DEUTSCHE NORM September 2015

DIN EN 61158-6-10

ICS 35.100.70; 35.160

Ersatz für
DIN EN 61158-6-10:2013-05
Siehe Anwendungsbeginn

Industrielle Kommunikationsnetze – Feldbusse – Teil 6-10: Protokollspezifikation des Application Layer (Anwendungsschicht) – Typ 10-Elemente (IEC 61158-6-10:2014); Englische Fassung EN 61158-6-10:2014, nur auf CD-ROM

Industrial communication networks –
Fieldbus specifications –
Part 6-10: Application layer protocol specification – Type 10 elements
(IEC 61158-6-10:2014);
English version EN 61158-6-10:2014, only on CD-ROM

Réseaux de communication industriels –
Spécifications des bus de terrain –
Partie 6-10: Spécification du protocole de la couche application – Éléments de type 10
(CEI 61158-6-10:2014);
Version anglaise EN 61158-6-10:2014, seulement en CD-ROM

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Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2014-09-23 angenommene Europäische Norm als DIN-Norm ist 2015-09-01.

Für DIN EN 61158-6-10:2013-05 besteht eine Übergangsfrist bis 2017-09-23.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 61158-600:2013-08.

Für dieses Dokument ist das nationale Arbeitsgremium K 956 „Feldbus“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in 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 (stability 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,
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Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf ein Dokument ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils aktuellste Ausgabe des in Bezug genommenen Dokuments.

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

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für die vorliegende Norm erfüllt.

Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 61158-6-10 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

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 das Protokoll des Application Layer für Typ 10 fest.

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Änderungen

Gegenüber DIN EN 61158-6-10:2013-05 wurden folgende Änderungen vorgenommen:

a) dynamisches Frame Packaging eingeführt;
b) Peer-to-Peer-Fragmentierung eingeführt;
c) Fast Forwarding eingeführt;
d) RT_CLASS_3 Aufstart und Forwarding verbessert;
e) isochrones Aufstarten verbessert;
f) geteilte RT_CLASS_3 ARs eingeführt;
g) herstellerspezifische Verbindungsblöcke eingeführt;
h) Diagnose von POF-Lichtwellenleitern eingeführt;
i) LLDP-EXT_MIB auf den neuesten Stand gebracht;
j) Autokonfiguration eingeführt;
k) Redundanz nach MRPD (Seamless Media Redundancy) eingeführt;
l) grundlegende Funktionen zur Systemredundanz eingeführt;
m) grundlegende Funktionen zur Konfiguration während des Betriebes eingeführt;
n) Startzeit nach Netzausfall verkürzt;
o) Verweisung auf MRP eingeführt;
p) Unterstützung von Mehrfach-Schnittstellen eingeführt;
q) Fehlerstatistik je Port eingeführt;
r) MRRT entfernt;
s) grundlegende Funktionen zur Kommunikation von Controller zu Controller
t) Entfernung von verteilter Automation.

Frühere Ausgaben

DIN V 19245-1: 1988-01
DIN EN 61158-6: 2005-05
DIN EN 61158-6-10: 2008-09, 2013-05

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Nationaler Anhang NA
(informativ)

1 Anwendungsbereich[N1)]

1.1 Allgemeines

Der Feldbus-Application Layer (FAL) liefert Benutzerprogramme mit Hilfsmitteln für den Zugriff auf die Feldbuskommunikationsumgebung. In dieser Hinsicht kann der FAL als ein Fenster zwischen zugehörigen Anwendungsprogrammen betrachtet werden.

Diese Norm stellt für Typ 10-Feldbusse maßgebliche allgemeine Elemente für zeitkritischen und nicht zeitkritischen Datentransfer zwischen Anwendungsprogrammen in einer Automatisierungsumgebung bereit. Der Begriff „zeitkritisch“ (en: time-critical) wird verwendet, um die Präsenz eines Zeitfensters darzustellen, in dem eine oder mehrere festgelegte Aktivitäten mit einem vorherbestimmten Grad an Gewissheit erledigt werden. Das Scheitern der Erledigung der festgelegten Aktivität innerhalb des Zeitfensters trägt das Risiko des Betriebsausfalls der Anwendung mit und somit das aufgeforderte Eingreifen mit dazugehörigem Risiko für Geräte, Anlage und möglicherweise Menschenleben.

Diese Norm definiert auf eine abstrakte Weise das von außen sichtbare Verhalten, das vom Typ 10 des Feldbus-Application Layer bereitgestellt wird, in Form von:

a) einer abstrakten Syntax zur Festlegung der Application Layer-Protokoll-Dateneinheiten, die zwischen kommunizierenden Anwendungseinheiten übermittelt werden;

b) der übertragenen Syntax zur Festlegung der Application Layer-Protokoll-Dateneinheiten, die zwischen kommunizierenden Anwendungseinheiten übermittelt werden;

c) des Anwendungskontext der Zustandsmaschine zur Festlegung des sichtbaren Dienstverhalten zwischen kommunizierenden Anwendungseinheiten;

d) der Anwendungsbeziehung der Zustandsmaschine zur Festlegung des sichtbaren Kommunikationsverhaltens zwischen kommunizierenden Anwendungseinheiten.

Der Zweck dieser Norm ist, das Protokoll zu definieren, welches bereitgestellt wird zur

- Festlegung der Leitungsdarstellung der Dienstprimitiven, welche in IEC 61158-5-10 beschrieben sind, und
- zur Festlegung des von außen sichtbaren Verhaltens verbunden mit ihrer Übertragung.

Diese Norm beschreibt das Protokoll des Typ 10-Feldbus-Application Layer in Übereinstimmung mit dem OSI-Basis-Referenzmodell (ISO/IEC 7498-1) und der OSI-Application Layer-Struktur (ISO/IEC 9545).

1.2 Spezifikationen

Das hauptsächliche Ziel dieser Norm ist das Festlegen der Syntax und des Verhaltens des Application Layer-Protokolls, welches die in IEC 61158-5-10 beschriebenen Application Layer-Dienste, vermittelt.

Ein zweites Ziel ist das Bereitstellen von Migrationspfaden von bisherigen bestehenden industriellen Kommunikationsprotokollen. Es ist dieses letztere Ziel, welches zur Vielfalt von Protokollen die in der IEC 61158-6 genormt sind, geführt hat.

[N1)] Die Nummerierung aus IEC 61158-6-10 wurde beibehalten.

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1.3 Konformität

Diese Norm legt keine individuellen Implementierungen oder Produkte fest, auch beschränkt sie die Implementierungen von Application Layer-Einheiten innerhalb eines industriellen Automatisierungssystems nicht. Konformität wird erreicht durch das Implementieren dieser Application Layer-Protokoll-Spezifikation.

3.2 Zusätzliche Begriffe zur dezentralisierten Peripherie

3.2.1
Alarm
(en: alarm)
Aktivierung eines Ereignisses, das einen kritischen Zustand aufweist

3.2.2
Alarmbestätigung
(en: alarm ack)
Bestätigung eines Ereignisses, das einen kritischen Zustand aufweist

3.2.3
Alarmdatenobjekt
(en: alarm data object)
Objekt, das kritische Zustände aufweist und auf die durch den Geräte/Slot/Subslot-Alarmtyp verwiesen wird

3.2.4
zuweisen
(en: allocate)
eine Ressource aus einem allgemeinen Bereich für die ausschließliche Nutzung durch eine spezifische Entität zuordnen

3.2.5
Anwendung
(en: application)
Funktion oder Datenstruktur, für die Daten konsumiert oder produziert werden

3.2.6
Interoperabilität auf Application Layer
(en: application layer interoperability)
Fähigkeit von Anwendungsentitäten, mithilfe der Dienste der FAL koordinierte und kooperative Operationen auszuführen

3.2.7
Anwendungsobjekte
(en: application objects)
mehrere Objektklassen, die zur Laufzeit für einen Austausch von PDUs im Netzwerk und innerhalb des Netzwerkgerätes sorgen und diesen verwalten

3.2.8
Anwendungsprozess
(en: application process)
Teil einer verteilten Anwendung in einem Netzwerk, der sich auf einem Gerät befindet und eindeutig adressiert wird

3.2.9
Anwendungsprozesskennung
(en: application process identifier)
unterscheidet mehrere in einem Gerät verwendete Anwendungsprozesse

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3.2.10
Anwendungsprozessobjekt
(en: application process object)
Komponente eines Anwendungsprozesses, die über eine FAL-Anwendungsbeziehung identifizierbar und zugänglich ist

Anmerkung 1 zum Begriff: Definitionen von Anwendungsprozessobjekten setzen sich aus einem Satz von Werten für die Attribute deren Klasse zusammen (siehe Definition von „Anwendungsprozessobjektklasse“). Auf die Definitionen von Anwendungsprozessobjekten kann mithilfe der Dienste des Objektverwaltungs-ASE der FAL von einem entfernten Standort aus zugegriffen werden. Objektverwaltungsdienste der FAL können zum Laden und Aktualisieren von Objektdefinitionen, zum Lesen von Objektdefinitionen und zur dynamischen Erstellung und Löschung von Anwendungsobjekten und deren Definitionen genutzt werden.

3.2.11
Anwendungsprozessobjektklasse
(en: application process object class)
die in Bezug auf den Satz der über das Netzwerk zugänglichen Attribute und Dienste der Anwendungsprozessobjekte definiert ist

3.2.12
Anwendungsbeziehung
(en: application relationship)
kooperative Verbindung zwischen zwei oder mehr Aufrufen von Anwendungsentitäten zum Zweck des Informationsaustausches und der Koordination des gemeinsamen Betriebs. Diese Beziehung wird entweder durch den Austausch von Protokolldateneinheiten der Anwendung oder als Ergebnis von Vorkonfigurationsaktivitäten aktiviert.

3.2.13
Anwendungsdienstelement für Anwendungsbeziehungen
(en: application relationship application service element)
Anwendungsdienstelement, das die alleinigen Mittel für den Aufbau und die Beendigung aller Anwendungsbeziehungen bereitstellt

3.2.14
Endpunkt der Anwendungsbeziehung
(en: application relationship endpoint)
Kontext und Verhalten einer Anwendungsbeziehung entsprechend der Sicht und Verwaltung durch einen der Anwendungsprozesse innerhalb der Anwendungsbeziehung

Anmerkung 1 zum Begriff: Jeder Anwendungsprozess, der in die Anwendungsbeziehung eingeschlossen ist, verwaltet seinen eigenen Endpunkt der Anwendungsbeziehung.

3.2.15
Attribut
(en: attribute)
Beschreibung eines von außen sichtbaren Merkmals oder einer von außen sichtbaren Funktion eines Objekts

Anmerkung 1 zum Begriff: Die Attribute eines Objekts enthalten Informationen zu veränderlichen Teilen eines Objekts. Attribute liefern üblicherweise Statusinformationen oder steuern den Betrieb eines Objekts. Attribute können auch das Verhalten eines Objekts beeinflussen. Attribute werden in Klassenattribute und Instanzattribute unterteilt.

3.2.16
backup
(en: backup)
Status der E/A-AR, der angibt, dass sich diese in Bereitschaft befindet

3.2.17
Verhalten
(en: behavior)
Anzeige dafür, wie das Objekt auf bestimmte Ereignisse reagiert

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3.2.18
Kanal
(en: channel)
Darstellung eines einzelnen physischen oder logischen Verbindungszweiges eines Eingabe- oder Ausgabe-Anwendungsobjektes eines Servers zum Prozess, um die Adressierung von Diagnose-Informationen zu unterstützen

Anmerkung 1 zum Begriff: Der Kanal stellt typischerweise einen einzelnen Stecker oder eine einzelne Klemme als reale Schnittstelle eines Moduls oder Untermoduls dar. Diese Referenz wird verwendet, um Ausfallpunkte innerhalb von Diagnose-PDUs zu identifizieren.

3.2.19
Kanaldiagnose
(en: channel diagnosis)
Informationen in Bezug auf ein spezifisches Element eines Eingabe- oder Ausgabe-Anwendungsobjekts, die zu Wartungszwecken bereitgestellt werden

BEISPIEL Leitungsbruch.

3.2.20
Klasse
(en: class)
Menge von Objekten, die allesamt den gleichen Typ von Systemkomponenten repräsentieren

Anmerkung 1 zum Begriff: Eine Klasse ist eine Verallgemeinerung eines Objekts; eine Vorlage für die Festlegung von Variablen und Methoden. Alle Objekte in einer Klasse sind in ihrer Form und in ihrem Verhalten identisch, enthalten aber üblicherweise unterschiedliche Daten in ihren Attributen.

3.2.21
Klassenattribute
(en: class attributes)
Attribut, welches allen Objekten innerhalb derselben Klasse gemeinsam ist

3.2.22
Klassencode
(en: class code)
eindeutige Kennung, die jeder Objektklasse zugewiesen ist

3.2.23
klassenspezifischer Dienst
(en: class specific service)
durch eine bestimmte Objektklasse definierter Dienst, um eine erforderliche Funktion auszuführen, welche nicht als allgemeiner Dienst ausgeführt wird

Anmerkung 1 zum Begriff: Ein klassenspezifisches Objekt ist für die Objektklasse, welche es definiert, eindeutig.

3.2.24
clear
(en: clear)
Status des E/A-Controllers, der angibt, dass der Steuerungsalgorithmus derzeit nicht ausgeführt wird

3.2.25
Client
(en: client)
a) Objekt, das die Dienste eines anderen (Server-)Objekts zur Ausführung einer Aufgabe nutzt;

b) Initiator einer PDU, auf die ein Server reagiert

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3.2.26
allgemeines Profil
(en: common profile)
Zusammenstellung geräteunabhängiger Informationen und Funktionalitäten, um Konsistenz zwischen allen Geräten herzustellen

3.2.27
Kommunikationsdatenobjekt
(en: communication data object)
Objekt(e), das (die) Parameter von Kommunikationsbeziehungen ist (sind) und durch Gerät/Slot/Subslot/Index referenziert wird (werden)

3.2.28
Konfigurationsprüfung
(en: configuration check)
Vergleich der erwarteten Strukturierung des E/A-Datenobjekts des Clients mit der tatsächlichen Strukturierung des E/A-Datenobjekts beim Server in der Anlaufphase

3.2.29
Konfigurationsfehler
(en: configuration fault)
durch den Server erkannter unzulässiger Unterschied zwischen der erwarteten Strukturierung des E/A-Datenobjekts und der tatsächlichen Strukturierung des E/A-Datenobjekts

3.2.30
Konfigurationskennung
(en: configuration identifier)
Repräsentation eines Teils von E/A-Daten eines einzelnen Eingabe- und/oder Ausgabemoduls eines Servers

3.2.31
konsumieren
(en: consume)
Vorgang des Empfangs von Daten von einem Provider

3.2.32
Konsument
(en: consumer)
Knoten oder Senke, der/die Daten von einem Provider empfängt

3.2.33
Kontextmanagement
(en: context management)
über das Netzwerk zugängliche Informationen (Kommunikationsobjekte), die die Verwaltung des Betriebs des Feldbussystems, einschließlich der Anwendungsschicht, unterstützen

Anmerkung 1 zum Begriff: Zur Verwaltung gehören Funktionen wie die Steuerung, die Überwachung und die Diagnose.

3.2.34
Übertragungspfad
(en: conveyance path)
unidirektionaler Strom von APDUs in einer Anwendungsbeziehung

3.2.35
zyklisch
(en: cyclic)
sich regelmäßig wiederholend

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3.2.36
Datenkonsistenz
(en: data consistency)
Mittel für die kohärente Übertragung des Eingabe- oder Ausgabedatenobjekts zwischen Client und Server und für den kohärenten Zugriff auf das Eingabe- oder Ausgabedatenobjekt innerhalb von Client und Server

3.2.37
Gerät
(en: device)
an den Verbindungszweig angeschlossene physikalische Hardware

Anmerkung 1 zum Begriff: Ein Gerät kann mehr als einen Knoten umfassen.

3.2.38
Geräte-ID
(en: device ID)
vom Anbieter zugewiesene Kennung des Gerätetyps

3.2.39
Geräteprofil
(en: device profile)
Zusammenstellung geräteabhängiger Informationen und Funktionalitäten, um Konsistenz zwischen ähnlichen Geräten desselben Gerätetyps herzustellen

3.2.40
Diagnosedatenobjekt
(en: diagnosis data object)
Objekt, das Diagnose-Informationen enthält und vom Gerät/Slot/Subslot/Index referenziert wird

3.2.41
Diagnose-Informationen
(en: diagnosis information)
alle Daten, die serverseitig für Wartungszwecke verfügbar sind

3.2.42
dynamische Neukonfiguration
(en: dynamic reconfiguration)
Änderung von E/A-Datenobjekten ohne Unterbrechung einer bestehenden Anwendungsbeziehung und fortlaufende Aktualisierung der nicht geänderten E/A-Datenobjekte

3.2.43
Endpunkt
(en: endpoint)
eine der Daten übermittelnden Entitäten, die an einer Verbindung beteiligt ist

3.2.44
Engineering
(en: engineering)
abstrakte Bezeichnung, welche die Client-Anwendung oder das Gerät kennzeichnet, die/das für die Konfiguration eines Automatisierungssystems verantwortlich ist

3.2.45
Fehler
(en: error)
Nichtübereinstimmung zwischen einem berechneten, beobachteten oder gemessenen Wert oder Zustand und dem festgelegten oder theoretisch richtigen Wert oder Zustand

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3.2.46
Fehlerklasse
(en: error class)
allgemeine Gruppierung für zugehörige Fehlerdefinitionen und entsprechende Fehlercodes

3.2.47
Fehlercode
(en: error code)
Kennzeichnung eines bestimmten Fehlertyps innerhalb einer Fehlerklasse

3.2.48
Ereignis
(en: event)
Instanz einer Änderung von Zuständen

3.2.49
erweiterte Kanaldiagnose
(en: extended channel diagnosis)
Informationen in Bezug auf ein spezifisches Element eines spezifischen Anwendungsobjekts, die zu Wartungszwecken bereitgestellt werden

BEISPIEL Ausfall des Verbindungszweiges.

3.2.50
Rahmen
(en: frame)
Einheit des Datentransfers auf einem Verbindungszweig

3.2.51
Identifikationsdatenobjekt
(en: identification data object)
Objekt, das Informationen zum Hersteller und Typ des Gerätes, Moduls und Submoduls enthält und durch Gerät/Slot/Subslot/Index referenziert wird

3.2.52
impliziter AR-Endpunkt
(en: implicit AR endpoint)
AR-Endpunkt, der lokal innerhalb eines Gerätes ohne Nutzung des Erstellungsdienstes festgelegt ist

3.2.53
eingehend
(en: inbound)
Eingangskommunikationsbeziehung von einem E/A-Gerät zu einem E/A-Controller

3.2.54
Index
(en: index)
Adresse eines Datensatzobjekts innerhalb eines Anwendungsprozesses

3.2.55
Instanz
(en: instance)
tatsächliches physikalisches Vorkommen eines Objekts innerhalb einer Klasse, das eines von mehreren Objekten innerhalb derselben Objektklasse identifiziert

3.2.56
Instanzattribute
(en: instance attributes)
Attribut, das für eine Objektinstanz eindeutig ist und sich nicht auf die Objektklasse bezieht

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3.2.57
instanziiert
(en: instantiated)
Objekt, das in einem Gerät erzeugt wurde

3.2.58
Aufruf
(en: invocation)
Vorgang der Nutzung eines Dienstes oder einer anderen Ressource eines Anwendungsprozesses

Anmerkung 1 zum Begriff: Jeder Aufruf bildet einen einzelnen Steuerungsthread, der durch seinen Kontext beschrieben werden kann. Sobald der Dienst ausgeführt oder die Nutzung der Ressource beendet ist, erlischt der Aufruf. Bei Dienstaufrufen wird ein Dienst, der initiiert, aber noch nicht ausgeführt wurde, als ausstehender Dienstaufruf bezeichnet. Bei Dienstaufrufen kann außerdem eine Aufruf-ID verwendet werden, um den Dienstaufruf eindeutig zu identifizieren und ihn von anderen ausstehenden Dienstaufrufen zu unterscheiden.

3.2.59
E/A-Controller
(en: IO controller)
Steuergerät, das für mehrere E/A-Geräte (Feldgeräte) als Client agiert

Anmerkung 1 zum Begriff: Hierbei handelt es sich üblicherweise um eine speicherprogrammierbare Steuerung oder ein verteiltes Steuerungssystem.

3.2.60
E/A-Datenobjekt
(en: IO data object)
Objekt, das zu Verarbeitungszwecken zyklisch übertragen wird und das durch Gerät/API/Slot/Subslot referenziert wird

3.2.61
E/A-Gerät
(en: IO device)
Feldgerät, das für den E/A-Betrieb als Server agiert

3.2.62
E/A-Parameterserver
(en: IO parameter server)
Server für Anwendungsparameter von E/A-Geräten (Client)

Anmerkung 1 zum Begriff: Hierbei handelt sich üblicherweise um ein Gerät zur Sicherung von Parameterdaten und zur Protokollierung von Online-Änderungen von Geräteparametern.

3.2.63
E/A-Subsystem
(en: IO subsystem)
Subsystem, das aus einem E/A-Controller und allen ihm zugeordneten E/A-Geräten besteht

3.2.64
E/A-Supervisor
(en: IO supervisor)
Engineering-Gerät, das die Inbetriebnahme und Diagnose eines E/A-Systems verwaltet

3.2.65
E/A-System
(en: IO system)
System, das aus allen zugehörigen E/A-Subsystemen besteht

Anmerkung 1 zum Begriff: Eine SPS mit mehr als einem E/A-Controller (Netzwerkschnittstelle) steuert beispielsweise ein E/A-System, das aus einem E/A-Subsystem für jeden E/A-Controller besteht.

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3.2.66
isochroner Modus
(en: Isochronous mode)
E/A-System, das eng getaktet mit einem Jitter von weniger als 1 µs ausgeführt wird

3.2.67
Member
(en: member)
Teil eines Attributs, das als Element eines Feldes strukturiert ist

3.2.68
Nachricht
(en: message)
Synonym für Rahmen

3.2.69
Methode
(en: method)
Synonym für einen funktionsfähigen Dienst, der von dem Server-ASE bereitgestellt und von einem Client aufgerufen wird

3.2.70
Modul
(en: module)
Hardware oder logische Komponente eines physischen Gerätes

3.2.71
Netzwerk
(en: network)
Menge von Knoten, die über ein bestimmtes Kommunikationsmedium miteinander verbunden sind, einschließlich zwischengeschalteter Repeater, Bridges, Router und Gateways unterer Schichten

3.2.72
Objekt
(en: object)
abstrakte Darstellung einer bestimmten Komponente innerhalb eines Gerätes, normalerweise eine Zusammenstellung zugehöriger Daten (in Form von Variablen) und Methoden (Prozeduren) für Operationen mit diesen Daten, die eine klar definierte Schnittstelle und ein klar definiertes Verhalten aufweisen

3.2.73
objektspezifischer Dienst
(en: object specific service)
Dienst, der für die Objektklasse, die ihn definiert, eindeutig ist

3.2.74
operate
(en: operate)
Status des E/A-Controllers, der angibt, dass der Steuerungsalgorithmus derzeit ausgeführt wird

3.2.75
ausgehend
(en: outbound)
Ausgangskommunikationsbeziehung von einem E/A-Controller zu einem E/A-Gerät

3.2.76
Paket
(en: packet)
Rahmen

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3.2.77
Peer
(en: peer)
Rolle eines AR-Endpunktes, in der dieser in der Lage ist, sowohl als Client als auch als Server zu agieren

3.2.78
physikalisches Gerät
(en: physical device)
Automatisierungsgerät oder anderes Netzwerkgerät

3.2.79
Punkt-zu-Punkt-Verbindung
(en: point-to-point connection)
Verbindung, die zwischen genau zwei Anwendungsobjekten besteht

3.2.80
primary
(en: primary)
Status der E/A-AR, der angibt, dass sich diese im Betriebszustand befindet

Anmerkung 1 zum Begriff: Neben einer E/A-AR mit dem Status „primary“ kann auch eine E/A-AR mit dem Status „backup“ vorhanden sein. Diese wird beispielsweise für die Redundanz und dynamische Neukonfiguration von E/A-Daten verwendet.

3.2.81
Provider
(en: provider)
Knoten oder Quelle, der/die Daten an einen oder viele Konsumenten sendet

3.2.82
PTCP-Unterdomäne
(en: PTCP subdomain)
bestimmte Menge von DTEs mit synchronisierten Uhren

3.2.83
qualifizierte Kanaldiagnose
(en: qualified channel diagnosis)
Informationen in Bezug auf ein spezifisches Element eines spezifischen Anwendungsobjekts, die zu Wartungszwecken mit einem parametrisierten Schweregrad bereitgestellt werden

BEISPIEL Überlastung.

3.2.84
Datensatzobjekt
(en: record data object)
Objekt, das bereits vorverarbeitet ist und zu Informationszwecken oder zum Zweck der weiteren Verarbeitung azyklisch übertragen wird und das durch Gerät/API/Slot/Subslot/Index referenziert wird

3.2.85
Ressource
(en: resource)
Verarbeitungs- oder Informationsfähigkeit

3.2.86
run
(en: run)
Status des E/A-Controllers, der angibt, dass der Steuerungsalgorithmus derzeit in Betrieb ist

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3.2.87
Server
(en: server)
a) Rolle eines AREP, in der dieser eine bestätigte Dienstantwort-APDU an den Client, der die Anforderung initiiert hat, zurückgibt;

b) Objekt, das einem anderen (Client-)Objekt Dienste bereitstellt

3.2.88
Dienst
(en: service)
Operation oder Funktion, die ein Objekt und/oder eine Objektklasse auf Anforderung eines anderen Objekts und/oder einer anderen Objektklasse hin ausführt

3.2.89
Slot
(en: slot)
Adresse einer strukturellen Einheit innerhalb eines E/A-Gerätes

Anmerkung 1 zum Begriff: Innerhalb eines modularen Gerätes adressiert ein Slot typischerweise ein physikalisches Modul. Innerhalb kompakter Geräte adressiert ein Slot typischerweise eine logische Funktion oder ein virtuelles Modul.

3.2.90
stop
(en: stop)
Status des E/A-Controllers, der angibt, dass der Steuerungsalgorithmus derzeit nicht ausgeführt wird

3.2.91
Untermodul
(en: submodule)
Hardware oder logische Komponente eines Moduls

3.2.92
Subslot
(en: subslot)
Adresse einer strukturellen Einheit innerhalb eines Slots

Anmerkung 1 zum Begriff: Ein Subslot kann eine physikalische Schnittstelle für Untermodule innerhalb eines Moduls adressieren. Im Allgemeinen stellt ein Subslot eine zweite Ebene für die Strukturierung von Daten innerhalb eines Gerätes dar.

3.2.93
Anbieter-ID
(en: vendor ID)
zentrale Verwaltungsnummer, die als Herstellerkennung verwendet wird

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NORME EUROPÉENNE

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Foreword

The text of document 65C/764/FDIS, future edition 3 of IEC 61158-6-10, prepared by SC 65C "Industrial networks" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61158-6-10:2014.

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- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-09-23

This document supersedes EN 61158-6-10:2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 61158-6-10:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61784-1	NOTE	Harmonized as EN 61784-1.
IEC 61784-2	NOTE	Harmonized as EN 61784-2.
IEC 61784-3-3	NOTE	Harmonized as EN 61784-3-3.
IEC 60793-2-30	NOTE	Harmonized as EN 60793-2-30.
IEC 60793-2-40	NOTE	Harmonized as EN 60793-2-40.

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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 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.

NOTE Attention is drawn to the fact that use of the associated protocol type(s) is restricted by its (their) intellectual-property-right holder(s). In all cases, the commitment to limited release of intellectual-property-rights made by the holder(s) 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 protocol type(s) in other combinations may require permission of their respective intellectual-property-right holder(s).

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning Type 10 elements and possibly other types given in this standard as follows:

The following patent rights for Type 10 have been announced by [SI]:

WO publication	Title (WO)
WO 02/043336 EP 1388238	System and method for parallel transfer of real-time critical and non-real-time critical data via switchable data networks, particularly Ethernet
WO 02/076033 EP 1368935	Synchronous clocked communication system with decentralized input/output modules and methods for integrating decentralized input/output modules in such a system
WO 03/028258 EP 1430628	Method for synchronizing nodes of a communication system
WO 03/028259 EP 1430627	Communications system and method for synchronizing a communications cycle
WO 04/030284 EP 1540895	Method for permanent redundant transmission of data telegrams in communication systems
EP 1558002	Method for assigning an IP address to a devic
EP 1318630	Matrices for controlling the device specific data transfer rates on a field bus

IEC takes no position concerning the evidence, validity and scope of these patent rights.

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The holders of these patent rights have assured the IEC that they are willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holders of these patent rights is registered with IEC. Information may be obtained from:

[SI]: Siemens AG
CT IP L&T
Otto-Hahn-Ring 6
D-81739 Munich
Germany

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (http://patents.iec.ch) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-10: Application layer protocol specification – Type 10 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 10 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 behavior provided by the Type 10 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 standard is to define the protocol provided to

a) define the wire-representation of the service primitives defined in IEC 61158-5-10 and
b) define the externally visible behavior associated with their transfer.

This standard specifies the protocol of the Type 10 fieldbus application layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498-1) 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 61158-5-10.

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.

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

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.

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

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

IEC 61158-5-10:2014, *Industrial communication networks – Fieldbus specifications – Application layer service definition – Type 10 elements*

IEC 61158-6-3:2014, *Industrial communication networks – Fieldbus specifications – Part 6-3: Application layer protocol specification – Type 3 elements*

IEC 61588, *Precision clock synchronization protocol for networked measurement and control systems*

IEC 62439-2, *Industrial communication networks – High availability automation networks – Part 2: Media Redundancy Protocol (MRP)*

ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange*

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

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*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

IEEE 754, *IEEE Standard for Floating-Point Arithmetic,* available at <http://www.ieee.org>

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IEEE 802, *IEEE Standard for Local and metropolitan area networks: Overview and Architecture, available at* <http://www.ieee.org>

IEEE 802.1AB-2005, *IEEE Standard for Local and metropolitan area networks: Station and Media Access Control Connectivity Discovery,* available at <http://www.ieee.org>

IEEE 802.1AS, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – IEEE standard for Local and metropolitan area networks – Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks,* available at <http://www.ieee.org>

IEEE 802.1D, *IEEE Standard for Local and metropolitan area networks – Media access control (MAC) Bridges,* available at <http://www.ieee.org>

IEEE 802.1Q, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks,* available at <http://www.ieee.org>

IEEE 802.3, *IEEE Standard for 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,* available at <http://www.ieee.org>

IEEE 802.11, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications,* available at <http://www.ieee.org>

IEEE 802.15.1-2005, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 15.1: Wireless medium access control (MAC) and physical layer (PHY) specifications for wireless personal area networks (WPANs),* available at <http://www.ieee.org>

IETF RFC 768, *User Datagram Protocol,* available at <http://www.ietf.org>

IETF RFC 791, *Internet Protocol,* available at <http://www.ietf.org>

IETF RFC 792, *Internet Control Message Protocol,* available at <http://www.ietf.org>

IETF RFC 826, *An Ethernet Address Resolution Protocol or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware,* available at <http://www.ietf.org>

IETF RFC 1034, *Domain names – concepts and facilities,* available at <http://www.ietf.org>

IETF RFC 1213, *Management Information Base for Network Management of TCP/IP-based internets: MIB-II,* available at <http://www.ietf.org>

IETF RFC 2131, *Dynamic Host Configuration Protocol,* available at <http://www.ietf.org>

IETF RFC 2132, *DHCP Options and BOOTP Vendor Extensions,* available at <http://www.ietf.org>

IETF RFC 2236, *Internet Group Management Protocol, Version 2,* available at <http://www.ietf.org>

IETF RFC 2365, *Administratively Scoped IP Multicast,* available at <http://www.ietf.org>

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IETF RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers,* available at <http://www.ietf.org>

IETF RFC 2674, *Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions,* available at <http://www.ietf.org>

IETF RFC 2863, *The Interfaces Group MIB,* available at <http://www.ietf.org>

IETF RFC 3418, *Management Information Base (MIB) for the Simple Network Management Protocol (SNMP),* available at <http://www.ietf.org>

IETF RFC 3621, *Power Ethernet MIB,* available at <http://www.ietf.org>

IETF RFC 4361, *Node-specific Client Identifiers for Dynamic Host Configuration Protocol Version Four (DHCPv4),* available at <http://www.ietf.org>

IETF RFC 4363, *Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering, and Virtual LAN Extensions,* available at <http://www.ietf.org>

IETF RFC 4836, *Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs),* available at <http://www.ietf.org>

IETF RFC 5735, *Special-Use IPv4 Addresses,* available at <http://www.ietf.org>

IETF RFC 5890, *Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework,* available at <http://www.ietf.org>

The Open Group — Publication C706, *Technical standard DCE1.1: Remote Procedure Call,* available at <http://www.opengroup.org/onlinepubs/9629399/toc.htm>

3 Terms, definitions, abbreviations, symbols and conventions

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

3.1 Referenced terms and definitions

3.1.1 ISO/IEC 7498-1 terms

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

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

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3.1.2 ISO/IEC 8822 terms

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

a) abstract syntax
b) presentation context

3.1.3 ISO/IEC 8824-1 terms

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

a) object identifier
b) type

3.1.4 ISO/IEC 9545 terms

For the purposes of this document, the following terms as defined 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

3.2 Additional terms and definitions for decentralized periphery

3.2.1
alarm
activation of an event that shows a critical state

3.2.2
alarm ack
acknowledgment of an event that shows a critical state

3.2.3
alarm data object
object(s) which represent critical states referenced by device/API/slot/subslot/alarm type

3.2.4
allocate
take a resource from a common area and assign that resource for the exclusive use of a specific entity

3.2.5
application
function or data structure for which data is consumed or produced

3.2.6
application layer interoperability
capability of application entities to perform coordinated and cooperative operations using the services of the FAL

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3.2.7
application objects
multiple object classes that manage and provide a run time exchange of PDUs across the network and within the network device

3.2.8
application process
part of a distributed application on a network, which is located on one device and unambiguously addressed

3.2.9
application process identifier
distinguishes multiple application processes used in a device

3.2.10
application process object
component of an application process that is identifiable and accessible through an FAL application relationship

Note 1 to entry: 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.

3.2.11
application process object class
class of application process objects defined in terms of the set of their network-accessible attributes and services

3.2.12
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

3.2.13
application relationship application service element
application-service-element that provides the exclusive means for establishing and terminating all application relationships

3.2.14
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 1 to entry: Each application process involved in the application relationship maintains its own application relationship endpoint.

3.2.15
attribute
description of an externally visible characteristic or feature of an object

Note 1 to entry: 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.

3.2.16
backup
status of the IO AR, which indicates that it, is in the standby state

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