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Industrial communication networks - Fieldbus specifications - Part 5-15: Application layer service definition - Type 15 elements

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Käesolev Eesti standard EVS-EN 61158-5-15:2008 sisaldab Euroopa standardi EN 61158-5-15:2008 ingliskeelset teksti.	This Estonian standard EVS-EN 61158-5-15:2008 consists of the English text of the European standard EN 61158-5-15:2008.
Standard on kinnitatud Eesti Standardikeskuse 28.04.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 28.04.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 14.03.2008.	Date of Availability of the European standard text 14.03.2008.
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ICS 25.040.40, 35.100.70

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61158-5-15

March 2008

ICS 35.100.70; 25.040.40

Partially supersedes EN 61158-5:2004

English version

Industrial communication networks - Fieldbus specifications - Part 5-15: Application layer service definition - Type 15 elements

(IEC 61158-5-15:2007)

Réseaux de communication industriels - Spécifications des bus de terrain - Partie 5-15: Définition des services des couches d'application - Eléments de type 15 (CEI 61158-5-15:2007)

Industrielle Kommunikationsnetze - Feldbusse - Teil 5-15: Dienstfestlegungen des Application Layer (Anwendungsschicht) - Typ 15-Elemente (IEC 61158-5-15:2007)

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CENELEC

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

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Ref. No. EN 61158-5-15:2008 E

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Foreword

The text of document 65C/475/FDIS, future edition 1 of IEC 61158-5-15, prepared by SC 65C, Industrial networks, of IEC TC 65, Industrial-process measurement, control and automation, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61158-5-15 on 2008-02-01.

This and the other parts of the EN 61158-5 series supersede EN 61158-5:2004.

With respect to EN 61158-5:2004 the following changes were made:

– deletion of Type 6 fieldbus for lack of market relevance;

– addition of new fieldbus types;

– partition into multiple parts numbered 5-2, 5-3, …, 5-20.

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)	2008-11-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2011-02-01

NOTE Use of some of the associated protocol types is restricted by their intellectual-property-right holders. In all cases, the commitment to limited release of intellectual-property-rights made by the holders of those rights permits a particular data-link layer protocol type to be used with physical layer and application layer protocols in type combinations as specified explicitly in the EN 61784 series. Use of the various protocol types in other combinations may require permission from their respective intellectual-property-right holders.

Annex ZA has been added by CENELEC.

———————

Endorsement notice

The text of the International Standard IEC 61158-5-15:2007 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61158-6-15	NOTE Harmonized as EN 61158-6-15:2008 (not modified).
IEC 61784-1	NOTE Harmonized as EN 61784-1:2008 (not modified).
IEC 61784-2	NOTE Harmonized as EN 61784-2:2008 (not modified).

———————

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC/TR 61158-1	2007	Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series	-	-
ISO/IEC 7498-1	-[1)]	Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model	EN ISO/IEC 7498-1	1995[2)]
ISO/IEC 8822	-[1)]	Information technology - Open Systems Interconnection - Presentation service definition	-	-
ISO/IEC 8824	-[1)]	Information technology - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1)	-	-
ISO/IEC 9545	-[1)]	Information technology - Open Systems Interconnection - Application Layer structure	-	-
ISO/IEC 10731	-[1)]	Information technology - Open Systems Interconnection - Basic reference model - Conventions for the definition of OSI services	-	-

[1)] Undated reference.

[2)] Valid edition at date of issue.

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INTRODUCTION

This part of IEC 61158 is one of a series produced to facilitate the interconnection of automation system components. It is related to other standards in the set as defined by the “three-layer” fieldbus reference model described in IEC/TR 61158-1.

The application service is provided by the application protocol making use of the services available from the data-link or other immediately lower layer. This standard defines the application service characteristics that fieldbus applications and/or system management may exploit.

Throughout the set of fieldbus standards, the term “service” refers to the abstract capability provided by one layer of the OSI Basic Reference Model to the layer immediately above. Thus, the application layer service defined in this standard is a conceptual architectural service, independent of administrative and implementation divisions.

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-15: Application layer service definition – Type 15 elements

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1 Scope

1.1 Overview

In network communications, as in many fields of engineering, it is a fact that “one size does not fit all.” Engineering design is about making the right set of trade-offs, and these trade-offs must balance conflicting requirements such as simplicity, generality, ease of use, richness of features, performance, memory size and usage, scalability, determinism, and robustness. These trade-offs must be made in light of the types of information flow (e.g. periodic, one-to-many, request-reply, events), and the constraints imposed by the application and execution platforms.

The Type 15 fieldbus provides two major communication mechanisms that complement each others to satisfy communication requirements in the field of automation: the Client/Server and the Publish/Subscribe paradigms. They can be used concurrently on the same device.

Type 15 Client/Server operates in a Client/Server relationship. Its application layer service definitions and protocol specifications are independent of the underlying layers, and have been implemented on a variety of stacks and communication media, including EIA/TIA-232, EIA/TIA-422, EIA/TIA-425, HDLC (ISO 13239), fiber, TCP/IP, Wireless LANs and Radios.

Type 15 Publish/Subscribe operates in a Publish/Subscribe relationship. Its application layer service definitions and protocol specifications are independent of the underlying layers and can be configured to provide reliable behaviour and support determinism. The most common stack is UDP/IP.

The fieldbus application layer (FAL) provides user programs with a means to access the fieldbus communication environment. In this respect, the FAL can be viewed as a “window between corresponding application programs.”

This part of IEC 61158 provides common elements for basic time-critical and non-time-critical messaging communications between application programs in an automation environment and material specific to Type 15 fieldbus. The term “time-critical” is used to represent the presence of a time-window, within which one or more specified actions are required to be completed with some defined level of certainty. Failure to complete specified actions within the time window risks failure of the applications requesting the actions, with attendant risk to equipment, plant and possibly human life.

This part of IEC 61158 define in an abstract way the externally visible service provided by the Type 15 fieldbus application layer in terms of

a) an abstract model for defining application resources (objects) capable of being manipulated by users via the use of the FAL service,
b) the primitive actions and events of the service;
c) the parameters associated with each primitive action and event, and the form which they take; and
d) the interrelationship between these actions and events, and their valid sequences.

The purpose of this part of IEC 61158 is to define the services provided to

1) the FAL user at the boundary between the user and the Application Layer of the Fieldbus Reference Model, and

2) Systems Management at the boundary between the Application Layer and Systems Management of the Fieldbus Reference Model.

This part of IEC 61158 specifies the structure and services of the Type 15 IEC fieldbus Application Layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498) and the OSI Application Layer Structure (ISO/IEC 9545).

FAL services and protocols are provided by FAL application-entities (AE) contained within the application processes. The FAL AE is composed of a set of object-oriented Application Service Elements (ASEs) and a Layer Management Entity (LME) that manages the AE. The ASEs provide communication services that operate on a set of related application process object (APO) classes. One of the FAL ASEs is a management ASE that provides a common set of services for the management of the instances of FAL classes.

Although these services specify, from the perspective of applications, how request and responses are issued and delivered, they do not include a specification of what the requesting and responding applications are to do with them. That is, the behavioral aspects of the applications are not specified; only a definition of what requests and responses they can send/receive is specified. This permits greater flexibility to the FAL users in standardizing such object behavior. In addition to these services, some supporting services are also defined in this standard to provide access to the FAL to control certain aspects of its operation.

1.2 Specifications

The principal objective of this part of IEC 61158 is to specify the characteristics of conceptual application layer services suitable for time-critical communications, and thus supplement the OSI Basic Reference Model in guiding the development of application layer protocols for time-critical communications.

A secondary objective is to provide migration paths from previously-existing industrial communications protocols. It is this latter objective which gives rise to the diversity of services standardized as the various Types of IEC 61158, and the corresponding protocols standardized in subparts of IEC 61158-6.

This specification may be used as the basis for formal Application Programming-Interfaces. Nevertheless, it is not a formal programming interface, and any such interface will need to address implementation issues not covered by this specification, including

a) the sizes and octet ordering of various multi-octet service parameters, and

b) the correlation of paired request and confirm, or indication and response, primitives.

1.3 Conformance

This part of IEC 61158 does not specify individual implementations or products, nor do they constrain the implementations of application layer entities within industrial automation systems.

There is no conformance of equipment to this application layer service definition standard. Instead, conformance is achieved through implementation of conforming application layer protocols that fulfill the Type 15 application layer services as defined in this part of IEC 61158.

1.4 Type overview

In network communications, as in many fields of engineering, it is a fact that “one size does not fit all.” Engineering design is about making the right set of trade-offs, and these trade-offs must balance conflicting requirements such as simplicity, generality, ease of use, richness of features, performance, memory size and usage, scalability, determinism, and robustness. These trade-offs must be made in light of the types of information flow (e.g. periodic, one-to-

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many, request-reply, events), and the constraints imposed by the application and execution platforms.

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ISO/IEC 7498-1, *Information technology – Open Systems Interconnection – Basic Reference Model – Part 1: The Basic Model*

ISO/IEC 8822, *Information technology – Open Systems Interconnection – Presentation service definition*

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

ISO/IEC 9545, *Information technology – Open Systems Interconnection – Application Layer structure*

ISO/IEC 10731, *Information technology – Open Systems Interconnection – Basic Reference Model – Conventions for the definition of OSI services*

3 Terms and definitions, abbreviations, symbols and conventions

3.1 Terms and definitions

For the purposes of this document, the following terms as defined in these publications apply:

3.1.1 ISO/IEC 7498-1 terms

a) application entity
b) application process
c) application protocol data unit
d) application service element
e) application entity invocation
f) application process invocation

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