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SLOVENSKI STANDARD
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Industrial communication networks - Fieldbus specifications - Part 5-12: Application layer service definition - Type 12 elements (IEC 61158-5-12:2019)

Industrielle Kommunikationsnetze - Feldbusse - Teil 5-12: Dienstfestlegungen des Application Layer (Anwendungsschicht) - Typ 12-Elemente (IEC 61158-5-12:2019)

Réseaux de communication industriels - Spécifications des bus de terrain - Partie 5-12 : Définition des services de la couche application - Éléments de type 12 (IEC 61158-5-12:2019)

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CENELEC

European Committee for Electrotechnical Standardization
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European foreword

The text of document 65C/947/FDIS, future edition 4 of IEC 61158-5-12, 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 approved by CENELEC as EN IEC 61158-5-12:2019.

The following dates are fixed:

•	latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2020-02-15
•	latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2022-05-15

This document supersedes EN 61158-5-12:2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of the International Standard IEC 61158-5-12:2019 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 61158-2	NOTE	Harmonized as EN 61158-2
IEC 61158-4-12	NOTE	Harmonized as EN 61158-4-12
IEC 61158-6-12	NOTE	Harmonized as EN 61158-6-12
IEC 61784-1	NOTE	Harmonized as EN 61784-1
IEC 61784-2	NOTE	Harmonized as EN 61784-2

Annex ZA
(normative)

Normative references to international publications
with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 61131-3	-	Programmable controllers - Part 3: Programming languages	EN 61131-3	-
IEC 61158-1	2019	Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series	EN IEC 61158-1	2019
IEC 61158-3-12	2019	Industrial communication networks - Fieldbus specifications - Part 3-12: Data-link layer service definition - Type 12 elements	-	-
ISO/IEC 646	1991	Information technology; ISO 7-bit coded character set for information interchange	-	-
ISO/IEC 7498-1	-	Information technology - Open Systems Interconnection - Basic reference model: The basic model	-	-
ISO/IEC 7498-3	-	Information technology - Open Systems Interconnection - Basic reference model: Naming and addressing	-	-
ISO/IEC/IEEE 8802-3	-	Standard for Ethernet	-	-
ISO/IEC 9545	-	Information technology - Open Systems Interconnection - Application layer structure	-	-
ISO/IEC 10646	-	Information technology - Universal Coded Character Set (UCS)	-	-
ISO/IEC 10731	-	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-
ISO/IEC/IEEE 60559	-	Information technology - Microprocessor Systems - Floating-Point arithmetic	-	-
IEEE 802.1D	-	IEEE Standard for local and metropolitan area networks - Media Access Control (MAC) Bridges	-	-
IETF RFC 791	-	Internet Protocol - DARPA Internet Program Protocol Specification	-	-

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Industrial communication networks – Fieldbus specifications –
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CONTENTS

IEC 61158-5-12:2019 © IEC 2019   – 3 –

Figure 3 – Server triggered invocation 19

Figure 4 – Slave reference model 20

Figure 5 – Simple slave device 21

Figure 6 – Complex slave device 22

Figure 7 – Master functional overview 23

Figure 8 – Process output data sequence 34

Figure 9 – Process input data sequence 35

Figure 10 – CoE server model 52

Figure 11 – Successful single SDO-Download sequence 57

Figure 12 – Unsuccessful single SDO-Download sequence 58

Figure 13 – Successful segmented SDO-Download sequence 58

Figure 14 – Successful single SDO-Upload sequence 59

Figure 15 – Unsuccessful single SDO-Upload sequence 59

Figure 16 – Successful segmented SDO-Upload sequence 60

Figure 17 – SDO information sequence 61

Figure 18 – Emergency service 62

Figure 19 – Command sequence 63

Figure 20 – PDO mapping 64

Figure 21 – Sync manager PDO assigment 64

Figure 22 – RxPDO service 66

Figure 23 – TxPDO service 66

Figure 24 – RxPDO remote transmission sequence 67

Figure 25 – TxPDO remote transmission sequence 67

Figure 26 – EoE sequence 87

Figure 27 – FoE read sequence with success 94

Figure 28 – FoE read sequence with error 95

Figure 29 – FoE write sequence with success 95

Figure 30 – FoE write sequence with error 96

Figure 31 – FoE write sequence with busy 96

Figure 32 – Successful AL control sequence 106

Figure 33 – Unsuccessful AL control sequence 107

Figure 34 – AL state changed sequence 108

Table 1 – Process output data 37

Table 2 – Process input data 38

Table 3 – Update process input data 39

Table 4 – SII read 47

Table 5 – SII write 48

Table 6 – SII reload 49

Table 7 – Allocation of SDO areas 53

Table 8 – SDO download expedited 71

Table 9 – SDO download normal 72

Table 10 – Download SDO segment 73

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-12: Application layer service definition – Type 12 elements

FOREWORD

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NOTE   Combinations of protocol types are specified in IEC 61784-1 and IEC 61784-2.

International Standard IEC 61158-5-12 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This fourth edition cancels and replaces the third edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

• Technical corrections; and

• Editorial improvements for clarification.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
65C/947/FDIS	65C/950/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

A list of all parts of the IEC 61158 series, published under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC web site.

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

• reconfirmed,

• withdrawn,

• replaced by a revised edition, or

• amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

This document 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 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 document 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 document is a conceptual architectural service, independent of administrative and implementation divisions.

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INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –

Part 5-12: Application layer service definition –
Type 12 elements

1   Scope

1.1   General

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 12 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 International Standard defines in an abstract way the externally visible service provided by the different Types of the 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 document is to define the services provided to

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

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

This document specifies the structure and services of the 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

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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 document to provide access to the FAL to control certain aspects of its operation.

1.2 Specifications

The principal objective of this document 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 document does not specify individual implementations or products, nor does it 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 any given Type of application layer services as defined in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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   All parts of the IEC 61158 series, as well as IEC 61784-1 and IEC 61784-2 are maintained simultaneously. Cross-references to these documents within the text therefore refer to the editions as dated in this list of normative references.

IEC 61131-3, *Programmable controllers – Part 3: Programming languages*

IEC 61158-1:2019, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

IEC 61158-3-12:2019, *Industrial communication networks – Fieldbus specifications – Part 3-12: Data-link layer service definition – Type 12 elements*

ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange*

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