



BSI Standards Publication

Industrial communication networks — Fieldbus specifications

Part 5-2: Application layer service definition — Type 2 elements

National foreword

This British Standard is the UK implementation of EN IEC 61158-5-2:2023. It is identical to IEC 61158-5-2:2023. It supersedes BS EN IEC 61158-5-2:2019, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/65/3, Industrial communications: process measurement and control, including fieldbus.

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

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Published by BSI Standards Limited 2023

ISBN 978 0 539 26667 2

ICS 25.040.40; 35.100.70; 35.110

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2023.

Amendments/corrigenda issued since publication

Date	Text affected
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 61158-5-2

May 2023

ICS 25.040.40; 35.100.70; 35.110

Supersedes EN IEC 61158-5-2:2019

English Version

**Industrial communication networks - Fieldbus specifications -
Part 5-2: Application layer service definition - Type 2 elements
(IEC 61158-5-2:2023)**

Réseaux de communication industriels - Spécifications des
bus de terrain - Partie 5-2: Définition des services de la
couche application - Eléments de type 2
(IEC 61158-5-2:2023)

Industrielle Kommunikationsnetze - Feldbusse - Teil 5-2:
Dienstfestlegungen des Application Layer
(Anwendungsschicht) - Typ 2-Elemente
(IEC 61158-5-2:2023)

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Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 65C/1203/FDIS, future edition 5 of IEC 61158-5-2, 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 IEC 61158-5-2:2023.

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) 2024-01-28
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-04-28

This document supersedes EN IEC 61158-5-2:2019 and all of its amendments and corrigenda (if any).

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Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61158-5-2:2023 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 61131-1	NOTE	Approved as EN 61131-1
IEC 61131-9	NOTE	Approved as EN IEC 61131-9
IEC 61158-2	NOTE	Approved as EN IEC 61158-2
IEC 61784-1 (series)	NOTE	Approved as EN IEC 61784-1 (series)
IEC 61784-2 (series)	NOTE	Approved as EN IEC 61784-2 (series)
IEC 62026-3	NOTE	Approved as EN 62026-3

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 61131-3	2003	Programmable controllers - Part 3: Programming languages	-	-
IEC 61158-1	2023	Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series	-	-
IEC 61158-3-2	2023	Industrial communication networks - Fieldbus specifications - Part 3-2: Data-link layer service definition - Type 2 elements	-	-
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
IEC 61158-6-2	2023	Industrial communication networks - Fieldbus specifications - Part 6-2: Application layer protocol specification - Type 2 elements	-	-
IEC 61588	2021	Precision Clock Synchronization Protocol for Networked Measurement and Control Systems	-	-
IEC 61784-3-2	-	Industrial communication networks - Profiles - Part 3-2: Functional safety fieldbuses - Additional specifications for CPF 2	EN IEC 61784-3-2	-
IEC 62439-3	2016	Industrial communication networks - High availability automation networks - Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)	EN IEC 62439-3	2018
ISO/IEC 646	-	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/IEEE 8802-3	-	Telecommunications and exchange between information technology systems - Requirements for local and metropolitan area networks - Part 3: Standard for Ethernet	-	-

EN IEC 61158-5-2:2023 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO/IEC 8859-1	-	Information technology - 8-bit single-byte coded graphic character sets - Part-1: Latin alphabet No. 1	-	-
ISO/IEC 9545	-	Information technology - Open Systems Interconnection - Application layer structure	-	-
ISO/IEC 10646	-	Information technology - Universal coded character set (UCS)	-	-
ISO/IEC 10731	-	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-
ISO/IEC 60559	-	Information technology - Microprocessor Systems - Floating-Point arithmetic	-	-
ISO 639-2	-	Codes for the representation of names of languages - Part-2: Alpha-3 code	-	-
ISO 8601-1	-	Date and time - Representations for information interchange - Part 1: Basic rules	-	-
ISO 8859-1	1987	Information processing - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No. 1	-	-
ISO 8859-2	1987	Information processing - 8-bit single byte coded graphic character sets - Part 2: Latin alphabet No. 2	-	-
ISO 8859-3	1988	Information processing - 8-bit single-byte coded graphic character sets - Part-3: Latin alphabet no. 3	-	-
ISO 8859-4	1988	Information processing - 8-bit single-byte coded graphic character sets - Part-4: Latin alphabet no. 4	-	-
ISO/IEC 8859-5	1988	Information processing - 8-bit single-byte coded graphic character sets - Part 5: Latin/Cyrillic alphabet	-	-
ISO 8859-6	1987	Information processing - 8-Bit single-byte coded graphic character sets - Part 6: Latin/Arabic alphabet	-	-
ISO 8859-7	1987	Information processing - 8-bit single-byte coded graphic character sets - Part 7: Latin/Greek alphabet	-	-
ISO 8859-8	1988	Information processing; 8-bit single-byte coded graphic character sets; Part 8: Latin/hebrew alphabet	-	-
ISO/IEC 8859-9	1989	Information processing - 8-bit single-byte coded graphic character sets - Part 9: Latin alphabet No. 5	-	-
ISO 11898-1	2015	Road vehicles - Controller area network (CAN) - Part 1: Data link layer and physical signalling	-	-
IETF RFC 1759	-	Printer MIB	-	-

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
1.1 General.....	9
1.2 Specifications	10
1.3 Conformance	10
2 Normative references	10
3 Terms, definitions, symbols, abbreviated terms and conventions	12
3.1 ISO/IEC 7498-1 terms	13
3.2 ISO/IEC 8822 terms	13
3.3 ISO/IEC 9545 terms	13
3.4 ISO/IEC 8824-1 terms	13
3.5 Type 2 fieldbus data-link layer terms.....	13
3.6 Type 2 fieldbus application-layer specific definitions	14
3.7 Type 2 abbreviated terms and symbols	22
3.8 Conventions.....	23
3.8.1 Overview	23
3.8.2 General conventions	23
3.8.3 Conventions for class definitions	24
3.8.4 Conventions for service definitions	25
4 Common concepts	26
5 Data type ASE	26
5.1 General.....	26
5.2 Formal definition of data type objects.....	26
5.3 FAL defined data types	26
5.3.1 Fixed length types	26
5.3.2 String types	33
5.3.3 Structure types	34
5.4 Data type ASE service specification.....	37
6 Communication model specification	37
6.1 Concepts	37
6.1.1 General	37
6.1.2 General concepts	38
6.1.3 Relationships between ASEs	38
6.1.4 Naming and addressing	40
6.1.5 Data types	41
6.1.6 Diagnostic connection points	48
6.2 ASEs	49
6.2.1 Object management ASE.....	49
6.2.2 Connection manager ASE.....	175
6.2.3 Connection ASE	193
6.3 ARs	207
6.3.1 Overview	207
6.3.2 UCMM AR formal model	218
6.3.3 Transport AR formal model.....	220
6.3.4 AR ASE services	230

6.4	Summary of FAL classes	237
6.5	Permitted FAL services by AR type	238
	Bibliography.....	240
Figure 1	– Overview of ASEs and object classes.....	40
Figure 2	– Addressing format using MAC, class, instance and attribute IDs	40
Figure 3	– Identity object state transition diagram	67
Figure 4	– Explicit and Implicit Setting interaction	70
Figure 5	– Static Assembly state transition diagram	75
Figure 6	– Dynamic Assembly state transition diagram	76
Figure 7	– Variable Assembly state transition diagram	78
Figure 8	– Typical timing relationships for acknowledged data production.....	89
Figure 9	– Example of a COS system with two acking devices	89
Figure 10	– Message flow in COS connection – one Connection object, one consumer.....	90
Figure 11	– Message flow in COS connection – multiple consumers	90
Figure 12	– Path Reconfiguration in a ring topology	103
Figure 13	– Doubly attached clocks in a PRP network.....	104
Figure 14	– Type 2 Time Synchronization offset clock model	106
Figure 15	– Type 2 Time Synchronization system with offset clock model	106
Figure 16	– Type 2 time synchronization group startup sequence	109
Figure 17	– Parameter object state transition diagram	115
Figure 18	– Example of Find_Next_Object_Instance service	141
Figure 19	– State Transition Diagram for Fragmentation Session.....	172
Figure 20	– Transmission Trigger Timer behavior	201
Figure 21	– Inactivity watchdog timer	202
Figure 22	– Using tools for configuration.....	202
Figure 23	– Production Inhibit Timer behavior	203
Figure 24	– Context of transport services within the connection model.....	210
Figure 25	– Application-to-application view of data transfer	210
Figure 26	– Data flow diagram for a link producer	211
Figure 27	– Data flow diagram for a link consumer.....	212
Figure 28	– Triggers	213
Figure 29	– Binding transport instances to the producer and consumer of a transport connection that does not have a reverse data path	214
Figure 30	– Binding transport instances to the producers and consumers of a transport connection that does have a reverse data path	214
Figure 31	– Binding transport instances to the producer and consumers of a multipoint connection when the transport connection does not have a reverse data path	215
Figure 32	– Binding transport instances to the producers and consumers of a multipoint connection when the transport connection does have reverse data paths.....	215
Table 1	– Valid IANA MIB printer codes for character set selection	36
Table 2	– Common elements	43
Table 3	– ST language elements.....	44
Table 4	– Type conversion operations.....	45

Table 5 – Values of implementation-dependent parameters	47
Table 6 – Extensions to IEC 61131-3:2003	47
Table 7 – Identity object state event matrix	68
Table 8 – Static Assembly state event matrix	76
Table 9 – Static Assembly instance attribute access	76
Table 10 – Dynamic Assembly state event matrix	77
Table 11 – Dynamic Assembly instance attribute access	77
Table 12 – Variable Assembly state event matrix	78
Table 13 – Variable Assembly instance attribute access	78
Table 14 – Message Router object Forward_Open parameters	82
Table 15 – Acknowledge Handler object state event matrix	85
Table 16 – Producing I/O application object state event matrix	87
Table 17 – PTPEnable attribute default values	94
Table 18 – Profile identification	101
Table 19 – Profile default settings and ranges	101
Table 20 – Default PTP clock settings	102
Table 21 – HAND set clock quality management	103
Table 22 – Path Reconfiguration Signalling message	104
Table 23 – Parameter object state event matrix	116
Table 24 – Status codes	118
Table 25 – Get_Attributes_All service parameters	120
Table 26 – Set_Attributes_All service parameters	122
Table 27 – Get_Attribute_List service parameters	124
Table 28 – Set_Attribute_List service parameters	126
Table 29 – Reset service parameters	128
Table 30 – Start service parameters	130
Table 31 – Stop service parameters	131
Table 32 – Create service parameters	133
Table 33 – Delete service parameters	135
Table 34 – Get_Attribute_Single service parameters	136
Table 35 – Set_Attribute_Single service parameters	138
Table 36 – Find_Next_Object_Instance service parameters	140
Table 37 – NOP service parameters	142
Table 38 – Apply_Attributes service parameters	143
Table 39 – Save service parameters	145
Table 40 – Restore service parameters	146
Table 41 – Get_Member service parameters	148
Table 42 – Set_Member service parameters	150
Table 43 – Insert_Member service parameters	151
Table 44 – Remove_Member service parameters	153
Table 45 – Group_Sync service parameters	154
Table 46 – Add_AckData_Path service parameters	156
Table 47 – Remove_AckData_Path service parameters	157

Table 48 – Get_Enum_String service parameters	158
Table 49 – Symbolic_Translation service parameters.....	160
Table 50 – Flash_LEDs service parameters	161
Table 51 – Multiple_Service_Packet service parameters.....	163
Table 52 – Get_Connection_Point_Member_List service parameters	165
Table 53 – Send_Receive_Fragment service parameters.....	167
Table 54 – Fragmentation Session Manager Event/Activity Matrix.....	171
Table 55 – Fragmentation State Event Matrix.....	172
Table 56 – CM_Open service parameters	184
Table 57 – CM_Close service parameters.....	186
Table 58 – CM_Unconnected_Send service parameters	188
Table 59 – CM_Get_Connection_Data service parameters.....	189
Table 60 – CM_Search_Connection_Data service parameters	190
Table 61 – CM_Get_Connection_Data service parameters.....	192
Table 62 – I/O Connection object attribute access	197
Table 63 – Bridged Connection object attribute access	198
Table 64 – Explicit messaging object attribute access.....	199
Table 65 – Connection_Bind service parameters	204
Table 66 – Service_Name service parameters	206
Table 67 – How production trigger, transport class, and CM_RPI determine when data is produced.....	209
Table 68 – Transport classes	220
Table 69 – UCMM_Create service parameters	230
Table 70 – UCMM_Delete service parameters	231
Table 71 – UCMM_Write service parameters	232
Table 72 – UCMM_Abort service parameters	234
Table 73 – TR_Write service parameters	234
Table 74 – TR_Trigger service parameters	235
Table 75 – TR_Packet_arrived service parameters	235
Table 76 – TR_Ack_received service parameters.....	236
Table 77 – TR_Verify service parameters	237
Table 78 – FAL class summary	237
Table 79 – FAL services by AR type	238

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –****Part 5-2: Application layer service definition –
Type 2 elements**

FOREWORD

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Attention is drawn to the fact that the use of the associated protocol type is restricted by its intellectual-property-right holders. In all cases, the commitment to limited release of intellectual-property-rights made by the holders of those rights permits a layer protocol type to be used with other layer protocols of the same type, or in other type combinations explicitly authorized by its intellectual-property-right holders.

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

IEC 61158-5-2 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 fifth edition cancels and replaces the fourth edition published in 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) new STIME, UTIME and NTIME data types in 5.3.1.5;
- c) updated list of managements objects in 6.1.3;
- d) new attributes and services for the ASE general formal model in 6.2.1.2.1, 6.2.1.3 and 6.5;
- e) clarifications, new attributes and services for the Identity ASE in 6.2.1.2.2;
- f) clarifications, new attributes and other extensions for the Assembly ASE in 6.2.1.2.3;
- g) new attributes and services for the Message Router ASE in 6.2.1.2.4;
- h) addition of missing class attributes for the Acknowledge Handler ASE in 6.2.1.2.5;
- i) clarifications, new attributes and services for the Time Sync ASE in 6.2.1.2.6;
- j) addition of missing class attributes for the Parameter ASE in 6.2.1.2.7;
- k) clarifications of service parameters, status codes and procedures in 6.2.1.3;
- l) addition of a new service for the Message Router ASE in 6.2.1.3;
- m) clarifications and new services for the Connection Manager ASE in 6.2.2;
- n) clarifications and new services for the Connection ASE in 6.2.3;
- o) removal of obsoleted transport options and related services in 6.3.3;
- p) removal of all references to CPF and CPs (material moved to profile documents);
- q) miscellaneous editorial corrections.

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

Draft	Report on voting
65C/1203/FDIS	65C/1244/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 parts of the IEC 61158 series, published 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.

The application service is provided by the application protocol making use of the services available from the data-link or other immediately lower layer. This document defines the application service characteristics that fieldbus applications and/or system management can exploit.

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

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-2: Application layer service definition – Type 2 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 part of IEC 61158 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 2 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 document defines in an abstract way the externally visible service provided by the Type 2 fieldbus application layer in terms of:

- an abstract model for defining application resources (objects) capable of being manipulated by users via the use of the FAL service;
- 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 FAL user at the boundary between the user and the application layer of the fieldbus reference model; and
- Systems Management at the boundary between the application layer and Systems Management of the fieldbus reference model.

This document specifies the structure and services of the Type 2 fieldbus application layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498-1) and the OSI application layer structure (ISO/IEC 9545).

FAL services and protocols are provided by FAL application-entities (AE) contained within the application processes. The FAL AE is composed of a set of object-oriented application service elements (ASEs) and a layer management entity (LME) that manages the AE. The ASEs provide communication services that operate on a set of related application process object (APO) classes. One of the FAL ASEs is a management ASE that provides a common set of services for the management of the instances of FAL classes.

Although these services specify, from the perspective of applications, how request and responses are issued and delivered, they do not include a specification of what the requesting and responding applications are to do with them. That is, the behavioral aspects of the applications are not specified; only a definition of what requests and responses they can send/receive is specified. This permits greater flexibility to the FAL users in standardizing such object behavior. In addition to these services, some supporting services are also defined in this document to provide access to the FAL to control certain aspects of its operation.

1.2 Specifications

The principal objective of this document is to specify the characteristics of conceptual application layer services suitable for time-critical communications, and thus supplement the OSI Basic Reference Model in guiding the development of application layer protocols for time-critical communications.

A secondary objective is to provide migration paths from previously-existing industrial communications protocols. It is this latter objective which gives rise to the diversity of services standardized as the various Types of IEC 61158, and the corresponding protocols standardized in subparts of IEC 61158-6.

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

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

1.3 Conformance

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

There is no conformance of equipment to this application layer service definition standard. Instead, conformance is achieved through implementation of conforming application layer protocols that fulfill the Type 2 application layer services as 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 61131-3:2003¹, *Programmable controllers – Part 3: Programming languages*

IEC 61158-1:2023, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

IEC 61158-3-2:2023, *Industrial communication networks – Fieldbus specifications – Part 3-2: Data-link layer service definition – Type 2 elements*

¹ A newer edition of this standard has been published, but only the cited edition applies.