



SLOVENSKI STANDARD SIST EN 61158-5-22:2015

01-marec-2015

Nadomešča:

SIST EN 61158-5-22:2012

**Industrijska komunikacijska omrežja - Specifikacije za procesna vodila - 5-22. del:
Definicija opravil na aplikacijski ravni - Elementi tipa 22 (IEC 61158-5-22:2014)**

Industrial communication networks - Fieldbus specifications - Part 5-22: Application layer service definition - Type 22 elements (IEC 61158-5-22:2014)

Industrielle Kommunikationsnetze - Feldbusse - Teil 5-22: Dienstfestlegungen des Application Layer (Anwendungsschicht) - Typ 22-Elemente (IEC 61158-5-22:2014)

Réseaux de communication industriels - Spécifications des bus de terrain - Partie 5-22: Définition des services de la couche application - Éléments de type 22 (CEI 61158-5-22:2014)

Ta slovenski standard je istoveten z: EN 61158-5-22:2014

ICS:

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
35.100.70	Uporabniški sloj	Application layer
35.110	Omreževanje	Networking

SIST EN 61158-5-22:2015

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 61158-5-22:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/42f7a405-8671-432d-b3cf-ad103e8ef8f0/sist-en-61158-5-22-2015>

EUROPEAN STANDARD

EN 61158-5-22

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2014

ICS 25.040.40; 35.100.70; 35.110

Supersedes EN 61158-5-22:2012

English Version

**Industrial communication networks - Fieldbus specifications -
Part 5-22: Application layer service definition - Type 22 elements
(IEC 61158-5-22:2014)**

Réseaux de communication industriels - Spécifications des
bus de terrain - Partie 5-22: Définition des services de la
couche application - Éléments de type 22
(CEI 61158-5-22:2014)

Industrielle Kommunikationsnetze - Feldbusse -
Teil 5-22: Dienstfestlegungen des Application Layer
(Anwendungsschicht) - Typ 22-Elemente
(IEC 61158-5-22:2014)

This European Standard was approved by CENELEC on 2014-09-22. 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.

[SIST EN 61158-5-22:2015](#)

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, 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: Avenue Marnix 17, B-1000 Brussels

Foreword

The text of document 65C/763/FDIS, future edition 2 of IEC 61158-5-22, 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 61158-5-22:2014.

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) 2015-06-22
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-09-22

This document supersedes EN 61158-5-22:2012.

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

iTeh STANDARD PREVIEW (standards.iteh.ai)

The text of the International Standard IEC 61158-5-22:2014 was approved by CENELEC as a European Standard without any modification.

<https://standards.iteh.ai/catalog/standards/sist/42f7a405-8671-432d-b3cf-61158-5-22-2014>

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

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, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When 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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61131-3	-	Programmable controllers - Part 3: Programming languages	EN 61131-3	-
IEC 61158-1	2014	Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series	EN 61158-1	2014
IEC 61158-4-22	2014	Industrial communication networks - Fieldbus specifications - Part 4-22: Data-link layer protocol specification - Type 22 elements	EN 61158-4-22 ¹⁾	-
IEC 61158-6-22	-	Industrial communication networks - Fieldbus specifications - Part 6-22: Application layer protocol specification - Type 22 elements	EN 61158-6-22 ¹⁾	-
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 8802-3	-	Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications	-	-
ISO/IEC 8822	-	Information technology - Open Systems Interconnection - Presentation service definition	-	-
ISO/IEC 8824-1	-	Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation	-	-

¹⁾ To be published.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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	-	-

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 61158-5-22:2015](https://standards.iteh.ai/catalog/standards/sist/42f7a405-8671-432d-b3cf-ad103e8ef8f0/sist-en-61158-5-22-2015)

<https://standards.iteh.ai/catalog/standards/sist/42f7a405-8671-432d-b3cf-ad103e8ef8f0/sist-en-61158-5-22-2015>



IEC 61158-5-22

Edition 2.0 2014-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Industrial communication networks – Fieldbus specifications –
Part 5-22: Application layer service definition – Type 22 elements**

**Réseaux de communication industriels – Spécifications des bus de terrain –
Partie 5-22: Définition des services de la couche application – Éléments
de type 22**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE **XC**
CODE PRIX

ICS 25.040.40; 35.100.70; 35.110

ISBN 978-2-8322-1742-9

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
1.1 General.....	7
1.2 Specifications.....	8
1.3 Conformance.....	8
2 Normative references.....	8
3 Terms, definitions, abbreviations, symbols and conventions.....	9
3.1 ISO/IEC 7498-1 terms.....	9
3.2 ISO/IEC 8822 terms.....	9
3.3 ISO/IEC 9545 terms.....	9
3.4 ISO/IEC 8824-1 terms.....	10
3.5 Type 22 fieldbus application-layer specific definitions.....	10
3.6 Abbreviations and symbols.....	13
3.7 Conventions.....	15
4 Concepts.....	18
4.1 Common concepts.....	18
4.2 Type specific concepts.....	18
5 Data type ASE.....	22
5.1 Overview.....	22
5.2 Formal definition of data type objects.....	22
5.3 FAL defined data types.....	22
6 Communication model specification.....	30
6.1 Application service elements (ASEs).....	30
6.2 Application relationships (ARs).....	71
Bibliography.....	76
Figure 1 – Producer-consumer interaction model.....	20
Figure 2 – RTFL device reference model.....	21
Figure 3 – RTFN device reference model.....	22
Figure 4 – Type 22 CeS device structure.....	31
Figure 5 – Successful SDO expedited download sequence.....	44
Figure 6 – Successful SDO normal download initialization sequence.....	44
Figure 7 – Successful SDO download sequence.....	44
Figure 8 – Successful SDO expedited upload sequence.....	45
Figure 9 – Successful SDO normal upload initialization sequence.....	45
Figure 10 – Successful SDO upload sequence.....	45
Figure 11 – Failed SDO expedited download initialization sequence.....	46
Figure 12 – Failed SDO download after initialization sequence.....	46
Figure 13 – Failed SDO download sequence.....	47
Figure 14 – Emergency sequence.....	47
Figure 15 – Heartbeat sequence.....	48
Figure 16 – Process data write sequence.....	48

Figure 17 – PDO mapping principle	49
Figure 18 – Process data object.....	49
Figure 19 – SEF service sequence.....	62
Table 1 – Object dictionary structure.....	31
Table 2 – Initiate SDO expedited download service.....	52
Table 3 – Initiate SDO normal download service	53
Table 4 – SDO download service	54
Table 5 – Initiate SDO expedited upload service	55
Table 6 – Initiate SDO normal upload service	57
Table 7 – SDO upload service	58
Table 8 – SDO abort service.....	59
Table 9 – Process data write service.....	60
Table 10 – Emergency service (EMCY).....	60
Table 11 – Heartbeat service	61
Table 12 – Send frame service	63
Table 13 – AL-Network verification service	65
Table 14 – AL-RTFL configuration service.....	65
Table 15 – AL-DelayMeasurement start service	67
Table 16 – AL-DelayMeasurement read service.....	67
Table 17 – PCS configuration service	68
Table 18 – MII read service	68
Table 19 – MII write service	68
Table 20 – AL-RTFN scan network read service	69
Table 21 – Application layer management service.....	70
Table 22 – Start synchronization service.....	70
Table 23 – Stop synchronization service	71
Table 24 – PTPNSU AREP class	73
Table 25 – PTMNSU AREP class.....	73
Table 26 – PTPNSC AREP class	73
Table 27 – PTPUTC AREP class.....	74
Table 28 – FAL services by AREP class	74
Table 29 – FAL services by AREP role	75

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
 FIELDBUS SPECIFICATIONS –**
**Part 5-22: Application layer service definition –
 Type 22 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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 61158-5-22 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

This edition includes the following technical changes with respect to the previous edition.

- Adopted revisions dates of cited standards.

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

FDIS	Report on voting
65C/763/FDIS	65C/773/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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 61158-5-22:2015](https://standards.iteh.ai/catalog/standards/sist/42f7a405-8671-432d-b3cf-ad103e8ef8f0/sist-en-61158-5-22-2015)

<https://standards.iteh.ai/catalog/standards/sist/42f7a405-8671-432d-b3cf-ad103e8ef8f0/sist-en-61158-5-22-2015>

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 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.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[SIST EN 61158-5-22:2015](https://standards.iteh.ai/catalog/standards/sist/42f7a405-8671-432d-b3cf-ad103e8ef8f0/sist-en-61158-5-22-2015)

<https://standards.iteh.ai/catalog/standards/sist/42f7a405-8671-432d-b3cf-ad103e8ef8f0/sist-en-61158-5-22-2015>

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-22: Application layer service definition – Type 22 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 standard 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 22 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 standard defines in an abstract way the externally visible service provided by 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 standard 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 standard specifies the structure and services of the 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 standard to provide access to the FAL to control certain aspects of its operation.

1.2 Specifications

The principal objective of this standard 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 standard 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 application layer services as defined in this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 61158-1:2014, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

IEC 61158-4-22:2014, *Industrial communication networks – Fieldbus specifications – Part 4-22: Data-link layer protocol specification – Type 22 elements*

IEC 61158-6-22, *Industrial communication networks – Fieldbus specifications – Part 6-22: Application layer protocol specification – Type 22 elements*

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 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

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

ISO/IEC 8824-1, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*

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*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3 Terms, definitions, abbreviations, symbols and conventions

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

3.1 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
- g) application transaction
- h) real open system
- i) transfer syntax

3.2 ISO/IEC 8822 terms

- a) abstract syntax
- b) presentation context

3.3 ISO/IEC 9545 terms

- a) application-association
- b) application-context
- c) application context name
- d) application-entity-invocation
- e) application-entity-type