

DIN EN 61158-6-13

ICS 35.100.70; 35.160

Ersatz für
DIN EN 61158-6-13:2008-09
Siehe Anwendungsbeginn

**Industrielle Kommunikationsnetze –
Feldbusse –
Teil 6-13: Protokollspezifikation des Application Layer
(Anwendungsschicht) – Typ 13-Elemente
(IEC 61158-6-13:2014);
Englische Fassung EN 61158-6-13:2014, nur auf CD-ROM**

Industrial communication networks –

Fieldbus specifications –

Part 6-13: Application layer protocol specification – Type 13 elements
(IEC 61158-6-13:2014);

English version EN 61158-6-13:2014, only on CD-ROM

Réseaux de communication industriels –

Spécifications des bus de terrain –

Partie 6-13: Spécification du protocole de la couche application – Éléments de type 13
(CEI 61158-6-13:2014);

Version anglaise EN 61158-6-13:2014, seulement en CD-ROM

Gesamtumfang 73 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

Anwendungsbeginn

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

Für DIN EN 61158-6-13:2008-09 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

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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 61158-6-13 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 13 fest.

Änderungen

Gegenüber DIN EN 61158-6-13:2008-09 wurden folgende Änderungen vorgenommen:

- a) redaktionelle Überarbeitung;
- b) neue Synchronisationsmöglichkeiten eingeführt.

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/A2: 2000-08
DIN EN 50170/A1: 2002-11
DIN EN 50170/A3: 2002-11
DIN EN 61158-6: 2005-05
DIN EN 61158-6-13: 2008-09

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 13-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 vorbestimmten 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 aufgeförderte Eingreifen mit dazugehörigem Risiko für Geräte, Anlage und möglicherweise Menschenleben.

Diese Norm legt Interaktionen zwischen entfernten Anwendungen fest und definiert das von außen sichtbare Verhalten, das vom Typ 13 des Feldbus-Application Layer bereitgestellt wird, in Form von:

- a) einer formellen abstrakten Syntax zur Festlegung der Application Layer-Protokoll-Dateneinheiten, die zwischen kommunizierenden Anwendungseinheiten übermittelt werden;
- b) der übertragenen Syntax zur Festlegung der Kodierungsregeln, welche auf die Application Layer-Dateneinheiten angewendet sind;
- c) dem Anwendungskontext der Zustandsmaschine zur Festlegung des sichtbaren Dienstverhalten zwischen kommunizierenden Anwendungseinheiten;
- d) der Anwendungsbeziehung der Zustandsmaschine zur Festlegung des sichtbaren Kommunikationsverhalten zwischen kommunizierenden Anwendungseinheiten.

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

- Festlegung der Leitungsdarstellung der Dienstprimitiven, welche in IEC 61158-5-13 beschrieben sind und
- zur Festlegung des von außen sichtbaren Verhaltens verbunden mit ihrer Übertragung.

Diese Norm beschreibt das Protokoll des Typ 13 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 61158-5-13 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 Steigerung von unterschiedlichen Protokollen, die in IEC 61158-6 genormt werden, führt.

^{N1)} Die Nummerierung aus IEC 61158-6-13 wurde beibehalten.

1.3 Konformität

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

3.6 Spezielle Begriffe

Für die Anwendung dieses Dokument gelten die folgenden Begriffe.

3.6.1

Empfang

(en: receiving)

Dienstinutzer, welcher eine bestätigte Primitive oder eine unbestätigte Primitive empfängt oder ein Service-provider, der eine bestätigte oder unbestätigte APDU empfängt

3.6.2

Ressource

(en: resource)

Verarbeitungs- oder Informationsfähigkeit eines Subsystems

3.6.3

Senden

(en: sending)

Dienstinutzer, welcher eine bestätigte Primitive oder eine unbestätigte Primitive sendet oder ein Service-provider, der eine bestätigte oder unbestätigte APDU sendet

3.6.4

Verwaltungsknoten

(en: managing node)

Knoten, welcher den SCNM-Mechanismus verwalten kann

3.6.5

gesteuerter Knoten

(en: controlled node)

Knoten, ohne die Fähigkeit, den SCNM-Mechanismus zu verwalten

– Leerseite –

English Version

**Industrial communication networks - Fieldbus specifications -
Part 6-13: Application layer protocol specification - Type 13
elements
(IEC 61158-6-13:2014)**

Réseaux de communication industriels - Spécifications des
bus de terrain - Partie 6-13: Spécification du protocole de la
couche application - Éléments de type 13
(CEI 61158-6-13:2014)

Industrielle Kommunikationsnetze - Feldbusse - Teil 6-13:
Protokollspezifikation des Application Layer
(Anwendungsschicht) - Typ 13-Elemente
(IEC 61158-6-13:2014)

This European Standard was approved by CENELEC on 2014-09-23. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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

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Foreword

The text of document 65C/764/FDIS, future edition 2 of IEC 61158-6-13, 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 61158-6-13:2014.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-06-23
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-09-23

This document supersedes EN 61158-6-13:2008.

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 61158-6-13:2014 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 61158-1	NOTE	Harmonized as EN 61158-1.
IEC 61158-6	NOTE	Harmonized as EN 61158-6 series.
IEC 61784-1	NOTE	Harmonized as EN 61784-1.
IEC 61784-2	NOTE	Harmonized as EN 61784-2.

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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.

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 specifies 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. 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 61158-3-13, *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 7498-1, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

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*

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 9899, *Information technology – Programming languages – C*

IEEE 754, *IEEE Standard for Floating-Point Arithmetic*

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 8824-1 terms

For the purposes of this document, the following terms as defined in ISO/IEC 8824-1 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**
- 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:

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

3.7 Abbreviations and symbols

AE	Application entity
AL	Application layer
AP	Application process
APDU	Application protocol data unit
AR	Application relationship
AREP	Application relationship end point
ARPM	Application relationship protocol machine
ASnd	Asynchronous Send (Type 13 frame type)
BNB-PEC	Buffered network-scheduled bi-directional pre-established connection
BNU-PEC	Buffered network-scheduled uni-directional pre-established connection
CmdL	Command layer
CN	Controlled node
cnf	confirmation
DL-	(as a prefix) data-link-

DLCEP	Data-link connection end point
DLL	Data-link layer
DLME	Data-link-management entity
DLSAP	Data-link service access point
DLSDU	DL-service-data-unit
DMPM	DLL mapping protocol machine
DNS	Domain name service
FAL	Fieldbus application layer
ind	indication
IP	Internet protocol (see RFC 791)
MAC	Media access controll
MN	Managing node
NMT	Network management
OD	Object dictionary
PDO	Process data object
PDU	Process data unit
QUB-CL	Queued user-triggered bi-directional connectionless
QUB-COS	Queued user-triggered bi-directional connection-oriented with segmentation
QUU	Queued user-triggered uni-directional
req	request
rsp	response
SDO	Service data object
SeqL	Sequence layer
UDP	User datagram protocol

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  
    fieldbus-version  
    reserved8  
    pduBody CHOICE{  
        [1h...5h] reserved  
        [6h] Sync-request  
        [7h...FFh] reserved  
    }  
}
```

4.2.5 Asyn2

```
Asyn2 ::= SEQUENCE {  
    message-type  
    destination  
    source  
    service-ID  
    pduBody CHOICE {  
        [1h] ident-response  
        [2h] status-response  
        [3h] NMT-request  
        [4h] NMT-command  
        [5h] SDO  
        [6h] Sync-response  
        [A0h...FEh] manufacturer-specific  
        [FFh] reserved  
    }  
}
```

4.2.6 Message-type

message-type ::= Unsigned8

— Contains the context specific APDU tags

4.2.7 Addresses

destination ::= Unsigned8
source ::= Unsigned8

— Node address (1...255)
— Node address (1...250, 253, 254)

4.2.8 Service-ID

service-ID ::= Unsigned8

— Contains the context specific tags for the pduBody

4.2.9 Reserved8

reserved8 ::= Unsigned8

4.2.10 Reserved16

reserved16 ::= Unsigned16

4.2.11 Reserved24

reserved24 ::= Unsigned24

4.2.12 Signaling-flags

```
signaling-flags ::= BitString {
  RD      (0)
  ER      (1)
  EA      (2)
  EC      (3)
  EN      (4)
  MS      (5)
  PS      (6)
  MC      (7)
  RS_bit1 (8)
  RS_bit2 (9)
  RS_bit3 (10)
  PR_bit1 (11)
  PR_bit2 (12)
  PR_bit3 (13)
  reserved (14)
  reserved (15)
}
```

The different APDU types use the flags as listed in Table 1. In all cases without "x" the flags are present but not written resp. interpreted.

Table 1 – Use of signaling-flags

	Isoc1	Isoc2	Asyn1	IdentResponse	StatusResponse	SyncResponse
RD	x	x				
ER			x			
EA	x		x			
EC					x	
EN		x			x	
MS	x	x				
PS						
MC						
RS	x	x		x	x	
PR	x	x		x	x	

The usage of these flags is specified in IEC 61158-3-13 and IEC 61158-4-13.

4.2.13 PDO-version

PDO-version ::= Unsigned8 — High nibble: main version; low nibble: sub version

4.2.14 Size

size ::= Unsigned8 — Size of PDO payload; max. 1490 octets due to Ethernet restrictions and protocol overhead

4.2.15 PDO-payload

PDO-payload ::= Any

4.2.16 NMT-status

```
NMT-status ::= CHOICE {  
  NMT_GS_OFF           Unsigned8 ::= 0000 0000b  
  NMT_xS_NOT_ACTIVE    Unsigned8 ::= 0001 1100b  
  NMT_xS_PRE_OPERATIONAL_1 Unsigned8 ::= 0001 1101b  
  NMT_xS_PRE_OPERATIONAL_2 Unsigned8 ::= 0101 1101b  
  NMT_xS_READY_TO_OPERATE Unsigned8 ::= 0110 1101b  
  NMT_xS_OPERATIONAL    Unsigned8 ::= 1111 1101b  
  NMT_xS_STOPPED        Unsigned8 ::= 0100 1101b  
  NMT_xS_BASIC_ETHERNET Unsigned8 ::= 0001 1110b  
}
```

NOTE If sender = MN: "x" := "M"; if sender = CN: "x" := "C".

4.2.17 Requested-service-ID

```
requested-service-ID ::= CHOICE {  
  no-service           [0h] IMPLICIT Unsigned8  
  ident-request        [1h] IMPLICIT Unsigned8  
  status-request       [2h] IMPLICIT Unsigned8  
  NMT-req-inv          [3h] IMPLICIT Unsigned8  
  manufacturer-specific [A0h]... [FEh] IMPLICIT Unsigned8  
  unspecified-invite    [FFh] IMPLICIT Unsigned8  
}
```

4.2.18 Requested-service-target

requested-service-target ::= Unsigned8 — Node address (1...255); not assigned (0)

4.2.19 Fieldbus-version

fieldbus-version ::= Unsigned8 — High nibble: main version; low nibble: sub version

4.3 Abstract syntax of Asyn1 pduBody

4.3.1 Sync-request

4.3.1.1 Overview

```
Sync-request ::= SEQUENCE {  
  synchronization-control Bitstring — see 4.3.1.2  
  PRes-time               Unsigned32 — time delay between end of the reception of the PRes from MN and start  
                                     of sending the own time-triggered PRes in ns  
  reserved                Unsigned32  
  sync-MN-delay           Unsigned32 — propagation delay between MN and CN in ns  
  reserved                Unsigned32  
  fallback-timeout        Unsigned32 — SoC timeout for deactivating the time-triggered sending of PRes in state  
                                     NMT_CS_PRE_OPERATIONAL_2 in ns  
  destination-MAC-address Unsigned32 — destination MAC address of the node the Sync-request is sent to  
}
```

NOTE The above listed elements are sometimes summarized as follows:
"synchronization-control" through "destination-MAC-address" are summarized under the term "sync-control".

4.3.1.2 Synchronization-control

```
Synchronization-control ::= Bitstring {
  PRes-time-valid          (0)          — The parameter PRes-time is valid
  Reserved bit1            (1)
  sync-MN-delay-valid      (2)          — The parameter sync-MN-delay is valid
  reserved bit2            (3)
  fallback-timeout-valid   (4)          — The parameter fallback-timeout is valid
  reserved bit3            (5)
  MAC-address-valid        (4)          — The parameter destination-MAC-address is valid
  reserved bit4 through bit26 (7)...(29)
  PRes-mode-reset          (30)         — Deactivate the time-triggered sending of PRes
  PRes-mode-set            (31)         — Activate the time-triggered sending of PRes. This bit overrules bit30
}
```

4.4 Abstract syntax of Asyn2 pduBody

4.4.1 Ident-response

4.4.1.1 Overview

```
Ident-response ::= SEQUENCE {
  signaling-flags
  NMT-status
  reserved8
  fieldbus-version
  reserved8
  feature-flags          BitString      — (see 4.4.1.2)
  MTU                    Unsigned16     — size of the largest possible IP frame incl. header
  poll-in-size           Unsigned16     — actual CN setting for Isoc1 data block size
  poll-out-size          Unsigned16     — actual CN setting for Isoc2 data block size
  response-time          Unsigned32     — time required by the CN to respond to Isoc1
  reserved16
  device-type            Unsigned32     — CN's device type
  vendor-ID              Unsigned32     — CN's vendor ID
  product-code           Unsigned32     — CN's product code
  revision-number        Unsigned32     — CN's revision number
  serial-number          Unsigned32     — CN's serial number
  vendor-specific-extension-1 Unsigned64 — for vendor specific purpose, to be filled with zeros if not used
  verify-configuration-date Unsigned32  — CN's configuration date
  verify-configuration-time Unsigned32  — CN's configuration time
  application-sw-date    Unsigned32     — CN's application software date
  application-sw-time    Unsigned32     — CN's application software time
  IP-address             Unsigned32     — current IP address value of the CN
  subnet-mask            Unsigned32     — current IP subnet mask of the CN
  default-gateway        Unsigned32     — current IP default gateway of the CN
  host-name              VisibleString32 — current DNS host name of the CN
  vendor-specific-extension-2 SEQUENCE SIZE(48) OF Unsigned8
                                     —for vendor specific purpose, to be filled with zeros if not in use
}
```

NOTE Some of the above listed elements are sometimes summarized as follows:

- "poll-in-size" through "response-time" are summarized under the term "cycle-timing",
- "device-type" through "serial-number" under "identity",
- "verify-configuration-date" and "verify-configuration-time" under "verify-configuration",
- "application-sw-date" and "application-sw-time" under "application-software-version",
- "vendor-specific-extension-1" and "vendor-specific-extension-2" under "vendor-specific-extensions",
- "IP-address" through "default-gateway" under "IP-address".

4.4.1.2 Feature-flags

```
feature-flags ::= BitString {
    Isochronous                (0)      — device may be isochronously accessed via Isoc1
    SDO by UDP/IP              (1)      — device supports SDO communication via UDP/IP
    SDO by ASnd                (2)      — device supports SDO communication via ASnd
    reserved for future use    (3)
    NMT-info services          (4)      — device supports NMT Info Services
    Extended NMT-state-commands (5)      — device supports Extended NMT State Commands
    Dynamic PDO mapping        (6)      — device supports dynamic PDO Mapping
    NMT services by UDP/IP     (7)      — device supports NMT Services by UDP/IP
    Configuration manager      (8)      — device supports Configuration Manager functions
    Multiplexed access         (9)      — CN device supports multiplexed isochronous access.
    Node-ID setup by SW        (10)     — device supports NodeID setup by software
    MN basic ethernet mode     (11)     — MN device supports Basic Ethernet Mode
    Routing Type 1 support     (12)     — device supports Routing Type 1 functions
    Routing Type 2 support     (13)     — device supports Routing Type 2 functions
    WriteMultipleByIndex       (14)     — device supports WriteMultipleByIndex SDO service
    ReadMultipleByIndex        (15)     — device supports ReadMultipleByIndex SDO service
    reserved bit1 through bit2 (16)...(17)
    Time-triggered PRes        (18)     — device supports time-triggered sending of PRes
    reserved bit3 through bit16 (19)...(31)
}
```

4.4.2 Status-response

4.4.2.1 Overview

```
Status-response ::= SEQUENCE {
    signaling-flags
    NMT-status
    reserved24
    static-error-bit-field
    List-of-errors
}
```

4.4.2.2 Static-error-bitfield

```
static-error-bit-field ::= SEQUENCE {
    error-register      BitString      — (see 4.4.2.3)
    reserved8
    specific-errors     SEQUENCE SIZE (6) OF Unsigned8 — Device profile or vendor specific errors
}
```

4.4.2.3 Error-register

```
error-register ::= BitString {
    Generic error          (0)      — 0, if no static error present, else 1
    Current                (1)      OPTIONAL
    Voltage                (2)      OPTIONAL
    Temperature            (3)      OPTIONAL
    Communication error    (4)      OPTIONAL
    Device profile specific (5)      OPTIONAL
    reserved               (6)      OPTIONAL — always 0
    Manufacturer specific  (7)      OPTIONAL
}
```

4.4.2.4 List-of-errors

List-of-errors ::= SEQUENCE SIZE (k) OF ErrorEntry — k >= 2, depends on device configuration

4.4.2.5 ErrorEntry

```
ErrorEntry ::= SEQUENCE {
    error-type      Unsigned16 — (see 4.4.2.6)
    error-code      Unsigned16 — (see 4.4.2.6 and Clause A.3)
    time-stamp      Unsigned64
    additional-information Unsigned64
}
```