

# INTERNATIONAL STANDARD

Industrial communication networks – Fieldbus specifications –  
Part 3-17: Data-link layer service definition – Type 17 elements

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –  
FIELDBUS SPECIFICATIONS –****Part 3-17: Data-link layer service definition – Type 17 elements**

## FOREWORD

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**NOTE** Use of some of the associated protocol types is restricted by their 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 particular data-link layer protocol type to be used with physical layer and application layer protocols in type combinations as specified explicitly in the IEC 61784 series. Use of the various protocol types in other combinations may require permission of their respective intellectual-property-right holders.

International Standard IEC 61158-3-17 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This first edition and its companion parts of the IEC 61158-3 subseries cancel and replace IEC 61158-3:2003. This edition of this part constitutes a technical addition. This part and its Type 17 companion parts also replace IEC/PAS 62405, published in 2005.

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

- a) deletion of the former Type 6 fieldbus, and the placeholder for a Type 5 fieldbus data-link layer, for lack of market relevance;
- b) addition of new types of fieldbuses;
- c) division of this part into multiple parts numbered 3-1, 3-2, ..., 3-19.

This edition of this part constitutes an editorial revision.

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

FDIS	Report on voting
65C/473/FDIS	65C/484/RVD

Full information on the voting for the approval of this 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.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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- withdrawn;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.

NOTE The revision of this standard will be synchronized with the other parts of the IEC 61158 series.

The 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.

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## 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/TR 61158-1.

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 data-link layer service defined in this standard is a conceptual architectural service, independent of administrative and implementation divisions.

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## INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

### Part 3-17: Data-link layer service definition – Type 17 elements

#### 1 Scope

This part of IEC 61158 provides common elements for basic time-critical messaging communications between devices in an automation environment. 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 Type 17 fieldbus data-link Layer in terms of

- a) the primitive actions and events of the service;
- b) the parameters associated with each primitive action and event, and the form which they take; and
- c) the interrelationship between these actions and events, and their valid sequences.

The purpose of this standard is to define the services provided to

- the Type 17 fieldbus application layer at the boundary between the application and data-link layers of the fieldbus reference model, and
- systems management at the boundary between the data-link layer and systems management of the fieldbus reference model;
- specifications

The principal objective of this standard is to specify the characteristics of conceptual data-link layer services suitable for time-critical communications, and thus supplement the OSI Basic Reference Model in guiding the development of data-link protocols for time-critical communications. A secondary objective is to provide migration paths from previously-existing industrial communications protocols.

This specification may be used as the basis for formal DL-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.
- Conformance

This standard does not specify individual implementations or products, nor does it constrain the implementations of data-link entities within industrial automation systems.

There is no conformance of equipment to this data-link layer service definition standard. Instead, conformance is achieved through implementation of the corresponding data-link protocol that fulfills the Type 17 data-link layer services defined in this standard.

## 2 Normative reference

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For all other undated references, the latest edition of the referenced document (including any amendments) applies.

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 10731:1994, *Information technology – Open Systems Interconnection – Basic Reference Model – Conventions for the definition of OSI services*

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*

Internet Engineering Task Force (IETF), *Request for Comments (RFC)*:

RFC 826 *Ethernet Address Resolution Protocol*  
(available at <<http://www.ietf.org/rfc/rfc0826.txt>>)

## 3 Definitions

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

### 3.1 Terms and definitions

#### 3.1.1 ISO/IEC 10731 terms

- a) (N)-connection
- b) (N)-entity
- c) (N)-layer
- d) (N)-service
- e) (N)-service-access-point
- f) confirm (primitive)
- g) deliver (primitive)
- h) indication (primitive)
- i) request (primitive)
- j) response (primitive)

#### 3.1.2 Other terms and definitions

##### 3.1.2.1

##### **bridge**

intermediate equipment that connects two or more segments using a data-link layer relay function

##### 3.1.2.2

##### **domain**

part of the RTE network consisting of one or two subnetwork(s)

NOTE Two subnetworks are required to compose a dual-redundant RTE network, and each end node in the domain is connected to both of the subnetworks.

**3.1.2.3****domain master**

station which performs diagnosis of routes to all other domains, distribution of network time to nodes inside the domain, acquisition of absolute time from the network time master and notification of status of the domain

**3.1.2.4****domain number**

numeric identifier which indicates a domain

**3.1.2.5****external bridge**

bridge to which neither internal bridges nor RTE stations are connected directly

**3.1.2.6****interface port**

physical connection point of an end node, which has an independent DL-address

**3.1.2.7****internal bridge**

bridge to which no routers, external bridges or nodes non-compliant with this specification are connected directly

**3.1.2.8****junction bridge**

bridge to which at least one router, external bridge or node non-compliant with this specification, and to which at least one internal bridge or RTE station is connected

**3.1.2.9****link**

physical communication channel between two nodes

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**3.1.2.10****network time master**

station which distributes network time to domain masters

**3.1.2.11****non-redundant interface node**

node which has a single interface port

**3.1.2.12****non-redundant station**

station that consists of a single end node

NOTE "non-redundant station" is synonymous with "end node".

**3.1.2.13****path**

logical communication channel between two nodes, which consists of one or two link(s)

**3.1.2.14****redundant interface node**

node with two interface ports one of which is connected to a primary network, while the other is connected to a secondary network

**3.1.2.15****redundant station**

station that consists of a pair of end nodes