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Edition 1.0 2002-02

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Electricity metering – Data exchange for meter reading, tariff and load control – Part 42: Physical layer services and procedures for connection-oriented asynchronous data exchange

Equipements de mesure de l'énergie électrique – Echange des données pour la lecture des compteurs, le contrôle des tarifs et de la charge – Partie 42: Services et procédures de la couche physique pour l'échange de données à l'aide de connexion asynchrone

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 42: Physical layer services and procedures for connection-oriented asynchronous data exchange

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DLMS[1] User Association
Geneva / Switzerland
www.dlms.ch

International Standard IEC 62056-42 has been prepared by IEC technical committee 13: Equipment for electrical energy measurement and load control.

This bilingual version (2013-05) corresponds to the monolingual English version, published in 2002-02.

[1] Device Language Message Specification.

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

FDIS	Report on voting
13/1266/FDIS	13/1272/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.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A and B are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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- withdrawn;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

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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 Scope

This part of IEC 62056 specifies the physical layer services and protocols within the Companion Specification for Energy Metering (COSEM) three-layer connection oriented profile for asynchronous data communication. The document does not specify physical layer signals and mechanical aspects. Local, implementation-specific issues are also not specified.

In annex A, an example of how this physical layer can be used for data exchange through the Public Switched Telephone Network (PSTN) using intelligent Hayes modems is given.

The use of the physical layer for the purposes of direct local data exchange using an optical port or a current loop physical interface is specified in IEC 62056-21.

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

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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 62056-21, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange* [1]

IEC 62056-46, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol* [1]

IEC 62056-53, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 53: COSEM application layer* [1]

IEC 62056-61, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 61: OBIS Object identification system* [1]

IEC 62056-62, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 62: Interface objects* [1]

NEMA C12.21:1999, *Protocol Specification for Telephone Modem Communication*

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1 To be published.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purpose of this part of IEC 62056, the definitions in IEC 60050-300 and IEC/TR 62051 as well as the following definitions apply:

3.1.1
client
a station asking for services, normally the master station

3.1.2
master
central station – station which takes the initiative and controls the data flow

3.1.3
server
a station delivering services. The tariff device (meter) is normally the server, delivering the requested values or executing the requested tasks

3.1.4
slave
station responding to requests of a master station. The tariff device (meter) is normally a slave station

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3.2 Abbreviations

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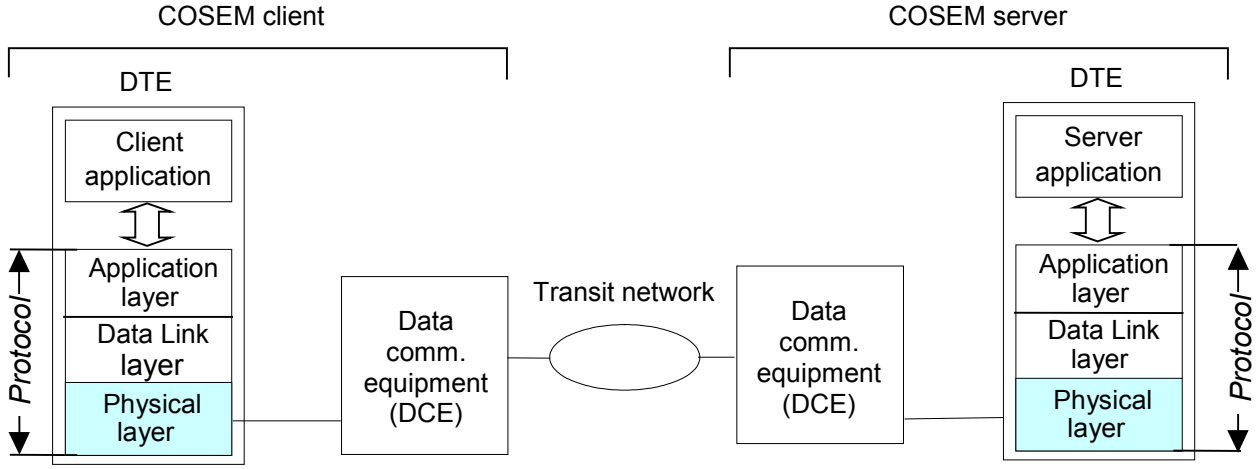
COSEM	COmpanion Specification for Energy Metering
DCE	Data Communication Equipment (communications interface or modem)
DTE	Data Terminal Equipment (computers, terminals or printers)
MSC	Message Sequence Chart
PDU	Protocol Data Unit
PH	PHysical layer
PHPDU	PHysical layer Protocol Data Unit
PHSDU	PHysical layer Service Data Unit
SDU	Service Data Unit

4 Overview

From the external point of view, the physical layer provides the interface between the DTE and the DCE, see Figure 2. Figure 1 shows a typical configuration for data exchange through a wide area network, for example the PSTN.



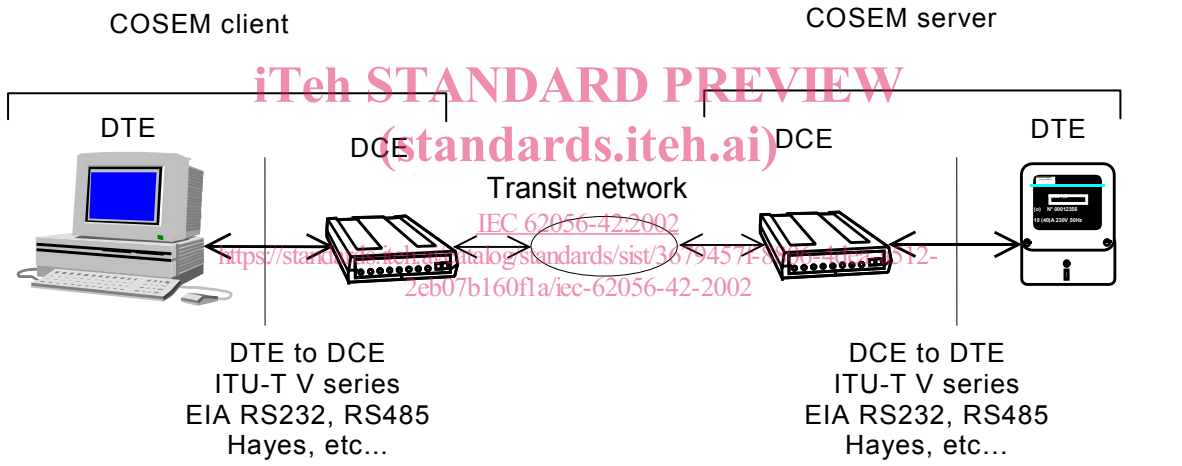


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Figure 1 – Typical PSTN configuration

From the physical connection point of view, all communications involve two sets of equipment represented by the terms caller system and called system. The caller is the system that decides to initiate a communication with a remote system known as the called party; these denominations remain valid throughout the duration of the communication. A communication is broken down into a certain number of transactions. Each transaction is represented by a transmission from the transmitter to the receiver. During the sequence of transactions, the caller and called systems take turns to act as transmitter and receiver.

From the data link point of view the central station normally acts as a master, taking the initiative and controlling the data flow. The tariff device is the slave, responding to the master station.

From the application point of view the central station normally acts as a client asking for services, and the tariff device acts as a server delivering the requested services.

The situation involving a caller client and a called server is undoubtedly the most frequent case, but a communication based on a caller server and a called client is also possible, in particular to report the occurrence of an urgent alarm.

For the purpose of local data exchange, two DTEs can be directly connected using appropriate connections.

To allow using a wide variety of media, this standard does not specify the physical layer signals and their characteristics. However, the following assumptions are made:

- the communication is point to point or point to multipoint;
- both half-duplex and duplex connections are possible;
- asynchronous transmission with 1 start bit, 8 data bits, no parity and 1 stop bit (8N1).

From the internal point of view, the physical layer is the lowest layer in the protocol stack.

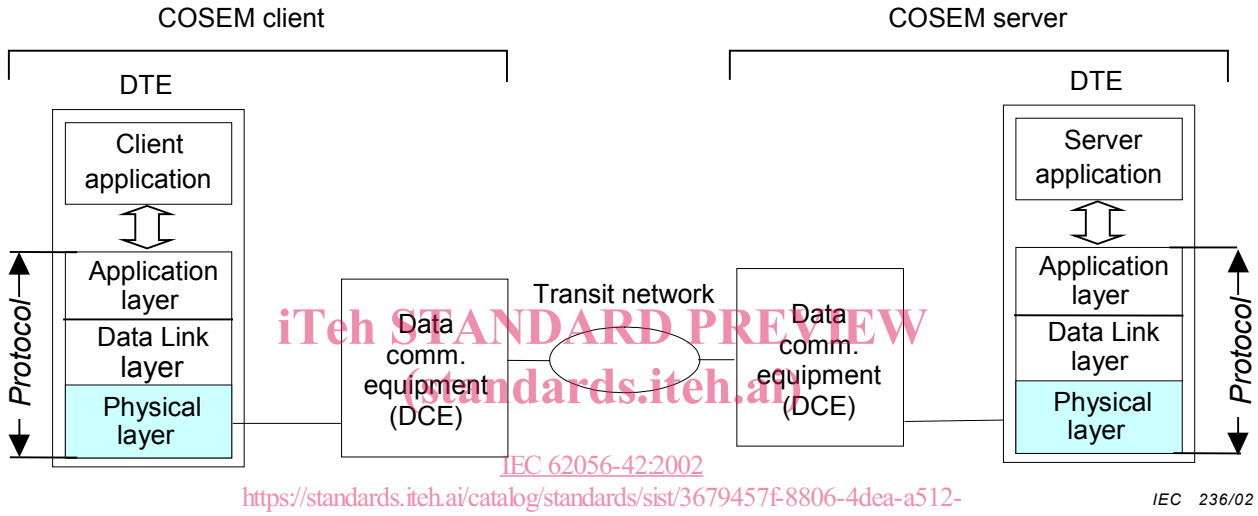

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Figure 2 – The location of the physical layer

This standard defines the services of the physical layer towards its peer layer(s) and the upper layers, and the protocol of the physical layer.

5 Service specification

5.1 List of services

ITU-T X.211 defines a set of capabilities to be made available by the physical layer over the physical media. These capabilities are available via service primitives, as follows:

5.1.1 Connection establishment/release related services

PH-CONNECT.request / PH-CONNECT.indication / PH-CONNECT.confirm

PH-ABORT.request / PH-ABORT.confirm / PH-ABORT.indication

5.1.2 Data communication services

PH-DATA.request / PH-DATA.indication

5.1.3 Layer management services

In addition to the services above, some additional physical layer services may be necessary, which are used by or provided for the layer management process, which is part of the application process. Some examples are given below:

PH-INITIALIZE.request / PH-INITIALIZE.confirm

PH-GET_VALUE.request / PH-GET_VALUE.confirm

PH-SET_VALUE.request / PH-SET_VALUE.confirm

PH-LM_EVENT.indication

As these services are of local importance only, their definition is not within the scope of this standard.

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5.2 Use of the physical layer services

Figure 3 shows how different service users use the service primitives of the physical layer.

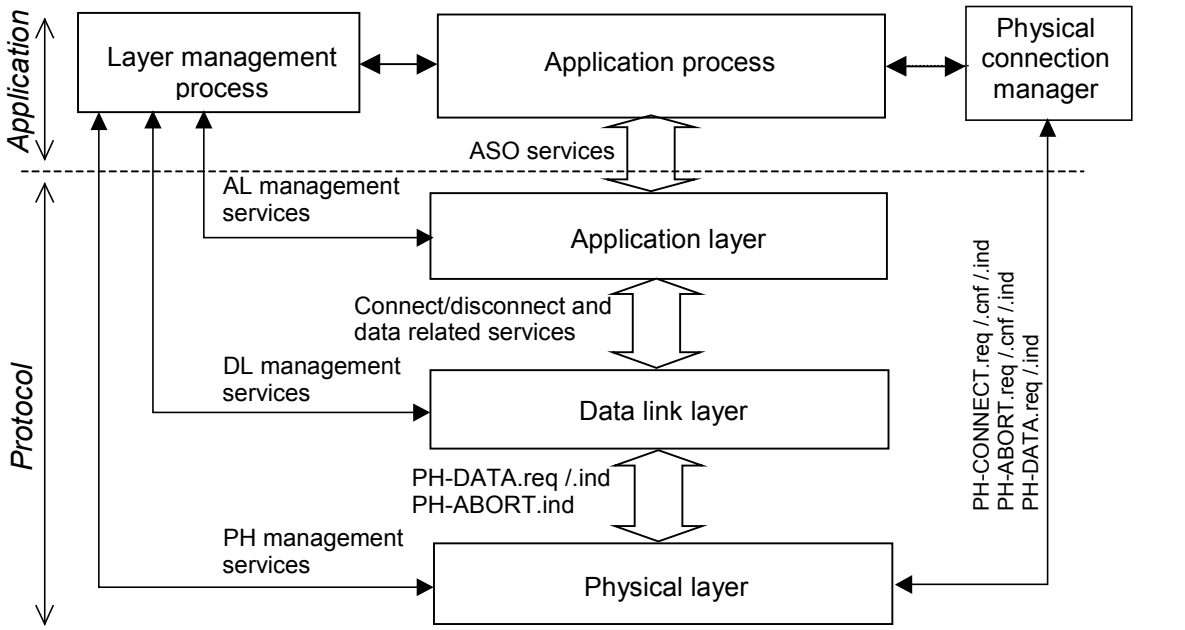

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Figure 3 – Protocol layer services of the COSEM 3-layer connection oriented profile

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As is shown in Figure 3, the connection establishment/release services are used by and provided for the physical connection manager application process, and not the data link layer. The reasons for this are explained in 6.3.1.

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5.3 Service definitions

5.3.1 PH-CONNECT.request

Function

This primitive is invoked by the service user entity to request the setting up of a physical connection to a remote device.

NOTE In the COSEM environment, it is the physical connection manager application process.

Service parameters

The semantics of the primitive is as follows:

```
PH-CONNECT.request
(
    PhConnType,
    PhConnReqParams
)
```

The PhConnType parameter specifies the type of connection requested, for example direct connection, PSTN modem connection, etc. This standard does not specify data/type(s) and/or value(s) for this parameter, because this is a local issue only.

The structure and the contents of the PhConnReqParams parameter depend on the value of the PhConnType parameter. For example, in the case of a PSTN connection it includes the phone number of the remote station, etc. As – similarly to the PhConnType parameter – the PhConnReqParams parameter contains implementation dependent data, data types/values for this parameter are not specified in this standard.

Use

The PH-CONNECT.request primitive is used for the establishment of a physical connection. The receipt of this primitive causes the PH-Layer entity to perform the required actions, for example dial the specified phone number, to establish a physical connection with the peer physical layer entity. An example of these actions in the case of an intelligent Hayes modem is given in annex A.

5.3.2 PH-CONNECT.indication

Function

This primitive is generated by the physical layer entity to indicate to the service user entity that a remote device requests that a physical connection to the local physical layer be established.

Service parameters

The semantics of the primitive is as follows:

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```
PH-CONNECT.indication ( )
```

Use

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The PH-CONNECT.indication primitive is used by the PH entity to indicate to the service user entity that a remote device requests that a physical connection be established.

5.3.3 PH-CONNECT.confirm

Function

This primitive is generated by the PH entity to convey the results of the associated PH-CONNECT.request to the service user entity.

Service parameters

The semantics of the primitive is as follows:

```
PH-CONNECT.confirm
(
    Result,
    PhConnCnfParams
)
```

The result parameter indicates whether the attempt to set up a physical connection was successful or not.

The structure and the value of the PhConnCnfParams parameter depend on the physical connection type of the corresponding CONNECTION.request service, which is actually being confirmed. For example, in the case of a PSTN connection it may include parameters of the established connection (V22, baud-rate, etc.). Data types and values for either the Result or the PhConnCnfParams parameter are not specified in this standard.

If the connection could not be established due to a local error – for example the phone line is not available – the PH-CONNECT.confirm service is locally generated.

Use

The PH-CONNECT.confirm primitive is used by the PH entity to convey the results of the associated PH-CONNECT.request.

5.3.4 PH-ABORT.request

Function

This primitive is invoked by the service user entity to request the disconnection of an existing physical connection.

Service parameters

The semantics of the primitive is as follows:

```
PH-ABORT.request ( )
```

Use

The PH-ABORT.request primitive is used to request the physical layer entity to terminate an existing physical connection.

5.3.5 PH-ABORT.confirm

Function

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This primitive is generated by the physical layer entity to indicate to the service user entity whether the request to terminate the physical connection was successful or not.

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Service parameters

The semantics of the primitive is as follows:

```
PH-ABORT.confirm
(
    Result
)
```

The Result parameter carries the result of the physical disconnection attempt.

Use

The PH-ABORT.confirm primitive is used by the PH entity to confirm to the service user entity the result of a physical disconnection attempt.

5.3.6 PH-ABORT.indication

Function

This primitive is generated by the physical layer entity to indicate to the service user entity a non-requested termination of a physical connection.

Service parameters

The semantics of the primitive is as follows:

```
PH-ABORT.indication( )
```

Use

The PH-ABORT.indication primitive is used by the PH entity to inform the service user entity that a physical connection has been unexpectedly terminated.

5.3.7 PH-DATA.request

Function

This primitive is invoked by the service user entity to request sending a data byte to one or several remote PH entity or entities using the PH transmission procedures.

Service parameters

The semantics of this primitive is as follows:

```
PH-DATA.request
(
    Data
)
```

The data parameter carries the byte to be transmitted by the PH layer entity.

Use

The PH-DATA.request primitive is used by the service user entity whenever data is to be transmitted to its peer entity or entities.

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The receipt of this primitive causes the PH entity to perform all PH specific actions and pass the PH service data unit – the received byte – to the physical data interface for transfer to the peer PH entity or entities.

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5.3.8 PH-DATA.indication

Function

This primitive is used to transfer data from the PH entity to the service user entity.

Service parameters

The semantics of this primitive is as follows:

```
PH-DATA.indication
(
    Data
)
```

The data parameter carries the received byte as received by the local PH entity.

Use

The PH-DATA.indication primitive is used by the PH entity to indicate to the service user entity the arrival of a valid data byte.