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PRE-STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 6-22: Application layer protocol specification – Type SNpTYPE elements**

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CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
1.1 General.....	9
1.2 Specifications.....	10
1.3 Conformance.....	10
2 Normative references	10
3 Terms, definitions, abbreviations, symbols and conventions	11
3.1 Referenced terms and definitions	11
3.1.1 ISO/IEC 7498-1 terms	11
3.1.2 ISO/IEC 8822 terms.....	11
3.1.3 ISO/IEC 9545 terms.....	11
3.1.4 ISO/IEC 8824 terms.....	11
3.2 Fieldbus application-layer specific definitions	11
3.3 Abbreviations and symbols.....	14
3.4 Conventions	17
3.4.1 General concept	17
3.4.2 Abstract syntax conventions.....	17
4 Application layer protocol specification.....	18
4.1 Operating principle	18
4.2 Device reference models.....	19
4.2.1 RTFL device reference model.....	19
4.2.2 RTFN device reference model	19
4.3 Application Layer structure	20
5 FAL syntax description	20
5.1 Introduction and coding principles	20
5.2 Data type encoding	20
5.2.1 Overview	20
5.2.2 Transfer syntax for bit sequences	21
5.2.3 Encoding of a Boolean value	21
5.2.4 TimeOfDay	21
5.2.5 TimeDifference	22
5.2.6 Encoding of floating point values	22
5.2.7 Encoding of Integer values	22
5.2.8 Encoding of Unsigned Integer values.....	23
5.2.9 Encoding of an OctetString value.....	24
5.2.10 Encoding of a VisibleString value	24
5.2.11 Encoding of an UnicodeString value	24
5.3 CeS encoding.....	24
5.3.1 Object dictionary	24
5.3.2 SDO	67
5.3.3 Process data write.....	72
5.3.4 Emergency	72
5.3.5 Heartbeat	74
5.4 Standard Ethernet frame communication	74
5.4.1 Overview	74

5.4.2	Send frame request	74
5.5	Management encoding	75
5.5.1	DLL management services	75
5.5.2	Application layer management	75
6	FAL protocol state machines	75
6.1	Overview	75
6.2	Fieldbus service protocol machine (FSPM)	77
6.3	Application relationship protocol machine (ARPM)	77
6.4	DLL mapping protocol machine	77
7	AP-context state machine	77
8	FAL service protocol machine (FSPM)	77
9	Application layer state machine (ALSM)	78
9.1	Description	78
9.2	States	80
9.2.1	Initialization (INIT)	80
9.2.2	ResetApplication (ResAP)	80
9.2.3	ResetCommunication (ResCO)	80
9.2.4	PreOperational (PreOP)	80
9.2.5	Operational (OP)	81
9.2.6	Stopped (ST)	81
9.3	Primitive definitions	81
9.3.1	FAL primitives	81
9.3.2	Primitives exchanged between DLL and ALSM	81
9.3.3	Primitives exchanged between FSPM and ALSM	81
9.4	State table	83
9.5	AL-service forwarding depending on AL-state	84
10	DLL mapping protocol machine (DMPM)	84
10.1	Overview	84
10.2	Primitives exchanged between ALSM and DMPM	84
10.3	Primitives exchanged between DLL and DMPM	89
10.4	ALSM to DLL mapping	91
Figure 1	– RTFL device reference model	19
Figure 2	– RTFN device reference model	20
Figure 3	– Encoding of TimeOfDay value	21
Figure 4	– Encoding of TimeDifference value	22
Figure 5	– Object dictionary addressing schema	25
Figure 6	– Relationships among protocol machines and adjacent layers	76
Figure 7	– ALSM protocol machine	77
Figure 8	– ALSM diagram	79
Table 1	– PDU element definition	17
Table 2	– Object definition	18
Table 3	– Transfer syntax for bit sequences	21
Table 4	– Transfer syntax for Integer data type	23
Table 5	– Transfer syntax for Unsigned data type	23

Table 6 – Object dictionary structure.....	24
Table 7 – Object dictionary object type definitions	25
Table 8 – Basic data type definitions.....	26
Table 9 – Complex data type definition	27
Table 10 – Communication section	28
Table 11 – Device type	30
Table 12 – Error register encoding	30
Table 13 – Error register	30
Table 14 – Object definition template	31
Table 15 – Encoding of event log entries	31
Table 16 – Event log	32
Table 17 – Manufacturer device name	32
Table 18 – Manufacturer HW version	33
Table 19 – Manufacturer SW version	33
Table 20 – CL configuration	34
Table 21 – Time sync IRQ configuration encoding	36
Table 22 – Time sync IRQ configuration	36
Table 23 – Time sync IRQ state	37
Table 24 – Store parameters read information	37
Table 25 – Store parameters	38
Table 26 – Restore parameters read information	39
Table 27 – Restore default parameters	39
Table 28 – Diagnostic information	40
Table 29 – Diagnostic threshold	43
Table 30 – IP address EMCY	45
Table 31 – Inhibit time EMCY	45
Table 32 – Encoding of consumer heartbeat entries	46
Table 33 – Consumer heartbeat list	47
Table 34 – Producer heartbeat parameter	48
Table 35 – Identity object	50
Table 36 – SDO protocol timeout	51
Table 37 – Enable client SDO parameter	52
Table 38 – Enable EMCY	52
Table 39 – PDO timeout tolerance	52
Table 40 – Store EDS	53
Table 41 – Storage format	53
Table 42 – OS command	54
Table 43 – OS command mode	55
Table 44 – OS debugger interface	56
Table 45 – OS prompt	57
Table 46 – Module list	58
Table 47 – Emergency subscriber encoding	58
Table 48 – Emergency subscriber	59

Table 49 – Client SDO parameter encoding	59
Table 50 – Client SDO parameter	60
Table 51 – Receive PDO communication parameter	61
Table 52 – Transmit PDO communication parameter	63
Table 53 – Mapping format	65
Table 54 – Receive PDO mapping parameter.....	65
Table 55 – Transmit PDO mapping parameter	66
Table 56 – Initiate SDO expedited download request	67
Table 57 – Initiate SDO expedited download response	67
Table 58 – Initiate SDO normal download request.....	67
Table 59 – Initiate SDO normal download response	68
Table 60 – SDO download request.....	68
Table 61 – SDO download response	68
Table 62 – Initiate SDO expedited upload request	69
Table 63 – Initiate SDO expedited upload response.....	69
Table 64 – Initiate SDO normal upload response	69
Table 65 – SDO upload request.....	70
Table 66 – SDO upload response	70
Table 67 – SDO abort request	70
Table 68 – SDO abort codes	71
Table 69 – Process data write request via MSC	72
Table 70 – Process data write request via CDC	72
Table 71 – Emergency request	72
Table 72 – Emergency error codes	73
Table 73 – Heartbeat request via MSC	74
Table 74 – Heartbeat request via CDC.....	74
Table 75 – Send frame request.....	74
Table 76 – Application layer management request.....	75
Table 77 – State transitions and management services.....	80
Table 78 – Primitives issued by ALSM to DLL	81
Table 79 – Primitives issued by DLL to ALSM	81
Table 80 – Primitives issued by FSPM to ALSM	81
Table 81 – Primitives issued by ALSM to FSPM	82
Table 82 – ALSM state table	83
Table 83 – Application layer states and communication services.....	84
Table 84 – Primitives issued by ALSM to DMPM	84
Table 85 – Primitives issued by DMPM to ALSM	87
Table 86 – Primitives issued by DMPM to DLL	89
Table 87 – Primitives issued by DLL to DMPM.....	90
Table 88 – ALSM to DLL mapping.....	91

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-22: Application layer protocol specification – Type SNpTYPE elements

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The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
65C/530/PAS	65C/534/RVD

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INTRODUCTION

This PAS contains an additional profile – SNpTYPE – which may be integrated into a future new edition of the IEC 61158-6 series.

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INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-22: Application layer protocol specification – Type SnpTYPE 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 61158-6 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 SnpTYPE 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 part of IEC 61158-6 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 part of IEC 61158-6 is to define the protocol provided to:

- 1) define the wire-representation of the service primitives defined in IEC/PAS 61158-5-22; and
- 2) define the externally visible behavior associated with their transfer.

This part of IEC 61158-6 specifies the protocol of the IEC fieldbus Application Layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498) and the OSI Application Layer Structure (ISO/IEC 9545).

FAL services and protocols are provided by FAL application-entities (AE) contained within the application processes. The FAL AE is composed of a set of object-oriented Application Service Elements (ASEs) and a Layer Management Entity (LME) that manages the AE. The ASEs provide communication services that operate on a set of related application process object (APO) classes. One of the FAL ASEs is a management ASE that provides a common set of services for the management of the instances of FAL classes.

Although these services specify, from the perspective of applications, how request and responses are issued and delivered, they do not include a specification of what the requesting and responding applications are to do with them. That is, the behavioral aspects of the applications are not specified; only a definition of what requests and responses they can send/receive is specified. This permits greater flexibility to the FAL users in standardizing such object behavior. In addition to these services, some supporting services are also defined

in this part of IEC 61158-6 to provide access to the FAL to control certain aspects of its operation.

1.2 Specifications

The principal objective of this part of IEC 61158-6 is to specify the syntax and behavior of the application layer protocol that conveys the application layer services defined in IEC/PAS 61158-5-22.

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 part of IEC 61158-6 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 referenced documents are indispensable for the application 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.

IEC 60559, *Binary floating-point arithmetic for microprocessor systems*

IEC/PAS 61158-3-22, *Industrial communication networks – Fieldbus specifications – Part 3- SNpTYPE: Data-link layer service definition – Type SNpTYPE elements*

IEC/PAS 61158-4-22, *Industrial communication networks – Fieldbus specifications – Part 4- SNpTYPE: Data-link layer protocol specification – Type SNpTYPE elements*

IEC/PAS 61158-5-22, *Industrial communication networks – Fieldbus specifications – Part 5- SNpTYPE: Application layer service definition - Type SNpTYPE elements*

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

ISO/IEC 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

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

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

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

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

3 Terms, definitions, abbreviations, symbols and conventions

For the purposes of this document, the following terms as defined in these publications apply:

3.1 Referenced terms and definitions

3.1.1 ISO/IEC 7498-1 terms

- 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 as defined 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 as defined 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 terms

For the purposes of this document, the following terms as defined in ISO/IEC 8824 apply:

- a) object identifier
- b) type

3.2 Fieldbus application-layer specific definitions

3.2.1

acyclic data

data which is transferred from time to time for dedicated purposes

3.2.2

bit

unit of information consisting of a 1 or a 0. This is the smallest data unit that can be transmitted

3.2.3

cell

synonym for a single DL-segment which uses RTFL communication model

3.2.4

channel

path provided for conveying data

3.2.5

client

object which uses the services of a server by initiating a message to perform a task

3.2.6

communication cycle

fixed time period between which the root device issues empty frames for cyclic communication initiation in which data is transmitted utilizing CDC and MSC

3.2.7

connection

logical binding between two application objects

3.2.8

cycle time

duration of a communication cycle

3.2.9

cyclic

events which repeat in a regular and repetitive manner

3.2.10

cyclic communication

periodic exchange of telegrams

3.2.11

cyclic data

data which is transferred in a regular and repetitive manner for dedicated purposes

3.2.12

cyclic data channel (CDC)

part of one or more frames, which is reserved for cyclic data

3.2.13

data

generic term used to refer to any information carried over a fieldbus

3.2.14

device

physical entity connected to the fieldbus

3.2.15

error

discrepancy between a computed, observed or measured value or condition and the specified or theoretically correct value or condition