

SLOVENSKI STANDARD
SIST EN IEC 61158-6-24:2023**01-november-2023****Nadomešča:****SIST EN 61158-6-24:2015**

**Industrijska komunikacijska omrežja - Specifikacije za procesna vodila - 6-24. del:
Specifikacija protokola na aplikacijski ravni - Elementi tipa 24 (IEC 61158-6-
24:2023)**Industrial communication networks - Fieldbus specifications - Part 6-24: Application layer
protocol specification - Type 24 elements (IEC 61158-6-24:2023)Industrielle Kommunikationsnetze - Feldbusse - Teil 6-24: Protokollspezifikation des
Application Layer (Anwendungsschicht) - Typ 24-Elemente (IEC 61158-6-24:2023)Réseaux de communication industriels - Spécifications des bus de terrain - Partie 6-24:
Spécification du protocole de la couche liaison de données - Eléments de type 2
(IEC 61158-6-24:2023)[SIST EN IEC 61158-6-24:2023](https://standards.iteh.ai/catalog/standards/sist/6d1da457-7e9b-42ce-8ce7-c5e8a41af79c/sist-en-iec-61158-6-24-2023)<https://standards.iteh.ai/catalog/standards/sist/6d1da457-7e9b-42ce-8ce7-c5e8a41af79c/sist-en-iec-61158-6-24-2023>**Ta slovenski standard je istoveten z: EN IEC 61158-6-24:2023****ICS:**

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
35.100.70	Uporabniški sloj	Application layer
35.110	Omreževanje	Networking

SIST EN IEC 61158-6-24:2023**en,fr,de**

EUROPEAN STANDARD

EN IEC 61158-6-24

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2023

ICS 25.040.40; 35.100.70; 35.110

Supersedes EN 61158-6-24:2014

English Version

**Industrial communication networks - Fieldbus specifications -
Part 6-24: Application layer protocol specification - Type 24
elements
(IEC 61158-6-24:2023)**

Réseaux de communication industriels - Spécifications des
bus de terrain - Partie 6-24: Spécification du protocole de la
couche liaison de données - Eléments de type 24
(IEC 61158-6-24:2023)

Industrielle Kommunikationsnetze - Feldbusse - Teil 6-24:
Protokollspezifikation des Application Layer
(Anwendungsschicht) - Typ 24-Elemente
(IEC 61158-6-24:2023)

This European Standard was approved by CENELEC on 2023-04-28. 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.

[SIST EN IEC 61158-6-24:2023](https://standards.iteh.ai/catalog/standards/sist/6d1da457-7e9b-42ce-8ce7-c5e8a41af79c/sist-en-iec-61158-6-24-2023)

<https://standards.iteh.ai/catalog/standards/sist/6d1da457-7e9b-42ce-8ce7-c5e8a41af79c/sist-en-iec-61158-6-24-2023>



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 61158-6-24:2023 (E)**European foreword**

The text of document 65C/1204/FDIS, future edition 2 of IEC 61158-6-24, 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 61158-6-24:2023.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2024-01-28 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2026-04-28 document have to be withdrawn

This document supersedes EN 61158-6-24:2014 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 61158-6-24:2023 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 61158-1:2023	NOTE Approved as EN IEC 61158-1:2023 (not modified)
IEC 61158-2	NOTE Approved as EN IEC 61158-2
IEC 61158-3-24	NOTE Approved as EN 61158-3-24
IEC 61158-4-24	NOTE Approved as EN IEC 61158-4-24
IEC 61158-6 (series)	NOTE Approved as EN 61158-6 (series)
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 61158-5-24	2023	Industrial communication networks - Fieldbus specifications - Part 5-24: Application layer service definition - Type 24 elements	EN IEC 61158-5-24	2023
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 9545	-	Information technology - Open Systems Interconnection - Application layer structure	-	-
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 19501	2005	Information technology - Open Distributed Processing - Unified Modeling Language (UML) Version 1.4.2	-	-
ISO/IEC/IEEE 60559	2020	Information technology - Microprocessor Systems - Floating-Point arithmetic	-	-



IEC 61158-6-24

Edition 2.0 2023-03

INTERNATIONAL STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 6-24: Application layer protocol specification – Type 24 elements**

**(<https://standards.iteh.ai>)
Document Preview**

[SIST EN IEC 61158-6-24:2023](https://standards.iteh.ai/catalog/standards/sist/6d1da457-7e9b-42ce-8ce7-c5e8a41af79c/sist-en-iec-61158-6-24-2023)

<https://standards.iteh.ai/catalog/standards/sist/6d1da457-7e9b-42ce-8ce7-c5e8a41af79c/sist-en-iec-61158-6-24-2023>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.40; 35.100.70; 35.110

ISBN 978-2-8322-6642-7

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

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
1.1 General.....	9
1.2 Specifications	9
1.3 Conformance	10
2 Normative references	10
3 Terms, definitions, symbols, abbreviated terms, and conventions	10
3.1 Referenced terms and definitions.....	10
3.1.1 Terms and definitions from ISO/IEC 7498-1	11
3.1.2 Terms and definitions from ISO/IEC 9545	11
3.1.3 Terms and definitions from ISO/IEC 8824-1	11
3.1.4 Terms and definitions from ISO/IEC 10731	11
3.1.5 Terms and definitions from ISO/IEC 19501	12
3.2 Additional terms and definitions	12
3.3 Abbreviations and symbols	17
3.4 Conventions.....	19
3.4.1 General conventions.....	19
3.4.2 PDU data type conventions.....	19
3.4.3 State machine conventions	19
4 Abstract syntax.....	22
4.1 Basic Data types.....	22
4.2 FAL PDU types	23
4.2.1 Top of APDU types: _APDU.....	23
4.2.2 PDUs for field device control service	24
4.2.3 PDUs for message service.....	37
4.3 Detailed definitions of _FDCService-PDUs.....	38
4.3.1 Short PDU type.....	38
4.3.2 Long PDU type	45
4.3.3 Enhanced PDU type	48
4.3.4 SubCommand PDU type	58
4.3.5 Short PDU type II.....	59
4.4 Device profile.....	66
5 Transfer syntax.....	66
5.1 Concepts	66
5.2 Encode rules.....	66
5.2.1 INTEGER and its subtypes	66
5.2.2 REAL type and its subtypes	68
5.2.3 BIT STRING type.....	69
5.2.4 OCTET STRING type and IA5String type	70
5.2.5 NULL type	71
5.2.6 Structure type and Array type	71
6 Structure of FAL protocol state machine	71
7 AP-context state machine (APC SM)	73
7.1 Overview.....	73
7.2 State descriptions	74

7.3	Triggering events	75
7.4	Action descriptions at state transitions	75
8	FAL service protocol machines (FSPM)	77
8.1	Overview	77
8.2	Field Device Control Protocol Machine (FDC PM)	77
8.2.1	Protocol overview	77
8.2.2	Cyclic communication mode	78
8.2.3	Event driven communication mode	82
8.2.4	Master Protocol Machine (FDCPM-M)	83
8.2.5	Slave Protocol Machine (FDCPM-S)	92
8.2.6	Monitor Protocol Machine (FDCPM-MN)	102
8.2.7	Error procedure summary	104
8.3	Message Protocol Machine (MSGPM)	106
8.3.1	Protocol overview	106
8.3.2	Requester Protocol Machine (MSGPM-RQ)	108
8.3.3	Responder Protocol Machine (MSGPM-RS)	111
9	Application relationship protocol machine (ARPM)	113
9.1	General	113
9.2	ARPM for FDC ASE	114
9.2.1	Overview	114
9.2.2	ARPM for FDC Master (ARPM-FDCM)	116
9.2.3	ARPM for FDC Slave (ARPM-FDCS)	122
9.2.4	ARPM for FDC Monitor (ARPM-FDCMN)	129
9.3	ARPM for MSG ASE (ARPM-MSG)	131
9.3.1	State descriptions	131
9.3.2	Triggering events	132
9.3.3	Action descriptions at state transitions	133
10	DLL mapping protocol machine (DMPM)	134
	Annex A (informative) Device profile and FDC command sets	135
	Annex B (normative) Virtual memory space and Device Information	137
	B.1 Overview	137
	B.2 Device Information	137
	B.2.1 Device identifier area structure	137
	B.2.2 Detail specifications of device IDs	138
	Annex C (informative) Basic message function	144
	Bibliography	145
	Figure 1 – Tree structure of APDU types	24
	Figure 2 – Encode of Integer subtypes	67
	Figure 3 – Example of transfer of INTEGER value	67
	Figure 4 – Encode of Unsigned subtypes	68
	Figure 5 – <i>Float</i> ₃₂ type encode	68
	Figure 6 – <i>Float</i> ₆₄ type encode	69
	Figure 7 – Bit field definition example with named bits	70
	Figure 8 – Bit field definition example with field size	70
	Figure 9 – SEQUENCE type encode	71

Figure 10 – Structure of FAL protocol state machines	73
Figure 11 – Statechart diagram of APCSM	74
Figure 12 – Example communication cycle of FDC master AP	79
Figure 13 – Example communication cycle of FDC slave AP	79
Figure 14 – Synchronous command communication in sync state	80
Figure 15 – Asynchronous command communication in sync state	81
Figure 16 – Asynchronous command communication in async state	82
Figure 17 – Event-driven communication	83
Figure 18 – Statechart diagram of FDCPM-M	84
Figure 19 – Statechart diagram of FDCPM-S	93
Figure 20 – Statechart diagram of FDCPM-MN	102
Figure 21 – PDU transmission flow for user message	107
Figure 22 – PDU transmission flow for one-way message	108
Figure 23 – Statechart diagram of MSGPM-RQ	109
Figure 24 – Statechart diagram of MSGPM-RS	111
Figure 25 – Example of single transfer process	114
Figure 26 – Example of dual transfer process	114
Figure 27 – Example of Synchronous command communication	115
Figure 28 – Timing chart for individual communication cycle setting	116
Figure 29 – Statechart diagram of ARPM-FDCM	117
Figure 30 – Statechart diagram of ARPM-FDCS	123
Figure 31 – Statechart diagram of ARPM-FDCMN	129
Figure 32 – Statechart diagram of ARPM-MSG	132
Figure B.1 – Memory map of virtual memory space	137
Figure B.2 – Memory map of device ID area	138
Table 1 – State transition descriptions	20
Table 2 – Description of state machine elements	20
Table 3 – Conventions used in state machines	21
Table 4 – Mapping for Protocol State Machines	72
Table 5 – State descriptions of APC SM	74
Table 6 – Trigger event descriptions of APC SM	75
Table 7 – Transitions of APC SM	75
Table 8 – FDC protocol mode	77
Table 9 – State descriptions of FDCPM-M	84
Table 10 – Trigger event descriptions of FDCPM-M	86
Table 11 – Transitions of main SM of FDCPM-M	87
Table 12 – Transitions of submachine of FDCPM-M	89
Table 13 – State descriptions of FDCPM-S	93
Table 14 – Trigger event descriptions of FDCPM-S	94
Table 15 – Transitions of main SM of FDCPM-S	95
Table 16 – Transitions of submachine of FDCPM-S	97
Table 17 – State descriptions of FDCPM-MN	102

Table 18 – Trigger event descriptions of FDCPM-MN.....	103
Table 19 – Transitions of main SM of FDCPM-MN	103
Table 20 – Transitions of submachine of FDCPM-MN	104
Table 21 – State descriptions of MSGPM-RQ.....	109
Table 22 – Trigger event descriptions of MSGPM-RQ	110
Table 23 – Transitions of MSGPM-RQ	110
Table 24 – State descriptions of MSGPM-RS	112
Table 25 – Trigger event descriptions of MSGPM-RS.....	112
Table 26 – Transitions of MSGPM-RS.....	113
Table 27 – State descriptions of ARPM-FDCM.....	117
Table 28 – Trigger event descriptions of ARPM-FDCM	119
Table 29 – Transitions of main SM of ARPM-FDCM	120
Table 30 – Transitions of submachine of ARPM-FDCM	121
Table 31 – State descriptions of ARPM-FDCS	123
Table 32 – Trigger event descriptions of ARPM-FDCS	125
Table 33 – Transitions of main SM of ARPM-FDCS.....	126
Table 34 – Transitions of submachine of ARPM-FDCS.....	127
Table 35 – State descriptions of ARPM-FDCMN	129
Table 36 – Trigger event descriptions of ARPM-FDCMN	130
Table 37 – Transitions of main SM of ARPM-FDCMN.....	130
Table 38 – Transitions of submachine of ARPM-FDCMN.....	131
Table 39 – State descriptions of ARPM-MSG	132
Table 40 – Trigger event descriptions of ARPM-MSG.....	133
Table 41 – Transitions of ARPM-MSG.....	133
Table A.1 – Example of registered device profiles.....	135
Table A.2 – Example command list of the profile '00'H.....	136
Table B.1 – Specifications of device IDs	138
Table C.1 – Example of message command set.....	144

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –****Part 6-24: Application 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 61158-6-24 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 second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

- addition of a new PDU type which called "Short PDU type II" in 4.2;
- update of Table 4;
- addition of examples of Synchronous Command communication in 9.2.1, Figure 27 and Figure 28.

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

Draft	Report on voting
65C/1204/FDIS	65C/1245/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. <https://sist-en-iec-61158-6-24-2023>

INTRODUCTION

This document 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 document 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 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 can work together in any combination.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[SIST EN IEC 61158-6-24:2023](https://standards.iteh.ai/catalog/standards/sist/6d1da457-7e9b-42ce-8ce7-c5e8a41af79c/sist-en-iec-61158-6-24-2023)

<https://standards.iteh.ai/catalog/standards/sist/6d1da457-7e9b-42ce-8ce7-c5e8a41af79c/sist-en-iec-61158-6-24-2023>