

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Réseaux de communication industriels – Spécifications des bus de terrain –
Partie 6-23: Spécification du protocole de la couche application – Eléments
de type 23**





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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
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 It also gives information on projects, replaced and withdrawn publications.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 online collection - oc.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.

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.

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 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online

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.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC online collection - oc.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.



INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Réseaux de communication industriels – Spécifications des bus de terrain –
Partie 6-23: Spécification du protocole de la couche application – Éléments
de type 23**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 25.040.40; 35.100.70; 35.110

ISBN 978-2-8322-9327-0

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

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
ITeH STANDARD PREVIEW (standards.iteh.ai)	
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

IEC 61158-6-23:2019
 IEC STANDARD PREVIEW
 (standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/46d1c771-bccf-40ea-b316-33cc0da45ec6/iec-61158-6-23-2019>

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 – MasterSolicitToken (without Transmission path delay measurement)	193
Table 102 – Master station state table – MasterSolicitToken (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

IEC STANDARD PREVIEW
 (standards.iteh.ai)
 IEC 61158-6-23:2019
 /standards/sist/46d1c771-bccf-40ea-b316-
 dccc6adf145/iec-61158-6-23-2019

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELD BUS 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 [IEC 61158-6-23:2019](http://standards.iteh.ai/catalog/standards/sist/46d1c771-bccf-40ea-b316-deeee6adfd45/iec-61158-6-23-2019)
- amended.

iteh STANDARD PREVIEW

(standards.iteh.ai)

<http://standards.iteh.ai/catalog/standards/sist/46d1c771-bccf-40ea-b316-deeee6adfd45/iec-61158-6-23-2019>

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