ICS 25.040.40, 35.100.70, 35.110

SLOVENSKÁ TECHNICKÁ NORMA

Január 2020

STN	**Priemyselné komunikačné siete Špecifikácie prevádzkových zberníc Časť 6-23: Špecifikácia protokolu aplikačnej vrstvy Prvky typu 23**	**STN EN IEC 61158-6-23 18 4020**

Industrial communication networks - Fieldbus specifications - Part 6-23: Application layer protocol specification - Type 23 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. 12/19

Obsahuje: EN IEC 61158-6-23:2019, IEC 61158-6-23:2019

Oznámením tejto normy sa od 25.07.2022 ruší
STN EN 61158-6-23 (18 4020) z apríla 2015

129839

Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2020
Slovenská technická norma a technická normalizačná informácia je chránená zákonom č. 60/2018 Z. z. o technickej normalizácii.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61158-6-23

August 2019

ICS 35.100.70; 35.110; 25.040.40

Supersedes EN 61158-6-23:2014 and all of its amendments and corrigenda (if any)

English Version

Industrial communication networks - Fieldbus specifications - Part 6-23: Application layer protocol specification - Type 23 elements (IEC 61158-6-23:2019)

Réseaux de communication industriels - Spécifications des bus de terrain - Partie 6-23: Spécification du protocole de la couche application - Eléments de type 23 (IEC 61158-6-23:2019)

Industrielle Kommunikationsnetze - Feldbusse - Teil 6-23: Protokollspezifikation des Application Layer (Anwendungsschicht) - Typ 23-Elemente (IEC 61158-6-23:2019)

This European Standard was approved by CENELEC on 2019-07-25. 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, Turkey 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

© 2019 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

European foreword

The text of document 65C/948/FDIS, future edition 2 of IEC 61158-6-23, 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 61158-6-23:2019.

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)	2020-04-25
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2022-07-25

This document supersedes EN 61158-6-23:2014 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.

Endorsement notice

The text of the International Standard IEC 61158-6-23:2019 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61784-1	NOTE	Harmonized as EN IEC 61784-1
IEC 61784-2	NOTE	Harmonized as EN IEC 61784-2

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.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 61158-1	2019	Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series	EN IEC 61158-1	2019
IEC 61158-5-23	-	Industrial communication networks - Fieldbus specifications - Part 5-23: Application layer service definition - Type 23 elements	EN IEC 61158-5-23	-
IEC 61158	series	Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 6: Application layer protocol specification	-	-
ISO/IEC 7498-1	-	Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model	-	-
ISO/IEC 8822	-	Information technology - Open Systems Interconnection - Presentation service definition	-	-
ISO/IEC 8824-1	-	Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation	-	-
ISO/IEC 9545	-	Information technology - Open Systems Interconnection - Application Layer structure	-	-
ISO/IEC 10731	-	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services	-	-

IEC 61158-6-23

Edition 2.0 2019-06

INTERNATIONAL STANDARD

Industrial communication networks – Fieldbus specifications – Part 6-23: Application layer protocol specification – Type 23 elements

IEC 61158-6-23:2019-06(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2019 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 Central Office
3, rue de Varembé
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.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC 61158-6-23

Edition 2.0 2019-06

INTERNATIONAL STANDARD

Industrial communication networks – Fieldbus specifications – Part 6-23: Application layer protocol specification – Type 23 elements

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.40; 35.100.70; 35.110

ISBN 978-2-8322-7014-1

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

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 9
INTRODUCTION 11
1 Scope 13
1.1 General 13
1.2 Specifications 14
1.3 Conformance 14
2 Normative references 14
3 Terms, definitions, symbols, abbreviated terms and conventions 15
3.1 Referenced terms and definitions 15
3.1.1 ISO/IEC 7498-1 terms 15
3.1.2 ISO/IEC 8822 terms 15
3.1.3 ISO/IEC 9545 terms 15
3.1.4 ISO/IEC 8824-1 terms 15
3.1.5 IEC 61158-1 terms 16
3.2 Additional Type 23 terms and definitions 16
3.3 Symbols and abbreviated terms 18
3.4 Conventions 19
3.4.1 General concept 19
3.4.2 Convention for the encoding of reserved bits and octets 19
3.4.3 Conventions for abstract syntax description 19
3.4.4 Conventions for bit description in octets 20
3.4.5 Conventions for state machine descriptions 20
4 FAL syntax description 21
4.1 FALPDU type C abstract syntax 21
4.1.1 Basic abstract syntax 21
4.1.2 Connect-PDU 22
4.1.3 ConnectAck-PDU 22
4.1.4 Scan-PDU 22
4.1.5 Collect-PDU 23
4.1.6 Select-PDU 23
4.1.7 Launch-PDU 23
4.1.8 Token-PDU 23
4.1.9 MyStatus-PDU 24
4.1.10 Transient1-PDU 24
4.1.11 Dummy-PDU 25
4.1.12 Transient2-PDU 25
4.1.13 NTNTest-PDU 25
4.1.14 CyclicDataW-PDU 26
4.1.15 CyclicDataB-PDU 26
4.1.16 CyclicDataOut1-PDU 26
4.1.17 CyclicDataOut2-PDU 27
4.1.18 CyclicDataIn1-PDU 27
4.1.19 CyclicDataIn2-PDU 27
4.2 FALPDU type F abstract syntax 28
4.2.1 Basic abstract syntax 28
4.2.2 Persuasion-PDU 29
4.2.3 TestData-PDU 30

4.2.4 TestDataAck-PDU 30
4.2.5 Setup-PDU 31
4.2.6 SetupAck-PDU 31
4.2.7 F-Token-PDU 32
4.2.8 F-MyStatus-PDU 32
4.2.9 Measure-PDU 32
4.2.10 F-Offset-PDU 33
4.2.11 F-Update-PDU 33
4.2.12 F-CyclicData-PDU 33
4.2.13 Transient1-PDU 33
4.2.14 TransientAck-PDU 36
4.2.15 Transient2-PDU 37
4.2.16 ParamCheck-PDU 37
4.2.17 Parameter-PDU 38
4.2.18 Timer-PDU 39
4.3 Data type assignments for type C 39
4.4 Data type assignments for type F 40
5 FAL transfer syntax 41
5.1 Encoding rules 41
5.1.1 Unsigned encoding 41
5.1.2 Octet string encoding 41
5.1.3 SEQUENCE encoding 42
5.1.4 LOctetString encoding 42
5.2 FALPDU type C elements encoding 42
5.2.1 FALARHeader 42
5.2.2 Connect-PDU 44
5.2.3 ConnectAck-PDU 45
5.2.4 Scan-PDU 45
5.2.5 Collect-PDU 46
5.2.6 Select-PDU 48
5.2.7 Launch-PDU 49
5.2.8 Token-PDU 49
5.2.9 MyStatus-PDU 49
5.2.10 Transient1-PDU 51
5.2.11 Dummy-PDU 55
5.2.12 Transient2-PDU 56
5.2.13 NTNTest-PDU 67
5.2.14 CyclicDataW-PDU 67
5.2.15 CyclicDataB-PDU 68
5.2.16 CyclicDataOut1-PDU 69
5.2.17 CyclicDataOut2-PDU 69
5.2.18 CyclicDataIn1-PDU 70
5.2.19 CyclicDataIn2-PDU 71
5.3 FALPDU type F elements encoding 72
5.3.1 FALARHeader 72
5.3.2 Persuasion-PDU 76
5.3.3 TestData-PDU 77
5.3.4 TestDataAck-PDU 77
5.3.5 Setup-PDU 78

5.3.6 SetupAck-PDU 80
5.3.7 F-Token-PDU 82
5.3.8 F-Measure-PDU 83
5.3.9 F-Offset-PDU 83
5.3.10 F-Update-PDU 84
5.3.11 F-MyStatus-PDU 84
5.3.12 F-CyclicData-PDU 89
5.3.13 Transient1-PDU 90
5.3.14 TransientAck-PDU 94
5.3.15 Transient2-PDU 95
5.3.16 ParamCheck-PDU 98
5.3.17 Parameter-PDU 99
5.3.18 Timer-PDU 106
6 Structure of the FAL protocol state machine 106
7 FAL service protocol machine (FSPM) 107
7.1 Overview 107
7.2 FSPM type C 107
7.2.1 Overview 107
7.2.2 FSPM 108
7.3 FSPM type F 111
7.3.1 Overview 111
7.3.2 FSPM 113
8 Application relationship protocol machine (ARPM) 118
8.1 ARPM type C 118
8.1.1 Overview 118
8.1.2 Acyclic transmission 118
8.1.3 Cyclic transmission 120
8.1.4 Connection control 125
8.1.5 Common parameter dist 163
8.2 ARPM type F 168
8.2.1 Overview 168
8.2.2 Acyclic transmission 169
8.2.3 Cyclic transmission 171
8.2.4 Channel control 174
8.2.5 Parameter dist 212
8.2.6 Synchronous trigger 215
8.2.7 Timer 217
8.2.8 Measure transmission 218
9 DLL mapping protocol machine (DMPM) 222
9.1 DMPM type C 222
9.2 DMPM type F 223
Bibliography 225

Figure 1 – Bit description in octets 20
Figure 2 – Structure for memory access information retrieve response 59
Figure 3 – Attribute definitions 59
Figure 4 – Access code definitions 60
Figure 5 – Structure for RUN request 61

Figure 6 – Structure for RUN response 61
Figure 7 – Structure for STOP request 62
Figure 8 – Structure for STOP response 62
Figure 9 – Structure for batch memory read request 62
Figure 10 – Structure for batch memory read response 63
Figure 11 – Structure for random memory read request 63
Figure 12 – Structure for random memory read response 64
Figure 13 – Structure for batch memory write request 65
Figure 14 – Structure for batch memory write response 65
Figure 15 – Structure for random memory write request 66
Figure 16 – Structure for random memory write response 66
Figure 17 – Relationships between protocol machines 107
Figure 18 – Structure of FSPM C 108
Figure 19 – Structure of FSPM F 111
Figure 20 – Structure of ARPM C 118
Figure 21 – Structure of ARPM F 168
Figure 22 – Structure of type C DMPM 222
Figure 23 – Structure of type F DMPM 224

Table 1 – State machine description elements 20
Table 2 – Description of state machine elements 20
Table 3 – Conventions used in state machines 21
Table 4 – afFType 42
Table 5 – priority 43
Table 6 – portChoice 44
Table 7 – portCheckResult 45
Table 8 – dstPortInfo 45
Table 9 – scanState 45
Table 10 – nodeType 46
Table 11 – loopState 47
Table 12 – Cyclic status 47
Table 13 – Parameter setting mode 47
Table 14 – opState 50
Table 15 – errorState 50
Table 16 – Data type 52
Table 17 – CPW 52
Table 18 – CPWC 53
Table 19 – CPWCR 53
Table 20 – cmParam 53
Table 21 – Details of param area 54
Table 22 – Details of application parameters 54
Table 23 – Details of LB/LW CM area and LB/LW CM additional area 55
Table 24 – Details of LX/LY CM 1 area and LX/LY CM 2 area 55

Table 25 – Destination module flag 57
Table 26 – Command types 58
Table 27 – Access codes of network module memory 60
Table 28 – Access codes of controller memory 60
Table 29 – byteValidity 67
Table 30 – afFType 72
Table 31 – dataType 73
Table 32 – varField 74
Table 33 – nodeType 74
Table 34 – ProtocolVerType 75
Table 35 – Link status 78
Table 36 – Port enable/disable specification 79
Table 37 – Cyclic transmission parameter hold status 86
Table 38 – Detailed application operation status 86
Table 39 – Error detection status 86
Table 40 – Slave-specific event reception status 88
Table 41 – dataSupType of dataType (0x07) 91
Table 42 – FieldSpecificTransient opHeader 91
Table 43 – command (dataType: 0x07, dataSubType: 0x0002) 92
Table 44 – subCommand type for each command type 92
Table 45 – Structure of Deliver node information 92
Table 46 – Structure of Deliver node information – message 93
Table 47 – Structure of Get statistical information response 93
Table 48 – Structure of Acquisition of node details response 94
Table 49 – Execution module specification 96
Table 50 – Command type 97
Table 51 – Cyclic data state table 109
Table 52 – Acyclic data state table 109
Table 53 – Management state table 111
Table 54 – Cyclic data state table 114
Table 55 – Acyclic data state table 114
Table 56 – Management state table 117
Table 57 – Synchronization state table 117
Table 58 – Measurement state table 117
Table 59 – Acyclic transmission state table 119
Table 60 – Acyclic transmission functions 120
Table 61 – Cyclic transmission state table 120
Table 62 – Cyclic transmission functions 125
Table 63 – Connection control state machine – Initial 126
Table 64 – Connection control state machine – Connect 126
Table 65 – Connection control state machine – Scan 128
Table 66 – Connection control state machine – ScanWait 131
Table 67 – Connection control state machine – Collect 134

Table 68 – Connection control state machine – CollectWait 137
Table 69 – Connection control state machine – Select 140
Table 70 – Connection control state machine – TokenStartWait 143
Table 71 – Connection control state machine – LaunchWait 146
Table 72 – Connection control state machine – TokenReleaseWait 149
Table 73 – Connection control state machine – TokenReleased 152
Table 74 – Connection control state machine – TokenWait 157
Table 75 – Connection control state machine – NTNTestMaster 162
Table 76 – Connection control state machine – NTNTestSlave 162
Table 77 – Function list of connection control 163
Table 78 – Common parameter dist state table 163
Table 79 – Function list of connection control 167
Table 80 – Mapping of internal service and acyclic transmission service 168
Table 81 – Acyclic transmission states 169
Table 82 – Acyclic transmission state table 169
Table 83 – Acyclic transmission functions 171
Table 84 – Acyclic transmission variables 171
Table 85 – Cyclic transmission states 172
Table 86 – Cyclic transmission state table 172
Table 87 – Cyclic transmission functions 174
Table 88 – Cyclic transmission variables 174
Table 89 – Master station channel control states 174
Table 90 – Slave station channel control states 175
Table 91 – Master station state table – MasterDown 175
Table 92 – Master station state table – Listen 175
Table 93 – Master station state table – MasterArbitration 177
Table 94 – Master station state table – PrimaryMasterScatterTD 178
Table 95 – Master station state table – PrimaryMasterSettingUp 180
Table 96 – Master station state table – PrimaryMasterHoldToken 183
Table 97 – Master station state table – PrimaryMasterSolicitToken 186
Table 98 – Master station state table – PrimaryMasterInviting 188
Table 99 – Master station state table – MasterWaitTD 190
Table 100 – Master station state table – MasterWaitSetup 192
Table 101 – Master station state table – MasterSolictToken (without Transmission path delay measurement) 193
Table 102 – Master station state table – MasterSolictToken (with Transmission path delay measurement) 195
Table 103 – Master station state table – MasterHoldToken 197
Table 104 – Master station state table – MasterMeasurement (without Transmission path delay measurement function) 200
Table 105 – Master station state table – MasterMeasurement (with Transmission path delay measurement function) 200
Table 106 – Slave station state table – SlaveDown 200
Table 107 – Slave station state table – SlaveWaitTD 201

Table 108 – Slave station state table – SlaveWaitSetup 202
Table 109 – Slave station state table – SlaveSolicitToken (without Transmission path delay measurement) 203
Table 110 – Slave station state table – SlaveSolicitToken (with Transmission path delay measurement) 204
Table 111 – Slave station state table – SlaveHoldToken 206
Table 112 – Master station channel control functions 209
Table 113 – Slave station channel control functions 210
Table 114 – Master station channel control variables 211
Table 115 – Slave station channel control variables 211
Table 116 – Master station channel control timers 212
Table 117 – Slave station channel control timers 212
Table 118 – Master station parameter dist states 212
Table 119 – Slave station parameter dist states 212
Table 120 – Master station parameter dist state table 213
Table 121 – Slave station parameter dist state table 214
Table 122 – Master station parameter dist functions 215
Table 123 – Slave station parameter dist functions 215
Table 124 – Master station synchronous trigger states 216
Table 125 – Slave station synchronous trigger states 216
Table 126 – Master station synchronous trigger state table 216
Table 127 – Slave station synchronous trigger state table 216
Table 128 – Synchronous trigger functions 216
Table 129 – Timer states – Best effort type 217
Table 130 – Timer states – Fixed cycle type 217
Table 131 – Timer state table – Best effort type 217
Table 132 – Timer state table – Fixed cycle type 217
Table 133 – Timer variables 217
Table 134 – Fixed cycle timer 218
Table 135 – Master station measure transmission states 218
Table 136 – Slave station measure transmission states 218
Table 137 – Master station measure transmission state table 219
Table 138 – Slave station measure transmission state table 220
Table 139 – Master station measure transmission functions 221
Table 140 – Slave station measure transmission functions 221
Table 141 – Master station measure transmission variables 222
Table 142 – Mapping of type C DMPM service and DL service 223
Table 143 – Destination address for each type C PDU 223
Table 144 – Mapping of type F DMPM service and DL service 224

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-23: Application layer protocol specification – Type 23 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 IEC 61784-1 and IEC 61784-2.

International Standard IEC 61158-6-23 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision. This edition includes the following significant technical changes with respect to the previous edition:

- addition of the transmission extended mode and related attribute (Clauses 3.2.28, 4.1.9, 4.4, 5.2.9.2, and 5.3);
- update of Table 4, Table 5, Table 16 and Table 48.

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

FDIS	Report on voting
65C/948/FDIS	65C/956/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

A bilingual version of this publication may be issued at a later date.

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 may 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 concerning Type 23 elements and possibly other types given in 8.1 and 8.2 as follows:

JP 05106658 US 9350626 DE 112006003943.1 KR 10-1029201 TWI 427974	[MEC]	Communication management device, communication node, communication system, and data communication method
JP 4503678 DE 112006003895T5 KR 10-1024472 CN 102325071 TW I333356	[MEC]	Communication management device, communication device, and communication method
JP 4995294 US 8687647 DE 112006004225.4 KR 10-1024482 CN10182037 TWI 427974	[MEC]	Communication node, and token issuing method and token-ring communication method in ring communication system
JP 05127977	[MEC]	Synchronization system, time master nodes, time slave nodes and synchronization method
JP 05106658 US 9350626 DE 112008004265.9 KR 10-1277368 CN 102594592 TWI 483586B	[MEC]	Communication management device, communication node, communication system, and data communication method
JP 5220165 US 9270483 DE 112008004268 KR 10-1256767 CN 102710480 TWI 455524	[MEC]	Communication management device, communication device, and communication method

JP 05084916 US 8908566 DE112008004245 KR 10-1253931 CN 102265561 TWI 405436	[MEC]	Communication management device, communication device, and communication method
JP 5172015 US 8842521 DE 112009004913 KR 10-1307092 CN 102461085 TWI 422190	[MEC]	Communication managing apparatus, communication nodes, and data communication method
JP 5449566 US 9270554 KR 10-1479883 CN 103109491	[MEC]	Network performance estimating apparatus, network performance estimating method, network structure recognizing method, communication managing apparatus, and data communication method

IEC takes no position concerning the evidence, validity and scope of these patent rights.

The holders of these patent rights have assured IEC that they are willing to negotiate licenses either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holders of these patent rights is registered with IEC. Information may be obtained from:

[MEC] Mitsubishi Electric Corporation
Corporate Licensing Division
7-3, Marunouchi 2-chome, Chiyoda-ku,
Tokyo 100-8310, Japan

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

ISO (www.iso.org/patents) and IEC (http://patents.iec.ch) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-23: Application layer protocol specification – Type 23 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 23 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 International Standard defines in an abstract way the externally visible behavior provided by the different Types of the fieldbus Application Layer in terms of:

a) the abstract syntax defining the application layer protocol data units conveyed between communicating application entities,

b) the transfer syntax defining the application layer protocol data units conveyed between communicating application entities,

c) the application context state machine defining the application service behavior visible between communicating application entities; and

d) the application relationship state machines defining the communication behavior visible between communicating application entities.

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

a) define the wire-representation of the service primitives defined in IEC 61158-5-23, and

b) define the externally visible behavior associated with their transfer.

This document specifies the protocol of the IEC fieldbus Application Layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498) 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 syntax and behavior of the application layer protocol that conveys the application layer services defined in IEC 61158-5-23.

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

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 the application layer service definition document. Instead, conformance is achieved through implementation of this application layer protocol specification.

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 IEC 61784-1 and IEC 61784-2 are maintained simultaneously. Cross-references to these documents within the text therefore refer to the editions as dated in this list of normative references.

IEC 61158-1:2019, *Industrial communication networks – Fieldbus specifications – Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series*

IEC 61158-5-23, *Industrial communication networks – Fieldbus specifications – Part 5-23: Application layer service definition – Type 23 elements*

IEC 61158-6 (all parts), *Industrial communication networks – Fieldbus specifications – Part 6: Application layer protocol specification*

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

ISO/IEC 8822, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8824-1, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO/IEC 9545, *Information technology – Open Systems Interconnection – Application Layer structure*

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

koniec náhľadu – text ďalej pokračuje v platenej verzii STN