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Edition 1.0 2007-12

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Part 6-13: Application layer protocol specification – Type 13 elements

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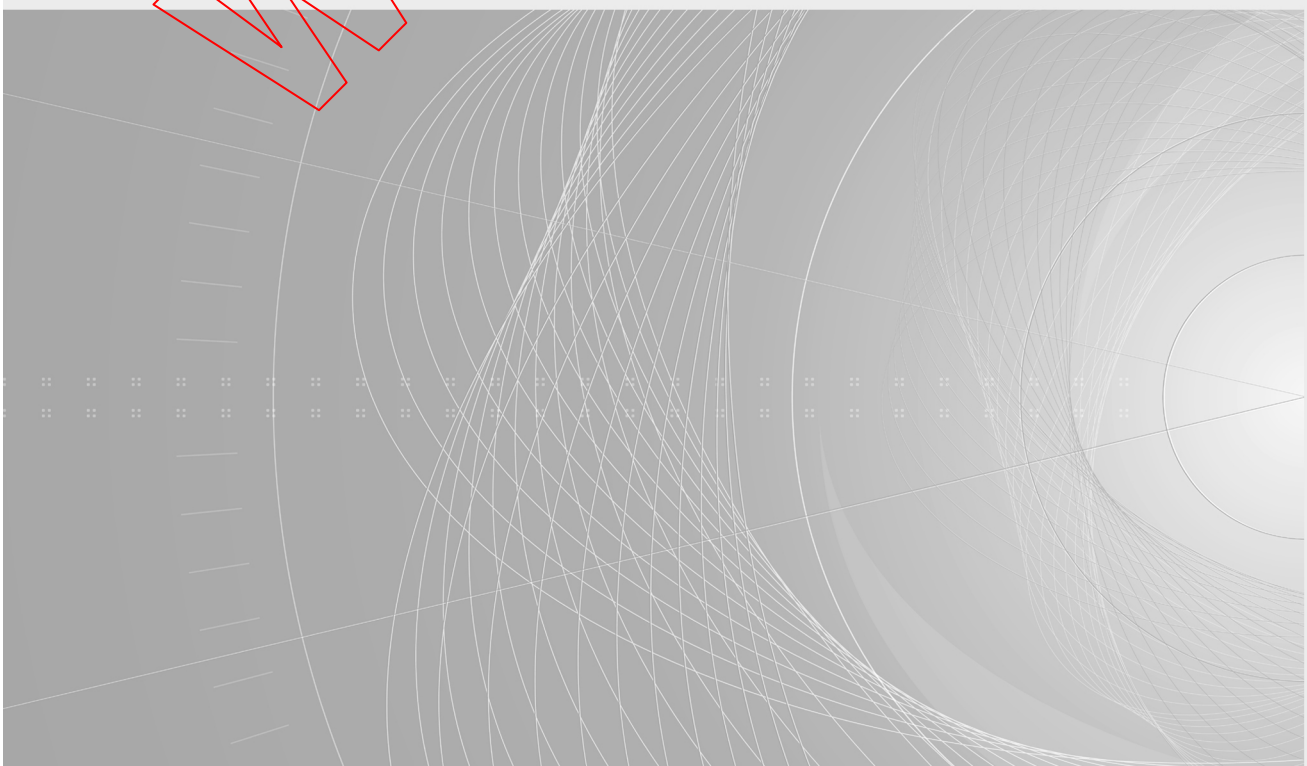

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Part 6-13: Application layer protocol specification – Type 13 elements

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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 61158-6-13 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 61158-6 subseries cancel and replace IEC 61158-6:2003. This edition of this part constitutes a technical addition. This part also replaces IEC/PAS 62408, published in 2005.

This edition of IEC 61158-6 includes the following significant changes from the previous edition:

a) deletion of the former Type 6 fieldbus for lack of market relevance;

b) addition of new types of fieldbuses;

c) partition of part 6 of the third edition into multiple parts numbered -6-2, -6-3, …

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

FDIS	Report on voting
65C/476/FDIS	65C/487/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.

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 standard 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 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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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-13: Application layer protocol specification – Type 13 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 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 13 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 standard specifies interactions between remote applications and defines the externally visible behavior provided by the Type 13 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 standard is to define the protocol provided to

1) define the wire-representation of the service primitives defined in IEC 61158- 5-13, and
2) define the externally visible behavior associated with their transfer.

This standard specify the protocol of the Type 13 fieldbus application layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498) and the OSI application layer structure (ISO/IEC 9545).

1.2 Specifications

The principal objective of this standard is to specify the syntax and behavior of the application layer protocol that conveys the application layer services defined in IEC 61158-5-13.

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.

1.3 Conformance

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

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Conformance is achieved through implementation of this application layer protocol specification.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 61158-3-13, *Industrial communication networks – Fieldbus specifications - Part 3-13: Data-link layer service definition – Type 13 elements*

IEC 61158-4-13, *Industrial communication networks – Fieldbus specifications - Part 4-13: Data-link layer protocol specification – Type 13 elements*

IEC 61158-5-13, *Industrial communication networks – Fieldbus specifications - Part 5-13: Application layer service definition – Type 13 elements*

ISO/IEC 7498 (all parts), *Information technology – Open Systems Interconnection – Basic Reference Model*

ISO/IEC 8822, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8824, *Information technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1)*

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

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3 Terms, definitions, symbols, abbreviations and conventions

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

3.1 ISO/IEC 7498-1 terms

This standard is partly based on the concepts developed in ISO/IEC 7498-1, and makes use of the following terms defined therein:

3.1.1
application entity

3.1.2
application process

3.1.3
application protocol data unit

3.1.4
application service element

3.1.5
application entity invocation

3.1.6
application transaction

3.1.7
transfer syntax

3.2 ISO/IEC 8822 terms

For the purposes of this document, the following term as defined in ISO/IEC 8822 applies:

3.2.1
abstract syntax

3.3 ISO/IEC 9545 terms

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

3.3.1
application-context

3.3.2
application-process-type

3.3.3
application-service-element

3.3.4
application control service element

3.4 ISO/IEC 8824 terms

For the purposes of this document, the following terms as defined in ISO/IEC 8824 apply:

3.4.1
any type

3.4.2
bitstring type

3.4.3
boolean type

3.4.4
choice type

3.4.5
false

3.4.6
integer type

3.4.7
module

3.4.8
null type

3.4.9
object identifier

3.4.10
octetstring type

3.4.11
production

3.4.12
simple type

3.4.13
sequence of type

3.4.14
sequence type

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3.4.15
structured type

3.4.16
tag

3.4.17
tagged type

3.4.18
true

3.4.19
type

3.5 Terms and definitions from IEC 61158-5-13

3.5.1
application relationship

3.5.2
client

3.5.3
error class

3.5.4
publisher

3.5.5
server

3.5.6
subscriber

3.6 Other terms and definitions

The following terms and definitions are used in this standard:

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3.6.1
receiving
service user that receives a confirmed primitive or an unconfirmed primitive, or a service provider that receives a confirmed APDU or an unconfirmed APDU

3.6.2
resource
processing or information capability of a subsystem

3.6.3
sending
service user that sends a confirmed primitive or an unconfirmed primitive, or a service provider that sends a confirmed APDU or an unconfirmed APDU

3.6.4
managing node
node that can manage the SCNM mechanism

3.6.5
controlled node
node without the ability to manage the SCNM mechanism

4 FAL syntax description

4.1 General

This description of the Type 13 abstract syntax uses formalisms similar to ASN.1, although the encoding rules differ from that standard.

4.2 FAL-AR PDU abstract syntax

4.2.1 Top level definition

```
APDU ::= CHOICE {
      [3] Isoc1
      [4] Isoc2
      [5] Asyn1
      [6] Asyn2
}
```

4.2.2 Isoc1

```
Isoc1 ::= SEQUENCE {
      message-type
      destination
      source
      reserved
      signaling-flags
      PDO-version
      reserved8
      size
      PDO-payload
}
```

4.2.3 Isoc2

```
Isoc2 ::= SEQUENCE {
      message-type
      destination
      source
      NMT-status
      signaling-flags
      PDO-version
      reserved8
      size
      PDO-payload
}
```

4.2.4 Asyn1

```
Asyn1 ::= SEQUENCE {
      message-type
      destination
      source
      NMT-status
      signaling-flags
      requested-service-ID
      requested-service-target
      EPL-version
}
```

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