

Electricity metering data exchange - The DLMS/COSEM suite - Part 8-4: Communication profiles for narrow-band OFDM PLC PRIME neighbourhood networks

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 62056-8-4:2019 sisaldab Euroopa standardi EN IEC 62056-8-4:2019 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 62056-8-4:2019 consists of the English text of the European standard EN IEC 62056-8-4:2019.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 01.03.2019.	Date of Availability of the European standard is 01.03.2019.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 17.220.20, 35.110, 91.140.50

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:  
Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

ICS 35.110; 17.220.20; 91.140.50

English Version

**Electricity metering data exchange - the DLMS/COSEM suite -  
Part 8-4: Communication profiles for narrow-band OFDM PLC  
PRIME neighbourhood networks  
(IEC 62056-8-4:2018)**

Échange des données de comptage de l'électricité - la suite  
DLMS/COSEM - Partie 8-4: Profils de communication pour  
réseaux de voisinage OFDM PLC PRIME à bande étroite  
(IEC 62056-8-4:2018)

Datenkommunikation der elektrischen Energiemessung -  
DLMS/COSEM - Teil 8-4: Kommunikationsprofile für  
Schmalband-OFDM-PLC-PRIME-Nachbarschaftsnetzwerke  
(IEC 62056-8-4:2018)

This European Standard was approved by CENELEC on 2019-01-17. CENELEC 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 CENELEC 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 CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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

## European foreword

The text of document 13/1749/CDV, future edition 1 of IEC 62056-8-4, prepared by IEC/TC 13 "Electrical energy measurement and control" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62056-8-4:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-10-17
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-01-17

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

## Endorsement notice

The text of the International Standard IEC 62056-8-4:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61334-4-1:1996      NOTE      Harmonized as EN 61334-4-1:1996 (not modified)

## Annex ZA

(normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61334-4-32	1996	Distribution automation using distribution line carrier systems - Part 4: Data communication protocols - Section 32: Data link layer - Logical link control (LLC)	EN 61334-4-32	1996
IEC 61334-4-511	2000	Distribution automation using distribution line carrier systems - Part 4-511: Data communication protocols - Systems management - CIASE protocol	EN 61334-4-511	2000
IEC 62056-1-0	-	Electricity metering data exchange - The DLMS/COSEM suite - Part 1-0: Smart metering standardisation framework	EN 62056-1-0	-
IEC/TS 62056-1-1	-	Electricity metering data exchange - The DLMS/COSEM suite - Part 1-1: Template for DLMS/COSEM communication profile standards	-	-
IEC 62056-4-7	2015	Electricity metering data exchange - The DLMS/COSEM suite - Part 4-7: DLMS/COSEM transport layer for IP networks	EN 62056-4-7	2016
IEC 62056-5-3	2017	Electricity metering data exchange - The DLMS/COSEM suite - Part 5-3: DLMS/COSEM application layer	EN 62056-5-3	2017
IEC 62056-6-1	-	Electricity metering data exchange - The DLMS/COSEM suite - Part 6-1: Object Identification System (OBIS)	EN 62056-6-1	-
IEC 62056-6-2	2017	Electricity metering data exchange - The DLMS/COSEM suite - Part 6-2: COSEM interface classes	EN IEC 62056-6-2	2018

IEC 62056-9-7	2013	Electricity metering data exchange - The DLMS/COSEM suite - Part 9-7: Communication profile for TCP-UDP/IP networks	EN 62056-9-7	2013
ITU-T G.9904	2012	SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS - Access networks - In premises networks - Narrow-band orthogonal frequency division multiplexing power line communication transceivers for PRIME networks	-	-
STD 0005	-	Internet Protocol	-	-
STD 0006	-	User Datagram Protocol	-	-
STD 0007	-	Transmission Control Protocol	-	-
RFC 1144	-	Compressing TCP/IP Headers for Low-Speed Serial Links	-	-
RFC 2460	-	Internet Protocol, Version 6 (IPv6) Specification	-	-
RFC 2464	-	Transmission of IPv6 Packets over Ethernet Networks	-	-
RFC 3315	-	Dynamic Host Configuration Protocol for IPv6 (DHCPv6)	-	-
RFC 4291	-	IP Version 6 Addressing Architecture	-	-
RFC 4862	-	IPv6 Stateless Address Autoconfiguration	-	-
RFC 6282	-	Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks	-	-

## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references .....	8
3 Terms, definitions and abbreviated terms .....	10
3.1 Terms and definitions.....	10
3.2 Abbreviated terms.....	10
4 Targeted communication environments.....	12
5 Use of the communication layers for this profile.....	13
5.1 Information related to the use of the standard specifying the lower layers .....	13
5.2 The structure of the communication profiles .....	13
5.2.1 Overview .....	13
5.2.2 The IEC 61334-4-32 profile.....	14
5.2.3 The TCP-UDP/IPv4 profile .....	14
5.2.4 The TCP-UDP/IPv6 profile .....	14
5.3 Lower protocol layers and their use.....	14
5.3.1 General .....	14
5.3.2 Physical layer .....	14
5.3.3 MAC layer.....	15
5.4 Service mapping and convergence layers .....	17
5.4.1 Overview .....	17
5.4.2 The IEC 61334-4-32 LLC SSCS.....	17
5.4.3 The IPv4 SSCS.....	19
5.4.4 The IPv6 SSCS.....	21
5.5 Registration and connection management.....	22
5.5.1 Overview .....	22
5.5.2 IEC 61334-4-32 profile.....	22
5.5.3 TCP-UDP/IPv4 profile .....	27
5.5.4 TCP-UDP/IPv6 profile .....	40
6 Identification and addressing schemes .....	55
6.1 IEC 61334-4-32 profile addressing.....	55
6.1.1 Overview .....	55
6.1.2 MAC address.....	56
6.1.3 IEC 61334-4-32 SSCS addresses .....	56
6.1.4 LLC addresses .....	56
6.2 TCP-UDP/IPv4 profile addressing .....	57
6.3 TCP-UDP/IPv6 profile addressing .....	57
7 Specific consideration for the application layer services .....	57
7.1 Overview.....	57
7.2 Application Association (AA) establishment and release: ACSE services .....	57
7.2.1 AA establishment: IEC 61334-4-32 profile.....	57
7.2.2 AA establishment: IP based profile .....	58
7.2.3 Application association release.....	59
7.3 xDLMS services .....	59
7.4 Security mechanisms .....	59
7.4.1 DLMS/COSEM security.....	59

7.4.2	Lower layers security .....	59
7.5	Transferring long application messages .....	59
7.6	Media access, bandwidth and timing considerations .....	60
7.7	Other considerations .....	60
8	Communication configuration and management .....	60
9	The COSEM application process .....	60
10	Additional considerations for the use of this profile .....	60
Annex A (informative)	Examples .....	61
A.1	Data exchange between two IP communication peers .....	61
A.2	Joining a multicast group .....	63
A.3	PRIME encoding examples .....	63
Annex B (normative)	New COSEM interfaces classes and OBIS codes .....	76
Annex C (informative)	IEC 61334-4-32 profile: Error cases during connection establishment .....	77
Annex D (normative)	Convergence layer constants .....	78
Bibliography	.....	79
Figure 1	– Communication architecture .....	12
Figure 2	– OFDM PLC PRIME communication profile architectures .....	14
Figure 3	– IEC 61334-4-32 SSCS services .....	18
Figure 4	– MSC for Data services in the case of logical name referencing .....	19
Figure 5	– IEC 61334-4-32 SSCS .....	22
Figure 6	– MSC for IEC 61334-4-32 SSCS services .....	26
Figure 7	– IPv4 SSCS services .....	28
Figure A.1	– MSC of IPv4 SSCS services .....	62
Figure A.2	– Joining MSC IPv4 profile .....	63
Figure C.1	– Error cases during connection establishment .....	77
Table 1	– Result values for SSCS services .....	25
Table 2	– AR_REGISTER_S message format .....	36
Table 3	– AR_REGISTER B message format .....	36
Table 4	– AR_UNREGISTER_S message format .....	36
Table 5	– AR_MCAST_REG_S message format .....	36
Table 6	– AR_MCAST_REG_B message format .....	37
Table 7	– AR_MCAST_UNREG_S message format .....	37
Table 8	– AR_MCAST_UNREG_B message format .....	37
Table 9	– AR_LOOKUP_S message format .....	38
Table 10	– AR_LOOKUP_B message format .....	38
Table 11	– IPv4 packet format without header compression negotiated .....	38
Table 12	– IPv4 packet format with VJ header compression .....	39
Table 13	– Connection data sent by the initiator .....	39
Table 14	– Connection data sent by the responder .....	40
Table 15	– IPv6 SSCS table entry .....	44
Table 16	– Mapping IPv6 precedence to PRIME MAC priority .....	45

Table 17 – AR_REGISTERv6_S message format.....	51
Table 18 – AR_REGISTERv6_B message format.....	51
Table 19 – AR_UNREGISTERv6_S message format.....	51
Table 20 – AR_UNREGISTERv6_B message format.....	52
Table 21 – AR_LOOKUPv6_S message format.....	52
Table 22 – AR_LOOKUPv6_B message format.....	52
Table 23 – AR_MCAST_REGv6_S message format.....	53
Table 24 – AR_MCAST_REGv6_B message format.....	53
Table 25 – AR_MCAST_UNREGv6_B message format.....	53
Table 26 – IPv6 Packet format without negotiated header compression .....	54
Table 27 – UDP/IPv6 Packet format with LOWPAN_IPHC header compression and LOWPAN_NHC.....	54
Table 28 – IPv6 Packet format with LOWPAN_IPHC negotiated header compression .....	54
Table 29 – IPv6 Connection signalling data sent by the initiator .....	55
Table 30 – IPv6 Connection signalling data sent by the responder .....	55
Table 31 – Client service access point values.....	57
Table 32 – Server service access point values.....	57
Table 33 – Application associations and data exchange in the IEC 61334-4-32 profile.....	58
Table D.1 – TYPE value assignment.....	78

preview generated by EVS

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICITY METERING DATA EXCHANGE –  
THE DLMS/COSEM SUITE –****Part 8-4: Communication profiles for narrow-band  
OFDM PLC PRIME neighbourhood networks**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this International Standard may involve the use of a maintenance service concerning the stack of protocols on which the present standard IEC 62056-8-4 is based.

The IEC takes no position concerning the evidence, validity and scope of this maintenance service.

The provider of the maintenance service has assured the IEC that he is willing to provide services under reasonable and non-discriminatory terms and conditions for applicants throughout the world. In this respect, the statement of the provider of the maintenance service is registered with the IEC. Information may be obtained from:

PRIME Alliance  
2-12, Avenue de la Renaissance  
1000, Brussels/ (BE)  
[www.prime-alliance.org.com](http://www.prime-alliance.org.com)

International Standard IEC 62056-8-4 has been prepared by IEC technical committee 13: Electrical energy measurement and control.

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

CDV	Report on voting
13/1749/CDV	13/1763/RVC

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

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

A list of all parts in the IEC 62056 series, published under the general title *Electricity metering data exchange – The DLMS/COSEM suite*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

As defined in IEC 62056-1-0, the IEC 62056 DLMS/COSEM suite provides specific communication profile standards for communication media relevant for smart metering.

Such communication profile standards specify how the COSEM data model and the DLMS/COSEM application layer can be used on the lower, communication media-specific protocol layers.

Communication profile standards refer to communication standards that are part of the IEC 62056 DLMS/COSEM suite or to any other open communication standard.

This International Standard specifies DLMS/COSEM communication profiles using Recommendation ITU-T G.9904:2012 *Narrow-band orthogonal frequency division multiplexing power line communication transceivers for PRIME networks*. It applies for devices installed on the neighbourhood network.

It follows the rules defined in IEC 62056-5-3:2017, Annex A, and in IEC 62056-1-0 and the IEC TS 62056-1-1 recommendations for its structure.

The communication profile specified in this document is based on the results of the European OPEN Meter project, Topic Energy 2008.7.1.1, Project no.: 226369, [www.openmeter.com](http://www.openmeter.com), and has been prepared by the PRIME Alliance Technical Working Group, [www.prime-alliance.org](http://www.prime-alliance.org).