Note: The interface version number is also part of the A1-telegram itself: X and Y are published as the last 2 characters of the Version information field, see chapter 8.

Note: The interface major version numbers (X) starting with 5 up until 9 are used for the industrial AMR segment (scope of this document) while major version numbers starting with 1 until 4 are used for the residential segment (scope of DSMR-P1).

The version of the eMUCS – A1 document is composed as follows: X.Y.Z, with X and Y the interface version, and Z the optional additional document version. The Z-position allows to release a new document version with clarifications or corrections while the interface specification remains the same.

Version	Modification	Date	Author(s)
E.5.0.0	First Publication	15/12/2022	Fluvius
E.5.0.1	Textual error in tag of Version number object (tag 9 instead of tag 10)	09/02/2023	Fluvius
E.5.0.2	Revised, aligned with structure of eMUCS P1 v2.1.1	27/07/2023	Fluvius

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1 Context

1.1 Introduction

This document is part of a set of interface companion specification documents for a digital meter system intended for electricity, gas, water, and possibly other provisions. The system architecture and related specification documents for this digital meter system are documented in eMUCS-System Architecture.

In 2016, “Netbeheer Nederland” published the DSMR-P1 V5.0.2 companion specification. The goal of this specification was to achieve a standardized interface to provide measurement data from the Automatic Meter Reading System for electricity, thermal, gas and water meters towards the consumers.

All Dutch DSO’s in (,the members of Netbeheer Nederland,) were committing to this interface specification to facilitate the market of Consumer Energy Management Systems (CEMS) and to avoid different variations of the interface.

At the start of the digital meter roll-out in Belgium, the Belgian DSOs agreed to re-use the DSMR P1 V5.0.2. as much as possible to facilitate the already existing market of Consumer Energy Management System based on DSMR P1 V5.0.2. The equivalents for the Belgian market of the companion specifications for the Dutch market (DSMR documents), are the eMUCS documents.

Consumer digital meters are installed in residential installations only. For the higher power segments, industrial AMR meters are installed. The eMUCS-A1 interface specification is introduced in order to fulfil the need for a companion specification in this market segment. This eMUCS-A1 document is derived also from the ‘DSMR P1 V5.0.2’ specification with the same philosophy in mind as the eMUCS-P1 for the residential digital meters.

Due to Belgian legislation and country specific needs for industrial meters, the eMUCS A1 interface specification is not identical to the DSMR P1 specification. <u>The A1 specification differences are limited to the set of data elements in the A1 telegram. The physical interface and the protocol are identical to the DSMR P1 V5.0.2.</u>

1.2 Document scope

The goal of the eMUCS companion specifications is to reach an open, standardised protocol implementation related to the communication of several types of electricity meters with other metering systems and devices.

This document (eMUCS-A1) specifies the communication protocol layers and the application interface A1 between a Other Service Module (OSM) like an ‘Consumer Energy Management System’ (CEMS) and the electricity meter. In the remainder of this document, the generic term OSM is used to indicate a device connected to the A1 port of the electricity meter

The application layer and data model are based on ‘DSMR-P1’. From chapter 2 to chapter 6.3, this document follows the DSMR P1 V5.0.2 document structure and incorporates integral parts from the DSMR P1 V5.0.2. Additional text with respect to the DSMR P1 V5.0.2 in these chapters is labeled in **green.** P1 is replaced by A1.

Chapter 7 specifies the representation of COSEM objects in the A1 telegram and Chapter 8 specifies the data elements of the A1 interface for the Belgium market. <u>These chapters replace the chapters 6.4 and further of the DSMR P1 V5.0.2.</u>

Note: This document (eMUCS – A1) describes the local consumer interface for the industrial installations, so called AMR meters. Next to the industrial segment, also the residential segment implements a local consumer interface based on the DSMR P1 V5.0.2. This interface is described in the document eMUCS-P1.

2 Design principles

Note: only the title of this chapter deviates from DSMR P1 5.0.2.

The interface is based on the following:

- Simple installation by customer;
- Simple and clearly defined interface;
- Low cost for the installation itself;
- Low cost for the customer installing, operating and maintaining the interface;
- Safe for the customer;
- The metering system or the data in it cannot be compromised.

The A1 interface is based on IEC 62056-21.

3 Abbreviation list

The content of this DSMR P1 chapter has been included in Abbreviations.

4 Normative references

The content of this DSMR P1 chapter has been included in appendix A – References.

5 Physical interface characteristics

This specification is based on the use of one OSM-device. It is however possible to use more devices by using an active or passive hub or repeater (not in scope of this document).

5.1 Physical connector

The A1 port connector type is RJ12. The Metering System holds a female connector; the OSM (Other Service Module) connects via standard RJ12 male plug.

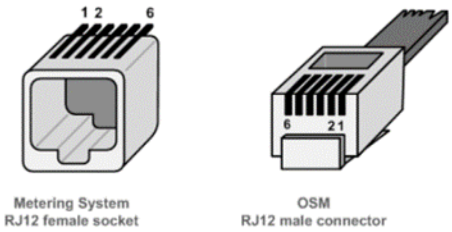

Figure 1: Physical connectors.

The A1 pin assignment is detailed in table below:

Pin#	Signal name	Description	Remark
1	+5V	+5V power supply	Power supply line
2	Data Request	Data Request	Input
3	Data GND	Data ground	
4	n.c.	Not Connected	
5	Data	Data line	Output. Open Collector
6	Power GND	Power ground	Power supply line

Table 2 A1 – Physical connector pin assignment

5.2 User safety

5.2.1 Installation Category

The A1 interface (being integral part of the entire Metering System) has to fulfil the requirements for Installation Category IV, meaning impulse withstand voltages = 6000 V. See IEC standard – Ref [5].

5.2.2 Galvanic Isolation

The A1 port lines must be galvanically isolated from the mains, Including +5V power supply line.

To secure a user of A1 port from electric shock, and at the same time to protect the Metering System against any kind of reversed connection, and to avoid the possibility of influencing the Metering System through the A1 port, **all the lines** of A1 port must be galvanically isolated from the mains (Including +5V power supply line).

To achieve galvanic isolation and to lower the possibility of influencing the Metering System through the A1 port, the signal lines (Data and Data Request) must be equipped with optocouplers.

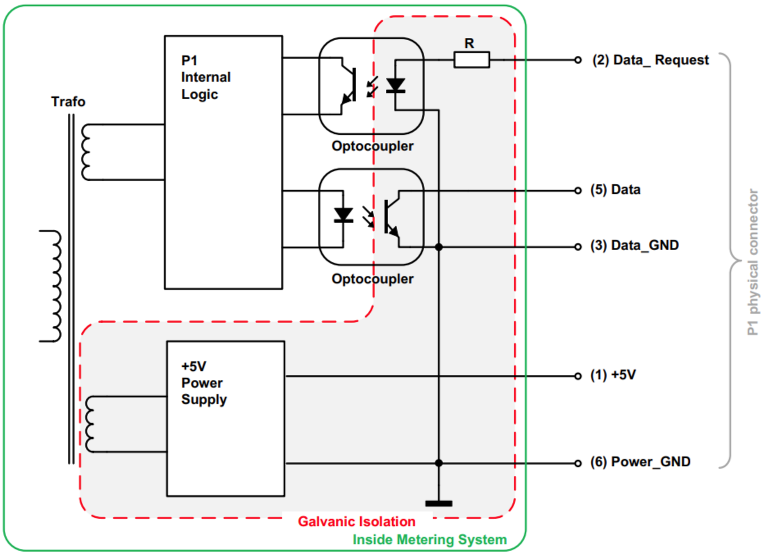

Figure 2 Galvanic isolation from the mains

The A1 port design (including optocouplers) must adhere to the relevant IEC standards for measurement equipment.

Especially:

IEC 60747-5-5 - Electrical safety standard.
IEC 61010 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use.

5.3 Power supply

The "+5V" power supply line is meant to provide a power source to OSM devices, to enable their ability to process and transfer received metering data further wired or wireless (i.e. via Bluetooth or Wi-Fi technologies).

The power consumption of the A1 circuitry shall **NOT** be included in the register values of the Electricity meter.

5.3.1 Voltage characteristics

The A1 interface must provide stable +5V DC power supply via "+5V" (pin 1) and "Power GND" (pin 6) lines.

"+5V" voltage and its tolerances are defined as follows:

- Nominal voltage U_L = 5,0 V
- Maximum voltage allowed U_{L_MAX} <= 5,5 V at I_L = 0 mA
- Minimum voltage allowed U_{L_MIN} >= 4,9 V at I_L = I_{L_CONT} = 250 mA

The "Allowed Voltage" window is presented on the picture below:

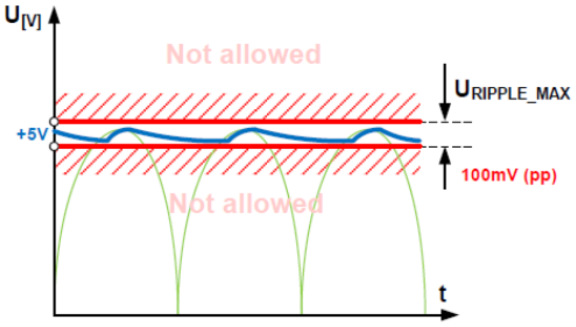

Figure 3: Allowed voltage window

The "Ripple Voltage" U_{RIPPLE_MAX} at I_{L_CONT} = 250 mA must not exceed 2% of a nominal volt-age (U_L). U_{RIPPLE_MAX} <= 100mV (pp - peak to peak), for frequencies lower or equal to 100 Hz. Defined at pure resistive load.

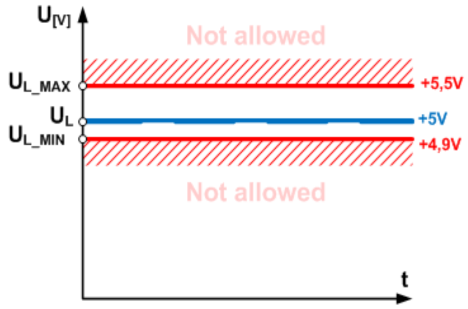

Figure 4: Ripple voltage window

The "Noise Level" U_{NOISE_MAX} must not exceed <= 50mV peak to peak, for frequencies higher than 50 kHz. Defined at pure resistive load.

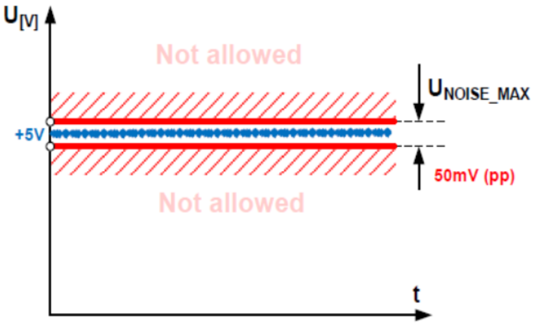

Figure 5 Noise level window

5.3.2 Current characteristics

The power supply must be able to continuously supply current I_{L_CONT} <= 250 mA.

The power supply line must be equipped with an overload / overcurrent mechanism, protecting A1 interface from excessive current by immediately shutting off the flow of current when it exceeds a level of I_{L_MAX} >= 300 mA.

The tolerance of triggering the overload / overcurrent mechanism should stay between I_{L_CONT}

+ 10mA >= 260 mA and I_{L_MAX} <= 300 mA.

The overload / overcurrent mechanism must be implemented as a “fold back” technology (see section 5.5.2).

5.3.2.1 Inrush current

Once the OSM device is connected to the A1 port (depends on OSM internal design), its power supply unit may require to use an excessive current for a very short period of time (usually for less than 1 ms). Such current is often called: an “Inrush current”.

The power supply must be able to cope with an Inrush current, caused by the OSM.

The E-meter must be able to withstand a typical “Inrush current” from a circuit as presented in the picture below.

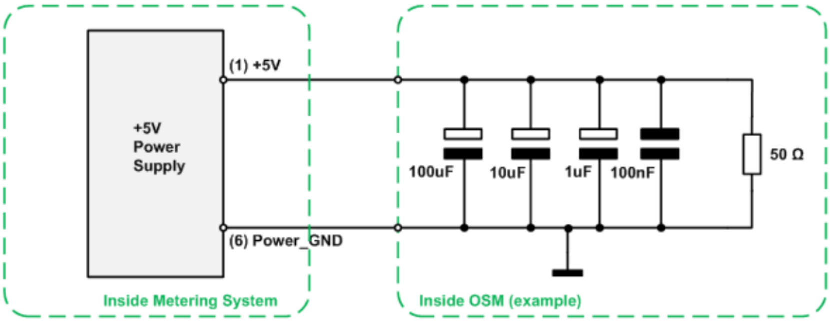

Figure 6 Inrush current circuit example

5.4 Variable load on power supply

The OSM devices may incorporate radio technologies such as Bluetooth and Wi-Fi. Such devices usually have a specific characteristic of power consumption.

To ensure the correct operation of these type of devices, the A1 “+5V” power supply must be able to cope with variable load.

If the load at OSM side remains within acceptable range (up to 250 mA), the power supply must provide accurate and continuous voltage regardless of the nature of load changes.

An example of a “Load Test Pattern” is presented on the picture below.

The exemplary “load change periods” could be: 2 ms, 20 ms, 200 ms, and 2 s.

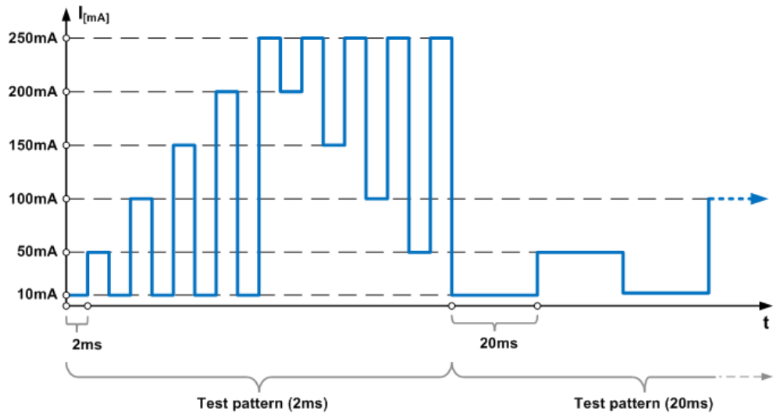

Figure 7: Variable load – test pattern example

5.5 Metering system protection

This section describes the protection of the metering system seen from the A1 port side.

5.5.1 Avoidance of influencing the Metering System through A1 port

It must not be possible to influence the Metering system in any way through the A1 port (except from requesting and receiving data, and getting +5V power supply as specified in section

Power supply on page 9).

Especially it shall not be possible to interrupt or block in any way the other modules/ports/parts of the Metering System (i.e. by maliciously manipulate the “Data Request” line).

See also section 5.2.2. – Galvanic isolation.

5.5.2 Short circuits

The “+5V” power supply line of the A1 port shall be able to withstand long lasting short circuits. The maximum “short circuit current” has to be limited to 50 mA. ISC <= 50 mA.

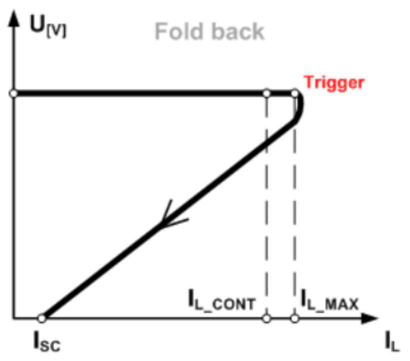

Figure 8: Over current / short circuit graph example

Once the short circuit / over current situation does no longer occur, the power supply has to return automatically to normal operation.

5.5.3 External OVP (Overvoltage Protection)

To protect the “+5V” power line from an external overvoltage, caused by or a failure at OSM side or by an incorrect (i.e. by mistake) connection of a higher voltage source to “+5V” line, an OVP (Overvoltage Protection) mechanism must be implemented.

The OVP mechanism for “+5V” line should be triggered at a level not lower than:

5,9 V (± 100 mV). V_{OVP} = 5,9 V and will protect the interface against voltages up to 15 V.

5.5.4 ESD – Electrostatical Discharge

All the lines of the A1 port have to be ESD protected.

ESD protection has to comply with IEC 61000-4-2 Applicable model - HBM Human Body Model.

5.6 A1 OSM protection

To protect the OSM device (connected via A1 port) from an overvoltage caused by a failure at Metering System side, an OVP (Overvoltage Protection) mechanism should be implemented, which will limit the voltage to less than 15V.

Note: The above requirement is only applicable for the "+5V" line, as the other lines (Data Request and Data) cannot be physically influenced by the Metering System due to the use of optocouplers.

5.7 A1 Data interface specification

To ensure a safe, stable solution the data connection will consist of three lines:

- "Data Request" line,
- "Data" line and
- "Data ground" line

Note: the protocol is based on IEC 62056-21 Mode D, exceptions are documented below where applicable.

5.7.1 "Data Request" line specification

The A1 port is activated (start sending data) by setting "Data Request" line high (to +5V).

While receiving data, the requesting OSM must keep the "Data Request" line activated (set to +5V).

To stop receiving data OSM needs to drop "Data Request" line (set it to "high impedance" mode). Data transfer will stop immediately in such case. For backward compatibility reason, no OSM is allowed to set "Data Request" line low (set it to GND or 0V).

Data Request line HIGH level:
The voltage range for HIGH level for Data Request line must be between 4,0 V. ($U_{DR\_1\_MIN}$ >= 4,0 V) and 5,5 V. ($U_{DR\_1\_MAX}$ <= 5,5 V).

Data Request line current consumption:
Depending on the voltage on the "Data Request" line, power consumption may vary between 4,0 mA ($I_{DR\_1\_MIN}$ >= 4,0 mA) and 10 mA ($I_{DR\_1\_MAX}$ <= 10 mA).

The Data Request line needs to be OVP protected. This OVP mechanism for Data Request line should be triggered at a level not lower than 5,9 V (± 100 mV). U_{OVP} = 5,9 V and will protect the interface against voltages up to 15 V.

5.7.2 "Data" line specification

Due to the use of optocouplers, the "Data" line must be designed as an OC (Open Collector) output, the "Data" line must be logically inverted.

"Data" line LOW level:
The voltage range for LOW level for Data line must be between 0 V ($U_{D\_0\_MIN}$ >= 0 V) and 1,0 V ($U_{D\_0\_MAX}$ <= 1,0 V).

"Data" line (while in LOW state) must be able to handle current up to and not exceeding 30 mA. ($I_{D\_0\_MAX}$ <= 30 mA).

From an OSM perspective, the maximum current flowing towards the "Data" line must not exceed 5 mA.

5.7.3 Addressing of the Metering System

Since a Metering System has only one A1 port, there is no need to address it.

5.8 A1 signal levels

		Requirement for the Meter			Requirement for OSM			
Symbol	**Description**	**Min**	**Typical**	**Max**	**Min**	**Typical**	**Max**	**Units**
U_{DR_1}	"Data request" line - HIGH level	-	-	5,5	4,0	5,0	5,5	V
I_{DR_1}	"Data request" line current	-	5	10	4	5	10	mA
U_{D_0}	"Data" line – LOW level	0	0,2	1	0	0,2	1	V
U_{D_1}	"Data" line – HIGH level	-	5,0	-	-	5,0	-	V
$I_{D\_0\_MAX}$	"Data" line max current	-	-	30	-	-	5	mA
U_L	"+5V" power supply – voltage	4,9	5	5,5	4,9	5	5,5	V
U_{RIPPLE_MAX}	"+5V" line maximum ripple voltage	-	-	100	-	-	100	mV
U_{NOISE_MAX}	"+5V" line- maximum noise	-	-	50	-	-	100	mV
V_{OVP}	OVP level ("+5V" and "Data request" lines)	5,8	5,9	15	-	-	-	V
I_{L_CONT}	"+5V" maximum continuous current	250	-	260	-	-	250	mA
I_{L_MAX}	"+5V" line overload protection trigger	260	-	300	-	-	-	mA
I_{SC}	"+5V" line Short Circuit current	-	-	50	-	-	-	mA

Table 3 A1 signal levels

Logical levels are specified as follows:
SPACE "0" usually > 4V
MARK "1" as < 1 V

6 Protocol description

The protocol is based on IEC 62056-21 Mode D. Data transfer is requested with request line and automatically initiated every second until request line is released. The information in the A1 telegram must be updated every second.

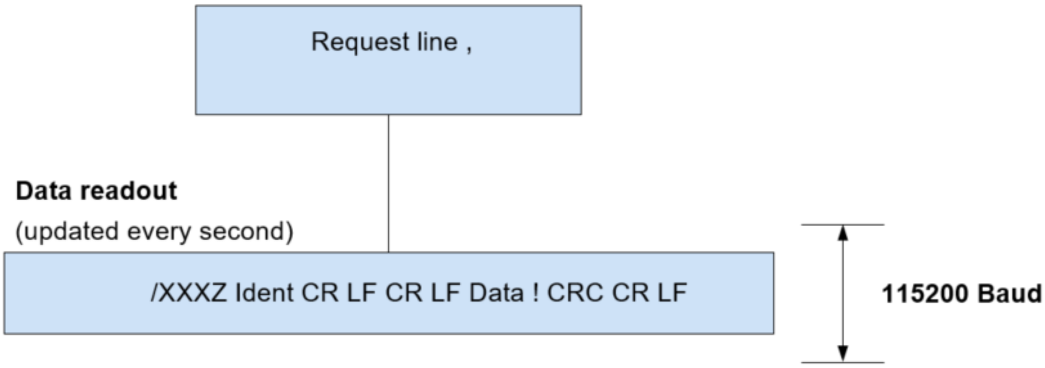

Figure 9: High level Protocol overview

6.1 Transfer speed and character formatting

The interface must use a fixed transfer speed of 115200 baud.

The Metering System must send its data to the OSM device every single second and the transmission of the entire A1 telegram must be completed within 1s.

The format of transmitted data must be defined as “8N1”. Namely:

- 1 start bit,
- 8 data bits,
- no parity bit and
- 1 stop bit.

Note:
This is not conforming to IEC 62056-21**Error! Reference source not found.** Mode D.

6.2 Data readout

The Metering System transmits the data message, as described below, immediately following the activation through the Request signal.

/	X	X	X	5	Identification	CR	LF	CR	LF	Data	!	CRC	CR	LF

One of the COSEM object attribute values in the data blocks could be used for firmware updates or parameter update of a A1 device. Because of this it is not allowed to split the large data block (which can contain up to 1024 characters).

CRC is a CRC16 value calculated over the preceding characters in the data message (from “/” to “!” using the polynomial: x16+x15+x2+1). CRC16 uses no XOR in, no XOR out and is computed with least significant bit first. The value is represented as 4 hexadecimal characters (MSB first). XOR is a bit operation that results in true if and only if one of the inputs is true.

6.3 End of transmission

The data transmission is complete after the data message has been transmitted by the Metering System. An acknowledgement signal is not provided for.

7 Representation of COSEM objects in the A1 telegram

All functions and data elements of the E-meter are modelled by using object modelling techniques. The Blue book contains an extensive library of COSEM interface class definitions. These class definitions are the templates or 'blueprints' for the interface objects which together realize the 'functional data model' of the E-meter. See Blue book section 'Object modelling and data identification' for more information. For each interface class definition, a class identifier (class ID) is assigned and the set of attributes and methods are specified.

This chapter specifies how the COSEM objects are represented in the A1 telegram. In section 7.1 the representation of attribute values is specified. Section 7.2 specifies which attributes of COSEM objects of several class IDs are represented in the A1 telegram and how these attributes are formatted.

Chapter **Error! Reference source not found.** defines which COSEM objects of the E-meter data model are published on the A1 telegram.

7.1 Representation of attribute values

The values stored in the attributes of the COSEM objects have a specified data type which fits to the purpose of the attribute (e.g. enumeration for status, or double-long-unsigned for measurement values). This section specifies for each data type how these values are represented in the A1 telegram. These representations are referred to as 'value formats'.

This specification is limited to the data types and value formats that are used in the current version of the A1 interface.

The following value formats are used in the A1 telegram:

Value Format	Legenda	Example
Fn(x,y)	F = indicator for floating decimal number n = total number of decimal digits x = minimum number of decimals behind the decimal point. y = maximum number of decimals behind the decimal point.	F7(3,3): YYYY.YYY F7(0,3): YYYY.YYY or YYYYY.YY or YYYYYY.Y or YYYYYYY
In	I = indicator for integer number n = maximum number of decimal digits. The minimum is 1.	Value 1 - I3: 1 Value 999 - I3: 999
Sn	S = indicator for alphanumeric string without ASCII code interpretation. n = number of characters.	S10: 482E313233
An	A = indicator for alphanumeric string with ASCII code interpretation.	A5: H.123
TST	TST = indicator for time stamp with format: YYMMDDhhmmssX Year, Month, Day, Hour, Minute, Second, and an indication whether DST is active (X=S) or DST is not active (X=W).	TST: 230704112259S
U	U = indicator of the unit of the measurement value. Possible values: kWh, kW, V, A, m3.	U: kWh
ID	ID = reduced OBIS Identifier. This is the OBIS code without value group F.	ID: 1-0:1.8.0
Z	Z = number of published entries. Represents the entries in use, but maximized to the maximum number of published entries, of a profile generic object.	Z: (3)

Table 4: Value formats used for COSEM attribute value representation in the A1 telegram

In the table below, the relation is established between the COSEM data type of the attributes, and the value format (= representation) of the value in the A1 telegram. The data type and tag refer to the COSEM data type and its tag, as specified in Blue book Table 2 – Common data types. For the E-meter developer, the data type, tag and value format are relevant for correct 'construction' of the A1 telegram from the COSEM data model in the E-meter. For the OSM developer, only the published value formats are relevant. COSEM attribute values with following data types are published in the A1 telegram with the following the value formats:

Data type	Tag	Value format(s)
double-long-unsigned (0…4 294 967 295)	6	Fn(x,y) or Z
octet-string	9	Sn, An, TST or ID. The value shall be compatible with the selected representation.
long-unsigned (0…65535)	18	Fn(x,y), In
scalar_unit_type (struct of scalar, unit)	2{15, 22}	U
array capture_object_definition (array of struct with class id, logical_name, attribute_index and data_index)	1{2{18,9,15,18}	(ID_1)..(ID_n)

Table 5 Value formats per data type of the COSEM attribute

Additional clarifications on the representation of data types are provided in the next sections.

7.1.1 Representation of COSEM data type octet-string

7.1.1.1 Representation with Sn

COSEM data type octet-string (tag 9) can be represented with Sn value format where octets are formatted with hexadecimal characters. Octet-string length is implicit. This representation does not impose restrictions on the value.

Note: An octet string with a length of m octets, will result in an Alphanumeric string Sn with a length of n, where n is 2 times m. In other words, the length in the value format Sn is the number of characters published in the A1 telegram. Each octet has 2 characters (0x23 is published as '23').

7.1.1.2 Representation with An

COSEM data type octet-string (tag 9) can be represented with value format An. In this case, the ASCII characters that correspond with the octet values are published. This representation is only possible if the octet values are in the range of ASCII codes.

An octet string with length n, will result in an Alphanumeric string An with length n. Example: A COSEM attribute with tag 9 (octet string), length 2 and content '0x31, 0x32' is on the A1 interface specified as A2 and is represented as '12'.

7.1.1.3 Representation with TST

Timestamps in COSEM are stored in attributes with COSEM tata type octet-string (tag 9). Their value format on the A1 interface is TST. This representation is only possible if the octet string contains a value that complies to the COSEM date-time format according to Blue book section 4.1.6.1, which is an octet string of 12 bytes. The DST indication is taken from the status byte.

7.1.1.4 Representation with ID

Logical names (= OBIS codes) are stored in attributes with COSEM data type octet-string (tag 9). Their value format on the A1 interface is ID, which is formatted as follows: A-B:C.D.E. In this reduced OBIS identifier, value group F is missing.

This representation is only possible if the octet string contains a value that complies to the logical name specification, which is an octet string with 6 bytes (one byte for value group A-F).

7.1.2 Representation of COSEM data type double-long-unsigned

For measurement values, COSEM data type double-long-unsigned is represented as a floating point decimal, value format Fn(x,y). The total number of decimal digits is fixed by n. If x is smaller than y, the number decimal digits behind the point may vary depending on the attribute value. In this specification, x and y are always equal. Note that the number of decimals behind the decimal point may differ from the scalar of the corresponding COSEM attribute.

The attribute value of attribute 7 of the Profile Generic class has data type double-long-unsigned and is represented as Z, with Z a positive number indicating the number of buffer entries in use, maximized to the specified maximum number that can be published.

7.1.3 Representation of COSEM data type long-unsigned

7.1.3.1 Representation with Fn(x,y)

For measurement values, COSEM data type double-long-unsigned is represented as a floating point decimal, value format Fn(x,y). The total number of decimal digits is fixed by n. If x is smaller than y, the number decimal digits behind the point may vary depending on the attribute value. In this specification, x and y are always equal. Note that the number of decimals behind the decimal point may differ from the scalar of the corresponding COSEM attribute.

7.1.3.2 Representation with In

COSEM data type unsigned is represented with value format In. The n defines the maximum number of decimals and shall correspond with the maximum attribute value. No leading zeros are published if the actual value needs less positions than the maximum value.

7.1.4 Representation of COSEM data type scalar_unit_type

The COSEM data type scalar_unit_type is a struct of a scalar and a unit. It is the data type of scalar-unit attributes of register objects that store measurement values. Only the unit part of this struct is included in the A1 telegram. Table 6 lists the units that are used in the current version of the A1 interface.

Note that for Active power and Active energy, the unit is preceded by a fixed scalar indicator. This is not the scalar taken from the attribute value.

Enum-unit-quantity from table 4 in Blue Book	Representation of the unit U in the A1 telegram
13 – Volume – m3	**m3**
27 – Active power – W	**kW**

Enum-unit-quantity from table 4 in Blue Book	Representation of the unit U in the A1 telegram
29 – Reactive power (Q) - var	**kvar**
30 – Active energy – Wh	**kWh**
32 – Reactive energy - varh	**kvarh**
33 – Current – A	**A**
35 – Voltage - V	**V**

Table 6 Representation of units in A1 telegram

7.1.5 Representation of COSEM data type 'array capture_object_definition'

The data type 'array capture_object_definition' is the data type of the attribute capture objects of the Profile Generic class. This data type is an array of structs holding the class id, logical_name, attribute_index and data_index. The array elements define the sources of the buffered entries in the buffer attribute.

Only the logical_name struct-elements are included in the A1 telegram, as list of reduced OBIS codes, in the following formatting: (ID_1)..(ID_n)

7.2 Representation of COSEM objects

This section specifies per class ID which object attributes are published on the A1 interface and how these attributes are represented in the A1 telegram. This specification is limited to the class id's that are used in the current version of the A1 interface. Table 7 lists per class ID the attributes that are included in the A1 telegram.

Class ID	Attributes in A1 telegram
1 - Data	1 - logical_name 2 - value
3 - Register	1 - logical_name 2 - value
4 - Extended Register	1 - logical_name 2 - value 3 - scaler_unit 5 - capture_time
5 - Demand Register	1 - logical_name 2 - value 3 - scaler_unit
7 - Profile Generic	1 - logical_name 2 - buffer 3 - capture_objects 7 - entries_in_use
8 - Clock	1 - logical_name 2 - time

Table 7 Attributes in A1 telegram per class id

For each class ID, the following formatting of the attributes apply, with Mv a value with the applicable value format from Table 4.

7.2.1 Class ID 1 - Data

Formatting of objects of Class ID 1 - Data	
A1 telegram element:	**Source:**
ID(Mv) Example: 0-0:96.1.4 (50221)	ID: Attribute 1 (logical_name) Example: 0-0:96.1.4.255
	Mv: Attribute 2 (value) Example: 50221

7.2.2 Class ID 3 - Register

Formatting of objects of Class ID 3 - Register	
A1 telegram element:	**Source:**
ID(Mv*U) Example: 1-0:1.8.0(000123.456*kWh)	ID: Attribute 1 (logical_name) Example: 0-0:1.8.1.255
	Mv: Attribute 2 (value) Example: 000123456
	U: Unit part of attribute 3 (scaler_unit) Example: {0,30}

7.2.3 Class ID 4 - Extended Register

Formatting of objects of Class ID 4 – Extended Register	
A1 telegram element:	**Source:**
ID(TST)(Mv*U) Example: 0-2:24.2.3(200512134558S)(00872.234*m3)	ID: Attribute 1 (logical_name) Example: 0-2:24.2.3.255
	Mv: Attribute 2 (value) Example: 872234
	U: Unit part of attribute 3 (scaler_unit) Example: {0,30}
	TST: Attribute 5 (capture_time) Example: 200512134558S

7.2.4 Class ID 5 - Demand Register

Formatting of objects of Class ID 5 – Demand Register	
A1 telegram element:	**Source:**
ID(Mv*U) Example: 1-0:1.24.0(00872.234*kW)	ID: Attribute 1 (logical_name) Example: 0-2:24.2.3.255
	Mv: Attribute 2 (current_average_value) Example: 872234
	U: Attribute 4 (scaler_unit) Example: {0,27}

7.2.5 Class ID 7 – Profile Generic

Formatting of objects of Class ID 7 – Profile Generic	
A1 telegram element:	**Source:**
ID(Z)(ID₁)…(IDₙ)(TST₁)(Mv₁₁*U₁₁)…(Mvₙ₁*Uₙ₁)…(TSTz)(Mv₁z*U₁z)…(Mvnz*Unz) with n the included capture objects and z the rows in the buffer. Example: 1-0:99.1.0(2)(1-0:1.8.0)(1-0:2.8.0)(200512140000S)(000000.234*kWh)(000000, 567)(200512134500S)(000000.123*kWh)(000000, 456)	ID: Attribute 1 (logical_name) Example: 1 0:99.1.0.255

	$ID_{1..n}$: Attribute 3 (capture_objects)
	Example:
	{
	{8,1-0:1.0.0.255,2,0}
	{3,1-0:1.8.0.255,2,0}
	{3,1-0:2.8.0.255,2,0}
	}

	(TST)(Mv*U): Attribute 2 (Buffer)
	Example:
	{
	[200512140000S, 234, 567]
	[200512134500S, 123, 456]
	}
	U: Unit part of attribute 3 (scalar unit) of the respective capture object in attribute 3 (capture objects)

	Z: Attribute 7 (entries_in_use) Example: 2

Notes:

- Only buffers with a clock in the capture objects can be published on the A1.
- The clock is not included in the A1 telegram element that represents the capture objects.
- The maximum number of published entries is 15. If more entries are in use, the 15 most recent entries are published.

Examples are given in the next sections:

7.2.5.1 Profile generic 'Maximum Demand History' examples

In the examples below the data preamble is grey highlighted.
See also data object Maximum demand history on pag. 30.

Example 1
shows a normal profile for 'Maximum Demand History' 1-0:98.1.0, containing only the last scheduled (automatic) billing profile reset. This profile indicates that it is the 12th billing profile reset of 2022.11.01 at 00:00:00 (midnight), with:

- maximum demand active energy import (1-0:1.6.0) = 00.552 kW recorded on 2022.10.15 @ 09:15:00;
- maximum demand active energy export (1-0:2.6.0) = 00.220 kW recorded on 2022.10.05 @ 13:45:00.

1-0:98.1.0(1)(0-0:0.1.0)(1-0:1.6.0)(1-0:1.6.0)(1-0:2.6.0)(1-0:2.6.0)(221101000000W)(12)(221015091500W)(00.552*kW)(221005134500W)(00.220*kW)

Example 2
shows an empty profile for 'Maximum Demand History' 1-0:98.1.0 with 0 entries

1-0:98.1.0(0)(0-0:0.1.0)(1-0:1.6.0)(1-0:1.6.0)(1-0:2.6.0)(1-0:2.6.0)()

Example 3
shows a normal profile for 'Maximum Demand History' 1-0:98.1.0 containing only the last scheduled (automatic) billing profile reset. This profile indicates that it is the 12th billing profile reset of 2022.11.01 at 00:00:00 (midnight), with:

- maximum demand active energy import (1-0:1.6.0) = 00.000 kW recorded on 2022.10.01 @ 00:00:00
- maximum demand active energy export (1-0:2.6.0) = 00.000 kW recorded on 2022.10.01 @ 00:00:00.

1-0:98.1.0(1)(0-0:0.1.0)(1-0.1.6.0)(1-0.1.6.0)(1-0.2.6.0)(1-0.2.6.0)(221101000000W)(12)(221001000000W)(00.000*kW)(221001000000W)(00.000*kW)

Example 4
shows a normal profile for 'Maximum Demand History' 1-0:98.1.0 containing only the last manual billing profile reset. This profile indicates that it is the 10th billing profile reset MANUALLY executed on 2022.11.04 @ 11:12:00, with:

- maximum demand active energy import (1-0:1.6.0) = 00.052 kW recorded on 2022.11.03 @ 10:15:00
- maximum demand active energy export (1-0:2.6.0) = 00.003 kW recorded on 2022.11.02 @ 12:45:00

1-0:98.1.0(1)(0-0:0.1.0)(1-0.1.6.0)(1-0.1.6.0)(1-0.2.6.0)(1-0.2.6.0)(221104111200W)(10)(221103101500W)(00.052*kW)(221102124500W)(00.003*kW)

7.2.5.2 Profile generic 'Energy History' examples

In the examples below the Data Preamble is grey highlighted.
See also data object Energy history on pag. 31.

Example 1
shows a normal profile for 'Energy History' 1-0:98.1.1 containing only the last scheduled (automatic) profile reset. This profile indicates that it is the 18th profile reset of 2022.06.01 at 00:00:00 (midnight) with:

- active energy import: +A (QI+QIV) (1-0:1.8.0) = 0000010.55 kWh,
- active energy export: -A (QII+QIII) (1-0:2.8.0) = 0000009.22 kWh,
- reactive energy import in quadrant I, inductive: +Ri QI (1-0:5.8.0) = 0000000.44 kvarh
- reactive energy export in quadrant II, capacitive: +Rc QII (1-0:6.8.0) = 0000000.25 kvarh
- reactive energy export in quadrant III, inductive: -Ri QIII (1-0:7.8.0) = 0000000.02 kvarh
- reactive energy import in quadrant IV, capacitive: -Rc QIV (1-0:8.8.0) = 0000000.10 kvarh

1-0:98.1.1(1)(0-0:0.1.0)(1-0:1.8.0)(1-0:2.8.0)(1-0:5.8.0)(1-0:6.8.0)(1-0:7.8.0)(1-0:8.8.0)(220601000000S)(18)(0000010.55*kWh)(0000009.22*kWh)(0000000.44*kvarh)(0000000.25*kvarh)(0000000.02*kvarh)(0000000.10*kvarh)

Example 2
shows an empty profile for 'Energy History' 1-0:98.1.1 with 0 entries

1-0:98.1.1(1)(0-0:0.1.0)(1-0:1.8.0)(1-0:2.8.0)(1-0:5.8.0)(1-0:6.8.0)(1-0:7.8.0)(1-0:8.8.0)()

7.2.6 Class ID 8 - Clock

<table>
<tr><th colspan="2">Formatting of objects of Class ID 8 - Clock</th></tr>
<tr><th>A1 telegram element:</th><th>Source:</th></tr>
<tr><td rowspan="2">ID(TST)
Example: 0-0:1.0.0 (200512140000S)</td><td>ID: Attribute 1 (logical_name)
Example: 0-0:1.0.0.255</td></tr>
<tr><td>TST: Attribute 2 (time)
Example: 200512140000S</td></tr>
</table>

8 A1 telegram representation and data elements

This section specifies the data elements that are published on the Belgium A1 interface together with their reduced OBIS reference including attribute data type and Value Format.

The electricity meter sends the A1 telegram every second with updated information for the electricity meter related objects.

Note that order of OBIS codes is not fixed. The OSM must be able to interpret the OBIS Reduced ID codes and understand the representation. To support correct interpretation of the telegram content by an OSM, the E-meter shall publish the active A1 version (data element 'Version information'), as the first line of the telegram.

Every line (data element) of the A1 telegram ends with a CR/LF (Carriage Return / Line Feed).

8.1 General data elements

The table below lists the general data elements. These data elements are not related to any device.

Data element	OBIS Reduced ID	Attri-bute	Class ID	Tag	Value Format	Value unit	Additional information
Header information	-	-	-	-	-	-	Manufacturer specific field.
Version information	0-0:96.1.4	2 Value	1 Data	9	A5	-	Encoded as DDDXY, where DDD is the 'DSMR-P1' version number and XY the major and minor version of the e-MUCs – A1 interface specification. Current version: 50250
Date-time stamp of the A1 message	0-0:1.0.0	2 Time	8 Clock	9	TST	-	This timestamp originates from the E-meter clock. This clock is synchronized from the Head-end systems timeserver. The meter-clock is the reference for all time-related measurements.

Table 8 General data elements

8.2 Electricity related data objects

The table below lists the electricity meter related data objects that are supported by this version of eMUCS-A1. Differences from and additions to DSMR-P1 are indicated.

Data element	OBIS Reduced ID	Attribute	Class ID	Tag	Value Format	Value unit	Additional information
Equipment identifier	0-0:96.1.1	2 Value	1 Data	9	S16	-	The Equipment Identifier contains only the fabrication number of 8 characters part of the manufacturer independent identification number according to DIN 43863-5 clause 3.
Instantaneous Active power import – total +P (QI+QIV)	1-0:1.7.0	2 Value	3 Register	18	F5(3,3)	kW	When there is simultaneous power consumption in one phase and power injection in another phase, the meter determines the net value (= algebraic sum of the energy in the 3 phases) and stores it in the appropriate single register (1.x.0 or 2.x.0) in 1 Watt resolution. See appendix 'B – Behaviour of phase information objects' on pag. 34.
Instantaneous Active power export – total -P (QII+QIII)	1-0:2.7.0	2 (Value)	3 Register	18	F5(3,3)	kW	When there is simultaneous power consumption in one phase and power injection in another phase, the meter determines the net value (= algebraic sum of the energy in the 3 phases) and stores it in the appropriate single register (1.x.0 or 2.x.0) in 1 Watt resolution. See appendix B
Instantaneous voltage L1	1-0:32.7.0	2 Value	3 Register	18	F4(1,1)	V	
Instantaneous voltage L2	1-0:52.7.0	2 Value	3 Register	18	F4(1,1)	V	See appendix 'B – Behaviour of phase information objects' on pag. 34.
Instantaneous voltage L3	1-0:72.7.0	2 Value	3 Register	18	F4(1,1)	V	
Instantaneous current L1	1-0:31.7.0	2 Value	3 Register	18	F5(2,2)	A	See appendix B
Instantaneous current L2	1-0:51.7.0	2 Value	3 Register	18	F5(2,2)	A	See appendix B

Data element	OBIS Reduced ID	Attribute	Class ID	Tag	Value Format	Value unit	Additional information
Instantaneous current L3	1-0:71.7.0	2 Value	3 Register	18	F5(2,2)	A	See appendix B
Instantaneous active power import – L1 (+P)	1-0:21.7.0	2 Value	3 Register	18	F5(3,3)	kW	See appendix B
Instantaneous active power import – L2 (+P)	1-0:41.7.0	2 Value	3 Register	18	F5(3,3)	kW	See appendix 'B – Behaviour of phase information objects' on pag. 34.
Instantaneous active power import – L3 (+P)	1-0:61.7.0	2 Value	3 Register	18	F5(3,3)	kW	See appendix B
Instantaneous active power export – L1 (-P)	1-0:22.7.0	2 Value	3 Register	18	F5(3,3)	kW	See appendix B
Instantaneous active power export – L2 (-P)	1-0:42.7.0	2 Value	3 Register	18	F5(3,3)	kW	See appendix B
Instantaneous active power export – L3 (-P)	1-0:62.7.0	2 Value	3 Register	18	F5(3,3)	kW	See appendix B
Instantaneous reactive power import – total +Q (QI+QII)	1-0:3.7.0	2 Value	3 Register	18	F5(3,3)	kvar	See appendix B
Instantaneous reactive power export – total -Q (QIII+QIV)	1-0:4.7.0	2 Value	3 Register	18	F5(3,3)	kvar	See appendix B
Instantaneous reactive power import - L1 (+Q)	1-0:23.7.0	2 Value	3 Register	18	F5(3,3)	kvar	See appendix 'B – Behaviour of phase information objects' on pag. 34.
Instantaneous reactive power import – L2 (+Q)	1-0:43.7.0	2 Value	3 Register	18	F5(3,3)	kvar	See appendix B
Instantaneous reactive power import – L3 (+Q)	1-0:63.7.0	2 Value	3 Register	18	F5(3,3)	kvar	See appendix B

Data element	OBIS Reduced ID	Attribute	Class ID	Tag	Value Format	Value unit	Additional information
Instantaneous reactive power export – L1 (-Q)	1-0:24.7.0	2 Value	3 Register	18	F5(3,3)	kvar	See appendix B
Instantaneous reactive power export – L2 (-Q)	1-0:44.7.0	2 Value	3 Register	18	F5(3,3)	kvar	See appendix B
Instantaneous reactive power export – L3 (-Q)	1-0:64.7.0	2 Value	3 Register	18	F5(3,3)	kvar	See appendix B
Active energy import +A (QI+QIV)	1-0:1.8.0	2 Value	3 Register	6	F9(2,2)	kWh	See appendix B
Active energy export -A (QII+QIII)	1-0:2.8.0	2 Value	3 Register	6	F9(2,2)	kWh	See appendix B
Reactive energy +Ri (QI)	1-0:5.8.0	2 Value	3 Register	6	F9(2,2)	kvarh	See appendix B
Reactive energy +Rc (QII)	1-0:6.8.0	2 Value	3 Register	6	F9(2,2)	kvarh	See appendix B
Reactive energy -Ri (QII I)	1-0:7.8.0	2 Value	3 Register	6	F9(2,2)	kvarh	See appendix B
Reactive energy -Rc (QI V)	1-0:8.8.0	2 Value	3 Register	6	F9(2,2)	kvarh	See appendix 'B – Behaviour of phase information objects' on pag. 34.
Current average demand active energy import +A (QI+QIV)	1-0:1.4.0	2 current average value	5 Demand Register	6	F5(3,3)	kW	See appendix B
Maximum demand active energy import +A (QI+QIV)	1-0:1.6.0	5 capture time	4 Extended register	9	TST	-	
		2 Value	4 Extended register	6	F5(3,3)	kW	See appendix B
Current average demand active energy export - A (QII+QIII)	1-0:2.4.0	2 current average value	5 Demand Register	6	F5(3,3)	kW	See appendix B

Data element	OBIS Reduced ID	Attribute	Class ID	Tag	Value Format	Value unit	Additional information
Maximum demand active energy export - A (QII+QIII)	1-0:2.6.0	5 capture time	4 Extended register	9	TST	-	
		2 Value	4 Extended register	6	F5(3,3)	kW	See appendix B
Maximum demand history (depth 1 month)	0-0:98.1.0	2 Buffer capture object 3 {1,0-0:0.1.0.255 ,2,0}	7 Profile Generic	18	I3	-	Number of billing resets
		2 Buffer capture object 4 {4,1-0:1.6.0.255 ,5,0}	7 Profile Generic	9	TST	-	
		2 Buffer capture object 5 {4,1-0:1.6.0.255 ,2,0}	7 Profile Generic	6	F5(3,3)	kW	See appendix 'B – Behaviour of phase information objects' on pag. 34.
		2 Buffer capture object 6 {4,1-0:2.6.0.255 ,5,0}	7 Profile Generic	9	TST	-	
		2 Buffer capture object 7 {4,1-0:2.6.0.255 ,2,0}	7 Profile Generic	6	F5(3,3)	kW	See appendix B

Data element	OBIS Reduced ID	Attribute	Class ID	Tag	Value Format	Value unit	Additional information
Energy history (depth 1 month)	0-0:98.1.1	2 Buffer capture object 3 {1,0-0:0.1.0.255,2,0}	7 Profile Generic	18	I3	-	Number of billing resets
		2 Buffer capture object 4 {3,1-0:1.8.0.255,2,0}	7 Profile Generic	6	F9(2,2)	kWh	See appendix B
		2 Buffer capture object 5 {3,1-0:2.8.0.255,2,0}	7 Profile Generic	6	F9(2,2)	kWh	See appendix 'B – Behaviour of phase information objects' on pag. 34.
		2 Buffer capture object 6 {3,1-0:5.8.0.255,2,0}	7 Profile Generic	6	F9(2,2)	kvarh	See appendix B
		2 Buffer capture object 7 {3,1-0:6.8.0.255,2,0}	7 Profile Generic	6	F9(2,2)	kvarh	See appendix B
		2 Buffer capture object 8 {3,1-0:7.8.0.255,2,0}	7 Profile Generic	6	F9(2,2)	kvarh	See appendix B
		2 Buffer capture object 9 {3,1-0:8.8.0.255,2,0}	7 Profile Generic	6	F9(2,2)	kvarh	See appendix B

Table 9 Electricity related data objects

Abbreviations

Abbreviation	Meaning
AMR	**Automatic Meter Reading**
CEMS	**Consumer Energy Management System**
COSEM	**Comprehensive Semantic Model for Energy Management**
CRC	**Cyclic Redundancy Check**
CT	**Current Transformer**
DIN	**Deutsches Institut für Normung**
DLMS	**Device Language Message Specification**
DSMR	**Dutch Smart Meter Requirements**
DSO	**Distribution System Operator**
DST	**Daylight Saving Time**
ESD	**Electro-static Discharge**
GND	**Ground**
eMUCS	**Extended Multi-Utility Companion Specification**
HES	**Head End System**
MSB	**Most significant byte**
IEC	**International Electrotechnical Commission**
OBIS	**Object Identification System**
OMS	**Open Metering System**
OSM	**Other Service Module**
OVP	**Over Voltage Protection**
VT	**Voltage Transformer**
XOR	**Exclusive OR**

Table 10 Abbreviations

Appendices

A – References

This appendix lists all referenced standards and eMUCS documents.

A.1 – Standards

The following standards are referred to in this company specification. For undated references the latest edition applies.

Identification	Description	Author
IEC 62056-21	Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange	IEC
IEC 62056-61	Electricity metering - Data exchange for meter reading, tariff and load control – Part 61: OBIS Object Identification System	IEC
IEC 60747-5-5	Electrical Safety Standard	IEC
IEC 61000-4-2	Electromagnetic compatibility (EMC) Part 4-2: Testing and measurement techniques—Electrostatic discharge	IEC
IEC 61010	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use	IEC

Table 11 Normative references (copied from DSMR P1 v5.0.2)

Identification	Description	Author	Version
DIN 43863-5	Identification number for measuring devices applying for all manufacturers	DIN	2012-04
Blue book	DLMS UA 1000-1 'Blue Book'. COSEM Interface Classes and Object Identification system.	DLMS User Association	14
DSMR-P1	Dutch Smart Meter Requirements (DSMR) for the P1 port	Netbeheer Nederland	Ed. 5.0.2

Table 12 Additional referenced standards

A.2 – eMUCS documents

The actual versions are listed in eMUCS-System Architecture.

Identification	Discription	Author
eMUCS-P1	extended Multi-Utility Companion Specification of the P1 consumer interface	Fluvius
eMUCS-S1	extended Multi-Utility Companion Specification of the S1 consumer interface	Fluvius
eMUCS-A1	extended Multi-Utility Companion Specification of the A1 interface	Fluvius
eMUCS-System Architecture	extended Multi-Utility Companion Specification for System Architecture	Fluvius

Table 13 List of referenced eMUCS documents

B – Behaviour of phase information objects

B.1 – Phase information objects on 3 wire AMR meters

Instantaneous voltages

Due to the lack of a neutral wire, AMR meters used in a 3 wire network (D – delta network) – like 3x230V and 3x110V – use one of the phases as reference. Consequently, the measured voltages are actually line voltages as opposed to phase voltages measured in a 4 wire network (Y – star network).

This reference phase is usually L2 and the measured voltages are U12 and U32 (see illustrations in 'Figure 10 3 wire network (Delta)' below).

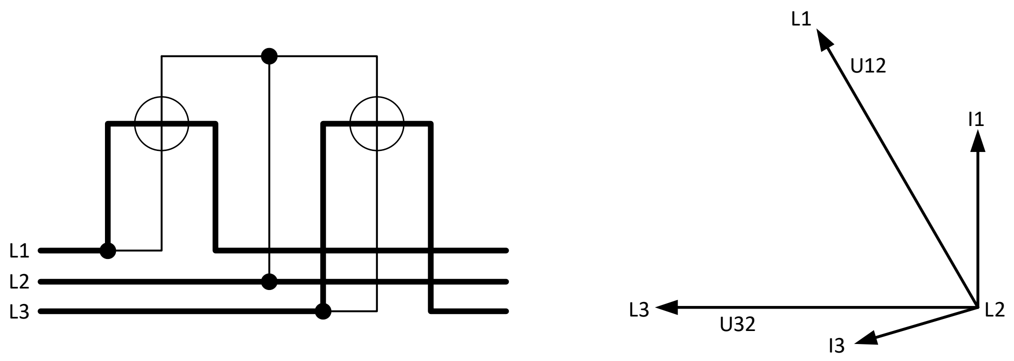

Figure 10 3 wire network (Delta)

Although 'line voltages' are measured on 3 wire meters, these voltages shall be represented on the A1 port by the same object used for the 'phase voltages', as follows:

- Instantaneous line voltage phase 1 U12 as Instantaneous phase voltage phase 1 U1 1-0:32.7.0
- Instantaneous line voltage phase 2 U31 as Instantaneous phase voltage phase 2 U2 1-0:52.7.0
- Instantaneous line voltage phase 3 U32 as Instantaneous phase voltage phase 3 U3 1-0:72.7.0

If the line voltage U31 is not measured or not available as calculated value, the A1 port will output a 0 V value for U2.

If the 3 wire AMR meter doesn't support any of the above objects, the A1 port will output all instantaneous voltages as 0 V values.

Instantaneous currents

AMR meters used in a 3 wire network (D) are usually based on the 2 Watt meter method and have therefore no current sensor in the reference phase (usually phase 2).

If the instantaneous current in the reference phase (I2) is not measured or not available as calculated value, the A1 port will output a 0 A value for the instantaneous current in reference phase (Instantaneous current phase 2 IL2 1-0:51.7.0).

If the 3 wire AMR meter doesn't support instantaneous current in any of the phases, the A1 port will output an instantaneous current as 0 A values on all 3 phases.

- Instantaneous current phase 1 I1 : 1-0:31.7.0

- Instantaneous current phase 2 I2 : 1-0:51.7.0
- Instantaneous current phase 3 I3 : 1-0:71.7.0

Instantaneous Active Power and Reactive Power

If the objects for instantaneous Active Power (P) and Reactive Power (Q) in both export and import for each individual phase are not supported by the 3 wire AMR meter, the A1 port will output the instantaneous Active Power P and Reactive Power Q as respectively 0 kW and 0 kvar values.

This applies to the following objects:

- Instantaneous active power import phase 1 +P1 (QI+QIV) : 1-0:21.7.0
- Instantaneous active power import phase 2 +P2 (QI+QIV) : 1-0:41.7.0
- Instantaneous active power import phase 3 +P3 (QI+QIV) : 1-0:61.7.0
- Instantaneous active power export phase 1 -P1 (QII+QIII) : 1-0:22.7.0
- Instantaneous active power export phase 2 -P2 (QII+QIII) : 1-0:42.7.0
- Instantaneous active power export phase 3 -P3 (QII+QIII) : 1-0:62.7.0
- Instantaneous reactive power import phase 1 +Q1 (QI+QII) : 1-0:23.7.0
- Instantaneous reactive power import phase 2 +Q2 (QI+QII) : 1-0:43.7.0
- Instantaneous reactive power import phase 3 +Q3 (QI+QII) : 1-0:63.7.0
- Instantaneous reactive power export phase 1 -Q1 (QIII +QIV) : 1-0:24.7.0
- Instantaneous reactive power export phase 2 -Q2 (QIII +QIV) : 1-0:44.7.0
- Instantaneous reactive power export phase 3 -Q3 (QIII +QIV) : 1-0:64.7.0

B.2 – Nominal values and primary data adaptation

AMR meters can be either connected directly to the grid or connected to the grid via CT/VTs. Regardless of the connection direct or indirect, all electrical quantities in the AMR meter are represented as nominal (secondary) values. The CT/VT transformer ratios, for AMR meters connected through CT/VTs, are NOT available in the A1 port telegram.

Therefore all object values in 'Table 9 Electricity related data objects' (on pag. 31) having a unit, shall be nominal (secondary) values. To obtain primary current, voltage, power, etcetera values, the OSM application must provide a means to enter the CT and VT transformer ratios through which the meter is connected.

If necessary, the OSM application will re-scale the primary values to a different unit (kA, kV, MW, GW, MWh, GWh, …) and/or adapt the number of digits.

D – Example of A1 telegram

Example of A1 telegram of 3 phase meter connected to 4 Wire (Y) grid

/LG_E660_Fluvius_3N400V

0-0:96.1.4(50250)
0-0:96.1.1(3630363633313739)
0-0:1.0.0(221001002600S)
1-0:1.8.0(0000005.17*kWh)
1-0:2.8.0(0000000.32*kWh)
1-0:1.7.0(00.000*kW)
1-0:2.7.0(00.000*kW)
1-0:21.7.0(00.000*kW)
1-0:41.7.0(00.000*kW)
1-0:61.7.0(00.000*kW)
1-0:22.7.0(00.000*kW)
1-0:42.7.0(00.000*kW)
1-0:62.7.0(00.000*kW)
1-0:32.7.0(000.0*V)
1-0:52.7.0(000.0*V)
1-0:72.7.0(236.4*V)
1-0:31.7.0(000.00*A)
1-0:51.7.0(000.00*A)
1-0:71.7.0(000.00*A)
1-0:3.7.0(00.000*kvar)
1-0:4.7.0(00.000*kvar)
1-0:23.7.0(00.000*kvar)
1-0:43.7.0(00.000*kvar)
1-0:63.7.0(00.000*kvar)
1-0:24.7.0(00.000*kvar)
1-0:44.7.0(00.000*kvar)
1-0:64.7.0(00.000*kvar)
1-0:5.8.0(0000000.27*kvarh)
1-0:6.8.0(0000000.08*kvarh)
1-0:7.8.0(0000000.14*kvarh)
1-0:8.8.0(0000000.10*kvarh)
1-0:1.4.0(00.000*kW)
1-0:2.4.0(00.000*kW)
1-0:1.6.0(000000000000S)(00.000*kW)
1-0:2.6.0(000000000000S)(00.000*kW)
0-0:98.1.0(1)(0-0:0.1.0)(1-0:1.6.0)(1-0:1.6.0)(1-0:2.6.0)(1-
0:2.6.0)(220923150348S)(2)(220901001500S)(00.224*kW)(220901011500S)(00.232*kW)
0-0:98.1.1(1)(0-0:0.1.0)(1-0:1.8.0)(1-0:2.8.0)(1-0:5.8.0)(1-0:6.8.0)(1-0:7.8.0)(1-
0:8.8.0)(220923150348S)(2)(0000005.17*kWh)(0000000.32*kWh)(0000000.27*kvarh)(0000000.08*kvarh)(000
0000.14*kvarh)(0000000.10*kvarh)
!3D9A