

INTERNATIONAL STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 6-23: Application layer protocol specification – Type 23 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 It also gives information on projects, replaced and withdrawn publications.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 61158-6-23

Edition 3.0 2023-03

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 978-2-8322-6641-0

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

CONTENTS

FOREWORD.....	14
INTRODUCTION.....	16
1 Scope.....	17
1.1 General.....	17
1.2 Specifications	18
1.3 Conformance	18
2 Normative references	18
3 Terms, definitions, symbols, abbreviated terms and conventions	19
3.1 Referenced terms and definitions.....	19
3.1.1 ISO/IEC 7498-1 terms.....	19
3.1.2 ISO/IEC 8822 terms.....	19
3.1.3 IEC 61158-1 terms.....	19
3.2 Additional Type 23 terms and definitions.....	19
3.3 Symbols and abbreviated terms	22
3.4 Conventions.....	23
3.4.1 General concept	23
3.4.2 Convention for the encoding of reserved bits and octets	23
3.4.3 Conventions for abstract syntax description	23
3.4.4 Conventions for bit description in octets	23
3.4.5 Conventions for state machine descriptions	24
4 FAL syntax description	25
4.1 FALPDU type C abstract syntax.....	25
4.1.1 Basic abstract syntax.....	25
4.1.2 Connect-PDU	26
4.1.3 ConnectAck-PDU.....	26
4.1.4 Scan-PDU	26
4.1.5 Collect-PDU.....	27
4.1.6 Select-PDU.....	27
4.1.7 Launch-PDU	27
4.1.8 Token-PDU.....	27
4.1.9 MyStatus-PDU.....	28
4.1.10 Transient1-PDU.....	28
4.1.11 Dummy-PDU.....	29
4.1.12 Transient2-PDU	29
4.1.13 NTNTest-PDU.....	29
4.1.14 CyclicDataW-PDU.....	30
4.1.15 CyclicDataB-PDU	30
4.1.16 CyclicDataOut1-PDU	30
4.1.17 CyclicDataOut2-PDU	31
4.1.18 CyclicDataIn1-PDU	31
4.1.19 CyclicDataIn2-PDU	31
4.2 FALPDU type F abstract syntax	32
4.2.1 Basic abstract syntax.....	32
4.2.2 Persuasion-PDU	33
4.2.3 TestData-PDU	34
4.2.4 TestDataAck-PDU.....	34
4.2.5 Setup-PDU	35

4.2.6	SetupAck-PDU.....	35
4.2.7	F-Token-PDU	36
4.2.8	F-MyStatus-PDU.....	36
4.2.9	Measure-PDU	36
4.2.10	F-Offset-PDU.....	37
4.2.11	F-Update-PDU	37
4.2.12	F-CyclicData-PDU	37
4.2.13	Transient1-PDU.....	37
4.2.14	TransientAck-PDU	41
4.2.15	Transient2-PDU.....	42
4.2.16	ParamCheck-PDU	42
4.2.17	Parameter-PDU	43
4.2.18	Timer-PDU	44
4.3	Data type assignments for type C	45
4.4	Data type assignments for type F.....	46
4.5	FALPDU type T abstract syntax	47
4.5.1	Basic abstract syntax.....	47
4.5.2	CyclicM-PDU	50
4.5.3	CyclicS-PDU.....	50
4.5.4	CyclicMs-PDU	50
4.5.5	CyclicSs-PDU	51
4.5.6	AcyclicPriority-PDU	52
4.5.7	AcyclicDetection-PDU.....	52
4.5.8	AcyclicDetectionAck-PDU	53
4.5.9	AcyclicTestDataHeader	54
4.5.10	AcyclicTestDataHeader	55
4.5.11	AcyclicData-PDU	55
4.5.12	PtpSync-PDU	55
4.5.13	PtpPdelayReq-PDU	55
4.5.14	PtpPdelayResp-PDU.....	55
4.5.15	PtpFollowUp-PDU.....	56
4.5.16	PtpPdelayRespFollowUp-PDU	56
4.5.17	PtpAnnounce-PDU.....	56
4.5.18	SImpIPAddressSet-PDU	56
4.5.19	SImpNetworkConfigMain-PDU	56
4.5.20	SImpNetworkConfigTslt-PDU	56
4.5.21	SImpNotification-PDU	56
4.5.22	SImpMasterConfig-PDU	57
4.5.23	SImpSlaveConfig-PDU	57
4.5.24	SImpCyclicConfigMain-PDU.....	57
4.5.25	SImpCyclicConfigTrnSubPayload-PDU	57
4.5.26	SImpCyclicConfigRcvSubPayload-PDU.....	57
4.5.27	SImpCyclicConfigRcvSrcInfo-PDU	58
4.5.28	SImpLinkDevicePrmWrite-PDU	58
4.5.29	SImpLinkDevicePrmWriteCheckRequest-PDU.....	58
4.5.30	SImpLinkDevicePrmWriteCheckResponse-PDU	58
4.5.31	SImpNMTStateUpload-PDU	58
4.5.32	SImpNMTStateDownload-PDU.....	59
4.5.33	SImpReadObject-PDU	59

4.5.34	SImpWriteObject-PDU	59
4.5.35	SImpObjectSubIDReadBlock-PDU	59
4.5.36	SImpObjectSubIDWriteBlock-PDU	59
4.5.37	SImpGetODList-PDU	59
4.5.38	SImpGetObjectDescription-PDU	60
4.5.39	SImpGetEntryDescription-PDU	60
4.5.40	SImpStopOwnStationCyclic-PDU	60
4.5.41	SImpStartOwnStationCyclic-PDU	60
4.5.42	SImpStopOtherStationsCyclic-PDU	60
4.5.43	SImpStartOtherStationsCyclic-PDU	60
4.5.44	SImpAllParameterGet-PDU	61
4.5.45	SImpParameterGet-PDU	61
4.5.46	SImpAllParameterSizeGet-PDU	61
4.5.47	SImpParameterSizeGet-PDU	61
4.5.48	SImpStationSubIDListGet-PDU	61
4.5.49	SImpDeviceIdentificationInfoGet-PDU	61
4.5.50	SImpDataMonitoring-PDU	62
4.5.51	SImpAllParameterSet-PDU	62
4.5.52	SImpParameterSet-PDU	62
4.5.53	SImpParameterVersionCheck-PDU	62
4.5.54	SImpDeviceIdentificationInfoCompare-PDU	62
4.5.55	SImpNodeSearch-PDU	62
4.5.56	SImpIPAddressSet-PDU	63
4.5.57	SImpDeviceInfoCompare-PDU	63
4.5.58	SImpParameterGet-PDU	63
4.5.59	SImpParameterSet-PDU	63
4.5.60	SImpParameterSetStart-PDU	63
4.5.61	SImpParameterSetEnd-PDU	63
4.5.62	SImpVerifyCheckCode-PDU	64
4.5.63	SImpOutputMapFileNameGet-PDU	64
4.5.64	SImpNewFile-PDU	64
4.5.65	SImpParameterSetCancel-PDU	64
4.5.66	SImpOpenFile-PDU	64
4.5.67	SImpCloseFile-PDU	64
4.5.68	SImpReadFile-PDU	65
4.5.69	SImpWriteFile-PDU	65
4.5.70	SImpStatusRead-PDU	65
4.5.71	SImpCommunicationSettingGet-PDU	65
4.5.72	SImpGetDeviceInfo-PDU	65
4.5.73	SImpGetBackupListFileName-PDU	65
4.5.74	SImpStartBackup-PDU	66
4.5.75	SImpEndBackup-PDU	66
4.5.76	SImpCheckRestoreVersion-PDU	66
4.5.77	SImpStartRestore-PDU	66
4.5.78	SImpEndRestore-PDU	66
4.5.79	SImpStatusRead2-PDU	66
4.5.80	SImpReqSearchNode-PDU	67
4.5.81	SImpGetSearchNodeState-PDU	67
4.5.82	SImpGetNodeList-PDU	67

4.5.83	SImpReqSetIPAddress-PDU	67
4.5.84	SImpSearchPrmControlStation-PDU	67
4.5.85	SImpRequestRestore-PDU	68
4.5.86	SImpCheckPrmDelivery-PDU	68
4.5.87	SImpRsvStationConfigTemporaryRelease-PDU	68
4.5.88	SImpRsvStationConfig-PDU	68
4.5.89	SImpGetEventNum-PDU	68
4.5.90	SImpGetEventHistory-PDU	69
4.5.91	SImpClearEventHistory-PDU	69
4.5.92	SImpClockOffsetDataSend-PDU	69
4.5.93	SImpSetWatchdogCounterInfo-PDU	69
4.5.94	SImpWatchdogCounterOffsetConfig-PDU	69
4.5.95	SImpRemoteReset-PDU	69
4.5.96	SImpGetCommunicationSet-PDU	70
4.5.97	SImpGetStationSubIDList-PDU	70
4.5.98	SImpGetDeviceInfo-PDU	70
4.5.99	SImpStartBackup-PDU	70
4.5.100	SImpEndBackup-PDU	70
4.5.101	SImpRequestBackup-PDU	70
4.5.102	SImpGetBackupPrm-PDU	71
4.5.103	SImpCheckRestore-PDU	71
4.5.104	SImpStartRestore-PDU	71
4.5.105	SImpEndRestore-PDU	71
4.5.106	SImpSetBackupPrm-PDU	71
4.5.107	SImpLinkupSpeed-PDU	71
4.5.108	SImpNodeIndication-PDU	72
4.6	Data type assignments for type T	72
5	FAL transfer syntax	72
5.1	Encoding rules	72
5.1.1	Unsigned encoding	72
5.1.2	Octet string encoding	72
5.1.3	SEQUENCE encoding	72
5.1.4	LOctetString encoding	72
5.2	FALPDU type C elements encoding	73
5.2.1	FALARHeader	73
5.2.2	Connect-PDU	75
5.2.3	ConnectAck-PDU	76
5.2.4	Scan-PDU	76
5.2.5	Collect-PDU	77
5.2.6	Select-PDU	79
5.2.7	Launch-PDU	80
5.2.8	Token-PDU	80
5.2.9	MyStatus-PDU	80
5.2.10	Transient1-PDU	82
5.2.11	Dummy-PDU	86
5.2.12	Transient2-PDU	87
5.2.13	NTNTest-PDU	98
5.2.14	CyclicDataW-PDU	98
5.2.15	CyclicDataB-PDU	99

5.2.16	CyclicDataOut1-PDU	100
5.2.17	CyclicDataOut2-PDU	100
5.2.18	CyclicDataIn1-PDU	101
5.2.19	CyclicDataIn2-PDU	102
5.3	FALPDU type F elements encoding	103
5.3.1	FALARHeader	103
5.3.2	Persuasion-PDU	108
5.3.3	TestData-PDU	109
5.3.4	TestDataAck-PDU	109
5.3.5	Setup-PDU	111
5.3.6	SetupAck-PDU	113
5.3.7	F-Token-PDU	114
5.3.8	F-Measure-PDU	115
5.3.9	F-Offset-PDU	116
5.3.10	F-Update-PDU	116
5.3.11	F-MyStatus-PDU	116
5.3.12	F-CyclicData-PDU	122
5.3.13	Transient1-PDU	123
5.3.14	TransientAck-PDU	128
5.3.15	Transient2-PDU	129
5.3.16	ParamCheck-PDU	132
5.3.17	Parameter-PDU	133
5.3.18	Timer-PDU	140
5.4	FALPDU type T elements encoding	141
5.4.1	CyclicM-PDU	141
5.4.2	CyclicS-PDU	144
5.4.3	CyclicMs-PDU	146
5.4.4	CyclicSs-PDU	147
5.4.5	AcyclicPriority-PDU	148
5.4.6	AcyclicDetection-PDU	150
5.4.7	AcyclicDetectionAck-PDU	151
5.4.8	AcyclicTestData-PDU	157
5.4.9	AcyclicTestDataAck-PDU	160
5.4.10	AcyclicData-PDU	162
5.4.11	Ptp-PDU	162
5.4.12	IpData-PDU	164
6	Structure of the FAL protocol state machine	164
7	FAL service protocol machine (FSPM)	165
7.1	Overview	165
7.2	FSPM type C	165
7.2.1	Overview	165
7.2.2	FSPM	166
7.3	FSPM type F	169
7.3.1	Overview	169
7.3.2	FSPM	171
7.4	FSPM type T	176
7.4.1	Overview	176
7.4.2	FSPM State Machine	177
8	Application relationship protocol machine (ARPM)	181

8.1	ARPM type C	181
8.1.1	Overview	181
8.1.2	Acyclic transmission	182
8.1.3	Cyclic transmission	183
8.1.4	Connection control	188
8.1.5	Common parameter dist	227
8.2	ARPM type F	232
8.2.1	Overview	232
8.2.2	Acyclic transmission	233
8.2.3	Cyclic transmission	235
8.2.4	Channel control	238
8.2.5	Parameter dist	278
8.2.6	Synchronous trigger	282
8.2.7	Timer	283
8.2.8	Measure transmission	284
8.3	ARPM type T	289
8.3.1	Overview	289
8.3.2	Cyclic Transmission	289
8.3.3	Acyclic Transmission	291
8.3.4	Channel Control	294
8.3.5	TimeSync Control	297
8.3.6	IPTrans Control	299
8.3.7	Handler	300
9	DLL mapping protocol machine (DMPM)	305
9.1	DMPM type C	305
9.2	DMPM type F	306
9.3	DMPM type T	307
	Bibliography	309
	Figure 1 – Bit description in octets	24
	Figure 2 – Structure for memory access information retrieve response	90
	Figure 3 – Attribute definitions	90
	Figure 4 – Access code definitions	91
	Figure 5 – Structure for RUN request	92
	Figure 6 – Structure for RUN response	93
	Figure 7 – Structure for STOP request	93
	Figure 8 – Structure for STOP response	93
	Figure 9 – Structure for batch memory read request	94
	Figure 10 – Structure for batch memory read response	94
	Figure 11 – Structure for random memory read request	95
	Figure 12 – Structure for random memory read response	95
	Figure 13 – Structure for batch memory write request	96
	Figure 14 – Structure for batch memory write response	96
	Figure 15 – Structure for random memory write request	97
	Figure 16 – Structure for random memory write response	97
	Figure 17 – Relationships between protocol machines	165

Figure 18 – Structure of FSPM C	166
Figure 19 – Structure of FSPM F	169
Figure 20 – Structure of FSPM T	176
Figure 21 – Structure of ARPM C	181
Figure 22 – Structure of ARPM F	232
Figure 23 – Structure of ARPM T	289
Figure 24 – Structure of type C DMPM	305
Figure 25 – Structure of type F DMPM	306
Figure 26 – Structure of type T DMPM	307
Table 1 – State machine description elements	24
Table 2 – Description of state machine elements	24
Table 3 – Conventions used in state machines	25
Table 4 – afFType	73
Table 5 – priority	74
Table 6 – portChoice	75
Table 7 – portCheckResult	76
Table 8 – dstPortInfo	76
Table 9 – scanState	76
Table 10 – nodeType	77
Table 11 – loopState	78
Table 12 – Cyclic status	78
Table 13 – Parameter setting mode	78
Table 14 – opState	81
Table 15 – errorState	81
Table 16 – Data type	83
Table 17 – CPW	83
Table 18 – CPWC	84
Table 19 – CPWCR	84
Table 20 – cmParam	84
Table 21 – Details of param area	85
Table 22 – Details of application parameters	85
Table 23 – Details of LB/LW CM area and LB/LW CM additional area	86
Table 24 – Details of LX/LY CM 1 area and LX/LY CM 2 area	86
Table 25 – Destination module flag	88
Table 26 – Command types	89
Table 27 – Access codes of network module memory	91
Table 28 – Access codes of controller memory	92
Table 29 – byteValidity	98
Table 30 – afFType	104
Table 31 – dataType	105
Table 32 – varField	106
Table 33 – nodeType	107

Table 34 – ProtocolVerType.....	108
Table 35 – Link status.....	111
Table 36 – Port enable/disable specification	112
Table 37 – Cyclic transmission parameter hold status.....	118
Table 38 – Detailed application operation status	119
Table 39 – Error detection status	119
Table 40 – Slave-specific event reception status.....	121
Table 41 – dataSupType of dataType (0x07).....	124
Table 42 – FieldSpecificTransient opHeader.....	124
Table 43 – command (dataType: 0x07, dataSubType: 0x0002)	125
Table 44 – subCommand type for each command type	125
Table 45 – Structure of Deliver node information	125
Table 46 – Structure of Deliver node information – message.....	126
Table 47 – Structure of Get statistical information response.....	127
Table 48 – Structure of Acquisition of node details response	128
Table 49 – Execution module specification.....	130
Table 50 – Command type	131
Table 51 – frameType	141
Table 52 – cycleNo	141
Table 53 – sa.....	141
Table 54 – da.....	142
Table 55 – commInfo	142
Table 56 – txAsynInfo	142
Table 57 – seqNo	143
Table 58 – Upper one octet of diagnosisData.....	143
Table 59 – Lower three octets of diagnosisData.....	144
Table 60 – Upper one octet of diagnosisData.....	145
Table 61 – Lower three octets of diagnosisData.....	145
Table 62 – mngPriority.....	149
Table 63 – KindFlag.....	149
Table 64 – previousNodePort.....	151
Table 65 – optionFlag	151
Table 66 – sendInfo	151
Table 67 – nodeType	152
Table 68 – IP address 4th octet	152
Table 69 – detectionRcvPort.....	153
Table 70 – myPort	153
Table 71 – Four bits of myPortLinkStatus.....	153
Table 72 – Four bits of myPortFilterStatus	154
Table 73 – performance	154
Table 74 – gmPriority.....	155
Table 75 – syncType.....	155
Table 76 – cyclicSize	156

Table 77 – function	157
Table 78 – optionInfo	157
Table 79 – Protocol version	158
Table 80 – Protocol type	159
Table 81 – Source information	159
Table 82 – Link status	162
Table 83 – Cyclic data state table	167
Table 84 – Acyclic data state table	167
Table 85 – Management state table	169
Table 86 – Cyclic data state table	172
Table 87 – Acyclic data state table	172
Table 88 – Management state table	175
Table 89 – Synchronization state table	175
Table 90 – Measurement state table	176
Table 91 – Primitives provided by FSPM	177
Table 92 – Cyclic Data state	177
Table 93 – Cyclic Data state table	178
Table 94 – Function used for Cyclic Data	178
Table 95 – Acyclic Data state	178
Table 96 – Acyclic Data state table	178
Table 97 – Management state	179
Table 98 – Management state table	180
Table 99 – TimeSync Data state	180
Table 100 – TimeSync Data state table	180
Table 101 – SLMP Data state	180
Table 102 – SLMP Data state table	181
Table 103 – Acyclic transmission state table	182
Table 104 – Acyclic transmission functions	183
Table 105 – Cyclic transmission state table	183
Table 106 – Cyclic transmission functions	188
Table 107 – Connection control state machine – Initial	189
Table 108 – Connection control state machine – Connect	189
Table 109 – Connection control state machine – Scan	191
Table 110 – Connection control state machine – ScanWait	194
Table 111 – Connection control state machine – Collect	197
Table 112 – Connection control state machine – CollectWait	200
Table 113 – Connection control state machine – Select	203
Table 114 – Connection control state machine – TokenStartWait	206
Table 115 – Connection control state machine – LaunchWait	209
Table 116 – Connection control state machine – TokenReleaseWait	212
Table 117 – Connection control state machine – TokenReleased	215
Table 118 – Connection control state machine – TokenWait	221
Table 119 – Connection control state machine – NTNTestMaster	226

Table 120 – Connection control state machine – NTNTestSlave	226
Table 121 – Function list of connection control	227
Table 122 – Common parameter dist state table	227
Table 123 – Function list of connection control	231
Table 124 – Mapping of internal service and acyclic transmission service	232
Table 125 – Acyclic transmission states	233
Table 126 – Acyclic transmission state table	233
Table 127 – Acyclic transmission functions	235
Table 128 – Acyclic transmission variables	235
Table 129 – Cyclic transmission states	236
Table 130 – Cyclic transmission state table	236
Table 131 – Cyclic transmission functions	238
Table 132 – Cyclic transmission variables	238
Table 133 – Master station channel control states	239
Table 134 – Slave station channel control states	239
Table 135 – Master station state table – MasterDown	239
Table 136 – Master station state table – Listen	240
Table 137 – Master station state table – MasterArbitration	241
Table 138 – Master station state table – PrimaryMasterScatterTD	242
Table 139 – Master station state table – PrimaryMasterSettingUp	245
Table 140 – Master station state table – PrimaryMasterHoldToken	248
Table 141 – Master station state table – PrimaryMasterSolicitToken	251
Table 142 – Master station state table – PrimaryMasterInviting	254
Table 143 – Master station state table – MasterWaitTD	256
Table 144 – Master station state table – MasterWaitSetup	257
Table 145 – Master station state table – MasterSolicitToken (without Transmission path delay measurement)	258
Table 146 – Master station state table – MasterSolicitToken (with Transmission path delay measurement)	260
Table 147 – Master station state table – MasterHoldToken	263
Table 148 – Master station state table – MasterMeasurement (without Transmission path delay measurement function)	266
Table 149 – Master station state table – MasterMeasurement (with Transmission path delay measurement function)	266
Table 150 – Slave station state table – SlaveDown	266
Table 151 – Slave station state table – SlaveWaitTD	267
Table 152 – Slave station state table – SlaveWaitSetup	268
Table 153 – Slave station state table – SlaveSolicitToken (without Transmission path delay measurement)	269
Table 154 – Slave station state table – SlaveSolicitToken (with Transmission path delay measurement)	271
Table 155 – Slave station state table – SlaveHoldToken	273
Table 156 – Master station channel control functions	276
Table 157 – Slave station channel control functions	277
Table 158 – Master station channel control variables	277

Table 159 – Slave station channel control variables.....	278
Table 160 – Master station channel control timers	278
Table 161 – Slave station channel control timers	278
Table 162 – Master station parameter dist states	279
Table 163 – Slave station parameter dist states	279
Table 164 – Master station parameter dist state table	279
Table 165 – Slave station parameter dist state table	280
Table 166 – Master station parameter dist functions	281
Table 167 – Slave station parameter dist functions	282
Table 168 – Master station synchronous trigger states.....	282
Table 169 – Slave station synchronous trigger states.....	282
Table 170 – Master station synchronous trigger state table.....	282
Table 171 – Slave station synchronous trigger state table.....	283
Table 172 – Synchronous trigger functions	283
Table 173 – Timer states – Best effort type.....	283
Table 174 – Timer states – Fixed cycle type	283
Table 175 – Timer state table – Best effort type	283
Table 176 – Timer state table – Fixed cycle type	284
Table 177 – Timer variables.....	284
Table 178 – Fixed cycle timer	284
Table 179 – Master station measure transmission states	285
Table 180 – Slave station measure transmission states	285
Table 181 – Master station measure transmission state table	285
Table 182 – Slave station measure transmission state table	287
Table 183 – Master station measure transmission functions.....	287
Table 184 – Slave station measure transmission functions.....	288
Table 185 – Master station measure transmission variables.....	289
Table 186 – Primitives provided by Cyclic Transmission	289
Table 187 – Cyclic Transmission state	290
Table 188 – Cyclic Transmission state table	290
Table 189 – Functions used for Cyclic Transmission.....	290
Table 190 – Variables used in Cyclic Transmission.....	291
Table 191 – Primitives provided by AcyclicTransmission.....	291
Table 192 – Acyclic Transmission state	291
Table 193 – Acyclic Transmission state table.....	291
Table 194 – Functions used for Acyclic Transmission	294
Table 195 – Variables used in Acyclic Transmission	294
Table 196 – Primitives provided by Channel Control	295
Table 197 – Channel Control state.....	295
Table 198 – Channel Control state machine.....	295
Table 199 – Functions used for Channel Control.....	297
Table 200 – Variables used in Channel Control.....	297
Table 201 – Primitives provided by TimeSync Control.....	297

Table 202 – TimeSync Control state	298
Table 203 – TimeSync Control state table	298
Table 204 – Functions used for TimeSync Control	298
Table 205 – Variables used in TimeSync Control	299
Table 206 – Primitives provided by IPTrans Control	299
Table 207 – IPTrans Control state in master station	299
Table 208 – IPTrans Control state table	299
Table 209 – Functions used for IPTrans Control	300
Table 210 – Variables used in IPTrans Control	300
Table 211 – Handler state	300
Table 212 – DOWN state machine	301
Table 213 – INIT state machine	301
Table 214 – RUN state machine	303
Table 215 – Functions used for Handler	304
Table 216 – Variables used for Handler	304
Table 217 – Mapping of type C DMPM service and DL service	305
Table 218 – Destination address for each type C PDU	306
Table 219 – Mapping of type F DMPM service and DL service	307
Table 220 – Primitives provided by DMPM	307
Table 221 – Cyclic Data state	307
Table 222 – DMPM state table	308

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 the IEC 61784-1 series and the IEC 61784-2 series.

IEC 61158-6-23 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:

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

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 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 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 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.

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 <http://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.