Main Document

Dutch Smart Meter Requirements

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CONTENT

1 INTRODUCTION

1.1 The Dutch standard for smart metering (NTA 8130)

The Ministry of Economic Affairs has at first commissioned the Netherlands Normalization Institute, NEN, to formulate and describe a standardized minimum set of basic functions for remotely readable metering for electricity, slave E meters, gas, thermal energy (heat) and water for domestic consumers (in this document we use the expression *domestic consumers* although *small scale consumers* might be more appropriate). Under the auspices of the NTA 8130 project group, set up for this purpose by NEN, work has been performed on the drafting of requirements that 'smart metering systems' must satisfy. During the formulation process, the formal field of view of mandatory functions has been reduced to electricity and gas. For water and thermal energy, recommendations are given in an appendix. This process has been finalized in April 2007, as its result, a so-called National Technical Agreement called *"Minimum set of functions for metering of electricity, gas and thermal energy for domestic customers"* has been brought out. The reference number of this Netherlands Technical Agreement is *NTA 8130*.

In March 2011 the ministry of EL&I has issued the Algemene maatregel van Bestuur "Besluit op afstand uitleesbare meet- inrichtingen" (AMvB) as an amendment to the Dutch E and G acts. Where the NTA8130 and the AMvB are in conflict, the AMvB takes precedence.

The document "Dutch Smart Meter Requirements" is an elaboration of the NTA8130 and the AMvB, commissioned by the Dutch grid companies, and aimed at meter interoperability. Also requirements have been added, mainly with respect to installation & maintenance, privacy & security, and performance.

1.2 Short description of the metering installation

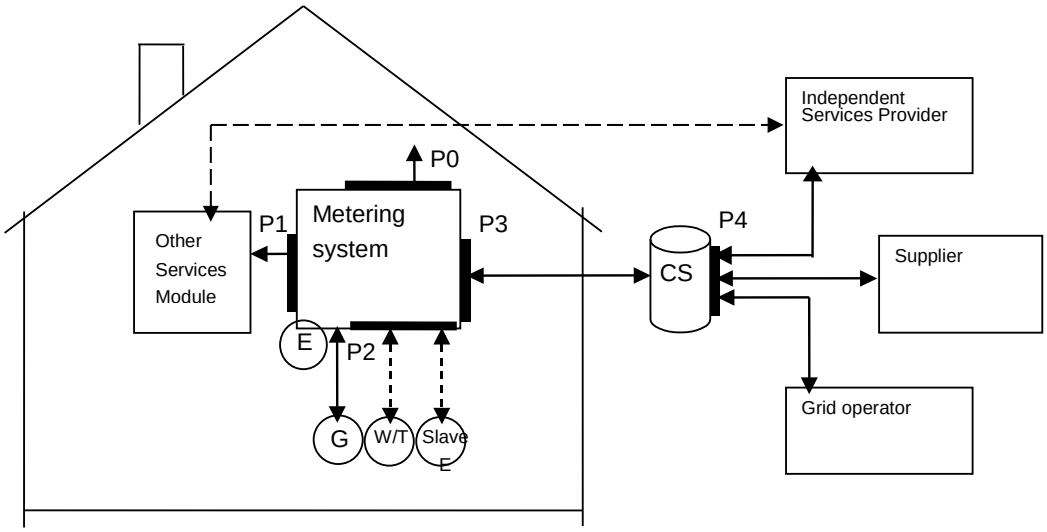


Figure 1-1 – Communication ports, part of the metering installation

As well as the displays on various parts of equipment, the metering installation has the following communication ports:

- **Port P0** for communication with external devices (e.g. hand-held terminal) during installation and on-site maintenance of the metering installation. The P0 port is only present on the E meter.
- **Port P1** for the communication between the metering installation and auxiliary equipment (a maximum of 5 appliances can be connected). P1 is a read-only interface, i.e. it cannot be used for sending data to the metering system. The specification of P1 is included in the relevant companion standard.
- **Port P2** for the communication between the metering system and one to four metering instruments and/or grid operator equipments. The specification of P2 is included in the relevant companion standard.
- **Port P3** for the communication between the metering installation and the Central System (CS).
- **Port P4** for the communication between the CS and independent service providers, suppliers and grid companies. Note that P4 is outside the scope of this document.

1.3 Business Use cases

The structure of the document is largely based on the business use cases that the smart meter product will support. These use cases are used as the framework in which the detailed requirements are placed. Regarding these business use cases, largely two main parts can be distinguished:

- Use cases based on operational requirements derived from the NTA 8130 and Novelle;
- Use cases with respect to the topics Installation and Maintenance (I&M).

This document provides the requirements for metering equipment (henceforth the term ‘Measuring equipment’ will be used) with respect to installation and maintenance processes.

1.4 Installation and Maintenance functionality

The base set of functionalities for the equipment is described in NTA 8130. As the functionalities with respect to installation and maintenance (I&M) in that document are incomplete, this document provides the complete set of requirements for I&M. The scope for the requirements in this document has been defined in the project initiation document as described below.

1.4.1 Installation and Deployment

Requirements for installation are focussed on facilitating a fast, safe and flawless installation and deployment of equipment. Furthermore the requirements shall be specified in such a way that personnel that performs installation, deployment and maintenance need not be highly qualified. Deployment means integrating the metering device in the operational metering chain. The requirements include physical characteristics and functionality to configure equipment.

1.4.2 Maintenance

Requirements for maintenance are focused on enabling remote maintenance. The equipment shall facilitate remote maintenance through functionality for:

- Automatic error detection (hardware, software, metrology etc.) and reporting
- Gathering diagnostics;
- Configuration of the metering installation (as a whole and individual components);
- Gathering the state of the metering installation (parameters).

Although on-site maintenance shall be kept to a minimum, it is important that the requirements address on-site maintenance, especially planned maintenance including replacement of components.

Chapter 6 of this document provides use cases for equipment, network and communication. These use cases are presented in a generic form, i.e. are not focused on any specific network or communication technology.

1.5 Presentation of processes

The metering and equipment responds to triggers. Each trigger initiates a process. The triggers for the presented use cases originate in CS or metering installation itself, or are time-initiated triggers. Typical examples of external events are a request for actual data, the detection of an outage, the installation of a meter, and so on. Trigger descriptions as used in the different use cases are presented in tabular form like in the example below.

Trigger	Description
Deploy E meter	On installation the E meter starts registering periodic meter readings and on deployment these meter readings are made available to the CS.

1.6 Presentation of requirements

In this document all requirements originating from the NTA 8130, or additionally added by the Working Group DSMR of Netbeheer Nederland, are presented in tables. Each requirement is tightly connected to one or more business use cases presented in the document. The ultimate goal of this procedure is to prevent ambiguity of the requirements due to a better understanding of the requirement. The table below presents the template for a requirement; the explanation for the attributes in the table is given in brackets.

[Unique identifier for the requirement.]

Descrip-tion	[This is the general description of the requirement. The description itself gives a general idea of what is required. Other attributes will provide the specifics for the requirement.]						
Rationale	[This attribute provides information on why the requirement is defined; it provides the background for the requirement.]						
Fit criteri-on	[This attribute provides insight on the criteria that will be used to verify if the requirement is met. It provides the framework for the logical test case that will be used to verify the requirement.]						
History	[Date the require-ment was accepted]	**Origin**	[Indicates the originator of the require-ment, e.g. NTA 8130.]	**Port**	[Port that is being addressed by re-quire-ment]	**Applicable**	[Indicates the applicability of the re-quirement, e.g. E meter, G meter etc.

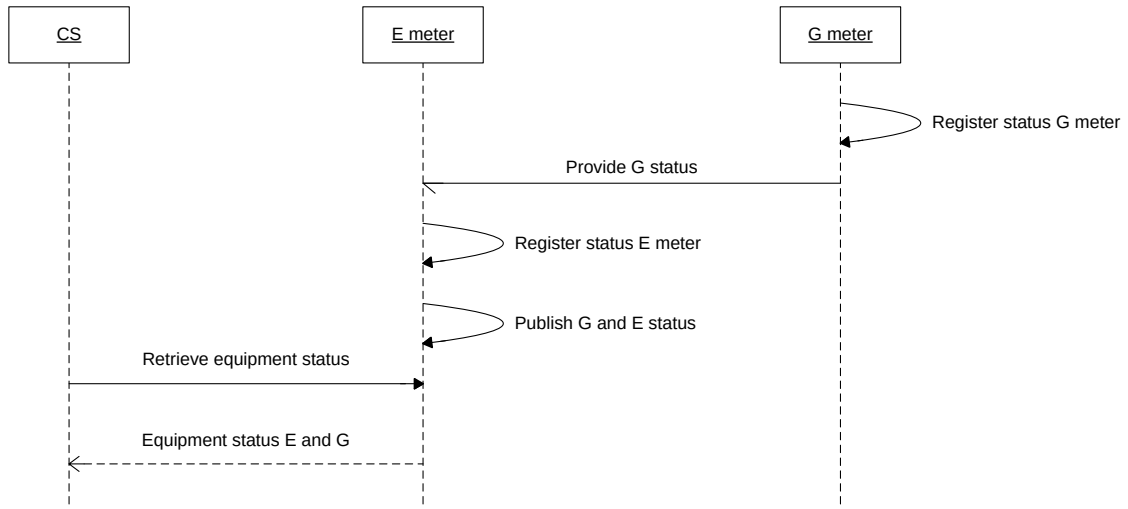
Table 1-1: Presentation of requirements

The Unique identifier for the requirement is constructed as follows: [DSMR version].[Chapter].[Number].

Although in the applicable field the parties are mentioned for which the requirements are applicable, this does not mean that other parties should not take note of these requirements and consider the direct or indirect consequences for their products and/or services.

The requirements description in this document is based on the business processes of the grid operators. The processes are provided as use cases. As a result the requirements are grouped based on functional relationships. The actual requirements are provided in a format based on the *Volere* requirements template.

1.7 Explanation of sequence diagrams



This document refers to sequence-diagrams according to the UML-method (Unified Modelling Language). UML is frequently used for software and system design. This example / model describes various, so-called ‘’entities’’ as the CS (Central System), the ”E meter’’ and ”G meter’’ for the meter infrastructure.

A function-call from one to the other entity is shown as a solid line with brackets (see ‘Retrieve equipment status()’’). The result of the function-call, a message, is shown in case this will be handed over to another entity as a dotted line (see ‘Equipment status E and G’). These two arrows show the function-call and the response.

In other cases such as ‘Register status E meter()’ a function call will be made within an entity. The response is not transferred to another entity, so in this case the dotted line is absent.

The half arrow (see ‘Provide G status’) represents non synchronized communication. The recipient has no request but receives uninvited information from another entity.

1.8 General remarks

1.8.1 Use cases for thermal, water and electricity sub-meters

In this document only the requirements and use cases for the electricity and gas equipment are specified. The functional requirements and use cases for thermal, water and electricity sub-meters (slave E meters) could be specified in a similar way (i.e. comparable to gas). The general requirements (see Chapter 2) will differ for thermal and water meters, yet these are not described in this document.

1.8.2 Dependency of use cases on medium

P2 interface

The communication on P2 will optionally be wired or RF. The meter readings will be collected once every hour.

P3 interface

The medium for P3 will be GPRS, as described in the NTA 8130 (§5.5.3.2). The P3 companion standard describes the communication between a central infrastructure (CS) and the metering system. The specific GPRS requirements are described in the separate DSMR GPRS requirements document.

1.8.3 Modularity of the E meter

This document presumes that the Communication module and Electricity meter are integrated. Therefore the terms “Electricity meter” and “Electricity equipment” are interchangeable.

1.8.4 Referenced documents

This document provides the requirements for metering and for shared communication equipment. The process of determining the requirements is conducted by multiple parties and disciplines. In order to enable maintenance on the requirements each requirement has an associated origin. The origin indicates the party or discipline that introduced or accepted the requirement and therefore is responsible for it.
All references in this document to “NTA” or “NTA 8130” refer to: Netherlands Technical Agreement, NTA 8130 (e), “Minimum set of functions for metering of electricity, gas and thermal energy for domestic customers”, Netherlands Normalization Institute (NEN), August 2007, reference ICS 17.120.10.

The origin used for the requirements are stated in the table below:

Origin	Description
EN	Derived from EN 50470.
NTA	Derived from the NTA 8130.
I&M	Based on information from the installation and maintenance work group.
Q&P	Based on information from the performance and quality work group.
TST	Technical Specification Team of Netbeheer Nederland
P&S	Based on the guidelines from the privacy and security work group version 1.5.
WGDSMR	Working Group DSMR

Table 1-2: Origin of Requirements

1.9 Document list

Following table shows the complete set of documents that build up the Dutch Smart Meter Requirements, of which this main document is a part of.

#	Document name postfix	Description
[1]	Main	The main document of the Dutch Smart Meter Requirements, containing all definitions and most of the use cases and requirements.
[2]	P1	Companion standard P1
[3]	P2	Companion standard P2
[4]	P3	Companion standard P3
[5]	GPRS	Additional document describing the requirements for the GPRS infrastructure as part of the Dutch Smart Meter Specification.

Table 1-3: Document List

2 DEFINITIONS AND ABBREVIATIONS

2.1 General definitions

This section provides general definitions for terms used throughout this text.

Name	Description
Timestamp	A timestamp is used to indicate a moment in time. In order to be useful the time stamp shall include the date as well as the time. The time in a timestamp shall be specified including hours, minutes and seconds. The format of a time stamp is defined as: yyyy-mm-dd h24:min:sec. The timestamps in the E meter are always in Local Time and include Deviation to UTC. Only on P2 level the time stamp is in UTC time.
Local time	This is the National Standard Time related to UTC time. In the Netherlands during the winter this equals UTC+1 hour, in summer it equals UTC+2 hours (Daylight Savings Time).
Batch identifier	A vendor delivers goods in batches. Each batch has a unique identifier assigned by the vendor. The batch identifier is part of the configuration information of equipment. This enables a GO to determine which equipment was part of a batch.
Meter data	Meter readings that can be used to determine the quantity of electricity or gas that was consumed. Meter data thus includes daily and monthly meter readings, interval readings and actual meter readings.
Legally Relevant	Programs, data and type specific parameters that belong to the measuring instrument or sub-assembly, and define or fulfil functions, which are subject to legal control.
Logical Component	All functionalities belonging to each other in an object (in DLMS this is called OBIS objects)
Installation mode	When in installation mode, the E meter scans for physically wired connected M-Bus devices, the E meter accepts and processes installation mode requests from wireless M-Bus devices.

Table 2-1: General Definitions

2.2 Parties involved

This section provides general definitions for involved parties, used throughout this text.

Name	Description	Abbr.
Consumer	The consumers of electricity and/or gas where smart meters are installed.	_
Grid operator	The grid operator responsible for the equipment and the services delivered through the equipment.	GO
Grid operator gas	The grid operator responsible for the gas equipment and the services delivered through that equipment.	GOG
Grid operator electricity	The grid operator responsible for the installation of equipment for electricity and gas and the services delivered through the electricity equipment.	GOE
Independent service provider	A company independent of grid operators, supply companies or metering companies that provides a service to the connections in the grid using the infrastructure provided by the grid operator and the metering company.	ISP
Supply company	The company that is responsible for delivery of electricity and/or gas to the connections.	SC

Table 2-2: Parties Involved

2.3 Meter readings

This section provides general definitions for meter readings, used throughout this text.

2.3.1 Meter reading electricity (E)

A meter reading for E contains the register values for all tariffs in both energy directions. As E meters support two tariffs for both energy directions, each meter reading E contains four register values with an indication for tariff and direction associated to each register value. The meter reading E also contains two registers for interval data (totals).

Attribute	Description
Equipment identifier	Identifier for the equipment that registered the meter reading, i.e. the equipment identifier for the E meter.
Time stamp	Date and time of the meter reading in local time (see table 2.1).
Tariff	In case of a periodic meter read or an actual meter read: - Identifier for the tariff that the register value applies to. In case of an interval meter read: - Not applicable.
Energy direction	The energy direction (delivery or consumption) that the register value applies to.
State	Meter state (for example logging information, error reports) at the time of the meter read.
Register value	In case of a periodic meter read or an actual meter read: - The register value is the value of the (periodic or actual) meter reading. In case of an interval meter read: - The register value contains 960 values of the 15 minutes interval data.
Unit of measurement	The unit of measurement that applies to the register value.

Table 2-3: Meter Readings Electricity

2.3.2 Meter reading gas (G)

Attribute	Description
Equipment identifier	Identifier for the equipment that registered the meter reading, i.e. the equipment identifier for the G meter.
Time stamp	Date and time of the meter reading in UTC time (see table 2.1).
State	Meter state (for example logging information, error reports) at the time of the meter read.
Register value	In case of a periodic meter read or an actual meter read: - The register value is the last available meter reading. case of an interval meter read: - The register value contains 240 values of the hourly interval data.
Unit of measurement	The unit of measurement that applies to the register value.
Converted	Indication if the meter reading was converted for temperature (yes/no).

Table 2-4: Meter Readings Gas

2.4 Equipment

This section provides general definitions for the equipment, used throughout this text. This document differentiates between equipment and the place where equipment can be installed. Throughout the document the following terminology is used for equipment:

Name	Description	Abbrev.
Measuring equipment	All equipment installed at the premises of the consumer for measuring consumption of commodities. The equipment therefore includes: E meter, G meter and a communication module.	
Metering instrument	Equipment with measurement functions for electricity or gas. The equipment therefore includes E meters and G meters.	
Meter	Residential measuring device for either electricity or gas. Meters include E meters and G meters.	
E meter	Residential measuring device for registration of electricity consumption and communication. The communication module is an integrated part of the E meter.	
G meter	Residential measuring device for registration of gas consumption.	
Communication module	The equipment that is responsible for communication between Measuring equipment at a connection and other entities (i.e. central systems).	
Central System	The ICT infrastructure, equipment and software used by the GO for meter management, meter readings and handling requests of ISP and SC.	CS
Equipment identifier	A global identifier for the equipment. The equipment identifier is composed of three parts: meter type, serial number and year of manufacturing. Equipment identifiers are represented as bar codes and also human readable codes.	
Local host	The equipment installed on a connection is composed of multiple pieces of equipment. This equipment is connected through a local network (P2). The E meter functions as a local host for this network and is referred to as the local host in the context of its function as a network component.	
Auxiliary equipment	Equipment provided by an Independent Service Provider or Supply Company that can be attached to the P1 port and can receive and process the information provided on P1, e.g. an in-house Energy Monitor. Also referenced as “Other Service Module” (OSM).	OSM
Installation mode	Installation mode is the state of the E and G meter where it is possible to bind a G meter to an E meter.	

Table 2-5: Equipment Terminology

This document minimizes the assumptions on the physical design of the equipment. For this reason, NTA 8130 introduces the notion of a metering installation. This metering installation provides a number of interfaces with other equipment. The interfaces are provided through ports. The table below provides a description of these ports.

Port	Origin	Description
P0	I&M	Port P0 for communication with external devices (e.g. hand-held terminal) during installation and on-site maintenance of the metering installation. The P0 port is only available on the E meter.
P1	NTA	Port P1 for the communication between the metering installation and auxiliary equipment (a maximum of 5 appliances can be connected). P1 is a read-only interface, i.e. it cannot be used for sending data to the metering system. The specification of P1 is included in the relevant companion standard.
P2	NTA	Port P2 for the communication between the metering system and one to four metering instruments. The specification of P2 is included in the relevant companion standard.
P3	NTA	Port P3 for the communication between the metering installation and the Central System (CS).

Table 2-6: Port Description

In NTA 8130 another port, P4, is defined as well. This port is not relevant for the equipment for which the requirements are presented in this document as this port handles communication between the CS and external parties.

For a functional description of the ports P1 through P4 is referred to NTA 8130.

2.5 Equipment state

Throughout the text the term ‘equipment state’ is used. Each piece of equipment is considered to have a state. The following sections present the definitions of the state of the various types of equipment.

2.5.1 Measuring equipment state

The equipment state for Measuring equipment is divided in two groups of information: operational parameters and configuration. The operational parameters are configuration items indicated as changeable by the GO in tables 2-7 and 2-8 and can be explicitly changed via the client service interface.

The configuration items indicated as “initially filled by the manufacturer” are set in the equipment by the manufacturer on behalf of the GO. The parameters for both operational parameters and configuration differ for E and G. The tables below provide the definition of the state for both E and G meter.

2.5.1.1 E configuration

Name	Description	Initially filled by manufacturer	Changeable by GO
Equipment identifier	The GO decides to use the equipment identifier or the serial number as the value for the equipment identifier in the E configuration.	Yes	No
Operational hardware version	The version identifier of the hardware in the meter.	Yes	No
Operational firmware version	The version identifier of the firmware that is operational in the meter.	Yes	No
Non-operational firmware version	The version identifier for the firmware that is uploaded in the meter for a future firmware upgrade. This version of the firmware is not operational yet.	No	No
Initial hw/sw configuration version	Device initial hardware, software and configuration information	Yes	No
Ordering info	Grid operators device ordering information	Yes	No
Location information	The location information of the meter, i.e. an indication of where the meter is installed. Typical examples are GPS coordinates or zip code and house number.	No	Yes
Hosted equipment	List of equipment identifiers for equipment connected to the E meter by means of P2 (M-Bus). The E meter functions as a host for equipment connected to P2.	No	Yes
Date - Time	Date and time of the internal clock.	Yes	Yes
Daylight savings	Indication if the clock in the meter has applied daylight savings time (DST) active	Yes	Yes
Duration of voltage swells	Definition of voltage swell in terms of duration, cf. use case “Provide power quality information”.	Yes	Yes
Threshold for voltage swells	Definition of voltage swell in terms of threshold, cf. use case “Provide power quality information”.	Yes	Yes
Duration of voltage sags	Definition of voltage sag in terms of duration, cf. use case “Provide power quality information”.	Yes	Yes
Threshold for voltage sags	Definition of voltage sag in terms of threshold, cf. use case “Provide power quality information”.	Yes	Yes
Threshold long power outage	Definition of long power outage (upper bound for duration), cf. use case “Provide power information”.	Yes	Yes
Maximum time adjustment	Definition of time adjustment allowed without generating an event, cf. use case “Synchronise time E meter”.	Yes	No
Tariff information	Time table indicating during which times of	Yes	Yes

Name	Description	Initially filled by manufacturer	Changeable by GO
	day and on what weekdays the various tariffs apply.		
Special days table	List of days where the tariff deviates from the standard (low instead of normal)	Yes	Yes
Alarm Filter	Indicates what events will be handled as alarm	Yes	Yes
Local port readout list	List of objects that is output to the P1 interface	Yes	Yes
Administrative in/out on P3	Indicates whether the meter will be read out via P3	No	Yes
Connection watchdog timer for P3	The duration after which the P3 connection is reset	Yes	Yes
Discover on open cover	Indicates whether the M-Bus discovery process is automatically started when the cover is opened	Yes	Yes
Discover on power on	Indicates whether the M-Bus discovery process is automatically started when the power of the E meter is switched on	Yes	Yes
Dynamic M-BUS address	Indicates whether M-Bus devices that are installed have their address initially configured as 0 or as a predefined value	Yes	Yes
Send commissioning notification	Indicates whether an alarm should be raised when a new M-Bus device is discovers	Yes	Yes
Send power up notification	Indicates whether an alarm when the device is powered on	Yes	Yes
P0 enabled	Indicates whether communication via P0 is enabled or not.	Yes	Yes
HLS 3 and 4 enabled on P3	Indicates which security levels are enabled on the P3 port	Yes	Yes
IP message content	A configurable attribute that contains contents of the IP message send when a PDP context is established.	Yes	Yes
IP message target address	A configurable attribute that defines the address of the receiver of the IP message, which is send after establishing PDP context	Yes	Yes
GPRS operation mode	Defines the GPRS operation mode: always on, external trigger or internal trigger	Yes	Yes
PPP set up	Defines username and password for GPRS connectivity	Yes	Yes
Master key	The key used to exchange new encryption keys	Yes	No
Encryption key	The key used to encrypt / decrypt messages	Yes	Yes

Table 2-7: E Configuration

2.5.1.2 G configuration

Name	Description	Initially filled by manufacturer	Changeable by GO
Equipment identifier	The GO decides to use the equipment identifier or the serial number as the value for the equipment identifier in the G configuration.	Yes	No
Operational firmware	The version identifier of the firmware that is operational in the meter.	Yes	No
Time	Date and time of the internal clock (if present).	Yes	Yes
Encryption key	The key used to encrypt / decrypt messages	Depending on GO	Yes

Table 2-8: G Configuration

2.6 Auxiliary reference information

Additionally, the following abbreviations will be used:

Abbreviation	Description
DSMR	Dutch Smart Meter Requirements (Main)
E	Electricity
FMEA	Failure Mode Effect Analysis
G	Gas
PQ	Power Quality

Table 2-9: Auxiliary Reference Information

Other information entities are defined as:

Name	Description
Interval values E	The interval values (register readings) provided for E shall at least contain the following information: ▪ Time stamp of the interval value; ▪ E status ▪ Interval value specified in kWh (three decimals); ▪ Indication for energy direction (consumption or production). The interval has been chosen to be 15 minutes. In Annex A of the P3 document the minimal numbers of digits used throughout the whole metering chain are shown.
Interval values G	The interval values (register readings) for G shall contain the following information: ▪ Time stamp of the interval values; ▪ G status ▪ Interval values specified in m^3 (two or three decimals); The interval has been chosen to be 60 minutes. In Annex A of the P3 document the minimal numbers of digits used throughout the whole metering chain are shown.
Power Quality information	Power Quality information shall contain the following information: ▪ Number of voltage swells; ▪ Number of voltage sags; ▪ Identification of the period in which this information has been registered.

	See also the specifications in NEN-EN 50160:2000.
Instantaneous Voltage information	The instantaneous voltage information shall contain the following information: ▪ Instantaneous voltage specified in V (with a precision of 1 V).
Average Voltage information	The average voltage information shall contain the following information: ▪ Average voltage specified in V (with a precision of 1 V).
Outages information	The outage information shall contain the following information: ▪ The number of short power outages (<T seconds); ▪ For outages >T seconds: ○ Time stamp of the end of the outage. The electricity meter shall provide the outage information for each phase.

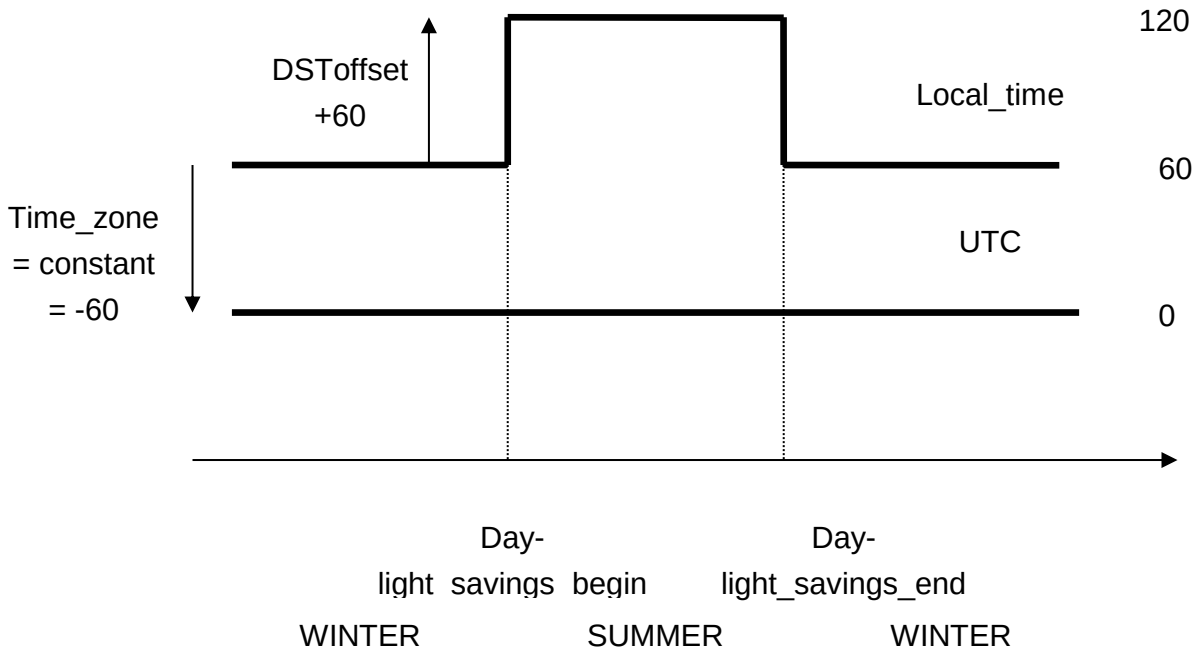
Table 2-10: Other Information Entities

2.7 Relation between the various time parameters

This section provides general definitions for time parameters, used throughout this text.

Time_zone: Attribute 3 of IC Clock in minutes. It is a constant depending on the geographic location (eg. Amsterdam: -60 minutes) = UTC – local time in winter (DST not active)
Deviation: Part of type “date_time” in minutes. It is dynamic and changes depending on the time_zone and if DST is active or not. It is calculated by the CS
Local_time: Local time (current time)
DSToffset: Daylight saving time offset in minutes (“summer time” – “winter time”)
DST active: Clock status bit 7 is set to true when DST is active (summer)
UTC: Universal Time Code

The following relations apply:
Deviation = UTC - local_time
Deviation = time_zone – DSToffset (if DST is active)



Example Amsterdam July:	**Example Amsterdam December:**
SUMMER TIME (Daylight Saving Time active) local time = 15:00 UTC = 13:00 Deviation = -120 DST offset = +60 Time_zone = -60	WINTER TIME (DST not active) local time = 15:00 UTC = 14:00 Deviation = -60 DST offset = +60 but not active Time_zone = -60

The table below shows an overview of the time definitions for different purposes.

	Timestamps registervalues in E meter	Timestamps registervalues in G meter	Synchronisation E meter	Synchronisation of G meter by E meter	Execution time of commands
E meter	Local Time	n.a.	Local Time	UTC Time	Local Time
G meter	Local Time	UTC Time	n.a.	UTC Time	Local Time[1]
P1 port	Local Time	n.a.	n.a.	n.a.	n.a.

Table 2-11: Overview of the time definitions for the different purposes.

The device shall always be able to deduce the UTC time from the timestamp in the synchronisation command. Therefore the timestamp shall contain the deviation.
When the E meter receives a time synchronisation it shall calculate the UTC time based on the deviation. The deviation will show the total deviation between the timestamp in the synchronisa-

[1] The E meter is responsible for the execution time of the command.

tion command and the UTC time. The deviation can be added to the timestamp in the synchronisation command to calculate the UTC time.

The G Meter shall use UTC time for time synchronisation and for time stamping of the register values. The E meter shall convert the time stamps from the G meter register values from UTC time into local time.

E meter clock synchronisation:
The time in the Electricity meters is set by applying the SET service to the attribute “time” of the “clock” object. The time attribute can be written as:

Date & Time	Deviation	Clock status
Date & Time according to the local time at the location of the device.	*Deviation* of the device local time *to UTC*	0x80 or 0x00 representing whether DST is active or not active at the date & time of the chosen location.

Table 2-12: Time attribute in type date-time

3 GENERAL REQUIREMENTS

This section provides the requirements that apply to all Measuring equipment in this document.

3.1 Measuring equipment

DSMR-M 4.3.2

Description	All metering instruments shall comply with the Dutch 'Metrologiewet' (Metrology Act).						
Rationale	The 'Metrologiewet' is the Dutch implementation of the EU Measurement Instruments Directive (MID). Hence, it is concerned with reliable and accurate measurement of commodities in the Dutch market.						
Fit criterion	The vendor shall supply a certificate from a notified body for the metering instrument stating that it complies with the Dutch 'Metrologiewet'.						
History	Nov. 2007	**Origin**	NTA	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M4.3.90

Description	It is not allowed to have a breaker or valve present in the meter						
Rationale	Because the decision of the department of Economic Affairs, a breaker and valve are removed from the 'AmvB metereisen GSA'						
Fit criterion	The meter does not have a breaker or valve installed .						
History	Mar. 2014	**Origin**	WGDSMR	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.3

Description	The type plate of metering instruments shall provide standardised information.						
Rationale	For operational convenience the type plate shall show standardised information. The layout of the type plate and the information shown will be determined in consultation with the grid operator.						
Fit criterion	The meter type plate shall clearly show the following information (in consultation with the grid operator): ▪ Legally required information; ▪ Equipment identifier (includes meter code, serial number and year of manufacturing. The internal digital ID number must match the number shown on the type plate); ▪ Barcode specified by the grid operator ▪ For E meters the meter code ▪ For G meters the meter code Furthermore if the grid operator requires this the type plate shall also show: ▪ A description of the communication medium (GPRS) ▪ Ownership identification (text or logo) of grid operator						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.4

Description	The vendor of equipment has to meet the requirements for life time expectancy.						
Rationale	The minimum life time expectancy must be 20 years						
Fit criterion	Suppliers should clearly show the expected life time of their products. The minimum technical lifetime for all the components of E and G meters is 20 years without maintenance or replacement of the battery. Life time expectancy of the battery of the G meter is calculated using the following conditions: ▪ The use of the display ▪ Hourly communication between G meter and E meter ▪ Yearly update of software (if applicable) ▪ Normal operation of the meter under normal operating conditions Reliability predictions must be done as described in IEC 62059-41. Estimation of the product life time must be done as described in IEC 62059-31-1. For FMEA calculations MIL-HDBK-217 (Electronic Reliability Design handbook) must be used. The results shall be clearly documented and must be available for the grid operator or an external party representing the grid operator.						
History	Dec. 2008	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter, Comm. unit

DSMR-M 4.3.5

Description	Each clock that is part of the metering instrument shall be accurate.						
Rationale	The accuracy of the measurements depends on the accuracy of the registration time of the measurement. For this reason all clocks in the system shall be accurate.						
Fit criterion	Any clock in a metering instrument shall meet the following criteria: ▪ Any clock that is NOT part of a P2 device shall deviate no more than 0.5 seconds per 24 hours. (According to NEN-EN-IEC 62054-21 Electricity metering (a.c.) Tarif and Load Control Part 21: Particular requirements for time switches, Clause 7.5.2.2 Requirements for crystal controlled time switches) ▪ Any clock that is part of a P2 device shall deviate no more than 10 seconds per 24 hours.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.6

Description	During power outage the clock time and date will remain within specifications.						
Rationale	Normally the clock is synchronised during communication. Sometimes communication is not possible during several days. When during a power outage the clock time becomes inaccurate, and after a power outage there is no communication for some time, the registration of the energy, registration of alarms and logs is not correct.						
Fit criterion	It is guaranteed that during a power outage of 5 days the clock time and date will remain within specifications (See IEC 62054-21).						
History	Sep. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.7

Description	The metrological functionality of the metering instrument shall not be affected by power outages.						
Rationale	An outage shall not lead to a loss of data in any way. This means that during the outage no meter data shall be lost or that information on the configuration of the meter or operational parameters are lost or modified even with an empty battery or a discharged supercap.						
Fit criterion	The following information shall be available after the outage as it was available before the outage: ▪ Meter data; ▪ E/G configuration; ▪ E/G operational parameters.						
History	Nov. 2007	**Origin**	EN	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.8

Description	Metering instruments shall re-connect to all communication channels automatically after a power outage in case the medium is available, using a randomising algorithm to reconnect.						
Rationale	A power outage can affect a large number of connections. It is therefore required that the equipment can re-establish communication channels without any intervention from external entities. In order to prevent that many disconnected meters re-establish a connection simultaneously, a randomising reconnect algorithm is to be used.						
Fit criterion	Metering instrument shall start the reconnect algorithm within 5 minutes after power was re-established after an outage using a randomising algorithm to reconnect.						
History	Nov. 2007	**Origin**	EN	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.9

Description	Metering instruments shall issue a tamper alarm when exposed to a magnetic field for which the meter is susceptible (metrological and functional).						
Rationale	Metering instruments shall not be susceptible for static magnetic fields from permanent magnets (as described in EN 50470-1 7.4.11 Immunity to continuous magnetic fields of external origin). However, very strong permanent magnets that can influence the metrological or the functional part of the meter are readily available. These magnets can even permanently damage meters.						
Fit criterion	Meters shall not be susceptible to magnetic fields up to 200 mT. The manufacturer shall define the value of the intensity of the magnetic field for which the meter is susceptible as well as the location on the meter where the highest sensitivity is present. The alarm shall be adjusted to 90% of the magnetic field value. If the meter is not susceptible, or the value at which the meter becomes susceptible for magnetic fields is not defined, the alarm value shall be 500 mT. The alarm shall comply with the requirements for error handling defined in this document. Magnetic field values are applicable at a stable temperature of 23°C for a meter without load (open current circuits) and after the voltage circuits have been energized for at least one hour to reach thermal stability.						
History	Nov. 2007	**Origin**	NTA	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.10

Description	The metering instruments must be able to safely and correctly operate within the temperature range of -25 °C till 55 °C, for G meters a range of -10°C till 40 °C applies.						
Rationale	When selecting metering equipment, attention shall be paid to the fact that the climatic conditions inside buildings depend on the outside (open-air) conditions, which can vary widely throughout the year. The metering equipment must be able to operate safely and correctly within the temperature range as described in EN 60721-3-3 and described in the MID.						
Fit criterion	The metering equipment must be able to operate safely and correctly within the temperature range as described in EN 60721-3-3 Table 1: 3K6 (-25 °C till 55 °C) and for G meters as described in the MID -10 °C till 40 °C applies. If the metering equipment is compliant to a higher class, the manufacturer must indicate which class.						
History	Aug. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.11

Description	The M-Bus cable between the Electricity meter and the M-Bus device shall be standardized.						
Rationale	The M-Bus cable shall be standardized to avoid interoperability problems and prevent having to use different type's op M-Bus cables depending on the meter manufacturers. The cable can then safely be used in a wide range of configurations and installations.						
Fit criterion	The M-Bus cable shall meet the following criteria: ▪ Standard 2-core cable LiYY cross section of 0,25 mm2 ▪ Exterior diameter maximum 4.5mm ▪ Length 2 meter (As a result of the short length there is no need to use the specified 0.5 mm2 cross section as described in EN 13757-2:2004) ▪ Color coded according DIN 47100 (White, Brown) ▪ Exterior color shall be yellow (RAL 1021) for Gas meters*. ▪ Exterior color shall be grey (RAL 7001) for Water meters ▪ Exterior color shall be red (RAL 3020) for Thermal meters ▪ Exterior color shall be blue (RAL 5015) for other M-Bus devices ▪ The cable must have cable end sleeves for the connection with the E meter ▪ The terminal connection shall be constructed to ensure strain relief and simple installation of the products but prevent access to the terminal connection by non-certified persons. When an increasing tensile force is applied on the cable, after installation in accordance with the manufacturer's instruction, either the cable shall break or the cable shall disconnect from the terminal connection, without any further damage to the gas* meter or electricity meter. ▪ Flame behavior in accordance with IEC 60332-1						
History	May 2009	**Origin**	TST WG1	**Port**	P2	**Applicable**	G meter

DSMR-M 4.3.12

Description	The M-Bus terminals shall have unified coding.						
Rationale	During installation it will be necessary to have the same terminal coding on every device.						
Fit criterion	On both E meters and M-Bus devices, terminals will be clearly coded using M1 M2. Whenever it is possible to connect multiple M-Bus devices, the coding shall be repeated.						
History	Oct 2010	**Origin**	TST	**Port**	P2	**Applicable**	E meter, G meter

DSMR-M 4.3.13

Description	The noise produced by the Measuring equipment will remain within acceptable limits.						
Rationale	Some meters produce noise as a result of the measuring method. The sound level produced by the Measuring equipment shall not annoy consumers.						
Fit criterion	The E meter shall not produce noise exceeding 35dB(A) measured at a distance of 1 m from the meter. At half of the maximum flow rate the G meter shall not produce noise exceeding 35dB(A) measured at a distance of 1 m from the meter.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.3.14

Description	The design of the devices must take in account that the security functionality is future proof.						
Rationale	In the design of devices (i.e. processing power, memory) consideration must be given to the following possible changes. ○ Asymmetric security algorithms ○ Key size ○ Key generation in the meter ○ Authentication on P2 ○ Firmware upgrade of M-Bus devices ○ Signed measurements ○ Up to 16 energy registers for E meters, 2 register for G meters (including storage) ○ Extend the number of M-Bus devices						
Fit criterion	The design of the device allows the mentioned future changes.						
History	Jan. 2011	**Origin**	P&S 1.5	**Port**	, P3	**Applicable**	E meter

3.2 E meter

DSMR-M 4.3.16

Description	Power consumption of the E meter shall be minimised and shall not be registered by the E meter.						
Rationale	From both an environmental and economic point of view, the energy consumption shall be minimized. In case there is no load at the customer premises the register values of the E meter shall not increase.						
Fit criterion	The average power consumed by the E meter shall meet the following criteria: ▪ The maximum allowed power consumption without communication and unconnected P1 device is for: - Single Phase Meters 2W / 10 VA - Poly phase Meters 4W / 20 VA ▪ For single phase meters, average power consumption shall not exceed 4 W during communication. For poly phase meters, average power consumption shall not exceed 8 W during communication. ▪ Power consumption of the E meter itself shall not lead to increasing register values of the E meter. ▪ M-Bus transmitters and receivers shall be switched off when no M-Bus devices are attached. During the M-Bus discovery process the transmitters and receivers shall be switched on.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.17

Description	A connection diagram for the E meter shall be available on the meter.						
Rationale	For safe installation and maintenance it is convenient to have a connection diagram readily available.						
Fit criterion	The connection diagram (as described in DIN 43856) shall be place on either the type plate of the meter or in the cover of the terminal block.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.18

Description	Non-mechanical displays on the E meter shall provide functionality to display meter readings, standardized messages and other required information in a convenient way.						
Rationale	For consumers the display is the only means to communicate with the meter. The meter shall therefore provide information in a convenient format.						
Fit criterion	The non-mechanical display for metering instruments shall meet the following criteria: ▪ Characters on the display shall have a minimal height of 8 mm; ▪ The display shall be able to display minimally 8 characters simultaneously.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.94

Description	During power-up of the meter the Legally Relevant Firmware version should be visible						
Rationale	The MID requires that the Legally Relevant Firmware version must be easily retrieved from the metering device. Next to showing this Firmware version in the Service mode of the meter (DSMR-M 4.3.55) it must also be visible during power up of the meter. The duration for which this is shown must be long enough to easily read the Legally Relevant Firmware version number.						
Fit criterion	During power up of the E meter the Legally Relevant Firmware version (Active Firmware Identifier) must be shown for 5 seconds.						
History	Sep. 2013	**Origin**	WG DSMR	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.19

Description	Several configurable readout definitions are needed to define display output in several modes (manual, auto and service) and the P1 output. The Standard Readout Object List is shown in P3, Annex B.						
Rationale	For the customer the display of the meter must have two readouts. In 'auto scroll mode', on the display a defined (minimal) set of items is visible. By the use of a button 'manual scroll mode' is activated. In manual scroll mode it is possible to show a second set of items. By pressing the button a new item will be shown. For P1 output is must be possible to define a third set of items. For service or test purposes it must be possible to define a fourth set of items. These items are only visible when the terminal cover is removed.						
Fit criterion	It must be possible to define four configurable readouts: ▪ P1 output (general local port read out). ▪ Auto scroll mode (general display readout). ▪ Manual scroll mode (alternate display readout). ▪ Service mode (service display readout).						
History	Apr. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.20

Description	In auto-scroll mode of the display, register values, instantaneous power and a display test are shown.						
Rationale	In auto-scroll mode of the display the register values for the defined tariffs, instantaneous power and a display test are shown.						
Fit criterion	In auto-scroll mode of the display is shown: ▪ The register values for the defined tariffs in both energy directions ▪ Active instantaneous power delivered and received (resolution 1 Watt). ▪ Blinking display test. The values are displayed simultaneously with the relevant tariff number including an identification for the energy direction. Each value is visible during a period of 5 seconds.						
History	Apr. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.21

Description	In manual-scroll mode of the display more information as the basic information showed in auto-scroll mode is shown.						
Rationale	In manual-scroll mode of the display the basic information shown in auto-scroll mode is extended with the ID's of the connected M-Bus devices						
Fit criterion	In manual-scroll mode of the display, the information of auto-scroll mode is extended with M-BUS ID's of connected M-Bus devices. Manual scroll mode is activated by pressing a button. Every time the button is pressed, a new item is shown. When the button is not touched during a period of 30 seconds, display mode changes from manual mode to auto scroll mode.						
History	Apr. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.22

Description	Service mode of the display is activated when the terminal cover is removed.						
Rationale	During installation (while the terminal cover is removed) most detailed information is needed for a quick installation, trouble shooting and testing.						
Fit criterion	Service mode of the display is activated when the terminal cover is removed. In service mode the next information should be visible: ▪ Actual date and time ▪ The register values for all tariffs in both energy directions in Wh resolution ▪ ID's of connected M-Bus devices ▪ Version of Legally Relevant and Non Legally Relevant Software ▪ Active instantaneous power per phase for both energy directions. During installation of M-Bus devices, if there are more than 10 devices available to choose from, at least 10 device ID's must be shown. Every time a button is pressed, a new item is shown. When the terminal cover is installed the display changes to auto scroll mode. The values are displayed simultaneously with the relevant reduced OBIS codes (value group C,D,E i.e.1.8.1) whenever the second display row is not occupied for other specified information.						
History	Apr. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.22a

Description	It must be possible to set E meters into "Installation mode" at the moment of installing metering instruments at a customer's premises.						
Rationale	During installation, G meters have to be commissioned to the E meter according to the P2 companion standard. Only after this process, regular communication between the E meter and the G meter will be able to start.						
Fit criterion	The method (power up and/or removal of the M-Bus cover), by which the E meter is set to "installation mode" is configurable via the configuration object.						
History	June 2011	Origin	TST	Port	n.a.	Applicable	E meter

DSMR-M 4.3.23

Description	The E meter shall provide electromagnetic compatibility (EMC).						
Rationale	For more reliability the meter shall be immune to all disturbances that can happen in practice.						
Fit criterion	In order for the E meter to be considered electro magnetically compatible, it shall meet the EMC criteria in the following standards: ▪ EN 50470-1 Electricity Metering Equipment (a.c.) – Part 1 General Requirements paragraph 7.4 Electromagnetic compatibility ▪ Special test levels for Immunity to damped oscillatory waves. IEC 61000-4-12, Ring wave immunity test (Chapter 5, testlevel x) Test levels for ring wave: Line to ground: 6 kV Line to line: 6 kV						
History	Nov. 2007	**Origin**	EN	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.24

Description	The E meter shall be compliant with NEN-EN-50470						
Rationale	The E meter is compliant with NEN-EN 50470-1 Electricity Metering Equipment (a.c.) – Part 1 General Requirements, and the E meter is compliant with NEN-EN 50470-3 Electricity Metering Equipment (a.c.) – Part 3: Particular requirements, Static meters class index A, B en C.						
Fit criterion	The E meter is compliant with NEN-EN-50470-1 and NEN-EN 50470-3						
History	Sep. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.25

Description	The E meter shall not be susceptible for electrostatic discharge.						
Rationale	For more reliability the meter shall be immune to all disturbances that can happen in practice.						
Fit criterion	The E meter shall be immune for electrostatic fields. The test shall be carried out according EN 50470-1 par. 7.4.5.						
History	Nov. 2007	**Origin**	EN	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.91

Description	The E meter shall be immune for electromagnetic disturbances in the frequency range of 2 - 150 kHz.						
Rationale	Static Watt-hour meters shall be immune for electromagnetic disturbances in the frequency range of 2kHz-150 kHz. As an extension for EN 50470-1 and EN 50470-3 the specific requirements and tests are described in NPR-CLC TR 50579.						
Fit criterion	The meter must comply to NPR-CLC TR 50579, Class B. Tests are part of the MID approval and the test results are described in the evaluation report of the MID approval. Also the meter documentation shall clearly state that electromagnetic disturbances in the frequency range of 2 kHz – 150 kHz are tested conform NPR-CLC TR 50579, Class B						
History	Sep. 2013	**Origin**	WG DSMR	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.26

Description	The poly-phase E meter shall be suitable to use in installations with right or left phase sequence.						
Rationale	The meter must be safely usable in a wide range of configurations and installations.						
Fit criterion	It shall be stated in the EC type-examination certificate or EC design examination that the meter is not sensitive to the applied phase sequence (influence due to reverse phase sequence ≤ 10% of the class accuracy, i.e. 0,2%, 0,1%, 0,05% respectively). Also the meter documentation shall clearly state that reversed phase sequence does not influence the accuracy of the energy measurement. No blinking indication on the display is allowed to identify phase sequence.						
History	Nov. 2007	**Origin**	EN	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.92

Description	The poly-phase E meter shall be suitable to be used in case of simultaneous consumption and delivery of energy						
Rationale	Meters are more often used in situations with distributed energy production.						
Fit criterion	The use of the poly phase watthour meter for simultaneous consumption and delivery has to be stated in the EC type-examination Certificate.						
History	Sep. 2013	**Origin**	WG DSMR	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.27

Description	The poly-phase E meter shall use the Ferraris energy measurement method.						
Rationale	Poly-phase E meter shall use the Ferraris method in which both energy directions of the 3 phases are summed and depending of the results, stored in a “+” or “-” register. The integration period shall be small enough for an accurate registration of delivered (A-) and consumed (A+) energy in separate registers.						
Fit criterion	The poly-phase E meter shall use the Ferraris energy measurement method.						
History	Nov. 2007	**Origin**	EN	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.28

Description	The display shall indicate every connected phase.						
Rationale	The network of the grid operators can have both right and left phase sequence. In both cases the phase indicators on the display shall show normal operation and not start flashing since this will cause unnecessary calls from customers to the GO.						
Fit criterion	Phase indicator will light constantly when phase is connected. For example: when L1 is disconnected, only indicators for L2 and L3 are shown.						
History	Jun 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.29

Description	The display shall indicate the energy flow of each phase during installation when the terminal cover is removed.						
Rationale	To prevent wrong connection of “phase in” and “phase out” we must have a mechanism in the meter to indicate the energy flow at each phase during installation.						
Fit criterion	Phase indicator will light constantly when energy is delivered to the customer. Phase indicator will blink when energy is received from the customer at this phase. This functionality is only present while the terminal cover is removed.						
History	Oct 2010	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.30

Description	It must be possible to read the actual value and direction of the energy flow of each phase.						
Rationale	There must be a method to check the proper wiring of an E meter during normal operation on distance, because an installer can make mistakes. By combining information from the customer and the actual power of each phase, it is possible to determine the right order of the phase in – phase out connections of each phase.						
Fit criterion	The actual power of each phase must be available for readout.						
History	Nov 2010	Origin	TST	Port	P0, P3	Applicable	E meter

DSMR-M 4.3.31

Description	The registration of energy shall start at a load as low as possible.						
Rationale	Energy efficient equipment makes it necessary to start an accurate registration of energy at low loads. This can be achieved by choosing a low value for Iref.						
Fit criterion	The current range for direct connected kWh meters will be: Imin=0,25A; Iref= 5A The current range will be: 0,25 - 5(*I*max) A. (Compliant with NEN-EN50740-1)						
History	Jan 2011	Origin	TST	Port	n.a.	Applicable	E meter

DSMR-M 4.3.93

Description	When there is only flow of energy in one direction (consumption or delivery), the E meter shall just register energy for this specific direction.						
Rationale	Some electric energy meters have turned out to register **very** small amounts of energy over a long period of time for the energy direction where no load occurs. Example: For a premise without energy generation, a very small amount of energy was registrated on the delivery registers (A-). This should never occur. This is an additional requirement on MID Annex MI-003 section 5.4.						
Fit criterion	When there is only flow of energy in one direction (consumption or delivery), the E meter shall just register energy for this specific direction.						
History	Sep. 2013	**Origin**	WG DSMR	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.32

Description	The E meter shall be protective class II.						
Rationale	The meter must be safely usable in a wide range of installations.						
Fit criterion	The E meter shall comply with EN 50470-1 sub clause 5.7 (Insulating encased meter of protective class II)						
History	Nov. 2007	**Origin**	EN	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.33

Description	AC Voltage Test according to an E meter protective class II						
Rationale	The meter must be safely usable in a wide range of installations.						
Fit criterion	The test shall be carried out according EN 50470-3 sub clause 7.2 (AC voltage test) table 3.						
History	Sep. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.34

Description	The E meter shall be class B, with class A mentioned on the type plate.						
Rationale	Class A instruments are sufficient for the purpose of residential usage. GO's however want a higher accuracy than class A and therefore require the metering instrument to fulfil class B requirements.						
Fit criterion	Testing for class A and B will be performed in two steps: ▪ A notified body for certifying meters will test the equipment to fulfil class A requirements; ▪ The GO will test the equipment to fulfil class B requirements.						
History	Nov. 2007	**Origin**	EN	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.35

Description	The status information displayed on the E meter by flags shall be standardised.						
Rationale	Through standardization of the status information on the display, the customer processes can be standardized.						
Fit criterion	For status information flags are required: • An indication if the meter is administrative on or off. Two flags for three possibilities Undefined (Factory setting) (value attribute 2 = 0); flag 1 and 2 off Administrative off (value attribute 2 = 1): flag 1 on or Default (value attribute 2 = 2): flag 2 on Identification is based on OBIS code 0-1:94.31.0.255 attribute 2 • An indication if the communication module is attached to the network • An indication per phase if the voltage is present • An indication for a successful self-check (Only visible in service mode) • Minimal 3 reserved flags for future use Flags are (together with register values) always visible in manual scroll mode, auto-scroll mode and service mode.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.36

Description	The information displayed on the E meter other than mentioned in DSMR-M 4.3.35 shall be standardised.						
Rationale	Through standardization of the information displayed on the E meter, the customer processes can be standardized.						
Fit criterion	Additional to flags, the display shall at least contain the following symbols: ▪ GPRS Signal Strength (4 levels). ▪ Actual energy Direction.						
History	Apr. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.37

Description	Terminal screws shall be of sufficient quality.						
Rationale	Screws shall not be worn during or after mounting.						
Fit criterion	The tightening torque to ensure a good connection shall be less then 3 Nm. This value shall be specified by the manufacturer. With a value of 1.5 times the value specified by the manufacturer, with a minimum of 3.5 Nm, it shall be possible to tighten and loose the screws 25 times without damage.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.38

Description	Meters shall be able to withstand currents related to the main fuses						
Rationale	The related currents to the main fuses are specified in the Meetcode.						
Fit criterion	Poly phase meters must be delivered in an Imax ≥ 100A version. Single phase meters must be delivered in an Imax ≥ 80A version.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.3.43

Description	The E meter shall convert the time stamps of the M-Bus register values from UTC time to Local Time.						
Rationale	The G meter has only UTC time information available while the interface on P1 and P3 is based on Local Time.						
Fit criterion	The E meter shall convert the time stamps of the M-Bus register values from UTC time to the Local Time of the E meter at the moment these register values are received via P2.						
History	Apr. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

3.3 G meter

DSMR-M 4.3.45

Description	G meters that are implemented as diaphragm meters shall comply with the latest release of EN 1359.						
Rationale	Multiple methods exist for measuring the amount of gas consumer. For each of these methods a specific standard is defined.						
Fit criterion	The vendor shall supply a certificate from a notified body for the metering instrument stating that it complies with the latest release of EN 1359.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.46

Description	G meters that are implemented as ultrasonic meters shall comply with EN 14236.						
Rationale	Multiple methods exist for measuring the amount of gas consumer. For each of these methods a specific standard is defined.						
Fit criterion	The vendor shall supply a certificate from a notified body for the metering instrument stating that it complies with EN 14236.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.47

Description	G meters that are implemented as rotary displacement meters shall comply with EN 12480.						
Rationale	Multiple methods exist for measuring the amount of gas consumer. For each of these methods a specific standard is defined.						
Fit criterion	The vendor shall supply a certificate from a notified body for the metering instrument stating that it complies with EN 12480.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.48

Description	The G meter is equipped with temperature conversion.						
Rationale	The G meter is equipped with temperature conversion. The G meter will convert the uncorrected measured volume to a volume at 0°C. and an absolute pressure at base conditions of 1013,25 mbar taking into account a pressure of 1043,5 mbar (average atmospheric pressure + working pressure; 1015,5+28mbar,) i.e.using the following formula: $\frac{\mathbf{273{,}15}\ [\boldsymbol{K}]}{\boldsymbol{tgas}\ [\boldsymbol{K}]} * \frac{\mathbf{1043{,}5}\ [\boldsymbol{mbar}]}{\mathbf{1013{,}25}\ [\boldsymbol{mbar}]}$						
Fit criterion	The G meter will convert the uncorrected measured volume to a volume at 0°C and 1013,25 mbar taking into account a pressure of 1043,5 mbar						
History	Jan. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.49

Description	G meters that are implemented with an electronic index and temperature conversion shall comply with MID (Measuring Instruments Directive), appendix MI-002, part 1, § 2.2 en part 2.						
Rationale	Multiple methods exist for temperature conversion, electronically or mechanically. For each of these methods a specific standard is defined. All new gas meters in The Netherlands such as diaphragm meters, ultrasonic meters etc. with an electronic index and temperature conversion need to comply with MID appendix MI-002, part 1, § 2.2 en part 2. The MID in turn refers to EN 1359:1998/A1:2006 (annex B) and EN 14236 (annex C)						
Fit criterion	The vendor shall supply a certificate from a notified body for the metering instrument stating that it complies with the MID, appendix MI-002, part 1, § 2.2 en part 2.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.50

Description	G meters that are implemented with a mechanical index and mechanical temperature conversion must have a MID approval and comply with EN 1359:1998 Annex-B supplemented with EN 1359:1998/A1:2006 Annex-B.						
Rationale	Multiple methods exist for temperature conversion, electronically or mechanically. For each of these methods a specific standard is defined.						
Fit criterion	The vendor shall supply a certificate from a notified body for the metering instrument stating that it complies with the MID, appendix MI-002, part 1, § 2.2 en part 2 and complies with EN 1359:1998 Annex-B supplemented with EN 1359:1998/A1:2006 Annex-B.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.51

Description	G meter shall transmit only the temperature converted interval value (the temperature converted interval value is also the only value indicated on the display).						
Rationale	In the Netherlands there are two types of temperature converted meters, G meters that are implemented with a mechanical temperature conversion and G meters that are implemented with an electronic temperature conversion. Only the temperature converted interval values will be transmitted to the CS. The unconverted interval values may only be used internally by the G meter.						
Fit criterion	By default only the temperature converted interval value will be transmitted and shown on the display. The unconverted interval values may only be used internally by the G meter.						
History	Nov. 2007	**Origin**	TST	**Port**	P2, P3	**Applicable**	G meter

DSMR-M 4.3.52

Description	G meters shall comply with the latest release of EN 12405						
Rationale	In the standards for measuring volume conversion is not included. G meters that convert the volume to m_n^3 shall comply with the latest release of EN 12405						
Fit criterion	The vendor shall supply a certificate from a notified body for the metering instrument stating that it complies with the latest release of EN 12405						
History	Sep. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.53

Description	The meter shall withstand a vertical drop as described in NEN-EN 1359 and keep full functionality.						
Rationale	In case of a vertical drop as described in NEN-EN 1359, not only metrological performance has to work properly but also other functions like communication.						
Fit criterion	All functions of the G meter must be able to withstand a vertical drop of the meter as described in NEN-EN 1359.						
History	Sep. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.54

Description	It should be possible to activate additional functions of the G meter.						
Rationale	Only one button is used for all functions.						
Fit criterion	Only one button is used to activate service mode and show Legally Relevant software versions.						
History	Mar. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.54a

Description	It must be possible to set wireless G meters into “installation mode” at the moment of installing metering instruments at a customers premises.						
Rationale	During installation G meters have to be commissioned to the E meter according to the P2 companion standard. Only after this process, regular communication between the E meter and the G meter will be able to start.						
Fit criterion	It must be possible to set G meters into installation mode with the button functionality.						
History	June. 2011	Origin	TST	Port	n.a.	Applicable	G meter

DSMR-M 4.3.55

Description	As required by MID the software version identification of Legally Relevant software shall be easily provided by the measuring instrument.						
Rationale	The version identification of Legally Relevant software shall easily be shown on the display.						
Fit criterion	The version identification of Legally Relevant software must be shown on the display in the service mode of the G meter.						
History	Mar. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.56

Description	It must be possible to activate a service mode in the G meter.						
Rationale	Testing of a meter must be done in a reasonable time. This is not possible if the standard resolution is not precise enough. In that case it must be possible to activate a service mode in the G meter during which the registers have a 0,1 litre resolution for G4 meters and a 1 litre resolution for meters > G6. In service mode the Legally Relevant Software is shown in the display						
Fit criterion	It must be possible to activate a service mode in the G meter during which the registers have a 0,1 litre resolution for G4 meters and a 1 litre resolution for meters > G6. In this service mode also the Legally Relevant Software is shown in the display. In case of a display with sleeping mode functionality: ▪ After activating the display by pushing the button, service mode is activated by a manufacturer specific action.. The code for the LR software is shown in service mode in the next sequence: Display test → Index value → LR → Display test →…… ▪ Return to sleeping mode after a manufacturer specific timeout (and optional by an action) In the case of a display without sleeping mode functionality activating of the service mode is done: ▪ by a manufacturer specific action. The code for the LR software is shown in service mode in the next sequence: Display test → Index value → LR → Display test → ….. ▪ Return to normal mode after a manufacturer specific timeout (and optional by an action). ▪ Testing at Qmin may not take more than 30 minutes. ▪ Test results shall be reproducible and repeatable (as described in MID).						
History	Nov. 2010	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.57

Description	Power consumption of G meter shall be minimised.						
Rationale	For economic and environmental reasons the power consumption of the meter shall be minimized. Besides this it is important to reduce power consumption in G meters that are powered by a battery as replacement of batteries is expensive. Finally the power used by G meters that use M-Bus as a power source shall not exceed the maximum power delivered by M-Bus.						
Fit criterion	The lifetime of the battery in the G meter shall exceed the lifetime of the G meter in situations where communication is restricted to the requirements stated in this document.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.58

Description	The G meter shall be compatible with the PN-class ≥ 0.2 bar.						
Rationale	The G meters will be used to connect customers to 30 and 100 mbar grids. In some cases standard 100 mbar grids are operated at 200 mbar. In case the household pressure regulator fails, the G meter can be subjected to 200 mbar.						
Fit criterion	No leakage and no permanent damage shall occur and all functionalities will be maintained in a 200 mbar pressure test.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.59

Description	The G meter must comply with the standard G series.						
Rationale	Only meters in the standard G range 1.6 to 25 are considered, as meters that can handle larger volumes require different installation environments than the ones envisioned for the product.						
Fit criterion	The respective G meters shall in accordance with the G series have maximum flow rates of: ▪ G1.6 2.5 m^3/h ▪ G2.5 4.0 m^3/h ▪ G4 6.0 m^3/h ▪ G6 10.0 m^3/h ▪ G10 16.0 m^3/h ▪ G16 25.0 m^3/h ▪ G25 40.0 m^3/h						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.60

Description	No leakage and no permanent damage shall occur in a 500 mbar pressure test.						
Rationale	G meters of G series 10 or higher will be used to connect customers to grids with higher pressures than 100 mbar. In case the pressure regulator fails, the G meter can be subjected to 500 mbar.						
Fit criterion	G meters of G series 10 or higher shall be compatible with the PN-class ≥ 0.5 bar.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.61

Description	G meters of G series 10 or higher the resolution will be in 0.01 m3						
Rationale	The NTA specifies 0.001 m3 resolution but these gas meters do not supply this resolution.						
Fit criterion	The G meters of G series 10 or higher use a resolution of 0.01 m3. The E meter shall handle automatically the proper M-Bus attribute (VIF)						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter, E meter

DSMR-M 4.3.62

Description	The metering instrument shall be class 1, with class 1.5 mentioned on the type plate.						
Rationale	Class 1.5 instruments are sufficient for the purpose of residential usage. GO's however want a higher accuracy than class 1.5 and therefore require the metering instrument to fulfil class 1 requirements.						
Fit criterion	Testing for class 1 and 1.5 will be performed in two steps: ▪ A notified body for certifying meters will test the equipment to fulfil class 1.5 requirements; ▪ The GO will test the equipment to fulfil class 1 requirements.						
History	Nov. 2007	**Origin**	Q&P	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.63

Description	The frequency of planned onsite maintenance on the G meter shall be minimized.						
Rationale	Onsite maintenance activities on the meter disturbs the consumer and shall therefore be kept to a minimum. Another reason to keep maintenance on location to a minimum is that it is very expensive.						
Fit criterion	No planned maintenance needed during the lifetime of the meter.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.64

Description	The G meter shall be suitable for Dutch Gas of second family group L.						
Rationale	In the Netherlands low calorific gas is used. In order to measure correctly, the meter needs to be suitable for this gas.						
Fit criterion	The G meter shall be suitable for Dutch Gas of second family group L.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.65

Description	Gas meters shall comply with Nederlandse Praktijk Richtlijn (NPR) 7028.						
Rationale	NPR 7028 contains the Dutch standards for diaphragm meters but is also considered applicable for ultrasonic gas meters. This standard contains some requirements (mainly about dimensions and connections) which are not described in EN 1359.						
Fit criterion	G meters shall comply with the requirements for connections and dimensions in NPR 7028. In contradiction to NPR 7028; for a G25 gasmeter the maximum width of the gasmeter is 540 mm.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.66

Description	All G meters shall be supplied with removable end caps installed.						
Rationale	The end caps serve to prevent ingress of dust and dirt into the meter during transport and installation.						
Fit criterion	Removable end caps will be installed on both inlet and outlet						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.76

Description	G meters shall have a flow direction from left (Gas in) to right (Gas out) when looking at the index.						
Rationale	The G meters have a standardized flow direction from left to right when looking at the index.						
Fit criterion	G meters shall comply with the standardized flow direction of left (Gas in) to right (Gas out) when looking at the index.						
History	Dec. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.77

Description	G meters shall have reverse flow protection or prevent the register value (for gas delivery) to change in case of a reversed flow direction.						
Rationale	Since the G meter has a standardized flow direction from left to right it could be possible to mount the meter in a reversed flow direction. If the G meter is mounted in a reversed flow direction the register values (for gas delivery) shall not change.						
Fit criterion	G meters shall have reverse flow protection or prevent the register value (for gas delivery) to change in case of a reversed flow direction.						
History	Dec. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.78

Description	In case a reversed flow direction is detected the G meter shall register this as a fraud attempt.						
Rationale	Since the G meter has a standardized flow direction from left to right it could be possible to mount the meter in a reversed flow direction. If the G meter is mounted in a reversed flow direction the G meter shall register an event.						
Fit criterion	The G meter shall register a fraud attempt in case a reversed flow direction is detected.						
History	Dec. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.3.79

Description	Displays shall provide easy to read values.						
Rationale	The characteristics of mechanical displays are defined in EN 1359. This document specifies the size of numerals for meter readings. Electronic displays shall conform to the sizing requirements.						
Fit criterion	The digits of displays shall have a minimal height of 4 mm and a minimal width of 2.4 mm. The distinction between the numbers before and after the decimal point must be clearly marked with for example a red frame on the meter plate.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

3.4 Communication channels

DSMR-M 4.3.80

Description	The E meter ***shall*** have a standardized local port for installation and maintenance purposes (P0).						
Rationale	The maintenance personnel want to access all meters in a similar fashion.						
Fit criterion	The P0 interface shall be implemented as an optical port. Only 1 local maintenance port P0 will be present per device.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0	**Applicable**	E meter

DSMR-M 4.3.80a

Description	The protocol to be used on the P0 interface shall be standardized.						
Rationale	The maintenance personnel want to access all meters in a similar fashion.						
Fit criterion	The protocol on the P0 interface shall be IEC 62056-21, mode E using 8 data bits. The application level shall be according to the P3 companion standard.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0	**Applicable**	E meter

DSMR-M 4.3.81

Description	Communication on the P1 interface shall be standardized.						
Rationale	The OSM is provided by a third party, therefore interoperability on P1 is required.						
Fit criterion	The P1 interface shall be implemented according to the P1 Companion Standard.						
History	Nov. 2007	**Origin**	TST	**Port**	P1	**Applicable**	E meter

DSMR-M 4.3.82

Description	Communication on the P2 interface shall be standardized.						
Rationale	Interoperability is required on the P2 interface, to allow for communication with different Gas (and water and thermal) meters.						
Fit criterion	The P2 interface shall be implemented according to the P2 Companion Standard.						
History	Nov. 2007	**Origin**	TST	**Port**	P2	**Applicable**	E meter, G meter

DSMR-M 4.3.83

Description	Communication on the P3 interface shall be standardized.						
Rationale	Interoperability is required on the P3 interface, to prevent vendor lock-in and to simplify the data acquisition process in the CS.						
Fit criterion	The P3 interface shall be implemented according to the P3 Companion Standard. The P3 Companion Standard is based on the DLMS/COSEM protocol.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

3.5 Event logging and error reporting

This section describes mandatory constraints from the point of view of installation and maintenance.

3.5.1 Logging

DSMR-M 4.3.84

Description	The log items shall facilitate the verification of the state of equipment and the process of troubleshooting.						
Rationale	Logging information is used in combination with the state of equipment to verify the correct functioning of Measuring and communication equipment. The logging shall therefore facilitate the construction of a history of activities that took place in the equipment.						
Fit criterion	Each log item shall contain at least the following information: ▪ Timestamp of the logged event; ▪ Activity type of the logged event (event code); ▪ Parameters of the logged event (if specified in use case).						
History	Nov. 2007	**Origin**	TST	**Port**	n.a	**Applicable**	E meter,

DSMR-M 4.3.85

Description	Equipment shall log all activities that modify the state of equipment.						
Rationale	The GO may need to determine what caused the state of equipment to change. In case of problems with equipment he can derive the possible cause of the problem by 'walking back' through the logging information and derive the state of the equipment 'along the way'.						
Fit criterion	The logging information for a designated period shall enable the reconstruction of the state at the start of that period given the state at the end of the period. All event codes shall have a value from a pre-defined range as defined in the Companion Standards for P2 and P3.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a	**Applicable**	E meter

3.5.2 Errors

In this section we will distinguish between:

- Normal errors: The term normal error is used for errors which occur during operation of the meter. These are logged as normal errors, i.e. an event log entry is generated and an error or alarm bit is set in the corresponding register, i.e. flat battery, memory errors, communication errors.
- Logical errors: The term logical error is used in case of errors in command parameters, i.e. the start date is after the end date, the activation date lies in the past, etc. These errors always lead to an error message sent back in the answer to the command. This kind of errors is not logged in the event log and no error bit is set in the error register.
- Software errors: General wisdom states that all software contains defects. This will be true for firmware that is part of the equipment too. People involved in maintenance of the equip-

ment shall therefore be informed on any software error that occurs. Examples of software errors include: index out of range, out of memory, invalid parameter etc.

DSMR-M 4.3.86

Description	The equipment shall support a uniform description for errors exchanged through P3.						
Rationale	In order to facilitate error handling by central systems, the equipment shall exchange uniform errors. This may involve functionality for the E meter for converting errors received through P2 before these errors are forwarded through P3. For individual errors presented throughout the document, additional attributes may be defined.						
Fit criterion	All errors exchanged with external entities shall at least contain the following information: ▪ Error code for the type of error. ▪ A corresponding event shall be stored, including the timestamp of when the error was raised.						
History	Nov. 2007	**Origin**	I&M	**Port**	P3	**Applicable**	E meter

DSMR-M 4.3.87

Description	The error code used in errors shall have a value from a pre-defined range as defined in the Companion Standards for P2 and P3.						
Rationale	For maintenance purposes a uniform error code for errors facilitates the process of handling the error. In case of uniform error codes the personnel does not need any knowledge of the equipment in order to determine what type of error occurred.						
Fit criterion	The value of error codes shall be in the range of error codes as defined in the Companion Standards for P2 and P3. Vendor specific alarms are not allowed.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a	**Applicable**	E meter, G meter

3.5.3 Error reporting

The equipment shall support two methods of event reporting. The first method is based on a request of a time frame specified by the CS. The second is a direct way of sending errors to a central system. The latter method is referred to as alarms.

DSMR-M 4.3.88

Description	The equipment shall include an event report through P3 if the Measuring equipment state is retrieved.						
Rationale	The personnel involved in maintenance of the equipment shall be regularly informed on new events. The event report is used for this purpose. Based on the error report maintenance personnel can decide on further actions. Events are retrieved from the equipment by Use case: Retrieve Measuring equipment state.						
Fit criterion	It shall be possible to retrieve a list of events through the P3 port.						
History	Nov. 2007	**Origin**	I&M	**Port**	P3	**Applicable**	E meter

3.5.4 Software errors

DSMR-M 4.3.89

Description	The equipment shall raise an error in case a malfunction of the software occurs.						
Rationale	General wisdom states that all software contains defects. This will be true for firmware that is part of the equipment too. People involved in maintenance of the equipment shall therefore be informed on any software error that occurs. Examples of software errors include: index out of range, out of memory, invalid parameter etc.						
Fit criterion	A watchdog that checks software activity shall detect software errors. If the watchdog detects an anomaly, the event is logged and the corresponding error is set in the error register.						
History	Nov. 2007	**Origin**	I&M	**Port**	P3	**Applicable**	E meter, G meter

4 ACCESS AND SECURITY

Cyber-security is a well-known issue in classical IT systems. For some years, attention has been focussed on cyber-security concerning industrial systems which are more complex, independent and interconnected.

Authorities put a special emphasis on Critical Infrastructure Protection and Industrial Automation Control Systems, especially infrastructure supporting energy, transport, telecommunications, and water..

Metering is directly affected by this focus. Security is everywhere in the metering process, from the meter to the central system, including each network and media used to communicate (home network, public network and enterprise network). All partners, from manufacturers to suppliers and regulation authorities have to work together in raising awareness and securing the metering systems.

4.1 Threats and critical actions

Risks for actors of an Advanced Meter Infrastructure (grid operator, supply company, customer) are multiple and of different natures:

- Access or alteration of information by unauthorized persons: intrusions and illicit changes.
- Willful actions by intruders, resulting in modifying settings of assets and confidence.
- Denial of service on a component of the system (meter, back-office, communication system): loss of system availability, leading to compromised process functionality or security.
- Hijacking of the automated meter by unauthorized persons, leaving the grid operator with no other option as to remediate the meters on customer premises.
- Privacy and legislation: many countries protect customer's and people's rights by laws, to ensure that personal and confidential information will not be disclosed within communicating systems; Grid systems shall not be a way to reveal information: theft and publication of information to unauthorized destinations should be prevented.

. Compromising security for a company could lead to Millions of Euros in damages (for equipment and responsibility).

For all these reasons, the entire metering infrastructure has to be protected and shall offer security services for all data, networks, and the components of which it is composed.

4.2 Assumptions

It is recommended that proven standards and industry best practices used for IT systems are implemented. This includes technologies deployed in other domains, such as the finance sector. Existing systems should be considered and adapted, and security measures not reinvented. As

threats and risks evolve along the life-span of the metering infrastructure, special attention shall be given to updating the security mechanisms.
The concept of “defense in depth” shall be applied to the entire system: security at each layer of the metering infrastructure, from the centralized system to the end-point meter, including networks. The WELMEC Software Guide 7.2 issue 4 gives guidance about software security which is extended to data communications networks (extension T). The requirements below are in accordance with Welmec Guide, taking into consideration that the metering infrastructure must offer the functionality necessary to cover risk categories B-C-D (requirements T1 to T6) of the Welmec Guide.

Security Assumptions:

- If physical intrusion of a meter happens, the compromising of one device shall not permit compromising all of the system.
- Sensitive information and commands will have to be protected.
- Most communications at application level between the device and the CS is encrypted, using the published and acknowledged encryption mechanism AES-128. Usage of trusted equipment, such as cryptographic processor embedded in smart-cards shall be considered because they are tamper resistant.
- Since security standards are available for IT systems and Industrial Automation and Control Systems, they shall be applied, from the very conception of the systems to the deployment of devices and system.

The metering infrastructure shall prevent:

- Unauthorized access, theft or misuse of confidential information (data cannot be read or altered in the meter or in transit across all networks).
- Loss of integrity or reliability of process data and production information.
- Loss of system availability (back-office and data processing is secured).
- Intrusions and illicit changes – for example illicit firmware upgrade.
- Process upsets leading to compromising of process functionality or loss of system capacity (separation of responsibilities for appropriate actions).

Identified requirements to complete these needs are:

- Access and Use Control
- Authenticity
- Data integrity
- Data Confidentiality

4.3 Access, Use Control and Authenticity

Only the grid operator is allowed to have access to the P3 port. In case there is a separate grid operator for electricity and for gas, only the electricity grid operator shall have direct access to the metering installation via the P3 port. The electricity grid operator is responsible for the correct data communication between the electricity meter and M-Bus devices, and is also responsible for the correct data communication from the metering installation to the central system and

vice versa. The manufacturer of equipment must ensure the correct implementation of the *identification*, *authentication* and *authorization* concerning the metering installation, and *confidentiality* of the data communication from the metering installation to the central system and between the metering installation and the connected Gas, Water, Thermal, end Slave E meter (P2 port), regardless of the communication medium used.

DSMR-M 4.4.1

Description	No physical port or interface can be accessed without opening the cover(s), except for P0 and P1.						
Rationale	For security reasons and to avoid any unauthorized person from accessing or modifying system components or data, it is necessary that no physical port or interface can be accessed without opening the cover(s), except for P0 and P1.						
Fit criterion	Physical ports or interfaces cannot be accessed without opening the cover(s), except for P0 and P1						
History	Sep. 2009	**Origin**	TST	**Port**	P2, P3	**Applicable**	E meter

DSMR-M 4.4.2

Description	The system shall be capable of automatically generating an event when the terminal cover is opened.						
Rationale	For security reasons and to avoid any unauthorized person from accessing or modifying system components or data, it is necessary to detect physical intrusion. The system must therefore be capable of automatically generating an event when the terminal-cover is opened.						
Fit criterion	An event for opening the terminal cover will be generated. Adequate measures must be taken to prevent false alarms (i.e by vibrations, humidity).						
History	July. 2009	**Origin**	P&S 1.5	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.4.3

Description	The construction of the E meter shall prevent intruding into the E meter and tampering with the E meter.						
Rationale	Intrusion and tamper attempts shall be visible on visual inspection.						
Fit criterion	The E meter and the block cap are protected by separate seals in order to prevent intruding into the E meter and tampering with the E meter.						
History	Nov. 2007	**Origin**	P&S 1.5	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.4.4

Description	The construction of the G meter shall prevent intruding into the G meter and tampering with the G meter.						
Rationale	Intrusion and tamper attempts shall be visible on visual inspection.						
Fit criterion	The connections of the G meter can be sealed on both sides (inlet and outlet). Any communication cables, batteries and similar, shall be locked behind sealable covers.						
History	Nov. 2007	**Origin**	P&S 1.5	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.4.5

Description	The M-Bus terminals on the E meter must be safely accessible.						
Rationale	Connecting the cable of the M-Bus device should be possible in a safe way. It should not be possible to touch live parts of the meter.						
Fit criterion	The M-Bus terminals on the E meter shall be accessible without breaking the seal of the terminal cover of the E meter. The M-Bus terminals on the E meter shall be separately sealable from the other terminals. For every M-Bus device separate terminals are required.						
History	Sep. 2009	**Origin**	TST	**Port**	P2	**Applicable**	E meter

DSMR-M 4.4.6

Description	The equipment shall provide functionality for authentication on the communication ports P0 and P3.						
Rationale	For security reasons it is important that equipment is able to determine authenticity of communication partners to ensure that data is not modified or compromised by any unauthorized entity.						
Fit criterion	No port can be accessed without correct authentication by applying an encryption algorithm that includes authentication mechanisms.						
History	Nov. 2007	**Origin**	P&S 1.5	**Port**	P0, P3	**Applicable**	E meter

DSMR-M 4.4.7

Description	The equipment shall support functionality to configure whether the P0 port is usable or not usable.						
Rationale	Some Grid Operators use a PDA connected to the P0 port for commissioning the E meter, or for some local maintenance tasks (e.g. Calibration Rack).						
Fit criterion	When the P0 port is configured as not usable then there shall be no method, including brute force attack, to gain access to the meter via the P0 port.						
History	Jan. 2011	**Origin**		**Port**	P0	**Applicable**	E Meter

DSMR-M 4.4.8a

Description	The equipment shall support functionality to configure the supported authentication mechanism on P0 and P3 port.						
Rationale	This functionality give the opportunity to the Central System to select another authentication mechanism when one authentication mechanism is not safe anymore.						
Fit criterion	It shall be possible to configure for HLS mechanism 3,4 and 5 or any combination for both P0 and P3 whether the meter accepts the authentication request or reject the authentication request.						
History	Jan. 2011	**Origin**		**Port**	P0, P3	**Applicable**	E Meter

DSMR-M 4.4.8b

Description	The equipment shall support functionality to configure different HLS mechanisms for P0 and P3 port. .						
Rationale	Some Grid Operators use a PDA connected to the P0 port for commissioning the E meter using HLS mechanism 4 with a secret that is shared with a group of meters. Access to the meter via the P3 port using such shared secret shall be prevented.						
Fit criterion	The HLS mechanism on P0 and P3 port can be configured independently from each other.						
History	Jan. 2011	**Origin**		**Port**	P0, P3	**Applicable**	E Meter

DSMR-M 4.4.9

Description	The equipment must be capable of managing access rights for any of its logical components, with an adequate granularity.						
Rationale	Users shall be authenticated and authorized to access the logical components of the equipment.						
Fit criterion	Access control will be offered for any of its logical components on attribute level. .						
History	July. 2009	**Origin**	TST	**Port**	P0, P3	**Applicable**	E meter

DSMR-M 4.4.10

Description	The equipment shall provide functionality for the authorisation of data communications on all of its communication interfaces.						
Rationale	For security reasons it is important that equipment is able to determine the authorisation of all communication partners.						
Fit criterion	Authorisation functionality shall be provided by access control mechanisms.						
History	July. 2009	**Origin**	P&S 1.5	**Port**	P0, P3	**Applicable**	E meter

DSMR-M 4.4.11

Description	All communications interfaces shall only support DSMR specified functionality. All other functionality on the communication interfaces shall be disabled. This also is applicable for the developer interface (e.g. JTAG).						
Rationale	It is important that the equipment does not respond to and is not adversely affected by communications using protocols and functionality other than those required for communications with other metering infrastructure equipment.						
Fit criterion	All communications interfaces shall only support DSMR specified functionality. All other functionality on the communication interfaces shall be disabled (Read and Write). This also is applicable for the developer interface (e.g. JTAG).						
History	July. 2009	**Origin**	P&S 1.5	**Port**	P0, P2 P3	**Applicable**	E meter, G meter

DSMR-M 4.4.12

Description	Interfaces shall not accept unauthorized or erroneous communications and are capable of handling (dropping) such communication (including TCP) without adverse effects on the operation of the equipment or the interface.						
Rationale	It is important that the interfaces do not accept unauthorized or erroneous communications and are capable of handling (dropping) such communication (including TCP) without adverse effects on the operation of the equipment or the interface.						
Fit criterion	Interfaces shall not accept unauthorized or erroneous communication and unauthorised communications will not adversely affect the operation of the remainder of the equipment.						
History	July. 2009	**Origin**	P&S 1.5	**Port**	P0, P2 P3	**Applicable**	E meter, G meter

DSMR-M 4.4.13

Description	Unused physical interfaces will be disabled by default, including the installation mode of the meter.						
Rationale	For security reasons it is important that management of physical interfaces shall be possible to enforce the security for local access.						
Fit criterion	Unused ports and interfaces are disabled by default. Mechanisms are implemented for enabling or disabling the interfaces.						
History	July. 2009	**Origin**	P&S 1.5	**Port**	P0, P2	**Applicable**	E meter

DSMR-M 4.4.14

Description	All keys (except the master key) that can be used by the grid operator can be changed via either the local maintenance port P0 or remotely via P3.						
Rationale	It must always be possible to change keys. This ensures that compromised keys do not lead to uncontrollable exposure of a (large group of) meter(s). A compromised master/default key alone does not allow the change of; software, settings, meter readings, etc.						
Fit criterion	Functionality must be implemented to change all keys (except the master/default key) via either the local maintenance port P0 or remotely via P3.						
History	July. 2009	**Origin**	P&S 1.5	**Port**	P0, P2, P3	**Applicable**	E meter, G meter

DSMR-M 4.4.15

Description	The E meter will forward the key as soon as possible to the M-Bus device.						
Rationale	The new key needs to be used for communication as soon as possible. For wireless communication this means that it will be included in the next communication session that is initiated by the M-Bus device.						
Fit criterion	The E meter will forward the key at the first opportunity to communicate to the M-Bus device.						
History	May 2010	**Origin**	TST	**Port**	P2	**Applicable**	E meter

DSMR-M 4.4.16

Description	Every attempt to access ports and components with an incorrect key must result in locking the port or component for 10 seconds and a message in a log file.						
Rationale	For security reasons it is important that for every attempt made to access port or components with an incorrect key, the port or component is locked for 10 seconds before another attempt can be made. Also this event must be logged in a log file.						
Fit criterion	The port or component must be locked for 10 seconds for every access attempt made with an incorrect key. Also this event must be logged in a log file.						
History	July. 2009	**Origin**	P&S 1.5	**Port**	P0, P3	**Applicable**	E meter

DSMR-M 4.4.17

Description	Illegal access to one device shall not lead to gaining access to multiple devices						
Rationale	Intercommunication between E meters is not allowed. M-Bus devices are only allowed to communicate with their designated E meter.						
Fit criterion	Illegal access to one device shall not lead to gaining access to multiple deployed devices.						
History	Jan. 2011	**Origin**	P&S 1.5	**Port**	n.a.	**Applicable**	E meter, G meter

4.4 Data Integrity

DSMR-M 4.4.18

Description	The equipment shall provide functionality to preserve the integrity of data storage, including integrity of equipment firmware.						
Rationale	It is important that the integrity of data and firmware stored in the equipment is maintained.						
Fit criterion	Security mechanisms shall be implemented to ensure the protection of data and encryption keys stored on the equipment. For example, keys shall be located in a dedicated place of the system and access shall be restricted to avoid alteration.						
History	July 2009	**Origin**	P&S 1.5	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.4.19

Description	The equipment shall provide functionality to report and log loss of integrity of data storage, including loss of integrity of equipment firmware.						
Rationale	It is important that any loss of integrity of data and firmware stored in the equipment is reported and logged, i.e. it shall provide some method of indicating when data or firmware has been changed without its control (for example report firmware hash).						
Fit criterion	Loss of integrity of data storage, including loss of integrity of equipment firmware is reported and logged. For example a regular hash check is performed to identify firmware changes and perhaps also a hash of metering data. For the G meter this is reported as a Fraud attempt, for the E meter this is reported as a specific memory error.						
History	July. 2009	**Origin**	P&S 1.5	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.4.20

Description	The E meter shall raise an event if the configuration is changed after the meter is deployed.						
Rationale	When the configuration of the meter is altered after it is deployed, it may indicate that the meter is hacked or has been tampered with. This has to be detected and an event shall be raised to inform the GO of this occurrence.						
Fit criterion	The E meter shall raise an event if the configuration is changed after the meter is deployed. The following read/write items are not considered as a configuration change: - Change of the clock of the meter - Change of the IP address of the meter - Change of the Error register - Change of the Alarm register - Change of the Consumer Short message - Change of the Consumer Long message						
History	Jan. 2011	**Origin**	P&S1.5	**Port**	P0, P2, P3	**Applicable**	E Meter

DSMR-M 4.4.21

Description	The equipment shall implement anti-replay mechanism.						
Rationale	It is necessary to prevent message replay. For example critical messages such as disconnects, alarms, etc. must be prevented from being replayed.						
Fit criterion	Classical encryption mechanisms (including time stamp or numbering with initial vector) based on open standards will be implemented to ensure the identification of each message and its uniqueness.						
History	July. 2009	**Origin**	P&S 1.5	**Port**	P0, P2, P3	**Applicable**	E meter, G meter

4.5 Data Confidentiality

DSMR-M 4.4.22

Description	The E meter and all connected devices (connected via P0, P2 and P3) shall provide functionality to prevent eavesdropping.						
Rationale	It is necessary to ensure confidentiality for data that have been identified as critical by owners, or legal authorities (commercial data, nominative data, etc). Implementation of encryption mechanisms is necessary on appropriate layers of the communication system to prevent eavesdropping.						
Fit criterion	All communication at application-level between the E meter and all connected devices (connected via P0, P2 and P3)is encrypted, using AES-128 as the encryption mechanism.						
History	Nov. 2007	**Origin**	P&S 1.5	**Port**	P0, P2, P3	**Applicable**	E meter

DSMR-M 4.4.23

Description	The device provides functionality for management of security keys, including safe storage and change.						
Rationale	Encryption keys must be managed such that they can be exchanged, stored, used and replaced, all in a secure manner.						
Fit criterion	Functionality for management of the security keys is provided.						
History	July. 2009	**Origin**	P&S 1.5	**Port**	P2, P3	**Applicable**	E meter, G meter

DSMR-M 4.4.24

Description	All communication pertaining to privacy sensitive data shall be secured so that integrity, authenticity, confidentiality and uniqueness are guaranteed.						
Rationale	Privacy sensitive data shall be protected at all times						
Fit criterion	○ No common secrets (including cryptographic keys) shall be present in smart meters. Thus, each smart meter shall have its own unique meter master key. ○ The meter master and encryption keys shall be stored on meters in a secure manner which resists attempts to discover them. ○ The message encryption key and message authentication key shall be updated using the meter master key with a secure key wrapping function. ○ The authentication secrets shall be updated using the meter master key with a secure key wrapping function. ○ The message encryption key and authentication key shall be unique per meter and shall be stored in a secure manner that resists attempts to discover them. ○ All cryptographic keys and random data involved in any cryptographic operation shall be cryptographically random. ○ Software which implements the security functions (e.g., authentication handshake protocol, message encryption/decryption, access control, etc) shall be protected from unauthorized access and modification. ○ Smart meter software for the E meter shall be renewable/updatable in case that a security compromise or a security vulnerability is found or there is a need to update meter functionality including cryptographic algorithm update. ○ Smart meter software for the E meter (as a whole or only a module) shall be updated in a secure manner that only authorized software can be loaded into the meter.						
History	Dec. 2010	**Origin**	P&S 1.5	**Port**	n.a.	**Applicable**	E meter, G meter

5 REQUIREMENTS DERIVED FROM NTA 8130 AND AMVB

This chapter provides the business use cases for metering equipment installed at the premises of the customers. Some of the requirements will occur in multiple use cases, to avoid confusion they are numbered separately.

5.1 Use case 1: Provide periodic meter reads

This section describes the process of gathering and providing periodic meter reads (see NTA 8130, §5.2.1). This process is triggered on the installation of the E meter.

This use case is concerned with periodic meter readings. Periodic meter readings are daily and monthly meter readings. Definitions for meter readings for E and G are provided in Chapter 2. All meter readings mentioned in this use case shall comply with these definitions. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-1.

Trigger	Description
Deploy E meter	On installation the E meter starts registering periodic meter readings (also for G, and, if desired, for W and T) and on deployment these meter readings are made available to the CS.

Figure 5-1a: Provide periodic meter reads – trigger description

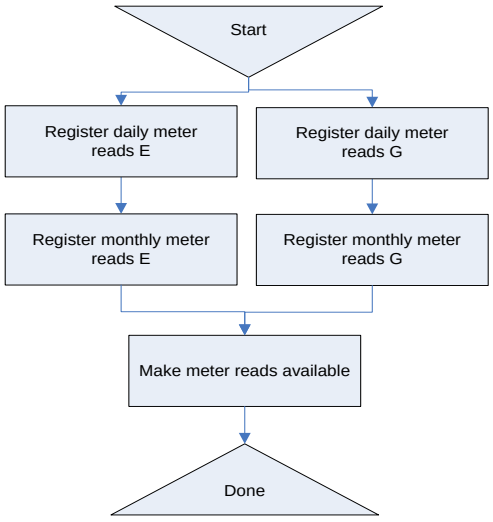


Figure 5-1b: Provide periodic meter reads – block diagram

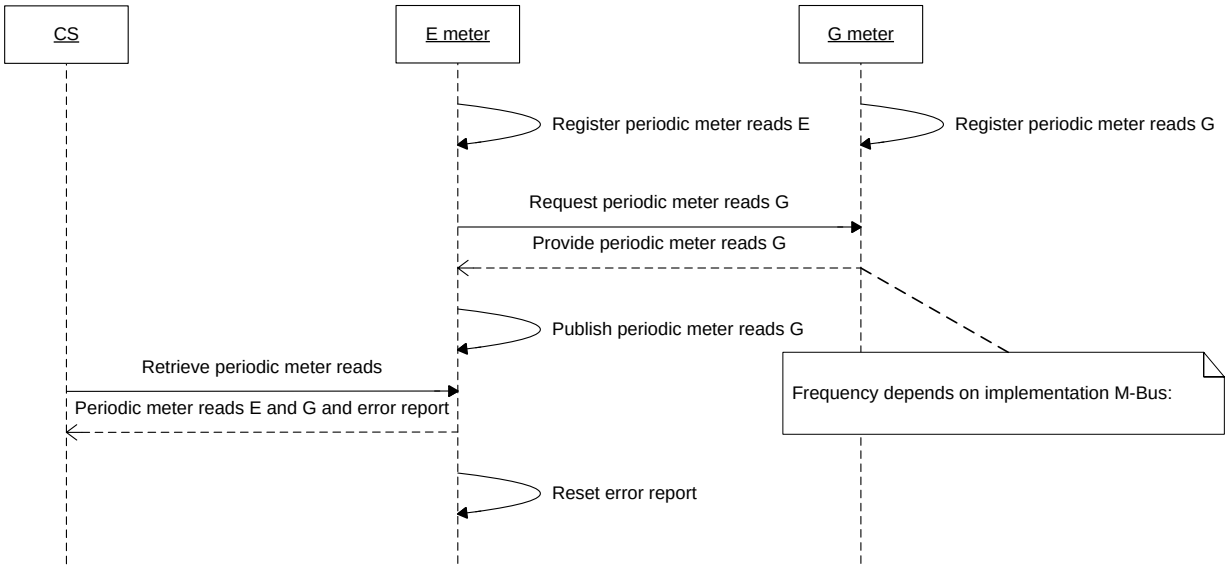


Figure 5-1c: Provide periodic meter reads – UML sequence diagram

Pre-conditions

- Not all necessary periodic meter reads are available in the E meter. The internal trigger to gather periodic meter reads occurred.

Parameters

- Equipment identifier for the E meter.
- The interval for which the periodic meter readings are requested.

Post-conditions

- All necessary meter reads are available.
- Error report.

5.1.1 Requirements for electricity

DSMR-M 4.5.1

Description	The E meter shall register a meter reading E at 00:00 hours every day.						
Rationale	This is required in NTA 8130 (see §5.2.1 in conjunction with definition of “daily meter reading”). Market processes (switching, moving, etc.) require the availability of daily meter reads.						
Fit criterion	The E meter shall register a meter reading as defined in Chapter 2 at 00:00 hours every day.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.1)	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.5.2

Description	The E meter shall provide the *40* most recent daily meter readings for E.						
Rationale	The period of forty days guarantees that no meter readings will be lost within a period of forty days in cases where the data can not be collected immediately after it was registered. The minimum and maximum retaining period for daily meter readings for E in the meter is 40 days.						
Fit criterion	The E meter shall have available meter readings E for the 40 most recent days in the past. The minimum and maximum retaining period for daily meter readings for E in the meter is 40 days. The information provided as periodic meter readings shall at least contain the following information: ▪ Meter readings E for the designated period using kWh as the unit of measurement ▪ Event report for the designated period.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.1)	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.5.3

Description	The E meter shall provide the *13* most recent monthly meter reads for E.						
Rationale	It is necessary to keep a one-year history of E consumption and/or production data available in the meter, e.g. in case of disturbances and data loss in the CS or on behalf of the customer. The minimum and maximum retaining period for E consumption and/or production data in the meter is 13 months.						
Fit criterion	The E meter shall have available meter readings E for each first day of the 13 most recent calendar months in the past. The minimum and maximum retaining period for monthly meter reads in the meter is 13 months. The information provided as periodic meter readings shall at least contain the following information: ▪ Meter readings E for the designated period using kWh as the unit of measurement ▪ Event report for the designated period.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.1)	**Port**	P3	**Applicable**	E meter

5.1.2 Requirements for gas

DSMR-M 4.5.4

Description	The 00.00 reading of the G meter is also used as daily meter reading.						
Rationale	The hourly readings are stored in the E meter in the hourly load profile and the 00.00 reading is copied into the daily load profile (combined). This is required in NTA 8130 (see §5.2.1 in conjunction with definition of “daily meterreading”). Market processes (switching, moving etc.) require the availability of dailymeter reads.						
Fit criterion	The 00:00 hour reading is stored in the E meter copied into the daily load profile.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.1)	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.5.5

Description	The exchange of meter reading between E meter and G meter takes place once an hour.						
Rationale	To extend the life time of the battery of the G meter, the communication between E meter and G meter is minimized.						
Fit criterion	The exchange of meter readings between the E meter and G meter takes place only once an hour.						
History	Mar. 2011	**Origin**	TST	**Port**	P2	**Applicable**	E meter, G meter

DSMR-M 4.5.6

Description	The E meter shall provide the *40* most recent daily meter readings for G.						
Rationale	The period of forty days guarantees that no meter readings will be lost within a period of forty days in cases where the data can not be collected immediately after it was registered. The minimum and maximum retaining period for daily meter readings for G in the meter is 40 days.						
Fit criterion	The E meter shall have available meter readings G for the 40 most recent days in the past. The minimum and maximum retaining period for daily meter readings for G in the meter is 40 days. The information provided as periodic meter readings shall contain the following information: ▪ Meter readings G for the designated period using m^3 as the unit of measurement; ▪ Event report for the designated period. The E meter will store the most recent captured M-Bus master value at 11 minutes past the hour in the profile(s). The 11 minutes gives the E Meter sufficient time to receive or to capture the recent hourly value from the G meter.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.1)	**Port**	P3	**Applicable**	E meter, G meter

DSMR-M 4.5.7

Description	Wireless devices must prevent congestion on the frequency band.						
Rationale	It can happen that a number of G meters are installed next to each other (for example in apartment buildings). To prevent congestion on the wireless frequency band, all wireless communication sessions shall be randomized.						
Fit criterion	Wireless devices shall randomly start their communication sessions within a window of 10 minutes past each whole hour.						
History	Jan. 2011	**Origin**	TST	**Port**	P2	**Applicable**	E meter, G meter

DSMR-M 4.5.8

Description	The E meter shall provide the *13* most recent monthly meter readings for G.
Rationale	It is necessary to keep a one-year history of G consumption data available in the E meter, e.g. in case of disturbances and data loss in the CS or on behalf of the customer. The minimum and maximum retaining period for monthly meter readings for G in the E meter is 13 months.
Fit criterion	The E meter shall have available meter readings G for each first day of the 13 most recent calendar months in the past. The minimum and maximum retaining period for monthly meter readings for G in the E meter is 13 months. The information provided as periodic meter readings shall at least contain the following information:

	▪ Meter readings G for the designated period using m^3 as the unit of measurement; ▪ Event report for the designated period.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.1)	**Port**	P3	**Applicable**	E meter, G meter

5.1.3 Error reporting

DSMR-M 4.5.9

Description	The E meter shall provide an indication that an error was registered by the equipment as part of a periodic meter read.						
Rationale	By providing error information the CS will be informed that the metering installation registered an error.						
Fit criterion	The meter shall provide information indicating an error was registered.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.8.5)	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.10

Description	The equipment shall issue a logical error in case the end date of the requested period is prior to the begin date.						
Rationale	The current use case has a parameter indicating for which period meter readings shall be retrieved. The interval can be provided as open or closed interval. For an open interval the timestamp for either the start or for the end of the interval is provided. In case of a closed interval timestamps for both start and for the end are provided. In the latter case the timestamp for the start shall be before the timestamp of the end of the interval otherwise a logical error is issued.						
Fit criterion	The logical error issued shall at least contain the generic attributes for errors.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

5.1.4 Performance

DSMR-M 4.5.11

Description	The E meter shall supply the periodic meter reads on P3 soon after the request was received.						
Rationale	If the information retrieval takes too much time, this will cause delays in the meter data collection process.						
Fit criterion	Total time to retrieve all requested information from the meter and publish it through P3 shall be less than 5 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

5.2 Use case 2: Provide actual meter reads through P3

This section describes the process of gathering and providing actual meter reads in the metering equipment to the CS (see NTA 8130: § 5.2.4). This process is triggered on the request of an actual meter read by a market participant. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-2.
Definitions for meter readings for E and G are provided in Chapter 2. All meter readings mentioned in this use case shall comply with these definitions.

Trigger	Description
Request for actual meter read	A market participant requests an actual meter read.

Figure 5-2a: Provide actual meter reads – trigger description.

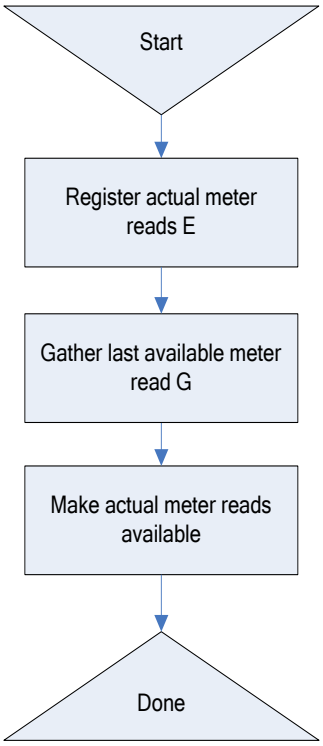


Figure 5-2b: Provide actual meter reads – block diagram.

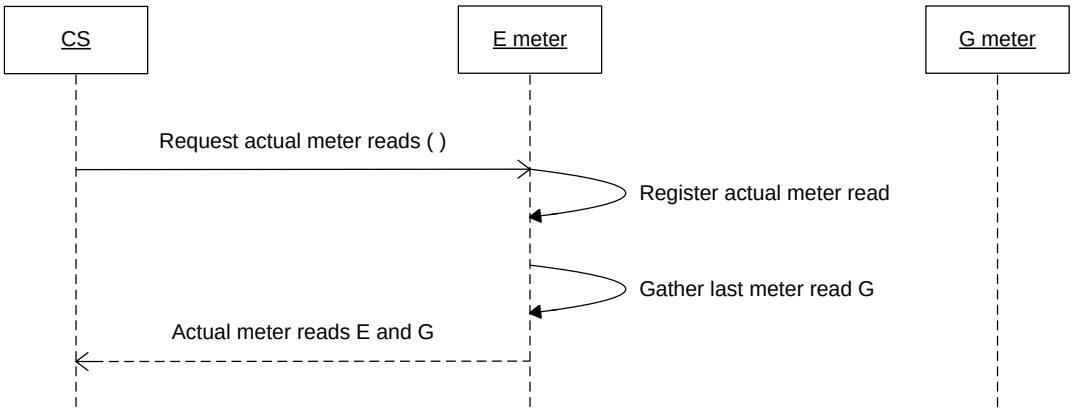


Figure 5-2c: Provide actual meter reads – UML sequence diagram.

Pre-conditions

- A market participant requires actual meter reads for a connection.

Parameters

- Equipment identifier for the E meter.

Post-conditions

- The actual meter reads are available.

5.2.1 Requirements for electricity and gas

DSMR-M 4.5.12

Description	The E meter shall provide functionality to register the actual meter readings E on request.						
Rationale	An actual meter reading is a meter reading on request. The E meter registers a meter reading at the moment it receives the request. Actual meter readings can be used to handle complaints from customers.						
Fit criterion	The E meter shall register a meter reading as defined in Chapter 2.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.4)	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.5.13

Description	The E meter shall provide functionality to retrieve actual meter reads.
Rationale	Under some circumstances an actual meter read is needed (for example, consider a call-centre agent handling a customer complaint). This is required in NTA 8130 (see § 5.2.4).
Fit criterion	The information provided as actual meter readings shall at least contain the following information: ▪ Actual meter reading E using kWh as the unit of measurement; ▪ Most recent meter reading G available in the E meter using m^3 as the unit of measurement;

History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.4)	**Port**	P3	**Applicable**	E meter

5.2.2 Error reporting

DSMR-M 4.5.14

Description	The E meter shall issue an error as soon as the scheduled G meter reading was not possible.						
Rationale	The communication between the E meter and the G meter is not 'always on', depending on the communication medium. For this reason the E meter provides the most recent meter reading G it has available. If the most recent scheduled meter reading G is not available an error is generated.						
Fit criterion	The E meter shall issue an error as soon as the scheduled G meter reading was not possible.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.4)	**Port**	n.a.	**Applicable**	E meter, G meter

5.2.3 Performance

DSMR-M 4.5.15

Description	The E meter shall have actual meter reads available on P3 immediately after the request was received.						
Rationale	Actual meter readings can be used to handle complaints from customers. An actual meter reading is a meter reading on request. The E meter registers a meter reading at the moment it receives the request; these must be provided immediately. The information needs to be actual.						
Fit criterion	Total time to retrieve all requested information from the meter and publish it through P3 shall be less than 5 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

5.3 Use case 3: Provide actual meter reads through P1

This section describes the process of gathering and providing actual meter reads in the metering equipment to the other services module (port P1). See also §5.2.5, §5.5.1.1 and Appendix B of NTA 8130. Port P1 is intended to be used simultaneously by multiple types of equipment (a maximum of 5 appliances can be connected), and is implemented using a RJ12 physical interface. This process is triggered if an external device is connected to the RJ12 plug (connector #2 – see Appendix B of NTA 8130). The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-3.

Trigger	Description
Request input of RJ12 plug is high.	Actual meter reads are requested by connecting an external device. The metering installation will henceforth deliver the actual (for E) and most recent (for G) meter data.

Figure 5-3a: Provide actual meter reads through P1 – trigger description.

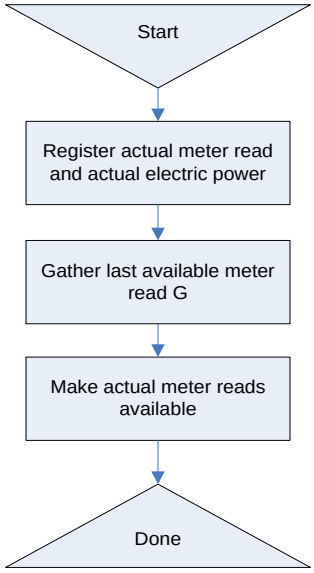


Figure 5-3b: Provide actual meter reads through P1 – block diagram.

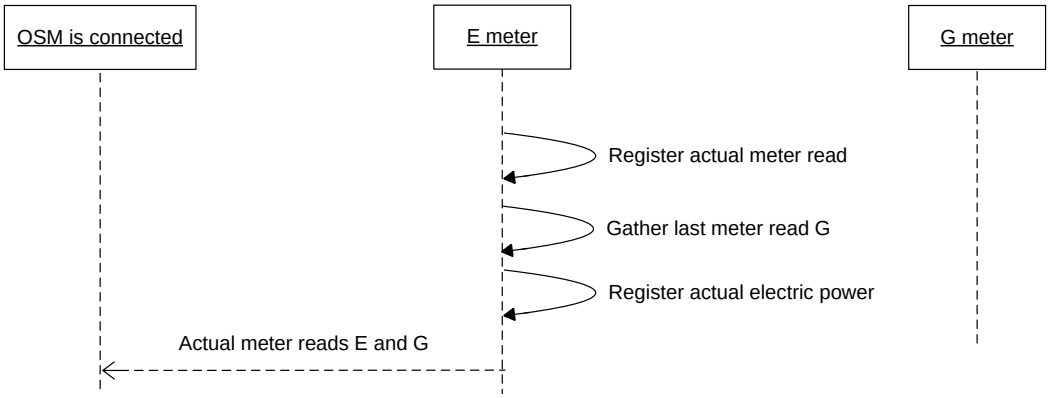


Figure 5-3c: Provide actual meter reads through P1 – UML sequence diagram.

Pre-conditions

- Actual meter reads are requested by the other services module (through P1).

Parameters

- None.

Post-conditions

- The actual meter reads are available to auxiliary equipment connected to P1.

5.3.1 Requirements for electricity and gas

DSMR-M 4.5.16

Description	On connecting an auxiliary equipment (on P1), the E meter shall register actual meter reads for electricity with a regular interval.						
Rationale	The actual meter readings are provided to give the consumer insight in the amount of electrical energy he uses in a near real-time fashion. The auxiliary equipment is responsible for providing the information to the consumer in a convenient way.						
Fit criterion	The E meter shall register actual meter readings every 10 seconds.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.5)	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.5.17

Description	On connecting auxiliary equipment (on P1), the E meter shall determine the actual electrical power.						
Rationale	The actual power is provided to the consumer in order to inform in a near real-time fashion. The auxiliary equipment is responsible for providing the information to the consumer in a convenient way.						
Fit criterion	The E meter shall determine the average electrical power (delivery and consumption) for every 10 second interval.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.5)	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.5.18

Description	The E meter shall provide the actual meter readings and actual power to the OSM every 10 seconds.						
Rationale	For the benefit of the customer, actual meter reads and the actual power are to be provided to the OSM through P1.						
Fit criterion	The information provided at P1 shall at least contain the following information: ▪ Equipment identifier(s); ▪ Actual meter reading E using kWh (three decimals) as the unit of measurement; ▪ Actual electrical power (delivery and consumption) specified with a resolution of 1 W; ▪ Most recent hourly meter reading G available in the metering equipment using m^3 as the unit of measurement (number of decimals depending on G meter type). When a utility service person is at a customer's premise and is communicating to the meter over its optical port (P0), the P1 port can be temporarily interrupted.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.5)	**Port**	P1	**Applicable**	E meter

DSMR-M 4.5.18a

Description	Detection of connection of equipment on the P1 port						
Rationale	GO wants to have insight in the use of P1 devices/P1 service by the customer						
Fit criterion	The E-meter shall detect and register the connection of auxiliary equipment to the P1 port. The GO shall be able to determine (via P3) the status of the P1 port being either: • P1 auxiliary equipment connected • P1 auxiliary equipment not connected Detection of a connected P1 device shall be done by monitoring the request line of the P1 interface						
History	Dec. 2018	**Origin**	SMR5.0	**Port**	P1	**Applicable**	E meter

5.3.2 Performance

DSMR-M 4.5.19

Description	The E meter shall have the actual meter reads available on P1.						
Rationale	For the benefit of the customer, actual meter reads are to be provided to the auxiliary equipment through P1. This information needs to be actual; therefore the information will be refreshed every 10 seconds.						
Fit criterion	Total time to retrieve all information from the meter and publish it through P1 shall be less than 10 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P1	**Applicable**	E meter

5.4 Use case 4: Provide interval values

This section provides the description of the process of making interval values available to the CS. The interval values are made available through the E meter (both interval values for electricity and gas). The process of providing interval values is an uninterrupted process that runs throughout the lifecycle of the metering equipment. This process is hence triggered on the deployment of the electricity meter. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-4.

Interval values are in fact time series composed of meter readings. This means that interval values differ from periodic meter reads only in the density of the measurements. As a result the interval values presented in this use case shall comply with the definitions of meter readings. Definitions for meter readings for E and G are provided in Chapter 2.

Trigger	Description
Deploy E meter	On installation the E meter starts registering interval meter reads and on deployment these meter reads are made available to the CS.

Figure 5-4a: Provide interval values – trigger description

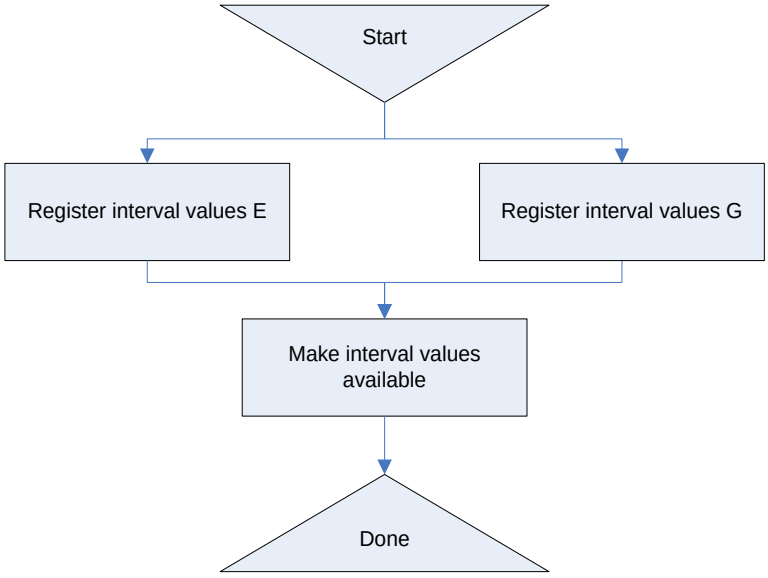


Figure 5-4b: Provide interval values – block diagram

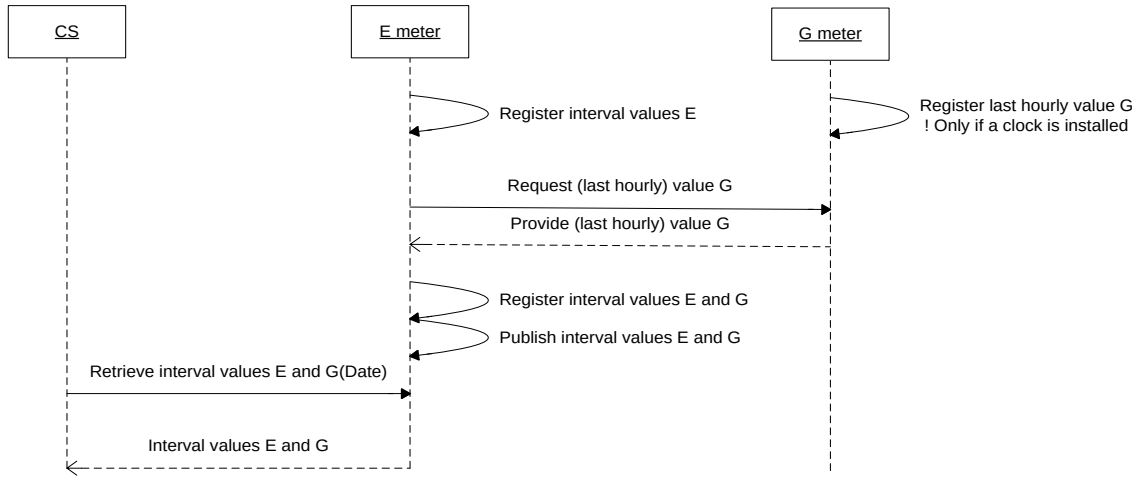


Figure 5-4c: Provide interval values - UML sequence diagram

Pre-conditions

Interval values E and G have been registered in the E meter. The G meter shall register the last hourly meter reading in case the gas meter has a clock.

In case the gas meter doesn't have a clock, the gas meter doesn't register the last hourly value, but the E meter requests the actual value and registers this value.

Parameters

- Equipment identifier for the E meter.
- The interval for which the interval values are requested.

Post-conditions

- Interval values for the requested period are provided on the designated ports.

Assumptions

-

5.4.1 Requirements for electricity

DSMR-M 4.5.20

Description	The E meter shall register meter readings E (from the total consumption and delivery registers) for 15 minute intervals.						
Rationale	Interval values are useful for both grid operator and supplier. The grid operator can use the interval values for fraud detection; the supplier can use the interval values for energy advice to customers or for analysis of consumption patterns.						
Fit criterion	The E meter shall register a meter reading E as defined in Chapter 2 every 15 minutes.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.6)	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.5.21

Description	The E meter shall provide functionality to retrieve the interval values for a designated period.						
Rationale	Interval values are useful for both grid operator and supplier. The grid operator can use the interval values for fraud detection; the supplier can use the interval values for energy advises to customers or for analysis of consumption patterns.						
Fit criterion	The interval values for the designated period shall at least contain the following information: ▪ Meter readings E with a measurement period of 15 minutes using kWh (3 decimals) as the unit of measurement; ▪ Meter readings G with a measurement period of 60 minutes using m^3 (three decimals for <= G6, two decimals for > G6) as the unit of measurement.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.6)	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.22

Description	The E meter shall provide on request interval data E for the 10 most recent days.						
Rationale	Interval data is used for analysis purposes. In order to be able to perform an analysis on interval data, interval data has to be available for a reasonable period. The interval data for that period can then be retrieved in a single request. The minimum and maximum retaining period for interval data for E in the meter is 10 days.						
Fit criterion	The E meter shall store a minimum and maximum of 10 days of interval data E.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.6)	**Port**	P1, P3	**Applicable**	E meter

DSMR-M 4.5.23

Description	The meter shall register interval data for the most 10 recent days. The meter shall also provide partly available interval data, for example if only 5 days are available, the meter shall give this data back on a request of 10 days.						
Rationale	If the requested interval data is only partly available in the meter then the meter must provide the available interval data. For example: The CS request 10 day's interval data and only 5 days are available, the meter shall provide the 5 days load profile						
Fit criterion	The meter shall also provide partly available interval data, and no logical error shall be issued.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

5.4.2 Requirements for gas

DSMR-M 4.5.24

Description	G meters shall register the last hourly meter reading.						
Rationale	Interval values are useful for both grid operator and supplier. The grid operator can use the interval values for fraud detection; the supplier can use the interval values for energy advises to customers or for analysis of consumption patterns. The G meter interval values will be stored in the E meter.						
Fit criterion	The G meter shall register a meter reading (as defined in Chapter 2) each whole hour (xx:00).						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.6)	**Port**	n.a.	**Applicable**	G meter, E meter

DSMR-M 4.5.25

Description	The E meter shall provide on request interval data G for the 10 most recent days.						
Rationale	Interval data is used for analysis purposes. In order to be able to perform an analysis on interval data, interval data has to be available for a reasonable period. The interval data for that period can then be retrieved in a single request. The minimum and maximum retaining period for interval data for G in the E meter is 10 days.						
Fit criterion	The E meter shall store a minimum and maximum of 10 days of interval data G.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.6)	**Port**	P1, P3	**Applicable**	E meter, G meter

5.4.3 Error reporting

DSMR-M 4.5.26

Description	The equipment shall issue a logical error in case the end date of the requested period is prior to the begin date.						
Rationale	In the function call to provide interval meter reads two parameters are given to identify the requested period. If (end date < begin date) a logical error will occur.						
Fit criterion	The equipment shall issue a logical error in case the end date of the requested period is prior to the begin date. The logical error issued shall at least contain the generic attributes for logical errors.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

5.4.4 Performance

DSMR-M 4.5.27

Description	The E meter shall have interval values available on P3 soon after the request was received (by the metering installation).						
Rationale	If the information retrieval takes too much time, this will cause delays in the meter data collection process.						
Fit criterion	Total time of retrieving the interval data for 1 day (both E and G) and publishing it on P3 shall be less than 5 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter, G meter

5.5 Use case 5: Provide equipment status to P1

This use case provides a description of the process of providing the state of the metering equipment to auxiliary equipment. See also §5.2.7.2, §5.5.1.1 and Appendix B of NTA 8130. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-5.

Trigger	Description
Request input of RJ12 plug is high.	Equipment status is requested by auxiliary equipment. The metering installation will provide the equipment status every 10 seconds.

Figure 5-5a: Provide equipment status to P1 – trigger description.

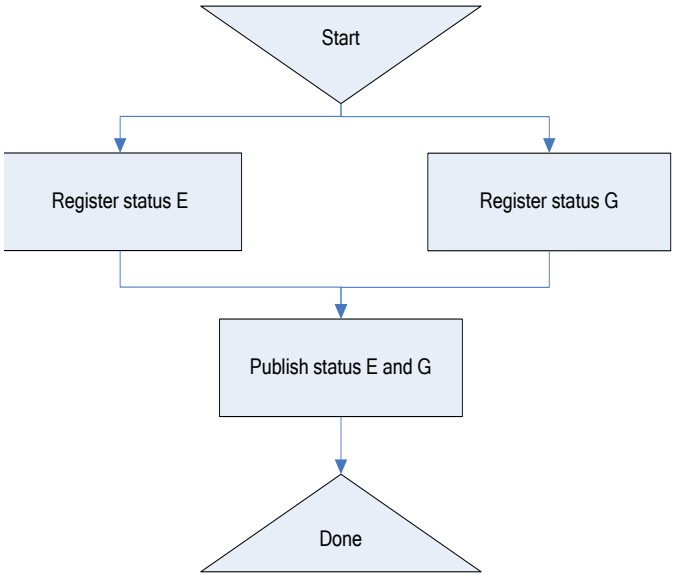


Figure 5-5b: Provide equipment status to P1 – block diagram.

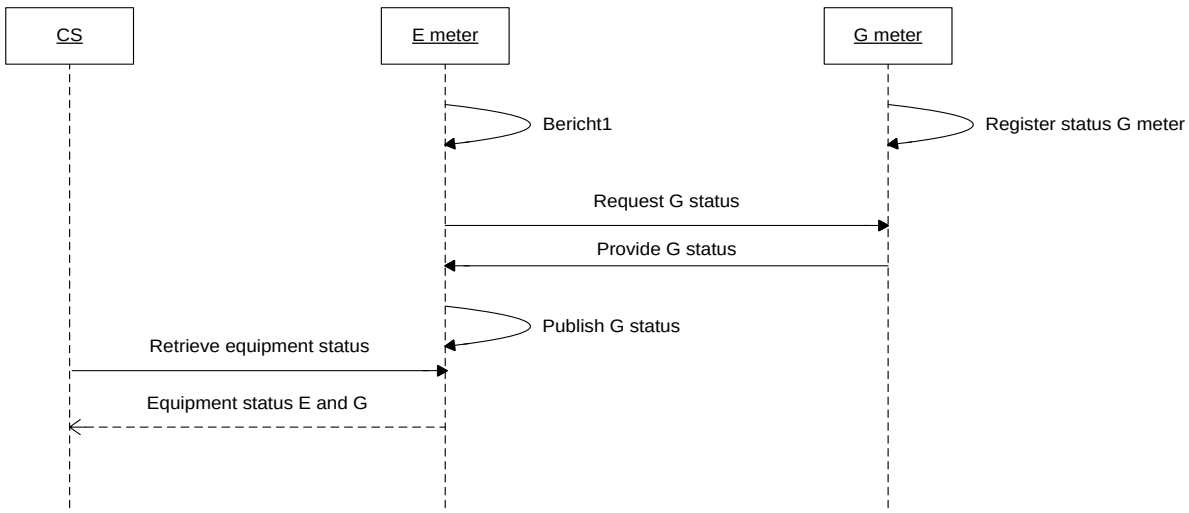


Figure 5-5c: Provide equipment status to P1 – UML sequence diagram.

Pre-conditions

- Request is activated by auxiliary equipment.

Parameters

- None.

Post-conditions

- The current status of the equipment is available to auxiliary equipment.

Assumptions

- None.

5.5.1 Requirements for electricity and gas

DSMR-M 4.5.28

Description	The E meter shall provide on the P1 port every 10 seconds the actual status of the E meter and the last known status for the G meter available in the E meter.						
Rationale	The actual status of the metering equipment is to be provided to the external service module through the P1 port.						
Fit criterion	The current status of the equipment is provided on the P1 port: ▪ Equipment identifier for the E meter; ▪ Equipment identifier for the G meter; ▪ Actual tariff E;						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.7.2, §5.5.1.1 and Appendix B)	**Port**	P1	**Applicable**	E meter

5.5.2 Performance

DSMR-M 4.5.29

Description	The E meter shall have the actual status available on P1.						
Rationale	For the benefit of the customer, the actual status reads is to be provided to the auxiliary equipment through P1. This information needs to be actual; therefore the information will be refreshed every 10 seconds.						
Fit criterion	Total handling time of registering E meter status, retrieving most recent G meter status and publish all information on P1 shall be less than 10 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P1	**Applicable**	E meter

5.6 Use case 6: Provide power quality information

This use case describes the process of gathering power quality measurements. Figure 5-6d provides the power quality parameters. See also §5.2.8.2 of the NTA 8130. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-6.

Trigger	Description
Deployment of E meter	On installation the E meter starts registering information on power quality and on deployment this information is made available to the CS. The Grid operator uses the power quality information for monitoring the grid for distribution of electricity.

Figure 5-6a: Provide power quality information – trigger description

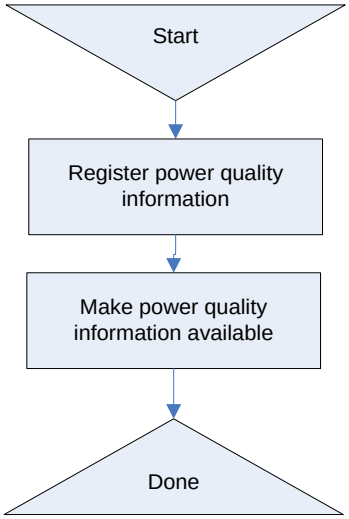


Figure 5-6b: Provide power quality information – block diagram

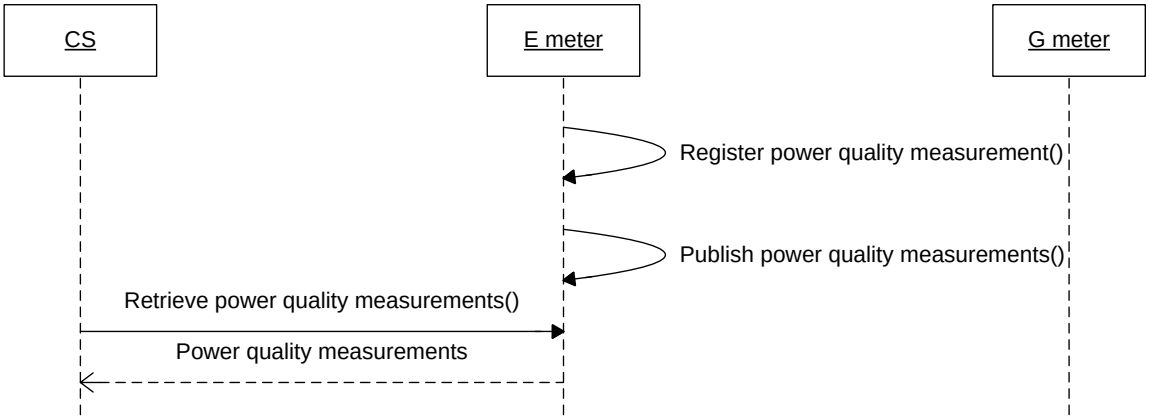


Figure 5-6c: Provide power quality information – UML sequence diagram

Value	Unit
Voltage	Volt
Current	Ampere
Active Power	kW
Reactive power	kVAr

Figure 5-6d: Capturing E parameters

Pre-conditions

- The grid operator wants to determine the quality of electricity supply.

Parameters

- Equipment identifier for the E meter;
- Period in which the power swells and sags have to be registered.

Post-conditions

- Power quality information is available for the designated equipment.

Assumption

- It is assumed that the sample population of electricity meters can be addressed in the software of the CS.
- CS needs to retrieve the power quality information regularly, in order to assign the quality measurements to specific periods.

5.6.1 Power quality

DSMR-M 4.5.30

Description	The E meter shall provide information on the voltage swells and sags.						
Rationale	The definition of voltage swells and power sags is specified in a local standard (NEN-EN 50160:2000). The Grid operators use the information to determine the quality of electricity supply.						
Fit criterion	The E meter shall provide the following: ▪ Equipment identifier for the E meter that the information originates from; ▪ Number of voltage swells (configurable for duration and threshold); ▪ Number of voltage sags (configurable for duration and threshold); In case of a polyphase meter the settings for duration and threshold are valid for all phases; the sags and swells have to be counted for every phase individually.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.3.8.2)	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.5.31

Description	The E meter shall have the functionality to record specific E-parameters.						
Rationale	For grid operational purposes it is necessary to be able to record E-parameters like Current and Voltages.						
Fit criterion	The E meter shall have the functionality to record instantaneous values and average values for measuring E parameters as described in figure 5.6d.						
History	Sep. 2009	**Origin**	TST	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.32

Description	Accuracy of measurement Voltage and Current parameters shall be at least 0.5%.						
Rationale	For grid operational purposes it is necessary to be able to record E-parameters like Current and Voltages within the specified accuracy.						
Fit criterion	The accuracy of the E meter for measuring the instantaneous values shall be at least 0.5% for Voltage (at 230 Volt) and Current (Imax) parameters.						
History	Sep. 2009	**Origin**	TST	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.33

Description	The interval time for capturing values shall be adjustable.						
Rationale	For grid operational purposes it is necessary to be able to adjust the interval period of E-parameters.						
Fit criterion	The interval period for E-parameters shall be adjustable between N seconds and N minutes per value, where N is adjustable.						
History	Sep. 2009	**Origin**	TST	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.34

Description	The E meter shall provide the average value for voltage, current, active power and reactive power.						
Rationale	Under some circumstances the average voltage is necessary (for the maintenance of the grid). The average voltage is determined for periods of N minutes.						
Fit criterion	The E meter shall provide the average value for voltage, current, active power and reactive power. The average voltage shall at least contain the following information: ▪ Equipment identifier for the meter from which the values originate; ▪ Time stamp for end of the period during which the average voltage was determined; ▪ Parameter name. ▪ Parameter value.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.35

Description	Constant recording of interval parameters in a circular buffer of the E meter.						
Rationale	The E meter's interval data memory is limited; therefore the oldest data will be overwritten after at least 960 recordings.						
Fit criterion	The Ring-buffer size of the E meter shall be at least 960 recordings per parameter.						
History	Sep. 2009	**Origin**	TST	**Port**	P3	**Applicable**	E meter

5.6.2 Performance

DSMR-M 4.5.36

Description	The E meter shall have the power quality information available on P3 soon after the request was received by the E meter.						
Rationale	Capturing the available interval information on P3 can take some time, therefore the E meter shall publish this information as soon as possible after the request for publishing is received.						
Fit criterion	Total handling time of retrieving power quality information and publish all information on P3 shall be less than 5 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

5.7 Use case 7: Sending power quality information to P1

This use case provides a description of the process of providing the power quality information to auxiliary equipment. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-7.

Trigger	Description
Request input of RJ12 plug is high.	Equipment status is requested by auxiliary equipment. The metering installation will provide the equipment status every 10 seconds.

Figure 5-7a: Provide Power Quality Information to P1 – trigger description.

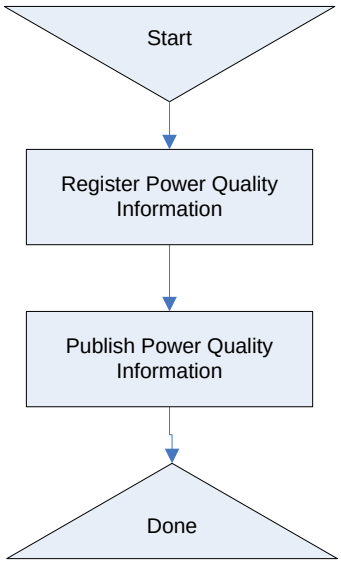


Figure 5-7b: Provide Power Quality Information to P1 – block diagram.

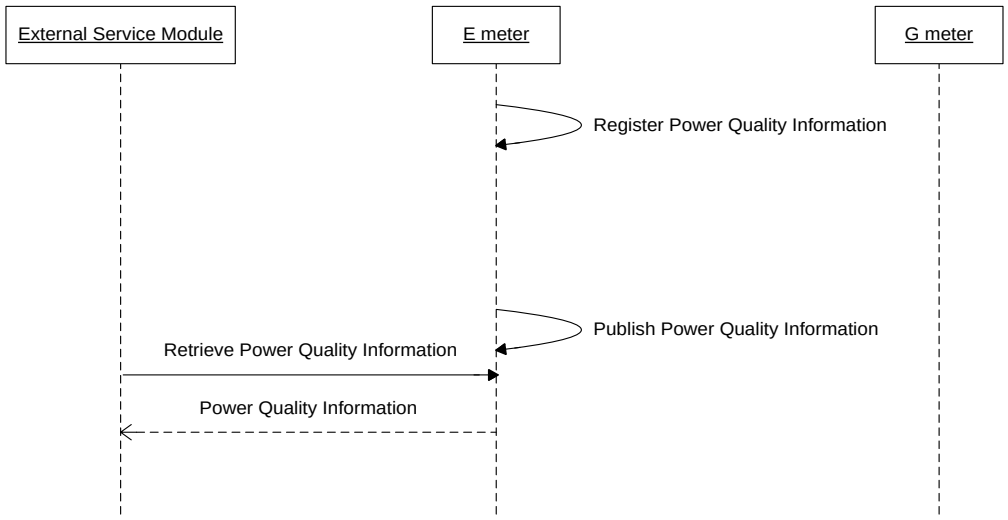


Figure 5-7c: Provide Power Quality Information to P1 – UML sequence diagram.

Pre-conditions

- Request is activated by auxiliary equipment.

Parameters

- None.

Post-conditions

- The power quality information is available to auxiliary equipment.

Assumptions

- None.

5.7.1 Requirements for electricity

DSMR-M 4.5.37

Description	The E meter shall provide every 10 seconds the power quality information available in the E meter.						
Rationale	The power quality information is to be provided to the external service module through P1.						
Fit criterion	The power quality information which is provided: ▪ Number of power failures in any phases; ▪ Number of long power failures in any phases; ▪ Power Failure Event Log; ▪ Number of voltage sags in phase L1; ▪ Number of voltage sags in phase L2 (poly phase meters only) ▪ Number of voltage sags in phase L3 (poly phase meters only); ▪ Number of voltage swells in phase L1; ▪ Number of voltage swells in phase L2 (poly phase meters only); ▪ Number of voltage swells in phase L3 (poly phase meters only)						
History	Jan. 2011	**Origin**	TST	**Port**	P1	**Applicable**	E Meter

5.7.2 Performance

DSMR-M 4.5.38

Description	The E meter shall have the power quality information available on P1.						
Rationale	For the benefit of the customer, the power quality information is to be provided to the auxiliary equipment through P1. This information needs to be up to date; therefore the information will be refreshed every 10 seconds.						
Fit criterion	Total handling time of retrieving the power quality information and publishing all information on P1 shall be less than 10 seconds.						
History	Jan. 2011	**Origin**	TST	**Port**	P1	**Applicable**	E meter

5.8 Use case 8: Provide outage information

This section describes the use case for retrieving outage information. NEN-EN 50160:2000 is a standard for the Dutch market. In this standard the duration (T) for short and long outages has been defined as 3 minutes, to differentiate between short and long outages. In the future this definition might change. Therefore it is required that T is configurable. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-8.

Trigger	Description
Deployment of E meter	On installation the E meters starts registering outages and on deployment this information is made available to the CS. Two types of outages exist: short and long outages. Short outages are detected for grid operating purposes while long outages can lead to retributions. In order to determine the value of the retribution, the duration of outages is used.

Figure 5-8a: Provide outage information – trigger description

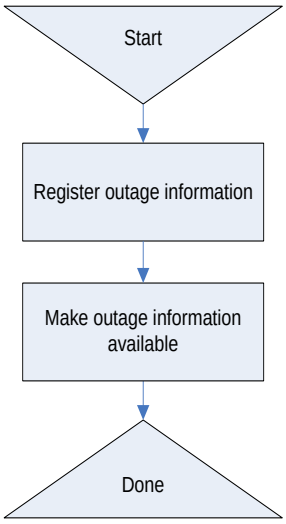


Figure 5-8b: Provide outage information – block diagram

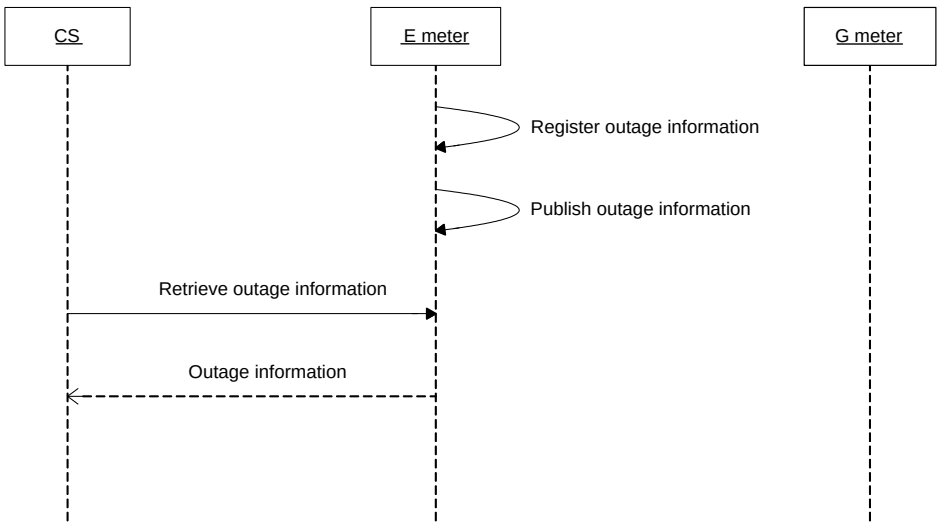


Figure 5-8c: Provide outage information – UML sequence diagram

Pre-conditions

- T is configured (set to a certain duration);
- The meter has counted short outages (<T);
- The meter has logged long outages (>T).

Parameters

- Equipment identifier for the E meter.

Post-conditions

- The GO has information on power quality available from the designated meter.

Assumptions

- It is assumed that the sample population of electricity meters can be addressed in the software of the CS.
- CS needs to retrieve the outage information regularly, in order to assign these measurements to specific periods.

5.8.1 Outage information

DSMR-M 4.5.39

Description	The E meter shall provide the number of short (<T) power outages.						
Rationale	The grid operator uses the information to determine the quality of the electricity supply.						
Fit criterion	The E meter shall provide at least the following information: ▪ Equipment identifier for the meter from which the measurements originate; ▪ Number of short electricity outages.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.8.3)	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.40

Description	The E meter shall provide information on long (>T) power outages.						
Rationale	The grid operator uses this information to determine retributions to customers for disturbances of electricity supply.						
Fit criterion	The electricity meter shall provide the following information on long outages: ▪ Equipment identifier for the meter from which the measurements originate; ▪ Outage duration; ▪ Time stamp for end of the outage.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.8.4)	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.41

Description	The electricity meter shall record and provide on request the 10 most recent long power outages.						
Rationale	§5.2.8.5 of NTA 8130 requires that the electricity meter shall provide the 10 most recent long power outages.						
Fit criterion	The electricity meter shall provide the 10 most recent long power outages.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.8.5)	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.42

Description	In the case of a 3-phase metering installation, a record is also kept in case there is an

	outage on one or more of the phase(s). See §5.2.8.4 of NTA 8130.						
Rationale	The grid operator uses the information to determine the quality of the electricity supply.						
Fit criterion	The electricity meter shall provide the power outage information for each phase in the same way as this is done in the case of a 1-phase metering installation. An outage on any of the phases (in the case of a 3-phase metering installation) will be handled as if it was an outage of a 1-phase metering installation. Hence, only the number of outages shall be counted (in the case of short outages) or recorded (in the case of long outages). No record need to be kept on which phase (R, S or T – or alternatively L1, L2, L3) the outage occurred.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.8.4)	**Port**	P3	**Applicable**	E meter

5.8.2 Performance

DSMR-M 4.5.43

Description	The E meter shall have the outage information available on P3 soon after the request was received by the metering installation.						
Rationale	If the information retrieval takes too much time, this will cause delays in the data collection process.						
Fit criterion	Total handling time of retrieving outage information and publish all information on P3 shall be less than 5 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

5.9 Use case 9: Provide tamper history (tamper detection)

This use case describes the activities associated with tamper. Attempts to violate (parts of) the metering installation or the removal of the meter cover must be detected and registered with a time stamp; this detection applies for both the electricity meter and the gas meter. Further, fraud attempts using magnetic fields must be registered in the metering equipment. The metering installation must be able to register at least the last 30 fraud attempts. Tamper detection (fraud and violation) is always active on all equipment (even during outages). The current process describes the retrieval of tamper detection (fraud detection). The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-9.

Trigger	Description
Deployment of metering equipment	On installation the metering equipment starts registering tamper attempts and on deployment this information is made available to the CS. The GO will collect information on tamper attempts periodically. Attempts of fraud (tamper signals) on the electricity and gas meter are registered and provided, so the grid operator is able to take appropriate actions to stop fraud.

Figure 5-9a: Provide tamper history – trigger description

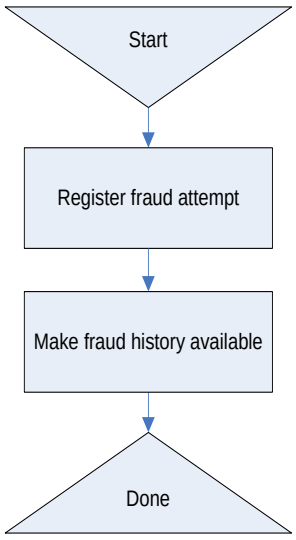


Figure 5-9b: Provide tamper history – block diagram

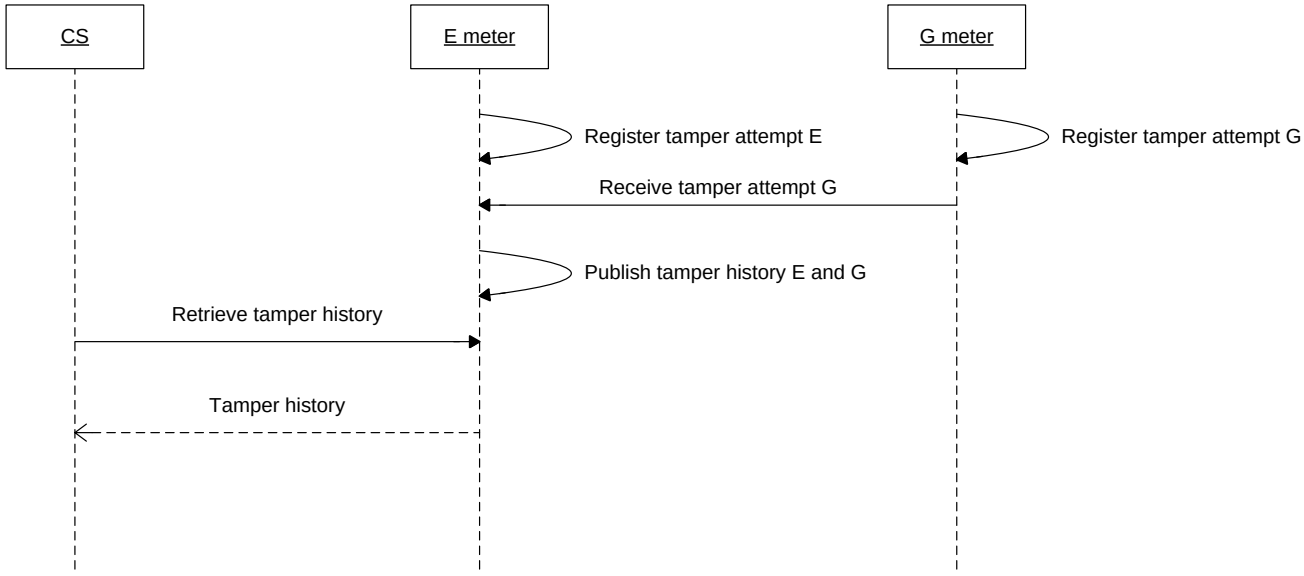


Figure 5-9c: Provide tamper history – UML sequence diagram

Pre-conditions

- The grid operator wants to retrieve tamper information from a meter.

Parameters

- Equipment identifier of the meter.

Post-conditions

- The tamper information is published.

Assumptions

- In general, the retrieval of an alarm byte in use case 1 (provide periodic meter reads) will be the trigger for CS to request the fraud history.

5.9.1 Tamper detection

DSMR-M 4.5.44

Description	Metering equipment shall detect physical tamper attempts.						
Rationale	The internals of metering equipment are protected by seals in order to prevent tampering. As breaking the seals cannot be detected automatically the meter shall provide other means to detect intervention with components protected by these seals.						
Fit criterion	Metering equipment register the following information for physical intervention: ▪ Equipment identifier for the meter that detected the physical intervention; ▪ Time stamp of the moment of the intervention if a clock is present.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.8.6)	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.5.45

Description	Metering equipment shall detect tamper attempts with magnetic fields if it is susceptible to these magnetic fields.						
Rationale	Not all metering equipment is immune for magnetic fields of various strengths. The equipment shall therefore be able to detect magnetic fields that it is susceptible for.						
Fit criterion	Metering equipment register the following information for magnetic intervention: ▪ Equipment identifier for the meter that detected the physical intervention; ▪ Time stamp of the moment of the intervention (if a clock is present in the G meter).						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.8.6)	**Port**	n.a.	**Applicable**	E meter, G meter

5.9.2 Tamper history

DSMR-M 4.5.46

Description	The E meter shall provide a reasonable number of detected tamper attempts.						
Rationale	The E meter shall be able to store a number of tamper attempts that provides the GO a reasonable timeframe to collect tamper information without any information getting lost.						
Fit criterion	The E meter shall be able to store the following numbers of tamper attempts: ▪ 30 most recent tamper attempts on G meter; ▪ 30 most recent tamper attempts on E meter. ▪ The registration of identical tamper events shall be limited to once per 15 minutes						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.2.8.6)	**Port**	P3	**Applicable**	E meter

5.9.3 Performance

DSMR-M 4.5.47

Description	The E meter shall have the tamper history available on P3 soon after the request was received by the metering installation.						
Rationale	If the information retrieval takes too much time, this will cause delays in the data collection process.						
Fit criterion	Total handling time of retrieving the tamper history and publish all information on P3 shall be less than 5 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

.

5.10 Use case 10: Display standard messages on meter display and P1

It must be possible for grid companies and suppliers to send standard messages concerning the supply of energy to the metering installation via port P3. These messages are displayed on the display of the metering installation and are also offered at port P1. The metering installation shall enable display of these messages. Messages concerning gas will also be displayed on the display of the electricity metering system; it must, however, be clear which messages apply to which commodity. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-10.

Trigger	Description
The GO or supplier wants to send a message	The grid operator or supplier informs the customer of executed or pending actions.

Figure 5-10a: Display messages on meter display and P1 – trigger description

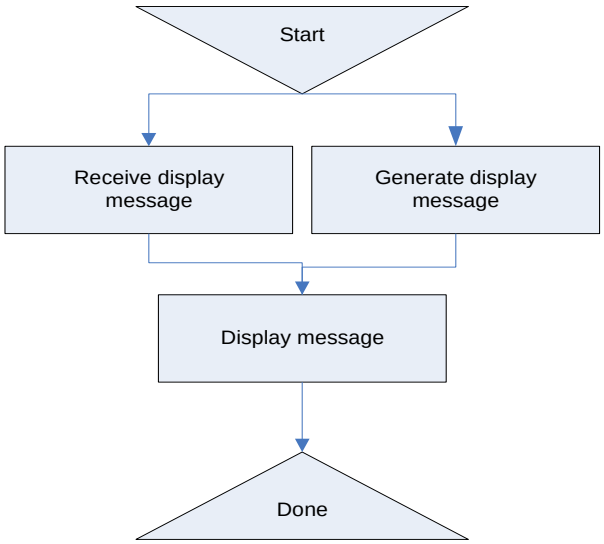


Figure 5-10b: Display messages on meter display and P1 – block diagram

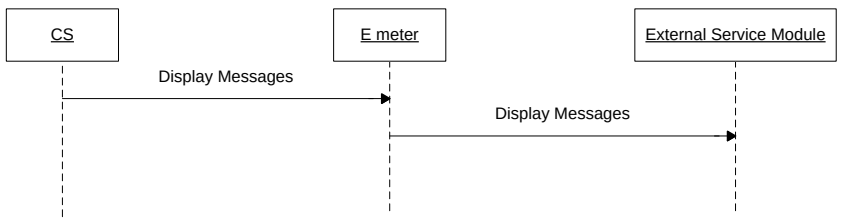


Figure 5-10c: Display messages on meter display and port P1 – UML sequence diagram

Pre-conditions

- The GO or supply company wants to inform the customer of executed or pending actions.

Parameters, either

- A message with syntax code NN, where NN numerical, or
- A concatenated message with syntax code NN+MM+LL…, where NN, MM, LL, and so on, are numerical (maximum 8 characters, see also P1 document), or
- An empty message.

Post-conditions, either

- The message is presented on P1 and on the display of the metering installation, or
- (In case of an empty message) the previous message is removed from P1 and the display of the metering installation.

Assumptions

- The assumption is made that the equipment that receives the information on P1 provides functionality to handle the messages in the appropriate way
- The CS shall decide which messages must be presented, when more than one needs to be presented, concatenation is handled in the CS.

5.10.1 Display standard messages

DSMR-M 4.5.75

Description	The E meter shall provide functionality to display received standard messages and standard messages generated by the meter.						
Rationale	Messages are used by the GO, the supplier, or by the meter in order to inform the customer.						
Fit criterion	The received standard message or the generated message (added to the received standard message) is shown on the display of the metering installation and it has the following characteristics: ▪ It can be displayed on a numerical display; ▪ Horizontal scrolling will be used if the message does not fit on the display; ▪ A new message will override the current message on the display; ▪ An empty message will result in the removal of the current message on the display, and return the display to auto scroll mode; ▪ Maximum length is 8 characters. ▪ The message shall be shown continuously on the display, until the consumer presses a button.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.3.2.1)	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.76

Description	The electricity meter shall provide functionality to provide standard messages to auxiliary equipment.
Rationale	Auxiliary equipment is usually installed at a convenient location for the consumer to view information whereas the metering installation can be in a less convenient place.

	For this reason the standard messages are provided to auxiliary equipment.						
Fit criterion	The standard message is provided to the auxiliary equipment.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.3.2.1)	**Port**	P1	**Applicable**	E meter

5.10.2 Performance

DSMR-M 4.5.77

Description	The E meter shall display a message on the meter display soon after the request was received by the metering installation.						
Rationale	The received message has to be shown on the display on short notice.						
Fit criterion	Total handling time after receiving the message shall be less than 5 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.78

Description	The E meter shall send a message to P1 soon after the request was received by the metering installation.						
Rationale	The received message has to be shown on the auxiliary device on short notice.						
Fit criterion	Total handling time after receiving the message shall be less than 5 seconds. The E meter continues to send the message to P1 (every 10 seconds) until the next message has been received.						
History	Nov. 2007	**Origin**	TST	**Port**	P1	**Applicable**	E meter

5.11 Use case 11: Sending long messages to port P1

For the market participant involved with the connection (GO, supply company and independent service provider), it is possible to send a long message to the metering installation. A long message differs from standard messages by the way the metering installation handles them. On arrival in the metering installation the long messages are directly forwarded to the auxiliary equipment. The long messages are not interpreted or displayed in the metering installation in any way. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-11.

Trigger	Description
A market participant wants to send a message	A market participant involved wants to send a data string through P3 to the OSM on P1.

Figure 5-11a: Sending messages to port P1– trigger description

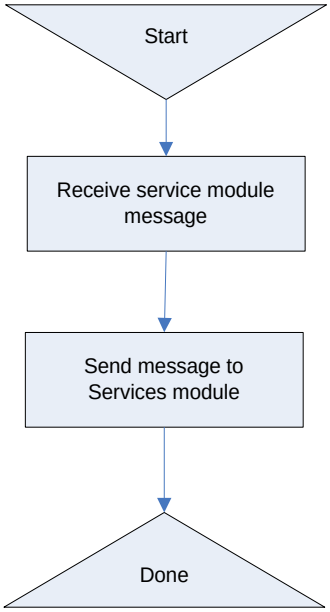


Figure 5-11b: Sending messages to port P1– block diagram

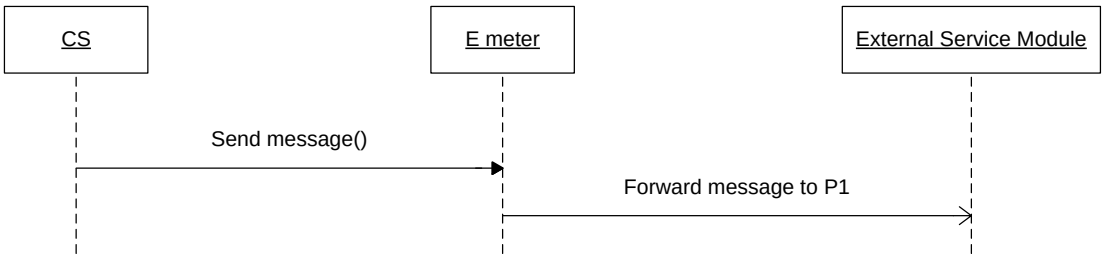


Figure 5-11c: Sending messages to port P1– UML sequence diagram

Pre-conditions

- A market participant involved with a connection wants to send a data string to the auxiliary equipment.

Parameters

- A long message (maximum 1024 characters).

Post-conditions

- The long message is provided to the auxiliary equipment. The central system assures at least 1 hour availability of the long message at the end customer device. In case another message is offered for processing, the new message is hold back by the CS in case the previous message was processed less than 1 hour ago"

5.11.1 Long messages

DSMR-M 4.5.79

Description	The E meter shall provide functionality to receive long messages.						
Rationale	Market participants can provide specific information to consumers through the auxiliary equipment. Note the difference with standard messages. The standard messages are provided to auxiliary equipment too, but are also displayed by the E meter itself..						
Fit criterion	The E meter shall accept long messages with a maximum of 1024 characters for distribution to the auxiliary equipment.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.3.2.2)	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.80

Description	The E meter shall provide functionality to forward long messages to the auxiliary equipment.						
Rationale	The contents of long messages are no concern for the metering installation. The contents are therefore forwarded to the auxiliary equipment directly. The E meter continues to send the message to the auxiliary equipment until the next message has been received.						
Fit criterion	The displayed message is available to the auxiliary equipment until the next message has been received.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.3.2.2)	**Port**	P1	**Applicable**	E meter

5.11.2 Error reporting

DSMR-M 4.5.81

Description	The equipment shall issue a logical error in case it cannot handle the received long message due to its size.
Rationale	Messages can be modified during transport (e.g. differing character sets). This could lead to situations where a message is longer than the size that can be handled by the equipment.
Fit criterion	The equipment shall issue a logical error in case it cannot handle the received long message due to its size. The logical error issued shall at least contain the generic at-

	tributes for errors.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

5.11.3 Performance

DSMR-M 4.5.82

Description	The E meter shall publish the message on the P1 port soon after the request was received by the metering installation.						
Rationale	The message shall become available for the external service module on short notice.						
Fit criterion	Total handling time after receiving the message shall be less than 5 seconds. The E meter continues to send the message to the auxiliary equipment until the next message has been received.						
History	Nov. 2007	**Origin**	TST	**Port**	P1	**Applicable**	E meter

5.12 Use case 12: Shift tariff times electricity

The supply company can deliver electricity for a flat rate (single tariff) or two tariffs. In the latter case, a calendar day is divided in two parts. The times during the day where a shift from one tariff to another takes place are denoted tariff shift times. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-12.

Trigger	Description
Change of tariff times	The supply company requests a change in the tariff switch times.

Figure 5-12a: Shift tariff times electricity – trigger description

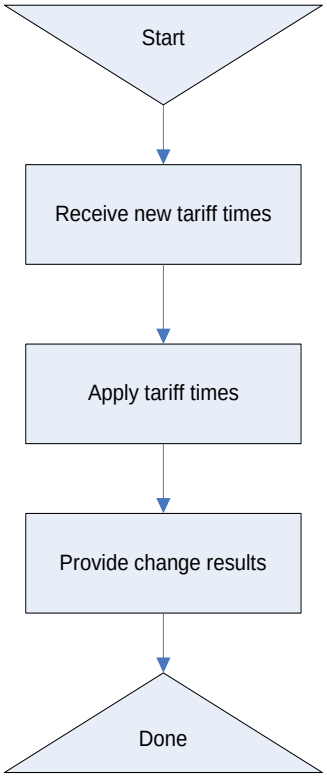


Figure 5-12b: Shift tariff times electricity – block diagram

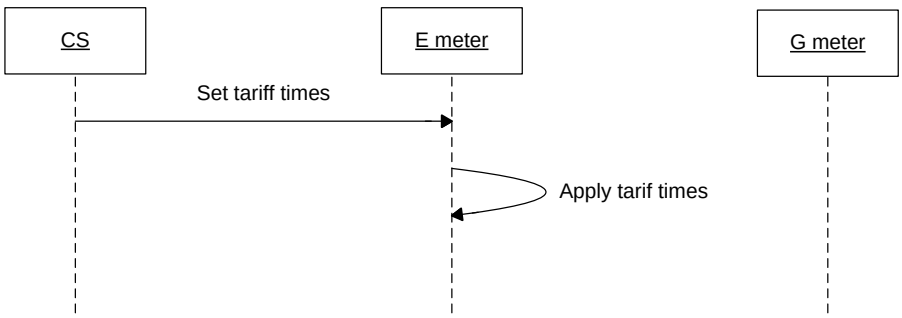


Figure 5-12c: Shift tariff times electricity – UML sequence diagram

Pre-conditions

- A shift of the tariff period is required

Parameters

- date at which the new shift times have to applied (activation date);
- tariff shift time to 'on-peak' tariff;
- tariff shift time to 'off-peak' tariff.

Post-conditions

- The tariff shift times have been set at the activation date;
- If setting of the tariff shift time has failed, an error is issued. The current active shift times must be not affected by this failure and must stay active.

Assumptions

- None.

5.12.1 Set tariff times

DSMR-M 4.5.83

Description	The electricity meter shall provide functionality to set two tariff shift times at a designated date.						
Rationale	A supplier may want to differentiate tariffs e.g. to satisfy customers with a specific consumption pattern. For this purpose the supplier can set tariff shift times per connection. Tariff shift times are applied at 00:00h in order to let the change coincide with a periodic meter read.						
Fit criterion	After 00:00h on the designated date the tariff shift times are applied and consumption is assigned to the correct tariff according to the tariff shift times.						
History	Nov. 2007	**Origin**	NTA 8130 ((§5.4.1)	**Port**	P3	**Applicable**	E meter

5.12.2 Logging and events

DSMR-M 4.5.85

Description	The E meter shall log info when the new Tariff Shift Time is applied.						
Rationale	It is important to have the means to verify when and which tariff is used and what the meter register values were.						
Fit criterion	The E meter shall log info when the new Tariff Shift Time is applied. The following info is logged: ▪ Activation date and time ▪ Event 9 and/or 19 will be used						
History	Sep. 2009	**Origin**	TST	**Port**	P3	**Applicable**	E meter

5.13 Use case 13: Synchronise time E meter

The general requirement DSMR-M 4.3.5 states the required accuracy of the time of the meter. To be able to verify that the internal clock of the metering equipment is operating and set correctly, the CS has to be able to synchronise the time of the metering equipment. This use case only applies to meters that use the CS for clock synchronisation, other methods are allowed as long as general requirement DSMR-M 4.3.5 is met. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-13.

Trigger	Description
Synchronise request from CS	A synchronise request is received from CS specifying the local time.

Figure 5-13a: Synchronise time E meter – trigger description

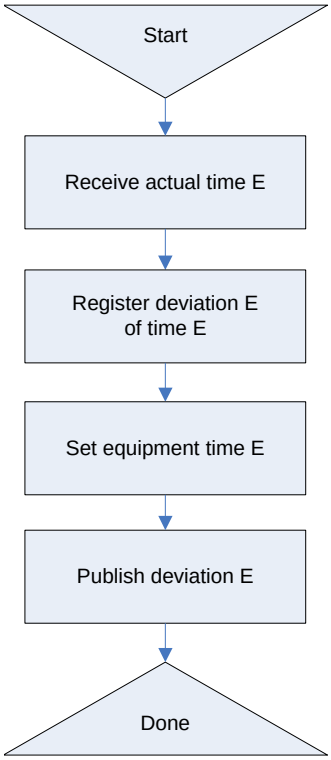


Figure 5-13b: Synchronise time E meter – block diagram

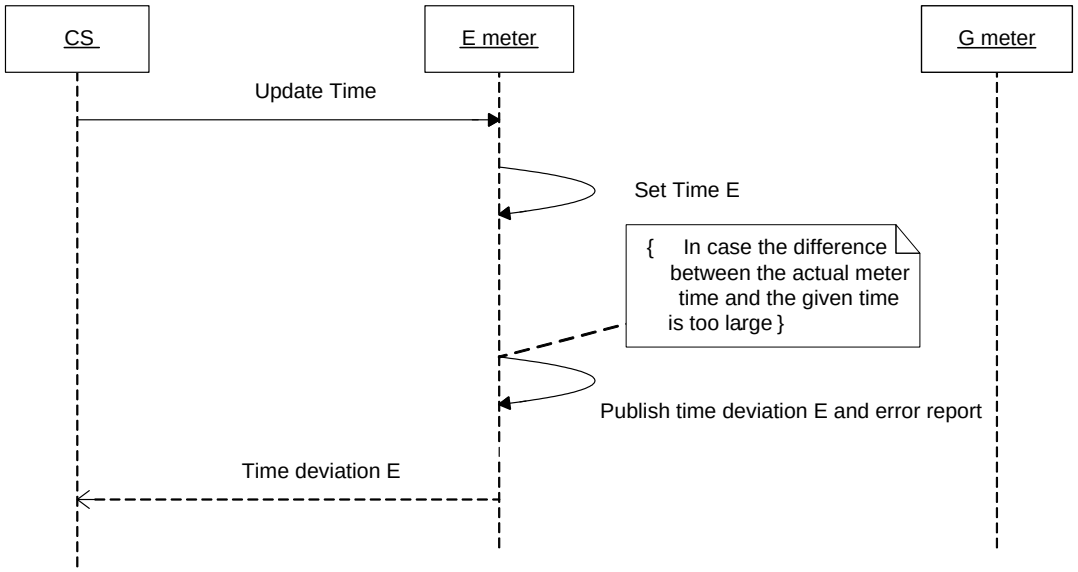


Figure 5-13c: Synchronise time E meter – UML sequence diagram

Pre-conditions

- The internal clock of the E meter can deviate from the local time.

Parameters

- Local time (possibly with the time needed for communication accounted for).

Post-conditions

- The internal clock of the metering equipment is within the limits of accuracy.
- If the clock is adjusted more than a predefined amount of time, this is logged as an error.

Assumptions

- The time it takes to send the local time from the CS to the meter can be neglected.
- After retrieval of the alarm byte concerning the time shift (in use case *Provide periodic meter reads*) and retrieval of the error logging including the applied time shift (use case *Provide error history*), it is the responsibility of CS to ascertain the quality of the periodic meter reads and interval values.

5.13.1 Synchronise time

DSMR-M 4.5.86

Description	The E meter shall provide functionality to synchronise its internal clock, and to adjust the maximal deviation that is accepted compared to the local time from the CS.
Rationale	It is required that the accuracy of the time of the meter is within limits. As it is not reasonable to equip meters with clocks that meet the accuracy during their lifetime, the meter shall provide functionality to synchronise its clock to external entities.
Fit criterion	▪ The E meter shall provide functionality to synchronise its internal clock. ▪ The deviation of the clock shall be within the limits of accuracy. ▪ The maximum deviation in seconds can be adjusted in the E meter (typically 60

	seconds).						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.87

Description	The E meter shall issue an event if the time adjustment is larger than the maximum deviation time.						
Rationale	In order for meter readings to be accurate, the time of registration has to be accurate too. Therefore the equipment shall provide information on large time adjustments.						
Fit criterion	If the time adjustment is more than the maximum deviation time in Seconds, two events are issued. The corresponding log entry contains the event Clock adjusted (old date/time) and the event Clock adjusted (new date/time).						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

5.13.2 Performance

DSMR-M 4.5.88

Description	The E meter shall have the logging information on large time shifts available for both E and G on P3 soon after the request was received by the metering installation.						
Rationale	If the information retrieval takes too much time, this will cause delays in the data collection process.						
Fit criterion	The retrieval of the stored information and publication on P3 shall take no more than 5 seconds.						
History	Nov. 2007	**Origin**	TST	**Port**	P3	**Applicable**	E meter

5.14 Use case 14: Synchronise time G meter

The general requirement DSMR-M 4.3.5 states the required precision of the time of the meter. To be able to verify that the metering equipment is operating accordingly and correct the time when necessary the E meter has to be able to synchronise the time of the G meter. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-14.

Trigger	Description
Deployment of gas equipment	At deployment the time of the metering equipment is probably not correct, so it has to be synchronized. If the P2 device has an internal clock, it shall be synchronised by the E meter via an M-Bus time set action after the first encrypted response is received. Note that time synchronisation is always initiated by the E meter. In wireless (RF) configurations the G meter allows the E meter to send commands once every hour.
Time change	Synchronisation is done at every time change of the bus master (including daylight savings time related changes)
Communication restart	Synchronisation is done at every restart of the communication (after communication breakdown, after M-Bus master breakdown, and after M-Bus slave breakdown).
Periodically	Synchronisation is done every 24 hours, to ensure a maximum deviation below 60 seconds.

Figure 5-14a: Synchronise time G meter – trigger description

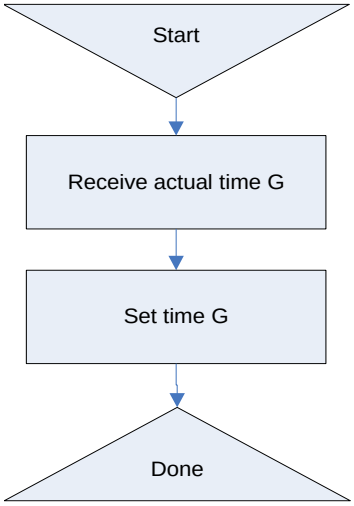


Figure 5-14b: Synchronise time G meter – block diagram

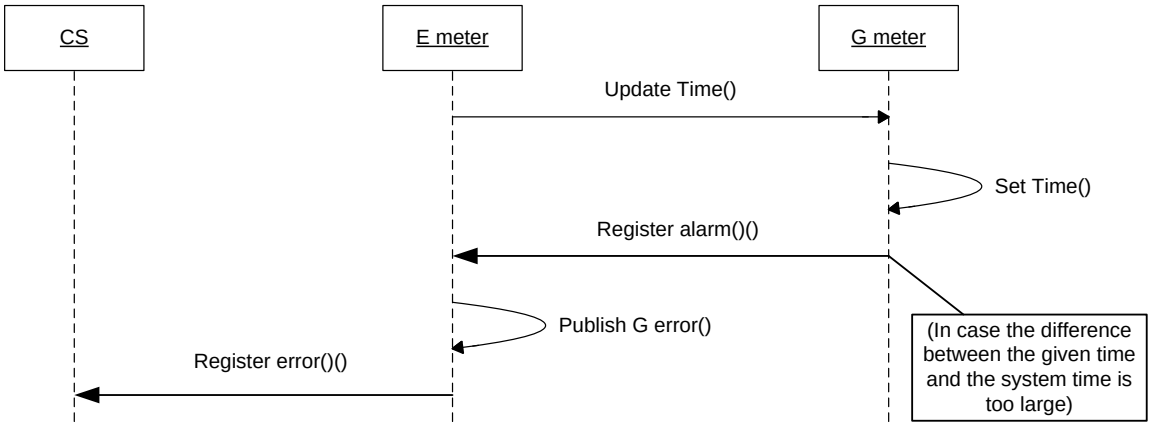


Figure 5-14c: Synchronise time G meter – UML sequence diagram

Pre-conditions

- The internal clock of the G meter can deviate from the E meter time.

Parameters

- Local time.

Post-conditions

- The time of the G meter is within the limits of accuracy.
- If the clock is adjusted more than a predefined amount of time, this is logged as an error.

Assumptions

- The time to send the local time from the E meter to the G meter can be neglected.

5.14.1 Synchronise time

DSMR-M 4.5.89

Description	The E meter shall provide functionality to synchronise the time of the G meter.
Rationale	It is required that the accuracy of the time of the meter is within limits. As it is not reasonable to equip meters with clocks that meet the accuracy during their lifetime, the E meter shall provide functionality to synchronise the clock of the G meter. Synchronisation is done: ▪ At every time change of the bus master (including daylight savings time related changes). ▪ At every restart of the communication (after communication breakdown, after M-Bus master breakdown, and after M-Bus slave breakdown). ▪ Every 24 hours, to ensure a maximum deviation below 60 seconds. ▪ The E meters shall automatically perform a M-Bus time set action after installation of a G meter.
Fit criterion	The G meter can be synchronized. Deviation of the clock shall be within the limits of accuracy.

History	Nov. 2007	Origin	NTA 8130	Port	P2	Applicable	E meter, G meter

DSMR-M 4.5.90

Description	The G meter shall provide functionality to synchronise its clock.						
Rationale	It is required that the accuracy of the time of the meter is within limits. As it is not reasonable to equip meters with clocks that meet the accuracy during their lifetime, the meter shall provide functionality to synchronise its clock to external entities.						
Fit criterion	The G meter can be synchronized						
History	Nov. 2007	Origin	NTA 8130	Port	P2	Applicable	G meter

DSMR-M 4.5.91

Description	The G meter shall provide functionality to publish large time shifts.						
Rationale	Time shifts shall be known in the CS in order to determine the quality of certain interval values.						
Fit criterion	Upon synchronisation, if the clock deviates more than 60 seconds, an alarm is raised. Upon first communication, the alarm is reported to the E meter.						
History	16-07-07	Origin	NTA 8130	Port	P2	Applicable	G meter

5.14.2 Error reporting

DSMR-M 4.5.92

Description	The E meter shall issue a normal error for large time adjustments that occur in the G meter.						
Rationale	In order for meter readings to be accurate, the time of registration has to be accurate too. Therefore the equipment shall provide information on large time adjustments.						
Fit criterion	If the time adjustment is more than S (typically 1 minute), an error is issued that contains the generic attributes for normal errors.						
History	Nov. 2007	Origin	NTA 8130	Port	P2	Applicable	E meter

5.15 Use case 15: Provide communication information

This use case is derived from the AmvB and describes the process of gathering information about communication sessions between CS and E meter. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-15. Figure 5-15d provides the communication log parameters.

Trigger	Description
Deployment of E meter	On installation the E meter starts registering communication sessions and on deployment this information is made available to the customer and the CS. The information is used to provide the customer with information about the time and reason for communication with central system of the Grid operator.

Figure 5-15a: Provide communication session information – trigger description

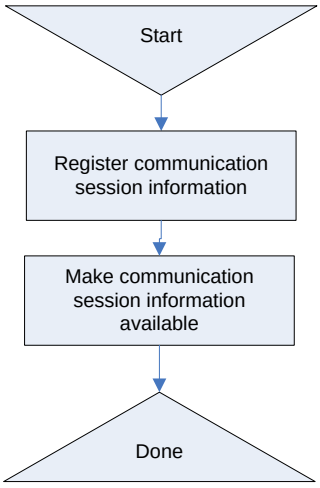


Figure 5-15b: communication session information – block diagram

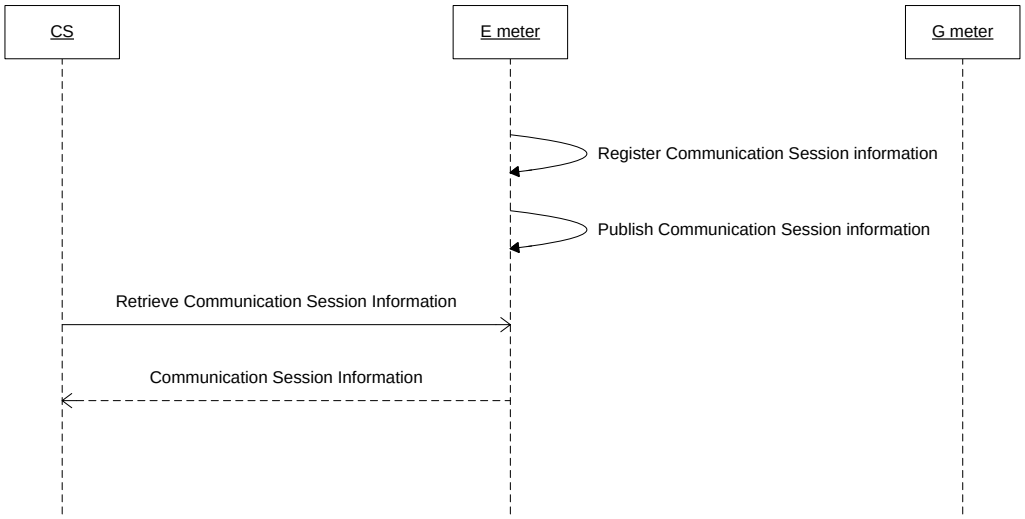


Figure 5-15c: Provide communication session information – UML sequence diagram

Comlog code	Meaning	Number of meter readings in display	Purpose	Explanation
1	Technical maintenance of the meter	None	time synchronisation, setting of tariff, special days table, status of meter (alarms and events) firmware upgrade.	
2	Technical maintenance of the grid	None	Power quality, definable load profile, instantaneous and active values.	
3	Meter readings E	Yes	Actual, daily and monthly meter readings	1 meter reading is defined as one set of data for consumption and delivery on all active tariffs at one timestamp[2]
4	Meter readings G	Yes	Actual (last hourly value), daily and monthly meter readings	1 meter reading is defined as one set of data for all connected[3] M-Bus devices at one timestamp[3]
5	Interval data E	Yes	Interval data E meter	1 meter reading is defined as one set of data for consumption and delivery at one timestamp[4]
6	Interval data G	Yes	Interval data all M-bus	1 meter reading is de-

[2] The timestamp for daily and monthly meter readings is defined as the date and time stored in the profile. The timestamp for actual reading (last hourly value for G) is defined as the time of the reading of the registers. All actual readings are considered to have the same timestamp and will always be different from the timestamp in the daily and monthly profiles. If daily and monthly meter readings are read in combination with the actual readings, the comlog counter must be incremented twice.

[3] Connected means that the M-Bus device is installed and not-connected means that the M-Bus device is de-installed or has never been installed.

[4] Timestamp is defined as the date and time of the measurement values.

			devices	fined as one set of data for all connected[5] M-Bus devices at one timestamp[7]

Figure 5-18d: Table of Comlog codes and explanation

Pre-conditions

- The customer wants to check when the GO has communicated with the E- and G meter and what type of information is exchanged.

Parameters

- Equipment identifier for the E meter;
- Period for which the communication session information has to be retrieved

Post-conditions

- Communication session information is available on the E meter display and/or the P3 port

Assumption

- None

5.15.1 Communication session information

DSMR-M 4.5.93

Description	The E meter must log for every communication session the date and time of the session, the type of data and if applicable the number of meter readings retrieved. This information must be made available on the display of the E meter and the P3 port.						
Rationale	The customer must have the possibility to verify if the Grid operator does not retrieve more data than the customer has given permission for.						
Fit criterion	The communication session log should comply to the following: ▪ The E meter must log for every communication session over P0 and P3; the date and time of the session, type of data exchanged and if applicable the number of meter readings retrieved. ▪ The date and time stamp logged is the end of the communication session. ▪ The information must be made available on the display of the E meter and the P3 port. ▪ The information must be stored for a year. (The number of entries is based on one communication session per day with all types of data exchange. ▪ Logging older than a year must be deleted.						
History	Sep. 2013	**Origin**	AmvB	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.94

Description	The communication session information shall be available per comlog code in a standardized way.
Rationale	The customer has to be able to check in an easy way when the GO has communicated with the E- and M-bus device and for which reason and how many data has been re-

<table>
<tr><td></td><td colspan="7">trieved.</td></tr>
<tr><td>Fit criterion</td><td colspan="7">The information must be displayed according to the navigation structure from figure 5-15.1:
In manual scroll the date and timestamp of the most recent communication session with the corresponding com log code is displayed,
Detailed com log information can be obtained by pressing the button for >5 seconds,
The first level of the com log menu shows the six com log types (when applicable) with corresponding date and timestamp of the most recent communication session,
The second level of the com log menu can be entered by pressing the button for >5 seconds,
The second level of the com log menu shows:
The date and timestamps of all communication sessions of this com log type,
The first entry shall be the most recent communication session and therefore this entry has the same timestamp as depicted in the first level
The number of meter readings retrieved by the CS (only applicable for com log codes 3 thru 6).
From the second level, the first level can be entered again via a button press of >5 seconds,
With a short button press <1 sec the next item within the menu will be selected,
Returning to auto scroll will occur after a timeout of 30 seconds (no button press),
The next item will be shown after releasing the button.</td></tr>
<tr><td>History</td><td>Sep. 2013</td><td>Origin</td><td>AmvB</td><td>Port</td><td>n.a.</td><td>Applicable</td><td>E meter</td></tr>
</table>

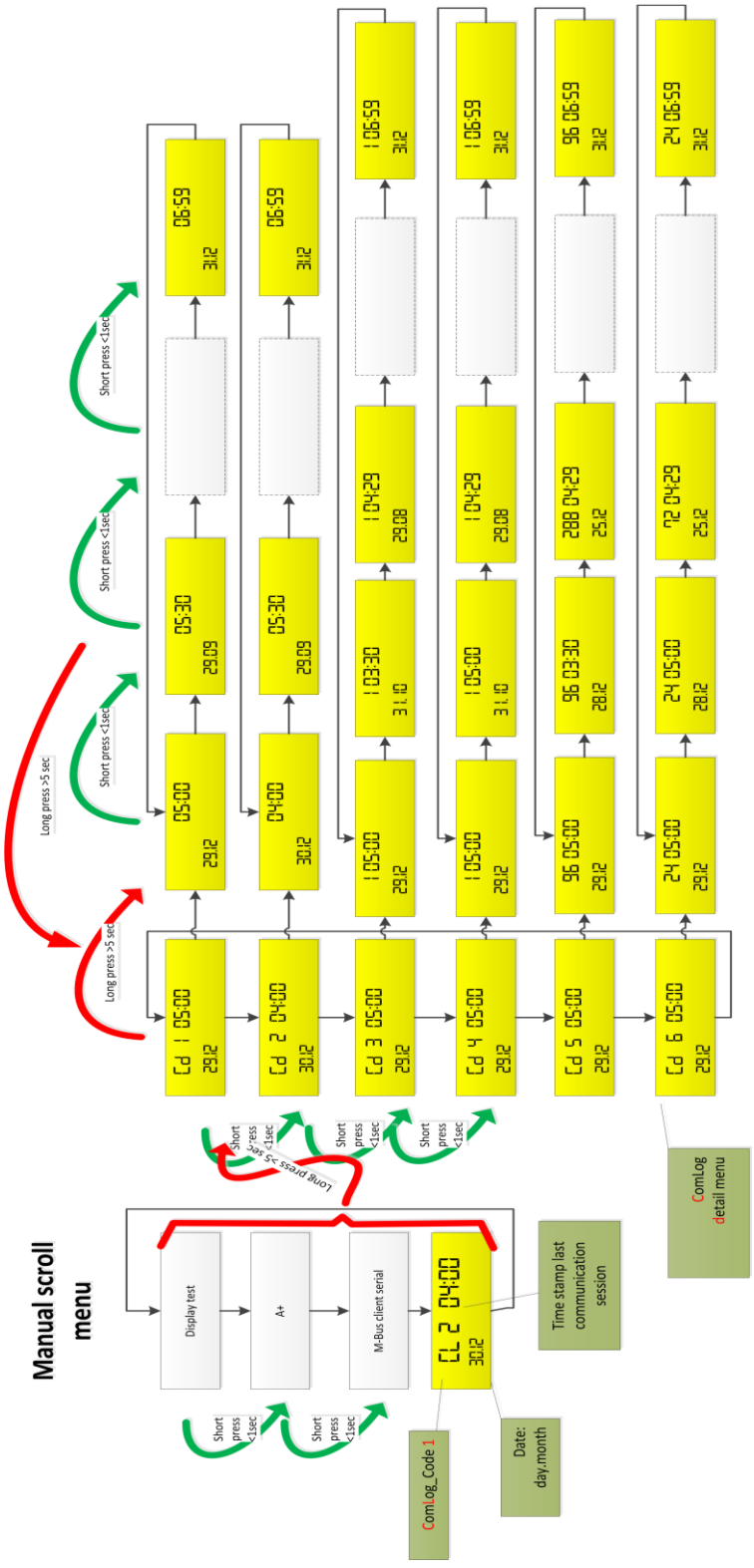


Figure 5-15.1 Communication session log navigation structure

5.16 Use case 16: Provide partial power outage information

This chapter describes the Use Case for detecting and sending Partial power outage information on a poly phase meter to the central system. The trigger description, block diagram and UML sequence diagram are depicted in Figure 5-16.

Trigger	Description
Power outage on one or two phases	On detecting a partial power outage on one or two out of three phases on a poly phase meter, the E meters starts registering this outages and if configured the event(s) will be pushed to the CS.

Figure 5-16a: Provide partial power outage information – trigger description

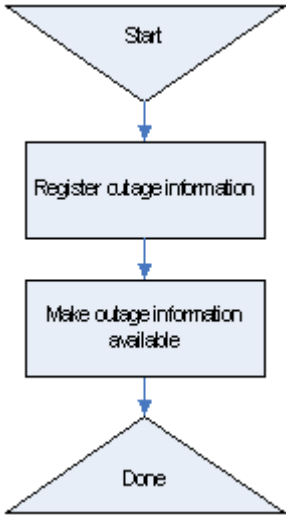


Figure 5-16b: Provide partial power outage information – block diagram

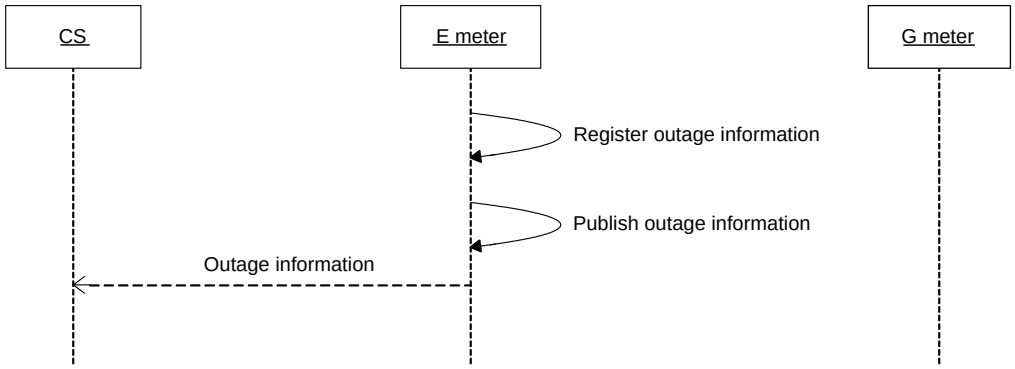


Figure 5-16c: Provide partial power outage information – UML sequence diagram

Pre-conditions

- The meter has detected a partial power outage;
- The meter has logged partial power outages;

Parameters

- Equipment Identifier for the E meter.

Post-conditions

- The GO has information on a partial power outage available from the designated meter.

Assumptions

- None

DSMR-M 4.5.95

Description	The poly phase E-Meter shall be able to detect partial power failure for outage signaling.						
Rationale	In about 90% of power outages in the field only one or two phases are disconnected. When all poly phase meters send power outage information the GO immediately gets a complete picture of the scale of power outage and can respond efficiently.						
Fit criterion	If for a poly phase E-Meter the voltage of one or two phases reaches a low value (same as used for the power outage mentioned in DSMR-M 4.5.39 DSMR-M 4.5.40) for a period longer than 3 sec, then a Partial Power Outage message is sent by the E Meter, if that function is configured and enabled in the E Meter. Time of detection is 3 sec. All parameters are the same for all phases. The message contains the situation at the detection moment.						
History	Dec. 2018	**Origin**	SMR5.0	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.96

Description	The Partial Power Outage message shall contain identification of the phases that suffered power outage.						
Rationale	Partial Power Outage can occur on any of the 3 phases so information about the affected phase is needed						
Fit criterion	Identification of the disconnected phase is send.						
History	Dec. 2018	**Origin**	SMR5.0	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.97

Description	The poly-phase E Meter shall be able to handle a new Partial Power Outage message immediately after completion (sending) the previous Partial Power Outage

	message.						
Rationale	A second phase could suffer a power outage soon after the previous one.						
Fit criterion	Completion of the Partial Power Outage messages includes handling on all protocol layers						
History	Dec. 2018	**Origin**	SMR5.0	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.98

Description	The Meter shall have the ability to test the Partial Power Outage function without the need for an interrupted main supply.						
Rationale	Testing of Partial Power Outage function in the field.						
Fit criterion	The Meter shall have a precisely timed event that triggers the activation of the Partial Power Outage message. With a programmable time-based event, an emulation of a massive outage is possible.						
History	Dec. 2018	**Origin**	SMR5.0	**Port**	P3	**Applicable**	E meter

DSMR-M 4.5.99

Description	It shall be possible to disable and enable the Partial Power Outage Signaling function.						
Rationale	There are situations where it may be useful to prevent unwanted Partial Power Outage messages (e.g. in case of signaling load issues).						
Fit criterion	Partial Power Outage Signalling can be disabled						
History	Dec. 2018	**Origin**	SMR5.0	**Port**	P3	**Applicable**	E meter

6 BUSINESS USE CASES FOR INSTALLATION AND MAINTENANCE

In this chapter the requirements are provided in a framework of use cases. The use cases represent the building block for business processes for installation and maintenance in which the equipment participates. The entity that executes the use cases is external to the equipment. The actual type of the external entity (system, user or other) is irrelevant for the requirements in this section. What is however important, is to have a clear division between the activities internal to the equipment and the external entity. Where gas meters are mentioned this could also be replaced with thermal, water, or slave E meters.

6.1 Measuring equipment use cases

This section provides the use cases that apply to all equipment.

6.1.1 Use case: Receive equipment

This use case provides descriptions of the activities that start after the equipment is produced and are completed at the moment the equipment is ready to be installed.

Trigger	Description
The GO has ordered equipment	The GO has ordered equipment from a vendor.

Reception of equipment is handled per batch, i.e. the GO considers each delivery of equipment as a single batch of equipment.

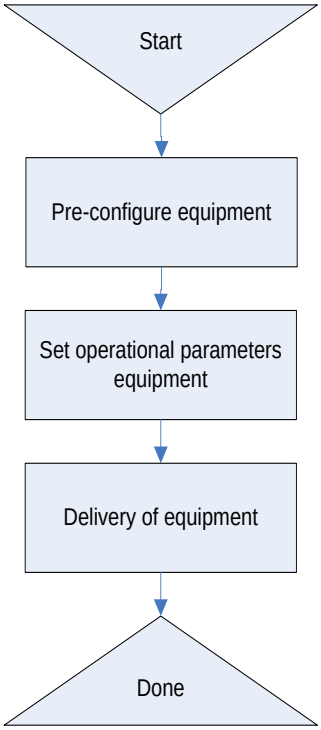


Figure 6-1: Receive equipment

Pre-conditions

- The equipment is in the initial state as produced.

Parameters

- Default configuration information;
- Default values for operational parameters.

Post-conditions

- The equipment is ready to be installed in the production environment

Assumptions

- -none-

6.1.1.1 Pre-configure equipment

The vendor handles pre-configuring the equipment. It involves setting values for the configuration and the operational parameters for the equipment. Refer to section 2.5 of the main document for a description of the configuration attributes for various types of equipment.

The GO will deliver a complete set of values for pre-configuring the equipment that is part of a batch of equipment, i.e. for each batch a new set of configuration values is provided.

The pre-configuration information for Measuring as provided by the GO consists of the following categories of information for each of the values in section 2.5.1:

Value	Description
Name	The name of the configuration item.
Value	The actual value to be pre-configured.
Displayable	Indicates if the name and value of the configuration item shall be displayable on the metering installation or not.

The activity of pre-configuring equipment is based on the assumption that it is more efficient and less error prone to do this separately from the physical installation. Another advantage of pre-configuring is that configuration information does not need to be distributed.

As the vendor performs the activity of pre-configuring the equipment, there are no requirements associated with this activity.

6.1.1.2 Set operational parameters equipment

The vendor will set the operational parameters for equipment prior to delivery. For this purpose the GO provides a complete set of values for the operational parameters. Refer to section 2.5.1.1 for a description of the operational parameters for the E meter and to section 2.5.1.2 for a description of operational parameters for G meter.

As the vendor performs the activity of setting the operational parameters for the equipment there are no requirements associated with this activity.

6.1.1.3 Delivery of equipment

The current section describes the requirements for delivery of equipment. All equipment is pre-configured by the vendor. After the vendor has preconfigured the equipment and set the operational parameters, the equipment is shipped to the GO.

The GO can verify that all requirements in this section are met through random samples determined before or after arrival of the equipment.

DSMR-M 4.6.1

Description	During the packaging of each E meter a mounting clip shall be included.						
Rationale	Sometimes it is necessary for installation purposes to use a mounting clip to fit the E meter on the meter board.						
Fit criterion	During the packaging of each E meter a mounting clip shall be included.						
History	Dec. 2008	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.2

Description	Measuring equipment shall have an equipment identifier according to the U.S.S code 128 bar code system.						
Rationale	GO's need an identifier for the meter that is used throughout its lifetime: the equipment identifier. The identifier for E and G meters contains the meter code. The meter code implicitly indicates that the meter is certified to be used in the Dutch market. The equipment identifier also includes the serial number for the equipment. The serial number is assigned by the vendor. Finally the equipment identifier contains the last 2 digits of the year of manufacturing (i.e. year of century). However, these last two digits can't be used to make the equipment ID unique.						
Fit criterion	The equipment identifier shall be compiled of three parts: ▪ Meter code, 5 character code (with leading spaces if is code is shorter than 5 characters); ▪ Serial number, 10 characters, assigned by the vendor, with leading zeroes if the number is shorter than 10 characters ▪ Year of manufacturing, 2 characters, assigned by the vendor as year of century. However, these last two digits can't be used to make the equipment ID unique.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.6.3

Description	The equipment identifier shall be printed in a form that is readable for both humans and machines.						
Rationale	The equipment identifier shall be provided in both machine readable and human readable form as this facilitates installation and maintenance processes. In order to improve readability the background colour of the bar code shall preferably be white.						
Fit criterion	The printed representation of the equipment identifier shall meet the following criteria: ▪ The bar code must comply with Code 128 bar code (also known as ANSI/AIM 128 or USS code 128) specifications; ▪ The width of the thinnest line or space in the bar code, also known as the 'significant dimensional parameter X' must be at least 0.3 mm; ▪ The blank zones preceding and following the bar code, also known as the 'quiet zone' must be a minimum of 6 mm; ▪ The height of the bar code must be a minimum of 7 mm; ▪ A written out representation of the contents of the bar code must be printed directly underneath the bar code with a minimum character height of 3 mm; ▪ The size of the label shall not exceed a height of 30 mm and a length of 75 mm; ▪ The label shall remain legible throughout the lifetime of the meter.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

6.1.2 Use case: Firmware upgrade

This use case provides a description of the requirements to equipment with respect to firmware upgrades.

Please note that NTA 8130 states that firmware upgrades for the metering installation are required. In this document this is interpreted as firmware upgrades for only E meters (no G meters).

Trigger	Description
Add functionality	The GO wants to add new functionality on existing hardware and therefore installs new firmware.
Add optimisations	The GO wants to deploy optimised version of the firmware.
Fix software defects	The current version of the software contains flaws (bugs, incompatibilities etc) and is therefore replaced with a new version.

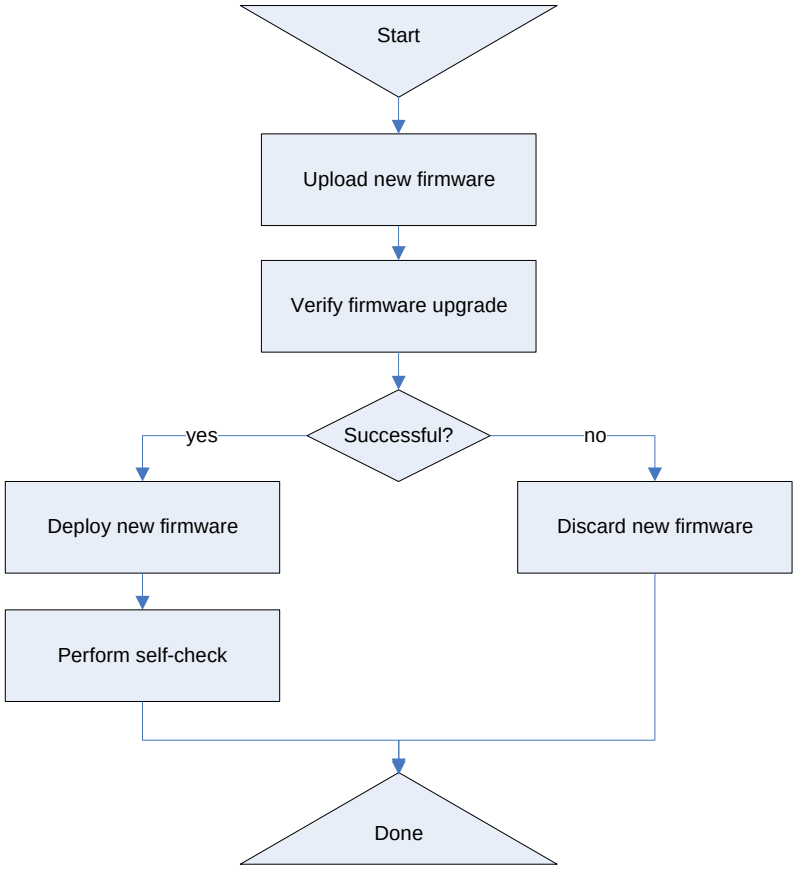


Figure 6-2: Firmware upgrade

Pre-conditions

- The current version of the firmware is incomplete, incorrect or outdated.

Parameters

- Date to deploy the new version of the firmware;
- New version of the firmware.

Post-conditions

- The new version of the firmware is deployed successfully or discarded;
- Verification of the new firmware is logged;
- The change of firmware is logged.

Assumptions

- The meter data in the metering instrument are not affected in any way by the firmware update;
- The state of the equipment (operational parameters and configuration) is not affected in any way by the firmware update;
- The metrological functions of metering instruments shall not be affected by a firmware upgrade.

6.1.2.1 Upload new firmware

DSMR-M 4.6.4

Description	The equipment shall provide functionality to upload new firmware to equipment.						
Rationale	It is expected that the firmware will be upgraded multiple times during the lifecycle of the equipment. Multiple reasons exist for upgrading firmware: new functionality added to firmware, optimisations in firmware, defects in firmware etc. For economic reasons it may not be feasible to upgrade firmware on-site, therefore both remote and local uploads of firmware are required.						
Fit criterion	The new version of the firmware shall be stored by the equipment. The fact that a new version of firmware is available can be verified through the state of the equipment.						
History	Nov. 2007	**Origin**	NTA	**Port**	P3, P0	**Applicable**	E meter

6.1.2.2 Verify firmware upgrade

DSMR-M 4.6.7

Description	The equipment shall issue a logical error in case the new firmware is incomplete, inconsistent or incompatible with the equipment-type.						
Rationale	A firmware upgrade is preceded by thorough testing and it is therefore not expected that firmware is not compatible. Incompatible firmware of a single piece of equipment usually implies that the upgrade will fail for other equipment too. As a firmware upgrade is a time-consuming activity users have to be informed of incompatible firmware immediately.						
Fit criterion	The logical error issued for incomplete, inconsistent (invalid identification or signing) or incompatible with the equipment-type firmware shall at least contain the generic attributes for logical errors. The new firmware shall not be deployed.						
History	Nov 2007	**Origin**	I&M	**Port**	P3	**Applicable**	E meter

DSMR-M 4.6.8

Description	The equipment shall log the event of successful verification of a new version of the firmware.

Rationale	For maintenance reasons it is important to verify if new firmware was received by the equipment and at what time and date it was verified.						
Fit criterion	The log information for the event shall at least contain the following information: Time stamp at which the new version of the firmware was verified						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

6.1.2.3 Deploy new firmware

DSMR-M 4.6.9

Description	The metering equipment shall deploy the new version immediately.						
Rationale	The metering equipment shall deploy the new version immediately.						
Fit criterion	The new version of the firmware is the operational version of the firmware in the equipment.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.10

Description	Deployment of new firmware shall not result in modification or deletion of any meter data, configuration parameters or operational parameters in the equipment.						
Rationale	The deployment of new firmware shall not have any additional activities as a result in order to have the equipment function correctly. This means that the firmware is supplied as 'plug-n-play' software.						
Fit criterion	No operational changes in the functioning of the meter shall occur after deployment of new firmware other than the documented changes for the new firmware.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.11

Description	A firmware upgrade for metering instruments shall not affect the metrological part of the instruments in any way.						
Rationale	According to European law and legislation it is not allowed to change the metrological characteristics or functionality in metering instruments. A firmware upgrade shall therefore not affect it. By following Welmec 7.2 Issue 4 (Software Guide – measuring Instruments Directive 2004/22/EC –) a compliancy with the software-related requirements contained in the MID (e.g. Annex 1, 7.6, 8.3, 8.4) can be assumed.						
Fit criterion	The equipment shall comply with Welmec 7.2 Issue 4 (Software Guide – measuring Instruments Directive 2004/22/EC –)						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.12

Description	The equipment shall log the event of deploying a new version of the firmware.						
Rationale	For maintenance reasons it is important to know at which time and date the firmware was deployed or discarded.						
Fit criterion	The log information for the event shall contain the following information: • Time stamp at which the new version of the firmware was deployed.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

6.1.2.4 Perform self-check

DSMR-M 4.6.13

Description	Immediately after the new firmware is deployed, a self-check is executed by the equipment. The results consist of the outcome of Use case: Perform self-check Measuring equipment'.						
Rationale	A self-check is executed to establish the correct running of the newly installed software. This can be considered as the final check performed during the process of a firmware upgrade.						
Fit criterion	The self-check that is executed as part of the firmware upgrade shall be performed within 10 seconds after the completion of the firmware update process,.						
History	Nov. 2007	**Origin**	I&M	**Port**	P3	**Applicable**	E meter

6.1.2.5 Discard new firmware

In case the verification of correct operation failed the new firmware shall not be deployed.

DSMR-M 4.6.14

Description	The equipment shall discard the new version of the firmware in case it is incomplete, inconsistent or incompatible with the equipment-type.						
Rationale	Equipment is able to store two versions of firmware: the version deployed and the version to be deployed. If the verification for correct delivery of the new version of the firmware fails, that version of the firmware shall not be deployed.						
Fit criterion	In case the firmware is incomplete, inconsistent or incompatible with the equipment-type, the new version of the firmware is prevented from activation by the equipment.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

6.1.2.6 Performance

DSMR-M 4.6.15

Description	The equipment shall complete a firmware upgrade within a limited period of time.						
Rationale	A remote firmware upgrade of firmware (P3) is not an online activity whereas a local firmware upgrade (P0) is considered an online activity (as on-site personnel may be waiting for it to complete).						
Fit criterion	The completion rates and times for execution of the use case for the respective ports are: P3 P0 80 %: 24 hours void 95 %: 48 hours void 99 %: 120 hours 5 minutes						
History	Nov. 2007	**Origin**	TST	**Port**	P0, P3	**Applicable**	E meter

6.1.3 Use case: Planned on-site maintenance

This section describes the use case for periodical on-site maintenance. This use case applies to Measuring equipment The equipment shall be implemented is such a way that planned on-site maintenance is kept to a minimum.

Trigger	Description
The battery of equipment is low	The GO has determined that the battery of the equipment needs to be replaced.
New communication	The GO want to change the communication technology for the equipment and therefore replaces the communications module.

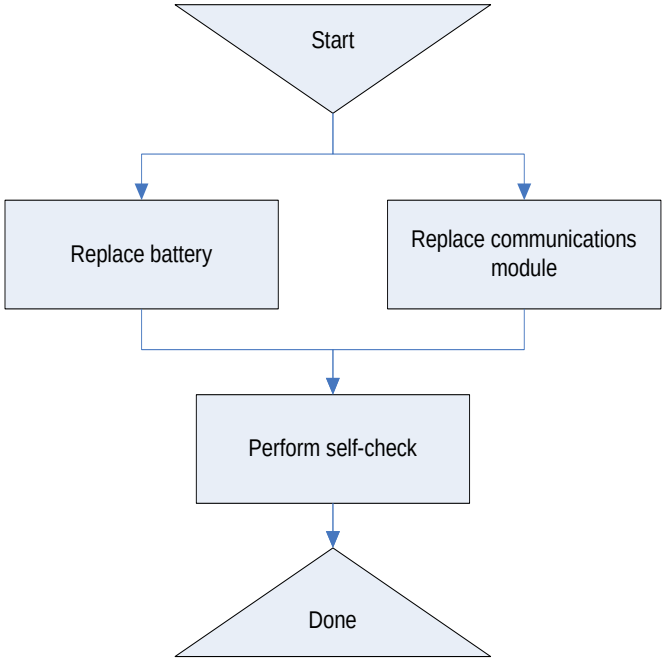


Figure 6-3: Planned on-site maintenance

Pre-conditions

- The equipment needs on-site maintenance.

Parameters

- -none-

Post-conditions

- The maintenance on the equipment was completed and the equipment functions correctly.

Assumptions

- -none-

6.1.3.1 Replace battery

The lifetime of the battery is required to be at least as long as the technical lifetime of the equipment. However, it is anticipated that a battery in individual meters can have a shorter lifetime than the meter itself. For this purpose the possibility of replacing the battery is necessary.

DSMR-M 4.6.16

Description	Equipment that contains a battery shall be constructed in such a way that replacement of the battery can be performed safely without disconnecting the equipment from the grid.						
Rationale	Lifetime of a battery can under some circumstances be shorter than the lifetime of the equipment.						
Fit criterion	Replacement of the battery module shall not lead to modification or loss of data in the equipment. The configuration and operational parameters of equipment will not be affected and need not to be changed as the result of replacing a battery. For metering instruments the meter data will not be affected by the replacement of the battery.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.6.17

Description	Equipment that contains a battery shall be constructed in such a way that replacement of the battery can be performed without breaking the metrological seal.						
Rationale	In case the metrological seal is broken, the equipment has to be recalibrated in order to be used. Replacing the battery shall not lead to mandatory recalibration as this is too time-consuming.						
Fit criterion	The battery can be replaced without breaking the metrological seal						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.6.18

Description	The battery lifetime counter must reset itself to the default value after changing the battery also the “battery low” bit must be reset						
Rationale	It must be possible to reset the battery lifetime counter without tools.						
Fit criterion	The battery lifetime counter and the battery low bit must be reset after a battery change by detecting the power down – power up sequence when exchanging the battery for a new one.						
History	Jan. 2011	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.6.19

Description	The activity of replacing the battery in equipment that contains a battery shall be completed in a limited period of time.
Rationale	The design of equipment shall enable fast replacement of the battery. The battery is located behind the non-metrological seal. The performance criterion presented here

	is based on the assumption that trained personnel replace the battery.						
Fit criterion	The battery is located behind the non-metrological seal. The completion rates and times for replacing the battery need to be 99 % in 5 minutes.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	G meter

6.1.3.2 Replace communications module

The state-of-the-art in communications technology changes quickly. It is therefore expected that the communications module that is part of the equipment may need replacement earlier than the equipment itself.
There are two concepts for the communication module: modular and integrated. If there is a separate (modular) communication module than the requirements in this paragraph apply. The communication module is located in the meter and can contain application and communication functionality.

DSMR-M 4.6.20

Description	The equipment shall be constructed in such a way that replacement of the communication module can be performed safely without disconnecting the equipment from the grid.						
Rationale	If the communications technology provides better means to communicate or a more cost-effective solution for communication, the GO may want to replace the communications module in the equipment with a new one that uses the better or more cost-effective means of communication.						
Fit criterion	Replacement of the communications module shall not lead to loss of data in the equipment. The configuration and operational parameters will not be affected and need not to be changed as the result of replacing a communications module. The meter data for metering instruments will not be lost or modified as the result of replacing the communications module.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.6.21

Description	The meter shall be constructed in such a way that replacement of the communications module can be performed without breaking the metrological seal.						
Rationale	In case the metrological seal is broken, the equipment has to be recalibrated in order to be used. Replacing the communications module shall not lead to mandatory recalibration as this is too time-consuming.						
Fit criterion	The communications module can be replaced without mandatory recalibration of the equipment.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.6.22

Description	The activity of replacing the communications module in equipment shall be complet-

	ed in a limited period of time.						
Rationale	The design of equipment shall enable fast replacement of the communications module. The performance criterion presented here is based on the assumption that trained personnel replace the communications module.						
Fit criterion	The completion rates and times for replacing the communications module need to be 99 % in 5 minutes.						
History	Nov. 2007	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter, G meter

6.1.3.3 Perform self-check

DSMR-M 4.6.23

Description	The equipment shall provide functionality to present the results of a self-check and retrieve the results from the local port during installation. The results consist of the outcome of 'Use case: perform self-check Measuring equipment'.						
Rationale	The maintenance personnel want to verify that the equipment functions correctly after the maintenance work is completed.						
Fit criterion	The self-check process shall comply with the description of the respective self-checks for the different types of equipment. The self-check process shall be completed within 10 seconds after initiation.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0	**Applicable**	E meter

6.1.4 Use case: Adjust equipment before installation

This use case handles the process of adjusting the equipment to the installation location. Adjustment of the equipment can be executed in two occasions during the installation process. The first occasion is prior to physical installation. Adjustment is then performed on attributes that are not depending on the location where the equipment is installed. The second occasion to adjust the equipment can take place after the equipment is physically installed. This will involve attributes that depend on the location where the equipment is installed.

It is important to note that the GO strives to minimize the number of adjustments to the equipment, hence the pre-configuration of the equipment by the vendor. The vendor shall thus handle the majority of the work during the activity of pre-configuring the equipment.

Trigger	Description
Measuring equipment is not configured correctly	The equipment is installed in a location where the default configuration or parameters applied during pre-configuration are not correct.
Measuring equipment is not configured completely	The equipment is installed in a location where the additional configuration values or parameters are required.

Install Measuring equipment	During installation of the equipment the configuration and operational parameters of the equipment may need to be modified.

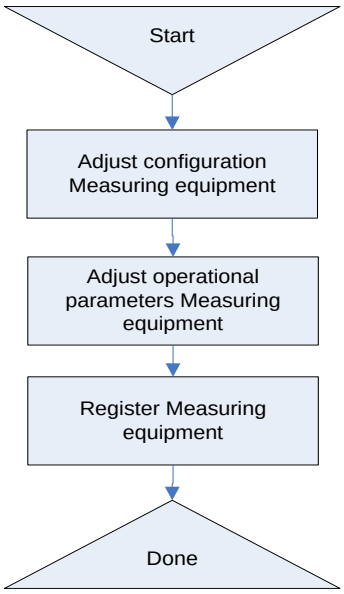


Figure 6-4: Adjust equipment

Pre-conditions

- The equipment is not configured correctly for the location where it is to be installed.

Parameters

- Configuration for the equipment
- Operational parameters for the equipment.

Post-conditions

- The equipment is configured correctly for the location where it is to be installed

Assumptions

- None.

6.1.4.1 Adjust configuration Measuring equipment

Although the vendor has pre-configured the equipment before shipping it, the GO may need to modify the configuration. There are multiple reasons to do this, consider the examples below:

- The default values for configuration provided by the GO have changed since the values were provided to the vendor;

- A sub-set of the equipment needs specific values (different from the default values) for configuration.

The GO thus needs facilities to adjust the configuration of the equipment. It should be noted that the adjustment of the configuration shall be kept to a minimum. It is the responsibility of the GO to minimize the amount of adjustment of equipment.

DSMR-M 4.6.24

Description	The vendor of the Measuring equipment shall deliver an integrated software package that supports adjusting the pre-configuration of the Measuring equipment **and** setting the operational parameters for all the Measuring equipment.						
Rationale	Although the vendor will pre-configure the meters according to the specifications of the GO, the GO needs a facility to modify the pre-configuration. The configuration process by the GO does not apply to the communication facilities used during the operational phase of the equipment (i.e. P3), but utilizes a local tool and port (i.e. P0).						
Fit criterion	The tool provided by the Measuring equipment vendor shall support the adjustment of pre-configuration functionality and setting operational parameters for all Measuring equipment as described in 'Use case: Adjust equipment'						
History	Nov. 2007	**Origin**	TST	**Port**	P0	**Applicable**	E meter

DSMR-M 4.6.25

Description	The meter shall provide functionality to set the internal clock to local time after the meter is physically installed.						
Rationale	The clock in the meter will not be adjusted to local time on delivery. Before the meter is deployed however, it needs to have the time set correctly in order to measure consumption correctly.						
Fit criterion	The meter shall provide functionality to set the internal clock to local time after the meter is physically installed.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

DSMR-M 4.6.26

Description	The E meter shall provide functionality to automatically adjust to daylight savings time and back.						
Rationale	Local time includes two shifts of an hour every year: switch to daylight savings time and back. The meter shall automatically perform these shifts according to the rules for applying daylight savings time.						
Fit criterion	The time and date of the internal clock will deviate less than 60 seconds from local time at any time.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

6.1.4.2 Adjust operational parameters Measuring equipment

During the activity of setting operational parameters the GO sets all parameters on behalf of external parties like SC's. After this activity is concluded, the meter is prepared to function according to the wishes of external parties.

DSMR-M 4.6.29

Description	The E meter shall provide functionality to set the periods for different tariffs for electricity before and after the meter is physically installed.						
Rationale	The periods for different tariffs will differ per SC and possibly per connection. In order to register consumption correctly for the different tariffs, the periods for the tariffs are configured before the E meter is installed.						
Fit criterion	The adjusted tariff periods will be applied at the time the E meter is deployed.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0,P3	**Applicable**	E meter

DSMR-M 4.6.30

Description	The E meter shall provide functionality to set the table for special days before and after the E meter is physically installed.						
Rationale	Currently the Dutch market uses a flat rate for electricity on special days like Easter, Christmas etc. This means that no differentiated tariffs are applied on these special days. The system shall therefore provide functionality to specify the special days.						
Fit criterion	The table for special days shall contain at least 30 positions to store the dates of special days. The special days can be set a year at a time or multiple years at once.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

DSMR-M 4.6.31

Description	The E meter shall provide functionality to set the standard messages in the meter before and after it is physically installed.						
Rationale	The meter uses standard messages. The contents of these messages are fixed for the Dutch market.						
Fit criterion	The adjusted standard messages will be applied at the time the meter is deployed.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.4.3 Performance

DSMR-M 4.6.32

Description	The activities for the process of adjusting Measuring equipment (excluding registering the equipment) shall be completed in a limited period of time.
Rationale	This process is typically executed after the meter is physically installed. The process does not support relaying a command and shall therefore be completed within a limited amount of time.

Fit criterion	The completion rates and times to be met are: P3 P0 99 %: 2 minutes 1 minute						
History	Nov. 2007	**Origin**	TST	**Port**	P0, P3	**Applicable**	E meter

6.1.5 Use case: Install Measuring equipment

This use case provides a description of the installation process of Measuring equipment and the requirements on the equipment needed to support the process. Most activities in the process are executed by personnel on-site. The activities are therefore required to complete swiftly in order to reduce the amount of time personnel spends waiting.

Trigger	Description
Measuring equipment does not meet regulatory standards	The GO replaces old Measuring equipment that does not meet regulatory standards or does not meet the requirement in the policy of the GO.
Malfunctioning equipment	The GO replaces the equipment as a result of malfunctioning of the meter.
End of lifecycle	The GO replaces the Measuring equipment at the end of the lifecycle of the equipment.

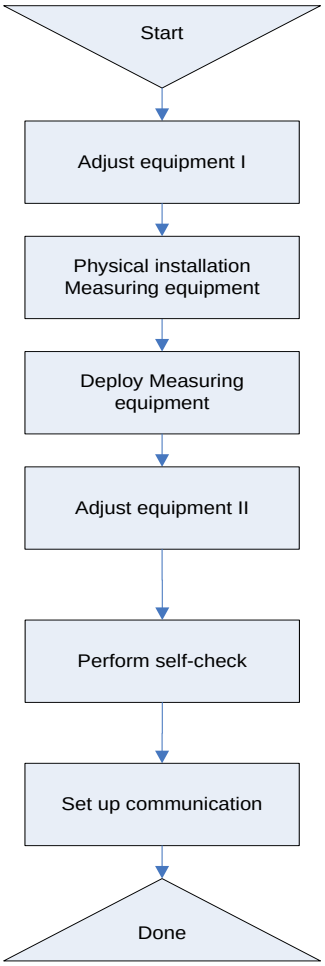


Figure 6-5: Install Measuring equipment

Pre-conditions

- The Measuring equipment is in the initial state as produced.

Parameters

- -none-

Post-conditions

- The Measuring equipment is ready to be deployed in the production environment

Assumptions

- It is assumed that the E meter functions as the local host to all Measuring equipment for installation purposes.

6.1.5.1 Physical installation Measuring equipment

During this activity the equipment is installed at the premises of the consumer. In order to minimize the costs of physical installation this section provides requirements that reduce the installation time.

DSMR-M 4.6.33

Description	The E meter shall fit on meter boards (installed base).						
Rationale	In order to reduce the costs for installation, the meter (including mounting hooks) shall fit on meter boards available in most households to reduce the time spent during installation. In existing installations, meter boards can be very small. In this case installation might only be possible if a short terminal cover is used.						
Fit criterion	The distance between the holes for mounting the meter on a meter board shall comply with DIN 43857. The external housing for single phase meter (including mounting hooks) shall not exceed the next dimensions: Height = 225 mm, width = 135 mm, depth = 140 mm. The external housing for polyphase meter (including mounting hooks) shall not exceed the next dimensions: Height = 330 mm, width = 180 mm, depth = 150 mm. The length of the meter cover shall guarantee that: - The cut-out for the installation wires in the meter board are covered up completely. - There is sufficient space between terminals and the bottom of the terminal cover for easy mounting of the wires.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.34

Description	The terminal block of E meter shall be constructed in a standard way.
Rationale	The installation of metering equipment requires a substantial investment. For this reason the E meter shall be constructed in a way that facilitates installation and reduces the investments needed.
Fit criterion	The construction of the terminal block shall comply with DIN 43856.

History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.35

Description	The terminal block of E meter shall facilitate a secure connection to the grid.						
Rationale	One of the major concerns of GO is to provide a safe and secure means for distribution of electricity. Therefore the E meter shall be connected to the grid using robust wiring.						
Fit criterion	The construction of the terminal block shall contain connectors suitable for wiring ranging from 4 mm^2 to 25 mm^2 for single phase meters, and from 4 mm2 to 35 mm2 for poly phase meters. The type of wires (that must be secured in a safe way) can be solid cores, composite cores or stranded wires. The terminal block must be suitable for cable sleeves.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.36

Description	It shall not be possible to come in contact with the terminal block of the meter.						
Rationale	The terminal block is protected by the terminal cover. It shall not be possible to come in contact with the screws of the terminal block.						
Fit criterion	The cover of the terminal block of the meter shall meet the criteria in IEC 60529 IP31 when installed.						
History	Sep. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.36a

Description	Removal of the terminal cover will not lead to instability of the meter cover.						
Rationale	When the terminal cover is removed, it must be possible to fix a clamp-on optical head that counts the impulses per kWh of the impulse led, for accuracy testing purposes. The meter cover must be stable to use a clamp-on optical head.						
Fit criterion	The meter cover will stay fixed in place, whenever the terminal cover is removed.						
History	May 2011	**Origin**	ET Metrology	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.37

Description	It must be possible to install an external antenna without the need to come in contact with the terminal block or circuit board (PCB) of the meter.						
Rationale	Low GPRS signal can necessitate the use for an external antenna. For safety reasons it must be possible to install such an antenna without having to come in contact with the terminal block or circuit board (PCB) of the meter.						
Fit criterion	An external antenna can be installed without having to come in contact with the terminal block or PCB.						
History	Sep. 2009	**Origin**	TST	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.38

Description	Terminal blocks of equipment must be designed in a proper way.						
Rationale	Unintended penetration of the meter by connection wires via the terminal block must be prevented. It must not be possible to damage internal circuit boards (PCB).						
Fit criterion	The terminal block shall be constructed in such a way that wires cannot enter the housing of the meter.						
History	Nov. 2011	Origin	TST	Port	n.a.	Applicable	E meter, G meter

DSMR-M 4.6.39

Description	The activity of physically installing Measuring equipment shall be completed in a limited period of time.						
Rationale	The physical installation is a time-consuming activity and therefore expensive activity. For this reason the meter shall be constructed in such a way that physical installation is a relatively quick process.						
Fit criterion	The completion rates and times to be met are: E meter G meter 80 %: 10 min 25 min						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter, G meter

6.1.5.2 Deploy Measuring equipment

At this point in the process the Measuring equipment is physically installed at the premises of the consumer. At this time the equipment is registering consumption according to the operational parameters provided by the market participants. Some activities required before the equipment is deployed are described here.

DSMR-M 4.6.40

Description	The E meter shall provide functionality to set location information in the meter after the meter is physically installed but before the meter is deployed.						
Rationale	GO's will set location information in the meter for maintenance reasons. The location information typically consists of zip code and house number or geographical co-ordinates.						
Fit criterion	The E meter shall provide functionality to set location information in the meter. The register size for the location information is set to 48 ASCII characters.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.5.3 Adjust equipment after installation

During this activity the configuration and operational parameters of the equipment are adjusted after physical installation of the equipment. For this activity ‘Use case: Adjust equipment’ is invoked over port P3 or P0.

DSMR-M 4.6.42

Description	The E meter shall provide functionality to invoke ‘Use case: Adjust equipment’ remotely.						
Rationale	After the Measuring equipment is installed it may need adjustment of configuration or operational parameters. The GO can decide to handle adjustment remotely.						
Fit criterion	Adjustment of the Measuring equipment shall comply with the description of use case ‘Use case: Adjust equipment’.						
History	Nov. 2007	**Origin**	I&M	**Port**	P3	**Applicable**	E meter

6.1.5.4 Perform self-check

DSMR-M 4.6.43

Description	The E meter shall provide functionality to invoke ‘Use case: Perform self-check Measuring equipment’ and retrieve the results locally (P0 or display).						
Rationale	The GO wants to verify that the metering installation functions correctly before the installation is completed. Typically personnel that installed the equipment shall invoke a self-check as one of the last steps of the installation process.						
Fit criterion	The result of the self-check that is executed as part of the installation process shall comply with the description of ‘Use case: Perform self-check Measuring equipment’.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.5.5 Set up communication

DSMR-M 4.6.45

Description	After the Measuring equipment is physically installed, a network attach shall be established automatically so that the meter can be contacted.						
Rationale	The final step of installation of Measuring equipment is to set up communication. At this point in the process a network attach shall be set up automatically.						
Fit criterion	The meter shall provide functionality to automatically attach to the network.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

DSMR-M 4.6.46

Description	The E meter shall indicate on the display that installation of an M-Bus device was successful.
Rationale	During installation it is important to have confirmation of a working connection between E meter and G meter
Fit criterion	In manual scroll mode the E meter shall indicate on the display the serial number of

	the successfully installed M-Bus device(s).						
History	Dec. 2008	**Origin**	I&M	**Port**	P2	**Applicable**	E meter; G meter

DSMR-M 4.6.47

Description	The activities for the process of installing Measuring equipment (excluding physical installation) shall be completed in a limited period of time.						
Rationale	The time between the actual connection to the grid and the moment the installation is completed shall be limited as during this period the meter may not be configured correctly. For this reason the period shall be limited.						
Fit criterion	The completion rates and times to be met are: P3 P0 99 %: 5 minutes 1 minute						
History	Nov. 2007	**Origin**	TST	**Port**	P3, P2 and P0	**Applicable**	E meter, G meter

6.1.6 Use case: Un-install Measuring equipment

This use case provides a description of the process of un-installing Measuring equipment and the requirements on the equipment needed to support the process. It is emphasized that the un-install process described here applies to smart metering equipment.
Various triggers exist for un-installing Measuring equipment as indicated in the table below.

Trigger	Description
Modification to function location	A change in the connection can lead to un-installation of equipment. Consider, for example, a situation where an E connection changes from single phase to poly-phase. This means the un-installation of a single phase E meter (and a subsequent installation of a poly phase meter).
Malfunctioning equipment	In case the GO experiences malfunctioning of equipment he can decide to replace the equipment.
End of life cycle	In case the life cycle of equipment is complete, it is un-installed.

Un-installing Measuring equipment does not address removing equipment temporarily for (re-) calibration.

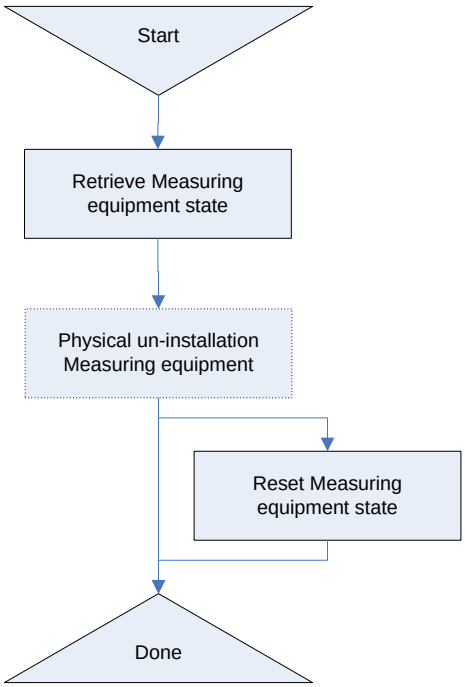


Figure 6-6: Un-install Measuring equipment

Pre-conditions

- Measuring equipment or a part of the Measuring equipment has to be uninstalled.

Parameters

- Equipment identifiers for the equipment that has to be uninstalled.

Post-conditions

- The state of the equipment is retrieved and the equipment has been un-installed.

Assumptions

- The assumption is made that meter data stored in the metering instruments is retrieved prior to the process of un-installing the instrument. Therefore only the actual meter readings are retrieved as part of the un-installation process.

6.1.6.1 Retrieve Measuring equipment state

The first step in un-installing equipment shall be to retrieve the state of the equipment.

DSMR-M 4.6.48

Description	The E meter shall provide functionality to invoke ‘Use case: Retreive Measuring equipment state’.
Rationale	The GO wants to retrieve all configuration information and operational parameters

	from the equipment at the time the equipment is un-installed. The personnel performing the un-installation therefore need to retrieve the equipment state just before the equipment is disconnected.						
Fit criterion	Retrieval of the state of the equipment that is executed as part of the un-installation process shall comply with the description of 'Use case: Retreive Measuring equipment state'.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.6.2 Removed

6.1.6.3 Reset Measuring equipment state

DSMR-M 4.6.50

Description	The Measuring equipment shall provide functionality to reset its state after the equipment is physically un-installed. A reset of Measuring equipment shall not affect the metrological part of the instruments in any way.						
Rationale	The GO can decide that equipment shall be re-used after it is un-installed. For this purpose the equipment shall provide functionality to reset the state to the default settings used for pre-configuring the equipment.						
Fit criterion	The E meter shall provide functionality to reset its state.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.6.51

Description	The Measuring equipment shall provide functionality to overwrite user meter data (only the data that is allowed according to the MID*)*, keys and personal details (including interval values) with zero's (0) after the equipment is physically un-installed. Overwriting this data shall not affect the metrological part of the instruments in any way. Keys should be reset to their original values (as listed in the original shipmentfile						
Rationale	The GO can decide that equipment shall be re-used after it is un-installed. For this purpose the equipment shall provide functionality to overwrite user meter data (only the data that is allowed according to the MID), keys and personal details (including interval values) with zero's (0). According to European law and legislation it is not allowed to change the metrological characteristics or functionality in metering instruments. By following Welmec 7.2 Issue 4 (Software Guide – measuring Instruments Directive 2004/22/EC –) a compliancy with the software-related requirements contained in the MID can be assumed.						
Fit criterion	Functionality to overwrite user meter data (only the data that is allowed according to the MID), keys and personal details (including interval values) with zero's (0) is provided using the defined security mechanism. Keys should be reset to their original value (as listed in the original shipmentfile).						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter, G meter

6.1.6.4 Performance

DSMR-M 4.6.52

Description	The activity of un-installing Measuring equipment shall be completed in a limited period of time.						
Rationale	Un-installing equipment requires retrieving the state and the actual meter readings from the equipment. After this 'virtual' un-install the physical un-install is executed (the physical un-install is not included in the times for un-installation).						
Fit criterion	The completion rates and times to be met are: P3 P0 80 %: 2 minutes 2 minutes						
story	Nov. 2007	**Origin**	TST	**Port**	P3, P2 and P0	**Applicable**	E meter, G meter

6.1.7 Use case: Retrieve Measuring equipment state

This use case provides a description of the process of retrieving the complete state of the Measuring equipment as defined in section 2.5.1.

Retrieval of Measuring equipment states is utilized for multiple purposes as indicated by the described triggers:

Trigger	Description
Un-install Measuring equipment	Before equipment is physically uninstalled the GO will need the current state of the equipment.
Inconsistencies in state reported	In case an inconsistency in the state of the equipment is suspected or experienced the GO will retrieve the state of the equipment to verify the inconsistency.
Unplanned on-site maintenance	Retrieval of the equipment state is performed as part of the process of unplanned on-site maintenance.

Pre-conditions

- The state of the Measuring equipment is unknown or unavailable to the GO.

Parameters

- The interval for which to retrieve logging and interaction history (optional)

Post-conditions

- The state of the Measuring equipment is available for the GO.

Assumptions

- -none-

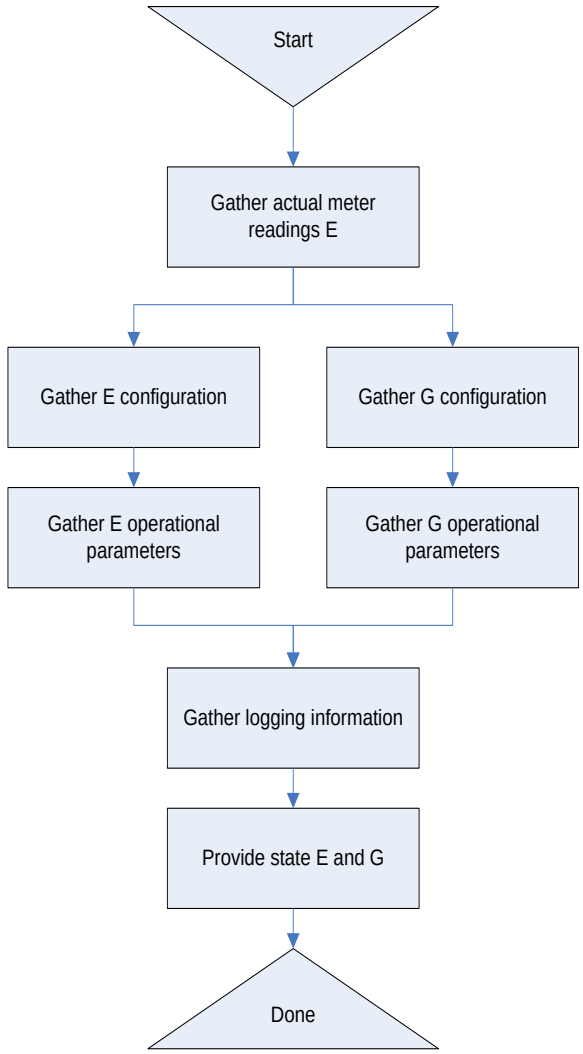


Figure 6-7: Measuring Equipment state

6.1.7.1 Gather actual meter readings E

DSMR-M 4.6.53

Description	The E meter shall automatically invoke use case *Provide actual meter reads* as part of retrieving the state.						
Rationale	In order to interpret the configuration and operational parameters the actual meter readings at the time the configuration and parameters were retrieved can be helpful.						
Fit criterion	The actual meter readings gathered shall be in accordance with the description of use case 'Provide actual meter reads'.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P2, P3	**Applicable**	E, Meter

6.1.7.2 Gather E configuration

The E configuration consists of information in the E meter that was inserted by the GO or the vendor of the meter (refer to section 0 for a complete description of the configuration E).

DSMR-M 4.6.54

Description	The E meter shall provide functionality to retrieve the E configuration.						
Rationale	Information on the configuration is used for maintenance purposes and for trouble-shooting the equipment.						
Fit criterion	The information retrieved as the E configuration shall at least contain the information specified in section '0'.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.7.3 Gather E operational parameters

The operational parameters for E include all parameters that are set on the E meter on behalf of SC's (refer to section 2.5.1.1 for a complete description of the operational parameters E).

DSMR-M 4.6.55

Description	The E meter shall provide functionality to retrieve the E operational parameters.						
Rationale	Information on the operational parameters is used for maintenance purposes and for troubleshooting the equipment.						
Fit criterion	The operational parameters retrieved for the E meter shall at least contain the information specified in section '2.5.1.1'.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.7.4 Gather G configuration

The configuration consists of information in the G meter that was inserted by the GO or the vendor of the meter (refer to section 2.5.1.2 for a complete description of the configuration G).

DSMR-M 4.6.56

Description	The E meter shall provide functionality to retrieve the G configuration.						
Rationale	Information on the G configuration is used for maintenance purposes and for troubleshooting the equipment.						
Fit criterion	The information retrieved as the G configuration shall at least contain the information specified in section '2.5.1.2'.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P2, P3	**Applicable**	E, Meter

6.1.7.5 Gather G operational parameters

The operational parameters G include all parameters that are set in the G meter on behalf of SC's (refer to section 2.5.1.2 for a complete description of the operational parameters G).

DSMR-M 4.6.57

Description	The E meter shall provide functionality to retrieve the G operational parameters.						
Rationale	Information on the G operational parameters is used for maintenance purposes and for troubleshooting the equipment.						
Fit criterion	The operational parameters retrieved for the G meter shall at least contain the information specified in section '2.5.1.2'.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P2, P3	**Applicable**	E meter

6.1.7.6 Gather logging information

The metering equipment is required to store logging information. This activity is concerned with retrieving the logging information from the equipment.

Besides logging activities the equipment issues logical errors as well. The errors are provided to external parties as part of the logging information.

DSMR-M 4.6.58

Description	The E meter shall provide logging information and errors from both the E meter and the G meter.						
Rationale	The E meter provides logging information to external entities. Logging information is used to verify the state of equipment and for diagnosis purposes in case of malfunctioning. The use case has an optional parameter for the period for which to retrieve the logging information. In case a value for this parameter is provided, the provided information shall be logged within the designated period.						
Fit criterion	The E meter shall provide on request of an external entity the log items for the designated interval.						
History	Nov. 2007	**Origin**	NTA (§5.3.1.3)	**Port**	P0, P3	**Applicable**	E meter

6.1.7.7 Provide state E and G

DSMR-M 4.6.59

Description	The E meter shall provide the actual meter readings for E and G, complete state and logging information.						
Rationale	For interpretation of the logging the most recent meter reads can be helpful and are therefore included in the state of the equipment. The logging information is used to derive how the equipment came in the state it is in.						
Fit criterion	The state and auxiliary information shall at least contain the following information: • Complete configuration and operational parameters for E and G meter; • The actual meter readings for E; • Last known meter readings for G available in the E meter; • Complete logging information for the requested interval;						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.7.8 Performance

DSMR-M 4.6.60

Description	The activity of remotely retrieving the state of Measuring equipment shall be completed in a limited period of time.						
Rationale	The state of equipment is retrieved for problem solving. Solving problems when performed remotely is not an 'online' activity: maintenance personnel are in other words not waiting for the state to be retrieved.						
Fit criterion	The completion rates and times to be met are: P3 P0 99 %: 1 hour 1 minute						
History	Nov. 2007	**Origin**	TST	**Port**	P3, P0	**Applicable**	E meter, G meter

6.1.8 Use case: Perform self-check Measuring equipment

The purpose of this use case is to provide the GO insight in the functioning of the Measuring equipment. For this reason the equipment shall be able to perform a self-check and report on the outcome.

Trigger	Description
Internal event	Internal event in the equipment can trigger this use case. Examples of events that invoke the use case are: firmware upgrade, power up and installation.
Install Measuring equipment	The self-check is usually performed as part of the process of installing Measuring equipment.
Unplanned on-site maintenance	A self-check is performed as part of the process of unplanned on-site maintenance
Periodically	A self-check is periodically performed.

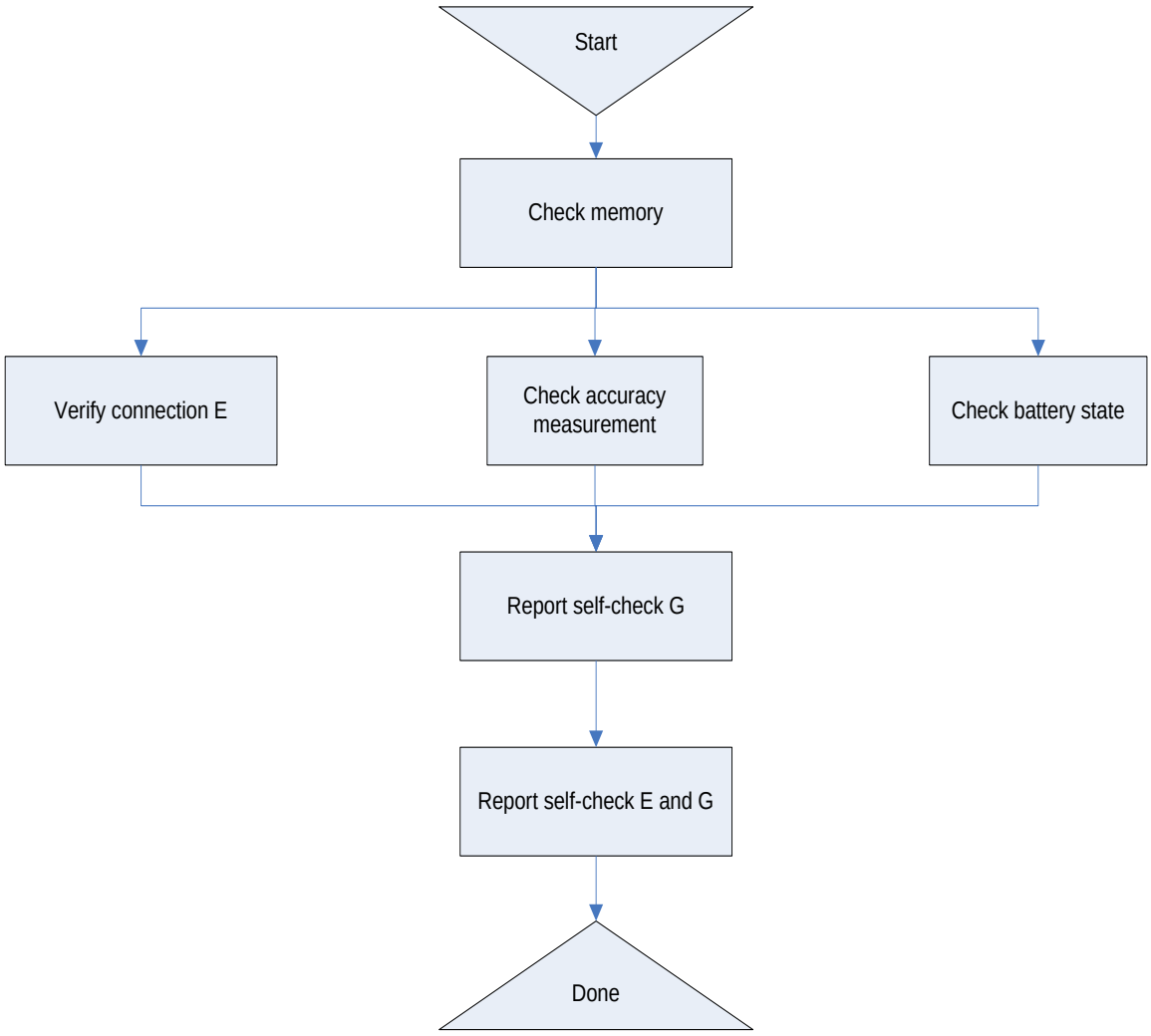


Figure 6-8: Perform self-check

Pre-conditions

- The overall condition of the Measuring equipment is unknown to the GO.

Parameters

- -none-

Post-conditions

- The overall condition of the Measuring equipment is known to the GO.

Assumptions

- -none-

DSMR-M 4.6.61

Description	The Measuring equipment shall automatically execute a self-check each time power re-occurs on the E meter.						
Rationale	During a period in which there is no power on the E meter, the meter cannot detect any malfunctioning and cannot report on any event. It is therefore important to determine that the equipment functions correctly each time it becomes able to report any malfunctioning.						
Fit criterion	The Measuring equipment shall verify that it functions correctly after each outage and each time it is connected to the grid.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter

DSMR-M 4.6.62

Description	The equipment shall provide functionality to log the results of a self-check after a firmware update.						
Rationale	Immediately after the new firmware is deployed, a self-check is executed by the equipment. This can be considered as the final check performed during the process of a firmware upgrade.						
Fit criterion	The self-check that is executed as part of the firmware upgrade shall be performed within 10 seconds after the completion of the firmware update process and shall comply with the description of the respective self-checks for the different types of equipment. The result of this self check will be logged in the event log (also in case of a good result).						
History	Jan. 2011	**Origin**	TST	**Port**	P3	**Applicable**	E Meter

6.1.8.1 Check memory

DSMR-M 4.6.63

Description	The Measuring equipment shall be able to perform a consistency check on the memory in the equipment.						
Rationale	It is assumed that errors in software lead to inconsistencies in memory. Errors can be caused by communication failure, intrusion, software defects, hardware defects etc. For maintenance reasons the result of a consistency check on the memory gives an overall indication of the condition of the equipment.						
Fit criterion	The equipment shall verify that the memory of the equipment is consistent.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter, G meter

DSMR-M 4.6.64

Description	The equipment shall issue a normal error if it detects an inconsistent state of the memory.						
Rationale	Inconsistencies in memory can lead to incorrect information being exchanged or to problems with communication. The inconsistent state shall therefore be reported as quickly as possible.						
Fit criterion	The error for inconsistent memory shall contain the generic attributes for errors.						
History	Nov. 2007	**Origin**	I&M	**Port**	P3	**Applicable**	E meter, G meter

6.1.8.2 Check accuracy measurement

Checking of accuracy of equipment can, to certain extend, be performed by the equipment itself. The ability to determine accuracy and the way this is performed differs per vendor. The vendor is therefore required to deliver as part of the documentation of the metering instruments a description of how accuracy drift is determined and what the reliability of the results is.

DSMR-M 4.6.65

Description	The metrological part of the metering instrument shall not be susceptible for accuracy drifts during the lifetime of the equipment.						
Rationale	Accuracy drifts cannot be easily determined, therefore they shall be avoided.						
Fit criterion	The stability of the measurement system shall be guaranteed, i.e. the accuracy of measurements shall not exceed the pre-defined level for measurement accuracy during the lifetime of the equipment.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter, G meter

6.1.8.3 Check battery state

Under some circumstances the application of a battery is essential (e.g. in G meters). However, in all situations where usage of a battery is not essential, equipment without a battery is preferred albeit that the equipment still has to meet all requirements.

DSMR-M 4.6.66

Description	The Measuring equipment using a battery shall be able to determine the remaining lifetime of the battery.						
Rationale	In case of a dead battery the G meter is not able to store data and to transmit it using an RF connection. For the G meter the battery is essential in case of an outage. The implementation of the algorithm for determining the remaining lifetime shall take actual usage of the battery and other aspects that influence the lifetime of the battery into account.						
Fit criterion	The method used to determine the remaining use time shall be specified and its accuracy shall be shown through test reports.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.6.67

Description	At the meter factory the moment that the end-of-use time alarm shall be raised shall be configurable.
Rationale	The moment the alarm has to be raised in based on three parameters: ▪ Expected life time of the battery ▪ Required length of period between the alarm raise and the end-of-use time ▪ Usage of battery
Fit criterion	The time between the alarm and the end-of-use time of the battery given the expected lifetime of the battery shall be configurable within the limits of the MID MI-002, according to a method specified by the meter vendor.

History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	G meter

DSMR-M 4.6.68

Description	The Measuring equipment using a battery shall issue a normal error if the remaining lifetime of the battery meets a predefined threshold.						
Rationale	GO's wants to be informed on the lifetime of batteries in order to plan and execute replacement. The remaining lifetime is predefined and can be used to determine if replacement of the battery can be combined with other on-site maintenance.						
Fit criterion	The error for battery lifetime shall contain the generic attributes for errors.						
History	Nov. 2007	**Origin**	I&M	**Port**	P3	**Applicable**	G meter

6.1.8.4 Check meter display

DSMR-M 4.6.69

Description	The equipment shall provide functionality to verify that the complete character and symbol set of the display is displayable in a readable way.						
Rationale	Displays are the means to communicate with consumers: meters are required to display meter readings correctly. If the display does not function correctly (e.g. because it is broken), consumers will question the reliability of the equipment as a whole.						
Fit criterion	If any of the character or symbols cannot be displayed correctly the test of the display fails. This is a visible test.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	E meter, G meter

6.1.8.5 Report self-check G

DSMR-M 4.6.70

Description	The G meter shall provide errors that resulted from the self-check to the E meter.						
Rationale	The E meter handles the logging information (including alarms) for all Measuring equipment. External systems can access the alarms through the E meter. The G meter shall therefore provide the alarms to the E meter.						
Fit criterion	All errors resulting from the self-check performed by G meter are available from the E meter (via standard event log) after each update of meter reads from the G meter to the E meter.						
History	Nov. 2007	**Origin**	I&M	**Port**	P2	**Applicable**	G meter

DSMR-M 4.6.71

Description	If the G meter has a display, it shall provide the result of the self-check G on the display of the G meter if the self-check fails.						
Rationale	A self-check can be invoked locally (as part of the installation process). Therefore the meter shall also provide the result of the self-check locally, i.e. on the display.						
Fit criterion	Each time the self-check is executed, the G meter shall update the display to provide the result of the last self-check, if the self-check fails.						
History	Nov. 2007	**Origin**	I&M	**Port**	n.a.	**Applicable**	G meter

6.1.8.6 Report self-check E and G

DSMR-M 4.6.72

Description	The E meter shall indicate if the self-check for E and G failed.						
Rationale	The E meter gathers the results of the self-check for E and receives the results of the self-check in the G meter.						
Fit criterion	If any of the verifications of the self-check failed, the self-check shall fail. If all verifications pass, the self-check passes. The result of the self-check shall at least contain the following information: ▪ Type of failure G; ▪ Timestamp for the execution of the self-check G; ▪ Type of failure E; ▪ Timestamp for the execution of the self-check E;						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter, G meter

6.1.8.7 Performance

DSMR-M 4.6.73

Description	The activity of executing a self-check on Measuring equipment shall be completed in a limited period of time.						
Rationale	A self-check is performed automatically and in multiple situations, either on power-up or at regular intervals. In some situations however, a self-check is considered to be an 'online' activity (i.e. someone is waiting for the result).						
Fit criterion	The completion rates and times to be met are: Display 99 %: 1 minute after power up						
History	Nov. 2007	**Origin**	TST	**Port**	Display	**Applicable**	E meter, G meter

6.1.9 Use case: Unplanned on-site maintenance

Under some circumstances on-site maintenance is necessary. Consider a situation where communication with the equipment is impossible (for a long period of time) or when part of the functionality of the equipment has become unavailable. It is however important to note that on-site maintenance is reduced to a minimum under all circumstances.

Trigger	Description
Malfunctioning equipment	The GO has determined that equipment is not functioning correctly. After the GO has determined that the problem cannot be solved remotely, the maintenance has to be performed on-site.

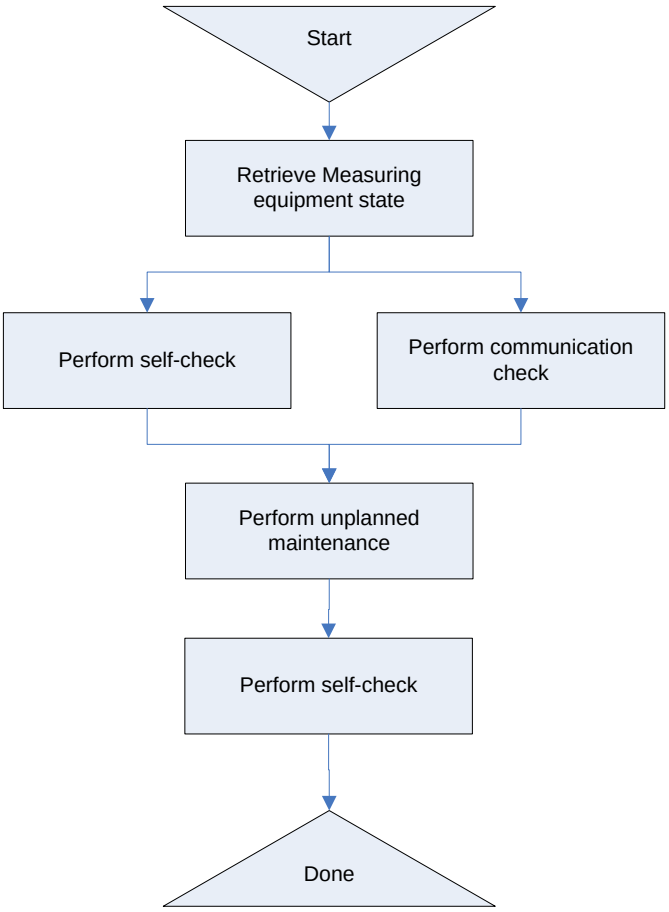


Figure 6-9: Unplanned maintenance on-site

Pre-conditions

- The equipment needs unplanned on-site maintenance.

Parameters

- -none-

Post-conditions

- The maintenance on the equipment was completed and the equipment functions correctly.

Assumptions

- -none-

6.1.9.1 Retrieve Measuring equipment state

DSMR-M 4.6.74

Description	The E meter shall provide functionality to invoke 'Use case: Retrieve Measuring equipment state' and present the results on the display and the local O&M device.						
Rationale	The GO wants to retrieve all configuration information and operational parameters from the equipment before actual maintenance on the equipment starts.						
Fit criterion	Retrieval of the state of the equipment that is executed as part of the maintenance process shall comply with the description of 'Use case: Retrieve Measuring equipment state'						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.9.2 Perform self-check

The self-check verifies that the meter functions correctly and, if not, reports the problems. Note that the self-check can be executed before and/or after the actual maintenance work takes place.

DSMR-M 4.6.75

Description	The E meter shall provide functionality to invoke 'Use case: Perform self-check Measuring equipment' and sent the results to the local O&M device.						
Rationale	The GO wants to verify that the meter functions correctly before the equipment is actually deployed. Performing the self-check shall be possibly remotely and locally.						
Fit criterion	The result of the self-check that is executed as part of the maintenance process shall comply with the description of 'Use case: Perform self-check Measuring equipment'.						
History	Nov. 2007	**Origin**	I&M	**Port**	P0, P3	**Applicable**	E meter

6.1.9.3 Perform communication check

The communication check verifies that the meter communicates correctly and, if not, reports the problems. Note that executing the communication check can be executed before and/or after the actual maintenance work takes place.

6.1.9.4 Perform unplanned maintenance

There are no requirements for performing unplanned maintenance on equipment