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CONTENTS

FOREWORD 7
0 INTRODUCTION 9
0.1 General 9
0.2 Patent disclosure 9
1 Scope 11
1.1 General 11
1.2 Specifications 12
1.3 Conformance 12
2 Normative references 12
3 Terms, definitions, symbols, abbreviated terms and conventions 12
3.1 Referenced terms and definitions 13
3.2 Type 23 specific terms and definitions 14
3.3 Symbols and abbreviated terms 16
3.4 Conventions 17
4 FAL syntax description 19
4.1 FALPDU type C abstract syntax 19
4.2 FALPDU type F abstract syntax 25
4.3 Data type assignments for type C 36
4.4 Data type assignments for type F 37
5 FAL transfer syntax 38
5.1 Encoding rules 38
5.2 FALPDU type C elements encoding 38
5.3 FALPDU type F elements encoding 68
6 Structure of the FAL protocol state machine 102
7 FAL service protocol machine (FSPM) 102
7.1 Overview 102
7.2 FSPM type C 103
7.3 FSPM type F 106
8 Application relationship protocol machine (ARPM) 113
8.1 ARPM type C 113
8.2 ARPM type F 159
9 DLL mapping protocol machine (DMPM) 211
9.1 DMPM type C 211
9.2 DMPM type F 212
Bibliography 213

Figure 1 – Bit description in octets 18
Figure 2 – Structure for memory access information retrieve response 55
Figure 3 – Attribute definitions 56
Figure 4 – Access code definitions 56
Figure 5 – Structure for RUN request 57
Figure 6 – Structure for RUN response 58
Figure 7 – Structure for STOP request 58
Figure 8 – Structure for STOP response 58

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(standards.iteh.ai)
IEC 61158-6-23:2014
https://standards.iteh.ai/catalog/standards/sist/...-iec-61158-6-23-2014

Figure 9 – Structure for batch memory read request 59
Figure 10 – Structure for batch memory read response 59
Figure 11 – Structure for random memory read request 60
Figure 12 – Structure for random memory read response 60
Figure 13 – Structure for batch memory write request 61
Figure 14 – Structure for batch memory write response 61
Figure 15 – Structure for random memory write request 62
Figure 16 – Structure for random memory write response 62
Figure 17 – Relationships between protocol machines 102
Figure 18 – Structure of FSPM C 103
Figure 19 – Structure of FSPM F 106
Figure 20 – Structure of ARPM C 113
Figure 21 – Structure of ARPM F 160
Figure 22 – Structure of type C DMPM 211
Figure 23 – Structure of type F DMPM 212

Table 1 – State machine description elements 18
Table 2 – Description of state machine elements 18
Table 3 – Conventions used in state machines 18
Table 4 – afFType 38
Table 5 – priority 39
Table 6 – portChoice 41
Table 7 – portCheckResult 41
Table 8 – dstPortInfo 41
Table 9 – scanState 42
Table 10 – nodeType 42
Table 11 – loopState 43
Table 12 – Cyclic status 43
Table 13 – Parameter setting mode 44
Table 14 – opState 46
Table 15 – errorState 47
Table 16 – Data type 48
Table 17 – CPW 49
Table 18 – CPWC 49
Table 19 – CPWCR 49
Table 20 – cmParam 49
Table 21 – Details of param area 50
Table 22 – Details of application parameters 50
Table 23 – Details of LB/LW CM area and LB/LW CM additional area 51
Table 24 – Details of LX/LY CM 1 area and LX/LY CM 2 area 51
Table 25 – Destination module flag 53
Table 26 – Command types 54
Table 27 – Access codes of network module memory 56

Withdrawn
iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 61158-6-23:2014

Table 28 – Access codes of controller memory 56
Table 29 – byteValidity 63
Table 30 – afFType 68
Table 31 – dataType 69
Table 32 – varField 69
Table 33 – nodeType 70
Table 34 – ProtocolVerType 71
Table 35 – Link status 74
Table 36 – Port enable/disable specification 75
Table 37 – Cyclic transmission parameter hold status 82
Table 38 – Detailed application operation status 82
Table 39 – Error detection status 82
Table 40 – Slave-specific event reception status 84
Table 41 – dataSupType of dataType (0x07) 86
Table 42 – FieldSpecificTransient opHeader 87
Table 43 – command (dataType: 0x07, dataSubType: 0x0002) 87
Table 44 – subCommand type for each command type 88
Table 45 – Strucure of Deliver node informantion 88
Table 46 – Strucure of Deliver node informantion – message 88
Table 47 – Strucure of Get statistical informantion response 89
Table 48 – Strucure of Acquisition of node details response 89
Table 49 – Execution module specification 92
Table 50 – Command type 93
Table 51 – Cyclic data state table 104
Table 52 – Acyclic data state table 104
Table 53 – Management state table 106
Table 54 – Cyclic data state table 109
Table 55 – Acyclic data state table 109
Table 56 – Management state table 112
Table 57 – Synchronization state table 112
Table 58 – Measurement state table 112
Table 59 – Acyclic transmission state table 113
Table 60 – Acyclic transmission functions 114
Table 61 – Cyclic transmission state table 115
Table 62 – Cyclic transmission functions 119
Table 63 – Connection control state machine – Initial 120
Table 64 – Connection control state machine – Connect 120
Table 65 – Connection control state machine – Scan 122
Table 66 – Connection control state machine – ScanWait 125
Table 67 – Connection control state machine – Collect 127
Table 68 – Connection control state machine – CollectWait 130
Table 69 – Connection control state machine – Select 133
Table 70 – Connection control state machine – TokenStartWait 136

Withdrawn
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IEC STANDARD PREVIEW
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Table 71 – Connection control state machine – LaunchWait 138
Table 72 – Connection control state machine – TokenReleaseWait 141
Table 73 – Connection control state machine – TokenReleased 144
Table 74 – Connection control state machine – TokenWait 149
Table 75 – Connection control state machine – NTNTestMaster 153
Table 76 – Connection control state machine – NTNTestSlave 154
Table 77 – Function list of connection control 154
Table 78 – Common parameter dist state table 154
Table 79 – Function list of connection control 158
Table 80 – Mapping of internal service and acyclic transmission service 159
Table 81 – Acyclic transmission states 160
Table 82 – Acyclic transmission state table 160
Table 83 – Acyclic transmission functions 162
Table 84 – Acyclic transmission variables 162
Table 85 – Cyclic transmission states 163
Table 86 – Cyclic transmission state table 163
Table 87 – Cyclic transmission functions 165
Table 88 – Cyclic transmission variables 165
Table 89 – Master station channel control states 165
Table 90 – Slave station channel control states 166
Table 91 – Master station state table – MasterDown 166
Table 92 – Master station state table – Listen 166
Table 93 – Master station state table – MasterArbitration 168
Table 94 – Master station state table – PrimaryMasterScatterTD 169
Table 95 – Master station state table – PrimaryMasterSettingUp 171
Table 96 – Master station state table – PrimaryMasterHoldToken 173
Table 97 – Master station state table – PrimaryMasterSolicitToken 176
Table 98 – Master station state table – PrimaryMasterInviting 179
Table 99 – Master station state table – MasterWaitTD 180
Table 100 – Master station state table – MasterWaitSetup 182
Table 101 – Master station state table – MasterSolictToken (without Transmission path delay measurement) 183
Table 102 – Master station state table – MasterSolictToken (with Transmission path delay measurement) 185
Table 103 – Master station state table – MasterHoldToken 187
Table 104 – Master station state table – MasterMeasurement (without Transmission path delay measurement function) 189
Table 105 – Master station state table – MasterMeasurement (with Transmission path delay measurement function) 190
Table 106 – Slave station state table – SlaveDown 190
Table 107 – Slave station state table – SlaveWaitTD 190
Table 108 – Slave station state table – SlaveWaitSetup 191
Table 109 – Slave station state table – SlaveSolicitToken (without Transmission path delay measurement) 192

Withdrawn

Table 110 – Slave station state table – SlaveSolicitToken (with Transmission path delay measurement) 194
Table 111 – Slave station state table – SlaveHoldToken 195
Table 112 – Master station channel control functions 198
Table 113 – Slave station channel control functions 199
Table 114 – Master station channel control variables 200
Table 115 – Slave station channel control variables 200
Table 116 – Master station channel control timers 201
Table 117 – Slave station channel control timers 201
Table 118 – Master station parameter dist states 201
Table 119 – Slave station parameter dist states 201
Table 120 – Master station parameter dist state table 202
Table 121 – Slave station parameter dist state table 202
Table 122 – Master station parameter dist functions 204
Table 123 – Slave station parameter dist functions 204
Table 124 – Master station synchronous trigger states 204
Table 125 – Slave station synchronous trigger states 205
Table 126 – Master station synchronous trigger state table 205
Table 127 – Slave station synchronous trigger state table 205
Table 128 – Synchronous trigger functions 205
Table 129 – Timer states – Best effort type 205
Table 130 – Timer states – Fixed cycle type 206
Table 131 – Timer state table – Best effort type 206
Table 132 – Timer state table – Fixed cycle type 206
Table 133 – Timer variables 206
Table 134 – Fixed cycle timer 206
Table 135 – Master station measure transmission states 207
Table 136 – Slave station measure transmission states 207
Table 137 – Master station measure transmission state table 207
Table 138 – Slave station measure transmission state table 208
Table 139 – Master station measure transmission functions 209
Table 140 – Slave station measure transmission functions 210
Table 141 – Master station measure transmission valiables 210
Table 142 – Mapping of type C DMPM service and DL service 211
Table 143 – Destination address for each type C PDU 211
Table 144 – Mapping of type F DMPM service and DL service 212

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-23: Application layer protocol specification – Type 23 elements

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0 INTRODUCTION

0.1 General

This part of IEC 61158 is one of a series produced to facilitate the interconnection of automation system components. It is related to other standards in the set as defined by the "three-layer" fieldbus reference model described in IEC 61158-1:2014.

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 standard 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 implementors 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 standard is concerned, in particular, with the communication and interworking of sensors, effectors and other automation devices. By using this standard together with other standards positioned within the OSI or fieldbus reference models, otherwise incompatible systems may work together in any combination.

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JP 4503678 DE 112006003895.8 KR 10-1024472 CN 201110218295.6 TW I333356	[MEC]	Communication management device, communication device, and communication method
JP 2010-045463 US 12/774377 DE 112006004225.4 KR 10-1024482 CN 201010148761.3 TW 099112461	[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 13/334863 DE 112008004265.9 KR 10-2011-7030535 CN 201210026699.X TW 101108048	[MEC]	Communication management device, communication node, communication system, and data communication method

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JP 2011-128274 US 13/325125 DE 112008004268.3 KR 10-2011-7029114 CN 201210127058.3 TW 101102132	[MEC]	Communication management device, communication device, and communication method
JP 05084916 US 13/142244 DE 112008004245.4 KR 10-2011-7014492 CN 200880132546.5 TW 098100145	[MEC]	Communication management device, communication device, and communication method
JP 2011-518195 US 13/377397 DE 112009004913.3 KR 10-2011-7027858 CN 200980159835.9 TW 098119663	[MEC]	Communication managing apparatus, communication nodes, and data communication method
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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 standard 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 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; and.

The purpose of this standard 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 standard 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

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such object behavior. In addition to these services, some supporting services are also defined in this standard to provide access to the FAL to control certain aspects of its operation.

1.2 Specifications

The principal objective of this standard 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 standard 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 standard. Instead, conformance is achieved through implementation of this application layer protocol specification.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 61158-1:2014, *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, *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*

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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*

3 Terms, definitions, symbols, abbreviated terms and conventions

For the purposes of this document, the following terms, definitions, symbols, abbreviations and conventions apply.

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3.1 Referenced terms and definitions

3.1.1 ISO/IEC 7498-1 terms

For the purposes of this document, the following terms given in ISO/IEC 7498-1 apply:

a) application entity
b) application process
c) application protocol data unit
d) application service element
e) application entity invocation
f) application process invocation
g) application transaction
h) real open system
i) transfer syntax

3.1.2 ISO/IEC 8822 terms

For the purposes of this document, the following terms given in ISO/IEC 8822 apply:

a) abstract syntax
b) presentation context

3.1.3 ISO/IEC 9545 terms

For the purposes of this document, the following terms given in ISO/IEC 9545 apply:

a) application-association
b) application-context
c) application context name
d) application-entity-invocation
e) application-entity-type
f) application-process-invocation
g) application-process-type
h) application-service-element
i) application control service element

3.1.4 ISO/IEC 8824-1 terms

For the purposes of this document, the following terms given in ISO/IEC 8824-1 apply:

a) object identifier
b) type

3.1.5 IEC 61158-1 terms

For the purposes of this document, the following terms given in IEC 61158-1 apply:

a) DLL mapping protocol machine
b) fieldbus application layer
c) FAL service protocol machine
d) protocol data unit

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