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**Industrial communication networks – Fieldbus specifications –
Part 6-25: Application layer protocol specification – Type 25 elements**

**Réseaux de communication industriels – Spécifications des bus de terrain –
Partie 6-25: Spécification du protocole de la couche application – Éléments
de type 25**





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Part 6-25: Application layer protocol specification – Type 25 elements
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Partie 6-25: Spécification du protocole de la couche application – Éléments
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**Part 6-25: Application layer protocol specification –
 Type 25 elements**
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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.

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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 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 implementers 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.

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-25: Application layer protocol specification – Type 25 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 International 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 25 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 behavior provided by the different Types of the fieldbus Application Layer in terms of:

- a) the abstract syntax defining the application layer protocol data units conveyed between communicating application entities,
- b) the transfer syntax defining the application layer protocol data units conveyed between communicating application entities,
- c) the application context state machine defining the application service behavior visible between communicating application entities; and
- 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:

- a) define the wire-representation of the service primitives defined in IEC 61158-5-25, and
- b) define the externally visible behavior associated with their transfer.

This document specifies the protocol of the IEC 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 Specification

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 61158-5-25. 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 subparts of IEC 61158-6.

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 the application layer service definition standard. Instead, 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 61158-3-25:2019, *Industrial communication networks – Fieldbus specifications – Part 3-25: Data-link layer service definition – Type 25 elements*

IEC 61158-5-25:2019, *Industrial communication networks – Fieldbus specifications – Part 5-25: Application layer service definition – Type 25 elements*

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 9545, *Information technology – Open Systems Interconnection – Application Layer structure*

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

ISO/IEC/IEEE 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Standard for Ethernet*

IEEE Std 802.1D, *IEEE Standard for Local and metropolitan area networks – Media access Control (MAC) Bridges*; available at <http://www.ieee.org> [viewed 2018-09-17]

IEEE Std 802.1Q, *IEEE Standard for Local and metropolitan area networks – Bridges and Bridged Networks*; available at <http://www.ieee.org> [viewed 2018-09-17]

IETF RFC 768, *User Datagram Protocol*; available at <http://www.ietf.org> [viewed 2018-09-17]

IETF RFC 791, *Internet Protocol*; available at <http://www.ietf.org> [viewed 2018-09-17]

3 Terms, definitions, symbols, abbreviations and conventions

For the purposes of this document, the following terms, definitions, symbols, abbreviations and conventions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Reference model terms and definitions

3.1.1 ISO/IEC 7498-1 terms

For the purposes of this document, the following terms given in ISO/IEC 7498-1 apply:

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- a) application entity;
 - b) application process;
 - c) application protocol data unit;
 - d) application service element; <https://standards.iteh.ai/catalog/standards/sist/b7b473da-cb38-4fcd-a099-b61d54ff46ff/iec-61158-6-25-2019>
 - e) application entity invocation; [b61d54ff46ff/iec-61158-6-25-2019](https://standards.iteh.ai/catalog/standards/sist/b7b473da-cb38-4fcd-a099-b61d54ff46ff/iec-61158-6-25-2019)
 - f) application process invocation;
 - g) application transaction;
 - h) real open system;
 - i) transfer syntax.

3.1.2 ISO/IEC 8822 terms

For the purposes of this document, the following terms given in ISO/IEC 8822 apply:

- a) abstract syntax;
- b) presentation context.

3.1.3 ISO/IEC 9545 terms

For the purposes of this document, the following terms given in ISO/IEC 9545 apply:

- a) application-association;
- b) application-context;
- c) application context name;
- d) application-entity-invocation;
- e) application-entity-type;
- f) application-process-invocation;
- g) application-process-type;
- h) application-service-element;

i) application control service element.

3.1.4 ISO/IEC 8824-1 terms

For the purposes of this document, the following terms given in ISO/IEC 8824-1 apply:

- a) object identifier;
- b) type.

3.2 Additional Type 25 terms and definitions

For the purpose of this document, the following definitions also apply.

NOTE Many definitions are common to more than one protocol Type; they are not necessarily used by all protocol Types.

3.2.1

ADP message

message conveyed by an autonomous decentralized system protocol

3.2.2

alive-message

message reporting own node state, periodically transmitted

3.2.3

block

basic unit of data transferred in a cyclic communication, each having a size of 64 octets

3.2.4

category N_f

category of an autonomous decentralized system protocol (full specifications) in type N

3.2.5

category N_l

category of an autonomous decentralized system protocol (light weight specifications) in type N

3.2.6

control communication

acyclic data communication for higher time-critical applications in type S network

3.2.7

cyclic communication

periodic data communication for real-time communication

3.2.8

cyclic transfer memory

memory which is allocated to each node in the data field, which each node transmits periodically for the purpose of sharing of this memory area logically

3.2.9

data field

logical place through which specific data passes, corresponding to real networks

3.2.10

domain

administrative set consisting of multiple data fields