

DIN EN 62056-8-3

ICS 35.240.60; 91.140.50

Einsprüche bis 2011-12-31

Entwurf**Datenkommunikation der elektrischen Energiemessung –
DLMS/COSEM –****Teil 8-3: PLC S-FSK Spezifikation für Areal-Netze
(IEC 13/1474/CDV:2011);****Englische Fassung FprEN 62056-8-3:2011**

Electricity metering data exchange –

The DLMS/COSEM suite –

Part 8-3: PLC S-FSK profile for neighbourhood networks (IEC 13/1474/CDV:2011);

English version FprEN 62056-8-3:2011

Échange de données dans les équipements de mesure de l'énergie électrique –

La suite DLMS/COSEM –

Partie 8-3: Profil PLC S-FSK pour réseaux de voisinage (CEI 13/1474/CDV:2011);

Version anglaise FprEN 62056-8-3:2011

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2011-10-31 wird der Öffentlichkeit zur Prüfung und
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Gesamtumfang 55 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Nationales Vorwort

Die Englische Fassung des europäischen Dokuments FprEN 62056-8-3:2011 „Datenkommunikation der elektrischen Energiemessung – DLMS/COSEM – Teil 8-3: PLC S-FSK Spezifikation für Areal-Netze“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 13/1474/CDV:2011 „Electricity metering data exchange – The DLMS/COSEM suite – Part 8-3: PLC S-FSK profile for neighbourhood networks“ unverändert in den Entwurf FprEN 62056-8-3:2011 übernommen worden.

Das internationale Dokument wurde vom TC 13 „Equipment for electrical energy measurement and load control“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Das DKE/K 461 hat auf seiner Sitzung am 2011-01-12 festgestellt, dass die Bedingungen des DIN-Präsidialbeschlusses 1/2004 für den vorliegenden Norm-Entwurf erfüllt sind, den vorliegenden Norm-Entwurf in englischer Sprache zu veröffentlichen. Auch die mit diesem Norm-Entwurf beabsichtigte Norm soll in englischer Sprache veröffentlicht werden. Sie steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen. Es kann davon ausgegangen werden, dass die Anwender über hinreichende englische Sprachkenntnisse verfügen. Für viele der verwendeten Benennungen existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender auf dem Gebiet der „Datenkommunikation der elektrischen Energiemessung“ in der Regel ebenfalls der englischen Benennungen bedienen.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Für diesen Norm-Entwurf ist das nationale Arbeitsgremium K 461 „Elektrizitätszähler“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (www.dke.de) zuständig.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnietsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Nationaler Anhang NA (informativ)

NA.1 Anwendungsbereich

Diese internationale beschreibt die DLMS/COSEM PLC SFSK Spezifikation für Areal-Netze.

NA.2 Normative Verweisungen

Die folgenden zitierten Dokumente sind für die Anwendung dieses Dokuments erforderlich. Bei datierten Verweisungen gilt nur die in Bezug genommene Ausgabe. Bei undatierten Verweisungen gilt die letzte Ausgabe des in Bezug genommenen Dokuments (einschließlich aller Änderungen).

ISO/IEC 8859-1:1998, *8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*

IEC 61334-4-1 Ed. 1.0:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 1: Reference model of the communication system*

IEC 61334-4-32 Ed. 1.0:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 32: Data link layer – Logical link control (LLC)*

IEC 61334-4-511:2000, *Distribution automation using distribution line carrier systems – Part 4-511: Data communication protocols – Systems management – CIASE protocol*

IEC 61334-5-1 Ed. 2.0:2001, *Distribution automation using distribution line carrier systems – Part 5-1: Lower layer profiles – The spread frequency shift keying (S-FSK) profile*

IEC 62056-46 Ed. 1.1:2007, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol*

IEC 62056-5-3 Ed. 3.0:201X, *Electricity metering data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer*

IEC 62056-6-2 Ed. 3.0:201X, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes*

ISO/IEC 8802-2 Ed. 3.0:1998, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 2: Logical link control*

NA.3 Begriffe und Abkürzungen

Für die Anwendung dieses Teils der IEC 62056 gelten die Begriffe nach IEC 60050-300, IEC 62051 und IEC 62051-1 und die folgenden Begriffe.

Bei Abweichungen zwischen den Begriffen im Glossar und denen in Produktnormen des TC 13 haben letztere Vorrang vor den Anwendungen der betreffenden Norm.

NA.3.1 Begriffe

Für die Anwendung dieses Dokuments gelten die folgenden Begriffe.

3.1.1

Initiator

Anwenderelement einer Client System Management Application Entity (SMAE). durch diese Norm definierter Dienstzugang und Sicherheitssystem

[IEC 61334-4-511, 3.8.1, modifiziert]

3.1.2**aktiver Initiator**

Initiator, der eine CIASE-Register-Anforderung ausgibt oder ausgegeben hat, wenn der Server im unkonfigurierten Zustand ist

[IEC 61334-4-511, 3.9.1]

3.1.3**neues System**

Serversystem, im unkonfigurierten Zustand ist: seine MAC-Adresse ist gleich "NEW-address"

[IEC 61334-4-511, 3.9.3]

3.1.4**Neuer Systemtitel**

Systemtitel eines neuen Systems [IEC 61334-4-511, 3.9.4]

ANMERKUNG Dies ist der Systemtitel eines Systems, das im Neuzustand ist.

3.1.5**registriertes System**

Serversystem, das eine individuelle, gültige MAC-Adresse hat (deshalb abweichend von "NEW Address", siehe IEC 61334-5-1: Medium Access Control)

[IEC 61334-4-511, 3.9.5]

3.1.6**Berichtersystem**

Serversystem, das einen DiscoverReport ausgibt

[IEC 61334-4-511, 3.9.6, modifiziert]

3.1.7**Subslot**

erforderliche Zeit, um zwei Bytes durch die physikalische Schicht zu übertragen

ANMERKUNG Timeslots sind im RepeaterCall-Modus der physikalischen Schicht in Subslots eingeteilt.

3.1.8**timeslot**

erforderliche Zeit, um einen physikalischen Rahmen zu übertragen

ANMERKUNG Wie in IEC 61334-5-1, 3.3.1 festgelegt, umfasst ein physikalischer Rahmen 2 Bytes Präambel, 2 Bytes Start-Subframe-Begrenzer, 38 Bytes PSDU und 3 Bytes Pause.

- 1 This page has been left intentionally blank.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICITY METERING DATA EXCHANGE – THE DLMS/COSEM SUITE
– Part 8-3: PLC S-FSK profile for 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.
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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:

DLMS¹ User Association
Geneva/Switzerland
www.dlms.ch

International Standard IEC 62056-8-3 has been prepared by technical committee 13:
Electrical energy measurement, tariff- and load control.

¹ Device Language Message Specification.

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

FDIS	Report on voting

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

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

148 The committee has decided that the contents of this publication will remain unchanged until
149 the stability date² indicated on the IEC web site under "<http://webstore.iec.ch>" in the data
150 related to the specific publication. At this date, the publication will be

- 151 • reconfirmed,
- 152 • withdrawn,
- 153 • replaced by a revised edition, or
- 154 • amended.

² The National Committees are requested to note that for this publication the stability date is 2017.

1 Scope

This International Standard specifies the DLMS/COSEM PLC S-SFK profile for neighbourhood networks.

It uses standards established by IEC TC57 in the IEC 61334 series, *Distribution automation using distribution line carrier systems* and it specifies extensions to some of those standards.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 61334-4-1 Ed. 1.0:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 1: Reference model of the communication system*

IEC 61334-4-32 Ed. 1.0:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 32: Data link layer – Logical link control (LLC)*

IEC 61334-4-511:2000, *Distribution automation using distribution line carrier systems – Part 4-511: Data communication protocols – Systems management – CIASE protocol*

IEC 61334-5-1 Ed. 2.0:2001, *Distribution automation using distribution line carrier systems – Part 5-1: Lower layer profiles – The spread frequency shift keying (S-FSK) profile*

IEC 62056-46 Ed. 1.1:2007, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol*

IEC 62056-5-3 Ed. 3.0:201X, *Electricity metering data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer*

IEC 62056-6-2 Ed. 3.0:201X, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes*

ISO/IEC 8802-2 Ed. 3.0:1998, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 2: Logical link control*

3 Terms, definitions and abbreviations

For the purposes of this part of IEC 62056, the definitions in IEC 60050-300, IEC 62051 and IEC 62051-1 apply and the terms and definitions below.

Where there is a difference between the definitions in the glossary and those contained in product standards produced by TC 13, then the latter shall take precedence in applications of the relevant standard.

3.1 Terms and definitions

3.1.1 initiator

user-element of a client System Management Application Entity (SMAE). It uses the CIASE and xDLMS ASE and it is identified by its system title [IEC 61334-4-511 3.8.1 modified]

3.1.2 active initiator

initiator, which issues or has last issued a CIASE Register request when the server is in the unconfigured state [IEC 61334-4-511 3.9.1]

197 **3.1.3**
 198 **new system**
 199 server system, which is in the unconfigured state: its MAC address equals "NEW-address"
 200 [IEC 61334-4-511 3.9.3]

201 **3.1.4**
 202 **new system title**
 203 system-title of a new system [IEC 61334-4-511 3.9.4]

204 NOTE This is the system title of a system, which is in the new state.

205 **3.1.5**
 206 **registered system**
 207 server system, which has an individual, valid MAC address (therefore, different from "NEW
 208 Address", see IEC 61334-5-1: Medium Access Control) [IEC 61334-4-511 3.9.5]

209 **3.1.6**
 210 **reporting system**
 211 server system, which issues a DiscoverReport [IEC 61334-4-511 3.9.6 modified]

212 **3.1.7**
 213 **sub-slot**
 214 the time needed to transmit two bytes by the physical layer

215 NOTE Timeslots are divided to sub-slots in the RepeaterCall mode of the physical layer.

216 **3.1.8**
 217 **timeslot**
 218 the time needed to transmit a physical frame

219 NOTE As specified in IEC 61334-5-1 clause 3.3.1, a physical frame comprises 2 bytes preamble, 2 bytes start
 220 subframe delimiter, 38 bytes PSDU and 3 bytes pause.

221 **3.2 Abbreviations**

222	.cnf	.confirm service primitive
223	.ind	.indication service primitive
224	.req	.request service primitive
225	.res	.response service primitive
226	AA	Application Association
227	AARE	A-Associate Response – an APDU of the ACSE
228	AARQ	A-Associate Request – an APDU of the ACSE
229	ACSE	Association Control Service Element
230	AE	Application Entity
231	AES	Advanced Encryption Standard
232	AL	Application Layer
233	AP	Application Process
234	APDU	Application Layer Protocol Data Unit
235	ASE	Application Service Element
236	A-XDR	Adapted Extended Data Representation
237	CIASE	Configuration Initiation Application Service Element
238	CI-PDU	CIASE PDU
239	Client	A station, asking for services. Normally the master station
240	COSEM	Companion Specification for Energy Metering

241	DA	Destination Address
242	DLMS	Device Language Message Specification
243	FCS	Frame Check Sequence
244	GCM	Galois/Counter Mode (GCM), an algorithm for authenticated encryption with
245		associated data
246	HCS	Header Check Sequence
247	HDLC	High-level Data Link Control
248	HES	(Metering) Head End System
249	ISO	International Organization for Standardization
250	LLC	Logical Link Control (Sublayer)
251	LN	Local Network
252	LNAP	Local Network Access Point
253	L-SAP	LLC sublayer Service Access Point
254	LSDU	LLC Service Data Unit
255	MAC	Medium Access Control (sublayer)
256	MAC	Message Authentication Code (cryptography)
257	MPDU	MAC Protocol Data Unit
258	NN	Neighbourhood Network
259	NNAP	Neighbourhood Network Access Point
260	NRM	Normal Response Mode
261	NS	Number of subframes (S-FSK MAC sublayer)
262	OBIS	Object Identification System
263	OSI	Open System Interconnection
264	PDU	Protocol data unit
265	PhL	Physical Layer
266	PLC	Power line carrier
267	PSDU	Physical layer Service Data Unit
268	RDR	Reply Data on Request (used in IEC 61334-4-32)
269	RLRE	A-Release Response – an APDU of the ACSE
270	RLRQ	A-Release Request – an APDU of the ACSE
271	SA	Source Address
272	SAP	Service Access Point
273	SDN	Send Data Non-acknowledged (used in IEC 61334-4-32)
274	SDU	Service Data Unit
275	SMAE	Systems Management Application Entity
276	SMAP	Systems Management Application Process

4 Targeted communication environments

The *DLMS/COSEM PLC S-FSK communication profile* is intended for remote data exchange on Neighbourhood Networks (NN) between *Neighbourhood Network Access Points* (NNAP) and *Local Network Access Points* (LNAPs) or *End Devices* using S-FSK power line carrier technology over the low voltage electricity distribution network as a communication medium. The functional reference architecture is shown in Figure 1.

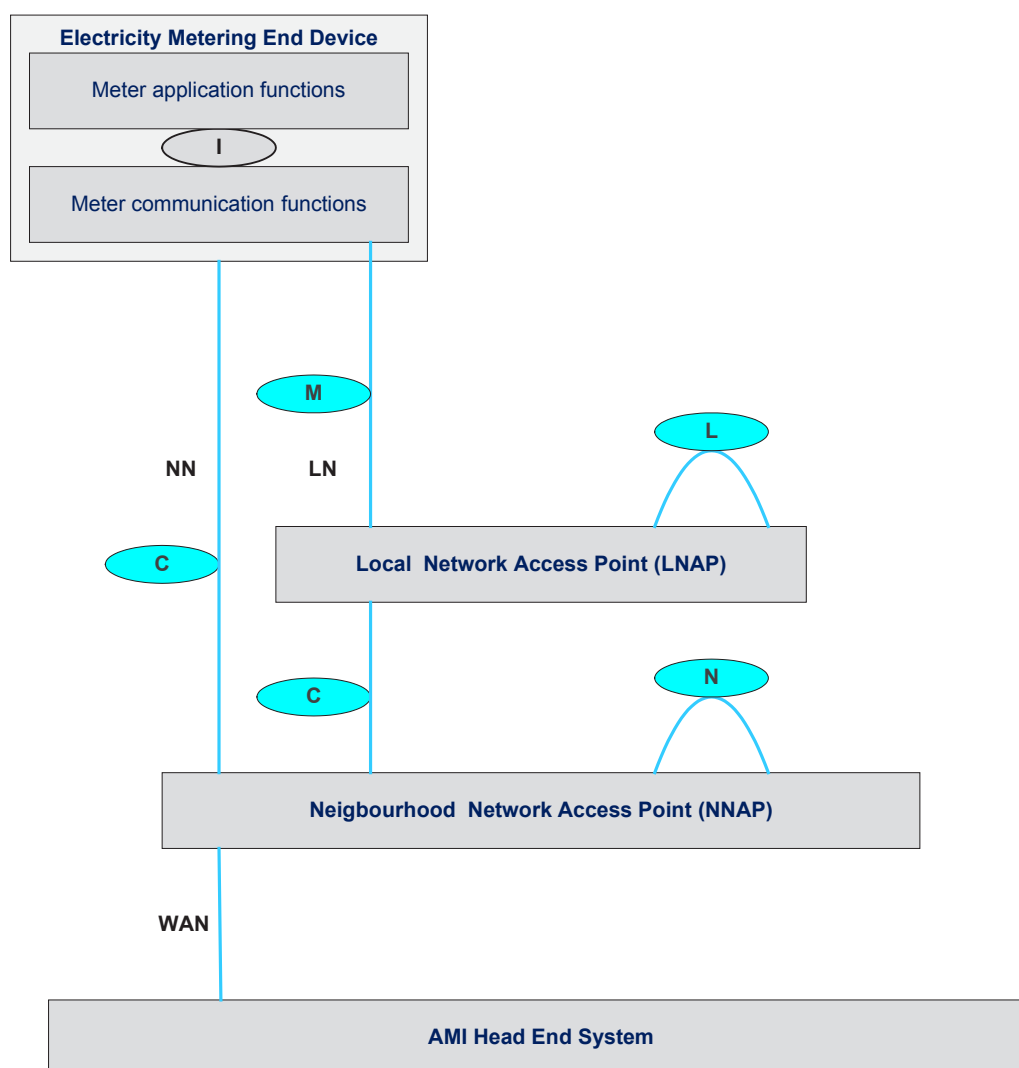


Figure 1 – Communication architecture

End devices – typically electricity meters – comprise application functions and communication functions. They may be connected directly to the NNAP via the C interface, or to an LNAP via an M interface, while the LNAP is connected to the NNAP via the C interface. The LNAP function may be co-located with the metering functions.

A NNAP comprises gateway functions and it may comprise concentrator functions. Upstream, it is connected to the Metering Head End System (HES) using suitable communication media and protocols.

End devices and LNAPs may communicate to different NNAPs, but to one NNAP only at a time. From the PLC communication point of view, the NNAP acts as an initiator while end devices and LNAPs act as responders.

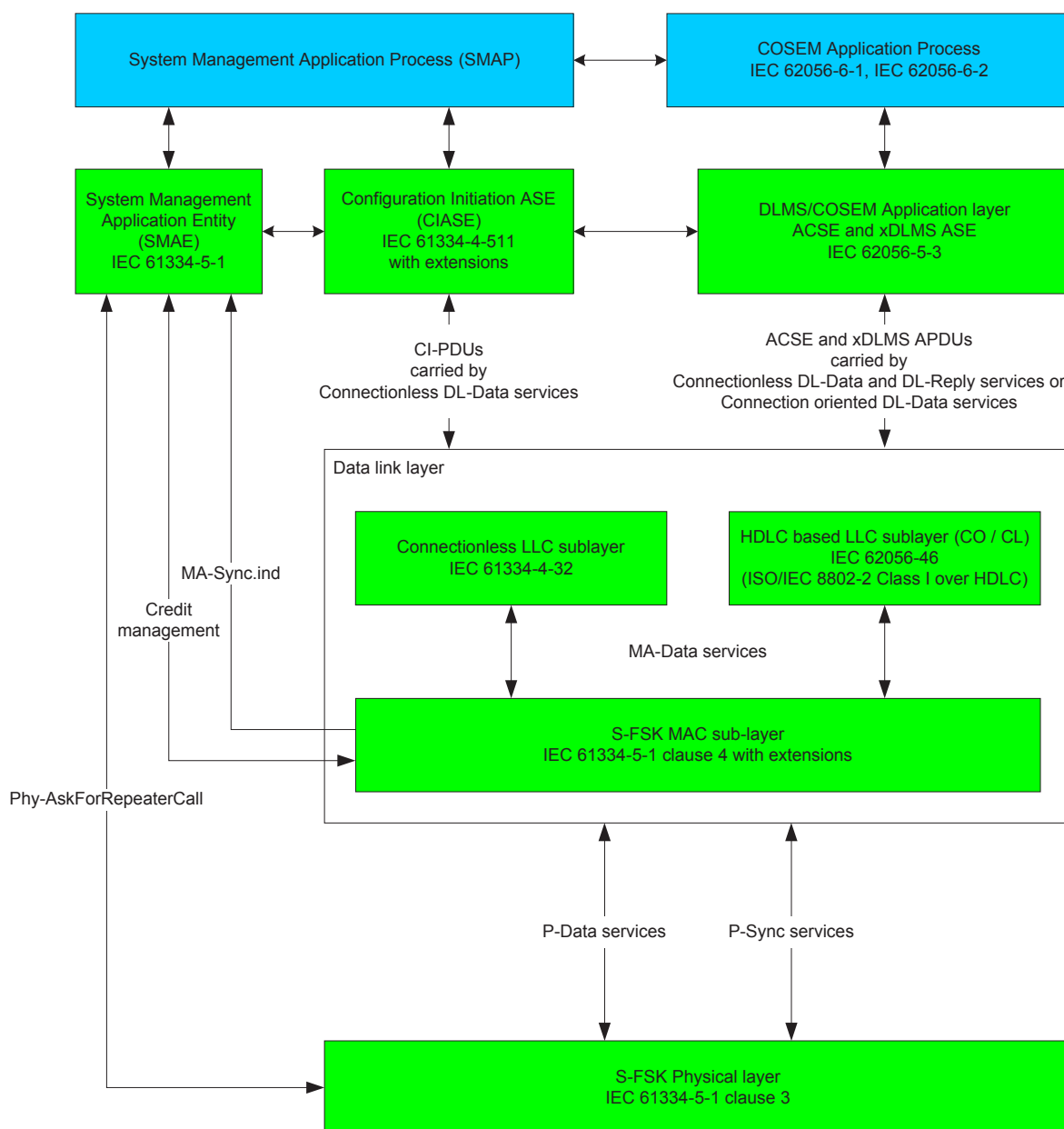
295 NNAPs and similarly LNAPs may communicate to each other, but this is out of the scope of
 296 this standard, which covers the C interface only.

297 When the NNAP has concentrator functions, it acts as a COSEM client. When the NNAP has
 298 gateway functions only, then the HES acts as a COSEM client. The end devices or the LNAPs
 299 act as COSEM servers.

300 5 Reference model

301 NOTE This clause is partly based on IEC 61334-4-1, clause 3.

302 The reference model of the *DLMS/COSEM PLC S-FSK communication profile* is shown in
 303 Figure 2. It is based on a simplified – or collapsed – three-layer OSI architecture. The layers
 304 are the *physical layer*, the *data link layer* and the *application layer*. The data link layer is split
 305 to the *MAC sublayer* and the *LLC sublayer*.



306
 307 **Figure 2 – The DLMS/COSEM S-FSK PLC communication profile**

6 The physical layer (PhL)

The PhL provides the interface between the equipment and the physical transmission medium that is the distribution network. It transports binary information from the source to the destination.

The PhL in this profile is as specified in IEC 61334-5-1 clause 3. It provides the following services to its service user MAC sublayer:

- P-Data services to transfer MPDUs to (a) peer MAC sublayer entity(ies) using the LV distribution network as the transport medium;
- P-Sync services to allow the MAC sublayer entity to ask for a new synchronization and to be informed of a change in the synchronization state of the PL. These services are used locally by the MAC sublayer.

See IEC 61334-5-1 clause 3.4.

7 The data link layer

7.1 General

The data link layer consists of two sublayers: the Medium Access Control (MAC) and the Logical Link Control (LLC) sublayer.

The *MAC sublayer* handles access to the physical medium and provides physical device addressing. The decision to access the medium is made by the initiator, directly for its own MAC sublayer, or indirectly for other MAC sublayers that are requested to transmit a response to a request sent previously by the initiator.

The *LLC sublayer* controls the logical links.

There are two LLC sublayer alternatives available:

- the connectionless LLC sublayer, as specified in IEC 61334-4-32;
- the LLC sublayer using the HDLC based data link layer, as specified in IEC 62056-46.

7.2 The MAC sublayer

The MAC sublayer of the DLMS/COSEM S-FSK PLC communication profile is as specified in IEC 61334-5-1 clause 4. It provides the following services to its service user LLC sublayer:

- the MA-Data services. These services allow the LLC sublayer entity to exchange LLC data units with peer LLC sublayer entities. See IEC 61334-5-1 4.1.3.1;
- the MA-Sync.indication service. This allows the SMAE entity to be informed of the synchronization and configuration status of the device. See IEC 61334-5-1 4.1.3.2.

7.3 The connectionless LLC sublayer

The connectionless LLC sublayer is as specified in IEC 61334-4-32. It is derived from ISO/IEC 8802-2 – similar to Class III operation – and it performs the following functions:

- addressing of application entities within the equipment;
- sending data with no acknowledgement (SDN);
- requesting data with reply (RDR).

It provides the following services:

- 346 • DL-Data services for transporting CI-PDUs, ACSE APDUs and client-server type xDLMS
347 APDUs;
- 348 • DL-Reply services for asking the remote LLC sublayer entity to send a previously
349 prepared LSDU;
- 350 • DL-Update-Reply services to prepare the LSDUs to be transferred using the DL-Reply
351 services.

352 For more, see IEC 61334-4-32 clause 2.1.

353 **7.4 The HDLC based LLC sublayer**

354 The HDLC based LLC sublayer is as specified in IEC 62056-46.

355 As explained in IEC 62056-46, 4.1.2, this sublayer can also be divided to two sublayers:

- 356 • the LLC sublayer based on ISO/IEC 8802-2. Here, it is used in an extended Class I
357 operation. The only role of this sublayer is to select the DLMS/COSEM Application layer
358 by using a specific LLC address. The LLC services are provided by the HDLC based MAC
359 sublayer;
- 360 • the MAC sublayer, based on the HDLC protocol. It provides addressing of application
361 entities within the equipment.

362 NOTE In this profile, there are two MAC sublayers. The HDLC MAC sublayer provides reliable LLC data transport
363 and segmentation. The Medium Access Control functionality is provided by the S-FSK MAC sublayer specified in
364 7.2.

365 The HDLC based LLC sublayer provides the following services:

- 366 • DL-Connect services to connect and to disconnect the data link layer;
- 367 • connectionless DL-Data services for transporting CI-PDUs, ACSE APDUs and xDLMS
368 APDUs;
- 369 • connection oriented DL-Data services for transporting ACSE APDUs and xDLMS APDUs.
370 These services provide reliable data transport and support segmentation to carry long
371 messages, in a transparent manner for the application layer.

372 **7.5 Co-existence of the connectionless and the HDLC based LLC sublayers**

373 The frames of the connectionless LLC sublayer and the HDLC based LLC sublayer can be
374 distinguished from each other as shown in Figure 3. This allows systems using the two
375 profiles to co-exist on the same network.

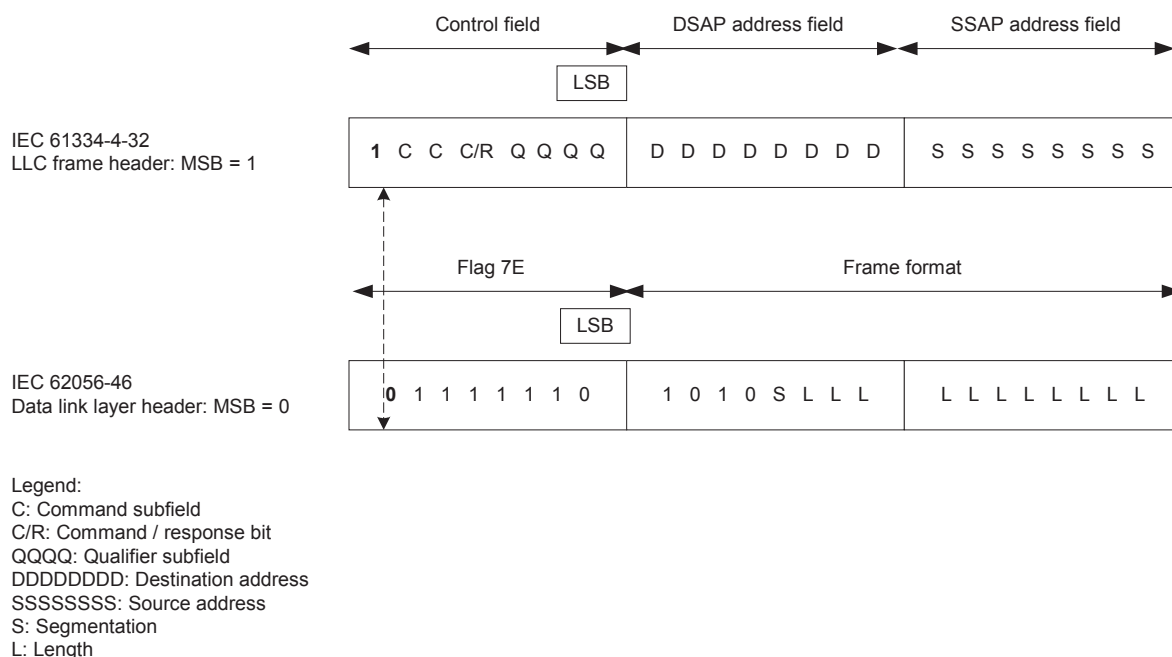


Figure 3 – Co-existence of the connectionless and the HDLC based LLC sublayers

8 The application layer (AL)

The application layer is the DLMS/COSEM Application layer as specified in IEC 62056-5-3 Ed.3.0:201X. It provides services to the COSEM application process (AP) and uses the services of the connectionless or the HDLC based LLC sublayer.

9 The application process (AP)

On the server side, the COSEM device- and object model – as specified in IEC 62056-6-2 Ed 3.0:201X – applies. Each logical device represents an AP.

The client side APs make use of the resources of the server side AP. A physical device may host one or more client APs.

10 The Configuration Initiation Application Service Element (CIASE)

NOTE This clause is based on IEC 61334-4-511 and constitutes an extension to it.

10.1 Overview

One of the activities of systems management is open system initialisation and / or modification. This is provided by the Configuration Initiation ASE (CIASE). It is specified in IEC 61334-4-511 with the extensions specified below.

The CIASE services are the following:

- the Discover service;
- the Register service;
- the PING service;
- the RepeaterCall service; and
- the ClearAlarm service.