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Industrial communication networks - Fieldbus specifications - Part 6-4: Application layer protocol specification - Type 4 elements

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 12/19

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Supersedes EN 61158-6-4:2014 and all of its  
amendments and corrigenda (if any)

English Version

**Industrial communication networks - Fieldbus specifications -  
Part 6-4: Application layer protocol specification - Type 4  
elements  
(IEC 61158-6-4:2019)**

Réseaux de communication industriels - Spécifications des  
bus de terrain - Partie 6-4: Spécification du protocole de la  
couche application - Eléments de type 4  
(IEC 61158-6-4:2019)

Industrielle Kommunikationsnetze - Feldbusse - Teil 6-4:  
Protokollspezifikation des Application Layer  
(Anwendungsschicht) - Typ 4-Elemente  
(IEC 61158-6-4:2019)

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

**EN IEC 61158-6-4:2019 (E)****European foreword**

The text of document 65C/948/FDIS, future edition 3 of IEC 61158-6-4, 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 61158-6-4:2019.

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) 2020-04-25
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-07-25

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

- IEC 61158-1:2019 NOTE Harmonized as EN IEC 61158-1:2019 (not modified)
- IEC 61158-2 NOTE Harmonized as EN 61158-2
- IEC 61158-4-4:2019 NOTE Harmonized as EN IEC 61158-4-4:2019 (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)

## 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](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61158-3-4	2019	Industrial communication networks Fieldbus specifications - Part 3-4: Data-link layer service definition - Type 4 elements	-EN IEC 61158-3-4	2019
IEC 61158-5-4	2019	Industrial communication networks Fieldbus specifications - Part 5-4: Application layer service definition - Type 4 elements	-EN IEC 61158-5-4	2019
ISO/IEC 7498-1	-	Information technology - Open Systems- Interconnection - Basic reference model: The basic model	-	-
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 9797-1	-	Information technology - Security- techniques - Message Authentication Codes (MACs) – Part 1: Mechanisms using a block cipher	-	-
ISO/IEC 10731	-	Information technology - Open Systems- Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-



IEC 61158-6-4

Edition 3.0 2019-06

# INTERNATIONAL STANDARD

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**Industrial communication networks – Fieldbus specifications –  
Part 6-4: Application layer protocol specification – Type 4 elements**



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67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.



IEC 61158-6-4

Edition 3.0 2019-06

# INTERNATIONAL STANDARD

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**Industrial communication networks – Fieldbus specifications –  
Part 6-4: Application layer protocol specification – Type 4 elements**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

#### Part 6-4: Application layer protocol specification – Type 4 elements

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

International Standard IEC 61158-6-4 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

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

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

- a) additional user parameters to services;
- b) additional services to support distributed objects;
- c) additional secure services.

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

FDIS	Report on voting
65C/948/FDIS	65C/956/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 the parts of the IEC 61158 series, 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.

## 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 protocol provides the application service by making use of the services available from the data-link or other immediately lower layer. The primary aim of this document is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer application entities (AEs) at the time of communication. These rules for communication are intended to provide a sound basis for development in order to serve a variety of purposes:

- as a guide for implementors and designers;
- for use in the testing and procurement of equipment;
- as part of an agreement for the admittance of systems into the open systems environment;
- as a refinement to the understanding of time-critical communications within OSI.

This document is concerned, in particular, with the communication and interworking of sensors, effectors and other automation devices. By using this document together with other standards positioned within the OSI or fieldbus reference models, otherwise incompatible systems may work together in any combination.

## **INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –**

### **Part 6-4: Application layer protocol specification – Type 4 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 4 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 specifies interactions between remote applications and defines the externally visible behavior provided by the Type 4 fieldbus application layer in terms of

- a) the formal abstract syntax defining the application layer protocol data units conveyed between communicating application entities;
- b) the transfer syntax defining encoding rules that are applied to the application layer protocol data units;
- c) the application context state machine defining the application service behavior visible between communicating application entities;
- d) the application relationship state machines defining the communication behavior visible between communicating application entities.

The purpose of this document is to define the protocol provided to

- 1) define the wire-representation of the service primitives defined in IEC 61158-5-4, and
- 2) define the externally visible behavior associated with their transfer.

This document specifies the protocol of the Type 4 fieldbus application layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498-1) and the OSI application layer structure (ISO/IEC 9545).

##### **1.2 Specifications**

The principal objective of this document is to specify the syntax and behavior of the application layer protocol that conveys the application layer services defined in IEC 61158-5-4.

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 protocols standardized in IEC 61158-6 series.

### 1.3 Conformance

This document do not specify individual implementations or products, nor do they constrain the implementations of application layer entities within industrial automation systems. Conformance is achieved through implementation of this application layer protocol specification.

## 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 61158-3-4:2019, *Industrial communication networks – Fieldbus specifications – Part 3-4: Data-link layer service definition – Type 4 elements*

IEC 61158-5-4:2019, *Industrial communication networks – Fieldbus specifications – Part 5-4: Application layer service definition – Type 4 elements*

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 8824-1, *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 10731, *Information technology – Open Systems Interconnection – Basic Reference Model – Conventions for the definition of OSI services*

ISO/IEC 9797-1, *Information technology – Security techniques – Message Authentication Codes (MACs) – Part 1: Mechanisms using a block cipher*

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