

STN	Priemyselné komunikačné siete Špecifikácie prevádzkových zberníc Časť 4-24: Špecifikácia protokolu údajovej vrstvy Prvky typu 24	STN EN IEC 61158-4-24 18 4020
------------	---	---

Industrial communication networks - Fieldbus specifications - Part 4-24: Data-link layer protocol specification - Type 24 elements

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 07/23

Obsahuje: EN IEC 61158-4-24:2023, IEC 61158-4-24:2023

Oznámením tejto normy sa od 02.05.2026 ruší
STN EN IEC 61158-4-24 (18 4020) z októbra 2019

137098

EUROPEAN STANDARD

EN IEC 61158-4-24

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2023

ICS 25.040.40; 35.100.20; 35.110

Supersedes EN IEC 61158-4-24:2019

English Version

**Industrial communication networks - Fieldbus specifications -
Part 4-24: Data-link layer protocol specification - Type 24
elements
(IEC 61158-4-24:2023)**

Réseaux de communication industriels - Spécifications des
bus de terrain - Partie 4-24: Spécification du protocole de la
couche liaison de données - Éléments de type 24
(IEC 61158-4-24:2023)

Industrielle Kommunikationsnetze - Feldbusse – Teil 4-24:
Protokollspezifikation des Data Link Layer
(Sicherheitsschicht) - Typ 24-Elemente
(IEC 61158-4-24:2023)

This European Standard was approved by CENELEC on 2023-05-02. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

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

EN IEC 61158-4-24:2023 (E)**European foreword**

The text of document 65C/1202/FDIS, future edition 3 of IEC 61158-4-24, 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 61158-4-24:2023.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2024-02-02 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2026-05-02 document have to be withdrawn

This document supersedes EN IEC 61158-4-24:2019 and all of its amendments and corrigenda (if any).

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

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 61158-4-24:2023 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 61784-1 (series) NOTE Approved as EN IEC 61784-1 (series)

IEC 61784-2 (series) NOTE Approved as EN IEC 61784-2 (series)

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 61158-2	2023	Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition	EN IEC 61158-2	2023
IEC 61158-3-24	2023	Industrial communication networks - Fieldbus specifications - Part 3-24: Data-link layer service definition - Type 24 elements	EN IEC 61158-3-24	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/IEEE 8802-3	2021	Telecommunications and exchange between information technology systems - Requirements for local and metropolitan area networks - Part 3: Standard for Ethernet	-	-
ISO/IEC 9899	-	Information technology - Programming languages - C	-	-
ISO/IEC 10731	-	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-
ISO/IEC 13239	2002	Information technology - Telecommunications and information exchange between systems - High-level data link control (HDLC) procedures	-	-
ISO/IEC 19501	2005	Information technology - Open Distributed Processing - Unified Modeling Language (UML) Version 1.4.2	-	-



IEC 61158-4-24

Edition 3.0 2023-03

INTERNATIONAL STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 4-24: Data-link layer protocol specification – Type 24 elements**





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2023 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.



IEC 61158-4-24

Edition 3.0 2023-03

INTERNATIONAL STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 4-24: Data-link layer protocol specification – Type 24 elements**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.40; 35.100.20; 35.110

ISBN 978-2-8322-6556-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	10
1.1 General.....	10
1.2 Specifications	10
1.3 Procedures	10
1.4 Applicability	11
1.5 Conformance	11
2 Normative references	11
3 Terms, definitions, symbols, abbreviated terms and conventions	12
3.1 Reference model terms and definitions	12
3.2 Service convention terms and definitions	13
3.3 Common terms and definitions.....	13
3.4 Symbols and abbreviations	16
3.5 Additional Type 24 symbols and abbreviations.....	16
3.6 Common conventions.....	16
3.7 Additional Type 24 conventions.....	17
3.7.1 Primitive conventions.....	17
3.7.2 State machine conventions.....	17
4 Overview of DL-protocol	18
4.1 Characteristic feature of the DL-protocol.....	18
4.2 DL layer component.....	19
4.2.1 Cyclic transmission control (CTC).....	20
4.2.2 Send receive control (SRC)	20
4.2.3 DL-management	20
4.3 Timing sequence.....	20
4.3.1 Overview	20
4.3.2 Cyclic transmission mode	20
4.3.3 Acyclic transmission mode.....	34
4.4 Service assumed from the PhL.....	34
4.4.1 General requirement.....	34
4.4.2 DL_Symbols	34
4.4.3 Assumed primitives of the PhS	35
4.5 Local parameters, variables, counters, timers	35
4.5.1 Overview	35
4.5.2 Variables, parameters, counters and timers to support DLE function.....	35
5 DLPDU structure	40
5.1 Overview.....	40
5.1.1 Transfer syntax for bit sequences	40
5.1.2 Data type encodings	41
5.1.3 Frame format.....	41
5.2 Basic format DLPDU structure	41
5.2.1 General	41
5.2.2 Synchronous frame.....	45
5.2.3 Output data or Input data frame	46
5.2.4 Delay measurement start frame	46

5.2.5	Delay measurement frame	47
5.2.6	Message token frame	47
5.2.7	Status frame	48
5.2.8	Cycle Information frame	49
5.2.9	Message frame	50
5.3	Short format DLPDU structure	51
5.3.1	General	51
5.3.2	Synchronous frame	53
5.3.3	Output data or Input data frame	53
5.3.4	Message frame	54
5.4	Short format II DLPDU structure	54
5.4.1	General	54
5.4.2	Asynchronous frame	56
5.4.3	Synchronous frame	57
5.4.4	Output data or Input data frame	57
6	DLE element procedure	58
6.1	Overview	58
6.2	Cyclic transmission control sublayer	58
6.2.1	General	58
6.2.2	DLS-user interface	58
6.2.3	Protocol machines in CTC	59
6.2.4	CTC-DLM interface	112
6.3	Send Receive Control	113
6.3.1	General	113
6.3.2	SRC-CTC interface	114
6.3.3	Detailed specification of SRC	114
6.3.4	SRC-DLM interface	119
7	DL-management layer (DLM)	120
7.1	Overview	120
7.2	Primitive definitions	120
7.2.1	Primitives exchanged between DLMS-user and DLM	120
7.2.2	Parameters used with DLM primitives	121
7.3	DLM protocol machine	121
7.3.1	C1 master	121
7.3.2	Slave and C2 master	126
7.4	Functions	130
7.5	DLM protocol machine for no time slot type	131
7.5.1	C1 master	131
7.5.2	C2 master and Slave	133
7.6	Functions for no time slot type	134
	Bibliography	135
	Figure 1 – Data-link layer component	20
	Figure 2 – Timing chart of fixed-width time slot type cyclic communication	21
	Figure 3 – Timing chart of configurable time slot type cyclic communication	23
	Figure 4 – Schematic diagram of cyclic event occurrence	25
	Figure 5 – Timing relationship between cyclic transmission and data processing	28

Figure 6 – Timing chart of no time slot type cyclic communication (Master send common address)	28
Figure 7 – Timing chart for multiple transmission cycle setting	29
Figure 8 – Timing chart for multiple transmission cycle setting figure title	30
Figure 9 – Schematic diagram for connection.....	31
Figure 10 – Schematic diagram of INPUT data response timing at the same interval	32
Figure 11 – Schematic diagram of INPUT data response timing at the same time	33
Figure 12 – Timing chart example of acyclic communication	34
Figure 13 – Basic format DLPDU structure.....	42
Figure 14 – Short format DLPDU structure.....	51
Figure 15 – Short format II DLPDU structure.....	54
Figure 16 – Acyclic transmission frame address field	55
Figure 17 – Cyclic transmission frame address	55
Figure 18 – Asynchronous frame	56
Figure 19 – Synchronous frame (to be used by C1).....	57
Figure 20 – Synchronous frame (to be used by C2 or slave)	57
Figure 21 – The state diagram of the C1 master for fixed-width time slot	60
Figure 22 – The state diagram of the C2 master for fixed-width time slot	67
Figure 23 – The state diagram of the slave for fixed-width time slot	71
Figure 24 – The state diagram of the C1 master for configurable time slot	73
Figure 25 – The state diagram of the C2 master for configurable time slot	82
Figure 26 – The state diagram of slave for configurable time slot.....	85
Figure 27 – The state diagram of the C1 master for no time slot type.....	89
Figure 28 – The state diagram of the C2 master for no time slot type.....	90
Figure 29 – The state diagram of the Slave for no time slot type	92
Figure 30 – The state diagram of message initiator for basic format.....	93
Figure 31 – The state diagram of message responder for basic format.....	97
Figure 32 – The state diagram of message initiator for short format.....	101
Figure 33 – The state diagram of message responder for short format.....	106
Figure 34 – The state diagram of the acyclic transmission protocol machine	111
Figure 35 – Internal architecture of one-port SRC	115
Figure 36 – Internal architecture of multi-port SRC	115
Figure 37 – Internal architecture of serializer	115
Figure 38 – Internal architecture of deserializer	117
Figure 39 – State diagram of the C1 master DLM.....	122
Figure 40 – State diagram of the Slave and the C2 master DLM	127
Figure 41 – State diagram of the C1 master DLM for no time slot type.....	132
Figure 42 – State diagram of the C2 master and slaves DLM for no time slot type	133
Table 1 – State transition descriptions	18
Table 2 – Description of state machine elements	18
Table 3 – Conventions used in state machines	18
Table 4 – Characteristic features of the fieldbus data-link protocol.....	19

Table 5 – List of the values of the variable Cyc_sel.....	36
Table 6 – List of the values of the variable Tunit.....	37
Table 7 – List of the values of the variable PDUType.....	38
Table 8 – List of the values of the variable SlotType.....	38
Table 9 – Transfer syntax for bit sequences.....	40
Table 10 – Bit order.....	41
Table 11 – Destination and source address format.....	42
Table 12 – Station address.....	42
Table 13 – Extended address.....	43
Table 14 – Message control field format (Information transfer format).....	43
Table 15 – Message control field format (Supervisory format).....	44
Table 16 – The list of Supervisory function bits.....	44
Table 17 – Frame type and data length format.....	44
Table 18 – The list of Frame type.....	45
Table 19 – Data format of the Synchronous frame.....	45
Table 20 – The field list of the Synchronous frame.....	46
Table 21 – Data format of the Output data or the Input data frame.....	46
Table 22 – The field list of the Output data or the Input data frame.....	46
Table 23 – Data format of Delay measurement start frame.....	47
Table 24 – The field list of Delay measurement start frame.....	47
Table 25 – Data format of Delay measurement frame.....	47
Table 26 – The field list of Delay measurement frame.....	47
Table 27 – Data format of Status frame.....	48
Table 28 – The field list of Status frame.....	48
Table 29 – The list of the DLE status.....	48
Table 30 – The list of Repeater status.....	49
Table 31 – Data format of Delay measurement frame.....	49
Table 32 – The field list of Cycle Information frame.....	50
Table 33 – Data format of Message frame.....	50
Table 34 – The field list of Message frame.....	50
Table 35 – Range of Station address field.....	51
Table 36 – Control field format (I/O data exchange format).....	52
Table 37 – Control field format (Message format).....	52
Table 38 – The field list of Message format.....	52
Table 39 – Data format of the Synchronous frame.....	53
Table 40 – The field list of the Synchronous frame.....	53
Table 41 – Data format of the Output data frame.....	53
Table 42 – The field list of the Output data frame.....	54
Table 43 – Data format of the Input data frame.....	54
Table 44 – The field list of the Input data frame.....	54
Table 45 – Range of Station address field.....	55
Table 46 – Cycle scale counter field format.....	56
Table 47 – The list of frame type.....	56

Table 48 – Data format of the Output data frame	57
Table 49 – The field list of the Output data frame.....	57
Table 50 – Data format of the Input data frame	57
Table 51 – The field list of the Input data frame	58
Table 52 – Primitives and parameters for the DLS-user interface issued by the DLS-user	58
Table 53 – Primitives and parameters for the DLS-user interface issued by the CTC	59
Table 54 – The state table of the C1 master for fixed-width time slot.....	61
Table 55 – The state table of the C2 master for fixed-width time slot.....	67
Table 56 – The state table of the slave for fixed-width time slot	71
Table 57 – The state table of the C1 master for configurable time slot	74
Table 58 – The state table of the C2 master for configurable time slot	82
Table 59 – The state table of slave for configurable time slot	86
Table 60 – The list of functions used by cyclic transmission machine.....	87
Table 61 – The state table of the C1 master for no time slot type	90
Table 62 – The state table of the C2 master for no time slot type	91
Table 63 – The state table of the Slave for no time slot type	92
Table 64 – The state table of message initiator for basic format.....	94
Table 65 – The state table of message responder for basic format.....	98
Table 66 – The state table of message initiator for short format	102
Table 67 – The state table of message responder for short format	106
Table 68 – List of functions used by the message segmentation machine	110
Table 69 – The state table of the acyclic transmission protocol machine	112
Table 70 – The list of functions used acyclic transmission protocol machine	112
Table 71 – Primitives and parameters exchanged between CTC and DLM	113
Table 72 – Error event primitive and parameters	113
Table 73 – primitives and parameters for SRC-CTC interface	114
Table 74 – Send frame primitive and parameters	114
Table 75 – Receive frame primitives and parameters	114
Table 76 – Primitives and parameters exchanged between SRC and DLM	119
Table 77 – Get value primitive and parameters	120
Table 78 – Error event primitive and parameters	120
Table 79 – The list of primitives and parameters (DLMS-user source).....	121
Table 80 – The list of primitives and parameters (DLM source)	121
Table 81 – State table of the C1 Master DLM.....	122
Table 82 – State table of the Slave and the C2 master DLM	127
Table 83 – The list of the functions used by DLM protocol machine	130
Table 84 – State table of the C1 Master DLM for no time slot type	132
Table 85 – State table of the C2 master and slaves DLM for no time slot type	133

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –****Part 4-24: Data-link layer protocol specification –
Type 24 elements**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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 61158-4-24 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 2019. This edition constitutes a technical revision.

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

- addition of a new cyclic transmission mode which called "no time slot type" in Subclause 4.3.2.4;
- addition of a new frame format for no time slot type in Subclause 5.4;
- addition of a new DLE element procedure for no time slot type in Subclause 6.2.3.2.4, 6.3.3.2.2.4, 6.3.3.3.2.4;
- addition of a new DLM protocol machine for no time slot type in Subclause 7.5, 7.6; and
- spelling and grammar.

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

Draft	Report on voting
65C/1202/FDIS	65C/1243/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, 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 data-link protocol provides the data-link service by making use of the services available from the physical layer. The primary aim of this document is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer data-link entities (DLEs) 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 implementers 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 document is concerned, in particular, with the communication and interworking of sensors, effectors and other automation devices. By using this document together with other standards positioned within the OSI or fieldbus reference models, otherwise incompatible systems could work together in any combination.

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. IEC takes no position concerning the evidence, validity, and scope of this patent right.

The holder of this patent right has assured IEC that s/he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from the patent database available at patents.iec.ch.

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

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 4-24: Data-link layer protocol specification – Type 24 elements

1 Scope

1.1 General

The data-link layer provides basic time-critical messaging communications between devices in an automation environment.

This protocol provides communication opportunities to all participating data-link entities:

- in a synchronously-starting cyclic manner, according to a pre-established schedule, or
- in an acyclic manner, as requested by each of those data-link entities.

Thus, this protocol can be characterized as one which provides cyclic and acyclic access asynchronously but with a synchronous restart of each cycle.

1.2 Specifications

This part of IEC 61158 provides specifies

- procedures for the timely transfer of data and control information from one data-link user entity to a peer user entity, and among the data-link entities forming the distributed datalink service provider;
- procedures for giving communications opportunities to all participating DL-entities (DLEs), sequentially and in a cyclic manner for deterministic and synchronized transfer at cyclic intervals up to 64 ms;
- procedures for giving communication opportunities available for time-critical data transmission together with non-time-critical data transmission without prejudice to the time-critical data transmission;
- procedures for giving cyclic and acyclic communication opportunities for time-critical data transmission with prioritized access;
- procedures for giving communication opportunities based on ISO/IEC/IEEE 8802-3 medium access control, with provisions for nodes to be added or removed during normal operation;
- the structure of the fieldbus DLPDUs used for the transfer of data and control information by the protocol of this document, and their representation as physical interface data units.

1.3 Procedures

The procedures are defined in terms of

- the interactions between peer DL-entities through the exchange of fieldbus DLPDUs;
- the interactions between a DL-service (DLS) provider and a DLS-user in the same system through the exchange of DLS primitives;
- the interactions between a DLS-provider and a Ph-service provider in the same system through the exchange of Ph-service primitives.

1.4 Applicability

These procedures are applicable to instances of communication between systems which support time-critical communications services within the data-link layer of the OSI or fieldbus reference models, and which require the ability to interconnect in an open systems interconnection environment.

Profiles provide a simple multi-attribute means of summarizing an implementation's capabilities, and thus its applicability to various time-critical communications needs.

1.5 Conformance

This document also specifies conformance requirements for systems implementing these procedures. This document does not contain tests to demonstrate compliance with such requirements.

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 61158-2:2023, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61158-3-24:2023, *Industrial communication networks – Fieldbus specifications – Part 3-24: Data-link layer service definition – Type 24 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/IEEE 8802-3:2021, *Information technology – Telecommunications and exchange between information technology systems – Requirements for local and metropolitan area networks – Part 3: Standard for Ethernet*

ISO/IEC 9899, *Information technology – Programming languages – C*

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

ISO/IEC 13239:2002, *Information technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures*

ISO/IEC 19501:2005, *Information technology – Open Distributed Processing – Unified Modelling Language (UML) Version 1.4.2*