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Edition 1.0 2014-06

INTERNATIONAL STANDARD

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Electricity metering data exchange – The DLMS/COSEM suite – Part 1-0: Smart metering standardisation framework

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ELECTRICITY METERING DATA EXCHANGE – THE DLMS/COSEM SUITE –

Part 1-0: Smart metering standardisation framework

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International Standard IEC 62056-1-0 has been prepared by IEC technical committee 13: Electrical energy measurement and control.

The text of this standard is based on the following documents:

FDIS	Report on voting
13/1574/FDIS	13/1580/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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INTRODUCTION

With the growing number of smart metering deployments, secure and interoperable data exchange between the different system components becomes essential. Besides supporting the execution of the supplier-consumer contract and providing the necessary billing data the smart meter becomes also the source of valuable information for the efficient operation of the smart grid.

The increasing range of applications that depend on metering data leads to a growing amount of data to be exchanged within the smart metering system and via the interfaces to other systems. Smart metering systems must be adaptable to different communication channels without creating any data incompatibilities for the supported applications.

The standards in the IEC 62056 DLMS/COSEM suite have been constantly improved and extended considering the growing requirements of the smart metering and smart grid applications. In particular, the object oriented COSEM data model has been extended with new interface classes supporting new smart metering and smart grid use cases. The application layer has been "fortified" with state-of-the art security features offering scalable security for the entire range of applications via a large range of communication channels. With the introduction of the concept of "communication profiles" the IEC 62056 DLMS/COSEM suite provides the means to link different communication channels standards with the consistent data model of DLMS/COSEM.

This International Standard summarises the principles the IEC 62056 standards are built on and sets the rules for future extensions to guarantee consistency.

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Smart metering forms an important part of smart grids and smart homes. In order to ensure the efficient and secure flow of information between the different applications and actors in the energy market, harmonisation of the standards worked out by the corresponding standardisation committees becomes necessary. In particular, a smart metering system offers interfaces to electricity and non-electricity meters, to home automation, to substation automation and to electricity distribution management systems. The standardisation concepts described in this standard ensure consistency within the scope of smart metering as a prerequisite to define harmonised interfaces to smart grid and smart home systems.

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The standards of the IEC 62056 DLMS/COSEM suite have been developed by IEC TC13 for the purposes of electricity metering. Some of the standards – in particular the COSEM data model – are also used by other Technical Committees responsible for non-electricity metering.

ELECTRICITY METERING DATA EXCHANGE – THE DLMS/COSEM SUITE –

Part 1-0: Smart metering standardisation framework

1 Scope

This part of IEC 62056 provides information on the smart metering use cases and on architectures supported by the IEC 62056 DLMS/COSEM series of standards specifying electricity meter data exchange. It describes the standardization framework including:

- the principles on which the standards shall be developed;
- the ways the existing standards shall be extended to support new use cases and to accommodate new communication technologies, while maintaining coherency;
- the aspects of interoperability and information security.

It also provides guidance for selecting the suitable standards for a specific interface within the smart metering system.

Other aspects of metering covered by TC13, like metrological requirements, testing, safety and dependability are out of the scope of this Standard.

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2 Normative references

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The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61334-4-32, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 32: Data link layer – Logical link control (LLC)*

IEC 61334-5-1, *Distribution automation using distribution line carrier systems – Part 5-1: Lower layer profiles – The spread frequency shift keying (S-FSK) profile*

IEC 62056 (all parts), *Electricity metering data exchange – The DLMS/COSEM suite*

IEC 62056-3-1, *Electricity metering data exchange – The DLMS/COSEM suite – Part 3-1: Use of local area networks on twisted pair with carrier signalling*

IEC 62056-4-7, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 4-7: COSEM transport layers for IPv4 networks* (to be published)

IEC 62056-5-3:2013, *Electricity metering data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer*

IEC 62056-6-1:2013, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-1: Object Identification System (OBIS)*

IEC 62056-6-2:2013, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes*

IEC 62056-7-6, *Electricity metering data exchange – The DLMS/COSEM suite – Part 7-6: The 3-layer, connection-oriented HDLC based communication profile*

IEC 62056-8-3, *Electricity metering data exchange – The DLMS/COSEM suite – Part 8-3: Communication profile for PLC S-FSK neighbourhood networks*

IEC 62056-9-7, *Electricity metering data exchange – The DLMS/COSEM suite – Part 9-7: Communication profile for TCP-UDP/IP networks*

IEC 62056-42, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 42: Physical layer services and procedures for connection-oriented asynchronous data exchange*

IEC 62056-46, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in the standards of the IEC 62056 series apply as well as the following:

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3.1.1
communication channel
physical or logical channel to transport data over single or multiple communication media

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3.1.2
communication medium
physical medium to transmit signals carrying information

3.1.3
exchangeability
ability of a specific system component to replace a specific component in an existing system without any need for configuration neither on the component's side nor of the system's side. Interoperability is a necessary but not a sufficient condition to achieve exchangeability. For hardware components the expression "plug-and-play" is also used to describe their exchangeability

3.1.4
external systems
systems supporting use cases beyond the scope of smart metering but exchanging information with the smart metering system

3.1.5
interoperability
ability of two or more system components to exchange information and to use the information that has been exchanged for the purpose the component is designed for

3.1.6
open standard
standard made available to the general public and being developed (or approved) and maintained via a collaborative and consensus driven process

3.2 Abbreviations

The following abbreviations are used in this standard:

APDU	Application Protocol Data Unit
CIM	Common Information Model of TC57
COSEM	Companion Specification for Energy Metering
DLMS	Device Language Message Specification
ERP	Enterprise Resource Planning
HES	Head End System
LN	Local Network
LNAP	Local Network Access Point
NN	Neighbourhood Network
NNAP	Neighbourhood Network Access Point
PLC	Power Line Carrier
WAN	Wide Area Network

4 Smart metering processes and use cases

Table 1 gives an overview on the use cases that shall be supported by the smart metering standards. The use cases are clustered into business processes. This clustering serves just illustration purposes; it may vary from utility to utility.

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Table 1 – Supported business processes and use cases

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Business process	Use case
Contracting and billing	Obtain meter readings on demand
	Obtain scheduled meter reading
	Set and maintain contractual parameters in the meter (see NOTE 2)
	Execute supply control
	Execute load control
Customer support	Provide information to the energy consumer
Infrastructure maintenance	Meter commissioning and registration
	Meter supervision
	Maintenance of the security system
	Manage events and alarms
	Firmware update
	Clock synchronisation
	Disconnection and re-connection of the consumer's premises
	Quality of supply supervision
NOTE 1 There are no commonly agreed names for the smart metering use cases within the standardisation community yet. In order to consider the universal scope of the IEC standards generic and self-explanatory names are used here. NOTE 2 The contractual parameters consider the credit mode or the debit mode (pre-payment) operation of the meter.	

The detailed requirements of the various use cases depend on the market and on the legal environment the smart metering system is operating in. The supporting standards shall be

designed to offer enough flexibility to meet the different market needs and the different legal environments.

In order to facilitate achieving interoperability, security and efficiency, the standards shall consider all aspects of data exchange in a smart metering system, including the functions to be supported, the data models (semantics), the data presentation (syntax), and the communication protocols for transporting the data over the interfaces using various communication technologies.

5 Smart metering reference architecture

Figure 1 shows the smart metering reference architecture enabling the data exchange necessary to support the use cases of Table 1. The different system components and their interfaces are identified. The partitioning between the different components is based purely on communication aspects; i.e. components and interfaces are specified wherever a transition from one communication medium to another may be considered.

A comprehensive set of smart metering standards shall support all interfaces identified in Figure 1. All specifications of communication protocols, data access methods or data structures shall describe only the “outside view”; i.e. how the data and the communication protocols behave on the interfaces. The behaviour within the components (“inside view”) is implementation specific and is therefore out of the scope of the standards in the IEC 62056 series.

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A practical realisation of a smart metering system will typically contain a subset of the components and interfaces shown in Figure 1. Components and interfaces which are not exposed and are therefore not accessible do not need to fulfil any standards.

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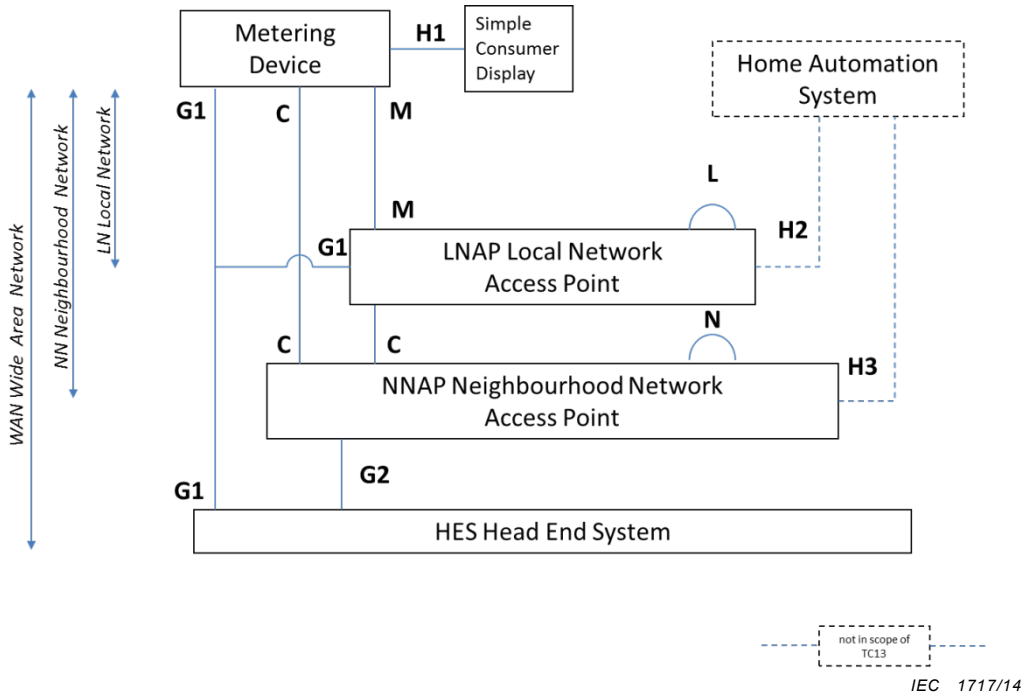

Figure 1 – Smart metering architecture[1]

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EXAMPLE 1 “PLC system”:

A PLC system typically uses the C interface between the Metering device and the NNAP (Data Concentrator). The communication between the NNAP and the HES uses the G2 interface.

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EXAMPLE 2 “IP communication via GPRS”

Typically uses the G1 interface between the meter and the HES.

EXAMPLE 3 “Hand Held Unit for local meter access”

This typically uses the M interface.

6 Interfaces to external systems

Smart metering systems exchange data with external systems on several levels using different interfaces. On LNAP level interfaces to Home Automation and to non-electricity meters may be provided, on NNAP level typically interfaces to substation automation equipment may be required, whereas on HES level typically interfaces to billing and ERP (Enterprise Resource Planning) systems are provided.

The interfaces between the smart metering system and these external systems shall use the standards of the IEC 62056 DLMS/COSEM suite or shall use the existing standards of the external system. Interoperability shall be achieved on data model level by mapping the data models of IEC 62056-6-2 and IEC 62056-6-1 to the data model of the external system.

NOTE 1 The specification of the mapping between the COSEM data model and the data model of CIM (IEC 61968-9) supporting the interface between a smart metering system and an ERP system is undertaken by TC13. See Table A.2.

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1 This architecture has been developed under the smart metering standardisation mandate M/441 of the European Commission.