

Distribution automation using distribution line carrier system —

Part 4: Data communication protocols —

Section 42: Application protocols — Application layer

The European Standard EN 61334-4-42:1997 has the status of a
British Standard

ICS 35.100.70

National foreword

This British Standard is the English language version of EN 61334-4-42:1997. It is identical with IEC 61334-4-42:1996.

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power system control and associated communications, which has the responsibility to:

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 36, an inside back cover and a back cover. This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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English version

**Distribution automation using distribution line carrier
systems Part 4: Data communication protocols
Section 42: Application protocols — Application layer**

(IEC 1334-4-42:1996)

Automatisation de la distribution à
l'aide de systèmes de communication
à courants porteurs
Partie 4: Protocoles de communication
de données
Section 42: Protocoles d'application
Couche application
(CEI 1334-4-42:1996)

Verteilungsautomatisierung mit Hilfe
von Trägersystemen auf
Verteilungsleitungen
Teil 4: Datenkommunikationsprotokolle
Hauptabschnitt 42:
Anwendungsprotokolle
Anwendungsschicht
(IEC 1334-4-42:1996)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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

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Foreword

The text of document 57/265/FDIS, future edition 1 of IEC 1334-4-42, prepared by IEC TC 57, Power system control and associated communications, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61334-4-42 on 1996-10-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-07-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex A and Annex ZA are normative and Annex B is informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 1334-4-42:1996 was approved by CENELEC as a European Standard without any modification.

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Introduction

The application layer supports the DLMS application specification and the management application of each station. DCP makes use of the connectionless ACSE ISO standards and of the application service elements DLMS and management.

1 Scope

The specifications of the sections of IEC 1334-4 apply to the communication through the so-called distribution line carrier technology (DLC) on both low and medium voltage distribution networks. The application range based on telecommunication processes is wide and cannot be described exhaustively in this section; application examples are: control and monitoring of the distribution network, order broadcast, control of user interfaces, public lighting, traffic lights supervision, automatic meter reading, etc.

This section of IEC 1334-4 describes the rules used to design an application service element, the ISO connectionless ACSE, and the DLMS Application Service Element.

Extensions to other communication media are also allowed.

The mapping of the DLMS services is based on the three-layer stack. Future extensions to stacks of more than three layers are possible and may use the rules described in this section. In such a case, the DLMS interface with the underlying layers should be remapped to the new one: the specification of the mapping criteria will be dealt with in corresponding appendices, in respect of the rules defined in this section.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 1334-4. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this section of IEC 1334-4 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 1334-4-1:1996, *Distribution automation using distribution line carrier systems — Part 4: Data communication protocols — Section 1: Reference model of the communication system.*

IEC 1334-4-32:1996, *Distribution automation using distribution line carrier systems — Part 4: Data communication protocols — Section 32: Data link layer — Logical link control (LLC).*

IEC 1334-4-41:1996, *Distribution automation using distribution line carrier systems — Part 4: Data communication protocols — Section 41: Application protocols — Distribution line message specification.*

ISO 7498:1984, *Information processing systems — Open Systems Interconnection — Basic Reference Model.*

ISO 7498-3:1989, *Information processing systems — Open Systems Interconnection — Basic Reference Model — Part 3: Naming and Addressing.*

ISO/TR 8509:1987, *Information processing systems — Open Systems Interconnection — Services conventions.*

ISO 8649:1988, *Information processing systems — Open Systems Interconnection — Service definition for the Association Control Service Element.*

Amendment 2 (1991): Connectionless-mode ACSE service

ISO/IEC 8824:1990, *Information technology — Open Systems Interconnection — Specification of Abstract Syntax Notation One (ASN.1).*

ISO/IEC 8825:1990, *Information technology — Open Systems Interconnection — Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1).*

ISO/IEC 9545:1994, *Information technology — Open Systems Interconnection — Application layer structure.*

3 Definitions

For the purposes of this International Standard, the following definitions apply:

3.1 Reference model definitions

This section is based on the concepts developed in ISO 7498 and makes use of the following terms defined in it:

- a) application layer;
- b) application process;
- c) application entity;
- d) (N) — function;
- e) (N) — layer;
- f) (N) — protocol;
- g) (N) — protocol-control-information;
- h) (N) — protocol-data-unit;
- i) real open system.

3.2 Naming and addressing definitions

This section makes use of the following terms:

- a) application-process title;
- b) application-entity qualifier;
- c) application-entity title;
- d) application-process invocation-identifier;
- e) application-entity invocation-identifier.

3.3 Service conventions definitions

This section makes use of the following terms defined in ISO/TR 8509:

- a) service-provider;
- b) service-user;
- c) confirmed service;
- d) non-confirmed service;
- e) provider-initiated service;
- f) primitive;
- g) request (primitive);
- h) indication (primitive);
- i) response (primitive);
- j) confirm (primitive).

3.4 Application layer specific definitions

3.4.1

application-association, association

a co-operative relationship between two applications-entities, formed by their exchange of application-protocol-control-information through their use of data link services. The relationship enables the communication of information and the co-ordination of their joint operation for an instance of communication

3.4.2

application context

an explicitly identified set of application-service-elements, related options and rules shared in common by two application entity-invocations that are necessary for the interworking of application-entities in an application-association

3.4.3**application-directory-function**

an application-function that processes data link addresses, application-entity-titles, and application-protocol-addressing-information to provide mapping among these categories of information

3.4.4**application-entity-invocation**

a specific use of part or all of the capabilities of a given application-entity in support of the communications requirements of an application-process-invocation

3.4.5**application-entity-type**

a specific set (called type) of application-entity functions that share common characteristics. Such a type may be referenced with a name

3.4.6**application-function**

an identifiable stand alone part of the activity of application-entities

3.4.7**application-process-invocation**

a specific utilization of part or all of the capabilities of a given application-process in support of a specific occasion of information processing

3.4.8**application-process-type**

a specific set (called type) of application-process functions that share common characteristics. Such a type may be referenced with a name

3.4.9**application-protocol**

a set of rules and formats (semantic and syntactic) which determines the communication behaviour of application-entities in the performance of application-functions

3.4.10**application-protocol-addressing-information**

those elements of the application-protocol-control-information which contain addressing information

3.4.11**application-protocol-control-information**

the information exchanged between application-entities using data link services, to co-ordinate their joint operation. This information is contained in application-protocol-data-unit

3.4.12**application-protocol-data-unit**

a unit of information, specified in an application-protocol, that consists of application-protocol-control-information and, possibly, user information

3.4.13**application-service-element**

a set of functions that provide a capability for the interworking of application-entity-invocations for a specific purpose on a single application-association

NOTE This definition refines the original definition of application-service-elements in ISO 7498, but is as specified in ISO/IEC 9545.

3.4.14**association-control-service-element**

an application-service-element that provides a single consistent means for establishing and terminating all application-associations

4 Abbreviations

For the purposes of this International Standard, the following abbreviations apply:

AA	: application-association;
ACSE	: association control service element;
AE	: application entity;
AEI	: application entity invocation;
AP	: application process;
APAI	: application protocol addressing information;
APCI	: application protocol control information;
APDU	: application protocol data unit;
ASE	: application service element;
DASE	: DLMS application service element;
DLMS	: distribution line message specification;
OSI	: open systems interconnection.

5 Application layer concepts

This clause describes the application layer concepts as they are defined in ISO/IEC 9545.

The concepts developed in this standard were designed for the seven layers connection oriented OSI model. DCP makes use of a three layers connectionless model, but the concepts still apply.

This specification, then, re-uses most of the ISO/IEC 9545 concepts and structure with the following special considerations:

- because no presentation layer is available, all references to it are removed and its necessary functionalities are performed directly by the application layer;
- the application layer makes a direct use of the data link services;
- the ACSE referenced by the DCP specification uses only unconfirmed services as defined in the ISO 8649 amendment 2.

5.1 Introduction

Standards for OSI are intended to support the communication requirements of applications (that is information processing tasks) requiring co-ordinated processing activities in two or more real open systems. In particular, standards for the OSI application layer define procedures for the support of distributed information processing.

The application layer is supported by the lower layers in OSI. In DCP, this in particular means the application layer making use of the data link services specified in future IEC 1334-4-31 [1]¹⁾ and in IEC 1334-4-32.

The application layer differs from the other layers of OSI in several important respects:

- entities in the application layer are made up of a collection of application-service-elements (ASEs), each of which is defined by a set of service and protocol standards. These ASEs are combined in various ways, to form various types of AEs;
- the application layer, as the highest layer of OSI, does not provide a service to a higher layer;
- the associations formed by the communication of protocol-control-information between entities in the application layer have a particular significance.

5.2 Application processes

An AP represents a set of resources, including processing resources, within a real open system that may be used to perform a particular information processing activity (the AP concept is defined in ISO 7498). An AP may require that its interactions with other APs be organized into a number of distinct parts, which may be invoked either simultaneously, or serially, or both.

¹⁾ Figures in square brackets refer to the bibliography given in Annex B.

5.3 Application entities

The aspects of an AP which need to be taken into account for the purpose of OSI are represented by one or more AEs. An AE represents a set of OSI communication capabilities of a particular AP. An AP without an AE cannot communicate in the OSI environment, nor in the DCP environment.

An AE represents one, and only one, AP in the OSI environment. Different APs may be represented by AEs of the same AE type. An AP may contain a set of AEs that are not all of the same AE type.

An AE-invocation represents a specific use of the possibilities of an AE. It represents specific communication activities of an AP-invocation. The aspects of an AP-invocation that need to be taken into account for the purposes of open systems interconnection are represented by one or more AE-invocations.

There may be zero, one, or more AE-invocations representing an AP-invocation at any particular time.

An AE-invocation models the communication functions, together with the associated state information for particular communication activities of an AP-invocation. Such activities are progressed through communication between AE-invocations related by application-associations.

An AE-invocation might be, consecutively, a partner in a number of application-associations. In DCP, at most one application-association may be defined within an AE-invocation, but there may be periods of time when an AE-invocation is not a party to any application-association. The lifetime of an AE-invocation is not determined by the duration of the application-association in which it is a participant.

5.4 Application service elements

An ASE is a set of functions that provides OSI communication capabilities for the interworking of AE-invocations for a specific purpose.

The communication capabilities of an ASE are defined by the specification of a set of services, a set of application-protocol-data-units (APDU), and the procedure governing their use. This constitutes the application-protocol between two ASEs of the same kind.

An AE may be composed of one or more ASEs of different kinds in order to realize a specific composite communication capability for a particular purpose.

5.5 Application-associations

An application-association is a co-operative relationship between two AE-invocations for the purpose of communication of information and co-ordination of their joint operation. This relationship is formed by the exchange of application-protocol-control-information (APCI) using the data link services.

When communication is required between two AEs to meet the needs of an application, an application-association is established between the AE-invocations of the two AEs. In DCP, an AE-invocation may support only one application-association simultaneously with an other AE-invocation.

An application-association-identifier may be associated with an application-association. This application-association-identifier is unique within the scope of the pair of associated AE-invocations. It provides the means to identify the related state information in each AE-invocation.

The termination of an application-association results from the action of the related AE-invocations. The AE-invocations may take such action in response to a failure in communications.

The application control service element (ACSE) is the service element within the application layer that provides the facilities to establish, control and terminate an application-association. This service element is described in a following clause.

5.6 Application context

5.6.1 Definition

To effectively exchange information on an application-association, the pair of AE-invocations must be mutually aware of, and follow, a common set of rules that governs the exchange. This common set of rules is called the application context to the application-association. This set of rules covers everything relevant to the exchange of information necessary to support the activities of the AE-invocations in the application-association. In DCP, this includes especially all the deciphering and deciphering conventions that are used between two application entities.

An application-association has only one application context. However, the set of rules that make up the application context of an application-association may contain rules for alteration of that set of rules during the lifetime of the application-association.