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

**Échange des données de comptage de l'électricité – La suite DLMS/COSEM –
Partie 5-3: Couche application DLMS/COSEM**

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<https://standards.iteh.ai/standards/iec/62056-5-3-2013>

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CONTENTS

FOREWORD.....	7
1 Scope.....	9
2 Normative references	9
3 Terms, definitions and abbreviations	11
3.1 Terms and definitions	11
3.2 Abbreviations	11
4 Overview	13
4.1 COSEM application layer structure	13
4.2 COSEM application layer services.....	14
4.2.1 ASO services.....	14
4.2.2 Services provided for application association establishment and release	14
4.2.3 Services provided for data transfer	15
4.2.4 Layer management services	19
4.2.5 Summary of COSEM application layer services	19
4.3 COSEM application layer protocols	20
5 Information security in DLMS/COSEM	20
5.1 Definitions	20
5.2 General	20
5.3 Data access security	21
5.3.1 Overview	21
5.3.2 Lowest level security (no security)	21
5.3.3 Low Level Security (LLS)	21
5.3.4 High Level Security (HLS)	22
5.4 Data transport security	23
5.4.1 Applying, removing or checking the protection: ciphering and deciphering	23
5.4.2 Security context.....	25
5.4.3 Security policy	25
5.4.4 Security suite	25
5.4.5 Security material	26
5.4.6 Ciphered xDLMS APDUs	26
5.4.7 Cryptographic keys	27
5.4.8 The Galois/Counter Mode of Operation (GCM)	30
6 COSEM application layer service specification	40
6.1 Service primitives and parameters.....	40
6.2 The COSEM-OPEN service	42
6.3 The COSEM-RELEASE service	47
6.4 COSEM-ABORT service	49
6.5 Security parameters	50
6.6 The GET service	51
6.7 The SET service.....	53
6.8 The ACTION service	56
6.9 The EventNotification service	60
6.10 The TriggerEventNotificationSending service	61
6.11 Variable access specification	62
6.12 The Read service	63

6.13	The Write service	67
6.14	The UnconfirmedWrite service.....	70
6.15	The InformationReport service.....	71
6.16	Client side layer management services: the SetMapperTable.request.....	72
6.17	Summary of services and LN/SN data transfer service mapping	72
7	COSEM application layer protocol specification	73
7.1	The control function.....	73
7.1.1	State definitions of the client side control function	73
7.1.2	State definitions of the server side control function.....	75
7.2	The ACSE services and APDUs	76
7.2.1	ACSE functional units, services and service parameters	76
7.2.2	Registered COSEM names	79
7.2.3	APDU encoding rules	81
7.2.4	Protocol for application association establishment.....	81
7.2.5	Protocol for application association release	85
7.3	Protocol for the data transfer services	89
7.3.1	Negotiation of services and options – the conformance block	89
7.3.2	Confirmed and unconfirmed service invocations	90
7.3.3	Protocol for the GET service.....	91
7.3.4	Protocol for the SET service.....	94
7.3.5	Protocol for the ACTION service	97
7.3.6	Protocol for the EventNotification service	99
7.3.7	Protocol for the Read service	100
7.3.8	Protocol for the Write service.....	104
7.3.9	Protocol for the UnconfirmedWrite service	108
7.3.10	Protocol for the InformationReport service.....	109
8	Abstract syntax of ACSE and COSEM APDUs	110
Annex A (normative)	Using the COSEM application layer in various communications profiles	124
Annex B (informative)	AARQ and AARE encoding examples.....	126
Annex C (informative)	Encoding examples: AARQ and AARE APDUs using a ciphered application context.....	140
Annex D (informative)	Data transfer service examples	148
Annex E (informative)	Overview of cryptography.....	163
Annex F (informative)	Significant technical changes with respect to IEC 62056-53	169
Bibliography	172
Index	174
Figure 1	– Structure of the COSEM Application layers	13
Figure 2	– Summary of COSEM AL services	19
Figure 3	– LLS and HLS authentication	23
Figure 4	– Data transport security in DLMS/COSEM	24
Figure 5	– Ciphered xDLMS APDUs.....	26
Figure 6	– Cryptographic protection of xDLMS APDUs using GCM.....	33
Figure 7	– Service primitives.....	40
Figure 8	– Time sequence diagrams	41
Figure 9	– Partial state machine for the client side control function	74

Figure 10 – Partial state machine for the server side control function.....	75
Figure 11 – MSC for successful AA establishment preceded by a successful lower layer connection establishment.....	82
Figure 12 – Graceful AA release using the A-RELEASE service.....	87
Figure 13 – Graceful AA release by disconnecting the supporting layer.....	88
Figure 14 – Aborting an AA following a PH-ABORT indication.....	89
Figure 15 – MSC of the GET service.....	92
Figure 16 – MSC of the GET service with block transfer.....	92
Figure 17 – MSC of the GET service with block transfer, long GET aborted.....	94
Figure 18 – MSC of the SET service.....	95
Figure 19 – MSC of the SET service with block transfer.....	96
Figure 20 – MSC of the ACTION service.....	98
Figure 21 – MSC of the ACTION service with block transfer.....	99
Figure 22 – MSC of the Read service used for reading an attribute.....	102
Figure 23 – MSC of the Read service used for invoking a method.....	103
Figure 24 – MSC of the Read Service used for reading an attribute, with block transfer.....	104
Figure 25 – MSC of the Write service used for writing an attribute.....	107
Figure 26 – MSC of the Write service used for invoking a method.....	107
Figure 27 – MSC of the Write Service used for writing an attribute, with block transfer.....	108
Figure 28 – MSC of the Unconfirmed Write service used for writing an attribute.....	109
Figure E.1 – Hash function.....	164
Figure E.2 – Encryption and decryption.....	165
Figure E.3 – Message Authentication Codes (MACs).....	166
Table 1 – Clarification of the meaning of PDU Size for DLMS/COSEM.....	16
Table 2 – Security suites.....	26
Table 3 – Security control field.....	27
Table 4 – Cryptographic keys and their management.....	30
Table 5 – Plaintext and additional authenticated data.....	34
Table 6 – Example for ciphered APDUs.....	37
Table 7 – HLS example with GMAC.....	39
Table 8 – Codes for AL service parameters.....	42
Table 9 – Service parameters of the COSEM-OPEN service primitives.....	43
Table 10 – Service parameters of the COSEM-RELEASE service primitives.....	47
Table 11 – Service parameters of the COSEM-ABORT service primitives.....	50
Table 12 – Security parameters.....	50
Table 13 – Service parameters of the GET service.....	51
Table 14 – GET service request and response types.....	52
Table 15 – Service parameters of the SET service.....	54
Table 16 – SET service request and response types.....	55
Table 17 – Service parameters of the ACTION service.....	57
Table 18 – ACTION service request and response types.....	58
Table 19 – Service parameters of the EventNotification service primitives.....	60

Table 20 – Service parameters of the TriggerEventNotificationSending.request service primitive.....	61
Table 21 – Variable Access Specification.....	63
Table 22 – Service parameters of the Read service	64
Table 23 – Use of the Variable_Access_Specification variants and the Read.response choices	65
Table 24 – Service parameters of the Write service	68
Table 25 – Use of the Variable_Access_Specification variants and the Write.response choices	68
Table 26 – Service parameters of the UnconfirmedWrite service.....	70
Table 27 – Use of the Variable_Access_Specification variants.....	71
Table 28 – Service parameters of the InformationReport service.....	72
Table 29 – Service parameters of the SetMapperTable.request service primitives	72
Table 30 – Summary of ACSE services.....	73
Table 31 – Summary of xDLMS services for LN referencing.....	73
Table 32 – Summary of xDLMS services for SN referencing.....	73
Table 33 – ACSE functional units, services and service parameters.....	77
Table 34 – Use of ciphered / unciphered APDUs.....	80
Table 35 – xDLMS Conformance block.....	90
Table 36 – GET service types and APDUs.....	91
Table 37 – SET service types and APDUs	95
Table 38 – ACTION service types and APDUs	98
Table 39 – Mapping between the GET and the Read services.....	100
Table 40 – Mapping between the ACTION and the Read services.....	101
Table 41 – Mapping between the SET and the Write services	105
Table 42 – Mapping between the ACTION and the Write service.....	106
Table 43 – Mapping between the SET and the UnconfirmedWrite services	108
Table 44 – Mapping between the ACTION and the UnconfirmedWrite services	109
Table 45 – Mapping between the EventNotification and InformationReport services.....	110
Table B.1 – Conformance block	127
Table B.2 – A-XDR encoding of the xDLMS InitiateRequest APDU.....	128
Table B.3 – A-XDR encoding of the xDLMS InitiateResponse APDU	129
Table B.4 – BER encoding of the AARQ APDU	132
Table B.5 – Complete AARQ APDU	134
Table B.6 – BER encoding of the AARE APDU	135
Table B.7 – The complete AARE APDU	139
Table C.1 – A-XDR encoding of the xDLMS InitiateRequest APDU	140
Table C.2 – Authenticated encryption of the xDLMS InitiateRequest APDU.....	141
Table C.3 – BER encoding of the AARQ APDU	142
Table C.4 – A-XDR encoding of the xDLMS InitiateResponse APDU.....	143
Table C.5 – Authenticated encryption of the xDLMS InitiateResponse APDU	144
Table C.6 – BER encoding of the AARE APDU	145
Table C.7 – BER encoding of the RLRQ APDU	146
Table C.8 – BER encoding of the RLRE APDU	147

Table D.1 – Objects used in the examples 148

Table D.2 – Example: Reading the value of a single attribute without block transfer 149

Table D.3 – Example: Reading the value of a list of attributes without block transfer 150

Table D.4 – Example: Reading the value of a single attribute with block transfer 151

Table D.5 – Example: Reading the value of a list of attributes with block transfer 153

Table D.6 – Example: Writing the value of a single attribute without block transfer 155

Table D.7 – Example: Writing the value of a list of attributes without block transfer 156

Table D.8 – Example: Writing the value of a single attribute with block transfer 158

Table D.9 – Example: Writing the value of a list of attributes with block transfer 160

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**ELECTRICITY METERING DATA EXCHANGE –
THE DLMS/COSEM SUITE –****Part 5-3: DLMS/COSEM application layer**

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DLMS¹ User Association
Zug/Switzerland
www.dlms.ch

¹ Device Language Message Specification.

International Standard IEC 62056-5-3 has been prepared by IEC technical committee 13: Electrical energy measurement, tariff- and load control.

This edition cancels and replaces IEC 62056-53 published in 2006. It constitutes a technical revision.

The significant technical changes with respect to IEC 62056-53 are listed in Annex F.

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

FDIS	Report on voting
13/1523/FDIS	13/1541/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.

A list of all the 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.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The numbering scheme has changed from IEC 62056-XY to IEC 62056-X-Y. For example IEC 62056-53 becomes IEC 62056-5-3.

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ELECTRICITY METERING DATA EXCHANGE – THE DLMS/COSEM SUITE –

Part 5-3: DLMS/COSEM application layer

1 Scope

This part of IEC 62056 specifies the DLMS/COSEM application layer in terms of structure, services and protocols for COSEM clients and servers, and defines how to use the DLMS/COSEM application layer in various communication profiles.

It defines services for establishing and releasing application associations, and data communication services for accessing the methods and attributes of COSEM interface objects, defined in IEC 62056-6-2², using either logical name (LN) or short name (SN) referencing.

Annex A (normative) defines how to use the COSEM application layer in various communication profiles. It specifies how various communication profiles can be constructed for exchanging data with metering equipment using the COSEM interface model, and what are the necessary elements to specify in each communication profile. The actual, media-specific communication profiles are specified in separate parts of the IEC 62056 series.

Annex B, Annex C and Annex D (informative) include encoding examples for APDUs.

Annex E (informative) provides an overview of cryptography.

2 Normative references

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 61334-4-41:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 41: Application protocols – Distribution line message specification*

IEC 61334-6:2000, *Distribution automation using distribution line carrier systems – Part 6: A-XDR encoding rule*

IEC/TR 62051:1999, *Electricity metering – Glossary of terms*

IEC/TR 62051-1:2004, *Electricity metering – Data exchange for meter reading, tariff and load control – Glossary of terms – Part 1: Terms related to data exchange with metering equipment using DLMS/COSEM*

² To be published simultaneously with this part of IEC 62056.

IEC 62056-6-1:—, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-1: Object Identification System (OBIS)*³

IEC 62056-6-2:—, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes*⁴

IEC 62056-8-3:—, *Electricity metering data exchange – The DLMS/COSEM suite – Part 8-3: Communication profile for PLC S-FSK neighbourhood networks*⁵

ISO/IEC 15953:1999, *Information technology – Open Systems Interconnection – Service definition for the Application Service Object Association Control Service Element*

ISO/IEC 15954:1999, *Information technology – Open Systems Interconnection – Connection-mode protocol for the Application Service Object Association Control Service Element*

ISO/IEC 8824-1:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO/IEC 8825-1:2008, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

FIPS PUB 180-1:2002, *Secure hash standard*

FIPS PUB 197:2001, *Advanced Encryption Standard (AES)*

NIST SP 800-38D:2007, *Recommendation for Block Cipher Modes of Operation: Galois/Counter Mode (GCM) and GMAC*

NIST SP 800-57:2006, *Recommendation for Key Management – Part 1: General (Revised)*

RFC 1321:1992, Internet Engineering Task Force (IETF). *The MD5 Message-Digest Algorithm*. Edited by R. Rivest (MIT Laboratory for Computer Science and RSA Data Security, Inc.) April 1992. Available from: <http://www.rfc-editor.org/rfc/rfc1321.txt>

RFC 3394:2002, Internet Engineering Task Force (IETF). *Advanced Encryption Standard (AES) Key Wrap Algorithm*. Edited by J. Schaad (Soaring Hawk Consulting) and R. Housley (RSA Laboratories) September 2002. Available from: <http://www.rfc-editor.org/rfc/rfc3394.txt>

RFC 4106:2005, *The Use of Galois/Counter Mode (GCM) in IPsec Encapsulating Security Payload (ESP)*

NOTE See also the Bibliography.

³ To be published simultaneously with this part of IEC 62056.

⁴ To be published simultaneously with this part of IEC 62056.

⁵ To be published simultaneously with this part of IEC 62056.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in RFC 4106, IEC/TR 62051 and IEC/TR 62051-1 and the following apply.

3.2 Abbreviations

AA	Application Association
AAD	Additional Authenticated Data (used with ciphering of APDUs)
AARE	A-Associate Response – an APDU of the ACSE
AARQ	A-Associate Request – an APDU of the ACSE
ACPM	Association Control Protocol Machine
ACSE	Association Control Service Element
AE	Application Entity
AES	Advanced Encryption Standard
AL	Application Layer
AP	Application Process
APDU	Application Layer Protocol Data Unit
API	Application Programming Interface
ASE	Application Service Element
ASO	Application Service Object
A-XDR	Adapted Extended Data Representation
base_name	The short_name corresponding to the first attribute (“logical_name”) of a COSEM object
BER	Basic Encoding Rules
CF	Control Function
CL	Connectionless
Client	A station, asking for services. In the case of the 3-layer, CO HDLC based profile it is the master station
.cnf	.confirm service primitive
CO	Connection-oriented
COSEM	Companion Specification for Energy Metering
COSEM class_id	COSEM interface class identifier
COSEM object	An instance of a COSEM interface class
DCS	Data Collection System
DLMS	Device Language Message Specification
DLMS UA	DLMS User Association
FCS	Frame Check Sequence
FIPS	Federal Information Processing Standard
GCM	Galois/Counter Mode, an algorithm for authenticated encryption with associated data
GMAC	A specialization of GCM for generating a message authentication code (MAC) on data that is not encrypted
HDLC	High-level Data Link Control

HLS	High Level Security
HMAC	Keyed-Hash Message Authentication Code
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
.ind	.indication service primitive
IP	Internet Protocol
ISO	International Organization for Standardization
IV	Initialization Vector
LDN	Logical Device Name
LLC	Logical Link Control (Sublayer)
LLS	Low Level Security
LSB	Least Significant Bit
MAC	Medium Access Control (sublayer)
MAC	Message Authentication Code (cryptography)
master	Central station – station which takes the initiative and controls the data flow
MSB	Most Significant Bit
MSC	Message Sequence Chart
NIST	National Institute of Standards and Technology
OBIS	OBject Identification System
OSI	Open System Interconnection
PDU	Protocol Data Unit
PHSDU	PH SDU
PLC	Power line carrier
PPP	Point-to-Point Protocol
.req	.request service primitive
.res	.response service primitive
RLRE	A-Release Response – an APDU of the ACSE
RLRQ	A-Release Request – an APDU of the ACSE
SAP	Service Access Point
Server	A station, delivering services. The tariff device (meter) is normally the server, delivering the requested values or executing the requested tasks.
TCP	Transmission Control Protocol
TDEA	Triple Data Encryption Algorithm
UDP	User Datagram Protocol
VAA	Virtual Application Association
xDLMS_ASE	Extended DLMS Application Service Element

4 Overview

4.1 COSEM application layer structure

The structure of the client and server COSEM application layers is shown in Figure 1.

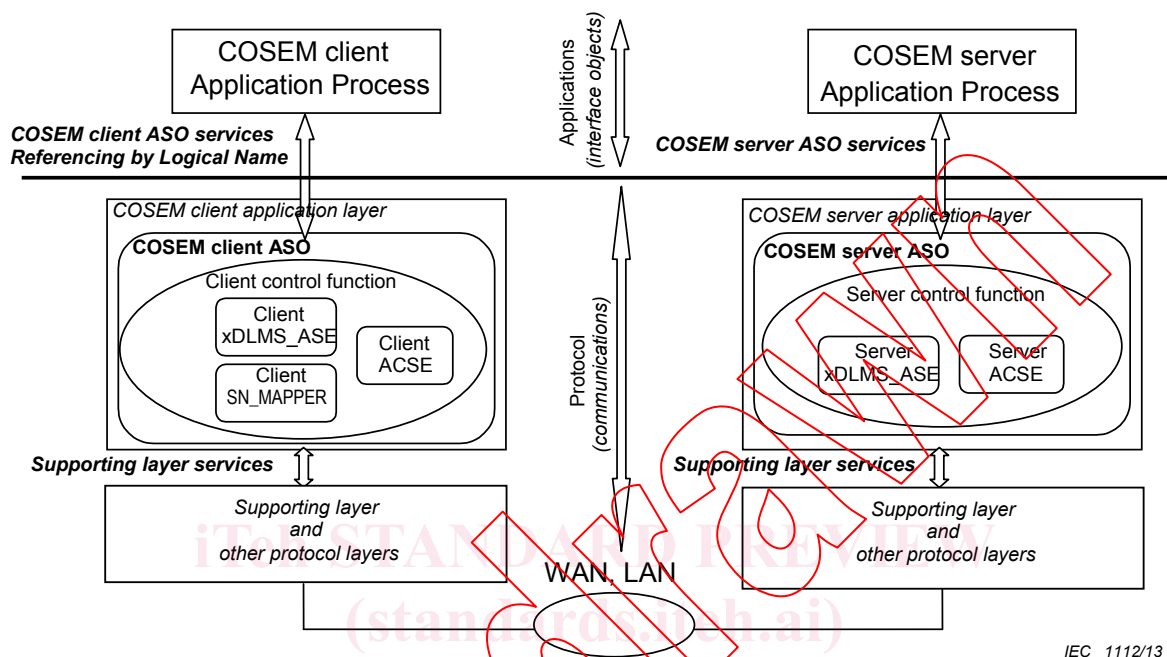


Figure 1 – Structure of the COSEM Application layers

The main component of the COSEM AL is the COSEM Application Service Object. It provides services to its service user, the COSEM Application Process, and uses services provided by the supporting lower layer. It contains three mandatory components both on the client and on the server side:

- the Association Control Service Element, ACSE;
- the extended DLMS Application Service Element, xDLMS_ASE;
- the Control Function, CF.

On the client side, there is a fourth, optional element, called the SN_MAPPER ASE.

The task of the ACSE is to establish, maintain, and release application associations. For the purposes of DLMS/COSEM connection oriented (CO) communication profiles, the CO ACSE, specified in ISO/IEC 15953 and ISO/IEC 15954 is used.

The task of the xDLMS_ASE is to provide data transfer services between COSEM APs. It is based on the DLMS standard, IEC 61334-4-41. It has been extended for DLMS/COSEM; see 4.2.3.1. The main objective of DLMS/COSEM is to provide a business domain oriented interface object model for metering devices and systems while keeping backward compatibility with the DLMS standard. To meet these objectives, DLMS/COSEM includes an evolution of DLMS. Remaining fully compliant to the DLMS standard, DLMS/COSEM provides a more metering specific view of the meter through the COSEM interface objects.

IEC 62056-6-2:—, 4.2 specifies two referencing methods to attributes and methods of COSEM interface objects for use in COSEM servers: LN and SN referencing. When LN referencing is used, the Logical Name of the COSEM objects shall be as specified in IEC 62056-6-1. Therefore, on the server side, two distinct xDLMS service sets are specified: one exclusively