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**Industrijska komunikacijska omrežja - Specifikacije za procesna vodila - 5-4. del:  
Definicija opravil na aplikacijski ravni - Elementi tipa 4 (IEC 61158-5-4:2023)**

Industrial communication networks - Fieldbus specifications - Part 5-4: Application layer service definition - Type 4 elements (IEC 61158-5-4:2023)

Industrielle Kommunikationsnetze - Feldbusse - Teil 5-4: Dienstfestlegungen des Application Layer (Anwendungsschicht) - Typ 4-Elemente (IEC 61158-5-4:2023)

Réseaux de communication industriels - Spécifications des bus de terrain - Partie 5-4: Définition des services de la couche application Eléments de type 4 (IEC 61158-5-4:2023)

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**ICS:**

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

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May 2023

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**Industrial communication networks - Fieldbus specifications -  
Part 5-4: Application layer service definition - Type 4 elements  
(IEC 61158-5-4:2023)**

Réseaux de communication industriels - Spécifications des  
bus de terrain - Partie 5-4: Définition des services de la  
couche application - Eléments de type 4  
(IEC 61158-5-4:2023)

Industrielle Kommunikationsnetze - Feldbusse - Teil 5-4:  
Dienstfestlegungen des Application Layer  
(Anwendungsschicht) - Typ 4-Elemente  
(IEC 61158-5-4:2023)

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**EN IEC 61158-5-4:2023 (E)****European foreword**

The text of document 65C/1203/FDIS, future edition 4 of IEC 61158-5-4, 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 61158-5-4:2023.

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) 2024-01-28
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-04-28

This document supersedes EN IEC 61158-5-4:2019 and all of its amendments and corrigenda (if any).

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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The text of the International Standard IEC 61158-5-4:2023 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 standard indicated:

IEC 61158-1 NOTE Approved as EN IEC 61158-1

<https://www.it-europe.org/catalog/standard/61158-5-4-2023>

IEC 61158-2 NOTE Approved as EN IEC 61158-2

IEC 61784-1 (series) NOTE Approved as EN IEC 61784-1 (series)

IEC 61784-2 (series) NOTE Approved as EN IEC 61784-2 (series)

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

| <u>Publication</u> | <u>Year</u> | <u>Title</u>   | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|--|--------------|-------------|
| IEC 61158-3-4      | 2023        | Industrial communication networks - Fieldbus specifications - Part 3-4: Data-link layer service definition - Type 4 elements       | -            | -           |
| IEC 61158-4-4      | 2023        | Industrial communication networks - Fieldbus specifications - Part 4-4: Data-link layer protocol specification - Type 4 elements   | -            | -           |
| IEC 61158-6-4      | 2023        | Industrial communication networks - Fieldbus specifications - Part 6-4: Application layer protocol specification - Type 4 elements | -            | -           |
| 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 8822       | -           | Information technology - Open Systems Interconnection - Presentation service definition  | -            | -           |
| ISO/IEC 8824-1     | -           | Information technology - Abstract Syntax Notation One (ASN.1) - Part 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 60559      | -           | Information technology - Microprocessor Systems - Floating-Point arithmetic  | -            | -           |





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# INTERNATIONAL STANDARD

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

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –  
FIELDBUS SPECIFICATIONS –****Part 5-4: Application layer service definition –  
Type 4 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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NOTE Combinations of protocol types are specified in IEC 61784-1 series and IEC 61784-2 series.

IEC 61158-5-4 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2019. This edition constitutes a technical revision.

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

- a) Use of extended data size in an APDU body. This extension is restricted to nodes operating on a P-NET IP network. There are no technical changes to this sub-part of the standard.

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

| Draft         | Report on voting |
|---------------|------------------|
| 65C/1203/FDIS | 65C/1244/RVD     |

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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 document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
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- replaced by a revised edition, or
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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 can 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 5-4: Application layer service definition – 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 document defines in an abstract way the externally visible service provided by the Type 4 fieldbus application layer in terms of:

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

The purpose of this document is to define the services provided to:

- the FAL user at the boundary between the user and the application layer of the fieldbus reference model, and
- 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 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).

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 document can 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.

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## 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 series and IEC 61784-2 series 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 61158-3-4:2023, *Industrial communication networks – Fieldbus specifications – Part 3-4: Data-link layer service definition – Type 4 elements*

IEC 61158-4-4:2023, *Industrial communication networks – Fieldbus specifications – Part 4-4: Data-link layer protocol specification – Type 4 elements*

IEC 61158-6-4:2023, *Industrial communication networks – Fieldbus specifications – Part 6-4: Application layer protocol specification – Type 4 elements*

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