DEUTSCHE NORM September 2008

DIN EN 61158-5-13

ICS 35.100.70; 35.160

Ersatzvermerk
siehe unten

Industrielle Kommunikationsnetze – Feldbusse – Teil 5-13: Dienstfestlegungen des Application Layer (Anwendungsschicht) – Typ 13-Elemente (IEC 61158-5-13:2007); Englische Fassung EN 61158-5-13:2008, nur auf CD-ROM

Industrial communication networks –
Fieldbus specifications –
Part 5-13: Application layer service definition – Type 13 elements (IEC 61158-5-13:2007);
English version EN 61158-5-13:2008, only on CD-ROM

Réseaux de communication industriels –
Spécifications des bus de terrain –
Partie 5-13: Définition des services des couches d'application – Eléments de type 13
(CEI 61158-5-13:2007);
Version anglaise EN 61158-5-13:2008, seulement en CD-ROM

Ersatzvermerk

Mit DIN EN 61158-5-2:2008-09, DIN EN 61158-5-3:2008-09, DIN EN 61158-5-4:2008-09, DIN EN 61158-5-5:2008-09, DIN EN 61158-5-7:2008-09, DIN EN 61158-5-8:2008-09, DIN EN 61158-5-9:2008-09, DIN EN 61158-5-10:2008-09, DIN EN 61158-5-11:2008-09, DIN EN 61158-5-12:2008-09, DIN EN 61158-5-14:2008-09, DIN EN 61158-5-15:2008-09, DIN EN 61158-5-16:2008-09, DIN EN 61158-5-17:2008-09, DIN EN 61158-5-18:2008-09, DIN EN 61158-5-19:2008-09 und DIN EN 61158-5-20:2008-09 Ersatz für DIN EN 61158-5:2005-05
Siehe jedoch Beginn der Gültigkeit

Gesamtumfang 60 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

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Beginn der Gültigkeit

Die von CENELEC am 2008-02-01 angenommene EN 61158-5-13 gilt als DIN-Norm ab 2008-09-01.

Daneben darf DIN EN 61158-5:2005-05 noch bis 2011-02-01 angewendet werden.

Nationales Vorwort

Mit DIN EN 61158-5-2:2008-09, DIN EN 61158-5-3:2008-09, DIN EN 61158-5-4:2008-09, DIN EN 61158-5-5:2008-09, DIN EN 61158-5-7:2008-09, DIN EN 61158-5-8:2008-09, DIN EN 61158-5-9:2008-09, DIN EN 61158-5-10:2008-09, DIN EN 61158-5-11:2008-09, DIN EN 61158-5-12:2008-09, DIN EN 61158-5-14:2008-09, DIN EN 61158-5-15:2008-09, DIN EN 61158-5-16:2008-09, DIN EN 61158-5-17:2008-09, DIN EN 61158-5-18:2008-09, DIN EN 61158-5-19:2008-09 und DIN EN 61158-5-20:2008-09 Ersatz für DIN EN 61158-5:2005-05.

Vorausgegangener Norm-Entwurf: E DIN EN 61158-500:2006-11.

Für diese Norm ist das nationale Arbeitsgremium K 956 „Feldbus“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (www.dke.de) zuständig.

Die enthaltene IEC-Publikation wurde vom SC 65C „Industrial networks“ erarbeitet.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem Datum (maintenance result date) unverändert bleiben soll, das auf der IEC-Website unter „http://webstore.iec.ch“ zu dieser Publikation angegeben ist. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation
– bestätigt,
– zurückgezogen,
– durch eine Folgeausgabe ersetzt oder
– geändert.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als Europäische Norm EN 60068 durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Einführung

Ein Feldbus ist ein digitaler serieller Datenbus für die Kommunikation zwischen Geräten der industriellen Automatisierungstechnik wie beispielsweise Messeinrichtungen, Stellgliedern, Reglern und speicherprogrammierbaren Steuerungen. Die Normen der Reihe DIN EN 61158 legen eine Anzahl von Feldbus-Protokolltypen fest.

Die vorliegende Norm legt die Dienste fest, die von einem Feldbus-Application Layer des Typs 13 (ETHERNET Powerlink) zur Verfügung gestellt werden. Dieser war in den unten aufgeführten früheren Ausgaben nicht enthalten.

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Änderungen

Gegenüber DIN EN 61158-5:2005-05 wurden folgende Änderungen vorgenommen:

a) Streichung des Typ 6-Feldbusses wegen zu geringer Marktbedeutung;

b) Hinzufügung von weiteren Feldbustypen;

c) Aufteilung in mehrere Teile, jeweils als 5-2, 5-3, …, 5-20 benummert.

Frühere Ausgaben

DIN V 19245-1: 1988-01
DIN 19245-1: 1991-04
DIN 19245-2: 1991-04
DIN EN 50170-1: 1997-07
DIN EN 50170-2: 1997-07
DIN EN 50170-3: 1997-07
DIN EN 50254: 1999-07
DIN EN 50170/A1: 2002-11
DIN EN 50170/A2: 2000-08
DIN EN 50170/A3: 2002-11
DIN EN 61158-5: 2005-05

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EUROPÄISCHE NORM

EUROPEAN STANDARD

NORME EUROPÉENNE

EN 61158-5-13

März 2008

ICS 35.100.70; 25.040.40

Ersatz für EN 61158-5:2004 (teilweise)

Deutsche Fassung

Industrielle Kommunikationsnetze – Feldbusse – Teil 5-13: Dienstfestlegungen des Application Layer (Anwendungsschicht) – Typ 13-Elemente

(IEC 61158-5-13:2007)

Industrial communication networks – Fieldbus specifications – Part 5-13: Application layer service definition – Type 13 elements
(IEC 61158-5-13:2007)

Réseaux de communication industriels – Spécifications des bus de terrain – Partie 5-13: Définition des services des couches d'application – Eléments de type 13
(CEI 61158-5-13:2007)

Diese Europäische Norm wurde von CENELEC am 2008-02-01 angenommen. Die CENELEC-Mitglieder sind gehalten, die CEN/CENELEC-Geschäftsordnung zu erfüllen, in der die Bedingungen festgelegt sind, unter denen dieser Europäischen Norm ohne jede Änderung der Status einer nationalen Norm zu geben ist.

Auf dem letzten Stand befindliche Listen dieser nationalen Normen mit ihren bibliographischen Angaben sind beim Zentralsekretariat oder bei jedem CENELEC-Mitglied auf Anfrage erhältlich.

Diese Europäische Norm besteht in drei offiziellen Fassungen (Deutsch, Englisch, Französisch). Eine Fassung in einer anderen Sprache, die von einem CENELEC-Mitglied in eigener Verantwortung durch Übersetzung in seine Landessprache gemacht und dem Zentralsekretariat mitgeteilt worden ist, hat den gleichen Status wie die offiziellen Fassungen.

CENELEC-Mitglieder sind die nationalen elektrotechnischen Komitees von Belgien, Bulgarien, Dänemark, Deutschland, Estland, Finnland, Frankreich, Griechenland, Irland, Island, Italien, Lettland, Litauen, Luxemburg, Malta, den Niederlanden, Norwegen, Österreich, Polen, Portugal, Rumänien, Schweden, der Schweiz, der Slowakei, Slowenien, Spanien, der Tschechischen Republik, Ungarn, dem Vereinigten Königreich und Zypern.

CENELEC

Europäisches Komitee für Elektrotechnische Normung
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique

Zentralsekretariat: rue de Stassart 35, B-1050 Brüssel

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Vorwort

Der Text des Schriftstücks 65C/475/FDIS, zukünftige 1. Ausgabe von IEC 61158-5-13, ausgearbeitet von dem SC 65C „Industrial networks“ des IEC/TC 65 „Industrial-process measurement, control and automation“, wurde der IEC-CENELEC Parallelen Abstimmung unterworfen und von CENELEC am 2008-02-01 als EN 61158-5-13 angenommen.

Dieser und die weiteren Teile der Normenreihe EN 61158-5 ersetzen EN 61158-5:2004.

Gegenüber EN 61158-5:2004 wurden die folgenden Änderungen durchgeführt:

– Streichung des Typ 6-Feldbusses wegen zu geringer Marktbedeutung;
– Hinzufügung von weiteren Feldbustypen;
– Aufteilung in mehrere Teile, jeweils als 5-2, 5-3…, 5-20 benummert.

Nachstehende Daten wurden festgelegt:

– spätestes Datum, zu dem die EN auf nationaler Ebene durch Veröffentlichung einer identischen nationalen Norm oder durch Anerkennung übernommen werden muss (dop): 2008-11-01

– spätestes Datum, zu dem nationale Normen, die der EN entgegenstehen, zurückgezogen werden müssen (dow): 2011-02-01

ANMERKUNG Die Anwendung einiger der aufgeführten Protokolltypen wird durch die Inhaber der Rechte an geistigem Eigentum hieran eingeschränkt. Die Zusage zur begrenzten Freigabe ihrer Rechte an geistigem Eigentum durch die Inhaber erlaubt in jedem Fall die Anwendung eines bestimmten Data Link Layer-Protokolls zusammen mit einem Physical Layer- und einem Application Layer-Protokoll in Typzusammenstellungen, die in der Normenreihe EN 61784 angegeben sind. Die Anwendung der verschiedenen Protokolltypen in anderen Zusammenstellungen erfordert möglicherweise die Erlaubnis des jeweiligen Inhabers der Rechte an dem entsprechenden geistigen Eigentum.

Der Anhang ZA wurde von CENELEC hinzugefügt.

Anerkennungsnotiz

Der Text der Internationalen Norm IEC 61158-5-13:2007 wurde von CENELEC ohne irgendeine Abänderung als Europäische Norm angenommen.

In der offiziellen Fassung sind unter „Literaturhinweise“ zu den aufgelisteten Normen die nachstehenden Anmerkungen einzutragen:

IEC 61158-3-13 ANMERKUNG Harmonisiert als EN 61158-3-13:2008 (nicht modifiziert).

IEC 61158-4-13 ANMERKUNG Harmonisiert als EN 61158-4-13:2008 (nicht modifiziert).

IEC 61158-6-13 ANMERKUNG Harmonisiert als EN 61158-6-13:2008 (nicht modifiziert).

IEC 61784-2 ANMERKUNG Harmonisiert als EN 61784-2:2008 (nicht modifiziert).

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CONTENTS

INTRODUCTION 5
1 Scope 6
1.1 Overview 6
1.2 Specifications 7
1.3 Conformance 7
2 Normative references 7
3 Terms, definitions, symbols, abbreviations and conventions 8
3.1 ISO/IEC 7498-1 terms 8
3.2 ISO/IEC 8822 terms 8
3.3 ISO/IEC 9545 terms 8
3.4 Fieldbus application-layer specific definitions 8
3.5 Abbreviations and symbols 15
3.6 Conventions 15
4 Concepts 18
4.1 Common concepts 18
4.2 Type specific concepts 18
5 Data type ASE 19
5.1 General 19
5.2 Formal definition of data type objects 20
5.3 FAL defined data types 20
5.4 Data type ASE service specification 25
6 Type 13 communication model specification 25
6.1 ASEs 25
6.2 ARs 46
6.3 Summary of FAL classes 53
6.4 Permitted FAL services by AREP role 54
Bibliography 55
Annex ZA (normative) Normative references to international publications with their corresponding European publications 56
Figure 1 – The ASEs of Type 13 19
Figure 2 – The AR ASE conveys APDUs between APs 42

Table 1 – Overall structure of the OD 18
Table 2 – Ident service 28
Table 3 – Status service 29
Table 4 – NMT-req-invite service 30
Table 5 – NMT-state-command service 31
Table 6 – NMT-info service 32
Table 7 – SDO-download 34
Table 8 – SDO-down-mult 35
Table 9 – SDO-upload 36
Table 10 – SDO-up-mult 37
Table 11 – SDO-abort 38

Documents
Document Sharing Hub
Full document details: DIN EN 61158-5-13:2008-09

Table 12 – PDO-transfer 41
Table 13 – Conveyance of service primitives by AREP role 42
Table 14 – Valid combinations of AREP roles involved in an AR 43
Table 15 – FAL class summary 53
Table 16 – Services by AREP role 54

Documents
Document Sharing Hub

Full document details: DIN EN 61158-5-13:2008-09

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 service is provided by the application protocol making use of the services available from the data-link or other immediately lower layer. This standard defines the application service characteristics that fieldbus applications and/or system management may 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 standard is a conceptual architectural service, independent of administrative and implementation divisions.

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-13: Application layer service definition – Type 13 elements

1 Scope

1.1 Overview

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 defines in an abstract way the externally visible service provided by the different Types of the fieldbus Application Layer in terms of

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

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

1) the FAL user at the boundary between the user and the Application Layer of the Fieldbus Reference Model, and
2) Systems Management at the boundary between the Application Layer and Systems Management of the Fieldbus Reference Model.

This standard specifies the structure and services of the IEC fieldbus Application Layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498) 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 standard to provide access to the FAL to control certain aspects of its operation.

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Full document details: DIN EN 61158-5-13:2008-09

1.2 Specifications

The principal objective of this standard 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 specification may 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 standard 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 any given Type of application layer services as defined in this standard.

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 60559, *Binary floating-point arithmetic for microprocessor systems*

IEC/TR 61158-1 (Ed.2.0), *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

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

ISO/IEC 7498-3, *Information technology – Open Systems Interconnection – Basic Reference Model – Part 3: Naming and addressing*

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

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*

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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

a) application entity
b) application process
c) application protocol data unit
d) application service element
e) application entity invocation
f) application process invocation
g) application transaction
h) real open system
i) transfer syntax

3.2 ISO/IEC 8822 terms

a) abstract syntax
b) presentation context

3.3 ISO/IEC 9545 terms

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

3.4 Fieldbus application-layer specific definitions

For the purposes of this part of IEC 61158, the following terms and definitions apply.

3.4.1
application
function or data structure for which data is consumed or produced

3.4.2
application objects
multiple object classes that manage and provide a run time exchange of messages across the network and within the network device

3.4.3
application process
part of a distributed application on a network, which is located on one device and unambiguously addressed

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3.4.4
application process identifier
distinguishes multiple application processes used in a device

3.4.5
application process object
component of an application process that is identifiable and accessible through an FAL application relationship

NOTE Application process object definitions are composed of a set of values for the attributes of their class (see the definition for Application Process Object Class Definition). Application process object definitions may be accessed remotely using the services of the FAL Object Management ASE. FAL Object Management services can be used to load or update object definitions, to read object definitions, and to dynamically create and delete application objects and their corresponding definitions.

3.4.6
application process object class
class of application process objects defined in terms of the set of their network-accessible attributes and services

3.4.7
application relationship
cooperative association between two or more application-entity-invocations for the purpose of exchange of information and coordination of their joint operation. This relationship is activated either by the exchange of application-protocol-data-units or as a result of preconfiguration activities

3.4.8
application relationship application service element
application-service-element that provides the exclusive means for establishing and terminating all application relationships

3.4.9
application relationship endpoint
context and behavior of an application relationship as seen and maintained by one of the application processes involved in the application relationship

NOTE Each application process involved in the application relationship maintains its own application relationship endpoint.

3.4.10
attribute
description of an externally visible characteristic or feature of an object

NOTE The attributes of an object contain information about variable portions of an object. Typically, they provide status information or govern the operation of an object. Attributes may also affect the behavior of an object. Attributes are divided into class attributes and instance attributes.

3.4.11
behavior
indication of how an object responds to particular events

3.4.12
channel
single physical or logical link of an input or output application object of a server to the process

3.4.13
class
set of objects, all of which represent the same kind of system component

NOTE A class is a generalisation of an object; a template for defining variables and methods. All objects in a class are identical in form and behavior, but usually contain different data in their attributes.

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3.4.14
class attributes
attribute that is shared by all objects within the same class

3.4.15
class code
unique identifier assigned to each object class

3.4.16
class specific service
service defined by a particular object class to perform a required function which is not performed by a common service

NOTE A class specific object is unique to the object class which defines it.

3.4.17
client
a) object which uses the services of another (server) object to perform a task

b) initiator of a message to which a server reacts

3.4.18
controlled node
All nodes except one (this is the Managing Node) in a Type 13 network are of this type.

3.4.19
connection
logical binding between application objects that may be within the same or different devices

NOTE Connections may be either point-to-point or multipoint.

3.4.20
connection channel
description of a connection between a sink and a source of data items

3.4.21
connection path
an octet stream that defines the application object to which a connection instance applies

3.4.22
connection point
buffer which is represented as a subinstance of an Assembly object

3.4.23
consume
act of receiving data from a producer

3.4.24
consumer
node or sink that is receiving data from a producer

3.4.25
consuming application
application that consumes data

3.4.26
control commands
action invocations transferred from client to server to clear outputs, freeze inputs and/or synchronise outputs

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3.4.27
conveyance path
unidirectional flow of APDUs across an application relationship

3.4.28
cyclic
repetitive in a regular manner

3.4.29
data consistency
means for coherent transmission and access of the input- or output-data object between and within client and server

3.4.30
device
physical hardware connected to the link

NOTE A device may contain more than one node.

3.4.31
device profile
a collection of device dependent information and functionality providing consistency between similar devices of the same device type

3.4.32
diagnosis information
all data available at the server for maintenance purposes

3.4.33
end node
producing or consuming node

3.4.34
endpoint
one of the communicating entities involved in a connection

3.4.35
error
discrepancy between a computed, observed or measured value or condition and the specified or theoretically correct value or condition

3.4.36
error class
general grouping for related error definitions and corresponding error codes

3.4.37
error code
identification of a specific type of error within an error class

3.4.38
event
an instance of a change of conditions

3.4.39
FIFO variable
a Variable Object class, composed of a set of homogeneously typed elements, where the first written element is the first element that can be read

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NOTE On the fieldbus only one, complete element can be transferred as a result of one service invocation.

3.4.40
frame
denigrated synonym for DLPDU

3.4.41
group
a) <general> a general term for a collection of objects.

Specific uses:

b) <addressing> when describing an address, an address that identifies more than one entity

3.4.42
invocation
act of using a service or other resource of an application process

NOTE Each invocation represents a separate thread of control that may be described by its context. Once the service completes, or use of the resource is released, the invocation ceases to exist. For service invocations, a service that has been initiated but not yet completed is referred to as an outstanding service invocation. Also for service invocations, an Invoke ID may be used to unambiguously identify the service invocation and differentiate it from other outstanding service invocations.

3.4.43
index
address of an object within an application process

3.4.44
instance
the actual physical occurrence of an object within a class that identifies one of many objects within the same object class

EXAMPLE California is an instance of the object class US-state.

NOTE The terms object, instance, and object instance are used to refer to a specific instance.

3.4.45
instance attributes
attribute that is unique to an object instance and not shared by the object class

3.4.46
instantiated
object that has been created in a device

3.4.47
logical device
a certain FAL class that abstracts a software component or a firmware component as an autonomous self-contained facility of an automation device

3.4.48
manufacturer ID
identification of each product manufacturer by a unique number

3.4.49
management information
network-accessible information that supports managing the operation of the fieldbus system, including the application layer

NOTE Managing includes functions such as controlling, monitoring, and diagnosing.

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3.4.50
message router
object within a node that distributes messaging requests to appropriate application objects

3.4.51
managing node
One node of a type 13 network must act as a managing node.

3.4.52
multipoint connection
connection from one node to many

NOTE Multipoint connections allow messages from a single producer to be received by many consumer nodes.

3.4.53
network
a set of nodes connected by some type of communication medium, including any intervening repeaters, bridges, routers and lower-layer gateways

3.4.54
node
host of one AP, identified by a unique DLCEP-address.

3.4.55
object
abstract representation of a particular component within a device, usually a collection of related data (in the form of variables) and methods (procedures) for operating on that data that have clearly defined interface and behavior

3.4.56
object dictionary
Collection of definitions. communication specific attributes and parameters, and application dependent data

3.4.57
object specific service
service unique to the object class which defines it

3.4.58
originator
client responsible for establishing a connection path to the target

3.4.59
physical device
automation or other network device

3.4.60
point-to-point connection
connection that exists between exactly two application objects

3.4.61
pre-established AR endpoint
AR endpoint that is placed in an established state during configuration of the AEs that control its endpoints

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3.4.62
process data
object(s) which are already pre-processed and transferred cyclically for the purpose of information or further processing

3.4.63
produce
act of sending data to be received by a consumer

3.4.64
producer
node that is responsible for sending data

3.4.65
property
general term for descriptive information about an object

3.4.66
provider
source of a data connection

3.4.67
publisher
role of an AR endpoint that transmits APDUs onto the fieldbus for consumption by one or more subscribers

NOTE A publisher may not be aware of the identity or the number of subscribers.

3.4.68
publishing manager
role of an AR endpoint in which it issues one or more confirmed service request APDUs to a publisher to request the publisher to publish a specified object. Two types of publishing managers are defined by this standard, pull publishing managers and push publishing managers, each of which is defined separately

3.4.69
push publisher
type of publisher that publishes an object in an unconfirmed service request APDU

3.4.70
push publishing manager
type of publishing manager that requests that a specified object be published using an unconfirmed service

3.4.71
push subscriber
type of subscriber that recognizes received unconfirmed service request APDUs as published object data

3.4.72
server
a) role of an AREP in which it returns a confirmed service response APDU to the client that initiated the request

b) object which provides services to another (client) object

3.4.73
service
operation or function than an object and/or object class performs upon request from another object and/or object class

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