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**Industrial communication networks – Fieldbus specifications –
Part 6-25: Application layer protocol specification – Type 25 elements**

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CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	10
1.1 General.....	10
1.2 Specification	11
1.3 Conformance	11
2 Normative references	11
3 Terms, definitions, symbols, abbreviations and conventions	12
3.1 Reference model terms and definitions	12
3.1.1 ISO/IEC 7498-1 terms.....	12
3.1.2 ISO/IEC 8822 terms.....	12
3.1.3 ISO/IEC 9545 terms.....	12
3.1.4 ISO/IEC 8824-1 terms.....	13
3.2 Additional Type 25 terms and definitions.....	13
3.3 Symbols and abbreviations	15
3.4 Conventions.....	16
3.4.1 General conventions.....	16
3.4.2 Conventions for class definitions	16
3.4.3 Conventions for bit description in octets	16
3.4.4 Conventions for state machine descriptions	17
4 FAL syntax description	18
4.1 FAL PDU type S abstract syntax	18
4.1.1 Basic abstract syntax.....	18
4.2 FAL PDU type N abstract syntax	22
4.2.1 Basic abstract syntax.....	22
4.2.2 CyclicData-PDU.....	22
4.2.3 MulticastData-PDU	23
4.2.4 PtoPData-PDU.....	23
4.2.5 Aliveinfo-PDU	23
4.2.6 Aliveinfo6-PDU	23
4.2.7 Inq-PDU	24
4.2.8 Ninq-PDU	24
4.2.9 Reply-PDU	24
4.2.10 RetransEnq-PDU	24
4.2.11 RetransConfirm-PDU	24
4.2.12 RetransNak-PDU	25
4.3 Data type assignments for type S.....	25
4.4 Data type assignments for type N	25
5 FAL transfer syntax	26
5.1 Encoding rules.....	26
5.1.1 Unsigned encoding	26
5.1.2 Octet string encoding.....	27
5.1.3 SEQUENCE encoding.....	27
5.2 FALPDU type S elements encoding.....	27
5.2.1 RCL_header	27
5.2.2 RHE-PDU	28

5.2.3	LCC-PDU	30
5.2.4	LCA-PDU	30
5.2.5	LCN-PDU	31
5.2.6	LNA-PDU	32
5.2.7	SCR-PDU	32
5.2.8	Cyclic_S-PDU	32
5.2.9	Cyclic_header	33
5.2.10	Control-PDU	33
5.2.11	RMTCTL-PDU	33
5.2.12	INFO-PDU	34
5.3	FALPDU type N elements encoding	35
5.3.1	General	35
5.3.2	FALAR-N Header	35
5.3.3	CyclicData-PDU	49
5.3.4	MulticastData-PDU	50
5.3.5	PtoP Data-PDU	50
5.3.6	Aliveinfo-PDU	50
5.3.7	Aliveinfo6-PDU	53
5.3.8	Inq-PDU	54
5.3.9	Ninq-PDU	55
5.3.10	Reply-PDU	55
5.3.11	RetransEnq-PDU	56
5.3.12	RetransConfirm-PDU	56
5.3.13	RetransNak-PDU	57
6	Structure of the FAL protocol state machine	58
7	FAL service protocol machine (FSPM)	58
7.1	Overview	58
7.2	FSPM type S	58
7.2.1	Overview	58
7.2.2	Interface of cyclic communication to FAL users	59
7.2.3	State machine of FSPM	61
7.3	FSPM type N	62
7.3.1	Overview	62
7.3.2	FSPM	63
8	Application relationship protocol machine (ARPM)	65
8.1	ARPM type S	65
8.1.1	Overview	65
8.1.2	Cyclic control	66
8.1.3	Remote control	70
8.1.4	RCL communication control	75
8.1.5	RT communication control	79
8.2	ARPM type N	83
8.2.1	Overview	83
8.2.2	General control	83
8.2.3	Cyclic transmission control	85
8.2.4	Acyclic transmission control	90
8.2.5	RT communication control	105
9	DLL mapping protocol machine (DMPM)	121

9.1	DMPM type S.....	121
9.2	DMPM type N.....	122
9.2.1	General	122
9.2.2	Communication port in transport layer	122
9.2.3	Quality of Service	122
	Bibliography.....	124
	Figure 1 – Bit description in octets	16
	Figure 2 – hd_sa.....	35
	Figure 3 – hd_da.....	36
	Figure 4 – Valid sequence number for reception message	40
	Figure 5 – hd_m_ctl	40
	Figure 6 – Valid reception packet sequence number	44
	Figure 7 – Node-list	55
	Figure 8 – Relationships between protocol machines	58
	Figure 9 – Structure of FSPM type S.....	59
	Figure 10 – Shared memory allocation in type S network	61
	Figure 11 – Structure of FSPM type N.....	63
	Figure 12 – Structure of ARPM type S	66
	Figure 13 – Sequence of cyclic communication	67
	Figure 14 – The primitives for cyclic control	67
	Figure 15 – The primitives for Remote control.....	70
	Figure 16 – The primitives for RCL communication control.....	75
	Figure 17 – The primitives for RT communication control	80
	Figure 18 – Structure of ARPM type N	83
	Figure 19 – Primitives of Cyclic transmission control.....	85
	Figure 20 – Primitives of acyclic transmission control	91
	Figure 21 – DSCP format.....	123
	Figure 22 – IEEE 802.1Q tag frame format	123
	Table 1 – State transition descriptions	17
	Table 2 – Descriptions of state machine elements	17
	Table 3 – Conventions used in state machine	17
	Table 4 – Frame Class.....	27
	Table 5 – DA_STaddress – DA_STaddress.....	27
	Table 6 – DA_MACaddress.....	27
	Table 7 – CMD field format	28
	Table 8 – Send Direction	28
	Table 9 – RHE ReceiveStatus.....	29
	Table 10 – Physical Linkdown.....	29
	Table 11 – RHE_pattern 1~4.....	30
	Table 12 – LCC-Kind	30
	Table 13 – RCL Status.....	31
	Table 14 – hd_h_type	35

Table 15 – Usage of Mgn or Lnn	37
Table 16 – Detailed conditions for sequence number check of reception message	39
Table 17 – Valid bits of hd_m_ctl	40
Table 18 – Specified TCD	41
Table 19 – hd_pkind	42
Table 20 – PDU with an effective hd_pseq	42
Table 21 – Detailed conditions for sequence number check of reception packet (Multicast communication with retransmission).....	44
Table 22 – Detailed conditions for packet sequence number check	45
Table 23 – Relation between message transmission/reception	46
Table 24 – hd_mode	46
Table 25 – Message priority level.....	46
Table 26 – Value of α	47
Table 27 – Example of header information for a UDP message fragmentation.....	47
Table 28 – Example of header information for a TCP message fragmentation	47
Table 29 – inqid_inq_sa value.....	48
Table 30 – inqid_tr_adr value.....	48
Table 31 – inqid_inq_seq value.....	49
Table 32 – Relationship between inqid_id_seq and inqid_tr_adr	49
Table 33 – Type of an alive-message.....	51
Table 34 – Type of an alive-message protocol	51
Table 35 – Time of each al_mode	52
Table 36 – Status change of tasks	52
Table 37 – Change of tasks content.....	52
Table 38 – The threshold of transmission factor.....	60
Table 39 – Example of the traffic control configuration menu	60
Table 40 – Cyclic data state table	61
Table 41 – Acyclic data state table.....	62
Table 42 – Cyclic data state table	64
Table 43 – Acyclic data state table.....	64
Table 44 – Cyclic control state table	68
Table 45 – Cyclic control functions.....	69
Table 46 – Cyclic control variables.....	70
Table 47 – Remote control state table.....	71
Table 48 – Remote control functions	74
Table 49 – Remote control variables	75
Table 50 – RCL communication control state table.....	76
Table 51 – RCL communication control functions	77
Table 52 – RCL communication control variables	79
Table 53 – RT communication control state table	80
Table 54 – RT communication control functions	82
Table 55 – RT communication control variables	82
Table 56 – Cyclic transmission control state table	86

Table 57 – Cyclic transmission control functions	88
Table 58 – Cyclic transmission control variables	90
Table 59 – Acyclic transmission control state table	91
Table 60 – Acyclic transmission control functions	101
Table 61 – Acyclic transmission control variables	104
Table 62 – RT communication control state table	105
Table 63 – RT communication control functions	116
Table 64 – RT communication control variables	120
Table 65 – ARPM to DL mapping	122
Table 66 – Assignment policy of communication ports	122
Table 67 – Default DSCP, IEEE 802.1D and IEEE 802.1Q priority mapping	123

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –**

**Part 6-25: Application layer protocol specification –
Type 25 elements**

FOREWORD

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International Standard IEC 61158-6-25 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

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 parts in 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-25: Application layer protocol specification – Type 25 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 International 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 25 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 document 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 61158-5-25, 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 7498-1) 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 Specification

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 61158-5-25. 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 standard. 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 61158-3-25:2019, *Industrial communication networks – Fieldbus specifications – Part 3-25: Data-link layer service definition – Type 25 elements*

IEC 61158-5-25:2019, *Industrial communication networks – Fieldbus specifications – Part 5-25: Application layer service definition – Type 25 elements*

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

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

ISO/IEC/IEEE 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Standard for Ethernet*

IEEE Std 802.1D, *IEEE Standard for Local and metropolitan area networks – Media access Control (MAC) Bridges*; available at <http://www.ieee.org> [viewed 2018-09-17]

IEEE Std 802.1Q, *IEEE Standard for Local and metropolitan area networks – Bridges and Bridged Networks*; available at <http://www.ieee.org> [viewed 2018-09-17]

IETF RFC 768, *User Datagram Protocol*; available at <http://www.ietf.org> [viewed 2018-09-17]

IETF RFC 791, *Internet Protocol*; available at <http://www.ietf.org> [viewed 2018-09-17]