SLOVENSKI STANDARD
SIST EN 13757-1:2022

01-februar-2022

Nadomešča:
SIST EN 13757-1:2015

Komunikacijski sistemi za merilnike - 1. del: Izmenjava podatkov

Communication systems for meters - Part 1: Data exchange

Kommunikationssysteme für Zähler - Teil 1: Datenaustausch

Systèmes de communication pour compteurs - Partie 1 : Échange de données

Ta slovenski standard je istoveten z: EN 13757-1:2021

ICS:

33.200	Daljinsko krmiljenje, daljinske meritve (telemetrija)	Telecontrol. Telemetering
35.100.70	Uporabniški sloj	Application layer

SIST EN 13757-1:2022 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13757-1

December 2021

ICS 33.200; 35.100.70; 35.240.99; 91.140.50

Supersedes EN 13757-1:2014

English Version

Communication systems for meters - Part 1: Data exchange

Systèmes de communication pour compteurs - Partie 1 : Échange de données

Kommunikationssysteme für Zähler - Teil 1: Datenaustausch

This European Standard was approved by CEN on 16 August 2021.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION

COMITÉ EUROPÉEN DE NORMALISATION

EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 13757-1:2021 E

Contents

Page

European foreword 4
Introduction 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 8
4 General description and security 10
4.1 Basic vocabulary 10
4.2 Layered protocols 10
4.3 Security 13
5 Network Architecture 17
5.1 M/441 Mandate 17
5.2 General 18
5.3 Basic architecture 18
5.4 Metering Architecture 19
5.5 Singular access point 21
5.6 Self-configurable network 21
5.7 Hand Held Unit for local access 21
5.8 Network layers 21
5.9 Multiple access 21
6 Application Layers for Metering 22
6.1 General 22
6.2 COSEM Application Layer for Metering 22
6.3 Companion Specification 22
6.4 COSEM Basic Principles 23
6.5 Management of a COSEM Device 24
6.6 Lower layers 25
7 Data Exchange 26
7.1 General 26
7.2 Data exchange using direct local connection 26
7.3 Data exchange using wired local area network (LAN) 27
7.4 Data exchange using wide area network (WAN) 28
7.5 Data exchange using M-Bus radio communication 34
7.6 Data Exchange using HDLC 34
8 Upper Layer Protocols 35
8.1 Introduction 35
8.2 Transport sub-layer 35
8.3 Application sub-layer 38
9 Cross-application data handling 39
9.1 General 39
9.2 Data tunnelling 40
9.3 Data translation 42
10 Extensions to COSEM 42
10.1 Introduction 42

10.2 M-Bus tunnelling 42
10.3 Specific object type – Error Reporting Object 43
11 Object Identification System (OBIS) 44
11.1 Object Identification System (Variable naming rules) 44
11.2 Abstract Objects (A = 0) 48
11.3 Media specific value groups 49
Annex A (normative) Basic class meters 99
Annex B (informative) DLMS Glossary 102

European foreword

This document (EN 13757-1:2021) has been prepared by Technical Committee CEN/TC 294 "Communication systems for meters", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2022, and conflicting national standards shall be withdrawn at the latest by June 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13757-1:2014.

Significant technical changes between this document and EN 13757-1:2014 are:

- The text has been updated to reflect increased use of IPv6 in 4.2.3;
- Figure 4 has been replaced with Table 3;
- Key wrapping has been added in 4.3.3.1;
- A description of pre-established Application Associations has been added in 4.3.4;
- Figure 11 has been replaced with a table and enhanced;
- A reference to GSM CSD has been added in 7.4.2;
- A security clause has been added in 7.5.4;
- 8.2.1 has been updated in line with 8.2.2 and 8.2.3, and now references EN 62056-4-7;
- Previous subclause 9.2.2.3 has been removed;
- New content has been added in 9.3 to align with EN 13757-3:2018, Annex H;
- Interface classes now refer to EN IEC 62056-6-1 and EN IEC 62056-6-2 to remove duplication;
- Clause 11 has had minor updates and been aligned with DLMS/COSEM object model;
- Mandatory COSEM Objects have been added in A.2;
- Annex B has been updated in line with EN 62056-6-1 and EN 62056-6-2;
- Annex D now references EN62056-6-1;
- The bibliography has been updated.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

The OBIS and COSEM Clause 6 to Clause 11 of this document are prepared in liaison with the DLMS User Association based in Zug, Switzerland, and more information about DLMS/COSEM can be obtained from www.dlms.com.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document is referred to in the CEN/CLC/ETSI TR 50572:2011, *Functional Reference Architecture for Communications in Smart Metering Systems*, as a standard for communications between elements in the Smart Metering Architecture. The M/441 Mandate, which led to the CEN/CLC/ETSI TR 50572, is driving significant development of standards in smart metering.

This document has been amended to reflect significant updates in Security practices, and updates to the OBIS model to reflect the state of the art. COSEM Classes have been removed from this document, as they are published in the EN IEC 62056-6-2 standard and there is a risk of contradiction.

For an overview of activities, see M/490, the mandate for standardization for smart grid, available from https://ec.europa.eu/energy/sites/ener/files/documents/2011_03_01_mandate_m490_en.pdf, and more generally https://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/smart-grids-task-force.

This document describes the data exchange and communications for meters and remote reading of meters in a generic way. It is Part 1 of EN 13757.

The main use of EN 13757-1 is to provide an overview of the protocols at the different levels and to provide a specification for the DLMS/COSEM application Layer for meters.

Additional parts to the series of standard EN 13757 are:

— Part 2: Wired M-Bus communication;

— Part 3: Application protocols;

— Part 4: Wireless M-Bus communication;

— Part 5: Wireless M-Bus relaying;

— Part 6: Local Bus;

— Part 7: Transport and security services.

The world of metering is going through a period of rapid change, and it is anticipated that this and other parts of the standard will require amending in a short period of time.

NOTE 1 This document makes repeated reference to EN 62056 standards. While the list of references is helpful, an essential companion to this document is the EN IEC 62056-6-2 standard.

NOTE 2 Some of the ISO/IEC documents listed under Clause 2 could be available only from ISO or IEC directly. If the document you require is not available from your national standards organization, ISO or IEC can be contacted to establish the status of the document and its availability. ISO can be contacted via www.iso.org.

NOTE 3 Clause 3 contains the terms and definitions special to remote reading of meters. Annex B is used to explain terms related to the object oriented model used in COSEM, detailed in EN IEC 62056-6-2 and OBIS, detailed in EN 62056-6-1.

1 Scope

This document specifies data exchange and communications for meters in a generic way.

This document establishes a protocol specification for the Application Layer for meters and establishes several protocols for meter communications which can be applied depending on the application being fulfilled.

This document also specifies the overall structure of the Object Identification System (OBIS) and the mapping of all commonly used data items in metering equipment to their identification codes.

NOTE Electricity meters are not covered by this document, as the standardization of remote readout of electricity meters is a task for CENELEC/IEC.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13757-2:2018, *Communication systems for meters - Part 2: Wired M-Bus communication*

EN 13757-3:2018, *Communication systems for meters - Part 3: Application protocols*

EN 13757-4:2019, *Communication systems for meters - Part 4: Wireless M-Bus communication*

EN 13757-5:2015, *Communication systems for meters - Part 5: Wireless M-Bus relaying*

EN 13757-6, *Communication systems for meters - Part 6: Local Bus*

EN 13757-7:2018, *Communication systems for meters - Part 7: Transport and security services*

EN 60870-5-2, *Telecontrol equipment and systems - Part 5: Transmission protocols - Section 2: Link transmission procedures (IEC 60870-5-2)*

EN 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 62056-3-1)*

EN 62056-4-7:2016, *Electricity metering data exchange - The DLMS/COSEM suite - Part 4-7: DLMS/COSEM transport layer for IP networks (IEC 62056-4-7)*

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

EN 62056-6-1:2017, *Electricity metering data exchange - The DLMS/COSEM suite - Part 6-1: Object Identification System (OBIS) (IEC 62056-6-1:2017)*

EN 62056-6-2:2018,[1] *Electricity metering data exchange - The DLMS/COSEM suite - Part 6-2: COSEM interface classes (IEC 62056-6-2:2017)*

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

1) The EN 62056 series of standards are in the process of revision/renumbering.

EN 62056-21:2002, *Electricity metering - Data exchange for meter reading, tariff and load control - Part 21: Direct local data exchange (IEC 62056-21:2002)*

EN 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 62056-42)*

EN 62056-46:2002, *Electricity metering - Data exchange for meter reading, tariff and load control - Part 46: Data link layer using HDLC protocol (IEC 62056-46:2002)*

ITU-T V.250, *Serial asynchronous automatic dialling and control*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
authorized party
utility, energy retailer, network operator, meter operator or data collection company authorized to access the information stored in the meter that is accessible to them according to the application association they can use

3.2
base conditions
fixed conditions used to express the volume of gas independently of the measurement conditions

EXAMPLE: temperature of 273,15 K and absolute pressure of 1,013 25 bar or temperature of 288,15 K and absolute pressure of 1,013 25 bar

3.3
billing period
period over which a consumer bill is calculated

Note 1 to entry: See also B.7.

3.4
calendar
mechanism to program changes to active registers for Time-of-Use Tariffs

Note 1 to entry: See Activity Calendar B.3.

3.5
concentrator
intelligent station in a hierarchical communications network where incoming data (generated by multiple meters) is processed as appropriate and then repackaged, relayed, retransmitted, discarded, responded to, consolidated, prioritized and/or increased to multiple messages

3.6
disturbance
influence quantity having a value within the limits specified, but outside the specified rated operating conditions of the measurement instrument

3.7
gas-volume conversion device
device that computes, integrates and indicates the volume increments measured by a gas meter as if it were operating at base conditions, using as inputs the volume at measurement conditions as measured by the gas meter, and other characteristics such as gas temperature and gas pressure

Note 1 to entry: The conversion device can also include the error curve of the gas meter and associated measuring transformers.

Note 2 to entry: The deviation from the ideal gas law can be compensated by the compressibility factor.

3.8
hand held terminal
portable device for reading and programming metering equipment at the customer's premises or at the access point

3.9
index
<gas and water metering> current reading of the total volume (mass) passed through the meter

3.10
index difference
<gas and water metering> difference between the index at the end of a measurement or billing period and the index at the start of the same measurement or billing period

Note 1 to entry: Index difference over a certain measurement or billing period is also known as consumption. For consumption, thresholds can be specified.

3.11
IPsec
end-to-end security scheme operating in the Internet Layer

Note 1 to entry: It works on IPv4 and IPv6 Networks.

Note 2 to entry: It is described in IETF RFC 4301.

3.12
measurement conditions
conditions of the gas whose volume is measured, at the point of measurement

EXAMPLE: the temperature and the pressure of the gas

3.13
scaler
exponent (to the base of 10) of the multiplication factor

Note 1 to entry: If the value is not numerical, then the scaler will be set to 0.

Note 2 to entry: See also B.49

3.14
specified measuring range
set of values of measurements (the pressure for the pressure transducer or temperature for the temperature transducer) for which the error of the conversion device is intended to lie within the limits specified in the standard

Note 1 to entry: The upper and lower limits of the specified measuring range are called maximum value and minimum value respectively.

3.15
specified field of measurement of a conversion device
set of values at measurement conditions for which the error of the conversion device is within specified limits

Note 1 to entry: A conversion device has a measuring range for every quantity that it processes.

Note 2 to entry: The specified field of measurement applies to the characteristic quantities of the gas that are used to determine the conversion factor.

3.16
unit
enumeration defining the physical unit

Note to entry: See also B.69.

4 General description and security

4.1 Basic vocabulary

All communications involve two sets of equipment represented by the terms **Caller** system and **Called** system. The **Caller** is the system that decides to initiate a communication with a remote system known as the **Called** party; these denominations remain valid throughout the duration of the communication.

A communication is broken down into a certain number of transactions. Each transaction is represented by a transmission from the **Transmitter** to the **Receiver**. During the sequence of transactions, the **Caller** and **Called** systems take turns to act as **Transmitter** and **Receiver**.

The terms **Client** and **Server** have the same meanings as in the DLMS model EN 61334-4-41. The **Server** is the system (meter) that acts as a receiver for service requests. The **Client** is the system (usually a data collecting system) that uses the Server for a specific purpose by means of one or more service requests.

The situation involving a **Caller Client** and a **Called Server** is undoubtedly the most frequent case, but a communication based on a **Caller Server** and a **Called Client** is also possible, in particular to report the occurrence of an urgent alarm and can offer savings in terms of data volumes in mass metering applications.

While the terms **Caller** and **Called** can imply a session, sessionless communications using, for example UDP over IP, are also a valid approach to communications for smart meters depending on the type of network.

4.2 Layered protocols

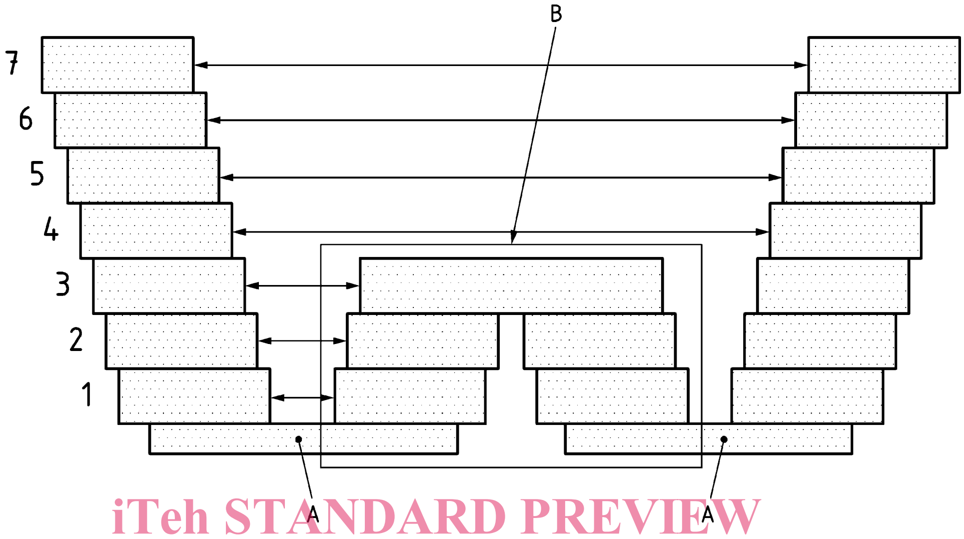
4.2.1 General

The purpose of this subclause is to explain, in a summarized way, the layered approaches and to explain the development since the initial issue of this document.

In order to perform automatic reading of meters, this document assumes a protocol stack approach. A protocol stack is divided into layers in order to reduce the complexity of the communicating system. Each layer provides services to the layer above on the basis of the layer below.

4.2.2 7 Layer Protocol

The architecture of data communication in this document is modelled using the ISO – OSI 7-layer reference model ISO/IEC 7498-1. The model is shown in Figure 1.



Key

A	physical media
B	relay entity
1	physical
2	data link
3	network
4	transport
5	session
6	presentation
7	application

Figure 1 — The OSI 7-layer model

All layers have a corresponding layer at the other end of the communications link. The three upper layers are application related. The three lower layers are communications related. The Transport Layer creates the link between them. There may be multiple instances of the three lower layers if a relay is inserted between the communicating partners.

It shall be kept in mind that this is a model and not an implementation guide, i.e. not all implementations follow this model. An example of this is the Internet series of standards. They follow the model for the four lower layers, but do not specify the application related part as independent layers. Layers not necessary and thus not implemented in a specific protocol may be handled as null layers.

4.2.3 IP Protocol

IPv4 and IPv6 are widely used protocols for transport of all kinds of data, including metering data. Its principal advantages are that it can be used to carry a wide variety of applications over a wide range of communications media.

Table 1 — Connection method independent Application Layers

Application Layer	**Common, method independent layer**	
	TCP/UDP IP Wrapper	
Transport	UDP	TCP
Network	IP	
Data Link	Any	Any
Physical	Any	Any

The architecture shown in Table 1 allows for multiple different communications media, while at the same time keeping a common connection method independent Application Layer. This is important as different connection methods are suited for different operating environments. The use of common layers lowers the overall cost and complexity of a remote readout metering system.

Users of the TCP/IP or UDP/IP protocol shall follow the standard EN 62056-4-7.

4.2.4 3 Layer Protocol

A very common model for simple meter readout without any relays is a collapsed three layer model as depicted in Table 2.

This is the IEC 3-layer model EN 61334-4-1, which is derived from OSI 7-layer model documented in ISO/IEC 7498-1.

The three layers of the IEC model are shown in Table 2.

Table 2 — IEC 3-layer model

Layer 7	Application
Layer 2	Data link
Layer 1	Physical

NOTE 1 The layer numbers refers to the numbering in the ISO-OSI 7_layer model.

This model ensures that the original concept of a model where the Application Layer is independent of communication transport method used, is maintained.

This division makes it possible to achieve an Application Layer that is independent of the communication connection method used, and the possibility of using the same communication method transport mechanism for different Application Layers. An example of this is shown in Table 3. The Physical Layer and in some cases the Data Link Layer are closely related and highly dependent on the Layers 1 and 2 depend on the connection method used (Optical interface, Power Line Carrier-Low Voltage (PLC – LV), Public Switched Telephone Network (PSTN), VHF/UHF radio, Twisted Pair cable (TP)). This document requires Application Layers that are independent of the connection method used.

Table 3 — Link and Physical layers in the 3 layer model

Application Layer	Common, method independent layer: this document/EN 13757-3/EN 16836-3					
Transport/Link Layer	EN 62056-46		EN 13757-7/EN 13757-4		EN 16836-2	?
Physical Layer	EN 62056-21	EN 62056-42	EN 13757-2/ EN 13757-6	EN 13757-4/ EN 13757-5	EN 16836-2	?
Connection Method	Optical (Local) Port	PSTN	Wired M-Bus (twisted pair baseband)	Wireless M-Bus	ZigBee®	Future methods (to be defined)

NOTE 2 The EN IEC 62056 series of standards provides a set of communications profiles for use with DLMS. These standards, are enumerated as 62056-7-x for Local Network technologies, 62056-8-x for Neighbourhood Network technologies, and 62056-9-x for Wide Area Network technologies.

4.3 Security

4.3.1 General

The data transferred between meters and head end systems is, in many cases, be regarded as the private data of the energy user, and therefore is subject to EU and national rules for the protection of said data. If communications to the meter can influence demand, then the meter can form part of critical national infrastructure. If data transferred from the head end to the meter can control the meter, then the integrity of the data can be a safety issue as well.

A mandate for standardization for security, M/487, is in place, and this is driving further standardization efforts in this area. A copy of the mandate can be obtained at ftp://ftp.cencenelec.eu/CENELEC/EuropeanMandates/M_487.pdf.

Security, therefore, is a much higher priority than in the earlier version of this document.

There are four key security aspects required for smart metering:

a) Ensuring that only those who should have access to information are granted access;

b) Ensuring that information is not changed accidentally or deliberately;

c) Ensuring that the source of the information cannot be falsified;

d) Ensuring that the source of information cannot be denied.

Item a) is normally named Confidentiality. This can be achieved by limiting the physical access, or by using cryptographic methods. Both methods shall be considered depending on the application and communications methods being used. It should be noted that data encrypted cannot be retrieved again if the 'key' is lost. The normal method for ensuring privacy is by encrypting information. With the cryptographic methods available this is very safe and reasonably easy to perform. The real issue is not the encryption and decryption, but the handling and distribution of the encryption/decryption key(s) – see 4.3.3.

Item b) is normally named Integrity. Integrity in communication is normally achieved by generating a compressed signature over the message, referred to as a message digest. If the message digest cannot be recalculated on the data received, then it is possible that the data are damaged. A method that is falling out of favour is Cyclic Redundancy Check. CRC has been in use for a long time to generate