

DIN EN 62056-46

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Ersatz für
DIN EN 62056-46:2003-01
Siehe jedoch Beginn der
Gültigkeit

**Messung der elektrischen Energie –
Zählerstandsübertragung, Tarif- und Laststeuerung –
Teil 46: Anwendung des HDLC-Protokolls in der Verbindungsschicht
(IEC 62056-46:2002 + A1:2006);
Deutsche Fassung EN 62056-46:2002 + A1:2007, Text Englisch**

Electricity metering –
Data exchange for meter reading, tariff and load control –
Part 46: Data link layer using HDLC-protocol (IEC 62056-46:2002 + A1:2006);
German version EN 62056-46:2002 + A1:2007, text in English

Equipements de mesure de l'énergie électrique –
Echange des données pour la lecture des compteurs, le contrôle des tarifs et de la
charge –
Partie 46: Couche liaison utilisant le protocole HDLC (CEI 62056-46:2002 + A1:2006);
Version allemande EN 62056-46:2002 + A1:2007, texte en anglais

Gesamtumfang 76 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Beginn der Gültigkeit

Die von CENELEC am 2002-03-01 angenommene EN 62056-46 gilt zusammen mit der am 2007-02-01 angenommenen Änderung A1 als DIN-Norm ab 2007-08-01.

Daneben darf DIN EN 62056-46:2003-01 noch bis 2010-02-01 angewendet werden.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN IEC 62056-46/A1:2004-08.

Für diese Norm ist das nationale Arbeitsgremium K 461 „Elektrizitätszähler“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (<http://www.dke.de>) zuständig.

Die enthaltene IEC-Publikation wurde vom TC 13 „Equipment for electrical energy measurement and load control“ erarbeitet.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem auf der IEC-Website unter „<http://webstore.iec.ch>“ mit den Daten zu dieser Publikation angegebenen Datum (maintenance result date) unverändert bleiben soll. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

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- durch eine Folgeausgabe ersetzt oder
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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.

K 461 hat auf seiner Sitzung am 2006-09-19 festgestellt, dass die Bedingungen des DIN-Präsidialbeschlusses 1/2004 für die vorliegende Norm erfüllt sind. Demnach besteht die Europäische Norm EN 62056-46 nur in einer englischen Sprachfassung, weil sie nicht unmittelbar im Zusammenhang mit Rechtsvorschriften steht und nicht als Sicherheitsnorm anzusehen ist. Es kann davon ausgegangen werden, dass die Anwender dieser Norm über hinreichende englische Sprachkenntnisse verfügen. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennung bedienen.

Änderungen

Gegenüber DIN EN 62056-46:2003-01 wurden folgende Änderungen vorgenommen:

Mit der Änderung A1 wurde einerseits die Variante eröffnet, einen weiteren „frame type“ zu verwenden, und andererseits eine Möglichkeit geschaffen, im Sinne der Performanceoptimierung größere Datenpakete zu verwenden.

Frühere Ausgaben

DIN EN 62056-46: 2003-01

Messung der elektrischen Energie –
Zählerstandsübertragung, Tarif- und Laststeuerung –
Teil 46: Anwendung des HDLC-Protokolls in der Verbindungsschicht
(IEC 62056-46:2002 + A1:2006)

Electricity metering –
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compteurs, le contrôle des tarifs et de la charge –
Partie 46: Couche liaison utilisant le protocole
HDLC
(CEI 62056-46:2002 + A1:2006)

Diese Europäische Norm wurde von CENELEC am 2002-03-01 und die A1 am 2007-02-01 angenommen. Die CENELEC-Mitglieder sind gehalten, die CEN/CENELEC-Geschäftsordnung zu erfüllen, in der die Bedingungen festgelegt sind, unter denen dieser Europäischen Norm ohne jede Änderung der Status einer nationalen Norm zu geben ist.

Auf dem letzten Stand befindliche Listen dieser nationalen Normen mit ihren bibliographischen Angaben sind beim Zentralsekretariat oder bei jedem CENELEC-Mitglied auf Anfrage erhältlich.

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CENELEC

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

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Ref. Nr. EN 62056-46:2002 + A1:2007 D

Vorwort

Der Text des Schriftstücks 13/1267/FDIS, zukünftige 1. Ausgabe von IEC 62056-46, ausgearbeitet von dem IEC TC 13 „Equipment for electrical energy measurement and load control“, wurde der IEC-CENELEC Parallelen Abstimmung unterworfen und von CENELEC am 2002-03-01 als EN 62056-46 angenommen.

Nachstehende Daten wurden festgelegt:

- spätestes Datum, zu dem die EN auf nationaler Ebene durch Veröffentlichung einer identischen nationalen Norm oder durch Anerkennung übernommen werden muss (dop): 2003-01-01
- spätestes Datum, zu dem nationale Normen, die der EN entgegenstehen, zurückgezogen werden müssen (dow): 2005-03-01

Die Internationale Elektrotechnische Kommission (IEC) und CENELEC weisen darauf hin, dass die Übereinstimmung mit dieser Internationalen Norm / Europäischen Norm die Inanspruchnahme eines Wartungsdienstes hinsichtlich der Protokolle, auf denen die vorliegende Norm IEC 61056-46 / EN 61056-46 beruht, bedeuten kann.

Die IEC und CENELEC nehmen keine Stellung zur Rechtmäßigkeit, zur Gültigkeit und zum Anwendungsbereich dieses Wartungsdienstes.

Der Anbieter dieses Wartungs-Dienstes hat IEC zugesichert, dass er bereit ist, Antragstellern in der ganzen Welt Wartungsdienste zu vernünftigen und nicht diskriminierenden Geschäftsbedingungen anzubieten. In diesem Zusammenhang ist die Erklärung des Anbieters des Wartungsdienstes bei IEC registriert. Informationen sind erhältlich bei:

DLMS¹⁾ User Association
Geneva / Switzerland
www.dlms.ch

Anhänge, die als „normativ“ bezeichnet sind, gehören zum Norminhalt.

Anhänge, die als „informativ“ bezeichnet sind, enthalten nur Informationen.

In dieser Norm ist Anhang ZA normativ und sind die Anhänge A, B und C informativ.

Der Anhang ZA wurde von CENELEC hinzugefügt.

¹⁾ Device Language Message Specification

Anerkennungsnotiz

Der Text der Internationalen Norm IEC 62056-46:2002 wurde von CENELEC ohne irgendeine Abänderung als Europäische Norm angenommen.

In der offiziellen Fassung sind unter „Literaturhinweise“ zu den aufgelisteten Normen die nachstehenden Anmerkungen einzutragen:

IEC 61334-4-41 ANMERKUNG Harmonisiert als 61334-4-41:1996 (nicht modifiziert).

IEC 61334-6 ANMERKUNG Harmonisiert als 61334-6:2000 (nicht modifiziert).

Vorwort zu A1

Der Text des Schriftstücks 13/1376/FDIS, zukünftige Änderung 1 zu IEC 62056-46:2002, ausgearbeitet von dem IEC TC 13 „Electrical energy measurement, tariff- and load control“, wurde der IEC-CENELEC Parallelen Abstimmung unterworfen und von CENELEC am 2007-02-01 als Änderung A1 zu EN 62056-46:2002 angenommen.

Nachstehende Daten wurden festgelegt:

- spätestes Datum, zu dem die Änderung auf nationaler Ebene durch Veröffentlichung einer identischen nationalen Norm oder durch Anerkennung übernommen werden muss (dop): 2007-11-01
- spätestes Datum, zu dem nationale Normen, die der Änderung entgegenstehen, zurückgezogen werden müssen (dow): 2010-02-01

Der Anhang ZA wurde von CENELEC hinzugefügt.

Anerkennungsnotiz

Der Text der Änderung 1:2006 zur Internationalen Norm IEC 62056-46:2002 wurde von CENELEC als Änderung zur Europäischen Norm ohne irgendeine Abänderung angenommen.

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INTRODUCTION (to amendment 1)

The amendment takes into account that in the third edition of ISO/IEC 13239, frame type 3 has been added as Annex H.4, as requested by IEC TC 13 WG 14, and that second editions of some parts of the IEC 62056 series are under preparation.

It specifies now that a secondary station may use more than one addressing scheme.

It contains some changes concerning the negotiation of the maximum information length field HDLC parameter for better efficiency.

References have been updated and some editorial errors have also been corrected.

ELECTRICITY METERING – DATA EXCHANGE FOR METER READING, TARIFF AND LOAD CONTROL –

Part 46: Data link layer using HDLC protocol

1 Scope

This part of IEC 62056 specifies the data link layer for connection-oriented, HDLC-based, asynchronous communication profile.

In order to ensure a coherent data link layer service specification for both connection-oriented and connectionless operation modes, the data link layer is divided into two sub-layers: the Logical Link Control (LLC) sub-layer and the Medium Access Control (MAC) sub-layer.

This specification supports the following communication environments:

- point-to-point and point-to-multipoint configurations;
- dedicated and switched data transmission facilities;
- half-duplex and full-duplex connections;
- asynchronous start/stop transmission, with 1 start bit, 8 data bits, no parity, 1 stop bit.

Two special procedures are also defined:

- transferring of separately received Service User layer PDU parts from the server to the client in a transparent manner. The server side Service user layer can give its PDU to the data link layer in fragments and the data link layer can hide this fragmentation from the client;
- event reporting, by sending UI frames from the secondary station to the primary station.

Annex B gives an explanation of the role of data models and protocols in electricity meter data exchange.

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 60050-300:2001, *International Electrotechnical Vocabulary – Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical measurements – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument*

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

IEC 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*

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* ¹⁾

IEC 62056-53:2006, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 53: COSEM Application layer*

IEC 62056-61:2006, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 61: OBIS Object identification system*

IEC 62056-62:2006, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 62: Interface classes*

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

ISO/IEC 13239:2002, *Information technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the definitions given in IEC 60050-300, IEC 62051 and IEC 62051-1 apply.

3.2 Abbreviations

APDU	Application layer Protocol Data Unit
COSEM	COmpanion Specification for Energy Metering
DISC	DISConnect (an HDLC frame type)
DL	Data Link
DM	Disconnected Mode (an HDLC frame type)
DPDU	Data link Protocol Data Unit
DSAP	Data link Service Access Point
DSDU	Data link Service Data Unit
FCS	Frame Check Sequence
FRMR	FRaMe Reject (an HDLC frame type)
HCS	Header Check Sequence
HDLC	High-level Data Link Control
I	Information (an HDLC frame type)
LLC	Logical Link Control (Sub-layer)
LSAP	LLC sub-layer Service Access Point
LPDU	LLC Protocol Data Unit
LSB	Least Significant Bit
LSDU	LLC Service Data Unit
MAC	Medium Access Control (sub-layer)
MSAP	MAC sub-layer Service Access Point (here it is equal to the HDLC address)
MSB	Most Significant Bit

¹⁾ To be published.

MSDU	MAC Service Data Unit
NDM	Normal Disconnected Mode
NRM	Normal Response Mode
N(R)	Receive sequence Number
N(S)	Send sequence Number
P/F	Poll/Final bit
PDU	Protocol Data Unit
PH	Physical layer
PSDU	Physical layer Service Data Unit
RNR	Receive Not Ready (an HDLC frame type)
RR	Receive Ready (an HDLC frame type)
SAP	Service Access Point
SDU	Service Data Unit
SNRM	Set Normal Response Mode (an HDLC frame type)
TWA	Two Way Alternate
UA	Unnumbered Acknowledgement (an HDLC frame type)
UI	Unnumbered Information (an HDLC frame type)
UNC	Unbalanced operation Normal response mode Class
USS	Unnumbered Send Status
V(R)	Receive state Variable
V(S)	Send state Variable

4 Overview

4.1 The LLC sub-layer

In the connection-oriented profile the only role of the LLC sub-layer is to ensure consistent Data Link addressing. It can be considered that the LLC sub-layer, defined in ISO/IEC 8802-2 is used in an extended class I operation, where the LLC sub-layer provides the standard connectionless data services via a connection-oriented MAC sub-layer.

The LLC sub-layer provides Data Link (DL) connection/disconnection services to the Service User layer, but it uses the services of the MAC sub-layer to execute these services.

The LLC sub-layer is specified in clause 5.

4.2 The MAC sub-layer

The MAC sub-layer – the major part of this data link layer specification – is based on ISO/IEC 13239 concerning high-level data link control (HDLC) procedures.

This standard includes a number of enhancements compared to the original HDLC, for example in the areas of addressing, error protection and segmentation. These enhancements have been incorporated in a new frame format, which meets the requirements of the environment found in telemetry applications for electricity metering and similar industries.

The MAC sub-layer is specified in clause 6.

4.3 Specification method

Sub-layers of the data link layer are specified in terms of **services** and **protocol**.

Service specifications cover the services required of, or by, the given sub-layer at the logical interfaces with the neighbouring other sub-layer or layer, using connection oriented procedures. Services are the standard way to specify communications between protocol layers. Through the use of four types of transactions, commonly known as service primitives (Request, Indication, Response and Confirm) the service provider co-ordinates and manages the communication between the users. Using service primitives is an abstract, implementation-independent way to specify the transactions between protocol layers. Given this abstract nature of the primitives, their use makes good sense for the following reasons:

- they permit a common convention to be used between layers, without regard to specific operating systems and specific languages;
- they give the implementers a choice of how to implement the service primitives on a specific machine.

Service primitives include service parameters. There are three classes of service parameters:

- parameters transmitted to the peer layer, becoming part of the transmitted frame, for example addresses, control information;
- parameters which have only local significance;
- parameters which are transmitted transparently across the data link layer to the user of the data link.

NOTE Data link layer management services are explained in Annex C.

This standard specifies values for parameters of the first category only.

The **protocol** specification for a protocol layer includes:

- the specification of the procedures for the transmission of the set of messages exchanged between peer-layers;
- the procedures for the correct interpretation of protocol control information;
- the layer behaviour.

The protocol specification for a protocol layer does not include:

- the structure and the meaning of the information which is transmitted by means of the layer (Information field, User data subfield);
- the identity of the Service User layer;
- the manner in which the Service User layer operation is accomplished as a result of exchanging Data Link messages;
- the interactions that are the result of using the protocol layer.

5 The LLC sub-layer

5.1 The role of the LLC sub-layer

The LLC sub-layer used in this profile is based on ISO/IEC 8802-2. The presence of this sub-layer in the connection-oriented profile is somewhat artificial: the LLC sub-layer is used as a kind of protocol selector, and the 'real' data link layer connection is ensured by the MAC sub-layer. It can be considered that the standard LLC sub-layer is used in an extended class I operation, where the LLC sub-layer provides the standard data-link-connectionless services via a connection-oriented MAC sub-layer. In order to be able to establish the data link connection, the LLC sub-layer provides transparent MAC connection/disconnection services to the service user protocol layer.

5.2 Service specification for the LLC sub-layer

This subclause specifies the services required of, or by, the LLC sub-layer at the logical interfaces with the Service User layer and the MAC sub-layer, using connection-oriented procedures. As the Service User layer 'sees' the services of the LLC sub-layer as the services of the data link layer, in this standard these services are called data link layer services and the prefix "DL" to designate these services is used.

5.2.1 Setting up the Data Link Connection

Overview

Figure 1 shows the services provided by the primary station (client side) and secondary station (server side) data link layers to the service user layer for data link connection establishment.

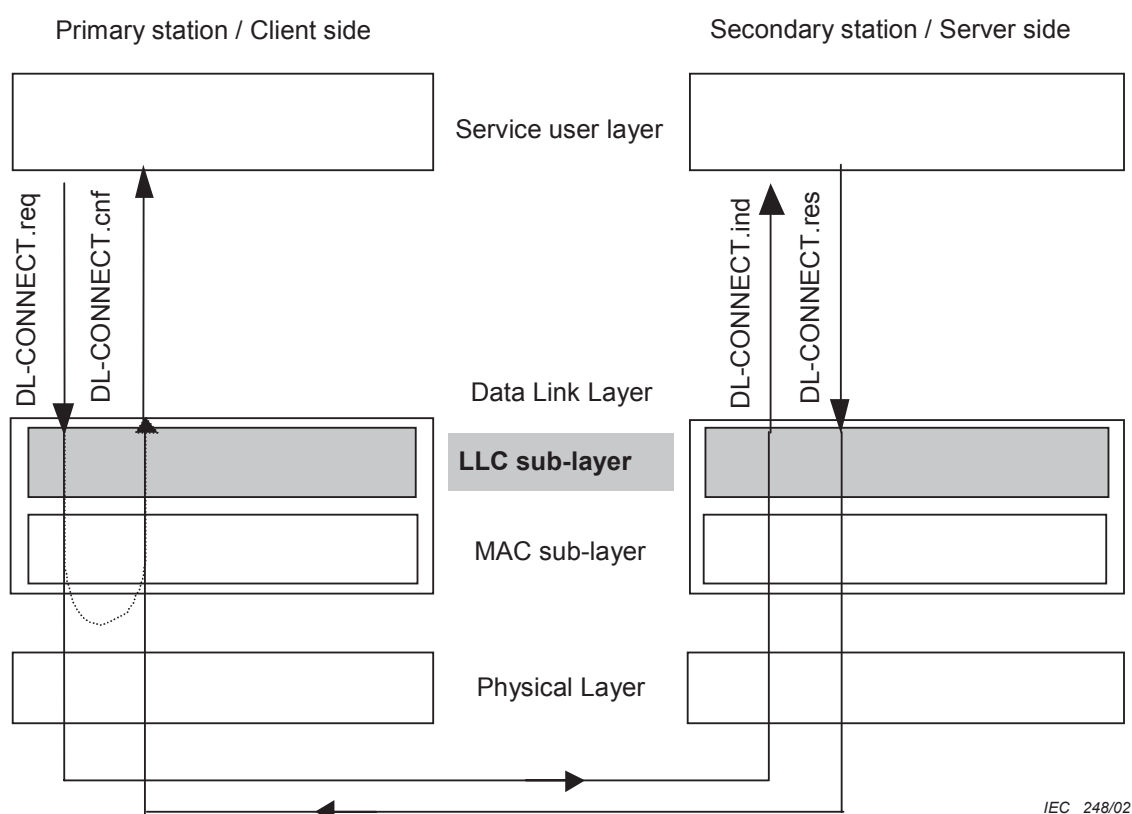


Figure 1 – Data Link (LLC) services for setting up the Data Link Connection

Data link connection establishment can only be requested by the primary station, so the DL-CONNECT.request and .confirm services are provided only at the client (primary station) side. On the other hand, the DL-CONNECT.indication and .response services are provided only at the server (secondary station) side.

The DL-CONNECT.request service primitive – in case of a locally detected error – can be also locally confirmed.

All these services are in fact, provided by the MAC sub-layer: the LLC sub-layer shall transparently transmit these services to/from the "real" service provider MAC sub-layer as the appropriate MA-CONNECT.xxx service primitive.

5.2.1.1 DL-CONNECT.request

Function

This service primitive is provided only at the client side. The Service User layer invokes this primitive to request set-up of a data link connection.

Service parameters

The semantics of the primitive is as follows:

```
DL-CONNECT.request
(
    Destination_MSAP1,
    Source_MSAP,
    User_Information
)
```

The Destination_MSAP and Source_MSAP parameters identify the referenced data link layer connection. The addressing scheme for the MAC layer is discussed in 6.4.2. The specification of the contents of the optional User_information parameter is not within the scope of this standard.

Use

The client side Service User layer entity invokes the DL-CONNECT.request primitive, when it wants to set up a connection with a peer data link layer.

5.2.1.2 DL-CONNECT.indication

Function

This service primitive is provided only at the server side. The LLC sub-layer uses this primitive to indicate to the Service User layer that the peer data link layer requested a Data Link connection.

Service parameters

The semantics of the primitive is as follows:

```
DL-CONNECT.indication
(
    Destination_MSAP,
    Source_MSAP,
    User_Information
)
```

The Destination_MSAP and Source_MSAP identify the referenced data link layer connection. The addressing scheme for the MAC layer is discussed in 6.4.2. The specification of the contents of the optional User_information parameter is not within the scope of this standard.

Use

The server side LLC sub-layer generates this primitive following the reception of an MA-CONNECT.indication primitive from the MAC sub-layer.

¹⁾ MSAP in this environment is equal to the HDLC address.

5.2.1.3 DL-CONNECT.response

Function

This service primitive is provided only at the server side. The Service User layer invokes this service primitive in order to indicate to the local data link layer whether the previously proposed data link connection can be accepted by the service user layer or not.

Service parameters

The semantics of the primitive is as follows:

```
DL-CONNECT.response
(
    Destination_MSAP,
    Source_MSAP,
    Result,
    User_Information
)
```

The Destination_MSAP and Source_MSAP parameters identify the referenced data link layer connection. The Result parameter (OK, NOK, NO_RESPONSE) indicates whether the proposed connection could be accepted or not, and whether a response frame should be sent or not.

- Result == OK. This means that the received connect request can be accepted by the service user layer.
- Result == NOK. This means that the received connect request cannot be accepted by the service user layer.
- RESULT == NO_RESPONSE: This means that no response to the DL-CONNECT.indication shall be sent.

The User_Information parameter may be present only when the Result is NOK. The specification of its content is not within the scope of this standard.

NOTE The Result parameter indicates only whether the Data Link Connection can or cannot be accepted by the service user higher layers. The data link layer itself may refuse a proposed connection, (e.g. because it supports only one connection at a given moment, thus it is not able to support a second one) even if the higher layers could accept it (Result==OK).

Use

The server side Service User layer entity invokes the DL-CONNECT.response primitive to indicate the result of a previously received request for connection.

5.2.1.4 DL-CONNECT.confirm

Function

This service primitive is provided only at the client side and it can be originated remotely or locally. The data link layer generates this primitive to indicate to the Service User layer the result of a previously received DL-CONNECT.request service.

Service parameters

The semantics of the primitive is as follows:

```
DL-CONNECT.confirm
(
    Destination_MSAP,
    Source_MSAP,
    Result,
    User_Information
)
```

The Destination_MSAP and Source_MSAP parameters reference data link layer connection, which is confirmed by the service. The Result parameter (OK, NOK-REMOTE, NOK-LOCAL, NO_RESPONSE) indicates the result of the previously invoked DL-CONNECT.request service.

- Result == OK. This means that the connect request was accepted by the remote station.
- Result == NOK-REMOTE. This means that the connect request was not accepted by the remote station.
- Result == NOK-LOCAL. This means that a local error has occurred, for example the service user layer tried to establish an already existing data link connection.
- RESULT == NO_RESPONSE. This means that there was no response from the remote station to the connect request.

The User_Information parameter is present only when the Result is NOK-REMOTE. The specification of its content is not within the scope of this standard.

Use

The LLC sub-layer indicates the reception of an MA-CONNECT.confirm primitive to the Service User layer by using this primitive.

5.2.2 Disconnecting the Data Link Connection

5.2.2.1 Overview

Figure 2 shows the services provided by the client and server side data link layers to the Service User layer for disconnecting a Data Link connection.

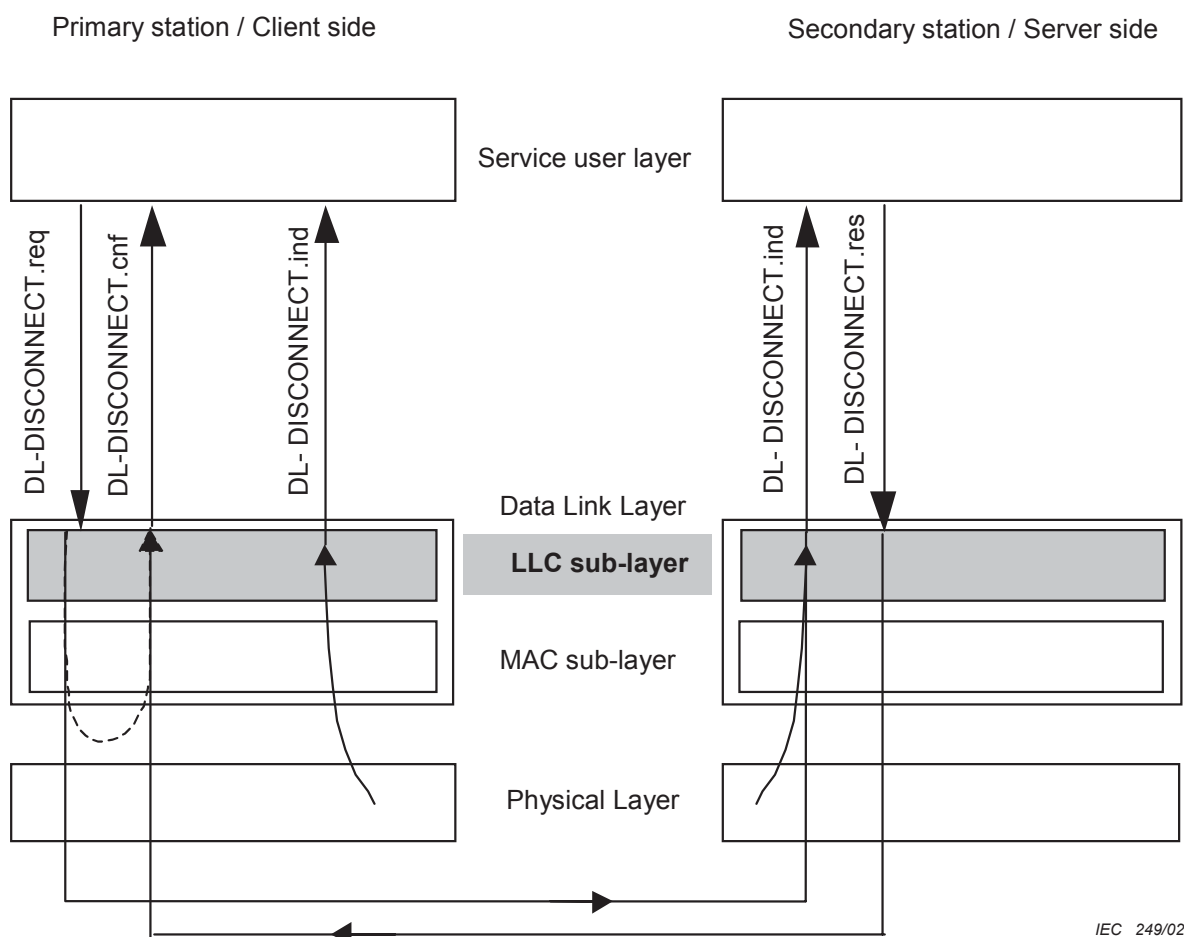


Figure 2 – Data Link (LLC) services for disconnecting the Data Link Connection

Data link disconnection can only be requested by the client device, so the DL-DISCONNECT.request and .confirm services are provided only at the client side. On the other hand, the remotely initiated (by the client) DL-DISCONNECT.indication and .response services are provided only at the server side.

NOTE When this data link layer is used together with the COSEM application layer as defined in IEC 62056-53, DL-DISCONNECT services are used to release existing Application Associations.

Both the client and server side LLC sub-layers provide a locally initiated DL-DISCONNECT.indication service, to signal a non-solicited disconnection, due to an unexpected loss of the data link and/or physical connection.

The DL-DISCONNECT.request service primitive – in case of a locally detected error – can be also locally confirmed.

These services are in fact provided by the MAC sub-layer: the LLC sub-layer shall transparently transmit these services to/from the MAC sub-layer as the appropriate MA-DISCONNECT.xxx service primitive.

5.2.2.2 DL-DISCONNECT.request

Function

This service primitive is provided only at the client side. It is invoked by the Service User layer to request disconnecting of an existing Data Link connection.

Service parameters

The semantics of the primitive is as follows:

```
DL-DISCONNECT.request
(
    Destination_MSAP,
    Source_MSAP,
    User_Information
)
```

The Destination_MSAP and Source_MSAP parameters specify the data link connection to be disconnected. The specification of the contents of the optional User_Information parameter is not within the scope of this standard.

Use

The client side Service User layer entity invokes this primitive to request a disconnection of a data link connection to peer data link layer(s).

5.2.2.3 DL-DISCONNECT.indication*Function*

This service primitive is provided at the client side and at the server side.

- The server side data link layer generates this primitive to indicate to the Service User layer that the peer data link layer requests the disconnection of a data link connection.
- On both the server and client sides, this primitive is used to indicate that the data link and/or physical connection abort occurred in a non-solicited manner (e.g. the physical line has been disconnected).

Service parameters

The semantics of the primitive is as follows:

```
DL-DISCONNECT.indication
(
    Destination_MSAP,
    Source_MSAP,
    Reason,
    Unnumbered Send Status,
    User_Information
)
```

The Destination_MSAP and Source_MSAP parameters specify the local and remote MSAPs of the terminated connection.

The Reason parameter (REMOTE, LOCAL_PHY, LOCAL_DL) indicates the reason for the DL-DISCONNECT.indication invocation.

- Reason == REMOTE. This means that the data link layer received a disconnection request from the client side. This case may happen only at the server side.
- Reason == LOCAL_DL. This means that there was a fatal data link connection failure.
- Reason == LOCAL_PHY. This means that there was a fatal physical connection failure.

The value of the USS parameter indicates whether at the moment of the DL-DISCONNECT.indication service invocation the data link layer has (USS==TRUE) or does not have (USS==FALSE) pending UI message(s).

The User_Information field may be present only when Reason == REMOTE. The specification of the contents of this parameter is not within the scope of this standard.

Use

The LLC sub-layer generates this primitive following the reception of an MA-DISCONNECT.indication primitive.

5.2.2.4 DL-DISCONNECT.response

Function

This service primitive is provided only at the server side. The Service User layer invokes this service primitive in order to indicate to the data link layer whether the previously proposed data link disconnection can be accepted by the Service User layer or not. As in this environment the server has no right to refuse the disconnection, the response depends only whether the referenced Data Link connection is existing or not.

Service parameters

The semantics of the primitive is as follows:

```
DL-DISCONNECT.response
(
    Destination_MSAP,
    Source_MSAP,
    Result
)
```

The Destination_MSAP and Source_MSAP parameters specify the remote and local MSAPs involved in the connection being disconnected. The Result parameter can have values OK, NOK and NO_RESPONSE.

- Result == OK. This means that the received disconnect request refers to an existing higher layer connection.
- Result == NOK. This means that the received disconnect request refers to a non-existing higher layer connection.
- RESULT == NO_RESPONSE: This means that no response to the DL-DISCONNECT.indication shall be sent.

Use

The server side Service User layer invokes the DL-DISCONNECT.response primitive to indicate the result of a previously received request for disconnecting the data link connection.

5.2.2.5 DL-DISCONNECT.confirm

Function

This service primitive is provided only at the client side. The data link layer generates this primitive to indicate to the Service User layer the result of a previously received DL-DISCONNECT.request service. This service can be originated remotely or locally.

Service parameters

The semantics of the primitive is as follows:

```
DL-DISCONNECT.confirm
(
    Destination_MSAP,
    Source_MSAP,
    Result
)
```

The Destination_MSAP and Source_MSAP parameters specify the local and remote MSAPs of the terminated connection. The Result parameter (OK, NOK, NO_RESPONSE) indicates the result of the attempt to close the data link connection.

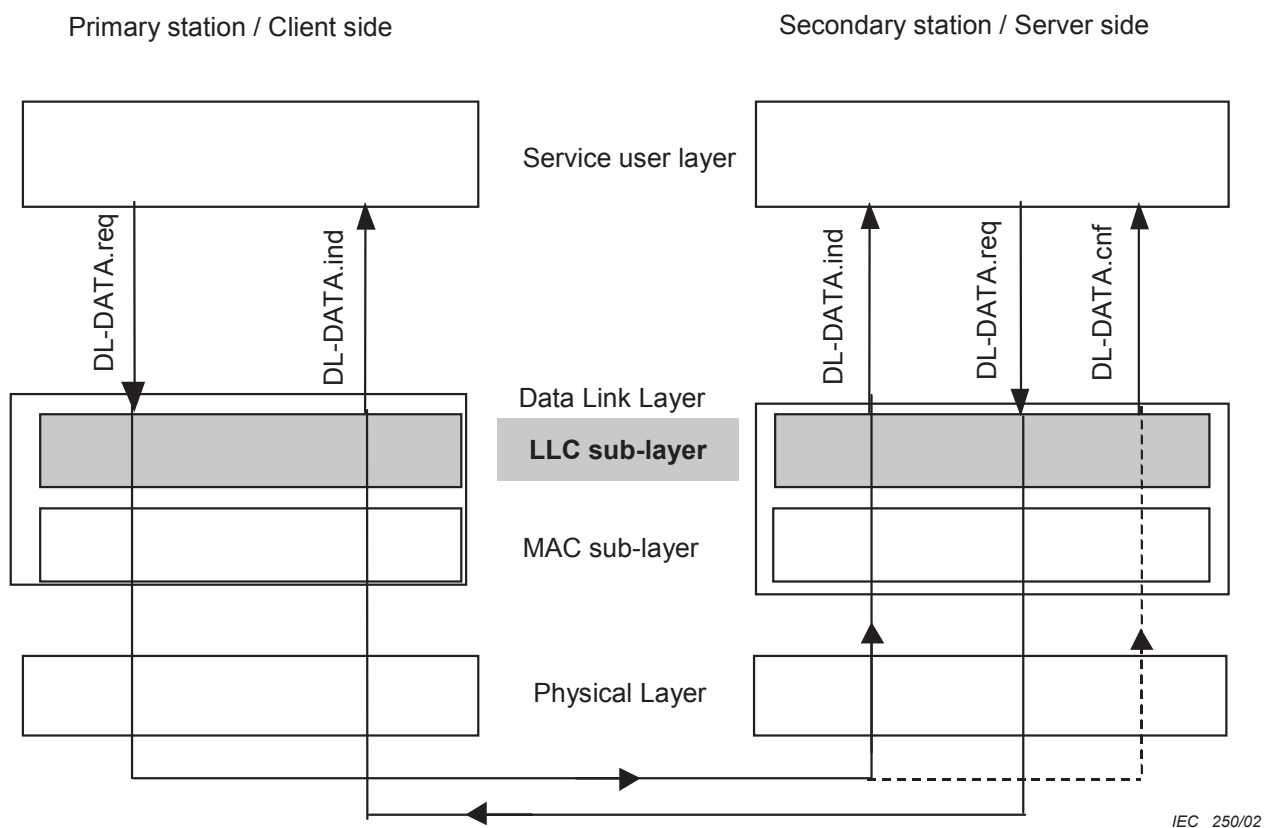
- Result == OK. This means that the disconnect request was accepted by the remote station.
- Result == NOK. This means that the disconnect request was not accepted by the remote station.
- Result == NO_RESPONSE. This means that there was no response from the remote station to the disconnect request.

Use

The client side LLC sub-layer indicates the reception of an MA-DISCONNECT.confirm primitive to the Service User layer using this primitive.

5.2.3 Data communication**5.2.3.1 Overview**

Figure 3 shows the data communication services provided by the data link layer to the Service User layer to exchange data.



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Figure 3 – Data link layer data communication services

In addition to the two standard .request and .indication services, a DL-DATA.confirm service is also provided at the server side. This service is necessary for transparent long message transfers, specified in 6.4.4.5.

5.2.3.2 DL-DATA.request

Function

The Service User layer invokes this primitive when data need to be transmitted to the peer layer entity(ies).

Service parameters

The semantics of the primitive is as follows:

```
DL-DATA.request
(
  Destination_LSAP,
  Source_LSAP,
  LLC_Quality,
  Destination_MSAP,
  Source_MSAP,
  Frame_type,
  Data
)
```

The Destination_LSAP and Source_LSAP parameters specify the referenced data link layer connection¹⁾. The value of the LLC_Quality parameter is used as the Control field of the PDU²⁾. See also 5.3.2.

The Destination_MSAP and Source_MSAP parameters specify the remote and local MSAPs involved in the data unit transmission. The Destination_MSAP can be an individual address, a group address, or a special HDLC address (ALL_STATION, NO_STATION, etc.). Please refer to 6.4.2.4.

The Frame_Type parameter indicates for the data link layer which type of frame shall be sent. Valid frame types are different for the client and server sides. Client side valid frame types are I_COMPLETE and UI. On the server side valid frame types are I_COMPLETE, I_FIRST_FRAGMENT, I_FRAGMENT, I_LAST_FRAGMENT, and UI. See also 6.4.3.

The Data parameter contains the Service User LSDU to be transferred to the peer layer. This parameter may be empty (e.g. when Frame_type == UI, but the UI frame contains no data).

Use

The DL-DATA.request primitive is invoked by the Service User layer entity to request sending of a protocol data unit to a single peer application entity or, in the case of multicasting and broadcasting, to multiple peer application entities.

The receipt of this primitive shall cause the LLC sub-layer to append the LLC specific fields (the two LLC addresses and the LLC_Quality parameter)³⁾ to the received LSDU, and to pass the properly formed LPDU to the MAC sub-layer (by invoking the MA-DATA.request primitive) for transferring it to the peer LLC sub-layer.

5.2.3.3 DL-DATA.indication

Function

This primitive is used to transfer the received data from the data link layer to its Service User layer.

Service parameters

The semantics of the primitive is as follows:

```
DL-DATA.indication
(
    Destination_LSAP,
    Source_LSAP,
    LLC_Quality,
    Destination_MSAP,
    Source_MSAP,
    Frame_type,
    Data
)
```

¹⁾ For COSEM purposes, the value of the Destination_LSAP parameter is constant and equal to E6_H. The value of the Source_LSAP parameter is E6_H or E7_H depending on whether the Data field corresponds to a command or to a response.

²⁾ For COSEM purposes, the value of the LLC_Quality parameter is set to 0, and reserved for future use.

³⁾ When Frame_type == I_FRAGMENT or I_LAST_FRAGMENT, no LLC specific field is appended to the LSDU.