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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Industrial communication networks – Fieldbus specifications – Part 4-1: Data-link layer protocol specification – Type 1 elements

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Réseaux de communication industriels – Spécifications des bus de terrain – Partie 4-1: Spécification du protocole de la couche liaison de données – Éléments de type 1

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Part 4-1: Data-link layer protocol specification – Type 1 elements

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International Standard IEC 61158-4-1 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 2007. This edition constitutes a technical revision.

The main change with respect to the previous edition is listed below:

- Improved terms

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

FDIS	Report on voting
65C/762/FDIS	65C/772/RVD

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0 INTRODUCTION

0.1 General

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 data-link protocol provides the data-link service by making use of the services available from the physical layer. The primary aim of this standard is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer data-link entities (DLEs) 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:

a) as a guide for implementors and designers;

b) for use in the testing and procurement of equipment;

c) as part of an agreement for the admittance of systems into the open systems environment;

d) as a refinement to the understanding of time-critical communications within OSI.

This standard is concerned, in particular, with the communication and interworking of sensors, effectors and other automation devices. By using this standard 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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0.2 Nomenclature for references within this standard

Clauses, including annexes, can be referenced in their entirety, including any subordinate subclauses, as "Clause N" or "Annex N", where N is the number of the clause or letter of the annex.

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Subclauses can be referenced in their entirety, including any subordinate subclauses, as "N.M" or "N.M.P" and so forth, depending on the level of the subclause, where N is the number of the subclause or letter of the annex, and M, P and so forth represent the successive levels of subclause up to and including the subclause of interest.

When a clause or subclause contains one or more subordinate subclauses, the text between the clause or subclause heading and its first subordinate subclause can be referenced in its entirety as "N.0" or "N.M.0" or "N.M.P.0" and so forth, where N, M and P are as above. Stated differently, a reference ending with ".0" designates the text and figures between a clause or subclause header and its first subordinate subclause.

NOTE This nomenclature provides a means of referencing text in hanging clauses. Such clauses existed in earlier editions of IEC 61784-3, Type 1 clauses. Those hanging clauses are maintained in this edition to minimize the disruption to existing national and multi-national standards and consortia documents which reference that prior subclause numbering.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 4-1: Data-link layer protocol specification – Type 1 elements

1 Scope

1.1 General

The data-link layer provides basic time-critical messaging communications between devices in an automation environment.

This protocol provides the data-link service by making use of the services available from the physical layer. The relationship between the International Standards for fieldbus data-link service, fieldbus data-link protocol, fieldbus physical service and systems management is described in IEC 61158-1.

This protocol provides communication opportunities to all participating data-link entities

a) in a cyclic asynchronous manner, sequentially to each of those data-link entities, and

b) in a synchronous manner, either cyclically or acyclically, according to a pre-established schedule.

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The specified protocol also provides means of changing the set of participating data-link entities and of modifying the set of scheduled communications opportunities. When the set of scheduled communications opportunities is null, the distribution of communication opportunities to the participating data-link entities is completely asynchronous.

Thus this protocol can be characterized as one which provides access asynchronously but with a synchronous overlay.

1.2 Specifications

This standard specifies

a) procedures for the timely transfer of data and control information from one data-link user entity to a peer user entity, and among the data-link entities forming the distributed data-link service provider;

b) the structure of the fieldbus DLPDUs used for the transfer of data and control information by the protocol of this standard, and their representation as physical interface data units.

NOTE In IEC 61158-4-1, gray boxes have been used in the tables to indicate that the specified field is not a conceptual part of the specific DLPDU.

1.3 Procedures

The procedures are defined in terms of

a) the interactions between peer DL-entities (DLEs) through the exchange of fieldbus DLPDUs;

b) the interactions between a DL-service (DLS) provider and a DLS-user in the same system through the exchange of DLS primitives;

c) the interactions between a DLS-provider and a Ph-service provider in the same system through the exchange of Ph-service primitives.

1.4 Applicability

These procedures are applicable to instances of communication between systems which support time-critical communications services within the data-link layer of the OSI or fieldbus reference models and which require the ability to interconnect in an open systems interconnection environment.

Profiles provide a simple multi-attribute means of summarizing an implementation's capabilities, and thus its applicability to various time-critical communications needs.

1.5 Conformance

This standard also specifies conformance requirements for systems implementing these procedures. This standard does not contain tests to demonstrate compliance with such requirements.

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.

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IEC 61158-1:2014, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

IEC 61158-4-1:2014
https://standards.iteh.ai/catalog/standards/sist/dc039f09-2cf9-437c-ac54-7775e1f7ab26/iec-61158-4-1-2014

IEC 61158-2:2014, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61158-3-1:2014, *Industrial communication networks – Fieldbus specifications – Part 3-1: Data link service definition – Type 1 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 8886, *Information technology – Open Systems Interconnection – Data link service definition*

ISO/IEC 10038:1993, *Information technology – Telecommunications and information exchange between systems – Local area networks – Media access control (MAC) bridges*

NOTE This edition has been withdrawn and replaced by ISO/IEC 15802-3:1998. However, the detailed references in this standard are to the 1993 edition.

ISO/IEC 10731, *Information technology – Open Systems Interconnection – Basic Reference Model – Conventions for the definition of OSI services*