



BSI Standards Publication

Industrial communication networks — Fieldbus specifications

Part 3-2: Data-link layer service definition — Type 2 elements

National foreword

This British Standard is the UK implementation of EN IEC 61158-3-2:2023. It is identical to IEC 61158-3-2:2023. It supersedes BS EN 61158-3-2:2014+A1:2019, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/65, Measurement and control.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Date	Text affected
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Part 3-2: Data-link layer service definition - Type 2 elements
(IEC 61158-3-2:2023)

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couche liaison de données - Eléments de type 2
(IEC 61158-3-2:2023)

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(Sicherheitsschicht) - Typ 2-Elemente
(IEC 61158-3-2:2023)

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European foreword

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- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-04-13

This document supersedes EN 61158-3-2:2014 and all of its amendments and corrigenda (if any).

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The text of the International Standard IEC 61158-3-2:2023 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 standard indicated:

- | | |
|----------------------|---|
| IEC 61158-1 | NOTE Approved as EN IEC 61158-1 |
| IEC 61158-2 | NOTE Approved as EN 61158-2 |
| IEC 61158-5-2 | NOTE Approved as EN IEC 61158-5-2 |
| IEC 61158-6-2 | NOTE Approved as EN IEC 61158-6-2 |
| IEC 61784-1 (series) | NOTE Approved as EN IEC 61784-1 (series) ¹ |
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¹ To be published. Stage at time of publication: FprEN IEC 61784-1-X:2023.

² To be published. Stage at time of publication: FprEN IEC 61784-2-X:2023.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61158-4-2	2023	Industrial communication networks - Fieldbus specifications - Part 4-2: Data-link layer protocol specification - Type 2 elements	EN IEC 61158-4-2	2023
ISO/IEC 7498-1	-	Information technology - Open Systems Interconnection - Basic reference model: The basic model	-	-
ISO/IEC 7498-3	-	Information technology - Open Systems Interconnection - Basic reference model: Naming and addressing	-	-
ISO/IEC 8886	-	Information technology - Open Systems Interconnection - Data link service definition	-	-
ISO/IEC 10731	1994	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
1.1 General.....	9
1.2 Specifications	9
1.3 Conformance	9
2 Normative references	10
3 Terms, definitions, symbols, abbreviated terms and conventions	10
3.1 Reference model terms and definitions	10
3.2 Service convention terms and definitions	12
3.3 Common data-link service terms and definitions	12
3.4 Additional Type 2 data-link specific definitions	14
3.5 Common symbols and abbreviations	16
3.6 Additional Type 2 symbols and abbreviations	17
3.7 Common conventions.....	17
4 Connection-mode and connectionless-mode data-link service	18
4.1 Overview.....	18
4.1.1 Data transfer services.....	18
4.1.2 DL-management services	22
4.1.3 Timing services	22
4.2 Facilities of the data-link service	22
4.3 Model of the data-link service	23
4.3.1 General	23
4.3.2 DLS-instance identification	23
4.3.3 Model of abstract queue concepts	23
4.3.4 QoS features	24
4.3.5 DLS-TxStatus	25
4.3.6 Receive queues	25
4.4 Sequence of primitives.....	25
4.4.1 Constraints on sequence of primitives	25
4.4.2 Relation of primitives at DLSAPs	26
4.4.3 Sequence of primitives at one DLSAP.....	27
4.5 Connection-mode data transfer	27
4.5.1 General	27
4.5.2 Function	27
4.5.3 Types of primitives and parameters	27
4.5.4 Sequence of primitives	29
4.6 Connectionless-mode data transfer.....	29
4.6.1 General	29
4.6.2 Function	29
4.6.3 Types of primitives and parameters	30
4.6.4 Sequence of primitives	32
4.7 Queue maintenance.....	32
4.7.1 Function	32
4.7.2 Types of primitives and parameters	32
4.7.3 Request primitive.....	33
4.7.4 Confirmation primitive.....	33

4.7.5	Sequence of primitives	33
4.8	Tag filter	34
4.8.1	Function	34
4.8.2	Types of primitives and parameters	34
4.8.3	Sequence of primitives	35
5	DL-management services	35
5.1	Sequence of primitives	35
5.2	Link synchronization	36
5.2.1	Function	36
5.2.2	Types of primitives and parameters	36
5.2.3	Sequence of primitives	37
5.3	Synchronized parameter change	37
5.3.1	Function	37
5.3.2	Types of primitives and parameters	37
5.3.3	Sequence of primitives	39
5.4	Event reports	40
5.4.1	Function	40
5.4.2	Types of primitives and parameters	40
5.4.3	Sequence of primitives	41
5.5	Bad FCS	41
5.5.1	Function	41
5.5.2	Types of primitives and parameters	41
5.5.3	Sequence of primitives	41
5.6	Current moderator	42
5.6.1	Function	42
5.6.2	Types of primitives and parameters	42
5.6.3	Sequence of primitives	42
5.7	Enable moderator	42
5.7.1	Function	42
5.7.2	Types of primitives and parameters	42
5.7.3	Sequence of primitives	43
5.8	Power-up and online	43
5.8.1	Function	43
5.8.2	Types of primitives and parameters	43
5.8.3	Sequence of primitives	44
5.9	Listen only	44
5.9.1	Function	44
5.9.2	Types of primitives and parameters	45
5.9.3	Sequence of primitives	45
5.10	Time distribution	45
5.10.1	Function	45
5.10.2	Types of primitives and parameters	45
	Bibliography	48
	Figure 1 – Relationships of DLSAPs, DLSAP-addresses and group DL-addresses	13
	Figure 2 – NUT structure	19
	Figure 3 – Medium access during scheduled time	20
	Figure 4 – Medium access during unscheduled time	21

Figure 5 – Queue model for the peer and multipoint DLS, DLSAPs and their DLCEPs	22
Figure 6 – Queue model of a multipoint DLS between a sending DLS-user and one or more receiving DLS-users	24
Figure 7 – DLS primitive time-sequence diagram	26
Figure 8 – State transition diagram for sequences of DLS primitives at one DLSAP	27
Figure 9 – Sequence of primitives for a successful connection-mode transfer	29
Figure 10 – Sequence of primitives for an unsuccessful connection-mode transfer	29
Figure 11 – Sequence of primitives for a successful connectionless-mode transfer	32
Figure 12 – Sequence of primitives for an unsuccessful connectionless-mode transfer	32
Figure 13 – Sequence of primitives for a queue maintenance request	34
Figure 14 – Sequence of primitives for a tag filter request	35
Figure 15 – Sequence of primitives for a local link synchronization	37
Figure 16 – Sequence of primitives for a DLM-get/set parameters request	39
Figure 17 – Sequence of primitives for a DLM-tMinus change request	39
Figure 18 – Sequence of primitives for a DLM-event indication	41
Figure 19 – Sequence of primitives for a DLM-bad-FCS indication	42
Figure 20 – Sequence of primitives for a DLM-current-moderator indication	42
Figure 21 – Sequence of primitives for a DLM-enable-moderator request	43
Figure 22 – Sequence of primitives for a DLM-power-up indication	44
Figure 23 – Sequence of primitives for a DLM-online request	44
Figure 24 – Sequence of primitives for a DLM-listen-only request	45
 Table 1 – Summary of connection-mode and connectionless-mode primitives and parameters	26
Table 2 – DL-connection-mode transfer primitives and parameters	28
Table 3 – DL-connectionless-mode transfer primitives and parameters	30
Table 4 – Fixed tag services available to the DLS-user	31
Table 5 – DL-queue maintenance primitives and parameters (single flush)	33
Table 6 – DL-queue maintenance primitives and parameters (flush by QoS)	33
Table 7 – DL-connectionless-mode tag filter primitives and parameters	34
Table 8 – Summary of DL-management primitives and parameters	36
Table 9 – Link synchronization primitives and parameters	37
Table 10 – Synchronized parameter change primitives and parameters (set configuration)	38
Table 11 – Synchronized parameter change primitives and parameters (get configuration)	38
Table 12 – Synchronized parameter change primitives and parameters (start countdown)	38
Table 13 – Synchronized parameter change primitives and parameters (tMinus)	38
Table 14 – DLMS-configuration-data	39
Table 15 – Event report primitives and parameters	40
Table 16 – DLMS events being reported	40
Table 17 – Bad FCS primitives and parameters	41
Table 18 – Current moderator primitives and parameters	42
Table 19 – Enable moderator primitives and parameters	43

Table 20 – Power-up primitives and parameters.....	43
Table 21 – Online primitives and parameters	44
Table 22 – Listen-only primitives and parameters	45
Table 23 – DLMS time and time quality parameters	46
Table 24 – Time distribution source quality	46

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FIELDBUS SPECIFICATIONS –****Part 3-2: Data-link layer service definition –
Type 2 elements****FOREWORD**

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NOTE Combinations of protocol types are specified in the IEC 61784-1 series and the IEC 61784-2 series.

IEC 61158-3-2 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This third edition cancels and replaces the second edition published in 2014 and Amendment 1:2019. This edition constitutes a technical revision.

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

- a) update of normative and bibliographic references;
- b) use of more inclusive terminology ("master" replaced by "active" or "supervisor");
- c) miscellaneous editorial corrections.

The text of this International Standard is based on the following documents:

Draft	Report on voting
65C/1201/FDIS	65C/1242/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all the parts of the IEC 61158 series, under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC web site.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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.

Throughout the set of fieldbus standards, the term "service" refers to the abstract capability provided by one layer of the OSI Basic Reference Model to the layer immediately above. Thus, the data-link layer service defined in this document is a conceptual architectural service, independent of administrative and implementation divisions.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 3-2: Data-link layer service definition – Type 2 elements

1 Scope

1.1 General

This part of IEC 61158 provides common elements for basic time-critical messaging communications between devices in an automation environment. The term "time-critical" is used to represent the presence of a time-window, within which one or more specified actions are required to be completed with some defined level of certainty. Failure to complete specified actions within the time window risks failure of the applications requesting the actions, with attendant risk to equipment, plant and possibly human life.

This document defines in an abstract way the externally visible service provided by the Type 2 fieldbus data-link layer in terms of:

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

The purpose of this document is to define the services provided to:

- the Type 2 fieldbus application layer at the boundary between the application and data-link layers of the fieldbus reference model;
- systems management at the boundary between the data-link layer and systems management of the fieldbus reference model.

Type 2 DL-service provides both a connected and a connectionless subset of those services specified in ISO/IEC 8886.

1.2 Specifications

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

This document can be used as the basis for formal DL-Programming-Interfaces. Nevertheless, it is not a formal programming interface, and any such interface will need to address implementation issues not covered by this specification, including:

- the sizes and octet ordering of various multi-octet service parameters;
- the correlation of paired request and confirm, or indication and response, primitives.

1.3 Conformance

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

There is no conformance of equipment to this data-link layer service definition standard. Instead, conformance is achieved through implementation of the corresponding data-link protocol that fulfills the Type 2 data-link layer services defined in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE All parts of the IEC 61158 series, as well as the IEC 61784-1 series and the IEC 61784-2 series 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 61158-4-2:2023, *Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements*

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

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

ISO/IEC 8886, *Information technology – Open Systems Interconnection – Data link service definition*

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

3 Terms, definitions, symbols, abbreviated terms and conventions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Reference model terms and definitions

This document is based in part on the concepts developed in ISO/IEC 7498-1 and ISO/IEC 7498-3, and makes use of the following terms defined therein:

3.1.1	DL-address	[ISO/IEC 7498-3]
3.1.2	DL-address-mapping	[ISO/IEC 7498-1]
3.1.3	called-DL-address	[ISO/IEC 7498-3]
3.1.4	calling-DL-address	[ISO/IEC 7498-3]
3.1.5	centralized multi-end-point-connection	[ISO/IEC 7498-1]
3.1.6	DL-connection	[ISO/IEC 7498-1]
3.1.7	DL-connection-end-point	[ISO/IEC 7498-1]
3.1.8	DL-connection-end-point-identifier	[ISO/IEC 7498-1]
3.1.9	DL-connection-mode transmission	[ISO/IEC 7498-1]
3.1.10	DL-connectionless-mode transmission	[ISO/IEC 7498-1]
3.1.11	correspondent (N)-entities correspondent DL-entities (N=2) correspondent Ph-entities (N=1)	[ISO/IEC 7498-1]
3.1.12	DL-duplex-transmission	[ISO/IEC 7498-1]
3.1.13	(N)-entity DL-entity (N=2) Ph-entity (N=1)	[ISO/IEC 7498-1]
3.1.14	DL-facility	[ISO/IEC 7498-1]
3.1.15	flow control	[ISO/IEC 7498-1]
3.1.16	(N)-layer DL-layer (N=2) Ph-layer (N=1)	[ISO/IEC 7498-1]
3.1.17	layer-management	[ISO/IEC 7498-1]
3.1.18	DL-local-view	[ISO/IEC 7498-3]
3.1.19	DL-name	[ISO/IEC 7498-3]
3.1.20	naming-(addressing)-domain	[ISO/IEC 7498-3]
3.1.21	peer-entities	[ISO/IEC 7498-1]
3.1.22	primitive name	[ISO/IEC 7498-3]
3.1.23	DL-protocol	[ISO/IEC 7498-1]
3.1.24	DL-protocol-connection-identifier	[ISO/IEC 7498-1]
3.1.25	DL-protocol-data-unit	[ISO/IEC 7498-1]
3.1.26	DL-relay	[ISO/IEC 7498-1]
3.1.27	reset	[ISO/IEC 7498-1]
3.1.28	responding-DL-address	[ISO/IEC 7498-3]
3.1.29	routing	[ISO/IEC 7498-1]
3.1.30	segmenting	[ISO/IEC 7498-1]
3.1.31	(N)-service DL-service (N=2) Ph-service (N=1)	[ISO/IEC 7498-1]
3.1.32	(N)-service-access-point DL-service-access-point (N=2) Ph-service-access-point (N=1)	[ISO/IEC 7498-1]
3.1.33	DL-service-access-point-address	[ISO/IEC 7498-3]
3.1.34	DL-service-connection-identifier	[ISO/IEC 7498-1]
3.1.35	DL-service-data-unit	[ISO/IEC 7498-1]
3.1.36	DL-simplex-transmission	[ISO/IEC 7498-1]

3.1.37	DL-subsystem	[ISO/IEC 7498-1]
3.1.38	systems-management	[ISO/IEC 7498-1]
3.1.39	DLS-user-data	[ISO/IEC 7498-1]

3.2 Service convention terms and definitions

This document also makes use of the following terms defined in ISO/IEC 10731 as they apply to the data-link layer:

- 3.2.1** **acceptor**
- 3.2.2** **asymmetrical service**
- 3.2.3** **confirm (primitive);**
 requestor.deliver (primitive)
- 3.2.4** **deliver (primitive)**
- 3.2.5** **DL-confirmed-facility**
- 3.2.6** **DL-facility**
- 3.2.7** **DL-local-view**
- 3.2.8** **DL-mandatory-facility**
- 3.2.9** **DL-non-confirmed-facility**
- 3.2.10** **DL-provider-initiated-facility**
- 3.2.11** **DL-provider-optional-facility**
- 3.2.12** **DL-service-primitive;**
 primitive
- 3.2.13** **DL-service-provider**
- 3.2.14** **DL-service-user**
- 3.2.15** **DLS-user-optional-facility**
- 3.2.16** **indication (primitive);**
 acceptor.deliver (primitive)
- 3.2.17** **multi-peer**
- 3.2.18** **request (primitive);**
 requestor.submit (primitive)
- 3.2.19** **requestor**
- 3.2.20** **response (primitive);**
 acceptor.submit (primitive)
- 3.2.21** **submit (primitive)**
- 3.2.22** **symmetrical service**

3.3 Common data-link service terms and definitions

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

NOTE Many definitions are common to more than one protocol Type; they are not necessarily used by all protocol Types.

3.3.1

DL-segment link local link

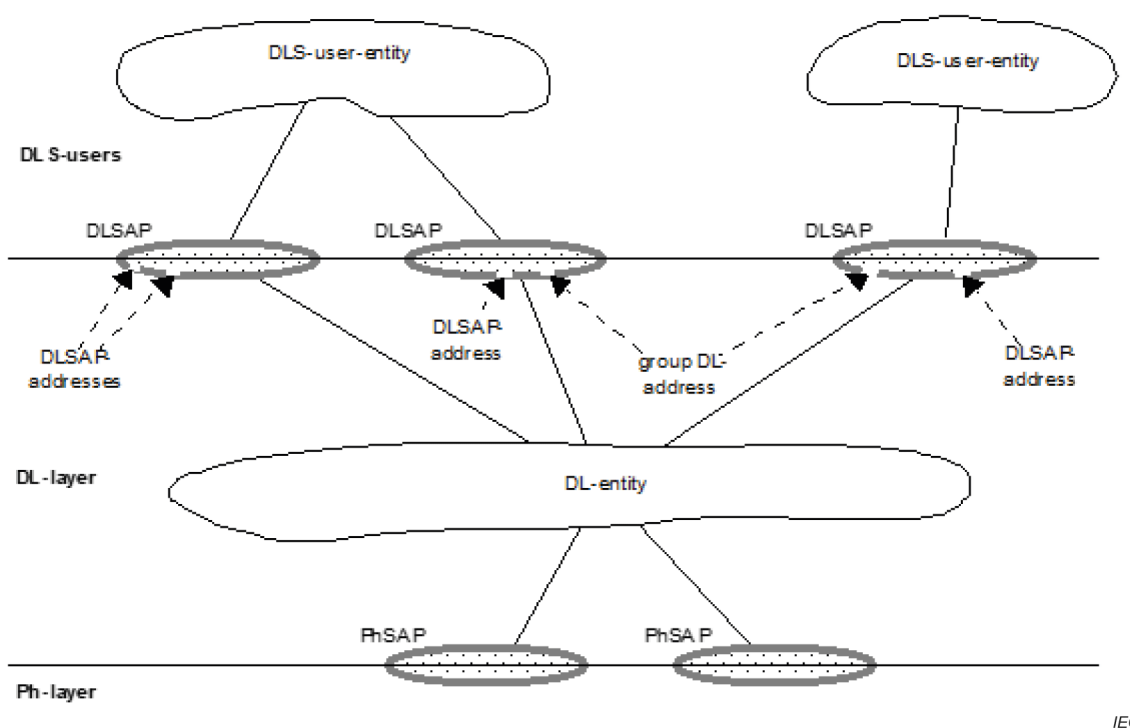
single DL-subnetwork in which any of the connected DLEs may communicate directly, without any intervening DL-relaying, whenever all of those DLEs that are participating in an instance of communication are simultaneously attentive to the DL-subnetwork during the period(s) of attempted communication

3.3.2

DLSAP

distinctive point at which DL-services are provided by a single DL-entity to a single higher-layer entity

Note 1 to entry: This definition, derived from ISO/IEC 7498-1, is repeated here to facilitate understanding of the critical distinction between DLSAPs and their DL-addresses (see Figure 1).



NOTE 1 DLSAPs and PhSAPs are depicted as ovals spanning the boundary between two adjacent layers.

NOTE 2 DL-addresses are depicted as designating small gaps (points of access) in the DLL portion of a DLSAP.

NOTE 3 A single DL-entity can have multiple DLSAP-addresses and group DL-addresses associated with a single DLSAP.

Figure 1 – Relationships of DLSAPs, DLSAP-addresses and group DL-addresses

3.3.3

DL(SAP)-address

either an individual DLSAP-address, designating a single DLSAP of a single DLS-user, or a group DL-address potentially designating multiple DLSAPs, each of a single DLS-user

Note 1 to entry: This terminology is chosen because ISO/IEC 7498-3 does not permit the use of the term DLSAP-address to designate more than a single DLSAP at a single DLS-user.

3.3.4

(individual) DLSAP-address

DL-address that designates only one DLSAP within the extended link