

BROCHURE



User Ports of Smart Meters

Explanatory note on the possibilities for product developers

Inhoudstafel

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1 Brochure summary

The aim of this brochure is to inform various international target groups about the technical implementation of the 'user ports' with which the smart meters will be equipped¹. Smart meters are being rolled out in Flanders from 2019. Many businesses and organisations, such as energy suppliers, app developers, etc. can use this document as the basis for initiating the development of a 'consumer energy management system' or CEMS (see concept note to the Flemish Government: Smart Meters).

This brochure provides the necessary basic information about the possibilities of smart meters and their integration with the user ports. The brochure describes both the physical interface (connection) and the information that is made available (data). In addition, the note includes a number of points to be taken into account during the development of applications.

This brochure is an update of the "User Port Guidelines" document published in November 2017. It contains more detailed information and supersedes the previous brochure.

2 Introduction

The introduction of smart meters is an important step in the digitalisation of energy grids. Smart meters will contribute to achieving the European targets for the integration of renewable energy, providing a stable energy supply and facilitating a competitive market. This document looks specifically at the functionalities of the user ports.

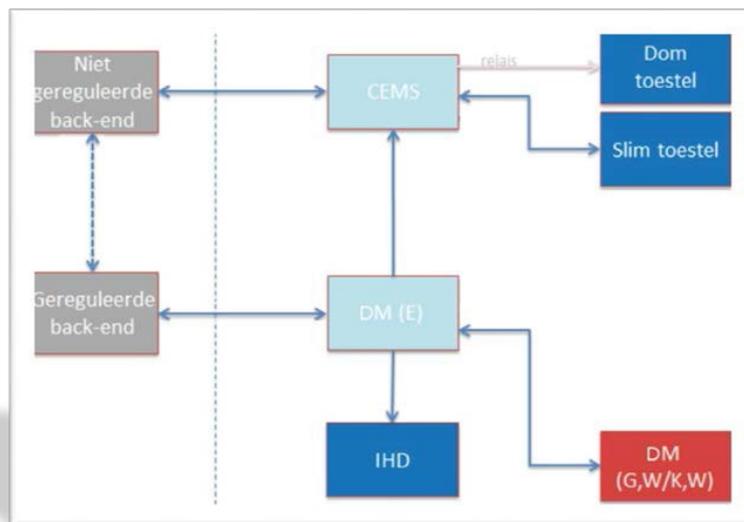


Figure 1 Metering system architecture

¹ This is the smart meter referred to in the note of the Flemish Government: <https://www.vlaamsparlement.be/parlementaire-documenten/parlementaire-initiatieven/1114919>

Smart meters will provide a more detailed view of a grid user's energy consumption and generation. The information is not only remotely read for billing purposes, it is also locally accessible to the customer via 'user ports'. These user ports offer the option to develop new and innovative applications that will allow network users (consumers, businesses and organisations) to monitor and adjust their energy consumption.

The smart meter that will be used by Fluvius from July 1st 2019 features two user ports. A "user port for consumption information" and a "user port for access to detailed information for local command and control applications".

3 Architectural concept of the smart metering set-up

Fluvius uses a meter based on open standards. The metering set-up consists of:

- An electricity meter that enables communication with the central systems, but also makes available data from all meters in the metering system on the user port. The user ports will be physically located on the electricity meter².
- A gas meter (if present) that is wirelessly connected to the electricity meter. The electricity meter collects data for the central systems for this gas meter.

In most cases, a metering system will comprise at least one electricity meter and possibly also a gas meter. This can be expanded with several meters, such as meters for local production systems or applications providing flexibility, and meters for other energy types. To ensure privacy, a metering system contains only meters that belong to one customer³.

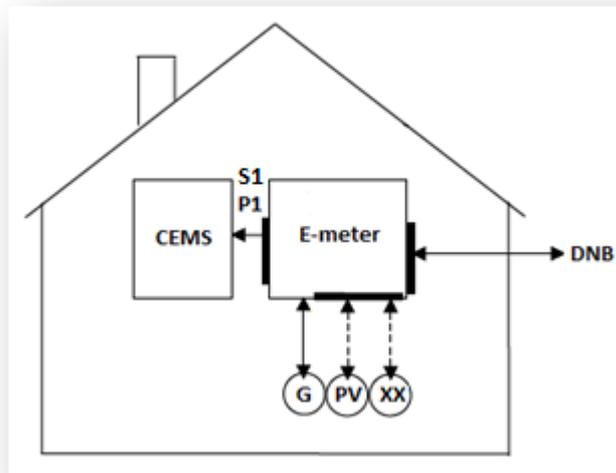


Figure 2: Metering system

² If only a gas meter is installed (i.e. no electricity meter), a user port cannot be made available.

³ The user port will therefore only provide data that belong to one and the same customer.

4 The user port for consumption information (P1)

4.1 Application

The user port for consumption information is designed to provide basic measurement data of and status information about the metering system in a simple and standardised way. This user port is aimed primarily at applications providing basic consumption feedback to the customer, especially about energy withdrawn and injected at the connection point.

The user port will deliver both consumption feedback and status information of the electricity meter and the connected gas meter(s).

4.2 Data made available

The following elements are available via the user port:

- Serial number of the electricity meter
- User port interface version
- Time the user port telegram was sent
- Index of the active energy consumed per counter (electricity)
- Index of the active energy generated per counter (electricity)
- Instant active power consumed
- Instant active power generated
- Current active counter (day/night)
- Connection status of the electricity meter (connected, disconnected or ready to reconnect⁴)
- Set threshold for switching off based on power (if the sum of the phases exceeds this)
- Set threshold for switching off based on current (if one of the phases exceeds this threshold)
- Voltage level per phase
- Current per phase
- Serial number of the gas meter (if present)
- Index of the gas meter (if present)
- Connection status of the gas meter (if present)
- Free text message

The user port works in one direction only. It is not possible for a distribution network user to send messages via the user port to the meter or to the distribution system operator.

Note: the message includes a free text field. This text field can be used to exchange information from the distribution system operator to the distribution system user (one way). This field is currently not used.

The Flemish smart meter will record the quality of the electricity supply and display the supply voltage.

⁴ 'Ready to reconnect' means that the distribution grid operator has released the meter for reconnection, allowing the customer to reconnect it to the grid by pressing the corresponding button (to restore the meter to the 'connected' status)

4.3 Physical interface

The user port is implemented in accordance with the Dutch concept, namely DSMR 5.0.2 P1⁵.

The physical and protocol implementation of the user port complies with the specifications laid down in Sections 5 and 6 of the document *DSMR 5.0.2 P1 companion standard*.

4.4 Software interface

The data made available on the user port differ slightly from those in the Netherlands (e.g. connection status) due to the market differences between the Netherlands and Flanders. As a result, the smart meter will have slightly different capabilities.

Because certain data objects from the minimum amount of data made available are not described in section 6.12 of DSMR 5.0.2 P1, this section was expanded. This expansion and a number of other nuances, referring to European standards like DMSR and DLMS, are described in the international specification document (eMUCS – H), which can be downloaded via the link below⁶.

4.5 Points to be taken into consideration

4.5.1 Future development of data made available

When smart meters will be introduced in 2019, the data described in section **Fout! Verwijzingsbron niet gevonden.**4.2 will be made available on the "user port" of the smart meter. In the future, this might be extended to additional data objects. This will depend on, among other things, developments of the market for the CEMS, but also the development of smart meter functionalities, the development of the smart meter itself and any additional regulations.

This must also be taken into account during development of the CEMS. The CEMS must be designed so that no compatibility issues can arise. This means that:

- Data objects can be added
- The position of data objects can be changed

To allow backwards compatibility, the distribution grid operator will not remove any data objects.⁷

⁵ See <http://www.netbeheernederland.nl/themas/hotspot/?dossierid=11010056&title=Slimme+meter>

⁶ See eMucs details: <https://1drv.ms/w/s!AnvfbLahjOzqjvxdFczqkOWGN46vsA?e=3lCjFC>

⁷ One exception is deactivation of the consumption port at the request of the customer or if the customer has not given its consent. In this case all data objects will become unavailable on the user port.

4.5.2 Text message as part of the data made available remains to be defined

As described in section 4.2, the list of minimum data made available contains a data object that may contain text with a maximum character length of 1024. When smart meters will be introduced in 2019, the content of this data object will be empty, but it may be used in the future to exchange messages with the CEMS, for example.

Possible structures within this text field should be defined in consultation with the parties concerned: meter supplier, energy supplier, ESCO, regulator and grid operators. Such consultation will be scheduled as soon as one of the parties deems it necessary to define the text message.

The following use cases could be considered for the future definition of the text message:

- The grid operator for congestion management
- The providers of flexibility
- The *energy service company* for management of the in-house system via the CEMS
- Etc.

Note: This text message must always be sent via the central systems of the grid operator.

5 The user port for advanced detection and control applications (S1)

5.1 Application

This user port (S1) is designed to provide "raw" data to an application (CEMS) at a particularly high frequency. The application must further process this "raw" data to make advanced calculations allowing for very detailed consumption feedback and control.

The data made available via this user port could, for example, be used to enable device detection (*Non-Intrusive Load Monitoring*). The "raw" data provides the developer with access to very detailed information on voltage and current consumption on the connection. Combining the consumption feedback from the P1 user port with additional data from the S1 user port allows for advanced control options.

5.2 Data made available

Unlike user port P1, user port S1 will provide only data relating to the electricity meter. In other words, this port does not provide any high-frequency data of sub-meters within the metering system.

On this user port, samples of the voltage and current sine waves are published. The sample frequency varies between 2000 Hz and 4000 Hz. The following data are available on the user port:

- Serial number of the electricity meter
- Sampling of the sine-wave voltage between phase 1 and neutral
- Sampling of the sine-wave voltage between phase 2 and neutral (only on polyphase meters)
- Sampling of the sine-wave voltage between phase 3 and neutral (only on polyphase meters)
- Sampling of the sine-wave current in phase 1
- Sampling of the sine-wave current between phase 2 and neutral (only on polyphase meters)
- Sampling of the sine-wave current between phase 3 and neutral (only on polyphase meters)
- Sampling of the sine-wave current in neutral

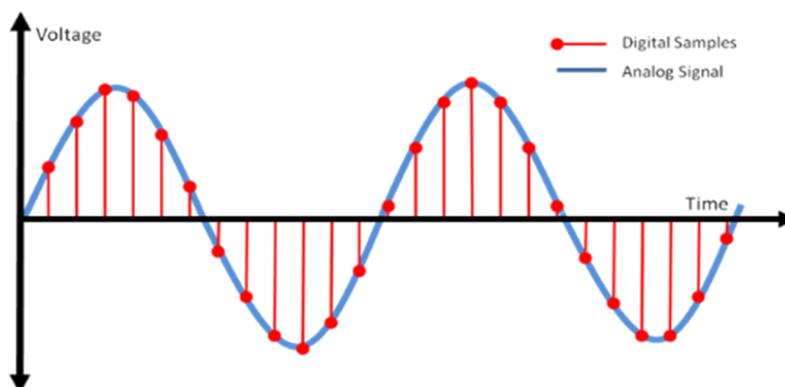


Figure1: Sampling of a sine wave

Note: when connecting a polyphase meter to a three-wire distribution system (delta network), phase 2 will be connected to the neutral of the meter (reference). As a result, the phase 2 voltage samples will always be 0.

5.3 Physical interface

Fluvius have elected to base the implementation of the physical interface as much as possible on existing standards and specifications.

- Physical interface: RS-422 (RJ-12 connector)
- Data layer: IEC13239 (HDLC)

Details on the physical interface can be found in the specifications document (eMUCS - H), which can be downloaded via link below⁸.

5.4 Points to be taken into consideration

5.4.1 Standardisation

Nowhere else in Europe has a port of this type been introduced on such a large scale, yet several market players have already expressed interest in deploying this port in the medium term. This user port makes the Flemish electricity meter future-proof.

Fluvius intends to place the user port on the agenda of the relevant standardisation working groups at European level in order to create a support base that is broader than just Flanders.

5.4.2 Sample frequency

The specification does not prescribe the use of a specific sample frequency. The sample frequency depends on the meter type and can therefore be different on future smart meters. By contrast, the bus speed (RS-422) will always be 1.5 Mbps.

This should be taken into account into the development of the application. The first generation of smart meters to be installed from 2019 will have a sample frequency of 2600Hz.

⁸ See more info on e-MUCS H via <https://1drv.ms/u/s!AnvfbLahjOzqiv8i333PGQCNBVfxqw?e=j3T551>

6 Supporting processes

6.1 Activating/deactivating the user port

Whether metering data may or may not be made available via the user ports depends on whether or not the distribution system user has given its consent to the parties concerned. The distribution system user is the owner of the data and must give its unambiguous consent in line with privacy legislation.

A system user must therefore always give his consent to the grid operator to activate the user ports. The grid operator remotely activates the user ports on the meter.

Note: Activation or deactivation of the two user ports cannot be separated from each other. This means that both user ports must always be activated or deactivated together. It is not possible to activate or deactivate only one of two user ports.

6.2 Connection of several CEMS to the user port(s)

There are situations where several CEMS have to be connected to the user port(s):

- In-home displays independent of CEMS
- CEMS of a gas supplier, CEMS of an electricity supplier (user port)

Since the user ports are unidirectional, there are options available to link several devices to one metering system. However, some caution is still in order, and we will look first of all at the physical properties of the interface.

7 More information

For more information, please consult www.fluvius.be/digitalemeter and www.fluvius.be/vragenoverdigitalementers, or contact Fluvius via digitalemeter@fluvius.be.

8 Terms and abbreviations used in this brochure

CEMS	: Consumer Energy Management System
SM	: Smart meter
DNB	: Distribution system operator
DSMR	: Dutch Smart Meter Requirements
E	: Electricity
eMUCS	: extended Multi Utility Companion Specifications
ESCO	: Energy Service Company
G	: Gas

- HDLC : High-Level Data Link Control
- IHD : In Home Display
- NILM : Non-Intrusive Load Monitoring
- P1 : User port for consumption information
- S1 : User port for advanced detection and control applications (S1)
- H/C : Heating/Cooling
- W : Water