Technical Prescriptions

Industrial Meter Systems
AMR eMUCS-A1

Version 5.0.1 (50250)

Revisions

Version	Modification	Date	Author(s)
E.5.0.0	First Publication	15/12/2022	SC-M&M-DCT
E.5.0.1	Textual error in tag of Version number object (tag 9 instead of tag 10	09/02/2023	SC-M&M-DCT

Table 1 Document revisions

Contents

Illustrations

Tables

1 Context

1.1 History

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 the consumers with measurement data from the 'Automatic Meter Reading' system for electricity, thermal, gas and water meters.

All DSOs, member of 'Netbeheer Nederland', have committed to this interface specification in order to facilitate the market of Home/Consumer Energy Management Systems (HEMS/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 use the 'DSMR P1 V5.0.2' specification (see DSMR-P1) as much as possible in order to facilitate the already existing market of Home Energy Management Systems based on it.

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 AMR meters, the A1 interface is not completely the same as the one specified by 'Netbeheer Nederland' or the one specified for the residential digital meters. The main differences are situated in the dataset of the 'A1 telegram'.

The physical interface (and the protocol) are identical to the DSMR-P1 specification in order to avoid incompatible hardware.

For words or abbreviations in blue (with a hyperlink), such as contractor, you will find an explanation in the table 'Definitions and Abbreviations' at the end of this document.
A phrase in green (with a hyperlink), such as 'TagNr.', refers to a 'specification frame' or a bookmark in this document.

1.2 Scope

This document gives an overview of the differences and additions to the 'DSMR P1 V5.0.2' specification in order to support the commercial market of Home Energy Management Systems, that develops new products and/or adapts existing devices for/to the Belgian industrial AMR market.

This document follows the 'DSMR P1 V5.0.2' document structure where possible and even copies integral parts from the 'DSMR P1 V5.0.2' specification document.

In this document, coloured text is used to highlight differences, additions and clarifications in relationship with the 'DSMR P1 V5.0.2' specification:

- orange text indicates a **clarification** added to the 'DSMR P1 V5.0.2' specification which does NOT conflict with the 'DSMR P1 V5.0.2' standard;
- green text indicates an **addition** to 'DSMR P1 V5.0.2' which does NOT conflict with 'DSMR P1 V5.0.2';
- red text indicates an **addition (or change) that conflicts** with 'DSMR P1 V5.0.2', hence possibly causes incompatibility.

1.3 Revision numbering

The Belgian A1 interface can evolve with changing regulations; this, to support the energy transition. The on-going evolution leads to several versions of the 'A1 telegram'.
For each version, a new eMUCS-A1 document version will be created (see also 'Table 1 Document revisions' on pag. 2).

Changes with regard to the previous published version are highlighted in this document.

Version numbers are formatted as 'X.Y' and increased with every change in following way:

- X reflects a major version change, for example HW change possibly not backwards compatible;
- Y reflects a minor version change, for example Extra data-objects, telegram change with backwards compatibility;
- Z reflects a textual change without impact on the content / behavior of the A1-port and is only related to the document itself

Major version number X ranging from 1 to 4 is used for the residential segment (scope of document eMUCS-P1). For the industrial AMR segment – discussed in this eMUCS A1 document – major version number X ranges from 5 to 9.

The 'A1 telegram' always contains the version number using OBIS code 0-0:96.1.4.255 (with current value 50250). Note that "Z" is not part of the version number published in the P1-port

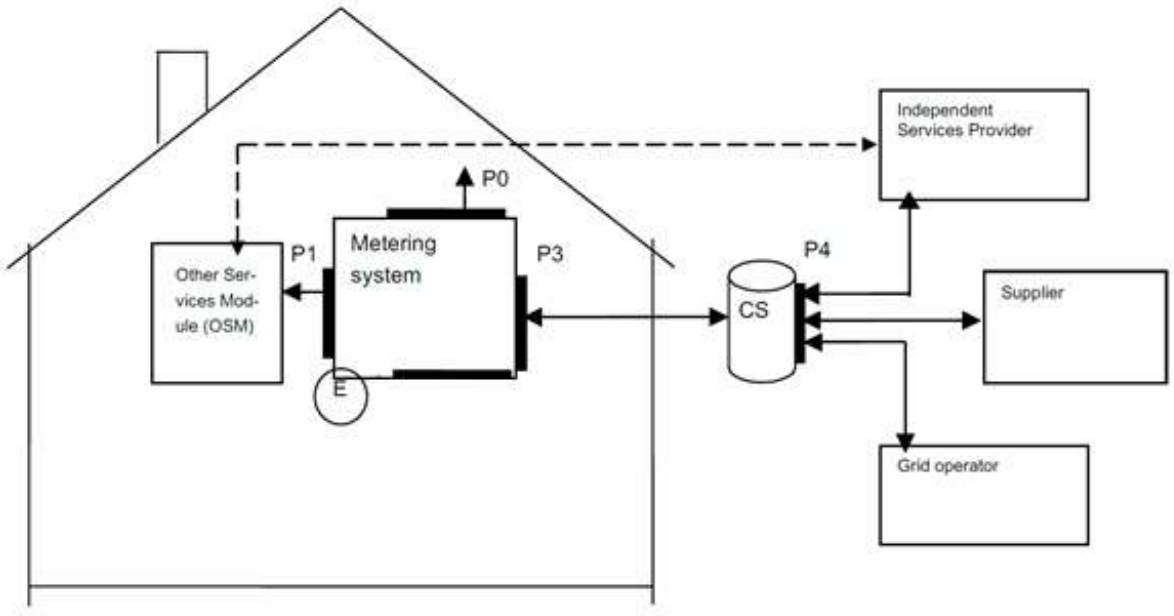
In appendix 'C – Implementation matrix' (see pag. 45), an implementation matrix gives the relationship between the eMUCS-A1 version an the meters installed in the field.

2 System architecture

This chapter corresponds partially to section 1 and 2 of DSMR-P1.

In the system architecture of the industrial AMR meters, no submeters are foreseen to connect to the measurement system.

Hence, in contradiction to the 'DSMR P V5.0.2' standard, providing data for submeters via the measurement system is out of scope.



The interface is based on the following:

- simple installation by the customer;
- simple and clear defined interface;
- low cost for the installation itself;
- low cost for the customer to install, operate and maintain 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 A1 Physical interface characteristics

This chapter corresponds to section 5 in DSMR-P1.

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).

3.1 Physical connector

This paragraph corresponds to subsection 5.1 in DSMR-P1.

The A1 port connector type is RJ12. The metering system holds a female connector; the OSM connects via a standard RJ12 male plug.

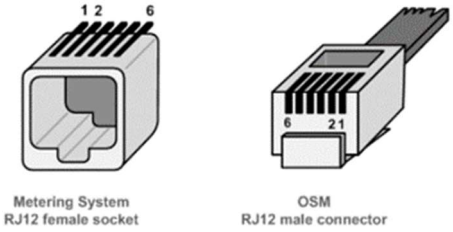


Figure 1 A1 – Physical connectors

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	

Table 2 A1 – Physical connector pin assignment

To request data from the A1 interface, the CEMS should make the 'Data Request' line high.

The Data line is an output with 'open collector'. This means that the CEMS should make this line 'high' via a pull-up resistor. The value of this resistor is chosen in such a way that the 'data line' max. current (ID_0_MAX) is not exceeded, as specified in 'DSMR-P1'.

3.2 User safety

This paragraph corresponds to subsection 5.2 in DSMR-P1.

3.2.1 Installation category

The A1 interface (being an integral part of the entire metering system) has to fulfil the requirements for Installation Category IV, meaning the impulse withstand voltage = 6000 V; see standard IEC 61010-1.

3.2.2 Galvanic isolation

All the lines of the A1 port must be galvanically isolated from the mains, including the +5V power supply line:

- to secure a user of the A1 port from electric shock;
- to protect the metering system against any kind of reversed connection;
- to avoid the possibility of influencing the metering system through the A1 port.

To achieve the galvanic isolation, the signal lines (Data and Data Request) must be equipped with optocouplers.

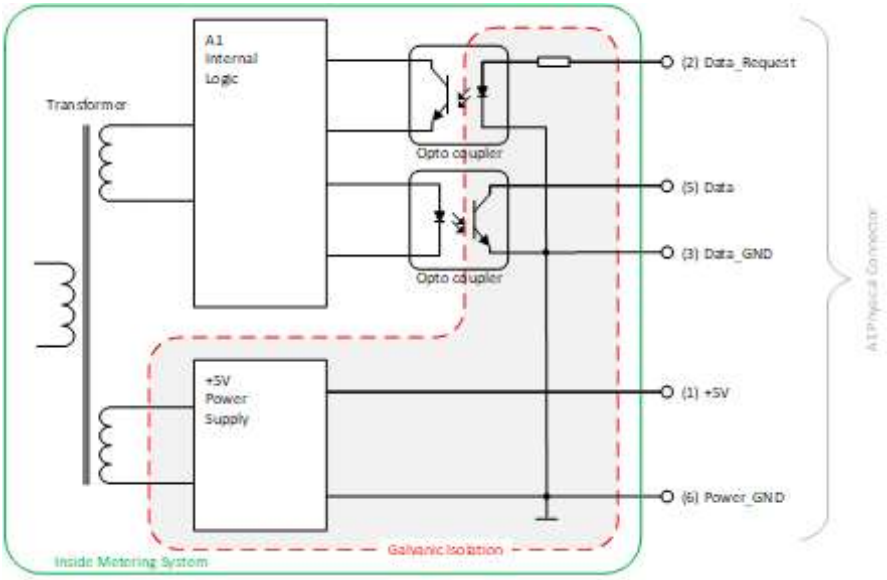


Figure 2 Galvanic isolation from the mains.

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 61010-1 – Safety requirements.

3.3 Power supply

This subsection corresponds to subsection 5.3 in DSMR-P1.

The +5V power supply line is meant to provide a power source to OSM devices in order 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.

3.3.1 Voltage characteristics

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

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

- nominal voltage UL = 5,0 V;
- maximum voltage allowed UL_MAX <= 5,5 V at IL = 0 mA;
- minimum voltage allowed UL_MIN >= 4,9 V at IL = IL_CONT = 250 mA.

The allowed 'ripple voltage' is defined, at pure resistive load, as:

- URIPPLE_MAX at IL_CONT = 250 mA must not exceed 2% of the nominal voltage (UL);
- URIPPLE_MAX <= 100mV (pp - peak to peak), for frequencies lower or equal to 100 Hz.

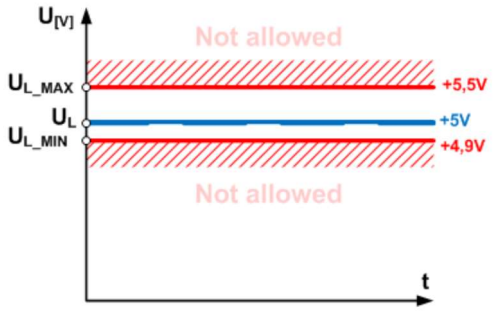


Figure 3 Allowed voltage window

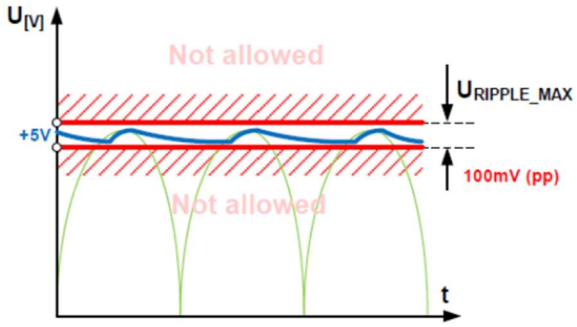


Figure 4 Ripple voltage window

The allowed 'noise level' is defined, at pure resistive load, as:

- UNOISE_MAX must not exceed <= 50mV peak to peak, for frequencies higher than 50 kHz.

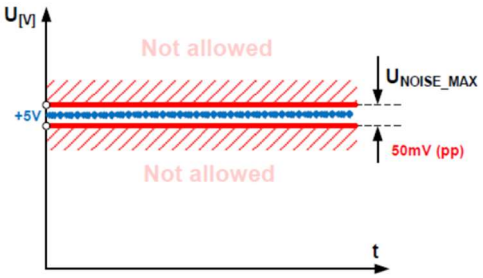


Figure 5 Noise level window

3.3.2 Current characteristics

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

In order to protect the A1 interface from excessive current, the power supply line must be equipped with an **overload/overcurrent mechanism**, that:

- immediately shuts off the flow of current when it exceeds a level of IL_MAX >= 300 mA;
- has a tolerance of triggering the mechanism
  between IL_CONT +10mA >= 260 mA and IL_MAX <= 300 mA;
- must be implemented as a 'fold back' technology (see paragraph 'Short circuits' on pag. 14).

3.3.2.1 Inrush current

The power supply load of the OSM device, connected to the A1 port, may require an excessive current for a very short period of time – usually less than 1 msec (depends on OSM internal design). Such current is often called an 'inrush current'.

The power supply of the A1 port must be able to cope with this inrush current, caused by the OSM. As a matter of fact, its power supply must be able to withstand a typical 'inrush current' from a circuit as presented in illustration 'Figure 6 Inrush current circuit example' below.

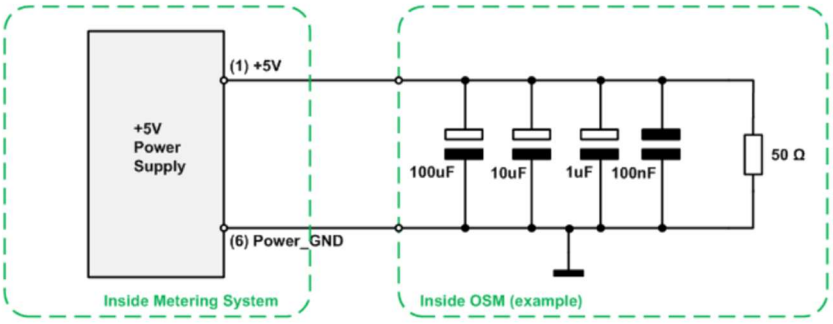


Figure 6 Inrush current circuit example

3.4 Variable load on power supply

This paragraph corresponds to subsection 5.4 in DSMR-P1.

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 this type of devices, the A1 '+5V power supply' must be able to cope with a variable load.

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

This must be validated with the 'load test pattern' presented in illustration 'Figure 7 'Variable load' test pattern' below.

The 'load change periods' are: 2 ms, 20 ms, 200 ms, and 2 s.

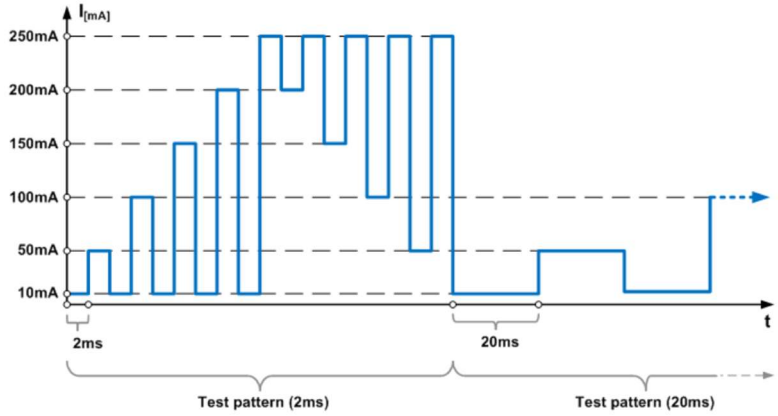


Figure 7 'Variable load' test pattern

3.5 Metering system protection

This paragraph corresponds to subsection 5.5 in DSMR-P1.

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

3.5.1 Avoidance of influencing the metering system through the A1 port

It should not be possible to influence the metering system in any way through the A1 port; except by requesting and receiving data and getting the +5V power supply as specified in paragraph 'Power supply' on pag. 11.

More specifically, it shall not be possible to interrupt or block in any way the other modules/ports/parts of the metering system (in particular by maliciously manipulating the 'Data Request' line).

See also paragraph 'Galvanic isolation' on pag. 10.

3.5.2 Short circuits

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

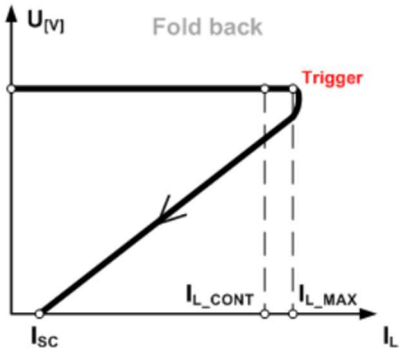


Figure 8 Example of 'overcurrent/short circuit' graph

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

3.5.3 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 the +5V line, an OVP mechanism must be implemented.

The OVP mechanism for the '+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.

3.5.4 ESD – Electrostatic Discharge

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

ESD protection has to comply with IEC 61000-4-2 with applicable model 'HBM' (Human Body Model).

3.6 OSM Protection

This paragraph corresponds to subsection 5.6 in DSMR-P1.

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

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.

3.7 A1 Data interface specification

This paragraph corresponds to subsection 5.7 in DSMR-P1.

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

- 'Data Request' line,
- Data line and
- 'Data ground' line

The protocol is based on IEC 62056-21 Mode D. Where applicable, exceptions are documented below.

3.7.1 '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 the OSM has to drop the 'Data Request' line (set it to 'high impedance' mode); hence, the data transfer will stop immediately.
For backward compatibility reasons, no OSM is allowed to set the 'Data Request' line low (set it to GND or 0V).

Data Request line:

- HIGH level
  The voltage range for HIGH level of the 'Data Request' line must be
  between 4,0 V (UDR_1_MIN >= 4,0 V) and 5,5 V (UDR_1_MAX <= 5,5 V).
- Current consumption
  Depending on the voltage on the 'Data Request' line, the power consumption may vary between 4,0 mA (IDR_1_MIN >= 4,0 mA) and 10 mA (IDR_1_MAX <= 10 mA).
- OVP protection
  This OVP mechanism should be triggered at a level not lower than 5,9 V (± 100 mV) UOVP = 5,9 V and will protect the interface against voltages up to 15 V.

3.7.2 Data line specification

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

Data line:

- LOW level
  The voltage range for LOW level for Data line must be
  between 0 V (UD_0_MIN >= 0 V) and 1,0 V (UD_0_MAX <= 1,0 V).
- While in LOW state, must be able to handle current
  up to and not exceeding 30 mA (ID_0_MAX <= 30 mA).
- From an OSM perspective, the maximum current flowing towards the Data line must not exceed 5 mA.

3.7.3 Addressing the metering system

Since the metering system has only one A1 port, there is no need to address it.

3.8 A1 signal levels

This paragraph corresponds to subsection 5.8 in DSMR-P1.

The table below indicates meter requirements, as well as OSM requirements.

Depending on which the device is under development, the implementation is executed in accordance with the meter requirements or in accordance with the OSM requirements.

Nevertheless, the development of one device has to take the requirements of the other device into account.

		Meter Requirement			OSM Requirement			
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 > 4 V
- MARK '1' as < 1 V.

4 A1 Protocol description

This chapter corresponds to section 6 in DSMR-P1.

The protocol is based on IEC 62056-21 Mode D.

Data transfer is requested with the request line and automatically initiated every second until the request line is released. The information in the A1 telegram must be updated every second.

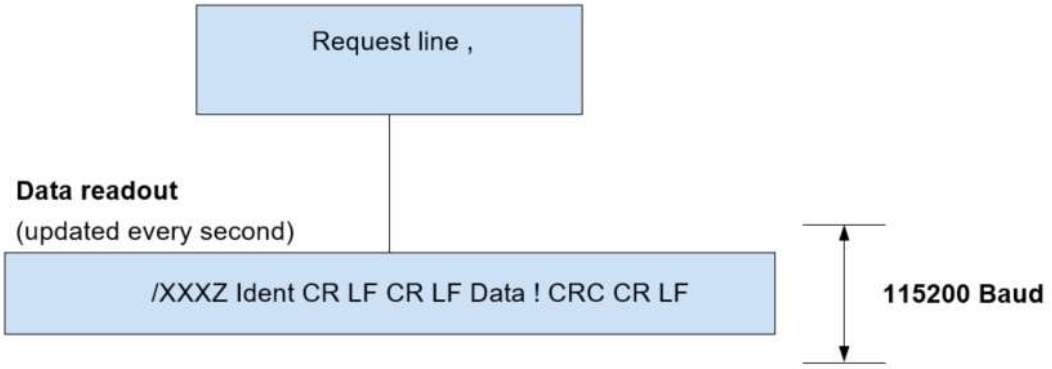


Figure 9 High level protocol overview

4.1 Transfer speed and character formatting

This paragraph corresponds to subsection 6.1 in DSMR-P1.

The interface has to use a fixed transfer speed of 115200 baud.

The metering system has to send its data to the OSM device every second and the transmission of the entire A1 telegram must be completed within 1 second.

The format of transmitted data must be defined as '8N1'; meaning:

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

This is inconsistent with IEC 62056-21 Mode D.

4.2 Data readout

This paragraph corresponds to subsection 6.2 in DSMR-P1.

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

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 the least significant bit first. The value is represented as 4 hexadecimal characters (MSB first).

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

4.3 End of transmission

This paragraph corresponds to subsection 6.3 in DSMR-P1.

The data transmission is complete after the data message has been transmitted by the metering system. An 'acknowledge' signal is not provided for.

4.4 Representation of the COSEM objects

This paragraph corresponds to subsection 6.4 in DSMR-P1.

IEC 62056-6-1 specifies the logical names of COSEM objects using OBIS. Value group F is not used.

The following value formats are used for A1 'Data Readout' value representations:

Value Format	Format – Example	Meaning
F*n*(x,y) *	F7(3,3) – YYYY.YYY	Floating decimal number with a fixed number of decimals behind the decimal point (in this case 3).
F*n*(x,y) *	F7(0,3) – YYYY.YYY or YYYYY.YY or YYYYYY.Y or YYYYYYY	Floating decimal number with a variable number of decimals behind the decimal point (with a maximum of 3).
I*n* *	I4 – YYYY	Integer number
S*n* *	S6 – CCCCCC	Alphanumeric string
TST	YYMMDDhhmmssX	ASCII presentation of Time stamp with Year, Month, Day, Hour, Minute, Second, and an indication whether DST is active (X=S) or DST is not active (X=W).

* *n* is the number of characters in the string; x=minimum and y=maximum number of decimals

Table 4: Value formats.

The COSEM object attribute values use the following Value Formats:

COSEM Data Type	Tag	Value Format
null-data	0	Empty
boolean	3	I1
bit-string	4	Sn
double-long	5	Fn(x,y)
double-long-unsigned	6	Fn(x,y)
floating-point	7	Fn(x,y)
octet-string	9	Sn
visible-string	10	Sn
binary coded decimal	13	S2
integer	15	In
long	16	Fn(x,y)
unsigned	17	Fn(x,y)
long-unsigned	18	Fn(x,y)
long64	20	Fn(x,y)
long64-unsigned	21	Fn(x,y)
enum	22	In
float-32	23	Fn(x,y), I
float-64	24	Fn(x,y), I

Table 5 COSEM object attributes

4.5 Representation of the COSEM data type ‘octet-string’ (tag 9)

This paragraph corresponds to subsection 6.5 in DSMR-P1.

The COSEM data type ‘octet-string’ is represented with the S*n* format, where octets are formatted with hexadecimal characters. The length of the octet-string is implicit.
See also paragraph ‘Representation of the COSEM objects’ on pag. 20.

(*XXYY..ZZ*)

(	separator
XX	hexadecimal value for the first octet
YY	hexadecimal value for the second octet
ZZ	hexadecimal value for the m-th octet, where m is the length of the octet-string
)	separator

An octet string with a length of m, will result in an alphanumeric string S*n* with a length of *n* nibbles, where *n* is 2 times m.

For example: a string ‘50250’ (ASCII) would be represented on the A1 port as (3530323530) with format S10; 10 being the number of nibbles.

4.6 Representation of the COSEM data type ‘bit-string’ (tag 4)

This paragraph corresponds to subsection 6.6 in DSMR-P1.

The COSEM data type ‘bit-string’ is represented with the S*n* format, where the bit-string is formatted with hexadecimal characters.
The first two hexadecimal characters represent the number of unused bits in all the bit-strings. The remaining hexadecimal characters represent bit-string values. The length of the bit-string is implicit.

(*XXYY..ZZ*)

(	separator	
XX	hexadecimal value for the first octet	the number of unused bits
YY	hexadecimal value for the second octet	the first bit-string of 8 bits
ZZ	hexadecimal value for the m-th octet	where m is the number of bit-strings
)	separator	

A bit string with a length of m, will result in an hexadecimal string S*n* with a length of *n*, where *n* is ‘2 times m’+2.

4.7 Representation of the COSEM data type ‘boolean’

This paragraph corresponds to subsection 6.7 in DSMR-P1.

The COSEM data type ‘boolean’ is represented with the I1 format where value ‘false’ is represented as 0 and value ‘true’ as 1.

4.8 Representation of the COSEM data type ‘enum’

This paragraph corresponds to subsection 6.8 in DSMR-P1.

COSEM data type ‘enum’ is represented with the In format, where enum values are represented as integer values.

4.9 Representation of the COSEM ‘OBIS Reduced ID’ objects

This paragraph corresponds to subsection 6.9 in DSMR-P1.

The COSEM objects identified with ‘OBIS Reduced ID’ use the following dataset formatting for representation:

Data Preamble	Data Payload
ID	(Mv*U)

ID	‘OBIS Reduced ID’-code	
(	Separator	ASCII 28 hex
Mv	COSEM object attribute value	
*	Separator	ASCII 2A hex
U	Unit of measurement value	Unit of capture objects attribute – only if applicable
)	Separator	ASCII 29 hex

4.10 Representation of M-Bus values

This paragraph corresponds to subsection 6.10 in DSMR-P1.

Submeters are out of scope for eMUCS-A1.

4.11 Representation of Profile Generic – Power failure logs

This paragraph corresponds to subsection 6.11 in DSMR-P1.

Data Preamble *			Data Payload *				
			Entry 1		…	Entry z	
ID	**(z)**	**(ID1)**	**(TST)**	**(Bv1*U1)**	**…**	**(TST)**	**(Bvz*Uz)**

* The parenthesis symbols are used as separators (not further indicated nor explained in the table below).

ID	'OBIS Reduced ID' code	
z	Number of values	maximum 10
ID1	Identification of the buffer value	'OBIS Reduced ID'-code of capture object attribute
TST	Time Stamp	power failure end time of Bv1
Bv1	Buffer value 1	most recent entry of the first buffer element without unit
*	Separator	ASCII 29 hex
U1	Unit of buffer (1) value	unit of capture objects attribute
…	*Chain of other buffer values*	*Maximum 8*
TST	Time Stamp	power failure end time of Bvz
Bvz	Buffer value z	oldest entry of buffer attribute without unit
*	Separator	ASCII 2A hex
Uz	Unit of buffer (z) value	Unit of capture objects attribute

Table 6 Formatting of 'Profile Generic – Power failure logs' in the A1-telegram

4.12 Representation of Profile Generic – Generalisation

This paragraph is not available in DSMR-P1 as it contains new functionality for the Belgian A1 port.

To support pushing of 'Profile Generic' classes (class ID 7) in a more general way, and not only related to the 'Power Failure' logs, the following clarifications are made:

Data Preamble *			**Data Payload ***				
			Entry 1		**…**	**Entry z**	
ID	**(z)**	**(ID1)..(IDn)**	**(TST)**	**($Bv_1$1*$U_1$1)..(Bv_n1*U_n1)**	**…**	**(TST)**	**(Bv_1z*U_1z)..(Bv_nz*U_nz)**

* The parenthesis symbols are used as separators (not further indicated nor explained in the table below).

ID	'OBIS Reduced ID' code	of the profile generic object	
z	Number of entries	maximum 15	
ID1 .. IDn	Identification of buffer values OBIS 'Reduced ID codes' of the capture objects attribute 1 to n, except the 'clock' object (= first object in the buffer)	where:	
		ID1	OBIS 'Reduced ID' code of the capture object attribute 1
		..	
		IDn	OBIS 'Reduced ID' code of the capture object attribute n
TST	Time stamp of the first entry in the buffer of the 'Profile Generic' object	obtained from the 'clock' object (= 1st object in the buffer)	
($Bv_1$1*$U_1$1) .. (Bv_n1*U_n1)	Values 1 to n of the first entry in the buffer	where:	
		$Bv_1$1	Value attribute of the capture object 1 of the first Entry
		*	Separator (ASCII 2A hex)
		$U_1$1	Unit of the capture object attribute 1 of the first Entry 1
		..	
		Bv_n1	Value attribute of the capture object n of the first Entry 1
		*	Separator (ASCII 2A hex)
		U_n1	Unit of capture object attribute n of the first Entry 1
…	*Chain of other buffer values*	*Maximum 13*	
TST	Time stamp of last Entry z in the buffer of the 'Profile Generic' object	obtained from the 'clock' object	
(Bv_1z*U_1z) .. (Bv_nz*U_nz)	Values 1 to n of the last Entry in the buffer	where:	
		Bv_1z	Value attribute of the capture object 1 of the last Entry z
		*	Separator (ASCII 2A hex)
		U_1z	Unit of the capture object attribute 1 of the last Entry z
		..	
		Bv_nz	Value attribute of the capture object n of the last Entry z
		*	Separator (ASCII 2A hex)
		U_nz	Unit of capture object attribute n of the last Entry z

Table 7 Formatting of 'Profile Generic – Generalisation' in the A1-telegram

4.12.1 Profile generic 'Maximum Demand History' examples

In the examples below the Data Preamble is gray highlighted.
See also data object Maximum demand history on pag. 35.

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)

4.12.2 Profile generic 'Energy History' examples

In the examples below the Data Preamble is gray highlighted.
See also data object Energy history on pag. 36.

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 import in quadrant III, inductive: -Ri QIII (1-0:7.8.0) = 0000000.02 kvarh
- reactive energy export 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)()

5 A1 Telegram representation and data objects

This chapter merges information of subsection 6.12 and section 5 of DSMR-P1.
This chapter clearly indicates the dataset implemented for the Belgian A1 telegram and makes the relationship between the Dutch dataset.

This chapter describes the data objects of the A1 interface together with their OBIS references and include object Attributes and Value Formats for 'Reduced ID' codes. The data objects are defined in IEC 62056-6-1.

The A1 telegram is sent every second with update information for the electricity related objects. Every line (data object) ends with a CR/LF (Carriage Return / Line Feed); see also appendix 'D – Examples of A1 telegrams' on pag. 46.

Be aware

The number of OBIS codes and the order of the OBIS codes is not fixed. The A1 device must be able to interpret the OBIS codes and understand their representation.
To clearly distinguish between different datasets – corresponding with different eMUCS-A1 documents, the OBIS code representing the 'version information of the telegram' is always the first one.

Some DSMR-P1 data objects are explicitly not integrated in the eMUCS-A1 telegram.

5.1 General data objects

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

Data object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
Header information	-	-	-	Manufacturer specific	-		x	x
Version information	0-3:0.2.8	2 (Value)	1 (Data)	S2, tag 9	-	Not used in the eMUCS-A1 telegram. Instead OBIS 0-0:96.1.4.255 is used to display the A1-telegram version (see below).	x	
Version information	0-0:96.1.4	2 (Value)	1 (Data)	S4, tag 10	-	Encoded as XXXYY, where XXX is the 'DSMR-P1' version number and YY the first two digits of the version of the eMUCS-A1 specification. Example: 50250		x
Date-time stamp of the P1 message	0-0:1.0.0	2 (Time)	8 (Clock)	TST	-		x	x
Text message max. 1024 characters	0-0:96.13.0	2 (Value)	1 (Data)	Sn (n=0..2048), tag 9	-	The text message may not contain CR, LF (0A,0Dh) to split the message.	x	

Table 8 General data objects

5.2 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 object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
Equipment identifier	0-0:96.1.1	2 (Value)	1 (Data)	Sn (n=0..96), tag 9	-	The Equipment Identifier contains only the fabrication number part of the manufacturer independent identification number according to DIN 43863-5 clause 3.	x	x
Meter Reading electricity delivered to client (Tariff 1)	1-0:1.8.1	2 (Value)	3 (Register)	F9(3,3), tag 6	kWh		x	
Meter Reading electricity delivered to client (Tariff 2)	1-0:1.8.2	2 (Value)	3 (Register)	F9(3,3), tag 6	kWh		x	
Meter Reading electricity delivered by client (Tariff 1)	1-0:2.8.1	2 (Value)	3 (Register)	F9(3,3), tag 6	kWh		x	
Meter Reading electricity delivered by client (Tariff 2)	1-0:2.8.2	2 (Value)	3 (Register)	F9(3,3), tag 6	kWh		x	
Tariff indicator electricity	0-0:96.14.0	2 (Value)	1 (Data)	S4, tag 9	-		x	

Data object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
Instantaneous Active power import – total +P (QI+QIV)	1-0:1.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	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. 43.	x	x
Instantaneous Active power export – total -P (QII+QIII)	1-0:2.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	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	x	x
Number of power failures in any phase	0-0:96.7.21	2 (Value)	1 (Data)	F5(0,0), tag 18	-		x	
Number of long power failures in any phase	0-0:96.7.9	2(Value)	1 (Data)	F5(0,0), tag 18	-		x	

Data object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
Power Failure Event Log (long power failures)	1-0:99.97.0	2 (Buffer)	7 (Profile Generic)	TST, F10(0,0), tag 6 Format applicable for the value within the log (OBIS code 0-0:96.7.19.255)	-	Timestamp (end of failure) – duration in seconds	x	
Number of voltage sags in phase L1	1-0:32.32.0	2 (Value)	1 (Data)	F5(0,0), tag 18	-		x	
Number of voltage sags in phase L2	1-0:52.32.0	2 (Value)	1 (Data)	F5(0,0), tag 18	-		x	
Number of voltage sags in phase L3	1-0:72.32.0	2 (Value)	1 (Data)	F5(0,0), tag 18	-		x	
Number of voltage swells in phase L1	1-0:32.36.0	2 (Value)	1 (Data)	F5(0,0), tag 18	-		x	
Number of voltage swells in phase L2	1-0:52.36.0	2 (Value)	1 (Data)	F5(0,0), tag 18	-		x	
Number of voltage swells in phase L3	1-0:72.36.0	2 (Value)	1 (Data)	F5(0,0), tag 18	-		x	
Instantaneous voltage L1	1-0:32.7.0	2 (Value)	3 (Register)	F4(1,1), tag 18	V		x	x
Instantaneous voltage L2	1-0:52.7.0	2 (Value)	3 (Register)	F4(1,1), tag 18	V	See appendix 'B – Behaviour of phase information objects' on pag. 43.	x	x
Instantaneous voltage L3	1-0:72.7.0	2 (Value)	3 (Register)	F4(1,1), tag 18	V		x	x
Instantaneous current L1	1-0:31.7.0	2 (Value)	3 (Register)	F5(2,2), tag 18	A	Value format deviation from DSMR-P1. See appendix B	x	x

Data object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
Instantaneous current L2	1-0:51.7.0	2 (Value)	3 (Register)	F5(2,2), tag 18	A	Value format deviation from DSMR P1. See appendix B	x	x
Instantaneous current L3	1-0:71.7.0	2 (Value)	3 (Register)	F5(2,2), tag 18	A	Value format deviation from DSMR-P1. See appendix B	x	x
Instantaneous active power import – L1 (+P)	1-0:21.7.0	2(Value)	3(Register)	F5(3,3), tag 18	kW	See appendix B	x	x
Instantaneous active power import – L2 (+P)	1-0:41.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kW	See appendix 'B – Behaviour of phase information objects' on pag. 43.	x	x
Instantaneous active power import – L3 (+P)	1-0:61.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kW	See appendix B	x	x
Instantaneous active power export – L1 (-P)	1-0:22.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kW	See appendix B	x	x
Instantaneous active power export – L2 (-P)	1-0:42.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kW	See appendix B	x	x
Instantaneous active power export – L3 (-P)	1-0:62.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kW	See appendix B	x	x
Instantaneous reactive power import – total +Q (QI+QII)	1-0:3.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kvar	See appendix B		x

Data object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
Instantaneous reactive power export – total -Q (QIII+QIV)	1-0:4.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kvar	See appendix B		x
Instantaneous reactive power import - L1 (+Q)	1-0:23.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kvar	See appendix 'B – Behaviour of phase information objects' on pag. 43.		x
Instantaneous reactive power import – L2 (+Q)	1-0:43.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kvar	See appendix B		x
Instantaneous reactive power import – L3 (+Q)	1-0:63.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kvar	See appendix B		x
Instantaneous reactive power export – L1 (-Q)	1-0:24.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kvar	See appendix B		x
Instantaneous reactive power export – L2 (-Q)	1-0:44.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kvar	See appendix B		x
Instantaneous reactive power export – L3 (-Q)	1-0:64.7.0	2 (Value)	3 (Register)	F5(3,3), tag 18	kvar	See appendix B		x
Active energy import +A (QI+QIV)	1-0:1.8.0	2 (Value)	3 (Register)	F9(2,2), tag 6	kWh	See appendix B		x

Data object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
Active energy export -A (QII+QIII)	1-0:2.8.0	2 (Value)	3 (Register)	F9(2,2), tag 6	kWh	See appendix B		x
Reactive energy +Ri (QI)	1-0:5.8.0	2 (Value)	3 (Register)	F9(2,2), tag 6	kvarh	See appendix B		x
Reactive energy +Rc (QII)	1-0:6.8.0	2 (Value)	3 (Register)	F9(2,2), tag 6	kvarh	See appendix B		x
Reactive energy -Ri (QIII)	1-0:7.8.0	2 (Value)	3 (Register)	F9(2,2), tag 6	kvarh	See appendix B		x
Reactive energy -Rc (QIV)	1-0:8.8.0	2 (Value)	3 (Register)	F9(2,2), tag 6	kvarh	See appendix 'B – Behaviour of phase information objects' on pag. 43.		x
Current average demand active energy import +A (QI+QIV)	1-0:1.4.0	2 (current average value)	5 (Demand Register)	F5(3,3), tag 6	kW	See appendix B		x
Maximum demand active energy import +A (QI+QIV)	1-0:1.6.0	5 (capture time)	4 (Extended register)	TST	-			x
		2 (Value)	4 (Extended register)	F5(3,3), tag 6	kW	See appendix B		x
Current average demand active energy export - A (QII+QIII)	1-0:2.4.0	2 (current average value)	5 (Demand Register)	F5(3,3), tag 6	kW	See appendix B		*

Data object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
Maximum demand active energy export -A (QII+QIII)	1-0:2.6.0	5 (capture time)	4 (Extended register)	TST	-			x
		2 (Value)	4 (Extended register)	F5(3,3), tag 6	kW	See appendix B		x
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)		-	Number of billing resets		x
		2 (Buffer) capture object 4 {4,1-0:1.6.0.255,5,0}	7 (Profile Generic)	TST	-			x
		2 (Buffer) capture object 5 {4,1-0:1.6.0.255,2,0}	7 (Profile Generic)	F5(3,3), tag 6	kW	See appendix 'B – Behaviour of phase information objects' on pag. 43.		x
		2 (Buffer) capture object 6 {4,1-0:2.6.0.255,5,0}	7 (Profile Generic)	TST	-			x
		2 (Buffer) capture object 7 {4,1-0:2.6.0.255,2,0}	7 (Profile Generic)	F5(3,3), tag 6	kW	See appendix B		x

Data object	OBIS Reduced ID	Attribute	Class ID	Value Format	Value unit	Additional information	Implementation/ publication in	
							DSMR-P1 V5.0.2	eMUCS-A1
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)		-	Number of billing resets		x
		2 (Buffer) capture object 4 {3,1-0:1.8.0.255,2,0}	7 (Profile Generic)	F9(2,2), tag 6	kWh	See appendix B		x
		2 (Buffer) capture object 5 {3,1-0:2.8.0.255,2,0}	7 (Profile Generic)	F9(2,2), tag 6	kWh	See appendix 'B – Behaviour of phase information objects' on pag. 43.		x
		2 (Buffer) capture object 6 {3,1-0:5.8.0.255,2,0}	7 (Profile Generic)	F9(2,2), tag 6	kvarh	See appendix B		x
		2 (Buffer) capture object 7 {3,1-0:6.8.0.255,2,0}	7 (Profile Generic)	F9(2,2), tag 6	kvarh	See appendix B		x
		2 (Buffer) capture object 8 {3,1-0:7.8.0.255,2,0}	7 (Profile Generic)	F9(2,2), tag 6	kvarh	See appendix B		x
		2 (Buffer) capture object 9 {3,1-0:8.8.0.255,2,0}	7 (Profile Generic)	F9(2,2), tag 6	kvarh	See appendix B		x

Table 9 Electricity related data objects

5.3 Gas related data objects

Submeters are out of scope for eMUCS-A1.

5.4 Thermal related data objects

Submeters are out of scope for eMUCS-A1.

5.5 Water related data objects

Submeters are out of scope for eMUCS-A1.

5.6 Slave E related data objects

Submeters are out of scope for eMUCS-A1.

Definitions and Abbreviations

Some terms are related to a tender for which this document could be used – they are of no importance for other uses of this document.

Abbreviation/Term	Meaning and Definition
AMR	**Automatic Meter Reading**
assignment	The assignment in this 'technical prescriptions' document fits in a public contract (sometimes also framework contract or contest) that relates to the execution of works, the supply of products or the provision of services by the contractor (prior to the award, the tenderer) under the supervision of the customer (prior to the award, the contracting authority). {N: opdracht}
CEMS	**Consumer Energy Management System**
COSEM	**Companion Specification for Energy Metering** The COSEM object model describes the semantics of the language. DLMS/COSEM uses a client-server paradigm where the end devices, typically meters are the servers and the HESs or concentrators are the clients.
CRC	**Cyclic Redundancy Check** An error-detecting code commonly used in digital networks and storage devices to detect accidental changes to digital data.
CT	**Current Transformer**
customer	See the 'overarching specifications' document for the exact meaning of this term, indicating Fluvius System Operator and/or possibly other operators who, as contracting authority awarded the contract and subsequently supervises the execution of the assignment. {N: opdrachtgever; syn.: klant, cliënt}
DIN	**Deutsches Institut für Normung** German institute for standardisation
DLMS	**Device Language Message Specification** The syntax of the language specified by the DLMS services. The application layer protocol that turns the information held by the objects into messages. The DLMS/COSEM specification is developed and maintained by the DLMS User Association.
DSMR	**Dutch Smart Meter Requirements**
DSO	**Distribution System Operator** Fluvius (System Operator) is an operating company that carries out tasks on behalf of and for a number of DSOs. {N: DNB – Distributie-Net-Beheerder}
DST	**Daylight Saving Time**
eMUCS	**Extended Multi-Utility Companion Specification**
HES	**Head End System** The software platform(s) used for managing operations and maintenance of digital meters.

Abbreviation/Term	Meaning and Definition
IDIS	**Interoperable Device Interface Specifications** Industry association
IEC	**International Electrotechnical Commission**
OBIS	**Object Identification System** The naming system of COSEM objects.
OMS	**Open Metering System**
OSM	**Other Service Module**
OVP	**OverVoltage Protection**
overarching specifications	The hierarchically highest overarching document of this tender is the 'Administrative specifications' document – also called 'Specifications for Supply Purchasing', with reference *&&dossier number&&* – drawn up by the purchasing department(s) of the contracting authority. For certain tenders, the 'functional specifications' document and the 'technical specifications' document may be used in hierarchical order, subordinate to the abovementioned specifications, also as an overarching document (for technical prescriptions). {N: overkoepelend document}
specification frame	This is a table in this document consisting of two columns with in the left field of the first line the label 'TagNr.' and in the right field the identification number of the technical prescription (consisting of the paragraph number followed by a hyphen and a sequential number).
subcontractor	Company – appointed by the contractor and approved by the customer, that executes part of the assignment. The contractor remains jointly and severally responsible for the proper execution of the assignment, also for the part of it which he has subcontracted. {N: onderaannemer}
technical offer	As part of the complete offer, the 'technical offer' consists of one or more document(s) containing binding proposals, as answer of a tenderer to a 'technical specifications' document. {N: technische offerte}
technical prescription	Each technical paragraph in this document, whether or not introduced by a specification frame or divided by one or more specification frames, contains mandatory technical prescriptions.
technical prescriptions	This document is called 'technical prescriptions' document (TVS) containing mandatory technical prescriptions within the framework of the 'overarching specifications' document. {N: Technische VoorSchriften (TVS)}
technical specifications	The 'technical specifications' document (also referred to as TLB), contains technical specifications within the framework of the 'overarching specifications'. Underlying these specifications may be a 'technical prescriptions'-document. {N: Technisch LastenBoek (TLB)}
VT	**Voltage Transformer**

Abbreviation/Term	Meaning and Definition
Legal terms	See the overarching specifications document for references to the following legally defined terms: • award {N: gunning} • contracting authority {N: aanbesteder} • contractor {syn.: supplier, service provider; N: opdrachtnemer} • offer {N: offerte} • public contract {N: overheidsopdracht} • procurement document {N: opdrachtdocument} • technical specification {N: technische specificatie} • tender {N: plaatsing; syn.: aanbesteding} • tenderer {N: inschrijver}

Table 10 Definitions and Abbreviations

Appendices

A – References

The 'reference lists' in this appendix are purely indicative. They only provide an overview of the standards, regulations and rules that may apply to this document.

A.1 – Customer Regulations

All eMUCS documents are technical prescriptions prepared by the customer.

Identification	Title	Author	Version
eMUCs-GUI-E	extended Multi-Utility Companion Specification of the Graphical User Interface for the Electricity meter	Fluvius	Ed. 2.0
eMUCs-GUI-G	extended Multi-Utility Companion Specification of the Graphical User Interface for the Gas meter	Fluvius	Ed. 2.0
eMUCS-M_{DLMS}	extended Multi-Utility Companion Specification of the I3 Interface (between electricity meter and HES)	Fluvius	Ed. 2.0
eMUCS-M_{MBUS}-G	extended Multi-Utility Companion Specification of the I2 interface for Gas meters (with an electricity meter)	Fluvius	Ed. 2.0
eMUCS-M_{MBUS}-W	extended Multi-Utility Companion Specification of the I2 interface for Water meters (with an electricity meter)	Fluvius	Ed. 2.0
eMUCS-P1	extended Multi-Utility Companion Specification of the P1 consumer interface	Fluvius	Ed. 2.0
eMUCS-S1	extended Multi-Utility Companion Specification of the S1 consumer interface	Fluvius	Ed. 2.0

Table 11 List of Customer Regulations

A.2 – Standards and Regulations

Identification	Title	Author	Version
DIN 43863-5	Identification number for measuring devices applying for all manufacturers	DIN	2012-04
DSMR-P1	Dutch Smart Meter Requirements (DSMR) for the P1 port	Netbeheer Nederland	Ed. 5.0.2
IDIS Package 3	IDIS Package 3, IP Profile X (extended functionality) IDIS Package 3, Smart Metering Objects	IDIS Association	Edition 1.0
IEC 60747-5-5	IEC 60747-5-5:2020 Semiconductor devices - Part 5-5: Optoelectronic devices - Photocouplers	IEC	2.0
IEC 61000-4-2	IEC 61000-4-2:2008 Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	IEC	2.0

Identification	Title	Author	Version
IEC 61010-1	IEC 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements Related Publications: IEC 61010-1:2010/AMD1:2016	IEC	3.0
IEC 62056-21	IEC 62056-21:2002 Electricity metering - Data exchange for meter reading, tariff and load control - Part 21: Direct local data exchange	IEC	1.0
IEC 62056-6-1	IEC 62056-6-1:2017 Electricity metering data exchange - The DLMS/COSEM suite - Part 6-1: OBIS Object identification system Edition 3.0, (2017) is in line with Blue Book Edition 12.2.	IEC	3.0
IEC 62056-6-2	IEC 62056-6-2, COSEM interface classes. Edition 3.0, (2017) is in line with Blue Book Edition 12.2	IEC	3.0
IEC 62056-6-3	IEC 62056-5-3, DLMS/COSEM application layer. Edition 3.0 (2017) is in line with Green Book Edition 8.3	IEC	8.3
OMS Volume 2	Open Metering System Specification, Generation 4, Volume 2 - Primary Communication.	OMS Group	Version 4.2.1

Table 12 List of Standards and Regulations

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).

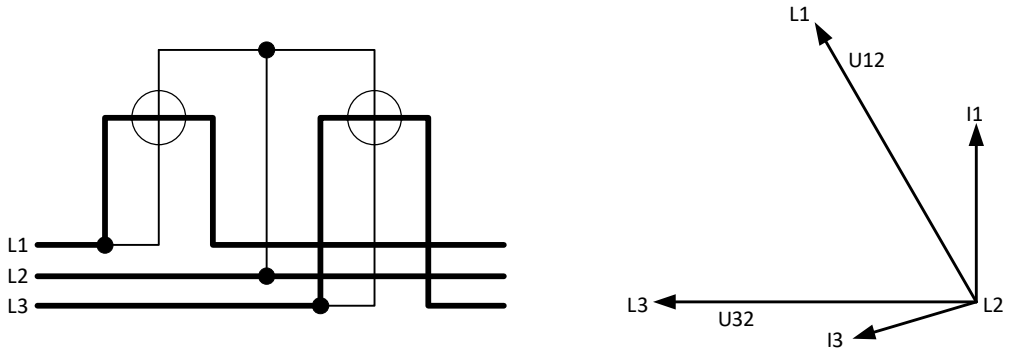


Figure 10 3 wire network (Delta)

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. 36) 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.

C – Implementation matrix

eMUCS-A1 can evolve, but always with backwards compatibility in mind.

This results in several versions of this document and also in several implemented versions in the field.
Depending on the evolution, the DSO decides to upgrade or not to upgrade meters that are already in the field.

The table below gives an overview of the versions that are applicable per DSO and per 'meter vendor'/'meter type'.

Meter Vendor/Type	Roll-out	Fluvius A1	ORES A1	RESA A1	SIBELGA A1
Landis + Gyr / E660	2023	50250	N/A	N/A	N/A
Iskraemeco / MT880	2023	50250	N/A	N/A	N/A

D – Examples of A1 telegrams

D.1 – A1 4 Wire (Y) telegram example

/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)(0000000.14*kvarh)(0000000.10*kvarh)
!3D9A