Industrial communication networks - Fieldbus specifications - Part 5-2: Application layer service definition - Type 2 elements

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NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 61158-5-2:2019 sisaldab Euroopa standardi EN IEC 61158-5-2:2019 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 61158-5-2:2019 consists of the English text of the European standard EN IEC 61158-5-2:2019.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 21.06.2019.	Date of Availability of the European standard is 21.06.2019.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 25.040.40, 35.100.70, 35.110

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61158-5-2

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ICS 25.040.40; 35.100.70; 35.110

Supersedes EN 61158-5-2:2014

English Version

Industrial communication networks - Fieldbus specifications - Part 5-2: Application layer service definition - Type 2 elements (IEC 61158-5-2:2019)

Réseaux de communication industriels - Spécifications des bus de terrain - Partie 5-2 : Définition des services de la couche application - Éléments de type 2 (IEC 61158-5-2:2019)

Industrielle Kommunikationsnetze - Feldbusse - Teil 5-2: Dienstfestlegungen des Application Layer (Anwendungsschicht) - Typ 2-Elemente (IEC 61158-5-2:2019)

This European Standard was approved by CENELEC on 2019-05-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 65C/947/FDIS, future edition 4 of IEC 61158-5-2, 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 61158-5-2:2019.

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 61158-5-2:2014.

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.

Endorsement notice

The text of the International Standard IEC 61158-5-2:2019 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 61131-1	NOTE	Harmonized as EN 61131-1
IEC 61158-2:2014	NOTE	Harmonized as EN 61158-2:2014 (not modified)
IEC 61784-1:2019	NOTE	Harmonized as EN IEC 61784-1:2019 (not modified)
IEC 61784-2:2019	NOTE	Harmonized as EN IEC 61784-2:2019 (not modified)
IEC 62026-3	NOTE	Harmonized as EN 62026-3

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	2003	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	EN IEC 61158-1	2019
IEC 61158-3-2	2014	Industrial communication networks - Fieldbus specifications - Part 3-2: Data-lonk layer service definition - Type 2 elements	EN 61158-3-2	2014
IEC 61158-3-2:2014/Amd 1	2019		-	-
IEC 61158-4-2	2019	Industrial communication networks - Fieldbus specifications - Part 4-2: Data-link layer protocol specification - Type 2 elements	-	-
IEC 61158-6-2	2019	Industrial communication networks - Fieldbus specifications - Part 6-2: Application layer protocol specification - Type 2 elements	EN 61158-6-2	2019
IEC 61588	2009	Precision clock synchronization protocol for networked measurement and control systems	-	-
IEC 61784-3-2	-	Industrial communication networks - Profiles - Part 3-2: Functional safety fieldbuses - Additional specifications for CPF 2	-	-
ISO 639-2	-	Codes for the representation of names of languages - Part-2: Alpha-3 code	-	-
ISO 8859-1	1987	Information processing - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No. 1	-	-

Publication	Year	Title	EN/HD	Year
ISO 8859-2	1987	Information processing - 8-bit single byte coded graphic character sets - Part 2: Latin alphabet No. 2	-	-
ISO 8859-3	1988	Information processing - 8-bit single-byte coded graphic character sets - Part-3: Latin alphabet no. 3	-	-
ISO 8859-4	1988	Information processing - 8-bit single-byte coded graphic character sets - Part-4: Latin alphabet no. 4	-	-
ISO/IEC 8859-5	1988	Information processing - 8-bit single-byte coded graphic character sets - Part 5: Latin/Cyrillic alphabet	-	-
ISO 8859-6	1987	Information processing - 8-Bit single-byte coded graphic character sets - Part 6: Latin/Arabic alphabet	-	-
ISO 8859-7	1987	Information processing - 8-bit single-byte coded graphic character sets - Part 7: Latin/Greek alphabet	-	-
ISO 8859-8	1988	Information processing; 8-bit single-byte coded graphic character sets; Part 8: Latin/hebrew alphabet	-	-
ISO/IEC 8859-9	1989	Information processing - 8-bit single-byte coded graphic character sets - Part 9: Latin alphabet No. 5	-	-
ISO 11898	1993	Road vehicles - Interchange of digital information - Controller area network (CAN) for high-speed communication	-	-
ISO/IEC 646	-	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 8859-1	-	Information technology - 8-bit single-byte coded graphic character sets - Part-1: Latin alphabet No. 1	-	-
ISO/IEC 9545	-	Information technology - Open Systems Interconnection - Application layer structure	-	-
ISO/IEC 10646	-	Information technology - Universal Multiple-Octet 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	-	-
IETF RFC 1759	-	Printer MIB	-	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-2: Application layer service definition – Type 2 elements

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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Attention is drawn to the fact that the use of the associated protocol type is restricted by its 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 layer protocol type to be used with other layer protocols of the same type, or in other type combinations explicitly authorized by its intellectual-property-right holders.

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

International Standard IEC 61158-5-2 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:

- addition of a data type in 5.3.2;
- clarifications of Object management ASE in 6.2.1;
- extensions of General ASE in 6.2.1.2.1;
- extensions/clarifications of Identity ASE in 6.2.1.2.2;
- update of Message Router ASE in 6.2.1.2.4;
- extensions/clarifications of Time Sync ASE in 6.2.1.2.6;
- updates of Parameter ASE in 6.2.1.2.7;
- updates of FAL ASE service specification in 6.2.1.3;
- extensions/clarifications of Connection manager ASE in 6.2.2;
- extensions/clarifications of Connection ASE in 6.2.3;
- extensions/clarifications of Application type in 6.3.1.4.5.
- miscellaneous editorial corrections.

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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-2: Application layer service definition – Type 2 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 2 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 Type 2 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 Type 2 fieldbus application layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498-1) 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 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 the Type 2 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 61131-3:2003[1], *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 61158-3-2:2014, *Industrial communication networks – Fieldbus specifications – Part 3-2: Data-link layer service definition – Type 2 elements*

IEC 61158-3-2:2014/AMD1:2019

IEC 61158-4-2:2019, *Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements*

[1] A newer edition of this standard has been published, but only the cited edition applies.